Another land-clearing device, the so-called transphibian tactical tree crusher, made its appearance at this time. Like the towed ball and chain experiments, the massive ninty-seven-ton machine proved only marginally effective. General Ploger pointed out the difficulty in deploying such a massive piece of equipment. He noted that for the price of one tree crusher, approximately $300,000, he could buy seven of the proven Rome plows with the tractors. He did, however, accede to the 1st Logistical Command's proposal to evaluate the machine. In March 1967, the logistical command contracted with LeTourneau Corporation of Longview, Texas, for a six-month rental of two tree crushers. The tree crushers arrived at Saigon's Newport in mid-July, and by the end of the month the logistical command's provisional detachment began to clear land around Long Binh Post. During the test period, which lasted to the middle of November, the two crushers used their pusher bars against large trees and used their cleated drums to chew up felled trees and vegetation. Approximately 2,000 acres in the depot and ammunition storage areas were cleared. The crushers did clear all kinds of vegetation averaging 2.1 acres per hour, but both machines spent about half the time in the repair shop.[15]

Following several modifications to alleviate the maintenance problems, the detachment and tree crushers were transferred to Ploger's command to support tactical operations. The detachment, operating under the control of the 93d Construction Battalion, leveled 1,300 acres supporting the 9th Division near the Binh Son Rubber Plantation, thirty-five miles southeast of Saigon. Again the equipment spent too much time in the shop. Fully satisfied that the machine's limitations outweighed the benefits—its downtime, vulnerability to enemy action, and difficulty working in shallow water with mud bottoms of inadequate bearing and where insufficient water depth could not float the crusher free from the suction of the mud—Ploger had the equipment returned to the United States after the lease expired.[16]

Land clearing had proved to be an effective weapon against the enemy, and the planners made preparations for even larger operations in 1968. Open areas along the cleared roads lessened his capability to mount ambushes and reduced the effectiveness of those that did take place. During the month following the clearing operations along Highways 1 and 20 and Route 2, the 11th Armored Cavalry Regiment reported no ambushes where previously many had occurred. Captured documents revealed that land clearing had a major

[15] Quarterly Hist Rpts, 1 Apr–30 Jun 67, MACDC, p. II-6, and 1 Jul–30 Sep 67, MACDC, p. II-5; Ploger, *Army Engineers*, pp. 98–99; Hay, *Tactical and Materiel Innovations*, p. 87; ORLLs, 1 May–31 Jul 67, 1st Log Cmd, 15 Aug 67, p. 112, 1 Aug–31 Oct 67, 1st Log Cmd, 11 Nov 67, pp. 113–14, and 1 Nov 67–31 Jan 68, 1st Log Cmd, 14 Feb 68, pp. 89–90, all in Historians files, CMH; Ltr, Ploger to CG, USARV, 15 Mar 67, sub: LeTourneau Transphibian Crusher, Ploger Papers, CMH; Interv, Bower with Ploger, 8 Aug 67, pp. 51–53; Interv, Sowell with Ploger, 16 Nov 78, sec. 9, pp. 11–12.

[16] Quarterly Hist Rpt, 1 Oct–31 Dec 67, MACDC, pp. II-5 to II-6; Hay, *Tactical and Materiel Innovations*, p. 87; ORLL, 1 Nov 67–31 Jan 68, 93d Engr Bn, 14 Feb 68, p. 10, Historians files, CMH; "Tree Crusher Tested in Vietnam," *The Army Engineer in Vietnam*, U.S. Army Engineer School Pamphlet (Fort Belvoir, Va.: n.d.), pp. 3–5; Interv, Bower with Ploger, 8 Aug 67, pp. 52–53.

The limitations of the transphibian tactical tree crusher outweighed its benefits, and the equipment was returned to the United States after the lease expired.

influence on the enemy, who regarded these operations as a threat to his plans. Newly cleared strips along roads reduced the need for convoy escorts and also became an effective barrier countering the enemy's free movement of troops and supplies. In the wake of these successful operations, II Field Force headquarters shifted priority in III Corps to area clearing (some 400,000 acres), whereas I Field Force continued to use its land-clearing team in II Corps mainly for road clearing.[17]

In late September, General Westmoreland ordered III Marine Amphibious Force to prepare for large-scale land-clearing operations in I Corps. The Directorate of Construction helped the marines with planning details, and by the end of the year ten Rome plow blades for the marines' bulldozers arrived in Da Nang. After considering operational requirements, III Marine Amphibious Force asked for two Army land-clearing teams to support future operations, but MACV suggested that the best source of land-clearing capability would be for that command to develop its own organic teams. The Construction Directorate also studied possible use of Rome plows by the South Vietnamese to support pacification in selected provinces. It soon became apparent, however, that Saigon's military engineers had limited operating and maintenance capabilities and could not be expected to join the land-clearing effort.[18]

The arrival of the southwest monsoon in late spring placed heavy demands on the combat engineers to keep the deteriorating ground supply

[17] Technical Report, Paul Bunyon Land Clearing Teams, incl. 9, tab B, p. 4, OCE Liaison Officer Trip Rpt no. 9.

[18] Ibid., pp. 4–5; Quarterly Hist Rpt, 1 Oct–31 Dec 67, MACDC, pp. II-6 to II-7.

routes open, while simultaneously clearing back the encroaching vegetation. As the 1st Division moved operations northward to the Cambodian border, the 1st Engineer Battalion used hand labor and unsophisticated expedients to rebuild and maintain Highway 13 and Rolling Stone Road between Ben Cat and Phuoc Vinh. Sometimes the troops had to blow stopped-up culverts and build short fixed span bridges over the water-filled gaps and timber roadways along muddy sections of the road. Several fixed spans were lifted intact to work sites by CH–47 helicopters, thus saving days of working time. During BLUEFIELD II, Company A also built the superstructure of a twenty-foot timber trestle bridge airlifted to a prepared site by a CH–47. Northwest of Saigon, the 65th Engineer Battalion and the 79th Engineer Group's 588th Engineer Combat Battalion supported the 25th Division by keeping supply routes open between Tay Ninh and Dau Tieng, Tri Bi, Prek Klok, and the Cu Chi area. The 9th Division's 15th Engineer Battalion and other engineer units continued to work on the roads to the east, southeast, and southwest of Saigon. Work proceeded along Highways 1 and 20 as far as the II Corps boundary, Highway 15 and Route 2 toward the coast and the port of Vung Tau, and Highway 4 into the delta region. The roads were open, but no one could say for how long.[19]

The heavy rains also played havoc at the austere, hastily built forward airstrips, especially at Special Forces camps near the Cambodian border. In May, the 79th Group's 168th Engineer Battalion airlifted troops to the Tong Le Chon airstrip west of An Loc to make repairs to the runway, turnaround, and parking apron. In June, the battalion deployed a task force to Chi Linh northeast of Saigon to repair the airstrip and enlarge the parking apron. By August, the 168th also extended the existing C–130 runway and added a turnaround and parking apron at Dong Xoai and began to upgrade the airfield at Loc Ninh to C–130 standards. Next, men and equipment boarded CH–54 and CH–47 helicopters and flew to the Bu Dop Special Forces camp to begin upgrading the runway for C–123 aircraft.[20]

A variety of work continued in support of pacification in the arc of provinces around Saigon. Operation ENTERPRISE, similar in scope to LAM SON 67, began in February in Long An Province southwest of the city and lasted throughout the year. While the 9th Division's 3d Brigade and South Vietnamese territorial units kept up the pressure on the Viet Cong, the 86th Engineer Battalion built several operating bases and artillery firing pads on rice paddies. What set this work apart was the need to import large quantities of rock from the Vung Tau quarry. The 34th Group arranged with transportation units for twenty-one barges, which carried the rock to the base camp sites in the delta. At Tan An, the engineers pushed up the rice paddy mud and

[19] ORLL, 1 Aug–31 Oct 67, II FFV, p. 28; 1st Engr Bn Hist, vol. 1, pp. III-22 to III-26; ORLL, 1 Aug–31 Oct 67, 34th Engr Gp, pp. 8–9; Engineer Support of Combat Operations, 1 Jul–1 Sep 67, incl. 9, p. 4, OCE Liaison Officer Trip Rpt no. 9; Galloway, "Essayons," pp. 238, 243–44.

[20] Engineer Support of Combat Operations, 1 May–1 Jul 67, incl. 7, pp. 5–6, OCE Liaison Officer Trip Rpt no. 8; Engineer Support of Combat Operations, 1 Jul–1 Sep 67, incl. 9, pp. 4–5, OCE Liaison Officer Trip Rpt no. 9; Interv, Webber with Manning, 18 Mar 68, p. 2.

topped it off with fill and rock to provide the necessary areas for cantonments and hardstands for a brigade base. This work also included the building of a C–123 airfield and heliport. Similar work took place at Ben Phuoc, a forward operating base for a mechanized infantry battalion, and Ben Luc, a forward support base for a composite artillery battalion. Near Saigon, the 199th Light Infantry Brigade and South Vietnamese units continued Operation FAIRFAX, a long-term pacification effort to keep the Viet Cong from reestablishing influence in the area. The 199th's 87th Engineer Company split its efforts between supporting operations in the field and improving the brigade's base camp at Long Binh.[21]

Operational Control Revisited

Increased emphasis on land clearing and road work illustrated the steady shift from base construction to combat support missions in 1967. Brig. Gen. Curtis W. Chapman's 20th Engineer Brigade, which arrived in August to take control of the three engineer groups in III and IV Corps, reported a twofold increase in tactical missions from August through September. By 20 September, 24 percent of the brigade's total productive effort was being devoted to combat support. In II Corps, a shift of combat operations toward the border brought forth similar patterns of engineer support.[22]

With tactical missions on the rise, the old operational control question resurfaced with a vengeance in early 1967. It was raised by General Palmer, who had taken over as commander of II Field Force in March and who wasted no time in requesting a change in who would command the nondivisional engineers. General Engler turned him down, noting that the field force had never used more than one and a half battalions at any time in tactical operations. General Westmoreland agreed.[23]

In late spring, General Engler returned to the United States and General Palmer took over as U.S. Army, Vietnam, deputy commander. Palmer soon took steps to formalize a more precise means of identifying engineer support for the field forces. He asked that the field force commanders and the Engineer Command draw up agreements identifying certain engineer units to be on call for duty in tactical operations. On 17 May, Ploger signed a memorandum of understanding with Maj. Gen. Frederick C. Weyand, who moved up from the 25th Division to command II Field Force. Brig. Gen. Charles M. Duke, the 18th Brigade commander, prepared a similar agreement with General Larsen of I Field Force.[24]

[21] Engineer Support of Combat Operations, 1 May–1 Jul 67, incl. 7, p. 4, and Miscellaneous Detailed Discussion, incl. 9, p. 6, OCE Liaison Officer Trip Rpt no. 8; ORLLs, 1 May–31 Jul 67, 34th Engr Gp, p. 7, and 1 Aug–31 Oct 67, 34th Engr Gp, p. 5; Galloway, "Essayons," p. 245.

[22] Engineer Support of Combat Operations, 1 Jul–1 Sep 67, incl. 9, p. 1, OCE Liaison Officer Trip Rpt no. 9; Galloway, "Essayons," pp. 221, 243.

[23] Ploger, *Army Engineers*, p. 141; Msg, Westmoreland MAC 3653 to Palmer, 17 Apr 67, Westmoreland Message files, CMH.

[24] Ploger, *Army Engineers*, p. 141.

Because Ploger foresaw few changes caused by the agreements to the operations of his command, he did not resist entering such arrangements. The agreement with Weyand put two battalions of Colonel Gelini's 79th Engineer Group, the 168th and the 588th, under II Field Force's operational control effective 6 June. The Engineer Command also earmarked three separate companies (the 100th Float Bridge, the 500th Panel Bridge, and the 362d Light Equipment) for the field force. Although II Field Force now had formal authority during combat operations, the 79th Group retained responsibility for all formal construction projects assigned these units. Ploger could not help but note that by August the units reported no significant change in their day-to-day operations.[25]

The memorandum of understanding drawn up between the 18th Engineer Brigade and I Field Force did not go into effect. The memorandum called for General Duke's brigade to provide one engineer battalion or equivalent force from each group and such float and panel bridge and light equipment company forces as required. Larsen, however, expressed his satisfaction with the support given by the 18th Brigade and preferred to keep the same kind of relationship that existed before General Palmer's request. He saw little advantage in the new arrangements because designating only certain engineer units could reduce the flexibility previously held by his commanders. Considering the larger geographic area of II Corps, it seemed unwise to have to move designated units a considerable distance, while bypassing units located in the area of an operation. Area support continued, with operational support missions retaining precedence over all other engineer support requirements. When General Larsen prepared to turn over his command in July, he wrote to General Duke commending the cooperation and support given by the 18th Engineer Brigade. He said the brigade's efforts "surpassed all expectations, even to the point that operational control of engineer elements by I Field Force was never required."[26]

Soon after succeeding General Ploger in August, General Duke, now with two stars, became aware that General Weyand still had some reservations concerning the responsiveness of support given by Engineer Command. On 16 September, he wrote to Weyand reaffirming that the 20th Engineer Brigade's units would respond immediately to operational support requirements. In urgent cases, Duke recommended that the field force commander have his staff engineer bypass the brigade headquarters and "transmit the requirement directly to the engineer group—or even the battalion—headquarters immediately concerned." He stressed that all routine

[25] Ibid.; Interv, Bower with Ploger, 8 Aug 67, p. 24; Rpt of Visit to Various Headquarters in Vietnam, 9–23 Jul 67, incl. 6, pp. 4–5, OCE Liaison Officer Trip Rpt no. 8. The memorandum of understanding is at tab L.

[26] Ploger, *Army Engineers*, p. 141; Interv, Bower with Ploger, 8 Aug 67, p. 24; Rpt of Visit to Various Headquarters in Vietnam, 9–23 Jul 67, incl. 6, p. 4, OCE Liaison Officer Trip Rpt no. 8. The memorandum of understanding is at tab K. Also Rpt of Visit to Various Headquarters in Vietnam, 15–30 Sep 67, incl. 7, p. 2, OCE Liaison Officer Trip Rpt no. 9. General Larsen's letter is at tab A.

or planned requirements would continue to be processed through the 20th Engineer Brigade.[27]

Ten days later, Duke met with Maj. Gen. George S. Eckhardt, the deputy commanding general of II Field Force, to discuss again the matter of operational control. According to Eckhardt, the operational support requirements had increased to such a degree, including responsibilities for rural development and the training of Vietnamese Army troops, that an entire group could be kept fully occupied. He then asked for operational control of a group headquarters plus all the combat battalions, light equipment companies, and bridge companies in the 20th Brigade. Since the field force had other units placed under its operational control to carry out its requirements, it seemed only natural to place the engineers in the same status. This new and enlarged request surprised Duke considering the evident success of past operations. He could not agree to such a request unless II Field Force accepted responsibility for the construction projects assigned to these units. Eckhardt stated that these conditions were unacceptable, suggesting that field force responsibility for combat operations would be incompatible with taking on construction projects outside the tactical realm.[28]

Since the two generals could not reach a new agreement, the procedure outlined in Duke's letter to General Weyand remained in effect. General Ploger later wrote that engineer units carried out operational support missions "with the ease and timeliness that made any change in the tactical arrangements seem unnecessary." He maintained that neither the support for tactical operations nor the progress on the base development program suffered appreciably. If more engineer units were available, he might have seen his way to place more units under the operational control of the field forces.[29]

The lack of further agreements did not deter engineer support of combat operations. In fact, this support increased. The Engineer Command reported that between 1 September and 15 November approximately 20 percent of its productive effort was devoted to operational support. The two brigades and all six groups reported increases. For example, the 45th Group in II Corps, with three combat and two construction battalions and several separate companies, calculated that 70 percent of its effort included land clearing, road and airfield maintenance and upgrading, minesweeping, firebase construction, and river crossings.[30] (*Chart 4*)

On the III Corps Border

On 29 September, the 1st Infantry Division launched Operation SHENANDOAH II. The operation had a two-pronged purpose, combining

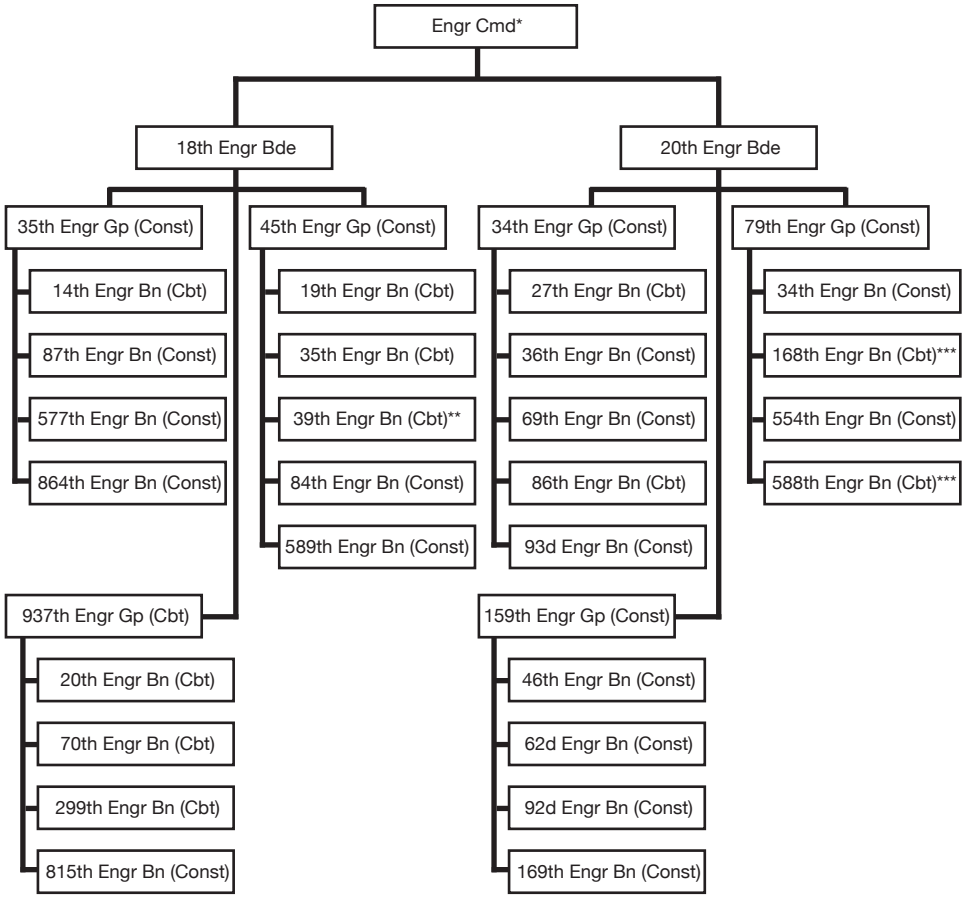
[27] Ploger, *Army Engineers*, pp. 142–43; Rpt of Visit to Various Headquarters in Vietnam, 15–30 Sep 67, incl. 7, p. 2, OCE Liaison Officer Trip Rpt no. 9. General Duke's letter is at tab B.

[28] Ploger, *Army Engineers*, p. 143; Rpt of Visit to Various Headquarters in Vietnam, 15–30 Sep 67, incl. 7, p. 2, OCE Liaison Officer Trip Rpt no. 9.

[29] Ibid.

[30] Rpt of Visit to Various Headquarters in Vietnam, 22 Nov–13 Dec 67, incl. 9, p. 1, OCE Liaison Officer Trip Rpt no. 10, 19 Jan 68, p. 7, OCE Hist Ofc.

CHART 4—ORGANIZATION OF U.S. ARMY ENGINEER COMMAND, VIETNAM, NOVEMBER 1967



* Engineer Command remained a provisional organization, lacking the approval of DoD.

** Operational Control (OPCON), Americal Division
*** OPCON, II Field Force

Const = Construction
Cbt = Combat

Source: Ploger, *Army Engineers*, p.135

search-and-destroy missions to inflict maximum casualties upon the newly arrived North Vietnamese forces in III Corps and roadwork, which included maintenance and upgrading and land clearing. The area of operation reached out from the division's base camp at Lai Khe approximately nineteen miles to the north, and west to the edge of the Michelin Rubber Plantation. While a mechanized infantry battalion from the 1st Brigade swept an area north of Lai Khe, the 3d Brigade began securing Route 240 between Ben Cat to the edge of the rubber plantation. Next, Rome plows began to push back the jungle about a little over one hundred yards on each side of the road. Simultaneously, the

During Operation SHENANDOAH*, the 1st Engineer Battalion supported the movement of the division's armored personnel carriers by erecting tactical bridging such as this armored vehicle launched bridge.*

1st Engineer Battalion started to reopen the road, by then reduced to little more than a footpath because of enemy obstacles and jungle overgrowth.[31]

Most of the 1st Engineer Battalion moved to the area of operations. Companies B and C worked along Route 240, upgrading the road and cutting down 100-foot-tall trees with explosives, and encountering resistance along the way. On 13 October, North Vietnamese troops ambushed a Company C column by setting off a command-detonated mine and firing small arms. The engineers returned fire and continued on their way after the enemy faded away. Four days later, Company C gained some vengeance by uncovering and destroying a ten-ton rice cache. Meanwhile, Companies A and D airlifted precut timber trestle bridges and men to worksites, installing the twenty-foot spans across gaps in the road. Together, the 1st Engineer Battalion with the help of the 168th Engineer Battalion's 27th Land Clearing Team cleared nearly 1,000 acres of dense jungle. They also cleared areas for five firebases, allowing 105-mm. howitzers to cover the division's western tactical area of responsibility. Since the rainy season continued throughout the campaign, the 1st Engineer Battalion again used timbers to build a corduroy base along the impassible muddy sections of the road. The battalion then topped off the road

[31] ORLL, 1 Aug–31 Oct 67, II FFV, p. 29. For more on the SHENANDOAH operation, see AAR, Opn SHENANDOAH II, 1st Inf Div, 12 Apr 68, Historians files, CMH; MacGarrigle, *Taking the Offensive*, pp. 347–49.

with over 700 five-ton dump truckloads of laterite and rock. All this work was accomplished in two weeks and enabled the 1st Division to penetrate one more enemy sanctuary. Although the division soon left the area, the message was clear. Allied forces could return at a moment's notice.[32]

Enemy forces gave little resistance during the initial stage of SHENANDOAH, but in October they turned on their tormentors and launched a series of attacks on South Vietnamese bases near the Cambodian border. It became obvious to General Westmoreland that the North Vietnamese had shifted efforts to the border areas of II and III Corps and were caught while building staging areas and base camps. He claimed that the enemy hoped to achieve important psychological victories to divert allied attention from the urban areas and I Corps and to offset the inauguration of the newly elected Thieu and Ky government. On 4 October, the 1st Division's mechanized infantry battalion came under attack six miles southwest of Chon Thanh. Two days later, an infantry battalion that moved into the area also came under attack. On the seventeenth, elements of another U.S. infantry battalion were ambushed eight and a half miles southwest of Chon Thanh. Friendly artillery and air strikes helped to beat off a Viet Cong regiment, but the enemy's heavy use of small arms and automatic weapons took a heavy toll on the American battalion.[33]

The first border battle began early in the morning of 27 October near the village of Song Be. North Vietnamese forces assaulted a South Vietnamese infantry battalion, but the defenders repulsed every assault and inflicted heavy losses on the attackers. Much the same happened two days later at Loc Ninh, where a Viet Cong regiment struck the district town and a nearby rubber plantation eight miles south of the border. Phase II of SHENANDOAH started when U.S. air power and infantry units went to the aid of the South Vietnamese. Battalions of the 1st Division launched airmobile assaults, swept adjacent rubber plantations, and repelled attacks on night defensive positions. By the time the enemy broke off the battle on 8 November, he had suffered nearly 1,000 killed. Operation SHENANDOAH II ended on 19 November.[34]

The 1st Engineer Battalion's major effort during the operation took place on supply routes north of Lai Khe. Following the national election, enemy forces had sabotaged Highway 13 to the point it could no longer support the division's supply convoys to its Quan Loi base just to the east of An Loc. On 17 October, Company A moved by fixed-wing aircraft from Phuoc Vinh to Quan Loi where it began to build sections of culvert for the road work to start on 1 November. The day before the enemy, in a carefully planned act of sabotage, blew three large craters along a two-mile section of the road,

[32] 1st Engr Bn Hist, vol. 1, p. III-26; *Always First, 1967–1968*, "Opn SHENANDOAH."

[33] ORLL, 1 Aug–31 Oct 67, II FFV, pp. 29–30; Westmoreland, *A Soldier Reports*, p. 288; CHECO Rpt, PACAF, 15 May 68, sub: VC Offensives in III Corps, Oct–Dec 67, p. 3, copy in Historians files, CMH. For more on these actions, see MacGarrigle, *Taking the Offensive*, pp. 349–61.

[34] ORLLs, 1 Aug–31 Oct 67, II FFV, app. 30–33, and 1 Nov 67–31 Jan 68, II FFV, pp. 24–25; Westmoreland, *A Soldier Reports*, pp. 287–88; Interv, Webber with Manning, 10 Apr 68, p. 2.

approximately halfway between sources of rock needed for the repairs. On 1 November, two platoons of Company B moved by CH–47 Chinooks from Di An to a site midway between Chon Thanh and An Loc to build a seventy-foot timber trestle bridge. The platoons, using the proven techniques of preparing abutments with demolitions and precutting and airlifting timber to the bridge site, completed the planned two-day project on the first day. With the early completion of the bridge, the battalion headquarters changed Company C's mission to load rock at Lai Khe that night and to move at first light. On the second day, Company A continued to move south, filling craters and repairing damaged culverts. Company C collected additional dump trucks at Chon Thanh, crossed over the new bridge, and pushed north filling craters and potholes along the way. Upon linking, both units joined forces to fill the remaining crater by 1400. A half hour later, the main supply column moved north, one day ahead of schedule. Work along Highway 13—filling potholes, installing new culverts, grading, and clearing trees along the road—continued throughout the operation.[35]

Keeping the heavily worn and damaged roads open continued after SHENANDOAH II. The 1st Division carried out operations near Highway 13 and built hasty night defensive positions and firebases along the road. Convoys moved more freely, and civilian traffic and economic activity increased. The Viet Cong and North Vietnamese, who once moved men and supplies along the road and crossed it at will, launched a series of night assaults against the American bases. During one attack on 10 December, elements of a North Vietnamese regiment struck a battalion-size task force five miles southwest of An Loc. U.S. ground fire and tactical air support drove the attackers back. Meanwhile, work along the key north–south road included a new bypass around the town of Ben Cat by Company C, 1st Engineer Battalion.[36]

In late November, the enemy again switched targets in a pattern of off-and-on offensives and attacked two South Vietnamese outposts in Phuoc Long Province not far from the Cambodian border. Just after midnight on 29 November, a reinforced Viet Cong battalion attacked the district headquarters compound at Bo Duc. Mortar rounds also struck the Bu Dop Civilian Irregular Defense Group–Special Forces camp a little more than a mile to the north. Friendly air and artillery strikes helped to oust the enemy from the district compound, and South Vietnamese and U.S. reinforcements moved by helicopters to the area. After setting up its night defensive position, a 1st Division infantry battalion soon came under heavy attack. Again firepower beat off the attackers. The 1st Division deployed more infantry battalions to probe the area. Several light encounters followed, and on the night of 8 December a battalion beat off another battalion-size attack. For the remainder of the month, one U.S. infantry battalion remained around Bu Dop while another moved to Song Be, where it carried out reconnaissance in force operations.[37]

[35] AAR, Opn SHENANDOAH II, 1st Engr Bn, 10 Dec 67, pp. 2–7, Historians files, CMH.
[36] ORLL, 1 Nov 67–31 Jan 68, II FFV, p. 37; *Always First, 1967–1968*, "Opn SHENANDOAH."
[37] ORLL, 1 Nov 67–31 Jan 68, II FFV, pp. 36–37.

With Bu Dop under threat, the engineers found themselves again repairing bridges, this time along Highway 14A. The enemy had severed the only road link between the Bu Dop Special Forces camp and the MACV advisory compound in Bu Duc. Company E, 1st Engineer Battalion, received a mission to replace a damaged Eiffel bridge that cluttered the stream crossing. The bridge company's engineers literally threaded the stiffeners of a helicopter-borne fifty-four-foot fixed span bridge, the longest bridge of this type installed by the unit, between the trusses of the older French bridge. Within a week, saboteurs destroyed the new bridge, but the determined engineers again replaced it.[38]

Summer Battles in the Highlands

In the western highlands of II Corps, General Westmoreland planned to continue screening the Cambodian border with light forces, introducing reinforcements only when large North Vietnamese units entered South Vietnam to mount offensive operations. Throughout the southwest or summer monsoon from April to October 1967, General Peers' 4th Infantry Division carried out this mission in an operation called FRANCIS MARION. Moving back to the flat rolling hills of western Pleiku Province south of the Se San River, the 1st and 2d Brigades tried to stifle large enemy movements through the area. This resulted in a series of border brushes and heavy contacts, and by late May MACV dispatched one of its strategic reserve forces, the 173d Airborne Brigade, to reinforce the hard-pressed division.[39]

Then in June, a growing threat developed farther north in Kontum Province. As a countermeasure, General Peers deployed two of the 173d's battalions to the Dak To 2 airstrip and Special Forces camp, a few miles southwest of the town of Dak To. This operation, initially dubbed GREELEY, which began on 17 June and lasted through 11 October, ranged over a rugged wilderness covered by thick double- and triple-canopy jungle. Thick bamboo fifteen to twenty feet high impeded movement in the only open areas of the mountainous rain forest. Within a few days, an airborne company clashed with a North Vietnamese Army infantry battalion and suffered heavy casualties in a violent battle. A week later, the rest of the 173d Airborne Brigade, a South Vietnamese airborne task force, and the 3d Brigade, 1st Cavalry Division, moved to Kontum City. The next few months involved grueling marches in western Kontum Province, where U.S. forces suffered mounting losses against firmly entrenched North Vietnamese units. Throughout July, the cavalry brigade systematically searched the area north of Kontum City. In August, a South Vietnamese infantry battalion moved to the area northwest of the province capital to stave off an impending attack at Dak Seang Special Forces camp north of Dak To. The battalion got hung up trying to assault a fortified hilltop, and two South Vietnamese airborne battalions moved to the field of battle. A few days later, a battalion threw back five mass attacks on its night defensive perimeter.

[38] *Always First, 1967–1968*, "Opn SHENANDOAH" and "Company E."

[39] Sharp and Westmoreland, *Report*, pp. 133, 153; ORLLs, 1 May–31 Jul 67, I FFV, pp. 9–11, and 1 Aug–31 Oct 67, I FFV, p. 10.

When the enemy withdrew to the west after suffering heavy losses, the South Vietnamese found three hilltops forming a regimental-size base area, many bunkers, and an elaborate mockup of the Dak Seang camp.[40]

The fighting at Dak Seang and mortar attacks on Dak Pek Special Forces camp to the north gave credence to a possible attack on Dak Pek. A sweep of the area by the 173d Airborne Brigade and Civilian Irregular Defense Group elements located a few bunkers but not the enemy. This operation may have thwarted an attack on Dak Pek. On 20 and 21 August, the two airborne battalions were moved by helicopters to the Dak To area. Further sweeps by U.S. and South Vietnamese forces failed to find the enemy. Meanwhile, most of the reinforcements had deployed elsewhere: the 1st Cavalry Division's brigade to the coast, the South Vietnamese airborne units to their home base near Saigon, and the bulk of the 173d Airborne Brigade to coastal Tuy Hoa. The remaining battalion of the 173d continued to sweep the area northeast of Dak To until 11 October when Operation GREELEY ended. The 4th Division's border operations resumed the following day under the name of Operation MACARTHUR.[41]

During Operation FRANCIS MARION, the 4th Division's 4th Engineer Battalion sent Companies A and B to the field to support the 1st and 2d Brigades, respectively. In turn, the companies usually doled out platoons to the infantry battalions and squads to infantry companies. The engineers cleared landing zones, swept roads for mines, improved forward base camps, destroyed enemy bunkers, and built firebases and their access roads. Company A, augmented with two Rome plows, built over ten miles of fair-weather tactical road to firebases near the Cambodian border. The plows also cleared the jungle for fields of fire around the bases. CH–54 helicopters airlifted smaller D6B bulldozers to hilltop outposts for clearing tasks. Two of the bulldozers under the direction of Company B also cleared eight hundred acres for the resettlement of ten thousand Montagnards. The engineer battalion's tankdozers and armored personnel carrier flamethrowers provided security.[42]

Other elements of the 4th Engineer Battalion moved forward to support the operation. Company D, which continued to do some base development work, built a road linking the Plei Me Special Forces camp to Highway 14. Company E stood by, ready to haul bridging and cargo. Headquarters Company augmented the companies in the field with equipment and security elements from the flame-throwing platoon. In addition, the battalion commander, Lt. Col. Norman G. Delbridge, organized an armored task force. This ad hoc organization used the tankdozer from each of the four line companies and armored personnel carriers from the flame-throwing platoon to accompany work parties and convoys. Initially the task force protected convoys hauling sand between Dragon Mountain base camp and Kontum City. Delbridge envisioned deploying the

[40] ORLLs, 1 May–31 Jul 67, I FFV, pp. 10–11, and 1 Aug–31 Oct 67, I FFV, p. 10–11. For more on GREELEY, see AAR, Opn GREELEY, 16 Dec 67, 4th Inf Div, Historians files, CMH; and MacGarrigle, *Taking the Offensive*, pp. 299–304, 309.

[41] ORLL, 1 Aug-31 Oct 67, I FFV, p. 10–11; AAR, Opn GREELEY, 4th Inf Div, pp. 10–11.

[42] ORLLs, 1 Feb–30 Apr 67, 4th Inf Div, 15 Jun 67, pp. 29–30, and 1 May–31 Jul 67, 4th Inf Div, 20 Aug 67, pp. 37–38, both in Historians files, CMH; Engineer Support of Combat Operations, incl. 8, p. 4, OCE Liaison Officer Trip Rpt no. 7, 2 Jun 67.

armored force to guard engineers working on roads and bridge sites, such as the road to Plei Me.[43]

During GREELEY, the 4th Engineer Battalion built an M4T6 floating bridge across the Dak Ta Tan River on Route 512 just west of the town of Tan Canh. Route 512 led to the two airstrips serving Dak To: Dak To 1 (or Old Dak To) and Dak To 2. Companies D and E worked together on the night of 17 June to build a 120-foot span across the river. Pre-inflated floats were carried forward by Company E's bridge trucks to a point near the bridge site. The floats were then lifted by CH–47 helicopters to the bridge site and placed in the river ready for assembly. Despite working at night and occasional mortar attacks, the engineers completed the bridge in twelve hours and it was ready for traffic by morning.[44]

Additional engineer support for the two operations came from the 937th Engineer Group. The 20th Engineer Battalion dedicated most of its efforts to operational support missions in the area west of Pleiku. Major tasks included upgrading forward airfields at Duc Co and Buon Blech and improving Highway 19 and other supply routes before the monsoon arrived. Then the battalion shifted the road work to Route 509 and a connecting road to Highway 19. In August, the 18th Engineer Brigade deployed the 35th Land Clearing Team to Pleiku. Under the direction of the 20th and 299th Engineer Battalions, detachments of Rome plows started clearing vegetation along the road between Highway 19 and Route 509 and Highway 19 between Mang Yang Pass and Pleiku. The 299th Engineer Battalion divided work between base facilities at Pleiku and Highway 14 from Pleiku to Dak To. The battalion also maintained nearby roads and made emergency repairs to the rain-damaged T17 airstrip at Polei Kleng. Companies B and D also supported Operation GREELEY at Dak To and Kontum, respectively, building helicopter revetments and temporary ammunition storage dumps.[45]

Ambushes remained a constant risk to the engineers while working and traveling these roads. The 299th Engineer Battalion was ambushed four times between November 1967 and January 1968. One of these ambushes that took place on 11 November 1967 along Highway 14 north of Kontum was especially brutal. A platoon from Company B, 299th Engineer Battalion, was en route to continue repairs to a previously damaged timber trestle bridge when it was ambushed by some fifty to eighty Viet Cong, who attacked with grenades, rockets, automatic weapons, and mortars. Sfc. John K. McDermott was in the lead vehicle when a recoilless rifle round exploded against his truck, but he managed to keep control of the vehicle and drove it off the road to allow the rest of the convoy to get by. McDermott then jumped from the truck and directed his men to safety. He killed two Viet Cong attackers before two more leaped at him bringing him to the ground. After struggling free, McDermott

[43] ORLLs, 1 Feb–31 Apr 67, 4th Inf Div, p. 30, and 1 May–31 Jul 67, 4th Inf Div, p. 38.

[44] ORLL, 1 May–31 Jul 67, 4th Inf Div, p. 38.

[45] Galloway, "Essayons," pp. 206, 208–09; Engineer Support of Combat Operations, 1 May–1 Jul 67, incl. 7, pp. 2–3, OCE Liaison Officer Trip Rpt no. 8; Engineer Support of Combat Operations, 1 Jul–1 Sep 67, incl. 9, p. 2, OCE Liaison Officer Trip Rpt no. 9; Engineer Support of Combat Operations, 1 Sep–15 Nov 67, incl. 9, p. 1, OCE Liaison Officer Trip Rpt no. 10.

wounded two of the attackers and proceeded under heavy fire to drive several trucks out of the ambush site. Despite intensive enemy rifle fire and exploding grenades, he rallied his men in a counterattack. Meanwhile, S. Sgt. Frank J. Walker, a squad leader who was riding behind McDermott when the ambush occurred, leapt from his truck, which was also hit, and charged into enemy machine gun fire, knocking out several Viet Cong positions. These heroic actions allowed the convoy to move out of danger. Within a half hour, reinforcements arrived and drove off the enemy. Six engineers died and four were wounded in the encounter. Nine Viet Cong were confirmed dead. Extensive damage was made to one 5-ton dump truck, one 3/4-ton truck, and one jeep. General Westmoreland later awarded the Distinguished Service Cross for valor to both sergeants in a ceremony at Pleiku.[46]

The 937th Group's other two battalions, the 70th Combat and the 815th Construction, worked in and around the Pleiku bases. The 815th relieved the 299th of many base development projects in the area. By midsummer, the construction battalion was hard at work on a heliport, a petroleum products storage area, the road network for the Pleiku evacuation hospital, and many smaller projects. In October, Col. Robert C. Marshall moved his fourth battalion, the 70th Engineer Battalion, from An Khe to Pleiku. Until then, the battalion had spent twenty-six months transforming the An Khe base camp into a major city and completing the only Army-built concrete runway in country. The 70th took over the 299th's responsibility for Highway 14 from Pleiku to Kontum and a share of construction projects in the area.[47]

Marshall had to contend with several shortcomings. All three of his combat battalions were charged with at least some base development work. Some of these projects, which required more engineering and vertical construction talent not found in the tables of organization for a combat group, were highly sophisticated. Shortages of electrical and plumbing supplies held up projects, and shortages of repair parts for equipment inherited from RMK-BRJ resulted in excessive downtime. Although the group took steps to cope with expected problems brought on by the monsoon, some projects had to be discontinued or delayed. The rains delayed paving at Camp Enari and completing site preparations at the Duc Co airfield. The improved roads stood up well during the monsoon season, but those that were not all weather turned into quagmires. The 937's engineer battalions struggled to keep Route 512, an alternate six-mile fair-weather route to Dak To, open to convoys. Since the 299th Engineer Battalion lacked sufficient rock for the road, wheeled vehicles endured considerable wear and tear trying to move through the muck. Ground mobility in the area was lost. For approximately twenty-eight days from September through October, the only movement to Dak To was by air. The battalion went so far as to recommend that tactical commanders conduct

[46] ORLL, 1 Nov 67–31 Jan 68, 299th Engr Bn, 31 Jan 68, pp. 7–8, 12, Historians files, CMH; "Two 299th Sergeants Awarded DSCs," *Castle Courier*, 10 February 1968.

[47] Galloway, "Essayons," pp. 209–10; ORLL, 1 Aug–31 Oct 67, 937th Engr Gp, pp. 11–12.

operations in the highlands during the monsoon season only when there were all-weather roads in the area.[48]

Dak To

In November, a few days after the battles at Loc Ninh and Song Be in III Corps, a third border battle erupted near Dak To. General Westmoreland later reported that the fierce fighting along the northwestern corner of II Corps was the pivotal battle of the last quarter of 1967. Here, too, North Vietnamese and Viet Cong forces took advantage of nearby sanctuaries in Cambodia and Laos and short supply lines. Just a few miles from the borders, Dak To stood astride a natural infiltration route into Kontum and Pleiku Provinces. Generally, Dak To consisted of the town and district headquarters on Highway 14, the short Dak To 1 airstrip a few miles to the southwest along Route 512, and the C–130 capable Dak To 2 airstrip and Special Forces camp farther west on Route 512. Dak To 2 lay on a valley floor close to a river, surrounded on all sides by peaks and ridges varying between 2,600 to 4,300 feet high. Tall, thick trees, up to a hundred feet tall and topped with double and triple canopies, covered the steep slopes.[49]

When the 4th Division began Operation MacArthur in mid-October, the sweeps throughout the region produced only sporadic contact with the enemy, mostly in Pleiku Province. This soon changed. Near the end of the month, allied intelligence revealed that a North Vietnamese division controlling five regiments was moving northeastward into adjacent Kontum Province. The 4th Division deployed the 1st Brigade headquarters and an infantry battalion by air to Dak To. There they reinforced a battalion in the area guarding a work site at Ben Het, where construction had begun on an airstrip and preliminary clearing for a proposed Civilian Irregular Defense Group camp. Also at Ben Het, Westmoreland planned to place 175-mm. guns that could reach the enemy's base camps inside Cambodia and southern Laos. In early November, a defecting enemy soldier divulged that the North Vietnamese division intended to capture the Dak To camp and Ben Het. Sharp contacts with enemy patrols confirmed the earlier intelligence. General Rosson, who had replaced General Larsen at I Field Force in August, began to airlift more U.S. and South Vietnamese units to the airstrip at the Dak To Special Forces camp. Before the enemy could launch his attack, the 4th Division had deployed a brigade of three battalions, including a battalion from the 173d Airborne Brigade. The division then set up firebases and began to assault the enemy's forward bases.[50]

The twenty-two or so days of fighting around Dak To became one of the largest battles of the war to date and the largest in the highlands. Seldom

[48] Galloway, "Essayons," p. 211; ORLLs, 1 Aug–31 Oct 67, 937th Engr Gp, pp. 7, 13–14, 1 Aug–31 Oct 67, 20th Engr Bn, pp. 1–2, and 1 Aug–31 Oct 67, 299th Engr Bn, p. 12.

[49] Sharp and Westmoreland, *Report*, pp. 138–39; Westmoreland, *A Soldier Reports*, p. 289; MACV History, 1967, vol. 1, p. 378. For more on enemy activity and terrain, see AAR, Battle for Dak To, 4th Inf Div, 3 Jan 68, pp. 2–5, Historians files, CMH.

[50] Sharp and Westmoreland, *Report*, p. 139; Westmoreland, *A Soldier Reports*, p. 288; AAR, Battle for Dak To, 4th Inf Div, Peers cover ltr, pp. 1–2, main rpt, pp. 1–2, 6–8.

during the war did enemy units stand their ground, but here they stubbornly defended heavily fortified trenches along the ridges and peaks of the mountains surrounding Dak To. The enemy had carefully selected this region as the site for his campaign. Hill 875 stood as a dominating terrain feature in relative isolation and beyond the range of fixed artillery positions. It appeared the enemy intended to draw the guns to temporary positions and also lure allied troops deep into the battlefield, pinning and wearing them down, and eventually annihilating them in a major battle. Initially, the 4th Division's 1st Brigade sent one infantry battalion to occupy the ridgeline running east to west south of the airstrip. A second battalion deployed southwest of Dak To, and the airborne battalion moved west to Ben Het to set up a firebase. During the first week of November, the brigade encountered enemy units moving to preselected and sometimes previously prepared positions. These fierce encounters prompted General Creighton W. Abrams—Westmoreland was in Washington at the time—to let General Rosson deploy the 173d Airborne Brigade with two more battalions to the Ben Het area. In a series of helicopter assault landings, the paratroopers and infantrymen moved from ridge to ridge, where they faced strong resistance from the entrenched enemy. Meanwhile, South Vietnamese troops took up blocking positions east of Dak To. They were joined by additional infantry and airborne troops to the north and northeast initially to block and then attack a North Vietnamese regiment moving down a valley from the northeast. To complete the ring around Dak To, the 1st Brigade, 1st Cavalry Division, deployed south and southeast to block possible attacks and intercept any withdrawing enemy. To the west of Ben Het, a North Vietnamese regiment began to cover the withdrawal to the southeast of two hard-hit regiments. This resulted in a violent five-day struggle beginning on 17 November for Hill 875, which involved two battalions of the 173d Airborne Brigade and a battalion from the 4th Division. When a battalion of the 173d found a large enemy force entrenched on the slopes and suffered moderately heavy casualties trying to reach the peak, the brigade commander quickly replaced it with another battalion. The hill was taken following the heaviest concentration of tactical air and artillery on any single terrain feature in the II Corps area. Northeast of Dak To, South Vietnamese forces inflicted heavy losses on the enemy in a fierce two-day battle.[51]

By the beginning of December, it became obvious that the U.S. and the South Vietnamese forces had the upper hand in the battle for the highlands.

[51] AAR, Battle for Dak To, 4th Inf Div, Peers cover ltr, pp. 1–2, main rpt, pp. 8–15. After action reports prepared by the 1st Brigade, 4th Infantry Division; 1st Brigade, 1st Cavalry Division; and the 173d Airborne Brigade are also in this report as inclosures 6, 7, and 8. Published accounts of the hill battles collectively known as Dak To are contained in Berry, *Sky Soldiers*, pp. 89–125; Edward F. Murphy, *Dak To* (Novato, Calif.: Presidio Press, 1993); and Shelby L. Stanton, *The Rise and Fall of an American Army: U.S. Ground Forces in Vietnam, 1965–1973* (Novato, Calif.: Presidio Press, 1985), pp. 168–78. For the opponent's view of the battle, see *Luc Luong Vu Trang Nhan Dan Tay Nguyen Trong Khang Chien Chong My Cuu Nuoc* [*The People's Armed Forces of the Western Highlands During the War of National Salvation Against the Americans*] (Hanoi: Nha Xuat Ban Quan Doi Nhan Dan [People's Army Publishing House]), 1980, pp. 56–69, copy in CMH (hereafter cited as *Western Highlands*).

During the fighting at Dak To, strong enemy defenses on Hill 875 included trenches.

Before the battle ended, the allies had temporarily reinforced to a strength of three U.S. brigades that included nine battalions and six South Vietnamese battalions. Massive B–52 and tactical air strikes, using targets located by long-range reconnaissance patrols, supported the friendly forces. In the heavy fighting throughout November, four enemy regiments lost 1,600 men and were virtually destroyed. General Westmoreland described the Dak To fight as "an engagement exceeding in numbers, enemy losses, and ferocity even the Ia Drang Valley Campaign of 1965." The allied attacks drove the enemy back into Laos and Cambodia and nullified his ability to stage major operations in the Central Highlands, at least for the time being. The fighting also caused heavy losses to the 4th Division and the 173d Airborne Brigade. The Americans lost nearly 300 killed and over 1,000 wounded. South Vietnamese casualties included nearly 100 killed and over 200 wounded.[52]

Throughout Operation MacArthur and the fighting around Dak To, engineer troops kept up a high pitch of supporting missions. Elements of the 4th Engineer Battalion, mainly Company A, supported the 1st Brigade, 4th Division; most of Company A, 8th Engineer Battalion, accompanied the 1st Cavalry Division's brigade; and the 173d Engineer Company supported the 173d Airborne Brigade headquarters and three of its battalions in the area. (The brigade had increased to four airborne infantry battalions with the arrival of the 3d Battalion, 503d Infantry, in October.) The 937th Engineer Group supported the campaign by building bridges and maintaining roads and airfields while simultaneously carrying out other tasks in the western highlands. The group's 299th Engineer Battalion bolstered tactical units in the Dak To and Kontum areas. Elements of the 20th and 70th Engineer Battalions, taking advantage of the approaching dry season, helped by working on roads leading into the area and nearby airfields.[53]

Again the organic engineers supporting the three combined arms brigades were parceled out to the infantry battalions and companies. Company A, 4th Engineer Battalion, provided a platoon to each of the three battalions of the 1st Brigade, 4th Division. The platoon headquarters remained in the battalion firebases, with the squads often accompanying the infantry companies. Work varied from clearing landing zones and firebases to helping the infantry set up defensive positions and laying barbed wire. Small D6B bulldozers airlifted by CH–54s sped up the clearing of six firebases. Demolitions, including the preferred C4 plastic type, TNT, and the XM37 Demolition Kit, helped speed up the clearing of heavy timber, bamboo, and brush. When the infantry companies went on operations, the engineer squads did demolition tasks and used mine detectors to help locate buried weapons and ammunition. Enemy soldiers, however, took steps to bury their caches deeper than nine to twelve inches, too deep for effective use by the detectors. The 173d Engineer Company followed different procedures. Two-man demolition teams were attached to each infantry

[52] Quoted in Sharp and Westmoreland, *Report*, p. 139. See also Westmoreland, *A Soldier Reports*, pp. 289–90; AAR, Battle for Dak To, 4th Inf Div, main rpt, pp. 16, 20–21, 32–35.

[53] AAR, Battle for Dak To, 4th Inf Div, main rpt, pp. 25–30; ORLL, 1 Nov 67–31 Jan 68, 937th Engr Gp, pp. 7–8.

company, with a noncommissioned officer remaining at the infantry battalion headquarters to control the teams and advise the staff. The rest of the company remained with the brigade, working in the base camp areas at Dak To 1 and Dak To 2 and dispatching troops on specific missions. Company A, 8th Engineer Battalion, deployed two platoons with the 1st Cavalry Division's 1st Brigade, with each platoon directly supporting an infantry battalion.[54]

Lt. Col. Domingo I. Aguilar, who had taken command of the 299th Engineer Battalion in mid-October, moved his forward command post to the airfield at Dak To 1. There the bulk of the intelligence, operations, supply, and maintenance and equipment elements coordinated and carried out their own supporting missions. The S–4 section's water purification teams provided the bulk of water for units in the Dak To area. These were supplemented by smaller water purification units of the 4th Engineer Battalion at Dak To 2 and the 173d Engineer Company at Ben Het. Aguilar's S–4 also arranged for the transportation of the heavy volume of construction materials required for the battalion's projects. Fleets of tractors and lowboy trailers from the battalion and from units of the 937th and 45th Engineer Groups hauled construction materials, particularly airfield matting. The maintenance section modified two D6B bulldozers allowing them to be broken down into two pieces, one with the tracks, chassis, and blade, the other with the engine and body. These were lifted by CH–54s to clear the jungle for artillery emplacements, ammunition storage areas, helicopter landing zones, and fields of fire.[55]

During the battle of Dak To, the 299th and its attached 15th Light Equipment Company provided general engineering support, and at various times took on direct-support missions for the three combat brigades. Company A continued to upgrade Route 512 between Dak To and the Highway 14 intersection in the town of Tan Canh. At the Dak To 1 airstrip, then only capable of handling C–7A Caribous on its 1,500-foot dirt runway, troops began to extend the runway to 2,300 feet. Support for the 173d Airborne Brigade at its Dak To forward bases included excavating holes for three tactical operations centers, building revetments for fuel bladders, and clearing fields of fire. Company B, located near the Kontum airfield, directed its efforts to maintaining Highway 14 from Kontum to Dak To, improving Route 511 to the west, and improving the airfield. With two sections of the 35th Land Clearing Team under its operational control, the company cleared about one hundred yards of jungle back on both sides of the road. Company B also built helicopter revetments and expanded ammunition storage for elements of the 1st Cavalry Division and the 173d Airborne Brigade. Earlier, Company C had moved to Ben Het on 22 October to build a C–7A airfield with provision for later expansion for C–130 transports. The company also began preparations for a Special Forces camp and stood ready to support 4th Division and 173d Airborne Brigade units in the area. The 937th Group furnished a section of the Rome plow platoon to clear vegetation around the Dak To 2 airfield and Special Forces camp and

[54] AAR, Battle for Dak To, 4th Inf Div, main rpt, pp. 29–30, and incl. 6, 7, and 8.

[55] AAR, Battle for Dak To, 4th Inf Div, main rpt, p. 25; AAR, Battle of Dak To/Opn MacArthur, 299th Engr Bn, 10 Dec 67, pp. 2–3, 10, Historians files, CMH.

east along Route 512 toward the intersection with Highway 14 at Tan Canh. While the Rome plows cleared both sides of the road back about one hundred yards, Company C graded the road and ditches and placed culvert. At Dak To 2, Company D supported combat units, worked on its section of Route 512 to Ben Het, and maintained the C–130 airfield.[56]

Enemy attacks on the forward bases and supply routes also kept the 299th busy. On the morning of 15 November, a mortar attack at Dak To 2 destroyed two of the three C–130s on the parking apron. In the late afternoon, another mortar attack destroyed the ammunition storage area. Two days later, Company D started hauling fill to build an expedient taxiway that served as a bypass to the damaged aircraft. A team of engineers topped off the earthen ramp with a dust-proofing treatment and peneprime, completing the job on the nineteenth. Meanwhile, other troops from Companies A and D built a new five-cell ammunition storage area, finishing this task on 28 November. To keep the supply roads open, the 299th also installed culvert bypasses next to the new bridges. The enemy tried to disrupt traffic by repeatedly attacking the spans. For example, on the night of 7 November sappers blew a bridge and its bypass along Highway 14. Company B immediately dispatched a platoon from Kontum and reopened the bypass by 1330 and within three days replaced the decking on the bridge.[57]

The 4th Engineer Battalion and the 937th Engineer Group weathered the demands of the operation with some diversions from regular tasks. Some confusion did arise concerning priority of work at the growing Dak To base camp. The 4th Division's after action report noted that equipment time was lost because of inadequate or incorrect work. An appointment of a base commander and a board composed of representatives of major units, the report stated, could have resolved this problem. When the 4th Engineer Battalion needed help, Lt. Col. Emmett C. Lee Jr., who replaced Delbridge in July, could call on Colonel Marshall's 937th Engineer Group. Marshall also reinforced his battalions. On 17 November, he placed one company from the 70th Engineer Battalion under the operational control of the 299th. Company C moved to Dak To and started to build a panel bridge over the Dak Poko River, replacing the 4th Engineer Battalion's M4T6 float bridge. The new Bailey bridge (a 240-foot double-single) was opened to traffic on 15 December. During its stay at Dak To, Company C also furnished dump trucks and front loaders, repaired two aircraft revetments, and took on some combat support missions for infantry and artillery units in the area. Meanwhile, the 70th's Company A continued to upgrade Route 509 west of Pleiku to a one-way fair-weather road. To the east, Company D kept open Highway 19 to the 937th Group's eastern boundary at Mang Yang Pass. The 20th Engineer Battalion kept two companies, A and D, and elements of the 584th Light Equipment Company working along Highways 14 and 19 west of Pleiku. In late October, despite the many base development projects at Pleiku, the 20th also shifted a platoon

[56] AAR, Battle for Dak To, 4th Inf Div, main rpt, pp. 25–29; AAR, Battle of Dak To/Opn MacArthur, 299th Engr Bn, pp. 2–8.

[57] AAR, Battle for Dak To, 4th Inf Div, main rpt, pp. 26–28; AAR, Battle of Dak To/Opn MacArthur, 299th Engr Bn, pp. 2, 4–8.

from Company C south to Buon Blech. The forty-man unit supported the 4th Division's 2d Brigade by upgrading the T17 airstrip to M8A1 matting and improving the firebase. On 2 November, another platoon from Company C interrupted base development work to move south to Phu Nhon airstrip to repair its damaged T17 membrane surface and subgrade.[58]

Although battles raged along the border and intelligence showed massive enemy troop movements still taking place, General Westmoreland in December 1967 believed the military situation in South Vietnam was turning in the allied favor. The South Vietnamese government succeeded in holding national elections. A new coordinated pacification program was under way. The protective arc around major cities expanded, and more U.S. troops arrived, allowing operations to shift to the remote border regions. When summoned to Washington by President Johnson in November, Westmoreland effused his most optimistic assessment of the war. "It is significant," he told the National Press Club, "that the enemy has not won a major battle in more than a year. In general, he can fight his large forces only at the edges of his sanctuaries. . . . His guerrilla force is declining at a steady rate. Morale problems are developing within his ranks."[59]

Though remaining heavily committed to completing the base infrastructure, the Army engineers' support to the combat forces increased with military operations. To support the flow of troops and supplies to these more remote areas, combat engineers pushed ahead on road and airfield work and cleared landing zones. Planners now considered the Rome plows used in clearing areas and along supply routes as a tactical weapon. Although the demand for combat engineers had increased, Generals Ploger and Duke managed to keep control of the bulk of engineer troops, parceling out units as needs arose.

General Westmoreland and his intelligence chief, Brig. Gen. Phillip B. Davidson, concluded that the border battles were North Vietnamese failures. Davidson later wrote that General Vo Nguyen Giap paid a bloody price for the tactical lessons that he and his staff learned to avoid direct attacks on American positions. Giap apparently learned this lesson well. During the attacks of the Tet offensive in late January 1968, the North Vietnamese and their Viet Cong allies carefully avoided American combat units, concentrating instead on South Vietnamese forces and some U.S. military headquarters. If Giap had hoped to draw U.S. units and command attention to the peripheries of South Vietnam in a series of diversionary battles, he failed. The U.S. forces' strategic mobility permitted them to move to the borders, smash Giap's attacks, and redeploy back to the interior in a mobile reserve posture. The enemy must have realized the futility of these attacks. One Viet Cong colonel who defected in 1968 characterized the "border battles" as "useless and bloody."[60]

[58] ORLLs, 1 Nov 67–31 Jan 68, 937th Engr Gp, pp. 7–8, 1 Nov 67–31 Jan 68, 70th Engr Bn, p. 4, and 1 Nov 67–31 Jan 68, 20th Engr Bn, pp. 1–4, 9–10; AAR, Battle for Dak To, main rpt, 4th Inf Div, pp. 29, 55–56; AAR, Battle of Dak To/Opn MacArthur, 299th Engr Bn, p. 8.

[59] Quoted in William M. Hammond, *Public Affairs: The Military and the Media, 1962–1968*, United States Army in Vietnam (Washington, D.C.: U.S. Army Center of Military History, 1988), p. 334.

[60] Quoted in Phillip B. Davidson, *Vietnam at War*: *The History, 1946–1975* (Novato, Calif.: Presidio Press, 1988), p. 469.

PART THREE
Changing Course

11

Tet, January–March 1968

In early 1968, the war reached a critical stage when Hanoi launched its Tet offensive throughout South Vietnam. The allies had suspected that heavy attacks were in the offing, but they only began to realize the scope and schedule of the offensive when the assaults began just after midnight on 30 January, coinciding with the start of the Vietnamese Tet celebrations ushering in the lunar New Year. By the next day, fighting erupted almost everywhere, as the Viet Cong and North Vietnamese attacked 36 of 44 provincial capitals and 64 of 242 district towns, as well as 5 of 6 of South Vietnam's autonomous cities, among them Hue and Saigon. Local force units and sappers spearheaded the assaults and attempted to hold their designated objectives until reinforcements could arrive in strength from outside the cities. Political cadres accompanied the assault groups with the intent, in vain as it turned out, to coax the local population into civil rebellion. The fighting at Khe Sanh, Hue, and Saigon was especially vicious, but throughout the country heavy rocket and mortar fire and demolition charges caused damage to airfields, logistical facilities, and supply routes. And while the South Vietnamese government and its forces constituted the prime enemy target, American units were swept into the turmoil.[1]

Defending the Coast

The earliest attacks took place in the coastal cities of II Corps. At 0035 on 30 January, only a half hour into the Vietnamese New Year, mortar rounds landed near the South Vietnamese Navy Training Center in Nha Trang. At 0410, two Viet Cong battalions attacked Qui Nhon. Cam Ranh Bay experienced its first major threat when sappers swam into the bay and set off a demolition charge on a tanker, leaving it with a diamond-shaped hole above the water line. Within two days, the enemy attacked major population centers in nine of the corps' twelve provinces. Highway 19 was cut just west of Qui Nhon, as were roads from Cam Ranh Bay to Da Lat and Ban Me Thuot. Heavy fighting at Da Lat, Ban Me Thuot, and Kontum shut down the airfields in all three towns.[2] (*Map 23*)

[1] For background on the Tet offensive, see Sharp and Westmoreland, *Report*, pp. 157–88; Westmoreland, *A Soldier Reports*, pp. 310–49; Davidson, *Vietnam at War*, pp. 473–74; and, for the best general account, Don Oberdorfer, *Tet!* (Garden City, N.Y.: Doubleday, 1971).

[2] Westmoreland, *A Soldier Reports*, p. 322; Bowers, *Tactical Airlift*, p. 322; ORLL, 1 Feb–30 Apr 68, U.S. Army Support Cmd, Cam Ranh Bay, n.d., p. 6, Historians files, CMH. For more on the attacks in II Corps, see ORLL, 1 Feb–30 Apr 68, I FFV, 15 May 68, pp. 11–14, Historians files, CMH; MACV History, 1968, vol. 1, p. 386, vol. 2, pp. 889–92; Col. Hoang Ngoc Lung, *The*


NORTH VIETNAM
DEMARCATION LINE
SOUTH CHINA SEA
Tchepone
Khe Sanh
Quang Tri
Hue
Savannakhet
Mekong R
I CTZ
Da Nang
Cu Lao Cham
Saravane
THAILAND
LAOS
Tam Ky
Chu Lai
Cu Lao Re
Paksé
Quang Ngai
Attopeu
Dak To
Kontum
Pleiku
An Khe
Qui Nhon
Stung Treng
Hau Bon
CAMBODIA
II CTZ
Tuy Hoa
Ban Me Thuot
Kratie
Ninh Hoa
Nha Trang
Snuol
Mekong R
Da Lat
Cam Ranh
An Loc
Phan Rang
PHNOM PENH
Tay Ninh
III CTZ
Svay Rieng
Bien Hoa
Phu Cuong
Xuan Loc
Long Binh
Phan Thiet
SAIGON
Chau Phu
Moc Hoa
Tan An
Phuoc Le
Dao Phu Qui
Go Cong
Sa Dec
My Tho
Vinh Long
Ben Tre
Rach Gia
Can Tho
Phu Vinh
SOUTH CHINA SEA
Gulf of Thailand
IV CTZ
Soc Trang
Bac Lieu
Ca Mau
Con Son
TET OFFENSIVE
1968
Engagement
0
100 Miles
0
100 Kilometers

MAP 23

The fighting in the Qui Nhon area lasted from 30 January well into February and was typical of the allied experience in coastal II Corps. Before the attack on Qui Nhon, South Vietnamese forces had uncovered local Viet Cong hideouts and captured several cadre and prerecorded tapes to be used following the seizure of the radio station. Expecting an attack, the province chief announced a ban on fireworks, which was ignored by some people, and a curfew. Despite these precautions, a Viet Cong sapper battalion and a local force battalion slipped into the city, some of the insurgents disguised as South Vietnamese soldiers. They seized and briefly controlled the radio station, freed the Viet Cong captives, and occupied the railway station. The South Vietnamese regrouped and with the help of troops from the South Korean Capital Division ousted the attackers. The counterattack, however, destroyed the radio station and damaged the train station's workshop, including a new General Electric locomotive, and other buildings in town.[3]

Since the Viet Cong's main objectives in Qui Nhon were South Vietnamese facilities, the attackers initially bypassed the Americans unless they happened to be in the way. At daybreak on 30 January, three employees of Pacific Architects and Engineers traveling to work in a company jeep passed near the radio station. The Viet Cong opened fire killing all three. In addition, seven U.S. soldiers died and several were wounded in Qui Nhon, including three soldiers who also drove by the radio station during the fighting.[4]

Army engineer units in the Qui Nhon area immediately took up arms to help defend U.S. installations. Just before the offensive, the 45th Engineer Group deployed a provisional infantry platoon from the 35th Engineer Battalion to guard RMK-BRJ's quarry and asphalt plant near Phu Cat. When the 35th received orders to head for I Corps, the security mission transferred to a platoon from the 523d Port Construction Company. The engineers assumed additional infantry duties when the U.S. Army Support Command, Qui Nhon, set in motion a rear area protection plan, which included mobile reaction forces drawn from the 45th Group. Within days of the Tet attacks, the group commander, Col. George W. Fink, ordered one company from the 84th Engineer Construction Battalion to hold the high ground west of the city and one from the 589th Engineer Construction Battalion to move into Qui Nhon proper and secure the airfield. Even so, the Viet Cong continued to attack. On 3 and 13 February, rockets struck fuel storage tanks near the camp of the 84th Battalion west of town, leaving holes but no other damage. On 3 February, a squad of sappers infiltrated the camp itself, and the engineers lost two killed and two wounded. A second attack occurred on the twenty-sixth, along with an assault on a nearby South Vietnamese ammunition depot. This time the

General Offensives of 1968–69, Indochina Monographs (Washington, D.C.: U.S. Army Center of Military History, 1981), pp. 49–51; and Lt. Col. Phan Van Son and Maj. Le Van Duong, eds., *The Viet Cong Tet Offensive, 1968*, trans. J5/Joint General Staff Translation Board (Saigon: Printing and Publications Center, Republic of Vietnam Armed Forces [RVNAF], 1969), pp. 359–424, copy in CMH.

[3] Lung, *General Offensives of 1968–69*, pp. 50–51; Son and Duong, eds., *Viet Cong Tet Offensive, 1968*, pp. 381–92.

[4] PA&E History, Jan–Jun 1968, p. 30; Son and Duong, eds., *Viet Cong Tet Offensive, 1968*, p. 388.

engineers killed two sappers without suffering any casualties. Meanwhile, at the 84th Battalion's Phu Tai quarry, a mortar attack on 11 February resulted in the construction battalion's third combat death.[5]

Viet Cong attacks on the roads leading out of Qui Nhon caused additional hazards for the engineers. Several convoys to Pleiku and Landing Zone ENGLISH were ambushed. With the departure of the 35th Engineer Battalion to I Corps, the 84th Engineer Battalion assumed responsibility for all of Highway 1 between Cu Mong Pass south of the city and Bong Son to the north. Five bridges required immediate repair, and sniper fire wounded sixteen engineers working along the way. Farther north along the dangerous stretch to Duc Pho, the 19th Engineer Battalion had to repair five bridges destroyed by fire, two destroyed by demolitions, and three more damaged by sapper attacks. The sappers also destroyed thirty-seven culverts using 100 to 200 pounds of explosives or artillery rounds. The battalion reported 255 contacts with enemy forces, who fired on the engineers in ninety-four separate incidents. Minesweep teams and work parties were caught in thirteen well-planned ambushes. In all, the 19th Engineer Battalion and attached units suffered seven killed and eighty-eight wounded. The 589th Engineer Battalion faced similar problems along Highway 19 to An Khe. When sappers destroyed two spans over the Phu Phong River, a little over four miles east of Binh Khe on the night of 27 February, Company C built a 160-foot panel bridge over a wrecked span and reopened the road to traffic by 1600 the following day. The next night, the company reinforced the span to carry heavier traffic. Another panel bridge was built downstream to allow two-way traffic along the busy road. This second crossing later served as a bypass when the engineers began to reconstruct the permanent bridge. The repaired bridge, consisting of a new timber pile pier, steel beams, and timber decking, opened to traffic on 10 April. Company D cleared mines and improved the road from the base of Mang Yang Pass eastward to An Khe. When the company finished repairing a large hole blown in one of the bridge's concrete decks, it began fixing three spans of another badly damaged bridge. Despite the enemy's efforts, the engineers quickly reopened the main roads and kept them open.[6]

By mid-March, Col. John A. Hughes Jr. had moved his 35th Engineer Group from Cam Ranh Bay to the 45th Group's small cantonment at Qui Nhon. This relocation was prompted by the impending move of the 45th Group to I Corps to take charge of engineer units slated to support Army troops deploying there. The move to Qui Nhon allowed Hughes and his 35th Group headquarters better control of operations in an area of responsibility that had more than doubled in size. Hughes also inherited three battalions

[5] MFR, 21 Feb 92, sub: Author's Recollections, 45th Engr Gp, p. 2; ORLLs, 1 Feb–30 Apr 68, 45th Engr Gp, 30 Apr 68, pp. 4, 8–9, 1 Feb–30 Apr 68, 84th Engr Bn, 14 May 68, pp. 3–4, and 1 Feb–30 Apr 68, 589th Engr Bn, 15 May 68, p. 5, all in Historians files, CMH; Interv, Maj Paul B. Webber, 26th Mil Hist Det, with Lt Col James F. Fraser, CO, 84th Engr Bn, 22 Feb 68, pp. 1, 8, VNIT 108, CMH.

[6] ORLLs, 1 Feb–30 Apr 68, 84th Engr Bn, p. 4, 1 Feb–30 Apr 68, 19th Engr Bn, 30 Apr 68, pp. 2–4, Historians files, CMH; 1 Feb–30 Apr 68, 589th Engr Bn, pp. 7–8, 10; and 1 Feb–30 Apr 68, 1st Log Cmd, p. 70.

Before and during the Tet offensive, the Viet Cong consistently attacked bridges like this one burnt along Highway 1 north of Qui Nhon.

(the 19th, 84th, and 589th) and several separate companies, making his the largest engineer group in Vietnam. It now consisted of 6 battalions, 9 separate companies, and 7 detachments, nearly 7,000 troops. Since the 14th and 35th Engineer Battalions were slated to move north with the 45th Group, Hughes faced the task of dividing the vast area among the remaining battalions to carry out tasks formerly assigned to eight battalions.[7]

Fortunately, most of the vast logistical complex and highway improvements in the Qui Nhon area were nearing completion. The 35th Group could concentrate on extending road improvements and operational support during the coastal dry season. The 19th Engineer Battalion, using crushed rock from the Tam Quan quarry that began operations on 11 January, steadily added a base course along Highway 1 between Bong Son and Mo Duc in southern I Corps. Simultaneously, the battalion carried out operational support missions for the 1st Cavalry Division and its successors, the 3d Brigade, 4th Division, and, in turn, the 173d Airborne Brigade and the Americal Division. The 19th Engineer Battalion made airfield repairs at Landing Zone ENGLISH, completed a small port at Sa Huynh, and built an access road to an artillery unit near Duc Pho. Minesweep teams carried out the repetitive but dangerous job of daily checks along Highway 1. Roadwork along Highway 1 by the 84th Engineer Battalion consisted of readying the base course to Bong Son for an asphalt

[7] ORLL, 1 Feb–30 Apr 68, 35th Engr Gp, 11 May 68, pp. 2–4, Historians files, CMH.

surface and widening the Cu Mong Pass south of Qui Nhon. The attached 523d Port Construction Company helped the 84th and other engineer units in several projects. Chief among the versatile company's accomplishments in Qui Nhon were the completion of a third fuel storage tank farm (three 50,000-barrel and four 10,000-barrel welded-steel tanks) and a second causeway bridge in the port. The 589th Engineer Battalion devoted most of its efforts to Highway 19 and An Khe's logistical and airfield facilities. With the attached 51st Asphalt Platoon's asphalt plant at An Khe in full production shortly after 15 March, the 589th Battalion began paving west of the city.[8]

Roads and Bases in the Highlands

The first attacks in the highlands took place around 0130 on 30 January at Ban Me Thuot, about an hour following the opening strike at Nha Trang. As celebrants set off a string of fireworks in the streets, a barrage of mortar and rocket rounds struck the town, followed by a ground assault by two Viet Cong battalions. Simultaneously, a battalion-size attack took place against the small district capital of Tan Canh near Dak To. Thirty minutes later, a North Vietnamese regiment and two separate battalions, almost 3,000 men, moved against Kontum City, and a half hour later the long-expected attack on Pleiku began.[9]

The 4th Infantry Division's preparations before Tet included assigning an infantry role to its 4th Engineer Battalion. Two brigades (the 3d Brigade remained with the Americal Division until the end of March) continued to carry on Operation MacArthur, guarding the border regions and searching for the enemy in an immense area of operations. On the morning of 25 January, Colonel Lee, the 4th Engineer Battalion's commander, received orders to organize two companies as infantry and prepare to deploy to one of three possible blocking positions outside Pleiku. Since Lee could not call back Companies A, B, and C from their commitment to the three brigades, he assembled the remaining units at Camp Enari, the battalion's base camp just west of Pleiku, and organized the task force around Company D, most of Company E (bridge company), a platoon from Company A, and a make-shift armor platoon of tankdozers from the land-clearing team. The division also attached an armor company (Company A, 69th Armor) to the task force and provided an artillery liaison officer and a forward observer. The engineers gained additional fire power by borrowing twelve .50-caliber machine guns from other units and issuing two hand grenades per man. Material for overhead protection and bunkers was loaded on trucks and included concertina wire, heavy timbers, salvaged M8A1 airfield matting, and sandbags. The task force was declared ready for deployment by 1630 and spent the evening and the next day reviewing artillery adjustment and medical evacuation procedures

[8] ORLLs, ibid., p. 2, 1 Feb–30 Apr 68, 45th Engr Gp, pp. 7–9, 1 Feb–30 Apr 68, 19th Engr Bn, pp. 1–6, 1 Feb–30 Apr 68, 84th Engr Bn, pp. 2–5, and 1 Feb–30 Apr 68, 589th Engr Bn, pp. 2–9.

[9] Westmoreland, *A Soldier Reports*, p. 322.

and firing weapons. The infantry mission, however, was canceled, and division headquarters returned the engineers to normal duties at 1530, 26 January.[10]

At 0930 on 30 January, a Viet Cong local force battalion stormed into the provincial capital of Pleiku, and the division ordered the 4th Engineer Battalion to help retake the city. Luckily for the defenders, a North Vietnamese regiment failed to rendezvous with the local forces, which then carried out the attack alone. The Viet Cong penetrated Pleiku's defenses only after crossing a large open field at great cost. At 1500, the engineers helicoptered to a landing zone outside town and set up a defensive perimeter. The armor company's tanks joined the task force that afternoon, followed that evening by the 4th Engineer Battalion's own armor force. The next morning, the task force and South Vietnamese troops advanced into town, took enemy fire, and continued the sweep until dusk. Company E took three prisoners, two of whom were members of sapper teams on suicide missions. The next morning, the engineers formed two skirmish lines and resumed the sweep, this time with the tank company. This drive resulted in the killing of twenty-one Viet Cong and the capture of several weapons. As the advance proceeded northward, resistance ceased. By nightfall, the engineer task force's command post moved to a South Vietnamese artillery compound. One platoon reinforced the Artillery Hill Camp west of town, and another platoon with a platoon of tanks guarded the power plant. The engineers also manned a nearby observation post equipped with two starlight scopes (optical instruments that intensified low light allowing its users to see at night). By 1930, the observation post reported enemy troops moving toward town. Heavy concentrations of firepower delivered by artillery, helicopter gunships, and Air Force AC–47 Spooky gunships halted the advance. South Vietnamese troops moving through the area the next day found some blood-soaked clothing, bandages, and equipment but no bodies. Several sweeps of the area followed without any traces of the enemy. Its mission as infantry completed, the task force returned to Camp Enari at 1800, 1 February, and its troops resumed normal chores as engineers.[11]

At Kontum City, elements of the 4th Engineer Battalion helped allied forces repel the enemy attack. Heavy fighting developed around government facilities and the airfield. By noon on 30 January, it became apparent that the South Vietnamese regular and territorial defenders needed help. The South Vietnamese rushed in a reinforced battalion, and the 4th Division deployed a task force centered on the 1st Battalion, 22d Infantry. In a campaign that lasted through 12 February, the 4th Division's task force (divided into teams and supported by two batteries of artillery; a company of armor; a troop of air cavalry; and two Dusters, or twin 40-mm. self-propelled guns) set up blocking positions, helped retake the city in house-to-house fighting, and pursued the enemy through nearby hamlets and heavily defended hills to the north. Supporting the 4th Division task force, the 3d Platoon, Company B, 4th Engineer Battalion, placed a squad with

[10] ORLL, 1 Nov 67–31 Jan 68, 4th Inf Div, 7 Mar 68, pp. 39–40, 50–51, Historians files, CMH.

[11] Ibid., pp. 40–41, 50–51.

each infantry company. Tasks included clearing mines, disposing of munitions, dispensing potable water at the task force's firebase, and destroying bunker complexes. Additional help and equipment came from the rest of the division engineer battalion or nondivisional engineers nearby. An armored vehicle launched bridge supporting the armor team came from the battalion's bridge company, and the 299th Engineer Battalion sent two D7 bulldozers to clear a patrol base for an infantry team. The engineers also made abundant use of their chain saws. One squad sent to support the armor team cleared a shroud of dense foliage that obstructed the tanks' fields of fire. Another squad cleared a landing zone, permitting helicopters to extract an infantry company.[12]

The 937th Engineer Group's construction program suffered because of the initial and follow-up attacks on roads and convoys. Mines and destroyed or damaged bridges blocked the main supply routes, and the nearly completed pipeline running parallel to Highway 19 was sabotaged. Rocket and mortar attacks caused some damage to buildings and airfield surfaces, which were quickly repaired. Quarries previously operating on a twenty-four-hour schedule were limited to daylight work. In March, Col. William J. Talbot assumed command of the group from Colonel Marshall. His main concern shifted to repairing the destruction caused by the enemy's attacks and carrying on the mix of operational support and construction tasks. One chore included sending the 299th Engineer Battalion's Company B to Kontum City, where it cleared some 1,500 cubic yards of debris. As for roadwork, the 20th, 70th, and 299th Engineer Combat Battalions, each backed by a light equipment company, labored to keep the critical supply routes open with daily mine sweeps and repairing road surfaces, culverts, and bridges. The 815th Engineer Construction Battalion, augmented by a construction support company and part of a pipeline company, continued base development tasks and paving Highway 19 east of Pleiku. Two dump truck companies and a land-clearing platoon also supported the group.[13]

Repairs and improvements at forward airstrips and helicopter facilities also resumed at full force. On 19 February, the 20th Engineer Battalion finished renovations at Buon Blech, and the runway and parking apron topped with new M8A1 matting could now handle C–130 aircraft. On the same day, the battalion started comparable upgrading at the Ban Don airstrip. The 20th Battalion also completed a C–7A airstrip (Operation FLORIDA) and various facilities at the Tieu Atar Special Forces camp and began to extract its lightweight airmobile equipment on 1 April. At Polei and Old Cheo Reo, the 70th Engineer Battalion labored to upgrade the airstrips to C–130 and C–123 traffic, respectively. Both Dak To airfields had more work done by the 299th

[12] ORLL, 1 Feb–30 Apr 68, I FFV, p. 13; AAR, Battle of Kontum/Tet Counteroffensive, 1st Bn, 22d Inf, n.d., pp. 1, 3–6, and an. D, pp. 2–3, Historians files, CMH.

[13] Engineer Support of Combat Operations, incl. 6, p. 1, OCE Liaison Officer Trip Rpt no. 11, 6 May 68, OCE Hist Ofc; ORLLs, 1 Feb–30 Apr 68, 937th Engr Gp, 30 Apr 68, pp. 3–4, 6–8, 1 Nov 67–31 Jan 68, 299th Engr Bn, 31 Jan 68, pp. 2–3, and 1 Feb–30 Apr 68, 299th Engr Bn, 30 Apr 68, p. 3, all in Historians files, CMH.

Engineer Battalion, which prepared Dak To 1 for C–123 traffic and Dak To 2 to withstand the effects of the southwest monsoon.[14]

After Tet, convoys carrying men and construction materials moved at great risk, and ambushes took an ever-increasing toll in casualties and damage to equipment. Dump trucks continued to haul sand on Highway 14 from Kontum, the only source of the material in the area, twice daily to the asphalt plant in Pleiku. The enemy, believing that U.S. and South Vietnamese forces would be dispersed while reacting to the attacks on the cities, made it a point to attack isolated vehicles and large convoys alike. Since Highway 14 served as the main supply road between the two province capitals, the engineers cleared a little over one hundred yards of vegetation from each side to reduce ambushes, but this did not discourage the attackers. On 6 March and again on 13 March, the 937th Group took heavy losses. In the second attack, the engineer vehicles at the rear of a 150-vehicle convoy were struck from both sides of the road. The enemy, estimated to range from two reinforced companies to two battalions, had taken positions behind berms of foliage and earth formed by the land clearing. After the initial fusillade of automatic weapons and rocket fire, sappers rushed toward the vehicles, throwing satchel charges at the trucks. The South Vietnamese armored cavalry squadron providing security entered the battle, and air strikes broke the attack. A few vehicles managed to run the ambush and clear the killing zone, but one hit a truck and blocked the road. A relief convoy consisting of wreckers and a company from the 70th Engineer Battalion moved to the ambush site to remove the disabled vehicles. Casualties from the three engineer companies (the 70th and 586th Dump Truck and the 509th Panel Bridge) totaled twelve dead and nineteen wounded. Equipment losses consisted of five trucks destroyed and another sixteen damaged.[15]

An investigation revealed the need for better coordination between the engineers and security forces and changes in convoy procedures. When the two officers in the serial containing the engineer vehicles were killed, communications with the convoy commander and the armored cavalry escort ceased. This left the engineers virtually helpless until the armored cavalry arrived. To counter future ambushes, the group assigned platoons from two combat engineer battalions as infantry to provide added security for engineer vehicles on Highway 14. Modifications to vehicles included armored plating welded to the doors of trucks or sand and gravel filled in door cavities. Makeshift armored trucks, usually a five-ton dump truck with the bed and sides sandbagged, were intermingled with every six dump trucks. Each armored truck carried a noncommissioned

[14] ORLLs, 1 Feb–30 Apr 68, 937th Engr Gp, pp. 4–6, 1 Feb–30 Apr 68, 20th Engr Bn, 30 Apr 68, pp. 2–3, 9–10, Historians files, CMH, 1 Feb–30 Apr 68, 70th Engr Bn, 30 Apr 68, pp. 6, 8, Historians files, CMH, and 1 Feb–30 Apr 68, 299th Engr Bn, pp. 1–8. For more on Operation FLORIDA, see Intervs, Maj Paul B. Webber, 26th Mil Hist Det, with Lt Col James H. Phillips, CO, 20th Engr Bn, 21 Mar 68, and Capt Leroy T. Cool, CO, Co B, 20th Engr Bn, 14 Mar 68, VNIT 175, CMH.

[15] Engineer Support of Combat Operations, incl. 6, p. 1, OCE Liaison Officer Trip Rpt no. 11; ORLLs, 1 Feb–30 Apr 68, 937th Engr Gp, p. 6, 1 Feb–30 Apr 68, 1st Log Cmd, p. 70; *Western Highlands*, pp. 85–86. For a full account of the 13 March ambush, see AAR/Intervs, 937th Engr Gp, 10 Jul 68, 26th Mil Hist Det, VNIT 176, CMH.

officer with a radio and three to five well-armed troops. These measures must have helped, for on 30 April the 937th Group reported no more ambushes of engineer convoys along Highway 14.[16]

The engineers tried to reduce ambushes by doing a more thorough job of land clearing. Although trees and vegetation were cut back about one hundred yards along many stretches of roads, the windrows of fallen timber left behind provided good cover and concealment for enemy troops. Company A, 70th Engineer Battalion, took care of this problem by using the "haystack" method. Since burning the fallen timber in the windrows was time consuming and inefficient, the battalion bulldozed the debris into piles, which were left to dry out for a few days, and then burned and the ashes scattered. The company, one of the engineer units assigned to protect convoys along Highway 14, also used two Rome plows and two bulldozers to clear an additional one hundred yards on each side of the road in areas most frequently used by the enemy. Rome plows of the 35th Land Clearing Team, attached to the 20th Engineer Battalion, were also busy at work on several supply routes. On 19 February, two sections of the team completed work along Route 7B west to the intersection of Highway 14. From there, the twenty Rome plows moved onto Highway 14 and by 9 March cleared 1,180 acres south of Phu Nhon toward Ban Me Thuot. Operations then moved to Highway 19 to widen the cleared areas from about one hundred to about three hundred yards between An Khe Pass and Mang Yang Pass. The team's third section of ten Rome plows, previously attached to the 35th Group at Phan Rang, moved to Ban Me Thuot and 70th Engineer Battalion control in late February and began clearing east along Highway 21. Hanoi's account of the war in the highlands acknowledged these prodigious efforts to keep the land lines open.[17]

The Fight for Saigon and the Delta

Although the allies in III Corps had expected trouble at Tet, the number of Viet Cong who slipped through the defenses around Saigon and the extent and fury of the offensive came as a shock. South Vietnamese and U.S. troops reacted quickly and turned back the enemy within a week, save for some holdouts in Cholon, the Chinese quarter of Saigon. The attack in Saigon began with the raid on the American embassy, a rectangular six-story fortress completed by RMK-BRJ the previous September. The embassy was a dubious military objective but of significant psychological value. After breaching the wall and entering the grounds and chancery building, but not the embassy building, all the sappers were killed. Simultaneous assaults at Tan Son Nhut Air Base and the nearby Joint General Staff compound, the Presidential Palace, and other installations in Saigon also failed, although some enemy soldiers did briefly penetrate the back side of the air base and the South Vietnamese headquarters

[16] ORLLs, 1 Feb–30 Apr 68, 937th Engr Gp, p. 6, and 1 Feb–30 Apr 68, 70th Engr Bn, pp. 3, 5–6; AAR/Intervs, 937th Engr Gp, 10 Jul 68, p. 6.

[17] ORLLs, 1 Feb–30 Apr 68, 937th Engr Gp, p. 4, 1 Feb–30 Apr 68, 20th Engr Bn, pp. 2–4, and 1 Feb–30 Apr 68, 70th Engr Bn, pp. 3, 7, 14; *Western Highlands*, p. 85.

complex. The assaults on Bien Hoa, Long Binh, the surrounding provinces, and in IV Corps were also short lived, although a second series of attacks in and around Saigon took place on 17 February, beginning with rockets striking Tan Son Nhut and MACV headquarters. Their intensity, however, was much less than the initial assaults. These attacks lasted intermittently until early March, highlighted by several fire fights inside Saigon and Cholon.[18]

The enemy interdicted all major roads from Saigon, delaying convoys on Highways 1 and 22 to Tay Ninh and Route 1A to Phuoc Vinh. Highway 13 to Lai Khe was cut repeatedly by sabotage and roadblocks. Convoys caught in outlying areas often waited for days for the engineers to clear the way. Ground transportation in the delta was also at a standstill since the Vietnamese drivers, fearing reprisals, stayed away from work. Most highway improvements in III and IV Corps ceased, including RMK-BRJ's project to upgrade the narrow and deteriorated Highway 4 in the delta. River barges that normally plied the waterways in the region were held up at Vung Tau. Rail movements stopped entirely. For several days, only priority airlifts could reach some of the inland bases.[19]

When Long Binh, Bien Hoa, and nearby posts came under fire on the morning of 31 January, Army engineers were already manning defensive positions. At the Long Binh post, parts of the perimeter were held by the 159th Engineer Group. The 79th Group headquarters and the attached 66th Engineer Topographic Company based at II Field Force headquarters at Plantation put about one-half their troops in perimeter bunkers. Just up the road at the 199th Light Infantry Brigade's Camp Frenzell-Jones, the 79th Group's 100th Float Bridge Company helped man perimeter positions. At 0300 on 31 January, the Viet Cong launched an intense rocket and mortar barrage at Plantation and Camp Frenzell-Jones. About the same time, rockets struck Bien Hoa Air Base and the adjacent III Corps headquarters compound, followed by ground assaults. When the barrage lifted at Plantation, the rest of the 79th Group's soldiers—clerk typists, carpenters, draftsmen, surveyors, and mapmakers—joined the troops on the line. Viet Cong soldiers, in position in Ho Nai Village on the other side of Highway 1A, opened up with a torrent of rifle and machine-gun fire and rocket-propelled grenades against the camp, succeeded by a ground attack aimed at the II Field Force headquarters. The defenders responded with automatic weapons fire and grenades, which stopped the assault and pinned down the attackers. Military police and Army helicopter gunships joined the fighting. Soon elements of the 199th Infantry Brigade, 9th Infantry Division, and 11th Armored Cavalry Regiment swept the area, leaving sixty enemy dead in Ho Nai. Some Viet Cong were caught milling around in the village (nicknamed "Widows' Village" because of the widows and orphans of South Vietnamese soldiers

[18] Sharp and Westmoreland, *Report*, p. 159; MACV History, 1968, vol. 1, pp. 390, 397; ORLL, 1 Feb–30 Apr 68, II FFV, 20 May 68, pp. 38–42, Historians files, CMH. For more on the fighting in III and IV Corps, see MACV History, 1968, vol. 1, pp. 390, 397–99, vol. 2, pp. 894–906; AAR, Tet Offensive, II FFV, 5 Aug 68, Historians files, CMH; Lung, *General Offensives of 1968–69*, pp. 51–75; General Donn A. Starry, *Mounted Combat in Vietnam,* Vietnam Studies (Washington, D.C.: Department of the Army, 1979), pp. 118–29.

[19] Bowers, *Tactical Airlift*, p. 322; MACV History, 1968, vol. 2, p. 653.

Bunkers like this were the first line of defense during the enemy attack on Plantation, the headquarters of II Field Force.

living there). Determined to liberate a prisoner of war camp just west of the village, the attackers had gotten lost, and were quickly killed or captured.[20]

The intensity of the opening attacks immediately shifted the engineers in the Saigon area from base construction to improving base defenses and operational support. At Plantation, the 79th Group's headquarters was heavily damaged, due largely to the concussion from an explosion set off by sappers who infiltrated through a thick bamboo grove between Plantation and the Long Binh ammunition dump. This gave Col. John H. Elder Jr., the group commander, good reason to rebuild an improved headquarters and a new tactical operations center protected in a reinforced-concrete block structure covered with sandbags. He also borrowed the 34th Group's 86th Engineer Battalion Land Clearing Team to eliminate the bamboo grove. Some nine hundred acres were cleared in a week. At Long Binh, Col. Harvey C. Jones, the 159th Engineer Group commander, quickly committed his four construction battalions (46th, 62d, 92d, and 169th) to improving the base perimeter, which involved adding more barbed wire fencing, reaction force bunkers, and access roads. Similar work went on at the U.S. Army camp at Bien Hoa and nearby firebases. Also under way at Long Binh was construction of a temporary tactical operations

[20] ORLLs, 1 Feb–30 Apr 68, 79th Engr Gp, 14 May 68, pp. 3, 9, 11, and 1 Feb–30 Apr 68, 159th Engr Gp, n.d., p. 5, both in Historians files, CMH; "Tet Truce Offensive, 1968," and "In Defense of Plantation, 1968," *Hurricane*, II FFV Magazine (April–June 1971): 2–4; Lung, *General Offensives of 1968–69*, p. 69; Engineer Support of Combat Operations, incl. 6, p. 1, OCE Liaison Officer Trip Rpt no. 11; Neil Sheehan, *A Bright Shining Lie: John Paul Vann and America in Vietnam* (New York: Random House, 1988), pp. 707, 714.

center for the 1st Logistical Command. This entailed excavating a 21-by-51-by-15-foot-deep pit, erecting heavy timbers with a blast cover of a single layer of 12-by-12-foot timbers, and a 1-foot reinforced-concrete floor on top of two inches of compacted soil. All exposed areas were covered with roofing felt and sprayed with peneprime. Altogether, the bunker had 604 square feet of working area, plywood paneled walls, fluorescent lighting, and electrical outlets. With so much construction, and reconstruction, under way, the group's lumber requirements between February and April rose sharply to more than 1 million board feet, up from 700,000 board feet in the three months before Tet. By March, the Long Binh depot had run out of 80-foot timber piles. Although 250 piles were found at the Qui Nhon depot, movement of the timber to Long Binh was delayed for a month, and construction there on the ammunition off-loading pier came to a halt. Transportation of engineer construction materials again took a lower priority to ammunition, fuel, and rations.[21]

There were other examples of engineers under attack in III and IV Corps. At Can Tho Airfield, Headquarters Company of the 69th Engineer Construction Battalion lost five men killed and several wounded while stopping an attack of over one hundred Viet Cong. North of Saigon at Phu Cuong, a reinforced Viet Cong battalion on the morning of 1 February struck the district headquarters and the South Vietnamese Army Engineer School just west of town. Because of the Tet holidays, the school was defended by only eighty-seven Vietnamese Army soldiers and four American advisers. By 0700, the enemy had overrun the northern half of the school. If the school had fallen, the Viet Cong would have dominated the high ground, which also overlooked the bridge site where men of the 41st Port Construction Company and Company B, 92d Engineer Construction Battalion, were building the steel and concrete bypass bridge over the Saigon River. The school troops were outnumbered and low on ammunition, and casualties were mounting. A request for help from the American senior adviser went to the engineers at the bridge site, and twenty-five men in a makeshift platoon were sent to the school. Guided by the advisers and aided by an air strike, the engineers counterattacked and drove the enemy back. Soon afterward, a South Vietnamese tank-infantry force arrived, and the Viet Cong were evicted from the school grounds. The U.S. engineers lost two killed and several wounded. Less than forty-eight hours later, while fighting was still going on, the engineers were back at work on the bridge.[22]

In the meantime, engineers assigned to the divisions and brigades were heavily engaged. Ongoing operations such as the 25th Division's YELLOWSTONE and SARATOGA; the 9th Division's RILEY, ENTERPRISE, and CORONADO; and the 1st Division's LAM SON 68, which succeeded LAM SON 67 on 1 February, continued.

[21] ORLLs, 1 Feb–30 Apr 68, 79th Engr Gp, pp. 3, 11, 1 Aug–31 Oct 67, 159th Engr Gp, p. 15, 1 Feb–30 Apr 68, 159th Engr Gp, pp. 5–10, 19–21, 1 Feb–1 Apr 68, 46th Engr Bn, 14 May 68, p. 7, Historians files, CMH, and 1 Feb–30 Apr 68, 34th Engr Gp, 1 May 68, p. 6, Historians files, CMH; Engineer Support of Combat Operations, incl. 6, p. 1, OCE Liaison Officer Trip Rpt no. 11.

[22] Msg, Maj Gen Charles M. Duke, CG, Engr Cmd and USARV Engr, ARV 263 to Cassidy, 5 Feb 68, Charles M. Duke Papers, CMH; Lt. Col. Walter R. Hylander Jr., "Port Construction Engineers in Combat," *Military Engineer* 60 (November-December 1968): 420–21.

The 1st Engineer Battalion's support of 1st Division operations typified the role of a divisional engineer battalion during February. On 4 February, Company B entered the village of An My with the 2d Brigade. With the help of the battalion's tunnel rats, the company found a large North Vietnamese Army staging base. Rome plows from the 27th Land Clearing Team moved in and razed the facility, deterring an expected attack on the Phu Loi base camp. During rocket and mortar attacks on the Lai Khe base camp, Company C put out fires that endangered the aviation refueling point and the base's ammunition supply point. With Highway 13 cut by roadblocks, craters, and mines, Company C just south of Ben Cat filled the largest mine crater encountered by the battalion to date, requiring some thirty-six truckloads of laterite. On the eighteenth, while working toward Phu Loi, a Company C platoon-size task force and its mechanized infantry escort came under heavy antitank and automatic weapons fire. A fierce battle followed for several hours with the engineers covering the maneuvering infantry with fire until the attackers withdrew, leaving behind fifty-five dead. The engineers suffered four wounded and damage to several vehicles.[23]

Because of the extensive damage to the cities and towns, and the flow of refugees, the Saigon government, with American urging, launched a massive recovery program. When the immediate threat subsided and the most important tasks had been completed, engineer troops turned their attention to helping Vietnamese civilians. General Westmoreland made American engineers available and authorized the drawing of large stocks of roofing, concrete, and other building materials, and providing emergency food supplies, drinking water, and medical help. South Vietnamese and allied engineers joined the effort. At Hoc Mon north of Tan Son Nhut Air Base, the 159th Engineer Group provided materials and foodstuffs for the South Vietnamese 5th Engineer Group's damaged dependent housing area. Carpenter shops and block shops were set up there, and work began on homes for some 540 people. Another effort, with commerce in mind, was Operation PEOPLE'S ROAD, aimed at reestablishing security and improving Highway 4 from the III Corps border to Can Tho before the onset of the rainy season. RMK-BRJ had started the work in January, but because of the threat to unarmed work parties along the road, MACV decided to have the 20th Brigade work on the My Tho to My Thuan section. While the 1st Brigade, 9th Division, provided security, the 34th Group's 86th Engineer Battalion started work on 2 March. By the end of the month, the battalion had completed the base course and grading and had paved two miles with a double bituminous surface treatment. The contractor did not do much between Saigon and My Tho in February but did resume work in early March. The South Vietnamese 40th Engineer Group, helped by the 69th Engineer Battalion, worked along the remaining sections to Can Tho.[24]

[23] *Always First, 1967–1968*, "Operation LAM SON" and "Company B and C"; Intervs, Maj William E. Daniel Jr., 17th Mil Hist Det, with 1st Lt William P. Francisco, Plt Ldr, 2d Plt, Co C, 2d Bn, 2d Inf, 1st Inf Div, pp. 1–8, and 1st Lt Terrence L. Hueser, Plt Ldr, 1st Plt, Co C, 1st Engr Bn, 1st Inf Div, 18 Jan 68, VNI 161, pp. 1–4, CMH.

