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RADIO SET AN/PRC - 64

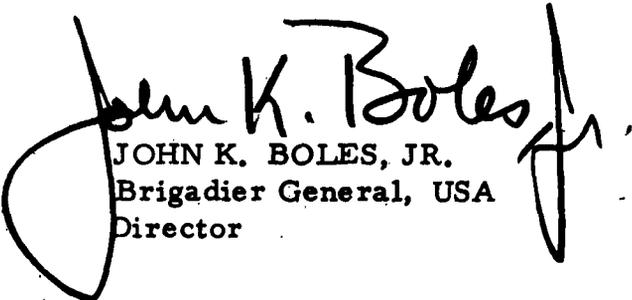
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JOINT RESEARCH AND TEST ACTIVITY
Office of the Director
APO San Francisco 96243

REPORT EVALUATION BY DIRECTOR, JRATA

The operational evaluation of the AN/PRC-64 Radio Set conducted by the Army Concept Team in Vietnam considered use of the equipment by special forces teams in the extremes of terrain environment normally encountered in Vietnam. The analysis of the data collected on the performance of the radio, indicates a communication reliability of 50 percent, which is at least as good as other equipment presently employed in performing the mission. While the AN/PRC-64 was not able to overcome many of the natural conditions which adversely effect radio communications in Vietnam, such factors as its lightweight, ease of installation and operation, and minimal maintenance requirements, provide significant advantages over existing equipment. Consideration of these factors, supports the recommendation that this equipment be procured as a replacement for the AN/GRC-109 radio in use by US Special Forces "A" Detachments in Vietnam. The conclusions and recommendations of the report are concurred in by this headquarters.

Approved:


JOHN K. BOLES, JR.
Brigadier General, USA
Director

15 May 1965

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**ARMY CONCEPT TEAM IN VIETNAM
APO San Francisco 96243**

FINAL REPORT

RADIO SET AN/PRC-64

JRATA Project No. 1A-105.0

15 May 1965

Approved:

Hugh E. Quigley

**HUGH E. QUIGLEY
Colonel, Armor
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AUTHORITY

Letter, AGAM-P (M) (17 Jul 64) ACSFOR, DA
31 July 64, subject: Army Troop Test Pro-
gram in Vietnam (U), as amended.

CINCPAC message DTG 160214Z Jan 64

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I. PREFACE

A. ABSTRACT

The purpose of this evaluation was to assess the suitability of the AN/PRC-64 radio set for use in the high atmospheric noise level existing in the Republic of Vietnam (RVN) and for use by US Special Forces patrols in the counterinsurgency environment of the RVN.

Two geographically different areas were chosen for the evaluation. Phase I was conducted in the Mekong Delta and phase II in the Central Highlands. The radios were used by US Special Forces "A" detachments during patrol operations and at forward operational base (FOB) stations in lieu of radio set AN/GRC-109. Data were collected from personal observations, discussions with Special Forces advisors and signal officers, and operators' logs.

The principal result of this evaluation was the determination that the AN/PRC-64 radio set provides reliable continuous wave (CW) communication at distances between 60 and 500 kilometers. It provides reliable voice communication only at distances between 0 and 20 kilometers and then only in the Mekong Delta. The whisper capability of the radio set is reliable and just as effective as a normal voice transmission. User reaction to the AN/PRC-64 was excellent and they recommend its adoption for counterinsurgency operations.

Although the AN/PRC-64 does not provide reliable voice communication at all distances and locations, it was concluded that its performance on CW and weight, size, and ease of operation make it suitable for use by US Special Forces teams in the RVN as a replacement for the AN/GRC-109.

B. OBJECTIVES AND METHODS

1. Objective 1 - Continuous Wave (CW) Reliability

Determine whether radio set AN/PRC-64 provides reliable CW communications at selected distances and locations.

Radio logs were maintained to meet this objective.

2. Objective 2 - Voice Reliability

Determine whether radio set AN/PRC-64 provides reliable voice communications at selected distances and locations.

The method used in meeting this objective was the same as for objective 1.

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3. Objective 3 - Whisper Capability

Determine whether radio set AN/PRC-64 provides reliable voice communications at selected distances and locations when using the whisper capability.

The methods employed in meeting this objective were analysis of radio logs and professional opinions.

4. Objective 4 - User Reaction

Assess user reaction to the radio.

The methods used to meet this objective were analysis of maintenance logs and professional opinions.

C. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

It is concluded that the AN/PRC-64 is suitable for use by US Special Forces teams in the RVN and it is recommended that it be procured and issued on the basis of 3 sets for each Special Forces "A" detachment and 15 sets for the Special Forces group signal company for contingency purposes and maintenance float.

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II. INTRODUCTION

A. PURPOSE

The purpose of this evaluation was to assess the suitability of the AN/PRC-64 radio set for use in the high atmospheric noise level existing in the RVN and for use by US Special Forces patrols in the counter-insurgency environment of the RVN.

B. BACKGROUND

In April 1963, the US Army Limited War Laboratory (USALWL) contracted for construction of 10 manpack radio sets to be used by long-range patrols engaged in counterinsurgency operations. Two radios were assembled by mid-July and development tests were started. As a result of field tests carried out in the Massanutten Mountains of Virginia, a number of changes and modifications to the radios were recommended. To complete the series of development tests, arrangements were made to further test the existing two sets with troops of the 25th Infantry Division at the Jungle and Guerrilla Warfare Training Center in Oahu, Hawaii. These tests began on 10 September 1963 and were completed on 23 September 1963. They indicated that the radio offered a potential for effective communication in a jungle environment.

In February 1964, the Commander, US Army Military Assistance Command, Vietnam (COMUSMACV), requested the Commander-in-Chief Pacific's (CINCPAC) approval to bring three AN/PRC-64 radio sets into the RVN for evaluation in a counterinsurgency environment. Commander-in-Chief Pacific recommended to the Department of the Army (DA) that the project be implemented by the Joint Research and Test Activity (JRATA). On 13 March 1964, DA, in a message to CINCPAC and the Army Concept Team in Vietnam (ACTIV), directed ACTIV to prepare an evaluation plan to meet the COMUSMACV stated objectives. An evaluation plan submitted through JRATA for CINCPAC approval on 12 May 1964 was subsequently approved by CINCPAC on 16 June 1964. Five AN/PRC-64 radio sets were shipped by the USALWL to ACTIV for the evaluation. The evaluation commenced on 3 October 1964.

The terrain and weather features vary greatly throughout the RVN. To insure that the broadest possible extremes of terrain and weather were used the evaluation was conducted in two phases. Phase I was conducted in the IV Corps Tactical Zone (CTZ), located in the flat inundated terrain of the Mekong Delta, while the II CTZ, located in the mountainous, jungle terrain of the Central Highlands, was used for phase II.

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C. DESCRIPTION OF MATERIEL

Radio set AN/PRC-64 is a battery-powered, crystal-controlled, high-frequency (HF) transceiver weighing approximately 10 pounds. It is amplitude-modulated (AM) and covers the 2.5 mc to 6.0 mc frequency range. It will operate on continuous wave (CW) or voice and has a rated power output of 5 watts on CW and 1.5 watts on voice. A special feature is provided to allow transmission of voice at a whisper. The set is encased in a waterproof metal box and carried in a fabric bag suitable for use with a combat harness. A microphone and a headset are contained in the lid of the waterproof case. A dipole antenna and a sealed spare battery are carried in the fabric bag. (See annex A for complete description.)

D. SCOPE

1. Definition of Project

Radio set AN/PRC-64 was evaluated to assess its potential in counterinsurgency operations with respect to its suitability for use in the high atmospheric noise level existing in the RVN and its suitability for use by US Special Forces in the RVN. The evaluation included operation of the radio during patrol operations in the CW mode, voice mode, and voice using the whisper capability. User reaction was measured in terms of ease of operation, transportability, maintainability and adaptability to a counterinsurgency environment.

2. Setting of Project

a. Environment

The setting of the evaluation was the Mekong Delta and the Central Highlands of the RVN. These areas provided extremes of weather ranging from wet to dry, and terrain which include tropical jungles, flat marshy delta, and rugged mountains. (For details see annex B.)

b. Military Elements

(1) Units

The Special Forces "A" detachments that provided data upon which this report is based were located at Can Tho, To Chau, and Tinh Bien (IV CTZ, Mekong Delta) and Buon Mi Ga, Phey Srunh, Buon Brieng, Soui Doi and Plei Mrong (II CTZ, Central Highlands), as shown in figure 1.

(2) Mission

The missions of the units included border surveillance, interdiction of lines of communication, and organization, control and defense of hamlets.

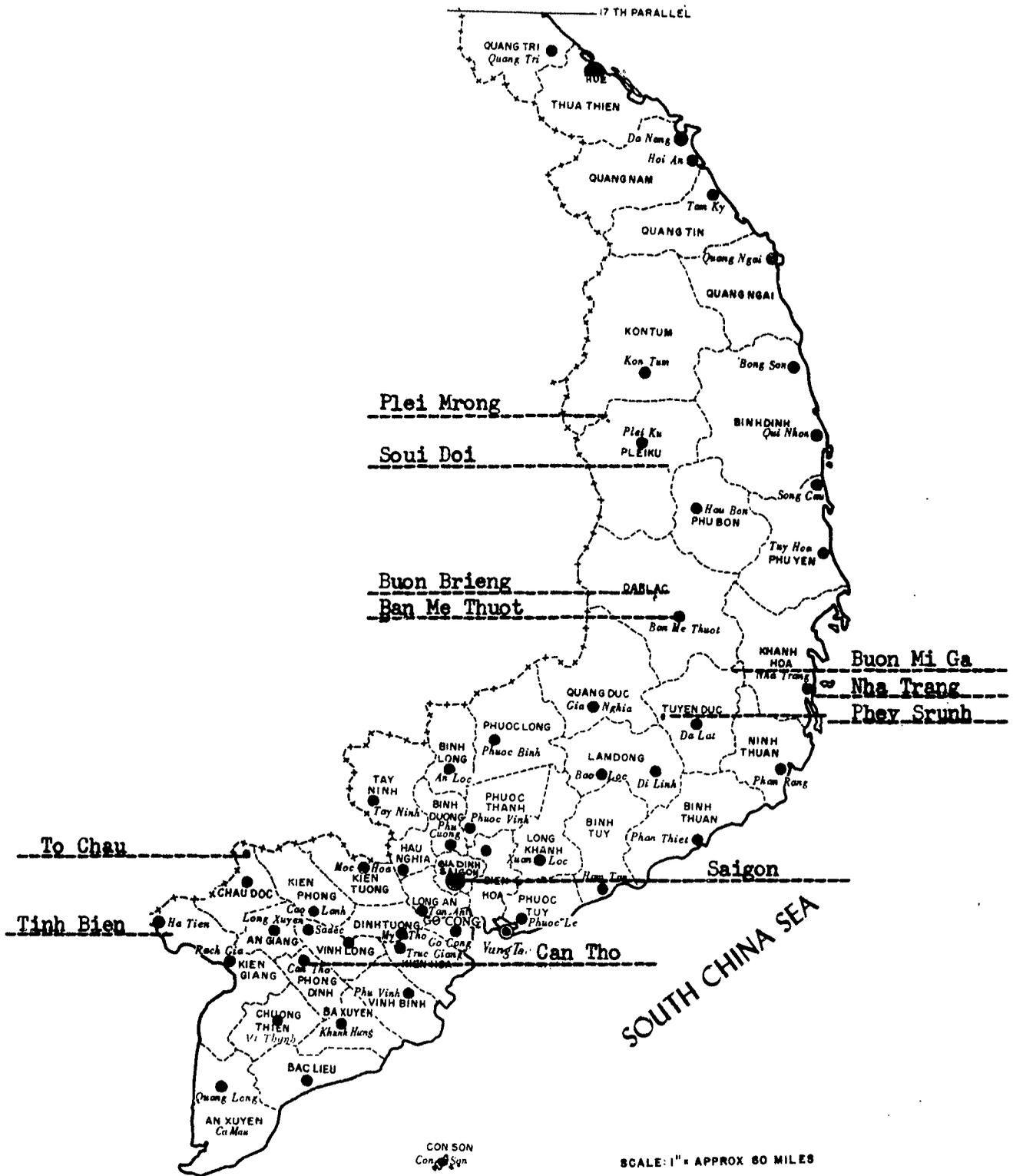


FIGURE 1. Geographical locations of evaluation teams and stations.

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(3) Equipment

Five AN/PRC-64 radio sets with a 6-month supply of spare parts and batteries were issued to the 5th Special Forces Group (Abn) for this evaluation.

(4) Tactics

Tactics employed during the evaluation included conventional offensive and defensive operations, reconnaissance and combat patrols, ambushes, and security missions. Conventional infantry tactics and techniques were habitually employed. These tactics varied with the terrain and tactical situation. The concept of communication of each operation was, however, generally the same.

E. EVALUATION DESIGN

1. Methodology

a. Data Collection Methods

Data collection was accomplished primarily by recording data on operational characteristics, maintenance, and terrain and weather. The ACTIV project officer made frequent visits to Special Forces detachments to discuss with detachment commanders, Special Forces signal officers and the project evaluators all aspects of the AN/PRC-64 from the user viewpoint. Enlisted evaluators were assigned with each radio set and they recorded significant events in appropriate logs.

b. Analysis

Records of a similar evaluation by the 25th Infantry Division on the island of Oahu, Hawaii, were reviewed and compared with the data obtained in the RVN.¹

The descriptive method of analysis was used by making qualitative analysis of professional experience and opinion, and quantitative analysis of numerical data.

