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Author(s): Thomas E. Spicknall

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This was the beginning of the R&U installation at Lai Khe, about 40 miles from Saigon. Tents were—and in places still are—the R&U contractor's only facilities at many installations in Vietnam.

Civilian Repairs and Utilities in the Combat Zone

By Thomas E. Spicknall

The Vietnam war has added new dimensions to the use of civilian repairs and utilities (R&U) support of American military forces. The Vietnam R&U, or "Post Engineer," contractor operation is the largest ever established in support of troops engaged in a war zone. For the R&U contractor this operation for the Army on the battlefield has presented the challenges and rewards of a pioneer effort.

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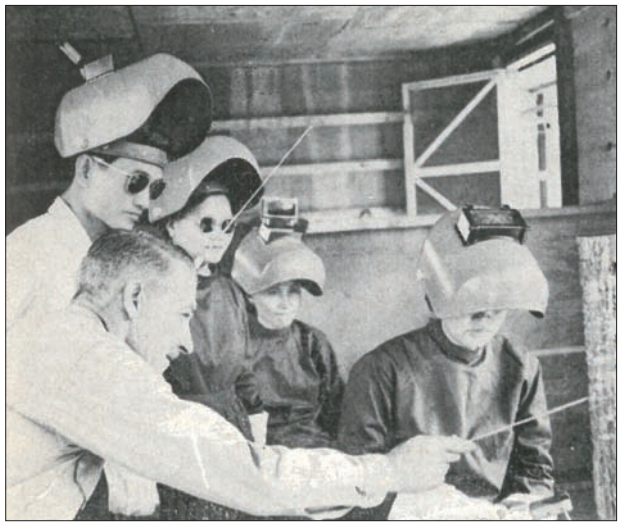

(Left) R&U Construction Crew Laying Warehouse Foundation at Vinh Long in the Mekong Delta—Guard Tower and Bunkers have been Built for Security in this Remote, Hostile Area. (Right) Vietnamese Women Being Trained as Welders—the Instructor for the R&U Contractor and a Vietnamese Interpreter-Assistant are Shown at the Left.

R&U in Vietnam has undergone a five-year evolution that closely parallels that of the American military commitment. The first Vietnam R&U contract[1] was let in May 1963, when the United States was maintaining an advisory force of approximately 5,000 men in the country. The purpose in bringing civilians into the combat zone was to relieve the advisors from nonmilitary tasks, freeing them to help the South Vietnamese meet the increasing Communist threat.

> Lack of any but the most rudimentary programs of health or sanitation meant that the military bases where these services were provided had to be made into islands of health in a sea of disease and pestilence.

The contractor was to provide R&U services at six sites which were designated by the Army: the northern ports of Qui Nhon and Da Nang (with nearby Phu Bai); Nha Trang, on the central coast; Pleiku, in the strategic Central Highlands; Tan Son Nhut Air Base, near Saigon; and Soc Trang, a Mekong Delta provincial capital. The contractor began operations with five Americans, 10 Filipino third-country nationals, and 259 local Vietnamese.

The basic problems faced by the Post Engineer contractor in Vietnam fell generally into four areas:

Logistics.—As the build-up accelerated, supplies and equipment could not be poured into Vietnam in quantities adequate to meet the needs. Combat priorities strained military supply channels and clogged the inadequate port facilities. Moving materiel inland involved communications routes under Viet Cong control.

Communications.—Military installations, especially those in remote areas, were virtually cities under siege, surrounded by enemy guerrilla units. Early communications consisted of ordinary mail and occasional messengers. Installation managers had to rely on the military for supplies and on their own ingenuity to provide the services required by the Army.

Labor.—Being chiefly agrarian, Vietnam was lacking in skilled labor. Just as the American Army was involved in training Vietnamese troops, so the contractor was engaged in a training program for Vietnamese workers. Supervisor-teachers had to be found and recruited for this purpose.

Environment.—The tropical climate, varied terrain, primitive communications systems, and general social and wartime conditions contributed to the difficulties involved in establishing a large-scale, coordinated R&U program.

