AIR OPERATIONS IN VIET NAM

THE AIR FORCE CIVIL ENGINEER'S ROLE IN COUNTERINSURGENCY

by Lt Col Francis E. Torr

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In a special air warfare situation the civil engineer is involved with all the usual engineering problems—weather, material availability, manpower, and the ever present problem of obtaining funds. Added to these are transportation to the site and working under constant or threatened harassment by insurgent forces.

Using Southeast Asia, more specifically the Republic of Viet Nam, as a locale for describing the Air Force Civil Engineer's role in counterinsurgency, one of the primary factors is the weather and its accompanying effects. The climate of South Viet Nam breaks down roughly into two seasons: the hot rainy season and the hot dry season, each lasting approximately six months. Construction work on airfields is generally limited to the dry season, for during the rainy season most flatland areas become seas of viscous mud. Stateside construction methods could overcome many of the wet-season construction problems, but often these methods require extremely costly and complex equipment that is not available to local construction organizations. The terrain features of Viet Nam run the gamut from the rice paddies of the delta country to the rugged, densely tree-covered upland mountains reaching altitudes of over 8000 feet. Construction problems in the mountainous areas revolve around accessibility, availability of skilled labor, and the ever present threat of ambush or surprise attack.

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Airfield sites that meet minimum standard design criteria are difficult to find. There are very few large, flat areas in the mountain territory which allow construction of runways of adequate length with unobstructed approaches. Airfield construction in the low, flat Mekong-Bassac River delta area presents a different problem. The delta area is covered by very soft, silty clay, hundreds of feet deep in some areas. Upon becoming saturated during the rainy season, this material becomes an unmanageable, plastic mass, with practically no bearing quality whatsoever.

SAW Airfields

With the weather and terrain factors and their effects in mind, the stage is set for planning the construction of a typical Special Air Warfare airfield. In the Republic of Viet Nam the types of aircraft that must be accommodated are the C-123, A-1H, and L-19A, plus other service types whose weight and flight characteristics fall within the criteria of the aircraft mentioned. First, to provide a fully operational, all-weather field for Special Air Warfare missions, a runway at least 6000 feet long is required. This runway must have a designed load capacity of 25,000 pounds on a single wheel having a constant tire contact area of 100 square inches in a tricycle gear configuration. These specific conditions and requirements in the RVN do not necessarily apply to all SAW operations.

In Viet Nam the civil engineer's problem of siting needed airfields had, for the most part, been done for him. Airfields constructed by the Japanese and the French during their occupancy still existed. Complete rehabilitation, enlargement, and additions, however, were generally needed before these airfields could support the mission requirements of Special Air Warfare operations.

The rehabilitation was no easy task. Pierced steel planking, the standby of World War II, was pressed into service to provide a surface over the old laterite paved runways, which were slowly sinking into the delta mud or being washed away by the torrential rains in the mountains. But this provided only stopgap relief, as the bearing quality

of the subsurface material was reduced to practically nothing during the rainy season. At one such field, Can Tho, a planned maintenance program of regrading and compacting the subsurface material has been put into effect. This program involves taking up a portion of the runway pierced steel planking as soon as the dry season starts and plowing up the subgrade material. This material is then wind-rowed for drying. After drying out, the material is graded and compacted, and the straightened runway planking is then relaid. This method leaves a portion of the runway available for minimum operation during the entire maintenance period. The rehabilitated runway barely lasts through the rainy season, after which the process must be repeated.

At another airfield, Soc Trang, a dike was constructed around the airfield to keep out the surface water of the delta area. Immediately inside this dike a large ditch was dug. This ditch slopes toward opposite ends of the airfield so that one half of the surface water run-off from the airfield is carried to each end. Two large diesel-powered pumps empty the water from these points over the dike, thus draining the airfield area and minimizing infiltration of water into the runway, taxiway, and apron base courses. The native laterite material was used to fill the voids in the crushed-rock surface, and a double-penetration asphalt surface was applied. This surface has held up through one rainy season reasonably well.