2. Limitations and Variables

The command and control of personnel using the AN/PRC-64 rested entirely with the 5th Special Forces Group (Abn). The evaluation was based only on those operations and environmental conditions that existed during the evaluation period. Radio frequencies available for use in the RVN were not always clear channels and interference from other higher powered stations was frequently encountered. The small number of radio

¹US Army Limited War Laboratory Report on Development Test of Radio Set AN/PRC-64 in Hawaii, September 1963.

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sets available limited the size of the sample that could be taken within the time allocated for the evaluation.

3. Support Requirements

COMUSMACV directed that the evaluation of the AN/PRC-64 would be supported to the maximum extent commensurate with the local combat situation. The 5th Special Forces Group (Abn) provided 5 enlisted evaluators, and 1 enlisted radio repairman was placed on 135 days TDY in the RVN from CONUS. The USAIWL provided five AN/PRC-64 radio sets and 6 months' supply of spare parts and batteries. Funds to support TDY personnel and shipment of equipment were provided by the US Army Combat Developments Command. The enlisted radio repairman received a 15-day training period prior to arriving in the RVN.

Action has been initiated to transfer the five AN/PRC-64 radios used in the evaluation to the 5th Special Forces Group (Abn) in accordance with MACV directives.

4. Time Schedule

Five AN/PRC-64 radio sets were issued to the 5th Special Forces Group (Abn) on 3 October 1964. Prior to field deployment, operator training was conducted in Saigon. On 19 October 1964 the radio sets were taken to Can Tho for distribution to "A" detachments and on 23 October 1964 phase I data collection started in the IV CTZ. The enlisted maintenance technician arrived in the RVN on 24 October 1964. Phase I data collection was completed on 24 November 1964. On 19 December 1964 the radios were withdrawn from IV CTZ, moved to the II CTZ, and redistributed to "A" detachments in that area during the week of 20 to 27 December 1964. Phase II data collection started on 29 December 1964 and continued through 15 January 1965. The maintenance technician was moved to the Special Forces operational base, Nha Trang on 27 December 1964 and remained there until completion of phase II data collection.

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III. DISCUSSION

A. OBJECTIVE 1 - CONTINUOUS WAVE (CW) RELIABILITY

The evaluation plan for the AN/PRC-64 listed three objectives which are closely related: to determine if the radio set provided reliable communications at selected distances and locations when operated in 1) the CW mode, 2) the voice mode, and 3) the voice mode at a whisper. Because of this close relationship, data collection for all three modes of operation was accomplished concurrently. For example, initial contact was established on CW and data on the transmission recorded. The operators would then switch to the voice mode and attempt to establish communication. If the voice transmission was successful, the whisper capability of the radio was tested and the data recorded. For this reason, those factors that produced like effects in all three modes are discussed only under objective 1 to avoid the redundancy that would occur if they were repeated under each objective.

During both phases I and II the evaluation teams used the same communication procedures. Radio contact between a patrol using AN/PRC-64 and a base camp or forward operational base was attempted on a scheduled basis and the results recorded. In addition, contact with other evaluation teams, the Special Forces Operational Base in Nha Trang, and the Tactical Operations Center in Saigon was attempted in order to evaluate the long range capability.

The radio frequencies assigned for the evaluation were 2791, 3540, 4830, and 4900 kilocycles. These frequencies provided the best possible selection within the band capability of the AN/PRC-64, the availability of frequencies for assignment and the radio frequency propagation prediction charts for Southeast Asia. It should be noted that frequency 4830 kc, which was installed in channel 3, is outside the normal bandwidth (3900 to 4800 kc) of channel 3. (See annex A for description of channel bandwidths.) Use of 4830 kc was necessary because a frequency between 3900 and 4800 kc was not available for assignment and was accomplished by realignment of channel 3 to accommodate 4830 kc.

The dipole antenna issued with the AN/PRC-64 proved satisfactory. Antenna length was found to be critical, however, and jumpers had to be properly spaced for the operating frequency. (See annex A for a description of the antenna.) The height of the antenna above the ground had no measurable effect on signal strength or readability. (For an explanation of signal strength and readability see annex C.) Antenna orientation was not critical. Good results were achieved in both a broadside orientation and in a north-south orientation. The antennas used at the base stations were fixed doublet types, mounted approximately 30 feet high.

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The AN/PRC-64 radiates a ground wave of approximately 20 km and a sky wave skip distance (one-hop) of approximately 60 km. (See figure 2.) This leaves a void area or skip zone from 20 to 60 km in which reliable communication cannot be established. The ground wave component (0 to 20 km) was unreliable in the mountainous jungle terrain of the Central Highlands. A total of 30 transmissions were attempted and only 3 CW contacts were successfully completed. In the Mekong Delta, where the terrain is flat and marshy, the ground wave component was reliable at distances up to 20 km. On all 16 transmissions attempted in this area reliable communication was established on CW and voice. The evaluation showed no measurable difference in sky wave propagation between the two areas. Figure 3 shows the distribution of CW transmissions by time of day and range. The communication reliability of the sky wave averaged 52 percent (60 to 200 km and 200 to 500 km). Although the overall communication reliability of the ground wave was 38 percent, this reliability factor is inflated by the 16 successful contacts in the Mekong Delta mentioned above. In the mountainous jungle terrain of the Central Highlands the communication reliability of the ground wave component was only 9 percent (3 successful contacts out of 34 attempts).

The AN/PRC-64 provided reliable communication in approximately 50 percent of the attempted contacts. (See figure 4.) Although this reliability percent is not as high as desired, if all factors that degrade HF-AM radio communication in the RVN are taken into consideration, this percentage is meaningful. First, the high atmospheric noise level prevalent in Southeast Asia degrades all forms of radio communication. It has a particularly adverse effect on low-powered HF-AM radio communication. Most failures in performance at night are related to normal ionospheric changes which alter the propagation conditions. These changes usually cause significant increases in interference levels during the early evening and night hours. Also, the normal nighttime decrease in ionospheric ionization density results in the failure of the ionospheric layers to support HF frequencies during early morning hours. Figure 4 shows the distribution of CW transmissions by time of day and frequency. The primary day frequency was 4900 kc with 4830 kc as an alternate and the primary night frequency was 3540 kc with 2791 kc as an alternate. A comparison of the effectiveness of the primary day and night frequencies (67 percent effective on 4900 kc and 29 percent effective on 3540 kc) attests to the effect of ionospheric changes on sky wave communication. The degrading effects of ionospheric changes on HF-AM communication are further supported by a comparison of the communication reliability percentages. As indicated in figure 4 only 23 percent of the attempted transmissions were successfully completed from 2000 to 0800 hours; whereas, during the more favorable propagation period from 0800 to 2000 hours, 65 percent of the attempted transmissions were successfully completed. The second factor that had an adverse effect on communication reliability was interference from higher powered stations. Frequency control and assignment in the RVN and neighboring countries is not rigidly enforced. Frequency control and assignment among military users and government agencies in the RVN is

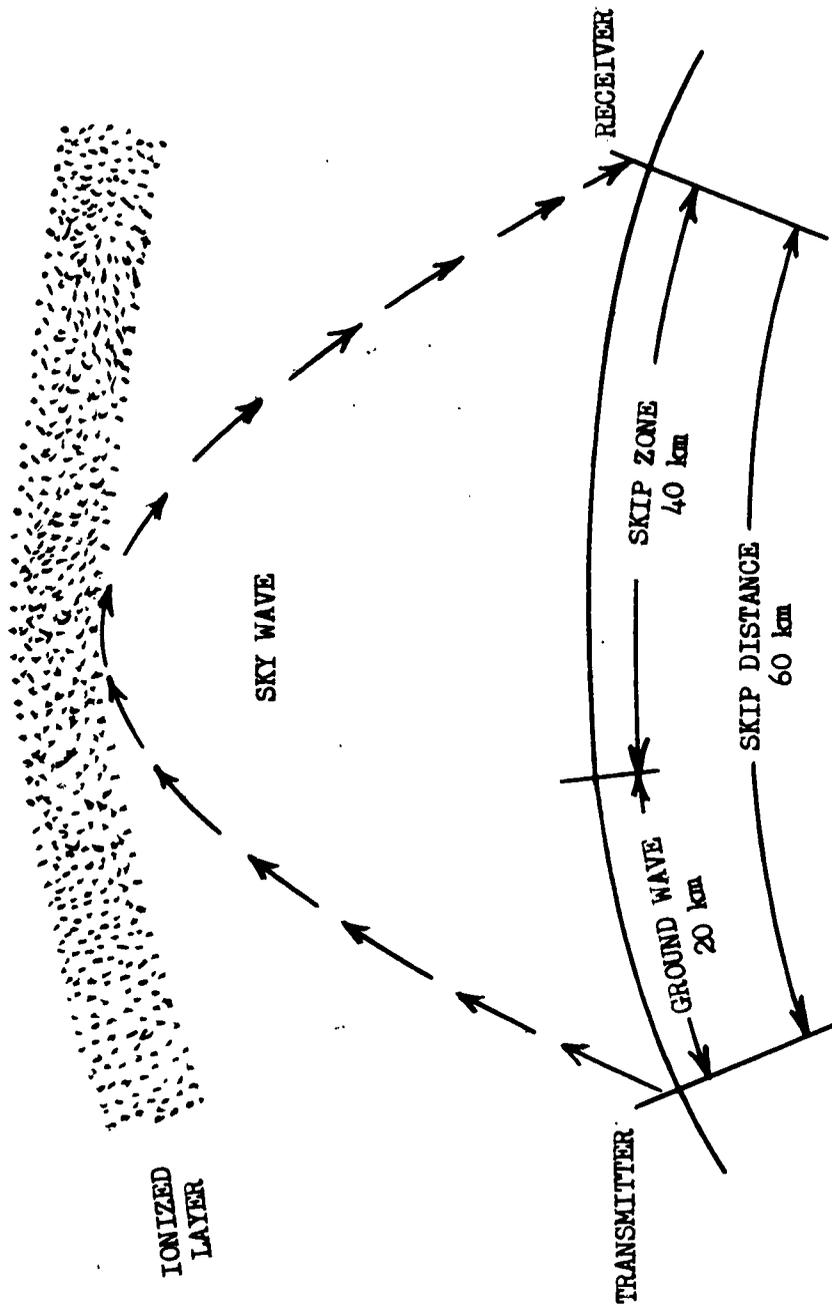


FIGURE 2. Ground wave and sky wave propagation of the AN/FRC-64.

R A N G E	TIME												Relia- bility		
	0800		1200		1600		2000		2400		0400		Totals		Percent
	A	C	A	C	A	C	A	C	A	C	A	C	A	C	
0 to 20 km (Gnd Wave)	11	5	9	6	9	5	8	2	6	1	7	0	50	19	38
20 to 60 km (Skip Zone)	3	0	3	1	2	0	2	0	2	0	2	0	14	1	7
60 to 200 km (Sky Wave)	63	43	56	43	52	34	45	19	35	11	43	10	294	160	54
200 to 500 km (Sky Wave)	30	19	27	19	25	14	21	8	17	4	21	3	140	67	48
Totals	107	67	95	69	88	53	76	29	60	16	73	13	499	247	50

Communication reliability = $\frac{19 \text{ contacts}}{50 \text{ attempts}} = 38\%$ (ground wave) A = attempted contacts

Communication reliability = $\frac{227 \text{ contacts}}{434 \text{ attempts}} = 52\%$ (sky wave) C = completed contacts

FIGURE 3. Distribution of CW transmissions by time and range.

F R E Q U E N C Y	TIME												Relia- bility			
	0800		1200		1600		2000		2400		0400		Totals		Percent	
	A	C	A	C	A	C	A	C	A	C	A	C	A	C		
2971 kc	10	0	0	0	0	0	0	10	2	10	3	30	4	60	9	15
3540 kc	8	0	0	0	0	0	0	22	4	29	13	31	9	90	26	29
4830 kc	18	10	16	8	18	5	5	7	2	6	0	5	0	70	25	36
4900 kc	71	57	79	61	70	48	37	21	15	0	0	7	0	279	187	67
Totals	107	67	95	69	88	53	76	29	60	16	73	13	499	247	50	

CR = 65%

CR = 23%

Communication reliability = $\frac{247 \text{ contacts}}{499 \text{ attempts}}$ = 50% (overall)

A = attempted contacts

Communication reliability = $\frac{189 \text{ contacts}}{290 \text{ attempts}}$ = 65% (0800 to 2000 hours)

C = completed contacts

Communication reliability = $\frac{58 \text{ contacts}}{209 \text{ attempts}}$ = 23% (2000 to 0800 hours)

FIGURE 4. Distribution of CW transmissions by time and frequency.

