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EXERCISE DESERT ROCK VI. ARMORED TASK FORCE. REPORT OF TEST. PA--ETC(U)
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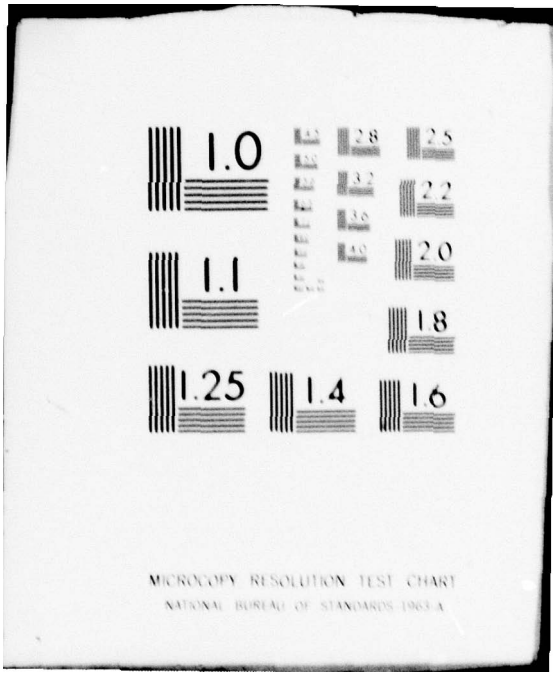
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

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LEVEL II

INVENTORY I

HQ the Armored School, Ft. Knox, KY, Combat Dev Gp.
Armored Task Force Participation —
Exercise DESERT ROCK VI 27 July 1955
DOCUMENT IDENTIFICATION
Final Test Report, Parts I thru III

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ARMORED TASK FORCE
DESERT ROCK VI

REPORT OF TEST

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HEADQUARTERS
THE ARMORED SCHOOL
Fort Knox, Kentucky

(1)

AICBB-G 354.2

1 August 1955

SUBJECT: Final Report of Test - Armored Task Force Participation - Exercise DESERT ROCK VI

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DATE OCT 3 '62

TO: Commandant
The Artillery School
Fort Sill, Oklahoma

Forwarded herewith are two copies of the Final Report of Test, Armored Task Force Participation, Exercise DESERT ROCK VI.

FOR THE COMMANDANT:

Robert L. Eaton
ROBERT L. EATON
CWO, USA
Asst Adj Gen

Incls
2 Copies, Report of Test
Cys 28 & 29.

Sent rec'd
only copy 28
18 Aug 55

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11 AUG 1955
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Combat Developments Group
The Armored School
FORT KNOX, KENTUCKY
27 July 1955

FILE NUMBER: AICBB-G 354.2

SUBJECT: Final Report of Test, Armored Task Force Participation, Exercise DESERT ROCK VI.

1. PROBLEM. In accordance with CONARC letter ATTNG-43 354/71 (S) (8 Dec 1954) subject: "Directive for Exercise DESERT ROCK VI" prepare the Final Report of Test, Armored Task Force Participation, Exercise DESERT ROCK VI, conducted at the AEC Nevada Proving Grounds during the period 18 April to 9 May 1955.

2. DISCUSSION.
   a. The final report is divided into three parts: PART I - Introduction; PART II - Atomic Test; PART III - Special Tests.
   b. For a detailed discussion of the test see:
      (1) PART I, which contains the purpose and objectives of the exercise and the sequence of events.
      (2) PART II, which discusses the participation of the armored task force in the atomic detonation at the Nevada Proving Grounds.
      (3) PART III, in which special tests conducted in conjunction with the atomic test are discussed. These tests include Army aviation; the chemical test; the overland march and communications.

3. CONCLUSIONS.
   a. Atomic test. (For a detailed discussion see PART II.)
      (1) The tactical play of this exercise was severely restricted and thus proved to be relatively unimportant. However, the over-all test was of tremendous importance. The results of this test, and the favorable reaction it created among personnel in building faith and confidence in equipment of the task force should serve as full justification for more detailed and extensive investigation and testing.
      (2) The Armored School should be an active participant in future tests of armor equipment and should be at least an observer of future military atomic tests and have direct access to AEC personnel for the purpose of coordination.
      (3) With the development of jettisonable auxiliary fuel tanks (or with considerable improvement in the daily battle hours of operation) armored units can be expected to deemphasize the necessity for an attack position as now known. In lieu thereof, an advance assembly area should be utilized from which armored units would move out in combat formation.
      (4) Movement through or near ground zero can be accomplished efficiently using the same techniques adopted for night operations; dust conditions create low visibility similar to conditions encountered at night.
      (5) An equipment and personnel study should be made to determine:
         (a) Distribution in the armored division of radiation detection materiel.
         (b) The most effective method for training as many crew members as possible to act as radiation monitors; subsequently, this training should be given to all officers and enlisted men of the armored division.

[redacted]

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(6) The results of this exercise lend increased emphasis to the requirement for simplification of the system for determining effects of atomic weapons.

(7) It was impossible to fulfill many of the CONARC objectives as outlined in the test directive. The terrain available in the vicinity of ground zero and restrictions imposed by the Atomic Energy Commission were the primary reasons for this inability. A short commentary on each objective follows:

(a) The restriction imposed on task force movement immediately prior to the detonation prevented determination of the capability of the reinforced tank battalion to be in motion and its motion so timed that no delay will result in advance of the task force into blast area. By observation of the task force movement, it appears probable that such timing is possible. Freedom of action in future tests would permit positive determination of this capability.

(b) Movement of a reinforced tank battalion into proximity of ground zero is determined by the height of burst of the weapon. In this particular test the height of burst was extremely low for a weapon of this yield. However, instrument readings in the vicinity of ground zero indicated that the task force could have passed directly through ground zero with little, if any, danger to personnel in armored vehicles. This statement does not apply to the wheeled vehicles of the task force.

(c) In subject test no time delay would have been required before the armored unit could enter the affected area to exploit the effects of the device.

(d) The only precaution that a reinforced tank battalion need take in moving to exploit an atomic attack is to ensure the use of radiac survey instruments to avoid excessive contamination.

(e) No field expedient is required to facilitate passage through a blast area in terrain similar to that found in the test site. Heavily wooded terrain would probably be impassible in the vicinity of ground zero.

(f) The speed and formation of the task force is influenced by the terrain and enemy in the vicinity of ground zero rather than by the effects of the atomic detonation. The atomic blast has no effect on the direction of attack.

(g) Any normal organization for combat is suitable for the reinforced tank battalion when exploiting the atomic attack.

(h) Artillery can be employed in the traditional manner to support the reinforced tank battalion in exploitation of an atomic attack. Overhead armor protection for artillerymen would increase the flexibility of this support by permitting placement of artillery closer to expected ground zero. Tactical air was not available for the test; therefore, no determination of limitation on such support is possible.

b. Army aviation. (For a detailed discussion see Annex A, PART III.)

(1) Field maintenance facilities available to the company were inadequate.

