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REPORT

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PROJECT
Contemporary
Historical
Examination of
Current
Operations
REPORT

**TACTICAL CONTROL SQUADRON OPERATIONS
IN
SEASIA (U)**

15 OCTOBER 1969

HQ PACAF

**Directorate, Tactical Evaluation
CHECO Division**

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Prepared by:

MR MELVIN PORTER

Project CHECO 7th AF, DOAC

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14. ABSTRACT Project CHECO was established in 1962 to document and analyze air operations in Southeast Asia. Over the years the meaning of the acronym changed several times to reflect the escalation of operations: Current Historical Evaluation of Counterinsurgency Operations, Contemporary Historical Evaluation of Combat Operations and Contemporary Historical Examination of Current Operations. Project CHECO and other U. S. Air Force Historical study programs provided the Air Force with timely and lasting corporate insights into operational, conceptual and doctrinal lessons from the war in SEA.					
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The counterinsurgency and unconventional warfare environment of Southeast Asia has resulted in the employment of USAF airpower to meet a multitude of requirements. The varied applications of airpower have involved the full spectrum of USAF aerospace vehicles, support equipment, and manpower. As a result, there has been an accumulation of operational data and experiences that, as a priority, must be collected, documented, and analyzed as to current and future impact upon USAF policies, concepts, and doctrine.

Fortunately, the value of collecting and documenting our SEA experiences was recognized at an early date. In 1962, Hq USAF directed CINCPACAF to establish an activity that would be primarily responsive to Air Staff requirements and direction, and would provide timely and analytical studies of USAF combat operations in SEA.

Project CHECO, an acronym for Contemporary Historical Examination of Current Operations, was established to meet this Air Staff requirement. Managed by Hq PACAF, with elements at Hq 7AF and 7AF/13AF, Project CHECO provides a scholarly, "on-going" historical examination, documentation, and reporting on USAF policies, concepts, and doctrine in PACOM. This CHECO report is part of the overall documentation and examination which is being accomplished. Along with the other CHECO publications, this is an authentic source for an assessment of the effectiveness of USAF airpower in PACOM.



MILTON B. ADAMS, Major General, USAF
Chief of Staff

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS PACIFIC AIR FORCES
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FOR THE COMMANDER IN CHIEF

A handwritten signature in cursive script, reading "Warren H. Peterson", is written over the typed name.

WARREN H. PETERSON, Colonel, USAF
Chief, CHECO Division
Directorate, Tactical Evaluation
DCS/Operations

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iii
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	(13) AFXOTZ. 1
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	(a) AFXPPGS 3

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- (1) HEADQUARTERS
 - (a) DO. 1
 - (b) DPL. 2
 - (c) DOCC. 1
 - (d) DORQ. 1
 - (e) DIO. 1
- (2) AIR FORCES
 - (a) 12AF
 - 1. DORF 1
 - 2. DI 1
 - (b) 19AF(DI). 1
 - (c) USAFSOF(DO) 1
- (3) WINGS
 - (a) 1SOW(DO). 1
 - (b) 4TFW(DO). 1
 - (c) 23TFW(DOI). 1
 - (d) 27TFW(DOI). 1
 - (e) 33TFW(DOI). 1
 - (f) 64TAW(DOI). 1
 - (g) 67TRW(C). 1
 - (h) 75TRW(DOI). 1
 - (i) 316TAW(DOP) 1
 - (j) 317TAW(EX). 1
 - (k) 363TRW(DOC) 1
 - (l) 464TAW(DOIN). 1
 - (m) 474TFW(TFOX). 1
 - (n) 479TFW(DOF) 1
 - (o) 516TAW(DOPL). 1
 - (p) 441OCCTW(DOTR). 1
 - (q) 451OCCTW(DO16-I). 1
 - (r) 4554CCTW(DOI) 1
- (4) TAC CENTERS, SCHOOLS
 - (a) USAFTAWC(DA). 2
 - (b) USAFTARC(DID) 2
 - (c) USAFTALC(DCRL). 1
 - (d) USAFTFWC(CRCD). 1

(e) USAFAGOS(DAB-C) 1

b. SAC

- (1) HEADQUARTERS
 - (a) DOPL. 1
 - (b) DPLF. 1
 - (c) DM. 1
 - (d) DI. 1
 - (e) OA. 1
 - (f) HI. 1
- (2) AIR FORCES
 - (a) 2AF(DICS) 1
 - (b) 15AF(DI). 1
- (3) AIR DIVISIONS
 - (a) 3AD(DO) 3

c. MAC

- (1) HEADQUARTERS
 - (a) MAOID 1
 - (b) MAOCO 1
 - (c) MACHO 1
 - (d) MACOA 1
- (2) AIR FORCES
 - (a) 21AF(OCXI). 1
 - (b) 22AF(OCXI). 1
- (3) WINGS
 - (a) 61MAWg(OIN) 1
 - (b) 62MAWg(OCXP). 1
 - (c) 436MAWg(OCXC) 1
 - (d) 437MAWg(OCXI) 1
 - (e) 438MAWg(OCXC) 1
- (4) MAC SERVICES
 - (a) AWS(AWXW) 1
 - (b) ARRS(ARXLR) 1
 - (c) ACGS(AGOV). 1

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d. ADC	(2) SUBORDINATE UNITS
(1) HEADQUARTERS	(a) Eur Scty Rgn(OPD-P) . . . 1
(a) ADODC 1	(b) 6940 Scty Wg(OOD) . . . 1
(b) ADOOP 1	
(c) ADLCC 1	
(2) AIR FORCES	
(a) AF ICELAND(FICAS) . . . 2	
(3) AIR DIVISIONS	
(a) 25AD(OIN) 2	
(b) 29AD(ODC) 1	
(c) 33AD(OIN) 1	
(d) 37AD(ODC) 1	
e. ATC	
(1) HEADQUARTERS	
(a) ATXPP-X 1	
f. AFLC	
(1) HEADQUARTERS	
(a) MCVSS 1	
g. AFSC	
(1) HEADQUARTERS	
(a) SCLAP 3	
(b) SCS-6 1	
(c) SCGCH 2	
(d) SCTPL 1	
(e) ASD(ASJT) 1	
(f) ESD(ESO) 1	
(g) RADC(EMOEL) 2	
(h) ADTC(ADGT) 1	
h. USAFSS	
(1) HEADQUARTERS	
(a) XR. 1	
(b) CHO 1	
	i. AAC
	(1) HEADQUARTERS
	(a) ALDOC-A 2
	j. USAFSO
	(1) HEADQUARTERS
	(a) COH 1
	k. PACAF
	(1) HEADQUARTERS
	(a) DP. 1
	(b) DI. 1
	(c) DPL 2
	(d) CSH 1
	(e) DOTECH 5
	(f) DE. 1
	(g) DM. 1
	(h) DOTECH. 1
	(2) AIR FORCES
	(a) 5AF(DOPP) 1
	(b) Det 8, ASD(DOASD) . . . 1
	(c) 7AF
	1. DO 1
	2. DIXA 1
	3. DPL 1
	4. TACC 1
	5. DOAC 2
	(d) 13AF
	1. CSH. 1
	2. DPL. 1
	(e) 7/13AF(CHECO) 1
	(3) AIR DIVISIONS
	(a) 313AD(DOI) 1
	(b) 314AD(DOP) 2
	(c) 327AD
	1. DO 1
	2. DI 1
	(d) 834AD(DO) 2

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(4) WINGS

(a)	8TFW(DCOA)	1
(b)	12TFW(DCOI)	1
(c)	35TFW(DCOI)	1
(d)	37TFW(DCOI)	1
(e)	56SOW(WHD)	1
(f)	347TFW(DCOOT)	1
(g)	355TFW(DCOC)	1
(h)	366TFW(DCO)	1
(i)	388TFW(DCO)	1
(j)	405TFW(DCOA)	1
(k)	432TRW(DCOI)	1
(l)	460TRW(DCOI)	1
(m)	475TFW(DCO)	1
(n)	633SOW(DCOI)	1
(o)	1st Test Sq(A)	1

(5) OTHER UNITS

(a)	Task Force ALPHA(DXI)	1
(b)	504TASG(DO)	1

m. USAFE

(1) HEADQUARTERS

(a)	ODC/OA	1
(b)	ODC/OTA	1
(c)	OOT	1
(d)	XDC	1

(2) AIR FORCES

(a)	3AF(ODC)	2
(b)	16AF(ODC)	2
(c)	17AF	
1.	ODC	1
2.	OID	1

(3) WINGS

(a)	20TFW(DCOI)	1
(b)	36TFW(DCOID)	1
(c)	50TFW(DCO)	1
(d)	66TRW(DCOIN-T)	1
(e)	81TFW(DCOI)	1
(f)	401TFW(DCOI)	1
(g)	513TAW(OID)	1

4. SEPARATE OPERATING AGENCIES

a.	ACIC(ACOMC)	2
b.	AFRES(AFRXPL)	2
c.	USAFA	
(1)	CMT	1
(2)	DFH	1
d.	AU	
(1)	ACSC-SA	1
(2)	AUL(SE)-69-108	2
(3)	ASI(ASD-1)	1
(4)	ASI(ASHAF-A)	2
e.	AFAFC(EXH)	1

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5. MILITARY DEPARTMENTS, UNIFIED AND SPECIFIED COMMANDS, AND JOINT STAFFS

a.	COMUSJAPAN.	1
b.	CINCPAC	1
c.	COMUSKOREA.	1
d.	COMUSMACTHAI.	1
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i.	CINCLANT.	1
j.	CHIEF, NAVAL OPERATIONS	1
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l.	CINCONAD.	1
m.	DEPARTMENT OF THE ARMY.	1
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p.	SECRETARY OF DEFENSE (OASD/SA).	1
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s.	CINCAL.	1
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6. SCHOOLS

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j.	Senior USAF Rep, US Army JFK Center for Special Warfare	1
k.	Senior USAF Representative, US Army Field Artillery School.	1

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TABLE OF CONTENTS

	<u>Page</u>
FOREWORD	x
CHAPTER I - ORGANIZATION	1
619th Tactical Control Squadron	4
Birth of the 505th TCG	8
Slippages and Frustrations	11
Success at Hon Tre	12
Phu Quoc Facility	14
CHAPTER II - PACER DOG	18
CHAPTER III - COMMANDO INDIAN	22
COMMANDO INDIAN Thailand	25
CHAPTER IV - TACTICAL CONTROL SQUADRON OPERATIONS	28
Air Refueling Operations	30
Invert - COMMANDO HUNT	31
Other Missions - Other Tasks	37
FOOTNOTES	
Foreword	40
Chapter I	40
Chapter II	42
Chapter III	43
Chapter IV	43
APPENDIX I - Equipment Used by TACS - SEA	46
GLOSSARY	54
FIGURES	<u>Follows Page</u>
1. (U) Functional Flow Diagram	4
2. (U) Organizational and Functions	6
3. (U) 505th Tactical Control Group	8
4. (C) 619th and 620th TCS Responsibilities	10
5. (C) 621st Tactical Control Squadron Responsibilities	10
6. (U) Air Defense Boundaries	30
7. (S) Refueling Anchors - MSEA	32
8. (S) Invert Responsibilities - COMMANDO HUNT	34
9. (S) Control Points	36

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FOREWORD

In late 1961, when the United States accelerated aid to South Vietnam and Thailand, communications and control facilities were primitive and limited. A rudimentary Air Traffic Control System existed, using high frequency (HF) radio for communications and low frequency beacons for navigational aids. This was sufficient to handle the commercial traffic and existing military traffic.^{1/}

Increased U.S. air involvement, made necessary by the rapidly growing Communist guerrilla activities in South Vietnam, Laos, and Thailand soon created a need for a comprehensive air request net and Tactical Air Control System (TACS) to control efficiently this increase in military traffic.

On 1 October 1961, the 5th Communications and Control Group and the 1st Mobile Communications Squadron were reorganized. The two 5th Communications and Control Squadrons were deactivated and their personnel and equipment became absorbed in the 1st Mobile Communications Squadron, which was then redesignated the 1st Mobile Communications Group under the Air Force Communications Service. The 605th Tactical Control Squadron was deactivated, and the 5th Communications and Control Group became the 5th Tactical Control Group under the Thirteenth Air Force at Clark Air Base, Philippines.^{2/}

The USAF initially inserted TDY units into South Vietnam and Thailand in November 1961, with elements of the 5th and 507th (Shaw AFB, South Carolina) Tactical Control Groups and the 1st Mobile Communications Group (MCG), which had already acquired the sobriquet of "1st Mob." These mobile units consisted basically of navigational aids (navaids) and single channel high frequency

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radio systems to link the widely spread activities. As the tempo of the operations increased and the extent of USAF participation grew to match the increased insurgency activity, these communications systems proved barely adequate for several reasons. Among them were:^{3/}

- . Existing systems did not provide sufficient voice or teletype channels for efficient military operations.
- . High frequency radio was widely used by nearly all communications facilities in Southeast Asia with no effective system of frequency control.
- . Because of security considerations, siting of communications and navigational aid equipment was predominantly not optimum for good radio propagation.

The nucleus for a TACS in Southeast Asia had, however, been formed. The need was known. All that remained was updating of equipment, proper siting, training of personnel (including cross-training of local personnel), and the development of procedures which would allow for an Air Traffic Control System to work side-by-side with a Tactical Air Control System without undue conflict. As it turned out, this was a prodigious undertaking. Duplication of functions existed in some areas, just as apposition of function existed in others. The primary function of an Air Traffic Control System is to provide orderly control of air traffic along airways and within the airspace surrounding terminal areas. The primary function of a TACS is to provide an air component commander with efficient control of his air assets within an area of armed conflict. The fact that these functions necessarily took place within the same airspace and at the same time continued to make the solution of problems difficult; however, great steps forward were taken.^{4/}

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CHAPTER I

ORGANIZATION

As 1962 began, the 5th Tactical Control Group had Control and Reporting Centers (CRCs) at Tan Son Nhut Air Base, South Vietnam, and at Don Muang Royal Thai AF Base, Bangkok, Thailand. Another CRP was emplaced at Da Nang. The airlift of its hardware was begun on 13 January and the radar was on the air by 15 January.^{1/}

The Southeast Asia Communications Region was activated on 2 February 1962, with a complement of the 5th Tactical Control Group loaned to them to provide expertise and experience in radar and mobile tactical communications and control. Operation BARN DOOR II, the move of the Don Muang CRC to Ubon, Thailand, started on 30 April. This move was made to bring the radar into a more favorable location for detecting suspected aerial activity in Laos, Cambodia, and the Republic of Vietnam. The site was declared operational on 10 May with the call sign Lion.^{2/}

A partial merger of the 5th Tactical Control Group (TCG) with the 1st MCG had been the subject of a study at the direction of Hq PACAF. The position taken by the 5th TCG in a report submitted on 21 June 1962 urged that either a complete merger or complete separation be effected, inasmuch as the partial join-up appeared unsuitable; roles, missions, responsibilities, and methodology appeared untenable on a split basis.^{3/}

At the end of June 1962, the 5th TCG had four detachments, all under control of the 2d Advanced Echelon (ADVON) in the Republic of Vietnam (RVN)

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and Thailand. These detachments were:^{4/}

1. Detachment 5-1 at Don Muang RTAFB, with one Weapons Staff Officer and six Weapons Controllers (WCs), working out of the Royal Thai Air Force Operations Center. These men also trained RTAF personnel and provided advisory services for up-country RTAFB radar sites.
2. Detachment 5-2 was Paris Control, the Control and Reporting Center at Tan Son Nhut Air Base in Saigon.
3. Detachment 5-3 was the Control and Reporting Post at Da Nang; Dets 2 and 3 operated the entire Tactical Air Control System in South Vietnam at that time. The call sign of Det 3 was Panama.
4. Detachment 5-4 was the CRP at Ubon Ratchathani, Thailand, call sign Lion. The men and equipment were originally from Detachment 1 at Don Muang before the previously mentioned BARN DOOR II.

