ENGINEERS AT WAR

ADRIAN G. TRAAS

The United States Army in Vietnam

ENGINEERS AT WAR


NORTH VIETNAM
DEMARCATION LINE
SOUTH CHINA SEA
QUANG TRI
Hue
I CTZ
THUA THIEN
LAOS
Da Nang
THAILAND
QUANG NAM
QUANG TIN
QUANG NGAI
KONTUM
BINH DINH
SOUTH VIETNAM
PLEIKU
CAMBODIA
PHU BON
PHU YEN
Tonle Sap
DARLAC
II CTZ
KHANH HOA
QUANG DUC
TUYEN DUC
Da Lat
Cam Ranh
PHUOC LONG
BINH LONG
NINH THUAN
LAM DONG
TAY NINH
III CTZ
BINH DUONG
LONG KHANH
BINH THUAN
BINH TUY
SOUTH CHINA SEA
HAU NGHIA
BIEN HOA
SAIGON
KIEN TUONG
CHAU DOC
KIEN PHONG
LONG AN
GIA DINH
PHUOC TUY
AN GIANG
DINH TUONG
GO CONG
Vung Tau
KIEN GIANG
VINH LONG
KIEN HOA
PHONG DINH
IV CTZ
VINH BINH
GULF OF THAILAND
CHUONG THIEN
BA XUYEN
BAC LIEU
AN XUYEN
SOUTH VIETNAM
1965–1966
Corps Tactical Zone Boundary
Administrative Boundary
Hue
Autonomous Municipality
0
150 Miles
0
150 Kilometers

United States Army in Vietnam

ENGINEERS AT WAR

by

Adrian G. Traas

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. . . to Those Who Served

Foreword

The military engineers who supported the U.S. Army in Vietnam wrote a proud record of achievement that spanned nearly two decades of war. Starting with a handful of advisers in the mid-1950s, Army engineers landed in force with U.S. ground units in 1965 and before long numbered more than 10 percent of the U.S. Army troops committed to the fight. Working in one of the world's harshest undeveloped regions, and under constant threat from an elusive and determined foe, the engineers met every test that came their way. They built ports and depots for a supply line that reached halfway around the globe, carved airfields and airstrips out of jungle and mountain plateaus, repaired roads and bridges to clear the advance for the combat infantryman, and constructed bases for an army whose communications grew in complexity with each passing year. They were often found in the thick of the fighting and fought as infantrymen as part of a long tradition of fighting while building. When the U.S. involvement in the Vietnam War began to wind down, the engineers were given another demanding mission, imparting to the South Vietnamese Army their specialized skills in construction and management. They left in place a robust infrastructure to support the South Vietnamese as they vainly struggled for survival against the armored spearheads of the North Vietnamese Army.

Engineers at War is the eleventh volume published in the United States Army in Vietnam official series. Like its companion volumes, it forcibly reminds us that the American soldier in Vietnam was courageous, infinitely adaptable, and tireless in pursuit of the mission. For the engineers, that mission and their comrades sustained them, in the best engineer tradition, even as the political and popular will to sustain the fight diminished. Their story and dedication should inspire all soldiers as they face a future of sustained operations around the world.

Washington, D.C.
30 September 2010

RICHARD W. STEWART
Chief Historian

The Author

Lt. Col. (Retired) Adrian G. Traas, U.S. Army Corps of Engineers, was born in Milwaukee, Wisconsin, and received his education at schools in Milwaukee and Delafield, Wisconsin, completing high school at St. John's Military Academy in Delafield, commission and bachelor of arts degree in history from Marquette University, and a master of arts degree in history from Texas A&M University. His military education includes the engineer basic and advanced courses, the U.S. Army Command and General Staff College, and the Air War College.

Colonel Traas served in a variety of command and staff positions as an officer in the Corps of Engineers from 1957 to 1989. He was company commander of engineer units in Korea and at Fort Belvoir, Virginia; post engineer in Verona, Italy; executive officer and commanding officer of the 64th Engineer Battalion (Base Topographic) with headquarters in Leghorn, Italy, and mapping projects in Ethiopia, Liberia, and Iran; assistant professor of military science at Texas A&M; chief of the Combat Support Branch and staff officer in the Concepts and Studies Division at the U.S. Army Engineer School, Fort Belvoir; and professor of military science at Marquette. He served two tours in Vietnam: the first tour as S–3 and executive officer with the 19th Engineer Battalion (Combat) and contract liaison and installation master planning officer with the 45th Engineer Group; the second tour as an adviser with the South Vietnamese 30th Engineer Combat Group, a deputy engineer with the Third Regional Assistance Command, and later deputy region engineer in I Corps. Prior to his military retirement, he served in administrative positions and as a historian at the U.S. Army Center of Military History.

He is the author of *From the Golden Gate to Mexico City: The U.S. Army Topographical Engineers in the Mexican War, 1846–1848* and contributed to *The Story of the Noncommissioned Officer Corps* and *The United States and Mexico at War: Nineteenth-Century Expansionism and Conflict.* He currently holds the title of visiting professor at the Center of Military History.

Preface

Engineers at War describes the experiences of engineers in support of combat operations and carrying out construction in a distant theater. "The performance of United States Army Engineers in Vietnam, "wrote General Harold K. Johnson, the Army chief of staff, "adds another brilliant chapter to their history." The building effort in South Vietnam from 1965 to 1968 allowed the United States to deploy and operate a modern 500,000-man force in a far-off undeveloped region. Although the engineers faced enormous construction responsibilities, the Army's top priority remained providing combat support to tactical operations. As a result, ground combat troops with their supporting engineers were able to fight the enemy from well-established bases, which gave U.S. and allied forces the ability to concentrate and operate when and where they wanted. 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 serve as economic resources for South Vietnam.

In the course of research and writing an engineering history, I have used many statistics. During the conflict, reports and correspondence used both the English and Metric Systems of measurement such as kilometers and miles and meters, yards, and feet. Engineers frequently used kilometers to measure road distances and feet to measure bridge spans. For consistency, I used the English System of measurement.

In researching and writing this book, I have received guidance and help from many people. At the Center of Military History much help and encouragement came from my colleagues in the Histories Division. Since combat operations involved a considerable part of the book, I relied on the knowledge and resources of the historians working on the combat volumes. These include George L. MacGarrigle, John M. Carland, Dale W. Andrade, and Erik B. Villard. Help was also gleaned from the extensive files of Vincent H. Demma and the work done by Charles R. Anderson, Andrew J. Birtle, Graham A. Cosmas, Richard A. Hunt, William M. Hammond, and David W. Hogan. Much credit goes to Joel D. Meyerson who helped me put the manuscript in final form. Thanks also go to John Schlight and Jeffrey J. Clarke who helped me early in the project.

I would like to recognize those in the Center's chain of command. The efforts and encouragements by a succession of branch chiefs are appreciated: John Schlight, Jeffrey Clarke, Joel Meyerson, and Andrew Birtle. My thanks also go to several History Division chiefs: Col. James W. Dunn,

Lt. Col. Richard O. Perry; Cols. Robert H. Sholly, William T. Bowers, and Clyde L. Jonas; Richard W. Stewart, and Joel Meyerson. I also appreciate the support given by several chiefs of military history: Brig. Gens. Douglas Kinnard, William A. Stofft, Harold W. Nelson, John W. Mountcastle, and John S. Brown; and Jeffrey Clarke.

Others at the Center of Military History contributed to this work. Staff at the Center under the leadership of Keith R. Tidman, Beth F. MacKenzie, and Diane S. Arms guided the manuscript to publication. Hildegard J. Bachman dedicated her editing talents to put a final touch to the book, cartographer Sherry L. Dowdy prepared the maps, and Gene Snyder designed the layout of the book. Contractor Anne Venzon created the index. Much credit for gathering research material for the book goes to Hannah M. Zeidlik and Robert K. Wright, former chiefs of the Historical Resources Branch; Frank R. Shirer, the current branch chief; James B. Knight, former librarian; and Rebecca C. Raines and Jennifer A. Nichols of the Force Structure and Unit History Branch.

Very helpful recommendations came from the panel review convened by Richard Stewart, the Center's chief historian and panel chair. I wish to thank the members of the panel: Brig. Gen. Gerald E. Galloway (USA, Ret.), University of Maryland and former Corps of Engineers officer; John C. Lonnquest, Corps of Engineers History Office, who provided extensive written comments; Donald A. Carter, Histories Division; Keith Tidman, Publishing Division; and Joel Meyerson, then acting chief of the Histories Division.

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Of course, I alone remain responsible for the interpretations and conclusions expressed in this book. The hope is that my service as an engineer officer who served two tours in Vietnam will lend some credibility to the engineer story.

Washington, D.C.
30 September 2010

ADRIAN G. TRAAS

Contents

PART ONE
Engineers Enter the War

Chapter *Page*

1. The Path to War 1
Early Years 1
Intervention 11

2. Engineers Cross the Pacific 19
The 35th Engineer Group (Construction) Deploys 19
Digging In 23
The Buildup Quickens 31
Supply Deficits 36
A New Engineer Brigade 42
More Units on the Way 47

3. First Battles 51
Early Operations 51
A Base for the 1st Cavalry Division 59
A Second Division Arrives 66
The Ia Drang 72

4. Organizing the Construction Effort 79
Preliminary Proposals 79
The Construction Boss Concept 85
A New Directorate 92
Operational Control 100
Toward an Engineer Command 103
Other Engineers 108

5. Building the Bases, 1966 111
The Cam Ranh Complex 111
Secondary Coastal Ports 118
Qui Nhon's Development 125

Highlands Camps 130
More Work at Phan Rang 136
Long Binh and the III Corps Shield 139
New Berths for Saigon 148
Projects in the Delta 151
Logistical Troubles Continue 154
Finance and Its Predicaments 160

PART TWO
Supporting the Offensive

6. Spoiling Attacks, January–September 1966 165
III Corps Battles 165
The II Corps War 175
Manpower 185
Forward Airfields 187
Tunnels 190
The Land-Clearing Weapon 194

7. The Campaign Widens, October 1966–June 1967 199
ATTLEBORO 199
The Western Highlands 201
On the Coast 216
The Delta 221
III Corps Again 223

8. To I Corps 235
Duc Pho and Chu Lai 235
Highway 1 and Other Assignments 251

9. Completing the Bases 265
Southern and Central II Corps 265
Farther North 272
III and IV Corps 279
The Saigon Projects 287
Funding, Overbuilding, and Logistics 291
Summing Up 298

10. Inland and to the Borders, June 1967–January 1968 301
Strategy in Mid-Passage 301
The Saigon Arc 303
Operational Control Revisited 311
On the III Corps Border 313
Summer Battles in the Highlands 318
Dak To 322

PART THREE
Changing Course

Chapter *Page*

11. Tet, January–March 1968 331
Defending the Coast 331
Roads and Bases in the Highlands 336
The Fight for Saigon and the Delta 340
Restoring Logistics in I Corps 345
Return to Normal 353

12. The Aftermath, April–December 1968 357
Relieving Khe Sanh 360
The A Shau 365
Two More Enemy Highpoints 368
Assessing Construction 379
Streamlining the Effort 383
New Approaches 388

13. The Land Lines of Communication 397
Early Roads and Rails 397
Initial Restoration Arrangements 405
Running the Programs 411
Sustaining Highway Improvement 413
The Builders 423
A Legacy 438

14. Year of Transition, 1969 443
The State of the Construction Program 443
Troop Withdrawals and Realignments 455
Vietnamization 458
Turning Over Bases 466
Supporting Combat 469

15. Year of Cambodia, 1970 483
Engineer Consolidation 483
Toward the Sanctuaries 486
Main Attacks 490
Secondary Assaults 509
Operations After Cambodia 512
Facilities Upgrades and Transfers 517

16. Last Battles and Departure 523
Laos: The Plan 523
The Operation 529
Redeployments and Reorganizations 541

Chapter *Page*

Operational Support After Laos 551
Winding Down the Construction Program 563
Last Transfers 571
Bowing Out 575

17. Conclusion 579
Control and Management 579
Materiel and Maintenance 581
Engineer Technique 583
The Soldiers 585

Bibliographical Note 589
Glossary 607
Map Symbols and Terms 615
Index 617

Tables

No.
1. Percent of Work in Place at Selected Locations, January 1969 446
2. Engineers in South Vietnamese Armed Forces Improvement and Expansion Program, 1968–1973 459

Charts

1. 18th Engineer Brigade, December 1965 49
2. MACV Engineer Division, May 1965 82
3. MACV Construction Directorate, February 1966 93
4. Organization of U.S. Army Engineer Command, Vietnam, November 1967 314
5. Army Construction in Place by Category, Troops, and Contractor, January 1969 447
6. U.S. Army Engineer Command Organizations, October 1971 544
7. U.S. Army Engineer Support Organizations, May 1972 549

Maps

South Vietnam, 1965–1966 . . . . . Frontispiece
1. Cam Ranh Bay, 31 December 1965 32
2. Qui Nhon Area, 31 December 1965 35
3. III Corps Tactical Zone, May–December 1965 55
4. II Corps Tactical Zone, July–November 1965 57
5. An Khe Base Camp, 31 December 1965 64
6. Battle of the Ia Drang, November 1965 75
7. Cam Ranh Bay, 31 December 1966 119

8. Tuy Hoa Air Base, June 1967 122
9. Qui Nhon Area, 31 December 1966 129
10. Pleiku Area, 31 December 1966 135
11. Long Binh Base, 31 October 1966 143
12. Saigon Base Development, October 1966 150
13. IV Corps Tactical Zone, 1966–1967 153
14. III Corps Tactical Zone, January–September 1966 166
15. II Corps Tactical Zone, January–September 1966 176
16. Western Highlands, October 1966–June 1967 203
17. 1st Cavalry Division Operations, October 1966–June 1967 217
18. Operation CEDAR FALLS, 8–26 January 1967 224
19. III Corps Operations, October 1966–June 1967 230
20. I Corps Tactical Zone, 1966–April 1967 237
21. Southern I Corps, April–May 1967 240
22. Chu Lai Area, March–August 1967 247
23. Tet Offensive, 1968 332
24. I Corps Tactical Zone, April–December 1968 362
25. The Engineer Groups, December 1968 390
26. Indochina Railroad System, 1966 401
27. Road System, 1960s 409
28. Cambodian Incursion, III and IV Corps Tactical Zones, May–June 1970 492
29. Cambodian Incursion, II Corps Tactical Zone, May–June 1970 511
30. LAM SON 719, Area of Operations, January–April 1971 527
31. Easter Offensive, March–May 1972 559

Illustrations

The Dong Nai River Bridge on the Saigon–Bien Hoa Highway 4
Generals Lyman L. Lemnitzer and Maxwell D. Taylor, Secretary of Defense Robert S. McNamara, and President John F. Kennedy, 1961 7
Teams of Army and Navy Engineers Carried Out Building Projects 8
South Vietnamese Engineers Undergo Bridge Construction Training . . . 9
Cam Ranh Bay's First Deep-Draft Pier 21
Engineers of the 35th Group Transfer to a Landing Craft 23
Crews Pave Concrete Pads at Night 24
Cam Ranh Bay Piers and Causeway 29
DeLong Pier Nearing Completion, 1965 30
Maj. Gen. Robert R. Ploger 44
Engineers Carry Out a River Reconnaissance 52
Troops Clear the Helicopter Area at the Base Camp at An Khe 60
Bulldozer Used for Building Roads 62
The Future Camp Radcliff, August 1965 63
Engineers Clear a Landing Zone 69
Troops of the 1st Battalion, 7th Cavalry, Advance at Landing Zone X-RAY 74

The 18th Engineer Brigade Staff at Its Headquarters in Saigon 85
General William C. Westmoreland 88
Brig. Gen. Carroll H. Dunn 90
General Dunn Visits the 45th Engineer Group Headquarters in Qui Nhon 100
The 18th Engineer Brigade Headquarters Building at Dong Ba Thin . . . 106
DeLong Piers at Cam Ranh Bay 113
Cam Ranh Bay Airfield 116
Port Under Construction at Vung Ro Bay 123
DeLong Pier Under Construction at Qui Nhon 127
Phan Rang Airfield 139
Port and Warehouses Under Construction at Newport 149
Dong Tam Base Camp 155
Sampans Haul Rock from Vung Tau to Long Binh 159
Engineers of the 1st Division Encountered Obstacles Along Roads 169
A 1st Engineer Battalion Mine-Clearing Team 171
Soldiers Training on Helicopter Ladders 177
Men of the 39th Engineer Battalion Build a Conglomerate Bridge 184
A 1st Division Soldier Enters a Tunnel During CRIMP 191
Rome Plows Clear Vegetation 196
Lt. Col. Joseph M. Kiernan 201
Aerial View of the Se San River 204
A Soldier Places MX19 Matting at New Plei Djereng Special Forces Camp . . 212
An M4T6 Raft Carries a Vehicle Across the Ea Krong River 213
Surveying and Site Preparation at Duc Lap 214
Work Crews Apply a Nonskid Compound to Duc Lap Airstrip 215
Men of the 15th Engineer Battalion Use an Airboat in the Delta 222
Detonating Cord Is Lowered into a Tunnel 227
An M4T6 Raft Is Used as a Patrol Boat 228
Men of the 39th Engineer Battalion Lay MX19 Matting 239
Airfield Work at Duc Pho Nears Completion 242
The Seabees and RMK-BRJ Improve the Chu Lai Base 245
Chu Lai Base Hosted a Jet Airfield and Logistic Facilities 248
Mines Pose a Constant Hazard Along Highway 1 255
RMK-BRJ Paves a Portion of Highway 1 256
The 19th Engineer Battalion Set Up a Main Base Camp 259
Wooden Barracks and Administrative Buildings Replace Tents at Cam Ranh Bay 266
T–2 Power Tankers and Land-Based Power Plant Produce Electricity . . . 268
Butler Warehouse Building at Long My 275
New Transformer Station 277
RMK-BRJ Built Several Headquarters Complexes at Long Binh 282
Engineers Completed the Dong Tam Base in Late 1968 286
MACV Headquarters Complex at Tan Son Nhut 289
A Ribbon-Cutting Ceremony Marked the Opening of the Newport Deep-Draft Port 290
Deep-Draft Port at Newport 299

A Modified D7E Bulldozer 305
Aerial View of Anti-Ambush Clearing 307
Transphibian Tactical Tree Crusher 309
An Armored Vehicle Launched Bridge 315
Strong Enemy Defenses on Hill 875 Included Trenches 324
Burnt Remains of Bridge Along Highway 1 North of Qui Nhon 335
Bunkers Were the First Line of Defense 342
View of Hai Van Pass 346
Destroyed French-Type Concrete Bridge 347
A 290M Scraper 349
A CH–54 Flying Crane Lowers a Dry Span Bridge 364
Aerial View of the Kham Duc Airfield 370
Enemy Mortar Attack at Kham Duc 372
Housing for Vietnamese Civilians Under Construction in Saigon 375
Mountaintop Firebase in the A Shau Valley 377
Pacific Architects and Engineers' Headquarters in Saigon 381
Vinnell Corporation's Central Control Room at the Long Binh Power Plant 382
Maj. Gen. David S. Parker 387
Progress Continues Along Highway 4 392
Crane Used for Construction 395
Mandarin Road, Early 1930s 399
President Ngo Dinh Diem Inaugurates Railroad Service 400
South Vietnamese Railway Workers Repair Tracks 410
Installation of Floating Balls at the Phu Cuong Bridge 416
The Phu Cat Quarry and Asphalt Plant 420
Barges Haul Rock to the Delta 422
Phu Cuong Bridge Under Construction 429
Troops Build New Bong Son Bridge 432
A South Vietnamese Army Engineers Panel Bridge 433
Bien Hoa Bridge Was Part of New Bypass Road North of Saigon 437
Flatcars on Front of a Train South of Phu Cat 439
Port at Cam Ranh Bay 444
Ship-to-Shore Pipeline at Cam Ranh Bay 444
Aerial View of Cam Ranh Bay 448
Seabees Pour Concrete for Wonder Arches at Da Nang Air Base 453
Wonder Arches at Bien Hoa Air Base 454
L-Shaped Helicopter Revetment 455
South Vietnamese Soldier Learns to Operate a Grader 461
A CH–47 Chinook Helicopter Drops Off Preassembled Culvert 475
Bridge Under Construction Along Route 547 476
Maj. Gen. John A. B. Dillard 485
An Armored Vehicle Launched Bridge in the Fishhook Area of Cambodia 493
Soldiers Uncover a Huge Complex Known as the City 494
A Sheridan Crosses an Armored Vehicle Launched Bridge 497
A CH–54 Flying Crane Transports Fixed-Span Bridging 498

Page

The Thien Nhon Airstrip Used a Section of Highway 22 as a Runway . . 501
Supplying Enough Maps Strained the Remaining Map Depot. 505
Rollers in Front of Combat Engineer Vehicle Expedited Mine Clearing . . . 508
Col. Kenneth E. McIntyre 525
A Dump Truck and Rome Plow Clear and Widen Highway 9 531
An Armored Vehicle Launched Bridge at Bridge 33 533
A Bucket Loader and Bulldozer at Work on Red Devil Road 535
A CH–54 Flying Crane Drops Off Equipment at Khe Sanh Airfield. . . . 536
Aerial View of Reopened Khe Sanh Airfield. 538
Excavating a Tactical Operations Center 555
Aerial View of Firebase BUNKER HILL 557
Third Regional Assistance Command Headquarters at Plantation 561
Col. Le Van Nghia Inspects the Repaired Bridge at Go Dau Ha 562
DeLong Pier Is Towed to Cam Ranh Bay 575

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PART ONE
Engineers Enter the War

1

The Path to War

The decision to commit American troops to Vietnam, first brigades, then divisions, launched the engineers, and the rest of the support establishment, on a rapid buildup for war. At the start of 1965, as the Communist insurrection neared victory, South Vietnam had about 23,000 U.S. advisers and support troops, including some one hundred military engineers who, along with contracting firms, managed facilities and performed construction on a limited scale. Base development planning had barely scratched the surface, hampered by a dearth of staff engineers and the absence of a broadly accepted concept of operations that could serve as a point of departure for future work on ports, airfields, and roads. When the first large contingent of Army engineers went ashore in June with the combat forces, the construction troops faced immense demands for preparation and coordination in order to shift the development of the battlefield into high gear on short notice. The lateness of the hour and the steeply mounting scale of engineer effort required left unsettled whether the combat units could be adequately supported in the early months of the war.

Early Years

American planners had been concerned for years about the state of South Vietnam's defenses, but until 1965 improvements had been hard to come by, as successive administrations had enforced limits on the degree of U.S. involvement in that country's affairs. When the First Indochina War ended in 1954, and the United States supplanted France as South Vietnam's protector against Communist attack, international prohibitions set by the 1954 Geneva Agreements against establishing new military bases in the South shaped the next five years of American contingency planning for Southeast Asia. Thailand became the cornerstone of American strategy in that part of Asia, and the Republic of Vietnam a secondary holding action. Almost all operational preparations were aimed at launching an expedition into the Laotian panhandle and points farther north, and readying northeast Thailand with stockpiles, airfields, and forward bases through a robust program of military construction while South Vietnam would be thinly defended along its borders.[1]

[1] Ronald H. Spector, *Advice and Support: The Early Years, 1941–1960*, United States Army in Vietnam (Washington, D.C.: U.S. Army Center of Military History, 1983), pp. 357–58; Richard Tregaskis, *Southeast Asia: Building the Bases: The History of Construction in Southeast Asia* (Washington, D.C.: Government Printing Office, 1975), pp. 13, 16.

If intervention came to Southeast Asia, construction support would fall to the Army and Navy engineering corps. Throughout most of its history, the Army Corps of Engineers had served as a combat support branch supporting troops in the field, as a construction agency for the Army and, later, the Air Force, and as an office to carry out civil works in the United States. Likewise, the Bureau of Yards and Docks carried out major building programs for the Navy and the Marine Corps. To avoid duplication of effort, the Department of Defense had divided overseas construction responsibilities between the Corps of Engineers, the Bureau of Yards and Docks, and, to a lesser degree, the Air Force. The Navy was given responsibility for Southeast Asia, including South Vietnam. In December 1955, the Navy established an engineering office in Bangkok, Thailand, initially to supervise contractors building air bases in that country. Because the military advisers in Vietnam had little engineering capability, they asked the Bangkok office to design and supervise any military assistance construction projects in South Vietnam.[2]

As long as the peace lasted in the 1950s, American construction projects in Vietnam remained modest and generally out of the spotlight and were financed with nonmilitary aid. A road network in the Central Highlands designed to open the remote area to Vietnamese settlement kept U.S. contractors and South Vietnamese Army and civilian engineers busy through the end of the decade. The project had the additional benefit of connecting the highlands with strategic terrain across the border in southern Laos. Runway construction in Vietnam fit the contingency plans as well. Worried that the state of the country's airfields would slow troop deployments by air in case of war, the U.S. Military Assistance Advisory Group in Saigon drew up plans to improve airfield facilities at key locations. But since the United States continued to abide by the restrictions under the Geneva Agreements against building new military bases, a logical recourse was to use economic assistance to build commercial airfields as a subterfuge. In 1956, a contractor hired by the U.S. Operations Mission, the agency charged with carrying out economic assistance in developing countries, completed a new north–south concrete runway at Saigon's international airport, Tan Son Nhut. Further improvements followed, and Saigon soon had an airfield capable of handling military jet aircraft paid for by foreign aid.[3]

[2] Erwin N. Thompson, *Pacific Ocean Engineers: History of the U.S. Army Corps of Engineers in the Pacific, 1905–1980* (Honolulu: Pacific Ocean Division, n.d.), p. 211; Lt. Gen. Carroll H. Dunn, *Base Development in South Vietnam, 1965–1970*, Vietnam Studies (Washington, D.C.: Department of the Army, 1972), pp. 16–17; Tregaskis, *Building the Bases*, pp. 13, 15, 19; Edward J. Marolda and Oscar P. Fitzgerald, *From Military Assistance to Combat, 1959–1965*, United States Navy and the Vietnam Conflict (Washington, D.C.: Naval Historical Center, Department of the Navy, 1986), p. 24. For an overview of the Corps of Engineers, see *The U.S. Army Corps of Engineers: A History* (Alexandria, Va.: Office of History, U.S. Army Corps of Engineers, 2007). Army engineer responsibilities during this period are outlined in U.S. Army Field Manual (FM) 5–1, *Engineer Troop Organizations and Operations*, May 1961, pp. 38–41.

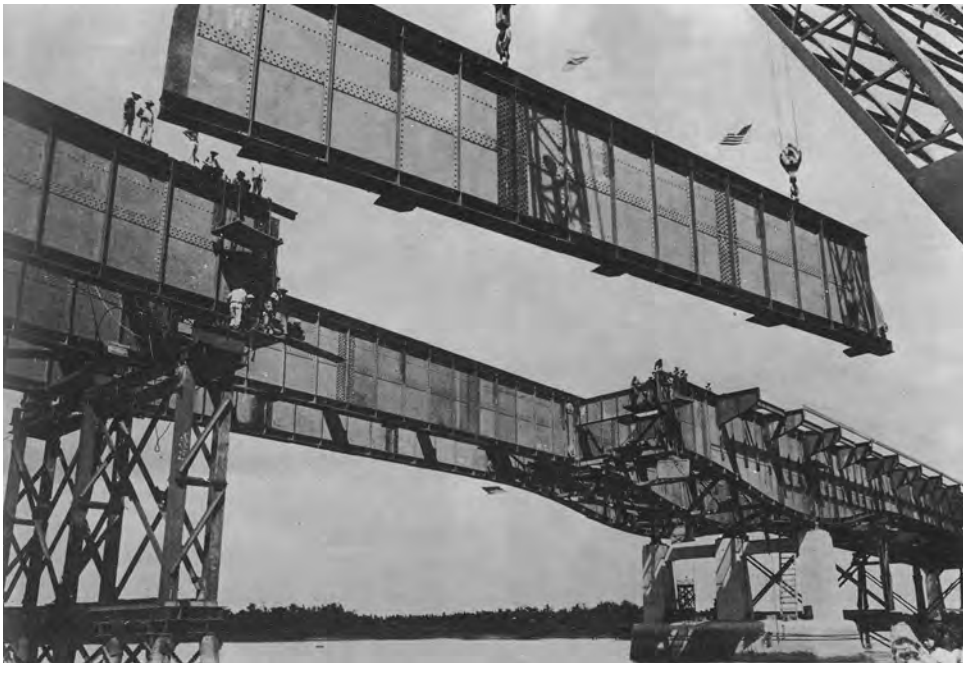
[3] Spector, *Early Years*, pp. 306–08, 360; Robert F. Futrell, *The Advisory Years to 1965*, United States Air Force in Southeast Asia (Washington, D.C.: Office of Air Force History, United States Air Force, 1981), p. 52; Ray L. Bowers, *Tactical Airlift*, United States Air Force in Southeast Asia (Washington, D.C.: Office of Air Force History, United States Air Force, 1983),

In 1957, the South Vietnamese president, Ngo Dinh Diem, on a state visit to the United States, received a pledge of additional assistance, including a package for the rehabilitation of his coastal highways laid waste during World War II and the Indochina War. Underpinning the pledge lay the belief in Saigon and Washington that the new nation was on the road to political stability and, with generous financial support assured from the United States, the economic future was bright. As before, the Operations Mission took the lead on the highway project. One segment of road, a twenty-mile stretch from Saigon northeast to Bien Hoa, became a model for observers of what a well-run economic aid program in Vietnam could accomplish. "The Bright Spot in Asia," an article in an American weekly magazine, described the positive developments in South Vietnam. The country's bright future was based on interviews with leading aid officials and senior members of the military advisory group. Other reports spoke of Diem's enormous popularity and effectiveness. All failed to heed the embers of insurrection igniting in the countryside.[4]

Initially, the scattered and sporadic nature of the violence misled almost every professional. As late as 1959, the chief of the advisory group was playing down the internal security threat represented by the Communist guerrillas, or Viet Cong, and declined to recommend that South Vietnamese Army combat units interrupt their training to join in pacification. But even as military officials were publicly affirming the point of view that the menace was overdone, the United States was shifting toward a progressively stronger counterinsurgency policy and the logistical wherewithal to support it. In 1960, at the direction of the State and Defense Departments, the embassy and military mission in Saigon drew up a comprehensive plan of political and military action that they hoped would help Diem reverse the trend on the battlefield. One year later, certain that the situation was worsening and that U.S. policy to contain Communist expansion was under attack in Southeast Asia, the administration of John F. Kennedy raised the level of American commitment to the Diem government, and the first U.S. military units entered South Vietnam. With this deployment, Special Forces teams, Army and Marine helicopter units, Air Force transports, Navy patrol boats, and more advisers descended on South Vietnam in 1961, quadrupling the American presence in the theater to 3,200 men. This number more than tripled again in 1962. A full military field headquarters, the U.S. Military Assistance Command, Vietnam (MACV), headed by a four-star Army general, took up station in Saigon in February 1962. While the advisory group headquarters stayed on as a subordinate element

pp. 42, 161–62; S. Sgt. Bob Reid, U.S. Air Force (USAF), "Vietnam Engineers in War," Military Engineer Field Notes, *Military Engineer* 55 (1963): 243; United States Operations Mission (USOM), *Annual Report for Fiscal Year (FY) 1962* (Saigon, 1962), pp. 22–23, 28–29, Historians files, U.S. Army Center of Military History (CMH), Washington, D.C.

[4] Robert G. Scigliano, *South Vietnam: Nation Under Stress* (Boston: Houghton Mifflin Co., 1963), pp. 102–29; Spector, *Early Years*, pp. 304, 315–16; USOM, *Activity Report of the Operations Mission to Vietnam, 30 June 1954 to 30 June 1956* (Saigon, n.d.), pp. 38–40, USOM, *Annual Report for FY 1961* (Saigon, 20 November 1961), pp. 23–26, both in Historians files, CMH.



The Dong Nai River Bridge on the Saigon–Bien Hoa Highway was built with U.S. economic assistance.

until 1964, the winds of change were tending in one direction: American units were entering the war.[5]

The Defense Department paid close attention to all facets of the deployment, including construction. Under the auspices of the Defense Department, theater-planning conferences met regularly in Honolulu at U.S. Pacific Command headquarters starting in December 1961. Almost everything short of combat troops, said Secretary of Defense Robert S. McNamara at the first meeting, would be offered to the South Vietnamese, with the survival of that nation the highest priority. During the conference, McNamara approved construction of a new airfield at Pleiku City in the western highlands, fuel storage tanks at Qui Nhon on the central coast, ammunition storage bunkers at several sites, and a refueling station at Tan Son Nhut. Other airfield projects were already under way at Bien Hoa, and Da Nang on the northern coast, and these too received support. What McNamara refused to authorize was the use of

[5] Leslie H. Gelb with Richard K. Betts, *The Irony of Vietnam: The System Worked* (Washington, D.C.: Brookings Institution, 1979), pp. 69–80; Spector, *Early Years*, pp. 333–35, 362–65; Admiral U. S. G. Sharp and General William C. Westmoreland, *Report on the War in Vietnam (As of 30 June 1968)* (Washington, D.C.: Government Printing Office, 1969), pp. 77, 80; Maj. Gen. George S. Eckhardt, *Command and Control, 1950–1969*, Vietnam Studies (Washington, D.C.: Department of the Army, 1974), pp. 20–23, 27–31, 41–42. For more on Special Forces, see Col. Francis J. Kelly, *U.S. Army Special Forces, 1961–1971*, Vietnam Studies (Washington, D.C.: Department of the Army, 1973), pp. 3–18.

U.S. engineer troops on construction projects. The entire building effort would be undertaken by civilian contractors under Navy management. This would have the effect of keeping U.S. troop ceilings in Vietnam within authorized limits, and would leave the Army and Navy engineer units serving on active duty in the Far East free to continue their projects elsewhere.[6]

This approach, relying on civilian construction contractors in a war zone, continued for the next three years, and seemed to most observers a worthwhile solution to the limited demands of a counterinsurgency campaign. The biggest contractor was the joint venture of two large firms: Raymond International of New York City and Morrison-Knudsen of Asia, Inc., based in Boise, Idaho. Known as RMK, the two firms had a proven record of handling construction projects overseas. The initial contract was of a fixed-price type, in which the consortium's profit depended upon the efficiency of its operations. After several false starts, missed deadlines, and changed requirements because of the war's innumerable vagaries, the Navy shifted to a cost-plus-fixed-fee contract, assuming most of the risk of construction and furnishing RMK with materials and equipment and paying its transportation costs. By the end of 1962, RMK employed more than 3,000 workers, of whom 2,900 were Vietnamese. The contract was expected to last a couple of years, and the firm would be responsible for the demobilization of its workforce when work neared completion. Little was it realized that this contract would continue almost to the end of the American involvement in the conflict, nearly eleven years later.[7]

To oversee the civilian construction projects, the Navy's Officer in Charge of Construction, Southeast Asia, located in Bangkok had established a branch office in downtown Saigon in February 1961. The first contracts it administered were to Thomas B. Bourne Associates, a Washington, D.C. company, which designed plans for new and improved airfields at nine locations, including Bien Hoa, Tan Son Nhut, and Da Nang. The Saigon office also awarded a contract in October to the Tudor Engineering Company and Pacific Architects and Engineers, Inc., a joint venture of two California firms, to design air control and warning stations at Da Nang and Tan Son Nhut. At the end of 1961, when the RMK contract began and the scope of work expanded dramatically, the Bureau of Yards and Docks elevated the title of the Saigon branch from the Resident Officer in Charge of Construction, Republic of Vietnam, to the Deputy Officer in Charge of Construction, Republic of Vietnam. In addition to managing the U.S. contracts, the Navy's construction office in Saigon hired some thirty local contractors, mostly Vietnamese firms, to join in building facilities for incoming units. Some of these projects were delayed by funding

[6] Marolda and Fitzgerald, *From Military Assistance to Combat*, pp. 164–65; Headquarters (HQ), Commander in Chief, Pacific, "CINCPAC Command History, 1961" (Honolulu: Deputy Chief of Staff for Military Assistance, Logistics and Administration, 1962), p. 103, CMH (hereafter cited as CINCPAC History, date); CINCPAC History, 1962, pp. 198–99; CINCPAC History, 1963, p. 106; Rpt, HQ CINCPAC, Secretary of Defense Conference, 16 Dec 61, pp. 1–2, 45, 48, Historians files, CMH.

[7] CINCPAC History, 1962, p. 198; Tregaskis, *Building the Bases*, pp. 28–31; Capt. Charles J. Merdinger, U.S. Navy (USN), "Civil Engineers, Seabees, and Bases in Vietnam," in *Vietnam: The Naval Story*, Frank Uhlig Jr., ed. (Annapolis: Naval Institute Press, 1986), pp. 228–53.

restrictions on peacetime contracts, such as the need to gain congressional approval for jobs exceeding $175,000, and a requirement mandating the use of American-made construction supplies that caused some projects to be redesigned mid-stride. Once the contractors shifted their work on facilities into higher gear, however, U.S. advisers and support troops began to move from their temporary quarters, which were often little more than tent cities, into new semipermanent cantonments.[8]

Between 1962 and mid-1964, South Vietnam experienced a mini-building boom as construction projects funded by the United States sprang up in a dozen cities and towns across the country. During this period, RMK completed most of its assigned projects, including a pair of jet-capable airstrips at Bien Hoa and Da Nang and two smaller all-weather runways at Pleiku and Can Tho, a town in the Mekong Delta. The work gave the small but expanding South Vietnamese Air Force greater capability to fly tactical support missions and to transport soldiers and materiel from region to region. With the completion of the runways, each of the country's four military zones—I Corps, II Corps, III Corps, and IV Corps—had a modern and centrally located airfield. Those sites also supported the growing number of U.S. aviation companies that were arriving in South Vietnam. To improve the country's limited port facilities, the firm built a new deep-draft pier at Cam Ranh Bay in II Corps, a sandy peninsula on the south-central coast that sheltered one of the world's fine natural harbors. The aim during these years was still limited—to support an advisory effort that, by most projections, was expected to peak in 1964 and then slowly decline in size as the South Vietnamese armed forces gained in skill and confidence. Hardly anyone paid attention to the engineering requirements that would be needed if the United States changed its policy and decided to commit large numbers of troops over a relatively short period of time.[9]

As the number of U.S. troops climbed, the need for Army engineers to support them grew apace. The steady influx of new units, particularly the helicopter companies that required a high degree of engineer support, put a strain on

[8] Tregaskis, *Building the Bases*, pp. 22–23, 27, 33, 35; Sharp and Westmoreland, *Report*, p. 77; Merdinger, "Civil Engineers, Seabees, and Bases in Vietnam," p. 234; Info Sheet, Office Deputy Chief of Staff for Logistics (DCSLOG), Department of the Army (DA), 6 Jun 62, sub: Status of Military Construction, South Vietnam, Incl. in Information Book for Chief of Staff, U.S. Army, Visit to MACV (Military Assistance Command, Vietnam), 10–17 Jun 62, Historians files, CMH; Joint Logistics Review Board, *Logistic Support in the Vietnam Era*, Monograph 1*, Advanced Base Facilities Maintenance* (Washington, D.C.: Department of Defense, ca. 1970), p. 12 (hereafter cited as JLRB, Monograph #, title); JLRB, Monograph 6*, Construction*, p. 51.

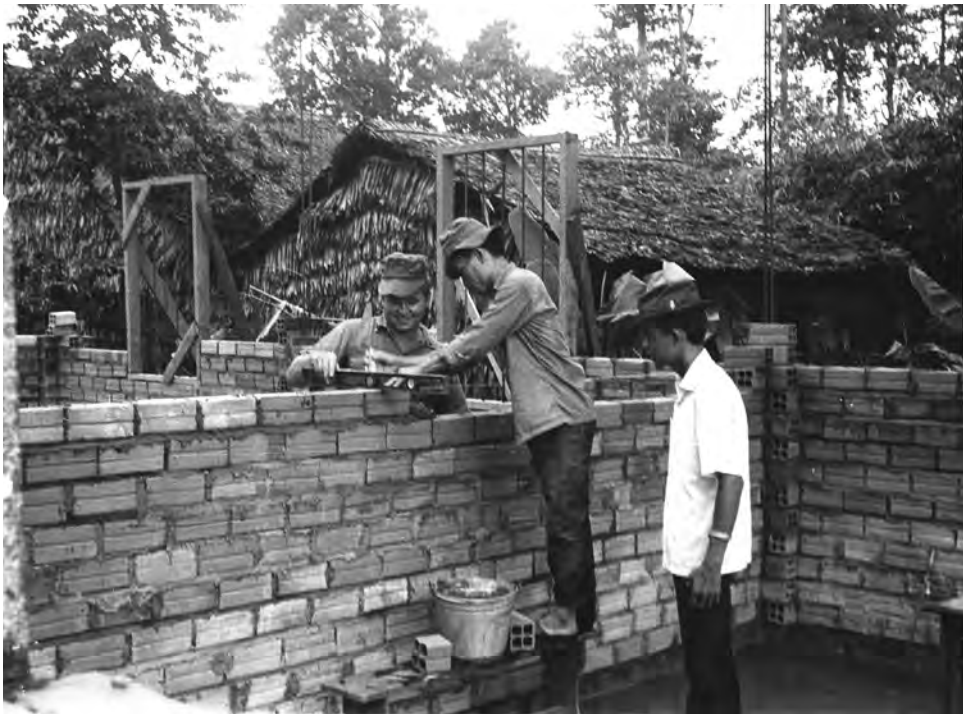
[9] Sharp and Westmoreland, *Report*, p. 81; Tregaskis, *Building the Bases*, pp. 32–33, 36, 39–47, 64–65, 66, 149; CINCPAC History, 1962, p. 198, ibid., 1963, pp. 108–10, and ibid., 1964, fig IV-11; Ltr, RMK (Raymond, Morrison-Knudsen) to Brig Gen Daniel A. Raymond, Dir of Construction, MACV, 23 May 67, sub: Observations of the Deputy Chairman, Raymond, Morrison-Knudsen, Brown and Root, and J. A. Jones (RMK-BRJ) Operating Committee, Incl. in Rpt, Brig Gen Daniel A. Raymond, sub: Observations on the Construction Program, RVN [Republic of Vietnam], 1 Oct 65–1 Jun 67, 1 Jun 67, Historians files, CMH (hereafter cited as Raymond, Observations on the Construction Program). For more on RMK's accomplishments during this period, see Diary of a Contract, NBy (Navy Bureau of Yards and Docks) 44105, January 1962–June 1967, RMK-BRJ, Jul 67, pp. 1–76, U.S. Navy Seabee Museum, Port Hueneme, Calif. (hereafter cited as Diary of a Contract).

Generals Lyman L. Lemnitzer, chairman of the Joint Chief of Staff, and Taylor, Secretary of Defense McNamara, and President Kennedy, 1961

the limited number of specialists such as plumbers, electricians, refrigeration technicians, and water supply experts. By the middle of 1962, the permanent engineer element in the Army component in Vietnam, the U.S. Army Support Group, Vietnam, stood at only four officers and thirty-six enlisted men, not enough to engage in planning or any degree of support.[10] There had been a high-level request just a few months before to increase the number of engineers, but it had not come to fruition. Following the visit of General Maxwell D. Taylor, the personal military adviser to President Kennedy, to South Vietnam in October 1961, the general had recommended sending a 6,000- to 8,000-man flood relief task force, primarily engineer troops, to the monsoon-ravaged Mekong Delta. While the engineers fulfilled their humanitarian mission, Taylor also expected them to improve the military infrastructure in the delta where the insurgency was at its most active. In the end, President Kennedy opted not to send the flood relief force because he wished to keep the American troop commitment as small as possible.[11]

[10] Bowers, *Tactical Airlift*, pp. 109–10; Futrell, *Advisory Years to 1965*, p. 111; Rpt, Feb–Jun 62, Office of Engr, pt. I, pp. 1, 4, in Staff Office Rpt, Jan–Jun 62, n.d., U.S. Army Support Group, Vietnam, Historians files, CMH.

[11] *United States-Vietnam Relations, 1945–1967: Study Prepared by the Department of Defense,* 12 vols. (Washington, D.C.: Government Printing Office, 1971), bk. 2, ch. IV.B.1, pp. 58–101, 114–37, bk. 11, pp. 327–28, 331–44, 359–66, 410–21; Marolda and Fitzgerald, *From Military*



Beginning in 1963, teams of Army and Navy engineers carried out building projects such as this dispensary by the Seabees.

A second and more modest request for Army engineers came in early 1964 when the U.S. Operations Mission asked for three engineer officers with civil engineering backgrounds and 112 engineers, organized into eight advisory teams, to carry out a variety of civic action projects in the delta. Four small teams of Army engineers had arrived a year earlier for four-month tours and had succeeded in making some headway in the countryside. Three teams had gone to Can Tho where they had advised South Vietnamese officials on jobs ranging from equipment maintenance to well-digging. The fourth team had deployed to the highlands, building and repairing Special Forces camps, and working alongside several U.S. Navy Seabee (construction battalion) Technical Assistance Teams, which had a more robust presence in Vietnam than the Army. But the Operations Mission soon reevaluated its civic action plan and withdrew the troop request following the poor results of the government's Strategic Hamlet and New Life programs, two controversial schemes to concentrate rural

Assistance to Combat, pp. 122–29; Maxwell D. Taylor, *Swords and Plowshares* (New York: W. W. Norton and Co., 1972), pp. 216–40, 245–47; Graham A. Cosmas, *MACV: The Joint Command in the Years of Escalation, 1962–1967,* United States Army in Vietnam (Washington, D.C.: U.S. Army Center of Military History, 2006), p. 20.

South Vietnamese engineers undergo bridge construction training

people into small defended enclaves. An expansion of Army civic action would have to await better days.[12]

So, apparently, would support of the South Vietnamese Army. Despite their small numbers, the engineers did their best to train their Vietnamese counterparts in such areas as equipment maintenance, staff planning, and the management of supplies and equipment. Two advisers were stationed at the Vietnamese Engineer School at Phu Cuong, fifteen miles north of Saigon, to improve its standards of education. Still, the number of engineer advisers through 1963, one per infantry division and a few at corps level, was woefully inadequate to give the South Vietnamese Army the help it needed. Deadline rates for South Vietnamese engineer equipment hovered near 50 percent, and, a forty-mile stretch of highway between the cities of Pleiku and Kontum took a South Vietnamese engineer construction battalion nearly three years to finish, even though the United States funded most of the heavy subgrading.[13]

[12] Kelly, *U.S. Army Special Forces,* p. 194; Marolda and Fitzgerald, *From Military Assistance to Combat*, p. 355; 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 Asst CofS, G–3, 1965), pp. 227, 229–30.

[13] Spector, *Early Years*, pp. 260–62; Lt. Col. Ralph F. Lentz, "Little Fort Belvoir of Southeast Asia," *Army Information Digest* 19 (August 1964): 17; Maj. Gen. Robert R. Ploger, *U.S. Army Engineers, 1965–1970*, Vietnam Studies (Washington, D.C.: Department of the Army, 1974),

With no hope of meeting its expanding requirements with Army engineers, the U.S. command once again turned to contractors. In 1963, under a cost-plus-fixed-fee arrangement with U.S. Army Support Group, Pacific Architects and Engineers took over facilities engineering services at U.S. installations. The initial contract provided for support at Tan Son Nhut, Pleiku, Qui Nhon, Nha Trang on the central coast, and Soc Trang, a helicopter base in the delta. The company's first main office consisted of a six-man squad tent in the Air Force headquarters section of Tan Son Nhut. Early priorities were to resolve maintenance problems plaguing electrical generators, water purification plants, and other utilities equipment. Over time, Pacific Architects and Engineers also began to supervise local contractors in the construction of new cantonments as part of the country's mini-building boom. Within a year, the firm had grown to 762 employees, more than double its original labor force, and had extended its reach to four additional sites as the number of American support troops continued to rise.[14]

In fact, the entire contracting effort—RMK, Pacific Architects and Engineers, and the local firms—was outgrowing its makeshift beginnings and, by the summer of 1963, was recording significant headway on every front. In July, a new cantonment with wooden barracks opened at Pleiku capable of housing an aviation battalion. Named Camp Holloway for CWO2 Charles E. Holloway, an Army helicopter pilot who was killed in action in Phu Yen Province in December 1962, it featured a new mess hall, officers and enlisted men's clubs, a barber shop, a laundry, and even an indoor theater. Flight line and other operational facilities were either completed or in progress. Meanwhile, cantonments and other facilities were going up for other aviation units at Bien Hoa, Vung Tau on the coast southeast of Saigon, and Vinh Long in the delta. Projects for the 8th Field Hospital at Nha Trang were expected to be completed by 1 April 1964 and for the 39th Signal Battalion's station at Phu Lam just south of Saigon by 30 May 1964.[15]

But though the construction effort was showing signs of progress, the military and political situation continued to deteriorate. With each passing month, the Viet Cong gained strength and expanded their foothold in the countryside, while American aid could not reverse the trend. The enemy was proving more resilient than expected; the South Vietnamese forces less effective than hoped. Even though U.S. helicopter companies were replacing their old and slow H–21 Shawnees with the more powerful UH–1 Iroquois, or "Huey," the Viet

pp. 26–27; Comments of Col William J. Parsons, Ofc Asst DCSLOG (Materiel Readiness), DA, 16 Jan 63, p. 5, on Briefing, Brig Gen Frank A. Osmanski, Asst CofS J–4, MACV, for Paul R. Ignatius, Asst Sec Army (Installations and Logistics), 11 Dec 62, Historians files, CMH.

[14] Ploger, *Army Engineers*, pp. 27–28; JLRB, Monograph 1, *Advanced Base Facilities Maintenance*, pp. 12, 18; Dunn, *Base Development,* pp. 89–90; Eric D. Johns, *History, Pacific Architects and Engineers Incorporated: Repairs and Utilities Operations for U.S. and Free World Military Forces in the Republic of Vietnam, 1963–1966*, [Saigon, n.d.], pp. 5–14, copy in CMH (hereafter cited as PA&E History, date).

[15] CINCPAC History, 1963, p. 106; Rpt, Jul–Dec 63, Office of Engr, pt. I, pp. 2–6, in Staff Office Rpt, Jul–Dec 63, n.d., U.S. Army Support Group, Vietnam, Historians files, CMH; John D. Bergen, *Military Communications: A Test for Technology*, United States Army in Vietnam (Washington, D.C.: U.S. Army Center of Military History, 1986), pp. 82–83.

Cong were adapting to the threat. At the battle of Ap Bac in January 1963, a Viet Cong unit defeated a much larger South Vietnamese force supported in part by the newer helicopters.

The status of the South Vietnamese government was hardly more encouraging. In May 1963, a Buddhist uprising in Hue, Saigon, and other cities threatened the stability of the government and the increasingly unpopular president, Ngo Dinh Diem. The crisis worsened in August when Diem authorized a violent crackdown on the Buddhist monks who had originally organized the rebellion. With the overall trends looking bleak, the way forward pointed to an even larger advisory force and a greater demand for engineering and construction support. And, for the first time, U.S. planners began to examine in a serious way the logistical and engineering obstacles the United States would face if it chose to intervene in Vietnam on a larger scale.[16]

Intervention

The situation in Vietnam continued to worsen as 1963 drew to a close. On 1 November 1963, a coterie of South Vietnamese generals engineered a coup that overthrew the government and led to the death of President Diem. Three weeks later, President Kennedy met his death from an assassin's bullet while on the campaign trail in Dallas, Texas. While the twin shocks did not immediately alter the U.S. approach to the war, they set the stage for a deeper American commitment to Vietnam. The military junta that came to power after the death of Diem proved to be fractious and inept, giving the Viet Cong even greater opportunity to spread their influence. A second coup in January 1964 only served to increase the instability of the South Vietnamese government and degrade the effectiveness of its armed forces. In the United States, meanwhile, Kennedy's successor as president, Lyndon B. Johnson, pledged to continue and, if necessary, to increase U.S. military support for the embattled South Vietnamese state. As the frequency and intensity of Viet Cong attacks grew with each passing month, so did the pressure for greater American intervention in the conflict.

The inadequacy of the logistical base in South Vietnam, and the inability of the base development plans to keep pace with even a small U.S. buildup became evident by the summer of 1964. In August, General William C. Westmoreland, the MACV commander, advised Admiral Ulysses S. G. Sharp, the head of Pacific Command, and the Joint Chiefs of Staff of problems accepting a 4,700-man buildup any faster than the nine months called for in earlier planning. Advancing the deployment of additional advisers and aviation troops to 30 September, Westmoreland noted, would cause particular trouble at airfields already saturated with aircraft and troops, and further deployments would result in overtaxed and overcrowded bases. The MACV commander added it would take five months to construct facilities for the new troops, and his entire logistical and administrative base was already operating

[16] Gelb with Betts, *Irony of Vietnam*, pp. 80–89; Dave R. Palmer, *Summons of the Trumpet: U.S.-Vietnam in Perspective* (San Rafael, Calif.: Presidio Press, 1978), pp. 22–44.

on a shoestring. Furthermore, real estate would have to be acquired through local channels, sometimes a slow process, because land and facilities could not simply be commandeered.[17]

With little or no planned increase in the number of military engineers assigned to Vietnam, it became evident that a large contractor force would have to be kept in the country. Anticipating the deployment of more forces to South Vietnam, the Army, Navy, and Air Force commands developed a broad spectrum of project requirements that, in turn, greatly expanded RMK's labor force and scope of work. By the end of 1964, the firm's strength had grown to nearly 4,000 and the company was building $1.2 million worth of projects every month, a figure projected to increase to $12 million per month by early 1965.[18] Pacific Architects and Engineers also expanded its operations as the war heated up. In early August, a clash between U.S. Navy destroyers and North Vietnamese patrol boats in the Gulf of Tonkin led President Johnson to authorize one-time air strikes against North Vietnam. Immediately afterward, MACV called on the firm to improve air base defenses, a task typically done by troops. In short order, the contractor erected emergency shelters, sand bag bunkers, security fences, and perimeter lighting at Tan Son Nhut, Bien Hoa, and other airfields. By September, the firm was devoting approximately 80 percent of its construction effort to this work.[19]

Despite the expanded contractor effort, a prodigious amount of work remained to be done before South Vietnam could support even a modest increase in U.S. forces. MACV OPLAN (Operation Plan) 32–64, published in mid-1963, provided a detailed outline of South Vietnam's logistical facilities and highlighted the many improvements that would be needed to support a large U.S. expeditionary force. The airfield directory listed 251 usable and abandoned fields, most of which were small and unimproved. The commercial fuel storage facilities were barely adequate for South Vietnamese needs and could not hope to support an expanded U.S. presence. In evaluating ports, the MACV plan noted that Saigon and Da Nang were the country's only primary points of entry. Da Nang, however, lacked deep-draft piers, which meant that the United States would have to employ over-the-beach techniques. While Cam Ranh Bay on the central coast had tremendous potential as a port, and Pacific Command had successfully lobbied to have the deep-draft pier built under the Military Assistance Program, years of work would be required before the sleepy fishing village became a modern naval harbor. In the meantime, OPLAN 32–64 identified smaller ports that could be used, as well as coastal landing sites suitable for landing cargo in over-the-beach operations.

[17] JLRB, Monograph 6, *Construction*, p. H-8; Ploger, *Army Engineers*, p. 24; Msg, COMUSMACV (Commander, U.S. Military Assistance Command, Vietnam) MACJ3 7738 to CINCPAC, 11 Aug 64, sub: Additional Support, RVN; Msg, CINCPAC to Joint Chiefs of Staff (JCS), 12 Aug 64, sub: Additional Support RVN; Sharp and Westmoreland, *Report*, p. 93. Messages in Historians files, CMH.

[18] Tregaskis, *Building the Bases*, pp. 65, 71, 77–78; Observations of the Deputy Chairman, RMK-BRJ Operating Committee, 23 May 67; JLRB, Monograph 6, *Construction*, p. 96; Ltr, RMK to Raymond, 23 May 67.

[19] PA&E History, 1963–1966, pp. 14–21.

Recognizing the vast amount of work to be done and the limits on his engineering resources, General Westmoreland set his construction priorities for the future in the following rank order: airfields, roads, railroads, ports, and logistics bases.[20]

In late 1964, General Westmoreland recommended the deployment of an Army logistical command and an engineer construction group to support the growing needs of his command and the expanding war. The MACV staff under Brig. Gen. Frank A. Osmanski, the J–4 (assistant chief of staff for logistics), had foreseen the need for a centralized logistical organization as early as 1962, but a proposal had not made it out of the headquarters. General Osmanski revived the idea in 1964 with a plan that included a robust construction capability. Justifying the need for engineer troops, Osmanski explained that RMK faced an increasing backlog, and the deployment of a 2,700-man engineer group of three battalions would help close that gap. Although RMK was in the process of increasing its monthly work in place, Osmanski pointed out that the firm would take twenty months just to complete its current backlog. MACV estimated that the construction program by late January 1965 would exceed $130 million. This information served as the basis for requesting the engineer group.[21]

The Navy disagreed with Osmanski, arguing that RMK could satisfactorily carry out an increased workload. In Honolulu, R. Adm. James R. Davis, the chief of the Pacific Division of the Bureau of Yards and Docks, and Pacific Command's adviser on construction in Vietnam, declared that the firm's "mobilization and rate of construction accomplishment can and will be promptly expanded as required by further program expansion." In Washington, R. Adm. Peter Corradi, the head of the Bureau of Yards and Docks, backed this position. Admiral Corradi added that there were no major constraints in the way to prevent the contractor from expanding operations provided plans and procurement actions were done in advance. He also cautioned the Defense Department to defer consideration to have an engineer group coordinate construction in Vietnam because any shift of responsibility from the Navy's construction office in Saigon would be disruptive.[22]

Notwithstanding these arguments, the Joint Chiefs of Staff endorsed Osmanski's plan on 15 January 1965 and recommended dispatching an

[20] Joint Tables of Distribution, MACV, 1 Jul 63, p. 7; Tregaskis, *Building the Bases*, pp. 45–46; JLRB, Monograph 6, *Construction*, pp. 22, H-5; JLRB, Monograph 12, *Logistics Planning*, pp. 27–28; COMUSMACV OPLAN (Operation Plan) 32–64, Phase II, 1 Jul 63, with four changes through 16 Nov 67. Joint Tables of Distribution and OPLAN 32–64 in Historians files, CMH.

[21] Msg, CINCPAC to JCS, 24 Dec 64, sub: Improvement of U.S. Logistic System in RVN, Historians files, CMH; Msg, Osmanski MAC 370 to Lt Gen Richard D. Meyer, Dir of Logistics, JCS, 26 Jan 65, sub: Engineer Const Gp for RVN, Westmoreland Message files, CMH; Lt. Gen. Joseph M. Heiser, *Logistic Support*, Vietnam Studies (Washington, D.C.: Department of the Army, 1974), p. 9; Joel D. Meyerson, "War Plans and Politics: Origins of the American Base of Supply in Vietnam," in *Feeding Mars: Logistics in Western Warfare From the Middle Ages to the Present*, ed. John A. Lynn (Boulder, Colo.: Westview Press, 1993), pp. 281–87.

[22] JLRB, Monograph 6, *Construction*, p. 107 (quotation); Msg, CINCPAC to JCS, 24 Dec 64, sub: Improvement of U.S. Logistic System in RVN; Msg, Meyer JCS 163 to Westmoreland, et al., 14 Jan 65, Westmoreland Message files, CMH; Tregaskis, *Building the Bases,* p. 80.

advance party to Saigon to set up the logistical element. Defense Secretary McNamara approved the plan in principle but, in no hurry to commit ground troops, decided further justification was warranted, particularly for the engineer group. In late January, he dispatched a Defense Department task force to Vietnam to make an on-site inspection and to review the management of the construction program. By early February, the team concluded that an engineer group was not needed at the time, but it did agree to recommend the deployment of a scaled-down logistical command. The team also proposed augmenting the Navy construction office in Saigon and increasing its responsibility for technical engineering support for U.S. forces. As far as depending on RMK to carry out an expanded construction role in Vietnam, the team felt that the firm had virtually unlimited capacity for expansion and a proven capability to work in a combat theater. Besides, the team noted that Seabee battalions stationed in the Pacific could be called upon for rapid augmentation. On 12 February, McNamara's deputy, Cyrus R. Vance, approved the team's report. This decision proved shortsighted. One month later, the need for the engineer group became critical.[23]

On 7 February, and again on the eighth and eleventh, President Johnson ordered reprisal air raids against the North after guerrillas struck American installations at Pleiku and Qui Nhon, killing thirty-two soldiers and wounding more than a hundred. A few days later, dissatisfied with the uncertain trajectory of his reprisal policy, the president took the next step up the rung of pressure toward a wider war, authorizing the start of the bombing offensive called ROLLING THUNDER and inviting discussion on dispatching an expeditionary ground force of soldiers and marines. An engineer group was only one element in the administration's debate on escalation as the commitment of ground troops hung fire through February into March. But once the White House tilted the issue in favor of intervention, other decisions followed that clarified the course of construction policy, not quite as quickly as General Westmoreland and the Joint Chiefs of Staff believed was required, but with enough forward momentum to begin shifting the theater of operations to a wartime footing.

The need for military engineers received confirmation in the weeks that followed when officials in the theater and the Defense Department started weighing plans of action to deploy American combat units. Initially Westmoreland recommended an aggressive enclave approach, with infantry battalions deployed in beachheads along the coast and an infantry division rushed to the Central Highlands as a blocking force to counter a growing concentration of North Vietnamese regulars in the border area. He also laid out a more ambitious option taken from the theater's OPLAN 32–64 of a full corps force on the northern border and on into Laos in order to isolate the southern battlefield from enemy reinforcement. The Joint Chiefs after quickly endorsing the

[23] Heiser, *Logistic Support*, p. 9; JLRB, Monograph 6, *Construction*, p. 107; Msg, Westmoreland MAC 582 to Adm Ulysses S. G. Sharp, CINCPAC, 6 Feb 65, Westmoreland Message files, CMH; Memo, Cyrus R. Vance, Dep Sec Def, for JCS, 12 Feb 65, sub: COMUSMACV Plan for Introduction and Employment of a U.S. Army Logistical Command, Historians files, CMH.

enclave approach expanded it to three full divisions—two American and one South Korean—toward the end of March.[24]

By this time, the theater's construction shortfalls had begun to loom large in official Washington. The tactical requirements alone for engineers were giving pause to the top-level service and secretariat staffs that were puzzling over the use of force and its costs. Every scenario now seemed fraught with limiting logistical factors and other dangers. The deployment of a division to the highlands, officials now believed, would absorb an engineer group all by itself, and was simply unsustainable without a buildout at the port of Qui Nhon, repairs to Highway 19 (the main east–west artery), and expansion of the Pleiku airfield. As for pitching a corps-size force on the northern border and in the Laotian panhandle, it would take every engineer battalion in the active Army and several from the reserves, and would require massive concurrent construction projects in Vietnam and Thailand, none of which could begin, given the realities of logistical lead time, until the autumn at the earliest.[25]

But there were deeper problems with Vietnam, inadequacies endemic to the country and the American commitment that had been understood for years, and all through March the logistical and construction professionals attempted to grapple with them, laying out with increasing clarity and urgency the steps the administration needed to take immediately to prepare the theater for war. Their recommendations addressed fundamental sources of unreadiness: from the importance of developing direct sea access to Vietnam by dredging and constructing new ports along the coast, and pre-positioning lighterage and construction material within a few days' sailing time of Vietnam, to streamlining administrative procedures for funding construction, and deploying the full logistical command and engineer construction group, and even laying the political groundwork for mobilizing the Reserves and National Guard to ensure that the combat troops received enough support.[26]

These were the overriding issues for the military leaders, what they believed to be the perils facing them, when President Johnson in March took control of

[24] Msg, COMUSMACV MACJ41 6125 to CINCPAC, 27 Feb 65, sub: Southeast Asia Logistic Actions, Historians files, CMH; Cosmas, *Years of Escalation, 1962–1967*, pp. 202–03; William C. Westmoreland, *A Soldier Reports* (Garden City, N.Y.: Doubleday and Co., 1976), p. 126.

[25] Memo, Acting Ch of Engineers for DCSOPS (Deputy Chief of Staff for Operations and Plans), 26 Mar 65, sub: South Vietnam Engineer Estimate, Pleiku-Kontum, with Incl, Engineer Strategic Studies Group, South Vietnam Engineer Estimate, Pleiku-Kontum, Mar 65, box 8, 68A/5926, Record Group (RG) 319, National Archives and Records Administration (NARA), Washington, D.C.; Memo, DCSOPS for CofS Army, 26 Apr 65, sub: Engineer Estimate, U.S. Army Corps Force Southeast Asia, with Incl, Engineer Strategic Studies Group, Engineer Estimate, U.S. Army Corps Force Southeast Asia, Apr 65, box 9, 68A/5926, RG 319, NARA; William C. Baldwin, *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), p. 129.

[26] Memo, Office CofS Army, 22 Feb 65, sub: VN Discussions; Msg, Commander in Chief USARPAC to CINCPAC, 19 Mar 65, sub: Contingency Planning for Southeast Asia/Western Pacific; Msg, JCS to CINCPAC, 20 Mar 65, sub: Emergency Construction Requirements, Southeast Asia, all Historians files, CMH; Meyerson, "Origins of the American Base of Supply," pp. 282–83.

the debate on intervention, settling on a gradualist approach to troop deployments. His decisions offered the possibility of even larger commitments in the future while postponing potential trouble with Congress and the public. A first decision in early March put Marine units at Da Nang when the ROLLING THUNDER raids started over North Vietnam. Because the mission was limited to providing for air base defense, few officials regarded the troops as the beginning of an American ground war. Over the next two weeks, however, on 15 and 20 March, the president opened Vietnam to larger deployments, ordering the dispatch of dredges to theater harbors along with LSTs (landing ships, tanks), and approving two large construction projects—a new runway at Da Nang air base in an effort to handle the rising tempo of operations and a jet airfield farther south at Chu Lai to catch the theater's overflow—two projects Pacific Command had been pushing as construction priorities since the fall of 1964.[27]

The main objective of the support professionals, a decision for a full logistical command and engineer construction group, emerged during a meeting of the National Security Council on 1 April. After weeks of high-level controversy over the question of ground troops, the president deferred the three-division force that the military leaders recommended but authorized what amounted to its support train for deployment, plus two more battalions of marines and an expansion of their mission. If the decision represented a continuation of the policy of incrementalism, it still constituted a serious commitment of American ground troops, providing for a complete theater logistical command totaling 5,900 soldiers, plus 13,000 more spaces in over a hundred logistical and engineer units, among which was a second engineer group to help lay the base for any additional commitments of forces he might later make.[28]

The president would make three such commitments in the weeks that followed: a task force of the 173d Airborne Brigade that landed at Bien Hoa and Vung Tau in early May and two Army infantry brigades—the 2d Brigade, 1st Infantry Division, and the 1st Brigade, 101st Airborne Division—scheduled for enclaves on the central coast in early summer. The hope in military circles was that the engineers would arrive just as quickly or even more so, and pace the rate of arrival of the rest of the support package and the combat units. But already, according to officials at the Department of the Army, there were signs that the engineer deployment was slipping badly, reinforcing old fears, Westmoreland's among them, that the support base would never be ready to receive the infantry and properly sustain it. At the last possible moment,

[27] John M. Carland, *Combat Operations: Stemming the Tide, May 1965 to October 1966*, United States Army in Vietnam (Washington, D.C.: U.S. Army Center of Military History, 2000), pp. 15–18; Msg, JCS 007929 to CINCPAC, 26 Mar 65, sub: COMUSMACV Requirement for Additional LST Support, Historians files, CMH; "The Joint Chiefs of Staff and the War in Vietnam, 1960–1968," Part 2, "1965–1966" (Historical Division, Joint Secretariat, Joint Chiefs of Staff, 1970), ch. 20, pp. 12–14, CMH; Jack Shulimson and Maj. Charles M. Johnson, U.S. Marine Corps (USMC), *U.S. Marines in Vietnam: The Landing and the Buildup, 1965* (Washington, D.C.: History and Museums Division, Headquarters, U.S. Marine Corps, 1978), pp. 6–15, 29–30.

[28] Msg, Sharp to Gen Earle G. Wheeler, Chairman JCS, 27 Mar 65, sub: U.S. and ROK (Republic of Korea) Deployments, Westmoreland Message files, CMH; National Security Action Memorandum 328 to Sec State, et al., 6 Apr 65, box 13, 70A/5127, RG 330, NARA.

engineer units in the United States were preparing to deploy, but on a schedule that raised questions about the soundness of the support buildup for the fighting that lay ahead.[29]

[29] Sharp and Westmoreland, *Report*, pp. 108–09.

2

Engineers Cross the Pacific

The expanding engineer involvement came about more as a reaction to growing U.S. military strength rather than the execution of carefully drawn-up plans. When President Johnson directed the increase of support troops on 1 April 1965, the initial engineer increment consisted of one group headquarters, two battalions, three separate companies, a platoon, and three detachments. As more combat troops arrived in the summer and fall, additional increments of engineers filtered in. By November, three groups and ten battalions were building ports, airfields, and bases throughout the country and providing tactical support to combat units. And from the first, the demands placed upon the engineers were immediate and taxing.

The 35th Engineer Group (Construction) Deploys

On 10 April 1965, Col. William F. Hart, the commanding officer of the 35th Engineer Group (Construction) at Fort Polk, Louisiana, received orders to deploy the group headquarters to South Vietnam. The 84th Engineer Battalion (Construction) at Fort Ord, California, and the 864th Engineer Battalion (Construction) at Fort Wolters, Texas, were to accompany the group. Planning began at once to transport equipment and supplies to nearby ports to be put aboard cargo ships bound for Vietnam. On 3 May, advance parties from the 35th Engineer Group and 864th Engineer Battalion departed by air for Saigon. Lt. Col. Thomas C. Haskins, the group executive officer, headed the two advance parties. Lt. Col. James E. Bunch, the commanding officer of the 864th, and members of his staff made up the second advance party.[1]

The deployment of the 35th Group was not trouble-free. Although the ninety-eight-man headquarters company had a high manpower readiness rating, the Army's deployment criteria, which specified a six-month period of remaining service and other conditions, created immediate turbulence.

[1] Two assigned battalions, the 46th Engineer Battalion (Construction) at Fort Leonard Wood, Missouri, and the 168th Engineer Battalion (Combat) at Fort Polk, Louisiana, remained behind for the time being. Quarterly Cmd Rpt, 1 Apr–30 Jun 65, 35th Engr Gp, 8 Jul 65, p. 1, Historians files, CMH; Interv, Maj John F. Hummer, 16th Mil Hist Det, with Lt Col James E. Bunch, Commanding Officer (CO), 864th Engr Bn, 1 May 66, Vietnam Interview Tape (VNIT) 10, p. 1, CMH. Depending on tables of organization and equipment and modified tables of equipment, the construction battalions were authorized approximately 900 troops organized in a headquarters and headquarters company, an engineer equipment and maintenance company, and three engineer construction companies. For a summary of the types of engineer units, their functions, strengths, and types of equipment, see Ploger, *Army Engineers*, app. D, pp. 215–18. Also see FM 5–1, *Engineer Troop Organizations and Operations*, September 1965.

Ultimately, only four of the original complement of twenty officers and warrant officers deployed to Vietnam: Colonel Hart, the executive officer, the adjutant, and the commander of the aviation section. Replacements reported just before embarkation, and they did not get acquainted with the unit until aboard the troop ship on its way to Vietnam.[2]

The 864th Engineer Battalion's problems were on a much larger scale. Colonel Bunch had only nine days to get his equipment to the port at Beaumont, Texas, to meet the 21 April shipping deadline. The nearly 900-man battalion also lost about one-third of its strength, including many important officers and noncommissioned officers. Among the key staff officers only the adjutant remained. Because Bunch traveled with the advance party, he did not meet his new executive officer and operations officer until the main body arrived at Cam Ranh Bay.[3]

After reaching Saigon, Colonel Haskins met with Col. Robert W. Duke, the commander of the recently activated 1st Logistical Command. Haskins now learned that the 35th Group would report to the logistical command. Duke and his staff had evaluated anchorages, road nets, and security requirements and had selected sites for base areas. It was evident that expansion of port and airfield capacities at Saigon, Qui Nhon, and Vung Tau would be major tasks facing the group. The port of Saigon alone could not handle the number of ships coming over to unload troops, equipment, and supplies. A MACV survey had concluded that despite some construction problems, the sandy Cam Ranh peninsula and its well-protected natural harbor would make an excellent port and logistical complex. Haskins and his team began developing a plan to distribute the first increment of 2,300 engineer troops expected to arrive by the end of the month. On 10 May, Colonel Bunch and his thirty-seven-man advance party flew from Saigon to Cam Ranh Bay to prepare for arrival of the group. Five days later, General Westmoreland gave the go-ahead to develop bases at Cam Ranh Bay, Qui Nhon, and elsewhere.[4]

Concurrent with this planning, MACV initiated a series of requests for real estate. The basis for acquiring real estate was a provision in the 1950 Pentalateral Agreement between United States, France, and the three Indochina states, which stipulated that the host country would provide land at no cost. In South Vietnam, real estate was either requested from the Joint General Staff for government-owned land or leased from private owners. In some cases, the Vietnamese government would purchase private land, and MACV would reimburse the government. The United States also paid the cost of indemnification and relocation when squatters were on the property, but the title itself was obtained and held

[2] Ploger, *Army Engineers*, pp. 32, 38; Quarterly Cmd Rpt, 1 Apr–30 Jun 65, 35th Engr Gp, pp. 1–2; Table of Organization and Equipment (TOE) 5–112D, Engr Gp (Const), 9 Nov 61.

[3] Interv, Hummer with Bunch, 1 May 66, p. 1.

[4] Heiser, *Logistic Support,* pp. 9–11, 15; Quarterly Cmd Rpt, 1 Apr–30 Jun 65, 35th Engr Gp, p. 2; Interv, Maj John F. Schiller, 15th Mil Hist Det, with Col Robert W. Duke, CO, 1st Log Cmd, 3 Jan 66, VNIT 1, pp. 5–7, CMH; Interv, Hummer with Bunch, 1 May 66, p. 2; Headquarters, United States Military Assistance Command, Vietnam, "Command History, 1965" (Saigon, Vietnam: Military History Branch, Office of the Secretary, MACV, 1966), pp. 107–08, CMH (hereafter cited as MACV History, date).

When the 35th Engineer Group arrived at Cam Ranh Bay, the only deep-draft pier was the one built by RMK in 1964.

by the Vietnamese government. This system was satisfactory as long as small plots were involved and time was not a factor, as was usually the case during the advisory years. But the arrival of marines and Seabees to build a jet airfield at Chu Lai in May revealed problems with current practice. Only two weeks before the marines landed, MACV dispatched two Army captains, an engineer and a finance officer, to negotiate with government officials and land owners for "each fruit tree, each banana tree, rice paddy, thatched hut and grave" at the construction site. Because this involved payment to 1,800 different property owners, the transaction was barely completed in time. Time was also a consideration at Cam Ranh Bay. By the time the Vietnamese government approved U.S. entry onto the peninsula, advance elements were already ashore. The U.S. Command expressed little concern about these formalities given its sense of tactical urgency and the fact that the peninsula was virtually uninhabited. The State Department took a different position, however, by not pronouncing itself satisfied with the legality of the occupation until an investigation was completed during the summer.[5]

Upon reaching Cam Ranh Bay, the advance party got right to work. The current tenants of the peninsula, the South Vietnamese Navy, provided the engineers one of the old French military buildings, a fortuitous move because the Americans did not bring any tents. With only hand tools, Bunch and his party prepared a temporary landing beach and installed "dead-men" (buried logs used as anchors) to hold down the LSTs now beginning to frequent the nascent port.[6]

[5] MACV History, 1965, pp. 108, 124 (quoted words, p. 124); Interv, Schiller with Duke, 3 Jan 66, p. 7; Dunn, *Base Development*, p. 29.

[6] Interv, Hummer with Bunch, 1 May 66, pp. 1–3.

The main body of the 35th Engineer Group departed San Francisco on 13 May aboard the U.S. Navy Ship (USNS) *Eltinge*, a World War II Liberty ship just out of mothballs. Aboard the *Eltinge* were the group headquarters, the 84th and 864th Engineer Battalions, the 513th Engineer Company (Dump Truck), the 584th Engineer Company (Light Equipment), the 178th Engineer Company (Field Maintenance), and the 53d Engineer Company (Supply Point). The *Eltinge* was expected to arrive at Cam Ranh Bay around 30 May. The ship, however, suffered repeated mechanical breakdowns and ended up being towed to Midway Island. At Midway, the troops and cargo were transferred to the USNS *Barrett*. Meanwhile, three ships carrying equipment proceeded on, and they arrived weeks before the main body. The *Barrett* continued to its original destination, Subic Bay in the Philippines, before proceeding to Vietnam. Colonel Haskins flew to the Philippines from Saigon to brief commanders and staff officers. When plans were finished, he flew back to Saigon to complete preparations for landing and deploying the group.[7]

When the ships carrying the equipment arrived at Cam Ranh Bay on 22 May, the small group of engineers and transportation troops on the scene faced a daunting task. Dump trucks, bulldozers, graders, and the multitude of other construction equipment were slung off the ships and on to the peninsula's sole pier. It took four days to unload the first vessel. After sitting on board the ships for almost a month, most of the construction equipment and vehicles had dead batteries and flat tires. Maintenance and repairs could not be done because the operators were on the *Eltinge* and later the *Barrett*. Colonel Bunch and his party pitched in by using makeshift jumper cables to start the equipment and vehicles. Then the officers and senior noncommissioned officers, trying to recall how to operate the equipment, managed to drive the items off the crowded pier to a parking area in the sand. Finally, after about a week and a half of round-the-clock effort, they finished the unloading.

On 9 June, the USNS *Barrett* dropped anchor off Cam Ranh Bay. On hand to receive the disembarking troops were Brig. Gen. John Norton, the commander of the U.S. Army Support Command; the advance parties; and some Transportation Corps soldiers. The ship's captain had balked at entering the bay because his charts did not show an approved harbor there, so the troops had to debark over the side of the vessel into landing craft. It took two to three hours until the offloading began. After half the troops came ashore, a driving rainstorm struck the bay, soaking everyone, a welcome relief from the extreme heat. Once ashore, the group headquarters, the 864th Engineer Battalion, the four separate engineer companies, a finance detachment, and Company D, 84th Engineer Battalion, moved to preselected defense positions in the sand dunes. The *Barrett* and the rest of the 84th Battalion proceeded to Qui Nhon.[8]

[7] Ploger, *Army Engineers*, p. 38; Quarterly Cmd Rpt, 1 Apr–30 Jun 65, 35th Engr Gp, p. 1.

[8] Interv, Schiller with Duke, 3 Jan 66, p. 8; Interv, Hummer with Bunch, 1 May 66, pp. 2–3; Quarterly Cmd Rpt, 1 Apr–30 Jun 65, 35th Engr Gp, p. 1; Capt. Lindbergh Jones, "Operations at Cam Ranh Bay," *Military Engineer* 58 (July-August 1966): 10.

Engineers of the 35th Group transfer to a landing craft at Cam Ranh Bay, June 1965.

Digging In

After building a campsite and getting the equipment in working order, the group commenced the transformation of the sandy peninsula into a depot and port. The first task required removing a large sand dune in order to build a LST ramp on the south beach. Bulldozers and earthmoving scrapers leveled other areas and gradually a road network began to take shape. Initially, bulldozers cut the first trails through the deep sand, twenty to thirty feet in places. These first tracks were so unstable that soon bulldozers were positioned at various points to tow stalled vehicles. After a few weeks, vehicle and equipment operators developed techniques to maneuver in the sand. They reduced tire pressure below the minimum prescribed standard, and climbed the dunes by moving along the contours instead of attempting a direct approach. Still, sand was a never-ending problem. Its abrasive action on moving parts caused maintenance problems on nearly all equipment. Traveling by foot through the deep sand also sapped the men's energy. Finally, the gleaming granules of sand magnified the already intense heat inside the dark green tentage. When the occupants raised the tent sides for ventilation, onshore winds carried even more sand into offices and troop quarters. Sand also crept into kitchens, foodstuffs, and clothing. Only the constant breeze, albeit mixed with sand, seemed to offer some relief from the searing sun.[9]

[9] Interv, Hummer with Bunch, 1 May 66, pp. 3–5; Jones, "Operations at Cam Ranh Bay," pp. 10–11.

Because of high daytime temperatures, crews pave concrete pads for buildings at Cam Ranh Bay at night.

The daytime heat forced the engineers to adjust work schedule and construction procedures when they started work on the depot buildings and troop housing. Temperatures, intensified by the reflection from the white sand, rose to 120°F. To avoid the effects of the heat as much as possible, crews worked in two shifts to take advantage of the cooler night air. One shift worked from 0100 to 1100 and the second began at 1500, working until 0100. The 35th Group also adopted special procedures to prevent damage caused by the intense heat. Crews set forms during the daylight hours, leaving the heavier work of placing concrete slabs to the evening hours. This practice served both to protect the men and ensure that the concrete properly set before the heat of the day removed the hydration water. At least the sand could be used to make a low-grade concrete that proved adequate for floor slabs and hardstands. The abundant supply of sand also made it possible to fill the large numbers of sandbags used in bunkers, revetments, machine gun positions, and steps.[10]

Until infantry troops arrived, the 35th Group provided most of the security on the peninsula. During the first night, the engineers placed temporary machine gun positions and listening posts along the high dunes. Some nervousness prevailed. Colonel Bunch recalled: "I think every shadow got a hole

[10] Jones, "Operations at Cam Ranh Bay," p. 12; Interv, Hummer with Bunch, 1 May 66, pp. 2–4.

shot in and there were very few VCs [Viet Cong] in the area I'm sure, but my people didn't realize that so they were actually more of a hazard to themselves than they were to anyone else." Though the Viet Cong made their presence felt with some long-range, ineffective sniping, the 1,200 engineers ashore that first day seemed sufficient. While getting settled, the 35th Group worked out a mutual security plan with the local South Vietnamese naval commander, but diverting engineers to guard duty imposed a heavy burden on operations. Colonel Bunch used 160 to 170 men per day for manning defenses and patrolling. On 12 July, an infantry battalion from the 1st Infantry Division came ashore and took over the defense of the peninsula. In October, South Korean troops assumed security responsibility for Cam Ranh Bay peninsula and the surrounding area.[11]

Meanwhile, the 84th Engineer Battalion, less Company D, completed its sea voyage to Qui Nhon on 11 June. While Transportation Corps lighters moved equipment ashore, the construction battalion, under the command of Lt. Col. Joseph J. Rochefort, started setting up a base camp just west of the city near the intersection of Highway 1 and Route 440. After settling in, the battalion embarked on the long-term transformation of the port city and surrounding area into a large logistics base. Soon, permanent beach ramps for landing craft were completed, and landfill operations were under way for a supply depot. With the help of a platoon from the 497th Engineer Company (Port Construction), the 84th installed two 4-inch marine pipelines to pump petroleum products from tankers offshore. Just south of the city, the battalion began building ammunition storage pads and set up an improvised rock-crushing plant next to Highway 1. Here, too, sand was abundant, not as loose as at Cam Ranh, but still enough to cause equipment breakdowns.[12]

While the troops got situated at Qui Nhon and Cam Ranh Bay, the 84th Battalion's Company D transshipped from Cam Ranh to Vung Tau, some thirty-five miles southeast of Saigon. After setting up its tent camp on the Vung Tau peninsula, the construction company began turning the port town and the surrounding area into a combat support base designed to relieve Saigon of some of its offloading and storage burdens. The most urgent task facing the engineers was improvement of the existing shallow-draft port facilities, a major project for a company-size unit of two hundred men. Unlike the sandy and mountainous terrain at Cam Ranh and Qui Nhon, the Vung Tau peninsula was marshy. The company commander, 1st Lt. Reed M. Farrington, learned that the plans for the depot did not take the marshy soil into account. A redesign became necessary, and the staging depot complex fell behind schedule. Despite such setbacks, the officers and men of Company D carried out their assignment. Operating with a minimum of supervision and support from higher headquarters, getting whatever supplies they could from local vendors,

[11] Interv, Hummer with Bunch, 1 May 66, pp. 2–3; Jones, "Operations at Cam Ranh Bay," p. 10.

[12] Maj. Gerald E. Galloway, "Essayons: The Corps of Engineers in Vietnam" (Master of Military Art and Science thesis, U.S. Army Command and General Staff College, 1968), p. 35, copy in CMH; Quarterly Cmd Rpt, 1 Jul–30 Sep 65, 84th Engr Bn, 14 Oct 65, pp. 2–3, Historians files, CMH.

Company D fended for itself until the 46th Engineer Battalion (Construction) arrived in September.[13]

All the while, the war continued to go badly for the South Vietnamese. Viet Cong main forces and guerrillas, steadily increasing in numbers and effectiveness, were systematically bleeding Saigon's forces in large and small engagements. In April, Westmoreland and Sharp proposed hastening troop deployments, raising U.S. strength to 82,000 plus 7,200 troops from Australia and South Korea. On 5 May, the 173d Airborne Brigade was airlifted from Okinawa to Bien Hoa to relieve South Vietnamese Army forces of some of their security responsibilities and to free them to counter the enemy threat. In early June, MACV confirmed the presence of elements of a North Vietnamese division in northern II Corps. The command also suspected another division to be nearby in the Laotian panhandle. By mid-June, two new military leaders took over control of the government. Lt. Gen. Nguyen Van Thieu became the de facto chief of state, and Air Vice Marshal Nguyen Cao Ky assumed the premiership. Washington now realized that the new government would need even more U.S. combat troops to help stem the tide.

More men were on the way. On 10 July, President Johnson ordered the deployment of an additional 10,400 logistical and engineer troops. Four days later, five engineer battalions received orders to Vietnam. On the twenty-eighth, Johnson announced the deployment of the 1st Cavalry Division (Airmobile) to II Corps. The remainder of the 1st Infantry Division had also been alerted for Vietnam. By August, the add-ons would increase the number of soldiers committed to the war to 210,000, followed in September with a further requirement of 9,800 support troops, many of them engineers.[14]

One of the five engineer battalions alerted for deployment to Vietnam was the 87th Engineer Battalion (Construction) at Fort Belvoir, Virginia. Lt. Col. John J. McCulloch, who assumed command in June, faced problems that confronted other deploying units that summer. Most of the problems in themselves were not unusual. The difficulty stemmed from the number of problems arising simultaneously. Manpower shortages plagued the battalion immediately. While needing more soldiers with construction skills, the 87th lost 40 percent of its men because of reassignments, discharges, and other reasons. The Army alleviated the shortage to some degree by assigning combat engineers as substitutes. Colonel McCulloch also took measures to adjust his organizational equipment for service in Vietnam. He obtained more tents, some salvaged household refrigerators, and water distributors, and left behind unneeded items such as space heaters. On 26 July, McCulloch and his advance party of sixty-seven men departed for Saigon. Following several delays and a rough flight, McCulloch's party arrived in Saigon on 4 August only to find that the battalion's destination had changed. Instead of the Saigon region, the 87th Battalion would be assigned to the 35th Group at Cam Ranh Bay. While in Saigon, McCulloch made arrangements with the 1st Logistical Command

[13] Ploger, *Army Engineers*, pp. 49–50, 79.

[14] Cosmas, *Years of Escalation*, *1962–1967*, pp. 200–56; Carland, *Stemming the Tide,* pp. 47–49.

for some missing items, including enough tentage for the entire battalion and small electrical generators. Most of the advance party then flew on to Cam Ranh Bay.[15]

The main body of nearly eight hundred men arrived at Cam Ranh Bay on 24 August and set up camp. During the next four months, the 87th Engineer Battalion built roads to the northern end of the peninsula and began building a 6,400-man cantonment, a petroleum tank farm, and a seven-and-a-half-mile fuel pipeline from the port to the new air base under construction by RMK. The 35th Group also asked the battalion to conduct tests to stabilize the sand. The 87th tried combinations of cement, crushed coral, asphalt, crushed rock, water, and decomposed granite, mixed in various degrees with sand, on the routes to the depot area and the ammunition supply point. For the time being, a mix of the decomposed granite and cement at an eight-inch thickness and moist cured for seven days afforded a substantial base course. Eventually, this method became the standard base course for all depot roads at Cam Ranh Bay.[16]

Also arriving on the same day as the 87th Engineer Battalion was the 497th Port Construction Company. This versatile unit of slightly more than two hundred men, previously based at Fort Belvoir and commanded by Capt. Paul L. Miles, proceeded to lay the ground work for the arrival of a DeLong pier, a prefabricated self-elevating barge pier developed by the DeLong Corporation of New York City. While the 87th Engineer Battalion worked on a combination rock fill causeway and panel bridge connecting the shore to the pier, the port construction company built a 550-foot sheet-pile bulkhead to protect the pier from beach erosion.[17]

Several other engineer companies arrived. The 102d Engineer Company (Construction Support), commanded by Capt. Jesse M. Tyson Jr., reached Cam Ranh Bay in late August with its quarrying, asphalt paving, and other specialized equipment. Captain Tyson and his lieutenants had no experience in asphalt production, but by using the knowledge of some of the noncommissioned officers, the 102d set up a plant. The unit began crushing rock in early November, and when rock production reached sufficient quantities, the roads around the peninsula received a topping of asphalt pavement. The 553d Engineer Company (Float Bridge), commanded by Capt. Richard L. Copeland, arrived a few days after the 102d. In October, the company put its M4T6 bridging equipment to good use, beginning regular ferry service to the mainland. Because of the heavy traffic, especially dump trucks hauling laterite—a soil rich in secondary oxides and used as a subgrade—to the peninsula, the 553d soon assembled a longer and swifter raft.[18]

[15] Ploger, *Army Engineers*, pp. 33–35; Quarterly Cmd Rpt, 1 Jul–30 Sep 65, 87th Engr Bn, 5 Oct 65, pp. 1, 3, Historians files, CMH.

[16] Ploger, *Army Engineers*, pp. 50, 53–54; Quarterly Cmd Rpt, 1 Jul–30 Sep 65, 87th Engr Bn, pp. 1–5; Galloway, "Essayons," pp. 42–43; Lt. Col. James M. Mueller, "Taming the Sands of Cam Ranh Bay," *Military Engineer* 58 (July-August 1966): 238–39.

[17] Ploger, *Army Engineers*, pp. 50–53; Dunn, *Base Development*, pp. 54–55.

[18] Ploger, *Army Engineers*, pp. 56–58; Galloway, "Essayons," pp. 46–47; Quarterly Cmd Rpt, 1 Oct–31 Dec 65, 35th Engr Gp, 19 Jan 66, pp. 1–4, Historians files, CMH.

The landing of Lt. Col. Paul D. Triem's 62d Engineer Battalion (Construction) (from Fort Leonard Wood, Missouri) at Cam Ranh Bay on 28 August marked the arrival of the fourth Army construction battalion and the second to be diverted from its original destination. Originally ordered to Qui Nhon to build an airfield, Triem received last-minute instructions to construct an airfield at Phan Rang farther down the coast. This change in plans illustrated the shifting priorities taking place during the hectic buildup that summer and the desperate need for another jet-capable airfield in South Vietnam. Studies at the Qui Nhon site had found it to be impractical from an engineering and security standpoint, which meant the proposed airfield at Phan Rang suddenly assumed the highest priority after that at Cam Ranh Bay. The advance party had already reached Qui Nhon, and the transport ship carrying the rest of the battalion approached the coast when MACV decided to shift the battalion. Colonel Triem sent the heavy equipment to Phan Rang by landing craft and moved the lighter equipment by road. After reaching Phan Rang the following month, the 62d Engineer Battalion started to build a 10,000-foot AM2 aluminum matting airstrip and cantonments. One construction company remained at Cam Ranh until November to help build the depot.[19]

By early September, the Cam Ranh peninsula began to take on the appearance of a bustling military facility. In the first month, the engineers dug in and tackled the environment. Within the first thirty days, the 35th Group built a tent and sandbag camp, lengthened the existing 1,100-foot airstrip to 1,400 feet, and built new roads or reinforced existing ones in the southern part of the peninsula. To relieve some of the congestion on the port's sole deep-draft pier, work crews expanded the LST unloading site on the beach and extended the existing 350-foot-long pier to 600 feet. Mid-August saw the completion of temporary motor pools, storage platforms, and storage areas for fifty-five-gallon petroleum drums. More engineers arrived, and the group headquarters refined plans for the building of a vast port and logistical complex. RMK was also hard at work in the northern part of the peninsula, building the country's sixth jet-capable airfield. By early September, with help from the contractor, the 35th Group completed more than thirty miles of all-weather road. In the port area, work proceeded feverishly to prepare the site for the arrival of the DeLong pier.[20]

Unfortunately, weather, as it often would in Vietnam, plagued progress or caused damage. In late 1965, the northeast monsoon rains washed out the unpaved roads crisscrossing the peninsula before they got paved. Heavy traffic and saturated subgrades combined to create a morass that could only be cured by removing the roadbed or mitigated by heavy applications of sand. The first monsoon that troops experienced in this part of Vietnam clearly showed the need for rapid paving and paying more attention to preserving the existing

[19] Ploger, *Army Engineers*, pp. 50, 55; Galloway, "Essayons," p. 45; Quarterly Cmd Rpt, 1 Oct–31 Dec 65, 62d Engr Bn, 8 Jan 66, p. 1, Historians files, CMH. AM2 matting consisted of 2-by-12-foot or 2-by-6-foot panels with honeycombed interiors that could be laid by hand. The latest in runway matting, it was designed to support landings of jet aircraft.

[20] Ploger, *Army Engineers*, p. 47; Tregaskis, *Building the Bases*, p. 142.

Deep-draft piers at Cam Ranh Bay in January 1966 showing the RMK pier built in 1964 at left and the recently completed DeLong pier and causeway on the right

vegetation. Strong winds caused the sands to drift like snow, a problem further exacerbated when unaware work crews cleared areas of their scanty scrub cover. This problem would be minimized later by planting grass and erecting snow fences.[21]

As for the arrival of the DeLong pier, the U.S. Army Materiel Command made arrangements to tow the only available pier stored at the Charleston Army Depot in South Carolina. The command obtained a contract tug, and on 11 August the tug, with the pier in tow, left Charleston for the long voyage via the Suez Canal and Indian Ocean. After eighty-one days at sea, the 300-by-90-foot steel pier arrived at Cam Ranh Bay on 30 October. By then, the engineers had completed the connecting causeway and sheet-pile bulkhead. DeLong engineers advised the 497th Port Construction Company on the emplacement and elevation of the pier. This work was completed in mid-December 1965. As 1966 dawned, Cam Ranh Bay boasted two deep-draft piers.[22]

The Delong pier had many advantages over conventional construction. The pier, essentially a barge supported by eighteen tubular steel caissons six feet wide and fifty feet long, could easily be moved into position. If harbor depths exceeded the caissons' lengths, then workers installed additional fifty-foot sections. Pneumatic jacks attached to large collars around the caissons

[21] Ploger, *Army Engineers*, p. 62; Galloway, "Essayons," p. 83.

[22] Dunn, *Base Development*, pp. 54–55; *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), p. 136; Quarterly Cmd Rpt, 1 Oct–31 Dec 65, 35th Engr Gp, pp. 3–4.

DeLong pier at Cam Ranh Bay nearing completion, December 1965

were used to jack the barge up on its legs to a usable height. Because of the mud conditions at Cam Ranh Bay, work crews joined three lengths of caissons totaling 150 feet for each leg. Although two sections could be joined before erection, the third had to be welded in place, a process that required twenty days. Most of the fittings and hardware of the barges and caissons arrived in poor condition, but the port construction crews succeeded in repairing or rebuilding the pier's vital components. The first DeLong pier at Cam Ranh Bay took forty-five days for construction by sixteen men. Estimates showed that constructing a timber-pile pier would have required at least six months by a forty-man construction platoon, plus supporting equipment and operators and a large number of hard-to-get timber piles and lumber.[23]

Such advantages inspired a demand for more of the unique piers. Logisticians and engineers recognized that the quickly assembled mobile piers could save valuable man-hours in readying the Vietnamese ports to receive the large influx of war materiel. The Army identified requirements for additional DeLong piers at Cam Ranh Bay, Qui Nhon, and Vung Tau. On 6 December, Secretary McNamara gave his approval for the Army Materiel Command to purchase more piers from the DeLong Corporation. Initially the contract called for delivery of twenty-one pier barges, seven measuring 300 by 80 by 13 feet (A-type barge or unit) and fourteen units measuring 150 by 60 by 10

[23] 1st Lt. David P. Yens and Capt. John P. Clement III, "Port Construction in Vietnam," *Military Engineer* 59 (January-February 1966): 20; Dunn, *Base Development*, p. 55; Ploger, *Army Engineers*, p. 52. For early background of the DeLong pier, see 2d Lt. Robin R. Forsberg, "Portable Piers and Packaged Ports," *Army Information Digest* 9 (September 1954): 55–59.

feet (B-type barge or unit). (One of the seven units was slated for Okinawa.) Manufacturing of the pier barges and caissons would be in Japan, thus cutting the towing time to eighteen days and reducing manufacturing costs. Procurement of jacks, compressors, valves, and other mechanical items from manufacturers continued in the United States. DeLong Corporation then married the components at the ports. In April 1966, McNamara authorized a further increase in the funding and number of DeLong units.[24]

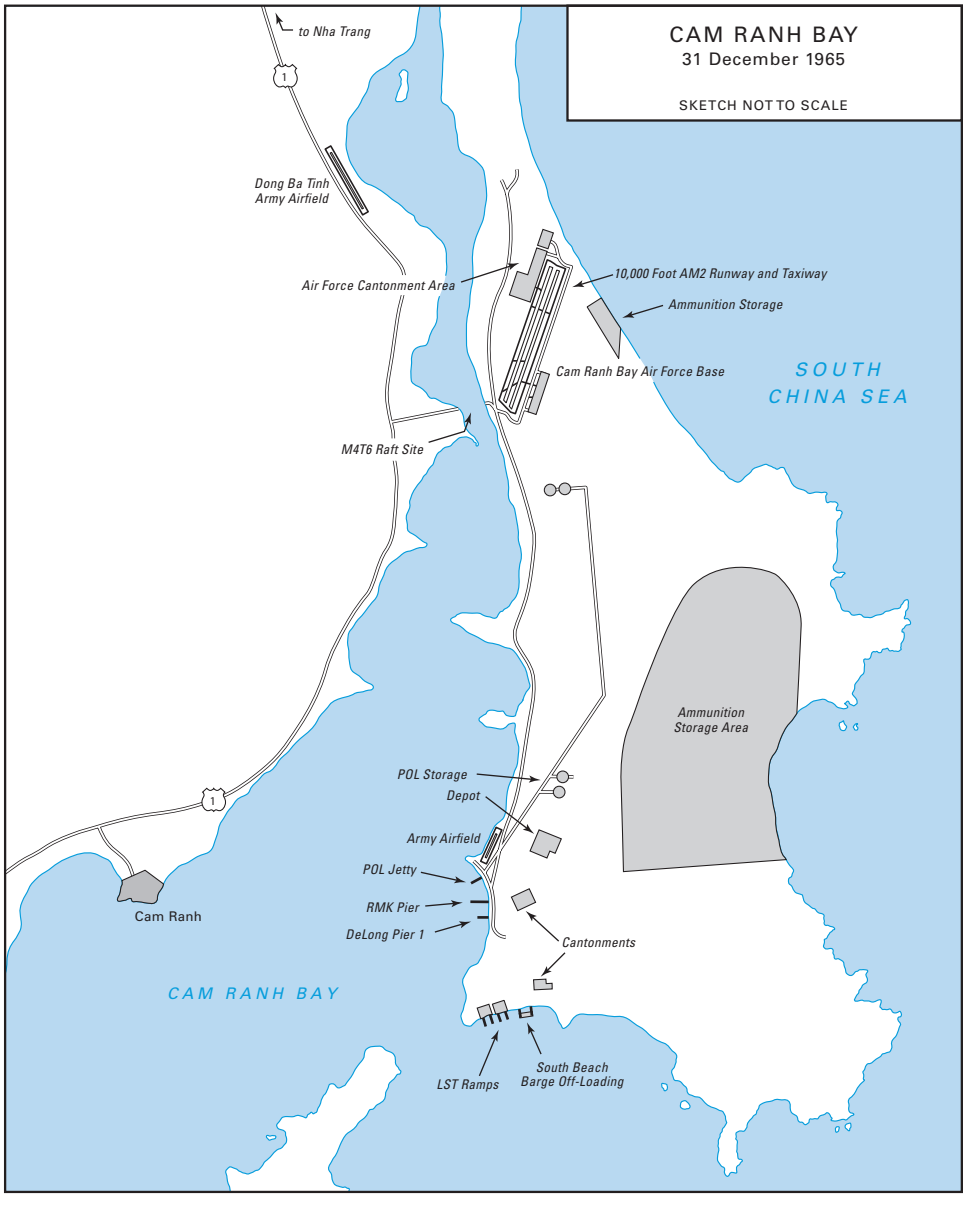
During the summer and fall of 1965, RMK completed a 10,000-foot AM2 aluminum matting expeditionary runway at Cam Ranh Bay on an all-sand subgrade. Based on lessons learned from the Seabees at the Chu Lai airfield, RMK paid attention to stabilizing the loose, granular particles before placing the rectangular aluminum honeycombed panels. Workers flooded the sand with sea water and compacted it with rubber-tired rollers. Following the compacting and grading with equipment borrowed from the 35th Group, the contractor applied a bituminous sealer, and in September began laying airfield matting. By 1 November 1965, the firm's deadline date, a runway, parallel taxiway, high-speed turnoffs, and a parking apron (totaling some 2.2 million square feet of aluminum matting and 1.3 million square feet of pierced steel planking) were ready. South Vietnam now had five airfields (Tan Son Nhut, Bien Hoa, Da Nang, Chu Lai, and Cam Ranh Bay, with a sixth, Phan Rang, under construction) that could handle jet fighters. RMK completed other facilities at the Cam Ranh air base and began preparations to add a second runway, a 10,000-foot concrete runway, before moving its workforce to help the depot projects in February 1966.[25] (*Map 1*)

The Buildup Quickens

While construction accelerated, the increases in the U.S. troop commitment during the summer imposed immediate manpower burdens on the engineers. Army planners had assumed that any augmentation to the existing force structure would come from the reserve components. In order to maintain a high degree of readiness, the Army kept a large proportion of combat formations in its active forces. Nearly one-half of the engineers and engineer equipment were in reserve units. When President Johnson decided in July not to call up the National Guard or Reserve units, the burden to furnish the engineer units fell on the active-duty force. This meant that nearly all the active combat and construction battalions in the United States would deploy to Vietnam. The training base would have to be

[24] *Arsenal for the Brave*, pp. 136–38.

[25] Tregaskis, *Building the Bases*, pp. 143–46, 148; USAF Airfield Construction in South Vietnam, July 1965–March 1967, Historical Division, Directorate of Information, Headquarters, Seventh Air Force (AF), n.d., pp. 110–12, copy in Historians files, CMH; Memorandum for the Record (MFR), MACJ02, sub: J–4 Briefing 2 Feb, Base Development at Cam Ranh Bay, 3 Feb 66, Historians files, CMH; C. M. Plattner, "The War in Vietnam: U.S. Air Buildup Spurs Base Construction," *Aviation Week & Space Technology* 84 (14 March 1966): 76; E. T. Lyons, "Aluminum Matting Runways in Vietnam," *Military Engineer* 58 (July-August 1966): 245.



Map 1

expanded and new units organized, equipped, and trained to meet future Vietnam deployments and worldwide commitments.[26]

With the increase in troop levels under way that summer, General Westmoreland asked for more engineer battalions. Before a deployment

[26] Ploger, *Army Engineers*, pp. 6, 8. For a list of active-duty engineer units in the United States and those deployed to Vietnam, see ibid., pp. 12–16.

conference convened at Pacific Command in early August, the MACV commander stated that he needed ten engineer battalions, five combat and five construction, excluding the organic battalions assigned to the 1st Infantry and 1st Cavalry Divisions. This number increased to twelve during the conference to meet an emergency requirement for more facilities. The Joint Chiefs of Staff approved this number, but before the end of the month Westmoreland added three more construction battalions to his request. This brought the total to fifteen, all needed in South Vietnam before the end of the year. Westmoreland pointed out that engineer units in country and scheduled for deployment still could not complete the required facilities before 31 December.[27]

The Army did what it could to meet Westmoreland's requirements. On 21 August, the Department of the Army informed MACV that five engineer combat and five construction battalions should be in Vietnam by December. By then, the Army had no choice but to deploy combat battalions as substitutes for the construction battalions, since all but two of the active-duty construction battalions in the United States had been deployed or alerted for duty in Vietnam. The only other active Army construction battalions were committed in Europe, Korea, Thailand, and other parts of the world. Approved mobilization plans included another eight construction and three combat battalions, but these units still needed to be manned, equipped, and trained. Accordingly, the Army nominated two of the nine remaining deployable engineer combat battalions in the United States for duty in Vietnam, and two more combat battalions became candidates to meet MACV's latest request. Deploying one of the two remaining construction battalions would round out the total of fifteen, which would not be reached until September 1966. In addition, the Army promised a light equipment company and a construction support company for two of the combat battalions. These two companies gave the combat battalions some comparable capabilities of two construction battalions. This, however, left the Army short of these types of companies in the United States.[28]

For the last year, the 70th Engineer Battalion (Combat) at Fort Campbell, Kentucky, had been readying itself for deployment. Because of its prolonged alert status, the 70th managed to avoid many of the manpower problems that plagued the construction battalions ordered to Vietnam. Lt. Col. Leonard Edelstein, the battalion commander, had almost all his key men on hand when the word came to deploy this first nondivisional engineer combat battalion, some 580 troops, arrived in mid-June. New standard road graders and the multifuel series of trucks had also reached the battalion.[29]

[27] Fact Sheet, Deputy Chief of Staff for Military Operations to Army Chief of Staff, 23 Aug 65, sub: COMUSMACV Requirements for Army Engineer Battalions, Historians files, CMH; Army Buildup Progress Rpt, 25 Aug 65, p. 35, CMH.

[28] Army Buildup Progress Rpts, 25 Aug 65, p. 35, and 1 Sep 65, pp. 36–37, CMH; Msg, DA 729240 to COMUSMACV, 21 Aug 65, sub: Army Engineer Battalions for RVN; Status of Deployment Spreadsheets, Incl to Memo, Dep CofS for Mil Opns for Army CofS, 4 Aug 65, both in Historians files, CMH.

[29] Ploger, *Army Engineers*, pp. 32–33; Galloway, "Essayons," pp. 29–30, 32; Quarterly Cmd Rpt, 1 Jul–30 Sep 65, 70th Engr Bn, 12 Oct 65, pp. 1–3, Historians files, CMH.