(2) Facilities for resupply of POL were inadequate.
(3) The company successfully performed its mission of supporting the armored task force during the exercise.
(4) Army aircraft can operate in close proximity to ground zero immediately following an atomic detonation.
(5) Army aircraft may be located on airstrips 16,000 yards from a 40 KT atomic detonation with no material damage to aircraft.

c. Chemical test. (For a detailed discussion see Annex B, PART III.)
(1) Personnel were handicapped in their operations by insufficient practice in the use of protective equipment.
(2) The M9A2 gas mask is not suitable for use in armored vehicles because of the difficulty experienced in using communications equipment.
(3) The rubber hood is not suitable for use with the collective protector face-piece because of design differences.
(4) The face-piece for the collective protector (M8) should be modified to provide a headset and arranged so that the chest set may be worn on the outside of the hood.
(5) With the exceptions noted above, the M8 collective protector is satisfactory for use in armored vehicles.
(6) The protective equipment used by the task force is so bulky that it presents a serious problem in storage and transportation within the battalion.
(7) Leading elements of the task force did not rapidly engage the enemy and reconnoiter and breach the barrier.

d. Communications. (For a detailed discussion see Annex D, PART III.)
(1) The test was not valid for the purpose of recommending changes or modifications of signal equipment.
(2) The atomic detonation has no adverse effect on signal communication.
(3) This test indicates present organic FM radio equipment for armored units will function satisfactorily under most conditions encountered on the atomic battlefield.
(4) A radio net is needed for rad-safe purposes during an attack through an area contaminated by radio-active material.

4. RECOMMENDATIONS.
a. Atomic test. (For a detailed discussion see PART II.)
(1) The Army utilize every opportunity to include armored units in future atomic tests.
(2) Future tests permit more freedom of action for participating Army units. Restrictions on movement prior to, during, and after the detonation be based on safety only. Operation of radios and engines not be interrupted.
(3) The Armored School be authorized to send observers to all atomic tests and have direct access to AEC personnel for purposes of coordination.
(4) Personnel from The Armored School be utilized as advisors for equipment tests involving the effects of atomic weapons on armored equipment.
(5) All studies relating to "Night Operations" be expanded to include consideration of reduced visibility resulting from dust in atomic detonations.
(6) A study be initiated to determine detection equipment and personnel required to provide commanders at all levels with necessary radiological information. This study should be the responsibility of the Chemical Corps. All arms and services should participate as advisors.

b. Army aviation. (For a detailed discussion see Annex A, PART III.)

(1) That field maintenance detachments accompany Army aviation units which are in the field for extended periods of time.

(2) That 1,200 gallon gasoline trucks be furnished to Army aviation units in the field on the basis of one per four aircraft of the H-19 or L-20 type.

c. Chemical test. (For a detailed discussion see Annex B, PART III.)

(1) That all personnel be required to wear protective equipment for extended periods of time during training in order to acquire a familiarity with this equipment.

(2) That gas masks and hoods be modified to permit use of communications equipment in armored vehicles.

(3) That the present protective clothing be replaced by a single lightweight garment which can be carried in the tank.

(4) That training of armored units emphasize detection, early reconnaissance, and breaching of chemical barriers.

d. Communications. (For a detailed discussion see Annex D, PART III.)

(1) During future atomic tests in which Armor participates, all radios remain "on" during the actual atomic blast.

(2) Only the authorized equipment and standard radio nets be used, in order to obtain a valid test of the effects of atomic radiation on armored radio communications.

(3) The logistical net be adopted for rad-safe use during an atomic attack.

Lawrence E. Schlanser

LAWRENCE E. SCHLANSER
Colonel, Armor
Director

ACTION BY APPROVING AUTHORITY.

HEADQUARTERS
THE ARMORED SCHOOL
Fort Knox, Kentucky

11 AUG 1955

APPROVED.

FOR THE COMMANDANT:

Robert L. Eaton

ROBERT L. EATON
CWO USA
Asst Adj Gen

FINAL REPORT OF TEST

Table of Contents

PART I

INTRODUCTION

ANNEX A - General.

ANNEX B - Sequence of Events.

ANNEX C - Distribution of Report.

PART I

ANNEX A

GENERAL

1. REFERENCES.

a. Letter, ATARM (S), OCAFF, 27 November 1954, subject: "Troop Test, Armor Task Force During Exercise DESERT ROCK VI."

b. Letter, ATTNG-43 354/71 (S) (8 Dec 54), OCAFF, 8 December 1954, subject: "Directive for Exercise DESERT ROCK VI."

c. Letter, AG No 10399, AMGCT-4 354.21 DRVI, Headquarters, Sixth Army, 30 December 1954, subject: "Directive for Exercise DESERT ROCK VI."

d. Letter, ATARM 354 (S), Headquarters, Continental Army Command, 3 February 1955, subject: "Troop Test, Armor Task Force During Exercise DESERT ROCK VI (U)."

e. Letter, ATTNG-TNG 354 (C), Headquarters, Continental Army Command, 4 February 1955, subject: "Exercise DESERT ROCK VI (U)."

f. Letter, AG No 1083, AMGBI-CI 354.2/DR VI, Headquarters, Sixth Army, 7 February 1955, subject: "Directive for Exercise DESERT ROCK VI."

g. Letter, ATTNG-D&R 354 (C), Headquarters, Continental Army Command, 19 February 1955, subject: "Exercise DESERT ROCK VI - 4."

2. PURPOSE.

a. To determine the capability of a reinforced tank battalion in immediate exploitation of an atomic attack to seize an objective, by capitalizing on the combined shock action and casualty effects of attacking armor in conjunction with the atomic explosion.

b. To determine the capability of a reinforced tank battalion in detection, reconnaissance, and reduction of an integrated chemical - antitank minefield.

c. To determine the capability of the Provisional Combat Aviation Company in support of the reinforced tank battalion.

3. OBJECTIVES.

a. Atomic test. To determine:

(1) The feasibility of the reinforced tank battalion being in motion and its movement so timed that no delay will result in the advance of the task force through a blast area.

(2) The minimum distance a reinforced tank battalion can approach ground zero in rapid follow-through of an atomic explosion and suffer no adverse effect on the more vulnerable elements of the battalion.

(3) The maximum time delay involved after an atomic explosion before an armored unit can enter the affected area in exploitation of the effects of a bomb.

(4) Necessary safety precautions required by elements of a reinforced tank battalion in exploitation of an atomic attack.

(5) Field expedients which should be developed or employed to facilitate passage through a blast area.

(6) Best formations, speeds and directions of attack in moving through a target area of an atomic attack.

(7) Most effective organization for combat of a reinforced tank battalion in exploitation of an atomic attack.

(8) Most effective use of artillery and tactical air in conjunction with an atomic attack and armor exploitation of such an attack.

b. Chemical test.

(1) Crew test the M8 Collective Protector.

(2) Determine the capability of an armored task force in breaching and traversing heavy chemical contamination.

(3) Determine the delay incurred in the conduct of an attack when encountering a chemical barrier.

c. Army Aviation participation. To determine the capability of the Provisional Combat Army Aviation Company in providing observation, reconnaissance and troop transport for the reinforced tank battalion.

4. ORGANIZATION OF TASK FORCE RAZOR. Task Force RAZOR was composed of the following units:

723d Tank Battalion (minus one company)
Company C, 510th Armd Inf Bn, 4th Armd Div
1st Platoon, Company B, 510th Armd Inf Bn, 4th Armd Div
Battery A, 22d Armd FA Bn, 4th Armd Div
1st Platoon, Company C, 24th Armd Engr Bn, 4th Armd Div
1st Combat Aviation Company (minus), 1st Armd Div

5. RESPONSIBILITY FOR PREPARATION OF THE FINAL REPORT OF TEST.

a. Atomic test--The Armored School.

b. Chemical test--The Armored School.

c. Overland movement--The Armored School.

d. Army Aviation participation--Aviation Section, The Armored Center.