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accomplished by joint agreements on frequency spectrum use between the Government of Vietnam (GVN), RVN Armed Forces, and COMUSMACV. This system, although not perfect, is relatively effective and mutual interference among military users and government agencies is minimized. However, control and assignment of radio frequencies of other non-military and non-government users is practically non-existent. In addition, Viet Cong use of the frequency spectrum along with neighboring countries on an uncontrolled basis makes the control exercised by military and government agencies in the RVN extremely ineffective. Consequently, it is virtually impossible to be assured of a clear channel frequency. Of the 252 unsuccessful contacts (499 minus 247 equals 252, figure 4) there were 104 transmissions when signal strength was sufficiently strong to support communications but, because of interference from other stations, readability was not acceptable. This indicates that approximately 45 percent of all unsuccessful contacts was attributable to frequency interference. Had frequency interference not been a factor the successful contacts would have increased from 247 to 351 (247 plus 104 equals 351) for a communication reliability of 70 percent as opposed to 50 percent actually experienced. Experience with radio communication in the RVN indicates that frequency interference has the same degrading effect on all low powered radios and is not a weakness peculiar only to the AN/PRC-64. The users stated that frequency interference is one of the major causes of failure to establish reliable communication with low powered radios in the RVN. The last factor that was considered in evaluating the performance of the AN/PRC-64 was its power output. There is a non-linear relationship in radio transmission between output power and signal strength -- the higher the output power, the stronger the signal strength and the better the readability. The AN/PRC-64, with a rated power output of 5 watts on CW and 1.5 watts on voice, does not radiate a strong signal even under ideal conditions. For this reason it was frequently necessary to make several attempts to establish communication before a satisfactory contact could be established. This is a common failing with all low-powered HF-AM tactical radio sets. Users stated that with HF-AM tactical radio sets of 15 watts or less of power output it is generally necessary to make several attempts to establish contact before a reliable communication channel can be established. The AN/PRC-64 was not compared on a transmission-for-transmission basis with the AN/GRC-109 (15 watts of output power) which is the current radio set used by Special Forces "A" detachments. The detachments involved in the evaluation used the AN/PRC-64 in lieu of the AN/GRC-109. Users stated, however, that from experience with the two sets, communication reliability was about the same. Therefore, considering the degrading factors of high atmospheric noise level induced by ionospheric changes, frequency interference, and low power output, the overall communication reliability of 50 percent is considered satisfactory for a low-powered HF-AM radio set in comparison with other equipment in use.

In summary, it was found that the AN/PRC-64 radiates a ground wave of approximately 20 km and a sky wave (one-hop) of approximately 60 km. The skip-zone is from 20 to 60 km. The ground wave component was unreliable

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in the mountainous jungle terrain of the Central Highlands, but it was reliable in the flat, marshy terrain of the Mekong Delta. The AN/PRC-64 provides reliable CW communication during favorable propagation periods at distances from 60 to 500 km. Annexes D and E contain details of phases I and II of the evaluation. Except for minor editorial changes they are substantially the same as submitted by the evaluators.

B. OBJECTIVE 2 - VOICE RELIABILITY

Voice transmission was attempted when a successful CW contact was established. At no time during the evaluation was it possible to establish voice communication without first establishing a reliable CW contact. Figure 5 shows the distribution of voice transmissions by the time of day and range. On ground wave (0 to 20 km) the 16 successful contacts shown were all in the Mekong Delta. No successful voice contact on ground wave was achieved in the Central Highlands. Communication reliability on sky wave (0 to 500 km) was 12 percent using the voice mode as opposed to 52 percent in the CW mode. During the favorable propagation period of 0800 to 2000 hours communication reliability in the voice mode was only 15 percent; whereas, the reliability factor for this same period was 65 percent in the CW mode as shown in figure 4.

In summary, it was found the AN/PRC-64 did not provide reliable voice communication. Although it was 100 percent reliable in the Mekong Delta because of the favorable terrain in that area for ground wave propagation, the overall performance of the AN/PRC-64 when operated in the voice mode was unreliable.

C. OBJECTIVE 3 - WHISPER CAPABILITY

When a successful voice transmission was achieved the operators switched to the whisper mode and continued the voice contact at a whisper. In each case reliable voice communication was maintained and no loss in signal strength or readability was noted.

In summary, it was found that the whisper capability of the AN/PRC-64 was reliable and was just as effective as normal voice transmission.

D. OBJECTIVE 4 - USER REACTION

Users found the physical characteristics of the AN/PRC-64 to be excellent for counterinsurgency use. It is small, compact, and can be easily carried by one man. It was operated under both wet and dry conditions and on several occasions inadvertently submerged during river crossings. At no time did the radio become inoperative because of weather or environmental conditions.

The users found the AN/PRC-64 easy to operate. It took approximately 30 minutes to familiarize qualified radio operators with tuning and operational procedures. During combat patrol operations the radio was placed

R A N G E	TIME												Relia- bility		
	0800		1200		1600		2000		2400		0400		Totals		Percent
	A	C	A	C	A	C	A	C	A	C	A	C	A	C	
0 to 20 km (Gnd Wave)	5	5	6	6	5	5	2	0	1	0	0	0	19	16*	84
20 to 60 km (Skip Zone)	5	0	7	1	3	0	0	0	0	0	0	0	19	1	5
60 to 200 km (Sky Wave)	43	5	51	10	36	4	19	4	11	0	10	0	170	23	14
200 to 500 km (Sky Wave)	9	1	11	2	8	0	6	0	3	0	2	0	39	3	7
Totals	62	11	75	19	52	9	27	4	15	0	12	0	247	43	16

CR = 15% CR = 7%

Communication reliability = $\frac{39 \text{ contacts}}{189 \text{ attempts}} = 15\%$ (0800 to 2000 hours) A = attempted contacts

Communication reliability = $\frac{4 \text{ contacts}}{54 \text{ attempts}} = 7\%$ (2000 to 0800 hours) C = completed contacts

* All 16 completed contacts were in the Mekong Delta.

FIGURE 5. Distribution of voice transmissions by time and range.

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in operation by one man in approximately ten minutes. It was taken out of operation, packed in the fabric bag, and made ready for movement within 5 minutes. In comparison the AN/GRC-109, which consists of three packages (transmitter 9 lbs, receiver 10 lbs, and hand generator 22 lbs), takes two men to transport, approximately 20 minutes to place in operation and another 10 minutes to prepare it for movement. In addition, the long wire antenna used with the AN/GRC-109 is cumbersome and time consuming to install and recover in jungle and mountainous terrain.

The AN/PRC-64 required no maintenance. During the evaluation one microphone and one ear plug headset became defective and were replaced. No other spare parts were consumed. Battery life was excellent and exceeded 14 days under normal operations. Users recommended that a more rugged CW key with less lateral movement be developed.

In summary, it was found that the weight, compact packaging, maintenance, and waterproof characteristics of the AN/PRC-64 make it suited for counterinsurgency operations in the RVN. The simplicity of operation and ease of familiarization of radio operators with the equipment (30 minutes), and the ease of transport and installation (10 minutes) by one man make it superior to the AN/GRC-109 for counterinsurgency operations. The potential users of the radio set in the RVN recommended that it be procured and issued on the basis of 3 sets for each US Special Forces "A" detachment and 15 sets for the Special Forces Group signal company as a replacement for radio set AN/GRC-109.

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IV. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

It is concluded that:

1. The AN/PRC-64 radio set provides reliable CW communication during favorable propagation periods at distances from 60 to 500 km.
2. The AN/PRC-64 radio set provides reliable voice communication at distances only from 0 to 20 km and then only in the flat, marshy terrain of the Mekong Delta. It does not provide reliable voice communication in the mountainous jungle terrain of the Central Highlands at any distance.
3. The whisper capability of the AN/PRC-64 is reliable and is just as effective as a normal voice transmission.
4. The weight, ease of installation and operation, compact packaging, maintenance, and waterproof characteristics of the AN/PRC-64 make it suited for counterinsurgency use in the RVN.
5. The AN/PRC-64 radio set is suitable for use in patrol operations by US Special Forces teams in the high noise level environment of the RVN.
6. The CW key is too fragile and has too much lateral movement.

B. RECOMMENDATIONS

It is recommended that:

1. The AN/PRC-64 be adopted for use by US Special Forces "A" detachments in the RVN as a replacement for the AN/GRC-109.
2. The AN/PRC-64 be procured and issued to the 5th Special Forces Group (Abn) on the basis of 3 sets for each US Special Forces "A" detachment and 15 sets for the Special Forces group signal company.
3. The CW key should be redesigned to make it more durable and to eliminate lateral movement.

ANNEX A
EQUIPMENT

1. CONCEPT OF EMPLOYMENT

The AN/PRC-64 is a lightweight HF radio designed for use by long range infantry patrols engaged in jungle warfare or counterinsurgency operations. Its light weight, compactness, ruggedness, and ease of operation make it suited for use by foot-mobile troops. Because of its low power output it should not be used as a net control or base station when a more powerful radio set is available. It will give best results when communicating with a fixed base station which has a horizontal wire antenna arranged for high angle transmission into the reflecting layers of the ionosphere. It is also designed to provide reliable communication among patrol groups using the dipole antenna, a component part of the set.

The frequency of the AN/PRC-64 has been set to cover the 2.5 to 6.0 megacycle range in order to obtain maximum benefit from the ionospheric layers which give the best reflective effects to vertical incidence signals. It will net with any HF-AM radio that covers the 2.5 to 6.0 megacycle band. During the evaluation it was netted at various times with the AN/GRC-87, AN/GRC-109 and AN/GRC-26. (See annexes D and E for net diagrams.)

Because of its role as a long range jungle patrol radio set, the AN/PRC-64 has some features not ordinarily found in tactical manpack radio sets. These special features include:

a) Whisper Voice

A switch on the control panel enables an operator to whisper into the microphone and obtain full modulation.

b) Battery Condition Indicator

When the battery test button on the control panel is depressed, a lamp will glow to indicate whether the internal battery is good.

c) Burst Transmission

The control panel has input keying terminals and a 12-volt output jack for connecting a burst code keyer. The circuits have been designed to allow keying speeds of up to 300 words per minute. This feature was not evaluated because a burst code keyer was not made available.

2. DESCRIPTION

Radio set AN/PRC-64 is a transceiver contained in a metal case measuring 9 x 5 x 3½ inches. (See figure A-1.) The minimum transmitter power output is 1.5 watts on voice and 5 watts on CW. A microphone and two earphones are supplied with the set. (See figure A-2.) A telegraph key is mounted on the panel and a jack is provided for connection of other keying means. An external wire antenna is used with the set.

A receiver and transmitter, each covering the frequency range of 2.5 to 6.0 mc on four preset crystal controlled channels, are contained in the metal case. The receiver frequency will be identical with the transmitter frequency when both channel selectors are set on the same number. Preset frequencies may be obtained in the following ranges:

Channel 1 - Range: 2.5 to 3.1 mc

Channel 2 - Range: 3.1 to 3.9 mc

Channel 3 - Range: 3.9 to 4.8 mc

Channel 4 - Range: 4.8 to 6.0 mc

The AN/PRC-64 relies on sky wave transmission to provide long distance communication. To achieve sky wave transmission, the dipole antenna is mounted horizontal to the ground and tuned to the operating frequency by changing its physical length. It consists of two equal length wires laid out in a straight line with the radio set in the center. The total length of wire used is 168 feet. It is arranged so that the length is adjusted for the channel in use as follows:

- a) Channel 1 has all shorting straps connected and uses the full length of 168 feet.
- b) Channel 2 has the shorting straps open 17 feet from each end making the full length 134 feet.
- c) Channel 3 has the shorting straps open 31 feet from each end making the full length 106 feet.
- d) Channel 4 has the shorting straps open 41 feet from each end making the full length 86 feet.

The weight of the set with mercury battery installed is approximately 8 pounds. A spare battery weighs 2½ pounds. The set, spare battery, and antenna kit are designed to be carried in a fabric case suitable for attachment to combat pack harness. (See figure A-3.)

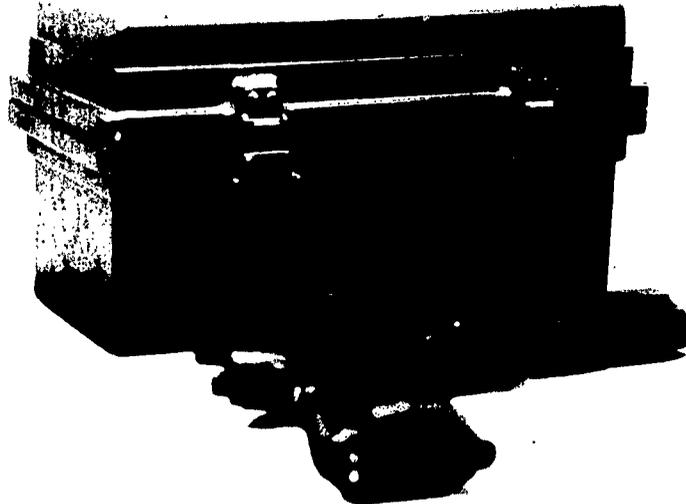


FIGURE A-1. AN/PRC-64 radio set.

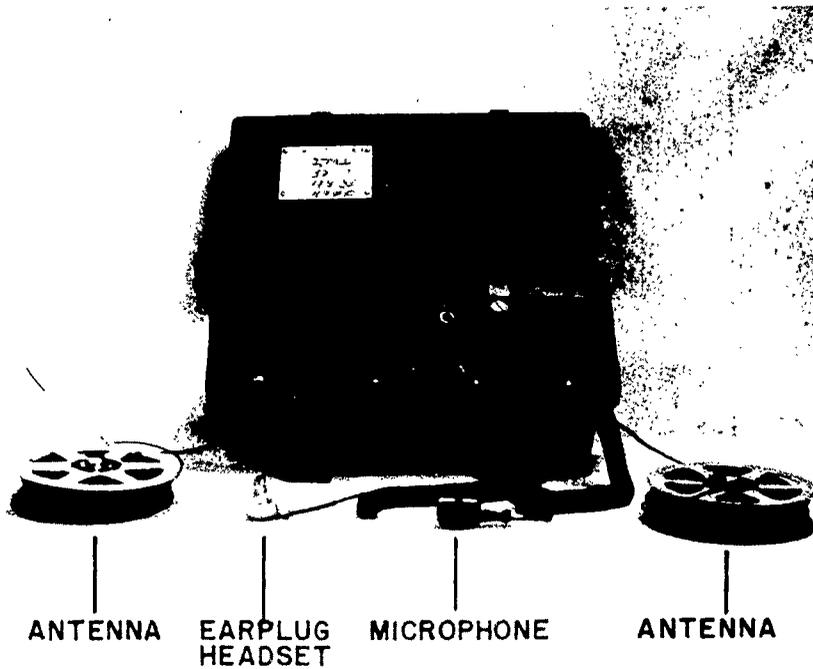


FIGURE A-2. AN/PRC-64 radio set with case open.



