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Technical Report
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FINAL REPORT ON COUNTERINSURGENCY RESEARCH AND ANALYSIS IN THAILAND (U)

By

YORK LUCCI

Prepared for:

U.S. ARMY MISSILE COMMAND
REDSTONE ARSENAL, ALABAMA

CONTRACT DA-31-124-ARO-D-200

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ABSTRACT (U)

(U) Stanford Research Institute's counterinsurgency research in Thailand during a five-year period (April 1964 to February 1969) is summarized in this final report. Most of this research was in four major categories:

(U) Insurgency in Southern Thailand. The Communist Terrorist Organization (CTO) of the South, associated with the Malayan Communist Party, was investigated extensively as to its organization, strength, and deployment. Analyses were made of the CTO camp system and logistic support system; the susceptibility of these systems to detection and interdiction; and the measures necessary for an effective counterinsurgency program.

(U) Border Control in Northeast Thailand. Operational requirements for a border control system for Northeast Thailand were specified on the basis of environmental and threat analyses. A river control subsystem, the Mekong River Surveillance (MRS) system, was organized as a test unit for controlled field experimentation and subsequently became an operational unit. This field testing was extended with modeling and computer simulation to yield cost/effectiveness evaluations of alternative river control systems. The river subsystem work was followed by planning research preliminary to the analysis and evaluation of a land border system.

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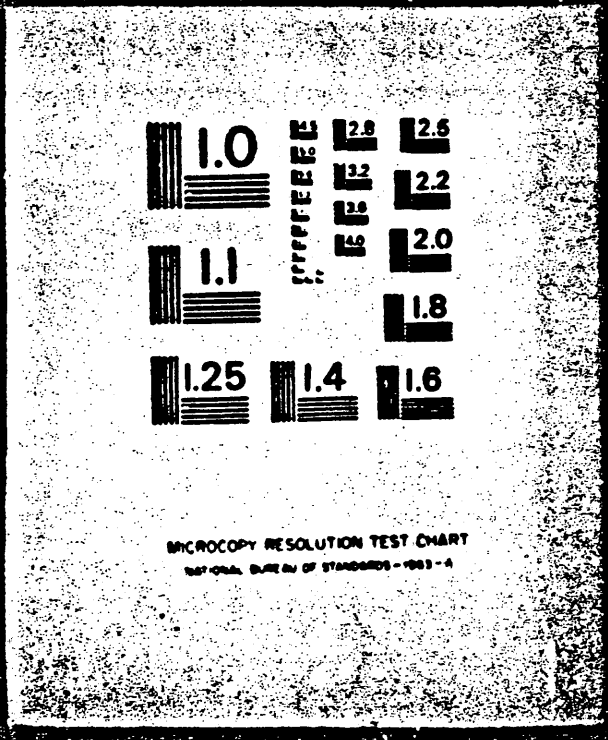

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SPONSORED BY THE ADVANCED RESEARCH PROJECTS AGENCY
FOR THE THAI-U.S. MILITARY RESEARCH AND DEVELOPMENT CENTER,
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(U) Counterinsurgency Surveillance Systems. Various devices and systems for detecting insurgency activity were developed and their operational feasibility investigated. The principal ones were seismic and magnetic sensors, but some study was also made of infrared, acoustic, and other techniques. Operational feasibility was demonstrated for a wireless seismic ambush aid system (successfully tested in South Thailand, Malaysia, and South Vietnam) and a remote area monitoring system; an unattended trail camera and an improved technique for seismic signal discrimination were also developed. Work was initiated on comparative cost/effectiveness evaluation of various operational systems for trail and area surveillance.

(U) Counterinsurgency Communications. CI communications systems in Northeast Thailand were investigated in detail. Deficiencies were described and requirements specified for small unit operations, for combined operations, and for long haul and support communications.

(U) Various additional tasks addressed military civic action, a handbook of CI programs, and other counterinsurgency studies.

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ABBREVIATIONS

ACTIV	Army Concept Team in Vietnam
AGILE	ARPA Overseas Defense Research program
AMPIRT	ARPA Multi-band Photographic and Infrared Reconnaissance Test
AMS	Army Map Service
ARL	Aerial Reconnaissance Laboratory
ARPA	Advanced Research Projects Agency
ASRCT	Applied Scientific Research Corporation of Thailand
AWC	Armed Work Cell, a division of the CTO
AWF	Armed Work Force, a division of the CTO
BACS	border area control system
BCS	border control system
BPP	Border Patrol Police
CAL	Cornell Aeronautical Laboratory, Inc.
CI	counterinsurgency
CIH	Joint Thai-Malaysian Combined Intelligence Headquarters
CINCSOUTH	Commander in Chief, Southern Forces
COMUSMACTHAI	Commander, U.S. Military Assistance Command-Thailand
CONUS	continental United States
CPM	Civil-Police-Military, an RTG counterinsurgency headquarters
CPT	Communist Party of Thailand
CSOC	Communist Suppression Operations Command
CT	Communist Terrorist
CTO	Communist Terrorist Organization

Abbreviations (Continued)

DIPOLEPLOT	a computer program for plotting magnetic anomalies
FARELF	Far Eastern Land Forces (British Command)
FM	frequency modulation
FM-1	1-watt FM radio
FM-5	5-watt FM radio
HF	high frequency
HQ	headquarters
Hz	Hertz (one cycle per second)
IR	infrared
IST	Institute of Science and Technology, University of Michigan
JSC	Joint Security Center
km	kilometer
MACTHAI	Military Assistance Command-Thailand
MAC-V	Military Assistance Command-Vietnam
MAGFISH	towed "fish" housing flux-gate and electromagnetometers for underwater sensing of boats
MAGYSPLOT	a computer program for plotting magnetic anomalies
MAP	Military Assistance Program
MCAT	Military Civic Action Team
MCID	Multi-purpose concealed intrusion detector
MCP	Malayan Communist Party
MCYL	Malayan Communist Youth League
MHz	megahertz (one million cycles per second)
MRDC	Military Research and Development Center
MRLA	Malayan Races Liberation Army
MRS	Mekong River surveillance
mv	millivolts
NSO	National Statistical Office

Abbreviations (Continued)

OSD	Office of the Secretary of Defense
P	probability
PBR	patrol boat - river
PE	program element
POL	petroleum, oil, lubricants
PPM	parts per million
PSID	personnel seismic intrusion detector
Psy Ops	psychological operations
RAC	Research Analysis Corporation
RACFO-T	Research Analysis Corporation Field Office-Thailand
RAM	remote area monitoring
R&D	research and development
RASD	Remote Area Security Development, a BPP program
RDC-T	Research and Development Center - Thailand
RDFU-T	Research and Development Field Unit - Thailand
RF	radio frequency
RGT	regiment
RPC	river patrol craft
RTA	Royal Thai Army
RTAF	Royal Thai Air Force
RTG	Royal Thai Government
RTN	Royal Thai Navy
RSSP	Rural Security Systems Program
RVS	Remote Village School, a BPP program
SA/CI	U.S. Embassy Special Assistant for Counterinsurgency
SEA	Southeast Asia
S-GG	Secretary General's Group, a division of the CTO
SP	spontaneous polarization

Abbreviations (Concluded)

SRI	Stanford Research Institute
SSB	single side band
SWIMMER	electromagnetometer developed for underwater use
TI	Texas Instrument
TNCA	Thai National Communications Agency
TREND	Tropical Environmental Data
USAF	United States Air Force
USOM	United States Operations Mission
VIST	Village Information System - Thailand
WAAS	wireless seismic ambush aid systems

I PROJECT ACTIVITIES, FINANCING, AND MANPOWER (U)

A. Purpose (U)

(U) This final report summarizes the results of almost five years' work by analysts of the Stanford Research Institute, studying problems of counterinsurgency in Thailand. The work was accomplished under contract to the Advanced Research Projects Agency (ARPA) of the Office of the Secretary of Defense (OSD), in the framework of Project AGILE, ARPA's Overseas Defense Research program. Actual work was conducted largely on site as part of the broad program of investigation being conducted by the joint Thai-U.S. Military Research and Development Center (MRDC) in Bangkok, Thailand, which is made up of a Thai component under the Royal Thai Government (RTG) Supreme Command Headquarters and the ARPA R&D Center-Thailand (RDC-T).*

B. Activities (U)

1. Surveillance Requirements Research: 1 April 1961 to 31 March 1963 (U)

(U) For the first two years the project was concerned exclusively with counterinsurgency surveillance requirements for Southeast Asia and particularly for Thailand.[3]† The objectives were threefold: (1) to determine and define requirements for surveillance processes and equipment in counterinsurgency operations in Southeast Asia, (2) to estimate

---

* (U) For most of this period the RDC-T was designated as ARPA R&D Field Unit-Thailand (RDFU-T).

† (U) References are to the List of Reports found at the back of this report.

(U)

the applicability of these results to other parts of the region and to other environments, and (3) to describe the process of insurgent and counterinsurgent operations in order to contribute to other AGILE efforts.

(U) Under the terms of reference established with ARPA, "requirement" has meant operational needs and the focus has been on systems to be used by indigenous forces. For southern Thailand, the prime users were to be the Thai and Malaysian forces engaged there against the Communist Terrorist Organization (CTO); in the Northeast, the users were to be the Thai forces engaged in CI operations against the activities of the Communist Party of Thailand (CPT).

(U) The surveillance work was defined by the tasks listed in Fig. 1. The area chosen for study was South Thailand along the Thai-Malaysian border. Studies were made of the conflict situation in the South and of the CTs' organization, operations, camp system, logistics, and support practices--as well as investigations into surveillance devices and systems. These are summarized in succeeding sections of this report.

2. Transition Period: 1 April 1966 to 31 March 1967 (U)

(U) The contract year 1 April 1966 to 31 March 1967 represented a period of transition, both geographically and functionally. Although South Thailand remained an area of major contract interest, the focus of attention shifted to the Northeast which, in 1965, became Thailand's principal area of conflict. At the same time, rather than an exclusive concern with surveillance requirements and systems, the scope of research was enlarged to a broad program of counterinsurgency research and analysis in Thailand. The shift in research emphasis is illustrated in Fig. 1.

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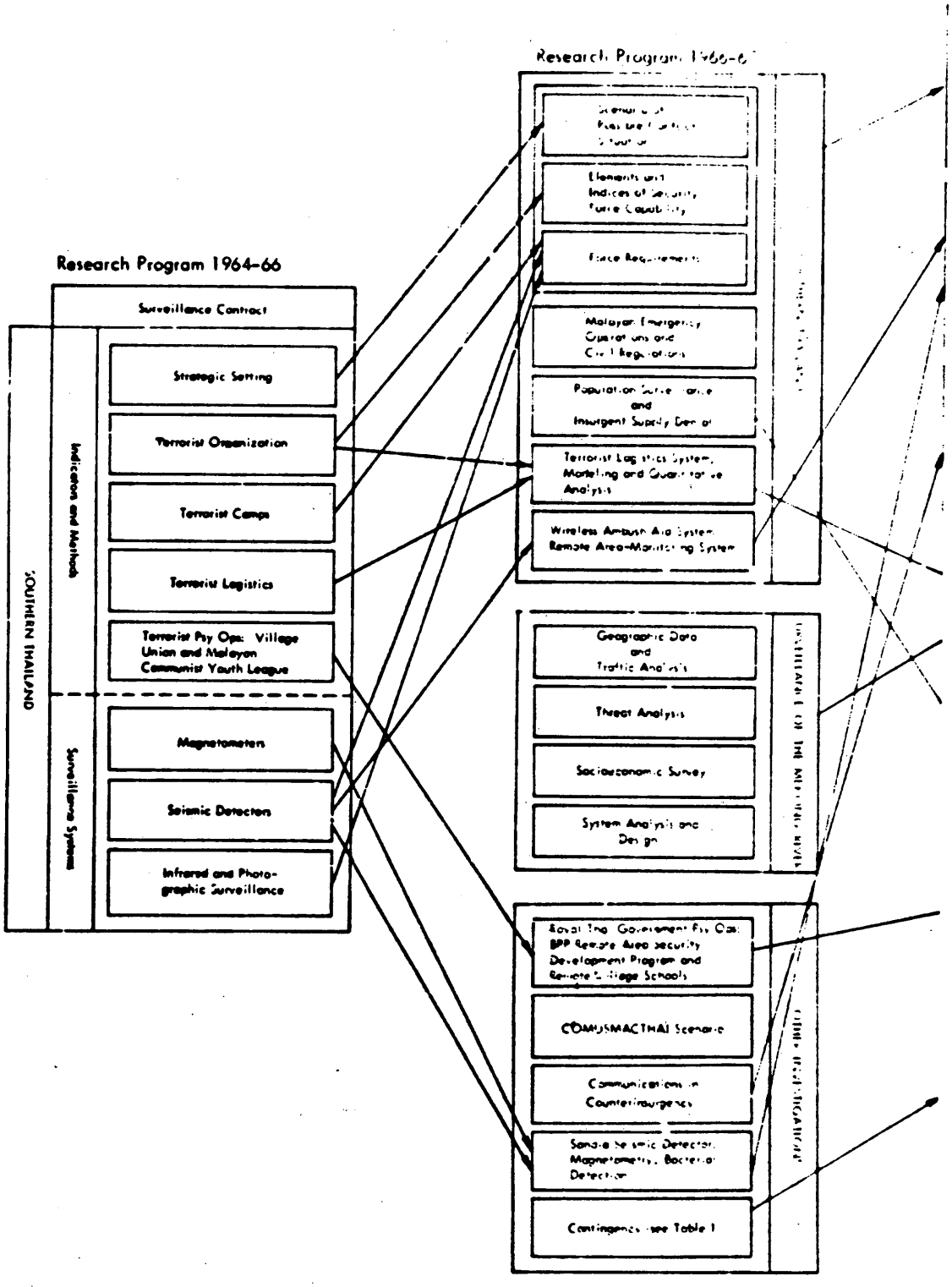

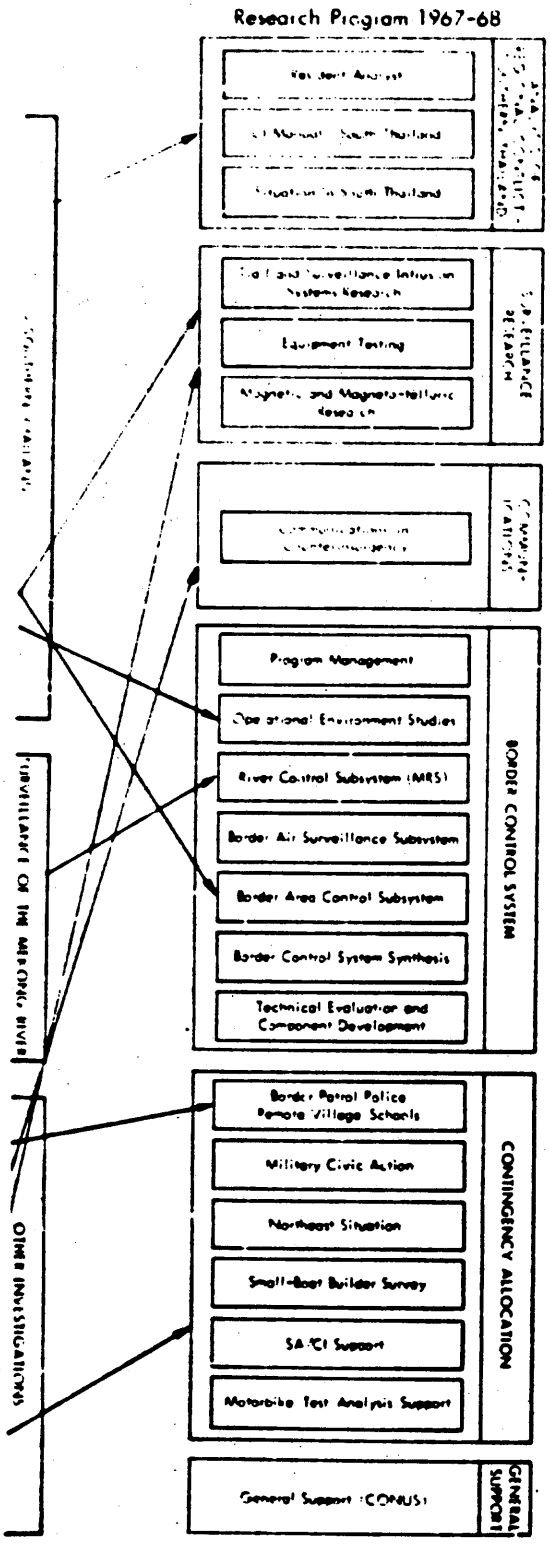

FIG. 1 RESEARCH PROGRAMS, 1964-68 (U)

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Border Control Research and Analysis: 1 April 1967 to 28 February 1969 (U)

(U) In the following contract period--shortened to seven months in order to rephase the contract to a 1 November starting date--the task structure underwent further change, which was generally maintained to the termination of the contract (see Fig. 1). The preponderant share of the SRI effort was given to the Mekong River Surveillance (MRS) study, which had become, at the request of ARPA, the river surveillance component of a larger border control system. In other aspects of the border control study, investigations were conducted into the operational environment of the land component of the border control system and methods of enhancing audio detection of intruding helicopters in the Northeast. Work also continued on insurgent surveillance techniques.

(U) In the year starting 1 November 1967, at the direction of ARPA, SRI assumed the role of system manager for border control and proposed a full system development plan, a summary of which was published in February 1968. Plans were prepared for tests of elements of a land system and system analysis of a full border control system for the Northeast.

(U) In the early fall of 1968, shortly before the close of the contract year, the U.S. Embassy disapproved continuation of the plans for large-scale system development in border control--in part because of its growing concern over and efforts to contain rapid escalation of the American presence in Thailand, in larger part perhaps, because of its concern that limited Thai financial and personnel resources required allocations according to threat priorities and border control was seen to be less important than other areas of conflict control. As a consequence of the Embassy's position, the Border Control Program was revised to a Border Area Security Program comprising three study elements: (1) evaluation and optimization of a CSOC Border Security Plan that was to be implemented

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on a pilot basis in two amphoes of the province of Nong Khai, 2) study of the other borders of Thailand to develop a data base on parameters that influence border control; and 3) systems analysis of the adaptability of the CSOC Plan to other borders of Thailand.

(U) At the close of the contract performance period--7 January 1966--plans for the revised Border Area Security Program were well underway, to be pursued under a new ARPA Border Area Security Study contract.

(U) During this same period, work was continued on the two other major programs--insurgency surveillance and CI communications--as well as a number of miscellaneous smaller research efforts. In insurgent surveillance, attention turned to investigation of the feasibility of employing a system consisting of deployed sensors monitoring traffic on trails or over an area, together with appropriate signal transmission links and receiving/recording equipment, to provide meaningful intelligence over time on the movement of insurgents in remote and inaccessible areas. In addition, CI application of magnetic and wireless seismic sensor systems were investigated, operational tests were made of other surveillance devices, and a basic magneto-telluric measurement program was initiated as a vehicle for a graduate student research training program.

(U) Also investigated were communications problems encountered in the field, where configurations of the standard equipment used by the various Thai military, paramilitary, and civil units in counterinsurgency do not allow the direct and effective communications needed to coordinate combined operations.

(U) In addition, a number of miscellaneous studies were conducted including studies of Thai military/civic action programs, study of the Remote Village School system of the Border Patrol Police (BPP), compilation of a manual describing CI organizations and programs and CI-related

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development programs in South Thailand, and several reports on CI operations and techniques employed in the Malayan Emergency that appeared to have relevance for the situation in Thailand, especially in the South.

1. Local Research Staff Training (U)

(U) One of ARPA's objectives in its association with SRDC was to contribute to the development of an indigenous Thai military R&D capability. This it sought to do in several ways, including on-the-job training provided through its contractor staff. Training was only an implicit objective of the work program, however, and--with a small exception--was never made explicit through a funded effort. Accordingly, no formal training programs were launched nor are measures readily available of the amount of training done. Nevertheless, SRI's local training activities under this contract alone have been significant for four of the almost five-year life of the contract, and countless hours have been spent in staff-conducted instruction. While most of the Thai staff were research assistants or field data collecters, they included systems analysts and operations researchers, and they are represented among the principals of some of the research conducted under this contract, as well as among the authors of some of the reports produced. The Thai staff at the close of the contract included two Ph.D. systems analysts operation researchers, four research analysts with advanced degrees or the equivalent, five research assistants, three research engineers, fourteen field assistants, one computer programmer, and three graduate students participating in an ARPA-SRI research program sponsored jointly with Chulalongkorn University and the Applied Scientific Research Corporation of Thailand.

C. Financing (U)

(U) The total contract funding was $6,431,505. Included in this total, however, were the following amounts for work unrelated to counter-insurgency research and analysis in Thailand, the primary purpose of the contract, but funded under this contract for the convenience of ARPA.

Operations analyses in support of CINCSOUTH	$119,995
Village Information System-Thailand (VIST), funded under this contract until a separate contract could be written	599,784
Special ARPA-WDC Project	6,000
U. S. Naval Postgraduate School consultant for ARPA	2,000
Total Contract Funds Unrelated to CI Research and Analysis in Thailand	$727,779

D. Manpower (U)

(U) Table I shows the total man-months of effort contractually committed and actually provided during the life of the contract.

Table I

MAN-MONTHS, CONTRACTED AND ACTUAL [illegible]
Man-Months

	Contractually Committed*	Actually Provided		
		Total	On Site	CONUS
U.S. Staff				
Professional	1,169.6	1,270	1,032	238
Support	257	263	195	68
Local Thai Staff**				
Professional	--	295	295	--
Support	--	588	588	--

* (1) Included are 105 man-months of U.S. professional and 52 man-months of U.S. support effort for the CINCSOUTH and VIST additions to the contract.

** (1) Explicit provision for local (Thai) staff was not made in the contract. Although the total man-months of local effort is considered accurate, a fire in May 1967 destroyed certain personnel records and the breakdown between professional and support effort is necessarily an estimate.

II SUMMARY OF RESULTS (U)

(U) The principal results of the research conducted under this contract are summarized below, with page references given to pertinent material in the succeeding sections.

(U) This research could be outlined in several ways: methodologically in terms of integrated systems research or component operations analyses; operationally in terms of insurgent and counterinsurgent actions and systems; functionally in terms of mission orientation; geographically in terms of the South and the Northeast; and chronologically in terms of major contract orientations. The classification employed is a compromise among these several schema. All of the research described here has been reported in detail in 65 published reports, 15 unpublished working papers, and periodic management and project status reports. All are included in the List of Reports found at the back of this report.

A. Operations Analyses (U)

(U) 1. (C) The insurgency along the Malaysian border in southern Thailand has been analyzed and described in detail, including the following aspects:

- The threat situation and its policy implications for the Royal Thai Government (pp. 51-56)
- The organization and deployment of the Communist Terrorist Organization (pp. 19-27)
- The CTO camp system and its probable distribution and changing character (pp. 27-13)

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- The CTO logistics system and its sensitivity to detection and interdiction (pp. 44-51)

- Based on the above, analysis of the surveillance and force requirements for an effective counterinsurgency effort (pp. 57-62)

- Specification of population surveillance and resource control measures for effective counterinsurgency, including the requirement for and feasibility of successfully implementing a resettlement program (pp. 62-68)

2. (U) Analysis of the Malayan Emergency Regulations and counterinsurgency operations, and their applicability to Thailand (pp. 63-69).

3. (U) Analysis of the operational environment in Northeast Thailand related to the problem of border control, including cross-border traffic, the socioeconomic environment, extent of smuggling, the logistic system and the requirements of the Northeast insurgents, the relation of the Vietnamese refugees to the threat situation, the physical environment, and the extent, deployment, and capabilities of the security forces assigned to the area (pp. 151-157).

4. (U) Counterinsurgency communications requirements for RTG security forces and other CI agencies in Northeast Thailand. Investigations were conducted and recommendations made for improving communications for small units, joint operations, and long haul and support communications (pp. 111-114).

5. (U) Investigation and description of the civic action activities of the RTG Border Patrol Police and military civic action conducted by the Royal Thai Army (pp. 168-170).

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B. Systems Analyses (U)

(U) 1. (U) Analyses leading to the organization of a pilot Mekong River surveillance and control organization, with which controlled field experimentation was conducted. Through modeling and computer simulation using field test performance inputs, system relationships and trade-offs were specified and recommendations made for system design. The test organization designed by SRI--and organized by MRMC, and the Communist Suppression Operations Command from elements of the Border Patrol Police (BPP), Marine Police, Royal Thai Navy (RTN), and Customs and Immigration--served for approximately nine months, at which time it was converted to operational status under CSOC operational control (pp. 126-150).

2. (U) Analyses leading to operational requirements for and a general system description of a land area border control system for Northeast Thailand, together with data requirements and general descriptions of system components test requirements. Although this work was terminated by ARPA redirection of the program before tests could be conducted and systems analysis completed, most of the work is directly applicable to the revised follow-on border control program (pp. 158-163).

3. (U) Partial analysis of the problems of system design (including sensor types and mixes, deployment, sensor densities, and signal transmission/recording linkages), system effectiveness (detection probabilities), and system cost to accomplish specified surveillance functions, such as area monitoring and linear barriers. A matrix of system type, effectiveness, and cost by various operational modes would serve as a basic input to the design of security systems for border control or village security. This work was terminated when only partially completed because of lack of funding support (pp. 101-104).

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C. Surveillance Devices Investigations (U)

1. (U) Development and operational testing of a wireless seismic ambush aid system. Originally developed in order to permit operational feasibility testing, a number of systems were locally fabricated in response to requests from RTG security forces. Favorable operational evaluations were obtained from the RTG and Malaysian security forces in southern Thailand, British Far East Land Forces in Malaya, and Australian forces in South Vietnam (pp. 84-90).

2. (U) Feasibility investigations and design of a remote area monitoring system, employing seismic or other sensors with wireless transmission of the sensor signal by narrow band radio equipment to a distant receiving recording station for real time, long range automatic monitoring of jungle trails (pp. 90-91).

3. (U) Design and feasibility testing of an unattended photographic trail monitor (pp. 92-93).

4. (U) Investigation of a technique and design of an electronic signal processor for discrimination of the human footstep seismic signal from most seismic "noise." The technique is based on the periodic distribution of the human footstep signal (pp. 91-92).

5. (U) Investigation of magnetic detection of ferrous metallic objects using the rubidium vapor magnetometer, Multi-purpose Concealed Intrusion Detector, and flux-gate magnetometer (pp. 71-82):

   a. (U) Search rules were developed for use of the rubidium vapor magnetometer in buried cache detection (pp. 71-76).

   b. (U) The operational feasibility of magnetic monitoring of road and trail traffic for concealed weapons was investigated and assessed using all three sensors (pp. 77-78).

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c. (U) The operational feasibility of magnetic and electromagnetic surveillance of boats and the problem of discrimination of ferromagnetic cargo (including possible contraband) from the ferromagnetic components of various boats used in Thailand was investigated and assessed, using a flux gate magnetometer, gradiometer, and an electromagnetometer ("Swimmer") (pp. 78-80).

6. (U) Tests were conducted to determine and compare ranges at which low-flying helicopters can be detected by ear both with and without the aid of certain auditory devices and to determine the azimuthal accuracy with which listeners can locate an audible but unseen helicopter, under the ambient conditions of Northeast Thailand (pp. 104-108).

D. Other Research and Support Services (U)

(U) As already mentioned under Financing in the previous section, several activities undertaken by SRI at the request of ARPA were unrelated to the primary purpose of this contract--the study of counterinsurgency in Thailand--but were funded under the contract as a convenience to ARPA. The activities applying in Thailand are described (pp. 167-175).

(U) ~~(C)~~ An unrelated but significant operations analysis effort was the research undertaken in support of CINCSOUTH during the period August 1955 to April 1966: the study considered the advantages and disadvantages of providing U.S. operational assistance to Central and Latin American countries engaged in counterinsurgency operations as well as alternative courses of action that would enable the United States to influence favorably the outcome of such counterinsurgency operations. Publications resulting from this study included a "think piece" research memorandum and reports on Peru and Honduras.[112,113,114] The content of these studies has not been covered in this report.

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III THE INSURGENCY IN SOUTHERN THAILAND (U)

(U) For the purpose of studying counterinsurgency surveillance requirements, the region in Thailand generally south of the Kra Isthmus was selected, with special attention to the strip of land about 30 to 40 kilometers wide along the Thai-Malaysian border and stretching across the border provinces of Narathiwat, Pattani, Songkhla, Yala and Satul (see Fig. 2). Southern Thailand was chosen as the area on which to focus because: (1) the problem there, although being given relatively little attention, seemed potentially serious; (2) the sides were clearly drawn and research lessons therefore might be expected to be sharp; and (3) it seemed likely that documentation of current and past events might be better there than for most other parts of Thailand.*

(U) Selected for special attention were the organization of the CT, their camp life, and their logistic support system. While these may have changed in detail during the two to three years since these studies were completed, the descriptions that follow are believed to remain substantially current.

(U) (C) Most of these descriptions and analyses are based on intelligence reports, captured documents, the personal observations of SRI staff, and interviews with police officers (Thai and Malaysian) and with CTs who had surrendered. Access to many of these sources of data is restricted so as not to endanger the informant, in some case, or eliminate the

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* (U) Insurgency in Northeast Thailand, which subsequently became more prominent and of much greater concern to the RTG was, when the project began in 1964, not serious.

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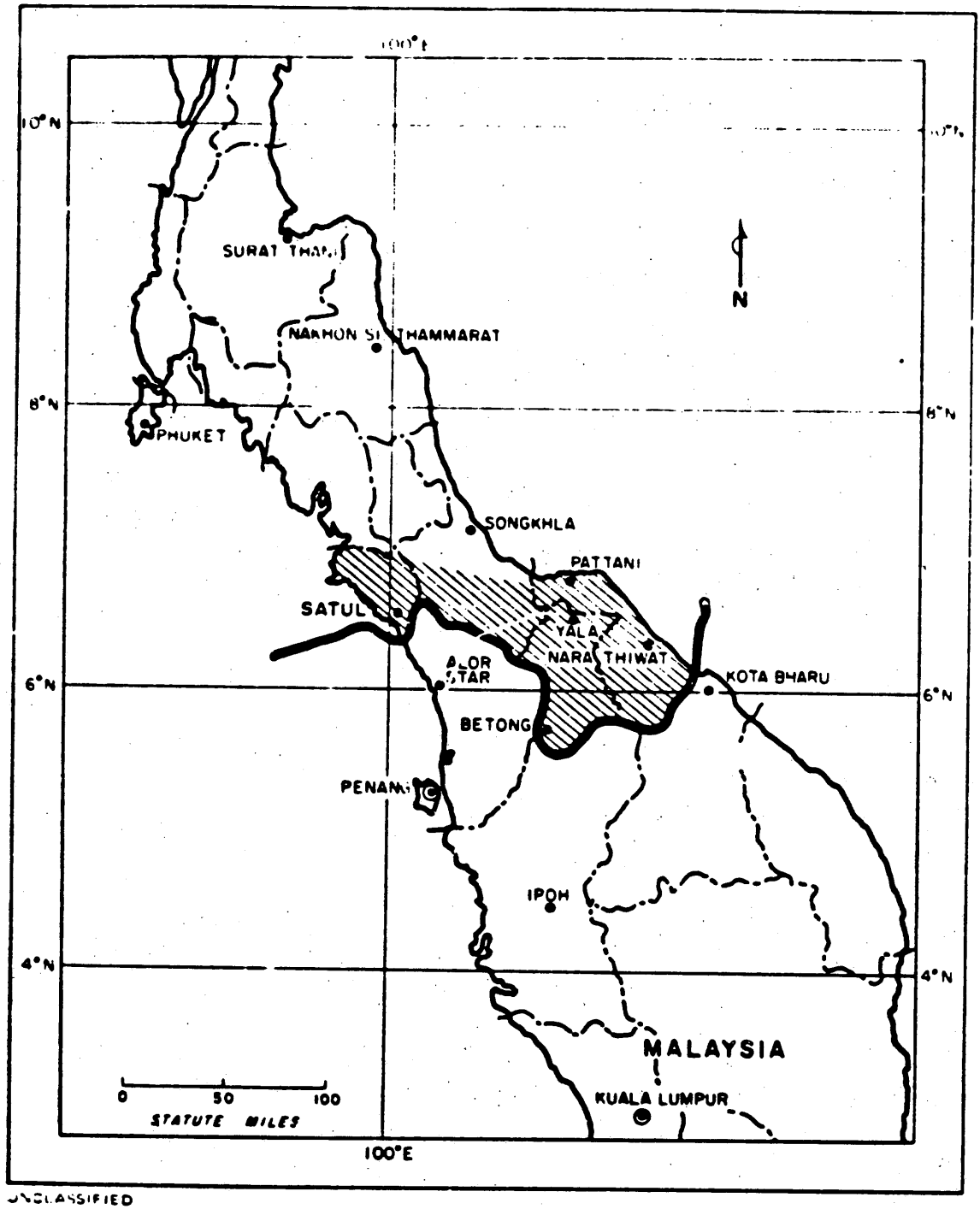

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FIG. 2 COMMUNIST TERRORIST AREAS IN SOUTHERN THAILAND (U)

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sources of data in the future. Readers interested in particular aspects or statements in this section are referred first to the detailed report and, in the case of conclusions in any report that are not credited to a source, are invited, upon establishing clearance and need-to-know, to review the source data with the authors.

A. The Communist Terrorist Organization* (U)

(U) The organized remnant of the communist army against which forces of the British Commonwealth fought from 1948 to 1960 in Malaya now occupies the area just north of the Thai Malaysian border. The leaders and about five or six hundred of those communist troops retreated over the border into Thailand. These insurgent forces are referred to individually as communist terrorist (CT) and collectively as the Communist Terrorist Organization (CTO).

(U) The CTO is made up of two basic elements: the Malayan Communist Party (MCP) and the Malayan Races Liberation Army (MRLA). Although all members of the CTO realize their affiliation with communism, there is a limited number of members of the Malayan Communist Party (MCP)--who seem to constitute the CTO's command echelons and to be distributed more sparsely in the lower levels.

(U) Until fairly recently, the other major element of the CTO, the Malayan Races Liberation Army (MRLA), seems to have been the disciplinary structure controlling all CTO members. It now may be called the National Liberation Army and may no longer cover the entire CTO. In any case, all

* (U) Much of this description and analysis has been taken from Reference 3 and 11. See also Reference 42.

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members of the CTO, whether or not they are members of the Communist Party, are believed by local security forces to be trained in the use of arms and usually to go armed; they often wear the jungle green and red-starred cap that is the MRLA uniform (see Fig. 3).

(U) The support element of the CTO is made up of the "masses organizations"--groups within the local populace that are not necessarily communist but do provide the CTO with recruits and support in logistics, subscriptions, and local intelligence.

(U) The CTO develops the plans and policy and conducts the communist subversion activities. The organization of CTO subordinate units is not standardized except in broad terms. The organization structure appears to have been combined into a single chain of command that is responsible both for the political and military training of the CTO members and the direction of the masses organization; before 1960 the CTO had distinctive political and military chains of command coordinated by commissars. The present organizational structure (see Fig. 4) has retained organizational titles, some of which are political and some military.

1. Organizational Elements (U)

(U) a. (U) Secretary-General's Group. The Secretary-General, assisted by the Central Committee, controls all activities of the CTO. The Secretary-General's Group contains a staff that assists in the implementation of the plans, policies, and doctrine formulated by the Central Committee, which consists of representatives of the Secretary-General's Group, the Regiments, and--possibly--District Headquarters. More specifically, the Central Committee provides general political guidance, selects the political and military areas of emphasis, establishes

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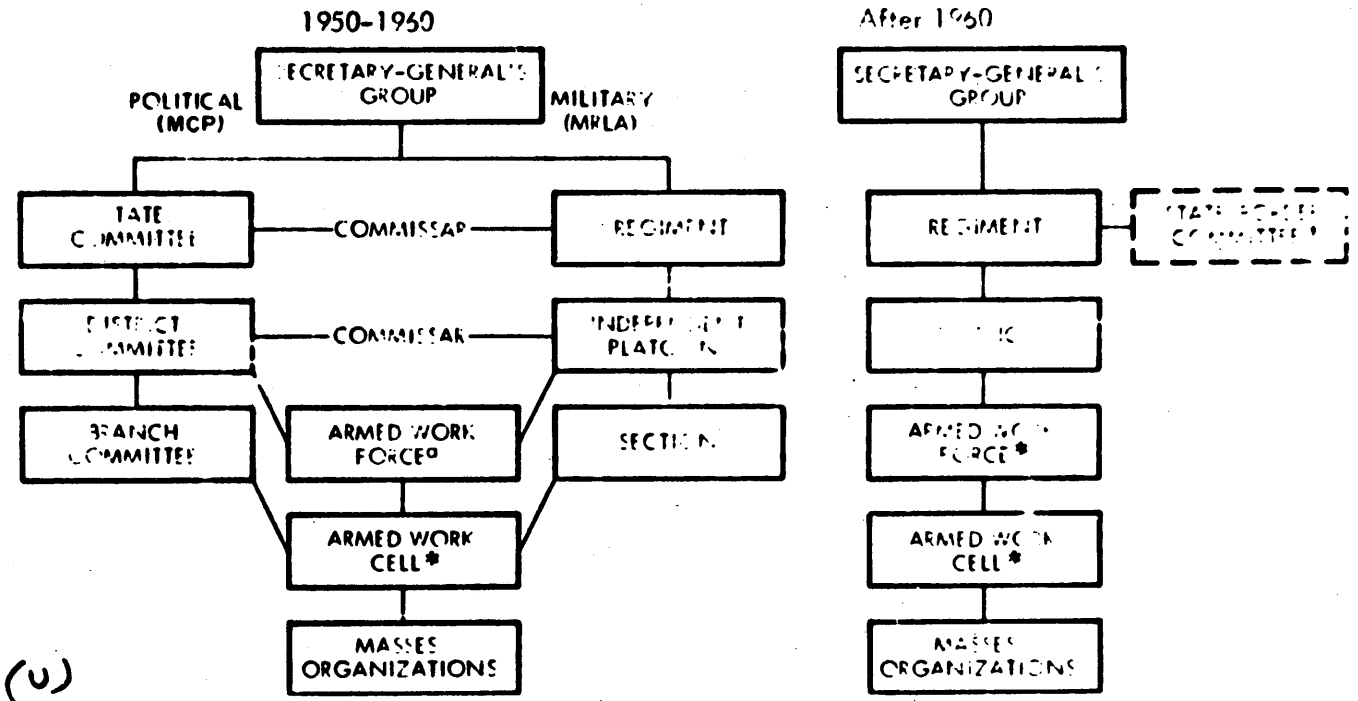
FIG. 3 ARMED CTs (U)



(U)

* A combination of Min Yuen (the People's Movement) and Malayan Races Liberation Army personnel.