PART I

ANNEX B

SEQUENCE OF EVENTS

1. 9 March 1955. Elements of 4th Armored Division closed in Camp Irwin, California.

2. 13 March 1955. 1st Combat Aviation Company closed in Camp Irwin, California.

3. 9 March 1955 to 17 April 1955. Task Force RAZOR (723d Tank Battalion reinforced) conducted training in preparation for the exercise.

4. 18 April 1955. Task Force RAZOR departed Camp Irwin enroute to the Atomic Energy Commission Proving Ground, Nevada. The task force marched 46 miles.

5. 19 April 1955. The task force marched 30 miles.

6. 20 April 1955. The task force marched 58 miles.

7. 21 April 1955. Task Force RAZOR marched 20 miles and closed in its assembly area at the AEC Proving Grounds.

8. 21 April to 4 May 1955. The task force engaged in rehearsals for the exercise, training for the atomic and chemical tests, and maintenance of equipment. On three occasions during this period the task force moved to the shot area for the night. However, in each case the shot was postponed due to weather conditions.

9. 5 May 1955. The task force conducted its maneuver in conjunction with the atomic detonation.

10. 7 May 1955. The task force departed the AEC Proving Ground enroute to Camp Irwin and marched 76 miles.

11. 8 May 1955. The task force marched 36 miles and bivouacked in DEATH VALLEY near the northern tip of the Camp Irwin Military Reservation. Individual protective clothing and equipment were issued in preparation for the chemical test.

12. 9 May 1955. The task force marched 35 miles and closed in Camp Irwin. As the task force entered the Camp Irwin Reservation, it participated in the chemical test.

PART I

ANNEX C

DISTRIBUTION OF REPORT OF TEST

12 - Commanding General, Sixth Army
3 - Commanding General, Fourth Army
3 - Commanding General, III Corps
3 - Commanding General, Camp Irwin, California
3 - Commanding General, 1st Armored Division
2 - Commanding General, 2d Armored Division
2 - Commanding General, 3d Armored Division
3 - Commanding General, 4th Armored Division
2 - Commandant, Command and General Staff College
1 - Commandant, Armed Forces Staff College
2 - Commandant, The Infantry School
2 - Commandant, The Artillery School
2 - Commandant, Army Aviation School
1 - Assistant Commandant, The Armored School
1 - G3, The Armored Center (File)
1 - AG, The Armored Center (File)
5 - Combat Developments Group, The Armored School (File)

PART II

ATOMIC TEST

ANNEX A - Operations

ANNEX B - Planning and Operational Problems

ANNEX C - Conclusions and Recommendations

[redacted]

PART II

ANNEX A

OPERATIONS

1. SCHEME OF MANEUVER. (See Inclosure 1.)

a. Although a tactical situation had been devised to lend realism to the actions of the task force, safety considerations imposed by the Atomic Energy Commission, in addition to a ten-day delay in shot time, eliminated all or most of the tactical testing value of this problem.

b. Originally, the scheme of maneuver visualized a reinforced tank battalion of three tank companies and an armored infantry company, supported by a battery of light artillery and a platoon of engineers, attacking on a relatively narrow front to seize two key terrain objectives--the attack to take place immediately after the atomic shot.

c. The attack situation as devised was sound. The enemy situation was realistic. However, the number of rehearsals conducted, and the degree to which the movement of almost every vehicle in the formation had been practiced, removed the spontaneity and freedom of action which normally characterize an armored mounted attack.

2. OPERATIONS.

a. Orientation and Rehearsal. Prior to movement to Camp Desert Rock from Camp Irwin, the task force, having available the scheme of maneuver and outline of attack, was able to conduct detailed rehearsals of task force formation, movement to an assembly area, movement to attack position, attack, and seizure of the objective.

b. Upon arrival at Camp Desert Rock, the task force moved into an assembly area. This location was approximately five miles from the preshot position, a time distance of approximately 1½ hours under strict administrative movement control. In the assembly area an administrative bivouac was maintained. Consequently there were no significant problems of communication, maintenance, or resupply.

3. FORMATION IN PRESHOT POSITION. (See Inclosure 2.)

a. The task force formation used was a line of tank companies in wedge formation. The armored infantry company (mounted) was in line to the rear of the tank companies. Leading tanks were 3200 yards from ground zero, while the armored infantry vehicles were 3900 yards.

b. The armored field artillery battery was located 5000 yards from ground zero. The lack of overhead cover on the M7B2 self-propelled howitzer precluded positioning the artillery in a more advanced position.

c. The armored engineer platoon was 5000 yards from ground zero. Wheeled vehicles of this platoon were not allowed in the preshot position.

[redacted]

4. OCCUPATION OF PRESHOT POSITION.

a. Once vehicles were established in the preshot position, control was exercised by radio until S-30 minutes when all sets were turned off. After S-30, EE8 field telephones were used for control of the task force.

b. Safety measures. All turrets were rotated to the rear, vision devices taped, and all hatches secured by S-10 minutes. No particular safety problems were encountered. However, it is noted that each vehicle commander must require his crew to remain in the vicinity of the vehicle from about S-30 so that all can be accounted for prior to shot time.

c. The detailed steps taken to occupy the preshot position ensured exact positioning, maximum control, and assurance that the task force could move as a unit after the shot. This, however, without extensive cover and concealment and sufficient space to deploy in combat formation would be impossible in a combat situation.

d. The battalion reconnaissance platoon and simulated mortar platoon of the tank battalion were not included in forward positions during the attack phase since the wheeled vehicles organic to these platoons are unarmored.

5. SHOT TIME.

a. The original plan contemplated movement of the task force at shot time plus nine minutes. Actually, movement occurred after 44 minutes. The order to attack, transmitted by radio, was heard by all units. It would further appear that this movement time could have been reduced had it not been for a requirement that the task force await AEC permission to turn on radios.

b. There was no damage to tanks of Task Force RAZOR. Most of the engine and fan access panels were dislodged in the M59 vehicles. However, this damage was minor and required only straightening of the panels and replacement.

c. Moving at an average speed of from 2 to 6 miles per hour, the task force experienced no major difficulty and was able to maintain control until it reached its objective. Dust conditions made it necessary for some tanks to turn on blackout driving lights to enable those in the rear to establish their relative positions. Visibility for the first 10 to 15 minutes was reduced to about 500 - 800 yards.

d. Rad-Safe personnel located in vehicles on the extreme right flank of the task force controlled movement and indicated when a reading of 10 Roentgens per hour was received, at which point the task force executed a partial left turn. It appears that Rad-Safe personnel will be required to collect and interpret Rad-Safe information and supervise decontamination. Their location and composition will depend on the situation. Some observers believe that such teams should be attached to a tank battalion sufficiently in advance of an operation such as this to ensure their familiarity with over-all battalion operations. Strengths should possibly be one Rad-Safe man per platoon, one per company, and three per battalion headquarters. Other observers suggested adding Rad-Safe organic personnel to the battalion strength. However, for a permanent organizational structure neither of these solutions appears

desirable. It would be entirely feasible, and save manpower, to qualify at least one crew member per vehicle as a radiation monitor in addition to his other duties. With standard, simplified training procedures, and with uncomplicated detection devices, all crew members could qualify as monitors. This subject is one for separate study concurrent with an equipment study to determine allocation to units, maintenance levels, and resupply of all radiation detection materiel. Although Rad-Safe personnel in this problem used a separate radio frequency, they could, under combat conditions, use normal command frequencies. Such is considered preferable, tactically. For this exercise, a separate frequency was adopted only as an added precautionary measure.

