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TECHNICAL REPORT NO. 67-01

RADIO SET, AN/PRC-64

DEVELOPMENT AND TEST PROGRAM

Final Report

By
Stanley D. Peirce

April 1967

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Aberdeen Proving Ground, Maryland 21005

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Frontispiece
AN/PRC-64 Radio being used in the jungle

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ABSTRACT

This report describes a lightweight man-pack radio for use by long range jungle patrols. It covers the development program and the many different tests given the AN/PRC-64 Radio which lead to its acceptance for use by "A" Detachments of the U. S. Army Special Forces.

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FOREWORD

The purpose of this project was to develop a lightweight, man-pack radio set in the low HF band for use by long range jungle patrols. This development was based on the PRC-52 radio made for the U. S. Army Electronic Development Laboratory under contract to Delco Radio Division of General Motors Corporation, who also produced all the AN/PRC-64 radios. The radio underwent many tests by different agencies and governments in diverse parts of the world.

The following paper prepared by W. B. Fegan, Major, Royal Australian Signals, would normally be an appendix to this report. However, since it so vividly explains the problem of jungle communications we took the liberty of placing it in the Foreword, feeling it would give the reader a much better understanding of the report.

COUNTER-INSURGENCY COMMUNICATIONS FOR JUNGLE OPERATIONS

1. Counter-insurgency operations generally follow a definite pattern, which is developed to counter the efforts of insurgents as they progress through the regular phases of a guerrilla force build-up. In brief, a commander, charged with combating guerrillas and extending control over an area, must move his forces into the area and establish local bases of operation.

2. These bases must be of sufficient size to dominate their local area. The primary task will be to control the civil population and isolate it from the guerrillas. Once this is achieved then the security forces must conduct offensive action against local guerrilla units. Bold, aggressive patrol action must then be maintained to ensure that the enemy does not effect a come-back. In some cases it may be necessary to arm friendly elements of the local population as village guards and police auxiliaries. These will require quick support by the military if they are to be effective. They can be invaluable in gaining time for the deployment of the regular forces if reliable communications and mutual confidence exist.

3. The gaining, analysis and dissemination of intelligence data is always a major effort in counter-insurgency operations. The requirements for communications facilities by intelligence officers are very heavy. In this respect, communications to civil police are very important and the military must be prepared to provide communication support to local civil authorities.

4. Another major communications requirement comes from the extensive use of air support for counter-insurgency forces. To offset the mobility of guerrilla forces in difficult terrain every possible use is made of air-mobile forces. Aerial re-supply of patrols, casualty evacuation as well as offensive air support require communications facilities.

5. There are many sub-divisions of the communication system which will be employed to meet these requirements. However, for the purposes of examination of communication problems peculiar to counter-insurgency operations, it is proposed to divide the system into only two categories. These may be classified as "In Jungle" and "Out of Jungle" communications.

6. Where both ends of a communication link are located outside the jungle there is no particular problem in providing the required scale and grade of service. When one or both ends of a link are located in the jungle there are a number of specific problems which are capable of solution, providing that the problems are recognised. These problems are:

a. Portable radio equipment cannot generate sufficient power to "bull-doze" a signal directly through the jungle vegetation.

b. Mobile groups within the jungle have to be combat ready at all times. They cannot carry large amounts of radio gear or put up elaborate antennas. They require maximum assistance from communication equipment based outside the jungle.

c. There is a distinct difference in the communication requirements of short range and long range jungle patrols operating in counter-insurgency roles.

d. A means of alerting security forces when civilians are menaced by guerrillas is a most important requirement of the communications system. To obtain timely, secure and accurate information of this nature is a major problem.

7. The problems outlined above are all capable of solution. However, it must be realized that the solutions will not be achieved by producing some hardware which can be issued to combat troops as the answer to all jungle communication problems. We certainly can improve some items of equipment, to make them more suitable for this environment, but the answers come through adaptation of the available equipment, to meet the requirements of the mission, the terrain and the local enemy situation.

8. To examine the first problem. Here is a table showing the loss at radio frequencies owing to jungle foliage:

Frequency in Megacycles	Loss per 0.1 Mile in Dense Jungle Foliage
2	12.6 db
3	15.4 "
5	20
10	28
30	48
50	63
100	86

9. These figures bring out the point that low power radio sets cannot push a signal THROUGH the jungle. So we are forced to accept this and look elsewhere for the solution. If both ends of a radio link can raise their antenna ABOVE the jungle there is no problem. However, we know this is an unacceptable requirement for the mobile patrols. So we have to examine the communication arrangements at the local base. The aim will be to have the base equipment as efficient as possible to compensate for the inherent inefficiency of the jungle equipment. If we can achieve this we will have the answer to problems a and b, above.