† "Regiment" and "State/Border Committee" are collocated as some Regimental Headquarters personnel are also members of the State/Border Committee.

Source: Ref. 11

FIG. 4 THE COMMUNIST TERRORIST ORGANIZATION BEFORE AND AFTER 1960 (U)

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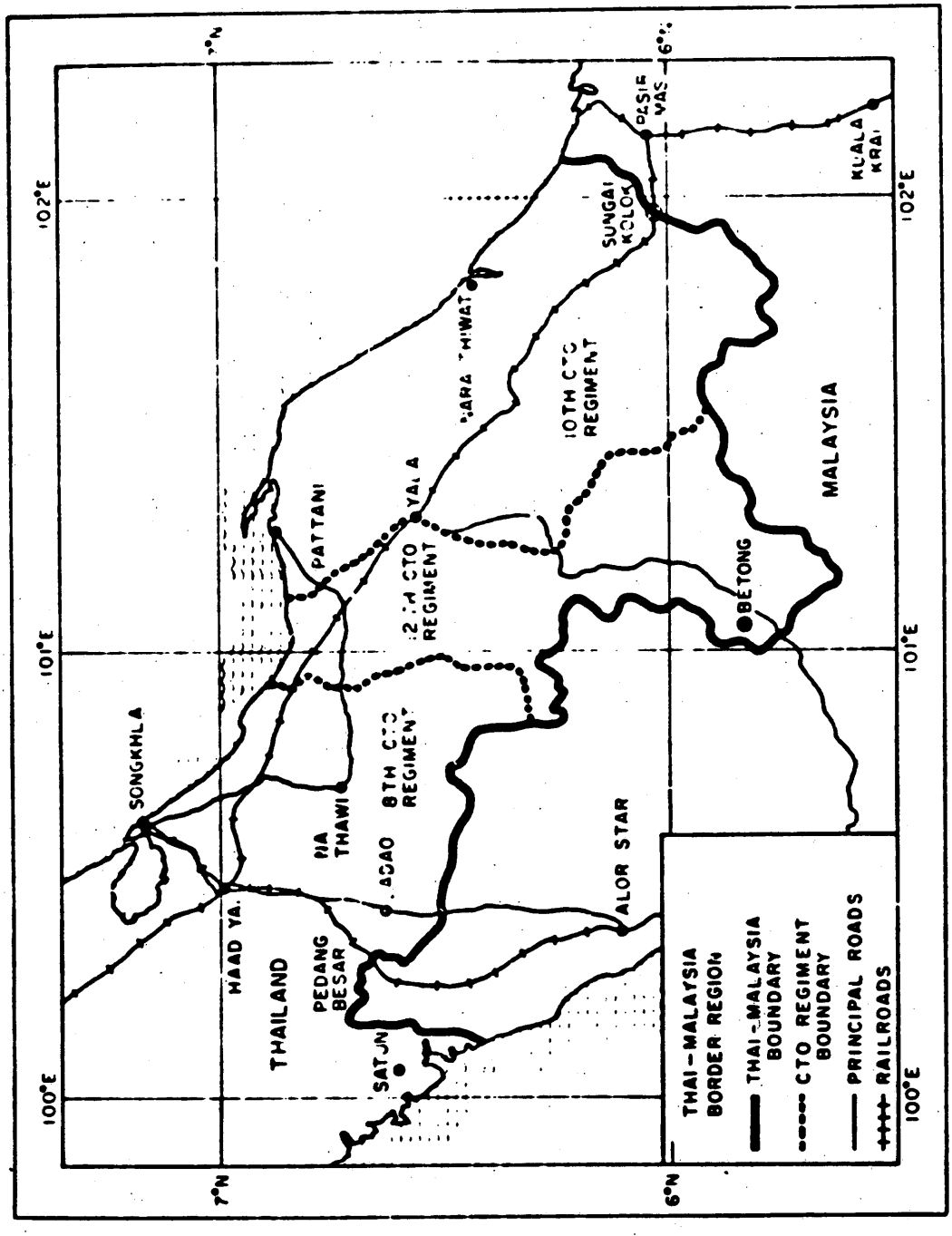
the policies of CT conduct, directs the dissemination of propaganda, and provides operational guidance. It directs three subordinate Regiments.

b. (U) (C) The Regiments. The three Regiments implement the policies of the Central Committee. Under the present strategy of maintaining a "seemingly peaceful" situation, the mission of the Regiments is predominantly one of political indoctrination of the populace. Each of the three Regiments is assigned a geographic area of responsibility and, in compliance with established MCP policies, appears to function autonomously within its area. These areas are shown in Fig. 5.

(U) (C) The CTO concentrates its efforts at all levels on the promotion of communist political ideas, using persuasion, good works, shows of force, and--occasionally--violence. Although there is evidence that all CTs receive military training, there appear to be only a few CTs who now are engaged solely in military types of activity; each Regiment contains at least one of these military contingents. Each Regiment, as well, has subordinate units as follows: District Headquarters, Armed Work Forces, and Armed Work Cells. All subordinate units are assigned specific geographic areas of responsibility and do not normally move outside their boundaries. The Regimental structure is generally similar for each of the three Regiments but varies considerably in total number and number of subordinate units.

(U) c. (C) Subordinate Elements. The fundamental operating units of the CTO are found at the Armed Work Force (AWF) level and below. The AWF are referred to by the CT as the "Min Yuen" (People's Movement). Two to four AWFs are formed under each District Committee; each, in turn,



(U)

FIG. 5 CTO REGIMENTAL AREAS IN SOUTHERN THAILAND (U)

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consists of upwards of 20 Armed Work Cells. The latter constitute the primary contact with the masses. A typical Armed Work Cell contains three armed members of the MRLA, and one or two members of the MCP. The MCP element of the Armed Work Cell conducts virtually all of the business of the CTO with the masses. These personnel are either drawn from the local area or have become so familiar with it that they can move about with relative ease. They are responsible for setting up local cells of Communist satellite and front organizations and local intelligence gathering systems, levying taxes, and acquiring and transporting supplies.

d. (U) Masses Organizations. Masses Organizations are composed chiefly of non-communist members who have been organized and who are dominated by the CTO. It is through the Masses Organizations that personnel are recruited into the CTO. They also provide the CTO with intelligence, logistic support--including the purchase and transportation of supplies--and they may assist in the collection of donations, organization of labor movements, and in additional supporting tasks required by the CTO. Masses Organizations consist of the Malayan Communist Youth League,[12] study groups, Village Unions,[36] mutual aid societies, and many other activities that may have popular local appeal. The trusted leaders of the groups are called Masses Executives, and it is through these persons that the CTO influences the Masses Organizations.

2. Strength and Activities (U)

(U) The number of CT in South Thailand is variously estimated at 800 to 1,000. All sources agree that these men (and some women) are well trained, well disciplined irregulars who are jungle-wise and schooled in

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the concurrent exercise of violence and persuasion. Their present policy calls for them to avoid conflict with Thai security forces, in order to present a "seemingly peaceful situation," but they fight whenever the Thai BPP are able to take contact with them.

(U) Although the CT seem well supplied with money and the purchase of arms would not appear to be hard to arrange, captured documents and the weapons that have been taken from them indicate that their guns are old (although excellently maintained) and of such a variety that the provision of ammunition would be troublesome even at low levels of activity. Some few CT platoons are heavily armed, with as many as five automatic weapons for 19 men, but even such groups seem to use weapons of World War II vintage. The present-day CT appear to be very competent at manipulating individual and group feelings among the people. They have established in the Chinese communities of the Betong and Sadao areas a solid support base. They collect taxes, and they have enough supporters to buy the supplies they need and to move them to the edge of the jungle where the CT themselves may pick them up. This system seems to be the same as the one used in the Malayan Emergency, with effective use of threats and (rarely) violence and an appeal to the pent-up energies of Chinese youth.

(U) In the eastern sector, there are indications that the CT are managing to establish a broader base among the Malay racial groups. Malaysian authorities responsible for continuously monitoring the activities of the CT both north and south of the border have indicated their conviction that race, religion, language, economic divisions, and local Muslim nationalism are being drawn on in a CT-led movement. Captured documents show little direct criti_sm by the CT of the Thai government.

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but they do indicate efforts to persuade villagers that the CT army is stronger and more orderly than the Thai security forces and that CT civic services are better than those of the Thai authorities.

(U) A source of recruits and of reserve probably is to be found in the satellite organizations, notably the MCYL and the Youth Executives it has organized. The fragmentary data available do not show how many individuals have been drawn into either the satellite or front groups or how widely distributed such groups may be, but it has been estimated that the MCYL has 200 to 250 members in the Betong area, and that supporters in the villages of that region many number 1,500.

(U) Details of the organization and approximate locations of the Secretary-General's Group and of the three Regiments in southern Thailand have been described in a project report.[11] The organization and strength of the Secretary-General's Group and, a an example, of the 12th Regiment are shown in Figs. 6 and 7.

B. CT Camp System* (U)

(U) The CT appear to live almost entirely in the jungle. Camps range in size from shelters for one or two men for overnight stops to heavily-fortified stations deep in the jungle where hundreds of men (and some women) live for years, training and perfecting their organization against the time when they may swing into active revolution. Some 260 of these camps were found by security forces between the beginning of 1960 and 1 April 1966.† The search for such camps has been one of the main

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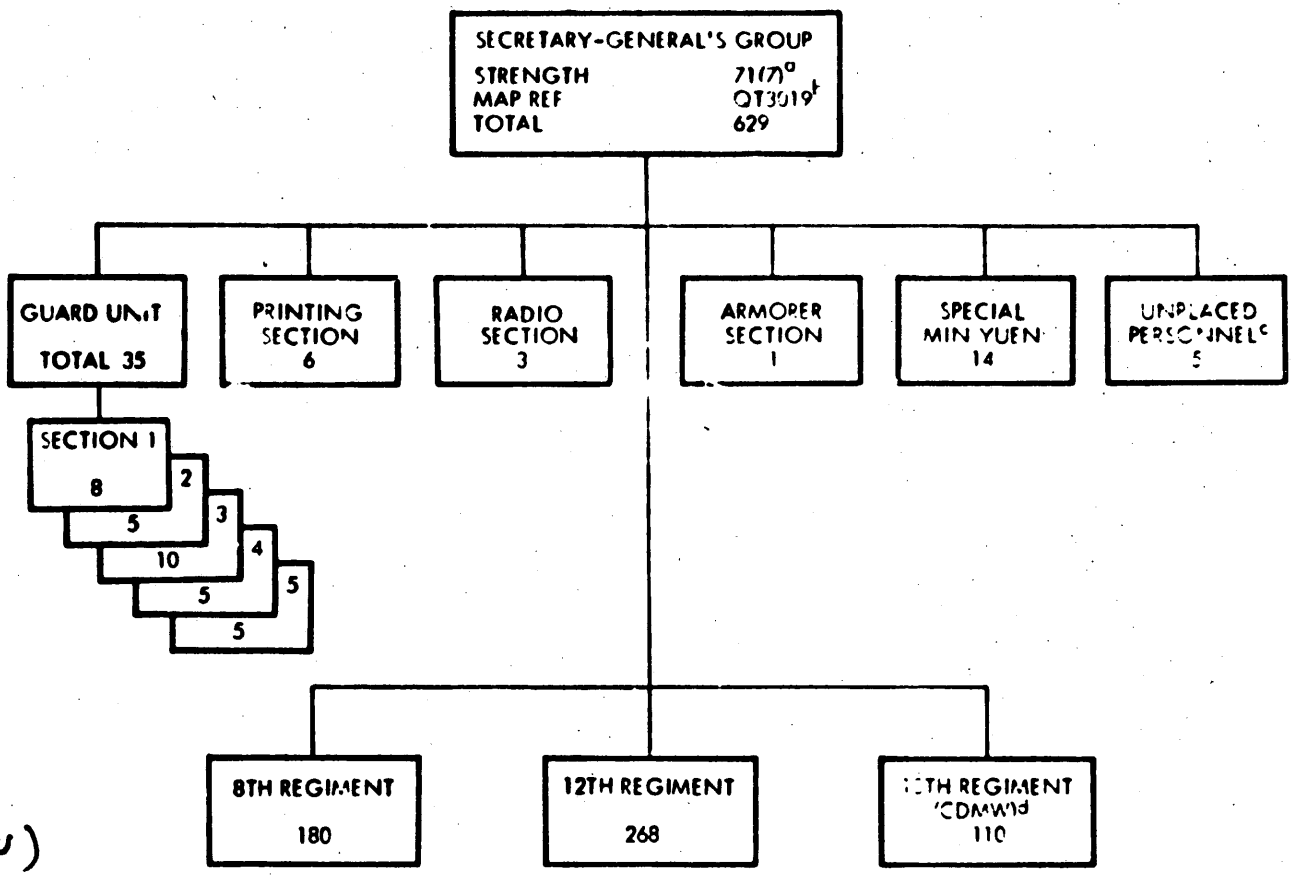
* (U) Much of this material is taken from Ref. 1.

† (U) Security forces in the South have continued to find camps since this study was completed and the total number is undoubtedly considerably higher.



(U)

a. Numbers in parentheses denote Secretary-General's Group staff.
b. Map reference, U.S. Map Service, Series L501.
c. Membership confirmed but assignment unknown.
d. Central Department of Malay Works.

Source: Ref. 11

FIG. 6 MACROSTRUCTURE AND STRENGTH OF CTO IN SOUTHERN THAILAND, WITH DETAILS ON STRUCTURE OF SECRETARY-GENERAL'S GROUP (U)

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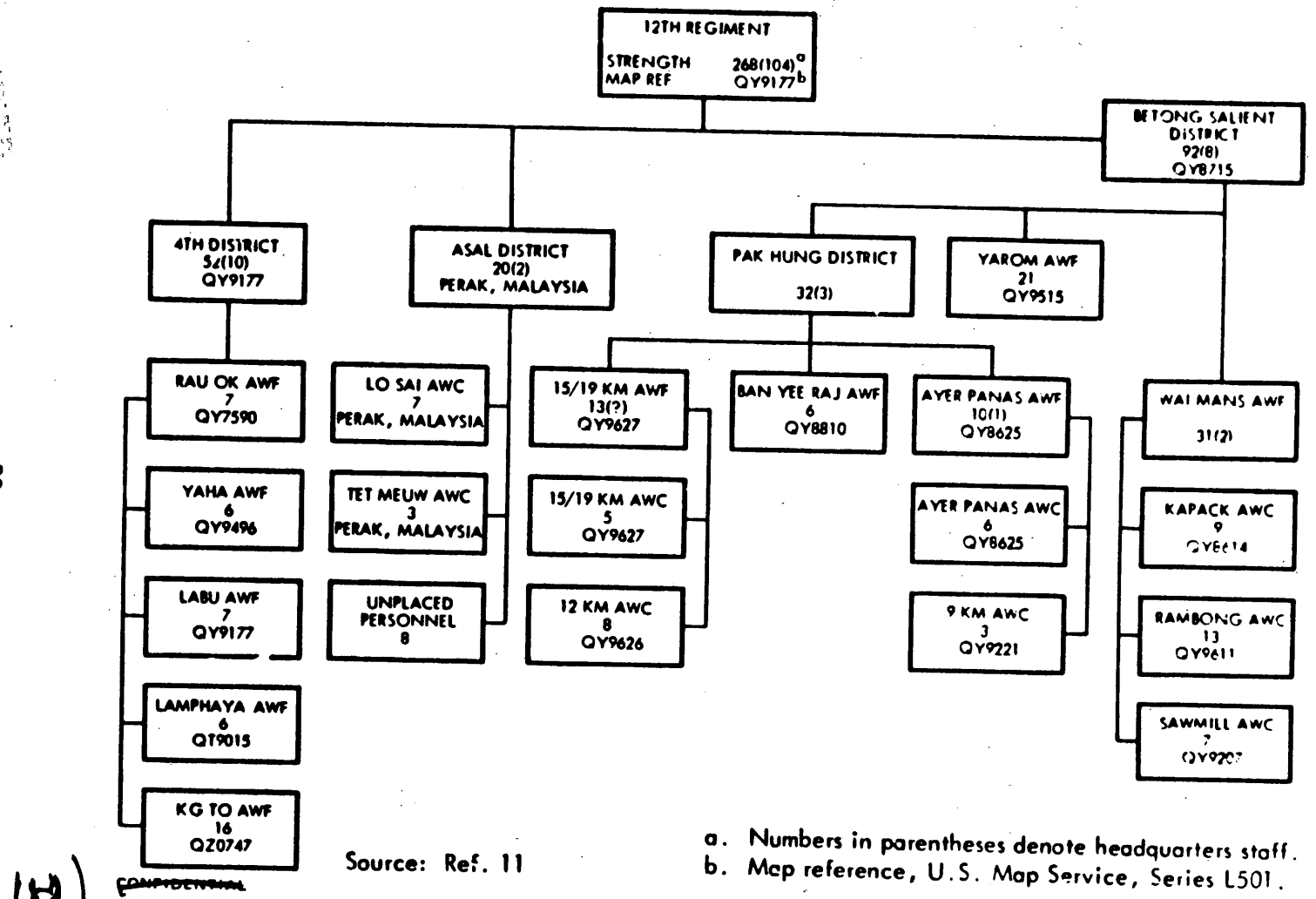

Source: Ref. 11

a. Numbers in parentheses denote headquarters staff.
b. Map reference, U.S. Map Service, Series L501.

FIG. 7 STRUCTURE AND STRENGTH OF CTO 12th REGIMENT (U)

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activities of security forces in the area, largely because the non-reliant strategy of the CTs has made that one of the few ways of establishing contact. Even so, only about 16 camps (out of 260) were discovered under conditions where the CTs were surprised and, in the absence of such surprise, very few casualties were imposed on the CTs or experienced by the security forces.

(U) The destruction or confiscation of the stores may have had only a minor impact on the CTs, since their logistic system has evidently not been strained during the period in question, but the discovery of the kinds of items used by them has helped in gaining an understanding of the kinds of interdiction that might hurt them, and the documents captured have been an important source of information on CT activities in southern Thailand. Furthermore, the geographic distribution of these camps and the changing pattern of their occupancy provide insights into the evolving character of the CTO, and the physical characteristics of the camps and their siting patterns, of course, provide the kind of data needed to improve the methods of search for still other camps.

1. Camps Discovered 1960-65 (U)

(U) The numbers of camps discovered in each year, 1960-65, are shown in Fig. 8. The geographic spread of these discovered camps is given in Fig. 9, where 191 of the 260 discovered* are spotted on a map of southern Thailand. The estimated capacities of these camps are indicated

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* (U) The subgroup of 191 includes those camps for which the Thai or Malaysian forces making the discovery estimated at least three items: the camp capacity (number of CTs), period of occupancy, and camp location (specified in grid coordinates from the local tactical-scale maps, AMS Series L707).

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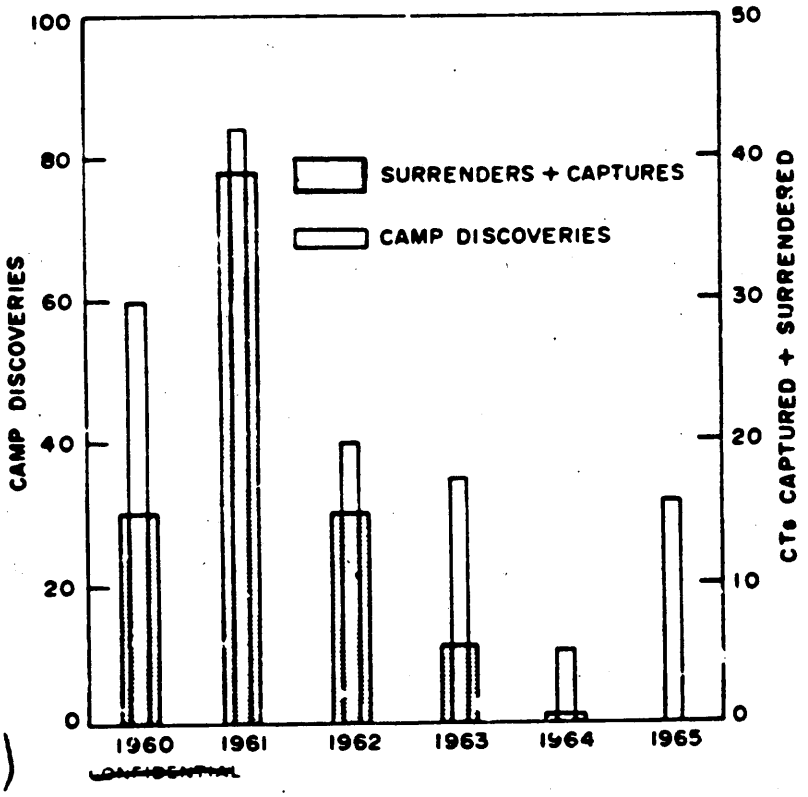

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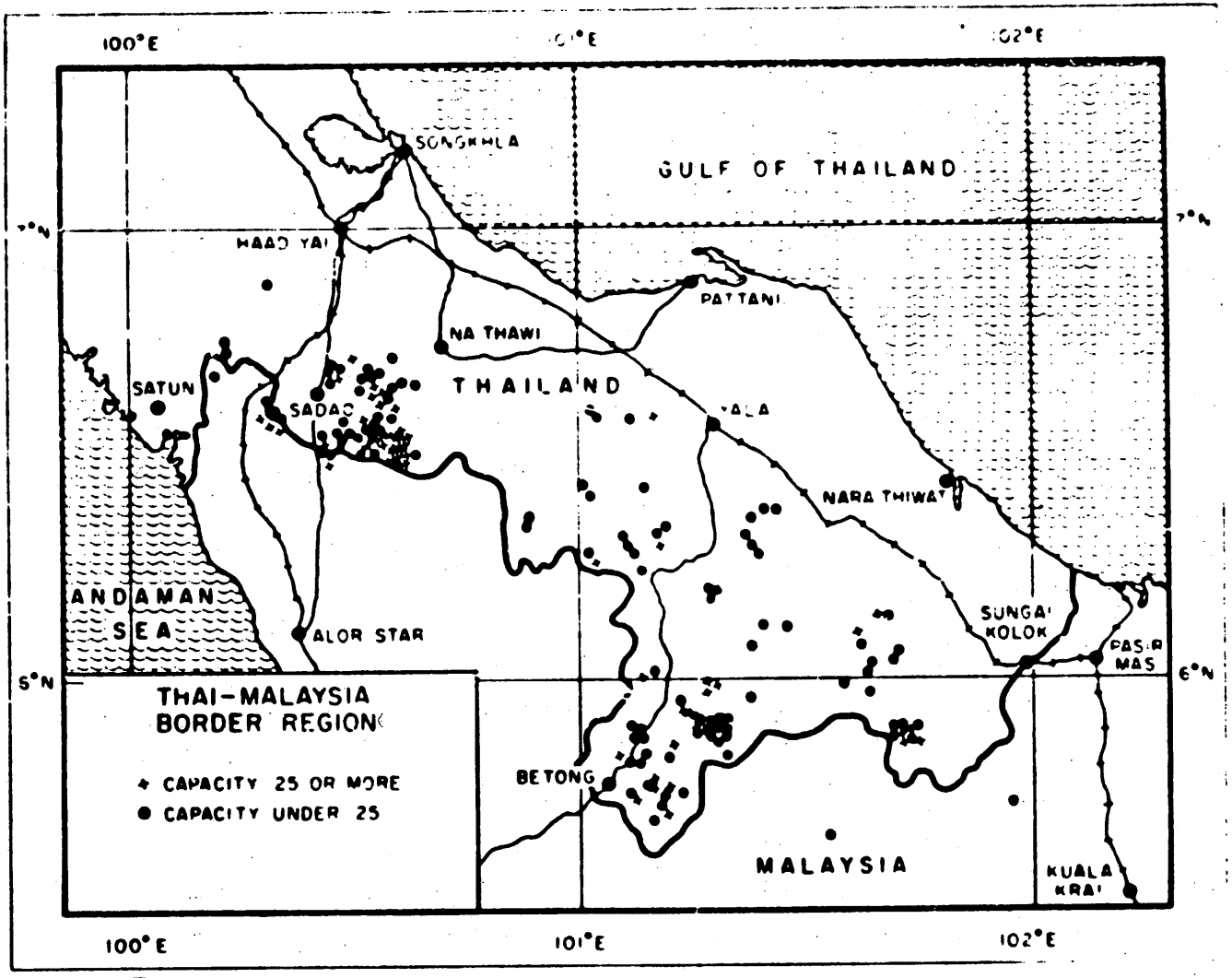
Source: Ref. 1

FIG. 8 CT SURRENDERS PLUS CAPTURES AND DISCOVERIES OF CT CAMPS BY YEAR (U)



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Source: Ref. 1

FIG. 9 DISTRIBUTION AND SIZE OF 191 CT CAMPS DISCOVERED IN SOUTHERN THAILAND (U)

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by the coding on Fig. 9 and are shown in statistical terms in the frequency distribution graph of Fig. 10. The diagram shown in Fig. 11 displays the progressive shift toward briefer occupancy in later years. That shift suggests the possibility that the living pattern of the CTs has undergone a gradual but drastic change during the last few years, characterized by a transition from long-term occupancy in deep jungle camps (which probably served a rest-and-rehabilitation function for the defeated CTs just after 1960) to a concentration of the CTs in short-term, mission-oriented camps located closer to the villages.

(U) A considerably smaller group, about a dozen camps, was reported in detail either because the process of discovery was notable in some way or because, in the case of about half of them, they were visited and reported on by members of the SRI team soon after their discovery. The latter have been described in detail in other publications.[1,31,32]

(2) (U) Details of camp siting and use also have been derived from the many captured CT documents consulted in the course of this research, interviews with surrendered CT personnel, and analyses of CT camping in Malaya (performed by British operations analysts). The following generalizations seem to apply to the larger and more permanent camps, used (intermittently, in some cases) for two to five years and ranging in capacity from about 15 to 250 CTs. They usually are found well back in the jungle and away from frequently traveled roads and trails. They are fortified with trenches, weapon firing positions, barricades, and (along the approaches to each camp) punji pits lined with sharp, wooden stakes. They usually have central cooking facilities, sleeping shelters, larger shelters for meetings, and often a level space cleared of undergrowth for sports.

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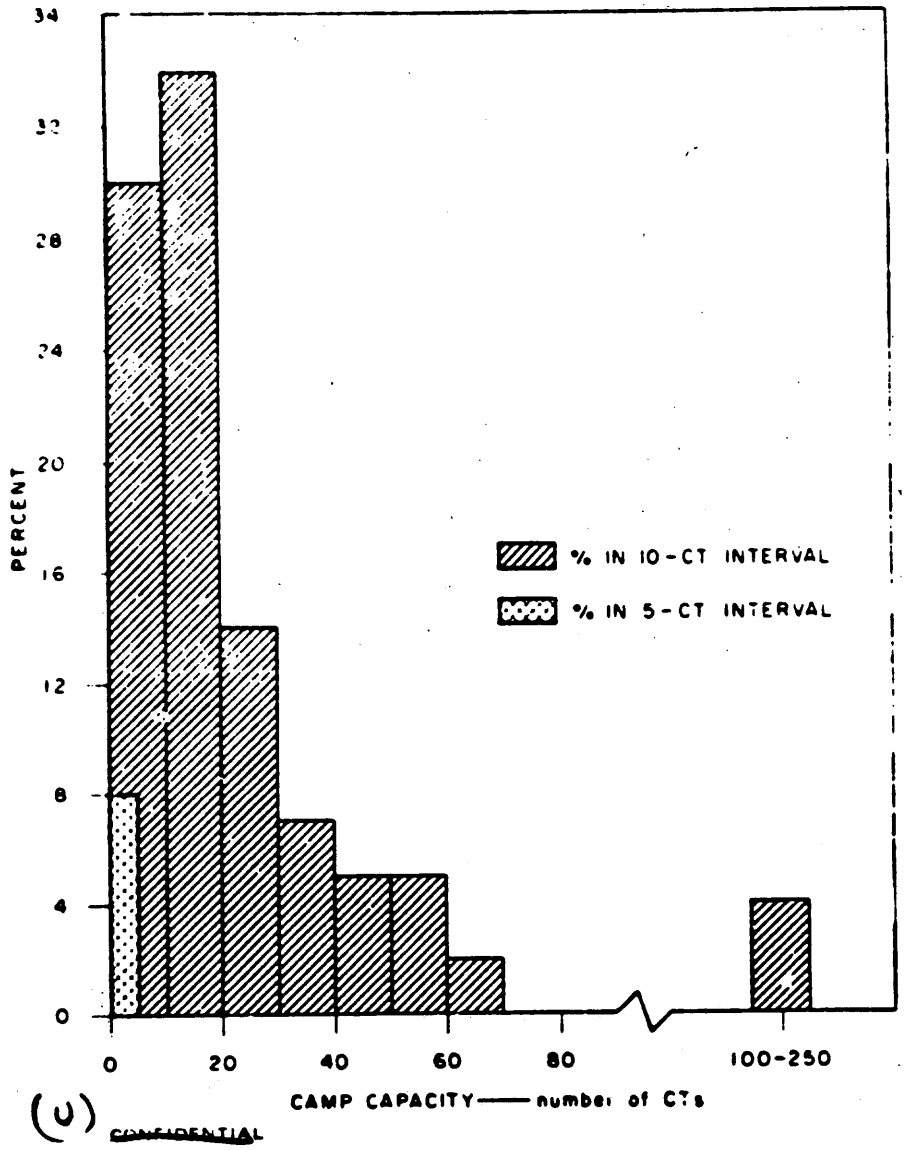

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FIG. 10 FREQUENCY DISTRIBUTION OF CAPACITIES OF CT CAMPS IN SOUTHERN THAILAND (U)

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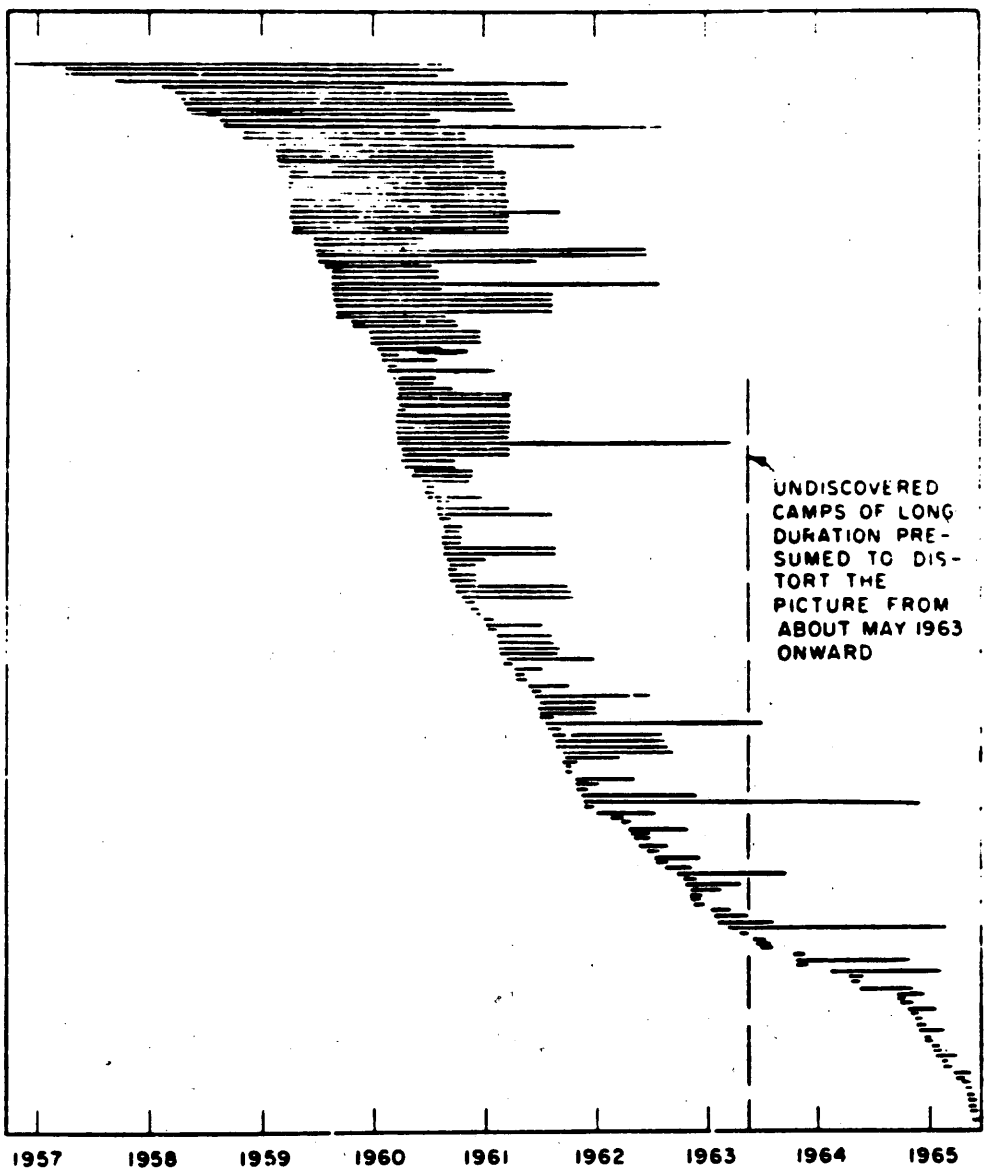

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FIG. 11 LENGTH OF OCCUPANCY OF 191 CT CAMPS DISCOVERED IN SOUTHERN THAILAND (U)

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(U) Site selection in Thailand follows much the same criteria that were used in Malaya--large camps usually are within a few hundred meters of potable water, under high spreading trees, on easily-defended terrain with an escape route or two leading to higher ground, within a few kilometers of an abandoned slash-and-burn clearing in which at least a few fresh vegetables may be raised, and located so that the morning sun enters the camp. In most parts of the border region, an east-facing spur tends to meet many of these desirable features, and such points are, indeed, often chosen as campsites.[42]

2. The Present Camp System, Estimated (U)

(U) Table II summarizes the possible composition of the CT camp system as it existed in April 1966. The estimated average capacities of occupied camps are based on intelligence reports by Thai and Malaysian

Table II

(U) ESTIMATED 1966 CT CAMP SYSTEM DATA (U)

Type of Camp	Percent of Total	Range in Capacity	Average* Capacity	Number of Camps†
AWC	60	1-9	5	35
AWF or District	30	10-29	12	18
Mobile Unit	5	30-49	40	3
Large Camps	5	50+	100	3

* (U) The figures in this column are, obviously, not arithmetic means but rather, are based on discussions with intelligence personnel.

(U)† The total capacity of the camps is estimated at 800 CTs.

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authorities. The last column reflects a calculation based on the frequency distribution of camp capacities shown in Fig. 9 and adjusted to reflect the assumption that the whole camp system would offer a capacity for 800 CTs. If, as has been suggested by intelligence personnel, camps ordinarily are occupied to 50 to 75 percent capacity, this would reflect a CT strength in the forest of 400 to 600 members. The last column also gives the estimate of the number of CT camps, whether occupied or unoccupied, which probably formed the targets of a camp surveillance system in the border region in mid-1966.

(U) Given these figures, intelligence estimates of the relative strengths of the three CT Regiments, and an understanding of the factors of terrain and mission objectives that bear upon the CTs, it was possible to hypothesize the disposition of the present CT camp system. This is shown in Fig. 12. It is not, of course, contended that the camps in question would be found at just the locations indicated on this map. However, the hypothesis has served as a needed basis for analyzing and planning logistics and command-control disruption.

3. A Recent Discovery* (U)

(U) (C) One of the largest and most interesting camps discovered was a political and military training center found near the town of Betong on 21 January 1967. It was thought by security forces personnel to have been either the headquarters for the CT Special District Committee or the Ayer Panas-Ban Yee Rai district of the Special District Committee. What made this find especially valuable was the large number of documents

* (U) The camp is described in detail in Ref. 51.