6. CONDUCT OF THE ATTACK.

a. Troop reaction. Because of the degree of orientation which participating troops had received, it was apparent that all of them felt a psychological tightening prior to the actual shot. This had been gradually built up over the period of delay which had taken place. After the shot, observers agreed there was some disappointment that its effects had been so relatively light. However, after the troops had had time to think about the problem and their experiences, there was created a sudden upsurge in the individual's confidence in his vehicle, his training, his unit, and his safety even had he been much closer to ground zero.

b. Control problems. There is every indication that present communication facilities are adequate. Radios functioned perfectly; however, when operating buttoned up in proximity to an atomic blast, it is impossible to use emergency visual signals. Consideration might well be given to the development of a type of external signaling device which can be operated as well as seen from within a tank turret. Since task force radios were not operating at the time the shot was detonated, future tests might also include examination of effects on operating tank mounted radio equipment and transmission facilities during a shot.

c. Traversing tank turrets to the rear proved effective in preventing damage of optical instruments. It takes only about eight seconds to traverse the turret 180° and consequently does not affect the over-all forward firing efficiency of tanks once the shot is detonated.

d. Dust reduces visibility in the zone of attack. This condition is aggravated by the destruction of local landmarks, and, in buttoned-up vehicles, by the limited all-around vision provided the vehicle commander. Training in night driving and in retaining formation and direction in heavy dust is very helpful. However, only an actual atomic detonation will provide optimum training.

e. Response to orders was prompt, indicating a high degree of training in the task force. It is imperative that crews be trained to start vehicles promptly and to commence firing within seconds after the blast.

f. Two M59 vehicles were temporarily lost to control of the formation and moved to within about 900 yards of ground zero. However, they were recovered quickly and rejoined the task force without difficulty.

g. Disabled vehicles were evacuated successfully from near ground zero in this exercise. Evacuation might pose a serious problem in more heavily-contaminated areas. Recovery crews should be schooled to stay with their vehicle is possible and to effect recovery promptly. While it would be best that this be accomplished without anyone dismounting from the recovery vehicle, or from the damaged one, such action is not possible with our present equipment.

h. Vehicular operations. As noted above, except for the fire walls between the engines and crew compartment of the M59, no damage was noted. A more reliable method of mounting or strengthening the panels would eliminate this deficiency.

i. Except for initial lack of visibility compensated to a great degree by strict radio control, no particular difficulty was experienced in the conduct of the attack. The task force moved to the objective, a distance of approximately four miles in 57 minutes, with the tank guns and coaxial machine guns firing at every opportunity.

7. TACTICAL OBSERVATIONS. The tactics of this particular problem were subordinated to the desire for actually positioning of an armored unit close to ground zero. Despite this limited application, there are certain fields in which research is indicated.

a. Desirability of an attack position. Present doctrine contemplates last-minute preparation in an assembly area for movement to an attack position. In the attack position, units deploy in an initial combat formation and, after spending a minimum of time, cross the line of departure. Even this relatively short period of time provides a concentration which might be a suitable target for an enemy atomic weapon. In order to reduce or remove this last-minute check, it might be well to consider elimination of the attack position as such, and require the armored unit to move out of a forward assembly area and, without pause, cross the line of departure for the attack. If it is possible to coordinate the movement with the employment of atomic weapons in a given situation, the forward momentum would not be broken. Even with present tanks and armored infantry vehicles, this might be accomplished by the use of disposable fuel tanks which would carry vehicles from the forward assembly area to the line of departure, where fuel tanks could be jettisoned and all armored vehicles would then move into the attack phase with full fuel tanks.

b. While further testing must be carried on, it is clear that forward tank elements can be much closer to ground zero during detonation of a weapon of this yield without ill effects on either vehicle or crew.

c. While dust and temporary conditions of bad visibility can be expected in the vicinity of ground zero, adequate blackout training and employment of night offensive operations technique will compensate for much of this deficiency. Also, by rapid forward movement through and out of the blast area, the period of poor visibility can be reduced significantly.

d. Rad-Safe equipment is necessary in forward elements; however, further study should be given to the desirability of adding additional personnel qualified as Rad-Safe monitors to the tank battalion, as opposed to training organic personnel in radiological detection to be performed as an additional part of their T/O&E assignment.

e. Even though administrative controls applied during this exercise negated some of its tactical value, the over-all operation was a significant advance in the development of armored attacks. The results proved conclusively that present day armor equipment has a high degree of suitability for employment with atomic weapons and provides a logical basis on which further and extensive research can be made.

f. If reconnaissance, artillery, and engineer troops, normally considered as part of the combined-arms team, are to be well forward in an attacking formation, the provision of adequate armor protection and overhead cover against blast, heat, and radiation effects is obvious. Lacking such equipment, and applying the experience of this exercise to a combat command attacking with task forces abreast, the depth of the combat command formation must be increased over than now considered normal in order to provide protection for these elements.

g. In offensive operations, if maximum use is to be made of the speed of the armored formation, the general attack plan must be coordinated closely with the employment of the atomic weapon to ensure maximum advantage in the time distance factors, once the shot is detonated. This requires close approximation of ground zero, and the extent of the blast area.

h. In defensive operations, further testing should be aimed at the development of a more accurate weapons effect scale which the commander can use to estimate his losses, given the factors of troop composition, vehicular equipment, dispersion distance, and known enemy capability to deliver specific type weapons in a given area.

[redacted]

