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DEPARTMENT OF THE ARMY
ARMY CONCEPT TEAM IN VIETNAM
APO 96243

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6 January 1967

SUBJECT: Final Report - Evaluation of Tunnel Exploration Kit (ACL-74/67)

TO: Commanding General
United States Army, Vietnam
ATTN: AVHGC
APO 96307

1. REFERENCES

- a. Letter, ACTIV-LCD, this headquarters, 18 April 1966, subject: Tunnel Exploration Kit.
- b. MACV Message 14697, 29 April 1966, subject: Tunnel Exploration Kit.

2. PURPOSE

Determine if the tunnel exploration kit satisfies the requirement for tunnel exploration in the Republic of Vietnam (RVN), recommend changes as appropriate, and recommend basis of issue.

3. BACKGROUND

a. During a visit to the 1st Infantry Division a need was indicated for accessories to be used in tunnel exploration (reference 1a). Large complexes of tunnels from 100 to 400 meters in length and varying in width and height require exploration normally from a crouch or crawling position.

b. Based on the requirement stated by the 1st Infantry Division, ACTIV drafted a message to DA, United States Army Limited War Laboratory (LWL), Aberdeen Proving Ground, Maryland, outlining the general specifications and characteristics of the proposed package to satisfy the stated requirement. With the concurrence of USARV, subject message was dispatched on 29 April 1966 (references 1a and 1b).

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c. LWL fabricated and shipped six of the requested items to ACTIV about 7 August 1966. Items arrived at ACTIV about 1 September 1966 and were distributed as follows: two each to the 1st and 25th Infantry Divisions, and one each to the 1st Cavalry Division (AM) and 173rd Airborne Brigade (SEP).

4. DISCUSSION

a. All components of the tunnel exploration kit are mounted on a specially designed fatigue cap and a standard web pistol belt. The major components of the kit are as follows:

- 1) Headlamp: The primary light source consists of a 6-volt headlamp mounted on the front of the fatigue cap. A bite-type on-off switch turns the light on and off.
- 2) Communication System: A highly sensitive bone conductor microphone may be attached to the inside top of the fatigue cap, worn on the bone in back of the head, or strapped around the throat. Reception is provided by an earpiece. Lead terminals from the trailing wire are secured to the pistol belt near a wire reel which is attached to the belt. The system may be used with the TA312/PT telephone or another bone conductor system.
- 3) Revolver: A .38 caliber, 4-inch barrel revolver is provided with each kit. A silencer and a small high intensity aiming light is mounted on the weapon. Ear valves are provided to protect the user's ears when the weapon is fired.

b. To establish a valid evaluation base, the test items were issued to units operating in II and III Corps Tactical Zones. Terrain in these areas includes portions of the delta, the central highlands, and the coastal plains of RVN.

c. Questionnaires were distributed to units selected to conduct the evaluation and completed by users of the tunnel exploration kit and their immediate supervisors. These data were subjected to descriptive, comparative, and qualitative analysis.

d. The evaluation of the tunnel kit was generally favorable. The kit was used under operational conditions by the 1st Infantry Division, 25th Infantry Division, and the 1st Cavalry Division (AM). The 173rd Airborne Brigade (Sep) only used the kit under training conditions. A brief description

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of tunnel complexes explored and summary of evaluation comments follows:

- 1) The majority of the tunnels explored were 50 yards or less in length, 3 to 4 feet in height, and 2 to 3 feet in width. Some tunnels, however, were over 500 yards long. Ventilation was provided by shafts constructed at periodic intervals.
- 2) There was general dissatisfaction with the headlamp attached to the fatigue cap. Comments were:
 - a) The bite-type on-off switch did not function properly.
 - b) One of the four reporting units indicated that batteries are installed in the battery box in series. Because of this, under adverse conditions batteries could be improperly installed.
 - c) The headlamp furnished sufficient light but tunnel explorers in the 1st Infantry Division indicated that since the light was mounted on the fatigue cap, difficulty was encountered when there was a change in tunnel direction. Because of this, and difficulty experience with the bite type on-off switch, these explorers used and recommended the adoption of the following or similar hand-held lamps:
 - 1 Ever-Ready All American
 - 2 Union Carbide Lamp (uses BA 200 Btry, model 108)
 - d) The headlamp is securely mounted on the fatigue cap. The weight of the lamp and the constant rubbing of the fatigue hat against the roof of the tunnel caused the hat to slide forward and downward. This was particularly true after the individual started to sweat.
 - e) One of the four units conducting the evaluation felt that the hard-type miners hat would be more effective than the modified fatigue cap.
- 3) The communication system was generally satisfactory. Of four units conducting the evaluation, one indicated that the earpiece had a tendency to fall off when the explorers crawled through the tunnel and one indicated difficulty with the wires snagging. The communications assembly currently contains two earpieces and two bone conductor

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microphones. These items may be used to form a complete communications system or the microphone may be used in conjunction with a TA 312/PT telephone, which is not included in the kit. One of the tunnel explorers recommended that this item be added.