An additional factor was the large amount of minor new construction work required of the contractor. Post Engineer services usually are in a ratio of approximately 85 percent repairs and utilities work to 15 percent minor new construction (costing not more than $25,000 per project). At the height of the troop build-up this ratio was almost reversed. Troop facilities first consisted of tents, then semipermanent structures, requiring a steady program of so-called minor construction that grew to gigantic proportions. By mid-1964, Post Engineer work had swung to emergency defense construction. Bunkers, troop cantonment areas, sentry towers, emergency utilities systems, security perimeter lighting, power plants, and similar facilities were given top priority.

The military bases, in many ways like the early American frontier forts which were thrust into a raw and hostile environment, were nevertheless expected to have modern sanitation, entomology services, pure water, refrigeration, and other facilities. But no proper refuse or sewage disposal facilities were available; public health and sanitation programs did not exist; there was no safe city water system or reliable local source of electric power. All facilities had to be built or converted from old colonial structures. Practically everything had to be started from scratch.

COMMUNICATIONS

Possibly the greatest operational advance in Vietnam R&U has been in communications. The Vietnamese telephone system is completely unreliable. Communications between the contract management office at Tan Son Nhut Air Base and the field installations early in the war took days at best, depending on the speed

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of the mails or the fortune of cross-country messengers.

As the contractor's operation grew to include thousands of employees at scores of locations, effective communications between installations and central management became imperative. In October 1966, the Army authorized a high-frequency single side-band radio net connecting major installations. Today there are 29 stations linked by that net, and it in turn is connected with a 33-station VHF-FM net with 96 mobile units and 250 hand-carried radio telephones. Instantaneous communication between the management office and installations is now routine.

LOGISTICS

Logistics, probably the most difficult problem facing the contractor, has become manageable only within the last year with the arrival of large quantities of R&U equipment. Throughout most of the troop buildup, materiel was scarce. At the end of 1964, for instance, more than 250 equipment items had been approved for R&U use, but only about 3 percent were in the country. Construction materials were also scarce, and imaginative use had to be made of what was available.

One installation manager found that he could replace the broken clutch rod of a truck with the vehicle's mirror arm. Guy wire or the handles from rolls of concertina barbed wire were used as welding rods. To conserve sandbags, a standard wartime construction item which rapidly decomposes in the tropical climate, 10 percent cement was mixed with the sand. The bags then hardened as dampness set in, and held their shape even through the heavy rains.

Installations all over Vietnam used artillery shell casings and expended rocket tubes for drainage tile.

Fifty-five-gallon oil drums were used for shower tanks, peneprime spreaders, asphalt heaters, forges, pumps, burn-out latrines, sumps, and many other unavailable items.

An insecticide fogger, one of the most useful improvisations, was made by mounting a drum filled with 6 to 7 percent malathion insecticide in diesel oil (for killing mosquitoes) on a ¾-ton truck and spraying the poisonous mixture out with the exhaust from the vehicle. The insecticide is drawn from the drum by the partial vacuum in a line connected to the exhaust pipe just behind the manifold, and sprayed out under pressure of the exhaust. This expedient apparatus can spray up to 9 square miles of cantonment area per day, as compared with the 40,000 to 50,000 square feet covered by a manually operated fogger.

In other cases, the over-all shortage of materiel and R&U equipment forced the contractor to resort to a number of improvisations.

Subcontracting of R&U services was especially irksome. Tight controls had to be exercised to prevent such practices as the selling of garbage and trash to refugees, or failure to make full deliveries of fuel and water. Even when subcontractors did their work honestly, as was the case with most of them, they were not equipped for the efficient operation required to support the Army.

Subcontracting of R&U services is being phased out as new equipment arrives. This equipment was obtained—some after four years delay because of priorities—through an unusual procedure which authorized the contractor to handle the procurement of nearly $12,000,000 worth of equipment and supplies.

This greatly alleviated the R&U equipment shortage in Vietnam, but moving the materiel from ports of entry to the sites where it is needed presents serious difficulties. Chief among these is the necessity of moving supplies such as cement, lumber, and plumbing fixtures by military airlift. This means that these things, not normally carried by air, became subject to air movement priorities. But close liaison with military transportation authorities makes it possible for such R&U priorities to be assigned to meet special situations. Cement for bunker construction or a generator for security perimeter lighting thus may be assigned priority even over ammunition or fuel, depending on the immediate situation.