10. If we analyse the difference in communication requirements between the types of jungle patrols we may then design the base radio installation to cater for three of our basic problems, and perhaps also provide a solution for the fourth. We have already placed these patrols in two categories. These may be defined as:

a. Short Range Patrols. Those patrols operating within a 15 mile radius of the local base.

b. Long Range Patrols. Those operating at ranges in excess of 15 miles.

11. The short range patrol is generally operating within the range of artillery and mortar support weapons of the local base. The requirement is principally for voice communication with some telegraphy. There is a need for 24 hour reliable circuits for close supervision and coordination by the base commander. The ideal communications would be VHF (FM) radio with "whisper facilities" and morse capability to provide constant, noise free, high quality links.

12. The long range patrol of necessity operates beyond the immediate close support area of the local base. It must be self-sufficient in all aspects and able to stay out for extended periods. The distance factor, coupled with the high attenuation of the jungle foliage, dictates the use of radio sets operating in the HF band and using horizontal wire antenna. Communication is impossible when the patrol is moving but is required at any time when the patrol is halted. The patrol base must have a high efficiency antenna and maintain ceaseless listening watch to compensate for the difficulty of operation experienced by the patrol. The use of such antennas as the "Shirley Array" of phased and spaced dipoles has been found to be very effective. The use of high speed keyers to give "burst transmission" is desirable for long range patrols.

13. The problem of communicating between civilian communities and the local military base requires a new approach in communication methods. The need is for some type of "fire alarm" to be distributed to each community which may be concealed and triggered surreptitiously. Construction of such a device appears to be well within the state of the art at the present time.

14. Now that we have examined the problems we might consider more solutions. It appears mandatory to elevate the base end of all radio links well above the jungle canopy. The most convenient way to do this would be to situate the base on high ground which overlooks the operational area. This will seldom be possible. To put up masts is seldom a practical solution as the height required for effective range is about 500 feet. The best solution appears to be the use of balloons.

15. In counter-insurgency operations there is no requirement to conceal the location of the static operational bases. In fact, the opposite is true, as the aim is to dominate the area by a show of overwhelming military strength. Therefore, the use of large balloons anchored over the bases would be acceptable and, as they would have to be equipped with aircraft warning lights on the cables and balloon body, there might be a bonus gained from the moral effect on the civilian population. In some cases these devices would also be very useful as navigation markers for jungle patrols and light aircraft who may be in a position to obtain a visual fix on the balloon warning lights.

16. The balloon equipment including gas generators, cables, winches, anchors, etc., should be available in easily transported packages. Normal transportation would be by truck but it would be advantageous to have the packages of convenient size and weight for transportation by light aircraft or helicopter. From investigations carried out to date, it appears that there would be no difficulty in obtaining commercial balloon equipment capable of lifting payloads of 70 to 80 pounds up to heights of 500 feet. This greatly exceeds the payload requirements for communication balloons which could vary from about 25 pounds to a maximum of about 40 pounds. To obtain a relatively stable platform for the radio equipment, the balloon would require aerodynamic shaping to give lift under heavy wind conditions. The "KYTOON" type equipment commercially available from a number of sources in the USA would appear to be very suitable.

17. Every effort should be made to use only the normal current field radio equipment for this requirement. For short range patrols the existing FM equipment would be ideal for this purpose, as the performance, size and weight characteristics of such FM radio sets as AN/PRC-25 would ensure adequate short range coverage. It may be necessary to develop a set of connectors from existing lightweight cables and plugs to operate the equipment by remote control. However, it should first be tried with existing remote control equipment, such as AN/GRA-6, to eliminate any time-consuming development not strictly necessary.

18. With the addition of the balloon equipment the short range patrol communication problem will be greatly simplified and may well be completely solved in many areas. If the balloon also carries the receiver for "village alarm" transmitters located in the surrounding countryside it would be a large step forward in providing constant surveillance of the area. With the development of a suitable alarm system, the problem of alerting security forces to guerrilla action will be considerably reduced.