[24] Westmoreland, *A Soldier Reports*, pp. 404–05; Sharp and Westmoreland, *Report*, p. 166; MACV History, 1968, vol. 1, p. 536, vol. 2, p. 653; ORLLs, 1 Feb–30 Apr 68, II FFV, p. 49,

Restoring Logistics in I Corps

In northern I Corps, North Vietnamese troops attacked Hue and Quang Tri City and cut off Tan My, one of the three ports above Da Nang. The other two, Dong Ha and Cua Viet, fell within artillery range from the Demilitarized Zone, making their use tenuous. The enemy also cut the Hai Van Pass along Highway 1 linking Da Nang to Hue. Supplies could be delivered by air, but the monsoon weather during February made flying and landing over-the-beach uncertain at best. Meanwhile, the North Vietnamese had increased their pressure on Khe Sanh. Earlier General Westmoreland had decided to hold the base, which he believed could tie down large North Vietnamese forces that otherwise could have moved unhindered around allied positions into the populated areas. On 5 February, heavy ground attacks followed by intense artillery fire the next day struck Khe Sanh and nearby Lang Vei Special Forces camp. Although the enemy took Lang Vei, the defenders at Khe Sanh and the surrounding hilltop outposts held out against heavy bombardments and ground assaults.[25]

On the eve of Tet, Brig. Gen. Willard Roper's 18th Engineer Brigade and Colonel Fink's 45th Engineer Group were preparing to send units to northern I Corps to support the 1st Cavalry Division, which had just deployed there to reinforce the marines. Fink and members of his staff made several trips to Phu Bai to coordinate the engineer deployment with the MACV Forward Command Post, an advanced headquarters that General Westmoreland established on 25 January to observe, direct, and, if necessary, control operations in the threatened northern provinces. On the twenty-ninth, General Roper, the commander of the 18th Engineer Brigade, and Fink traveled north to reconnoiter the group's new area of responsibility. The following day—the same day the attacks began in the northern half of the country—the group dispatched a reconnaissance party to the Gia Le combat base, just south of Hue. One of the party's helicopters was shot down with heavy casualties, including the death of the group's operations officer.[26]

The first unit of the 45th Group to start north was the 35th Engineer Battalion from Landing Zone HAMMOND in northern II Corps. On 2 February, Lt. Col. John V. Parish Jr., who had assumed command of the battalion two

1 Feb–30 Apr 68, 159th Engr Gp, pp. 5, 24, and 1 Feb–30 Apr 68, 34th Engr Gp, pp. 9–10; Quarterly Hist Rpt, 1 Jan–31 Mar 68, MACDC, 20 Apr 68, pp. IV-17 to IV-18, Historians files, CMH.

[25] Westmoreland, *A Soldier Reports*, pp. 336–41, 345–47; Sharp and Westmoreland, *Report*, pp. 162–64; Tolson, *Airmobility*, pp. 165–68; Pearson, *War in the Northern Provinces*, pp. 73–78. For more on the Tet offensive in I Corps, see MACV History, 1968, vol. 1, pp. 376–79, vol. 2, pp. 883–89; Jack Shulimson, Lt. Col. Leonard A. Blasiol, Charles R. Smith, and Capt. David A. Dawson, *U.S. Marines in Vietnam: The Defining Year, 1968* (Washington, D.C.: History and Museums Division, Headquarters, U.S. Marine Corps, 1997), pp. 113–223; Bowers, *Tactical Airlift*, pp. 295–316.

[26] Col. George B. Fink, "Engineers Move to I Corps," *Military Engineer* 60 (September-October 1968): 358; MFR, 21, Feb 92, sub: Author's Recollections, 45th Engr Gp, p. 2; Engineer Support of Combat Operations, incl. 6, pp. 1–2, OCE Liaison Officer Trip Rpt no. 11; ORLL, 1 Feb–30 Apr 68, 45th Engr Gp, p. 7; Ploger, *Army Engineers*, p. 150.

The Hai Van Pass was often obscured by clouds and fog.

weeks earlier, was alerted to get ready for the move. The battalion began its preparations. Initially, Parish hoped to make an amphibious landing off to the north of Hue, build an access road to Highway 1, and work south to Camp Evans, the 1st Cavalry Division's forward base camp. This approach seemed quicker and preferable to disembarking at Da Nang, the scene of a hectic buildup of Army support units. Colonel Parish was also concerned that the battalion's arrival in Da Nang could result in changing the unit's mission to do local projects.[27]

The Parish plan never got off the ground. No sooner had he received his alert to move than the whole tactical situation turned dire along the coastal plain from Quang Tri south to the Hai Van Pass, making foolhardy any attempt to insert the engineers into the teeth of North Vietnamese resistance. Pending stabilization of the battle for Hue and improvement in allied fortunes in the countryside nearby, which did not seem likely for some time, the engineers would start from the safe haven of Da Nang, working overland with infantry to reopen Highway 1 as far as the Hai Van Pass. And there was no room for delay—the fighting north of the pass was consuming supplies at an alarming

[27] ORLL, 1 Feb–30 Apr 68, 45th Engr Gp, p. 8; AAR/Intervs, 35th Engr Bn, 29 Mar 68, 26th Mil Hist Det, p. 2, and incl. 8, Interv, Maj Paul B. Webber, 26th Mil Hist Det, with Lt Col John V. Parish Jr., CO, 35th Engr Bn, 29 Mar 68, VNI 10, p. 1, CMH. VNI 10 also contains maps, photographs, and other documents.

North of the Hai Van Pass, the enemy destroyed bridges like this French-type concrete bridge.

rate, threatening a deficit in logistical support that a land line alone had the earliest chance to avert.[28]

With time of the essence, the battalion made the trip to Da Nang in less than a week. Parish began by moving men and equipment down Highway 1 to the port at Qui Nhon, some thirty miles to the south. Initial plans had Navy LSTs transporting the unit over a two-week period. The sudden availability of a much larger capacity contract freighter, the *Maryland* of Seatrain Lines adapted to haul containers besides vehicles and general cargo, accelerated the deployment. The first two LSTs with Companies B and C less some equipment departed Qui Nhon on the tenth. Two more LSTs arrived the following day to load the two companies' remaining equipment and part of the battalion's largest unit, the attached 517th Light Equipment Company. When the *Maryland* showed up on the twelfth, a day ahead of schedule, the rest of the battalion, with some difficulty, loaded the freighter in two days. Seven 290M tractors and scrapers could not fit through the cargo hole, so three more LSTs carried these items, a second attached company (the 511th Panel Bridge), and the balance of the battalion. The brisk pace of loading resulted in the abandonment of tent frames and floors, items that the battalion had planned to take.

[28] Msg, Westmoreland MAC 01858 to Wheeler and Sharp, 9 Feb 68, Westmoreland Message files, CMH; Interv, Webber with Parish, 29 Mar 68, p. 1; Pearson, *War in the Northern Provinces*, pp. 58–59.

Remaining elements reached the new camp, which was at the Nam O Beach site seven and a half miles north of Da Nang just off Highway 1, by midnight 17–18 February.[29]

The enemy had done a thorough job in cutting Highway 1 between Da Nang and Hue. Sappers closed the narrow winding Hai Van Pass with three major breaks and many obstacles. Along a straight stretch farther north, dubbed the Bowling Alley, they destroyed every bridge and culvert and excavated large trenches along the way. During the first two weeks of February, attempts by the 7th Marine Engineer Battalion and Naval Mobile Construction Battalion 62 to clear the road resulted in heavy casualties and loss of equipment. When the 35th Engineer Battalion arrived, it too could not proceed due to the strong presence of enemy forces. On 14 February, the battalion's first reconnaissance party, which included Colonel Parish, the operations officer, and battalion sergeant major, ran into a command-detonated mine and did not reach Hai Van Pass. Repeated efforts over the next few days resulted in enemy fire and several casualties. Only the arrival of the infantry, which swept the area west of the pass and similar efforts by the marines to the north, made it possible for the 35th Battalion to reopen the road.[30]

Real progress began on the morning of 21 February. Minesweep teams reached the pass, and the following day work parties and equipment began filling cuts and replacing culverts along the roadway. Although Army and Marine infantry reduced direct attacks by the enemy, he still harassed the engineers. Mines also posed a threat. The minesweep teams could not find all the mines, particularly homemade nonmetallic types that did not show readings on the mine detectors. Many vehicles passed over deeply buried mines without setting them off, but heavier loads such as tractor-trailers would usually cause the pressure-type mines to detonate. This happened on the twenty-second, resulting in heavy damage to a tractor-trailer and seriously wounding the driver. By the twenty-fourth, Companies C and D worked their way to Hai Van Pass. On that day, a D7 bulldozer working on the road hit a mine, damaging the bulldozer and wounding several engineers. The next day, Companies A and B moved farther north to a bivouac on the sea. From there, the units began reopening the Bowling Alley to traffic. Work included the around-the-clock building of a 105-foot, single-lane M4T6 trestle bridge. By 29 February, Company B met elements of the 32d Naval Construction Regiment working south. In the early morning hours of 1 March, a mine-clearing team swept the road and reported it clear. Engineers working on the road briefly took a break and watched a 100-vehicle convoy from Da Nang file past. This marked the first time since the start of the Tet attacks a month earlier that vehicles could make the trip to Hue. In all, the 35th Battalion in the period from 21 to 29

[29] AAR/Interv, 35th Engr Bn, 29 Mar 68, p. 2, and incl. 10, Interv, Maj Paul B. Webber, 26th Mil Hist Det, with Maj Wilbur C. Buckheit, XO [Executive Officer], 35th Engr Bn, 29 Mar 68, VNI 10, pp. 1–2, CMH.

[30] ORLL, 1 Feb–30 Apr 68, 35th Engr Bn, p. 3; Fink, "Engineers Move to I Corps," p. 358; Commander in Chief Pacific Fleet, Pacific Area Naval Operations Review, Feb 68, pp. 85–87, copy in Historians files, CMH; Interv, Webber with Parish, 29 Mar 68, pp. 1–2.

At the top of Hai Van Pass, the 35th Engineer Battalion deployed equipment like this 290M scraper to widen the road and reduce sharp curves.

February suffered damage to one 5-ton tractor trailer, two D7 bulldozers (one a total loss), and three 5-ton dump trucks. Ten men were wounded.[31]

The reopening of Highway 1 eased the logistical crisis around Hue, but officials still faced the task of supporting the action farther north and reconstituting the forward stockpiles, especially the fuel and ammunition, that would be needed for the relief of Khe Sanh. By one estimate, another 1,000 tons a day would be needed, nearly four times the rated capacity of Highway 1, if the counteroffensive was to kick off as planned on 1 April. With no other practical alternative but supply by sea, the surest way to move materiel in bulk, the U.S. command now gambled that the battle for the northern coast was about to be won. It immediately laid plans for a logistical-over-the-shore, or LOTS, site east of Quang Tri City, confident that the receipts would eliminate the deficit looming over future operations. The facility was to open in mid-March.[32]

With a LOTS site now on the drawing board, logistics figured heavily in Colonel Fink's decision to locate the headquarters of his 45th Group in Da Nang. Initially he considered placing the headquarters farther north at Phu Bai near the MACV Forward Command Post and the 1st Cavalry and

[31] AAR/Interv, 35th Engr Bn, 29 Mar 68, pp. 3–5; ORLL, 1 Feb–30 Apr 68, 35th Engr Bn, pp. 3–4; Fink, "Engineers Move to I Corps," pp. 358–59; HQ, 35th Engr Bn, Summary of Operations in I Corps, incl. 6, tab F, OCE Liaison Officer Trip Rpt no. 11.

[32] MACV History, 1968, vol. 1, pp. 477, 479, vol. 2, p. 619; Msgs, COMUSMACV to CO, 3d Nav Const Bde, 16 Feb 68, sub: Hai Lang Beach Road Construction, and CG III MAF to COMUSMACV, 18 Feb 68, sub: LOTS Operation Northern I CTZ, both in box 1, 71A/354, RG 334, NARA.

101st Airborne Divisions. Setting up operations temporarily in Da Nang, however, made it easier to coordinate operational and logistical matters for the group's projected four combat engineer battalions and attached units. These units initially included the 35th Engineer Battalion working on Highway 1, the 39th Engineer Battalion supporting the Americal Division, and the 14th Engineer Battalion, preparing to move to its new assignment, the over-the-shore site near Quang Tri. The group's fourth battalion, the 27th, was alerted in late March to move from its base sixty-two miles east of Saigon to support the 101st Airborne Division at Camp Eagle, south of Hue. An advance party from the group headquarters had arrived in Da Nang on 15 February. In mid-March, the group headquarters completed its relocation from Qui Nhon and moved into buildings provided by the 7th Marine Engineer Battalion next to the 1st Marine Division's headquarters just west of Da Nang Air Base. There, the 45th Group had easy access to the III Marine Amphibious Force headquarters in Da Nang, the 3d Naval Construction Brigade across the road at Red Beach, and the logistical complexes throughout the metropolitan area.[33]

Some modifications to command and control and logistical support for the engineers in northern I Corps now became necessary. The 45th Group remained an assigned unit under the 18th Engineer Brigade at Dong Ba Thin, but III Marine Amphibious Force exercised operational control and the U.S. Navy provided most of the logistical support. On 25 February, the Marine command assigned the Army group the mission to minesweep, maintain, and upgrade Highway 1 between the bridge at Nam O and Phu Loc. The command also directed the 3d Naval Construction Brigade and Marine Corps engineer units in the area to help the Army engineers with supplies. Also made available were materials from the Seabee brigade's pre-positioned and packaged war reserve stocks and heavy bridge timbers and large culverts programmed by the 3d Naval Construction Brigade for future major highway improvements. Save for the extreme southern part of I Corps, the 45th Group's units relied on supplies provided by the Navy.[34]

Meanwhile, after considerable delay, the 14th Engineer Battalion began arriving at the over-the-shore site on 20 March. On 6 February, Lt. Col.

[33] ORLLs, 1 Feb–30 Apr 68, 45th Engr Gp, pp. 1–10, and 1 Feb–30 Apr 68, 27th Engr Bn, 7 May 68, p. 9, Historians files, CMH; Engineer Support of Combat Operations, incl. 6, p. 2, OCE Liaison Officer Trip Rpt no. 11; Msg, COMUSMACV to CG, USARV and CG, III MAF, 2 Feb 68, sub: Engineer Support for Northern I CTZ, box 5, 71A/354, RG 334, NARA; Msg, CG, III MAF to COMUSMACV, 18 Feb 68, sub: LOTS Operation Northern I CTZ; Quarterly Hist Rpt, 1 Jan–31 Mar 68, MACDC, p. II-3; MFR, 21 Feb 92, Author's Recollections, 45th Engr Gp, pp. 2–3.

[34] ORLLs, 1 Feb–30 Apr 68, 45th Engr Gp, pp. 1, 5–6, 11–12, and 1 Feb–30 Apr 68, 1st Log Cmd, p. 4; Ltrs, CG, III MAF to CO, 45th Engr Gp, sub: Assignment of Responsibility for Land Lines of Communication, 25 Feb 68, tab D, and CG, III MAF to CO 45th Engr Gp, sub: Interim Guidance on Tactical Support Functional Components [TSFC], Program and Reporting Procedures for Lines of Communications, 26 Feb 68, tab E, both in incl. 6, OCE Liaison Officer Trip Rpt no. 11. For more on the two services' logistical support arrangements, see MACV History, 1968, vol. 2, pp. 616–18; Heiser, *Logistic Support*, pp. 216–17; and Merdinger, "Civil Engineers, Seabees, and Bases in Vietnam," pp. 244–46.

Bennett L. Lewis received the warning order to prepare for immediate deployment from Cam Ranh Bay to I Corps. A Navy survey revealed, however, that LSTs could not beach but would require a 900-foot amphibious causeway to discharge cargo. The pontoon causeway, which had to be shipped from Japan and assembled by the Seabees, was not expected to be completed until 15 March. Lewis had to postpone the deployment, and planning continued. When the 35th Engineer Battalion reopened Highway 1 north of Da Nang on 1 March, the 14th Engineer Battalion put the move in motion. The heavy equipment and cargo went directly by sea to the beach site, now called Utah Beach. On 14 March, the battalion, less Company C at Phan Thiet, departed for Da Nang aboard the SS *Carolina*. Following delays at Da Nang's congested harbor, the troops and vehicles moved by land to Utah Beach. Two LSTs transported Company C and the remaining cargo at Cam Ranh Bay directly to Utah Beach.[35]

After arriving at the beach site, the 14th Engineer Battalion took over construction from Naval Mobile Construction Battalion 10. So far the Seabees had reopened an old narrow French road (Route 602) to Hai Lang where it connected to Highway 1, laid out sand roads, emplaced matting in open storage areas, and dug pits for fuel storage bladders. Company A started to improve the access road to two lanes topped with laterite and to construct two timber pile bridges, 120 and 140 feet long. It also built facilities and defense positions for the 159th Transportation Battalion task force, which ran the over-the-shore operation. Company B began building a sand-cement road system connecting sand-cement access ramps and storage pads built by the other two companies at the beach. The Earthmoving Platoon, Company C, 589th Engineer Battalion, joined the 14th Battalion on the beach. The platoon's 290M scrapers, bulldozers, graders, and water distributors increased the 14th's capabilities significantly. Company C of the 14th Battalion swept the access road for mines. Its greatest challenge was an antivehicular mine similar to the Soviet TMB2 mine with a pressure device that contained only a small amount of metal. The mine proved extremely difficult to detect.[36]

The over-the-shore facility was a major accomplishment. A joint effort by Army engineers, Navy Seabees, Army transportation units, Navy landing ships, and a Marine Corps fuel detachment transformed the beach into a key logistical facility. LSTs and other landing craft discharged cargo over the pontoon causeway while amphibious resupply cargo barges and lighters brought

[35] MACV History, 1968, vol. 2, p. 619; Msgs, CG, III MAF to CG, 18th Engr Bde, 15 Feb 68, sub: Hai Lang Beach Road Construction, CG, III MAF to Commander in Chief Naval Forces, Vietnam, 15 Feb 68, sub: Pontoon Causeways at Hai Lang Beach, and CG, 18th Engr Bde to CG, III MAF, 16 Feb 68, sub: Unit Deployment, all in box 1, 71A/354, RG 334, NARA; Ploger, *Army Engineers*, p. 150; AAR, 14th Engr Bn, 7 May 68, sub: Relocation of 14th Engineer Battalion to I Corps Tactical Zone, pp. 16–23, incl. 1, ORLL, 1 Feb–30 Apr 68, 14th Engr Bn, 30 Apr 68, Historians files, CMH; ORLLs, 1 Feb–30 Apr 68, 14th Engr Bn, pp. 2–6, and 1 Feb–30 Apr 68, 45th Engr Gp, pp. 9–11.

[36] ORLL, 1 Feb–30 Apr 68, 14th Engr Bn, pp. 4–6; Interv, 1st Lt Raymond F. Bullock, 26th Mil Hist Det, with Lt Col Bennett L. Lewis, CO, 14th Engr Bn, 20 Aug 68, VNIT 241, p. 2, CMH; Interv, Maj Alexander E. Charleston, 30th Mil Hist Det, with Lt Col Charles H. Sunder, CO, 159th Trans Bn, 7 Jul 68, VNI 63, pp. 1–2, CMH.

supplies of all types ashore from deep-draft ships. Over time, Utah Beach contained extensive ammunition and fuel storage areas, a helicopter refueling point, a road net with a two-lane connection to Highway 1, and fuel pipelines laid offshore and from the beach to Highway 1 and then north to Dong Ha. Each day truck convoys moved cargo inland from the beach storage area to the forward support bases of the combat divisions. Although daily deliveries of under 350 tons were originally predicted, the beach facility usually averaged over 1,000 tons. (Because of its achievements, the facility shortly took on the name of Wunder Beach, a play on words by the personnel on the beach of the 159th Transportation Battalion's commanding officer, Lt. Col. Charles H. Sunder.) As an additional benefit, the new inland road also crossed and effectively cut a main North Vietnamese supply route leading into Hue.[37]

The fighting to retake Hue lasted three weeks. Viet Cong and North Vietnamese troops, moving under the concealment of low fog, infiltrated the old imperial capital with the help of accomplices inside the city. They quickly captured most of the city on the south bank of the Perfume River and later seized the bulk of the northern half, including the Imperial Citadel. U.S. Marines drove the enemy from most of the south bank in a few days. The fierce battle for the Citadel, in which U.S. and South Vietnamese units suffered heavy casualties, raged until the end of February.[38]

To the north and northeast, the 1st Cavalry Division began striking back at the enemy. The 1st Brigade helped South Vietnamese troops clear Quang Tri City. The 3d Brigade, which had been conducting operations between Chu Lai and Da Nang, was ordered to reinforce weakened local forces and block the enemy's approaches to Hue. Eventually four battalions were involved at Hue in some of the heaviest fighting of the war. By the end of the operation, the brigade had killed over four hundred enemy, nearly all North Vietnamese.

Supporting the 1st Cavalry Division were Army, Navy, and Marine Corps engineers. A platoon from Company A of the division's 8th Engineer Battalion accompanied the first cavalry battalion alighting at Landing Zone El Paso near Hue on 17 January. Joined two days later by a second platoon, the divisional engineers, using their own and borrowed heavy engineer equipment, concentrated on opening Camp Evans. As the rest of the division arrived, the 8th Engineer Battalion committed its resources to daily minesweeps along Highway 1 between Quang Tri and Hue, developing new landing zones and firebases, and supporting units closing into the area. Additional engineering support came from Seabee units—mainly Naval Mobile Construction Battalions 5 and 10—before the arrival of the 14th and 35th Engineer Battalions. At Camp Evans, Naval Mobile Construction Battalion 10 helped the 8th Engineer Battalion build a C–7 Caribou airstrip, which officially opened on 13 March. Work progressed to expand the airfield to C–130 capability. On 11 March,

[37] Pearson, *War in the Northern Provinces*, pp. 59–62; Interv, Charleston with Sunder, 7 Jul 68, pp. 1–3.

[38] Westmoreland, *A Soldier Reports*, pp. 329–31; Sharp and Westmoreland, *Report*, p. 160; Pearson, *War in the Northern Provinces*, pp. 39–48; Tolson, *Airmobility*, pp. 158–64; Lung, *General Offensives 1968–69*, pp. 75–85. For more on the battle for Hue, see Keith William Nolan, *Battle for Hue: Tet, 1968* (Novato, Calif.: Presidio Press, 1983).

part of the battalion operations section moved to Ca Lu to survey the area and coordinate the construction of a new C–123 airstrip and base facilities (Landing Zone STUD) by Marine Corps engineers and Seabees. These and other projects typified the Seabees' responsiveness. When the division's chief of staff had trouble with the III Marine Amphibious Force staff concerning the space requirements for the division headquarters, the Seabees' commander simply asked what the division wanted done and in what order to have it done. General Tolson later wrote, "This was just the first example of the magnificent support we received from the Seabees."[39]

The 1st Cavalry Division's shift northward also brought home the 8th Engineer Battalion's need for a fourth line company and additional equipment. Although the Seabees and Marine Corps engineers provided invaluable construction support, the 8th Engineer Battalion still lacked the general support capability found in the other divisions' engineer battalions. This meant that Col. Edwin S. Townsley, the battalion commander, had to reduce the amount of direct support to the brigades in the field and take troops from the line companies to help the headquarters set up camp and do other tasks. The daily minesweeps along Highway 1 took up about 40 percent of the battalion's effort, with most of the troops drawn from the line companies. Since the 3d Brigade was collocated with the division headquarters at Camp Evans, Company C, which provided direct support to the brigade, saw 50 percent of its capability drawn off to work on bunkers, tactical operations centers, and perimeter defenses. Townsley also pointed out the need for more backhoes and airmobile bulldozers, which were considered vital to firebase construction. Since the brigades usually opened at least two firebases during operations, he recommended increasing the number of authorized backhoes from three to six and boosting the number of bulldozers from the two on hand to the six currently authorized. This would enable each line company to build two firebases concurrently.[40]

Return to Normal

Operational support missions continued at a high pitch through March, absorbing two-thirds of Engineer Command's capacity, then began to subside as the Tet offensive petered out. By April, most of the roads had been reopened and the bridges repaired, allowing most engineer units, except those in I Corps, to return to a more typical allocation of effort between ordinary construction missions and providing for the divisions and brigades. One pacing factor in this return to normality was the extent to which the Vietnamese labor force felt safe to go back to work.

III Corps returned to normal fairly quickly. By the end of March, the 79th Engineer Group, operating north of Saigon, had put the Tet cleanup behind

[39] Quoted words from Tolson, *Airmobility*, p. 160; ORLL, 1–31 Mar 68, 8th Engr Bn, 1 Apr 68, pp. 1–2, Historians files, CMH; *Memoirs of the First Team,* p. 184.

[40] ORLLs, 1–31 Mar 68, 8th Engr Bn, pp. 4–5, and 1–30 Apr 68, 8th Engr Bn, 4 May 68, pp. 6–7, Historians files, CMH.

it and had started to stockpile construction material in preparation for the approaching rainy season when the weather would focus the expenditure of effort on base camp development projects. Three-fourths of its Vietnamese workers were back on the job. Closer to the capital, the 159th Engineer Group turned its attention to long-term defense, constructing combat-essential roads and hardening such facilities as airfields, generators, and fuel storage sites. Cantonments, laboratories, and storage yards were now also a construction priority. In II Corps, the picture was mixed. At An Khe and Cam Ranh Bay, little touched by the Tet offensive, base construction projects continued as before. Elsewhere, worker absenteeism and the closing of several quarries slowed the postattack cleanup, and as March ended the 35th Engineer Group had yet to complete its repairs to facilities at Phan Thiet, Nha Trang, and Tuy Hoa. Ordinary construction was picking up, but so far at reduced priority.[41]

The contractors faced some of the same problems as the troop units because of the absenteeism of their Vietnamese employees. The fighting near the bases forced many workers to stay home or seek safety elsewhere. Those who did report for work or were at work during the attacks faced the same risks as the military. Pacific Architects and Engineers, the Army's facilities engineering contractor, had several facilities outside the base perimeters with security guards neither armed nor trained to defend against attacks. Civilians working side-by-side with soldiers often lacked the minimum protection of helmets and flak jackets. Sometimes the civilian engineers and technicians were barred from entering the bases. Fifteen employees of Pacific Architects and Engineers were killed and several others wounded during the Tet attacks. Eight Americans were missing, and seven were reported taken prisoner. Despite the intensity of the attacks countrywide, the firm evacuated only one site—at Vinh Long in the delta. The displaced Americans and third-country nationals returned to Vinh Long on 4 February and began repairs on electrical distribution lines, perimeter lighting, and power system for the water pumping station. By 12 February, 120 of the 177 Vietnamese had reported to their jobs, with conditions returning to near normal. At many locations, the contractors continued to carry out critical operations using American supervisors, Filipino and Korean workers, and the Vietnamese who reported to work. Essential services as mundane as trash collection resumed with military escorts, often with American, Filipino, and Korean supervisors and technicians doing this necessary chore. By early March, the facilities engineering contractor reported it had returned to 80 percent of its normal level of work. Construction work by RMK-BRJ slipped by one month, but by early March the firm reported that 82 percent of its workforce was on the job.[42]

[41] Engineer Support of Combat Operations, incl. 6, p. 1, OCE Liaison Officer Trip Rpt no. 11; ORLLs, 1 Feb–30 Apr 68, 18th Engr Bde, 30 Apr 68, pp. 1–2, Historians files, CMH, 1 Feb–30 Apr 68, 79th Engr Gp, pp. 2, 4, 1 Feb–30 Apr 68, 159th Engr Gp, pp. 5–19, 1 Feb–30 Apr 68, 34th Engr Gp, pp. 2, 5–8, 1 Feb–30 Apr 68, 35th Engr Gp, pp. 5–6, 1 Feb–30 Apr 68, 937th Engr Gp, pp. 3–5.

[42] PA&E History, Jan–Jun 1968, pp. 28, 33–34, 38–39, 44–45; Quarterly Hist Rpt, 1 Jan–31 Mar 68, MACDC, pp. III-2 to III-4; MACV History, 1968, vol. 2, p. 671.

Army engineers were now carrying out tasks throughout South Vietnam. From the Mekong Delta to the northernmost provinces of I Corps, engineer troops were hard at work in support of combat operations, road and airfield improvements, and base construction. Much of this work was carried out under hazardous conditions. More severe tests would come following the enemy's Tet offensive as the allies readied themselves for counteroffensive operations.

12

The Aftermath, April–December 1968

By the end of March, the storm of the Tet offensive had abated. Far from collapsing, the South Vietnamese government had rallied, and although fighting appeared touch-and-go in many places, no South Vietnamese units were destroyed, and their casualties were surprisingly low. More than simply rallying, however, the government also mobilized, approving a MACV plan to increase the armed forces to over 800,000 men in the next two years. To establish a self-sufficient logistical system, the expansion plan included four construction battalions. Senior U.S. Army engineers in Washington and Saigon also made preparations to organize and train South Vietnamese Army land-clearing companies.[1]

Americans at home saw a different picture, especially when word got out that even more U.S. troops would be needed in Vietnam. Dramatic images showing the sapper attack on the American embassy in the heart of Saigon, the besieged marines at Khe Sanh, and the bitter fight for Hue dimmed General Westmoreland's contention of an allied victory. President Johnson's claims of progress in the war, already doubted by many, lost more credibility, and he showed signs of frustration with the war. Defense Secretary McNamara, also disenchanted, left office on 1 March, replaced by Clark M. Clifford, an adviser and close friend of the president. Public skepticism over the war swelled after the media revealed Westmoreland's request for an additional 206,000 troops. At the time he had about 500,000 of the 525,000 American troops promised, and he needed all of them. Though most of the new troops were intended for the strategic reserves, the size of the request cast further doubts on the conduct of the war. Westmoreland did get some modest reinforcements in February. The 27th Marine Regimental Landing Team took up positions south of Da Nang and freed other Marine Corps units to move north. Meanwhile, the 3d Brigade, 82d Airborne Division, which included Company C from the division's 307th Engineer Battalion, joined the 101st Airborne Division at Phu

[1] MACV History, 1968, vol. 1, pp. 26–27; Sharp and Westmoreland, *Report*, pp. 161–62, 164; Jeffrey J. Clarke, *Advice and Support: The Final Years*, *1965–1973*, United States Army in Vietnam (Washington, D.C.: U.S. Army Center of Military History, 1988), pp. 293–94, 313–14; Msgs, Maj Gen Robert R. Ploger, Dir of Topography and Mil Engineering, OCE, GVP 297 to Maj Gen Charles M. Duke, CG, Engr Cmd and USARV Engr, 4 Apr 68, sub: Land Clearing Companies; Duke ARV 989 to Ploger, 16 Apr 68, sub: Army of the Republic of Vietnam (ARVN) Land Clearing Companies; Brig Gen Andrew P. Rollins, MACV Dir of Const, MAC 05396 to Ploger, 23 Apr 68, sub: ARVN Land Clearing Companies, all in Duke Papers, CMH.

Bai as its third brigade. This measure allowed the 101st Airborne Division's 3d Brigade to remain in the Saigon area.[2]

The small increases in U.S. force levels came after much debate in Washington. Without mobilization, the United States had become overcommitted. The strategic reserves had dwindled during a period of international tension. North Korea captured an American naval vessel, the USS *Pueblo*, a week before the Tet offensive. Chronic problems in the Middle East persisted. Civil unrest in the United States between 1965 and 1968 required the use of Army troops. After extensive deliberation, Johnson chose the modest force increase that would meet Westmoreland's first troop request. A mechanized infantry brigade, including an attached engineer company, from the 5th Infantry Division would replace the 27th Marines in July. President Johnson also overcame his reluctance to mobilize the reserves. There were two reserve call-ups to meet and sustain these deployments, one in March and one in May. The call-ups totaled 62,000 men, nearly 54,000 of them Army, and included a National Guard engineer combat battalion and a light equipment company as part of the 13,500-man support package for Vietnam. This raised the manpower authorization to 549,500, the peak U.S. strength in Vietnam. For a disappointed Westmoreland, this meant that he would have to make the best possible use of American troops, and the South Vietnamese would have to take on a larger share of the war effort. As a signal to foster negotiations, Johnson also curtailed air strikes against North Vietnam. When the president outlined his decision in a nationwide address on 31 March, he surprised the nation and the world by announcing that he would not seek reelection and would devote his full attention to resolving the conflict. Though Hanoi had suffered a military defeat, Johnson's actions implied that the Communists had achieved a political and diplomatic victory.[3]

To keep the number of mobilized support troops low, Washington authorized civilian substitutes. In addition to the 13,500 support troops, MACV received authority to hire 13,035 additional local civilians to augment logistic and construction units. MACV already had initiated a civilianization program in January, but the Tet offensive forced the command to defer the program for six months. Civilianization would have converted some military spaces, but using local nationals required a degree of stability in Vietnam, and fixed units and bases. During Tet, many Vietnamese failed to show up for work. If the U.S. Army, Vietnam, had completed the program, many logistical and engineering units would have lacked the flexibility to carry out their

[2] Westmoreland, *A Soldier Reports*, pp. 350–59; Sharp and Westmoreland, *Report*, pp. 170, 184; MACV History, 1968, vol. 1, pp. 225, 244–45; Hammond, *Military and the Media, 1962–1968*, pp. 344–45, 357–66, 371–73, 375–82. For more on the request for additional forces, see *The Pentagon Papers: The Defense Department History of United States Decisionmaking on Vietnam,* Senator Gravel ed., 4 vols. (Boston: Beacon Press, 1971), 4:539–604; Davidson, *Vietnam at War*, pp. 492–520.

[3] MACV History, 1968, vol. 1, pp. 227–28. For the text of Johnson's 31 March speech, see *Pentagon Papers* (Gravel) 4:596–602. See also Herbert Y. Shandler, *The Unmaking of a President: Lyndon Johnson and Vietnam* (Princeton: Princeton University Press, 1977), pp. 194–217, 229–36.

missions. For Engineer Command, the conversion would have amounted to almost two thousand spaces, about 20 percent of the total planned for U.S. Army, Vietnam. Each of the five construction battalions involved in the program would have lost ninety-nine military positions. Similar substitutions of Vietnamese workers would have occurred in smaller units such as construction support companies. MACV also considered transferring construction projects from engineer units to RMK-BRJ and raising the consortium's manning level, enough to replace a construction battalion. Ironically, Saigon's mobilization was expected to hinder MACV's civilianization program and the contractor's ability to hire more workers. Viet Cong reprisals against Vietnamese employees also provoked fear and reluctance on the part of potential workers. On the other hand, as the government inducted more men in the armed forces, women entered the workforce in larger numbers. That spring, Pacific Architects and Engineers hired about 200 women trainees. At the end of June, 161 women successfully completed training, and Pacific Architects and Engineers hired them as electricians, welders, drivers, mechanics, and plumbers.[4]

On 1 April, Westmoreland believed the allied forces were ready to counterattack. He told his senior commanders that forces in I Corps were "now in position to seek decisive battles in Quang Tri and Thua Thien." Along the coastal regions and in the western highlands "our troops are orienting their operations on the enemy to keep him away from population centers and resources." Moving south, he noted, "Allied campaigns throughout III and IV Corps are diligently securing and restoring lines of communications and installations (economic lifelines) that are vital to these rich and populated areas." Westmoreland concluded: "We must go after the enemy throughout the country; we must hound him and hurt him. We can achieve a decisive victory and we must do so at once, to restore the perspective with which the world sees this war. We must demonstrate by our actions that we are, in fact, winning the war."[5]

Westmoreland's admonition to increase the tempo of pressure against the enemy came soon after the announcement that he would be leaving Vietnam. On 23 March, he was informed of his appointment as Army chief of staff. His deputy, General Abrams, would replace him that summer. In the few remaining months as MACV commander, Westmoreland directed counteroffensive operations, including the relief of Khe Sanh and a drive into the A Shau Valley. The war had reached a peak and, as usual, Army engineers, now spread from the Demilitarized Zone to the delta, were heavily involved in those operations.[6]

[4] Sharp and Westmoreland, *Report*, p. 165; Westmoreland, *A Soldier Reports*, p. 359; MACV History, 1968, vol. 2, p. 678; Quarterly Hist Rpt, 1 Jan–31 Mar 68, MACDC, pp. II-10 to II-11; PA&E History, Jan–Jun 1968, p. 17. For more on the military force levels and civilianization program, see MACV History, 1968, vol. 1, pp. 225–33; Msg, Palmer ARV 1569 to Gen Creighton W. Abrams, Dep COMUSMACV, 9 Jun 68, sub: Program 6 Civilianization; Msg, Gen Johnson WDC 8527 to Palmer, 11 Jun 68, sub: Civilianization Program—Program 6; Msg, Palmer ARV 1622 to Gen Johnson, 14 Jun 68, sub: Civilianization Program, all in Creighton W. Abrams Papers, CMH.

[5] Quoted in MACV History, 1968, vol. 1, pp. 26–27.

[6] Westmoreland, *A Soldier Reports*, p. 439.

Relieving Khe Sanh

In mid-March, the North Vietnamese apparently had given up at Khe Sanh and began to pull back into Laos just as Westmoreland decided to reestablish a land link with the Marine base. He did not consider the base in great peril but became anxious to reestablish contact "if for no other reason than to silence dolorous critics and allay President Johnson's concern." MACV Forward Command Post under Westmoreland's deputy, General Abrams, had developed a plan, code-named Operation PEGASUS, before the end of February, but weather conditions and logistic preparations held up launching the campaign. Planning continued while allied forces retook Hue, more Army reinforcements reached the area, engineers reopened the lines of communication, and logisticians reconstituted stockpiles. When the logistics-over-the-shore supply facility at Wunder Beach began to discharge over one thousand tons a day, MACV set 1 April as the D-day for the relief of Khe Sanh.[7]

Meanwhile, five widely scattered U.S. divisions, three Army and two Marine, had taken up positions in I Corps, and Westmoreland considered the force too large to be controlled from a single headquarters. The recent arrivals included the 101st Airborne Division, which deployed from III Corps to Phu Bai on 19 February. When the 101st took over responsibility for the 1st Cavalry Division's old operating area, the cavalrymen moved to a new base and airstrip called Landing Zone STUD at Ca Lu in central Quang Tri Province to prepare for PEGASUS. At that point, Westmoreland decided to upgrade the III Marine Amphibious Force to the level of a field army headquarters with a subordinate Army corps. On 10 March, accordingly, MACV Forward at Phu Bai officially became Provisional Corps, Vietnam, and General Abrams returned to Saigon. Lt. Gen. William B. Rosson, who had earlier commanded Task Force OREGON and then I Field Force, and was currently serving as Abrams' deputy at MACV Forward, assumed command of the new Army corps and operational control of the two Army divisions, the 3d Marine Division, and other supporting forces in northern I Corps.[8]

Operation PEGASUS began at 0700 on 1 April with American and Vietnamese forces moving out from Landing Zone STUD along Highway 9 toward the Khe Sanh base. This followed an allied deception operation initiated a few days earlier northeast of Dong Ha. The PEGASUS force, under the control of the 1st Cavalry Division, included the division's three brigades, a Marine Corps regiment, a South Vietnamese airborne task force, and the garrison at Khe Sanh, over 30,000 troops. The 1st Marines led the ground attack, securing and repairing the road as it advanced westward. Poor weather delayed the airmobile part of the operation to 1300, when the 1st Cavalry Division's 3d Brigade began seizing high ground in a series of airmobile assaults. On 3 April, the 2d Brigade landed three battalions southeast of Khe Sanh and attacked to the northwest. During the fourth day, the marines continued their push while the

[7] Quoted in ibid., p. 347; Pearson, *War in the Northern Provinces*, p. 68.

[8] Pearson, *War in the Northern Provinces*, pp. 68–69; Shulimson, et al., *U.S. Marines in Vietnam, 1968*, p. 284.

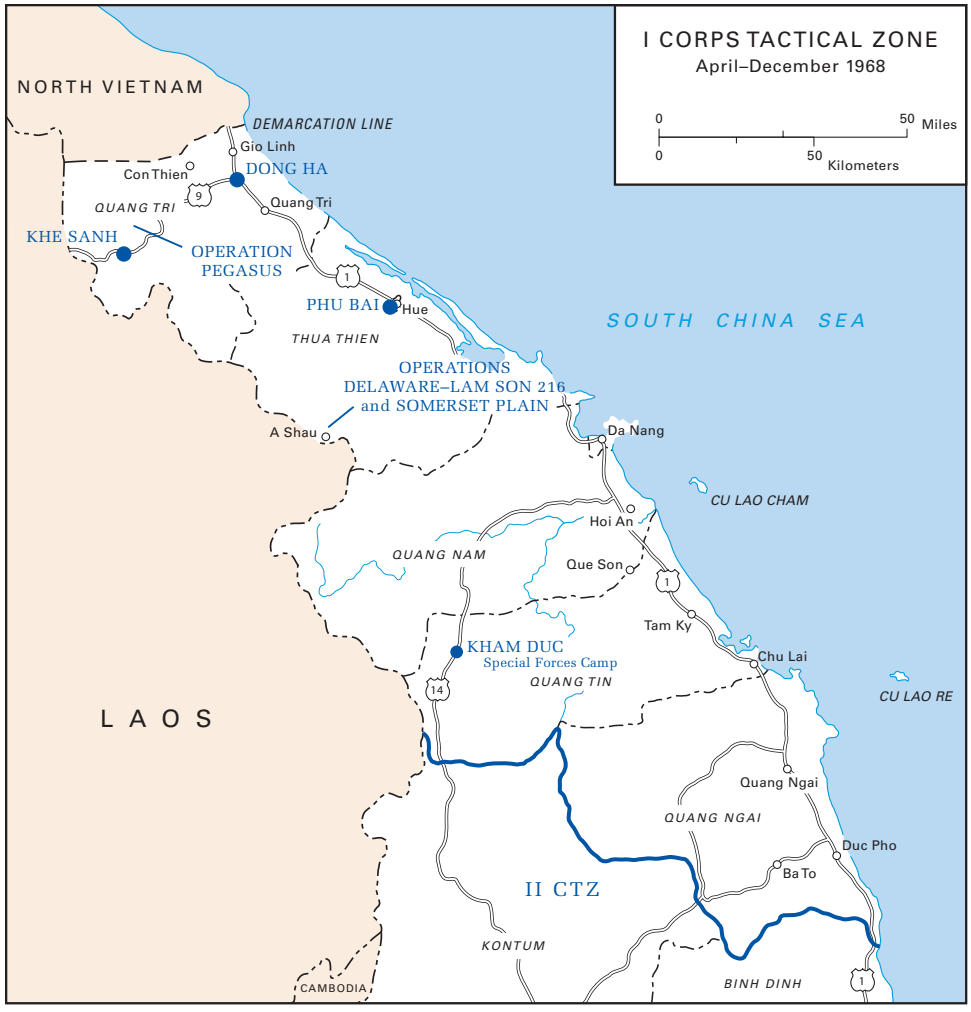
cavalrymen applied pressure throughout the battle area. The following day, elements of the 26th Marines sallied forth from Khe Sanh and seized Hill 471 southeast of the base. On 5 April, North Vietnamese troops tried in vain to retake the hill, but the marines, sustained by artillery and close air support, cut down the attackers in one of the major fights of the campaign. That same day, units of the 1st Cavalry Division's 1st Brigade air-assaulted into positions overlooking Highway 9 south of the base. More air cavalry troops landed on Hill 471 to relieve the marines in the first relief of Khe Sanh's defenders. The official linkup came the following afternoon when the 1st Cavalry Division airlifted South Vietnamese airborne troops to the base. On the morning of the eighth, the 3d Brigade cleared the remaining section of road and linked up with the 26th Marines. Two days later, the 1st Brigade seized the old Lang Vei Special Forces camp. Provisional Corps, Vietnam, officially ended PEGASUS on 15 April.[9] (*Map 24*)

PEGASUS depended much on the logistical portion of the plan, which in turn depended on the engineers. Carrying out the logistic operation hinged on the construction at Landing Zone STUD. Before this work could start, the 3d Marine Division had to clear Highway 9 westward from the Marine artillery base at the Rockpile. Supplies, fuel, ammunition, and construction material were then stockpiled at STUD. On 14 March, a joint task force of engineers under the operational control of the 1st Cavalry Division—consisting of elements of the 11th Marine Engineer Battalion, Naval Mobile Construction Battalion 5, and the 8th Engineer Battalion—reached STUD and began work. Within twelve days, the tri-service engineers completed a C–7A Caribou airstrip 1,500 feet long by 150 feet wide. The Seabees, who were augmented with heavy equipment from the 32d Naval Construction Regiment, concentrated on the airfield. When PEGASUS jumped off on 1 April, Landing Zone STUD had reached about 83 percent completion. By the time the operation ended, the base was in full operation and included an extended C–123 airstrip with parking ramps, ammunition storage areas, aircraft and refueling facilities, road nets, and strengthened defenses. Many vital supplies for the operation were brought up from Wunder Beach, where the 14th Engineer Battalion had arrived to join the Seabees working at the over-the-beach logistics facility.[10]

When the 1st Marines began its attack, two companies of Lt. Col. Victor A. Perry's 11th Marine Engineer Battalion and an attached bridge platoon from the 7th Marine Engineer Battalion followed, repairing Highway 9 as the advance continued. On the first day, the 11th Engineer Battalion cleared one mile of

[9] Sharp and Westmoreland, *Report*, pp. 164, 186; Tolson, *Airmobility*, pp. 169–78; Pearson, *War in the Northern Provinces*, pp. 81–89. See also Shulimson, et al., *U.S. Marines in Vietnam, 1968*, pp. 283–90; Operation PEGASUS, Historical Study 3–68, 31st Mil Hist Det, HQ Prov Corps Vietnam, May 1968 (hereafter cited as Operation PEGASUS), copy in Historians files, CMH.

[10] Westmoreland, *A Soldier Reports*, p. 347; Tolson, *Airmobility*, pp. 170–71; Capt. Moyers S. Shore II, USMC, *The Battle for Khe Sanh* (Washington, D.C.: History and Museums Division, Headquarters U.S. Marine Corps, 1969), pp. 133, 150; ORLL, 1 Feb–30 Apr 68, 8th Engr Bn, p. 2; Operation PEGASUS, pp. 6–7, 12; Fink, "Engineers Move to I Corps," p. 359; Shulimson, et al., *U.S. Marines in Vietnam, 1968*, p. 284.



Map 24

road and built four bypasses. The following day the engineers, protected on the flanks by Marine infantry, cleared almost two miles of road and built two more bridges and two bypasses. By the seventh, they had gone over five miles and replaced or rebuilt five of the nine bridges to Khe Sanh. On 8 April, helicopters lifted a third company to another bridge site. Meanwhile, back at Dong Ha, the 11th's fourth line company and a bridge company assembled prefabricated bridge sections and bridge parts. The 1st Cavalry Division's CH–54s lifted the finished bridge sections and M4T6 floating bridges to three sites. The last bridge went in on 11 April, and the Class 50 road, capable of supporting the standard divisional loads of approximately fifty tons, officially opened at 1600. In eleven days, the 11th Engineer Battalion and attached units reconstructed over eight miles of road, filled craters, cleared landslides, repaired or replaced bridges, and constructed bypasses. It seemed fitting that the first vehicle to make the trip from

Dong Ha to Khe Sanh since the summer of 1967 should be the jeep of the 11th Battalion's command group.[11]

As the 11th Marine Engineer Battalion worked overland, elements of the Colonel Townsley's 8th Engineer Battalion accompanied the leapfrogging 1st Cavalry Division units to the besieged base. Company C provided direct support to the 3d Brigade's battalions air-assaulting into Landing Zones CATES, MIKE, and THOR. This support included hasty engineering tasks such as demolitions, field fortifications and wire, tactical operations center construction, and artillery positions. At Landing Zone CATES, the company established and maintained the brigade's water supply point. As the division approached Khe Sanh, Company C opened several landing zones, and furnished light bulldozers to speed up reopening the road link to the Marine base. Company B accompanied the 2d Brigade's assaults into Landing Zones TOM and WHARTON. Company A already had a platoon at Landing Zone STUD, where it built the division's tactical operations center and remained in general support. The remainder of the company opened Landing Zone SNAPPER for the 1st Brigade, supported the South Vietnamese 3d Airborne Task Force on Landing Zone SNAKE, and sent out a demolition squad and minesweep team to support the assault on Lang Vei.[12]

Although PEGASUS was a joint engineering effort, the need for more Army engineers in northern I Corps had become obvious. The commitment of the two Army divisions to the area had placed heavy demands on the available engineers to build combat and logistical bases and carry out road improvements. Both the 1st Cavalry Division's 8th Engineer and the 101st Airborne Division's 326th Engineer Battalions were small organizations consisting of only three instead of four letter companies. They not only lacked a bridge company authorized in infantry and armor divisions but also lacked the equipment to build new camps. For the time being Company D, 14th Engineer Battalion, at Camp Evans served as the 1st Cavalry Division's fourth engineer company, a temporary measure at best. On 15 March, Provisional Corps, Vietnam, informed the III Marine Amphibious Force that it urgently needed additional Army engineering support for the two divisions and requested another engineer battalion.[13]

The assignment fell to the 27th Engineer Combat Battalion, located at the time about sixty-two miles east of Saigon. The 27th Engineer Battalion had been carrying out base development work and operational support for the 11th Armored Cavalry Regiment at Blackhorse base camp and other bases nearby. During the Tet offensive, the battalion reopened roads cut by the Viet Cong and designated two line companies as a ready reaction force, freeing armored cavalry units for operations outside the base camp. On 24 March, a warning

[11] Tolson, *Airmobility*, pp. 173, 178; Pearson, *War in the Northern Provinces*, pp. 83–84, 88; Shulimson, et al., *U.S. Marines in Vietnam, 1968*, pp. 284, 589; Operation PEGASUS, pp. 29, 40, 46, 56.

[12] ORLL, 1 Feb–30 Apr 68, 8th Engr Bn, pp. 2–3.

[13] Operation PEGASUS, pp. 8–9; Fink, "Engineers Move to I Corps," p. 359; ORLLs, 1 Feb–30 Apr 68, 14th Engr Bn, p. 6, and 1 Aug–31 Oct 68, 14th Engr Bn, 31 Oct 68, p. 2, Historians files, CMH.

An Army CH–54 Flying Crane lowers a dry span bridge over a gap as the Marine 11th Engineer Battalion worked to reopen Highway 9 to Khe Sanh during Operation PEGASUS.

order dispatched through the 20th Engineer Brigade and 34th Engineer Group to Lt. Col. Kent C. Kelly, the battalion commander, ordered him to prepare the unit for the move north. The group quickly transferred projects to the 36th Engineer Construction Battalion. Colonel Kelly established a staging area at Bien Hoa, and on 4 April an advance party flew to Phu Bai and drove a short distance north to Gia Le to establish a base camp near Camp Eagle. In the next month, most of the 27th Battalion and the attached 591st Light Equipment Company moved by land, sea, and air, making this the longest of the engineer moves in Vietnam to date. Wheeled vehicles and cargo packed in Conex containers moved to Saigon for loading aboard a ship. A few days later, 325 troops flew aboard six C–130s to Da Nang to meet the ship and begin off-loading. After moving to a staging area at the 35th Engineer Battalion's camp north of Da Nang, the vehicles convoyed over the Hai Van Pass to Gia Le. The rest of the troops flew directly to Phu Bai airfield. Engineer equipment that would have been difficult to move over the road was placed aboard LSTs at Newport for shipment beyond the Hai Van Pass to the port at Tan My. This movement required six LST loads spread over a twenty-day period, with the last LST reaching Tan My on 30 April. Two of the 27th Battalion's units stayed behind. Company D remained at Phan Thiet and was placed under the 87th Engineer Construction Battalion's control. The 27th Land Clearing Team continued its mission in III Corps under the 168th Engineer Combat Battalion.[14]

The A Shau

The 27th Engineer Battalion arrived just in time to support a major operation, an airmobile assault against the North Vietnamese redoubt in the A Shau Valley. Located less than seven miles from the Laotian border and running northwest to southeast, the valley extends between two high and steeply sloped mountain ranges that climb to over three thousand feet. Among the few man-made features were three abandoned airfields spread along the valley floor. North Vietnamese troops had controlled the A Shau since March 1966 when they overran the Special Forces camp in the southern end and established a major staging area to infiltrate troops and supplies through Laos into Thua Thien Province. After reviewing detailed intelligence of the North Vietnamese bastion, General Tolson exclaimed: "This was his [the enemy's] Cam Ranh Bay, so to speak." The valley's peculiar location and topography expose it to both the northeast and southwest monsoons, and the brief interval between monsoons—mid-April to mid-May—prompted Westmoreland's planners to propose a quick strike. During the last days of Operation PEGASUS, Provisional Corps, Vietnam, completed final preparations for the assault, called Operation DELAWARE–LAM SON 216, committing elements of Tolson's 1st Cavalry Division and the 101st Airborne Division along with South Vietnamese forces.

[14] ORLL, 1 Feb–30 Apr 68, 27th Engr Bn, pp. 1–2, 8–10, 14–16; Ploger, *Army Engineers*, p. 151; Fink, "Engineers Move to I Corps," p. 359.

A corps reserve was established by moving the 196th Light Infantry Brigade to Camp Evans.[15]

The operation began on the morning of 19 April with preplanned air and artillery strikes. But almost at once, heavy antiaircraft fire met the 1st Cavalry Division's 3d Brigade, and poor weather played havoc with helicopter assaults and Air Force resupply missions. Just getting the desired firebases in place to support an assault on the old French airstrip at A Luoi took until the twenty-fourth. Meanwhile, to the east, the 1st Brigade, 101st Airborne Division, drove westward along Route 547, a narrow, winding, overgrown, unimproved road. On the second day, the cavalry division's 3d Brigade expanded operations with one battalion pushing southeast and another blocking Route 548 that entered the valley from Laos. The following day, 21 April, fighting increased as the allied units moved deeper into the sanctuary. As the weather temporarily improved, the 1st Brigade, 1st Cavalry Division, inserted a battalion into the central part of the A Shau, about a mile south of the A Luoi airstrip. Two more battalions followed, sweeping the surrounding area. During the rest of April, the buildup of forces and supplies continued around the airstrip, and by early May North Vietnamese resistance lessened. On 12 May, the 1st Cavalry Division and South Vietnamese airborne troops pushing westward along Routes 547 and 547A met some six miles east of A Luoi. As the operation progressed, American and South Vietnamese forces uncovered vast enemy caches. One find of interest to engineers was a large maintenance area and two Soviet-manufactured bulldozers used in building the logistical base and supply routes. By mid-May the rains of the southwest monsoon intensified, and the allies began to pull out. Operation DELAWARE–LAM SON 216 officially ended on 17 May.[16]

During the A Shau operation, the engineers played a vital role. Company C, 8th Engineer Battalion, moved with the cavalry division's 3d Brigade into landing zones and concentrated on setting up and improving firebases. Most of Company A accompanied the 1st Brigade's assault battalions into Landing Zones CECILE and STALLION (A Luoi airfield). The unit also made minesweeps, constructed defensive positions and tactical operations centers, cleared fields of fire, and prepared artillery positions. While the 1st Brigade continued its buildup, CH–54 helicopters brought in construction equipment broken down into sections to work on the airstrip. On 1 May, a team from Headquarters Company, augmented with equipment from the 326th Engineer Battalion, opened the 2,900-foot runway to C–7A Caribous and four days later to C–130s. Company A of the 326th supported the 1st Brigade, 101st Airborne

[15] Interv, Capt Joseph W. A. Whitehorne, 14th Mil Hist Det, with Maj Gen John J. Tolson, CG, 1st Cav Div, 27 May 68, p. 5 (quoted words), Historians files, CMH; Tolson, *Airmobility*, p. 182; Pearson, *War in the Northern Provinces*, pp. 3–4, 89; Spector, *After Tet*, p. 138. For more on the planning of the operation, see MFR, Brig Gen John R. Chaisson, Director, MACV Combat Operations Center, 17 Apr 68, sub: Report of Visit by COMUSMACV to HQ, PCV [Provisional Corps, Vietnam] 14 Apr 68, Westmoreland History files, CMH.

[16] Sharp and Westmoreland, *Report*, pp. 165, 187; Tolson, *Airmobility*, pp. 184–92; Pearson, *War in the Northern Provinces*, pp. 89–92; Bowers, *Tactical Airlift*, p. 333; Spector, *After Tet*, pp. 139–40.

Division, and concentrated on clearing landing zones and constructing firebases. Prior to the operation elements from the 27th Engineer Battalion, still in the process of moving from III Corps, cleared and opened Route 547 from Hue to the valley. On 14 April, Company A, 27th Engineer Battalion, started roadwork to Firebase BIRMINGHAM, approximately twenty miles east of the valley. Within a few days, a platoon from the 27th Battalion's Company B reached Firebase BASTOGNE to work on the defenses and the road to Firebase BIRMINGHAM. Another platoon moved farther west to the 101st Airborne Division's Firebase VEGHEL to support the South Vietnamese airborne task force. During the operation, the 591st Light Equipment Company organized an ad hoc land-clearing platoon of ten D7E bulldozers mounting Rome plows to clear vegetation out to three hundred yards along Route 547. Seabee units in I Corps provided additional equipment such as bulldozers and maintenance troops.[17]

During the operation, Army engineers noted some disturbing trends. In several cases, the 8th Engineer Battalion's minesweep teams were blown up by command-detonated mines. Security elements were alerted to get at least one hundred yards to either side and forward of the minesweep team and to use grappling hooks along the ditches to uncover the connecting wires. To make detection more difficult and dangerous, the enemy was also burying mines deeper than normal while placing scrap metal just above the mine. The 27th Engineer Battalion warned its mine-detector operators to keep checking suspected areas for signals that might reveal real mines.[18]

During DELAWARE–LAM SON 216, the abysmal weather affected air operations, especially the efforts to keep A Luoi airstrip open. The operation did not call for major units to remain in the area after the operation, and the provisional corps overruled opening Route 547 all the way into the A Shau Valley. Instead, troops and supplies arrived by air. The 8th Engineer Battalion should have reached A Luoi on the second day to begin rebuilding the airstrip, but the poor weather and intense antiaircraft fire delayed its arrival ten days to 29 April. Meanwhile, supplies were delivered by helicopters and C–130 airdrops until the engineers opened the airstrip to the first C–130 on 4 May. Heavy rainstorms turned the red dust of A Luoi into mud, and the airstrip remained closed from midday 7 May until the morning of the ninth. Withdrawal of troops began on 10 May, but heavy rains the following day again closed the strip to fixed-wing landings. Since the airstrip did not have ample time to dry out, helicopters had to be used to lift out the remaining supplies and troops as the operation ended.[19]

[17] ORLLs, 1 Feb–30 Apr 68, 8th Engr Bn, 4 May 68, pp. 2–4, and 1 May–31 Jul 68, 8th Engr Bn, 1 Aug 68, pp. 1–4, Historians files, CMH; Bowers, *Tactical Airlift*, p. 340; ORLL, 1 Feb–30 Apr 68, 27th Engr Bn, pp. 11–12, and incl. 2, ORLL, 1 Feb–30 Apr 68, 591st Engr Light Equip Co, pp. 2, 7–9; Ploger, *Army Engineers*, pp. 151–52; Fink, "Engineers Move to I Corps," p. 359; Tolson, *Airmobility*, pp. 187, 189–90.

[18] ORLL, 1 Feb–30 Apr 68, 8th Engr Bn, pp. 4–5.

[19] Interv, Whitehorne with Tolson, 27 May 68, p. 6; Bowers, *Tactical Airlift*, pp. 332–33, 339–41; Tolson, *Airmobility*, p. 190; Stanton, *Rise and Fall of an American Army*, pp. 262–63.

Allied officers declared PEGASUS and DELAWARE–LAM SON 216 tactical and strategic successes, but it did not take long for North Vietnamese forces to return to Khe Sanh and the A Shau. Though no longer cut off or threatened with imminent attack, Khe Sanh remained under siege. North Vietnamese artillery, dug deep into the mountains in nearby Laos, continued to bombard the base. Badly mauled North Vietnamese units withdrew across the border to regroup and refit, and by early May enemy troops returned in large numbers. Operation DELAWARE–LAM SON 216 initially seemed worth the cost. The operation resulted in an impressive list of captured ammunition, weapons, and equipment; disrupted future enemy operations; and effectively showed that he had no sanctuaries. Still, truck sightings in the valley less than a week after the allied withdrawal confirmed that the interdiction would not be long-lived. After PEGASUS, senior U.S. Army and Marine Corps commanders in I Corps continued to declare the Khe Sanh base a liability. They recommended that the base be abandoned and destroyed and the area defended with airmobile troops from Landing Zone STUD. The marines had long advocated quitting Khe Sanh and employing a mobile defense along the Demilitarized Zone. Westmoreland agreed in principle, but he disagreed with the recommended timing and deferred the decision to his successor, General Abrams. Preparations already under way to close the base were canceled, and the marines dug in again. On 15 April, fresh Marine battalions and two battalions from the 1st Cavalry Division launched a new operation, SCOTLAND II. In the ten weeks that followed PEGASUS, American troops in or near Khe Sanh suffered more than twice the casualties reported during the siege. In June, Abrams became theater commander, and he quickly decided to close the combat base. With shells continuing to rain down on the base, the marines completed the evacuation on the evening of 5 July. The decision to leave Khe Sanh caused some bewilderment in the United States. Abrams justified this move by pointing out that not tying down troops to specific terrain would better the chances to counter future threats.[20]

Two More Enemy Highpoints

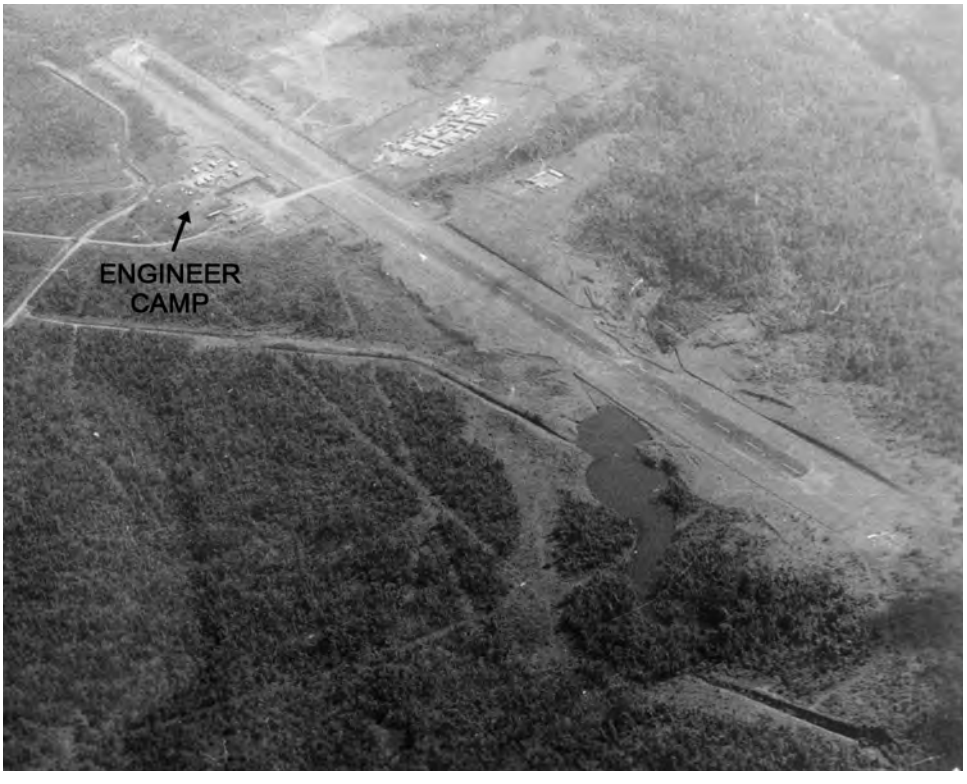
Hanoi's actions suggested a renewed offensive, and it began on 5 May. Its timing coincided with the opening of the long-heralded Paris peace talks after President Johnson ordered a halt to bombing North Vietnam above the 20th Parallel. This offensive, known by American troops as the "Mini-Tet," turned out to be a reduced version of the Tet offensive. At the same time, it showed the conferees in Paris that Hanoi would continue to fight. Except at Saigon and a few other places, the May offensive featured rocket and mortar attacks against towns, cities, and U.S. installations. Attacks on bridges and airfields were usually repulsed. In northern I Corps, the allied forces anticipated the attacks and blocked enemy advances toward Dong Ha. After a series of bloody engagements in the eastern Demilitarized Zone,

[20] Interv, Whitehorne with Tolson, 27 May 68, p. 5; Bowers, *Tactical Airlift*, pp. 341–42; Tolson, *Airmobility*, p. 192; Spector, *After Tet*, pp. 128–29, 140, 228–31.

the planned attack on Hue never got under way. Strong North Vietnamese forces did succeed in taking the Special Forces camp at Kham Duc, located about ninety miles southwest of Da Nang near the Laotian border. In the area around Pleiku and Kontum, preemptive attacks by the 4th Division, elements of the 173d Airborne Brigade, and the 3d Brigade, 101st Airborne Division, plus heavy B–52 strikes, forced the enemy to cancel attacks and withdraw into Cambodia. The main attack took place in Saigon. American and South Vietnamese troops on the approaches to the capital intercepted and destroyed many small guerrilla bands. Those that got into the city holed up in the Cholon district and fought stubbornly, often setting fires in the highly flammable shanty neighborhoods. This gave the impression of a city under siege and was designed to embarrass the government and influence the talks in Paris. Allied efforts to rout the enemy created more destruction. By mid-May, the allied forces had rooted the Communists out of most of their strongholds, ending the worst of the street fighting. Rocket and mortar attacks continued, however, and renewed attacks in Cholon and near the Phu Tho racetrack took place later that month.[21]

Army engineers witnessed the only real North Vietnamese battlefield success—Kham Duc. Kham Duc and its satellite camp at Ngoc Tavik, five miles to the south, served as the last remaining Special Forces camps along the Laotian border in I Corps after the fall of Lang Vei. The camp sat astride Highway 14, which also served as an avenue for the North Vietnamese coming down the roads and tracks of the Ho Chi Minh Trail just across the border. Although the two outposts could not completely block the infiltration into South Vietnam, they kept the enemy's activities under observation and frequently hindered his movements. Placed in one of the most rugged border regions in Vietnam only ten miles from the Laotian border, the Kham Duc camp, village, and airfield sat in a milewide bowl surrounded by hills rising abruptly to heights of two thousand feet. Earlier in January when General Westmoreland canceled the first of his projected YORK operations, he had still wanted the airfield upgraded to handle sustained C–130 traffic and pads built for a radio navigation system. These tasks were passed down through command and engineer channels to Company A, 70th Engineer Battalion, 937th Engineer Group, at Pleiku. To meet the 1 April completion date, the 70th Engineer Battalion made plans to move the company by air. Delivering the unit's equipment and construction material, mostly M8A1 matting, would have required some forty C–130 sorties. Due to the scarcity of airlift at the time, the Air Force balked at handling the requirement until early April. Concerned that increasing rains during April would create construction problems, group headquarters tried to delay the project until the next dry season. The request was denied, and on 9 April the first platoon flew to Kham Duc and moved to a nearby abandoned

[21] Sharp and Westmoreland, *Report*, pp. 166–68; Westmoreland, *A Soldier Reports*, pp. 359–61; MACV History, 1968, vol. 1, pp. 132–33, 393. For more on the fighting during this period, see ORLLs, 1 May–31 Jul 68, II FFV, pp. 22–35, and 1 May–31 Jul 68, I FFV, 15 Aug 68, pp. 13–19; Starry, *Mounted Combat*, pp. 129–31; Lung, *General Offensives of 1968–69*, pp. 91–106; Spector, *After Tet*, pp. 142–83; Keith William Nolan, *The Magnificent Bastards: The Joint Army-Marine Defense of Dong Ha, 1968* (Novato, Calif.: Presidio Press, 1994).



An aerial view of the Kham Duc airfield with engineer camp to the left of the airfield

camp located on higher ground adjacent to the airfield. Work was well under way by the time the last element arrived on 15 April. Still, it would be several days before the company's two D7E bulldozers, each too large for a C–130, arrived aboard C–124 Globemasters.[22]

Company A made good progress until 10 May, when the North Vietnamese launched their attack. First Lt. Daniel W. Waldo Jr., former executive officer and now company commander, assigned tasks to each of the three line platoons. The 2d Platoon developed a sand pit and access road, and the 1st Platoon started on the pads, which were leveled and waterproofed with a coating of RC–3, an asphaltic cutback material. This was covered by a one-inch layer of sand and topped off with M8A1 matting. With the arrival of the first bulldozer on 18 April, the 1st Platoon began clearing the new parking apron area. Meanwhile, the 3d Platoon worked on the runway and existing parking apron, patching and sealing the many holes and improving drainage. After the

[22] Bowers, *Tactical Airlift*, p. 343; Spector, *After Tet*, p. 166; AAR/Interv, Upgrading Kham Duc Airfield (Opn SANTA BARBARA), 26th Mil Hist Det, 24 Jul 68, pp. 1–4, and incl. 2, Interv, Maj Paul B. Webber, 26th Mil Hist Det, with Capt Daniel W. Waldo Jr., CO, Company A, 70th Engr Bn, 24 Jul 68, VNIT 214, pp. 1–2, 4, CMH.

first mortar rounds struck the base at 0630, the engineers resumed work on the airfield. Another attack at 1000 brought all work to a halt.[23]

Within a few days, Kham Duc was hastily evacuated. Until then, Company A helped defend the base and tried to keep the runway open. During the second mortar attack, one soldier was wounded while repairing a telephone line between the engineer and the Special Forces camps. Following this attack, the 3d Platoon spotted North Vietnamese soldiers on the southeast side of the airfield and took them under fire. An intense firefight followed, and three more engineers were wounded. After one and one-half hours, the platoon withdrew to its camp. A major ground attack now appeared imminent, and later that morning an infantry battalion task force from the Americal Division began arriving by air and assumed command at Kham Duc. Company A spent the rest of the day clearing fields of fire and improving defensive positions. Earlier in the day, Ngoc Tavak also came under heavy attack, and the defenders were forced to abandon the camp and withdraw to Kham Duc before darkness. Scattered mortar fire rained down on Kham Duc on 11 May as the last of the reinforcements arrived. By then U.S. commanders had second thoughts about another protracted battle, and they recommended vacating the camp. After reviewing the situation that evening, General Westmoreland approved the withdrawal. Kham Duc, Westmoreland later wrote, "had none of the importance of or defensive potential of a Khe Sanh, and I ordered evacuation." Just before midnight, the 70th Engineer Battalion ordered Lieutenant Waldo to get out with as much equipment as possible, but because of intense enemy fire early the next day this was easier said than done. Army and Marine helicopters managed a few pickups during the morning, but a downed CH–47 blocked the runway. Since the two bulldozers had been disassembled for evacuation, the engineers used a bucket loader to move the damaged Chinook. Fuel leaking from the burning helicopter, however, set the bucket loader ablaze, and the engineers had to abandon it. Frantically, they reassembled a bulldozer and finally moved the helicopter, permitting the landing of C–123s and C–130s. When one C–130 took off down the cratered and shrapnel-littered runway, mortars burst on all sides flattening a tire. The crew aborted the takeoff, offloaded the passengers, and with the help of engineer maintenance troops cut away the ruined tire. With fuel streaming from holes in the wings, the damaged and nearly empty aircraft managed to take off. At 1100, a C–123 took off with forty-six engineers, and CH–47s carried out the remaining sixty-four between 1100 and 1500. That afternoon, two C–130s were shot down within minutes, but helicopters and transports, protected by close-in air strikes, completed the evacuation by 1600. Following the evacuation, air strikes demolished the remains of the camp, including Company A's equipment and construction materials.[24]

[23] AAR/Interv, Upgrading Kham Duc Airfield, pp. 4–6, and incl. 2, Interv, Webber with Waldo, 24 Jul 68, pp. 1–2, 6; Bowers, *Tactical Airlift*, p. 343.

[24] Westmoreland, *A Soldier Reports*, p. 360 (quotation); Bowers, *Tactical Airlift*, pp. 343–47; Spector, *After Tet*, pp. 166–75; AAR/Interv, Upgrading Kham Duc Airfield, pp. 4–11, and incl. 2, Interv, Webber with Waldo, 24 Jul 68, pp. 5–10.

Enemy mortar attack at Kham Duc as shown from the engineer camp

The forced evacuation of the engineers at Kham Duc greatly affected Company A. Those men aboard the C–123 were flown to Da Nang, and those carried out by helicopters were dropped off at Landing Zone Ross where other helicopters transported them to Landing Zone Baldy. Within a few days, the engineers were flown to their home base at Pleiku. Thirty-one men were wounded, almost a third of the engineers at Kham Duc. None died. Company A lost almost all its equipment and some weapons and communications gear, including both D7E bulldozers, eight 5-ton dump trucks, two bucket loaders, one grader, other assorted equipment, and all squad and platoon tool kits. Construction material left behind and assumed destroyed by the Air Force included 432 bundles of M8A1 airfield matting, 360 drums of asphalt, and 1,200 bags of cement. These were approved as combat losses, but by the end of June the unit still lacked its replacement bulldozers, dump trucks, and grader. As a result, the unit restricted its work to construction tasks in the Pleiku area.[25]

[25] Quarterly Hist Rpt, 1 Apr–30 Jun 68, MACDC, p. II-9, Historians files, CMH; AAR/Interv, Upgrading Kham Duc Airfield, pp. 9–11, and incl. 2, Interv, Webber with Waldo, 24 Jul 68, pp. 11–12.

The May attacks in the Saigon area proved more destructive than Tet. Some 15,000 homes were destroyed creating nearly 104,000 new refugees. With the monsoon on the horizon, the South Vietnamese government began a crash reconstruction program. Fortunately, the government's Central Recovery Committee established during the Tet offensive was still carrying out Project RECOVERY, and was able to move quickly to erect temporary housing. Media claims that allied firepower had caused much of the damage prompted General Westmoreland to lend assistance. On 13 May, he ordered General Rollins, the director of construction, to organize a joint engineer task force of U.S. Army, Navy, and Air Force engineers to help build some 1,500 temporary family units. Westmoreland also endorsed naming the cooperative effort Operation DONG TAM, the same Vietnamese term used for the delta base, literally meaning "united hearts and minds." Under Rollins' direction, the participating organizations—the Directorate of Construction, the Navy's Officer in Charge of Construction, and the three services' engineer units—formed Task Force DONG TAM. The South Vietnamese chief of engineers, Col. Nguyen Chan, dispatched two liaison officers to the task force's headquarters, and the Navy's Officer in Charge of Construction provided a civilian draftsman and used an architectural engineering contractor to design the housing areas. The United States Agency for International Development provided cement and roofing from its stocks, and the U.S. Army furnished the rest of the materials, which the agency later replenished. All work came under the general control of the Central Recovery Committee.[26]

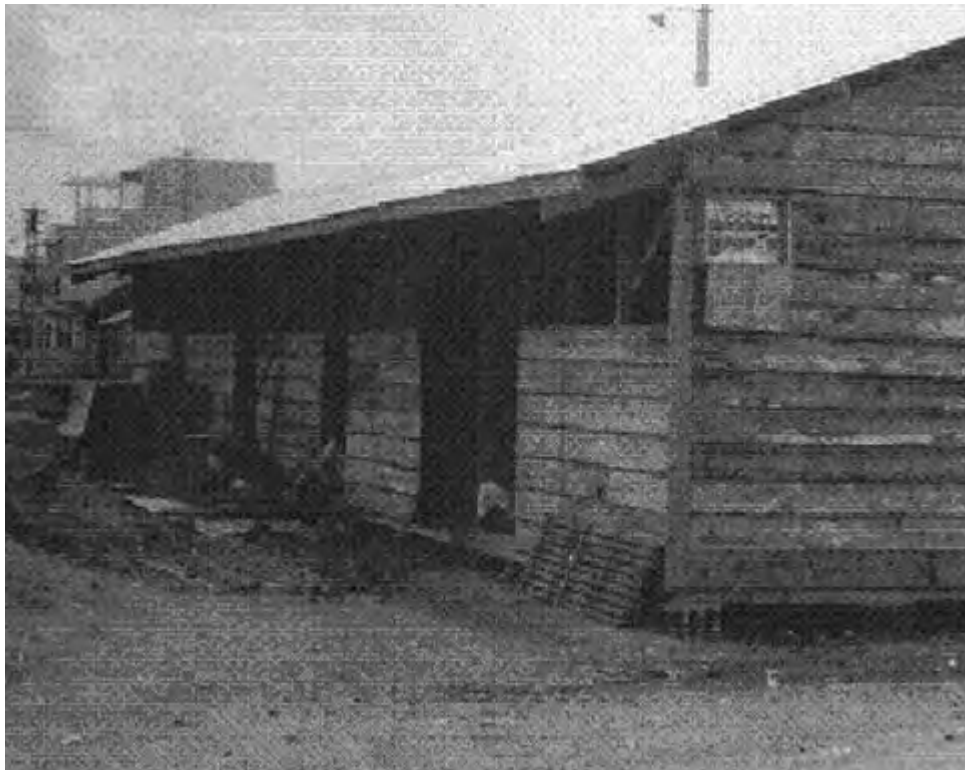
Within a few days Task Force DONG TAM began operations, which lasted through the summer. Since the 46th Engineer Construction Battalion at nearby Long Binh ran a prefabrication lumber yard, it became the U.S. Army's most logical representative unit. On 19 May, Lt. Col. Pendleton A. Jordan, who just assumed command of the battalion, deployed Capt. Theodore B. McCulloch's Company B and other elements to the Phu Tho racetrack in Saigon. McCulloch's task force, which eventually numbered 217 officers and men plus Vietnamese laborers, quickly established a bivouac and set up a prefabrication yard. Simultaneously, the South Vietnamese Army's 301st Engineer Combat Battalion based in the Saigon area and the Ministry of Public Works began clearing rubble and debris. Soon a team from the Air Force's 823d Civil Engineering Squadron, Red Horse, from Tan Son Nhut Air Base arrived to help the 301st Engineer Battalion construct housing. On 23 May, elements of the 46th Engineer Battalion began site work in another part of the city. A week later, Naval Mobile Construction Battalion 58 in Da Nang deployed a detachment of fifty-two Seabees to a third site in metropolitan Saigon. Enemy attacks in late May and coordination problems caused by the hasty bringing together of the diverse workforce initially hampered the operation.

[26] MACV History, 1968, vol. 1, pp. 540, 542, vol. 2, pp. 675–76; Quarterly Hist Rpt, 1 Apr–30 Jun 68, MACDC, p. V-1; MFR, Brig Gen Andrew P. Rollins, 17 May 68, sub: Saigon Emergency Housing, Westmoreland History files, CMH; AAR/Interv, Opn DONG TAM, 26th Mil Hist Det, 12 Sep 68, with enclosed AAR, Task Force HELPER under Opn DONG TAM, 26th Mil Hist Det, 10 Sep 68, p. 1, and incl. 1, Interv, 1st Lt Raymond F. Bullock, 26th Mil Hist Det, with Maj Gen Andrew P. Rollins, MACV Dir of Const, 31 Aug 68, VNIT 253, pp. 1–2, CMH.

After two weeks on the job, the original completion date was moved back two weeks to the end of July. Plans called for 20-by-60-foot standard wooden barracks shells divided into five family units. Each unit consisted of 240 square feet of living space under corrugated metal roofing, lightly topped mortar or wooden floors, and one ceiling light fixture and outlet in areas provided with electrical power. Shared toilet facilities were built at most of the sites. By late June, the task force had completed over 300 housing units, with the 46th Engineer Battalion completing 120. As work progressed, additional tasks included road networks, drainage systems, running water, and electricity for each dwelling, which extended the project another four weeks. In early August, the Construction Directorate decided to keep the 46th Engineer Battalion's prefabrication yard open for another five weeks so that the Vietnamese could build 1,200 more family units. By early September, the project finally neared completion. The 46th Engineer Battalion alone had cleared 141,000 square feet of area; removed over 300 truckloads of rubble; and used more than 4 million board feet of lumber, 10,000 bags of cement, and 3,500 truckloads of gravel, rock, sand, and laterite fill. A week later, the battalion began restoration work at the Phu Tho racetrack.[27]

Though it appeared Operation DONG TAM achieved its intended purpose, the engineers had some misgivings about how they had gotten the job done. General Rollins noted that projects of this type were "not a very efficient way of using engineer troops." He believed that the operation would have been better organized under one service. Since Westmoreland considered DONG TAM a one-time venture, Rollins concluded the political goal was accomplished, and he hoped the South Vietnamese engineers would do more of this kind of work. Colonel Jordan agreed, noting that his battalion happened to be the most accessible Army unit in the area. He reckoned a single reinforced engineer battalion "would have done the job much more efficiently." There were other problems. The high level interest in the success of the housing project prompted excessive supervision by higher headquarters. Company B's junior officers, under pressure to get the job done, initially overlooked the importance of equipment maintenance. The company's deadline rate soon far exceeded the rates in the rest of the battalion. To make matters worse, the arrival of the rainy season caused flooding in the lower bivouac area, and many trucks and even bulldozers got stuck in the mud. Jordan quickly ordered improvements to the maintenance area and more mechanics to fix the equipment. Still, construction deadlines were not met because of poor estimates, and unstable soil conditions were made worse by the rains. Army engineers also faced a hostile populace during the rubble cleanup. The people apparently

[27] MACV History, 1968, vol. 1, p. 676; Quarterly Hist Rpt, 1 Apr–30 Jun 68, MACDC, pp. V-1 to V-2; AAR/Interv, Opn DONG TAM, 26th Mil Hist Det, with enclosed AAR, Task Force HELPER under Opn DONG TAM, 26th Mil Hist Det, pp. 2–4, and incl. 1, Interv, Bullock with Rollins, 31 Aug 68, pp. 2–4, incl. 2, Interv, 1st Lt Raymond F. Bullock, 26th Mil Hist Det, with Lt Col Pendleton A. Jordan, CO, 46th Engr Bn, 27 Aug 68, pp. 1–2, and incl. 5, Briefing on Opn DONG TAM for VIPs, n.d., p. 1, all in VNIT 253, CMH; Msg, COMUSMACV MACDC 22618 to CG, USARV, 27 Aug 68, sub: Opn DONG TAM, box 1, 71A/0354, RG 334, NARA; MACDC Fact Sheet, 6 Sep 68, sub: Opn DONG TAM, box 1, 71A/0354, RG 334, NARA.



The DONG TAM project provided emergency housing for Vietnamese civilians such as this unit under construction in Saigon.

did not expect any help and were initially suspicious. As work neared completion, the mood changed and many inhabitants welcomed the Americans with smiles, hand waving, and military salutes.[28]

In mid-August, Hanoi launched the last and weakest of its three offensives in 1968. Mortar and rocket attacks on populated areas and attacks on remote outposts were typical. In I Corps, the Americal Division's armored cavalry squadron blocked North Vietnamese forces heading toward Tam Ky City. In II Corps, the enemy avoided contact with two exceptions. One attack took place against Duc Lap district headquarters near the Cambodian border. Another struck the Dak Seang Special Forces camp farther north along the Laotian border. In III Corps, the U.S. 25th Division fought off enemy attacks at Firebase BUELL, two miles northeast of Tay Ninh City, and a night defensive position west of Dau Tieng. Other isolated attacks included an unsuccessful assault on

[28] AAR/Interv, Opn DONG TAM, 26th Mil Hist Det, with enclosed AAR, Task Force HELPER under Opn DONG TAM, 26th Mil Hist Det, pp. 4–5, and incl. 1, Interv, Bullock with Rollins, 31 Aug 68, pp. 2–4, incl. 2, Interv, Bullock with Jordan, 27 Aug 68, pp. 1–4, incl. 3, Interv 1st Lt Raymond F. Bullock, 26th Mil Hist Det, with Capt Theodore B. McCulloch, CO, Company B, 46th Engr Bn, 25 Aug 68, VNIT 253, pp. 1–4, CMH. VNIT 253 also contains photographs, site drawings, and a map.

the Duc Lap Special Forces camp and a damaging ambush on a supply convoy traveling between Long Binh and Tay Ninh. During the attack on the convoy, an engineer squad from the 65th Engineer Battalion and escorting mechanized infantry returning from a minesweeping operation fought off the attackers until relieved by an armored cavalry troop. The battered convoy reached Tay Ninh, but some two dozen ruined vehicles littered the road.[29]

August also marked the arrival of the 1st Brigade, 5th Infantry Division (Mechanized), the last major U.S. tactical unit sent to Vietnam. The mechanized brigade consisted of one tank battalion, which came with two armored vehicle launched bridges; two infantry battalions (one of them mounted on armored personnel carriers); a self-propelled artillery battalion; an armored cavalry troop; and an engineer company (Company A, 7th Engineer Battalion). In a short time, the brigade, which deployed along the Demilitarized Zone under 3d Marine Division control, surprised the North Vietnamese who had never battled true armor formations in this area.[30]

Finally, two U.S. Army reorganizations in midsummer created a new corps headquarters in I Corps and a second airmobile division. On 15 August, the Provisional Corps, Vietnam, became the XXIV Corps, a headquarters that previously saw combat service in the Pacific during World War II. Lt. Gen. Richard G. Stilwell, who had replaced General Rosson in July, assumed command of the corps and operational control over the 1st Cavalry, 101st Airborne, and 3d Marine Divisions and the 1st Brigade, 5th Division. Like its predecessor, XXIV Corps remained under the operational control of the III Marine Amphibious Force. The Department of the Army had considered converting the 101st Airborne Division to an airmobile configuration before the division deployed. Conversion began on 1 July. A year would pass before the full complement of helicopters was available and support facilities at Camp Eagle were expanded.[31]

Hanoi's offensives did not deter the allies from trying to regain the initiative through a series of operations aimed at supply trails, caches, and way stations. Along the Demilitarized Zone, U.S. Marines, no longer tied down to fixed bases, expanded airmobile operations. They followed the Army's lead in setting up mutually supporting firebases atop jungle peaks as the infantry fanned out below searching for trails and supplies. In early August, allied forces returned to the A Shau Valley. A brigade-size task force from the 101st Airborne Division and elements of the South Vietnamese 1st Infantry Division were airlifted into the valley in Operation Somerset Plain. Along with finding and destroying caches and base camps, the invading troops this time left the area littered with minefields. These obstacles hardly daunted the North Vietnamese, however, and they quickly moved back from neighboring Laos. After withdrawing from the A Shau, the 101st carried out an integrated airmobile, naval, and ground cordon

[29] Starry, *Mounted Combat*, pp. 131–36; Lung, *General Offensives of 1968–69*, pp. 109–12; Spector, *After Tet*, pp. 235–40; Stanton, *Rise and Fall of an American Army*, p. 276.

[30] Starry, *Mounted Combat*, pp. 139–41.

[31] MACV History, 1968, vol. 1, p. 219, 239–42; Tolson, *Airmobility*, pp. 195–97; Msg, CG, 101st Abn Div, to CG, USARV, 12 Aug 68, sub: Construction Facilities at Camp Eagle, box 1, 71A/0354, RG 334, NARA.

Mountaintop firebase of the 101st Airborne Division in the A Shau Valley during Operation SOMERSET PLAIN

operation on the enemy sanctuary at Vinh Loc Island, east of Hue. II Corps saw a continuation of reconnaissance and reconnaissance in force operations. Around Saigon, a large-scale campaign, Operation TOAN THANG ("Complete Victory"), started in April aimed at enemy units in the area. In the delta, the U.S. 9th Division fought several battles, destroying a main force battalion southwest of Can Duoc near the III/IV Corps border. To support the effort in the delta, a study done by Army and Navy headquarters in Vietnam concluded that additional units of the 9th Division could be stationed at Dong Tam without further dredging. With a modest addition of naval craft to the river assault squadrons, an expanded force could support two brigades afloat and one at Dong Tam. By midyear, planning was under way to reorganize the 9th Division to a mobile river configuration and move it to IV Corps. On 25 July, the division headquarters moved from Bearcat to a new base camp at Dong Tam.[32]

During Operation SOMERSET PLAIN, which took place from 3 to 19 August, elements of the 101st Airborne Division's 326th Engineer Battalion and the 45th Group's 27th Engineer Battalion furnished engineering support. Expansion of Firebase BIRMINGHAM as a forward supply point included helicopter rearming and refueling points and more pads for troop and cargo helicopters. Again, the 27th Engineer Battalion kept the main supply route, Route 547, to BIRMINGHAM open and supported the divisional engineers. Four

[32] MACV History, 1968, vol. 1, pp. 242–43, 392–94; ORLLs, 1 Aug–31 Oct 68, XXIV Corps, 15 Nov 68, p. 15, Historians files, CMH, and 1 Aug–31 Oct 68, I FFV, pp. 11–15; Spector, *After Tet*, pp. 231–35; Fulton, *Riverine Operations*, pp. 168–69.

new firebases covering the five infantry battalions in their sweeps were built. While paratroopers provided security, work crews from Company A of the 326th alighted from helicopters and cleared the landing zones with chain saws and demolitions. When there was enough room, CH–47 helicopters brought in small bulldozers to level the sites. Usually within two days, the engineers had enlarged the area enough to allow a CH–54 to deliver a larger D5A bulldozer. The altitude at Firebase Eagle's Nest, however, was too great to airlift that bulldozer, and the engineers borrowed a smaller T6 bulldozer from the Seabees. The new firebases included artillery positions, bunkers for command posts, fire direction centers, communications equipment, ammunition storage, and passenger and cargo helipads. Steep terrain in several instances required the fastening of handholds so that the engineers could pull themselves up the slopes, proof of their determination to support the operation. Before departing the A Shau, the 326th Engineer Battalion placed minefields at three defiles along Route 548. Chemical delay fuzes were adapted for use with the M16 antipersonnel and M18 antitank mines and set to self-destruct in forty-five days. Electronic sensors were also placed in the minefields to detect any attempts to remove the mines.[33]

The move of additional 9th Division units and headquarters to Dong Tam caused a major shift of the 34th Engineer Group's units to the delta base. Previously the group had carried out operational support and construction tasks in all of IV Corps and southern III Corps, which included Long An Province, part of Gia Dinh Province, Phuoc Tuy Province, the Rung Sat Special Zone, and Vung Tau. The number of units attached to the Vung Tau–based headquarters usually stood at three construction battalions, one to two combat battalions, and an assortment of smaller units, altogether some 3,900 to 4,200 men. Of these units, elements of the 69th and 93d Construction Battalions were completing a 7,500-man cantonment at Dong Tam for the division's riverine brigade. In mid-June, the rest of the 93d Construction Battalion and the attached 67th Dump Truck Company and 702d Power Distribution Detachment moved from Long Thanh North. Companies B and D, 86th Combat Battalion, which had been working along Highway 4, reinforced the 93d's efforts to meet the added base camp requirements. In late August, more help arrived when the 36th Construction Battalion dispatched two construction platoons from Company B and one construction platoon from Company D. In September, the 113th Concrete and Paving Detachment arrived at Dong Tam to help the 93d Construction Battalion's concrete production.[34]

[33] Maj. Emmett Kelly, "Into the A Shau," in *A Distant Challenge: The US Infantryman in Vietnam, 1967–1972* (New York: Berkley Publishing, 1985), pp. 115–21; 45th Engr Gp (Const) Operational Support, 1 Jul–1 Nov 68, incl. 5, tab A–2, pp. 1–2, OCE Liaison Officer Trip Rpt no. 13; ORLL, 1 Aug–31 Oct 68, XXIV Corps, p. 15.

[34] 34th Engr Gp (Const) Status of Principal Construction Projects, 15 Nov 67–15 Feb 68, incl. 5, tab B–1, pp. 2–3, OCE Liaison Officer Trip Rpt no. 11, 6 May 68; 34th Engr Gp (Const) Troop Construction, 1 Feb–1 Jul 68, incl. 2, tab E–1, pp. 3–4, OCE Liaison Officer Trip Rpt no. 12, 23 Sep 68, OCE Hist Ofc; ORLLs, 1 May–31 Jul 68, 34th Engr Gp, 1 Aug 68, pp. 1–2, 6, 13–14, 1 May–31 Jul 68, 93d Engr Bn, 14 Aug 68, pp. 2, 5, and 1 Aug–31 Oct 68, 93d Engr Bn, 15 Nov 68, pp. 1, 9, 11, all in Historians files, CMH.

Assessing Construction

Hanoi's offenses had caused some disruption to military construction, but the program steadily neared completion. American military and civilian engineers had in less than three years built an impressive array of operational, logistic, and support facilities needed during the buildup. Under the overall direction of MACV's Directorate of Construction, a carefully managed program combined the needs of the three services and allied forces. Between 1 January 1965 and 1 January 1968, the United States had provided $1.48 billion in Military Construction funds to build Army, Navy, and Air Force facilities in Vietnam. Comparing the funds available to the work done to this point showed the Military Construction Program to be 65 percent complete. Funding would reach $1.71 billion by year's end.[35]

As a rule, the Construction Directorate ensured that only minimum essential construction using austere standards consistent with operational and tactical requirements was accomplished. This included the use of DeLong piers and prefabricated buildings that could be salvaged when U.S. forces left the area. The military now had four major ports along with additional smaller ports and over-the-shore beach facilities, relieving congestion and ending the temporary disruption to civilian ports. There were now depots with over 11 million square feet of covered storage, over 5 million yards of open storage, 2.5 million cubic feet of cold storage, and hospitals providing 8,250 beds. Five major jet air bases had been built since 1965, increasing the total to eight. Over one hundred smaller fields, many with newly developed aluminum and steel matting, allowed transport aircraft to airlift material to dispersed forces. Many key roads had been reopened and restored, with increased efforts devoted to expanding road networks and improving secondary roads. As the construction program progressed, the task of maintaining, repairing, and operating the facilities also grew. Facilities engineering contractors—the Army's Pacific Architects and Engineers and the Navy's Philco-Ford—took on most of the repairs and utilities operations at the expanding bases.[36]

Meanwhile, despite General Palmer's admonition to tighten up the base construction program, overbuilding remained a concern. In May 1968, General Duke, shortly before turning over command of engineer troops in Vietnam, stated in his debriefing report that the number and size of base camps continued to be a problem and bore watching. Nevertheless, unauthorized self-help construction by troop units continued as commanders arrived and departed. Commanders and troops characteristically leaned toward improving living and working conditions, and they found ways such as bartering to obtain building materials.[37]

In May, Pacific Architects and Engineers marked its fifth anniversary as the U.S. Army's facilities engineering contractor in the Republic of Vietnam.

[35] MACV History, 1967, vol. 2, p. 843; ibid., 1968, vol. 2, p. 670.
[36] Sharp and Westmoreland, *Report*, pp. 257–64.
[37] Debriefing, Maj Gen Charles M. Duke, 14 May 68, pp. 5–6, Senior Officer Debriefing Program, DA, Historians files, CMH.

Manpower ceilings limited direct hiring, and the Army called upon Pacific Architects and Engineers to expand its organization as the buildup and pace of facilities construction increased. Approximately 24,750 employees (1,750 Americans, 4,000 third-country nationals, and 19,000 Vietnamese) manned seventy-two major company installations and an assortment of supply and equipment maintenance facilities. When Army units moved into I Corps in 1967, the firm expanded operations in areas not supported by the Navy. The sheer magnitude of its buildings and grounds gives an idea of the size of the facilities placed in its care. In mid-1968, the company maintained over 43 million square feet of building space and 11.5 million square yards of roads. It ran 1,128 generating plants ranging from small single units to a cluster of seven 1,000-kilowatt machines at MACV headquarters. Total monthly output neared 30 million kilowatt-hours and electrical distribution lines extended 650 miles. That summer, Pacific Architects and Engineers took over responsibility for the new central power plant at An Khe consisting of six 1,500-kilowatt generators, the first of several large complexes to increase and stabilize electricity at major bases. The company operated 137 water treatment facilities purifying some 300 million gallons a month. Among its six sewage treatment plants, the Long Binh facility included a huge sewage lagoon that processed 70,000 gallons a day. Other tasks included entomology services, refrigeration and air-conditioning maintenance, and trash collection. A fleet of 123 compactor trucks that arrived in late 1967 hauled away about 350,000 cubic yards of refuse every month and allowed the facilities engineering contractor to do away with most of its refuse collection subcontractors. With military units and subcontractors, the company disposed of 500,000 cubic yards of trash each month in sanitary fills. Forty-three ice-making plants produced 300 tons of potable ice each day such as the small but vital plant at Da Lat, which provided ice to preserve fresh vegetables delivered to troops throughout the country. By mid-1968, the company's fire department had grown to forty-one stations with a roster of nearly one thousand people, over a hundred pumpers and tankers, and a newly opened school in Vung Tau.[38]

The Army's power plant arrangements with Vinnell Corporation also expanded in the three years following the first contract. These contracts, awarded by Army Materiel Command, involved construction of power plants and distribution systems under the Military Construction, Army, program, plus operation and maintenance at seven locations. Cam Ranh Bay now had five T–2 power ships in operation, each with an output of 3,100 kilowatts. Power plants at Qui Nhon, Nha Trang, and Vung Tau contained two ships, each with an output of 4,300 kilowatts. Vinnell brought the last ship, which arrived March 1967, online on 6 September 1967. At Long Binh, work progressed on a large land-based power plant, which would include twenty 1,500-kilowatt diesel-driven generators when completed in late 1968. Land-based plants were also at Cam Ranh Bay, Phu Loi, and Bien Hoa, with more

[38] PA&E History, Jan–Jun 1968, pp. 1–6; Dunn, *Base Development*, p. 93. For more on Pacific Architects and Engineers' five years in Vietnam, see *PA&E News Vietnam*, 1 and 15 May 68, copy in Historians files, CMH.