Logistics problems also have been alleviated by the assignment of two Caribou aircraft for R&U operations. Approximately 10 percent of the 10,000 tons of R&U cargo moved monthly is carried on these two aircraft. (In terms of bulk tonnage, military water craft carry 60 percent and military land transport, 20 percent.)

As the American troop build-up went from 48,000 troops in Vietnam in June 1965 to more than 350,000 in June 1967, immediate nearby offshore procurement was mandatory.

A secondary supply problem resulted from emergency procurement of equipment which is not standard to the military system, and from the contractor's authorized equipment, much of which consists of commercial rather than military engineer/construction equipment. This means that repair parts are not found in the military supply system.

As the American troop build-up went from 48,000 troops in Vietnam in June 1965 to more than 350,000 in June 1967, immediate nearby offshore procurement was mandatory. Nonstandard generators and air conditioners bought in Singapore and Japan later became standard headaches at installations which had little chance of getting replacement parts within six months.

The need for nonstandard repair parts required the establishment of a special supply depot under a separate contract. This depot now supplies nonstandard parts to all American troops supported by the 1st Logistical Command, and stocks more than 18,000 line items. By a direct arrangement with supply channels in the United States, parts may be obtained within 45 days.

LABOR

Military mobilization has placed a heavy drain on the Vietnam labor pool and left little of what was, to begin with, an extremely meager source of technically skilled labor. The contractor now has 18,000 Vietnamese employees. The Army, recognizing the long range effect of the American operations on the technological development of Vietnam, emphasizes the training programs by American contractors. In October 1966, the R&U contractor established a formal department to supplement on-the-job training. The company now offers classroom instruction in more than 70 job classifications. During the past fiscal year approximately 2,000 Vietnamese attended classes, and about 3,000 were in the on-the-job training programs.

In addition to the scarcity of skilled Vietnamese labor, the

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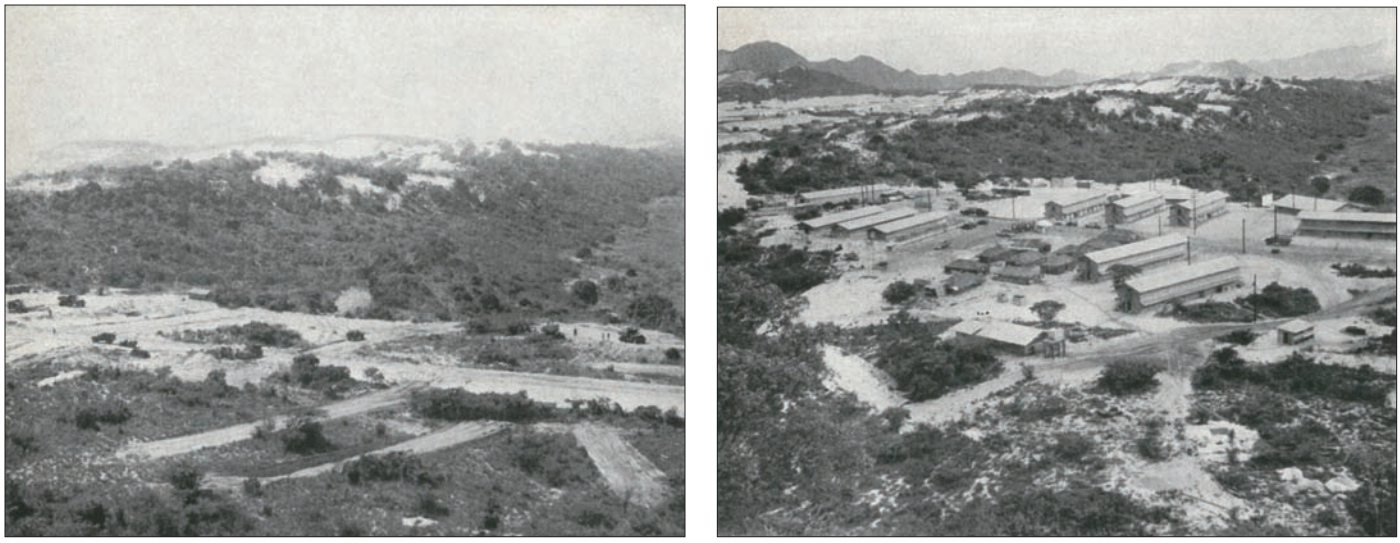