Many safety features enjoyed by pilots flying out of Stateside bases do not exist at Viet Namese airfields, mainly because crushed rock and laterite are unavailable at the sites. The construction materials that did find their way into the delta area had to be barged in or trucked overland. The meager highway system with its hundreds of bridges provides excellent opportunities for insurgent ambush. For these reasons present airfield layouts are limited in length, lateral clearance, and parking facilities. If more airfields are to be constructed in the delta area, the engineers contemplate hydraulic dredging of river-bottom sand. The sand will be pumped to the nearby shore and dried. Then it will be spread like a thick blanket over the silty clay site of the airfield. After this blanket settles,

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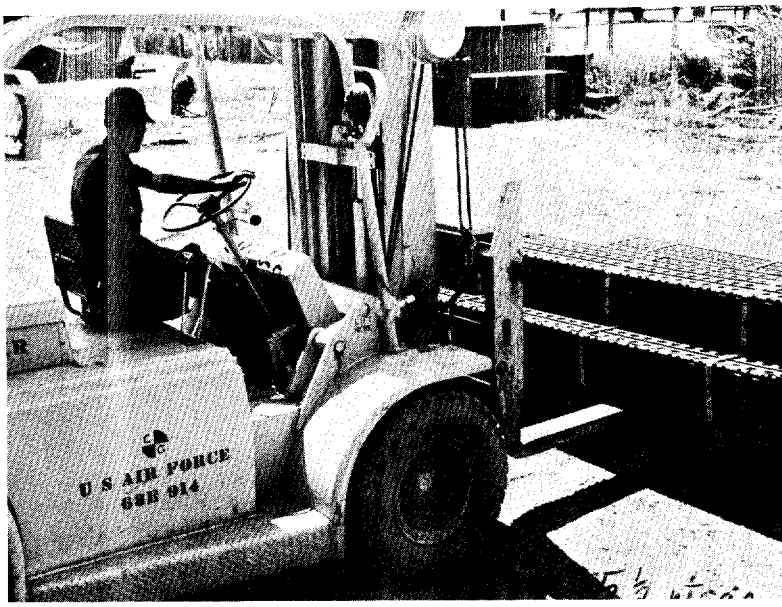
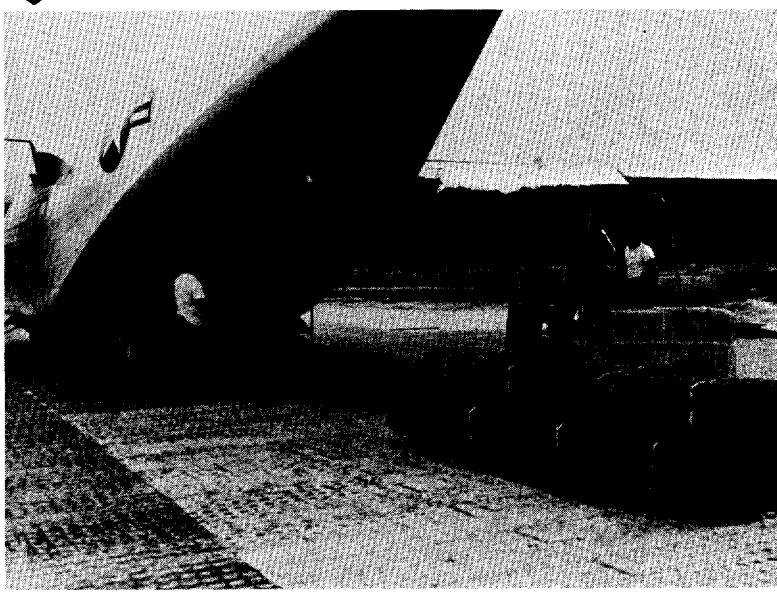
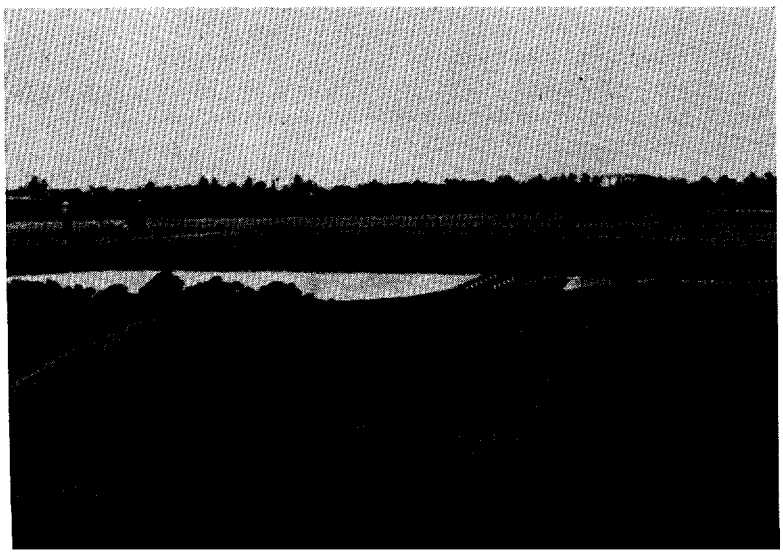