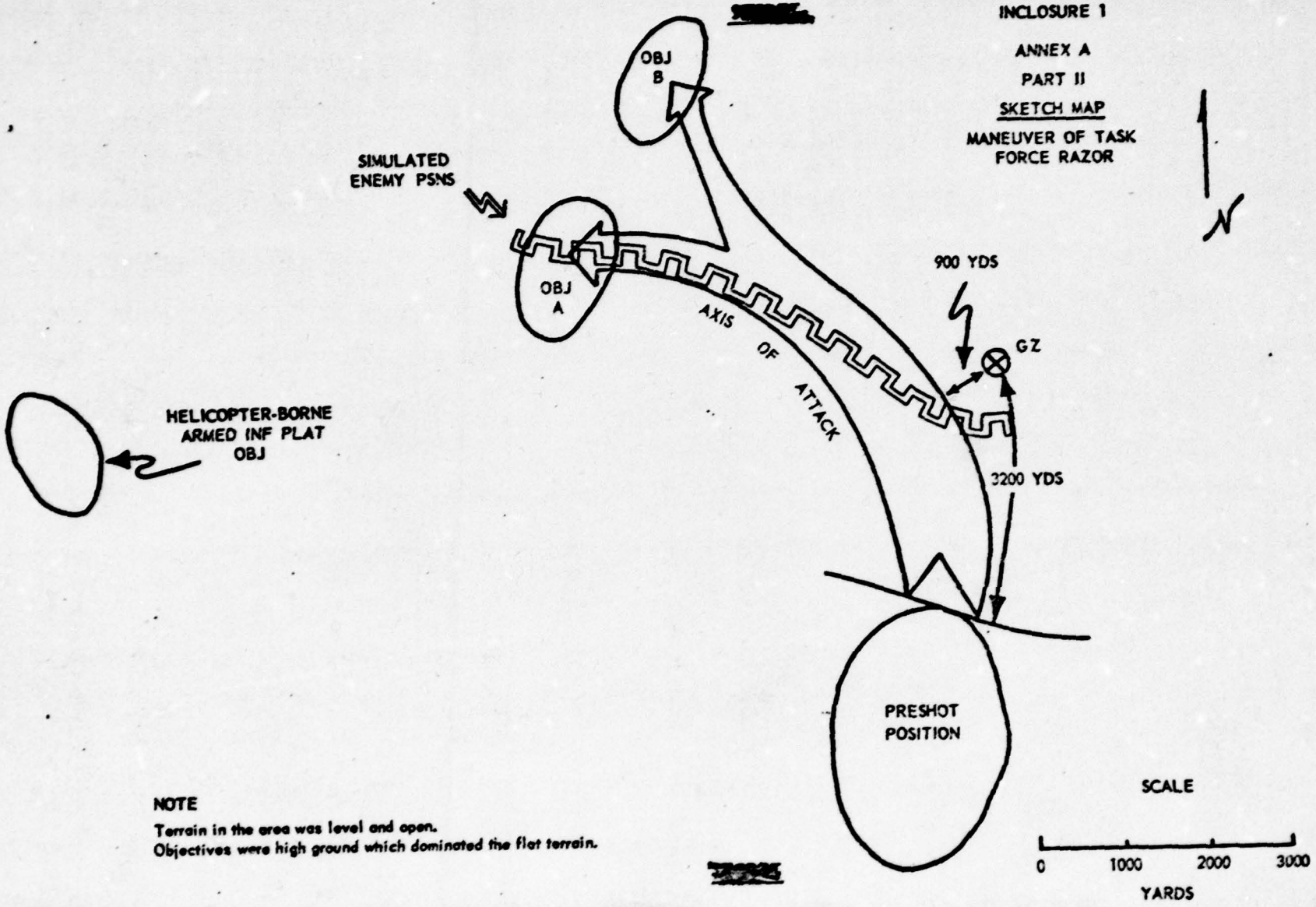
INCLOSURE 1

ANNEX A

PART II

SKETCH MAP

MANEUVER OF TASK FORCE RAZOR



NOTE

Terrain in the area was level and open.
Objectives were high ground which dominated the flat terrain.

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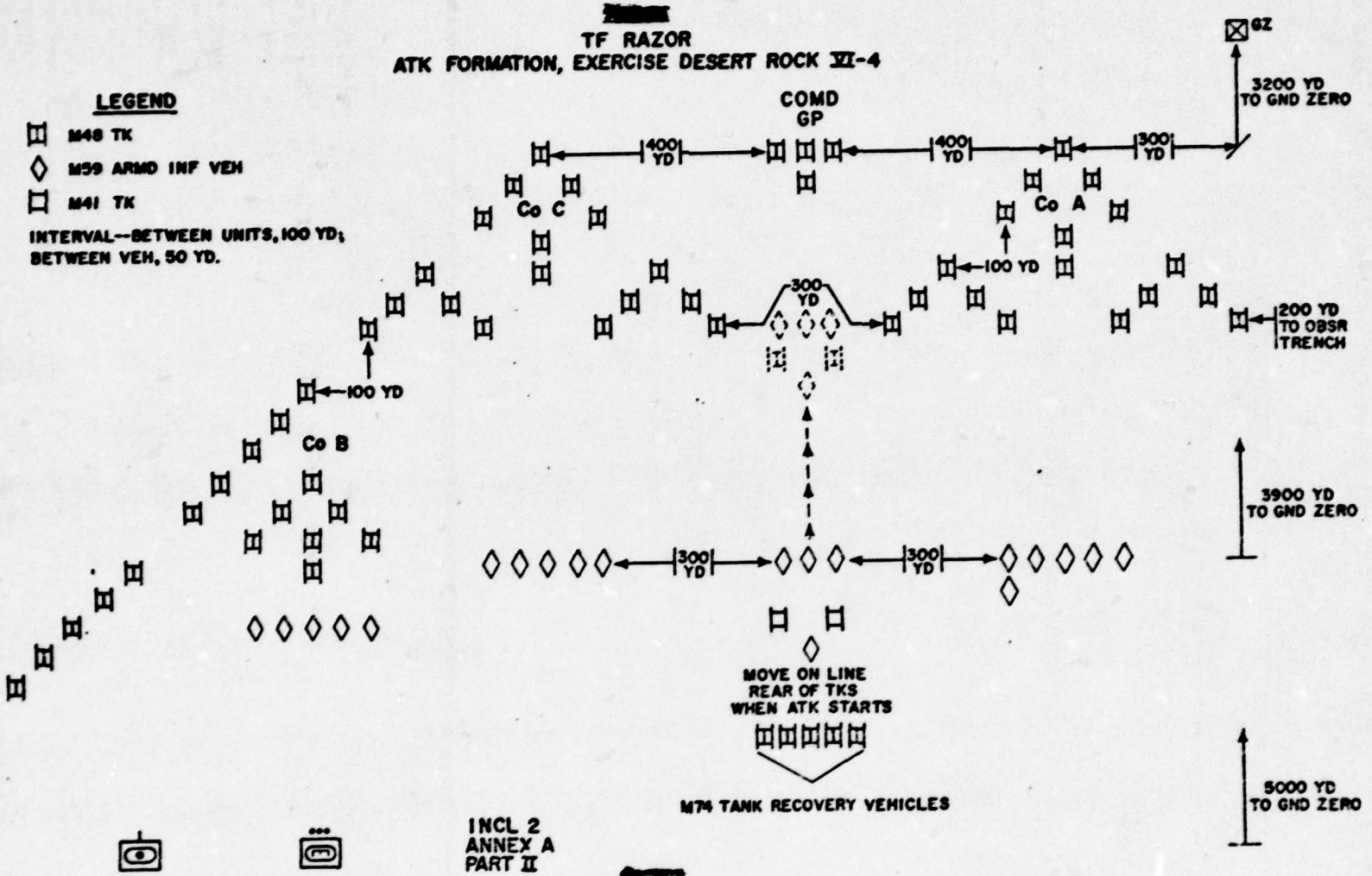
TF RAZOR

ATK FORMATION, EXERCISE DESERT ROCK XI-4



INCL 2
ANNEX A
PART II

[redacted]

PART II

ANNEX B

PLANNING AND OPERATIONAL PROBLEMS

1. RESTRICTIONS. The only restrictions encountered during this operation were in connection with the atomic test. These restrictions may be divided into tactical and administrative restrictions.

a. Tactical restrictions (Atomic Energy Commission).

(1) The scheme of maneuver in the vicinity of ground zero was limited to the area available to the Army. Large segments of the area around ground zero were assigned to the Federal Civil Defense Administration and Army elements other than the task force. This situation forced the adoption of an unrealistic maneuver.

(2) No task force movement was permitted in the test site after 2200 hours the day before the shot. This restriction prevented the normal tactical movement from the assembly area to the attack position. It also forced the adoption of a static position during the detonation.

(3) The task force was required to effect radio silence not less than 30 minutes prior to the detonation. This restriction necessitated the use of telephone communications between all vehicles of the task force. Obviously in armored units this is an unreal situation.

(4) Task force vehicular engines were not permitted to operate later than 30 minutes prior to shot time. This restriction necessitated starting the vehicular engines after the actual detonation.

(5) The task force was not permitted to pass directly through ground zero. AEC instrumentation and the possibility of exceeding stringent safety limits for possible excessive contamination of vehicles were the reasons for this restriction.