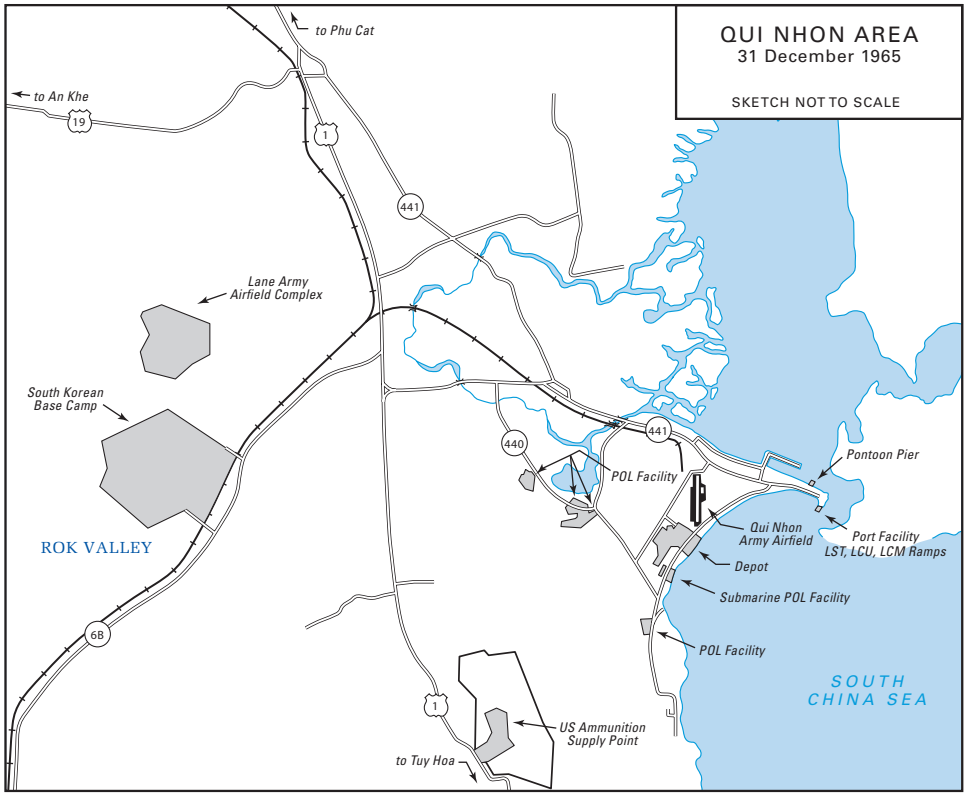
The battalion's destination was Qui Nhon. Equipment shipped out of the port of Mobile, Alabama, in mid-July arrived in Qui Nhon well before the main body, making the 70th one of the few engineer battalions of any type to find its equipment waiting on the shore. Troops followed a few weeks later. The advance party reached Qui Nhon on 16 August, and with the help of the 84th Engineer Battalion it moved the equipment to an assembly area. When the main body arrived on the nineteenth, operators moved vehicles and equipment to a base camp outside the city. Two days later, Companies A and C, escorted by security forces of the 1st Brigade, 101st Airborne Division, moved up Highway 19 to An Khe. There, the two companies helped launch the construction of a huge base camp for the 1st Cavalry Division, then en route and expected to arrive by mid-September. The rest of the battalion moved to An Khe a few weeks later.[30]

When the USNS *Mann* carrying the 70th Engineer Battalion reached Qui Nhon, it also disembarked the headquarters of the 937th Engineer Group (Combat) commanded by Col. Roland A. Brandt. The 937th Group assumed responsibility from the 35th Group for all projects and nondivisional engineer units in the northern II Corps area. From August until December, the group concentrated its efforts on Qui Nhon and An Khe with a smaller force at Pleiku. In Qui Nhon, the major emphasis was the development of the port, depot, and fuel storage facilities and the construction of a 400-bed hospital. At An Khe, the group supervised the 70th Battalion's work on the 20,000-man division base camp. By October, work had also started there on a 140-bed hospital and a second access road to Highway 19. In December, the engineers launched a major self-help effort to build a cantonment of the tropical-type wooden buildings to house the division and its support units. By the end of the year, group units were also building facilities for U.S. units at Pleiku. The 937th Group also supported the development of the Republic of Korea (ROK) Capital Division's base camp in an area dubbed ROK Valley approximately twelve and a half miles west of Qui Nhon.[31]

September marked the arrival of the second nondivisional engineer combat battalion, the 19th from Fort Meade, Maryland. The battalion, commanded by Lt. Col. Amos C. Mathews, disembarked at Qui Nhon on 2 September and moved into the 70th Engineer Battalion's former base camp outside the city. Priority to offload the 1st Cavalry Division, which arrived at the same time, caused delays getting the battalion's equipment ashore. By the end of the month, the battalion began to work on several construction projects. These included the expansion and improvement of the ammunition depot and taking over the construction of a 50,000-barrel petroleum storage area and refueling facility from the 70th Engineer Battalion. The 19th also helped South Korean

[30] Ploger, *Army Engineers*, pp. 33, 75; Galloway, "Essayons," pp. 29–30, 32; Quarterly Cmd Rpt, 1 Jul–30 Sep 65, 70th Engr Bn, pp. 1–3.

[31] Quarterly Cmd Rpts, 1 Jul–30 Sep 65, 937th Engr Gp, 15 Oct 65, pp. 2–5, and 1 Oct–31 Dec 65, 937th Engr Gp, 15 Jan 66, pp. 2–5, both in Historians files, CMH; Ploger, *Army Engineers*, pp. 75–78; Galloway, "Essayons," pp. 25, 27, 29, 32; *The Logistics Review, U.S. Army, Vietnam, 1965–1969*, vol. 7, *Engineering Services System*, (U.S. Army, Vietnam, n.d.), pp. T-46, T-48 (hereafter cited as Logistics Review, USARV, vol. 7, Engineering Services System).



MAP 2

engineers build access and perimeter roads for the Capital Division's base camp. Before the end of the year, the battalion completed a macadam heliport for fifty UH–1 helicopters, a maintenance area, and a cantonment for two U.S. Army aviation companies at Lane Army Airfield near the Korean camp. Like the 70th Engineer Battalion at An Khe, the 19th found itself doing work typically done by a construction battalion. To help carry out its work, the 19th was supported by the 509th Engineer Company (Panel Bridge) from Fort Riley, Kansas, which arrived about the same time. When the bridge company's vehicles reached Qui Nhon the following month, the unit was used as a dump truck company.[32] (*Map 2*)

The fifth Army construction battalion ordered to Vietnam, the 46th from Fort Leonard Wood, had its destination changed from Qui Nhon to the Saigon area. Its primary mission would be to turn Long Binh Plantation, a formerly cleared area now overgrown with scrub jungle fifteen miles northeast of Saigon on Highway 1A, into a major logistics base. Upon disembarking at Vung Tau on 27 September, the battalion, commanded by Lt. Col. George G. Hagedon,

[32] Galloway, "Essayons," p. 36; Quarterly Cmd Rpts, 1 Jul–30 Sep 65, 19th Engr Bn, 15 Oct 65, p. 2, and 1 Oct–31 Dec 65, 19th Engr Bn, 31 Dec 65, pp. 2–3, both in Historians files, CMH.

took control of Company D, 84th Engineer Battalion, and the work in the port. The 46th's Company D proceeded to Qui Nhon to replace the 84th's Company D. Within a few weeks, the companies were exchanged—Company D of the 46th became Company D of the 84th and Company D of the 84th became Company D of the 46th. This exchange would recur in Vietnam to avoid moving two like units over long distances to their parent units. By 4 October, the 46th completed its move to Long Binh, built its base camp, and began its first major construction project, a 400-bed facility for the 93d Evacuation Hospital. Next, the battalion built a tactical operations center for the arriving 1st Division at Di An several miles to the west, several tropical buildings for the MACV flight detachment at Tan Son Nhut, and a large ammunition storage area at Long Binh covering some eight and a half square miles. To keep up the high pitch of construction, the battalion worked two 10-hour shifts, seven days a week with the men getting off an average of two and a half days per month. However, the departure of many experienced equipment operators and other troops due to separation from service and retirement made it difficult to maintain two shifts. Only a few replacements arrived, and by the end of the year the battalion was 164 men below its authorized strength of 895. Hiring 325 Vietnamese workers helped somewhat.[33]

Supply Deficits

From the outset, shortages of materials slowed the construction effort. The underdeveloped economy of Vietnam forced logisticians to import most construction items. Initially, lumber, airfield matting and membrane, DeLong piers, generators, and prefabricated buildings were all scarce. These items, except lumber, required long lead times. Although sand, rock, and gravel could be obtained in Vietnam, the initial paucity of quarries in secure areas and the scarcity of crushing and screening equipment had forced the engineers to consider even importing crushed rock. As early as December 1964, U.S. Army, Pacific, proposed pre-positioning lumber, barbed wire, airfield matting, and other construction stocks within a few days' sailing time of Vietnam. In Washington, the chief of engineers prepared several estimates of construction materials needed to support the buildup in Southeast Asia. The engineers recommended $70 million in obligating authority to buy and place additional materials in Vietnam. The Joint Chiefs of Staff passed the proposal on to Pacific Command, but the command requested only $10 million. This measure, authorized in April 1965, proved too little and too late when the 35th Engineer Group arrived at Cam Ranh Bay two months later. Although the 1st Logistical Command had submitted requisitions, the depots in Okinawa did not receive significant deliveries of material until December. Only small quantities of plumbing and electrical components arrived. Meanwhile, the 35th Group pressed the logistical command for urgently needed stores of timber and cement. Instead of waiting for supplies from the United States,

[33] Ploger, *Army Engineers*, pp. 79–81; Galloway, "Essayons," pp. 48–49, 51; Quarterly Cmd Rpt, 1 Oct–31 Dec 65, 46th Engr Bn, 13 Jan 66, pp. 1–4, Historians files, CMH.

the command placed orders with the procurement office at U.S. Army, Japan, for offshore acquisition in the Far East. When the requirement for electrical generators, ranging in size from 100 to 1,500 kilowatts, came up, these, too, were purchased in Japan.[34]

All units complained about not getting the right amount of construction materials. According to Colonel McCulloch, shortages of lumber, nails, plumbing and electrical fixtures, and reinforcing bar put his 87th Engineer Battalion at Cam Ranh Bay well behind schedule. In Qui Nhon, Colonel Mathews' 19th Engineer Battalion started work on the fuel storage facility on 7 September only to be hamstrung by shortages of culvert, steel tanks, piping, and fittings. The steel tanks did not arrive until early December. Shortages of culvert also held up roadwork and heliport construction at the South Korean camp outside Qui Nhon. Rain-damaged bags of cement were issued by the 82d Engineer Supply Point Company to the 19th with the admonition "take it or leave it." The 62d Engineer Battalion reported a loss of 294 platoon days at Phan Rang because of shortages of cement, culvert, and matting. At Long Binh, Colonel Hagedon complained of shortages of cement, nails, hinges, plywood, lumber, screening, and culvert. Projects, especially the 400-bed hospital, were held up because of the lack of cement.[35]

Under these conditions, engineers made use of whatever they could get their hands on. Maximum use was made of locally available materials. Expedients were common solutions. For example, the 46th Engineer Battalion substituted napalm cylinders for culvert, and the 19th Engineer Battalion welded fifty-five-gallon drums and also used napalm cylinders. The 84th Engineer Battalion resorted to applying boat oil to control dust. Some materials such as airfield matting came from different manufacturers and did not match. At Phan Rang, the 62d Engineer Battalion found that M8 airfield matting used in the parking areas had slight dimensional variations which, multiplied over several rows, caused improper seating of the bayonet lugs. This problem was solved by welding and banding the bayonet lugs under the locking slot.[36]

From both an equipment and construction material outlook, rock-producing quarries had become a critical concern. When the engineers arrived, they found only a few old French rock quarries in operation. It did not take long to realize that rock was a scarce and critical resource in a country where much of the terrain was sandy and marshy. Since construction of the base

[34] Interv, Schiller with Duke, 3 Jan 66, p. 29; JLRB, Monograph 6, *Construction*, pp. 161, 163, 165–66; Special Operational Report–Lessons Learned (ORLL), 1 Jan–31 Oct 65, DA, 23 Aug 66, incl. 3, pp. 3–4, Historians files, CMH; Msg, DA 709720 to CINCUSARPAC [Commander in Chief, United States Army, Pacific], 2 Apr 65, sub: Stockpiling Construction Materiel and Equipment, Historians files, CMH; Quarterly Cmd Rpt, 1 Apr–30 Jun 65, 35th Engr Gp, p. 2.

[35] Quarterly Cmd Rpts, 1 Jul–30 Sep 65, 87th Engr Bn, p. 6, 1 Jul–30 Sep 65, 84th Engr Bn, p. 2, 1 Oct–1 Dec 65, 19th Engr Bn, pp. 2, 4–5, 1 Oct–31 Dec 65, 62d Engr Bn, p. 8, and 1 Oct–31 Dec 65, 46th Engr Bn, p. 3.

[36] Quarterly Cmd Rpts, 1 Oct–31 Dec 65, 19th Engr Bn, p. 3, 1 Oct–31 Dec 65, 62d Engr Bn, p. 5, 1 Jul–30 Sep 65, 84th Engr Bn, pp. 1–2, and 1 Oct–31 Dec 65, 46th Engr Bn, 13 Jan 66, p. 3; Section III, Lessons Learned, 19th Engr Bn, 13 Mar 66, p. 3, Incl to Command Rpt for Quarterly Period Beginning 1 October 1965, 31 Dec 65, Historians files, CMH.

complexes and roads depended on adequate supplies of rock for base course foundations and concrete, one of the first things the engineers did was to find a source of rock and set up quarries and crusher sites. This the 864th Engineer Construction Battalion did at Cam Ranh Bay by reopening an abandoned quarry used earlier by RMK. Outside Qui Nhon, the 84th Engineer Construction Battalion found a quarry site but had to build three miles of access roads to get to it. To speed up production, the 84th built a makeshift plant to feed the crusher. Using dunnage from cargo vessels in the harbor, the resourceful quarrymen built a lumber retaining wall. Then they covered it with a salvaged 2½-ton dump truck bed with attached channel beams and pierced steel planks to provide a funnel onto the feeder of the crusher. This improvised plant became the highest volume producer of crushed granite in South Vietnam until contractor plants reached heavy production levels in late 1966.[37]

Meanwhile, the Army made an effort to get more rock crushers to Vietnam. On 19 October, fifteen sets (thirteen 75-ton-per-hour and two 225-ton-per-hour) of quarrying and crushing equipment were authorized for shipment. Both 225-ton-per-hour sets were undergoing rebuilding at the Granite City, Illinois, depot. The first set was expected to reach Vietnam by the end of January 1966 and the second by the end of March. Five of the 75-ton-per-hour sets were ready for shipment except for two 100-kilowatt generators per crusher. These generators were being purchased.[38]

The Navy's construction material stock position before the buildup fared somewhat better. Of the established pre-positioned war reserve requirements for forward bases, the Navy had 51 percent already available in stockage, known as the Advanced Base Functional Components System. Developed by the Navy in World War II to meet the needs of the island-hopping campaign in the Pacific, this functional components system provided deploying naval engineer units with material or prefabricated packages of components to build complete overseas facilities. In Vietnam, the 30th Naval Construction Regiment at Da Nang oversaw supplies and construction materials for four Seabee battalions and two Marine Corps engineer battalions.[39]

Like the Navy, the Army had a program known as the Engineer Functional Components System. Developed during the Korean War, the Army's system consisted only of data published in three technical manuals (5–301, 5–302, and 5–303), which provided staff guidance, plans, construction details, and bills of materiel for the specific buildings and facilities. The Army intended to use the system as a basic planning guide based on building blocks for constructing bases in a theater of operations. The data in the manuals could be used to order and construct individual buildings or facilities or even an entire installation in a single requisition.[40]

[37] Ploger, *Army Engineers*, pp. 44, 48, 123–24.

[38] Army Buildup Progress Rpt, 3 Nov 65, p. 56, CMH.

[39] For a full description of the Navy's functional components system, see JLRB, Monograph 6, *Construction*, pp. 26, 33, 163–64, 172, 183, and B-3 to B-6.

[40] Ibid., p. 33; Dunn, *Base Development*, pp. 47, 115–16.

The Army found the Engineer Functional Components System unsatisfactory in Vietnam and would end its use in late 1966. Although the engineer system saved a certain amount of preparation in compiling long, complicated bills of materials and thousands of separate requisitions, it did not include many required facilities. The design criteria also did not turn out to be compatible with requirements. All the structures in the system were wooden and designed for a temperate climate as opposed to tropical Vietnam. Modifications were allowed when requesting materials for individual structures. Corrugated steel roofing replaced the tar paper called for in the specifications. The locally adapted tropical-type buildings also needed more screening. However, if a single requisition for an entire installation went forward, an entire bill of materials including insulation, roofing felt, and tar paper arrived, for depots in the United States did not stock the materials as sets. Instead, some depots only carried certain components. Pallets of lumber, crates of nails, and electrical and plumbing fixtures arrived in bulk, making identification with a specific project a major problem. Material lists were not updated to meet current construction practices. Old designs still included World War II–vintage electrical wiring known as knob and tube wiring and incandescent light fixtures instead of fluorescent. Design standards also turned out to be lower than those adopted for Vietnam. This resulted in excesses of component items and shortages of requested modified items.[41]

The Navy appeared more satisfied with its system. During the buildup in Vietnam, the Seabees and contractor used many elements of the Advanced Base Functional Components System. Despite some degree of obsolescence, the components system provided the Navy the building blocks for the planning and construction of bases ashore. An example of construction with the Advanced Base Functional Components System was the Da Nang Hospital built almost entirely of Quonset huts.[42]

The Air Force looked to the Army and Navy to provide the bulk of materials and construction forces to build airfields in Southeast Asia. The Navy administered the procurement of materials for the contractor before the buildup under the Military Assistance Program and Air Force construction funds later. Since contingency plans did not call for additional major air bases in Vietnam, Army engineer units faced difficulties in getting sufficient quantities of airfield matting. Air Force civil engineers and construction squadrons deploying to Vietnam also required materials for base maintenance and construction. To meet the supply needs of the first two Red Horse squadrons (Rapid Engineering Deployment and Heavy Operational Repair Squadron,

[41] Dunn, *Base Development*, pp. 47, 116–18; JLRB, Monograph 6, *Construction*, pp. 166–67; Logistics Review, USARV, vol. 7, Engineering Services System, p. T-49. For an analysis of the Engineer Functional Components System, see Engr Studies Ctr Rpt no. 159, Analysis of the EFCS [Engineer Functional Components System], Jun 67, Historians files, CMH.

[42] Edwin B. Hooper, *Mobility, Support, Endurance: A Story of Naval Operational Logistics in the Vietnam War, 1965–1968* (Washington, D.C.: Naval Historical Division, Department of the Navy, 1972), pp. 37, 75, 170; Merdinger, "Civil Engineers, Seabees, and Bases in Vietnam," p. 244.

Engineering), due to arrive in early 1966, the Air Force Logistics Command assembled supply packages of lumber, cement, pipe, and other materials, which later deploying squadrons took with them. Although base supply offices requisitioned additional materials, they could not keep up with the demand.[43]

Although the Air Force depended on the Army and Navy to do major construction, the air service also developed construction support packages for its bases. The priority of effort went to operational facilities—runways, ramps, taxiways, and facilities to support weapons systems, followed by maintenance facilities. "Grey Eagle" supply kits airlifted to Vietnam contained minimum support equipment such as tents, electric generators, portable runway lights, and vehicles. In June 1965, the Air Force also contracted for inflatable shelters that could be erected quickly and easily to provide enough covered space for maintenance of fighter aircraft, critical components, ground equipment, ammunition, and war readiness materiel. When more permanent operational facilities were completed, base civil engineers turned their attention to building more permanent administrative and living facilities. They replaced tents with barracks and the portable generators with permanent generating plants.[44]

The key to much of the early construction in Vietnam was keeping engineer equipment in operation. It did not take long for breakdowns in equipment to occur under heavy use. Unlike other units in country, engineers typically operated on a two-shift schedule, approximately twenty hours a day. While a tank ran three or four hours a day, a bulldozer ran much longer, with little time out for maintenance. Heavy use—especially of bulldozers, scoop loaders, and five-ton dump trucks—led to breakdowns, with equipment remaining inoperative for long periods because of poor resupply of repair parts. By November 1965, the wear and tear, humidity, sand, and the lack of spare parts were affecting engineer operations. Of 1,218 pieces of Army construction equipment in country, 190 had been deadlined (down for repairs) for more than seven days.[45]

Units that had only fifteen days of repair parts in stock and no provision for automatic resupply soon faced critical shortages. The 510th Engineer Direct Support Maintenance Company arrived at Cam Ranh Bay in June 1965 without its stockage of repair parts. The unit remained ineffective until stocks began to arrive some ninety days later. The 70th Engineer Battalion, which arrived at Qui Nhon with only fifteen days' stockage plus a few extra parts, saw its readiness drop to a little more than 50 percent in forty-six days because of the lack of replacement parts and maintenance support units. Five of seven TD20 bulldozers were down as well as fifteen of the battalion's thirty-nine

[43] JLRB, Monograph 6, *Construction,* pp. 163–64, 172; Contemporary Historical Evaluation of Combat Operations (CHECO) Rpt, Pacific Air Forces (PACAF), Project RED HORSE, pp. 9–10, copy in Historians files, CMH.

[44] John Schlight, *The War in South Vietnam: The Years of the Offensive, 1965–1968*, United States Air Force in Southeast Asia (Washington, D.C.: Office of Air Force History, United States Air Force, 1988), p. 169; *Department of Defense Annual Report for Fiscal Year 1965* (Washington, D.C.: Government Printing Office, 1967), p. 336.

[45] Dunn, *Base Development*, pp. 120–21; Ploger, *Army Engineers*, pp. 50, 201–02; Quarterly Cmd Rpts, 1 Jul–30 Sep 65, 18th Engr Bde, 15 Oct 65, pp. 9–10, Historians files, CMH, and 1 Jul–30 Sep 65, 70th Engr Bn, p. 3.

dump trucks. When the 19th Engineer Battalion was informed that no spare parts were available in Vietnam for seven new HD16 bulldozers scheduled for issue to the unit before its departure from the United States, the 19th elected to take its old TD18 bulldozers. But three of the older bulldozers were inoperative when offloaded in Qui Nhon, and spare parts were unavailable. Due to their age, the TD18s became a perpetual maintenance problem. It did not help that the 578th Engineer Direct Support Company only reached Qui Nhon in late November, five months after the first two construction battalions. Worse, U.S. Army, Vietnam, did not have a heavy maintenance capability in the command or depot stocks to borrow equipment for use as "floats." The command did not expect the first two engineer heavy-equipment maintenance companies to reach Vietnam until the end of 1966.[46]

To compensate, Army Materiel Command began assembling special push packages of spares for airlift to Vietnam. A special sixty-day shipment was flown to Qui Nhon and Cam Ranh Bay in July when construction equipment began breaking down. Washington took a similar action to get electrical generators to Vietnam. Although a thirty-day shipment of engineer repair parts reached Saigon on 19 October, it proved to be only partially effective in removing equipment from deadline. Assemblies and components, such as torque converters, engine clutches, radiators, and axles, were in greater demand than repair parts.[47]

The rate of equipment down for repairs continued to worsen as 1965 drew to a close. In early December, the Army reported 36 percent or 49 of the 136 bulldozers in Vietnam were deadlined. The shortage of repair parts became so serious that in December, following one of his visits to Vietnam, Secretary McNamara authorized an emergency airlift system known as the Red Ball Express. The engineers took advantage of this rapid delivery system, and complete bulldozer tracks and other heavy items seemingly inappropriate for airlifting across the Pacific were soon being delivered. This around-the-clock, seven-day-a-week operation helped to get at least some equipment back into operation. Sometimes parts arrived within ten days after requisitioning. Still, by late February 1966, the engineers' deadline rate remained high—23.5 percent or 445 out of 1,852 pieces of equipment were inoperative.[48]

[46] Quarterly Cmd Rpts, 1 Jul–30 Sep 65, 18th Engr Bde, pp. 9–10, 1 Oct–31 Dec 65, 18th Engr Bde, 18 Jan 66, p. 9, 1 Jul–30 Sep 65, Historians files, CMH, 1 Jul–30 Sep 65, 19th Engr Bn, pp. 4–5, 1 Jul–30 Sep 65, 70th Engr Bn, p. 3; Special ORLL, 1 Jan–31 Oct 65, DA, incl. 3, p. 17; Situation Report of Engineer Equipment in South Vietnam, incl. 17, and Ltr, Commanding General (CG), 18th Engr Bde to CG, 1st Log Cmd, sub: Engineer Maintenance Support, 13 Jan 66, incl. 17, tab B, Office of the Chief of Engineers (OCE) Liaison Officer Trip Rpt, no. 1, 15 Mar 66, OCE Historical Ofc, Fort Belvoir, Va.; Msg, CG, USARV AVD-MD 50482 to CINCUSARPAC, 6 Feb 66, sub: High Mortality of Engineer Construction Equipment and MHE [materials handling equipment], box 11, 69A/702, RG 319, NARA.

[47] *Arsenal for the Brave*, pp. 209–11; Army Buildup Progress Rpt, 2 Mar 66, p. 56, CMH; Trip Rpt, Special Assistant to the Chief of Staff for Supply and Maintenance, 17 Dec 65, p. 2–1, Historians files, CMH.

[48] *Arsenal for the Brave*, pp. 253–54; Heiser, *Logistic Support*, pp. 50, 176; Ploger, *Army Engineers*, p. 69; Dunn, *Base Development*, p. 122; Special ORLL, 1 Jan–31 Oct 65, DA, incl. 3, p. 17; Situation Rpt on Engr Equipment in South Vietnam, incl. 17, tab A, OCE Liaison Officer

Among the most recalcitrant pieces of equipment were bulldozers. In January 1966, Army engineers in Vietnam had twelve makes and models, and less than 20 percent of the bulldozers had been removed from deadline status through Red Ball–furnished repair parts. The problem was this: at the beginning of the buildup, the Army had found it difficult to come up with enough engineer equipment to meet the requirement of its units. Consequently, bulldozers, scrapers, and cranes of several makes and varieties, including hard-to-support Korean War–vintage items, were drawn from depots and active and reserve units throughout the United States and shipped to Vietnam. The diversity of repair parts required by this equipment created a logistical nightmare. At the end of January, the deadline rate for bulldozers in Vietnam had risen to 47 percent. While there were plans to reduce the number of makes and models to three, with preference to the Caterpillar D7, the D7s would not be shipped before the summer. As an interim measure, the Army Materiel Command sent over 118 Allis Chalmers HD16Ms. Recognizing that another make and model complicated the repair parts problem, officials recommended that the Allis Chalmers be used only in the Cam Ranh Bay area. Requirements in Vietnam were such, however, that the HD16Ms had to be split between Cam Ranh Bay and Saigon. It was summer before the bulldozer deadline rate dropped below 25 percent.[49]

A New Engineer Brigade

Between June and September 1965, all nondivisional Army engineer units came under the command of Colonel Duke's 1st Logistical Command. Planning for Army construction centered in the command's small Engineer Office, which in May was transferred from the support command following the activation of the logistical command. During August, the Engineer Office, staffed with seven assigned officers augmented by temporary duty soldiers of the 539th Engineer Detachment (Control and Advisory) on Okinawa, concentrated on preparing the Army's construction program in Vietnam, acquiring real estate, coordinating construction work done for the Army by civilian firms, overseeing facilities engineering, and requisitioning construction materials. Lt. Col. Floyd L. Lien, who became command engineer in August, found himself in an unusual position of directing the work of the 35th and 937th Engineer Groups, both commanded by colonels.[50]

Colonel Hart also found himself in an unusual position soon after his 35th Engineer Group set up shop at Cam Ranh Bay. Colonel Duke charged him with the added responsibility of establishing the Cam Ranh Bay Logistical

Trip Rpt no. 1, 15 Mar 66; Msg, CG, USARV AVD-MD 50482 to CINCUSARPAC, 6 Feb 66, sub: High Mortality of Engineer Construction Equipment and MHE.

[49] *Arsenal for the Brave*, pp. 248–52; JLRB, Monograph 6, *Construction*, p. 181; MACV History, 1966, p. 282.

[50] Ploger, *Army Engineers*, pp. 5, 65; Galloway, "Essayons," p. 19; History, 539th Engr Det, 1965, p. 14; JLRB, Monograph 6, *Construction*, p. 23; Interv, Schiller with Duke, 3 Jan 66, p. 24; Interv, Maj John F. Schiller, 15th Mil Hist Det, with Lt Col Floyd L. Lien, Engineer, 1st Log Cmd, 7 Aug 66, VNIT 29, pp. 1–9, CMH.

Area and commanding all the logistical troops in the vicinity. Colonel Hart and his staff took on other functions ranging from mail, chaplain, and medical services; overseeing a military police detachment; and establishing and operating depots for all supplies. This arrangement lasted for the better part of three months until the 504th Quartermaster Depot arrived and took over logistical support for the area on 7 August.[51]

The decisions to send more American troops in the summer of 1965 included the newly activated 18th Engineer Brigade. A brigade headquarters seemed appropriate because of the growing number of engineer units. During the late summer of 1965, the 18th Engineer Brigade prepared for its move to Vietnam. Under its acting commander, Col. C. Craig Cannon, the brigade's Headquarters Company assembled at Fort Bragg. Most of the 34 officers and 110 enlisted men came from the 159th Engineer Group (Construction) alerted earlier for deployment. A small advance party led by Colonel Cannon reached Saigon on 3 September, and the brigade's main body followed on the twenty-first. The headquarters settled in several former U.S. Operations Mission buildings next to Tan Son Nhut Air Base. Nondivisional units placed under 18th Brigade control consisted of the 35th and 937th Groups, four construction (62d, 84th, 87th, and 864th) and two combat (19th and 70th) battalions, and nine separate companies—altogether over 6,200 men. Before the end of the month, the brigade assumed operational planning and supervision for forty-four construction projects at nine separate locations in II, III, and IV Corps.[52]

In the meantime, the Army selected an engineer general officer to command the 18th Brigade. General Harold K. Johnson, the Army chief of staff, advised Westmoreland that "in view of the monumental tasks confronting this brigade and to provide the requisite skill and experience I feel that a brigadier general should command it." Westmoreland readily agreed and placed the brigade directly under U.S. Army, Vietnam (USARV), the successor headquarters of the U.S. Army Support Command. Although Westmoreland also assumed command of USARV, General Norton, who became deputy commanding general, ran the command on a day-to-day basis. The MACV commander decided not to place the brigade under the 1st Logistical Command because he believed the latter already had enough problems associated with the logistical buildup. In addition, a large share of the brigade's effort would be supporting the Air Force, and Westmoreland wanted a general officer to coordinate and negotiate priorities at a senior level. Late in the evening of 12 August, Lt. Gen. William F. Cassidy, the chief of engineers, called the recently promoted

[51] Ploger, *Army Engineers*, p. 41; 1st Lt Wallace R. Wade, Spec Charles Miele, and Spec Edward C. Swab, A History of Cam Ranh Bay Through June 1966, Cam Ranh Bay Sub Area Cmd, Nov 66, p. 86, box 18, 70A/782, RG 334, NARA.

[52] Msg, DA 723668 to COMUSMACV, et al., 14 Jul 65, sub: Deployments to RVN, Historians files, CMH; Ploger, *Army Engineers*, pp. 63–69; Quarterly Cmd Rpt, 1 Jul–30 Sep 65, 18th Engr Bde, 15 Oct 65, pp. 1–6, Historians files, CMH; Interv, Lt Col Lewis C. Sowell Jr. with Maj Gen Robert R. Ploger, 21 Nov 78, sec. 8, pp. 2–3, Senior Officer Oral History Program, U.S. Army Military History Institute (MHI), Carlisle Barracks, Pa.; Ltr, Ploger to Office, Chief of Engineers, n.d., Historians files, CMH.

General Ploger
(shown as major general)

Brig. Gen. Robert R. Ploger and informed him that he would command the 18th Brigade.[53] The surprised Ploger, who had just become the New England Division Engineer, was given short notice to rendezvous with the advance party. He arrived in Saigon on 5 September.[54]

Not all nondivisional engineers were assigned to the 18th Brigade. When General Norton asked Ploger to prepare a letter of instruction to assign engineer units and missions, the question of engineer maintenance and supply units came up. Ploger did not argue against assigning these units to the 1st Logistical Command. He knew that the Army was undergoing a reorganization to transform technical service maintenance and supply units into functional organizations. Besides, he felt he already had enough to handle, and preferred to attack supply and maintenance problems from a position of control but not operational responsibility. The 1st Logistical Command Engineer retained facilities engineering responsibilities, mainly overseeing Pacific Architects and Engineers and utilities detachments, and served as the clearinghouse for the command's construction requirements.[55]

When General Ploger reported for duty, General Norton agreed that the 18th Brigade commander should hold the dual responsibility of 18th Engineer Brigade commander and U.S. Army, Vietnam, engineer. Such an arrangement eliminated the need for duplicate staffs at brigade and the USARV headquarters and conserved scarce manpower resources. Holding both offices gave Ploger procurement and management authorities and put him in an ideal

[53] General Ploger received his commission in the Corps of Engineers upon graduating from the U.S. Military Academy in 1939. During World War II, he served as commander of the 129th Engineer Battalion, 29th Infantry Division, which participated in the D-Day assault on Omaha Beach and in later operations in France and Germany. Subsequent assignments included staff positions in Washington, D.C.; liaison work with the Atomic Energy Commission; engineer district work on Okinawa; and command of an engineer group at Fort Lewis, Washington. Interv, Sowell with Ploger, 16 Nov 78, sec. 7, p. 32.

[54] Ploger, *Army Engineers*, p. 63; Msg, Gen Johnson WDC 6543 to Westmoreland, 2 Aug 65 (quotation); Msg, Lt Gen John L. Throckmorton, Dep COMUSMACV MAC 3994 to Westmoreland, 5 Aug 65; Msg, Westmoreland HWA 2069 to Gen Johnson, 6 Aug 65, all in Westmoreland Message files, CMH.

[55] Interv, Maj Roy Bower, 26th Mil Hist Det, with Maj Gen Robert R. Ploger, CG, Engr Cmd, Vietnam, 8 Aug 67, VNIT 89, pp. 5–6, CMH; Quarterly Cmd Rpt, 1 Oct–31 Dec 65, 1st Log Cmd, 19 Feb 66, p. 14, Historians files, CMH.

position to oversee the allocation of equipment and material resources. He transferred several officers from the brigade to the small USARV Engineer Office, which up until then consisted of Lt. Col. Andrew Gaydos and one or two enlisted men. The brigade staff absorbed the bulk of engineer staff matters. Ploger assigned Col. William W. Watkin, who had just arrived in country, as his deputy at USARV headquarters. Colonel Cannon, the deputy brigade commander, ran the day-to-day operations at the brigade. This dual-hatted role idea would be adopted by several other senior staff officers. In time the surgeon, the provost marshal, and the aviation officer commanded brigade-size troop units.[56]

General Ploger's first major act was to draft a blueprint to carry out the rapidly expanding construction load and other support requirements. Following a suggestion made by General Norton, Ploger on 7 October issued a one-page policy statement entitled "Our Objectives and Standards." The document emphasized the brigade's purpose: to serve the combat forces and support the "man with the rifle." Ploger also admonished his commanders and staff to make sure that drainage, roads, and associated utilities were included in project design and construction. Brigade units would devote their primary efforts to the needs of others. Improvements to engineer camps were never to be refined beyond those of the units they supported.[57]

General Norton also suggested that Ploger present the engineer picture to the MACV commander. On 4 November, Ploger briefed General Westmoreland on the brigade's construction program. He reported that Army projects for fiscal years 1965 and 1966 totaled some 170 battalion-months, a battalion-month comprising the expected outcome of either one construction battalion or one combat battalion plus a light equipment company. These figures did not include work to be done for the Air Force. At this time, the brigade consisted of 7,900 officers and men, or the equivalent of 8.4 battalions. This magnitude of work when compared to the brigade's capability meant that almost two years would be required to complete its projects, provided the brigade did not commit troops to the support of tactical operations, a very unlikely prospect.[58]

Ploger highlighted several factors affecting engineer priorities. Primary support would go to the tactical forces followed by building the logistical facilities. The construction effort would meet the minimum needs of units, then gradually improve the living conditions in the base camps. Besides the backlog of work, the engineers faced other problems, including shortages of construction material, breakdowns of equipment, complex real estate arrangements, and peacetime construction procedures in a war zone. "The inescapable conclusion," Ploger remarked, "is that engineer operations in the foreseeable future will be a continuous allocation of shortages."[59]

[56] Ploger, *Army Engineers*, pp. 86–87; Interv, Sowell with Ploger, 21 Nov 78, sec. 8, pp. 6–7; Quarterly Cmd Rpt, 1 Jun–31 Aug 65, USARV, 15 Nov 65, p. 12, Historians files, CMH.

[57] Ploger, *Army Engineers*, pp. 65, 67 (quoted words, p. 65). A copy of this statement is on p. 219.

[58] Ibid., pp. 67, 201. A copy of this briefing is on pages 199–204.

[59] Ibid., pp. 201–04 (quotation, p. 204).

In concluding his briefing, Ploger emphasized priorities and standards of construction. Since a substantial portion of the work dealt with building troop cantonments, he pointed out that commanders should follow six prescribed levels of physical improvement. These ranged from Standard 1, no site preparation, to Standard 5, modified, which would include buildings and waterborne sewage systems. Standard 2 called for leveling sites for the camps and building roads while troops put up their own tents. Standard 3 added floors and wooden frame buildings for kitchens, administration, storehouses, infirmaries, and bath houses; electrical distribution to the buildings; and, piped water from a storage tank. Standard 4, which Ploger recommended as the current objective for cantonment construction, improved the tents with the addition of wood frames and electrical distribution throughout the camp. If units expected to remain at the same location for more than twelve months, buildings could be added under Standard 5.[60]

Westmoreland concurred with the gradual upgrading to Standard 4 and a priority list that Ploger submitted during the briefing. The fifty-five (later fifty-nine) priority categories ranged from immediate tactical and operational requirements to less urgent but still required items. Essential and basic tasks, such as clearing and grubbing of troop areas, field fortifications, and clearing of fields of fire around defense perimeters, topped the list. Water supply points, ramps for landing craft, airstrips, roads and hardstands at ports, hospitals, ammunition storage areas, and communications facilities came next. At the bottom of the list were officer billets and chapels. His rationale regarding the inclusion of chapels was to make sure they were not left out. Initially mess halls and service clubs could be used for religious assemblies. He also requested that the MACV commander admonish all commanders that they must lower their expectations at least for the time being. Instead, the troops should be encouraged to do as much cantonment construction as possible through self-help on a gradual scale of upgrading and not to rely entirely on engineers. Westmoreland agreed and advised his senior commanders of these points during meetings.[61]

Ploger presented the same briefing to other commanders in late 1965 and early 1966. He briefed Maj. Gen. Stanley R. Larsen, commander of Field Force, Vietnam (the tactical headquarters set up at Nha Trang by General Westmoreland in September 1965 to command and control U.S. Army combat units in II Corps), and Maj. Gen. Jonathan O. Seaman, commander of the 1st Infantry Division, informing them where things stood and trying to gain their agreement to keep construction to the essentials. Since he began to travel extensively to check on progress and lend encouragement to engineer soldiers, Ploger checked for deviations. Sometimes he found slight variations from the standard when his troops helped a commander to carry out a pet project. "I was aware of it," he recalled, "but there was no point in hassling at it." He tried to point out that use of materials for nice-to-have projects deprived others of

[60] Ibid., pp. 67, 204–11; Interv, Sowell with Ploger, 21 Nov 78, sec. 8, p. 21.

[61] Ploger, *Army Engineers*, pp. 69, 204, 229–30; Interv, Sowell with Ploger, 21 Nov 78, sec. 8, pp. 22–25; MACV History, 1965, p. 127.

more essential requirements. Commanders always tried to better the lot of their soldiers, and the misuse of materials remained a pervasive problem.[62]

More Units on the Way

More engineer units arrived in the last three months of 1965 or were on their way. In October 1965, a third Army construction group and another combat engineer battalion arrived. Two combat battalions arrived in November, and on New Year's Day 1966 two more combat battalions joined the brigade. The 299th Engineer Battalion (Combat) from Fort Gordon, Georgia, and the 630th Engineer Company (Light Equipment) from Fort Bliss, Texas, landed at Qui Nhon on 22 October. Neither unit immediately operated at full capacity; the 299th had to wait nearly a month for its equipment to arrive. Offloading took time, and by the end of the year the light equipment company still had some of its equipment aboard a ship anchored at Cam Ranh Bay. Working under the direction of the 937th Engineer Group, the 299th joined the 19th, 70th, and 84th Engineer Battalions in northern II Corps. The 299th Battalion's initial projects in the Qui Nhon area included taking over the ammunition depot and roadwork. A reinforced platoon was also dispatched to Pleiku to work on base development projects.[63]

On 30 October, the headquarters of the 159th Engineer Construction Group arrived from Fort Bragg, set up headquarters at Long Binh, and took control of 18th Brigade units and operations in III and IV Corps. The group, commanded by Col. James H. Hottenroth, had been brought up to strength over the summer after losing troops to the 18th Brigade. The group inherited the 46th Engineer Construction Battalion at Long Binh, and by the end of the year it added two engineer combat battalions, two separate companies, and several detachments. In early November, the 588th Engineer Battalion (Combat) from Fort Lee, Virginia, arrived at Vung Tau followed later by its equipment on other ships. The estimated shipping time of twenty-seven days stretched to forty-four days for one ship and fifty-seven days for the other two ships. Initially the battalion worked on base development projects for the 1st Division at Phu Loi and Di An and the 173d Airborne Brigade at Bien Hoa. Shortages included lumber in all sizes, culvert, sandbags, barbed wire, dynamite, and fuses. In late November, the 168th Engineer Combat Battalion from Fort Polk arrived. Like other engineer units its equipment arrived later, 7 December. Early efforts also included base development projects for the 1st Division.[64]

On New Year's Day 1966, the 20th Engineer Battalion (Combat) from Fort Devens, Massachusetts, and the 39th Engineer Battalion (Combat), and the 572d Engineer Company (Light Equipment) from Fort Campbell,

[62] Interv, Sowell with Ploger, 21 Nov 78, sec. 8, pp. 24–26 (quotation, p. 26).

[63] Ploger, *Army Engineers*, p. 79; Quarterly Cmd Rpt, 1 Oct–31 Dec 65, 937th Engr Gp, pp. 2–3, 5; Galloway, "Essayons," p. 37.

[64] Ploger, *Army Engineers*, pp. 79–80, 83; Galloway, "Essayons," pp. 48–49, 51–52; Quarterly Cmd Rpts, 1 Oct–31 Dec 65, 159th Engr Gp, 14 Jan 66, pp. 1–4, 1 Oct–31 Dec 65, 588th Engr Bn, 13 Jan 66, pp. 1–4, and 1 Oct–31 Dec 65, 168th Engr Bn, pp. 1–3, all in Historians files, CMH.

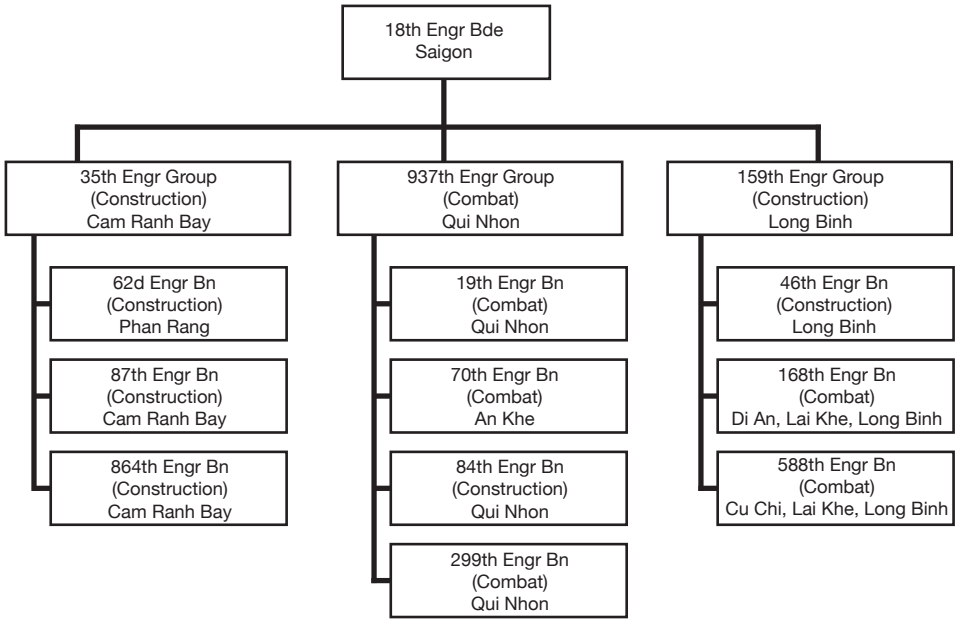
Kentucky, joined the 35th Group at Cam Ranh Bay. Shortly after its arrival, the 39th Engineer Battalion, the 572d Light Equipment Company, and a South Vietnamese engineer float bridge company built a badly needed 1,115-foot M4T6 bridge across the bay. It took two days to assemble the rafts and one day to install the bridge between the peninsula and the mainland. When General Larsen flew over the site on 8 January, he could only exclaim "Where did that damn thing come from?" Just the day before a ferry offered the only crossing. Later in the month, the 20th Engineer Battalion, helped by light equipment and dump truck companies, renewed work on an Army aviation base at Dong Ba Thin on the mainland side of the bay. The arrival of the two combat battalions also enabled the group to accelerate the construction of warehouses, open storage hardstands, and a convalescent hospital in the northern part of the peninsula.[65]

By the close of 1965, the equivalent of some twenty Army, Navy, and Marine Corps engineer battalions; many smaller engineer units, including Air Force civil engineering teams; and civilian contractors were building the operational, logistical, and support facilities required for the expanding U.S. and allied commitment. By then U.S. troop strength had reached 184,300. The 18th Engineer Brigade had grown to over 9,500 men consisting of three groups, ten battalions, and an assortment of separate companies. (*Chart 1*) Several thousand Army engineers were also assigned to the two divisions (1st Infantry and 1st Cavalry), two separate airborne brigades (173d and 1st Brigade, 101st Airborne Division), one infantry brigade (3d Brigade, 25th Infantry Division), and the logistical command. Some 2,100 Seabees were assigned to the 30th Naval Construction Regiment's four construction battalions. Marine Corps engineers totaled nearly two thousand men in two battalions and smaller units. As early as August 1965, the Air Force deployed small specialized construction teams (dubbed Prime Beef—a combination nickname and acronym for Base Engineer Emergency Force) to Southeast Asia on temporary duty tours to augment the base engineers. Prime Beef teams built cantonments, installed utilities, and quickly erected revetments to protect aircraft from enemy shelling. Meanwhile, the Air Force was readying battalion-size Red Horse civil engineer squadrons to undertake larger projects at air bases. In August, the Navy's construction consortium added two more construction firms, J. A. Jones Corporation and Brown and Root, to form Raymond, Morrison-Knudsen, Brown and Root, and J. A. Jones, better known as RMK-BRJ. Before the end of the year, the RMK-BRJ's workforce jumped from 2,000 to 22,000. Pacific Architects and Engineers' workforce rapidly multiplied from its 2,000-person ceiling in June 1965. Plans were under way to construct several deep-draft ports with satellite shallow-draft ports; to build airfields, depots, and other facilities within these port complexes; to improve the roads inland from the ports; to build inland bases; and finally to expand the roads to these bases.[66]

[65] Ploger, *Army Engineers*, pp. 56–59, 84 (quotation, p. 58); Galloway, "Essayons," pp. 79–81; ORLL, 1 Jan–30 Apr 66, 35th Engr Gp, 15 May 66, pp. 1–2, 5–6, Historians files, CMH.

[66] Ploger, *Army Engineers*, pp. 84; Heiser, *Logistic Support*, p. 14; Tregaskis, *Building the Bases*, p. 183; Quarterly Cmd Rpt, 1 Oct–31 Dec 65, 18th Engr Bde, 21 Jan 66, p. 1; MACV

CHART 1—18TH ENGINEER BRIGADE, DECEMBER 1965



Source: Cmd Rpt, 31 Dec 65, 18th Bde
Chart 1, Ch 2

Authorized Troops 10,217
On Hand Troops 9,510

Concentration on base development would become much harder because of the increasing demand to support tactical operations. By the end of the year, the construction backlog reached 212 battalion-months. The pool of military engineer units, however, had just about reached bottom. With the arrival of the 20th and 39th Engineer Battalions in the first days of 1966, General Ploger could look forward to receiving only a few more units by summer. The Joint Chiefs of Staff and the Department of Defense had approved the deployment of up to twenty-five engineer battalions, but that number was simply not available without calling up the reserves. The Department of the Army in its annual report for 1965 noted that engineer resources in the United States "could not provide balanced support to current combat forces and that currently deployed engineer units fall considerably short of meeting balanced force requirements." Newly activated Army engineer construction battalions could not be expected for some time.[67]

History, 1965, p. 126; Shulimson and Johnson, *U.S. Marines in Vietnam, 1965*, app. F; PA&E History, 1963–1966, p. 30.

[67] MACV History, 1965, p. 128; JLRB, Monograph 6, *Construction*, p. 109; Army Buildup Progress Rpts for 6 Oct, 3 Nov, and 1 Dec 65, CMH; Special ORLL, 1 Jan–31 Oct 65, DA, incl. 3, p. 2 (quotation).

3

First Battles

By the summer of 1965, substantial numbers of U.S. Army and Marine ground forces, with supporting air and naval elements, had deployed to South Vietnam. Initially assigned to guard the air bases at Da Nang and Bien Hoa, American ground troops were soon committed by General Westmoreland to "the points of maximum peril on a 'fire brigade' basis." In the south, he built up U.S. forces—the 173d Airborne Brigade and the 1st Infantry Division—in a protective arc around Saigon. The evidence presented to the MACV commander also suggested that the North Vietnamese Army intended to cut South Vietnam in half along Highway 19 from Pleiku in the highlands to Qui Nhon on the central coast. To counter this threat, Westmoreland deployed the 1st Cavalry Division to the Central Highlands. While the cavalry division took on the mission to open—and to keep open—Highway 19, other reinforcements, including the 1st Brigade, 101st Airborne Division, stiffened South Vietnamese forces on the strategically critical highly populated coast.[1]

Organic engineer units—companies with separate brigades and battalions with divisions—accompanied the combat forces. Organized to help the movement of friendly troops and impede the movement of the enemy, combat engineers also found themselves assigned projects in the base camps. Still, by virtue of their mission the combat engineers bore the brunt of the support for the maneuver elements.

Early Operations

The first Army engineer unit of appreciable size to reach South Vietnam was the 173d Engineer Company, 173d Airborne Brigade. In early May 1965, the three-thousand-man brigade under the command of Brig. Gen. Ellis W. Williamson began arriving to protect Bien Hoa Air Base and the airfield and port at Vung Tau. Engineer elements consisted of a brigade engineer, Maj. Harold P. Austin, his small staff, and the 152-man 173d Engineer Company commanded by Capt. Thomas L. Morley. Immediately upon arrival, the company's 1st Platoon at Vung Tau and the 2d Platoon at Bien Hoa helped the infantry battalions dig in and set up water and shower points. By 12 May, the rest of the company, which included an equipment section and bridge platoon, reached Bien Hoa, where the airborne brigade set up headquarters and a base camp on high ground northeast of the airfield. The brigade quickly settled in and went to work building bunkers for protection against mortars, digging

[1] Sharp and Westmoreland, *Report*, pp. 98–99, 107 (quoted words p. 98); MACV Concept of Operations, 30 Aug 65, an. A (Intelligence), p. A-1.

Engineers of the 173d Engineer Company, 173d Airborne Brigade, carry out a river reconnaissance in one of their inflatable rafts.

trenches, clearing fields of fire, and erecting barbed wire barriers. From the bunkers and trenches, the paratroopers could see about 656 feet of open area, which then gave way to thick brush and, finally, jungle farther north.[2]

While the 173d Engineer Company helped the brigade settle in, Major Austin's office coordinated base camp development with the Navy's Officer in Charge of Construction; ordered engineer equipment and supplies; and reconnoitered roads, helicopter landing zones, existing and potential airstrips, water sources, and river crossing locations. This and information gathered through other sources became the basis for selecting convoy routes used in operations. In essence, Major Austin and his successor, Maj. Merritt R. Holcomb, who replaced him on 7 July, operated like a division engineer, but did not command the engineer company. Captain Morley, who was soon promoted to major and

[2] Hist Rpt of the 173d Engr Co (Abn), 173d Abn Bde (Sep), 1 Jan–31 Dec 65, n.d., p. 10; Quarterly Cmd Rpt, 1 May–31 Jul 65, 173d Abn Bde, 15 Aug 65, p. 1; Annual Hist Supp, 1965, 173d Abn Bde (Sep), n.d., p. 36, app. C, all in Historians files, CMH; Galloway, "Essayons," p. 5; Carland, *Stemming the Tide*, p. 23.

replaced by Capt. Mark S. Sowell Jr. on 4 July, ran the company on a day-to-day basis.[3]

Although the 173d Engineer Company concentrated on base construction, elements of the company were dispatched to the field. During May, the Viet Cong ended a two-month lull and launched attacks against South Vietnamese forces. In northern III Corps, the enemy's Dong Xoai campaign began on 11 May with an attack on the capital of Phuoc Long Province, Song Be. Overrunning most of the town, the attackers held their ground into the next day. Two days following the attack, a twelve-man team from the engineer company, led by M. Sgt. Earnest F. Pena, arrived to boost the defenses of the joint Special Forces and MACV advisory camp at Song Be. The team quickly built and fortified bunkers, repaired perimeter fences, dug defensive emplacements, and helped guard the camp. Meanwhile, back at the Bien Hoa camp, a fifteen-man demolition team on 14 May joined a paratroop company patrolling outside the perimeter. As the brigade's two infantry battalions—the 2d Battalion (Airborne), 503rd Infantry, at Bien Hoa and the 1st Battalion (Airborne), 503d Infantry, at Vung Tau—moved out on independent operations, engineer demolition teams joined the infantry companies in the field. The Viet Cong offered little resistance to these initial forays.[4]

Then, during the night of 9 June, a paramilitary Civilian Irregular Defense Group (CIDG) camp and adjacent district headquarters compound just west of Dong Xoai in Phuoc Long Province came under attack. Most of Seabee Team 1104 had arrived from Tay Ninh City a few days earlier to improve the CIDG camp. For the next fourteen hours, Seabees, Special Forces troops, and advisers fought alongside their allies against an overwhelming enemy. Following an intense mortar barrage, the attackers breached the barbed wire defenses, overran the CIDG compound, and penetrated the district headquarters compound. The surviving Americans and some South Vietnamese held out in the district headquarters building, calling in air strikes. One wounded Seabee, Construction Mechanic Third Class Marvin G. Shields, carried the seriously wounded Special Forces commander from one of the defensive berms to the district headquarters building. Then Shields and a Special Forces officer, 2d Lt. Charles Q. Williams, second in command of the Special Forces detachment, manning a 3.5-inch rocket launcher, destroyed a Viet Cong machine-gun position. Shields was wounded again and later died aboard an evacuation helicopter. By then most of the Americans had been picked up by U.S. Army helicopters. Two of the Seabees, who had become separated during the fighting, were later found by a South Vietnamese Army relief force still holding out in the area. For a time, the 173d Airborne Brigade was poised to intervene, but the enemy withdrawal eliminated the need.[5]

[3] Annual Hist Supp, 1965, 173d Abn Bde, pp. 64–66.

[4] Hist Rpt of the 173d Engr Co, 1 Jan–31 Dec 65, pp. 10–11; Quarterly Cmd Rpt, 1 May–31 Jul 65, 173d Abn Bde, pp. 1, 3–15; Annual Hist Supp, 1965, 173 Abn Bde, pp. 36, 64.

[5] Shields and Williams received the Medal of Honor. Later the Navy awarded the Navy Unit Commendation Medal to members of the Seabee team present at the battle. COMCBPAC Reports, Special Edition Seabee Teams, October 1959–July 1968, "Helping Others Help Themselves," (Commander Naval Construction Battalions, U.S. Pacific Fleet, 1969), pp. 45–51, copy in

The Viet Cong shift to larger attacks led Westmoreland to request and get approval to deploy U.S. ground troops on unlimited offensive operations. Near the end of June, the 173d Airborne Brigade, now enlarged to three infantry battalions with the arrival of an Australian task force, and with all battalions at Bien Hoa, extended operations farther afield. In one operation, a battalion-size force of paratroopers penetrated Viet Cong–controlled War Zone D just beyond the Dong Nai River some six miles north of the brigade base camp. Then, on the twenty-eighth, the entire brigade and South Vietnamese Army troops ventured deep into the enemy redoubt. During the three-day sweep, demolition teams from the 173d Engineer Company uncovered and blew up mines and booby traps; cleared helicopter pads and landing zones; and destroyed Viet Cong tunnels, supply caches, and weapons emplacements. The rest of the engineer company joined with the gun jeeps of Troop E, 17th Cavalry, and M113 armored personnel carriers and M56 self-propelled antitank guns of Company D, 16th Armor, to form a composite battalion to patrol the roads and protect the brigade's command element and artillery.[6]

On 6 July, the 173d Engineer supported the brigade in another operation in War Zone D. The brigade's three battalions made airmobile assaults in an attempt to close a trap around the Viet Cong just north of the Dong Nai. While demolition teams moved out with the infantry, the rest of the company under Captain Sowell moved into an artillery firebase south of the river. At the firebase, the engineers' mission was to serve as a security force for the artillery and to run platoon-size patrols to clear the area to the north and east while the armor patrolled to the west and south. Besides inflicting casualties on the Viet Cong, the airborne brigade uncovered a large base complex consisting of mess halls, classrooms, latrines, and an extensive tunnel system. More than 150 booby traps were found during the operation. The engineers returned to Bien Hoa on the ninth and resumed base development work.[7]

The next operation took the 173d Airborne Brigade south to Phuoc Tuy Province. Leading off the operation on 28 July, the brigade's artillery battalion and the 173d Engineer Company moved by vehicle convoy along Highway 15 to an artillery firebase near Vung Tau. In the process, the task force cleared the highway for the first time in months, allowing the South Vietnamese Army to resupply a garrison at Binh Gia along the way. The following day, the brigade's

Historians files, CMH (hereafter cited as "Helping Others Help Themselves"); Tregaskis, *Building the Bases*, pp. 117–33; Shelby L. Stanton, *The Green Berets at War*: *U.S. Army Special Forces in Southeast Asia, 1956–1975* (Novato, Calif.: Presidio Press, 1985), pp. 120–23; After Action Rpt (AAR), Dong Xoai, Phuoc Long Province, 5th Special Forces (SF) Gp (Abn), 1st SF, 7 Jul 65, Historians files, CMH.

[6] Hist Rpt of the 173d Engr Co, 1 Jan–31 Dec 65, pp. 11–14; Quarterly Cmd Rpt, 1 May–31 Jul 65, 173d Abn Bde, p. 15, incl. 15; Lt. Gen. John J. Tolson, *Airmobility, 1961–1971*, Vietnam Studies (Washington, D.C.: Department of the Army, 1973), p. 64; *The First Three Years: A Pictorial History of the 173d Airborne Brigade (Separate)* (Brigade Information Office, n.d.), Section III, "Combat," 5 May 65–Jan 66, copy in CMH.

[7] Hist Rpt of the 173d Engr Co, 1 Jan–31 Dec 65, pp. 11–15; Quarterly Cmd Rpt, 1 May–31 Jul 65, 173d Abn Bde, p. 16, incl. 17; F. Clifton Berry Jr., *Sky Soldiers,* The Illustrated History of the Vietnam War (New York: Bantam Books, 1987), pp. 24–25; *Pictorial History of the 173d Airborne Brigade*, Section III, "Combat"; Tolson, *Airmobility*, p. 64.

MAP 3

two U.S. battalions began the operation with an airmobile assault. While the two battalions swept the area to sever a suspected Viet Cong supply route and other brigade forces set up blocking positions, the engineer and armor companies, now relieved of their security mission at the firebase, checked out reported Viet Cong locations and caches. The significance of the campaign was evident: the airborne brigade was no longer confining itself to the Bien Hoa bridgehead.[8] (*Map 3*)

Meanwhile, a second U.S. Army infantry brigade, the 2d Brigade, 1st Infantry Division, arrived in Vietnam. The 3,900-man unit, organized to operate on its own much like the 173d Airborne Brigade until the remainder of the division followed, left Fort Riley, Kansas, in June 1965. Company B, 1st

[8] *Pictorial History of the 173d Airborne Brigade*, Section III, "Combat"; Hist Rpt of the 173d Engr Co, 1 Jan–31 Dec 65, p. 15.

Engineer Battalion, commanded by Capt. Michael Volpe, deployed with the brigade. Plans called for the 2d Brigade to guard Qui Nhon and Cam Ranh Bay, but a change in plans sent the brigade to Bien Hoa, freeing the 173d Airborne Brigade for use as a mobile reserve. After a three-week sea voyage, the 2d Brigade reached Cam Ranh Bay. One battalion task force, including an engineer platoon, disembarked to guard the base in the early stages of development. The balance of the brigade proceeded to Vung Tau and from there to Bien Hoa where, under the operational control of the 173d Airborne Brigade, it would help protect the air base.[9]

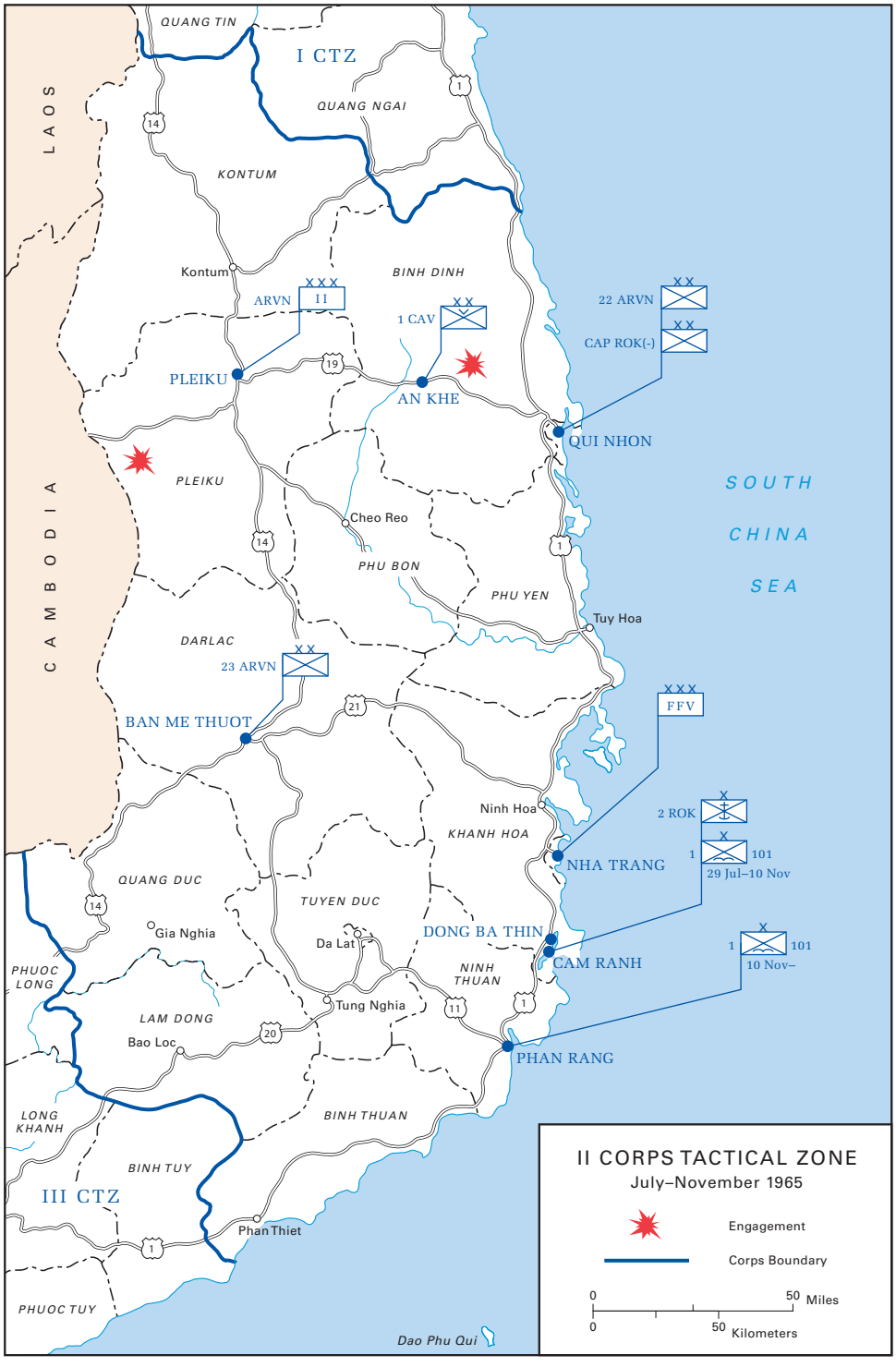
After reaching Bien Hoa, the 2d Brigade moved into an area about two miles southeast of the flight line. Men of the brigade immediately set about clearing the elephant grass, thick brush, and ant hills that clogged the encampment site. Despite daily downpours and nightly sniping, the troops, sometimes working around the clock, cleared the area. Other tasks included building artillery gun emplacements and clearing fields of fire along the outer perimeters. As the brigade extended operations out from the encampment, Company B provided demolition teams, cleared areas of dud explosives, built bunkers, reconnoitered roads, and helped set up ambushes. Back at camp, the company built more than twelve and one-half miles of interior roads, drainage systems, buildings, and a tactical operations center.[10]

Company B provided a platoon to each infantry battalion during the operations of the 2d Brigade. The 1st Battalion, 18th Infantry, and Company B's 1st Platoon remained in the Cam Ranh Bay area for approximately three weeks. The engineer platoon worked on roads, bunkers, and helipads. In early August, the 2d Battalion, 18th Infantry, moved with the 173d Airborne Brigade to II Corps. The brigade's third infantry battalion, the 2d Battalion, 16th Infantry, carried out operations around Bien Hoa. In September the 2d Battalion, 16th Infantry, ran the first battalion-size operation in Long Thanh District, southeast of Bien Hoa, followed by a one-day operation in Tan Uyen District to the northwest. The presence of extensive Viet Cong activity in the area led to further battalion sweeps. In one encounter, the engineers used 800 pounds of explosives to destroy a Viet Cong tunnel. With the 2d of the 18th Infantry back from the Central Highlands, the brigade mounted a two-battalion operation, which resulted in the first encounter with the enemy and the destruction of well-defended, dug-in positions. On 29 September, the 1st of the 18th relinquished its mission at Cam Ranh Bay to the recently arrived 1st Brigade, 101st Airborne Division, and rejoined the 2d Brigade. For the first time since reaching Vietnam, the brigade's battalions and engineer company were together at one location.[11] (*Map 4*)

[9] *Vietnam, the First Year: A Pictorial History of the 2d Brigade, 1st Infantry Division*, (Tokyo, Japan: Brigade Information Office, n.d.), "Company B, 1st Engr Bn," and "Deployment to Vietnam" sections, copy in CMH.

[10] *Pictorial History of the 2d Brigade, 1st Infantry Division*, "Company B, 1st Engr Bn," section; *Always First: A Pictorial History of the 1st Engineer Battalion, 1st Infantry Division, October 1965–March 1967* (1st Engineer Battalion, n.d.), "Company B" section, copy in CMH.

[11] *Pictorial History of the 2d Brigade, 1st Infantry Division*, "Deployment to Vietnam" and "Company B, 1st Engr Bn," sections.


QUANG TIN
I CTZ
QUANG NGAI
LAOS
KONTUM
Kontum
BINH DINH
ARVN
II
1 CAV
22 ARVN
CAP ROK(-)
PLEIKU
AN KHE
QUI NHON
PLEIKU
SOUTH
CHINA
SEA
Cheo Reo
PHU BON
PHU YEN
Tuy Hoa
CAMBODIA
DARLAC
23 ARVN
FFV
BAN ME THUOT
Ninh Hoa
KHANH HOA
2 ROK
1
101
29 Jul–10 Nov
NHA TRANG
QUANG DUC
TUYEN DUC
Gia Nghia
Da Lat
DONG BA THIN
1
101
10 Nov–
CAM RANH
PHUOC
LONG
NINH
THUAN
Tung Nghia
LAM DONG
Bao Loc
PHAN RANG
LONG
KHANH
BINH THUAN
BINH TUY
III CTZ
Phan Thiet
PHUOC TUY
Dao Phu Qui
II CORPS TACTICAL ZONE
July–November 1965
Engagement
Corps Boundary
0
50 Miles
0
50 Kilometers

MAP 4

The 1st Brigade, 101st Airborne Division, followed an even more vagabond road as a mobile brigade. Originally slated to relieve the 173d Airborne Brigade at Bien Hoa so that the 173d could return to Okinawa, the 1st Brigade instead was dispatched to II Corps where the strategically important areas between Qui Nhon and Cam Ranh Bay were still wide open and at risk. Like the 173d, the 3,600-man 1st Brigade consisted of qualified paratroopers, but was bigger, having three airborne infantry battalions and a three-platoon engineer company, Company A, 326th Engineer Battalion. Upon reaching Cam Ranh Bay on 29 July, the brigade set up camp on the mainland at Dong Ba Thin where, unlike the soft sands of the Cam Ranh peninsula, the ground was so hard that Company A engineers used road-cratering charges before digging could commence on defensive positions. As the brigade set up a rough-and-ready encampment, the paratroopers started on-the-job training from squad-size patrols to a brigade-size operation west of Nha Trang. The brigade also underwent intensive training in airmobile tactics. Starting in late August, the brigade in Operation HIGHLAND provided security for the 1st Cavalry Division by protecting the port of entry at Qui Nhon, clearing Highway 19, guarding convoys, and initially securing the airmobile division's base area at An Khe, allowing the division to move safely inland. In mid-September, the brigade ran into a strong enemy force north of the An Khe Pass in the largest encounter with the enemy to date by U.S. Army forces. Between 2 October and 10 November, the 1st Brigade screened the arrival and deployment of the South Korean Capital Division in the Qui Nhon area. It did the same for the Korean 2d Marine Brigade at Cam Ranh Bay. Company A engineers supported the brigade in the field with minesweeping and demolition teams. Having completed its pathfinder assignment of opening up II Corps to follow-on reinforcements, the brigade moved on to Phan Rang, some twenty-five miles south of Cam Ranh Bay.[12]

One of the airborne engineer company's tasks during Operation HIGHLAND was to clear land mines around the An Khe airstrip inside the base. Inhabitants were consulted to get an idea of minefield boundaries. Using mine detectors and probing with bayonets at first, the 2d Platoon found two old unmarked minefields containing U.S. antipersonnel mines. Mines found were destroyed in place with one-half-pound explosive charges. The plastic M14 blast-type mines were especially difficult to detect. One of the undetected M14 mines was stepped on and detonated by a soldier who had just probed the area; he lost part of his foot. Once reasonably assured there were no antitank mines, a remote-controlled bulldozer traversed the area mainly to detonate undetected M14 mines. Then the bulldozer pulled a sheepsfoot roller over the area several times to compact the soil. Several M16 bouncing antipersonnel fragmentation mines were found in the Song Ba riverbed inside the base just west of the

[12] Galloway, "Essayons," p. 53; Quarterly Cmd Rpts, 1 Jul–30 Sep 65, Field Force Vietnam (FFV), 15 Oct 65, p. 6, and 1 Oct–31 Dec 65, FFV, 14 Jan 66, pp. 9–10; Quarterly Cmd Rpt, 1 Jul–30 Sep 65, 1st Bde, 101st Abn Div, 18 Oct 65, pp. 1–3, all in Historians files, CMH.

airfield. Most of those were pointed out by a Vietnamese boy who grazed his cattle in the area. Altogether Company A removed 225 mines.[13]

In November, MACV asked the 1st Brigade, 101st Airborne Division, to set up a new base camp and to protect Phan Rang Air Base, then undergoing transformation into a jet fighter field. In addition to building the air base, the 62d Engineer Construction Battalion was charged with building a cantonment for the paratroopers. Company A of the 326th helped when it could but spent most of the time in the field supporting the brigade's tactical operations. The brigade continued to spend most of its time away from its base camp. Shortly after the brigade's arrival at Phan Rang, two infantry battalions and supporting troops were airlifted to Bien Hoa to support operations in III Corps. The units returned to Phan Rang on 22 December.[14]

After the 173d Airborne Brigade returned from the highlands in early September, it resumed operations the following month in War Zone D and the enemy Iron Triangle, and provided security for units of the 1st Infantry Division as they moved into base camps near Saigon. The Iron Triangle region lay northwest of Saigon, and its features included fairly level terrain covered by patches of dense second-growth jungle mingled with an undergrowth of bamboo and other foliage. To soften up the Viet Cong redoubt, Air Force B–52 Stratofortress heavy bombers, in their first direct-support mission, bombed suspected enemy locations. Four task forces swept through the approximately sixty-square-mile area, but encountered only light opposition. Left behind, however, were large numbers of booby traps and command-detonated mines. Demolition teams, which landed with the heliborne assault forces, destroyed enemy camps, bunkers, and tunnels. At the close of the operation, General Williamson prematurely remarked: "The Iron Triangle is no more." Later in the month, the brigade cleared the nearby Phu Loi–Di An region for the 1st Division.[15]

A Base for the 1st Cavalry Division

While these operations were under way, the 16,000-man 1st Cavalry Division readied itself for the long sea voyage to South Vietnam. A 1,000-man advance party, which included Company C, 8th Engineer Battalion, arrived at the division's base camp at An Khe in late August. The An Khe area in western Binh Dinh Province, selected as a forward combat base by General Westmoreland, afforded the airmobile division a lodgment from which to operate in a wide radius. An Khe also lay within reasonable distance from Qui Nhon for ground resupply along Highway 19. While the 1st Brigade, 101st Airborne Division, guarded the region, the advance party led by Brig. Gen. John M. Wright Jr. laid out unit traces and fixed the approximate size of the

[13] AAR, Opn HIGHLAND, 1st Bde, 101st Abn Div, 5 Dec 65, incl. 13, p. 1, Historians files, CMH.

[14] Galloway, "Essayons," p. 53; Quarterly Cmd Rpt, 1 Oct–31 Dec 65, FFV, pp. 10–11.

[15] Hist Rpt of the 173d Engr Co, 1 Jan–31 Dec 65, pp. 17–18; Berry, *Sky Soldiers*, pp. 29–32; *Pictorial History of the 173d Airborne Brigade*, Section III, "Combat" (quoted words).

Troops clear the helicopter area at the 1st Cavalry Division's new base camp at An Khe.

camp. Wright then gathered all available officers and enlisted men in the party to clear trees and brush by hand. He placed the division's heliport near the center of the base and announced that the 3,000-by-4,000-foot field would "look exactly like a fine golf course." According to Wright, clearing by hand, instead of using engineer equipment, would preserve the turf and minimize the dust caused by the swirling blades of the division's helicopters. The division hired large numbers of civilian refugees to continue with the work. The heliport became known as the Golf Course.[16]

Meanwhile, Colonel Edelstein's 70th Engineer Combat Battalion arrived from Qui Nhon, where the unit had just disembarked, to work on the base camp. Tasks included building an access road from Highway 19 to the division base area, maintaining the existing pierced steel plank airstrip at An Khe, helping clear the large division heliport, and providing a company on standby to maintain Highway 19 from Qui Nhon to An Khe. Work on the eight-mile access road began on 28 August. The goal was to complete the road before the main body of the division began arriving on 11 September.[17]

[16] Interv, Lt Col David M. Fishback with Lt Gen John M. Wright Jr., 1 Mar 83, 2:382–92 (quoted words, p. 391), Senior Officer Oral History Program, MHI; Westmoreland, *A Soldier Reports*, p. 189; Maj. J. D. Coleman, ed., *1st Air Cavalry Division: Memoirs of the First Team, Vietnam, August 1965–December 1969* (Tokyo, Japan: Dai Nippon Printing Co., n.d.), pp. 25–26, 181; Galloway, "Essayons," p. 54; Rpt, 14th Mil Hist Det, 1st Cav Div (Ambl), 9 Jun 67, sub: Seven Month History and Briefing Data (September 1965–March 1966), p. 18, box 16, 74/053, RG 319, NARA.

[17] Quarterly Cmd Rpt, 1 Jul–30 Sep 65, 70th Engr Bn, 12 Oct 65, p. 2; AAR, Opn HIGHLAND, 70th Engr Bn, 5 Oct 65, p. 1. Both in Historians files, CMH.

It soon became apparent that more earthmoving equipment would be needed to complete the road by the required date. Initially, a grader and several bulldozers were borrowed from the 84th Engineer Battalion in Qui Nhon. This was followed a week later by two front loaders and two more graders from the 632d Engineer Company (Light Equipment) and a section containing twelve 5-ton dump trucks from the 513th Engineer Company (Dump Truck), both companies also at Qui Nhon.[18]

Since all entrances to the 1st Cavalry Division area were constricted by the Song Ba River on the east and Hon Cong Mountain on the west, a massive rock-tipped hill, and one or more villages along the way, a relatively narrow corridor remained through which to build the road. Although the engineers tried to follow the high ground to the camp, more than 30,000 cubic yards of fill had to be used to stabilize the sandy silt, which formed the subgrade of the major portion of the road. Removing the sandy silt would have entailed a prohibitive excavation effort within the limited time available. To make matters worse, a high water table would have made the soil completely unstable and virtually untrafficable to engineer equipment. Instead, just the top layer of soil and vegetation was removed, ditches cut, and the road topped off with four to six inches of laterite or decomposed granite. This method stabilized the soil and produced a suitable wearing surface in dry weather. Initially Edelstein's Company A hauled fill from an open-pit rock quarry on Highway 19 about two and one-half miles from An Khe, and Company C opened another pit at the base of Hon Cong Mountain on the western edge of the base little more than one-half mile from the road project. Later, the Highway 19 site was abandoned because of the longer haul distance, and both units used the Hon Cong Mountain pit. The most time-consuming part of the project involved the installation of numerous drainage facilities. A drainage survey revealed the need for nine bridges and thirty-one culverts, but bridge materials and culverts were not available at the time. Concrete culverts were procured locally, and supply channels managed to provide 540 feet of corrugated metal culvert. Bridging remained unavailable, and it became necessary to depend entirely on culverts. Unfortunately, culverts could not handle the flow of water during heavy rains. Working two 10-hour shifts with 2-hour maintenance breaks and using all available earthmoving equipment, the battalion completed the access road, dubbed Route 70, on the night of 11 September. Much work still remained, including widening sections of the road from a single lane to two lanes. The road also ran through a village and could not be widened until arrangements were made through civil affairs channels.[19]

During this period, security was a major concern, and soldiers had to be diverted from work sites and placed on guard duty. Although the 70th Engineer Battalion's bivouac areas and work sites were within the thinly held perimeter of the 1st Brigade, 101st Airborne Division, this provided little protection against isolated sniper fire and small guerrilla bands during darkness.

[18] AAR, Opn HIGHLAND, 70th Engr Bn, pp. 2–3.

[19] Ibid., pp. 3–6; Quarterly Cmd Rpt, 1 Oct–31 Dec 65, 1st Cav Div, 10 Jan 66, p. 24, Historians files, CMH.

Heavy-duty equipment such as this bulldozer from the 70th Engineer Battalion was used to build roads at the 1st Cavalry Division's Camp Radcliff.

Since the paratroopers were usually conducting operations requiring most of their men, isolated work sites such as the quarries and access road were usually protected by the engineers themselves. Security forces at each site usually consisted of four men with machine guns and M79 grenade launchers. Strict policies were adopted to avoid friendly casualties. Returning fire to disperse one or two snipers was restricted to small areas to avoid hitting the outer perimeter manned by the airborne brigade or in some other area occupied by friendly troops. Actually, only a few sniper rounds were received, and progress at the work sites was not impaired.[20]

In mid-September, the main body of the 1st Cavalry Division came ashore at Qui Nhon and moved inland to An Khe. Maj. Gen. Harry W. O. Kinnard, the commanding general, recognized the vulnerability of the highlands base camp. In a directive, he called for a small and compact camp that could be defended with few troops. Construction of Camp Radcliff (named in honor of Maj. Donald G. Radcliff, the first member of the division to lose his life in Vietnam) became a cooperative effort of all units on the base under the supervision of the division's 8th Engineer Battalion commanded by Lt. Col. Robert J. Malley. To provide the link between the division and other engineer organizations assigned to help build the base, Colonel Malley assigned one of his officers as Assistant Division Engineer, Base Development. This small

[20] AAR, Opn HIGHLAND, 70th Engr Bn, pp. 6–7.

The future Camp Radcliff shown here on 30 August 1965 would soon be transformed from a small tent city to a large base camp of wood frame and metal prefabricated buildings.

office clarified division priorities into guidance for the other engineers in the area.[21]

Because of an ever-increasing number of base projects, the engineers could only respond to the most urgent requests and frequently worked around the clock. One pressing assignment for the 8th Engineer Battalion was to level the top of Hon Cong Mountain for use as a signal relay station. With their light and modular equipment designed for transport by Army helicopters, which eliminated the need to cut an access road to the top, the airmobile engineers got right to work. Within three days, trees and vegetation had been cleared, a small bulldozer had been airlifted in to clear a helipad, and a larger bulldozer, a D6B, at 22,000 pounds, had been flown to the mountaintop in sections and reassembled to start moving dirt and rock. Over the next thirty days, the D6B, working with demolitions teams, cleared a 200-by 400-foot area and cut 12 to 14 feet off the top of Hon Cong Mountain. The engineers also built a security fence around the site and constructed bunkers for the radio vans. During their work on the hilltop, the engineers drew Viet Cong attention and exchanged weapons fire with the enemy for several nights. In the following months, more radio equipment,

[21] Galloway, "Essayons," pp. 54–55; Tolson, *Airmobility*, p. 72.

Map 5

an Air Force weather station, artillery counterbattery detectors, and an Armed Forces Radio Service transmitter were placed on the hilltop.[22] (*Map 5*)

Gradually, the engineers transformed Camp Radcliff's tent city into a permanent combat base. In addition to the access road, the 70th Engineer Battalion also built a nine-mile perimeter road. After completing the roads, the 70th turned to building logistics facilities, protective bunkers, more roads within the camp, and Quonset huts for a 140-bed mobile surgical hospital. By early December, the 1st Cavalry Division began a major program to construct,

[22] *Memoirs of the First Team*, p. 181; Rpt, 14th Mil Hist Det, 1st Cav Div, 9 Jun 67, sub: Seven Month History and Briefing Data (September 1965–March 1966), p. 18; Capt. Paul G. Cerjan, "Vertical Envelopment - with Bulldozers," Military Engineer Field Notes, *Military Engineer* 60 (January-February 1968): 17; Bergen, *A Test for Technology*, pp. 152–53.

on a largely self-help basis, tropical-type building cantonment facilities for the twenty thousand men of the division and supporting units. Getting lumber through supply channels was very involved and slow, and only limited amounts were received. Timber was abundant in the area, and time-consuming efforts were soon under way to authorize local procurement. Pacific Architects and Engineers, which set up its facilities engineering shop in September, was able to get enough material to prefabricate kits to build latrines and showers.[23]

Another high-priority task was to build a strong perimeter defense. With the help of the 70th Engineer Battalion and some two thousand Vietnamese laborers, the 8th Engineer Battalion built a truly formidable obstacle system. Over time, the engineers built a defense perimeter one hundred yards in depth around the base camp. The perimeter consisted of four layers of barbed wire fences, a layer of claymore antipersonnel command-detonated mines, and inner and outer cattle fences to keep people and animals from straying into the mines that guarded the succeeding layers of wire. Vietnamese laborers worked for the most part outside the fence clearing vegetation. The claymore mine, developed by the Army before the war and introduced into combat in Vietnam, was designed as a one-shot, directional-fragmentation weapon that could be aimed to cover a specific area. Consisting of a plastic body, a fixed slit-type sight, four adjustable legs, electrical wire connections, and hand-held firing device, the claymore when fired spread steel fragments over a wide area. The weapon became quite popular for use in permanent and temporary defense positions and ambushes. In considering the terrain and the interlocking fields of fire, the division laid out long sections of the perimeter in a straight line to make it easier for helicopter gunships to help defend the base. The 70th Engineer Battalion further embellished the perimeter with 1,032 lights on concrete poles and sixty-eight guard towers, each equipped with a searchlight.[24]

To give the 70th Engineer Battalion at An Khe a greater construction capability, Colonel Brandt dispatched additional engineers and equipment from 937th Group resources. Although the 70th with its array of bulldozers, front loaders, and graders had more construction equipment than the lightly equipped 8th Engineer Battalion, it lacked the heavy equipment to do all of the required base camp construction. More equipment and operators from the Qui Nhon–based 632d Light Equipment Company were borrowed, increasing the light equipment element to a platoon. During the first months, the 70th Engineer Battalion had to make do with 80 to 160 Vietnamese hired to crush rock by hand, an unsophisticated but necessary means to obtain the all-important material. Not until the newly arrived 630th Engineer Company

[23] Quarterly Cmd Rpts, 1 Oct–31 Dec 65, 1st Cav Div, 10 Jan 66, p. 24, 1 Oct–31 Dec 65, 937th Engr Gp, 15 Jan 66, pp. 3–4; ORLL, 1 Feb–30 Apr 66, 70th Engr Bn, 7 May 66, pp. 2–6, Historians files, CMH; PA&E History, 1963–1966, p. 32.

[24] Rpt, 14th Mil Hist Det, 1st Cav Div, 9 Jun 67, sub: Seven Month History and Briefing Data (September 1965–March 1966), p. 19; Lt. Col. Albert N. Garland, ed., *Infantry in Vietnam* (New York: Jove Books, reprint of 1967 Infantry edition, 1985), pp. 257–59; Interv, Fishback with Wright, 1 Mar 83, 2: 397–98, 401–02; Quarterly Cmd Rpt, 1 Oct–31 Dec 65, 937th Engr Gp, pp. 4–5; ORLLs, 1 Jan–30 Apr 66, 937th Engr Gp, 30 Apr 66, p. 5, 1 Jan–30 Apr 66, 70th Engr Bn, p. 5, and 1 May–31 Jul 66, 70th Engr Bn, 15 Aug 66, pp. 3, 6, Historians files, CMH.

(Light Equipment) joined the 70th in early 1966 did the battalion get the benefit of a 75-ton-per-hour rock crusher.[25]

Maintaining the 4,200-foot airfield runway became a chronic problem for the 70th Engineer Battalion. Company C formally took over maintenance of the airstrip from South Vietnamese Army engineers on 29 August. Already on the scene was a platoon the 84th Engineer Construction Battalion had dispatched earlier to repair defects in the combination M8 and M6 pierced steel plank matting, which caused dangerous breaks in the airstrip's surface. Using an arc welder left behind by the 84th's platoon when it returned to Qui Nhon, the 70th's welding crew worked almost continuously to keep the airfield in operation. The condition of the strip under unusually heavy C–130 transport traffic deteriorated to the point that the welders could not keep up repairs. Despite all the effort, C–130 aircraft suffered frequent cuts and blowouts of landing gear tires. The Air Force complained bitterly, but the airfield had become so indispensable to 1st Cavalry Division operations that its closure for repairs could not be tolerated. This precluded engineer work crews from removing the old matting and repairing the base, a critically required task. A number of methods were considered, and the decision was simply to lay another layer of matting over the existing runway. By working only at night or during light traffic over a period of six nights, work crews placed some 1,500 linear feet of M8 matting. At the end of each night's work, welders fused the second layer's leading edges to the old surface. To compensate for the undulations in the existing pierced steel planking caused by base failures, a layer of crushed rock was placed on the low areas before placing the second layer of planking. This was only a temporary expedient, and plans were drawn up to build a new parallel runway.[26]

A Second Division Arrives

In October 1965, the rest of the 1st Infantry Division arrived to take up positions on the northern approaches to Saigon. While preparing for the deployment, General Seaman, acting on guidance from the Army chief of staff, General Johnson, began to reorganize the division from its mechanized configuration to a force considered more suitable for the counterinsurgency and jungle warfare in Vietnam. The result was a lighter organization, and units and equipment considered inappropriate to Vietnam stayed behind. These included the two armor battalions and units assigned to employ nuclear weapons, such as the Honest John missile battalion and the atomic demolitions platoon from the engineer battalion. To make up for the loss of the armor battalions, the Army transferred two infantry battalions from another division. In turn, the division's two mechanized infantry battalions were reorganized as standard dismounted infantry battalions, thus building the division around nine infantry battalions. The armored cavalry

[25] ORLLs, 1 Feb–30 Apr 66, 70th Engr Bn, pp. 4–5, 8–9, and 1 May–31 Jul 66, 70th Engr Bn, pp. 3, 8.

[26] Galloway, "Essayons," p. 30; Bowers, *Tactical Airlift*, p. 209; Quarterly Cmd Rpt, 1 Jul–30 Sep 65, 70th Engr Bn, p. 2; AAR, Opn HIGHLAND, 70th Engr Bn, pp. 1–2.

squadron, which did retain its M48A3 Patton diesel-powered tanks, replaced the older M114 armored reconnaissance vehicles with M113 armored personnel carriers, which had better overall reliability and mobility. Training geared to counterinsurgency warfare followed in the short time remaining before deployment. In mid-September, the division started to embark at ports along the west coast.[27]

The commander of the 1st Engineer Battalion, Lt. Col. Howard L. Sargent Jr., readied the battalion for its deployment. By the time the division began its move, the engineer battalion reached its authorized strength of over nine hundred men and made necessary adjustments in equipment. At first, there was a possibility that the battalion's float bridge company would remain behind to lighten the division. Considering the large number of rivers in Vietnam, the Army and MACV agreed to keep the bridge unit. To satisfy the division's lighter configuration, the heavier Class 60 floating bridge, which required a large crane to emplace the heavy steel deck bays, was replaced by the aluminum-decked M4T6 (Class 50–55) bridge. Manpower alone could easily place the twenty-two hollow sections, known as balk, in staggered pattern in each bay. The battalion's six 60-foot scissors-type armored vehicle launched bridges and four M48 tank launchers were left behind to lighten the division. Yet, the battalion was allowed to keep its four M48 tankdozers, the only tanks in the division outside the cavalry squadron brought to Vietnam, to provide armor protection to the engineers and infantry. Special training for the 1st Engineer Battalion included demolitions, jungle warfare, counter-ambush techniques, Viet Cong booby traps, and the M4T6 bridge.[28]

The vessels carrying the 1st Division reached Vietnam between 1 and 30 October. After disembarking at Vung Tau, the troops were flown to Bien Hoa and trucked to a nearby staging area. Supplies and equipment came through Vung Tau and the port of Saigon. After picking up its equipment, the division dispersed to four base camps north of the capital under the protection of the 2d Brigade and the 173d Airborne Brigade. Division headquarters and support troops moved to Di An, the 1st Brigade to Phuoc Vinh, the 3d Brigade to Lai Khe, and the division artillery to Phu Loi. These bases together with the previously established camps at Bien Hoa were positioned to guard the approaches to Saigon from the northwest, north, and northeast and to block enemy movement between War Zones C and D. Although the Viet Cong avoided a major fight, the 2d Brigade and the 173d Airborne Brigade encountered large numbers of mines and booby traps, mostly the command-detonated directional type. In all, the division succeeded in moving over 9,600

[27] Quarterly Cmd Rpt, 1 Oct–31 Dec 65, 1st Inf Div, n.d., pp. 1–2, 6, 12, Historians files, CMH; Carland, *Stemming the Tide*, pp. 63–66.

[28] *Pictorial History of the 1st Engineer Battalion*, Deployment to RVN; Quarterly Cmd Rpt, 1 Oct–31 Dec 65, 1st Inf Div, p. 11; 1st Engineer Battalion Unit Historical Rpt, 1965, 30 Mar 66, p. 2, Historians files, CMH (hereafter cited as 1st Engineer Battalion History, 1965); Msg, DA 729121 to CG, U.S. Continental Army Cmd, 20 Aug 65, sub: Float Bridge Requirements, Historians files, CMH.

troops and their equipment and supplies to their destinations in III Corps without loss of life or serious injury to anyone.[29]

After picking up their equipment at the Saigon port, elements of the 1st Engineer Battalion moved to the base camp sites that would house the units they supported. Company A moved north to Phuoc Vinh to support the 1st Brigade, and Company C proceeded up Highway 13—III Corps' main north-south artery—to Lai Khe to support the 3d Brigade. This left Headquarters and Headquarters Company and Companies D and E (the bridge company) for the clearing and development of the division's camps at Di An and Phu Loi just north of Saigon. At each camp, the engineer companies began constructing defenses and facilities. Initial tasks included clearing fields of fire and building roads, portable tent floors, wood buildings, security fences, bunkers, concrete floors, and helipads.[30]

At the same time, the 1st Engineer Battalion's intelligence section reconnoitered the area. Roads and bridges leading to Tay Ninh, Phuoc Vinh, and Vung Tau were surveyed. Wells were checked to determine their capacity for use as water points. Over twenty sites were located for possible laterite pits for use in road and hardstand construction. Reconnaissance teams also made soundings along the channel on the Dong Nai River for ferrying heavy equipment from Saigon to Tan Uyen north of Bien Hoa.[31]

At first, little base development support came from the 18th Engineer Brigade. The only other engineer battalion in the area, the 46th Construction Battalion, had arrived about the same time, and it was committed to projects at Long Binh and Vung Tau. Construction support from the engineer brigade began picking up toward the end of the year with the arrival of the 168th and 588th Engineer Combat Battalions. By then the 46th Engineer Battalion was able to complete the 1st Division's tactical operations center at Di An.[32]

In October, with some of the combat and support units still settling into their base camps, the 1st Division starting seeking out the Viet Cong. General Westmoreland had given General Seaman free rein to operate in a fan-shaped area opening northward from Saigon over a distance of some thirty-four miles in a region ranging from grasslands to rolling forested hills. Over the next three months, the 173d Airborne Brigade, under the operational control of the 1st Division, conducted many company-size and smaller operations east and northeast of the capital city. The 1st Division sought out the enemy in battalion-size or larger operations, mostly north of Saigon. Some of these operations resulted in major encounters with the Viet Cong.[33]

The 173d Airborne Brigade's biggest battle to date took place during Operation HUMP. In early November, the 173d again entered War Zone D to

[29] Quarterly Cmd Rpt, 1 Oct–31 Dec 65, 1st Inf Div, pp. 12, 23; Carland, *Stemming the Tide*, pp. 66–68; *Pictorial History of the 2d Brigade, 1st Infantry Division*, "Deployment to Vietnam" and "Company B" sections.

[30] Quarterly Cmd Rpt, 1 Oct–31 Dec 65, 1st Inf Div, p. 23; 1st Engineer Battalion History, 1965, p. 3.

[31] 1st Engineer Battalion History, 1965, pp. 1–2.

[32] Galloway, "Essayons," pp. 48–49, 51–52.

[33] Carland, *Stemming the Tide*, pp. 73–76.

Engineers use hand tools to clear a landing zone.

hunt down an enemy force reported massing near the confluence of the Dong Nai and Song Be Rivers. In one sharp battle, the enemy tried to encircle one of the brigade's battalions. The dense jungle and close fighting made resupply and evacuation impossible. On the early morning of 9 November, engineer teams were lowered from hovering helicopters to clear landing zones. With their power saws, they cut down trees, some 250 feet high and 6 feet in diameter, allowing helicopters to land and pick up casualties. The enemy, identified as a hard-core Viet Cong regiment, had been decimated and left behind more than 400 dead.[34]

In November and December, the 3d Brigade, 1st Division, teamed up with the South Vietnamese 5th Infantry Division in search-and-destroy operations in the area between Highway 13 and the Michelin Rubber Plantation to the west. During Operations BUSHMASTER I and II, the brigade encountered strong Viet Cong forces at Bau Bang, Trung Loi, and Ap Nha Mat in the fiercest fighting by units of the division thus far. The sharp battles resulted from chance encounters or enemy ambushes on returning convoys. During its sweeps, the brigade uncovered large caches of food, medicine, and supplies. Company C, 1st Engineer Battalion, provided a composite platoon and

[34] AAR, Opn HUMP, 173d Abn Bde, 19 Dec 65, pp. 1, 5–6, 9; 173d Abn Bde, Critique of Operation Hump, 19 Nov 65, pp. 14–15, both in Historians files, CMH; Hist Rpt of the 173d Engr Co, 1 Jan–31 Dec 65, pp. 18–19; Berry, *Sky Soldiers*, pp. 33–40; *Pictorial History of the 173d Airborne Brigade*, Section III, "Combat."

demolition teams, which helped the infantry destroy several camps, training facilities, tunnel complexes, and defense works.[35]

During November, the 2d Brigade continued clearing operations outside the 1st Division's base camps at Di An and Phu Loi. During Operation VIPER, which lasted until the end of the year, American troops located more than seventy Viet Cong tunnels and thirty-four camp sites. The division also found out how well the enemy had designed his defenses. Viet Cong camps were protected by perimeters of sharp wooden punji stakes, five-foot-deep trenches with firing ports, bunkers, and occasionally barbed wire. Often a system of tunnels branched out from the center of the camps. Company B engineers who ventured into the tunnel complexes also found compartments consisting of kitchens, dispensaries, classrooms, and living quarters, an indication of the many enemy complexes awaiting discovery.[36]

Before the year ended, other operations extended the reach of American forces in III Corps, but this time the action took place east of Saigon. During Operation NEW LIFE, which ran from 21 November to 17 December, the 173d Airborne Brigade moved by air to the air strip at Vo Dat in Binh Tuy Province and joined with South Vietnamese forces to prevent the rice harvest from falling into enemy hands. North of Vo Dat, in the La Nga Valley, a large group of refugees from North Vietnam had arrived in 1954 and transformed the once virgin jungle into the fifth highest rice-producing area in South Vietnam. In 1963, the Viet Cong moved in and with little resistance confiscated one half of the rice crop. They came back the following year and took the entire crop. During NEW LIFE, the airborne brigade saturated the area with patrols and sweeps. In the end, the farmers harvested their crops without interference and officials restored district-level government to the thirty thousand inhabitants of La Nga. During the operation, the 173d Engineer Company together with Australian engineers repaired over twenty-seven miles of local roads, built eleven bridges, and completed several civic action projects. For the first time, the 173d Engineer Company took along its bridging, assault boats, and construction equipment. Besides putting up a thirty-eight-foot dry span, the bridge platoon joined forces with Troop E, 17th Cavalry, to patrol the La Nga River. Using two assault boats, the twenty-man river patrol set out on 4 December, traveling about thirty miles. Along the way, the patrol discovered several caves, tunnels, and hidden sampans. At one point, the patrol came under fire, and the boats took several hits. While the engineer operators guided the boats out of range, artillery fire was directed on the enemy.[37]

[35] Quarterly Cmd Rpt, 1 Oct–31 Dec 65, 1st Inf Div, pp. 17–18; AARs, Opn BUSHMASTER I, 1st Inf Div, 21 Dec 65, p. 4, and Opn BUSHMASTER II, 1st Inf Div, 30 Dec 65, p. 5, both in Historians files, CMH; 1st Inf Div Info Release, Battle of Ap Nha Mat, 20 Feb 67, Vietnam Interview (VNI) 137, CMH. For more on the 1st Division's operations to the end of 1965, see Carland, *Stemming the Tide*, pp. 84–92.

[36] Quarterly Cmd Rpt, 1 Oct–31 Dec 65, 1st Inf Div, p. 17; *Pictorial History of the 2d Brigade, 1st Infantry Division*, "Deployment to Vietnam" and "Company B, 1st Engr Bn," sections.

[37] AAR, Opn NEW LIFE, 173d Abn Bde, 26 Jan 66, pp. 1–3, 12, 24, Historians files, CMH; *Pictorial History of the 173d Airborne Brigade*, Section III, "Combat"; Hist Rpt of the 173d Engr Co, 1 Jan–31 Dec 65, pp. 19–21.

From Operation NEW LIFE, the 173d Airborne Brigade moved directly to Operation SMASH, another search-and-destroy mission in a loosely coordinated operation with the 1st Division's 2d Brigade. Intelligence had indicated that the Viet Cong might be planning a major assault in the Xuan Loc area during the Christmas holiday period. The 173d's battalions patrolled west of Route 2, and the 2d Brigade worked east of Highway 15. During the week-long operation, demolition teams of the 2d Platoon, 173d Engineer Company, attached to the 2d Battalion, 503d Infantry, saw action. On 18 December, the airborne infantry and engineers successfully assaulted a strongly defended trench system manned with heavy machine guns. On the same day, the engineers escorted by Troop E, 17th Cavalry, moved south along Highway 15 toward Vung Tau to repair the road. In typical fashion, the Viet Cong had blocked the highway with ditches and other obstacles. Sniper fire caused the engineers to bring two squads for additional security. By the end of the operation, work crews filled some sixty ditches along fourteen miles of thoroughfare. On 22 December, the brigade returned to Bien Hoa to enjoy the Christmas holiday. It found a much improved base camp. Members of the engineer company who had remained behind not only upgraded the living quarters, but they also had built a new mess hall in time for Christmas dinner. As for the 2d Brigade, it saw no Viet Cong but found bases and destroyed supply caches. While the effects on enemy operations could not be determined, U.S. commanders believed that they had prevented a holiday offensive. More importantly, the presence of their units at some distance from the capital had served notice that the Americans were now here to stay in these contested parts of III Corps.[38]

The units under General Seaman's command gained valuable experience as they roamed throughout III Corps. Air transports and helicopters airlifted infantry task forces to airstrips and landing zones prepared and maintained by combat engineers. During these operations, combat engineers carried out a variety of tasks. The 1st Engineer Battalion provided mine detector and demolition teams, set up water points, maintained supply roads, and built bridges and rafts. The battalion's tankdozers proved very popular with the infantry by clearing paths through the jungle, exposing tunnel complexes, and detonating booby traps.[39]

Securing Highway 13, which ran through the enemy's well-entrenched strongholds of War Zones C and D, continued to be one of the priorities involving the divisional engineers. Like most Vietnamese national highways, Highway 13 had a bituminous surface treatment, adequate for the limited volume and weight of traffic before the U.S. buildup. The combination of an insufficient subgrade and poor drainage, heavy rains, Viet Cong sabotage, little maintenance by the South Vietnamese, and the pounding from heavy military convoys had resulted in a complete breakdown of the road. The 1st Division was determined to break Viet Cong control and open the road to a normal

[38] AAR, Opn SMASH, 173d Abn Bde, 26 Jan 66, pp. 1–2, 5–8, Historians files, CMH; *Pictorial History of the 173d Airborne Brigade*, Section III, "Combat"; Hist Rpt of the 173d Engr Co, 1 Jan–31 Dec 65, pp. 21–22.

[39] 1st Engineer Battalion History, 1965, p. 3.

flow of commerce. The 1st Engineer Battalion concentrated on clearing mines and making repairs. Since the 1st Division had arrived at the end of the rainy season, the engineers did not have to worry about the road being inundated in many places.[40]

To help the infantry destroy enemy tunnel complexes, the 1st Engineer Battalion organized a platoon made up of armored personnel carriers mounted with flamethrowers. Referred to by Colonel Sargent as the "Tunnel Killer Team," the platoon also used tankdozers, smoke pots, scoop loaders, and air compressors to carry out its mission. After the engineers inserted an air hose, the air compressor drove smoke through the tunnel exposing other holes in the dense jungle growth. Demolitions, scoop loaders, or tankdozers then sealed the holes. Still, the dense jungle could conceal other holes. Sargent reported that during the air compressor's first use, other holes could not be found. He concluded there must have been other holes because the compressor never idled, an indication of high pressure in the tunnel.[41]

The Ia Drang

While General Seaman extended his reach in III Corps, General Kinnard's immediate task in II Corps was to secure his base at An Khe and to hold open the highway to the coast. To do so, the 1st Cavalry Division on 6 October dispatched elements of the 2d Brigade to take control of the Vinh Thanh Valley, a Viet Cong–dominated rice-growing area located about twelve and one-half miles east of An Khe. Operation HAPPY VALLEY, which lasted until 19 November, involved air assaults, patrols, night ambushes, and civic action. Units of the 3d Brigade eventually replaced the 2d Brigade. While HAPPY VALLEY continued, the 1st Cavalry Division launched SHINY BAYONET, a five-day thrust into the Suoi Ca Valley in an attempt to find and destroy North Vietnamese units reported operating northeast of the division base. Little contact was made, but the cavalrymen gained experience operating in the field.[42]

During the two operations, the division's 8th Engineer Battalion dispatched elements appropriate for the mission. Companies B and C, respectively, supported the 2d and 3d Brigades. In addition, Company B constructed the Vinh Thanh Special Forces camp in the Vinh Thanh Valley complete with defensive fortifications, wire, underground bunkers, interconnecting trenches, quarters, and a dispensary. The engineers also did daily minesweeping and clearing along Highway 19 and Route 3A leading to the camp. Another task for Companies B and C was road maintenance. During this work, each company lost a 3/4-ton dump truck to land mines.[43]

[40] Ibid.

[41] Ibid.; Ltr, Lt Col Howard L. Sargent, CO, 1st Engr Bn, to Chief of Engrs, 14 Nov 65, Historians files, CMH.

[42] Quarterly Cmd Rpt, 1 Oct–31 Dec 65, 1st Cav Div (Ambl), 10 Jan 66, pp. 13–15, Historians files, CMH.

[43] *Memoirs of the First Team*, p. 27; Rpt, 14th Mil Hist Det, 1st Cav Div, 9 Jun 67, sub: Seven Month History and Briefing Data (September 1965–March 1966), pp. 18–19, 31–33, 36.

The assumption was that the 1st Cavalry Division's next operation would also be in Binh Dinh Province, but instead the division found itself increasingly oriented to the western highlands. In an uninhabited and rugged area between the Cambodian border and the Special Forces camp at Plei Me, some twenty-five miles south of Pleiku City, the North Vietnamese had concentrated three regiments. The Chu Pong Massif, with peaks rising to over 2,300 feet, dominated the area. A river, the Ia Drang, flowed along the mountain's northern edge, generally to the northwest. The dense vegetation provided excellent concealment for the enemy. On 19 October, Plei Me came under attack by one of the regiments. The South Vietnamese hesitated dispatching a relief force, fearing to leave Pleiku undefended. On 22 October, General Kinnard sent a battalion task force, including an artillery battery, to secure Pleiku upon departure of the relief force. Then, seeing an opportunity for combat, he obtained permission the following day to transfer the entire 1st Brigade to Pleiku. In a series of leapfrog moves by helicopter, the air cavalry's artillery kept the South Vietnamese column under cover of its 105-mm. howitzers. The relief column cautiously advanced, beating off a fierce attack before reaching Plei Me on the twenty-fifth.[44]

These events led to the Pleiku Campaign, the 1st Cavalry Division's first real combat test as a fighting force. On 27 October, General Westmoreland visited the division's 1st Brigade outpost at Landing Zone HOMECOMING south of Pleiku, where he gave General Kinnard the go-ahead to seek out and destroy the enemy in the western highlands. For the next two weeks, the 1st Brigade and the 1st Squadron, 9th Cavalry, combed the jungle near Plei Me, making occasional contact with the enemy.[45]

At that point, on 9 November, General Kinnard substituted the 3d Brigade. On the fourteenth, Lt. Col. Harold G. Moore's 1st Battalion, 7th Cavalry, made an airmobile assault into Landing Zone X-RAY, adjacent to the Chu Pong range. Without realizing it, the battalion had deployed almost on top of two North Vietnamese regiments. The North Vietnamese fell on the cavalry battalion. Over the next two days, in some of the fiercest fighting of the war in an area covered with high grass interspersed with ant hills nearly as high as a man's head, the battalion and reinforcements from the 3d Brigade beat back repeated assaults. Artillery at nearby Landing Zone FALCON and Air Force fighter-bombers pounded suspected enemy concentrations around the perimeter. The Air Force also unleashed B–52 raids on enemy positions and supply routes. At great risk, UH–1 Hueys flew in reinforcements, ammunition, medical supplies, rations, and water and carried off the dead and wounded. At dawn on the sixteenth, the Americans still held the landing zone. The North Vietnamese withdrew toward the sanctuary of Cambodia,

[44] AAR, Pleiku Campaign, 1st Cav Div, 4 Mar 66, pp. 10, 18–25, Historians files, CMH; Rpt, 14th Mil Hist Det, 1st Cav Div, 9 Jun 67, sub: Seven Month History and Briefing Data (September 1965–March 1966), p. 38; Carland, *Stemming the Tide*, pp. 99–104; Sharp and Westmoreland, *Report*, pp. 99, 110; Westmoreland, *A Soldier Reports*, pp. 189–90.