FIGURE A-3. AN/PRC-64 radio set attached to combat pack.

ANNEX B

SETTING OF THE EVALUATION

The Republic of Vietnam (RVN) occupies a crescent-shaped area of about 67,000 square miles on the southeastern edge of the Indochina Peninsula. Although only 45 miles wide at the 17th parallel, its demilitarized northern border with the Democratic Republic of Vietnam (North Vietnam), it has a seacoast of 1,500 miles on the South China Sea and Gulf of Siam, and western borders with Laos and Cambodia of about 900 miles. The land borders are poorly defined and drawn through difficult and inaccessible terrain.

1. TERRAIN

There are four distinct geographical regions: The highlands located in the north and central portion, the plateaus of the central highlands, the coastal plain, and the Mekong Delta in the south. See figure B-1.

The northern two-thirds of the RVN is dominated by a chain of broken mountains and rugged hills extending in a northwest-southeast direction and terminating on the northern edge of the delta plain about 50 miles north of Saigon, the capital. The area is characterized by steep slopes, sharp crests, narrow valleys, and dense vegetation. It is sparsely populated, mainly by primitive and nomadic tribes, and it contains few roads or trails.

The central highlands adjacent to the Laos-Cambodia border contain extensive plateau areas. Here, the mountains give way to more gently rolling terrain. The northern plateau is covered by almost impenetrable tropical forests and jungles, which often have two dense overhead layers of foliage at heights of about 40 and 125 feet. The southern portion is typical savannah country, with large open expanses covered by tropical grasses and open forest. This region is more heavily populated than the northern highlands and has more roads and trails.

The coastal plain, varying from 10 to 25 miles in width, extends from the 17th parallel to the Mekong Delta. At several places mountain spurs jut out to the sea, cutting the plain into a series of compartments roughly at Mui Dinh, Mui Ke Ga, Quang Ngai, Da Nang, and Hue, north of which the spurs become more frequent. The area is characterized by sandy beaches and dunes, backed up by rice fields, fertile areas, and marshes extending to the mountains. It contains many small cities.

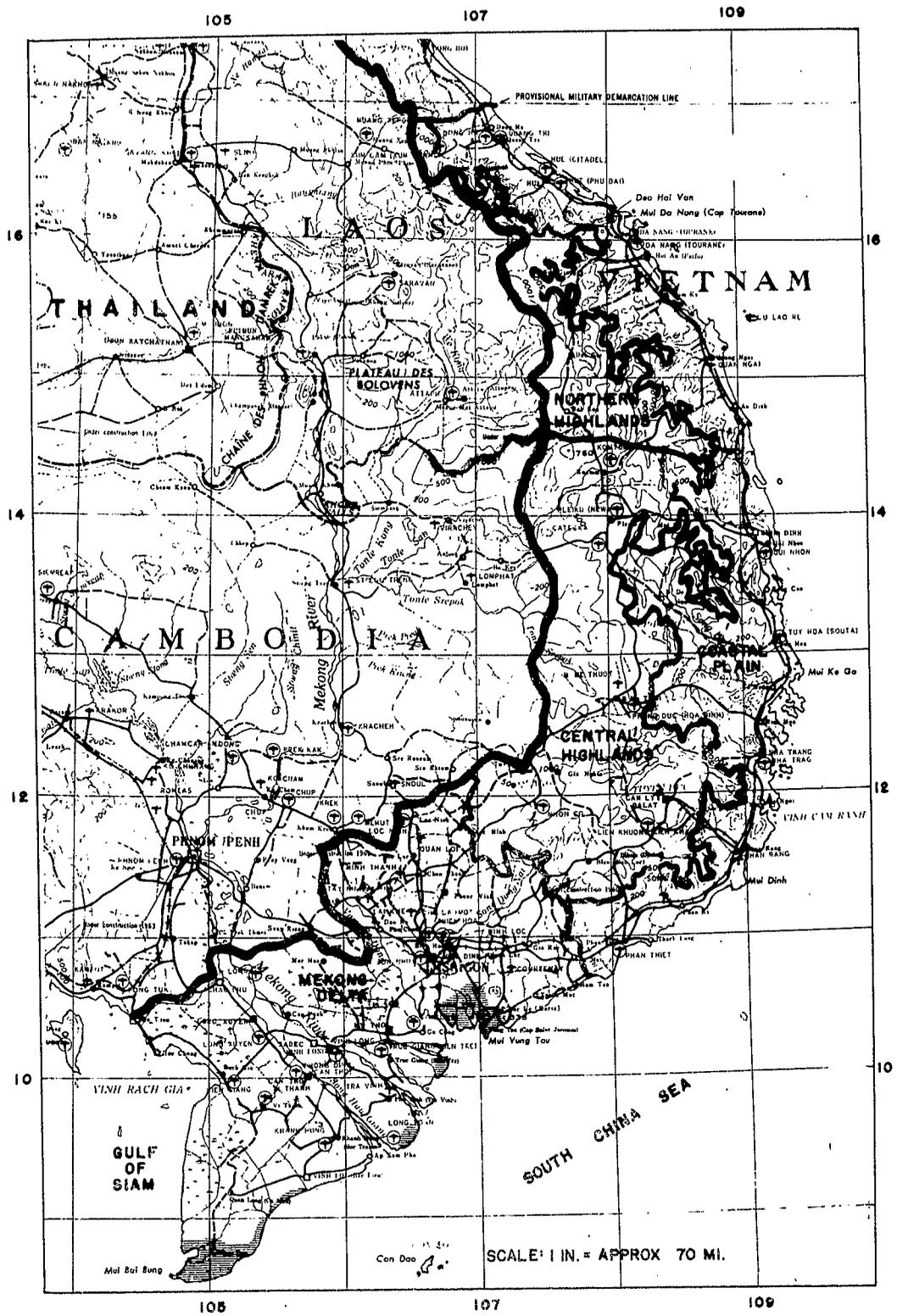


FIGURE B-1. Geographical regions, RVN.

The southern third of the country is part of the large delta plain formed by the rivers Hau Giang, Mekong, Vam Co, Saigon, and Dong Nai. The Hau Giang flows directly to the South China Sea. The huge Mekong splits into four branches and the Vam Co and Dong Nai enter the Saigon before reaching the sea. In addition to these major tributaries, the area is cut by a number of smaller streams and a dense network of canals. The plain is relatively flat with few points exceeding an elevation of 20 feet above sea level. It is a very fertile area with more than 9,000 square miles under rice cultivation. Drainage is effected chiefly by tidal action, with the difference between ebb and flood as much as ten feet in some areas. The southernmost tip of the delta, known as the Ca Mau Peninsula, is covered with dense jungles, and mangrove swamps stand at the shoreline and on river estuaries. The eastern portion of the delta plain is heavily forested. The Plain of Reeds, a large marshy area covered with tall reeds and scrub trees, is located in the center of the delta region adjacent to the Cambodian border. During the rainy season, a major portion of the entire area is inundated.

2. CLIMATE AND WEATHER

The climate is hot and humid, subtropical in the north and tropical in the south where the monthly mean temperature is about 80 degrees Fahrenheit. The annual rainfall is heavy in most regions and torrential in many. It is heaviest at Hue which has an annual average of 128 inches. The low of 28 inches at Mui Dinh, a small cape on the eastern coast some 62 miles south of Nha Trang, results from the presence of hills in the area. At Saigon, rainfall averages 80 inches annually. (See figure C-2.)

Seasonal alternation of monsoon winds profoundly influences the weather throughout the year, although geographical features alter patterns locally. The winter monsoon blows generally from the northeast from early November to mid-March and often brings floods to the northern portion of the RVN. This is the period of the dry season in the delta, which usually lasts from December through March. The winds begin to shift in March, and with the exception of the coastal plain, high temperature and humidity prevails in all of the RVN from April to mid-June. The summer monsoon blows generally from the southwest from mid-June to late August or early September, bringing to the delta region heavy and frequent rains, high humidity, tropical temperatures, and maximum cloudiness. Mountains cause clouds to pile up and deposit moisture before the clouds reach the coastal plain or the northern highlands, which areas are dry during this period. In September the winds begin to shift again, and the coastal plain receives its maximum amount of rain and cloud cover, including severe tropical storms and typhoons.

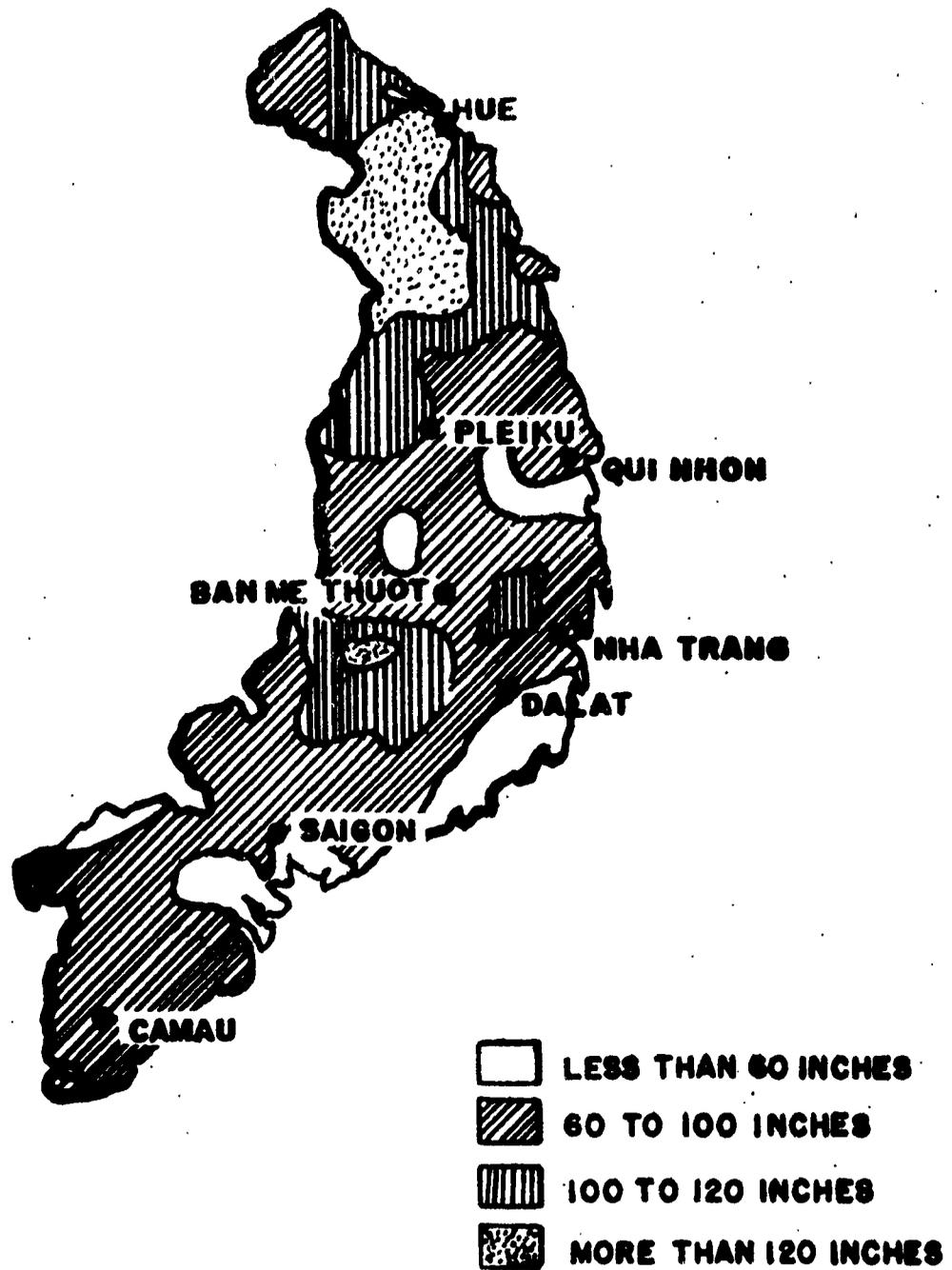


FIGURE B-2. Annual precipitation, RVN.

3. COMMUNICATIONS

Roads throughout the RVN are few in number, poorly cared for, and narrow. Road travel to major areas in the north is often stopped completely when bridges and narrow places are destroyed, either by natural causes or the Viet Cong (VC). In the delta region, 2,500 miles of navigable inland waterways ease somewhat the communication burden placed on the 1,200 miles of primary and secondary roads in the region.

A single-track, narrow gauge railroad connects Saigon with the northern provinces by way of the coastal plain. The system and equipment is old and frequently damaged by the VC.

There is no wire telephone communication among the major centers of population. What radio telephone service is available is at the mercy of the often unstable atmospheric conditions over the RVN. Telephone equipment used in major cities is antiquated or makeshift.