With so few CRCs/CRPs to cover a vast geographical area, and equipped with little sophisticated equipment, concentrated efforts were made to acquire more of each. The newly developed multi-channel single sideband and other mobile radio systems provided a larger--though nonetheless limited--number of voice and teletype channels. Although this increased the number of available channels per frequency, it still was not the final answer to the communications problems in SEA. In September 1962, Project BACK PORCH I, a program to install a 72-channel microwave system linking the major operating locations throughout Vietnam, was begun. This system and the Thai-based AN/TRC-24 system were being augmented with U.S. Army tropospheric and radio relay facilities to achieve linkage by two tropo paths, one from Bangkok through Ubon via Army tropo to the BACK PORCH system in Vietnam, and the other through a Philco tropo system between Bangkok and Saigon.^{5/}

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Although these efforts at upgrading the facilities for long-range communications greatly improved the communications picture in early 1963, there were still several gaps in the overall structure. Dependence upon HF radio linking Vietnam with the Philippines and with Thailand still hampered operations. As the situation involved navigational aids, it was much the same as in communications; the few international airports had visual omnirange (VOR) as well as low frequency radio beacons and very high frequency (VHF) voice communications; other airfields, however, had low frequency nondirectional beacons only, and seldom any ground/air communications.^{6/}

Alone, communications and nav aids were essentially tools--means to an end. The ends in this case were air traffic control on one side, and tactical control and air defense on the other. Although no active enemy air threat existed over South Vietnam and Thailand, the potential was ever-present. There was not at that time any adequate integrated Tactical Air Control System in-being, capable of turning back any immediate air threat. A rigorous program of training, to teach both South Vietnamese and the Thais the technique of operating a successful Tactical Air Control System was necessary, not only to handle an air defense function, but to manage effectively the air war against the enemy on the ground.^{7/}

The 1st Mobile Communications Group and the 507th Tactical Control Group were performing extended TDY in Thailand, but their function was predominantly one of air traffic control, tower duty, and assisting the Thai controllers with terminal control (GCA, instrument letdowns, etc.). The 5th Tactical Control Group had detachments throughout SEA, among them four CRC/CRPs in South Vietnam. These were the CRC "Paris" at Tan Son Nhut, and CRPs "Pyramid" at Ban Me Thuot,

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"Pagoda" (later renamed "Peacock" apparently for politico/religious reasons) at Pleiku, and "Panama" at Da Nang.^{8/}

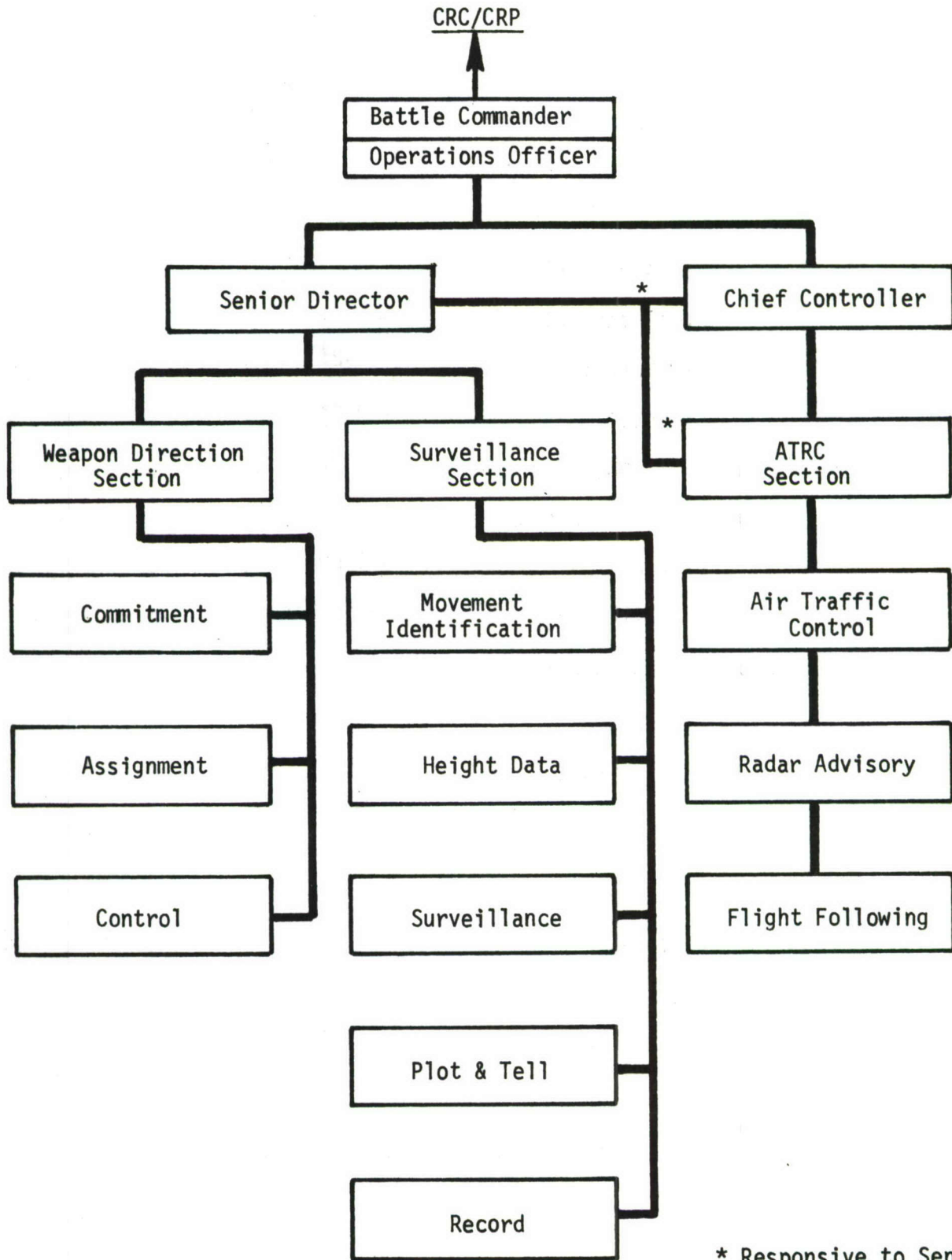
619th Tactical Control Squadron

By Department of the Air Force (AFOMO) letter 117N, dated 10 December 1963, the 619th Tactical Control Squadron was activated; it was organized on 8 April 1964 under the 5th Tactical Control Group. Stationed at Tan Son Nhut AB, RVN, it was under operational control of the 2d Air Division. Prior to its activation the 619th TCS had been the 5th TCG's Det 5-2. As this was the expanding period of the war, the 619th had, even upon the day of its activation, three detachments of its own: Det 1, Da Nang; Det 2, Ubon; and Det 3, Can Tho, RVN.^{9/} The Monkey Mountain (Da Nang) and Can Tho radars became operational on 11 April 1964, and represented a considerable improvement in early warning and tactical control capability. Tan Son Nhut (Paris Control) and Can Tho (Paddy) provided Cambodian Border surveillance, both for Cambodian air activity and to give "Stormy Weather" warnings to any friendly aircraft whose course or proximity could cause them to penetrate Cambodian airspace.^{10/}

The CRC and CRPs were tasked with several other responsibilities which forecast the need for immediate expansion of the system. These included handling normal Air Route Traffic Control reporting, issuing traffic advisories, and giving aid in the event of an inflight emergency. The CRC/CRPs were tasked with monitoring Air Defense Force (ADF) and tactical air navigation (TACAN) stations as a cross check of radar positioning. A primary responsibility was the detection and confirmation of any unusual air activity such as an indication of hostile intent by unknown or enemy aircraft. The CRCs and CRPs coordinated

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FUNCTIONAL FLOW DIAGRAM (TYPICAL)



* Responsive to Senior Director in charge of CRC

FIGURE 1

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reconnaissance missions, gave vectors or steers to requesting aircraft, and controlled such differing missions as flaredrops, escort missions, herbicide missions, and troop or supply drops. Their radars also monitored the flight positions of all aircraft within their range in order to issue weather advisories and even to provide vectors around areas of heavy precipitation. ^{11/}

These are statistics showing the total activity handled by Paris Control alone during the period of 1 Jan-30 Jun 1964: ^{12/}

Flight Plans

<u>Received</u>	<u>Correlated</u>	<u>Canceled</u>	<u>Tracks Carried</u>
14,797	10,642	1,289	23,296

Intercepts

<u>Actual Intercepts</u>		<u>Simulated Intercepts</u>	
U.S. - 131	VNAF - 21	U.S. - 772	VNAF - 644

Sorties

<u>Prebriefed</u>	<u>Immediate Requests</u>	<u>Emergencies</u>	<u>Flt Follows</u>
U.S. 2,454	U.S. 508	U.S. 16	U.S. 2,491
VNAF 1,163	VNAF 62	VNAF 0	VNAF 1,820

Although large numbers of USAF aircraft had not yet been deployed to SEA during this period (most aircraft being support in nature: C-123s and Army Caribou), the need was foreseen for further radar coverage, communications, and especially GCI capabilities for those tactical aircraft stationed in Thailand. On 13 July 1964, a preliminary crew from the 605th Tactical Control

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Squadron departed Clark AB, Philippines, to select a site for a radar unit at Udorn Thani, Thailand. Thus was laid the groundwork for Detachment 4, 619th TCS, which was destined to become a joint United States Air Force and Royal Thai Air Force Control and Reporting Post, and eventually a Tactical Control Squadron in itself.^{13/} On 22 July 1964, 56 men were deployed to Udorn and work was begun after the arrival of the first load of equipment. By 26 July, the CRP was already in limited operation; by 14 August, the original personnel were replaced by CONUS TDY personnel--an indication of the burgeoning construction and operation going on in the TCS field.^{14/}

The following chronological listing of facilities and nav aids commissioned in South Vietnam and Thailand by the 1964th Communications Group at Tan Son Nhut shows the frenetic activity generated in the communications, nav aid, and tactical control field during the last six months of 1964:^{15/}

- 11 Jul - Facility commissioned at Nha Trang, RVN.
- 2 Aug - TACAN commissioned at Korat, Thailand.
- 13 Aug - Radio Beacon commissioned at Takhli, Thailand.
- 13 Aug - UHF/VHF Direction Finding unit at Takhli, Thailand.
- 13 Aug - Control Tower commissioned at Udorn, Thailand.
- 14 Aug - ASR/PAR service commissioned at Korat, Thailand.
- 15 Aug - ASR/PAR service commissioned at Bien Hoa, RVN.
- 19 Aug - Control Tower commissioned at Korat, Thailand.
- 24 Aug - TACAN commissioned at Bien Hoa, RVN.
- 27 Aug - TACAN commissioned at Udorn, Thailand.
- 28 Aug - TACAN commissioned at Takhli, Thailand.
- 9 Sep - Control Tower commissioned at Nakhon Phanom, Thai.
- 11 Sep - VHF DF commissioned at Udorn, Thailand.
- 29 Sep - TACAN commissioned at Nakhon Phanom, Thailand.
- 2 Oct - ASR/PAR service commissioned at Udorn, Thailand.
- 9 Oct - ASR/PAR service commissioned at Takhli, Thailand.
- 20 Nov - Radio Beacon commissioned at Da Nang, RVN.
- 21 Nov - RACAN commissioned at Nakhon Phanom, Thailand.
- 20 Dec - Mobile RAPCON commissioned as backup GCA at Pleiku, RVN.
- 27 Dec - Control Tower deployed to Can Tho (New).

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ORGANIZATION
AND
FUNCTIONS

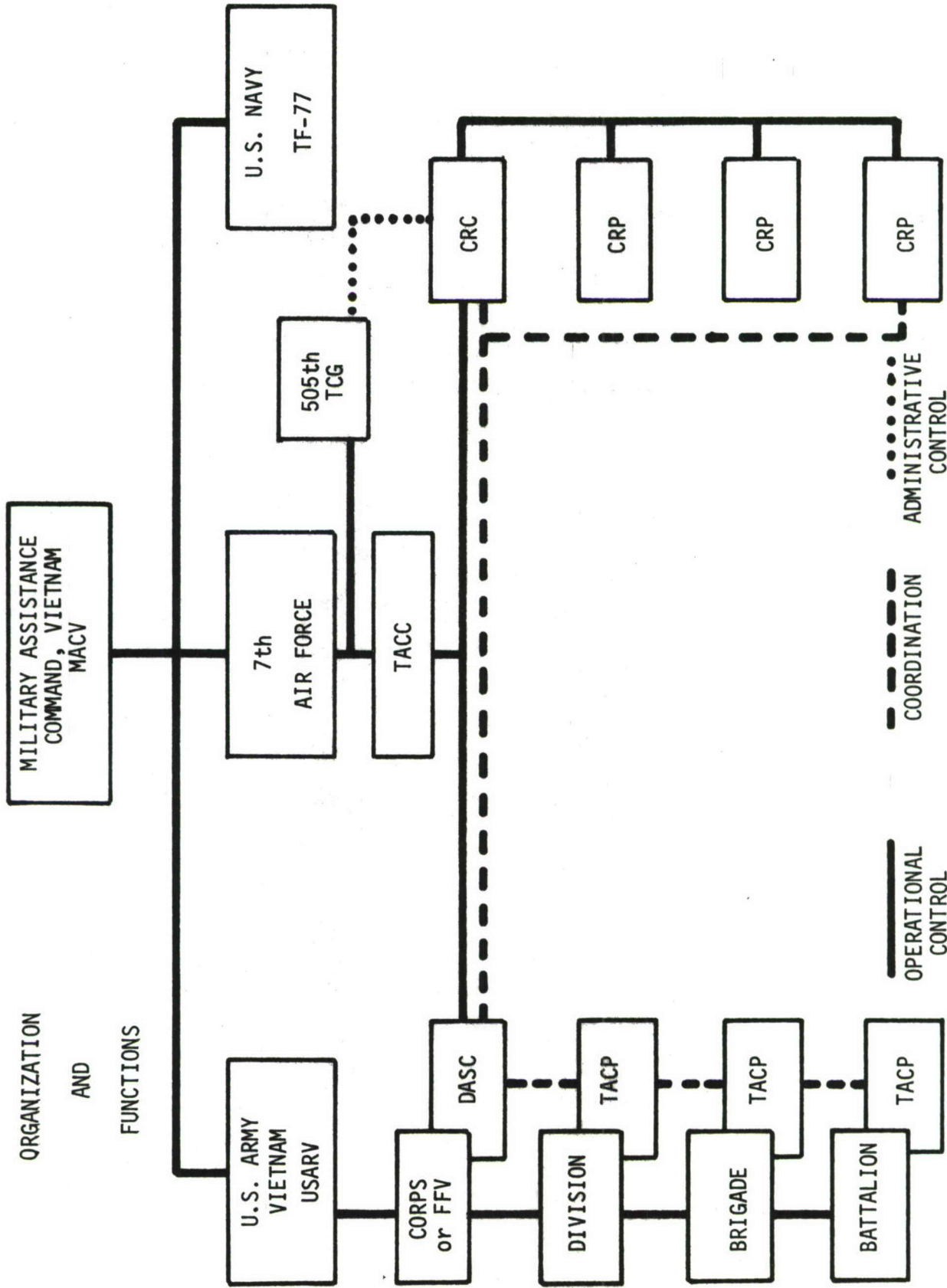


FIGURE 2

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On 4 January 1965, the 5th Tactical Control Group began deploying personnel to Nakhon Phanom, Thailand, to relieve the 507th TCG TDY personnel who were then manning Invert, the CRP there. On 21 January, the 5th TCG assumed full operational control and responsibility for the site. The 5th TCG also relieved the 507th at Don Muang RTAFB and manned the site there until the Military Assistance Program Control and Reporting Post (MAP CRP) at Green Hill became operational as "Dressy Lady." The 5th TCG then deactivated the Don Muang facility and began initial operations at Green Hill. ^{16/}

The 5th Tactical Control Group continued to have a high percentage of its personnel deployed to Tactical Air Control System facilities throughout Southeast Asia, often finding themselves in unique configurations, locations, or methods of deployment. An example was the deployment of an AN/UPS-1 radar (early model search radar) to Nui Ba Den--Black Virgin--Mountain near Tay Ninh, RVN. The equipment had to be airlifted to the airstrip near Tay Ninh City, then carried by helicopter to the top of the mountain. ^{17/} As a further example of the security problems involved in the siting of facilities in South Vietnam, U.S. forces "owned" the bottom of Nui Ba Den and the top few hundred meters--between were "owned" by the Viet Cong.