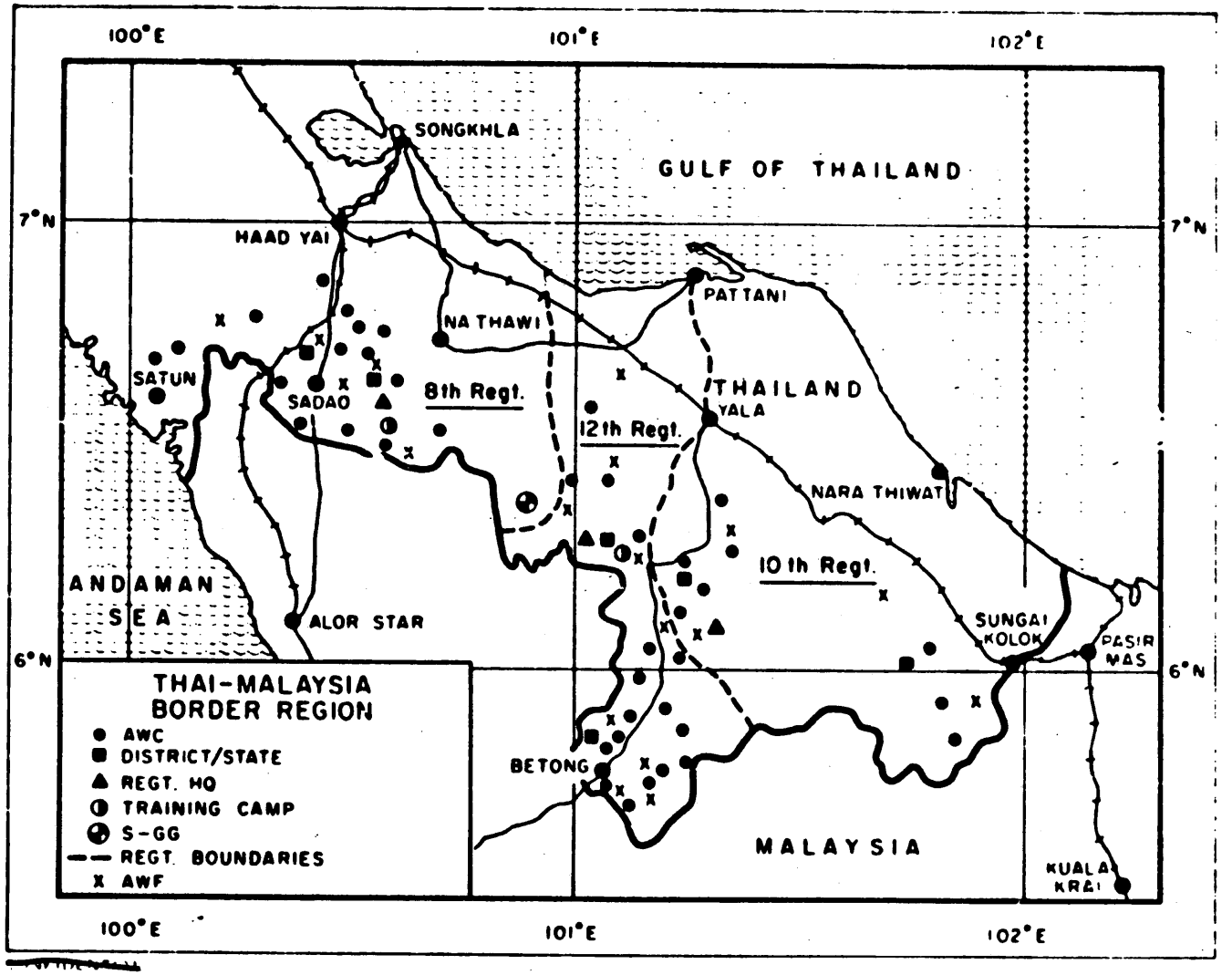


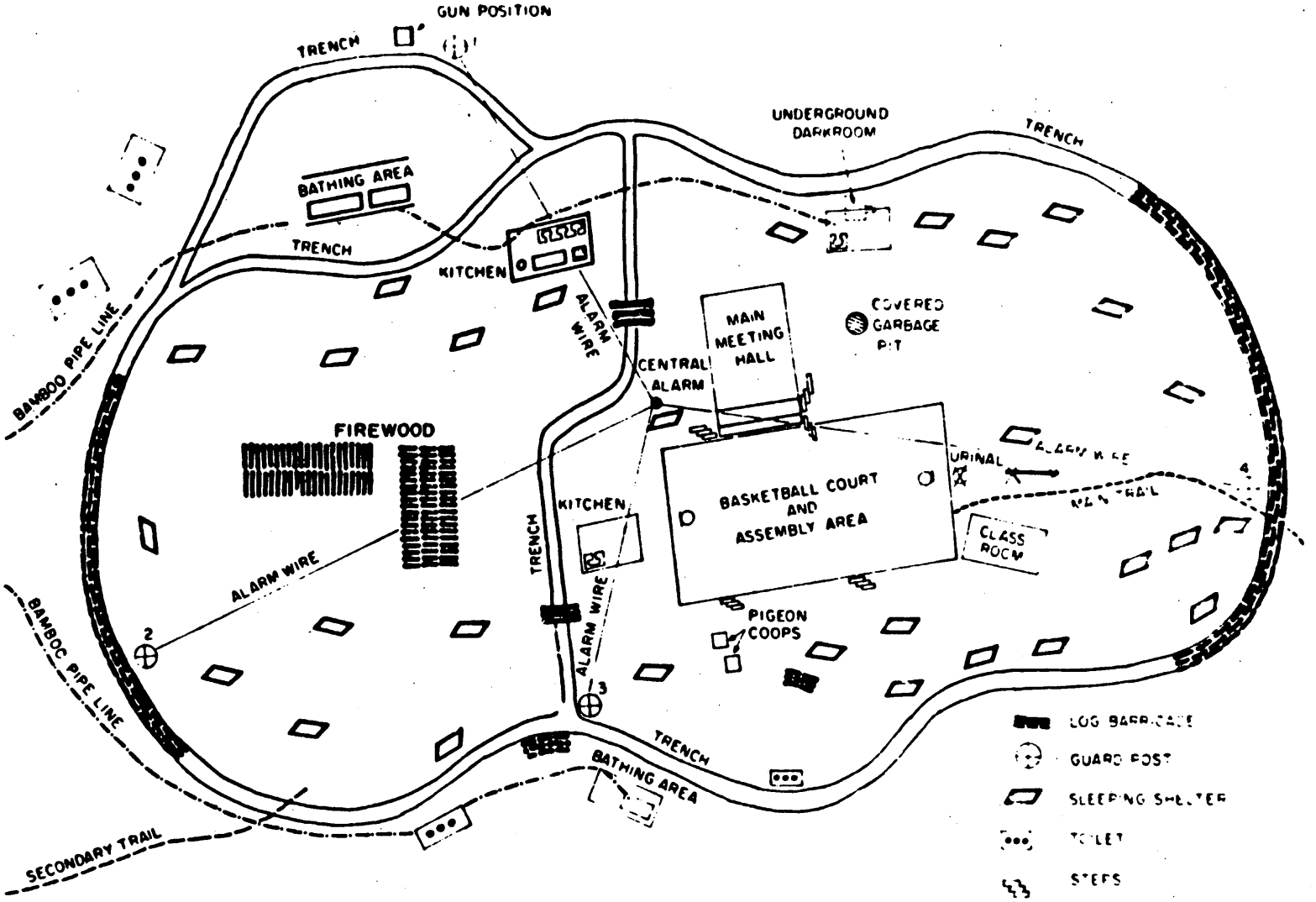
FIG. 12 HYPOTHETICAL DISTRIBUTION OF PRESENT CT CAMPS IN SOUTHERN THAILAND (U)

(U)

recovered from the camp indicating more extensive local organization, recruitment, and population control than had been suspected and the discovery of a darkroom and 96 negatives of photographs taken by the CT which, while they may not have been taken in that particular camp, present an impressive, if not alarming picture of the level of political and military indoctrination and organization. The size and layout of the camp is indicated in Fig. 13, and photographs of the camp and of CT camp activities are shown in Figs. 11 through 16.

4. The Value of Camp Surveillance (U)

(U) The CTs emphasize the quality of their organization and the military discipline that governs their daily lives. Many of them go in uniform and references to their "army" (the Malayan Races Liberation Army--MRLA--or, more recently, the National Liberation Army) are frequent. To maintain such a posture, the CTs need a place to hide, indoctrinate, and drill. The chief service of the camps is to offer such hiding places, and reciprocally, the chief counterinsurgency value in finding them lies in the denial of concealment for the MRLA. Sporadic discoveries will not accomplish such denial, however; a rate of discovery of about 100 camps per year, with a sizable proportion of such discoveries accomplished by surprise, would be needed to begin disruption of the living and command patterns established now in the CTO.



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Source: A composite of sketches make by SRI and BPP personnel.

FIG. 13 PLAN OF A LARGE CT CAMP (U)

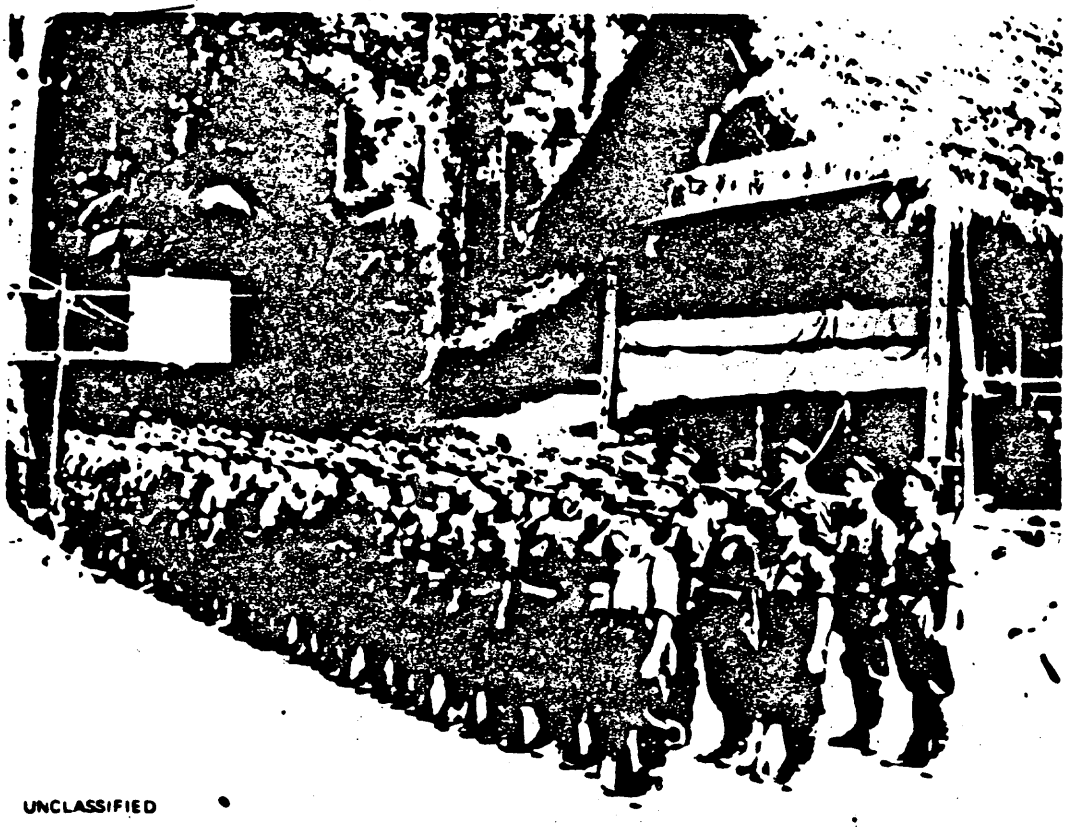

FIG. 14 FORMATION OF CT ON BASKETBALL COURT. Note apparent size of camp--large meeting hall, other structures, and spacious parade or recreational area. (U)

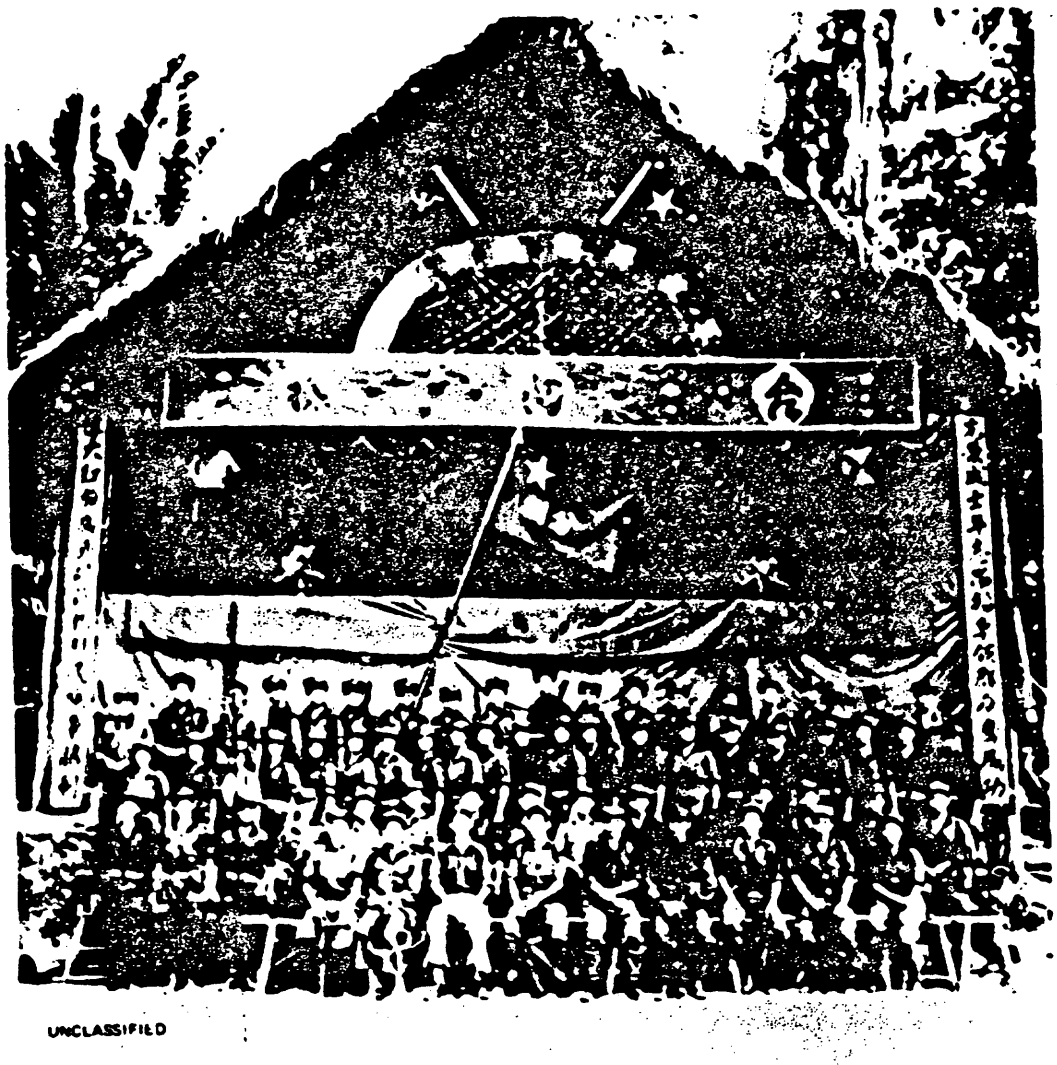

FIG. 15 CT GROUP PHOTO, POSSIBLY TAKEN AFTER GRADUATION OR CELEBRATION (U)

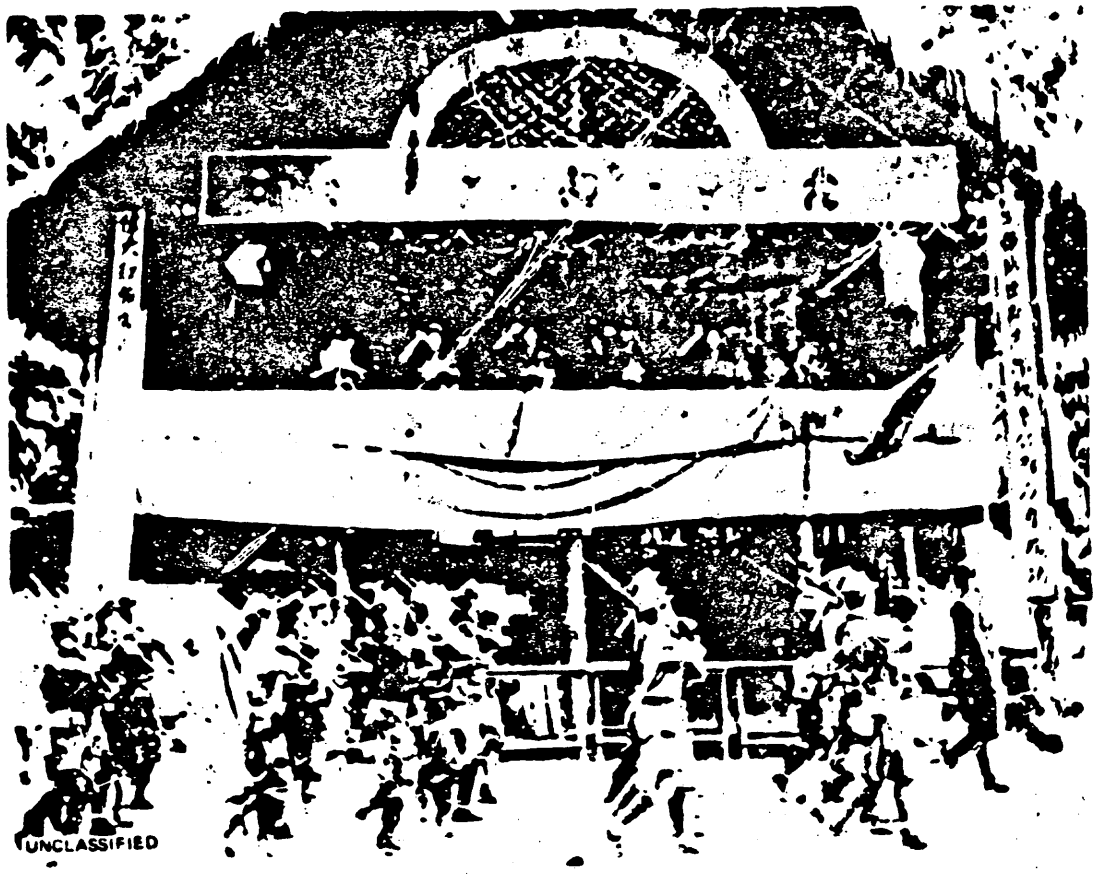

FIG. 16 CTs PASSING IN REVIEW, WITH FOUR LEADERS ON REVIEWING STAND GIVING COMMUNIST SALUTE (U)

[illegible] CT Logistics* (U)

(U) CT logistics was chosen as a priority research subject for the reason that it proved to be one of the most important targets of counter-insurgency in Malaya during the Emergency and because the problems and the enemy in southern Thailand are essentially the same as those in Malaya during the Emergency.

(U) The materiel used by the CTs[2,32] was analyzed to identify those items of greatest value in terms of the impact of their loss upon CT operations, as well as those items that appeared to make detection feasible. Work was then concentrated on a description of the logistics processes to determine points at which detection might take place.

1. The Logistic Process (U)

(U) The CT logistic requirements and processes form an elaborate but extremely flexible system linking the CT consumers in the jungle with sources of supply in nearby villages and towns. A very large number of CT requirements for materiel are identical with those of the host population. Virtually all items are procured from the existing open and black markets or from farms and rubber estates. Except for a modest amount of materiel donated to the cause, the CTs pay for their supplies, using funds solicited from the population.

(U) In the current, relatively subdued phase of insurgency, the major items of consumption are food and clothing. Ordnance items, such as weapons, ammunition, and explosives, are used only for training, unavoidable contacts with security forces, or occasional assassinations. Rice, canned milk, sardines, medicines, plastic cloth for shelter, paper

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* (U) Much of this material is taken from Refs. 2 and 3.

propaganda), tennis shoes, and cloth for making uniforms constitute the main high-volume items. Other critically important items required in smaller quantities are salt, spare parts for radio receivers, field glasses, weapons, antibiotics, anti-malarial and sulpha drugs, printing ink, stencils, and other printing supplies.

(U) The following seems to be the standard way in which supplies are ordered and provided. Orders to procure items emanate from the camps occupied by the CTs in the jungle and jungle fringe, ultimately reaching the various sources by means of couriers. Higher echelons, such as the Regiment and District Headquarters and training camps, are supplied through the Armed Work Force units that are most conveniently located relative to these larger camps and to sources. The Armed Work Cell, in turn, is called upon to organize supporters and manage (but usually not conduct) that portion of the procurement process that must be performed in the open.

(U) An order proceeds by courier down the various links to the source. If the order is large, it may be subdivided between more than one Armed Work Force and several Armed Work Cells. On arrival at the Cell, an order is usually executed through the buffer of one or more Masses Executives or supporters. If the order is for fairly standard items that are readily available in the area, a date, time, and place of delivery may be specified. The contact with the supporter usually takes place in rubber plantations or the jungle fringe. The supporter is given delivery instructions and the necessary funds, proceeds to the source or sources of the items, completes the purchase, and returns to the area specified for delivery. In certain cases the time between order and delivery may be less than a day but, if the items are rare, or if

(U)

[illegible] on order and deliver [illegible] and 1965 on which data [illegible] instructions often require that the [illegible] purchased be stored temporarily in a supporter's house or other convenient hiding place for [illegible] days.

2. Financial Support (U)

(U) The CT policy is to pay for services and materiel, thus creating an image of legitimacy and avoiding alienation of the population. Although there are mentions in some captured documents of large sums received as donations from wealthy supporters and a few indications that Communist China may contribute some money to the CTs, a substantial proportion of the CTs' income is believed to come from taxes paid by the inhabitants of the areas of CT operation, principally the rubber estate owners but also the rubber tappers, shopkeepers, and mine workers. The rates of taxation vary, depending upon the ability of the source to pay. Rubber tappers are called upon to contribute from 5 to 20 baht* per month, estate owners are taxed on the basis of the number and productivity of their trees--from 3 to 5 baht per acre per month, and shopkeepers are asked to pay an assessment, based on their profit, of from 100 to 500 baht per month.

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* (U) 1 baht = about $0.05 U.S.

[redacted]

4. [redacted]

(U) The CTs have developed a fairly elaborate, centralized courier system for communicating among the organizational units. In the jungle the CT courier is a part of a Courier Cell, consisting of one or more couriers and bodyguards. Each Courier Cell is assigned to specific links in the system, the terminals being "mailboxes" or camps. In the jungle the courier usually travels in uniform with one or two bodyguards. He may choose among several routes to cover a given link and it is likely that the same message is sent by two routes. The period between trips and the routes taken are frequently changed to prevent the creation of a pattern that might be detected by intelligence agents, informers, or security forces on patrol.

4. Transport of Materiel (U)

(U) From the point of purchase to the point of delivery to the CTs, the supporter may use any type of transport vehicle that happens to be available and convenient. Transport of materiel beyond the jungle fringe* is performed by the CTs themselves, acting as porters.

5. Storage of Materiel (U)

(U) The CTs maintain a fairly elaborate system of caches for storing materiel. The two basic types of caches are: the temporary cache, used by supporters for materiel in transit and by the CTs when surprised by security forces, and the semipermanent cache, used by CTs for camp overflow, emergencies, strategic reserves, and arms.

* (U) There is some indication that the fringe, in this context, extends about five kilometers into the forest.

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(U) [illegible] Armed Work Cell, reportedly, [illegible] from [illegible] to six [illegible] caches scattered [illegible] operations, while the Armed Work Forces and higher headquarters [illegible] one or more caches in the immediate vicinity of their camps. The [illegible] of these caches is to reduce the risk and amount of loss in case of [illegible] prise attack by security forces. In addition to an overflow cache, two or three emergency caches are maintained at rendezvous points one or two kilometers from each established camp for use in case the unit has to leave unexpectedly. These caches are thought to contain about two weeks' provisions for the unit involved.

(U) The semipermanent cache usually consists of one or more metal drums* with sealed lids buried in the ground, the tops roughly a half meter from the surface. These caches are very carefully prepared and hidden, and they are reported to be checked once every two or three months for leakage and deterioration.

G. System Management (U)

(U) With the exception of training and the occasional movement of Mobile Units, the CT commander can predict the activities of system elements, and the location and number of CTs in the various headquarters are relatively stable; requirements for logistic support can be planned for well in advance. Sources and channels of procurement are well established. The number of CTs is small, compared with the host population, and they are spread out. The impact of CT logistics upon indigenous materiel distribution systems therefore is relatively small, and management

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* (U) Steel, 50-gallon drums (used by Thai road builders to store tar along highways), and carbide tins (about 12-gallon size) often are used.

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(U)

of the system would be triple if it were not for the flexibility of the security. The lessons learned by the CTs during the Malayan Emergency are reflected in preventionary measures to be found throughout the present organization.

7. Value of Logistic System Analysis (U)

(U) The logistic system employed by the CTs in southern Thailand has disclosed a marked similarity to that employed by the CTs in Malaya during the Emergency. Many of the same system strengths and weaknesses that existed then still characterize the CT logistic system in southern Thailand. For example, while redundancy and flexibility tend to protect the CT logistic system, the system has such inherent weaknesses as dependence on the local populace for logistical support. Recognition of such weaknesses by the British in Malaya led them to direct civil regulations and operations against CT logistics so as to cut their sources of supply and force them into the open.

(U) Thus, it is hoped that elimination of the CT threat in Thailand can be precipitated through planned operations based on detailed analysis of the CT logistic system. In an effort to provide such analysis, a quantitative study of the CT logistics system in the Thai-Malaysian border region was conducted by SRI.[5,18,50] Fundamentally, the goals of this study were not only to develop an analysis of a specific insurgent logistic system, but also to develop the analytical models necessary to evaluate such a logistic system, and to make such models broad enough for application to insurgent logistic systems in general.

(U) Three deterministic model routines were developed that provide for a detailed quantitative analysis of the logistic system. The three routines--covering the ordering and consumption process, the communication

process, and the transportation process--are interlocking, as are the functions in the actual logistic process. In addition to these deterministic models, a stochastic model was developed to provide probability functions on interdiction of insurgent logistic system functions by security forces.

(U) From the models, and the limited testing done with them, the conclusions of earlier analyses--that an insurgent logistic system is particularly sensitive to interdiction of the courier and porter networks--were validated. In addition, an upper level of logistic support capability was established, and the models appear to have a sufficiently broad base to be used for the analysis of insurgent logistic support efforts other than those employed by the CT.

8. Surveillance of CT Logistics (U)

(U) Such efforts at interdiction would, however, have to persist for a period sufficient to allow for the depletion of reserves and the effects of food shortages and exposure to have an impact on CT morale. To accomplish this, a balanced application of intelligence, patrolling, and civil regulations would be needed.

(U) ~~(C)~~ Since the parts of the CT logistic system that are found outside the forest often are masked by activities of non-CTs, they will be very difficult to identify unless the background of innocent economic activity is controlled through civil regulations. A few such regulations have been applied in southern Thailand during the last few years but never on the scale or with the consistency used during the Malayan Emergency. In light of SRI studies, it seems unlikely that effective surveillance of the CT logistic system outside of the jungle will be

accomplished without concurrent, comprehensive civil regulation. The possibility is examined in some detail below.

(U) Within the jungle, however, particular surveillance systems appear promising as supplements to regular police work, particularly in the monitoring of trail traffic. As will be seen in Section IV, such monitoring could give useful information on CT strength and activity. Analysis has also indicated that the CT pattern of acceptable cultivation in a jungle clearing is distinctly different from the cultivation pattern of a subsistence farm in the same region.[43] Identifying such pattern differences could be used for detection of CT camps, in conjunction with visual or photographic reconnaissance.

D. The Strategic Setting* (U)

(U) The present setting for conflict in southern Thailand is not solely a result of the historical background, but it springs also from the geography and ethnography of the region as well as from the sizes and abilities of the CT and counterinsurgent forces.

(U) Whether because of its distance from the capitol--the southern border is approximately 450 air miles from Bangkok--or because the military threat has been perceived to be slight, the South has been something of a forgotten land. It has long stood low on most priority lists, although there has been growing Government concern about the situation in the South and a consequent progressive increase in general attention to it.

* (U) The material for this section is taken from Refs. 10 and 25.

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(U) Much of the area is covered by jungle, especially near the Malaysian border and along the western coast, and a large part of the jungle is mountainous. Much of the eastern coast is relatively easy to patrol but the western coast has heavy forest right down to the water, many off-shore islands, and navigable estuaries reaching back into the jungle. In the border area the jungle is very heavy and the area is laced by streams and a few trails, and is dotted with a small number of rice-producing valleys. The forests where the CT now most frequently operate cover perhaps 10,000 square kilometers. The border itself twists for about 400 kilometers across the peninsula.

1. Ecology (U)

(U) Game, fruit, and edible plants are not plentiful in the South. Movement, except along stream beds or the occasional trail, is slow and the gathering of the little food that exists is correspondingly difficult. It rains often and heavily. If the jungle lay adjacent to the rice fields and if the local villagers produced an excess of food, the guerrilla might live in the jungle most of the time and come out briefly and only a little way to get plenty of food, but even this option is denied in this border area. Many of the local people work in tin mines or rubber groves and use the money from such work to import food to supplement the locally insufficient crops.

(U) On the other hand, rubber cultivation places many tappers in isolated positions, leaving them vulnerable to terrorist extortion and nearly impossible to protect. The CT, therefore, carried over from Malaya a pattern that somewhat parallels that of the local people. They acquire money (by collecting "taxes") and use that money to buy supplies (forcing or otherwise inducing local people to serve as their intermediaries).

(U) Control of the food supplies needed by a guerrilla force of a few hundred men requires the control of very small quantities--ounces of rice and single packets of vitamin tablets. It calls for a smooth functioning, pervasive local administration system of a kind that never existed in South Thailand and takes time to create. Some villages have almost their sole contact with the Thai Government through occasional visits by the Border Patrol Police (BPP).

2. Communal Relations (U)

(U) In South Thailand there are three ethno-cultural groups. One is the Chinese a second is of Malay racial stock and culture and follows the Muslim religion; the third, is racially Thai and its religion is Buddhism.

a. (U) Chinese. The Chinese dominate several regions along the border, including the two around the towns of Sadao and Betong in the western and central sectors, respectively. They provide not only the shopkeepers and businessmen in these towns--roles held by Chinese in many parts of Southeast Asia--but also a high proportion of the rubber tappers and tin-mine laborers in the two areas. They often labor under the same kind of political ostracism that has frustrated the "overseas" Chinese communities for decades. Such frustrations seem to bear most heavily upon the young people, and were considered important among the motivations that drove young Chinese into the CT organization during the Malayan Emergency. They probably have similar effects now in the Chinese enclaves near Betong and Sadao.

(U) (C) Whatever the supply of recruits from the Chinese community or the degree of willing support offered by it to the CT, there seems to be no question concerning the tangible support that it provides them.

(U)

The CT collect taxes in money from those who have some and in labor from poorer people, and utilize the Min Yuen in a well-developed system of contacts. The Chinese communities near Betong and Sadao are known to provide significant funds to support the CT.

b. (U) Muslims (mainly Malays). The Muslim community in South Thailand covers most the border areas except those of the Chinese enclaves mentioned above. The regions just north and south of the present border were once part of a single country, the kingdom of Pattani, and some feelings of solidarity still link the people within them. There are similarities in cultural traits and religious and political ties, with the religious tie strongest. Religious schools (with instruction given chiefly in the Malay language) offered almost the only education beyond the fourth grade in South Thailand--although this is now changing--and the Hadji in each village tend to be the respected leaders. These religious and cultural ties have fostered irredentist movements against the present Thai Government and CT propaganda now makes a play to this residual sense of nationalism.

c. (U) Buddhists (mainly Thai). A rather small proportion of residents in rural areas near the border are Buddhists, with a larger proportion to be found in the towns. A disproportionate share of them are associated with the military, police, and civil administration. Reliable data on income distributions are not available but, given the prevalent association in Thailand between income and governmental power, it seems fair to guess that this group also contains a disproportionate share of property owners.

(U) The most important segments of this community, in the present context, probably are the security forces and other government agencies engaged in civil administration and economic development. The counterinsurgent forces that are most important in the area are the Border Patrol Police and the Army. There are two other branches of the police, the Provincial Police and the Marine Police, but neither has the combat capability to contend with the CT in the region.

3. Thrust of the CT Threat (U)

(U) Although the existence of any well-organized insurgent force such as the CTO in an area of ethnic tension and economic depression such as southern Thailand would present any nation with a serious security problem, nevertheless the CTO is self-identified as Malayan. It continues to insist that its objective is to return to Malaysia and overthrow the present government there; it insists, further, that it has no hostile intentions toward the Thai Government. Indeed, the CT are especially careful to maintain what is described in one document as an "apparently peaceful situation" so that the Thai Government may elect not to pursue too vigorous a campaign against them. They never seek contact with Thai security forces; they fight and fight well when it becomes impossible to avoid combat, but they usually break off contact as soon as possible.[39]

(U) Although the CTO does play on Thai-Muslim grievances against the Thai Government, it does not encourage overt anti-Thai political activity by this group. Instead, it encourages Thai-Muslims to support the return of the CTO to Malaysia as their best means of gaining redress. Moreover, there would appear to be greater revolutionary potential in ethnically-divided, highly-politicized, and economically more sensitive Malaysia than in comparatively homogenous, politically inert, and economically primitive South Thailand.

(U) Accordingly, despite some evidence to the contrary, it can be concluded that the CTO remains primarily a threat to Malaysia and only secondarily a threat to Thailand.[26] Further, so long as it adheres to its present policies, its threat to Thailand depends essentially on its ability to make good its threat against Malaysia. The ethnic and economic conditions that allow the CTO to survive are, in Thailand, almost entirely localized in the South. There is no hard evidence that the CTO is working with Thai Communist Party insurgent groups elsewhere in Thailand or has made any plans to do so.

(U) As will be seen, the Thai lack the resources to eliminate the CTO militarily without withdrawing excessive assets from areas where insurgency represents a greater primary threat to national security. They are also unwilling, so long as they assess the CTO to be primarily a threat to Malaysia, to risk the social and economic upheaval that large scale counterinsurgency operations along the border would produce. They recognize that they run certain risks--including that of arousing Malaysian hostility--in continuing their present policy of what might be termed "aggressive surveillance" toward the CTO. However, at the present time and for the foreseeable future, this is probably their best course of action, or inaction.

(U) Yet, in spite of the fact that the CT are in the area only to gain strength and perfect their organization so that they may return to the fight in Malaysia, the CT must preempt three obvious forms of sovereign control--namely, the effective exercise of coercive power, taxation, and the provision of some civic government. Such action inevitably puts them and the Thai Government in basic competition, whether or not either of the parties wants the conflict between them. The CT represent a significant weapon, small as armies go, but excellent. That weapon seems now to be trained on Malaysia, but it is possible that it might be directed also or instead at Thailand.

4. Thai Security Forces (U)

(U) There is reason to doubt that security forces now available in the South are sufficiently strong to cope with the CTs if the latter were to abandon their strategy of passivity. The numerical ratio between insurgent and counterinsurgency forces needed to give a break-even situation varies from one situation to another and has never been exactly determined for any one case. The force ratio of the Malayan Emergency (about 100,000 against 5,000) was sufficient but not excessively so, as indicated by the 12 years needed to win. There seems to be no evident reason for thinking that the required ratio against the CTs now would be much lower than that needed against them in that earlier period. After all, the CT have had a dozen years in which to organize and train; they retain a core of extremely capable jungle fighters; the Thai counter-insurgent force are competent but have not had experience against a determined foe; and the jungle covers the hills over a wide enough area to give room for hiding and maneuvering. Under such conditions, it seems likely that the force to cope with the CTs should outnumber them something like 20:1 or at least 10:1. The present ratio is smaller, as discussed below.

(U) The main counterinsurgent force operating against the CT in South Thailand is the BPP force of about 1,100 men. Its headquarters is in Songkhla (Hq 9th Area BPP) and perhaps a third or a half of that number are in the jungle hunting CT at any given time. The BPP is probably too small to cope effectively with the CT if the latter were to go over abruptly to the offensive. Provincial Police (of whom perhaps 1,000 could be spared from regular work) and a few thousand Royal Thai Army troops provide immediately available backup for the BPP. The BPP is also supported by Malaysian patrols on some occasions and by Malaysian Special

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Branch intelligence experts who have combated CTs for nearly 20 years, but the number of such forces which can operate effectively in Thailand is limited.

(U) If all available anti-CT forces were brought to bear, they would outnumber the CT by somewhere between five and ten to one: those now engaged have only about a two to one margin at best. Force ratio, admittedly, is not by itself an adequate measure of capacity, but it is the one most frequently used. The situation along the Thai-Malaysian border, therefore, is serious. The enemy force: (1) is big enough to be dangerous, (2) has enough room and cover to operate, and (3) has been in place long enough to have consolidated its internal organization and its association with many villagers; the available counterinsurgent forces in the area may therefore be too few to cope with the CTs if the latter should opt for armed struggle.

E. Counterinsurgency Force Requirements* (U)

(U) Given the possibility that the thrust of the CT threat could be directed against Thailand, the question arises of whether it might not be wise to act now against the force and to remove it before it can take the initiative. That question raises another one: "What forces would probably be required to accomplish such a victory over the CTO?"

(U) To answer the second question, three different working tools were prepared: a scenario of possible events following a decision to attack the CTO with forces currently available;[15] a theory (formulated in terms of indexes of capability) to facilitate comparisons between

* (U) Material for this section is taken from Ref. 4.

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Malaysia and Thailand of the counterinsurgency forces required[17]; and analytic models expressive of the advantages to be expected if particular surveillance systems were added to the counterinsurgent arsenal.[17]

(U) The scenario considers the strategy and capabilities of the CTO and the counterinsurgency forces the RTG might employ to counter the CT threat and to force them into military retaliation. This hypothetical conflict is analyzed in three time phases: (1) the first through the third month, (2) the fourth through the sixth month, and (3) the seventh month, when the CTs would turn to active defense. The sociopolitical support base, the actual forces available for the operations, and the logistics and command-control are described for each side, as well as friendly-force and CI orders-of-battle assumed to be available for use in the hypothetical conflict. The results of this research[15] can at best be considered plausible rather than proven and, as a vehicle for analysis, may be of value to Thai and U.S. officials who have an interest in commitment of security forces against the CTs along the Thai-Malaysian border.

