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STUDENT REPORT

PROJECT TURNKEY CONSTRUCTION OF TUY HOA AIR BASE, SOUTH VIETNAM -- A HISTORICAL PERSPECTIVE -- IS THERE FUTURE APPLICATION?

MAJOR JEFFREY L. TYLEY 87-2580

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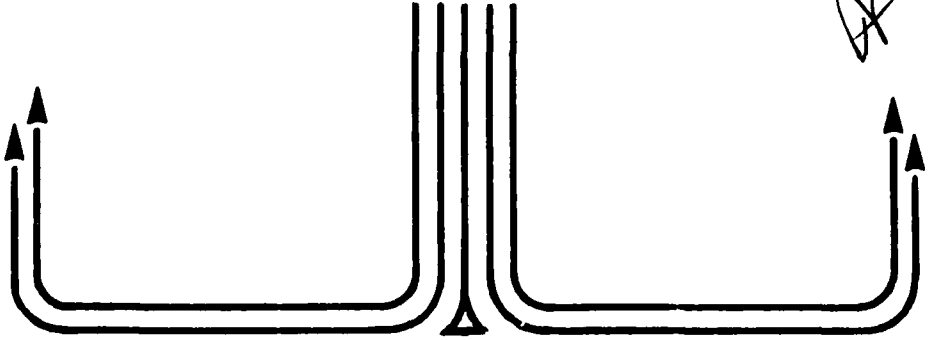

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This article describes the construction of Tuy Hoa air base, South Vietnam using a unique construction contracting technique called turnkey. The article highlights the wartime need for building Tuy Hoa and examines the specific contract provisions used to meet the operational need dates. The construction of the base is discussed along with the lessons learned and application of the turnkey technique in future Air Force milita ·· construction programs.

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PREFACE

All to often in the base support career fields, we loose sight of our wartime mission requirements. The day-to-day base level problems have a tendency to cloud our thinking toward performing these same basic functions in a combat environment. This is additionally hampered by the fact the majority of the active duty armed force no longer possesses any actual combat experience. Hence we have lost a valuable learning tool from our experience base.

This article highlights a success story of Air Force Civil Engineers in building a completely new jet fighter base in South Vietnam using a unique construction contracting technique called "turnkey". The article examines the forward thinking of civil engineers to overcome the obstacles typically faced in combat situations and concentrate on measures to meet wartime mission needs.

This commitment seen on the battlefields of South Vietnam has direct application to civil engineers faced with future warfighting situations. History is one of our best teachers, and the lessons learned in South Vietnam are well worth remembering. Subject to clearance, this manuscript will be submitted to the Air Force Journal of Logistics for consideration.

ABOUT THE AUTHOR

Major Jeffrey L. Tyley is a career civil engineering officer having served in the majority of base level engineering positions. He was a distinguished AFROTC graduate from North Dakota State University graduating in 1974 with a bachelor's degree in civil engineering. Following an initial assignment to Elmendorf AFB, Alaska, he was assigned to the Air Force Institute of Technology, civilian institution program, at the University of Arkansas for graduate studies. He completed his master's degree in industrial engineering and was designated a distinguished graduate. While assigned to the Deputy Chief of Staff, Engineering and Services, Headquarters Strategic Air Command (SAC) he additionally served aboard the SAC airborne command post. He has subsequently served with a civil engineering RED HORSE (Rapid Engineer Deployable Heavy Operational Repair Squadron Engineers) squadron in Korea and as a Chief of Operations in a civil engineering squadron at Barksdale AFB, Louisiana.

Major Tyley has previously published articles in the Air Force Engineering and Services Quarterly on the effects of the MT. St. Helens volcanic eruption on Fairchild AFB, Washington and the function of civil engineers on the SAC airborne command post. Major Tyley is a member of the Air Command and Staff College class of 1987.

PROJECT TURNKEY CONSTRUCTION OF TUY HOA AIR BASE, SOUTH VIETNAM -- A HISTORICAL PERSPECTIVE -- IS THERE FUTURE APPLICATION?