It was during the largest buildup of U.S. forces in SEA, mid-1965, that the Tactical Control Groups and Squadrons achieved their largest growth. Effective on 1 January 1965, the 619th TCS had already assumed administrative and operational control over OL-1 and OL-2 of the 5th Tactical Control Group. By the end of June 1965, the 619th TCS consisted of: ^{18/}

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Headquarters - Tan Son Nhut AB, Vietnam

Detachment 1 - Da Nang, Vietnam

Detachment 2 - Ubon RTAFB, Thailand

Detachment 3 - Can Tho Airfield, Vietnam

Detachment 4 - Udorn RTAFB, Thailand

Birth of the 505th TCG

Within weeks, this organization and its location changed drastically. On 1 August 1965, the 619th TCS, although still assigned to the 5th TCG, was attached for operational control to the newly formed Tactical Air Support Group Provisional 6250th.^{19/} Redesignated the 505th Tactical Control Group on 8 November 1965, its headquarters was located at Tan Son Nhut. Simultaneously, the 619th was relieved of its assignment to the 5th TCG and assigned to the 505th. Under the same set of orders, the 620th Tactical Control Squadron was formed and located at Da Nang Air Base, Vietnam.^{20/}

In a realignment designed to give better operational distribution of detachments, the 619th's units at Da Nang, Ubon, Udorn, Nakhon Phanom, and Green Hill were given to the 620th TCS, which also accepted the newly organized detachment at Dong Ha, Vietnam, and the planned detachments at Mukdahan City, Chiang Mai Airport, Phitsanulok City, Takhli Air Base and Bang Sung, Thailand.^{21/}

Although the 505th Tactical Control Group at Tan Son Nhut, along with its 619th and 620th Tactical Control Squadrons, made up the primary controlling elements in the Southeast Asia conflict, the 5th TCG continued to provide considerable assistance, siting and installing CRPs and Forward Air Control

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Post (FACP) packages. On 25 November, the 5th TCG was in the process of installing a CRP at Dong Ha, the northernmost radar installation in the Republic of Vietnam, and an FACP at Ca Mau, the southernmost airfield in the Republic. It was at the latter location that the 5th TCG suffered its first casualty, as the result of a Viet Cong mortar attack on this marginally secure camp.^{22/} Less than one month later, on 17 December 1965, the 5th deployed a UPS-1 radar to support the new Forward Air Control Post. The site became operational on 23 December and provided excellent control in the southern Delta area. This took some of the pressure off Paddy, the CRP at Can Tho, which was rapidly approaching its control saturation point.^{23/}

The buildup and area coverage of Southeast Asia by Tactical Control Squadrons and the TACS came close to its present structure in early 1966. The 621st Tactical Control Squadron was activated on 23 February 1966 at Udorn RTAFB, and assumed control of the 619th and 620th Thailand units.^{24/} This gave a defined area of control for each of the three SEA squadrons. The 619th TCS had control of Paris CRC and all the CRPs in the southern portion of South Vietnam; the 620th TCS controlled Panama CRC and the CRPs in the north. Brigham CRP at Udorn was shortly thereafter elevated to the status of a CRC, giving the 621st TCS two CRCs and three CRPs. Dressy Lady, the other CRC located at Green Hill, ran the Bangkok Sub-Sector which included "Dora", at Phitsanulok. Brigham had the Udorn Sub-Sector with CRPs "Invert," Nakhon Phanom; "Viking," Mukdahan; and "Lion," Ubon (Fias. 4, 5).^{25/}

Even though the Southeast Asia Integrated Tactical Air Control System' (SEAITACS) structure was beginning to take form around the 505th Tactical

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Control Group and its three squadrons, the 619th, 620th, and 621st, considerable interplay continued throughout South Vietnam and Thailand, with other units involved in related endeavors. Communications, power, ground environment, and mobility were followed by stability, upgrading of equipment, and interface among units; all these were necessary in the setting up of the system. As a result, at any one time during the period, one could find PACGEEIA, 1st MCG, 5th TCG, 605th TCG and 608th TCS (Clark AB) all working together to provide a package for the final user, perhaps the 505th's 621st Tactical Control Squadron. The following excerpts, telescoped from the 5th Tactical Control Group's semi-annual history give a graphic representation of the situation as it existed: ^{26/}

"The deployment to Phitsanulok, Thailand, was completed on 23 Jun 1966. Plans are for the site (Det 8, 621 TCS) to remain in place until the MAP Site at Chieng Mai, Thailand, becomes operational. The Thai TPS-1D at Phitsanulok will be upgraded to an FPS-36 radar by PAC-GEEIA in the third quarter of FY 67. Estimated phaseout and return of equipment to 5th TCG are programmed for the second quarter of FY 68...The package was formed from the original 608th TCS on 1 Jan 1966 at the Dau Area Training Site, Clark Air Base, between 1 Jan and 15 Jan 66....On 20 April 1966, 5th TCG Radar Operations confirmed the names of Group personnel to be deployed with the package. Between 1 Dec 1965 and 9 May 1966, 5th TCG Siting Team surveyed and studied the proposed site, and on 9 May 1966, 13AF published Operations Order 313-66 ordering the deployment....On this date, 9 May, the package was notified that the site had been approved by the Royal Thai Government...."

The foregoing is a compressed version of the siting and setting up of the Phitsanulok CRP, Dora. It illustrates that none of the units engaged in building the Southeast Asia Integrated Tactical Air Control System was independent of the other.

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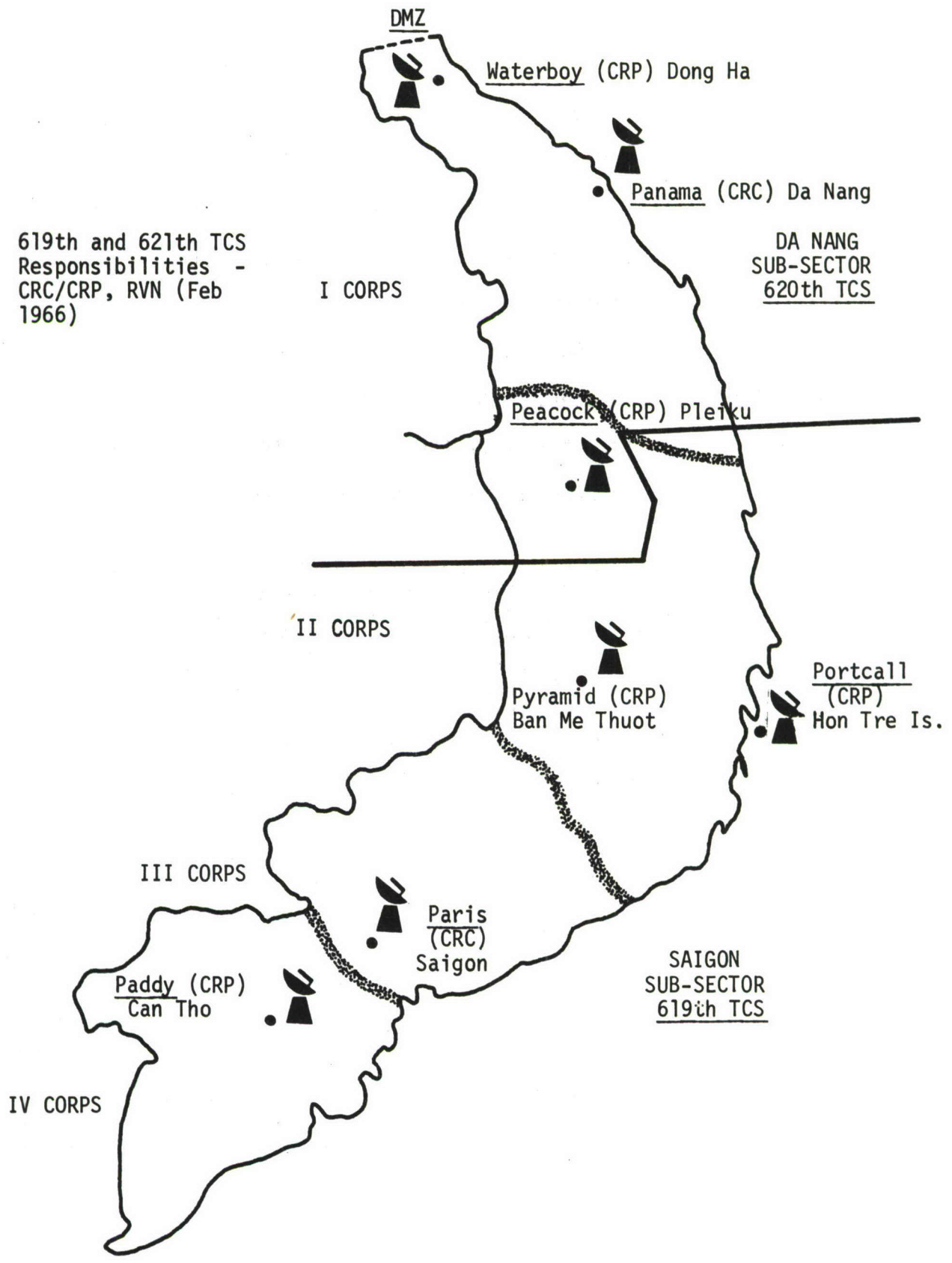


FIGURE 4

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**621ST RESPONSIBILITIES
CRC/CRP
THAILAND
(FEB 1966)**

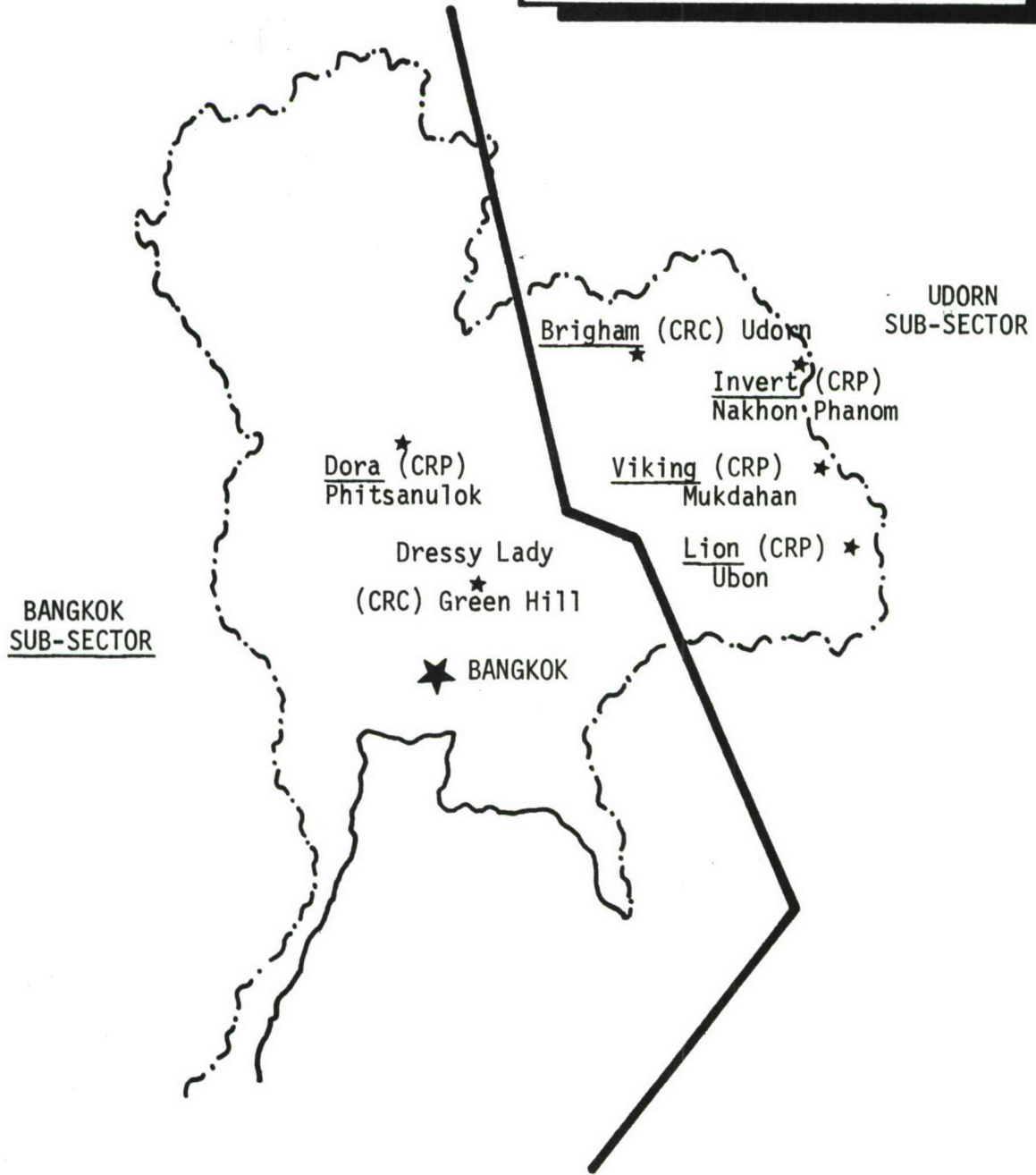


FIGURE 5

CONFIDENTIAL

Slippages and Frustrations

As a result of personnel and equipment shortages during this critical building period, slippages and frustrations occurred. The 5th Tactical Control Group had been tasked to set up a Reporting Post (RP) at Takhli, Thailand, during the early part of August. This proposed RP was to provide surveillance to the CRC at Green Hill and the CRP at Phitsanulok; the 9 August Alerting Order quoted an operational date of "on or about 1 October." This date, from the beginning, was expected to slip because of the unavailability of support personnel and equipment, and the delay in site preparation.^{27/}

A small team departed Clark Air Base on 9 September to erect an operations shelter and install air-conditioners for the Reporting Post, which was still scheduled to be operational by 1 October. The entire construction project was completed by 16 September 1966, and although the basic physical facilities were available, the operationally ready date remained highly questionable. The RP package deployment data was still held in abeyance throughout October; the MPS-9 scopes had not been received and no projected operational date was available.^{28/}