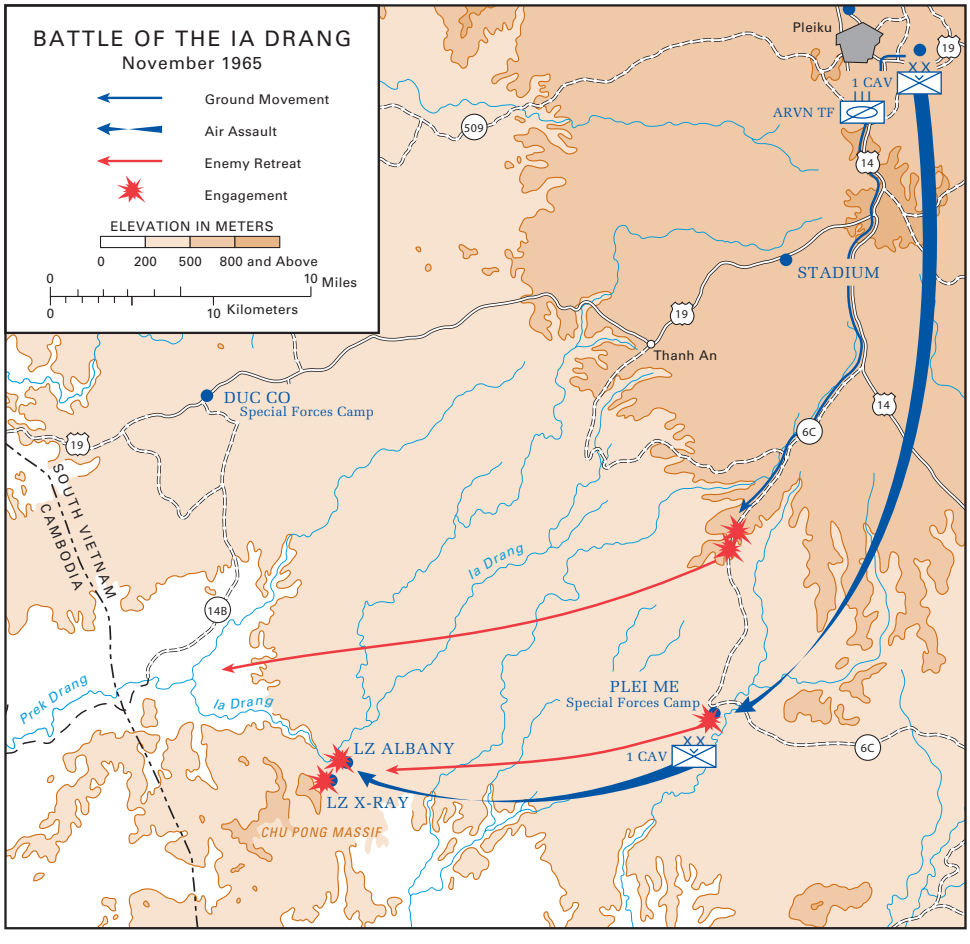
[45] Westmoreland, *A Soldier Reports*, p. 190; AAR, Pleiku Campaign, 1st Cav Div, pp. 27–67, 76; Tolson, *Airmobility*, pp. 74–75; Rpt, 14th Mil Hist Det, 1st Cav Div, 9 Jun 67, sub: Seven Month History and Briefing Data (September 1965–March 1966), pp. 37–44.

Troops of the 1st Battalion, 7th Cavalry, advance at Landing Zone X-RAY where attached engineers also fought as infantry.

but in the process bloodied the 2d Battalion, 7th Cavalry, in an ambush near Landing Zone ALBANY. The 2d Brigade moved in and chased the enemy to the border. General Kinnard sought permission to enter and finish off the North Vietnamese units, but officials in Washington rejected the request. President Johnson had decided that the United States sought no wider war and would fight the ground war solely within the borders of South Vietnam. Unable to pursue the enemy into Cambodia, American efforts west of Pleiku quickly petered out. On November 26, the troops returned to An Khe, satisfied in the knowledge that airmobility coupled with strong artillery and air support had dealt a blow to the North Vietnamese.[46]

The 8th Engineer Battalion provided continuous support throughout the Pleiku Campaign. Companies A, B, and C provided direct support to the 1st, 2d, and 3d Brigades, respectively. In turn, platoons were attached to the infantry battalions, and squads or demolition teams deployed with the infantry companies to clear landing zones and booby traps. The 3d Brigade deployed

[46] AAR, Pleiku Campaign, 1st Cav Div, pp. 69–132; Rpt, 14th Mil Hist Det, 1st Cav Div, 9 Jun 67, sub: Seven Month History and Briefing Data (September 1965–March 1966), p. 44–50. For more on the Pleiku Campaign, see Carland, *Stemming the Tide*, pp. 111, 113–47; John A. Cash, "Fight at Ia Drang, 14–16 November 1965," in *Seven Firefights in Vietnam* by John A. Cash, John Albright, and Allan W. Sandstrum (Washington, D.C.: Office of the Chief of Military History, U.S. Army, 1970), pp. 3–40; Joseph L. Galloway, "Fatal Victory," *U.S. News & World Report* (29 October 1990): 32–34, 36–37, 40–43, 44–45, 47–51; and Lt. Gen. Harold G. Moore and Joseph L. Galloway, *We Were Soldiers Once . . . and Young: Ia Drang—The Battle That Changed the War in Vietnam* (New York: Random House, 1992), pp. 59–327.



Map 6

nine five-man demolition teams from Company C, 8th Engineer Battalion, to its three infantry battalions, three teams to each battalion. Besides overseeing the committed units, Colonel Malley and his staff reconnoitered the roads and bridges and areas for landing zones and airstrips. At STADIUM, a forward support base southwest of Pleiku astride Highway 19, the battalion set up a water point and provided the tactical units with a continuous supply of water throughout the operation. Water was a special problem at X-RAY because the nearby streambed was dry, making the cavalrymen totally dependent on the water hauled in by helicopters.[47] (*Map 6*)

[47] AAR, Pleiku Campaign, 1st Cav Div, pp. 1, 5; Rpt, 14th Mil Hist Det, 1st Cav Div, 9 Jun 67, sub: Seven Month History and Briefing Data (September 1965–March 1966), p. 18; AAR, Ia Drang Campaign, 8th Engr Bn, 16 Dec 65, p. 1, Historians files, CMH; Carland, *Stemming the Tide*, p. 126.

Seven engineers from Company C were at X-RAY clearing helicopter landing areas and fighting as infantry. The largest area available to land helicopters was vulnerable to enemy fire, and Colonel Moore noticed a smaller area just east of his battalion command post that could take two helicopters if some trees were removed. He turned to his engineer demolition team leader, Sgt. George Nye, to clear the trees. As the enemy fire intensified Nye recalled, "You could see the enemy, and suddenly we were part of the 1st Battalion, 7th Cavalry. It's tough to try to be an infantryman and a demolition specialist at the same time, but we did it. We blew those trees; no sawing. The intensity of fire made working with a saw tough, working without a weapon. By blowing the trees we could spend more time fighting." After the enemy withdrew from X-RAY, the remaining engineers collected and destroyed 100 enemy rifles and machine guns, 300 to 400 hand grenades, 7,000 rounds of ammunition, 3 cases of rocket-propelled grenades, and 150 entrenching tools.[48]

Throughout the forward areas, hasty building tasks characterized the 8th Engineer Battalion's work in the field. CH–47 Chinook helicopters lifted equipment, in sections if necessary, to job sites. After the attack on Plei Me, Company A, less the 3d Platoon and reinforced with equipment from Headquarters Company, moved to the camp to repair the airfield, destroyed unexploded shells, and buried enemy dead. A major effort included filling a large bomb crater, some fifty-five feet wide and twenty feet deep in the center of the runway. At STADIUM, Company A worked on field fortifications and extended the runway. As the brigades moved in and out of the area, Companies B and C took over engineering tasks. Company C continued maintaining the airstrip at STADIUM, filling ruts caused by CV–2 Caribou and C–123 Provider aircraft. By this time, it had become routine for the airmobile engineers to build landing zones, participate in reconnaissance missions and infantry patrols, clear mines, and repair roads.[49]

During the Pleiku Campaign, the 8th Engineer Battalion suffered its first battle deaths. While on a road reconnaissance near STADIUM, a jeep from the company headquarters hit a mine, killing two noncommissioned officers and wounding two other engineers. When the North Vietnamese struck the perimeter at STADIUM in a mortar and ground attack, Company C defended an assigned sector, which the enemy failed to penetrate. Company C lost one soldier killed in action and three wounded. The demolition teams from Company C attached to the 1st Battalion, 7th Cavalry, at Landing Zone X-RAY suffered two deaths. By the end of the Pleiku Campaign, the 8th Engineer Battalion had lost six killed and thirteen wounded.[50]

[48] Moore and Galloway, *We Were Soldiers Once*, pp. 76, 116, 161–63, 199 (quoted words, pp. 76 and 162); AAR, Ia Drang Campaign, 8th Engr Bn, pp. 3–4.

[49] Rpt, 14th Mil Hist Det, 1st Cav Div, 9 Jun 67, sub: Seven Month History and Briefing Data (September 1965–March 1966), pp. 18–19; AAR, Ia Drang Campaign, 8th Engr Bn, pp. 2–4.

[50] Rpt, 14th Mil Hist Det, 1st Cav Div, 9 Jun 67, sub: Seven Month History and Briefing Data (September 1965–March 1966), p. 19; AAR, Ia Drang Campaign, 8th Engr Bn, pp. 3–4 and incl. 1; Galloway, "Fatal Victory," p. 45; Moore and Galloway, *We Were Soldiers Once*, p. 76.

Following the Ia Drang battles, General Westmoreland decided to move another brigade into the highlands to provide a permanent American presence. Between 18 December 1965 and 23 January 1966, the 3d Brigade, 25th Infantry Division, moved from Hawaii by sea and air to Pleiku. Two infantry battalions disembarked at Cam Ranh Bay and flew to Pleiku, while the third flew direct from Hawaii. The preparations begun in 1962 to build an airfield at Pleiku capable of handling large transport planes now proved well worth the effort.[51]

The Hawaii-based 25th Division, commanded by Maj. Gen. Frederick C. Weyand, had long prepared for operations in the Far East. Tapped as the Army's immediate reaction force in the Pacific, the Tropic Lightning Division often participated in deployments and exercises to Thailand, Taiwan, and Okinawa. The division specialized in jungle warfare and counterinsurgency operations. In January 1963, soldiers of the 25th Division responded to MACV's call by volunteering to serve as aerial door gunners to protect UH–1 helicopters. With the departure of the 3d Brigade, the rest of the division prepared itself for the long sea voyage leading to a different destination northwest of Saigon.[52]

As the 3d Brigade began to arrive and set up its base camp on the high ground northeast of Pleiku, elements of the 1st Cavalry Division guarded the surrounding area. The 3d Brigade soon took over its own defenses, placing priority on building a perimeter and an austere base camp at the same time. Accompanying the 3d Brigade was Company D, 65th Engineer Battalion. Attached to Company D were a bridge platoon from Company E, 65th Engineer Battalion, and two water supply teams, an engineer equipment section, and a medical section from Headquarters Company.[53]

As 1965 came to an end, elements of the 1st Cavalry Division directed their attention to Binh Dinh Province east of An Khe. Company C, 8th Engineer Battalion, supported the 3d Brigade in Operation CLEAN HOUSE, the division's last major operation of the year. Between 17 and 30 December, short but fierce encounters took place in the Suoi Ca Valley a few miles west of Highway 1 and north of Qui Nhon. The 1st Platoon attached to 2d Battalion, 7th Cavalry, and the 3d Platoon attached to the 1st Battalion, 8th Cavalry, served primarily as infantry, while the 2d Platoon attached to the 1st Battalion, 7th Cavalry, did extensive demolition work that included blocking caves believed to be used by the enemy. The balance of the company used its own and borrowed equipment from Headquarters Company to maintain roads leading to the brigade's forward support element.[54]

[51] Westmoreland, *A Soldier Reports*, p. 198; Quarterly Cmd Rpt, Oct–Dec 65, 25th Inf Div, n.d., pp. 4–6, and ORLL, 1 Jan–30 Apr 66, 3d Bde, 25th Inf Div, 23 Jun 66, pp. 1–2, both in Historians files, CMH.

[52] Quarterly Cmd Rpt, Oct–Dec 65, 25th Inf Div, pp. 8–9; *The 25th's 25th . . . in Combat, Tropic Lightning, 1 October 1941–1 October 1967*, 25th Infantry Division, 25th Div Public Affairs Ofc, n.d., pp. 129–67, 179–81, copy in CMH.

[53] Quarterly Cmd Rpt, Oct–Dec 65, 25th Inf Div, Part II, incl. 9; Msg, CG, 25th Inf Div to Asst Div Cmdr-2, 12 Dec 65, sub: HOLOKAI XI & XII, Historians files, CMH; ORLL, 1 Jan–30 Apr 66, 3d Bde, 25th Inf Div, p. 2.

[54] *Memoirs of the First Team*, p. 30; Rpt, 14th Mil Hist Det, 1st Cav Div, 9 Jun 67, sub: Seven Month History and Briefing Data (September 1965–March 1966), pp. 19, 51–56.

The 8th Engineer Battalion's Intelligence Section was also hard at work. Throughout December, the section's reconnaissance troops flying in a UH–1D helicopter at treetop level recorded data on all major roads in the II Corps area. The reconnaissance engineers also landed at the bridge locations to determine their types and vehicle-carrying capacities.[55]

By year's end, General Westmoreland believed that the emergency phase of the war had passed. Combat engineers assigned to the divisions and separate brigades had settled into a pattern of closely supporting infantry, armor, and artillery units in the field. Base development responsibilities remained secondary missions, only accomplished on a regular basis by troops remaining behind at the base camps. As for nondivisional combat engineer support, it remained under centralized command and concentrated on base development, providing operational support when necessary. Because the buildup proceeded so rapidly, construction had been done on a crash basis. As the engineer effort grew in size, the need for organizational and managerial changes soon became evident.

[55] Rpt, 14th Mil Hist Det, 1st Cav Div, 9 Jun 67, sub: Seven Month History and Briefing Data (September 1965–March 1966), p. 19.

4

Organizing the Construction Effort

With the arrival of contingents of Army engineers, Navy Seabees, Marine Corps engineers, Air Force engineers, and civilian contractors, U.S. construction strength mounted rapidly. Changing requirements for facilities from which to conduct or support combat operations and deployments interfered with the establishment of construction priorities, which, in turn, depended on the availability of labor, equipment, materials, and sites, for which there was intense competition among the services. Because of the rapid buildup, construction was initially accomplished on a crash basis under existing command and control arrangements. As the number of engineer units increased, the requirement grew to organize the construction effort.

Preliminary Proposals

Before 1965, several engineering offices in South Vietnam were involved in construction matters, but no single agency exercised supervision and control. Although the Navy's construction offices in Bangkok and Saigon provided some supervision of the construction program, the engineering offices within MACV planned and set priorities. MACV did this through three separate offices: the Base Development Branch, J–4; the Engineer Branch, Directorate of Army Military Assistance Program Logistics, J–4 (formerly the Engineer Advisory Branch, Military Assistance Advisory Group [MAAG]); and a small Engineer Branch within the Headquarters Commandant, which had the housekeeping responsibility for the headquarters. The Army's Support Command engineer, the Air Force's 2d Air Division civil engineer, and the Navy's Public Works provided engineering support to their respective services. Added to this were the contractors; Vietnamese Army engineers; Army, Navy, and Air Force engineer detachments; and Pacific Command and its subordinate service commands and their engineering staffs in Hawaii.[1]

Rules governing who would control a coordinated construction program in Vietnam, however, had yet to be worked out. In December 1961, the U.S. buildup had been expected to increase the tempo of construction, and the Military Assistance Advisory Group established an office to obtain real estate and monitor and coordinate construction matters for all U.S. military personnel in the country. Later these functions were passed to the MACV Base Development Branch. This small branch, however, had limited authority and concerned itself with other matters. It watched out for possible duplication of facilities or inequitable construction standards among the services, saw

[1] Joint Tables of Distribution, MACV, 1 Sep 64, pp. 47–50, Historians files, CMH.

that military assistance construction projects fitted into contingency and base development plans, prepared base development portions of MACV war plans, and acquired real estate. Funding and approval of projects continued to be processed through service channels, and the office did not oversee construction. The Base Development Branch was strictly a planning and coordinating office with "primary cognizance" over construction matters. Initially the branch was headed by a Navy commander, assisted by an Army major, who also served as real estate officer, and a Marine Corps major. The branch underwent an organizational change in September 1964 when an Army colonel was authorized as the chief, assisted by a Navy commander and an Air Force major.[2]

A loose organization known as the U.S. Construction Staff Committee composed of representatives from the various U.S. agencies met primarily to coordinate construction for the Vietnamese military forces and civilian agencies. Chaired by the MACV J–4, the committee included representatives of the Engineer Branch, Directorate of Army Military Assistance Program Logistics, J–4; the U.S. Operations Mission; the Deputy Officer in Charge of Construction, Republic of Vietnam; the U.S. Army Support Command; and other MACV and service agencies in South Vietnam. The modest requirements for the U.S. advisory teams, the MACV staff, and the small number of U.S. military units took up little of the committee's time.[3]

During the spring of 1965, the Engineer Branch, Directorate of Army Military Assistance Program Logistics, J–4, expanded its attention beyond military assistance projects. Col. Kenneth W. Kennedy took over the branch in November 1964, and under his tenure the branch assumed a larger role planning U.S. base requirements. Kennedy and members of his staff reconnoitered and prepared a major study for the development of Cam Ranh Bay as a logistics base. He also participated in the J–4 proposal to deploy an Army logistical command and engineer group to Vietnam in anticipation of a future military buildup. Throughout this time, Kennedy advocated the creation of a MACV command engineer office.[4]

Colonel Kennedy's proposal received strong backing from Lt. Gen. Walter K. Wilson, the chief of engineers, and Lt. Gen. Lawrence J. Lincoln, deputy chief of staff for logistics, also a Corps of Engineers officer. During the Department of Defense team's visit to Vietnam in January 1965 to investigate the logistical command and engineer group proposals, it also recommended that command engineering responsibilities should be passed to the Navy's construction office in Saigon. Generals Wilson and Lincoln strongly disagreed. Wilson mainly disagreed, not because the Deputy Officer in Charge

[2] Ltr, Chief, Military Assistance Advisory Group (MAAG), Vietnam, to CINCPAC, 8 Feb 62, sub: Report of Chief, MAAG, Vietnam for Period 2 Sep 1961 to 8 Feb 1962; Joint Tables of Distribution, MACV, 1 Jul 63, p. 7 (quoted words); Joint Tables of Distribution, MACV, 1 Sep 64, pp. 47–50; Interv, Capt E. Gregory, Mil Hist Br, MACV, with Col Kenneth W. Kennedy, MACV Engineer, 10 Nov 65, p. 1, box 6, 69A/702, RG 334, NARA.

[3] MFR, Col Kenneth W. Kennedy, 8 Feb 71, sub: Thoughts on Vietnam: Nov 1964–Nov 1965, pp. 6–7, OCE Hist Ofc.

[4] Interv, Gregory with Kennedy, 10 Nov 65, p. 1; MFR, Kennedy, 8 Feb 71, sub: Thoughts on Vietnam, pp. 1–2.

of Construction in Saigon lacked effectiveness in supervising contract construction, but, rather, because of the need for a command engineer with a sufficient staff to plan and advise on all military engineering matters for the Military Assistance Command, Vietnam. Lincoln supported Wilson and noted that the team's proposal considered the engineer mission only within the scope of construction, facility, and real estate matters. "Such an arrangement," he argued, "would require a Navy Civil Engineer to perform a role for which he has no background." In mid-March, after his visit to Vietnam, Lt. Gen. William F. Cassidy, the chief of engineer's designee, lent his support. Lt. Gen. Bruce Palmer Jr., the deputy chief of staff for military operations, who also looked into the proposal during his visit to the theater, agreed with the engineers when he reported his findings to the chief of staff, General Johnson. As a result, the MACV engineer, the Army contended, logically had to be a Corps of Engineers officer.[5]

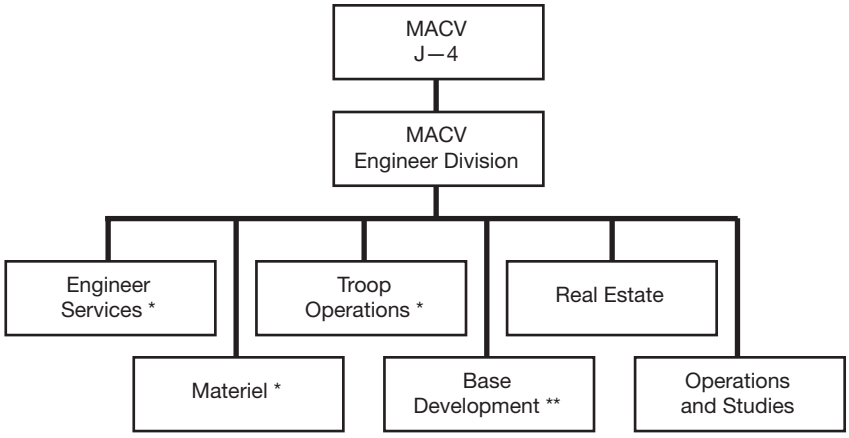
On 7 April 1965, Colonel Kennedy was appointed MACV engineer. The appointment came when the J–4, with General Westmoreland's concurrence, notified him that in addition to heading the Engineer Branch, he would also be the director of Army Military Assistance Program Logistics and take over direction of the Base Development Branch, with the mission of planning and supervising construction of facilities needed for the buildup. A few days later, Kennedy was on his way to Hawaii to attend the deployment planning conference at Pacific Command headquarters. Within twenty-four hours after his arrival, he prepared a hasty base development plan estimated to cost $266 million. Troop construction requirements totaled 113 battalion-months for Army construction units and another 21 battalion-months in Seabee effort. The Army and Navy representatives at the conference made tentative agreements to deploy eight Army and three Navy construction battalions. They also recognized that construction would lag far behind the imminent buildup of combat forces, that construction would be austere, and that operations would have to be supported across the beach. But Kennedy later recalled: "Many forgot this as soon as they got ashore."[6]

Returning to Saigon, Kennedy was shocked and dismayed to find out that the Support Command engineer, Lt. Col. Edmond J. Cochard, had briefed General Taylor, now the U.S. ambassador to Saigon, without coordinating with the MACV engineer. Taylor, who initially resisted the U.S. buildup, only approved the deployment of five construction battalions, three less than the

[5] Ch of Engrs, Summary Sheet, 13 Feb 65, sub: Engineer Staff for MACV, and Addendum to Summary Sheet, Lt Gen Lawrence J. Lincoln, DCSLOG, to CofS Army, 19 Feb 65, sub: Engineer Staff for MACV (quoted words), Incls in Memo, Secretary of the General Staff for CofS Army, 27 Feb 65, sub: Engineer Staff for Hq MACV; Memo, Lt Gen Bruce Palmer, DCSOPS, for CofS Army, 25 Feb 65, sub: Engineer Staff for Hq MACV, all in Historians files, CMH; Interv, Lynn Alperin, OCE Hist Ofc, with Brig Gen Kenneth W. Kennedy, 23 Apr 84, pp. 297–98, OCE Oral History Interview Collection; MFR, Kennedy, 8 Feb 71, sub: Thoughts on Vietnam, pp. 1–2.

[6] MRF, Kennedy, 8 Feb 71, sub: Thoughts on Vietnam, pp. 2–3 (quoted words p. 3); Interv, Gregory with Kennedy, 10 Nov 65, pp. 1, 3; Interv, Alperin with Kennedy, 23 Apr 84, pp. 299–306.

CHART 2—MACV ENGINEER DIVISION, MAY 1965



Source: Interv, Gregory with Kennedy, 10 Nov 65

* Original advisory sections of Engineer Branch, Director of Army Military Assistance Program Logistics, J–4
** Assumed control in April 1965

number Kennedy and the conferees had agreed upon in Hawaii. Fortunately, Kennedy found this out in time to change the message sent to the Department of the Army. The modified message read that five battalions were needed at once with the other three to be provided on call. In any case, Kennedy recognized that the engineers needed to improve coordination.[7]

In May, further reorganization affected Kennedy's MACV engineer operations. He was relieved of his duties as director of Army Military Assistance Program Logistics, and those functions were absorbed by the J–4. A separate MACV Engineer Division was formally established under J–4 supervision. Two new branches were added: Real Estate and Operations and Studies. With the arrival of U.S. military units now under way and with the need to acquire land for new bases, Kennedy had no recourse but to take the arriving 64th Engineer Detachment (Terrain Analysis) and assign the topographic unit to the Real Estate Branch. The U.S. Construction Staff Committee continued to meet with Kennedy, who served as the executive secretary.[8] (*Chart 2*)

As the buildup intensified so did the burden on the Engineer Division. Twelve officers and ten enlisted men were authorized; their workload increased by three to four times. Colonel Kennedy shuttled between Saigon and Honolulu, attending more planning conferences at Pacific Command headquarters. The

[7] MFR, Kennedy, 8 Feb 71, sub: Thoughts on Vietnam, p. 3; Interv, Alperin with Kennedy, 23 Apr 84, pp. 307–08.

[8] MFR, Kennedy, 8 Feb 71, sub: Thoughts on Vietnam, p. 4; Interv, Gregory with Kennedy, 10 Nov 65, p. 1; Interv, Alperin with Kennedy, 23 Apr 84, pp. 312–13; Misc files, MACV Real Estate Br, 15 Oct 65, Historians files, CMH.

planners struggled to develop a basic construction program and justify supplemental funds for all the services. As the scope of engineer activities expanded with the buildup, the J–4 on 15 November underwent another reorganization. This included elevating the MACV engineer to the J–4 deputy for engineering and finally authorizing additional personnel. But the engineer staff increased by less than half to eighteen officers and seventeen enlisted men.[9]

During this time, Kennedy faced practices that made coordinating and controlling construction difficult. Engineer offices of service headquarters continued to submit projects through their service chain of command for funding and approval and had a free hand in assigning work to troops. For instance, Army requirements proceeded through the U.S. Army, Pacific, which reviewed all Army construction projects in the Pacific and integrated them into a priority listing. The avalanche of work involved in base development planning overwhelmed the small MACV engineer staff, and more of this responsibility was delegated to the service commands. This meant the Army Support Command and its successor U.S. Army, Vietnam, would prepare base development plans for II, III, and IV Corps, the Air Force's 2d Air Division for specified air bases, and the III Marine Amphibious Force for I Corps.[10]

Without clear-cut control, the MACV Engineer Division began exerting more influence in construction matters. The division reviewed plans for new projects exceeding $25,000 and had authority to establish priorities. As a MACV staff office, the division issued regulations outlining base development procedures, the acquisition of real estate, and construction standards. When the subordinate service headquarters received approval and funding from their services, Kennedy had the option to do the work either by troops or contract. Projects considered more suitable for accomplishment by contract, usually larger and more complex projects in more secure areas, were passed on to the Deputy Officer in Charge of Construction in Saigon. This arrangement made sense because the Navy construction office in Saigon had increased its architect-engineering capability. It also helped that the Bureau of Yards and Docks had raised the Saigon office to an independent Officer in Charge of Construction to handle growing construction requirements. Projects not sent to the Officer in Charge of Construction were assigned to the Army and Navy commands in Vietnam. Those projects assigned to U.S. Army, Vietnam, were further delegated to the 1st Logistical Command and later the 18th Engineer Brigade. Although more projects were assigned to the growing number of Army engineer units, the logistical command also looked to Pacific Architects and Engineers to carry out much of the construction. In I Corps, the III Marine Amphibious Force assigned its troop projects to the 30th Naval Construction Regiment or a Marine Corps engineer battalion.[11]

[9] Raymond, Observations on the Construction Program, p. 9; Interv, Gregory with Kennedy, 10 Nov 65, pp. 2–3; Dunn, *Base Development*, p. 18.

[10] Interv, Gregory with Kennedy, 10 Nov 65, pp. 4–6; Interv, Alperin with Kennedy, 23 Apr 84, pp. 313–15; MFR, Kennedy, 8 Feb 71, sub: Thoughts on Vietnam, pp. 4–5; JLRB, Monograph 6, *Construction*, p. 86; MACV History, 1965, p. 127.

[11] Interv, Alperin with Kennedy, 23 Apr 84, pp. 314–15; Tregaskis, *Building the Bases*, p. 106; MFR, Kennedy, 8 Feb 71, sub: Thoughts on Vietnam, pp. 8–9; MACV History, 1965, p. 127; Army Buildup Progress Rpt, 22 Sep 65, p. 34, CMH.

As MACV engineer, Kennedy also used his position to call on help from other agencies. In his role as senior adviser to the South Vietnamese Army engineers, he exerted influence over the employment of those units. In several instances, the South Vietnamese engineers prepared beach unloading sites and campsites, and gave other help during the initial buildup. Help also came from the U.S. Operations Mission. Since Viet Cong harassment had stopped almost all aid projects, the mission made equipment and materials available for U.S. military use. For instance, nine hydraulic dredges were placed under the MACV engineer's control, and several metal prefabricated warehouse kits were transferred to the military. This enabled the engineers to build some badly needed warehouses at Da Nang, Cam Ranh, and the Saigon port.[12]

One of Kennedy's high-priority projects was Cam Ranh Bay. After General Westmoreland decided to transform the sandy peninsula into a major base in May 1965, interest by the three services began to snowball. Months later Kennedy remarked: "At first we couldn't get anybody to put anything there but now we can't keep people out and it's now one of the most overcrowded facilities that I know of." He advocated putting the air base on the mainland. Westmoreland, Kennedy, and Lt. Gen. Joseph H. Moore, commander of the 2d Air Division, boarded the MACV commander's helicopter and reconnoitered the area from the air. Westmoreland then ordered the aircraft to land at a spot on the northern part of the peninsula and made up his mind to put the airfield there. After listening to Kennedy's proposal for a mainland site, Westmoreland noted he understood the rationale, but his preference remained with the peninsula location primarily for security reasons. During the building of Cam Ranh Bay, Kennedy held weekly planning sessions with representatives of the agencies concerned to decide funding and location. They divided the peninsula functionally into four areas: a northern sector for the Army for later development into a convalescent hospital and a replacement and recreation center, a sector for the Air Force base, another sector for the Army port and depot complex, and a small sector on the southeast corner for a Navy facility.[13]

The arrival of two senior engineering officers in September placed Kennedy, still a colonel, in the unusual position of directing an admiral and a general. R. Adm. William F. Heaman, arrived to take over temporarily as Officer in Charge of Construction. General Ploger's arrival the same month to take command of the 18th Engineer Brigade added to Kennedy's predicament. As uncomfortable as this arrangement may have appeared, Kennedy's relations with the two were excellent. Besides, he figured the two flag officers had enough to handle. At the end of November, he ended his tour and turned over the office to Col. Daniel A. Raymond, a brigadier general designate.[14]

[12] MFR, Kennedy, 8 Feb 71, sub: Thoughts on Vietnam, pp. 7–8.

[13] Quote from Interv, Gregory with Kennedy, 10 Nov 65, p. 13; MFR, Kennedy, 8 Feb 71, sub: Thoughts on Vietnam, p. 11; Interv, Alperin with Kennedy, 23 Apr 84, pp. 318–22; Development of Cam Ranh Bay, 1st Log Cmd, 30 Oct 66, p. 1, box 13, 68A/4975, RG 319, NARA.

[14] Tregaskis, *Building the Bases*, pp. 106, 183, 187; Interv, Alperin with Kennedy, pp. 341–44; Msg, COMUSMACV MACJ4-EN to CINCPAC, 18 Aug 65, sub: Construction Effort, Historians files, CMH.

The 18th Engineer Brigade staff at its headquarters in Saigon. General Ploger is fifth from the left in the front row.

The Construction Boss Concept

Back in Washington, high-level officials in the Department of Defense had come to the opinion that control of the construction program needed to be tightened. After his visit to South Vietnam in July 1965, Edward J. Sheridan, the deputy assistant secretary of defense for properties and installations, in his role as deputy overseer of Defense Department construction matters, recommended a central office within MACV other than the J–4 to coordinate the military building effort—a construction boss or "construction czar." During his visit to Cam Ranh Bay, he expressed concern over what appeared to him to be vague construction responsibilities between troops and contractors. General Westmoreland initially agreed but later indicated that the situation had improved to his satisfaction. In an exchange of messages with Admiral Sharp at Pacific Command, he pointed out that Sheridan's visit came at a time his command faced a herculean task to plan and formulate construction requirements. Westmoreland believed that Kennedy's office had been strengthened and the staff had gotten valuable experience. He also felt the impending arrivals of General Ploger and his brigade headquarters and Admiral Heaman as the new Officer in Charge of Construction would give him the organizations and expertise to satisfy construction requirements.[15]

Neither Sheridan nor Defense Secretary McNamara shared Westmoreland's views. McNamara felt that the job warranted an Army major general. By then, Sheridan seriously considered selecting Brig. Gen. Carroll H. Dunn, an Army

[15] JLRB, Monograph 6, *Construction*, p. 87; MFR, Lt Col John E. Gray, OCE, 27 Jan 66, sub: Conference of Deputy Assistant Secretary of Defense (Properties and Installations), Ofc Asst Sec Def (Installations and Logistics), with Brig Gen Carroll H. Dunn, Carroll H. Dunn Papers, CMH; Msg, COMUSMACV MACJ4-EN to CINCPAC, 18 Aug 65, sub: Construction Effort; Msgs, Sharp to Westmoreland, 26 Aug 65, and Westmoreland MAC 4356 to Sharp, 27 Aug 65, both in Westmoreland Message files, CMH.

engineer serving in Korea as deputy chief of staff of Eighth Army, as best qualified to run the theater's construction program. When McNamara visited Saigon in November 1965, he was dismayed to find no progress on the construction czar proposal. Upon his return to Washington, he directed General Earle G. Wheeler, chairman of the Joint Chiefs of Staff, to examine the problem. In a series of messages to Sharp and Westmoreland, Wheeler presented the Defense Department's case for a construction czar. He pointed out that construction projects in Vietnam cut across all the services and were financed, controlled, and executed by several agencies, including a civilian contractor. He also noted that the defense secretary had departed Saigon with the realization that the construction program would grow to the billion-dollar level. Besides the appointment of a construction chief, Wheeler added that Washington would authorize a large expansion of the MACV engineer office to about 150 men. The Army general heading this organization would report directly to Westmoreland, not the J–4. Wheeler summed up by noting that the chiefs of the services' engineering officers agreed.[16]

Westmoreland continued to support the status quo. He argued that his new deputy chief of staff J–4 for engineering, soon to be General Raymond, exercised sufficient control over the construction program, and that Admiral Heaman, besides serving as the Officer in Charge of Construction, also helped the J–4 as a special assistant for contract construction. He also felt satisfied with his three construction agencies: the 18th Engineer Brigade, the 30th Naval Construction Regiment, and the Officer in Charge of Construction. What he really wanted, besides sufficient funding for the construction program, was more flexibility in using the construction funds allocated to him. Wheeler responded that every effort would be made to allow more flexibility and emphasized the best way to isolate any construction problems would be to assign such responsibility to a single manager. This approach would simultaneously reduce a large workload on the J–4. He also recognized that Dunn, who would soon be a major general, might cause some rank disparity with the J–4, a brigadier general. This could not be helped.[17]

On 8 December, Westmoreland answered that he could not solve logistical and construction problems by changes in organization. He had a board of officers look at the construction czar proposal, and it reaffirmed his position to keep the J–4 in charge of a strong engineering organization. Westmoreland also independently solicited the views of Admiral Heaman, who fully indorsed the board's findings. The MACV commander felt his deputy assistant chief of staff J–4 for engineering did everything in the Defense Department's proposal. During McNamara's visit in November, he had outlined what he considered to be major construction problems. These did not include organization or management within his command.

[16] Msg, Wheeler JCS 4658–65 to Sharp, 1 Dec 65; Msg, JCS 7886 to CINCPAC, 4 Dec 65, both in Westmoreland Message files, CMH; MFR, Gray, 27 Jan 66, sub: Conference of Deputy Assistant Secretary of Defense (Properties and Installations), Ofc Asst Sec Def (Installations and Logistics), with Dunn, Dunn Papers, CMH. See also Cosmas, *Years of Escalation, 1962–1967*, pp. 281–82.

[17] Msg, Westmoreland MAC 6176 to Sharp and Wheeler, 5 Dec 65; Msg, Wheeler JCS 4761–65 to Westmoreland and Sharp, 7 Dec 65, both in Westmoreland Message files, CMH.

Instead, MACV's problems were the lack of construction units, the lack of spare parts for construction equipment, and the delays in the delivery and distribution of critically needed building materials. Westmoreland especially disliked the funding restrictions that precluded rapid responsiveness to new requirements. He agreed that an augmentation of twenty-four people for his engineering office would improve its effectiveness. He also pointed out that a separation of the construction from the overall logistics function could cause more problems than it would solve. "Aside from [the] proliferation of staff elements," Westmoreland argued that, "the close coordination between construction, movement control and transportation would be impaired."[18]

By this time Westmoreland believed that the Pentagon was trying to tell him how to do his job. "It is incredible to me," he recorded in his personal notes, "that higher headquarters would suggest how a subordinate command would be reorganized to do the job the commander is responsible for. Nevertheless, this proposal has been raised on several occasions, and despite my position, it is still an issue." Sensing he would lose the argument anyhow, he proposed to Sharp another way to use General Dunn. In a carefully crafted backchannel message, Westmoreland suggested raising the rank of his J–4 to major general and putting Dunn in that position. "It has become increasingly clear to me," he wrote, "that the magnitude of the logistics mission confronting the command calls for a J–4 of greater rank and more varied experience." He praised the effectiveness of his current J–4 but noted "that an Army engineer officer is most likely to combine general logistic experience with competence to manage the extensive construction program." Therefore, he concluded, the Defense Department should reconsider the construction czar proposal since the J–4 would be an Army engineer.[19]

On 18 December, Wheeler provided further guidance. He explained that the construction program—now approaching $1 billion—amounted to nearly one-half of the entire Corps of Engineers' construction effort, both civil and military. This fact had impressed the chairman and seemed to prove that MACV required "powerful organizational arrangements." Such a strong, centralized organization under a "construction boss," Wheeler added, would receive "quick, top level approval" to Westmoreland's appeals for more flexibility in the construction program. Without a construction boss in MACV, Wheeler predicted, "it is practically certain that procedures giving such flexibility will not receive approval, at least not at this time."[20]

Although Admiral Sharp had supported Westmoreland, he realized something had to be done. He identified the construction problems in Vietnam to be those concerned with funding, the lack of construction personnel and

[18] Quote from Msg, COMUSMACV 43885 to CINCPAC, 8 Dec 65, sub: MACV Construction Staff Augmentation, box 44, 71A/2351, RG 330, NARA; Westmoreland Historical Notes, no. 2, 8 Dec 65, Westmoreland History files, CMH; JLRB, Monograph 6, *Construction*, p. 87.

[19] Westmoreland Historical Notes, no. 2, 8 Dec 65; JLRB, Monograph 6, *Construction*, p. 87; Msg, Westmoreland MAC 6257 to Sharp, 8 Dec 65, Westmoreland Message files, CMH.

[20] Msg, Wheeler JCS 4934–65 to Westmoreland and Sharp, 18 Dec 65, Westmoreland Message files, CMH; Tregaskis, *Building the Bases*, p. 204.

General Westmoreland

equipment, and the long supply lines. If an Army engineer served as the J–4, then, according to Sharp, the MACV construction office should be headed by a Navy Civil Engineer Corps rear admiral. By 22 December, Sharp agreed with the points brought out in Wheeler's 18 December message and withdrew his suggestion for the Navy engineer construction boss if it would help settle the matter. He also wanted to make sure that they did not set up the construction agency outside the MACV staff, with the agency's operation left to "Westy's judgement." Realizing that further debate over a construction boss seemed fruitless, Sharp recommended that they "get on with setting him up."[21]

On 20 December, the Joint Chiefs of Staff recommended establishment of the position of construction boss, and on 6 January 1966 the deputy secretary of defense, Cyrus R. Vance, concurred. "It should be clearly understood," Vance stated in a memorandum to Wheeler, "that the 'engineer construction boss' has full authority to discharge the responsibilities placed on him, and that such authority rests in him and not in the MACV-J4." Sharp alerted Westmoreland, and Westmoreland promptly requested General Dunn for assignment as his J–4 with authority vested in him to coordinate and control all construction projects. Brig. Gen. John D. Crowley, his current J–4, would serve as deputy J–4 and concentrate on matters other than construction. Westmoreland was convinced this approach offered him the most effective and efficient arrangement. This would permit Dunn to arbitrate conflicting interests involving port operations, transportation, and related matters essential to support construction. In another message to Sharp the following day, Westmoreland reiterated his concern that his construction boss should have control over funding allocations and expressed "strong views as to how my staff should be organized."[22]

[21] JLRB, Monograph 6, *Construction*, p. 87; Msg, Sharp to Wheeler, 22 Dec 65, Westmoreland Message files, CMH.

[22] Memo, JCS JCSM–891–65 for Sec Def, 20 Dec 65, sub: Construction Management in Vietnam, quoted in Msg, JCS 1836 to COMUSMACV, 17 Jan 66, sub: Construction Management in Vietnam, Dunn Papers, CMH; Memo, [Cyrus R.] Vance for Chairman, JCS, 6 Jan 66, sub: Construction Management in Vietnam (first quotation), OCE Hist Ofc; Msg, Wheeler JCS 103–66 to Sharp and Westmoreland, 6 Jan 66; Msg, Westmoreland MAC 0179 to Sharp and Wheeler, 9 Jan 66, sub: Construction Czar; Msg, Westmoreland MAC 0215 to Sharp, 10 Jan 66 (second quotation), all in Westmoreland Message files, CMH.

Wheeler replied on 13 January that no one had intended to tell Westmoreland how he should organize his staff. Still, Defense Department officials expressed skepticism over the proposal to make Dunn the J–4 and whether one officer could handle both jobs. Wheeler pointed out that pursuing the J–4 proposal "will inevitably delay the decentralizing of functions and funds as you have requested." Reflecting on his experience as a general staff officer, the chairman did not see any problems of "rank inversion" between Crowley and Dunn. Westmoreland's proposal, Wheeler added, might be the best solution, but he frankly doubted it. Two days later, Wheeler reiterated these concerns to both Sharp and Westmoreland. In discussing the matter with Secretary Vance, he learned that any relaxation of controls by the Defense Department "over the construction effort was predicated upon the construction boss being neither the J4 nor reporting through the J4 to COMUSMACV."[23]

On 14 January, Wheeler informed Sharp and Westmoreland that Secretary McNamara had approved and issued a memorandum outlining interim procedures for construction management in Vietnam. In essence, Westmoreland's construction boss had supervision and directive authority over all military and civilian agencies involved in military construction in the country. To help carry out this vast task, the engineering staff would be increased by three to four times the number of additional people requested by MACV. McNamara's construction charter contained Defense Department policies dealing with approval and reprogramming of construction funds and standards of construction. The charter also gave to the MACV commander broad authority to issue construction directives within fifteen broadly defined functional categories (for example, cantonments, ports, maintenance buildings, hospitals, and airfield pavements). Westmoreland now had the authority to transfer funding from one category to another, provided the amount did not exceed 10 percent of the receiving functional category. The following month, McNamara amended this charter along with subsequent policy memos dealing with fiscal accounting and construction reporting procedures.[24]

Westmoreland decided to accept, at least for the time being, assigning Dunn solely as his construction chief. He still had reservations about the wording in Secretary Vance's 6 January memorandum. In a message to Wheeler on the eighteenth, he complained: "It is inconceivable that 'full' authority be vested in one of my subordinates and not in me and further that I be restricted in the authority I might choose to delegate to my J4 in the interest of carrying out my broad and demanding responsibilities." Still, he concluded "there is nothing to be gained at this juncture by making an issue of what I consider an arbitrary and unprecedented decision by Secretary Vance." One week later,

[23] Msg, Wheeler JCS 205–66 to Sharp and Westmoreland, 13 Jan 66; Msg, Wheeler JCS 227–66 to Sharp and Westmoreland, 15 Jan 66, both in Westmoreland Message files, CMH.

[24] Msg, Wheeler JCS 213–66 to Sharp and Westmoreland, 14 Jan 66, Westmoreland Message files, CMH; Tregaskis, *Building the Bases*, pp. 204–05; Memos, [Robert S.] McNamara for JCS and Secretaries of Military Departments, 14 Jan and 12 Feb 66, sub: Construction Approval Procedures for South Vietnam; JCS JCSM–39–66 for CINCPAC, 14 Jan 66, sub: Construction Management in Vietnam, all in MACV Dir of Const, Plans and Opns Div, Development of the Construction Directorate, 15 Jun 70, Historians files, CMH.

General Dunn

Westmoreland learned that *Time* magazine was preparing an article about construction in Vietnam. He decided to announce that General Dunn would be designated as his director of construction, not MACV engineer, since he would not have any troops under his command.[25]

In mid-January, Dunn left his assignment in Korea and proceeded to Washington to be briefed on the construction picture in Vietnam.[26] He met with Sheridan and members of the Southeast Asia Construction Group. This group, established the previous September, monitored and supported the military construction programs presented to Congress. Its members included people from the Defense Department's installations and logistics office and an Army colonel, an Air Force colonel, and a Navy captain from the services engineering offices. Dunn also met with Sheridan's chief, Paul R. Ignatius, the assistant secretary of defense for installations and logistics. Ignatius pointed out that Secretary McNamara had granted to General Westmoreland a broad construction charter, which gave wide managerial latitude to his construction chief. Dunn would be given ninety days to develop a detailed construction program, while minimizing the inflationary effect of a huge construction program on the South Vietnamese economy. He also considered Dunn to be his representative in Saigon. Dunn

[25] Msg, Westmoreland MAC 0459 to Wheeler, 18 Jan 66, Westmoreland Message files, CMH; Westmoreland Historical Notes, no. 3, 25 Jan 66, Westmoreland History files, CMH.

[26] Upon his graduation from the University of Illinois with a degree in mechanical engineering, Dunn was commissioned a second lieutenant in 1938 through the Reserve Officers' Training Corps and was selected to serve in the Regular Army. During World War II, he served as commander, 105th Engineer Battalion, 30th Infantry Division, which arrived in Normandy shortly after D-Day. He led the battalion across France to the Elbe River in Germany. Subsequent assignments included command of the 1153d Engineer Group (Combat) in France; Assistant Chief of Staff, G–4, 2d Infantry Division, Camp Swift, Texas, and Fort Lewis, Washington; instructor at the Engineer School, Fort Belvoir, Virginia; and the Engineer Section, General Headquarters, Far East Command, Tokyo, Japan, during the Korean War. After promotion to colonel, he served as Executive Officer to the Chief of Engineers in Washington, D.C.; Director of the Army Waterways Experiment Station, Vicksburg, Mississippi; student at the Industrial College of the Armed Forces in Washington, D.C.; Area Engineer, Thule, Greenland; and Director and Deputy Commander of the Titan II Missile System Construction Program. As a brigadier general, he served as Division Engineer, Southwestern Division, Dallas, Texas; and Deputy Chief of Staff, Eighth Army, Seoul, Korea.

took this comment as a hint of the detailed control that would be exerted by the Defense Department over his operations in the war zone.[27]

On 18 January, Dunn and Sheridan met with members of the Military Construction Subcommittee of the House Appropriations Committee. Both soon found themselves the recipients of an informal hearing before the entire subcommittee gathered in the office of Congressman Robert L. F. Sikes of Florida, the chairman. Sikes remarked that the subcommittee had recently toured South Vietnam and voiced concern about the lack of construction battalions and lighterage to unload ships. Congressman Charles D. Long of Maryland asked about the engineer's views on the call-up of reserve construction battalions. Dunn replied that deployment priorities should include units needed for the logistics base buildup, but he could not address the manner of providing such units. Long also came up with some interesting statistics. He foresaw a requirement for sixty construction battalions in Southeast Asia plus some 60,000 civilian laborers. South Vietnam had only 23,000 skilled workers, and the congressman prodded Sheridan for the Defense Department to make contractors run training programs raising the skill levels of Vietnamese workers.[28]

Dunn next met Air Force engineering officials. Brig. Gen. Guy H. Goddard, the deputy director for construction in the Air Force's Directorate of Civil Engineering, pointed out that air base construction, although approved and funded, did not receive high enough priority. The chief problem, according to Goddard, stemmed from the Army's failure to live up to its troop support agreement for construction in Vietnam and Thailand. Goddard also pointed out that the new Air Force Red Horse squadrons, organized to repair airfields and do light construction tasks, could not alleviate the airfield construction gap. The civilian head of the secretary of the Air Force's installations office expressed similar concerns.[29]

In his meeting with R. Adm. A. C. Husband, chief of the Navy's Bureau of Yards and Docks, Dunn was briefed on the problems faced by the Officer in Charge of Construction. First was the long lead times in letting contracts, and this tied up funds. The admiral pointed out the shortages of LSTs and lighterage and the backup of ships carrying construction materials. To make matters worse, the South Vietnamese government imposed enough red tape, which made it difficult to hire workers from other countries. It took a long time to get real estate. Equipment deliveries were frequently delayed. The

[27] MFR, Gray, 27 Jan 66; sub: Conference of Deputy Assistant Secretary of Defense (Properties and Installations), Ofc Asst Sec Def (Installations and Logistics), with Dunn; MFR, Gray, 27 Jan 66, sub: Assistant Secretary of Defense (Installations and Logistics) Meeting with Gen Dunn, MACV Engr Designate, Dunn Papers, CMH; Dunn, *Base Development*, p. 43; *Engineer Memoirs, Lieutenant General Carroll H. Dunn* (Alexandria, Va.: Office of History, U.S. Army Corps of Engineers, 1998), p. 102.

[28] MFR, Gray, 27 Jan 66, sub: Appearance of Gen Dunn Before Military Construction Subcommittee, House Appropriations Committee, Dunn Papers, CMH.

[29] MFRs, Gray, 27 Jan 66, sub: Briefing of Gen Dunn, by the Department of the Air Force Directorate of Civil Engineering, and Conference of Gen Dunn with Deputy for Installations, Office of the Assistant Secretary of the Air Force (Installations and Logistics), both in Dunn Papers, CMH.

Navy's office in Saigon needed more specific instructions by the using agencies and increased staffing to prepare plans. In several cases, contractors could not disengage from projects after completing most of the work because of add-on refinements by the customers. Refinements could be better done by military engineers. To obtain a better balance of troop and contract construction, the Navy engineers advised assigning construction troops in areas threatened by the enemy. Dunn also learned that the Navy's contracting effort, running at a rate of some $14 million per month, would gradually climb to $40 million by October 1966.[30]

Dunn's whirlwind visit to the capital included meeting more officials. He attended meetings with the Army chief of engineers, members of the Army Staff, and the Joint Chiefs of Staff J–4. The new construction chief wrapped up his stay by resolving some questions in a final conference with Ignatius and Sheridan. Dunn pointed out his concern with the fiscal accountability restrictions in McNamara's 14 January memorandum, which he felt, if not resolved, would impede management of the construction program. The construction charter called for funds to be apportioned to each service by Defense Department categories, altogether forty-five separate accounts. Dunn suggested a breakout of funds not further than the three services. Otherwise he would become a "chief accountant" at the expense of his construction management function. Ignatius agreed, and the Defense Department made this and several other administrative changes in a memorandum signed by McNamara on 12 February. In addition, the Officer in Charge of Construction would maintain fiscal accounting for the contracts it administered. This practical arrangement did not last long. Later, the Defense Department reinstated restrictive funding and accounting procedures.[31]

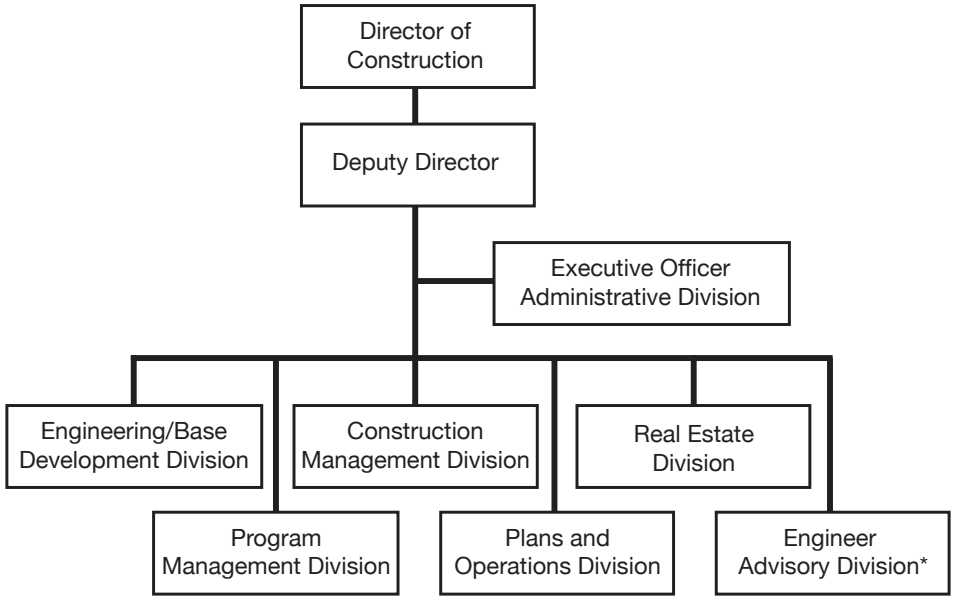
A New Directorate

On 15 February 1966, the MACV Directorate of Construction became operational. Besides overseeing the construction program, General Dunn as the director of construction also assumed control of the advisory effort for the South Vietnamese Army engineers. Structured along functional lines, the new directorate organized the former MACV engineering office into seven main divisions: Administrative, Engineering and Base Development, Construction Management, Real Estate, Program Management, Plans and Operations, and Engineer Advisory. The initial organization called for 144 people, about one-half Army, one-quarter Navy and Marine Corps, and one-quarter Air Force. To

[30] MFR, Gray, [1] 8 Jan 66, sub: Briefing of Gen Dunn, MACV Engr Designate, by Navy Bureau of Yards and Docks, Dunn Papers, CMH.

[31] MFR, Gray, 1 Feb 66, sub: Principal Level Conference to Resolve Funding Procedures for the South Vietnam Construction Program, Dunn Papers, CMH; Tregaskis, *Building the Bases*, pp. 204–05; Memo, McNamara for JCS and Secretaries of Military Departments, 12 Feb 66, sub: Construction Approval Procedures for South Vietnam; Memo, Department of Defense (DoD) Comptroller for JCS and Service Assistant Secretaries for Financial Management, 7 Mar 66, sub: Fiscal Procedures and Accounting for Construction in Vietnam, both in MACV Dir of Const, Plans and Opns Div, Development of the Construction Directorate, Dunn Papers, CMH.

CHART 3—MACV CONSTRUCTION DIRECTORATE, FEBRUARY 1966



	Army	Navy	Air Force	Total
Officers	23	14	12	49
Enlisted Men	19	4	6	29
Total	43	18	18	78

*Totals do not include the Engineer Advisory Division.

Source: Raymond, Observations on the Construction Program, p. 163

reflect the joint makeup of the directorate, MACV assigned a Navy civil engineering corps captain as the deputy and an Air Force engineer lieutenant colonel as the executive officer. Army engineers headed five of the divisions while Air Force engineers headed the other two (Engineering and Base Development, and Program Management). The Engineer Advisory Division remained entirely staffed by the Army.[32] (*Chart 3*)

When Dunn reported to Westmoreland, he put any doubts about his role to rest. McNamara's memorandums in effect delegated to the director of construction the authority to decide requirements and set priorities, which bothered Westmoreland. In one of Dunn's first meetings with the MACV commander, Westmoreland alluded to the fact that the secretary of defense

[32] Msg, COMUSMACV MAC 05240 to CINCPAC, 18 Feb 66, sub: Construction Management Organization, MACV; MACV Directive 415–2, 15 Feb 66, *Construction: Mission and Functions of the Director of Construction*, p. 1, in MACV Dir of Const, Plans and Opns Div, Development of the Construction Directorate, Dunn Papers, CMH; Joint Tables of Distribution, Construction Directorate, MACV, 1 May 66, pp. 1–7, Historians files, CMH.

had given this authority to his construction chief. Dunn responded: "I know for whom I work, and obviously the priorities that are going to be set are those which you feel are the ones needed." After that conversation, Dunn recalled the two had a good working relationship, and "never once did he fail to back me up completely in the decisions that I reached."[33]

Dunn's first task as director of construction was to sort out the growing number of projects required by the three services and to work out a priority list. Kennedy and Raymond, the latter now Dunn's deputy, had thrashed over these same problems. But Dunn had a Defense Department charter that gave him the authority to approve what each service did with its construction funds. This authority clearly allowed him to allocate troops, contractors, or a mix of both to each major project. The breakout for the building effort remained essentially the same. Seabees and Marine Corps engineers supported all the services in I Corps. Army engineers supported the services in the other three corps. The large construction consortium of RMK-BRJ continued to work on projects throughout the country.[34]

Between 1965 and the spring of 1966, MACV's construction priorities began taking a dramatic turn. In 1965, General Westmoreland topped his list with improving airfields and related facilities, then improving roads and railroads, rehabilitating and expanding ports, and building logistics facilities. Putting logistics facilities at the bottom of the priority list, however, created another problem. Deep-draft vessels brought about 90 percent of all military supplies and equipment into the country. Of that amount, construction materials alone constituted about 40 percent. This presented an ironic situation. Increased shipping carrying the materiel for the buildup was backing up offshore, which, in turn, delayed construction of the ports and storage facilities needed to resolve the shipping backup. The same limited berth space at the Saigon port also had to make way for ships carrying U.S. economic assistance and other commercial shipping. Secretary McNamara, during his visit to South Vietnam in November 1965, voiced his annoyance over what he considered overlapping and conflicting priorities exemplified by the glut of ocean-going ships anchored off the mouth of the Saigon River at Vung Tau waiting their turn to use the Saigon port. Colonel Raymond and the Officer in Charge of Construction came up with a quick estimate to fund the urgently needed port work and presented the defense secretary with a revised program. Following McNamara's visit, Westmoreland reevaluated the priorities and shifted more effort to port improvements and logistical facilities.[35]

For some time, Air Force officials had complained about what they termed inadequate construction support. Even when airfield work ranked at the top of the priority list, the air service criticized the lack of support

[33] *Engineer Memoirs, Lieutenant General Carroll H. Dunn*, p. 103 (quotation).

[34] Ibid., pp. 212–13; Tregaskis, *Building the Bases*, pp. 204–05.

[35] Dunn, *Base Development*, pp. 36, 51; Heiser, *Logistic Support*, p. 17; Tregaskis, *Building the Bases*, pp. 188–90; Msg, COMUSMACV MACJOO 42038 to CINCPAC, 28 Nov 65, sub: Priority of Construction, RVN, box 4, 69A/702, RG 334, NARA; Interv, Stuart I. Rochester with Maj Gen Daniel Raymond, 11 Jan 80, pp. 71–72, OCE Hist Ofc; MACV J–4 Briefing, 28 Nov 65, Historians files, CMH.

to complete new airstrips and improve older ones at Cam Ranh Bay, Phan Rang, Qui Nhon, and Tan Son Nhut. As far back as June 1965, the Pacific Air Forces had requested two reinforced Army engineer battalions to operate under Air Force control. Westmoreland, however, insisted on establishing an integrated priority list and keeping the Army engineer troop construction effort under Army control.[36]

When Dunn arrived in Saigon, he found his staff engaged in the planning stages reflecting the recent changes in priorities. Westmoreland had just postponed construction of a jet fighter base and supporting port complex at Tuy Hoa. The air base work, scheduled to start on 1 February, had dropped in priority following the review giving preference to ports. Although the MACV commander confirmed the need for three additional air bases, their siting would be determined by existing and programmed port projects. New air bases requiring port facilities that only supported those bases, like Tuy Hoa, dropped to a lower priority. Besides, MACV had just received $4.3 million to design and construct the first increment of a new large port complex, Project NEWPORT, to improve Saigon's port capacity. In addition, design work by the Officer in Charge of Construction continued for another high-priority job, a new MACV headquarters complex in Saigon. This project, which had Westmoreland's personal interest, required delicate, high-level negotiations for valuable real estate. Negotiations were also under way with Vietnamese officials to resolve real estate problems encountered by RMK-BRJ at its University quarry site outside Saigon.[37]

Then there were additional construction requirements driven by expected increases in U.S. and allied strength. At another joint planning conference held in Hawaii in early February 1966, Westmoreland asked Sharp for more troops. From a seventy-one battalion force arranged with McNamara the preceding summer, the MACV commander now foresaw the need to increase his combat force to 102 infantry battalions, 79 U.S. and 23 allied. The increase of American troop strength to 429,000 included many support troops, and this meant a further increase in the base construction program.[38]

By the spring of 1966, Dunn refined construction priorities using the Defense Department's fifteen functional categories. He divided these categories into five priorities. The command grouped port facilities, airfield pavements, and communications facilities under Priority I. Airfield support complexes, hospitals, maintenance support buildings, and liquid fuel

[36] Schlight, *Years of the Offensive*, p, 66; Msg, COMUSMACV MACJ4-EN 22789 to CINCUSARPAC, 2 Jul 65, sub: USARPAC FY 1966 Construction Requirements Priority List; Msg, COMUSMACV MACJ4-EN 27583 to CINCPAC, 6 Aug 65, sub: Engineer Troop Support for USAF in RVN, both in box 26, 77/53, RG 319, NARA.

[37] Schlight, *Years of the Offensive*, p, 66; Msg, COMUSMACV MACJ4-EN 22789 to CINCUSARPAC, 2 Jul 65, sub: USARPAC FY 1966 Construction Requirements Priority List; Msg, COMUSMACV MACJ4-EN 27583 to CINCPAC, 6 Aug 65, sub: Engineer Troop Support for USAF in RVN; Msg, COMUSMACV to CINCPAC, 23 Jan 66, sub: Airfield and Port Construction; Disposition Form (DF), MACV Dir of Const to Ch, Hist Br, MACV, 19 Feb 66, sub: Historical Summary [1–31 Jan 66]. Second and third msgs and DF in Historians files, CMH.

[38] Westmoreland, *A Soldier Reports*, pp. 192–93.

storage followed under Priority II. Priority III included ammunition storage, cold storage, warehouse storage, and administrative buildings. Projects in Priority IV encompassed lines of communications (roads and railways), shed storage, and open storage areas. Cantonments placed last in Priority V. MACV listed the NEWPORT project as the highest priority followed by more port work at Da Nang, Qui Nhon, Cam Ranh Bay, and Vung Tau. The command also listed the other Priority I projects, including the runways, aprons, and taxiways at four air bases (Da Nang, Chu Lai, Phan Rang, and Phu Cat), and several sophisticated communications systems. While outlining the priorities in answer to a query from the U.S. Embassy in Saigon, MACV also pointed out that troop self-help was to be used to the maximum to build the cantonments. Ongoing plans to move many support units out of Saigon resulted in the command giving Long Binh the highest priority in the cantonment category.[39]

A few weeks after his arrival, General Dunn presented an up-to-date status report on military construction to Admiral Sharp during his visit to Saigon. Dunn pointed out that the funding picture, including the anticipated Fiscal Year 1966 supplemental appropriation, now totaled approximately $861 million. Since troop labor involved only the cost of materials, Dunn noted that this amount would total just over $1.2 billion if the work was assigned to a contractor. He also mentioned the add-on of another $1.3 billion in contract costs for new projects outlined in the February conference in Hawaii, increasing the construction program to approximately $2.5 billion in contract values. To bring home the impact of getting the job done with his available resources, Dunn pointed to another chart depicting a month-by-month execution capability by military engineers and contractors. Together, the U.S. construction forces could complete about $601.4 million in work during 1966. This meant that, at the same rate of accomplishment, it would not be until mid-November 1967 before a start could be made on the new requirements.[40]

During the briefing, Dunn emphasized the need to have fund authorization for the added projects before beginning work. At least five to six months' lead time was necessary to obtain certain construction materials. Longer lead times were necessary to get plants and specialized equipment such as dredges. Unless advance procurement funds became available, the MACV construction chief warned that advance procurement would have to come out of the command's operating funds, thus cutting back on the rate of ongoing work.[41]

Dunn believed that by the end of 1966, minimal acceptable facilities could be completed to support tactical and logistical operations. This could only happen after giving close attention to priorities and carefully allocating resources. American forces, however, would still be left "with much less than

[39] Memo, Dunn for Dep Amb William Porter, 20 May 66, sub: MACV Military Construction Priorities, Historians files, CMH.

[40] MFR, MACV Dir of Const, 3 Mar 66, sub: General Dunn's Briefing for Admiral Sharp on 3 March 1966, Historians files, CMH.

[41] Ibid.

the needed facilities for the desired degree of efficiency in operations and economy of effort." Although he expected that the installation of additional DeLong piers and other port work would provide adequate port capacities by August 1966, much remained to be done in ancillary facilities—hardstands, transit storage, access roads, and other improvements—to increase the efficiency of port operations. The same applied to the need for tactical jet airfields. He cited the minimum aircraft "beddown" requirements that were developed at a Pacific Command conference in January. Dunn went on to say that the expeditionary airfield construction, and expansion at existing airfields, should meet essential operational needs. Prefabricated runways and additional aprons would be in service that year, but some effectiveness, efficiency, and safety margins would be sacrificed. The permanent airfield pavements and upgrading air base facilities, he noted, would stretch out beyond the end of the year. He warned that such projections were independent of any contingency requirements that might arise.[42]

The director of construction went on to outline starts on new projects, progress on others, and some improvements in funding and management. During McNamara's visit the previous November, MACV received authorization to start Project NEWPORT and the new MACV headquarters. Washington also made funds available for advance procurement of long-lead-time items. Work was now under way at Newport. Long Binh was being transformed into a major logistical base. Clearing a site for the new MACV headquarters building at Tan Son Nhut Air Base had begun, and prefabricated building materials were on order. Enough DeLong pier units to provide sixteen deep-draft berths were due in April, and installation was expected by September. Dunn expressed some satisfaction in the relief granted by the Defense Department in financial accounting and funding flexibility. In addition, McNamara had gone to Congress with a request for a $200 million contingency fund to meet unforeseen construction requirements worldwide.[43]

As far as construction assets were concerned, Dunn could claim some progress in the first three months of 1966. The 18th Engineer Brigade increased from nine to eleven battalions. The 30th Naval Construction Regiment would expand from four to five battalions in March. Two Air Force Red Horse squadrons had arrived at Phan Rang and Cam Ranh Bay Air Bases. RMK-BRJ's workforce now stood at 28,066, and the value of the consortium's physical plant had grown from $32.9 to $53.5 million. The Officer in Charge of Construction had brought in two dredges with seven more on the way. In appraising the construction picture to Sharp after three weeks on the job, Dunn summarized: "A lot of progress made; a long way to go; a lot of problems to solve; and, a good solid foundation has been made."[44]

The timely arrival of the right type and enough construction materials stood high among the construction chief's concerns. He communicated

[42] Ibid.

[43] Ibid.

[44] Ibid. (quotation); CHECO Rpt, PACAF, 1 Sep 69, sub: Project RED HORSE, pp. 5, 9, copy in Historians files, CMH (hereafter cited as Project RED HORSE).

directly with General Frank S. Besson Jr., commander of the Army Materiel Command, to work out a forecast of tonnages and a shipping plan. Even under ideal circumstances, Besson noted it would take between 120 to 150 days lead time to ship materials from the United States. The Materiel Command was charged with getting more DeLong piers, and Dunn prodded Besson to include these units as early as possible. To cut down on production and shipping lead times, Besson pressed forth with negotiations to have the piers built in Japan. The two generals also exchanged ideas on a proposal to take World War II T–2 (Liberty ship) tankers out of storage, convert them into electrical power-generating ships, and move them to port and base complexes. The contractor operator would then tie the power ships into a land electrical distribution system, to be built and maintained by the contractor. Dunn suggested such systems for Cam Ranh Bay, Qui Nhon, and Nha Trang, and possibly Vung Tau and Long Binh.[45]

Another method to speed up procurement of construction equipment and material entailed creative financing. Earlier, in September 1965, Secretary McNamara had authorized some advanced procurement for the services in anticipation of additional funding, but even these expedient measures fell short. In January 1966, McNamara authorized the Bureau of Yards and Docks "advance obligation authority." This temporary procedure authorized the bureau to use $200 million in the Navy Stock Fund for additional advanced procurement to support projects in Vietnam. The Navy engineering office could obligate money in contract arrangements, but no expenditures would be made until Congress appropriated the $700 million in supplemental funds requested for 1966. In late March, Dunn advised the chief of engineers that his office authorized the Officer in Charge of Construction to purchase over $40 million in equipment, over $33 million for generators, and $4 million for DeLong piers at Da Nang. He added that the advance purchase of one thousand prefabricated buildings and thirty highway bridges would follow, thus cutting down on the critical lead time to get these projects under way. When Congress appropriated the supplemental funds, the services reimbursed the Navy Stock Fund.[46]

Ironically, Dunn had to put up with some reduction in funding because of urgent requirements to expand training bases in the United States. The Army's funding requirement to improve and build facilities at training centers and schools and for new units turned out to be greater than anticipated. In early June 1966, with the Defense Department's concurrence, the Army reprogrammed some construction funds destined for Southeast Asia. This amounted to a $37.1

[45] Msg, Gen Frank S. Besson, CG, U.S. Army Materiel Cmd, WDC 3441 to Dunn, 19 Mar 66; Dunn SOG 0287 to Besson, 3 Apr 66; Dunn SOG 0297 to Besson, 5 Apr 66; Dunn SOG 0316 to Besson, 12 Apr 66, all in Dunn Papers, CMH.

[46] Army Buildup Progress Rpts, 6 Oct 65, p. 38, 3 Nov 65, p. 56, 2 Mar 66, p. 67, CMH; Memo, McNamara for Service Secretaries, 22 Sep 65, sub: Advance Procurement of Construction Materials and Construction Equipment for U.S. Military Construction in South Vietnam, Historians files, CMH; Tregaskis, *Building the Bases*, pp. 198–99; JLRB, Monograph 6, *Construction*, p. 104; Msg, Dunn SOG 152 to Maj Gen Thomas J. Hayes, Dep Ch of Engrs, OCE, 22 Mar 66, Dunn Papers, CMH.

million cut and caused major readjustments to Army projects in Vietnam. To make matters worse, the Officer in Charge of Construction informed Dunn of escalating contract costs. Calling upon the tenant units to help build their own cantonments reduced contract labor costs and spared engineering troops for higher-priority projects. In responding to a congressional query passed on to him by Brig. Gen. Charles C. Noble, Sheridan's chief for Southeast Asia construction, Dunn noted that many combat and support units had already made extensive use of self-help to improve their living conditions.[47]

Perhaps Dunn's severest challenge as construction chief centered on the Air Force's demand to build its own jet fighter base at Tuy Hoa. Not at all happy with Westmoreland's construction priorities, Air Force officials in Washington pressed demands for the immediate construction of more airfields. In February, the air service proposed hiring its own contractor, thus bypassing the use of Army engineers and the Navy's prime contractor. This so-called turnkey proposal invited the contractor to design and build the base in a single package and literally turn over the keys of the completed facility to the user. At first Dunn, Westmoreland, and Sharp did not agree, but the Air Force argued that its contractor would add to MACV's construction assets. Both sides continued arguing who should build the base and whether or not to shift the location to Hue. In early May, McNamara decided to let the Air Force build the base at Tuy Hoa. Before the month was out, the Air Force had selected a contractor, who moved quickly to build an interim AM2 aluminum matting runway, and then a permanent runway and all of the facilities for a complete air base. Six months later, F–100 jet fighters touched down on the interim runway.[48]

Despite the Pentagon's insistence on making Dunn the director of construction, he served in that job for only five months. By 1 July, Westmoreland had made his move to make the engineer general his J–4. Since airfields, ports, and bases remained high priorities, the MACV commander still preferred to have an engineer officer as head of his logistical staff. In early April, he discussed the matter with Secretary Vance during his visit to Vietnam. Vance, who earlier rejected Westmoreland's proposal to appoint Dunn as J–4, now agreed. "This, I hope settles the matter," Westmoreland wrote in his diary, "which was somewhat annoying to me several months ago when JCS proceeded to organize the staff and failed to support a position that I had very strongly taken." He then advised Admiral Sharp, General Wheeler, and General Johnson that Dunn would take over the MACV logistical position on 1 July and that

[47] Army Buildup Progress Rpts, 22 Jun 66, p. 45, 22 Aug 66, p. 11, CMH; Richard P. Weinert, *The Role of USCONARC in the Army Buildup, FY 1966* (Fort Monroe, Va.: U.S. Continental Army Command, 1967), pp. 172–73; Msg, Dunn SOG 0579 to Maj Gen Charles C. Noble, Chief Southeast Asia Construction, Asst Sec Def (Installations and Logistics), DoD, 21 Jun 66, Dunn Papers, CMH.

[48] Tregaskis, *Building the Bases*, pp. 219–22; Schlight, *Years of the Offensive*, pp. 87–88, 120–22, 155; Dunn, *Base Development*, pp. 62–63; Msg, COMUSMACV MACDC 06315 to CINCPAC, 27 Feb 66, sub: USAF Proposal for Additional Cost Plus Fixed Fee Construction Contractor in Vietnam, box 4, 69A/702, RG 334, NARA; Msg, Dunn SOG 152 to Hayes, 22 Mar 66, Dunn Papers, CMH.

General Dunn visits the 45th Engineer Group headquarters in Qui Nhon in late 1967 as the MACV J–4. From left to right, seated: *Brig. Gen. Charles M. Duke, commanding general of 18th Engineer Brigade; General Dunn; and Col. Kenneth T. Sawyer, commanding officer of the 45th Engineer Group. Group staff in the background includes the author* (second from the left).

Raymond would become the new director of construction. When Dunn took on his new job, he would be a major general and Raymond would have his star. As J–4, Dunn exercised general guidance over the Construction Directorate until his departure in September 1967. By that time, Westmoreland's top logistics priority had become supply and supply management, and he recruited a skilled manager in that field to replace Dunn.[49]

Operational Control

As more engineers arrived in Vietnam, operational control became increasingly a matter of debate and concern. Tactical commanders felt that the workload and the demands placed on them justified the need for additional combat

[49] Quote from Westmoreland Historical Notes, no. 5, 6 Apr 66; Msg, Westmoreland MAC 2751 to Sharp, Wheeler, and Gen Johnson, 7 Apr 66, Westmoreland Message files, CMH; Westmoreland, *A Soldier Reports*, p. 509; *Engineer Memoirs, Lieutenant General Carroll H. Dunn*, p. 104.

engineer units. Organic engineer units lacked the manpower and equipment to handle all the tasks involved in base development. Just to move the equipment of a division or a brigade by road to a bivouac area or base camp dictated extensive engineering effort. In such cases, nondivisional engineer units proved valuable with their greater capability to provide materials such as rock, sand, culverts, and earth fill.[50]

The operational control of units under General Ploger's command became an issue from the moment the first engineer units came ashore. The initial emphasis on base development made engineer commanders and staff officers reluctant to transfer any of the few units available to the tactical commands. At the end of 1965, the 18th Engineer Brigade had five combat battalions in country, all committed to construction, with two more expected momentarily. Under more conventional circumstances, an Army corps would have commanded at least one engineer group or perhaps one group per division, with the groups receiving directions from the corps engineer. In Vietnam, however, General Westmoreland had established the Field Force, Vietnam, at Nha Trang. Lt. Gen. Jean E. Engler, who became the deputy commanding general, U.S. Army, Vietnam, in January 1966, agreed that 18th Engineer Brigade units would not be placed under field force command. He and Ploger felt that the demands of the construction program were such that the engineer brigade had to keep control of all its construction assets, including the combat battalions. Ploger also emphasized that engineers placed under the control of tactical commanders could be misused on pet or unessential projects.[51]

When Ploger had briefed General Westmoreland the previous November, he felt then that the 18th Engineer Brigade could ill afford to attach units to the tactical commands. Besides, most of the brigade's equipment could not be easily transported aboard helicopters to support the fast-flowing combat operations. Attached units, Ploger said later, "would have spent more time traveling about the countryside than working as engineers." The 18th Engineer Brigade commander believed "every hour and every day engineer troops spent away from the work site constituted a serious waste."[52]

The command structure that Ploger and his subordinate commanders developed, both for construction and operational support, corresponded closely to the principle of general support used by artillery units. While the major construction projects influenced the location and distribution of 18th Engineer Brigade units, the centralized system allowed engineer commanders to dispatch the closest units to support tactical operations. In Vietnam, the field force commands (Field Force, Vietnam, in II Corps, later designated I Field Force, Vietnam, when II Field Force, Vietnam, was established in early 1966) had their own planning sections but no assigned troops, and had to request the use of the general support engineer units. Each supporting unit commander could disapprove the request in whole or in part. This rarely happened since Ploger made it clear to all

[50] Ploger, *Army Engineers*, pp. 140, 186–87.
[51] Interv, Bower with Ploger, 8 Aug 67, pp. 22–23.
[52] Ploger, *Army Engineers*, pp. 140–41; Interv, Bower with Ploger, 8 Aug 67, p. 17 (quoted words).

his commanders and officers that operational support missions had top priority. If they could not handle a request, they were to pass it up through the engineer chain. Although this system was designed to suit the situation in Vietnam, tactical commanders still preferred direct control over supporting engineers.[53]

The 70th Engineer Combat Battalion's general support mission at An Khe is a good example. Experience showed that it took at least one battalion-month to prepare a site for use by one division. The 70th Engineer Battalion's attempt to help set up the 1st Cavalry Division's base camp in less time pointed out the need for more engineer troops, and the battalion remained at An Khe long after the arrival of the division, improving facilities and living conditions. In time, as more engineer battalions arrived in Vietnam, the divisions found at least one of the 18th Engineer Brigade's battalions conveniently located at or near their base camps. When the 1st Cavalry Division deployed to northern Binh Dinh Province, backup support was provided by the nearby 19th and 35th Engineer Battalions. In the western highlands, the 20th and 299th Engineer Battalions at Pleiku were often summoned to help division engineers.[54]

Oddly enough, occasional circumstances caused the 18th Engineer Brigade to control divisional engineering units. An advance element of the 25th Division—Company C, 65th Engineer Battalion—served under 18th Engineer Brigade and 35th Engineer Group control until the arrival of the 3d Brigade, 25th Division. The divisional engineer company did a variety of construction work that included joining forces with elements of light equipment and dump truck companies at Dong Ba Thin airfield complex. Company C also carried out the combat engineers' secondary role as infantry by providing convoy security to the 62d Engineer Construction Battalion when it moved to Phan Rang.[55]

Ploger's insistence on a centralized system of control not only had advantages from an engineering standpoint, but also benefitted nearby tactical units. Since engineer groups and battalions operated in assigned areas of responsibility, the need to move units from other areas over long distances was greatly reduced. This also gave the enemy fewer opportunities to ambush slow-moving convoys carrying construction equipment. The assignment of a given area to an engineer unit allowed it to become familiar with the local terrain and conditions. Over a period of time, this helped the divisions and brigades when they operated in these localities. An engineer battalion based near the new area of operations of redeployed divisions and brigades could be called upon for support and local intelligence and continue to apply its experience there to the nearby combat unit's advantage.[56]

The peculiar requirements of cost accounting for construction projects also dictated the need for centralized control. The accounting procedures

[53] Ploger, *Army Engineers*, pp. 142, 186; Interv, Bower with Ploger, 8 Aug 67, pp. 17–18; Interv, Sowell with Ploger, 21 Nov 78, sec. 9, p. 10; Ltr, Ploger to All Officers, sub: Concept of Engineer Operations SVN, 16 Nov 66, box 31, 77/51, RG 319, NARA.

[54] Ploger, *Army Engineers*, p. 187.

[55] Ibid., p. 55; Galloway, "Essayons," p. 96; *The 25th's 25th . . . in Combat, Tropic Lightning*, pp. 187–89.

[56] Ploger, *Army Engineers*, p. 188.

laid out by the Defense Department specified that an accurate record be kept showing the dollar value of material used in and the number of man-hours expended on any given project at any point in time. The task of keeping a running account of total costs and manpower used on a project evolved into a difficult procedure even when passed up through the various headquarters. If this function had been done by divisional battalions or brigade units assigned or attached to tactical headquarters, separate reporting chains would have been necessary. Along with this responsibility would have gone the administrative burden and problems of verification and enforcement that would have complicated the already rigorous demands placed on the tactical organizations in the field. As General Ploger later pointed out, even while doing base camp self-help projects, tactical units looked to an engineer unit to do all the cost accounting. If the engineers providing the supervision and guidance for the self-help projects did not handle the flow of construction materials as well as the bookkeeping, the magnitude of the paperwork would have overwhelmed the tactical units.[57]

Toward an Engineer Command

During the second half of 1966, the 18th Engineer Brigade gained more critically needed units and group headquarters to share command and control responsibilities. The 45th Engineer Group (Construction) under Col. George M. Bush traveled from Fort Bragg, North Carolina, and arrived at Cam Ranh Bay in early June. Upon settling in at Dong Ba Thin across the bay, the 45th Group assumed control over the 20th and 39th Engineer Battalions, two light equipment companies, and a dump truck company from the 35th Group. On 31 July, Lt. Col. James L. Kelly's 577th Engineer Battalion (Construction) from Fort Benning arrived and joined the 45th Group. Also that month, the 79th Engineer Group (Construction) from Fort Lewis, Washington, set up its headquarters at Long Binh. The 79th Group, commanded by Col. David C. Clymer, took over control of the 168th and 588th Engineer Battalions and two light equipment companies from the 159th Group. Two later arrivals, the 27th Engineer Battalion (Combat) in September and the 86th Engineer Battalion (Combat) in October, expanded the group to four combat battalions and several smaller units. The 159th Group at Long Binh added the 169th Engineer Battalion (Construction) from Okinawa in May, which together with the 46th and 62d Construction Battalions comprised a construction group made up of three construction battalions. By mid-November, two more combat battalions, the 14th from Fort Bragg and the 35th from Fort Lewis, arrived, with the 14th going to the 35th Group and the 35th to the 45th Group. In addition, another divisional engineer unit served with the 18th Brigade. In October, the 15th Engineer Battalion, 9th Infantry Division, preceded the division's move from Fort Riley to III Corps and the Mekong Delta in December 1966 and January 1967. For the time being, the 15th Engineer Battalion came under the operational control of the 159th Group. In a little over one year, Army engineer

[57] Ibid., pp. 188–89.

units under the 18th Brigade had grown to 5 groups, 19 battalions, 21 companies, 2 separate platoons, and 7 detachments.[58]

Since the Army had established three principal logistical support bases at Qui Nhon, Cam Ranh Bay, and the Saigon–Long Binh area, General Ploger initially superimposed his three groups' areas of responsibility in and around these base areas. The 937th Group at Qui Nhon provided engineering construction and combat support to U.S. forces in northern II Corps. The 35th Group at Cam Ranh Bay did the same in southern II Corps, and the 159th Group at Long Binh supported both III and IV Corps. Adjustments to these geographic areas of responsibility followed the arrival of the 45th and 79th Groups. Projects and engineer units at Tuy Hoa, Nha Trang, Dong Ba Thin and the northern Cam Ranh peninsula were transferred from the 35th Group to the 45th Group. Most of III Corps and the units in the area were transferred to the 79th Group, which permitted the 159th Group to concentrate on base development projects in the Saigon–Long Binh area.[59]

A group's designation as either construction or combat had only a small effect on the nature of its assigned mission or type of units assigned to it. Although four of the group headquarters were organized to oversee construction units and one to lead combat engineers, the assignment of geographic areas and work in these areas led to the attachment of a mix of combat and construction battalions to groups regardless of their designation. By 1 November 1966, seven of the ten combat engineer battalions worked under two of the four construction groups while one of the seven construction battalions served under the direction of the brigade's only combat group, the 937th. With the arrival of the 35th Engineer Battalion in early November, another combat battalion was added to a construction group.[60]

Other measures were also taken to keep track of operations. Control of five groups put an added burden on the 18th Brigade headquarters at Tan Son Nhut. As a partial remedy, General Ploger directed that each group assign a liaison officer to the brigade's operations section. The activation of a second U.S. corps-level command, II Field Force, Vietnam, under General Seaman at Long Binh, in March 1966, to coordinate the U.S. ground war in III Corps prompted the brigade to establish a Combat Support Section. For the sake of consistency, General Larsen's Field Force, Vietnam, at Nha Trang, which filled the same function in II Corps, received a new name, becoming I Field Force, Vietnam. Serving as the link to the field forces, the Combat Support Branch coordinated operational support for the two field forces.[61]

[58] 45th Engr Gp Hist, 10 Sep 70, p. 1; ORLLs, 1 May–31 Jul 66, 18th Engr Bde, 26 Aug 66, pp. 4–5, 18, 1 Aug–31 Oct 66, 18th Engr Bde, 30 Nov 66, p. 13, and 1 Aug–31 Oct 66, 577th Engr Bn, 31 Oct 66, p. 3, all in Historians files, CMH; Ploger, *Army Engineers*, pp. 131–33; Galloway, "Essayons," pp. 136, 138–39, 144, 148, 155.

[59] Ploger, *Army Engineers*, p. 132 and maps pp. 85, 132; ORLL, 1 May–31 Jul 66, 18th Engr Bde, p. 4; ORLL, 1 May–31 Jul 66, I FFV, 25 Aug 66, p. 42 and incl. 46, Historians files, CMH.

[60] Galloway, "Essayons," pp. 102–03; ORLL, 1 May–31 Jul 66, I FFV, p. 42, and incl. 46.

[61] Eckhardt, *Command and Control*, pp. 52–54; ORLLs, 1 Feb–30 Apr 66, 21 Jul 66, 18th Engr Bde, p. 1, Historians files, CMH, and 1 May–31 Jul 66, 18th Engr Bde, p. 6; Ploger, *Army Engineers*, p. 133.

Although units in the brigade submitted progress reports and communicated via radio-teletype, Ploger and subordinate commanders and staffs also kept abreast of progress by frequent visits. Helicopters and other small aircraft parceled out between the brigade and group headquarters allowed commanders and staff officers to check on even the most remote projects. Ploger made it a point to check with the supported unit commanders. In this way, he reiterated priorities and made sure 18th Brigade units complied with his policies. One policy insisted that the engineers did not enjoy any better accommodations or facilities than the other units. During his first trip to Qui Nhon not long after his arrival, Ploger found out that the engineers had built a very fine service club with materials in critically short supply. After pointing the responsible officers "in the right direction," he later reflected that the low-priority facility "could have come back to bite anybody associated with it if we hadn't changed that fairly rapidly."[62]

With five groups in country and a sixth due in, a change to the Army engineer command structure seemed imminent. Plans for a larger organization centered on an engineer command. Ploger visualized an Army command engineer assisted by a deputy overseeing two brigades. He felt that these two positions and the two brigades could be handled by four brigadier generals. Further, Ploger considered setting up an integrated staff, that is, one engineering office for both the engineer command and U.S. Army, Vietnam. General Engler, however, favored an engineer command headed by a major general with the command disassociated from the U.S. Army, Vietnam, staff as was done with the 1st Logistical Command. He preferred to have engineering matters processed through the U.S. Army, Vietnam, G–4, a common practice since most special staffs coordinated actions through one of the general staffs. Besides, Ploger on 1 November 1966 would become a major general and outrank all the general staff.[63]

Before the end of 1966, General Ploger took steps to establish the U.S. Army Engineer Command, Vietnam (Provisional). In anticipation of the reorganization and to ease coordinating with the groups in II Corps, Ploger on 18 November moved part of his staff to Dong Ba Thin under Col. Paul W. Ramee, the brigade's deputy commander. Ramee then established a provisional northern headquarters to take control of the 35th, 45th, and 937th Groups. The 921st Engineer Group (Combat), which had arrived at Dong Ba Thin between late September and early October, had remained uncommitted, and its troops and equipment joined the new northern headquarters. With the activation of the provisional engineer command on 1 December, the northern headquarters became the 18th Brigade. Later that month, as part of General Westmoreland's effort to move U.S. headquarters and troops out of Saigon, the new Engineer Command headquarters—the former 18th Brigade staff

[62] Interv, Sowell with Ploger, 21 Nov 78, sec. 8, pp. 18–19, 25 (quoted words, p. 19).

[63] Interv, Bower with Ploger, 8 Aug 67, pp. 7–11; Interv, Sowell with Ploger, 21 Nov 78, sec. 9, p. 6; Ltr, Maj Roy Fowler, CO, 26th Mil Hist Det, to Charles B. MacDonald, Office, Ch of Mil Hist, 18 Aug 67, Historians files, CMH.

The 18th Engineer Brigade headquarters building at Dong Ba Thin

that remained in Saigon—moved into a partially completed cantonment at Bien Hoa.[64]

Shifting of responsibilities and personnel between Engineer Command and U.S. Army, Vietnam, followed. During a transition period in December, Engineer Command took over functions such as mapping and intelligence, base development planning, engineer design, construction management, and materials. In turn, Engineer Command transferred three officers to the U.S. Army, Vietnam, G–3 to carry out staff work dealing with engineering doctrine, force development, and organization and equipment. Engineer Command also transferred nineteen officers and nineteen enlisted men to the U.S. Army, Vietnam, G–4 to man the newly organized Installations Division primarily to handle the construction program, facilities engineering, and real estate. Although he no longer had a staff at U.S. Army, Vietnam, headquarters, Ploger still served as the Engineer, U.S. Army, Vietnam. Ploger later recalled that Engler "didn't want anybody making decisions affecting engineering that didn't have the concurrence of the engineer command so, in effect, I was a staff officer for him but my staff did not function inside USARV."[65]

[64] Ploger, *Army Engineers*, pp. 133–35; ORLLs 1 Aug–31 Oct 66, 18th Engr Bde, p. 5, 1 Nov 66–31 Jan 67, U.S. Army Engr Cmd, Vietnam, 31 Jan 67, pp. 1, 22–24, 1 Aug–31 Oct 66, 921st Engr Gp, 15 Nov 66, p. 7, all in Historians files, CMH; General Orders 6525 and 6526, USARV, 27 Nov 66.

[65] Rpt of Visit to Various Headquarters in Vietnam, 28 Feb 67, incl. 7, p. 1, OCE Liaison Officer Trip Rpt no. 6, 6 Mar 67, OCE Hist Ofc; Interv, Bower with Ploger, 8 Aug 67, pp. 13–14

It did not take long to realize that this division of staff responsibilities would create problems. U.S. Army, Vietnam, began to refer construction matters to the Installations Division, not Engineer Command and the MACV Directorate of Construction as envisioned by Ploger. He took exception when the Installations Division, which he viewed primarily as a facilities engineering office, began to evaluate and modify construction programming and scheduling, items he previously approved. Ploger considered this a waste of scarce manpower, as evidenced by the Installations Division's assignment to three officers the nearly impossible job of keeping track of the work done by his command. Ploger tried to persuade the G–4 that no one in U.S. Army, Vietnam, headquarters had the qualifications to review construction matters. His plea met without success, and he regretted his agreement to remove Engineer Command from U.S. Army, Vietnam, headquarters.[66]

With the establishment of the provisional engineer command, Ploger's span of control improved from directly supervising five groups to supervising one brigade and two groups. The 18th Brigade retained control over the 35th, 45th, and 937th Engineer Groups and served as the major operational support link with I Field Force. Since a second brigade headquarters would not arrive for some time, Engineer Command directly controlled the other two groups and dealt directly with II Field Force. The command further adjusted geographic areas of responsibility. The 937th Group moved inland to Pleiku and assumed responsibility for the Central Highlands. The 45th Group had moved from Dong Ba Thin to Tuy Hoa and then to Qui Nhon and took over the remaining area in northern II Corps. Remaining at Cam Ranh Bay, the 35th Group extended its area north to Tuy Hoa. Reporting directly to Engineer Command, the 159th Group concentrated its base construction efforts in the Saigon–Long Binh–Vung Tau area and the new base under construction for the 9th Division at Dong Tam in the Mekong Delta. Also reporting directly to Engineer Command was the 79th Group, whose area of responsibility comprised the remainder of III and IV Corps. This arrangement would remain until March 1967, when the 34th Engineer Group (Construction) arrived and assumed area responsibility for IV Corps and the Vung Tau enclave in III Corps. The arrival of the 20th Engineer Brigade in August 1967 allowed the Engineer Command to place the groups operating in III and IV Corps under the control of the second brigade, thereby reducing to two the number of headquarters reporting directly to the command. Despite these shifts, General Ploger took some satisfaction that "there hasn't been a shade of difference in the way things get done in the field."[67]

(quotation); Ploger, *Army Engineers*, p. 135; Interv, Maj Robert H. Van Horn, 3d Mil Hist Det, with Col Fred M. Walker, Exec Officer, USARV Engr Sec, 27 Dec 66, pp. [1–2], VNIT 31, CMH.

[66] Interv, Bower with Ploger, 8 Aug 67, pp. 14–16, 18–21; ORLL, 1 May–31 Jul 67, Engr Cmd, Vietnam, p. 9; Interv, Van Horn with Walker, 27 Dec 66. Walker recalled that the Installations Division was to be responsible for the overall guidance of the Army construction program, base development, repairs and utilities, and real estate. Regardless, Ploger objected to two USARV engineer staff sections.

[67] Ploger, *Army Engineers*, pp. 136–38; Interv, Bower with Ploger, 8 Aug 67, pp. 16–18 (quoted words, p. 18).

As 1966 drew to a close, Ploger viewed the operations of Engineer Command with satisfaction. Nearly all the nondivisional engineer units in Vietnam came under his command. This command arrangement did not follow Army doctrine for a theater of operations, which typically had engineer combat groups assigned to corps and field armies and engineer commands with the construction units in the rear echelons. However, Ploger and senior engineer officers considered this the best approach under the circumstances. Engineer groups and most battalions in Vietnam were assigned geographic areas of responsibility, and they simultaneously carried out construction and operational support missions, with the latter getting priority. Engineer Command could draw upon the talents of over 16,000 soldiers in over fifty units, varying in size from detachments to battalions, to take on the full range of engineering tasks.[68]

Other Engineers

Other Army engineers and contractors also contributed to the construction effort. When not supporting operations in the field, division and brigade engineer units turned to base camp construction. The 1st Logistical Command utilities detachments, which were organized to carry out facilities engineering, had a limited construction capability. Pacific Architects and Engineers, which reported to the logistical command, continued to concentrate on construction. By the end of 1966, Pacific Architects and Engineers had increased its manpower to 16,000 people at thirty-five installations.[69]

Navy and Marine Corps engineers also expanded their construction capabilities. By the end of 1966, the 30th Naval Construction Regiment directed the efforts of eight Seabee battalions in I Corps. Four Seabee technical assistance teams, which had evenly divided their attention since late 1963 to build or improve Special Forces camps and carry out civic action projects for the U.S. Agency for International Development, which succeeded the U.S. Operations Mission, were now totally committed to support the aid mission during their six-month tours. The marines now had five engineer battalions—two supporting the 1st and 3d Marine Divisions and three heavier force battalions operating under the III Marine Amphibious Force. Like the Army engineers, the Seabees found it necessary to organize a larger command under a flag officer. On 1 June 1966, the newly established 3d Naval Construction Brigade set up shop in Saigon. R. Adm. Robert R. Wooding, who took over as the Officer in Charge of Construction in December, assumed a second hat as commanding officer of the 3d Brigade. By May 1966, RMK-BRJ's workforce expanded to more than 40,000 and 3,700 pieces of equipment. During the summer, the consortium's strength reached a peak of some 50,000 working at forty project sites. In October, the firm's monthly work in place reached $44 million and

[68] Rpt of Visit to the 18th Engr Bde, 29 Oct–17 Nov, incl. 7, tab A, OCE Liaison Officer Trip Rpt no. 5, 9 Dec 66, OCE Hist Ofc.

[69] PA&E History, 1963–1966, p. 42.

continued to grow at a fast pace. To supervise the consortium's efforts, the Saigon office increased its workforce in early 1967 to about one thousand.[70]

The Air Force demonstrated its air base maintenance and modest construction capabilities at the major air bases. Facility maintenance engineers at bases in the United States provided a good foundation to draw upon. When Air Force wings deployed to Vietnam, their base civil engineering maintenance forces went with them. By the end of 1966, thirty Prime Beef teams totaling nearly one thousand airmen completed projects costing nearly $5 million. In January 1966, the Air Force deployed its first Red Horse civil engineering squadron, the 555th, to Cam Ranh Bay, and before year's end five of the Air Force engineering squadrons were working at major air bases in South Vietnam. Although the squadrons had only 400 men each, they usually employed large numbers of Vietnamese workers. As noted earlier, the Air Force also received the go-ahead to administer its own construction contract to build Tuy Hoa Air Base. The contractor, Walter Kidde Constructors, Inc., of New York, had authorization to employ almost 1,700 people in its multinational workforce.[71]

Two contractors involved with construction and maintenance of facilities were added in 1966. In March, the Army Materiel Command awarded a contract to Vinnell Corporation of Los Angeles, California, to provide electrical power at major bases. The Army withdrew eleven T–2 tankers from the Maritime Reserve Fleet, and Vinnell converted them to floating electric power-generating barges for use at bases at Cam Ranh Bay, Qui Nhon, Nha Trang, and Vung Tau. The following month, Vinnell got the go-ahead to begin work on land-based electrical generation and distribution systems at these bases as well as at Long Binh. While Pacific Architects and Engineers provided the Army with base maintenance and construction support under the 1st Logistical Command in II, III, and IV Corps, the Navy in 1966 called upon Philco-Ford Corporation to provide skilled personnel to work under the Public Works Office, Naval Support Activity, Da Nang, in I Corps. The Public Works Office supervised a base maintenance force made up of Seabees, local nationals, and personnel furnished by the contractor.[72]

Engineer elements belonging to the allied forces were another construction resource. As early as March 1965, the Republic of Korea had dispatched a medical and engineer group known as the Dove Force to work on civic action projects near Saigon. The two South Korean divisions that deployed to II Corps in 1965 and 1966 had organic engineer battalions. In the summer of 1965, a company-size engineering element accompanied the Australian

[70] Tregaskis, *Building the Bases*, pp. 281, 287–88, 297, 300; "Helping Others Help Themselves," p. 30; Jack Shulimson, *U.S. Marines in Vietnam: An Expanding War, 1966* (Washington, D.C.: History and Museums Division, Headquarters, U.S. Marine Corps, 1982), p. 292; Army Buildup Progress Rpt, 18 May 66, p. 35, CMH; Summary Rpt of Activities of 3d Naval Const Bde, 1 Jun–30 Nov 66, in U.S. Naval Forces, Vietnam, Monthly Historical Summary, Nov 66, app. III, box 9, 69A/702, RG 334, NARA.

[71] USAF Airfield Construction in South Vietnam, pp. 4–13, 39, 70, 119–20; Project Red Horse, pp. 5, 9, 12, 16, 26, 30; Tregaskis, *Building the Bases*, p. 158; Dunn, *Base Development*, pp. 90–91.

[72] Tregaskis, *Building the Bases*, p. 224; Dunn, *Base Development*, pp. 78–79.

Task Force. New Zealand had contributed an engineer platoon as early as mid-1964 to do civic action work. That platoon was replaced the following year by an artillery unit to support the Australian Task Force in southern III Corps. Although the Philippines did not send a combat force, it did send a 2,000-man Civic Action Group to Vietnam in late July 1966. This force, which included nearly 500 engineers, embarked on a series of civic action projects in Tay Ninh Province and the Saigon region.[73]

By the end of 1966, the engineers were well organized to carry out the construction program and support the troops in the field. The establishment of the director of construction meant that General Westmoreland exercised direct control of the construction effort in Vietnam, including direction of the Navy's Officer in Charge of Construction and its construction consortium, RMK-BRJ, in areas of project assignment, priorities of effort, and standards of construction. Through his construction chiefs, the MACV commander controlled the use and allocation of all construction resources in Vietnam. As for the Army engineers, General Ploger's creation of an engineer command eased the coordination of the increasing numbers of engineer units entering the country. The dual-role concept as commander of nearly all engineer troops and chief engineer staff officer for U.S. Army, Vietnam, was retained. Even though the field force engineers lacked their own engineer units, Ploger's principle of priority support to tactical commanders provided the engineers needed in any combat operation.

[73] Ploger, *Army Engineers*, pp. 155–56; Lt. Gen. Stanley R. Larsen and Brig. Gen. James L. Collins Jr., *Allied Participation in Vietnam*, Vietnam Studies (Washington, D.C.: Department of the Army, 1975), pp. 60–64, 90, 105, 123.

5

Building the Bases, 1966

Like the previous year, most engineer support in 1966 concentrated on base development. In late 1965, the 18th Engineer Brigade devoted 85 to 90 percent of its effort to construction and the balance to combat support, a ratio that remained constant until the autumn of 1966. Planning and construction focused on developing Saigon, Da Nang, Qui Nhon, and Cam Ranh Bay as the major receiving deep-draft ports—the so-called logistics islands or enclaves—and nearby roads and airfields to improve the delivery, storage, and distribution of materiel. Inland bases at An Khe, Pleiku, and the approaches to Saigon were also heavily developed. All the lodgments included supporting services: maintenance, supply, transportation, hospitalization, communications, and quarters to house troops. The development of major air bases, capable of handling large cargo and jet aircraft, in or near these complexes, served as a major link in the delivery of critically needed supplies. As the year wore on, the complexes took on an air of relative permanence as metal prefabricated and wooden buildings replaced tents and open spaces.[1]

The Cam Ranh Complex

During 1966, the sandy Cam Ranh Bay peninsula and surrounding environs grew into a vast military complex. Plans called for the site to host port facilities, airfields, and depots for all classes of supplies, hospitals, cantonments, and other facilities. Civilian contractors played a major role in the area's development. RMK-BRJ worked on the new airfield and logistical facilities, and DeLong Corporation installed portable deep-draft piers. Pacific Architects and Engineers set up facilities engineering shops. The Air Force dispatched civil engineering units to work on the air base, and the Navy sent Seabees to develop the naval facility. Cam Ranh Bay was a microcosm of the theater's construction effort.[2]

In late April 1966, two of the DeLong barges for the third general cargo pier arrived. In preparation the 497th Port Construction Company completed a sheet-pile bulkhead between the two existing piers. A routine for installing the piers had been established: the 35th Engineer Group built connecting causeways, abutments, roads, and hardstands; the DeLong Corporation

[1] Rpt of Visit to the 18th Engr Bde, 10 Feb–3 Mar 66, incl. 6, p. 1, OCE Liaison Officer Trip Rpt no. 1, 15 Mar 66, OCE Hist Ofc.

[2] ORLLs, 1 Feb–30 April 66, 35th Engr Gp, 15 May 66, pp. 1–2, and 1 May–31 Jul 66, 35th Engr Gp, 15 Aug 66, pp. 1–2, both in Historians files, CMH. For more on RMK-BRJ's work at Cam Ranh Bay, see Diary of a Contract, pp. 226–33.

installed the piers. When technical problems arose, the military and civilian engineers worked closely to resolve them. DeLong began installing the third pier in May and, despite some difficulty, positioned and readied the pier for caisson jacking by the end of June.[3]

Associated port work proceeded at high tempo. On the south beach, the 497th Port Construction Company completed a timber pile U-shaped marginal wharf in April and two permanent LST ramps in June. The 220-foot wharf, the first of its kind designed and built for shallow-draft vessels in the bay, could unload two barges simultaneously. The wharf was supported by 315 timber piles in seventeen feet of water and became the largest work of its type built by Army engineers since World War II. Unfortunately, it did not take long to realize that the untreated lumber used for bracing the fuel pipeline jetty and wharf had to be replaced because of the presence of marine wood borers in the bay. In late May, the 497th began to replace the bracing with treated lumber. The port construction engineers stabilized the area behind the wharf with crushed coral, which the 87th Engineer Battalion found offshore. Coral, made up of the skeletons of minute spherical animals, was chemically similar to limestone and frequently used by engineers in the Pacific during World War II. At Cam Ranh Bay, coral was used extensively for beach landing sites, roads, and hardstands. At the storage area next to the first DeLong pier, the 497th also designed and constructed a roll-on/roll-off ramp for unloading shallow-draft vessels. The company's diving section removed obstacles, including a sunken vessel that blocked a second sheet-pile bulkhead. The divers also used underwater demolitions to loosen the coral for quarrying.[4]

The 497th Port Construction Company then concentrated on placing sheet-pile bulkheads between the RMK and DeLong piers, and the 87th Construction Battalion worked on the construction of causeways to connect the new DeLong piers to the shoreline. In July, the battalion built a 600-foot causeway to the second DeLong pier. To the north, the 87th with some help from RMK-BRJ began building a 3,600-foot causeway to a new ammunition pier. The causeway alone required 27,000 cubic yards of sand, 6,000 cubic yards of blast rock, and 15,000 cubic yards of laterite on top of 11,000 cubic yards of hydraulic dredged fill. In August, DeLong completed its second cargo pier and began to place Pier Number 3 just to the south of the existing RMK pier and DeLong Numbers 1 and 2. In October, more dredging in the entrance channel got under way, and by the end of the month, the 87th began construc-

[3] ORLLs, 1 Feb–30 Apr 66, 35th Engr Gp, p. 3, and 1 May–31 Jul 66, 35th Engr Gp, p. 4; Yens and Clement, "Port Construction in Vietnam," pp. 21–22; Dunn, *Base Development*, p. 55; Galloway, "Essayons," p. 76; Ploger, *Army Engineers*, pp. 52–53; Quarterly Hist Rpt 1 Apr–30 Jun 66, MACV Directorate of Construction (MACDC), 11 Jul 66, pp. 14, 25–26, Historians files, CMH.

[4] ORLLs, 1 Feb–30 Apr 66, 35th Engr Gp, pp. 3–4, and 1 May–31 Jul 66, 35th Engr Gp, pp. 3–4; Yens and Clement, "Port Construction in Vietnam," p. 22; Situation Rpt on the Construction of Port Facilities in South Vietnam, incl. 12, pp. 1–2, OCE Liaison Officer Trip Rpt no. 3; Karl C. Dod, *The Corps of Engineers: The War Against Japan*, United States Army in World War II (Washington, D.C.: Office of the Chief of Military History, U.S. Army, 1966), p. 385.