(U) Military science has developed one major index reflecting relative capability in regular war, namely, the ratio between the opposing forces. This ratio is adjusted in terms of firepower and other such modifiers, but it emerges as the dominating parameter in analytic evaluations. As an example, there is the generally-respected rule of thumb that a force attacking a fortified point should have about a 3:1 advantage in order to have a break-even chance of success. There has been a natural tendency to carry this index over from regular war situations to counterinsurgency and one sees the needed counterinsurgent forces expressed in terms of a needed ratio of forces--10:1 over the insurgent

seems to be a popular estimate of the force ratio that supposedly marks the balance point.

(U) The variation among such estimates has led to a feeling that something is wrong with the index or its application. It is argued that the difficulty is basic--that the solution is not to adjust and modify the force-ratio index but to abandon it as a primary indicator of counter-guerrilla capability. Other indexes should serve to estimate capacity for the lower intensities of insurgency; the particular set to be applied in any given instance will depend on the strategic situation.[17]

(U) For the situation in South Thailand, indexes for offensive operations, defensive operations, and intelligence penetrations were derived and then tested using data from the Malayan Emergency. Although more complex indexes--such as terrain, population distribution, and the quality and placement of agents--were derived, they could not be tested because of the lack of available data.

(U) The derived indexes of counterinsurgent capability were then applied to the estimation of the CI forces that would be needed to defeat the CT in southern Thailand. A flow chart (Fig. 17), showing the structure of the capabilities analysis and the requirement analysis, appears on the next page. The salient results of the research are as follows.[17]

(U) First, and probably most important, a theory for the estimation of offensive and defensive force requirements--and for gauging the adequacy of intelligence penetration--was developed; its application to data from the Malayan Emergency shows a stability that suggests this theory is at least significantly better than prior methods of force projection based on force ratios. The theory indicates that requirements for the lower intensities of counterinsurgency should be derived from the environment, with little reference to insurgent strength.

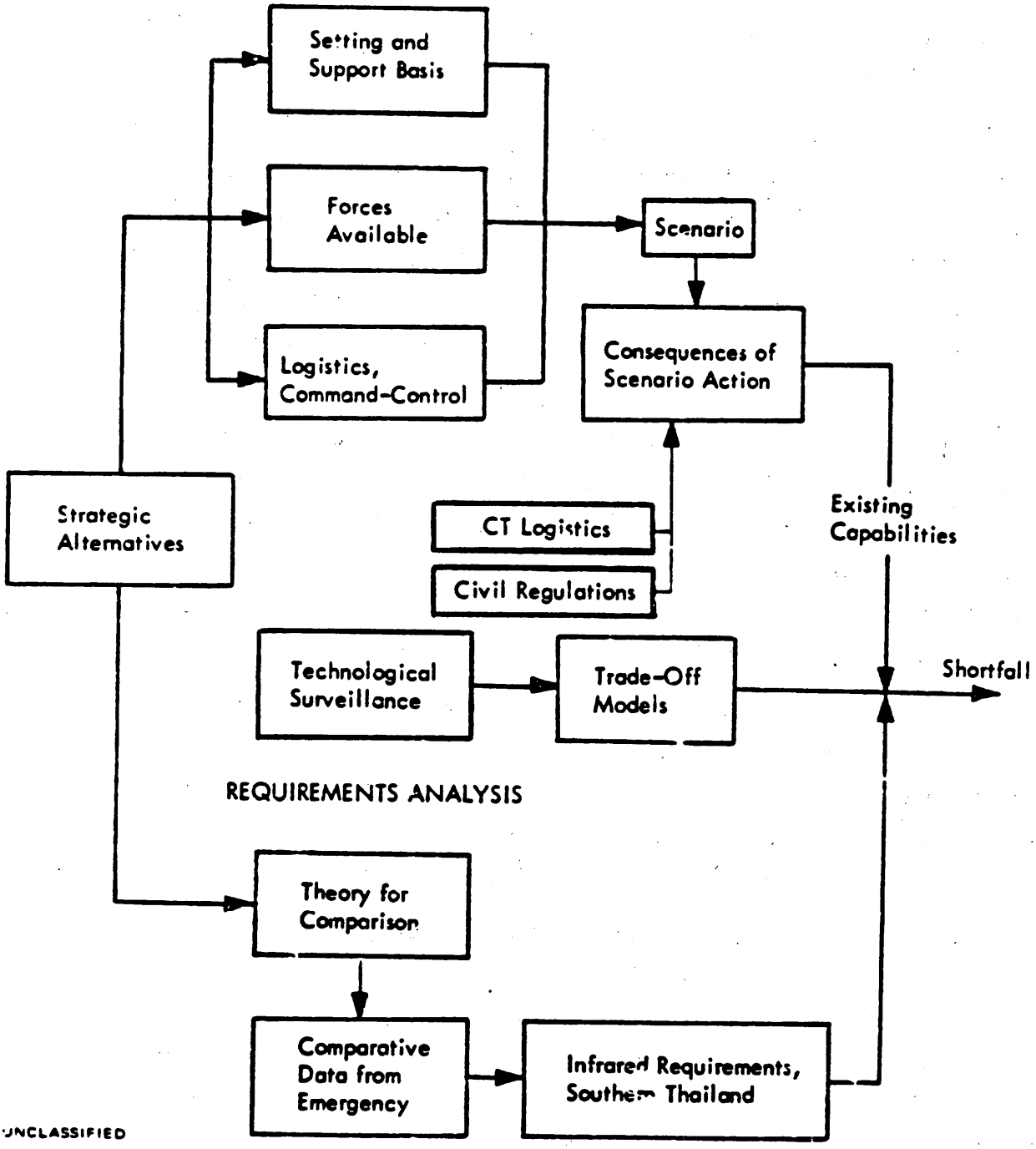

FIG. 17 FLOW CHART FOR ANALYSIS OF THE CONFLICT IN SOUTHERN THAILAND (U)

(U) Second, data on about a dozen regional operations during the Emergency--operations of the same general geographic size as those that might be expected in southern Thailand, and conducted on generally similar terrain--showed an average CT force density of 2.4 men per square kilometer of operational area. Given the areas to be covered in the southern border area of Thailand--and following designated assumptions as to the sequence of regional operations there--it would take an offensive force of about 5,000 men a period of about five years to defeat the CTO in that region. From analysis of the potentialities of infrared and seismic surveillance systems, it is argued that the total probably could be reduced by about 1,000 to 4,000 if suitable numbers of such systems were obtained and fully integrated with the ground attack force. Data on two of the Emergency operations support the estimate of 4,000, assuming similar densities of defensive forces for southern Thailand.

F. Civil Regulations in Counterinsurgency (U)

(U) It is by now generally accepted that the prerequisite to military victory over insurgents is the reestablishment of government control over the population and breaking that of the insurgents. To make most effective use of security forces and technical aids to detection and tracking of guerrilla bands requires a limited population control program, including curfews, registration systems, and the like. A corollary to this postulate is that, to be effective a population control program must be adapted to the complexities--social, political, cultural, and environmental--of the area in which the insurgency exists.

(U) The close control of populated area requires the government to apply extraordinary administrative and police measures in order to establish or reestablish its authority in regions where the population is

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disaffected or threatened by subversion. These measures, referred to collectively as population surveillance and resources controls, are selective constraints upon activities and facilities normally left to individual choice, which can range from simple individual registration systems to the actual physical relocation or detention of individuals and communities, accompanied by strict rationing and supervision of food supplies. They are designed to separate physically the mass of the population from the subversive or disaffected elements who must rely on it for supplies and recruits, and who seek to control it for their own anti-government purposes.

(U) The many similarities between the insurgency situation in southern Thailand and earlier in Malaya--the composition of the insurgent force and the geographic, ethnic, and economic likenesses of northern Malaya and southern Thailand--frequently evoke the supposition that the Malayan remedies should be applicable to Thailand as well. This supposes that programs of population and resources controls, coupled with aggressive military or paramilitary operations, may be effective against the CTs in southern Thailand as they were in Malaya during the Emergency. To examine the validity of this supposition, studies were undertaken of the Malayan experience and its applicability to South Thailand.

1. The Malayan Emergency Regulations (U)

(U) While the application of the Emergency Regulations is often cited as a prime factor in the defeat of the insurgency in Malaya, there were no concise descriptions of the Regulations themselves with explanations of the reasons for their adoption and the methods by which they were applied. A first effort, then, was to prepare such a description.[47]

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covering not every aspect of the Emergency Regulations, but confined to those Regulations that were used successfully and concentrating on control measures that can normally be used when Phase I insurgency--mass subversion accompanied by selective terrorism--is underway.

(U) In the first two years of the Emergency, the initiative was in the hands of the insurgents, with the government on the defensive and in the process of consolidating its forces and resources. By mid-1950, however, the insurgent offensive had failed, and the government was able to embark on an extensive program of resettlement and regrouping of squatters, rubber tappers, mine workers, timber cutters, villagers, and other sources of CT support. When combined with the development of adequate physical facilities for the protection of the population, such measures made it increasingly difficult for the enemy to gain easy access to the people, which was essential to CT survival. The further imposition of controls on food and other materials required by the CTs to live and perform their functions, and the extensive and sustained application of such controls in selected areas, combined with major operations, ultimately placed such a strain on the CTO that its members were forced to surrender or flee--or be killed.

(U) It is notable that, while the measures taken were often severe and unpopular with the people, they were imposed selectively, with as much care and understanding as was feasible and with an appreciation of the need for gaining the active support and participation of the population. It was, therefore, the policy that control measures should be related to the threat, be kept to the minimum, and be relaxed or removed whenever possible.

(U) The Malayan experience indicates that successful resources control is impossible without prior imposition of population controls. During the Emergency the basic control on which the use of all others depended was the resettlement of the rural Chinese population into compact "New Villages," where they initially could be prevented from aiding the communist terrorists and could then gradually be converted to supporting the government against the insurgents.

(U) As throughout the Emergency the Malay population remained loyal, or at least passive, toward the government and was, except in rare instances, hostile toward the almost totally Chinese CTs, the insurgent campaign was essentially a contest between the government and the Chinese population. Malay Home Guards proved well able to defend their villages against terrorist coercion; hence the Emergency Regulations were enforced almost entirely on the Chinese, affecting the Malay population relatively little.

(U) Most importantly, the counterinsurgency experience in Malaya pointed to the need to have a comprehensive set of civil regulations drawn up before the onset of violence in order that they may be exercised immediately when required.

2. Applicability of Emergency Regulations to Southern Thailand (U)

(U) Along with the study of the Malaya experience, investigation was also made of existing Thai legislation that might authorize the use of population surveillance and measures to deny terrorist supply.[48] A resumé of relevant Thai laws was believed necessary because Thai officials concerned with counterinsurgency had frequently stated that, however desirable such measures might be in certain situations in Thailand, there was no legislation to authorize their use, or that the law actually forbade such measures.

(U) It was concluded that existing Thai legislation supplies sufficient authorization for the imposition by decree of almost all the useful measures employed in Malaya during the Emergency and those considered desirable by the Joint Thai-Malaysian General Border Command responsible for counterinsurgency operations in the Thai-Malaysian border area.

(U) Having eliminated the possibility of legal barriers, study was then made of whether and how the Royal Thai Government should integrate administrative controls on the civil population and the economy into an operational plan for the elimination of the CTO.[13] No attempt was made to demonstrate necessity for the RTG to take any such action, but only to determine the feasibility of using population surveillance and terrorist supply denial measures in southern Thailand, assuming feasibility. Consideration was given to the most appropriate measures or systems of measures, together with the manner of their implementation, if the RTG should decide on a campaign to eliminate the CTO.

(U) As was indicated from other SRI studies reported above, CTO control of the rural Chinese is facilitated by the fact that a large percentage of the Chinese in Betong and Sadao live widely scattered on isolated rubber plantations. This exposes individuals to the visits of terrorists and inhibits efforts of the government to provide security. In addition, most of these rural Chinese are rubber tappers, who work in isolation during hours of darkness. This, too, facilitates CTO access to the population and inhibits government security efforts; at the same time, poor surface communications and rugged terrain, especially in Betong, place severe limitations on government rural security efforts.

(U) The total cost of a population surveillance program combined with a fairly extensive program of community development in Betong and Sadao would not be greatly in excess of 40,000,000 baht, or about

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U.S. $2,000,000. The Royal Thai Government has the resources to support population surveillance of the Chinese of Betong and Sadao, as well as a considerable community development program to offset the negative aspects of population surveillance.

(U) However, the ability of the RTG to administer successfully a terrorist supply denial program on the lines of the Malayan food denial system is marginal. At the present time coordination among various branches of the civil administration itself and civil coordination with security forces, both police and military, is inadequate to conduct an effective program.

(U) It was concluded that:

- Development of a formal system of population surveillance to deny the CTs the support of the rural Chinese population of Betong and Sadao would make a great contribution to the success of any campaign designed to eliminate the CTO. Curfews, more rigid enforcement and improvement of existing identity card and household registration systems, establishment of prohibited areas and, probably, the fencing of regrouped villages should be made part of such a program.

- However, the basis for any functioning system of population surveillance must be the regrouping of the rural Chinese populations of those districts into compact communities. Such communities should be so located as to allow their populations continued access to their present properties or places of employment, be given priority for community development and supplied with pure water, electricity, schools, and roads, and be provided with security. Insofar as possible, regrouping should be carried out on a voluntary basis.

- CT control over the Thai-Muslim community is not tight enough to require involuntary regrouping of Thai-Muslims except on a very minor scale. Consequently, there is little risk of an adverse Thai-Muslim reaction.

(U)

- A comprehensive program of supply denial is probably unnecessary, but the regrouping of the rural Chinese population would permit the initiation of one if it becomes necessary. If attempted, a supply denial program should not be undertaken on any scale except as part of military operations conducted with sufficient force and determination to ensure the elimination or reduction of the terrorist force to impotence.

- An appropriate command structure, embracing all the civil, police, and military elements required, would have to be devised to ensure proper functioning of any population surveillance and support denial system. Such a structure does not now exist.

G. Other Lessons from the Malayan Emergency (U)

(U) Because of the apparent relevance of the Malayan Emergency to the situation in southern Thailand, other aspects of the Emergency were studied in addition to the Regulations. A detailed description was prepared of the counterinsurgency operational strategy and tactics evolved during the Malayan Emergency and their geneses.[14] The first major lesson from the Emergency is the need to deploy all available army units on an offensive role inside the jungle; although contacts were few, it prevented terrorists' forming the large units needed to win a revolutionary war.

(U) A second lesson was learned from the success met in resettling the terrorists' support population into areas where it could be protected and patrolled. Supply controls in populated areas, covered by troops and police reinforced by deep-jungle striking forces, reduced insurgent unit size, owing to their logistics problems, and therefore reduced their capacity for large, offensive operations.

(U) Quick, accurate intelligence is the key to successful counterinsurgency operations. From a series of experimental operations starting in 1952, the counterinsurgency forces discovered that the communists' logistics and political link with the people could be interdicted by penetrating the insurgent supply organizations that operated in the open. This penetration, together with patrol harassment and selective tightening and relaxing of supply controls, forced the terrorists into chosen killing grounds, where they were ambushed by counterinsurgency forces. This operational strategy was pursued successfully and--in just over six years--eliminated communist terrorism from the country.

(U) Finally, details on command, training, operational planning, logistics, finance, and psywar were described and discussed with particular attention given to the intelligence organization of the Malayan-British security forces.

IV SURVEILLANCE DEVICES AND SYSTEMS (U)

(U) The investigations of the insurgency situation in southern Thailand described in the preceding section had as their primary goal the identification of surveillance requirements. The specification of a number of these stemmed in particular from the studies of CT camp and logistic support practices.[3] Concurrently with these investigations and analyses, operational tests and evaluations were conducted of devices that appeared to offer promise for the detection of CTs. These evaluation activities developed principally around three types of sensors: magnetic, seismic, and infrared.

A. Magnetic Detection (U)

1. Cache Detection (U)

a. (U) Rubidium Vapor Magnetometer. Early in the project work a Varian rubidium vapor magnetometer was procured at the request of ARPA and an evaluation program was defined to assess the capability of the instrument to detect the presence of moving or stationary objects made of or containing iron. Insurgents on the move carry arms, equipment, and supplies, many of which contain ferrous metal. When not in use, such items are buried or cached, often in the ground. The practice of the CTs in southern Thailand of burying caches of supplies in metal, 50-gallon drums made magnetic sensing of buried caches an attractive detection possibility.

(U) A magnetometer measures the strength of the magnetic field near its sensor. Since the magnetic field is changed by ferrous objects, a magnetometer can detect such objects when it is moved past them. Tests

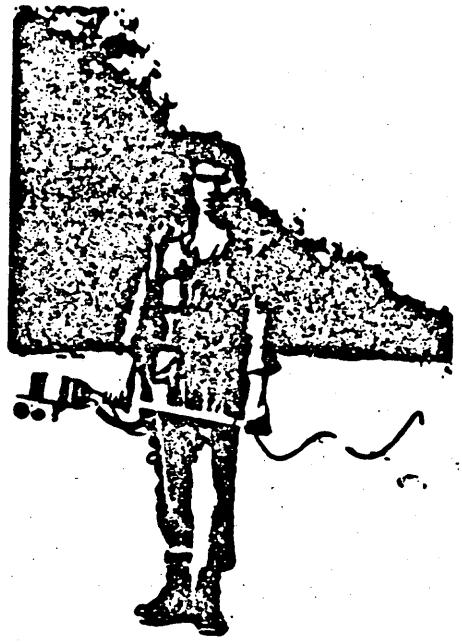
(U)

done at Calaveras, California, in August 1961[1,2] showed that a magnetometer could successfully detect the presence of different numbers of rifles in different positions and at a depth of about 3 meters. This initial success was enough reason to design a program to test the magnetometer in Southeast Asia in areas with soil types typical of that part of the world. The purpose of the test program was to find out if the differences between natural or innocent magnetic variations and the variations caused by an object of interest are sufficiently large to ensure efficient employment of the magnetometer.

(U) Efficient operation depends on the ability to detect reliably, to discriminate, and to conduct searches in a reasonable time and in all the likely places of concealment of weapons and supplies. The last involves consideration of the instrument's weight and handling characteristics.

(U) The instrument used for the tests, the rubidium vapor magnetometer manufactured by Varian Associates, Inc., is a highly accurate scientific instrument used to measure the earth's magnetic field and was not designed for use in counterinsurgency efforts. It is available in two versions: the more accurate but heavy and bulky stationary magnetometer, and a portable version consisting of a back-pack battery power unit, a mixer-oscillator unit that can be fastened to the belt, and one or two self-oscillators (see Figs. 18a and 18b).

(U) On the basis of a series of tests suggested by SRI, MRDC in March 1965 developed a test plan by which the School of Engineering of Chulalongkorn University was to collect and analyze the data and report the results. Program management was provided by MRDC and technical guidance by SRI.



Held at rest position

Held at in-use position

FIG. 18 PORTABLE VERSION OF THE RUBIDIUM VAPOR MAGNETOMETER (U)

(U) The main part of the plan, the data gathering, was concentrated on determing the detection limitations for certain objects in magnetically varying soils; if the magnetometer would not be able, in the large majority of cases, to detect an object hidden in the soil because of magnetic variations in the latter, the instrument would be useless as a surveillance instrument. A preliminary report[36] by SRI had suggested simple methods for analyzing the background data that would yield significant information in regard to the effectiveness of magnetic detection. At the same time theoretical expected magnetic anomaly shapes were analytically derived.[34]

(U) In a final report[13]* it was concluded that a magnetometer can distinguish between background variations and a signal created by an object, the detection distance depending on the sensitivity of the instrument and on the size of the object. Search rules were suggested that would enable the operator to reject many anomalies created by magnetic variations of the soil.

(U) By means of the measurements collected in the Chulalongkorn studies it was hoped that a quantitative estimate of the effectiveness of magnetic search could be made. Unfortunately, the data received only scant attention, and only a very general conclusion regarding search effectiveness was reached: namely, iron-rich soils with a high magnetic susceptibility are magnetically noisy and thus are difficult to search, whereas iron-poor soils can be searched easily with a magnetometer. On the basis of this distinction it was deduced in an MRDC report that 20 percent of Thailand and 30 percent of Vietnam are covered by soils susceptible to magnetic search.

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* (U) These results are taken from an SRI report. Several reports were also published by Chulalongkorn University and MRDC.

b. (U) Magnetic Soil Data. In a subsequent report,[58] the 1965 data plus some data acquired more recently were analyzed statistically to reach a quantitative estimate of the usefulness of magnetic search in terms of the average number of natural magnetic disturbances occurring that could be confused with disturbances from buried caches--the so-called false signals. An attempt was also made to establish a number of general relationships between the magnetic susceptibility of soils and the natural magnetic field background observed over soils. In this connection it was shown that magnetic mapping could be used to supplement conventional soil mapping techniques and, thus, might have potential in land-use studies.

(U) Based on available knowledge of soils in Thailand, it was estimated that 80 percent of the surface is covered by soils that are susceptible to magnetic search. This estimate is much higher than the 20 percent proposed earlier by MRDC researchers. The analysis of the magnetic field data also showed that a soil type could not always be identified positively by the magnetic background variations over it.

(U) A follow-up report[59] considered several theories, assumptions, and tests concerning induced and remanent magnetism, pertinent to magnetic search in couterinsurgency operations in Thailand. Also, several observations were made on the effects of distance and mass on signal strength. The flux-gate magnetometer was considered for use in magnetic search and a conventional or sonic portable drill was suggested for checking anomalies.

c. (U) Magnetic Profiles. In a related effort, a technical note[59] was prepared that was primarily a portfolio of magnetic profiles useful for evaluation of magnetic sensing in counterinsurgency surveillance. It differs from the many other similar sets of magnetic curves found in the geophysical literature in that it deals exclusively with

(U)

causative bodies that most nearly represent the targets sought in counter-insurgency, and it is the first such set of curves that include the vertical and horizontal gradients of the total horizontal and vertical components of the magnetic field.

(U) The causative bodies used in this portfolio are a simple dipole and an extremely long horizontal cylinder. The dipole model can be used to approximate a light weapon (rifle) or buried drum. The long horizontal cylinder approximates a tunnel.

(U) The inclusion of derivative curves is the result of improvements in magnetic instrumentation that allow the direct measurement of magnetic gradients. Direct measurement of magnetic gradients offers the possibility of using magnetic sensors in surveillance work that eliminate the effects of natural geomagnetic noise variations and enhance the ability to discriminate between near and distant ferromagnetic masses.

(U) The curves in this portfolio were computed and machine plotted using two separate programs, DIPOLEPLOT and MAGSYLPLOT, for plotting of magnetic anomalies, respectively, from spherical or short rod-like bodies and from long horizontal cylinders. The distinguishing feature of the programs is that nine parameters of the perturbation field are calculated and plotted: the total, vertical, and horizontal field components plus the vertical and horizontal derivatives of each component. The inclusion of derivatives was based on the increased use of magnetic gradiometers.

2. Traffic Monitoring (U)

(U) Today, a variety of magnetic sensors exist, some of which are capable of detecting field changes as small as one part per million of the earth's ambient field. These ultra-sensitive magnetometers are

(U)

easily capable of detecting rifles at distances of three meters or more, and hence it is worth investigating their potential usefulness for traffic monitoring in counterinsurgency. However, the mere detection of a magnetic anomaly at the implanted sensor does not necessarily provide definitive or even useful information. For qualitative evaluation of traffic, either the magnetic signatures registered must be sufficiently distinctive that they can be distinguished from ordinary harmless objects and weapons, or else the pattern of casual traffic and its associated magnetic signals must differ markedly, in frequency or time of day, from the pattern of insurgent traffic.

a. (U) Roads and Trails. In exploration[64] of a first possibility, casual traffic* patterns were examined to determine what ferromagnetic objects were customarily carried. The magnetic field effects from simulated and actual rural pedestrian traffic were then recorded, as were the magnetic signatures of simulated firearms carried in various positions. For this work a Multi-purpose Concealed Intrusion Detector (MCID), a flux-gate magnetometer, and a rubidium-vapor magnetometer were used to sense the passing traffic, but the emphasis of the work was on the MCID device because of its simplicity and greater potential usefulness to Thai counterinsurgency authorities. Tests were made in Bangkok and in a rural area of Northeast Thailand. In support of this work, the types of ferromagnetic articles associated with pedestrian traffic were identified and their magnetic strength measured.

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* (U) Casual pedestrian traffic is defined as the normal flow of people on foot and also ox-carts, bicycles, and motorcycles insofar as these occur on rural pathways. Larger vehicles were excluded, although automobiles, trucks, and buses are common on all major roads.

(U) (C) As might be expected, it was found that pedestrian traffic in rural Thailand is generally magnetic by reason of the man-made artifacts (tools and carrying vessels) commonly carried. Many of the hand-carried objects in casual traffic are weakly magnetic, and thus would escape magnetic screening by the devices tested. This would include small, concealed weapons such as sidearms. While casual traffic also contains ferromagnetic objects that are relatively large in size and have correspondingly large magnetic moments, shoulder arms of the type common to both villagers and insurgents (rifles, shotguns) have similarly large magnetic moments, but produce distinctive, more regular magnetic signatures by which they can be distinguished from the strongly magnetic but harmless artifacts such as carrying vessels, ox-carts, and bicycles.

(U) (C) It was concluded that of the sensors tested, the MCID appears to have the greatest potential for trail monitoring because of its simplicity, low cost, and broad coverage, but it does present problems for covert emplacement. Since none of the sensors tested, including the MCID, provides unequivocal identification of the source of magnetic disturbance, the sensory data provided must be further interpreted in terms of time of day and established traffic patterns. On this basis, the MCID has potential value as a trail monitor in detecting the movement of armed individual or groups at times, places, or frequencies not characteristic of the general population.

(U) b. (C) Boats. Another area of feasibility investigation was the use of magnetic and electromagnetic devices in scanning boats for ferromagnetic contraband.[63] Although it is generally assumed that some arms are currently being smuggled across the Mekong in the Northeast, there is no reason to suspect that most river and klong (canal) traffic in Thailand is anything but harmless casual and commercial traffic. However, should the present low-level insurgency in Thailand escalate, one

(U) (C)

might expect the river systems draining from the Northeast and the vast network of rivers and klongs in the Chao Phya lowlands to serve as avenues for clandestine movements of arms. In that case, the riverine law enforcement agencies would need a rapid means for scanning suspect boats.

(U) (C) Magnetic detection of ferromagnetic material on boats was earlier studied by the joint Thai-U.S. Military Research and Development Center (MRDC) in 1965 using a prototype MCID. Although tests clearly demonstrated the ability of the MCID to detect ferromagnetic objects on boats, the MCID was found ineffective for quantitative work, and the tests did not cover one important aspect, namely, discrimination of ferromagnetic cargo (including possible contraband) from the normal ferromagnetic components of the various boats used in Thailand. The SRI effort treated the discrimination problem.

(U) (C) Magnetic and/or electromagnetic search devices will detect arms hidden on boats provided that the sensors can be brought close to the contraband, the magnetic effects from normal ferromagnetic components of the boats can be suppressed relative to the effects from the contraband, and the harmless cargo hiding the contraband is not ferromagnetic. Accordingly, the problem addressed was that of distinguishing ferromagnetic cargo from the intrinsic magnetic components of boats typical of those used in Thailand.

(U) (C) Measurements were made by means of a commercial flux-gate magnetometer and gradiometer, and an electromagnetometer ("Swimmer") developed for underwater use by the U.S. Naval Ordnance Laboratories. The sensing devices were held underwater at the ends of two aluminum

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cantilever supports which could be adjusted to vary sensor position and orientation relative to the passing test boats. (See Fig. 19 for a suggested design.*)

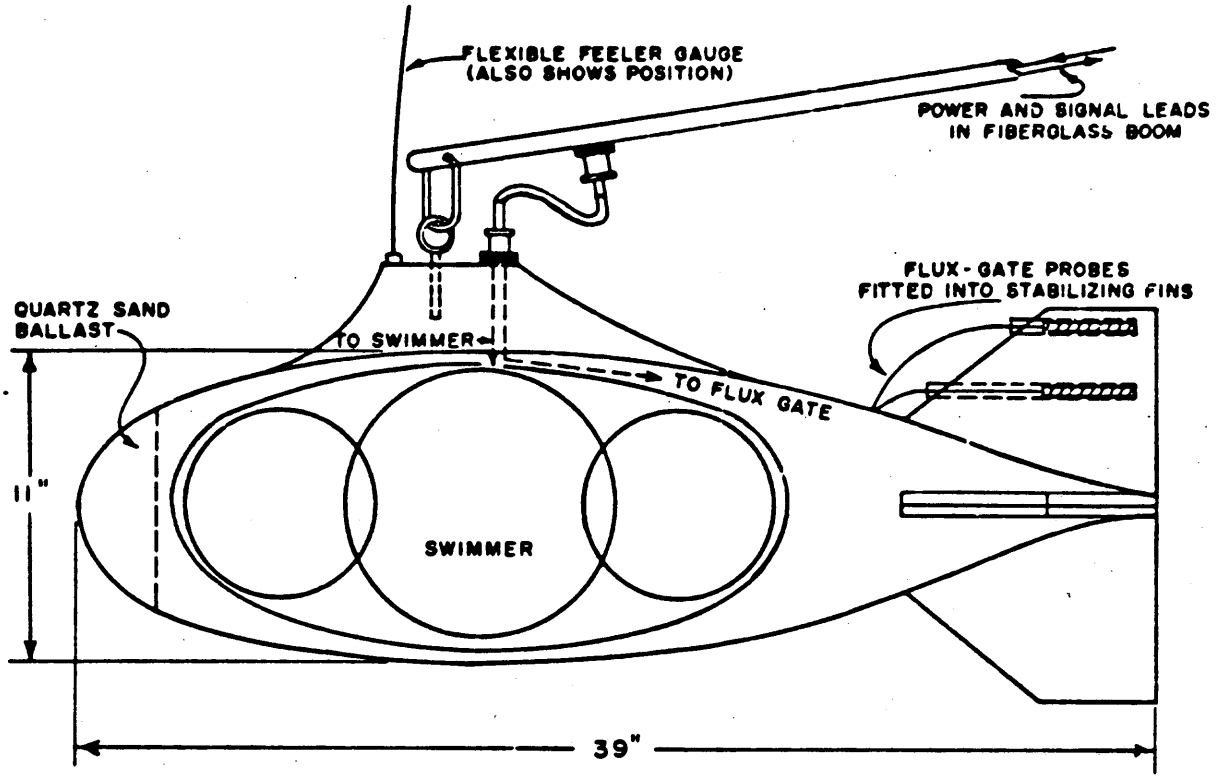
(U) The tests showed the electromagnetometer ("Swimmer") to be more effective than the flux-gate in either the magnetometer or gradiometer mode of operation. With use of the Swimmer, discrimination of ferromagnetic cargo from the vessel's intrinsic ferromagnetic components should be possible for most common boats and barges. However, since discrimination is largely dependent on the physical separation of the cargo from other substantial sources of magnetism, this search technique will not avail on steel-hulled ships or when a clandestine cargo is hidden around the engine. The devices tested do not, of course, identify the specific source of an anomaly; harmless artifacts give the same response as rifles.

B. Electrical Potential Anomalies (U)

(U) In a somewhat different direction, an experiment was performed to measure the amplitudes of anomalous electrical potential (spontaneous polarization or SP anomalies) in the soil around a corroding steel drum.[EE]

(U) The two containers favored most by the CT for caches are the 50-gallon steel oil drums and the 12-gallon carbide drums. To hinder corrosion, the steel containers are painted or greased by the insurgents.

(U)* (C) The MAGFISH, so-called, was designed so that it could be produced locally, given the necessary electronic elements. Where the design of devices has been addressed in this project, the emphasis has been on the utilization of local capabilities with a view to maximizing local self-reliance. Because of lack of ARPA interest, no action was initiated with regard to exploring local production capability of the MAGFISH.



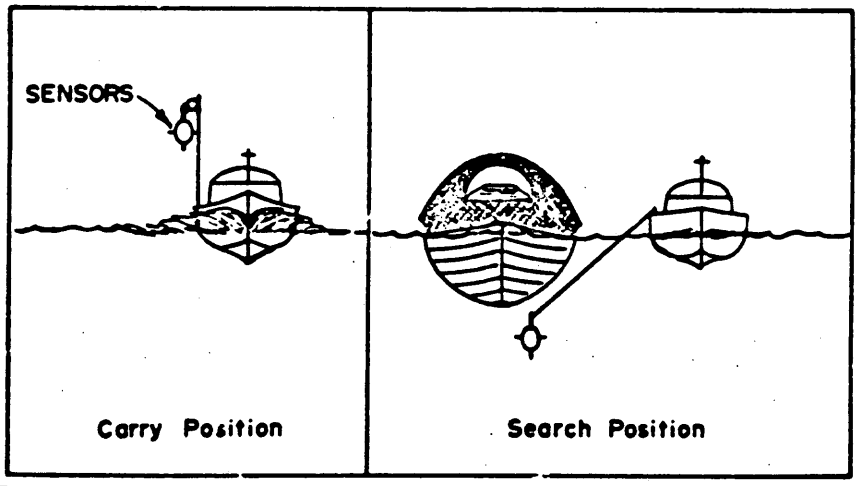


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FIG. 19 TOWED "FISH" FOR HOUSING SENSORS, WITH RETRACTABLE BOOM (U)

(U)

but these measures seldom prevent ultimate corrosion. In the corrosion process a complex electrochemical reaction takes place between the metal containers and the surrounding soil so as to produce a static electrical potential anomaly around the containers. Hence, it is possible that the CT caches might cause detectable potential anomalies if subsurface conditions are conducive to a rapid rate of corrosion and if the corroding object is close to the surface.

(U) The objective of the simple experiment was to determine whether this technique for artifact detection could be applied to counterinsurgency. The scope of the work was confined to studying the physical phenomenon; no attempt was made at operational analysis of the technique.

(U) As was anticipated, a buried steel drum caused an electrical potential anomaly in the surrounding soil. The measured potentials were relatively large near the drum, 80 mv or so, and decreased in magnitude away from the drum. At distances of only 1.5 to 2.0 drum diameters, the anomalous potentials approached the average level of noise potentials. The short-range effect observed is in agreement with the accepted oxygen-cell theory of iron corrosion. Whether results similar to those described would be observed in other climatic regions is problematical.

(U) The test results show that a deeply-buried drum stands little chance of being detected even though it is undergoing corrosion. However, inasmuch as insurgents must resort to shallow burial of their caches to make them easily recoverable, there should be a reasonable chance of detecting them by this means. There is at least one commercially-available SP instrument that seems to embody the features necessary in a device for rapid field surveys.

C. Seismic Detection (U)

1. Early Investigations (U)

(U) Project work initially was turned to investigations of seismic detectors because of the usefulness of trail monitoring in detection of logistic patterns, and the study was accelerated because of the interest of Thai and Malaysian security forces in devices for use in laying ambushes. The Texas Instruments (TI) 150A had been tested at the MRDC in 1963 and later by the British for use against Indonesian infiltrators in Borneo; it was also demonstrated repeatedly by SRI team members to security forces in Thailand and Malaysia.

(U) It proved possible in October 1965 to arrange a local demonstration of French equipment originally developed for monitoring the Algerian frontier. Designed for use in protecting major fixed installations, such as atomic energy installations, factories, and depots, it was not immediately applicable to the detection of the operations--CT logistics, camping activities, and ambushes--selected for attention during the initial two-year period of the SRI contract.

(U) It soon became evident that, although the TI 150A was a useful device as it stood, there were disadvantages in its human engineering as well as in its dependence on wires, and that there are other requirements for seismic detectors for which the TI 150A was not designed, such as road and trail monitoring and surveillance of border operational area, or the space around a fixed depot or base. Although the TI equipment could be used for short-term, short-distance monitoring under some circumstances, it was severely limited for most monitoring situations.

2. Wireless Systems (U)

a. (U) Ambush Aids. Analysis of potential applications indicated the need for a wireless detection system to replace the wired systems for situations of offensive-ambush and temporary-perimeter defense. Toward this goal, SRI had been investigating the feasibility, desirability, design requirements, and actual design of a wireless ambush system for use in Southeast Asia. The inital reporting on this subject[39,40] attempted to establish a set of seismic surveillance system requirements. Subsequently SRI developed--for purposes of conducting field investigations of operational feasibility--several prototype wireless seismic instruments adapted specifically to the requirements of the ambush mission.

(U) (C) Two such prototype instruments are shown in Fig. 20. The feasibility of using such a simple seismic ambush system was established during an operational ambush conducted in the Betong area of southern Thailand between 7 and 21 July 1966.[45] As can be seen from Fig. 20, the wireless ambush system fielded during these tests was highly improvised; for example, the geophone transmitter was enclosed in the 30-caliber ammunition box. Communications were provided by two small "handy talkies," and the geophone transmitters were monitored by a third transceiver with speaker and transmitter muted. Citizen-band frequencies were used throughout.