MANPACK RADIO FOR LONG RANGE PATROLS IN JUNGLE WARFARE

1. The most important item of equipment in a manpack radio station is the man. He is often forgotten in studying the problem of providing optimum communications, in an environment which is very restrictive to radio propagation. General speaking, the approach to date has been to provide a radio set which is quite easy to carry and operate, in a temperate climate. This usually produces an equipment which can be used in the jungle but does impose severe tactical limitations, which could probably have been avoided if designers were really aware of the limitations imposed by the jungle on men at war.

2. From the moment a soldier arrives in a tropical theatre of war, he is subjected to a set of conditions that tend to undermine his resistance and lower his physical and mental efficiency. Even in areas where comparatively good road conditions exist, it will not always be possible to make full use of the transport available, and consequently the soldier will often be forced to move on foot, carrying on his back what he requires for himself and for the fighting efficiency of his unit.

3. Movement under tropical conditions is seldom easy; the ground is difficult underfoot, and is made progressively worse when a number of men are forced, as they are on most occasions, to move along one track. In open country, the lack of shade and the heat from the ground increases fatigue, so that the advantages the soldier would normally expect to gain by being able to move away from the rain forest, are thereby minimized.

4. A great deal of the movement is up or down steep slopes, and the distances which can be covered in a given period, and the time during which the soldier can keep moving, are therefore much less than would be the case under non-tropical conditions, while the physical and mental strain is considerably greater. The basic load carried by the soldier, to enable survival in the jungle, exceeds the minimum load for comfortable movement. In addition the requirement for personal weapons, ammunition, etc., adds to the burden. Communications equipment will always be additional to these basic requirements. The soldier will be overloaded before he picks up the radio set.

5. Apart from their normal role, all troops will be required to do a number of manual tasks, such as unloading landing craft, recovering air dropped supplies, digging weapon pits and numerous other tasks involving heavy physical labour. The tropical climate tends to produce lassitude even when there is no physical exertion, and strength and energy is therefore, slowly but surely sapped. As a result, troops are continually subjected to conditions that tend towards excessive fatigue, and with it, a lowered resistance to disease. In addition, mental strain engendered by operations will also take its toll. In most areas it is impossible to maintain communications to troops moving in the jungle. So the radio operator is expected to do his communicating during halts when most other troops are resting. This means that the manpack radio set in jungle warfare

is often operated by an exhausted man who has to hurry in order to complete his task before the order to march is given.

6. To say that a manpack radio needs to be as light as possible is meaningless. However, we can arrive at a maximum weight which cannot be exceeded without reducing the efficiency of the operator. It has been determined from long experience that 40 pounds is the maximum weight that the average man can be expected to carry under these conditions. While the amount of clothing, food, shelter, arms and ammunition are variables which depend on the mission, terrain, enemy activity, supply situation and other factors, it can be stated from experience that a general figure of 25 pounds for these items is a minimum amount covering the basic needs of the soldier in a variety of situations. To this must be added the individual's share of group loads to be carried. However, it can be safely assumed that the radio operator will not be required to carry other than radio gear except in an emergency.

7. It might be assumed from the foregoing that a weight of 15 pounds might now be allocated to the radio set. This must be approached with caution. In jungle operations, "spare" batteries to power the set are always regarded as part of the basic load. At least one spare battery will always be carried with the set. If other accessories such as hand operated generators are provided they must be included in the set weight figure. Fifteen pounds should include all the items needed to operate the radio set for an extended period (say up to 10 days), in the jungle.

8. So we now have a figure for the all up weight of the radio set. It might be profitable at this stage to examine the environment in which this equipment will operate and assess the distances over which it will be required to provide communication.

9. Operations requiring manpack equipment are generally restricted in the ground distance which they cover. A party on foot in the jungle will seldom exceed 8 miles per day. In many areas it will only make 2 or 3 miles per day. In the more open tropical terrain it may be possible to greatly exceed these distances if enemy activity does not restrict the rate of advance. So we may safely assume that a figure of 15 miles per day would be a fair maximum to impose in considering communication ranges for foot parties in tropical terrain.