The second DeLong cargo pier was completed at Cam Ranh Bay in August 1966, and work on the third DeLong pier (to the right of the first DeLong pier) had begun.

tion of an 830-foot causeway to a fourth DeLong pier. North of the main port, DeLong finished installation of the 600-foot ammunition pier in mid-October, allowing safer and more direct delivery of ammunition to its storage facility. The firm completed its third cargo pier in early December.[5]

Impressive progress was also made elsewhere on the peninsula. In the lower half, Colonel McCulloch's 87th Engineer Battalion completed storage tanks and connections for a 172,000-barrel fuel storage facility south of the air base, maintained over ten miles of road, built hardstands for ammunition and general storage areas, placed over 500 sand-cement and concrete slabs in the Army cantonment, and supervised troops building the cantonment under the self-help program. In April 1966, the 18th Brigade approved upgrading the old light aviation runway to handle C–130 transports. After a slow start, the 87th in September resumed work, and in two weeks completed the runway base and

[5] ORLLs, 1 Aug–31 Oct 66, 35th Engr Gp, 31 Oct 66, pp. 3–6, and 1 Nov 66–31 Jan 67, 35th Engr Gp, 15 Feb 67, pp. 3–4; Unit History, 35th Engr Gp (Const), n.d., pp. 12–13; Quarterly Hist Rpts, 1 Jul–30 Sep 66, MACDC, 21 Oct 66, p. 38, and 1 Oct–31 Dec 66, MACDC, 21 Jan 67, pp. 26–27, Historians files, CMH; MACV Monthly Evaluation, Aug 66, p. F-5, all in Historians files, CMH; Yens and Clement, "Port Construction in Vietnam," pp. 21–22; Galloway, "Essayons," p. 131.

surfaced it with the newly introduced M8A1 solid steel plank matting. The airfield became operational on 11 October when the Air Force landed a C–130 on the new 2,900-foot runway. Depot work by the 864th Engineer Battalion included roads, drainage, open storage areas, refrigerated storage facilities, and an automated data processing facility. By the end of June the battalion, commanded by Lt. Col. Robert A. Seelye since January when he replaced Colonel Bunch, reported that the depot as 59 percent complete. To the north at Hon Tre Island just offshore from Nha Trang, Company C and heavy equipment from Company A carved a road to the top of a mountain and cleared the crest for an air defense missile unit. Meanwhile, the 102d Construction Support Company's asphalt plant had made its first cold-mix pavement and produced its first hot mix. By summer, the roads in the depot and at the southern end of the peninsula had taken on a new look.[6]

In February 1966, Air Force Red Horse engineers arrived. The 555th Civil Engineering Squadron began to work on troop housing, roads, utilities, and other air base support facilities. Originally conceived to augment base engineers to handle heavy bomb damage or disasters, Red Horse squadrons quickly adapted to a construction role in Vietnam. In justifying an engineering force, Air Force officials emphasized that Red Horse squadrons provided an emergency capability only and did not minimize the need for Army engineer battalions to build the airfields. To General Dunn, the arrival of the Red Horse squadrons represented another construction asset, except they worked only on Air Force projects.[7]

Meanwhile, construction of the permanent runway and taxiway by RMK-BRJ lay almost dormant because of the diversion of the firm's earthmoving equipment in January to the Army ammunition and logistic support area project. Although the Air Force deployed four F–4 Phantom squadrons onto the adjacent AM2 airfield, the temporary aluminum runway and taxiways built by the contractor soon had problems. A twenty-three-inch rainfall in December 1965 raised the water table to the level of the matting, forcing workers to improvise a drainage system. Rain made the metal runway slick, and the fighters had to land with drag chutes or land at other airfields. As the dry season approached in early 1966, a constant north wind pushed the taxiway three feet south over the dry sand, while the runway edged north under the weight of the planes landing from the south. Landing the planes to the south for three weeks moved the runway back. Daily stress measurements and periodic shifts in the direction of landings kept the shifting under control. The moving sand also created bumps and dips, and Air Force work

[6] Galloway, "Essayons," pp. 79–80; Col. William L. Starnes, "Cam Ranh Army Airfield," *Military Engineer* 59 (September-October 1967): 358; Tregaskis, *Building the Bases*, pp. 275–77; Situation Rpt on the Construction of Depots and Supply Points in Vietnam, incl. 14, pp. 2–3, OCE Liaison Officer Trip Rpt no. 3; ORLLs, 1 Feb–30 Apr 66, 87th Engr Bn, 15 May 66, pp. 1–3, 1 May–31 Jul, 66, 87th Engr Bn, 15 Aug 66, pp. 2–3, and 1 May–31 Jul 66, 864th Engr Bn, 15 Aug 66, pp. 1–2, all in Historians files, CMH.

[7] Project Red Horse, pp. 1–2, 9; USAF Airfield Construction in South Vietnam, pp. 112–13.

crews found themselves continually replacing sections of the aluminum matting and smoothing the sand.[8]

At the same time, there was an urgent need for an airfield capable of handling large transport aircraft. Although the AM2 matting had the strength to land and park large planes, the narrowness of the runway and taxiways and the limited amount of AM2 parking apron precluded the use of the Boeing 707 commercial jets or the larger C–133 cargo transports. The construction of the Army's replacement center in II Corps hinged on completing the new runway and other flight facilities. As a result, MACV decided to have the Officer in Charge of Construction redesign the permanent airfield for earlier use as an interim logistical air facility. When RMK-BRJ returned to its airfield project in June 1966, revised plans called for building the concrete runway in increments, 4,000 to 6,000 feet, with AM2 taxiways and aprons. This measure would at least allow C–130 cargo planes to use the airfield before the onset of the next monsoon season.[9]

In mid-October 1966, the firm turned over to the Air Force an 8,000-foot concrete runway. Work continued on the taxiways and high-speed turnoffs, and the hauling of fill for the remaining 2,000 feet of runway. To build up the south end of the field, three dredges excavated some 1.5 million cubic yards of hydraulic fill. By November, the parallel concrete taxiway and 90,000-square-yard AM2 parking apron were completed, permitting the Air Force's Military Airlift Command to begin operations at Cam Ranh Bay. The adjacent AM2 runway continued to be used and maintained by Air Force civil engineers. Its use, however, according to one squadron commander, continued to be "a sporty proposition." Soft shoulders and the lack of an overrun and aircraft barriers often caused planes to sink into the soft sand when they veered off the runway.[10]

In 1966, the Cam Ranh peninsula became the first site in Vietnam to receive electrical power from the T–2 power-generating tankers, now on their way from American shipyards. The first tanker, the *French Creek*, arrived in June. Once positioned and hooked up by Vinnell Corporation to a completed section of the land line distribution system, the modified tanker began to generate power to the depot on 5 September. The second tanker, the *Kennebago*, arrived shortly after the *French Creek*. Eventually Cam Ranh Bay would get five of the eleven T–2 tankers, with Nha Trang, Qui Nhon, and Vung Tau scheduled to get two each. When the ships arrived, the contractor temporarily moored them to withstand tide and weather. Vinnell was also charged with building the land-based electrical distribution systems at the four locations. By December, the firm had completed 80 percent of the forty-one miles of primary line and 5 percent of the eleven miles in the secondary line at Cam Ranh Bay.[11]

[8] Schlight, *Years of the Offensive*, p. 119; USAF Airfield Construction in South Vietnam, p. 10.

[9] MFR, J–4 Briefing 2 Feb 66, Base Development Cam Ranh Bay; Ltr, MACV MACJ44-USBD to CG, USARV, sub: Cam Ranh Bay USAF Base, box 11, 69A/702, RG 334, NARA.

[10] Schlight, *Years of the Offensive*, pp. 171–72 (quoted words, p. 172); Quarterly Hist Rpts, 1 Jul–30 Sep 66, p. 38, MACDC, and 1 Oct–31 Dec 66, MACDC, pp. 27–28; Diary of a Contract, pp. 227–28; USAF Airfield Construction in South Vietnam, p. 113.

[11] MACV Monthly Evaluation, Jun 66, p. A–30; "Floating and Land Based Power Plants," *Vinnell* 11 (May 1969): 6–7; Dunn, *Base Development*, pp. 78–80; Miscellaneous Detailed

Cam Ranh Bay airfield from the northeast in October 1966 after the completion of the concrete runway on the right

Although the 20th and 39th Engineer Combat Battalions encountered problems carrying out construction projects, both units quickly adapted to their new missions following their arrival on 1 January. The 20th Engineer Battalion, commanded by Lt. Col. Richard L. Harris, moved across the bay to Dong Ba Thin Army aviation base to continue the work started by Company C, 65th Engineer Battalion. The 20th had arrived in the middle of the northeast monsoon, and it concentrated on hauling fill to get the aviation units and equipment above the flood waters that inundated Dong Ba Thin from December through February. By May the battalion, with the trucks of the 513th Dump Truck Company, brought the cantonment areas to grade, built seventy-five concrete pads for UH–1 helicopters, completed a pierced steel plank parking ramp for the C–7 Caribous, and began laying planking for a taxiway parallel to the runway. Following these jobs, work crews completed landing ramps for CH–47 helicopters, the airfield taxiway, and a cantonment area. In mid-July, elements of the battalion began moving to Ninh Hoa and Nha Trang. The other combat battalion, the 39th, under Lt. Gen. Earnest E. Lane, erected buildings in the depot area and a convalescent hospital on the seaside of the peninsula. By midyear, the battalion began shifting operations

Discussion, incl. 11, pp. 4–5, OCE Liaison Officer Trip Rpt no. 4, 23 Sep 66, OCE Hist Ofc; Miscellaneous Detailed Discussion Vietnam, incl. 8. p. 5, OCE Liaison Officer Trip Rpt no. 5.

from Cam Ranh Bay to Nha Trang, Ninh Hoa, and Tuy Hoa. Both battalions were now under the control of Colonel Bush's 45th Group.[12]

During the second half of 1966, Col. William R. Starnes' 35th Group concentrated on base development projects at Cam Ranh Bay, Nha Trang, and Phan Rang. The 3,000-man group now consisted of the 62d, 87th, and 864th Construction Battalions and assorted smaller units. To keep pace with the troop buildup, the 35th accelerated work at the Cam Ranh Bay depot and other facilities at the southern end of the peninsula. Locally, the 864th Construction Battalion divided its efforts between building the depot at Cam Ranh Bay and an air-conditioned prefabricated communications center at Dong Ba Thin. Part of the battalion also worked on roads, bridges, and beach off-loading facilities at Nha Trang. The new beach facilities included four temporary LST ramps and four barge points that increased the unloading of cargo from about 9,700 short tons in January to over 21,000 short tons in December. Other work by the 87th Engineer Battalion was carried out at Phan Thiet, where a battalion task force supported an infantry battalion of the 1st Cavalry Division operating in the area. The engineer task force repaired and maintained an airfield, constructed landing craft anchorages, and improved base facilities.[13]

In July, another long-awaited construction battalion, Lt. Col. James L. Kelly's 577th Engineer Battalion (Construction) from Fort Benning, Georgia, arrived and joined the 45th Group. Not surprisingly, ships carrying the battalion's equipment did not arrive until later. The battalion assumed responsibility for projects at Dong Ba Thin. Company C, however, was detached while en route and assigned to work with the 46th Construction Battalion at Long Binh. At Dong Ba Thin Colonel Kelly initiated around-the-clock operations. Company B began building a regimental base camp for the South Korean 9th Division. In mid-August, Company D shifted to Nha Trang to build a 400-man evacuation hospital for the Koreans. Returning to Cam Ranh Bay in early October, Company D started work on facilities for an inbound replacement battalion. Once set up, the replacement battalion would handle the influx of replacements and departure of soldiers completing their one-year tours.[14]

[12] Galloway, "Essayons," pp. 80–81, 83; ORLLs, 1 Feb–30 Apr 66, 20th Engr Bn, 15 May 66, pp. 3–4, 1 May–31 Jul 66, 20th Engr Bn, 15 Aug 66, pp. 1–2, 8, 1 Feb–30 Apr 66, 39th Engr Bn, n.d., pp. 3–7, and 1 May–31 Jul 66, 39th Engr Bn, 14 Aug 66, pp. 1–4, all in Historians files, CMH; Unit History, 15 Aug 1917–1 Sep 1971, 20th Engr Bn, n.d, pp. 7–8, Historians files, CMH; Situation Rpt on the Construction of Cantonments, Administrative and Community Facilities in South Vietnam, incl. 8, p. 1, OCE Liaison Officer Trip Rpt no. 3.

[13] ORLLs, 1 Aug–31 Oct 66, 35th Engr Gp, pp. 1–2, 1 Nov 66–31 Jan 67, 35th Engr Gp, pp. 1–3, 1 Aug–31 Oct 66, 864th Engr Bn, 14 Nov 66, p. 1–3, 1 Nov 66–31 Jan 67, 864th Engr Bn, 15 Feb 67, pp. 1–4, 1 Aug–31 Oct 66, 87th Engr Bn, 14 Nov 66, pp. 1–4, and 1 Nov 66–31 Jan 67, 87th Engr Bn, 11 Feb 67, pp. 1–5, all in Historians files, CMH; Galloway, "Essayons," pp. 130–31, 133–34; 35th Engr Gp History, pp. 12–13; Ltrs, MACV MACJ322 to CG, USARV, sub: Development of Hon Tre Air Defense Complex, 11 Apr 66, and Brig Gen Carroll H. Dunn MACDC to CG, USARV, sub: Hon Tre Island Facility, 17 Jun 66, both in Historians files, CMH.

[14] ORLLs, 1 Aug–31 Oct 66, 577th Engr Bn, 31 Oct 66, pp. 1, 3–5, and 1 Nov 66–31 Jan 67, 577th Engr Bn, 31 Jan 67, p. 2; Galloway, "Essayons," pp. 127–28.

In late October, elements of the 14th Engineer Battalion (Combat) commanded by Lt. Col. William F. Brandes reached Cam Ranh Bay. Back in January, the battalion received alert orders to deploy from Fort Bragg by March, but shortages of personnel and equipment delayed its departure to September. Since the equipment did not arrive for several months, the soldiers could only use their hand tools. Companies A and C debarked at Cam Ranh Bay while the headquarters and Companies B and D continued on to Vung Ro Bay, eighteen miles south of Tuy Hoa near Highway 1. Company A helped the 577th Engineer Battalion build the replacement center, and Company C moved to Ninh Hoa to support the South Korean 9th Division. After disembarking at Vung Ro Bay, the remainder of the battalion moved to Tuy Hoa. Working with hand tools, Companies B and D maintained Highway 1 between Tuy Hoa and Vung Ro and the access road to the recently opened port at Vung Ro Bay. When the 577th Engineer Battalion received orders to move to Tuy Hoa, Colonel Brandes began to consolidate his units at Cam Ranh Bay.[15]

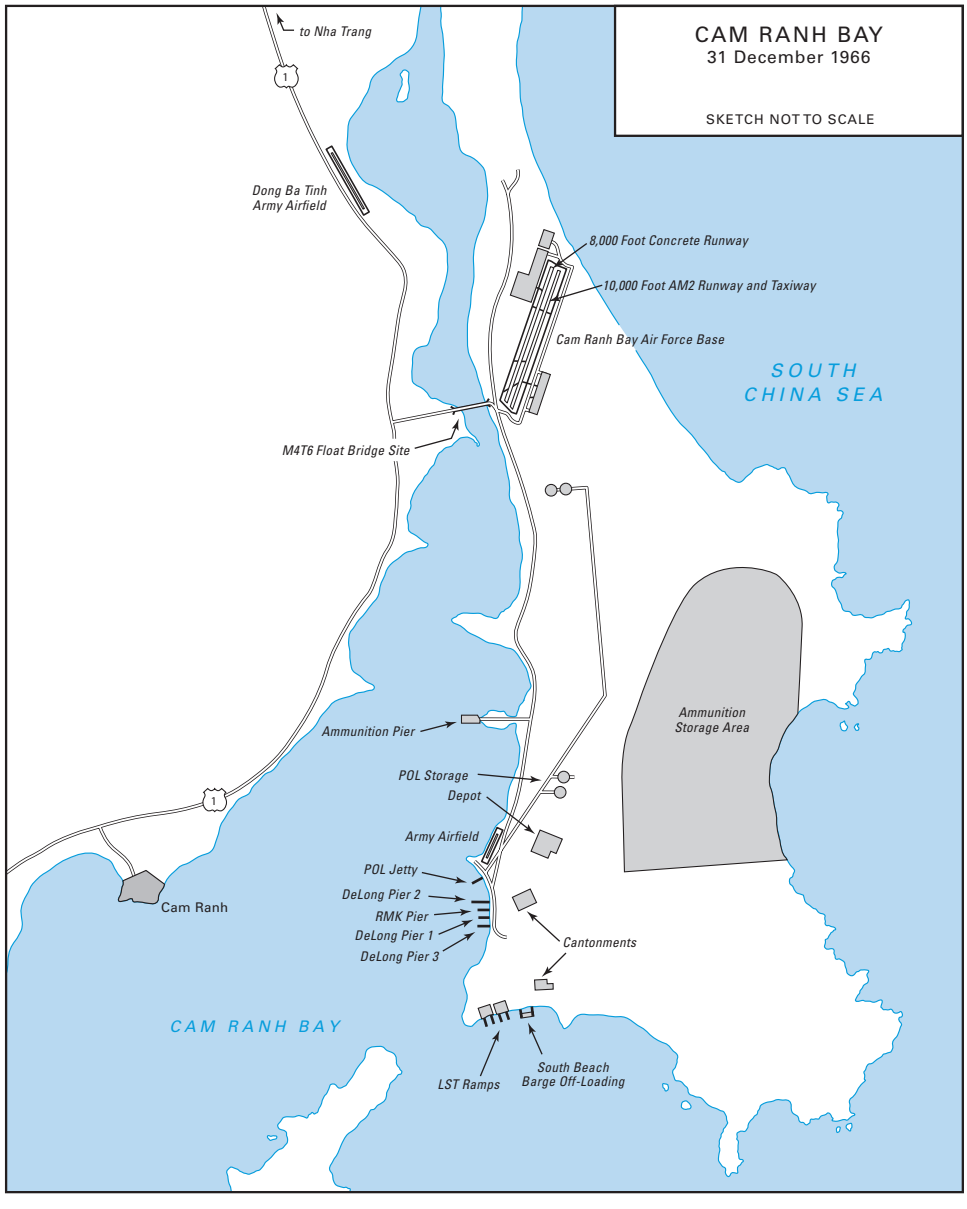
By the end of 1966, the combined efforts of troops and contractors had transformed Cam Ranh Bay into a major logistical base supporting over 36,000 troops. During the eighteen months, critical projects at the deep-water port, depot, and air base were completed or nearing completion. Whenever the builders finished a portion of a facility, such as new piers and warehouses, impatient operating agencies did not hesitate to put them to immediate use. By late 1966, the base boasted five deep-draft piers, four landing craft ramps, and wharves capable of handling nearly 6,000 short tons of cargo per day. More significantly, port capacity rose from approximately 73,000 short tons of cargo unloaded in January 1966 to nearly 153,000 short tons in December. A jetty with two 6-inch fuel pipelines had a rated capacity to pump ashore 30,000 barrels of product daily. Actual figures varied. Logistic planners looked forward to completing the port complex by mid-1967. Also in operation were the Air Force base with its two long runways, an Army airfield on the peninsula, and another Army airfield at Dong Ba Thin.[16] (*Map 7*)

Secondary Coastal Ports

In April 1966, Maj. Gen. Charles W. Eifler, who assumed command of the 1st Logistical Command in January 1966, began to take measures to build an all-weather port in the Tuy Hoa area. He recognized the need to do something before the approaching winter monsoons struck the central coastal lowlands in October. Before the buildup in the Tuy Hoa area, the logistical command managed to support the small number of troops by bringing in supplies over the beach during the dry season and by air during the monsoon when heavy seas halted over-the-shore operations. Vung Ro Bay appeared to offer many advantages that Tuy Hoa did not have for the development of an all-weather

[15] ORLL, 1 Nov–31 Jan 67, 14th Engr Bn, 9 Feb 67, pp. 1–5, Historians files, CMH; Galloway, "Essayons," pp. 128–29.

[16] Dunn, *Base Development*, p. 68; MACV History, 1966, p. 298; Port Development Reference Study, MACJ44, 5 Dec 66, pp. 14–15, box 8, 69A/702, RG 334, NARA; Ltr, CINCPAC to JCS, sub: Port Development Plan, RVN, 10 Jun 67, p. 3, box 3, 84/051, RG 319, NARA.



Map 7

port, mainly a well protected, wide harbor. Only four bridges along the short distance of Highway 1 from Vung Ro to Tuy Hoa would require replacement or repair.[17]

[17] Col. John J. Sawbridge, "They Built a Port to Beat the Weather," *Army Digest* 22 (September 1967): 44; Debriefing, Maj Gen Charles W. Eifler, 13 Jun 67, p. 4, Senior Officer Debriefing Program, DA, Historians files, CMH.

On 27 April, a 39th Engineer Battalion reconnaissance party led by Colonel Lane began to survey Vung Ro Bay. While infantrymen of the 1st Brigade, 101st Airborne Division, cleared the immediate area, Lane and his men scoured the beaches, bay, road, and surrounding mountains. The engineers confirmed that the bay could fit deep-draft ships. They found ample space to build facilities, and a road could be cut through the thick jungle foliage and mountains of rock to connect the port to Highway 1. The survey completed, Colonel Lane became an enthusiastic supporter of the Vung Ro project, but he did not live to see the completed port. Several weeks later, enemy ground fire killed Lane during an aerial reconnaissance over the project area.[18]

General Larsen concurred in the need for a temporary port at Vung Ro to support combat forces around Tuy Hoa. The I Field Force commander expected the arrival of the 196th Light Infantry Brigade and a South Korean regiment. From a logistics standpoint, Larsen did not consider it feasible to supply an equivalent two-brigade force by air during the monsoon season. He also ruled out opening Highway 1 from Qui Nhon to Tuy Hoa because he lacked troops to secure the route. As for opening Highway 1 from Tuy Hoa south to Cam Ranh Bay, Larsen believed that this would require more forces and engineering effort than the Vung Ro proposal. Estimates showed that it would take only thirty days to do the road work from Tuy Hoa and improve the bay for barge traffic. Aware of the ongoing debate between the Army and Air Force over whether to construct the deep-draft port facility at Vung Ro or Tuy Hoa, Larsen prodded MACV to get started on at least a temporary port at Vung Ro. Westmoreland concurred, and on 15 July the MACV Directorate of Construction directed the 18th Engineer Brigade to do the work.[19]

On 25 July, while I Field Force initiated Operation JOHN PAUL JONES to secure the area, the development of Vung Ro Bay began in earnest. As the 1st Brigade, 101st Airborne Division, and South Korean 2d Marine Brigade kept the Viet Cong at bay, the 39th Engineer Battalion swung into action. Elements of the battalion began repairing Highway 1 and erecting several new bridges between Tuy Hoa and Vung Ro. On the twenty-seventh, Task Force SCHULTZ—consisting of Company A, elements of the Equipment Platoon, Headquarters Company, 572d Light Equipment Company, and 553d Float Bridge Company, under the command of Maj. John H. Schultz, the battalion executive officer—debarked from a landing craft and began building a port out of jungle, sand, and rock. Men and equipment cleared more than 125 acres of thick, tangled underbrush, moved some 400,000 cubic yards of earth, and used large quantities of dynamite to blast away solid rock for an access road. Within two weeks, the task force blazed a passable pioneer road two miles from the beach to Highway 1. In the port area, work crews put down a six- to eight-inch layer of laterite and rock over some 10,000

[18] ORLL, 1 Feb–30 Apr 66, 39th Engr Bn, p. 2; Sawbridge, "They Built a Port to Beat the Weather," pp. 44–45; Ploger, *Army Engineers*, pp. 57, 223.

[19] Msg, Lt Gen Stanley R. Larsen AVF-GD 5321 to Westmoreland, 7 Jul 66, sub: Vung Ro Bay; Msg, Westmoreland MAC 23595 to Larsen, 9 Jul 66, sub: Vung Ro Bay; Msg, COMUSMACV MACDC-BRD to CG, USARV, 15 Jul 66, sub: Vung Ro Bay. All in Historians files, CMH.

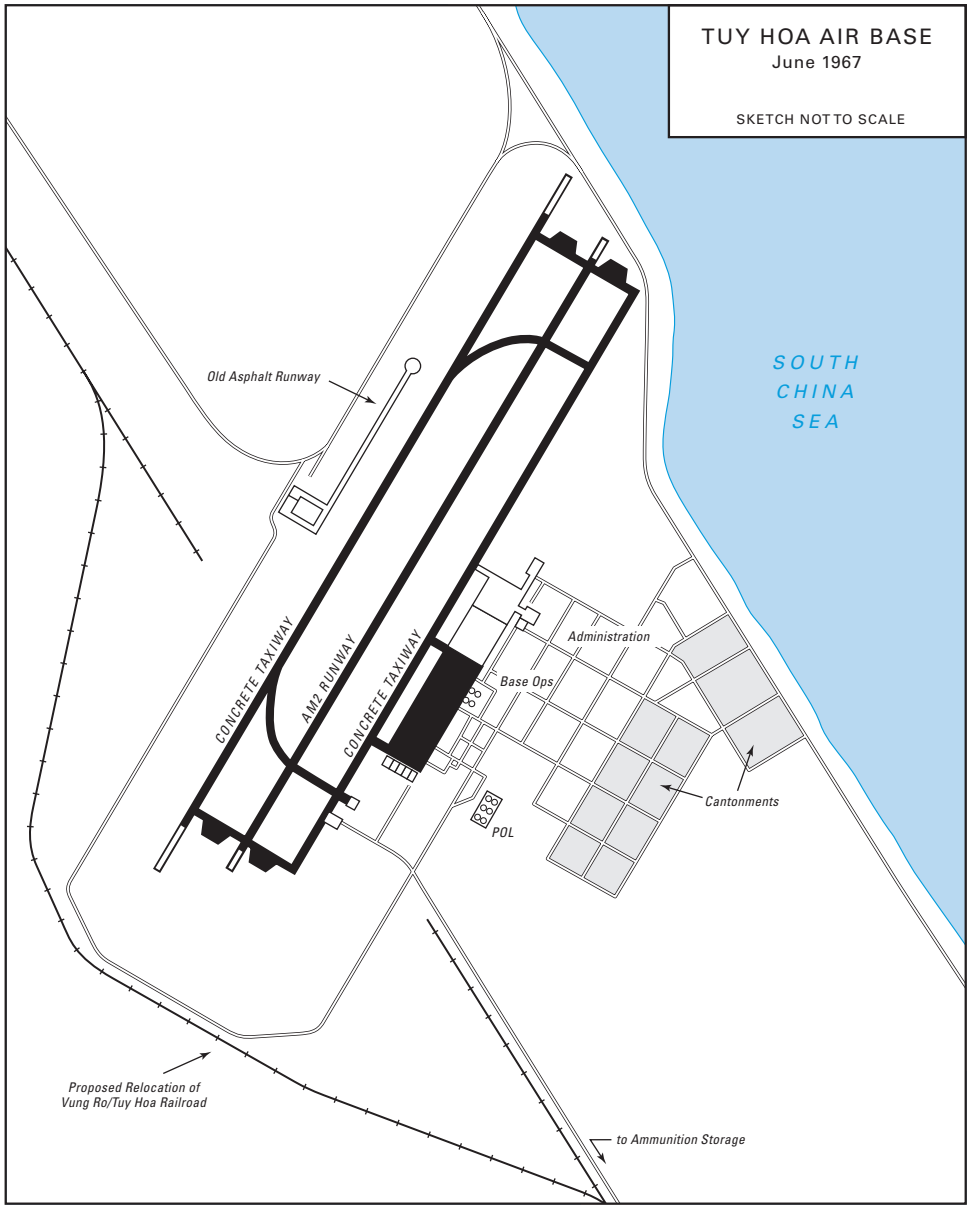
square yards of sand. They also built two concrete ramps for landing craft and installed a fuel pipeline from mooring points in the bay to a temporary storage facility inland. Elements of the 497th Port Construction Company assembled a floating pier made out of Navy cube sections for barge discharge. The steel cubes, fastened with angle irons and cable, required very little on-site construction. Cubes were joined together in connected sections or as a complete pier in the water and towed into position. The port became operational in late September, and on 11 October it opened to unrestricted traffic. The dedication of Port Lane took place five days later, and the 1st Logistical Command officially took over operation of the facility. In the first two weeks of operation, more than 565 tons of vitally needed supplies arrived daily, just before the monsoon deadline.[20]

By then MACV wanted to make Vung Ro the permanent deep-draft port for the Tuy Hoa area. While the Army proceeded to build its interim port at Vung Ro, the Air Force went ahead with its own plans for Tuy Hoa Air Base. The Air Force developed its own shallow craft harbor near Tuy Hoa to discharge materiel for the turnkey project. Planning called for the Air Force contractor, Walter Kidde Constructors, to dredge an interim port at the mouth of the Da Rang River and convert the facility into a permanent port the following year. When Pacific Command and the Joint Chiefs of Staff became aware of the development of two independent ports, they raised questions. Meetings between Army and Air Force representatives at MACV produced little more than an issue—Vung Ro versus Tuy Hoa. By mid-September, MACV predicted that the garrison strength of U.S. and South Korean troops in the area would exceed 18,000 and recommended to Pacific Command and the Joint Chiefs that Vung Ro Bay should be the permanent port.[21] (*Map 8*)

The Tuy Hoa port issue remained open until January 1967. A survey disclosed that the Tuy Hoa site involved time-consuming efforts to bring the harbor to the point of accommodating fully loaded T–1 tankers and pointed out the difficulty of tanker operations during the monsoon season, even after completion of a pier and breakwater. A tropical storm in December brought this point home. High tides and swells caused water to wash over the sandspit that separated the safe haven from the South China Sea. This water shifted the sand and silt and reduced the depth of the dredged entrance channel. MACV recommended that the port should be abandoned when the contractor no longer required it. On 13 January, the Joint Chiefs of Staff ruled in favor of Vung Ro Bay. The Air Force did not dissent. The Tuy Hoa site served its purpose by offloading construction

[20] ORLLs, 1 May–31 Jul 66, 39th Engr Bn, p. 1, and 1 Aug–31 Oct 66, 35th Engr Gp, p. 4; AAR, Opn John Paul Jones, 39th Engr Bn, 17 Nov 66, pp. 1–4, Historians files, CMH; Sawbridge, "They Built a Port to Beat the Weather," pp. 45–46; Galloway, "Essayons," p. 125; Rpt of Visit to 18th Engr Bde Units, incl. 7, p. 4, OCE Liaison Officer Trip Rpt no. 4; Army Construction in Vietnam, 7 Dec 66, incl. 9, p. 8, OCE Liaison Officer Trip Rpt no. 5.

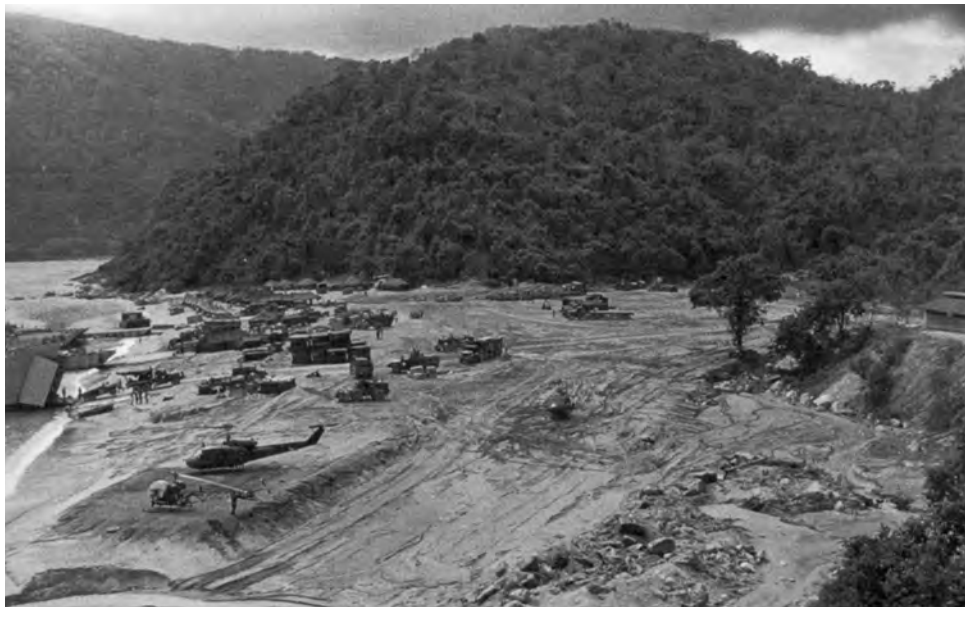
[21] Msg, COMUSMACV MAC 41026 to CINCPAC, 11 Sep 66, sub: Vung Ro–Tuy Hoa Port, box 5, 69A/702, RG 334, NARA; USAF Airfield Construction in South Vietnam, pp. 75–79.



Map 8

supplies, and this enabled Walter Kidde to finish the airfield project forty-five days before the 1 January 1967 deadline.[22]

[22] USAF Airfield Construction in South Vietnam, pp. 86–89; Quarterly Hist Rpt, 1 Oct–31 Dec 66, MACDC, p. 29.



Port under construction at Vung Ro Bay

The 39th Engineer Battalion, now under the command of Lt. Col. Taylor R. Fulton, divided its attention to projects in the Tuy Hoa area and improvements at Vung Ro Bay. Work included base requirements for an army logistics subarea command and cantonments for the incoming 4th Infantry Division's 1st Brigade, a regiment of the South Korean 9th Division, and an army aviation battalion. The 39th continued to upgrade the facilities at Port Lane, worked on base development projects, repaired roads, and built a heliport for aviation units that supported the 1st Brigade, 101st Airborne Brigade. The sixty-four minipad heliport consisted of 24-by-24-foot pierced steel planking placed directly over sand treated with peneprime, a dust-control material with an asphalt base. These measures provided in minimum time maximum protection for the helicopters from sand and dust. Hardstands and the connecting road to Highway 1 were paved. By the end of 1966, a DeLong pier consisting of two "A" units was installed, adding Vung Ro to the growing number of ports that could discharge cargo from oceangoing ships. Most significantly, the sheltered bay could safely harbor up to a dozen large vessels.[23]

Meanwhile, a trade off of engineer units took place in two of the coastal bases. The reason for the moves stemmed from requirements for heavy construc-

[23] Sawbridge, "They Built a Port to Beat the Weather," p. 46; Army Construction in Vietnam, 7 Dec 66, incl. 9, p. 8, OCE Liaison Officer Trip Rpt no. 5; ORLL, 1 Nov–31 Jan 67, 39th Engr Bn, 31 Jan 67, pp. 1–7, Historians files, CMH; USAF Airfield Construction in South Vietnam, pp. 88–89; Galloway, "Essayons," pp. 125, 127. For more on peneprime and dust control, see Col. Charles R. Roberts, "Trends in Engineer Support" (Student thesis, U.S. Army War College, 1969), pp. 43–46.

tion equipment at Tuy Hoa and the 35th Group's need for a combat battalion. For several days in November, the 14th Combat and the 577th Construction Battalions shuttled men and equipment between Tuy Hoa and Dong Ba Thin. The 14th took over the 577th's projects at Cam Ranh Bay, and the 577th took over the 14th's projects at Tuy Hoa. At the South Korean cantonment south of town, the 577th centered efforts on a 400-bed evacuation hospital and a CH–47 heliport. It also completed a 330-foot causeway leading to the DeLong pier at Port Lane along with other improvements. By the end of the year, the 577th and a platoon from the 643d Engineer Pipeline Company began installing an eight-inch fuel pipeline between the port and the air base with a spur leading to the allied camp. The 577th also took over rehabilitation and maintenance of Highway 1 between Tuy Hoa and Port Lane.[24]

Since Highway 1 was not opened for regular use until November, all construction supplies for the 45th Engineer Group had to be brought in by sea. Limited intercoastal shipping could only handle ammunition and rations, with construction materials put aboard on a space-available basis. This almost halted vertical construction (buildings), but the continual prodding by Colonel Bush and the opening of Port Lane brought deep-draft vessels carrying construction materials. By November, the grim logistics situation began to improve. The frequent moves of the group's battalions continued to cause replacement parts problems until the headquarters arranged for direct support maintenance on an area basis. Still, units frequently left an area just about the time previously requisitioned parts arrived, and it took several weeks for the parts to reach the unit.[25]

Some twenty-eight miles to the south at Ninh Hoa, the 45th Group found a practical way to resolve transporting large tonnages of materials from Cam Ranh Bay. Truck convoys moving north placed a heavy burden on congested Highway 1, and there was constant need for security during the trip. The group turned to the Vietnamese Railway. With the arrangement of ample government security forces, the railway started service between the two areas. The opening of the railroad reduced congestion and wear on the key coastal road.[26]

About twenty-two miles south of Ninh Hoa at Nha Trang, military engineers and RMK-BRJ improved facilities to meet the influx of U.S. Air Force and Army aviation units and support organizations. Company C, 864th Engineer Construction Battalion, completed several warehouses and a depot hardstand and started building a fuel storage area. During a two-week period, Company B, 39th Engineer Battalion, transformed a trail around the city into a single-lane bypass road. The contractor's workforce enlarged and modernized the 8th Field Hospital with twenty new buildings in a project started the previous October. In April, the firm also started to reshape the crown of the airfield's main runway and completed the paving by mid-June. Prime Beef

[24] ORLLs, 1 Nov 66–31 Jan 67, 18th Engr Bde, 24 Feb 67, p. 5, Historians files, CMH, 1 Nov 66–31 Jan 67, 577th Engr Bn, pp. 2–4, and 1 Nov 66–31 Jan 67, 14th Engr Bn, p. 5.

[25] Galloway, "Essayons," p. 130.

[26] ORLL, 1 Nov 66–Jan 67, 45th Engr Gp, pp. 9–10, Historians files, CMH.

construction teams built cantonment and other facilities for Air Force units at the base.[27]

Qui Nhon's Development

A corresponding surge of construction took place at the cluster of bases in and around the port city of Qui Nhon. In February 1966, the 1st Logistical Command declared that Qui Nhon would serve as one of its major Army logistics bases. The newly established Qui Nhon Support Command projected requirements for expanded storage capacity, which caused an even higher tempo of work for the 937th Engineer Group and its new commander, Col. William W. Watkin. Major improvements for the overtaxed port facilities and construction of a large maintenance facility were added to the depot construction projects. Three of the group's four battalions—19th Combat under Colonel Mathews, 299th Combat under Lt. Col. Reuben L. Anderson, and 84th Construction under Lt. Col. James D. Madison, who assumed command in January 1966—focused on Qui Nhon area projects. Operational support, for the most part, remained limited. The Navy's Officer in Charge of Construction established a construction office in Qui Nhon to oversee work done by RMK-BRJ. In May, RMK-BRJ began to move workers up Highway 1 to Phu Cat to begin preparations for constructing South Vietnam's eighth jet air base. Simultaneously, the Air Force dispatched Prime Beef teams to the Qui Nhon airfield to build cantonment facilities.[28]

In Qui Nhon, Colonel Madison's 84th Construction Battalion concentrated on depot, airfield, and port work. In the depot, the battalion built more prefabricated warehouses, sheds, and open storage areas. Many of the buildings, however, reached Vietnam without all their components, and the engineers had to improvise or locally fabricate the missing items. That expedient resolved the problem somewhat but added to the delays and costs. By April, the 84th, which adopted the motto "Never Daunted," began to construct approximately 175,000 cubic feet of refrigerated storage. At the Qui Nhon airfield, the battalion built a 1,197-foot extension to the runway and additional parking ramps. Also under way were many other projects, including the expansion of the 85th Evacuation Hospital to 480 beds.[29]

[27] Galloway, "Essayons," p. 80; Tregaskis, *Building the Bases*, pp. 149, 288; Situation Rpt on the Construction of Depots and Supply Points in South Vietnam, incl. 12, p. 2, OCE Liaison Officer Trip Rpt no. 1; Situation Rpt on Lines of Communication Construction in South Vietnam, incl. 6, p. 2, and Situation Rpt on the Construction of POL Facilities in South Vietnam, incl. 13, p. 2, OCE Liaison Officer Trip Rpt no. 3; Quarterly Hist Rpt, 1 Apr–30 Jun 66, MACDC, p. 25; USAF Airfield Construction in South Vietnam, pp. 119–20, 123–24, 126–27. For more on RMK-BRJ work at Nha Trang, see Diary of a Contract, pp. 234–35.

[28] Galloway, "Essayons," p. 73; Tregaskis, *Building the Bases*, p. 215; ORLL, 1 Feb–30 Apr 66, 937th Engr Gp, 15 May 66, pp. 3–6; USAF Airfield Construction in South Vietnam, pp. 120, 126. For more on RMK-BRJ work at Phu Cat Air Base and Qui Nhon, see Diary of a Contract, pp. 236–40, 266–70.

[29] Galloway, "Essayons," pp. 34–36, 70; ORLLs, 1 Feb–30 April 66, 937th Engr Gp, pp. 3–4, 6, 1 Feb–30 Apr 66, 84th Engr Bn, 14 May 66, pp. 1–5, and 1 May–31 Jul 66, 84th Engr Bn, 14 Aug 66, pp. 2–5, Historians files, CMH.

Further improvements in the port area were carried out by the 84th and the 1st Platoon, 497th Port Construction Company. In February, a 200-foot rock fill causeway was finished and connected to a Navy cube floating pier, 42 feet wide by 792 feet long. In another major project, the Qui Nhon peninsula was extended to receive more landing craft. When the pipeline dredge *Ann* arrived in April to work on a Navy MARKET TIME coastal surveillance base, MACV simultaneously gave its approval for the dredge to furnish fill for the extension. By the end of the month, the *Ann* completed this work and moved on to the Qui Nhon MARKET TIME site. When the engineers finished the extension and landing craft ramps, the in-transit storage area doubled in size. In early June, the port construction and construction engineers completed the installation of a four-inch submarine pipeline in the harbor. The new pipeline facilitated the transfer of fuel from tankers to a new 50,000-barrel capacity tank farm on the mainland. To stabilize the tankers while unloading, work crews installed a system of anchorages and moorings.[30]

The enlarged logistics base meant that even more work would be required to transform Qui Nhon into a major port complex. After the *Ann* completed its dredging at the MARKET TIME facility in late May, it began work on an extensive program to develop a deep-draft port. On 20 June, the hopper dredge USS *Davison* from the Corps of Engineers civil works fleet started work on the two-mile deep-draft approach channel and turning basin. Phase I planning for the expanded port included eight barge unloading points, two permanent LST ramps, and DeLong piers providing four deep-draft berths. In June, work began on a four-lane port access road one and a half miles across the bay to bypass the congested city. As part of this undertaking, RMK-BRJ began to drive sheet pile and place hydraulic fill for the bypass road's subbase. While the contractor dredged fill for the causeway leading to the pier complex, the 84th Engineer Battalion added landing craft ramps. The DeLong Corporation installed two prefabricated piers. Dredging the channel for deep-water shipping in the harbor continued. By December, the new pier complex with its four deep-draft berths boosted the cargo unloading performance from a little more than 59,000 short tons in January to over 113,000 short tons. The battalion improved the submarine fuel pipeline by more than doubling its length to 5,500 feet and began placing two additional lines. In the depot, drainage facilities were improved before the winter monsoon. To satisfy the ever-increasing demand for rock, the 84th assumed responsibility for the operation of the quarry south of Qui Nhon. The battalion pooled its equipment with the 73d Construction Support Company, and the combined capacity of the rock crushers increased to two 75-ton-per-hour units and one 225-ton-per-hour unit.[31]

[30] Quarterly Hist Rpt, 1 Apr–30 Jun 66, MACDC, 8 Aug 66, pp. 24–25; Galloway, "Essayons," p. 70; ORLLs, 1 Feb–30 April 66, 937th Engr Gp, p. 6, 1 Feb–30 Apr 66, 84th Engr Bn, p. 3, and 1 May–31 Jul 66, 84th Engr Bn, pp. 3–4; Yens and Clement, "Port Construction in Vietnam," pp. 22–23; Ploger, *Army Engineers*, p. 107.

[31] ORLLs, 1 May–31 Jul 66, 84th Engr Bn, pp. 3–5, 1 Aug–31 Oct 66, 84th Engr Bn, 14 Nov 66, pp. 2–6, and 1 Nov 66–31 Jan 67, 84th Engr Bn, 14 Feb 67, pp. 3, 5, all in Historians files, CMH; Galloway, "Essayons," pp. 108–10; MACV History, 1966, p. 299.

DeLong pier under construction at Qui Nhon in November 1966. Arrow indicates the hydraulic fill for port hardstand.

Outside Qui Nhon, the 19th Engineer Battalion carried on with an array of construction projects. Colonel Mathews departed in July and turned the reins of command over to Lt. Col. Nolan C. Rhodes. This transfer of command was literal, for it involved turning over the bit and reins of a bridle that, according to legend, came from a seahorse that rescued the drowning battalion commander during the World War II amphibious landing at Anzio, Italy. (The unit's insignia was also emblazoned with a little seahorse.) One major project involved expanding the 50,000-barrel tank farm to 112,000-barrel capacity at a second site on the outskirts of town. The fuel-thirsty 1st Cavalry Division's 450 helicopters had placed heavy demands on the logistics base and had created an urgent need for more fuel storage, including the construction of a fifty-one-mile fuel pipeline from Qui Nhon to An Khe. In late August, Company C began work on the pipeline and pumping stations. Normally, engineer pipeline companies did this type of work, and MACV made arrangements for a platoon from the 697th Pipeline Construction Company based in Thailand to help. By mid-September, work crews had placed thirty-three miles of pipeline, but a shortage of clamps forced a temporary halt. Work shifted to building pump stations and welding pipeline sections. Bad welding rods caused more delays, and a plea went out to airlift acceptable welding rods from the United States. Meanwhile, at Lane Army Airfield outside Qui Nhon, the battalion continued to make improvements. Peneprime was used extensively to cut down on the dust, and twenty-five pads were added to the heliport. In mid-February, the 19th began to build a large maintenance facility at Cha Rang near the intersection of Highways 1 and 19. The transfer of areas of responsibility between the

937th and the 45th Groups in November resulted in the transfer of the Cha Rang and the pipeline projects to the recently arrived 35th Engineer Battalion (Combat). The 19th also picked up the ammunition depot road maintenance project from the 299th Engineer Combat Battalion. Several operational missions were also assigned to the 19th later in the year.[32]

Much progress at the Qui Nhon ammunition depot had been made by the 299th Engineer Battalion. The depot site, which was perched near the base of a steep slope next to Highway 1 southwest of the city, presented a tremendous challenge in design and drainage. Company B built roads, concrete ammunition pads, earthen berms around the pads, buildings, guard towers, and fencing. However, huge runoffs of water following heavy rains repeatedly damaged roads, berms, and other structures. Except when called out on operational missions, Company C kept busy patching assigned sections of Highways 1 and 19. In late July the battalion, now commanded by Lt. Col. Richard M. Connell who replaced Colonel Anderson in April, received word to move the headquarters, Company C, and part of the 630th Light Equipment Company to Pleiku to join Company A, which had been hard at work building facilities for the 3d Brigade, 25th Division. Company B remained at the ammunition depot until relieved by the 19th.[33] (*Map 9*)

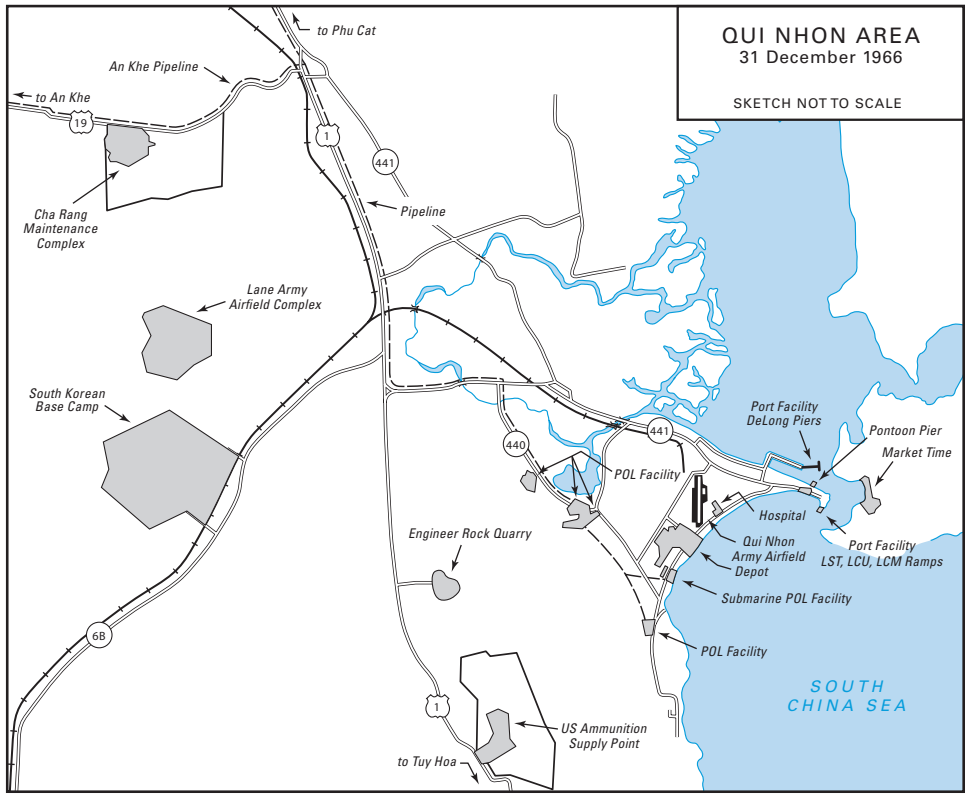
In November 1966, the 35th Engineer Battalion under the command of Lt. Col. Wesley E. Peel arrived at Qui Nhon from Fort Lewis, Washington. The battalion was unique in that it had four line companies compared to the three in the nondivisional combat battalions that arrived earlier. Newly arriving combat engineer battalions were organized under the later Table of Organization and Equipment (TOE) 5–35E series, while the battalions in country were still organized under the series 5–35D TOE. After settling in, the 35th assumed the Cha Rang depot and pipeline projects from the 19th. It also supported 1st Cavalry Division operations around Bong Son, some fifty miles north of Qui Nhon. This included keeping Highway 1 open to Bong Son during the winter monsoon already under way. Along Highway 19, the battalion and pipeline platoon completed five pump stations, two H-frame crossings, and four suspension crossings. Heavy rains and rising waters in December, however, caused the collapse of the fourth suspension bridge, and the project completion date of 31 December slipped back a week. By 20 January, with pipeline tests successfully completed, the 35th turned over the pipeline to the 1st Logistical Command. Soon fuel began to flow through the pipeline to An Khe. During this period, the battalion operated with only three lettered companies, for Company D had been ordered to Pleiku to work under the 20th Engineer Battalion's control.[34]

Before the end of the year, the 45th Group's area of responsibility and units under its control changed dramatically. By late 1966, the burgeoning Qui Nhon

[32] Galloway, "Essayons," pp. 67, 70, 71; ORLLs, 1 Feb–30 Apr 66, 19th Engr Bn, 9 May 66, pp. 3–5, 1 May–31 Jul 66, 19th Engr Bn, 13 Aug 66, pp. 1–2, 1 Nov 66–31 Jan 67, 19th Engr Bn, 31 Jan 67, pp. 1–7, and 1 Nov 66–31 Jan 67, Engr Cmd, 31 Jan 67, pp. 16–18. ORLLs in Historians files, CMH.

[33] ORLLs, 1 Feb–30 Apr 66, 299th Engr Bn, 30 Apr 66, pp. 3–4, and 1 May–31 Jul 66, 299th Engr Bn, 31 Jul 66, pp. 2–4. All in Historians files, CMH.

[34] ORLLs, 1 Nov 66–31 Jan 67, Engr Cmd, pp. 17–18, and 1 Nov 66–31 Jan 67, 45th Engr Gp, p. 4; Galloway, "Essayons," pp. 163, 173.



Map 9

complex supported combat operations of over 62,000 combat and support troops. Because of the establishment of the engineer command and the shift of the 18th Engineer Brigade to Dong Ba Thin, other shifts of boundaries took place within the new brigade area. The 937th Engineer Group moved inland to Pleiku and assumed responsibility for the Central Highlands. On 10 November, Colonel Bush's 45th Engineer Group shifted its area of responsibility north to the I/II Corps boundary and moved to a more central location in Qui Nhon. In turn, the 35th Group extended its responsibility from Cam Ranh Bay to a point north of Nha Trang. The 45th Group lost the 14th Engineer Battalion to the 35th Group, and the 20th Engineer Battalion moved to the highlands to work under the 937th Group. Colonel Bush retained control of the 39th and 577th Engineer Battalions, and the 19th, 35th, and 84th Engineer Battalions in Qui Nhon along with all construction projects in the area were transferred to the 45th Group. As a result, Colonel Bush ended up commanding the largest engineer group in Vietnam—five battalions and several companies and smaller units totaling over 3,600 men.[35]

[35] Ploger, *Army Engineers*, pp. 134, 136; Dunn, *Base Development*, p. 68; ORLL, 1 Nov 66–31 Jan 67, 45th Engr Gp, p. 3; Rpt of Visit to the 18th Engr Bde, 29 Oct–17 Nov, incl. 7, tab A, OCE Liaison Officer Trip Rpt no. 5.

Highlands Camps

Work continued at a high pace at the 1st Cavalry Division's An Khe base camp. Colonel Edelstein's 70th Engineer Battalion improved access to the base by adding a one-and-a-half-mile road to Highway 19 east of An Khe City. To complete the road, the 70th spanned a river with a 260-foot double-double panel bridge. The Bailey bridge consisted of two tiers of double panels on each side of the roadway. Other projects completed were a perimeter security lighting system and a division tactical operations center. Extensive self-help construction under the supervision of the engineers continued in troop areas. In March 1966, Company B, 84th Engineer Battalion, arrived from Qui Nhon and set up a new quarry and larger rock crusher plant. The construction unit also added many wood frame buildings, one of which included a reinforced-concrete security room for use by the division's communications section, a sixty-ton-capacity ice-making plant, and a central telephone dial exchange.[36] Improving the An Khe airfield, however, turned into a major and troublesome endeavor. Through early spring, C–130s were continuing to suffer frequent tire cuts and blowouts. In late May, the rough condition of the new matting and the destructive effect of the pierced steel planking on the medium range aircraft's tires again reached an unacceptable level, forcing the closure of the airfield for repairs.[37]

To improve the airfield situation, the engineers figured three projects would have to be undertaken. First, engineer units at An Khe would build an alternate T17 membrane assault strip at the Golf Course. Second, new matting would be placed on the old airfield. Third, the engineers would construct a completely new C–130 runway. In late May, the 8th Engineer Battalion completed about one-third of the alternate airstrip's earthwork before turning that phase of construction over to Company B, 84th Engineer Battalion. On 10 June, the 70th Engineer Battalion began to lay T17 membrane while Company B finished the earthwork. Designed to serve as a rapid means to protect the runway base from the effects of moisture, the recently developed T17 membrane consisted of a neoprene-coated nylon fabric packaged in sheets measuring 303 by 60 feet. As part of the process of laying and securing the membrane

[36] Galloway, "Essayons," pp. 70, 72; ORLLs, 70th Engr Bn, 1 Feb–30 Apr 66, 7 May 66, pp. 2–8, 1 May–31 Jul 66, 70th Engr Bn, 15 Aug 66, pp. 2–8, 1 Aug–31 Oct 66, 70th Engr Bn, 31 Oct 66, pp. 1–2, 1 Nov 66–31 Jan 67, 70th Engr Bn, 31 Jan 67, pp. 2–6, 1 Feb–30 Apr 66, 84th Engr Bn, 14 May 66, pp. 3–4, 1 May–31 Jul 66, 84th Engr Bn, 14 Aug 66, pp. 3, 21, 1 Aug–31 Oct 66, 84th Engr Bn, 14 Nov 66, p. 1–2, and 1 Nov 66–31 Jan 67, 84th Engr Bn, p. 2. ORLLs in Historians files, CMH.

[37] Galloway, "Essayons," p. 30; Bowers, *Tactical Airlift*, pp. 209, 230–31; ORLLs, 1 Feb–30 Apr 66, 70th Engr Bn, pp. 2, 6, 11, and 1 May–31 Jul 66, 70th Engr Bn, pp. 2, 6; Quarterly Hist Rpt 1 Apr–30 Jun 66, MACDC, p. 23; Situation Rpt on the Construction of Airfields in South Vietnam, incl. 13, p. 1, OCE Liaison Officer Trip Rpt no. 1; Situation Rpt on Airfield Construction in SEA, incl. 13, p. 1, OCE Liaison Officer Trip Rpt no. 2, 6 May, OCE Hist Ofc; Situation Rpt on Airfield Construction in South Vietnam, incl. 7, p. 2, OCE Liaison Officer Trip Rpt no. 3; Ltr, Lt Gen Joseph H. Moore, CG, Seventh AF, to Westmoreland, 13 May 66, sub: Hazardous Airfield Conditions at An Khe, and 1st indorsement, Brig Gen Carroll H. Dunn to Cmdr, Seventh AF, 22 May 66, Historians files, CMH.

from moving during landings and takeoffs, work crews dug anchor ditches to hold the edges in place. Since the membrane provided no bearing capacity, the base required good compaction. As a finishing touch, a skid-proofing compound was applied to the membrane's surface. In a little over one week, the 70th placed T17 membrane on a 3,200-by-60-foot runway, a 900-by-180-foot parking area, and two 215-by-36-foot taxiways. The battalion also built a 100,000-square-foot compacted laterite hardstand and moved the control tower. The 70th Engineer Battalion officially completed the Golf Course project on 18 June.[38]

Air operations shifted to the T17 membrane Golf Course airstrip, and the main airfield was closed for rehabilitation. Soon the new airstrip had its own problems. A six-man maintenance crew was assigned to inspect and patch tears in the membrane after each C–130 landing. Although it did not rain very much, the impact and weight of the cargo planes repeatedly made ruts eight to twelve inches deep. This condition required frequent roller and vibratory compactor work that in itself proved damaging to the membrane. Nevertheless, the durability of the T17 membrane exceeded expectations, assuring its usefulness for forward operations, if given the proper maintenance. Unfortunately, the membrane runway at An Khe was considered less than satisfactory. On 11 July, a few days before Colonel Edelstein transferred the command of the 70th Engineer Battalion to Lt. Col. John R. Redman, the unit received a construction directive to fortify the Golf Course airstrip with AM2 matting. Since the main runway was still closed, the directive mandated that one half the strip always be open to emergency traffic. Pacific Command controlled the scarce matting, and MACV had to request the diversion of matting from the Phu Cat Air Base project. Within a week, Company A began removing and replacing the membrane after filling and compacting bad spots. AM2 matting was then placed over the runway, taxiways, and parking apron. The onset of daily rains made the job that much more difficult. On 20 August, Colonel Redman received word from the division that the strip had to be ready for use on the twenty-fifth for a tactical operation. The battalion added more men to lay matting and completed the runway and two taxiways at 0600 25 August, four hours before the first aircraft touched down.[39]

A month later, the monsoon season was in full swing, and the Golf Course airstrip again began to show signs of failure. At one location, the weight of the taxiing aircraft started to force up mud through the joints in the matting. Since the matting did not appear damaged, the airstrip remained open with

[38] Ploger, *Army Engineers*, pp. 111–12; *Memoirs of the First Team*, p. 181; Situation Rpt on Airfield Construction in South Vietnam, incl. 7, p. 2, OCE Liaison Officer Trip Rpt no. 3; ORLLs, 1 May–31 Jul 66, 70th Engr Bn, pp. 2, 6, and 1 May–31 Jul 66, 84th Engr Bn, pp. 1–2.

[39] AAR, 70th Engr Bn, Golf Course Airstrip, 11 Sep 66, Incl in ORLL, 1 Aug–31 Oct 66, 70th Engr Bn, pp. 12; Galloway, "Essayons," p. 70; Bowers, *Tactical Airlift*, p. 231; Quarterly Hist Rpt, 1 Apr–30 Jun 66, MACDC, pp. 23–24; Msg, CG I FFV to CG USARV, 27 May 66, sub: An Khe Airfield Requirements; Msg, COMUSMACV MACDC-CM to CINCPAC, 14 Jun 66, sub: AM2 Matting Requirements for An Khe Airfield; Msg, COMUSMACV MACDC-CM 20885 to Cmdrs Seventh AF, 1st Log Cmd, 1st Cav Div, USA Support Cmd, 18 Jun 66, sub: AM2 Matting Requirements for An Khe Airfield. Msgs in Historians files, CMH.

the suspected section closely monitored. By 30 September, the matting in this area had become deformed, but the strip remained open due to an ongoing operation. The 70th Engineer Battalion continued to monitor the airstrip, and on 7 October repair crews observed a hairline crack in the joint of the end panel of the depression. Landing and taxiing of C–130 transports caused AM2 panels in this section to become disengaged in two places. Further investigation revealed a subgrade failure that called for rehabilitation of some 300 feet of the runway. Due to the high priority given to the military operation, the 1st Cavalry Division authorized shutting down the airfield for only thirty-six hours. Taking turns in around-the-clock shifts, Companies A and C completed repairs at 0400 9 October. Another problem soon followed. Because of the lack of anchorage systems, the constant shifting of the aluminum matting continued to tear the membrane, thus allowing water to erode the subbase. The 70th again removed larger sections of matting and membrane. Work crews added and compacted crushed rock in the subgrade, applied peneprime in place of the membrane, and replaced the matting. The problems at An Khe simply reemphasized the importance of adequate drainage and the difficulties of doing earthwork during the monsoon. In December, another major change in specifications took place at the main airfield. The new asphalt runway would become the taxiway after completion of a concrete runway, the first of that type attempted by engineer troops in Vietnam.[40]

Over at the 12-million-square-foot Golf Course heliport, the 70th Engineer Battalion started building over four hundred ramps for the division's helicopter fleet. Heavy vehicle traffic had torn off much of the grass cover, and in a short time the heliport became extremely dusty. General Wright even went to the extreme of having Vietnamese laborers cut sod and transplant it to the heliport. He recognized that every little bit helped to reduce dust and helicopter maintenance problems, but even under optimum conditions putting down sod by this method was a slow process, perhaps, according to one estimate, taking up to twenty years. The engineers turned to a better method. The ramps, which varied in size according to the size of the aircraft, were leveled and topped off with an asphalt surface treatment. Workers then covered the treatment with airfield matting. Together the two surfaces reduced dust and flying particles and provided a firm foundation even when it rained.[41]

At Pleiku, more engineers arrived to help build the forward base for the 3d Brigade, 25th Division. In early January, a reinforced platoon from Company A, 299th Engineer Battalion, moved from Qui Nhon to help build facilities for the infantry brigade. A second platoon followed a week later, and by early April the entire company had moved to Pleiku. Work began on an ammuni-

[40] AAR, 70th Engr Bn, Golf Course Airstrip Repair, 9 Nov 66, Historians files, CMH; ORLLs, 1 Nov 66–31 Jan 67, 70th Engr Bn, p. 3, 1 Nov 66–31 Jan 67, 937th Engr Gp, 15 Feb 67, p. 12, 1 Aug–31 Oct 66, pp. 1–2, and 1 Nov 66–31 Jan 67, 84th Engr Bn, p. 2.

[41] Galloway, "Essayons," p. 72; Interv, Fishback with Wright, 1 Mar 83, 2:399–400; Situation Rpt on the Construction of Airfields in South Vietnam, incl. 13, p. 1, OCE Liaison Officer Trip Rpt no. 1; Situation Rpt on Airfield Construction in SEA, incl. 13, p. 1, OCE Liaison Officer Trip Rpt no. 2; ORLLs, 1 Feb–30 Apr 66, 70th Engr Bn, p. 6, and 1 May–31 Jul 66, 70th Engr Bn, p. 4.

tion depot and roads in and around the base. By June, Company A started building an aircraft maintenance facility, a cantonment area, an eighty-bed hospital, and more depot facilities. The company also ran an experiment by laying T17 membrane along a 2,000-foot section of road as a dust-control measure. To keep the surface from being punctured and torn with sharp objects, work crews closed the test section to tracked vehicles and dump trucks hauling gravel. After two weeks of use, the membrane held up well and appeared to be a good expedient road surface. On 29 July, Colonel Connell moved his battalion headquarters and most of the attached 630th Light Equipment Company to Pleiku. Company B remained at Qui Nhon working on the ammunition depot until 21 August before rejoining the battalion. In August, the battalion began making preparations to help the arriving 4th Infantry Division set up a division-size base camp outside Pleiku.[42]

The forward presence of a full division at Pleiku called for more engineers to lend a hand in base development and operational support. On 10 October, the 20th Engineer Battalion under Lt. Col. Robert L. Gilmore, who had replaced Colonel Harris in April, along with the attached 584th Light Equipment Company, moved from Ban Me Thuot to the 4th Division's new Dragon Mountain base camp. Although Colonel Gilmore took over base development responsibilities from the 299th, only a limited amount of time could be devoted to base construction. Priority went to forward airfields and roads in support of the division's operations. Whenever possible, Vietnamese laborers were hired and put to work manufacturing prefabricated buildings used in the self-help construction program. Company A initiated work on an interim water supply system by installing a pump station and pipeline from a nearby lake to a 1,000-barrel storage tank on the base. This undertaking included building a suspension bridge with a 300-foot clear span over a deep ravine and placing the pipeline underground inside the camp. Meanwhile, Company C constructed a loading ramp and crusher head wall for the 584th Light Equipment Company's quarry. The light equipment company helped build several forward airfields and upgrade Highway 19. By early December, the 20th gained a fourth line company with the attachment of Company D, 35th Engineer Battalion, to help the building effort at Pleiku. Since RMK-BRJ was already working at the air base and Camp Holloway, the firm received notice to proceed in June to build a cantonment, a hospital, and other support facilities for the Army.[43]

At nearby Pleiku Air Base, the Air Force expanded its presence from an outpost of 150 men to a complex of over 2,100 personnel. From this most inland of major air bases, the Air Force dispatched attack fighters, psychological warfare planes, gunships, forward air control observation planes, and rescue helicopters. Beginning in October 1965, a succession of Prime Beef

[42] ORLLs, 1 Feb–30 Apr 66, 299th Engr Bn, pp. 4–5, 1 May–31 Jul 66, 299th Engr Bn, pp. 1–2, and 1 Nov 66–31 Jan 67, 299th Engr Bn, 14 Feb 67, pp. 1–7, Historians files, CMH; AAR, Test Road T17, Co A, 299th Engr Bn, 30 Mar 66, incl. 9, tab C, OCE Liaison Officer Trip Rpt no. 3; Galloway, "Essayons," pp. 117, 119, 165.

[43] ORLLs, 1 Aug–31 Oct 66, 20th Engr Bn, 10 Nov 66, p. 3–4, 10, and 1 Nov 66–31 Jan 67, 20th Engr Bn, 12 Feb 67, p. 1–7, both in Historians files, CMH; Diary of a Contract, pp. 209–10.

teams built cantonments, aircraft ramps, operations facilities, and helped assemble fuel storage bladders and their dispensing systems. The teams also built two-story wooden troop billets and a kennel for Air Police guard dogs. By 13 September 1966, the teams had completed thirteen barracks housing over 900 men. RMK-BRJ also worked on cantonment facilities, which included an additional 1,000 kilowatts of power and a utilities system (water, sewers, sewage plant, and power distribution), and completed a 30,000-square-yard parking apron in December.[44] (*Map 10*)

On 10 November, the 937th Engineer Group, now under the command of Col. Ernest P. Braucher who replaced Colonel Watkin in August, assumed responsibility for the highlands and moved its headquarters to Pleiku. Although the group lost the 19th and 84th Engineer Battalions, it gained the 20th Engineer Battalion and Company D, 35th Engineer Battalion. The group retained the 70th and 299th Engineer Battalions and Company B, 84th Engineer Battalion. Colonel Braucher also had several smaller units to provide specialized support: the 509th and 511th Panel Bridge Companies (one platoon of the 509th remained attached to the 45th Group), the 584th and 630th Light Equipment Companies (the 630th also had a platoon attached to the 45th Group), the 585th Dump Truck Company, and two platoons and a part of a support platoon from the 554th Float Bridge Company.[45]

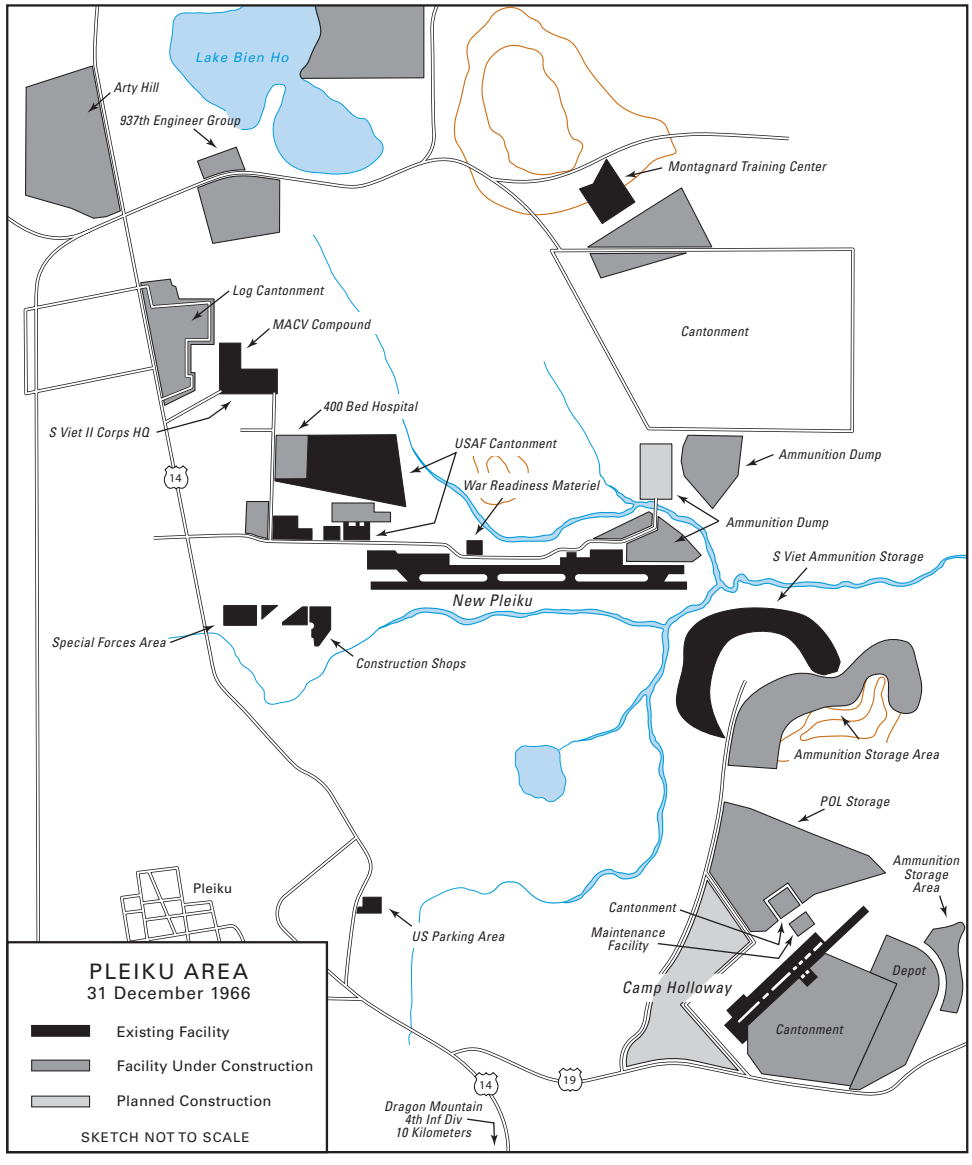
On the negative side, the 937th Engineer Group lost a major portion of its construction capability while taking on a larger area of responsibility. Although the 937th had given up the eastern half of its territory to the 45th Group, its area increased by 30 percent after taking over the southern highlands from the 35th Group. The recent influx of U.S. troops into the Pleiku area created requirements for construction that more than matched the resources at Colonel Braucher's disposal. This ensued despite transferring the Qui Nhon area projects and gaining the 20th Engineer Battalion. The loss of the skilled men and equipment of all but one company of the 84th, the only construction battalion in northern II Corps, could not be made up. The 84th had provided a reservoir of journeymen plumbers, fitters, electricians, and other key trades needed on the group's projects.[46]

For the most part, the 937th Group had tackled large projects typically carried out by a construction group headquarters. The small operations (S–3) and supply (S–4) sections of the group headquarters and the combat battalions required augmentation to handle the additional engineering tasks. In the end, this meant that the group and combat battalion headquarters tasked their units to locate qualified officers to assume engineering tasks at the headquarters. In turn, this situation left several companies short of officers. To some degree, the attachment of light equipment and construction support companies did bring the combat battalion on a par with the construction battalions. The 937th Group managed to get by with its two light equipment companies,

[44] Schlight, *Years of the Offensive*, pp. 172, 176; USAF Airfield Construction in South Vietnam, pp. 120, 127–28; Diary of a Contract, pp. 208–09.

[45] ORLL, 1 Nov 66–31 Jan 67, 937th Engr Gp, p. 2; Galloway, "Essayons," p. 163.

[46] ORLL, 1 Nov 66–31 Jan 67, 937th Engr Gp, pp. 6, 12.



MAP 10

but the transfer of one of the two companies to the 159th Group in April severely depleted the group's construction equipment resources.[47]

In its first year in Vietnam (August 1965 to August 1966), the 937th Engineer Group had expended over 90 percent of its effort in construction.

[47] ORLLs, 1 Feb–30 Apr 66, 937th Engr Gp, p. 8, 1 May–31 Jul 66, 937th Engr Gp, 15 Aug 66, p. 10, Historians files, CMH, and 1 Nov 66–31 Jan 67, 937th Engr Gp, pp. 5–6; Galloway, "Essayons," pp. 75–76.

With such a heavy construction responsibility, the group concentrated its efforts in and around Qui Nhon and at An Khe, improving and expanding logistic and support facilities, and to a lesser degree at Pleiku. As the pace of combat operations increased in the highlands, I Field Force tasked the nondivisional engineers of the 937th Group for more operational support. With the shift to the western highlands, the proportion of operational support missions dramatically increased. Much of this effort went to building and maintaining forward airfields and tactical supply routes supporting operations. By the end of 1966, the group's construction and operational missions reached a balance. While the 70th Engineer Battalion concentrated almost entirely on construction at An Khe, the 20th Engineer Battalion devoted nearly all its effort to operational support. The 299th Engineer Battalion's effort fluctuated but broke down almost evenly between construction and operational support.[48]

More Work at Phan Rang

At Phan Rang, Colonel Triem's 62d Engineer Construction Battalion continued work at the joint Army and Air Force facility where most of the effort went into the jet fighter base. First, military engineers built an AM2 aluminum matting airfield followed by the civilian contractor, RMK-BRJ, which built a permanent 10,000-foot concrete runway, taxiways, and parking aprons. The first rains of the monsoon fell in September and October 1965, but a period of fair weather followed. Earthwork progressed satisfactorily until mid-December when heavy rains again set in. Nearly nine inches of rain fell within a ten-day period, hindering the use of heavy construction equipment, and resulting in the loss of many productive days. The 62d also suffered a high rate of equipment breakdowns and a lack of repair parts. In January 1966, the battalion and the contractor tackled the problem by pooling equipment. Military operators used the contractor's equipment at night, an arrangement that lasted until mid-February when RMK-BRJ began to work on the ammunition storage area.[49]

Although much earthwork remained to be done on the runway, the 62d began placing matting in areas as soon as the subgrade and base course were completed. All available electrical lighting was used to do earthwork at night. During the day, matting was laid even though temperatures reached 100 or more degrees. Through a trial and error method, the 62d found that small crews of soldiers proved more effective at laying the matting than Vietnamese laborers. On the other hand, the Vietnamese became proficient placing membrane sections on the subgrade and disassembling the bundles of AM2 matting. The first aircraft touched down on the interim runway on 20 February. By

[48] ORLL, 1 Nov 66–31 Jan 67, 937th Engr Gp, p. 6; 937th Engr Gp History, pp. 3–5; Galloway, "Essayons," pp. 108–09, 160.

[49] Quarterly Cmd Rpt 1 Jan–30 Apr 66, 62d Engr Bn, 11 May 66, pp. 1, 5–6, and ORLL, 1 May–31 Jul 66, 62d Engr Bn, 13 Aug 66, pp. 1–4, both in Historians files, CMH; Maj. Donald A. Haas, "Phan Rang Air Base," *Military Engineer* 58 (November-December 1966): 431–32; Galloway, "Essayons," pp. 45–46; Situation Rpt on the Construction of Cantonments, incl. 8, p. 2, OCE Liaison Officer Trip Rpt no. 3.

mid-March, the 10,000-by-102-foot runway and adjacent taxiways and parking aprons became operational when the first F–4 Phantoms landed, making Phan Rang the country's sixth operational jet fighter base.[50]

Work continued on the airfield, but bad weather caused more problems. After the 62d Engineer Battalion laid more matting on the north taxiway, heavy rains in May caused base course and subgrade failures. This forced the Army engineers and Air Force civil engineers of the 554th Red Horse Squadron, which arrived in January, to stop construction and make repairs. Although the AM2 matting had held up well to wear, Red Horse engineers, who were building aircraft revetments at the time, noticed depressions on the parking ramp. As the rains continued (Phan Rang had the unenviable distinction from the builder's point of view of having two rainy seasons, both winter and summer monsoons), the depressions deepened and quickly filled with water, often causing the fighter-bombers to drag their wing-hung ordnance. The ramp failures spread next to the taxiway, then the runway. With the help of RMK-BRJ, the Army engineers went to work trying to restore the taxiway and ramp. The 554th Red Horse Squadron took over runway repairs.[51]

It was determined that rain alone had not caused the base course failure. Red Horse engineers opined that Army engineers in their attempt to meet deadlines deviated from the original plans and substituted another waterproofed membrane instead of the more rugged and superior T17 membrane. Air Force engineers also attributed the failures due to hasty workmanship. In fact, the prefabricated metal surfaces could not seal water out of the joints between panels. Even the T17 and various asphalt products turned out less than satisfactory. Since each takeoff and landing produced powerful thrusts against the surface, work crews tried anchoring the matting in attempts to prevent the runway from creeping. Unfortunately, the anchorages allowed surface water access to the subgrade. By June, the 62d Engineer Battalion completed the north taxiway and turned attention to the parking ramp. Also that month, Red Horse engineers, working at night to avoid the 125-degree heat reflecting from the AM2 matting, replaced nearly 90,000 square feet of runway matting. The runway remained open for operations, though at times it was reduced to only 6,000 feet of usable length. During this time, RMK-BRJ continued work on the concrete runway.[52]

By the end of the year, the 62d Engineer Battalion's largest and most troublesome project at the air base neared completion. By then, Colonel Triem

[50] Haas, "Phan Rang Air Base," pp. 432–33; Lyons, "Aluminum Matting Runways in Vietnam," p. 246; Dunn, *Base Development*, p. 62; USAF Airfield Construction in South Vietnam, pp. 104–05. See also Quarterly Cmd Rpt, 1 Jan–30 Apr 66, 62d Engr Bn, pp. 3–4, and ORLL, 1 May–31 Jul 66, 62d Engr Bn, p. 3.

[51] ORLL, 1 May–31 Jul 66, 62d Engr Bn, pp. 2–3, 6; USAF Airfield Construction in South Vietnam, pp. 105–06; Situation Rpt on Airfield Construction in South Vietnam, incl. 7, pp. 1, 3–4, OCE Liaison Officer Trip Rpt no. 3; Msg, COMUSMACV MACDC-CM 15141 to CG, USARV, and OICC (Officer in Charge of Construction) RVN, 13 May 66, sub: Expeditionary Airfield Phan Rang, Historians files, CMH.

[52] USAF Airfield Construction in South Vietnam, pp. 107–08; Situation Rpt on Airfield Construction in South Vietnam, incl. 7, pp. 3–4, OCE Liaison Officer Trip Rpt no. 3; Ploger, *Army Engineers*, p. 114; ORLL, 1 May–31 Jul 66, 62d Engr Bn, p. 6.

had departed in late June and Lt. Col. Andrew J. Waldrop had assumed command ten days later. A notable achievement by the 62d Engineer Battalion as it entered its second year in Vietnam included the completion of the million-square-foot AM2 parking apron. Another project for the Air Force included completing a 46,000-barrel fuel storage area and connecting it to the six-inch pipeline leading to the beach. At the beach, the 62d installed two 8-inch submarine pipelines from the shore 1,200 feet out to a discharging and mooring facility. Work also began on two LST ramps and a new road to the air base. With the help of a fifty-man self-help contingent from the 1st Brigade, 101st Airborne Division, progress on the 4,700-man cantonment area began to raise the troop billets to Standard 4. The 62d also deployed forces inland to Bao Loc and to Da Lat to do airfield work.[53]

At the permanent airfield, RMK-BRJ completed the 10,000-foot concrete runway and four connecting taxiways on 12 October 1966. The new runway alleviated many operational adversities that had plagued the Army and Air Force engineers at the interim AM2 airfield. By year's end, the new runway and its supporting taxiway system were in service. All the roads were graded and most were topped with an asphalt surface. The Air Force occupied more than one-half of the sixty-seven barracks and work continued on the remainder. Work also proceeded into the final stages of installing an electrical power plant, water and sewage system, dining hall, dispensary, and other structures. To compensate for some slippage and deletions from construction schedules forced by contract costs, MACV tasked the 554th Red Horse Squadron with a six-month work program. This would provide Air Force personnel in 1967 those facilities that did not materialize in 1966.[54]

With a good share of its work completed, Colonel Waldrop received orders in late November to move the 62d Engineer Battalion to Long Binh. The second major move of the battalion while in Vietnam vividly brought out the hardships involved in relocating a 900-man heavy construction battalion. Companies continued to work on projects, phasing out construction approximately three to five days before loading on a LST for the voyage south. The move extended over a seven-week period, and as a result the battalion could barely keep up maintenance, medical, supply, engineering, and administrative support at two locations. Colonel Waldrop estimated the move had set back the battalion's maintenance effort by two months and recommended against phased movement of engineer construction battalions.[55]

[53] ORLLs, 1 Aug–31 Oct 66, 62d Engr Bn, 31 Oct 66, pp. 1–4, and 1 Nov–31 Jan 67, 62d Engr Bn, 12 Feb 67, pp. 1–4 and incl. 1, AAR, Bao Loc Airfield, both in Historians files, CMH; Galloway, "Essayons," p. 134.

[54] USAF Airfield Construction in South Vietnam, p. 110; Quarterly Hist Rpts 1 Jul–30 Sep 66, MACDC, p. 39, and 1 Oct–31 Dec 66, MACDC, p. 29. For more on RMK-BRJ work at Phan Rang, see Diary of a Contract, pp. 250–54.

[55] ORLL, 1 Nov 66–31 Jan 67, 62d Engr Bn, pp. 1–4, 11. For an account of the procedures involved in such a move, see Sgt. Maj. Edward J. Malen, "Engineer Battalion Move by Landing Craft," *Military Engineer* 60 (July-August 1968): 262–63.

Phan Rang airfield at the end of 1966 showing concrete runway and taxiways on the left and AM2 runway on the right

Long Binh and the III Corps Shield

Colonel Hottenroth's 3,000-man 159th Engineer Group pressed ahead on the Saigon base complex and tactical base camps forming a protective arc around the capital. The group's assignments included Long Binh, base camp facilities for the 1st and 25th Divisions, and the port at Vung Tau. Units carrying out this work were the 46th Construction and 168th and 588th Combat Battalions augmented by two light equipment companies and one construction support company. In addition, well-drilling detachments drilled for sources of fresh water. Besides its own troops and contractor personnel working in the area, the group also employed over 1,300 Vietnamese on a daily hire basis.[56]

At Long Binh, the 159th Group gradually transformed the former rubber plantation into a major Army base. The 46th Engineer Battalion, less Company D at Vung Tau, but reinforced with Company C, 168th Engineer Battalion, completed the 400-bed 93d Evacuation Hospital. Only shortages of electrical and plumbing supplies delayed the timely completion of the medical facility. In addition to the buildings, work at the hospital involved installation of an electrical distribution system by Pacific Architects and Engineers and construction of a minimum sewage system and access roads.

[56] Galloway, "Essayons," p. 83; ORLL, 1 Feb–30 Apr 66, 159th Engr Gp, 13 May 66, p. 1–7, Historians files, CMH; Rpt of Visit to the 159th Engr Gp, Long Binh, Vietnam, 15–18 Feb 66, incl. 6, tab C, p. 1, OCE Liaison Officer Trip Rpt no. 1.

Work continued at the giant ammunition supply depot, the unit's highest priority project. Seasonal rains hampered the construction of earthen berms and the extensive drainage and culvert work, but by early May approximately 20 percent of the depot, which included more than three million square feet of storage space, was done. Work on sheds and bunkers progressed at an equal pace.[57] (*Map 11*)

The 46th Engineer Battalion, commanded by Lt. Col. George Mason who replaced Colonel Hagedon on 17 January, also worked on other projects in the Long Binh area. In late January, the battalion began to clear nearby land along Highway 1A for the II Field Force headquarters. After clearing the land for the new camp, which became known as Plantation, the 46th erected seventeen vertical wall Quonset buildings. Facilities for support units followed. Pacific Architects and Engineers installed power plants and security lighting. In April, work began on a new cantonment between Long Binh and Plantation for the 90th Replacement Battalion located at the intersection of Highways 1A and 15. By the end of May, the replacement battalion moved out of Saigon to its new camp, which was capable of housing 3,000 individual replacements, soon to be expanded to a 6,000-man capacity. On the Dong Nai River, the 46th completed a barge off-loading facility known as the Cogido Dock. The new facility greatly increased the capacity for unloading barges used to transship ammunition from deep-draft ships docking downstream at Nha Be, thus avoiding hauling the dangerous cargo through populated areas to the Long Binh depot. After almost a year in country, the battalion finally took the time to complete its own maintenance shops, semipermanent headquarters buildings, and clubs.[58] (*Map 12*)

The move of Army troops from Saigon to Long Binh showed the massive scope of work still to come. The camp continued to grow in importance as Operation Moose (Move Out Of Saigon Expeditiously) ordered by General Westmoreland sent increasing numbers of U.S. troops to the former plantation. Long Binh had also become a major staging area for incoming men and units. From May to December, Long Binh grew from 6,000 to 20,000 men, with more troops to follow. By late 1966, the complex supported over 100,000 soldiers operating in III and IV Corps.[59]

The 18th Engineer Brigade initially handled most of the work at Long Binh. After some delay, RMK-BRJ began to mobilize its workforce and gradually assumed the bulk of construction. In late October, base development plans noted that most of the cantonment and about half the logistical facilities would be built with the $91 million earmarked from Fiscal Year 1966 supple-

[57] Galloway, "Essayons," p. 84; ORLLs, 1 Feb–30 Apr 66, 159th Engr Gp, pp. 3–4, 1 May–31 Jul 66, 159th Engr Gp, 12 Aug 66, p. 5, and 1 May–31 Jul 66, 46th Engr Bn, 11 Aug 66, p. 1, both in Historians files, CMH; PA&E History, 1963–1966, p. 37; Situation Rpt on Hospital Construction in South Vietnam, incl. 15, p. 1, OCE Liaison Officer Trip Rpt no. 3.

[58] Galloway, "Essayons," pp. 84–86; ORLLs, 1 Feb–30 Apr 66, 159th Engr Gp, pp. 5–6, 1 May–31 Jul 66, 159th Engr Gp, pp. 8–9, and 1 May–31 Jul 66, 46th Engr Bn, p. 2; PA&E History, 1963–1966, p. 39.

[59] Dunn, *Base Development*, p. 69; Army Construction in Vietnam, incl. 9, p. 1, OCE Liaison Officer Trip Rpt, no. 5.

mental funds. The rest of the facilities would be funded from the 1967 supplemental program at a cost of $77 million. Initial planning called for RMK-BRJ to complete the U.S. Army, Vietnam, and 1st Logistical Command permanent headquarters buildings by April 1967. Because of a scare brought on by a serious cash-flow problem that summer, the Officer in Charge of Construction slipped the projected completion date to August 1967.[60]

Throughout the summer and early fall of 1966, rains impeded progress in the Saigon area. Horizontal work (mainly earthwork) at Long Binh slowed down, but despite the mire, construction units maintained a moderately efficient rate on vertical projects. Experience gained a year earlier made the 159th Engineer Group headquarters attentive to drainage, and the commanders and staff admonished the constructing units to build drainage facilities before other work began. After almost a year commanding the group in Vietnam, Colonel Hottenroth passed the 159th Group to his successor, Col. Richard McConnell, in September.[61]

The 169th Engineer Battalion (Construction), which arrived from Okinawa in late May, became an integral part of the work under way at the logistical and headquarters complex. The battalion, commanded by Lt. Col. Marvin W. Rees, built a post headquarters and a stockade to detain U.S. soldiers charged or convicted of military offenses. The unit also cleared more storage areas, operated a prefabrication shop for the self-help construction program, began construction of the 24th Evacuation Hospital, built cantonments, and set up its asphalt plant. In August and September, the 169th built a staging area for the newly arrived 11th Armored Cavalry Regiment. Elements of the battalion helped to build the barge off-loading facility at Cogido Dock.[62]

North of Saigon, Lt. Col. Manley E. Rogers' 168th Engineer Battalion focused its efforts on the 1st Division's base camps at Di An, Phu Loi, and Lai Khe. On 28 April 1966, Lt. Col. Edwin F. Pelosky assumed command of the battalion and would hold that position for the next year. At Di An, Headquarters Company and Company A completed thirty-seven tropical buildings for the division headquarters and began building warehouses and storage areas for the Division Support Command. In January, Company B began building a C–130 airstrip for the 3d Brigade at Lai Khe. Despite the necessity of hauling all material to the base by armed convoys, work crews finished the M8 pierced steel plank strip within two months. Coinciding with the airfield work, Company B improved the base camp and completed an adjacent heliport for twenty-five helicopters. In early May, Company A took over base construction from the 588th Engineer Battalion at Phu Loi and completed a control tower, an airfield operations building, and an M8 pierced steel plank parking ramp for the 196 helicopters supporting the division.

[60] Army Construction in Vietnam, incl. 9, pp. 1–2, OCE Liaison Officer Trip Rpt, no. 5; Raymond, Observations on the Construction Program, p. 27. For more on RMK-BRJ projects at Long Binh, see Diary of a Contract, pp. 278–82.

[61] Galloway, "Essayons," pp. 138–39; ORLL, 1 Aug–31 Oct 66, 159th Engr Gp, pp. 7–8.

[62] Galloway, "Essayons," pp. 136–37; ORLLs, 1 May–31 Jul 66, pp. 2–3, 31 Jul 66, and 1 Aug–31 Oct 66, 169th Engr Bn, 31 Oct 66, pp. 4–7, Historians files, CMH.

Elements of the battalion also supported several operations and helped patrol areas around base camps.[63]

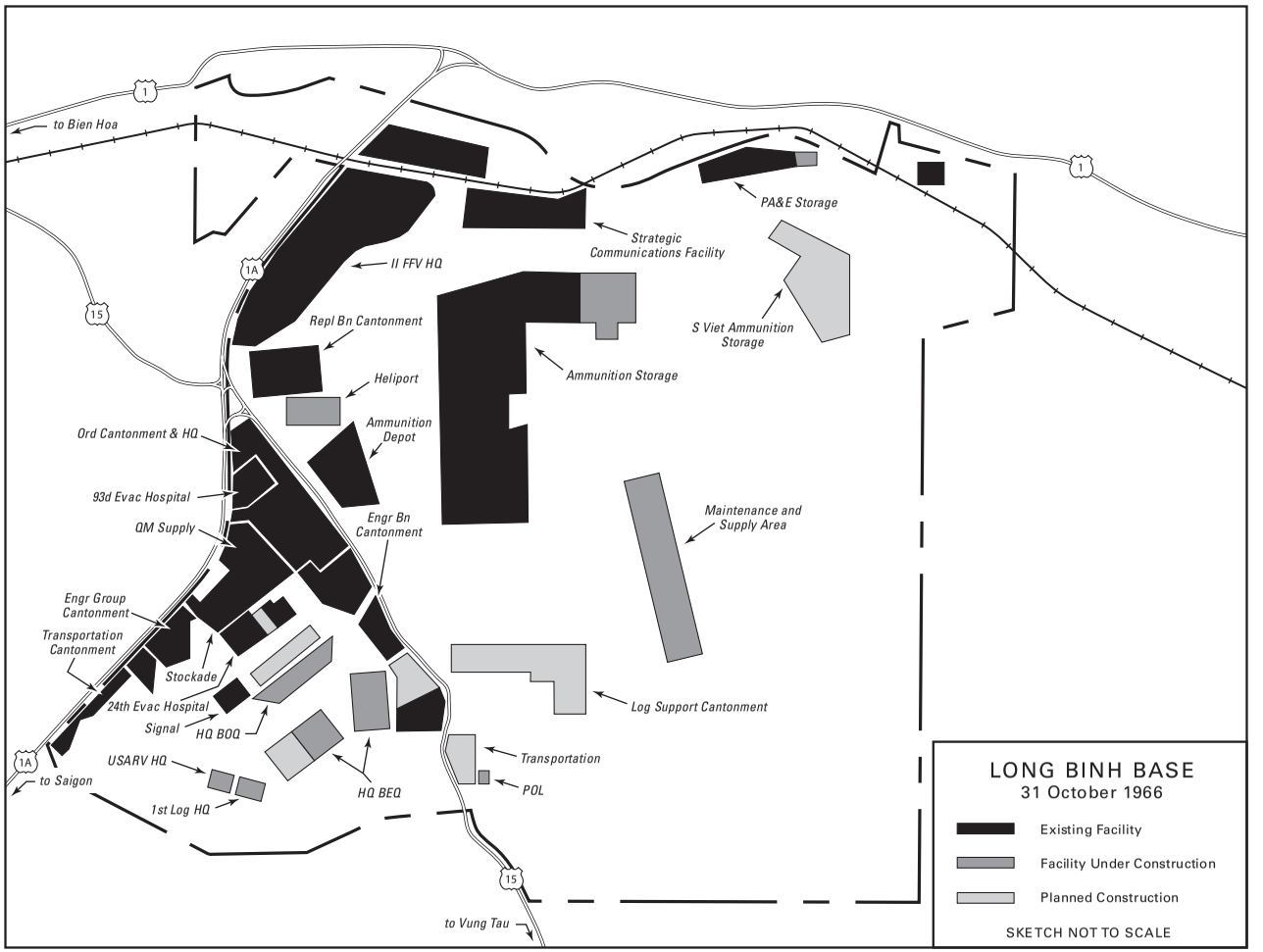
On 23 February, the 168th dispatched a platoon from Company C to Cu Chi northwest of Saigon to help build the 25th Infantry Division's base camp. General Westmoreland counted on the division to fill part of the gap in combat power and guard the approaches to Saigon from this direction. By this time, the MACV commander was convinced that major tactical headquarters and support units needed a full-time home where the individual soldier could train, take care of his equipment, and get some rest and relaxation. The 25th Division under the command of General Weyand made extensive studies before leaving Hawaii. Base development plans were put into final form following an advance party's reconnaissance. The division's 65th Engineer Battalion under Lt. Col. Carroll D. Strider assembled precut lumber kits for tents and latrines, which accompanied each unit. Upon arriving at Cu Chi, troops easily assembled the kits. Initial priority went to clearing fields of fire and constructing perimeter bunkers and wire barriers. Building semipermanent buildings followed. In early April, the 362d Light Equipment Company arrived to work on the camp's road net and drainage ditches. Before the end of the month, the division headquarters and medical personnel occupied facilities consisting of shed-type prefabricated buildings.[64]

The 159th Group's other combat engineer battalion, the 588th, commanded by Lt. Col. William T. Moore, also carried out construction work for the 1st Division. Company B worked at the Phuoc Vinh base camp northeast of Lai Khe, where it concentrated on building a cantonment, a heliport, and repairing airfield facilities. Heavy usage of the dirt airstrip (originally built by the Japanese during World War II) had caused considerable erosion, exposing large rocks that caused aircraft tire blowouts. The company remedied this problem by placing a six-inch topping of laterite on the field. Employing an expedient method to build parking ramps for helicopters, workers sprayed an asphalt cut-back treatment over the cleared area. They topped this off with pierced steel planking, thus completing a moderately dust-free heliport. On 1 June, Company B became Company C, 168th Engineer Battalion, in a transfer of companies between the two battalions. Company C, 168th Engineer Battalion, at Long Binh suddenly found itself redesignated Company B, 588th Engineer Battalion. Meanwhile, the redesignated Company C moved to the 2d Brigade's new base camp at Bearcat just off Highway 15 some five miles southeast of Long Binh. Besides the usual cantonment building tasks, the company built an eight-foot-high berm around the camp perimeter, providing a measure of security from enemy observation and direct fire.[65]

[63] Galloway, "Essayons," p. 87; ORLLs, 1 Feb–30 Apr 66, 159th Engr Gp, pp. 4–6, 1 Feb–30 Apr 66, 168th Engr Bn, 13 May 66, pp. 1–3, and 1 May–31 Jul 66, 168th Engr Bn, 14 Aug 66, pp. 1–3, both in Historians files, CMH.

[64] Lt. Gen. John H. Hay Jr., *Tactical and Materiel Innovations*, Vietnam Studies (Washington, D.C.: Department of Army, 1974), pp. 149–51; Galloway, "Essayons," p. 87; ORLLs, 1 Feb–30 Apr 66, 159th Engr Gp, pp. 2, 6, and 1 Feb–30 Apr 66, 168th Engr Bn, pp. 2–3.

[65] ORLLs, 1 Feb–30 Apr 66, 159th Engr Gp, p. 5, 1 May–31 Jul 66, 588th Engr Bn, 15 Aug 66, pp. 1–2, Historians files, CMH, and 1 May–31 Jul 66, 168th Engr Bn, pp. 1–2.


to Bien Hoa
1
1A
15
PA&E Storage
Strategic Communications Facility
II FFV HQ
S Viet Ammunition Storage
Repl Bn Cantonment
Ammunition Storage
Heliport
Ammunition Depot
Ord Cantonment & HQ
93d Evac Hospital
QM Supply
Engr Bn Cantonment
Maintenance and Supply Area
Engr Group Cantonment
Transportation Cantonment
Stockade
24th Evac Hospital
Signal
HQ BOQ
Log Support Cantonment
USARV HQ
to Saigon
HQ BEQ
Transportation
POL
1st Log HQ
to Vung Tau
LONG BINH BASE
31 October 1966
Existing Facility
Facility Under Construction
Planned Construction
SKETCH NOT TO SCALE

Map 11

As usual RMK-BRJ undertook the more complex construction projects. Following a terrorist bombing of the U.S. Embassy in March 1965, RMK-BRJ received a contract to build a new, more secure six-story building. In October, the consortium started work on an Army logistics depot in the eastern suburbs along the Saigon River bank. In December, workers began building a new ammunition depot, concrete parking aprons, and an Air Force cantonment at Tan Son Nhut Air Base. In April 1966, RMK-BRJ started planning for a 10,000-foot parallel runway at the air base. Lengthy negotiations with Vietnamese officials to remove graves in the path of the runway, however, delayed the start of the project to the end of the year. Also in late 1966, RMK-BRJ started building a new massive two-story prefabricated steel MACV headquarters building and complex costing $25 million adjacent to Tan Son Nhut Air Base. Projects given to the contractor at Bien Hoa Air Base included a fuel storage area, cantonment and flight line facilities, an aircraft maintenance shop, a new hangar, taxiway resurfacing, and aircraft parking aprons. Planning had also begun to add a parallel concrete runway and more aprons and taxiways. The consortium's new University Quarry—so named because of its proximity to a future Saigon University site—reached an impressive 250-ton-per-hour capacity in February 1966. (The quarry was also referred to as the SUMPCO Quarry [Saigon University Mineral Products Company] or SUMCO [Saigon University Materials Company].) In Saigon, the firm began work in April 1966 on an Armed Forces Radio and Television Service facility.[66]

Colonel Clymer's newly arrived 79th Engineer Group became operational on 20 July. With the help of the 46th Engineer Battalion, the 79th constructed cantonment facilities at nearby Plantation, where it moved the following month. The move to Plantation eased coordinating engineering support with its major customer, II Field Force. While the 159th Engineer Group concentrated on base development projects in Saigon, Long Binh, and Vung Tau, the 79th Group served a dual role as a construction and combat group. In its construction role, the 79th built bases for the 1st and 25th Divisions, and the 196th Light Infantry Brigade and the 11th Armored Cavalry Regiment following their arrival by the end of September. Simultaneously, the group provided operational support to these units. Early that month, the group lost its commander when Colonel Clymer injured his knee at a work site and had to be medically evacuated. Lt. Col. Walter C. Gelini assumed command. Gelini would become a colonel and remain in command for a full year.[67]

By the end of the year, Colonel Gelini commanded units usually found in a combat group. Starting with the two engineer combat battalions it inherited from the 159th, the 79th Group grew to four combat battalions, the 27th, 86th, 168th, and 588th, and a host of smaller units. Initially, its smaller units included the two light equipment companies, the 362d and 557th, and the three

[66] Tregaskis, *Building the Bases*, pp. 148, 249–52, 261, 271; Quarterly Hist Rpt, 1 Apr–30 Jun 66, MACDC, pp. 26–27; Ltr, Brig Gen Daniel A. Raymond, MACDC, to CG, Seventh AF, sub: Tan Son Nhut Parallel Runway, 14 Jun 66, Historians files, CMH. For more on RMK-BRJ work in the Saigon area, see Diary of a Contract, pp. 191–207.

[67] Galloway, "Essayons," p. 139; ORLL, 1 Aug–31 Oct 66, 79th Engr Gp, 14 Nov 66, pp. 3, 5–9, Historians files, CMH.

well-drilling detachments. In early September, the 66th Engineer Topographic Company, a corps support unit, joined the group. Although the topographic company belonged to the 79th Group, U.S. Army, Vietnam, controlled the specialized unit's mapping efforts. In early October, the 18th Engineer Brigade transferred the 617th Panel Bridge Company from the 159th to the 79th Group. In mid-October, the 100th Engineer Company (Float Bridge) and in mid-December the 500th Engineer Company (Panel Bridge) joined the group. The group also increased its area of responsibility in III and IV Corps, leaving the construction at Saigon and Long Binh and the new Dong Tam base in the delta to the 159th Group.[68]

Work at the 1st Division base camps continued to preoccupy Colonel Pelosky's 168th Engineer Battalion. To keep pace with its heavy work load, the battalion operated on a seven-day, seventy-five-hour work week, easing up only Sunday mornings. Support for the battalion at Di An, Phuoc Vinh, Phu Loi, and Lai Khe included elements of two light equipment companies and three well-drilling detachments. In late October, the group transferred responsibility for Phu Loi and Lai Khe to the newly arrived 86th Engineer Battalion (Combat). The 168th shifted its main effort to Di An. This action allowed enough time for the battalion to build cantonment facilities on the northern side of the camp—known as the North Forty—to fit another move by the division's 2d Brigade in March, this time from its short stay at Bearcat. Before moving to Di An, Company A at Phu Loi and Company B at Lai Khe had spent much time maintaining troublesome airfields at the two bases. During the rainy season, the two companies fought rutting and subgrade failures on the runways with rock. To keep the clouds of dust down during the dry periods, Company A applied peneprime near helipads.[69]

The 588th Combat Engineer Battalion consolidated its efforts in the 25th Division's area of operations. In late June, Company B (formerly Company C of the 168th) at Long Binh joined the headquarters and Company A at Cu Chi. Company B then moved to Tay Ninh to begin construction of a new base camp for the 196th Infantry Brigade, then en route and expected to arrive in two weeks. On 22 August, Company C departed Bearcat and began to construct a 400-bed evacuation hospital for the 25th Division. With the hospital work moving along, the company sent a platoon to Tay Ninh in late October to build the first modern Army hospital consisting of inflatable, rubber-type buildings, formally known as MUST (medical unit, self-contained, transportable).[70]

During this period, the 588th, now under the command of Lt. Col. James F. Boylan, had grown into a considerable force. The battalion had under its operational control at Cu Chi a platoon-size force from the 100th Float Bridge Company, the 362d Light Equipment Company, and Company B, 86th

[68] Galloway, "Essayons," p. 139; ORLLs, 1 Aug–31 Oct 66, 79th Engr Gp, pp. 5–9, and 1 Nov 66–31 Jan 67, 14 Feb 66, pp. 1–5, Historians files, CMH.

[69] Galloway, "Essayons," pp. 139, 141; ORLLs, 1 May–31 Jul, pp. 1–3, and 1 Aug–31 Oct 66, 168th Engr Bn, 12 Nov 66, pp. 1–8, Historians files, CMH.

[70] Galloway, "Essayons," pp. 141–42; ORLLs, 1 May–31 Jul 66, 588th Engr Bn, pp. 1–3, 1 Aug–31 Oct 66, 588th Engr Bn, 14 Nov 66, pp. 1–3, and 1 Nov 66–31 Jan 67, 588th Engr Bn, 13 Feb 67, pp. 1–5, both in Historians files, CMH.

Engineer Battalion. Company B, which had arrived with the rest of the 86th at Vung Tau on 17 October, began building a post exchange consisting of several prefabricated metal buildings complete with electrical fixtures and concrete floors. In November, the 588th supervised a platoon from the 643d Engineer Pipeline Construction Company in the building of a 3,000-barrel fuel storage facility at Tay Ninh. After completing this project in early December, the platoon returned to Long Binh. By the end of the year, the battalion eagerly awaited the arrival of the valuable hauling assets of the incoming 67th Engineer Dump Truck Company.[71]

The 27th Engineer Battalion (Combat) commanded by Lt. Col. Charles R. Roberts supported the newly arrived 11th Armored Cavalry Regiment and the 3d Brigade, 4th Division. Arriving before the advance party and the rest of the battalion in mid-August, Company C moved to Xuan Loc, approximately twenty-five miles east of Long Binh, to build camps for the armored cavalry regiment. After completing a long sea voyage, which included a stop at Da Nang, the rest of the 800-man battalion, which had four lettered companies, arrived at Vung Tau on 30 September and moved to staging areas at Long Binh and Di An. While waiting for its equipment, the battalion headquarters worked on base development plans for the 11th Armored Cavalry Regiment's 6,000-man base camp near Xuan Loc. Meanwhile, the line companies took up their hand tools and went to work. Company B at Di An helped the 168th Engineer Battalion build the cantonment for the 2d Brigade, 1st Division. When the equipment arrived near the end of October, the headquarters and Company A moved to Xuan Loc, and joined the regiment's 919th Engineer Company on base camp construction. After completing its tasks at Di An, Company B, on 1 November, moved east of Xuan Loc to Gia Ray to open a quarry and set up a rock crusher.[72]

On 17 October, Company D, 27th Engineer Battalion, was attached to the 3d Brigade, 4th Division. When the brigade arrived that month, it did not join the rest of the division in II Corps. Instead, it was diverted to III Corps as a trade off for the 3d Brigade, 25th Division, at Pleiku. Since the 3d Brigade, 4th Division, deployed to III Corps without its usual supporting company from the 4th Engineer Battalion, Company D assumed that role and began to improve the brigade's base camp and airstrip at the vacated Bearcat camp. Within a month, the brigade joined the 25th Division northwest of Saigon at Dau Tieng. Company D continued to support the brigade by clearing South Vietnamese Army minefields around the base camp, building roads in the camp, and making improvements to the airfield. Outside the camp, Company D worked on roads, bridges, and culverts, and carried out combat engineering tasks typical for a divisional engineer company that included clearing firebases, mine clearing, and demolitions.[73]

[71] ORLLs, 1 May–31 Jul 66, 588th Engr Bn, p. 2, and 1 Nov 66–31 Jan 67, 588th Engr Bn, pp. 2–5.