BY MAJOR JEFFREY L. TYLEY

Historically, we enter each new war with the combat experience we gained from the last major conflict we fought. Air Force civil engineers entered the war in Southeast Asia (SEA) with a Korean War combat engineering experience base, much like we entered the Korean War with engineering applications learned on the battlefields of the Second World War. (6:11)

As we approach the last decade of this century, we discover an alarming trend in the military where the majority of the force no an longer possesses any actual combat experience. Over the past two decades, this critical combat engineering expertise is vanishing from our ranks leaving a peacetime acclimated engineering force. Although these people are gone forever, their historical achievements and valuable lessons learned on the battlefields of SEA are recorded for a new generation of civil engineers to consider if and when confronted with a future warfighting situation. For many of us reading about these past combat exploits may be the closest we ever come to actual combat. Therefore, we must not forget the valuable experiences our engineering predecessors learned in SEA.

SEA was a combat proving ground for civil engineering witnessing a new birth in mobility, military troop construction, and expedient air base construction all in support of a rapidly growing air war. The Vietnam experience tested Prime BEEF (Base Engineer Emergency Force) mobility capabilities; created and employed RED HORSE (Rapid Engineer Deployable Heavy Operational Repair Squadron Engineers), our first military troop construction squadrons, and lastly tasked our military construction capabilites to rapidly build new jet air bases.

This article concentrates on the last major initiative, the construction of an air base in South Vietnam at Tuy Hoa using a unique construction technique called "turnkey". Under turnkey, a single contractor, designs and constructs a complete project. We will trace Project Turnkey through the successful construction of Tuy Hoa and discuss the application this initiative has in future Air Force construction programs.

Project Turnkey represents a historic milestone in Air Force civil engineering. For the first time since World War II, the Department of Defense (DOD) had awarded a design-construction contract and for the first time in its 19-year history, the Air Force was permitted to function as its own construction agent. (5:24) It appeared the Air Force had finally entered the large-scale military construction arena closely guarded by the Army Corps of Engineers and the Naval Facilities Engineering Command. (5:24)

URGENCY OF NEED

The US Military Assistance Command Vietnam (MACV) was the command element in South Vietnam. The Navy was designated the construction agent, responsible for supervising all civilian military contract construction in SEA. Since 1962, the Navy had accomplished all construction by a civilian construction combine called RMK-BRJ; (Raymond International Inc., of New York; Morrison-Knudsen Co. Inc., of Boise; Brown-Root Inc., of Houston; and J.A. Jones of Charlotte, N.C.). RMK-BRJ was working under a Navy cost-plus-fixed-fee contract. The contract essentially paid the contractor a specified "fixed-fee" over and above the actual construction expenses incurred. This proved to be an attractive arrangement for the contractor and was responsive in providing facilities for the tri-services in the early part of the war. However, by 1965, the SEA military build-up was escalating and subsequently overcrowding existing airfields. This overcrowding further prevented assigning additional flying units to South Vietnam. The Air Force was concentrated at three airfields: Tan Son Nhut, Bien Hoa and Da Nang. Three additional airfields were approved by MACV for construction at Cam Ranh Bay, Phan Rang and Phu Cat (Figure 1). (8:255) Each was to be built by RMK-BRJ. For the first time in history, the military found itself engaged in a war almost entirely relying on civilian construction support. (13:45)

In early 1966, the combat flying requirements confirmed the Air Force's need for a fourth jet air base to meet the demands of a growing air war. The base had to be operational by the end of 1966. The site selected was Tuy Hoa, a sandy delta on the coast of the South China Sea 240 miles northeast of Saigon. The dilemma unfolded as RMK-BRJ was saturated with work and could not support the operational date any earlier than June 1967 without altering urgently required tri-service construction projects. The limited military troop construction units were already committed to other mission critical projects. The Air Force was told by the MACV commander, General William Westmoreland to look at alternative approaches to meet the need date.

The military objective quickly became one of constructing air base facilities at Tuy Hoa on a schedule providing for interim air operations by not later than the end of December 1966 and sustained air operations by mid-1967. (3:160)

With construction underway at the new jet bases at Cam Ranh Bay and Phan Rang, RMK-BRJ had surged to over $500 million worth of on-going military construction projects. The critical requirements imposed by an enlarged air war had simply outstripped the one manager-one contractor construction practice used by the Navy and RMK-BRJ. (9:253) The Air Force was additionally constrained by shortages of in-theater equipment, materials, labor and port facilities. (9:253)

Major General Robert H. Curtin, the Air Force Director of Civil Engineering summed up the SEA construction situation:

> We felt from our point as a customer, that the people running the store were in too big an operation. We would have liked to see it broken down into smaller segments for managing. In any event, we did feel that the RMK-BRJ operation was getting too big and unwieldly. (1:221)

TURNKEY CONCEPT

The Air Force recommended a new construction concept totally separate from the existing Navy and RMK-BRJ effort. The Air Force proposal called for using a new American contractor not previously involved in SEA. The proposal, called "turnkey", would require a states-side contractor, under Air Force direction, to take on a "packaged job" of managing and supervising the entire task of designing and constructing a completely operational air base, "turning-the-keys" over to the Air Force when finished. (3:160)

Using the turnkey procedure, the contractor would be responsible for both design and construction. This represented a significant departure from the traditional design-bid-construct contracting practice used by the Navy (and the Army Corps of Engineers). Under the traditional practice, the project design is obtained by contract from an architect-engineer design firm and then construction by a separate contract with a construction firm. (1:222) In South Vietnam, construction was accomplished by RMK-BRJ once the design was provided.

The unique feature of turnkey was the entire project of designing and building would be performed by the same contractor.

Therefore, the construction people were involved in the design of facilities from the very beginning. Except for real estate acquistion and physical security, the contractor would be responsible to the Air Force for the entire project. This included all design, procurement of supplies and equipment, transportation to the site, labor management and construction. (3:160)

Senior Air Force officials lobbied in Washington for approval of the proposal and Brigadier General Guy H. Goddard, the Deputy Director for Construction, Directorate of Civil Engineering summarized the new initiative:

> Mr McNamara empowered the Air Force to act as its own design and construction agent, and to retain a contractor outside the RMK-BRJ contract. And we did this with the full concurrence of MACV, General Westmoreland, and with the full realization that our method of operation had to be confined so as not to do damage of any type to the other effort (construction) which was most important. (1:221)

The Air Force imposed several restrictions on the turnkey concept to keep within the DOD mandate not to interfere in any way with existing military construction in SEA. The restrictions included:

* To prevent further crowding of Vietnamese ports, all men, equipment and materials must come in over the beach at Tuy Hoa.

* To avoid competing with RMK-BRJ for local labor, multiskilled U.S. labor would build the base, working 10-hours per day, seven days per week. Local labor hired must come from the Tuy Hoa area.

* To further protect the South Vietnamese economy from inflation, the turnkey workers would receive only 5 percent of their wages in-country, and that

in military script. The remaining 95 percent would be deposited in accounts back in the U.S.

* To reduce competition with RMK-BRJ for Pacific shipping, all turnkey equipment and materials would be shipped only from East coast or Gulf ports.

* To reinforce the isolation, U.S. employees must abide by rules designed to keep them out of local affairs. (5:24-25)

Although separate of Navy controlled SEA military construction, Project Turnkey would be independently controlled by the Air Force as part of the established MACV construction management operation. Accordingly, the Secretary of Defense, on 27 May 1966, officially approved Project Turnkey for constructing an air base at Tuy Hoa with the Air Force as the construction agent. (9:254)

The Air Force had its wish -- build an air base from a zero base and act as its own construction agent. However, the real issue was the Air Force had promised DOD combat air missions would be flying out of Tuy Hoa by December 1966 and that was only 7 months away!

CONTRACT PROVISIONS

The Air Force estimate to complete Project Turnkey was $52 million. A cost-plus-fixed-fee contract, similar to the contract arrangement between the Navy and RMK-BRJ was selected.

Reacting to the short deadlines, the Air Force began negotiating in March 1966 with civilian construction contractors

in anticipation of DOD approving the project. Despite the constraints the Air Force would impose upon the contractor not to interfere with any on-going SEA military construction, response from industry appeared enthusiastic. Initially, nine construction firms were solicited to provide estimates on Project Turnkey. The field was quickly narrowed to two potential candidates, Overseas Development from Texas and Walter Kidde Construction Inc. from New York. Walter Kidde Construction (WKC) was eventually selected on 13 May 1966 as the turnkey contractor.

A letter contract was signed between the Air Force and WKC following the 27 May 1966 DOD approval. The contract was to take effect 4 days later on 31 May 1966.

To meet the wartime mission dates, Project Turnkey was divided into two separate phases. The first phase was to provide an interim expeditionary airfield using government furnished AM-2 aluminum-matting and mobile kit facilities. The second phase was a completely operational concrete airfield with all supporting facilities and utilities to support four jet fighter squadrons and several thousand men. (9:258) The concept of operation entailed constructing the second phase while combat air missions were being flown from the AM-2 expeditionary runway.