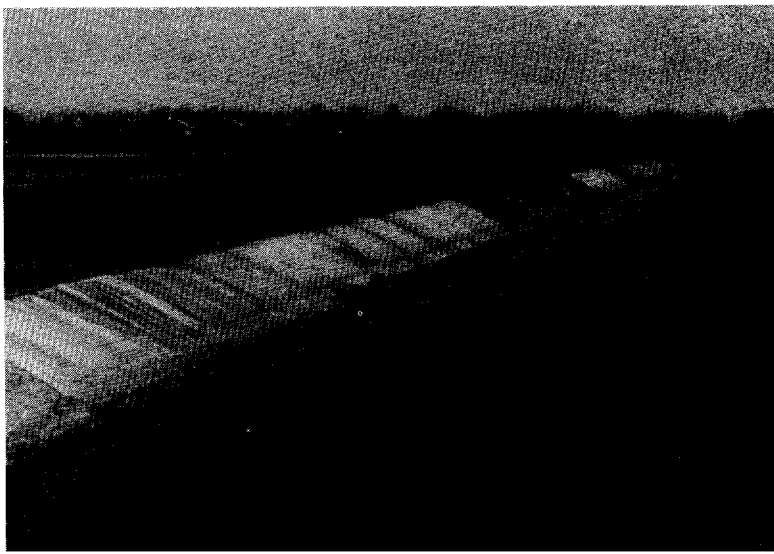
Pierced steel planking is moved by fork lift (photo above) and loaded into a C-123 at Da Nang Air Base, South Viet Nam. (Photo below) It will be flown to Aloui and assembled for an auxiliary airstrip.



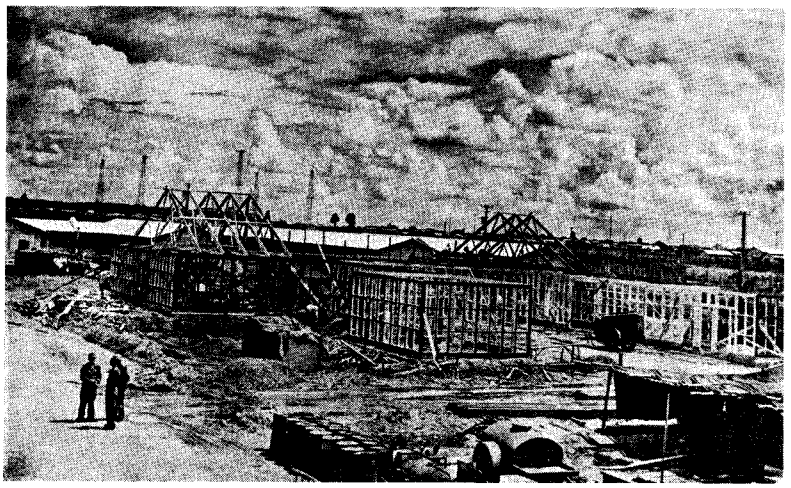
At Can Tho Airfield, the plowed and wind-rowed subgrade of the parking apron dries prior to regrading, as the work of runway rehabilitation progresses in the background.