Seventh Air Force was under the impression that the MPS-9 scopes for the deployment would be shipped to the 5th TCG. The Oklahoma City Air Materiel Area (OCAMA), however, had diverted shipment of the scopes to the 505th Tactical Control Group at Tan Son Nhut. The 505th, in turn, was scheduled to ship the scopes to Takhli. All personnel at the Reporting Post remained in a ready status to meet the commitment upon reception of the scopes and the completion of related actions, but no firm operationally ready date had been determined by

the end of November 1966.^{29/}

A message in December indicated that the manning of the Takhli RP might be suspended, but since no definite decision had been made regarding its status, all operating personnel remained alerted and ready to meet the commitment pending final determination. As of 18 January 1967, the Takhli deployment (among several others, including deployments to Qui Nhon, Vietnam, and Bang Sung, Thailand) continued to be held in abeyance. This situation remained the same throughout February and March. Finally, on 25 April, word was received that the Reporting Post for Takhli had been deleted from the SEAITACS Plan. All 5th TCG actions concerned with the deployment were halted, and equipment and personnel were returned to Clark Air Base.^{30/}

Success at Hon Tre

Other frustrating occasions occurred, such as the cancelation of the Bang Sung, Thailand, Reporting Post, after it had been 90 percent completed. Some projects, however, although plagued by delays, finally achieved success. One such was the CRP at Hon Tre Island, Vietnam, off the bay at Nha Trang, the beautiful resort city midway up the coast of South Vietnam. Initially slated to become operational on 31 August 1966, the Recommended Operational Date (ROD) was slipped to 1 October because of delay in site preparation, adverse weather conditions, and unavailability of construction personnel and equipment.^{31/}

Except for the radars themselves, the package had been completely formed and equipment readied for deployment. The MPS-11 (search) and TPS-40 (height finder) radars required considerable work, however, there were delays in site preparation. The date was slipped on 10 October, dependent upon the availability

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of scopes and bits and pieces for installation. It was further slipped, because of delays in preparation of the site until 30 November. With the onset of the northeast tropical convergence and subsequent rains, it slipped again to show a projected operationally ready date of 25 December 1966.^{32/}

Anticipating difficulties with the MPS-11 radar, the 5th Tactical Control Group arranged for procurement of an FPS-8 (Penny Ton) radar for deployment as the prime search radar until a suitable FPS-11 could be readied. Although the two November slippages did occur, coordination for initial movement was made by the 5th TCG, with a Navy LST scheduled to depart the Philippines and arrive at Hon Tre by 16 November.^{33/} By now, the activation date for the Hon Tre CRP was set at 31 December 66, assuming there would be suitable on-island storage space, a usable road to the site, and that generators would be in place and working. However, PACAF advised that the FPS-8 search radar would not be available until about 15 January 1967.^{34/}

The deployment continued to make steady, though slow, progress during January, although the inclement weather continued to hamper the project. Both search (FPS-8) and height (TPS-40) radars were received during the middle of the month, but it was not until 15 February that the Portcall CRP was declared operational as Detachment 11 of the 619th Tactical Control Squadron.^{35/}

By the close of 1966, the SEAITACS structure in South Vietnam and Thailand consisted of the following Tactical Air Control Group, Squadrons, CRCs, CRPs, and RPs:^{36/}

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505th Tactical Control Group, Tan Son Nhut Air Base, Vietnam

619th Tactical Control Squadron, Tan Son Nhut Air Base, Vietnam

620th Tactical Control Squadron, Da Nang, Vietnam

621st Tactical Control Squadron, Udorn, Thailand

619th TCS

<u>Call Sign</u>	<u>Location</u>	<u>Function</u>	<u>Remarks</u>
Paris	Saigon, RVN	CRC	MAP Funded.
Paddy	Can Tho, RVN	CRP	Det 3 (MAP).
Penthouse	Trang Sup, RVN	RP	Det 7, near Tay Ninh, removed Apr 68. "No height finder radar."
Playboy	Ca Mau	RP	Det 8, 65 NM SW Can Tho, removed Jun 68 "No height finder radar."
Pyramid	Ban Me Thuot	CRP	Det 9 (MAP), 140 NM NE Saigon.
Portcall	Hon Tre Island	CRP	Det 11, 5 miles off coast at Nha Trang, RVN.

620th TCS

Panama	Da Nang, RVN	CRC	MAP, Son Tra Peak, Monkey Mountain.
Peacock	Pleiku, RVN	CRP	MAP, Western II Corps, Central Highlands, Det 2.
Waterboy	Dong Ha, RVN	CRP	Removed after typhoon damage, Det 1.*

621st TCS

Brigham	Udorn, Thai	CRC	MAP
Lion	Ubon	CRP	Det 3, MAP
Dressy Lady	Green Hill	CRC	Det 4, MAP, 50 NM North of Bangkok
Invert	Nakhon Phanom	CRP	Det 5, nine miles from Mekong River and Laos.
Viking	Mukdahan	CRP	Det 6, across Mekong River from Savannakhet.
Dora	Phitsanulok	CRP	Det 8, ninety air miles north of Takhli.

Phu Quoc Facility

Because of the position of Cambodia toward the U.S., military overflight of that country was not allowed. Although one airway (Amber 8) and a non-controlled overflight track existed over Laos, it was not always convenient nor

*Approximately October 1969.

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necessarily safe for military aircraft to use these routes. The alternative method of circumnavigating Cambodia was to use the "Bamboo Route," past Phu Quoc Island on the west coast of South Vietnam to a point in the Gulf of Siam where a direct track would take an aircraft to Bangkok without violating the territorial rights of Cambodia. This was not an "airway" since it was not internationally recognized as such, was not numbered, and traffic (once outside territorial limits) was not controlled. It was, however, heavily traveled, and for this reason--as well as for Air Defense purposes--it was decided to install a search radar on this South Vietnamese island.

The 5th Tactical Control Group was notified on 1 April 1967 of the impending deployment of the FACP to the island.^{37/} The Phu Quoc Forward Air Control Post developed into the 5th TCG's most urgent project during the following month. The site survey was completed during May, and a location near the runway at Duong Dong (a fishing village on the west side of the island), was recommended after it was determined that the site would satisfy operational requirements. As previously mentioned, a primary purpose of the FACP was to bridge the overwater gap between the Green Hill, Thailand, radar and the Paris/Paddy GCI sites.^{38/}

A previously planned deployment to Qui Nhon had been held in abeyance, which meant that the search radar scheduled for that site could be used at the Phu Quoc facility. This was firmly established and a recommended operational date of 18 July 1967 was set. For communications, the 1st Mobile Communications Group provided UHF (AN/TRC-32) and VHF (BC-639/640) air-to-ground radios. A tropo communications path was sited from Duong Dong to Rach Gia to Can Tho

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to Saigon. Land acquisition and obtaining CINCPAC approval were two limiting factors at the end of June 1967.^{39/} The actual system became operative in the third quarter of the year using 24-channel (AN/TRC-97A) tropo links by relay at Rach Gia on the Gulf of Thailand coast, and a tie-in with the Army's integrated Wideband Communications System (IWCS) at Can Tho.^{40/}

Detachment 1, 619th TCS, at Phu Quoc was organized on 15 July 1967, and the site became operational on 24 August 1967, using the call sign Swissboy. It was activated under PACAF Special Order G-120, and assigned to the 619th TCS.^{41/}

This period marked the peak buildup of Tactical Control Squadron Detachments in Southeast Asia. Staff studies prepared by the 505th Tactical Control Group recommended deactivation of Penthouse, Detachment 7, at Trang Sup, and of Playboy, Detachment 8, at Ca Mau. Upgrading of radar equipment under Project PACER DOG made it possible for the prime radar to do without these "gap fillers." Trang Sup was deactivated in April, and Ca Mau in June. Personnel from the units were absorbed by other 619th TCS and 620th TCS detachments and helped realign their assigned strengths far closer to that of their authorized strengths. Equipment from the sites was recovered by the 5th Tactical Control Group and returned to Clark Air Base, Philippines.^{42/}

The final site to be deactivated (within the time frame of this report) was the last detachment activated--Swissboy, on Phu Quoc Island. Acting on verbal orders by the Commander, Seventh Air Force, Gen. George S. Brown, deactivation began on 7 December 1968, with a one month deadline for completion.

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(The Duong Dong-Rach Gia radio relay link had been deactivated previously, on 15 October.)^{43/} Detachment 1 began deactivation immediately after receiving the order; the radar set was taken out of the SEAITACS net at 1245H and dismantling was begun. All equipment was off the island by 31 December 1968 (with the exception of the generators, which were awaiting helicopter airlift). The move was completed on 7 January 1969, when the last personnel departed by C-130 airlift.^{44/}

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CHAPTER II

PACER DOG

In the days of hurried expansion, the radar and communications equipment which were placed in the field were often antiquated and low powered. Usually van mobile and short-range, they were intended to be in position only a short time before recovery and subsequent depot or organizational level maintenance. This could not always be arranged and as a result many of them remained in service for extended periods of time. A good example was the aforementioned Trang Sup gap filler. Meant to be in the field for only 90 days before retrieval, it actually was in position for over two years with only preventive maintenance and on-the-run field maintenance to support it.^{1/}

In August 1967, Project PACER DOG was instituted to upgrade this existing UPS-1 search and TPS-10 and TPS-40 height finder net with MPS-11 and FPS-8 search and MPS-14 and FPS-90 height finders. Initially, under the joint 7AF/13AF Programmed Action Directive (PAD) 68-104, PACER DOG was to replace four search and six height finder radars at selected sites throughout Vietnam and Thailand. Two radar sets were to be maintained at Clark Air Base, Philippines by the 5th Tactical Control Group as contingency radar packages should some site in South Vietnam suffer battle damage to the point that it had to leave the net. In addition, two more were maintained at the Sacramento Air Materiel Area (SMAMA) as emergency replacements, should any of the field units require depot level maintenance.^{2/}

The initial effort under Project PACER DOG came on 18 September 1967,

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when a team from the 5th Tactical Control Group arrived in South Vietnam to begin installation of an MPS-11 at Trang Sup, where the ancient UPS-1A had finally started breaking down with increasing frequency. The Beneficial Occupancy Date for Trang Sup was established as 4 October 1967.^{3/}

The siting teams continued to be kept busy throughout September and October, visiting Ban Me Thuot, RVN, to make preparations for installation of an MPS-11 at Detachment 9 of the 619th there. This took place on 4 September, and was immediately followed by a siting at Detachment 8 at Ca Mau. Between 11 and 25 October, the team surveyed Mukdahan and Phitsanulok, Thailand, to obtain information required for the future deployment of MPS-14 height finders at those two units. This heavy duty height radar was scheduled to be available from the depot in November 1967 for deployment to Mukdahan, and in January 1968 for Phitsanulok. Slippage occurred on this deployment because of surface shipment and attendant corrosion and damage.^{4/}

Other stations scheduled to receive radar upgrading under the program were Nakhon Phanom, Thailand (installing an additional MPS-11 there), and Pleiku and Hon Tre in South Vietnam. These RVN stations, along with Ban Me Thuot, were all to receive the FPS-90 height finder, a heavy duty, extended range radar. The Ground Electronics Engineering and Installation Agency (GEEIA) was to perform the actual installation of these radars.^{5/}

Once begun, upgrading of the search radars in Southeast Asia proceeded rapidly. Starting with the installation of the MPS-11 at Trang Sup, RVN, this is a chronology of the operationally ready dates of the units:^{6/}

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<u>Det</u>	<u>Unit</u>	<u>Location</u>	<u>Date</u> <u>Oper Ready</u>	<u>Type Radar</u>
Det 7,	619TCS	Trang Sup, RVN	18 Oct 67	MPS-11 Search
Det 5,	621TCS	Nakhon Phanom, Thai	10 Nov 67	MPS-11 Search
Det 11,	619TCS	Ban Me Thuot, RVN	12 Nov 67	MPS-11 Search
Det 8,	619TCS	Ca Mau, RVN	24 Dec 67	MPS-11 Search
(for) Det	6-621	Clark AB, PI (Stored)	Feb 68	MPS-14 Height
Contingency		Clark AB, PI (Stored)	Feb 68	MPS-11 Search
Det 1,	620TCS	Dong Ha, RVN	4 May 68	MPS-14 Height

The MPS-14 deployed to Dong Ha was necessitated by battle damage suffered by the height finder at that site, a TPS-40. The older, hard to maintain, height radar was not scheduled to be returned to the northern I Corps installation. ^{7/}

As a Programmed Action Directive, PACER DOG was terminated on 28 April 1968. The project continued, however, with the 5th Tactical Control Group being tasked to receive and install replacement radars and return the recovered units to the Sacramento Air Materiel Area. The name PACER DOG remained in effect as the project title for upgrading the SEA radar system. ^{8/}

On 24 August 1968, an MPS-14 height finder was airlifted to Phitsanulok, Thailand, and was accepted and declared operational on 24 September. At Nakhon Phanom, Invert (Det 5, 621st TCS) officially accepted an FPS-90 height finder on 16 September. ^{9/}

Other sites scheduled to receive the updated height finders experienced some delays. At Ban Me Thuot, RVN, construction was delayed for two reasons. One, funds for letting the contract had not been received and two, a potential radiation hazard existed. The U.S. Army operated helicopters out of Ban Me Thuot that were armed with electronically detonable devices, and since they

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operated in proximity to the site of the proposed FPS-90, it was believed GEEIA should perform a radiation study.^{10/}

Plans for the installation of the MPS-14 at Mukdahan, Thailand, were completed and the equipment began arriving on the station. However, the laterite pad which was to be used for the installation had been preempted for installation of an MSQ-77 (COMBAT SKYSPOT) radar site. Discussions regarding moving the entire MPS-14 site were in progress in late December 1968, but installation of the height radar was delayed, pending the outcome of these talks.^{11/} Installation of an FPS-90 at Detachment 2, 620th TCS (Pleiku, RVN) was nearing completion, with final acceptance to take place in January 1969.

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CHAPTER III

COMMANDO INDIAN

"Unless and until a single integrated Air Traffic Control System is established, the ever present danger of mid-air collisions exists....To have an effective air traffic control system in SEA that is responsive to military requirements and can provide radar control, it is recommended that a strong position be taken on implementing the ARTC function of the SEAITACS Plan with sufficient priority established to acquire the necessary equipment and personnel."