10. Next we may consider the maximum distance over which the patrol may wish to communicate: Here again we have to look to the limitations of the area and the physical endurance of the men. It is possible that a patrol may be air-lifted into a remote area and operate hundreds of miles in advance of the headquarters to which it must communicate. However, this must of necessity be considered as a special case. In this event the patrol will need an advanced base in its area of operations, containing reserves of ammunition, food, medical supplies and communication equipment. The communications between the advanced patrol base and the rear headquarters must NOT be confused with the requirement for the manpack radio set. If we join the two together we must inevitably effect a compromise which will suit neither

requirement. There are areas of compatibility which we may profitably explore later. But let us be definite which we consider of prime importance here. The manpack set to be carried into combat is our primary consideration.

11. So we return to the problem of fixing the maximum distance for this manpack radio. Again we must look at the conditions of operation for the patrol, to determine the time it can spend in the jungle and remain effective. When the factors of food supply, fatigue, health and combat effectiveness are studied and compared with operating experience a figure of about 10 days is generally accepted as a reasonable maximum for planning purposes. If we take the worst possible case and assume a patrol moving away from its base in a straight line, for 5 days, at the maximum rate of advance, we come to a figure of 75 miles as the required maximum range of the basic manpack set. This figure will satisfy the requirement for a combat patrol which is completely self contained. For larger scale operations where carriers or pack anamals are employed the requirements are essentially different. It is most important that this fact be kept in mind.

12. We might now consider the type of communications which we need for the jungle patrol. The missions of all patrols can be broadly grouped within two categories, "Fighting" and Reconnaissance". Analysis of these suggests that for all patrols the communications are required for one or more of the following purposes:

Status Reports (including contact reports)

Fire Support

Intelligence

Casualty evacuation

Re-inforcement and re-supply

13. With the exception of fire support, all the above can be accomplished by a message. Telegraphy at slow speeds would be acceptable and telegraphy at high speeds would be desirable. However, fire support requests and co-ordination do require a voice capability. This fire support can be of two types; Artillery or air support. Because of the limitations of the weapons the voice communication range is limited to comparatively short distances. A voice range of 15 miles would be quite adequate for all forseeable fire support communications.

14. At this stage it may be expedient to summarize our conclusions to see just what we have determined to this point. We require a radio set with the following characteristics:

a. Weight not to exceed 15 pounds, for the complete radio set including spare batteries.

b. Ability to transmit voice signals for 15 miles and telegraphy for 75 miles.

15. We should now consider the form factor of this radio. For the type of communications envisaged there is no requirement for operating the set on the move. However, the set must be able to come into operation very quickly with the minimum of physical effort. Due to the extremely high attenuation of the radio signal by the jungle vegetation it will be impossible to transmit a direct wave. The distances involved require a sky wave transmission which in turn requires a horizontal wire antenna. Therefore we can dispense with any form of vertical whip antenna.

16. When the radio operator puts on his set it will be the last item of his equipment to be draped around his overloaded form. If he becomes a casualty the set should be quickly transferred to another man and all its accessories must go with it. There is a great temptation for the designer to form the components of the set in little packets, to be tied together around the body of the operator. This may make for the best weight distribution but it is a bad tactical feature, and generally makes operation of the equipment difficult from the prone position. Therefore, the radio should be a single unit, easily transferred from man to man. On many occasions operation will be with the operator lying flat out in mud, working in very dim light and often in heavy tropical rain. Therefore the radio should have the minimum number of controls and external accessory units requiring connection. In fact it should be possible to operate the set in the dark.

17. A source of many communication failures with manpack equipment is the handsets or microphone/headsets that are subject to physical damage which often manifests itself in fractured lead wires. To minimise these failures it would be desirable to have microphone and receiver "built in" to the body of the set. A light weight ear plug receiver would be required for watch keeping and for noiseless operation. Morse key should also be "built in". With the inclusion of the foregoing features the form factor of the equipment will conform to the practical requirements of the task.

18. We turn now to the essential details of the radio set which have not yet been covered. High on the list for a jungle patrol radio is the requirement for a "Whisper facility". This switches in circuits which gives increased sensitivity to the microphone and decreases audio output of the receiver to allow quiet voice operation.

19. Another essential requirement is the inclusion in the set of a "Battery Condition Indicator". This should indicate a battery as good or bad by a push-button query. This feature will eliminate the worry about battery condition which causes unnecessary battery replacement and thereby complicates patrol logistics.

20. The need for increased range in the circumstances where a patrol base had to be set up at some extended distance indicates the need for the basic patrol set to be fitted with high power amplifiers and their attendant heavy power source. It is therefore desirable that the basic manpack set be capable of functioning in this manner, as part of a team transportable radio set. However, this requirement must not compromise any of the essential manpack requirements. Such factors as extended frequency ranges to

allow operation over longer distances should be rejected if they tend to compromise the basic requirement for operation at shorter ranges.