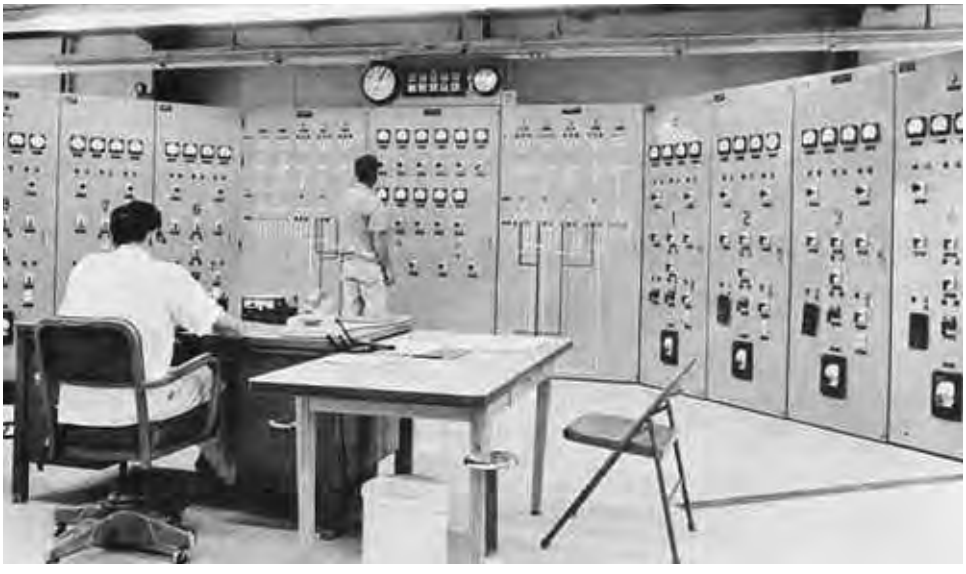
Pacific Architects and Engineers' headquarters in Saigon

programmed. In November 1967, Army Materiel Command modified the contract to build twelve more land-based plants and distribution systems. Planning for Fiscal Year 1969 envisioned land-based power plants replacing the power ships. Vinnell also had contracts to run a field maintenance shop, a Class IV Engineer Material Yard, and stevedoring operations for the 1st Logistical Command at Cam Ranh Bay.[39]

With cutbacks in construction funds already happening, planners in Washington and Saigon examined the roles of engineering troops and contractors. The contracts awarded to RMK-BRJ, Pacific Architects and Engineers, and Vinnell had resulted in tailor-made forces to do a job. Although the contractors required considerable time to mobilize, they were, because of their tailored makeup, more efficient than troop units. On the other hand, only the cost of construction materials was charged to the troop projects. Decreases in construction funds in 1967 reduced RMK-BRJ's workforce to 18,000, and MACV planned to end the civilian construction effort in 1968. As the contractor phased out, troops would assume more of the construction workload. Fortunately, most of the major work that best suited the contractors' talents, such as technical expertise, special equipment, and organizing for specific tasks would be completed.[40]

[39] Dunn, *Base Development*, pp. 78–79; Debriefing, Duke, 14 May 68, pp. C-6 to C-7, Senior Officer Debriefing Program, DA, Historians files, CMH; "Floating and Land Based Power Plants," "Vinnell Makes History in Long Binh," "12 Additional Power Plants," *Vinnell* 11 (Spring 1969): 6–11; Procurement Support in Vietnam, 1966–1968, pp. 50–51. See also Thomas E. Spicknall, "Civilian Repairs and Utilities in the Combat Zone," *Military Engineer* 61 (March-April 1969): 77–80.

[40] JLRB, Monograph 6, *Construction*, p. 126; MACV History, 1967, vol. 2, pp. 841–42; ibid., 1968, vol. 2, p. 678.



Vinnell Corporation's central control room at the Long Binh power plant

These plans were modified in 1968, when MACV transferred projects assigned to military engineer units in the major enclaves to RMK-BRJ, freeing the troops to do projects in more remote areas. Troop to contractor transfers took place in areas where RMK-BRK had a mobilization capability. These included work sites in Saigon, Da Nang, and Cam Ranh Bay, and satellites in Chu Lai, Can Tho, Dong Tam, and Vung Tau. After further study that summer, MACV decided to obligate available funds before the end of the fiscal year and raise the contractor's workforce to 25,000, decreasing the backlog of construction from eleven to eight months. As of 7 December, RMK-BRJ had 23,804 people on its payroll (2,256 Americans, 1,766 third-country nationals, and 19,782 Vietnamese).[41]

During 1968, the buildup of engineer units reached its peak. Engineer troops comprised approximately 11 percent of all U.S. forces in Vietnam, and Army engineers exceeded all other branches except the infantry. Between July and December 1967, military engineer construction battalions had grown from fourteen to fifteen Army and from ten to eleven Seabee. This did not include a variety of smaller units and repairs and utilities specialists. Adding the eleven Army nondivisional combat battalions, three Fleet Marine Force battalions, and five Air Force Red Horse squadrons (but excluding the Army's eight divisional battalions and the companies with the separate brigades and the Marine Corps' two divisional battalions) the construction force had risen to forty-five battalions. Army engineers gained two more nondivisional combat battalions in

[41] MACV History, 1968, vol. 2, pp. 678–79; Quarterly Hist Rpts, 1 Jan–31 Mar 68, MACDC, p. V-18, 1 Apr–30 Jun 68, MACDC, p. V-19, and 1 Jul–30 Sep 68, MACDC, p. V-13, Historians files, CMH.

1968. Naval engineering forces, which reached twelve Seabee construction battalions that summer, would level off to ten battalions by the end of the year.[42]

At the same time, in order for U.S. Army, Vietnam, to stay under the current troop ceiling, Engineer Command had to share in troop cutbacks. Plans at midyear called for the fifteen construction battalions and six separate companies (one float bridge and five construction support) to lose 4,561 spaces. Each construction battalion would lose 204 military spaces and convert to a modified Type B organization, which could be augmented by local civilian employees. Several units were further reduced, brought to zero strength, or scheduled for inactivation. The 62d Construction Battalion at Long Binh lost its three line companies and became the controlling headquarters for three land-clearing companies. At Cam Ranh Bay, the 87th Engineer Construction Battalion was scheduled for inactivation on 31 March 1969. Also reduced to zero strength were a float bridge company, a pipeline company, a panel bridge company, a dump truck company, and two detachments. Although assigning infantrymen as engineer replacements made up some of the shortages, there were soon critical deficiencies in construction foremen, equipment operators, mechanics, electricians, and plumbers.[43]

Streamlining the Effort

Since the early days of the buildup, U.S. Army Engineer Command, Vietnam, had directed troop construction, and 1st Logistical Command facilities engineering. In turn, logistical command had charged its engineering staff and U.S. Army Procurement Agency, Vietnam, to carry out the facilities engineering mission and to administer the Pacific Architects and Engineers and Vinnell contracts. By early 1967, it had become evident that Pacific Architects and Engineers' rapid growth demanded better control. As a result, 1st Logistical Command established a Contract Operations Branch under its engineer at the firm's Contract Management Office in Saigon and increased the number of contracting officers' representatives within the staff engineers at the Saigon, Qui Nhon, and Cam Ranh Bay Support Commands and large installations. The Contract Management Office helped identify and resolve many problems while directing and analyzing Pacific Architects and Engineers' activities and operations. By that time, however, the contract had risen to $100 million a year. Army planners, accordingly, sought ever-greater control over soaring costs and the potential for overbuilding.[44]

[42] MACV History, 1967, vol. 2, pp. 842–43; ibid., 1968, vol. 2, p. 679; Sharp and Westmoreland, *Report*, p. 263; Tregaskis, *Building the Bases*, pp. 300–301.

[43] Rpt of Visit to Various Headquarters in South Vietnam, 11–31 Jul 1968, incl. 1, pp. 2–4, OCE Liaison Officer Trip Rpt no. 12; Rpt of Visit to Various Headquarters in South Vietnam, 1–21 Nov 68, incl. 3, pp. 7–9, OCE Liaison Officer Trip Rpt no. 13; Quarterly Hist Rpt, 1 Oct–31 Dec 68, MACDC, p. II-3, Historians files, CMH; ORLLs, 1 Nov 68–31 Jan 69, 18th Engr Bde, pp. 2–3, 1 Aug–31 Oct 68, 20th Engr Bde, pp. 3–4, 1 Nov 68–31 Jan 69, 20th Engr Bde, pp. 2–3, and 1 Nov 68–31 Jan 69, 35th Engr Gp, p. 5; FM 5–1, *Engineer Troop Organizations and Operations*, September 1965, pp. A-B-2, A-B-41.

[44] Dunn, *Base Development*, pp. 92; Procurement Support in Vietnam, 1966–1968, pp. 36, 38.

It seemed logical that one organization, such as Engineer Command, should combine those responsibilities, but the Army still had difficulty justifying an engineer command. After succeeding General Ploger in August 1967, General Duke continued to use the integrated staff that combined those of the command and the engineer section of headquarters U.S. Army, Vietnam. In practice, Duke found that he spent almost 80 percent of his time as USARV Engineer and 20 percent on Engineer Command matters.[45]

In September 1967, Duke took steps to develop a new organization. He seemed satisfied that the two engineer brigades had done an impressive job in accomplishing their combat support, road improvements, and construction missions in that order of priority. Still, he wanted to address Washington's concerns about his ability to account for Military Construction, Army, funds, and he wanted to do so with an organization that would not downgrade combat and operational support, require an additional base structure, or add troop spaces. After an exchange of ideas with Maj. Gen. Frederick J. Clarke, the deputy chief of engineers, Duke gained General Palmer's approval for what he believed to be the most workable solution. Thus, construction and facilities engineering functions were merged under a new organization, the U.S. Army Engineer Construction Agency, Vietnam (Provisional). U.S. Army, Vietnam, activated the new command on 15 March 1968, and on the twenty-ninth Brig. Gen. William T. Bradley took command. Basically, the new command served as a management organization to coordinate the construction and facilities engineering efforts carried out by engineer units and contractors. The Construction Agency assumed responsibilities for construction, base development planning, and the Army's part of the highway, railroad, bridge restoration, and revolutionary development support programs. The new command also served as a link with MACV's Directorate of Construction on matters dealing with the Army portion of the Military Construction Program. Troop projects were directed to the two brigades, and other construction projects were assigned to the Navy's Officer in Charge of Construction for RMK-BRJ. On 1 April, the 1st Logistical Command transferred its real estate functions to the Construction Agency. Three months later on 1 July, the agency took over the facilities engineering responsibilities, which included the management of the Pacific Architects and Engineers and Vinnell contracts and the supervision of the utilities detachments.[46]

[45] Rpt of Visit to Various Headquarters in Vietnam, 15–30 Sep 67, incl. 7, p. 1, 4, OCE Liaison Officer Trip Rpt no. 9.

[46] Ltr, Palmer to Gen Johnson, 14 Nov 67, Harold K. Johnson Papers, MHI; Ploger, *Army Engineers*, pp. 143–45; Dunn, *Base Development*, pp. 92–93; Debriefing, Duke, 14 May 68, p. 5, Senior Officer Debriefing Program, DA, Historians files, CMH; Interv, Maj Paul B. Webber, 26th Mil Hist Det, with Maj Gen Charles M. Duke, CG, Engr Cmd and USARV Engr, 14 May 68, VNIT 164, pp. 20–27, CMH; Quarterly Hist Rpt, 1 Apr–30 Jun 68, MACDC, p. II-4; Rpt of Visit to Various Headquarters in Vietnam, 22 Nov–13 Dec 67, incl. 7, p. 1, OCE Liaison Officer Trip Rpt no. 10; Rpt of Visit to Various Headquarters in Vietnam, 11–31 Mar 68, incl. 4, pp. 4–5, tabs L–N, OCE Liaison Officer Trip Rpt no. 11; Msg, Duke ARV 2130 to Maj Gen Frederick J. Clarke, Dep Ch Engr, 3 Dec 67, sub: Engineer Organization; Msg, Duke ARV 016 to Clarke, 3 Jan 68; Msg, Clarke GVP 015 to Duke, 9 Jan 68; Msg Duke ARV 061 to

The Construction Agency's organization closely paralleled Corps of Engineers districts and facilities engineering offices in the United States. Offices and divisions in the headquarters dealt with comptroller, administration, automatic data processing, engineering, real estate, supply, safety, public information, and real property functions. When the agency took over the facilities engineering function, it set up district engineer offices at Saigon (Southern), Cam Ranh Bay (Central), and Qui Nhon (Northern). In turn, the district engineers oversaw the installation engineers. For example, the Southern District Engineer's area of responsibility included the Cu Chi, Long Binh, Tan Son Nhut, Lai Khe, Vung Tau, Dong Tam, Can Tho, and Saigon port installations. Large installations like Long Binh controlled the nearby Bien Hoa and Long Thanh Army bases. This structure provided a vertical command channel from the agency through the district engineers to the installation engineers, who could now operate free from the whims of local commanders. As more Army troops moved into northern I Corps, the Northern District added Phu Bai, Da Nang, Camp Evans, and Camp Eagle to its list of bases. Eventually each installation engineer managed all Army-funded construction programs, facilities engineering contracts, and real estate matters in his area of responsibility. He also commanded the engineer detachments, mostly utilities, at a base or bases. Facilities engineering support for forty-five Integrated Wideband Communications Systems sites built and maintained by Page Communications Engineers would be added to the facilities engineering contract in Fiscal Year 1969. The Construction Agency also provided troops to operate and maintain large-capacity air conditioners and generators at each site. In its aim to control and improve technical performance, particularly Pacific Architects and Engineers' operations, the agency nearly tripled the number of supervisors from 73 to 212.[47]

Despite these developments, 1st Logistical Command's procurement agency retained administrative control of the facilities contracts. General Duke proposed giving the Construction Agency contracting officer authority for the contracts, but 1st Logistical Command insisted on keeping the old arrangement, and Department of the Army agreed. To make matters more complex, the U.S. Army Procurement Agency, Vietnam, not only came under the control of 1st Logistical Command, but its procurement chain went to U.S. Army, Japan. The construction and procurement agencies, accordingly, worked out a memorandum of understanding in which installation engineers

Clarke, 10 Jan 68; Msg, Clarke GVP 031 to Duke, 11 Jan 68; Msg, Duke ARV 126 to Clarke, 18 Jan 68, all messages in Duke Papers, CMH.

[47] Dunn, *Base Development*, p. 92; Interv, Webber with Duke, 14 May 68, pp. 35–38; Debriefing, Duke, 14 May 68, pp. 6, C-7, Senior Officer Debriefing Program, DA, Historians files, CMH; JLRB, Monograph 1, *Advanced Base Facilities Maintenance*, pp. 27–30; Rpt of Visit to Various Headquarters in South Vietnam, 11–31 Jul 68, incl. 1, p. 6, OCE Liaison Officer Trip Rpt no. 12. Trip report no. 12 also contains U.S. Army Engineer Construction Agency, Vietnam (USAECAV), organization charts, a chart depicting the flow of base development plans and construction requests, and Letter of Instruction from CG, Engr Troops, Vietnam, to CG, USAECAV, 31 Jun 68. See also USAECAV Organization and Functions Manual, 27 May 68, OCE Hist Ofc.

served as the key link to the two organizations. While the installation engineers now reported through command channels to the Construction Agency, they continued as the Procurement Agency's contracting officers' representatives evaluating the performance of Pacific Architects and Engineers.[48]

General Duke and the Army Procurement Agency seemed satisfied with this arrangement. After only two months, Duke claimed the new command had already proved its worth. Construction programming became more effective within a single command. "You have one agency," Duke stated in an interview, "that develops the requirements, that designs the facilities, that directs its construction and inspects it during the construction. . . . As far as I know, this has never been done before. And frankly, I think it's superb."[49]

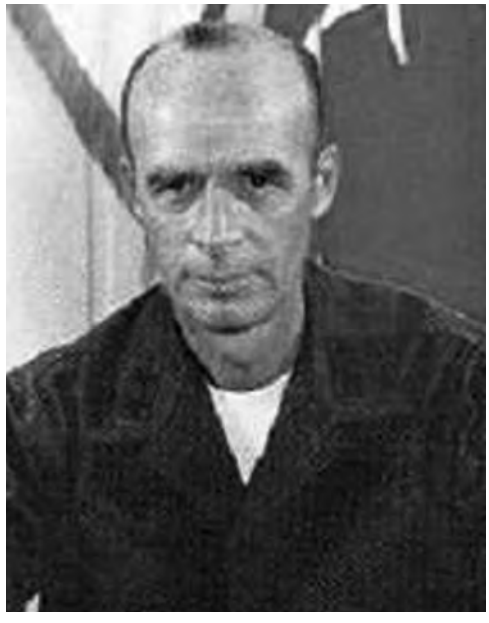
The establishment of the Army Engineer Construction Agency, Vietnam, also resulted in a name change for Engineer Command and a broadening of its functions. Since Defense Department approval of an engineer command or an organization with command in its name seemed so doubtful, U.S. Army, Vietnam, inactivated the command and on 29 March activated Engineer Troops, Vietnam. Duke carried on as a commander and staff engineer. In the first role, he commanded three major subordinate organizations, the 18th and 20th Engineer Brigades and the Army Engineer Construction Agency, Vietnam. As the U.S. Army, Vietnam, engineer, he directed a staff charged with planning, developing policies, and setting construction priorities. His staff also continued to carry out mapping and engineer intelligence functions. The old Engineer Command had handled all personnel matters, including assigning all field grade officers by name. Through an agreement with the U.S. Army, Vietnam, G–1, Duke was still able to select his battalion and group commanders and play a role in the assignment of Corps of Engineers colonels.[50]

In May 1968, as General Duke prepared to leave Vietnam, he outlined major problems to be solved. Not only did Army engineers fail to gain contracting authority, but also they still had to contend with the existing cost-plus-fixed-fee contracts. He believed that control over the facilities engineering contract would have allowed the Army Engineer Construction Agency, Vietnam, to take over contracting authority for Military Construction, Army, construction when the large tri-service contract with RMK-BRJ no longer proved practical. Each service would then directly contract its own construction, but this did not happen. When comparing contractors, Duke rated Pacific Architects and Engineers' performance below that of RMK-BRJ and Vinnell. The facilities engineering contract, originally negotiated in 1963 and renewed annually, remained little changed, thus reducing incentives that would come from a cost-plus-award-fee contract. Although Pacific

[48] Dunn, *Base Development*, pp. 92–93; Interv, Webber with Duke, 14 May 68, pp. 17–20; Debriefing, Duke, 14 May 68, p. 6, Senior Officer Debriefing Program, DA, Historians files, CMH.

[49] Interv, Webber with Duke, 14 May 68, pp. 37–46 (quotation, pp. 37–38); Debriefing, Duke, 14 May 68, p. 5, Senior Officer Debriefing Program, DA, Historians files, CMH.

[50] Rpt of Visit to Various Headquarters in South Vietnam, 11–31 Mar 68, incl. 4, p. 4, and HQ USARV, General Order 1381, Engr Troops, Vietnam (Prov), 28 Mar 68, incl. 4, tab L, OCE Liaison Officer Trip Rpt no. 11; Interv, Webber with Duke, 14 May 68, pp. 28–32.



General Parker

Architects and Engineers had to compete for the Qui Nhon area contract in 1968, the cost-plus-award-fee contract would not go into effect until 1970. Pacific Architects and Engineers' familiarity with operations in Vietnam gave the firm a distinct advantage, and it won the contract. Duke believed the competition resulted in better performance, especially in road maintenance.[51]

In a different area, although he viewed his relations with the Directorate of Construction and the Navy's Officer in Charge of Construction as good, some of their practices bothered him. He preferred that the Construction Directorate confine its activities to programming and reprogramming projects and funds and setting construction standards. Duke became concerned, however, when Construction Directorate's staff officers visiting projects and work sites returned to their offices and wrote disparaging inspection reports. The Navy construction office's handling of funds also came in for criticism. He was disturbed by the Navy's operation "in letting us see the behind the scenes manipulations of theirs insofar as cost is concerned." The Army's inspection system of cost-plus contracts, he claimed, was much more elaborate.[52]

General Duke's departure in May preceded the changeover of all senior Army engineers in Vietnam. On 21 July, Maj. Gen. David S. Parker took over as U.S. Army, Vietnam, Engineer and Commanding General, Engineer Troops, Vietnam (Provisional), formerly known as Engineer Command, Vietnam. In October, General Bradley, who temporarily replaced Duke for three months, replaced General Rollins as the MACV director of construction. Col. John H. Elder Jr. replaced General Roper at 18th Engineer Brigade in September. Roper, who had commanded the brigade since November 1967, then assumed command of the U.S. Army Engineer Construction Agency, Vietnam, during his remaining months in Vietnam. Col. Harold R. Parfitt took command of the 20th Engineer Brigade from General Chapman in November. (Both Elder and Parfitt were on the brigadier generals promotion list.) Parker concurred in the integrated engineer headquarters and the two brigades but had doubts about a separate construction agency. He saw some duplication and overlap

[51] Debriefing, Duke, 14 May 68, p. 6, Senior Officer Debriefing Program, DA, Historians files, CMH; Dunn, *Base Development*, p. 93.

[52] Interv, Webber with Duke, 14 May 68, pp. 38–48.

between the agency and his engineer staff sections and would have preferred to combine the two organizations. Since the construction agency had greatly improved the control and quality of the construction program and got better performance from the facilities engineering contractor, Parker decided that such a quick change would have generated too much turbulence. At some point in time, after American forces started to phase out, Parker visualized consolidating the two organizations.[53]

New Approaches

In the aftermath of Hanoi's offensives, both sides changed approaches and consolidated forces. After heavy troop, equipment, and supply losses, the North Vietnamese and Viet Cong retired to their sanctuaries. On the allied side, American troop strength continued to rise, and in-country moves took place. In September, the 101st Airborne Division's 3d Brigade, which had stayed behind in III Corps, rejoined the division in exchange for the 3d Brigade, 82d Airborne Division. In late October, the 1st Cavalry Division moved by sea and air to III Corps to respond to a growing threat in the south. The move, code-named Operation LIBERTY CANYON, involved redeploying the division nearly four hundred miles between the two fronts. By mid-November, the division had set up its headquarters at Phuoc Vinh and its support at Bien Hoa, and had begun operations along the Cambodian border. As for IV Corps, the 9th Division, which had moved its headquarters and a second brigade to Dong Tam, readied itself for the dry season. The campaign would be known as SPEEDY EXPRESS.[54]

The latest deployments caused some changes in the allied order of battle. In I Corps, III Marine Amphibious Force continued to direct U.S. ground operations of one Army corps and two divisions. North of the Hai Van Pass, the XXIV Corps had operational control of the 101st Airborne Division, 3d Marine Division, and the 1st Brigade, 5th Infantry Division. South of the pass to the I/II Corps border, III Marine Amphibious Force directed operations of the 1st Marine and Americal Divisions. Other forces in I Corps included two South Vietnamese infantry divisions and infantry regiment and a South Korean Marine brigade. I Field Force now had only two major tactical units, an infantry division and an airborne brigade, in II Corps. The 4th Infantry Division continued operations in the western highlands around the border regions. Most of the 173d Airborne Brigade remained in Binh Dinh Province with a battalion-size task force in the south. Two South Vietnamese and two South Korean Infantry divisions covered the rest of II Corps. In III Corps, II

[53] Debriefing, Maj Gen David S. Parker, USARV Engr and CG, Engr Troops, Vietnam, 14 Oct 69, pp. 7–8, Senior Officer Debriefing Program, DA, Historians files, CMH; Parker's Comments on OCE Manuscript, 14 Dec 77, pp. 1–6, Historians files, CMH; Debriefing, Brig Gen Willard Roper, CG, 18th Engr Bde, 7 Oct 68, p. 5, Senior Officer Debriefing Program, DA, Historians files, CMH; Debriefing, Brig Gen Curtis W. Chapman, CG, 20th Engr Bde, 30 Oct 68, p. 2, Senior Officer Debriefing Program, DA, Historians files, CMH.

[54] MACV History, 1968, vol. 1, pp. 401; Tolson, *Airmobility*, pp. 209–13; *Memoirs of the First Team*, p. 42.

Field Force controlled the U.S. 1st and 25th Infantry Divisions; 1st Cavalry Division; 3d Brigade, 9th Infantry Division; 3d Brigade, 82d Airborne Division; 199 Light Infantry Brigade; and the 11th Armored Cavalry Regiment. Allied forces included most of a Thai infantry division and the Australian and New Zealand task force. Three South Vietnamese infantry divisions and airborne and Marine contingency forces also ringed the area around Saigon. In IV Corps, the U.S. corps advisory group had operational control over the rest of the 9th Infantry Division. South Vietnamese forces in IV Corps consisted of three infantry divisions.[55]

Amid these adjustments, engineer dispositions also changed. After the 45th Group and the 14th, 27th, and 35th Engineer Battalions moved to I Corps, the two engineer brigades shifted areas of responsibility several times to fit the tactical moves and engineering priorities. On 1 November, the 18th Brigade's last adjustment of the year took place when the 937th Group at Pleiku took over responsibility for the northern half of II Corps and the 35th Group the southern half. As a result, the 937th Group gained the 19th and 84th Engineer Battalions, formerly 35th Group units in Binh Dinh Province. In turn, the 35th took control of the 70th Engineer Battalion at Ban Me Thuot. Since the 937th now had responsibility for the Qui Nhon area, the 35th Group's headquarters returned to a more central location at Cam Ranh Bay. In III and IV Corps, the arrival of the 1st Cavalry Division and emphasis given to the highway restoration program prompted realignments in the 20th Brigade as well. The 79th Group at Plantation near Long Binh kept northern III Corps; the 159th Group at Long Binh took over more of the southern half, including Saigon, Long Binh, Bien Hoa, Phu Loi, Lai Khe, Xuan Loc, and Blackhorse; and the 34th Group, which moved to Dong Tam in December, held on to parts of southern III Corps and all of IV Corps. Units affected by boundary changes and moves included the transfer of the 34th Construction and 168th Combat Battalions from the 79th to the 159th Group. In return, the 159th transferred the 62d Engineer Battalion to the 79th.[56] (*Map 25*)

Both LIBERTY CANYON and SPEEDY EXPRESS actively involved the engineers. During LIBERTY CANYON, which lasted until 30 December, squads from the 8th Engineer Battalion cleared fields of fire by cutting down trees with chain saws and demolitions and helped fortify battalion bases. The three line companies focused efforts at forging firebases and landing zones out of the dense jungle near the Cambodian border. Within sixty days, Company C built ten firebases and more than thirty landing zones. Most of the 79th Engineer Group bolstered the 1st Cavalry Division's engineers at Phuoc Vinh, Quan Loi, Song Be Tay Ninh, and other locations. One combat battalion devoted all

[55] MACV History 1968, vol. 1, pp. 218, 244, 372, 401, 646.

[56] Rpt of Visit to Various Headquarters in the Republic of Vietnam, 1–21 November 1968, incl. 3, p. 7 and tab O, OCE Liaison Officer Trip Rpt no. 13; Quarterly Hist Rpt, 1 Jul–30 Sep 68, MACDC, p. II-3; ORLLs, 1 Nov 68–31 Jan 69, 20th Engr Bde, 10 Feb 69, pp. 2–3, 1 Aug–31 Oct 68, 35th Engr Gp, 31 Oct 68, pp. 2–3, 1 Nov 68–31 Jan 69, 35th Engr Gp, 31 Jan 69, p. 4, 1 Nov 68–31 Jan 69, 937th Engr Gp, 31 Jan 69, p. 2, 1 Nov 68–31 Jan 69, 79th Engr Gp, 14 Feb 69, p. 6, incl. 6, 1 May–31 Jul 68, 34th Engr Gp, pp. 1–2, 1 Aug–31 Oct 68, 34th Engr Gp, 1 Nov 68, pp. 1–2, and 1 Nov 68–31 Jan 69, 159th Engr Gp, 14 Feb 69, p. 2, all in Historians files, CMH.


NORTH VIETNAM
DEMARCATION LINE
Quang Tri
Hue
SOUTH CHINA SEA
Da Nang
45
14th Bn
27th Bn
35th Bn
39th Bn
THAILAND
LAOS
Cu Lao Re
Quang Ngai
Kontum
Pleiku
937
19th Bn
20th Bn
84th Bn
299th Bn
815th Bn
Qui Nhon
CAMBODIA
Tuy Hoa
Ban Me Thuot
35
70th Bn
87th Bn
116th Bn
577th Bn
589th Bn
864th Bn
Cam Ranh
Mekong R
79
34th Bn
168th Bn
554th Bn
588th Bn
Tay Ninh
SAIGON
159
31st Bn
46th Bn
62d Bn
92d Bn
169th Bn
Phan Thiet
Dao Phu Qui
My Tho
Go Cong
Phuoc Le
Rach Gia
34
36th Bn
69th Bn
86th Bn
93d Bn
SOUTH CHINA SEA
Gulf of Thailand
Bac Lieu
Con Son
THE ENGINEER GROUPS
December 1968
0
100 Miles
0
100 Kilometers

MAP 25

its efforts to the airmobile divisions' deployment while the group's other two combat battalions and one construction battalion spent about 50 percent of their resources supporting the operation. Much work went into readying the base camps for the cavalry division's fleet of aircraft. The group erected protective revetments around helicopters and fixed-wing aircraft and expanded airfield facilities. Other tasks included upgrading base defenses, and logistical, medical, and communications facilities. This work caused a general slowdown of other construction projects and continued into 1969.[57]

Operation SPEEDY EXPRESS, due to begin on 1 December, diverted much of the 34th Group's highway improvement efforts for months. Col. Earnest Graves Jr., who assumed command of the group in September, recalled that SPEEDY EXPRESS curtailed plans to upgrade Highway 4, the major road south of Saigon. The engineers hastily built forward bases to be used as jumping-off points to seal the Cambodian border, but frequent changes in engineer priorities in the delta caused turmoil. After one month's work, the engineers had to change plans to include the addition of a 1st Cavalry Division brigade, which called for a different distribution of troops and materials. The airmobile brigade, however, was not used in the operation. The operation slipped into the following year, and the initial number of forward bases was scaled back from eleven to four. Finding land in the densely populated delta became a major problem. Formal real estate arrangements involved a tedious process through U.S. and South Vietnamese channels. Some land was reclaimed by dredging or by drying out paddy mud.[58]

With the tactical emphasis shifting to III and IV Corps, the II Corps command worried that it would lose engineers. In November, the I Field Force commander, General Peers, met with Colonel Elder and discussed the effects of the 18th Brigade's troop reductions and possible deployment of units to support SPEEDY EXPRESS. Elder reported the impending loss of nearly two thousand military spaces, and he considered inactivation of whole units as less objectionable than civilianization. The brigade considered zeroing out two battalions and transferring a third battalion to III Corps, actions that Peers viewed as "totally unsatisfactory." He informed General Abrams, citing road and airfield maintenance problems, which, added to other requirements in a vast area of operations, were "such that we will have difficult time maintaining the status quo to keep our head above water." Peers concluded that replacing soldiers with the local national civilians was "infeasible, undesirable and in combat areas may be impossible." Abrams told Peers that the civilianization program must be completed. He added, however, that a recent lifting of Department of the Army restrictions on the replacement pipeline had given U.S. Army, Vietnam, a chance to consider increasing engineer unit manning

[57] Hist Rpt, 14th Mil Hist Det, 1st Cav Div, Opn LIBERTY CANYON 1–69, p. 5; 8th Engr Bn Hist, 1968, pp. 14–15; ORLL, 1 Nov 68–31 Jan 69, 79th Engr Gp, incls. 4, 6; Quarterly Hist Rpt, 1 Oct–31 Dec 68, MACDC, p. II-4.

[58] Quarterly Hist Rpt, 1 Oct–31 Dec 58, MACDC, p. II-4; Interv, Capt Raymond F. Bullock, 26th Mil Hist Det, with Col Earnest Graves, CO, 34th Engr Gp, 11 Jul 69, VNIT 445, pp. 3–4, CMH; AAR, Opn SPEEDY EXPRESS, 16 Mil Hist Det, 14 Jun 69, pp. 29–30, Historians files, CMH.

Despite delays caused by Operation SPEEDY EXPRESS, the 34th Engineer Group continued to make progress along Highway 4.

levels. Abrams also noted that a U.S. Army, Vietnam, engineer study would review the future disposition of engineer units in II Corps. Generally, the number of U.S. Army engineer battalions in II Corps remained about the same: ten following the Tet deployments to I Corps, eleven between September 1968 to March 1969, and ten again when the 87th Engineer Battalion was zeroed out.[59]

Facing the possible loss of the 18th and 20th Engineer Brigade units, U.S. commanders turned to greater use of allied engineers. While expressing his concerns about the civilianization program, General Peers proposed using Vietnamese soldiers just completing basic engineer training to flesh out the U.S. engineer units. He noted that General Parker already had initiated an affiliation program with nearby Vietnamese engineer units. The Vietnamese soldiers would not have to be assigned to the American units. Instead, Peers suggested the soldiers could remain assigned to the associated unit but work with the U.S. unit. Abrams responded that an on-the-job training program and increased participation by Vietnamese engineer units in the highway restoration program were under consideration. He also advised Peers to see if the South Korean engineers supporting their two divisions in II Corps could take

[59] Msg, Lt Gen William R. Peers, CG, I FFV, NHT 1900 to Abrams, 13 Nov 68; Msg, Abrams MAC 16033 to Peers, 20 Nov 68. Both in Abrams Papers, CMH.

over some road and airfield responsibilities. Peers also cited an urgent need to improve South Vietnamese engineer units in II Corps. To this Abrams replied that ultimately more Vietnamese Army engineer units would be activated and given the same equipment as U.S. units. Meanwhile, an affiliation program for logistical units called Project BUDDY had been advocated by Maj. Gen. Joseph M. Heiser Jr., commanding general of the 1st Logistical Command. He felt that firsthand observation and experience on the job would be the best way to improve the skills of the South Vietnamese Army. Abrams approved the BUDDY proposal in January 1969, and the engineers enthusiastically adapted General Heiser's concept to their needs.[60]

As 1968 came to a close, the U.S. Army engineers reluctantly carried out the civilianization program. In late October and early November, the 18th and 20th Engineer Brigades reported hiring 6,600 Vietnamese workers. By the end of the year, the 20th Brigade was authorized a local national workforce of 4,358 employees. Authority for an additional 73,200 man-days for the quarter also allowed the brigade to hire daily laborers with Assistance-in-Kind funds. Senior engineer officers, including General Parker, still declared their doubts about the program. On 16 November, Parker and his staff briefed Lt. Gen. Frank T. Mildren, General Palmer's successor as Deputy Commanding General, U.S. Army, Vietnam. During the briefing, the engineers pointed out several problems with the civilianization program. Fewer troops in the construction units meant fewer supervisors. Local nationals could neither be employed in hostile areas nor stand guard or defend base camps. Their holidays conflicted with American work schedules. The engineers considered some jobs too complex for the civilians' limited experience, and cited their poor vehicle and equipment maintenance habits, and possible labor problems. Parker insisted that the construction battalions could not absorb any more local nationals. Engineer units at the time the program started, he noted, were already employing as many civilians as they could find, train, and supervise. Eventually, the two brigades had difficulty in recruiting skilled workers from the reduced manpower pool, which the contractors also depended on for workers. One group, the 35th, reported that moving its construction units to rural areas had caused further problems in recruiting skilled employees. Parker succinctly concluded, "We cannot operate on a mobile basis in a counterinsurgency environment at reduced TOE strength." He bluntly declared the civilianization program a complete failure. Generals Roper and Chapman echoed these concerns in their debriefing reports near the end of 1968. Roper preferred to use the civilians above the authorized military strengths, as was true earlier. Chapman suggested restricting civilianization to one company so that the other companies in a battalion could retain their "complete integrity and usefulness."[61]

[60] Msg, Peers NHT 1999 to Abrams, 1 Dec 68, sub: Upgrading ARVN Engineer Capabilities; Msg, Abrams MAC 16667 to Peers, 5 Dec 68, sub: Upgrading ARVN Engineer Capabilities, both in Abrams Papers, CMH; Debriefing, Parker, 14 Oct 69, p. 4, Senior Officer Debriefing Program, DA, Historians files, CMH; Ploger, *Army Engineers*, pp. 169–70; Heiser, *Logistic Support*, pp. 240–41.

[61] Rpt of Visit to Various Headquarters in South Vietnam, 1–21 Nov 68, incl. 3, pp. 7–9, OCE Liaison Officer Trip Rpt no. 13; ORLLs, 1 Nov 68–31 Jan 69, 20th Engr Bde, p. 4, and

Fortunately, several new units joined the two brigades that year, easing troop losses. During August and September, the 116th Engineer Combat Battalion, a National Guard unit from Utah called to active duty in May following Tet, deployed from Fort Lewis, Washington, to Phan Rang Air Base to begin a ten-month tour of duty. The last element of the 800-man battalion, the largest single National Guard unit deployed to Vietnam, arrived at the air base in mid-September. After additional training and attachment to the 35th Engineer Group, the 116th deployed to three locations in southern II Corps: battalion headquarters and Company D inland to Bao Loc, Companies A and C inland to Di Linh, and Company B south to coastal Phan Thiet. At Bao Loc and Di Linh, the battalion's efforts centered on maintaining and upgrading Highway 20. It offered general engineering support at Phan Thiet. A second National Guard engineering unit sent to Vietnam, the 131st Light Equipment Company from Vermont, joined the 35th Group in September. After a short stay with the 577th Engineer Battalion at Tuy Hoa, the company moved inland in mid-November, joining the 70th Engineer Battalion at Ban Me Thuot. There it undertook the rebuilding of Highway 21, airfield work, and civil affairs projects that included moving Montagnards to more secure locations. Also in 1968, the last Regular Army battalion arrived in Vietnam. On 24 April, the 31st Engineer Combat Battalion reached Vung Tau aboard the USNS *Barrett*. Back in November 1967, General Duke had asked the chief of engineers to deploy the battalion, then based at Fort Bliss, Texas, two months ahead of schedule. General Ploger, assigned to the Office of the Chief of Engineers after leaving Vietnam, had cited the unit's shortage of almost four hundred enlisted men and experienced officers and noncommissioned officers. He pointed out that an early deployment required strong justification and an "acceptance of serious reduction in training." When the battalion did arrive, it moved to Blackhorse and accomplished a mix of combat support and construction projects, initially under the control of the 34th Group, and from July to November, under the 159th Group. In November, the battalion moved to Phuoc Vinh where it was committed to Operation LIBERTY CANYON and the 1st Cavalry Division. In December, the 31st Battalion was transferred to the 79th Group.[62]

1 Nov 68–31 Jan 69, 35th Engr Gp, p. 6; Ltr, 1st Lt Raymond F. Bullock, CO, 26th Mil Hist Det, to Cmd Historian, HQ USARV, 19 Nov 68, sub: Civilianization of Engineer Construction Battalions (Briefing of Lt Gen Frank T. Mildren, DCG, USARV), 16 Nov 68, Historians files, CMH; Debriefing, Parker, 14 Oct 69, pp. 8–9 (quoted words, p. 9), Senior Officer Debriefing Program, DA; Debriefing, Roper, 7 Oct 68, pp. 5–6, Senior Officer Debriefing Program, DA; Debriefing, Chapman, 30 Oct 68, pp. 4–5 (quoted words, p. 5), Senior Officer Debriefing Program, DA. Debriefings in Historians files, CMH.

[62] Ltr, HQ 18th Engr Bde to CG, Engr Troops, Vietnam, 18 Sep 69, sub: Evaluation of National Guard Units, incl. 1, 116th Engr Bn (Cbt), p. 6, incl. 2, 131st Engr Co (Light Equip), p. 37; Msgs, Rollins ARV 1928 to Ploger, 1 Nov 67, sub: Acceleration of Engr Bn, and Ploger GVP 935 to Rollins, 9 Nov 67, sub: Acceleration of Engineer Battalion, both in Duke Papers, CMH; ORLLs, 1 Feb–30 Apr 68, 34th Engr Gp, p. 2, 1 Aug–31 Oct 68, 159th Engr Gp, p. 2, and 1 Nov 68–31 Jan 69, 79th Engr Gp, p. 6; Annual Hist Sum, Aug 69 to Sep 70, 31st Engr Bn, n.d., pp. 5–6, Historians files, CMH.

A crane belonging to the 116th Engineer Battalion from the Idaho National Guard, which carried out engineer support in the highlands, including highway work

The disposition of Army engineer forces at the end of 1968 reflected the emergence of the highway improvement program, which came up during the meeting between Generals Parker and Mildren. The discussion turned to engineer support in the four corps. In I Corps, seventeen Army, Navy and Marine nondivisional engineer battalions, four of these Army combat battalions, supported the equivalent of four and one-third U.S. divisions. II Corps had eleven Army engineer battalions (five combat and six construction) backing one division and a separate brigade. III Corps had ten Army battalions (four combat and six construction) supporting the equivalent of four divisions. And IV Corps had three construction battalions supporting two-thirds of an American division. Mildren criticized this breakdown, noting that the seventeen battalions in I Corps accomplished the same work as ten battalions in II Corps. Most of the battalions in I Corps, however, were not Army but Navy and Marine engineers under III Marine Amphibious Force control. The deputy U.S. Army commander pointed out that the bulk of engineer work would be concentrated in III and IV Corps. This meant moving the 19th Engineer Battalion from II to III Corps and the 35th Engineer Battalion from I Corps to IV Corps. In the end, the 19th remained in II Corps and continued working on Highway 1 between Phu Cat and Mo Duc. As the year ended, the 35th and its attached 517th Light Equipment Company began its second major move in one year. This time the battalion moved almost the length of the country from Da Nang to Binh Thuy to bolster the 34th Groups' work along Highway 4 in the delta. Army engineers were now working on major sections of the nation's highways: 35 miles in I Corps, 290 miles in II Corps, 253 miles in III Corps, and 45 miles in IV Corps. The coming year would see even more military engineers and civilian workers committed to renovating the nation's highways.[63]

[63] Ltr, Mildren Briefing, 16 Nov 68; ORLLs, 1 Nov 68–31 Jan 69, 45th Engr Gp, p. 41, and 1 Nov 68–31 Jan 69, 19th Engr Bn, 31 Jan 69, p. 1, Historians files, CMH.

13

The Land Lines of Communication

Before the arrival of U.S. forces, South Vietnam's land lines of communication consisted of the system of highways and railroads built by the French. Though the French administrators of Indochina had constructed an effective if modest transportation system over the years, the destructive effects of World War II, the First Indochina War, and Viet Cong interdiction later had left the network in ruins. By 1965, the severing of these transportation links had disrupted economic development, restricted the government's military movements, and raised serious questions about the government's claim that it still controlled a fair portion of the countryside. As U.S. planners began considering intervention with ground combat troops to stave off a Communist victory, it was plainly evident that the system of roads and railroads would not support a modern expeditionary force. Other lines of communication, the ports and airfields, would have to be relied on first. Once the situation improved, ground transportation would be reclaimed.[1]

Early Roads and Rails

The most direct and preferred link between major cities during the French colonial period was rail. Before World War II, Indochina possessed some 1,800 miles of narrow one-meter gauge track built to high standards. It was a single track line with double track or sidings at stations holding trains of varying lengths. Roadbeds consisted of steel ties (treated wooden ties near the coast) and deep rock ballast. The stretch running from the Demilitarized Zone to Saigon had been built so that trains did not have to climb up grades steeper than 1 percent. Designs also included gradual curves with few having a radius of less than 1,300 feet. French and Vietnamese engineers made deep cuts and fills well above the waterways, built tunnels, and built bridges to cross the many rivers—shallow most of the year but susceptible to major floods during the monsoon—descending from the highlands. The main line running from Saigon to Hue to Hanoi was completed in 1936, or some forty years after it was begun. Considered one of the finest railroad systems in prewar Southeast Asia, service operated daily between Hanoi and Saigon at average speeds of

[1] For more political and economic background of the Vietnamese ground transportation system during the colonial period, see Joseph Buttinger, *Vietnam: A Dragon Embattled*, 2 vols. (New York: Praeger, 1967), 1:7–8, 21–22, 26–29, 32–33, 2:970–71; Stanley Karnow, *Vietnam: A History* (New York: Viking Press, 1983), pp. 115–18.

twenty-seven miles per hour. A trip between the two cities usually took about forty-two hours.[2]

The colonial administrations simultaneously developed the highway system. By the beginning of World War II, Indochina could claim one of the finer road systems in the Far East with a network of approximately 22,000 miles, approximately two-thirds in the Vietnamese colonies. The French improved the indigenous "Mandarin Road," originally built by the Annamite emperors to connect Hue with both extremities of their domain. Redesignated Colonial Route 1 (later Highway 1), the stretch between Saigon and Hanoi became a modern all-weather road. Although, in contrast to the rail lines, the main highways were marginally designed, narrow, partially surfaced asphalt or macadam roads; they were still considered quite an accomplishment and appropriate for the light and intermittent traffic of the period. Road widths varied from sixteen to twenty feet and narrowed in mountainous regions and at bridges, typically at one-half of the road widths allowing only one vehicle to cross at a time. Steep grades and rugged terrain in the highlands, rice paddies in the lowlands, and seasonal monsoons presented formidable obstacles to the road builders. The French improvised construction techniques and relied heavily on Vietnamese workers doing the manual labor and using local materials to place the base course. Workers usually topped off this "Telford base," which consisted of large uniformly graded rock placed in a single layer over a compacted subgrade, with an asphalt or a light penetration macadam. Although adequate for prewar World War II traffic loads, the Telford base became unsuitable for heavier loads since wheel loads bearing down directly on to a single rock and the weaker soil beneath punched the rock into the subgrade. This defect was made worse during wet weather by the impact and vibration of fast, heavy moving loads. Maintenance became a process of annual reconstruction. The only way to resolve this built-in structural deficiency for heavier traffic was the complete removal of the Telford base.[3]

During the First Indochina War, fighting practically destroyed the highways and railroads of South Vietnam. More than 60 percent of the 11,800-mile road system received damage in varying degrees, with most of the major bridges destroyed or damaged. The encroaching jungle reclaimed many sections of road, and only ruts and mud remained in sections still claimed to be open to traffic. Approximately two-thirds of Highway 1 between Saigon and Hue was impassable to motor traffic. Highway 19 from Qui Nhon to the western border had 310 permanent bridges; 240 of them had to be reconstructed. Only some 560 miles of the 1,400-mile railway system remained open, with enormous gaps separating the former link between Saigon and the new border at the Demilitarized Zone. The war left nearly all the stations, depots, and other rail facilities in a damaged state and little in the way of rolling stock and

[2] Dunn, *Base Development*, p. 108; *Indo-China*, Geographical Handbook Series, Great Britain (Cambridge, England: Naval Intelligence Division, December 1943), pp. 424, 429–30; Jerry A. Pinkepank, "Rails Through Vietnam—1," *Trains* 29 (March 1969): 27–28.

[3] Buttinger, *Vietnam: A Dragon Embattled*, 1:33; *Indo-China*, pp. 409–10; Vietnam Transportation Study, Based on Field Studies Conducted April 1965 through May 1966 for the Government of Vietnam and the U.S. Agency for International Development (USAID) (Washington, D.C.: Transportation Consultants, Inc., June 1966), pp. 101–02.

The Mandarin Road (shown here in the early 1930s) ran adjacent to the South China Sea from the Chinese border to Saigon.

personnel to run the system. In 1955, the United States began to fund road and railway upgrading under the Foreign Aid Program.[4]

Much of the railroad was temporarily restored by the Vietnam Railway System, a semiautonomous railroad agency formed after the 1954 Geneva Agreement. Upgrading included modernization of shop facilities, mechanizing track maintenance, changing from steam to diesel-electric locomotive power, and replacing rolling stock with modern equipment. Bridge girders resting in the gaps suffered little damage and could be raised and reused. Since the bridges were of a standard design, damaged sections were easy to replace. By 1959 through service between Saigon and Dong Ha resumed, but the expedient nature of the repairs required much slower train speeds. Through service only lasted for a year and the government postponed further improvements. In September 1961, service between Saigon and Loc Ninh was suspended for security reasons. In the first six months of 1962, the Viet Cong blew up or derailed sixteen trains, machine-gunned thirteen others, and sabotaged the line at some thirty places. By April, all-night trains ceased operations. Viet Cong sabotage and the destructive typhoons of 1964 reduced the rail system to a little more than 180 miles. That year alone, the insurgents initiated 650 incidents of sabotage. In total, 620 bridges and over 236,000 feet of track were destroyed. Locomotives were damaged nearly 400 times. Only short sections,

[4] Vietnam Transportation Study, pp. 83, 129; Lt. Col. Nelson P. Conover, "The Lines of Communication Program in Vietnam, A Case Study," Research Paper, U.S. Army War College, 1973, p. 7 (hereafter cited as "LOC Program in Vietnam"), copy in Historians files, CMH.

President Diem inaugurates railroad service from Saigon to Dong Ha on 7 August 1959.

such as Saigon to Bien Hoa and Da Nang to Hue, remained operational; the rest of the system remained too damaged to operate or unused. The rail authority also dropped attempts to restore the Saigon to My Tho line in the delta as impractical.[5]

Nevertheless, the South Vietnamese government considered the restoration of the battered railway system paramount for the nation's development and steadfastly believed the railway a strategically important link. Government officials believed that a strong Republic of Vietnam had to have an operating railroad to serve as the backbone of the nation's mass transportation system. Besides plans for restoring regular freight and passenger service, Vietnamese railroad officials planned for new lines to haul coal, fertilizer, and cement from existing and newly developed facilities. The railway service estimated that it would take six to eight months of minimal repairs to restore all of the disrupted traffic.[6] (*Map 26*)

[5] Dunn, *Base Development*, pp. 108–09; "The Trans-Viet-Nam Railroad: Its History and Significance," *News from Viet-Nam*, Press and Information Office, Republic of Vietnam Embassy, 5, no. 14 (1 September 1959): 9–13; USOM, *Annual Report for the 1958 FY (July 1, 1957 to June 30, 1958)* (Saigon, n.d.), pp. 9–10, USOM, *Annual Report for FY 1961* (Saigon, 20 November 1961), p. 31, both in Historians files, CMH; Pinkepank, "Rails Through Vietnam—2," *Trains* 29 (April 1969): 38; *The Postwar Development of the Republic of Vietnam: Policies and Programs*, 2 vols. (Saigon and New York: Joint Development Group, Postwar Planning Group, Development and Resources Corporation, March 1969), 2:363, copy in CMH (hereafter cited as *Postwar Development of Vietnam*).

[6] "The Trans-Viet-Nam Railroad," pp. 13–15; Vietnam Transportation Study, pp. 3, 132–33; Mary E. Anderson, et al., *Support Capabilities for Limited War Forces in Laos and South Vietnam* (Santa Monica, Calif.: Rand Corporation, 1962), p. 75.


CHINA
CHINA
Lao Cai
Red R
Black R
Lang Son
BURMA
Dien Bien Phu
HANOI
Haiphong
NORTH VIETNAM
Mekong R
Luang Prabang
LAOS
GULF OF TONKIN
HAINAN
Vinh
VIENTIANE
Inoperable
Udon Thani (Udorn)
Dong Hoi
DEMARCATION LINE
Dong Ha
Quang Tri
THAILAND
Savannakhet
Hue
Da Nang
Paksé
Nakhon Ratchasima (Korat)
Kontum
BANGKOK
Pleiku
Qui Nhon
CAMBODIA
SOUTH VIETNAM
Tonle Sap
Kratie
Ban Me Thuot
Nha Trang
Mekong R
Snuol
GULF OF THAILAND
Loc Ninh
Da Lat
PHNOM PENH
Svay Rieng
Bien Hoa
Phan Thiet
SAIGON
Sihanoukville
Phu Quoc
Can Tho
SOUTH CHINA SEA
Con Son
INDOCHINA
RAILROAD SYSTEM
1966
0
150
Miles

Map 26

Meanwhile, of all the U.S. nonmilitary assistance provided to South Vietnam under the U.S. Operations Mission's direction, most of the approximately 40 percent of the funds set aside for transportation was used on highway restoration. The U.S. Military Assistance Advisory Group considered roadwork important and closely coordinated projects with Vietnamese engineers and the operations mission and its American contractors. Between 1955 and 1962, the operations mission employed Capitol Engineering Corporation of Dillsburg, Pennsylvania, to do the engineering design and inspections, and Johnson, Drake, and Piper to do the construction. Starting in 1957, the construction firm built and improved over 180 miles of main highways. Highways 1A, 19, and 21 were designed and built to modern highway standards. The contractor also repaired other national and interprovincial routes and replaced damaged and demolished bridges with modern or temporary structures or ferries. A completely rebuilt four-lane Highway 1A and its eight bridges handled high-speed and heavy traffic over the twenty-one miles between Saigon and Bien Hoa and provided an impressive showcase of American highway engineering. The new Bien Hoa Highway also boasted two large concrete four-lane bridges spanning the wide Dong Nai and Saigon Rivers (1,489 and 3,234 feet, respectively). Descending from Ban Me Thuot to Ninh Hoa over its ninety-three-mile course, Highway 21 required forty-four bridges. The rebuilt Highway 19 between Qui Nhon and Pleiku also included forty new bridges within its 106-mile distance. Field surveys and construction plans proceeded for other major roads. After five years, however, the two firms left the country because of the worsening road security.[7]

The Vietnamese director general of highways, Ministry of Public Works, with U.S. financial and technical help, strived to maintain and rebuild the young nation's roads. The director's responsibility included managing the design, construction, and maintenance of the national and interprovincial highways, while local governments administered the provincial routes and city streets. To do this, the director relied on government workers, local contractors, and South Vietnamese Army engineer units. Because of President Diem's interest in developing the Central Highlands, the highway agency concentrated efforts on improving Highway 14, considered by the government as the transportation backbone of the region. The 114-mile road project, the agency's first major venture using mechanized equipment, included rebuilding the road and laying a double bituminous surface treatment, all to be done by the end of 1962.

[7] Vietnam Transportation Study, pp. 90–91; Conover, "LOC Program in Vietnam," pp. 8–9; Buttinger, *Vietnam: A Dragon Embattled*, 2:970–71; USOM, *Activity Report, 30 June 1954 to 30 June 1956*, pp. 38–40, USOM, *Annual Report (July 1, 1957 to June 30, 1958),* pp. 5–8, USOM, *Annual Report for FY 1960* (Saigon, 1 October 1960), pp. 9–12, USOM, *Annual Report for FY 1961* (Saigon, 20 November 1961), USOM, *Annual Report for FY 1962* (Saigon, n.d.), pp. 21–23, all in Historians files, CMH; Memo, Chief, Temporary Equipment Recovery Mission (TERM) for Ch MAAG, 19 Jan 57, sub: Conference with USOM on Roads; Ltr, Dep Ch MAAG (Log) to Director, USOM, 10 Jun 57; DF, TERM Engineer to Ch MAAG, 11 Jun 57, sub: Road Priorities. Memo, Ltr, and DF in Samuel T. Williams Papers, MHI.

Another program included major bridge reconstruction. Designed jointly by Capitol Engineering and the director general of highways and assigned to local contractors, work began in 1961 with intent to replace bridges on Highways 1, 13, and 14. For replacement and repair of bridges destroyed or damaged by insurgent sabotage, the U.S. Operations Mission ordered large shipments of structural steel for fabrication into movable, military-type bridge sections.[8]

Meanwhile, South Vietnamese Army engineers focused their efforts on the "strategic roads" program in the highlands. Diem firmly believed that the new rural roads would open the remote area to settlement and support military operations. Lt. Gen. Samuel T. Williams, the chief of the military advisory group, fully supported the rural project because it provided good training and meshed nicely with U.S. contingency plans. One project involved Route 5 from coastal Mo Duc inland to Kontum. Completion of this project would have resulted in another strategic link between the highlands and the coast and possibly led to future commercial and strategic links to Laos and Thailand. The routing of a section through Pakse in Laos became the topic of many high-level discussions between U.S. and Vietnamese officials. While the highway department worked along the eastern one-third of the road, troops of the 4th Engineer Combat Group advanced from Kontum over the remaining and more difficult stretch. Then in late 1959, the Viet Cong launched several hit-and-run attacks along the road. The insurgents succeeded in setting fire to the wooden bridge decks (a frequent practice throughout the war), damaged some construction equipment, and captured an engineering work party. As the insurgents increased the number of attacks, American advisers were evacuated.[9]

Despite these setbacks, Saigon in early 1962 renewed the road-building plan for the entire country. Plans included more than 180 miles of military roads of minimum standards reaching to outposts in previously inaccessible mountainous areas near the Cambodian and Laotian borders. South Vietnamese Army engineers gave this effort high priority, and U.S. Seabee teams added some military roads at Special Forces camps. Several U.S. advisers considered the plan too ambitious, however, and in the end Saigon did not accomplish its goals. In May 1963, MACV headquarters reported that out of

[8] USOM, *Annual Report for FY 1961*, p. 26, and ibid., *FY 1962*, pp. 22–23; Dunn, *Base Development*, p. 99; Conover, "LOC Program in Vietnam," p. 8.

[9] Spector, *Early Years*, p. 307; "Communists Attack South Vietnamese Roadbuilders," Daily Intelligence Bulletin for 19 Nov 59, Asst CofS for Intel, DA, p. 4, Historians files, CMH; Memo of Conversation Between Diem and Williams, 20 Dec 57, in *Foreign Relations of the United States, 1955–1957,* vol. 1, *Vietnam* (Washington, D.C.: Government Printing Office, 1985), pp. 729, 889–93; Memo, Lt Gen Samuel T. Williams, Ch MAAG, for Amb Elbridge Durbrow, 14 Jan 59, in *Foreign Relations of the United States, 1958–1960,* vol. 1*, Vietnam* (Washington, D.C.: Government Printing Office, 1986), pp. 131–33. Both volumes contain numerous references to President Diem's interest in this program and highway restoration. On 9 May 1957, during his visit to the United States, the Vietnamese leader outlined his strategic highway program in the highlands to President Dwight D. Eisenhower. The American president, half jokingly, said there was an old adage that roads sometimes were a "golden bridge for your enemies." For more on the Eisenhower comment, see *Foreign Relations of the United States, 1955–1957,* vol. 1, *Vietnam*, pp. 797–98.

nine hundred miles of roads programmed for improvement and construction, the government's military and civilian engineers succeeded in accomplishing only 20 percent of the roadwork.[10]

By then the director general of highways lacked the capability to improve much less restore the nation's road system. Much of the equipment left by the American contractors stood idle for lack of repair parts and adequate maintenance support, and the central repair facility filled rapidly with unusable and deteriorating machinery. Although the director issued a "Ten-Year Plan of Highway Improvement, 1965–l975" in 1964, in reality no capability existed to carry it out. The Vietnamese also persisted in using outdated and improper engineering practices learned under the colonial administration. Many officials recognized these defects, but supervisors and laborers fearing the possible loss of jobs strongly resisted modernization. To make matters worse, the U.S. Operations Mission's advisory staff had dropped to just four people in the agency's Roads Branch of its Public Works Division.[11]

Deteriorating road conditions persisted. Frequently, the Viet Cong sabotaged roads using the "piano keyboard" method. This old Viet Minh practice cut trenches several hundred yards along alternate sides of the roadway, thereby stopping vehicle traffic but leaving a small walkway for pedestrians and insurgents. Cutting roadways and destroying culverts and bridges reversed most of the earlier rebuilding efforts. Because the work crews lacked sufficient security on the job, nearly all work on the highway system stopped. The storms that swept over the country in late 1964 exacerbated the already deteriorating road system. During 1965, entire sections of key Highway 1 were closed to traffic in several provinces, and the Viet Cong and North Vietnamese regular units threatened to sever Highway 19, effectively dividing the country.[12]

The U.S. Agency for International Development, the operations mission's successor organization, urgently revived its transportation program for the hard-pressed Vietnamese nation. In April 1965, the Agency for International Development negotiated a contract study with a Washington firm to analyze South Vietnam's entire transportation system, particularly roads and the means to their improvement. By then the United States had made a large investment in the road system, over $57 million between 1955 and 1964. Some of this work greatly helped the U.S. military buildup. The Saigon to Bien Hoa Highway carried an increased volume of military traffic and served as the link to large bases built along its route. Despite its poor condition and security, Highway 19 still served as a vital link in the movement and resupply of U.S. forces in the Central Highlands. Still, the study, which was completed in June

[10] MFR, MAAG J–3, 1 Mar 62, sub: Briefing for William P. Bundy, Dep Asst Sec Def for International Security Affairs; Memo, Robert H. Johnson, National Security Council Staff, for Walt W. Rostow, Dep Spec Asst to the President, 14 Oct 61, sub: Subjects for Exploration in Vietnam; MAAG-Vietnam Military Assistance Plan/Program, FY 1964–1969, 1 May 1963. All in Historians files, CMH. For more on the Seabee teams' roadwork, see Marolda, *From Military Assistance to Combat*, pp. 192–200, 346–55; and *Helping Others Help Themselves*, pp. 29–43.

[11] Conover, "LOC Program in Vietnam," p. 9; Vietnam Transportation Study, pp. 110, 113–14.

[12] Conover, "LOC Program in Vietnam," p. 8; Vietnam Transportation Study, p. 91; MACV History, 1965, p. 122.

1966, showed that damage had reduced the capacity of the country's transportation network by at least 50 percent. The study declared the railway system almost entirely inoperative, the highways cut in many places with more than one thousand bridges and culverts damaged or destroyed, and the capacity of inland waterways blocked in many places. Even if the director general's crews could repair some of the road damage, they could not have sustained the level of maintenance needed to overcome the deterioration caused by the increased weight and volume of heavy military vehicles. Between 1957 and 1966, railway freight dropped nearly 50 percent. Only coastal shipping and civil air transport managed to expand service. As for solutions, the Agency for International Development study outlined logical tasks for postwar nation building, but these were insupportable because no one could foresee the extent or duration of the war.[13]

Initial Restoration Arrangements

Early in the U.S. buildup, land-line improvements had lagged behind logistical facilities and air and water lines of communication, but this changed as road usage increased. Initially, engineer troops used expedient methods such as filling craters, tactical bridging, and some road and bridge improvements to support tactical and logistic traffic. During 1966, road traffic increased at an accelerated rate. It was helped by General Westmoreland who urged commanders to use the roads instead of relying on helicopters. By recognizing that major improvements would have to be made to the ground transportation system, engineering staffs developed plans to restore the railway system and major portions of the road network leading to ports and major bases. A bypass to move convoys around congested Saigon was also considered essential. In April 1966, General Ploger proposed building a new direct road connecting Long Binh with the 25th Division's base camp at Cu Chi. The proposed two-lane paved road included fabricating a large bridge near Phu Cuong. Though the II Field Force commander was reluctant to provide road construction security, General Engler, the USARV commander, approved the highway and detailed planning began. Ploger also directed his group commanders to help South Vietnamese roadwork and to issue materials if bridges and roads were built to U.S. specifications. As far as committing U.S. engineers to the highways, which were deteriorating because of heavy traffic, he had to balance roadwork with all the priority tasks assigned to Engineer Command. In early December, Ploger set maximum and minimum guidelines for his commanders. A minimum of 10 percent of unit effort would be devoted to roadwork. In January 1967, Westmoreland reiterated to his field commanders that because of limited tactical airlift capability and the need to strengthen the nation's

[13] Conover, "LOC Program in Vietnam," pp. 9–10; Vietnam Transportation Study, p. 91; MACV History, 1965, p. 3; Dunn, *Base Development*, p. 99; *Postwar Development of Vietnam*, 2:364.

economic posture, the "overall strategy will include aggressive action to open secure, and use land and water lines of communication."[14]

Military planners understood that programs funded by the Agency for International Development had strategic military value, and they began to take steps to merge the efforts between U.S. and Vietnamese military and civilian agencies. MACV J–4 and the Directorate of Construction coordinated roadwork with Saigon's Joint General Staff through a Joint Roads and Bridges Committee. During a meeting held in April 1966, the committee discussed plans to reinforce bridges along Highway 15 to the port at Vung Tau. At the same meeting, the committee agreed to dispatch a joint team of military and civilian engineers to reconnoiter Highway 1 from Ninh Hoa to Phan Rang and from Qui Nhon to Bong Son. In May, the committee set priorities and classification standards for the selected routes. Class 50 roads with two-way Class 35/one-way Class 50 bridging became the norm for divisional loads. Following the Highway 1 reconnaissance, the South Vietnamese Army chief of engineers used these standards to decide which bridges should be replaced. The MACV director of construction then arranged the transfer of steel beams from U.S. Agency for International Development stocks to U.S. and South Vietnamese engineers to get the bridge work under way.[15]

Similar arrangements took place to restore the railroad. In March 1966, a Joint MACV/Agency for International Development Study Group reviewed the reconstruction and security efforts and considered the South Vietnamese government's proposal that the U.S. command rent the railroad system. MACV headquarters, which did not plan to operate a U.S. military rail service, declined the offer, preferring to have U.S. forces continue the customer relationship with the Vietnam National Railway Service. In April, Washington pledged additional commodity support provided the Vietnamese government carried out railway operations and reconstructed those sections damaged by floods and the war. Reconstruction efforts were coordinated through three standing committees composed of members of the Military Assistance Command, Vietnam, the U.S. Agency for International Development, and the South Vietnamese government. Primary responsibility rested with the South Vietnamese/U.S. Railway Reconstruction Committee. A joint U.S. Railroad Coordinating Committee consisting of MACV staff and civilian aid officials met for the first time in August and held regular monthly meetings. The Directorate of Military Construction and the Agency for International Development prepared to reconstruct some 375 miles of a 713-mile system by the end of 1967. The plan encompassed four phases, and some slippage was anticipated. This objective was in line with one of the goals set forth during a recent U.S.-South Vietnamese conference in Honolulu: to increase the open

[14] Quoted in MACV History, 1967, vol. 1, p. 327; Dunn, *Base Development*, p. 99; Ploger, *Army Engineers*, p. 115–16; Ltr, Ploger to COs 18th Engr Bde, 79th Engr Gp, 159th Engr Gp, 4 Dec 66, sub: Allocation of Engineer Effort, box 31, 77/051, RG 319, NARA; Msg, COMUSMACV MACCOC11 08709 to CINCPAC, 19 Mar 66, sub: Rail and Road Communications—I and II Corps, box 5, 69A/702, RG 334, NARA.

[15] Quarterly Hist Rpts, 1 Apr–30 Jun 66, MACDC, pp. 6–7, and 1 Jul–30 Sep 66, MACDC, p. 8.

roads and railroads from about 30 to 50 percent. Progress depended on the phased securing of areas through which the railroad passed. Both governments agreed that the Vietnam National Railway Service would rebuild the main lines and U.S. forces would fund and build spurs, sidings, and marshaling yards. The Agency for International Development furnished construction materials such as rails, ties, structured steel, bridge trusses, and equipment. In addition, the U.S. military ordered two hundred rail cars and spare parts to supplement the fleet of Vietnamese rolling stock for the handling of military cargo. The 1st Logistical Command would control the cars and make arrangements with the Vietnam National Railway Service for maintenance on a reimbursable basis. Of the $25 million programmed for restoration from 1966 through 1969, about two-thirds ($16.8 million) of the funding came from the U.S. Agency for International Development.[16]

The railway contributed to the allied war effort in several ways. For instance, the first shipment along the Qui Nhon to Phu Cat section, which reopened in July 1966, delivered nine hundred tons of construction materials to build Phu Cat Air Base. During the construction, the Vietnam National Railway Service also hauled rock from the RMK-BRJ quarry outside Qui Nhon. This undertaking alone kept many dump trucks from clogging Highway 1, by then the main supply route to Bong Son. When Phu Cat Air Base became operational, the railroad hauled supplies, ammunition, and fuel on a daily forty-three-mile round trip along a secure route patrolled by allied troops. Similar arrangements were made in October to haul rock for air base construction at Tuy Hoa. Since the new airfield would cross the rail line, the Air Force had to relocate the line. Even closed sections were put to use as temporary bypasses for allied vehicular traffic. During Operation THAYER in late 1966, the redecking of the Bong Son railroad bridge provided a critical link over the Lai Giang River since the highway bridge could not support required loads. The conversion of the railroad bridge for truck traffic turned out to be extremely timely after the Viet Cong destroyed two sections of the highway bridge. In I Corps, the marines removed sections of track between Da Nang and Chu Lai for vehicular use. After getting Saigon's approval, the marines were supposed to stockpile the tracks, but South Vietnamese troops appropriated some rail left next to the right of way. The marines did transport the remainder to the Da Nang rail yard.[17]

Highway and railway security and restoration goals incorporated in the 1967 Combined Campaign Plan met with varying degrees of success. Allied military

[16] MACV History, 1966, pp. 294–96; Heiser, *Logistic Support*, pp. 165–66; Dunn, *Base Development*, p. 109; U.S. Agency for International Development/Vietnam, Project Status and Accomplishment Report, July–December 1970, Project: Railway Rehabilitation, p. 209, Historians files, CMH; Quarterly Hist Rpts, 1 Apr–30 Jun 66, MACDC, pp. 6–7, and 1 Jul–30 Sep 66, MACDC, pp. 8–10; Msg, Lt Gen Jean E. Engler, DCG USARV, MAC 5568 to Besson, 4 Jul 66, Dunn Papers, CMH; MFR, MACJ03, sub: Railroad Briefing, 10 March 1966, 12 Mar 66, box 5, 69A/702, RG 334, NARA; Msg, COMUSMACV MACDC-PO 40427 to CG, USARV, COMNAFORV, and Cmdr, Seventh Air Force, 7 Sep 66, sub: Vietnam Line of Communications Requirements, box 5, 69A/702, RG 334, NARA.

[17] Dunn, *Base Development*, pp. 109–10; MACV History, 1966, p. 296; Quarterly Hist Rpts, 1 Apr–30 Jun 66, MACDC, p. 7, 1 Jul–30 Sep 66, MACDC, pp. 9–11, and 1 Oct–31 Dec 66, MACDC, pp. 1–4; Pinkepank, "Rails Through Vietnam—2," p. 42.

operations included eliminating enemy ambushes from vital roads and rail lines. Land clearing of a 100- to 300-yard-wide strip of vegetation along key roads reduced the enemy's ability to mount ambushes and reduced the effectiveness of those that did occur. The cleared strips also provided cleared right-of-ways for later route restoration and upgrading. This surge in operations and restoration work in 1967 increased the percentage of military essential roads classified as "secure" (Green). During 1966, the roads defined as secure—those that could be traveled during daylight hours without an armored escort—varied from a low of 698 miles (23 percent) to 742 miles (43 percent). The 1967 Combined Campaign Plan identified 1,296 miles of roads essential for military operations. During the year, roads classified Green rose from 609 miles in January (35 percent) to 1,063 miles (61 percent) in December. The goal of 50 percent secure was exceeded by almost 11 percent. Military engineers and contractors in 1967 upgraded 170 miles of highway and city streets to MACV standards. They also maintained 4,432 miles of roads and streets, constructed 18,218 feet of new bridging, and rebuilt or replaced 39,845 feet of destroyed or damaged bridges with tactical bridging. Highway tonnages increased approximately 100 percent over that moved in 1966. Specific achievements included the reopening of Highway 1 in southern II Corps and northeastern III Corps and the opening or securing of remaining stretches in I Corps. In early 1968, engineers temporarily reopened the road from Saigon all the way to the Demilitarized Zone, but Highway 1 still required major upgrading and many sections remained vulnerable to sabotage and ambushes.[18] (*Map 27*)

On the other hand, railroad restoration plans continued to lag in 1967. The number of sabotage incidents clearly showed the Viet Cong's determination to disrupt restoration of the system. Attacks even took place on the outskirts of Saigon. In April, satchel charges caused light to heavy damage to ten locomotives and a crane parked in a rail yard. A month later, a mine caused a train's derailment. Because of these attacks, the Vietnam National Railway Service restored less than sixty-two miles in the period December 1966 to June 1967. To repair the recently damaged lines, the railway service diverted equipment and work crews from reconstruction projects. Some U.S. officials now seriously doubted the value of railroad restoration. In July, Robert W. Komer, who had recently assumed the new position as Westmoreland's deputy for civil operations and revolutionary development support, or pacification, proposed eliminating or deferring railroad restoration. Komer asserted that available roads and coastal shipping voided the railroad's economic significance. He believed railroad security troops could be put to better use in pacification. MACV J–4 reevaluated the plans and

[18] MACV History, 1967, vol. 2, pp. 762, 764–66, 844–45; Msg, COMUSMACV MACDC-PO 32400 to CINCPAC, 2 Oct 67, sub: Highlights of Land Clearing RVN—Opn PAUL BUNYON, Westmoreland Message files, CMH; Sharp and Westmoreland, *Report*, p. 144. For more on the reopening of Highway 1, see Msgs, COMUSMACV MACJ322 19486 to DCG USARV, CG III MAF, CG I FFV, CG II FFV, 15 Jun 67, sub: Opening of Highway 1; CG II FFV AVFBC-P 70009 to COMUSMACV, 1 Jul 67, sub: Opening of Highway 1; CG III MAF to COMUSMACV, 4 Jul 67, sub: Opening of Highway 1; CG I FFV AVFA-GC-PL A1974 to COMUSMACV, 5 Jul 67, sub: Opening of Highway 1. All in box 3, 70A/782, RG 334, NARA.


NORTH VIETNAM
DEMARCATION LINE
Tchepone
Quang Tri
Khe Sanh
Hue
SOUTH CHINA SEA
Savannakhet
Mekong R
Da Nang
Cu Lao Cham
THAILAND
Saravane
Tam Ky
Chu Lai
Cu Lao Re
LAOS
Paksé
Quang Ngai
Attopeu
Dak To
Kontum
Pleiku
An Khe
Qui Nhon
Stung Treng
Hau Bon
CAMBODIA
Tuy Hoa
Kratie
Ban Me Thuot
Ninh Hoa
Nha Trang
Snuol
Da Lat
Cam Ranh
An Loc
Phan Rang
PHNOM PENH
Tay Ninh
Svay Rieng
Bien Hoa
Xuan Loc
Phan Thiet
SAIGON
Chau Phu
Moc Hoa
Tan An
Phuoc Le
Dao Phu Qui
Sa Dec
Vinh Long
My Tho
Go Cong
Ben Tre
Rach Gia
Can Tho
Phu Vinh
Gulf of Thailand
Soc Trang
Bac Lieu
Ca Mau
Con Son
ROAD SYSTEM
1960s
National Highway
Interprovincial Route
0
100 Miles
0
100 Kilometers

MAP 27

South Vietnamese railway workers repair tracks between Qui Nhon and Phu Cat.

facilities needed for U.S. logistical bases and recommended continuing restoration. General Abrams, acting for Westmoreland, advised Komer that "a decision to write off the rail system prematurely would also be undesirable. From a long-range standpoint, a balanced transportation system in Vietnam may prove valuable." By October, however, persistent sabotage and difficulties moving materials to work sites set back the railway service's scheduling by six months. At the end of 1967, 296 miles (39 percent) of the rail lines were operational, 61 miles (8 percent) were undergoing repair, and 413 miles were not operational (53 percent). Although the security goal of 55 percent was not reached, statistics alone did not present the complete picture. Movement of military tonnage by rail increased nearly threefold over that moved in 1966. The Vietnam National Railway Service also transported vegetables from Da Lat to coastal towns and started a daily passenger service between Saigon and Long Binh to ease the commute for the base's Vietnamese civilian workforce.[19]

[19] MACV History, 1967, vol. 2, pp. 766–69; Dunn, *Base Development*, p. 109; Memo, Robert W. Komer, Dep Civil Operations and Revolutionary Development Support, for Westmoreland, 9 Jul 67, sub: Vietnamese National Railroad System (VNRS) Restoration; Memo, Abrams for Komer, 22 Jul 67, sub: VNRS Restoration. Both in box 3, 70A/782, RG 334, NARA. For more on the restoration schedule, see Staff Study, MACJ45, 29 Jun 67, sub: Vietnamese National Railroad, box 3, 70A/782, RG 334, NARA.

Running the Programs

The mature Lines of Communication Program, robustly organized and decently funded, dates from the end of 1967. Progress had not been lacking the previous year as planners had begun turning their attention from ports and bases to land lines restoration and improvement. For one thing, the perennial tug-of-war over land transport financing had been resolved in the Agency for International Development/Department of Defense Realignment Program of November 1966, which recognized the Agency for International Development's fiscal limitations. Under this program, the Defense Department would fund certain civilian aid projects, including railway sabotage replacement and highway maintenance and upgrading, provided they were clearly war related or incurred more than 50 percent of their cost because of enemy attacks. Retroactive to 1 July 1966, the program tasked Department of the Army with programming, budgeting, and funding the highway maintenance program. The Army, in turn, passed the requirement to MACV headquarters and, in January 1967, the Construction Directorate assumed responsibility for developing the highway maintenance and upgrading portion of the realignment program.[20]

Even so, highway funding remained under pressure through 1967. Major shortfalls, including $35 million in Agency of International Development/Department of Defense funds and $50 million in military construction contingency money, affected the upgrading of Highway 1 north of Cam Ranh Bay and Highway 4 south of Vinh Long. The Construction Directorate feared that the holdup of contingency funds could cause work on several major bridges and bypasses to slip one year. As it is, Fiscal Year 1968 requirements had grown to $109.5 million, and the directorate estimated that about $130 million (including $50 million in military construction funds) would be needed each year through the close of Fiscal Year 1970.[21]

Into the breach stepped Robert Komer who, in November 1967, traveled to Washington to solicit support for the pacification and highway programs. There he presented a memorandum to Secretary McNamara, pointing out crucial funding needs. He contended that roads were not only militarily essential and saved airlift, but they were also vital for pacification. Only military engineers or U.S. contractors, he said, could do the job. And as the Agency for International Development did not have the money, the Defense Department

[20] MACV History, 1967, vol. 2, p. 763; Conover, "LOC Program in Vietnam," pp. 10–11; Quarterly Hist Rpts, 1 Oct–31 Dec 66, MACDC, pp. 42–43, and 1 Jan–31 Mar 67, MACDC, pp. 1, 53; MACDC-EBD Fact Sheet, [5 Dec 67], sub: Highway Restoration Program in Vietnam, box 3, 70A/782, RG 334, NARA. See also Msg, COMUSMACV MACDC-PO 08067 to Sec State and Sec Def, 9 Mar 67, sub: Upgrading of Highway System RVN, box 3, 70A/782, RG 334, NARA; and Memorandum of Understanding Between the Department of the Army and the Agency for International Development, 25 May 67, box 4, 74/167, RG 334, NARA.

[21] Conover, "LOC Program in Vietnam," p. 11; MACDC-EBD Fact Sheet, [5 Dec 67], sub: Highway Restoration Program in Vietnam. For more on funding problems during the period 17 April–26 June 1967, see backchannel messages between MACV's directors of construction and the Defense Department's chiefs of Southeast Asia Construction, Dunn Papers, CMH.

was his only recourse. McNamara scribbled a note in the margin of the memorandum directing his comptroller and installations and logistics chief to find the money required. Komer later noted that the money was requested and approved on military grounds for pacification purposes. "Here," he declared, "was a case where the two went quite well together."[22]

From this point on, Washington recognized highway improvement work as a distinct entity and always referred to it as the Lines of Communication Program, or, in military terms the LOC Program, under the administration of the Directorate of Construction. In December, the U.S. Mission Council in Saigon agreed, and the formal transfer of military and civilian highway programs to MACV headquarters took place on 1 February 1968. Early in 1968, the directorate's consolidated highway funding request for Fiscal Year 1969 again exceeded $100 million. Approved funding levels varied from year to year, but by 1972, the funding level in all categories of restoration reached a cumulative total of nearly $500 million.[23]

With the accent on organization and concentrated effort, the South Vietnamese military also came on board. On 1 November 1967, recognizing the inadequate coordination, program overlap, and duplication of work among the two allies, the South Vietnamese Joint General Staff and MACV headquarters agreed to consolidate all responsibilities for land lines of communication. A Combined Central Highway and Waterways Committee consisting of representatives from Military Assistance Command, Vietnam, the U.S. Agency for International Development, and South Vietnamese military and civilian agencies, and chaired by the chief of staff of the Joint General Staff, first met on 22 November to discuss and approve the committee's charter. Planning then advanced to restore and upgrade approximately 2,532 miles of national and interprovincial highways to support military operations and pacification and to stimulate economic development. Highway construction standards applied to all construction agencies: U.S., South Vietnamese, and allied engineers.[24]

[22] Conover, "LOC Program in Vietnam," pp. 20–21; Msg, Sec Def DEF 4127 to COMUSMACV, 1 Dec 67, box 3, 70A/782, RG 334, NARA; Interv, Rand Corp. with Robert W. Komer, Organization and Management of the New Model Pacification Program, 1966–1969, 7 May 1970, p. 122, Robert W. Komer Papers, CMH.

[23] Conover, "LOC Program in Vietnam," pp. 18–19, 21–23, 40; Memo, Lt Col James S. Sibley, Chief, LOC Div, Engr Cmd, for CG, Engr Cmd, VN, 5 Jun 70, sub: Authority for LOC Program, incl. 3, and Memo, Brig Gen William E. Bryan Jr., Acting CofS, MACV, for Rollins, 27 Dec 67, sub: Mission Council Action, incl. 4, 26th Mil Hist Det, LOC Study, 10 Feb 71, VNIT 813, CMH. See also MACV Directive 415–6, 11 Mar 70, *Construction: Surface Lines of Communication, Restoration and Maintenance of Highways and Bridges*, an. A, p. 2, Historians files, CMH.

[24] Conover, "LOC Program in Vietnam," pp. 19–20; Quarterly Hist Rpt, 1 Oct–31 Dec 67, MACDC, pp. V-13 to V-15; Dunn, *Base Development*, p. 100; Ploger, *Army Engineers*, p. 161; MACV Directive 415–6, 11 Mar 70, an. A, p. 1. See also Charter for the Combined Central Highway and Waterway Committee signed by Gen Westmoreland (COMUSMACV), Gen Cao Van Vien (Chief, Joint General Staff, Republic of Vietnam Armed Forces), Mr Donald G. MacDonald (Dir, USAID), and Mr Buu Don (Ministry of Public Works), incl. 6, 26th Mil Hist Det, LOC Study, 10 Feb 71, VNIT 813, CMH; and Lt. Gen. Dong Van Khuyen, *RVNAF Logistics*, Indochina Monographs (Washington, D.C.: U.S. Army Center of Military History, 1980), p. 380.

Organizational changes took place at the Directorate of Construction on 1 January 1968 with the establishment of a separate Lines of Communication Division. The Construction Management Division, formerly responsible for the highway program, was deactivated with its remaining functions transferred to other divisions. The new division, headed by Col. Charles R. Clark, directed the planning and execution of all national and interprovincial highway programs, plus waterways, railways, and dredging done by military engineers, contractors (mainly RMK-BRJ), and American and Vietnamese civilian agencies. The Agency for International Development retained responsibility for secondary road projects in the provinces. Finally, on 1 February, the Lines of Communication Division took over the advisory mission, which included advising the director general of highways and his five highway district engineers and their staffs and the provincial public works chiefs on all aspects of the country's roads and ferries. A third branch, the Advisory Branch, which included several civilian aid technicians, was added.[25]

Sustaining Highway Improvement

Before long, highway improvement evolved into the single biggest construction program of the Vietnam War. The Combined Central Highway and Waterway Committee and the Directorate of Construction's Lines of Communication Division envisioned a highway program lasting through 1974, but General Westmoreland, recognizing its tactical and economic importance, directed an accelerated plan to complete most restoration work by the end of 1971. As a result, priorities were adjusted, with 2,199 miles earmarked for earlier completion, and the remaining 333 miles placed in deferred status. These figures, however, did not include upgrading and new road construction supporting tactical operations in areas not served by the major road networks or other local road programs sponsored by the Agency for International Development. In addition, the Philippine Civic Action Group worked on local roads and bridges in Tay Ninh Province. Railroad restoration along the main branch lines also got increased attention. The Lines of Communication Division mainly concerned itself with U.S. military rail spurs, and the division regularly participated in the meetings of the joint railroad coordinating committee.[26]

[25] Conover, "LOC Program in Vietnam," pp. 22–23; Dunn, *Base Development*, pp. 22–23, 100; Msg, COMUSMACV 10964 to CG, USARV, Cmdr Seventh Air Force, COMNAVFORV, 18 Apr 68, sub: Transfer of Highway Advisory Functions to MACV, box 6, 71A/354, RG 334, NARA; Memo of Understanding, MACDC-LOC, 1 Feb 68, sub: HQ MACV Assumption of the Highway Civil Advisory Responsibility, in Booklet, MACDC-PO, Development of the Construction Directorate, 15 Jun 70, box 11, 72A/870, RG 334, NARA. See also 26th Mil Hist Det, LOC Study, 10 Feb 71, 10 Apr 68, sub: Transfer of Highway Advisory Functions to MACV, incl. 5, and above cited 1 Feb 68 Memo of Understanding, incl. 9, VNIT 813, CMH.

[26] Dunn, *Base Development*, p. 103; Conover, "LOC Program in Vietnam," p. 23; Tregaskis, *Building the Bases*, p. 391; Larsen and Collins, *Allied Participation in Vietnam*, p. 64; MACV History, 1968, vol. 2, p. 660; MACV History, 1969, vol. 2, pp. IX-90, IX-92; Memo, HQ MACV, MACJ45, sub: Minutes of Meeting, Joint MACV/USAID Railroad Coordinating Committee, 9 Feb 68, box 1, 71A/354, RG 334, NARA.

The centralized management and increased planning capability showed in other areas as well. Improved cost estimates and cost accounting made funding, if not easier, at least more orderly. More explicit construction standards set forth as the result of a clearly defined highway program enabled the Navy's Officer in Charge of Construction to hire specialized architect-engineer firms to solve design problems. Nearly all of the Navy's design firms were now involved in highway projects. Their diverse and sophisticated skills ranged from developing computerized bridge designs using prestressed concrete beams to photogrammetric designs of highway layouts. By 1969, the architect-engineer effort expanded to $15 million in design contracts alone. The road builders also anticipated the large bridge-building requirement, and the design firms developed a series of standard designs for bridge decks, beams, prestressed concrete piles, pier protection, security lighting, and abutments. As a result, design costs averaged a low 1.5 percent of bridge construction, reducing design costs, simplifying construction, and saving time.[27]

Army engineers relied on civilian consulting firms to provide engineering expertise and methods to improve quality control. For instance, the U.S. Army Engineer Construction Agency, Vietnam, hired Quinton-Budlong Company to design bridges, to review road and bridge designs prepared by the units, and to give advice on equipment operation and maintenance, safety, and other engineering services. Included among the more than one hundred employees in Vietnam were experts in quarry and asphalt plant operations, well drilling, welding, mechanics, electrical designs, and licensing equipment operators. Formally referred to as "technical representatives," several employees functioned at work sites and unit headquarters—including sixteen at 18th Engineer Brigade. Leo A. Daly Company concentrated on architectural engineering tasks, and Technical Services Corporation provided four asphalt equipment experts. The U.S. Army Construction Agency, Vietnam, trained quality assurance personnel who checked the quality of crushed rock, earth compaction, and asphalt production and gathered other quality control data. Since quarries and asphalt plants were the key to carrying out the highway program, commanders and staffs looked for ways to improve operations. In 1970, Brig. Gen. Henry C. Schrader, the 18th Brigade's commander, started organizing engineer industrial control centers at group headquarters. The centers, consisting of at least one officer and several noncommissioned officers and enlisted men from each battalion running a quarry and asphalt plant, served as a centralized agency in the planning, installation and construction, and operation for all industrial complexes in each group. Modern soil-testing devices such as nuclear dosimeters were also used, and a central materials testing laboratory was established at Long Binh. General Schrader personally played a major role in obtaining and evaluating the nuclear dosimeters.[28]

[27] Conover, "LOC Program in Vietnam," pp. 24, 48; Tregaskis, *Building the Bases*, p. 420; Interv, Richard Tregaskis with Frank S. McGarvey, Morrison-Knudsen International Company, Inc., Boise, ID, 19 Jun 70, p. 11, Richard Tregaskis Papers, Naval Facilities Engineering Command Hist Ofc, Port Hueneme, Calif.

[28] Msg, CG, USAECAV to CINCUSARPAC, 11 Jul 68, sub: Engineering Contract Support, box 2, 74/167, RG 334, NARA; Maj. Henry A. Stearns, Maj. Rudolph E. Abbott, and Capt.

Highway construction standards followed U.S. practices as much as possible. These standards, based on criteria established by the American Association of State Highways Officials, ranged from a Class A highway (23 feet wide and 8-foot shoulders) to a Class F road (23 feet wide and 2-foot shoulders). The Directorate of Construction incorporated the Class F road to make the most use of the French-constructed highway system's alignments on existing embankments. This class called for laying a rock or asphalt stabilized base over the existing road and widening the traveled way, or actual road less shoulders, to 23 feet and paving it with an asphaltic concrete surface. Design life of the rehabilitated highway system ranged from twenty years for a Class A road to ten years for Classes C or D. Design life did not apply to the Class F roads.[29]

Bridges were essential links along the stretches of restored highways. One inventory showed approximately 750 bridges in the road net's restoration and upgrading program. Over one-third of these bridges met satisfactory conditions or were under construction when the program began. Culverts would replace many bridges, and others would not have to be replaced for several years. Plans called for approximately 250 new bridges totaling 37,000 feet. Standard roadway widths for two-lane roads were set at 25 feet. Designs also provided for curbs and one-meter (3.3-foot) width sidewalks with guardrails. Short span bridges of 165 feet or less called for 40-foot roadway widths without sidewalks. Since bridges were the most vulnerable links of the highway system, engineers devised various methods of protection. Pier protection and security lighting systems were included in designs for major bridges. The chain-link fence stand-off pier protection system consisted of steel beams driven into the riverbed with fencing and concertina wire hung from the beams. In regions with extreme tidal variations, engineers built a flotation system known as a floating catwalk. This system could be fabricated easily, and the Styrofoam or steel balls were floated to the bridge for installation. Once emplaced and covered with wooden platforms, the catwalk was connected with chain-link fencing and the interior was filled with concertina. The floating catwalk also served as an observation post for guards, who could walk completely around the bridge pilings at water level. Antiswimmer devices and mine booms were developed to frustrate enemy demolition teams. Concertina wire was suspended from floating buoys and fastened on the river bottom. Changes in the tides, typical in most of Vietnam's waterways, caused the concertina to shift

James L. Campbell, "LOC Highway Restoration, Vietnam," *Military Engineer* 65 (March-April 1973): 85; 1st Lt. Doug Noble, "Quinton-Budlong, The Consulting Engineer," *Kysu'* 2 (Spring 1970): 9–10; Memo, Brig Gen Henry C. Schrader, CG, 18th Engr Bde, sub: Industrial Complex Control Center, 23 Jun 70, Henry C. Schrader Papers, MHI. See also Engr Cmd, Reg no. 415–30, Construction: Quinton-Budlong Consultants, 8 Apr 71, box 2, 74/571, RG 334, NARA; Interv, Capt David D. Christensen, 26th Mil Hist Det, with 1st Lt Robert McKay, OIC [Officer in Charge], Central Materials Testing Lab, USAECAV, 2 Jan 71, VNIT 794, CMH; 1st Lt. Robert Hoyler, 18th Engr Bde, Report on the Evaluation of Nuclear Moisture-Density Gauges, 18 Apr 71, Vietnam Collection, MHI.

[29] Dunn, *Base Development*, pp. 102–03; History, LOC Program, incl. 3, tab X, OCE Liaison Officer Trip Rpt no. 22, 8 May 72, p. 183, OCE Hist Ofc. For more on highway standards, see MACV Directive 415–6, 11 Mar 70, an. A.

Floating balls being readied for installation at the Phu Cuong Bridge pier protection system

and agitate unpredictably, hindering swimmers from trying to pass through it. Mine booms constructed of heavy timber attached to steel cables and across the river upstream of the bridge were employed to stop or detonate floating mines. Usually several feet of chain-link fence were hung from the timbers to catch submerged mines.[30]

The highway program required the procurement and transportation of vast quantities of construction materials and equipment to the work sites. As roadwork moved farther away from the logistics bases, a greater burden was placed on the entire supply system, and to reduce the number of times material was handled planners sought ways to ship directly from supply points to the users. Stocks of cement, asphalt, and culvert material dwindled rapidly, and engineers and logisticians improvised or borrowed materials from other services. For instance, the 45th Group borrowed construction materials from the Seabees when it moved to I Corps in early 1968 and began to reopen Highway 1 through the Hai Van Pass. It also became clear that the standard equipment assigned to engineer units to do roadwork would not suffice.[31]

The short timetable for completing the roadwork prompted ideas for additional road-building equipment. Even if commanders shifted more engineer troops to the roads, the construction rate would not increase since road construction was limited by rock production and rock-hauling capability. In 1968 at the suggestion of the Lines of Communication Division, the USARV Engineer, the Army Engineer Construction Agency, Vietnam, and the 18th and 20th Brigades analyzed rock requirements, production capabilities, and the advantages of furnishing Army engineer units with high-capacity civilian construction equipment. The engineers concluded that additional rock-production equipment (rock crushers, rock drills, and large-capacity rock-hauling trucks) and road-working equipment (heavy-duty and hand compactors, asphalt pavers and distributors, dump trucks, and cement mixers) would be required to complete the road program by the specified time. Evidence showed that "straight commercial" equipment used in the United States and not designed to meet military requirements (such as the twenty-ton rough terrain crane) or modified for military use (like the Caterpillar 830MB and Clark 290M wheeled tractors and the Euclid and LeTourneau 18-cubic-yard earthmoving scrapers) would increase the troops' road-building ability to the rigorous standards required for a permanent highway system.[32]

[30] Ploger, *Army Engineers*, pp. 120–21; MACV Directive 415–6, 11 Mar 70, an. B; Capt. Edward D. Florreich, "Lines of Communication Restoration Program," *Kysu'* 2 (Spring 1970): 13. See also Bridge Protection in the Republic of Vietnam, Engr Adv Div, MACV, 1 Jan 68, MHI; and Capt. Robert J. Oldmixon, "Pier Protection," *Engineer* 2 (Spring 1972): 26–29. The 41st Port Construction Company worked on many pier protection systems in and around Saigon. For more on techniques and equipment, see Interv, Capt David D. Christensen, 26th Mil Hist Det, with Capt Harold W. Wagner Jr., CO, 41st Engr Co (Port Const), 4 Dec 70, VNIT 774, CMH.

[31] Dunn, *Base Development*, p. 102. For more on engineering materials, see Interv, Christensen with Lt Col John L. Moffat, Dir of Materiel, USAECV, 7 Apr 71, VNIT 879, CMH.

[32] Dunn, *Base Development*, pp. 103–06; Conover, "LOC Program in Vietnam," pp. 24–25; Purchase of Construction Equipment with MCA [Military Construction, Army] Funds, p. 1, incl. 3, tab K, OCE Liaison Officer Trip Rpt no. 13.

Purchase of commercial construction equipment totaling some $23 million from Military Construction, Army, funds began in December 1968. By July 1969, most of the more than seven hundred items of machinery in original factory colors arrived at the ports of Cam Ranh Bay, Qui Nhon, and Saigon. For easier identification, a purple roadrunner cartoon character running on a green circle with the letters *MCA-LOC* appeared as an emblem on all the new equipment. Among the most important items reaching the 18th and 20th Engineer Brigades were eight 250-ton-per-hour rock crushers and 226 twelve-cubic-yard dump trucks. The high-volume all-electric crushers, considered the key to the success of the highway program, replaced the lower-capacity 75-ton-per-hour plants. Just as portable as the smaller plants but easier to operate and maintain, the new crushers required fewer operators (one compared to three for the 75-ton-per-hour crushers), and produced at least three times as much rock. In addition, six 225-ton-per-hour crushers from depot stocks in the United States arrived before the 250-ton-per-hour models, thus making possible the rapid rate of road improvement in 1969. When the new crushers were put into operation, many of the 75-ton-per-hour crushers judged uneconomically repairable were turned in. Feeding the fourteen large crushers required the addition of thirty-six track drills, ground-level rock feeders, and 600-cubic-foot-per-minute air compressors to the equipment purchase list. Quarry operations also improved with the addition of 29 six-cubic-yard scoop loaders to load the 100 fifteen-cubic-yard Euclid dump trucks purchased in 1967 for quarry work. Far simpler to operate, faster, and easier to maintain, each of the new scoop loaders replaced two 40-ton crane shovels. The new twelve-cubic-yard dump trucks joined the fleet of standard five-ton Army dump trucks, by then hard-pressed to meet hauling needs. New earth compaction equipment included sixty heavy-duty compactors plus hand compactors to speed up culvert backfilling. Also twelve new backhoes for culvert placement and excavation in confined areas saved thousands of man-hours of digging and many hours of equipment time on crane-mounted shovels and clamshells. To speed up the paving effort, six asphalt pavers and fourteen distributors augmented the equipment on hand. Seven asphalt curb extruders were ordered. Their use in the Central Highlands helped redirect and channel monsoonal runoff and the manufacture of curb and gutter systems in villages and towns. Since bridges required about an average of 165 cubic yards of concrete for abutments, deck slabs, and approach slabs, the engineers requested additional cement mixers. Central batch plants and transit mixers replaced the small 16S cement mixers and allowed work on more than one bridge at a time, thus significantly reducing production and maintenance man-hours. Altogether, the new equipment increased the construction capability of the two brigades by as much as 50 percent.[33]

[33] Ploger, *Army Engineers*, pp. 120, 124–25; Dunn, *Base Development*, pp. 103–07, 122; Army Activities Rpt, 9 Jul 69, p. 41, CMH; Engr Cmd History, 8 Jul 72, p. 23, Historians files, CMH; Florreich, "Lines of Communication Restoration Program," p. 12. See also Interv, 1st Lt Raymond F. Bullock, 26th Mil Hist Det, with Lt Col Paul J. Kline, Chief of Supply Br, Supply and Maint Div, Engr Sec, USARV, 9 Mar 69, incl. 4, VNIT 445, CMH. For the Army's justification to purchase commercial construction equipment, see Memo, Ploger, OCE, for Asst Sec Army (Installations and Logistics), sub: Requirement for Heavy Construction Equipment—USARV, 19 Jul 68, Historians files, CMH. The merits of military and commercial construction

Manufacturers quickly provided the off-the-shelf construction equipment. In fact, this transaction was much faster than the normal procurement of standard military equipment. Since most of the commercial buy was new to the Army, the contract inserted provisions for factory representatives to prepare the equipment for use and to train the operators. Management of the equipment operators school came under the 169th Engineer Construction Battalion, which also picked up and processed all the equipment destined for 20th Brigade units. By early 1970, the Long Binh–based battalion had distributed 103 pieces of equipment to the brigade's units in III and IV Corps. The U.S. Army Mobility Equipment Command also awarded a $5 million contract to Dynalectron Corporation of Fort Worth, Texas, to provide maintenance and repair parts support. In May 1969, the firm began setting up shop at twenty-six locations in Vietnam, and its employees, numbering between 125 to 200 technicians, accomplished all unit-level maintenance and ran small repair parts distribution points at job sites for the 18th and 20th Brigade units. Vinnell Corporation provided backup engineer equipment and automotive maintenance support from its field maintenance shop at Cam Ranh Bay.[34]

In carrying out the highway restoration program, engineer units built base camps and industrial sites along the routes to be upgraded. This included building and maintaining quarries, asphalt plants, and access roads. During 1969, the 18th and 20th Engineer Brigades used more than 70,000 tons of rock every week, a rate that more than doubled the following year. The following year, the plants operated by engineer troops produced 340,000 cubic yards of rock and 60,000 tons of asphalt monthly to support the highway program. In addition, Army engineers relied on RMK-BRJ's crushers for 38 percent of the rock required monthly to sustain an annual construction rate of 177 miles as set forth in 1968. By mid-1970, the two brigades ran eighteen rock-crusher sites. Most rock ended up as landfill, base courses, and asphaltic concrete on the roads. Of the eleven asphalt plants set up by 1970, all but two operated in conjunction with quarries. Both plants were located near paving sites, and trucks hauled rock to the plants from quarries and stockpiled.[35]

The near nonexistence of rock deposits in the Mekong Delta, where finding dry ground could sometimes be a problem, meant transporting large quantities of rock into the delta. At that time there were only two large sources for

equipment are discussed in Maj. Gerald M. Tippins, "CCE—An Impossible Dream?" *Engineer* 2 (Spring 1972): 12–15.