[72] ORLLs, 1 Aug–31 Oct 66, 27th Engr Bn, 31 Oct 66, pp. 2, 8–9, and 1 Nov 66–31 Jan 67, 27th Engr Bn, 13 Feb 67, pp. 1–5, both in Historians files, CMH; Galloway, "Essayons," p. 144; Carland, *Stemming the Tide*, p. 166.

[73] ORLL, 1 Nov 66–31 Jan 67, 3d Bde, 4th Inf Div, p. 18, Historians files, CMH.

The other new arrival, the 86th Engineer Battalion (Combat), commanded by Lt. Col. Colin M. Carter, completed its long journey from Fort Dix, New Jersey, when it reached Vung Tau on 16 October aboard the USNS *Weigle*. After disembarking, the companies moved by air to their destinations. Headquarters and Company A deployed to Phu Loi, Company B to Cu Chi, Company C to Lai Khe, and Company D to Bien Hoa. At Phu Loi, Company A took over cantonment and airfield facility construction from Company A, 168th Engineer Battalion. Plans were under way to build seven large prefabricated maintenance hangars at the airfield, but five of the hangar sets still had not arrived. Similarly, Company C took over projects from Company B, 168th Engineer Battalion, at Lai Khe. Company B at Cu Chi worked on base development projects under the direction of the 588th Engineer Battalion. Company D at Bien Hoa completed a C–130 parking ramp at the airfield, and helipads, access roads, and cantonment projects on the Army side of the base. The battalion also received several combat support missions.[74]

At Tan Son Nhut and Bien Hoa Air Bases, RMK-BRJ made little progress on the parallel runways. By December, excavation work at Tan Son Nhut was only 3 percent complete. The fruitless negotiations to remove the two hundred or so graves came to a sudden end in early December when a Viet Cong force infiltrated the air base and had to be driven out of their hideaways, most of which were in the cemetery. Within a few days, the South Vietnamese Army appeared on the scene and without any explanation removed the tombstones. By the end of the year, excavation work had begun on the new runway. At Bien Hoa, only 50 percent of the plans were ready, and authorization for the work for the new runway, taxiways, and apron was held off until 1967.[75]

Air Force Prime Beef teams continued their work at both air bases, and advance elements of the 823d Civil Engineering Squadron had arrived at Bien Hoa Air Base in October. The 823d became the fifth Red Horse squadron deployed to Vietnam to support Air Force construction and repair requirements. By January 1967, the squadron deployed elements to Tan Son Nhut, Vung Tau, Da Nang, and Pleiku.[76]

By the autumn of 1966, Pacific Architects and Engineers began reducing its construction activities and turned attention to its facilities engineering mission. In October, Vinnell Corporation, which was also moving eleven T–2 power-generating tankers to four other locations, began construction of a central electrical power plant at Long Binh. The design called for a series of 1,500-kilowatt generators to be connected and synchronized to work on one power system. Because of the threat of night attacks, the firm's highest priority centered on installing security lighting around the ammunition depot. The contractor worked day and night to install over ten miles of security lighting around the perimeter. Power to other areas became available when workers completed portions of the pole line. Despite enemy activities and hazardous

[74] ORLL, 1 Nov 66–31 Jan 67, 86th Engr Bn, 14 Feb 67, pp. 9–13, Historians files, CMH; Galloway, "Essayons," p. 144.

[75] Tregaskis, *Building the Bases*, pp. 251–52; Diary of a Contract, pp. 199, 205.

[76] USAF Airfield Construction in South Vietnam, pp. 120, 126–29.

conditions, construction of the plant continued satisfactorily during the winter of 1966–1967.[77]

New Berths for Saigon

The backlog of ships at the commercial port in Saigon had convinced MACV of the need for more extensive port facilities. At the beginning of 1966, the port had ten deep-draft alongside berths, seven large and four small berths tied to buoys, two LST berths, and three T-shaped piers for coastal shipping. These facilities handled 90 percent of the cargo arriving in South Vietnam, but the daily average of 13,000 short tons was more than Saigon could handle. The current port, adequate by peacetime standards, just did not have enough berths, barges, landing craft ramp space, and storage space to support both the country's commercial needs and the large quantities of economic assistance and military cargo now reaching Vietnam. Also exacerbating port operations were the lack of military control and the coordination problems with Vietnamese port officials. At best, three to four berths could be reserved for military cargo, another three to four for economic assistance cargo, while the rest remained for civilian use.[78]

To resolve these problems, MACV laid plans to build a new deep-draft port for military cargo along the Saigon River. The proposed site, named Newport, was in a sparsely populated area adjacent to Highway 1A about two miles northeast of the city. To get the port operational as soon as possible, planning proceeded for seven lighterage berths and four landing craft slips and ramps. Four deep-draft berths would be built later. MACV again turned to the Officer in Charge of Construction to design the facility and select a contractor.[79]

The Navy assigned the construction portion of the Newport project to RMK-BRJ. With such high interest in the project, the Officer in Charge of Construction assigned a full-time officer as a Resident Officer in Charge of Construction to oversee work, which soon became a twenty-four-hour-a day, seven-day-a-week maximum effort. By mid-May 1966, RMK-BRJ had dredged the LST slips and drove the first piles for the barge wharves. Unfortunately, the silty material from the river could not be used to fill the former rice paddy land and bayou. Instead, local contractors furnished much of the fill, and their little sampans accounted for about 3,900 of the 9,150 cubic yards of sand hauled in from other places each day. By midyear, the director of construction reported that RMK-BRJ drove 156 piles for the barge and LST wharves. The firm's concrete precast yards also made eighteen concrete deck slabs for the deep-

[77] PA&E History, 1963–1966, pp. 42; "Vinnell Makes History at Long Binh," *Vinnell* 11 (May 1969): 8–10, copy in Historians files, CMH.

[78] MACV History, 1966, pp. 709–10.

[79] Dunn, *Base Development*, p. 59; Quarterly Hist Rpt, 1–31 Jan 66, MACDC, 19 Feb 66, Historians files, CMH; MACV History, 1966, p. 710; MACV Monthly Evaluation, May 66, p. G-5; Msg, Robert S. McNamara OSD 5096–65 to Westmoreland, 31 Dec 65, Westmoreland Message files, CMH; Msg, COMUSMACV MACJ44 to CG, USARV, 4 Jan 66, sub: Project Newport, Historians files, CMH.

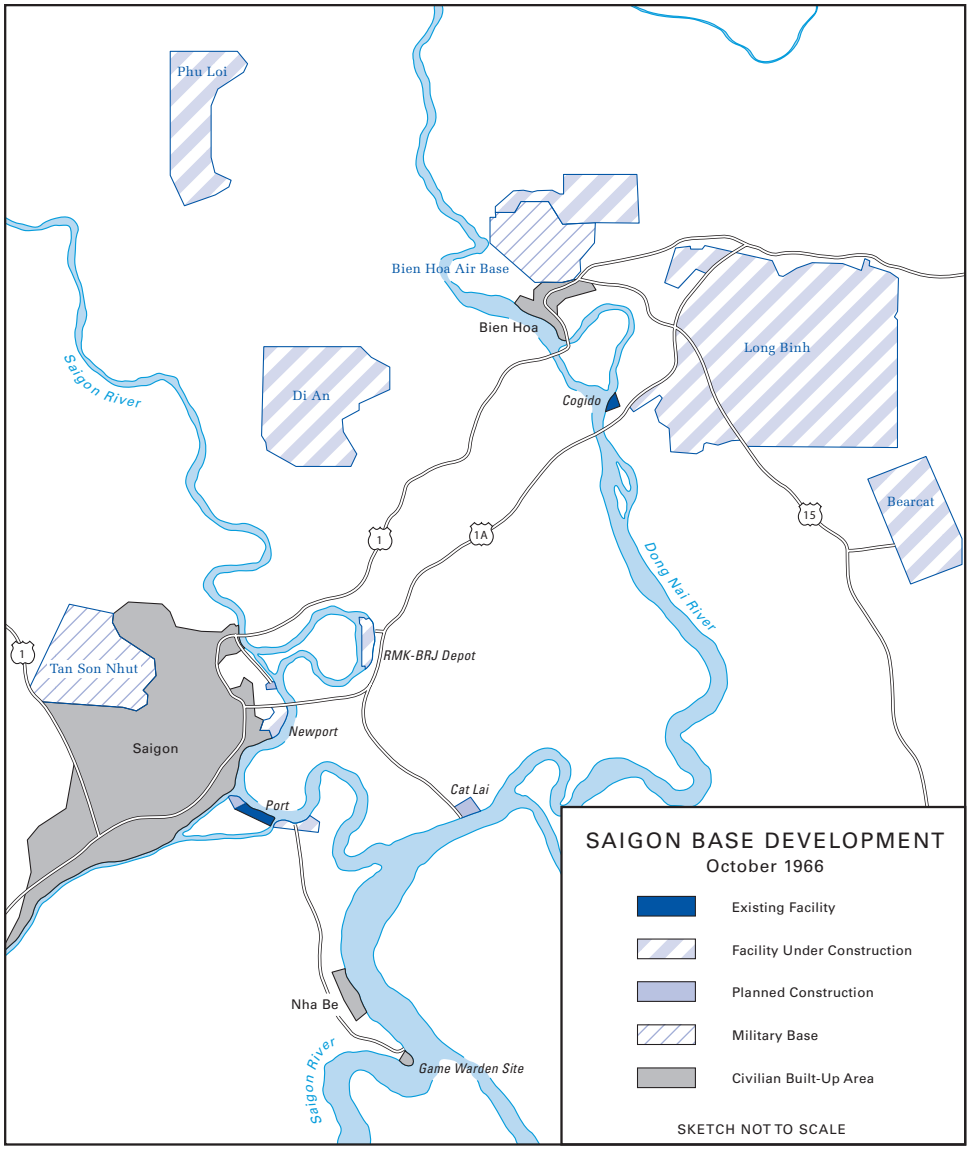
Port and warehouses under construction in late 1966 at Newport

draft wharf. General Dunn informed Washington that the informal estimate to complete the demanding project now reached $30 million.[80]

Despite several problems, progress continued to be made on the docks and open-storage facilities. In August, the Joint Chiefs of Staff asked for a reevaluation of the entire project to refine the cost required to complete the port as originally designed. The new figure totaled more than $61 million, approximately double the earlier estimate. To save some money, the Army deferred some warehouses and other buildings. For a few days, a halt in the delivery of sand threatened progress. One of the Vietnamese contractors complained that "VC [Viet Cong] tax assessors" had charged the sampan operators a large fee. About ten days' supply of sand was on hand, so the Officer in Charge of Construction ended that contract and negotiated a new one with other vendors. In October, the construction office turned over four barge wharves, one LCM/LCU (landing craft, mechanized, and landing craft, utility) ramp, one LST slip, and thirty-eight acres of filled land to the 1st Logistical Command. Work then commenced on four deep-draft berths, which included four deep-draft berths, more filled land, transit warehouses, a power-generating facility, and a perimeter road.[81]

[80] Quarterly Hist Rpt, 1 Apr–30 Jun 66, MACDC, p. 27; Ltr, Dunn MACDC to CG, USARV, sub: Newport, Increment II, 18 May 66; DF, Raymond MACDC to CofS, MACV, sub: Status Report, 10 Jun 66, Historians files, CMH; Msg, Dunn SOG 0528 to Noble, 24 Jun 66, Dunn Papers, CMH; Tregaskis, *Building the Bases*, p. 91. Report and letter in Historians files, CMH. See also Diary of a Contract, pp. 261–63.

[81] Quarterly Hist Rpts, 1 Jul–30 Sep 66, MACDC, pp. 40–41, and 1 Oct–31 Dec 66, MACDC, p. 30; Tregaskis, *Building the Bases*, p. 246.



MAP 12

Other efforts were also under way to relieve the pressure on the Saigon port. By April, dredging along the Soirap River between Vung Tau and Saigon opened a second deep-draft channel, which provided an alternate route for shipping along the Saigon River. The second channel lessened the impact in case the Viet Cong did succeed in sinking a ship. Additionally, three buoy berths were installed in the Dong Nai River at Cat Lai for mooring and off-loading ammunition ships to barges.[82]

[82] Quarterly Hist Rpt, 1 Apr–30 Jun 66, MACDC, p. 27.

At Vung Tau, Company D, 46th Engineer Battalion, made headway on port facilities, the airfield, and projects for Australian units in the area. As the only company-size engineer unit at Vung Tau, Company D completed a variety of projects, including warehouses and fuel storage facilities for the 1st Logistical Command and helped the Australian task force to develop supply and troop staging areas. The fuel tank farm presented a challenge and involved removing three old storage tanks destroyed by the French when they evacuated the area. Work crews had to cut the damaged tanks with explosives, remove them from their protective shields, and replace them with new 10,000-gallon bolted steel tanks.[83]

By March, the 536th Engineer Detachment (Port Construction), the first of its kind to do this specialized work in III Corps, arrived at Vung Tau. The detachment initially concentrated on preparing designs and assembled its pile driving and diving barges before starting work on new piers and LST ramps. Plans called for the installation of a DeLong pier, but the extensive dredging requirements on the sheltered side of the peninsula prompted the Construction Directorate to change priorities. Of the seven DeLong piers intended for delivery to South Vietnam, Vung Tau dropped to the bottom of the list. The detachment also demonstrated the versatility of port construction units when it assembled and rehabilitated twenty-four barges belonging to the Army's 4th Transportation Command.[84]

Projects in the Delta

Although few U.S. troops were in the delta region, military and civilian engineers carried out extensive construction there. In early April, RMK-BRJ completed a 4,000-foot runway and other base facilities on An Thoi, a small island off the coast of the larger Phu Quoc Island near the Cambodian coast. At the Army's Vinh Long helicopter base, work that started in June 1965 continued. The contractor began further modernization at Binh Thuy Air Base. More work also awaited the firm at Can Tho, where the U.S. Navy launched patrol boat operations. In February, the Air Force began to dispatch Prime Beef teams to Binh Thuy to build billets and operational facilities for Air Force personnel.[85]

MACV had long considered the possibility of basing U.S. ground troops in the Mekong Delta. A survey team concluded that all land suitable for large tactical units was either heavily populated or occupied by the South Vietnamese armed forces. If American troops deployed to the delta, they would have to share already crowded areas or displace a portion of the population. Since the

[83] Galloway, "Essayons," pp. 84–86; ORLLs, 1 Feb–30 Apr 66, 159th Engr Gp, pp. 5–6, 1 May–31 Jul 66, 159th Engr Gp, pp. 8–9, and 1 May–31 Jul 66, 46th Engr Bn, p. 2.

[84] Galloway, "Essayons," pp. 84–86; ORLLs, 1 Feb–30 Apr 66, 159th Engr Gp, pp. 2, 5–6, 1 May–Jul 66, 159th Engr Gp, p. 8, and 1 May–31 Jul 66, 46th Engr Bn, p. 2; Quarterly Hist Rpt, 1 Apr–30 Jun 66, MACDC, p. 15.

[85] Tregaskis, *Building the Bases*, pp. 294–95; Quarterly Hist Rpt, 1 Apr–30 Jun 66, MACDC, p. 27; USAF Airfield Construction in South Vietnam, pp. 119, 123, 125. For more on RMK-BRJ work in the delta, see Diary of a Contract, pp. 123–26, 241–43.

command considered both courses unacceptable, the planning staff searched for other means of basing troops. The MACV Engineer proposed dredging river sand as fill material and building up an area to fit a division. Yet, the number of dredges necessary to do the work would not be available until late 1966. Although not entirely satisfied with this solution, the command believed the building of a base area by dredging operations a sound choice.[86]

Planning went forward to station a joint Army and Navy riverine force in the northern delta. Recalling that the French had dispatched small landing craft from land bases during the First Indochina War, planners envisioned river flotillas consisting of barracks ships and landing craft carrying ground troops on operations along the delta's waterways. In early 1966, General Westmoreland approved plans to develop two land bases and one mobile floating base in the delta. One land base would house an infantry division headquarters and one brigade, and a second brigade would occupy a base in the northern part of the delta, probably in Long An Province in III Corps. The third brigade would be based on the water.[87] (*Map 13*)

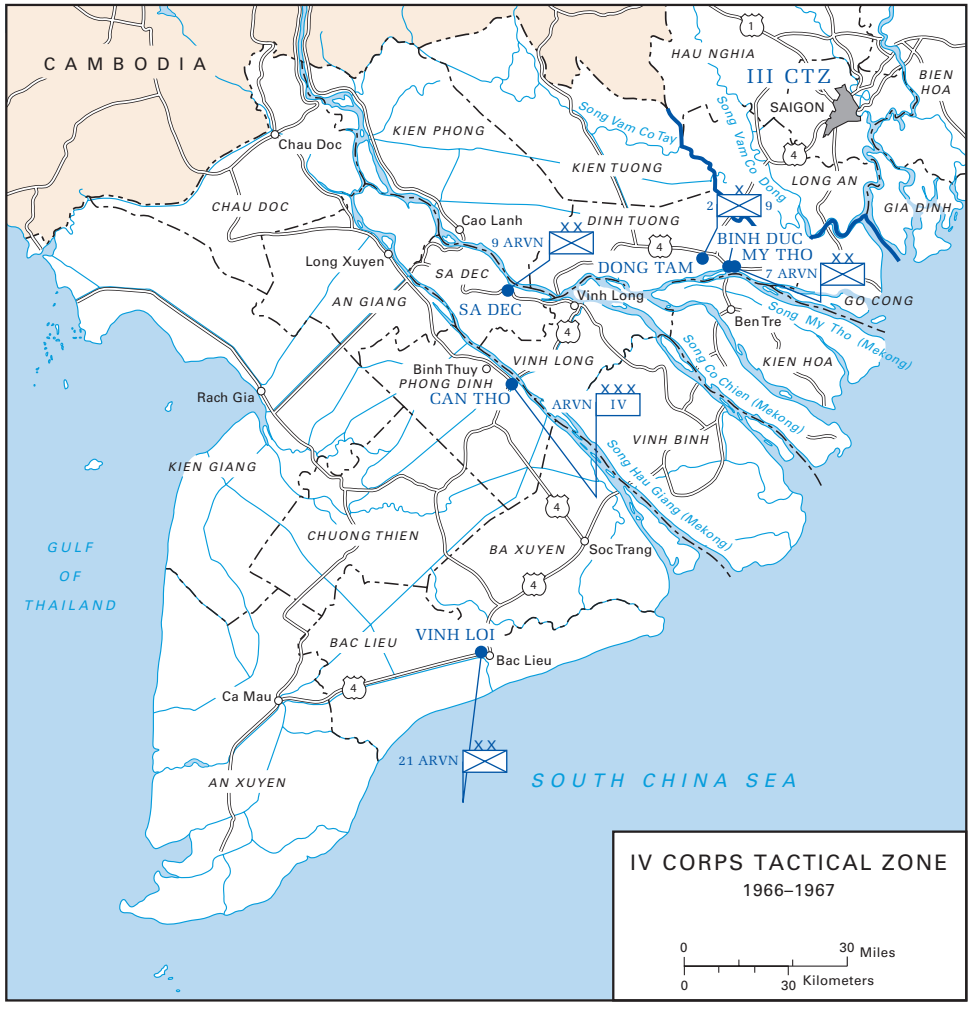
In May 1966, Westmoreland directed a survey to find a land base for the division headquarters and the one brigade. Tactical resupply and the transportation of materials dictated that the new delta base be accessible to a system of navigable waterways. Since the monsoon season drastically reduced the little available dry land, enough suitable fill had to be located near the site to raise an area of approximately 600 acres to a level higher than the watery countryside. The Directorate of Construction found four locations—designated Bases W, X, Y, and Z—suitable for dredging and building the land base and submitted these to Westmoreland for consideration. He picked Base W located about forty miles southwest of Saigon and about three miles west of My Tho. He believed that the site should be given a significant name in Vietnamese—something dealing with friendship and cooperation. He selected the Vietnamese term *dong tam*, which translated meant "united hearts and minds."[88]

The plan called for three major operations to transform the marshy land into a riverine base. First, the builders had to excavate a rice paddy to make a turning basin for ships. The second task consisted of dredging an entrance channel into the turning basin from the My Tho River. Third, to make the one-square-mile base, sand had to be dredged from the river and pumped into the rice paddies. For this last task alone, engineers estimated that approximately 10.5 million cubic yards of fill would be required. This figure included not only

[86] Maj. Gen. William B. Fulton, *Riverine Operations, 1966–1969*, Vietnam Studies (Washington, D.C.: Department of the Army, 1973), pp. 26–27. For more background on the delta and planning, see George L. MacGarrigle, *Combat Operations: Taking the Offensive, October 1966 to October 1967*, United States Army in Vietnam (Washington, D.C.: U.S. Army Center of Military History, 1998), pp. 393–97.

[87] Fulton, *Riverine Operations*, pp. 27–28.

[88] Quarterly Hist Rpts, 1 Apr–30 Jun 66, MACDC, p. 13, and 1 Jul–30 Sep 66, MACDC, p. 43; Ploger, *Army Engineers*, p. 145; Fulton, *Riverine Operations*, pp. 33, 47–48.



Map 13

the landfill for the base but also a sufficient stockpile of sand for airfield and road projects and to make concrete.[89]

The first phase of the Dong Tam project began in July with the arrival of a clamshell dredge to prepare the work site for two larger dredges. The sixteen-inch pipeline cutterhead *Cho Gao* arrived in late July but could not start pumping until 4 August because of a mine scare. The Viet Cong, aware that the base could cripple their efforts to control the heavily populated and rice-producing delta region, soon began to make their presence known. Sappers mined the *Cho Gao*, but the Americans found and removed the mines in time. The Viet

[89] Dunn, *Base Development*, p. 53; Ploger, *Army Engineers*, p. 145; Quarterly Hist Rpt, 1 Jul–30 Sep 66, MACDC, p. 43.

Cong also mortared the dredge, causing some minor delays. Throughout July and August, the *Cho Gao* dredged the entrance channel and turning basin, pumping at an average rate of some 13,000 cubic yards of fill daily.[90]

The largest dredge in South Vietnam, the thirty-inch pipeline cutterhead *Jamaica Bay*, previously at work at Da Nang, arrived in September. Crews working among the fillpipes on shore came under sniper fire, and a plastic explosive charge damaged a dragline. Despite the harassment, the *Jamaica Bay* maintained its schedule with no breakdowns, pumping at a daily average rate of over 26,000 cubic yards. By 1 January 1967, the dredge had pumped some 2.3 million cubic yards of fill, creating 155 acres of dry land. The *Cho Gao* continued its work on the turning basin and completed 85 percent of the LST area. In October 1966, a Seabee detachment deployed from I Corps and built a concrete pontoon pier for Navy forces. Within a few weeks, the 159th Engineer Group deployed elements to start work on a 7,500-man camp and operational base for troops of the 9th Infantry Division.[91]

Logistical Troubles Continue

During 1966, Army engineers continued to have trouble obtaining building supplies and keeping equipment running. As General Ploger pointed out to General Westmoreland during his November 1965 briefing, some $25 million in building materials ordered earlier had not arrived. To carry out the construction program through June 1966, Ploger had estimated that some 325,000 tons of supplies would be needed. If the experience of previous wars continued, then about 15 percent of the total theater tonnage would consist of construction items. Translated into terms of shipping, this meant that one out of every seven ships would be loaded with lumber, airfield matting, bridge sets, generators, asphalt, cement, and prefabricated buildings. Ploger's estimate turned out to be on the modest side. By the summer of 1966, about a third of the tonnage reaching Vietnam turned out to be construction items.[92]

Even when construction supplies started reaching the depots, distribution to engineer units fell short. During the summer of 1966, two shiploads of one-inch lumber were delivered to Cam Ranh Bay where there was a shortage of two-inch lumber, and five shiploads of two-inch lumber were shipped to Qui Nhon where there was no one-inch lumber. Meanwhile, shortages of two-by-fours were exacerbated by the decision to put troops in wood frame barracks

[90] Dunn, *Base Development*, p. 53; Tregaskis, *Building the Bases*, p. 292; Quarterly Hist Rpt, 1 Jul–30 Sep 66, MACDC, p. 43.

[91] Dunn, *Base Development*, p. 53; Tregaskis, *Building the Bases*, pp. 292–93; Quarterly Hist Rpts, 1 Jul–30 Sep, 66, MACDC, pp. 43–44, and 1 Oct–31 Dec 66, MACDC, p. 33; Msg, COMUSMACV MACDC-CM to COMNAVFORV (Commander Naval Forces, Vietnam), 19 Aug 66, sub: Dredging of Deep Draft Facility at Observation Point Da Nang, box 5, 69A/702, RG 334, NARA.

[92] Ploger, *Army Engineers*, p. 202; Army Buildup Progress Rpt, 26 Oct 66, pp. 56–57, CMH; USARV Engr, Summary of Total Tonnages of Troop Construction Material for Jan 66–Jun 67, 8 Mar 66, incl. 20, tab B, OCE Liaison Officer Trip Rpt no. 2; Construction Logistics in Vietnam, incl. 9, p. 1, and 18th Engr Bde, Memo for Brigade S–4, sub: Construction Logistics, 19 Aug 66, incl. 9, tab G, p. 1, OCE Liaison Officer Trip Rpt no. 4.

The Dong Tam base camp surrounded by rice paddies began to take shape by the end of 1966.

instead of tents. Even when tents were used, two-by-fours were substituted for tent poles and used in wooden flooring. Although 1st Logistical Command increased the requisition objective for lumber from 50 to 75 million board feet as of 1 October, no one could say when the additional supplies would arrive. Another problem emerged from the reorganization of certain technical service supply units, including engineer supply units, into general depots, irrespective of the fact that a war was going on and a loss of some technical expertise was bound to result. No sooner were the new depots constituted in Vietnam than inexperienced depot troops had trouble identifying arriving inventory, especially electrical and plumbing supplies. By the summer of 1966, engineer units were regularly sending "scrounging" expeditions to the supply yards to search out items they required.[93]

The 159th Engineer Group at Long Binh continued to have the same problems from the previous year. In May, Colonel Hottenroth reported that the group continued to be plagued by shortages of construction materials and essential equipment parts and an inability to organize properly to meet the construction mission. For instance, workers had constructed troop showers up to the point of installing the shower heads only to discover that the part was not available. A 34E concrete paver remained inoperable for two months because it lacked major components, and well-drilling rigs had arrived without casings or screens. "The logistic system," Hottenroth noted, "appears to have withered due to past efforts to eliminate military spaces in supply and maintenance operations and as a result in my judgment been unable to

[93] Construction Logistics in Vietnam, incl. 9, pp. 1, 4, and 18th Engr Bde, Memo for Brigade S–4, 19 Aug 66, sub: Construction Logistics, incl. 9, tab G, p. 3, OCE Liaison Officer Trip Rpt no. 4; ORLL, 1 Aug–31 Oct 66, 35th Engr Gp, pp. 9, 16.

expand to meet the workload." He noted that seven months had gone by after he had submitted a request to modify the battalions' tables of organization and equipment. It appeared uncertain whether the Department of the Army would organize the units under the latest organizational tables. Travel to the dispersed project sites by the group's commanders and staffs posed another problem; road travel was risky and not enough aircraft were available. Finally, he concluded, the myriad of administrative and reporting tasks had become burdensome. On the plus side, the weather during the period turned out to be favorable for construction.[94]

When equipment broke down or was not available, engineers found other ways to get the job done, by hand if necessary. While visiting the 159th Group in March, the Chief of Engineers' liaison officer from Washington found that, although the group's units had their authorized complement of seven 16S concrete mixers, they did not have enough mixers to handle the large number of projects at many different sites. The group had requested twelve additional mixers the previous November, but none had arrived. In the end, the engineer company responsible for the Lai Khe base camp project resorted to mixing concrete by hand while trying to fashion a homemade mixer. A query with Colonel Lien at the 1st Logistical Command revealed an awareness of the problem, but his staff could not provide the status of the request before the liaison officer's departure.[95]

Colonel Gelini reported that logistics support for his 79th Engineer Group had been generally good, but there was a critical shortage of dump trucks. The inadequate hauling capability affected the group's construction efforts, especially the transport of rock. To make matters worse, the 79th Group had to use its trucks to pick up cargo at supply points in the Saigon–Long Binh area and haul it to its outlying units. Fortunately, the assignment of a panel bridge company with 35 five-ton dump trucks and a float bridge company with 50 five-ton bridge trucks and 39 two-and-a-half-ton cargo trucks to the 79th Group added capacity. Both bridge companies unloaded and stored their bridges at Long Binh and put their trucks on the road hauling supplies.[96]

Colonels Hart and Starnes, commanders of the 35th Group at Cam Ranh Bay, reported similar shortages. Hart complained that the regular supply system could not respond quickly enough for his units to complete their port, depot, and cantonment projects. He felt that certain special items, such as sheet piling, fuel pipeline supplies, and lumber, should be programmed in bulk instead of waiting for projects to be assigned to units, which then had to requisition the materials through normal supply channels. Hart also believed that responsibility for construction supplies should be returned to engineer commanders instead of the recent trend to general supply units. In another matter, Hart and Starnes believed that the current organization of the 497th Port

[94] ORLL, 1 Feb–30 Apr 66, 159th Engr Gp, pp. 7–8 (quotation, p. 7); Galloway, "Essayons," pp. 52, 89.

[95] Rpt of Visit to the 159th Engr Gp, Long Binh, Vietnam, 15–18 Feb 66, incl. 6, tab C, and Situation Rpt on Engr Equipment in South Vietnam, incl. 17, OCE Liaison Officer Trip Rpt no. 1.

[96] ORLL, 1 Aug–31 Oct 66, 79th Engr Gp, pp. 1–7; Galloway, "Essayons," p. 147.

Construction Company did not have the flexibility required to support construction work at more than one port at a time. Both men suggested changes in tables of authorization. Even so, a platoon had been detached and was hard at work on Qui Nhon port.[97]

While the 937th Engineer Group had some problems getting supplies, notably rock, electrical, and plumbing material, the main difficulty lay in transporting supplies inland to An Khe and Pleiku. Transportation units gave higher priority to ammunition, rations, and fuel, leaving little space for construction items. To support their projects, both the 299th Engineer Battalion at Pleiku and the 70th Engineer Battalion at An Khe put their trucks on Highway 19 for the long-distance haul to Qui Nhon. The 70th reported it had to use its own vehicles to haul at least 75 percent of the construction items used by the unit. Supply technicians usually accompanied the convoys to Qui Nhon to help depot troops locate needed items. Gradually, the supply situation improved, and construction supplies reached the group in increasing quantities. Repair parts became more plentiful, but Colonel Braucher, the group commander, still complained of a lack of direct-support maintenance units.[98]

The equipment situation, however, brightened. By early April, seventy-seven new HD16M bulldozers were shipped to Vietnam, forty-four to Cam Ranh Bay and thirty-three to Saigon, and more were on the way. About the same time, Caterpillar shipped 294 D7E bulldozers from Peoria, Illinois, to Army depots in the United States. Once complete packages of spare parts were available, which was expected in late April, D7Es would be shipped to Vietnam. Meanwhile, two of the bulldozers were airlifted to Saigon to acquaint operators and mechanics with the new standard bulldozer. Three technicians—one maintenance, one supply, and one factory representative—started on-the-job training courses on 18 March. At the beginning of June, the parts support buildup was approaching 90 percent completion. Shipment of the new bulldozers, however, was held up by engine failures, which had to be evaluated. On 16 June, the Army Materiel Command authorized the release of 336 D7Es from the increasing depot stocks, 268 to Vietnam and the rest for issue to units deploying to Vietnam. The bulldozers began arriving in Vietnam on 25 August. By early 1967, 196 of the D7E bulldozers that had reached Vietnam were in the hands of Engineer Command units, replacing the HD16Ms, TD20s, and TD24s.[99]

More good news concerned earthmoving equipment. By early June, 250 of the 840 Clark 290M tractors under contract had been delivered to Army depots. Some defects, however, still had to be fixed, and repair parts were not to reach the required 90 percent level before mid-July. Before being shipped to Vietnam, comparison-type testing of the new tractor with attached Euclid

[97] ORLLs, 1 Feb–30 Apr 66, 35 Engr Gp, pp. 6–9, and 1 May–31 Jul 66, 35th Engr Gp, pp. 5, 8, 10.

[98] Galloway, "Essayons," p. 119; ORLLs, 1 Feb–30 Apr 66, 937th Engr Gp, p. 8, 1 Nov 66–31 Jan 67, 937th Engr Gp, pp. 15–17, 1 Aug–31 Oct 66, 70th Engr Bn, pp. 2–3.

[99] Army Buildup Progress Rpt, 6 Apr 66, p. 47, CMH; *Arsenal for the Brave*, pp. 250–52; Rpt of Visit to the 18th Engr Bde, incl. 7, p. 5, OCE Liaison Officer Trip Rpt no. 4; ORLL, 1 Nov 66–31 Jan 67, Engr Cmd, 31 Jan 67, p. 21, Historians files, CMH.

and LeTourneau eighteen-cubic-yard scrapers was carried out. Twenty-five of the scrapers had been delivered by LeTourneau against a contract for 330, and repair parts were expected to reach the required level by early July. By January 1967, seventy-one Clark 290M wheeled tractors with LeTourneau scrapers had been received by Engineer Command units. They replaced 830Ms and other tractor-scraper combinations.[100]

Red Ball Express shipments of repair parts continued to remove equipment from deadlined status, but the rate was still high because of the variety of makes and models. Often a piece of equipment became deadlined for lack of a single part, but equipment requiring several parts usually had to wait for Red Ball items to come in piecemeal. During the period 5 December 1965 to 3 May 1966, parts received through Red Ball removed from deadline 110 of the 370 tracked and 28 of the 128 wheeled bulldozers. The 18th Engineer Brigade's overall equipment deadline rate dropped from 28.5 percent in January to 16.2 percent in early June. A vigorous maintenance program also helped. Nevertheless, by the autumn of 1966 the 18th Brigade reported that equipment productivity averaged less than 60 percent due to lack of parts.[101]

Rock continued to be a scarce commodity. An especially acute shortage of rock existed in III and IV Corps. Just two U.S. quarries, the RMK-BRJ University Quarry outside Saigon and the 159th Engineer Group quarries nearly thirty-one miles to the south at Vung Tau, were in operation in early 1966. Because of the lack of barges, only small quantities of rock could be shipped from Vung Tau to the Long Binh area. The 1st Logistical Command in late 1965 even resorted to buying rock from Singapore, which proved to be prohibitively expensive.[102]

When rock from quarries in Korea arrived in Saigon, a nightmarish situation involving customs, labor difficulties, and lighterage problems followed, producing lengthy delays and creeping costs. The engineers devised a scheme to tranship the rock on hundreds of sampans for delivery to a point near Long Binh for off-loading on trucks for the short haul to the base. At the off-loading site, it quickly became evident that the crane operator could not use the two-cubic-yard clamshell, since the weight and size of the clamshell would have easily sunk the sampans. This left the slower method of hand labor and conveyors as the only means to bring the precious rock ashore. This was the first and last shipment from Korea, and the Army ended the contract.[103]

[100] Army Buildup Progress Rpt, 6 Apr 66, p. 47, CMH; *Arsenal for the Brave*, pp. 250, 252; Rpt of Visit to the 1st Log Cmd, 12 and 15 Nov, incl. 10, p. 5, OCE Liaison Officer Trip, Rpt no. 5; ORLL, 1 Nov 66–31 Jan 67, Engr Cmd, 31 Jan 67, p. 21.

[101] Rpt of Visit to the 35th Engr Gp, Cam Ranh, Vietnam, 22–25 Feb 66, incl. 6, tab B, p. 1, and Situation Rpt on Engr Equipment in South Vietnam, incl. 17, OCE Liaison Officer Trip Rpt no. 1; Army Buildup Progress Rpts, 4 May 66, p. 35, 11 May 66, p. 45, and 8 Jun 66, p. 47, CMH; ORLL, 1 Aug–31 Oct 66, 18th Engr Bde, p. 8; *Arsenal for the Brave*, p. 251.

[102] Dunn, *Base Development*, p. 102; Quarterly Cmd Rpt, 1 Oct–1 Dec 65, 1st Log Cmd, 19 Feb 66, p. 14, Historians files, CMH; Situation Rpt on Construction Materials, incl. 16, OCE Liaison Officer Trip Rpt no. 1; ORLL, 1 Nov 66–31 Jan 67, 159th Engr Gp, 14 Feb 67, p. 11, Historians files, CMH.

[103] Dunn, *Base Development*, pp. 102–03.

Sampans were hired to haul rock from Vung Tau to the Long Binh area.

Additional crushing plants and associated quarry sets consisting of wagon and tracked rock drills trickled into the country. By May 1966, larger 225-ton-per-hour rock crushers reached Cam Ranh Bay and Qui Nhon. In addition, larger numbers of the smaller but versatile 75-ton-per-hour units arrived: five in the Saigon area, two at Cam Ranh Bay, and two at Qui Nhon. This equipment only put a dent in the requirements for rock. General Ploger felt larger units in the 500- and 1,000-ton-per-hour categories and larger rock-hauling trucks were needed. This situation posed another problem, for the 18th Engineer Brigade could barely provide enough men to operate the equipment already on hand. A more pragmatic approach rested with the arrival of more light equipment companies and their 75-ton-per-hour units and the purchase of rock from RMK-BRJ. By midyear things looked up for the 35th Engineer Group at Cam Ranh Bay when the 102d Construction Support Company prepared to open a new quarry site (two 10-hour shifts) consisting of a 225-ton-per-hour and three 75-ton-per-hour units.[104]

For the 79th Group, however, crushed rock needed for extensive concrete work at the base camps north of Saigon was still critically short. By way of solution, the group tried to develop quarries near construction sites. But at the Frenchman's Quarry southwest of Bien Hoa blasting work in August 1966 damaged a nearby Buddhist pagoda, and the province chief ordered a halt to operations. Blasting resumed a month later following negotiations with local officials. This time the engineers used new blasting techniques and operated only at specific times. They also repaired the pagoda.[105]

[104] Equipment and Equipment Maintenance, incl. 21, OCE Liaison Officer Trip Rpt no. 2, 6 May 66; Engr Equipment Situation, incl. 10, OCE Liaison Officer Trip Rpt no. 3, 28 Jun 66.

[105] Galloway, "Essayons," p. 147; ORLLs, 1 Aug–31 Oct 66, 79th Engr Gp, p. 10, and 1 Nov 66–31 Jan 67, 79th Engr Gp, 14 Feb 67, p. 9, Historians files, CMH.

Finance and Its Predicaments

In August 1966, the Naval Facilities Engineering Command requested a $200 million increase in construction funds to keep RMK-BRJ going in Vietnam. The deficit had developed, in part, because the contractor's mobilization costs—supplies, materials, and equipment—had been underestimated a year earlier, as had everything else related to construction, including the size of the U.S. troop commitment. In response to the request, McNamara determined that $60 million should be enough to keep the contractor in business. But he also asked Sharp and Westmoreland to furnish him with a restatement of their construction program no later than 1 October.[106]

The $200 million that the Navy asked for in August shocked many in Washington. Soon the news media began to report charges of cost overruns, waste, and mismanagement on the part of the contractor. The nationwide Huntley-Brinkley evening television news of 7 September announced: "A major scandal involving $200 million has come to light in South Vietnam." The Associated Press, in a national story, concluded that the Pentagon admitted it misled civilian contractors by overstating probable contract awards and underestimating costs. Senator John Stennis of Mississippi, chairman of the Preparedness Investigating Subcommittee of the Armed Services Committee, wrote to McNamara about a *Washington Post* article that appeared on 8 September with the caption "Builders Running $200 Million in Hole in Vietnam." McNamara tried to explain the rise in contracting costs. In response to the senator's query he wrote: "We consider the cost growth as moderate and to be expected, considering the exigencies of wartime conditions under which the initial cost estimates were made and the work performed."[107]

McNamara then went into detail. Several projects had changed, resulting in changes in design, methods, scope, and materials. For example, the initial design and construction directive issued in May 1966 for the headquarters complex at Long Binh provided for slightly more than 100,000 square feet of buildings. By late summer, several changes in scope increased the magnitude of work to 2.8 million square feet. Weather and site relocations increased costs at Phu Cat Air Base and the MACV headquarters building. Then too, recent strikes, civil unrest, wage increases, and lost time due to enemy activity had added to the higher costs. In July, 3,500 Vietnamese, 200 Koreans, and 600 Filipinos had walked off their jobs at Cam Ranh Bay because of working

[106] JLRB, Monograph 6, *Construction*, pp. 70, 73; Quarterly Hist Rpt, 1 Jul–30 Sep 66, MACDC, pp. 25–28; Msg, Westmoreland 25637 to Sharp, 25 Jul 66, sub: Construction Programs and Funds; Memo, Robert S. McNamara, Sec Def, for Secretary of the Navy, 7 Sep 66, sub: Inadequacy of Contract Construction Funds, RVN, both in box 44, 71A/2351, RG 330, NARA; Msg, JCS to CINCPAC, 9 Sep 66, sub: Construction Program in SVN, Historians files, CMH.

[107] Transcript of Huntley-Brinkley Evening News (first quoted words), 7 Sep 66, box 36–14, OCE History files; Ltr, McNamara to Senator John Stennis (second quoted words), 12 Sep 66, box 44, 71A/2351, RG 330, NARA; Tregaskis, *Building the Bases*, p. 333; Statement by Edward J. Sheridan, Dep Sec Def (Properties and Installations) Before the Staff of the Senate Preparedness Investigating Subcommittee, 13 Sep 66, pp. 7, 11, box 44, 71A/2351, RG 330, NARA.

conditions and wages. The defense secretary added that the transfer of the $60 million, and possibly more, would ensure continuation of the consortium's work. A reduction in RMK-BRJ's workforce from 51,000 to approximately 43,000 by the beginning of 1967 would, according to McNamara, also increase efficiency and reduce costs.[108]

Meanwhile, General Raymond, who had returned to the United States in July on a thirty-day rest and recuperation leave, found himself spending most of his leave in Washington trying to clarify the $200 million requirement. The MACV construction chief spent hours going over the funding problem with the top officials of the Naval Facilities Engineering Command and the Pentagon. He discussed the funding predicament with Assistant Secretary of Defense Ignatius and his staff. Raymond also traveled to Capitol Hill almost daily to explain the funding situation before congressional subcommittee hearings.[109]

Exercising its oversight function, Congress sent teams to examine the construction program firsthand. A team from its auditing agent, the Government Accounting Office, arrived in Vietnam in July. In reviewing the performance of RMK-BRJ, the auditors noted that during the haste of the buildup the contractor dumped equipment and materials at port staging areas, depots, and project sites, and the flood of arriving materiel inspired thievery on a grand scale. RMK-BRJ could not account for the whereabouts of approximately $120 million worth of items shipped from the United States. In October, staff members of the Armed Services Committee toured bases and received detailed briefings. In one long question-and-answer session in which many cost figures were discussed, Capt. Paul E. Seufer, the Officer in Charge of Construction in Vietnam, perhaps best summed up his organization's efforts. "If anything," he told a subcommittee staff member, "I would like you to go away from here with a feeling that you have run into an organization that is on top of the management of a rather amorphous thing and we're doing a good job." The Government Accounting Office team's report prepared in December concluded that "neither the Navy nor the contractor were adequately equipped to manage the mass buildup and neither devoted sufficient attention to maintaining a reasonable degree of management control over the fast escalating construction program."[110]

While Congress and the Pentagon continued to spar over costs, Defense Department officials were having second thoughts about the authority they

[108] Ltr, McNamara to Stennis, 12 Sep 66; Msg, Brig Gen Daniel A. Raymond SOG 882 to Lt Gen Richard D. Meyer, Director for Logistics, Joint Chiefs of Staff, J–4, 8 Oct 66, Dunn Papers, CMH; Army Buildup Progress Rpt, 21 Jul 66, p. 43, CMH; Quarterly Hist Rpt 1 Jul–30 Sep 66, MACDC, pp. 27–28.

[109] Tregaskis, *Building the Bases*, pp. 332–33; Quarterly Hist Rpt, 1 Jul–30 Sep 66, MACDC, pp. 1, 25–26.

[110] Draft, Report to the Congress of the United States, Survey of United States Construction Activities in the Republic of Vietnam, Government Accounting Office, Dec 66, pp. 2, 4, box 4, 74/167, RG 334, NARA; RVN Supplemental Data Sheet, Officer in Charge of Construction, sub: Briefing of Mr. French's Investigation for the Senate Sub-committee, p. 16 (quoted words), Incl to Ltr, OICC RVN to COMUSMACV, 1 Nov 66, sub: Senate Briefing of Preparedness Investigating Subcommittee Minority Counsel, Mr. Stuart P. French, box 16, 70/782, RG 334, NARA.

had granted Westmoreland in January to control the construction program. In May, the Pentagon asked Westmoreland to send General Dunn to Washington to draft new procedures. Following Dunn's return to Saigon, he and Raymond reviewed various drafts transmitted by message from Washington. In late June, General Noble, the Defense Department's chief for Southeast Asia construction, informed Dunn of the possibility of returning to more-detailed line-item justifications. Almost in despair, Raymond responded such a move "would be a step backward and involve time consuming detail." Dunn and Raymond managed to hold off any drastic changes for the time being. But by September, the unfavorable press coverage over contracting costs renewed Defense Department interest in tightening up construction procedures.[111]

McNamara now appeared determined to revalidate projects before approving any further work. During his visit to South Vietnam in October, he told General Raymond of his determination to reassert the authority granted to him earlier by Congress, and warned that he would require that new projects funded from the Fiscal Year 1967 Supplemental appropriation be submitted on a line-item basis instead of by categories. On 31 January 1967, McNamara made it official, forwarding a memorandum to the field rescinding the broad flexibility passed on to Westmoreland a year earlier. More changes would be forthcoming in 1967, and the Construction Directorate reluctantly began to adapt to the new details of construction management.[112]

Despite these problems and thanks to a growing U.S. military and civilian engineer workforce, the network of major and minor base complexes showed significant progress by the end of 1966. These achievements did not come about without difficulty. The engineers made mistakes. Often construction materials were not available in specified types or quantities. Equipment constantly broke down. Funding continued to plague construction managers. Meanwhile, the engineers also had to support ongoing tactical operations.

[111] Msg, Dunn MAC 3876 to Noble, 14 May 66; Msg, Dunn WDC 6375 to Raymond, 31 May 66; Msg, Noble 3557–66 to Dunn, 22 Jun 66; Msg, Dunn SOG 0538 to Noble, 28 Jun 66; Msg, Noble 3698–66 to Dunn, 29 Jun 66; Msg, Raymond SOG 0546 to Noble, 30 Jun 66; Msg, Noble WDC 13795 to Raymond, 22 Nov 66; Msg, Noble WDC 14521 to Raymond, 9 Dec 66. All in Dunn Papers, CMH.

[112] Raymond, Observations on the Construction Program, RVN, p. 52; Memo, McNamara for Secs of Svc Depts and Chairman JCS, 31 Jan 67, sub: Construction Approval Procedures for South Vietnam, in Booklet, Development of the Construction Directorate, incl. 5, tab I, Historians files, CMH; Msgs, Raymond SOG 0901 to Noble, 12 Oct 66, Raymond SOG 1085 to Noble, 25 Nov 66, Raymond SOG 1173 to Noble, 14 Dec 66, all in Dunn Papers, CMH.

PART TWO
Supporting the Offensive

6

Spoiling Attacks, January–September 1966

During 1965 and 1966, military engineers carried out construction that encompassed almost every phase of engineering endeavor. American commanders at all levels had accepted the development of the fixed, somewhat permanent bases from which to operate. The increase in the number of tactical operations in 1966 began to draw the engineers, especially those in the divisions and brigades, more deeply into their combat and operational support missions. The nature of the war focused attention on several aspects of combat engineering. Before enough forces became available to open and maintain the road system, the combat forces depended almost wholly on aerial resupply, especially when they operated any distance from the coastal bases. Engineers were needed to increase the number of airfields in and around the interior bases, and to help detect, penetrate, and destroy the enemy's well-concealed bunkers and tunnel complexes. When not occupied with high-priority base development projects, combat engineers of the 18th Engineer Brigade increasingly reinforced the division and brigade engineers.

III Corps Battles

In January 1966, allied forces in III Corps began a series of spoiling attacks, radiating out from Saigon, to clear main roads, hinder enemy operations, and improve security. MACV deployed the 1st Division and the 173d Airborne Brigade into the corps' northern and western areas. During the first week of the year, a battalion from the airborne brigade made an air assault in the delta country on the east and west sides of the Vam Co Dong River in Hau Nghia Province northwest of Saigon in Operation MARAUDER. After a brief encounter, the paratroopers pursued the Viet Cong force. Later a patrol uncovered a battalion-size base camp where the enemy left behind a sizable quantity of supplies, weapons, ammunition, and important documents. Once everything of value was removed, a demolitions team set about destroying the base.[1] (*Map 14*)

MARAUDER was followed on 7 January by Operation CRIMP in the Ho Bo Woods in southwestern Binh Duong and northeastern Hau Nghia Provinces. Both the 3d Brigade, 1st Division, and the 173d Airborne Brigade participated in the war's largest operation by U.S. forces thus far. Much of the terrain was open, except near the Saigon River, which was choked with thick jungle and overgrown rubber plantations. During the operation, General Seaman sent his 3d Brigade through the southern part of the sector. Infantrymen and engineers found and destroyed bunkers, houses, sampans, supplies, and food, and

[1] Carland, *Stemming the Tide*, pp. 168–69.

Map 14

in one tunnel complex captured a huge collection of maps, charts, and documents. The Viet Cong did not stand and fight, using instead hit-and-run and ambush tactics to inflict casualties. In the northern part of the sector, the 173d Airborne Brigade discovered a large tunnel complex, but the enemy managed to slip away from the brigade's dragnet of one Australian and two American infantry battalions.[2]

A little over a month after CRIMP ended, General Seaman launched another spoiling attack north of Saigon—Operation MASTIFF. In a series of helicopter lifts, the 1st Division's 2d and 3d Brigades joined by the division's armored cavalry squadron deployed along three sides of a thirty-nine-square-mile area bordering the west bank of the Saigon River. Although the Americans uncov-

[2] Ibid., pp. 169–73; AAR, Opn CRIMP, 173d Abn Bde, 23 Feb 66, p. 1; AAR, Opn CRIMP, 3d Bde, 1st Inf Div, 15 Feb 66, p. 1, both in Historians files, CMH.

ered base camps, small hospitals stocked with medical supplies, training areas, rice storage caches, and small munitions factories, they met little organized resistance. Seaman terminated the operation on 25 February. Both CRIMP and MASTIFF gave U.S. commanders a frustrating reminder of the enemy's skills at avoiding a fight with large formations.[3]

In March, the 1st Division launched a series of smaller or battalion-size operations north of Lai Khe and immediately west of Highway 13 near the hamlet of Bau Bang. By reducing the size of the U.S. units sent to the field, the Americans hoped that the Viet Cong would see them as tempting targets and go after them. The tactics worked, resulting in a battle at Lo Ke Rubber Plantation just west of Bau Bang. Within a few days, all three battalions of the 3d Brigade were sweeping the battle area. Though the enemy again slipped away, he suffered heavy casualties and loss of equipment.[4]

Throughout these operations, Colonel Sargent's 1st Engineer Battalion and Captain Sowell's 173d Engineer Company supported the infantry. Combat engineers augmented every infantry company and larger unit in the field with demolition teams. They also cleared and repaired roads, built landing zones, carried out the slow and deliberate clearance of bunkers and tunnels, and set up water points. During CRIMP, Company C supported the 3d Brigade and cleared and repaired roads into the area of operations. The battalion's tankdozers and flamethrowers also supported the operation. Company B supported the 2d Brigade in Operation MASTIFF. Similarly, the 173d Engineer Company supported the 173d Airborne Brigade in Operations MARAUDER and CRIMP.[5]

To the north and east of Saigon, U.S. forces launched three major operations during the winter and early spring. In Operation MALLET, the 2d Brigade swept the area around Long Thanh southeast of Long Binh. Rice caches and base camps were uncovered with little opposition. The major impact of this operation, which ended in mid-February, was the opening of Highway 15 and the reestablishment of a government presence in the area. MALLET had not quite wound down when the 1st Division launched Operation ROLLING STONE. The purpose of the operation was to provide security for the 1st Engineer Battalion as it repaired and upgraded supply routes linking Highway 13 with Route 16 north of Saigon in Binh Duong Province, thereby improving ground traffic between the 1st Division's bases at Lai Khe and Phuoc Vinh. The operation would also allow the South Vietnamese government to extend its control over the intervening territory and cut a major enemy supply and infiltration route linking War Zones C and D. Seaman assigned the security mission to the 1st Brigade, which in turn tasked one of its three battalions to guard the engineers on a rotation basis, while the other two probed nearby to keep the enemy off balance. Two weeks into the operation, strong Viet Cong forces attempted to attack 1st

[3] Carland, *Stemming the Tide*, pp. 173–75.

[4] Ibid., pp. 175–78.

[5] HQ, 1st Engr Bn, 1st Engineer Battalion in Vietnam, n.d., 2 vols., vol. 1, pp. III-3 to III-4 (hereafter cited as 1st Engr Bn Hist), copy in CMH.

Brigade defensive positions outside the hamlet of Tan Binh just north of the roadwork and less than three miles west of Route 16. The attack was beat off with many enemy casualties. After the repulse at Tan Binh, the Viet Cong avoided battle, choosing instead to harass the work parties with occasional mortar and sniper fire. Although they killed three engineers and wounded twenty-nine, they were unable to stop the 1st Engineer Battalion, and by 2 March the roadwork was complete.[6]

Operation ROLLING STONE was the first major operation of the 1st Engineer Battalion as a unit. Work began on 7 February when Capt. Joseph M. Cannon, commanding officer of Company D, dispatched a platoon with a bulldozer, grader, scoop loader, and four dump trucks to open two and one-half miles of Route 2A, or Route Orange, a supply road branching off Highway 13 north of Phu Cuong and leading to Phuoc Vinh. The Viet Cong blocked the road with about fifty berms and trenches, but in a single day the platoon swept the road for mines, pushed the berms aside, and filled the ditches. On the ninth, Capt. Charles R. Kesterson, the Company A commander, deployed five mine-clearing teams to clear Highway 13 in leapfrog fashion north from Phu Loi to Ben Cat. Since the Viet Cong also ran buried wires to mines, which were command detonated from a distance, two bulldozers with rooters preceded the teams along the sides of the road to cut or expose the wires. Each team consisted of nine men: three mine detector operators with metallic detectors, and six probers. At times the mine-clearing teams were fired on, but accompanying tankdozers quickly suppressed enemy snipers with canister rounds and machine gun fire. Similarly, Company C under Capt. Robert F. Zielinski moved south from Lai Khe, clearing the road to Ben Cat. From Ben Cat attention turned to upgrading eleven miles along Routes 7B and 1A to Route 16. Engineer reconnaissance determined that a three-mile stretch of new road roughly following a cart track and ridgeline through jungle, plantations, and rice paddies just north of the existing road could be built east of Ben Cat without bridges or culvert. A bridge over the existing road had been partially destroyed, and shortly after the reconnaissance the Viet Cong, believing the bridge would be repaired, demolished it.[7]

On 10 February, the battalion less Company B moved from Di An and Lai Khe over the cleared Highway 13 to an area designated Base Camp 1 about one and one-quarter miles east of Ben Cat. While the engineers set up the field camp, equipment operators immediately went to work on the road. Throughout the operation, the weather was warm and sunny. The lack of rain made it easier for vehicles to move about but hindered compaction during the roadwork. Three cargo trucks were rigged as expedient water trucks, and a water semitrailer and a 500-gallon-per-minute water pump were borrowed from the Vietnamese Ministry of Public Works for use in compacting the base course. During the first day, the first half mile of a new pioneer road was

[6] Carland, *Stemming the Tide*, pp. 179–80; AAR, Opn ROLLING STONE, 1st Engr Bn, 12 Mar 66, pp. 1, 8–9, Historians files, CMH.

[7] AAR, Opn ROLLING STONE, 1st Engr Bn, pp. 2–5; 1st Engr Bn Hist, vol. 1, p. III-6; Garland, ed., *Infantry in Vietnam*, pp. 222–24.

Engineers of the 1st Division encountered obstacles along roads such as the berm under construction by the Viet Cong.

cleared and a laterite pit was opened within the camp's perimeter, allowing bulldozers to clear the roadway and stockpile laterite until dusk at 1900. Pushing east, tankdozers, bulldozers, and graders cleared vegetation to a width of sixty feet. The fifty-five-ton tankdozer proved very effective in clearing hedgerows and stumps when compared to the twenty-seven-ton bulldozer. Next graders, water tankers, and pneumatic rollers went to work on a thirty-eight-foot-wide base course. The first six-inch layer of laterite was shaped by graders and compacted by dump trucks hauling laterite. This was followed by a twelve-inch layer of laterite compacted by steel rollers. Fortunately, the laterite used for the wearing surface of the entire road had good moisture content and compacted well without additional water. As the roadwork progressed, Colonel Sargent on 16 February moved the battalion to Base Camp 2, which also contained laterite, near the juncture of the new road and Route 7B. Similarly, on 23 February Base Camp 3 was opened farther east on Route 2A. It was on the night of 23–24 February that the Viet Cong attacked the 1st Brigade's field camp 1,100 yards to the northeast. On the morning of the twenty-sixth, engineer tankdozers and engineer security forces guarding minesweeping teams found three dead Viet Cong along the road. Apparently the bodies were a lure, and the engineers soon found themselves engaged in a heavy firefight that lasted about thirty minutes. Work resumed, and the 1st Engineer Battalion

completed the thirty-foot-wide all-weather laterite road (Route Orange) from Ben Cat to Route 16 in three weeks, a half week ahead of schedule.[8]

As usual, the engineers checked for mines throughout ROLLING STONE. Thanks to the thorough sweep along Highway 13, the 1st Engineer Battalion was able to move to Base Camp 1 completely unhampered. This move contrasted sharply with previous ones in which several American soldiers had been killed in mining incidents along the same road. Venturing out from Base Camp 1 on the morning of the eleventh, mine-clearing teams discovered U.S. fragmentation bomblets emplaced by the enemy as antipersonnel mines in an area cleared just the day before. This was further evidence that the Viet Cong would take every opportunity to mine roads that were used by U.S. forces, and particularly those under construction where it was difficult to detect the presence of a concealed mine. Mine-clearing teams were dispatched every day from the field camps to clear both the area to be worked on that day and the completed portion of the road back to the starting point at Ben Cat. Despite the sweeps, some mines went undetected. On the first day out of Base Camp 2, 17 February, S. Sgt. Clyde C. Foster, while improving a secondary road to a laterite pit with his bulldozer, detonated two mines in rapid succession. Fortunately, the bulldozer absorbed much of the blast and Sergeant Foster was unharmed. On the same day, the clearing teams working on the completed portion of the road found six antipersonnel and two pressure-activated antivehicular mines, which had obviously been put in the preceding night after roadwork ceased. When the battalion prepared to return to Di An via Ben Cat at the end of the operation, mine-clearing teams swept the road ahead of the leading units. Company C began moving out of Base Camp 3 at 1000, 2 March, and traveled some distance without incident. Just east of old Base Camp 2, two pressure-activated mines were detonated and an armored personnel carrier and a tank were damaged. The road had been checked and cleared not more than a few hours earlier. No further incidents marred the return march, but the battalion learned that unless every inch of ground was under constant observation—a physical impossibility—the enemy would take a toll of friendly soldiers.[9]

In March, General Westmoreland launched more spoiling operations in III Corps. The 1st Division's 1st Brigade joined the 173d Airborne Brigade in Operation SILVER CITY, a sweep of the southwestern sector of War Zone D. Again the two units found and destroyed rice caches, caused numerous casualties, interdicted the enemy's lines of communications leading to Saigon, and disrupted one of the major Viet Cong sanctuaries in III Corps. Then, in anticipation of a fresh wave of enemy attacks, General Seaman, who assumed command of the newly activated II Field Force, Vietnam, sent the 1st Division on a preemptive campaign. For sixteen days, beginning on 29

[8] AAR, Opn ROLLING STONE, 1st Engr Bn, pp. 3, 5–8; 1st Engr Bn Hist, vol. 1, p. III-6; Garland, ed., *Infantry in Vietnam*, pp. 224–25.

[9] AAR, Opn ROLLING STONE, 1st Engr Bn, incl. 2; Garland, ed., *Infantry in Vietnam*, pp. 224–25. See also Cir 350–3–1, 1st Engr Bn, 20 May 66, sub: Mine Clearing, incl. 11, tab B, OCE Liaison Officer Trip Rpt no. 3.

A 1st Engineer Battalion mine-clearing team along Highway 13

March, the division, now under Maj. Gen. William E. DePuy, dispatched the 2d and 3d Brigades and the 1st Battalion, Royal Australian Regiment, on a sweep through a large area of Phuoc Tuy Province southeast of Saigon. The 1st Engineer Battalion provided demolition teams, water supply, clearing landing zones, roadwork, and bridge building. During the operation, called ABILENE, a U.S. infantry company encountered a Viet Cong battalion on the morning of 11 April, and the Americans beat off repeated attacks well into the night. Before reinforcements arrived the next day, thirty engineers from Company B descended through the jungle canopy on ladders hanging from the rear of hovering CH–47 helicopters. Armed with chain saws and hand tools, the combat engineers carved out a landing zone that allowed evacuation helicopters to lift out the casualties. This was the first time the 1st Engineer Battalion used this technique. Another first for the battalion took place when it used an armored vehicle launched bridge, borrowed from the 65th Engineer Battalion, 25th Division, to cross a forty-foot gap, enabling an ammunition resupply convoy to reach its destination. A culvert bypass was later built at the bridge site and the scissors bridge was withdrawn. Elsewhere, a pioneer road was blazed through dense jungle and the armored vehicle launched bridge was used for the second time, allowing artillery to move to a new location.[10]

[10] Carland, *Stemming the Tide*, pp. 181–83, 306; ORLLs, 1 Feb–30 Apr 66, II FFV, 1 Jun 66, p. 8, and 1 Feb–30 Apr 66, 1st Inf Div, n.d., p. 6, both in Historians files, CMH; 1st Engr Bn Hist, vol. 1, pp. III-4, III-6 to III-7; *Pictorial History of the 2d Brigade, 1st Infantry Division*, Company B, 1st Engr Bn sections. For more on clearing landing zones, see Cir 350–3–1, 1st Engr Bn, 17 Apr 66, sub: Construction: Helicopter Landing Zone Construction, incl. 11, tab A, OCE Liaison Officer Trip Rpt no. 3.

On 24 April, the 1st Division and its engineers entered War Zone C near the Cambodian border in Operation BIRMINGHAM—the first major drive into the enemy stronghold since 1962. During the operation, the 1st Engineer Battalion airlifted mine-detection teams to sites along Highways 1 and 22, while other elements preceded road bound convoys, replacing blown bridges and repairing roads along the way. Engineer teams also repaired Route 243 near Nui Ba Den (Black Virgin Mountain) and Route 26, bypassing Highway 22 from Tay Ninh to Go Dau Ha. Besides enemy harassment, mud and mines plagued the engineers. The monsoon season had begun in early May, and work crews had to tackle the sticky problem of rutted roads made soft by the constant pounding of tracked vehicles and heavy convoys. At this time, the 1st Engineer Battalion opened a road from Tay Ninh to the Michelin Plantation allowing supply vehicles and artillery to move by convoy. One major result of the operation was the discovery of a vast supply cache near the border. BIRMINGHAM took its toll of engineers. By the end of the operation on 16 May, the 1st Engineer Battalion lost two men killed, including the death of Captain Kesterson, Company A commander, when he stepped on a mine while rushing to the aid of his minesweeping team struck down by a blast from a claymore mine. The battalion also suffered sixteen wounded.[11]

During June and July, the 1st Division and the South Vietnamese 5th Division mounted a series of operations along the eastern flank of War Zone C. In Operation EL PASO II, the aim was to open Highway 13 from Saigon to rubber plantations in Binh Long Province and to seek out and destroy a Viet Cong division, then in the process of preparing to seize and hold the province capital of An Loc and several district capitals. By the end of the operation, highly effective counter-ambush tactics based on the armored cavalry's firepower and the rapid reaction of helicopter-borne infantrymen uncovered supply caches and forced the Viet Cong to withdraw into sanctuaries along the border. Again the 1st Engineer Battalion supported the division by minesweeping and opening supply roads, clearing landing zones, and serving as infantry.[12]

Keeping the roads open for resupply convoys remained one of the 1st Engineer Battalion's major responsibilities. In late August, the battalion supported the 1st Brigade to clear and secure Routes 16 and 1A for a resupply convoy from Di An to Phuoc Vinh. Code-named AMARILLO, the operation started out as a routine road-clearing job. The road was in poor condition and two culverts had been blown. While Company C worked north, Company A started at Phuoc Vinh and worked south. When the two infantry battalions guarding the road were committed to action against a reinforced Viet Cong battalion about five miles west of Route 16, the 1st Engineer Battalion was tasked to assume the security mission formerly assigned to the infantry battalions. By then, a north-bound convoy was about halfway to Phuoc Vinh.

[11] Sharp and Westmoreland, *Report*, p. 125; MACV History, 1966, pp. 383–84; ORLL, 1 Feb–30 Apr 66, II FFV, pp. 8–9; 1st Engr Bn Hist, vol. 1, pp. III-7 to III-8; AAR, Opn BIRMINGHAM, 1st Inf Div, n.d., pp. 23–24, Historians files, CMH; *Always First, 1965–1967*, "Mud and Mines."

[12] Sharp and Westmoreland, *Report*, p. 126; MACV History, 1966, pp. 385–86; Galloway, "Essayons," p. 150.

Lt. Col. Joseph M. Kiernan, who had recently assumed command from Colonel Sargent, called out the remaining elements of the battalion from Di An. The road was secured, and the convoy passed without incident. At nightfall, Company A formed a defensive perimeter for the brigade command post and artillery base at Ap Bo La near the intersection of Routes 16 and 1A. A few miles to the south, the rest of the battalion set up a defensive perimeter. During the night, both perimeters were probed by Viet Cong, and Company A killed two of the enemy with small-arms fire. For three critical days, the 1st Engineer Battalion acted as infantry while the infantry battalions engaged the enemy in bitter fighting. On 26 August, the rest of the battalion moved north to protect the brigade command post. During the move, a 2½-ton truck from Headquarters Company was destroyed by a command-detonated claymore mine. The blast was so strong that pellets penetrated the engine and cracked the block. Six of the eight engineers in the truck were wounded. On the night of the twenty-seventh, the Viet Cong again made probing attacks on the 1st Brigade's perimeter. Company E, on the west side came under attack and before the night was over six Viet Cong were killed. There were no American casualties. On 28 August, the battalion resumed its mission as engineers. They destroyed tunnel complexes discovered by the infantry, cleared jungle and landing zones, and continued road and bridge work.[13]

In September, the battalion returned to Route 16 in Operation LONGVIEW. Just south of Tan Uyen, work crews replaced a failing bridge, weakened by heavily laden convoys, with two 90-foot triple-single Bailey bridges supported at midpoint on a pier. Plans called for the Ministry of Public Works to build the pier, but work progressed too slowly and the piles were too short to carry the design load. The 1st Engineer Battalion took over and assembled a reinforced raft from its float bridge set for use as a pile-driving platform. After splicing additional piles to the Vietnamese piles, work crews, using a pile driver and operator from the 169th Engineer Battalion, drove the fourteen piles. The bridge opened to convoy traffic at 1230, 27 September. Meanwhile, Companies A and D cleared Route 16 of mines and obstacles. At one location, known as Ambush Corner, Company D bulldozed the jungle on both sides of the road to hamper future ambushes.[14]

The following month, the 1st Engineer Battalion directed its attention to Highway 13, by now dubbed Thunder Road, in Operation TULSA. Again, obstacles had to be removed, and monsoon rains inundated the road in many places. Potholes and mine craters turned into bottomless pits. Working continuously to keep the road open to convoys and commercial traffic, the battalion turned to expedients such as placing timbers and perforated steel planks to surface the wet, sagging artery. Other improvisations included replacing a damaged bridge within two hours with a rock-filled french drain. When a mine ripped apart a bridge north of Phu Cuong, the battalion called on CH–47 Chinook helicopters to lift sections of the dry span bridge to the site. To the

[13] 1st Engr Bn Hist, vol. 1, pp. III-8 to III-9; *Always First*, *1965–1967*, "Committed as Infantry." For more on AMARILLO, see Carland, *Stemming the Tide*, pp. 325–33.

[14] 1st Engr Bn Hist, vol. 1, pp. III-9 to III-10; *Always First*, *1965–1967*, "Back to Route 16."

dismay of the engineers, only one helicopter showed up, and the engineers had to place an armored vehicle launched bridge over the almost completed dry span bridge in time for a scheduled convoy.[15]

Two other engineer mainstays in III Corps were the 168th and 588th Combat Battalions. Both concentrated on building the arc of forward bases protecting Saigon as well as carrying out operational support missions. Headquarters Company and Company A, 588th Engineer Battalion, worked on 1st Division projects at Phu Loi until late April when the 168th Engineer Battalion took over. In early May, the two companies of the 588th moved to the 25th Division's Cu Chi base camp, relieved the 168th platoon there, and supported the 65th Engineer Battalion's base development projects. A month later, Company B at Long Binh joined the battalion. In addition, the 588th Engineer Battalion maintained the airfield at Dau Tieng, improved the Loc Ninh Special Forces camp, and kept roads open and cleared jungle from a potential Viet Cong assembly area near Cu Chi. Company C at Bearcat joined the battalion in late August. When the 1st Division entered War Zone C near the Cambodian border in late April in Operation BIRMINGHAM, elements of the 588th Engineer Battalion and the 617th Panel Bridge Company helped the 1st Engineer Battalion keep Highways 1 and 22 open between Cu Chi and Tay Ninh. In mid-May, the 588th sent men to Di An, where they joined troops of the 1st Engineer Battalion to train on tunnel destruction techniques. Following the training, the 588th became the 18th Engineer Brigade's tunnel destruction force.[16]

At the beginning of 1966, the 168th Engineer Battalion had units at Di An, Lai Khe, and Long Binh carrying out construction and security tasks. Headquarters and Headquarters Company and Company A were at Di An, the 1st Division's main base, where Company A was busy building tropical wooden buildings, drainage ditches, roads, hardstands, latrines, and showers. First priority was for kitchens and dining halls, and a total of sixteen of the former and thirty-two of the latter were completed before the end of April. A carpenter shop was set up and began fabricating latrines and roof trusses. Most wood frame buildings included three-foot-high masonry walls. At Di An, Company A also ran combat patrols and night ambushes. In late April, most of Company A moved to Phu Loi to take over projects from the 588th. In addition to an array of tropical wooden buildings, metal prefabricated warehouses, sheds, and hangars, the company kept busy improving the Phu Loi airfield and the camp's drainage system. Company B did work both on the cantonment and airfield at Lai Khe. In early June, when the 1st Division launched Operation EL PASO II, Company B took over perimeter security. The battalion's third lettered company, Company C, augmented the 46th Engineer Construction Battalion's many projects at Long Binh. These included the 93d Evacuation Hospital and the head-

[15] 1st Engr Bn Hist, vol. 1, pp. III-10 to III-11; AAR, Opn TULSA, 1st Engr Bn, 22 Nov 66, OCE Hist Ofc; *Always First*, *1965–1967*, "Miracle of Thunder Road."

[16] ORLLs, 1 May–31 Jul 66, 588th Engr Bn, pp. 1–3, 1 Aug–31 Oct 66, 588th Engr Bn, pp. 1–3, and 1 Nov 66–31 Jan 67, 588th Engr Bn, pp. 1–5; Galloway, "Essayons," pp. 141–42.

quarters complex for II Field Force at nearby Plantation. To help carry out these labor-intensive projects, Company C employed approximately 140 Vietnamese workers as masons, carpenters, and general laborers.[17]

The II Corps War

In II Corps, U.S., South Korean, and South Vietnamese forces launched a series of operations in the highlands and the key coastal province, Binh Dinh. Until late January 1966, existing airfields adequately supported operations of the 1st Cavalry Division, and forward airfield work mainly consisted of repairs. Other than this, the division's 8th Engineer Battalion limited its combat support to landing zones and road repairs. When airmobile operations shifted farther afield at the end of January, the division increased its dependence on cargo planes for logistical support, and airmobile engineers stepped up efforts to clear landing zones, build forward airfields, and open supply roads. Between 26 January and 5 June, Colonel Malley's 8th Engineer Battalion carried through an extensive airfield building program resulting in seven new airfields, lengthening two fields to twice their previous size, and repairing and maintaining many others. Other airfields in II Corps were being improved by the 18th Engineer Brigade.[18] (*Map 15*)

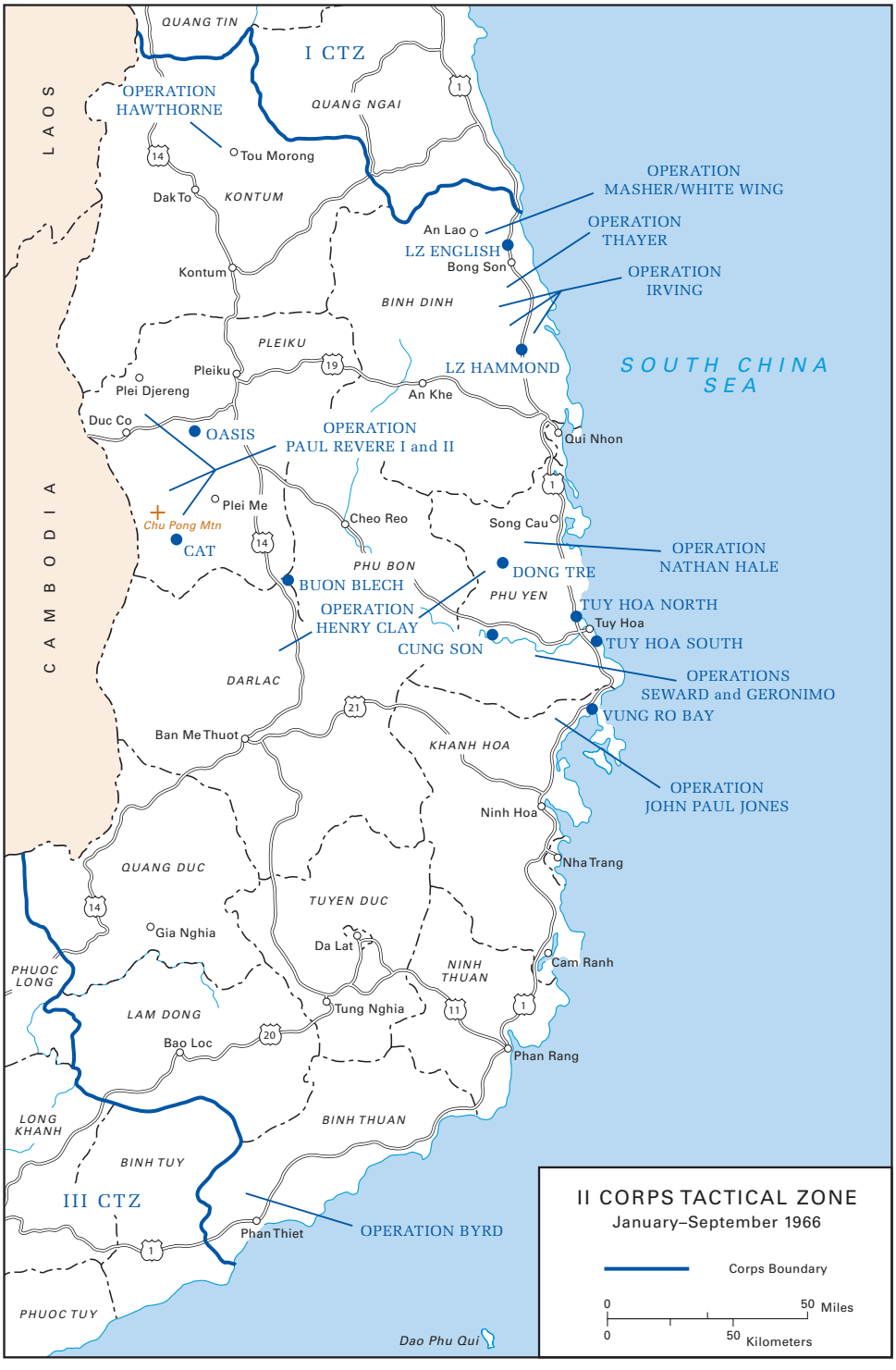
From 4 to 18 January, the 1st Cavalry Division and the 3d Brigade, 25th Division, moved into the border area north of the Chu Pong Mountain to locate infiltration routes from Cambodia. Following a first phase, which involved clearing Highway 19 between An Khe and Pleiku, the infantry moved by helicopters into newly cleared landing zones in the heavily forested areas. During Operation MATADOR, the 8th Engineer Battalion descended down troop ladders from hovering CH–47 helicopters for the first time in combat. Once on the ground, work crews used power saws to clear areas to fit one or two Huey helicopters. The next wave of helicopters delivered light engineer equipment to expand the landing zone to fit Chinook helicopters. In other cases, the Air Force dropped napalm and fragmentation bombs, ranging from 250 to 750 pounds, to cut holes in the forests. During the operation, troops uncovered several base camps and bunkers, and the enemy offered little resistance.[19]

In late January, the 1st Cavalry Division shifted operations from Pleiku and Kontum Provinces to the valleys along the coastal plains of northeastern Binh

[17] ORLLs, 1 Feb–30 Apr 66, 168th Engr Bn, pp. 1–3, 1 May–31 Jul, 168th Engr Bn, pp. 1–3, and 1 Aug–31 Oct 66, 168th Engr Bn, pp. 3–5; Galloway, "Essayons," pp. 141–42.

[18] Rpt, 14th Mil Hist Det, 1st Cav Div, 9 Jun 67, sub: Seven Month History and Briefing Data (September 1965–March 1966), p. 20; Lt. Col. Robert J. Malley, "Forward Airfield Construction in Vietnam," *Military Engineer* 59 (September-October 1967): 318–22. See also Lt. Col. Robert J. Malley, "Engineer Support of Airmobile Operations" (Student essay, U.S. Army War College, 1967), pp. 11–15.

[19] MACV History, 1966, p. 372; ORLL, 1 Feb–30 Apr 66, I FFV, 15 May 66, p. 7, Historians files, CMH; Rpt, 14th Mil Hist Det, 1st Cav Div, 9 Jun 67, sub: Seven Month History and Briefing Data (September 1965–March 1966), pp. 57–60; Tolson, *Airmobility*, p. 92.


QUANG TIN
I CTZ
QUANG NGAI
LAOS
OPERATION HAWTHORNE
Tou Morong
14
Dak To
KONTUM
An Lao
LZ ENGLISH
Bong Son
OPERATION MASHER/WHITE WING
OPERATION THAYER
OPERATION IRVING
Kontum
BINH DINH
PLEIKU
Pleiku
19
LZ HAMMOND
SOUTH CHINA SEA
Plei Djereng
An Khe
Duc Co
OASIS
OPERATION PAUL REVERE I and II
Qui Nhon
1
CAMBODIA
Plei Me
Chu Pong Mtn
CAT
Cheo Reo
Song Cau
14
PHU BON
DONG TRE
OPERATION NATHAN HALE
BUON BLECH
PHU YEN
TUY HOA NORTH
OPERATION HENRY CLAY
Tuy Hoa
CUNG SON
TUY HOA SOUTH
DARLAC
OPERATIONS SEWARD and GERONIMO
21
VUNG RO BAY
Ban Me Thuot
KHANH HOA
OPERATION JOHN PAUL JONES
Ninh Hoa
Nha Trang
QUANG DUC
TUYEN DUC
14
Gia Nghia
Da Lat
NINH THUAN
Cam Ranh
PHUOC LONG
LAM DONG
Tung Nghia
11
1
20
Bao Loc
Phan Rang
LONG KHANH
BINH THUAN
BINH TUY
III CTZ
Phan Thiet
OPERATION BYRD
1
PHUOC TUY
Dao Phu Qui
II CORPS TACTICAL ZONE
January–September 1966
Corps Boundary
0
50 Miles
0
50 Kilometers

Map 15

A CH–47 Chinook helicopter hovers while troops practice climbing down a ladder.

Dinh Province. Reinforced by South Vietnamese and South Korean troops, the 3d Brigade began Operation MASHER. Washington had problems with such a provocative name like MASHER, and MACV renamed the operation WHITE WING. When the remaining two brigades joined the hunt, the operation phased into a massive search-and-destroy effort called WHITE WING. By the time the operation ended on 6 March, the division's troop carrying helicopters had completed a full circle of airmobile sweeps around the Bong Son Plain. The operation, also known as the Bong Son Campaign, temporarily cleared the plain of

strong enemy forces. Several enemy battalions were destroyed and the division captured a large number of arms, but Binh Dinh was not yet secure.[20]

During MASHER/WHITE WING, the 8th Engineer Battalion teamed up with South Vietnamese, South Korean, and 937th Group engineers to maintain air and ground lines of communication from Qui Nhon to the combat area. While most of the 8th Engineer Battalion supported the forces in the field, elements of the battalion built two forward airfields. Beginning on 28 January and working around the clock for seventy hours, Company A and the 2d Equipment Platoon, Headquarters Company, opened the airstrip at Landing Zone DOG (later renamed ENGLISH) to Caribou aircraft, a few miles north of the town of Bong Son. Continuing on their own for another day, they improved the dirt airstrip to C–123 standards. In early March, Headquarters Company completed a 3,200-foot airfield for C–130s at a landing zone four miles north of Phu Cat (later named Landing Zone HAMMOND).[21]

South of HAMMOND another hasty airstrip took shape. A small force led by 1st Lt. Thomas O. Boucher and S. Sgt. Sherman L. Kohlway from Company A, 19th Engineer Battalion, completed a strip for the South Vietnamese 22d Infantry Division at An Nhon about eleven miles north of Qui Nhon just off Highway 1. Elements of the 84th Engineer Battalion and the 630th Engineer Light Equipment Company provided equipment support. The completed 1,800-foot-long, 80-foot-wide airstrip with 10-foot shoulders and a 35-foot cleared area on both sides was able to accommodate Caribou aircraft. The engineers hauled 40,000 cubic yards of fill during the round-the-clock operation. Although built primarily for use by the South Vietnamese division, the airstrip could also be used to relieve the traffic flow to the Qui Nhon airfield. The South Vietnamese division commander dedicated the airstrip to the memory of Maj. Stuart M. Andrews, U.S. Air Force, who was missing in action since being downed in March.[22]

In late March, the 1st Cavalry Division returned to the highlands to begin Operation LINCOLN. Teaming up with the 3d Brigade, 25th Division, the airmobile division reentered the Ia Drang area in another search-and-destroy mission, which resulted in moderate contact with the enemy. To support this and future operations, the 8th Engineer Battalion moved a platoon by CH–47 helicopters to Landing Zone OASIS thirty-one miles southwest of Pleiku. Within four hours, the platoon cleared a new dirt airstrip for Caribou transports. Next, Company A arrived to build a separate runway for C–130s. Using the battalion's lightweight bulldozers, graders, scrapers, and pneumatic rollers, the reinforced company carved out a new 3,500-by-60-foot runway. Instead of covering the runway with metal matting, work crews used T17 membrane for the first time in Vietnam. On 2 April, the first aircraft landed. During the

[20] Rpt, 14th Mil Hist Det, 1st Cav Div, 7 Jun 67, sub: Seven Month History and Briefing Data (September 1965–March 1966), pp. 61–67; Carland, *Stemming the Tide*, pp. 202–15; Tolson, *Airmobility*, pp. 92–93.

[21] Rpt, 14th Mil Hist Det, 1st Cav Div, 7 Jun 67, sub: Seven Month History and Briefing Data (September 1965–March 1966), pp. 20–21; Malley, "Forward Airfield Construction in Vietnam," p. 319; Galloway, "Essayons," p. 66.

[22] "19th Engineers Extend Airstrip," *Castle Courier*, 23 May 1966.

operation, the runway supported over five hundred landings and take-offs without significant damage.[23]

While the infantry swept over the western highlands, the 8th Engineer Battalion went to work on more airfields. Since vehicles could not get to all of the sites, helicopters had to move men and equipment. Some of the equipment could not be moved in one lift and had to be broken down into sections. In addition to its own CH–47 Chinooks, the division used CH–54 Tarhes or Flying Cranes, large cargo-carrying helicopters, to lift sections of D6B bulldozers, Caterpillar Model 112 graders, and MRS 100 tractor-scrapers. The bulldozer and grader required two lifts by the Flying Cranes, and sections of the tractor-scraper were delivered in four loads. Although the CH–47 could lift the bulldozer's track and blade, CH–54s usually carried out the initial sorties. After the tracks were laid out, a CH–54 brought in the bulldozer's body to be set on the tracks.[24]

On 3 April, two platoons and equipment arrived at the first site, Landing Zone CAT, in the trackless jungle some 43.5 miles southwest of OASIS, and close to the Cambodian border. An advance work party cleared a landing zone using hand tools and chain saws. Next, helicopters brought the equipment: two D6B bulldozers, two motorized graders (one with a scraper), a self-propelled pneumatic roller, and vibratory compactor. More helicopters delivered a light dump truck, which also served as a makeshift water distributor carrying a 500-gallon fuel bladder. By 5 April, the first Caribou landed on the hastily built strip, and the next day C–123 transports landed and took off from the completed 2,300-foot airstrip. This mix of equipment became the standard package when future airfield work required helicopters to transport all construction equipment.[25]

In twenty days, the 8th Engineer Battalion built four forward airfields and extended one more. Equipment moved by truck, helicopter, and fixed-wing aircraft. One D6B bulldozer, used in all but two of the projects, had moved 92 miles by truck, over 170 miles in four moves by helicopter, and 50 miles by C–130. During the twenty-day period, this bulldozer was in operation sixteen days.[26]

On 5 June, the 8th Engineer Battalion added another airfield, this one at Buon Blech Special Forces camp in northern Darlac Province. About four weeks earlier, Company B, augmented by two equipment platoons, moved to the camp under the protection of a 1st Cavalry Division task force. While an infantry company, artillery, and helicopter gunships of the task force secured the area, the engineer company fought the effects of heavy rains, cleared the site, and moved large quantities of earth. On 25 May, work crews began to

[23] MACV History, 1966, p. 374; ORLL, 1 Feb–30 Apr 66, I FFV, p. 8; AAR, Opn LINCOLN, 8th Engr Bn, 13 Apr 66, p. 2, Historians files, CMH; Rpt, 14th Mil Hist Det, 1st Cav Div, 7 Jun 67, sub: Seven Month History and Briefing Data (September 1965–March 1966), p. 21; Malley, "Forward Airfield Construction in Vietnam," pp. 319–20; Galloway, "Essayons," p. 92; *Memoirs of the First Team*, p. 181.

[24] Malley, "Forward Airfield Construction in Vietnam," p. 320; Rpt, 14th Mil Hist Det, 1st Cav Div (Ambl), 7 Mar 67, sub: Seven Month History and Briefing Data (April–October 1966), pp. 48–51, Historians files, CMH; Tolson, *Airmobility*, pp. 269, 274.

[25] Malley, "Forward Airfield Construction in Vietnam," p. 320; Galloway, "Essayons," p. 92.

[26] Malley, "Forward Airfield Construction in Vietnam," p. 320; Galloway, "Essayons," p. 95.

place T17 membrane on the 3,200-foot runway and parking apron that could accommodate five C–130s.[27]

Other airfields supporting operations in the highlands were assigned to the 18th Engineer Brigade. General Westmoreland expressed concern about the airstrip at Cheo Reo, about halfway between Pleiku and Tuy Hoa near Route 7B. On 27 February, he directed that the airstrip be upgraded to C–130 standards. The Field Force, Vietnam, engineer tasked the 937th Group to carry out the improvements. In turn, the group passed the mission to Colonel Anderson's 299th Engineer Combat Battalion. On 26 March, Company C set out from Qui Nhon on a 160-mile road march along Highway 19 to Pleiku then south a few miles on Highway 14 and then southeast along Route 7B to Cheo Reo. Due to security concerns along Route 7B, the unit took all necessary supplies and materials and completed the grueling trip in one day. After reaching Cheo Reo, the company repaired soft spots on the runway, added 700 feet to the runway, and topped it off with M8 matting. A T17 membrane-covered parking ramp was added. Completing its work on 23 April, the company returned to Qui Nhon on the twenty-fourth, repeating the long trip in a single day.[28]

Although busy with various construction projects in the Qui Nhon and Pleiku areas, the 299th Engineer Battalion received a steady flow of operational missions elsewhere in II Corps. In mid-May, Company C ventured out again with the 630th Light Equipment Company for three weeks to Plei Kly, twenty-five miles south of Pleiku, to build an airfield to support the 3d Brigade, 25th Division, in Operation PAUL REVERE. During PAUL REVERE, U.S. troops reentered the Chu Pong–Ia Drang area for the first time since the late 1965 campaign. The 299th task force built a 3,100-by-60-foot runway, a turnaround, and a parking apron, all covered with T17 membrane. On 8 June, two platoons from Company A left Pleiku to provide additional support to the 1st Brigade, 101st Airborne Division, in the Dak To area. The paratroopers, who had moved into the area following search-and-destroy operations in coastal Phu Yen Province, had just begun HAWTHORNE, an eighteen-day search-and-destroy operation in Kontum Province. One of the engineers' major efforts was to keep the asphalt-surfaced Dak To airfield in operation.[29]

At midyear, U.S. forces continued spoiling attacks in II Corps. In June, the 1st Brigade, 101st Airborne Division, returned to Phu Yen Province to carry out Operation NATHAN HALE, a twelve-day search-and-destroy mission. The 1st Cavalry Division returned to Binh Dinh Province in September and launched Operations THAYER I, IRVING, and THAYER II. These and other combined operations with South Korean and South Vietnamese forces resulted in large North Vietnamese Army and Viet Cong losses and the capture of large quantities of supplies. By October, elements of the 4th

[27] Galloway, "Essayons," p. 95; Situation Rpt on Airfield Construction, incl. 7, p. 3, OCE Liaison Officer Trip Rpt no. 3.

[28] Msg, CG, FFV to COMUSMACV, 2 Mar 66, sub: Repairs to Cheo Reo Airfield, Historians files, CMH; ORLLs, 1 Feb–30 Apr 66, I FFV, p. 26, and 1 Feb–30 Apr 66, 299th Engr Bn, 30 Apr 66, p. 3, Historians files, CMH.

[29] MACV History, 1966, pp. 372, 374, 377; ORLL, 1 May–31 Jul 66, 299th Engr Bn, 31 Jul 66, pp. 1–3, Historians files, CMH; Galloway, "Essayons," p. 73.

Infantry Division and the 3d Brigade, 25th Division, followed later by elements of the 1st Cavalry Division, moved to the western highlands near the Cambodian border to continue Operation PAUL REVERE. Again, the sweeps disrupted enemy plans and raised havoc to his base areas. Operations in Phu Yen Province late in the year included SEWARD, which found the 1st Brigade, 101st Airborne Division, protecting the rice harvest, and GERONIMO I, a combined operation that included the 1st Brigade, 4th Division, and 1st Brigade, 101st Division. Long-running campaigns such as Operation BYRD in Binh Thuan Province demonstrated that an airmobile infantry battalion task force from the 1st Cavalry Division, supported by a platoon from the 8th Engineer Battalion, could operate alone over an extended period of time against small enemy forces.[30]

In July, two brigades of the 1st Cavalry Division swept west through Phu Yen, Phu Bon, and Darlac Provinces to the Cambodian border in Operation HENRY CLAY. Engineering tasks for the 8th Engineer Battalion teams attached to the assaulting infantry battalions included sweeping roads for mines and repairing forward airstrips. Repairing the airstrips posed some problems because much of the battalion's equipment remained committed to higher-priority projects such as the An Khe airfield. As usual, ingenuity was brought into play. Lt. Col. Charles G. Olentine, who replaced Colonel Malley on 19 June, noted that at Buon Blech one of his Company A platoons used a quartermaster laundry dryer as an expedient to dry the ground under the T17 membrane, allowing the glue to hold satisfactorily.[31]

During the series of PAUL REVERE operations near the Cambodian border, the 3d Brigade, 25th Division, saw heavy combat. In August, the 1st Cavalry Division diverted forces from Binh Dinh Province to reinforce the 3d Brigade. Operation PAUL REVERE II brought forth the heaviest commitment by the 8th Engineer Battalion in any single operation to date. Colonel Olentine moved his headquarters to OASIS, marking the first time that the headquarters operated outside Camp Radcliff since arriving in Vietnam. Monsoon rains had returned, and Olentine committed all of his resources during the month-long operation to keep the C–130 OASIS airstrip open and to carry out other missions to support the operation. Landing zones were cleared, enemy bunkers destroyed, and bridges and culverts built to cross the rising rivers and streams. Additional help came from 18th Engineer Brigade units of the 937th Engineer Group. The 299th Engineer Battalion, augmented with trucks and equipment from the 19th and 70th Engineer Battalions, the 630th Light Equipment Company, and the 509th Panel Bridge Company units hauled rock, put in culverts, and helped maintain roads. When the 1st Cavalry Division returned to Binh Dinh

[30] MACV History, 1966, pp. 378–79; ORLLs, 1 May–31 Jul 66, I FFV, 25 Aug 66, pp. 12–13, 1 Aug–31 Oct 66, I FFV, 30 Nov 66, pp. 10–12, 17–22, 23–28, and 1 Nov 66–31 Jan 67, I FFV, 6 Mar 67, pp. 9–18, all in Historians files, CMH; *Memoirs of the First Team*, pp. 182–83.

[31] ORLL, 1 May–31 Jul 66, I FFV, pp. 12–13; Rpt, 14th Mil Hist Det, 1st Cav Div, 7 Mar 67, sub: Seven Month History and Briefing Data (April–October 1966), pp. 100–103; AAR, Opn HENRY CLAY, 8th Engr Bn, 7 Aug 66, pp. 1–3, OCE Hist Ofc.

in mid-September, the 3d Brigade remained to carry out Operations PAUL REVERE III and IV.[32]

In southern Phu Yen Province, the 39th Engineer Battalion under Lt. Col. Taylor R. Fulton moved from Cam Ranh Bay and Nha Trang to Tuy Hoa to concentrate on the Vung Ro Bay port complex and carry out operational support for nearby combat units. Between 10 and 25 July, the battalion headquarters, Companies A and B, and the 572d Light Equipment Company moved by sea aboard landing craft to Tuy Hoa where they joined Company C. During Operation JOHN PAUL JONES, a three-phase series of sweeps running from 21 July to 5 September intended to secure the Vung Ro area and ensure that farmers around Tuy Hoa could harvest their rice crop without interference, elements of the battalion supported the 1st Brigade, 101st Airborne Division. Once the paratroopers secured Vung Ro Pass and Highway 1, Company C reopened and maintained Highway 1 from Tuy Hoa to the port project area. At Tuy Hoa South airfield, Company B built sixty-four 12-by-12-foot helicopter landing pads and two refueling pads, all on peneprime-treated sand and topped off with pierced steel planking, for aviation units supporting the airborne brigade. During Operation SEWARD, another sweep around Tuy Hoa lasting from 5 September to 26 October, the battalion's major tasks supporting the 1st Brigade, 101st Airborne Division, were building an airstrip capable of handling C–130s at Dong Tre Special Forces camp southwest of the town of Song Cau and repairing the gravel runway at Cung Son Special Forces camp airstrip twenty-two miles west of Tuy Hoa. Tasks also included minesweeping and maintaining Routes 6B and 7B to the two camps. Later, Company B began extending and placing T17 membrane surfacing at the Cung Son airstrip.[33]

Prior to Operation JOHN PAUL JONES, the valley area south of Tuy Hoa had been under Viet Cong control for several years, and Highway 1 was blocked by numerous ditches cut across the pavement and blown bridges and culverts. The key to the success of the Vung Ro Bay port project was the reopening of the road from Ban Nham on the Song Ban Thach, about ten miles south of Tuy Hoa, to Vung Ro. Four major bridges had been destroyed in this stretch of highway, and engineer reconnaissance teams accompanying the infantry in their advance relayed information back to the 39th Engineer Battalion concerning the bridges and the condition or existence of bypasses. Although a partly destroyed 850-foot concrete T-beam bridge was still standing at Ban Nham, the usable concrete spans, piers, and superstructure were old and damaged. The destroyed spans had been replaced by French Eiffel bridging; at best, the bridge might take ten-ton (Class 12) vehicles. No bypass was possible.

[32] ORLL, 1 Aug–31 Oct 66, I FFV, pp. 17–19; Rpt, 14th Mil Hist Det, 1st Cav Div, 7 Mar 67, sub: Seven Month History and Briefing Data (April–October 1966), pp. 104–10; ORLL, 1 Aug–31 Oct 66, 8th Engr Bn, 31 Oct 66, pp. 1–2; AAR, Opn PAUL REVERE II, 8th Engr Bn, 8 Sep 66, pp. 1–5, both in OCE Hist Ofc; *Memoirs of the First Team*, p. 182.

[33] AAR, Opn JOHN PAUL JONES, 39th Engr Bn, 17 Nov 66, pp. 1, 4; AAR Opn SEWARD, 39th Engr Bn, 17 Nov 66, pp. 1–4, Historians files, CMH; ORLL, 1 May–31 Jul 66, 39th Engr Bn, pp. 1–2.

A decision was made, therefore, to construct a Class 60 float bridge just downstream from the existing bridge.[34]

Colonel Fulton assigned the job to Company C and the 553d Engineer Company (Float Bridge). The bridging was transported on one ship and on 21 July was offloaded by transportation units on a beach just south of Tuy Hoa. When the bridge company arrived the following day, the bridging was loaded on bridge trucks in an around-the-clock operation for transport to Company C at the bridge site. Construction of the bridge began at dawn on the twenty-fourth. The bridge center line was located adjacent to and twenty feet downstream from the old bridge, but it was necessary to place the three work sites upstream because of shallow water and lack of space for work sites downstream. One work site was devoted to building the end sections. At this time it was discovered that sections of Class 60 steel treadway end ramps were missing, and plans were promptly made for expedient construction of the end ramps from M4T6 dry spans. The M4T6 bridge decking, known as balk (hollowed aluminum beams), was designed to be assembled by hand. At the other two work sites, work crews began assembling the successive bays. First, air compressors inflated two floats for each bridge section or bay. Only two cranes were available to lift and emplace the heavy Class 60 decking on the floats, so construction of each bay was slow. Upon completion, each bay was floated downstream under the damaged bridge and joined to the floating span. Anchor cables were secured to the existing bridge piers and bridle lines were run to each bay as it was joined. By early the next morning, the first 375-foot span was completed to a sandbar island at midstream and the makeshift end sections were placed. A hasty roadway was bulldozed across the island and topped off with pierced steel planking. New work sites were prepared on the island for construction of the span to the far shore. Since the channel on this side of the island was too shallow for a 27-foot power boat and construction of floats, a crane with a clamshell attachment was rushed to the site to dredge and deepen the river. As work continued into the second night, successive bays and the end sections were assembled and pulled into place by hand. By 1100, the bridge was open to traffic.

Although the project took a day longer to complete than anticipated, the rest of Highway 1 to Vung Ro was opened on the morning of 27 July. Along the way, Company C repaired a damaged concrete-decked bridge and built five bypasses, which were improved by the construction of a 110-foot double-single Bailey bridge and four 23-foot M4T6 dry spans. Meanwhile, improvements were made at the float bridge site. Due to the approaching monsoon, the sandbar probably would be flooded with six to eight feet of water, making it unusable as a ford. This predicament was remedied by constructing a Class 60 treadway fixed span on Class 50 trestles across the island. M4T6 dry spans were again used as ramps to connect the fixed spans to the floating Class 60 bridges on both sides of the island. This remedy eliminated the need for the pierced steel plank roadway and made it possible to adjust the height of the overland fixed span

[34] Lt. Col. Taylor R. Fulton, "Conglomerate Tactical Bridging," *Military Engineer* 59 (September-October 1967): 323; AAR, Opn JOHN PAUL JONES, 39th Engr Bn, p. 1.

During Operation JOHN PAUL JONES*, men of the 39th Engineer Battalion built a conglomerate bridge made up of several different tactical bridges.*

to the changing flood depths. Since the 800-foot span was composed of seven parts—four M4T6 dry span end sections, two Class 60 float bridges, and a Class 60 dry span trestle—it was called the conglomerate bridge.[35]

By midyear, more combat engineers arrived in the western highlands of II Corps. The 299th Combat Engineer Battalion in shifting operations to Pleiku helped build the 4th Division's base camp, maintained roads in the area, and carried out various operational support missions. Heavy wheeled and tracked vehicle traffic combined with monsoon rains had turned a section Highway 19 west of Pleiku into a slippery sea of mud. The battalion determined that only rock would save the road. Throughout August, the 299th supported by other 937th Engineer Group units hauled some 8,000 cubic yards of rock from quarries as far away as An Khe. Elements of the battalion also completed the improvement of defenses at the Duc Co Special Forces camp near the Cambodian border. During the period, another company of the battalion ventured into the highlands to improve and build C–130 airstrips south and southeast of Pleiku.[36]

[35] Fulton, "Conglomerate Tactical Bridging," pp. 323–25; AAR, Opn JOHN PAUL JONES, 39th Engr Bn, pp. 1, 4.

[36] ORLLs, 1 May–31 Jul 66, 299th Engr Bn, pp. 1–2, and 1 Nov 66–31 Jan 67, 299th Engr Bn, 14 Feb 67, pp. 1–7, Historians files, CMH; Galloway, "Essayons," pp. 117, 119, 165.

The 20th Engineer Combat Battalion was also shifting operations to the western highlands. In mid-August, Company B moved by convoy to Ban Me Thuot to build a brigade-size bivouac area for the 4th Division. When this work neared completion, the company moved a month later to the remote Phu Tuc Special Forces camp southeast of Pleiku to extend an existing Caribou airstrip for C–130s. By 10 October 1966, the battalion and the attached 584th Light Equipment Company completed the move to the 4th Division's Dragon Mountain Base Camp outside Pleiku. Within a short time, the battalion was carrying out a large share of the 937th Engineer Group's operational support missions in the highlands, devoting most of its efforts to working on forward airfields and roads in support of tactical operations.[37]

Manpower

In April and May 1966, many Army engineers neared the end of their twelve-month tour of duty. Since nearly all had arrived with their units on the same ship, the rotation dates would be the same. The prospect of losing so many seasoned men at the same time threatened the operational expertise of many units. Seabee battalions faced a different circumstance. After completing a tour of approximately eight months, an entire battalion returned to a home base, and another battalion arrived in time to take over projects, equipment, and base camp.[38]

While the 18th Engineer Brigade worked on getting replacements, group commanders initiated programs to reduce the so-called rotational hump. The approach usually taken involved adjusting rotation dates and exchanging men between units with different deployment dates. For instance, Colonel Bush's 45th Engineer Group had two battalions that departed the United States the same day in December 1965. Excluding earlier departures and extensions, approximately 717 enlisted men and 33 officers were expected to depart in December 1966. To offset this excessive turnover, the group set a goal restricting battalion losses to no more than 25 percent of their soldiers in a one-month period. To achieve this goal, Bush promulgated a four-step program. First, battalions were authorized 10 percent overstrength. Second, some individual tours were shortened by as much as one month, allowing the administrative load to be spread over at least two months. Third, the tours of 10 percent of the men eligible for rotation were extended by one month or longer if necessary, using a combination of voluntary or involuntary methods. Last, the group exchanged soldiers who had less Vietnam service with men from other battalions, including divisional engineer battalions, to lessen the impact of the loss on the unit.[39]

Other manpower factors affected productivity. In April 1966, one battalion commander reported that only 89.7 percent of the battalion's authorized strength

[37] ORLLs, 1 May–31 Jul 66, 20th Engr Bn, pp. 1–2, 8, 1 Aug–31 Oct 66, 20th Engr Bn, pp. 1–4, 6–8, and 1 Nov 66–31 Jan 67, 20th Engr Bn, pp. 1–3.

[38] Ploger, *Army Engineers*, pp. 185–86.

[39] Ibid., p. 130; ORLLs, 1 May–31 Jul 66, 18th Engr Bde, 26 Aug 66, p. 4, Historians files, CMH, and 1 Aug–31 Oct 66, 45th Engr Gp, p. 5; Galloway, "Essayons," p. 108.

of 525 enlisted men was on hand, and only 40 percent worked on projects related to the construction program. To support the continuity of operations, Bush kept company and battalion mess, maintenance, supply and administrative troops, and equipment operations at or slightly above authorized levels. Guard duty took away more men. As a result, shortages turned up mostly in the line squads, about three men in each squad, leaving platoons with only about sixteen to eighteen men on the job each day. Hiring Vietnamese laborers helped somewhat, but the commander warned that the effects of the manpower shortages would be most severely felt when the battalion started on projects requiring technical skills and carried out operational support missions. To make matters worse, about 270 of the battalion's enlisted men were scheduled to depart in July and August 1966.[40]

General Ploger attempted to bring relief to the manpower problem. In March 1966, he asked U.S. Army, Vietnam, for additional troops to augment 18th Brigade units. He contended that the brigade needed an enlisted overstrength of between 10 to 15 percent to take full advantage of the dry season to complete as much work as possible before monsoon weather curtailed activity. The brigade had already fallen 700 men below authorized strength and 1,160 by the end of the month. Since engineer fillers were beginning to arrive in the number required, Ploger indicated that he could get by with filling one-half to two-thirds of this shortage with soldiers from other branches. Some of these men without engineering skills had relieved engineer soldiers previously tied down with security duties, which at Long Binh alone amounted to 2 officers and 77 enlisted men daily. Between late August and early September, the 18th Engineer Brigade, with a strength now approaching 13,000 soldiers, had received 1,100 men from other branches to learn engineering skills or assume other duties. This measure helped ease the manpower problem.[41]

Hiring Vietnamese civilian laborers helped the 18th Engineer Brigade take up some of the manpower slack. By September 1966, the brigade supplemented its strength with approximately 5,400, mostly unskilled, workers. The contractors had exploited the skilled labor market to such a degree that those hired by the brigade worked on jobs requiring few or no technical skills. Engineer units began training programs to instruct Vietnamese workers in such skills as carpentry, masonry, mechanics, and vehicle operation. By late 1966, the 159th Engineer Group at Long Binh began to graduate a class of heavy equipment operators every two weeks, thus alleviating a serious shortage of military operators.[42]

Efforts were also under way to ease a growing shortage of engineer officers. One way to relieve the problem at brigade headquarters was to designate

[40] Extract of a Letter from a Battalion Commander to a Group Commander, incl. 6, tab G, OCE Liaison Officer Trip Rpt, no. 2.