Since only 7 months remained before the interim airfield was required, a compressed project schedule required WKC to: (2:2-5)

* Complete all designs.....90 days (31 Aug 66)

* Complete mobilization forces, material and equipment, ready to start work on interim airfield facilities.....120 days (30 Sep 66)

* Complete construction of interim airfield facilities.....210 days (27 Dec 66)

* Complete all remaining airfield construction.....390 days (24 Jun 67)

The project initially included constructing a port complex at Tuy Hoa, but was later deleted by JCS in January 1967 in favor of the existing port facilities at Vung Ro 22 miles to the south.

The Air Force engineers' 3 month estimate for WKC to mobilize and begin work predicted no physical construction was likely to start before October 1966. This left only 3 months to construct the interim airfield and 9.5 total months to complete the entire project. To preclude any work slippages the Air Force engineers included several monetary incentives for performance and employee conduct to entice WKC to meet all scheduled dates.

In addition to the stated fixed-fee for design and construction of $2.17 million, WKC could receive another $1 million for completing all construction ahead of schedule and controlling their work force in-country. (16:2)

Specifically, the incentives concerned three separate areas. First, individual monetary bonuses of $1000 could be earned by WKC's employees for general good conduct and diligence on the job. The restriction imposed was all employees must earn the bonus or none would. (8:608) Second, WKC could receive $100,000

for the effectiveness of their employee discipline program and controlling possible inflationary impacts on the South Vietnamese economy. (8:608-609) Third, WKC could earn $900,000 for meeting or exceeding required construction completion dates. In particular, $400,000 for the interim facilities in phase one, $360,000 for sustained facilities in phase two and $140,000 for manpower demobilization toward the latter project stages.

Project Turnkey was proving to be a unique departure from the typical military construction practice. The restrictions imposed and monetary incentives are normally not part of the traditional lump-sum competitive bid procedure.

The Air Force's Project Turnkey had the eyes and ears of the entire DOD and military establishment on them, and WKC had not yet set foot on the site or began design of the first facility.

BUILDING TUY HOA

The clock was quickly ticking away on Project Turnkey and by mid-June 1966, RMK-BRJ had construction steadily progressing at the other new fighter bases in South Vietnam. The Air Force civil engineers charged ahead with a compressed schedule where absolutely no room existed for delays or construction slippages. The Project Turnkey motto became: "Do It Once--Do It Right". (14:4) Every stage of the project from mobilization through construction was designed and managed to employ timesaving measures to get the job done.

To manage Project Turnkey, and keep within the established MACV chain of command in SEA, the Director of Civil Engineering for Seventh Air Force at Tan Son Nhut AB, Colonel Archie S. Mayes (later Brigadier General) was appointed the Project Turnkey director. He was designated TKC-1.

Colonel Mayes' management operations staff included 50 Air Force representatives stretching across the globe from New York to Saigon to the sandy deltas of Tuy Hoa (Figure 2). TKC-2 was established at WKC's New York home offices to manage project design, mobilization and procurement. A small element, TKC-2-1, was formed at the gulf port of Brookley AFS in Mobile, Alabama to monitor shipping. TKC-3 under Colonel David S. Chamberlain (later Brigadier General) was the on-site manager at Tuy Hoa.

WKC was impressed with the urgency and lost no time negotiating with subcontractors for shipping, transportation and construction. B.B. McCormick and Sons Inc. of Jasksonville Beach, FL was hired as the principal construction subcontractor for building the horizontal work (i.e. AM-2 and concrete airfields, roads, water and sewage systems, etc.). WKC would construct the remaining vertical facilities and electrical distribution system.

The limitation of a 700-man U.S. work force required WKC to recruit multiskilled workers proficient in several trades. Examples included heavy equipment operator-truck driver, iron worker-carpenter-cook, welder-barber and even a mortician-truck

driver. Despite the promise of long hours in a hostile environment and little time off, over 4000 men applied. (5:24-25)

Success of the mobilization phase was the first crucial step. Within 3 weeks after the contract was signed, WKC had the first ship leaving from Philidelphia laden with a portion of the 3.4 million square yards of AM-2 matting needed for the interim airfield. McCormick followed suit and within 4 weeks had over 12 million dollars worth of materials enroute to Tuy Hoa. (15:2-3) By mid-July 1966 five vessels were at sea bound for Tuy Hoa. Within 7.5 months the last ship bound for Tuy Hoa would depart the U.S. The contractor had shipped 75,000 tons of material through the port at Brookley AFS and when completed, over 161,000 tons of material would be delivered to Tuy Hoa.