(U) (C) It was recognized before the mission that the seismic and telemetry equipment did not satisfy the environmental requirements of an operational ambush system, yet the importance of the mission, together with the fact that a previous and similar mission had aborted after compromise at the ambush site, dictated that whatever equipment was available should be used. Further, the probability was high that the ambush could be sprung since good intelligence was available, and

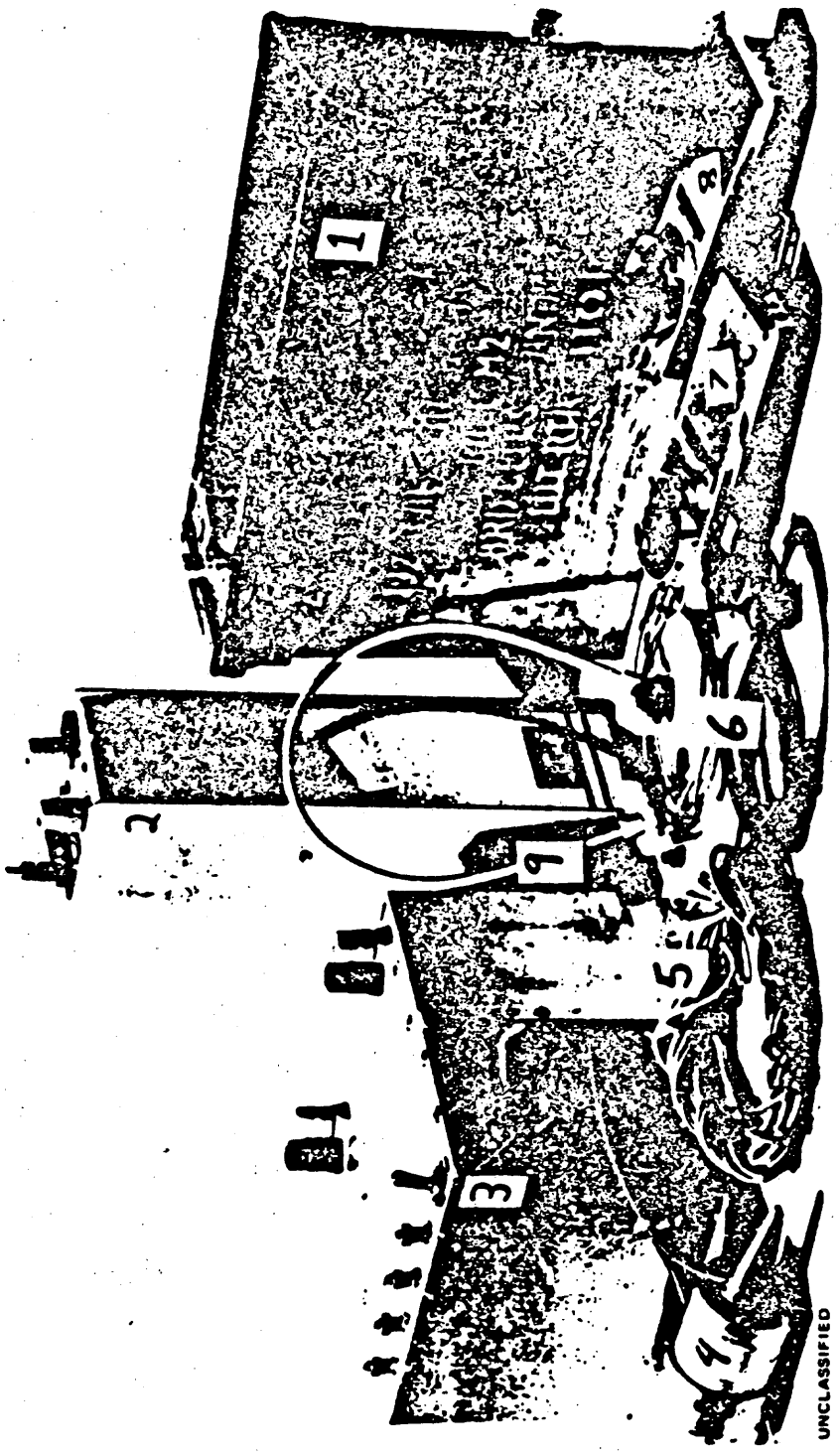

FIG. 20 EXPERIMENTAL WIRELESS SEISMIC DETECTION SYSTEM FOR AMBUSHING: (1) Type II monitor, (2) Monitor receiver, (3) and (4) Type I monitor, (5) and (6) Monitor antenna, (7) and (8) Handy talkies, (9) Receiver earphones. (U)

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(U)

opportunities to test ambush systems under such conditions are infrequent. Accordingly, the decision was made to assist this ambush mission with the breadboard seismic equipment that was available.

(U) The principal conclusion drawn from that ambush experience was that wireless ambush systems are both feasible and highly desirable for counterinsurgency forces engaged in jungle operations. This desirability is, of course, drawn from the importance that must be attached to the ambush mission itself in jungle operations, based upon counterinsurgency strategy currently being used. The feasibility of such systems had now been positively demonstrated during an operational mission by counterinsurgency forces.

(U) It must be noted that these prototypes and the operational feasibility demonstration just described occurred before any commercially available seismic intrusion detection systems were available. Indeed, this experience, as will be seen below, was valuable in the tests and evaluations of an early version of the Sandia Seismic Intrusion Detector, conducted in Thailand later that year.

(U) On 7 August 1966 a joint patrol comprising Thai and Malaysian security forces was ambushed near Betong in southern Thailand. Ten members of the patrol were assassinated by communist terrorists in that encounter.

(U) On 26 August 1966 SRI was asked by the MRDC, following a request from the Supreme Command headquarters-Thailand, to assist in Operation Overdue, a major Thai-Malaysian sweep-and-clear operation in southern Thailand. For this operation SRI agreed to provide, among other assistance:

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- Wireless seismic ambush aid systems (WAAS), instruction in their use, and maintenance
- A wireless seismic remote area-monitoring system (RAM), with instruction and maintenance.

(U) (C) It must be noted again that until the Operation Overdue commitment, ARPA's and SRI's objectives for SRI's work on detection subsystem were the testing of the feasibility of using various gear operationally and the specification of detailed requirements for such equipment; it was never intended that SRI actually develop and construct surveillance devices. But these original objectives had to be suspended for Overdue, as the operation was planned originally for November of 1966 and, in August when SRI was asked to take part, there was no off-the-shelf seismic detection equipment available for counterinsurgency operations. As it had been SRI's work during the previous contract year that had shown the possibilities and promise of such gear to the security forces in the South, leading to the Overdue request, SRI became involved in design and construction.

(U) In response to the request for the wireless ambush aid systems, the prototype system described earlier was more adequately designed and re-engineered and--through the services of a local electronic assembly firm--20 sets, designated Detector Set X4A (see Fig. 21) were assembled. An operations and maintenance manual for these systems also was eventually published.[56]

(U) (C) As it turned out, Operation Overdue was not executed but was eventually superseded by Operation Sawaddi, which began in June 1967 and continued for some time. Although four of the X4A WAAS sets were made available to the security forces in the South, no operational feedback has been obtained concerning their use and performance. One set was

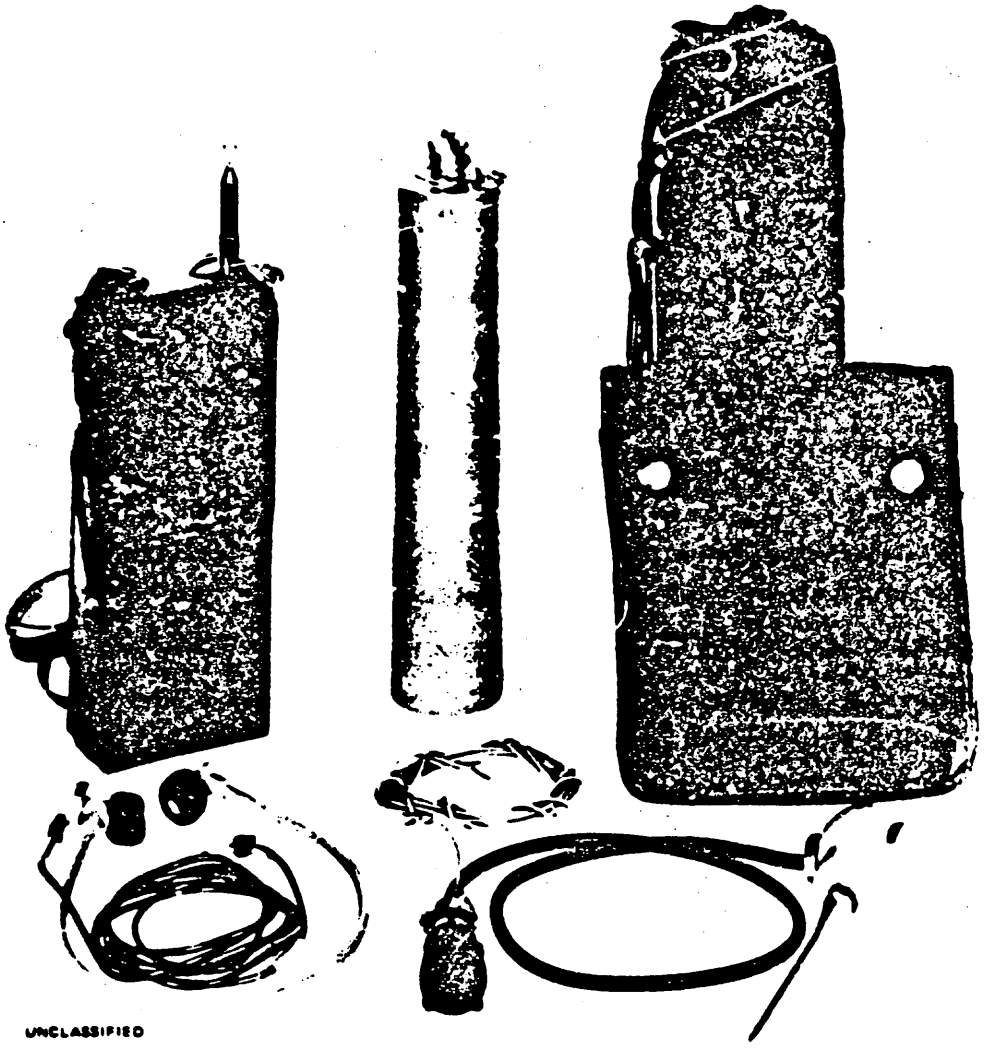

FIG. 21 DETECTOR SET X4A (U)

(U)

taken to the British Far Eastern Land Forces (FARELF) where it was evaluated by the Jungle Warfare School in Malaysia. It was judged to be an excellent patrol device and the recommendation was that it should be brought into service on a scale of one set per infantry platoon.

(U) (C) Six sets were delivered to the Army Concept Team in Vietnam (ACTIV) for evaluation by U.S. and Australian forces (Hqs 1, ATF, Nui Dat) in Vietnam. The Australian forces suggested that certain improvements be considered and that the equipment be accepted into service in infantry units for use in ambush and early warning roles.

(U) However, no continuation of the WAAS development was planned inasmuch as it was undertaken for a specific operation (Operation Overdue) in southern Thailand, and, in any case, the Sandia Personnel Seismic Intrusion Detector based on essentially the same concept had been carried to a further state of development.

(U) (C) It may be useful to consider, however, that the WAAS is a less sophisticated device than the Sandia PSID, is less costly and more easily maintained, demonstrably satisfied a CI combat requirement, and--most importantly--is capable of production by local resources. Each WAAS set, including a pair of transmitting sensors and a pair of commercially available handy-talkie transceivers, costs something less than $500 per set for the 20 sets of essentially handmade systems; volume production would result in a lower cost. Emphasis was placed on local fabrication of the sensor electronics housing and assembly, with electronic parts procured principally from Hong Kong and Japan. In short, the WAAS systems even in--or because of--the relatively unsophisticated engineering and packaging configuration utilized, seemed to be ideally suited for the operational and technological environment of Thailand. Inasmuch as the Thai, sooner or later, would develop a requirement for

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such devices, the development of an indigenous capability for their fabrication seemed a useful goal. Unfortunately, there was no interest in ARPA in pursuing the possibility of at least establishing the basis for developing a Thai production capability.

b. (U) Remote Area Monitoring. Research was undertaken to investigate the possibility of a real-time, ground-to-ground wireless capability for monitoring the movements of insurgents in jungle areas. The basis for the requirement of a remote area monitoring (RAM) system stemmed from the recognition that information regarding trail movements could result in useful intelligence concerning the location of CTs, inasmuch as there was little casual or "innocent" traffic in the jungle and CTs and CT-supporters used the jungle trails.

(U) In the approach taken in this research, a system of narrow band radio equipment was used to telemeter in real-time the occurrence of an intrusion event near a sensor deployed within the jungle. Associated with the sensor is an electronic signal processor whose purpose is to discriminate human target signals from environmental noise signals. The signal processor activates a nearby radio frequency transmitter whose RF carrier is modulated by various tone codes that identify the transmitter and provide the seismic analog signals of the footstep rate of the approaching human target. The RF carrier is demodulated at the receiver by an array of very narrow band filters whose function is to identify the individual transmitters deployed in the jungle complex. All transmitted signals and the time of the transmission are recorded on magnetic tape. Evaluation of the transmitted information may be performed using any of several techniques. Statistical methods are developed to assist in the classification of signals received.

(U) The results of this research generally support the conclusion that real time monitoring techniques are feasible and offer promise for further development and wider application. Low power, narrow band, high frequency radio equipment will reliably transmit signals from jungle areas to distant receiving/recording stations, and it is possible to discriminate against most forms of environmental noise to be found in jungle areas.

(U) The report of this research identifies alternative system configurations and recommends that certain design options be further investigated.[60] Recommendations are also made for research leading to improved noise discrimination and basic design improvements in narrow band radio equipment.

c. (U) Signal Discrimination. Seismic intrusion devices are susceptible to microseisms (signals) that originate from a variety of sources. Generally, signals of military interest are those associated with human intrusion events. Microseisms generated by the natural environment (rain, wind, thunder, animals, etc.) are usually regarded as undesirable noise. The presence of environmental and other forms of seismic noise (machines, aircraft, artillery fires, etc.) complicate the difficulty of identifying and classifying seismic signals generated by a human intrusion.

(U) Noise signals of any form are highly undesirable in seismic detection systems and particularly systems that are remotely deployed, for noise signals, if incorrectly classified, become false alarms. Excessive noise signals can also hasten the exhaustion of power supplies. Accordingly, research was undertaken to investigate a technique and its application for discriminating human seismic intrusion signals in a background of environmental seismic "noise".[58]

(U) First, the walking rates of a sample of 30 Thailand natives were analyzed to tentatively establish a human footstep statistical signature comprised of two distributions. Observations upon animal gaits common to jungle regions lead to the hypothesis that the statistical human signatures derived from experimental data are probably unique. Second, a noise rejection filter was designed whose purpose is to accept seismic signals that arrive within the human footstep-rate bandpass. The filter suppresses noise and false alarms and admits seismic signals that qualify as originating from a walking man.

(U) Although the human footstep signal occurs over a broad range of the spectral distribution of seismic signals, it has a high degree of periodicity and a small dispersion of the standard deviation. This may form the basis for a human intrusion signal classification technique. Filtering and electronic techniques are described that will guard against most environmental seismic noise.

d. (U) Trail Camera. In late September 1967, SRI was requested by security forces in southern Thailand to supply a trail camera to assist in the task of identifying and apprehending CTs and their supporters. The camera package was constructed hurriedly, tested briefly, and deployed in southern Thailand along a jungle trail leading to a suspected CT encampment.

(U) The technical approach upon which the trail camera system is based involves a geophone sensor that detects a human footstep, and an electronic signal processor that examines the geophone output and, if certain criteria associated with the human walking rate are satisfied, electronically activates a hidden camera.

(U) Limited testing in the Bangkok area verified the concept and technical aspects of surreptitious trail photography. An initial

(U)

operational deployment was a failure in that no CTs were photographed and certain deployment problems were encountered; however, the mission was considered successful from a technical viewpoint inasmuch as the camera system performed well. The deployment lasted for four days and occurred during heavy monsoonal rainfall. Under this severe environmental condition, a total of 58 noise alarms (i.e., worthless photographs) were recorded. Test photos taken during installation and at recovery were satisfactory.

(U) Subsequent trail-camera missions have been conducted and, although the results of these later missions are not available, indirect word has been received indicating satisfactory operation of the system.

(U) A new trail camera system has been designed[62] that features a new signal processor which should respond principally to seismic signals generated by man and should provide improved immunity to noise and false alarms. Certain technical inadequacies that were discovered in the hurriedly constructed initial camera system have been corrected in the new system design.

D. Infrared Detection (U)

(U) SRI's role in the MRDC-sponsored aerial infrared (IR) detection studies was that of a support contractor. During 1964 and 1965, SRI cooperated with the MRDC and other contractors in the ARPA Multi-band Photographic and Infrared Reconnaissance Test (AMPIRT) program, which was concerned with different techniques and procedures in the use of various multi-band aerial cameras and infrared scanners to detect and identify insurgent-related activities and objects against the background and under the forest canopies found in Southeast Asia generally, and Thailand specifically.

(U) The responsibilities for test design, creation of an appropriate target complex, and implementation of the ground portion of the tests were allocated among RDFU-T, Research Analysis Corporation (RAC), and SRI. The test design was the primary responsibility of SRI; the initial target complex of AMPIRT I was directed by RAC and continued by SRI; field implementation was done by RDFU-T. The primary contractors--University of Michigan Institute of Science and Technology (IST) and Cornell Aeronautical Laboratory, Inc. (CAL)--conducted all the airborne activity and measurement of the diverse set of physical ground phenomena.

(U) A salient feature of the AMPIRT test design was the provision for incorporating results that emerged from the overall ARPA surveillance program and for retaining a core set of target elements that remained invariant in type and geometrical relationship throughout the test series, permitting assessment of seasonal influences on target detection and identification. The target items used in the AMPIRT series reflected the best information available at the time and were gleaned from various sources in Southeast Asia, including the Thai Border Patrol Police, USOM, MAC-V, Malaysian security forces, RDFU-T, RAC, CAL, IST, and the basic work done by SRI in its Surveillance Project.

(U) The original test plan by RDFU-T specified determination of "ground truth." The magnitude of the job of reporting on every target during each flight was not fully appreciated, but a concerted effort by SRI achieved a fairly comprehensive reporting of the test conditions. A report[43] was prepared describing the nature of the target complex and presenting reasons for considering the targets as useful indicators of insurgent activity, alone or in patterns. (See Table III.) Results of the test were reported separately by CAL and IST.

Table III

(U) AMPHIBIOUS TARGET TYPES (U)

Fires

- Charcoal--pot, no pot
- Wood--pot, no pot
- Husk--pot, no pot

} Cooking

- Warming
- Countermeasures
  - In bank--wood, charcoal
  - Covered with dirt
  - Quenched with water
  - Scattered
  - Covered with leaves
  - Covered with thatch
  - Covered with foil, no pot
  - Covered with umbrella
- Dug-in stove, with pot
  - Thatch roof
  - Uncovered
- Location
  - In hut, thatch roof
  - In hut, galvanized roof
  - In temporary shelter
- No fire in hut
- In barge, under tin roof
- Tommy cooker
- Cookers (Type 1, 2, 3)
- Marker fires

Locals

- Standing with:
  - Cigarette
  - No Cigarette
  - Hoe
  - Load
  - Pick
  - Rifle
- Squat with:
  - Hoe
  - Load
  - Pick
  - Rifle
- Leaning against
  - Tree
  - Hut
  - Canal bank
  - Sled
  - Strawstack
- Submerged in canal
- On sled

Soldiers

- Standing
- Squat
- Prone

Unoccupied Positions

- Foxhole
- Machine-gun
- Mortar

Occupied Position

- Foxhole
- Machine-gun
- Mortar
- Machine-gun, not dug in
- Mortar, not dug in

Positions in Preparation

- Foxhole
- Machine-gun
- Mortar

Evasive Actions

- Running to tree
- Squat by bush
- Face turned down
- Squat under umbrella and camouflage net
- Squat under camouflage net

Transport

- Boat
- Boat with boatman
- Barge
- Buffalo sled with load
- Buffalo sled with mortar
- Oxcart
- Oxcart with load
- Oxcart with mortar
- Bicycle
- Horse and rider
- Elephant

Structures (Huts)

- Thatch roof
- Galvanized-steel roof
- Temporary shelter
- Collapsed

Construction

- Basketball court
- Bunker
- Bamboo water pipe
- Cache (tree and ground)
- Helicopter trap
- Latrine
- Mines
- Paddy trail
- Rock pile
- Tunnel
- Trench
- Garden
- Watchtower

Materiel

- Aluminum pots
- Black cloth
- Clay pots
- Hoes
- Hot generator
- Khaki cloth
- Nylon camouflage sheet
- Plastic sheet
- Picks
- Radio antenna
- Refuse pile
- Aluminum foil
- Truck, engine hot
- Yellow cloth

(U) AMPIRT included two kinds of experiments. The initial investigations were tests of particular IR scanners and photo techniques. In these portions of the test series, the patterns of items exposed on the ground for detection and identification were known and were recorded systematically. No real-time assessment was attempted nor were there efforts to combine the photo and IR sensors within a single, optimized surveillance system or to imitate the conditions of actual search for an enemy.

(U) AMPIRT IVB, flown during the period 17 to 28 November 1965, was radically different; the objective of the flights was to detect enemy installations whose locations were known to the test team and to security forces. About 700 sq km of jungle-covered hills near the Thai-Malaysian border were overflown in an attempt to detect and identify indicators of CT camps.

(U) Although it never will be possible to know the percentage of actual targets that the system detected, since no one outside of the CTO knows the number of installations present during the overflights, the November exercise provided a body of experience that could serve as a basis for subsequent improvement in the interior workings of the surveillance system, particularly in cooperation between the surveillance activities and the security forces for whom the data are produced. Regrettably, the SRI suggestion that the exercise be regarded as a system test was not accepted, and as a result the test plan for AMPIRT IVB did not provide for umpiring or studying the various internal processes intrinsic to system effectiveness. So far as is known, no such system test has yet been made.*

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* (U) The infrared equipment has since been made into the Aerial Reconnaissance Laboratory (ARL), an operating unit of the RTAF and MRDC.

(U) SRI's roles in AMPIRT IVB were to furnish the air-conditioned darkroom; analyze imagery and ground-truth data furnished MRDC; provide assistance in the selection of target areas and evaluation of the information acquired; and in coordinating with IST and CAL, to develop a statement of desired ground-truth data and, if appropriate, a questionnaire or checklist for use by Thai and Malaysian police in collecting these data. In addition, SRI served an anomalous role as a self-appointed coordinator to whom fell the job of developing a procedure for the consolidation and presentation of the results to the joint Thai-Malaysian Central Intelligence Headquarters (CIH).

(U) An account of the events during the field trial and some of the lessons learned were reported[44] and a guide [3] was prepared for operational utilization of infrared sensors and photographic equipment for detection of tactical targets, which included information on facilities, planning of flights, data recording and flow with sample data recording forms, and data interpretation.

E. Photomosaics as Aids to Surveillance* (U)

(U) It is almost trite to say that maps are needed for economic development or combat. However, photomosaics fill the needs of counter-insurgency surveillance better than maps do and mosaics are cheaper and easier to keep current.

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* (U) The reference here is to what is technically called an uncontrolled mosaic, a combination of clinped aerial photographs of approximately the same scale. An annotated master, with ridges and streams indicated, and with approximate locations of a few coordinate intersections shown, is rephotographed for multiple-copy production. The

(U) No reliable maps are available for much of Thailand, and the few adequate ones that exist are held closely by security forces. Village headmen, census takers, development officials, forestry officials--all involved in nation-building and, therefore, in counterinsurgency--work from charts with no believable topographic detail and only a modicum of cultural detail. By necessity, ground reconnaissance has been the precursor to any attack on a camp, since there has been nothing to rely on but the experience of individuals who have been there. The use of seismics to monitor trails; IR to spot fires, warm buildings, or warm trucks; or reports of extraordinary activities in the villages, all require spatial analogs if they are to be effective. The only two that seem at all practicable are maps and photomosaics.

(U) For things like road surveys, good contour lines are essential, and the exact distances between points is vital, but for most other government activities (and especially those connected with counterinsurgency), the cultural detail and the currency which are obtainable with

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(U)

relaxation of a requirement for identical scales on all component photos simplifies the production enormously and results in only modest errors if a little care is taken in the original photography and printing. When the area of concern is smaller than above five kilometers on a side, and when the aerial photographic system used is excellent, sufficient detail for most uses is obtained on a single exposure, obviating the need for a mosaic composition of several pictures.
The material in this section is taken principally from Ref. 3.

(U)

mosaics are more important. The case is strongest in airborne surveys with IR scanners.

(U) In the first place, a hot spot sighted by the IR can be designated in only a few ways. One of these, suitable only for a limited sort of tactical application, involves the teamed use of a visual display (real-time viewer) in an airborne scanner and a ground patrol. Neither the aircraft nor the patrol need know where it is in absolute terms, since the aircraft searches only in the immediate neighborhood of the ground unit and calls out the position of a hot spot relative to that of the patrol. A better procedure, if it can be made to work, would be to provide both the patrol and the aircraft with area photos on which identical reference grids had been drawn, and the aircraft could use these coordinates to direct the patrol to the hot spot.

(U) The more standard use of scanners of this sort, however, involves taking the data on film or tape (or both), studying it after the flight, and then providing position data to strike forces. If the position of the aircraft could be known to about five-meter accuracies, and its attitude and altitude above terrain recorded at all times, it may be possible to calculate the coordinates of a hot spot directly under the aircraft which was recorded on the imagery, but this is not possible at this time in most areas in Thailand.

(U) The only other method visualized to date requires the transfer of spots from IR imagery to either a map or a mosaic through recognition of adjacent terrain forms and other clues. The mosaic is the more practical alternative, since it contains the kind of clues--cultivation patterns, houses, and forest areas--that are to be seen on an IR strip.

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A map can be of little use in such things because tactical maps take several years to produce, and the cultural detail needed will change during this time. A mosaic may be of some use, especially for less demanding discriminations, for several years, but its value nevertheless fades rapidly. Observations suggest that the mosaics should be not more than two years old in any case, and that a search for small CT camps along the edge of cultivation probably will need a mosaic based on photography from the same year and preferably the same season.

(U) Mosaics are important to other kinds of systems and activities as well. For navigation aids to ground patrols searching the jungle, primary reliance was placed on photos by Malayan security forces during the Emergency, and the U.S. Special Forces now use mosaics rather than maps. Application of population surveillance and resource denial regulations requires current data on village locations, distribution of houses, rice fields, and the like, most of which are available at sight from a mosaic.

(U) In support of the requirement for mosaics for use by ground troops, some investigation was made into the possibility of printing photomosaics on lightweight, flexible, crease-resistant, fungus-resistant rapid drying material--material that could be wadded and carried in the pocket and endure the wear and tear of jungle operations. Several commercially available possibilities with acceptable image quality were experimented with--impregnated cellulose fiber sheet, extruded (no fiber) plastic sheet, non-woven fabric, acrylic plus polyester, plastic coated cellulose sheets and others--and tests were made with regard to the qualities mentioned above and others. Several promising materials were turned up but work on this effort was cut off at the point at which field testing was required.

F. Trail Systems and Model (U)

(U) A basic problem confronting any CI force operating against a communist terrorist force in remote areas is that of obtaining intelligence about the location and movements of the CTs. The areas are so large and the number of CTs so small relative to the total area (at least at the present time in Thailand) that searching for the CTs without adequate intelligence is an almost futile task. At the same time, a variety of surveillance devices have been developed and perfected during the past few years, the applicability of which in an intrusion detection or ambush aid role is readily apparent but the broader use of which in counterinsurgency is not so self-evident and has not been adequately investigated--such as the possibility that surveillance devices can provide some of the intelligence required in counterinsurgency.

(U) A research program was undertaken to determine whether a "thin" surveillance system, consisting of intrusion detection devices monitoring traffic on trails or implanted over an area, can--over time--establish traffic patterns and detect anomalies in those established patterns. Specifically, the objectives of the research were to determine system detection capabilities and system costs associated with specified levels of sensor densities, types and mixes of sensors, and modes of sensor implacement.

(U) Operations research techniques were used to develop a methodology for designing traffic monitoring systems. On the basis of a model using an area of northeastern Thailand, adding various scenarios of CT activities, and deploying different sensor systems, a system design methodology was to be developed as well as a system design itself, which was then to be tested in a field experiment. The field experiment was to be conducted during the second phase of the program, as a test of the soundness of the methodology developed and as a validation of the input

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values to be used in gaming of the model. Concurrent with the field experiment, additional gaming would refine the methods. The final product of this program was to be recommendations regarding the use of surveillance systems by counterinsurgency forces, hopefully detailing the system--listing types and numbers of sensors, data transmission and reception equipment, recommendations regarding the organization of the interpretation element, and instructions for determining the location of the sensors for particular objectives as well as guidelines for interpretation of the data.

(U) The program was originally divided into ten subtasks, the first seven of which were as follows:

1. Feasibility Analysis (U)

(U) A preliminary selection was made of typical sensors which were evaluated on the basis of comparable cost levels for candidate systems in various modes and according to operation merit. A case study was then made to indicate the effect of sensor configuration variations on effectiveness and cost.

2. Objectives and Criteria (U)

(U) Requirements for intelligence regarding CT movements were singled out that are amenable to being fulfilled by surveillance systems. Objectives were written specifiying these requirements and measures were then developed for assessing system effectiveness.

3. Description of the Physical Environment (U)

(U) A 10 x 10 kilometer area in Changwat Sakon Nakhon was selected; it was large enough to include most of the physical features required and to allow a considerable latitude in postulated CT movements, yet manageable in size for gaming. The choice of the area did not imply that a surveillance system would be restricted to that area or an area of that size. A photographic enlargement was made of 1:50,000 maps of the 10 x 10 kilometer gaming area giving 2 x 2 meter, 1:5,000 maps, a convenient size for gaming, much like sand-table games.

4. Research into CT Traffic Patterns in Northeast Thailand (U)

(U) Terrorist movements can be divided into two broad classes: those of very few men (such as supply activities and couriers), which are almost never reported in incident reports, and those of larger groups (such as armed propaganda meetings, attacks, and camp movements), which do appear in incident reports. A careful study was made of incident reports, filling gaps in the data with interviews with officials in the Northeast and captured or surrendered CTs.

5. Development of Casual Traffic Statistics (U)

(U) Just as data on CT movements are required to build a realistic gaming situation, data on casual, or "innocent," traffic are also required. The casual traffic is the background against which the CT traffic must be counted. Relatively good data on the activities of the villagers living in the area were available; however, their typicality of other sections of the Northeast is not known.

6. Selection of Candidate Sensor Categories (U)

(U) While research into sensors as such was not a part of this program, it was necessary to postulate reasonable sensor characteristics. Accordingly, the available literature was examined for descriptions of applicable sensors. Evaluation of the completed matrices led to the elimination of many of the sensors, principally because of excessive power drain and difficulty of implantment or concealment.

7. Synthesis of the Model (U)

(U) As a result of the decision by ARPA to terminate work on this project on 31 October, it could not be completed as originally envisioned. The approach was modified slightly in order to be able to bring meaningful closure to the task. Specifically, this consists of scenarios outlining games to be played, together with descriptions of the game inputs and expected outputs, and outlines for sensitivity analysis and development of a model.

(U) The first six tasks have been completed and working papers written.[90-95] As of the date of this report, the seventh task was being completed under a small support provision provided by the follow-on contract. A final report of the overall effort was in preparation.

G. Sonic Detection (U)

1. Helicopter Audio Detection (U)

(U) Conducted as part of the SRI Border Security System studies (see Section VI) but more appropriately reviewed in the context of SRI's surveillance program was a test of audio detection of helicopters.[28] This test was conducted, under field conditions in northeastern Thailand, to determine and compare ranges at which a low-flying helicopter can be detected by ear both without and with the aid of certain auditory devices,

(U)

including use of a geophone. A secondary test objective was to measure the azimuthal accuracy with which listeners can locate an audible but unseen helicopter.

(U) Communist insurgents in Southeast Asia in the past have relied on transport on land and over water for logistic support and infiltration of personnel, but since early 1967 there have been reports from northeastern Thailand of communists using helicopters to cross into Thailand. These reports are by no means fully confirmed, but they are numerous enough to invite investigation into the matter and into the corollary problems of air surveillance and control. Accordingly, SRI included a study of the requirements for and the techniques of detecting, tracing, and reporting low-flying, presumably hostile, aircraft penetrating the Thai border in the northeastern province of Nakhon Phanom.

(U) A test site (see Fig. 22) was set up about 45 kilometers west of Nakhon Phanom municipality. An-H-34 helicopter repeatedly flew a pre-established flight path about 40 kilometers long, passing over the test site located at approximately the mid-point of the flight path. The test subjects, 18 young Thai men whose hearing had been tested to meet USAF requirements, recorded detection information which was correlated with time/position data for the helicopter. In addition to the unaided ear, candidate sensors included microphones positioned (1) in a shaped hole 5 feet deep in the ground, (2) at ground level, (3) in a 30-inch reflector at ground level, (4) on a 5-foot fence post, and (5) on a 70-foot tower. Also tested were a mounted acoustic horn (megaphone), and a seismic sensor (geophone). A special test was also conducted to measure ability of listeners without listening devices to determine the direction of an audible but unseen low-flying helicopter.

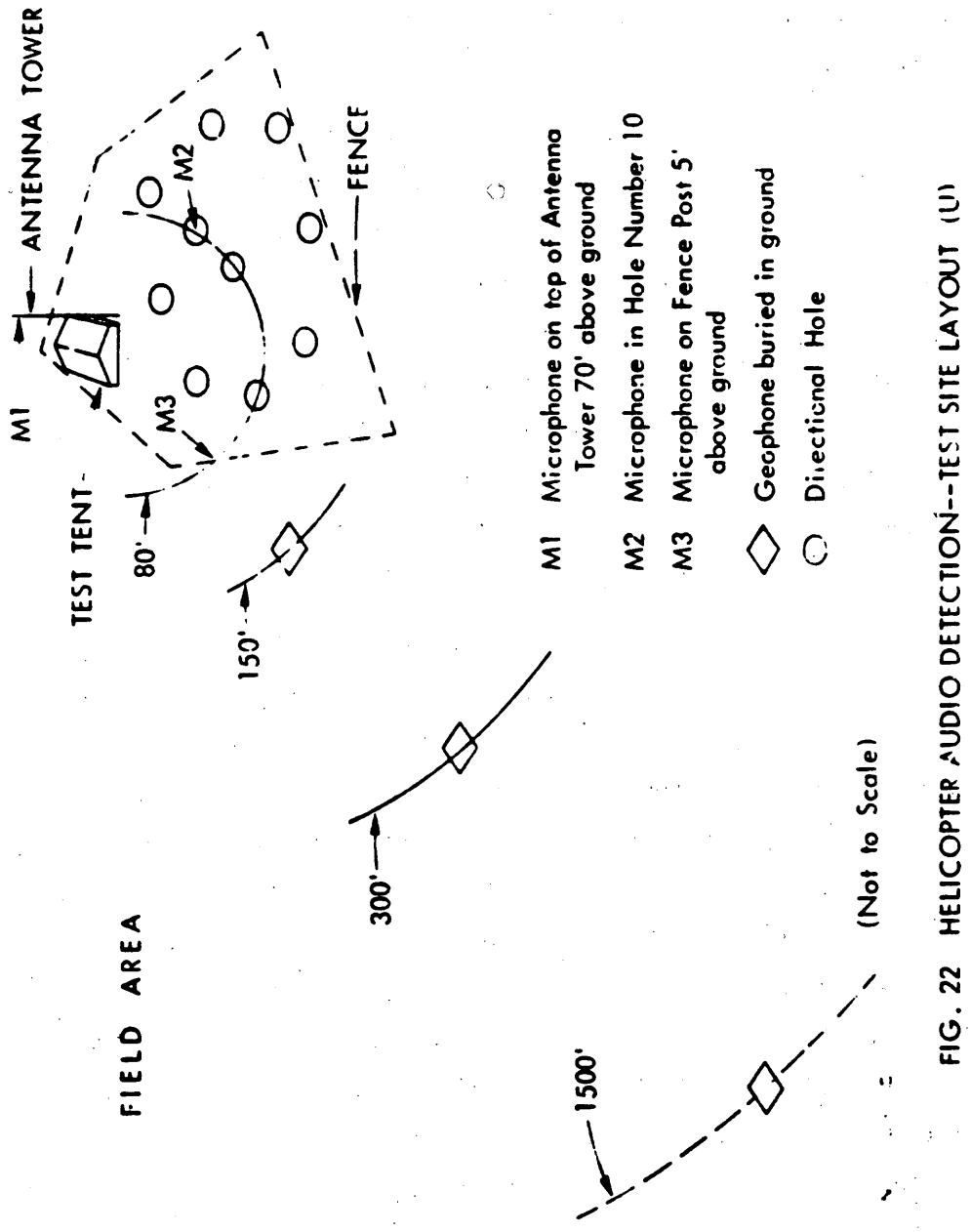


FIG. 22 HELICOPTER AUDIO DETECTION--TEST SITE LAYOUT (U)

(U) The following conclusions were drawn:

- Of the several acoustic and seismic aids to hearing that were tested, none out-performed the unaided ear in terms of detection range

- Using only their ears, listeners were able to hear the sound of an approaching helicopter a mean distance of 11.7 kilometers. Supplementary trial indicated that maximum detection ranges are reduced by at least 25 percent when test subjects are unable to anticipate approximate flight time

- The shaped holes reportedly used by the Viet Cong to provide an early warning of approaching helicopters did not, in the design used in this test, provide any such capability. The holes were tested to discover if any increased detection range resulted from their use and whether there was a marked pattern of directionality associated with them. The answer was no in both cases

- The geophone showed the poorest results in both detection range and signal quality for direct interpretation by listeners. However, the geophone does produce a distinctive signal in response to the audio energy output of a helicopter, and it might lend itself very well to an automated system whereby the signal is analyzed by a processing device

- The range at which a human observer, using electronic aids or simply the unaided ear, can detect and properly identify an unseen airborne helicopter varies widely with climatic conditions (particularly wind) and locale. Under certain atmospheric conditions, including still air, overcast sky, and a minimum of insect and other background noises, the unaided human ear can hear the the sound of a low-flying unseen helicopter at distances of 25 kilometers or more

- Test results indicate that the human ear is capable of selectively searching for, detecting, and identifying the sound of an unseen low-flying helicopter when the subject sound level is well below the ambient background noise level

(U)

- An auditor without acoustic aid can point with considerable accuracy to the sound of an unseen helicopter, his accuracy increasing with the duration of the contact. The mean error for all trials was 9° behind the moving helicopter, very nearly the theoretical error attributable to the speed of sound and the distances involved.