In effect, rural areas are virtually isolated. It is not unusual for a VC act of terrorism or sabotage to take place in an outlying delta area and be reported in Saigon a week or more later. Most incidents accounted for take at least two or three days to get into the situation reports to Saigon.

4. POPULATION

The RVN has a population of approximately 15.7 million, with an average density of 234 per square mile. The highland region is generally the least settled of the geographic areas of the RVN, and the coastal plain contains the most people. About 90 percent of the people live on the 13 percent of the land best suited for rice cultivation: the delta and the small river basins of the coastal plain.

Racially, the population is composed of 85 percent ethnic Vietnamese, 6 percent Chinese (who have established a great influence on the economy of the RVN), 5 percent Montagnard (the nomadic aboriginal tribe people living in the highlands), 3 percent Khmer-Cham (of Cambodian descent), and 1 percent European, Indian, and other small groups.

Religiously, about 80 percent profess Buddhism, about 10 percent profess Catholicism, and the rest profess Muhammedanism, Hinduism, Protestantism, Cao Daism, or Hoa Haoism (two local sects).

Socially, there is an upper class composed of old mandarin families, landed gentry, government officials, professional men, intellectuals, clergy, and wealthy businessmen; an urban middle class of civil servants, teachers, and small businessmen; and a lower class, mainly composed of farmers, but with a growing group of urban workers. Mobility upward within the structure is possible but difficult, especially up from the lowest.

Vietnamese culture is based on traditional Chinese customs and has been profoundly influenced, especially among the upper class living in the cities, by the French. Most rural Vietnamese continue to follow the traditional way of life. The great divergence in racial, religious, social, and cultural structures has produced continued strife and tension among the people who belong to the various groups. There seems to be no evidence of a permanent stabilizing force available within the Vietnamese society to control conflicting elements.

The Vietnamese have a deep and traditional belief in destiny and man's inability to change the natural order of events. This concept, reinforced by religious beliefs, results in a high valuation of the virtues of stoicism, patience, and endurance. The Vietnamese are proud of their ethnic traditions and hold themselves superior to ethnic minorities in the RVN and to the peoples of neighboring countries.

Most of the people living in the countryside, who make up 90 percent of the population and who provide the main targets for the VC, care neither for the government in Saigon nor for the VC. They want to be left alone to grow their crops, raise their families, have a tranquil old age, and die traditionally.

ANNEX C

SIGNAL STRENGTH AND READABILITY RATING SYSTEM

1. GENERAL

This annex is an explanation of the signal strength and readability ratings used during the evaluation. They were based on operator estimates and were not derived through instrumentation.

2. SIGNAL STRENGTH

- 1 - Faint signal
- 2 - Weak signal
- 3 - Fairly good signal
- 4 - Moderately strong signal
- 5 - Strong signal

3. READABILITY SCALE

- 1 - Unreadable
- 2 - Barely readable, occasional words distinguishable
- 3 - Readable with considerable difficulty
- 4 - Readable with practically no difficulty
- 5 - Perfectly readable

4. RATINGS

Signal strength and readability ratings were given in the form exemplified by 4 by 5 or 5 x 3. The signal strength was given first and the readability second. A signal and readability rating of 3 x 3 or higher was considered satisfactory to pass traffic and was used as a standard in determining communication success or failure in this evaluation.

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ANNEX D

PHASE I EVALUATION

1. GENERAL

Based on an agreement between the CO, 5th Special Forces Group (Abn) and the ACTIV project officer, the group was issued five AN/PRC-64 radio sets for evaluation on 3 October 1964. Operator training and familiarization with the data collection plan was conducted in Saigon prior to deployment of personnel and equipment to the field.

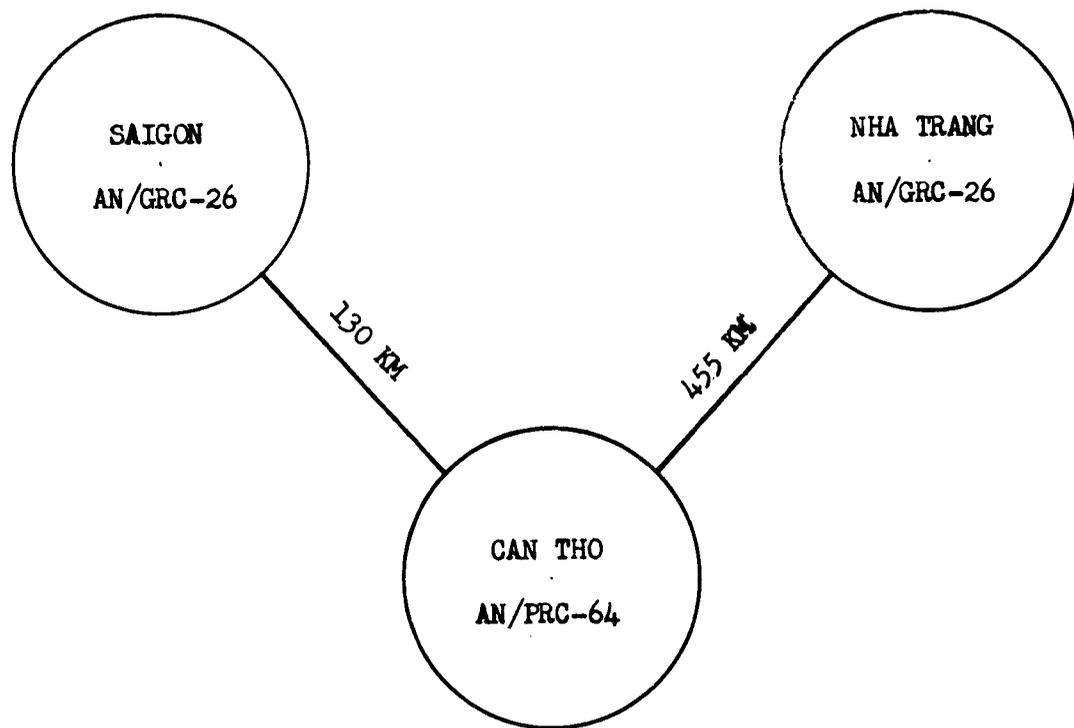
2. DATA COLLECTION

On 19 October 1964 the AN/PRC-64's were taken to Can Tho for further distribution to Special Forces "A" detachments. From 19 through 20 October operational checks were made from Can Tho to base stations at Saigon and Nha Trang. (See figure D-1.) Two types of antennas were employed. A folded dipole constructed of 300-ohm twin lead was unsatisfactory, while the antenna issued with the radio proved satisfactory. The operators' log showed a communication reliability rate of 55 percent. All successful contacts were on CW and each time when the set was switched to the voice mode, communication was unsatisfactory. Of the 8 unsuccessful attempts, 4 were caused by interference from more powerful stations. During two days of extensive operations no battery attrition was noted. On one radio a new battery was installed and the receiver purposely left on to determine battery life with receiver on continuously. After 48 hours the set was inoperative and the battery totally discharged.

On 20 October one radio was taken to Tinh Bien. (See figure D-2.) This set was used to communicate with the "B" detachment at Can Tho, the "A" detachment at To Chau, the base stations at Saigon and Nha Trang, and the "A" detachment at Tinh Bien when it was on patrol operations. The AN/PRC-64 was used in lieu of the AN/GRC-109 when units were on patrol operations and used in lieu of the AN/GRC-87 when units were at the base camp. One of the objectives of the test at Tinh Bien was to determine the one-hop skip distance of the sky wave component and the multi-hop characteristics of the set. The overall communication reliability from Tinh Bien was 67 percent. All successful contacts were on CW and when the voice mode was tried, communication failed. Communication with To Chau was marginal and was the first indication that the sky wave skip distance was about 60 km. Continuous wave communication with all other stations in the net was excellent and indicated that the AN/PRC-64 has excellent multi-hop sky wave characteristics. During the 5-day period, the set required no maintenance and the battery showed no noticeable loss of power output.

On 21 October, one radio was taken to To Chau. (See figure D-3.) This radio was used to communicate with the "B" detachment at Can Tho,

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$$\text{Communication reliability} = \frac{10 \text{ contacts}}{18 \text{ attempts}} = 55\%$$

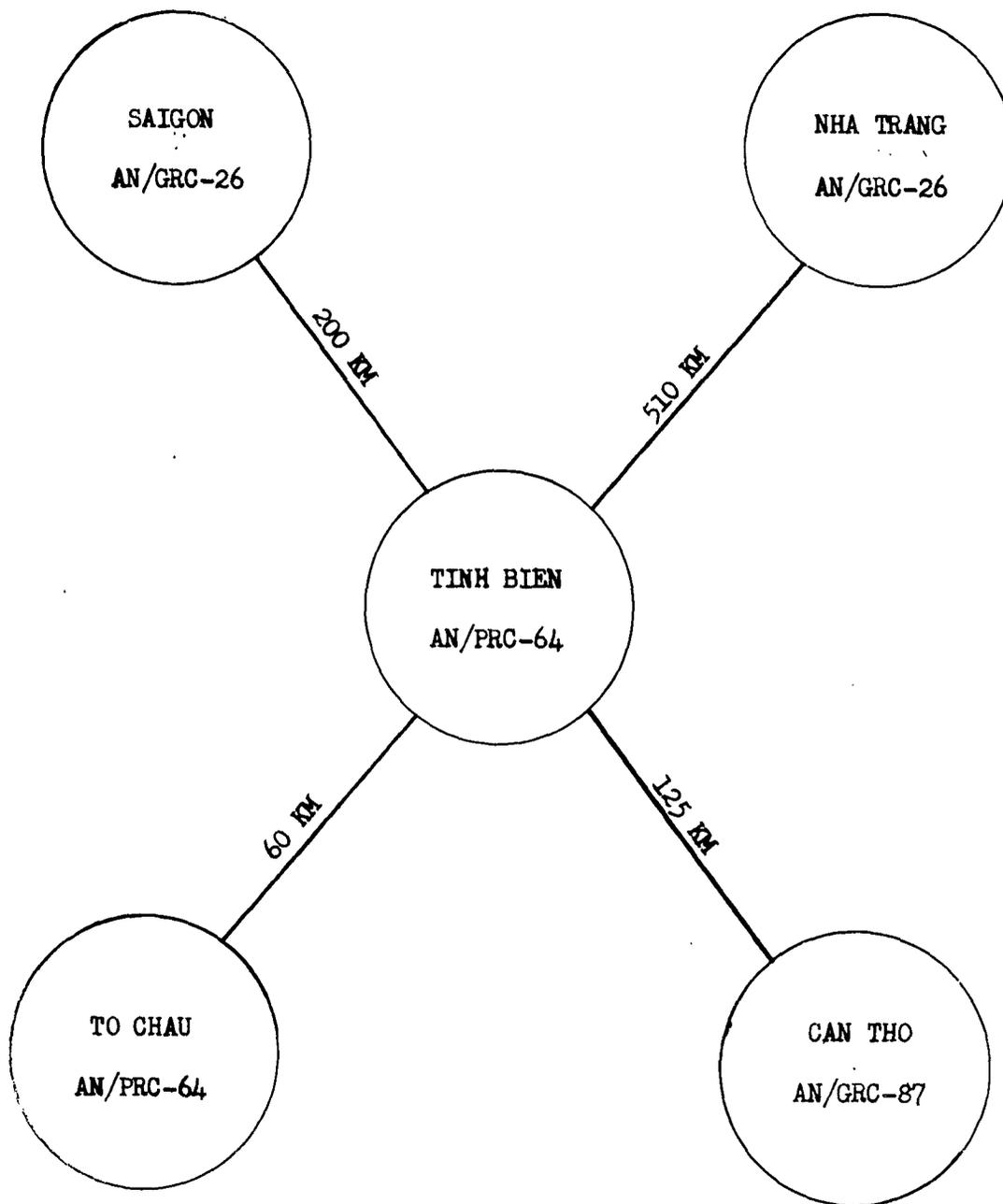
FIGURE D-1. Team number 1 radio net, 19 to 20 October 1964.