Throughout the design of Project Turnkey, simplicity and rapidity of construction were strictly emphasized. (3:163) Initial designs were completed in only enough detail to permit material estimates for construction supplies and equipment Plans were later refined and literally approved on the drawing board by the Air Force engineers at TKC-2 in New York. (2:5) To accelerate design, flexibility was crucial. Maximum use was made of off-the-shelf products including packaged systems, prefabricated buildings and adapting facility designs to structures already in use in SEA.

The Air Force base master plan for Tuy Hoa was strictly enforced to prevent chaos at the construction site. The plan forbid make-shift or temporary contractor facilities typically

found on large construction sites. The contractors facilities were carefully planned and sited to be incorporated into useable base facilities when completed. (3:163) The contractor's motor pool became the base motor pool, the morgue became the air-conditioned base computer facility and the worker housing eventually became the home for the military officers and men. To prevent congestion, interim facilities in excess of a single tent had to be approved in advance by TKC-1. (7:11-13) Even construction roads and haul routes followed the final road configuration. This prevented random traversing across base and aided in effectively compacting the final road subgrade. (7:13)

Designs progressed so rapidly plans were complete on 39 facilities comprising 300 construction drawings within 11 weeks following the contract. WKC completed design within the original 90-day contract stipulation.

In early June 1966 the first 30-man contractor advance party and Air Force engineers arrived at Tuy Hoa. The 4340-acre site was barren except for the tents of the 101st Airborne Division who had secured the area from the Viet Cong earlier. The first ship arrived 11 August 1966 with materials for the 80-man portacamp. This camp would eventually expand to accommodate the full 700-man deployment.

On 25 August 1966 construction started on the 9000-foot interim airfield. By 1 September, 30 days ahead of schedule, WKC was fully mobilized at Tuy Hoa with 700 U.S. workers. Two weeks later 29,000 tons of material were off loaded on site. WKC hired

300 Philippine stevedores to unload supplies over the beach and an additional 600 South Vietnamese laborers.

Fueled by monetary incentives for early completion, WKC steadily progressed with construction. During the first week of October 1966, the interim airfield soil-cement base was ready to accept the first 2- by 12-foot section of AM-2 aluminum matting. Construction crews working 10-hour days laid the matting at a rate of 600 to 800 lineal feet per day. (4:4-7) By mid-October the interim airfield was 50 percent complete and on 12 November 1966 the last piece of matting was locked into place.

The first aircraft to use the new strip on 12 November were a C-124 and C-130 transport aircraft carrying navigational aid and ground control approach equipment. The interim airfield was finished and operational a full 6 weeks ahead of schedule.

On 15 November 1966, 18 F-100 Super Sabres of the 308th Tactical Fighter Squadron flew combat missions from Bien Hoa recovering at their new base at Tuy Hoa. The F-100s began flying combat air strikes from Tuy Hoa the very next day. Tuy Hoa had gone to war 6 weeks early.

By mid-December 1966 two more F-100 squadrons from the 31st Tactical Fighter Wing at Homestead, Florida arrived at Tuy Hoa making the wing fully operational.

By the end of December, WKC had completed the interim facilities -- the mat airfield, sufficient POL and ammunition storage, communications facilities, navigational aids, fighter

squadron operations building, dining hall, basic utilities and road network all within the specified 210-day requirement. (9:260)

The contractor immediately began constructing the 9500-foot concrete runway and sustained facilities required in phase two. Facilities were virtually completed on a daily basis with design changes resolved in the field by Air Force engineers at Tuy Hoa. The concrete airfield was finished on 28 April 1967. By mid-May 1967 the base was essentially complete with a cantonment area for 4000 men, two jet capable runways with full aircraft parking, maintenance and operations facilities, POL storage and the supporting physical plant. (9:260) On 10 June 1967 all contract facilities were completed 2 weeks ahead of schedule and by 12 June the majority of the contractor work force was demobilized. (11:30)

In a single year, Project Turnkey had transformed some of the most isolated real estate in South Vietnam into a fully operational jet fighter base. The Air Force had kept its promise, combat air strikes were being flown from Tuy Hoa in less than 7 months after signing the contract and without infringing on any other military construction on-going in SEA.