2. Binaural Listening (U)

(U) Research on binaural listening suggests that surveillance against intrusion may be assisted by using the binaural signal-processing capabilities of the central nervous system. To determine the state of the art and to glean new ideas, the pertinent literature in the binaural listening field was reviewed.[106] It was concluded that most present research is oriented toward basic studies rather than applications, but several promising electronic devices that are analog models of human capability for binaural signal processing have been developed. Research results on use of these electronic models are too inconclusive to establish with reasonable certainty whether the devices can replace the human being in binaural listening. They suggest that surveillance may be improved by binaural listening to signals from pairs of specially placed and oriented sensors. Exploratory research on such a system was recommended.

H. Surveillance Equipment Testing (U).

(U) SRI has for several years been charged by ARPA to provide equipment test support to the Surveillance Division of the MRDC on an as-required basis. Such support generally comprises test design and data analysis of test programs prescribed by the RDC-T Surveillance Program Manager and reported by the RDC-T. In some instances SRI has been assigned full design, test, and evaluation and reporting responsibility.

(U)

Most such efforts have been modest, resulting in memorandum reports. A more prominent one was the test and evaluation conducted in late 1966 of the Sandia Seismic Intrusion Detector.[1]

(U) The equipment was tested at Saraburi and Haadyai to determine its ability to detect human intruders in the secondary, semi-evergreen forest of Thailand. The equipment was used with both real-time and store modes, and ground interrogator units were employed with wireless sensors. SRI's extensive experience, by that time, with seismic systems and with CI surveillance requirements proved particularly valuable. Although the equipment did not meet the requirements of jungle operations and was returned to the Sandia Corporation for possible modification, the Sandia field engineers carried back with them an appreciation of the operational requirements that surely assisted in the development of the later successful Sandia equipment.

V COMMUNICATIONS IN COUNTERINSURGENCY (U)

(U) The first study of counterinsurgency communications requirements in Thailand was conducted by SRI in 1963-65. That research was limited in scope, focussing principally on the Border Patrol Police. Since then, many new organizations have become involved in CI operations, major changes in recent years being the formation of the CSOC-CPM-JSC structure in 1966 and the takeover by the 2nd Army of all CI operations in the Northeast. Little, if any, information was available about the communication capabilities, deficiencies, and requirements of the new organizations, their command/control structure and procedures, and their tactical modes of operation, especially combined operations.

(U) Accordingly, in late 1967, a study was initiated the objective of which was to determine the operational requirement for communications among the security forces and other CI organizations of the Royal Thai Government in Northeast Thailand, and to set guidelines for systems improvements and future developments.

(U) The organization, missions, operations, and communication facilities and practices of all CI forces and agencies in northeastern Thailand were investigated, from small patrol units to the highest headquarters in Bangkok. For the observation of actual field operations, six critical changwats were selected--Nong Khai, Sakon Nakhon, Nakhon Phanom, Kalasin, Ubon, and Udon. In the first three of these changwats all amphoes, target areas, and many tambons and checkpoints were visited. In the other three changwats, samples were taken of the critical amphoes. In addition, all major headquarters and communication centers in the

Northeast and in Bangkok were visited. Concurrent with the field investigations, important background data were obtained from USOM and MACTHAI and from ARPA and its contractors.

(U) It was found that, in general, most security and security-related organizations are usually well-equipped to operate independently, but their added CI requirements for joint and coordinated operations are often in conflict with their original requirements.

(U) Some of the more specific findings and recommendations are presented below.

A. Small Unit Communications (U)

(U) At the small unit level, the patrolling range requirement is critical but often is inadequately or only marginally met. It was demonstrated that the ranges from patrol to base can be increased by raising the antenna heights and increasing the antenna gains at the base station. Increasing the base station transmitter power does not help since this provides only one way gain. A base station equipped with a 1-watt transmitter and a high-gain antenna, due to its two-way gain, will perform better than a 5-watt station with a standard antenna. Accordingly, it was recommended that FM-1s or similar equipment should be used in preference to FM-5s, and the money saved should be invested in better antenna installations. This simple procedure should give an increase of about 50 percent in communication coverage for patrols, and also help to improve the critical power supply for remote locations.

(U) Dry cell batteries can feasibly replace large wet cells for 5-watt equipment and are more economical. Thus it was recommended that, in the absence of a local power source, preference be given to the use of dry cells or smaller wet cell batteries.

(U) While battery resupply and equipment maintenance is a common problem, it is primarily an organizational problem and is amenable to procedural solutions. It was recommended that a MRDC Thai team be established to develop detailed procedures and advise the users in the field on their implementation.

(U) In critical areas the issue of existing sets modified from single frequency to two frequencies would increase the flexibility of the unit assignments.

(U) With regard to fixed or semi-fixed installations, enough data from ARPA-MRDC sponsored research is now available which, if presented in simple graphic or tabular form, would allow the field technician to make better performance predictions and tailor installations more efficiently. It was recommended that the MRDC Electronics Laboratory develop such tables and teach their applications.

B. Joint Operations Communications (U)

(U) As many as 12 different units may be involved in joint operations, not counting civilian agencies that may give communications support. About 60 percent of these units are USOM-supported and, accordingly, are generally provided with identical types of equipment; however, with one exception, every organization operates on its own frequency. The other 40 percent of the units in joint operations are supported partly by MACTHAI and partly by CSOC. As a result there is a conglomeration of equipment with little or no interface capabilities. In order to overcome this problem, CSOC has set up equipment pools and proposed a plan of providing HF SSB equipment to units of squad size and up. This is a feasible but costly solution, essentially adding another layer of equipment to the existing ones, and thereby exacerbating the already severe problems of operator shortage and strained maintenance

(U)

facilities. In addition, the indiscriminate use of the HF spectrum is already causing many interferences, and the present equipment pools can only be regarded as a stopgap measure.

(U) A far better approach would appear to be the use of an area communications system, which would provide communication for direct command and control of all units within the area with a minimum of additional equipment put into the field. Such an area communication system would put multiple high-powered equipment served by high gain antennas into a secure, fixed center, shifting the equipment burden from the operator in the field as much as possible to a permanent, well-staffed center. In addition, this center would have switching capabilities and direct access to major headquarters and command centers. It is expected that this approach would satisfy the CI communication needs with maximum reliability and efficiency at reasonable costs, with a reduction in maintenance and operator requirements. As an immediate measure to ease the interface problems, however, it was recommended that USOM upgrade supplied equipment with a second channel attachment and tune all the single-channel 150 MHz equipment to one of two common frequencies. This approach is justified by the fact that in CI operations, actions take place in a very small area only at any given time; thus a self-interference problem should not exist.

C. Long Haul and Support Communications (U)

(U) Serious problems arise in the long haul facilities, where lack of a good common user backbone system forces all agencies to rely on HF circuits. HF with its built-in propagation and interference problems is an unreliable medium for communication. Problems are compounded by the lack of fast coding methods. Under these handicaps, effective command and control of major operations from distant headquarters becomes virtually impossible. Therefore, a prime requirement

(U)

for all Thai as well as U.S. sponsoring agencies is to combine forces to investigate the requirements and set the economical base for a unified Thai National Communications Agency (TNCA). There are obvious and immense political problems involved, however, and these may be resolved only when the need-pressure becomes so great that a unified approach can no longer be ignored. But while the compelling conditions may be still in the future, the need and time for planning for such an eventuality are already here.

(U) For the defense effort, the country needs a fixed backbone system connecting all major command centers and strong points. Yet, most of the military type of hardware on hand is of limited use to this mission. High grade commercial equipment backed up with good engineering practices could do a much better job at less cost. Accordingly, it was recommended that: (1) the policy of supplying military type hardware be discontinued unless there is immediate application for the equipment supplied; (2) sponsoring agencies channel available funds into fixed plant installations; (3) an engineering department be created to advise on existing systems and make plans for future requirements; and (4) preliminary studies be sponsored for the establishment of a Thai National Communications Agency.

VI BORDER SECURITY SYSTEM STUDIES (U)

(U) Thailand has a border more than 8,000 km long comprised, variously, of land areas adjoining nations that are friendly, neutral, and hostile to the RTG; rivers separating such countries; and a long, easily approached coastline. Although there is no evidence at this time of need to defend these borders against major overt attacks from any of its neighbors, a sufficient number of border intrusions for purposes of subversion have been verified to prompt the RTG and the U.S. Mission to concern themselves with ways of strengthening the security of the border areas.

A. Program Genesis and Growth (U)

(U) (C) Denying insurgents personnel and materiel support from outside the nation being subverted is a basic counterinsurgency principle. For Thailand's Northeast, which was the area of principal conflict from 1965 to at least mid-1968, this meant monitoring and controlling traffic on the Mekong River, which forms most of the Thai-Lao border, as well within the border area adjoining the river. The easy crossing afforded by the river and the presence of Pathet Lao within relatively short distances of the Lao bank have made the Mekong River a natural border crossing area for insurgents and their support. The Thai and U.S. governments' interest in research on suitable modes of surveillance and control of insurgency-related river traffic led to a formal request on 23 February 1966 from COMUSMACTHAI to the Director, RDFU-T, which proposed "a series of studies aimed at developing surveillance systems for the Mekong River boundary... to determine which military systems, preferably one or more of these already in inventory, are applicable to surveillance of the Mekong."

(U) Evolving at the same time as the Mekong project was the ARPA Rural Security Systems Program (RSSP), a multi-disciplinary approach to both security and socioeconomic causes and consequences of insurgency in the Northeast. Under RSSP a province of the Northeast, Nakhon Phanom, was selected as a test area--an area which would be intensively studied and in which counterinsurgency security systems and nation-building programs would be developed and tested. As a result of several considerations--U.S. Mission interest, an already initiated Mekong study, and the basic CI principle of border control--development of a border control system for Northeast Thailand was the first of the security system programs initiated under RSSP. To that end, the Mekong River surveillance study, initiated in 1966, was extended to include system studies of land and air surveillance and control in the border area. The ultimate goal of these studies was the testing and optimization of a pilot border control system, made up of river, land, and air elements, and the preparation of implementation plans for the entire river border.

(U) The rationale for the border control system (BCS) studies, in the absence of a significant border threat, was to provide a pilot organization as insurance against the day when it might be needed. At that time--if and when needed--the long development lead time would have been overcome, alternatives would have been explored, and plans would be available providing the concepts of operation, what to buy, and how much it would cost to achieve a desired level of border control.

(U) With the emergence of a broadly defined BCS development program, SRI was designated system manager and assigned responsibility to: (1) manage and direct the research effort, analyzing requirements and developing a system design; (2) demonstrate the interrelationships and trade-offs; (3) develop a pilot system large enough for significant experimentation; (4) design and conduct tests and analyze their results; (5) recommend an optimum border control system; and (6) prepare implementing plans for the RTG. Although initially intended for the Northeast,

(U)

research and system design were to take account of the potential requirement of extension of the BCS to borders other than the Mekong River border.

B. General Research Approach (U)

(U) Border control research is complex. In addition to addressing the problem of how to inhibit infiltration, understanding first had to be achieved of the activities of many segments of the social, economic, and political structures in the border area and, to some extent, U.S.-Thai policy for assistance programs, in order to derive operational requirements and constraints that define and delimit possible border control measures. It is clear that border control must represent the government in matters of cross-border daily intercourse while at the same time attempting to inhibit infiltration contained within the cross-border traffic. Unlike border defense, which can be invoked in times of need by calling on reserve military resources, border control must be a daily affair. But it must also be flexible enough to be able to make the transition quickly and smoothly into border defense, should the threat escalate. The multiplicity of system interfaces resulting from these several operational roles (see Fig. 23) can easily render the system ineffectual unless clearly structured.

(U) The research approach taken was to divide the border problem into operationally functional parts, i.e., river and land control operations and air surveillance. The intent was to combine subsequently the findings of these separate but related studies into recommendations for an overall border control system, using trade-off cost and effectiveness analyses of the three subsystems.

(U) Although priority was given to Thailand's river border, it was believed that the research done on the land areas of the river border

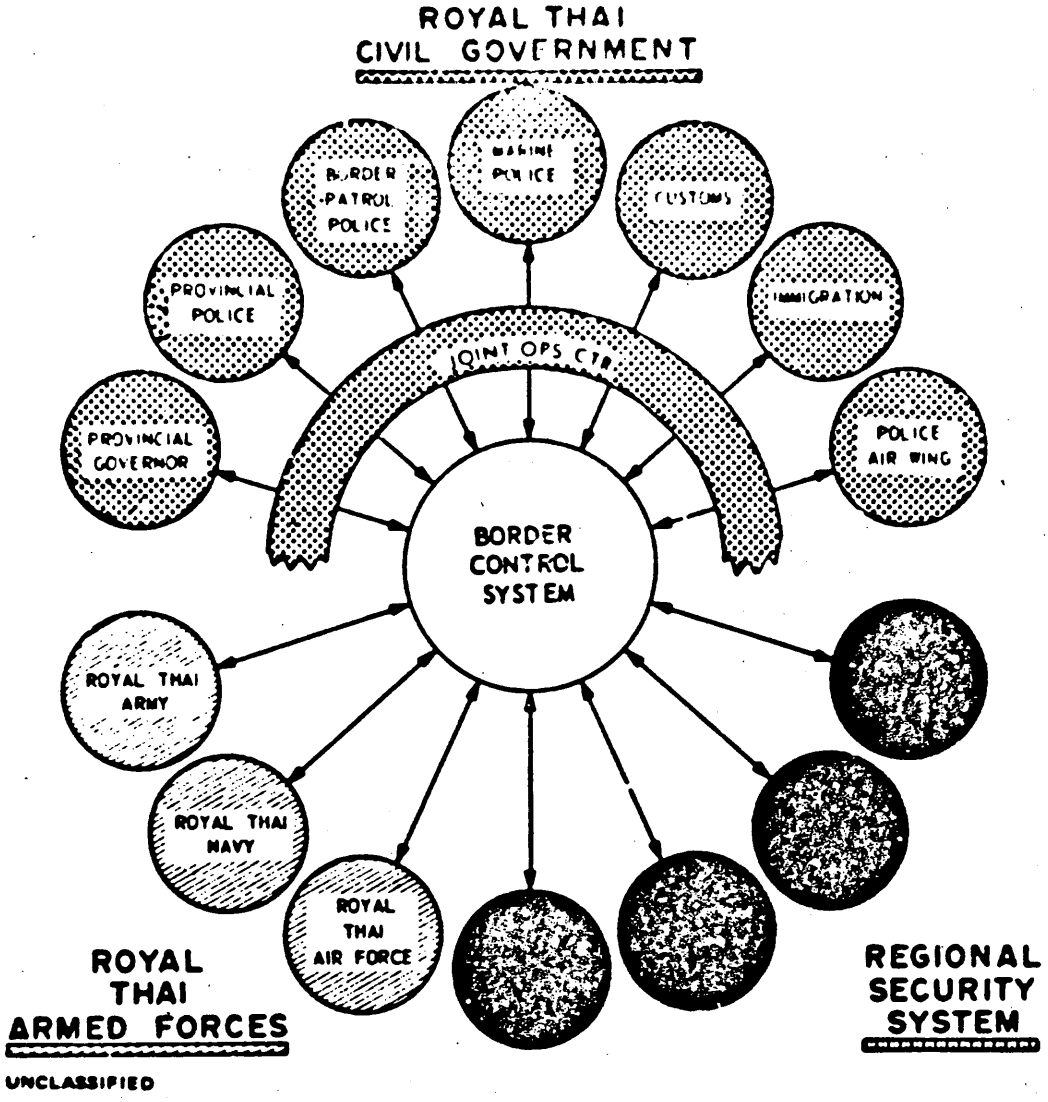


FIG. 23 BORDER CONTROL SYSTEM INTERFACES (U)

would have direct applicability to land borders. Accordingly, care was taken to avoid unnecessarily restricting the land border area research. In other words, no assumption was made as to the type or amount of support the land border control subsystem would receive from the river subsystem. Similarly, restrictive assumptions were avoided for the air surveillance subsystem.

(U) A system development plan was prepared[66] which detailed not only the objectives, system concepts, research approach, and evaluation criteria, but the management structure, functional flow diagrams, schedules, funding, man-months, and support and materiel requirements for the total program. For convenience, the studies that comprised the SRI border control research were divided into seven tasks:

Task 1. Program Management and Support

Task 2. Operational Environment

Task 3. River Control Subsystem

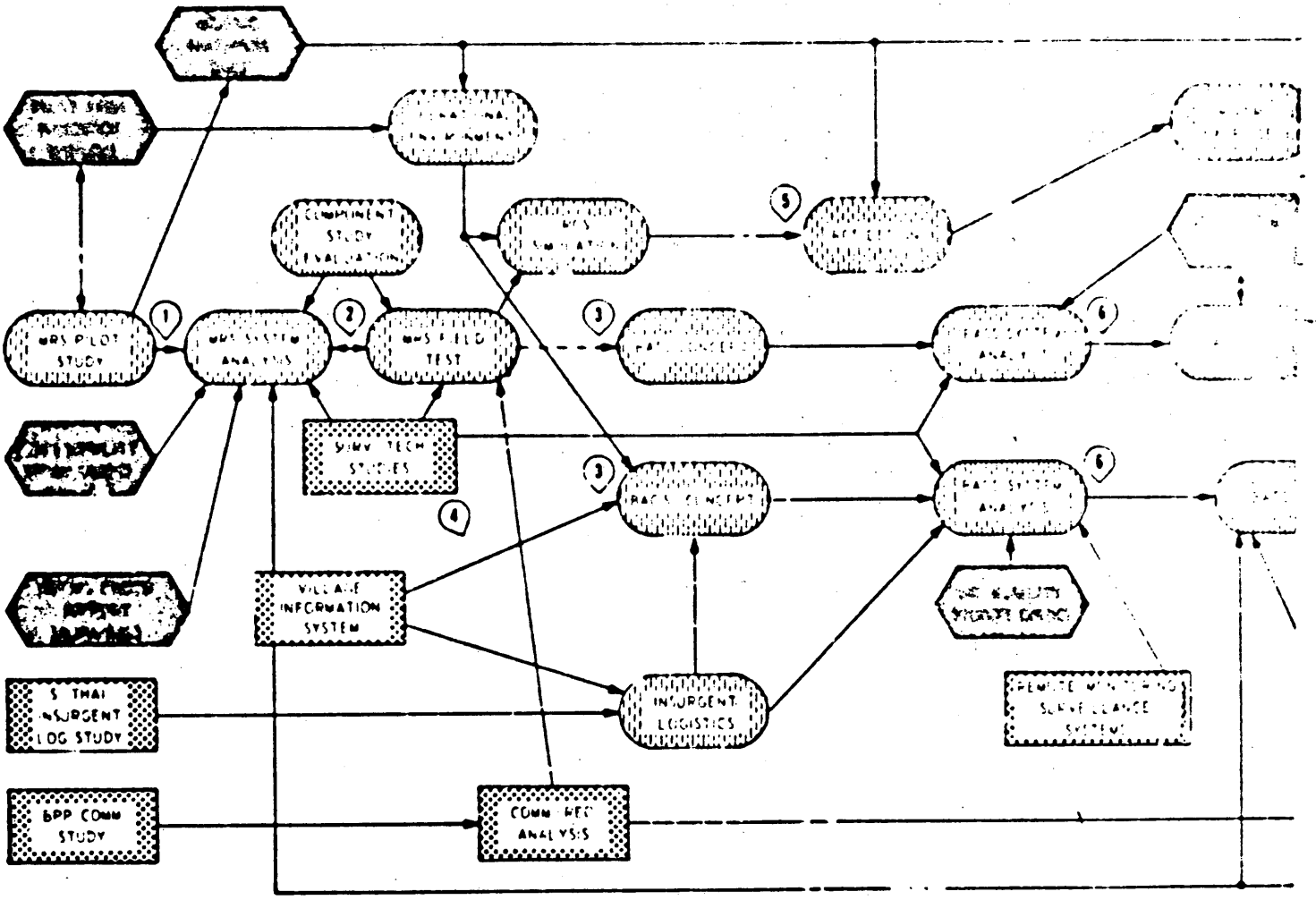
Task 4. Border Air Surveillance Subsystem

Task 5. Border Area Control Subsystem

Task 6. Border Control System Synthesis

Task 7. Technical Evaluation and Component Development

(U) The relationship among the study components and the related RDC-T study efforts is shown in the flow chart at Fig. 24. The overall analysis approach and the analytical techniques used are shown in Fig. 25. Work accomplished on the primary subsystems is described as follows.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ORS SYSTEM ANALYSIS
ORS FIELD TEST
SIMV TECH STUDIES
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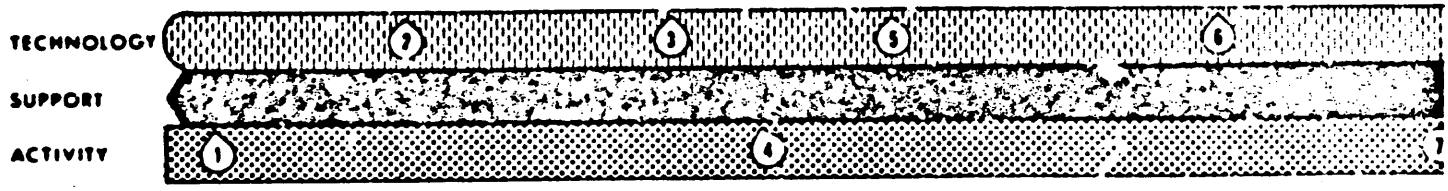
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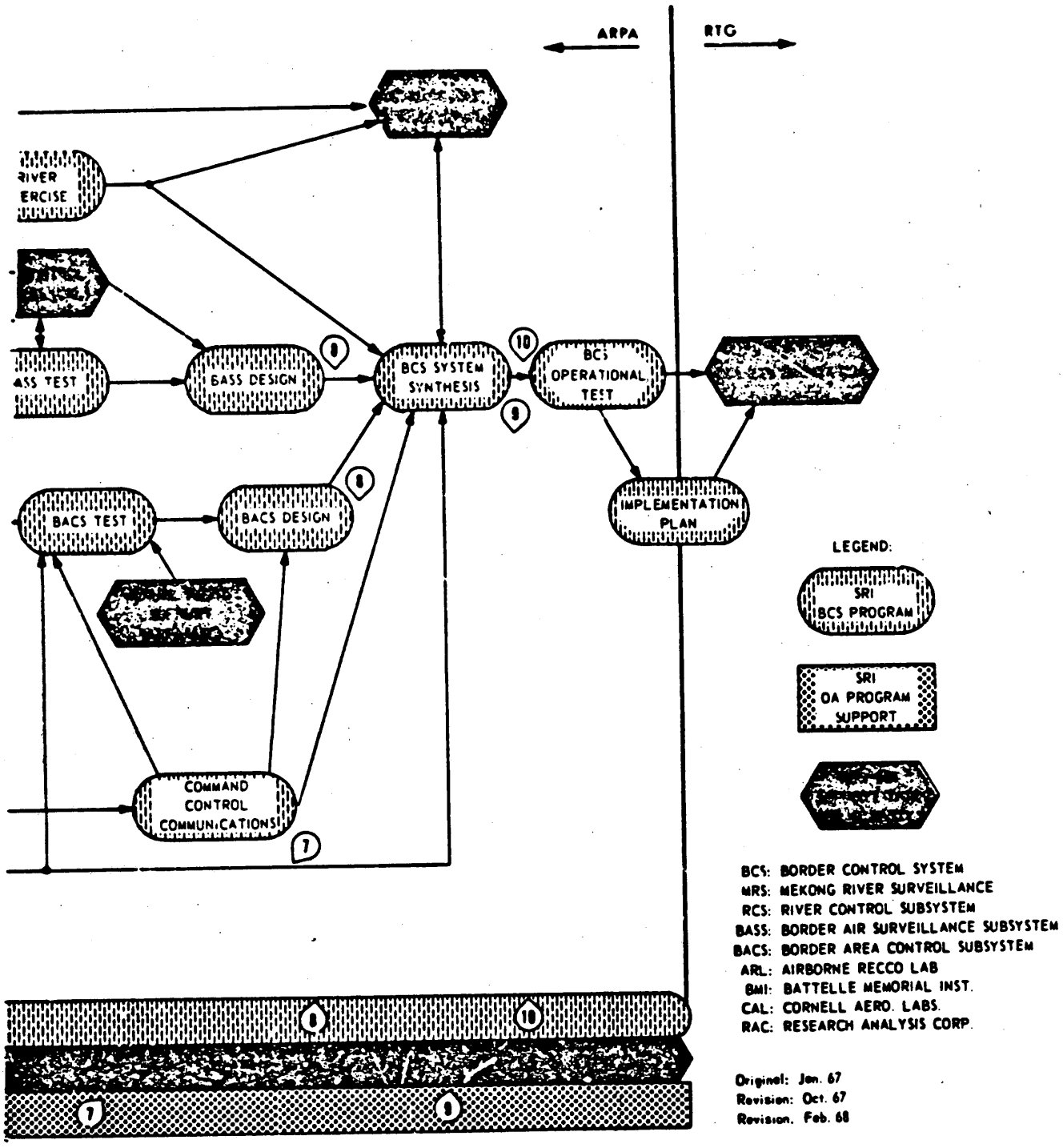

FIG. 24 BORDER CONTROL SYSTEM DEVELOPMENT--TASK FLOW CHART (U)

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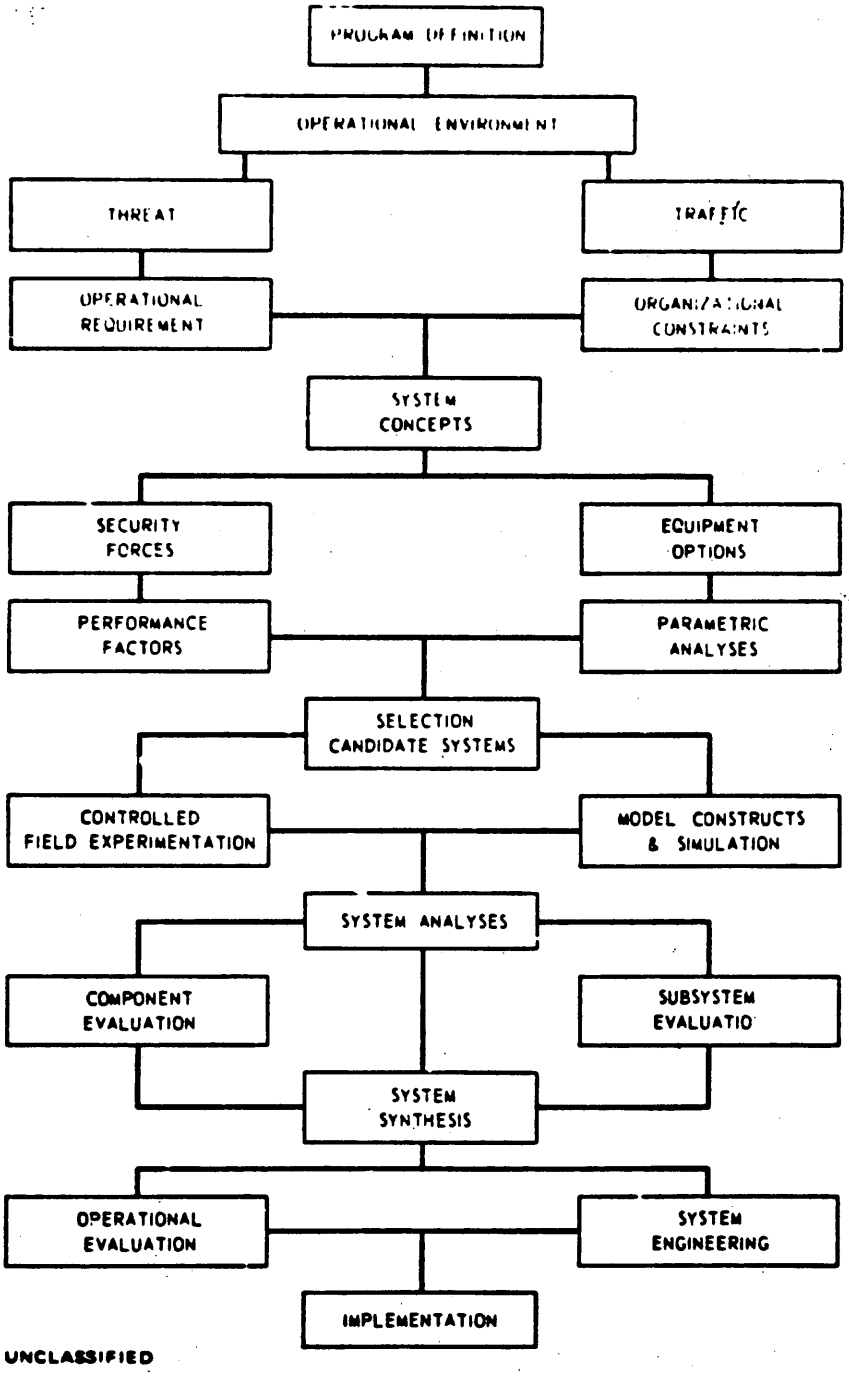

FIG. 25 BORDER CONTROL SYSTEM DEVELOPMENT--
RESEARCH APPROACH (U)

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C. Mekong River Surveillance (MRS) Study* (U)

(U) In response to the February 1966 COMUSMACTHAI request, ARPA agreed to make Mekong surveillance a part of its research program and by May 1966, when SRI was contracted for the Mekong effort, the research objective had been expanded to include not only available equipment but also forces and tactics which, if used by the Thai government, would have the best chance of yielding an effective and least-cost means of inhibiting insurgent traffic crossing the Mekong border into Thailand.

(U) It was recognized early in the research that the MRS project would involve many elements of the Royal Thai Government as well as the U.S. Mission. To monitor the research and assist in coordination, the MRS Steering Committee was formed under the auspices of the U.S. Embassy with representation from MACTHAI, USOM, AND ARPA. The Steering Committee and the MRDC established study guidelines and system constraints and enlisted the cooperation of the relevant agencies of the RTG as well as of the U.S. advisory agencies. At every step of the way, study plans were reviewed by the Steering Committee and the MRDC before their implementation.

(U) Royal Thai Government monitorship and participation was extensive throughout. MRS research and tests were reviewed and approved by the RTG Supreme Command. The Communist Suppression Operations Command (CSOC) issued operational orders for the formation of the test organization and assigned command and headquarters staff to the test unit. CSOC also assigned a senior adviser for field test operations, as did the MRDC. The test unit was composed entirely of Thai military and paramilitary personnel, drawing on personnel from the Royal Thai Navy, Marine Police, Border Patrol Police, Police Air Wing, and Customs and Immigration departments.

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* (U) Material in this section is taken from Refs. 7, 20, 21, 49, 53, and 66 through 75.

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1. System Analyses (U)

a. (U) Early Investigations and Operational Requirements.

In May and June 1966, preliminary investigations were initiated on the basis of which it was decided--with the endorsement of the Steering Committee--that the task was of such scope that a pilot approach should be adopted. Accordingly, a pilot area was chosen--a 50-kilometer stretch of the Mekong roughly centering about the provincial seat of Nakhon Phanom (see Fig. 26).

(U) Early field studies showed that there were only 12 authorized crossing points* along the entire 800-kilometer Mekong border between Thailand and Laos[70] and that uncontrolled traffic crosses the Mekong with little chance of being apprehended by meager Thai and Lao forces. Illegal traffic is of three types: (1) innocent, albeit illegal, crossings† that may be seasonal or are prompted by work opportunities, festivals, and family ties; (2) smuggling and illegal entry not related to insurgency; and, (3) smuggling and illegal entry in support of the terrorists in the Northeast. There are regulations governing cross-river traffic, rigorous enforcement of which could create greater problems than it solved; curtailing innocent but illegal traffic might make the job of surveillance easier, but it might also alienate the people by interfering with their work, family or social and religious life.[71] Hence, a river surveillance system on the Mekong must be able to discriminate among the several kinds of illegal traffic.

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* (U) Additional crossing points were planned and may have been subsequently authorized.

† (U) Crossings that are illegal only because the travelers have not crossed the river at authorized crossing points or have not followed proper immigration procedures.

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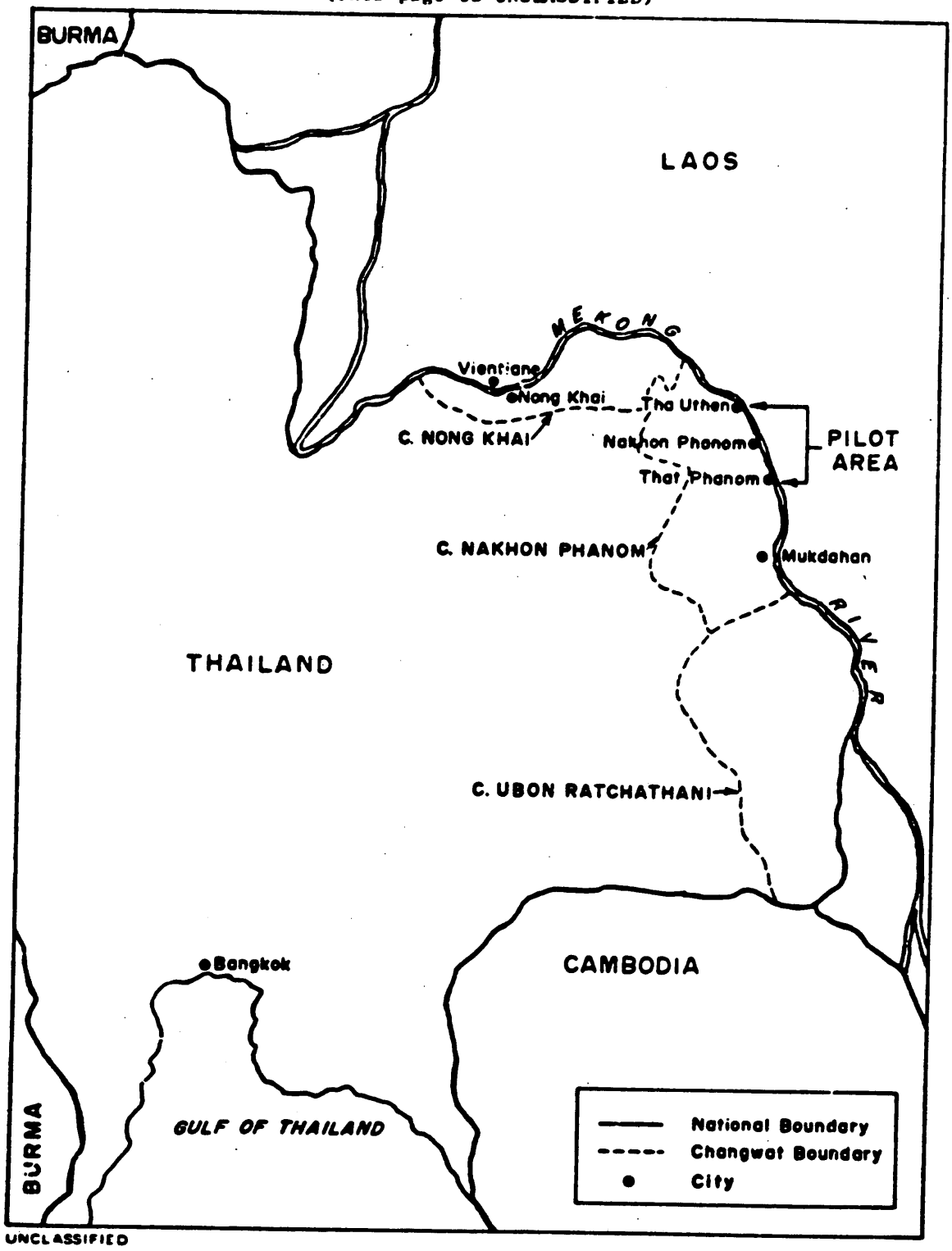


FIG. 26 MRS PILOT AREA (U)

(U) Background studies provided information on insurgent activities and logistics, normal traffic, the physical environment, existing Thai forces, the socioeconomics of the area, laws and regulations relating to cross-border traffic, and Thai-Lao relations, customs, and traditions.[45,53,67]

(U) The relatively low level of insurgency-related traffic estimated at present and the Thai government's policy of employing civilian and police agencies in counterinsurgency roles were two other vital factors considered in setting out operational requirements for the river surveillance system.

(U) Considering the surveillance objective, the Thai government security policies, the socioeconomic conditions in the area, the nature of the threat at present, and the geophysical and traffic data, the general operational requirements that the river surveillance system must meet were set out:

(1) Flexibility to cope with seasonal change.

(2) Adaptability to meet changes in threat tactics.

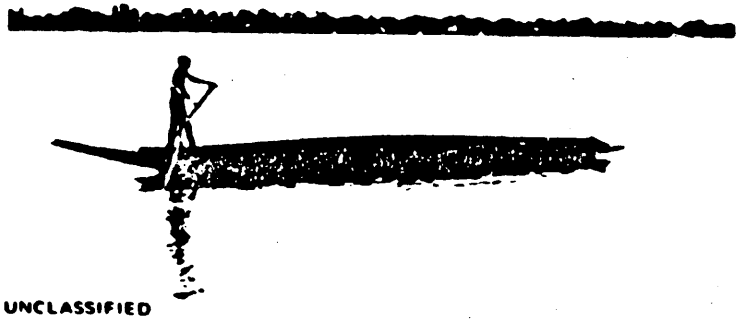
(3) Capability to handle two problems: legal crossings at authorized points (not part of the MRS investigation) and unauthorized crossings at all other points.