21. We may now detail the characteristics of the manpack radio for jungle patrols. These could be placed in two categories - "Essential features" and "Desirable features." These are:

Essential Features

a. Weight of complete station including spare battery not to exceed 15 pounds.

b. Ability to provide telegraph (ICW) communication up to 75 miles over jungle terrain.

c. Ability to provide voice communication up to 15 miles over jungle terrain.

d. Wire antenna capable of quick erection and recovery for efficient radiation in dense jungle.

e. Single unit construction.

f. Whisper facility.

g. Battery condition indicator built in the set.

h. Ability to operate in extremely wet and muddy environment.

i. "Built-in" morse key.

Desirable Features

a. High speed telegraphy. Possibly up to 300 words-per-minute.

b. "Built-in" microphone and receiver.

c. Ability to operate as a driver unit for high power amplifier.

22. At the present time, there does not appear to be any equipment available with the characteristics outlined above. A possible interim solution might be obtained by the adaptation of components from an existing lightweight radio equipment. A survey of such an adaptation is attached. It is recommended that this adaptation of the Radio Set AN/PRC-52 be investigated.

W. B. FEGAN
Major, R. Aust Sigs

CONVERSION OF AN/PRC-52 FOR JUNGLE PATROL RADIO SET

1. An interim solution to the current (1962-63) problem of obtaining an efficient light-weight pack set may be the adaptation of components of the AN/PRC-52 to form a single unit radio. It is possible that a number of comparatively simple fitments would provide an acceptable interim patrol pack-set.

2. The components of the AN/PRC-52 which would be required are:

Transmitter, T-797

Receiver, R-1026

Coupler Antenna, CL-863/R

Adapter, Battery Terminal U/218/Frame LP

3. A preliminary appraisal of the problem indicates that the probable work required will be:

a. Construction and fitting of a modulator unit.

b. Fitting of a new dry battery adaptor box to provide internal location of 22-1/2 volt dry battery.

c. Connection of lightweight handset and waterproof external morse key.

d. Housing units in lightweight water-proof carrying case.

e. Provision of suitable antenna.

4. If the adaptation proved successful the result would be a radio set with the following characteristics:

a. Frequency range, 3 to 8 megacycles.

b. Channels available - 4.

c. RF power output - 5 watts.

d. Modulation - Voice, CW.

e. Keying speeds - up to 300 words per minute. (Using external keyer unit).

f. Size (approximately) - 6" high x 5" wide x 5" deep.

g. Weight of complete station including spare battery - less than 7 pounds.

ACKNOWLEDGEMENT

U. S. Army Limited War Laboratory is much indebted to MAJ W. B. Fegan, Royal Australian Signals, who was a Special Projects Officer at the Laboratory during most of the development of the PRC-64. He was personally responsible for much of the basic concept of the AN/PRC-64 radio, and his vigorous and enthusiastic action during the development and testing of the prototypes contributed greatly to the success of the project.

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INTRODUCTION

High attenuation due to jungle foliage makes it essential to use sky wave propagation for any transmissions beyond short ranges. Previous equipments for this purpose have been too bulky and heavy to be man-packed on long range patrols. Development of the AN/PRC-64 was undertaken to provide the lightest possible equipment to accomplish the mission. Although the PRC-64 radios will net with each other, it is intended that they be used whenever possible against a more powerful base station. The set is primarily designed for CW use; however, it also has an AM capability and an input for a burst keyer. This report covers the concept, acquisition, and testing of the AN/PRC-64 radio.

CONCLUSIONS

The results of the test program indicated that the AN/PRC-64 is well suited to withstand rugged environmental conditions. Its performance was equal to or superior to all the other man portable radios with which it was evaluated. Because of its size, weight, ease of operation, and maintenance it is suitable for use by long range patrols on counter-insurgent and normal operations.

DEVELOPMENT

By the latter half of calendar year 1962, Delco Radio Division had delivered to U. S. Army Electronic Development Laboratory (USAEDL) some models of a small HF radio transmitter and receiver, the AN/PRC-52. Propagation testing with these equipments was carried out between the Delco plant and Fort Monmouth.