LESSONS LEARNED

Project Turnkey had become an Air Force reality by providing a valuable extension to the combat air units fighting the war in Vietnam. The net construction cost was within the programmed

$52 million and produced the newest tactical air base in South Vietnam ahead of schedule. (11:31) In fact, in comparable contract dollars for Phan Rang and Cam Ranh Bay, the number of facilities at Tuy Hoa were 30 percent greater and completed in a shorter period of time. (12:9) This represents a significant achievement in providing facilities to support the beddown of additional aircraft in a combat theater. Lt General William W. Momyer, commander of Seventh Air Force summarized the accomplishment by saying:

> This means that F-100 Super Sabres will be able to reach vital targets faster. They'll be able to provide even more effective air support of friendly ground forces. And in the long run they'll contribute to saving American lives. He also cited the fact that as a result of Tuy Hoa AB, the time gap between a call for air strikes, and the response, would be reduced by precious minutes. (4:7)

The principle lessons learned demonstrate the distinct advantage, where time is a premium, of using the same contractor for design and construction coupled with the provision for total on-site change order authority by Air Force civil engineers. (14:15) This involved the construction force in the project from the design stage and is a significant departure from the traditional design-bid-construct approach. As a result, delays were few and the over design of simple items caused by the inflexibility of architect-engineer design firms operating in Vietnam under conventional peacetime contracts was eliminated. (8:267) The authority given to the TKC-3 Air Force civil engineers at Tuy Hoa to make immediate field changes prevented

construction delays. This also departs from the traditional approach where the final decision is usually resolved at higher levels of management. Although not all field changes reduced construction manhours, the ratio of increased manhour changes to decreased changes was on the order of 1-to-15. (14:14) The total number of field changes was minor in comparison with similar construction projects. (8:267)

Another lesson was the direct relationship between monetary incentives and contractor performance and work force control. The timely completion of Project Turnkey enabled WKC to collect the full incentive package. By abiding by WKC's list of commandments (Figure 3), the civilian workers collected the individual bonuses and remained out of local affairs. The $900,000 performance and demobilization incentive was key in delivering the facilities on time to meet operational deadlines. WKC qualified for the $400,000 incentive by completing the interim airfield ahead of schedule. The $360,000 incentive for sustained facilities under phase two was divided into five separate facility groups. The first group was due on 7 March and the remaining in 30 day increments of 7 April, 7 May, 7 June and 24 June 1967. To qualify for each incentive, all facilities in the group had to be complete by the date specified. A 10 percent late fee would be assessed for late completion. As a result, WKC completed some facilities four months ahead of schedule. For instance, the early completion of dormitories and latrines in the first group enabled the airmen to move from tents to hard

facilities. This represents an important morale factor in a combat environment. Requiring WKC to complete each group by a specified date prevented saving correction of minor construction deficiencies (i.e. workmanship mistakes/punchlist items) until the very end of the contract which is typical in tradition construction projects.

The final $140,000 demobilization incentive was established to gradually reduce the contractor's work force toward the latter project stages. The incentive spread over 4 months beginning in April 1967 forced WKC to drawdown to specified manpower levels. This served two purposes, first to orderly phase the civilian work force from the hostile environment. Secondly, and most important, it prevented WKC from saving extra workers to correct punchlist items at the end of the contract.

A well developed base master plan and simplicity of design were instrumental in achieving the motto of doing the job right the first time. Strict control over temporary structures and maximum use of packaged systems, prefabricated buildings and off-the-shelf materials were vital in this compressed construction project.

Project Turnkey clearly proved the Air Force capable of acting as the construction agent for a major military construction project. The dramatic lessons learned highlighted a success story that could not have been completed without dedicated people. The Air Force civil engineers were committed to

completing the project on schedule, within funding constraints and without degrading quality of the finished project. (14:2)

FUTURE APPLICATION

With Project Turnkey completed in early July 1967, no similar construction effort was programmed for SEA, but not because the Air Force found the civilian contractor's "package deal" unsatisfactory, rather there was no further need at the time for a similar air base in SEA. (10:83)

Constructing Tuy Hoa air base using a turnkey approach fulfilled a specific operational need at a specific point in time. The turnkey approach was the best construction delivery system available to meet the need of a compressed construction schedule.