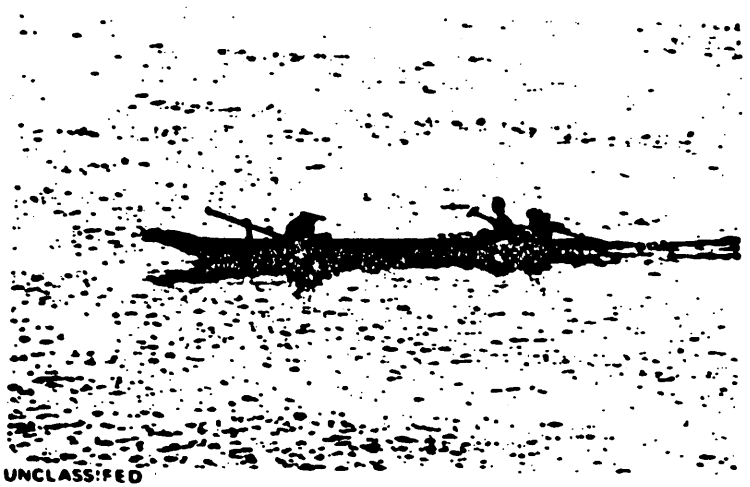
(4) Operational compatibility with other border control measures.

(U) The particular operational requirements to inhibit unauthorized crossings were:

(1) Surveillance of the Lao bank and tributaries for the earliest possible alert to pending, unusual activities on the Mekong.

(2) Day and night detection of boats (12 ft and larger) crossing the river. (See Fig. 27.)





There are an estimated 8,000 to 10,000 Thai and Lao boats along the entire 800-kilometer Mekong River border. About 90 percent of these are small craft without motors, used for fishing or transporting foodstuffs and other goods to markets along or across the river; about 10 percent of the small boats have long-shaft outboard motors and can cross the river in five minutes or less. Larger boats, carrying 20 or more people cross the river beween the 12 authorized crossing points along the Mekong border. People, goods, and livestock carried by these larger boats are inspected by customs and immigration officials, but law enforcement is rather perfunctory because of undermanning.

FIG. 27 TYPICAL MEKONG RIVER BOATS (U)

(U)

(3) Classification of boats crossing the river.

(4) Interception of suspicious craft.

(5) Evaluation of the activities of people in suspicious craft.

(6) Communication of findings to proper authorities.

(7) Maintenance of a visible, continuous law enforcement presence as an overt barrier to border violation.

b. (U) Selecting Functional Elements and Candidate Equipment System. In selecting the functional elements, consideration was given to the seven particular operational requirements listed above, the linear nature of the area, and the following guidelines and constraints imposed by the Steering Committee and the Royal Thai Government:

(1) RTG must approve and support the system

(2) System must be based on existing forces and their command and control structures

(3) System must accommodate Thai security force operating procedures

(4) System must minimize adverse effects on local socio-economic patterns

(5) Border control is primarily a law enforcement, not a military activity

(6) Equipment will be operated and mairtained by Thai forces

(7) Equipment must be fundable under Thai, USOM, and MAP programs.

(U) A preliminary system analysis was then undertaken. The above operational requirements and constraints were used to screen possible air, land, or river force functional modes. From this it was concluded that the river surveillance system should be made up largely of

(U)

river forces but that land and air forces should have supporting roles. The dominant role of the river forces is indicated in Table IV.

(U) A parametric analysis was then made of possible platforms, sensors, and communication devices that could operate in the indicated modes and satisfy the operational requirements. More than 100 possible combinations were examined and ranked for component compatibility and performance in the environment. Candidate system elements were selected on the basis of the highest ranking (and least cost where there was a large cost differential for components of roughly equivalent performance).

(U) Deployment and tactical concepts were then defined for these candidate system elements. The generalized deployment model is shown in Fig. 28.

2. Research Design (U)

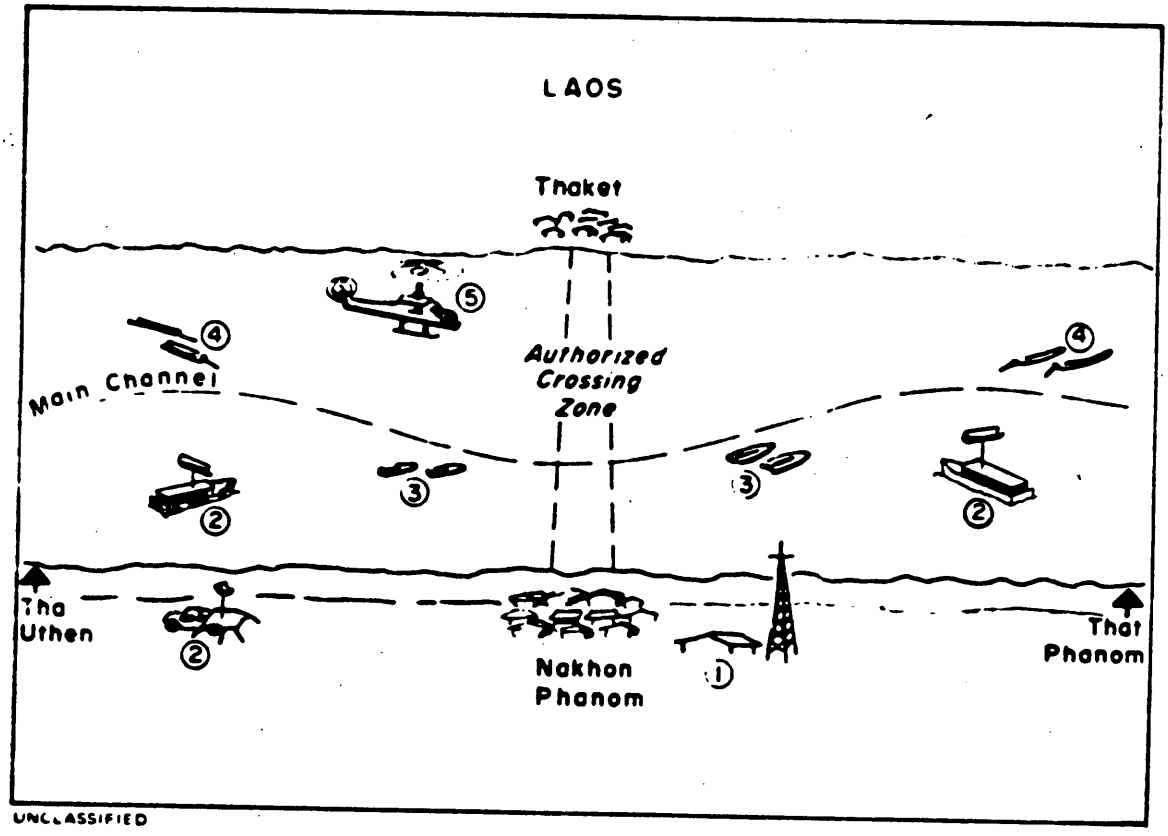
(U) a. (C) Field Tests, Computer Simulation, and Modeling.[72] These preliminary system design concepts were reviewed by the Steering Committee, the MRDC and, eventually, the Supreme Command. In view of the several RTG elements involved, the following test philosophy was agreed upon, having as its purpose the minimization of premature concern over roles and mission. The tests should start with a small system, used as an ad hoc, joint test unit in a limited area. The tests were to be part of a larger study, the objective of which was to determine the operational effectiveness of candidate systems. This determination would be accomplished by field test data analysis, through computer simulation and closed-equation modeling in which penetration tactics representing different threat situations could be tested against various deployments of various systems. This combination of tests,

(U)

Table IV

MRS OPERATIONAL REQUIREMENT VS MODE (U)

Operational Requirement	Mode			Comment
	Land Forces	River Forces	Air Forces	
Surveillance of Lao bank and tributaries			x	Random daytime sampling by aircraft considered most satisfactory, since it offers coverage of Lao rivers.
Detection Day Night	x x	x x		Detection possible in all modes. Air systems least desirable in view of complexity and number of aircraft systems needed for full coverage. Possible for river force to accomplish other functions as well.
Classification	x			River mode preferred, since classification best accomplished at close range.
Interception		x	x	River mode has option of hot pursuit and the most flexibility in environment of heavy cover and few roads. May need land backup. Rotary-wing aircraft possible air mode.
Evaluation	x	x		River or land modes optionally. River interception force most likely to initiate evaluation, augmented by land forces.
Communication	x	x	x	No preferred mode, since all elements must communicate. Central control needed.
Visible, Continuous Presence		x	x	River or air forces could meet this requirement; river mode preferred; first-cut analysis indicated air mode much more expensive.



ELEMENT	FUNCTION
① Central Control, Land	Coordination, Control, and Communication
② Radar Site, Land or River	Nighttime Detection
③ Picket Boats, Small Boat	Visible Barrier and Daytime Detection
④ Intercept Force, Land and/or River	Intercept and Search
⑤ Air Reconnaissance	Daytime Reconnaissance

FIG. 28 MRS DEPLOYMENT MODEL (U)

(U)

simulation, and modeling was clearly necessary;* data on system-component performance were essential for system evaluation, and it would have been enormously expensive to observe in the field all penetration schemes, surveillance tactics, and deployments possible with candidate systems. Therefore, a computer simulation was needed to extend the evaluation to situations that could not be observed in the field.

b. (U) Need for Field Testing. The test plan was designed specifically to obtain not otherwise available use-data on surveillance equipment and techniques. Findings of the analytical study indicated that certain improvements in boats, added detection sensors, communications devices, and perhaps most important of all, the concept of combined operations should improve the river surveillance performance of the existing Thai police and security forces along the border. Use-data were required reflecting as truly as possible the real value of equipment and techniques as employed by the Thai user-agencies in the actual environment. With test data as inputs, modeling and simulation could meaningfully consider force requirements, system processing times, estimates of the usefulness of advanced sensors and techniques, deployment strategies, and requirements for sensors and related equipment.

(U)

* (U) This combination of controlled field test/simulation/modeling, and the techniques of accomplishing it, had been refined and successfully employed by SRI in the conduct of its research for the Combat Developments Command Experimentation Center, Fort Ord, California. A number of staff personnel with extensive CDCEC experience took part in the MRS test program and were able to bring to it the benefit of that experience.

c. (U) Design of the Tests. The experiment itself was designed to produce a data base that would permit study of component performance measures, critical interactions, and a simple system operation; the analytical output was analysis of variance tests of hypotheses, confidence intervals, and empirical distribution functions. Given the variations in such factors as weather conditions and the capabilities of controllers and player personnel, and the objectives of the experiment, a fairly large number of replications could not be avoided.

(U) Three types of tests--A, B, and C series--were defined (see Table V) and, except for minor deviations, these letters denoted both a chronological sequence and progressively more complex system implementation, with a complete system fielded for the first time in the C series. The A series tests were designed to estimate simple operating characteristics of surveillance components, such as boat speeds and maximum radar ranges. The B series experiments determined main effects and critical interactions of sensor-platform combinations operating under a wide variety of background conditions: that is, the B series dealt with detection, tracking, and target classification, but it did not include the chase, intercept, and evaluation functions. Finally, the C series was a joint computer simulation and field experiment that considered a fully operational system subjected to nontrivial penetration tactics. The first phase of the C series was an experiment in which a full surveillance system was deployed against targets using straightforward penetration tactics. Specifically, single target boats followed direct paths across the river, and the target boat crews made no attempt to blend in with normal, innocent boat traffic or to use any other devious tactics. The second phase of the C series was a computer simulation exercise with a two-fold objective: first, to reproduce some of the previously-observed field situations as a first-step model validation and, second, to provide data on the outcome of runs in which more complex penetration

Table V

(U) MRS FIELD TEST SERIES (U)

Test	Purpose
A-1 Maximum Radar Ranges	Find max. ranges of radars, find effects of antenna height, locate radar sites, fix target start points
A-2 "Standard" Radar Cross-Sections	Calibrate target boats to standard radar cross-section measurement
A-3 Boat Speeds	Assess boat dynamics and operational capabilities of various boat-engine combinations under test
A-4 Evaluation	Estimate time to search boat and probability of evaluating test boat as innocent or guilty
A-5 Equipment Reliability	Estimate component reliability in order to estimate functional reliability of system
A-6 Communications Range Distribution	Find effectiveness at ranges and under conditions in which system must operate
A-7 Aircraft Target Classification	Find capability of aircraft to classify and communicate location of target
A-8 Sensor Target-Passing	Assess system ability to maintain identification of target boat passing from one sensor zone to another
A-9 Sensor Operator Multiple-Boat-Tracking Ability	Assess operator's ability to keep track of target boats moving among other boats
A-10 Radar Detection Helicopters	Find probability of detection by marine radars of helicopter as a function of helicopter altitude and range
B-1 Operational Detection and Track	Establish operation performance of sensor-platform combination under range of environmental conditions
C-1 Full-System Tests	All the above plus chase, intercept, and evaluation functions

(U)

tactics are introduced. The rationale for the content and sequencing of the test series is detailed in the test plan.[7]

d. (U) Support Training, Monitoring, and Data Collection. Responsibilities for training in procedures and operational techniques, for direct monitoring of the tests, and for field data collection were assigned to a supporting contractor, the Battelle Memorial Institute (BMI), which has provided support to the MRS and in the course of compiling a Mekong River data book, had acquired extensive experience on the Mekong River using MRDC Thai field engineers as data collectors. Overall responsibility for the design and implementation of the test and the data requirements resided, however, with the SRI staff.

(U) By June 1967 the SRI test plan was approved, and between June and 4 September, when the tests began, equipment, facilities, and logistic support were procured, modified, or built, and personnel were assigned or hired. Equipment, personnel, and organization of the MRS test program are presented in the tables and figures on the succeeding pages.

3. Summary of Study Structure and Investigations (U)

(U) Fig. 29 shows the overall structure and interrelationships of the MRS study together with investigations, analyses, and coordination performed under the various parts of the study. Table VI provides details of equipment and personnel, and Figs. 30 and 31 show the test unit organization and photographs of various components and equipment.

(U) The field test program was completed in March 1968 and represents probably the first time large-scale controlled field testing has been conducted with a non-U.S. security organization in the locale and under the conditions of actual operations. An interim report[21] embodying the

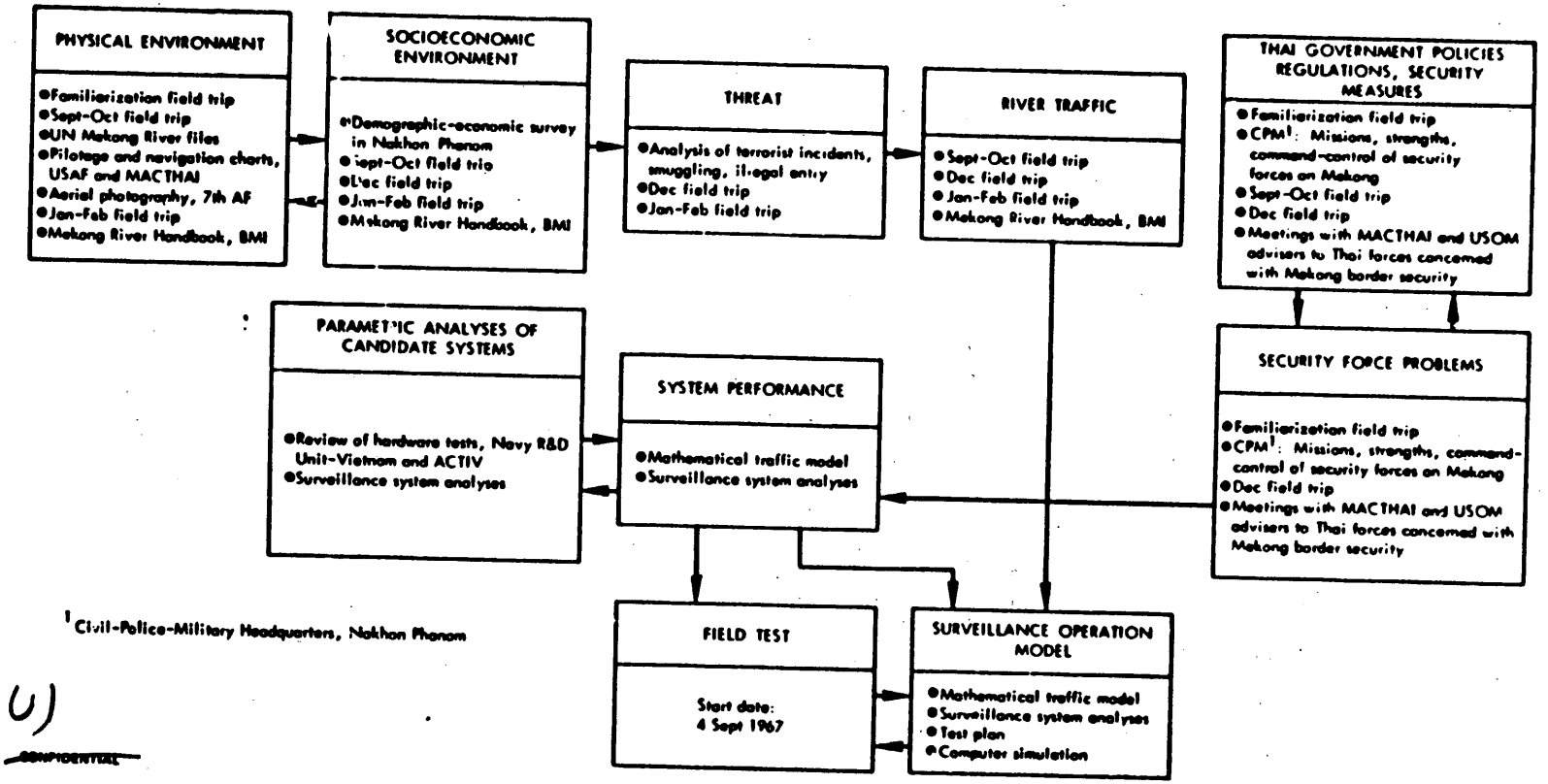


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FIG. 29 MRS PROJECT STRUCTURE AND INVESTIGATIONS (U)

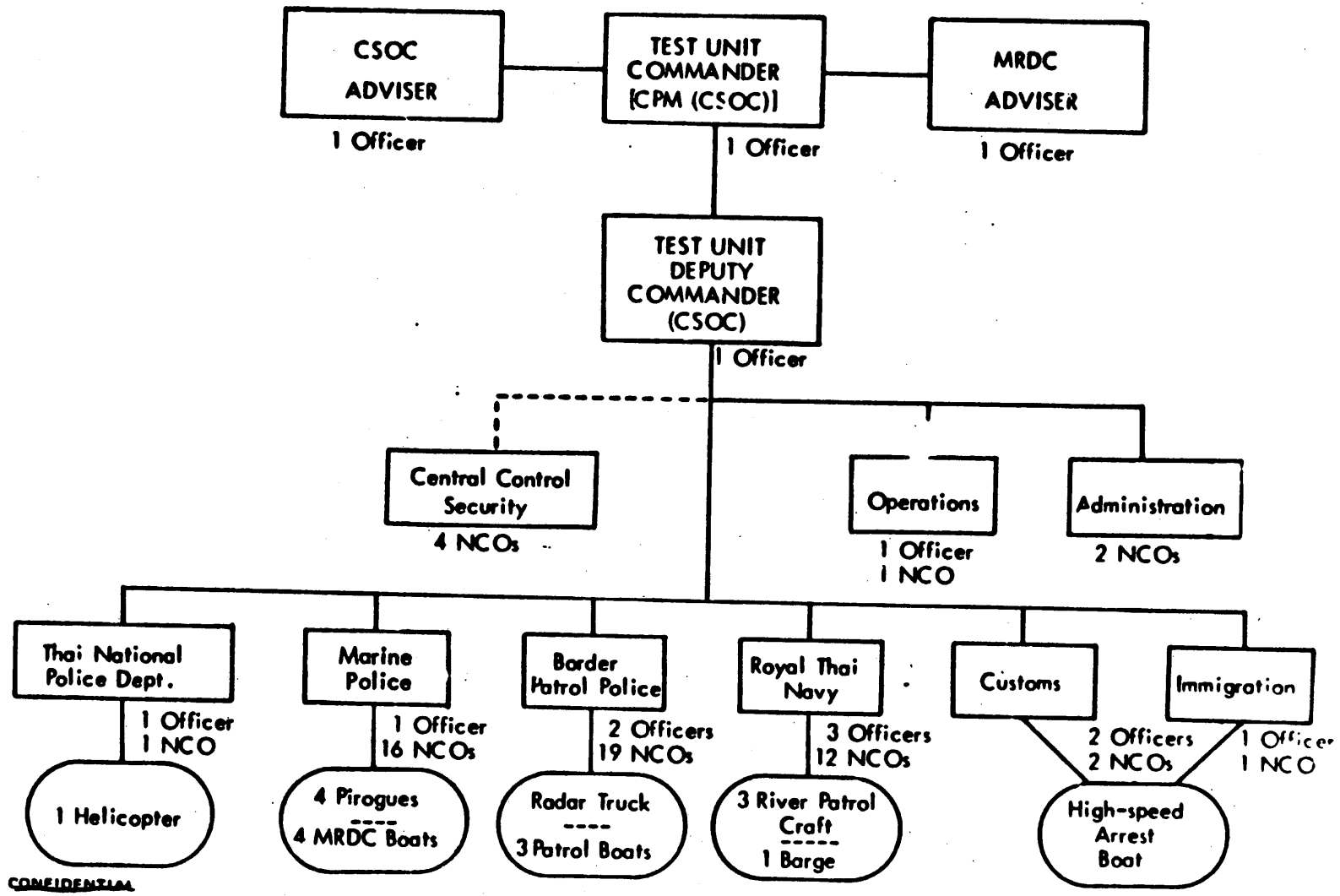

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FIG. 30 MRS TEST UNIT ORGANIZATION CHART (U)

Table VI

(U) MRS TEST EQUIPMENT CONFIGURATION (U)
(Not Including Communications Equipment)

Element	Equipment
Central Control	1 Shore Station*
Radar Sites (platforms)	3 River patrol boats, with Raytheon 1500B radars (3-cm, marine)
	1 Barge, with Decca 329 and 202 radars (3-cm, marine)
	1 3/4-ton Truck, with Decca 329 radar (3-cm, marine)
Picket-Chase Boats	4 MRDC shallow-draft boats, 40- and 60-hp
	4 Marine Police pirogues, Rotax engines
	3 Border Patrol Police boats, 18-hp
Arrest Boat	1 High-speed, inboard-outdrive boat, 200-hp
Air Reconnaissance	1 Light observation helicopter

* (U) Central Control building and compound made available by the provincial government.

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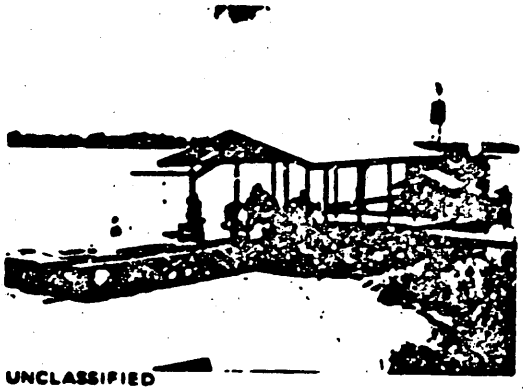
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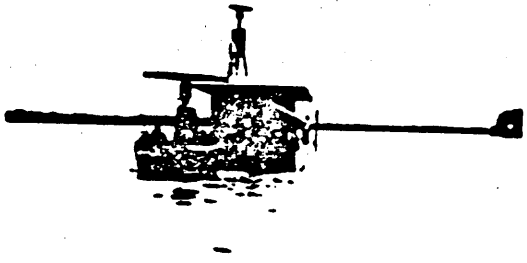
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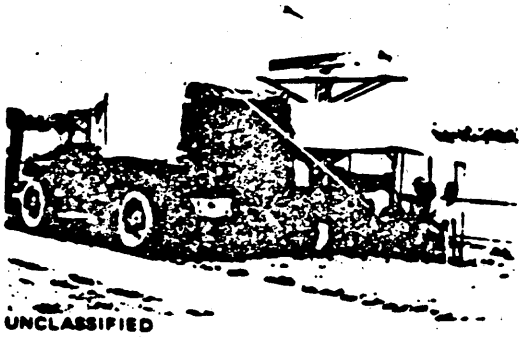
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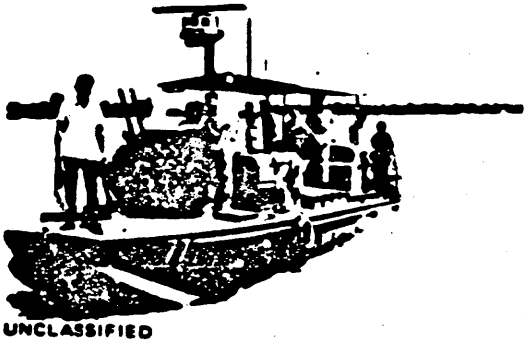
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Left, top to bottom

Control center with quarters and electronic maintenance

Barge with Decca radars

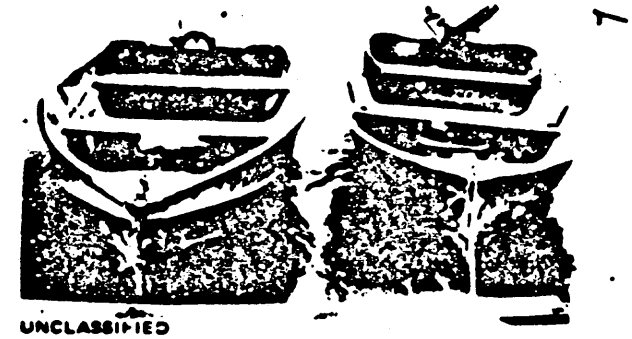
RPC with Raytheon radar

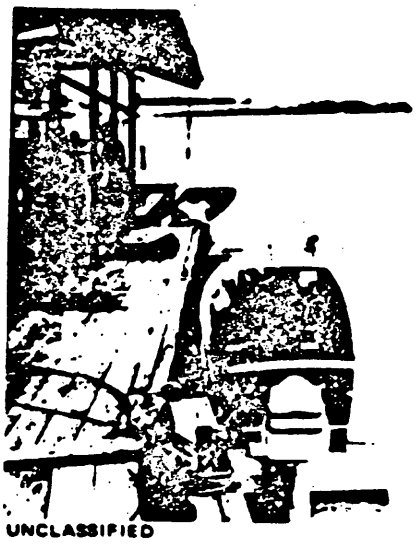
Right, top to bottom

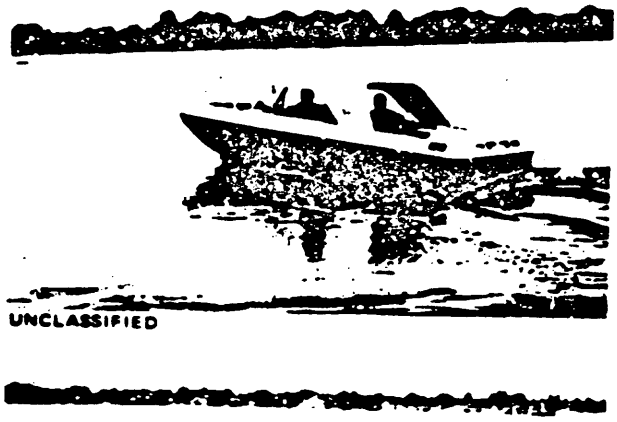
Dock and boat maintenance

3/4 ton truck with Decca radar

FIG. 31 MRS UNIT COMPONENTS (U)







Left, top to bottom

BPP aluminum boats

Hi-speed outdrive arrest boat

Marine Police pirogue with long-shaft engine

Right

MRDC shallow-draft boat with outboard engine

FIG. 31 MRS UNIT COMPONENTS Concluded (U)

(U)

results of most of the field testing was published in February 1968 in order to meet some requirements of U.S. Navy Advisory Group, JUSMAGTHAI. In March 1968, the test unit shifted to a quasi-operational mode, after which operational evaluations were conducted by the study team. On 1 July 1968, by order of the Communist Suppression Operations Command, the test unit was converted to fully operational status and on 11 July 1968, in a formal ceremony at the unit control center compound, Lt. Gen. Saiyud Kerdphol, Director of Operations and Coordination, CSOC, accepted from Maj. Gen. Prasart Mokkhaves, Commanding General, MRDC, transfer of all test systems from MRDC to CSOC.

(U) Following the conclusion of field testing in March 1968, work continued on the simulation using local computer facilities. In mid-summer 1968 the simulation activity was transferred to SRI's own computer center in Menlo Park and the bulk of the simulation was completed in November 1968 with some added runs made in January 1969.*

4. System Costing (U)

(U) Costs were estimated for the alternative systems of border security activities where the systems may differ in equipment, personnel, operation, and maintenance. Quite obviously a common set of costing rules and standards would be necessary to permit meaningful comparative

* (U) Arrangements had been made to use the computer facilities of the RTG National Statistical Office (NSO) which operates a data processing center containing an IBM 360/40 computer. The computer was made available without charge by the RTG but the rapidly escalating demands placed on the center's facilities for direct Government operations created severe scheduling problems and seriously delayed the simulation program. Recognizing that, in spite of the best intentions and full spirit of cooperation of the RTG, scheduling problems could not be successfully resolved, it was decided to transfer the work to the United States. Although this resulted in added delay, it at least ensured that the computer work would be completed.

(U)

cost analyses, but no such standard was available. Accordingly, a costing methodology was developed[27] based on the concept of equivalent annual costs. Computation of the equivalent annual costs includes consideration of such factors as appropriate discount rate or opportunity cost of capital, costs of investments, expected life of equipment, net salvage value at end of expected life, and annual costs of maintenance and operation.

(U) Along with the methodology, a catalog of equipment, spare parts, maintenance, POL, personnel salary, per diem, and related costs was developed for the MRS tactical organization. The methodology was then applied to the computation of the MRS unit and the cost of a base line system was derived. Applying this base line system cost, the costs of variant systems could be readily compared.

5. Selected Findings* (U)

(U) (C) The relatively simple surveillance/intercept concept described below can be highly effective as a filter for illegal crossings and, at the same time, can assist in processing legal traffic by utilizing the radar platform/subcontrol stations as checkpoints. The system concept calls for:

(1) Daytime visual surveillance, with observers spaced approximately 2 km apart

(2) Fast intercept and arrest boats, capable of speeds on the order of 40 km/hr

(3) Radar night surveillance and vectoring of intercept arrest boats, the radar capability to be equivalent to that of Decca 329 and radar platforms to serve as checkpoints for processing legal crossings as well as subcontrol stations for the system

* (U) For detailed findings and conclusions and their documentation, see Ref. 7.

(U)

4) Radio links between all system elements

5) Central command control to process information inputs and make decisions related to deployment and intercept tactics.

(U) Applying the concept described above, the study defined a first-choice MRS unit system configuration reflecting final cost and effectiveness assessments.* This unit configuration consisted of the following:

Command-Control Center

Eight PBRs† with Decca 329 radar

Sixteen 45 km/hr MRDC chase boats

Support facilities

Total annual costs for such a unit was estimated at U.S.$528,400 or, prorating over the 200 km area of responsibility considered appropriate for this highly mobile unit, the annual costs would be approximately U.S.$2,640 per km.

(U) The effectiveness and operations coverage within the area of responsibility that this unit could provide is shown below:

Effectiveness (Percent Targets Intercepted)	Operating Coverage (Kilometers)	Radar Spacing (Kilometers)	Chase Boat Spacing (Kilometers)
20	64	8.0	4.0
30	49	6.2	3.1
40	36	4.5	2.25

* (U) For detailed cost and effectiveness curves, see Ref. 7.
† (U) U.S. Navy, patrol boat-river.

(U) (C) Depending upon the specific threat indicated by intelligence inputs, and the operational objective, at any given time the unit commander has considerable latitude in his choice between extent of river coverage and level of system effectiveness. The cost per operating kilometer will, of course, vary accordingly--from U.S. $8,330 per km at the 20 percent level of effectiveness to U.S. $15,480 per km at the 40 percent level.

(U) The above costs assume chase boats and platforms are underway approximately two hours per day. These costs per kilometer are increased by more than 25 percent if chase boats and radar platforms are underway as much as 18 hours per day. Under some conditions patrolling may increase effectiveness, but this is uncertain in most cases.

(U) (C) Total system costs per kilometer are relatively insensitive to the choice of radar platforms among the types examined (truck, barge, RPC, PBR*); also, the choice of boat type is not an important factor so long as speeds are roughly equivalent.

(U) (C) Of the total yearly system costs, approximately 70 percent are personnel costs. The costs per kilometer given above assumed a reasonable level of training and motivation similar to that exhibited by the MRS test unit during the tests. Since the effectiveness of the system is highly sensitive to response times (a parameter measure related to training and motivation), it follows that the cost per kilometer to achieve the indicated levels of effectiveness would be greatly influenced by the state of training and motivation.

(U) The system as shown by the tests required a minimum of high skills and therefore, in general, a satisfactory state of training was readily accomplished. Exceptions to this were the maintenance personnel,

(U)

* (C) U.S. Navy boat designations: RPC=river patrol craft; PBR=patrol boat-river.

U

who were carefully selected on the basis of previous training. Degree of motivation, however, is a different matter. Although motivation was not assessed, the routine nature of the surveillance tasks, noted even during test periods when many activities were artificially introduced, can be expected to degrade motivation and, therefore, effectiveness during actual operations.

6. Recommendations* (U)

(U) On the basis of the limited present threat it does not appear that placing a full MRS-type surveillance intercept capability along the entire Mekong would warrant the costs that would be incurred. On the other hand, implementation of the MRS as river control reinforcement units for selected areas is considered a necessity at present and an insurance against permitting cross-river insurgent traffic from increasing freely. Selectively employed MRS units could also at the present time contribute to reducing smuggling and assist in the flow of legal trade, both of which would produce revenue that could at least in part offset the MRS costs. For these reasons, phased MRS implementation is recommended, as follows:

a. (U) First Phase. Although limited in the amount of river it can effectively cover, the small MRS river control unit, created as a test vehicle for purposes of this study and now operationally a part of the Nakhon Phanom CPM, should be retained and supported. It offers unique and immediate opportunities to train cadres of RTG forces in effective ways, as shown by this study, of screening river traffic along the Mekong.

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* (U) These are principal planning recommendations of the study. For other, including operating, recommendations, see Ref. 7.

(U)

b. (C) Second Phase. In order to give this existing MRS unit sufficient size to show its potential, it should be augmented as resources become available. First consideration should be given to adding 2 PBRs, equipped with radars equivalent to the Decca 329.

(U) (C) Small boats capable of 30 to 40 km/hr should then be added. Personnel should be augmented to permit 24-hour operations. This would require a total of approximately 300 staff and operating personnel. A unit of this size should be reasonably sufficient to cover effectively an appreciable length of border and still small enough to allow efficient administration and support by one Command-Control Center.

(U) (C) The area of responsibility for such an augmented unit should be on the order of 150 to 200 km (75 to 100 km either side of the Command-Control Center). Radio linking between Command-Control and at least one of the radar platforms should have a range capability of approximately 50 km: with FM-5 radios, this can be accomplished by suitably elevated high-gain antennas.

(U) This recommendation on unit size is made after consideration of maximizing returns on the "fixed" system costs. Also, the augmented unit with operational flexibility represents a substantial obstacle to any river crossing intentions of insurgents over its area of operations.

(U)

c. (C) Third Phase. Although the augmented unit recommended above should prove adequate for 20 to 25 percent of the Mekong border, a second unit of river surveillance intercept forces should be established as trained personnel and other resources become available. This unit should be similar to the first augmented one but have more capability, especially mobility.

(U) (C) With a capability of moving at least 100 km per day, including support and first echelon maintenance, the coverage afforded by

(U)

this second unit, added to the coverage given by the first augmented unit, should be sufficient to provide a reasonable level of cross-river traffic control along the entire Mekong boundary for the foreseeable future.

(U) The question of the number of Central Control facilities required for these two units should be carefully examined along with other border security plans. At this time it is suggested that a feasible approach might be to plan for the MRS units to share common facilities such as billeting and communications with improved Marine Police or BPP facilities at four selected fixed sites approximately every 150 to 200 km along the river, the surveillance/intercept units to be assigned to an area on a periodic basis of expected operational need. The nominal requirements for the purely operational aspects of the MRS units at any of these fixed bases would add little to what would be needed in a well established border area control center.

D. Border Air Surveillance Study (U)

U) Air control over the border is considered more appropriately part of a broader air intrusion and interception system. Air surveillance, on the other hand, may be an important function that can be performed by the border control system and provide an alerting input to the air control system. Inasmuch as the broader control system was already the subject of a separate RDC-T study, the study effort under BCS was confined to an investigation of suitable techniques of detecting, tracking, and reporting low-flying presumably hostile aircraft penetrating the Thai border, and recommending a system, based on readily available equipment, which can provide surveillance of the low-altitude airspace over the border area and an interface with the more general air control and intercept system. After preliminary investigation, these requirements resolved into tests of audio detection of helicopters with the unassisted ear and

(U)

with the ear assisted by certain devices. These tests and their results have already been described earlier in this report (see pp. 104-108).

E. Border Area Control Subsystem Study (U)

1. Operational Environment (U)

(U) During the period May 1967 through March 1968, SRI conducted a detailed investigation into the factors in the operational environment that would affect the border control subsystem in the land area adjacent to the Mekong River. The investigation, conducted in the province of Nakhon Phanom, the pilot area, was divided into several studies as listed and described below:

- Description of the insurgent support requirements and estimate of the cross-border traffic generated by it
- Description of the physical environment and its implication for border-control design and operations
- Description of the agencies and organizations currently concerned with border control in the area and assessment of the job they are doing
- Description of the socioeconomic background and its relationship to border control measures.

(U)

a. (C) Insurgent Logistics and Insurgent Traffic.[22] An attempt was made to determine the current and possible future pattern of insurgent supply in northeastern Thailand, providing the basis for analyzing the types and amounts of materiel and their transport with which a border control system would be confronted. In general, the only items of supply not readily available from local sources are weapons, ammunition, explosives, and some medicines. Insurgents purchase their supplies and pay a fair price, obtaining cash from outside sources. Insurgent personnel

traffic has so far been mostly small groups crossing the border enroute to or from Laos or North Vietnam for training.