(Left) Site of the Cam Ranh Area R&U Headquarters on the Barren Peninsula, November 1966 (Right) The Same Site as Shown in March 1967 — These pictures illustrate the nature of the American build-up throughout Vietnam.

personnel level of American and third-country nationals was always behind authorized manning schedules, which, in turn, lagged behind the support needed. As an example, during 1964, the rise in the troop level from 5,000 to 14,000 increased the R&U equipment maintenance work by approximately 150 percent, but there was no concurrent increase in manning. In general, personnel resources, like materiel, have only recently reached levels commensurate with support requirements.

ENVIRONMENT

Lack of any but the most rudimentary programs of health or sanitation meant that the military bases where these services were provided had to be made into islands of health in a sea of disease and pestilence. Water sources are not safe. Malaria and plague, the latter found in all provinces of Vietnam, are serious health hazards.

Entomology services took on added importance. Since early 1967, when dead rats were found amidst equipment and cargo containers returning to the United States from Vietnam, the R&U contractor has been providing plague control service for retrograde cargo. Treatment of cargo with rat poison and diazinon insecticide dust has increased from 35 to 112 tons per month.

Entomologists found American rat poison only fairly effective in Vietnam, but the plague control program was improved when someone mixed the poison with *muoc mam*, the salty, fermented fish sauce that is a dietary staple. Vietnamese rats took to it with relish.

The contractor's entomology teams have been called upon to help stop plague epidemics in civilian communities near military bases. This work, co-ordinated between the military, the contractor, and the Agency for International Development, has halted plague outbreaks at Vung Tau. Cam Ranh, Tay Ninh, Kontum, and other smaller communities.[2]

The most critical test of civilian R&U ability in the combat zone came during the Viet Cong Tet offensive in February 1968, when the enemy struck at many installations and their support sites manned by R&U contractor personnel. The civilians kept up critical fuel and water deliveries, and maintained power plants and emergency utilities services throughout the fiercest enemy attacks of the war. Their achievements established beyond doubt the feasibility of civilian R&U support to troops in combat.

PRESENT SCOPE

The repairs and utilities operation in Vietnam has grown to the extent that today the contractor is maintaining more than 37,000,000 square feet of building area, 4,000,000 square feet of leased facilities, 115,587 acres of unsurfaced grounds, nearly 108,000,000 square feet of surfaced area, and more than 700 miles of roads. Custodial services are provided for 113,000,000 square feet of building space.

The R&U contractor operates more than:

- 2,500 refrigeration units
- 900 cold storage plants
- 1,200 air conditioning plants
- 1,000 electric generators producing approximately 23,000,000 kwh per month
- 40 ice plants, providing 10,000 tons of ice per month
- 130 water treatment facilities producing 320,000,000 gallons of potable water and 30,000,000 gallons of non-potable water a month

Services include the operation of dozens of fire stations, and the collection and disposal of 347,000 cubic yards of refuse and over 8,000,000 gallons of raw sewage a month by the sanitation crews.

R&U support is being provided at more than 100 permanent installations and at more than 230 support sites. This operation is unprecedented in size and complexity and has provided challenges which have been met successfully by the contractor's Vietnamese, third-country nationals, and American personnel who make it work.

TME

[1] Let to Pacific Architects and Engineers, Inc. (PA&E), a firm which had had prior experience in providing peacetime R&U support to the United States Army in Korea, Japan, and Okinawa.
[2] At the 1967 Western Pacific Quarantine Seminar in Manila, the Saigon representative of the World Health Organization (WHO) cited the R&U contractor's handling of these plague outbreaks. He reported that WHO was considering adopting the same procedures as a world-wide standard.

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