[34] Dunn, *Base Development*, p. 122; ORLL, 1 Nov–31 Jan 70, 169th Engr Bn, 14 Feb 70, p. 11, Historians files, CMH; 1st Lt. Eugene Roberts, "The Great Race, New Equipment," *Kysu'* 1 (Summer 1969): 11; Stearns, Abbott, and Campbell, "LOC Highway Restoration, Vietnam," p. 85; Visit to Various Headquarters in the Republic of Vietnam, 1–22 May 1969, incl. 5, p. 7, OCE Liaison Officer Trip Rpt no. 14, 7 Jul 69, OCE Hist Ofc; Engr Cmd History, 8 Jul 72, p. 16; "Other Logistical Support Services: Field Maintenance," *Vinnell* 11 (May 1969): 12–14.

[35] Dunn, *Base Development*, pp. 102, 111; Ploger, *Army Engineers*, pp. 124, 162; Briefing for the Undersecretary of the Army, incl. 14o, p. 7, OCE Liaison Officer Trip Rpt no. 16, 30 Apr 70, OCE Hist Ofc. For more on quarrying operations, see Spec. Mike Barry, "The Rhythm of Tam Quan Quarry," *Kysu'* 1 (Summer 1969): 3–5; Memo, Capt Kurt E. Schlotterbeck, 26th Mil Hist Det, for Mr Warner Stark, CMH, sub: 94th Quarry Detachment, 30 Nov 69, VNIT 547, CMH. VNIT 547 includes interviews, diagrams, photos, and a large-scale map of the Vung Tau area.

RMK-BRJ industrial sites such as the Phu Cat quarry and asphalt plant provided rock and asphalt for the highway program.

crushed rock in the area—RMK-BRJ's University Quarry outside Saigon and the 159th Engineer Group's quarry at Vung Tau run by the 103d Construction Support Company's quarry platoon. In November 1966, the consortium added a 400-ton-per-hour crusher to the 250-ton-per-hour plant and aggregate production jumped to an average of 6,500 tons per day. In late January 1967, it reached a record production of more than 12,000 tons per day. Also that month, RMK-BRJ set up a hot-mix asphalt and concrete batch plant at its University Quarry site. Similarly, the Vung Tau quarry now operated by the 94th Engineer Quarry Detachment evolved into the Army's largest producer of crushed rock. This quarry produced most of the rock hauled to the 34th Engineer Group's projects in the delta. By late 1969, Vung Tau's production averaged 70,000 tons per month. Among the few outcroppings found in the northwest corner of IV Corps, two South Vietnamese quarries—an army quarry at Nui Sam and a Ministry of Public Works quarry at Nui Sap—produced rock for local highway and construction projects. By 1968, barges and sampans were transporting more than 150,000 tons of rock per month from these four quarries to off-loading sites in the delta. In January 1970, more than 200,000 tons of rock were shipped, and in August 1971 production exceeded 272,000 tons.[36]

[36] Dunn, *Base Development*, pp. 102–03; Ploger, *Army Engineers*, p. 124; Tregaskis, *Building the Bases*, pp. 249–50, 261; *Diary of a Contract*, pp. 255–56; Florreich, "Lines of Communication Restoration Program," p. 12; ORLL, 1 Feb–30 Apr 66, 159th Engr Gp, p. 2, 13

Transporting rock to the delta greatly increased following the establishment of the MACV Delta Transportation Plan. The plan called for the construction of twelve barge off-loading points—seven by the U.S. Army (including the RMK-BRJ site at Can Tho) and five by the South Vietnamese. One key problem facing the planners was the gathering, repairing, and movement of off-loading equipment—clamshell cranes, bulldozers, and conveyor belts—and getting them to the sites. The U.S. Agency for International Development and U.S. Army, Vietnam, helped by obtaining some equipment for the South Vietnamese. Army Engineer Hydrographic Survey Team Number 1, a ten-man team based at Long Binh, the only one of its kind in the Army, charted water routes along the delta's many canals.[37]

Expediting the distribution of crushed rock to where it was needed the most was charged to a small Delta Rock Agency formed within the Lines of Communication Division. This meant the three major customers in the delta—the U.S. Army, the South Vietnamese Army, and Vietnam's Ministry of Public Works—would integrate construction operations and distribute rock on a quid pro quo basis. Their rock needs were forecasted for certain periods and forwarded to the Delta Rock coordinator, a Directorate of Construction staff officer, who decided what portion of each forecast would be filled at the discharge points. Crushed rock was loaded aboard barges linked together and ferried by Military Sea Transportation Service tugs to the unloading points. During 1971 over 7.1 million tons of crushed rock had been distributed, and almost 1.2 million tons were shipped in 1972. That year, two of the quarries ended operations: Vung Tau in February and University Quarry in June. To make up for the loss of the two quarries, South Vietnamese engineers increased production at Nui Sam, and the U.S. Agency for International Development extended its contract with Vinnell Corporation to run Nui Sap through 1973.[38]

May 66, Historians files, CMH; Memo, Schlotterbeck for Stark, 30 Nov 69, sub: 94th Quarry Detachment, p. 1; MACV History, 1971, vol. 1, p. IX-9; Ltr, CO, 34th Engr Gp to CG, 20th Engr Bde, 19 Oct 67, sub: Rock Requirements in the Delta, Historians files, CMH.

[37] Quarterly Hist Rpts, 1 Jan–31 Mar 68, MACDC, p. IV-19, 1 Jul–30 Sep 68, MACDC, p. IV-7, 1 Oct–31 Dec 68, MACDC, p. IV-9, and 1 Jan–31 Mar 69, MACDC, 19 Apr 69, pp. IV-9 to IV-10, Historians files, CMH; Background Statement Leading to Formation of the Delta Rock Agency, incl. 3, tab E–1, OCE Liaison Officer Trip Rpt no. 13; Spec. Mike Barry, "Down a Not So Lazy River," *Kysu'* 1 (Winter 1969): 25–26; MACV History, January 1972–March 1973, vol. 1, p. E-32. For more on the U.S. Army Hydrographic Survey Team, see HQ, Engr Cmd, AVCC-MO-I, U.S. Army Topographic Support of Military Operations in the Republic of Vietnam, 25 Feb 71, pp. 58–82, Historians files, CMH; and Capt. Joseph Cascio, "The Water Mappers," *Kysu'* 1 (Spring 1969): 7–8.

[38] Quarterly Hist Rpts, 1 Apr–30 Jun 68, MACDC, pp. IV-6 to IV-7, 1 Jul–30 Sep 68, MACDC, p. IV-8, 1 Oct–31 Dec 68, MACDC, p. IV-10, and 1 Jan–31 Mar 69, MACDC, p. IV-10; Concept of Organization, incl. 3, tab E–2, OCE Liaison Officer Trip Rpt no. 13; Barry, "Down a Not So Lazy River," pp. 25–26; MACV History, January 1972–March 1973, vol. 1, p. E-32. For more on the Delta Rock Agency, see AAR, Development of the Delta, Phase I, 26th Mil Hist Det, 18 Jul 69, which includes Interv, Capt Raymond F. Bullock, 26th Mil Hist Det, with Capt John H. Morgan, Coordinator, Delta Rock Agency, 10 Apr 69, incl. 7, and MACDC-LOC, sub: Standard Operating Procedure Delta Rock Agency, n.d., incl. 9, VNIT 445, CMH; and, HQ, MACV Directive 55–15, 8 May 69, *Transportation and Travel, Rock Movements, and Operations in the Delta*, Historians files, CMH.

Barges haul rock to the delta.

At times mud and the scarcity of rock, particularly in the delta, compelled the road builders to develop base course stabilization expedients. Engineers found that lime caused the clay to coagulate into sand-sized particles, which adhered together, forming a much more stable base than the clay alone. Henceforth, they used this stabilization method for all delta road construction. The clay-lime stabilization process was not new. It had been used by road builders in many parts of the world and tested on selected airstrips in Vietnam. Paddy clay could be used to build a strong and durable subgrade, making possible faster construction and allowing the rock barged in at great expense to be used only for the final base course and paving. As true of almost all other horizontal construction in Vietnam, this road-building technique could not be done in the monsoon season. When the rains stopped, roadside paddies were diked and pumped out. Bulldozers and earthmovers scraped out clay to form or expand a roadbed several feet above the surrounding paddies. As the clay dried out, controlled amounts of lime and moisture were added and mixed into the clay with a rotary tiller or disk harrow and compacted with a sheepsfoot roller or a segmented compactor and allowed to cure. Soil stabilization machines later were used to mix the lime with the clay fill. The engineers repeated this process with several (usually four) eight-inch layers of subbase. An eight-inch layer of crushed rock or cement was added to the last course, and a double layer of asphalt topped off the road. The 34th Engineer Group accomplished most of the thirty-seven miles along Highway 4 in the IV Corps area by using this method.[39]

[39] Dunn, *Base Development*, p. 107; Ploger, *Army Engineers*, pp. 118–19; Conover, "LOC Program in Vietnam," pp. 42–43; Florreich, "Lines of Communication Restoration Program,"

Elsewhere in Vietnam engineers used similar stabilization methods. In June 1969, the 554th Engineer Construction Battalion, 79th Group, started upgrading thirty-one miles of Highway 13 from Lai Khe to An Loc using Portland cement instead of lime. In this case, no suitable laterite for the subbase could be found in sufficient quantity along the route. The only source of rock for the base course available in the area was located near An Loc. Furthermore, the battalion would not have a rock crusher on site until late fall. Tests of the local silty sand, however, revealed an unusually low level of plasticity and twice the strength of lateritic material previously used for subbase construction. The battalion commander, Lt. Col. Elbert D. H. Berry, ordered further tests to see if cement would serve as a bonding agent between the silty sand particles, thus increasing the bearing capacity. After many tests, the battalion found that six inches of the soil-cement would provide Class A strength for the MACV Class F highway. This method eliminated the need for a rock quarry at An Loc, but it meant building a completely new parallel road since traffic could not travel on the base course during the seven-day curing process. Work started in late December when Vietnamese civilian workers laid out the bags of cement and dumped the contents on the new eight-inch subbase lift of silty sand. A grader in conjunction with a rotary tiller and a water distributor then spread and scarified the cement evenly over the surface. A segmented embankment compactor followed. The soil-cement, like concrete, required a moist cure. Since this method was almost impossible during the dry season, the 554th accomplished this with less effort by thoroughly dampening the completed base course and coating it with an asphalt cutback to seal in the moisture. After the curing period, the battalion paved the surface with two and one-half inches of asphaltic concrete.[40]

The Builders

To achieve the escalated rate of roadwork by 1971, the Lines of Communication Division and the Combined Central Highway and Waterway

pp. 12–13; Interv, 1st Lt Raymond F. Bullock, 26th Mil Hist Det, with Lt Col Richard E. Leonard, CO, 36th Engr Bn, 20 Mar 69, VNIT 445, pp. 5–8, CMH. VNIT 445 also includes other interviews, documents, and a large map covering highway and other construction in the delta.

[40] Ploger, *Army Engineers*, pp. 119–20; Spec. Blanchard de Merchant, "Cement Stabilization of QL 13," *Kysu'* 2 (Spring 1970): 23–25. The 554th also faced a strange soil stabilization problem at a site of a just-completed dry span bridge on Route 8A near Phu Cuong, part of the main supply route from Cu Chi to Long Binh. Seven days after the bridge opened to traffic, the north lane of the east approach mysteriously dropped seven feet. More laterite and rock fill were added, but the approach continued to sink. A team of geologists and soils experts from the 20th Brigade discovered that this phenomenon was caused by the newly added fill that was slipping along a huge subsurface plane. The laterite and rock had displaced the silty, fluid paddy clay to the area of least resistance away from the "dam" created by the old roadbed along the south side of the new roadbed and the perpendicular bridge abutments. Having identified the problem, the engineers added blast rock and fill to the north side of each approach, thus creating sufficient force perpendicular to the subsurface plane and containing the clay. Capt. Gary D. McDonald, "The Terrible Temper of Rach Ba Bep," *Engineer* 2 (Spring 1972): 10–11.

Committee reordered priorities and switched responsibilities among the builders. Carrying out the highway program were the 20th Engineer Brigade in III and IV Corps, the 18th Engineer Brigade in II Corps and southern I Corps along Highway 1 to the Binh Son Bridge south of Quang Ngai, and the 3d Naval Construction Brigade in the rest of I Corps. RMK-BRJ supported the troops by providing rock and asphalt and upgrading assigned sections of road and building major bridges. South Vietnamese and allied military engineers participated to a smaller degree. In several areas, including Highways 19 and 1 west and north of Qui Nhon, the consortium and troops worked jointly. The troops of the 45th Group prepared the roadbed and RMK-BRJ did most of the paving. The centralized management system introduced in late 1967 eased shifting of resources under changing conditions. For instance, engineer troops took over insecure road sections from RMK-BRJ. In addition, this planning took into consideration added repair and maintenance work caused by enemy action and monsoon weather. Often distances were too great to upgrade to MACV standards during one construction season, and road sections were simply patched up to survive the monsoon.[41]

Nevertheless, a considerable amount of work had already been done by 1968. The 35th Engineer Group began paving operations at Cam Ranh and advanced both north and south along Highway 1. By early summer of 1967, the group also started fabricating twenty-foot reinforced-concrete spans. The 159th Group paved Highway 15 between Long Binh and Vung Tau and built a causeway near the port city. Paving along Highway 19 between Qui Nhon and An Khe and Highway 1 north to Bong Son by the 45th Group and RMK-BRJ was well under way. During 1968, the Combined Central Highway and Waterway Committee formally assigned 1,182 miles of the highway program to U.S. Army engineers, 218 miles to the Seabees, and 729 miles to RMK-BRJ. Early in the buildup, South Korean Army engineers of the Dove Unit, a task force devoted to local improvement programs based in Bien Hoa Province, began road and bridge work in the Saigon area. Later, South Korean engineers helped RMK-BRJ build a new North Capital Bypass around Saigon.[42]

As time passed, these figures changed because of funding, program reviews, and U.S. troop withdrawals. In 1969, South Vietnamese Army engineers formally entered the Lines of Communication Program and assumed responsibility for 103 miles of highways. By the end of 1969, the troops and contractor completed 997 miles. Work progressed slowly in 1970 adding another 464 miles, for a total of 1,585 miles or 65 percent of the highway program. A cutback by the House Armed Services Committee in construction funds that

[41] Conover, "LOC Program in Vietnam," pp. 23–25, 27; History, LOC Program, OCE Liaison Officer Trip Rpt no. 22, p. 184. For an example of road priorities shown on sketch maps corps by corps, see MACDC-LOC, Construction Bulletin No. 415–3–2, 15 Oct 69, sub: Lines of Communication Restoration Priorities, incl. 8, 26th Mil Hist Det, LOC Study, 10 Feb 71, VNIT 813, CMH.

[42] Ploger, *Army Engineers*, pp. 117, 156; Larsen and Collins, *Allied Participation in Vietnam*, p. 123; Stearns, Abbott, and Campbell, "LOC Highway Restoration, Vietnam," p. 86. For more on Highway 1, see Spec. Randy Hunter, "The Long Road: Asphalt Lifeline from the Delta to the DMZ," *Kysu'* 1 (Fall 1969): 17–22.

year primarily involving highway restoration caused the Secretary of Defense to direct a thorough review of the highway program. In September, he reduced the fund ceiling by $49 million from $496.7 million to an interim $447 million. This resulted in the deferral of about 300 miles to be constructed by the South Vietnamese government later. U.S. Army troop responsibility dropped from 1,566 to 1,151 miles, the Navy from 267 to 248 miles, and the contractor from 614 to 560 miles. South Vietnamese Army engineer responsibility, however, increased from 103 to 322 miles. The priority assigned to the program remained high with 42 percent of the U.S. engineer troop effort, 25 percent of contractor effort, and 25 percent of South Vietnamese engineer troop effort devoted to the road program.[43]

The highway program had become the U.S. Army Engineer Command's largest single project. As of early 1969, twenty-one of the 18th and 20th Engineer Brigades' twenty-eight battalions and more than half of the 33,000 troops had been directly involved in the road program at one time or another. That May sixteen battalions, nine in the 18th and seven in the 20th Brigade, were committed to highway upgrading, which in March absorbed 32.1 percent and 31 percent, respectively, of their total effort. By the spring of 1970, more than 11,000 men of the 26,000 in the two brigades were occupied in some aspect of the highway construction program. As U.S. combat forces withdrew from Vietnam, a larger proportionate share of engineer battalions stayed behind, with fourteen carrying out roadwork to the end of 1970. By then the 19th Engineer Combat Battalion completed its portion of Highway 20 near the II/III Corps border and departed Vietnam. In 1971, the remaining battalions finished their road projects, with the last three departing near the end of the year. The Army road builders consisted largely of construction battalions and their attached units, including port construction companies and detachments. Nonetheless, an average of three combat battalions augmented with light equipment, construction support, and dump truck companies dedicated their efforts to the highway program. Actually, most of the combat battalions helped the effort by maintaining assigned sections of road and doing specific tasks such as base course work and building bridges.[44]

[43] Conover, "LOC Program in Vietnam," pp. 34–36; History, LOC Program, OCE Liaison Officer Trip Rpt no. 22, pp. 184–85; Stearns, Abbott, and Campbell, "LOC Highway Restoration, Vietnam," p. 86; Dunn, *Base Development*, pp. 111–12; Ploger, *Army Engineers*, p. 117; MACV History, 1970, vol. 2, pp. IX-63 to IX-67; Army Activities Rpts, 5 Aug 70, p. 21; 26 Aug 70, p. 23; 16 Sep 70, p. 23, CMH. For more on roadwork between 1967–1970, see LOC sections: Quarterly Hist Rpts, 31 Mar 67 through 31 Dec 70, MACDC; OCE Liaison Officer Trip Rpts, nos. 6–19; MACV History, 1968, vol. 2, pp. 651–53; MACV History, 1969, vol. 2, pp. 91–97.

[44] Dunn, *Base Development*, p. 102; Engr Cmd, AVHEN, Fact Sheet, sub: Vietnamization of the LOC Effort, 18 Jan 72, box 2, 74/571, RG 338, NARA; Conover, "LOC Program in Vietnam," pp. 33–34; Army Activities Rpt, 9 Jul 69, incl. 5, p. 41, CMH; Visit to Various Headquarters in the Republic of Vietnam, 1–22 May 1969, p. 3, OCE Liaison Officer Trip Rpt no. 14; History, LOC Program, OCE Liaison Officer Trip Rpt no. 22, pp. 186, 189, 194. For more on road-building problems facing Army engineer troops, see Interv, Capt Wilbur T. Gregory, 26th Mil Hist Det, with Lt Col James S. Sibley, Chief, LOC Div, Const Dir, USAECV, 5 Oct 70, VNIT 740, CMH. See also History of the 18th Engr Bde LOC Program, 7 Apr 70, Schrader Papers, MHI; and S. Sgt. Matt Glasgow, "Roads to Peace: 20th Brigade Road Construction" *Kysu'* 2 (Fall 1970): 2–5.

It became apparent that the existing multipurpose nine-hundred-man U.S. Army construction battalion was not the best organization to do extensive roadwork. Normally construction battalions assigned projects to the three identical construction companies, which in turn assigned tasks to the single earthmoving and two vertical construction platoons. Additional specialized personnel and equipment were attached as necessary. Since roadwork is considered horizontal construction (earthmoving, paving, and drainage work involving much heavy equipment), battalions experimented by pooling personnel and equipment into functional-type companies, typically an earthmoving company with most of the heavy equipment, a dump truck company, and a vertical construction company consisting of tradesmen (carpenters, electricians, masons, plumbers, and steelworkers) to do structural or finish work above ground. In the delta, where there were a large number of bridges to be built, the 159th Engineer Group organized a bridge-building company and gave it equipment suited to that task. By centralizing personnel and equipment, including Vietnamese civilian workers and commercial construction equipment and attached troops and equipment from other units, local commanders believed these organizations allowed better use of equipment and resulted in improved road production.[45]

In I Corps, the 3d Naval Construction Brigade and Marine Corps engineers finished their share of the highway program in 1971. Earlier, in mid-1968, when the number of Seabee battalions increased to twelve, about 30 percent of the Navy's engineer troop effort already had shifted to the highway program. One important project was the completion by Naval Mobile Construction Battalion 8 in September of the seven-and-a-half-mile road between Hue and the new permanent port facility at Tan My. In the spring of 1969, all five Marine Corps engineer battalions (including the two divisional battalions) and all ten Seabee battalions concentrated on Highways 1 and 9 in northern I Corps and Route 4 south of Da Nang. Starting at Lang Co, just north of the Hai Van Pass, the 3d Brigade rebuilt approximately eighty-seven miles of Highway 1 north to Dong Ha, then some twenty miles of Highway 9 west to the Vandegrift Combat Base at Ca Lu. Large supplies of crushed rock, estimated at 1.8 million tons, and asphalt were required. The 30th Naval Construction Regiment ran the quarries, crushers, and asphalt plants, and the five battalions of the 32d Naval Construction Regiment provided the road work crews. Road improvements undertaken during 1969 by the road builders in I Corps (including Army engineers of the 45th Engineer Group, South Vietnamese Army engineers, and RMK-BRJ) cut travel time between Da Nang and Hue from six hours to two, and between Da Nang and Dong Ha to four and one-half hours. Major bridge construction by the Seabees included the opening on 30 March of the new 825-foot, timber-piled-supported, concrete-decked Liberty Bridge at An Hoa, about nineteen miles southwest of Da Nang, which replaced the

[45] Stearns, Abbott, and Campbell, "LOC Highway Restoration, Vietnam," p. 85; Interv, Capt William A. Kunzman, 16th Mil Hist Det, with Col John W. Brennan, CO, 159th Engr Gp, 24 Feb 72, VNIT 1038, pp. 4, 8–9, CMH.

original bridge washed away by monsoon floods in late 1967. The new bridge not only cut travel time between Da Nang and An Hoa by half, but it also increased the allied capability to support tactical and pacification operations and economic development into the An Hoa basin. During the same month, the 1st Marine Engineer Battalion completed upgrading Route 4 to western Quang Nam Province. Before departing Vietnam, Seabee units completed road and shoulder work along with permanent and timber bridges on Highway 1 north and south of Da Nang. Naval Mobile Construction Battalion 5 resurfaced the steep, winding, and heavily traveled section through the Hai Van Pass. South of Da Nang, persistent enemy harassment failed to halt Naval Mobile Construction Battalion 62's improvement of Route 4. Naval Mobile Construction Battalions 62, 10, and 74 also completed three major concrete and steel highway bridges at Dong Ha, Quang Tri, and Cau Do (just south of Da Nang), respectively.[46]

In mid-1969, RMK-BRJ was completing a work-in-place rate of more than $6 million a month. By January 1970, the consortium had completed 375 miles with about 322 remaining. Overall, its share of the nearly $500 million highway program came to about $300 million. Normally, the assignment to construct the most difficult permanent bridges, including the manufacture of prestressed concrete bridge beams and pilings used in the highway program went to RMK-BRJ. For instance, from May through July 1971, the firm started building five major bridges near Saigon costing nearly $20 million. These included the 1,343-foot Tan An Bridge and the 1,738-foot Ben Luc Bridge along Highway 4 in the delta; the 2,654-foot Bien Hoa Bridge across the Dong Nai River leading to the Phu Cuong and North Capital Bypasses; the 1,819-foot Binh Loi Bridge over the Saigon River on Highway 13; and the 1,571-foot Saigon River Bridge on the North Capital Bypass. The consortium operated quarries and asphalt plants throughout the country, including the Saigon University industrial site, a major supplier to the Delta Rock Agency, and the Phu Cat site, which supplied rock and asphalt in the Qui Nhon region. Although normally assigned the less dangerous routes, the firm's crews still endured enemy harassment. Several incidents took place in early 1970 on Highway 1 between Qui Nhon and Nha Trang. In March, a project manager was killed by a mine north of Chi Thanh between Song Cau and Tuy Hoa. In that incident, a Vietnamese worker was killed and another badly injured. The same month, three South Korean soldiers were killed guarding the firm's Chi Thanh installation. In the next three months, three more supervisors became

[46] Charles R. Smith, *U.S. Marines in Vietnam: High Mobility and Standdown, 1969* (Washington, D.C.: History and Museums Division, Headquarters, U.S. Marine Corps, 1988), pp. 267–68; Tregaskis, *Building the Bases*, pp. 298–99, 412–14, 417–18; Lt. (jg) J. A. Schroeder, "The Col Co Road to Hue," *Military Engineer* 61 (May-June, 1969): 165–68. For more on Seabee road and bridge work, see Tregaskis, *Building the Bases*, pp. 409–22; I Corps highway construction summaries in Quarterly Hist Rpts, MACDC, for years 1969–1971; MACV History, 1968, vol. 1, pp. 475–80; MACV History, 1969, vol. 2, pp. IX-98 to IX-100; Lt. James M. Ramsey, USN, and Lt. (jg) John O'Blackwell, "The Cam Lo River Bridge," *Military Engineer* 62 (January-February 1970): 29–31; Lt. Cmdr. Gordon W. Callendar Jr., "Seabee Bridging at Hue," *Military Engineer* 62 (September-October 1970): 316–19.

casualties—one by another mine, the second in an ambush south of Tuy Hoa, and the third during a mortar attack at Chi Thanh. As for the thousands of Vietnamese workers, RMK-BRJ's prolonged stay in Vietnam afforded them the opportunity to learn new skills, which hopefully could be a vital source for future economic development after the war.[47]

U.S. military engineers also undertook several bridge projects of the scope usually assigned to the consortium. The 1,002-foot Phu Cuong Bridge spanning the Saigon River north of Saigon developed into one of the largest and most complex bridge projects undertaken by engineer troops in Vietnam. Begun in October 1967, and opened to traffic in late June 1968, the bridge completed a key link along the Phu Cuong Bypass. This main supply route bypassed Saigon and connected the depot complex at Long Binh with U.S. Army bases at Di An, Phu Loi, Cu Chi, and Lai Khe. Units of the 20th Brigade's 159th Engineer Group tasked to do the bridge included Company B, 92d Engineer Construction Battalion, and the 41st Engineer Port Construction Company. Construction consisted of fourteen 60-foot spans and two 81-foot navigational spans with approximately 20 feet of clearance above mean high water. The two abutments and five land-based piers were constructed of built-up steel members. Depths of penetration for the piles through the riverbed's organic silt averaged over 200 feet with a maximum depth of approximately 270 feet for several piles. Tidal fluctuation of eight feet in the river and the current caused tricky problems during the alignment of the steel jacket legs into which the piles were placed. Over six miles of steel piping alone were used in the piers. All circular piles and their prefabricated jackets were filled with concrete for additional rigidity. The two navigational spans consisted of eighteen 81-foot prestressed concrete beams, and the remaining fourteen spans held five steel stringers and precast concrete deck panels. Getting the 22-ton, 81-foot beams to the job site and in place turned into a major engineering operation. Trucks had to haul the beams some fifteen miles over the partially completed road directly onto the bridge. The 41st Engineer Company used Navy cube work barges mounting large cranes to lift the beams and move them from the point of pickup to the span being placed. This movement took place only during the slack tide because of the difficulty of controlling the barges maneuvered into place by a land craft, mechanized. Curbing was cast on the deck, which then was topped off with a four-inch asphaltic concrete wearing surface. An extensive lighting and pier protection system and other fixtures were completed in August.[48]

[47] Conover, "LOC Program in Vietnam," p. 31; Tregaskis, *Building the Bases*, pp. 418, 420–21, 429–30; Quarterly Hist Rpt, 1 Oct–31 Dec 71, MACDC, 8 Mar 72, pp. III-8 to III-9, Historians files, CMH.

[48] Capt. Thomas C. Weaver, "The Phu Cuong Bridge, Construction and Features," *Military Engineer* 61 (March-April 1969): 122–24; Quarterly Hist Rpt, 1 Apr–30 Jun 69, MACDC, 19 Jul 69, p. IV-5, Historians files, CMH; Unit History, 41st Engr Co (Port Const), n.d., p. 1, Historians files, CMH. See also Capt. John E. Schaufelberger, "Precast Concrete Deck Panels," *Military Engineer* 61 (March-April 1969): 124; 20th Engr Bde Press Release, Phu Cuong Bridge and Bypass, 11 Jun 68, Historians Files, CMH; and Interv, 1st Lt. Raymond F. Bullock, 26th Mil Hist Det, with Lt Col Robert L. Crosby, CO, 92d Engineer Battalion, 29 Nov 68, VNIT 336, CMH.

The Phu Cuong Bridge under construction

The construction of the Phu Cuong Bridge did not go unnoticed by the Viet Cong, who saw both military and propaganda value in its destruction. Mortar rounds frequently struck the bridge site during construction. During the Tet offensive, enemy troops launched a major attack on the South Vietnamese Army Engineer School a few hundred yards from the engineers' work camp. American engineers helped their South Vietnamese colleagues in a counterattack that succeeded in keeping the enemy from overrunning the

school and bridge. On 6 November 1968, Viet Cong sappers swam to the bridge and expertly fastened a demolition charge that destroyed two spans and caused other major damage. The 65th Engineer Battalion, 25th Division, quickly installed an M4T6 floating bridge and reopened the critical bypass road to traffic within twenty hours. Soon afterward the 41st Port Construction Company returned to make permanent repairs. Capt. Thomas C. Weaver, the company commander, concluded that as little as fifty pounds of explosives had sufficed to do the damage because the original bridge design did not call for cross-bracing of the steel I-beams. An M48 tank sitting on the bridge at the time of explosion added its weight to the heavy weight of the bridge and multiplied the damage. The new design made it more difficult to unhinge the stringers if the concrete deck panels started breaking away. A major salvage operation followed. Divers, often working by feel alone and in changing tides, worked underwater clearing debris, checking piers, and locating damaged bridge components. Driving new piles became especially difficult because of the rubble, and the divers faced the extra hazard of placing charges on the bottom to break up the large pieces of concrete and steel blocking the way. Two piers were shifted several feet, which meant that ten 60-foot-length steel beams had to be extended to 65 feet. This splicing of five-foot extensions took two welders all day and about one hundred pounds of rod to complete the job. Time allowed for repair extended to four months. With additional support from the 159th Group, especially welders from other units and the 92d Engineer Battalion, the 41st beat its adjusted deadlines, completing the repairs on 14 February 1969.[49]

The Bong Son bridges crossing the Lai Giang River on Highway 1 some fifty miles north of Qui Nhon epitomized spans that underwent several changes during the war. During the Bong Son Campaign in 1966, the existing single-lane bridges, a multispan Eiffel truss highway bridge and a railway bridge covered with planking to carry heavier loads, were used. A third crossing during the dry season consisted of a combination causeway and M4T6 floating bridge. When the Viet Cong damaged the Eiffel bridge in October 1966, the 35th Engineer Combat Battalion raised the Eiffel spans and completed the reconstruction in late July several months before the next monsoon season. By late 1969, traffic became so congested that the 84th Engineer Construction Battalion prepared plans to build a new permanent bridge. The 1,634-foot-long span, claimed as one of the longest bridges to be built by American troops in Vietnam, with a dual-lane roadway twenty-four feet wide, evolved into one of the largest and most demanding projects undertaken by the battalion. An engineer task force consisting of Company B and the 536th Port Construction Detachment departed Qui Nhon and set up camp in a grove of coconut trees on the river bank. Although plans called for the removal of several trees, which represented a major portion of the local economy and sentimental value, the engineers relented and carefully fitted

[49] AAR, Repair of Phu Cuong Bridge, 26th Mil Hist Det, 4 Apr 69, VNIT 376, CMH; ORLL, 1 Feb–3 Mar 69, 92d Engr Bn, n.d., p. 8, Historians files, CMH; Unit History, 41st Engr Co (Port Const), pp. 1–2. VNIT 376 includes interviews, photographs, and design sketches.

the twenty-four tropical wooden buildings between the trees. This resulted in some of the trees jutting through the overhangs of the tin roofs, and several young trees were transplanted. (During work breaks, villagers harvesting the crops showed their appreciation by treating the Americans to fresh coconuts.) Site preparations also included setting up an industrial plant consisting of a precast deck slab yard, a rebar processing yard, and a stringer yard. Five bulldozers fashioned an earthen dike diverting water to the far shore so that a construction causeway could be built. Concurrent training took place on the operation of forty-ton cranes, welding machines, transit mixers, and special items of equipment. Bridge construction began in early 1970 and lasted until September. The bridge consisted of twenty-six 60-foot and one 70-foot steel spans. Each of the twenty-six piers included a reinforced-concrete cap resting atop ten H-piles. Because the I-beams came in random 30- to 40-foot lengths, all 162 stringers had to be spliced. Welding operations continued day and night. Once the stringers were in place and welded together with steel braces, a crane lifted eight-inch reinforced-concrete deck slabs into place. Four hundred and eighty-nine slabs went into the completed structure and three inches of asphaltic concrete surfaced the roadway. Handrails, curbs, lighting, and a pier protection system followed.[50]

During the American troop withdrawals, South Vietnamese engineers gradually took over more of the highway program. Before they assumed their part in the highway program, South Vietnamese Army engineers doing road and bridge work received support from U.S. engineer units in the form of materials as long as they followed U.S. specifications. While the Americans concentrated on roads used for tactical or logistical operations, the South Vietnamese, through their advisers and on-the-job training programs sponsored by neighboring U.S. Army engineer and Seabee units, gained experience in the more pacified areas. Over time, South Vietnam's engineering capability developed and expanded in size. Although South Vietnamese Army engineers were faced with many of their own increased combat support and construction missions, the South Vietnamese Army Chief of Engineers, Col. Nguyen Chan, agreed in late 1969 to participate fully in the highway restoration program. Initially, three construction battalions assumed responsibility for three sections totaling 103 miles along Highway 1 in II and III Corps and Highway 4 in IV Corps. This work included the building of fifty bridges totaling 9,445 feet long. In July 1970, U.S. troops transferred another 178 miles, including 65 miles of Highway 14 in II Corps; and sections of Route 7B (Cheo Reo to Highway 14 in central II Corps), Route 2 (Nui Dat to

[50] ORLLs, 1 Aug–31 Oct 69, 84th Engr Bn, 31 Oct 69, p. 3, 1 Feb–30 Apr 70, 84th Engr Bn, 30 Apr 70, p. 2, 1 May–31 Jul 70, 84th Engr Bn, 31 Jul 70, p. 2, and 1 Aug–31 Oct 70, 84th Engr Bn, 31 Oct 70, p. 2, all in Historians files, CMH; Capt. Roger L. Baldwin, "Long Bridge at Bong Son," *Military Engineer* 63 (September-October 1971): 334–35; 1st Lt. John Gamble and Spec. Newell Griffith, "Bridge Over Troubled Waters," *Kysu'* 2 (Fall 1970): 18–21. See also articles on the 577th Engineer Construction Battalion's bridge project on Highway 1 south of Tuy Hoa by 1st Lts. John P. Guthrie and Hubert C. Roche, "Cau Ban Thach Bridge," *Military Engineer* 61 (July-August 1969): 270–72; and the 46th Engineer Battalion's Bailey Bridge modification to a key bridge in Saigon by Maj. Maxim I. Kovel and Capt. Richard M. Goldfarb, "New Life for the Fish Market Bridge, Saigon," *Military Engineer* 60 (March-April 1968): 102–04.

Troops of the 84th Engineer Battalion build the new Bong Son Bridge.

Highway 1 in southern III Corps), Route 8A (Rach Gia to Route 27 in western IV Corps), and Route 2B (Ham Tan to Highway 1 in southern III Corps). At the end of 1970, the South Vietnamese commitment stood at 300 miles, of which 17.5 miles were completed.[51]

As the U.S. engineer presence decreased, South Vietnamese Army engineers took over quarries and asphalt plants and received more road-building equipment. In 1970, Vietnamese engineers took over operations at the Freedom Hill Quarry outside Da Nang. Later that year, they began on-the-job training at U.S. Army industrial sites, thus easing transfers at Phu Loc and Da Nang in I Corps, Weigt-Davis and Ban Me Thuot in II Corps, and

[51] Ploger, *Army Engineers*, pp. 116, 174–75; Tregaskis, *Building the Bases*, pp. 406–07; Conover, "LOC Program in Vietnam," p. 35; History, LOC Program, OCE Liaison Officer Trip Rpt no. 22, pp. 185, 187, 189. See also Spec. Peter Elliot, "Paving the Way to Vietnamization," *Kysu'* 2 (Fall 1970): 25–28.

South Vietnamese Army engineers became proficient in repairing and building bridges such as this panel bridge.

Nui Le in III Corps the following year. Also in 1971, construction units were authorized and equipped with 35 and later 75-ton-per-hour rock crushers, 5-ton dump trucks, and 150-ton-per-hour asphalt plants. In March 1972, the 6th Construction Group assumed responsibility for operations at the Dillard industrial work site south of Da Lat. By early 1973, the South Vietnamese had receipted for approximately 550 items of special heavy construction equipment. These transfers included much of the U.S. Army's commercial equipment, thus passing on the enhanced capability for high-quality road building. Dynalectron continued to supply the parts and repaired the equipment at the work sites.[52]

Bridge building became one task in which the South Vietnamese Army engineers excelled. Before entering the highway program, they completed numerous projects, including the rock-unloading piers for the Delta Rock Agency. In 1967 as the 45th Engineer Group upgraded Highway 1 to Bong Son, the South Vietnamese Army 20th Engineer Combat Group, using U.S. materials, worked on several bridges outside Qui Nhon. In late 1970 when Lt. Col. Francis R. Geisel's 554th Engineer Construction Battalion began upgrading thirty-two miles along Highway 20 near Bao Loc, the South Vietnamese 203d Engineer Combat Battalion already had completed three bridges. Geisel noted that the 203d did a good job despite the poor decking, which was not

[52] Conover, "LOC Program in Vietnam," pp. 35–36, 41, 44; MACV History, January 1972–March 1973, vol. 2, p. E-30; Khuyen, *RVNAF Logistics*, pp. 381, 384.

properly creosoted and placed and began rotting, and the shortage of some equipment. The 203d was also building all the bridges using U.S. materials along the 815th Construction Battalion's thirty-one miles of Highway 20 while the U.S. battalion concentrated on roadwork. Lt. Col. George K. Withers, the 815th's commanding officer, recalled in early 1971 that the 203d could get along just fine without his advice and was certain "that they can build bridges much better than we can." In late 1970, the 20th Group's 201st Engineer Combat Battalion finished one of the longest bridges in South Vietnam, the 3,281-foot Tuy Hoa Bridge on Highway 1.[53]

In late 1971, the U.S. troops' roadwork came to a close, RMK-BRJ's share neared completion, and the South Vietnamese took over the balance of the program. Earlier in the year, highway planners, facing the accelerating troop withdrawals, tried to resolve discrepancies and develop more realistic scheduling. By then the Seabees had completed nearly all of their assigned work in I Corps—188 miles, mostly sections of Highways 1 and 9, before departing Vietnam. U.S. Army Engineer Command's share was set at 1,094 miles, of which 751 miles had been completed. The planners deferred 279 miles of national and provincial highways, which would be completed by the Vietnamese. More adjustments followed as Washington hastened the departure of engineer troops and sought ways to close out the costly RMK-BRJ contract. Nevertheless, Maj. Gen. Robert P. Young, who replaced Brig. Gen. Robert M. Tarbox as the director of construction in December 1970, had to contend with transferring more highway and bridge construction to contractors. One approach included hiring Vietnamese contractors under so-called lump-sum contracts, which would have the added benefit of strengthening South Vietnam's construction industry, one of the nation-building goals for the country. This concept became known as the Clarke Plan, named for Lt. Gen. Frederick J. Clarke, who became Chief of Engineers in August 1969, and under whose direction the plan was devised. The Clarke Plan, put in final form in June 1971, called for the transfer of fifty-seven miles of highway in the Mekong Delta. A pilot contract for just over $1.6 million was awarded by the Officer in Charge of Construction to a local Vietnamese firm, and in November the contractor began to upgrade six miles of a badly deteriorated Route 27 north of Binh Thuy. In July, RMK-BRJ took over an additional 17.5 miles as the 20th Engineer Battalion prepared to stand down. The consortium's assigned work increased to 615 miles, with 595 miles completed at the end of the year. In addition, the contractor undertook major repairs, including repaving one hundred miles of Highways 13, 19, and 22 originally completed by the 18th and 20th Brigades. (Final reports still counted the one hundred miles as completed by the troops.) Base course and pavement failures along Highway 19 required the rebuilding of seventy-three miles of road east and west of An Khe. Work started in January with the construction of a base camp and installation of rock crushers and an asphalt plant. Roadwork got under way in March.

[53] Intervs, Capt David D. Christensen, 26th Mil Hist Det, with Lt Col Francis R. Geisel, CO, 554th Engr Bn, 17 Jan 71, pp. 2–3, 8–10, and Lt Col George K. Withers Jr., CO, 815th Engr Bn, 15 Jan 71, pp. 2–3, 9, both in VNIT 813, CMH; Khuyen, *RVNAF Logistics*, p. 381; Quarterly Hist Rpt, 1 Oct–31 Dec 70, MACDC, 17 Jan 71, LOC Sec, para 2d(1)(b), Historians files, CMH.

April saw a sharp increase in enemy action against the contractor. These attacks included direct rocket hits on the quarry, causing seven lost days of operation and damage to a generator shed, and an ambush in June that killed two Navy inspectors and wounded three employees. In December, U.S. Army engineers completed their commitment as the 35th Engineer Group's Task Force WHISKEY finished the final section of Highway 1 near Phan Thiet, bringing the total completed by Army troops to 905 miles. An Australian engineering squadron did subgrade repair and emplacement of base rock along Routes 2 and 23 in Phuoc Tuy Province, with paving carried out by RMK-BRJ and South Vietnamese Army engineers. The Directorate of Construction credited the Australians with completing 7.5 miles along Route 23. South Vietnamese Army engineers completed 127 of the 417 miles assigned to them.[54]

During 1972, RMK-BRJ completed its highway assignment, leaving the unfinished portion of the highway program to the South Vietnamese. In the Saigon region, the firm finished its assigned bridge and road projects. These included several bypass roads, most notably the North Capital Bypass in May, as well the realignment and rehabilitation of the eight miles of Highway 1 between Bien Hoa and the bypass. Traffic now could bypass Saigon's fast increasing congestion and converge with key roads outside the city. Also completed by midyear and transferred to the director general of highways were the bridges at Tan An and Ben Luc, the Binh Loi Bridge, the Saigon River Bridge on the North Capital Bypass, and the impressive concrete and steel Bien Hoa Bridge over the Dong Nai River. These immaculate, gleaming, off-white spans included precast concrete bridge beams and pilings manufactured by the firm. In the highlands, daylight attacks along Highway 19 forced RMK-BRJ to move its crews and equipment to Cam Ranh Bay, but they returned and finished the roadwork before the North Vietnamese launched their massive Nguyen Hue (Easter) offensive in April. The firm ended its Vietnam operations in May. Its construction accomplishments included 615 miles of road, many large bridges, and hundreds of small bridges.[55]

In 1972, South Vietnamese Army engineers' growing participation in the highway program resulted in the activation of two new construction groups. Elements from five construction battalions and one combat battalion were now committed to roadwork, and elements of seven additional battalions were tasked with bridge construction. Altogether, the equivalent of nine battalions was committed to the highway program. During the year, Vietnamese Army

[54] History, LOC Program, OCE Liaison Officer Trip Rpt no. 22, pp. 189–95; Stearns, Abbott, and Campbell, "LOC Highway Restoration, Vietnam," p. 86; Conover, "LOC Program in Vietnam," pp. 31–32, 34, 35–38; Tregaskis, *Building the Bases*, p. 421; Clarke Plan, incl. 2, tab X, LOC Program Summary, OCE Liaison Officer Trip Rpt no. 22; Army Activities Rpts, 17 Feb 71, p. 25; 19 May 71, p. 61; 9 Jun 71, p. 61; 20 Dec 72, p. 22, CMH; Msg, Maj Gen Robert P. Young, MACV Dir of Const, MAC 01763 to Brig Gen Richard McConnell, Asst Dir of Const Opns, Office of Asst Sec Def (Installations and Logistics), 8 Feb 71, sub: Switch of LOC Construction from Troop to Contractor; Msg, Young MAC 08609 to McConnell, 7 Sep 71, sub: VN Construction Industry Development. All messages in Robert P. Young Papers, MHI.

[55] Tregaskis, *Building the Bases*, pp. 420, 430–31; Stearns, Abbott, and Campbell, "LOC Highway Restoration, Vietnam," p. 86; Army Activities Rpt, 20 Dec 72, p. 22, CMH; Quarterly Hist Rpt, 1 Oct–Dec 71, MACDC, pp. III-8 to III-9.

engineers completed 58 miles of road and 3,400 feet of new bridging, bringing their totals to 181 of 417 miles of assigned roadwork and 24,842 of 37,650 feet of assigned bridge construction. Hanoi's offensive interrupted progress, but South Vietnamese Army engineers rallied to repair 150 bridges totaling 12,264 feet. Of that number, they permanently or temporarily repaired 122 with tactical bridges, bypasses, or rafts. The first Vietnamese lump-sum contractor completed three of the assigned six miles, and the Officer in Charge of Construction awarded two more contracts to Korean firms using Vietnamese subcontractors, one in March for thirty-five miles and another in June for twenty-seven miles. These contractors completed fifteen miles of road in 1972.[56]

Although the extensive development of roads, airfields, and water transportation overshadowed the restoration of the railroad and reduced the urgency of an operational railway system, the slight increases in rail service sustained basic civilian and military operations, particularly on short hauls. Railroad restoration made little progress in early 1968 due to the Tet offensive. In March, General Westmoreland became concerned that the closure of the Hue/Tan My or the Dong Ha/Cua Viet port complexes could seriously hamper operations in northern I Corps. With the influx of reinforcements into the area, he urged greater emphasis on reopening secure land lines of communication, both highway and rail. Planners estimated that opening the Da Nang to Hue rail line, which had been closed since early 1965, would increase the daily military resupply capability by 800 to 1,000 tons. Westmoreland also felt that reopening the railroad would be a tangible symbol to the Vietnamese people of the Saigon government's control of the area. As a demonstration of allied support, MACV assigned the 3d Naval Construction Brigade to do major bridge repairs along the line. In the spring of 1968, a Seabee detachment successfully raised and reconstructed a railway bridge just south of Phu Bai. In mid-July, Naval Mobile Construction Battalion 1 began rebuilding the three remaining demolished bridges on the southwest shores of Lap An Bay. Since the rail line and Highway 1 diverged southeast of the bay and no road ran parallel along this stretch, material and equipment were off-loaded from trucks and placed on rail cars for transport to the work camp and bridge sites. A Vietnam National Railway Service work train locomotive, however, would not be available for several months, and other attempts failed to push the loaded rail cars. The innovative Seabees then borrowed a small Marine Corps four-wheeled vehicle, called the Mule, which fitted exactly on the one-meter tracks and successfully moved the cars without difficulty. When possible, bridge sections were lifted back on to new piers. In November, enemy sappers dropped one side of the railroad bridge near Phu Loc, but the battalion raised and repaired the bridge

[56] MACV Construction Directorate, Lines of Communication Division Briefing, U.S. LOC Construction Progress, LOC Lump Sum Program, FY 1972 AID/DoD Program, Presented to the Combined Central Highway and Waterway Committee Plenary Session, 28 Jun 72, pp. 2, 5–7, Historians files, CMH; Stearns, Abbott, and Campbell, "LOC Highway Restoration, Vietnam," p. 86; Engr Cmd, AVHEN, Fact Sheet, sub: Vietnamization of the LOC Program, 18 Jan 72; MACV History, January 1972–March 1973, vol. 2, pp. E-30 to E-31; Khuyen, *RVNAF Logistics*, pp. 384, 386; Conover, "LOC Program in Vietnam," pp. 36–37.

Bien Hoa Bridge, completed in 1972 by RMK-BRJ, was part of a new bypass road north of Saigon.

before the end of the year. Rail service between Da Nang and Hue resumed on 16 January 1969, and planning proceeded to expand service north from Hue to Dong Ha.[57]

As the intensity of the Tet offensive lessened, repair trains began reopening other lines. The rail line between Saigon and Xuan Loc was restored, and on 15 December 1968 passenger and cargo service started on the 200-mile line between Qui Nhon and Phan Rang. Security continued to plague railway progress. Yet, despite an average of fifteen interdictions per month, as compared to eight per month in 1967, operational trackage increased to 336 miles, or about 45 percent of the railway system.[58]

Railway restoration made slow but steady progress. Enemy sabotage persisted, and the Vietnam National Railway Service had to contend with manpower and equipment shortages and the inevitable heavy rains. During 1969,

[57] MACV History, 1968, vol. 1, pp. 658–59; Lt. Theodore I. Harada, "Seabees on the Railroad," *Military Engineer* 61 (July-August 1969): 262–66.

[58] MACV History, 1968, vol. 1, pp. 660–62.

the Seabees continued to help the beleaguered rail service restore its bridges, which included raising one span and replacing another at the Song Bo Bridge nine miles north of Hue. At U.S. logistical facilities, the construction of rail spurs and sidings by RMK-BRJ and the Vietnam National Railway Service neared completion. These included spurs from the military docks at Newport, Qui Nhon, and Da Nang. By early 1971, the railroad operated in three separate areas with approximately 60 percent, or 441 miles, of the 770 miles of the programmed main line and branch line system. The longest run, some 249 miles, ran from the Long Song River (south of Phan Rang) to Phu Cat. During 1970, cargo transported by rail climbed 15 percent over 1969 (from 595,190 to 685,030 short tons), and the number of passengers transported by rail increased a dramatic 40 percent over the same period (from 1.75 million to 2.4 million). In April 1970, President Thieu temporarily canceled restoration work, but he rescinded this order the following February. The railway service immediately resumed planning to close the remaining gap between Saigon and Phu Cat.[59]

A Legacy

With the return of all roadwork to the South Vietnamese government and the departure of the remaining U.S. troops, the Agency for International Development assumed the Directorate of Construction's responsibility for managing the highway program. Planning began in the fall of 1970 when MACV and the Agency for International Development agreed to set up a joint committee to study the return of the highway advisory function to the civilian agency. A contract consulting team, Booz Allen, was hired to recommend institutional changes that the director general of highways could use to increase its capability. In May 1971, the joint ad hoc committee submitted its detailed report, which evaluated the condition of the highway system, estimated maintenance requirements, appraised the director general of highways' capability, and proposed a timetable for the transfer of functions. One of the intermediate steps took place in July 1971 when the Directorate of Construction reestablished the Highways Engineering and Advisory Branch, as it existed before 1968. The advisory function was transferred on 1 July 1972. The Agency for International Development took over all MACV responsibility for managing the highway program on 1 January 1973, and the Delta Rock Agency in March. That month, the last American troops departed Vietnam in compliance with the Paris Peace Accords that were signed in late January. The only U.S. military connection during the ensuing armistice period continued through the small Engineer Branch, Defense Attaché Office, which provided

[59] MACV History, 1969, vol. 1, pp. 97–98; ibid., 1970, vol. 2, pp. IX-71 to IX-77; MACV History, January 1972–March 1973, vol. 2, p. E-22; Railroad Spur Construction, sec. III, Lines of Communication Division (MACDC-LOC), in Quarterly Hist Rpt, 1 Jan–30 Apr 71, MACDC, p. III-15, Historians files, CMH; Tregaskis, *Building the Bases*, p. 417; Dunn, *Base Development*, pp. 109–11.

Flatcars on front of a train south of Phu Cat were intended to detonate mines placed on the tracks by the Viet Cong.

some technical assistance and maintenance support through the Dynalectron contract for the commercial construction equipment.[60]

The director general of highways faced many uncertainties as a highway organization. Although U.S. forces and RMK-BRJ did transfer many major items of equipment, which included five former RMK-BRJ industrial sites and two prestressed concrete plants, it was recognized that the equipment would require a larger and technically skilled workforce. The Directorate of Construction identified the Vietnamese agency's problems earlier in a September 1968 study that emphasized the need for massive reforms in the Saigon government's procedures and policies. The director general of highways did increase its workforce to 6,000 employees in 1972, but the Construction Directorate considered a further expansion to 10,000 by 1975 necessary to maintain and use the equipment and facilities in its charge. Considering Saigon's requirements for military personnel and funding in other areas at the time, the Directorate of Construction doubted that the highway agency would get the needed expansion. Inevitably, the road network would require more major repairs. Problems facing the director general in 1972 included authority to hire an additional 4,000 workers, procuring over 1,500 pieces of equipment, rising costs, inadequate funding, the loss of over 300 engineers and trained

[60] MACV History, 1971, vol. 3, p. IX-18; ibid., January 1972–March 1973, vol. 2, p. E-30; USAID/Vietnam, Project Status and Accomplishment Report, July–December 1970, Project: Highways Improvements, p. 205; Khuyen, *RVNAF Logistics*, p. 381; Fact Sheet, Engineer Branch, Defense Attaché Office, 1 Apr 74, sub: The ARVN Lines of Communication Program, U.S. Army Engineer Programs, copy in OCE Hist Ofc. For more on the advisory transfer, see USAID/MACV Ad Hoc Committee Final Report, n.d., box 3, 72A/7061, RG 334, NARA.

technicians to the military draft since 1968, and the unfavorable competition with contractors for trained technicians.[61]

At best, the director general attempted to preserve the upgraded highway system, using its own personnel to do maintenance and minor repairs and relying on South Vietnamese Army engineers and contractors to do most major repairs and new construction. Some progress was made in carrying out its maintenance mission. In 1971, the highway department had 105 teams backed up by 16 support teams that prepared cold-mix patches, seal-coated road surfaces, and repaired wooden bridge decks. It also began preparations to train some 600 Regional and Popular Forces troops to do work on the rural roads. Between 1968 and 1971, highway crews repaired 491 miles of road and 28,215 feet of bridging. In 1971, the highway department seal-coated 149 miles of road and made plans to increase this effort to 435 miles. Also between 1968 and 1971, the director general of highways built 8,202 feet of new bridging and could have done more but lacked funds to utilize fully local contractors. It faced many repairs in I Corps because U.S. engineers in the rush to finish work did not upgrade all the bridges and culverts along Highway 1. In some sections, the enemy destroyed newly emplaced culverts, and the troops filled the gaps to keep the road open. As a result, severe flooding followed heavy rains. In 1971, the highway agency replaced twelve bridges and nine culverts and planned to continue this work through 1975.[62]

Following the departure of RMK-BRJ in mid-1972, South Vietnamese Army engineers carried out most of the remaining bridge and highway modernization tasks until the country's collapse in April 1975. Work progressed satisfactorily despite difficulties supplying spare parts and fuel and transporting long and heavy prestressed concrete beams to construction sites. There was also the continuing sabotage and fighting between 1973 and 1975. In 1974, the engineers began producing rock for all military and civilian highway projects in the delta. With help from Defense Attaché Office technicians, the quarry at Nui Sam was modernized with the addition of two 250-ton-per-hour rock crushers. By 31 July 1974, Vietnamese engineers reduced the remaining highway program to 146 miles of highway and 9,298 feet of bridging. In April 1975, only 70 miles of new roadwork and 6,600 feet of bridging remained to be completed. During 1974 and 1975, however, Communist forces intensified their sabotage efforts along the highways. Several sections of Highway 4 were blown up at one time, increasing the demand for more rock and tactical bridging. South Vietnamese engineers reacted by stockpiling rock and dirt along the road west of My Tho. The troops and the highway department increased

[61] MACV History, 1971, vol. 1, pp. IX-19 to IX-20; Conover, "LOC Program in Vietnam," pp. 45–46; For more on the director general of highways' projects, personnel, funding, equipment, and maintenance facilities, see USAID/MACV Ad Hoc Committee Final Report.

[62] MACV History, 1971, vol. 1, pp. IX-19 to IX-20; Briefing by director general of highways at June 28th, 1972 Combined Central Highway and Waterway Committee Meeting, box 1, 74/0089, RG 334, NARA. For more on the director general of highways' organization, its work along Highway 1 in I Corps, and status in late November 1971, see Briefing by MACV Construction Directorate Lines of Communication Division for General Frederick C. Weyand, Dep COMUSMACV, 29 Nov 71, box 4, 72A/7061, RG 334, NARA.

the tactical bridge reserves by recovering panel bridges used by U.S. engineers along secondary roads in the pacification program and substituted Eiffel bridges and steel-timber permanent and semipermanent structures in their place. Nearly 2,296 feet of panel bridging were recovered and placed in reserve stocks. Efforts were also under way to round out incomplete panel bridge and M4T6 floating bridge sets when the collapse occurred.[63]

The nearly completed highway system encompassed modern, paved highways stretching almost the entire length of the country. Of the program's 2,532 miles, the road builders had by late 1972 completed 1,911 miles, with 288 miles in progress or programmed, and 333 miles deferred. These figures did not include the many more local roads and bridges improved or built to support tactical operations and pacification or city streets funded under other programs. All the builders participated in one or more of these projects. In the case of local roads and bridges, the Combined Central Highway and Waterway Committee's standards did not apply, but the unpaved and lower weight-bearing bridges connected hamlets and villages to secondary roads, which in turn joined major roads. Funding allocations, including civilian and military assistance, for the Lines of Communication Program alone totaled $460.3 million, or more than $236,000 per mile. Altogether, thirty industrial sites, including quarries, rock crushers, and asphalt plants, were set up to supply rock and asphaltic concrete. Between 1968 and 1972, these sites provided over 27 million tons of rock and 2.5 million tons of asphalt. The improved roads included Highway 1 connecting Saigon with the coastal cities and towns north to Dong Ha and west to Go Dau Ha, where it connected with Highway 22 to Tay Ninh; Highway 19 from outside Qui Nhon to Pleiku; Highway 21 from Nha Trang to Ban Me Thuot; Highway 13 from Saigon to An Loc; Highway 20 from Da Lat to Highway 1 west of Xuan Loc; Highway 4 from Saigon to the delta, and connecting to other improved roads in this important rice-growing region; Highway 15 connecting Saigon to Vung Tau; and parts of Highway 14 in the highlands between Dak To, Pleiku, and Buon Blech. The bypasses around Saigon diverted traffic and helped improve the area's defenses. Besides the national highways, the highway program included lesser roads such as Routes 9, 10, and 27 in the delta. The improved roads were opened to two-way traffic with bridges of thirty-five-ton capacity and above. Save for some unfinished sections in the delta, the road system provided reliable, rapid surface routes to all the major population centers. The loss of life and vehicles to enemy mines dropped dramatically, and military convoys covered distances in one day what previously required two to three days. The heavy fighting starting with the Easter offensive damaged some roads and bridges, mainly the northern sections of Highway 1 nearest the Demilitarized Zone and Highway 13 near An Loc, but most of the road net survived intact. Since South Vietnam's armed forces depended much more on road transportation than U.S. units, the improved highway system became an important factor as Saigon moved forces to oppose the North Vietnamese. The nation-building value was very

[63] Khuyen, *RVNAF Logistics*, pp. 384, 386, 388–89.

evident as the volume of civilian truck traffic increased between major cities, and people settled along the new highways.[64]

Compared to the roads, the railroad system did not live up to its potential for moving military freight because it was so easily interdicted. Only five short portions operated with relative security: Saigon to Xuan Loc, Bien Hoa, and Long Binh; Nha Trang north to Tuy Hoa and south beyond Phan Rang; Qui Nhon to Phu Cat; and Da Nang to Hue. Nevertheless, the railroad was a valuable transportation asset for carrying newly landed cargo on short runs to the depots. One daily freight train from the Saigon port to Long Binh carried the equivalent of 6,800 truckloads a week, thus eliminating a large number of truck runs from Saigon's congested streets and the Bien Hoa Highway. Military cargo could also move by rail from Qui Nhon and Cam Ranh Bay to Phu Cat, Tuy Hoa, Nha Trang, and Phan Rang. The railroad also hauled large quantities of crushed rock from several quarries at low rates. Even though any value gained by rail transportation for U.S. forces diminished as the withdrawal gained momentum, the potential for commercial and military use by the South Vietnamese remained an important nation-building goal.[65]

[64] Conover, "LOC Program in Vietnam," pp. 40–41; Army Activities Rpts, 19 Jul 72, p. 24; 20 Dec 72, p. 22, CMH; MACV History, January 1972–March 1973, vol. 2, p. E-30; Ploger, *Army Engineers*, p. 118; Dunn, *Base Development*, pp. 107–08, 112; Khuyen, *RVNAF Logistics*, p. 379. See also "LOC," *Engineer* 1 (Spring 1971): 18–21; Florreich, "Lines of Communication Restoration Program," pp. 11–16; and HQ, Engr Cmd, AVCC-CC, Fact Sheet, sub: Tactical and Rural Roads Programs as of 29 Feb 72, incl. 6, OCE Liaison Officer Trip Rpt no. 22.

[65] Dunn, *Base Development*, p. 111; Khuyen, *RVNAF Logistics*, p. 76; Peter Braestrup, "Saigon is Restoring Railroad: Controversial Project Proceeds with U.S. Aid," *Washington Post*, 8 December 1968.

14

Year of Transition, 1969

The new year, 1969, brought a change in the direction of American policy in Vietnam as the United States committed itself to gradual withdrawal of its forces and to turning over greater responsibility to the South Vietnamese. After Secretary of Defense Melvin R. Laird toured the theater in March, planning began in earnest in Saigon and Washington for the execution of the opening phase of the withdrawals commencing in the summer and for accelerated training of the Vietnamese under the "Vietnamization" concept. The year thus became a time of transition for U.S. forces, including the engineers, as several units departed and others moved to new areas and missions.[1]

The State of the Construction Program

At the start of 1969, the $1.7 billion military construction program passed the 75 percent completion mark. Military engineers and contractors had built six deep-water ports at Da Nang, Qui Nhon, Cam Ranh Bay, Vung Ro Bay, Vung Tau, and Saigon with twenty-seven deep-draft berths providing a capacity of 600,000 short tons per month. In addition, shallow-draft facilities at nine other ports handled 800,000 short tons per month. Mooring buoys and unloading facilities capable of discharging 1.25 million barrels of fuel daily had also been constructed. Over 270 miles of pipeline moved fuel to major bases. Some pipelines were laid in secure areas such as the six-mile line from the Saigon River to Tan Son Nhut Air Base. Longer sections included the 109-mile pipeline running through contested territory between Qui Nhon and Pleiku. Eight jet-capable air bases with fifteen 10,000-foot concrete runway/taxiway systems and parking aprons were in service, supplemented by some eighty-three auxiliary airfields capable of handling C–123 or C–130 cargo planes. Together, these airfields supported over 5,750 aircraft of all types. The engineers had also built four major depot complexes at Long Binh, Da Nang, Qui Nhon, and Cam Ranh Bay. Most of the so-called hard-core logistical requirements such as ports, airfields, and depots were completed.[2]

The construction program remained a shared undertaking between contractors and troops. Contracts absorbed most funds for ongoing and approved projects (64 percent or $260 million against $149 million allocated for troop

[1] MACV History, 1969, vol. 1, p. II-3. For more on Vietnamization, see Clarke, *Final Years*, pp. 341–60.

[2] MACV History, 1969, vol. 2, pp. IX-87 to IX-88; Dunn, *Base Development*, pp. 129–30; Heiser, *Logistic Support*, p. 78; Quarterly Hist Rpt, 1 Oct–31 Dec 68, MACDC, pp. VI-4 to VI-5. See also HQ MACV, MACDC-BD, Construction Program South Vietnam (Complex Review), 1 Mar 69, Historians files, CMH.

The busy port at Cam Ranh Bay showing a tanker at a petroleum pipeline pier and ships along side of the four cargo piers.
(below) *Ship-to-shore pipeline at Cam Ranh Bay transferred large quantities of fuel daily.*

construction). However, the troops carried out more projects because their labor was not charged to the program. Although the RMK-BRJ contract was originally programmed to close out in late 1967, the highway program and the impending cutback in troop strength convinced planners to retain a good share of the consortium's construction capability. At the start of 1969, the firm's workforce consisted of 25,000 personnel, staffed and equipped to carry out about $22 million of work per month. (Planners used a rough figure of $1 million per month per one thousand employees.) To operate efficiently, RMK-BRJ required about $100 million of backlog work. It appeared certain at the time that some contract capability would be required as long as U.S. forces were stationed in Vietnam. The contract effort would continue at approximately a 40-30-30 distribution to the Army, Navy, and Air Force, respectively, until the latter two programs were completed. Then the consortium's effort would entirely support the Army. By calculating the firm's work-in-place rate and the backlogs, planners estimated that RMK-BRJ could finish its share of the Air Force and Navy projects by the beginning of August 1969 and January 1970, respectively. Ideally, the Army's backlog would be done by April 1970. Other firms continued to augment the construction effort. The facilities engineering contractors, Pacific Architects and Engineers (the largest next to RMK-BRJ with more than 20,000 employees) and Philco-Ford, also worked on minor new construction projects at bases. Vinnell Corporation, which built and operated several Army central power plants, received word to build three more power plants at Can Tho, Vinh Long, and Cha Rang outside Qui Nhon, raising the total to fifteen. There were smaller firms such as dredging companies and local contractors, the latter with a combined $1.5 monthly construction capability.[3] (*Table 1*)

Much work still remained to be completed by engineer troops. Army engineers, who had the largest share of troop projects, had finished only about 53 percent of their construction jobs. The Seabees were further along, finishing more than 61 percent of their projects. Together, Army, Navy, and Air Force engineers completed almost 56 percent of assigned work. From a fiscal standpoint, Army engineers had more than $104 million of work remaining, the Seabees $36.5 million, and Air Force engineers $8 million. The approximate backlog was thirty-one months.[4]

The Army's construction program came close to the total completion figure only because of the great amount of work done by contractors. By May 1969, the Army's $887.4 million program, managed in Vietnam by the U.S. Army Engineer Construction Agency, reached 72 percent completion. Army engineers finished $127.6 million or 57 percent of $224.6 million set aside for troop construction compared to the contractors $513.6 million or 77 percent of an assigned $662.8 million. More variation took place in highway construction. RMK-BRJ finished

[3] MACV History, 1969, vol. 2, p. IX-88; Army Troop Construction in the Republic of Vietnam, 1 Feb–1 Apr 69, incl. 6, pp. 1–3, OCE Liaison Officer Trip Rpt no. 14; PA&E History, FY 1969, pp. 1, 3; "12 Additional Power Plants," *Vinnell* 11 (May 1969): 10, Historians files, CMH.

[4] MACV History, 1969, vol. 2, pp. IX-88 to IX-89.

TABLE 1—PERCENT OF WORK IN PLACE AT SELECTED LOCATIONS, JANUARY 1969

	Percent by	
Location	*Troops*	*Contractor*
Saigon	2	98
Tan Son Nhut	6	94
Bien Hoa	21	79
Tuy Hoa	22	78
Can Tho	22	78
Cam Ranh Bay	29	71
Phan Rang	33	67
Nha Trang	37	63
Phu Cat	40	60
Vung Tau	46	54
Da Nang	48	52
Chu Lai	57	43
Long Binh	59	41
Qui Nhon	67	33
Pleiku	71	29
Phu Bai	73	27
An Khe	75	25
Cu Chi	92	8
Total	40	60

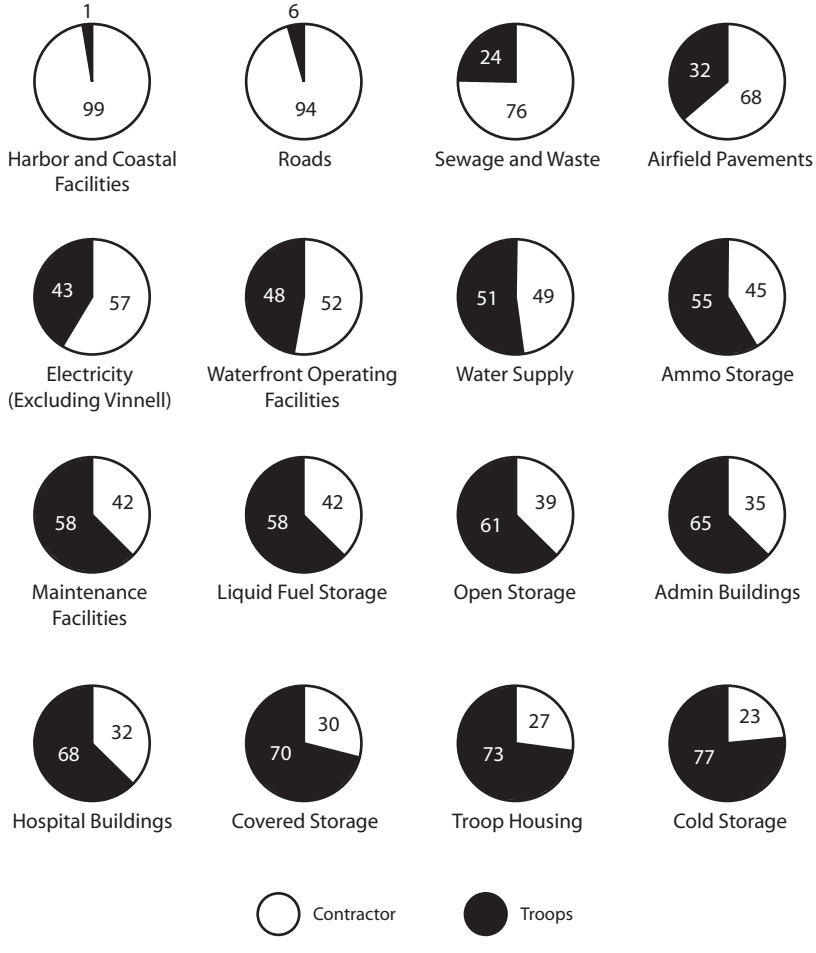
Sources: Military Assistance Command, Vietnam, *Construction Status Report, South Vietnam*, 28 Feb 69; JLRB, Monograph 6, *Construction*, p. 125.

42 percent of its share of roadwork compared to only 8.1 percent by the troops. This latter percentage, however, did not reflect the nearly $24 million in Military Construction, Army, funds used to buy commercial construction equipment. The Army received nearly $35 million in construction funds for the highways, but the troops expended only $2.8 million as the approximate value of work in place. Also, the MACV Construction Directorate planned to transfer as much work as possible to RMK-BRJ to enable the troops to do more operational support missions.[5] (*Chart 5*)

In 1969, Army engineers numbered approximately 36,000 soldiers and comprised 10 percent of the total Army force in Vietnam. Of this number, over

[5] Army Troop Construction in the Republic of Vietnam, 1 Feb–1 Apr 69, incl. 6, pp. 1–3, OCE Liaison Officer Trip Rpt no. 14.

CHART 5—ARMY CONSTRUCTION IN PLACE BY CATEGORY, TROOPS, AND CONTRACTOR, JANUARY 1969



Sources: Military Assistance Command, Vietnam, *Construction Status Report, South Vietnam*, 28 Feb 69; JLRB, Monograph 6, *Construction*, p. 124.

28,000 served under General Parker. Most of the remaining engineers were assigned to the seven Army divisions, the four infantry and airborne brigades, and the armored cavalry regiment. Parker relied on the 18th and 20th Engineer Brigades, the U.S. Army Engineer Construction Agency, and a small planning staff at Headquarters, U.S. Army, Vietnam, to carry out his command's large construction and operational support responsibilities. Subordinate units comprised six groups, twenty-seven battalions, and many separate companies, teams, and detachments. The 18th Brigade under Brig. Gen. John H. Elder Jr., and after May 1969 Col. John W. Morris, reported 13,310 personnel on its rolls (95.5 percent of authorized strength). Col. Harold R. Parfitt's larger 20th Brigade stood near full

Aerial view of Cam Ranh Bay from the south and the port to the left and the peninsula filling in with depots and troop billets

strength (99.1 percent) with 13,798 troops. Brig. Gen. Elmer P. Yates' Engineer Construction Agency, which included utilities detachments, reported 1,106 troops on hand, or 87.2 percent of 1,268 authorized personnel. Critically short military occupational specialties ranged from plumbers (231 of 591, or 39 percent of authorized personnel on hand) to auto repair parts specialists (86 of 127, or 67.7 percent). On the other hand, there were almost double the number of carpenters authorized, and almost all the authorized number of quarrymen were present.[6]

A review of the 18th Brigade's projects in the spring of 1969 illustrates the variety and scope of construction carried out by its three groups, thirteen construction and combat battalions, and smaller specialized units. In I Corps, the 45th Engineer Group's four combat battalions took on several projects. The 14th Engineer Battalion expanded a surgical hospital at Camp Evans, and the 27th Engineer Battalion built an 11,520-square-foot UH–1 maintenance hangar, hardstand, and sixty-foot observation tower at Phu Bai. Major roadwork carried out by the 19th and 39th Engineer Battalions included upgrad-

[6] Visit to Various Headquarters in the Republic of Vietnam, 1–22 May 69, incl. 5, p. 3, OCE Liaison Officer Trip Rpt no. 14. See also tabs H through J for station lists of all units down to company level, tab G listing critical personnel shortages, and tabs K through L for Letters of Instruction issued in January to commanding generals, Engineer Troops [Engineer Command], Engineer Construction Agency, and 18th and 20th Engineer Brigades.

ing Highway 1 between Quang Ngai and Bong Son. In northern II Corps, the 937th Engineer Group's 815th Engineer Construction Battalion at Pleiku completed air-conditioned communications buildings, a 33,450-square-foot aircraft maintenance hangar, maintenance shops, and troop housing. The 20th Engineer Combat Battalion worked on an 8,800-square-foot wood frame post exchange and a 12,800-square-foot wood frame theater for the 4th Division at nearby Dragon Mountain. At Qui Nhon, the 84th Engineer Construction Battalion finished two similar communications facilities, a prisoner of war hospital, two cold-storage warehouses, a prefabricated metal 120-by-200-foot warehouse, and seven 120-by-200-foot two-story wood frame buildings. In the port area, the 536th Port Construction Detachment built an ammunition off-loading facility, and the 84th Engineer Battalion and the 643d Engineer Company (Pipeline) extended two eight-inch petroleum pipelines eight miles to a tank farm. Extensive roadwork under way by the 84th and 815th Engineer Battalions, and the 299th Engineer Combat Battalion progressed along Highways 1, 14, 19, and Route 7B near Cheo Reo. In southern II Corps, the 35th Engineer Group's 864th Engineer Construction Battalion completed another communications facility and a seawall and hardstand at Nha Trang. The 577th Engineer Construction Battalion finished a 10,500-barrel tank farm and cantonment facilities at Tuy Hoa and worked on a 4,500-barrel tank farm at Da Lat. At Phan Thiet and Bao Loc, the 116th Engineer Combat Battalion built base camp facilities. Ongoing projects included the 589th Engineer Construction Battalion's 24,000 square feet of warehouses at Dong Ba Thin and the 87th Engineer Construction Battalion's 200,000-barrel tank farm for the Air Force at Cam Ranh Bay (with help from the 497th Port Construction Company and 643d Engineer Pipeline Company). All five battalions of the 35th Group were improving twenty-five MACV advisory camps, which stood at 48 percent complete and included new billets, mess halls, wells, water storage and sewage systems, and latrines and shower facilities. Also, all of the group's battalions were doing major roadwork along Highways 1, 11, 20, and 21.[7]

Likewise the 20th Brigade accomplished a variety of construction in III and IV Corps. Newly completed base construction at Long Binh by the 159th Engineer Group's 46th and 169th Engineer Construction Battalions included a stockade complete with prefabricated steel administrative buildings and wood frame barracks, mess hall, latrines, administrative buildings, and guard towers. Cantonment and water supply facilities were added for the 1st Division at Lai Khe by the 34th Engineer Construction and 168th Engineer Combat Battalions, and a new wood frame operations building for the Royal Thai Army Aviation Company was finished at Long Thanh North by the 92d Engineer Construction Battalion. Major work under way by the 46th and 92d Engineer Battalions consisted of eight prefabricated steel, open-sided Pascoe warehouse buildings for the rear echelons of the 1st Cavalry and 101st Airborne Divisions at Bien Hoa. The 92d and 168th Engineer Battalions

[7] Principal Construction Projects, 35th, 45th, and 937th Engr Gps, 1 Feb–15 Apr 69, incl. 6, tabs A through C, OCE Liaison Officer Trip Rpt no. 14; Ploger, *Army Engineers*, p. 163. See also PA&E History, FY 1969 and FY 1970.

were adding cantonment facilities at Long Thanh and Lai Khe. Also at Lai Khe, the 714th Power Distribution Detachment was building an electrical power distribution system, and at Cogido near Long Binh the 497th Port Construction Company was working on an ammunition off-loading wharf. Roadwork extended along Highway 13 (34th Engineer Battalion), the Phu Cuong Bypass (46th Engineer Battalion), and Highway 20 (169th Engineer Battalion). The 159th Group's 41st Port Construction Company also began the Phu Cuong Bridge pier protection system. In western III Corps, the 79th Engineer Group's 554th Engineer Construction Battalion completed a wood frame communications center, a maintenance hangar, and an aircraft fire station for the 25th Division at Cu Chi. The 588th Engineer Combat Battalion built dog kennels for the division at Tay Ninh, and the 554th Engineer Battalion finished MACV adviser facilities at Bao Trai. Ongoing projects included asphalt paving and an 11,520-square-foot hangar at Cu Chi airfield by the 554th Engineer Battalion and upgrading MACV adviser facilities by the 31st and 588th Engineer Combat Battalions. Highway improvements by the 554th and 588th Engineer Battalions progressed along Highways 1 and 22. In the delta, the 34th Engineer Group finished wood frame cantonments and water and power distribution systems for the 9th Division at Dong Tam (69th and 93d Engineer Construction Battalions), a 1,000-barrel petroleum tank farm at Vi Thanh (69th Engineer Battalion), and airfield paving at Vinh Long (36th Engineer Battalion). Roadwork by the group's 34th, 36th, and 69th Engineer Battalions and the 35th Engineer Combat Battalion covered approximately seventy-three miles.[8]

The Seabees continued supporting U.S. forces in I Corps. At the start of 1969, the 3d Naval Construction Brigade had ten naval mobile construction battalions, which included two battalions of reservists, divided among two construction regiments in I Corps. In addition, two construction battalion maintenance units, one in I Corps and the second at Cam Ranh Bay, detachments from an amphibious construction battalion, and fifteen Seabee teams carried out construction tasks. Battalions continued to rotate during the year, peaking at twelve at midyear and five at the end of the year when the 3d Marine Division departed. The drop in the number of Seabee battalions prompted the departure of the 30th Naval Construction Regiment in December. Highway upgrading made progress despite the added effort required to repair monsoon-damaged roads. Improved stretches extended along Highways 1 and 9. The Liberty Bridge over the Ky Lam River connecting An Hoa and Go Noi Island to Da Nang was completed in March, and the Hue highway bridge opened to two-way traffic in September. Projects for the Navy and Marine Corps in the Da Nang area included 176,000 cubic feet of refrigerated storage, over 300,000 square feet of covered storage, a data processing center, and concrete aircraft shelters at Da Nang Air Base and Marble Mountain Air Facility. Also completed or under way were five hangars and airfield facilities at Quang Tri, sixteen wood frame hangars for the U.S. Army at Camp Evans and Camp Eagle,

[8] Principal Construction Projects, 34th, 79th, and 159th Engr Gps, 1 Feb–15 Apr 69, incl. 6, tabs D through F, OCE Liaison Officer Trip Rpt no. 14; Ploger, *Army Engineers*, p. 163.

a 200-bed hospital for the 1st Marine Medical Battalion in Da Nang, concrete aircraft shelters at Chu Lai, and improvements at Marine Corps combat bases. At the start of 1969, the naval construction forces faced backlogs of twenty-four months of vertical construction and thirty months of horizontal construction. When the troop withdrawals gained momentum in 1969, the backlogs dropped dramatically when the naval command canceled or deferred several projects. By the end of the year, the programmed backlog fell to under four weeks of horizontal construction and under five weeks of vertical work, sufficient for the planned employment of five battalions.[9]

Marine Corps engineers comprised the third cohort of U.S. military engineers in I Corps. The two divisional battalions, two heavy engineer battalions, two bridge companies, and one line company from another battalion swept roads for mines, built firebases, maintained and improved roads, and ran water supply points. They also did some construction. The fifth battalion, the 9th Engineers at Chu Lai (headquarters and three companies) and Tam Ky (part of a fourth line company) focused on maintaining and improving Highway 1 north of Chu Lai, including some operational support for the Army's Americal Division. With the departure of the 3d Marine Division, the 3d and 11th Engineer Battalions halted all construction projects. Before leaving Vietnam in late November, the 11th Engineer Battalion dismantled two combat bases and helped the 3d Battalion prepare the Cua Viet and Dong Ha Combat Bases for transfer to the South Vietnamese. The 1st and 7th Engineer Battalions stayed with the 1st Marine Division in the Da Nang area, and the 9th Battalion and one bridge company remained at Chu Lai.[10]

In 1969, the five Air Force Red Horse squadrons of the 1st Civil Engineering Group concentrated on the aircraft shelter program, air base improvements, and emergency repairs. Between 10 August 1968 and 31 May 1969, the 554th Civil Engineering Squadron based at Phan Rang Air Base completed forty-one construction projects costing $1.2 million, and included an armament and electronics shop, a flight line fire station, a concrete access taxiway, six troop barracks, two 20-man officers quarters, a 49,000-square-yard asphalt hardstand, and a base theater. The unit also built more than the equivalent of one mile of reinforced-concrete revetment wall to protect Air Force barracks. During the same period, the 819th Civil Engineering Squadron at Phu Cat Air Base finished thirty-two projects totaling $1.8 million. Some of these projects included a 250,000-gallon water storage tank, a 5,000-foot chain-link security fence, new officers quarters, replacement aircraft ramps, and a communications facility. A sewer line and an officers dining hall were among the projects completed at Pleiku. The three other Red Horse squadrons—the 555th at Cam Ranh Bay, the 820th at Da Nang, and the 823d at Bien Hoa—carried out similar work. Red Horse units also built, improved, and manned perimeter defenses. At Phan Rang, teams deployed fourteen times in response

[9] MACV History, 1969, vol. 1, p. IV-13, vol. 2, pp. IX-98 to IX-100; Smith, *U.S. Marines in Vietnam, 1969*, pp. 267–69; Quarterly Hist Rpt, 1 Oct–31 Dec 69, MACDC, 19 Jan 70, p. II-3, Historians files, CMH.

[10] Smith, *U.S. Marines in Vietnam, 1969*, pp. 267–70, 377, 382.

to mortar, rocket, and sapper attacks. (The 589th Construction Battalion and other Army tenant units also helped guard their part of the base's perimeter.) At Da Nang, emergency repairs were severely tested on 27 April 1969 when a grass fire destroyed ammunition and bomb storage and fuel storage areas two miles southwest of the air base. Continuous concussions from the blasts also damaged many buildings. Red Horse work crews began repairing operations buildings and the passenger terminal, and within a month most of the damage was repaired. The Air Force also reduced some of its engineering force in 1969. In December, the 555th Civil Engineering Squadron at Cam Ranh Bay was inactivated, and the personnel and equipment were distributed among the four remaining squadrons.[11]

In 1969, aircraft shelters became a high-priority item, especially for the Air Force and Navy. The 1968 Tet attacks revealed the weakness of uncovered revetments when twenty-five Air Force aircraft alone valued at $94 million were destroyed and another 251 were damaged by high-trajectory rockets and mortars. Now faced with an urgent requirement to protect its planes, the Air Force adopted an existing double-corrugated steel arch building design, the "Wonder Arch" named after the building's manufacturer, the Wonder Trussless Building Company. Sections were bolted together and topped off with unreinforced concrete (fifteen inches thick on ridges and twenty-nine inches thick in valleys) which provided good protection. An added freestanding backwall gave equal protection and included an opening to let out jet exhaust. A few shelters could also be fitted with a front closure device. The Air Force program, called Project Concrete Sky, originally figured on 408 shelters costing $8.775 million at six air bases. However, sixteen shelters for Phu Cat Air Base were canceled, reducing the number of shelters to 392 and the price to $7.992 million. Production of materials began in mid-1968, and by October the 820th Civil Engineering Squadron began building the first Wonder Arches at Da Nang Air Base. Work got off to a slow start. Instructions were missing, many metal parts had been damaged during shipment, and the arches were larger than the spaces for them in the existing revetments. Despite these and other problems, Red Horse engineers cut the erection time for one shelter from one week to one day. All ninety-eight shelters at Da Nang were completed fifty-two days ahead of schedule. Elsewhere, Air Force engineers built 75 shelters at Bien Hoa, 62 at Tan Son Nhut, 40 at Phu Cat, 61 at Phan Rang, and 56 at Tuy Hoa. Since military engineers lacked enough concrete batch plants for the concrete covers, the MACV Construction Directorate committed RMK-BRJ's large-capacity plants and its fleet of truck-mounted transit mixers. The firm completed 53 concrete covers at Da Nang, 68 at Bien Hoa, and all 62 at Tan Son Nhut. Air Force engineers did the rest. All the shelters were completed by 13 January 1970 at a final cost of $15.7 million, well worth the investment in deterring

[11] Project Red Horse, pp. 1–2, 7–9, 11, 13, 15–16, 19–25, 29–30; Roger P. Fox, *Air Base Defense in the Republic of Vietnam, 1961–1973* (Washington, D.C.: Office of Air Force History, United States Air Force, 1979), p. 115; Smith, *U.S. Marines in Vietnam, 1969*, pp. 263–64; Quarterly Hist Rpt, 1 Oct–31 Dec 69, MACDC, p. II-4.

Seabees pouring concrete for Wonder Arches at Da Nang Air Base

future damage to expensive aircraft. A comparable Navy program planned 299 shelters at five bases, but this number was eventually reduced to 122 at Da Nang, Marble Mountain, and Chu Lai. Elements of the 3d Naval Construction Brigade began building shelters in July 1969. By mid-1970, the brigade would complete 114 shelters and place concrete covers on all the shelters except 45 at Da Nang, which were poured by RMK-BRJ.[12]

Though the Wonder Arches proved cost-effective for expensive fighter aircraft, ensuring the same degree of protection for all aircraft did not appear warranted. The cost of a completed shelter, including the concrete, came to about $30,000, remarkably cheap when compared to saving a $2 million to $4 million aircraft. When the last shelter at Tuy Hoa Air Base was capped in early 1970, the Air Force had a combined total of nearly 1,400 protective structures, including approximately 1,000 revetments. Such cocoon-type shelters, however, seemed impractical for the large number of Army helicopters in Vietnam. Even flying skid-mounted

[12] Dunn, *Base Development*, p. 65; Tregaskis, *Building the Bases*, pp. 388–90; Fox, *Air Base Defense in the Republic of Vietnam*, pp. 70–71; MACV History, 1969, vol. 2, pp. IX-100, IX-102; ibid., 1970, vol. 2, p. IX-53; Project Red Horse, pp. 6–7, 14, 18, 94–96; Nalty, *Air War Over South Vietnam*, pp. 35–36; Capt. Paul Y. Thompson, "Aircraft Shelters in Vietnam," *Military Engineer* 61 (July-August 1969): 273–74.

Wonder Arches like these at Bien Hoa Air Base could not be used for all types of aircraft, and the Army used less expensive revetments.

helicopters in and out of uncovered revetments was considered hazardous. A September 1969 study by the Engineer Strategic Studies Group, Office of the Chief of Engineers, reported that to shelter all 4,210 Army aircraft in Vietnam would cost a prohibitive $300 million. Just covering some of the Army's high-cost aircraft—the fixed-wing OV–1 Mohawk surveillance airplane, and CH–47 and CH–54 helicopters—would cost $54 million. Considering losses of Army aircraft in Vietnam, the study concluded it was not cost-effective to undertake a covered shelter program.[13]

Since some protection could be achieved with revetments alone, they were used and given high priority in 1969. The Army typically used the parallel and L-shaped revetments for helicopters and the U-shaped revetment for fixed-wing aircraft. Since aviation units moved frequently, each move required new revetment construction. Many helicopters had revetments in two or more locations. Designs ranged from revetment bins five feet high and four feet thick to portable revetments that could be easily assembled, disassembled, and moved. Precast concrete yards were already manufacturing bridge decking for the highway program, and conversion to movable concrete revetments was easily accomplished. The first concrete revetments were installed at Phu Loi in mid-1970. From late 1970 on, the precast concrete revetment was adopted for wide use and offered the advantage of long life and portability. Also, in early 1970, Army engineers

[13] Tregaskis, *Building the Bases*, p. 389; Fox, *Air Base Defense in the Republic of Vietnam*, pp. 70–71; Dunn, *Base Development*, p. 67; Engineer Strategic Studies Group, OCE, Sep 69, An Analysis of the Requirement for Army Aircraft Shelters, pp. ix, H-5.

L-shaped helicopter revetment

developed a practical revetment consisting of two walls of M8A1 runway matting with one foot of compacted earth between them. In March, four-sided revetments were specified for aircraft costing $1 million or more. A movable M8A1 revetment placed on a warehouse cart was developed as the fourth side to be connected and towed away from U-shaped revetments. Still, protection for most Army aircraft consisted of practical expedients such as earth- or rock-filled corrugated steel bins and fifty-five-gallon drums.[14]

Troop Withdrawals and Realignments

On 10 June 1969, President Richard M. Nixon announced that 25,000 U.S. troops would be withdrawn from South Vietnam starting within thirty days. Included in this number were 15,400 Army troops, 8,400 Marines, and 1,200 Navy personnel. Phase I redeployment involved most of the 9th Infantry Division from northern IV Corps and a regimental landing team in northern I Corps from the 3d Marine Division. MACV led off the redeployment with first-rate combat units to make the reduction credible to Hanoi, the American public, and the South Vietnamese government. MACV's other criteria were operational: it would

[14] Dunn, *Base Development*, pp. 67–68; Ploger, *Army Engineers*, pp. 162–63; *Department of the Army Historical Summary, Fiscal Year 1969* (Washington, D.C.: U.S. Army Center of Military History, 1973), p. 112; Capt. Glen E. Brisbine, "Combat Aircraft Revetments—A Review," Military Engineer Field Notes, *Military Engineer* 64 (March-April 1972): 92–94.

reduce the U.S. presence in areas where strong South Vietnamese units, backed by U.S. tactical air, artillery, and helicopter support, could take up all or part of the ground fighting; where progress in pacification and military operations was being made; and where nearby U.S. forces could readily reinforce in emergencies. Since Saigon had to be protected at all costs, III Corps would be exempt from the early reductions. On 16 October, the president announced Phase II reductions of 40,500 men, and a Phase III redeployment of 50,000 men on 15 December, to be completed by 15 April 1970. By then, U.S. military strength in the theater would drop to 434,000.[15]

The first withdrawals involved several engineer units. Most of the 9th Division, including its 15th Engineer Battalion left in September. Company C, however, remained with the 3d Brigade at Tan An in southern III Corps and became the 571st Engineer Combat Company. On 19 June, the 86th Combat Battalion at Camp Viking near My Tho received orders to depart in August. In the past, the 86th had supported the 9th Division and carried out road and bridge construction in III and IV Corps. Attached units (595th Light Equipment Company, 523d Port Construction Company, and 67th Dump Truck Company) were reassigned. Personnel with less than ten months' service in Vietnam were transferred to other engineer units. Line companies in the 86th were reduced to zero strength, and remaining troops were transferred to headquarters company, which departed with the battalion headquarters on 15 August. Most of the battalion's equipment was transferred to other engineer units, and the 93d Construction Battalion took over responsibility for the construction materials in the supply yard.[16]

By the end of the year, two more units had also departed Vietnam. In November, the 70th Combat Battalion, which had served in the highlands for more than four years, left. The 70th had moved from Pleiku to the Ban Me Thuot area in September 1968, where it built several firebases and helicopter revetments for an air cavalry unit moving into the area. About one-half of the engineers were reassigned to other units, equipment was either turned in or transferred to other units, and the main base camp (Camp Jerome) was torn down. On 19 November, the 70th transferred its remaining projects to the 864th Construction Battalion. Company B at the Hot Rocks Quarry east of Ban Me Thuot became Company C, 19th Engineer Combat Battalion. In December, Company C, 307th Engineer Battalion, returned to Fort Bragg, North Carolina, with the 3d Brigade, 82d Airborne Division.[17]

[15] MACV History, 1969, vol. 1, pp. IV-10 to IV-13, IV-16, IV-18. See also Clarke, *Final Years*, pp. 346–59.

[16] MACV History, 1969, vol. 1, pp. IV-13, IV-15 to IV-19; Quarterly Hist Rpt, 1 Oct–31 Dec 69, MACDC, p. II-8; Ploger, *Army Engineers*, p. 158; ORLLs, 1 Nov 68–31 Jan 69, 18th Engr Bde, 31 Jan 69, pp. 2–3, and 1 May–31 Jul 69, 86th Engr Bn, 9 Aug 69, pp. 1–2, 11, both in Historians files, CMH. For more on engineer units selected for redeployment, see Msg, Abrams MAC 7181 to Adm John S. McCain, CINCPAC, 6 Jun 69, sub: Force Planning, Abrams Papers, CMH.

[17] ORLLs, 1 Aug–31 Oct 68, 70th Engr Bn, 31 Oct 68, pp. 3, 5, and 1–29 Nov 69, 70th Engr Bn, 29 Nov 69, pp. 2, 5. Both in Historians files, CMH.

The year 1969 also saw the scheduled departures of the two National Guard engineer units sent to Vietnam in 1968. In August, nearly one thousand men of the 116th Engineer Combat Battalion from Idaho and the 131st Light Equipment Company from Vermont reached the end of their tours in southern II Corps. Both moved to nearby transfer stations and to their home states for demobilization ceremonies. The 116th spent most of its tour in the Bao Loc area upgrading or maintaining Highways 1 and 20 and Route 8B. The battalion also provided operational support for Task Force SOUTH, an American and South Vietnamese Army task force operating in southeast II Corps. Other duties involved maintaining Phan Thiet and Bao Loc airfields and improving MACV adviser camps. Civic action projects included providing water to the outlying Montagnard villages and improving drainage and village roads. To the north, the 131st Light Equipment Company, under the 70th Engineer Battalion's control, ran Hot Rocks Quarry, helped rebuild fifty-seven miles of Highway 21 to the juncture with Highway 1 north of Nha Trang, and built several airfields. The 131st also did extensive civic action work. One major project involved relocating three thousand Montagnards from seventeen villages to a more secure central village. Work included clearing and leveling a one-square-mile area for the consolidated village, digging wells, improving roads, transporting people and animals, and even moving houses on low-bed trailers and reassembling them at the new site.[18]

The 19th Engineer Combat Battalion filled the void left by the departing 116th Battalion. This was a logical move since the 19th was nearly done upgrading eighteen and a half miles of Highway 1 from the I/II Corps border to Duc Pho. Control of the battalion passed from the 45th Group to the 35th Group for the second time in sixteen months. On 5 August, an advanced party moved to Bao Loc and began the process of taking over the 116th's projects and equipment. Some of the 19th's equipment and all tactical bridging and construction supplies were either transferred to nearby engineer units or turned in to the Qui Nhon depot. Base camps were transferred or dismantled, including the main camp at Landing Zone LOWBOY. Several units, however, remained behind for a short time to complete the roadwork.[19]

After the 19th Engineer Battalion moved to southern II Corps, it inherited two units formerly attached to the 116th, the 572d Light Equipment Company and the 547th Asphalt Platoon at Camp Smith. After settling in, the 19th proceeded to upgrade fifty miles of Highway 20. Other units also moved.