(U) As already described in Section III, the insurgent logistic system is rudimentary and is localized around villages. So long as it remains so, it is unlikely that there can be a substantial increase in numbers of insurgents living in the forest or much increase in insurgent activity. Villagers living near forests probably are useful in the transport of materials from market to village and then to insurgent-underground points. An increase in logistic activities, the discovery of improved caches, and growing cross-border traffic would signal a change in insurgent intentions. The implications for border control are that the system should focus on detecting arms, ammunition, and explosives as targets and should be sensitive to detecting changes, such as increases in cash availability in villages. A short analysis was done which showed that if the insurgency escalated, a greater dependence would develop on supplies from abroad.

(U)

b. (C) Description of Security Force.[24] There are four elements of the RTG in Nakhon Phanom having a border control function: the riverine agencies (Customs, Immigration, and Marine Police), Border Patrol Police, assigned land forces, and the Civil-Police-Military (CPM) command-control organization. A policy of civil control was formulated by CSOC in 1966 and was manifested in the CPM organization at province and amphoe (district) levels, but in September 1967 operational control was taken over by the Second Army, and since that time an increasing military influence has been noted. The CPM has continued as the basic command and control organization with authority over all assigned forces except the RTA and the BPP, but the organization suffers at present because there is no operations center where information is received and processed, and action orders given out.

(U) (C) Operations. Village security units have a defensive role, while offensive operations by Army units have been limited. The BPP discharges its border security mission unilaterally, with a minimum of liaison with CPMs, and is far too thin on the ground to be effective. The overall picture is that far too little is being done with the forces available.

(U) (C) Civil Regulations. Thus far, only curfews, household registration, and identification systems have been used. Curfews have been ineffective, owing to nonenforcement. Household registration is basically a method for maintaining vital statistics and is not a response to counterinsurgency needs. The identification card act of 1962 generally is being adhered to, but there are many exceptions and it is inadequate for security checks.

(U) (C) Intelligence. Intelligence gathering on insurgent activities is laid down as a function of all forces in the area. Only the Special Branch of the Provincial Police has funds for an intelligence network, although the small contingency funds administered by the nai amphoes* could be called on. What is lacking is a centrally-organized agency for the collection of tactical intelligence on insurgents, including border infiltration.

(U) (C) RTG Emphasis on Border Control. Until the end of 1967 there was little evidence of particular concern in the RTG over border control, but in December 1967 the Second Army ordered a range of border control measures, including a reorganization that placed certain BPP platoons under Special Operations Center (RTA) command, and the

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* (C) Appointed heads of amphoes, a sub-province administrative area equivalent to a county.

(U)

implementation by the CPMs of many population and resources control measures. These orders were a little too ambitious for the local CPMs to implement. In March 1968 the activities of the Pathet Lao near the Thai border increased the sense of urgency in the RTG about the border control problem.

(U) Village Security in the Border Area.[20] Owing to better communications near the river, villages there have better contact with police and border agencies such as Customs and Immigration, and enjoy greater prosperity than many inland villages. However, only a few riverine villages have a security force of police, military, or paramilitary stationed in them. In the event of outbreaks of local banditry, night watches have, traditionally, been organized by the village headman, using men from the village. Customarily, their watches consist of six to ten men, who patrol the village during the night. This activity has been encouraged and further organized by local authorities; in some areas all riverine villages have these night watches.

(U)

c. Potential Assistance from the Local Populace.[20,89] The ethnic composition of the Mekong border population in Nakhon Phanom and adjacent provinces is basically homogeneous. The majority are Thai/Lao, with communities of other groups originating from Laos and countries adjacent to it. All groups are rapidly acculturating to the regional cultural norm and, because of improving communications, are also considerably influenced by central Thai customs.

(U) Except in villages with predominantly Vietnamese population, riverine villagers generally exhibit a pro-government attitude, and it should not be difficult to enlist their support in a program of river surveillance and border control, provided it is reasonable from the point

(U)

of view of minimizing interference with villager river activities. Various civil organizations, associations, and other groups were investigated for their potential as information-gathering elements in a border control system, particularly community development workers, malaria eradication teams, farmers and rice farmers' associations, commercial credit banks, mobile development units, and the Developing Democracy programs.

(U) Elements of the Vietnamese refugee population in Nakhon Phanom are suspected by the RTG of playing an important supportive role in insurgent activities.[74] There are 35,000 to 40,000 Vietnamese in the Northeast, largely North Vietnamese; most of their communities are located close to the river, near the larger towns. It is estimated that nine out of ten of those Vietnamese refugees hold allegiance to the North Vietnam government, and they constitute a potential major security threat in the border area.

d. (U) The Socioeconomic Situation in Nakhon Phanom.[28] The movement patterns of commodities and people were observed in the border area.

(U) There is a rice deficit near the border necessitating the importation of rice from areas inland. In the event of large-scale insurgency in the area, insurgents would have difficulty procuring rice locally, and strong control of rice movements through the area would therefore be a powerful tool in combating insurgency. The smuggling of rice out of Thailand may be supporting insurgency in Laos and thereby adding to the communist threat to Thailand. This further accentuates the need to control rice movements through the border.

(U) Thai and Lao cross the river frequently. The major purposes of cross-river travel are (1) social visitation between Thai and Lao riverine villagers, (2) intervillage barter, and (3) exploitation by

(U)

Thai villagers of natural resources and land in Laos. It is estimated that about 10 percent of routine cross-border traffic is for social purposes. Along with this traffic, small-scale but frequent cross-border smuggling (particularly of rice) is practiced in towns and villages throughout the entire Thai/Lao Mekong border. Present border control measures to restrict this illegal traffic are ineffective. Although immigration records show about 1,000 persons per day passing through official crossing points, there is evidence that actual crossings may be six to ten times that number. The major movement of commodities is out of Thailand; in 1967, for example, the balance of trade favored Thailand by about U.S. $8,000,000 for the entire Mekong border.

(U) Smuggling is, in some respects, a way of life in the Northeast and it contributes considerably to the economy of the area. It ranges from the running of guns and ammunition to relatively harmless illegal imports of luxury items in small quantities. From the CI point of view, a border control system must be designed to focus on those categories of smuggling that are or may be concerned directly with insurgent support, such as gun-running and the illegal export of rice; it would be counter-productive to close the border altogether.

(U) Most people and goods move only short distances within the border area. Villagers living within five kilometers of the Mekong are usually river-oriented, whereas the activities of villagers more than five kilometers from the river ordinarily are related to the interior. Restriction on long-distance movement, therefore, probably would not impose a great hardship on many persons, nor would curfew regulations seriously hamper the economic activity of the majority of villages inland from the border. Population control along the border probably should be different from what would be appropriate more than five kilometers inland.

e. (U) The Physical Environment. The type of terrain and ground cover, extent and type of cultivation, density of population and degree of development--particularly road building--have obvious implications for a land border control system. On the basis of such parameters, a three level typology was tentatively identified based on village and population density, road density, intensity of rice farming, and forest area density, each of which appeared to be qualitatively related to the border control problem but for which quantitative relationships were desired, individually or collectively in a typological relationship.

(U) It soon became apparent, however, that the available data--maps and documents--did not show the true nature of the road conditions or passability in both wet and dry season and, in any case, were inaccurate. There are many more roads--all-weather and dry roads--in border areas than are shown on maps. Because roads were considered a key factor, a detailed road survey eventually was undertaken in several amphoes of Nakhon Phanom, using the services of the BMI data collection team. These data were in the last stage of analysis when this border control program was redirected and activities were suspended. The analysis has since been completed and will appear as a first report under the new border control program.

2. Constraints (U)

(U) A number of constraints had to be taken into account to ensure that the final recommended plan would address practical and realizable objectives. Although subject to change, the following principal system constraints had to be considered:

- Compatible with overall RTG security objectives
- Based on existing forces and their command/control structure
- Adaptable to Thai operating procedures

(U

- Minimal adverse affect on local social, economic, and cultural patterns
- A law enforcement, not a military function
- Operable and maintainable by Thai security forces
- Procurable through AID, MAP, or RTG purchase

3. General System Concept (U)

(U) From the results of the operational environment studies, a set of operational requirements were derived which, when taken with the constraints described above, indicated the outlines of the system. From these preliminary analyses evolved a generalized concept of a river/land border control system, somewhat as follows. Border control should not necessarily be set up uniformly along the whole Mekong border (see Fig. 32). However, it initially and primarily should contain a broad-coverage detection or intelligence network to detect infiltration nd insurgent support, distinguishing it from the innocent traffic that regularly crosses the river border. In those areas where the insurgent support traffic is found to build up despite the efforts of existing local border security forces to inhibit such traffic, available local paramilitary security resources should be directed to reinforce the local border security force. If the buildup continues and the marshalled local forces are still inadequate to deal with it, then additional forces and equipment capable of countering the infiltration threat should be brought in.

4. General System Description (U)

(U) Elements and alternatives were defined for performing the several functions of the system: alert, detect, track, intercept, command/control, and communications. The alternatives were then given an initial screening on a matrix in which the suitability of each was

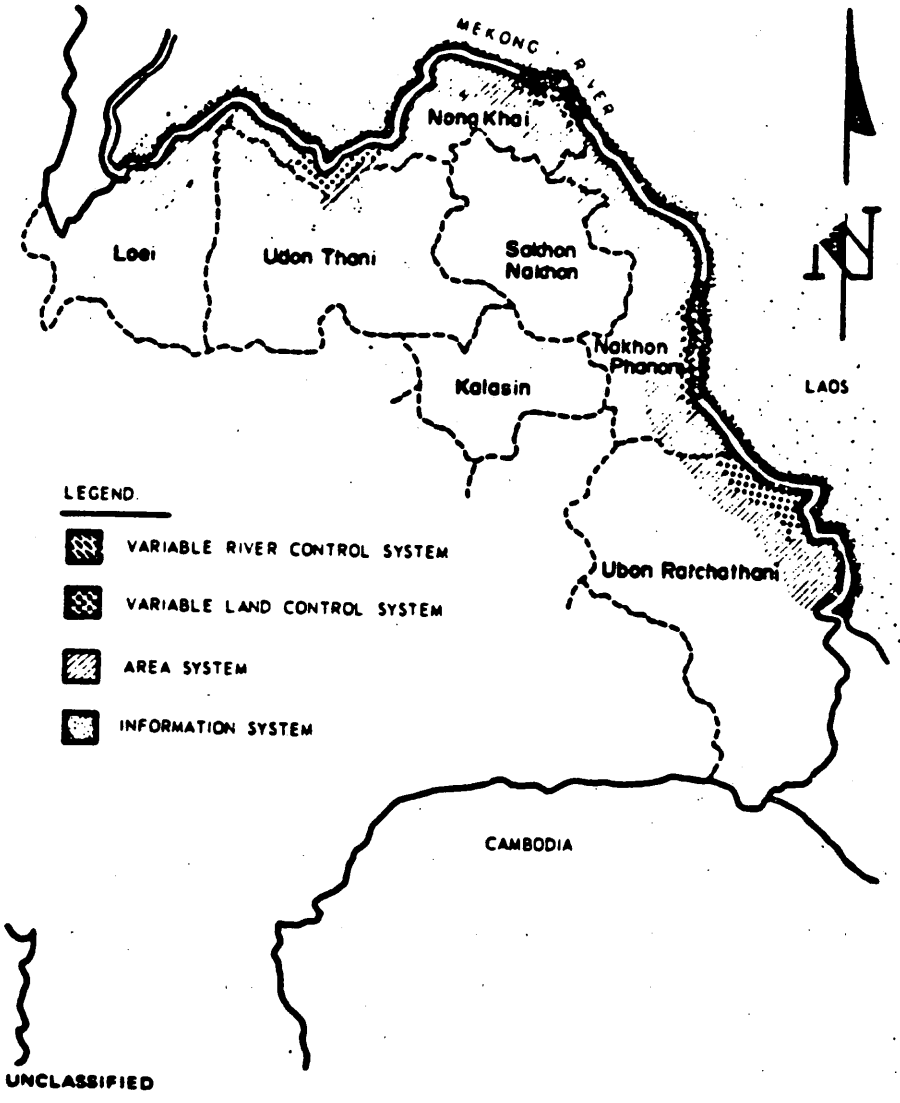

FIG. 32 BORDER CONTROL SYSTEM CONCEPT (U)

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judged against the constraints and against the operational environment parameters. Performance data were then required on the basis of which choices could be made, considering both performance and cost. Performance data on functional element alternatives, however, are most meaningfully evaluated in a system context, in which the functioning elements can be visualized in a coherent, interacting form as in real life. Accordingly, an operational system description was developed, not as a proposed plan but as a working hypothesis.

(U) The general system was visualized as shown in Fig. 33. It is readily apparent from the figure that, with two exceptions, all system elements are based on or make use of already-existing organizations and security forces. As was indicated above, the control centers already exist although they required added capabilities and facilities, and the security forces were already available if not necessarily adequate. The principal new requirements centered on the riverbank watch element and the village surveillance network. These, however, could probably be low-cost, villager-staffed elements and did not need to be constantly-functioning elements.

(U) In this regard, it should be noted that in the tactical use of this system or any system like it--apart from these elements that are clearly meant to be permanently functioning elements--system implementation can be achieved piecemeal on an as-required basis. If, for example, the situation were quiet, the local control center could suspend riverbank watches. When alerted, however, by agent information or other alerting elements, it could activate river watches over specific sections of the river. The alerted bank observers (and/or river-based MRS units) could then maintain full-time surveillance of the river until directed otherwise. If a suspicious landing were observed, this information would be relayed to the control center, which then would alert the village

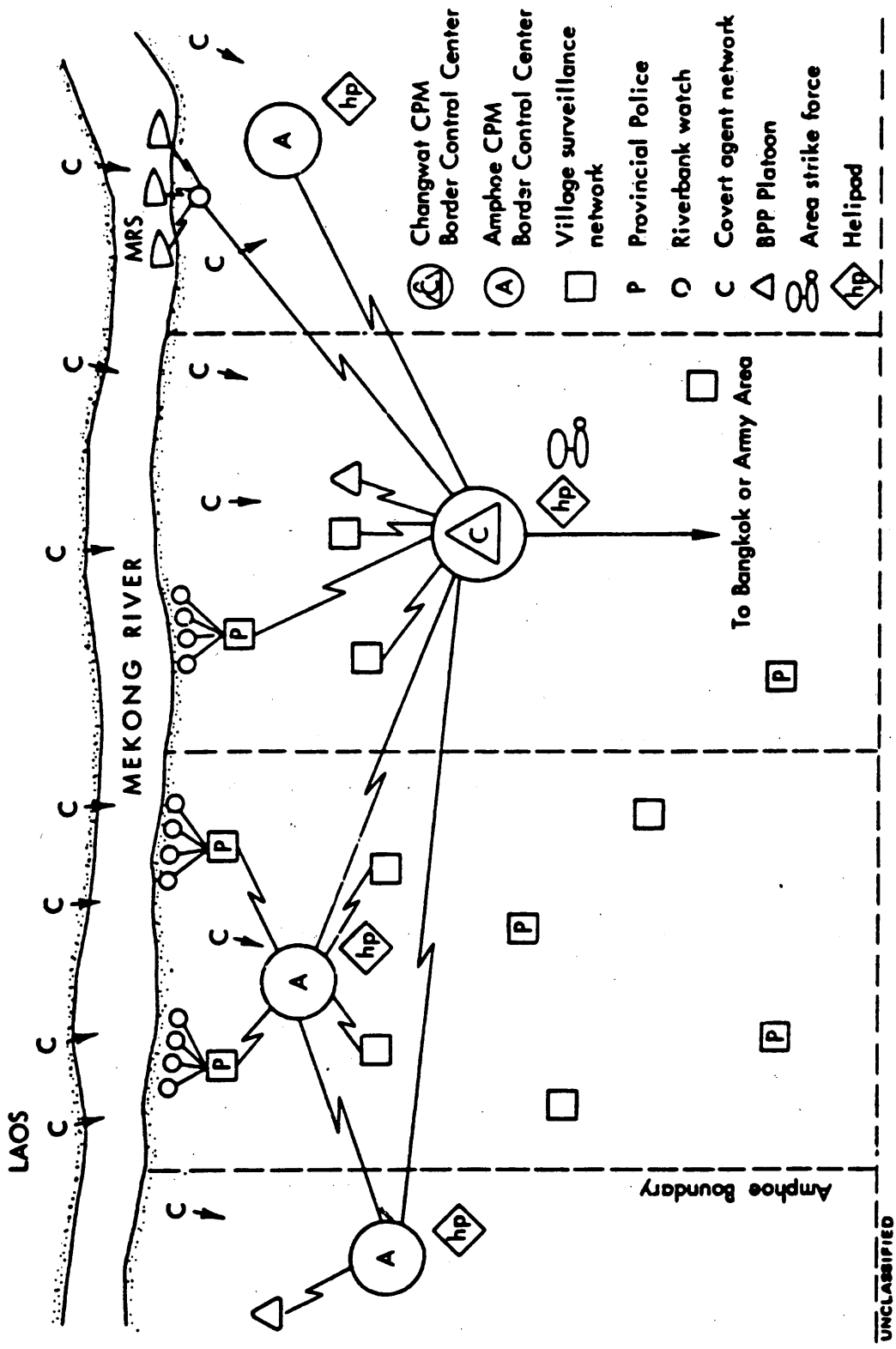

FIG. 33 BORDER AREA CONTROL SYSTEM--GENERAL SYSTEM DESCRIPTION (U)

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surveillance network, air observers (if available), police checkpoints, and other elements of the system. As soon as the target position had been established, strike forces would be dispatched to intercept or ambush the target.

(U) The strategy would be one of localizing, tracking, and intercepting suspicious parties before they could reach support havens in the area or could pass through the border area, and would employ only as much of the system as necessary for only as long as necessary. It is emphasized, however, that this was a hypothetical system, described to provide a system framework within which the separate elements could be investigated and evaluated. Within each of the functional elements, a number of options and problem areas were raised that required assessment and resolution before they could be combined into a border area control test system for operational system test. At this point, it was possible to outline a tentative test plan.

5. Border Area Control System: Test Plan Outline (U)

a. (U) Concept of BACS Testing. A series of separate tests were to be conducted addressed to the problems and options in the several elements of the system. During the tests, efforts would be made to determine and implement ways of improving the techniques to give lower costs and increased performance. The term "test" is used here to denote a field experiment in a broad sense. The tests were to have several objectives: collecting quantitative performance data wherever possible; defining problems associated with establishing, training, and operating the functional elements; and arriving at judgments on the suitability and acceptability of a particular candidate element from actual observations.

(U) Achievement of these objectives would in some cases require controlled testing in which parameters of interest are systematically varied while others are held constant and the resulting performance is measured. In other instances, the best that could be hoped for was subjective evaluation applied against clearly-defined criteria, under operational conditions that would permit neither control nor measurement. In all cases, qualitative observations were to be recorded as well as quantitative data collected, where available.

b. (U) Test Descriptions and Field Data Required. No unilateral attempt was made by SRI to develop detailed BACS test plans. Since the nature of the tests as we conceived them called for considerable involvement of operational Thai security forces and the local border populace, it was believed essential that approval first be obtained from the RTG and determination made concerning the extent to which government security forces and local civil support could be expected. At that time, test plans were to be developed along practical guidelines, worked out with both the MRDC and the agencies having responsibilities for border control. In Table VII is presented a function comparison of the present structures and the conceptual system, together with the field test data considered necessary to assess the feasibility and performance of the conceptual system. The rationale for this conceptual system and the test program as well as personnel and support requirements were developed in some detail.[61]

6. Redirection of Border Control Research (U)

(U) (C) Continuation of the BACS research program described above, although approved by the RTG Supreme Command and previously approved by the U.S. Embassy, was in September 1968, disapproved by the U.S. Ambassador. SRI had, however, previously effected a liaison with the Communist

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Table VII

(C) MEKONG BORDER AREA CONTROL (U)

Function	Present Structure	Conceptual System Element	Test Data Required to Assess Conceptual Element
1. Alerting	Lacks organized and supervised efforts. Reporting follows administrative chain vertically. Too few observers. Limited coverage. Slow response.	Network of villagers trained and organized to collect information. Established lines of routing and transmission to local control center. Rewards.	Selection criteria and training required. Reaction ability of villagers after a period of training in simple doctrine and procedures, to be tested by introducing simulated information of various types.
2. Detection	Border Patrol, Marine, Provincial police, etc. at sparse locations. No mechanism to establish linear or area surveillance. Ad hoc cooperation only.	Bank watch and village lines organized and trained. In reserve until alerted. Quick transmission of observations for evaluation and response at local-level control center.	Controlled field testing of vision aids to produce probability of detection by villagers, Border Patrol Police, etc. Tests of remotely-monitored sensor devices.
3. Tracking	Practically no capability.	Utilize alerting and detection networks to report time and place of transiting suspects. Local control centers collate process reports.	Tests of sensor devices in typical environments and situations. Detection and tracking tests to be combined.
4. Interception	Foot and occasional vehicular patrols. (Border Patrol and Provincial police, Volunteer Defense Corps, etc.). Cooperation on an ad hoc basis.	Special response teams of composite structure to act in defined areas of responsibility.	Selected tests to check validity of operations analysis and map play.
5. Command and Control	Skeletal amphoe CPMs. Effectiveness limited; lacking sufficient staff and equipment. Overlap of command responsibility on an area basis.	Augmented amphoe CPM linked to alerting, detection, and intercept elements. Reporting to changwat CPM, reinforced on special occasion by RTA if target area co-located in amphoe.	Command post exercises CPX to test processing, decisionmaking, and issue of directives. Primarily tests of amphoe CPM; limited tests of changwat CPM.
6. Communications	Multiplicity of noncompatible equipment. Insufficient repair and maintenance facilities. Limited lateral reporting lines.	Functionally-designed communications planned to link elements to local control center. Relays and communications nodes as necessary, depending on terrain and force dispersion.	Test of communications links in operation evaluation type drills of each element.

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Suppression Operations Command and obtained their views with regard to border control planning, a difficult achievement in view of the severe restrictions placed on contact between contractor personnel and agencies of the RTG, even on RTG-approved programs. Through such liaison, it was determined that CSOC counted border control among its CI objectives and was in the process of developing plans for a pilot border control system to be operationally implemented. From an SRI and RDC-T point of view, it seemed eminently reasonable to exploit the CSOC plan as the basis for the BCS study, and the study was proceeding along such lines when the Embassy directive terminated the planned BCS program. CSOC having at the same time requested from the U.S. Embassy assistance in the evaluation of the pilot plan, Operations Plan 9--which at that time was still an operational concept rather than an operations plan--the Embassy in turn requested such support from RDC-T which, in its turn, assigned SRI to the task.

(U) The SRI response was to conduct a case study of border security measures applicable to Thailand, using the CSOC plan as the vehicle of study, in order to determine the most feasible way of strengthening the RTG security forces along the border. At the same time, and to the extent possible, the analytical models used in the evaluation would be generalized for applicability to any border area of the type represented in the study.

(U) Three discrete tasks were identified:

(U) Task 1. Field Evaluation of the CSOC Border Security Plan. The objectives were: (1) to assist MRDC in the evaluation of pilot tests of CSOC border security plan, (2) to make ad hoc recommendations for improving test operations, and (3) to develop data for further analysis

(U)
and evaluation of the adaptability of the CSOC plan in border areas other than the test area.

(U) Task 2. Operational Environment--Other Borders. The objective was to develop a comparative data base by border types on border areas of Thailand, covering the major parameters influencing border security operations.

(U) Task 3. Analysis of CSOC Plan for Applicability to Other Border Areas. The objectives were: (1) to determine the most feasible adaptations of the CSOC border security plan for different types, with cost and effectiveness implications; (2) to develop recommendations for the RTG concerning border security planning factors; (3) to prepare field manuals for general operational implementation guidance, and (4) to the extent possible, to derive relationships between insurgency/counterinsurgency interactions applicable to border security in other areas and countries.

(U) This program was approved by the U.S. Embassy and ultimately by the RTG, and funded under a new ten-month contract by ARPA. Much of work accomplished under the previous border control program will benefit and in considerable part be directly applicable to the new program. That it is now a more realistic program, conducted in the context of analytic support to an essentially Thai program, represents a considerable gain for all parties involved.

VII OTHER RESEARCH (U)

A. Magneto-telluric Research (U)

(U) In the pursuit of its objective of developing a Thai military research and development capability, the RDC-T has recognized the need for assisting in the development of related basic research and a more broadly based research capability. The magneto-telluric program is a step in that direction--a primarily Thai effort, with RDC-T providing funding and administrative support and SRI providing technical guidance. This research program was initiated in 1967 as a means of establishing a closer working relationship between MRDC and the Thai civilian scientific community, represented by Chulalongkorn University and the Applied Scientific Research Corporation of Thailand (ASRCT). The actual research is done by graduate students from the University; Dr. Ittipon Padunchewit, Department of Electrical Engineering, serves as Project Leader, and ASRCT provides technician and administrative support.

(U) In essence, the method of approach calls for the creation of a multi-disciplinary graduate research program at Chulalongkorn University. The students, working toward M.Sc. or M.A. degrees in physics, mathematics or electrical engineering, have selected for their thesis topics some aspect of the work related to measurement and study of geomagnetic-geoelectric phenomena. The principal equipment is magnetometers available from RDC-T plus air-core coil magnetometers and earth-current apparatuses that have been constructed at the Laboratory Support Division, MRDC; these will be sited at the ASRCT TREND site. The students will process selected data using computer programs they have written for their specific research undertaking, under the supervision of a mathematician-programmer provided

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by ASRCT. The RTG National Statistical Office has granted the students computer time on its IBM 360/40 computer.

(U) It was planned that the measurement facility would be functioning by 1 April 1969* but data analysis activities have been going for a longer time. Although actual data have not been available, the computer analysis main and sub-routines have been in preparation since June 1968. In addition to continuing their graduate academic training, the students have been engaged in formal and informal seminars and on-the-job training related directly to the program. The SRI technical advisor to the program, a PhD geophysicist available on a half-time basis, has been conducting such instruction, as well as thesis counseling, assisting in the design and testing of magnetic and electric field measuring equipment, and assisting in planning data collection and analysis.

(U) In addition to the research training aspects of the program, ultimately a widely useful data base will be developed on natural low-frequency electromagnetic phenomena in Thailand. ARPA's role will have been principally that of a catalyst for a program that should prove to be a national resource but the program will also have direct and indirect benefits for the MRDC. It is anticipated that the program will be continued by RTG agencies once the ARPA support has terminated.

B. Border Patrol Police Civic Action (U)

(U) The objective of another investigation was to study the BPP Remote Village School (RVS) and Remote Area Security Development (RASD) programs--to describe their organization, goals, and operations, and to determine to what extent these programs have created goodwill among the

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* (U) This facility subsequently went into operation.

(U)

villagers, the extent to which this goodwill is transferred from the civic action agency to the RTG, and the extent to which civic action activities lead to more and better intelligence about insurgents, particularly their attempts to gain villager loyalties and logistic support. The analysis was based principally on a detailed questionnaire distributed to the BPP RVS teachers for self-administration, plus extensive observation of civic action activities, interviews with BPP and village personnel, and memoranda for record and other police documents.

(U) As a result of a fire in May 1967, which gutted SRI's offices, the drafts of two reports, "Civic Action in Thailand: An Analysis of the Thai Border Patrol Police/U.S. Navy Seabee Civic Action Team Program" and "Civic Action in Thailand: An Analysis of the Remote Security Development Program of the Thai Border Patrol Police," plus all supporting data and documentation described above, were completely destroyed. The principal findings and conclusion were, however, reported in the MRDC Semiannual Reports for the periods 15 November 1966 to 15 May 1967 and 15 May 1967 to 15 November 1967. In general, substantial evidence was uncovered to support the validity of the BPP program as an effective and significant form of civic action in Thailand and the recommendation was made that the Remote Village School program be expanded. While not conclusive, the data did not indicate that the goodwill being engendered by the program is being transferred to the RTG.

C. Military Civic Action in Thailand (U)

(U) In April 1968, MRDC, in response to an RTA request, granted $5,000 to the RTA, Third Army Forward, headquartered in Ban Chieng Kang, Province Nan, to be used in its civic action program. At the same time, MRDC requested, through its Combat Systems Division, that Mr. F. M. Osanka,

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an SRI staff member with extensive experience in civic action in Thailand, be assigned to monitor and record the expenditure of the funds and concomitantly to undertake a study of military civic action through participant observation and documentation of the activities of the Third Army Forward Military Civic Action Team (MCAT). The primary objective was a detailed descriptive analysis of the organizational and operational characteristics of the MCAT. During the ensuing period, documentary research was made for historical and current background and materials concerning RTA military civic action, and an extensive bibliography was compiled. Field data collection was conducted during the period 5 July to 30 August 1968. A report of the research was prepared[108] and submitted in early March 1969 to the Combat Systems Division for publication by MRDC.

D. SRI-Songkhla Office (U)

(U) For a period of approximately three years, terminating in late 1968, SRI maintained an office in Songkhla, southern Thailand, comprising a small Thai clerical staff, offices, darkroom, limited living facilities, Land Rover for local transportation, and direct radio communication with MRDC, for the use not only of SRI but of all MRDC staff making field trips to southern Thailand.

(U) For a period of approximately two and a half years, SRI also had a resident analyst in Songkhla, to establish and maintain close liaison with RTG and Malaysian security forces and other official agencies in the South, to assist SRI researchers in the conduct of research in the South, to provide administrative assistance to SRI researchers and other MRDC personnel visiting the area, to arrange for and provide continuous collection of data relating to the situation in southern

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Thailand, to provide darkroom support to the MRDC Aerial Reconnaissance Laboratory as required, and to conduct independent research as required.

E. Handbook of CI Organizations and Programs--South Thailand[39] (U)

(U) The SRI resident analyst in Songkhla was asked to compile a description of the CI organizations, programs, and activities in the border provinces of southern Thailand--the five provinces on or immediately to the north of the Thai-Malaysian border. It was intended to serve as a supplement to the seven-volume Counterinsurgency Organizations and Systems in Northeast Thailand, a comprehensive treatment of the same subject being compiled by the Research Analysis Corporation Field Office-Thailand (RACFO-T) for ARPA. The approach taken has been to rely on the RACFO-T volumes to present the basic or generalized mission, organization, and operations information, confining the supplementary report to organization and programs not found in the Northeast or, with organizations and programs common to both regions, presenting information that relates specifically to the South. The threat situation in the South is described. As in the case of the Northeast series of reports, this is intended to be a handbook of value to those involved in Thailand's CI effort as practitioners, advisers, or researchers.

F. MACTHAI Scenario (U)

(U) At the request of COMUSMACTHA*, ARPA RDFU-T undertook to construct a "worst-case, advanced Phase I*" scenario for Thailand, to assist in contingency planning. SRI staff members worked with MACTHAI, RDFU-T and other contractor personnel in this joint effort, contributing to the

* (U) U.S. JCS definition.

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scenario, to a brief history of the communist movement in Thailand, and to the chronology and analysis of insurgent incidents in the Northeast.* Early in the scenario work, it became apparent that sheer tabulation of insurgent incidents was of limited use and that a mode of weighting was needed so that the seriousness of incidents could be compared. Accordingly, one of the SRI analysts devised an incident weighting scale and methodology.

G. Confidence Scaling of Intelligence Reports[7] (U)

(U) Growing out of the preparation of the MACTHAI scenario was the matter of the confidence that could be placed in intelligence reports ratings. It is common practice in the intelligence communities of the United States and other countries to code each intelligence report with an estimate of (a) the reliability of the report and (b) the credibility or likelihood of the event. Six-point scales are used in both ratings with identifying qualitative phrases. Problems derive from the fact that the qualitative phrases are perceived differently by different users, since exact definitions are lacking. A further complication is that the equivalence of various letter-number designations is unknown; for example, is a B3 rating equal to a C1 or worth several times the latter. Accordingly, the problem was to determine how much confidence is placed in reports bearing various letter-number designations and whether an ordering of the report levels exists in the intelligence community, and to assess whether and what differences exist in this regard among different intelligence groups. Using magnitude estimation scaling, it was shown that the confidence attached to intelligence reports from various agents can

* (U) The scenario was published by ARPA RDFU-T, classified Secret.

(U)

be determined quantitatively and that remarkable agreement exists among different groups with regard to the confidence that can be attached to an intelligence report. Using values of insurgent incident seriousness and confidence in the available reports, a practical procedure was suggested for effective display of this information and its implications for decision-making.

H. Village Locater (U)

(U) Also growing out of the MACTHAI scenario effort was the beginning of the Village Information System-Thailand (VIST). Because of the Thai-to-Roman transliteration problem, villages in Thailand may have a number of names or different name spellings. The scenario required a unified name list in the Roman alphabet, a coding system, and a list of coordinates for all villages in Thailand, about 18,000. When these compilations were begun by SRI, it was found that two coding systems were being used, that villages were identified by various names, and that lists of coordinates were incomplete. A working list of names in the Roman alphabet was made which met the needs of the MACTHAI scenario, and the village list project was turned over to the ARPA VIST project for incorporation and completion.

I. Support to the Special Assistant for Counterinsurgency, U.S. Embassy (U)

(U) When the Special Assistant for Counterinsurgency (SA/CI) office was established by the U.S. Embassy, staff support was insufficient for the large job it faced. At the request of the Embassy, through RDFU-T, Dr. D. C. MacMichael, an SRI staff member, was assigned to the SA/CI office in December 1966. He continued there until April 1968, assisting in the

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review and evaluation of counterinsurgency research programs in Thailand. His work was for, and all reports were made to, the SA/CI.

J. Supreme Command Operations Center (U)

(U) As a result of a request from MACTHAI to RDFU-T, Mr. W. R. Roberts, an SRI staff member, held discussions with officers of MACTHAI and the RTA concerning plans for an RTG Supreme Command operations center and delivered to MACTHAI a preliminary design for the center.

K. Radio Frequency Control in Thailand (U)

(U) In the summer and fall of 1966, Mr. D. Price, an SRI staff member, was assigned by the Director, RDFU-T to work with USOM and FCC representatives from the United States in their investigations of the problem of frequency control in Thailand. Mr. Price was then appointed by the Director, RDFU-T to the Communications Committee under the office of the SA/CI, U.S. Embassy. Together with other SRI staff members and the Program Manager for Communications, RDFU-T, several memoranda were submitted to the SA/CI Committee concerning problems relating to short and long-haul communications in Thailand.

L. Other MRDC Support Activities (U)

(U) Research and analysis and report writing support was provided to the Mobility Division on the Motorbike Test conducted in southern Thailand. For the Research and Analysis Division, a working paper was written describing the organization of the CT armed groups in the Northeast, to be used in the ARPA monograph on the insurgency situation in

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Northeast Thailand. As a result of a request from the RTG Naval Ordnance Department to MRDC, a test was made of the feasibility of magnetically detecting mines dropped in the Chao Phya River during World War II and presumably lying buried in the river bottom: using a mine of the type sought and a portable rubidium-vapor magnetometer, it was shown that a sensitive magnetometer of the rubidium-, cesium-vapor or proton precession type could probably be effectively used.[110] In response to MRDC requests, SRI staff members have frequently delivered lectures to the Thai Armed Forces staff colleges on guerrilla warfare, operations research, and related subjects.

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107. Handbook for Field-Work, Operations of the Special Operations Center (SOC), Thailand. Translation, 45 pages. (Confidential)†

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110. Magnetic Detection of Mines at the Mouth of the Chao Phya River, N. E. Goldstein. December 1968, 9 pages. (Unclassified)

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111. South Thailand Border Operations, Economic Development, Attitudes of Thai-Muslim Population, and Effectiveness of Counterinsurgency, D. C. MacMichael. June 1968, 67 pages. (Confidential NOFORN)

UNPUBLISHED TRIP REPORTS

Records are available on 104 trip reports prepared during the life of the contract. The list is incomplete, however, as a result of the Sirinee Building fire in May 1967, which gutted the SRI office and destroyed most of the unclassified records and files. These mainly are reports of data collection and observation/orientation field trips, principally to the South and Northeast areas of Thailand but including points all over Thailand of interest from a security point of view. Additionally, a number of trips were made to Singapore, Hong Kong, Malaysia, Phillipines, and Korea on insurgent and security-related problems in those areas, particularly with regard to insurgent surveillance and border control problems.

UNRELATED PUBLISHED REPORTS

(See page 15)

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11 SUPPLEMENTARY NOTES

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13 ABSTRACT Stanford Research Institute's counterinsurgency research in Thailand during a five-year period (April 1964-February 1969) is summarized under the following categories:

Insurgency in Southern Thailand. The Communist Terrorist Organization (CTO) of the South (Malayan Communist Party) was investigated extensively as to its organization, strength and deployment. Analyses were made of the CTO camp system and logistic support system; the susceptibility of these systems to detection and interdiction; and the measures necessary to an effective counterinsurgency program. (U)

Border Control in Northeast Thailand. Operational requirements for a border control system for Northeast Thailand were specified on the basis of environmental and threat analyses. A river control subsystem, the Mekong River Surveillance (MRS) system, was organized as a test unit for controlled field experimentation. This field testing was extended with modeling and computer simulation to yield cost/effectiveness evaluations of alternative river control systems. (U)

CI Surveillance Systems. Various devices and systems for detecting insurgency activity were developed and investigated as to operational feasibility. These principally involved seismic and magnetic sensors, but some study was also made of infrared, acoustic, and other approaches. Operational feasibility was demonstrated for a locally fabricated wireless seismic ambush aid system, a remote area monitoring system, an unattended trail camera, and an improved technique for seismic signal discrimination. (U)

Counterinsurgency Communications. CI communications systems in Northeast Thailand were investigated in detail and requirements specified for small unit operations, combined operations, and long haul and support communications. (U)

Various other counterinsurgency studies were also addressed. (U)

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Marine radar						
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