Although this achievement is 20 years old, today's Air Force civil engineers could conceivably be confronted with a similar problem in future limited conflict situations. The challenge to provide facilities or an entire air base may very well be required. This could be further compounded by the same situation in SEA of fighting a limited war without a formal declaration. Therefore we must face the realization of being confronted with a peacetime construction programming system to support wartime mission requirements.

To effectively operate will require flexibility and an awareness of the construction delivery systems available.

Turnkey represents only one of the potential systems. Other options cover the spectrum from military troop construction to the traditional design-bid-construct to the more progressive design-construct approaches. Each system has specific advantages, disadvantages and limitations in a combat environment. The civil engineers must carefully weigh the requirements and select a strategy using a construction delivery system that best meets the wartime needs.

Our predecessors showed us what could be done on the sandy beaches of Tuy Hoa by aggressively plowing new ground in order to meet wartime needs.

SUMMARY

Project Turnkey represents a historic milestone in the warfighting annals of Air Force civil engineering. The commitment of these dedicated engineers toward supporting the operational mission needs of a growing air war were impressive. They transformed the barren beaches of Tuy Hoa into the most modern jet fighter base in SEA. All in less than a single year.

The warfighting attitude of these engineers serves as a reminder of what can be expected from the next generation of engineers facing a combat environment. Many of the lessons learned from the turnkey application are not new, but the practical experiences learned are well worth remembering. In the next war, there will not be time to relearn the experiences of

SEA. Therefore, today's engineers can refine their warfighting experience base by remembering what happened on the battlefields of SEA. Their motto for responsiveness is as appropriate today as it was over 20 years ago--"Do It Once--Do It Right".