[18] MACV History, 1969, vol. 1, pp. IV-16 to IV-17; ORLL, 1 Aug–31 Oct 69, 35th Engr Gp, 31 Oct 69, p. 7, Historians files, CMH; Lt. Col. Harvey L. Latham, "The Longest Weekend," *Kysu'* 1 (Summer 1969): 7–9; Ltr, CG, 18th Engr Bde, to CG, Engr Trps, VN, 18 Sep 69, sub: Evaluation of National Guard Units, pp. 6–7, 37–38, Historians files, CMH; AAR, Engineer National Guard Units, 26th Mil Hist Det, 17 Jul 69, pp. 2–3. The AAR also contains interviews from Capt. Raymond F. Bullock, CO, 26th Mil His Det, with Engineer National Guard Units to LOC Program, Vietnam, 35th Engr Gp, 70th Engr Bn, 116th Engr Bn, and 131st Engr Co, Jun–Jul 69, VNIT 446. The evaluation and report contain much information concerning the readiness of the two units, statistics comparing the units with Regular Army engineer units in Vietnam, commanders' evaluations, and interviews.

[19] ORLLs, 1 Aug–31 Oct 69, 35th Engr Gp, p. 7, and 1 Aug–31 Oct 69, 19th Engr Bn, 13 Nov 69, pp. 1, 5–6. Both in Historians files, CMH.

The 497th Port Construction Company, which had been attached to the 20th Brigade, returned to the 18th Brigade and resumed work at Cam Ranh Bay and Qui Nhon. The Earthmoving Platoon, Company C, 93d Construction Battalion, left the 35th Group and rejoined the battalion in the delta.[20]

Vietnamization

If Vietnamization was not a new idea, what was new were the tempo, timing, intensity, and relationship with pacification and the U.S. troop withdrawals. By 1967, the number of Army engineer advisers had increased several times over from around 50 in the early 1960s to around 150. The previous year, the MACV Construction Directorate had taken on advisory responsibilities for South Vietnamese engineer construction units, engineer equipment and maintenance, and the Engineer School at Phu Cuong. The Directorate's Engineer Advisory Division headed by a colonel was authorized nearly sixty officers and enlisted men. The rest of the engineer advisers were assigned to MACV corps and division advisory detachments with the advisers working with corps engineer staffs, combat engineer groups, and divisional and nondivisional engineer battalions.[21]

Training programs also expanded. The Engineer School tripled its student capacity to three thousand to handle the growing population of student officers, officer candidates, noncommissioned officers, and enlisted soldiers. In addition, a selected number of officers and enlisted men were sent to the U.S. Army Engineer School at Fort Belvoir to attend engineering courses. The number steadily increased from 34 in 1965 to 105 in 1968 and 218 in 1969.[22]

When the Americans started to get pacification on its feet in mid-1967, General Abrams, as General Westmoreland's deputy, was charged with upgrading South Vietnam's armed forces. By this time, the South Vietnamese Army engineers were organized to support a national army of ten infantry divisions. Organized along American lines, each division had one engineer battalion of over 400 men. Backing the divisional engineers, each corps now had a combat engineer group consisting of several combat engineer battalions (540 men each) and separate dump truck, float bridge, panel bridge, and light equipment companies. From north to south, the 10th, 20th, 30th, and 40th

[20] Report of Visit to Various Headquarters in the Republic of Vietnam, 1–21 Nov 68, incl. 3, p. 7, OCE Liaison Officer Trip Rpt no. 13; ORLLs, 1 Aug–31 Oct 69, 35th Engr Gp, p. 7, 1 Nov 69–31 Jan 70, 35th Engr Gp, 31 Jan 70, pp. 5–6, 1 Nov 69–31 Jan 70, 19th Engr Bn, 31 Jan 70, p. 1, and 1 Nov 69–31 Jan 70, 864th Engr Bn, 31 Jan 70, pp. 2, 7, 9. ORLLs in Historians files, CMH.

[21] Joint Table of Distribution, Construction Directorate, MACV, 1 May 1966; Talking Paper, sub: MACV Advisory Structure, 23 Jul 67, tab C, pp. 6, 10, and tab E, p. 5, Historians files, CMH. For more on the advisory effort, see Clarke, *Final Years*, pp. 49–78, and Cosmas, *Years of Escalation*, *1962–1967*, pp. 288–90.

[22] In late 1964, six South Vietnamese captains and the author attended the same officer career course at Fort Belvoir. Unpublished Monograph, "The Development and Training of the South Vietnamese Army," CMH, 1973, pp. 16–17; Ploger, *Army Engineers*, pp. 167–71; Lt. Gen. Dong Van Khuyen, *The RVNAF*, Indochina Monographs (Washington, D.C.: U.S. Army Center of Military History, 1980), pp. 171, 206.

TABLE 2—ENGINEERS IN SOUTH VIETNAMESE ARMED FORCES IMPROVEMENT AND EXPANSION PROGRAM, 1968–1973

	End of June					
Major Engineer Elements	*1968*	*1969*	*1970*	*1971*	*1972*	*1973*
Combat Engineer Battalion (Division)	10	10	10	10	11	12
Combat Engineer Battalion (Separate)	13	13	12	12	12	12
Combat Engineer Group Headquarters	4	4	4	4	4	4
Engineer Battalion Construction	8	10	13	17	17	17
Engineer Construction Group Headquarters	2	2	3	4	4	4

Source: Khuyen, *RVNAF*, p. 19

Groups supported I Corps, II Corps, III Corps, and IV Corps, respectively, with twelve combat battalions and several separate companies and platoons. There were two construction groups, the 5th supporting the two southern corps and the 6th in the two northern corps. Combat service support engineers were found in depot, maintenance, post engineer, topographical, utilities, and sawmill units. Altogether, there were over 14,000 soldiers in engineer combat units and nearly 3,000 troops in the engineer construction units.[23] (*Table 2*)

By 1969, the enlargement of the South Vietnamese Army engineer force had gained momentum. In MACV's Phase I expansion plan, the 71st Construction Battalion, the first of the four new construction battalions envisioned in the plan, was organized at Can Tho in June 1968. By the end of September, U.S. advisers reported the new battalion had 85 percent of its authorized personnel and 10 percent of its authorized equipment. Pending the formation of the 7th Construction Group, the 71st trained under the tutelage of the South Vietnamese 40th Engineer Combat Group and operated independently in the Bac Lieu area of southern IV Corps.[24]

For Phase II, MACV planned to add one nondivisional combat battalion, five construction battalions, two construction group headquarters, and three land-clearing companies. By 1971, the Phase II program would result in an engineer force of ten divisional battalions, twelve combat battalions in four

[23] South Vietnamese Army divisional engineer battalions were numbered the same as the parent division, and nondivisional engineer combat units were numbered in a pattern matching respective corps and groups such as the 30th Group in III Corps with the 301st and 302d Engineer Battalions; separate engineer companies also had a similar three-digit unit designation; construction groups were numbered 5th through 8th and their battalions began with the same numbers such as 5th Group and its 51st and 52d Battalions. Force Structure Plan, Republic of Vietnam Armed Forces, FY 1967–1969, Military Assistance Program Directorate, 10 Jan 67, pp. 9, 12; Fact Sheet, MACDC-PP, 19 May 71, sub: ARVN Engineer Troop Strength, both in Historians files, CMH; Quarterly Hist Rpt, 1 Apr–30 Jun 67, MACDC, p. II-11; Quarterly Hist Rpt, 1 Oct–31 Dec 68, MACDC, p. II-8.

[24] MACV History, 1968, vol. 1, pp. 250–51; Quarterly Hist Rpt, 1 Jul–30 Sep 68, MACDC, p. II-4.

groups, and seventeen construction battalions in four groups. This organization, MACV believed, would be able to provide more than enough combat and general support and allow the South Vietnamese Army engineers to take on a meaningful share of the highway program. American planners also developed a smaller force structure, called Phase III, in case of a lesser North Vietnamese and Viet Cong threat. A force of six or eight divisions instead of ten would mean a matching reduction of divisional battalions, and the number of nondivisional battalions would be reduced to twelve. The number of construction battalions would remain the same because of the highway improvement program.[25]

Initially MACV planners envisioned unit-to-unit equipment transfers from departing U.S. units, but in 1969 the transfer process included newer equipment from depot stocks. This decision was prompted by General Abrams who, on 31 May, established criteria designed to ensure that all used U.S. Army equipment was safe to operate, serviceable, and operable to the extent required for its intended purpose. Replacements for any missing or defective parts had to be on order for delivery to the Vietnamese armed forces before a piece of equipment was considered transferable. Equipment not available from the depots came from U.S. units. An engineer unit slated for redeployment or inactivation continued its mission as long as possible, then turned over responsibilities, bases, and equipment to Vietnamese units. In June 1969, the 18th and 20th Brigades received instructions to begin transferring equipment to Vietnamese engineer units on a massive scale. These demands were not excessive since Vietnamese engineer units were authorized less equipment than their American counterparts. During August and September 1969, the 18th Brigade transferred approximately 193 separate major items of equipment to the 40th Base Depot, the only engineer base depot in the Vietnamese Army. In late October, the brigade was tasked to transfer more equipment, this time to the new 805th Heavy Equipment Company at Da Nang and to the 63d Construction Battalion at Nha Trang. The 20th Brigade accomplished similar transfers, including equipment destined for the 63d Construction Battalion. A single U.S. battalion, the 92d Construction at Long Binh, received, stored, staged, and transferred some two hundred pieces of equipment for the brigade.[26]

Meanwhile, South Vietnamese Army engineer units gained valuable experience through training programs sponsored under Project BUDDY by U.S.

[25] MACV History, 1969, vol. 2, pp. VI-16 to VI-17, VI-19 to VI-20; Quarterly Hist Rpts, 1 Oct–31 Dec 68, MACDC, p. II-8, and 1 Jan–31 Mar 69, MACDC, p. II-11; Fact Sheet, U.S. Army Engr Cmd, AVHEN-MO, 29 Nov 69, sub: ARVN Engineer Improvement and Modernization, Historians files, CMH; Msg, Abrams MAC 7005 to Stanley R. Resor, Sec Army, 2 Jun 69, sub: Release of Information Pertaining to ARVN Force Levels, Abrams Papers, CMH.

[26] MACV History, 1969, vol. 2, pp. VI-20 to VI-21; Ploger, *Army Engineers*, pp. 172–74; Ltr, Col Harry A. Griffith, CO, 35th Engr Gp, EGA-CO to Brig Gen John W. Morris, CG, 18th Engr Bde, 22 Nov 69; DF, MACJ462, sub: Condition Criteria for Transfer of US Equipment to RVNAF, 7 Nov 69, incl. 12b, and Chart: Construction Equipment Comparison for U.S. and RVNAF Units, incl. 12d, OCE Liaison Officer Trip Rpt no. 16; ORLLs, 1 Aug–31 Oct 69, 18th Engr Bde, 31 Oct 69, pp. 7–8, and 1 Aug–31 Oct 69, 159th Engr Gp, 14 Nov 69, p. 26. Ltr, DF, and ORLLs in Historians files, CMH.

A South Vietnamese soldier operates a grader under the watchful eye of a U.S. soldier.

Army engineer units. Between August and December 1969, the 84th and 815th Construction Battalions trained 167 South Vietnamese soldiers from the 6th Construction and 20th Combat Groups to operate D7E bulldozers, 290M scrapers, twenty- and forty-ton cranes, scoop loaders, and asphalt plants. The 35th Group arranged the training and equipment transfers for the newly activated 63d Construction Battalion. In December, the 20th Brigade reported its units had trained 426 South Vietnamese soldiers, with another 176 undergoing training. On-the-job training sessions included courses on soils analysis by the 36th Construction Battalion, asphalt plant assembly by the 36th Battalion and the 544th Construction Support Company, and quarry operations by the 92d and 169th Construction Battalions and the 94th Quarry Detachment. Through such methods, the Vietnamese quickly learned to operate newer and complex machines. Besides these programs, the 100th Float Bridge Company between May and October provided on-the-job training to the 301st Combat Battalion, 30th Combat Group, on assembling the M4T6 floating bridge.[27]

[27] Ploger, *Army Engineers*, pp. 170–71; Dunn, *Base Development*, p. 139; Fact Sheets, 937th Engr Gp, sub: Engineer Training of ARVN Forces, 9 Feb 70, and 35th Engr Gp, sub: Current ARVN Affiliation, 12 Feb 70, both in incl. 15c, and Fact Sheet, 20th Engr Bde, sub: RVNAF OJT Program, 16 Feb 70, incl. 16c, OCE Liaison Officer Trip Rpt no. 16. For more on the

Joint projects, especially highway upgrading, increased, encouraging South Vietnamese engineers to assume more responsibility. In I Corps, the South Vietnamese expanded minesweeping, bridge repair, and land-clearing operations, and began to take on more road maintenance responsibilities. In II Corps, the 18th Engineer Brigade's efforts to help South Vietnamese engineer units develop a greater horizontal construction capability (quarry, road and airfield, and paving operations) began to bear fruit. After South Vietnamese Army engineers joined the highway improvement program in 1969, they began work on the long concrete and steel Highway 1 bridge at Tuy Hoa. The Vietnamese 20th Engineer Group built the bridge, and the U.S. 937th Group provided the materials and technical advisers. In the highlands, 20th Group units provided twenty dump trucks to support U.S. efforts along Highway 14. The 61st Construction Battalion, 6th Construction Group, assumed responsibility for upgrading thirty-four miles of Highway 1 between Phan Rang and Phan Thiet. In early 1970, the 20th Brigade began making plans to transfer the Gia Ray industrial site located midway between Saigon and the II/III Corps border. Sometime after 1 May, South Vietnamese engineers were expected to take over the production of all crushed rock and asphalt concrete for Highway 1 roadwork between Gia Ray and the II/III Corps border. In IV Corps, South Vietnamese engineers assumed a larger share of airfield maintenance and began building major highway bridges. The Vietnamese 40th Engineer Combat Group also took over quarry operations at Nui Sam.[28]

Operation SWITCHBLADE teamed U.S. and South Vietnamese land-clearing units under Project BUDDY. Originally MACV called for the activation of three land-clearing companies beginning in July 1970 and six-month training cycles for each under the tutelage of the 62d Engineer Battalion (Land Clearing). Lt. Gen. Julian J. Ewell, the II Field Force commander, considered land clearing one of his most valuable assets, and he proposed accelerating the activations and training by six months. MACV concurred and the 318th Land Clearing Company, 30th Engineer Combat Group, was activated on 1 December 1969. Lt. Col. Paul C. Driscoll, the 62d's commanding officer, named the training program Operation PLOWSHARE. However, he quickly changed the name to SWITCHBLADE after learning the same code word was used in the program for the peaceful use of atomic energy to make excavations. On 15 December, the 62d welcomed the first group of seventy-five trainees to Long Binh and assigned them to the 501st Land Clearing Company and Company A, the battalion's direct-support maintenance unit. The program consisted of classes followed by on-the-job training with the 62d's officers, tractor-trailer drivers, Rome plow operators, and mechanics acting as instructors on a one-to-one basis. Special seats were installed in the

administrative arrangements of Project BUDDY, see Memo, USARV Engr AVHEN-MO for Dep Engr, 22 Apr 69, sub: Utilization of US Facilities for OJT of ARVN Maintenance Personnel—"Project BUDDY," Historians files, CMH.

[28] MACV History, 1969, vol. 2, pp. VI-147 to VI-148; Fact Sheet, EGC-CS, sub: Engineer Training of ARVN Forces, 9 Feb 70, and Fact Sheet, 35th Engr Gp, sub: Current ARVN Affiliation, 12 Feb 70, both in incl. 15c; Ltr, 20th Engr Bde to CG, USA Engr Cmd, VN, sub: Review of the LOC Restoration Program, 19 Feb 70, incl. 16d, OCE Liaison Officer Trip Rpt no. 16.

cabs for the Vietnamese engineers to sit on and observe the American operators. Later in the training program, the Americans occupied the observers' seats. From this vantage point, the trainees began to understand the intricacies of land clearing and the importance of daily operational maintenance. On 15 January 1970, thirty trainees accompanied the 501st to War Zone C for forty-five days to support a 1st Cavalry Division operation near the Cambodian border. Several large ten-ton tractors hauling trailers carrying the Rome plows and their American and Vietnamese operators in the cabs were driven by Vietnamese soldiers. In late January, a second cycle of thirty Vietnamese soldiers began training with the 984th Land Clearing Company. This group spent its forty-five days in the field supporting the 11th Armored Cavalry Regiment in War Zone C. They were followed by thirty more trainees who began training with the 60th Land Clearing Company. By the middle of March, the 318th had almost sixty qualified plow operators, and the training of support personnel was in high gear.[29]

The next stage of Operation SWITCHBLADE saw the emergence of the 318th as an operational land-clearing company. An earlier than expected inactivation of the 501st Land Clearing Company in April 1970 resulted in the transfer of ten Rome plows and the formation of the 318th's first operational land-clearing platoon. A joint provisional land-clearing company consisting of American and Vietnamese personnel was formed and employed in a cutting operation in the jungle east of Tay Ninh. The former trainees enthusiastically manned the lead plows with the Americans following behind. Capt. Nguyen Van Tich, the 318th's company commander, guided the cut from a low-flying OH–58 observation helicopter. Tich, who attended the U.S. Army Engineer School at Fort Belvoir, exuded confidence. When asked if he envisioned problems for the first operation, he replied, "My men are ready. I think we should be able to match the American engineer's performance, at least on this first operation." By early May, the operation was proclaimed a success, and the convoy of trucks and lowboys, which returned the provisional company to Long Binh, brought an end to direct U.S. supervision. Most of the remaining equipment, including twenty-five additional Rome plows, was transferred from the 62d Engineer Battalion and other U.S. units during the fifteen-day stand-down period. MACV's Engineer Advisory Division also assigned one officer and two maintenance noncommissioned officers as advisers. On 25 May, the 318th began its first forty-five-day cycle. Captain Tich controlled

[29] Lt. Gen. Julian J. Ewell and Maj. Gen. Ira A. Hunt Jr., *Sharpening the Combat Edge: The Use of Analysis to Reinforce Military Judgment,* Vietnam Studies (Washington, D.C.: Department of the Army, 1974), p. 218; Ltr, HQ, 20th Engr Bde, AVRI-OS, to CG, USARV, 21 Jan 70, sub: ARVN Land Clearing; Memo, Dep Senior Adviser, III Corps, MACCZ-IIIEN, for Senior Adviser, III Corps, 7 Feb 70, sub: Training of ARVN Land Clearing Companies; Ltr, HQ, 62d Engr Bn, Lt Col Driscoll to CO, 79th Engr Gp, 6 Nov 69, sub: Proposed Plan for Activation of ARVN Land Clearing Companies, all in Historians files, CMH; ARVN Land Clearing Training (Operation SWITCHBLADE) Feb 70, incl. 16g, OCE Liaison Officer Trip Rpt no. 16; Interv, Capt Kurt E. Schlotterbeck, CO, 26th Mil Hist Det, with Lt Col Paul C. Driscoll, CO, 62d Engr Bn (Land Clearing), 22 Jun 70, VNIT 707, pp. 50–52, CMH. See also Spec. Bob Dart, "Vietnamization of Land Clearing—The Beginning," *Kysu'* 2 (Spring 1970): 5–8; and Spec. Neil Gaston, "Vietnamization of Land Clearing—The Final Phase," *Kysu'* 2 (Summer 1970): 12–16.

the company's operations, and only a few advisers accompanied the unit. The 318th operated like a U.S. land-clearing company, with the 30th Group's S–3 and S–4 sections working closely with their U.S. counterparts. Requisitions for repair parts were submitted to the Area Logistical Command to establish demands on the South Vietnamese supply system. The 62d continued to provide some parts and maintenance support, with the expectation that the South Vietnamese logistics system would take over this responsibility by 1 January 1971. After completing the cutting cycle on 9 July, the 318th reverted to the control of the 30th Group, but the company remained at Long Binh until the group could find a permanent home. This proved beneficial. Neither the 62d nor the 318th by themselves had enough ten-ton tractors and twenty-five-ton trailers on hand to move a company's thirty Rome plows to the field at once. As a simple solution, the two units pooled their tractors and trailers.[30]

Meanwhile, the 62d continued its training program. In late February 1970, soldiers from the 218th Land Clearing Company, 20th Engineer Combat Group in II Corps, started training. The 118th Land Clearing Company, 10th Engineer Combat Group in I Corps, began its training cycle the following month. The methods were the same. Almost every skill required of the U.S. unit was included during the on-the-job training program. Rome plow operators, heavy truck drivers, mechanics, and medical personnel trained and worked together. Vietnamese cooks, however, were not included. Colonel Driscoll recalled, "It wouldn't be too helpful to train them to cook our stuff when they're not going to be able to get it." By midyear, he expressed satisfaction on the progress of the training program. Maintenance skills, however, required more effort than operating the bulldozers because some trainees expected to come in from a cut, park their equipment, and go to bed. They quickly learned that the American operators took pride in making sure the equipment was ready to go the following morning. Driscoll did not see language as a major barrier. "Just put a GI and an ARVN in a cab and in a couple of days," he noted, "the ARVN's got it. It's rather amazing, really. But that was the key to the whole concept of the program, was the ability of the GI to be motivated to get the lesson across." Driscoll noted interesting differences between the South Vietnamese companies. Most of the 318th's soldiers had just completed basic training and were "cooperative and pliable," but the 118th consisted of older, experienced soldiers who required more motivation. This attitude may also have stemmed from the fact that the 118th would not be working with the 62d very long, and the Vietnamese may have considered the program as just another training exercise. However, in the field their attitude changed. The 118th developed a competitive spirit, and its soldiers did not hesitate to help man the berm line defenses when the Americans came under attack. Driscoll

[30] Capt. Nguyen Van Tich quoted in Gaston, "Vietnamization of Land Clearing—The Final Phase," pp. 12–16. Also, MFR, HQ II FFV, AVFB-EN, Col John Perkins III, II Field Force Engr, sub: Operation of 318th ARVN Engineer Land Clearing Company, 22 Apr 70, Historians files, CMH; Interv, Schlotterbeck with Driscoll, 22 Jun 70, pp. 52–54.

did not have any qualms about the 118th's future as a successful land-clearing company.[31]

Certain organizational differences allowed the South Vietnamese land-clearing companies to operate more independently than their U.S. counterparts. The Vietnamese companies included a direct-support maintenance section with a third-echelon maintenance capability, unlike the U.S. companies that depended on battalion maintenance. Also, the South Vietnamese planned to assign more tractors and trailers to their land-clearing companies. Colonel Driscoll recalled just before his departure in July 1970 that the Vietnamese land-clearing companies would have twenty 10-ton tractors with low-bed trailers compared to only ten in the U.S. companies. Nevertheless, the Vietnamese companies were not 100 percent mobile. Both the U.S. and Vietnamese companies depended on other engineer units to move thirty Rome plows at one time. Still, Driscoll believed that the South Vietnamese had "a real good TO&E [table of organization and equipment]."[32]

A memorandum of understanding between MACV and the U.S. Army Engineer Command, Vietnam, formalized the training and affiliation programs. Signed on 26 March 1970 by Brig. Gen. John A. B. Dillard, who replaced General Parker in December 1969 as the commander of Engineer Troops, and Maj. Gen. Raymond C. Conroy, MACV's J–4, the memorandum defined the procedures governing training assistance. The document also confirmed that the affiliation program supplemented the Vietnamese training system and MACV's advisory role. General Dillard, who was promoted to major general on 1 April 1970, aggressively pushed his command to accelerate assistance. Most of the command's groups and battalions worked closely with nearby Vietnamese Army engineer units. For instance, the 159th Engineer Group at Long Binh sponsored the 5th Construction Group at Hoc Mon. The 31st Combat Battalion supported the 301st Combat Battalion. Several U.S. units were associated with more than one Vietnamese unit. In I Corps, the 45th Group worked with the 8th Construction and 10th Combat Groups. In the delta, the 35th Combat Battalion sponsored four Vietnamese engineer battalions, the 402d and 403d Combat, the 73d Construction, and the 21st Combat of the 21st Infantry Division. Dillard felt that the South Vietnamese chief of engineers' decision to take on part of the highway restoration program and the Vietnamese engineers' willingness to seek training were indicative of real progress.[33]

[31] Interv, Schlotterbeck with Driscoll, 22 Jun 70, pp. 55–61; Gaston, "Vietnamization of Land Clearing—The Final Phase," p. 16.

[32] Fact Sheet, HQ, USA Advisory Group, III CTZ, MACV, MACCZ-IIIEN, 5 Feb 70, Historians files, CMH; Interv, Schlotterbeck with Driscoll, 22 Jun 70, p. 61.

[33] Ltr, Maj Gen John A. B. Dillard, CG Engr Cmd and USARV Engr, AVCC-CG to Ploger, OCE, sub: RVNAF Engineer Training, 14 Apr 70; Memorandum of Understanding Between MACV J–4 and CG, U.S. Army Engr Cmd, VN, sub: RVNAF Training, 26 Mar 70; 18th and 20th Engr Bdes ARVN Affiliation Program, Associated Organizations, incl. 2 to Ltr, Dillard AVCC-CG to Ploger, 14 Apr 70. All in Historians files, CMH. See also Spec. Curt Nelson, "U.S.-ARVN Training; Benefits on Both Sides," *Kysu'* 1 (Winter 1969): 21–24; and Elliot "Paving the Way to Vietnamization," pp. 25–28.

Turning Over Bases

As the U.S. withdrew more troops from Vietnam, many bases, ports, and other facilities became excess to American needs. Some departing U.S. units either tore down their camps or transferred them to other units. Prefabricated buildings were often disassembled and moved to other bases or returned to the United States. Sometimes new construction requirements arose when U.S. units not leaving Vietnam moved from a transferred base to another base. Although all remaining bases and facilities would eventually be given to the Vietnamese, MACV developed a priority system to allow other U.S. forces and agencies to have a last chance to use them.[34]

These transfers took place under broad guidelines established by MACV and the Joint General Staff. MACV wanted to turn over surplus bases as soon as possible, with priority given to the South Vietnamese armed forces. The command's directive outlined assurances that the U.S. occupants would provide for a continuity of operations and maintenance responsibility. Also, South Vietnamese personnel were supposed to get adequate training in the operation and maintenance of the facility's equipment and systems. Similar directives issued by the Joint General Staff and Central Logistics Command complemented the MACV directive. In November 1969, MACV and the Joint General Staff established a combined U.S.-Vietnamese committee for coordinating base and facility transfers along with similar committees in the four corps.[35]

When it came time to transfer a base to the Vietnamese, it was expected to be usable with a functional utilities system. If sophisticated equipment was essential to American operations at a base, but not for the incoming South Vietnamese, it would be removed. Usually this meant replacing high-voltage systems with low-voltage systems and removing air conditioners except in critical facilities such as hospital operating rooms. Generally, air conditioners were removed with the stipulation that windows would be provided. Still, Lt. Gen. Dong Van Khuyen, the commanding general of the Central Logistics Command, asserted that some U.S.-built bases were "too spacious and consisted of too many buildings and types of structures, all equipped with a complex array of utilities." Frequently, the bases were too big for the Vietnamese units to fill all the barracks, to man all the guard and defense positions, and to maintain all the facilities. Too, departing U.S. units usually left the installations in increments, failing to guard all the unoccupied areas, which gave rise to theft and destruction. "Sometimes," General Khuyen recalled, "entire mobs broke into a few bases and openly dismantled and took away everything in sight in complete defiance of the few PF [Popular Forces] guards." This situation would worsen at several bases as the withdrawal of U.S. forces accelerated.[36]

[34] Ploger, *Army Engineers*, pp. 171–72; Dunn, *Base Development*, p. 142.

[35] MACV History, 1969, vol. 2, pp. VI-123 to VI-124; ibid., 1970, vol. 2, p. IX-36; Khuyen, *RVNAF Logistics*, pp. 179–80. For more on base transfer policies, see MACV History, 1969, vol. 2, pp. IX-102 to IX-105; MACV Directive 735–3, 3 Nov 69, *Disposal of Excess US Armed Forces Real Property and Related Property in the Republic of Vietnam*, Historians files, CMH.

[36] Ploger, *Army Engineers*, p. 172; Khuyen, *RVNAF Logistics*, pp. 181, 184–85 (first quote, p.184, second, p.185); MACV History, 1970, vol. 3, pp. IX-36, IX-40.

The departure of the 9th Division in mid-1969 set the pattern for the departure of tactical units. Redeploying from a combat zone required the division's maneuver units to phase their stand-down and departures while keeping pressure on the enemy. For the 9th Division, this process started in July with the infantry battalions standing-down within their firebases while still conducting security operations before turning over the bases to the South Vietnamese. The units then moved to Dong Tam, where they were billeted aboard barracks ships. Tactical coordination with the South Vietnamese 7th Infantry Division, which operated in the same tactical area, took place without difficulty. As the 9th Division's operations drew to a close, engineering support also phased out. Projects in progress relating to pacification or civic action continued to completion. Not all of the 9th Division, however, departed. The 3d Brigade was reorganized as a separate brigade consisting of four infantry battalions and other elements totaling over 5,800 soldiers.[37]

Dong Tam marked the first major disposal of real property in Vietnam and foreshadowed problems with future base transfers. A joint Army–Pacific Architects and Engineers inventory of the base reported 1,001 buildings and facilities valued at $9.2 million. Some items—such as air conditioners, lighting fixtures, and ceiling fans—were removed and shipped out. Several buildings were also looted and damaged, probably by both departing Americans and arriving Vietnamese, despite the posted Off Limits signs. A Pacific Architects and Engineers real estate specialist complained about South Vietnamese Army transfer officials arriving late and delaying the signing of transfer forms that the facilities engineering contractor's clerks had worked around the clock to prepare. Despite these difficulties, Dong Tam was transferred for South Vietnamese occupancy on 1 September, but the unfamiliar procedures and delays held up the complete transfer until late October. It became obvious that training programs for the South Vietnamese covering certain skills such as operating and maintaining large generators had to be set up. One solution included temporarily assigning personnel from the incoming unit for on-the-job training before the transfer. Another and better approach called for Pacific Architects and Engineers to teach these skills. The firm already had in place an excellent training program for its Vietnamese employees.[38]

In mid-September, Pacific Architects and Engineers began training South Vietnamese soldiers. The first course trained engineers to operate and maintain Dong Tam's central power plant's four 500-kilowatt generators and thirty-nine miles of high-voltage distribution lines. Three American and one Vietnamese instructor assisted by three interpreters taught mechanical and electrical facets of high-voltage generation and distribution. Each course lasted seventeen weeks and a second cycle followed. The firm's electrical supervisor later commented that the Vietnamese soldiers were good students, learned fast, and were

[37] MACV History, 1969, vol. 3, pp. D-1 to D-2, D-5, D-13. For more on the redeployment of the 9th Division, see MACV History, 1969, vol. 3, an. D.

[38] PA&E History, FY 1970, pp. 12–13, and app., PA&E Memo, Froilan V. Udtujan, Real Estate Mgmt Spec, for Acting Mgr, Engr Dept, sub: Trip Report to Dong Tam Installation, 9 Sep 69; Quarterly Hist Rpt, 1 Oct–31 Dec 69, MACDC, p. V-6; MACV History, 1970, vol. 2, pp. IX-35 to IX-36, IX-40.

interested in the work. The engineers completed the second cycle at the end of May 1970, fully qualified as high-voltage technicians. Later, the contractor's program moved to Nha Trang Air Base where the firm taught 150 Vietnamese airmen comprehensive facilities engineering courses that ranged from eight to twelve months.[39]

The departure of the 9th Division and the transfer of Dong Tam generated new construction requirements for the 34th Group at a time when there were fewer units to do the work. The 3d Brigade, 9th Division, headquarters complex at Tan An required expansion; a new battalion-size base camp at Can Giuoc had to be built; and aviation and support units had to be moved elsewhere, which required new facilities. Little time was allowed despite the imminent departure of the 9th Division's 15th Engineer Battalion and the group's 86th Engineer Combat Battalion. The 34th Group also faced a critical shortage of construction materials. This problem was reduced when engineers removed bunkers from closed firebases and collected all unused lumber at Dong Tam. Materials held as a contingency reserve to repair damaged bridges were also used. The group diverted units from other projects, and work began at the 3d Brigade's headquarters and the base camp at Can Giuoc. Expanding the Tan An airfield and adding helicopter and fixed-wing parking aprons and revetments at Vinh Long and Can Tho also got under way. While the 93d Construction Battalion concentrated its efforts at Tan An, the 36th and 69th Construction Battalions worked on the other aviation projects.[40]

More base transfers followed. In October 1969, Blackhorse, forty miles east of Saigon and former base camp for the 11th Armored Cavalry Regiment, was transferred to the South Vietnamese 18th Division. This time no significant damage took place at the 700-acre camp valued at $1.9 million. Camps in III Corps occupied by the 3d Brigade, 82d Airborne Division, which departed Vietnam in December, were either dismantled or turned over to the Vietnamese. At Vung Tau, several U.S. Army buildings, mostly barracks, worth $3 million were turned over to the Vietnamese national police in March 1970. In February 1970, a portion of the 1st Division's camp at Dau Tieng was transferred, but that part of the camp included Pacific Architects and Engineers facilities. The firm had to move operations to the other side of the camp. Dau Tieng's new status also meant reduced manning. Consequently, the contractor moved the equipment and maintenance shop to a new parent installation at Cu Chi. In addition, 160 tons of supplies and 498 pieces of equipment no longer needed at Dau Tieng were redistributed to other installations in Vietnam. In I Corps, the South Vietnamese 1st Division accepted portions of the 3d Marine Division's base at Dong Ha, and in III Corps the Vietnamese Air Force received former RMK-BRJ facilities at Bien Hoa Air Base. Also, U.S. Army units inherited several vacated camps by the end of the year. The 3d Marine Division's base at Quang Tri became the home base for the 1st Brigade, 5th Infantry Division

[39] PA&E History, FY 1970, pp. 76–78. For more on the contractor's training program, civilian and military, see PA&E History's Appendix A, "Training Accomplishments."

[40] ORLL, 1 Aug–31 Oct 69, 34th Engr Gp, 1 Nov 69, pp. 5–8, Historians files, CMH.

(Mechanized). A portion of the departing Philippine Civic Action Group's camp at Tay Ninh was transferred to elements of the 1st Cavalry Division.[41]

Supporting Combat

As in 1968, a major share of the allied effort in 1969 remained committed to finding, fixing, and destroying North Vietnamese and Viet Cong formations and their base areas. In the northernmost provinces of I Corps, the 3d Marine Division, the 1st Brigade, 5th Division, and the 101st Airborne Division guarded the Demilitarized Zone. In southern I Corps, the 1st Marine and Americal Divisions carried out small-unit patrolling and security operations. In II Corps, the 4th Division screened the Central Highlands along the Cambodian border and the 173d Airborne Brigade conducted most of its security operations in Binh Dinh Province. In III Corps, the 1st Cavalry and 25th Divisions defended the area along the Cambodian border. The 1st Division, the 11th Armored Cavalry Regiment, the 199th Infantry Brigade, the 3d Brigade, 82d Airborne Division, and the 3d Brigade of the 9th Division shielded the Saigon approaches. The South Vietnamese armed forces, nearly one million strong, continued their security mission and participated in joint operations with U.S. forces. Allied forces also carried out security missions in their areas of responsibility: two South Korean army divisions protected the coastal lowlands in II Corps; the Korean marine brigade operated south of Da Nang; and the Australian and Thai forces secured the region southeast of Saigon and guarded the approaches from that direction.[42]

During the year, ground combat in South Vietnam lessened significantly, with occasional violent contacts between American and North Vietnamese units. In January, XXIV Corps began a series of offensive operations aimed at North Vietnamese base areas near the Laotian border. A reinforced U.S. Marine regiment struck an enemy stronghold north of the A Shau Valley in Operation DEWEY CANYON and uncovered large caches. In March, the 101st Airborne Division launched a series of operations in the A Shau Valley itself in an effort to destroy the redoubt and to interdict supply routes built by North Vietnamese engineers. One heavy and violent contact between American and North Vietnamese units occurred when the division's 3d Brigade and South Vietnamese Army elements launched a heliborne operation, APACHE SNOW, into the valley. On 11 May, one of the brigade's battalions collided with a sizable enemy force entrenched on Dong Ap Bia (Hill 937), resulting in a bloody battle better known as Hamburger Hill. Three more battalions were thrown into the fray before the crest finally fell. In the United States, the apparent waste of American lives in taking another enemy position and then

[41] MACV History, 1969, vol. 2, p. 105; ibid., 1970, vol. 2, pp. IX-35, IX-37; Quarterly Hist Rpt, 1 Oct–31 Dec 69, MACDC, pp. V-4 to V-5; PA&E History, FY 1970, pp. 13–14.

[42] MACV History, 1969, vol. 1, pp. II-13, V-3, vol. 2, p. VI-10; Stanton, *Rise and Fall of an American Army*, pp. 295, 303, 308, 319.

leaving it sparked more criticism on the conduct of the war. Washington sent out word to hold casualties down.[43]

Organic engineer units carried out minesweeping and demolition support and general support in their parent organizations' tactical areas. Divisional elements such as the 8th Engineer Battalion supported the 1st Cavalry Division's border operations by building and improving tactical roads, firebases, landing zones, and forward airfields. In September, the 8th began resurfacing and expanding the vital Bu Dop airstrip, but monsoonal rains and mud hampered building the additional four hundred feet of runway. Frequent enemy mortaring left craters pockmarking the strip, adding more repair work to the project. Tragedy struck the airmobile engineer battalion when a helicopter carrying the battalion commander, Lt. Col. Andre G. Broumas, and members of his staff during a flight from Quan Loi and Bu Dop was shot down, killing all aboard.[44]

A major accomplishment of the 1st Division's 1st Engineer Battalion in 1969 was the opening of nearly fifty-six miles of a direct all-weather supply route between Phuoc Vinh and Song Be. Before 1969, this stretch of Route 1A, actually a crude path, had been closed for five years and supplies had to be airlifted to bases at Dong Xoai, Bunard, and Song Be. The joint U.S.-South Vietnamese Army task force under the coordinating control of Lt. Col. Robert Segal's 1st Engineers got under way in January. As the battalion committed equipment, bridging, minesweeps, and its land-clearing section to the operation, the South Vietnamese 301st Engineer Combat Battalion concentrated on the roadwork and bridge construction. Land-clearing companies of the 62d Engineer Battalion cut 200-yard-plus-wide swaths along both sides of the road. The road was opened and secured in June, and civilian commercial traffic soon took advantage of the improved route.[45]

The 101st Airborne Division's Operation KENTUCKY JUMPER, a division-wide operation that included Operation APACHE SNOW, illustrated the operational support role of the new airmobile engineer battalion. Between 1 March and 31 July, the 326th Engineer Combat Battalion built nine new firebases. The 326th also opened over ninety landing zones, and on 13 June reopened the abandoned 1,500-foot C–7A Ta Bat airstrip on the floor of the A Shau Valley. At Camp Eagle, the division's base camp, and brigade base camps improvements were made to tactical operation centers, fire direction centers, helipads, bunkers, billets, and interior roads. Helicopter airlift of the 326's equipment

[43] Davidson, *Vietnam at War*, pp. 612–15. For more on Operation APACHE SNOW, see MACV History, 1969, vol. 2, pp. V-56 to V-57; ORLL, 1 May–31 July 69, 101st Abn Div, 20 Aug 69, pp. 4–6, Historians files, CMH; HQ, 22d Mil Hist Det, Narrative Operation APACHE SNOW, Historians files, CMH; Stanton, *Rise and Fall of an American Army*, pp. 299–302; and Samuel Zaffiri, *Hamburger Hill, May 11–20, 1969* (Novato, Calif.: Presidio Press, 1988).

[44] *Memoirs of the 1st Air Cavalry Division*, *August 1965–December 1969*, p. 185. See also Spec. Ken Hammond, "The Divisional Engineer," *Kysu'* 1 (Winter 1969): 6–8; and 14th Mil Hist Det, 1st Cav Div, Construction of a Fire Base, 10 Oct 69, Historians files, CMH.

[45] *The First Infantry Division in Vietnam, 1969* (n.p.: 1st Infantry Division, n.d.), "June 1969" and "1st Engineer Battalion" sections; AAR, Opn TOAN THANG pp. 2–64, Phase I, 1st Engr Bn, 20 Feb 69, 1st Engineer Battalion in Vietnam, vol. 2, pp. VIII-19 to VIII-32, CMH; ORLL, 1 May–31 Jul 69, 1st Inf Div, 29 Aug 69, pp. 5–6, Historians files, CMH. See also 1st Engr Bn, Fundamentals of Engineer Support, [1969], Historians files, CMH.

jumped 30 percent over the previous quarter. Together, the airlifts included 144 CH–47 Chinook and 192 CH–54 Flying Crane sorties. Techniques developed to disassemble equipment into transportable sections paid off in early June when the battalion rebuilt the Ta Bat airstrip. Four D5A bulldozers, two M450 bulldozers, two TD6 bulldozers borrowed from the Seabees, four graders, two backhoes, five 3/4-ton dump trucks, three sheepsfoot rollers, a thirteen-wheel roller, and other assorted equipment moved by air from Camp Eagle in several stages. Upon completion of the clay-surfaced airstrip and the first landing and takeoff by a Caribou, the equipment was dismantled for airlift back to Camp Eagle the next morning. Three miles south of Camp Eagle, the battalion reopened and improved an abandoned firebase (later renamed ARSENAL) to counter North Vietnamese rocket attacks. Roadwork to the firebase, which involved making side hill cuts and placing several culverts and the reconstruction of the firebase served as excellent training models for the battalion.[46]

During APACHE SNOW and the bitter fighting for Dong Ap Bia, the 326th airlifted teams often under heavy enemy fire to clear landing zones. The teams, encumbered with chain saws and rucksacks loaded with plastic explosives, rappelled through holes in the dense forest canopy and cut down trees to make landing zones for helicopters to bring in more troops and supplies and evacuate casualties. Engineer teams also opened holes in the canopy so that the infantry's 81-mm. mortars could fire.[47]

In terrain suitable for armored and mechanized infantry operations, attached engineers provided equally important support. In mid-March 1969, the 1st Brigade, 5th Division, formed Task Force REMAGEN around elements of an armored battalion and a mechanized infantry battalion and other supporting arms, including a reinforced engineer platoon. The task force advanced along Highway 9 from Ca Lu to the Khe Sanh plateau. It then turned south, screening the northern flank of the 3d Marine and 101st Airborne Divisions operating in the valleys to the southeast. Company A, 7th Engineer Battalion, led the task force down the dirt road, clearing mines, building bypasses, and spanning streams with armored vehicle launched bridges, which were immediately lifted back onto their carriers after the column crossed. Task Force REMAGEN roamed the area until the end of April, encountering only light resistance and some mortar fire directed from Laos.[48]

In III Corps, the 919th Engineer Company sent its platoons with each of the 11th Armored Cavalry Regiment's three squadrons on their wide-ranging sweeps. Additional support was also available with the activation of a fourth platoon in early 1969. In June, the 4th Platoon moved with the regimental headquarters to Quan Loi. There it made repairs to the headquarters area, improved base defenses, served as a ready reaction for perimeter defense, and escorted convoys along Highway 13. During one ambush along the road, the

[46] ORLL, 1 May–31 July 69, 101st Abn Div, pp. 1, 4, 39–42; Bowers, *Tactical Airlift*, p. 493.

[47] AAR, Opn APACHE SNOW, 3d Bn, 187th Inf, 20 Jun 69, p. 1, Historians files, CMH; Zaffiri, *Hamburger Hill*, pp. 66–67, 104–06.

[48] Starry, *Mounted Combat*, pp. 153–54; Smith, *U.S. Marines in Vietnam, 1969*, pp. 64, 66; Stanton, *Rise and Fall of an American Army*, pp. 297–98.

engineers responded by firing their combat engineer vehicle's demolition gun against enemy troops for the first time.[49]

In 1969, the 18th and 20th Engineer Brigades committed nearly one-half of their total effort to operational support missions. Combat and construction engineers worked on airfield and bridge repairs, minesweeps, base camp defenses, aircraft revetments, tactical roads, and land clearing. In I Corps, the 45th Group assigned the 14th Combat Battalion to upgrade five miles of Route 8B to an all-weather two-lane compacted dirt road for the 3d Marine Division, the 39th Combat Battalion to restore an ammunition supply point for the Americal Division, and the 27th Combat Battalion to build a new helicopter hardstand for the 101st Airborne Division at Camp Eagle.

In II Corps, the 937th Group's 20th Combat Battalion stabilized the subbase and base course and added four inches of new asphalt at the Cheo Reo Airfield. Also in the highlands, the 299th Combat Battalion upgraded Route 512 between Dak To and Ben Het to one-lane all-weather capability. The 20th Combat and 84th and 815th Construction Battalions erected high chain-link stand-off fences around tank farms at An Khe, Qui Nhon, and Pleiku. In the Bong Son area, the 19th Combat Engineers repaired artillery gun pads and helipads for the 173d Airborne Brigade. In southern II Corps, the 35th Group directed the 70th Combat Battalion's building of an underground medical bunker at Ban Me Thuot. The 116th Combat Battalion built nine L-shaped and twenty-one parallel aircraft revetments at Phan Thiet, and the 577th and 589th Construction Battalions constructed gun pads, guard towers, and bunkers at firebases. At Nha Trang, the 864th Construction Battalion resurfaced an aircraft ramp.

In III Corps, the 159th Engineer Group (46th, 92d, and 169th Construction and 168th Combat Battalions) improved defenses at base camps, built bridge pier protection systems, and constructed aircraft parking aprons and revetments. A major undertaking by the 169th was the construction of a 3,800-square-foot reinforced-concrete underground tactical operations center for MACV and III Corps headquarters next to the Bien Hoa Air Base. Also in III Corps, the 79th Group's 31st Combat Battalion completed bunkers and defenses for an advisory team at Song Be, and the 554th and 588th Construction Battalions made airfield improvements for the 1st Cavalry and 25th Divisions.

In IV Corps, the 34th Group's 86th Combat Battalion built gunpads for the 9th Division's firebases, and the 36th Construction Battalion improved perimeter defenses at Vinh Long. At Vi Thanh Airfield, the 69th Construction Battalion upgraded the facility to C–130 status, and the 93d Construction Battalion added aircraft revetments at Dong Tam. Also, the 35th Combat Battalion built 96 bunkers, 9 guard towers, and 7 tactical operations centers

[49] Starry, *Mounted Combat*, pp. 154–55; ORLLs, 1 Nov 68–31 Jan 69, 11th Armd Cav Regt, 10 Feb 69, p. 21, and 1 May–31 Jul 1969, 11th Armd Cav Regt, 18 Aug 69, p. 18. Both in Historians files, CMH.

and laid over 15,750 feet of concertina barbed wire at Binh Thuy and Soc Trang base camps.[50]

Combat engineers often formed their own infantry units and ran reconnaissance patrols and small search and clear operations. Such organizations and operations became more prevalent as infantry units withdrew or were committed elsewhere. For instance, the 19th Engineer Battalion endured incessant harassment while working on Highway 1 between Bong Son and Duc Pho. The most serious incident occurred on 22 July 1968 when a convoy of the attached 137th Light Equipment Company was ambushed near Tam Quan, resulting in the deaths of 12 engineers and major damage to vehicles and equipment. During the quarter ending 31 January 1969, the 19th Battalion recorded 202 incidents, including small arms and grenade attacks and mine and booby trap explosions that caused 5 deaths and 31 wounded and damage to vehicles and equipment. Explosives also destroyed twelve culverts, and sappers frequently cut trenches and built barricades of bamboo, wire, and metal along the road. In reaction, the 19th began platoon-size reconnaissance and combat operations, often at night, near base camps. In one instance, the engineer-infantrymen, using night-vision devices, detected an enemy company-size force moving near the perimeter. A call for supporting artillery and fire from a dual 40-mm. "Duster" air defense cannon destroyed the column. In May, during one period of heightened enemy activity, Companies A and D reorganized as infantry to protect work parties and to carry out sweeps, night ambushes, and patrols. One platoon from each company returned to their engineering duties, but the bulk of the two companies continued their infantry role for several months. The battalion continued to carry out infantry missions after moving to the Bao Loc area, where there were no U.S. combat units nearby. Its previous experiences with the enemy on Highway 1 proved valuable for the men of the 19th because they still had to deal with roadblocks, booby traps, ambushes, and sniper fire.[51]

Another notable combat engineer feat in 1969 was the 27th Engineer Battalion's extension of a main supply route deep into the A Shau Valley. Previous expeditions into the valley had found both the enemy and adverse weather almost insurmountable barriers. To retain control permanently would

[50] Ploger, *Army Engineers*, p. 163; Principal Construction Projects, 159th Engr Gp, 1 Feb–15 Apr 69, incl. 6, tab F, Engineer Operational Support in the Republic of Vietnam, 1 Feb–15 Apr 69, incl. 7, OCE Liaison Officer Trip Rpt no. 14. For more on the nondivisional combat engineers during this period from the perspective of their commanders, see Interv, Schlotterbeck with Lt Col James E. Hays, CO, 70th Engr Bn, 26 Oct 69, VNIT 492, CMH; Interv, Schlotterbeck with Lt Col George N. Andrews, CO, 31st Engr Bn, 11 Jan 70, VNIT 573, CMH; and Interv, Col Robert D. Arrington, with Lt Col James E. Caldwell, CO, Company B, 31st Engr Bn, 1985, MHI.

[51] ORLLs, 1 Nov 68–31 Jan 69, 19th Engr Bn, 31 Jan 69, pp. 3, 6, 1 May–31 Jul 69, 19th Engr Bn, 11 Aug 69, pp. 2, 14, and 1 Nov 69–31 Jan 70, 19th Engr Bn, 31 Jan 69, p. 3. All in Historians files, CMH. For more on the 22 July 1968 ambush, see AAR, 13th Mil Hist Det, Ambush of the 137th Engineer Company's Convoy in Binh Dinh Province, 12 Aug 68, VNI 187, CMH. See also Interv, Schlotterbeck with S Sgt Phillip V. Hawkins, S–2 NCO, 19th Engr Bn, 30 Mar 70, VNIT 670, CMH; and Spec. Paul Grieco, "Engineer Groundpounders," *Kysu'* 2 (Summer 1970): 26–28.

require the movement of armor and heavy artillery and a large steady flow of supplies from the 101st Airborne Division's base at Camp Eagle across the coastal plain, through the mountains, and into the valley. Beyond Firebase BASTOGNE, Route 547, which was nothing more than a six- to eight-foot cart trail, proceeded westward thirty miles to the junction with Route 548 near the Ta Bat airstrip. When given the go-ahead, the 45th Engineer Group assigned the road project to the 27th Combat Battalion commanded by Lt. Col. Malcolm D. Johnson and after 26 June by Lt. Col. Stuart Wood. Additional units were attached to help. Besides his four line companies and headquarters company, Johnson controlled all or parts of eight other engineer companies. These included two light equipment companies, a panel bridge company, a land-clearing company, an earthmoving platoon from a construction battalion, and a company and platoon from another combat engineer battalion. A combat engineer company from the South Vietnamese 1st Division also joined the engineer task force. This conglomeration of engineer units, totaling some 1,500 men, was designated Task Force TIGER. Work on the all-weather twelve-foot-wide supply link began in March.[52]

The project, code-named Operation HORACE GREELY, featured nearly every facet of road construction. Daily minesweep teams headed out from the firebases and night defensive positions preceding the roadwork. While the teams were checking for mines, the battalion commander and his operations officer reconnoitered the road by air. Blasting and removal of hundreds of tons of rock were required to widen the roadway in areas that had steep drops of 200 to 300 feet with sheer bluffs rising directly above. Explosives were used to such an extent that Lt. Gen. Richard G. Stilwell, XXIV Corps commander, personally requested more when the engineers exceeded their allocation. The 59th Land Clearing Company did much of the cutting and clearing of vegetation and earthwork. Since the vegetation had been defoliated by chemicals for some time, visibility and safety for the advancing plows was eased. The bulldozers' protective cab covers also reduced the danger of large falling trees. Clearing areas bordering the roadway sometimes dropped off sharply to 60 percent grades. The engineers solved this problem by developing an unusual method of tandem dozing called yo-yo dozing. This method used two bulldozers, one positioned on the roadway as an anchor and the other hooked to the first, rear end to rear end, then lowered over the edge of the slope with its plow pointed straight down to clear a swath through the trees and brush. When the dozer with the plow reached the bottom of the grade, the two dozers reversed their winches and the anchor dozer drew the second dozer back up the grade to begin a new cut. This technique was repeated until the 250-yard strip was cleared. Culverts were assembled in the base camps and transported, dangling by hook and line from CH–47s, to the construction sites. Farther down the

[52] Ploger, *Army Engineers*, p. 152; Interv, Schlotterbeck with Lt Col Stuart Wood Jr., CO, 27th Engr Bn, 15 Jun 70, VNIT 680, pp. 6–7, 17, CMH; ORLL, 1 May–31 July 69, 27th Engr Bn, 7 Aug, 69, pp. 3–4, Historians files, CMH; Zaffiri, *Hamburger Hill*, pp. 47–48.

A CH–47 Chinook helicopter drops off preassembled culvert on Route 547.

road, other elements of Task Force TIGER built a 160-foot panel bridge with concrete abutments and piers over the Song Bo River.[53]

By mid-June, Task Force TIGER reached the juncture with Route 548. By working out of the firebases and night defensive positions and the 101st Airborne Division providing security, the task force steadily pushed west. By 18 June, a small trace had been cut opening the route to small tracked and wheeled vehicles. A month later, the engineers had widened the road to pass tanks. By the end of July, 12.5 of the 18.5 miles between Firebase BASTOGNE and Firebase CANNON had been upgraded to a Class 50 two-lane all-weather road. Three new bridges (a 160-foot Class 60 panel bridge, an 80-foot Class 50 one-lane timber trestle bridge, and a comparable 63-foot timber trestle bridge), ninety-five culverts, and four fording sites complemented the roadwork. Work on the route's remaining section did not get beyond pioneer road status, sufficient for the passage of five-ton trucks. In mid-September, the 101st Airborne Division completed another operation (MONTGOMERY RENDEZVOUS) to deny the enemy access into the valley. Before long, however, the withdrawal of American forces precluded future efforts to keep the North Vietnamese Army out of the A Shau. The 101st Airborne Division pulled back toward the coast, and the engineers ceased further roadwork. Again the allies had to concede control of the valley. When Colonel Wood later checked the road, he found it cut by eighty-six rock

[53] Ploger, *Army Engineers*, pp. 152–53; Interv, Schlotterbeck with Wood, 15 Jun 70, pp. 7–12; ORLL, 1 May–31 Jul 69, 14th Engr Bn, pp. 5–6. See also 1st Lt. J. P. Donahue, "547, The A Shau Expressway," *Kysu'* 1 (Fall 1969): 6–9.

Bridge under construction along Route 547

slides, three serious enough that it would have taken a bulldozer two days to clear.[54]

In 1969, land-clearing operations continued to prove their effectiveness in supporting tactical operations, and land-clearing units increased in size and number. Before December 1968, three land-clearing platoons (or teams at the time) operated in Vietnam, each equipped with thirty Rome plow blades and protective cabs mounted on D7E bulldozers. Two of the platoons were assigned to the 20th Brigade to carry out land-clearing missions for II Field Force, and the third was assigned to the 18th Brigade to support I Field Force. Other engineer units, particularly the divisional battalions, carried out land clearing on a smaller scale. The successful use of modified bulldozers as a tactical weapon spurred tactical commanders to request more units. Engineer leaders agreed that expansion was needed and began programming organizational changes. With only sixty-four men, existing land-clearing teams could do little more than oper-

[54] Interv, Schlotterbeck with Wood, 15 Jun 70, pp. 26–28; ORLL, 1 May–31 Jul 69, 27th Engr Bn, pp. 3–4; ORLLs, 1 May–31 Jul 69, 45th Engr Gp, 31 Jul 69, pp. 2–3, 1 May–31 Jul 69, XXIV Corps, 20 Aug 69, p. 19, and 1 Aug–31 Oct 69, XXIV Corps, 14 Nov 69, pp. 10, 24. ORLLs in Historians files, CMH.

ate the equipment, and their parent units experienced a severe drain on their maintenance capabilities.[55]

Expansion began in December 1968 when the three teams expanded to three companies with the same number of Rome plows and more administrative and maintenance capabilities. One month later, in January 1969, three additional land-clearing companies were activated, bringing the total to six. These were evenly divided between the two brigades, which took different approaches to their command arrangements and locations. The 18th Brigade's area of responsibility encompassed the widespread and restrictive geography of I and II Corps and their road nets. Consequently, it assigned each of its three companies, the 59th, 538th, and 687th, to a group. On the other hand, the 20th Brigade's area of operations included more level expanses in III Corps and road nets adequate for the large convoys of heavy tractor-trailers from a central base to the cutting areas. The assignment of its three companies to an existing battalion seemed the most practical choice. The 62d Construction Battalion based at Long Binh, one of the units programmed for inactivation or personnel cutbacks in 1968, was selected for this purpose. In January 1969, its three lettered construction companies (B, C, and D) were inactivated and replaced by the 60th, 501st, and 984th Land Clearing Companies. Company A, the equipment and maintenance company, was modified for the battalion's new mission. The 62d's authorized personnel strength dropped from 905 to 647, but the actual number hovered around 700, which included many volunteers from the lettered construction companies. Also that month, the brigade reassigned the 62d from the 159th Group to the 79th Group, which directly supported II Field Force operations.[56]

The 62d became the first land-clearing battalion ever to be assembled. Its immediate concerns focused on assigning troops to the right jobs and ensuring an adequate stock of repair parts. Soldiers from the construction battalion were reassigned to suitable specialties or retrained to fill vacancies. Arrangements were made with the 1st Logistical Command to order repair parts to build up stockages. A new commander also arrived. On 13 January, Lt. Col. Valentine E. Carrasco, who guided the battalion's transition from a construction to a land-clearing organization, transferred the colors to Lt. Col. Maximiano R. Janairo. In turn, Colonel Janairo led the new battalion for six months before transferring command to Colonel Driscoll. Driscoll commanded the battalion for a full year instead of the normal six months. When asked why during his end of tour interview, he replied: "I don't know. Nobody told me why it was. When my six months was drawing to a close, I just kept my mouth shut. It could have been that my date was overlooked. It could have been that maybe I had so many skeletons buried in the closet that they didn't feel like foisting them off on someone else." He surmised that the real reason to leave him in

[55] Ploger, *Army Engineers*, p. 99.

[56] Ibid., pp. 99–100; ORLLs, 1 May–31 Jul 68, 62d Engr Bn, 13 Aug 68, p. 2, 1 Feb–30 Apr 69, 62d Engr Bn, 10 May 69, p. 2, and 1 Nov 68–31 Jan 69, 159th Engr Gp, 14 Feb 69, p. 2, all in Historians files, CMH; Land Clearing Battalion Chronology, p. 1, incl. 10 to Rpt, 26th Mil Hist Det, 16 Jul 69, sub: Land Clearing, VNIT 522, CMH.

command was to carry out the training at a critical time for the new South Vietnamese land-clearing companies.[57]

During 1969, the 62d incorporated new procedures and refined land-clearing doctrine. At company level, the key to successful operations was close coordination with its security element. Platoon leaders worked closely with their infantry or armored cavalry escorts. Maintenance, a constant problem because of the wear and tear caused by extended stays in the field and dangerous operating conditions, was improved thanks to a more responsive repair parts system. An authorized float of twenty-seven D7E tractors also compensated for any shortage of repair parts. Heavily cratered areas caused by B–52 strikes added to the many hazards involved in clearing operations, especially after vegetation around the crater grew back. It typically took several hours to retrieve a D7E that had crashed through the vegetation and fallen in. Pulling out the larger D9 bulldozer became a major effort. As for the danger from enemy fire, Colonel Driscoll recalled that a soldier assigned to his battalion had a one in three chance of being a casualty and a two in three chance if he was assigned to a land-clearing company.[58]

The transformation to a land-clearing battalion proceeded quickly and was soon followed by clearing operations. Reorganizing one of the existing teams into the 60th Land Clearing Company was not feasible until the team returned from the field. On 14 January, the 60th deployed for the first time. It cleared two hundred yards on each side of Route 1A between Phuoc Vinh and Dong Xoai as part of the 1st Engineer Battalion's road project. Similarly, the 501st Land Clearing Company deferred its reorganization from a team until it returned from the Trang Bang area where it cut hedgerows and destroyed bunker complexes in support of the 25th Division. In January the new 984th Land Clearing Company began organizing. The number of D7E Rome plows increased from nine to fifteen by the end of the month. By then one platoon was ready and was sent to help the 60th along Route 1A. Later operations bore out the effectiveness of company-size land clearing. The 60th cut nearly 5,000 acres and destroyed forty-five bunkers and fighting positions for the 199th Infantry Brigade in the Gang Toi and Hat Dich areas east of Saigon. During this six-week operation, the 60th lost three D7Es and two men were wounded. In mid-January, the 501st moved to War Zone C in support of the 1st Cavalry Division and cleared over 3,700 acres in two weeks. The 984th cut over 3,000 acres in the Trapezoid area for the 1st Division, but the company lost three D7Es, and thirty-five engineers were wounded.[59]

As 1969 progressed, II Field Force wore down the enemy and pushed him back toward his Cambodian base areas. General Ewell exploited these successes by pushing teams of armored cavalry and Rome plows to open roads

[57] Land Clearing Battalion Chronology, VNIT 522, p. 1; Interv, Schlotterbeck with Driscoll, 22 Jun 70, pp. 4–5 (quoted words).

[58] Land Clearing Battalion Chronology, VNIT 522, p. 8; Interv, Schlotterbeck with Driscoll, 22 Jun 70, pp. 15, 66.

[59] Land Clearing Battalion Chronology, VNIT 522, p. 1; Land Clearing Operations (1 Nov 69–31 Jan 70), pp. 1–2, incl. 16f, OCE Liaison Officer Trip Rpt no. 16. Inclosure 16f also has seven overlays depicting the operations during this period.

in War Zone C. Cuts on each side of the roads were reduced to about fifty yards, which automatically sped up operations fourfold. The 100-yard-plus swath allowed adequate aerial observation and did not unduly expose vehicle to ambushes. Also, instead of completely clearing large areas, the 62d adopted a lane-clearing technique, initially a 1,000-yard-plus lane, which would expose an enemy base area. Again much time was saved, and the lanes were further reduced to a little more than 500 to 600 yards, again increasing the savings. This technique was successfully used south of the Michelin Rubber Plantation and east of the Saigon River. By the end of 1969 and in early 1970, the 62d's three companies had spread out in III Corps taking advantage of the first half of the dry season. They cut large areas for the 1st Infantry and 1st Cavalry Divisions, the 199th Infantry Brigade, and South Vietnamese and Thai forces.[60]

The 18th Engineer Brigade's land-clearing operations met with equal success. Soon after its activation on 1 January 1969, the 59th Land Clearing Company moved north to the 45th Group. It began clearing operations for the 3d Marine Division in "Leatherneck Square" near Dong Ha, where it cleared nearly seven thousand acres in the first full-scale land-clearing operation in I Corps. After a one-week maintenance break, the company cleared another one thousand acres for the marines before joining the 27th Engineer Battalion in Operation HORACE GREELY. Besides the work along Route 547, the 59th cleared sections along Route 548 and other areas near firebases and the A Shau airstrip. Later platoons joined the 14th, 27th, and 39th Engineer Battalions in clearing operations. In northern II Corps, the 937th Group's 35th Land Clearing Team expanded into the 538th Land Clearing Company. It cleared sections along Highways 1 and 14 and Route 6B near Qui Nhon. The 18th Brigade's third land-clearing company, the 687th, was formed from the inactivated 87th Engineer Construction Battalion and attached to the 35th Group. Upon completion of its training, the new company moved to southern II Corps and began clearing operations along Highways 11, 20, and 21A. In April, the 2d Platoon was sent to Qui Nhon to clear the area around the petroleum tank farm. In June, the platoon deployed to I Corps to take part in a Marine Corps operation. Other elements of the 687th completed the clearing of almost seven thousand acres. After a maintenance break, the 687th on 30 October resumed clearing operations along Highway 1 and in the Cam Ranh Bay area. One month later, the company moved to Ban Me Thuot to clear both sides of local Route 1.[61]

Elsewhere, engineers supported clearing operations with ordinary bulldozers, some of which were equipped with Rome plow kits. Using Rome plows to destroy bunker complexes proved much more thorough when compared to the usual method of employing demolitions. Often demolitions only destroyed the beams. The holes remained, and the enemy could easily rebuild the bunker. If the engineers blasted the roof in, the enemy could burrow even deeper

[60] Ewell and Hunt, *Sharpening the Combat Edge*, p. 220; Land Clearing Operations (1 Nov 69–31 Jan 70), pp. 1–2, incl. 16f, OCE Liaison Officer Trip Rpt no. 16.

[61] Smith, *U.S. Marines in Vietnam, 1969*, p. 24; ORLLs, 1 Nov 68–31 Jan 69, 18th Engr Bde, 31 Jan 69, p. 2, 1 Feb–30 Apr 69, 18th Engr Bde, 30 Apr 69, p. 3, 1 May–31 Jul 69, 18th Engr Bde, 31 Jul 69, pp. 3–4, 1 Aug-31 Oct 69, 18th Engr Bde, 31 Oct 69, pp. 3–4, and 1 Nov 69–31 Jan 70, 18th Engr Bde, 31 Jan 70, pp. 2–3. All in Historians files, CMH.

and continue to use the area. On 9 June 1969, the 4th Division dispatched an infantry battalion and two 26-man engineer teams from the division's 4th Engineer Battalion to destroy a large bunker complex in the western highlands. Equipment consisted of two D7E bulldozers mounting Rome plow kits, two D7Es with standard bulldozer blades, one combat engineer vehicle with a bulldozer blade, one M48A3 tank, and a trailer-mounted air compressor. The D7Es, especially those with the Rome plow blades, could rip off the tops of bunkers, fill in the holes, and clear the area of vegetation. The combat engineer vehicle and tank provided additional security. During the clearing operation, the compressor blew out the bulldozers' radiators three or four times a day to remove dirt and debris churned up while stripping the jungle. Working closely with the infantry companies, the teams destroyed 1,350 bunkers and cleared potential landing zones. Another method of land clearing was the continued use of anchor chains dragged by a team of two bulldozers. A third D7E followed the chain to help clear excessive debris collected in front of the chain. The 65th Engineer Battalion, 25th Division, complemented the 62d Land Clearing Battalion's work by using this method. Using six D7Es, the 65th daily knocked down an average of 125 acres of trees from four to eight or twelve inches in diameter.[62]

In the delta, with its inundated rice paddies and poor drainage, Rome plows had been considered impractical until, early in 1969, a joint U.S. and Vietnamese Army engineer operation changed that view. One Viet Cong-dominated area between Sa Dec, Vinh Long, and Can Tho, excluding segments next to Highway 4, became known as the Y base area because of its canal network. Rice paddies covered 80 percent of the Y, the rest being cultivated wood lines. Four main canals formed the Y with many others interspersed throughout the area. Thick vegetation around the canals provided the enemy cover and concealment. Removing this vegetation became the major objective in destroying this sanctuary. The area was considered too large for hand clearing, and it was decided to try the Rome plows. After the South Vietnamese infantry cleared out enemy main force units, an infantry security force and the South Vietnamese 9th Engineer Battalion, 9th Infantry Division, moved in by land. Simultaneously, the U.S. 595th Light Equipment Company arrived by water in landing craft. Conventional blade D7E bulldozers built a dirt access road parallel to the main canal far enough to cover a day's land clearing. Underbrush was also cleared some thirty to fifty yards from the canal. From this road, perpendicular branches were extended out to the paddy land to provide access for the Rome plows. This pattern was repeated, the bulldozers building the roads and the Rome plows cutting the trees. Not all the wood line could be cut, and chain and hand saws were used to cut the remaining trees. During the initial thirty-seven-day period, three Rome plows from the company's land-clearing detachment cut five miles along both sides of one canal. Over the

[62] MACV Combat Experiences 4–69, MACJ3-053, 3 Nov 69, sec. 1, pp. 1–11, Historians files, CMH; Capt. Robert A. Adams, "Anchor Chain Land Clearing," *Military Engineer* 63 (July-August 1971): 259. See also Capt. David R. Fabian, "Bunker-busting Operation," Military Engineer Field Notes, *Military Engineer* 62 (March-April 1970): 102–03.

next seventy-five days, another 1,833 acres were cleared, linking the northern secure areas with those in the south. The detachment also destroyed over two thousand bunkers along with living areas and a small hospital and captured large quantities of ammunition, equipment, and documents. It succeeded in removing all traces of enemy activity in a fifty-square-mile area. During the operation, the small U.S. contingent suffered nearly 50 percent casualties, and mines disabled one-half of the bulldozers.[63]

At times Army and Marine land clearers pooled their Rome plows into provisional organizations in support of operations. In June, the 2d Platoon of the 687th Land Clearing Company moved to I Corps to take part in the 1st Marine Division's Operation PIPESTONE CANYON, joining personnel and equipment from the 7th and 9th Marine Engineer Battalions to form a provisional land-clearing company operating under the control of the III Marine Amphibious Force. PIPESTONE CANYON took place in two notorious areas, Dodge City and Go Noi Island, approximately six to twelve miles south of Da Nang and four to twelve miles west of Hoi An. For several years, the Viet Cong and North Vietnamese had used both areas as havens and staging areas for attacks into the coastal lowlands and on Da Nang. During the 164-day operation, the combined force transformed Go Noi Island from a densely vegetated tract to a cleared area free of tree lines and other cover long used by the enemy to conceal his movement across the island. Nearly twelve thousand acres were cleared before the platoon rejoined the 687th at Phan Thiet on 1 September. In August, a provisional land-clearing platoon from the 39th Engineer Combat Battalion joined the 9th Marine Engineer Battalion to clear areas for the 1st Marine and Americal Divisions. One operation swept across an enemy staging area known as Barrier Island about twelve miles south of Da Nang. A joint operation, this effort included an amphibious landing on the seaward side of the island with security provided by South Korean Marines. Another operation cleared a coastal area just north of Duc Pho. In late November, the platoon returned to the battalion's base at Chu Lai for maintenance, and fifteen days later made another amphibious landing along the coast just south of Da Nang. After clearing more than two thousand acres, the platoon returned to Chu Lai on 31 December.[64]

The cumulative effects of land-clearing operations in Vietnam had a decided impact on the enemy. He increasingly had to adjust to the disappearance of his base areas and the unveiling of his trails. Land clearing enabled friendly forces to observe, shoot, and move through hundreds of thousands of acres of territory he considered his domain. Land clearing also went hand in hand with pacification. Traffic flowed on hundreds of miles of roads made safer by pushing back the jungle growth that had provided excellent concealment. Newly cleared land

[63] Capt. Stephen E. Draper, "Land Clearing in the Delta," *Military Engineer* 63 (July-August 1971): 257–59.

[64] MACV History, 1969, vol. 1, p. V-58; ORLLs, 1 May–31 Jul 69, 18th Engr Bde, p. 3, 1 Aug–31 Oct 69, 18th Engr Bde, p. 3, 1 May–31 Jul 69, 45th Engr Gp, p. 3, and 1 Nov 69–31 Jan 70, 39th Engr Bn (Cbt), 31 Jan 70, pp. 1–3, 13, all in Historians files, CMH; Smith, *U.S. Marines in Vietnam, 1969*, pp. 174–87, 270; 1st Lt. J. P. Donahue, "The Clearing of Barrier Island," *Kysu'* 2 (Spring 1970): 26–28.

also had the potential for agriculture and settlement. The tactical effectiveness of the Rome plows continued in 1970 as preparations were being made to deprive the North Vietnamese Army from the immunity of retreat into sanctuaries long extant in Cambodia.[65]

[65] Ploger, *Army Engineers*, p. 103.

15

Year of Cambodia, 1970

During 1970, American policy stayed on course as U.S. forces hastened their withdrawal from Vietnam. For the most part, military operations were characterized by dispersed and highly mobile spoiling attacks, geared to exploiting progress in Vietnamization and pacification. But though the withdrawal proceeded rapidly, the war also took a dramatic upswing with a multidivision operation into Cambodia during the spring.

The redeployments in 1970 took place in three increments. At the beginning of the year, U.S. ground elements included some 330,000 soldiers and 55,000 marines out of a total U.S. force of 475,000. By 15 April, however, the 1st Division, the 3d Brigade of the 4th Division, a Marine Corps regimental landing team, and an Air Force fighter group had departed. As of 15 October, the 3d Brigade of the 9th Division, the 199th Light Infantry Brigade, another Marine Corps regimental landing team, and three Seabee battalions had gone. By the end of December, the rest of the 4th Division and two of the three brigades of the 25th Division returned to the United States. When 1970 ended, U.S. troop strength had dropped to 335,000, including 250,000 soldiers and 25,000 marines.[1]

More U.S. Army engineers also left, but this hardly lessened their workload, and the engineers organized accordingly. The engineer command structure under U.S. Army, Vietnam, which had reached a peak strength of 33,000 in 1969, dropped to about 22,000 by the end of 1970. By then the six engineer groups had dropped to five and the twenty-four battalions to twenty. Inevitably, the command reorganized, as the USARV Engineer and the U.S. Army Engineer Construction Agency consolidated.[2]

Engineer Consolidation

The policy of entrusting to one senior Army engineer the dual responsibilities of USARV staff engineer and command of all Army engineer units that were not organic to other commands had continued since the early days of the buildup. After April 1968, the engineer's dual role titles were Commanding General, Engineer Troops, Vietnam (Provisional), and USARV Engineer. The Engineer Troops, Vietnam, consisted of three subordinate commands—the 18th and 20th Engineer Brigades and the construction agency. Under this

[1] MACV History, 1970, vol. 1, pp. I-5, IV-7.

[2] Military Personnel Strength Summary, incl. 6A, OCE Liaison Officer Trip Rpt no. 18, 2 Nov 70, OCE Hist Ofc; ORLLs, 1 Nov 70–29 Apr 71, 18th Engr Bde, 30 Apr 71, p. 2, and 1 Nov 70–15 Apr 71, 20th Engr Bde, 25 Apr 71, p. 3, both ORLLs in Historians files, CMH.

organization, the two brigades commanded all nondivisional engineer combat and construction units while the construction agency centralized control over the Army's construction program and facilities engineering.[3]

In October 1969, USARV headquarters directed its major commands, including the engineers, to start consolidating or eliminating headquarters. The engineers considered several options before deciding to combine the headquarters of the Engineer Troops/USARV Engineer with the Engineer Construction Agency into a new consolidated engineer command and staff headquarters. The consolidation made sense. The Engineer Troops/USARV Engineer and the construction agency were located at Long Binh. There was already overlap and duplication of functions between the USARV Engineer's Facilities Engineering Division and the construction agency's Real Property Management and Real Estate Divisions. There was also uncertainty over responsibility for staff supervision and control and management of troop construction projects between the USARV Engineer's Construction Division and the construction agency's Engineering Division. The USARV Engineer did not have the technical engineering capability to review construction requests, contractor designs, and to do its own designs. This capability existed only in the construction agency's Engineering Division. Finally, the loss of twenty-three spaces in the USARV Engineer required some internal reorganization, and the planners anticipated that more personnel savings would be possible if the headquarters of the Engineer Troops/USARV Engineer and the Engineer Construction Agency were consolidated.[4]

The organization of the new U.S. Army Engineer Command, Vietnam (Provisional), received USARV approval on 7 January 1970 and was formalized as a command on 1 February. General Dillard, the commander, continued to serve concurrently as the USARV Engineer. The Engineer Command staff functioned as the USARV Engineer staff, and consisted of the Directorate of Construction, Directorate of Facilities Engineering, Military Operations Division, Materiel Division, and administrative and special staff offices. With the consolidation of the construction agency as part of the Engineer Command's staff, two major subordinate commands remained, the 18th and 20th Brigades. The authorized strength of the Engineer Command stood at over 26,000 men, making it the second largest subordinate element of USARV after the 1st Logistical Command. General Tarbox, formerly commanding general of the construction agency, became the deputy commander and the deputy USARV engineer.[5]

[3] Ploger, *Army Engineers*, p. 179.

[4] Debriefing, Parker, 14 Oct 69, p. 7, Senior Officer Debriefing Program, DA, Historians files, CMH; Interv, OCE Hist Ofc with Maj Gen David S. Parker, 7 Jan 85, pp. 271–72, OCE Hist Ofc; Memo, Maj Gen David S. Parker for OCE Hist Ofc, Dec 1977, pp. 2–3, Historians files, CMH; Briefing, USARV Engineer Reorganization, n.d., incl. 14P, pp. 1, 4–8, 10–11, OCE Liaison Officer Trip Rpt no. 16. See also Briefing, USARV Engineer, 7 Jan 70, Historians files, CMH.

[5] Briefing, USARV Engineer Reorganization, incl. 14P, pp. 11–14, OCE Liaison Officer Trip Rpt no. 16; "Engineer Command Reorganized," *Castle Courier*, 9 February 1970, p. 3. See also Ltr, Lt Gen Frank T. Mildren, AVHEN, to CG, USAECV(P), sub: Letter of Instruction (LOI), 17 Feb 70, incl. 14J, OCE Liaison Officer Trip Rpt no. 16.

General Dillard

Two new positions, the Director of Construction and the Director of Facilities Engineering, were established. Colonels occupied both, and they directed two of the command's most pressing missions, the highway program and facilities engineering services involving base transfers and closures. The Director of Construction oversaw several components carrying out the Army's construction program. The Engineering Division planned, programmed, and designed the Army's construction and highway improvement projects in Vietnam, and the Construction Division supervised and coordinated the accomplishment of these projects. Also, the Director of Construction's Electrical Systems Office managed the Army's high-voltage program in Vietnam. Both divisions maintained close ties and coordinated RMK-BRJ's army construction projects with the Navy's Officer in Charge of Construction. The Director of Facilities Engineering supervised the Real Estate Division, the Installations Division, and three District Engineer offices. Through its local area offices, the Real Estate Division managed over 1,100 land-use concurrences with the Vietnamese government and over 400 leases totaling about $19 million a year. In 1970, the only Women's Army Corps officer authorized to wear the Corps of Engineers insignia, Lt. Col. Margaret M. Jebb, served as deputy chief of the Real Estate Division. Coordination and supervision of the Pacific Architects and Engineers' facilities engineering contract, now amounting to about $100 million per year, came under the Installations Division. Similarly, the division supervised the high-voltage power operation contract with Vinnell Corporation. In addition, the Installations Division inherited the Base Development Branch, formerly in the construction agency's Engineering Division. Though emphasis on base development had declined, the branch played a key role in base transfers and new requirements when U.S. forces moved from one base to another. The engineer districts remained much as they were under the construction agency except the Greater Saigon Engineer District, now incorporated into the Southern Engineer District. This district had its headquarters in Saigon and oversaw all U.S. Army installations in III and IV Corps. The Central Engineer District at Cam Ranh Bay carried out the same role in II Corps, as did the Northern District at Da Nang for I Corps.[6]

[6] Briefing, USARV Engineer Reorganization, incl. 14P, pp. 11–14, OCE Liaison Officer Trip Report no. 16; "Engineer Command Reorganized," p. 3; Spec. Larry Crabtree, "Only WAC Wearing Engineer Brass Receives Ph.D. of Philosophy," *Castle Courier*, 13 July 1970.

The Military Operations Division and Materiel Division, also headed by colonels, made up the third and fourth major staff elements. The Military Operations Division handled a wide range of operational functions, including coordinating engineer support for tactical operations and preparing plans for the disposition of engineer forces and contingency plans. It served as the central agency for all USARV mine and countermine activities and carried out mapping and intelligence missions. This division also had the responsibility for all USARV engineer activities related to Vietnamization and the training of South Vietnamese Army engineer units. Finally, the Materiel Division coordinated the movement and distribution of all engineer equipment and construction materials with other USARV staff agencies and engineer units.[7]

General Dillard believed in the reorganization. On 23 February, he wrote to General Clarke, Chief of Engineers, noting improved responsiveness and control over the command's programs and improvement in morale. The reorganized engineer command and staff arrangement was even serving as a model for the consolidation of the 1st Logistical Command and the USARV logistical staff. His main concern about the proposed logistical reorganization was the possibility that his command would be placed under a deputy commanding general for logistics. This was an old worry of engineers because Army doctrine had in the past called for engineer construction commands to operate in rear areas under the theater army logistical commands. Although he and Clarke preferred to be entirely separate or included in the operational chain, both senior engineers did not foresee any problems or lack of responsiveness in operating this way. Anyhow, the engineer command and staff structure continued to operate as a major staff agency and major command within U.S. Army, Vietnam. Within six months, the provisional command received Department of the Army approval as a table of distribution organization.[8]

Toward the Sanctuaries

For years the North Vietnamese and Viet Cong had taken advantage of sanctuary in Laos and Cambodia, where refitting, resupplying, and training could be carried out without interference. These staging areas and supply points continued to pose a danger to South Vietnam, especially the large base areas and support depots within short striking distance of Saigon. As the North Vietnamese and Viet Cong increased their hold over the Cambodian border region, it became increasingly clear to American officials that, despite his currently reduced strategy of small-scale attacks, the enemy could stage from these bases to launch an invasion after the Americans withdrew.[9]

[7] Briefing, USARV Engineer Reorganization, incl. 14P, p. 13, OCE Liaison Officer Trip Report no. 16; "Engineer Command Reorganized," p. 3.

[8] Ltr, Maj Gen John A. B. Dillard, CG, Engr Cmd and USARV Engr, to Maj Gen Frederick Clarke, Ch Engr, 23 Feb 70; Ltr, Clarke to Dillard, ENGME-P, 20 Mar 70, both in Historians files, CMH; FM 5–1, *Engineer Troop Organizations and Operations*, September 1965, p. 1–2; Interv, Capt David D. Christensen, 26th Mil Hist Det, with Maj Gen Charles C. Noble, CG, USAECV, 25 Jul 71, VNIT 919, p. 7, CMH.

[9] MACV History, 1970, vol. 1, p. III-77; Davidson, *Vietnam at War*, p. 623; Stanton, *Rise and Fall of an American Army*, p. 336.

Allied operations after the Tet offensive of 1968 had destroyed many of the enemy bases in South Vietnam, making the sanctuaries even more critical to Hanoi. By early 1969, the enemy was sortieing regularly from the cross-border redoubts. These forays were typically preceded by logistical buildups inside Vietnam, which General Abrams called a logistical nose. The allied countertactic was to cut off this logistical nose and thus frustrate the attack that was intended to follow. A variety of forces were deployed to prevent these buildups and to seal the borders of South Vietnam. The 1st Cavalry Division and its engineers were at the forefront of this campaign.[10]

Beginning in the fall of 1968, the 1st Cavalry Division had positioned most of its combat units along the Cambodian border. The division assumed responsibility along an arc some ninety miles wide and thirty miles deep. The division's area of responsibility comprised the provinces of Phuoc Long, Binh Long, Tay Ninh, and Binh Duong and straddled the enemy's lines of communication leading southward from the border to Saigon. As the 1st Division redeployed from Vietnam, the 1st Cavalry Division moved in, setting up operations, working with local Vietnamese forces, and learning about the enemy. The North Vietnamese and Viet Cong attempted to reestablish their logistical system, with the aim of repeating the attacks of Tet 1968. Throughout 1969, the 1st Cavalry Division fought a series of skirmishes along these supply lines, thwarting strong North Vietnamese forces attempting to position themselves closer to the capital. Although enemy attempts in the early months of 1970 were weaker, he still tried to operate in force in these critical areas. In several instances, the cavalrymen uncovered base camps and fair-sized caches. Apparently, cutting the trails was causing a backlog of supplies in Cambodia. This was an ideal time to strike at the Cambodian supply base.[11]

The 1st Cavalry Division's 8th Engineer Battalion continued to improve base camps and support tactical operations. Battalion headquarters and headquarters company joined the division headquarters at Phuoc Vinh; Company A at Tay Ninh supported the 1st Brigade; Company B helped the division settle in at Phuoc Vinh then moved to Lai Khe with the 2d Brigade; and Company C supported the 3d Brigade at Quan Loi. In the field, the battalion concentrated on building and upgrading landing zones and firebases, improving base defenses, and giving minesweep and demolition support to the infantry battalions. As the division uncovered enemy supply caches, the engineers stored and distributed captured rice to nearby villages.[12]

As in the past, the 20th Engineer Brigade's 79th Engineer Group reinforced the divisional engineers in III Corps north and west of Saigon. Much of the priority work went to improving the forward airfields, main supply

[10] Starry, *Mounted Combat*, pp. 138–39.

[11] Tolson, *Airmobility*, pp. 218–20; *Memoirs of the First Team*, p. 42. For more on the 1st Cavalry Division's operations along the Cambodian border, see J. D. Coleman, *Incursion* (New York: St. Martin's Press, 1991) pp. 34–211; Keith William Nolan, *Into Cambodia: Spring Campaign, Summer Offensive, 1970* (Novato, Calif.: Presidio Press, 1990), pp. 3–65; Shelby L. Stanton, *Anatomy of a Division: The 1st Cav in Vietnam* (Novato, Calif.: Presidio Press, 1987), pp. 158–77.

[12] *Memoirs of the First Team*, pp. 184–85.

routes, and base camps. The 31st Engineer Combat Battalion with the help of the 557th Light Equipment Company completed the resurfacing of the Phuoc Vinh airfield and built helicopter and fixed-wing revetments at Phuoc Vinh and Song Be. Work at the Phuoc Vinh airfield involved removing the M8A1 matting, preparing the base course, putting down a twelve-inch layer of soil-cement, and topping that off with a three-inch layer of asphaltic concrete. With the additional 400 feet of runway, the field was upgraded to a 4,100-foot Type II C–130 airfield. Upon completion of this work in February 1970, the battalion shifted to upgrading taxiways and parking ramps. Vertical construction involved building a new sixty-foot control tower, a helicopter refueling point, and other facilities for the 1st Cavalry Division. The 31st also upgraded several forward airstrips scattered across northern III Corps, including the strips at Tong Le Chon, Katum, Bu Dop, Dong Xoai, and Loc Ninh Special Forces camps. The 588th Engineer Battalion, which included the 362d Light Equipment and the 544th Construction Support Companies, covered some 6,400 square miles and maintained 110 miles of roads. Other support for the 1st Cavalry and 25th Divisions included building new or improving artillery gun pads, aircraft revetments, bunkers, air control and counter-mortar fire towers, and clearing fields of fire. In the Lai Khe area, the 168th Engineer Combat Battalion concentrated on operational support and base camp construction for the 1st Division. Elements of the battalion supported the 1st Cavalry Division at Quan Loi and Phuoc Vinh, where one platoon began work on the foundation and floor for a hangar being moved from Blackhorse. In September 1969, when enemy forces were detected approaching Lai Khe, the battalion served as a base defense force under the 1st Division. The 168th departed Vietnam about the same time as the 1st Division in April 1970.[13]

As the 79th Group's only construction battalion, the 554th Engineer Battalion was committed to base construction and highway improvement work. Most of this effort took place at the 25th Division's Cu Chi camp and along Highways 1 and 22. At Cu Chi, improvements included building bunkers and revetments for the 12th Evacuation Hospital. Working with Pacific Architects and Engineers, the 554th also reconstructed a concrete and asphalt helipad for the hospital's medical evacuation helicopters. Another job involved paving interior roads at the base. In late 1969, the 554th began shifting operations to Lai Khe and Highway 13 upgrading.[14]

The overthrow of the Cambodian chief of state, Prince Norodom Sihanouk, in March 1970 hastened the events leading to the U.S. attack into Cambodia. Sihanouk's successor, Prime Minister Lon Nol immediately demanded that the North Vietnamese and Viet Cong leave Cambodia,

[13] Annual Hist Sum, Aug 69–Sep 70, 31st Engr Bn, pp. 6–7; ORLL, 1 Feb–30 Apr 70, 31st Engr Bn, 9 May 70, pp. 5–9; ORLLs, 1 Feb–30 Apr 69, 588th Engr Bn, 14 May 69, pp. 1–2, 1 May–31 Jul 69, 14 Aug 69, 588th Engr Bn, pp. 1–2, 1 Nov 69–31 Jan 70, 588th Engr Bn, 15 Feb 70, pp. 1–2, 1 May–31 Jul 69, 168th Engr Bn, 11 Aug 69, pp. 2, 4–8, and 1 Aug–31 Oct 69, 7 Nov 69, 168th Engr Bn, pp. 2, 4–11, all in Historians files, CMH.

[14] ORLLs, 1 May–31 Jul 69, 554th Engr Bn, n.d., pp. 2, 4–9, 1 Aug–31 Oct 69, 554th Engr Bn, 14 Nov 69, pp. 2, 4–7, 1 Nov 69–31 Jan 70, 554th Engr Bn, 14 Feb 70, pp. 2, 3–5, and 1 Feb–30 Apr 70, 554th Engr Bn, 14 May 70, pp. 2, 4–7, all in Historians files, CMH.

and threatened to block the flow of supplies coming by sea through the port of Sihanoukville. Almost at once, the North Vietnamese Army and *Khmer Rouge* (the Communist insurgents in Cambodia) launched attacks in the Cambodian border areas to retain control over all routes leading to their bases. The small, inexperienced Cambodian Army was no match for the North Vietnamese, who drove west and threatened the capital, Phnom Penh. It became evident that without outside help, Lon Nol and his pro-Western government would be overthrown, the port of Sihanoukville would be reopened to the Communists, and all of Cambodia could become a major base area outflanking allied forces in South Vietnam. The collapse of Cambodia would be a disastrous blow to South Vietnamese hopes for survival, imperil the time needed to complete Vietnamization, and jeopardize the safe withdrawal of U.S. forces.[15]

Lon Nol's appeal for help prompted the South Vietnamese to mount large-scale operations across the border. In mid-April, III Corps units launched Operation TOAN THANG (TOTAL VICTORY) 41, a three-day thrust into the Angel's Wing area of Cambodia, a key stronghold west of Saigon. Because U.S. forces were not allowed in Cambodia, American advisers stayed behind, although a brigade of the U.S. 25th Division supported the operation by screening the border. Before the end of the month, the South Vietnamese launched two short thrusts into Cambodia from IV Corps, basically confidence builders for the South Vietnamese Army. Although the allies declared the attacks a success, the North Vietnamese avoided contact and knew about the operations in advance. The short durations of the operations prevented a careful search of the base areas.[16]

Although U.S. engineers did not accompany the South Vietnamese across the border, they lent considerable help. In preparation for TOAN THANG 41, III Corps engineer advisers arranged with the 20th Brigade to provide forty complete M4T6 floats, cranes, and bridge boats on 30 March to an assembly area near Go Dau Ha. Elements of the South Vietnamese 30th Group assembled the raft sections, which were then transported by CH–54s to the Ben Soi Bridge site west of Tay Ninh. Other 30th Group engineers launched the sections into the Vam Co Dong River and connected them into a floating bridge, which was completed the following day. A 600-foot access road and a 90-foot panel bridge leading to the floating bridge were also built by 30th Group engineers. In early April, the group's 303d Combat Battalion built a M4T6 dry span and

[15] Davidson, *Vietnam at War*, pp. 624–25; Palmer, *25-Year War*, pp. 98–99. See also, MACV History, 1970, vol. 3, pp. C-1 to C-13; Brig. Gen. Tran Dinh Tho, *The Cambodian Incursion*, Indochina Monographs (Washington, D.C.: U.S. Army Center of Military History, 1979), pp. 1–17, 29–32; Starry, *Mounted Combat*, pp. 166–67; Lt. Gen. Sak Sutsakhan, *The Khmer Republic at War and the Final Collapse*, Indochina Monographs (Washington, D.C.: U.S. Army Center of Military History, 1980), pp. 32–83.

[16] Davidson, *Vietnam at War*, p. 625; Palmer, *25-Year War*, p. 99; Starry, *Mounted Combat*, pp. 167–68. For more on the South Vietnamese reaction and April cross-border operations, see Tho, *Cambodian Incursion*, pp. 32–50. See also MACV History, 1970, vol. 3, pp. C-14 to C-35; Rpt, Opn TOAN THANG 41, 14–17 Apr 70, U.S. Army Advisory Gp, III Corps, 7 Jun 70, Historians files, CMH.

a panel bridge along the approaches to the Angel's Wing. As the operation neared, the III Corps Engineer on 10 April asked the 20th Brigade to provide three 45-foot M4T6 dry spans. Four days later, another request asked for 200 feet of 24-inch culvert. The 20th Brigade did not have this size culvert in stock, but supply personnel found the required size and amount in the 25th Division's 65th Engineer Battalion and delivered it to Go Dau Ha that night. Early planning called for the dry spans to be assembled at Go Dau Ha and lifted by CH–54s, but weather and other problems prevented using the helicopters. Two of the bridges were loaded on trucks and the third was partially assembled so that it could be lifted by a Chinook on the morning of 14 April if required. During TOAN THANG 41, the 30th Group attached a platoon from the 301st and 303d Combat Battalions to each of the three attacking South Vietnamese task forces and assigned one company from the 301st in general support. One task force also had an attached platoon of engineers from the South Vietnamese 25th Division's 25th Engineer Battalion. Other work done by the 30th Group included opening and keeping open the main supply route between Bien Hoa and the Cambodian border and maintaining roads on the Vietnamese side of the border. On the Cambodian side, the South Vietnamese installed dry spans and one culvert and found the roads to be in good condition, although overgrown with grass in places. As for the Vietnamese engineer effort, the III Corps advisory group's report of the operation succinctly noted: "Planning was timely and complete. Advance preparation prevented delays in execution. Provision was made to cope with any contingencies. Execution was aggressive and effective."[17]

Main Attacks

Meanwhile, President Nixon and his advisers concluded that U.S. forces would have to intervene in Cambodia to ensure the success of the South Vietnamese raids. On 28 April, Nixon made the decision to send U.S. forces across the border in combined operations with the South Vietnamese. The objectives were to relieve pressure on the ragtag Cambodian Army, to destroy supplies and enemy troops in the base areas, and to seize the elusive enemy headquarters for southern Vietnam, *COSVN*. The main attack consisted of operations by South Vietnamese forces from III and IV Corps and by elements of II Field Force. Weather was a major concern, for the monsoon season would begin in late May. Good weather conditions were expected in early May, and the area chosen for the first attack was flat, with few natural obstacles to cross-country movement. For the Americans, timing and distance were critical factors. To allay the expected outcry in the United States, the Americans would be in and out of Cambodia by the end of June. Nixon also limited the U.S. invasion to no more than thirty kilometers (eighteen and a half miles) into Cambodia.[18]

[17] Tho, *Cambodian Incursion*, p. 48; Rpt, Opn TOAN THANG 41, pp. 7-1 to 7-2.