The heavy Viet Namese rainfall creates drainage problems. A ditch inside the earthen dike at Soc Trang Airfield carries the water to pump at far end, which empties it over the dike.



In December 1961 facilities had to be constructed immediately at Tan Son Nhut AB near Saigon and at bases in Bien Hoa, Da Nang, Pleiku, and Nha Trang. At first tents were set up to house incoming Air Force personnel at Da Nang.



Later the Civil Engineering Directorate arranged for construction of semipermanent quarters for airmen at Tan Son Nhut, Da Nang, and Bien Hoa, along with mess halls, base exchanges, and recreational facilities. Construction, as shown, is usually done by Viet Namese contractors and labor, under supervision of AF engineering personnel.

The finishing touches. Roads and walkways will follow.

VIET NAM

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it will provide the stability required for the construction of an asphalt-surfaced runway, taxiway, and apron system. Gradual settling of airfields constructed by these methods is expected. Thus, planned maintenance will have to be performed at least once every two years to "lift" the airfield above the water table. Preliminary cost estimates for the construction of such an airfield average about $4.5 million. This amount will provide only the minimum runway, taxiway, and apron and does not include the structures necessary for aircraft maintenance, operations, or personnel billeting.

Buildings

In providing the support facilities for a Special Air Warfare airfield, the engineer's problems are not overly complex in the construction of buildings. Wood for flooring and framing is available locally, and corrugated asbestos roofing in easy-to-handle 3x5-foot sheets is readily available to all parts of Viet Nam. Since there is no extremely cold weather, wooden buildings with louvered sides provide the shelter required. Viet Namese workers can erect them. Because they were rapidly constructed to replace tents at Bien Hoa Airfield, this type of structure became known as the "Bien Hoa hut." Larger, more permanent facilities are generally provided through the Military Assistance Programs. These more complex structures are designed and constructed by a Navy Construction Agency, with guidance for functional design provided by USAF counterparts of the Viet Namese using agency. Owing to the large buildup necessary to support other service missions at airfield sites, considerable coordination must be accomplished by the Air Force Civil Engineer to preclude siting conflicts and duplication of effort and to provide for maximum use of available real estate.

Water and Waste Disposal

Potable water in Viet Nam is obtained from wells. Frequently in the delta area, wells must be drilled to a depth of 500 feet before a desirable stratum is reached. At a cost of roughly $15,000 each, wells are considered a more economical means of obtaining water. In the up-country areas, solid rock must be penetrated before a water-bearing stratum is encountered. These problems of providing potable water do not appear to be difficult to overcome until it is realized that modern well-drilling machinery is practically non-existent in Viet Nam.

Sanitary disposal of waste matter is accomplished by means of septic tanks with leaching fields. The clay soil, upon reaching saturation, prevents further leaching of effluent from septic tanks; therefore, when the ground areas become saturated during the rainy season, surface overflowing of septic systems becomes a major problem.

The production of electricity is one of the most serious single problems with which the Air Force Civil Engineer must contend. Only at large installations, such as Tan Son Nhut near Saigon, is commercial power available in quantity. Moreover the available power not only is unreliable but is 50-rather than 60-cycle alternating current. Most of the electronic equipment designed to provide the needed communications for the Tactical Air Control System for Special Air Warfare operates on 60-cycle a-c. Power for this equipment and for isolated navigational aids and innumerable other Air Force facilities must be generated by means of portable gasoline or diesel-powered generators. Generators ranging from 3.5 to 150 kw output in 8 configurations, manufactured by over 20 different firms, found their way to Viet Nam to satisfy the USAF's increasing demand for electricity. These machines, designed for use as "emergency" generators to provide short-term power while the prime source of power is being repaired, were pressed into service as primary sources of power.

The high-speed engines in Air Force portable generating equipment have a short life-span and dependability factor, which is acceptable if their normal usage is to be for periods of short duration. When these units are called upon to operate continually from one oil change until the next, a high breakdown rate is experienced. Since so many makes and models are involved, a supply of parts for needed repairs is hard to come by. An extremely tight control over generator usage and maintenance must be effected if any appreciable dependability is to be obtained. In order that a highly mobile, packaged generator can provide a maximum output, electrical control is accomplished by sophisticated internal systems. The high skill level required to troubleshoot these systems is not usually found among power-production specialists within the AFSC 543X0 career field. The continued successful use of this type of unit requires an improved parts supply system and higher-level training of power-production specialists.