(6) The task force was not permitted to continue to attack in a single direction. Instruments and cameras located northwest of ground zero forced the task force to turn approximately 90° in the vicinity of ground zero and attack an objective located almost due west of ground zero.

b. Tactical restrictions (Army). The Army criteria for exposure of personnel to nuclear radiation was the only limitation that might have affected the tactical employment of the task force. This limitation was negated by the presence of AEC instruments in the vicinity of ground zero.

c. Administrative restrictions (AEC).

(1) The main supply route connecting the task force with Camp DESERT ROCK was blocked by AEC security guards. No prior notification of this restriction was received. It had been assumed that the task force was within the AEC test site in its assembly area. Following

arrival in the assembly area, an AEC security guard was posted on the route leading from the assembly area to the attack position. This route was also used as an MSR prior to the atomic test. To traverse the security guard barrier, it was necessary to obtain AEC badges for all drivers of individual vehicles and personnel not driving in convoy. Rosters of personnel in convoys were prepared and were checked by the security guard when these convoys passed through the barrier. The only alternate route followed the trail which the task force had used to enter the area. It was approximately 60 miles long and was a cross-country road. Maximum speed of wheeled vehicles on this route was approximately 6 miles per hour.

(2) No one was permitted to remain within the barrier overnight except when the shot was scheduled for the following morning. Vehicles were left in position without guards during these periods.

d. Administrative Restrictions (Army). There were no Army restrictions on administrative operations.

2. EQUIPMENT AND PERSONNEL. The task force was subjected to several personnel levees after arrival at the test site. These levees reduced the efficiency of the task force and imposed the burden of returning such personnel to Camp Irwin for processing.

3. FUNDING.

a. A clearer delineation of the responsibility for budget preparation would have overcome some of the initial funding difficulties. The directive left some question as to the headquarters responsible for preparing budget estimates. The addition of elements to the task force, subsequent to publication of the directive, complicated the funding problem.

b. The decision to deny payment of per diem to personnel involved as observers and planners imposed an unnecessary financial burden on individuals concerned.

4. PROCEDURAL PROBLEMS.

a. The project officer from the Combat Developments Group, The Armored School, was not permitted to make direct contact with AEC officials. This resulted in a series of problems that were obviously due to the incomplete briefing of AEC officials.

b. The test directive did not specify a single commander as the officer responsible for the over-all conduct of the test. This resulted in delayed decisions during early planning stages.

[redacted]

PART II

ANNEX C

CONCLUSIONS AND RECOMMENDATIONS

1. CONCLUSIONS. Although there are many minor conclusions which can be deduced of a commendable or deficient nature concerning equipment and operational procedures, the following are believed to represent the most significant, arranged in order of approximate priority:

a. The tactical play of this exercise was severely restricted and thus proved to be relatively unimportant. However, the over-all test was of tremendous importance. The results of this test, and the favorable reaction it created among personnel in building faith and confidence in equipment of the Task Force should serve as full justification for more detailed and extensive investigation and testing.

b. The Armored School should be an active participant in future tests of armor equipment and should be at least an observer of future military atomic tests and have direct access to AEC personnel for the purpose of coordination.

c. With the development of jettisonable auxiliary fuel tanks (or with considerable improvement in the daily battle hours of operation) armored units can be expected to de-emphasize the necessity for an attack position as now known. In lieu thereof, an advance assembly area should be utilized from which armored units would move out in combat formation.

d. Movement through or near ground zero can be accomplished efficiently using the same techniques adopted for night operations; dust conditions create low visibility similar to conditions encountered at night.

e. An equipment and personnel study should be made to determine:

(1) Distribution in the armored division of radiation detection materiel.

(2) The most effective method for training as many crew members as possible to act as radiation monitors; subsequently, this training should be given to all officers and enlisted men of the armored division.

f. The results of this exercise lend increased emphasis to the requirement for simplification of the system for determining effects of atomic weapons.

g. It was impossible to fulfill many of the CONARC objectives as outlined in the test directive. The terrain available in the vicinity of ground zero and restrictions imposed by the Atomic Energy Commission were the primary reasons for this inability. A short commentary on each objective follows:

[redacted]

(1) The restriction imposed on task force movement immediately prior to the detonation prevented determination of the capability of the reinforced tank battalion to be in motion and its motion so timed that no delay will result in advance of the task force into a blast area. By observation of the task force movement, it appears probable that such timing is possible. Freedom of action in future tests would permit positive determination of this capability.

(2) Movement of a reinforced tank battalion into proximity of ground zero is determined by the height of burst of the weapon. In this particular test the height of burst was extremely low for a weapon of this yield. However, instrument readings in the vicinity of ground zero indicated that the task force could have passed directly through ground zero with little, if any, danger to personnel in armored vehicles. This statement does not apply to the wheeled vehicles of the task force.

(3) In subject test, no time delay would have been required before the armored unit could enter the affected area to exploit the effects of the device.

(4) The only precaution that a reinforced tank battalion need take in moving to exploit an atomic attack is to insure the use of radiac survey instruments to avoid excessive contamination.

(5) No field expedient is required to facilitate passage through a blast area in terrain similar to that found in the test site. Heavily wooded terrain would probably be impassible in the vicinity of ground zero.

(6) The speed and formation of the task force is influenced by the terrain and enemy in the vicinity of ground zero rather than by the effects of the atomic detonation. The atomic blast has no effect on the direction of attack.

(7) Any normal organization for combat is suitable for the reinforced tank battalion when exploiting the atomic attack.

(8) Artillery can be employed in the traditional manner to support the reinforced tank battalion in exploitation of an atomic attack. Overhead armor protection for artillerymen would increase the flexibility of this support by permitting placement of artillery closer to expected ground zero. Tactical air was not available for the test, therefore no determination of limitations on such support is possible.

2. RECOMMENDATIONS. The following recommendations pertain to the "Atomic Phase" of this operation.

a. The Army utilize every opportunity to include armored units in future atomic tests.

b. Future tests permit more freedom of action for participating Army units. Restrictions on movement prior to, during, and after the detonation be based on safety only. Operation of radios and engines not be interrupted.

c. The Armored School be authorized to send observers to all atomic tests, and have direct access to AEC personnel for purposes of coordination.

[redacted]

d. Personnel from The Armored School be utilized as advisors for equipment tests involving the effects of atomic weapons on armored equipment.

e. All studies relating to "Night Operations" be expanded to include consideration of reduced visibility resulting from dust in atomic detonations.

f. A study be initiated to determine detection equipment and personnel required to provide commanders at all levels with necessary radiological information. This study should be the responsibility of the Chemical Corps. All arms and services should participate as advisors.

[redacted]

PART III

SPECIAL TESTS

ANNEX A - Army Aviation

ANNEX B - Chemical Test

ANNEX C - Overland March

ANNEX D - Communications

[redacted]

PART III

ANNEX A

ARMY AVIATION

1. GENERAL.

a. During the period 18 April 1955 to 5 May 1955 the 1st Combat Aviation Company (Provisional) participated in the test of the Armored Task Force in Exercise DESERT ROCK VI.

b. Purpose. Army aviation participation was designed to determine the capability of the combat aviation company (-) in support of a reinforced tank battalion during the exploitation of a friendly atomic detonation.

c. Organization. The 1st Combat Aviation Company (Provisional) consisted of:

(1) Nineteen officers and 28 enlisted men.

(2) Seven H-19D Helicopters.

(3) Three H-23B Helicopters.

(4) Three L-19A aircraft.

(5) Three L-20A aircraft.

(6) Four ¼-ton trucks with trailers.