ANNEX D

D-2

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$$\text{Communication reliability} = \frac{20 \text{ contacts}}{30 \text{ attempts}} = 67\%$$

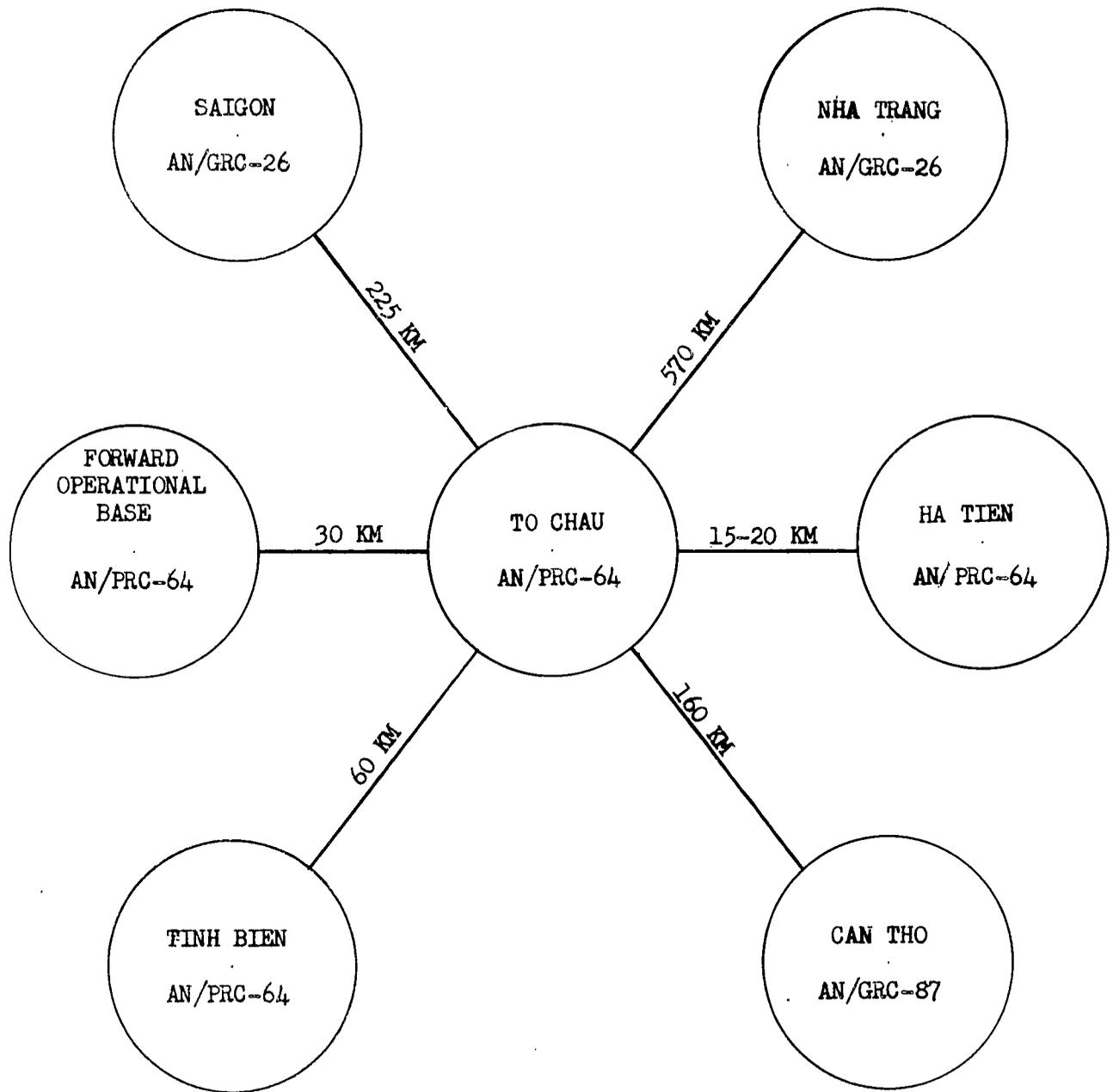
FIGURE D-2. Team number 2 radio net, 23 October to 3 November 1964.

D-3

ANNEX D

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$$\text{Communication reliability} = \frac{22 \text{ contacts}}{36 \text{ attempts}} = 60\%$$

FIGURE D-3. Team number 3 radio net, 23 October to 3 November 1964.

ANNEX D

D-4

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the base stations at Saigon and Nha Trang, and the "A" detachment at To Chau when it was displaced. Skip zone determination was accomplished by using the AN/PRC-64 on a patrol operation and determining the maximum range of the ground wave component. The set performed satisfactorily on both voice and CW at distances up to 20 km. At ranges beyond 20 km communication was marginal and no traffic was passed. No contact was possible with the forward operational base 30 km from To Chau. Communication with Tinh Bien (60 km away) was marginal but good enough to pass CW traffic. The skip zone was estimated to be between 20 and 60 km. Overall communication reliability was 60 percent. On 16 of the 22 successful contacts 5 x 5 voice communication was established on ground wave. In each case the whisper mode was tested and no loss in modulation or readability was noted.

3. FINDINGS

- a) The antenna length for optimal operation must be tuned to the operating frequency.
- b) Although not critical, optimal operation occurred with the antenna oriented broadside to the receiving station. This was particularly true on ground wave.
- c) The one-hop sky wave skip distance is about 60 km and the ground wave component is about 20 km.
- d) The set required no maintenance during the 10-day period and the battery was still good at the end of the evaluation.

4. CONCLUSIONS

- a) Antenna length is critical and jumpers must be accurately set for the operating frequency.
- b) Antenna orientation is not critical.
- c) The skip zone is between 20 and 60 km.
- d) Reliable voice communication is limited to the ground wave.
- e) Reliable CW communication on sky wave at distances from 60 to 500 km could be established.
- f) The radio set is rugged, waterproof, easily transported and requires minimal maintenance.
- g) Battery life exceeds 10 days under normal operations.

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ANNEX E

PHASE II EVALUATION

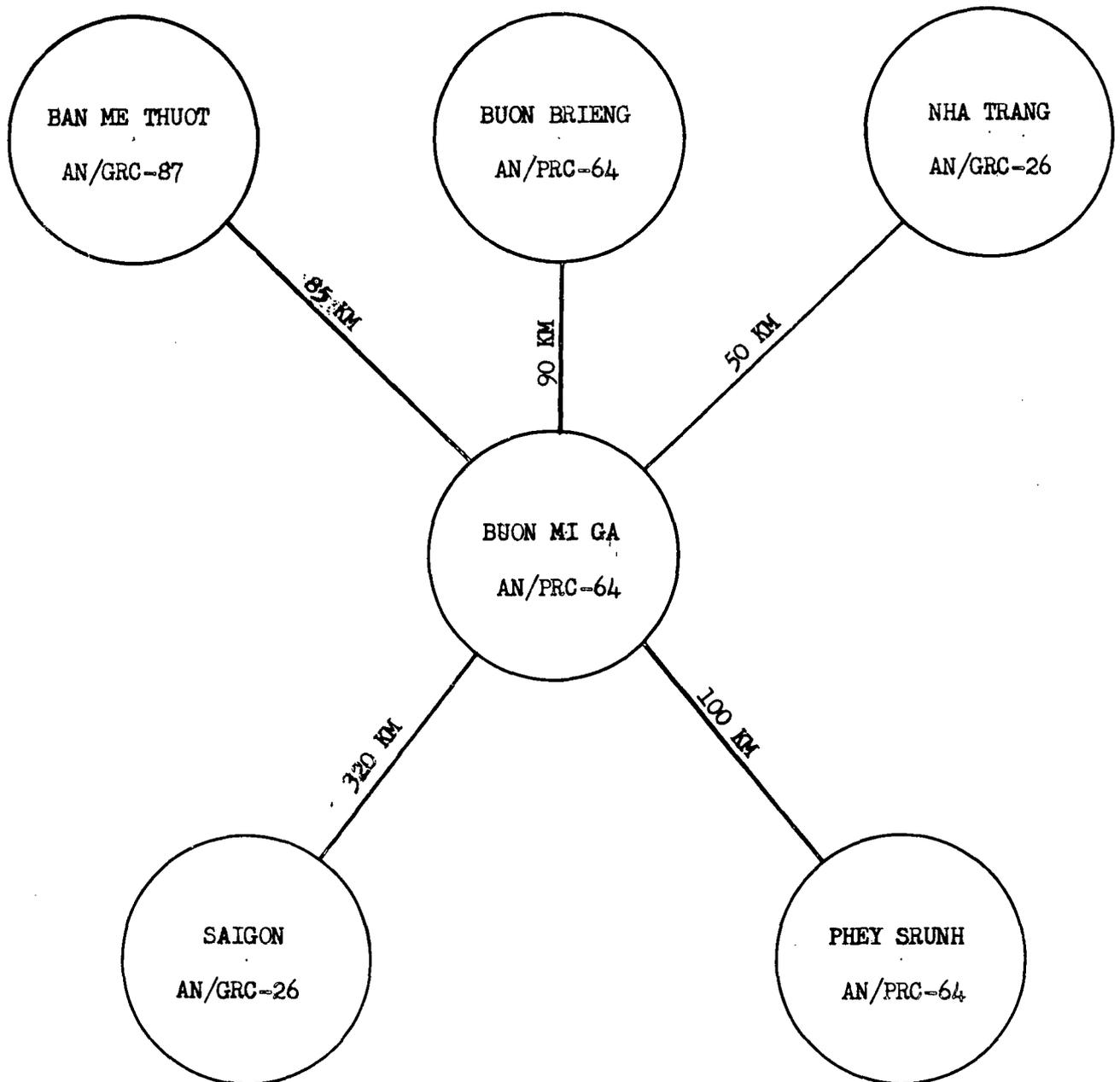
1. GENERAL

Four radio teams were organized and deployed to various Special Forces detachments in the II CTZ. These teams operated from Special Forces camps, forward operational bases, and accompanied combat operations.

2. DATA COLLECTION

Team number 1 was deployed to the Special Forces camp at Buon Mi Ga from 26 December 1964 to 1 January 1965. The terrain in this area is mountainous with heavy vegetation and open, clear valleys. The weather during the test period was cloudy to overcast with temperatures ranging from a low of 60 degrees at night to a high of 75 degrees during the day. While units were operating in this area, the radio was used both as a fixed station and on patrol operations. On one particular operation the AN/PRC-64 was used to establish communications during a rest break. In less than 10 minutes, the radio was set up, contact was established, one message transmitted, one message received, and the radio was secured and ready for movement. The ability to rapidly employ the AN/PRC-64 in all types of terrain was one of the major advantages noted in comparison with the AN/GRC-109. The AN/GRC-109, consisting of three packages (transmitter, receiver, and hand generator), takes two men approximately 20 minutes to place in operation and another 10 minutes to secure it and make it ready for movement. Likewise, the long wire antenna used with the AN/GRC-109 is cumbersome and time consuming to install and recover in jungle and mountainous terrain. Communication from Buon Mi Ga was established to Nha Trang, Saigon, the Special Forces "B" detachment at Ban Me Thuot, team number 2 at Phey Srunh, and team number 4 at Buon Brieng. (See figure E-1.) Overall communication reliability was 57 percent. Voice communication was unreliable. During the 29 successful CW contacts only 4 successful voice contacts could be established. When voice contact was established, the whisper mode was checked and was satisfactory. There was no maintenance required and the battery showed no weakness at end of the 5-day test. Team number 1 was further deployed to the Special Forces camp at Soui Doi from 1 to 7 January 1965. The terrain is flat to the south and mountainous to the north. The weather was generally clear with temperatures ranging from a low of 60 to a high of 80 degrees. From Soui Doi contacts were established with Nha Trang, Phey Srunh, Buon Brieng, and Buon Mi Ga. (See figure E-2.) Communication reliability at this site was 44 percent. On 15 attempted contacts, interference from more powerful stations caused readability to be unacceptable even though the signal strength was fairly good. During the 19 successful CW contacts, voice communication could

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$$\text{Communication reliability} = \frac{29 \text{ contacts}}{51 \text{ attempts}} = 57\%$$

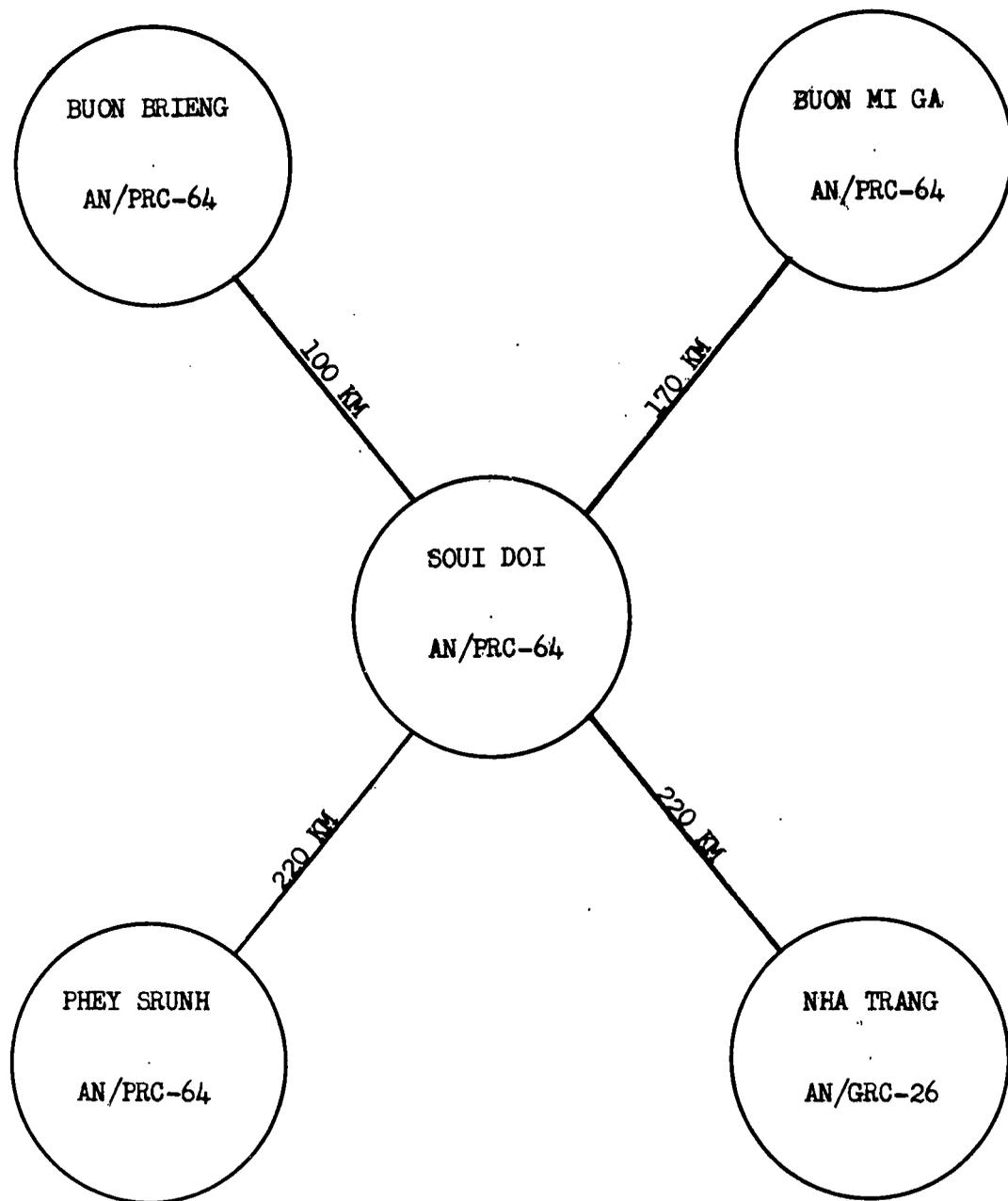
FIGURE E-1. Team number 1 radio net, 26 December 1964 to 1 January 1965.