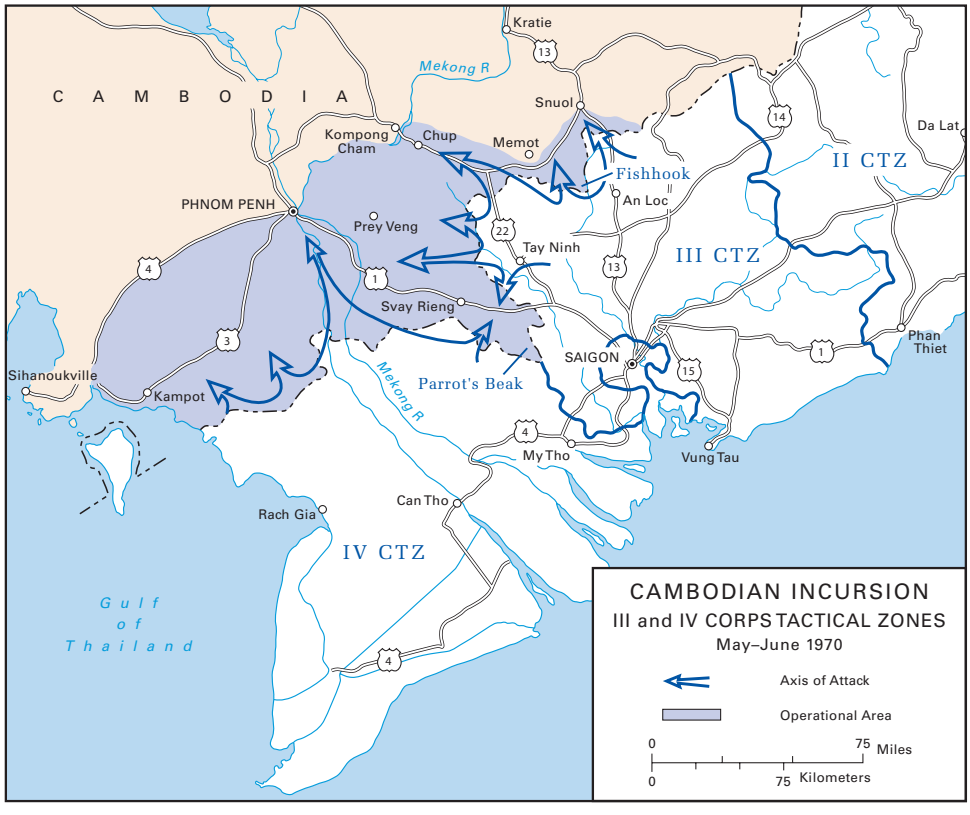
[18] Davidson, *Vietnam at War*, p. 625–26; Palmer, *25-Year War*, p. 99–100; Starry, *Mounted Combat*, pp. 168, 178; MACV History, 1970, vol. 3, p. C-32. For an overview and operational

The major South Vietnamese part of the offensive, Operation TOAN THANG 42 (also called ROCKCRUSHER), began on the morning of 29 April when III Corps forces entered Cambodia's Svay Rieng Province. The mission included opening and securing Highway 1 to allow the evacuation of Vietnamese refugees and to help the Cambodian Army regain control of its territory. Three South Vietnamese infantry-armor task forces moved south and west in the Angel's Wing, meeting stubborn resistance as the Viet Cong and North Vietnamese attempted to remove supplies and equipment. Nonetheless, the South Vietnamese quickly seized the first objectives and, on 1 May, swept past the provincial capital of Svay Rieng, opening Highway 1 east to Vietnam. South Vietnamese helicopters quickly moved captured troops and materiel back across the border, while larger caches were guarded, pending removal, or destroyed. TOAN THANG 42 evolved into several phases as forces attacked south into the Parrot's Beak, and the advance continued westward along Highway 1 to clear the southern part of Svay Rieng. On 3 May, III Corps forces linked up with IV Corps units advancing from the south. After seizing more weapon and supply caches, the South Vietnamese advanced west toward Phnom Penh, opening the road for Vietnamese residents who wanted to flee Cambodia. Other forces attacked north to the Chup Rubber Plantation near Kompong Cham, a provincial capital located on the Mekong River twenty-one miles northeast of Phnon Penh, and west from Vietnam along Highway 7. U.S. ground participation involved sending elements of the 3d Brigade, 9th Division, into the Parrot's Beak not far from its area of operations in Long An Province.[19]

While the South Vietnamese were busy in the Angel's Wing, the TOAN THANG 43 attack started at dawn on 1 May into the Fishhook area of Cambodia. To spearhead the attack, Lt. Gen. Michael S. Davison, the II Field Force commander, put together a highly mobile force around the 1st Cavalry Division. All together, about 12,000 Americans and nearly 5,000 South Vietnamese formed the assault echelons, making the Cambodian incursion the biggest operation since JUNCTION CITY in 1967. This force, commanded by Brig. Gen. Robert L. Shoemaker of the 1st Cavalry Division, included for its airmobile elements the 3d Brigade, 1st Cavalry Division, and the South Vietnamese 3d Airborne Brigade. The 11th Armored Cavalry Regiment; the 2d Battalion, 34th Armor, of the 25th Division; the 2d Battalion (Mechanized), 47th Infantry of the 9th Division; and the South Vietnamese 1st Cavalry Regiment provided ground reconnaissance and assault capabilities. Following intensive B–52 and tactical air and artillery strikes, the airborne brigade air-assaulted into an area north of the Fishhook to seal off escape routes. As air cavalry screened to the north, American armor and mechanized infantry, meeting some resistance, advanced across the border from

summaries of the Cambodian Incursion in III and IV Corps, see MACV History, 1970, vol. 3, pp. C-35 to C-86, C-93 to C-97; II FFV Commander's Evaluation Report, Cambodian Operation, 31 Jul 70, Incl to ORLL, 1 May–31 Jul 70, II FFV, 14 Aug 70, Historians files, CMH.

[19] Starry, *Mounted Combat*, pp. 167–68, 176–77; Tho, *Cambodian Incursion*, pp. 51–70, 83–90, 127. For more on the 3d Brigade, 9th Division's participation, see AAR, Opn TOAN THANG 500, 3d Bde, 9th Inf Div, 3 Jun 70, Historians files, CMH.



Map 28

the south toward the suspected location of *COSVN*, hoping to envelope the enemy flank to the west. All first-day objectives were taken by dark.[20] (*Map 28*)

Task Force Shoemaker advanced steadily over the next few days. On 2 May, the armored column cut the road east of Memot and linked up with the South Vietnamese airborne forces. The following day, elements of the 1st Cavalry Division's 2d Brigade reinforced the task force. North Vietnamese forces avoided contact, sprinkling the roads with antitank mines. They left behind fully stocked depots as the allies probed their positions and uncovered caches. By early afternoon on the fourth, the 11th Armored Cavalry broke out of the jungle. The armored column proceeded north twenty-five miles through large rubber plantations using Highway 7 as the axis of advance toward Snuol and its important road junction. After taking Snuol on 5 May, the cavalrymen discovered an improved road, large enough for trucks and

[20] Starry, *Mounted Combat*, pp. 170–71; Tho, *Cambodian Incursion*, pp. 70–75; Palmer, *Summons of the Trumpet*, pp. 233–34; Tolson, *Airmobility*, pp. 222–24. For more on the operation, including day-to-day events, see AAR, Cambodian Campaign, 1st Cav Div, 18 Jul 70; AAR, Opn Dong Tien II and Toan Thang 43, 11th Armd Cav Regt, 9 Dec 70, both in Historians files, CMH. See also Coleman, *Incursion*, pp. 234–48; Nolan, *Into Cambodia*, pp. 85–183.

An armored vehicle launched bridge being emplaced in the Fishhook area of Cambodia

carefully hidden under the jungle canopy. Advancing along this road they found and destroyed an abandoned truck convoy laden with supplies. Snuol turned out to be the hub of an extensive logistical operation. It included a fully equipped motor park, complete with grease racks and spare parts, and a large storage area containing tank gun ammunition. When President Nixon on 7 May proclaimed the cross-border operation a success and said that U.S. troops would be withdrawn from Cambodia by 30 June, the search efforts intensified.[21]

On 5 May, the 1st Cavalry Division dissolved Task Force SHOEMAKER and took direct control of TOAN THANG 43. During the period 6 to 13 May, 1st Cavalry Division troopers found a huge complex dubbed the City. The City covered about one square mile consisting of a well-organized storage depot capable of receiving and issuing large quantities of supplies. Most of the storage bunkers contained large quantities of weapons and munitions. Storage bunkers held clothing, food stocks, and medical supplies. The large number of mess halls and training facilities showed that the complex was also used to

[21] Starry, *Mounted Combat*, pp. 172–74; Tho, *Cambodian Incursion*, pp. 74–76; Tolson, *Airmobility*, pp. 224–25.

Soldiers of the 1st Cavalry Division uncovered the huge complex known as the City.

provide refresher military and political training to recent replacements from North Vietnam.[22]

Meanwhile, on 6 May other allied forces launched three simultaneous attacks against other bases straddling the border. The 1st Brigade, 25th Division, deployed two mechanized and two straight infantry battalions in the Dog's Head area northwest of Tay Ninh City and attacked toward Krek in Operation TOAN THANG 44 (also called BOLD LANCER). On 11 May, the brigade found a large cache fourteen miles west of the border, and the operation ended three days later. The next day, the 1st Brigade deployed to the Fishhook and relieved the 1st Cavalry Division. Elements of the 1st Cavalry Division's 2d Brigade and the South Vietnamese 5th Division launched the second and third cross-border operations, TOAN THANG 45 and TOAN THANG 46, from Binh Long and Phuoc Long Provinces. On the second day, the air cavalry troopers found an important weapons cache, nicknamed Rock Island East, which eventually yielded 329 tons of munitions. This cache was so large that it was decided to build a pioneer road linking the base area with Highway 14 across the border. Meanwhile, the division moved the 1st Brigade from War Zone C to the area around the Cambodian town of O'Rang, east of the 2d Brigade not far from the II/III Corps boundary in South Vietnam. A bat-

[22] Tho, *Cambodian Incursion*, pp. 76–78; Tolson, *Airmobility*, pp. 226–29.

talion of the 199th Infantry Brigade joined the foray, and this brought U.S. combat forces in the area to eight battalions. By the end of May, contacts with enemy forces increased along with the discovery of more weapons and supply caches. By early June, the entire division moved into the area. On 5 June, a hospital complex with surgical facilities was discovered northwest of Bu Dop. During the second week of June, units of the 3d Brigade unearthed an underground shelter containing more communications equipment and a shop with parts and accessories. Sites located by the South Vietnamese in Base Area 350 included a hospital complex capable of providing medical treatment for five hundred men. The 1st Cavalry Division began withdrawing its forces from Cambodia on 20 June. It closed the last firebase on 27 June, and by 29 June all U.S. units had returned to South Vietnam.[23]

During the eight-week incursion, around-the-clock support, much of it from Brig. Gen. Edwin T. O'Donnell's 20th Brigade, came from the engineers. Besides the attacking units' organic engineers, five nondivisional battalions, and several separate companies and detachments, provided direct and general support. The bulk of the units came from Col. Ernest J. Denz's 79th Group. Task Force EAST, composed of the 31st Combat and 554th Construction Battalions and the 362d Light Equipment Company, supported the 1st Cavalry Division. Task Force WEST, composed of the 588th Combat Battalion, attached elements of the 92d Construction Battalion, and the 557th and 595th Light Equipment Companies supported the 25th Division. Units in general support included the 62d Land Clearing Battalion; the 79th Provisional Bridge Company; a mixture of separate companies, platoons, and detachments; and twenty-one tractors and trailers from the 34th Group and the 18th Engineer Brigade. Priority went to opening main supply routes over long-unused roads from Tay Ninh and An Loc. Deteriorating forward tactical airfields were also repaired and upgraded. Priority also went to building logistic facilities at the airfields and upgrading the surrounding roads to all-weather. Organic engineers, the 1st Cavalry Division's 8th Engineer Battalion, the 25th Division's 65th Engineer Battalion, and the 11th Armored Cavalry Regiment's 919th Engineer Company, concentrated on opening, maintaining, and closing firebases and attack routes and helped with the removal and destruction of caches. Together, the equivalent of three nondivisional battalions supported the 1st Cavalry Division. This was a threefold increase compared to engineer effort for the division during normal operations. With only two days' notice, supporting engineers during the three days from 29 April through 1 May opened nine firebases for Task Force SHOEMAKER. Over forty-five miles of laterite roads and two dirt airstrips had to be upgraded

[23] Starry, *Mounted Combat*, pp. 174–75; Tolson, *Airmobility*, p. 229; Tho, *Cambodian Incursion*, pp. 78–83. See also AAR, Cambodian Campaign, 1st Cav Div; AAR, Cambodian Operations, 25th Inf Div, 19 Jul 70; AAR, Opn BOLD LANCER I, 1st Bde, 25th Inf Div, 18 Jul 70, all in Historians files, CMH; *The U.S. 25th Infantry Division, October 1969–October 1970, Yearbook* (n.p.: Tropic Lightning Association, n.d.), pp. 80–81; Nolan, *Into Cambodia*, pp. 205–402.

on the same two days' notice to handle the division's large resupply effort channeled through Tong Le Chon and Katum.[24]

The 11th Armored Cavalry Regiment's rapid advance to Snuol along Highway 7 relied on hasty bridging. After the lead tanks broke out of the jungle on the early afternoon of 4 May, they raced to the first of three bridges destroyed by the retreating North Vietnamese. The cavalry secured the site, placed an armored vehicle launched bridge, and went on. Resuming the advance the next day, the cavalry laid another armored vehicle launched bridge at a second crossing site. However, plans for the third crossing site called for a M4T6 dry span. Lt. Col. Scott B. Smith, the 1st Cavalry Division engineer and commander of the 8th Engineer Battalion, had reconnoitered the bridges with the cavalry regiment's intelligence officer and found the third site too wide for the armored vehicle launched bridge. There were no other nearby launching sites. Smith requested the 79th Bridge Company at Quan Loi to preassemble the dry span for helicopter lift when the 11th Armored Cavalry secured the area. On the morning of 5 May, Smith airlifted a team of engineers—a platoon from Company C, 31st Engineer Battalion, the bridge sections, and a bulldozer dismantled in two sections—to the original site. Once assembled, the bulldozer began leveling the embankments. The engineers assembled the two 30-foot ramp sections and a 15-foot center span delivered later in the morning by a CH–54 in three loads. Although the engineers worked hard, it became obvious that the bridge would not be ready until late afternoon. Anxious not to lose the momentum of the attack, Col. Donn A. Starry, the 11th's commanding officer, set out on foot with an armored vehicle launched bridge. He found a place where the span could be used. After carefully testing several places, the vehicle's operator let down the bridge with a few inches to spare across the gap and a cavalry troop tried it out. By 1300, the regiment's column of M48 Patton tanks and M551 Sheridan armored cavalry assault vehicles resumed the advance. Working in waist-deep mud and fighting the Flying Crane's hurricane-like winds most of the day, the engineers wrestled the last of the dry span sections into place and completed the 75-foot bridge later that afternoon.[25]

More engineers soon crossed the border. On 14 May, the 31st Engineer Battalion, which had already assigned Company C to maintain Highway 13 from An Loc to Snuol, ordered the company to Snuol to build bypasses around the heavily damaged town. This work consisted primarily of placing a laterite cap on existing light roads through the rubber plantation. Culvert, preassembled by Company D in Song Be, was airlifted to crossing sites. On 5 June, Company C, 588th Engineer Battalion, joined 11th Armored Cavalry elements at the western edge of the Memot Plantation. The company began

[24] Ploger, *Army Engineers*, p. 176; AAR, Cambodian Campaign, 1st Cav Div, p. G-1; AAR, Opn TOAN THANG 43, 20th Engr Bde, n.d., pp. 1–3, 9; AAR, Opn TOAN THANG 43, 79th Engr Gp, 15 Aug 70, pp. 3–4, 7, all in Historians files, CMH. For more concerning 79th Group operations, see Intervs, Capt David D. Christensen, 26th Mil Hist Det, with Col Ernest J. Denz, CO, 79th Engr Gp, and staff officers, 26 Nov 70, VNIT 773, CMH.

[25] Starry, *Mounted Combat*, pp. 172–73; AAR, Opn DONG TIEN II and TOAN THANG 43, 11th Armd Cav Regt, pp. 10–11; AAR, Opn TOAN THANG 43, 20th Engr Bde, p. 10; AAR, Opn TOAN THANG 43, 79th Engr Gp, p. 23; 31st Engr Bn, Annual Hist Sum, Aug 69–Sep 70, 31st Engr Bn, p. 7; Coleman, *Incursion*, p. 243; Nolan, *Into Cambodia*, pp. 135–36.

A Sheridan of the 11th Armored Cavalry crosses an armored vehicle launched bridge.

to upgrade existing trails to help the regiment's search for the enemy and his caches. The onset of the rains, which fortunately held off for three weeks in May, slowed progress, but this did not hamper the momentum of the armored cavalry. However, by mid-June, heavy rains and traffic caused steady deterioration of the two launched bridge crossings. Company C, 31st Engineer Battalion, moved to nearby Firebase COLORADO to make repairs and complete a 110-foot triple-single panel bridge. Although the rains caused problems for the engineers, a larger concern was a sudden increase in North Vietnamese activity in the area. Early one morning during heavy rains, the enemy struck the crowded base with rocket-propelled grenades and small-arms fire, wounding thirteen engineers and damaging several vehicles. Thirty dump trucks from the 104th Dump Truck and 79th Bridge Companies that reached the base with their loads of rock the previous day had to park in partially exposed positions. On the morning of 17 June, work parties en route to the bridge sites were taken under fire and were forced to remain within the base for the remainder of the day. The next day, eight engineers were wounded on their way to a bridge site.[26]

At this time, the incursion reversed, and the U.S. troops began to withdraw from Cambodia. On the nineteenth, disassembly of the panel bridge and

[26] AAR, Opn TOAN THANG 43, 20th Engr Bde, pp. 11, 18, 21, 26; AAR, Opn TOAN THANG 43, 79th Engr Gp, pp. 9–10, 12; AAR, Cambodian Campaign, 1st Cav Div, pp. G-6 to G-7. For more about the 31st and 588th Engineer Battalions during the Cambodian operation, see Interv, Capt Kurt E. Schlotterbeck, 26th Mil Hist Det, with Lt Col Gwynn A. Teague, CO, 31st Engr Bn, 6 Jul 70, VNIT 728; Interv, Schlotterbeck with Lt Col Thomas A. Stumm, CO, 588th Engr Bn, 24 May 70, VNIT 668, both in CMH.

A CH–54 Flying Crane transports fixed-span bridging during the Cambodian incursion.

75-foot dry span began. Two separate sections of the dry span were easily hauled away by helicopter. The third section, however, was so deeply mired in the mud that it could not be removed. It had to be destroyed in place. The 110-foot panel bridge was dismantled and carried away in trucks. On 26 June, all U.S. units in the area returned to Vietnam through Katum.[27]

Throughout the operation, the engineers worked hard on the main supply routes. In the western sector, the 588th Engineer Battalion upgraded and maintained forty miles of Route 4 from Tay Ninh to Memot. The main effort involved building a new road from Katum. Work on the extension just south of the border began on 5 May. It took the 588th, with the help of the 595th Light Equipment Company's earthmoving equipment and the 984th Land Clearing Company's Rome plows in the lead, three days to gouge out a tactical road through the jungle. This allowed tracked vehicles to move to Firebase X-RAY just across the border. Augmented by five 290M scrapers and a roller from the 595th Light Equipment Company, the 588th Battalion's Company A pushed on, completing the eleven-mile road on 16 May. Meanwhile, Company D, 92d Engineer Battalion, joined Company D, 588th Engineer Battalion, in a joint effort to maintain Highway 22 from Tay Ninh to Cambodian Route 78, and on to its

[27] AAR, Opn TOAN THANG 43, 20th Engr Bde, p. 11; AAR, Opn TOAN THANG 43, 79th Engr Gp, pp. 12–13.

juncture with Highway 7 at Krek. One of two major spans built along the way involved erecting a 180-foot panel bridge consisting of a 140-foot triple-double span and a 40-foot double-single span supported by an intermediate pier.[28]

Also busy in the western sector were the 25th Division's engineers. One of the first tasks facing the division's 65th Engineer Battalion was to blaze a road to the Rach Cai Bac, a stream along the border some five miles west of Thien Nhon. While an infantry battalion made a helicopter assault to secure a bridgehead, a few miles on the Cambodian side, Companies B and E began installing a M4T6 floating bridge. Bulldozers cleared away brush on the river banks, and the bridge trucks loaded with bridge decking, each with an inflatable float set on top, pulled up at intervals. The men of the combat line and bridge companies worked past dark, completing the job forty-five minutes before midnight. At dawn on 7 May, armored vehicles began crossing the 225-foot river into Cambodia. Meanwhile, Company A, which routinely supported the 1st Brigade, helped prepare the support base at Thien Nhon. Five Rome plows from the 984th Land Clearing Company began to widen and lengthen the airstrip and clear fields of fire around the base.[29]

In the eastern sector, the 31st Engineer Battalion opened routes to handle the heavy loads needed to supply the 1st Cavalry Division and return captured supplies. Besides its work along Highway 13, the 31st on 26 May began upgrading Highway 14A, which was little more than a trail, from Loc Ninh to Bu Dop. By 1 June, Companies A and D reinforced with equipment from the 557th Light Equipment Company and 554th Construction Battalion, with protection provided by two cavalry troops, completed the upgrading. On 11 May, a platoon from Company B, a team of Rome plows from the 62d Land Clearing Battalion, and a panel bridge platoon from the 79th Bridge Company started working north along the heavily mined stretch from Bu Dop to Firebase Brown inside Cambodia. Encountering an 80-foot gap along the way, the engineers used bulldozers to push out causeways from each bank. This narrowed the gap and allowed fitting the 38-foot M4T6 dry span airlifted from Quan Loi. Once across the gap, Rome plows opened the road to Firebase Brown. Without the plows, the road would have taken several additional days to open. Operating from Firebase Brown, and then Firebase Myron, the engineer task force added three panel bridges. These included an 80-foot span to replace the dry span, another standard dry span, and several culverts.[30]

In addition to the various supply routes, the engineers built access roads to the cache sites. Initially the 1st Cavalry Division planned to remove the captured stores at the City by helicopter. However, after finding more weapons and munitions, the division ordered the engineers to build an access road to evacuate the supplies by vehicle. Aerial reconnaissance revealed an unused trail leading east across the border to Company C, 31st Engineer Battalion's, camp

[28] AAR, Opn Toan Thang 43, 20th Engr Bde, pp. 12, 17–18; AAR, Opn Toan Thang 43, 79th Engr Gp, pp. 9–11; AAR, Cambodian Campaign, 1st Cav Div, pp. G-6 to G-7; S. Sgt. Matt Glasgow, "Thrust into Cambodia," *Kysu'* 2 (Fall 1970): 13.

[29] The U.S. 25th Infantry Division, October 1969–October 1970, Yearbook, pp. 80, 82; Tho, *Cambodian Incursion*, pp. 78–79; Nolan, *Into Cambodia*, pp. 220–21.

[30] AAR, Opn Toan Thang 43, 20th Engr Bde, pp. 21, 26; AAR, Opn Toan Thang 43, 79th Engr Gp, pp. 13–14; AAR, Cambodian Campaign, 1st Cav Div, p. G-6.

near Highway 13. On 9 May, Company C and the 557th Light Equipment Company moved to the foot of the trail and began ripping a narrow channel through the thick jungle. With a D7E bulldozer in the lead, and a hovering helicopter keeping the work party on course, Rome plows widened the swath while road construction equipment shaped a new road. Late that day, the bulldozers broke through the trees at one side of the cache. Engineer and transportation vehicles quickly began hauling several thousand tons of supplies back to Vietnam over the 13.5-mile "Cache City Road." Fortunately, rainfall had not yet become a factor in the operation, and the dry weather enabled the engineers to use hasty fords, thus eliminating the need for culverts and large amounts of fill. In late May, the 31st's Company B helped the 1st Cavalry Division remove several hundred tons of supplies from Rock Island East. Rome plows widened a three-mile trail, formerly a North Vietnamese supply route, through the jungle. The improved route allowed engineer and transportation units to haul the captured material to Highway 14 and back to Vietnam.[31]

Engineers also made headway at the forward airfields, adding more offloading and logistical facilities. At the heavily used Bu Gia Map airstrip, the 8th Engineer Battalion added a new 250-foot square soil-cement parking ramp, a helicopter refueling facility, two gunship rearm points, and a 15,000-gallon-per-day water supply point. Daily maintenance of the laterite runway surface and parking ramp kept the fair-weather airfield open despite heavy daily rains. The 31st Engineer Battalion did similar work at Bu Dop and Loc Ninh. Planners looked to Loc Ninh as a dependable backup to Bu Dop. Similar improvements were made at Thien Nhon, Katum, and Tong Le Chon. Company D, 588th Engineer Battalion, and the 362d Light Equipment Company were already committed to upgrading the Thien Nhon airfield when the Cambodian operation began. The large number of aircraft sorties and the resultant failures in the M8A1 matting kept the 588th busy patching the runway and welding the matting's joints. Reinforcing elements of the 92d Engineer Battalion from Long Binh arrived on the eleventh to begin work on a brigade-sized logistics base, which was completed within six days. Thien Nhon was unusual in that a section of Highway 22 served as the runway. At Katum, Company C, 588th Engineer Battalion, and elements of the 362d Light Equipment Company started extensive maintenance work on 2 May. The airfield could not be closed during daylight hours, so the engineers worked at night, using soil-cement stabilization covered with a MC70 asphalt coating. On 11 May, Company D moved to Katum from Cu Chi to place some 8,000 square yards of M8A1 matting on the 1,200-foot runway. Company A joined the effort and built a logistics complex, an airfield bypass road, a staging area, a road in the ammunition storage area, a berm to protect parked tractor-trailers, and an aerial resupply hook-out pad to sling load cargo. At Tong Le Chon, rain and heavy air traffic caused several soft spots on

[31] AAR, Opn Toan Thang 43, 20th Engr Bde, pp. 21, 26, 32; AAR, Opn Toan Thang 43, 79th Engr Gp, pp. 13–15; Glasgow, "Thrust into Cambodia," pp. 13, 16. See also Spec. Harry Huntington, "The Cache Road," *79th Pioneer* 2 (30 May 1970): 3.

The Thien Nhon airstrip used a section of Highway 22 as a runway.

the airfield. On 19 June, a platoon from the 557th Light Equipment Company moved to the base and completed repairs in ten days.[32]

Land-clearing units again displayed their ability to support combat operations. Teams probed suspected bunker and cache areas and cut pioneer roads for tracked and wheeled vehicles to haul away captured supplies. For the first time since the activation of the 62d as a land-clearing battalion, smaller task forces or platoons instead of complete companies moved to the cutting sites. For instance, between 10 May and 5 June, the 2d Platoon, 60th Land Clearing Company, supported the 31st Engineer Battalion by opening roads to cache sites. The platoon also helped the armored cavalry in reconnaissance-clearing missions. During the cuts, plows frequently unearthed more caches. Both sides of Highway 14A were also cleared back to about twenty-five yards for a distance of about six miles. On 18 May, another task force of Rome plows from the 984th Land Clearing Company joined the 588th Engineer Battalion at Thien Nhon to clear suspected ambush sites along Highway 22 and Cambodian Route 78. The thirteen plows also cleared fields of fire around the base. The first plows entered Cambodia on 26 May, and soon one plow detonated a mine. No one was hurt and the plow withstood moderate damage. On 4 June, the task force moved west of the base along Route 20 and cleared both sides of the road to the border. It finished this job on 6 June. In mid-May,

[32] AAR, Cambodian Campaign, 1st Cav Div, p. G-5; AAR, Opn TOAN THANG 43, 20th Engr Bde, pp. 40, 43, 46; AAR, Opn TOAN THANG 43, 79th Engr Gp, pp. 10–11. For more on earlier work at Thien Nhon by the 588th Engineer Battalion, see Capt. Francis L. Smith Jr., "Combat Engineers at Thien Nhon," *Military Engineer* 62 (November-December 1970): 392–93.

it became evident that if the armored cavalry was to maintain momentum around Snuol, routes of travel would have to be cleared through the jungle. A task force from the 60th Land Clearing Company, consisting of twenty-eight men and nine Rome plows, joined the cavalrymen. Although ambushed several times, in seven days the land clearers cut some 155 acres.[33]

Due to the small number of plows available and the extremely dense bamboo growth in the Snuol area, the land clearers developed several cutting techniques. The standard echelon formation was not workable. Instead, a lead plow pushed ahead some fifty to one hundred yards into the jungle with the remaining plows dividing and simultaneously pushing to the left and right. Once the direction of the cut was decided, the lead plow rejoined the others. When the plows neared the point of the deepest penetration, the process was repeated. This method allowed the plows to double and triple up in removing the bamboo and left a thirty-to-forty-yard-plus corridor free of downed trees. Although daily production dropped, this method had the advantage of giving the accompanying armored cavalry a much wider and faster reaction time to enemy attacks. The cavalry dropped the normal procedure of keeping the armored vehicles in cleared areas, and instead moved some of their forces ahead and on both flanks of the plows. This was a slow process. The armored vehicles had trouble forcing their way through the jungle, but this method did break up potential ambushes and gave the plows better protection. Firing at random intervals, "recon by fire," apparently proved effective, for the enemy did not test the advance. Colonel Driscoll, the 62d's commanding officer, however, was convinced that the recon by fire method was not really all that good. He recalled: "We've been hit within two or three seconds after gunships have worked the precise area in which we get hit." In addition, Driscoll did not see much of a deterrence in using "shotguns" on the plows. "There is a drawback to putting a second man in the cab of the plow," he noted, "because there's no buddy seat in there . . . and he sits up high and he's exposed an awful lot more than the operator. If they hit a mine, he's almost a cinch to get some fragmentation from it." Finally, the cavalry-engineer teams used "automatic ambushes" to protect the land clearers in the cutting areas and in their night defensive positions. At the end of the cutting day, security forces placed trip wires across trails connected to a series of five or six claymore mines. This helped reduce enemy activity, but it also required the delicate and time-consuming task of deactivating the weapons the next day.[34]

In early June, both land-clearing companies entered the Fishhook. There they worked with the 11th Armored Cavalry to find and destroy enemy fortifications, hiding places, and supplies and equipment. Until 1 June, the bulk of the 60th Land Clearing Company had been cutting near Minh Thanh northwest of Lai Khe. The 984th had been working in the Bearcat area south-

[33] AAR, Opn TOAN THANG 43, 20th Engr Bde, pp. 46–52; AAR, Opn TOAN THANG 43, 79th Engr Gp, pp. 15–16.

[34] AAR, Opn TOAN THANG 43, 20th Engr Bde, pp. 59–60; Interv, Schlotterbeck with Driscoll, 22 Jun 70, pp. 25–26.

east of Long Binh. North Vietnamese resistance had been increasing in the Fishhook, and the land clearers encountered the heaviest enemy attacks of the Cambodian campaign. In its first day of cutting, the 60th's security force discovered fifty bunkers, some weapons and munitions, and twenty tons of rice. Two days later, the cavalry-engineer force found another bunker complex about one square mile in area. On 7 June, they unearthed a large complex of seventy-five bunkers with two feet of overhead cover and fifty huts. During the search, more weapons and medical supplies were found. On the ninth, the land clearers and their cavalry escort came under fire several times, but they did find and destroy another 150 bunkers and huts. Such finds continued until the close of the operation on 24 June. Enemy attacks were frequent, from small arms, mortar rounds, and rocket-propelled grenades. On the sixteenth, the enemy made some seventy individual attacks against the cutting force. Three operators suffered wounds and two plows received light damage. One Rome plow struck a mine, wounding the operator and damaging the plow. The next day, the lead plow was struck by some one hundred rounds of automatic rifle fire and a rocket-propelled grenade. This attack killed one engineer and wounded another and left one plow moderately damaged. The 984th, which arrived in Cambodia in mid-June, also had its share of enemy contact. On the night of 19 June, rocket and mortar attacks against the company's night defensive position killed three and wounded eighteen engineers. Harassing attacks on the twenty-second and twenty-third wounded another eleven engineers. Still, between 4 and 24 June, the two companies cleared about 1,700 acres of jungle and destroyed more than 1,100 enemy structures. Supplies uncovered included X-ray equipment, medical supplies, communications equipment, various weapons, 10,000 rounds of small-arms ammunition, and 500 mortar rounds. Both units departed Cambodia via Katum and were among the last units to cross the border.[35]

The Cambodian operation illuminated the methods and hazards of land clearing. During the June cuttings, the mission of the company-size operations was to support the armored cavalry to locate enemy caches. The 60th and 984th made their cuts as rays from night defensive positions. In the Fishhook, II Field Force usually assigned one land-clearing company to support one armored cavalry troop. The land clearers, however, found one platoon of ten plows sufficient to support a troop and recommended this ratio for future operations. If, during their probing cuts, the land clearers found they could not finish the cut that day, they could expect enemy contact the following day. To allay this problem, they bypassed all large trees and continued the cut as fast as possible within a seven- to nine-hour period. After returning to the night defensive position, operators still had daily maintenance to do. This meant sharpening blades, changing oil, and cleaning their machines. In addition, each plow required sixty to seventy gallons of gas and seventy

[35] AAR, Opn TOAN THANG 43, 20th Engr Bde, pp. 52–59; AAR, Opn TOAN THANG 43, 79th Engr Gp, pp. 17–22; Starry, *Mounted Combat*, pp. 175–76; Glasgow, "Thrust into Cambodia," pp. 16–17; Spec. Dave Massey, "Land Clearing Team, Rome Plows on the Border," *Hurricane* (September 1970): 34–37.

gallons of water daily. Of the two land-clearing companies in Cambodia, the 984th suffered more casualties, mostly by indirect fire against night laagers. In the attack that caused three deaths and eighteen wounded, the engineers had inherited the position used the previous day by the armored cavalry. Typically, engineers tried to complete overhead cover before nightfall while bulldozers formed a berm around the position. If the land clearers could not finish the fortifications, they slept under their bulldozers or heavy equipment. The 60th made this a standard practice. Although not as comfortable or as protective as a bunker, the bulldozers gave ample protection.[36]

Maps and terrain intelligence played important roles in the Cambodian operation. Four years earlier, the Engineer Command had established two map depots in Vietnam. Due to the large troop withdrawals before Cambodia, only the 547th Map Depot Platoon at Long Binh remained in Vietnam. The Cambodian offensive severely tested the map supply system. The depot received no advance notice of the operation, and apparently II Field Force did not prepare map supply plans. At first, stocks of the border region seemed adequate for limited needs, but as the operation grew in scope restockage became necessary. On 1 May, II Field Force made the first emergency requisition for 58,000 Cambodian large-scale sheets. The 66th Engineer Company (Topographic) (Corps), a unit under the control of II Field Force, sent the request directly to the 29th Engineer Battalion (Base Topographic) in Hawaii. The maps reached the depot on the fourth. That day the 66th forwarded another request to the 29th, this time for 600,000 Cambodian and Laotian map sheets. The twenty-eight tons of maps reached Vietnam on 11 May. Between 1 and 10 May, the 66th's Reproduction Platoon printed over 45,000 map sheets of Cambodia to meet initial demands. From 1 May to 2 June, the depot issued over 685,000 maps, almost three times the average issued over the same period. Cartographers also produced two uncontrolled mosaics of Cambodian airfields. Altogether, the 66th Topographic Engineer Company issued almost one million maps to support the Cambodian operation. The 517th Engineer Terrain Detachment in the Engineer Section at II Field Force headquarters furnished additional topographic information. There, expert terrain analysts looked at contours, vegetation, soil-bearing capacities to support armored vehicle movement, and information on likely enemy storage sites and supply routes. Given the poor secondary roads and the reliance on motor vehicles, especially in areas like the Dog's Head and Fishhook, terrain and road knowledge before the attack became essential.[37]

South Vietnamese engineers continued to do a creditable job of supporting their combat forces. At the start of TOAN THANG 42, the 30th Group placed one platoon in direct support and one company in general support of each

[36] AAR, Opn TOAN THANG 43, 20th Engr Bde, p. 61; Massey, "Land Clearing Team, Rome Plows on the Border," p. 37. For more on a commander's views of the Cambodian operation, see Interv, Schlotterbeck with Driscoll, 22 Jun 70, pp. 23–39.

[37] AAR, TOAN THANG 43, 20th Engr Bde, p. 64; U.S. Army Topographic Support of Military Operations in the Republic of Vietnam, pp. 100–101, 117–18; ORLL, 1 Feb–30 Apr 70, II FFV, 14 May 70, p. 42, Historians files, CMH. See also Spec. Larry Mayo, "Battle Maps," *Kysu'* 1 (Summer 1969): 26–28.

Supplying enough maps for the Cambodian operation put a strain on the remaining map depot in Vietnam.

corps task force. Before the operation, the group again borrowed M4T6 floats and equipment from the 20th Brigade. These floats made possible the crossing by two task forces over the Vam Co Dong. Flying Crane helicopters picked up finished raft sections from the assembly site and dropped them off at the bridge site, where the South Vietnamese 301st and 303d Engineer Combat Battalions and the 317th Float Bridge Company tied the sections together into a bridge. By early evening of the twenty-fifth, the bridge was finished well before the armored task forces began their move into Cambodia. On 1 May, direct support grew to company-size operations. South Vietnamese combat engineers opened and repaired supply routes along the axis of advance, built passable roads out of trails, and erected M4T6 dry spans and panel bridges or bypasses for the armor and wheeled columns to follow. Other tasks included building supply points protected by solid earthen revetments and helipads to evacuate the wounded. Also, on 30 May the 303d Engineer Combat Battalion finished a forward airstrip with a laterite runway. To the south in IV Corps, the 40th Combat Group built a C–7 Caribou airstrip at Neak Luong. In mid-June, an enemy mortar attack destroyed six floats at the critical Ben Soi Bridge, but the 301st Engineer Combat Battalion repaired the bridge in four hours. At Svay Rieng, the 303d Engineer Battalion took four days to replace a destroyed bridge with a 160-foot double-double panel bridge. Later in the operation, the 301st Engineer Battalion used four D7E bulldozers to clear vegetation on both sides of Highway 7 near the Chup Rubber Plantation. In June and July, as some forces withdrew, unguarded bridges were disassembled and stocked. Not to be outdone by enemy sappers, 30th Group engineers used demolitions

to destroy a 272-foot Eiffel bridge to deny its use to the enemy. The North Vietnamese Army had used the bridge spanning the Kompong Spean River at Kompong Trach for several years. Work shifted to improving defensive positions at bridges and bypasses as enemy forces increased their attacks. Engineer camps were also attacked. On 4 July, 120 rounds of 82-mm. mortar fire struck in and around the perimeter of Company A, 301st Engineer Battalion, at Krek. The attack killed five engineers and damaged several pieces of equipment. American advisers reported that the Vietnamese engineers gained tremendous confidence during the operation. This was the first time that battalion-size engineer units had to live and work in a combat environment, making sure that bridges and roads were completed on time.[38]

The Cambodian operation confirmed basic engineer principles in supporting a corps in the attack. Detailed planning at the 20th Brigade began only two to three days before the campaign and then continued for the next three weeks. General O'Donnell held nightly command and staff meetings, including representatives from groups and battalions, at brigade headquarters just outside Bien Hoa Air Base. At this time, orders were issued for the following day. O'Donnell stopped this practice after the units completed their moves, adequate bridge stocks and building materials reached the forward areas, and the scope of the operation became apparent. Task force organizations worked without difficulty since the brigade and groups routinely allocated resources based on the extent of the assignment. As in the past, engineer units quickly moved out of their base camps and firebases. They easily switched from regularly assigned construction jobs to the hasty, constantly changing main supply routes and combat support missions. Working relationships did not pose any problems since engineer units worked with the same supported combat unit. The brigade and group continued the practice of allowing the two battalion task force commanders the flexibility to accept combat and operational support missions directly from the divisions. This helped speed up reaction time. Tactical commanders assigned priorities, and the 20th Brigade and 79th Group allocated the needed resources.[39]

Despite the short lead times and some setbacks during the incursion, U.S. engineers could look back on an impressive list of accomplishments. They built 35 miles of new roads and opened, repaired, or upgraded another 221 miles, and built or reinforced fifteen bridges. Roads were made passable by improving drainage, patching holes, and capping the surface with rock or laterite. Consequently, locating laterite borrow pits became critical. When placed on a dry base, laterite caps held up throughout the monsoon season. The engineers also built enough turnouts on the many single-lane roads to handle passing vehicles. Large amounts of tactical bridging were brought forward and used, over 345 feet of M4T6 dry span and 710 feet of panel bridging. Several delays in building the panel bridges occurred, however, because of missing parts and inexperience. Whenever possible, work crews used culverts or the large mul-

[38] AAR, Opn Toan Thang 42, U.S. Army Advisory Gp, III Corps, pp. 4-3, 14-2 to 14-4; Khuyen, *RVNAF Logistics*, pp. 193–94.

[39] AAR, Opn Toan Thang 43, 20th Engr Bde, pp. 69–70.

tiplate arch to conserve bridging and make the crossings less vulnerable to destruction.[40]

The key to opening and maintaining forward tactical airfields lay in the building of bypass roads where the main roads also served as runways. Early construction of the bypasses at Thien Nhon and Katum permitted their continued use. The engineers placed six hundred feet of M8A1 matting at each end of the two airfields in an attempt to ensure runway usage when the rains came. However, poor drainage under the matting made continuous maintenance necessary. When necessary, work took place at night to allow daylight landings. Patching potholes with soil-cement, laterite, and hot- and cold-mix asphalt continued throughout the operation. The cold mix proved to be the best material because it could be stockpiled at each end of the field. In case it became necessary, sufficient matting for one complete airfield in Cambodia was stockpiled at Quan Loi.[41]

As in the past, road mines posed major threats to armored columns and supply convoys. During the Cambodian operation, II Field Force used the only available vehicle-mounted mine detonator, the M48 Tank-Mounted Clearing Roller. This roller was obtained through the ENSURE (Expediting Non-Standard Urgent Requirements for Equipment) management system. Through this program, items were developed and procured either for evaluation purposes or for operational requirements. To speed up clearing operations for this operation, two tanks and one combat engineer vehicle mounted the rollers. The rollers cut clearing times by 50 percent when compared to using hand-held detectors. One precaution was necessary. If the roller only made one pass, all vehicles behind it had to follow in its exact path. Also, when the rollers set off mines, one or more of the replaceable wheels and sometimes the wheel arm assemblies had to be replaced. Mines over sixty pounds usually caused enough damage to require replacement of the entire arm assembly. Replacement typically took four men forty-five minutes. The 65th Engineer Battalion tried mounting the roller on one of its four combat engineer vehicles. Although designed for the M48A3 tank chassis it did, after removal of the bulldozer blade and some minor modifications, fit the combat engineer vehicle's chassis. However, to replace the rollers and assembly arms, a wrecker was required because the engineer vehicle's boom was too short for the job. After using the roller for several days and after setting off three mines, the engineers realized that enemy sappers were trying to figure the minimum size needed to destroy the mine roller. Combat engineers judged it best to use the roller infrequently along the same road, because daily usage encouraged the enemy to increase the number and size of mines. They argued it was better to use the roller with the tank since mounting the roller on the combat engineer vehicle took a specialized piece of equipment away from its primary mission. No matter how they were mounted, the rollers were considered better than the expedients of "running" or "busting" the road with tanks or dump trucks.[42]

[40] Ibid., pp. 70–71.
[41] Ibid.
[42] Ibid., p. 12; AAR, Opn TOAN THANG 43, 79th Engr Gp, p. 33; AAR, Cambodian Operation,

Rollers placed in front of M48 tanks and this combat engineer vehicle expedited clearing roads of mines.

The cross-border operation took its toll on engineers. Casualties in 20th Brigade units totaled 7 killed and 132 wounded. Mortar and rocket attacks accounted for most casualties, and most of these losses took place between 16 and 19 June in the Fishhook. On 16 June, a work party en route from Firebase COLORADO to a bridge site was ambushed and suffered eight wounded. It was during this period that the 584th Land Clearing Company lost twenty-one soldiers. Other casualties were scattered in sporadic attacks or mines throughout the campaign. Tragedy also struck at the higher commands. On 12 May, General Dillard's helicopter was shot down while he was reconnoitering Route 509 about ten miles southwest of Pleiku. Others killed in the incident included Col. Carroll T. Adams, commanding officer, 937th Engineer Group; Lt. Col. Fred V. Cole, commanding officer, 20th Engineer Combat Battalion; Capt. William D. Booth, aide de camp; Cmd. Sgt. Maj. Griffith A. Jones of the Engineer Command; and five others. Cmd. Sgt. Maj. Robert W. Elkey of the 937th Group was the sole survivor.[43]

25th Inf Div, pp. 11–12; Heiser, *Logistic Support*, p. 53. For more on the tank roller evaluations in armored operations, see Final Report, Army Concept Team in Vietnam (ACTIV), sub: Optimum Mix of Armored Vehicles for Use in Stability Operations, ACTIV Proj. No. ACG 69F, 27 Jan 71, pp. III-8, G-33, Historians files, CMH.

[43] AAR, Opn TOAN THANG 43, 20th Engr Bde, p. 68; Ploger, *Army Engineers*, pp. 176–77; "MG Dillard, 9 Others Die in Crash," *Castle Courier*, 18 May 1970; Nolan, *Into Cambodia*, p. 201.

Secondary Assaults

The secondary attacks from II Corps were designed to draw North Vietnamese forces north and to cut their logistics lifeline north of the main battle. U.S. and South Vietnamese forces spearheaded the operations, known as BINH TAY I through IV, from Kontum in the north to Ban Me Thuot in the south. Headquarters I Field Force and II Corps received little warning of the attack. When orders were received on 2 May, units of the U.S. 4th Division and the South Vietnamese 22d Infantry Division were operating in enemy Base Area 226 in northwest Binh Dinh Province. The 173d Airborne Brigade in northern Binh Dinh Province was the only other American tactical unit of any size in II Corps. The 4th Division had already lost a brigade to redeployment.[44]

On 6 May, elements of the 4th Division reinforced by the South Vietnamese 40th Regiment, 22d Division, commenced Operation BINH TAY I. The task force made air assaults into Base Area 702 west of Kontum and just south of the tri-border area of Laos, Cambodia, and South Vietnam. South Vietnamese forces began the BINH TAY II and III operations on 14 and 20 May into Base Areas 701 and 740 west of Pleiku and Ban Me Thuot, respectively. BINH TAY IV, carried out by the South Vietnamese in late June, was not directed toward destruction of enemy forces or bases but toward the evacuation of Cambodian and Vietnamese refugees.[45]

Although preceded by B–52 strikes, the 4th Division's attacks ran into trouble, and the division's foray across the border only lasted ten days. An infantry battalion on loan from the 101st Airborne Division failed to reach its intended landing zone because of heavy fire. Other units of the 4th Division also met resistance at their landing zones and were forced to withdraw. But after this initial opposition, the North Vietnamese avoided contact throughout the operation. By 7 May, the 1st Brigade's three battalions reached the objective area, followed by the 2d Brigade's three battalions. When the troops landed, helicopters dropped off 105-mm. howitzers to provide close fire support. Heavier artillery such as 8-inch howitzers and 175-mm. guns provided support from bases on the South Vietnamese side of the border. On 9 May, the airborne battalion uncovered a rice depot containing about 500 tons. Two days later, elements of other battalions discovered a North Vietnamese dispensary complete with surgical equipment and medicine and a twenty-bed hospital. On the thirteenth, most of the 2d Brigade returned by helicopter to Camp Radcliff. Once at their home base, they began standing down pending redeployment to the United States. The 1st Brigade began pulling out of Cambodia on 15 May, completing its withdrawal the following day. South Vietnamese units stayed behind, continuing the search in the base area. BINH TAY I ended on 25 May.[46]

The number of training areas, base camp complexes, and other facilities discovered during BINH TAY I revealed the scope and permanency of the North

[44] MACV History, 1970, vol. 3, p. C-88; Tho, *Cambodian Incursion*, p. 90.
[45] MACV History, 1970, vol. 3, pp. C-87 to C-91; Tho, *Cambodian Incursion*, pp. 90–100.
[46] MACV History, 1970, vol. 3, pp. C-87 to C-88; Tho, *Cambodian Incursion*, pp. 90–95. For more on BINH TAY I, see AAR, Opn BINH TAY I, 4th Inf Div, 21 Jul 70, Historians files, CMH.

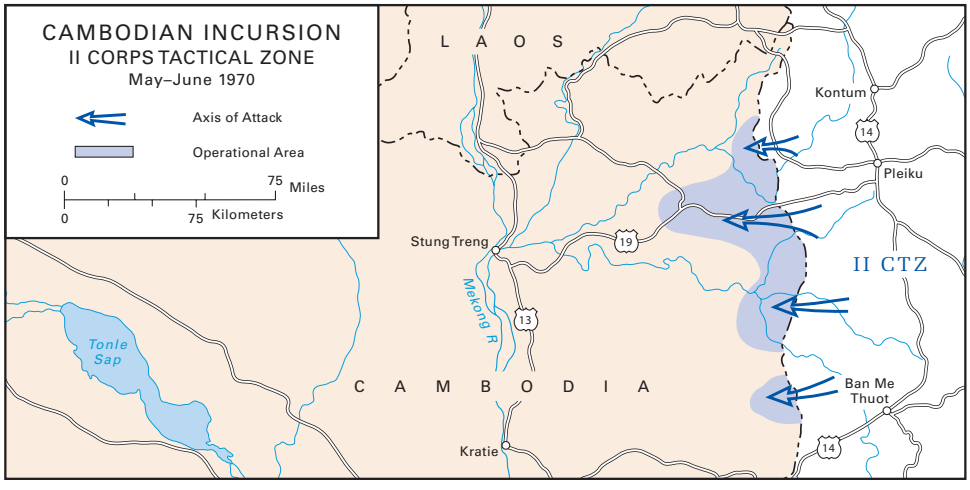
Vietnamese forces in this stronghold. By 13 May, the 4th Division had uncovered over 15 tons of munitions, 500 tons of food, large amounts of medical supplies, over 800 crew-served weapons and small arms, and a variety of other military equipment. The South Vietnamese found still more. Given the effort it would take to reestablish Base Area 702 during the rainy season, the North Vietnamese had suffered a blow.[47]

During BINH TAY I, the 4th Division's 4th Engineer Battalion and elements of the 937th Engineer Group, 18th Engineer Brigade, rendered support. The I Field Force Engineer Section planned and coordinated the construction effort and operational support tasks. Divisional engineers carried out the usual missions: one line company in direct support of each brigade (Company B less one platoon to the 1st Brigade and Company C to the 2d Brigade) and one line company (Company D) in general support. (Company A had redeployed with the 3d Brigade.) Company A, 299th Engineer Combat Battalion, provided the third platoon to accompany the 1st Brigade's attached airborne battalion. In turn, each line company doled out one platoon to each infantry battalion while the company headquarters remained with the brigade headquarters. On the morning of 4 May, the 4th Engineer Battalion's forward headquarters moved from Camp Radcliff to Engineer Hill outside Pleiku. On 11 May, the battalion forward deployed with the division headquarters to New Plei Djereng. At the end of the operation on 16 May, the 4th Engineer Battalion returned to Camp Radcliff with the division headquarters. In the midst of BINH TAY I, the 4th Engineer Battalion and 937th Group changed commanders. On 13 May, Lt. Col. Richard L. Curl replaced Lt. Col. John R. Brinkerhoff, who had commanded the 4th Battalion for one year. Curl would depart with the division in December. At the 937th, Col. James C. Donovan replaced Colonel Adams, who died when General Dillard's helicopter was shot down. Adams had commanded the group for five months.[48] (*Map 29*)

The engineers provided the normal close support for the infantry battalions assaulting the base area. Primary tasks included opening landing zones, clearing mines and booby traps, and building fortifications. Typically, rappelling teams, with their chain saws and explosives, dropped from hovering helicopters and cleared the landing zones. They usually were followed by a Case 450 airmobile bulldozer to help build battalion-size firebases. On the Vietnamese side of the border, Company D, reinforced with D7 bulldozers and graders from Company B, repaired Route 509 from the juncture with Highway 19 to New Plei Djereng. At New Plei Djereng, one platoon along with elements of Company E, the bridge company, built field fortifications for the 4th Division's forward logistical base. Company E anticipated its bridging mission by moving two armored vehicle launchers with three bridges to New Plei Djereng. It also kept a bridge platoon on alert with two sets of M4T6 floating bridge at Engineer Hill. When the bridge mission was discontinued on 14 May, the platoon returned the bridging to Camp Radcliff; the trucks

[47] MACV History, 1970, vol. 3, pp. C-87 to C-88.

[48] AAR, Opn BINH TAY I, 4th Inf Div, pp. 17–18; ORLL, 1 May–31 Jul 70, I FFV, 15 Aug 70, p. 45, Historians files, CMH; Ploger, *Army Engineers*, pp. 221, 226.



Map 29

returned to New Plei Djereng and transported elements of an infantry battalion back to Camp Radcliff. At New Plei Djereng, the 4th Engineer Battalion built helicopter pads and refueling points. Two asphalt distributors also spread peneprime in an attempt to reduce the acute dust problem at the forward base. Reinforcing the 4th Engineer Battalion, Company B, 20th Engineer Combat Battalion, maintained Highway 19 from Highway 14 to Duc Co. At the Duc Co forward base, the company built berms around the fuel storage point, an ammunition supply point, and a rearm point. On 16 May, the company took over the Route 509 maintenance from Company D and continued this task until 29 May when it returned to Engineer Hill.[49]

Engineers supporting BINH TAY I experienced several annoying problems. Due to the shortage of ten-ton tractors and trailers, it took four days to shuttle all the bulldozers and graders to the Route 509 work sites. Heavy air and road traffic at New Plei Djereng forced the engineers to spread peneprime only at night. Also, the 4th Engineer Battalion's limited equipment and supply of peneprime did not completely overcome the dust problem. On the other hand, heavy rains during the latter part of the operation hampered overland supply. Without nearby sources of good rock, engineers resorted to using the local basaltic soil, which when used as a surface course turned into a soupy mud under heavy rains and traffic. Had the operation continued longer with no change in the weather, resupply by road would have been drastically reduced. The 4th Engineer Battalion also had mixed results using the combat engineer vehicle with expendable rollers. During dry weather, the engineers could clear the main supply route within an hour, but the onset of heavy rains reduced the rollers' effectiveness. Running at slower speed helped. Still, mud collected in the road wheels and caused excessive wear to the mine roller's bearings.[50]

[49] AAR, Opn BINH TAY I, 4th Inf Div, pp. 17–19.
[50] Ibid., pp. 19–20.

The cross-border incursions hurt the North Vietnamese Army. By the end of June, U.S. and South Vietnamese forces captured or destroyed almost 10,000 tons of materiel and food. This amounted to enough rice to feed more than 25,000 enemy troops a full ration for an entire year, individual weapons to equip fifty-five full-strength battalions, crew-served weapons to equip thirty-three full battalions, and recoilless rifle ammunition for more than 9,000 typical attacks against allied forces. In all, 11,362 enemy soldiers were killed and over 2,000 captured. For the 1st Cavalry Division, the operation in Cambodia exceeded all expectations. Maj. Gen. George W. Casey, who took command of the 1st Cavalry Division on 12 May from Maj. Gen. Elvy B. Roberts, summed up the results as "impressive." In a letter to his troops on 6 July, he wrote that the division "killed enough of the enemy to man three NVA [North Vietnamese] Regiments; captured or destroyed individual and crew-served weapons to equip two NVA Divisions; and denied the enemy an entire year's supply of rice for all his maneuver battalions in our AO [area of operations]." For the next fourteen months, there were almost no North Vietnamese and Viet Cong operations in South Vietnam other than sporadic ambushes and attacks by fire.[51]

Operations After Cambodia

Besides the Cambodian incursion, allied military operations in 1970 focused on enemy base areas inside South Vietnam, on protecting the population, and on exploiting progress in Vietnamization and pacification. In some areas, the Regional and Popular Forces assumed greater responsibilities for security. On 1 July, allied forces launched a countrywide Summer Campaign to intensify the pacification efforts, with the emphasis on eliminating the Viet Cong underground and guerrilla forces. The Fall Campaign began on 1 October, and it concentrated allied forces against contested border areas. With these operations and the hundreds of small-unit actions, Saigon's control over the countryside expanded.[52]

In I Corps, which faced the heaviest enemy threat, XXIV Corps took over command from the Marine Corps, and the South Vietnamese assumed greater responsibility. At the beginning of the year, U.S. ground forces consisted of some 50,000 Army troops and 55,000 marines, down from 79,000 marines a year earlier before the departure of the 3d Marine Division. In Quang Tri Province, the 1st Brigade, 5th Division, continued to guard the invasion routes across the Demilitarized Zone, and the 101st Airborne Division protected Hue. The III Marine Amphibious Force with its 1st Marine Division guarded Da Nang. During the summer, the marines made one last sweep through the Que Son Valley, keeping the area quiet until the division departed. In southern I Corps, the Americal Division continued security operations in Quang Tin

[51] Quoted words from Tolson, *Airmobility*, pp. 232–33; Starry, *Mounted Combat*, pp. 179–81; MACV History, 1970, vol. 1, p. I-3; Stanton, *Rise and Fall of an American Army*, p. 342. For more on the results of the Cambodian operation, see MACV History, 1970, vol. 3, pp. C-103 to C-108.

[52] MACV History, 1970, vol. 1, pp. I-1, I-4, V-6; Stanton, *Rise and Fall of an American Army*, p. 343.

and Quang Ngai Provinces. South Vietnamese forces assumed responsibility in western Quang Tri Province from the U.S. Marines and took control of several firebases south of the Demilitarized Zone. Meanwhile, U.S. and South Vietnamese forces carried out combined and separate operations to keep pressure on the enemy and deny him access to the population.[53]

In II Corps, the allies continued to pursue the main forces, attack the Viet Cong underground, and protect the population. Enemy activity was generally light. After the 4th Division redeployed in October and November, the South Vietnamese 22d Division assumed responsibility in the highlands. By then, the South Vietnamese controlled most of the corps area except parts of the coast. The 173d Airborne Brigade in northern Binh Dinh Province and the two Korean divisions to the south carried out pacification operations.[54]

An example of engineers supporting pacification was the completion of a bridge and causeway in the village of Tam Quan in northern Binh Dinh Province. The bridge and causeway stretched nearly 800 feet and provided fishermen from an off-shore island with a more rapid link to mainland markets, allowing them to make a quick sale of their daily catch. The project fell to the men of the 2d Platoon, Company B, 39th Engineer Battalion. Only two of the squad leaders and platoon sergeant were experienced in building timber bridges, and this one would be entirely over water. According to Sp4c. Richard Del Gaudio, "Before we moved down there, they told us we'd be working on an island paradise—ideal conditions, beautiful setting and plenty of beach." They did find a quiet village on the mainland separated by a tidal river from the off-shore island. The men wanted to live there, but they had to settle for nearby Landing Zone ENGLISH NORTH and commute to the bridge site.[55]

Each day's early morning hours were spent sweeping for mines in the quarry area north of Tam Quan and the one-and-a-half-mile road from Highway 1 through the village to the job site. "We found eleven mines altogether," 1st Lt. John W. Erdman noted, "Nine using the detectors and two the hard way." One mine was pointed out by a child as the engineers were sweeping through the village. Dump trucks from Companies A and D at Chu Lai were sent south on loan to haul the large quantity of rock from the Tam Quan quarry to complete the first section of the causeway. A crane from the 137th Light Equipment Company was then dispatched to drive bridge piling. While Sp4c. James Bradford operated the crane, the 39th Battalion's surveyor, Sp4c. Ronald Rauch ensured that the bridge remained in line. "This proved to be quite a hassle, considering the rocky bottom conditions the piling had to be driven through," recalled Rauch. Work progressed on the timber bridge, and the engineers figured they would be finished within a week. One morning during the minesweep, however, the men sensed something was wrong. No

[53] MACV History, 1970, vol. 1, pp. I-5, V-7; Graham A. Cosmas and Lt. Col. Terrence P. Murray, USMC, *U.S. Marines in Vietnam: Vietnamization and Redeployment, 1970–1971* (Washington, D.C.: History and Museums Division, Headquarters, U.S. Marine Corps, 1986), pp. 2, 17, 84.

[54] MACV History, 1970, vol. 1, pp. I-5, V-8. For more on some of the allied operations in II Corps, see ORLL, 1 May–31 Jul 70, I FFV, 15 Aug 70, pp. 10–15.

[55] Spec. Willis Meeuwsen, "Bridge for the People," *Kysu'* 2 (Summer 1970): 6–7.

mines were found, and as the mine team rounded the last curve they found the bridge was in flames. The bridge was too far gone to be saved. Lieutenant Erdman questioned the villagers through an interpreter and learned that after a brief firefight with the Popular Forces night security, the Viet Cong had set fire to the abutment and substructure of several pile bents. The fire spread quickly upward along the freshly creosoted piles to the superstructure. By noon all the spans had dropped into the water. Six weeks of work seemed lost.[56]

Col. William R. Wray, commanding officer of the 45th Engineer Group, and Lt. Col. Hugh G. Robinson, the commander of the 39th Battalion, flew to the job site. After viewing the damage, Colonel Wray suggested the bridge be rebuilt using the unburnt portions of the piles for support. That evening pencil sketches were made and discussed, and by morning the idea had taken shape. Brig. Gen. John W. Morris at 18th Engineer Brigade sent a message emphasizing the importance of the project. "Everyone was down in the dumps," Erdman observed, "but it didn't take much push after it was decided what had to be done." With infantry from the 173d Airborne Brigade setting up a guard position and additional Popular Forces security now on the scene, the engineers responded by working late hours and sometimes through the night. "We had to work at night to cut off the burnt piles, because only then was the tide low enough," said Specialist Del Gaudio. After cutting off the piles, a 10-by-12-inch cap was bolted and scabbed onto them. This provided a substructure for the modified timber trestle bridge. The troops also developed a way to prefabricate the twenty-foot bents at Landing Zone ENGLISH NORTH and haul them to the bridge site. By using the sawed-off piles and prefabricated bents, the platoon rebuilt the bridge in only twenty-two days. To complete the second section of causeway, the 511th Engineer Company (Panel Bridge) contributed thirteen dump trucks and a platoon of men to help the 39th's engineers. Four days later, the entire project was completed without further incident.[57]

In III and IV Corps, the allies consolidated their gains while enemy activity remained light to moderate. Later in the year, following the departure of 25th Division headquarters and two of its brigades, the 9th Division's 3d Brigade, and the 199th Infantry Brigade, the South Vietnamese Army assumed more responsibility for the border and over 50 percent of the territory of III Corps. Allied plans included South Vietnamese forays into Cambodia and battalion and smaller size operations to strengthen government control over the countryside. The 1st Cavalry Division, the 25th Division's 2d Brigade, and the 11th Armored Cavalry Regiment, the only U.S. ground combat units in III Corps, interdicted enemy supply routes, located and destroyed caches, and supported pacification. Australian and Thai forces continued to support pacification east and southeast of Saigon. The South Vietnamese had already assumed responsibility for ground operations in IV Corps when the 9th Division departed. A strong U.S. advisory effort, naval forces, helicopter units, and some combat support elements, including the 34th Engineer Group, remained in the delta.[58]

[56] Ibid., pp. 7–8.
[57] Ibid., p. 8.
[58] MACV History, 1970, vol. 1, pp. I-5, V-8 to V-10; ORLL, 1 Aug–31 Oct 70, II FFV, 14 Nov

Although Cambodia represented the year's operational highlight, 1970 still saw the engineers active in other areas. They began or completed construction projects, continued operational and combat support missions that included land clearing, improved MACV advisory facilities, and made progress in the highway program. Some units prepared to stand down and others moved to new locations to replace departing units. In I and II Corps, the 18th Engineer Brigade commanded by General Morris and then by his successor, General Schrader, who assumed command in May, still controlled three groups consisting of eleven battalions, altogether almost 13,000 men. In I Corps, the three battalions of the 45th Group (14th, 27th, and 39th Combat) carried out operational support tasks for XXIV Corps and highway projects. Work included building bunkers, aircraft revetments, security towers, access roads to bases, and repairing the Mai Loc Special Forces airstrip in Quang Tri Province. Seabee units, which went from five battalions early in the year to two battalions by year's end, worked on construction projects, including aircraft shelters. Three Marine Corps engineer battalions carried out similar tasks for the 1st Marine and Americal Divisions. Another Marine engineer task included dismantling prefabricated buildings in the Force Logistics Command's depot outside Da Nang for shipment to Okinawa. By the end of the year, only the 1st Marine Engineer Battalion and one reinforced company of the 7th Marine Engineer Battalion remained.[59]

In northern II Corps, the 937th Group's four battalions (20th and 299th Combat and 84th and 815th Construction) and in southern II Corps the 35th Group's four battalions (19th Combat and 577th, 589th, and 864th Construction) completed bunkers, aircraft revetments, and repairs to several airfields. Much effort went to the highway program along with some construction. The 864th Battalion was so spread out that it formed two large task forces, Task Force 21 outside Ban Me Thuot and, about 125 miles to the south, Task Force WHISKEY not far from Phan Thiet. The battalion headquarters remained at Nha Trang, over 60 miles by air from Ban Me Thuot and almost 125 miles from Phan Thiet. To prepare for the turnover of Camp Enari near Pleiku, the 937th disassembled two aircraft hangars and ten Pascoe buildings and reassembled them at Camp Radcliff.[60]

70, pp. 23–29, Historians files, CMH.

[59] ORLLs, 1 Feb–30 Apr 70, 18th Engr Bde, 30 Apr 70, pp. 2–4, 1 May–31 Jul 70, 18th Engr Bde, 31 Jul 70, pp. 3–4, and 1 Aug–31 Oct 70, 18th Engr Bde, 31 Oct 70, pp. 3–4, all in Historians files, CMH; Cosmas and Murray, *U.S. Marines in Vietnam, 1970–1971*, pp. 324–27; Combat-Operational Support, I/II CTZ (Corps Tactical Zone) (18th Engr Bde), incl. 15b, OCE Liaison Officer Trip Rpt no. 16. See also Significant Construction Projects and Operational Support Activities of 45th Engr Gp, incl. 10H, OCE Liaison Officer Trip Rpt no. 17, 30 Jul 70, OCE Hist Ofc, and incl. 7G, OCE Liaison Officer Trip Rpt no. 18.

[60] ORLLs, 1 Feb–30 Apr 70, 18th Engr Bde, pp. 2–4, 1 May-31 Jul 70, 18th Engr Bde, pp. 3–4, 1 Nov 69–31 Jan 70, 35th Engr Gp, p. 5, and 1 Nov 69–31 Jan 70, 864th Engr Bn, pp. 2–13; Combat-Operational Support, I/II CTZ (18th Engr Bde), incl. 15b, OCE Liaison Officer Trip Rpt no. 16. See also Significant Construction Projects and Operational Support Activities of 35th and 937th Engr Gps, incls. 10G and 10I, OCE Liaison Officer Trip Rpt no. 17, and incls. 7F and 7H, OCE Liaison Officer Trip Rpt no. 18.

In III and IV Corps, the 20th Brigade headed by Brig. Gens. O'Donnell and Kenneth B. Cooper, who took command in November, also controlled three groups made up of twelve battalions, some 12,000 men. In northern and western III Corps, the 79th Group's four battalions (31st and 588th Combat, 554th Construction, and 62d Land Clearing), besides supporting the Cambodian operation, worked on highways, some construction, airfield improvements, and a variety of operational support missions. The 159th Group and its four construction battalions (34th, 46th, 92d, and 169th) focused efforts in the Saigon–Long Binh area and the highway program. In IV Corps, the 34th Group's four battalions (35th Combat and the 36th, 69th, and 93d Construction) supported the remaining U.S. units in the delta and sought to complete its share of the highway program.[61]

The 326th Engineer Battalion's work at Firebase RIPCORD typified the experience of engineers working where the only access was by helicopter. In April, the 101st Airborne Division established Firebase RIPCORD atop a hill twenty-four miles west of Hue to help prevent the North Vietnamese Army from moving into populated coastal regions of Quang Tri and Thua Thien Provinces. On 11 April, a small engineer party equipped with hand tools, power saws, and demolitions landed and fanned out and cut fields of fire and established fighting positions while the infantry searched the surrounding area. The engineers next cleared a rough landing zone. With enough space opened, a CH–54 lifted in a Case 450 tractor followed by a CH–47 carrying the blade and a drum of diesel fuel. Within minutes the engineers manhandled the blade to the tractor, which then cleared the hilltop of debris and excavated the first gun pit for the artillery. Another helicopter dropped off a Case 580 combined scoop loader and backhoe. Ammunition berms were pushed up and more gun pits were carved into the hilltop. Although poor weather held off the arrival of the artillery pieces for several days, construction continued into July. By then, the North Vietnamese began to subject the base to daily attacks by mortars, recoilless rifles, and rocket-propelled grenades. Artillery fire, air strikes, and ground sweeps failed to drive off the determined North Vietnamese, who appeared to be preparing for a full-scale attack. Rather than face another siege like Khe Sanh, the division decided to close the firebase. The evacuation, which included the engineer equipment, took place on 23 July under heavy enemy fire, and several Chinook helicopters were heavily damaged. In August and September, this story was repeated at Firebase O'REILLY some five miles north of RIPCORD. O'REILLY was abandoned in early October. Clearly the North Vietnamese were determined to protect their most important base areas and supply routes, especially in northern I Corps, and their

[61] ORLLs, 1 Feb–31 Apr 70, 20th Engr Bde, 26 May 70, pp. 3–4, 7-8, 1 May–31 Jul 70, 20th Engr Bde, 13 Aug 70, pp. 2–3, 6, and 1 Aug–31 Oct 70, 20th Engr Bde, 15 Nov 70, pp. 3–4, 6–8, all in Historians files, CMH; Fact Sheet, 20th Engr Bde, Operational Support and Combat Support Missions, 1970, incl. 16b, OCE Liaison Officer Trip Rpt no. 16. See also Significant Construction Projects and Operational Support Activities of 34th Engr Gp, 79th Engr Gp, and 159th Engr Gp, incls. 11E to 11G, OCE Liaison Officer Trip Rpt no. 17, and incls. 8C to 8E, OCE Liaison Officer Trip Rpt no. 18.

pressure on Firebases RIPCORD and O'REILLY indicated they still had enough strength to exploit allied weakness.[62]

The steady departure of engineer units continued in 1970. Two engineer combat battalions, the 1st and 168th, left in April when the 1st Division returned to Fort Riley, Kansas. The 168th returned to Fort Lewis, Washington, where it was inactivated. On 15 August, a color guard detachment representing the 35th Engineer Combat Battalion, which had served in I, II, and IV Corps, headed to Fort Lewis for inactivation. A color guard detachment representing the 4th Engineer Battalion left on 6 December for the 4th Division's new home base at Fort Carson, Colorado. Two days later, the 65th Engineer Battalion less one company returned with the 25th Division headquarters and two brigades to their home base in Hawaii. Company B remained behind in III Corps with the 2d Brigade. On 15 December, color guards from the 19th and 588th Engineer Battalions returned to Fort Lewis for inactivation ceremonies. Also by the end of the year, the first of the six engineer group headquarters, the 79th at Long Binh, had left the country. Engineer units of the other services also returned to home bases in the Pacific or United States. In February, the Air Force's 819th and 820th Red Horse Squadrons departed for the United States. The U.S. Navy's Mobile Construction Battalions 1, 5, 7, 10, 62, 74, and 121 completed their tours and returned to their home bases. Most were not replaced. At the end of the year, only Naval Mobile Construction Battalions 3 and 74, the latter returning to Vietnam for its fourth and final tour, and Construction Battalion Maintenance Unit 302 remained in Vietnam.[63]

Facilities Upgrades and Transfers

Though base construction had declined, it remained a major factor in engineering planning and execution. Strict controls still applied to new construction, and only emergency requirements such as the aircraft shelter program were considered. This was emphasized by General Abrams, who in early 1970 advised his commanders to use existing facilities, and for more temporary needs "make do or do without." In April and October 1970, the Army's funding allocation for Vietnam projects increased by only $20.2 and $15 million, respectively, for urgently required work. This brought the Army's total construction program to $992 million. During the year, the Navy and Air Force programs reached $446.6 million and $405.3 million, respectively. In dollar figures, the three services' military construction programs at the end of 1970 totaled $1.774 billion. Work in place proceeded at a steady rate, from $15 million per month in the second half of 1969 to $13 million per month through April 1970. The MACV Construction Directorate reviewed the remaining projects and assigned work to be carried out by troops and

[62] MACV History, 1970, vol. 3, pp. G-1 to G-6; Cosmas and Murray, *U.S. Marines in Vietnam, 1970–1971*, pp. 84–85; Stanton, *Rise and Fall of an American Army*, pp. 344–46.

[63] Quarterly Hist Rpts, 1 Jan–31 Mar 70, MACDC, 18 Apr 70, p. II-2, 1 Apr–30 Jun 70, MACDC, 24 Jul 70, p. II-3, 1 Jul–30 Sep 70, MACDC, 23 Oct 70, p. II-7, and 1 Oct–31 Dec 70, MACDC, 17 Jan 71, p. II-9 to II-10. All in Historians files, CMH.

RMK-BRJ. Some savings were made when RMK-BRJ freed some $30 million after reducing overhead, amortization, and other cost efficiencies, releasing the funds to fulfill unfinanced requirements. Facilities engineers also began to face sizable cuts in operations and maintenance funds after the transfer of bases. Washington only provided $108 million for Fiscal Year 1971 instead of the projected $139.2 million. As a result, Pacific Architects and Engineers and Philco-Ford faced a reduction in services and personnel.[64]

During 1970, the emphasis on Vietnamization continued, with most funds released by the Department of Defense slated for improving and modernizing Vietnamese facilities and for the highway program. The total funded and unfunded dollar of work remaining came to $379 million for the Improvement and Modernization Program, U.S. forces, and the highways and railways program. Also, during the first half of the year, MACV and the service components carefully reviewed unfunded requirements for possible deletions. As a result, $214.5 million in unfunded requirements dropped to $81.8 million by the end of the year. Maximum use was to be made of vacated facilities to fill South Vietnamese requirements. South Vietnamese Army project groupings included building and upgrading hospitals, training centers and schools, communications facilities, depots, and company-size camps for the regular forces and regional forces. By the end of 1970, many of these facilities were completed or under way.[65]

Notwithstanding the reductions in funding, engineer troops and contractors made progress in upgrading bases, roads, and rail lines. The emphasis on roadwork shifted to quality control instead of miles paved, with more than half of the program completed. Security concerns temporarily halted main rail line restoration, but work proceeded on the spurs. The Air Force completed its aircraft shelter program, and the Navy's program neared completion. Other new work consisted primarily in improving forward airfields, upgrading staging areas at ports and marshaling yards, and improving MACV adviser facilities.[66]

Rigid health standards imposed by the Department of Agriculture and the U.S. Public Health Service caused an upgrading of the staging areas for returning equipment and material. The facilities included wash racks, parking areas, grease racks, maintenance shops, and lighting systems for twenty-four-hour operation to clean, prepare, and stage vehicles and equipment for shipment to the United States. By the end of the year, all the required facilities at Newport,

[64] MACV History, 1970, vol. 2, pp. IX-45, IX-49; Ltr, MACDC-PP to CINCPAC, sub: CPAF [Cost Plus Award Fee] Contractor, RVN, 22 Oct 70, Historians files, CMH; Ltr, Abrams, MACDC-PO to CG, USARV, 5 Feb 70, sub: Utilization of Facilities and Construction Resources, Historians files, CMH; Report of Liaison Visit to the Office of the USARV Engineer, incl. 6, p. 1, OCE Liaison Officer Trip Rpt no. 18.

[65] MACV History, 1970, vol. 3, pp. IX-49, IX-51.

[66] Ibid., pp. IX-52 to IX-53, IX-66, IX-73; Quarterly Hist Rpts, 1 Jan–31 Mar 70, MACDC, pp. VI-3 to VI-4, and 1 Jan–31 Mar 71, MACDC, p. II-1; Report of Liaison Visit to Office of the USARV Engineer, incl. 6, p. 1, OCE Liaison Officer Trip Rpt no. 18.

Long Binh, and Da Nang were completed. The last retrograde facility at Qui Nhon was completed on 1 February 1971.[67]

The upgrading of MACV advisory facilities, which began in 1968, neared completion. Of 244 sites selected for vertical construction and water supply projects, troops and contractors completed work at 191. Ongoing work continued at 27 sites, while 26 awaited the start of construction. During the first quarter of 1971, 9 more sites would be added, with 228 completed by 31 March, 12 in progress, and only 13 programmed to start construction.[68]

For the South Vietnamese, the construction of dependent shelters remained an important program that increasingly drew American backing. This program dated from 1961 when 64,000 family units were planned for servicemen below the grade of sergeant. An eight-year long-range program developed jointly by MACV and the Joint General Staff estimated a total requirement of 200,000 shelters. Over the years, several problems hampered construction. These included a lack of contractor interest, difficulty in obtaining land, shortages of transportation, and in 1964 the diversion of material caused by floods. Between 1961 and 1963 the government completed only 18,700 units; about 6,500 in 1965; under 10,000 for active military and a separate Regional Forces program in 1966; 2,408 units in 1967; and 4,951 units in 1969. In 1966, the Defense Department tried a pilot program for self-help dependent housing in III Corps by providing supplies and materials to build over 9,000 units. However, due to tactical operations, combat units could not find the time to do the work. In late 1968, Saigon decided to set aside some money for self-help, but only about 2,400 shelters were finished. Starting in 1969, U.S. and South Vietnamese funds were also allocated for the Popular Forces. In November 1969, MACV and the Joint General Staff established the Dependent Shelter Program Group to manage the jointly funded program. By April 1970, the joint group determined the need for 240,000 shelters, taking into account that 40,000 families could be sheltered in vacated U.S. bases. After almost ten years, the requirement for new housing still stood at 200,000 units to be built in eight years.[69]

The plans for 1970 identified about 16,000 shelters for construction. U.S. funds, provided from the services' accounts, totaled $4.3 million, with the Vietnamese government spending the equivalent of $5 million. Several designs were examined, and the approved standards were functional and austere, in deference to the living standards of the Vietnamese. Under these standards, the cost for each unit would be held to $600. The United States contributed cement, lumber, and corrugated metal, and the Vietnamese government provided the rest of the materials and military engineers, contractors, and troop units to do the work. American funding was expected to grow to $6 million

[67] MACV History, 1970, vol. 3, p. IX-54; Quarterly Hist Rpt, 1 Jan–31 Mar 71, MACDC, p. II-1.

[68] Ibid. See also 1st Lt. Daniel L. Campbell, "Builders for the Advisors," *Kysu'* 2 (Summer 1970): 20–22.

[69] MACV History, 1970, vol. 3, pp. IX-54 to IX-57; Quarterly Hist Rpt, 1 Jan–31 Mar 70, MACDC, p. II-3. For more on the dependent shelter program, see Khuyen, *RVNAF Logistics*, pp. 389–95.

for each of the following seven years. Costs were expected to increase, with additional funds required for community facilities such as schools and dispensaries. However, deliveries of U.S. materials for 1969 and 1970 fell behind schedule, and it took until mid-1970 before materials began to arrive in large amounts. In May, President Thieu wrote President Nixon asking for more help to complete the program in four years. Nixon responded by promising financial support to build 20,000 shelters per year for five years. By the end of the year, workers completed 7,909 shelters with 5,739 under construction. In addition, 1,121 military families lived in excess U.S. military facilities. Because of Thieu's interest in getting more dependent housing as soon as possible, his military planners considered committing the equivalent of four engineer construction groups in 1971. Problems continued to trouble the housing program. One difficulty included Saigon's timely release of funds. Another involved theft by corrupt officials and officers of the U.S.-furnished materials.[70]

Base transfers gained momentum in 1970. By the end of the year, seventy-seven transfers ranging from firebases to large base camps were completed with thirty-eight still in process. In I Corps, several Marine Corps facilities, including the Da Nang Force Logistics Command compound and 7th and 9th Engineer Battalion camps, were declared excess. They were transferred in January and May. In II Corps, the 4th Division transferred Camp Enari/Dragon Mountain (over 1,400 buildings totaling over 2 million square feet of floor space) to the South Vietnamese 22d Division in April. Camp Radcliff would be transferred after the departure of the 4th Division. Major transfers in III Corps included the 1st Division's Lai Khe base camp (over 500 buildings totaling 445,000 square feet of floor space) to the South Vietnamese 5th Division. The United States also turned over the 25th Division's base camp at Cu Chi (over 3,200 buildings amounting to over 2.3 million square feet of floor space) to the South Vietnamese 25th Division in December.[71]

Transfers also extended to ports. In November 1969, a joint U.S.-Vietnamese committee announced schedules for complete or partial turnovers at Can Tho, Saigon, Vung Tau, Nha Trang, Qui Nhon, and Da Nang. In January 1970, the South Vietnamese began to move cargo through the shallow-draft ports of Hue, Dong Ha, and Chu Lai. The ports of Can Tho and Saigon (excluding Newport) were transferred in March and June. Not everything would be left behind. Planning was under way to disassemble some prefabricated buildings, airfield matting, and DeLong piers. Transfer problems persisted, with the lack of trained Vietnamese facilities engineers among the major obstacles. To make up for these deficiencies, U.S. forces continued on-the-job training programs

[70] MACV History, 1970, vol. 2, pp. IX-59 to IX-63; Quarterly Hist Rpts, 1 Apr–30 Jun 70, MACDC, pp. II-3 to II-IV, 1 Jul–30 Sep 70, MACDC, pp. II-5 to II-6, and 1 Oct–31 Dec 70, MACDC, pp. II-2.

[71] MACV History, 1970, vol. 1, p. I-5, vol. 2, pp. IX-36 to IX-39; Quarterly Hist Rpt, 1 Jan–31 Mar 70, MACDC, pp. V-4 to V-5; Khuyen, *RVNAF Logistics*, p. 182; For more transfer lists, see Quarterly Hist Rpts, 1 Apr–30 Jun 70, MACDC, p. V-3, 1 Jul–30 Sep 70, MACDC, p. III-3, and 1 Oct–31 Dec 70, MACDC, pp. V-3 to V-5; PA&E History, FY 1970, app. Summary of Transfer and Abandonments of Real Property; PA&E History, FY 1971, pp. 82, 84, Historians files, CMH.

and using contract instructors. The Army's facilities engineering contractor, Pacific Architects and Engineers, continued to play a major role in training Vietnamese personnel as well as administering base transfers.[72]

By the end of 1970, the future of South Vietnam looked hopeful thanks to pacification and Vietnamization. While U.S. forces had cut their manpower by almost one quarter, the South Vietnamese military, including the Regional and Popular Forces, hovered around one million. Improved security made some of the fruits of the construction effort more meaningful to the people of Vietnam. The highway program, for example, had completed 1,461 miles or 65 percent of the 2,226 miles of main roads slated for improvement. At the start of 1970, 1,613 miles of road had reached the Green security status. By the end of the year, the allies claimed 71.4 percent Green and 97 percent in the less secure Amber status along 2,745 miles of road, which included the Green miles. The security status for the railway system at the end of the year only reached 44 percent Green, but the lower-priority rail system managed to support essential and military operations. Security goals along the vital waterways especially in the Mekong Delta reached 80 percent Green. MACV considered the Cambodian operation an important military success. Perhaps the clearest indication of success was the lowering of the U.S. profile as South Vietnamese units assumed more of the burden of fighting and supporting its forces. As the 1970 MACV History declared: "If progress in Vietnamization and pacification was the keynote in 1970, the theme of 1971 would be testing the viability of our progress." This would be seen with the forthcoming South Vietnamese foray in Laos in February.[73]

[72] MACV History, 1970, vol. 2, pp. IX-36 to IX-43; Quarterly Hist Rpt, 1 Jan–31 Mar 70, MACDC, p. V-4; DF, USARPAC, GPCO-ME, to CofS Army, sub: Management Study of DeLong Barges Used as Piers, 29 Jun 70, Historians files, CMH. For more on PA&E's facilities engineering and training efforts, see PA&E History, FY 1970, pp. 35–54, 69–80; PA&E History, FY 1971, pp. 37–86. Both in Historians files, CMH.

[73] MACV History, 1970, vol. 1, p. I-6, vol. 2, pp. VII-1 to VII-3, IX-65 to IX-66, IX-69 to IX-72, IX-78 to IX-79. Green status roads were physically open and traffic could move during daylight hours with relative freedom. Amber status roads were physically open but security measures, such as armed escorts, were required. MACV noted that for measurement purposes, total roads in Amber status included miles in Green status. Red was the unsafe status, and the roads were closed by enemy control or by explosive damage. The same security codes applied to railroads.

16

Last Battles and Departure

The years 1971 to 1973 saw American and other allied forces complete their withdrawal from Vietnam and the signing of the Paris Agreement, which was supposed to bring the war to a close. These years were highlighted by a South Vietnamese cross-border thrust into Laos, an operation which showed that Vietnamization still needed work, and the large-scale North Vietnamese Easter offensive one year later, which showed that Vietnamization might be succeeding after all. For the military engineers, it was a time of wrapping up the construction program, making headway on highway improvements, transferring facilities and responsibilities to the South Vietnamese, and providing combat operational support to the dwindling allied combat force.

Laos: The Plan

Although an attack plan had long been on the books, the trigger for the allied raid into Laos was evidence of a North Vietnamese buildup across the border for what was shaping up to be a major dry-season offensive in northern I Corps in early 1971. On 23 December 1970, President Nixon approved the campaign in principle, subject to final review. After further coordination between Washington and Saigon, the president approved the operation in detail on 18 January 1971. President Thieu concurred and named the operation LAM SON 719 after the birthplace of Le Loi, a national hero of antiquity. The 719 denoted the year (1971) and the objective (Highway 9). The attacking ground forces would be solely South Vietnamese because the U.S. Congress after Cambodia had prohibited the expenditure of funds for any American ground troops campaigning outside South Vietnam.[1]

LAM SON 719 was to be a spoiling attack, not to seize terrain but to upset North Vietnamese plans and deter future offensives. American and South Vietnamese commanders planned to cut supply and infiltration routes, destroy logistical complexes, and inflict losses on enemy forces. The incursion would take place within a narrow corridor some fifteen miles on either side of Highway 9 and go no farther in Laos than Tchepone, a logistical center on the Ho Chi Minh Trail about twenty-five miles west of the border. Allied commanders envisioned a four-phase operation that would last at least ninety days, or until the onset of the Laotian rainy season in early May.

[1] MACV History, 1971, vol. 2, pp. E-15, E-17; Davidson, *Vietnam at War*, pp. 637, 639, 641; Palmer, *25-Year War*, p. 109. For more background on LAM SON 719, see Maj. Gen. Nguyen Duy Hinh, *Lam Son 719*, Indochina Monographs (Washington, D.C.: U.S. Army Center of Military History, 1979), pp. 32–35.

In the first phase, Operation DEWEY CANYON II, starting on 30 January, U.S. XXIV Corps would seize the approaches inside South Vietnam up to the border. Advancing on D-Day, a task force under the control of the 1st Brigade, 5th Infantry Division (Mechanized), would occupy the Khe Sanh area and clear Highway 9 for the advancing South Vietnamese. Farther to the south, the 101st Airborne Division would conduct diversionary operations in the A Shau Valley. In Phase II, South Vietnamese I Corps forces, mainly the Airborne Division reinforced by the 1st Armored Brigade, artillery, and engineers, would attack along Highway 9 in a series of leapfrogging air assaults and armored advances. In the third phase, the Airborne and 1st Infantry Divisions, after occupying Tchepone, would expand search operations to destroy enemy bases and stockpiles while rangers manned blocking positions to the north. Phase IV would involve withdrawing the South Vietnamese from Laos, ending the operation on or about 6 April. During all phases of LAM SON 719, U.S. forces would provide artillery fire, helicopter airlift, and tactical and strategic air support.[2]

For the engineers, the operation began on 12 January, eighteen days before D-Day, when Col. Kenneth E. McIntyre, commanding officer of the 45th Engineer Group, was summoned to meet with the XXIV Corps G–2 in Da Nang. Formerly at Phu Bai, the XXIV Corps in March 1970 had moved to the former III Marine Amphibious Force's headquarters at Camp Horn, Da Nang; the 45th Group headquarters had also moved from Phu Bai on 1 December 1970 and was comfortably quartered at the former Seabee Camp Haskins at Red Beach just west of Da Nang. The XXIV Corps engineer, Col. John H. Mason, was out-of-country, and Lt. Gen. James W. Sutherland, the XXIV Corps commander, wanted to have a senior engineer involved in the planning. McIntyre was asked to take charge of engineer planning until Mason's return two days later. Critical information was needed as soon as possible. Could Highway 9 be opened for wheeled vehicles to Khe Sanh by D plus 1 and to the Laotian border by D plus 7? Could the Khe Sanh airstrip be opened to handle C–130 aircraft? McIntyre responded that he would immediately get his staff on the job and reconnoiter the road and airfield. The G–2 told him, however, that planning was restricted to a small circle of men, and there could be no ground reconnaissance or unusual activity in the area. Fortunately, Brig. Gen. John G. Hill, the commander of the 1st Brigade, 5th Division, had a ready-made solution since the brigade constantly operated west along Highway 9. When the G–2 agreed that some reconnaissance was necessary, Hill arranged for McIntyre to accompany an aerial reconnaissance carried out under the guise of a helicopter raid.[3]

[2] MACV History, 1971, vol. 2, p. E-25; Davidson, *Vietnam at War*, pp. 642–43; Hinh, *Lam Son 719*, pp. 35–40; Palmer, *Summons of the Trumpet*, pp. 239–40; Palmer, *25-Year War*, p. 111. See also Cosmas and Murray, *U.S. Marines in Vietnam, 1970–1971*, pp. 195–96.

[3] Brig. Gen. Kenneth E. McIntyre, "The Magnificent Sight," *Army Engineer* 2 (November-December 1994): 30; Col. Kenneth E. McIntyre, "Secret Planning," *Kysu'* 3 (Fall 1971): 15; Interv, Capt David D. Christensen, 26th Mil Hist Det, with Col Kenneth E. McIntyre, CO, 45th Engr Gp, 8 Mar 71, VNIT 891, pp. 3–4, CMH; ORLL, 1 Feb–30 Apr 71, 45th Engr Gp, 30 Apr 71, p. 1, Historians files, CMH.

Colonel McIntyre

A few hours later, the 45th Group commander, seated aboard a 101st Airborne Division AH–1 Cobra gunship and accompanied by another Cobra and two UH–1 Hueys, took off from Camp Eagle and headed west for Khe Sanh and the Laotian border. In between rocket firings, the pilot and Colonel McIntyre searched for a trace of Highway 9, which for long stretches was difficult to find, especially west of Khe Sanh, where the road was almost completely overgrown along the remaining fourteen miles to the border. In this stretch alone, all ten bridges had been destroyed, and the road had been cut in several places by bomb and shell craters. All but three of the thirty-three bridges along Highway 9 between the abandoned Firebase VANDEGRIFT, twelve miles east of Khe Sanh, and a staging area for the operation, and the Laotian border were down. Flying over the former 3,700-foot Khe Sanh airstrip, McIntyre saw that the AM2 aluminum matting was riddled with hundreds of rocket and shell holes, and a huge crater overlapped the strip near its eastern end.[4]

Hoping he sounded more confident than he felt, Colonel McIntyre reported to the G–2 that the job could be done. To do this, the engineers would have to repair, replace, or bypass thirty bridges, clear about twenty-two miles of road, and virtually rebuild several sections of roadway. The only way to meet the deadlines would be to transport tactical bridging or culverts by helicopter to each stream crossing to join up with engineer teams and equipment that had moved overland to their work sites. As far as Khe Sanh airfield was concerned, McIntyre asked that the 101st Airborne Division's 326th Engineer Battalion land there on D-Day to begin repairing the runway and apron and to prepare two nearby sites for tactical bridging. The G–2 approved this request, and McIntyre continued his solitary planning. Although the only engineer involved thus far in DEWEY CANYON II, McIntyre later stated, "I'm sure what made it a success from a engineering viewpoint is that we were brought in on it early enough so that engineer aspects could influence the total plan." This allowed him to mesh tactical planning with engineer planning and gave him enough

[4] McIntyre, "The Magnificent Sight," pp. 29–31; Interv, Christensen with McIntyre, 8 Mar 71, pp. 4–6; Interv, Christensen with Col Kenneth E. McIntyre, CofS, Engr Cmd, 20 Jul 71, VNIT 923, pp. 19–20, CMH.

lead time to identify long-range equipment requirements. What he considered most important was getting heavy-lift helicopter support that might not have been available if he had joined the planning team at a later date.[5] (*Map 30*)

McIntyre still needed more data on Khe Sanh airfield and the bridge sites. Some limited aerial photo coverage, including a low-level movie film of Highway 9, proved helpful. He also arranged with General Hill for additional reconnaissance. On 13 January, ranger and engineer reconnaissance teams from the 1st Brigade, 5th Division, were inserted at Khe Sanh and the Bridge 36 site a few miles east of the airfield. After spending about ninety minutes on the ground, the team at the airstrip verified what McIntyre had seen from the air. At the bridge site, the team found that both embankments needed work before the gap could be bridged. Although the teams gathered the required information, they did not know of the impending operation.[6]

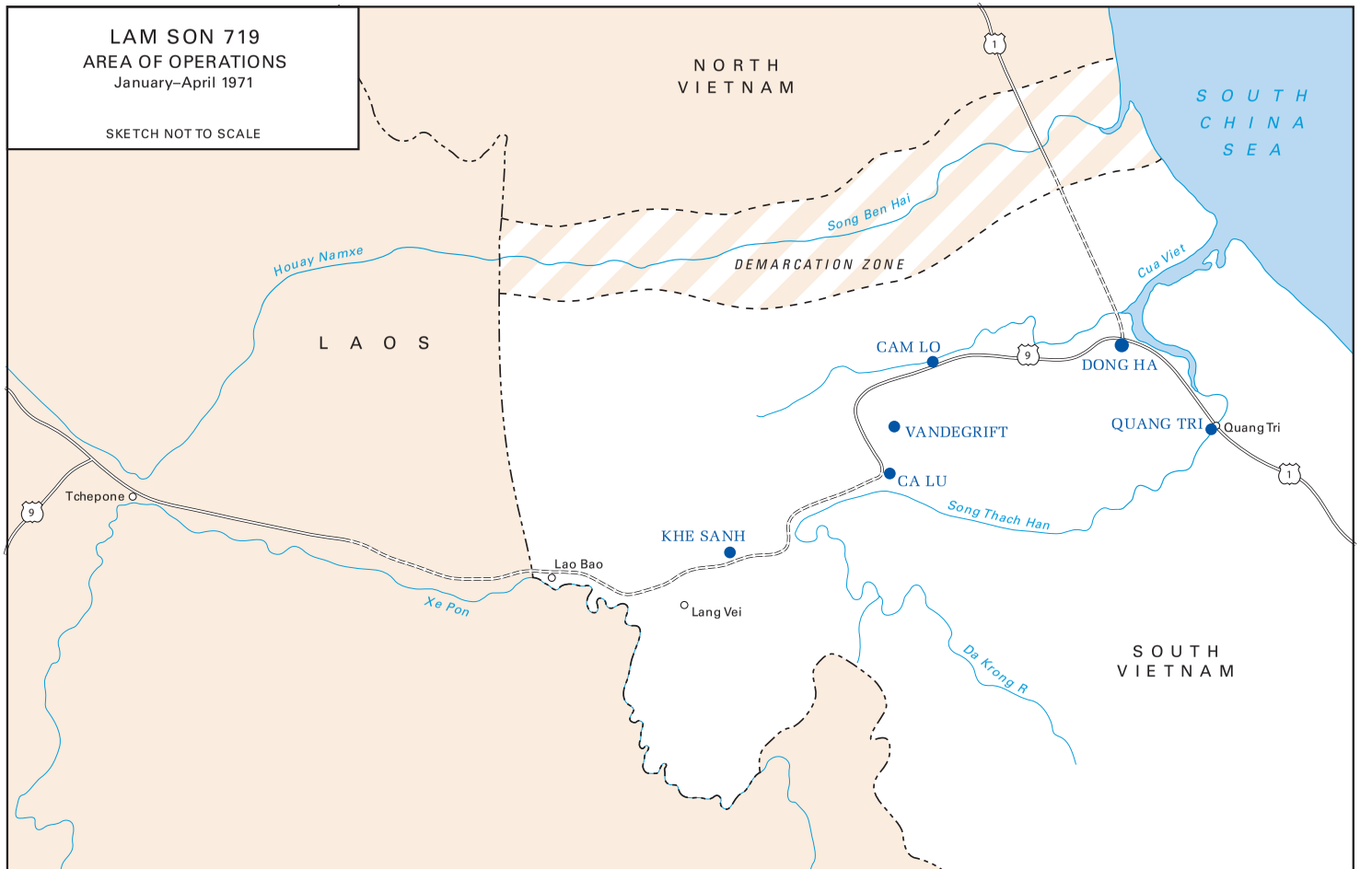
When Colonel Mason returned, he and McIntyre began preparing the engineer plan. Normally the 45th Group would receive missions from the 18th Engineer Brigade and Engineer Command, but General Sutherland thought there would be undue strain on security if all levels of the engineer command were made aware of the operation. As a result, the 45th Group was placed under the operational control of XXIV Corps effective 18 January. Then, about ten days before the operation, McIntyre received permission to bring the commanders of the 14th, 27th, and 326th Engineer Battalions into the planning group. Eventually the engineer planning team grew to eight officers from the 45th Group and two from the XXIV Corps Engineer Section. Still, the security restrictions on Dewey Canyon II and Lam Son 719 presented problems. Colonel McIntyre recalled that even the XXIV Corps G–4 was not involved in the planning until a few days before D-Day. As for the engineers' major supplier, the U.S. Army Support Command at Da Nang, only the commanding general, his deputy, and another officer participated in the planning. The few planners did not have the experience and information they needed to get all the details right. Although group and battalion operations officers were included in the planning, company commanders and platoon leaders were not briefed until D minus 2. The troops were informed on D minus 1, 29 January, and then confined to their bases.[7]

During the preparations, cover stories and deceptions were devised. When, a few days before the operation, bridging was moved to Quang Tri Combat Base, the troops were told that Highway 1 was in danger of being cut north of the Hai Van Pass. When the 27th Engineer Battalion at Camp Eagle began

[5] Interv, Christensen with McIntyre, 20 Jul 71, pp. 22–23 (quotation, p. 22); McIntyre, "The Magnificent Sight," p. 31; Interv, Christensen with McIntyre, 8 Mar 71, pp. 7–8, 20–21.

[6] McIntyre, "Secret Planning," p. 15; Interv, Christensen with McIntyre, 8 Mar 71, p. 5; Intervs, Christensen with Maj Richard A. Miles, Bde Engr, 1st Bde, 5th Inf Div, Capt George B. Schoener, CO, Co A, 7th Engr Bn, and 1st Lt Allen D. Ackerman, Asst Bde Engr, 1st Bde, 5th Inf Div, 10 May 71, VNIT 887, pp. 4–7, CMH.

[7] McIntyre, "The Magnificent Sight," p. 32; Interv, Christensen with McIntyre, 8 Mar 71, pp. 7, 15, 20; Interv, Christensen with Col John H. Mason, XXIV Corps Engr, 8 May 71, VNIT 892, pp. 3, 9–11, 17–18; Interv, Christensen with Lt Col Russell L. Jornes, CO, 27th Engr Bn, 21 Mar 71, VNIT 897, pp. 3–4. All VNITs in CMH.