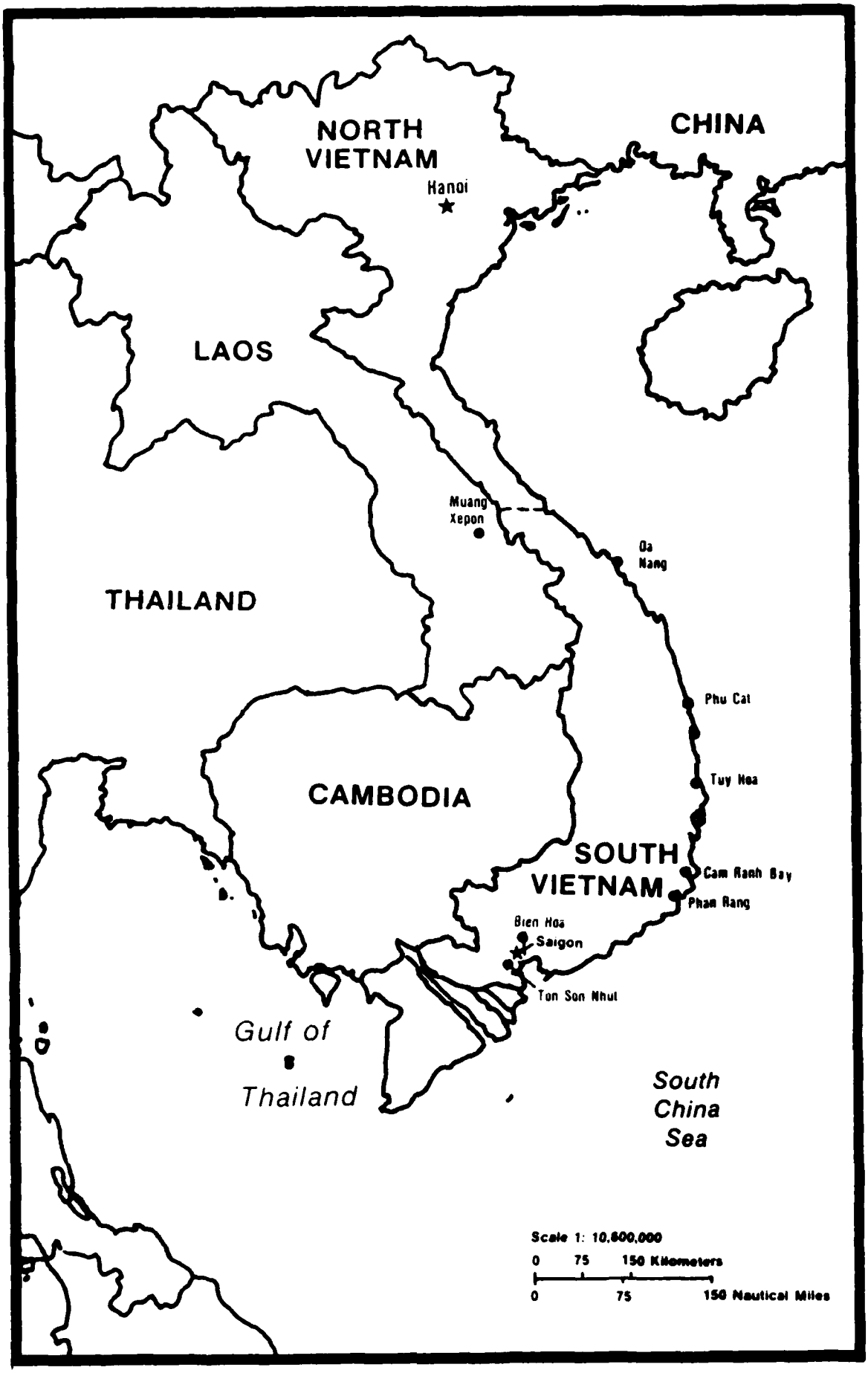

Figure 1. South Vietnam Jet Air Bases

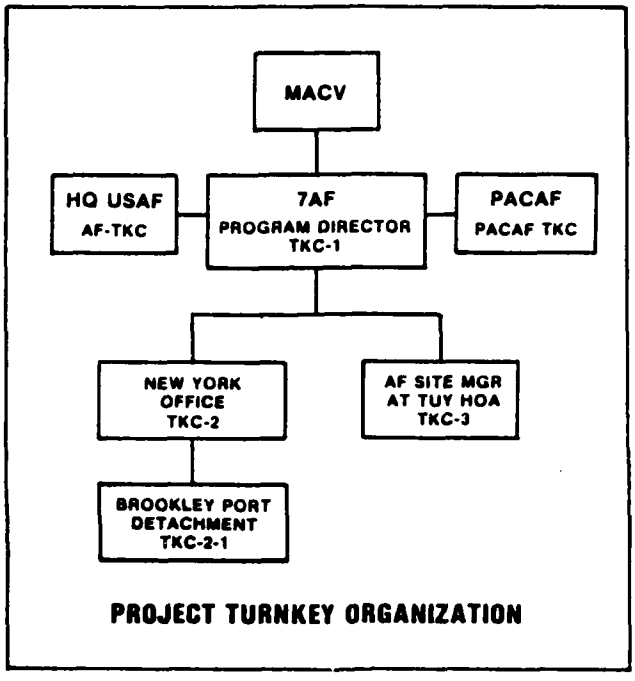

Figure 2. Project Turnkey Construction Management Organization

EMPLOYEE OF PROJECT TURNKEY MUST NOT:

1. Participate in the religious or political affairs of Vietnam or get involved in discussions of such topics with Vietnamese citizens.

2. Assualt, threaten or use physical violence against Vietnamese or third country nationals except when bona fide self-defense is involved.

3. Exchange currency, scrip, money orders or other forms of currency or dollar instruments.

4. Fail, upon arrival in Vietnam, to declare the amount of United States and foreign currency and dollar instruments in his possession or to deposit all his United States currency and dollar instruments in the Project Manager's office upon arrival at the job site.

5. Sell merchandise, personal property or commissary goods.

6. Engage in any unauthorized or illegal business activity.

7. Carry or possess weapons.

8. Leave the job site without specific approval.

9. Attempt to bring dependents into Vietnam.

10. Obtain or use water or food from any source other than job site facilities.

11. Use narcotics or use alcoholic beverages excessively.

12. Import any of the following into Vietnam by any means whatsoever: narcotics, marihuana, explosives, ammunition or fireworks, privately-owned firearms, Vietnamese currency in excess of 500 piasters, gold or silver bullion, obscene or pornographic literature, printed matter advocating treason or insurrection against the United States or any country with which the United States has entered into a mutual defense or assistance program.

13. Engage in any activity or conduct in any matter which would degrade the image of the United States or which would have or tend to have undue inflationary effect upon the economy of Vietnam. (7:611-612)

Figure 3. The labor "Code-of-Conduct" used by WKC.

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