Although the AN/PRC-52 modules were not yet designed for operational use in the field as such they did indicate the feasibility of producing the lightweight man-pack set envisioned by U. S. Army Limited War Laboratory (USALWL) for long range patrols.

With these modules as a basis USALWL entered into discussions with Delco relative to the detailed requirements for the jungle radio. Although several refinements were added as the testing progressed, the basic concept of the radio remained unchanged. During these initial discussions basic features were determined.[1]

1. A frequency range of 2.5 to 6.0 megacycles with 4 crystal controlled channels.

2. The equipment configuration and a waterproof case for full compatibility with a jungle environment.

3. The mercury primary battery which would provide approximately seventeen days operation consisting of one hour receiving and ten minutes transmission operation per day.

4. A battery condition indicator.

5. Circuitry for amplitude modulation.

6. A "whisper switch" to provide a 10 db change of gain in the microphone circuit.

7. A keyer jack for an external hand key or a burst keyer.

Inasmuch as the sets were produced a few at a time it was possible to add refinements as the testing progressed. In this way the original panel layout was improved; a better key was added; and the battery compartment and interlock switch improved. A somewhat different case was provided on the later models. The most important refinement was the addition of a 500 cycle narrow band filter for use on CW.

A memorandum to the Commanding Officer of USALWL from the Chief of Research and Development (OCRD), dated 3 January 1963[2] specifically requested the Laboratory to commence procurement of the jungle radio based on the above mentioned Delco proposal. By April 1963, Delco had a contract and the first models were delivered to USALWL in July 1963. During the next year or so a total of twenty-two AN/PRC-64's were procured from Delco as the test program progressed.

DEVELOPMENT TEST PROGRAM

Although the AN/PRC-64 has never been subjected to a full set of formal engineering and operational tests for type classification, the test program that it did undergo was indeed extensive. Summaries of most of the tests appear below.

Environmental: A series of environmental tests designed to prove whether or not the PRC-64 would meet the severe conditions to be encountered on jungle patrols were conducted by the U. S. Army Electronic Development Laboratory. The equipments withstood these tests well. What minor deficiencies did show up were corrected in all other units.

Development Tests: When the first two sets were delivered to USALWL in mid July, development tests by USALWL were commenced immediately in the Shenandoah Valley of Virginia, using enlisted personnel of the Special Warfare Center. These tests brought out the need for some of the modifications, such as the rearrangement of the panel layout, that were subsequently made.

To complete the development tests, arrangements were made to further test the existing two sets under operational training conditions, with troops of the 25th Infantry Division, at the Jungle and Guerrilla Warfare Training Center in Oahu, Hawaii, in mid September 1963.

The general aim of these tests was to gain experience in using the AN/PRC-64 under actual operational conditions encountered by patrols in tropical jungle, i.e., heavy foliage, dampness and tropical downpours. Tests were carried out on voice and CW out to 225 miles, against larger base stations and against the PRC-64 acting as a base station. CW contact was always made and voice contact most of the time. Little difference in performance was noted when the PRC-64 was used instead of the larger base stations. The radios held up under strenuous use without breakdown. Reactions of the testing personnel to the sets were enthusiastic. A detailed memorandum[3] covering this test, undated, by MAJ W. B. Fegan, Royal Australian Signals, is in the USALWL files. The 25th Infantry Division was furnished later two more sets for further evaluation. A favorable report was received from them by their letter dated 15 April 1964.[4]

Frequency Stability Tests: As part of the engineering tests of PRC-64 and more particularly in support of a later narrow band modification to the equipment, frequency stability tests were conducted at USALWL. In order to use the 500 cps narrow band filters successfully over the temperature range that the equipment was designed to operate, it is essential that the frequency stability of the transmitter and receiver be somewhat less than 500 cps.

The transmitter and receiver were subjected to varying temperatures within the range of USALWL's hot-cold box of approximately -43°C to +75°C (specified operating range is -18°C to +52°C). The transmitter's frequency drifted through a maximum range of 90 cps. The receiver's passband over the temperature range was compared to a standard frequency. The signal was always within the receiver's frequency range and a BFO tone of 1000 cps could always be obtained by adjusting the BFO control. It was, therefore, concluded that successful CW communication between narrow banded PRC-64's is possible in excess of the specified temperature limits although slight frequency drifts occur as a result of temperature changes. A detailed report is contained in reference 6.