ANNEX E

E-2

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$$\text{Communication reliability} = \frac{19 \text{ contacts}}{43 \text{ attempts}} = 44\%$$

FIGURE E-2. Team number 1 radio net, 1 to 7 January 1965.

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be established in only 4. Variations in antenna height had no noticeable effect on signal strength. Antenna orientation, although not critical, gave best results when on a north-south heading. Since patrols were not active during the evaluation period, the AN/PRC-64 was employed as a base station in lieu of the AN/GRC-87. The radio required no maintenance during the period and no battery failure occurred. The key, however, is too fragile and has too much lateral movement for good CW transmitting. It should be redesigned to make it more rugged and stable.

Team number 2 was located in the Special Forces camp at Phey Srunh from 29 December 1964 to 11 January 1965. Phey Srunh is located in a valley surrounded by mountains averaging 2500 feet in elevation. During the evaluation period the weather was clear. Temperatures ranged from 60 degrees during the early morning hours to 80 degrees at mid-day. The radio at this location was used as a base station in lieu of the AN/GRC-87 between 28 December 1964 and 6 January 1965. The schedule called for a contact with all stations in the net every 4 hours. (See figure E-3.) Initial contact was on CW and, if successful, was switched to voice. Communication with stations at Soui Doi, Buon Brieng, and Buon Mi Ga was marginal both on CW and voice and little traffic was passed. Continuous wave communication with Nha Trang and Saigon was excellent and there was no difficulty in passing traffic. Communication reliability was 53 percent. Voice communication was unreliable. Satisfactory voice communication could be established in only 8 of 62 successful CW contacts. During these 8 voice contacts the whisper mode was excellent. The height of antenna was not critical, as was found when the antenna was lowered to 3 feet above the ground and then raised to 30 feet. A communication check with the Special Forces Operational Base at Nha Trang showed no change in signal strength or readability. Likewise, antenna orientation was not critical and produced no significant change in signal strength or readability regardless of its relationship with the receiving station. Between 7 and 11 January 1965, team number 2 was deployed on a 5-day patrol operation. A schedule was established for contacts with the "A" detachment at Phey Srunh (40 km away). No communication could be established with this detachment during the 5-day patrol. Continuous wave communication was established with Nha Trang at a distance of 140 km. When there were no trees on which to hang the antenna, two assistant radio operators held it from 3 to 6 feet off the ground. The radio required no maintenance. The microphone failed and was replaced. During the 2-week period the battery was replaced once. The radio proved to be far superior to the AN/GRC-109 for patrol operations. It was easy to transport and was placed in operation in one-third the time it takes to get the AN/GRC-109 into operation.

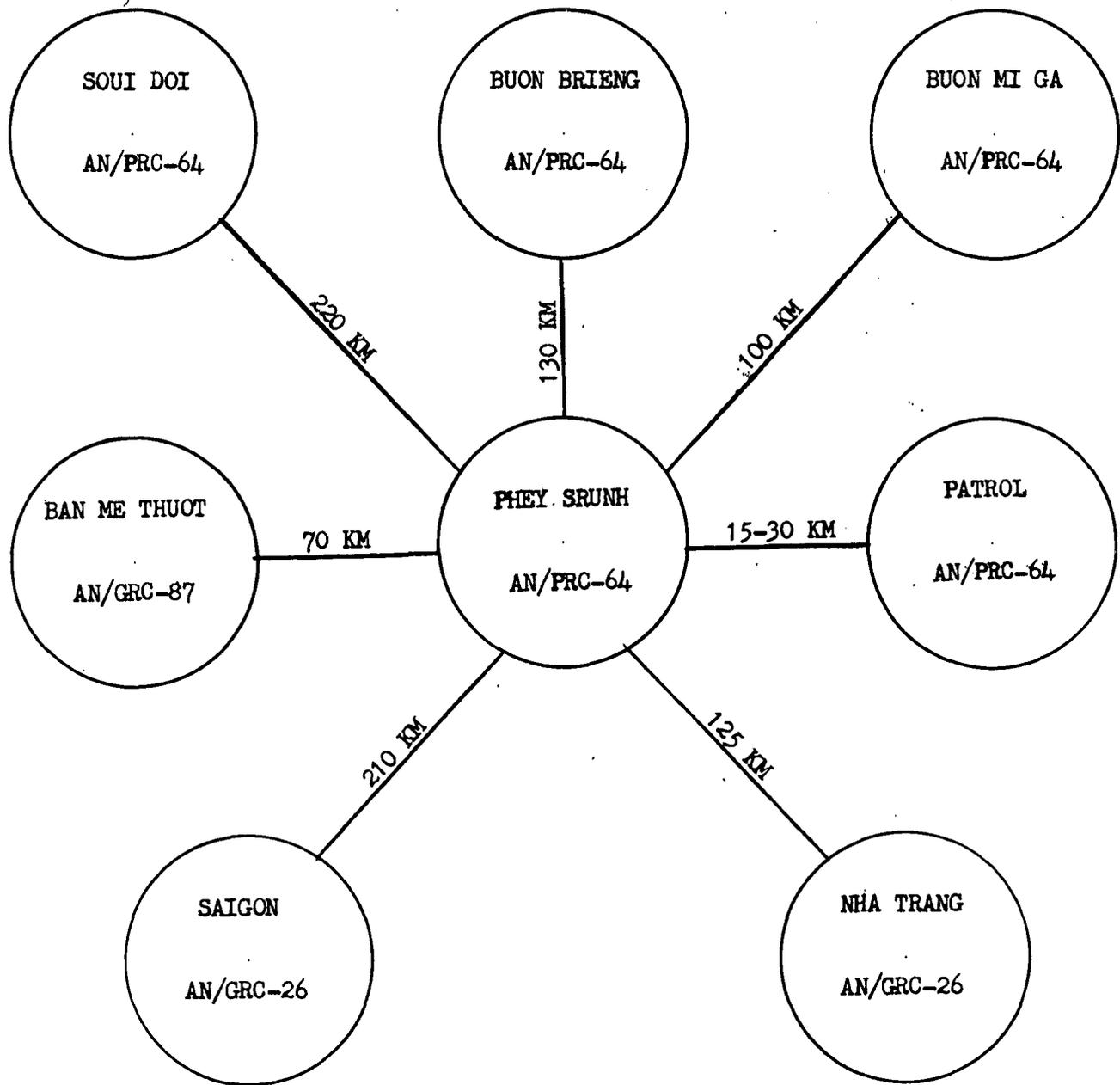
Team number 3 was deployed to Buon Mi Ga from 29 December 1964 to 5 January 1965. The operational area was located 16 kilometers northeast of Buon Mi Ga at the forward operational base. The area in which the evaluation was conducted was a deep valley surrounded on three sides by mountains. Primary growth covered the local terrain. The weather was generally cool with a high of 75 degrees during the day and a low of 60

ANNEX E

E-4

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$$\text{Communication reliability} = \frac{62 \text{ contacts}}{117 \text{ attempts}} = 53\%$$

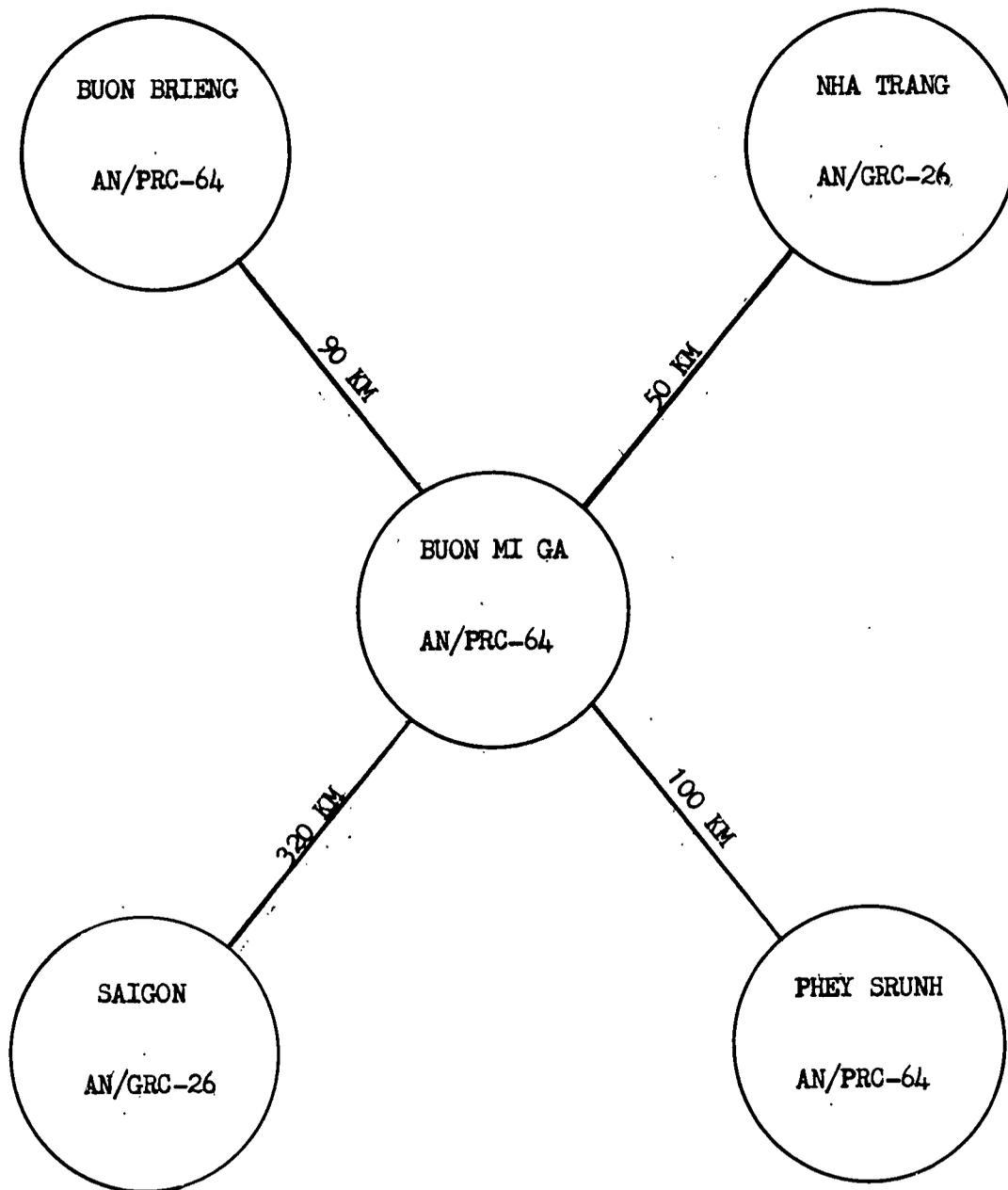
FIGURE E-3. Team number 2 radio net, 28 December 1964 to 11 January 1965.

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degrees at night. It was overcast to partly cloudy and the humidity was generally high. While on patrol, attempts were made to establish contact with the forward operational base (4 to 10 km away) and the base camp (20 km away). No communication could be established with either the forward operational base or the base camp. Reliable CW communication was established with all other stations in the net. (See figure E-4.) Communication reliability was 41 percent. The bulk of the unsuccessful contacts were between the patrol and the forward operational base on ground wave. Voice communication could be established in only 4 of the 30 successful CW contacts. To place the radio in operation as rapidly as possible two assistants held the extended antenna approximately 3 to 6 feet off the ground. This method did not hinder movement of patrols and was usually accomplished rapidly in all terrain during rest or meal breaks. While on patrol, the AN/PRC-64 was inadvertently submerged in water on several river crossings and no damage was noted. On 7 January 1965, team number 3 was redeployed to the Special Forces camp at Plei Mrong. The terrain was generally flat, with gently rolling hills. The weather was clear with temperatures ranging from 80 degrees during the day to 65 degrees at night. As no operations were originating from the camp, the AN/PRC-64 was used as a base station in lieu of the AN/GRC-87. Communication from this station was established with Soui Doi, Nha Trang, Phey Srinh, and Buon Brieng. (See figure E-5.) Communication reliability was 34 percent. On 22 attempts interference from more powerful stations was the cause of not establishing communication. Voice communication was unsatisfactory and could be established on only 1 of the 15 successful CW contacts. During the 2-week period the battery was replaced once. The radio required no maintenance. The ear plug headset became defective and was replaced.