The problems mentioned, while presenting a constant challenge to the Special Air Warfare engineer, can by no means be allowed to occupy his full time. Programming, budgeting, and acquiring man-power must still be accomplished in accordance with peacetime methods. In a fast-moving situation, in which the engineer in counterinsurgency often finds himself, these methods will not suffice. Spontaneous requirements must be met instantly with construction authority, funds, materiel, and manning in order to stay ahead of the enemy in a counterinsurgency situation.

Special CE Squadron

Several studies are in the process of being evaluated at various levels of authority which have as their purpose increasing the effectiveness of Civil Engineer support. One of these studies recommends the organizing and equipping of special civil engineer squadrons. These squadrons, especially trained to be self-sufficient in a Special Air Warfare situation, would have complete packaged equipment to erect prefabricated buildings of sizes and shapes

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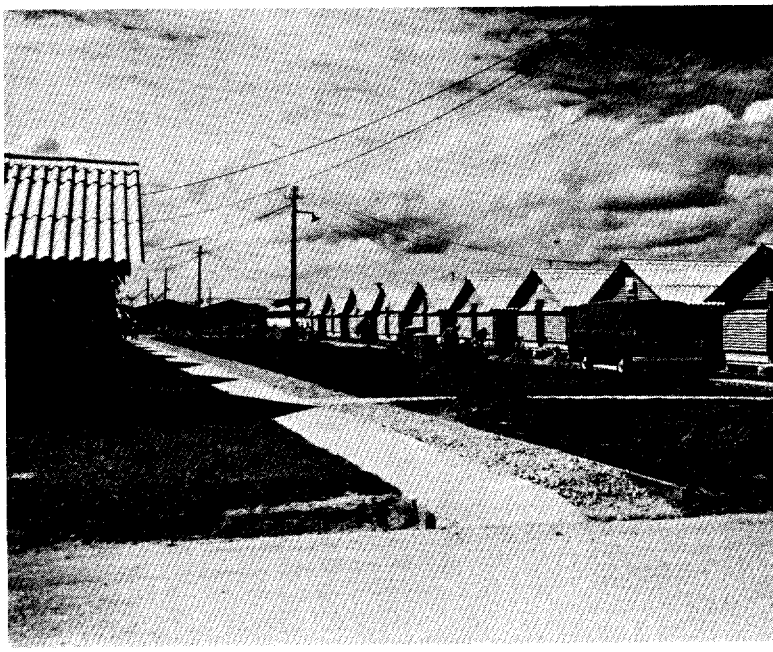
Viet Namese workers complete the brick understructure of a masonry barracks as AF personnel supervise.

One of many rows of barracks at Bien Hoa Air Base. The Bien Hoa huts, unlike the masonry quarters at Tan Son Nhut, are built of prefabricated steel sections.