LAM SON 719
AREA OF OPERATIONS
January–April 1971
SKETCH NOT TO SCALE
NORTH VIETNAM
SOUTH CHINA SEA
Song Ben Hai
DEMARCATION ZONE
Houay Namxe
Cua Viet
LAOS
CAM LO
DONG HA
VANDEGRIFT
QUANG TRI
Quang Tri
CA LU
Song Thach Han
Tchepone
KHE SANH
Lao Bao
Xe Pon
Lang Vei
Da Krong R
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MAP 30

stockpiling culvert and practicing putting down and taking up of aluminum matting, the story was that the unit was about to enter the A Shau Valley.[8]

As for the Khe Sanh airstrip, several surprises arose during the planning. Since AM2 repair kits were unavailable, the replacement of damaged panels would have to be improvised, and restoring the runway would take longer than originally predicted. Fearing a serious delay, McIntyre recommended a parallel assault strip, 3,200 by 60 feet, be constructed and used until the old runway could be repaired. He considered this one of his better decisions, for the repair of the existing runway would take more than four weeks. Even this approach gave some concern, for the parallel dirt airstrip was sited based on a topographic map of the area: it could have been right on top of a minefield or old underground bunkers. In addition, McIntyre learned that the soil was almost entirely clay, which mandated topping the assault strip with matting. At first he considered requisitioning the light-duty M8A1 matting because it was readily available, but he realized it might not hold up on the clay. Since the AM2 matting was not available in the quantities required, he used MX19 aluminum matting.[9]

When the 45th Group received its mission statement, it divided the engineering tasks into six parts. In the first, Lt. Col. Robert H. Carpenter's 14th Engineer Combat Battalion based at Quang Tri would open Highway 9 to Khe Sanh. In the second, the battalion would work with Company A, 7th Engineer Battalion, in building an alternate parallel road north of Highway 9. The third task entailed building logistical support facilities at the reopened VANDEGRIFT base. Lt. Col. Russell L. Jornes' 27th Engineer Battalion, which would move overland on D plus 1 to Khe Sanh, was given the fourth and fifth tasks: open Highway 9 west of the base and repair the old Marine airstrip. For the sixth task, Task Force 326, comprised of six platoons totaling about 230 men from the 326th Engineer Battalion under the command of its executive officer, Maj. Gene A. Schneepeck, and under the operational control of the 45th Group, would be airlifted to Khe Sanh and begin constructing the assault airstrip. The task force would also prepare nearby bridge sites for tactical bridging. When the 27th Engineer Battalion reached Khe Sanh, it would assume operational control of the airborne engineers and provide heavier construction equipment as they continued working on the assault airstrip.[10]

One unknown was the weather. Ground transportation for the corps-size operation of about 35,000 troops depended on a single long, narrow, winding

[8] McIntyre, "The Magnificent Sight," p. 32; Interv, Christensen with Jornes, 21 Mar 71, pp. 9–12, 22–23; Interv, Christensen with Mason, 8 May 71, p. 11; Interv, Christensen with Maj Gene A. Schneepeck, XO, 326th Engr Bn, 18 Mar 71, VNIT 893, pp. 15–19, CMH.

[9] McIntyre, "The Magnificent Sight," pp. 31–32, 35; Interv, Christensen with McIntyre, 8 Mar 71, pp. 5–6, 10–12; Interv, Christensen with Mason, 8 May 71, p. 4–6; ORLL, 1 Feb–30 Apr 71, 45th Engr Gp, p. 18.

[10] McIntyre, "The Magnificent Sight," p. 32; Interv, Christensen with McIntyre, 8 Mar 71, pp. 8–9; Interv, Christensen with Mason, 8 May 71, pp. 9–10; ORLL, 1 Feb–30 Apr 71, 45th Engr Gp, p. 22; Interv, Christensen with Schneepeck, 18 Mar 71, p. 2; Interv, Christensen with Jornes, 21 Mar 71, pp. 28–29; Interv, Christensen with Lt Col Robert H. Carpenter, CO, 14th Engr Bn, 7 Mar 71, VNIT 886, pp. 9–10, CMH.

road that hardly existed. Air transportation would have to rely on uncertain airstrips at Khe Sanh. Heavy rains could wash out most of the culvert bypasses and effectively close Highway 9 and possibly the airstrips. These concerns were expressed when Colonels McIntyre and Mason met with General Sutherland, seven days before the operation. Acknowledging these concerns, Sutherland replied, "I am confident that you engineers will do whatever is necessary to make this operation a success."[11]

By D minus 1 the engineers were ready. Two panel bridge sets had been moved from Chu Lai to the Quang Tri Combat Base. All M4T6 bridging in depot contingency stocks at Da Nang to be used as dry spans also arrived at Quang Tri. Four armored vehicle launched bridges and three launchers from the 1st Brigade, 5th Division's Company A, 7th Engineer Battalion, and the 1st Battalion, 77th Armor, were made available to cross gaps along Highway 9. In the last few days before the operation began, the 14th and 27th Battalions assembled 4,700 feet of 36-inch corrugated metal culvert and rigged them in bundles of four 20-foot sections for helicopter lift. The engineers also assembled ten 38-foot M4T6 dry gap spans for CH–54 Flying Cranes. One day before the start of DEWEY CANYON II, the 45th Group Headquarters (Forward), some thirty men, moved to the Quang Tri Combat Base. Over half of the forward consisted of aviators, crew chiefs, and maintenance troops. Altogether, the group would assemble nearly 1,100 troops for the operation, including the men from Task Force 326.[12]

The Operation

DEWEY CANYON II began under the guise of an artillery raid. At 0400 on 29 January, D minus 1, an armored task force accompanied by Company D, 14th Engineer Battalion, left Quang Tri City northward along Highway 1 and turned west on Highway 9, reaching Firebase VANDEGRIFT in midmorning. Other elements of the 14th Battalion moved to Ca Lu. After arriving at VANDEGRIFT, Company D began upgrading the approaches to the firebase. At day's end, the company went through the motions of bedding down for the night. Shortly after midnight, two columns advanced west toward Khe Sanh, setting in motion DEWEY CANYON II. The main effort, Troop A, 3d Squadron, 5th Cavalry, with elements of the 14th Engineer Battalion and the 59th Land Clearing Company working together as an armored cavalry-engineer team, moved from VANDEGRIFT along Highway 9. The secondary effort, the remainder of the 3d Squadron, 5th Cavalry, and elements of Company A, 7th Engineer Battalion, moved from Firebase ELLIOTT north of VANDEGRIFT to build the alternate road to Khe Sanh.[13]

[11] McIntyre, "The Magnificent Sight," p. 33 (quotation).

[12] Ibid., p. 32; Interv, Christensen with McIntyre, 8 Mar 71, p. 31; Interv, Christensen with Carpenter, 7 Mar 71, pp. 10–11.

[13] McIntyre, "The Magnificent Sight," p. 33; Robert P. Miller, "The Road to Laos," *Army* 40 (January 1990): 27–29; AAR, Opn LAM SON 719, XXIV Corps, 30 Jan–6 Apr 71, 14 May 71, p. 4, Historians files, CMH; Interv, Christensen with Carpenter, 7 Mar 71, pp. 13–16.

The main column on Highway 9 set out at one minute after midnight, 30 January. At the lead were a Rome plow, dismounted cavalry troops and engineer minesweeping teams, a Sheridan tank equipped with an infrared light, and an armored cavalry assault vehicle. Engineer bridge and culvert work crews, Rome plows, bulldozers, tanks, and armored cavalry assault vehicles down the line followed. The pace during the first hour in the darkness and no moonlight was much too slow to suit 1st Lt. Robert P. Miller, one of the platoon leaders from Company D, 14th Engineer Battalion, near the front of the column. Miller later recalled it was like driving down a black tunnel, and he asked and received quick approval from the troop commander to turn on the lead Rome plow's headlights. The minesweep also slowed the advance, and it was discontinued because the operators could not get even a partial swing of their mine detectors in the high elephant grass in the road. After advancing about four hundred yards, the Sheridan became mired at the first stream crossing. The Rome plows passed the tank and pushed on, scraping the road clear of vegetation and widening it to some degree. On this stretch the road lay in the narrow Song Thach Han River valley, with the river on the left and hills on the right. Not able to stray far from the original roadbed, the column forded streams as it advanced. The Rome plows with their angled blades did a good job clearing vegetation, but a straight line D7 bulldozer had to be brought up to cut the steep banks to bypass the downed bridges. Although none of the first nine intermittent streams were flowing, a bulldozer did bog down in a wide muddy stream bed, and winching it out cost the column more precious minutes. In the darkness, the column had advanced only two and a half miles, but the advance increased speed as daylight spread over the valley.[14]

As the day dawned, the sky began to fill with helicopters ferrying troops, howitzers, small bulldozers, culvert sections, and supplies of all kinds to Khe Sanh. Joining Major Schneepeck's Task Force 326 were three infantry battalions that would secure the base and begin operations in the area. Sling-loaded CH–47 and CH–54 helicopters carrying M4T6 dry span bridges and culvert met teams of engineers at bypassed bridge sites. The preassembled frame of each bridge was carried by a Flying Crane followed by a Chinook with a load of deck balk slung underneath. Chinook after Chinook brought four twenty-foot sections of preassembled culverts dangling at the end of a fifty-foot sling. An impressive 116 helicopter sorties flew in support of 45th Group missions that first day, 84 by Chinook and Flying Cranes. During the first two days, Army and Marine Corps helicopters also moved 425 tons of engineer supplies and equipment to Khe Sanh in one of the most ambitious airlifts in support of engineer operations in the war.[15]

[14] Starry, *Mounted Combat*, p. 187; McIntyre, "The Magnificent Sight," p. 33; Miller, "The Road to Laos," pp. 27–29; ORLL, 1 Feb–30 Apr 71, 45th Engr Gp, p. 19; AAR, Opn LAM SON 719, XXIV Corps, p. 4; Interv, Christensen with Carpenter, 7 Mar 71, pp. 13–16. See also Steven J. Rogge, "A Combat Engineer Squad Leader in Vietnam," *Army Engineer* 2 (August-September 1994): 32; Keith W. Nolan, *Into Laos: The Story of DEWEY CANYON II/LAM SON 719, Vietnam 1971* (Novato, Calif.: Presidio Press, 1986), pp. 64–99.

[15] McIntyre, "The Magnificent Sight," p. 33; AAR, Opn LAM SON 719, XXIV Corps, p. 4; AAR, Opn LAM SON 719, 101st Abn Div, 30 Jan–9 Apr 71, n.d., p. 12–2, Historians files, CMH.

A dump truck and Rome plow begin clearing and widening Highway 9 during the opening phase of LAM SON *719.*

As the cavalry-engineer column pushed westward along Highway 9, Task Force 326 engineers began preparing bridge sites near Khe Sanh for tactical bridging. At 0830, shortly after infantry units had landed on nearby hills, a platoon of Task Force 326 landed between Bridges 33 and 34 and teams moved the short distance to work on the abutments at both sites. At Bridge 33, an abutment was prepared for an armored vehicle launched bridge when the cavalry-engineer column reached the bridge site later that day. The airmobile engineers also placed a helicopter-delivered M4T6 dry span at Bridge 34 and built a culvert bypass at Bridge 35, clearing mines and booby traps along the way. Frequently their mine detectors could not be used because of the heavy vegetation, especially the very sharp-edged ten- to twelve-foot elephant grass, and they had to probe for mines with bayonets. From Bridge 34 to 35, the teams visually swept the road followed by two small M450 bulldozers that sheared off the top two to three inches of soil and rolled off antitank mines to the side. Near the end of the day, the bulldozers reached Bridge 36 and work crews began working on the bridge abutments. The cavalry-engineer column reached Bridge 36 by nightfall, only two bridges short of Khe Sanh. Before D-Day was over, the 14th Engineer Battalion had placed three armored vehicle launched bridges and seven M4T6 dry spans and constructed thirteen culvert bypasses, thereby meeting the D-Day objectives. Colonel McIntyre attributed this remarkable progress to the massive helicopter support and "the stellar

performance of platoon leaders and squad leaders whose aggressive leadership, flexibility and good engineering judgement carried the day. The baton had been successfully passed from the planners to the doers."[16]

Some mix-ups did occur. While watching the progress of the Chinooks and Flying Cranes from his own helicopter, Colonel McIntyre noticed some returning with their loads of bridges and culvert. He followed them back to their pickup points and discovered some of the helicopter crews had not been able to communicate with the engineers on the ground. All radio frequencies had been changed on D minus 1, but some of the crews had not been given the new ones. McIntyre spent the next several hours passing out slips of paper with the correct frequencies. He also developed a simple arrangement by having large numbers painted on bed sheets and informing the helicopter pilots to deliver materials to the matching bridge site on the ground.[17]

The next day, 31 January, the road was open to Khe Sanh. That morning a M4T6 dry span was in place at Bridge 36, and the first armored units reached Khe Sanh at 1230. By the end of the day, tracked and wheeled vehicles were flowing into the combat base. Roadwork west of the base to the Laotian border was continued by Colonel Jornes' 27th Engineer Battalion. Two Rome plows from the 1st Platoon, 59th Land Clearing Company, now attached to the 27th Battalion, blazed the way for the 1st Squadron, 1st Cavalry, all the way to the border by the end of D plus 2. About two hundred yards short of the border, the engineers put up a road sign warning American troops not to go any farther. Highway 9 was opened to traffic on D plus 5, two days ahead of schedule. Together, the 14th and 27th Battalions and Task Force 326 crossed a total of 39 streams with 12 M4T6 dry spans, 8 armored vehicle launched bridges, 2 eighty-foot panel bridges, and 84 forty-foot sections of culverts. All the bridges would be removed at the end of the operation.[18]

Work continued along Highway 9 throughout the operation. Except for brief maintenance periods and when wet weather caused very slick conditions, the road remained open twenty-four hours a day. On 2 February, a tank retriever towing an M48A3 Patton tank damaged an eighty-foot double-single panel bridge at Bridge 10 several miles north of VANDEGRIFT. Traffic continued to move over the bypass during the construction of a new bridge, which opened four days later. With one exception two-way wheeled traffic could traverse all the way from Dong Ha to the Laotian border. The switchback crossing at Bridge 36 was a major bottleneck early in the operation. Heavy traffic had caused the M4T6 dry span bridge to settle fast, and it was replaced by an armored vehicle launched bridge. A sharp turning radius and steep slopes

[16] McIntyre, "The Magnificent Sight," pp. 33–34 (quotation); Miller, "The Road to Laos," p. 29; ORLL, 1 Feb–30 Apr 71, 45th Engr Gp, p. 19; AAR, Opn LAM SON 719, 101st Abn Div, p. 12–1; Interv, Christensen with Schneepeck, 18 Mar 71, pp. 9, 31–32, 38–49.

[17] McIntyre, "The Magnificent Sight," p. 34; Interv, Christensen with Carpenter, 7 Mar 71, pp. 18–19.

[18] McIntyre, "The Magnificent Sight," pp. 34–35; ORLL, 1 Feb–30 Apr 71, 45th Engr Gp, p. 19 and incl. 5; Interv, Christensen with McIntyre, 8 Mar 71, pp. 22–23; Interv, Christensen with Jornes, 21 Mar 71, pp. 21–22. See also AAR, Opn LAM SON 719, 101st Abn Div, p. 12–1.

An armored vehicle launched bridge at Bridge 33

on both sides of the bridge caused some trucks and trailers and low-beds to miss the turn. A bypass could not be built, and the engineers resorted to blasting some thirty-five feet of rock from the northern approach, making entry easier. On 8 March, 45th Group engineers installed a second armored vehicle launched bridge with higher abutments and a better approach. The following day, rains in the mountains to the north caused a sudden rise in the water. Rushing water caused some damage to the abutments of the original bridge. This approach was further improved, and Bridge 36 suffered no other problems. On the peak day some 2,100 vehicles used the road. Security west of Khe Sanh improved with fifty-yard-wide strips on both sides of the road cleared by Rome plows.[19]

Along the alternate route to Khe Sanh, Company A, 7th Engineer Battalion, began clearing a tracked vehicle road, called Red Devil Road, in honor of the unofficial nickname for the 5th Division. Building this second route had been considered for several years, and past reconnaissances had shown this was possible. Moving in a southwesterly direction, bulldozers began cutting a tank trail along a rising ridge line, which ran about four and one-half miles and required fewer stream crossings and side hill cuts as well as better drainage and a minimum of work. This took two and one-half days. Then instead of following the ridge to the top of the mountain, the bulldozers proceeded down the hill with a steep side hill cut, making several switchbacks,

[19] McIntyre, "The Magnificent Sight," pp. 34–35; Miller, "The Road to Laos," pp. 30, 33; ORLL, 1 Feb–30 Apr 71, 45th Engr Gp, pp. 19–20; Interv, Christensen with Carpenter, 7 Mar 71, pp. 28–29.

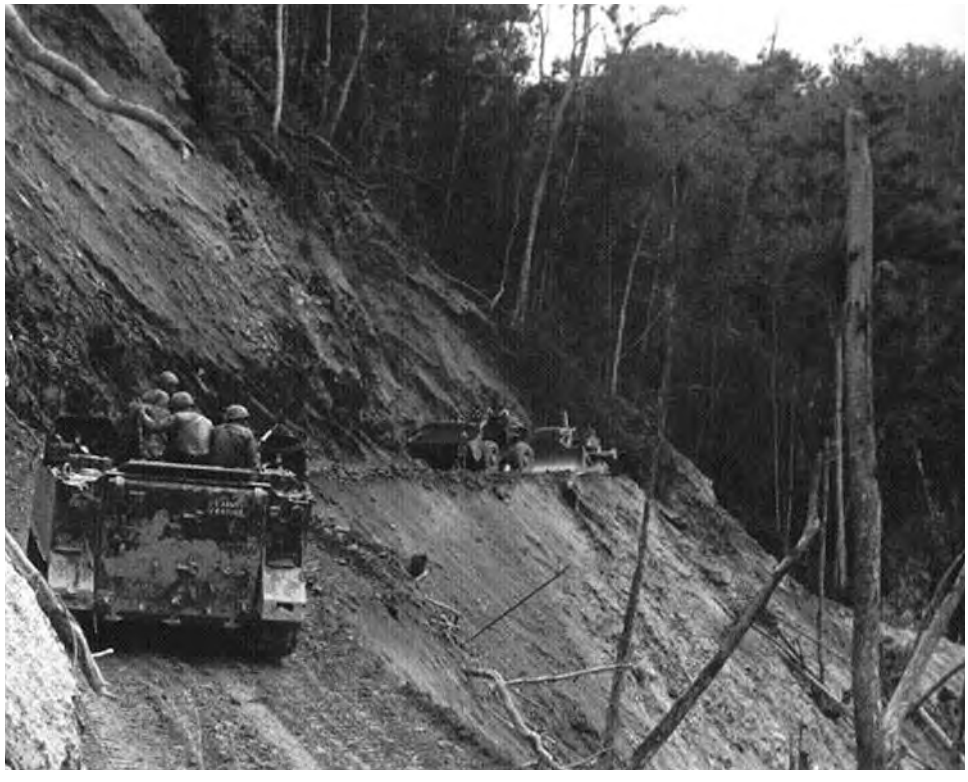
and pushed across a valley about 300 to 400 yards wide. Here the trail had to be gouged out of dense vegetation and one stream crossed on the fourth day. The steep banks of the stream made fording impossible, and a thirty-foot section of forty-eight-inch culvert was brought up, rolled into the stream, and topped off with dirt. On the other side of the valley, the bulldozers moved up a steep ridge with grades 30 to 40 percent in a number of spots. The next stretch extended across a flat region known as the Punchbowl, crisscrossed by several small streams and more than one mile of dense jungle on the eastern end. Bangalore torpedoes were used to help cut through the heavy vegetation, and the streams were either forded or temporary box culverts made out of logs were built. On 8 February, the column met a 14th Engineer Battalion column pushing out from Khe Sanh. Little contact was made with the enemy, and opening Red Devil Road was accomplished in much less time than anticipated. Improvements continued throughout the operation. These involved installing more culverts and upgrading the pioneer road to a fair-weather wheeled vehicle road.[20]

During LAM SON 719, the 1st Brigade, 5th Division, exploited the use of armored cavalry-engineer teams to build an additional fifty miles of pioneer trails and fair-weather roads in the Khe Sanh area. Such team efforts usually consisted of a mechanized engineer platoon with three armored personnel carriers and one or two bulldozers from Company A, 7th Engineer Battalion, and an armored cavalry platoon. This type of organization afforded a highly armed road-building team that quickly bulldozed pioneer roads through rugged terrain and steep grades. Later the grades were reduced and the road surfaces improved for wheeled vehicles. Steep hills surrounded the Khe Sanh Plain, and the new roads provided added mobility for the armored and mechanized units and ground access to firebases. These measures kept most of the enemy's mortar fire out of the Khe Sanh area and rocket fire to a minimum. After some ten days into the operation, a cavalry-engineer team built another route, called Red Devil Drive, some nine miles along a ridgeline from Khe Sanh to a ranger group headquarters near the border. Built in four days as a tank trail, this road was soon improved to handle truck traffic and allowed the movement of 175-mm. guns and ammunition to a firebase supporting South Vietnamese forces inside Laos. A tank trail was also blazed north of Red Devil Road to block possible North Vietnamese threats from that direction. Other trails followed, linking areas with Highway 9 and Red Devil Road.[21]

The most difficult stretch of road was built south of Red Devil Road during the latter stages of LAM SON 719. About three miles long, this road served two purposes. It was to link up with Firebase CATES overlooking Highway 9 and also to confuse North Vietnamese forces in that area as to what the next allied course of action would be. Rugged triple-canopy jungle barred the way, and

[20] Interv, Christensen with Miles, et al., 10 May 71, pp. 10–11, 22–25, 32, 45–49; ORLL, 1 Feb–30 Apr 71, 45th Engr Gp, p. 22.

[21] AAR, Opn LAM SON 719, XXIV Corps, pp. 92–93; ORLL, 1 Feb–30 Apr 71, 1st Bde, 5th Inf Div (Mech), 11 Jun 71, pp. 12, 21–22, Historians files, CMH; Interv, Christensen with Miles, et al., 10 May 71, pp. 29–31, 34–36.



A bucket loader and bulldozer at work on Red Devil Road

the steep grades were just about the maximum for bulldozers to traverse. This was the only place that the bulldozers of Company A, 7th Engineer Battalion, received rocket-propelled grenade fire. One bulldozer was hit twice, badly damaging the engine, and it had to be dragged out by another bulldozer.[22]

Meanwhile, at Khe Sanh work proceeded on the two airstrips. On D-Day, Major Schneepeck's Task Force 326 started around-the-clock work on the assault airstrip, and the 1st Platoon, Company A, 27th Engineer Battalion, began to remove damaged matting from the existing airstrip. Once the engineers were on the ground, it became obvious that they could not complete the assault airstrip by the end of D plus 3. Mines laid by the marines and the lack of minefield records restricted movements in and around the base. The clayey soil coupled with a steady drizzle and heavy ground fog made it difficult for the soil to dry enough to get proper compaction. Even with the 27th Engineer Battalion's D7E bulldozers and scrapers, the task force did not complete the dirt strip until D plus 5. The first C–130 landed at 1600 the next day, 4 February, opening Khe Sanh to cargo aircraft for the first time in three years. However, the plane got mired in seven-inch ruts. Although a safe takeoff was narrowly managed, the Air Force determined that the packed earth airstrip was unsatisfactory for prolonged

[22] Interv, Christensen with Miles, et al., 10 May 71, pp. 35–36.

At Khe Sanh Airfield, a CH–54 Flying Crane drops off sectionalized engineer equipment.

use during poor weather. Meanwhile, another C–130's wheels bumped into a concrete slab about an inch under the runway's surface, and the aircraft had difficulty maneuvering around this obstacle. The engineers quickly excavated the entire slab. On 7 February, a twenty-sortie C–130 effort hauled 250 tons of MX19 matting from Bien Hoa to Quang Tri. In turn, heavy-lift helicopters began delivering the matting to Khe Sanh. Despite intermittent rain, the engineers again compacted the assault strip using heavy rollers, and on 12 February they began laying the first of nearly 17,000 panels of the aluminum matting. The matted assault strip opened on the fifteenth, receiving its first C–130 that afternoon. On that day transports began regular flights into Khe Sanh. In addition, the battalion cleared, graded, compacted, and laid M8A1 matting for a new 350-by-850-foot parking apron near the west end of the assault strip. Other airfield work included repairs to an old parking apron between the two runways, turnarounds, and overruns. On 20 February, Major Schneepeck and his Task Force 326 were released from operational control of the 27th Engineer Battalion and returned to its home at Camp Eagle.[23]

[23] "Lam Son 719," *Engineer* 1 (Summer 1971): 27; AAR, Opn LAM SON 719, 101st Abn Div, pp. 12-2 to 12-4; ORLLs, 1 Feb–30 Apr 71, 45th Engr Gp, pp. 20, 22, and 1 Feb–30 Apr 71, 27th Engr Bn, 30 Apr 71, pp. 1, 4, 10, Historians files, CMH; Bowers, *Tactical Airlift*, pp. 513–14; Nalty, *Air War Over South Vietnam*, pp. 257–58; Interv, Christensen with Schneepeck, 18 Mar 71, pp. 54–78; Interv, Christensen with Jornes, 21 Mar 71, pp. 18–21, 23–24, 26–28. See also Nolan, *Into Laos*, pp. 100–15.

Repair of the old AM2 runway proved even more difficult. Removing and replacing the damaged panels was a very slow process, because the subgrade had failed in many places, and there were scores of dud rounds buried under the matting. The engineers used several thousand pounds of explosives to clear old minefields and the dud rounds. Furthermore, the expedient anchorage system of U-shaped pickets driven into the ground and bent over the matting was giving way, and the touchdown area at the eastern edge of the runway had failed. In one instance, the gust created by a helicopter's blades lifted up a section of matting and flipped it over. Since the standard anchorage system was not on hand, the expedient method was effectively modified. Two eight-foot U-shaped pickets were welded to a three-foot angle iron. The pickets were driven into the ground with the angle irons holding the edge of the mats in place. It took a month for the 27th Engineer Battalion to restore the runway for C–130 use. It opened on 1 March. Nearly two thousand AM2 panels were used in the repair work. If AM2 repair kits had been available, repairs would have proceeded more quickly. "In retrospect," Colonel McIntyre later wrote, "it would have been faster to have pulled the AM2 matting off to one side and to have started over from scratch."[24]

The Air Force's decision to enlarge the refuel and rearm area and add other improvements compounded the engineers' workload. Task Force 326 had to move its bivouac site to make room, and when the airborne engineers started clearing the new refuel and rearm area they uncovered huge amounts of buried debris, including fifty-five-gallon drums, timbers, old matting, and parts of bunkers. Bulldozer operators had to be especially careful in scraping away the dirt since the bulldozer blades could easily rip open barrels containing aviation fuel or diesel. More reinforced-concrete slabs were also found and had to be removed. Improvements made by the 27th Engineer Battalion's attached 591st Light Equipment Company included a 538,200-square-foot helicopter staging area, improved roads within the base, and berms for the helicopter rearm pad. The company used over 90,000 gallons of peneprime to stabilize the helicopter area and interior roads. Another task assigned to the light equipment company required digging up and removing the remains of over one hundred bunkers built by the Marine Corps.[25]

Despite the many problems at Khe Sanh, the airfield readily handled the forty C–130 flights planned for each day. This figure was reached on 19 February for the first time with the arrival of 350 tons of supplies, including 57,000 gallons of aviation fuel. Supply buildup was rapid, and a two-day stockage was attained in critical 105- and 155-mm. ammunition. On the peak day, 28 February, sixty-two C–130s flew into Khe Sanh. From 15 February until the end of the operation, one or both of the runways were available for service. On 9 March, however, a C–130 lost its right rear wheel while landing,

[24] Quote from McIntyre, "The Magnificent Sight," pp. 34–35; "Lam Son 719," p. 27; Nalty, *Air War Over South Vietnam,* p. 258; ORLLs, 1 Feb–30 Apr 71, 45th Engr Gp, pp. 20–21, 1 Feb–30 Apr 71, 27th Engr Bn, p. 9, and 1 Feb–30 Apr 71, 27th Engr Bn, 30 Apr 71, pp. 1, 4, 9, Historians files, CMH; Interv, Christensen with Schneepeck, 18 Mar 71, pp. 56–57.

[25] Interv, Christensen with Schneepeck, 18 Mar 71, pp. 78–79; Interv, Christensen with Jornes, 21 Mar 71, p. 17; ORLL, 1 Feb–30 Apr 71, 27th Engr Bn, p. 8.

Aerial view of reopened Khe Sanh Airfield

and the bare axle ripped the matting for some two thousand feet. Lacking enough replacement matting, repair crews quickly patched the damaged area with epoxy cement mixed with river run sand hauled in from the Ca Lu area. This method proved much better than soil-cement because of its quicker curing time. In fact, weather became more of a limiting factor than the condition of the runways.[26]

Besides the road and airfield work, Army engineers carried out routine operational support tasks during the cross-border operation. Company A, 7th Engineer Battalion, made minesweeps along Highway 9 between Dong Ha and Cam Lo and minesweeps and assault bridging for the mechanized brigade's artillery raids around VANDEGRIFT. The company also provided a 1,500-gallon-per-hour water point and built fortifications at Khe Sanh. The 326th Engineer Battalion built bunkers, fortifications, and tactical operations centers for the 101st Airborne Division and helped close down the Khe Sanh base. Units of the 45th Group built operational and logistical facilities at VANDEGRIFT, Khe Sanh, and along the juncture of Highway 9 and the Laotian border. During the operation, group units continued to provide engineering support to other U.S. units throughout I Corps. For example, the 27th Engineer Battalion's other three line companies and the attached 591st Light Equipment Company built dog kennels at Phu Bai for the battalion's

[26] McIntyre, "The Magnificent Sight," p. 35; Bowers, *Tactical Airlift*, p. 514; ORLLs, 1 Feb–30 Apr 71, 45th Engr Gp, p. 20, and 1 Feb–30 Apr 71, 27th Engr Bn, p. 10; Interv, Christensen with Jornes, 21 Mar 71, pp. 34–36.

mine detection dogs, constructed new fighting positions and bunkers at Camp Eagle, and reopened and maintained thirty miles of Route 547 into the A Shau Valley.[27]

Once the engineers reopened Highway 9 on the Vietnamese side of the border, South Vietnamese armored and airborne forces crossed into Laos at 1000 on 8 February and advanced west five and a half miles toward Tchepone. Although intelligence reports had indicated that the terrain along the Laotian part of Highway 9 was favorable for armored vehicles, a road net did not exist. Highway 9 was a neglected forty-year-old single-lane dirt track, with high shoulders on both sides and no maneuver room. Huge bomb craters, undetected earlier because of the dense grass and bamboo, restricted the armored vehicles to the road. Helping to lead the way, the South Vietnamese 101st Engineer Battalion used bulldozers to fill in craters and ditches. Some parts of the road had been destroyed beyond quick repair, and the engineers built bypasses. As the armored units moved along Highway 9, elements of the South Vietnamese Airborne Division, 1st Infantry Division, and rangers made assaults into landing zones north and south of the road. U.S. Marine Corps helicopters lifted small D4 bulldozers to open the firebases. Meanwhile, U.S. Army helicopters and artillery had moved to Khe Sanh to provide fire support, and air cavalry reconnaissance teams searched for North Vietnamese forces.[28]

Enemy reaction to the border crossing was swift and violent. Soon South Vietnamese units were bogged down by heavy North Vietnamese resistance and bad weather. Elements of some five North Vietnamese divisions plus tanks and large numbers of field and antiaircraft artillery faced the South Vietnamese, and the drive toward Tchepone stalled. After several days' delay, the South Vietnamese air-assaulted into heavily damaged Tchepone, but by then the North Vietnamese counterattacked with Soviet-built T54 and T55 tanks, heavy artillery, and infantry. They struck the rear of the South Vietnamese forces strung out on Highway 9, blocking their main avenue of withdrawal, and overwhelmed several South Vietnamese firebases, depriving the troops on the road of critically needed flank protection. The result was a near disaster. U.S. Army helicopters trying to rescue South Vietnamese soldiers from their besieged hilltop firebases encountered intense antiaircraft fire. Panic soon ensued, and desperate troops even clung to helicopter skids to reach safety. In one instance, U.S. CH–54 helicopters airlifted two small bulldozers to help set up a crossing point for armored vehicles on the steep-banked Xepon River in order to reach Highway 9. The last elements of the 1st Division left Laos on 21 March, and the remaining forces withdrew into South Vietnam over the next few days. Operation LAM SON 719 officially ended on 6 April.[29]

[27] ORLLs, 1 Feb–30 Apr 71, 1st Bde, 5th Inf Div, p. 12, 1 Feb–30 Apr 71, 45th Engr Gp, p. 18, and 1 Feb–30 Apr 71, 27th Engr Bn, pp. 4–8; AAR, Opn LAM SON 719, 101st Abn Div, pp. 12-4 to 12-5.

[28] Starry, *Mounted Combat*, pp. 190–92; Tolson, *Airmobility*, pp. 240–41; Hinh, *Lam Son 719*, p. 65–68; Davidson, *Vietnam at War*, p. 656; Interv, Christensen with Mason, 8 May 71, p. 27. See also Cosmas and Murray, *U.S. Marines in Vietnam, 1970–1971*, pp. 196–99.

[29] Starry, *Mounted Combat*, pp. 192–96; Tolson, *Airmobility*, pp. 241–44; Hinh, *Lam Son 719*, pp. 117–18.

Although the South Vietnamese reached Tchepone, it was of little consequence. Their stay there was brief, and the supply caches discovered were disappointingly small. Operations along the Ho Chi Minh Trail were hardly disrupted. Actually, the North's infiltration reportedly increased during the operation as Hanoi shifted traffic to roads and trails farther to the west in Laos. In addition to heavy personnel losses, the South Vietnamese lost large amounts of equipment, and all of the combat engineer equipment, including thirty-one bulldozers, in their disorderly withdrawal. Over 100 U.S. Army helicopters were also destroyed and more than 600 damaged, the highest number in any one operation of the war. LAM SON 719 vividly illustrated that Vietnamization still had a long way to go and that the South Vietnamese were still heavily dependent on U.S. advisers. There were some successes. During the incursion, South Vietnamese forces inflicted heavy casualties on the North Vietnamese, forestalling a spring offensive in the northern provinces. LAM SON 719 also helped delay major operations by Hanoi for the remainder of 1971 and early 1972. The operation, however, failed to sever the Ho Chi Minh Trail for any appreciable time. The trail was in full operation within a week.[30]

By 25 March, U.S. forces had begun making preparations to pull back from their forward bases. Concern now centered on whether North Vietnamese forces would push across the border toward Khe Sanh. Already, sappers had penetrated the VANDEGRIFT logistical base and succeeded in blowing up 10,000 gallons of aviation fuel. The enemy had also harassed Khe Sanh with mortar, artillery, and sapper attacks. As a result, General Sutherland ordered the removal of the airfield matting at Khe Sanh several days before the planned 1 April date. Company A, 326th Engineer Battalion, began to clean up and recover salvaged construction materials. Two additional engineer platoons were airlifted to the base and, by 1 April, the day the airfield officially closed, 524 bundles of MX19, 179 bundles of AM2, and 34 bundles of M8A1 matting were ready to be put aboard departing C–130s. All the MX19 and AM2 matting emplaced at the Khe Sanh airfield was removed with the exception of the panels used to repair the old AM2 runway. On 5 April, a platoon from Company C, 326th Engineer Battalion, augmented with four M450 bulldozers arrived by air and began tearing down the base. Equipment that was not salvageable was buried, and bunkers and munitions left behind were destroyed. The engineers departed the next day, the same day the last South Vietnamese and U.S. forces boarded helicopters at the base.[31]

During the campaign, the 45th Group suffered personnel and equipment losses. Six engineers were killed and eleven wounded in action, seven seriously enough to be medically evacuated. Five of the deaths and three seri-

[30] MACV History, 1971, vol. 2, pp. E-33 to E-34, E-45; Starry, *Mounted Combat*, p. 197; Tolson, *Airmobility*, p. 252; Hinh, *Lam Son 719*, pp. 127, 131, 139; Davidson, *Vietnam at War*, pp. 650–51.

[31] William M. Hammond, *Public Affairs: The Military and the Media, 1968–1973*, United States Army in Vietnam (Washington, D.C.: U.S. Army Center of Military History, 1996), p. 483; Hinh, *Lam Son 719*, pp. 109, 117, 119, 125; Bowers, *Tactical Airlift*, p. 518; ORLL, 1 Feb–30 Apr 71, 45th Engr Gp, pp. 21–22; AAR, Opn LAM SON 719, 101st Abn Div, 30 Jan–9 Apr 71, p. 12–5.

ously wounded were members of the 59th Land Clearing Company during an artillery attack late in the operation near the Laotian border. Several days later, a road grader operator from the 14th Engineer Battalion was killed in an attack along Highway 9. Two other engineers were wounded. The next day, a 14th Engineer Battalion convoy heading toward Khe Sanh was ambushed: one engineer was wounded and two 10-ton tractors were damaged. Major equipment losses during the operation included six bulldozers.[32]

Attacks along Highway 9 were mostly harassing small arms, mortar, and rocket-propelled grenade fire on work parties and convoys. Minesweep teams easily detected the poorly buried mines. While rocket, mortar, and artillery fire did some damage to the Khe Sanh airfield, repairs were usually made within a few hours. During the sapper attack, some 230 rounds were directed at the base, but the air facility suffered no damage. No injuries were inflicted upon 45th Group personnel and no equipment was damaged. Of the forty sappers who tried to enter the base, eighteen were killed or captured.[33]

Redeployments and Reorganizations

LAM SON was the last major engineer operation of the war, for the redeployments in 1971 and 1972 saw the departure of nearly all engineer troops and major organizational changes. In the engineer advisory effort, corps-level field force headquarters were consolidated with corps advisory elements. The forming of the Third Regional Assistance Command in III Corps and the Second Regional Assistance Command, later Second Regional Assistance Group, in II Corps joined together the former field force engineer sections and corps engineer advisory teams. In III Corps, for example, the II Field Force Engineer Section at Plantation became the Third Regional Assistance Command Engineer Section. Engineer advisers at III Corps headquarters at Bien Hoa and the 30th Engineer Combat Group at Hoc Mon now reported to the command engineer. Engineer advisers with South Vietnamese construction units, such as those with the 5th Engineer Construction Group at Hoc Mon, continued to report to the MACV Engineer Advisory Division in Saigon.[34]

After much study, Engineer Command, Vietnam, decided its share of the Increment VI drawdown in early 1971 would be the 18th and 20th Brigade headquarters, the 937th Group headquarters, and the 46th and 589th Construction Battalions. Maj. Gen. Charles C. Noble, the commanding general from June 1970 to August 1971, noted that the ability to get around by aircraft and modern communications allowed him to forego the intermediate brigade headquarters. "Intermediate headquarters," he wrote in his debriefing report, "if not essential for command or control, only serve to slow down the action, to dilute the force of policies and directives, and to fritter away

[32] ORLL, 1 Feb–30 Apr 71, 45th Engr Gp, p. 21; Hinh, *Lam Son 719*, p. 130.
[33] ORLL, 1 Feb–30 Apr 71, 45th Engr Gp, pp. 21–22.
[34] MACV History, 1971, vol. 1, pp. II-20 to II-21.

precious high quality manpower resources." As far as he was concerned, the restructuring of Engineer Command "has tightened up the 'outfit.' "[35]

Col. William J. Schuder's 937th Engineer Group at Phu Tai outside Qui Nhon underwent several unit changes before it departed in early April 1971. When the 19th Engineer Combat Battalion left the Ban Me Thuot area in December 1970, its area of responsibility was divided. The 20th Engineer Combat Battalion took over responsibility for the Ban Me Thuot area in Darlac Province. Task Force SIERRA (610th Construction Support Company; Company D, 84th Engineer Construction Battalion; and one platoon of the 299th Engineer Combat Battalion) was formed to continue the upgrading of Highway 21. Meanwhile, the group's 84th Battalion prepared to move to Da Nang and 45th Group control, but serious flooding in Binh Dinh Province delayed the move until January 1971 because of the need to reopen washed-out roads. In March, the 937th's headquarters reduced its strength to zero, and its remaining units and area of responsibility in northern II Corps were transferred to the 35th Engineer Group.[36]

The 18th and 20th Engineer Brigades left soon afterward. Among the major functions transferred from the brigades to Engineer Command were deputy engineer, aviation officer, chaplain's office, and communications section. Special advisers, some not previously assigned at Engineer Command level, included officers assigned to other organizations. The chief of the Plans Division, Military Operations Directorate, took on the additional duties as inspector general; the surgeon in the 92d Engineer Battalion became the medical adviser; and the headquarters commandant's duties were taken over by the executive officer. Although the size of the headquarters slightly increased, the departure of the two brigades resulted in almost three hundred spaces. On 18 April, General Schrader saw his 18th Brigade furl its flag at Dong Ba Thin. At the ceremony, the brigade was awarded the Meritorious Unit Commendation, Second Oak Leaf Cluster, a culmination of its service since arriving in Vietnam on 3 September 1965. Two days later, a similar ceremony was held at Bien Hoa where Lt. Gen. William B. McCaffrey, deputy commanding general of the U.S. Army, Vietnam, saluted the men of the 20th Brigade. The brigade's commanding officer, General Cooper, assumed new duties as the deputy commanding general of Engineer Command. Upon the departure of the two brigade headquarters, Engineer Command assumed direct control of the four remaining engineer groups.[37]

[35] Debriefing, Maj Gen Charles C. Noble, 6 Aug 71, p. 1 (quotation), p. 2 (quoted words), Senior Officer Debriefing Program, DA, Historians files, CMH; Reorganization of HQ, USAECV, Briefing, Commanding Officers Conference, Engr Cmd, 18–19 May 71, p. 1, Historians files, CMH.

[36] ORLLs, 1 Feb–24 Mar 71, 937th Engr Gp, 24 Mar 71, pp. 2–3, and 1 Feb–30 Apr 71, 35th Engr Gp, 30 Apr 71, pp. 3–4, both in Historians files, CMH. For more about the 937th Group commander's experiences during this period, see Intervs, Christensen with Col William J. Schuder, CO, 937th Engr Gp, 10 Dec 70, VNIT 784, and 5 Apr 71, VNIT 878, CMH.

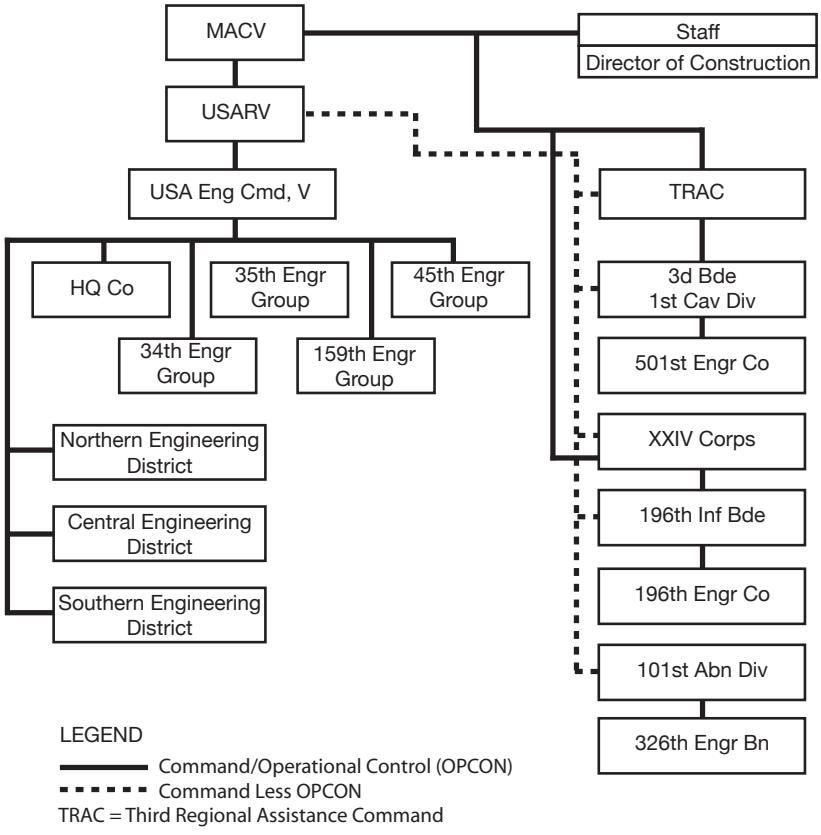
[37] ORLLs, 1 Feb–30 Apr 71, Engr Cmd, n.d., p. 1, 1 Feb–29 Apr 71, 18th Engr Bde, 30 Apr 71, p. 7, and 1 Nov 7–15 Apr 71, 20th Engr Bde, 25 Apr 71, p. 3; AARs, Standdown After Action Rpt, 18th Engr Bde, 27 Apr 71, p. 1, and Standdown After Action Rpt, 20th Engr Bde, 1 May 71, p. 1. All in Historians files, CMH. See also Spec. James Lohre and Spec. Albert Gore, "18th & 20th Drawdown," *Kysu'* 3 (Fall 1971): 20–27.

Despite the large Increment VI withdrawals, Engineer Command was still a large organization. Assigned strength on 30 April 1971 stood at 17,500, some 2,500 below authorization strength and down from 23,000 the previous November. By 30 September, the command's military strength dropped to 14,400, but Vietnamese workers increased 15 percent between October 1970 and April 1971, from about 4,100 to over 4,700. In April, the command's four groups commanded eighteen battalions (six combat, eleven construction, and one land clearing) and assorted companies and detachments. Engineer Command assigned each group engineering responsibility for a corps area: 45th Group, I Corps; 35th Group, most of II Corps; 159th Group, III Corps and part of southern II Corps; and 34th Group, IV Corps. Training of South Vietnamese Army engineers gained momentum for programmed transfers of roadwork and industrial sites. At the time, the command's productive effort averaged 46 percent highway work, 45 percent combat and operational support, and 9 percent construction. The Northern, Central, and Southern Engineering Districts, although reduced by 26 percent because of base closings and decreased projects, continued to supervise contract construction and the facilities engineering contracts.[38] (*Chart 6*)

When Col. John S. Egbert's 35th Group headquarters at Cam Ranh Bay took charge of the 937th Group's missions and units, its area of responsibility expanded to all II Corps except Lam Dong Province bordering III Corps. Egbert now commanded six battalions and assorted smaller units. Highway restoration remained the group's major effort (63 percent), with combat and operational support and some construction consuming the remaining capability (28 and 9 percent, respectively). In late April, the 589th Battalion completed thirty-four miles of Highway 1 and then stood down. Task Force SIERRA continued roadwork along Highway 21 through June. In August, another task force, WHISKEY, was organized to complete Highway 1 between Phan Thiet and the II/III Corps border. Construction included refurbishing convalescent hospital buildings at Cam Ranh Bay for a religious retreat center, disassembling several prefabricated aircraft hangars at the An Khe and Tuy Hoa airfields and warehouses at the Long My depot outside Qui Nhon for return to U.S. stocks, and civic action projects. Enemy action against the engineers diminished. While an average of five incidents was reported between April and July, the number dropped to one over the next three months. Most attacks usually amounted to one or two mortar or rocket rounds causing little damage. Despite the heavy convoy traffic, road ambushes averaged just over one per month. Beginning in August, the group began cutting its strength, from a high of 5,200 down to just over 1,700 at the end of October. By then the 20th and 864th Engineer Battalions and Task Force SIERRA had been redeployed or inactivated. The 815th Battalion

[38] ORLL, 1 Feb–30 Apr 71, Engr Cmd, pp. 2–3, 12–13; U.S. Army Engineer Support Organizations, South Vietnam, 3–29 Apr 71, tab A, incl. 2, OCE Liaison Officer Trip Rpt no. 19, 28 Jun 71; HQ, Engr Cmd, Periodic Report of Engineer Command Activities, 20 Nov 71, p. 2; Org Chart, Engr Cmd, 1 Dec 71. Last two in Historians files, CMH. For a listing of engineer unit redeployments, see HQ, Engr Cmd, sub: Engineer Command History, 8 Jul 72, app. G-1, Historians files, CMH.

CHART 6—U.S. ARMY ENGINEER COMMAND ORGANIZATIONS, OCTOBER 1971



Source: Tab A, Incl 1, OCE Liaison Officer Trip Rpt no. 22, 8 May 72

was transferred to the 159th Group. In early November, the 35th Group headquarters began closing down and departed on the twenty-first, almost six and one-half years after arriving at Cam Ranh Bay on 9 June 1965. The 299th Battalion also departed that month, ending more than six years of service in Vietnam. As 1971 drew to a close, only two troop units, the 577th Engineer Battalion with a reduced strength of 252 personnel and Task Force WHISKEY, remained in II Corps doing highway work under Engineer Command's direction.[39]

The 34th Group at Binh Thuy in the delta also departed in November. Col. James A. Johnson and his successor Col. John F. McElhenny, who assumed command in May, commanded four construction battalions, the 34th, 36th,

[39] ORLLs, 1 Feb–30 Apr 71, 35th Engr Gp, 30 Apr 71, pp. 1, 3–4, and 1 Aug–31 Oct 71, 35th Engr Gp, 21 Nov 71, pp. 1–2, both in Historians files, CMH. See also Interv, Christensen with Col John S. Egbert, CO, 35th Engr Gp, 6 Jan 71, VNIT 813, CMH.

69th, and 93d and their attached units. The group's main tasks included highway work and the training of South Vietnamese engineer units to take over the roadwork in IV Corps. Despite heavy road and bridge work, units began to depart that summer. Combat and operational support dropped to zero, and the engineers experienced only minor contact with the enemy. The most significant incident happened in July when an explosive charge was set off next to a work barge of the 523d Port Construction Company at a bridge site along Route 7A in Vinh Binh Province. Eight engineers were wounded, and the barge suffered minor damage. An ambush of a convoy along Highway 4 the following month took the life of a driver of a ten-ton tractor with low bed. Meanwhile, the 93d Battalion had dropped to zero strength on 31 July and was inactivated. By the end of September, only one full battalion, most of another, and part of a third remained, less than two thousand men. On 15 October, the 34th Battalion completed its drawdown to a color detachment, which flew to the United States a few days later. Also on 15 October, the 69th Battalion began its drawdown scheduled for completion by 15 November. Simultaneously, the group headquarters began to stand down, and the sole remaining battalion in the delta, the 36th Construction, was transferred to 159th Group control on 1 October. Upon the departure of the 34th Group, Colonel McElhenney moved to the deputy engineer position at Engineer Command.[40]

The 45th Group in I Corps continued operations until early 1972. In April 1971, Col. Walter O. Bachus assumed command, replacing Colonel McIntyre, who moved up to Engineer Command to assume duties as chief of staff. At this time, the group consisted of the 14th, 27th, and 39th Combat and the 84th Construction Battalions and assorted smaller units, some 3,500 troops. The 14th Battalion was the only engineer unit permanently located along the Demilitarized Zone, but the Quang Tri–based battalion departed in August. The other units were located in the Hue–Phu Bai, Da Nang, and Chu Lai areas, with the 39th Battalion supporting the Americal Division and the 27th Battalion supporting the 101st Airborne Division. Some of the work accomplished by the group included a 5,000-square-foot hardstand at Marble Mountain Airfield (84th Battalion); nine miles of fair-weather roads in the Quang Tri base area (14th Battalion); airfield improvements and repairs at Chu Lai (39th Battalion); 2,500 square feet of M8A1 matting for the Phu Bai airfield terminal (27th Battalion); and improvements at Firebases VEGHEL, BASTOGNE, RAKKASAN, and SALLY (27th Battalion). During the three-month period ending in November, the group reported fifty-six projects or operations requiring one platoon week of effort. Serious setbacks in work, however, occurred in late 1971 as a result of Typhoon Hester. The storm and its fourteen inches of rain in a twenty-four-hour period on 24 October damaged buildings, knocked out several bridges, and washed out parts of Highway 1.

[40] ORLL, 1 Aug–31 Oct 71, 34th Engr Gp, 13 Nov 71, pp. 1–4, Historians files, CMH; Engr Cmd Statistical Summary, 30 Sep 71, tab DD, incl. 2, OCE Liaison Officer Trip Rpt no. 21, 4 Jan 72. See also Intervs, Christensen with Col John F. McElhenny, CO, 34th Engr Gp, 14 Sep 71, VNIT 966; Lt Col Francis A. Sarnowski, CO, 34th Engr Bn, 13 Sep 71, VNIT 965. Both in CMH.

A section of the Pohl Bridge built by the Seabees in 1968 and a major link to the firebases along Route 547 was carried away as thousands of tons of logs and debris accumulated against the concrete pillars. Work crews from the 26th and 27th Engineer Battalions and the South Vietnamese 127th Float Bridge Company rushed to the scene to clear debris and begin rafting operations. At Chu Lai, widespread damage to buildings took place at the time the 39th Engineer Battalion's strength was about 50 percent due to redeployment. By 8 November, the 39th Battalion at Chu Lai had dropped to company strength with the mission to support the 196th Infantry Brigade. By then tactical operations had diminished and so did the group's casualties. From May through October, 9 engineers were killed in action, 8 died from nonbattle causes, and 34 were wounded, with all the battle deaths and most of the wounded taking place between May and July. No casualties were suffered between November 1971 and January 1972 when the combat battalions began to stand down. As the 101st Airborne Division began preparing for its departure, the 27th Battalion started redeploying to Fort Bragg, North Carolina, on 31 December. The group headquarters began to stand down on 15 January 1972. This left the 84th Construction Battalion at Da Nang with one company and a utilities detachment at Phu Bai and Company A, 39th Battalion, at Chu Lai as the only nondivisional engineer units in I Corps.[41]

The 159th Engineer Group at Long Binh, the last of the six group headquarters in Vietnam, stayed until April 1972. Col. John W. Brennan, who replaced Col. Levi A. Brown in late May 1971, assumed control of the 31st Combat; the 62d Land Clearing; the 92d, 169th, and 554th Construction Battalions and their attached units; and the 66th Topographic Company, altogether just under 3,900 troops. The stand-downs, including the 46th Construction Battalion in April and the 62d Land Clearing Battalion's headquarters in July, were offset in October when the 36th and 815th Construction Battalions, formerly 34th and 35th Group units, joined the 159th Group. The number of troops jumped to more than 6,700, but diminished with each unit stand-down. During 1971 and early 1972, the 36th, 169th, 554th, and 815th Battalions concentrated on the highway program, the 92d Battalion on base development work, and the 31st Battalion and the attached land-clearing companies on combat and operational support missions. The group's area of responsibility included all of III and IV Corps and Lam Dong Province in southern II Corps, where the 554th Battalion tried to complete thirty-one miles of Highway 20. Several unusual but priority vertical construction projects, all at Long Binh, involved constructing a confinement facility (92d Battalion), a post exchange warehouse complex (169th Battalion and later 92d Battalion), a medical retention facility for drug testing (92d Battalion and Pacific Architects and Engineers), and a structure containing three handball courts at nearby Plantation (46th Battalion and 92d Battalion). These and several other projects of a more permanent nature at

[41] ORLLs, 1 Aug–30 Nov 71, 45th Engr Gp, 30 Nov 71, pp. 1, 3, 7–13, and 1 Dec 71–28 Jan 72, 28 Jan 72, pp. 1–3, both in Historians files, CMH; "Hester Cuts Priorities" and "Debris Rams Bridge, Span Lost to Current," *Castle Courier*, 15 November 1971.

Long Binh came about because of the possibility that the base might house a residual force for an indefinite period.[42]

As a result of these stand-downs, Engineer Command reduced manning and streamlined its organization. Because of the reduced requirement for engineering services, the Engineer Directorate, responsible for designs, design reviews, and cost estimates, was reduced to a division and placed under the Construction Directorate on 1 August 1971. Programming and review functions for Military Construction, Army, projects were transferred to the Operations Division, Facilities Engineering Directorate, and responsibility for monitoring Military Construction, Army, funds moved to the Program and Budget Office. Meanwhile, senior engineers in Washington and Saigon pondered the practicality of one general heading both Engineer Command and the MACV Construction Directorate. General Clarke, the chief of engineers, proposed the idea, and General Noble and General Young, who had been the director of construction since December 1970, fully agreed. In Washington, General Dunn and General Raymond, the first two directors, saw no difficulty in one general filling both positions with a deputy general at Engineer Command. The dual-hatted responsibility passed to General Young on 5 August upon the departure of General Noble. During the Increment X drawdown in January 1972, the Engineer Command headquarters dropped from 334 to 213 personnel. In March, General Young departed Vietnam and General Johnson, the deputy commanding general, assumed the two positions.[43]

During the Increment XI drawdown that took effect in April 1972, the Engineer Command was replaced by a smaller U.S. Army Engineer Group, Vietnam. By the end of that month, U.S. troop strength dropped a further seventy thousand, and the engineer headquarters was reduced by an additional one hundred spaces. As a result, Engineer Command designed an engineer force consisting of 903 military, augmented with Vietnamese laborers and facilities engineering contractors, to provide limited operational support and minor construction and facilities engineering services. Earlier, on 1 January 1972, subordinate provisional "engineer regions," one in each corps area, or military region, were formed. The company-size engineer regions, commanded by lieutenant colonels, assumed all engineer support missions by 15 April. As the engineer regions became operational and assumed facilities engineering responsibilities, the district engineer offices were inactivated. In Military Region 1, personnel and equipment from the 84th Engineer Construction

[42] ORLLs, 1 Feb–30 Apr 71, 159th Engr Gp, 20 May 71, pp. 1–2, 5, 35–7, and 1 Aug–31 Oct 71, 159th Engr Gp, 20 Nov 71, pp. 1–3, 4–5, both in Historians files, CMH. See also Interv, Capt William Kunzman, 46th Mil Hist Det, with Col John W. Brennan, CO, 159th Engr Gp, 24 Feb 72, VNIT 1038; Interv, Christensen with Lt Col Charles E. Eastburn, CO, 92d Engr Bn, 29 Jun 71, VNIT 900. Both in Historians files, CMH.

[43] Engr Cmd History, 8 Jul 72, p. 1; Msg, Maj Gen Charles C. Noble, CG, Engr Cmd, ARV 1574 to Maj Gen Frederick J. Clarke, 1 May 71; Msg, Brig Gen Curtis W. Chapman, Dir Mil Engineering, OCE, 232 to Maj Gen Robert P. Young, 4 May 71, sub: Engineer Organization, both in Young Papers, MHI; Memo, Col N. C. Manitsas, CofS, Engr Cmd, AVCC-C/S, for Dirs of Const, Materiel, and Mil Ops, sub: Reorganization of Headquarters, Engineer Command, 26 Feb 71; Ltr, HQ, Engr Cmd, ACCC-E, sub: Limited Reorganization of Headquarters, Engineer Command, 28 Jul 71. Memo and letter in Historians files, CMH.

Battalion at Da Nang, the last engineer battalion to stand down in the region, were formed into Engineer Region, Military Region 1. The region engineers moved to the eastern side of the Da Nang River to Camp Horn, the headquarters for the First Regional Assistance Command. Also retained for a while were a port construction platoon and a well-drilling detachment. In II Corps, the 497th Port Construction Company, which completed its stand-down on 15 April, manned and outfitted Engineer Region, Military Region 2, at Pleiku. At Long Binh, the 92d Engineer Construction Battalion served as the nucleus for Engineer Region, Military Region 3, before drawing down in April. A well-drilling detachment also remained. Engineer Region, Military Region 4, at Binh Thuy received personnel and equipment from the 36th Construction Battalion when it stood down in January. On 30 April, Col. Alfred L. Griebling, former chief of staff of Engineer Command, assumed command of Engineer Group, Vietnam. On the same day, the new headquarters became operational and took control over the engineer regions and assumed the engineer staff role in U.S. Army, Vietnam, headquarters. By then all battalion-size engineer units had redeployed, inactivated, or stood down, including the 159th Group on 30 April. Key staff elements carried over from Engineer Command included Operations, Administrative, Facilities, and Materiels Directorates, which became divisions, and a Programs and Budget Office.[44] (*Chart 7*)

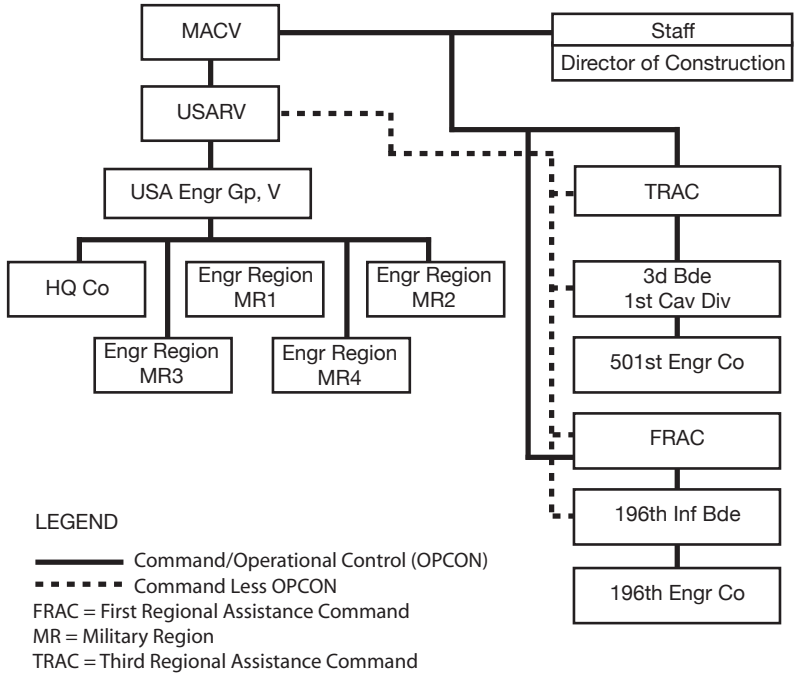
There was, however, some concern whether this smaller engineer force had the capability to support the 69,000 U.S. troops still in country. In his March 1972 debriefing, General Young noted that the engineer group would be mostly facilities engineering oriented. There would be platoon-size troop organizations that could undertake minor construction and some combat support. However, Young pointed out, "This austere approach to engineers in the total force structure cannot provide the level of engineer support, particularly combat engineer support, dictated by experience and doctrine." He also warned, "It is a reasonable, calculated risk which will succeed if no major combat action or natural disaster is experienced." The facilities engineering contractors could provide some additional construction capability, but South Vietnamese engineers would have to be called to do additional combat and operational support.[45]

Nearly all the other services' engineers had departed by this time. In I Corps, the marines transferred or demolished their bases. In September and October 1970, Marine Corps engineers leveled much of An Hoa Combat Base, dismantling or demolishing 340 buildings and flattening fortifications, leaving intact only the airfield, the industrial complex, and a small portion of the base for the South Vietnamese. Base demolition accelerated in early 1971. Ironically, Firebase RYDER in the Que Son Valley had been rehabilitated

[44] Engr Cmd History, 8 Jul 72, pp. 1–2; Debriefing, Young, 5 Aug 71–15 Mar 72, 6 Nov 72, p. 16, Senior Officer Debriefing Program, DA, Historians files, CMH. The term *military region* emerged in July 1970 when the South Vietnamese government, in an administrative move that incorporated the territorial forces into the regular army, redesignated the corps tactical zones as military regions. I Corps Tactical Zone, for example, became Military Region 1, or MR 1.

[45] Debriefing, Young, 6 Nov 72, p. 16, Senior Officer Debriefing Program, DA, Historians files, CMH.

CHART 7—U.S. ARMY ENGINEER SUPPORT ORGANIZATIONS, MAY 1972



Source: Tab A, Incl 1, OCE Liaison Officer Trip Rpt no. 22, 8 May 72

only the previous September. During February and March, the 1st Engineer Battalion redeployed, leaving its Company A with Company A, 7th Engineer Battalion, as elements of the stay-behind 3d Marine Amphibious Brigade to guard the Da Nang area. During the final months of redeployment, Marine engineers provided combat support, operated water points, and leveled numerous camps and firebases near Da Nang. In May, the 3d Marine Amphibious Brigade ceased combat operations and turned over operations to the 196th Infantry Brigade. The last elements of the 3d Marine Amphibious Brigade and its engineers departed in late June.[46]

Meanwhile, the Seabees had consolidated headquarters and had withdrawn almost all units. In March 1970, the 32d Naval Construction Regiment assumed the functions of the 3d Naval Construction Brigade, and the Officer in Charge of Construction, Vietnam, took over the duties of brigade commander. The latter part of 1970 saw the 32d Regiment headquarters moving to Saigon and three construction battalions redeploying to their home ports and the arrival in Da Nang and Bien Hoa of two replacement battalions. Both battalions returned to their home bases in April 1971, and Naval Mobile Construction Battalion 5 arrived at Bien Hoa for its sixth and final tour in

[46] Cosmas and Murray, *U.S. Marines in Vietnam, 1970–1971*, pp. 243–44, 246, 325, 327.

Vietnam. In November, Naval Mobile Construction Battalion 5 completed its assigned coastal radar sites and departed for Guam. The brigade headquarters stood down at the same time. Construction Battalion Maintenance Unit 302, which helped build dependent shelters in I Corps, left its Cam Ranh Bay base the following February and moved to Subic Bay, Philippines. By March 1972, only four Seabee teams remained, three in the delta and one in III Corps, mostly doing civic action projects. This was quite a drop from eight teams in 1967 and fifteen teams in 1968. The team at Go Cong on the coast southeast of Saigon finished its work in April and transferred its camp to Regional Forces engineers. By the end of the month, the teams and controlling detachment headquarters left Vietnam, thus ending over nine years of service in South Vietnam.[47]

The few remaining Air Force civil engineers continued to concentrate on improvements and repairs at the major air bases. Of note was support of Projects ENHANCE and ENHANCE PLUS when, beginning in May 1972, Washington supplemented combat losses during the Easter offensive with additional equipment for new South Vietnamese armor, artillery, and air force units. The increased aircraft inventory of the rapidly expanding South Vietnamese Air Force resulted in new projects totaling over $3 million in Military Assistance funds for facilities improvements at eight air bases. Work included a depot overhaul at Bien Hoa Air Base, installation of additional petroleum storage tanks at several air bases, and reorganization of the civil engineering school. Construction of the petroleum storage tanks at five of the bases was to be awarded to contractors in April 1973 and completed in August. The Bien Hoa construction and the remainder of the base projects were scheduled to start in March 1973 and be completed in July. Several of the prefabricated airstrips and buildings, however, would be retrograded and returned to stock at overseas bases and stateside depots. In late 1972, civil engineers dismantled several prefabricated barracks buildings at Da Nang Air Base. The Seventh Air Force also recovered almost 8 million square feet of AM2 aluminum matting from Phan Rang, Cam Ranh Bay, and Tuy Hoa.[48]

The few U.S. Army engineer units in South Vietnam departed before the end of 1972. The 501st Engineer Company, formed from one of the line companies of the 1st Cavalry Division's 8th Engineer Battalion, supported the stay-behind 3d Brigade, 1st Cavalry Division, at Bien Hoa. At Da Nang, one of the line companies of the 26th Engineer Battalion, Americal Division, became the 196th Engineer Company, 196th Infantry Brigade. Increment XII withdrawals, which saw the departure of 20,000 more troops by the end of June, left only 49,000 U.S. military personnel in Vietnam. The two brigades were reduced to battalion-size task forces, and the engineer companies were reduced to platoons. In August, the two task forces departed, marking the end

[47] Tregaskis, *Building the Bases*, pp. 300–301, 417–18, 436; MACV History, 1971, vol. 1, pp. V-39 to V-41.

[48] Clarke, *Final Years*, pp. 452–53; MACV History, 1972–1973, vol. 2, p. E-60; Fact Sheet, 8 May 72, sub: Status of Retrograde of Aluminum Airfield Matting, incl. 1, p. 321, OCE Liaison Officer Trip Rpt no. 22.

of the Army's ground combat role in the war. The next two increments ending in November further reduced U.S. forces to 27,000. By then Engineer Group, Vietnam, now down to some 221 soldiers, no longer had a troop capability, and only supervisory military personnel remained in the engineer regions.[49]

Operational Support After Laos

Following LAM SON 719, U.S. ground forces concentrated on defending critical bases while the South Vietnamese assumed primary responsibility for the ground war. The days of massive U.S. offensive operations were over. In III Corps, South Vietnamese Army units began replacing U.S. units along the border in early 1971 and carried out operations trying to block the return of enemy main force units and launched counterinfiltration operations into Cambodia. Although U.S. ground forces could not enter Cambodia, many continued to support South Vietnamese cross-border operations until their redeployment. Ground activity then centered on patrolling and sweeping the rocket belts, strips of land from which the enemy could fire barrages at bases and cities. This security role was dubbed dynamic defense, and by the end of the year all U.S. ground units had shifted into it. After LAM SON 719, the 101st Airborne Division gradually disengaged from direct contact with North Vietnamese Army units in the jungled western regions in I Corps and concentrated on dynamic defense in its assigned coastal region. The Americal Division fulfilled a similar role in southern I Corps. Occasionally the enemy lashed out at the defensive positions. The most severe attack occurred in March 1971 when sappers overran Firebase MARY ANN southwest of Tam Ky killing and wounding over one hundred American soldiers. In November, the newly organized South Vietnamese 3d Infantry Division took up positions along the Demilitarized Zone formerly manned by the 1st Brigade, 5th Division.[50]

As 1972 opened, only sixteen U.S. maneuver battalions remained in country, and most soon departed. In I Corps, only the 196th Infantry Brigade was left guarding Da Nang. Allied ground operations in II Corps revolved around the two South Korean divisions carrying out security missions and combat operations in their assigned areas. In III Corps, only the 3d Brigade, 1st Cavalry Division, and the 2d Squadron, 11th Armored Cavalry, remained in positions along the rocket belt surrounding the Saigon–Bien Hoa–Long Binh complex. No U.S. ground combat force had operated in IV Corps since August 1969.[51]

Seven of the thirteen nondivisional combat engineer battalions had departed by early 1971. Only the 31st Engineer Battalion in III Corps, the 20th and 299th Battalions in II Corps, and the 14th, 27th, and 39th Battalions in I Corps remained in South Vietnam. Over the next year, these units carried

[49] Chart, U.S. Army Engineer Support Organizations, South Vietnam, 1 May 72, tab A, incl. 1, OCE Liaison Officer Trip Rpt no. 22, 8 May 72; Redeployments of U.S. Forces from the RVN, Army Activities Rpt, 8 Nov 72, p. 3, CMH; Clarke, *Final Years*, app. C, U.S. Troop Redeployments, p. 524; ORLL, 1 Aug–31 Oct 72, Engr Gp, Vietnam, 31 Oct 72, p. 3, OCE Hist Ofc.

[50] MACV History, 1971, vol. 1, pp. I-5, IV-3, IV-21, IV-31, IV-35.

[51] Ibid., 1972–1973, vol. 1, p. 9.

out combat and operational support missions primarily geared to support the remaining combat forces as they shifted into their dynamic defense roles. All but the Long Binh–based 31st Battalion would be gone by early 1972, and it would depart in mid-March.[52]

The 31st Engineer Battalion and its attached light equipment company typified these operations. During the first half of 1971, the battalion centered its efforts on building firebases and on local road upgrades in III Corps. In February, a platoon-size force, while at work improving and maintaining the local road net and building gun pads for eight-inch howitzers at Firebase BLUE near the Cambodian border, helped defend the base when it was attacked in the early morning hours of the twenty-third. The engineers took up arms, put out fires, helped root out several sappers holed up in bunkers, and after the attack disposed of unexploded munitions. Miraculously, the platoon suffered only minor injuries and no fatalities. Over the next several months, the battalion worked on other firebases near the border. In June, Company B and the 1st Platoon, 557th Light Equipment Company, completed Firebase PACE on Highway 22. Work included building four heavy gun pads, an interior road net, hardstand and storage areas, a berm with four 40-mm. Duster positions, and an access road to the base. The following month, the company and light equipment company elements completed the rehabilitation of Firebase ELSENBERG just off Route 13 southwest of Tay Ninh. At the same time, the 557th Light Equipment Company upgraded Highway 22 between Firebase PACE and Tay Ninh to an all-weather road, with a twelve-foot roadway and four-foot shoulders. To the east at Song Be, Company A improved Firebase BUTTONS, several local routes in the area, and airlifted elements to Bu Gia Map and Katum to carry out assorted tasks. Other Company A elements removed a M4T6 floating bridge and returned it to stock at Long Binh, repaired the runway at Loc Ninh, and improved the adjacent firebase. Meanwhile, Company C labored to upgrade two legs of the so-called Phu Hoa Triangle Road in Binh Duong Province southwest of Phu Cuong, giving access to rice paddies unused since the 1968 Tet offensive. However, the onset of the rainy season and other priorities halted this work for several months.[53]

At midyear, the 31st Battalion's emphasis shifted to improving base defenses, installing aircraft revetments, participating in the highway improvement program, and other operational support tasks. In July, Company C began installing prefabricated bunkers, erecting towers, clearing fields of fire, and building 875 yards of berm and a berm road at Phu Loi. Late that month, the company started building a hardstand and erecting aircraft revetments. Heavy rains caused problems in compacting the hardstand over a saturated subgrade, but this work was completed in September and the perimeter work by the end of the year. Later in the year, Company B completed Bridge 4 on Highway 20. This project involved two 60-foot spans, a center pier with

[52] ORLL, 1 Feb–30 Apr 71, Engr Cmd, incl. 1.

[53] ORLLs, 1 May–31 Oct 71, 31st Engr Bn, 4 Nov 71, pp. 1–4, and 1 May–31 Oct 71, 159th Engr Gp, 20 Nov 71, pp. 5–6, both in Historians files, CMH; Spec. Albert Gore, "Threatened Overrun of FSB BLUE Thwarted by Quick Reactions," *Castle Courier*, 5 April 1971, pp. 4–5.

a steel pile concrete cap, steel pile and concrete cap abutments, and concrete slab decks. The battalion employed its M48 mine-rolling tank on uncharted or suspected minefields. Between May and July, nearly five thousand antipersonnel mines were detonated on the perimeter at Di An. This was followed by the rolling of a suspected minefield on the southwest corner at Phu Loi Post to allow the clearing of fields of fire. Another task involved the construction of a large bunker sheltering four Signal Corps teletype vans.[54]

When the 62d Land Clearing Battalion headquarters stood down, its two land-clearing companies, maintenance company, and attached bridge company remained intact and were transferred to the 31st Combat Battalion. In more than four years, the Rome plows had cleared more than 215,000 acres in III Corps, and the 62d Battalion cleared some 60,000 acres since the Cambodian incursion. The affiliated South Vietnamese 318th Land Clearing Company also cleared 22,000 acres in III Corps as well as considerable land in Cambodia. Other cuts included 3,300 acres cleared in January and February 1971 by the 984th Land Clearing Company for the Royal Thai Army forces east of Bearcat base and 5,500 acres cut from mid-January to early March by the 60th Land Clearing Company around the village of Vo Dat in Binh Tuy Province. The 60th Land Clearing Company then moved to Hau Nghia Province to clear 18,000 acres. Several of the larger D9 bulldozers being evaluated for land-clearing operations were formed into a team for smaller land-clearing projects. Although the D9 was found excellent for cutting first traces, it quickly outpaced the security force's armored cavalry assault vehicles and D7 bulldozers. Land clearing continued to be dangerous work. During the period 1 November 1970 to 30 April 1971, there were 76 casualties, including 6 killed in action, a rate of about 15 percent in a unit averaging 500 men. Security forces, especially infantry on foot, were also more prone to suffer casualties as the Rome plows crashed through the jungle. In June, Lt. Col. Robert P. Monfore, who had commanded the 62d Battalion for nearly one year, turned over command to Lt. Col. Walter P. Hayes. Following the closeout of land-clearing battalion headquarters, Colonel Hayes became the Engineer, Third Regional Assistance Command.[55]

In anticipation of the quickening redeployments, commanders kept up the high pitch of land-clearing operations during 1971. In July and August, the 984th Land Clearing Company and the 318th Land Clearing Company cut over 9,000 acres in the Boi Loi Woods resulting in the virtual destruction of an enemy sanctuary in lower Tay Ninh Province. In August, the 60th Land Clearing Company began a cut in the Tan Uyen rocket belt north of Bien Hoa in an attempt to keep the enemy from launching rockets at the bases in the area. After clearing more than 1,400 acres, the company was pulled from this mission and moved by sea to I Corps in a high-priority mission with the

[54] ORLL, 1 May–31 Oct 71, 31st Engr Bn, 4 Nov 71, pp. 4–5.

[55] ORLLs, 1 Nov 70–30 Apr 71, 62d Engr Bn, 14 May 71, pp. 1–8, 17, Historians files, CMH, and 31st Engr Bn, 1 May–31 Oct 71, p. 1; Spec. Ray Smietanka, "Rome Plows," *Hurricane* (April–June 1971): 42–44; Interv, Maj John L. Hitti, 17th Mil Hist Det, with Lt Col Walter P. Hayes, CO, 62d Engr Bn, and Third Regional Assistance Command (TRAC) Engr, 17 Oct 71, VNIT 983, pp. 2, 10–11, CMH.

45th Group's 59th Land Clearing Company to clear the Da Nang rocket belt. Meanwhile, the 984th and 318th Land Clearing Companies continued the Tan Uyen cut and cleared another 3,500 acres. In October, the 984th Company deployed north to clear strips along Highway 13 between An Loc and Loc Ninh.[56]

In II Corps, the 35th Group's 538th Land Clearing Company completed clearing jungle around isolated villages in Tam Quan District near Bong Son. While clearing one area for a night defensive position, the land clearers discovered they had chosen a North Vietnamese bunker complex. The enemy soldiers apparently made a hasty retreat from the area, since fires were still burning, ice was found, and laundry was left to dry. During the next forty days, the land clearers found and destroyed hundreds of tunnels and bunkers. Returning to its base camp at Cha Rang Valley near Highways 1 and 19, the company relaxed, recuperated, and repaired bulldozers before moving out for another forty-five to sixty days in the field, this time clearing 200-yard strips of thick vegetation that had grown on both sides of Highway 19 in the An Khe Pass. December, however, saw the departure of the 59th, 538th, and 984th Land Clearing Companies. U.S. land-clearing operations came to an end on 14 December when the 60th Land Clearing Company finished its cut in the Ham Tan region in the southeastern corner of III Corps and departed the following month. All land clearing now passed to the South Vietnamese.[57]

The building of firebases, which guarded the approaches to the U.S. bases and protected the Saigon and Da Nang military complexes, was among the last major operational support missions for U.S. Army engineers. In III Corps, this work involved building firebases for the 3d Brigade, 1st Cavalry Division; the 2d Squadron, 11th Armored Cavalry Regiment; and the 23d Artillery Group. Construction of these bases was the culmination of the experiences gained over the years. Extensive land clearing, earthwork, construction of berms, and excavation for fire direction centers, personnel shelters, and materials were required. In late February 1972, the 3d Brigade, recently reduced from four to three infantry battalions, began building six firebases northeast of Saigon to provide an artillery fan over the rocket belt and its approaches. Among the firebases were Bunker Hill, Grunt II, Ennis, and Crossed Sabers. Earlier, the 2d Squadron moved to its new firebase, Fiddler's Green, north of Saigon. From these more elaborate and permanent firebases, the cavalrymen and airmobile infantry launched operations to keep enemy rocketeers off balance. The firebases also served as rest and recuperation centers for the company-size units rotating in and out of the field and boasted sound defenses, better living conditions, and even wells at three of the bases. Intended to serve as models for the South Vietnamese,

[56] ORLLs, 1 May–31 Oct 71, 159th Engr Gp, pp. 7–8, and 31st Engr Bn, 1 May–31 Oct 71, pp. 5–6; Spec. David L. Myers, " 'Rocket Pocket' Gets Plowed," *Castle Courier*, 4 October 1971.

[57] Spec. David L. Myers, "538th LC Co. Strips Treacherous An Khe Pass," *Castle Courier*, 15 November 1971; Engr Cmd History, 8 Jul 72, app. G-1; HQ, TRAC, Semiannual Written Review, 23 Jan 72, p. 64, Historians files, CMH.

Excavating a tactical operations center at one of the new firebases north of Bien Hoa Air Base

the firebases would be transferred to the South Vietnamese when the U.S. units departed.[58]

Illustrative of the firebases was BUNKER HILL located on a squat laterite hill seventeen miles northeast of Saigon and nine miles north of Bien Hoa. Construction plans were developed by Maj. Peter J. Offringa, the air cavalry brigade's engineer, who directed the 3d Brigade's 501st Engineer Company operations and coordinated additional engineer support with the Third Regional Assistance Command Engineer and the 159th Group. Soon a task force under the direction of the 3d Platoon, 501st Engineer Company, and earthmoving equipment from the 557th Light Equipment Company began cutting the initial swath through the scrubby undergrowth covering the hill. Timing was critical, for the light equipment company only had fifteen days before standing down. A vertical construction platoon from the 92d Construction Battalion rounded out the task force. For the next two weeks, an average of four Caterpillar 830s hauled their 20-cubic-yard loads from 0730 to 1730, leveling the area and forming a perimeter berm. Once the scrub was removed, the familiar triangular shape of another 1st Cavalry Division firebase became evident. The scrapers also dug slots for fighting and living bunkers under the berm while bulldozers dug slots for the tactical operations center, mess hall, ammunition and supply

[58] HQ, TRAC, Engr Adviser, Fact Sheet for G–3, n.d., sub: Engineer After Action Rpt, 15 Dec 1971 Thru 6 Aug 1972, p. 1, Historians files, CMH; Maj. Peter J. Offringa, "Bunker Hill: Anatomy of a Firebase," *Engineer* 3 (Summer 1973): 19–20.

storage areas, medical bunker, base defense and fire direction center, and a post exchange bunker. Helicopter pads were positioned close to the entrance of the base and accessible to the aid station.[59]

As the earthwork progressed, other engineers began working on the structures. The vertical construction platoon built the framework for the tactical operations center and the mess hall and supervised Vietnamese laborers pouring concrete floors for both structures. Modular design was incorporated whenever possible. Conex containers were widely used. Dug eight feet into the ground, the sturdy tactical operations center was covered by M8A1 matting and the equivalent of seven layers of sandbags. An underground tunnel connected the operations center to the base defense/fire direction center bunker. The 105-mm. howitzers were placed on a 200-foot equilateral triangular pad raised six feet to provide direct fire over the berm. Individual mortar pits were sandbagged to a height sufficient to protect the crews. The mess hall consisted of a 20-by-40-foot storage area and two 10-by-20-foot serving areas. Even though it was eight feet underground and covered with a roof, the mess hall was well ventilated through a series of vents consisting of M8A1 matting and 72-inch culverts. Troops were not exposed to enemy fire while being served, and the eating areas were dispersed. Wide flange beams were used to support the ammunition storage point's roof, which was topped off with M8A1 matting, plastic sheeting for waterproofing, three feet of soil, and coated with peneprime. The basic design incorporated the majority of the living and fighting bunkers as part of the eight-foot-high triangular earth berm in order to take full advantage of its protection. Conex containers, with the doors removed, were used as two-man living bunkers and positioned into trenches before the berms were finished. Twelve-foot-wide rolls of plastic were used for waterproofing, and five feet of earth protected the top, front, and rear. The design of the fighting bunkers emphasized primary and supplemental bunkers. Corner bunkers were constructed as a three-unit module with the center Conex oriented with the apex, and the units to the left and right were positioned to provide coverage to the front and the flanks. Above each corner arose fifteen-foot observation towers with radar towers on the roofs. Extensive rows of barbed-wire obstacles reinforced by claymore mines, trip flares, and fougasse (a combination of napalm and C4 demolitions) surrounded the base.[60]

The thirty-five-day construction effort resulted in a comfortable and efficient battalion-size operating base. Water was pumped from a nearby river, treated, and pumped to a sixteen-foot-high tower. Gravity-feed distribution led to showers, drinking water tanks, mess hall, and mess hall wash rack area. Hauling water by truck was only needed to fill fifty-five-gallon washing barrels in the vicinity of the living and latrine areas. This home away from home also boasted three temporary volleyball courts, horseshoe pits, and an outdoor stage used for movies, USO shows, and a briefing area. BUNKER HILL was the

[59] Offringa, "Bunker Hill: Anatomy of a Firebase," pp. 20, 25.
[60] Ibid., pp. 21, 24–25.

Aerial view of Firebase BUNKER HILL

last major firebase built by Army engineers, and it epitomized the evolution of firebase construction during the Vietnam War.[61]

Allied commanders anticipated a significant enemy offensive in 1972, most likely again during Tet, but no one expected the blitzkrieg-like invasion of the South that began on 30 March. This 1972 assault, known as the Easter offensive or Nguyen Hue offensive, broadly resembled the Tet offensive of 1968, except the North Vietnamese Army, not the Viet Cong, bore the brunt of combat. With nearly all U.S. combat troops gone and South Vietnamese military capacity still lacking, North Vietnam sensed an opportunity to demonstrate the failure of Vietnamization and hasten eventual victory. Total U.S. military strength in country was about 95,000, of which only 6,000 were combat troops. Countering the offensive fell almost exclusively to the South Vietnamese and their U.S. advisers, and allied air power. Attacking on three fronts North Vietnamese Army regulars poured out of the Demilitarized Zone and Laos and captured Quang Tri. The provincial capital was retaken in September after a bloody battle. In the Central Highlands, North Vietnamese units moved into Kontum Province, forcing the South Vietnamese to give up several border posts before being halted. In III Corps, the enemy took Loc Ninh on 2 April and surrounded An Loc, where a three-month-long battle ensued until the siege was broken. Often massive firepower provided by U.S. air and naval forces helped decide victory or defeat for the South Vietnamese. At An Loc, resupply airdrops for the besieged city by U.S. Air Force C–130

[61] Ibid., pp. 24–25.

cargo planes became regular and efficient, and the defenders were kept well supplied.[62] (*Map 31*)

During the Easter offensive, U.S. ground forces, including supporting engineers, stayed in their defensive roles near major installations. The largest incremental drawdown was entering its final month when the enemy offensive began. It continued unabated. Redeployments remained on schedule with eight U.S. maneuver battalions standing down by 30 June, leaving only the two battalion task forces at Bien Hoa and Da Nang. April and May saw over 30,000 U.S. troops leave Vietnam. Another 20,000 would depart by 1 July, reducing the number in Vietnam to 49,000. Allied forces—Australians, Thais, and South Koreans—had departed or were in the process of leaving. While maintaining redeployment and installation transfer schedules, the United States reacted to the enemy attack by bringing in additional fighter-bomber, airlift, and gunship aircraft to help the beleaguered South Vietnamese. The enemy offensive also brought about an acceleration of the Improvement and Modernization Program, and more armor, aircraft, and ships were delivered. Occasionally, American installations at Da Nang and Bien Hoa, where U.S. Marine Corps fighter-bombers deployed to beef up tactical air support, received light rocket attacks but no ground assaults. As for the fighting, aviators bore the brunt of combat, flying bombing, aerial resupply, and gunship missions. Advisers with South Vietnamese combat units directed the air strikes, which helped decimate Hanoi's forces.[63]

Although constantly dwindling in numbers during this period, the regional engineers carried out operational support missions, minor construction projects, and other tasks. In I Corps, a detachment of Military Region 1 engineers working on bunkers at Quang Tri was trapped for two days until rescued. The last rescue helicopter also carried out a Pacific Architects and Engineers generator operator. Later, the same soldiers built a bunkered forward tactical operations center (TOC) (dubbed Super TOC) for the First Regional Assistance Command at Hue and placed 4,500 mines around the communications facilities at Phu Bai. During the height of the enemy attacks near Pleiku, Military Region 2 engineers replaced missing matting at the Camp Holloway airfield to allow C–130s to land and deliver supplies and evacuate personnel. Military Region 3 engineers built revetments for medical evacuation helicopters and ready rooms for the crews at Tan Son Nhut and improved defenses at Long Binh and Third Regional Assistance Command at nearby Plantation. In the delta, engineers built live-in bunkers and replaced revetments and worked

[62] MACV History, 1972–1973, vol. 2, p. L-9; Lt. Gen. Ngo Quang Truong, *The Easter Offensive of 1972*, Indochina Monographs (Washington, D.C.: U.S. Army Center of Military History, 1980), pp. 127, 134, 171–72. For more on the Easter offensive and South Vietnamese counterattacks, see MACV History, 1972–73, vol. 1, pp. 33–101, vol. 2, annexes J to L; Maj. Charles D. Melson and Lt. Col. Curtis G. Arnold, *The U.S. Marines in Vietnam: The War That Would Not End, 1971–1973* (Washington, D.C.: History and Museums Division, Headquarters, U.S. Marine Corps, 1991), pp. 2–184; Dale Andrade, *Trial by Fire: The 1972 Easter Offensive, America's Last Vietnam Battle* (New York: Hippocrene Books, 1995).

[63] MACV History, 1972–1973, vol. 1, pp. 33, 35, 37, 46, 49; Clarke, *Final Years*, p. 482; Melson and Arnold, *U.S. Marines in Vietnam, 1971–1973*, pp. 157–58, 162, 164.


NORTH VIETNAM
DEMARCATION LINE
SOUTH CHINA SEA
Kammouane
Sakon Nakhon
Savannakhet
Tchepone
Dong Ha
Quang Tri
Hue
Muong Nông
Mekong R
THAILAND
MR 1
Da Nang
Saravane
Tam Ky
LAOS
Ubon Ratchathani
Paksé
Quang Ngai
Attopeu
Dak To
Tam Quan
Hoai Nhon
Kontum
Hoai An
Pleiku
Qui Nhon
Lomphat
Stung Treng
SOUTH VIETNAM
Siem Reap
CAMBODIA
Tonle Sap
MR 2
Kompong Thom
Ban Me Thuot
Pursat
Kratie
Mekong R
Nha Trang
Snuol
Kompong Cham
Chup
Memot
Loc Ninh
An Loc
PHNOM PENH
MR 3
Neak Luong
Tay Ninh
Takeo
Svay Rieng
SAIGON
SOUTH CHINA SEA
Kampot
Phu Quoc
Rach Gia
Can Tho
MR 4
GULF OF THAILAND
Con Son
EASTER OFFENSIVE
March–May 1972
North Vietnamese Axis of Attack
MR
Military Region
Note: On 1 July 1970, Corps Tactical Zones were redesignated Military Regions.
0
100
Miles

MAP 31

on perimeter defenses at Can To Airfield. Regional engineer troops also substituted for Vietnamese workers who stayed home during the attacks.[64]

A dramatic engineer-related mission during the Easter offensive involved the destruction of bridges spanning the 500-foot-wide Mieu Giang River at Dong Ha near the Demilitarized Zone. On 2 April, Easter Sunday, a North Vietnamese tank column approached from the north. The Seabee-built steel girder wooden decked highway bridge, capable of bearing sixty-ton loads, seemed to be the logical crossing for the drive down Highway 1 to Quang Tri and Hue. A South Vietnamese marine battalion and army tanks took up defensive positions on the southern bank, while gunfire from U.S. warships helped slow the enemy approaching the highway bridge and an old railroad bridge upstream. Although one of the railroad bridge's spans had been destroyed, foot soldiers could still get across. South Vietnamese aircraft joined in and destroyed several tanks nearing the highway bridge. Meanwhile, confusion reigned among South Vietnamese commanders and U.S. senior advisers whether or not to blow the highway bridge. At the scene were two American advisers, Marine Corps Capt. John W. Ripley with the marines and Army Maj. James E. Smock with the armored unit. When it appeared that the North Vietnamese would make a crossing in overwhelming force, the advisers requested and received permission to destroy the bridge. Engineers from the 3d Division had hauled five hundred pounds of TNT blocks and C4 plastic explosives to the base of the highway bridge. Ripley, who had received extensive demolitions training, realized that the explosives still had to be properly placed in the supports. A high chain-link fence topped by sharp steel concertina wire prevented easy access to the girders. Once Ripley cleared the fence, he had Smock push the boxes of explosives over the fence to him. He then crawled hand over hand dragging the boxes one by one along the underside of the southern span and placed them in the channels formed by the six supporting I-beams. All this took some two and one-half hours. At first the North Vietnamese watched but then started shooting at him. The tanks could roll across the bridge at any moment, but for some reason they did not. While Ripley completed preparations at the main highway bridge, Smock hastily placed demolitions on the railroad bridge. Meanwhile, Ripley had prepared both a time fuse and an electrical detonation. The electrical charge failed to set off the explosives, and the fuse seemed to take forever. At this time, a South Vietnamese colonel and his American adviser emerged, and they felt the bridge should not be destroyed. Suddenly there was an explosion. The span was neatly severed from the abutment, and it plunged into the river. It was not certain whether the fuse finally set off the charges. A previously requested air strike in the area may have set off a sympathetic detonation of the demolitions. In any case, the enemy armor advance toward Quang Tri was halted at Dong Ha, at least for the time being. The determined North Vietnamese tried get-

[64] General comments, Gerald E. Galloway, Historians files, CMH; ORLL, 1 Aug–31 Oct 72, Engr Gp, Vietnam, pp. 5, 7.

Aerial view of the Third Regional Assistance Command headquarters at Plantation with the engineer buildings to the right of the entrance road

ting tanks across at a bridge farther west at Cam Lo, but naval gunfire and air strikes halted this advance. Air strikes later destroyed this bridge.[65]

Fewer U.S. engineer advisers and smaller engineer staffs remained at the end of the April drawdown. In the Third Regional Assistance Command Engineer Section, all military personnel but the plans and operations officer had departed. Colonel Hayes, a captain, and two noncommissioned officers returned to the United States. All the advisers with the 30th Engineer Combat Group also departed. The remaining member of the section, Maj. Adrian G. Traas, was transferred to the G–3 to carry out engineering and other duties in the section. He continued as the sole link to the III Corps Engineer and 30th Group commander, Col. Le Van Nghia, often arranging helicopter transport and materials and accompanying Colonel Nghia on his visits to the field. The three division advisory teams in III Corps retained one engineer officer as engineer battalion advisers, several advisers remained with the 5th Engineer Construction Group, and a lieutenant colonel served as the III Corps Civil Operations and Revolutionary Development Support engineer adviser. The

[65] MACV History, 1972–1973, vol. 2, pp. L-8 to L-9; Starry, *Mounted Combat*, p. 208; Melson and Arnold, *U.S. Marines in Vietnam, 1971–1973*, pp. 50–58, 60–61, 64; Andrade, *Trial by Fire*, pp. 90–94. There are several versions on the destruction of the bridges at Dong Ha. See Col. Gerald H. Turley, *The Easter Offensive* (Novato, Calif.: Presideo Press, 1985), pp. 132–58, 177–91; John G. Miller, *The Bridge at Dong Ha* (Annapolis: Naval Institute Press, 1989); Vicki Vanden Bout, "Ripley at the Bridge," *Leatherneck* 69 (February 1986): 16–19.

Colonel Nghia inspects repaired bridge at Go Dau Ha, which was completed by the 302d Engineer Battalion on 18 July after being destroyed during the Easter offensive.

Military Region 3 Engineer, Lt. Col. Ralph A. Luther, former commander of the 92d Construction Battalion, reported to Engineer Group, Vietnam. In the other corps, engineer positions were consolidated. In I Corps, the Military Region 1 Engineer, Lt. Col. Gerald E. Galloway, assumed additional duties as the First Regional Assistance Command staff engineer. In II Corps, the adviser to the 20th Engineer Combat Group assumed the duties as Second Regional Assistance Command Engineer, and a similar assignment was given to the 40th Combat Group adviser in IV Corps.[66]

By this time, South Vietnamese Army engineers had taken over almost all operational support missions. In III Corps, months before the Easter offensive, Colonel Nghia's 30th Group concentrated on supporting cross-border operations in Cambodia and road and bridge work. The group reopened and upgraded Highway 22 from Tay Ninh to the border, placed a laterite cap on Route 13 from Chon Thanh to Minh Thanh, opened a rural road in the Angel's Wing between Highway 1 west of Go Dau Ha and Ben Cau, upgraded Highway 1 from Xuan Loc to the II/III Corps border, and improved local roads in Tay Ninh and Binh Duong Provinces near the Cambodian border. In early 1972, the group assumed contingency responsibility from U.S. engi-

[66] HQ, TRAC, Semiannual Written Review, 23 Jan 72, pp. 36–37; OCE Liaison Officer Trip Rpt no. 22, 8 May 72, pp. 4–8.

neers for thirty-two critical bridges in the corps area. Arrangements were made by the engineer adviser, Major Traas, to transfer contingency stocks of panel and M4T6 bridges along with excess bridge parts stored at Long Binh. Responsibility for all forward airfields within the corps was also assumed by the 30th Group. During and after the Easter offensive, the group reopened sections of main supply routes cut by the enemy. Examples of this work included replacing a blown culvert on Highway 1 near Trang Bang and rebuilding a blown bridge across the Vam Co Dong River at Go Dau Ha. Attempts to relieve surrounded An Loc involved moving the group's 318th Land Clearing Company to Highway 13 where it cleared growth and enemy bunkers on each side of the road north of Lai Khe.[67]

The Easter offensive was a grave challenge for South Vietnam, and for the most part South Vietnamese troops resisted with determination. Well-planned U.S. air strikes, particularly the massive B–52 raids, caused many of the 100,000 North Vietnamese and Viet Cong casualties and destroyed at least one-half of their tanks and large-caliber artillery. To some degree, it appeared that Vietnamization was working, provided that massive U.S. airpower, logistical support, and advisers were available. The halting of the North Vietnamese offensive allowed the United States the appropriate amount of time, a "decent interval," to bow out of Vietnam. Nevertheless, North Vietnam still had gained considerable territory along the Laotian and Cambodian borders as well as the area just south of the Demilitarized Zone. These occupied areas would serve as the launch points for the final Communist assault in 1975.[68]

Winding Down the Construction Program

During 1971 and 1972, the massive military construction program neared the end. In 1972, for the first time since the 1965 buildup, a fiscal year Defense Department budget contained no request for authorizations or appropriations for military construction to support operations in Southeast Asia. Thus far, more than $1.8 billion for military construction had been appropriated. Still, much work needed to be done, particularly in the highway and modernization and improvement programs. Although the Department of the Army did approve $36 million for Fiscal Year 1970, this was disapproved by the Defense Department, and further funding by Congress became difficult. Command guidance stressed making do and doing without. Even more rigid construction limitations were established in September 1971. New project starts costing over $50,000 had to get Defense Department approval prior to the obligation of funds, and project overruns would have to be financed from funds already assigned. In terms of dollars spent and man-hours, 1971 was another busy year, but the downward trend was unmistakable and inevitable. As the year

[67] HQ, TRAC, Semiannual Written Review, 23 Jan 72, pp. 36–37.
[68] Truong, *Easter Offensive*, pp. 158, 172, 176, 179–80.

drew to a close, about $97 million in construction funding previously appropriated still remained to be completed.[69]

Rather than saying construction was coming to an end in Vietnam, the MACV Construction Directorate declared that the program was entering a new phase, and emphasized a new and higher standard of construction to complete outstanding projects. Buildings still needed to be erected or improved as units moved to other locations. A great majority of the camps were designed for a five-year life. The temporary standard two-story wooden buildings, some going back five or more years, showed signs of the ravages caused by monsoons and termites. Despite the drastic restrictions, new construction carried out by the U.S. Army Engineer Command, Vietnam, continued at a surprisingly high rate. General Noble reported that 10 to 15 percent of the Engineer Command's effort was still devoted to construction. In May 1971, the MACV Construction Directorate received $25 million in Fiscal Year 1971 Military Construction, Army, funds, boosting the Army's share of military construction in South Vietnam to $968.4 million. This figure changed little the following year, rising to $970.2 million and dropping to $954.1 million later in the year. For Fiscal Year 1973, the directorate forecasted the need for $58 million in Military Construction, Army, funds to support the facilities needed by residual forces and the modernization and improvement program for the South Vietnamese. Almost $41 million of this amount would be used to upgrade the facilities at Tan Son Nhut and Long Binh. More work was also programmed at Can Tho and Da Nang.[70]

Attention increasingly turned to improving living standards. A concerted effort had been under way for some time to improve the advisory camps. General Abrams deemed better housing and recreation facilities at base camps necessary to keep troops away from the less wholesome attractions of Vietnamese society, while at the same time lowering the American profile in Vietnam. As the war wound down, disciplinary problems, especially drug use, had become major command concerns. In May 1971, Abrams reiterated "the necessity for creative and imaginative programs to meet the diversified needs and interests of our personnel during the period of redeployment." Emphasis was placed on intramural sports programs and building sports facilities on a self-help basis using operations and maintenance or nonappropriated funds. Troops also spent spare time improving barracks and game rooms. General Noble told his commanders that their troops "must do something about these needs, be it the repair of a movie projector or the construction of a basketball court."[71]

[69] MACV History, 1971, vol. 1, pp. IX-1, IX-13 to IX-14; Construction Directorate Briefing for Mr. Barry J. Shillito, Asst Sec Def (Installations and Logistics), 13 Dec 71, p. 2, Historians files, CMH.