Military Potential Test: In May 1964 USALWL requested U. S. Army Test and Evaluation Command to establish a Military Potential Test of the AN/PRC-64. These tests were accomplished by the U. S. Army Airborne, Electronics and Special Warfare Board from June through September 1964 at Fort Bragg, North Carolina, and in September and October at the U. S. Army Tropic Test Center, Fort Clayton, Canal Zone. Under this program extensive tests of the service type were conducted based on criteria furnished by USALWL and with the AN/TRC-77 as the control item. The formal conclusions and recommendations stated in part that the AN/PRC-64 had sufficient military potential to warrant further consideration for Army use and further development should be considered.[5]

Comparative Tests: The U. S. Army Airborne, Electronics and Special Warfare Board was directed to conduct a special study to compare Radio Sets TR-TM-4A (French HF SSB Tactical Radio), HC-162-D and AN/PRC-64. The sets were evaluated against criteria principally derived from the Qualitative Materiel Requirement for Radio Set, Man Packed, Single Sideband, Medium and

High Frequency approved by OCRD, 16 January 1963. The study concluded that the AN/PRC-64 was the best of the three for use in jungle patrol operations although it did not meet all criteria and had certain deficiencies and shortcomings. It recommended that the PRC-64 be considered for further development as a long range patrol radio.[10]

Operational Testing: Many operational tests by different agencies took place throughout the world including tests by the Australian Army in Australia and the British in Malaya. There are either formal test reports or memoranda, which are summarized below.

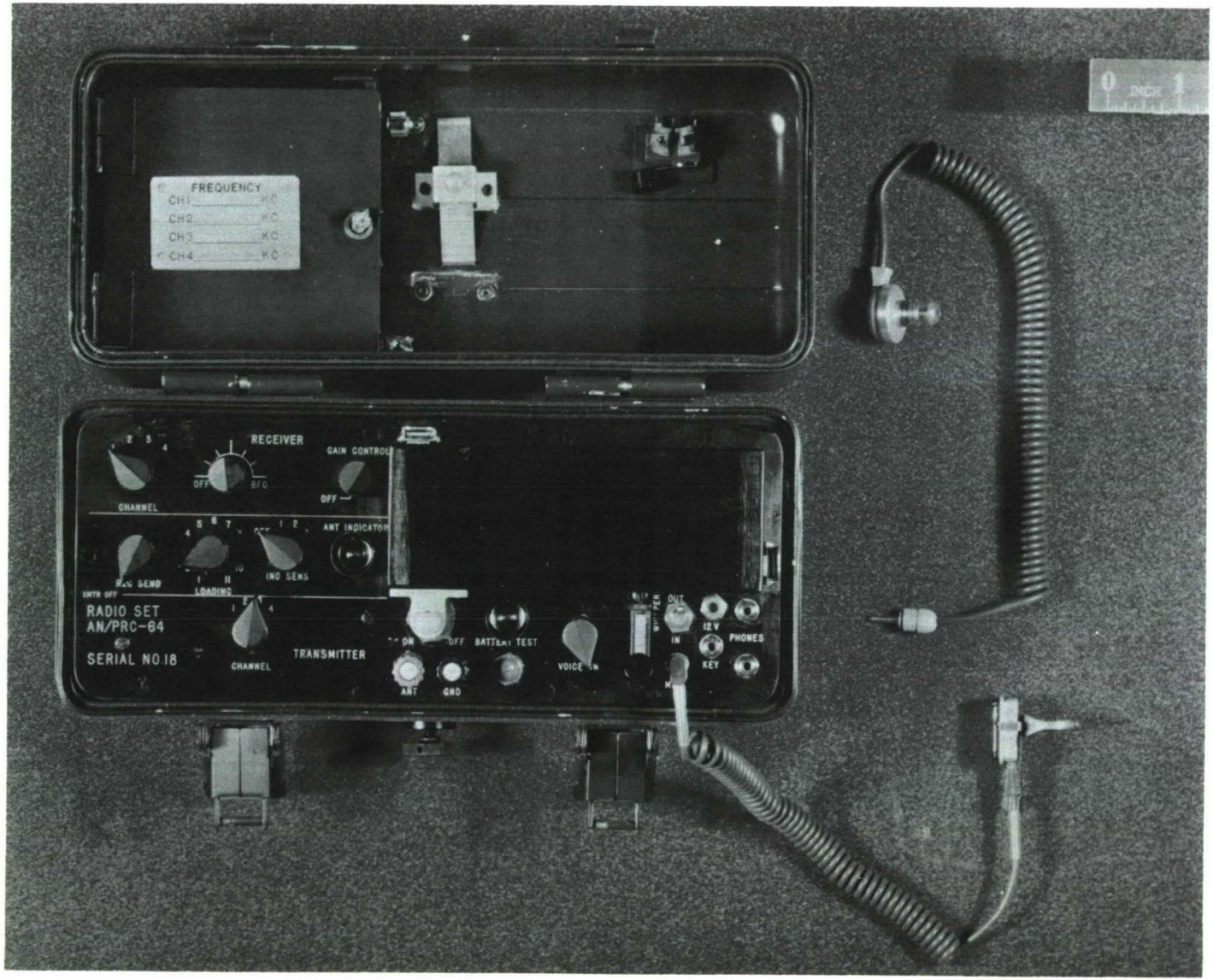
Australian Military Forces: During the development of the AN/PRC-64 Australian Military Forces cooperated by loaning two Army Officers of the Royal Australian Signals to USALWL as well as equipment. In response to their request two AN/PRC-64's arrived in Australia in July 1964 on loan until January 1965. The sets were rotated through four diversified units for operational tests by each and for their comments. These tests included a comparison with the Australian equipment, Radio Set A510. It was concluded[7] that the "a" Radio Set AN/PRC-64 provides a significant increase in communication capability over Radio Set A510 and "b" Radio Set AN/PRC-64 meets the essential requirements for operational performance of AHQ MC(Military Characteristics) No. 246 for a Radio Set Lightweight, High Frequency. The AMF subsequently bought a quantity of AN/PRC-64's from Delco.