VIET NAM

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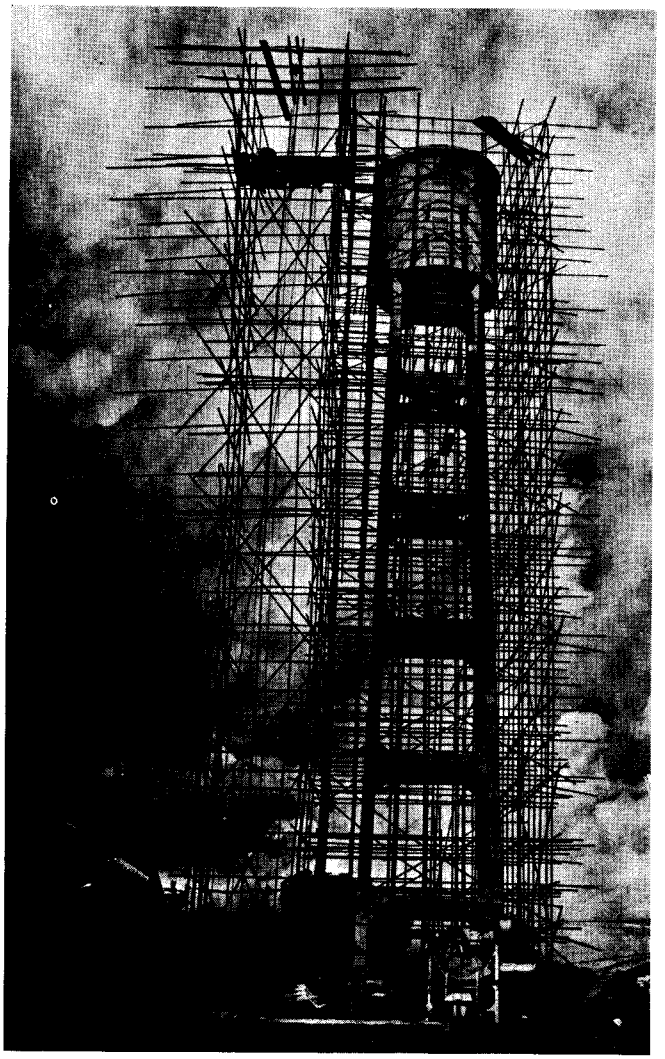
predetermined to fit the requirement. Equipment would include portable generators and sufficient tools and supplies to operate and maintain them. Upon exhaustion of certain prepackaged material, replacement packages could be provided from the nearest hard-core base to keep the squadron fully equipped for its mission.

Design Capability Centralized

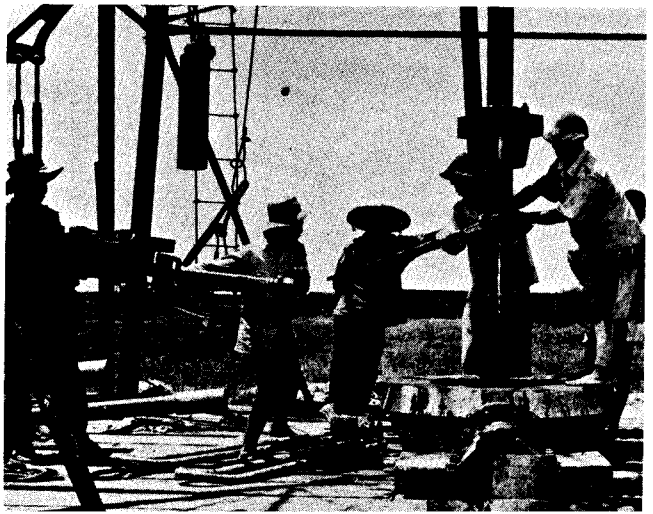
Another study recommends that all design capability be centralized in one industrial area in the Special Air Warfare locale. Required items could then be designed in accordance with materials available. Local national contract forces could be assembled and deployed to the various sites to perform the construction. This method would replace the present system of providing civil engineering capability individually to each deployed organization. The present method is considered by some to divide the total engineering capability available in the overall area below the point of maximum efficiency. Peacetime methods of providing construction funds for a Special Air Warfare operation through annual programming add an obstacle for the Air Force COIN engineer. In many instances the need for support construction is immediate. If standard items of construction could be predesigned for the geographical area concerned, package funding to cover the cost of planned numbers of facilities could be accomplished for budget purposes. Upon receipt of the budget authorizations and fund, the engineer could continue throughout the year to provide required support without reprograming, reducing scope to keep within funds available for a specific project, or compromising design standards to stay within dollar authorization levels.

It is hoped that this presentation of the problems in the civil engineering role has provided thought-provoking suggestions which may lead to improvement in the capability to support Special Air Warfare. CE



Construction of the water tower. The entire job was completed in 25 days by the Viet Namese branch of a U.S. corporation.

A new water well was drilled in 1962 to supply the Air Force cantonment or permanent quarters area at Tan Son Nhut Air Base, Saigon. Drilling to depth of 115 feet took 5 days.



The roadbed was prepared mainly by hand labor—picks, shovels, etc.—and the tar used for final surfacing was melted down in barrels over open fires.