Team number 4 was deployed to the Special Forces camp located at Buon Brieng from 28 December 1964 to 9 January 1965. The terrain in the operational area ranged from rolling hills to mountains. The jungle foliage was light. The weather was clear with early morning haze burning off around mid-morning. During this period the AN/PRC-64 was employed on a 10-day patrol operation approximately 30 km from the base camp. The purpose was to evaluate the ground wave (0 to 20 km) capabilities of the AN/PRC-64 on voice and CW in communicating with the base camp. An additional purpose was to further check the skywave (60 to 500 km) capabilities of the set when employed on patrol operations. (See figure E-6.) Skywave communication reliability was 49 percent. No contacts were successful on ground wave. No direct communication with the base camp at Buon Brieng or Ban Me Thuot was established during the evaluation. The 39 successful contacts were with stations 60 km or more distant. Voice communication was unsatisfactory and only 6 contacts could be established in the 39 successful CW contacts. The AN/PRC-64 was found to be an ideal radio to carry and install. In good locations the radio could be put into operation in approximately 5 minutes. Under adverse conditions, such as terrain obstacles or operational requirements, the radio required approximately 10 minutes to set up. The mercury battery used in the AN/PRC-64 was found to be satisfactory. During the test, 1 battery was used 3 hours a day for 12 days.

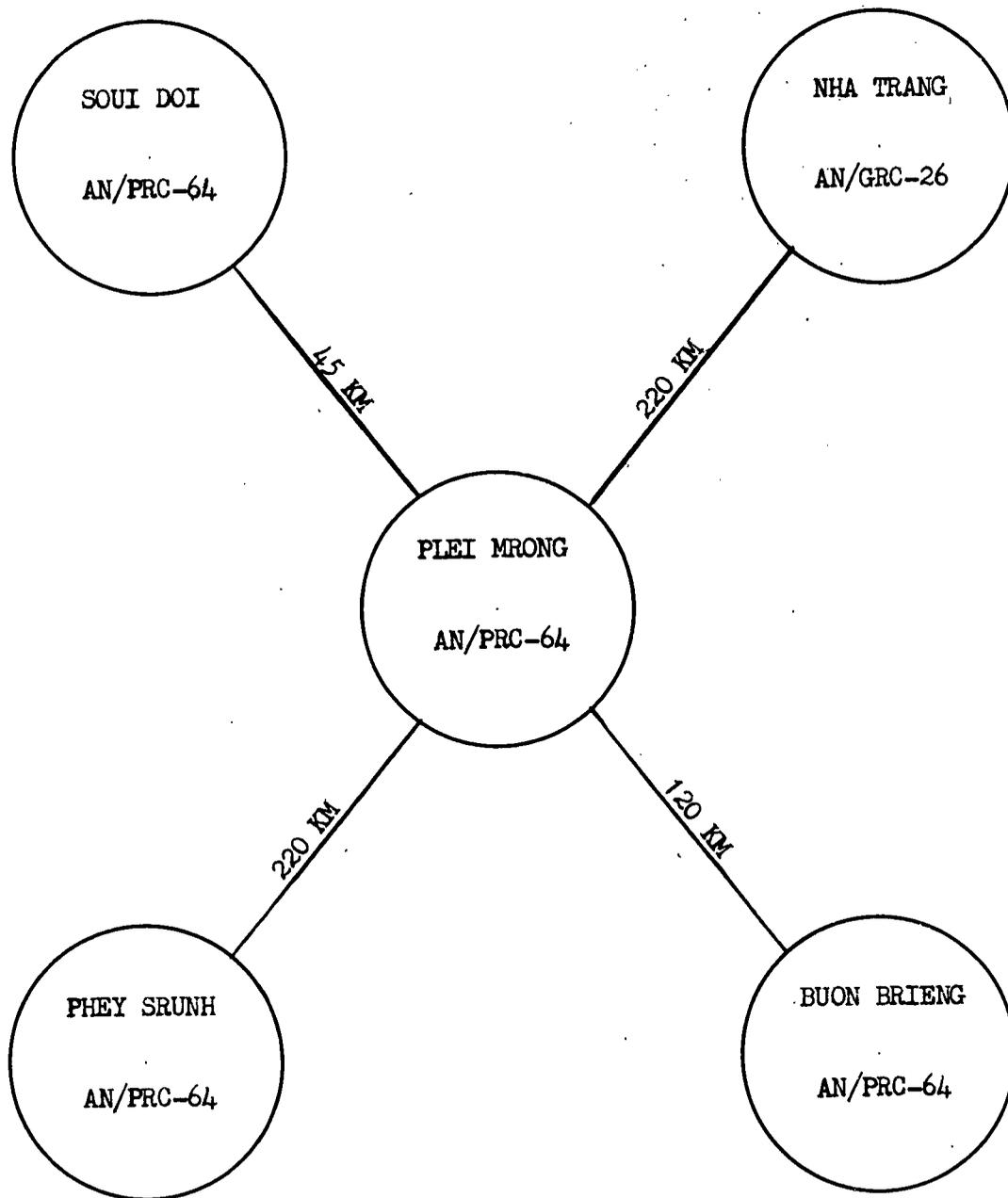
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$$\text{Communication reliability} = \frac{30 \text{ contacts}}{73 \text{ attempts}} = 41\%$$

FIGURE E-4. Team number 3 radio net, 29 December 1964 to 5 January 1965.

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$$\text{Communication reliability} = \frac{15 \text{ contacts}}{43 \text{ attempts}} = 35\%$$

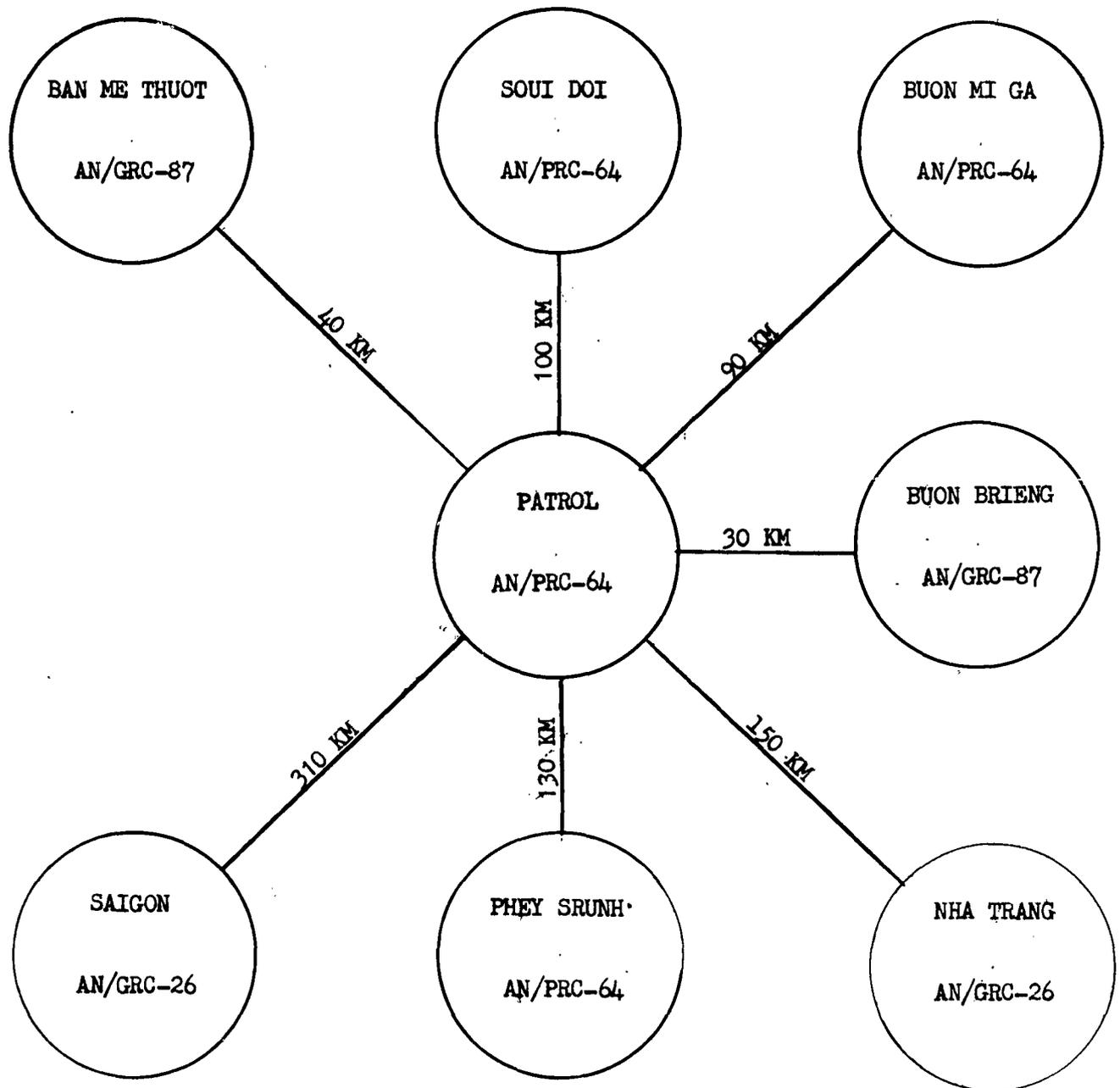
FIGURE E-5. Team number 3 radio net, 7 to 12 January 1965.

ANNEX E

E-8

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$$\text{Communication reliability} = \frac{39 \text{ contacts}}{80 \text{ attempts}} = 49\%$$

FIGURE E-6. Team number 4 radio net, 28 December 1964 to 9 January 1965.

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The antenna issued with the AN/PRC-64 proved to be satisfactory for patrol operations. Length is critical but orientation and height above ground had no noticeable effects on signal strength or readability. Proper selection of frequency is critical and communication between 2200 and 0800 hours were at best marginal. Very little traffic was passed during this period. A comparison between the AN/PRC-64 and the AN/GRC-109 as a patrol radio was made. Neither radio adequately provides reliable communication under 60 km, but both provide reliable CW communication at distances greater than 60 km. The physical and operational characteristics of the AN/PRC-64 make it suited for patrol operations. It is far superior to the AN/GRC-109 for patrol operations.

3. FINDINGS

- a) The physical characteristics of the AN/PRC-64 are excellent. The radio is small and lightweight and can easily be carried, installed, and operated by one man.
- b) The AN/PRC-64 is easy to operate. Approximately one-half hour of instruction is required to completely familiarize a qualified radio operator on the tuning and operating procedures of the radio.
- c) Antenna height and orientation are not critical factors and greatly facilitate rapid employment.
- d) The power output of the AN/PRC-64 is not sufficient to produce a ground wave capable of eliminating the skip zone.
- e) The ground wave is limited to approximately 20 km and the skip distance is approximately 60 km.
- f) The AN/PRC-64 has excellent sky wave characteristics. When the distance between stations was greater than 60 km reliable CW communication could be established during favorable propagation periods.
- g) The AN/PRC-64 did not provide reliable voice communication.
- h) When the whisper mode was used there was no loss in signal strength or readability.

4. CONCLUSIONS.

- a) The AN/PRC-64 does not provide reliable voice communication.
- b) The AN/PRC-64 meets all environmental requirements for a patrol radio, and provides reliable CW communication at distances between 60 and 500 km.

ANNEX F

EQUIPMENT FAULTS

1. DEFICIENCIES

None

2. SHORTCOMINGS

<u>Shortcoming</u>	<u>Suggested Corrective Action</u>	<u>Remarks</u>
Key is too fragile and has too much lateral movement.	Key should be redesigned to make it more durable and to eliminate lateral movement.	Lateral movement of key has a degrading effect on sending Morse code.

3. CORRECTED DEFICIENCIES/SHORTCOMINGS

None

4. PREVIOUS DEFICIENCIES

<u>Deficiency Previous Test</u>	<u>Finding This Test</u>
Receiver module became unplugged because of heavy bumping during cross-country movement. Deficiency was corrected by installation of a clamp that prevents modules from vibrating loose during movement or handling.	No trouble was experienced with modules becoming unplugged during evaluation.

ANNEX G

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13 ABSTRACT The purpose of this evaluation was to assess the suitability of the AN/PRC-64 radio set for use in the high atmospheric noise level existing in the Republic of Vietnam (RVN) and for use by US Special Forces patrols in the counterinsurgency environment of the RVN. (FOUO) Two geographically different areas were chosen for the evaluation. Phase I was conducted in the Mekong Delta and phase II in the Central Highlands. The radios were used by US Special Forces "A" detachments during patrol operations and at forward operational base stations in lieu of radio set AN/GRC-109. Data were collected from personal observations, discussions with Special Forces advisors and signal officers, and operators' logs. (FOUO) The principal result of this evaluation was the determination that the AN/PRC-64 radio set provides reliable continuous wave (CW) communication at distances between 60 and 500 kilometers. It provides reliable voice communication only at distances between 0 and 20 kilometers and then only in the Mekong Delta. The whisper capability of the radio set is reliable and just as effective as a normal voice transmission. User reaction to the AN/PRC-64 was excellent and they recommend its adoption for counterinsurgency operations. (FOUO) Although the AN/PRC-64 does not provide reliable voice communication at all distances and locations, it was concluded that its performance on CW and its weight, size, and ease of operation make it suitable for use by US Special Forces teams in the RVN as a replacement for the AN/GRC-109. (FOUO)		

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
AN/PRC-64 in counterinsurgency operations HF Communication in high noise level environment Long range patrol communication Manpack jungle radio set AN/PRC-64 Low powered HF communication in jungle environment						

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