Vietnam Evaluation: In late 1964 and early 1965 an evaluation of the AN/PRC-64 was conducted for the Army Concept Team in Vietnam (ACTIV) by the 5th Special Forces Group (Airborne) in Vietnam. Five AN/PRC-64's were issued to "A" detachments for the tests. The results of the tests and the conclusions reached were favorable to the PRC-64.[8] Because of its performance, weight, size and ease of operation it was considered a suitable replacement for the AN/GRC-109. It was recommended that the set be procured for the use of U. S. Special Forces "A" Detachments.

European Tests: Two PRC-64's were furnished in April 1965 to Company "C" (Long Range Patrol), 58th Infantry, for tests in Germany. The objective was to determine if the PRC-64 was suitable for long range patrol use and whether it could replace the AN/TRC-77. The conclusions from these tests were that the PRC-64 is greatly superior to the TRC-77 and could be used successfully for Long Range Patrol type operations.[9]

After the first production purchase of 159 sets for the Special Forces several additional purchases, principally by the United States and Australian Armies, have extended the total number of AN/PRC-64 sets produced to 500.

Radio Set AN/PRC-64 closed



Radio Set AN/PRC-64 opened

LIST OF REFERENCES

1. Delco Proposal dated 21 December 1962.

2. OCRD Memorandum dated 3 January 1963.

3. USALWL Memorandum "Report on Field Test-Radio Set AN/PRC-64, by W. B. Fegan, MAJ, R. Aust Sigs, undated.

4. HQ, 25th Infantry Division "Evaluation of Radio Set AN/PRC-64" dated 15 April 1964.

5. USATECOM Final Report of Military Potential Test of Radio Set AN/PRC-64 dated 18 March 1965.

6. USALWL Technical Note 65-09 "Frequency Stability, etc." dated September 1965.

7. Australian Military Forces Report of Trials of Radio Set AN/PRC-64 (C), undated.

8. ACTIV Report "Radio Set AN/PRC-64" dated 15 May 1965.

9. Company "C" Long Range Patrol 58th Infantry Division letter "Report of Field Test" dated 1 September 1965.

10. USAA,E&SWBD letter "Special Study, etc." dated 25 March 1965.

11. Report on FARELF User Trial of the AN/PRC-64 G(OR&A) Report 7/66(C)UK

12. Report on Visit by FARELF Observer of Australian Trials of Radio Set AN/PRC-64 G(OR&A) Memo 2/64(C)

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13. ABSTRACT

This report describes a lightweight man-pack radio for use by long range jungle patrols. It covers the development program and the many different tests given the AN/PRC-64 Radio which lead to its acceptance for use by "A" Detachments of the U. S. Army Special Forces.

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