--Maj. Gen. Gordon M. Graham
Vice Commander, Seventh Air Force

Perhaps one of the most significant developments in the control of aircraft in Southeast Asia was the initial step toward development of an effective Air Traffic Regulatory System.^{1/} Although such a plan had been approved by the Chief of Staff of the Air Force, and by CINCPACAF, diplomatic problems and low priority forced the program to remain dormant until mid-1967. The preceding quotation from Maj. Gen. Gordon M. Graham's End-of-Tour Report generated sufficient interest and correspondence which culminated in a high priority for the Air Traffic Regulation Center (ATRC) project.^{2/}

The concept of operations for ATRCs stated that "...The ATRC shall be charged with the application of air traffic control principles in a tactical or combat environment." As a component part of the Tactical Air Control System each ATRC would be sited and collocated with a Control and Reporting Center or Post, and be linked internally to enable coordination of aircraft movement data and transfer of control information to and from the CRC/CRP tactical positions.^{3/} A mandatory requirement would be instantaneous voice communications

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with adjacent airspace control authorities, terminal ATC facilities, and civilian Air Route Traffic Control (ARTC) traffic controllers.^{4/}

As initially envisioned, six ATRC elements were to be placed in selected locations to most satisfactorily cover all of South Vietnam. These were:^{5/}

Binh Thuy (formerly Can Tho), "Paddy," CRP
Tan Son Nhut (Saigon), "Paris," CRC
Ban Me Thuot, "Pyramid," CRP
Hon Tre Island, "Portcall," CRP
Pleiku, "Peacock," CRP
Da Nang (Monkey Mountain), "Panama," CRC

Operation COMMANDO INDIAN, the code name for establishing these Air Traffic Regulation Centers in South Vietnam (and others), rapidly got under way. Immediate assistance of six highly qualified air traffic control staff officers to implement and manage the program was requested. The team, headed by the Deputy Commander of the 1st Mobile Communications Group, arrived in-country on 6 November 1967.^{6/}

The 5th Tactical Air Control Group also dispatched a site survey team from Clark Air Base, P.I., to perform a site survey, prepare needed Bills of Materials (BOMs), plan equipment layout, and identify construction and power requirements. This team arrived in RVN on 17 December 1967. It was determined that four additional controller positions should be installed at each of the Hon Tre, Tan Son Nhut, and Monkey Mountain sites, and two additional controller positions at the remaining detachments, Binh Thuy, Ban Me Thuot, and Pleiku.^{7/}

COMMANDO INDIAN was carried through the initial and intermediate coordination stages with respect to operations, equipment, and manning. The primary

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manning and equipment involved in the installation of ATRC facilities were to be provided by the Air Force Communications Service. Command and Control of operations would be exercised through the normal Seventh Air Force, 505th Tactical Control Group, and the Tactical Control Squadrons.^{8/}

On 1 February 1968, the final Programmed Action Directive for COMMANDO INDIAN was published. In addition to surveying the technical sites and preparing the Bills of Materials, the 5th TCG was tasked to receive, assemble, check out, and store Communications and Electronics equipment until installation could be accomplished. Also, the 5th TCG was to assist the 505th TCG in the installation of elements at the sites.^{9/}

The project moved ahead, but slowly, through the spring of 1968, with most delays being caused by construction and housing problems. Housing was a problem at Ban Me Thuot, for example. It was solved in April by direct lease of an in-town billet. By the end of June, the construction programs for COMMANDO INDIAN were at the following stages of completion for the various sites:^{10/}

- . Paris (Tan Son Nhut) Operations Building, 2% complete, with 95% line items on hand.
- . Panama (Monkey Mountain) Operations Building, 50% complete; Ground/Air Transmitter Receiver (GATR) Building, 50% complete; new dormitory approved but not yet started.
- . Paddy (Binh Thuy) complete.
- . Pyramid (Ban Me Thuot) complete.
- . Portcall (Hon Tre Island) Operations Building, 30%; GATR, 50%.
- . Peacock (Pleiku) Operations Building, 80%; air-conditioning

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unit not yet available for installation to enable construction of required ducting.

A previously set operational date of late May was reestablished as 1 September 1968.

The first completed RVN COMMANDO INDIAN package was deployed in July at the Binh Thuy Paddy site. The primary equipment was airlifted into Binh Thuy on 9 July, with minor items following through the month and into early August. Radar and radio maintenance NCOs were loaned to Binh Thuy from the 5th TCG to assist in installation of radar scopes and air/ground radio equipment.^{11/}

By the end of September, the COMMANDO INDIAN project was well on its way to completion in South Vietnam. All new operations and radio buildings required for the program had been completed or needed only minor inside finishing. Through the final quarter of 1968, five of the six RVN detachments selected for ATRC facilities were completed. Only Portcall, on Hon Tre Island, awaited a pair of ten-ton air-conditioners to allow them to complete the installation in the new operations building.^{12/}

COMMANDO INDIAN - Thailand

Ground work with Thai authorities over the possibility of instituting a COMMANDO INDIAN program in Thailand was under way early in 1968. Oral approval for ATRCs was received; however, no action could be taken until formal approval was made by the Royal Thai Air Force (RTAF). A COMMANDO INDIAN Conference was held at Bangkok in late June 1968, to review progress of the program; to identify problem areas remaining; and to recommend actions to expedite operational dates.^{13/}

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The COMMANDO INDIAN technical site survey in Thailand was begun on 16 July 1968 when a nine-man team from the 5th Tactical Control Group, together with representatives of Thai and U.S. control agencies, surveyed Udorn, Ubon, and Green Hill sites. An informal critique was held at Bangkok following the survey, and a formal conference was set for early September to discuss and coordinate approval of the siting report with all interested agencies.^{14/}

This conference convened at Headquarters, 5th Tactical Control Group, Clark Air Base, Philippines, on 2 September 1968, with representatives from PACAF, 7AF, 13AF, and 7AF/13AF in attendance, along with representatives of the Royal Thai Air Force, Air Force Advisory Group - Thailand, and the 5th and 505th Tactical Control Groups. A final version of the site survey report was reviewed, corrected, and approved at the last meeting which was held on 6 September 68. Later, however, the recommendation was made to PACAF by the Commander, 7AF/13AF, that storage, checkout, and installation of the equipment for the project be accomplished by GEEIA (483d GEEIA Squadron), rather than the 5th TCG as was the case in COMMANDO INDIAN, RVN. It was estimated that this move would result in significant dollar savings, and would reduce 5th TCG problem areas of storage space and thinly spread personnel.^{15/}

(COMMANDO INDIAN, Thailand, received RTAF approval soon after the turn of the year. To determine the suitability of accomplishing the installation tasks, PACGEEIA was tasked to review the technical site surveys and reports. No in-country staging base had been identified, and shipment of major equipment items was delayed until this had been accomplished. Headroom spaces for AFCS personnel had not been allocated, nor had an installation start date been

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established, but it was known that the original August 1969 milestone date would have to be slipped.)^{16/}

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CHAPTER IV
TACTICAL CONTROL SQUADRON OPERATIONS

Tactical Control Squadron operations fall into several categories, which are in turn assigned appropriate priorities. Among the categories are air defense, control of strike aircraft to and from target areas, rendezvous of fighters and tankers--and in one significant instance--primary control of an area of operations during the COMMANDO HUNT campaign. Strictly speaking, the Tactical Control Groups and Squadrons are not in the Directorate of Operations. These units perform the broad organizational, administrative, and command functions, but it is the CRCs/CRPs under operational control of 7AF--part of the Tactical Air Control System--which do the "operating." Through the TACS' radars, communications facilities, scopes, and other hardware, they maintain contact with the aircraft and accordingly are directly involved with operations.

By a Letter of Agreement with the South Vietnamese Air Force and the Directorate of Civil Aviation, a general priority system was established, effective 15 April 1968, as follows:^{1/}

- Priority 1 - Active Air Defense Intercepts.
- Priority 2 - Immediate Tactical Requirements.
- Priority 3 - Other Tactical Requirements.

These priorities were applicable in South Vietnam to tactical departures and recoveries that fell within their scope. In all cases, except emergencies and search and rescue (SAR), Active Air Defense Intercept would take precedence; however, although its priority was high, its incidence was low. Intercepts

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launched out of Saigon to pick up unidentified aircraft coming toward the capital from Cambodia usually found that an international commercial carrier had penetrated RVN airspace before its flight plan had been received.

Slow moving unknowns were often reported along the northeastern border of Thailand, but they either dropped off the scope and into the ground clutter or retreated into Laos without overt hostile activity. If identified, these frequently turned out to be Thai Border police operating without a flight plan; many were assumed to be pilots engaged in smuggling between the two countries. The possibility did exist that some of these aircraft were involved in clandestine resupply of Thai Communist guerrilla elements but this was difficult to prove.^{2/} Often these aircraft were too low to be detected on radar, but were reported some days later by villagers. When they were detected, they could be tracked only for relatively short periods of time, making immediate decision and response mandatory. Thai tactical decision time at the Air Operations Center (AOC) frequently took longer than the track was on the scope, and many times, even though tactical decision response was prompt, the target had disappeared before the intercept aircraft could reach its last known position.^{3/}

As a typical indication of the low incidence of active air defense sorties, compared to tactical sorties, the 621st Tactical Control Squadron CRCs/CRPs, over a three-month period from July through September 1969, averaged only two air defense sorties a day, while averaging 612 tactical sorties, 399 tactical recoveries, and 311 rendezvous each day.^{4/}

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The low incidence of air defense sorties, however, did not lessen their importance. The potentiality for destruction, inherent in modern munitions and weapons systems, made it mandatory to investigate each unknown and be prepared to counter it, should it pose a threat. Aircraft used in Southeast Asia for air defense conceivably could have been any type; however, those used most often by the USAF were F-102s and F-4s. The VNAF relied on the F-5, while the RTAF used F-5s, F-86s and T-28s--the latter chiefly in investigating the previously mentioned low, slow border violators along their northeastern borders.^{5/}

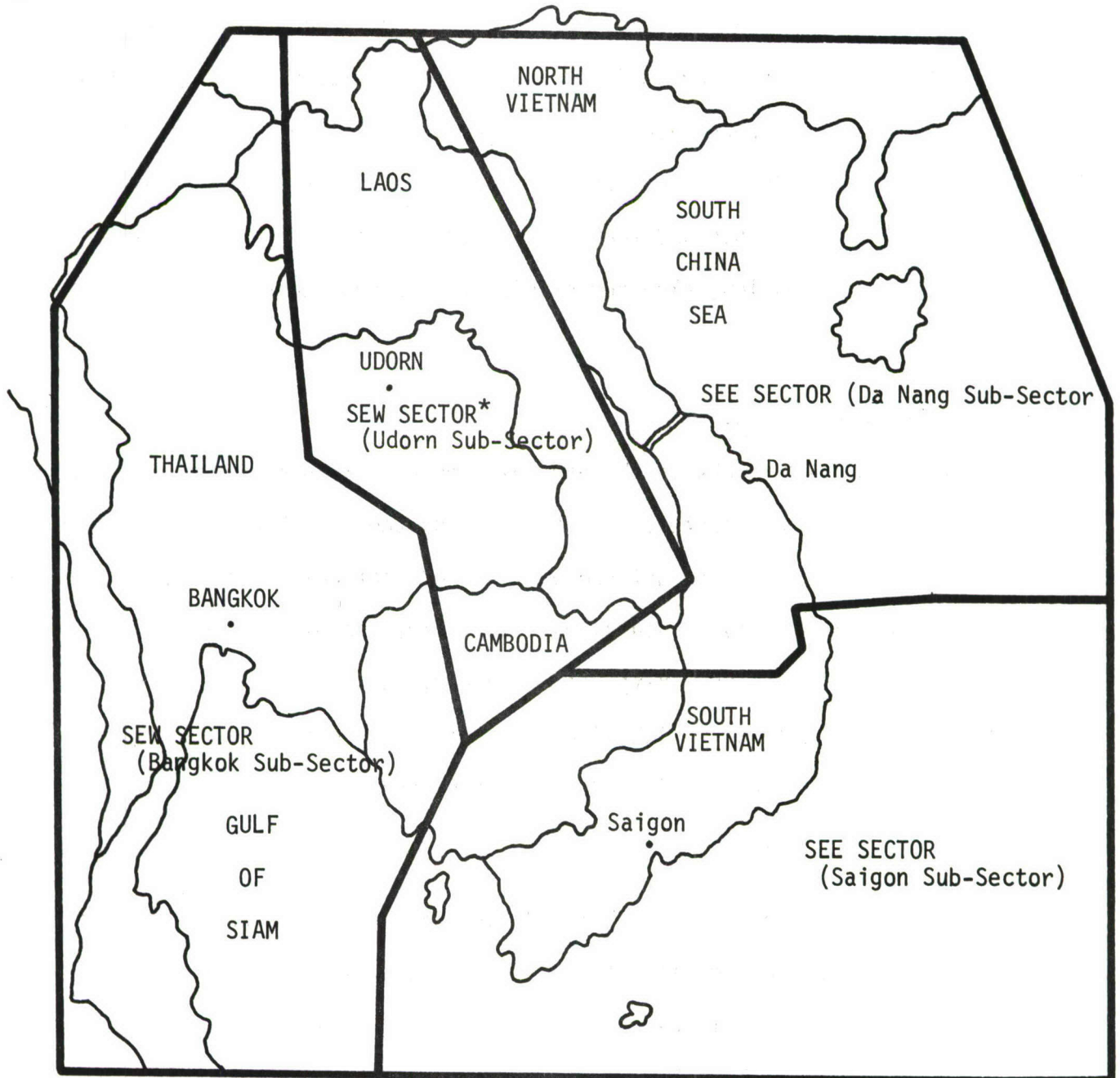
Air Refueling Operations

Not all the CRCs/CRPs in SEA had the same proportions of tasks as did others. As could be expected, Portcall, facing the open South China Sea, was not extremely active in air defense but handled tactical rendezvous in II Corps Tactical Zone (CTZ), gave navigational assistance and provided handoffs for aircraft recovering at Nha Trang, Cam Ranh Bay, and Phan Rang. Paddy, in the Delta, was not overly busy with RAPCON coordination, but did work strike aircraft over a large area and in addition had responsibility for the south end of Mango refueling anchor.

Invert, at Nakhon Phanom, Thailand, was so busy directing tactical traffic in and out of Laos (especially after the 1 November 1968 bombing halt), that it was used only as a primary refueling CRP for one track (White) and a backup for another (Lemon), while Brigham became known as the manager of "the super aerial service station that pumps more gas in 24 hours than any such operation in history."^{6/}

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AIR DEFENSE BOUNDARIES (MSEA)



LEGEND

SEE = Southeast Asia East
SEW = Southeast Asia West

FIGURE 6

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Brigham, the CRC at Udorn, was primary for Green, Orange, Red, Lemon, and Peach refueling anchors. Before the bombing halt, Brigham and the other refueling managers had been primarily involved with twice-a-day waves of fighters en route to targets in North Vietnam. With the cessation of bombing north, refueling ceased to be two concerted periods of refueling each day, but instead became a continuous 24-hour-a-day operation. In addition, the tracks were reoriented East-West instead of North-South to cover the panhandle portion of Laos.^{7/}

Figure 7 depicts the general areas of the refueling anchors in Mainland Southeast Asia, and shows the potential difficulties experienced by Weapons Controllers in the CRCs/CRPs. The anchors could, for the most part, be moved farther north to meet returning fighters having fuel difficulties, or they could be moved south, if an enemy air threat were imminent. There were nine anchors which could be used by the 621st TCS, three (two in the Gulf of Tonkin and one south of Da Nang) which the 620th TCS controlled, and Mango Anchor in the South China Sea, controlled variously by Paddy or Paris, depending upon the direction from which the fighters were coming.^{8/}

Invert - COMMANDO HUNT

As noted previously, control of tactical sorties comprised the largest single body of effort for the CRCs/CRPs. Nowhere was this more graphically proved than during the Northeast Monsoon Campaign in Laos, 1968-1969 - COMMANDO HUNT I. Close examination of the role played by Invert (Det 5, 621st TCS, Nakhon Phanom, Thailand) during this campaign would entail a look at all facets of tactical control by Control and Reporting Centers/Posts.