(7) Two 2½-ton trucks.

(8) One 1½-ton trailer.

(9) One 2½-ton truck, fuel, 1,200 gallon.

2. SUMMARY OF OPERATIONS.

a. During the period 13 March 1955 to 28 March 1955 the company was employed in Operation SURFBOARD at Hunter Liggett Military Reservation, California.

b. From 28 March 1955 to 17 April 1955, the company engaged in training with Task Force RAZOR in preparation for Exercise Desert Rock. This training included three field exercises and familiarization flights over the route to Camp Desert Rock, Nevada. During this period the company also performed numerous administrative flights for Headquarters, Camp Irwin.

c. During the period 18 April 1955 to 21 April 1955, the company participated in the overland movement of Task Force RAZOR from Camp Irwin, California, to Camp Desert Rock, Nevada. High winds on 18 April limited the employment of fixed wing aircraft. Missions accomplished by the company during the move included:

[redacted]

(1) Airlifting a dismounted armored infantry platoon with H-19's to seize critical terrain features ahead of the main body.

(2) Column control and radio relay with L-19's and H-23's.

(3) Airlifting of engineer spanners to points where the route of march crossed hard-surfaced roads.

d. From 21 April 1955 to 4 May 1955 the company was based at the Camp Desert Rock airstrip. Operations during this period included rehearsals for the atomic shot and administrative flights in support of Task Force RAZOR and Headquarters, Camp Desert Rock.

e. On D-1, 4 May 1955, the company moved to the YUCCA LAKE airstrip in preparation for the shot. The airstrip was 16,000 yards from ground zero.

f. On D-Day, 5 May 1955, all aircraft remained on the ground until shot +3 minutes. At this time one L-19 took off to provide observation and radio relay for Task Force RAZOR. Two H-23's took off to evacuate simulated casualties from the task force. One H-19 was used to mark the task force objectives as a control measure.

g. At shot +9 minutes, six H-19's, each carrying six combat equipped troops, airlifted the dismounted armored infantry platoon to an objective on the left flank of the task force.

h. At shot +40 minutes, five H-19's, two L-20's, and one L-19 airlifted supplies from YUCCA LAKE to the task force objective.

i. On the afternoon of 5 May 1955, the company was released from task force control and began preparations for the return to Fort Hood, Texas. Three L-19's remained to support the task force during its return march to Camp Irwin, California.

3. DISCUSSION.

a. Maintenance and Supply.

(1) Only a 15-day stock level of parts was carried by the company. Since the company was away from Fort Hood for 57 days, supply became a serious problem.

(2) Maintenance was handicapped by a lack of shelter, high winds, and dust.

(3) Aircraft parts were drawn from Sharpe General Depot, Stockton, California, and from Fort Hood, Texas. Parts for H-19's were not available in the Sixth Army Area.

(4) Transportation maintenance organizations in the Sixth Army area were not equipped to perform field maintenance on H-19's. In some cases aircraft had to be flown to Norton Air Force Base, San Bernardino, California, for field maintenance. There the work was accomplished by company mechanics, using tools and equipment available at the air base. After the company moved to Camp Desert Rock, field maintenance was accomplished by a Transportation Maintenance Detachment from Stockton, California, which established facilities at Nellis Air Force Base, Las Vegas, Nevada.

(5) The supply of POL was limited by the gasoline carrying capacity of the company. The one 1,200-gallon gasoline truck and the 5-gallon cans which could be carried were inadequate.

b. Operations.

(1) Operations were limited only by the weather and restricted maintenance facilities. However, all task force missions were accomplished without difficulty.

(2) H-19s were able to safely carry only 6 combat-equipped soldiers, instead of 7, since the terrain exceeded 5,000 feet in elevation.

(3) On D-Day some difficulty was encountered due to reduced visibility caused by the dust from the blast effect. However, by shot +40 minutes, dust was no longer a problem. No take-offs were postponed or cancelled because of dust.

(4) As a safety measure all aircraft doors and windows were opened before the blast. There was no damage, to aircraft, except that windows in the cargo compartments of the H-19's were dislodged by the blast wave. These windows were easily pushed back into position.

(5) During the period 18 April to 5 May, the company flew a total of 558 hours.

4. CONCLUSIONS.

a. Field maintenance facilities available to the company were inadequate.

b. Facilities for resupply of POL were inadequate.

c. The company successfully performed its mission of supporting the armored task force during the exercise.

d. Army aircraft can operate in close proximity to ground zero immediately following an atomic detonation.

e. Army aircraft may be located on airstrips 16,000 yards from a 40 KT atomic detonation with no material damage to aircraft.

5. RECOMMENDATIONS.

a. That field maintenance detachments accompany Army aviation units which are in the field for extended periods of time.

b. That 1,200-gallon gasoline trucks be furnished to Army aviation units in the field on the basis of one per four aircraft of the H-19 or L-20 type.

[redacted]

PART III

ANNEX B

CHEMICAL TEST

1. GENERAL. On 9 May 1955 as Task Force RAZOR entered the Camp Irwin Reservation on its return-march from the Nevada Proving Ground, it encountered an integrated chemical-antitank minefield. The minefield blocked the route of march and could not be by-passed. The test was designed to provide observation and evaluation of:

a. Necessary reconnaissance and detection of the contents and limits of the barrier area, including identification of the toxic agents utilizing the M9A2 detector kits.

b. Reduction of and/or passage through the carrier, marking for following troops, and if necessary, minor decontamination to make traversing the field feasible.

c. Institution of proper individual and collective protective measures including use of the M8 collective protector in those vehicles in which it was installed.

d. Decontamination of personnel and equipment after passage of the contaminated area.

e. First aid measures and evacuation, if necessary.

2. PREPARATION FOR THE TEST.

a. The 50th Chemical Service Platoon filled, emplaced, and detonated the chemical mines and decontaminated the area after the test. HD (distilled mustard) portions of the minefield were detonated at 081530 May. MR (molasses residium) mines were detonated at 090800 May. The flanks of the barrier consisted of HD mines. These mines provided sufficient vapor concentration on the trail passing through the center of the minefield to permit detection with the M9A2 detector kit. The center of the barrier consisted of MR mines and practice antitank mines.

b. The location and time of detonation of the HD mines were planned to avoid liquid contamination of participating personnel. Weather conditions during the period were unstable and dissemination of liquid in the area was so timed as to eliminate danger from vapor without appreciably detracting from the test. Records extracted from laboratory data (FM 3-5, TM 3-215) were used as a basis for the amounts of toxics and time of dissemination.

c. M8 collective protectors were installed in 21 tanks of the task force prior to departure from Camp Irwin. Seventeen of these tanks were in Company B, 723d Tank Battalion, which was the leading element of the task force during the chemical test. All other elements of the task force used the M9A2 gas mask. Pre-test chemical training was conducted prior to departure from Camp Irwin and while at the Nevada Proving Grounds.

[redacted]

d. Class II protective clothing and individual protective equipment were issued to the task force in their bivouac area in DEATH VALLEY on 8 May 1955. The issue and fitting of this clothing and equipment required four hours.

e. On the day of the test, a decontamination station and limited first aid facilities were established near the barrier by the 50th Chemical Service Platoon. A check point was located 1600 yards from the barrier to inspect the fit of clothing and masks of participating personnel before they entered the contaminated area.