[70] MACV History, 1971, vol. 1, pp. IX-13 to IX-14; Construction Directorate Briefing for Mr. Shillito, 13 Dec 71, pp. 3–4; Quarterly Hist Rpt, 1 Oct–31 Dec 71, MACDC, 8 Mar 72, p. II-8, Historians files, CMH; Army Activities Rpts, 21 Jan 72, p. 2, 16 Aug 72, p. 19, and 20 Dec 72, p. 21; Debriefing, Noble, 6 Aug 71, p. 6, Senior Officer Debriefing Program, DA, Historians files, CMH; Engr Cmd History, 8 Jul 72, p. 29.

[71] Quotes from Ltr, MACJ12, Abrams to DCG, USARV, sub: Morale and Welfare Activities, 7 May 71, with first Indorsement, Lt Gen William B. McCaffrey, DCG, USARV, 25 May 71,

Indicative of these requirements, Engineer Command reported the completion of 103 major base construction and repair projects between February 1970 and April 1972. This work, valued at $4 million in materials, included new recreation facilities at Long Binh, a confinement facility at Long Binh (better known as LBJ or Long Binh Jail), a religious retreat center at Cam Ranh Bay, an equipment retrograde facility at Da Nang, and a post exchange warehouse complex at Long Binh. Among the high-priority projects with short suspense dates were the retrograde facilities at ports such as the one at Da Nang. All were completed on time. Physical security projects—the construction of perimeter lighting, chain-link fencing, and concrete revetments—became a continuous operation. During the same period, contract work valued at $21 million resulted in the completion of forty-seven major projects, including the Long Binh and Newport rail spurs, a petroleum pipeline at Qui Nhon, a cinder block cantonment for the 8th Radio Research Unit at Phu Bai, and an indoor theater and outdoor pool at Long Binh completed by the summer of 1972. Another $1.4 million was used by troops and contractors to improve MACV adviser sites. Engineer troops worked on ten port construction and repair projects, expending some $600,000 in materials, at Da Nang, Qui Nhon, Cam Ranh Bay, and Newport. Also, in late 1971 damage caused by Typhoon Hester diverted much engineer activity in I Corps to repair work. The port of Da Nang required extensive repairs caused not only by the typhoon but also heavy usage by ships involved in retrograde operations. At Qui Nhon, port construction troops were called on to repair a failing wharf. On the operational side, the command directed over two thousand taskings, ranging from airfield repairs to firebase construction.[72]

During 1971, Seabee units with help from RMK-BRJ kept up a high pace of work. Major efforts centered on completing assigned sections of the highway program in I Corps, building logistical facilities at new and existing naval bases throughout the country, completing a network of sixteen coastal radar surveillance sites covering the entire South Vietnamese coast, and helping build dependent housing for South Vietnamese naval personnel. Work at naval bases and radar sites was part of the Navy's Accelerated Turnover to the Vietnamese—a time-phased transfer of equipment, operational and logistical bases, and responsibilities to the South Vietnamese Navy. The first of the radar sites, which were designed to complement MARKET TIME operations by detecting Hanoi's seaborne infiltration, commenced operations on 1 July at Vung Tau. One month later, a second site atop Monkey Mountain overlooking Da Nang harbor was turned over to the South Vietnamese. By December, the seventh site had been turned over and the remaining nine stations would follow by mid-1972. Seabee teams also drilled wells, repaired bridges, and helped the U.S. Agency for International Development on various civic action projects. From Soc Trang in the delta to Xuan Loc in III Corps, detachments worked on roads, schools, a maternity clinic, and other projects to raise living standards

and second Indorsement, Noble, 2 Jun 71, to subordinate commanders and staffs, Historians files, CMH; Construction Directorate Briefing for Mr. Shillito, 13 Dec 71, p. 4.

[72] Engr Cmd History, 8 Jul 72, pp. 7–8.

in outlying areas. In the delta, teams found time to install playground equipment at local hospitals and orphanages, grade local roads and install culverts, and repair water systems.[73]

Construction for South Vietnamese modernization and improvement began to show fruition. This work accomplished under the Military Assistance Service Funded (MASF) category of military construction included depot upgrades. The depot program was designed to provide the South Vietnamese armed forces with a rebuild capability for most engineer, signal, and ordnance equipment. The 40th Engineer Base Depot in Saigon was one of the beneficiaries. Initiated in 1969, the depot upgrade program was almost complete in 1972. Large equipment deliveries brought about by Projects ENHANCE and ENHANCE PLUS, however, prompted an urgent need for a greater combat vehicle rebuild capability. In December, almost $2 million was added by the Defense Department for new rebuild facilities. A part of this money was slated for more upgrades for the 40th Engineer Base Depot. During 1972, much work also went into building new wards for provincial hospitals. Work ranged from $231,000 for rehabilitation work in Qui Nhon to over $2.3 million for a 450-bed hospital in Saigon.[74]

The South Vietnamese dependent housing effort still had its ups and downs. On the upward side, the U.S. made a commitment in 1970 to furnish $6 million to purchase building materials over a five-year period from 1971 to 1975 to build an additional 100,000 housing units. Also most South Vietnamese divisions were taking over the large bases left behind by U.S. forces and making sufficient land available for housing. Construction was enhanced when Pacific Architects and Engineers transferred a cement block–making machine to the 5th Engineer Construction Group, which from its rear base at Hoc Mon began making cement blocks for the program in III Corps. In addition, the South Vietnamese chief of engineers designed and built thirty-three manual and electric operated cement block–making machines for issue to engineer units in the other corps areas. Shortages in other building materials were made up by diverting materials from other projects. Construction carried out by Vietnamese troops and small local contractors progressed satisfactorily until 1972 when the Easter offensive damaged a number of houses already built or under construction. The program was nearly stopped as contractors abandoned work sites, the supply of materials slowed down, and engineer units devoted more effort to support military operations. Work resumed in late 1972 but was interrupted again when the U.S. Congress cut assistance funds. With only a limited amount of assistance funds forthcoming, Saigon had to suspend the program after 75 percent of the housing had been completed.[75]

During 1971, the time finally arrived to phase out the construction contract with the joint venture contractor, Raymond, Morrison-Knudsen, Brown and

[73] Marolda, *By Sea, Air, and Land*, pp. 318–19; Tregaskis, *Building the Bases*, pp. 417–18; MACV History, 1971, vol. 1, pp. V-6 to V-7, V-37 to V-41.

[74] MACV History, 1971, vol. 1, p. VIII-57; ibid., 1972–1973, vol. 2, pp. E-7 to E-8, E-23; Clarke, *Final Years*, pp. 452–53. See also Khuyen, *RVNAF Logistics*, pp. 307–26.

[75] MACV History, 1972–1973, vol. 1, pp. E-32, E-34; Khuyen, *RVNAF Logistics*, pp. 394–95.

Root, and J. A. Jones. In early 1970, the Naval Facilities Engineer Command in Washington decided the best way to end the cost-reimbursable contract was to do it in stages. During Phase I, RMK-BRJ and the Officer in Charge of Construction in Saigon reviewed all completed work totaling some $1.3 billion. This phase, which was completed in May 1971, proved so successful that a Phase II analysis covering another $227 million was completed in November. Completion of about $200 million still remained, and a final goal of nearly $1.9 billion was set for 1 July 1972. In order to meet this date, all projects had to reach the Officer in Charge of Construction not later than 1 May 1971 to allow time to forward notices to proceed to the contractor by 1 June. Planning also started for the orderly disposal of construction equipment, depots, and industrial sites. There were over 7,500 major items of equipment alone. With only eleven months to go, $38 million worth of materials, supplies, and spare parts had to be used and any residual inventory passed on to another agency.[76]

Despite the impact of the North Vietnamese 1972 Easter offensive, RMK-BRJ completed most of its tasks ahead of schedule in mid-May. As soon as the jobs were finished, the contractor reduced manning and closed out sites. The Officer in Charge of Construction worked closely with MACV for the transfer of the contractor's camps, shops, and other facilities to U.S. and Vietnamese government agencies, with the U.S. Agency for International Development accepting many for final transfer to the Vietnamese. A system was developed to distribute a complete listing of usable equipment and materials worldwide. U.S. military organizations could request any item, paying only the cost of shipping. As part of the Vietnamization effort, about three thousand items of equipment were transferred to the U.S. Agency for International Development for use in a program to foster the growth of a construction industry in Vietnam. Equipment not claimed, about one-half, was transferred to the U.S. Army Property Disposal Agency, Vietnam, for sale. Nearly all the surplus construction materials were purchased from the contractor or transferred to other agencies in Vietnam. On 3 July 1972, the Officer in Charge of Construction held a ceremony in Saigon to note the end of the RMK-BRJ contract, which had run nearly eleven years. Accounting and administrative closeouts followed, and the Officer in Charge of Construction, Saigon, office closed its doors in early October. At that time, no disputes remained between the Navy and RMK-BRJ, a remarkable achievement for a contract relationship of this scope.[77]

RMK-BRJ's part in the wartime building effort was striking. The firm accounted for more than 60 percent of the construction in Vietnam, with the rest by military engineers and other contractors. RMK-BRJ employed over 200,000 people from 1962 to 1972, with Vietnamese comprising at least 80 percent of the workforce. To sustain the large construction load, equipment valued at $208 million was shipped across the Pacific and distributed to seventy-five construction camps and hundreds of smaller work sites. Along with the massive amount of airfield, port, depot, cantonment, and roadwork,

[76] Tregaskis, *Building the Bases*, pp. 423–29.
[77] Ibid., pp. 423–29, 431–33, 436.

some of RMK-BRJ's significant building feats included MACV headquarters, much of Long Binh Post, the U.S. Embassy, the deep-draft Newport and its railroad spur connecting line to Long Binh, and five major bridges and a new Saigon bypass. Left behind to be operated by the Vietnamese government were several industrial facilities such as quarries, concrete prestress plants, dredging, and heavy construction equipment and maintenance repair shops. It was anticipated that South Vietnam's future economic growth would greatly benefit through the marketable skills learned by more than 150,000 Vietnamese men and women. Women's roles in construction, thanks to RMK-BRJ and other U.S. firms, had expanded to heavy equipment operators, welders, and electricians.[78]

The closeout of the RMK-BRJ contract did not end the Navy's involvement in administering construction contracts. During the late stages of the RMK-BRJ program, the Officer in Charge of Construction awarded an increased number of contracts to Vietnamese and non-Vietnamese firms. In early 1972, the construction agency awarded a major road-building project in the delta to a Vietnamese firm and a $3.5 million contract to a Vietnamese joint venture for a combined arms school near Long Binh. As the RMK-BRJ contract was nearing an end, the Naval Facilities Engineering Command in Washington made plans for a new organization to replace the Officer in Charge of Construction. On 1 September, that part of the agency administering the remaining contracts in Vietnam was reconfigured as the Director of Construction, Republic of Vietnam. The new office reported to the Officer in Charge of Construction, Thailand, thus returning to the organizational structure that existed before 1 July 1965.[79]

Modifications were also made for facilities engineering services. At the beginning of Fiscal Year 1971 (1 July 1970), Pacific Architects and Engineers, Philco-Ford Corporation, and Vinnell Corporation employed over 25,100 workers carrying out facilities engineering and high-voltage power production costing $108.6 million. Some 1,100 military personnel assigned to Engineer Command's Facilities Engineering Directorate, the three district engineer offices, and engineer detachments supervised the contracts. In addition, a small organization, Facilities Engineer, Saigon, composed of direct-hire U.S. and Vietnamese civilians, provided facilities engineering services to leased facilities in Saigon. The Army determined it was in the best interest of the government to negotiate sole-source contracts for facilities engineering requirements. Cost-plus-award-fee contracts were again used and cost-incentive features were added as part of the award fees with the expectation that the two facilities engineering contractors would perform at a high level and at the same time reduce costs to increase earnings. In July 1970, Pacific Architects and Engineers began its eighth year in South Vietnam with an $82 million contract (down from $100 million in Fiscal Year 1970) and 21,000 employees. The contract renewal charged the firm to continue buildings and grounds

[78] "Summary of Vietnam Construction," *Military Engineer* 64 (September-October 1972): 56–58; Merdinger, "Civil Engineers, Seabees, and Bases in Vietnam," p. 235.

[79] Tregaskis, *Building the Bases*, pp. 436–37.

maintenance, power production, potable water and ice supply, sanitation, air conditioning and refrigeration, and fire protection services at U.S. and allied installations in II, III, and IV Corps, and in I Corps north of the Hai Van Pass. During the year, however, the number of major bases dropped from twenty-nine to sixteen, the contract was reduced another $16 million, and the workforce dropped to 14,000. Following the turnover of logistic support in I Corps to the Army in the summer of 1970, Philco-Ford continued to carry out facilities engineering support at Da Nang and Chu Lai. By 30 June 1971, base transfers and budgetary constraints reduced the three contractors' workforce by 7,200 and the contracts to $90.6 million.[80]

In July 1970, land-based high-voltage power requirements were separated from facilities engineering requirements and opened to competitive bidding. A contract was awarded to Pacific Architects and Engineers to operate and maintain generators and distribution systems at thirty-two sites. Vinnell Corporation still operated and maintained eleven T–2 tankers as power barges (four at Cam Ranh Bay, two at Nha Trang, three at Qui Nhon, and two at Vung Tau), an interrelated land site recently completed at Cam Ranh Bay, and land-based power plants at Da Nang, Phu Bai, and Chu Lai under cost-plus-incentive terms. Plans were under way since 1969 to begin removing the tankers when the land-based plants came online. The estimated cost of returning the ships to the United States for disposal, including towing, came to $140,000 per ship. Since the ships were old and obsolete and the U.S. Navy no longer had requirements for their future use, the Maritime Commission agreed to sell the ships to competitive bidders as scrap at their present locations. On 20 August 1970, the first two barges were removed from the system at Cam Ranh Bay, and in March and April 1971 all three barges at Qui Nhon were removed from power generation. Vinnell then took over operation of the newly completed land-based power system for the remainder of the fiscal year.[81]

During Fiscal Year 1972, the Army renewed the sole-source facilities engineering and power barge contracts and again put the land-based high-voltage contracts out to competitive bidding. While the facilities engineering contracts with Pacific Architects and Engineers and Philco-Ford remained a cost-plus-award-fee contract with an incentive feature, the power barge contract with Vinnell was changed to a fixed price. As for the land-based high-voltage requirement, Pacific Architects and Engineers competed with six other firms and again was awarded a contract to operate most of the plants, including Qui

[80] PA&E History, FY 1970, p. 2; ibid., FY 1971, pp. 1–3; Summary of Facilities Engineering Support for FY 71, tab T, pp. 1–3, OCE Liaison Officer Trip Rpt no. 20, 2 Sep 71; Engr Cmd History, 8 Jul 72, p. 10; AAR, Opn COUNTDOWN, HQ, USARV, 4 Jun 73, vol. 2, p. D-2-1, Historians files, CMH; Col. Warren S. Everett, "Contractors in the Combat Zone," *Military Engineer* 64 (January-February 1972): 37–38. For more on facilities engineering, see Intervs, Christensen with Col Marion M. Wood, Northern Dist Engr and later Dep Engr, Engr Cmd, 11 Aug 71, VNIT 963; Lt Col Pierpont F. Bartow, Northern Dist Engr, 28 Jul 71, VNIT 962; and Lt Col Paul D. Matthews, Central Dist Engr, 19 Aug 71, VNIT 964. All in CMH.

[81] Summary of Facilities Engineering Support for FY 71, pp. 3–4, OCE Liaison Officer Trip Rpt no. 20, 2 Sep 71; Engr Cmd History, 8 Jul 72, pp. 11–12; MFR, USARPAC G–4, 1 Mar 69, sub: Replacement of T–2 Ships RVN; Ltr, Dir Const, USARV Engr, to USARPAC, sub: Disposition of Power Barges in RVN, 12 Jun 70, both in Historians files, CMH.

Nhon. Vinnell continued to operate high-voltage plants at Da Nang, Phu Bai, Chu Lai, and Cam Ranh Bay. By July 1971, Pacific Architects and Engineers' facilities engineering contract dropped to $51.68 million and its workforce to 12,444 (788 U.S., 860 third-country national, and 10,796 Vietnamese). With the departure of U.S. Marines and the consolidation of remaining forces in I Corps, Philco-Ford's contract expanded slightly to $14.46 million and its workforce to 3,206 (134 U.S., 447 third-country national, and 2,625 Vietnamese).[82]

By late 1972, nearly all facilities engineering and power generation were consolidated under one contractor, Pacific Architects and Engineers. Philco-Ford decided to close out its Vietnam operation at the end of September; Facilities Engineer, Saigon, phased out in February 1973 with most employees transferring to Pacific Architects and Engineers; and the firm was selected for a new consolidated contract awarded on 1 October for the remainder of Fiscal Year 1973. Pacific Architects and Engineers also became responsible for facilities engineering at Da Nang and Phu Bai, the remaining high-voltage barges at Nha Trang and Tuy Hoa, and increased management responsibilities in the Military Assistance Service Funded program. Major installations offices remained at Nha Trang, Camp Holloway outside Pleiku, ROK Valley outside Qui Nhon, Tan Son Nhut, Long Binh, and Can Tho. Clustered under these installations were other bases and MACV advisory team sites. For the Nha Trang and ROK Valley installations, South Korean forces became the facilities engineering firm's major customer. In order to comply with the new contract terms, Pacific Architects and Engineers made organizational changes, including the creation of a Da Nang office and a Military Assistance Service Funded Program Office, and incorporated the power barges and land-based power plants under the installation offices. By helping the South Vietnamese to assume ever-increasing responsibilities for former U.S. installations, the firm's Military Assistance Service Funded Program Office expanded on-the-job training and supplies for the many low-voltage generators at transferred installations and signal sites. To this end, the office dispatched six contact teams to carry out training and to help maintain and overhaul the power plants and distribution systems.[83]

[82] Summary of Facilities Engineering Support for FY 72, pp. 1–2, and Facilities Engineer FY 72 Proposals, pp. 1–2, both in tab T, OCE Liaison Officer Trip Rpt no. 20, 2 Sep 71; Status of Land Based High Voltage Power Plants, tab GG, incl. 1, p. 255, OCE Liaison Officer Trip Rpt no. 22, 8 May 72. For more on facilities engineering from the contractor's perspective, see Intervs, Christensen with Mr Charles N. Leightner, General Manager's Representative, Military Region 1 (MR 1), PA&E, 29 Jul 71, VNIT 959; Mr William F. Lane, General Manager's Representative, MR 2, PA&E, 18 Aug 71, VNIT 960; and Mr Lawrence Farnum, Installation Engr, Philco-Ford, 31 Jul 71, VNIT 961. All in CMH.

[83] PA&E, General Manager's Special Instructions, Contract DAJB11–73–0026, Revised Organizational Structure, September 1972, Historians files, CMH; AAR, Opn COUNTDOWN, HQ, USARV, vol. 2, p. D-2-1.

Last Transfers

The accelerated redeployments in 1971 and 1972 dramatically increased base transfers and reductions in leases. Compared to the transfer of 75 bases in 1970, the number in 1971 more than doubled to 173, including 105 former Army facilities. By the end of the year, a total of 278 bases, adviser sites, and industrial complexes, or 33 percent, had been turned over to the South Vietnamese since the transfers began in 1969. Military leases were reviewed to see if leaseholders could be moved to rent-free facilities as units and activities redeployed. As a result, the number of leases decreased steadily from 420 in July 1970 to 316 by 1 February 1971, reducing leasing costs from $11.8 million to $10.4 million. This savings, however, did not correspond to the drop in the number of leases since the costs of renewed leases increased. Savings in Military Assistance Program funds were achieved by substituting U.S. facilities slated to be closed instead of proceeding with planned improvement and modernization projects. The Construction Directorate, working closely with the MACV J–4, identified eighty-four projects valued at $11.4 million for cancellation. The directorate also closely worked with the U.S. Agency for International Development to determine what facilities not needed by the South Vietnamese armed forces could be used by civilian agencies such as the Ministry of Education, which expressed interest in using excess facilities for schools.[84]

By then several South Vietnamese military units and civilian agencies had moved into the former U.S. bases. Larger operational bases, composed chiefly of tin-roofed wooden barracks and prefabricated metal buildings used for offices and warehouses, along with surfaced roads, electrical-generating systems, and deep-well water supply systems, were usually turned over to South Vietnamese divisions. Despite their advantages, these bases caused certain problems. Some were too spacious even for an entire South Vietnamese division. Often units taking over the bases found themselves short of personnel to fill all the barracks and to man all the guard posts and defense positions and incapable of properly maintaining all the facilities. As a result, South Vietnamese units gradually shrank their living perimeter and cannibalized buildings no longer in use. New major South Vietnamese bases included Dong Tam (occupied since 1969 by the 7th Division); Vinh Long Airfield (9th Division); Blackhorse eight miles south of Xuan Loc (18th Division training center); Bearcat (Armor School and the site for a newly constructed Infantry School); Cu Chi (25th Division and several logistical units); Lai Khe (5th Division); Di An (Marine Division and the Railway Service); Camp Enari outside Pleiku (47th Infantry Regiment); Freedom Hill outside Da Nang (3d Division); and Camp Eagle (1st Division). The more permanent logistical bases usually accommodated logistical and field support units. Many expedient battalion and brigade bases, however, were usually destroyed or abandoned. Large or small, abandoned bases, including Camp Radcliff at An Khe, were often looted. Engineer units

[84] MACV History, 1971, vol. 1, p. VIII-61; Ltr, HQ, MACV, MACDC-RPM, to CINCPAC, sub: Planning for Disposal of Facilities, 13 Mar 71, Historians files, CMH.

were too preoccupied to participate in salvage operations and were usually used to recover prefabricated metal buildings only.[85]

The redeployment of two U.S. brigades characterized the stand-downs of separate infantry brigades and their camps. Before ending operations in late April 1971, the 2d Brigade, 25th Division, closed six firebases and transferred three others to the South Vietnamese and Thai forces in the area, transferred its main base camp (Camp Frenzell-Jones) near Long Binh to other U.S. units, and consigned two base camps at Xuan Loc to the South Vietnamese 18th Division. At the closed firebases, the brigade's 54th Engineer Company leveled berms, swept the areas for mines, and hauled away usable materials. Along the Demilitarized Zone, the 1st Brigade, 5th Division, made arrangements with Pacific Architects and Engineers and the 101st Airborne Division to transfer the bases at Quang Tri and Dong Ha to the South Vietnamese 1st Division prior to its departure in August. The South Vietnamese were slow to move in, however, and the lack of security led to looting.[86]

The Americal Division's stand-down was centered at the large 18,000-man Chu Lai base camp. The base was served by a water system consisting of sixteen wells and five lakes capable of producing 1.3 million gallons of potable water per day. A 7,000-kilowatt high-voltage electrical system with one main plant and three substations served about 85 percent of the base, the remainder being served by a low-voltage system. The $50 million installation contained some four thousand buildings of temporary and preengineered construction, an airfield with three runways, a dock area with five ramps along the beach, and a thirty-three-mile perimeter lighting system. Planning began in early August 1971 to transfer the entire base to the South Vietnamese 2d Division. In this case, detailed instructions and close coordination with the installation engineer and well-controlled South Vietnamese quartering parties prevented excessive looting. Units were not cleared to depart until all trash had been moved to a sanitary fill. On 2 October, Typhoon Hester caused extensive damage and a virtual stop to the policing campaign. About one thousand buildings were repaired mostly through unit self-help, and South Vietnamese officials declared their requirements would be satisfied without further repairs. The 2d Division requested that storm debris be left in place and no attempt be made to clear collapsed buildings. Additionally, the quartering parties requested a halt to the trash removal because trash was very often of value to the South Vietnamese soldier. In the final days, the police emphasis was placed on recovering abandoned equipment and materials. Although the base was transferred on 27 November, some U.S. contractor personnel remained for

[85] Khuyen, *RVNAF Logistics*, pp. 180–85.

[86] AAR, Opn KEYSTONE ROBIN (CHARLIE), 2d Bde, 25th Inf Div, 28 Apr 71, pp. 109–10, 117; AAR, Opn KEYSTONE ORIOLE (BRAVO), 1st Brigade, 5th Inf Div, 19 Aug 71, pp. 90–92. Both in Combined Arms Research Library (CARL), Fort Leavenworth, Kans. For more on other stand-downs in late 1970, see AAR, Opn KEYSTONE ROBIN, 3d Bde, 9th Inf Div, 8 Oct 70; AAR, Opn KEYSTONE ROBIN, 199th Inf Bde, 12 Oct 70; and AAR, Opn KEYSTONE ROBIN, 25th Inf Div, 15 Dec 70, all in CARL.

awhile to reconfigure the electrical system to South Vietnamese needs and to assist and train the new tenants to operate the system.[87]

During 1972, the remaining major bases were transferred or dismantled. Most of the real estate and facilities at Cam Ranh Bay were turned over by 1 May. Only the Navy's MARKET TIME installation at the southern end of the peninsula, the Sea-Land transport facility, and the property disposal yard remained under U.S. control. At Qui Nhon, the port facilities and the Phu Tai complex had been turned over in November 1971, followed by the incremental transfer of the camps in and around the city. At Da Nang, the bulk of facilities were transferred in May and June, with Camp Horn, the 95th Evacuation Hospital, a covered storage area near Camp Horn, the air base, and China Beach still in U.S. hands. Other major transfers included Phu Cat Air Base in December 1971, Phan Rang Army and Air Base during the period March to May 1972, Tuy Hoa Air Base on 22 February 1972, and Bien Hoa Air Base in June 1972. In late October, as the peace negotiations appeared to be nearing fruition, the Joint Chiefs of Staff directed MACV to title transfer all remaining bases and adviser sites. Procedures were streamlined, and by 10 November the title transfer was completed with the understanding that U.S. forces would continue to occupy facilities in use until no longer needed. This transfer also conveniently preempted the provisions in the cease-fire agreement concerning the mandatory dismantling of U.S. bases in South Vietnam. Joint physical inventories followed over the next sixty days. On 12 November, the South Vietnamese took formal possession of the Long Binh complex, estimated at $107 to $120 million in value. Extensive prior planning had taken place, and as the South Vietnamese units (the 3d Area Logistics Command and other logistical units, a 175-mm. artillery battalion, an armor squadron, an airborne battalion, and three ranger groups) moved in, U.S. units were consolidated and moved to another part of the post. By November, the recently reorganized U.S. Army, Vietnam/MACV Support Command headquarters, including Engineer Group, Vietnam, completed the move of its 2,900 member staff to Tan Son Nhut.[88]

Several bases or portions of bases were taken over by civilian agencies. At Long Binh, the Ministry of Economic Affairs took over a one-mile stretch bordering the Bien Hoa Highway to expand the Bien Hoa Industrial Zone. The ministry also took over several other camps, including RMK-BRJ's facilities at Cam Ranh Bay for industrial development. At Phu Loi, a former 1st Cavalry Division camp, the Ministry of War Veterans used the base as a vocational and handicraft training for veterans and disabled service men. The Ministry of National Education converted a former South Korean logistics base at Nha Trang into a community college.[89]

With the drawdowns and base transfers, large quantities of construction equipment and materials were retrograded to depots in the United States and

[87] AAR, Opn KEYSTONE ORIOLE (CHARLIE), Americal Div, 15 Dec 71, pp. F-1 to F-3, CARL.

[88] Turn Over Plans, p. 235, OCE Liaison Officer Trip Rpt no. 22, 8 May 72; MACV History, 1972–1973, vol. 2, pp. E-28 to E-29, F-31; AAR, Opn COUNTDOWN, HQ USARV, vol. 1, pp. A-3-I-3-1 to A-3-I-3-2, vol. 2, pp. D-1, D-10, D-3-1; Khuyen, *RVNAF Logistics*, pp. 183–86.

[89] Khuyen, *RVNAF Logistics*, pp. 183–84.

overseas or transferred to the South Vietnamese. Many of the Army engineer units were inactivated in country and their equipment was turned in. The Engineer Command's Materiel Directorate monitored the turn-ins and reviewed requests by MACV and USARV logisticians for lateral transfers to U.S. and South Vietnamese engineer units. As a result, about 90 percent of the equipment issued to South Vietnamese engineer units under the Improvement and Modernization Program came from Engineer Command's assets rather than depot stock. Most of this equipment was used in the highway restoration program and included the commercial equipment and industrial plants. In February 1972, the MACV Engineer Advisory Division assumed responsibility from Engineer Command for administering the Dynalectron maintenance contract for the commercial equipment. Similarly, much of RMK-BRJ's equipment and industrial complexes were transferred to the South Vietnamese. What could not be used or cared for by the South Vietnamese, such as prefabricated buildings and AM2 matting, was disassembled and shipped out. Equipment and materials not transferred to the South Vietnamese or considered too expensive or too much trouble to retrograde were turned in to property disposal channels to be sold to the highest bidders.[90]

Some of the high-dollar equipment returned to U.S. stocks included high-voltage generators and DeLong piers. These were major items in the retrograde program involving equipment valued at over $75 million. Shipment of the 5,000-kilowatt generators offered no real problems, but the large 15,000-kilowatt generators, each almost the size of a locomotive, required heavy lift cranes and heavy transport vehicles to be moved along carefully reconnoitered roads and bridges capable of supporting the heavy loads to the ports. Returning these generators also depended on the hookup of replacement low-power generators or connection of existing loads to commercial power. By 1 November 1972, only 38 of the 129 generators had been returned to the United States, but the potentially successful cease-fire talks spurred the shipment of 57 more valued at over $9.6 million by 28 March 1973. The rest were shipped out by MACV's successor Defense Attaché Office.[91]

DeLong piers at five ports were steadily reduced. The two A-type barges comprising the DeLong pier at Da Nang were removed by RMK-BRJ in June and towed to Subic Bay. Between July and November, DeLong Corporation prepared the two A-type barges of the pier at Vung Ro Bay for shipment to the United States. In both instances, U.S. Navy tugboats towed the sections. In July, DeLong Corporation began preparing the two A-type barges of Pier Number 1 at Cam Ranh Bay for shipment the following June. By November 1972, five DeLong piers, valued at some $60 million, were still in country: one at Qui Nhon consisting of four A-type barges, one at Vung Tau consisting of seven B-type barges, and three at Cam Ranh Bay consisting of four A-type and

[90] Engr Cmd History, 8 Jul 72, p. 14–15; Fact Sheets, MACJ46-AE, sub: Dynalectron Maintenance Contract, n.d., tab U, and RVNAF Engineer Participation in the Lines of Communications Program, 2 Mar 72, OCE Liaison Officer Trip Rpt no. 22, 8 May 72.

[91] AAR, Opn COUNTDOWN, HQ USARV, vol. 1, p. 77, vol. 2, pp. D-3 to D-4, D-4-1 to D-4-20.

One of the DeLong piers being towed to Cam Ranh Bay for return to the United States

six B-type barges. In December, the ammunition pier (six B-type barges) at Cam Ranh Bay was released for retrograde and by February 1973 was disassembled and en route to the United States. In June 1973, dismantling of another pier at Cam Ranh Bay and the remaining pier at Qui Nhon was nearing completion. Dismantling of the last DeLong pier at Cam Ranh Bay was programmed to begin in June 1974. All that remained of the five piers at Cam Ranh Bay was the permanent pier built by RMK in 1964.[92]

Bowing Out

In late October 1972, the prospect of the cease-fire negotiations appeared to be nearing a successful conclusion. General Weyand, who replaced General Abrams in June, began planning for successor agencies once a treaty was signed. Three new organizations would assume MACV's responsibilities: a successor headquarters in Thailand, a U.S. element of a four-party joint military commission putting the cease-fire machinery in place once the cease-fire went into effect, and the Defense Attaché Office to monitor military activities and provide technical assistance to the South Vietnamese. The cease-fire began on 28 January

[92] Fact Sheet, AVCC-CC, sub: DeLong Piers, RVN, 17 Mar 72, incl 10, OCE Liaison Officer Trip Rpt no. 22, 8 May 72; Periodic Rpt of Engr Cmd Activities, 17 May 72, p. 7, OCE Hist Ofc.

1973, and the war ground to a halt, at least temporarily. In the sixty days that followed, over 58,000 foreign troops departed South Vietnam, including about 23,000 Americans and 35,000 South Koreans. MACV headquarters dissolved on 29 March, and the three new agencies took over its remaining functions.[93]

The continuing drawdown of U.S. forces resulted in more changes for the few remaining U.S. military engineers. Major reorganizations of the U.S. Army Engineer Group, Vietnam, occurred in September and December 1972. The final organization resulted in a staffing of 100 military, 40 Department of Army civilians, and 674 Vietnamese employees. By this time, all the region engineers had ceased functioning as separate elements, and their personnel were assigned to the group's Headquarters and Headquarters Company. On 28 December the group, the USARV Engineer Section, the MACV Directorate of Construction, and the Engineer Advisory Division were consolidated into one organization under Col. Russell J. Lamp, who became the MACV Command Engineer. The USARV Engineer Section and U.S. Army Engineer Group merged to direct projects and plans and administration. A Construction Division took care of construction and engineering and real estate. The combining of the MACV, USARV, and Engineer Group real estate offices significantly reduced processing time for leasing and base transfers. A newly established Engineer Branch, Defense Attaché Office, took over functions that would provide some support to the South Vietnamese after the last U.S. troops departed. These duties consisted of facilities maintenance, the highway improvement program to include technical assistance and maintenance support for the commercial equipment, the retrograde of equipment, support for large generators and air conditioners at certain communications sites, dependent shelters, the Military Assistance Service Funded program, and construction materials. Region engineers, who had stood their troop elements down, also reported to the Engineer Branch. By then the region engineers had been reduced to a few personnel. As the region engineers stood down, the Engineer Group formed a mobile engineer platoon at Tan Son Nhut and platoon-size forces of local nationals in each region. Pacific Architects and Engineers and Facilities Engineer, Saigon, provided the bulk of facilities engineering support.[94]

In late January 1973, following the signing of the armistice agreement, the MACV Command Engineer accomplished one final project. The engineers were tasked to help provide facilities for the Four-Party Joint Military Commission and the International Commission of Control and Supervision overseeing the cease-fire terms. Lacking any planning guidance, this final construction requirement came as a surprise. Within twenty-four hours, local national employees and Pacific Architects and Engineers began building or renovating offices, living quarters, and conference facilities. About two weeks later, all but two of the fourteen regional sites had been completed. By the time all U.S. and allied forces departed on 29 March, most of the fifty-two team sites and twelve control points were done.

[93] MACV History, 1972–1973, vol. 2, pp. G-1, H-2; Clarke, *Final Years*, pp. 495–96.

[94] MACV History, 1972–1973, vol. 2, pp. E-30, G-12; AAR, Opn COUNTDOWN, HQ USARV, vol. 1, pp. 30–31, 75–76, 78–79, vol. 2, pp. D-1 to D-2, D-8, D-1-1, D-7-1.

Pacific Architects and Engineers continued unfinished work under the direction of the Engineer Branch, Defense Attaché Office.[95]

By then all that remained of the engineer infrastructure was the small Engineer Branch, in the Army Division of the Defense Attaché Office. Altogether, this division consisted of three military and 277 U.S. civilian personnel. The Defense Attaché Office comprised five attachés representing the three services. Pacific Architects and Engineers continued to provide facilities engineering and limited construction services to the Defense Attaché Office until the final collapse of South Vietnam in 1975.[96]

[95] AAR, Opn COUNTDOWN, HQ USARV, vol. 1, pp. 33–34, vol. 2, pp. D-4 to D-5, D-11 to D-12.

[96] MACV History, 1972–1973, vol. 2, p. G-12.

17

Conclusion

There is no doubt that the accomplishments of the military and civilian engineers in Vietnam were numerous, varied, and significant. Army engineers and their military and civilian partners opened new ports along the coast, constructed and improved airfields in the dense jungle, built and paved roads, erected logistical facilities and housing, and provided support for tactical operations to counter an attempted Communist takeover of South Vietnam. The number of Army engineer units grew from the 35th Group's initial contingent of two construction battalions to an engineer command consisting of two brigades, six groups, twenty-eight battalions, forty-two separate companies, and various teams and detachments. Another seven engineer battalions were assigned to the divisions and eight companies to the separate brigades and regiment. During the war, over 200,000 soldiers served in engineer units, on engineer staffs assigned to major commands, in other staff and command positions, and as engineer advisers. In early 1969, when the Army reached its peak strength in Vietnam, there were over 40,000 troops serving with Army engineer units. During the course of the war, over 1,500 soldiers (engineers and non-engineers), including 143 officers, were killed or died of injuries while serving in engineer units and in other engineer assignments.[1]

The construction effort in South Vietnam allowed the United States to deploy and operate a modern 500,000-man force in a far-off underdeveloped land. Ground combat troops were able to fight the enemy from well-established bases, which gave U.S. and allied forces the opportunity to concentrate and operate when and where they wished. Although most of the construction was temporary, more durable facilities, including airfields, port and depot complexes, headquarters buildings, communications facilities, and an improved highway system, were intended to boost South Vietnam's defensive capabilities and developing economy.

Control and Management

In Vietnam, the employment of the engineers required adjustments to Army doctrine to cope with the nature of the war. There were no front lines; the enemy was anywhere and everywhere, often intermingled with the population.

[1] Galloway, "Essayons," pp. 252, 298; Dunn, *Base Development*, p. 26; Computer Reports by Military Occupational Specialty, 26 Jan and 20 Apr 2005, Information Technical Management Division, Washington Headquarters Services, Department of Defense; Casualty Information Sheet, n.d., Historian, U.S. Army Engineer School, Fort Leonard Wood, Mo. See also "U.S. Army Hostile Deaths by Combat Arms Branch," *VFW Magazine* 90 (June-July 2003): 22.

Consequently, construction units were not assigned to a communications zone to the rear, nor were combat engineer units to a combat zone to the front. Rather, engineers not assigned to divisions and separate brigades were placed under a single central command starting with the 18th Engineer Brigade and eventually U.S. Army Engineer Command, Vietnam.[2]

Centralization violated the long-held doctrine of giving the corps commander control of engineer resources, but this was always more theoretical than real in Vietnam, since the commander had merely to pick up the phone, and any nearby units would be his as long as he needed them. In a letter to General Duke, General Larsen of I Field Force had nothing but praise for the cooperation his headquarters received from the 18th Engineer Brigade. As far as he was concerned, the response of the brigade's units surpassed all expectations to the point that operational control was never an issue. General DePuy, a former commander of the 1st Infantry Division, later remarked that Engineer Command forces supported him so effectively that he was unaware for some time that they were not under the control of II Field Force. When asked of the desirability of assigning construction units to his 1st Logistical Command, General Eifler replied that the separate engineer disposition served many requirements and he was satisfied whenever he received his fair share of construction support.[3]

What did engineers themselves think of the centralized system? Engineer general officers supported it. Duke, Parker, Noble, and Young emphasized the high priority given to operational support and the flexibility in the use of engineer units. In late 1967, a survey conducted by Maj. Gerald A. Galloway, a student at the U.S. Army Command and General Staff College at Fort Leavenworth, Kansas, of past and present engineer brigade, group, battalion, and separate company commanders, found a two-to-one margin of approval. The minority position came from seven of nine division engineers, who were concerned about being saddled with base development projects, and one of three field force engineers.[4]

Like the nondivisional engineers, construction resources were also centrally managed, in this case by the MACV director of construction. Until the advent of the directorate, control at the service level had led to competition among the services' construction agencies for limited resources and a variety of construction programs responsible to different heads in Saigon and Washington. The first year of the buildup, when construction projects mush-

[2] Galloway, "Essayons," pp. 254–63. See also FM 100–10, *Field Service Regulations, Administration*, July 1963, para. 2-6 to 2-7; FM 100–15, *Field Service Regulations, Larger Units*, March 1966, para. 2-6 to 2-12; and FM 5–1, *Engineer Troop Organizations and Operations*, September 1965, para. 1-1 to 1-10.

[3] Ploger, *Army Engineers*, pp. 140–41; Galloway, "Essayons," pp. 276–78 (interviews with Generals DePuy and Eifler); Debriefing, Young, 15 Mar 72, p. 1, Senior Officer Debriefing Program, DA, Historians files, CMH; Ltr, Lt Gen Stanley R. Larsen, CG, I FFV, to Brig Gen Charles M. Duke, CG, 18th Engr Bde, n.d., copy in Rpt of Visit to Various Headquarters in Vietnam, 15–30 Sep 67, incl. 7, tab A, OCE Liaison Officer Trip Rpt no. 9.

[4] Galloway, "Essayons," p. 278; Debriefings, Duke, 14 May 68, p. 1, Parker, 5 Dec 69, p. 7, Noble, 2 Jul 71, p. 2, and Young, 15 Mar 72, pp. 2–3, Senior Officer Debriefing Program, DA. All debriefings in Historians files, CMH.

roomed with no central planning or direction, proved especially difficult in this regard. Unification under MACV brought clarity to project assignments, priority of effort, and construction standards. Reporting directly to the MACV commander, the office worked well enough that a later Defense Department logistical review recommended that future contingency plans establish the composition and role of a construction directorate on the staff of every joint forces commander.[5]

Materiel and Maintenance

To ensure that projects were carried out efficiently, the engineers depended on having the right equipment and receiving their supplies on time. One of the innovations of the Vietnam War was the purchase of commercial equipment to speed up the highway program. Senior engineers were pleased with the results. General Roper, a former 18th Engineer Brigade commander, believed military construction equipment manufactured to Army specifications was many years behind that used in the construction industry. He became a strong advocate of procuring commercial equipment without the restriction of military specifications, noting that several ten-ton dump trucks could be bought for the price of one standard military five-ton dump truck. Commercial vehicles operated in almost every environment that the military vehicle faced and outproduced the military dump truck by a factor of two to one. In justifying the equipment, Roper had his staff review the highway program to see how long it would take to finish it with available equipment. The answer was eight years, but incorporating additional, mostly commercial construction equipment, cut the time to four years or less without an increase in manpower. This result led to the request in 1968 for commercial equipment using Military Construction, Army, funds. General Parker, who commanded all nondivisional engineer troops in 1968 and 1969, conceded that the commercial equipment was not as rugged as the military, but it had performed well in the year since it was procured.[6]

Although engineers usually made do with the equipment on hand, modifications often resulted in better performance. A good example was the D7E bulldozer, equipped with a larger-than-normal Rome plow blade, sharpened each day, and its stinger projection used to split large trees before the blade sliced them off. Adding this powerful blade along with a protective cab, thereby creating the famous Rome plow, made the standard bulldozer an effective tactical weapon in clearing jungle growth.[7]

Lighter engineer equipment also arrived on the scene, initially with the 1st Cavalry Division. Before the division deployed, the air assault tests at Fort Benning had been promising with respect to engineer organization, training, operational concepts, and light equipment. But the proof was in combat, and

[5] Dunn, *Base Development*, pp. 18–19,137; JLRB, Monograph 6, *Construction,* pp. 87–89, 91–92.

[6] Debriefings, Parker, 14 Oct 69, p. 11, and Roper, 7 Oct 68, p. 4, Senior Officer Debriefing Program, DA. Both in Historians files, CMH.

[7] Roberts, "Trends in Engineer Support," pp. 34–35; Ploger, *Army Engineers*, pp. 96, 103.

the division's battle experience in the Central Highlands and along the coast exceeded the most optimistic forecasts. Again and again, light equipment of the 8th Engineer Battalion—small dump trucks, bulldozers, and scrapers—moving with the heliborne assault elements, cleared landing zones and forward airstrips and helped to elevate the tempo of operations. Later in the war, Colonel Malley, the engineer who took the 8th Battalion to Vietnam, thought that all combat engineers, including the nondivisional, should be issued airmobile equipment. A start was made in 1968 when ten airmobile sets arrived in Vietnam, seven going to units, among them the 101st Airborne Division, which was being reorganized as an airmobile division, and three to equipment pools under the control of Field Force (Corps). When additional sets arrived a year later, along with an infusion of repair parts, there was finally enough light equipment on hand to meet the airmobile requirements of operations.[8]

Airfield matting, on the other hand, caused headaches throughout the war. T17 membrane airfields required constant monitoring and repairs before ruptures caused by landings and takeoffs allowed water to get through to the subgrade. Experience showed that if T17 matting was used, it always required repairs. M8A1 steel matting was not much better. Crews struggled to connect panels made by different manufacturers and keep the panels aligned. Manufacturers apparently did not follow the same specifications. Once this problem was reported, Army Materiel Command insisted that the manufacturers meet its criteria. Commanders were more favorably inclined to AM2 and MX19 aluminum matting. The problem with the AM2 matting was the need for an expedient anchoring system. Later, accessory kits contained systems that correctly secured the matting. Better yet, the MX19 matting was initially provided with anchoring kits and was reported to be easy to place and remove. The trend was definitely toward using the MX19 as the standard airfield matting.[9]

The single greatest deficiency in engineer operations during the war, however, was poor equipment maintenance. General Parker believed that this defect needed to be corrected in the military school system. Added to the maintenance issue was the variety of makes and models of engineering equipment. To correct these problems, Parker pushed the idea of employing command maintenance inspection teams and established a school at Long Binh for repair parts clerks. These steps helped lower deadline rates, but equipment still on deadline was often the most needed on construction projects. Assigning more light equipment companies to every combat battalion helped, but the additional units outstripped the ability of the logistical system to provide backup maintenance. Parker suggested giving a third-echelon maintenance capability to light equipment companies similar to that of the construction battalions. Generals Morris and Chapman, in reviewing their experiences in

[8] Malley, "Engineer Support of Airmobile Operations," pp. 15–17; Logistics Review, USARV, vol. 7, Engineering Services System, pp. T-58 to T-60, U-34 to U-36, V-8, V-12 to V-14.

[9] Roberts, "Trends in Engineer Support," pp. 40–43.

commanding the 18th and 20th Engineer Brigades respectively, proposed the same capability for the combat battalions.[10]

Engineer Technique

In Vietnam, engineer reconnaissance teams played key roles in examining future work sites and determining if construction material was available nearby. Often, however, the teams had to travel over insecure roads. Security arrangements for the teams varied. When an engineer battalion carried out a reconnaissance operation in a division's area of operations, the division provided security. For example, when the 19th Engineer Battalion began road work between Bong Son and Duc Pho in 1967, south of the I/II Corps boundary, the 1st Cavalry Division protected the work parties. North of the boundary, Task Force OREGON provided protection. But in many cases, the engineers were on their own. Helicopters helped speed up reconnaissance, but there was always a question of availability and the danger of being shot down by enemy fire. When doing ground reconnaissance, many engineers preferred the armored personnel carrier (M113) to the 3/4-ton truck. With their mobility, protection, and firepower, M113s gave engineers entry into some of the most difficult and dangerous terrain in the country.[11]

To deny cover and concealment to the enemy, the engineers made important breakthroughs in counter-tunneling and land clearing. Through trial and error, engineers found that the acetylene method supplemented with satchel charges did a better job at collapsing tunnels than standard shaped charges. Rome plows came to be regarded as first-class tactical weapons and a trend of the future. Throughout the war, the Engineer School gave land-clearing classes to the officers in the advanced course under the reasonable assumption that future counterinsurgencies fought in jungles would require land-clearing units to spearhead advances and deny terrain to the enemy. But when U.S. forces withdrew from Vietnam and the Army turned its attention to conventional scenarios in Europe and elsewhere, the land-clearing classes vanished from the school curriculum. The land-clearing experience survived, if tenuously, in the few lessons-learned tracts that were published during the war.[12]

The enemy's use of mines and booby traps was a significant problem in Vietnam and resulted in a large proportion of the battle casualties suffered by U.S. soldiers. Mines alone caused two-thirds of all combat losses of armored personnel carriers and tanks. All sorts of munitions, many of U.S. origin, were turned into lethal mines. In 1969, the Army established the Mine Warfare Center at U.S. Army, Vietnam, headquarters, and began to disseminate reports on enemy techniques and countermeasures. While the losses to mines

[10] Debriefings, Brig Gen John W. Morris, CG, 18th Engr Bde, 13 Jul 70, p. 13, Parker, 14 Oct 69, pp. 10–11, Chapman, 30 Oct 69, pp. 8–9, and Brig Gen Harold R. Parfitt, CG, 20th Engr Bde, 1 Nov 69, pp. 6–7, Senior Officer Debriefing Program, DA. All in Historians files, CMH.

[11] Roberts, "Trends in Engineer Support," pp. 50–52; ORLLs, 1 Feb–31 Mar 67, 14th Engr Bn, p. 12, 1 Aug–31 Oct 67, 20th Engr Bn, p. 22, 1 Nov 66–31 Jan 67, 27th Engr Bn, p. 15.

[12] Roberts, "Trends in Engineer Support," pp. 35–36, 54–55; Debriefing, Parker, 14 Oct 69, p. 2, Senior Officer Debriefing Program, DA, Historians files, CMH.

remained serious, General Parker believed that the center's efforts helped to improve the ratio of mines detected to undetected. Using mine-detecting dog teams also showed promise, and improved models of metallic and nonmetallic mine detectors began to arrive in Vietnam. Despite this progress, mine warfare still favored the forces that placed the mines and put those forces that had to detect them or neutralize their effects at a continuing disadvantage.[13]

Another major innovation during the Vietnam War was the firebase in whose design and construction engineers played key roles. By late 1966, U.S. tactical units made it a common practice to build firebases within range of impending operations with artillery and infantry, headquarters elements, medical facilities, and other support. Typically, engineer bulldozers cleared fields of fire on slightly elevated land. Taking drainage into consideration, protective berms were pushed up from the outside, which would allow water to be drained and create a natural obstacle such as a moat. Drained artillery pads followed. Sixty-inch culvert or Conex containers topped off with pierced-steel planking and roofing paper and about two to three feet of earth or sandbags could be fitted in the berms as troop living and fighting positions. By piecing together the materials, tactical operations and fire-direction centers could be built. Fuel storage bladders could also be positioned in berms pushed up by the bulldozers. Firebases were constantly improved while the infantry maneuvered and the artillery provided fire support.[14]

Mapmaking provided another arena for engineer innovation in Vietnam. Up-to-date maps and topographic information were key ingredients to military operations in Vietnam, especially the placement of artillery fire. During the early stages of the war, artillery units normally supported ground units from fixed positions into which ground control had been extended. Surveys enabled the artillery to ensure the accuracy of fire, but as artillery units moved to more remote areas it became more difficult to support friendly units because surveys were lacking. In early 1967, Lt. Col. Arthur L. Benton, the former chief of the Mapping and Intelligence Division of the Engineer Section, U.S. Army, Vietnam, who had returned to Vietnam on temporary duty from the Army Map Service in Washington, D.C., developed a system known as photogrammetric positioning. By tying aerial photographs to base maps, artillery surveyors could readily obtain azimuth and location of firing positions. Working with the photograph and overprint of a map, aerial observers could give accurate references to targets. Tests proved favorable, and a system was in place after Operation CEDAR FALLS.[15]

[13] Hay, *Tactical and Materiel Innovations*, pp. 130–36; Debriefing, Parker, 14 Oct 69, pp. 3–4, Senior Officer Debriefing Program, DA, Historians files, CMH. For more on mine countermeasures, see Ewell and Hunt, *Sharpening the Combat Edge*, pp. 136–47.

[14] Hay, *Tactical and Materiel Innovations*, pp. 97–106; Ltr, 20th Engr Bde to CG, USARV, 9 Aug 69, sub: Fire Support Base Construction Experience, Historians files, CMH. See also Ltr, 14th Mil Hist Det to Office Ch of Mil Hist, sub: The Construction of a Fire Base in the 1st Cavalry Division (Airmobile), 10 Oct 69, Historians files, CMH; Maj. Geoffrey A. Fosbook Jr., "Clearing Artillery Fire Support Bases," *Military Engineer* 61 (March-April 1969): 87–89.

[15] ORLLs, 1 Aug–31 Oct 66, II FFV Artillery, 14 Nov 66, pp. 12–13, 1 Feb–30 Apr 67, II FFV Artillery, n.d., pp. 8–9; Ltr, Col Arthur Benton to author, 25 Aug 98; Citation, Incl in

Finally, the engineers fought as infantry when needed. All engineer soldiers were trained to fight as infantry, and engineer units were organized and equipped to defend themselves. From the earliest days of the buildup, engineers in units like the 173d Engineer Company, 173d Airborne Brigade, were assigned infantry duties to defend firebases and run patrols. The 1st Engineer Battalion had its M48 tankdozers acting as armor to protect infantrymen and engineers. It also organized a platoon made up of armored personnel carriers mounted with flamethrowers, tankdozers, scoop loaders, and air compressors to destroy tunnel complexes. In the highlands, the 4th Engineer Battalion combined its flame platoon's four flamethrower tracks with the four tankdozers from the four line companies and a tank retriever to form an engineer armored task force to protect convoys hauling sand between Dragon Mountain and Kontum City, reducing the dependence on infantry and armor for security. In the delta, combat engineers attached to the riverine force frequently filled out infantry units that were short of riflemen. During the Tet offensive, the retaking of Pleiku City was helped by a task force from the 4th Engineer Battalion. Clerk typists, carpenters, draftsmen, surveyors, and mapmakers of the 79th Engineer Group headquarters joined the troops on the perimeter to help defend II Field Force headquarters at Plantation when it came under attack. Outside Qui Nhon, the 84th Engineer Construction Battalion defended the approaches to the city.[16]

The Soldiers

Despite the improvements in organization, equipment, and technique, it was still the engineer soldier who had to carry out the mission under trying conditions. Almost all senior officers looking back as the war wound down commented on the dedication and courage of their engineers. These same officers, however, were struck by the youth and inexperience of the men in the ranks. Because the bulk of the reserves were not called up, the Army had to create an entire new corps of junior officers and noncommissioned officers on a crash basis through candidate schools, faster promotions, and direct appointments. New, inexperienced junior noncommissioned officers were dubbed "shake and bake" to denote how quickly they got their new ranks. General Noble in particular believed that something was missing from their training. They seemed to lack initiative and confidence and, more pointedly, leadership training. He wrote that modern-day training seemed to be focused on the classroom, not on the practical art of handling men. He considered it regrettable that the Army had cut back on close-order drill and marching in formation. "In close order drill," he wrote, "the chain of command, from the squad leaders on up, exercised positive, man to man and voice leadership."

Recommendation for Award, Lt. Col. Arthur L. Benton, 26 Jul 67, Engr Cmd. All in Historians files, CMH.

[16] FM 5–135, *Engineer Battalion: Armored, Infantry, and Infantry (Mechanized) Divisions*, November 1965, p. 2–1; FM 5–1, *Engineer Troop Organizations and Operations*, September 1965, pp. A-B-11, A-B-15, A-B-48, A-B-52, A-B-71; Debriefing, Duke, 14 May 68, p. A-12, Senior Officer Debriefing Program, DA, Historians files, CMH.

The Vietnam-era Army lost that time-honored means of nurturing effective leaders, and there were consequences for performance in the units.[17]

The vagaries of the one-year tour in Vietnam also seriously affected unit performance. The threat was particularly insidious on the one-year anniversary of a unit's arrival in the theater, for on that date the unit, in theory, would undergo a 100 percent turnover in officers and men. To reduce this "rotation hump," the Army tried various expedients, one of which, in the 45th Engineer Group, required that there be no manpower loss larger than 25 percent in any thirty days during a unit's second year in Vietnam. Although the one-year tour was considered a morale booster, the constant rotation of troops caused turbulence as the replacements took time to become proficient. The long duration of the war also meant second and sometimes third tours for career soldiers. By 1970, frequent family separations caused some captains and majors to leave the service.[18]

The engineer school system and on-the-job training were supposed to provide all the skills that the soldier needed, but both sometimes fell short. General Morris believed that mechanics and specialized equipment operators running asphalt pavers, rock crushers, and well drillers should have been trained in the United States and sent to Vietnam as teams. Noble remarked that commanders never seemed satisfied that incoming troops were adequately prepared. Even a few more weeks of practicing on equipment at the Fort Leonard Wood training center did not seem to produce the proficiency to operate graders, cranes, paving machines, and scrapers. Proficiency only came after months on the job, but most soldiers either left the service after completing their tours or were promoted. In either event, the operator was lost and new ones had to be trained. The highest rank for equipment operators then authorized was specialist fifth class. A possible solution, according to Noble, was to authorize the next higher rank (E–6) to operate the more complex construction equipment. This solution could have resulted in significant savings to the Army in the long run.[19]

Regardless of the concerns expressed by the senior leadership, the engineer soldier demonstrated the ability to adapt to the many challenges thrown in his path. Though plagued by acute deficiencies in engineering skills, the first engineers in Vietnam quickly responded to the missions placed upon them. In some cases, only one noncommissioned officer may have had the experience needed to get the job done, but within a short time the engineer soldiers learned from their sergeant to carry out the new tasks with confidence. Their efforts were evident in the struggle against a relentless enemy and adverse physical conditions. Accompanying the infantry, engineer soldiers ferreted out and destroyed enemy mines and tunnel complexes. Engineers manning Rome plows cleared paths through the jungle. Engineers cleared defensive perimeters

[17] Debriefings, Noble, 6 Aug 71, p. 10 (quoted words), and Chapman, 30 Oct 69, p. 9, Senior Officer Debriefing Program, DA. Both in Historians files, CMH.

[18] Debriefings, Chapman, 30 Oct 69, p. 10, and Morris, 13 Jul 70, p. 9, Senior Officer Debriefing Program, DA. Both in Historians files, CMH.

[19] Debriefings, Morris, 13 Jul 70, p. 9, and Noble, 6 Aug 71, p. 39, Senior Officer Debriefing Program, DA. Both in Historians files, CMH.

at base camps and firebases and built and often manned the bunkers and fighting positions. In their builder role, they completed or restored a multitude of airfields, roads, and bridges. The combat troops had base camps they could return to, not as comfortable as they may have liked, but constantly being improved. All these achievements were made possible through the endeavors of the engineer soldier and his officers.[20]

[20] Ploger, *Army Engineers*, pp. vii, 183.

Bibliographical Note

This account of engineer operations in South Vietnam draws on a wide range of sources. These include published and unpublished accounts, command histories, unit reports and histories, messages, personal papers, interviews, memoirs, studies, and research papers. Of special value in preparing this volume were the monographs *U.S. Army Engineers* by Maj. Gen. Robert R. Ploger and *Base Development* by Lt. Gen. Carroll H. Dunn, both in the U.S. Army Vietnam Studies series; the Naval Facilities Engineer Command's *Southeast Asia: Building the Bases* by Richard Tregaskis; and, "Essayons: The Corps of Engineers in Vietnam," a thesis prepared by Brig. Gen. Gerald E. Galloway while a student at the U.S. Army Command and General Staff College. These publications and thesis include many useful maps, charts, tables, glossaries, and appendixes. The companion combat volumes in the United States Army in Vietnam series fully depict the combat operations and provide more detailed maps of the operations. Altogether, these works provided the framework in this study's account of construction and engineer combat support.

Other sources were valuable in fleshing out the engineer story. Most of the engineer-related interviews were gleaned from the Center of Military History Vietnam Interview Collection. Personal accounts, memoirs, and articles helped fill in gaps, and like the interviews added a human element missing in the official reports. Interviews of senior officers conducted later were also consulted. At higher levels, the Military Assistance Command, Vietnam (MACV) commanders' and senior engineers' collections provided backchannel messages, memorandums, and journals. Likewise, official debriefing reports, some with enclosures, gave frank assessments of the war and engineer efforts. Various reviews, trip reports, and studies on the construction program, engineer combat support, and engineer organizations were of great value in preparing this study. The trip reports prepared by the Office of the Chief of Engineers liaison officers provide not only narratives of engineer operations in South Vietnam but also informative annexes dealing with topics of interest and numerous color slides used by the liaison officer in his briefings.

Unpublished Sources

Among the unpublished sources were quarterly command reports and the operational reports – lessons learned (ORLLs) prepared by engineer units at the battalion level and higher. Periodic after-action reports (AARs) prepared by the units provided accounts of specific operations. These sources vary in quality from unit to

unit and are heavy in production figures that show the effectiveness of the support carried out by the engineers. A few units produced histories that also highlighted unit accomplishments and added some human interest. Similarly, interviews conducted in the field added a personal touch to engineer operations. Staff papers and reports put together by higher headquarters such as the Construction Directorate and the Office of the Chief of Engineers provide information on decisions affecting engineer operations, organization, logistics, and personnel matters. Special reports, studies, and investigations carried out at higher levels by the Defense Department, various headquarters, special study groups, and agencies depicted pros and cons of the construction effort. In all, the blending of these sources helped to achieve a balanced appreciation of the engineer endeavor in South Vietnam.

The ORLLs that replaced the command reports in late 1965 recorded a unit's activity over a three-month span (November–January, February–April, May–July, and August–October), arranged into sections on intelligence, operations, training, personnel, and logistics. Usually enclosures included an after-action account of an operation, statistics, maps, and design sketches. Engineer activities were also included in ORLLs prepared at logistical and support command, corps, division, and separate brigade levels. The ORLL was most useful in describing what the unit did during the period, innovative techniques, and avoiding future mistakes. In general, ORLLs lacked sufficient detail of individual operations and specific accomplishments by engineer soldiers in successfully carrying out unit missions. For this, the researcher has to turn to the combat after-action report, or AAR, interviews, and public affairs articles.

Unfortunately, AARs were not prepared for the bulk of engineer operations. Usually only significant operations merited AARs. Like ORLLs, engineer contributions to operations were included in AARs prepared by division and separate brigades. The AARs prepared by engineer units described the support rendered to tactical operations and specific projects such as constructing forward airfields. The majority of engineer AARs were prepared at the battalion level, but a few covering major operations such as the Cambodian incursion were prepared by engineer group and brigade headquarters. In a division-size operation, the division engineer prepared accounts depicting operations by the organic engineer battalion and other supporting engineers. Typically, the same format was used with topical headings, including task organization, intelligence, mission, concept of operation, chronology, execution, logistics and administration, and conclusions and recommendations. Sometimes AARs included maps, photographs, and design sketches. In some cases, AARs included oral interviews conducted by Engineer Command's military historians. The value of the AARs, besides the usual record-keeping account, was encompassed in the lessons on which the Army could base future doctrine, techniques, and possible corrective action.

National Archives and Records Administration

Many of the documents cited in this volume are in the custody of the National Archives and Records Administration (NARA). Records dealing with operations are housed in its facility at College Park, Maryland. Four record groups—Record

Group (RG) 319, Records of the Army Staff; RG 330, Records of the Department of Defense; RG 334, Records of Interservice Agencies; and RG 338, Records of the Army Commands—contain most of the ORLLs, AARs, correspondence and messages, and annual histories. Recently, NARA transferred the Vietnam War material in RGs 334 and 338 to a new record group—RG 472, Records of the U.S. Forces in Southeast Asia, 1950–1975. The documents consulted in RG 330 are the backup papers used in the Defense Department's report by the Joint Logistical Review Board dealing with construction and advanced base facilities maintenance. Since RGs 334 and 338 citations are reflected in this volume, researchers need to rely on the archivists at NARA to locate the documents in RG 472.

U.S. Army Center of Military History

The U.S. Army Center of Military History (CMH) located at Fort Lesley J. McNair in Washington, D.C., houses records that were critical in researching the engineer story. A photocopied set of the papers of General William C. Westmoreland assembled during his tour of duty as MACV commander, contains his backchannel messages and journal, as well as additional material that deals with engineer matters such as the messages between Westmoreland and Washington and Honolulu dealing with the establishment of a construction czar. Some engineer-related material can also be found in the photocopied collection of General Creighten W. Abrams. Critical, however, are the collection of papers of Lt. Gen. Carroll H. Dunn, the first MACV director of construction; the backchannel messages of Maj. Gen. Charles M. Duke, the commander of the 18th Engineer Brigade and later as the Engineer, U.S. Army, Vietnam; and copies of correspondence by Maj. Gen. Robert R. Ploger, the first commander of 18th Engineer Brigade and Engineer Command.

The CMH Vietnam Interview Collection, altogether some two thousand interviews, included over two hundred interviews with engineer commanders, staff officers, and soldiers. Many of the engineer-related interviews have been transcribed. Summaries of the interviews and occasionally AARs are contained in the files. Most of the interviews were with departing battalion commanders covering the period of their command. There are also interviews with commanders and staff officers at command, brigade, and group levels. Only a few interviews were held with company commanders and enlisted soldiers and contractor representatives. The interviews with AARs that stand out are with the commander and staff of the 35th Engineer Battalion (Combat) after it reopened the Hai Van Pass; the commander and soldiers of Company A, 70th Engineer Battalion (Combat), following the evacuation of Kham Duc; the commanders and staff of the 34th and 35th Engineer Groups who discussed the highway improvement program in their areas of responsibility; and the commander of the 62d Engineer Battalion (Land Clearing) following the Cambodian incursion. Most valuable are the interviews that took place soon after an operation or event because details were still fresh in the minds of the participants. The end-of-tour interviews were of limited value in this volume because the questions and answers mostly dealt with trends such as training, discipline, and morale but little on specific operations during the six-month or one-year tour.

Other useful holdings are the copies of command histories prepared by U.S. Military Assistance Command, Vietnam (MACV); the Commander in Chief, Pacific (CINCPAC); U.S. Army, Vietnam (USARV); U.S. Army, Pacific (USARPAC); the histories of the Joint Chiefs of Staff; and the twelve-volume Defense Department Study on U.S.-Vietnam Relations commonly known as the Pentagon Papers. The Historians files collection, which are maintained in the working files of Histories Division or the research files of the Historical Resources Branch, include copies of AARs, ORLLs, interviews, letters, messages, memorandums, reports, briefings, studies, unit histories such as a two-volume unpublished history of the 1st Engineer Battalion in Vietnam, and other documents. Also available in the Historical Resources Branch are the published unit yearbooks of several divisions and separate brigades and the 1st Engineer Battalion in Vietnam; contemporary field manuals and tables of organization and equipment (TOEs); the papers of Thomas B. Thayer (with some references dealing with construction, base transfers, land mines, and booby traps) assembled by the former director of the Southeast Asia Office in the Office of the Assistant Secretary of Defense for Systems Analysis; the report by the Joint Logistics Review Board, which includes volumes on construction and facilities engineering; a volume dealing with engineering services in the multivolume *Logistics Review, U.S. Army, Vietnam*; and engineer-related items in the personal papers of Robert W. Komer, the MACV Deputy for Civil Operations and Revolutionary Development Support (DEPCORDS). Copies of the weekly Army Buildup Progress Report (11 August 1965 to 20 December 1972), prepared by the Office of the Chief of Staff of the Army (and which became the Army Activities Report: Southeast Asia on 26 March 1969), include charts, graphs, and maps depicting base development progress and engineer unit dispositions as well as disclosing engineer problems. A collection of senior officer debriefing reports portray the views of several engineer generals before their departure from Vietnam. Some of the reports contain engineer subject annexes. Also in the files are copies of engineer-related documents, MACV complex reviews, Brig. Gen. Daniel A. Raymond's Observations on the Construction Program, development of the MACV Construction Directorate, backup documents for the MACV command histories, and annual histories prepared by Pacific Architects and Engineers.

U.S. Army Military History Institute

The U.S. Army Military History Institute (MHI) at Carlisle Barracks, Pennsylvania, has large holdings of Vietnam War documents, varying from unit-level to high-level conduct of the war. In many instances, these documents duplicate holdings in the National Archives. MHI also holds the papers of many senior Army officers, including Corps of Engineers generals. These include the papers and messages of Generals Robert P. Young, Charles C. Noble, and Henry C. Schrader. The Senior Officers Oral History Program files at MHI include an extensive interview with Maj. Gen. Robert R. Ploger. (A copy of the Ploger interview is also available at CMH.) In addition, MHI's Senior Officer Oral History Program contains interviews with Army War College students who served as engineer company commanders during the Vietnam War. MHI also houses the

Senior Officer Debriefing Reports, which include debriefings with senior Corps of Engineers officers. MHI is the main repository of newspapers and magazines published by commands in Vietnam. Engineer Command's biweekly newspaper, *Castle Courier*, and a quarterly magazine, *Kysu'*, contain a variety of articles on engineer operations, construction, highway restoration, and many human interest stories.

Office of History, Headquarters, U.S. Army Corps of Engineers

The Office of History, U.S. Army Corps of Engineers, is located at the Humphreys Engineer Center in Alexandria, Virginia, near Fort Belvoir. The Office of History's extensive Research Collection includes a wide variety of engineer-related material. Holdings contain many ORLLs and AARs prepared by engineer units in Vietnam, General Raymond's Development of the Construction Directorate and observations on the construction program, documents, reports, personal papers, photographs, interviews, and field and technical manuals. The office also contains periodicals such as the Engineer Command's biweekly newspaper, *Castle Courier,* and quarterly magazine, *Kysu',* and bimonthly *Military Engineer* published by the Society of Military Engineers.

The Office of History received copies of all the Office, Chief of Engineers (OCE) Liaison Officer Trip Reports, which were prepared to brief the Chief of Engineers and Washington officials. Besides a narrative of his visit to Army headquarters in Honolulu and Saigon and engineer units in South Vietnam, the OCE Liaison Officer assembled a wealth of information on unit dispositions, operations, construction, and engineer logistics and personnel. The narratives typically included candid comments during his meetings with senior engineer officers. Altogether, twenty-two reports were heavily mined in the preparation of this volume.

The Office of History has conducted a series of oral history interviews with senior engineer officers that cover their careers and service in Vietnam. This series called Engineer Memoirs includes interviews with Lt. Gen. Frederick J. Clarke, Chief of Engineers during the Vietnam War; Lt. Gen. Carroll H. Dunn, MACV Director of Construction, MACV J–4, Director of Military Construction at the Office of the Chief of Engineers, and Deputy Chief of Engineers; and other senior officers. The full citation for the memoir used in this volume is as follows:

Engineer Memoirs, Lieutenant General Carroll H. Dunn. Alexandria, Va.: Office of History, U.S. Army Corps of Engineers, 1998.

The Office of History, U.S. Army Corps of Engineers, and engineer divisions have published histories of their organizations and activities. For this volume, the author consulted an overview of the Corps' history and a history prepared by the Pacific Ocean Division. Full citations follow:

Thompson, Erwin N. *Pacific Ocean Engineers: History of the U.S. Army Corps of Engineers in the Pacific, 1905–1980*. Honolulu: Pacific Ocean Division, n.d.

U.S. Army Corps of Engineers. *The U.S. Army Corps of Engineers: A History*. Alexandria, Va.: Office of History, U.S. Army Corps of Engineers, 2007.

The Engineer Studies Group, later the Engineer Studies Center, a former field operating activity of the Corps of Engineers, did a broad spectrum of studies to assist OCE, the Army Staff, and the Defense Department and the Joint Chiefs of Staff, in making decisions on base development and strategic forces planning. The Office of History prepared a history of the Engineer Studies Center. A bibliography of the Engineer Studies Center publications is in the historian's files. The Engineer Studies Group and Center files are now in the National Archives. Complete citations used in this volume are as follows:

An Analysis of the Requirement for Army Aircraft Shelters. Engineer Strategic Studies Group, Office, Chief of Engineers, Department of the Army, September 1969.

Baldwin, William C. *The Engineer Studies Center and Army Analysis: A History of the U.S. Army Engineer Studies Center, 1943–1982*. Fort Belvoir, Va.: U.S. Army Corps of Engineers, 1985.

Bibliography of Publications, U.S. Army Corps of Engineers, Engineer Studies Center. N.p., n.d.

U.S. Navy Seabee Museum

The U.S. Navy Seabee Museum at Port Hueneme, California, houses the reports prepared by Seabee units following their tours in Vietnam and the Richard Tregaskis Papers. Tregaskis, noted for his book *Guadalcanal Diary*, had written *Southeast Asia: Building the Bases* for the Naval Facilities Engineering Command. *Building the Bases* was a chief source for sketching the work done by Seabee units and the joint-venture contractor, Raymond, Morrison-Knudsen, Brown and Root, and J. A. Jones (RMK-BRJ). Backup materials, including interviews used in the preparation of *Building the Bases,* are held in the Tregaskis Papers. Although Tregaskis concentrated on the Seabees and RMK-BRJ, he did include some work done by Army engineers. Most important were his interviews with senior Army and Navy engineers plus an interview with General Westmoreland in the Pentagon after he became the Chief of Staff of the U.S. Army. Also available at the U.S. Navy Seabee Museum is Diary of a Contract, a history prepared by RMK-BRJ. The Seabee unit reports should be of interest to researchers who want to delve into the accomplishments of the naval construction battalions.

Other Holdings

Several other repositories were useful in the preparation of this volume. The Office of Air Force History at Bolling Air Force Base in Washington, D.C., maintained files used in the preparation of John Schlight's *The War in South Vietnam: The Years of the Offensive, 1965–1968*, which cites Air Force documents and histories on air base construction and Red Horse engineers. The holdings of the U.S. Naval History and

Heritage Command at the Navy Yard in Washington, D.C., and the Marine Corps History and Museums Division at Quantico, Virginia, were checked for materials on Navy and Marine Corps engineers. The library at the U.S. Army Command and General Staff College at Fort Leavenworth, Kansas, has large holdings of ORLLs and AARs on the Vietnam War and copies of the MACV Complex Reviews. Copies of the MACV Complex Reviews were also found at the Army War College's library at Carlisle Barracks, Pennsylvania. In addition, many of the ORLLs, AARs, and Senior Officer Debriefing Reports are in the holdings of the Defense Technical Information Center at Fort Belvoir. The command historian of the Engineer School at Fort Leonard Wood, Missouri, has some holdings similar to the Corps of Engineers Historical Office. These include ORLLs, AARs, and OCE Liaison Officer Trip Reports.

Student theses and essays done by engineer officers attending the Command and General Staff College and Army War College provided additional background on engineer construction and combat support. Those consulted are as follows:

Conover, Lt. Col. Nelson P. "The Lines of Communication Program in Vietnam, A Case Study." Research paper, U.S. Army War College, 1973.

Galloway, Maj. Gerald E. "Essayons: The Corps of Engineers in Vietnam." Master of Military Art and Science thesis, U.S. Army Command and General Staff College, 1968.

Malley, Lt. Col. Robert J. "Engineer Support of Airmobile Operations." Student essay, U.S. Army War College, 1967.

Roberts, Col. Charles R. "Trends in Engineer Support." Student thesis, U.S. Army War College, 1969.

Published Primary Sources

Among the published primary sources are the histories prepared by major commands and the Joint Chiefs of Staff. Sections of the histories cover engineering activities. Complete citations for the histories used in this volume are as follows:

Arsenal for the Brave: A History of the United States Army Materiel Command, 1962–1968. Washington, D.C.: Historical Office, U.S. Army Materiel Command, 1969.

Headquarters, Commander in Chief, Pacific. "CINCPAC Command History 1961." Honolulu: Deputy Chief of Staff for Military Assistance, Logistics and Administration, 1962.

_____. "CINCPAC Command History, 1962." Honolulu, 1963.

_____. "CINCPAC Command History, 1963." Honolulu, 1964.

_____. "CINCPAC Command History, 1964." Honolulu, 1965.

Headquarters, U.S. Army, Pacific (USARPAC). History of U.S. Army Operations in Southeast Asia, 1 January–31 December 1964. Honolulu: Military History Division, Office of the Assistant Chief of Staff, G–3, 1965.

Historical Division, Joint Secretariat, Joint Chiefs of Staff. "The Joint Chiefs of Staff and the War in Vietnam, 1960–1968," Part 2, 1965–1966. Washington, D.C., 1970.

Military History Branch, Headquarters, United States Military Assistance Command, Vietnam. "Command History, 1964." Saigon, 1965.
_____. "Command History, 1965." Saigon, 1966.
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_____. "Command History, 1969." Volumes 1–3. Saigon, 1970.
_____. "Command History, 1970." Volumes 1–4. Saigon, 1971.
_____. "Command History, 1971." Volumes 1–2. Saigon, 1972.
_____. "Command History, 1972–1973." Volumes 1–2. Saigon, 1973.
Procurement Support in Vietnam, 1966–1968. U.S. Army Procurement Agency, Vietnam. Japan: Toshio Printing Co., n.d.
Weinert, Richard P. *The Role of USCONARC in the Army Buildup, FY 1966.* Fort Monroe, Va.: U.S. Continental Army Command, 1967.

Admiral U. S. G. Sharp and General William C. Westmoreland directed the preparation of an overview of their commands covering the period from 1964 to 1968. Sharp's part of the report includes a section covering construction in Vietnam and Thailand, and Westmoreland's part presents a command account of the war in South Vietnam, including several appendixes. One of the appendixes outlines base development and construction in South Vietnam. The complete citation is: Sharp, Admiral U. S. G., and General William C. Westmoreland. *Report on the War in Vietnam (As of 30 June 1968)*. Washington, D.C.: Government Printing Office, 1969.

Two sets of studies published under Department of the Army auspices were used in the preparation of this volume. The first series, the Vietnam Studies, consists of twenty-one monographs by senior officers who served in Vietnam. The monographs cited in this volume are:

Collins, Brig. Gen. James L. Jr. *The Development and Training of the South Vietnamese Army, 1950–1972*. Washington, D.C.: Department of the Army, 1973.
Dunn, Lt. Gen. Carroll H. *Base Development in South Vietnam, 1965–1970*. Washington, D.C.: Department of the Army, 1972.
Eckhardt, Maj. Gen. George S. *Command and Control, 1950–1969*. Washington, D.C.: Department of the Army, 1974.
Ewell, Lt. Gen. Julian J., and Maj. Gen. Ira A. Hunt Jr. *Sharpening the Combat Edge: The Use of Analysis to Reinforce Military Judgment*. Washington, D.C.: Department of the Army, 1974.
Fulton, Maj. Gen. William B. *Riverine Operations, 1966–1969*. Washington, D.C.: Department of the Army, 1973.
Hay, Lt. Gen. John H. Jr. *Tactical and Materiel Innovations*. Washington, D.C.: Department of the Army, 1974.
Heiser, Lt. Gen. Joseph M. Jr. *Logistic Support*. Washington, D.C.: Department of the Army, 1974.
Kelly, Col. Francis J. *The U.S. Army Special Forces, 1961–1971*. Washington, D.C.: Department of the Army, 1973.

Larsen, Lt. Gen. Stanley R., and Brig. Gen. James L. Collins Jr. *Allied Participation in Vietnam*. Washington, D.C.: Department of the Army, 1975.

Pearson, Lt. Gen. Willard. *The War in the Northern Provinces, 1966–1968.* Washington, D.C.: Department of the Army, 1975.

Ploger, Maj. Gen. Robert R. *U.S. Army Engineers, 1965–1970*. Washington, D.C.: Department of the Army, 1974.

Rogers, Lt. Gen. Bernard W. *Cedar Falls–Junction City: A Turning Point*. Washington, D.C.: Department of the Army, 1974.

Starry, General Donn A. *Mounted Combat in Vietnam*. Washington, D.C.: Department of the Army, 1978.

Tolson, Lt. Gen. John J. *Airmobility, 1961–1971*. Washington, D.C.: Department of the Army, 1973.

A second set of studies published by the Center of Military History in limited quantities, the Indochina Monographs, was done by contract and authored by senior South Vietnamese, Cambodian, and Laotian officers. The series consists of twenty monographs covering subjects of special interest to the authors who consulted available records. The series also provides personal commentary and experience, thereby giving them the character of primary sources. The following monographs were used:

Hinh, Maj. Gen. Nguyen Duy. *Lam Son 719*, Washington, D.C.: U.S. Army Center of Military History, 1979.

Khuyen, Lt. Gen. Dong Van. *The RVNAF*. Washington, D.C.: U.S. Army Center of Military History, 1980.

_____. *RVNAF Logistics*. Washington, D.C.: U.S. Army Center of Military History, 1980.

Lung, Col. Hoang Ngoc. *The General Offensives of 1968–69*. Washington, D.C.: U.S. Army Center of Military History, 1981.

Sutsakhan, Lt. Gen. Sak. *The Khmer Republic at War and the Final Collapse*. Washington, D.C.: U.S. Army Center of Military History, 1980.

Tho, Brig. Gen. Tran Dinh. *The Cambodian Incursion*. Washington, D.C.: U.S. Army Center of Military History, 1983.

Truong, Lt. Gen. Ngo Quang. *The Easter Offensive of 1972*. Washington, D.C.: U.S. Army Center of Military History, 1980.

Several published unit histories were consulted. Typically, divisions and brigades prepared histories in the form of yearbooks depicting operations. Unit histories usually have sections on the activities of organic engineer units. The 1st Engineer Battalion, 1st Infantry Division, also published several histories. These published histories typically include photographs of commanders and troops, photographs of operations, and maps. The histories used in this publication and available at the Center of Military History are as follows:

Always First: A Pictorial History of the 1st Engineer Battalion, 1st Infantry Division, October 1965–March 1967. 1st Engineer Battalion, n.d.

Always First: 1st Engineer Battalion, 1967–1968. 1st Engineer Battalion, n.d.
Coleman, Maj. J. D., ed. *1st Air Cavalry Division: Memoirs of the First Team, Vietnam, August 1965–December 1969.* Tokyo, Japan: Dai Nippon Printing Co., n.d.
The First Three Years: A Pictorial History of the 173d Airborne Brigade (Separate). Brigade Information Office, n.d.
The 1st Infantry Division in Vietnam, 1969. N.p.: 1st Infantry Division, n.d.
The 25th's 25th . . . in Combat, Tropic Lightning, 1 October 1941–1 October 1967. The 25th Infantry Division, 25th Division Public Affairs Office, n.d.
The U.S. 25th Infantry Division, October 1969–October 1970, Yearbook. N.p.: Tropic Lightning Association, n.d.
Vietnam, the First Year: Pictorial History of the 2d Brigade, 1st Infantry Division. Tokyo, Japan: Brigade Information Office, n.d.

The MACV Directorate of Construction prepared periodic reports of the construction program known as Complex Reviews, which show a broad picture of facilities requirements as determined by the force structure in South Vietnam. Sketch maps of major base complexes are included. Related is the 1964 base development plan for Southeast Asia published by U.S. Army, Pacific. Full citations are as follows:

Base Development Plan No. 1–64, Vol. VI, Southeast Asia. Headquarters, U.S. Army, Pacific. Fort Shafter, Hawaii: U.S. Army, Pacific, n.d.
Construction Program South Vietnam (Complex Review). Saigon: Directorate of Construction, MACV, 1 December 1966.
Construction Program South Vietnam (Complex Review). Saigon: Directorate of Construction, MACV, 1 April 1967.
Construction Program South Vietnam (Complex Review). Saigon: Directorate of Construction, MACV, 15 January 1968.
Construction Program South Vietnam (Complex Review). Saigon: Directorate of Construction, MACV, 1 March 1969.

In 1969, the Department of Defense established the Joint Logistics Review Board and asked it to address the entire construction process. Two monographs cover base development planning, funding, standards for facilities, construction resources, and facilities engineering. The studies include numerous charts and tables. A similar study was prepared by U.S. Army, Vietnam. Full citations for studies used in this publication are as follows:

Joint Logistics Review Board. *Logistics Support in the Vietnam Era*. Monograph 1, *Advanced Base Facilities Maintenance*. Washington, D.C.: Department of Defense, n.d.
_____. *Logistics Support in the Vietnam Era*. Monograph 6, *Construction*. Washington, D.C.: Department of Defense, n.d.
_____. *Logistics Support in the Vietnam Era*. Monograph 12, *Logistics Planning*. Washington, D.C.: Department of Defense, n.d.

The Logistics Review, U.S. Army, Vietnam, 1965–1969, vol. 7, *Engineering Services System*. Headquarters, U.S. Army, Vietnam, n.d.

What became known as the Pentagon Papers were classified histories of Defense Department policy-making on Vietnam from 1945 through early 1968, prepared at Defense Secretary Robert S. McNamara's direction. They were leaked to the press in 1971 and commercial editions were published. The narrative in these volumes is supplemented by extracts and reproductions of many high-level documents, including several dealing with a deployment of engineer troops. The two publications used in this volume are as follows:

United States-Vietnam Relations, 1945–1967: Study Prepared by the Department of Defense, 12 vols. Washington, D.C.: Government Printing Office, 1971.
The Pentagon Papers: The Defense Department History of United States Decisionmaking on Vietnam. Senator Gravel Edition, 4 vols. Boston: Beacon Press, 1971.

The Department of Defense and Department of the Army have published annual histories, which include discussions of military construction in Vietnam. Those consulted and cited in this study are as follows:

Annual Report of the Department of Defense for Fiscal Year 1965. Washington, D.C.: Government Printing Office, 1967.
Annual Report of the Department of Defense for Fiscal Year 1967. Washington, D.C.: Government Printing Office, 1969.
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Also used were contractor-prepared histories by RMK-BRJ and Pacific Architects and Engineers. These were published in limited quantities and include photographs. Copies are in Historians files at the Center of Military History. These are:

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FM 5–1, *Engineer Troop Organizations and Operations.* Washington, D.C.: Government Printing Office, May 1961.

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references in the combat operations volumes in this series, one has been used as a source for this work. The volume has been translated under the auspices of the Center of Military History. The histories and translations may be used by researchers who visit the Center. The citation for the publication used in this book is:

Luc Luong Vu Trang Nhan Dan Tay Nguyen Trong Khang Chien Chong My Cuu Nuoc [*The People's Armed Forces of the Western Highlands During the War of National Salvation Against the Americans*]. Hanoi: Nha Xuat Ban Quan Doi Nhan Dan [People's Army Publishing House], 1980.

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U.S. Army

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Bergen, John D. *Military Communications: A Test for Technology*. Washington, D.C.: U.S. Army Center of Military History, 1986.

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Glossary

Aggregate	Crushed rock used with cement to form concrete.
AM2 Matting	Rectangular aluminum matting used on jet fighter bases and selected Army airfields.
Armored Vehicle Launched Bridge	A sixty-three-foot scissors-type bridge launched from an armored carrier for spans up to fifty-seven feet and capable of supporting Class 60 loads, that is, the approximate weight in tons of vehicles, equipment, and armor.
Bailey/Panel Bridge	The Bailey bridge, also called a panel bridge, is a portable preengineered tactical truss bridge from World War II vintage named after its British designer. The bridge, which can be easily and quickly constructed, is supported by two main trusses formed from ten-foot steel panels that are coupled with steel pins.
Balk Decking	Hollow aluminum decking used on M4T6 floating bridges and fixed spans. The deck balk pattern distributes the load over more than one pontoon or float. (*See also* M4T6 Bridge.)
Bent	A structural frame similar to a tower used to support a bridge or railroad trestle.
Butler Warehouse	A large prefabricated metal building.

CINCPAC	Commander in Chief, Pacific. Traditionally a naval commander heading the U.S. Pacific Command (PACOM); controls all service forces in the Pacific area, including Military Assistance Command, Vietnam (MACV), and reports directly to the Joint Chiefs of Staff.
Class (30, 50, 60)	Classification of bridges that indicate the safe weight-bearing capacity; small yellow classification signs are affixed to the front and sides of vehicles showing their safe loads.
Class 60 Floating Bridge	Pneumatic floats covered with two deck-tread panels, curbs, and filler panels that can support division loads as a float bridge or raft; assembling the bridge requires cranes and air compressors.
Compacted	Soil compressed by rolling to reduce surface volume in preparation for construction.
Conex	A reusable metal container used for shipping military equipment.
COSVN	*Central Office for South Vietnam*
Creosoted Timber	Piles and timbers treated with wood-tar distillate as a preservative.
D7E Bulldozer	New standard military bulldozer introduced in 1966 in the D7 series of bulldozers dating back to World War II.
Decomposed Granite	Granite deposits often marked by outcroppings of granite boulders.
DeLong Pier	A prefabricated pier developed by the DeLong Corporation used for rapid building of port quays and ship berths.

Dry Span	A portable bridge for crossing short gaps under forty-five feet or longer spans using trestle bents; made up of M4T6 floating bridge superstructure components such as trestles and balk decking. (*See also* Balk Decking.)
Eiffel Bridge	A French designed and manufactured bridge for carrying light traffic.
Fair-Weather Road	Unpaved roads normally suitable for traffic during dry season but susceptible to damage during rainy season.
Float Bridge	Tactical bridge designed to float on water on inflated rubber floats or metal pontoons. Types of float bridges included a foot bridge, light tactical raft, M4T6 bridge and raft, and Class 60 bridge and raft.
Hardstand	Hard-surfaced area for parking aircraft, equipment and vehicles, and supplies.
Hopper Dredge	A self-propelled and seaworthy dredge using hydraulic suction pipes to excavate bottom material into internal hoppers as opposed to separate barges. The dredge can carry its waste to a dumping site.
Horizontal Construction	Engineering term used to differentiate construction at or near ground level as compared to vertical construction, which is associated with structural work above ground; included is use of equipment for earthmoving, paving, and drainage work to build roads, canals, airfields, and open-storage areas. (*See also* Vertical Construction.)

Laterite	A red to brown, porous soil rich in secondary oxides of iron and aluminum. Laterite is unique in tropical regions such as Vietnam and is used widely as subgrade material for roads, airfields, and open-storage areas.
LCM	Landing craft, mechanized
LCU	Landing craft, utility
LOC	Lines of communication
LST	Landing ship, tank
M4T6 Bridge	Portable bridge used to build rafts, float bridges, and short fixed spans with hollow-tubed decking (also known as balk decking).
M8 Matting	Pierced steel landing matting distinguished by round holes in the matting developed in World War II.
M8A1 Matting	Solid steel airfield matting widely used on forward airfields and parking areas.
MAAG	Military Assistance Advisory Group
MACV	Military Assistance Command, Vietnam
MAP	Military Assistance Program
MCA	Military Construction, Army. Funds appropriated for Army construction.
MILCON	Military Construction. Funds appropriated for major construction.
MUST	Medical unit, self-contained, transportable
MR	Military Region
MX19 Matting	Square aluminum matting with honeycombed interior introduced in 1966 and proved preferable for heavily used forward airfields.

OICC	Officer in Charge of Construction, Republic of Vietnam. Naval Facilities Engineer Command's officer and office charged with supervising RMK-BRJ (Raymond, Morrison-Knudsen, Brown and Root, and J. A. Jones) in South Vietnam.
OMA	Operations and Maintenance, Army. Funds appropriated for repair and maintenance of facilities.
Operation MOOSE	Move Out Of Saigon Expeditiously
OPLAN	Operation Plan
PA&E	Pacific Architects and Engineers. California engineering firm under contract by the Army to provide facilities engineering services and minor construction.
PACOM	Pacific Command. Joint command under the CINCPAC who commands all service forces in the Pacific, including MACV.
Peneprime	A rapidly placed, temporary dust-control material with an asphalt base that was sprayed on a leveled, graded, and compacted area, such as helipads, to bond sand particles.
Philco-Ford Corporation	Facilities engineering contractor working for the Navy and later the Army in I Corps.
Pioneer Road	Hastily built roads supporting tactical operations; the roads may be subsequently improved or abandoned upon completion of an operation or the closing of a firebase.
Prime Beef	Air Force engineering teams derived from nickname (Prime) and acronym (Base Engineering Emergency Force).

Red Horse	Air Force engineering squadrons derived from acronym Red (Rapid Engineering Deployable) and Horse (Heavy Operational Repair Squadron, Engineering).
RMK-BRJ	Raymond, Morrison-Knudsen, Brown and Root, and J. A. Jones. A joint venture of four American contractors under the direction of the OICC, Republic of Vietnam, hired to do large construction projects for the armed forces and U.S. agencies in South Vietnam.
ROK	Republic of Korea
Rome Plow	A D7E bulldozer equipped with a heavy-duty protective cab and a special tree-cutting blade manufactured by the Rome Plow Company of Cedartown, Georgia. Used to clear vegetation and deny cover and concealment to enemy forces.
RVN	Republic of Vietnam, also known as South Vietnam.
Sheepsfoot Roller	A towed roller with attached feet used to compact loose soil as contrasted to a motorized pneumatic-tired and steel-wheeled roller.
T–2 Tanker	A tanker used as an electrical power ship.
T17 Membrane	Rubberized fabric used as an expedient airfield surfacing material on runways, taxiways, and parking areas.
TOE	Table of organization and equipment
Transphibian Tactical Tree Crusher	A land-clearing device that was only marginally effective in felling trees and vegetation.
Turnkey	Air Force construction contract package used at Tuy Hoa without Army or Navy engineering resources.
USARPAC	U.S. Army, Pacific

USARV	U.S. Army, Vietnam
USAID	U.S. Agency for International Development. State Department agency reorganized and renamed in 1961 to carryout long-range economic assistance programs. (*See also* USOM.)
USOM	U.S. Operations Mission. A field agency under USAID and its predecessor organization charged with carrying out economic and technical assistance in underdeveloped nations.
USNS	U.S. Navy Ship
Vertical Construction	In contrast to horizontal construction, vertical construction is more labor intensive and requires the use of hand tools; also includes efforts by carpenters, masons, steelworkers, plumbers, electricians, and other building tradesmen to build aboveground structures. (*See also* Horizontal Construction.)
Vinnell Corporation	California firm awarded a contract with the Army to convert T–2 tankers to generate electricity and to build, operate, and maintain land-based power distribution systems.
Wonder Arches	Steel aircraft shelters, reinforced with concrete that were designed to protect Air Force and Marine Corps fighter aircraft from bomb and rocket damage.

Map Symbols and Terms

Military Units

Function

Airborne Infantry . . . . . 

Airmobile Infantry . . . . . 

Armored Cavalry . . . . . 

Engineer . . . . . 

Infantry . . . . . 

Marine Corps . . . . . 

Size Symbols

Battalion or Armored Cavalry Squadron II

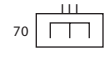
Regiment or Group. III

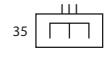
Brigade X

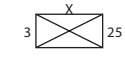
Division. XX

Corps. XXX

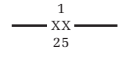
Examples

70th Engineer Battalion (Combat). . . . . 

35th Engineer Group (Construction). . . . . 

3d Brigade, 25th Infantry Division . . . . . 

1st Cavalry Division (Airmobile) . . . . . 

Boundary between the 1st and 25th Infantry Divisions . . . . . 

Geographic Terms

Nui	Mountain
Song	River

Acronyms and Abbreviations

Arty	Artillery
ARVN	Army of the Republic of Vietnam
Aust	Australian
BEQ	Bachelor Enlisted Quarters
BOQ	Bachelor Officers' Quarters
Bn	Battalion
CAV	Cavalry
CTZ	Corps Tactical Zone
Evac	Evacuation
FFV	Field Force, Vietnam
HQ	Headquarters
Inf Div	Infantry Division
LCM	Landing Craft, Mechanized
LCU	Landing Craft, Utility
Log	Logistics
LST	Landing Ship, Tank
LZ	Landing Zone
MACV	Military Assistance Command, Vietnam
MAF	Marine Amphibious Force
MR	Military Region
Ops	Operation
Ord	Ordnance
PA&E	Pacific Architects and Engineers
POL	Petroleum, Oils, and Lubricants
Repl	Replacement
Rgt	Regiment
RMK-BRJ	Raymond, Morrison-Knudsen, Brown and Root, and J. A. Jones
ROK	Republic of Korea
TF	Task Force
USAF	U.S. Air Force
USARV	U.S. Army, Vietnam

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