[41] Ploger, *Army Engineers*, pp. 130–31; Rpt of Visit to the 18th Engr Bde and Subordinate Units, 9–18 Apr 66, p. 1, incl. 6, OCE Liaison Officer Trip Rpt no. 2; Rpt of Visit to the 18th Engr Bde and Subordinate Units, 28 May–11 Jun 66, p. 1, incl. 5, OCE Liaison Officer Trip Rpt no. 3; Rpt of Visit to the 18th Engr Bde, p. 1, incl. 7, OCE Liaison Officer Trip Rpt no. 4; Army Buildup Progress Rpt, 10 Aug 66, p. 63.

[42] Ploger, *Army Engineers*, p. 131; Rpt of Visit to the 18th Engr Bde, p. 5, incl. 7, OCE Liaison Officer Trip Rpt, no. 4.

positions that could be filled by officers from other branches. Engineer group and battalion headquarters did the same. Signal Corps officers took over communications positions, and Adjutant General Corps officers replaced engineers in administrative jobs. Ploger also asked U.S. Army, Vietnam, to locate soldiers not assigned engineering duties but who had engineering backgrounds for reassignment to the brigade. In Washington, an Army study found that to fill officer positions in the new engineer units being raised, especially captains and lieutenants, an increasing number of engineer officers had to be diverted from other assignments. The solution pointed to temporarily assigning officers from other branches to the Corps of Engineers for eighteen months. Newly commissioned officers in other branches were also diverted to the Corps of Engineers. Officers with engineer and engineer-related degrees but assigned to other branches such as Armor or Field Artillery suddenly received orders to report to engineering jobs. This was the case in the 84th Engineer and the 589th Engineer Battalions (Construction) outside Qui Nhon. A field artillery officer with an engineering degree served as the 84th's operations officer. Similarly, an armor officer was assigned as operations officer in the 589th when it arrived in early 1967. Reserve officers volunteering to come on active duty were eagerly accepted.[43]

The long-term solution to the shortfall in officers, however, lay in the United States, and programs were soon in train to raise Reserve Officers Training Corps enrollments at universities and colleges, increase the size of classes at the U.S. Military Academy, and turning to the time-honored expedient for quick expansion by increasing the output of the Officer Candidate Schools. With the demands of Vietnam, the Army also stepped up its efforts to develop promising enlisted men, particularly college graduates and those with some college training, as junior officers. The Engineer Officers Candidate School at Fort Belvoir was reactivated in the fall of 1965. By June 1966, 1,132 junior engineer officer graduates had been commissioned. The number would climb steadily, reaching some 4,000 in 1968. When the school closed in January 1971, 5,859 new second lieutenants had been assigned to the Corps of Engineers. Altogether, the number of graduates reached 10,380, the balance being assigned to other branches.[44]

Forward Airfields

One task many engineer soldiers faced in South Vietnam was building forward airfields for cargo aircraft. Throughout South Vietnam, airfields gained importance as the final, vital link sustaining military operations. The land lines of communication—roads and rail—presented major security and

[43] ORLL, 1 May–31 Jul 66, 18th Engr Bde, p. 10; Army Buildup Progress Rpts, 6 Apr 66, p. 3, and 4 May 66, p. 6, CMH.

[44] Ploger, *Army Engineers*, pp. 183–86; Interv, Bower with Ploger, 8 Aug 67, pp. 22–23; Ronald H. Spector, "The Vietnam War and the Army's Self-Image," in *Second Indochina War Symposium*, ed. John Schlight (Washington, D.C.: U.S. Army Center of Military History, 1986), pp. 176–77; Ronald H. Spector, *After Tet: The Bloodiest Year in Vietnam* (New York: Free Press, 1993), pp. 32–34.

maintenance problems, and did not exist in many areas. The fluid nature of the war and the absence of battle lines prompted American forces to respond to tactical requirements in as mobile a fashion as possible. When compared to the massive effort required to build and maintain the land lines, it became apparent that an expanding network of airfields would better serve tactical mobility.[45]

Although General Westmoreland shifted some construction units to do port construction, he also pushed building and upgrading airfields for transport aircraft up to and including the C–130 Hercules. Existing and new major air bases under construction could easily accommodate the medium-range Hercules. While each of combat base camps occupied by U.S. divisions and brigades had an airstrip suitable for C–123 landings, the capabilities and locations of forward airstrips still fell far short of U.S. Air Force criteria for the more desirable, larger-capacity C–130. Coupled with the need to upgrade existing airstrips, Westmoreland pursued the goal of establishing a checkerboard pattern of forward airfields covering the entire country.[46]

The growing importance of forward airfields in tactical planning led Westmoreland to push for a coordinated upgrading effort. In May, a coordinating group representing MACV, U.S. Army, Vietnam, and Seventh Air Force (which succeeded the 2d Air Division) reviewed the airfield construction priority list and identified the urgent need for C–130 airfields. The airfields had to have an all-weather capability to handle sixty sorties a day to support division-size operations. In early June, Westmoreland approved a master plan and priority listing of forty airfields submitted by the group, now known as the Joint Airfield Evaluation Committee. Top priority for upgrading between July and September went to ten sites in Pleiku, Kontum, and Darlac Provinces in II Corps, and Binh Long and Phuoc Long Provinces in III Corps. Airfields in the coastal regions of I and II Corps had second priority, and airfields not covered in priority one in III Corps and all of IV Corps became third priority. Because of a shortage of airfield matting, the committee decided to limit the upgrade to the first priority fields at Kontum, Plei Me East, and Loc Ninh.[47]

The MACV Directorate of Construction designated Army funds for airfield construction. In late June, General Dunn informed U.S. Army, Vietnam, that the Military Construction Program covered funding requirements for airfields supporting logistical bases and division and brigade base camps. Top priority airfields by corps areas in this group included the division bases at

[45] MACV History, 1966, p. 300; Bowers, *Tactical Airlift*, p. 185.

[46] MACV History, 1966, pp. 300–301; Ltr, Westmoreland 001093 to CG, FFV, 10 Dec 65, sub: Tactical Employment of US Forces and Defensive Action; Interv, Rochester with Raymond, 11 Jan 80, p. 86; Bowers, *Tactical Airlift*, pp. 224–25; Situation Rpt on Airfield Construction, incl. 7, p. 1, OCE Liaison Officer Trip Rpt no. 3; Ploger, *Army Engineers*, p. 108. For a list of airfields and C–130 airfield criteria, see MACV Concept of Operations, 30 Aug 65.

[47] MACV History, 1966, pp. 301–02; Quarterly Hist Rpts, 1 Apr–30 Jun 66, MACDC, pp. 7–9, and 1 Jul–30 Sep 66, MACDC, p. 15; Bowers, *Tactical Airlift*, pp. 186, 230; Msg, COMUSMACV 18054 to CGs, III MAF, I FFV, and II FFV, 26 May 66, sub: Master Plan for Upgrading Airfields in RVN; Msg, COMUSMACV 20225 to CG, USARV, et al., 13 Jun 66, sub: Airfield Evaluation, both in box 5, 69A/702, RG 334, NARA.

An Khe in II Corps and Cu Chi in III Corps and a brigade base in IV Corps. Materials used by troops to build the forward deployment airfields required for tactical operations fell within the other funding categories, Operations and Maintenance, Army (O&MA), and Procurement of Equipment and Missiles for the Army (PEMA). These included fields at Kontum and Cheo Reo in II Corps and Song Be and Loc Ninh in III Corps.[48]

By midyear, the upgrading program had achieved a degree of coordination, but more mundane troubles plagued the construction efforts. The weight of the C–130s, with high landing impact and maximum braking action, frequently caused runway surface problems. The M8A1 matting proved especially troublesome. The newly developed T17 membrane surfacing also presented high maintenance requirements on soils with low-bearing ratios. Under such conditions, AM2 and MX19 matting became the choice for surfacing runways, the M8A1 matting for taxiways and parking, and the T17 membrane principally for C–123 airfields.[49]

The need for continuing maintenance and shortages of matting presented difficulties for the engineers, who were still spread thin. There were more than two hundred airfields, including simple dirt strips, that were candidates for maintenance and upgrading. Airfield matting came under tight control, and in several cases MACV diverted matting from other projects—for example, shifting the AM2 originally programmed for Phu Cat Air Base to An Khe's Golf Course airstrip. By September, airfields supporting Marine Corps operations in I Corps received special attention. The sharp burred edge of the mat adjacent to the connector hooks in newly installed M8A1 matting at several airstrips near the Demilitarized Zone caused blowouts to C–130 tires. More AM2 matting was diverted to Dong Ha and an alternate airfield at Khe Sanh farther inland, and the Seabees completed both C–130 airfields in mid-October before the northeast monsoon came in full force, much to Westmoreland's relief.[50]

By the end of 1966, the number of airfields and airstrips had grown to 282, which represented an increase from 243 listed airfields in July. In I Corps, the Seabees also improved An Hoi, Duc Pho, and Quang Ngai to C–130 capability, and fifteen other airfields throughout South Vietnam received similar priority listing. In November, MACV listed over sixty airfields requiring upgrading to C–130 capability, and the command expected to upgrade twenty-four of these by mid-1967.[51]

[48] Ltr, Dunn to CG, USARV, 25 Jun 66, sub: C–130 Airfield Requirements, box 5, 69A/702, RG 334, NARA.

[49] MACV History, 1966, pp. 302–03; Msg, CG, I FFV, to CG, USARV, 18 Aug 66, sub: Landing Mat, box 5, 69A/702, RG 334, NARA.

[50] MACV History, 1966, pp. 303–05; Quarterly Hist Rpts, 1 Apr–30 Jun 66, MACDC, pp. 20, 23–24, 1 Jul–30 Sep 66, MACDC, pp. 15–16, and 1 Oct–31 Dec 66, MACDC, pp. 8–9, 24; Tregaskis, *Building the Bases*, pp. 304–06.

[51] MACV History, 1966, pp. 300, 305.

Tunnels

During search-and-destroy operations, U.S. forces often came across enemy base areas containing vast networks of bunkers and tunnels. These networks had evolved over time as a natural response by the guerrillas to the advantages in aircraft and artillery held by the French, then the South Vietnamese, and finally the Americans. While U.S. units could move or destroy caches of supplies and munitions with relative ease, they had to develop individual and unit skills in the techniques of detecting, penetrating, and destroying the well-concealed bunker and tunnel complexes. Specially trained teams were established to search the tunnel complexes for prisoners, equipment, and documents. The soldiers in these teams, usually made up of men of small physical stature because the Vietnamese built entrances no larger than eighteen inches, proudly called themselves "tunnel rats." Combat engineers contributed men, equipment, and the demolitions expertise to destroy the enemy tunnels.[52]

As allied operations increased during 1966, the troops discovered even more extensive tunnel complexes. The local Viet Cong used hastily built simple, shallow structures, while larger forces established well-constructed excellent camouflaged systems usually found in uninhabited areas. No two tunnel complexes were exactly alike, and lengths varied from about 6 to over 4,300 yards. Passageways leading from the small entrances from well-concealed, hidden trap doors expanded to about 2 feet wide and 2½ to 3 feet high and extended in straight sections to about 50 feet long. The sections joined at various angles to one another, thus forming a zigzag pattern. This pattern served to protect the Viet Cong from observation. It also protected them from shock waves caused by explosives dropped into the tunnel, from shrapnel of detonating grenades, from direct-fire weapons, and made it easier to ambush tunnel rats during their search. The larger and more permanent tunnel complexes, especially those in the war zones, were elaborate, having as many as four distinct levels that held compartments usable as quarters, hospitals, and mess facilities. Rooms discovered during Operation CRIMP measured approximately 4 feet by 6 feet by 3 feet high and were found about every 100 yards. Shelves were provided along one side wall together with various types of seats. In some cases, air shafts were dug inside by rodents held against the tunnel roof in cages. Some tunnel complexes contained facilities for manufacturing and storing war materials. Booby traps were used extensively, both inside and outside the entrance and exit trap doors. Often, grenades placed in trees near the exit trap doors could be activated by pulling a wire from under the trap door or by the trap door itself.[53]

Moving from ad hoc methods practiced during CRIMP, allied units developed techniques and teams to deal with tunnels. Two-man teams usually explored the

[52] Ploger, *Army Engineers*, p. 92; Sharp and Westmoreland, *Report*, p. 122; Maj. Glen H. Lehrer, "Viet Cong Tunnels," *Military Engineer* 60 (July-August 1968): 244.

[53] Rpt, MACV, 18 Apr 66, sub: Lessons Learned no. 56: Operations Against Tunnel Complexes, pp. 1–8, Historians files, CMH; Ploger, *Army Engineers*, p. 94; Lehrer, "Viet Cong Tunnels," pp. 244–45; Capt. Francis E. Trainor, "Tunnel Destruction in Vietnam," *Military Engineer* 60 (September-October 1968): 341; Diary of an Infiltrator, Extracts from Captured Diaries, Dec 66, U.S. Mission in Vietnam, box 1, 70A/782, RG 334, NARA.

A 1st Division soldier enters a tunnel during Operation CRIMP.

tunnels, one member staying at the entrance and the other descending into the tunnel. Equipped with a telephone, communications wire, compass, bayonet, flashlight, and pistol, the man in the tunnel explored the network, keeping in communication with his partner at the entrance. Riot-control chemicals and acetylene gas—along with explosives—appeared to be the best way to deny use of the tunnels to the enemy. In the 1st Division, tunnel destruction was assigned to the division's chemical officer, but the division engineer soon assumed most of this responsibility. It also became obvious that such an unnatural and stressful task should be given to volunteers. In April 1966, MACV incorporated lessons learned during CRIMP in a document that spelled out recommended techniques to detect and destroy tunnel complexes, especially those found in the war zones and Viet Cong base areas.[54]

Combat engineers on the scene came forth with proposals to neutralize the tunnels. Colonel Sargent, commander of the 1st Engineer Battalion, believed the best approach lay in denying the enemy use of a tunnel instead of trying to collapse it with explosives. It took large quantities of explosives to destroy tunnels, and Sargent suggested using Mighty Mite smoke blowers to find the

[54] ORLL, 1 Feb–30 Apr 66, 1st Inf Div, p. 20; Operations Against Tunnel Complexes, pp. 9–13; Ploger, *Army Engineers*, p. 94; Tom Mangold and John Penycate, *The Tunnels of Cu Chi* (New York: Random House, 1985), pp. 101–03.

exits, then place CS gas sacks inside the tunnel and a small explosive charge at each exit. Detonating explosives and gas simultaneously, he believed, would seal the tunnel and trap the riot-control tear gas. This method worked well in collapsing tunnels with less than eight to ten feet of overburden.[55]

The acetylene gas tunnel demolition kit looked promising. The kit, which originated in a MACV request for help in November 1964 and was developed by the U.S. Army Munitions Command's Picatinny Arsenal in Pennsylvania, worked on the principle of mixing calcium carbide and water to produce a highly explosive acetylene gas. Mighty Mite or other blowers pushed the gas into the tunnel. A small explosive charge detonated the combination of the gas and oxygen.[56]

A Department of the Army team, consisting of Maj. Jack E. Mowery from the Chief of Engineers and two civilians from Picatinny Arsenal, arrived in Vietnam in May 1966 to test the system and train combat engineers in its use. The team gave a three-day training course at Di An for selected troops from the 1st, 65th, 168th, and 588th Engineer Combat Battalions. A similar course at An Khe followed for members of the 8th and 70th Engineer Combat Battalions and Company A, 326th Airborne Engineer Battalion. In turn, these teams were expected to train other tunnel destruction teams.[57]

The Department of the Army team also tested the kit in the field. Near the village of Ba Ria, some thirty-one miles north of Vung Tau, the 173d Airborne Brigade found a tunnel complex, heavily fortified trenches, and a machine gun bunker. The 173d Engineer Company and tunnel demolition troops from the 588th Engineer Battalion spent two days exploring the tunnels, and after removing enemy material attempted to destroy the complex, with varying degrees of success. Destruction of an enemy-occupied tunnel complex found by the 25th Division in the Ho Bo Woods north of Cu Chi met with more success. While the assistant division commander and staff members assembled to observe the demonstration, Company C, 65th Engineer Battalion, sealed the entrances. The combination of three acetylene generators and a Mighty Mite blower pushed the gas through a hose into the tunnel. The explosion set off by electric blasting caps produced good results. About eight feet of overburden dropped into the tunnel, and loose earth sealed the entrances.[58]

Satisfied with the results, the U.S. Army, Vietnam, adopted the system for immediate use. The equipment brought by the Army team remained in Vietnam, with more sets to follow. Acetylene gas tunnel demolition kits were

[55] Ltr, Lt Col Howard L. Sargent to Lt Gen William F. Cassidy, OCE, 13 Jun 66; Ltr, Sargent to Cassidy, 16 Jul 66, both in OCE Hist Ofc.

[56] Rpt, DA Tunnel Destruction Team, sub: The Employment of Acetylene in the Destruction of Viet Cong Tunnels, n.d., pp. 1–2, Historians files, CMH; Tech Info Rpt 33.8.7.5 HQ, Army Materiel Command, Oct 66, sub: Interim Report, Tunnel Destruction Demolition Set, XM69, pp. 1–8, box 8, 84/051, RG 319, NARA.

[57] Rpt, DA Tunnel Destruction Team, pp. 3–5; Ltr, HQ USARV, AVEN-O, to USARV G–2, G–3, CGs, I FFV, II FFV, and 1st Div, and CO, 3d Bde, 25th Div, 2 Jul 66, sub: Tunnel Destruction, incl. 7, tab F, OCE Liaison Officer Trip Rpt no. 4, 23 Sep 66.

[58] Rpt, DA Tunnel Destruction Team, pp. 6–17; Rpt, 65th Engr Bn, n.d., sub: Destruction of Tunnels and Bunkers, p. 12, OCE Hist Ofc.

issued based on one tunnel destruction team for each division and four to the 18th Engineer Brigade. The command also charged the engineer brigade to provide teams and equipment to support the separate brigades and to develop a light acetylene system.[59]

But demolition teams continued to experience mixed results in their attempts to destroy the complexes. Returning to the Ho Bo Woods in support of a 25th Division operation in late June, the team from the 65th Engineer Battalion encountered sniper fire. The battalion reported that the bulky acetylene kit should not be used in assault demolition work, but only in more deliberate denial operations. The 588th Engineer Battalion had more success in supporting the Australians and other units. In July, a team helped the 45th Engineer Group to destroy six bunkers near Tuy Hoa "with 100% effectiveness." In November, the 588th trained more four-man teams from the 1st, 15th, 27th, 86th, and 168th Engineer Battalions and the 919th Engineer Company, 11th Armored Cavalry.[60]

Overall, results were frequently less than desired because of technical and tactical factors. General Ploger noted that operators had difficulty obtaining a complete mix of the explosive gases. Using oxygen when the acetylene was generated produced better results but added to logistical requirements. U.S. commanders preferred to carry regular explosives, which were no heavier than the generators and oxygen bottles and could stand rougher treatment. The 65th Engineer Battalion had some success with bangalore torpedoes, five-foot-length pipe-type explosives normally joined together to breach barbed-wire obstacles, by placing them throughout the tunnels. Because tunnel rats usually searched the tunnels before destruction, some commanders felt this obviated the need for acetylene generators. Deliberate tunnel destruction with the generators also took time. This conflicted with the preference of most tactical commanders to move on rather than to keep their troops in a recently won area. As a result, the short duration of U.S. operations allowed the Viet Cong to reoccupy and rebuild their tunnels. The Viet Cong later boasted of the invincibility of their complexes. Meanwhile, the engineers, whether using different types of explosives or acetylene generators or attempts to flood the tunnels, continued to seek faster and better means of destruction.[61]

[59] Rpt, DA Tunnel Destruction Team, p. 17; Ltr, HQ USARV, 22 Jul 66, sub: Tunnel Destruction.

[60] Rpt, 65th Engr Bn, sub: Destruction of Tunnels and Bunkers, pp. 12–14; ORLLs, 1 May–31 Jul 66, 588th Engr Bn, pp. 1–2, 1 Aug–31 Oct 66, 588th Engr Bn, p. 2, and 1 Nov 66–31 Jan 67, 588th Engr Bn, pp. 1–2; Combat Activities and Operational Support, incl. 11, pp. 3–4, OCE Liaison Officer Trip Rpt no. 5.

[61] Ploger, *Army Engineers*, p. 94; Combat Activities and Operational Support, incl. 11, pp. 3–4, OCE Liaison Officer Trip Rpt no. 5; Rpt, 65th Engr Bn, sub: Destruction of Tunnels and Bunkers, pp. 7, 10; ORLL 8–66, DA, Engineer Notes no. 1, 13 Oct 66, p. 26; USARV Combat Lessons Bull, no. 5, 8 Feb 67, pp. 3–4; Sedgwick D. Tourison, *Talking with Victor Charlie: An Interrogator's Story* (New York: Ivy Books, 1991), pp. 282, 287.

The Land-Clearing Weapon

Since the heavily forested areas of Vietnam also concealed Viet Cong base areas, MACV planners agreed something had to be done to deny the sanctuaries, either by chemical defoliants, burning, or simply cutting and clearing the forest growth. The use of herbicides began with the early American buildup in 1961. In considering various techniques to turn the tide against the insurgents, the Kennedy administration authorized the South Vietnamese to run tests of a chemical plant killer. Helicopters and fixed-wing aircraft sprayed the herbicide Dinoxol along a section of road north of Kontum and a section of Highway 13 north of Saigon. Although the results disappointed the Americans, President Diem became a staunch supporter of the defoliation program. Despite concern that the United States could be charged with employing chemical or biological warfare, President Kennedy approved the use of defoliants selectively and under careful control. In January 1962, the Air Force deployed spray-equipped C–123s to South Vietnam under the code name Operation RANCH HAND. Similarly, the South Vietnamese deployed helicopters on defoliation missions. The controversial program gained momentum in 1966, improving observation from both the air and ground and the defense of fixed bases. Agent Orange proved the most powerful of the herbicides, killing foliage and producing drying in four to six weeks. Agent Blue, a drying agent on contact, resulted in leaves drying up and dropping off, but the leaves could grow back. Still, most of Vietnam remained a verdant land, and even in the defoliated areas the enemy had some tree canopy and reoccupied his bases. Accordingly, MACV formulated plans to deny the Viet Cong his forest sanctuaries permanently by cutting and clearing with specially equipped bulldozers operated by engineer units.[62]

General Westmoreland's interest in land clearing went back to 1965 while attending one of the Hawaiian deployment conferences. By a chance encounter, he met a B. K. Johnson, who claimed to have cleared rain forests

[62] William A. Buckingham Jr., *Operation RANCH HAND: The Air Force and Herbicides in Southeast Asia, 1961–1971* (Washington, D.C.: Office of Air Force History, United States Air Force, 1982), pp. 11–12, 16–17, 20–22, 30–31, 121–29, 185; Bowers, *Tactical Airlift*, pp. 89–90, 392–93; Schlight, *Years of the Offensive*, pp. 42, 91–92; F. Clifton Berry Jr., *Gadget Warfare*, The Illustrated History of the Vietnam War (New York: Bantam Books, 1988), pp. 48–57; MACV History, 1966, pp. 774–75; Westmoreland, *A Soldier Reports*, p. 280. Spraying the herbicides from aircraft reached its height in 1967 and 1968. Spraying continued at a reduced rate until April 1970 when use of Agent Orange was halted. By May 1971 all spraying stopped. Meanwhile, in October 1970 Congress directed the Defense Department to commission the National Academy of Science to review the herbicide program. In addition, the Engineer Strategic Studies Group (later the Engineer Studies Center) was requested to study the military effects of herbicides. The Studies Group was picked because of the large background of information on hand of the geology, climatology, flora of the area, other surveys of the country, and the capability to do war-gaming. This completed study sparked more controversy when it concluded herbicides could be useful in future conflicts depending on a variety of factors. For more on Air Force and the Engineer Studies Center participation, see Bernard C. Nalty, *Air War Over South Vietnam, 1968–1975*, United States Air Force in Southeast Asia (Washington, D.C.: Air Force History and Museums Program, United States Air Force, 2000), and Baldwin, *Engineer Studies Center,* pp. 172–78.

in Australia by shattering big trees with a crane mounting a 5,000-pound steel ball on a chain. This intrigued the MACV commander. Returning to Saigon he dispatched Capt. Robert L. Stuart, MACV Engineer Section, to observe the clearing operations on the King Ranch property in Australia and to assess its possible application to military operations. While visiting the ranch, Stuart observed large D8 and D9 bulldozers, two or four in a tandem hook-up dragging a chain, or a large hollow steel ball and ship anchor chain, or a chain and a wire rope. The nine-foot-diameter ball kept the middle of the chain up off the ground. Its weight also prevented the chain from sliding over the top of bent trees. The bulldozers were also modified with a reinforced canopy to protect the operator, reinforced push bars and undercarriages, and an extension on the blade. The simple extension on the blade, locally called a tree horn, allowed the operator more latitude in pushing down a tree. By positioning the blade high enough so that the bulldozer did not sit on the tree's root system, the full force of the tractor could knock down a large tree in less than one minute. In late September 1965, Stuart returned and reported to Westmoreland that the procedures used in Australia could be effectively used in Vietnam. Westmoreland agreed and tasked U.S. Army, Vietnam, to obtain similar equipment from the United States for tests.[63]

In February 1966, the Department of the Army offered to obtain six sets of a special land-clearing blade, cab guard and screen, instead of the equipment requested by MACV. The Rome Plow Company of Cedartown, Georgia, had developed a special cutting blade for mounting on a standard military bulldozer. The sharp blade cut medium trees and brush at or near ground level, and a "stinger," which protruded from one corner of the blade, split longer trees. MACV still preferred the King Ranch idea and heavier bulldozers because the equipment could clear seven acres an hour compared with two for the Rome plow. The Department of the Army, however, suggested testing the Rome Plow Company blades first.[64]

In late June, a company representative arrived to brief the engineers. On 1 August, four Rome plow blades mounted on Allis Chalmers HD16M tractors reached the port of Saigon. The 169th Construction Battalion ran controlled tests in the Long Thanh area from 9 through 15 August and reported favorable results. The 588th Engineer Combat Battalion ran the second test from 17 to 27 August at the abandoned Filhol Rubber Plantation near the 25th Division's Cu Chi base camp. On the tenth day, three of the bulldozers struck mines, causing extensive damage but no casualties. The test ended the next day. Results revealed that the bulldozers equipped with Rome plows could clear

[63] Quarterly Hist Rpt, 1 Jul–30 Sep 66, MACDC, p. 18; Ltr and incls, MACV to CofS Army, no. 0172, 5 Feb 66, sub: Clearing of Rain Forests in Republic of Vietnam, CMH; Historical Notes, no. 1, 24 Oct 65, p. 11, Westmoreland Papers, CMH; Interv, U.S. Army Center of Military History with Gen William C. Westmoreland, 6 Dec 89, p. 102, CMH; Interv, Bower with Ploger, 8 Aug 67, p. 53; Interv, Sowell with Ploger, 21 Nov 78, sec. 9, p. 7; Westmoreland, *A Soldier Reports*, p. 280; Ploger, *Army Engineers*, pp. 97–98.

[64] Ploger, *Army Engineers*, p. 98; Quarterly Hist Rpt, 1 Jul–30 Sep 66, MACDC, p. 19; Ltr, Raymond MACDC-AD to CG, USARV, sub: Clearing Rain Forest in RVN, 11 Jun 66, box 11, 69A/702, RG 334, NARA.

Rome plows clear vegetation during Operation PAUL BUNYON.

trees at approximately twice the rate of a standard bulldozer. Since the equipment worked best as a team, the 79th Engineer Group assigned all four plows and operators to the 557th Light Equipment Company. Soon the plows went to work clearing 500-yard-wide strips around base camps and 100-yard-wide strips on both sides of key roads. With their value now proven and capabilities made known, the team's Rome plows could not keep up with the requests.[65]

In September 1966, all activities pertaining to the Rome plows took on the code name PAUL BUNYON. Westmoreland appointed General Raymond to chair a task force to develop a land-clearing plan. Raymond decided that the best approach was the formation of special teams made up of approximately one hundred men and thirty D7E tractors and plows. Estimates based on experience projected that such a team could clear over 250 acres a day of heavy brush and scattered trees in the Viet Cong sanctuaries. In turn, the 18th Engineer Brigade recommended fifty-six additional Rome plow kits and disk harrows to keep areas free from regrowth. In early October, Westmoreland reluctantly agreed that the only way he could get the scarce bulldozers as soon as possible would be by holding up the deployment of three engineer battal-

[65] Quarterly Hist Rpt, 1 Jul–30 Sep 66, MACDC, p. 19; Miscellaneous Detailed Discussion, incl. 11, pp. 3–4, OCE Liaison Officer Trip Rpt no. 4; ORLLs, 1 Aug–31 Oct 66, 79th Engr Gp, 14 Nov 66, p. 10, 1 Aug–31 Oct 66, 169th Engr Bn, 1 Nov 66, p. 4, both in Historians files, CMH; ORLL, 1 Aug–31 Oct 66, 588th Engr Bn, p. 6; Msg, Raymond SOG 0798 to Cassidy, 15 Sep 66, Dunn Papers, CMH.

ions. The completed PAUL BUNYON plan called for the 18th Engineer Brigade to undertake land-clearing operations in coordination with the field forces, with the initial phase taking place in III Corps. Control of the land-clearing teams and their priorities remained with the U.S. Army, Vietnam, commander. Since large-scale land-clearing operations could literally change the face of the country, Westmoreland vetted the plan with Ambassador Henry Cabot Lodge during a Mission Council meeting.[66]

Westmoreland, emphasizing the need to "think big," still saw merit in the King Ranch ball-and-chain technique to level Viet Cong base areas. MACV requested the heavy chain from the Navy, but the Pacific Command could only provide a lighter one and one-half-inch commercial chain, which MACV claimed would not work. Although the towed ball worked well in the Australian jungle, difficulties in fabricating sets of balls and chains, the large size of the ball, troubles in transporting it, and inadequate equipment stood in the way of early success. The maintenance requirements of the heavier D9 bulldozer were also a concern. Instead, the 18th Engineer Brigade tested the Australian method of land clearing with the more common D7E bulldozers using smaller, locally fabricated steel balls, and a Navy chain.[67]

The tests of the Rome plows continued with good results. By November, three plows remained at Long Binh, clearing fields of fire and perimeter strips around the ammunition storage area. Three other Rome plows moved to Pleiku to help clear the 4th Division's new base camp. In December, military airlift delivered six more kits, four going to Long Binh and two to Pleiku, bringing the total in country to twelve. Clearing requirements for the 9th Division camp at Bearcat resulted in the move of two Rome plows from Long Binh. By the end of the year, U.S. Army, Vietnam, had placed the order for the remaining fifty Rome plows.[68]

By the autumn of 1966, operational support tasks had picked up as the tempo of tactical operations increased. By then, five engineer battalions and four companies organic to a like number of divisions, separate infantry and airborne brigades, and an armored cavalry regiment, backed by eleven engineer combat battalions and an assortment of separate companies of the 18th Engineer Brigade, kept resupply roads open, built and reopened forward airfields, and explored and destroyed enemy tunnels and bunkers. The combat

[66] Quarterly Hist Rpts, 1 Jul–30 Sep 66, MACDC, pp. 20–21, and 1 Oct–31 Dec 66, MACDC, p. 6; Msg, Ploger MAC 7326 to Besson, 23 Aug 66, sub: Information on Rome Plow; Msg, Raymond SOG 0798 to Cassidy, 15 Sep 66, both in Dunn Papers, CMH; MFR, MACJ02, 23 Aug 66, sub: Forest Clearing; DF, Asst CofS, J–4 to Dir of Cons, sub: MACV Task Force on Land Clearing Operations, 25 Aug 66, both box 12, 69A/702, RG 334, NARA; MACV Planning Directive 10–66, Opn PAUL BUNYON, 23 Sep 66, pp. 1–2; Memo, MACDC for Dep COMUSMACV, 3 Oct 66, sub: Paul Bunyon Program, both in 69A/702, RG 334, NARA; Msg, COMUSMACV 44465 to CGs, II FFV and USARV, 6 Oct 66, sub: Control and Use of Rome Plows, box 5, 69A/702, RG 334, NARA.

[67] Ploger, *Army Engineers*, p. 98; Quarterly Hist Rpts, 1 Jul–30 Sep 66, MACDC, p. 20, and 1 Oct–31 Dec, 66, MACDC, pp. 6; Interv, Sowell with Ploger, 21 Nov 78, sec. 9, pp. 7–9; Interv, Bower with Ploger, 8 Aug 67, pp. 53–54.

[68] Quarterly Hist Rpt, 1 Oct–31 Dec 66, MACDC, pp. 6–7; Sharp and Westmoreland, *Report*, p. 122.

engineers also applied new developments in accomplishing their missions. These included the T17 membrane matting for forward airfields, various tunnel exploration kits, and specially designed Rome plow bulldozer kits to clear the land. The ensuing months would see an even greater role played by the engineers in combat operations.

7

The Campaign Widens, October 1966–June 1967

The American ground offensive in Vietnam dates from the late weeks of summer 1966, when General Westmoreland finally received the troops he needed to challenge the in-country enemy sanctuaries and inflict heavy casualties. This influx of troops had come after a lengthy pause in deployments, when Westmoreland had been reduced to carefully husbanding his resources for about six months and fighting a transitional campaign with limited forces. Starting in July, however, the flow resumed of infantry, armor, artillery, and their supporting forces, adding importantly to the pressure that could be brought to bear in the Central Highlands, on the II Corps coast, and in the corridors leading out from Saigon. By January, the Army's infantry, tank, and armored cavalry strength had nearly doubled from summer levels, and engineer strength had risen by almost a third to twenty-three battalions. With these reinforcements, the thrust of U.S. strategy shifted, becoming one of operating at a rapidly rising tempo and giving no respite to the Viet Cong and the North Vietnamese—in short, of expanding the war on a major scale with the expectation of significant results. The plan was to launch a heavy series of operations just after the start of the new year, but the offensive began sooner than Westmoreland expected.[1]

Attleboro

In October 1966, the discovery in Tay Ninh Province of a Viet Cong division and a North Vietnamese regiment led to the largest U.S. operation of the war to that point. The trigger was an American element new to Vietnam, the 196th Light Infantry Brigade, which, while searching for rice and other Communist supplies on the southern fringes of War Zone C, became dispersed in inhospitable terrain. Seeing a tantalizing opportunity to destroy an American unit, the enemy turned on the 196th. The battle that followed under the code name Operation Attleboro involved over 22,000 U.S. and allied troops, including the 1st Infantry Division, two brigades from the 4th and 25th Infantry Divisions, the 173d Airborne Brigade, the new 11th Armored Cavalry Regiment, and the 196th. Control of the operation passed from the 196th to the 1st Division and finally to General Seaman's II Field Force, making it the first Army operation in South Vietnam controlled by a corps-size headquarters. The series of engagements extended into late November. The enemy took serious casualties and lost huge quantities of weapons, ammunition, and supplies. In one battle, the 1st Division's 1st Battalion, 28th Infantry, repulsed an

[1] MacGarrigle, *Taking the Offensive*, pp. 13–15; Sharp and Westmoreland, *Report*, p. 131.

assault by two North Vietnamese battalions, inflicting heavy casualties on the attackers and discovering a large cache of enemy ordnance nearby. The Viet Cong division was so badly mauled in the fighting that it would not reappear in combat until the following spring.[2]

ATTLEBORO brought forth heavy demands for engineers to destroy enemy tunnels and bunkers, clear jungle, repair roads and airfields, and build bridges. Directly involved were the 1st Engineer Battalion, 1st Division; the 65th Engineer Battalion, 25th Division; the 173d Engineer Company, 173d Airborne Brigade; and the 175th Engineer Company, 196th Infantry Brigade. The 3d Brigade, 4th Division, which had just arrived in Vietnam and participated later in the operation, was supported by Company D, 27th Engineer Combat Battalion, 79th Engineer Group.[3]

Missions performed by Colonel Kiernan's 1st Engineer Battalion during ATTLEBORO reflected the support given by other engineer units. Initial assignments included upgrading nine miles of road between Tay Ninh and Suoi Da and the construction of a ford and later a bridge over a stream north of Suoi Da. Since the Communists usually tried to destroy all bridges that they did not find useful, Company D built a combination timber trestle and M4T6 dry span bridge to cross the sixty-three-foot gap. The design allowed for the forty-five-foot dry span to be removed and replaced on short notice. The engineers left enough lumber at the site so that villagers could build a light bridge to replace the dry span for use by bicycles and motor scooters. The 1st Engineer Battalion also removed a low-capacity Eiffel bridge and replaced it with a two hundred-foot panel bridge across the Saigon River at Dau Tieng and opened twelve and a half miles of road to the town, allowing movement of artillery and troops to the Michelin Plantation. While Company A concentrated on the bridge, Company C bulldozed a wide swath of rubber trees to reduce the possibility of ambushes. On 20 November, Company C moved by helicopters to the top of Nui Ong Mountain. There in a little over one day, the engineer troops cut vegetation and blasted and leveled the peak into a firing position for two artillery batteries.[4]

The bridge across the Saigon River presented a major engineering challenge. To make room for the higher-capacity panel bridge (a Military Class 60 bridge to support heavy division traffic), Company A had to remove the old bridge without damaging its two piers. By carefully using acetylene torches and steel-cutting charges, welders successfully dropped all three spans. In the meantime,

[2] Sharp and Westmoreland, *Report*, p. 29; MACV History, 1966, pp. 386–87; ORLL, 1 Nov 66–31 Jan 67, II FFV, 25 Apr 67, p. 19, Historians files, CMH; Lt. Gen. Bernard W. Rogers, *Cedar Falls–Junction City: A Turning Point*, Vietnam Studies (Washington, D.C.: Department of the Army, 1974), pp. 8–12; and especially MacGarrigle, *Taking the Offensive*, pp. 31–59.

[3] ORLLs, 1 Aug–31 Oct 66, 27th Engr Bn, 31 Oct 66, p. 2, 1 Aug–31 Oct 66, 4th Inf Div, 22 Dec 66, p. 46, and 1 Nov 66–31 Jan 67, 3d Bde, 4th Inf Div, 23 Feb 67, p. 18. All in Historians files, CMH.

[4] This operation was code-named BATTLE CREEK for the 1st Division. Unless otherwise noted, this section is based on AAR, Opn BATTLE CREEK, 1st Engr Bn, 23 Dec 66; Ltr, Lt Col Joseph M. Kiernan to All Men 1st Engineer Bn, Thanksgiving Day 1966, sub: 1st Engineer Actions in Operation Battle Creek, both in OCE Hist Ofc; *Always First, 1965–1967*, "Prepared for the Unexpected" and "The Bulldozer in the Attack."

the troops rebuilt the abutments and used CH–47 Chinook helicopters to position I-beam caps on the piers. The 617th Panel Bridge Company readied the bridge for assembly, and work crews, now working around the clock, completed the bridge on 21 November.

During ATTLEBORO, elements of the 1st Engineer Battalion accompanied the combat forces and more than once served as infantry. When the 1st of the 28th Infantry uncovered the large enemy cache, a platoon from Company C descended seventy-foot ladders from Chinook helicopters and hacked out a clearing in the jungle. Helicopters shuttled in and out of the landing zone to remove the captured material. An engineer squad used satchel charges to destroy four enemy bunkers, a machine shop, and a hospital. When the 1st Division's infantry battalions became heavily committed, Colonel Kiernan assigned company-size engineer task forces in the role as infantry to protect artillery firebases.

Colonel Kiernan led the 1st Engineer Battalion, 1st Infantry Division, from 16 August 1966 to 3 June 1967 when he was killed in a helicopter accident.

By Thanksgiving, ATTLEBORO had drawn to a close, and the units returned to their combat bases. Although frequently under fire, the 1st Engineer Battalion did not suffer casualties and claimed to have killed nineteen Viet Cong. As the year ended, the battalion busied itself with preparations to support a major clearing operation in the Iron Triangle. ATTLEBORO proved the time had come to use larger forces and the added firepower now available to shift the search-and-destroy operations to the corps level.[5]

The Western Highlands

In the western highlands, General Larsen's I Field Force continued its series of border surveillance operations in Pleiku and Kontum Provinces. In mid-October, elements of the 4th Infantry Division under the command of Maj. Gen. Arthur S. Collins and the attached 3d Brigade, 25th Infantry Division, launched PAUL REVERE IV in the hope of finding the enemy and his major enemy supply base in the Plei Trap Valley, a jungle-covered river basin some twelve and a half miles wide, marked on the west by the Nam Sathay River and

[5] Rogers, *Cedar Falls–Junction City*, p. 12.

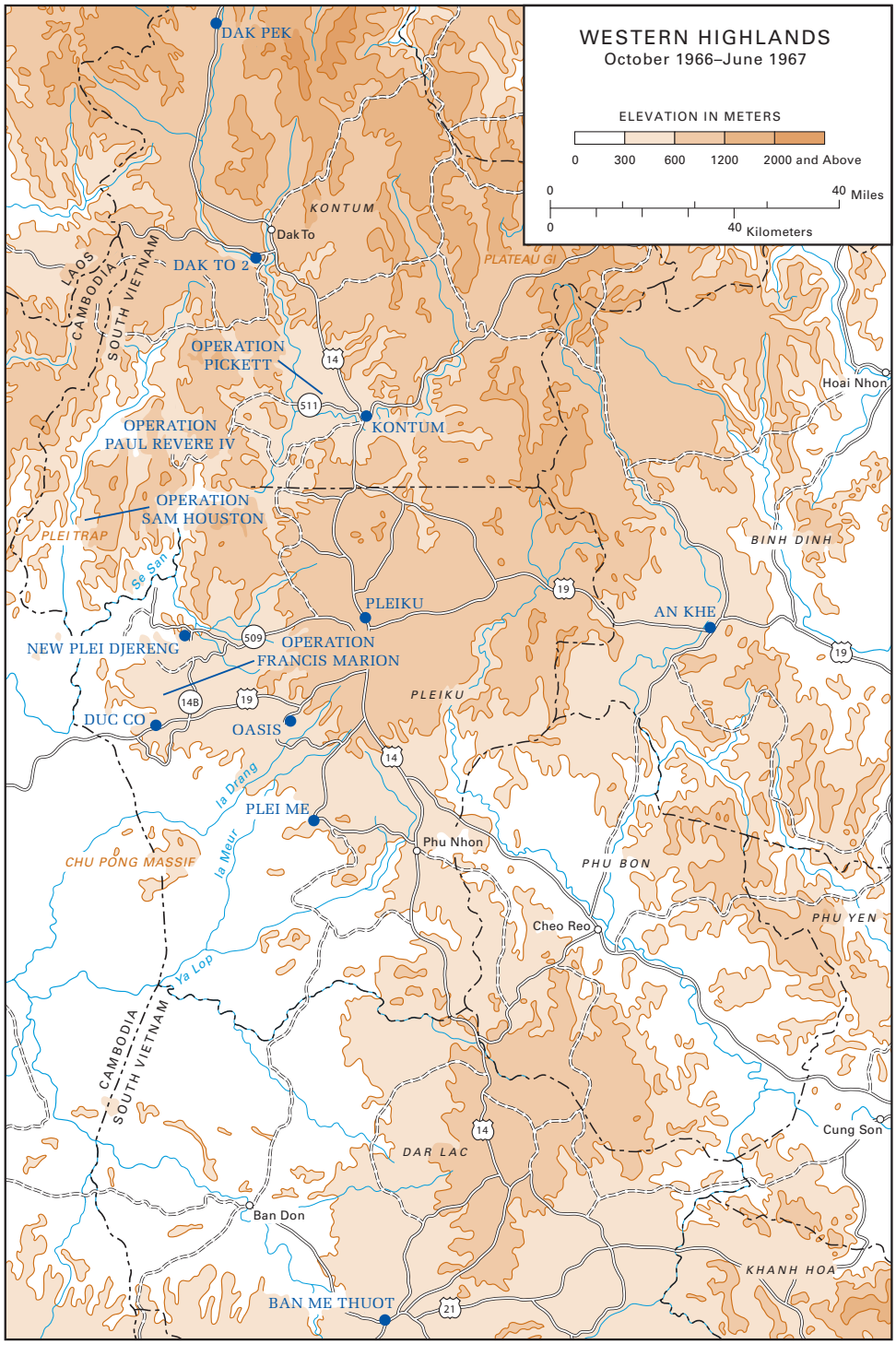
Cambodia, and on the east by the Se San River. The 2d Brigade, 1st Cavalry Division, screened the attacking force's southern flank in the Duc Co area. Heavy resistance was encountered, and in early December General Larsen airlifted the 1st Brigade, 101st Airborne Division, from Phu Yen Province into the northern Plei Trap. Assaults on well-fortified and dug-in enemy bases typified the action to the end of the year. PAUL REVERE IV disrupted a planned North Vietnamese offensive, inflicting over 1,200 enemy killed and captured, but the sharp engagements and enemy sniping caused substantial American losses. The remote and rough terrain and restrictions placed on operating near the border made the operation that much more difficult. By the second week in December, the North Vietnamese had vanished into Cambodia.[6] (*Map 16*)

On New Year's Day 1967, the 4th Division resumed the border campaign with SAM HOUSTON, but the campaign did not get going until the division crossed the Nam Sathay River in mid-February. By then, enemy activity in the area increased sharply, and several battalion-size engagements took place before the operation ended in early April. Maj. Gen. William R. Peers, who took over command of the 4th Division in early January, claimed the enemy was hurt severely, but because of the dense, rugged terrain, which limited the full use of American firepower, the area favored the enemy during the vicious close fighting. PAUL REVERE IV and SAM HOUSTON featured the building of landing zones and firebases and the opening of a supply route to the Se San, bridging the river, and extending the road west to a newly opened firebase. Because the 4th Division did not enjoy the vast airmobile resources of the 1st Cavalry Division, it relied heavily on roads for resupply. During the second phase of SAM HOUSTON, enemy mines made it increasingly difficult to keep the roads open west of Pleiku City. Although combat engineers swept the roads daily, fifty-three vehicles suffered mine damage, with over 90 percent of the incidents taking place between 14 February and 5 April. The 4th Division then moved into another frontier campaign in Operation FRANCIS MARION, which would run until October 1967, with the aim of destroying enemy forces and tracking down food and ammunition caches, rest areas, and infiltration routes.[7]

Directly supporting the attack into the Plei Trap Valley were Company B from Lt. Col. Norman G. Delbridge's 4th Engineer Battalion; Company D, 65th Engineer Battalion; and Company C, 20th Engineer Combat Battalion. Company B carried out close combat support missions, building and improving supply roads and clearing helicopter landing zones as the division's 2d Brigade advanced into the Plei Trap. In early December, the company built a pioneer road known as Route 509B from Plei Djereng to the Se San River, a

[6] MACV History, 1966, pp. 378–79; ORLLs, 1 Aug–31 Oct 66, I FFV, pp. 10–12, 17–22, 23–28, and 1 Nov 66–31 Jan 67, I FFV, pp. 9–18. For more on operations in the highlands, see MacGarrigle, *Taking the Offensive*, pp. 61–76, 166–77.

[7] MACV History, 1967, pp. 375–78; Interv, George L. MacGarrigle, CMH, with Lt Gen William R. Peers, CG, 4th Inf Div, 21 Oct 75, pp. 1–2, Historians files, CMH; ORLLs, 1 Nov 66–31 Jan 67, I FFV, pp. 9–18, and 1 Feb–30 Apr 67, I FFV, 30 May 67, pp. 19–20, Historians files, CMH; AAR, Opn SAM HOUSTON, 4th Inf Div, 16 May 67, with Cover Ltr, Maj Gen William R. Peers, 16 May 67, Historians files, CMH.


WESTERN HIGHLANDS
October 1966–June 1967
ELEVATION IN METERS
0
300
600
1200
2000 and Above
0
40 Miles
0
40 Kilometers
DAK PEK
KONTUM
Dak To
DAK TO 2
LAOS
CAMBODIA
SOUTH VIETNAM
PLATEAU GI
OPERATION PICKETT
14
511
KONTUM
Hoai Nhon
OPERATION PAUL REVERE IV
OPERATION SAM HOUSTON
PLEI TRAP
Se San
BINH DINH
19
PLEIKU
AN KHE
NEW PLEI DJERENG
509
OPERATION FRANCIS MARION
PLEIKU
19
14B
DUC CO
OASIS
14
Ia Drang
PLEI ME
Phu Nhon
CHU PONG MASSIF
Ia Meur
PHU BON
PHU YEN
Cheo Reo
Ya Lop
CAMBODIA
SOUTH VIETNAM
14
Cung Son
DAR LAC
Ban Don
KHANH HOA
BAN ME THUOT
21

Map 16

Aerial view the Se San River bordering the rugged Plei Trap Valley, the area where the North Vietnamese Army had a major supply base

distance of fourteen miles. When the 4th Division pushed across the Se San to the west, an armored vehicle launched bridge and an M4T6 dry span were used to span the river. From mid-November to early December, elements of Company C, 20th Engineer Battalion, cut a three-mile extension of the road through thick jungle west of the Se San. A firebase for 4th Division artillery was built and some clearing and surveying were done for a C–130 airfield. Two bulldozers equipped with Rome plow blades were used extensively for the first time in this area to level the dense vegetation. The Rome plows made the initial cut and a bulldozer followed doing the rough road construction. Demolitions were taken along to fell trees considered too big for the Rome plows, but it soon became apparent the plows could easily knock down any sized tree much

faster than the time required to do the demolition work. In early January, part of Company C returned to the Plei Trap to extend Route 509B another four miles to the northwest and built several firebases. This time there were two Rome plows and two bulldozers to do the clearing. The road was improved from pioneer status into a well-shaped, adequately drained one-way road. Altogether, the engineers placed six armored vehicle launched bridges and three M4T6 dry span bridges along Route 509B. Likewise, Company D, 65th Engineer Battalion, supported the advance of the 25th Division's 3d Brigade as it advanced into the Plei Trap. Platoons were attached to each of the infantry battalions, and tasks included clearing landing zones, destroying enemy bunkers, and building defensive perimeters and helipads.[8]

Close support from the 4th Division's engineers intensified during Operation SAM HOUSTON. Engineer squads from Company A, 4th Engineer Battalion, were attached to infantry battalions on a mission basis. The rest of the company, using demolitions and chain saws, cleared and improved firebases. This was a major effort, and D4B bulldozers were airlifted into the landing zones by 1st Cavalry Division CH–54 Flying Cranes. By 17 March, the company began widespread minesweep operations along major supply routes. On 4 April, elements of Company A accompanied by an infantry company and armor platoon providing security began improving Highway 19 from Duc Co to the Cambodian border. The job involved widening the existing gravel road, which was overgrown with vegetation and damaged from craters caused by artillery rounds. Two bulldozers and one Rome plow (the battalion had four Rome plows with protective cab assemblies considered sufficient to support most combat operations) cleared brush and widened and rough graded the road. Since there was some rock on the road, limited traffic during wet weather could be supported. Little contact was made with the enemy, but his presence in the area was evident when mines and trip flares were discovered. Undetected mines, however, damaged one truck and one bulldozer. Meanwhile, Company B provided one squad to each of the 2d Brigade's three infantry battalions to help clear landing zones and firebases. At the brigade's field command post, the 1st Platoon built defensive bunkers, an interior road net, and helicopter pads. Peneprime was generously applied to reduce dust at helicopter pads, refueling points, and roads. When the brigade moved west of the Se San, it became necessary to commit one engineer platoon to each infantry battalion to clear landing zones and firebases. From 14 to 22 March, the 1st Platoon replaced an armored vehicle launched bridge with a one-way timber pile bent bridge. Similarly, the 2d Platoon extracted two of the launched bridges and a dry span and then moved to Landing Zone OASIS to work on interior roads and helicopter pads. Company D, which was usually held in general support, on 6 February dispatched a squad to accompany the 2d Battalion, 35th

[8] ORLLs, 1 Aug–31 Oct 66, 4th Inf Div, 22 Dec 66, p. 47, 1 Nov 66–31 Jan 67, 4th Inf Div. 20 Mar 67, p. 30, 1 Nov 66–31 Jan 67, 3d Bde, 25th Inf Div, 14 Feb 67, pp. 29–30, 1 Nov 66–31 Jan 67, 20th Engr Bn, 12 Feb 67, pp. 3–4, 9, 17–18, all in Historians files, CMH, and 1 Nov 66–31 Jan 67, 937th Engr Gp, p. 9; Operational Support, USAECV [U.S. Army Engineer Command, Vietnam] (Prov), p. 1, incl. 7, tab R, OCE Liaison Officer Trip Rpt no. 6.

Infantry, 25th Division, when it was placed under the operational control of the 1st Brigade. Over the next seven weeks, the squad cleared thirteen landing zones. On 6 March, two D4Bs were airlifted into one landing zone to help. When the bulldozers were first placed in the landing zone there was room for only one helicopter, but after a day's work there was enough cleared area to land six helicopters. The 4th Battalion's bridge company, Company E, lent its bridging expertise in erecting, repairing, and removing M4T6 dry span and float bridges. During SAM HOUSTON, the battalion did not go unscathed. Two engineers were killed and seven wounded. Equipment losses were six 5-ton dump trucks, one bulldozer, two water supply points, one tankdozer, a trailer, and a fuel pod.[9]

During FRANCIS MARION, Companies A and B of the 4th Engineer Battalion continued sweeping for mines, clearing landing zones, firebases, and helipads, carrying out road maintenance and improvements, and working on base development at Dragon Mountain. Both companies built two new east–west roads running from Highway 14B to the west providing access to firebases. Company A with the 1st Brigade swept Highway 19 east to Duc Co, north on Highway 14B to Route 509, then west on Route 509 to New Plei Djereng Special Forces camp. The minesweeps, which included infantry and armored cavalry escorts, emanated from several locations to allow rapid and simultaneous movement by the mine-clearing teams. On 12 April, Company A augmented with two Rome plows blazed a ten-mile pioneer road (Route 4A) from the junction with Highway 14B west to a firebase. The company then helped further develop the firebase by working on the helipad and defenses and supporting infantry battalions in clearing vegetation at landing zones and other firebases. Company B supported the 2d Brigade at OASIS by improving interior roads to all-weather use, built a 250-by-750-foot helicopter loading pad, and prepared protective berms in ammunition storage areas. On 9 April, the company, augmented by two Rome plows, cleared 800 acres for the resettlement of 10,000 Montagnard villagers. The Rome plows cleared an average of twenty-five acres per day in light to medium vegetation. Some delays were caused by small leaves from bamboo thickets clogging the bulldozers' radiator grills, which resulted in overheating and frequent stops to cool the engines. Using air-compressor hoses to blow the leaves out of the radiators helped but did not solve this problem. FRANCIS MARION would continue for another six months.[10]

Supporting the 1st Cavalry Division's 2d Brigade during its screening operation in the Duc Co area was Company B, of Colonel Olentine's 8th Engineer Battalion. The company moved with the brigade and set up operations at OASIS, where the cavalrymen encountered clouds of dust stirred by scores of helicopters landing and taking off every day. The dry season from

[9] ORLL, 1 Feb–30 Apr 67, 4th Inf Div, 15 Jun 67, p. 29, Historians files, CMH; AARs, Opn SAM HOUSTON, 4th Engr Bn, 23 Apr 67, pp. 1–9, 12, Historians files, CMH, and Opn SAM HOUSTON, 4th Inf Div, p. 7.

[10] ORLLs, 1 Feb–30 Apr 67, 4th Inf Div, pp. 29–30, 1 May–31 Jul 67, 4th Inf Div, pp. 37–38; Engineer Support of Combat Operations, 26 May 67, incl. 8, p. 4, OCE Liaison Officer Trip Rpt no. 7.

September to April was now in effect. To overcome the discomfort, flight hazards, and increased wear on engines caused by the dust, Company B answered with peneprime, generously spraying the helipads. A modification to the sticky petroleum mixture not only significantly reduced the dust but also prevented vehicle traffic from ripping up the hardened peneprime adhering to the laterite soil. Company B also developed mobile minefield kits to hasten the placement and retrieval of antipersonnel mines. The enemy's ability to move back and forth across the Cambodian border had given him a tactical advantage. As a countermeasure, U.S. troops looked more to using mines to block or canalize enemy movements, protect artillery firing positions, and strengthen ambush sites. Conventional methods, however, required large amounts of material and time, considerable drawbacks in quick-moving airmobile operations. With the mobile minefield kits—consisting of 150 small M14 antipersonnel blast mines, 6 claymore antipersonnel mines, 6 trip flares, a spool of communications wire, 18 ammunition box rods, 10 minefield markers, and 3 sledge hammers—designed for quick installation and removal, engineer squads were able to place a fifty-five-yard-wide minefield in forty-five minutes and pick it up in about the same time.[11]

Another novel weapon used by combat engineers in the western highlands were armored personnel carriers mounted with flamethrowers from the Flame Platoon, Headquarters Company, 4th Engineer Battalion. During SAM HOUSTON, three of the platoon's four flamethrower tracks and a fuel carrier were attached for nine days (24 February to 4 March) to Company A to clear ambush sites along Route 509B on both sides of the Se San. It took fifty-seven loads of napalm to burn off 55- to 110-yard strips of vegetation on each side of approximately ten miles of the road. Progress was limited to shooting only nine loads a day due to 1½- to 2-hour curing times needed for the napalm to thicken, and the engineers looked into ways for a faster incendiary mix. On 30 April, the flame platoon's four flamethrower tracks were combined with the four tankdozers from the four line companies and a tank retriever into an engineer armored task force, which initially provided security for convoys hauling sand between Dragon Mountain and Kontum City. This naturally led to guarding work crews on the roads and at bridge sites and dump trucks hauling fill, reducing the dependence on infantry and armor for security.[12]

Though the 4th Engineer Battalion did a commendable job of carrying out assignments, some equipment shortages affected operations. At the beginning of 1967, the battalion did not have any of its authorized four launchers for the rapidly erected armored vehicle launched bridges. One launcher arrived for use in SAM HOUSTON, but the shortage of three launchers seriously limited the reaction time in relocating the launched bridges. The battalion expected three new M60A1 launchers by May. During SAM HOUSTON, the shortage of 600-gallon-per-hour water purification units meant that the 1,500-gallon-per-hour unit had

[11] AARs, Opn PAUL REVERE IV, 8th Engr Bn, 26 Jan 67, p. 7, an. A, and Opn THAYER II, 8th Engr Bn, 28 Feb 67, p. 26; ORLL, 1 Nov 66–31 Jan 67, 8th Engr Bn, 31 Jan 67, pp. 4, 7–8. All in Historians files, CMH.

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

to be used on a part-time basis at the most critical location, which reduced potable water at other sites. Still, the battalion was able to supply more than 1.2 million gallons to using units during the operation. Two 600-gallon-per-hour units eventually arrived, but they were minus their components. By the end of April, the battalion was able to support the 1st and 2d Brigades with one water point each with two others at Dragon Mountain. There was still a shortage of four units. Fortunately, water points run by the 20th and 299th Engineer Battalions in the field, at project sites, and at the division base camp helped supply the needed water. On the plus side, the battalion received all of the replacement D7E bulldozers and all eight Clark 290M tractors with LeTourneau-Westinghouse scrapers authorized in the unit's modified table of organization and equipment.[13]

General engineering support to the 4th Division and other forces in the western highlands fell to Colonel Braucher's 937th Engineer Group. In November 1966, the group headquarters and elements of the 509th Engineer Company (Panel Bridge), 585th Engineer Company (Dump Truck), and 554th Engineer Company (Float Bridge) moved from Qui Nhon to Pleiku City. In a switch of areas of responsibility, the 45th Group moved to Qui Nhon and took over the eastern half of northern II Corps while the 937th Group assumed the western half of the 45th Group's area and some of the 35th Group's area, resulting in an increase of the 937th Group's area of responsibility by approximately 30 percent. With this realignment of territory, the 937th Group lost two battalions (the 19th Combat and 84th Construction), gained one (the 20th now located at the 4th Division's Dragon Mountain base camp), and retained two (the 299th Engineer Combat Battalion also near Pleiku City, and the 70th Engineer Combat Battalion at An Khe). Although down to three engineer combat battalions, the group's engineer combat companies were expected to increase by three in 1967 when the three battalions were to expand to four letter companies under the E-series of organization and equipment. In addition, the group also had several company-size and smaller units, including Company B, 84th Engineer Battalion, with the 70th Engineer Battalion at An Khe; Company D, 35th Engineer Battalion, with the 20th Engineer Battalion; and either all or parts of two light equipment companies, two panel bridge companies, one dump truck company, and one float bridge company. The attachment of the 102d Construction Support Company in March and the arrival of the 815th Engineer Construction Battalion in April increased the group's strength by 24 percent and released the combat battalions in the Pleiku City area of most of their base camp construction duties, freeing them to concentrate on tactical operations and roadwork.[14]

As the tactical situation gradually improved and U.S. and allied forces moved from reaction missions to carefully planned operations, the 937th Group followed suit with more orchestrated planning to meet the requirements of the combat forces. One of these requirements took place in the latter part of

[13] ORLLs, 1 Feb–30 Apr 67, 4th Inf Div, pp. 32–33, 1 May–31 Jul 67, 4th Inf Div, p. 39; AAR, Opn Sam Houston, 4th Engr Bn, pp. 9–10, 12.

[14] ORLLs, 1 Nov 66–31 Jan 67, 937th Engr Gp, pp. 2, 4–5, 1 Feb–30 Apr 67, 937th Engr Gp, pp. 2–3.

PAUL REVERE IV in support of the 1st Brigade, 101st Airborne Division, when it deployed into the northern Plei Trap. On 3 December 1966, group headquarters tasked the 299th Engineer Battalion under Lt. Col. Walter G. Wolfe to support the airborne brigade's search-and-destroy Operation PICKETT in Kontum Province. Company A, elements of the 554th Float Bridge Company, and Company E, 4th Engineer Battalion, were charged with building a float bridge across the Krong Poko River leading to Polei Kleng Special Forces camp west of Kontum City. Company C was to provide backup support on Route 511 west of Kontum City and Highway 14 between Pleiku and Kontum City. On the fourth, the 2d Platoon, Company A, left Pleiku and arrived at Kontum City, dropping off a grader and bulldozer at the airfield to ready it for the C–130 airlift of the airborne brigade. The next day, the platoon moved out on Route 511 to begin improving crossing sites for the trucks carrying the float bridging. The six-mile stretch was little more than a trail, which crossed many small streams and swamps. Four crossings were upgraded by using 240 feet of 36-inch culvert. One of the crossings, however, washed out after the platoon made it across. When the platoon reached the Krong Poko River, it began laying out the bridge site. The rest of the Company A task force, which departed Pleiku on 5 December, installed culvert at the washed-out site to allow passage before it washed out again. Upon arrival at the Krong Poko, the task force began constructing the float bridge. But the poor near-shore landing and lack of space there to inflate the floats made it necessary to pull the operation about a mile back from the river. Inflated floats atop bridge trucks were shuttled to the bridge site where a crane lifted the floats into the water for assembly. On completion of the 420-foot bridge in the early morning of 7 December, two platoons of Company A crossed over and began working on the short distance to the Special Forces camp while the 2d Platoon continued improving the road to the east.[15]

The 299th Battalion's support of Operation PICKETT continued at a high pitch until its termination on 21 January 1967. Company A continued to improve the Kontum airfield's taxiways, ramps, bivouac areas, and roads. On 26 December, an engineer squad was committed to the airborne brigade to carry out minesweeps and hasty road repairs northwest of Kontum City. At Polei Kleng, the company applied peneprime to helicopter landing areas, improved the airstrip to handle C–123 transports, built a refueling point, and supported the 101st Airborne Division elements at the Special Forces camp. Since there was a forward supply element at Polei Kleng, the battalion S–4 section set up a water supply point, which provided approximately 2,000 gallons of potable water a day. On 6 January, T17 membrane was placed on the airstrip, and the job was finished by the eleventh. As traffic increased on Highway 14, the wooden bridges rapidly deteriorated, and it became necessary to put Company C on repairing bridge damage as well as filling potholes on bridge approaches. As the operation began to wind down, Company C dispatched a

[15] AAR, Opn PICKETT, 299th Engr Bn, 8 May 67, pp. 1–3, 5, incl. 3 to ORLL, 1 Feb–31 [*sic*] Apr 67, 299th Engr Bn, 8 May 67, Historians files, CMH; Operational Support, USAECV (Prov), p. 1, incl. 7, tab R, OCE Liaison Officer Trip Rpt no. 6.

platoon and a bulldozer to upgrade seven miles of road so that an artillery battery that had been airlifted to a firing position could depart overland. On 20 January, Company A returned to Polei Kleng to remove the float bridge from the Krong Poko. The float bridge and the dry span were removed the next day, and the engineers returned to Pleiku.[16]

Keeping supply routes in the western highlands open and building new tactical roads were among the 937th Group's major duties. Of note was Highway 19, the eighty-one-mile supply route between Qui Nhon and Pleiku City, where heavy convoy traffic became routine. The key road, which had virtually disintegrated because of heavy traffic and weather, underwent upgrades, including new bridges, base course work, widening, and preparation for paving. Roads supporting operations west of Pleiku City to the Cambodian border were repaired to carry two-lane all-weather traffic. Increased emphasis was placed on Highway 19W from Dragon Mountain to Duc Co and Highway 14B and Route 509 between the intersection of Highway 19W to Plei Djereng, altogether forty-seven miles, the only roads leading to the western sector of the 4th Division's area of responsibility. Route 509B extended twenty-eight miles from Plei Djereng Special Forces camp into the Plei Trap Valley, and a new six-mile stretch of Route 511, formerly a trail, extended to Polei Kleng Special Forces camp. Maintaining these mostly unpaved roads became a never-ending task, especially during the rainy season.[17]

Not all bridges were erected to stay in place. The Kon Bring Bridge is an example of the detailed planning arrangements and last-minute adjustments even for a supposedly simple bridge-building task. In early November 1966, the 299th Engineer Battalion was given the task to build and remove a M4T6 dry span bridge at the hamlet of Kon Bring on Highway 14 about two miles northwest of the town of Dak To. The existing bridge, an Eiffel structure, had been destroyed in October, and the dry span would enable a team of the 539th Engineer Control and Advisory Detachment to withdraw its equipment from Dak Seang Special Forces camp, some fifteen and a half miles up the road. The engineer team had just completed building the camp and CV–2 Caribou airstrip and was ready to move to its next assignment. On 10 November, Colonel Wolfe dispatched his operations officer to coordinate the move and bridge site security with the Special Forces staff at Kontum City, where he learned that the engineer team also needed low-bed trailers to carry its equipment. Eventually three low-beds would be needed to carry a combination front loader and backhoe, a small bulldozer, a cement mixer, and a 2½-ton truck that could not be towed. A grader could make it out on its own. The 2d Platoon, Company C, was tasked to build the bridge. On 9 November, the platoon picked up forty-five feet of M4T6 dry span from the 554th Float Bridge Company, and practiced erecting the bridge on dry land at its camp outside Pleiku City. At 0630, 12 November, the 2d Platoon departed Pleiku City with the bridge and two low-beds. On reaching

[16] AAR, Opn Pickett, 299th Engr Bn, pp. 3–5; Operational Support, USAECV (Prov), p. 1, incl. 7, tab R, OCE Liaison Officer Trip Rpt no. 6.

[17] ORLLs, 1 Nov 66–31 Jan 67, 937th Engr Gp, pp. 7–11, 13–14, and 1 Feb–30 Apr 67, 937th Engr Gp, pp. 7–12.

Tan Canh, a village just south of Dak To and east of the Dak To Special Forces camp, the platoon turned over the low-beds to Company A, which had been working at the airfield. In turn, the 2d Platoon was to borrow a bulldozer and front loader from Company A and continue on to the bridge site. Company A, however, needed the bulldozer to build a bypass around a bridge incapable of supporting heavy loads. This caused a delay of two and one-half hours for the Company B platoon, and it did not reach the bridge site until 1330. The bridge was installed by 1730, and the platoon dug in with the South Vietnamese escort for the night. The next morning, the low-beds loaded with supplies for Dak Seang and a Civilian Irregular Defense Group escort left Dak To, crossed the bridge, picked up the equipment at Dak Seang, and made the return trip to Dak To by noon. Company C then removed and reloaded the bridge and joined Company A at the Dak To airfield. The next day, Company C made the return trip to Pleiku City.[18]

Between October 1966 and June 1967, I Field Force had tasked the 937th Engineer Group to build and upgrade several C–130 airstrips near the Cambodian border to all-weather capability to support combat operations. Nine airfields in the western highlands were upgraded to all-weather capability (eight to C–130 and one to C–123) to be used as jumping-off points for operations. Like the roads, these airfields routinely required maintenance and repairs. Typically, the airfield projects were company-size and spread over a wide geographic area. Taking advantage of the dry weather, the 20th Engineer Battalion built new airfields at New Plei Djereng and Duc Lap Special Forces camps and rehabilitated and extended the T17 covered fields at Landing Zone Oasis, Phu Nhon southeast of Oasis, Phu Tuc Special Forces camp farther to the southeast, and Buon Blech Special Forces camp southwest of Phu Tuc. At New Plei Djereng five miles south of the existing dirt airstrip at Plei Djereng, five work crews of Company D, 35th Engineer Battalion, surfaced the 3,500-by-60-foot runway with the new MX19 matting, four-foot square aluminum sheets encasing an aluminum honeycomb. This airstrip, built at a better site just south of the old strip, marked the first use of this new matting in Vietnam. After completing the work at New Plei Djereng in time to support Sam Houston, Company D moved to Oasis, where it removed the T17 membrane and replaced it with an asphalt-treated vinylon cloth—a strong, burlap-type, synthetic fiber material—on the repaired subgrade. The runway was topped off with MX19 matting. The problem with all prefabricated metal surfacing in Vietnam was the inability to seal water out of the joints between panels. This technique offered the subgrade some protection.[19]

[18] ORLL, 1 Nov 66–31 Jan 67, 299th Engr Bn, 14 Feb 67, p. 2, and incl. 2, AAR, Kon Bring Bridge, 299th Engr Bn, 27 Nov 66; Unit History, 1966, 539th Engr Det, n.d., pp. 15–16, both in Historians files, CMH.

[19] ORLLs, 1 Nov 66–31 Jan 67, I FFV, pp. 58–60, 1 Feb–30 Apr 67, I FFV, pp. 65–67, 69, 1 Nov 66–31 Jan 67, 937th Engr Gp, pp. 8–11, and 1 Feb–30 Apr 67, 937th Engr Gp, pp. 7–8; Operational Support, USAECV (Prov), p. 1, incl. 7, tab R, OCE Liaison Officer Trip Rpt no. 6; AAR, Oasis Airfield, 20th Engr Bn, 10 Jun 67, pp. 1–7; Construction Performance Rpt [Plei Djereng], 20th Engr Bn, 5 Feb 67, pp. 1–7; Completion Rpt, Project 20–6 [Phu Tuc], 20th Engr Bn, 22 Mar 67, incls. 1–7. All 20th Battalion reports in box 4, 72A/2315, RG 319, NARA.

A soldier of the 20th Engineer Battalion places MX19 matting at New Plei Djereng Special Forces camp.

The T17 airfield project at Duc Lap, code-named Operation DUCHESS, typified some of the challenges—long distances, security, and logistics—facing the engineers in the highlands. Upon completing work at Buon Blech airstrip, Company C, 20th Engineer Battalion, was ordered to move to Duc Lap Special Forces camp some 150 miles south of Pleiku City to build the new C–130 airstrip. A convoy carrying construction materials from the battalion at Dragon Mountain would make the fifty-three-mile trip down Highway 14, rendezvous with Company C at Buon Blech Special Forces camp, and proceed with Company C to Duc Lap. Meanwhile, a reconnaissance along the convoy route found the three-span Eiffel bridge over the Ea Krong River south of Ban Me Thuot could not support the convoy's heavy loads. The bridge could not be bypassed, and reinforcing it was not considered feasible. Battalion headquarters determined the best way to cross the river in insecure territory was by raft. On 27 January, sections of a M4T6 raft were assembled and airlifted by six C–130s to Ban Me Thuot for pickup and installation by the South Vietnamese 23d Division's engineers. The four-float raft was quickly assembled at the bridge site and secured. On 1 February, ninety-five trucks loaded with construction materials and a security force consisting of a South Vietnamese Special Forces company and their advisers from Buon Blech set out from Pleiku. The convoy reached Buon Blech in less than eight hours without difficulty.

An M4T6 raft carries a 20th Engineer Battalion vehicle across the Ea Krong River on the way to build a new C–130 airstrip at Duc Lap Special Forces camp.

Company C and the convoy carrying construction materials—altogether 110 vehicles—proceeded to Ban Me Thuot and remained overnight. The next morning, the engineer column left Ban Me Thuot, crossed over the Ea Krong River by raft, and reached Duc Lap in the early afternoon, completing the trip without a single breakdown or major incident. Clearing and grubbing of the area began on 3 February, and the following morning all equipment and troops were hard at work. Twelve days later, six C–7A Caribous (on 1 January 1967 all Army Caribous were transferred to the Air Force and their designation changed from CV–2 to C–7A in the process) landed on the partly completed airstrip. A C–123 airstrip was completed in eighteen days, and a hasty C–130 dirt airstrip was ready in twenty days. Special emphasis was placed on proper drainage, including the airstrip's crown, ditches, and culverts. As the airstrip work neared completion, construction began on the parking apron and its two 40-by-80-foot access ramps and a two-mile access road to Highway 14. A six-inch layer of high-quality laterite was spread and shaped, wetted down with a water distributor, and compacted with a steel-wheeled roller. Laying of T17 membrane on the airstrip, parking ramp, and access ramps began on 15 February and lasted for twenty-five days. This work was done at night to avoid excessive wrinkles caused by heat expansion during the day. As workers placed the membrane, another work party followed applying a nonskid compound.

Surveying and site preparation at Duc Lap

By 7 April, the C–130 airstrip was complete, and Company C was ready to return home. On the first leg of the return, a mine caused some damage to a tractor-trailer, and the brakes failed on a grader causing it to overturn down an embankment and seriously injuring two men. On the way back, the raft at the Ea Krong was retrieved. The following afternoon, 8 April, the convoy reached Dragon Mountain without any further incidents, bringing Operation DUCHESS to an end.[20]

The 299th Engineer Battalion was also assigned several airfield projects of note. Besides the work at Kontum City and Polei Kleng, the Dak To airfield project was a major undertaking involving considerable planning, roadwork, and logistical support. The undertaking was generated by I Field Force's requirement to support a brigade-size force out of the Dak To forward supply area, on this occasion the 1st Brigade, 101st Airborne Division, during its foray into the northern Plei Trap. The existing 4,200-foot bituminous surface treatment airfield had sustained severe damage during Operation HAWTHORNE several months earlier from the combined effects of heavy use and seasonal rains. To get to Dak To, however, required improving Highway 14 from Kontum City to Dak To. Company A was given the job of improving the airfield and the initial opening of the road to Class 31 traffic and upgrading four of the northernmost water crossings while Company B was tasked to

[20] For detailed accounts of Duc Lap, see Maj. Darryle L. Kouns, "Combat Engineers in Operation DUCHESS," *Military Engineer* 62 (May-June 1967): 173–76; and Completion Rpt, Project 01–937/OS–66 [Duc Lap], 20th Engr Bn, 21 Apr 67, box 4, 72A/2315, RG 319, NARA.

Work crews apply a nonskid compound to Duc Lap airstrip.

improve the three southernmost crossings from Kontum City. Repairs to the Dak To airfield began on 30 October. As much as possible, work was done at night and during periods of slack air traffic, thereby keeping the airfield open throughout the repair period. Numerous soft spots and rutted areas were refilled with crushed rock, compacted with a steel-wheeled roller, and seal-coated. The patches and seal coat, despite some bleeding of asphalt, held out well, and C–130 aircraft regularly used the airfield with no detrimental effects. On 20 November, its work done, Company A departed Dak To. After all the heavy equipment passed over the dry span and M4T6 float bridge, work crews dismantled the bridges and loaded them on bridge trucks for the trip home.[21]

The Dak To project illustrated that administration, logistics, and communications were needed for engineer projects at remote locations. Some 210 cubic yards of 3/4- and 3/8-inch aggregate were needed for the airfield patching, but neither the aggregate nor the transport was available to move that amount to Dak To. The 937th Group came to the rescue arranging for trucks from other units and enough aggregate from Qui Nhon, some 100 cubic yards, to get started. Another 40 cubic yards came later, and the 299th produced the remaining 70 cubic yards of 3/4-inch rock, which was carried in battalion dump trucks. Asphalt required for patch work and seal coat was moved by transportation units and the battalion's vehicles.

[21] ORLL, 1 Nov 66–31 Jan 67, 299th Engr Bn, p. 2, and incl. 3, AAR, Dak To Airfield and Route 14B (Kontum to Dak To Airfield), 299th Engr Bn, 18 Dec 66, pp. 1–6, 9; ORLL, 1 Nov 66–31 Jan 67, 937th Engr Gp, pp. 7–8.

One of the most critical resupply problems was getting repair parts and third-echelon mechanics. The group again helped by using its helicopters, but still this was not good enough to prevent lost time because of deadlined equipment. The repair problem was alleviated by the tenth day when an ordnance contact team and truck arrived at Dak To. As for food and potable water, the battalion attached a water supply team for the duration of the operation. The company also carried a fifteen-day supply of B-rations with fresh A-rations occasionally flown in by group helicopters or more frequently carried in resupply convoys.[22]

As a result of the engineers' efforts, the new and improved roads and airfields made possible sustained operations in the highlands and on the border. These operations gave rise to some cautious optimism. For although the enemy controlled the tempo of fighting near the border, making it a costly undertaking to send U.S. troops there, those troops would nonetheless return whenever sizeable enemy forces sallied forth over the border from Cambodia.[23]

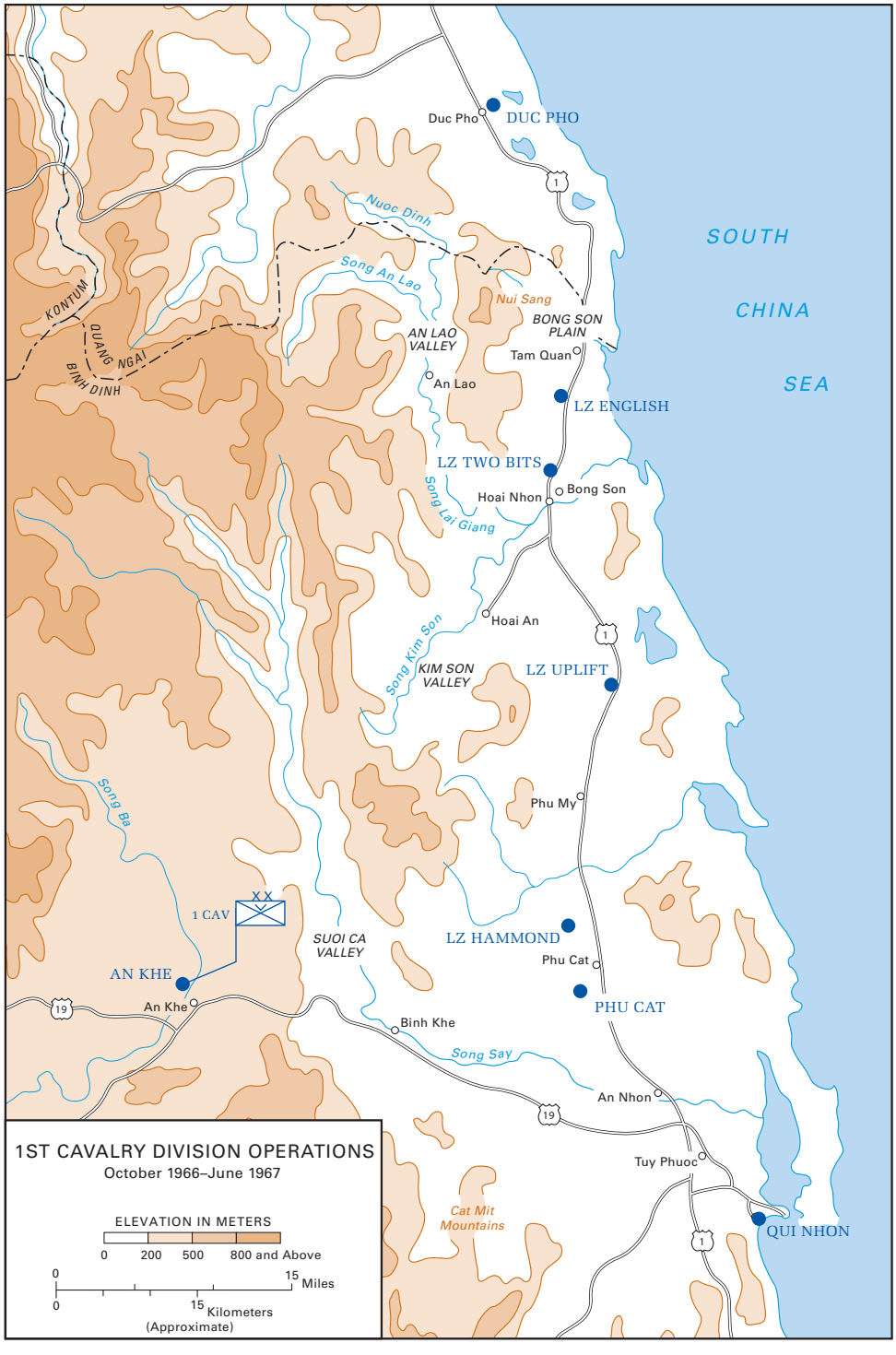
On the Coast

In Binh Dinh and Phu Yen Provinces, U.S., South Korean, and South Vietnamese forces continued their attempts to weaken the enemy's hold on the agriculturally rich coastal region. The 1st Cavalry Division's return to Binh Dinh Province in September 1966 marked the beginning of a series of battles that kept the division in action for seventeen months. Operation THAYER I began with a five-battalion air assault into the mountains of the Kim Son Valley, popularly known as the Eagle's Claw or Crow's Foot because of the shape of the tributary valleys. The cavalrymen did not meet much resistance, but they did uncover significant supply caches. Operation IRVING unfolded on 2 October when elements of the 1st Cavalry Division moved east from the valleys and maneuvered into position around Landing Zone HAMMOND, the division's main forward supply base at the entrance to the Suoi Ca Valley. There they joined South Korean and South Vietnamese troops in an effort to trap the enemy in a coastal pocket. In October 1966 and January 1967, THAYER II and PERSHING extended the preceding operations as part of an all-out effort to pacify eastern Binh Dinh Province. The size of the forces in the operations ranged from a brigade with two battalions to all three brigades. Besides inflicting casualties on the enemy, the operations greatly reduced his dominance in the critical province.[24] (*Map 17*)

[22] AAR, Dak To Airfield and Route 14B (Kontum to Dak To Airfield), 299th Engr Bn, pp. 6–8.

[23] MacGarrigle, *Taking the Offensive*, pp. 76, 177; ORLLs, 1 Nov 66–31 Jan 67, 937th Engr Gp, pp. 7–11, 13–14, and 1 Feb–30 Apr 67, 937th Engr Gp, pp. 7–12.

[24] ORLLs, 1 Aug–31 Oct 66, I FFV, pp. 21–27, and 1 Nov 66–31 Jan 67, I FFV, p. 15; Tolson, *Airmobility*, pp. 117–18, 124; Rpt, 14th Mil Hist Det, 1st Cav Div, 7 Mar 67, sub: Seven Month History and Briefing Data (April–October 1966), pp. 111–32; *Memoirs of the 1st Air Cavalry Division*, p. 33–34. See also Carland, *Stemming the Tide*, pp. 256–74, and MacGarrigle, *Taking the Offensive*, pp. 85–89, 160–84.


Duc Pho
DUC PHO
Nuoc Dinh
Song An Lao
Nui Sang
BONG SON PLAIN
AN LAO VALLEY
Tam Quan
An Lao
LZ ENGLISH
LZ TWO BITS
Hoai Nhon
Bong Son
Song Lai Giang
Hoai An
Song Kim Son
KIM SON VALLEY
LZ UPLIFT
Phu My
Song Ba
XX
1 CAV
SUOI CA VALLEY
LZ HAMMOND
Phu Cat
AN KHE
An Khe
PHU CAT
Binh Khe
Song Say
An Nhon
Tuy Phuoc
Cat Mit Mountains
QUI NHON
KONTUM
QUANG NGAI
BINH DINH
SOUTH CHINA SEA
1ST CAVALRY DIVISION OPERATIONS
October 1966–June 1967
ELEVATION IN METERS
0 200 500 800 and Above
0 15 Miles
0 15 Kilometers
(Approximate)

Map 17

Colonel Olentine, the commanding officer of the division's 8th Engineer Battalion, directed engineering support from a forward command post at Landing Zone HAMMOND. Companies A, B, and C continued supporting the 1st, 2d, and 3d Brigades, respectively. In turn, the companies attached a platoon to each assaulting battalion. Typically, the engineers cleared and expanded landing zones and artillery positions and destroyed bunkers and tunnel systems. When the division found several caves in the coastal mountains in use by the enemy, the demolitions men used shaped charges instead of the usual C4 plastic explosives. The shaped charges, normally used to make large craters in roads, proved highly effective in breaking up the rock, thus making it easier to destroy the caverns.[25]

While the 1st Cavalry Division concentrated on clearing the enemy in eastern Binh Dinh Province, 937th Group engineers kept Highway 1 open. Beginning in September with Operation THAYER, Company B, 19th Engineer Battalion, with the help of a platoon from Company C and elements of the South Vietnamese Army 6th Engineer Group, coped with mines and torrential rains. The highway and railroad bridges crossing the Lai Giang River at Bong Son still stood. The 1,600-foot Eiffel truss highway bridge, however, had suffered damage to several spans, reducing loads to twelve tons. Miraculously, the unused railroad bridge a few hundred yards to the east remained undamaged, and Company A laid a plank decking for vehicular use.[26]

Coinciding with the beginning of THAYER, the 1st Cavalry Division expanded operations north of the Lai Giang to the An Lao Valley and the Bong Son Plain. Division plans during the autumn of 1966 included upgrading the airstrip at Landing Zone ENGLISH to C–130 traffic. Because of the difficulty in moving heavy earthmoving and construction equipment up Highway 1 and across the Lai Giang, the 937th Engineer Group decided to transport men and equipment by sea to a beach site used earlier by the 1st Cavalry Division east of the village of Tam Quan. The engineers then were to proceed to Highway 1 and head south to the airstrip.[27]

The 937th Group's plan to rebuild the access route to Highway 1 and airfield work was called Operation DUKE and was carried out by elements of the 19th and 84th Engineer Battalions in two phases. Colonel Rhodes' 19th Engineer Battalion kicked off the Phase I roadwork. On 13 September, Company A and the 509th Panel Bridge Company loaded aboard the Landing Ship Dock *Gunston Hall* at Qui Nhon and headed north. After some difficulty coming ashore in a high surf the following day, the task force rendezvoused

[25] AARs, Opn THAYER, 8th Engr Bn, 29 Oct 66, pp. 1–3, 7–8, Opn IRVING, 8th Engr Bn, 7 Nov 66, pp. 1–3, 9, and Opn THAYER II, 8th Engr Bn, 28 Feb 67, pp. 1–2, 4–5; ORLLs, 1 Aug–31 Oct 66, 8th Engr Bn, pp. 2–6, and 1 Nov 66–31 Jan 67, 8th Engr Bn, 31 Jan 67, pp. 1–4. All in Historians files, CMH.

[26] AARs, Opn THAYER, 8th Engr Bn, pp. 1–2, Opn IRVING, 8th Engr Bn, pp. 1–2, and Opn THAYER II, 8th Engr Bn, pp. 2, 5; ORLL, 1 Nov 66–31 Jan 67, 19th Engr Bn, pp. 7–9; Galloway, "Essayons," p. 113; Lt. Col. Nolan C. Rhodes, "Operation DUKE," *Military Engineer* 61 (September-October 1969): 332–33.

[27] Unless otherwise noted, the narrative covering Operation DUKE is based on Rhodes, "Operation DUKE," pp. 330–33, and Galloway, "Essayons," pp. 111, 113.

with South Vietnamese forces and set up a defensive perimeter. Work crews quickly repaired a causeway that had been partly washed out; built a 250-foot Bailey bridge across the tidal inlet (an earlier bridge had been removed); replaced a damaged seventy-foot Bailey bridge leading to Highway 1; and proceeded inland to Highway 1 and turned south, clearing mines and making road repairs along the way. Company B, 84th Engineer Battalion, which had landed on the sixteenth to do the airfield work, followed. When Company B reached the airstrip at ENGLISH the following day, the 19th Engineer Battalion task force proceeded down Highway 1 to Qui Nhon, completing its portion of Phase I.

In early October, the 937th Engineer Group began Phase II of Operation DUKE: the return of Company B, 84th Engineer Battalion, from ENGLISH to the beach site for the return trip to Qui Nhon. By then the company had extended the runway at ENGLISH to over 3,300 feet and built an aircraft parking area. On 4 October, elements of the 19th Battalion started back up Highway 1 from Qui Nhon to secure the beach site and remove the two Bailey bridges from the beach access road. Included in the convoy were two hundred tons of steel and lumber for use on the railroad bridge over the Lai Giang at Bong Son. After unloading the materials and leaving two float bridge platoons to help work on the railroad bridge, the task force crossed the highway bridge without difficulty. South Vietnamese security forces escorted the convoy past ENGLISH to the Tam Quan beach site where the engineers set up a defensive perimeter that evening. When Company B, 84th Engineer Battalion, joined the task force on the beach, work crews removed the two Bailey bridges and replaced them with a steel stringer bridge and a suspension footbridge. An enemy probe on the night of 9 October and heavy mortar fire the next evening, which wounded eighteen men, coaxed the engineers to finish the job and get off the beach. When the LST that had delivered the stringers and taken aboard the bulldozers, graders, dump trucks, and other equipment could not free itself from the beach, the Navy brought in smaller LCUs. As a result, it took several more days to return the troops and equipment to Qui Nhon.

The airfield at Landing Zone ENGLISH got more attention the following month when the 19th Engineer Battalion returned on 19 November to upgrade it to an all-weather capability. Company C took six days to place M8A1 matting on the runway, but heavy rains forced the engineers to switch from T17 membrane to the metal matting on the taxiway and parking area. To keep on schedule, Colonel Rhodes sent two platoons from Company B to assist. Still, the heavy rainfall (over thirty inches fell in November and December) and a lack of matting caused delays. The two companies completed the surfacing, including a peneprime treatment of the runway's shoulders, on 20 December. By this time, Landing Zone ENGLISH had been transformed into a large logistical base and a key airfield to move 1st Cavalry Division troops long distances. The combination of heavy use and rains at ENGLISH made maintenance an endless task for the engineers of several units.[28]

[28] ORLL, 1 Nov 66–31 Jan 67, 19th Engr Bn, pp. 7–8, 20–22.

Meanwhile, efforts were under way with South Korean forces south of Qui Nhon to reopen gaps along Highway 1 in Phu Yen Province. In December and January, elements of the 19th Engineer Battalion, now under the command of Colonel Bush's 45th Engineer Group, pushed south with roadwork while the 39th Engineer Battalion at Tuy Hoa pressed northward. As the South Korean Capital Division swept the area southward, Company A, 19th Engineer Battalion, reopened the road south of Qui Nhon from the Cu Mong Pass to Song Cau, filling sixty-five cuts in the road and building three panel bridges. As the South Korean 9th Division pushed northward from Tuy Hoa, Colonel Fulton pressed his 39th Engineer Battalion to work on the road and bridges. The reopening of the road for the first time in years was cause for some symbolic gesture. To emphasize the importance of this occasion, the 1st Brigade, 101st Airborne Division, dispatched a thirty-four-vehicle convoy (dubbed Operation ROADRUNNER) from Kontum City by way of Highway 19 to Qui Nhon, then down Highway 1 to the brigade's home base at Phan Rang. To help speed up the crossing over the Song Cau at Ha Yen, the 39th Engineer Battalion dispatched two platoons from Company A and part of the 553d Float Bridge Company to assemble a light tactical raft to supplement the South Vietnamese M4T6 raft at the ferry site. The restored road's original asphalt surface was in fair condition and held up under local traffic. The 45th Engineer Group remained responsible for keeping the north-south highway open and assigned maintenance to the battalions in the area.[29]

By mid-1967, operations launched by allied forces in the coastal lowlands took away the previous dominance enjoyed by the Viet Cong and the North Vietnamese. The enemy was forced out of populated areas, and his large-scale operations became extremely risky. In Binh Dinh Province, the 1st Cavalry Division inflicted heavy losses on the enemy, but he still contested the province. The engineers contributed by reopening roads and making airfield improvements. Coastal Highway 1, albeit in poor condition and dangerous in many places, was passable during daylight traffic almost its entire length. Newly opened stretches included thirty-one miles from Landing Zone ENGLISH north to Duc Pho and another thirty-one miles from the Cu Mong Pass to Tuy Hoa. Interior roads were declared safe up to twelve and a half miles into the mountains. Meanwhile, completion of jet-capable runways at Phu Cat by RMK-BRJ and Tuy Hoa by Walter Kidde and the addition of second permanent runways at Cam Ranh Bay and Phan Rang by RMK-BRJ allowed for the stationing of more Air Force tactical fighter-bombers to provide support to the ground forces in II Corps. Work also progressed on the new permanent concrete runway at An Khe.[30]

[29] ORLLs, 1 Nov 66–31 Jan 67, 19th Engr Bn, p. 9, and 1 Nov 66–31 Jan 67, 39th Engr Bn, p. 3.

[30] MacGarrigle, *Taking the Offensive*, pp. 83, 92, 322–24; ORLL, 1 Feb–30 Apr 67, I FFV, pp. 51, 66–69.

The Delta

By the spring of 1967, the Mobile Riverine Force, the joint U.S. Army–Navy afloat element, was in place at Dong Tam and was beginning a long series of operations under the code name CORONADO. The 9th Division's 2d Brigade provided the ground forces from three infantry battalions and other attached units. The Navy provided some one hundred boats and crews. From two barracks ships, the troops went on operations in armored troop carriers, preceded by minesweeping craft and escorted by armored boats called monitors. When the flotilla reached the objective, the men debarked under the protective fire of weapons mounted on the river craft, including 105-mm. howitzers on Ammi pontoon barges. When operations began, the Viet Cong countered with ambushes from the shore and in battalion strength. As time passed, the Mobile Riverine Force pressed forward into enemy-held areas, with results that lent encouragement that riverine operations might succeed.[31]

Army engineers organized for operations in this environment. The 1,015-man 15th Engineer Battalion, the 9th Division's organic engineer battalion, under Lt. Col. William E. Read continued to divide its efforts among the division's three brigades. Battalion headquarters, Company A, and Company E, the bridge company, were located near the division's and its 1st Brigade base camp at Bearcat east of Saigon. Company C was located at the 3d Brigade's base camp at Tan An southwest of Saigon, and Companies B and D supported the 2d Brigade at Dong Tam also southwest of Saigon. The 15th Engineer Battalion used a broad array of equipment, including Rome plows, tankdozers, and bridging to support the division's widely scattered operations in III and IV Corps. Meanwhile, general support for the 9th Division's operations in the delta fell to the recently arrived 34th Engineer Group.[32]

Riverine operations by their nature reduced the requirements for combat engineer support and eliminated many demolitions and minesweeping tasks. Consequently, combat engineers attached to the riverine force frequently filled out infantry units that were short of riflemen. The usual allocation of engineers from the divisional engineer battalion was one engineer platoon to support each infantry battalion in the field. For example, Company D at Dong Tam typically supported the same two infantry battalions of the 2d Brigade on operations, providing a platoon to each battalion, while the remaining platoon and equipment worked at the Dong Tam camp. Lt. Col. Thomas C. Loper, who assumed command of the 15th Engineer Battalion in September 1967, reported that habitually fragmenting the two platoons into two- or three-man demolition teams to support infantry companies of the two battalions of the 2d Brigade in the field did not seem economical. Consequently, the battalion began field tests by setting aside one of the platoons at a central location aboard a barracks ship to respond to calls while the other platoon dispatched

[31] Westmoreland, *A Soldier Reports*, p. 209; MacGarrigle, *Taking the Offensive*, pp. 402, 411–30; Fulton, *Riverine Operations*, pp. 68, 73–74, 84–85.

[32] ORLL, 1 Nov 67–31 Jan 68, 15th Engr Bn, 31 Jan 68, pp. 1, 4, Historians files, CMH; Galloway, "Essayons," pp. 244–45.

Men of the 15th Engineer Battalion use an airboat in the delta.

demolition teams to the infantry companies. Loper also put two of his M113 armored personnel carriers mounting flamethrowers aboard armored troop carriers for use against enemy positions along the waterways. The remaining two M113s with flamethrowers were used to clear heavily booby trapped areas. Until then, the battalion's flamethrower platoon had been used for job site security and supporting the division's three brigades and the Thai regiment.[33]

Among the 15th Engineer Battalion's unusual elements were the 1st and 2d Airboat Platoons, activated and attached to the battalion in December 1967. These unique Army units were used to support the 3d Brigade in Long An Province and Thai forces in the Nhon Trach District of Bien Hoa Province. This coincided with the Navy dispatching three Patrol Air-Cushion Vehicles, or PACVs, to the Mobile Riverine Force. PACVs, also known as hovercraft that could skim right over river banks and dikes, had been demonstrated earlier in the Plain of Reeds, southwest of Saigon. The Army's smaller and considerably less expensive airboats (each hovercraft cost close to $1 million) with mounted machine guns had been successfully used by the Special Forces. Because the 15th Engineer Battalion had powered bridge erection boats, reconnaissance and pneumatic assault boats, responsibility for river reconnaissance, and some maintenance capability, assigning the twenty-eight airboats to the battalion was a logical choice. A short training program was conducted at Long Binh and concluded in a joint operation with the 720th Military Police Battalion.

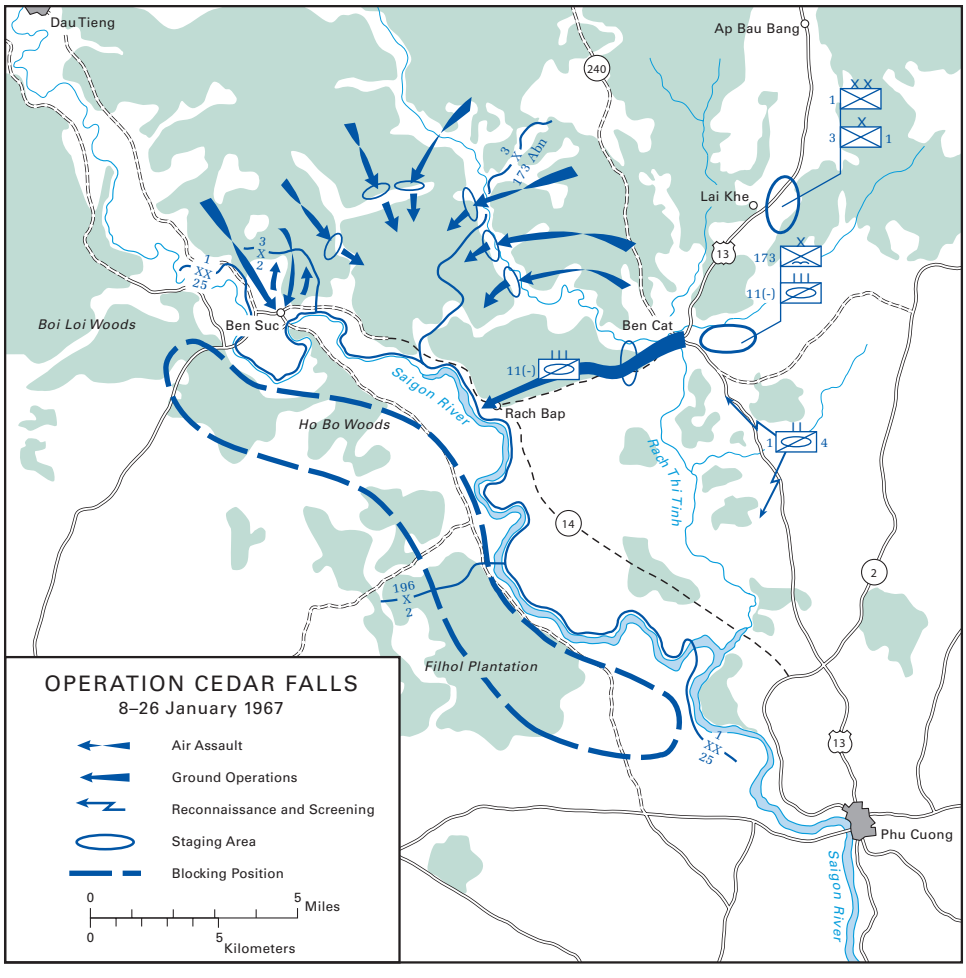
[33] ORLLs, 1 Feb–30 Apr 67, 34th Engr Gp, pp. 5–9, and 1 May–31 Jul 67, 34th Engr Gp, pp. 1–3, 5–11, 1 Nov 67–31 Jan 68, 15th Engr Bn, pp. 4–6, 9–10; Fulton, *Riverine Operations*, pp. 139, 141; Galloway, "Essayons," pp. 244–45.

Within a few days, the airboats began supporting tactical operations. On 16 December, the 1st Airboat Platoon departed Long Binh with sixteen boats and infantry machine gunners to support 3d Brigade operations in Long An Province. From the eighteenth through the twenty-ninth, the boats carried out screening and reconnaissance missions, moved troops into battle, and operated under day and nighttime conditions. On 5 January, five airboats began working with the Thai regiment. The boats were used almost daily, and by the eighteenth, eleven boats were working with the Thais. Some success was reported by the battalion with reconnaissance and screening missions, but there was less success in transporting troops. Although the airboats were rated to carry seven men, their speed and maneuverability decreased when exceeding the optimum load of three (operator, gunner, and one passenger). The dry season precluded the entry of airboats into the rice paddies, the primary intended use, thus confining them to rivers and streams. Their loud noise gave the enemy enough time to set up ambushes along the channelized waterways. Maintenance and supply problems included a lack of special tools and spare parts. Supplying the specified aviation fuel to remote areas was another problem for a while. Refueling took a long time because the size of the fuel intake hole was too small. A special nozzle was made, but it still took up to three hours to refuel one platoon. The battalion also reported the need for better communications, since only five radios were authorized for each platoon. The battalion felt that each boat needed a radio, while the command and control boat needed two, one for communicating within the platoon and the other for communicating with the supported unit and requesting artillery fire.[34]

III Corps Again

As the threat along the border in III Corps abated following Operation ATTLEBORO, General Westmoreland in early 1967 launched the first of several large clearing operations north of Saigon. Operation CEDAR FALLS began on 8 January 1967 with the objective of destroying the Viet Cong *Military Region 4* headquarters harbored in the Iron Triangle. Under the direction of General Seaman's II Field Force, the corps-size sweep involved the 1st and 25th Divisions, the 173d Airborne Brigade, the 196th Infantry Brigade, and the 11th Armored Cavalry Regiment. After maneuvering units into position, Seaman launched airmobile assaults to seal the enemy bastion, exploiting the natural barriers of the Saigon and Thi Tinh Rivers that formed two of its boundaries. A series of sweeps followed to push the enemy toward the blocking forces. During the nineteen-day campaign, the enemy preferred to hide or infiltrate through allied lines than fight. Still, some seven hundred Viet Cong were killed, and approximately the same number were taken prisoner. When CEDAR FALLS ended on 26 January, the combined American and South Vietnamese

[34] ORLL, 1 Nov 67–31 Jan 68, 15th Engr Bn, pp. 12–14, 20–22; Berry, *Gadget Warfare*, pp. 35–38; Edward J. Marolda, *By Sea, Air, and Land: An Illustrated History of the U.S. Navy and the War in Southeast Asia* (Washington, D.C.: Naval Historical Center, Department of the Navy, 1994), pp. 167–68.



Map 18

force had found and destroyed major installations, including over 1,100 bunkers, 400 tunnels, and 500 other structures, including fortifications. They had also captured large quantities of food and supplies, confiscated many enemy documents, and cleared land for future operations.[35] (*Map 18*)

Before and during Cedar Falls, the Engineer Command and the 1st Division's 1st Engineer Battalion formed a task force to support the combat forces gathering around the Iron Triangle. Colonel Kiernan, the division engineer and commander of the 1st Engineer Battalion, coordinated these efforts. Units in the task force included elements of his battalion; flame-throwing platoons from the division's 1st Squadron, 4th Cavalry; and tunnel rats from the

[35] Westmoreland, *A Soldier Reports*, p. 249; Sharp and Westmoreland, *Report*, pp. 133, 137, 152; ORLL, 1 Nov 66–31 Jan 67, II FFV, pp. 7–8; MacGarrigle, *Taking the Offensive*, pp. 96–112.

242d Chemical Detachment. Most of the rest of the engineers came from the 79th Engineer Group (elements of the 27th, 86th, 168th, and 588th Combat Engineer Battalions, and the 557th Light Equipment Company) and the 159th Engineer Group (elements of the 169th Engineer Construction Battalion). In addition, the 1st Logistical Command's Saigon Support Command provided a detachment from the 188th Maintenance Battalion to render backup maintenance support to the bulldozer fleet being formed for large jungle-clearing operations. The bulldozers were consolidated under the headquarters of one engineer battalion, Colonel Pelosky's 168th. Pelosky organized four teams, each consisting of six to twelve bulldozers. The engineer task force also set up a composite maintenance team that could fabricate parts.[36]

In a deception operation called NIAGARA FALLS (5 to 7 January), the 1st Division moved into attack positions. The 600-man engineer task force helped lead the way. The task force, supported by fifty-nine bulldozers, four Rome plows, and tunnel demolition teams from the 79th and 159th Engineer Groups in a short shakedown operation, cleared one-half square miles of jungle bordering the Thi Tinh River southeast of the Iron Triangle. On 5 January, a 1st Engineer Battalion bridge platoon with a pile-driving crane from the 169th Engineer Construction Battalion completed a 160-foot panel bridge across the Thi Tinh River west of Ben Cat. This route provided a rapid crossing for the 11th Armored Cavalry Regiment. Shortly after the start of CEDAR FALLS, a span of the new bridge collapsed under the combined load of a recovery vehicle towing a disabled M48 tank. Work crews from the 1st Engineer Battalion worked throughout the night removing the damaged section and installing an armored vehicle launched bridge to cross the gap. An engineer task force followed the 11th Armored Cavalry, clearing jungle and building landing zones, roads, and support areas. While the majority of engineers provided the customary support for a combat operation, they also took the opportunity to make CEDAR FALLS one of the most unique operations in the war up to that point. For the first time, engineers deployed bulldozers and Rome plows on a massive scale to open large jungle areas during a combat operation. Until then, the Rome plows had worked in safe or partially secure areas. Now they became part of an assault team or dozer-infantry team to destroy enemy fortifications. The dozer part of the team included standard D7E bulldozers, tankdozers,

[36] Unless otherwise noted, engineer roles in CEDAR FALLS and NIAGARA FALLS are based on Rogers, *Cedar Falls–Junction City*, pp. 29, 31–41, 60–79; Ploger, *Army Engineers*, pp. 139–40; *Always First*, *1965–1967*, "The Bulldozer in the Attack"; Combat Lessons Bulletin, HQ USARV, no. 5, 8 Feb 67, sub: Engineer Operations in the Iron Triangle; Lt. Col. Joseph M. Kiernan, "Combat Engineers in the Iron Triangle," *Army* 17 (June 1967): 42–45; AAR, Opn CEDAR FALLS, 1st Engr Bn, 2 Mar 67, Historians files, CMH; Ltr, Kiernan to All Men 1st Engr Bn and Dozer and Demolition Teams, 79th Gp, 29 Jan 67, sub: Engineer Actions on Operations NIAGARA FALLS and CEDAR FALLS, both in OCE Hist Ofc; Interv, Capt George E. Creighton Jr., 17th Mil Hist Det, with Lt Col Joseph M. Kiernan, CO, 1st Engr Bn, 20 Apr 67, Historians files, CMH; Self Interv, Maj John D. Simpson, S–3, 168th Engr Bn, 8 Jul 67, pp. 1–77, VNIT 48, CMH; ORLL, 1 Nov 66–31 Jan 67, 168th Engr Bn, 14 Feb 67, pp. 4, 8, 10–12, Historians files, CMH; Rpt of Visit to Various Headquarters in Vietnam, incl. 7, tab R, p. 2, OCE Liaison Officer Trip Rpt no. 6.

and Rome plows. The 1st Engineer Battalion also created an instant navy with its fleet of bridge erection boats to patrol the rivers.