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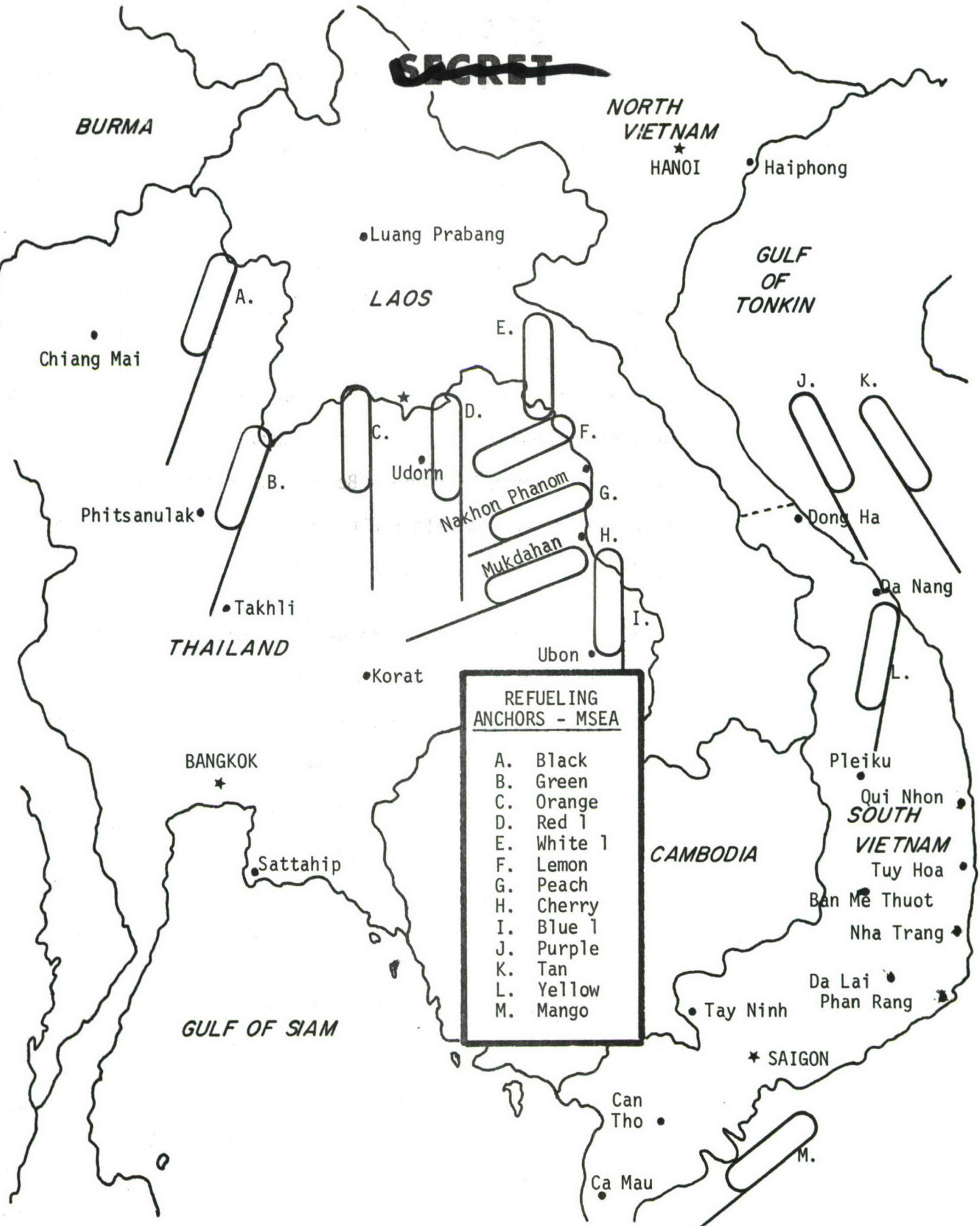
The 1 November 1968 bombing halt and subsequent intensified interdiction in Laos necessitated major shifts in the tasks with which the CRPs/CRCs were involved. Invert, which had previously been responsible for White 1 Anchor (and backup for Lemon and Peach) and radar monitoring, was drastically affected by the COMMANDO HUNT campaign. As of 1 October 1968, Invert had a mission which rarely required more than two controllers in action at any given time. By 15 November, the detachment was averaging 350 to 400 controlled tactical sorties per day in this interdiction campaign in the Laotian panhandle. Invert was responsible for monitoring the North Vietnamese Border and issuing border warnings, as well as monitoring approximately 300 FAC sorties a month and maintaining constant coordination with Sycamore, the command agency.^{9/}

Control of tactical offensive missions outside of South Vietnam had historically been the province of the Airborne Battlefield Command and Control Centers. COMMANDO HUNT was an integrated interdiction campaign which included implantation of sensors (IGLOO WHITE) along the enemy's infiltration routes in the Laotian panhandle, detection of enemy movement by the Infiltration Surveillance Center (ISC) at Task Force Alpha (TFA), operational direction by the Combat Operations Center (COC), nicknamed Sycamore, and subsequent control of tactical sorties by Invert.^{10/}

It was planned that TFA would rapidly exploit sensor information in the COMMANDO HUNT area through Sycamore/Invert. This COMMANDO HUNT area was composed of a portion of STEEL TIGER from 16°30' to 18°00'N. (Fig. 8.) The implementation of COMMANDO HUNT did not alter the relationships between the 7AF, 505th TCG, and the 621st TCS; however, it did align Detachment 5,

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MSEA - Mainland Southeast Asia
Not to Scale

FIGURE 7

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621st TCS, under Task Force Alpha to be operationally responsible to TFA. ^{11/}

The COMMANDO HUNT campaign officially started on 15 November 1968, but the Invert/Sycamore relationship had begun in October. The most immediate problem was one of educating both controllers and aircrews alike in the procedures to use. While the Tactical Air Control System in other areas of SEA had previously been involved with strike flight monitor, FAC and MSQ handoffs, departure, and recovery, etc., there had never been as heavy a load in such a confined area. In addition, COMMANDO HUNT required far more control and involvement than ever before. Detachment 5 responsibilities included the following: ^{12/}

- . Flight following or control of strike aircraft in transit to and from the target area for traffic separation and join-up with FAC.
- . Flight following, monitoring, or control of orbiting aircraft such as ABCCC, Crown (Airborne Rescue Commander), Candlestick (C-123) and Blindbat (C-130 flaeship).
- . Flight following, monitoring or control of any aircraft operating over Laos when requested.
- . Flight following, monitoring or control of FACs, reconnaissance, and support aircraft for COMMANDO HUNT.
- . Flight following and altitude separation for the ARC LIGHT (B-52s) force; issuance of Heavy Artillery Warnings to clear the drop zone of conflicting traffic.
- . Assistance to Bromo and Lid (MSQ-77, COMBAT SKYSPOT) in locating the flights that were to be conducting radar bombing, and in clearing the target area of conflicting traffic; also, control of MIGCAP forces protecting the B-52s.
- . Monitoring of the Positive Control Area from the DMZ to 18°00'N to prevent inadvertent border crossings into North Vietnam.
- . Any assistance required for conducting Search and Rescue (SAR) missions. Invert carried responsibility for assisting the Crown aircraft and other SAR forces in any manner possible, including stacking strike forces in holding patterns for possible use, and

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flight following of A-1 Sandy aircraft and CH-3 Jolly Green helicopters to and from the SAR area.

In addition to these responsibilities, Det 5 provided backup support for other missions, and backup responsibility for Lemon Anchor, as well as its Category I air defense requirement. The Positive Control Area (PCA) mentioned here was established with the advent of the bombing halt on 1 November 1968. The PCA was a ten-nautical-mile Buffer Zone parallel to the NVN Border from the Demilitarized Zone to 19°00'N-106°22'E).^{13/}

During the first few days of operation, several difficulties were met and overcome. Peaks and valleys in sortie rates were smoothed out. Controllers from the 7th Airborne Command and Control Squadron at Udorn were placed on temporary duty at TFA to help ease the transition, and aircrews were carefully briefed, so that they could adapt quickly to the new control system.^{14/}

By the time the campaign was officially launched on 15 November 68, basic procedures for the orderly conduct of the mission had been firmly established. The operation centered around three scope positions--one tactical radar monitor scope and two area control scopes. The tactical radar monitor accepted handoffs from adjacent units and monitored flights en route to the COMMANDO HUNT area. The controller at this position passed target information to the flights and in turn handed them off to the appropriate area control scope, depending upon target location. The area controller then provided vectors to FACs or target area, and provided altitude separation and traffic advisories. Upon completion of the mission, flights would contact the area controller for handoff to the tactical monitor controller or to an adjacent unit for recovery.^{15/}

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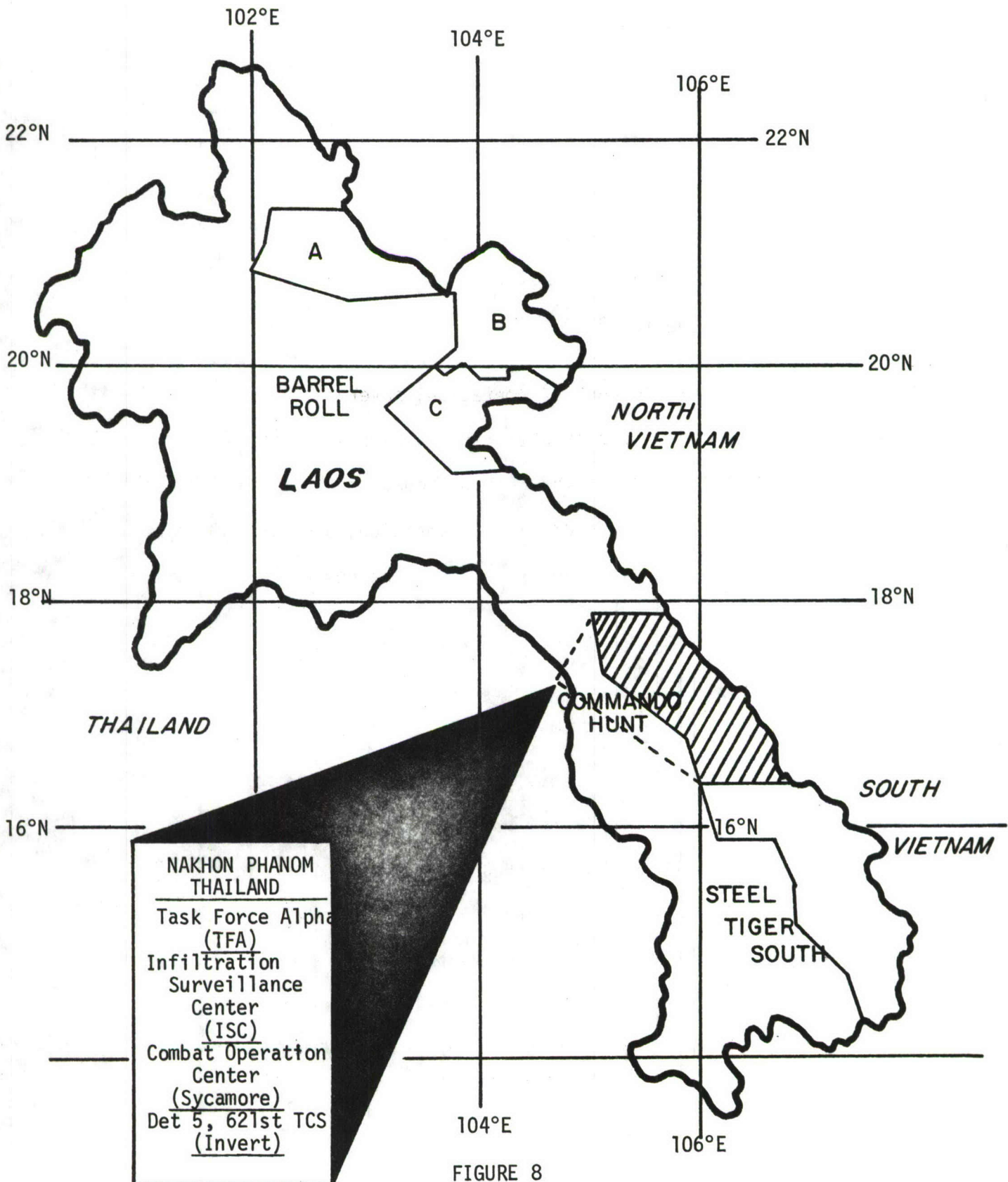


FIGURE 8

The adjacent radar units working closely with Invert on COMMANDO HUNT were Brigham CRC at Udorn, 107 NM on the 270° radial from Nakhon Phanom (NKP); Lion CRP at Ubon, 125 NM on the 175° radial; Viking CRP at Mukdahan, 50 NM on the 179° radial; and Waterboy CRP at Dong Ha, and Panama CRC at Da Nang, South Vietnam. Invert did extensive coordinating with both these sites on USAF, Marine, and Navy aircraft entering COMMANDO HUNT from South Vietnam. ^{16/}

The use of Control Points was precipitated by the COMMANDO HUNT program, to provide strike missions with reference points for flight planning purposes and to facilitate entrance control of the strike forces into the target areas by functioning as holding points. Eight Control Points were selected, identified by TACAN channels and located on TACAN DME radials. They were as follows: ^{17/}

<u>CONTROL POINT</u>	<u>LOCATION</u>	<u>COORDINATES</u>	<u>CONTROL AGENCY</u>
#51 Ch 51	R-045/65NM	1601N/10940E	Lion - Ubon, Thailand
99 Ch 99	045/25NM	1656N/10502E	Viking - Mukdahan
89 Ch 89	005/45NM	1807N/10443E	Brigham - Udorn
69 Ch 69	265/45NM	1619N/10656E	Waterboy - Dong Ha, RVN
77 Ch 77	240/60NM	1532N/10720E	Panama - Da Nang, RVN
72 Ch 72	345/35NM	1610N/10621E	Lion - Ubon
70 Ch 70	015/75NM	1834N/10308E	Brigham - Udorn
79 Ch 79	360/25NM	1934N/10254E	Brigham

All jet flights fragged into Laos were assigned a control point and a control point time; these were listed in the daily STEEL TIGER and Alpha Frags and the 7AF Specification Operations and advisories. Each flight was to arrive at its control point at an altitude assigned by the appropriate CRC/CRP and as close as possible to the assigned time. Normally, the flight contacted Sycamore for mission instructions five minutes prior to arriving at the holding point,

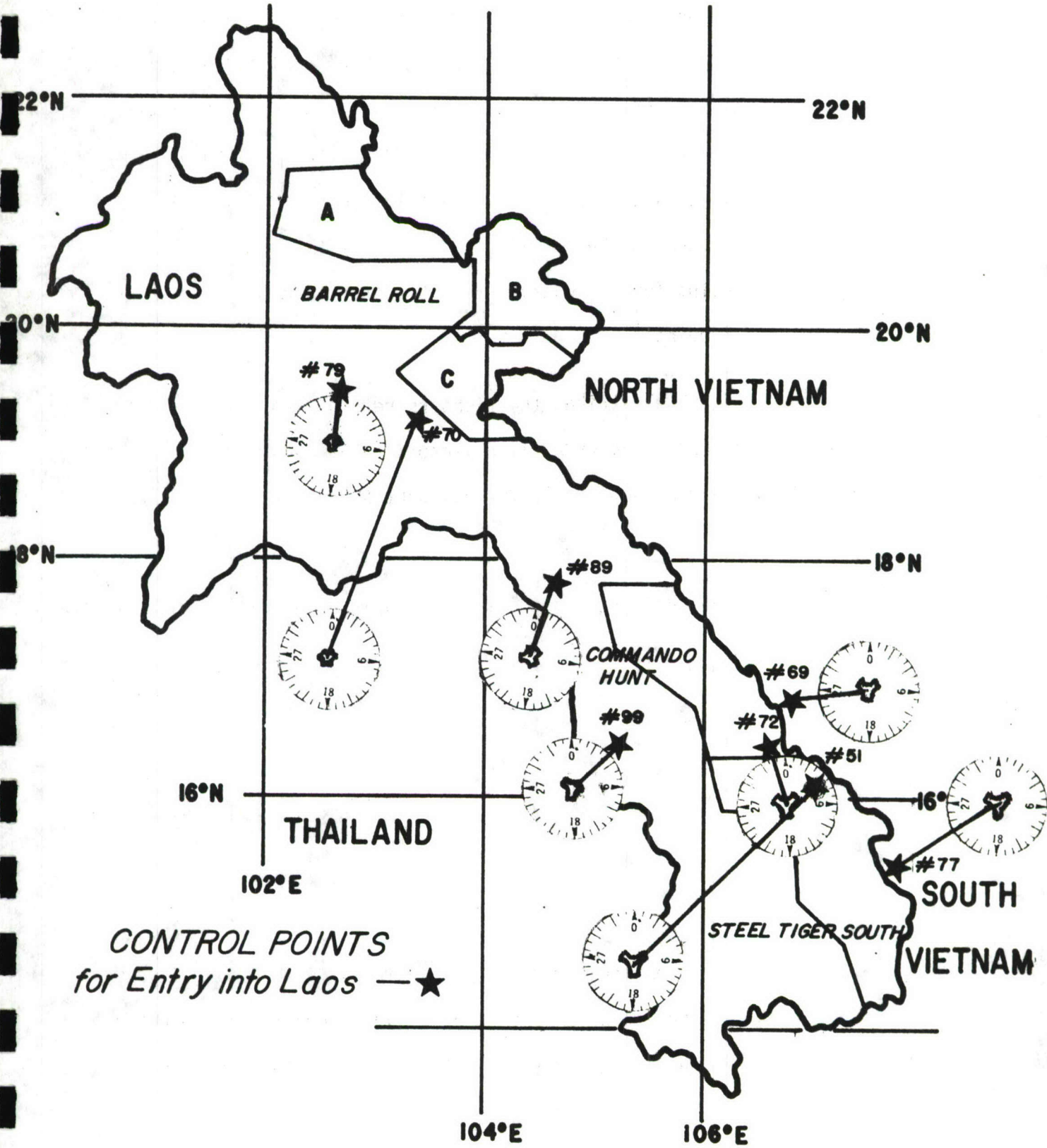
then upon receiving them, it contacted Invert. If mission instructions had not been received prior to a flight's arrival at its holding point, or if directed by Invert, the flight would set up a left hand holding pattern between the control point and a point 15 miles farther away from the TACAN station and on the control point radial. The tasked CRC/CRP continued to provide control until Invert/Sycamore was ready to assume control of the flight for vectoring to the appropriate FAC or MSQ Initial Point (IP). Normally, the flight, upon contacting Invert, was vectored directly to his FAC or IP, by-passing the control point.^{18/}