- 4) The .38 caliber revolver with silencer attached and aiming light mounted, was carried during tunnel exploration. The following comments were noted:
 - a) All four units indicated that the revolver, with silencer attached and aiming light mounted, is large and awkward.
 - b) Of three units reporting on the aiming light, one stated that it was effective, one stated it was ineffective, and one stated that it served little or no purpose because its light was diffused and overshadowed by the larger and stronger miners lamp.
 - c) The holster, while desirable, was considered large and bulky by three of the four reporting units. A general comment was that the holster did not fit snugly and could not be securely fixed to the pistol belt.
 - d) Of four reporting units, one indicated that the silencer reduced the sharpness of the blast when the weapon was fired, and three indicated that the silencer was ineffective. It should be noted, however, that the non-availability of half load ammunition necessitated the use of full load ammunition.
- 5) The ear valves were considered to be effective by one of the four reporting units, two units indicated that the weapon was not fired with the ear valves installed, and the fourth unit had no comment.
- 6) In addition to the items organic to the kit, tunnel explorers in three of the four reporting units used a knife as a probe during tunnel exploration. One of the reporting units recommended the addition of a double edge 6 to 8 inch knife.

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- 7) A breathing apparatus was not a part of the tunnel kit but questionnaires asked if such an item were desired. Two of three reporting units indicated that breathing was difficult, and one of the two units indicated a desire for a lightweight breathing apparatus to be worn during tunnel exploration. The third unit indicated that a breathing apparatus designed to be worn during tunnel exploration is not necessary. This unit felt, however, that a breathing apparatus should be available on the surface for emergency use.
- 8) Three of the four reporting units used 3-man tunnel exploration teams, and one used a 5-man team. The breakdown of these teams were generally as follows:
 - a) Three man team:
 - 2 - explorers
 - 1 - supervisor
 - b) Five man team:
 - 2 - explorers
 - 2 - general support
 - 1 - supervisor
- 9) There was a wide spread in the recommended basis of issue for the tunnel exploration kit. While the overall organization for tunnel exploration was similar and two men were used in the tunnel in all cases reported, units assigned tunnel exploration missions varied. This difference in mission assignment accounts, in part, for the wide spread in recommended basis of issue. The recommended basis of issue by unit was:
 - a) 1st Infantry Division
 - 1 1 each per brigade.
 - 2 1 each per support command.
 - 3 2 each per division chemical, biological and radiological element or headquarters and headquarters company.

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b) 25th Infantry Division

1 2 each per platoon in the rifle company.

2 2 each per reconnaissance platoon in the headquarters and headquarters company.

3 1 each per rifle squad in the armored cavalry squadron.

c) 1st Cavalry Division (AM)

1 3 each per infantry company.

2 3 each per engineer company.

d) 173rd Airborne Brigade (Sep)

1 1 each per engineer company.

2 1 each per rifle company.

5. FINDINGS

a. The headlamp provided sufficient light for tunnel exploration but had the following shortcomings:

- 1) The bite-type on-off switch did not function properly.
- 2) With the headlamp mounted on the fatigue cap, difficulty was encountered when there was a change in tunnel direction.
- 3) With the headlamp mounted on the fatigue cap, the cap had a tendency to slide forward, particularly after the individual started to sweat.

b. The communication system was satisfactory but the earphone had a tendency to fall off as the individual crawled through the tunnel. A TA 312/P1 telephone was needed in the kit.

c. The .38 caliber revolver, with silencer attached and aiming light mounted, was large and awkward.

d. The silencer was ineffective with full load ammunition.

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e. The aiming light was accurate but not effective because it was overshadowed and diffused by the larger and stronger headlamp.

f. The holster was large and bulky and had a tendency to slide on the pistol belt as the individual crawled through the tunnel.

g. The ear valves were effective.

h. A knife was frequently used as a probe during tunnel exploration.

i. Difficulty in breathing was generally experienced during tunnel exploration.

j. The number of tunnel kits required, and the recommendation as to which units these kits should be issued, depended upon the concept of operation of the unit involved.

k. The most frequent organization for tunnel exploration consisted of three men, one supervisor, and two explorers.

6. CONCLUSION

It is concluded that:

a. The tunnel exploration kit with changes recommended below will satisfy the requirement for tunnel exploration.

b. The different concepts of operation, dictated by operational conditions, preclude the establishment of a firm basis of issue.

7. RECOMMENDATIONS

It is recommended that:

a. A hand-held, battery-operated light be substituted for the current headlamp. The two lights utilized by one unit involved in tunnel exploration were the Ever-Ready All American and the Union Carbide Lamp (uses BA 200 Btry, model 198).

b. A better system be devised for attaching the earphone to the ear.

c. A TA 312/PT telephone be added to the tunnel kit.

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- d. A smaller caliber (.22 or .25) pistol, with silencer, be substituted for the .38 caliber revolver.
- e. The aiming light be deleted from the tunnel exploration kit.
- f. The holster be redesigned to conform to the requirements of the smaller caliber pistol and requirements of firm attachment to the pistol belt.
- g. A double edge knife be added to the tunnel exploration kit.
- h. Each tunnel exploration kit contain, as a minimum, the necessary items to equip two men for tunnel exploration work.
- i. The tunnel kit be issued on an "as required" basis.
- j. A lightweight breathing apparatus, capable of being worn by explorers or used on the surface under emergency conditions, be added to the tunnel kit.

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