Dozer-infantry teams moved into the jungle together, simultaneously clearing vegetation, searching for the enemy, and destroying his fortifications. One technique involved placing two tankdozers at the point to clear vegetation and detonating booby traps, followed by four bulldozers abreast, some equipped with Rome plow blades, with two more bulldozers to clean up the windrows of cut vegetation. Infantry worked alongside the dozers, at the same time carrying out search-and-destroy missions. A second technique employed a Rome plow in the lead followed by troops in armored vehicles. When the plow uncovered an enemy position, the vehicles provided fire support for the attacking infantry. Experience during NIAGARA FALLS revealed the continuous need for on-the-spot servicing and small repairs by the bulldozer operators and maintenance teams.

The duration of CEDAR FALLS did not allow for jungle clearing in the entire Iron Triangle. Instead, as Kiernan recommended, the engineers cleared only strategic areas, 7 or 8 percent of the sixty-three square miles of jungle. By the end of clearing operations on 22 January, the 1st Division engineer task force had cleared a total of 2,711 acres or 4 square miles. This included 55- to 110-yard strips of jungle on each side of major roads and thirty-four landing zones spaced throughout the bastion for helicopter resupply and medical evacuation. Engineers lifted into the jungle by helicopters cleared three of the landing zones, and the dozer-infantry teams cleared the remainder. At the northwest corner of the triangle, the village of Ben Suc, a suspected enemy fortified supply and political center, was sealed off and villagers evacuated. Bulldozers, tankdozers, and demolition teams then leveled buildings, collapsed tunnels, and obliterated bunkers and underground storage rooms. The teams also cut numerous swaths in the Iron Triangle, usually in widths of 33 to 55 yards, to permit rapid movement of mechanized and airmobile units in future operations. The effect of this clearing lasted for a time, but vegetation always returned.

While the engineers cleared the jungle above ground, the tunnel rats and demolition teams explored and destroyed Viet Cong complexes found in villages and logistical base areas. The 1st and 168th Engineer Battalions discovered an effective method to destroy deeper tunnels by using conventional demolitions with acetylene gas. Demolition satchel charges, which were thirty-pound charges of TNT, and forty-pound cratering charges placed at critical locations (rooms, tunnel junctions, exits, and entrances) or spaced at about 27-yard intervals, provided a powerful boost for the acetylene. The combined effect helped to collapse tunnels as deep as 15 to 20 feet below the surface.

Basically, however, the 1st Engineer Battalion's tunnel rats had the main job, going where a flashlight guided the way and a pistol was the primary weapon. "Charlie is in there. All we have to do is dig him out," explained Pfc. Michael R. Tingley, who served in a team of seven tunnel rats working in conjunction with the division's chemical detachment. Other team members carried gas masks, nauseating gas, grenades, smoke grenades, a telephone, and fifty-foot lengths of reinforced rope. One team member, Pfc. Roger L. Cornett, noted, "Handling

Detonating cord used to initiate an explosive charge is lowered into a tunnel by troops of the 173d Engineer Company, 173d Airborne Brigade, during Operation CEDAR FALLS.

explosives is real touchy at times. You can't really worry about it but you often wonder." Another tunnel rat with six months' experience with explosives, Pfc. Stephen E. Sikorski, added, "I'm most concerned about booby traps," and regarded his work as a "specialty that can either build or destroy."[37]

[37] "Engineers Turn Tunnel Rats," *Pacific Stars and Stripes*, 11 June 1967, extracted from *Always First: 1st Engineer Battalion, 1967-1968* (1st Engr Bn, n.d.), copy in CMH.

Men of the 1st Engineer Battalion use an M4T6 raft as a patrol boat.

During NIAGARA FALLS and CEDAR FALLS, 1st Division engineers attempted to seal off enemy escape routes. General DePuy, the division commander, suggested mounting quad .50-caliber machine guns (four heavy machine guns mounted on a single pedestal and fired by one gunner) on platforms placed at the confluence of the Saigon and Thi Tinh Rivers. Kiernan turned the task over to his bridge company. Using components of a M4T6 floating bridge, Company E assembled two rafts at the Vietnamese Engineer School at Phu Cuong, some seven and a half miles downstream. Each raft contained two bridge floats connected with aluminum decking, one quad .50- and six .30-caliber machine guns for additional firepower. Sandbags were placed on the floats and decking to protect the riflemen and grenadiers. A twenty-seven-foot utility boat propelled each raft. The makeshift armed rafts were given the imposing name of monitors. In addition, the engineer navy included two armed utility boats, dubbed U-boats, and several pneumatic assault boats, each manned by two engineers and thirteen infantrymen for river patrols. Early on 5 January, the engineer flotilla left Phu Cuong and moved up the Saigon River. Nearing their destination, the lead elements came under sniper fire. The rafts and an armed helicopter overhead returned the fire, killing four of the enemy. By nightfall, the monitors took up position at the juncture of the two rivers, one raft tied to the east bank and the other anchored in midstream.

While the monitors remained in the same general area during CEDAR FALLS, the engineer utility and assault boats of the 1st and 25th Divisions and 173d Airborne Brigade patrolled the rivers. The patrols checked all Vietnamese boats and took several Viet Cong suspects to interrogation points. In addition,

the boats ferried supplies to outposts along the rivers, and returned with large quantities of rice and other enemy supplies extracted from nearby inlets.

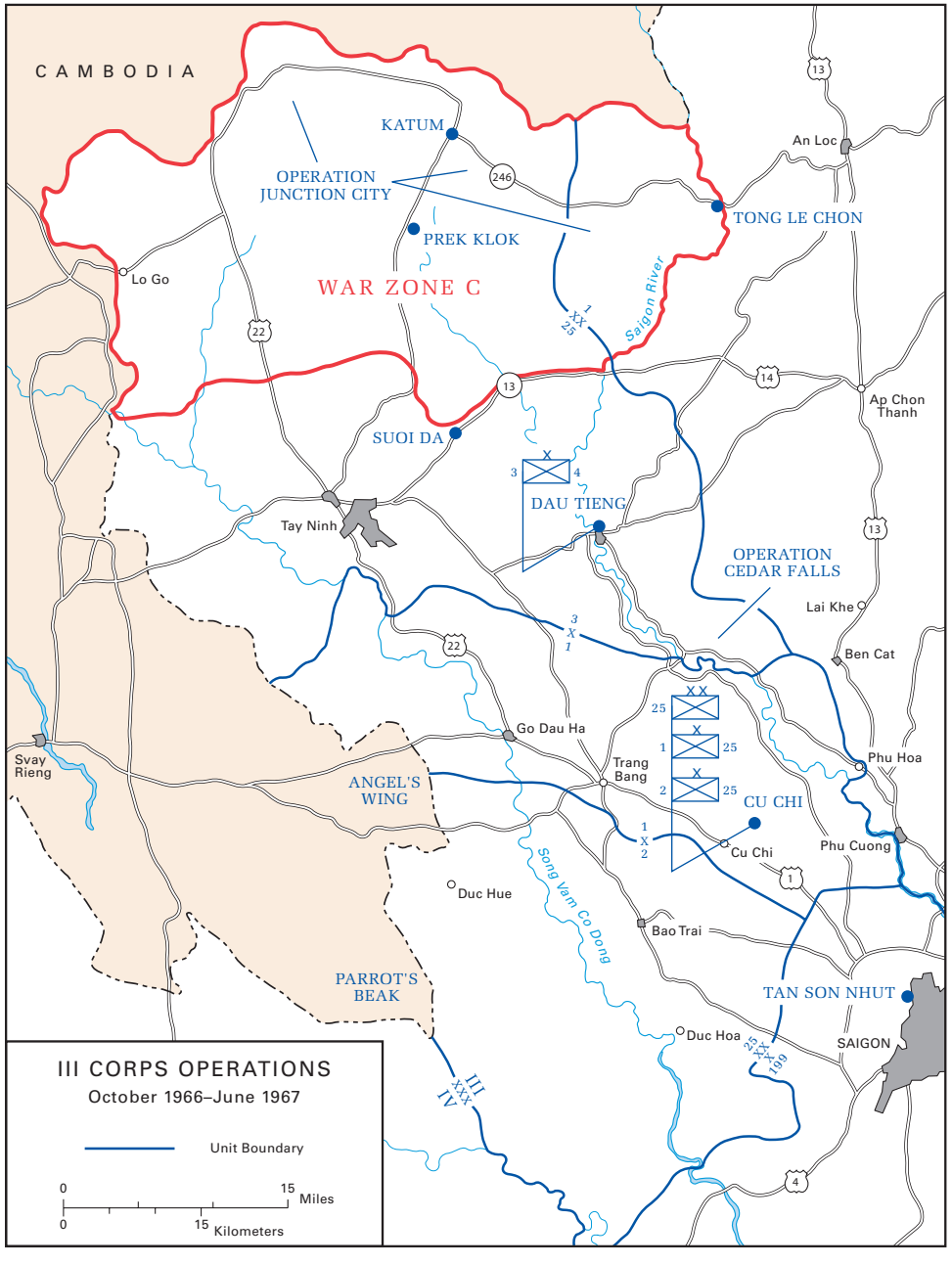
Encouraged by the results of CEDAR FALLS, allied forces in February intensified their pressure on the enemy in the largest operation of the war to that time, JUNCTION CITY, an attack on War Zone C. While South Vietnamese forces remained near the populated areas, elements of the U.S. 1st and 25th Divisions, the 196th Infantry Brigade—altogether six brigades—and the 11th Armored Cavalry maneuvered into position to establish a horseshoe-shaped cordon around the war zone. On 22 February, a battalion of the 173d Airborne Brigade, in the only combat paratroop jump of the war, dropped into a blocking position near the Cambodian border. Combined armored and mechanized elements of the 2d Brigade, 25th Division, and the 11th Armored Cavalry thrust northward through the open end of the horseshoe. Meeting little resistance at the outset, advancing troops found numerous enemy base camps, which they destroyed. Before the end of Phase I on 17 March, several sizable engagements took place, with two major battles occurring at or near Prek Klok, approximately halfway between Tay Ninh City and the Cambodian border, along Route 4.[38] (*Map 19*)

As JUNCTION CITY entered its second phase, American forces concentrated their efforts in the eastern part of War Zone C, close to Highway 13. A brigade from the 9th Infantry Division replaced the 173d Airborne Brigade, and units began search-and-destroy operations in their assigned sectors. Enemy troops struck sharply against night defensive positions and firebases in attempts to isolate and defeat individual units. The combined firepower of the U.S. units, supporting artillery, and close air support, however, forced the attackers to break contact after suffering large losses.

By mid-April, the scale of JUNCTION CITY had tapered off. The third phase saw most Army units withdrawn, either to return to their bases or to take part in other operations. For the next month, a joint U.S.–South Vietnamese Army task force roamed throughout the war zone, but the temporarily shattered enemy had retreated into Cambodia. The operation officially came to an end at midnight on 14 May.

Engineer tasks in JUNCTION CITY paralleled those in CEDAR FALLS. Although the region was too large to level with bulldozers, tankdozers, and Rome plows, the engineers managed to destroy some of the major hideouts. In the western sector of operations, the 65th Engineer Battalion, 25th Division, supported by elements of the 27th, 86th, and 588th Engineer Combat Battalions; Company C, 4th Engineer Battalion, 4th Division; the 175th Engineer Company, 196th Infantry Brigade; and the 500th Panel Bridge Company cleared land along the sides of roads and built landing zones and bridges along the way. The engineers also provided minesweeping and demolition teams and maintained forty-one miles of roadway. In the eastern half of War Zone C, the 1st Engineer Battalion—backed by the 168th Engineer

[38] MacGarrigle, *Taking the Offensive*, pp. 113–43; Westmoreland, *A Soldier Reports*, p. 249; Sharp and Westmoreland, *Report*, pp. 133–34, 137, 152–53; ORLL, 1 Feb–30 Apr 67, II FFV, 15 May 67, pp. 21–23, Historians files, CMH.



Map 19

Battalion during Phase I, the 27th Engineer Battalion during Phase II, and the 173d Engineer Company—opened, cleared, improved, and maintained over forty-six miles of roads and opened and repaired several airstrips. At the start of the operation, Company D and Headquarters Company moved from the

just-completed C–130 airstrip at Suoi Da to begin work on an airstrip capable of handling C–123s at Katum, completing the laterite-topped airstrip in six days. The 168th Engineer Battalion built a new Special Forces camp and a 3,100-foot M8A1 airstrip that was capable of handling C–130s at Prek Klok, helped complete the airstrip at Katum, and repaired the T17-covered airstrip at Suoi Da. Similarly, the 27th Engineer Battalion constructed a Special Forces camp at Tong Le Chon.[39]

The 168th Engineer Battalion played a major part in the second battle at Prek Klok. The battalion shared defense responsibilities inside the circular wagon train–type perimeter with 1st Division units—a mechanized infantry battalion and an artillery battalion. On the night of 10 March, the Viet Cong launched a heavy mortar barrage followed by the main attack on the perimeter's eastern sector. During the attack, the engineers fought as infantry, filling in the gaps from their foxholes in the front lines. Air strikes and fire from other firebases helped drive away the attackers with heavy losses. U.S. losses were three killed and thirty-eight wounded, including two engineers killed (one from the 168th and one from attached elements of the 27th Engineer Battalion) and seven wounded.[40]

After JUNCTION CITY, Colonel Kiernan reviewed the accomplishments of his engineers. He told his troops that the battalion had built "more than one-half of all Bailey Bridging employed to date in Vietnam . . . and constructed half of all C–130 airfields built by U.S. Engineers in the II Field Force area." While Company D worked on the airfields during JUNCTION CITY, the other companies worked on roads and bridges.[41]

The battalion completed two panel bridges: the first on Route 246 over the Saigon River and the second on Route 1A over the Song Be River. To meet a short deadline to allow passage of the 11th Armored Cavalry, Companies A and B helped by Company E's bridge experts worked day and night to complete a two-span 220-foot bridge over the Saigon River at Tong Le Chon. Company A then deployed to the Song Be site south of Phuoc Vinh to rebuild a three-span bridge, claimed by Kiernan as one of the longest and most sophisticated Bailey bridges built by an engineering unit since World War II. Since the Vietnamese government would not allow removal of the concrete truss approach spans, the battalion had to modify panel bridge parts in order to fit the new center span between the old French trusses. Kiernan reported the new span was partially built on the existing center span, then jacked up from the old steel truss, and returned to a final position after the older truss dropped into the river one hundred feet below "with a beautifully executed demolition charge." The battalion completed the 430-foot cantilever bridge just as

[39] Ploger, *Army Engineers*, p. 140; Galloway, "Essayons," p. 193; Rogers, *Cedar Falls–Junction City*, pp. 122–23, 152–53, 155, 159; AAR, Opn JUNCTION CITY, 1st Engr Bn, 14 Apr 67, pp. 2, 4–5; Ltr, Kiernan to All Men 1st Engr Bn, 14 Apr 67, sub: 1st Engineer Actions on Operation JUNCTION CITY, both in OCE Hist Ofc; *Always First, 1965–1967*, "The Big Push into War Zone C"; Engineer Support of Combat Operations, 26 May 67, incl. 8, pp. 5–6, OCE Liaison Officer Trip Rpt no. 7, OCE Hist Ofc.

[40] Rogers, *Cedar Falls–Junction City*, pp. 117–21; Interv, Simpson, 8 Jul 67, pp. 79–115.

[41] Ltr, Kiernan to 1st Engr Bn, 14 Apr 67.

JUNCTION CITY came to a close, and the previously rated Class 23 (thirty-ton capacity) bridge could now carry tanks and fully loaded supply vehicles in the next operation by the division.[42]

In the wake of JUNCTION CITY, allied forces resumed clearing operations closer to Saigon and ventured into War Zone D. Just north of the Iron Triangle, the 1st and 25th Divisions began Operation MANHATTAN. The 1st and 65th Engineer Battalions continued extensive land-clearing projects and the destruction of hundreds of bunkers, tunnels, and installations. Monsoon rains began to fall, and keeping the unpaved routes open became a major challenge. In May, the 1st Division started Operation DALLAS by entering the rolling, jungle-covered area of War Zone D to the east of Route 1A. The following month, the division moved north of Phuoc Vinh in Operation BILLINGS. Notable 1st Engineer Battalion achievements during BILLINGS, which ended on 26 June, included clearing landing zones, destroying bunkers, and reopening the twenty-mile stretch of Route 1A from Phuoc Vinh to Dong Xoai. Carving infantry landing zones in the heart of the jungle was dangerous. During one landing zone clearing mission, the 1st Platoon, Company C, had to stop work when the infantry security force tried to beat off an attack. During the three hours of fierce fighting against an estimated North Vietnamese battalion, the engineers doubled as infantrymen and self-appointed medics.[43]

Combat engineers suffered their share of casualties during these operations, and just as often became victims of accidents. The 1st Engineer Battalion suffered one man killed in action and seven wounded during CEDAR FALLS; one killed and forty-two wounded during JUNCTION CITY; and sixteen wounded in Operations MANHATTAN, DALLAS, and BILLINGS. By its very nature, military engineering is dangerous. Working with construction equipment, handling explosives, and traveling by vehicles and aircraft, coupled with long hours and fatigue, meant that engineers in even so-called secure areas could be killed or injured. For instance, during JUNCTION CITY, two tankdozers of the 1st Engineer Battalion with leading elements of the 3d Brigade moving north along the road between Suoi Da and Katum were lost to mines on the first morning of the operation. A party looking for laterite was attacked and suffered three casualties within six hundred feet of the battalion command post. At the Katum airstrip, surveying was often interrupted by sniper fire. Shortly after Operation DALLAS, the 1st Engineer Battalion suffered a deadly blow when a helicopter carrying the battalion's command group struck a high-tension wire while flying low under the flight pattern at Bien Hoa Air Base and crashed to the ground. Killed in the incident were Kiernan, who only had seven days to go before returning home; Lt. Col. Rodney H. Smith, executive officer and commander-designate; Maj. Millard L. Treadwell, operations officer; and Sgt. Maj. Terry M. Rimes, who was about to assume the post of battalion sergeant

[42] Ibid.

[43] ORLL, 1 May–31 Jul 67, II FFV, 18 Sep 67, pp. 19–20, Historians files, CMH; 1st Engr Bn Hist, vol. 1, pp. III-21 to III-22; Engineer Support of Combat Operations, 26 May 67, incl. 8, pp. 6–7, OCE Liaison Officer Trip Rpt no. 7. See also MacGarrigle, *Taking the Offensive*, pp. 145–55, 339–43.

major. Maj. Edwin C. Keiser, assistant division engineer, assumed temporary command of the battalion.[44]

By mid-1967, Army engineers had proven their ability to support fast-moving combat operations in II and III Corps and more recently in IV Corps. In III Corps, they kept resupply roads open; built and reopened forward airfields; cleared the land for landing zones and mutually supporting firebases; cut swaths through dense vegetation that cloaked the enemy; and destroyed enemy base areas, tunnels, and bunkers. Similarly, in much larger II Corps, key roads were being opened and more airfields sprinkled the hinterlands. Most impressive was the gradual return of coastal Highway 1 to service with accompanying benefit to the local economy. Much work, however, remained in pushing the air and road supply lines into the inhospitable interior. As for the engineers' prodigious efforts, local commanders expressed their appreciation, but some still wanted them under their direct control. Senior engineers continued to emphasize priority to support combat operations, but at the same time striving to complete base development projects and turning attention to the growing highway restoration program.

New techniques and equipment and reliance on technology did not always result in complete success. Although a great boon as an expedient runway surface, the T17 membrane, like the new metal mattings, required a good base, and frequent failures caused by heavy rains required extensive airfield repairs. The tunnel destruction teams in III Corps using the acetylene and explosives together achieved good results, but the Viet Cong had built too many burrows for the few trained tunnel rats and engineers to explore and map. Similarly, the impressive results of the bulldozers and Rome plows in land-clearing operations in III Corps were tempered by the large areas of dense vegetation and heavy maintenance requirements. In the course of a day's operations, it was common for most of the Rome plows to sustain disabling damage of some sort. Troops in land-clearing units suffered higher casualty rates both from enemy action and natural hazards. Aside from falling trees, the operators often faced swarms of bees. In the end, elusive enemy troops still had abundant jungle cover to move about and build concealed supply caches. The jungle also quickly reclaimed the cleared areas. Although the engineers reopened many roads, the enemy came back at night to bury mines and destroy bridges. Sweeping for mines became a daily morning task. Heavy rains and traffic required continuous maintenance on the unsurfaced roads. Much work remained to improve the coastal road network and to extend road and air supply lines to the contested interior. Meanwhile, the military and civilian engineers remained heavily committed to base development, for the logistics bases and ports played a crucial role in supporting the combat forces.

The allied offensives had set the enemy back, but he remained a major threat in the countryside. A discouraging feature of the war was the fact that the allies could not muster enough troops to occupy the enemy strongholds and thereby prevent him from returning. As soon as American troops left areas they

[44] 1st Engr Bn Hist, vol. 1, pp. III-19 to III-22; Rogers, *Cedar Falls–Junction City*, p. 155; *Always First, 1965–1967*, "The Big Push into War Zone C."

had cleared such as the Iron Triangle, the enemy returned. Meanwhile, trouble was brewing in I Corps. In 1967, the threatening situation against the marines along the Demilitarized Zone intensified. General Westmoreland, concerned that the Marine forces there were insufficient, decided to send Army troops to the northern provinces.

8

To I Corps

In early 1967, a growing North Vietnamese threat below the Demilitarized Zone between the two Vietnams brought infantry units of the U.S. Army to I Corps for the very first time. General Westmoreland had planned to put the Army temporarily in southern I Corps in connection with his dry-season campaign beginning in the spring. But during the winter, a quickening of enemy activity in the A Shau Valley and Quang Ngai Province, and his conviction that the marines in I Corps were stretched to the limit, forced him to postpone his campaign indefinitely and to rush in reinforcements on a schedule not quite his own. On 28 February, he completed an initial planning action preparatory to the deployment of units northward, approving a new makeshift division to be created from brigades in II and III Corps, but deferred actually selecting the units until the division headquarters could be formally activated. Five weeks later, on 6 April, with eight North Vietnamese regiments counted in the vicinity of the Demilitarized Zone, and enemy artillery hammering Marine bases along the border, Westmoreland ordered I Field Force to enter southern I Corps by the next evening so that the marines there could be sped at once to the threatened north. With this order, which implemented the provisional division called Task Force OREGON, the brigades fell into place. But because the brigades were still scattered through the interior, with the nearest one too far south to meet the schedule, I Field Force called on its most agile unit to serve as the tip of the knife, and within hours elements of the 1st Cavalry Division were air-assaulting north into Duc Pho to relieve the marines.[1]

Duc Pho and Chu Lai

What the 1st Cavalry Division found in southern I Corps were facilities scarcely adequate for the marines, let alone the Army. For two years, the marines had treated southern I Corps as a backwater holding action while looking to the north. Da Nang had become the command and support hub of the corps-level III Marine Amphibious Force, nourishing satellite bases at Chu Lai and Phu Bai in consonance with the strategy, which was to hold the line as far north as possible and to pacify the rural population around the cities and towns. Well to the south lay Duc Pho, a district headquarters just above

[1] MacGarrigle, *Taking the Offensive*, pp. 203–10; Lt. Gen. Willard Pearson, *The War in the Northern Provinces, 1966–1968*, Vietnam Studies (Washington, D.C.: Department of the Army, 1975), pp. 12–13; Maj. Gary L. Telfer, Lt. Col. Lane Rogers, and V. Keith Fleming Jr., *U.S. Marines in Vietnam: Fighting the North Vietnamese, 1967* (Washington, D.C.: History and Museums Division, Headquarters, U.S. Marine Corps, 1984), pp. 75–78.

the I/II Corps line, a town that had only become important to the Americans in January when the marines dispatched a battalion to cope with a rise in Viet Cong activity and to cut an enemy supply line to the coast. Despite two months of heavy fighting, the marines were barely dug in, still without beach and pier facilities or an airfield, or a secure lifeline down Highway 1 from the port at Chu Lai, and therefore dependent on helicopter resupply from ships offshore. Westmoreland's orders to I Field Force were to the point: turn the town of Duc Pho into a robust support base—and do so quickly—and a staging area as large as necessary for the Army commitment.[2]

To spearhead that commitment, Maj. Gen. John J. Tolson, the 1st Cavalry Division's commander, chose his reserve unit, the 2d Battalion, 5th Cavalry. At first light on 7 April, the cavalrymen boarded Caribous and Chinooks at An Khe for the flight to Landing Zone ENGLISH where they transferred to Huey helicopters for the journey to Duc Pho. By nightfall, the 2d Battalion relieved the marines outside the town. The 1st Cavalry Division's 2d Brigade headquarters flew in the following morning and assumed control of all Army and Marine forces in the area, now designated LE JEUNE. A second cavalry battalion followed the headquarters. Because the marines at the time had too few helicopters to effect their redeployment north, they remained under the control of the 2d Brigade until 21 April.[3] (*Map 20*)

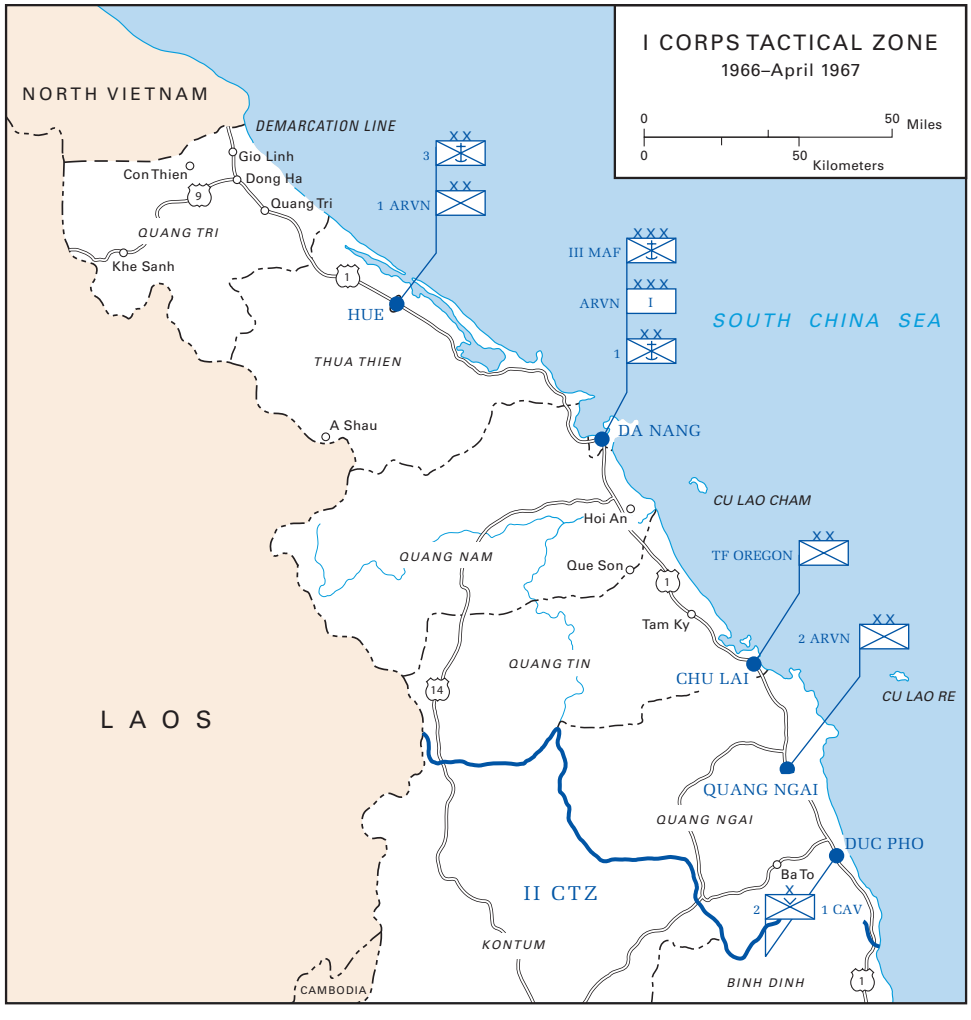
With follow-on forces on their way to Duc Pho, one of the first priorities was construction of a rough but ready airfield. The assignment fell to the division's 8th Engineer Battalion. Building on a reconnaissance of the site the previous month, advance elements of the battalion, including Company B, arrived on 7 April to start work east of the town in an open area called Landing Zone MONTEZUMA. Over a period of forty-eight hours, helicopters delivered thirty-one pieces of equipment weighing over two hundred tons—making this the largest movement for the airmobile engineer battalion up to that point. The movement of the equipment, much of it partially disassembled, required twenty-four CH–54 Flying Crane sorties and fifteen CH–47 Chinook sorties. Work proceeded at a rapid pace around the clock, with operators running their equipment at night under the lights of vehicles and a floodlight set. This caused some concern to the marines who had endured nightly sniper and mortar fire over the past three months. The rumble of the bulldozers, graders, and other earthmoving equipment turned out to be the only activity to disturb their sleep that night. By dawn of the second day, the engineers completed one-half of the runway, and the work continued without interference.[4]

After twenty-four hours of continuous work, the 8th Engineer Battalion completed a 1,400-foot Caribou strip and proceeded into the next night to

[2] MacGarrigle, *Taking the Offensive*, pp. 205, 211; Pearson, *War in the Northern Provinces*, p. 15; Tolson, *Airmobility*, p. 131; Telfer, Rogers, and Fleming, *Fighting the North Vietnamese*, pp. 52–57, 63.

[3] MacGarrigle, *Taking the Offensive*, pp. 210–11, 227–43; Tolson, *Airmobility*, pp. 130–33; Telfer, Rogers, and Fleming, *Fighting the North Vietnamese,* pp. 78–79.

[4] Maj. Gene A. Schneebeck and Capt. Richard E. Wolfgram, "Airmobile Engineer Support for Combat," *Military Engineer* 59 (November-December 1967): 397–98; AAR, Opn LE JEUNE, 8th Engr Bn, 4 May 67, pp. 1–2, Historians files, CMH; Tolson, *Airmobility*, pp. 132–33.



Map 20

expand the runway for C–123 use. On 9 April, the first Caribous began delivering sections of culvert to be used to carry a drainage channel under the expanded runway. Air traffic was extremely heavy on that first day with over a thousand landings by helicopters and fixed-wing aircraft. Work crews tried to reduce the immense dust clouds of the light sandy soil stirred by the heavy helicopter traffic by spreading peneprime on the helipads and refueling areas. On the evening of the tenth, work began on the installation of the culvert. Two scrapers cut a trench while a squad completed the culvert assembly for the drainage channel. Two bulldozers slowly moved the culvert into position and pushed it into the trench. The heavy equipment continued the cut, fill, and compaction work. By dawn the next day, the compacted earth C–123 runway, 2,500 feet long and 50 feet wide, was done. A few days later, work began on a second Caribou airstrip placed 145 feet west of the C–123 runway's centerline.

The second strip, completed on the evening of 15 April, became necessary to allow further expansion of the original airstrip to handle C–130s. Upon its completion, the Caribou runway then reverted to a taxiway.[5]

On 10 April, an advance party of the 39th Engineer Combat Battalion arrived from Tuy Hoa to coordinate support requirements with the 8th Engineer Battalion and to prepare for the 39th's main mission—engineering support for Task Force OREGON. The main body of the battalion traveled by ship. On 12 April, Company D came ashore two and a half miles east of Duc Pho at Landing Zone GUADALCANAL, also called RAZORBACK BEACH. A few days later, Company A and parts of the Headquarters Company and the 4th Platoon, 554th Float Bridge Company, came ashore. Two companies, Company B at Tuy Hoa and Company C at Vung Ro Bay, remained behind for the time being. Other elements of the 554th Float Bridge Company and a bridge platoon of the 509th Panel Bridge Company were also scheduled to join the 39th Engineer Battalion.[6]

Since the 1st Cavalry Division could not completely resupply the 2d Brigade by airlift and roads, the 39th Battalion's first job was to build a road from the beach to Duc Pho as a ground link for supplies delivered by landing craft. Despite heavy rains and enemy mines, the 39th Battalion task force blazed a trail to Landing Zone MONTEZUMA on the twenty-second. Within three days, the trail was upgraded to a pioneer road. While Company D continued to improve the road, Company A moved men and equipment to Duc Pho to take over the C–130 airfield work. Company A, which endured some sniper fire, completed topping off the runway with MX19 aluminum matting on 15 May. The first C–130 landed on the new 3,500-by-60-foot strip with 300-foot overruns that evening. The following morning, Company A joined the expanded all-weather C–130 runway to the temporary Caribou airstrip. The Duc Pho airfield, renamed BRONCO, was officially completed on 31 May. The 39th Engineer Battalion also built helicopter pads and an ammunition supply point, and connected an access road from the airfield to Highway 1. On 30 June, the battalion began building revetments for all aircraft parked at BRONCO.[7]

Direct support to the 2d Brigade's two infantry battalions during operations in the LE JEUNE area came from the 8th Engineer Battalion's Company B, which carried out minesweeps, tunnel and bunker destruction, and general support. The latter chores included building helicopter revetments and pioneer roads, installing 6,000 yards of concertina barbed wire around the Landing Zone MONTEZUMA perimeter, and spreading peneprime to reduce dust. One

[5] Schneebeck and Wolfgram, "Airmobile Engineer Support for Combat," pp. 398–99; AAR, Opn LE JEUNE, 8th Engr Bn, pp. 3, 6–7; Tolson, *Airmobility*, p. 133.

[6] ORLL, 1 May–31 Jul 67, 39th Engr Bn, 15 Aug 67, pp. 2–3, 5; AAR, Opn BAKER/MALHEUR I, 39th Engr Bn, 16 Sep 67, pp. 1–2, both in Historians files, CMH.

[7] AAR, Opn BAKER/MALHEUR I, 39th Engr Bn, pp. 2–6; AAR, Opn LE JEUNE, 8th Engr Bn, pp. 1–2, 5–6; ORLL, 1 May–31 Jul 67, 39th Engr Bn, pp. 1–2, 5; Schneebeck and Wolfgram, "Airmobile Engineer Support for Combat," pp. 398–99; Quarterly Hist Rpt, 1 Apr–30 Jun 67, MACDC, 11 Jul 67, p. IV-8, Historians files, CMH; ORLL, 1 May–31 Jul 67, Task Force OREGON, 5 Nov 67, p. 35, Historians files, CMH.

Men of the 39th Engineer Battalion lay MX19 matting at Duc Pho.

of the battalion's water points was also airlifted from Landing Zone ENGLISH to Duc Pho on the eighth. Because the only source of water lay some 550 yards outside the perimeter, troops every morning had to sweep the road to the water point for mines.[8] (*Map 21*)

On 12 April, Task Force OREGON, under the command of Maj. Gen. William B. Rosson, was officially activated and eight days later opened its headquarters at Chu Lai some thirty-seven miles north of Duc Pho. The task force relieved the 1st Marine Division on the twenty-sixth and formally took over responsibility for the Chu Lai and Duc Pho sectors. By then the 196th Light Infantry Brigade, which had been withdrawn a few days earlier from the final phase of JUNCTION CITY, completed its move to Chu Lai. Reinforcing the brigade were a battalion from the 3d Brigade, 25th Infantry Division, and a squadron from the 11th Armored Cavalry Regiment. When, on 22 April, two battalions from the 3d Brigade, 25th Division, replaced the 2d Brigade, 1st Cavalry Division, at Duc Pho, the LE JEUNE operation ended. During the first week in May, the 1st Brigade, 101st Airborne Division, put ashore at RAZORBACK BEACH and joined Task Force OREGON, making the task force equivalent to a three-brigade division.[9]

[8] Schneebeck and Wolfgram, "Airmobile Engineer Support for Combat," p. 399; AAR, Opn LE JEUNE, 8th Engr Bn, 4 May 67, pp. 4–7.

[9] MacGarrigle, *Taking the Offensive*, pp. 213–14, 229, 232, 236; Sharp and Westmoreland, *Report*, p. 153.


SOUTHERN I CORPS
April–May 1967
Operational Boundary
ELEVATION IN METERS
0
200
500
800 and Above
0
10 Miles
0
10 Kilometers
TAM KY
TAM KY
TF OREGON
XX
196
X
Ky Khuong
1
CHU LAI
QUANG TIN
QUANG NGAI
Binh Son
529
Song Tra Bong
Tra Bong
BATANGAN PENINSULA
SOUTH
CHINA
SEA
Son Tinh
5B
Song Tra Khuc
QUANG NGAI
QUANG NGAI
Ha Thanh
5B
582
Nghia Hanh
5B
Mo Duc
Minh Long
Song Ve
Song Tra Cau
3
25
X
1
101
X
Song Re
QUANG NGAI
KONTUM
BRONCO
Duc Pho
RAZORBACK
Ba To
1
5B
Gia Vuc

Map 21

On 11 May, Task Force OREGON launched its first major operation, MALHEUR, with the airborne brigade making a sweep inland from Duc Pho. The heliborne search-and-destroy operation lasted until the end of May, followed by MALHEUR II, which ended on 2 August. Operations HOOD RIVER and BENTON followed. Although the operations resulted in large enemy losses and the capture of food, weapons, and ammunition caches, they did not draw enemy forces into large-scale fighting.[10]

Army engineers allocated to Task Force OREGON, in addition to the 39th Battalion, were drawn from units that supported the three brigades. Company A, 326th Engineer Battalion, deployed with the 1st Brigade, 101st Airborne Division; the 175th Engineer Company with the 196th Infantry Brigade; and Company C, 65th Engineer Battalion, with the 3d Brigade, 25th Division. Technically the separate companies of these brigades were considered part of the 39th Engineer Battalion, but they remained attached to their respective brigades.[11]

As soon as the 39th Engineer Battalion completed the Duc Pho airfield, attention turned to reopening Highway 1 to traffic between Chu Lai and Duc Pho and south to the I/II Corps boundary. Logistics planners emphasized that this stretch would be the only dependable means of supply during the forthcoming monsoon. The road was secure between Chu Lai and Quang Ngai City, but between Quang Ngai and Duc Pho and south to the corps border it was controlled by the enemy and needed extensive repairs. General Westmoreland reemphasized the importance of the highway when he learned of plans to build a Caribou-capable airstrip at Mo Duc, about half-way between Duc Pho and Quang Ngai City. The airfield would support a nearby firebase and the district advisory team, but Westmoreland announced during a visit to Chu Lai that airfield work could be delayed until 1 September.[12]

With elements of Task Force OREGON providing security, the 39th Engineer Battalion, and the 9th Marine Engineer Battalion, which had stayed behind in southern I Corps to support the Army, were ordered to bring the road to pioneer status, followed by more improvements. A new 75-ton-per-hour rock crusher was shipped to the 39th Engineer Battalion so it could set up a quarry approximately three miles south of Duc Pho. Limited rock production started on 10 September.[13]

Company A opened the road to traffic northward from Duc Pho, filling craters, grading, and building bypasses around destroyed bridges, followed

[10] MacGarrigle, *Taking the Offensive*, pp. 229–43; Sharp and Westmoreland, *Report*, p. 154; Telfer, Rogers, and Fleming, *Fighting the North Vietnamese*, p. 119.

[11] Engineer Support of Combat Operations, 26 May 67, incl. 8, p. 2, OCE Liaison Officer Trip Rpt no. 7.

[12] Msgs, COMUSMACV 18616 to COMNAFORV, 8 Jun 67, sub: Support of Project OREGON, and Task Force OREGON to III MAF, 31 May 67, sub: Visit of COMUSMACV, 30 May 67; Memo, 1st Log Cmd, 18 Jun 67, sub: Trip Report, Visit to Chu Lai, 5 Jun 67, pp. 1, 3; Memo, Lt Gen Bruce Palmer Jr., Dep CG, USARV, for COMUSMACV, 5 Nov 67, sub: Engineer Requirements in Americal Division TAOR [Tactical Area of Responsibility], p. 2. Messages and memos in Historians files, CMH.

[13] ORLLs, 1 May–31 Jul 67, Task Force OREGON, p. 23, 1 May–31 Jul 67, 39th Engr Bn, pp. 3, 9, and 1 May–31 Jul 67, 45th Engr Gp, p. 4.

Once the airfield work at Duc Pho neared completion, the engineers turned their attention to reopening Highway 1 to Chu Lai.

by repairing or rebuilding the bridges. In many cases culverts were installed instead of bridges. Along the way, Company A provided its own security and deployed demolition teams and a bulldozer to destroy nearby tunnels and bunkers. When the Viet Cong retaliated by destroying a new forty-five-foot dry span on the evening of 1 June, work crews returned the next day and replaced the damaged span with two culverts. Company C, which had now rejoined the battalion, was given the job to improve the road southward from Quang Ngai City. On the fourteenth, the two companies met, and the fifty-mile stretch of Highway 1 between Chu Lai and Duc Pho was now open to convoy traffic. South of Duc Pho, Company D opened the road to the corps border on 8 July, linking up with the 8th Engineer Battalion working north from Bong Son. The next day the first convoy traversed this stretch.[14]

Although now open between Chu Lai and the border during daylight hours, Highway 1 still resembled a trail with many bypasses, culverts instead of bridges, and temporary bridges. Much work still needed to be done. The danger of mines and ambushes remained foremost in the minds of engineers working on the road. During the three-month period ending on 31 July, the 39th Engineer Battalion suffered three killed and twenty-six wounded, mostly along Highway 1. In July, the southernmost one-third of the 39th Engineer

[14] ORLLs, 1 May–31 Jul 67, 39th Engr Bn, pp. 2–5, and 1 May–31 Jul 67, 45th Engr Gp, p. 4; Quarterly Hist Rpt, 1 Jul–30 Sep 67, MACDC, 21 Oct 67, p. IV-8, Historians files, CMH; MacGarrigle, *Taking the Offensive*, pp. 242–43.

Battalion's Highway 1 responsibility was transferred to the 19th Engineer Battalion, which began to deploy north from Qui Nhon to work on the road from Bong Son to Duc Pho. Meanwhile, Seabees based in Chu Lai upgraded the highway from Quang Ngai City to Chu Lai, and Marine engineers worked northward from Chu Lai. Improvements to Highway 1 gradually advanced from a pioneer dry-weather roadbed and bypasses to a road with semipermanent bridges and a road surface which, if properly maintained, could bear divisional loads year-round.[15]

Yet for all of the good work along Highway 1 as well as at Duc Pho airfield, the 39th Engineer Battalion was not trouble-free. Logistical problems abounded. Sustaining U.S. forces around Duc Pho was the job of Task Force GALLAGHER, a special group of support units organized to manage supply for all Army units in the area. For the engineers, this included Class IV construction and barrier materials. Equipment and supplies not available from Task Force GALLAGHER came from the Qui Nhon Support Command with help from the 45th Group headquarters, which was conveniently located next door to the support command. Construction work, however, was slowed by Task Force GALLAGHER's lack of forklifts to load heavy materials. Work was also slowed because the MX19 airfield matting kits did not have turndown adapters, and the engineers had to improvise time-consuming anchorage systems to hold the Duc Pho runway in place. The 39th Engineer Battalion's shortage of seven scoop loaders, one twenty-ton crane-shovel, a welding set, an air compressor, two 10-kilowatt generators, and several vehicles and trailers further affected the unit's capability. Efforts were made through the 45th Group supply officer to speed the delivery of these items.[16]

Another problem facing the 39th Engineer Battalion was maintenance support. Initially, there were no direct or general support maintenance units in the area, and replacement parts for engineer equipment were almost nonexistent. An eleven-man contact team from a maintenance company based at Tuy Hoa provided some repair capability to the 39th Engineer Battalion but no repair parts. By mid-June, the lack of spare parts for engineer equipment had become critical. When the problem came to the attention of General Westmoreland during a visit to Chu Lai, Task Force OREGON, U.S. Army, Vietnam, and the Qui Nhon Support Command reacted by checking all requisitions and initiating a crash program to improve supply flow. By 5 July, the engineer repair parts situation at Duc Pho had become "marginally adequate."[17]

In stark contrast to Duc Pho, Army troops at Chu Lai found a well-developed complex supporting some 19,000 marines and sailors on a base still undergoing construction. Following the construction of an 8,000-foot AM2 airstrip there in mid-1965, the Seabees added a 4,000-foot AM2 crosswind runway and separate helicopter facilities the following year. In late 1966, RMK-BRJ

[15] ORLLs, 1 May–31 Jul 67, 39th Engr Bn, pp. 6–9, and 1 May–31 Jul 67, 45th Engr Gp, p. 3.
[16] ORLL, 1 May–31 Jul 67, 39th Engr Bn, pp. 6–8; AAR, Opn BAKER/MALHEUR I, 39th Engr Bn, p. 6.
[17] ORLLs, 1 May–31 Jul 67, Task Force OREGON, p. 36 (quoted words), 1 May–31 Jul 67, 39th Engr Bn, pp. 8–9; AAR, Opn BAKER/MALHEUR I, 39th Engr Bn, p. 6; Msg, Task Force OREGON to III MAF, 31 May 67, sub: Visit of COMUSMACV, 30 May 67.

completed a 10,000-foot concrete runway. The shallow-draft port had several LST and LCU ramps, a barge discharge pier, and pipelines for offshore fuel discharging. LSTs, however, could enter the port area only at high tide, and monsoonal storms and typhoons threatened the facilities. The contractor was nearing completion of a fifth hangar and was working on a large power plant when it received word to phase down. On 1 May 1967, RMK-BRJ turned over uncompleted projects, concrete and asphalt plants, shops, and work camps to the Navy, which in turn divided the facilities and projects among Army, Navy, and Marine Corps engineers on the scene. Total contract cost for work done during the twenty-two months RMK-BRJ had been at Chu Lai came to some $37 million. The Seabees, in addition to completing work for the 6,500 Marine aviation, communications, and naval support troops staying behind, had already begun planning for Task Force OREGON. The former Marine Corps commander in southern I Corps, a brigadier general, remained as the installation coordinator.[18]

Marine ground units began leaving Chu Lai in April, and they took with them their generators and water purification sets. As a result, water rationing became necessary for several weeks. Existing wells could not support the troops housed by Task Force OREGON, and Army engineers had to drill a new well. After repeated efforts, they received enough pumps and filtration units, and on 20 May water rationing was no longer required. Additional wells were dug in August. As for generators, the 1st Logistical Command temporarily assumed facilities engineering responsibility for the task force's headquarters, and generators were furnished to the headquarters repair and utilities section. On the other hand, the marines left behind some refrigeration equipment and a limited ice-making capability, supplemented by small amounts of ice purchased on the economy. In order to provide more ice, the Seabees began building a fifteen-ton-capacity ice-making plant in May and completed it in mid-July.[19]

In mid-June, General Westmoreland decided to leave Task Force OREGON in southern I Corps throughout the autumn monsoon. As a result, base construction requirements at Chu Lai and Duc Pho took on a new perspective. Initially, the 39th Engineer Battalion, the 9th Marine Engineer Battalion, and Naval Mobile Construction Battalions 71 and 8 (the latter replaced by Naval Mobile Construction Battalion 6 in early August), concentrated on completing the most urgently needed facilities to support operations. Between 1 and 16 May, two large complexes for the Army's 14th Aviation Battalion at Chu Lai were completed. The aviation facilities consisted of M8A1 landing mat aprons, helicopter pads, taxiways, and refueling pads, plus liberal applications of peneprime for dust control. With the approaching northeast monsoon in mind, attention turned to upgrading Highway 1 to an all-weather supply route, improving ammunition supply points, forward supply areas, and helipads,

[18] Telfer, Rogers, and Fleming, *Fighting the North Vietnamese*, pp. 320–23; MacGarrigle, *Taking the Offensive*, p. 299; MACV Complex Review, 1 Dec 66, pp. 40–47; Diary of a Contract, pp. 244–46; Memo, 1st Log Cmd, 18 Jun 67, sub: Trip Report, Visit to Chu Lai, 5 Jun 67, p. 1.

[19] ORLL, 1 May–31 Jul 67, Task Force OREGON, pp. 34–35; Quarterly Hist Rpt, 1 Jul–30 Sep 67, MACDC, p. IV-4; Msg, Maj Gen Charles W. Eifler, CG, 1st Log Cmd, to Gen Dwight E. Beach, CINCUSARPAC, 31 May 67, sub: Leventhal Report, Historians files, CMH.

While the base at Duc Pho had very little work done, the base at Chu Lai was consistently improved by the Seabees and RMK-BRJ.

upgrading living quarters to Standard 2 tentage with raised wooden floors and tent frames at Chu Lai and Duc Pho, and providing revetments for each aircraft at the two bases. Other work slated for the 39th Engineer Battalion was the new airfield at Mo Duc.[20]

[20] ORLL, 1 May–31 Jul 67, Task Force OREGON, pp. 28, 35; Quarterly Hist Rpt, 1 Apr–30 Jun 67, MACDC, p. IV-5.

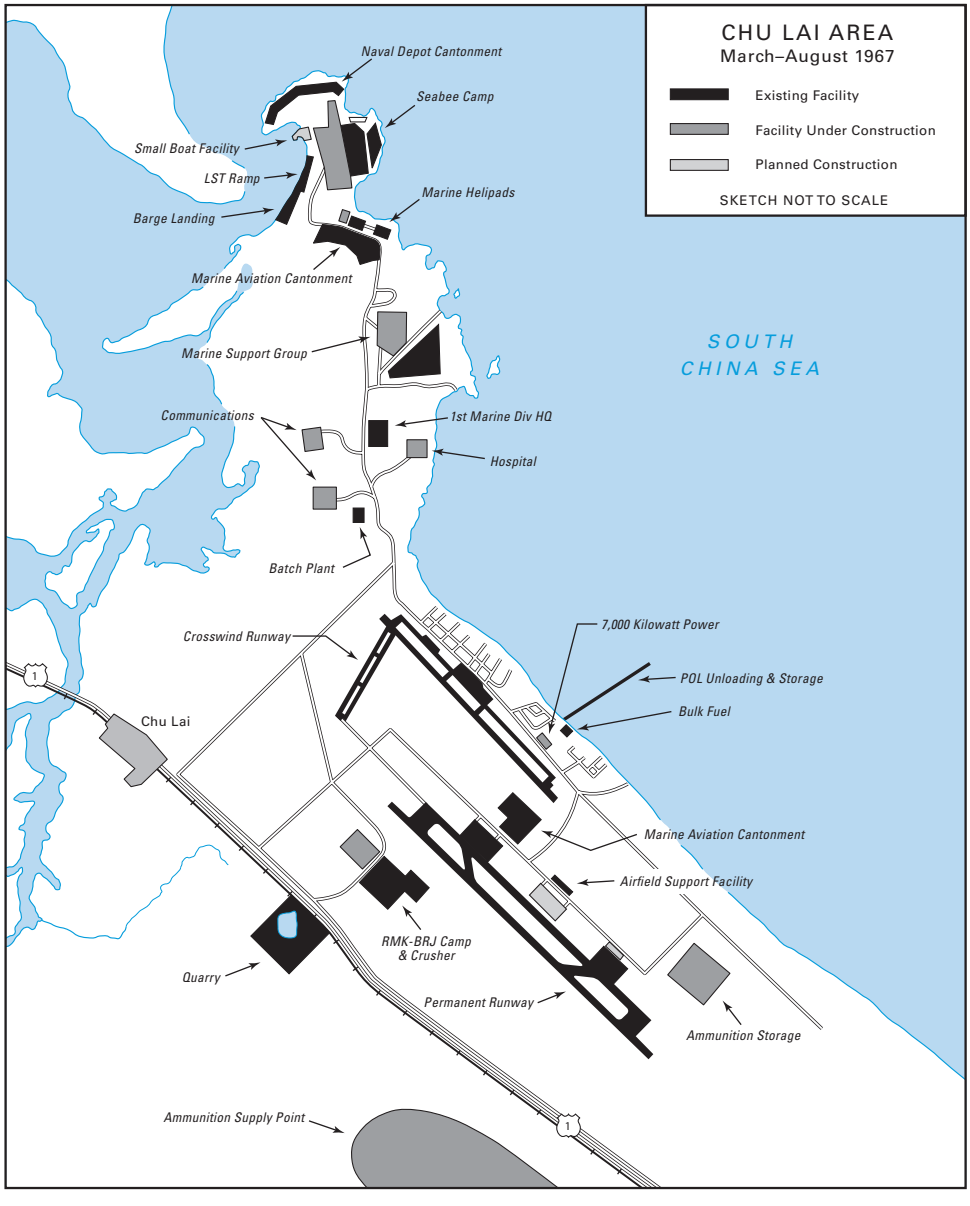
With the added workload, the 39th Engineer Battalion pressed to reclaim its remaining company left behind in II Corps. On 19 May, Company B had moved sixty-two miles north over Highway 1 to Qui Nhon where it stayed for one month with the 19th Engineer Battalion at Long My. During its stay at Long My, the company prepared to rejoin its parent unit and helped the 19th with its depot projects. On 21 June, Company B departed Qui Nhon aboard an LST and reached Chu Lai the same day. Soon the company was at work building roads in support of tactical operations, an ammunition supply point at Quang Ngai City, and taking on several base camp projects at Chu Lai.[21]

Meanwhile, Lt. Col. Joseph F. Castro, who replaced Colonel Fulton in July as commanding officer of the 39th Engineer Battalion, learned that Engineer Command did not have jurisdiction to issue construction directives for construction in I Corps, still a Navy and Marine Corps preserve. As a result, units could not draw materials to make tent frames and latrines for self-help base development. The problem was passed to the MACV Directorate of Construction. In turn, the directorate prepared a list of additional and unprogrammed projects, including $5.2 million for Task Force OREGON and passed these requirements on to Washington for approval and funding. With this action and approval, steps were taken to obtain materials and get tentage construction under way to keep the troops out of the mud before the rains arrived in a few months. In addition, the 1st Logistical Command began preparations to have Pacific Architects and Engineers take over facilities engineering responsibilities at Chu Lai and Duc Pho.[22] (*Map 22*)

Progress at Chu Lai continued at an impressive rate through the remainder of 1967. Improvements continued on the offshore fuel pipelines by extending them out another 1,500 feet. By July, the lines were ready for T–2 tanker operation. In June, Naval Mobile Construction Battalion 8 began expanding fuel storage tank capacity on the beach. Five 10,000-barrel tanks were completed by Naval Mobile Construction 6 in August and September, but the tanks soon developed leaks. The Seabees applied an epoxy seal, and the tanks were in service by November. Additional ammunition storage pads for Marine Corps jet fighters based at Chu Lai were started in July and finished in October. An approach and centerline runway lighting system for the 10,000-foot runway was installed in September. Two of the hangars under construction for the marines were ready for use in late October. Naval Mobile Construction Battalion 6 completed an engine maintenance shop in October and neared completion of an avionics repair facility in December. Quarry operations run by Naval Mobile Construction Battalion 71 picked up momentum in June with a two-shift operation. In May and June, the Seabees were even able to slip in the construction of a new chapel. As evidence of permanency, the Seabee

[21] ORLLs, 1 May–31 Jul 67, Task Force OREGON, pp. 23, 35, 1 May–31 Jul 67, 39th Engr Bn, pp. 2–3; Msg, CG, USARV, AVDF-GC 623 to Engr Cmd, 30 May 67, sub: Request for Additional Engineer Company, Historians files, CMH.

[22] Memo, 1st Log Cmd, 18 Jun 67, sub: Trip Report, Visit to Chu Lai, 5 Jun 67, p. 3; Msg, Brig Gen Mahlon E. Gates, MACV Dir of Const, SOG 1343, to Brig Gen Daniel A. Raymond, Ch of Southeast Asia Const, Dept of Def, 1 Jul 67, Historians files, CMH.



Map 22

battalion began construction of a dairy plant in early June. The plant was completed in August, and Foremost Dairy, one of two firms contracted to produce milk and dairy products in Vietnam, began production in August. Also in August, MACV directed U.S. Army, Vietnam, to start shipping 40-by-90-foot prefabricated buildings from Army stocks in Qui Nhon to Chu Lai. Four of the eighteen buildings in stock were to be erected by the

Chu Lai base hosted a jet airfield and logistic facilities.

Seabees for use as warehouses for Class II and IV storage, a post office, and a post-exchange addition.[23]

At Duc Pho, extensive development was also under way at the combat base. Plans were developed to provide an all-weather capability for the C–130 airfield and additional crushed rock for roadwork. Procurement action on a runway lighting system was initiated in August. In late August, Naval Mobile Construction Battalion 71 was charged with providing technical help on self-help construction projects in the cantonment area to replace tents with wooden buildings. During October and November, the Seabee battalion completed a refueling facility that included a 16,000-barrel tank farm. By the end of the year, the brigade-size camp was well on its way to become a semipermanent installation, including facilities engineering support by Pacific Architects and Engineers.[24]

As 1967 drew to a close, Task Force OREGON transformed itself into a legitimate division. General Westmoreland resigned himself to the fact that Army troops would have to remain in southern I Corps indefinitely. On 25 September, Task Force OREGON officially became the 23d Infantry Division (Americal).

[23] Quarterly Hist Rpts, 1 Apr–30 Jun 67, MACDC, pp. IV-4 to IV-5, 1 Jul–30 Sep 67, MACDC, pp. IV-3 to IV-4, V-3, and 1 Oct–31 Dec 67, MACDC, 21 Jan 68, pp. IV-3 to IV-4, last in Historians files, CMH. For more on dairy products, see U.S. Army Procurement Agency, Vietnam, *Procurement Support in Vietnam, 1966–1968* (Japan: Toshio Printing Co., n.d.) pp. 142–44.

[24] Quarterly Hist Rpts, 1 Jul–30 Sep 67, MACDC, p. IV-7, and 1 Oct–31 Dec 67, MACDC, p. IV-6.

The Americal designation came about because of comparable circumstances in the Southwest Pacific Theater during World War II. U.S. Army units on New Caledonia were transformed into the Americal Division to support the Marine Corps on Guadalcanal. In Vietnam, the title seemed appropriate as a means to promote good working relationships between the Marine Corps and the Army. Similarly, the Americal remained the only division to be formed outside the United States in the two wars. But rather than completely restructure the task force, the MACV commander allowed the three constituent brigades to retain their identities. The new division consisted of the 196th Light Infantry Brigade at Chu Lai; the 3d Brigade, 4th Infantry Division at Duc Pho; and the 1st Brigade, 101st Airborne Division, now at Tam Ky, the capital of Quang Tin Province about eighteen and one-half miles northwest of Chu Lai.[25] A fourth brigade, from the 1st Cavalry Division, was put under the operational control of the new division and relieved the marines in the Que Son Valley, a populated, fertile area extending inland from Highway 1 along the Quang Nam–Quang Tin provincial border some thirty-one miles northwest of Chu Lai. In October, the 198th Light Infantry Brigade arrived at Hoi An in Quang Nam Province, replacing the 1st Brigade, 101st Airborne Division, and in December the 11th Light Infantry Brigade reached Duc Pho and replaced the 3d Brigade, 4th Division. The two new brigades had their own engineer companies, the 55th with the 198th Brigade and the 6th assigned to the 11th Brigade.[26]

For the most part, existing engineer units were merged into the division's new 26th Engineer Battalion. Senior engineer officials, including General Cassidy, the chief of engineers; General Ploger at Engineer Command; and Brig. Gen. Andrew P. Rollins Jr., who assumed command of the 18th Engineer Brigade in September, had supported the idea to leave the infantry brigades' organic engineer companies with the brigades and to activate a battalion at division level. This option, however, did not prevail, with the final decision by the Department of the Army in early November. Companies A, B, and C of the newly activated 26th Engineer Battalion were formed by assigning new designations to the three companies assigned to the 11th, 196th, and 198th Infantry Brigades. To flesh out the rest of the new battalion, Ploger and Rollins transferred men and equipment from the 18th Engineer Brigade, mostly from the 39th Engineer Battalion, to form the headquarters and Company D. The command also gave the 554th Float Bridge Company a new designation: Company E, the 26th Battalion's bridge company. Elements lost by the 39th Engineer

[25] On 1 August 1967, the 3d Brigade of the 25th Infantry Division was redesignated the 3d Brigade of the 4th Infantry Division. The 4th Division's original 3d Brigade, which had been operating under the 25th Division in III Corps since entering Vietnam, was simultaneously redesignated the 3d Brigade of the 25th Division. In addition, both engineer companies attached to the two brigades exchanged designations. This change of title resolved some administrative problems of two brigades located so far away from their divisions. It also brought the 3d Brigade, 4th Division, in southern I Corps a step closer to rejoining its parent division in the highlands. MacGarrigle, *Taking the Offensive*, pp. 245, 267.

[26] ORLL, 1 Aug–31 Oct 67, Americal Div, 26 Nov 67, pp. 1–2, Historians files, CMH; Memo, Palmer for COMUSMACV, 5 Nov 67, sub: Engineer Requirements in Americal Division TAOR, p. 1; Sharp and Westmoreland, *Report*, p. 138.

Battalion were reconstituted from Engineer Command assets. Colonel Castro moved over to the 26th Engineer Battalion in mid-December as its first commander. On 20 January 1968, the 39th Engineer Battalion was released from its attachment to the Americal Division and returned to 45th Group control. The battalion, now under the command of Lt. Col. James M. Miller, continued to provide general support to the Americal Division.[27]

While the introduction of an Army division threw the enemy off balance in southern I Corps, the North Vietnamese kept relentless pressure on the marines all along the Demilitarized Zone. By September, the increased shelling endangered the construction of strongpoints and combat bases parallel to the Demilitarized Zone. The construction by Marine engineers, begun in April, was part of the long-debated electronic anti-infiltration barrier, the "McNamara Line," ordered by Secretary McNamara to be built from the coast to the Laotian border. Mounting casualties prompted Westmoreland and the Marine commander, who both had doubts whether the system would work, temporarily to halt construction and concentrate on improving existing strongpoints and combat bases. As 1967 came to an end, Marine units constantly pounded by North Vietnamese artillery continued to be pinned down inside their fortified bases, hindering their operations.[28]

Meanwhile, the Americal Division continued the slow process in a seemingly never-ending search for elusive enemy units. In September, Westmoreland assigned all of Quang Ngai and Quang Tin Provinces and part of Quang Nam Province to the Americal Division, allowing the marines to shift more forces north. Operation WHEELER, which ran from 11 September to 15 October, was an attempt to clear the area in the interior northwest of Chu Lai. In October, the deadly game of cat and mouse continued north of WHEELER in the Que Son Valley as Operation WALLOWA. This time the 1st Cavalry Division's 3rd Brigade, operating under the control of the Americal Division, was brought north from Binh Dinh. After relieving elements of the 1st Marine Division, the cavalry brigade launched a series of air assaults in the valley. This operation, combined with the 1st Brigade, 101st Airborne Division, and later the 196th Infantry Brigade, extended into the following year. To the south the 3d Brigade, 4th Division, in the Duc Pho and Mo Duc districts faced the same situation. While these operations took a toll against the enemy, the North Vietnamese in the area remained an effective threat. In the end, the dry-season

[27] Rpt of Visit to Various Headquarters in Vietnam, 22 Nov–13 Dec 67, incl. 7, p. 1, OCE Liaison Officer Trip Rpt no. 10, 19 Jan 68, OCE Hist Ofc; ORLLs, 1 Nov 67–31 Jan 68, Engr Cmd, Jan 68, p. 15, 1 Nov 67–31 Jan 68, 39th Engr Bn, 9 Feb 68, pp. 2, 8, both in Historians files, CMH; Msg, Maj Gen Robert R. Ploger, CG, Engr Cmd, GVP 921 to Brig Gen Andrew P. Rollins Jr., CG, 18th Engr Bde, 3 Nov 67, sub: Engineer Battalion of 23d Inf Div (Americal); Msg, Rollins ARV 1978 to Ploger, 9 Nov 67, sub: Americal Engineer Battalion, both in Robert R. Ploger Papers, CMH; Memo, Palmer for COMUSMACV, 5 Nov 67, sub: Engineer Requirements in Americal Division TAOR, pp. 1–2.

[28] MacGarrigle, *Taking the Offensive*, pp. 255–63. For more on the Demilitarized Zone barrier, see Pearson, *War in the Northern Provinces*, pp. 21–24; Shulimson, *An Expanding War*, pp. 414–19; and Telfer, Rogers, and Fleming, *Fighting the North Vietnamese*, pp. 86–94.

operations in southern I Corps were not the ambitious sweeps into the interior that Westmoreland had anticipated.[29]

Highway 1 and Other Assignments

During most of 1967, the 1st Cavalry Division continued to put pressure on the enemy in neighboring Binh Dinh Province. Operation PERSHING began on 11 February with the purpose of eliminating Viet Cong and North Vietnamese forces from that rice-rich coastal province. A continuation of the cavalry division's campaigns in Binh Dinh Province since early 1966, PERSHING continued into early 1968.[30]

While operating on the coastal plains of Binh Dinh, the division combined the surprise of cavalry with the shock of armor to overwhelm North Vietnamese Army and Viet Cong defenses. Enemy fortifications were well organized and typically prepared in a series of hedgerows quickly thrown up in an elaborate perimeter that gave excellent cover and concealment around an entire village. During an attack, enemy troops remained ensconced in their bunkers, and 1st Cavalry Division forces could only kill or capture them by destroying the bunkers. This led to the attachment of a tank company from the 4th Division. Both the M48A3 tank's 90-mm. gun and heavy armor proved the effectiveness of using armor to deal with the fortifications. The tank's heavy weight alone, or in concert with the engineers' bulldozers, was able to crush trench lines and bunkers. In September, the division received another armor capability with the attachment of the 1st Battalion (Mechanized), 50th Infantry, a recent arrival in Vietnam. General Tolson did not confine this newest unit to mechanized infantry operations, directing the battalion to train for airmobile warfare. With the armored personnel carriers at a central position near Landing Zone UPLIFT, troops could be flown from any landing zone when a mission needed a mechanized unit. Engineer minesweeping teams and bulldozers normally accompanied the armored columns. The onset of the monsoon limited the movement of armor cross-country, and engineering equipment, especially bulldozers and portable bridging, helped overcome obstacles and gaps along the way.[31]

The 1st Cavalry Division deployed troops to I Corps more than once. By the spring of 1967, the enemy had suffered severe troop and supply losses. Relentlessly pursued in every direction of Binh Dinh Province, the remaining elements of the North Vietnamese *3d People's Army of Vietnam (PAVN) Division* sought refuge in adjacent Quang Ngai Province. These frequent retreats to the north, to rest and regroup, contributed to the 1st Cavalry Division's participation in the LE JEUNE operation in April. In May, elements

[29] MacGarrigle, *Taking the Offensive*, pp. 264–83; Telfer, Rogers, and Fleming, *Fighting the North Vietnamese*, pp. 119–20.

[30] Tolson, *Airmobility*, pp. 129–30; MacGarrigle, *Taking the Offensive*, pp. 180–85.

[31] Tolson, *Airmobility*, pp. 130, 139–41; MacGarrigle, *Taking the Offensive*, pp. 186–89, 321; ORLLs, 1 Feb–30 Apr 67, 1st Cav Div, 23 May 67, p. 29, 1 May–31 Jul 67, 8th Engr Bn, 31 Jul 67, pp. 2–3, 12–13, 1 Aug–31 Oct 67, 8th Engr Bn, 31 Oct 67, p. 4; AAR, Opn PERSHING, 1st Cav Div, 29 Jun 68, pp. 13–15. ORLLs and AAR in Historians files, CMH.

of the 3d Brigade based in the An Lao Valley started a series of battalion-size air assaults in southern Quang Ngai Province. In August, the brigade made a major reconnaissance in force into Song Re Valley, for years a sacrosanct Viet Cong stronghold northwest of Duc Pho. By late September, the steady enemy buildup in I Corps generated another call for reinforcements. This time the 3d Brigade moved to Chu Lai and, operating under the control of the Americal Division, began Operation WALLOWA. After relieving elements of the 1st Marine Division, the cavalry brigade launched a series of air assaults in the Que Son Valley. This operation, combined with the 1st Brigade, 101st Airborne Division, and later the 196th Infantry Brigade (WHEELER/WALLOWA), extended into the following year.[32]

In late 1967, the division also fought a major battle in northern Binh Dinh Province during Operation PERSHING. The Battle of Tam Quan took place late in the campaign between 6 and 20 December. By chance a scout team discovered an enemy radio antenna near the town of Tam Quan. The 1st Cavalry Division used "piling on" tactics that had proved successful in earlier operations. An infantry battalion and elements of the mechanized infantry battalion deployed first. The 1st Brigade added forces and teamed up with South Vietnamese troops in a battle characterized by massive use of artillery, tactical air support, and air assaults. The mechanized force, which included flame-throwing armored personnel carriers, closed in to destroy and crush enemy trenches. Combat engineer bulldozers from the 19th Engineer Battalion supported the attackers by building a causeway over the spongy ground, burying trench lines, and clearing areas for helicopter medical evacuation. Enemy forces, consisting primarily of a North Vietnamese Army regiment, lost 650 men during this fierce engagement.[33]

During these operations, the 8th Engineer Battalion provided the full range of support in the field and at the combat bases. In northeastern Binh Dinh, the division dotted the area of operations with many landing zones of various types, which enabled air cavalry forces to move and fight anywhere quickly. The 8th Engineer Battalion helped build or improve existing landing zones at mountaintop firebases (HUMP and LARAMIE), Caribou airstrips (LITTS and MAHONEY), and forward operating bases (the division's tactical command post at TWO BITS near Bong Son, and GERONIMO, ENGLISH, PONY, UPLIFT, and HAMMOND). Landing Zone TWO BITS also included a C–123 runway, and Landing Zone ENGLISH, thanks to continuous improvements made by 45th Engineer Group units, could handle C–130 transports. The engineers also helped pacification efforts to return territory to government control. This activity centered on reopening and improving Highway 1 and local roads.[34]

Within the framework of pacification, the 8th Engineer Battalion carried out contrasting missions of destruction and building. While supporting the 2d

[32] Tolson, *Airmobility*, pp. 142–44, 147–49; MacGarrigle, *Taking the Offensive*, pp. 186–92, 263, 275–81, 315–19.

[33] Tolson, *Airmobility*, pp. 149–50; MacGarrigle, *Taking the Offensive*, p. 322; AAR, Opn PERSHING, 1st Cav Div, p. 16.

[34] Engineer Support of Combat Operations, 26 May 67, incl. 8, pp. 2–3, OCE Liaison Officer Trip Rpt no. 7; ORLL, 1 May–31 Jul 67, 8th Engr Bn, pp. 1–7.

Brigade's operations on the coast some twenty-five miles north of Qui Nhon, Company B destroyed several well-prepared bunkers in and around the villages. During the first week in June, Company A working with the 1st Brigade north of Landing Zone ENGLISH reopened a five-mile section of Highway 1 to the I Corps boundary. After airlifting earthmoving equipment to the work site, the engineers opened a pioneer road in four days. When the 1st Brigade pushed into the An Lao Valley northwest of Bong Son, Company A reopened a section of Route 514, erecting several timber bridges along the way. Company A also answered the brigade's call to destroy fortified villages in the valley.[35]

Repairing damage caused by enemy attacks on the forward bases and countering his increased use of mines and booby traps drew heavily on the 1st Cavalry Division's engineers. In one seventy-day period during Operation PERSHING, the 8th Engineer Battalion reported 268 discoveries of mines or booby traps. On 6 June, the ammunition dump at Landing Zone ENGLISH was blown up, and the battalion straightaway committed troops and equipment to build a new seven-bay ammunition storage area.[36]

Meanwhile, the 45th Engineer Group began a northward shift in northern II Corps and southern I Corps to reopen and upgrade Highway 1. In May, the 18th Engineer Brigade moved the group's southern boundary northward from Ninh Hoa to Tuy Hoa. Concurrently, the 35th Group took control of the 577th Engineer Construction Battalion and responsibility for projects at Tuy Hoa and Port Lane. The arrival of the 589th Engineer Battalion (Construction) from Fort Hood, Texas, in late April restored the 45th Group's construction capability, allowing Col. Kenneth T. Sawyer, who replaced Colonel Bush in May, some flexibility to refocus the efforts of his three combat battalions from base construction to tactical operations and roadwork. By this time, the 35th and 39th Engineer Battalions were supporting the 1st Cavalry Division and Task Force OREGON on a regular basis. Both battalions were also hard at work reopening and upgrading Highway 1 in their areas of responsibility. In addition, Colonel Sawyer planned to move the 19th Engineer Battalion northward and position it between the 35th and 39th Engineer Battalions to work on the road between Bong Son and Duc Pho.[37]

The 35th Engineer Battalion had been providing the 45th Group's principal backup engineering support to the 1st Cavalry Division since late 1966. At the height of the northeast monsoon, Colonel Peel had moved his Headquarters and Company A from Cha Rang Depot to Landing Zone HAMMOND to support Operation THAYER. This mission continued during PERSHING, and by late April the battalion centered its efforts on supporting the division and improving Highway 1 between Qui Nhon and Landing Zone ENGLISH. Company B

[35] Engineer Support of Combat Operations, 1 May–1 Jul 67, incl. 7, p. 29, OCE Liaison Officer Trip Rpt no. 8, 18 Aug 67, OCE Hist Ofc.

[36] Engineer Support of Combat Operations, 26 May 67, incl. 8, p. 3, OCE Liaison Officer Trip Rpt no. 7; Engineer Support of Combat Operations, 1 May–31 Jul 67, incl. 7, p. 2, OCE Liaison Officer Trip Rpt no. 8; ORLLs, 1 Feb–30 Apr 67, 1st Cav Div, p. 29, 1 May–31 Jul 67, 8th Engr Bn, p. 2.

[37] ORLLs, 1 Feb–30 Apr 67, 45th Engr Gp, 11 May 67, pp. 1–5, and 1 May–31 Jul 67, 45th Engr Gp, 14 Aug 67, pp. 2–6, both in Historians files, CMH.

moved by air and road to ENGLISH to maintain a section of Highway 1 and the airstrip. Despite the earlier work by the 19th Engineer Battalion, the runway at ENGLISH started to fail. When the heavy rains slackened in mid-February, Company B removed the matting, repaired the subgrade, and laid new M8A1 matting.[38]

Colonel Peel immediately assigned the attached Company D, 20th Engineer Battalion, the job of building all semipermanent bridges along Highway 1 between Phu Cat and Bong Son, a mission that soon extended to the battalion's entire length of the road. By the end of July, Company D, which on 1 May had been redesignated Company D, 35th Engineer Battalion, averaging two to three new bridges each week, completed thirty timber trestle bridges. The new bridges consisted of timber pile abutments, bents, and piers, and wood and steel stringers depending on the lengths of spans. This arrangement lasted until the autumn, when the impending monsoon dictated a change in the battalion's construction techniques, and each company took charge for all work along its assigned section of the road.[39]

When Lt. Col. David N. Hutchison took command of the 35th Battalion on 1 July, he inherited a battalion now committing most of its resources to improving Highway 1. The emphasis on the roadwork reflected the high priority that MACV and the South Vietnamese government gave to reopening major roads, especially Highway 1 running from the Demilitarized Zone to Saigon and on to the Cambodian border. Each morning mine detection teams checked the road between Landing Zones HAMMOND and ENGLISH, later extending north to the I Corps border and south to the Phu Tai ammunition depot south of Qui Nhon. Work parties followed to work on sections of the road assigned to each company. Using specifications set by the MACV Construction Directorate, the troops widened and elevated the road, placed culverts, and repaired and replaced bridges.[40]

Replacing some old narrow French-built concrete spans along Highway 1 required their destruction. Tight working space in populated areas prevented the construction of the new spans parallel to the old bridge, which was done when possible. After improving a bypass around the bridge to carry traffic, the engineers sometimes had to destroy the old bridge with explosives. On the outskirts of one town north of Qui Nhon, however, the concussion of the blast dislodged some roof tiles of several nearby buildings. As the dust and smoke cleared, the onlookers could hear the sound of crashing tiles as they slid off the roofs of nearby buildings and struck the ground.[41]

Specialized engineer units augmented the 35th Engineer Battalion's road-building capability. Attachments from two separate companies that arrived

[38] ORLL, 1 Feb–30 Apr 67, 35th Engr Bn, 9 May 67, pp. 1–5, Historians files, CMH.

[39] Road Construction by Army Engineer Troops, incl. 9, tab F20, p. 1, OCE Liaison Officer Trip Rpt no. 7; ORLLs, 1 Feb–30 Apr 67, 35th Engr Bn, p. 5, 1 May–31 Jul 67, 35th Engr Bn, 10 Aug 67, pp. 2, 4–5, and 1 Aug–31 Oct 67, 35th Engr Bn, 8 Nov 67, p. 6, last two in Historians files, CMH.

[40] ORLLs, 1 May–31 Jul 67, 35th Engr Bn, p. 2, and 1 Aug–31 Oct 67, 35th Engr Bn, p. 2.

[41] ORLL, 1 Aug–31 Oct 67, 35th Engr Bn, p. 7; MFR, 21 Feb 92, sub: Author's Recollections, 45th Engr Gp, p. 1, Historians files, CMH.

Mines were a constant hazard as the 35th Engineer Battalion worked along Highway 1 between Qui Nhon and Bong Son.

in June included the 2d Platoon, 137th Light Equipment Company, and the 1st Platoon, 70th Dump Truck Company. The haul capability of the dump truck platoon's 24 five-ton dump trucks greatly increased the amount of fill, subcourse, and base course materials used by the 35th Engineer Battalion. The arrival of the 517th Light Equipment Company in July further increased the battalion's equipment capabilities. Once settled in, the 517th replaced the 137th's platoon and began operations on 1 August. The small rock crusher, earthmovers, bucket loaders, graders, cranes, and bulldozers of the light equipment company made possible the amount of work done by the battalion before the monsoon rains began that autumn. The cranes also increased pile-driving operations, thus allowing the simultaneous construction of several bridges. At Bong Son, the 553d and 554th Float Bridge Companies helped Company B span the Lai Giang with a 224-foot M4T6 floating bridge strung between two causeways. South Vietnamese Army engineers also did some bridge work on Highway 1 with materials provided by the 35th Engineer Battalion.[42]

The road improvement effort in Binh Dinh Province received extensive support from RMK-BRJ's Phu Cat industrial site. Initially established to support the construction of Phu Cat Air Base, the quarry and asphalt plant set aside an increasing amount of production for Army projects. Sometimes this placed

[42] Engineer Support of Combat Operations, 26 May 67, incl. 8, p. 3, OCE Liaison Officer Trip Rpt no. 7; ORLLs, 1 May–31 Jul 67, 35th Engr Bn, p. 2, 5, and 1 Aug–31 Oct 67, 35th Engr Bn, pp. 2, 5.

RMK-BRJ paves a portion of Highway 1 north of Qui Nhon.

the two services in competition for the same products, especially crushed rock. The 45th Group needed rock for the road, but the air base commander insisted on getting two-inch clean rock to fill aircraft revetments. Fortunately, the efficient plant served both needs. By mid-1967, the consortium's asphalt plant was in full operation, as shown by newly paved streets in Qui Nhon and twenty-one miles of new pavement along Highway 1 from the port city to the air base. Large belly dump trucks delivered hot asphalt to the firm's paving machine. Once the asphalt was spread by the paving machine, rollers compacted the two-inch surface. Operations then shifted to Highway 19. Following behind the 589th Engineer Battalion's base course work, the contractor hauled and placed the asphalt surface to An Khe. The forty-one-mile stretch between the intersection with Highway 1 and the city of An Khe and the gate of Camp Radcliff was finished before the end of the year.[43]

Convoy traffic on both Highways 1 and 19 greatly increased but moved along briskly thanks to the newly surfaced roads. An asphalt surface provided a swifter all-weather supply route link and made it difficult for the enemy to mine. Since the trucks and semitrailer moving inland on Highway 19 had to negotiate sharp curves along the An Khe Pass, the contractor paved the shoulders. The Viet Cong could still place command-detonated mines by tunneling

[43] Engineer Support of Combat Operations, 26 May 67, incl. 8, p. 4, OCE Liaison Officer Trip Rpt no. 7; MFR, 21 Feb 92, sub: Author's Recollections, 45th Engr Gp, p. 1.

a hole from the embankment, but at least the drivers could see any tampering with the road's surface.[44]

To get a jump on paving Highway 1, Colonel Sawyer arranged with local RMK-BRJ officials to work on Sundays. The foremen agreed to operate the asphalt plant on their off day and to lend the paving equipment to the 35th Engineer Battalion. During the week, Company A prepared the road with a six-inch base course, which included a three-inch layer of crushed stones obtained from the Phu Cat quarry. Using its dump trucks to haul the asphalt, the battalion paved almost one mile each Sunday. By the end of October, the total reached six miles. Commenting on the team work between the group and the contractor, Colonel Sawyer explained that the RMK-BRJ industrial site at Phu Cat had given his group the capability of an additional engineer construction support company.[45]

In mid-July, the 19th Engineer Battalion started its move north. Colonel Rhodes and his staff coordinated the deployment with the two major tactical units on both sides of the corps boundary, the 1st Cavalry Division and the 3d Brigade, 25th Division. The 19th Battalion reconnoitered several potential base camp sites. One hilltop site near Tam Quan had a commanding view of the highway and the South China Sea, but it had to be rejected. An access road would have to be built, and considerable earthwork would be required to build a base camp atop the hill. Also looking for a suitable site for the battalion's main camp, Colonel Sawyer spotted from his helicopter a slight rise of land amid rice paddies just off Highway 1, some six miles north of Landing Zone ENGLISH. The group commander selected this location, known by the 1st Cavalry Division as Sniper's Island. Before the battalion's move north, Rhodes departed Vietnam, leaving the executive officer, Maj. Richard W. Stevens, temporarily in charge. Following the dispatch of an advance party to Sniper's Island, a task force from battalion headquarters, Companies A and B, and elements of the 137th Light Equipment Company departed the Long My base camp before dawn on Sunday, 16 July. The task force, led by the operations officer, Maj. Adrian G. Traas, rendezvoused with minesweep teams from the 35th Engineer Battalion north of Qui Nhon. Traveling some sixty-two miles up Highway 1, the convoy arrived at its destination without incident. That afternoon an infantry company from the 1st Cavalry Division arrived at Sniper's Island to help guard the hastily drawn perimeter for the first night. A few days later, Lt. Col. Andrew C. Remson Jr. flew in by helicopter to take command of the battalion.[46]

At Sniper's Island, the 19th Engineer Battalion set forth to build a defensible base camp and to start work on Highway 1. Scrapers and bulldozers moved earth to form a protective berm around the perimeter. Using lumber

[44] MFR, 21 Feb 92, sub: Author's Recollections, 45th Engr Gp, p. 1.

[45] ORLLs, 1 Aug–31 Oct 67, 35th Engr Bn, 8 Nov 67, p. 3, Historians files, CMH, and 1 Aug–31 Oct 67, 35th Engr Bn, p. 3; MFR, 21 Feb 92, sub: Author's Recollections, 45th Engr Gp, p. 1.

[46] MFR, 21 Feb 92, sub: Author's Recollections, 19th Engr Bn, pp. 1–2; Interv, Maj Paul D. Webber, CO, 26th Mil Hist Det, with Lt Col Andrew C. Remson, CO, 19th Engr Bn, 22 Apr 68, incl. 2, p. 1, VNIT 80, CMH; ORLL, 1 May–31 Jul 67, 19th Engr Bn, 31 Jul 67, p. 2. Both in Historians files, CMH.

hauled from Qui Nhon, troops built a tactical operations center and mortar-proof live-in bunkers along the berm and inside the perimeter. An artillery forward observer stayed with the battalion for several days to register artillery fire around the perimeter. In addition, an artillery unit took up position next to the camp for a short time. Meanwhile, reconnaissance parties set out to examine the road and bridge sites between Bong Son and Duc Pho. Soon work was under way. Abutments on several destroyed bridges were removed in preparation for the construction of timber trestle bridges, and concrete was used to patch up holes along the road.[47]

By late September, the 19th Battalion had completed its deployment. Company D, which was newly formed in June, remained at Long My until late August when it moved to a new bivouac site called Landing Zone THUNDER approximately five miles south of Duc Pho. In late September, Company C moved six miles north of the battalion headquarters, now known as Landing Zone ENGLISH NORTH. Like the 35th Engineer Battalion, the 19th Engineer Battalion with its attached units grew into a large reinforced battalion with over one thousand men. The 1st Cavalry Division considered a force this size straddling Highway 1 beneficial because the engineers' presence helped block the free movement of the enemy in several places. The 137th Light Equipment Company opened quarries at Tam Quan and Duc Pho, and the 513th Dump Truck Company added a section of eight 5-ton dump trucks. In mid-December, the 73d Construction Support Company, which had provided the 45th Group with rock crushing and paving in and around Qui Nhon, moved from its Phu Tai complex to join Company C at Landing Zone LOWBOY and set up operations at Tam Quan and Duc Pho. At the same time, the battalion's responsibility was extended ten miles north of Duc Pho to Mo Duc, and Company B moved to Landing Zone MAX six miles north of Duc Pho.[48]

At first the battalion's roadwork centered on clearing and upgrading Highway 1 to the I/II Corps border and improving on the 8th Engineer Battalion's pioneer work to upgrade the road to all-weather traffic. This involved filling all large holes and building hasty bypasses, covering the road with a sand-asphalt mix seal coat, using culverts where necessary, and spanning sixteen gaps where the enemy had destroyed the bridges. New spans included seven panel bridges (totaling 690 feet long), three decked railroad bridges used as substitute highway bridges, and six timber trestle bridges. Work was completed ahead of schedule on 8 September. The battalion moved to the next stage of work to upgrade the road, dubbed Seahorse Highway in tribute to the unit's insignia depicting a seahorse, all the way to Duc Pho to MACV standards.[49]

[47] MFR, 21 Feb 92, sub: Author's Recollections, 19th Engr Bn, pp. 1–2; ORLL, 1 May–31 Jul 67, 19th Engr Bn, p. 5.

[48] MFR, 21 Feb 92, sub: Author's Recollections, 19th Engr Bn, p. 2; ORLLs, 1 Aug–31 Oct 67, 19th Engr Bn, 31 Oct 67, pp. 1–3, and 1 Nov–31 Jan 68, 19th Engr Bn, 31 Jan 68, pp. 1, 3–4, both in Historians files, CMH.

[49] ORLLs, 1 Aug–31 Oct 67, 19th Engr Bn, pp. 2–4, and 1 Nov–31 Jan 68, 19th Engr Bn, 31 Jan 68, p. 3.

After moving north of Bong Son, the 19th Engineer Battalion set up a main base camp on the rise of land overlooking the surrounding rice paddies.

By the end of the year, six U.S. engineer battalions of three services shared minesweeping and roadwork along Highway 1 in northern Binh Dinh and Quang Ngai and Quang Tin Provinces. The 35th Engineer Battalion continued its work from Qui Nhon to Bong Son; the 19th Engineer filled the gap between Bong Son and Duc Pho and later to Mo Duc; and the 39th Engineer Battalion from Mo Duc to Chu Lai. The newly activated 26th Engineer Battalion of the Americal Division took on a portion of the minesweeping duties along this stretch of road. The 9th Marine Engineer Battalion and Naval Mobile Construction Battalion 6 carried out minesweeps and roadwork north of Chu Lai.[50]

The improved road helped the flow of combat troops and cargo and civilian traffic. In late December, Highway 1 served as the most practical means to move the arriving 11th Light Infantry Brigade from Qui Nhon to Duc Pho, where it joined the Americal Division. Pacification efforts in the area also made civilian travel less dangerous, at least during daylight. This measure of security and further improvements, as shown by the construction of new bridges and paving, prompted a resurgence of commercial traffic and a growing confidence on the part of the South Vietnamese government, which tried to reclaim control over the region. A determined enemy, however, struck back. With renewed vigor, the Viet Cong waged a relentless campaign of mining the roads, ambushing vehicles, and damaging or destroying recently built bridges.

[50] ORLLs, 1 Aug–31 Oct 67, 45th Engr Gp, pp. 4–5, 1 Nov 67–31 Jan 68, 45th Engr Gp, pp. 4–5, 1 Nov 67–31 Jan 68, Americal Div, 8 Feb 68, p. 30, last in Historians files, CMH.

Even though enemy activity along the Americal Division's section of Highway 1 was extremely high, the road was never closed for an entire day. Destroyed or damaged bridges were usually discovered during early morning reconnaissance overflights or by minesweep teams. Normally, the road was open to traffic by noon or at least open to traffic before nightfall.[51]

As usual, the Viet Cong displayed ingenuity when using mines and explosives to disrupt traffic. The 35th Engineer Battalion reported that the enemy had taken advantage of the American soldier's reluctance to get dirty if he did not have to, by burying mines deep under mud puddles or covering them with a layer of water buffalo dung. Scoop loader operators working in borrow and fill pits also had to be wary of mines buried deep in the sand and rock. In October 1966, Viet Cong sappers had expertly destroyed one of the central concrete piers of the 1,352-foot highway bridge over the Lai Giang at Bong Son. The explosion dropped two spans into the river and left a 194-foot gap. Fortunately, traffic could still cross over the railroad bridge. Later, the engineers responded with several projects that improved crossings over the river. Starting in late May 1967, Company B of the 35th Engineer Battalion built two new timber pile piers and raised and repaired the double Eiffel span, closing the gap on 29 July. Also, with the end of the monsoon several months earlier, the battalion returned the M4T6 floating bridge to service. In July, Company B replaced the timber decking on the railroad bridge. Three spans were now available to cross traffic over Lai Giang at Bong Son.[52]

At other crossings, the Viet Cong resorted to a simple method of damaging the new timber trestle bridges by setting the decks on fire. The engineers countered by placing sheet metal under the treadway and dirt, gravel, and asphalt on the decking. The battle of wits between the adversaries continued. The enemy next started to burn the creosoted piles and sun-dried timbers of the substructures and the undersides of the superstructures. One bridge near Tam Quan became a frequent target. During the initial attack, only the high level of the water under the bridge prevented the piles from being burned completely to the ground. The 35th Engineer Battalion rebuilt the center span of the 221-foot bridge with steel I-beams and stringers on top of two hollow-steel pile bents, each made up of four piles filled with concrete. The Viet Cong's success in destroying bridges this way also depended on the steadfastness of the security forces. North of Qui Nhon, soldiers of the South Korean Capital Division zealously defended their positions. Farther north, the Viet Cong usually brushed past the South Vietnamese bridge guards without much resistance.[53]

Although travel along Highway 1 between Qui Nhon and Bong Son became fairly secure during the day, the enemy still ambushed vehicles and work parties. One of these ambushes took place at twilight on 9 October when a small party from the 35th Engineer Battalion en route to its base camp at Landing

[51] ORLL, 1 Nov 67–31 Jan 68, Americal Div, pp. 23, 31, 33.

[52] ORLLs, 1 Feb–30 Apr 67, 35th Engr Bn, p. 4, 1 May–31 Jul 67, pp. 4, 6–7. For more on the Bong Son Bridge repair, see Capt. Gerald W. Kamicka, "Rebuilding the Bong Son Highway Bridge," *Military Engineer* 60 (March-April 1968): 112–13.

[53] ORLLs, 1 Aug–31 Oct 67, 45th Engr Gp, pp. 8–9, 1 Aug–31 Oct 67, 35th Engr Bn, p. 9.

Zone HAMMOND came under fire from both sides of the road. The barrage wounded the officer in charge, 2d Lt. Robert E. Knadle. He directed his men to defensive positions while remaining in the open near his disabled jeep to radio for reinforcements and medical evacuation. Knadle operated the radio until wounded again, this time by an enemy grenade. Although mortally wounded, the lieutenant remained in charge, leading his men against the attackers until reinforcements arrived. The U.S. Army posthumously awarded Lieutenant Knadle the nation's second highest award, the Distinguished Service Cross.[54]

Farther north the 19th and 39th Engineer Battalions, working in the contested territory between Bong Son and Chu Lai, suffered even more casualties. Soon after arriving at Landing Zone ENGLISH NORTH, the 19th Battalion experienced its first casualty. During a minesweeping operation along Highway 1 north of the base, a jeep detonated a mine, which killed one soldier. Another ambush on the same road struck vehicles of the 137th Light Equipment Company, resulting in several casualties. From November to the end of January, a period that included the battalion's participation in the Battle of Tam Quan, the 19th Engineer Battalion and its attached units lost three killed and five wounded. Along the 39th Engineer Battalion's section of the highway, Company C was frequently fired upon by snipers and lost men and vehicles to mine explosions. From May through July, Companies C and D suffered three killed and fifteen wounded along the road. Elements of Company B sweeping a local road for mines south of Chu Lai discovered two Viet Cong placing a mine. The team's point man fired his grenade launcher and killed one enemy soldier. In late July, the enemy ambushed a platoon along the same road twice, resulting in two dead and three wounded Americans.[55]

Mines were especially insidious. From May through July, the 39th Battalion discovered sixty mines and thirty-one booby traps. Twelve mines and eight booby traps were detonated accidently. Most of the mines consisted of bamboo firing devices with an electric blasting cap and about twenty pounds of explosive. Seldom were the mines marked in any way. Most of the booby traps were hand grenades with trip wires connected to the pin. The 35th Engineer Battalion reported the enemy's clever use of empty chambers so that minesweep teams could pass by. After the minesweep team and first convoy passed by, the Viet Cong returned, removed the board over the top of the chamber, quickly placed a mine, and topped off the chamber with fill to make the road appear undisturbed. Several vehicles returning as little as three hours later were destroyed.[56]

October brought forth the annual northeast monsoon. In the 19th Engineer Battalion's sector, the first heavy rains, twelve inches in one twenty-four-hour period, caused washouts along Highway 1. The battalion rallied by building

[54] General Order 6340, USARV, 10 Dec 67, copy in CMH; Robert G. McClintic, "Clearing the Way," *Engineer* 1 (Fall 1971): 9–10; "35th Lt. Receives DSC Presented Posthumously," *Colt 45 News* 2 (2 April 1968): 1, Historians files, CMH.

[55] MFR, 21 Feb 92, sub: Author's Recollections, 19th Engr Bn, pp. 2–3; ORLLs, 1 May–31 Jul 67, 39th Engr Bn, pp. 3–5, 1 Aug–31 Oct 67, 19th Engr Bn, p. 2, 1 Nov 67–31 Jan 68, 19th Engr Bn, p. 3.

[56] ORLLs, 1 May–31 Jul 67, 39th Engr Bn, pp. 9–10, 1 Feb–30 Apr 67, 35th Engr Bn, pp. 5–6.

two panel bridges, one dry span, and one float bridge in less than seventy hours. The 35th Battalion faced similar problems in several areas where new bridges remained incomplete and the bypasses exposed to washouts. One evening, the rising waters threatened a washout of a bypass north of Qui Nhon despite the efforts of the 35th Engineer Battalion, which had used all the available crushed rock from the RMK-BRJ Phu Cat quarry. Although the quarry did have some rock destined for aircraft revetments at the air base, employees on the scene hesitated to release the more expensive two-inch washed rock normally used in concrete work. The 35th Engineer Battalion appealed to the group commander, Colonel Sawyer. Sawyer dispatched Major Traas, now the group contract liaison and installation master planning officer, to persuade local RMK-BRJ officials, who lived across the street from the headquarters in Qui Nhon, to issue the rock. By using the substitute rock as fill, the 35th Engineer Battalion managed to keep the crucial road to Bong Son open the next morning.[57]

In southern I Corps, a tropical storm dumped seventeen inches within twenty-four hours. Flooding washed out sections of Highway 1, and it took the 39th Engineer Battalion one week to repair the damage. The rains also closed Razorback Beach at Duc Pho, and supplies could only be delivered by air. Looking for an alternate over-the-beach site, the Americal Division ordered engineers to build a limited facility at the small port town of Sa Huynh located just north of the I/II Corps border. The 19th Engineer Battalion built a one-half-mile access road through a marshy area from Highway 1 and a 165-by-250-foot off-loading area. With this work completed on 15 October, the odds to continue over-the-beach supply operations during the monsoon for units based at Duc Pho were improved. Meanwhile, the engineers continued roadwork, improved the Duc Pho airstrip, and expanded ammunition and fuel storage sites.[58]

Besides roadwork and daily minesweeps, the 45th Group's three combat battalions carried out other tasks. The 35th Engineer Battalion continued to maintain the English airstrip, built artillery-firing platforms at Landing Zones Uplift and Pony, rehabilitated the Phu Cat Regional Forces Training Center, and cleared fields of fire at Landing Zone Pony and Phu Cat Air Base. The 19th Engineer Battalion built bunkers and helicopter revetments at Landing Zone Two Bits for the 1st Cavalry Division. During the Battle of Tam Quan, elements of Company A and the 137th Light Equipment Company helped destroy bunkers and tunnel complexes, killing ten enemy soldiers in the process. The 39th Engineer Battalion supported the Americal Division with jungle clearing, bunker construction, and destroying enemy tunnel and bunker complexes and captured munitions.[59]

[57] ORLL, 1 Aug–31 Oct 67, 19th Engr Bn, p. 4; MFR, 21 Feb 92, sub: Author's Recollections, 45th Engr Gp, p. 1.

[58] MacGarrigle, *Taking the Offensive*, p. 269; ORLLs, 1 Aug–31 Oct 67, Americal Div, p. 35, 1 Aug–31 Oct 67, 45th Engr Gp, p. 4, 1 Aug–31 Oct 67, 19th Engr Bn, p. 3.

[59] ORLLs, 1 Aug–31 Oct 67, 45th Engr Gp, pp. 4–5, and 1 Nov 67–31 Jan 68, 45th Engr Gp, p. 4.

By the end of 1967, it seemed certain that the U.S. Army's role in I Corps would grow. Earlier that year, other than advisers and Special Forces troops, the Army only had several batteries of 175-mm. guns and 105-mm. self-propelled howitzers in northern I Corps—the 175-mm. guns delivering long-range fire support into and across the Demilitarized Zone and the howitzers giving direct support to the marines. By year's end with the Americal Division and supporting troops on the scene, Army troops in I Corps numbered over twenty thousand with more to come. Together, Army, Navy, and Marine Corps engineers developed the combat bases at Chu Lai and Duc Pho and upgraded roads, especially Highway 1. With the anticipated arrival of even more troops in I Corps, additional Army engineers would be drawn northward.[60]

[60] Pearson, *War in the Northern Provinces*, p. 12; Tolson, *Airmobility*, p. 150.

9

Completing the Bases

The momentum of combat that carried over into 1967 did not diminish the construction effort. Military engineers and contractors continued an all-out effort that had started in 1965 to finish the theater's bases, a task that had been given urgency with the resumption of the troop buildup in the summer of 1966. At the start of 1967, roughly half of the envisioned construction was done, but new requirements were still being added. Cost containment was also a growing issue, leading Engineer Command to pass on more work to engineer troops, to approve essential construction only, and to step up coordination between the contractor and troop efforts to save money and materiel. Meanwhile, the completion of projects did not end engineer responsibilities. There were increased demands on the facilities engineers to maintain, repair, and upgrade the expanding bases, which, in turn, meant budgeting more operations and maintenance funds and enlarging the utilities workforce.[1]

Southern and Central II Corps

In southern II Corps, the 35th Engineer Group, Air Force engineers, and the contractors continued to push ahead on base development. And because it constituted the crown jewel of the widening system of II Corps bases, Cam Ranh Bay received the lion's share of engineer attention. As 1967 dawned, the peninsula continued to be dominated by scrub and sand. But all along the fringes, and into the interior as well, lay evidence of a maturing infrastructure of an expanding army. Off the north, near the neck, stood the Air Force base, and farther north still the Army replacement center and a hospital. To the west facing the bay clustered the piers, pipelines, and electrical power ships, while behind the port lay the Army depot, cantonments, and ammunition stores, with Army and Navy maintenance sheds clinging to the southern shore.[2]

The 35th Engineer Group committed the equivalent of two to three battalions to projects in the bay area. Most work went to the 1st Logistical Command's Cam Ranh Bay Support Command, whose 15,000 troops were stationed on every part of the peninsula. In addition to paving roads and building barracks, warehouses, ammunition pads, and tank farms, the engineers constructed an air-conditioned automatic data processing facility for

[1] Dunn, *Base Development*, pp. 71, 74–75; Quarterly Hist Rpts, 1 Oct–31 Dec 66, MACDC, tab A, 1 Oct–31 Dec 67, MACDC, 21 Jan 68, tab A, Historians files, CMH; Letter of Instruction, 18th Engr Bde, 24 Nov 66, tab J, incl. 7, OCE Liaison Officer Trip Rpt no. 6, p. 4.

[2] Dunn, *Base Development*, pp. 68–69; Ploger, *Army Engineers*, pp. 59–60; Quarterly Hist Rpts, 1 Oct–31 Dec 66, MACDC, p. 27, 1 Oct–31 Dec 67, MACDC, p. IV-10; MACV History, 1966, p. 298; ibid., 1967, vol. 2, pp. 831–32.

During 1968, wooden tropical barracks and administrative buildings, designed and built by the 35th Engineer Group such as these buildings in the replacement center, had replaced tents at Cam Ranh Bay.

the logistical command's 14th Inventory Control Center, and also a strategic communications facility on the other side of the bay at Dong Ba Thin. For the inventory control center, Company D, 864th Battalion, had to lay a dust-proof floor and create an extensive power distribution system in the 2,000-square-foot masonry building. At Dong Ba Thin, the 864th's Company B cleared ten acres of heavily vegetated land, constructed access roads, protective berms, generator pads, and administrative buildings, and prepared concrete bases for eleven large antennas.[3]

For its part, RMK-BRJ worked on as many as twenty projects at once at Cam Ranh Bay. In April, the contractor completed a 2,000-foot concrete runway extension thereby giving the air base two 10,000-foot runways. The extended runway was now open to all aircraft, including the ever-increasing number of commercial jets transporting troops to and from Vietnam. The depot area neared completion with the addition of a 200,000-barrel fuel tank farm and more storage facilities. RMK-BRJ made many of the port improvements, which included dredging the ammunition pier's turning basin. The dredged material was put to use as filling behind the bulkheads between the four DeLong piers. And not least of all, RMK-BRJ supplied a steady flow of

[3] Galloway, "Essayons," pp. 176, 178, 180–81, 217, 219–20; ORLLs, 1 Nov 66–31 Jan 67, 864th Engr Bn, pp. 3–4, 1 Feb–30 Apr 67, 864th Engr Bn, 13 May 67, pp. 2–5, 1 May–31 Jul 67, 864th Engr Bn, 8 Aug 67, pp. 2–4, all in Historians files, CMH.

ready-mix concrete, crushed rock and asphalt, and building supplies from its depot to Army and Air Force engineers.[4]

Linking the peninsula to the mainland became a reality when RMK-BRJ began driving piles for a new bridge in late June. The combination railroad and highway bridge, located just south of the My Ca ferry and float bridge site, required eight pile bents, fourteen spans (seven each for the railroad and the highway), approaches, abutments, and decking. In September the bridge was well along, the east and west approaches being filled with dredged material, with an estimated date of completion the spring of 1968.[5]

Bringing electricity to the entire peninsula became possible when the Army and Air Force worked out a distribution arrangement. Part of the Army complex, including the convalescent and replacement centers, was located a long way from the planned T–2 tanker power plant and was separated from the main Army installation to the south by the concrete runway. Meanwhile, the Air Force had to plan for electrical power to serve its facilities on either side of the runway. To avoid building two power plants, the Air Force agreed to construct a power plant north of the runway and provide 5,000 kilowatts to the Army complex, while the Army reciprocated by supplying a like amount of power to Air Force units south of the runway. Early in the year, Vinnell connected two of the five T–2 tanker power plants to the electrical distribution system, with a third coming online in late February. The land-based diesel electrical power plant of eight 1,100-kilowatt units, a switching station to protect the primary line, and the last two tanker connections were completed in May. All told, the tankers, in conjunction with the land-based plant, generated 34,200 kilowatts over 121 miles of pole lines (60 miles primary line, 27 miles secondary line, and 34 miles street lighting).[6]

The Nha Trang base complex also saw significant progress. In the late spring of 1967, the Officer in Charge of Construction, to avoid more cost overruns, began phasing down the RMK-BRJ contract at Nha Trang and some other locations and transferring remaining work to engineer troops. Altogether, the firm completed over $31 million in base construction in and around the former sleepy resort. Top effort went to paving the beach road, completing a warehouse and maintenance complex and 2,500-man cantonment for the 1st Logistical Command, and work along Highway 1. The logistical complex and cantonment project were challenging because of the technical work required. These projects featured hot and cold potable water systems and a waterborne sewage system. Meanwhile, Vinnell moved

[4] Diary of a Contract, pp. 226–33; Quarterly Hist Rpts, 1 Jan–31 Mar 67, MACDC, pp. 34–35, 1 Apr–30 Jun 67, MACDC, pp. IV-1 to IV-11, and 1 Jul–30 Sep 67, MACDC, pp. IV-12 to IV-13.

[5] Quarterly Hist Rpts, 1 Jan–31 Mar 67, MACDC, pp. 34–35, 1 Apr–30 Jun 67, MACDC, pp. IV-1 to IV-11, and 1 Jul–30 Sep 67, MACDC, pp. IV-12 to IV-13.

[6] "Floating and Land Based Power Plants," pp. 6–7; Development of Cam Ranh Bay, 30 Oct 67, 1st Log Cmd, pp. 6–1 to 6–3, box 13, 68A/4975, RG 319, NARA; Dunn, *Base Development*, p. 80; Fact Sheet, 6 Feb 67, tab J, incl. 8, OCE Liaison Officer Trip Rpt no. 6.