After a COMMANDO HUNT strike, the fighters returned to Invert's area control primary frequency and were given vectors out of the area; subsequently they were followed and handed off to the adjacent sites for refueling or recovery control.^{19/}

From 15 November 1968 until 30 November, Invert provided radar monitoring or control for:^{20/}

Jet strike sorties	3,236	
Prop strike sorties	481	
COMBAT SKYSPOT sorties (MSQ)	1,421	
Support Sorties	98	
FAC sorties	700	(An additional 2,021 Non-COMMANDO HUNT sorties were provided monitor/control services.)
Recce sorties	340	
Total sorties	6,276	

After the November period, COMMANDO HUNT statistics were tabulated by number of missions rather than sorties. This gave a more realistic picture of Invert's workload during December and the ensuing months. For December



*CONTROL POINTS
for Entry into Laos* — ★

104°E

106°E

FIGURE 9

1968, the statistics were as follows: ^{21/}

Jet strike missions	3,050
Prop strike missions	703
COMBAT SKYSPOT	569
Support missions	302
FAC missions	1,368
Recon missions	801
Non-COMMANDO HUNT	3,000
TOTAL	9,793

This figure, averaging about 10,000 missions per month, was maintained throughout the balance of the COMMANDO HUNT campaign. At times, Invert monitored or controlled a "mission a minute," no mean task for a CRP with eight control positions and 25 controllers. ^{22/}

Other Missions - Other Tasks

In the I Corps Tactical Zone, RVN, the Tactical Control Squadrons worked closely with similar control agencies of other services, particularly with the United States Marine Corps (USMC). The Marine CRP in I Corps, "Vice Squad," was also located at Da Nang, not far from Panama, on Monkey Mountain. Although similar in function to its USAF counterpart, there were differences in procedures and especially in terminology. Under the Single Management concept, the Marine tactical fixed-wing strike and reconnaissance assets came under the TACC as of 10 March 1968. Subordinate to the TACC was the Tactical Air Direction Center (TADC), the Command Post of the Commanding General, 1st Marine Air Wing. The TADC normally passed all its aircraft to one of its subordinate Direct Air Support Centers, (DASCs) Air Support Radar Teams (ASRTs) for strike direction, depending upon the nature of the mission. ^{23/}

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The Marines had five DASCs in I Corps located at Khe Sanh, Dong Ha, Phu Bai, Da Nang, and Chu Lai; these were all collocated with ground element Fire Support Coordination Centers (FSCC). If these agencies received USAF support, they handled it as if it were Marine airpower, whether it were for close air support or tactical air support. As long as it was visual bombing, the DASCs would pass the air resources on to a terminal controller, ground or air--TAC(G) or TAC(A)--for expenditure.^{24/}

The ASRTs were the Marine version of the USAF MSQ-77 precision radar bombing sites. The Marine equipment, the TPQ-10, however, did not have the range of USAF radar, nor was it compatible with the Air Force X-band transponder beacon; it thus shortened the range even more--to about 20 nautical miles. Once within "skin paint" distance, however, it was extremely accurate. Six ASRTs were located in I Corps, one at Khe Sanh, one at Phu Bai, two at Dong Ha and two at Da Nang.^{25/}

The USMC equivalent to the USAF Control and Reporting Post was their Tactical Air Operations Center, nicknamed Vice Squad. It was tasked, under the Marine concept, to direct and control anti-air warfare operations. In the I Corps environment, however, it was used much as the Air Force employed its CRCs/CRPs--to control strike aircraft in CAS, TAS, or interdiction functions. When used by USAF aircraft, Vice Squad primarily provided radar vector to a predetermined orbit point, and handoff to a TPQ-10 site which was ready to handle the aircraft. Vice Squad was also used to steer aircraft to an overwater Marine refueling anchor, Call Sign Basketball. This tanker, a KC-130 probe and drogue refueler, had a standard orbit at 14,000 feet, 50 nautical miles from

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Da Nang on the 090° radial of Channel 77, the Da Nang TACAN. Basketball operated two cycles a day, one from 0800 to 1100 hours and one from 1300 to 1700 hours. ^{26/}

In the event an aircraft on Barrier Combat Air Patrol (BARCAP) guarding YANKEE STATION against enemy air attack from NVN, developed fuel problems, Vice Squad could arrange rendezvous by sending Basketball north if necessary. The U.S. Navy also kept a contingency tanker, either A-3 or A-6, over YANKEE STATION for any of its aircraft overhead without sufficient fuel for safe recovery on the carriers. ^{27/}

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FOOTNOTES

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1. (S) CHECO Rprt, Hq PACAF, DOTEK, "Air Traffic Control in SEA," 14 Feb 69.
2. (S) Hist Rprt, 5th TCG.
3. (S) Hist Rprt, 13AF, Jul-Dec 63.
4. (C) Interviews with Earl Buss, ATC Advisor to Hq 7AF/13AF, Udorn, Thailand, by Project CHECO personnel;
(C) Interviews with Al Barker, ATC Advisor to Hq 7AF, TSN, RVN, by Project CHECO Personnel;
(C) Interviews with Robert Powell, ATC Advisor, CAAG, USOM, Thailand, by Project CHECO personnel.

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1. (S) Hist Rprt, 5th TCG, 62.
2. Ibid;
(C) Oral Discussion, Capt Richard A. Zern, Asst Staff Ops Off, 621st TCS, Udorn, Thailand, and Mel Porter, Hq 7AF, DOAC, 14 Oct 69.
3. (S) Hist Rprt, 5th TCG, 62.
4. (S) Hist Rprt, 13AF, Jul-Dec 63.
5. Ibid.
6. Ibid.
7. Ibid.
8. (C) Special Research Project, Mel Porter, Hq 7AF, DOAC, Aug 63-Jun 64.
9. (U) SO G-5, Hq PACAF, 8 Jan 64.
10. (S) Input, MonEval, 2d Air Div to MACV, 3 May 64.
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12. (S) Hist Rprt, 5th TCG, Jul-Dec 64.
13. (C) Hist Rprt, 5th TCG, Jul-Dec 64.

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14. Ibid.
15. (C) Hist Rprt, 2d Air Div, Jul-Dec 64.
16. (S) Hist Rprt, 5th TCG, Jan-Jun 65.
17. Ibid.
18. Ibid.
19. (U) SO G-106, Hq PACAF, 30 Jul 65.
20. (U) SO G-195, Hq PACAF, 8 Nov 65.
21. (U) SO G-236, Hq PACAF, 21 Dec 65.
22. (S) Hist Rprt, 5th TCG, Jan-Jun 66.
23. (S) Input, MonEval, 2d Air Div to MACV, 10 Jan 66.
24. (U) SO G-48, Hq PACAF, 18 Feb 66;
(U) Study Guide, TACS, Thailand.
25. Ibid;
(U) Study Guide, Stan/Eval, "Paris Control."
26. (S) Hist Rprt, 5th TCG, Jan-Jun 66.
27. (S) Ltr, Hq PACAF, subj: Radar Siting Rprt (Takhli), 20 Jul 66.
28. (S) Hist Rprt, 5th TCG, Jul-Dec 66.
29. Ibid.
30. (S) Hist Rprt, 5th TCG, Chronology of Significant Events, Jan-Jun 67.
31. (S) Ltr, 7AF, subj: Radar Deployment, 20 Oct 66.
32. (S) Ltr, 7AF, subj: Radar Deployment, 20 Oct 66.
33. (S) Msg, 5th TCG, DCM/235, subj: Hon Tre Deployment, Nov 66.
34. (S) Msg, 7AF DEOR 96659, subj: Hon Tre Deployment;
(S) Msg, CINCPACAF, DOCO/DNMA, 33195, subj: Radar Deployment.
35. (S) Hist Rprt, 5th TCG, Chronology of Significant Events, Jan-Jun 67.
36. (S) Cmd Status Rprt, Hq 7AF, Jan 67;
(S) Standard Briefing, 621st TCS, Udorn, Thailand;
(S) Interviews, Maj Charles R. Giddings, Asst Ops Off, 505th TCG,
TSN, RVN, with CHECO Personnel, 20 Nov 69.

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37. (S) Hist Rprt, 5th TCG, Chronology of Significant Events, Jan-Jun 67.
38. (S) Msg, 5th TCG, DCOP, 01356, subj: Interim Radar Survey, May 67.
39. (S) Hist Rprt, 5th TCG, Jan-Jun 67.
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41. (U) SO G-120, Hq PACAF.
42. (S) Hist Rprt, 505th TCG, Jan-Mar 68, pg 6;
(S) Hist Rprt, 5th TCG, Chronology of Significant Events, Apr-Jun 68.
43. (U) Hist Rprt, 5th TCG, Chronology of Significant Events, Oct-Dec 68.
44. (C) Msg, Chief of Staff, 7AF to COMUSMACV, subj: Det 1, 619th TCS, 081050Z Dec 68;
(U) Historical Data Record, Det 1, 619th TCS, Jan-Mar 69.

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1. (S) Input, Hist Rprt, Det 7, 619th TCS, Jul-Sep 67. (Extract is UNCLASSIFIED.)
2. (S) Hist Rprt, 5th TCG, Jul-Sep 67.
3. (S) Input, Hist Rprt, Det 7, 619th TCS, Jul-Sep 67. (Extract is UNCLASSIFIED.);
(S) Hist Rprt, 5th TCS, Jul-Sep 67.
4. (S) Hist Rprt, 5th TCS, Jul-Sep 67.
5. (S) Hist Rprt, 505th TCG, Apr-Jun 68.
6. (S) Hist Rprt, 5th TCG, Chronology of Significant Events, Oct-Dec 67;
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8. (S) Hist Rprt, 5th TCG, Chronology of Significant Events, Apr-Jun 68.
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(U) Installation Inspection Certificates, CEM, 4 Sep 68, 16 Sep 68.
10. (S) Hist Rprt, 5th TCG, Oct-Dec 68.

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11. Ibid.

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1. (S) End-of-Tour Rprt, Vice Comdr, 7AF, Maj Gen Gordon M. Graham, 1 Aug 67.
2. (U) Briefing Guide, COMMANDO INDIAN Project, undated.
3. (U) Air Traffic Regulatory Element, RVN, undated.
4. Ibid.
5. (S) Hist Rprt, 5th TCG, Oct-Dec 67.
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7. Ibid.;
(S) Msg, CINCPACAF, Dept 122110, subj: COMMANDO INDIAN, Dec 67.
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(U) PAD 68-113, 7AF, 1 Feb 68.
10. (S) Hist Rprt, 505th TCG, Apr-Jun 68.
11. (C) Msg, 5th TCG, DOCP, 100845Z Jul 68;
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(C) Msg 5th TCG, DOCP, subj: Interim Operations Rprt, 260927Z Jul 68.
12. (U) Hist Rprt, 505th TCG, Oct-Dec 68.
13. Ibid.
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APPENDIX I

EQUIPMENT USED BY TACS - SEA

RADAR

- . AN/MPS-11 One of the most widely used radars in SEA. Although 20 years old, this mobile tactical radar was equipped with parametric amplifiers which increased its radar paint characteristics out to over 200 nautical miles. Other characteristics and performance data were: Frequency range 1,280-1,350 MC, frequency band "D", peak power output 1 megawatt, both normal and Moving Target Indicator (MTI) receivers.
- . AN/FPS-8 High power, heavy duty "Penny Ton" radar. (Similar long-range capabilities as MPS-11.
- . AN/FPS-100A Dual channel installation designed for long-range search operation. Each channel contained complete transmitting, receiving, monitoring and control systems. In normal use, one channel fed the antenna while the other fed a dummy load. A switching system permitted changing the output connection of the two channels so the active channel became the standby channel and visa versa. This switching enabled fast changing of operating frequency for antijamming purposes. Characteristics and data: two megawatts peak power at a pulse width of six microseconds and pulse repetition frequency (PRF) of approximately 360 pulses per second (PPS). Average power approximately 4,300 watts. Operating frequency variable between 1,250 and 1,350 megacycles. Each channel capable of being retuned independently and retuned five times within a one hour period. FPS-100A could detect a one square meter target at a distance of 200 miles.
- . AN/FPS-20 High-powered, long-range, fixed-range early warning radar. Dual channel, dual modulator, 2 megawatt, 220-mile search system used for track in range and azimuth. Provided search information for computers, height finders, ground-controlled intercept (GCI) and target position indicators.
- . AN/TPS-40 Modified version of AN/MPS-16. Long-range, high-powered, mobile height finder with a maximum range of 100 NM and a maximum height range capability of 100,000 feet. Other characteristics and data: frequency range 5,280 megacycles + 30, frequency band "G" and peak power output 1 megawatt. Several ECCM features to allow it to operate in an ECM environment.

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- . AN/FPS-90 High powered, long-range, fixed-range height finder for use in association with a search radar of comparable range capability. The FPS-90 had a maximum range of 200 NM and a maximum height range capability of 75,000 + feet. Characteristics and performance data: Frequency range 2,700-2,900 MCS, frequency band "G" and peak power output 5 megawatts. ECCM features.

RADAR SCOPES

- . AN/UPA-35 Scope indicator group with a universal type of plan position indicator (PPI), sometimes referred to as the "Cadillac" of manual control consoles. Sophisticated features and easily read displays greatly enhanced the weapons control function.
- . GPA-126 The GPA-126 radar scope, formerly designated as the OA-99, was one of the older consoles in use; has been retained by the TACS system because of its simplicity in design, dependability, and minimum maintenance requirements. While the GPA-126 did not have all of the sophisticated features of the UPA-35 (such as a cursor, large and brilliant display, etc), it did possess all of the basic features necessary to accomplish any weapons control mission.

IFF/SIF Systems

- . GPA-122 Encoder/decoder provided the controller in the manual system with many capabilities never available previously. The system was a digitized, transistorized type and provided the following:
 - . Simultaneous tracking of six different modes and codes.
 - . Three distinguishable displays for beacon decoding.
 - . Both an audible and a visual emergency alarm system, in addition to the standard PPI display.
 - . A degarble feature which eliminates false decodes generated by aircraft in proximity to one another.
 - . An IP (flash) feature, which allows, when activated, the three different flash returns to be displayed as the standard double bar return on the PPI.

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COMMUNICATIONS

- . AN/ARC-1 An AM, VHF, voice airborne radio set capable of operating on any one of 10 pre-set channels in the 100-156 MCS range.
- . AN/ARC-3 An AM, VHF, voice airborne radio set capable of operating in any one of 8 pre-set channels in the 100-156 MCS range.
- . AN/ARC-5 An AM, CW, or voice airborne multi-channel transmitting and receiving set capable of operating the 0.5 - 9.1 MCS or 100-156 MCS range, depending upon transmitting/receiving groups installed.
- . AN/ARC-8 An AM, LF & HF voice airborne radio set capable of operating in the 0.2 - .5 and 2-18 MCS range.
- . AN/ARC-12 An AM, VHF, voice radio set capable of operating on any one of 9 pre-set channels plus guard in the 225-350 MCS range.
- . AN/ARC-27 An AM, UHF, voice, airborne radio set capable of operating on any one of 18 pre-set channels of 1,750 available plus guard in the 225-399 MCS range.
- . AN/ARC-34 An AM, VHF, voice, airborne radio set capable of operating on any one of 20 pre-set channels of 1,750 available in the 225-339.9 MCS range.
- . AN/ARC-44 An FM, HF-VHF voice airborne radio set capable of operating on any frequency in 0.1 MCS increments in the 24-49.9 MCS range. Primarily used for communications with AN/PRC-10 equipped ground stations.
- . AN/ARC-45 An AM, UHF, voice, multi-channel airborne radio set capable of operating on any one of 12 pre-set channels in the 225-339.9 MCS. Range tuned in increments of 0.1 MCS.
- . AN/ARC-49 An AM, VHF, voice airborne radio set capable of operating on any one of 48 pre-set channels in the 100-150 MCS range.
- . AN/ARC-55 An AM, UHF, voice airborne radio set capable of operating on any one of 18 pre-set channels of 1750 available plus guard in the 225.399.9 MCS range.
- . AN/ARC-59 An AM, HF, voice, airborne radio set capable of operating on any one of 20 pre-set channels of 166 available in 2-18.5 MCS ranges. Tuned in increments of 0.1 MCS.

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- . AN/ARC-60 An AM, UHF, voice airborne radio set capable of operating in any of 16 pre-set channels (receiver continuous tuning) in the 228-258 MCS range. Transmitter tuned in increments of 0.1 MCS.
- . AN/ARC-65 An AM, HF, voice, airborne transceiver set capable of operating on any one of 20 pre-set channels of 44,000 available in the 2-23,995 MCS range. Tuned in increments of 0.5 MCS.
- . AN/ARC-73 (Collins VHF 101) An AM, VHF, voice, airborne radio set capable of operating on any one of 720 pre-set channels. Set tuned in 0.050 MCS increments. Transmitting range, 116-151.95 MCS. Receiving Range, 116-151.95 MCS.
- . AN/ARC-77 An AM, HF, voice, airborne radio set.
- . AN/FGC-52 Kleinschmidt teletypewriter terminal equipment used on the secure teletype circuits.
- . AN/GRC-10 An FM radio relay facility providing 4 channel telephone teletype, or facsimile service. Frequency range 54-70-9 MCS. Range 30-50 miles. Used in the RVNCS.
- . AN/GRC-27 An AM, UHF, voice, ground radio set capable of operating on any of 10 pre-set channels of 1750 available in the 225-399.0 MCS range. Primary use G/A.
- . AN/GRC-32 An AM, UHF, voice ground radio set capable of operating on any any of 18 pre-set channels of 1,750 available in the 225-399.9 MCS range. Primary use G/A.
- . AN/GRT-3 A single channel ground UHF transmitter capable of operating on any frequency in the 225-399.9 MCS.
- . AN/GRR-7 A single channel UHF ground receiver capable of receiving on any frequency in the 225-399.9 MCS range.
- . AN/GTA-6 A telephone terminal system designed to meet the needs of a radar site complex. Used in the AOC, GRC, and CRP's.
- . AN/MRC-85 72 channel tropospheric scatter equipment presently providing 68 voice and 48 teletype circuits. Used in the RVNCS at Phulan, Nha Trang, Pleiku, Qui Nhon, and Da Nang.
- . AN/MRC-94 Vehicular mounted assemblage of an AN/TRC-75 which is voice, HF, SSB, transceiver capable of operating in the 2-30 MCS range, with 1 KW of power, the Collins VHF 101 (AN/ARC-73) set and the AN/ARC-27 UHF set.

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- . AN/PRC-10 An FM, HF-VHF voice ground radio capable of operating on any frequency in 0.1 MCS increments in the 38-54.9 MCS range. Approximately 18,000 AN/PRC-10 have been sent to the RVN and it was the most available radio equipment for use by ground forces for A/G communications. Battery operated with a total weight of approximately 25 lbs. Power output approximately 1 watt. It was temporarily installed in some USAF, VNAF aircraft for air/ground communications.
- . AN/TRC-24 An FM, 12-channel voice or teletype radio relay facility operating in the frequency range 50-600 MCS, A, 50-100 MCS, B, 100-225 MCS, C, 225-400, D, 400-600 MCS. Used in the RVNCS.
- . AN/TRC-29 An FM or PRM 48-channel microwave radio relay system capable of operating in the frequency range 1,700-2,400 MCS. Range 25 miles or line of sight. Programmed for use in the RVNCS.
- . AN/TRC-32 A shelter containing two each AN/GRC-27. Primary use G/A.
- . AN/TRC-90 A 24-voice and 16-teletype channel tropospheric scatter system. Frequency range 4,400-5,000 MCS. Used in the RVNCS.
- . AN/TRR-7 A shelter containing two BC 1,421, VHF, AM receivers capable of receiving on any frequency between 100-156 MCS. Primary use G/A.
- . AN/TRT-3 A shelter containing two BC 640 channel transmitters capable of transmitting on any frequency between 100-156 MCS, crystal controlled. Primary use G/A.
- . AN/TSC-15 An HF, SSB, shelter mounted radio system capable of handling 3 voice & 4 teletype channels simultaneously. Frequency range 2-30 MCS in 1 KC increments. USAF back-up for RVNCS.
- . AN/URR-27 A ground non-tactical VHF voice receiver designed for operation as a pretuned, single channel receiver but with provisions for continuous tuning. Frequency operating range 103.9 - 191.9 MCS. Primary use G/A.
- . AN/URT-7 A ground voice or CW, VHF, radio set capable of operating on any one of 4 pre-set channels in the 115-156 MCS range. Primary use G/A.
- . Collins 618 S-1 An airborne AM, HF radio set operating in the 2-30 MCS range.

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- . Collins 618T -3 (Collins HF 103) An airborne SSB transceiver operating in the 2-30 MCS range. It is Tunable in 0.1 steps.
- . Collins KWM-2A A voice HF, SSB, radio transceiver capable of operating in the 3-4.5 and 6-30 MCS range. Used primarily among ASOCs, ALOs, and deployed contingency.
- . KW-26 Synchronous crypto device used to provide on-line encryption for the secure teletype circuits.
- . TA-34/pt A portable, general purpose, field telephone that can operate with any field switchboard.
- . TA-312/pt Replacement for TA-34/pt.

Equipment Used in the Air Request Net of ARVN AAGS:

- . AN/GRC-9 An AM, HF, voice or CW lightweight man transportable front line radio set capable of operating in the 2-12 MCS range. Particularly adopted to jungle operation.
- . AN/GRC-26 Mobile radio teletype station for use at Division Army or Corps level. AM, voice, CW, or frequency shift capability. Frequency range, basic model, receive 1.5-18 MCS, transmit 2-18 MCS; "D" model, receive 0.5-32 MCS, transmit 1.5-20 MCS.
- . AN/GRC-87 An AN/GRC-9 with a hand crank generator for field use. Same capability as AN/GRC-9.
- . AN/SCR-188 or AN/SCR-193 A vehicular mounted HF, AM, voice, or CW radio set capable of transmitting in the 1.5-6.2 MCS range and receiving in the 1.5-18 MCS range. Nomenclature depended on the type of vehicle in which the equipment was installed.
- . AN/PRC-10 An FM, HF-VHF, voice ground radio capable of operating on any frequency in 0.1 MCS increments in the 38-54.9 MCS range. Used for point-point and ground to air communications.
- . AN/VRC-30 A vehicular mounted assemblage of the following:
AN/ARC-27, (AM, UHF, 225.0-399.9 MCS); AN/TRC-7, (AM, VHF, 100-156 MCS); AN/PRC-9, (FM, HF-VHF 27-38.9 MCS); AN/VRC-14, (FM, HF-VHF 27-38.9 MCS). Used primarily for ground to air communications.

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Equipment used in the Civilian Communications Network. This net was established by the American Embassy through the United States Operations Division. This network united most of the hamlets, villages, districts, and province headquarters. Requests for air support were often forwarded over this system to province headquarters.

- . Radio Industries HT-1 A VHF, AM, Voice, transistorized hand carried portable transceiver powered by flashlight batteries. Frequency range 30-40 MCS. Power output about 1 watt. Usually found at hamlets and villages.
- . Radio Industries TR-5 A VHF, AM, Voice or CR transistorized transceiver with a power output of 5 watts. Frequency range 30-40 MCS. Power output about 1 watt. Usually found at villages and districts.
- . Radio Industries TR-20 - TR-35 Same as TR-5 except that the TR-20 has a 20 watt output. Usually found at districts and provinces.
- . Dial Tele A general purpose telephone instrument used on common-user dial systems.
- . AN/TTC-7 Central office telephone manual 3 position multiple field telephone exchange; local or common battery lines; basic equipment capacity 180 local subscribers and 20 trunk lines.
- . AN/MTC-1 Basically same as AN/TTC-7 except mounted in 2 mobile vans (1 each AN/MTA-3) (2 ea AN/MTA-4)
- . Tele cable The common telephone cable in use is WD-1/TT single pair field wire and 5 pair and 26 pair field cable.
- . R-508/9/11 An AM, voice, VHF, airborne radio receiver having continuous tuning over the 118-148 MCS range.
- . T-363/366 An AM, voice, VHF airborne transmitter having 5 pre-set channels in the 132-148 MCS range.

Point to point usually by wire, dependable, but in certain regions not practical due to the terrain or distance required. Alternate for wire microwave. It operated in the UHF band, dependable but limited to line of sight.

HF Single Side Band (SSB), back-up form of communications. Requires more power to operate and easily affected by weather or by hostile action.

Direction Finders, used primarily for navigation assistance to aircraft.

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Teletype, used extensively in the air control system for sending messages, flight plans, weather reports, status reports, etc. fast method of communicating.

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GLOSSARY

AC&W (or ACW)	Aircraft Control and Warning
ACC	Area Control Center
ADCC	Air Defense Control Center
ADF	Air Defense Force
ADVON	Advanced Echelon
AFCS	Air Force Communications Service
AFSC	Air Force Systems Command
AM	Amplitude Modification
AOC	Air Operations Center
ARCP	Air Refueling Control Point
ARCT	Air Refueling Control Time
ARTC	Air Route Traffic Control
ASR	Area Surveillance Radar
ASRT	Air Support Radar Team
ATC	Air Traffic Control
ATCS	Air Traffic Control System
ATRC	Air Traffic Regulation Center
BARCAP	Barrier Combat Air Patrol
BDA	Battle Damage Assessment
BOD	Beneficial Occupancy Date
BOM	Bill of Material
CAP	Combat Air Patrol
CAS	Close Air Support
CINCPAC	Commander-in-Chief, Pacific Command
CINCPACAF	Commander-in-Chief, Pacific Air Forces
COC	Combat Operations Center
COMSEC	Communications Security
COMUSMACTHAI	Commander, United States Military Assistance Command, Thailand
COMUSMACV	Commander, United States Military Assistance Command, Vietnam
CONUS	Continental United States
CRC	Control and Reporting Center
CRP	Control and Reporting Post
CTZ	Corps Tactical Zone
CW	Continuous Wave
DASC	Direct Air Support Center
DCA	Defense Communications Agency (U.S.); Directorate of Civil Aviation (Vietnam)
DLM	Depot Level Maintenance
DME	Distance Measuring Equipment
DMZ	Demilitarized Zone

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E&I	Engineering and Installation
ECM	Electronic Countermeasures
ECCM	Electronic Counter-Countermeasures
FAC	Forward Air Controller
FACP	Forward Air Control Post
Flt	Flight
FM	Frequency Modulation
FSCC	Fire Support Coordination Center
GATR	Ground/Air Transmitter Receiver
GCA	Ground-Controlled Approach
GCI	Ground-Controlled Intercept
GEEIA	Ground Environment Engineering and Installation Agency
HF	High Frequency (Radio)
IFF	Identification, Friend or Foe
IMC	Instrument Meteorological Conditions
IFR	Instrument Flight Rules
IP	Initial Point
ISC	Infiltration Surveillance Center
ITACS	Integrated Tactical Air Control System
IWCS	Integrated Wideband Communications System
LST	Landing Ship, Tank
MACThai	Military Assistance Command, Thailand
MACV	Military Assistance Command, Vietnam
MAP	Military Assistance Program
MAW	Marine Air Wing
MCG	Mobile Communications Group
MTI	Moving Target Indicator
NCO	Noncommissioned Officer
NM	Nautical Mile
NORM	Not Operationally Ready, Maintenance
NORS	Not Operationally Ready, Supply
NVN	North Vietnam
OCAMA	Oklahoma City Air Materiel Area
OPR	Office of Primary Responsibility
OR	Operationally Ready
PACAF	Pacific Air Forces
PACGEEIA	Pacific Ground Environment Engineering and Installation Agency
PAD	Programmed Action Directive
PAR	Precision Approach Radar
PCA	Positive Control Area

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PCS	Permanent Change of Station
PPI	Plan Position Indicator
PPS	Pulse Per Second
PRF	Pulse Repetition Frequency
RAPCON	Radar Approach Control
ROD	Recommended Operational Date
RP	Reporting Post
R.P.	Republic of the Philippines
RTAF	Royal Thai Air Force
RTAFB	Royal Thai Air Force Base
RVN	Republic of Vietnam
SAR	Search and Rescue
SEA	Southeast Asia
SEADAB	Southeast Asia Data Base (File)
SEAITACS	Southeast Asia Integrated Tactical Air Control System
SIF	Selective Identification Feature
SMAMA	Sacramento Air Materiel Area
SSB	Single Sideband
TAC	Tactical Air Command
TACAN	Tactical Air Navigation
TACC	Tactical Air Control Center
TACP	Tactical Air Control Party
TACS	Tactical Air Control System
TADC	Tactical Air Direction Center
TAS	Tactical Air Support
TCG	Tactical Control Group
TCS	Tactical Control Squadron
TDY	Temporary Duty
TFA	Task Force Alpha
UHF	Ultra High Frequency
UR	Unsatisfactory Report
USMC	United States Marine Corps
VHF	Very High Frequency
VOR	Visual Omnidirectional Range
WC	Weapons Controller
WT	Weapons Technician