By May 1967, five T–2 power tankers and a land-based power plant began producing electricity at Cam Ranh Bay.

two T–2 power tankers into place, and by July the electrical contractor was capable of distributing 15,000 kilowatts online.[7]

In the Tuy Hoa area, the 577th Construction Battalion split the workload with the 39th Engineer Combat Battalion. The 577th mostly carried out base development, and the 39th handled combat support missions with the exception of Company B, which continued to work at Port Lane, the subsidiary port at Vung Ro Bay. The 577th's major projects included the expansion of the South Korean cantonment at Tuy Hoa and the upgrading of Highway 1 between Vung Ro and the allied encampment just south of Tuy Hoa. Companies B and D maintained and patched the road with cold-mix asphalt, a forerunner to the envisioned widening to twenty-four feet, hot-mix asphalt surface, six-foot shoulders, and Class 35 two-way bridges.[8]

One of the projects undertaken by Company D, 577th Engineer Battalion, was a 400-bed hospital at Phu Hiep near Tuy Hoa, which officially opened on 17 June. No comparable medical facility existed for a radius of eighty miles. From 7 December 1966 to 15 March 1967, the men worked, often in high winds and driving rain, to ready the facility for its first patients. In mid-March, a heli-

[7] Diary of a Contract, pp. 234–35; "Floating and Land Based Power Plants," pp. 6–7; ORLL, 1 Aug–31 Oct 67, 864th Engr Bn, 7 Nov 67, pp. 2–5, Historians files, CMH; Dunn, *Base Development*, p. 80; Fact Sheet, 6 Feb 67, tab J, incl. 8, OCE Liaison Officer Trip Rpt no. 6; Quarterly Hist Rpt, 1 Apr–30 Jun 67, MACDC, p. IV-11.

[8] Galloway, "Essayons," pp. 174–75, 220; ORLLs, 1 Feb–30 Apr 67, 577th Engr Bn, n.d., pp. 2–4, 1 May–31 Jul Oct 67, 577th Engr Bn, n.d., pp. 2–4, and 1 Aug–31 Oct 67, 577th Engr Bn, 11 Nov 67, pp. 2–4, ORLLs in Historians files, CMH.

copter arrived carrying several wounded infantrymen. Although not officially open, the hospital treated those soldiers and subsequently cared for several hundred allied casualties. Almost all of the hospital's plumbing and fixtures and major parts of the generators, maintenance buildings, latrines, and water towers were improvised by the engineers. Many Vietnamese children were also treated there. Capt. Richard F. Hill, the Company D commander, said: "The men don't say much about their work, but you can see the enthusiasm and pride in their eyes when an injured or sick child is treated and released from the hospital."[9]

Air Force engineers complemented the construction program in southern II Corps. In the spring of 1967, the 554th Civil Engineering Squadron at Phan Rang became the first Air Force engineering unit to set up and operate a concrete batch plant. Most of this production was used for large aircraft dispersal hardstands. The employment of Vietnamese workers increased from 11 in April 1966 to 685 by September 1967. At first, most were hired as unskilled laborers or as painters, carpenters, and masons and had to be closely supervised. Eventually, a semiskilled labor pool was built up and included vehicle mechanics. At Tuy Hoa, Walter Kidde, working under the turnkey concept, finished the airfield lighting in February, and the entire $52 million permanent facility—a 9,000-foot interim AM2-surfaced runway, a 10,000-foot concrete primary runway and taxiway with parking aprons, and a logistic complex that included an extensive fuel storage facility and two maintenance hangars and cantonment—by the end of June 1967, one year after the initial contract award. Though the turnkey idea, where the contractor built the base in a single package, was a success at Tuy Hoa, no similar construction project was planned elsewhere because the Air Force did not need another jet-capable base in South Vietnam.[10]

During 1967, the equipment problems plaguing the Army engineers in the 35th Group subsided. In the spring, the status of earthmoving equipment improved considerably with the arrival of the Clark 290M tractors and scrapers, which replaced the worn-out 830M tractors and scrapers. Likewise, relief was brought to the 864th Battalion's badly worn bulldozers, as HD16 models were gradually replaced by the D7Es. At Cam Ranh Bay's quarry, one of the largest troop-operated quarries in Vietnam set up by the 864th Engineer Battalion and currently operated by the 87th Engineer Battalion, equipment and manpower shortages eased when the 610th Engineer Company (Construction Support) arrived in August.[11]

[9] "Engineers Build Jungle Hospital," *Castle Courier*, 30 June 1967.

[10] Schlight, *Years of the Offensive*, pp. 224–25; Tregaskis, *Building the Bases*, p. 223; USAF Airfield Construction in South Vietnam, p. 95; Directorate of Construction, MACV, Construction Program South Vietnam (Complex Review), 15 Jan 68, p. 11–1, Historians files, CMH (hereafter cited as MACV Complex Review, date).

[11] ORLLs, 1 Nov 67–31 Jan 68, 35th Engr Gp, p. 9; 1 Nov 66–31 Jan 67, 864th Engr Bn, pp. 1–2, 1 Feb–30 Apr 67, 87th Engr Bn, p. 3, 1 May–31 Jul 67, 864th Engr Bn, p. 3. For more on the Clark 290M tractor and scraper, see Pfc. Randy Hunter, "The 290M: Where There's a Man . . . There's a 290," *Kysu'* 1 (Summer 1969): 22–25.

The Clark 290M tractor and scraper required skilled operators and mechanics. For example, Pfc. Gerald Schreiner of the 557th Engineer Company (Light Equipment) was one of the few men qualified to operate a 70,000-pound machine capable of moving 20 cubic yards of earth while leveling hills and filling low spots at the Phuoc Vinh base camp. On a typical day, he moved 400 to 600 yards of laterite to a new revetment area for an Army assault helicopter unit. By 0800, the thermometer already registered 105°F. "I guess I make 20 or 30 trips a day between the job and laterite pit," he yelled over the noise made by the 400-horsepower engine to a reporter from the Engineer Command's public affairs office. "The trick is to roll with the ship," he grinned, while shifting the heavy-duty transmission into second gear for a particularly steep hill. Schreiner controlled the 290's main components by three levers to the right of the operator's seat to fill the scraper with dirt and empty it at the job site. Seven hours later, his face resembled a topographical map with rivulets of sweat racing through reddish dust-caked plains. At night he tried to get six hours of sleep from the mosquitoes, muggy heat, and occasional rocket attacks.[12]

A great deal of maintenance had to be done to keep a machine like Schreiner's 290M working. "The heat really fouls up the turbochargers," declared Sfc. Henry Flagg, the light equipment company's maintenance chief. The turbochargers could double the engine's horsepower, but the combination of too much heat and too little oil could cause the engine to freeze up and reduce its performance. The heat also took its toll on the four 24-volt batteries often cracking them. Flagg's mechanics could replace two engines a day, but because engine exchange was considered third-echelon work, this practice had to cease. Still, there was enough maintenance work like checking the oil level in each of the five large sumps and tightening connections to keep the 290M running. "You know," Flagg told the reporter, "we whip 90 percent of the problems we have with these babies by simply practicing a little preventive maintenance." In closing, he remarked: "The men are pretty good about it too; they know that when you got a piece of machinery like this you got to take care of it."[13]

By the end of the year, Cam Ranh Bay, Tuy Hoa, Nha Trang, and Phan Rang were large operating installations with the full range of appurtenant facilities, including administrative buildings, hospitals, warehouses, barracks, repair shops, mess halls, and a deep-draft port at Cam Ranh Bay. The construction effort at Cam Ranh Bay, eventually costing over $145 million, had transformed the peninsula into a major logistical center. As of 31 December 1967, the port offered deep- and shallow-draft berthing facilities with one permanent and four DeLong piers, six LST ramps, an ammunition pier, a fuel discharging jetty, 1,700 feet of sheet-pile wharf, and a barge wharf. The port handled an average of 6,800 short tons of dry cargo and 30,000 barrels of petroleum products daily. The peninsula abounded with depots and maintenance shops, which when completed would total over 1.4 million square feet of covered storage, 1.2 million square feet of open ammunition storage, and

[12] Hunter, "The 290M: Where There's a Man," pp. 22–25.
[13] Ibid., p. 25.

bulk storage for over 775,000 barrels of fuel. Supplementing the storage facilities were standard military containers and trailer van containers transportable by specially designed ships put into use in 1967 by Sea-Land Services, Inc. Electrical power came from central systems relieving the insufficient tactical generators. Intensive well drilling improved the water production and quality. Some 25,000 troops from all the services worked and lived on the base, and they enjoyed access to many of the comforts offered on bases in the United States. On the negative side, central waterborne sewage systems were originally provided at few locations. Burn-out latrines, locally manufactured from fifty-five-gallon drums cut in half and partially filled with diesel fuel, were widely used. This primitive system proved practical but distasteful because of the inevitable odors and the dense, foul, black smoke generated during burning. Troops were particularly unhappy when assigned this duty. On one side of the peninsula the Army had burn-out latrines, while on the other side the Navy and Air Force enjoyed a central sewage system. In any case, more construction was programmed to improve operations and living conditions, including a complete water and sewage system.[14]

As combat bases, Cam Ranh Bay, Tuy Hoa, and Phan Rang hosted large jet-capable airfields, each with permanent 10,000-foot runways and necessary facilities supporting large numbers of fighter-bomber and cargo aircraft. With air base construction complete, the operations tempo increased dramatically. At Cam Ranh Bay, the average number of Air Force aircraft on hand increased from 87 to 128 assigned to four F–4 Phantom tactical fighter-bomber squadrons, two C–130 Hercules squadrons, and two C–7 Caribou squadrons. The number of sorties flown jumped from 8,349 during the last quarter of 1966 to 33,342 during the last three months of 1967. In addition, the Navy and the Army housed another forty aircraft on the air base. Army airfields at Cam Ranh Bay and Dong Ba Thin housed over seventy fixed-wing aircraft and helicopters. In terms of landings and takeoffs, Cam Ranh Bay topped 43,000 in October, ranking it just behind the monthly averages at the top three airports in the United States. Phan Rang increased from 86 to 111 Air Force planes assigned to three F–100 Super Sabre fighter-bomber squadrons, one B–57 Canberra medium-bomber squadron, and three C–123 Provider transport squadrons. Sorties increased from 8,709 during the last three months of 1966 to 23,950 during the same period in 1967. During the last quarter of 1966, the new Tuy Hoa Air Base bedded down an average of seventeen F–100s. A total of 778 sorties were flown during this period. By the end of 1967, the average number of aircraft increased to sixty-two (three F–100 squadrons), and the sorties flown in the last three months of the year leaped to 9,211.[15]

[14] MACV Complex Review, 15 Jan 68, pp. 8-1 to 8-2; Dunn, *Base Development*, p. 84; MACV History, 1967, vol. 2, p. 833; Development of Cam Ranh Bay, pp. 2-3, 3-1; Heiser, *Logistic Support*, pp. 26–27, 171–73.

[15] MACV Complex Review, 1 Apr 67, pp. 138, 192; ibid., 15 Jan 68, pp. 8-3, 8-5 to 8-6, app. V; Development of Cam Ranh Bay, pp. 2-1 to 2-3; Schlight, *Years of the Offensive*, app. 1; U.S. Air Force Statistical Digest, FY 1967, Headquarters, USAF, pp. 50, 58, 64, and U.S. Air Force Statistical Digest, FY 1968, Headquarters, USAF, pp. 52, 62, 68, both at Office of Air Force History, Bolling Air Force Base, Washington, D.C.

Even though the main war effort did not take place along the envisioned Cam Ranh Bay–Ban Me Thuot–Pleiku axis, Cam Ranh Bay continued to play an important role in the logistics picture, serving as a sustaining base for the entire Army theater of war. It served as a major juncture for transshipping supplies from oceangoing vessels to coastal-type shipping. The ammunition storage areas allowed the Army to keep large stocks of ammunition in country relatively safe from enemy attack, and the cold-storage facilities allowed fresh vegetables to be brought down from Da Lat and stored prior to distribution.[16]

Farther North

Impressive progress was also made to bases at Qui Nhon, An Khe, and Pleiku. Expanding logistical facilities supporting the 1st Cavalry and 4th Divisions and South Korean forces in northern II Corps remained a high priority. Operations by the 1st Cavalry Division and the South Korean Capital Division coupled with a severe northeast monsoon in the coastal region placed a heavy dependence on Highway 1 from Bong Son south to Ninh Hoa. Responsibility for engineering support in the eastern half of northern II Corps now fell to the 45th Engineer Group following the departure of the 937th Group to Pleiku. To improve control of its five battalions and retain a major engineer headquarters in Qui Nhon, Colonel Bush moved the 45th Group headquarters from Tuy Hoa. After Bush's departure in May, Colonel Sawyer concentrated much of the group's efforts in the Qui Nhon area, employing three to four battalions. As work on the Qui Nhon depot complexes proceeded, enlargement of logistical facilities in the hinterlands gained momentum. This task fell to Colonel Braucher's 937th Group which, following its move from Qui Nhon, could now concentrate on base construction and operational support in the western half of northern II Corps. Upgrading Highway 19 from Qui Nhon to Pleiku was shared by the two engineer groups.[17]

The two groups took different approaches in implementing an Engineer Command directive in November 1966 to establish Contract Liaison and Installation Master Planning offices to serve as go-betweens with civilian contractors and Army users. Duties assigned to the contract liaison offices included offering technical advice to installation commanders to help carry out their master planning responsibilities, monitoring troop self-help construction, providing a contracting officer's representative on specified contracts, and participating in final inspections of completed projects. In the 45th Group, a separate office was established consisting of a captain (later a major), a clerk and jeep driver, and a Vietnamese Army sergeant who served as an interpreter. Coordination with the RMK-BRJ field office located at Phu Cat Air Base mainly concerned rock and asphalt production and paving. The office also maintained liaison with Vinnell and Pacific Architects and Engineers to check the status of their projects. In addition, the 45th Group's contract liaison officer handled civil affairs matters and

[16] Heiser, *Logistic Support*, p. 27.
[17] Galloway, "Essayons," p. 169.

served as point of contact with the Vietnamese Railroad and U.S. Agency for International Development office in Qui Nhon. The 937th Engineer Group also set up a separate office but assigned the duties to the S–3. He was assisted by one officer and one noncommissioned officer. Regional Contract Liaison and Installation Master Planning officers were assigned at installations in the group's area of responsibility to keep watch over RMK-BRJ's projects.[18]

A major development for the 45th and 937th Groups was the conversion of more combat battalions to the new TOE 5–35E series, which called for four lettered companies. In February, four companies were split from the new 31st Engineer Battalion (Combat) at Fort Hood and deployed to Vietnam. These companies became Company D of the 20th and 299th Battalions of the 937th Group and the 39th Battalion of the 45th Group (the fourth company was assigned to the 588th Engineer Battalion in III Corps), and gave the former D-series battalions a 25 percent increase in capability to carry out operational support and construction missions. Conversion of the other combat battalions—the 19th and 70th—came over the following months. The stripping of the four companies from the 31st Engineer Battalion, however, meant that the battalion would have to be rebuilt. Its deployment from Fort Hood to Vietnam would be delayed by more than a year.[19]

In Qui Nhon, Colonels Bush and Sawyer found functioning port, depot, hospital, and cantonment facilities well on their way to completion. Base development plans for the 45th Engineer Group's chief customer, the Qui Nhon Support Command, called for more port and depot facilities, maintenance shops, and administrative buildings. For almost a year now, Qui Nhon was coequal with Cam Ranh Bay, and requirements for storage facilities greatly increased. The port served as the entry point for the material needs of the two U.S. and one South Korean divisions and Phu Cat Air Base. Envisioned was a logistical complex supporting over 100,000 troops in northern II Corps.[20]

During 1967, the 45th Group completed major projects for the Qui Nhon Support Command. Men of the 84th Engineer Battalion and the 643d Engineer Pipeline Company completed a refrigerated warehouse, a causeway in the port area, and more than four miles of eight-inch fuel line within the city and twenty miles of six-inch line from a tank farm outside Qui Nhon to Phu Cat Air Base. Dredging in the harbor was done by two dredges, the *Ann* operated by RMK-BRJ and the USS *Davison* manned by the Corps of Engineers. A new turning basin was completed in mid-March, and the dredged material was put to good use as fill for an access road to the docks and behind the bulkhead.[21]

[18] ORLLs, 1 Nov 66–31 Jan 67, 45th Engr Gp, pp. 7–8, 1 Nov 66–31 Jan 67, 937th Engr Gp, pp. 14–15.

[19] Galloway, "Essayons," p. 158.

[20] Dunn, *Base Development*, p. 71; MACV Complex Review, 15 Jan 68, p. 4-1.

[21] Galloway, "Essayons," pp. 170, 213; ORLLs, 1 Nov 66–31 Jan 67, 84th Engr Bn, pp. 2–7, 1 Feb–30 Apr 67, 84th Engr Bn, 14 May 67, pp. 2–5, Historians files, CMH, 1 May–31 Jul 67, 45th Engr Gp, p. 5, 1 Aug–31 Oct 67, 45th Engr Gp, p. 5, and 1 Nov 67–31 Jan 68, 45th Engr Gp, p. 5.

RMK-BRJ retained a significant presence in Qui Nhon. MARKET TIME facilities for the Navy's coastal patrol operations, under construction at Qui Nhon since February 1966, were completed in May 1967. At the Qui Nhon airfield, the firm completed an airfield lighting system, a 3,400-foot taxiway extension, most of the work on an operations building, two maintenance hangars, and two large warehouses before turning the project over to Army engineers in May. Atop Vung Chua Mountain overlooking the city, the firm helped Page Communications Engineers, the Army Signal Corps contractor charged with building fixed communications systems, by laying foundations for buildings and antennas, and building fuel storage, water, and sewage systems, access roads, bunkers, security lighting, and security fencing.[22]

North of Qui Nhon, RMK-BRJ's projects at Phu Cat Air Base neared completion. The concrete runway, 10,000 feet long by 125 feet wide, was completed on 14 March, and all work on the taxiways and warm-up apron was completed on 25 March. In May and June, two squadrons of F–100s were transferred from Bien Hoa and Phan Rang and began operations. During the last three months of 1967, the average number of aircraft stood at sixty-seven (mostly F–100s and C–7As). A total of 15,057 sorties were flown between 1 October and 31 December. RMK-BRJ and Air Force engineers pressed on with more projects, adding a control tower, runway lighting, paved roads, aircraft revetments, and improvements in living and working conditions.[23]

In early 1967, Vinnell Corporation mobilized its workforce to carry out its electric power-generation project for bases in the Qui Nhon area. Two T–2 tankers had arrived but not positioned because dredging was in progress. Upon completion of the dredging, the tankers were moved to mooring dolphins built by the 45th Group. Simultaneously, Vinnell erected pole lines to military bases in the city, and the first increment of power came online in April. By summer, the tankers were providing up to 15,000 kilowatts of electricity. In November, Vinnell's contract was modified to add power plants and distribution systems to bases outside Qui Nhon. Altogether, plans called for the installation of six 1,500-kilowatt generators in the Phu Tai Valley southwest of the city and three 1,500-kilowatt generators for the South Korean encampments in ROK Valley just west of Qui Nhon. A power plant for Cha Rang depot and maintenance facility was also in the works.[24]

South of Qui Nhon, work progressed on depot facilities. The 19th Engineer Battalion continued improving the Phu Tai ammunition depot and began to build new depots for the Qui Nhon Support Command and the 34th Aviation Group at Long My, eight miles south of the city. To speed up the tempo of construction, Colonel Bush ordered the battalion to move to the

[22] Diary of a Contract, pp. 236–40; Tregaskis, *Building the Bases*, p. 287.

[23] Diary of a Contract, pp. 266–70; Tregaskis, *Building the Bases*, pp. 286–87; Schlight, *Years of the Offensive*, pp. 155, 158, 173, app. 1; Quarterly Hist Rpts, 1 Jan–31 Mar 67, MACDC, p. 36, 1 Apr–30 Jun 67, MACDC, p. IV-12, 1 Jul–30 Sep 67, MACDC, p. IV-10, 1 Oct–31 Dec 67, MACDC, p. IV-8; U.S. Air Force Statistical Digest, FY 1968, p. 62.

[24] Quarterly Hist Rpt, 1 Jul–30 Sep 67, MACDC, p. IV-13; Fact Sheet, 6 Feb 67, tab J, incl. 8, OCE Liaison Officer Trip Rpt no. 6; "Floating and Land Based Power Plants," p. 10; MACV Complex Review, 15 Jan 68, p. 4–13.

In 1967, construction of depot facilities outside Qui Nhon were under way such as this Butler warehouse building being built by the 19th Engineer Battalion at Long My.

work site. Extensive earthwork and vertical construction were required, and the group attached several 830M tractors and scrapers, and operators from the 84th Engineer Battalion to move fill down an adjacent mountain to the depot site. Operating heavy construction equipment did have its hazards, and on one occasion one of the scrapers tipped over coming down the slope. Fortunately, the operator was not seriously injured. By April, level plateaus had been shaped for the depots and the battalion's base camp, later to become the depot's cantonment. A concrete plant borrowed from a paving detachment at An Khe was pressed into service to make concrete floors for the 120-by-200-foot Butler warehouse and 40-by-200-foot storage sheds. The Butler buildings were especially challenging because few of the combat engineers had experience erecting huge prefabricated metal buildings. In July, the 19th received long-awaited orders to move north of Bong Son to begin Highway 1 improvements, and the 84th Battalion took over the three depot projects.[25]

West of Qui Nhon, the newly arrived 589th Engineer Battalion (Construction) from Fort Hood took over the jobs at Cha Rang from the 35th Battalion in April. The battalion set up camp along Highway 19 near the intersection with Highway 1, putting it in a position to take on projects at the South

[25] Galloway, "Essayons," pp. 170, 214; ORLLs, 1 Feb–30 Apr 67, 19th Engr Bn, 30 Apr 67, pp. 2–6, 1 May–31 Jul 67, 19th Engr Bn, 31 Jul 67, pp. 2, 4, both in Historians files, CMH.

Korean Capital Division's base camp in ROK Valley, expanding on the work previously done by the 19th and 35th Engineer Battalions.[26]

At Camp Radcliff just outside An Khe, construction of the 1st Cavalry Division's base camp also neared completion. The division's base development planners predicated their requirements on supporting a troop strength expected to increase to 31,800 by the end of 1967. The 70th Engineer Battalion and Company B, 84th Engineer Battalion, completed a 65,000-barrel fuel tank farm, upgraded tactical roads east of An Khe, prepared Highway 19 from An Khe to the An Khe Pass for paving, supported self-help construction, and finished the 4,365-by-72-foot concrete runway. Heavy rains during the southwest monsoon, however, penetrated the AM2 matting at the Golf Course airstrip, and breaks in the T17 membrane resulted in saturation and breakdown of the subgrade. Repairs had to be repeated to what was believed to be an overly safe drainage system. With most of the base camp work completed, the 70th Engineer Battalion moved on to the Engineer Hill encampment outside Pleiku. By October, the battalion, in a period of twenty-six months, had played a major role in turning scrub land into a major camp.[27]

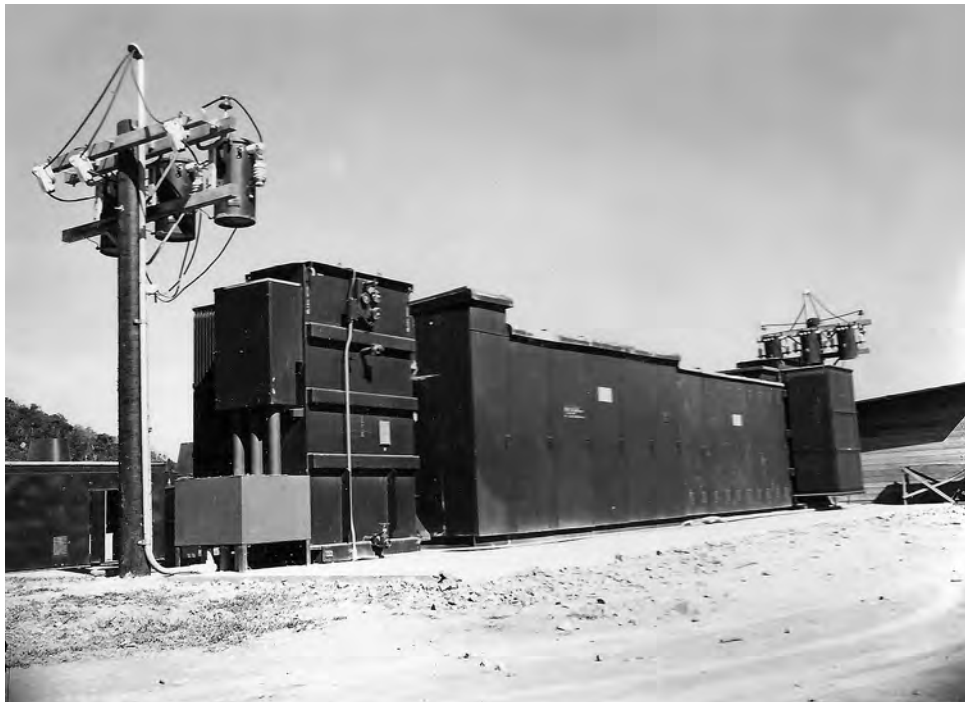
In October 1966, RMK-BRJ received notice to build an electrical power plant and distribution system at Camp Radcliff. Since the firm had no projects at An Khe, it first had to set up camp on the base. The setting of the poles began in January, and soon, thanks to help from Army Signal Corps units, 230 poles were in place. Work on concrete slabs for the generators, transformers, and powerhouse was completed in April, and the site was ready for the six 1,500-kilowatt Army-furnished generators still en route. By June, the locomotive-size generators, hauled by Army tractor-trailers from Qui Nhon, finally arrived. On 1 August, the electrical distribution line work was turned over to the 589th Engineer Battalion.[28]

At Pleiku, the pace of base development continued to grow following the arrival of the 4th Division at the Dragon Mountain Base Camp, six miles south of the city. But the added workload imposed a strain on the 937th Engineer Group, which also had commitments to support the division and other combat units in the western half of II Corps. The group had become the center of base development activity, particularly after 1 April 1967 when RMK-BRJ ended operations in Pleiku. By then the balanced distribution of effort between combat support and construction shifted to a 40:60 ratio. Heavy combat loads west and north of Pleiku kept a steady demand on engineer support in building and maintaining forward airstrips and supply roads. In mid-April, help arrived when the 815th Engineer Battalion (Construction)

[26] Galloway, "Essayons," pp. 213–14; ORLLs, 1 May–31 Jul 67, 45th Engr Gp, pp. 4–5, 1 Aug–31 Oct 67, 45th Engr Gp, pp. 5–6, and 1 Nov 67–31 Jan 68, 45th Engr Gp, p. 5.

[27] Galloway, "Essayons," pp. 167–68, 209–10; MACV Complex Review, 15 Jan 68, pp. 5-1, 5-8; ORLLs, 1 May–31 Jul 67, 45th Engr Gp, pp. 4–5, 1 Aug–31 Oct 67, 45th Engr Gp, pp. 5–6, 1 Nov 67–31 Jan 68, 45th Engr Gp, p. 5, 1 Nov 66–31 Jan 67, 70th Engr Bn, pp. 2–5, 1 Feb–30 Apr 67, 70th Engr Bn, 10 May 67, pp. 6–8, 1 May–31 Jul 67, 70th Engr Bn, 10 Aug 67, pp. 4–9, 1 Aug–31 Oct 67, 70th Engr Bn, 14 Nov 67, pp. 1, 3–6, 1 Nov 67–31 Jan 68, 70th Engr Bn, 31 Jan 68, pp. 6–7, last four in Historians files, CMH.

[28] Diary of a Contract, pp. 275–76.



As a new transformer station went online, RMK-BRJ continued to work on an electrical power plant and distribution system at Camp Radcliff.

deployed from Fort Belvoir and soon became the group's main construction force. The 815th took over running the contractor's two 225-ton-per-hour rock crushers, construction materials storage area, and the bulk of equipment left behind by the contractor. RMK-BRJ did finish an asphalt parking apron and cantonment work at Pleiku Air Base, and Army cantonment construction was nearly completed. The remaining work was transferred to the 937th Engineer Group. Like An Khe, the string of camps around Pleiku was transformed into a livable semipermanent base complex for a division and supporting units. The move of the 70th Engineer Battalion from An Khe also helped balance the workload between combat support and construction in the area.[29]

During the course of the year, the 45th and 937th Engineer Groups noted a gradual reduction in equipment and supply deficiencies. In early 1967, getting supplies to the job sites in the 937th Engineer Group's area of responsibility improved to the point that Colonel Braucher reported the increased availability of Class IV construction materials was the most noteworthy development in the three-month period since 1 November. In An Khe, requisitions for building supplies were submitted first through the group and routed to the 70th

[29] Ibid., pp. 208–10; Galloway, "Essayons," pp. 163, 206; Quarterly Hist Rpts, 1 Jan–31 Mar 67, MACDC, p. 36, 1 Apr–30 Jun 67, MACDC, pp. IV-12 to IV-13, 1 Jul–30 Sep 67, MACDC, pp. IV-11, IV-12, 1 Oct–31 Dec 67, MACDC, p. IV-8.

Engineer Battalion S–4 for submission to the Qui Nhon Support Command. Since there was no Class IV yard in the An Khe logistical support activity, the 70th Battalion was chosen to run the building materials storage facility. In Pleiku, requisitions were submitted through group headquarters to the Pleiku logistical support activity, which did operate a Class IV yard. Still, shortages of electrical and plumbing supplies and lumber and cement delayed several projects at An Khe and Pleiku, as did shortages of equipment. Of forty-eight authorized graders, the 937th Group was short ten. Only twenty-seven scoop loaders of sixty-one authorized and three motorized rollers of seven authorized were on hand. Repair parts were more plentiful. The chief maintenance concern was the lack of direct-support maintenance units. As for the 45th Group, Colonel Bush complained that the lack of compaction equipment needed in earthmoving work—thirty-five-ton compactors, sheepsfoot rollers, wobbly-wheel rollers, ten-ton steel-wheel rollers, asphalt finishing rollers, and water distributors—hampered road, airfield, and depot expansion projects.[30]

Some heavy construction equipment transferred from RMK-BRJ helped the equipment situation. Running the contractor's former rock crushers, however, became a challenge for the 815th Battalion at Pleiku. One was in a state of disrepair and turned out to be a maintenance nightmare. The second crusher was new and had not been assembled. There were no maintenance catalogs or plans, but the battalion's maintenance team persisted and brought the crusher, like the first crusher, a Pettibone, online in August.[31]

By the end of 1967, the 45th and 937th Engineer Groups and the contractors had accomplished most of their base construction projects. Qui Nhon, An Khe, and Pleiku became major staging areas for operations in northern II Corps. Qui Nhon developed into a major port and logistical complex supporting American and Korean troops in the region. Like other deep-draft ports under development, Qui Nhon's added port capability reduced the pressure on LSTs, permitting their greater use for deliveries to shallow-draft ports instead of LCUs and LCMs. By the end of December, the daily port discharge capacities increased to 6,275 short tons of cargo, not much below Cam Ranh Bay, and 59,000 barrels of petroleum products, almost double the capacity at Cam Ranh Bay, up from 4,450 short tons and 14,000 barrels in January 1967. Among the improvements in logistics was the new depot complex under construction at Long My. The demand for logistical facilities was so great that the Qui Nhon Support Command took over each building and storage area the moment they were ready for use and began relocating supplies stacked up on the beach. Qui Nhon also boasted three 400-bed hospitals, two American and one South Korean. Improved roads emanating from Qui Nhon, Highway 1 north to Phu Cat and beyond and Highway 19 to An Khe, were surfaced with asphalt. A new jet-capable airfield at Phu Cat was in operation, and

[30] Galloway, "Essayons," pp. 168, 175, 210; ORLLs, 1 Nov 66–31 Jan 67, 937th Engr Gp, pp. 15–17, 1 Feb–30 Apr 67, 937th Engr Gp, pp. 13–14, 1 Aug–31 Oct 67, 937th Engr Gp, 31 Oct 67, p. 13, 1 Feb–30 Apr 67, 45th Engr Gp, 11 May 67, pp. 5–6, last two in Historians files, CMH.

[31] Unit History, 815th Engr Bn, n.d., p. 9, Historians files, CMH; ORLLs, 1 May–31 Jul 67, 815th Engr Bn, 9 Aug 67, pp. 2, 4–8, 1 Nov 67–31 Jan 68, 815th Engr Bn, 31 Jan 68, pp. 2–7, both in Historians files, CMH; Galloway, "Essayons," p. 209.

improvements were under way to upgrade inland forward airstrips to C–130 capability. Inland camps at An Khe and Pleiku were taking the form of World War II stateside camps. Work would continue at a slightly lower pace to complete ongoing projects, enhance existing facilities, and improve working and living conditions. To ensure that the bases received constant maintenance and utilities services and some new construction, Pacific Architects and Engineers routinely hired more workers and set up shops at many locations.[32]

III and IV Corps

Base construction in III and IV Corps made great strides in 1967 thanks to the arrival of a second engineer brigade headquarters, a sixth group headquarters, and six newly raised construction battalions from the United States. On 3 August, the 20th Engineer Brigade headquarters, commanded by Brig. Gen. Curtis W. Chapman Jr., arrived at Bien Hoa Air Base from Fort Bragg. Two days later, Engineer Command placed the 34th, 79th, and 159th Groups under the 20th Brigade. The new brigade's mission encompassed operational support, troop construction, and civic action in III and IV Corps. This command arrangement simplified Engineer Command's span of control to two brigades with each brigade commanding three groups. Each brigade also supported the field force in its area of responsibility.[33]

Headquarters, 20th Engineer Brigade, was a new unit activated only three months before deploying to Vietnam. Despite several problems, the brigade headquarters company was able to meet the requirements for overseas deployment. Based on the experiences of the 18th Engineer Brigade, changes were made to the table of organization and equipment to fit the situation in Vietnam. An intelligence section was established, and the operations branch was expanded to four sections dealing with plans, construction operations, operational support, and liaison. General Chapman decided that most design work was to be done at group, battalion, and port construction company level. Standard drawings, such as barracks, mess halls, and showers, that had been developed by the three groups were catalogued for use by all the groups. A maintenance section was organized within the S–4. In so doing, the brigade put itself in a position to give technical help and speed up delivery of spare parts.[34]

Noteworthy among the many bases under development in III and IV Corps, Long Binh continued to grow into a major logistical and headquarters complex. By mid-1967, General Westmoreland's campaign (Operation MOOSE) to reduce the U.S. troop presence in Saigon resulted in relocating approximately half of the soldiers to Long Binh. On 15 July, U.S. Army, Vietnam, headquarters announced its move from Saigon to Long Binh even as construction

[32] Heiser, *Logistic Support,* p. 171; MACV Complex Review, 15 Jan 68, pp. 4-5, 4-6, 4-12; MACV History, 1967, vol. 2, p. 833; CINCPAC Port Development Plan, 12 Jan 67, p. 17, Historians files, CMH.

[33] Galloway, "Essayons," pp. 156–60, 221; ORLL, 1 Aug–31 Oct 67, 20th Engr Bde, 31 Oct 67, p. 2, Historians files, CMH; Ploger, *Army Engineers*, p. 138.

[34] ORLL, 1 Aug–31 Oct 67, 20th Engr Bde, pp. 2–6, 12–13.

workers rushed to finish the new facilities. Other major headquarters, including U.S. Army Engineer Command and the 1st Logistical Command, had also taken up residence on the base. During 1967, more requirements for storage, airfield, maintenance, and community facilities were added to accommodate some 35,000 troops. This number would eventually increase to over 40,000. There was enough room, for the base covered over twenty-six square miles, nearly ten undeveloped. As a result, there was a large backlog of work facing the 5,000-man 159th Engineer Group.[35]

To carry out this work, Colonel McConnell, the group commander, relied on four construction battalions. By midyear, the 62d Engineer Battalion, which had completed its move from Phan Rang in January, finished expanding the II Field Force tactical operations center at Plantation and built the Long Binh central dial telephone facility. One of the challenging projects assigned to the 169th Battalion entailed shoring up the failing upper structure of one of the U.S. Army, Vietnam, headquarters buildings erected by RMK-BRJ. The 46th Engineer Battalion devoted much of its effort to the Long Binh ammunition depot. Considered to be one of the largest ammunition storage areas in the world at the time, the depot contained 225 storage pads offering 250,000 square yards of storage and thirty-nine miles of roads. Following a spring Viet Cong attack on the depot, the battalion's Company B repaired damaged pads and improved the protective berms around the pads. Work assigned to the 92d Engineer Battalion included landscaping around the new U.S. Army, Vietnam, headquarters and building bunkers at the MACV headquarters at Tan Son Nhut.[36]

The timely flow of the right type of construction supplies to the 159th Group's project sites still had hurdles to overcome. The combined efforts of engineer units and self-help programs exhausted stocks of electrical and plumbing supplies, water tanks for mess halls and showers, and two-inch lumber as soon as they arrived. This shortfall took place despite the large quantities of supplies reaching the depots. Asphalt and peneprime needed at Long Binh, Bien Hoa, and Bearcat for dust control on roads and helipads were in short supply. Getting rock and sand remained a problem because of the lack of convenient sources and transportation. A contract with a Korean company to deliver 100,000 cubic yards of rock from Korea was plagued with problems of gradation control, shipping schedules, port facilities, equipment availability, and Vietnamese bureaucracy. By April, only 23,000 cubic yards had been delivered, and the 159th Engineer Group cancelled the contract. Hiring a Vietnamese contractor to haul rock from the Vung Tau quarry by

[35] MACV Complex Review, 1 Dec 66, p. 197; ibid., 15 Jan 68, pp. 13-1 to 13-2; "Long Binh Post," *Army* 23 (April 1968): 48; Dunn, *Base Development*, p. 145.

[36] Galloway, "Essayons," pp. 182–83, 224–25; ORLLs, 1 Nov 66–31 Jan 67, 159th Engr Gp, pp. 7–10, 1 Nov 66–31 Jan 67, 46th Engr Bn, pp. 1–5, 1 Nov 66–31 Jan 67, 62d Engr Bn, pp. 1–2, 1 Nov 66–31 Jan 67, 169th Engr Bn, pp. 2, 5–8, 1 May–31 Jul 67, 62d Engr Bn, 31 Jul 67, pp. 1–6, 1 Aug–31 Oct 67, 62d Engr Bn, 31 Oct 67, pp. 4–6, 1 Nov 67–31 Jan 68, 62d Engr Bn, 31 Jan 68, pp. 2, 5–8, 1 Aug–31 Oct 67, 169th Engr Bn, 11 Nov 67, pp. 2–9, 1 Feb–30 Apr 67, 46th Engr Bn, 15 May 67, pp. 1–5, 1 May–31 Jul 67, 46th Engr Bn, 14 Aug 67, pp. 1–6, 1 Aug–31 Oct 67, 46th Engr Bn, 1 Nov 67, pp. 1–8, last seven in Historians files, CMH.

truck helped somewhat, but that contract expired without renewal on 30 June. Using barges to haul rock from Vung Tau to Dong Tam and Long Binh was only partially successful at first because tugs were not readily available to move loaded barges. Overcoming this problem and the Vietnamese bureaucracy resulted in gradually improved barge traffic. While a search continued for suitable quarry sites, the group was able to procure much of the rock for Long Binh from RMK-BRJ's University Quarry outside Saigon. Then there was the constant challenge of keeping up with rising standards of living, especially at the large Long Binh base. Standards were elevated nearly to those used in the United States.[37]

The contractors working at Long Binh took much of the strain off the 159th Group. During 1967, RMK-BRJ carried out approximately $25 million of work on the base. Most visible were the headquarters and support facilities for U.S. Army, Vietnam, and 1st Logistical Command. Building the headquarters complexes involved erecting six 2-story buildings forming an "H" for the Army headquarters and four 2-story buildings for the logistical command; adding asphalt roads and parking; and installing water, storm, and sewer lines. The buildings featured amenities such as air conditioning, indoor plumbing, and vinyl tiled floors, things that customers now expected and incorporated into designs. Such items were not readily available, and U.S. Army, Vietnam, and U.S. Army Engineer Command, Vietnam, recognized this problem and focused on getting the materials rather than lowering standards. Construction on this priority project for the U.S. Army, Vietnam, headquarters complex started in December 1966. After working day and night, the contractor had two of the buildings ready for occupancy in early July 1967. All six buildings were ready by the end of the month. Three of the logistical command's buildings were completed in late October and the fourth the following month. Since the windows of these buildings were designed not to open, occupancy was held up until air conditioning was installed in December. Other projects related to the arrival of the two headquarters were quarters for officers and enlisted men, dispensaries, chapels, support buildings, and utilities, including water and sewer distribution systems. Another high-priority project was constructing two buildings for the 14th Inventory Control Center, which managed the Army's depot assets. The hope was that the third-generation computers expected in late 1967 would bring some order out of the tremendous influx of supplies coming over the beaches and arriving at the ports. One building housed the computers, and the other contained the administrative center. Using Army-furnished materials, RMK-BRJ met the beneficial occupancy date of 28 June.[38]

[37] Galloway, "Essayons," pp. 184, 225, 227; ORLLs, 1 Nov 66–31 Jan 67, 159th Engr Gp, p. 11, 1 Feb–30 Apr 67, 159th Engr Gp, 14 May 67, pp. 18–19, 1 May–31 Jul 67, 159th Engr Gp, 14 Aug 67, pp. 14–15, last two in Historians files, CMH.

[38] Quarterly Hist Rpts, 1 Jul–30 Sep 67, MACDC, p. IV-15, 1 Oct–31 Dec 67, MACDC, 21 Jan 68, p. IV-12, Historians files, CMH; Diary of a Contract, pp. 278–82; Army Construction in Vietnam, 11 Aug 67, incl. 8, p. 5, OCE Liaison Officer Trip Rpt no. 8; Galloway, "Essayons," p. 184; Heiser, *Logistic Support*, p. 23; Dunn, *Base Development*, pp. 114–15.

At Long Binh, RMK-BRJ built several headquarters complexes, including U.S. Army, Vietnam, which were ready for occupancy by the end of June 1967.

The power plant at Long Binh begun the previous October by Vinnell started coming online in 1967. The firm's responsibility in this project included not only the design, which Vinnell subcontracted, but also the construction, operation, and maintenance of the plant claimed to be the only one of its kind in the world. For the first time, twenty-one 1,500-kilowatt generators were connected and synchronized to work simultaneously on one power system, or in electrical terms on a single loop. As soon as pole lines were strung, power was made available to users. Because of the strong possibility of enemy attacks, extra measures and precautions were designed into the system. Ten-foot-high revetments were built around generator complexes. If enemy fire hit one complex, the damage would be confined to that one complex. Besides physical protection, the plans called for fail-safe devices to ensure that power would continue to flow to the major headquarters, the hospital, and the computer center. In case any one part of the plant or distribution system was damaged, a series of reclosers would lock that part out of the remaining system. Work continued, and by November 1968, 19,000 kilowatts of power were being delivered. Vinnell also built power plants and distribution systems at Long Thanh, Bearcat, Di An, Xuan Loc, Bien Hoa, Phu Loi, and Cu Chi.[39]

Fifteen miles northeast of downtown Saigon, RMK-BRJ carried out projects at Bien Hoa Air Base for Army and Air Force tenants, and the 159th

[39] "Vinnell Makes History at Long Binh," pp. 8–10.

Engineer Group committed forces to improve the Army side of the base. A long-delayed authorization to begin a second 10,000-foot concrete runway (parallel to the one built by the contractor in 1962 and 1963) was finally made in early April 1967. This work was justified, for Bien Hoa had become the busiest air base in South Vietnam. Excavation soon began, and a night shift was added. Concrete work started in the second week of June, but by then annual rains held up progress. Work on the new runway, taxiway, warm-up aprons, and perimeter roads extended to April 1968.[40] The contractor also ran into delays in the ammunition storage area originally authorized to be built in 1965. Work begun in April 1966 lasted to mid-1967. Other facilities built for the Air Force included an engine test stand; blast pads; a fire station; a 10,000-foot-8-inch welded-steel fuel pipeline from the Dong Nai River to the air base; water; utilities systems; airmen's dormitories; and runway shoulder rehabilitation and replacement airfield lighting cables. RMK-BRJ also built a telephone exchange building and drilled nine water wells on the Army side of the base. Projects carried out by the 159th Engineer Group included building a communications center with air conditioning, general officers quarters, and a road that would provide a direct link between Bien Hoa and Long Binh.[41]

Also greatly improved was the string of bases for the 1st and 25th Divisions defending Saigon from the north. The 79th Engineer Group at Plantation under Colonel Gelini, who was replaced by Col. Joseph A. Jansen in July, continued to carry out base camp construction simultaneously with its operational support missions and roadwork. Work at the divisions' base camps progressed from minimum essential facilities to more sophisticated and more permanent support facilities. Making this possible was the arrival in April and May of the 554th Engineer Battalion (Construction) from Fort Knox and the 34th Engineer Battalion (Construction) from Fort Stewart. The two construction battalions increased the group's construction capability and allowed the group's combat engineer battalions to boost operational support to the 1st and 25th Divisions during a period of increased combat activity.[42]

East of Saigon, the 27th Engineer Combat Battalion took up the development of the 11th Armored Cavalry Regiment's Blackhorse base camp at Xuan Loc. Along with its attached units—the 591st Light Equipment Company at Blackhorse, the 94th Quarry Detachment at Gia Ray, and two sections of the 2d Platoon, 67th Dump Truck Company, at Blackhorse—the battalion's strength was almost 1,100, with about 870 men in the battalion and over 200 in

[40] Bien Hoa was not only the busiest airport in Vietnam in terms of landings and takeoffs (over 70,000 in January and over 83,000 in September 1967), but Bien Hoa and Tan Son Nhut even exceeded Chicago's O'Hare, the busiest airport in the United States, which averaged slightly over 47,000 landings and takeoffs per month in 1966. MACV Complex Review, 15 Jan 68, app. V.

[41] Tregaskis, *Building the Bases*, p. 252; Quarterly Hist Rpts, 1 Oct–31 Dec 67, MACDC, 21 Jan 68, p. IV-11, 1 Apr–30 Jun 68, MACDC, 24 Jul 68; ORLL, 1 Aug–31 Oct 67, 1st Log Cmd, 11 Nov 67, p. 114, Rpts and ORLL in Historians files, CMH; Diary of a Contract, pp. 203–07; Galloway, "Essayons," pp. 224; ORLL, 1 May–31 Jul 67, 159th Engr Gp, pp. 9, 11–12.

[42] Galloway, "Essayons," pp. 184–85, 187–89, 233, 235, 239; ORLLs, 1 Nov 66–31 Jan 67, 79th Engr Gp, pp. 2–5, 1 Feb–30 Apr 67, 79th Engr Gp, 13 May 67, pp. 2–5, 1 May–31 Jul 67, 79th Engr Gp, 8 Aug 67, p. 2, last two in Historians files, CMH.

the attached units. Company A concentrated on building a 1,500-foot airstrip and a sixty-bed surgical hospital, while Company C helped build cantonment areas. East of Xuan Loc at Gia Ray, Company B did cantonment construction and ran a quarry from the base of Nui Chua Chan.[43]

When the 34th Engineer Group (Construction) from Fort Lewis under Col. Joseph M. Palmer arrived at Vung Tau in late March, it assumed a wide area of responsibility for southern III Corps (less the Long Binh–Saigon area) and all IV Corps. During the late spring and the summer of 1967, the group expanded to five battalions with the May, June, and September arrivals of the 69th, 93d, and 36th Construction Battalions. At this time, the group's construction commitments increased with the assumption of responsibility from RMK-BRJ for work at Vung Tau and Can To on top of expanding the base camps at Dong Tam, Long Thanh, and Xuan Loc. Despite this and the addition of the construction units, the group's ratio of operational support to base construction showed a significant increase, from 16 to 33 percent by the end of July.[44]

At Vung Tau, RMK-BRJ, Vinnell, and DeLong transformed the once small port into a key base. Several miles north of the city at Cat Lo, which served as a hub for GAME WARDEN naval patrol activities, RMK-BRJ built a base camp and storage and repair facilities for U.S. and South Vietnamese naval forces. At the port, the firm dredged a turning basin for deep-water ships and a 12,700-foot-long channel. Other jobs included facilities for Page Communications and the Signal Corps and included antenna and microwave antenna footings; slabs for communications trailers and buildings; water and sewage lines; and roads, drainage, and walkways. These jobs were finished in March 1967. DeLong completed the pier facility on 22 April. In late 1967, Vinnell finished installing both primary and secondary electrical distribution systems, and two power ships were online providing a generating capacity of 11,000 kilowatts. Simultaneously, Pacific Architects and Engineers hooked up buildings to the system.[45]

Vung Tau was one of the places selected to phase down RMK-BRJ operations. The 69th Engineer Battalion from Fort Hood arrived at Vung Tau on 1 May and took over the contractor's projects at the ammunition depot and the fuel storage area, which involved building a 50,000-barrel addition to the existing tank farm. The battalion also built a barge-loading facility to support the movement of supplies to the Mekong Delta. On 20 September, the 36th Engineer Battalion from Fort Irwin, California, reached Vung Tau, marking the sixth and final construction battalion scheduled for Vietnam in 1967. On

[43] Galloway, "Essayons," pp. 185, 187, 227, 229; ORLLs, 1 Nov 66–31 Jan 67, 27th Engr Bn, 13 Feb 67, pp. 3–5, 1 Aug–31 Oct 67, 27th Engr Bn, 8 Nov 67, pp. 3–4, 10–14, 1 Nov 67–31 Jan 68, 27th Engr Bn, 8 Feb 68, pp. 1–2, 8–13. ORLLs in Historians files, CMH.

[44] ORLLs, 1 Feb–30 Apr 67, 34th Engr Gp, 18 May 67, pp. 5–9, and 1 May–31 Jul 67, 34th Engr Gp, 10 Aug 67, pp. 1–3, 5–11, both in Historians files, CMH; Galloway, "Essayons," pp. 227, 244–45.

[45] Quarterly Hist Rpts, 1 Jan–31 Mar 67, MACDC, p. 41, 1 Apr–30 Jun 67, MACDC, pp. IV-17, IV-19, 1 Jul–30 Sep 67, MACDC, pp. IV-17, IV-23, 1 Oct–31 Dec 67, MACDC, p. IV-14; Diary of a Contract, pp. 222–24.

1 October, the battalion took over the projects at Vung Tau, and the 69th Battalion moved to Dong Tam and Can To. The 36th Battalion continued work on port facilities, a 5,000-man cantonment, rehabilitated the airstrip, and designed and built three 50,000-barrel fuel storage tanks and their concrete pads, a manifold system, and a jetty for off-loading T–2 tankers.[46]

Meanwhile, the 34th Group began moving more units into the delta region to take over projects started by RMK-BRJ and to build the bases for the 9th Division and support units. In May, company-size task forces from the 27th and 69th Engineer Battalions were on the job in Vinh Long and Can To doing airfield and cantonment construction. By midyear, one company from the Long Thanh–based 86th Engineer Combat Battalion moved to Dong Tam to help the building effort, and the rest of the battalion deployed to delta bases to work on base construction and support the 9th Division in the field. When the 69th Engineer Battalion moved to Dong Tam in October, it assumed construction responsibility for the base.[47]

The Viet Cong made concerted efforts to hinder construction at Dong Tam. The insurgents knew the base held a commanding position in the delta and could hamper their control of the region. By the end of 1966, the dredges had made substantial progress in filling in the base area and clearing approach channels. On 9 January 1967, Viet Cong sappers succeeded in sinking the *Jamaica Bay*, the largest dredge in Vietnam. This attack prompted General Westmoreland to send elements of the arriving 9th Division to the partially filled Dong Tam site to take over security from the South Vietnamese and begin work on the base. Two companies of the division's 15th Engineer Battalion accompanied the advance elements. Within a few weeks, Company C, 577th Engineer Battalion, moved from Long Binh to build facilities for the 7,500-man camp and operational base. Company C also replaced a weak Eiffel bridge with two panel bridges connecting the camp with the city of My Tho to the east.[48]

Meanwhile, the Navy's Officer in Charge of Construction diverted another dredge from Cam Ranh Bay, and in March the *Jamaica Bay*'s sister dredge, the *New Jersey*, arrived. On 7 May, the first LST entered the turning basin, relieving the smaller LCMs supplying the base for other use. By then the engineers had completed 20 percent of the planned construction, including a runway for light Army planes and helicopters, a sixty-bed MUST (medical unit, self-contained, transportable) hospital consisting of inflatable buildings, and numerous cantonment buildings.[49]

[46] Galloway, "Essayons," pp. 230, 232–33; ORLLs, 1 May–31 Jul 67, 69th Engr Bn, 31 Jul 67, pp. 2, 6–8, 1 Nov 67–31 Jan 68, 36th Engr Bn, 13 Feb 68, pp. 2, 5–7, both in Historians files, CMH.

[47] Galloway, "Essayons," pp. 185, 229–30, 232; ORLL, 1 May–31 Jul 67, 69th Engr Bn, pp. 2, 6–8.

[48] MacGarrigle, *Taking the Offensive*, p. 402; Tregaskis, *Building the Bases*, pp. 292–93; Dunn, *Base Development*, p. 53; Ploger, *Army Engineers*, p. 145; Galloway, "Essayons," pp. 183–84; Quarterly Hist Rpt, 1 Jan–31 Mar 67, MACDC, p. 41.

[49] Tregaskis, *Building the Bases*, p. 293; Ploger, *Army Engineers*, pp. 145–46; Quarterly Hist Rpt, 1 Apr–30 Jun 67, MACDC, pp. IV-17, IV-18.

After overcoming the challenging soil conditions, engineers completed the Dong Tam base in late 1968.

The builders of Dong Tam faced challenges found nowhere else in Vietnam. At Dong Tam, the rain was severe enough that it almost halted construction for two months, and all efforts went into saving what had been built. The instability of the ground in the delta and the high water table caused special problems. Large buildings required supporting piles. When underground storage tanks popped out of the ground after removal of their contents, workers had to place concrete collars around the tanks. Holes dug for communications and power poles were shored up with fifty-five-gallon drums. Scarce rock moved by barge from the Vung Tau quarry, a five- to ten-day trip, and was used only on the most important concrete structures. Sand-cement sufficed for other work. By June 1967, the growing base occupied 4.6 square miles. In addition to the cantonment and storage facilities for the 9th Division's 2d Brigade, the installation had a 1,640-foot airstrip and a 0.8-square-mile turning basin for shipping, with boat and barge landing sites. Summer saw the completion of more permanent buildings, water and electrical distribution systems, a waterborne sewage system, more ramps for landing craft, warehouses, hardstands, and maintenance shops. The Dong Tam project would extend to late 1968 when it was officially declared complete.[50]

[50] MacGarrigle, *Taking the Offensive*, p. 411; Ploger, *Army Engineers*, pp. 146–49; ORLL, 1 Feb–30 Apr 67, 159th Engr Gp, p. 19. For more on Dong Tam, see Maj. Bryon G. Walker, "Construction of a Delta Base," *Military Engineer* 60 (September-October 1968): 333–35.

Though the 34th Group had many of the same problems as the other engineer groups, it had to put up with the challenges of working in the delta. Rain, while not a major problem at the better-developed Vung Tau complex, played havoc in the delta, especially at Dong Tam and the newer sections of Long Thanh, areas that had been built since the 1966 monsoon. After assuming responsibility for transporting construction supplies and rock to the delta from the 20th Brigade, the group continued to work closely with Transportation Corps officials in scheduling the tows of 300- and 700-ton barges to off-loading sites. From May to the end of the year, twenty-four barges were hauling approximately 7,000 tons of bulk construction material each month to the delta. Rock requirements set up by MACV, however, were much larger, some 38,000 tons per month from Vung Tau to the delta. During an eight-month period, the barges only moved 50,000 tons. Since the 1st Logistical Command controlled the majority of barges, the group recommended that the logistical command take over responsibility for moving the rock. On 15 January 1968, the 1st Logistical Command took over the operation while the group retained responsibility for the loading and unloading of rock, a task also under consideration for transfer to the logistical command.[51]

The Saigon Projects

In Saigon, RMK-BRJ completed several eye-catching projects. One of these was the new U.S. Embassy complex located about four blocks from Independence Palace, the Vietnamese White House. The old leased building downtown had been bombed several times and was susceptible to attack, and work began on the new site in September 1965. Delays in plans and funding, however, delayed occupancy until September 1967. Surrounded by a concrete wall and encased in a masonry rocket shield, the peculiar structure resembled a giant pillbox rising above the surrounding neighborhood. At first plans called for a four-story building, but this was changed in February 1967 to six floors topped off with a penthouse helicopter landing pad.[52]

Next in line was the $25 million MACV headquarters complex. The project had started on a site in the Chinese quarter of Cholon in west Saigon in February 1966, but strong protests by the inhabitants halted work in May. As a result, the project shifted to the northern edge of Tan Son Nhut Air Base. Surveying the new site began on 1 July, but stringent security requirements for construction workers resulted in slow hiring. It was not until September that construction got into high gear. At its peak, the project employed over 100 Americans, 300 Koreans and Filipinos, and over 1,200 Vietnamese. By the end of June 1967, less than twelve months from the time excavation started for the security fence and less than eleven months from the time the first concrete slab

[51] Galloway, "Essayons," pp. 229, 233; ORLLs, 1 Feb–30 Apr 67, 34th Engr Gp, p. 7, 1 May–31 Jul 67, 34th Engr Gp, pp. 15–16, 1 Nov 67–31 Jan 68, 34th Engr Gp, 1 Feb 68, p. 14, last in Historians files, CMH.

[52] Tregaskis, *Building the Bases*, p. 250; Quarterly Hist Rpt, 1 Jul–30 Sep 67, MACDC, 21 Oct 67, p. IV-22, Historians files, CMH; Diary of a Contract, p. 191.

was poured, the project was 96 percent complete. In August, MACV headquarters began moving in. The two-story building contained a foundation of concrete caissons, 310,000 square feet of concrete floors with vinyl tile covering, an insulated metal roof, insulated double-wall metal siding, suspended acoustical ceilings, plastered fixed partitions, and plywood movable partitions. Also part of the new MACV complex were a three-story metal prefabricated barracks and mess hall, a one-story metal prefabricated building containing headquarters commandant offices and a warehouse, a power plant, a chiller plant, and a telephone exchange building. A chapel and automated data processing buildings were added and completed in the autumn. The complex had the largest air-conditioning plant in Southeast Asia, its own fresh water system with wells and treatment plant, and almost 1¼ mile of water and sewage lines. Surrounding the buildings were paved roads and four acres of parking lots, and 6,000 feet of 12-foot-high wire mesh security fence with lights every 90 feet. It was no wonder that the MACV headquarters became known as the Pentagon East, or the Little Pentagon, for it was more than one-third (twelve acres of enclosed space) the size of the Pentagon in Washington (thirty-four acres). MACV headquarters now had enough space for 4,000 troops and civilian workers in one complex.[53]

Next door at Tan Son Nhut, RMK-BRJ worked on airfield expansion and base development. All official objections to building the parallel runway through an old Vietnamese cemetery vanished overnight on 4 December 1966 when the Viet Cong infiltrated the base and had to be routed out of their hiding places, including the cemetery. Within a few days, the South Vietnamese Army appeared on the scene with bulldozers and leveled the obstructing tombstones. Progress was fast thereafter, and the new runway was in use on 15 April 1967 and dedicated on 3 June. The entire parallel runway project consisted of a 150-by-10,000-foot main runway of 10 inches of concrete (11 inches on the 1,000-foot touchdown section of either end); runway lighting; 930,000 square feet of taxiway and apron of 12 inches and 11 inches of concrete, respectively; 1 million square feet of compacted fill for the shoulders; and 400,000 square feet of soil-cement overruns, of which the 150 linear feet next to the runway on both ends was overlaid with 3 inches of asphalt. More 10-inch-thick concrete parking aprons were also built. Among the various air base facilities added by the contractor at Tan Son Nhut was a hardened concrete command post for the Air Force. During 1967, Tan Son Nhut bedded down an average of 142 Air Force aircraft. Over 126,000 sorties were flown in 1967.[54]

RMK-BRJ also wrapped up other projects in Saigon. The firm built the facilities for the country's first television broadcasting stations for the Armed Forces Radio and Television Service and the Vietnamese government. About four blocks from Tan Son Nhut, RMK-BRJ undertook the rehabilitation of

[53] Tregaskis, *Building the Bases*, pp. 250–51; Quarterly Hist Rpt, 1 Jul–30 Sep 67, MACDC, p. IV-21; Diary of a Contract, pp. 194–96; Dunn, *Base Development*, p. 145.

[54] Tregaskis, *Building the Bases*, pp. 251–52; Quarterly Hist Rpt, 1 Jul–30 Sep 67, MACDC, p. IV-21; Diary of a Contract, pp. 197–202; U.S. Air Force Statistical Digest, FY 1967, pp. 60–61, and U.S. Air Force Statistical Digest, FY 1968, p. 66.

The MACV headquarters complex at Tan Son Nhut (the airfield is in the background) was completed by RMK-BRJ in the summer of 1967.

the 3d Field Hospital. The improved complex was completed in May 1967. On Saigon's southern outskirts at the Phu Lam signal site, the contractor had been at work since July 1966. By May 1967, the project neared 50 percent completion, and the automatic switching center was activated in 1968. Some twenty other projects in Saigon were accomplished ranging from repairing of the fender system on a pier at the port, a penthouse addition to the MACV communications center, and a number of rehabilitation jobs on military offices and billets.[55]

East of Saigon, RMK-BRJ and Army engineers completed Newport. After finishing landing craft slips and ramps and barge off-loading wharfs in December 1966, the contractor began work on the deep-water berths and port buildings. When completed, the complex—consisting of a 2,400-foot wharf, four deep-draft berths, and two transit sheds, each containing four interconnected buildings, 120 by 200 feet—totaled 290,000 square feet. The inner 140 feet of the pier structure involved building a wharf of free-standing pipe or H-pile with steel caps, stringers, and a concrete deck. Two piers made up the outer 140 feet supported by prefabricated steel jackets and concrete deck sections. The jackets and deck trusses were made at the firm's fabrication yard at Poro Point in the Philippines. The piers were the idea of H. William Reeves, who adapted a design for oil platforms he built earlier

[55] Tregaskis, *Building the Bases*, p. 251; Diary of a Contract, pp. 191–93; MACV History, 1967, vol. 2, p. 793; Bergen, *A Test for Technology*, p. 302.

A ribbon-cutting ceremony marked the opening of the Newport deep-draft port facility in Saigon when Brig. Gen. Shelton E. Lollis, commanding general of the 1st Logistical Command, officiated by cutting the ribbon as (left to right) *Generals Ploger, Dunn, and Raymond and Admirals Husband and Seufer observe.*

in the Gulf of Mexico, where piles were driven through steel tubes designed as part of the pier sections. Reeves, who had been sent to Vietnam earlier as a consulting engineer, returned to work for Brown and Root as part of the combine. Like the DeLong piers, the Reeves piers were prefabricated but with smaller sections and permanent. In late January 1967, the first berth was declared open and commemorated in a ribbon-cutting ceremony as the first ship came alongside. The second berth was completed in March, and all four were finished in July. Construction of a power plant and a maintenance shop proceeded concurrently with the pier work. At the peak of the port project, RMK-BRJ employed some 1,800 Vietnamese workers and 210 Americans and third-country nationals. The work schedule consisted of two 10-hour shifts per day, seven days a week. Meanwhile, fill operations for the port area continued. Fill material was hauled by the firm's trucks from the University Quarry and subcontractors' sampans. Newport could now accommodate simultaneously four oceangoing vessels, four shallow-draft landing craft, and seven barges. As with most projects, more improvements would be made. The cost up to that point was nearly $25 million.[56]

[56] Quarterly Hist Rpts, 1 Jul–30 Sep 67, MACDC, p. IV-21, 1 Oct–31 Dec 67, MACDC, pp. IV-2 to IV-21; Diary of a Contract, pp. 262–63; Tregaskis, *Building the Bases*, pp. 237, 246; Dunn, *Base Development*, p. 143.

Funding, Overbuilding, and Logistics

During 1967, construction funding was on the downswing. By midyear, the total authorization since 1965 for military construction in Vietnam was $1.482 billion, including the $397 million Fiscal Year 1967 supplemental. The funding for 1967 as compared to $850 million in 1966 indicated that the greatest part of the construction effort was financed and well on its way to completion. Nevertheless, Pacific Command and MACV believed the downward trend for Fiscal Year 1968 did not provide for all the required facilities and highway upgrading. But when Pacific Command requested additional supplemental funds, the Johnson administration demurred. By September and October 1967, added construction requirements totaled $341 million, primarily to support the increased troop levels. In the end, MACV received $164.5 million supplemental funds for Fiscal Year 1968, which was much better than the $77 million Fiscal Year 1968 regular appropriation. Only $69.1 million would be forthcoming for Fiscal Year 1969, bringing the total funds for Vietnam military construction to $1.71 billion.[57]

Meanwhile, General Raymond and his Construction Directorate faced a second funding overrun that came to light in January 1967. The Navy's Officer in Charge of Construction in Saigon continued to underestimate the full degree of RMK-BRJ's mobilization costs. Costs also swelled when the scope of projects expanded, and the Navy's Officer in Charge of Construction in Saigon faced cash-flow problems. Up to this point, planning had been based on about $600 million equally divided between the contractor and troop effort. This figure did not include the $200 million to complete the contractor's portion of the construction program, and now the Officer in Charge of Construction disclosed that the contractor required more than the $200 million estimated the previous July. In light of a reduced Fiscal Year 1967 supplemental program, Raymond could not expect relief in the planned Fiscal Year 1968 regular program submission, and he had to wait until about 1 November before these funds would become available. Raymond had no choice but to take steps to align future work within the new funding level. Since most of operational and logistical facilities were done, he looked to the increasing troop capability to take over a major share of the remaining work.[58]

The Naval Facilities Engineering Command also took steps to fix the overrun problem and dispatched its comptroller, Capt. Donald G. Iselin, to Saigon in February. One option that seemed to have the most merit allowed the consortium to complete current jobs along with some new work and the highway restoration program, turning the smaller and remote sites such as Pleiku over to the troop units. Besides easing the transition, Iselin believed that an infusion of cash for new work in the program would go a long way.

[57] CINCPAC History, 1967, vol. 2, pp. 897–99; MACV History, 1967, vol. 2, pp. 843–44; MACV History, 1968, vol. 2, p. 670; Quarterly Hist Rpt, 1 Jan–31 Mar 67, MACDC, pp. 11–12; Quarterly Hist Sum, 1 Jan–31 Mar 69, MACDC, 19 Apr 69, app. 1, Historians files, CMH.

[58] Raymond, Observations on the Construction Program, pp. 35–36; Quarterly Hist Rpt, 1 Jan–31 Mar 67, MACDC, pp. 11–16; Msg, Raymond SOG 0138 to Noble, 23 Jan 67, Dunn Papers, CMH.

The Officer in Charge of Construction would only need part of that money to do the new jobs, enough to pay the labor since equipment and materials had already been purchased. The rest of the money could then be used to pay for the labor on current jobs. Iselin and Raymond traveled to Washington to recommend this approach to Defense Department officials. During the briefing, Assistant Secretary of Defense Ignatius went along with Iselin's proposal, agreeing that the only way to handle the problem was to establish some level of effort. When Iselin drew up his plan he called it, for lack of anything better, the Level of Effort. Following this approach, the contractor was allocated a specific amount of funds at each of its remaining locations. Productive use of equipment, manpower, and materials was the major consideration at each site. The plan matched the firm's given capability to a known workload, purposely established at such a level that work would always be ready, waiting for the capability rather than the consortium's original posture of having more than enough capability and frequently waiting for work. Armed with Pentagon concurrence of the Level of Effort concept, Iselin returned to Saigon in March. Raymond agreed to put the Level of Effort plan into action. Iselin held a series of meetings to work out the details with the Construction Directorate, Officer in Charge of Construction, RMK-BRJ, and the three services. On the twenty-fifth, Raymond directed the implementation of the system by 1 April 1967.[59]

By June, the Construction Directorate and the Officer in Charge of Construction had taken steps to absorb the overrun and phase down the contract with RMK-BRJ. The Navy's Saigon office came up with a final estimate of $300 million to finish the contractor's projects. Other measures included transferring some of the contractor's projects, materials, and equipment to troop units; consolidating, closing out, or transferring the firm's operating sites; and where possible, reducing the scope of projects. The Officer in Charge of Construction hastened plans to reduce the number of employees from 48,800 to 17,000 by August and to phase out the contract by 1 July 1968. Since the reduction released workers with construction skills, the planning assumed that most of them would be able to find employment with other construction organizations. Losing all the firm's construction capability, however, did not make much sense. In July 1967 MACV, after consulting with Honolulu and Washington, decided to retain the contractor and a workforce of at least 15,000 to finish some projects and to carry out highway restoration.[60]

[59] Tregaskis, *Building the Bases*, pp. 336–40, 342–45; Intervs, Richard Tregaskis with Capt Donald G. Iselin, Comptroller, Naval Facilities Engr Cmd, 29 Jan 71, pp. 6–21, and Brig Gen Daniel A. Raymond, Former Dir of Const, MACV, 20 Jul 70, pp. 19–21, both in Richard Tregaskis Papers, Naval Facilities Engr Cmd Hist Ofc, Port Hueneme, Calif.; Quarterly Hist Rpt, 1 Jan–31 Mar 67, MACDC, pp. 16–17, 19–20; MACDC Paper, n.d., sub: Level of Effort Concept, Dunn Papers, CMH.

[60] MACV History, 1967, vol. 2, pp. 840–42; Raymond, Observations on the Construction Program, pp. 36–37, 60–61; Quarterly Hist Rpts, 1 Jan–31 Mar 67, MACDC, pp. 16–20, 1 Apr–30 Jun 67, MACDC, 11 Jul 67, pp. III-4, IV-2, IV-3, 1 Jul–30 Sep 67, MACDC, 21 Oct 67, p. III-3; Msg, COMUSMACV 09024 to CINCPAC, 17 Mar 67, sub: Reduction in RMK-BRJ Work Force; MACDC Fact Sheet, 5 Apr 67, sub: Construction Contractor Demobilization, RVN; Msg, CINCPAC to COMUSMACV, 20 May 67, sub: Construction Contractor Capability; Msg, COMUSMACV 17260 to CINCPAC, 26 May 67, sub: Construction Contractor

One way to cut down the number of projects and save money and engineering resources was to make sure facilities, especially troop billets, were not overbuilt. Since tents could be expected to survive little more than one year in such a climate, General Westmoreland had allowed construction of wooden tropical buildings. It was also recognized that roads, mess halls, latrines, showers, dispensaries, water towers, chapels, post offices, and other facilities would have to be built sooner or later. After reviewing the cantonment standards in 1966, U.S. Army, Vietnam, continued to use the field, intermediate, and temporary cantonment standards based on expected tenure of occupancy. In October 1966, MACV revised Directive 415–1 prescribing the three cantonment standards, which with minor modifications remained in effect for the remainder of the conflict. General Westmoreland concurred in using troops to build cantonments, but he considered it inappropriate to provide base camps beyond the mere necessities for units that operated and lived in the field most of the time. He was surprised, therefore, during a visit to Phan Rang in September 1967 to learn that new facilities were being built for the 1st Brigade, 101st Airborne Division, particularly since the unit spent most of its time away from camp and did not make full use of the buildings already erected. On returning to Saigon he told General Palmer, the deputy commanding general of U.S. Army, Vietnam, to stop the work at Phan Rang and to look into the status of base camp construction.[61]

General Palmer, who in March 1967 had left the Army staff as chief of operations to command II Field Force, and on 1 July succeeded General Engler as deputy commander of U.S. Army, Vietnam, took immediate steps. No friend of the base camp concept, Palmer considered the policy "pernicious," and the "manpower it soaked up was appalling, not to mention the waste of material resources and the handicap of having to defend and take care of these albatrosses." It was also obvious to him that the camps were being overbuilt, and construction was too sophisticated. He himself became aware of a situation involving the 196th Infantry Brigade at Tay Ninh. And at Pleiku, Palmer found the 4th Engineer Battalion building concrete sidewalks for the 4th Division while the ammunition and fuel dumps remained impassable mud holes in the rainy season. His personal view was that all units should live in the field, with minimum facilities serving all the forces in a large area. He set up a base development study group under the chairmanship of the G–4, comprising staff officers of U.S. Army, Vietnam, and 1st Logistical Command, to evaluate all base camp construction requirements. The twelve-man study group reviewed base development plans for tactical and logistical bases and the reasons for their locations, degree of development, and their support to the tactical forces. Altogether, thirty-two Army bases and their satellites were visited and evaluated. At Qui Nhon, the study

Demobilization; Msg, COMUSMACV 17572 to CINCPAC, 29 May 67, sub: Construction Contractor Demobilization. Two reports, messages, and fact sheet in Historians files, CMH.

[61] Dunn, *Base Development*, pp. 45, 73–74; Ltr, Westmoreland to Dep CG, USARV, 23 Jan 67, sub: Cantonment Construction Policy; Westmoreland Historical Notes, no. 21, 6 Sep 67, both in Westmoreland History files, CMH. MACV Directive, 415–1, 20 Oct 66, *Construction: Cantonments, Standards of Construction To Be Used by US and FWMA Forces in RVN*, an. A.

group recommended that the port and logistical complex continue its base development program at the construction pace then under way, but that Tay Ninh, with the departure of the 196th Infantry Brigade to I Corps and a now-outdated base development plan, be considered for possible closing. At Bien Hoa, the study group found that the 173d Airborne Brigade only used 22 percent of its base camp capacity at any given time and recommended any additional construction for the brigade should be deferred. With reference to Bien Hoa, the team also noted that the 20th Engineer Brigade and newly arrived 34th Engineer Battalion were living and working in tents considered below acceptable standards and recommended that the construction battalion be housed in a portion of the airborne brigade's cantonment. At Phan Rang, the study group verified Westmoreland's concern that the brigade of the 101st Airborne Division had not occupied its cantonment for more than a few days. The study group's report suggested several reprogramming actions to assure the continuation of only essential base construction. General Palmer approved these recommendations and a proposed "hotel" concept. This meant that in any given base camp, the Army would not try to bed down every man since a large part of maneuver units would always be in the field.[62]

Despite MACV's efforts to tighten the construction program, the Defense Department expanded upon the already constricting procedures of the construction authority. On 3 April, Secretary McNamara issued another procedural memorandum that did away with the concept that treated the entire country as one installation and instead divided the country into nineteen base complexes along with their satellite sites. Although the fifteen broad functional facility category groups had worked well for MACV program managers, they apparently did not provide the detail needed by the Defense Department. The Defense Department now preferred more detailed facility category groups, which nearly doubled the number of the superseded categories, but they did provide more detail and gave a better picture of what was being built. For example, the MACV list depicted hospitals as one category group, and dental clinics and dispensaries were lumped under cantonments. The Defense Department listed hospitals, dental clinics, and dispensaries as separate groups. MACV planners were now faced with managing over five hundred entities compared to the previous fifteen.[63]

The command again faced what amounted to a system that one could expect under normal peacetime procedures. Programming, reprogramming, reevaluation, rejustification, and resubmittals, with all of the attendant

[62] Dunn, *Base Development*, pp. 74–75; General Bruce Palmer Jr., *The 25-Year War: America's Military Role in Vietnam* (Lexington: University Press of Kentucky, 1984), pp. 69–71 (quoted words, p. 69); Report of HQ USARV Ad Hoc Group to Study Base Development, 18 Sep 67, pp. 2, 6, 8, 14–15, an. C, apps. II, XXII, XXIV, Historians files, CMH; Army Construction in Vietnam, incl. 8, p. 1, OCE Liaison Officer Trip Rpt no. 9, 24 Oct 67, OCE Hist Ofc.

[63] JLRB, Monograph 6, *Construction*, pp. 74–76; Raymond, Observations on the Construction Program, pp. 51–52, 211–13 (tab V, Office of the Secretary of Defense Memorandum, 3 Apr 67, sub: Construction Approval Procedures for SVN); Quarterly Hist Rpt, 1 Jan–31 Mar 67, MACDC, pp. 20–21.

administrative burdens became a way of life for the construction managers. Since the Defense Department required copies of all construction directives, the Construction Directorate faced a possible increase of approximately 1,500 entities to manage for each of the annual and supplemental appropriations. General Raymond later reported that even though the MACV commander retained some flexibility, "the new system has imposed a monumental paperwork task since, one there are so many separate projects and two copies of all amendments must be forwarded to DOD." He noted that one reprogramming action alone could include five to ten amendments to the construction directives. As the Defense Department's logistics study in 1969 pointed out, the modified system "provided maximum visibility and minimum flexibility." The engineers had to abide by these restrictions and assigned more troops and civilians to do the bookkeeping.[64]

Bookkeeping also applied to construction supplies, especially those used by the contractors. In late 1966, RMK-BRJ had instructions to start construction on projects estimated to cost $823 million, some two-thirds of the entire construction program. Once the Seabees and the contractor had drawn large amounts of equipment and materials from Navy stockpiles, it became apparent that RMK-BRJ still needed equipment and materials in quantities far greater than could be replenished by Navy depots. This would bring the total equipment requirements to 5,000 items, an increase of 4,000, plus another 1,000 pieces of rental equipment like barges, tugs, dredges, and pile drivers. The firm scoured the Far East for dredges and cement. When Westmoreland decided to house troops in tents with wood frames and wood frame buildings, RMK-BRJ added to its growing lists a huge demand for lumber. The firm's Saigon office placed an order for 78.4 million board feet of lumber, and the home office at San Bruno, California, almost cornered West Coast lumber sources. This not only increased the price of lumber but also made it difficult for Defense procurement officials to satisfy the needs of the services within a specified time limit and at reasonable prices.[65]

Sorting and inventorying these vast stores of building materials and equipment during the hectic buildup posed major challenges. At first RMK-BRJ dumped equipment and materials at port staging areas, depots, and project sites. The flood of arriving materiel inspired thievery on a grand scale. Changes in project priorities and criteria also left the contractor with excesses of some materials. It became apparent that the consortium had to build its own depots and work camps in Vietnam to secure and house the growing stocks, which by May 1966 had grown in value to $162 million.[66]

It did not take long for Congress to become concerned. A team from its auditing agent, the General Accounting Office, arrived in Vietnam in July 1966

[64] Raymond, Observations on the Construction Program, p. 52 (quoted words); JLRB, Monograph 6, *Construction*, pp. 74–77, 80 (quoted words).

[65] Tregaskis, *Building the Bases*, pp. 199–201, 225, 281; JLRB, Monograph 6, *Construction*, p. 174; Report to the Congress of the United States, Survey of United States Construction Activities in the Republic of Vietnam, General Accounting Office, Dec 66, pp. 1–2, 6, 31, box 4, 74/167, RG 334, NARA (hereafter cited as GAO Rpt).

[66] Tregaskis, *Building the Bases*, pp. 201, 212, 239–40; GAO Rpt, pp. 52–70, 77–81.

to survey construction activities. In December, the team's report concluded that problems it uncovered came about because of the speed in which RMK-BRJ had to mobilize. In noting the contractor's loss of control over materials and equipment, the team pointed out the magnitude of the problem. RMK-BRJ could not account for the whereabouts of approximately $120 million worth of supplies shipped from the United States. The report prompted a lively exchange of views between the auditors and the commands. In response to the findings concerning inadequate depots, MACV and Pacific Command noted that the contractor's facilities were at least equal to those provided to the military forces.[67]

The Navy and RMK-BRJ made a concerted effort to fix the problem. In July 1966, the Officer in Charge of Construction in Saigon established a Material Department to monitor the contractor's procurement, shipping, inventory, property, and equipment programs. RMK-BRJ built major depot and repair complexes near Saigon, at Cam Ranh Bay and Da Nang, with subsidiary storage areas at other locations. Near Saigon, RMK-BRJ began to capitalize on plans made earlier in the year to transform a marshy cigar-shaped island at Thu Duc into a vast storage and maintenance area. A large amount of fill was needed for the firm's depot, but the Newport project had a higher priority and received the lion's share of crushed rock from the firm's University Quarry. This slowed progress somewhat. Nevertheless, some 1.2 million cubic yards of sand and 240,000 cubic yards of rock were used to stabilize an area of over 4 million square feet at Thu Duc. The firm completed most of the vertical construction (administration buildings, warehouses, and maintenance shops), utilities systems, surface stabilization, barge anchorages, and floating piers in early 1967. At the end of May, the inventory value of material (excluding spare parts) at Thu Duc totaled approximately $30 million. Altogether, the firm's depot facilities in South Vietnam grew to twenty sites with ninety-seven warehouses providing 800,000 square feet of floor space. The firm also improved its security force by hiring Koreans and ethnic Chinese Nung mercenaries. While doing all this, the firm finally got the go-ahead to improve its camp sites for its American and third-country employees.[68]

Indicative of the development of the bases was the corresponding expansion of the facilities engineering contractor, Pacific Architects and Engineers. During 1967, 5,000 more employees were hired, increasing the firm to over 20,000 workers, including 1,500 Americans, 3,000 third-country nationals, and 16,000 Vietnamese. At the start of the year, Pacific Architects and Engineers had responsibility for forty-nine permanent camps. These included major installations at Qui Nhon, Da Nang, Cu Chi, Long Binh, Vung Tau, Tuy Hoa, Nha Trang, Cam Ranh Bay, and Phan Rang. By the end of the year, the firm had facilities engineering responsibility for 39 primary sites (classified as A installations), 57 smaller permanent offices (B and C installations), and 200

[67] GAO Rpt, pp. 2, 16–17, 52; Msg, CINCPAC to OSD, 6 Jan 67, sub: GAO Draft Report, Survey of U.S. Construction Activities in the Republic of Vietnam, 16 Dec 1966. Messages and correspondence concerning the report are in the same file with the report.

[68] Tregaskis, *Building the Bases*, pp. 201, 248–49, 281–84; Diary of a Contract, pp. 262–63.

isolated Special Forces and adviser sites maintained by roving maintenance teams. The Long Binh complex alone required a facilities engineering staff of 2,153 (80 U.S., 334 third-country nationals, and 1,739 Vietnamese). Taking care of the U.S. Army, Vietnam, headquarters complex required the dedicated services of 2 Americans, 6 third-country nationals, and 200 Vietnamese workers. The firm was still doing some $1 million in new construction each month, including jobs like building kennels for sentry dogs guarding a communications site at Long Binh. Though not in its facilities engineering charter, the firm pitched in to help hook up 2,200 telephones and run 200,000 feet of cable at MACV headquarters and 1,095 telephones and 25,000 feet of cable at Long Binh. The contractor also built engineer construction materiel yards for the logistical command in Saigon, Long Binh, and Vung Tau, stocking items from nails to prefabricated buildings.[69]

Because the Army supply system fell short of the contractual requirements with Pacific Architects and Engineers, the firm had unique supply problems of its own. Unlike the Navy's contract with RMK-BRJ and the Air Force's contract with Walter Kidde at Tuy Hoa Air Base, which allowed the two firms to procure the bulk of their equipment and supplies, the contract with Pacific Architects and Engineers called for the Army to provide these items. Despite the efforts of the 1st Logistical Command engineer and the U.S. Army Procurement Agency, Vietnam, Pacific Architects and Engineers received little of the equipment it was authorized. More than once the contractor resorted to purchasing materials and equipment from civilian sources. When the Army renewed the contract in mid-1966, the firm only possessed $3 million of the approximately $22 million of equipment and tools specified in the contract. The contractor's difficulties varied from cancellations of requests for the missing equipment to critical shortage of space aboard ships and aircraft bound for Vietnam. In one instance, more than $1 million of equipment, vehicles, and prefabricated buildings purchased in Singapore reached Saigon almost six months later. The ever-expanding bases exacerbated the facilities engineering contractor's materiel shortages, particularly refuse trucks, fire trucks, prefabricated buildings, and hand-operated insecticide foggers and rodenticide. Because of the lack of refuse trucks, Pacific Architects and Engineers had to hire local contractors, who demanded increasing prices to haul away the military's trash. In late 1966, the contractor had on hand only 78 of the authorized 626 pieces of "rolling stock," but by mid-1967 the number on hand soared to 674. By then, however, the shortfall in equipment was great because requirements had quadrupled over the authorized levels.[70]

Nevertheless, Pacific Architects and Engineers reported some improvement as equipment began to trickle in. Cement mixers, road graders, jeeps, assorted trucks, generators, and small shipments of water treatment plants, requested

[69] *History, Pacific Architects and Engineers, Incorporated: Repairs and Utilities Operations for U.S. and Free World Military Forces, Republic of Vietnam, Calendar Year 1967* [Saigon, n.d.], pp. 3, 6–7, 9, 14, 20, 23, copy in CMH.

[70] JLRB, Monograph 6, *Construction*, pp. 173, 175; ORLL, 1 Nov 66–31 Jan 67, 1st Log Cmd, n.d., p. 75, Historians files, CMH; PA&E History, 1963–1966, pp. 47–50.

when the troop population began to rise, started arriving in September 1966. When thirty pickup trucks arrived in Saigon that month, Vietnamese customs red tape held up distribution for a month. Another contractor accidentally picked up and stored some transformers in Phan Rang, and it took the firm one month to locate them.[71]

The rapid growth of the facilities engineering contract made it evident that the Army needed better control. Although the 1st Logistical Command's engineer monitored the contractor's work, the command's procurement agency managed the contract. To keep track of the firm's performance, the procurement agency relied on contracting officer's representatives, a title and responsibility typically given to staff officers as an additional duty. On 1 December 1966, Col. Robert W. Fritz, who replaced Colonel Lien as the 1st Logistical Command engineer, established a Contract Management Branch at the firm's Contract Management Office in Saigon. The branch, which later expanded to a division of three branches, supervised and controlled all technical aspects of the contractor's operations. Fritz assigned duties as contracting officer's representatives to the staff engineers of the Saigon, Qui Nhon, and Cam Ranh Bay support commands. In turn, the three commands appointed contracting officer's representatives among the staff engineers of the installations within the support command areas. These assignments corresponded with Pacific Architects and Engineers' three area and forty-five installation offices.[72]

Summing Up

By the end of 1967, the bases, all in full operation, were nearing completion. The builders had made tremendous headway to reduce the backlog, especially at the major complexes in and around Long Binh, Cam Ranh Bay, Da Nang, and Qui Nhon. Since 1965, a vast base development program provided the operational, logistic, and support facilities that enabled the United States to deploy and operate a force now approaching 500,000. The construction of deep-draft ports with satellite shallow-draft ports, major air bases, depots and logistical complexes, and troop bases proceeded concurrently with the arrival of troops and their supplies. The anticipated long duration of operations made economical sense to upgrade troop housing from tents to tropical wood-framed buildings and install better utilities beyond the designs called for in technical manuals. Statistics of completed Army facilities alone showed the immense effort put into the construction program. Over 4.4 million square yards of airfields were cleared, graded, and surfaced; 160 miles of pipeline and storage tanks capable of storing more than 37 million gallons of fuel were built; and 11.6 million square feet of covered and open storage for dry cargo were in place at the supply depots. Hospitals were capable of handling 2,800

[71] PA&E History, 1963–1966, pp. 48–49.

[72] Dunn, *Base Development*, p. 92; Rpt of Visit to the 1st Log Cmd, 12 and 15 Nov 66, p. 2, incl. 10, 7 Dec 66, OCE Liaison Office Trip Rpt, no. 5; ORLL, 1 Nov 66–1 Jan 67, 1st Log Cmd, pp. 73–74; U.S. Army Procurement Agency, Vietnam, *Procurement Support in Vietnam, 1966–1968*, n.d., pp. 30, 36, Historians files, CMH.

Among the major accomplishments in building the bases in South Vietnam were the deep-draft ports such as Newport shown here in October 1967.

patients. Engineer troop strength increased as more construction battalions activated in 1966 crossed the Pacific, and command and control improved with the arrival of a second engineer brigade and the sixth engineer group. The long-awaited arrival of new equipment greatly helped, but getting construction supplies continued to be a challenge. With the construction program over the hump, planning was set in motion in 1967 to make sure there was no overbuilding and to cut back the expensive contract with RMK-BRJ. Washington also reduced funding and imposed more restrictions. Congress allocated over $1.5 billion in construction funds to the Defense Department for Fiscal Year 1968 starting 1 July 1967, but only $300 million was slated for Southeast Asia, as compared to $1.1 billion the previous year. Still, the expansion of combat operations generated new requirements for roads, airfields, cantonments, and advanced logistical bases, an almost never-ending process as combat forces deployed to new areas. Priority now shifted to highway improvements. As 1968 dawned, the engineers looked forward to finishing the bases, making headway on the road improvement program, and supporting tactical operations.[73]

[73] Dunn, *Base Development*, pp. 133–34; Annual Report of the Secretary of the Army in Department of Defense Annual Report for Fiscal Year 1967 (Washington, D.C.: Government Printing Office, 1969), p. 218; Annual Report of the Department of Defense for Fiscal Year 1968 (Washington, D.C.: Government Printing Office, 1971), p. 90.

10

Inland and to the Borders, June 1967–January 1968

During his visit to the United States in April 1967, General Westmoreland spoke of the importance of persevering on all fighting fronts simultaneously. He was now at the midpoint of his three-phase strategy that began with protecting his logistical bases with occasional forays. Currently, the allies were trying to gain the initiative and eliminate the enemy's base areas and possibly his main forces. Westmoreland's third phase envisioned moving into sustained ground combat to mop up the last of the main forces, or at least push them across the borders and try to contain them. "At one and the same time," he told a gathering of the Associated Press managing editors in New York City, "we must fight the enemy, protect the people, and help them build a nation in the pattern of their choice." A few days later in an address before a joint session of Congress, Westmoreland expanded on his war-winning strategy. He explained that the enemy, despite suffering large losses on the battlefield, still clung to the belief that he could defeat the allies through a clever combination of psychological and political warfare. "The only strategy which can defeat such an organization," he stated, "is one of unrelenting but discriminating military, political, and psychological pressure on his whole structure—at all levels."[1]

Strategy in Mid-Passage

This strategy in the mid-passage of the war was incorporated in the Joint Vietnamese-U.S. Combined Campaign Plan for 1967. With enlarged forces, added firepower, and improved mobility, Westmoreland carried the battle to the enemy regularly throughout the year. The plan provided for highly mobile American forces to carry the bulk of the offensive effort against Viet Cong and North Vietnamese Army main force units. South Vietnamese forces took on the primary role in pacification. Westmoreland viewed the U.S. effort as complementary—to drive the enemy main forces away from the priority pacification areas. He estimated that over half the U.S. combat forces would operate close to the heavily populated areas against guerrillas and local forces. These units would reinforce Vietnamese units in pacification, just as designated Vietnamese units would help carry the attack against the main forces.[2]

The Combined Campaign Plan also contained a blueprint for the security and restoration of the roads. As the priority construction of ports, airfields, and

[1] Quoted in Sharp and Westmoreland, *Report*, pp. 131–32; Westmoreland, *A Soldier Reports*, pp. 224–29.

[2] Sharp and Westmoreland, *Report*, pp. 131–36; MACV History, 1967, vol. 1, pp. 317–22.

bases neared completion, more effort combining U.S. and South Vietnamese military and civilian resources could go to the highway restoration program. Planners viewed a good highway system as a high-priority requirement supporting military operations and nation-building. Early in 1967, MACV's Directorate of Construction developed plans to upgrade about two thousand miles of roads. Dependable roads would also reduce dependency on the expensive air and slow water transportation systems. Sabotage, monsoon rains, and increasingly heavy use by allied military forces together had intensified the poor condition of the roads. Repairs were far beyond the capabilities of the South Vietnamese, and military engineers usually made minimum repairs and improvements to support military operations and the vital flow of commerce. The engineers would often repeat this process pending a fully funded restoration program. To carry out the program, the Directorate of Construction estimated an annual cost of about $130 million over the course of three years employing troop and contractor capability.[3]

While he prepared to upgrade the highways, additional troops and weaponry permitted Westmoreland to increase the scope and pace of offensive operations. In March, Westmoreland regarded the Army's force ceiling under Program 4 of the buildup to be inadequate for the assigned missions, and he asked Washington for more troops. Washington reluctantly relented, and in October approved a force ceiling (Program 5) of 525,000 for 1968. U.S. strength increased significantly during 1967, from 385,000 to 486,000. By the end of the year, the number of maneuver battalions available to allied forces rose from 256 to 278. U.S. Air Force aircraft in South Vietnam increased from 834 to 1,085, and twenty-eight tactical fighter squadrons could be called upon to provide close air support and assist in the interdiction campaign. The number of B–52 sorties rose sharply. Army and Marine Corps helicopter units could muster over 3,000 helicopters of all types.[4]

By the autumn of 1967, Westmoreland had refined his earlier concept of a three-phase war to one of four phases. He saw 1968 as the year of the third phase, in which the Americans would continue to help strengthen the South Vietnamese military. The United States would also turn over more of the war effort to the South Vietnamese. In what he termed the fourth—and decisive—phase, Westmoreland could see the "U.S. presence becoming superfluous as infiltration slowed, the Communist infrastructure was cut up, and a stable government and capable Vietnamese Armed Forces carried their own war to a successful conclusion." He also expected that the enemy would try to do something to change this trend.[5]

Although events later in 1967 pointed to some kind of change in Hanoi's plans, probably something big, General Westmoreland had no intention of sit-

[3] MACV History, 1967, vol. 1, pp. 326–30, vol. 2, pp. 762–63; MACDC-EBD Fact Sheet, sub: Highway Restoration Program in Vietnam, n.d., box 3, 70A/782, RG 334, NARA; Quarterly Hist Rpts, 1 Jan–31 Mar 67, MACDC, p. 1, and 1 Oct–31 Dec 67, MACDC, p. II-1.

[4] Sharp and Westmoreland, *Report,* p. 131; MACV History, 1967, vol. 1, pp. 135–36, 147–49; Schlight, *Years of the Offensive*, p. 159. For more on the troop ceiling requests, see MACV History, 1967, vol. 1, pp. 135–66 and Cosmas, *Years of Escalation, 1962–1967*, pp. 451–66.

[5] Quoted in Sharp and Westmoreland, *Report*, p. 136.

ting back to await the enemy's next move. The promulgation of the Combined Campaign Plan for 1968 in November 1967 did not foresee any major changes in allied plans. U.S. ground forces would carry on with the destruction of the enemy's main forces and base areas, contain the border areas and his use of infiltration and invasion routes, and help South Vietnamese forces to open and secure roads and the countryside. Westmoreland had concluded in mid-1967 that the enemy was in a position of weakness. Hanoi had nothing tangible to show but increasing losses in personnel and materiel after a little more than a year of fighting the growing number of American troops. He regarded Hanoi's choices as few, and intended to keep them that way. Indeed, as additional U.S. ground forces arrived, he saw an opportunity to employ the 1st Cavalry Division as a theater exploitation force in areas where good weather prevailed. In a series of operations code-named YORK, the division would deploy to the III Corps border during the December to April dry season in the south. During the May to September dry season farther north, the cavalry division would then move to I Corps to sweep the four provinces along the Laotian border. Reestablishing control in the A Shau Valley could set the stage for an invasion of Laos, which, along with a possible amphibious assault around the Demilitarized Zone, could, Westmoreland believed, end the war.[6]

The Saigon Arc

Integral to these hopes for the future was progress in III Corps, and by mid-1967 II Field Force had completed a series of large-scale operations following JUNCTION CITY. With the onset of the monsoon season, U.S. and allied forces had settled in assigned areas meant to block the approaches to Saigon. The command's maneuver forces included the 25th Infantry Division guarding the northwest approaches, the 1st Infantry Division to the north and northeast of the capital, the 9th Infantry Division east of Long Binh and to the southwest in the delta, the 11th Armored Cavalry Regiment farther to the east, and the 199th Light Infantry Brigade in Gia Dinh Province surrounding Saigon. II Field Force focused on strengthening security in the countryside, holding off enemy attempts to sabotage the national elections, and continuing to strike enemy base areas and defeat and destroy his forces. Other forces in the area included South Vietnamese regular and territorial units, the 1st Australian Task Force southeast of Saigon, and the Royal Thai Volunteer Regiment.[7]

By this time, the deployment of Rome plows and bulldozers had become a routine part of operations in the III Corps Tactical Zone. Their effectiveness during CEDAR FALLS had bolstered MACV's earlier requests for land-clearing teams. Although standard bulldozers had helped to prove the effectiveness of the land-clearing concept, their use in these operations had affected construction projects. MACV warned that similar use in the future would slow work at Long Binh and elsewhere until the land-clearing capability increased. As a

[6] Ibid., p. 157. For details on the Combined Campaign Plan and the YORK series of operations, see MACV History, 1967, vol. 1, pp. 338–45, ibid., 1968, vol. 1, pp. 13–24.

[7] ORLL, 1 Aug–31 Oct 67, II FFV, 15 Nov 67, pp. 21–22, 57, 61, Historians files, CMH.

result, II Field Force deferred large forest-clearing operations (PAUL BUNYON) pending the arrival of land-clearing teams being formed at Fort Lewis, Washington.[8]

Rome plow kits reaching combat engineering units gradually increased. In December 1966, the Rome Plow Company rushed six kits to South Vietnam by air shipment. By early February, the Georgia-based company began weekly shipments of nine blades that continued over the next several weeks. As of late March, thirty medium and six light blades were in South Vietnam, but only twelve were mounted. The remainder still required attachment to the bulldozers. Totals in III Corps included four kits to the 1st Division, four to the 25th Division, two to the 11th Armored Cavalry Regiment, eight to the 79th Engineer Group, and four to the 159th Engineer Group. At midyear, plans called for a total of 174 blades, including 90 for three new land-clearing teams that began to arrive in May.[9]

The 27th, 86th, and 35th Land Clearing Teams reported for duty in May, June, and July, respectively. Originally proposed as self-contained teams, each consisting of 112 men and thirty Rome plows, the teams were reduced in scope by the Army to 64 men. The teams now depended on engineer battalions for maintenance, logistical, and administrative support. After undergoing several weeks of intensive training, the teams became operational approximately one month after their arrival. Two teams were attached to combat engineer battalions in III Corps, the 27th to the 168th Engineer Battalion at Di An and the 86th to the 86th Engineer Battalion at Bearcat. The third team, the 35th, deployed to II Corps, where it joined the 35th Engineer Battalion north of Qui Nhon.[10]

Battalion commanders used different approaches to assimilate the teams. Lt. Col. John R. Manning, who assumed command of the 168th Engineer Battalion in May, organized a land-clearing task force to support the 27th Land Clearing Team. Besides creating a small task force headquarters, the battalion formed a maintenance section consisting of a warrant officer, six mechanics, plus a contact team from a direct-support maintenance company. Another augmentation included a small communications section to provide a radio link between the task force and security forces. Lt. Col. James F. Miley of the 86th Engineer Battalion placed his land-clearing team in one of his line companies, which, in turn, designated two platoons to supervise and support the two sections. A mechanized infantry battalion usually provided security,

[8] Quarterly Hist Rpt, 1 Jan–31 Mar 67, MACDC, pp. 6–7; Msg, COMUSMACV 03824 to CINCPAC, 1 Feb 67, sub: Engineer Land Clearing Teams, box 18, 84/051, RG 319, NARA; Msg, COMUSMACV 09572 to CGs, USARV and II FFV, 22 Mar 67, sub: Forest Clearing Operations, box 5, 70A/782, RG 334, NARA. For more background on the land-clearing teams, see Army Buildup Progress Rpts, 23 Feb 67, p. 14, and 8 Mar 67, Supp, p. 1, CMH.

[9] Ltr, J. T. Soules, Vice President, Rome Plow Co, to Ploger, 9 Feb 67, Historians files, CMH; Quarterly Hist Rpts, 1 Oct–31 Dec 66, MACDC p. 7, 1 Jan–31 Mar 67, MACDC, p. 6, and 1 Apr–30 Jun 67, MACDC, pp. II-6 to II-7.

[10] Quarterly Hist Rpts, 1 Apr–30 Jun 67, MACDC, p. II-7, and 1 Jul–30 Sep 67, MACDC, pp. II-5 to II-6; ORLLs, 1 Aug–31 Oct 67, Engr Cmd, p. 27, 1 May–31 Jul 67, 79th Engr Gp, p. 8, 1 May–31 Jul 67, 34th Engr Gp, p. 2, and 1 May–31 Jul 67, 45th Engr Gp, pp. 2–3. For more on the deployment of the teams, see Army Buildup Progress Rpts, 19 Apr 67, p. 1, and 12 Jul 67, Supp, p. 1, CMH.

A modified D7E bulldozer equipped with a Rome plow and an armored cab

and the armored personnel carriers also carried an engineer demolition squad, welder, and mechanics to support each land-clearing section. The extensive supervision and maintenance support required by the teams in the field forced engineer commanders to look for a more permanent solution. Col. Joseph A. Jansen, the commanding officer of the 79th Engineer Group, suggested organizing a separate land-clearing company. The U.S. Army, Vietnam, engineer staff agreed and began to prepare a table of organization for such a unit.[11]

The arrival of the land-clearing teams started a new phase of exposing enemy sanctuaries, base camps, and infiltration routes. During combat operations, the teams leveled large areas of jungle, forests, and rubber plantations. Bulldozers equipped with the plows cleared areas on both sides of supply routes and reduced the threat of ambushes and increased security, at least during the daylight hours. During August, search-and-destroy operations, which included extensive road and jungle clearing, penetrated known and suspected base camps and staging areas and prevented the Viet Cong's infiltration into populated areas. By September, the land clearers opened large areas previously inaccessible to friendly forces. Operations in the Ong Dong jungle by the 1st Division, and the Filhol Plantation and the Ho Bo Woods by the 25th Division did much to deny the enemy previously secure base camps and forced him to abandon established lines of communications for less desirable routes. Simultaneously, the jungle-clearing effort improved allied base camp security by expanding fields of fire and clearing concealed avenues of

[11] Engineer Support of Combat Operations, 1 Jul–1 Sep 67, incl. 9, pp. 1–2, OCE Liaison Officer Trip Rpt no. 9, 24 Oct 67, OCE Hist Ofc.

approach leading to the bases. Not only did cleared areas make it less difficult to detect enemy movements, but they also complemented efforts to improve base camp defenses from rocket and mortar attack. Land-clearing rates averaged 1.2 acres per hour when cutting and piling vegetation up to six inches in diameter, more than double the standard D7E bulldozer's 0.5 acres. The ratio for cutting dense vegetation, including larger trees, remained the same: 1.04 acres with the Rome plows and 0.4 acres with the standard bulldozer. By the end of the summer, the teams had leveled over 30,000 acres of vegetation.[12]

The 1st Infantry Division centered its efforts north and northeast of Saigon. Two operations specifically designed to deny the enemy his secure base areas, LAM SON 67 and PAUL BUNYON, epitomized the contribution made by the land-clearing teams. During LAM SON 67, a pacification operation that began in February, the 27th Land Clearing Team cleared a jungle area often used by the Viet Cong for mortar attacks on Bien Hoa Air Base. Between 3 and 16 July, the team cleared 2,610 acres, averaging 186 acres per day, and discovered and destroyed eight tunnels, nine base camps, and several mined booby traps. Three days later, the team joined Company A, 168th Engineer Battalion, and the 1st Engineer Battalion in the first phase of Operation PAUL BUNYON in the Ong Dong Jungle, some ten miles north of Di An. Between 19 July and 13 August, they cleared 7,740 acres at the rate of 309 acres per day and destroyed five base camps and more booby traps. On 16 August, the effort shifted to Highway 13, dubbed Thunder Road. During Phase II of PAUL BUNYON, the land clearers cut 5,200 acres along the road averaging 325 acres per day. In addition, the 1st Engineer Battalion's Rome plow section, imitating an earlier experiment by the 9th Division, connected 180 feet of heavy anchor chain from a Navy cruiser between two bulldozers and cleared some 1,500 nearby rubber trees. The clearing operation, which continued into September, also resulted in finding and destroying thirteen base camps, fourteen tunnel complexes, and many mines and booby traps. By the end of the month, the 1st Engineer Battalion with help from the 79th Engineer Group had cleared selected sectors of jungle along Highway 13 and Route 1A toward An Loc and Phuoc Vinh, respectively. During Operation BLUEFIELD II the same month, the 1st Engineer Battalion reopened Highway 13 and cleared vegetation a little over one hundred yards on each side of Route 301. This effort opened a second land route to Phuoc Vinh from the west.[13]

Similar operations took place to the east and southeast of Saigon. On 10 July, the allies initiated Operation PADDINGTON to open a jungle area used by the Viet

[12] ORLL, 1 Jul–31 Oct 67, II FFV, pp. 21, 28; Miscellaneous Detailed Discussion, incl. 9, p. 3, OCE Liaison Officer Trip Rpt no. 8, 11 Aug 67; Ltr, HQ USARV, AVHEN-MO, to MACV, sub: Technical Report, Paul Bunyon Land Clearing Teams, n.d., incl. 9, tab B, p. 3, OCE Liaison Officer Trip Rpt no. 9; Galloway, "Essayons," p. 201. See also ORLL, 1 Jul–31 Oct 67, Engr Cmd, incls. 3 and 4, pp. 1–6; DA Pam 525–6, *Military Operations, Lessons Learned: Land Clearing*, 16 Jun 70.

[13] ORLL, 1 Jul–31 Oct 67, II FFV, p. 28; 1st Engr Bn Hist, vol. 1, pp. III-22 to III-26; Engineer Support of Combat Operations, 1 Jul–1 Sep 67, incl. 9, p. 3, OCE Liaison Officer Trip Rpt no. 9; Interv, Maj Paul B. Webber, 26th Mil Hist Det, with Lt Col John R. Manning, CO, 168th Engr Bn, 10 Apr 68, VNIT 106, pp. 1–2, CMH. For more on PAUL BUNYON, see Technical Report, Paul Bunyon Land Clearing Teams, incl. 9, tab B, OCE Liaison Officer Trip Rpt no. 9.

An aerial view of an anti-ambush clearing on each side of a road by Rome plows

Cong as an operations and logistics base in Phuoc Tuy Province. The combined operation by the 1st Brigade, 9th Division; the 1st Squadron, 11th Armored Cavalry Regiment; the 1st Australian Task Force; and South Vietnamese army and marine units cleared strips along Route 23 and other local roads. As part of an engineer task force deployed by the 9th Division, the 15th Engineer Battalion's Company B used fourteen Rome plows and three bulldozers to clear the jungle back a little over two hundred yards. Also in July, the 9th Division attached elements of the 11th Armored Cavalry Regiment to protect the 86th Engineer Battalion's land-clearing task force in Operation EMPORIA, a continuation of jungle-cutting along roads. Between 21 July and 15 August, Company B and the 86th Land Clearing Team in its first operation cleared 1,586 acres on both sides of Highway 20, the key land route from the vegetable-producing area around Da Lat. The task force next cleared another 1,005 acres along Highway 1 between Xuan Loc and Gia Ray. In September, Rome plows moved south on Route 2 cutting vegetation from the 11th Armored Cavalry's camp at Blackhorse to Ba Ria. In another jungle-clearing operation under the 9th Division's 1st Brigade (AKRON III), the 86th team's Rome plows, while cutting the thick underbrush and towering trees near the borders of Phuoc Tuy, Bien Hoa, and Long Khanh Provinces, uncovered a fresh trail on 8 October. This led to the discovery of the largest weapons cache to date in III Corps.[14]

[14] ORLLs, 1 May–31 Jul 67, II FFV, pp. 23–24, 1 Aug–31 Oct 67, II FFV, p. 33, 1 May–31 Jul 67, 34th Engr Gp, p. 8, and 1 Aug–31 Oct 67, 34th Engr Gp, pp. 5–6; Engineer Support of Combat Operations, 1 Jul–1 Sep 67, incl. 9, p. 4, OCE Liaison Officer Trip Rpt no. 9; AAR, Opn PADDINGTON, 15th Engr Bn, 23 Sep 67, p. 3, OCE Hist Ofc.