3. CONDUCT OF THE TEST.

a. The advance guard, a tank platoon, reached the barrier at 090915 May. This platoon proceeded through the contaminated area without halting and had to be ordered to return to the near side of the barrier. The task force commander was informed of the barrier at 0948 hours.

b. Proper reconnaissance and identification measures were then taken by the leading elements. The vapor concentration remaining in the area was so slight as to make detection difficult. Strong lapse conditions coupled with very low winds limited vapor to the immediate area of dissemination. For safety reasons reconnaissance of the area was limited to 100 yards on either side of the main trail.

c. Leading elements opened fire with blank ammunition to neutralize simulated enemy positions in the vicinity of the barrier. However, there was some delay in engaging the enemy. Simulated artillery fire was initiated at 1003 hours.

d. Armored engineers were brought forward and initial breaching of the barrier was completed at 1132 hours. A bulldozer was used to clear a lane through the barrier. The lane was properly marked.

e. The main body began moving through the barrier at 1152 hours. All elements of the task force had cleared the barrier by 1400 hours.

f. Protective clothing and masks were worn by all personnel until they were checked for contamination at a point 3 miles beyond the barrier. No decontamination of personnel or vehicles was required. The check for contamination was completed at 1440 hours.

g. There were no gas casualties during the test. However, five individuals became ill from wearing gas masks and rubber hoods.

h. The 50th Chemical Service Platoon completed decontamination of the barrier area at 1645 hours.

4. CONCLUSIONS.

a. Personnel were handicapped in their operations by insufficient practice in the use of protective equipment. Casualties mentioned in paragraph 3g would have been reduced if personnel had been more familiar with the equipment.

b. The M9A2 gas mask is not suitable for use in armored vehicles because of the difficulty experienced in using communication equipment.

c. The rubber hood is not suitable for use with the collective protector face-piece because of design differences.

d. The face-piece for the collective protector (M8) should be modified to provide a headset and arranged so that the chest set may be worn on the outside of the hood.

e. With the exceptions noted above, the M8 collective protector is satisfactory for use in armored vehicles.

f. The protective equipment used by the task force is so bulky that it presents a serious problem in storage and transportation within the battalion.

g. Leading elements of the task force did not rapidly engage the enemy and reconnoiter and breach the barrier.

5. RECOMMENDATIONS.

a. That all personnel be required to wear protective equipment for extended periods of time during training in order to acquire a familiarity with this equipment.

b. That gas masks and hoods be modified to permit use of communications equipment in armored vehicles.

c. That the present protective clothing be replaced by a single lightweight garment which can be carried in the tank.

d. That training of armored units emphasize detection, early reconnaissance, and breaching of chemical barriers.

[redacted]

PART III

ANNEX C

OVERLAND MARCH

1. The overland march of Task Force RAZOR from Camp Irwin, California to Camp Desert Rock, Nevada provided an excellent test of the operational performance of the M48 medium gun tank and M59 armored infantry vehicle. The distance from Camp Irwin, California, to Camp Desert Rock, Nevada, is approximately 160 miles. The route of march passed over terrain composed of eroded desert flats and mountain ranges up to 5000 feet in elevation. Most of the route was cross-country for the tracked vehicles.

2. The march from Camp Irwin to Camp Desert Rock took four days. This march included a number of tactical situations which required the task force to deploy and eliminate simulated enemy resistance. The average rate of march was 7.9 miles per hour.

3. The return march to Camp Irwin followed the same route. However, with the exception of the chemical test on the last day, the return trip was an administrative march. The return march took three days. The average rate of march was 8.5 miles per hour.

4. The task force included the following vehicles:

55 - M48 tanks.
2 - M41 tanks.
5 - M74 tank recovery vehicles.
1 - M75 armored infantry vehicle.
25 - M59 armored infantry vehicles.
4 - M7B2 self-propelled howitzers.
1 - D7 caterpillar.
1 - 5-ton tractor with trailer.
1 - 5-ton tractor with 25-ton towboy trailer.
2 - 5-ton dump trucks.
1 - 2½-ton tractor with 10-ton van.
4 - M62 wreckers.
5 - M34 2½-ton trucks.
10 - M37 3/4-ton trucks.
2 - M42 ambulances.
6 - M170 ¼-ton ambulances.
7 - M38A1 ¼-ton trucks.
48 - M38 ¼-ton trucks.
2 - M34 gasoline tanker trucks (1200-gallon capacity).
56 - M135 2½-ton trucks.

5. MAJOR BREAKDOWNS. Listed below are the major assemblies which were replaced during the exercise, including the overland march and return, and the period spent at the Nevada Proving Ground.

a. Six AV 1790 engines were replaced in M48 tanks for the following reasons:

(1) Engine locked. Probable cause was failure of the driver to check for hydrostatic lock.

[redacted]

(2) One engine replaced due to low oil pressure.

(3) Two engines replaced due to mechanical failure of quill shafts and accessory drives.

(4) One engine replaced due to low compression.

(5) One engine replaced because of a broken piston.

b. One transmission CD850 was replaced due to failure of the convertor. This failure was caused by missing inspection plates under the tank which allowed dirt to clog the oil coolers.

c. One engine was replaced on an M59 armored infantry vehicle due to low compression.

d. The following assemblies were replaced on wheeled vehicles:

(1) Truck, 2½-Ton, M135--Five engines and three transmissions.

(2) Truck, ¼-Ton, M38--Two engines and one transfer case.

(3) Truck, ¼-Ton, M38A1--One front differential.

6. FIRST AND SECOND ECHELON MAINTENANCE.

a. Throttle cross shafts were frozen on two M59 armored infantry vehicles due to drivers' leaving off drain plugs.

b. One differential output propeller shaft universal on an M59 armored infantry vehicle broke.

c. Most carburetors on M59 armored infantry vehicles started flooding on the first day in the dust because of the plastic needle bearing in the carburetor. These were replaced with steel needle bearings by the factory representative and functioned satisfactorily.

d. One M59 armored infantry vehicle had a leaking carburetor which allowed the fuel pump to fill the crankcase with gasoline. After the gasoline was drained and fresh oil was added, the carburetor caught fire.

e. The alternator bearings on M59 armored infantry vehicles were affected by the metallic dust common to the desert.

f. An M48 tank starter was burned out by a driver continuously running the starter when the fuel pump was inoperative.

g. The self-aligning bearings on throttle linkage and shafts of most M48 tanks were frozen.

h. Bearings on two engine cooling fans of M48 tanks were burned out.

i. Eight transmission oil cooler lines on M48 tanks were replaced.

j. Two transmission oil cooler lines on M48 tanks were replaced.

k. Two steel idlers were replaced on M7B2 self-propelled howitzers.

7. *FUEL CONSUMPTION.* See Inclosure 1. Fuel consumption of M48 tanks was carefully checked during the overland march. Tanks were refueled from 5-gallon cans. Listed below is the fuel consumption for the M48 tank as determined during the march. Differences between the going trip and the return trip are attributed to the lack of tactical maneuvering on the return and consequent increased rate of march.

a. Gallons per mile, going trip: 4.6.

b. Gallons per mile, return trip: 4.1.

c. Total trip: 4.2 gallons per mile.

8. COMMUNICATIONS. See Annex D, Part III.

FUEL CONSUMPTION - M48 TANKS

	Camp Irwin to Desert Rock (Sample of 15 M48 Tanks)							Desert Rock to Camp Irwin (Sample of 10 M48 Tanks)							
Date	18 April		19 April		20 April	21 April	Total Trip Up	7 May			8 May	9 May		Total Return Trip	Total Trip
Refueling Halt	1	2	3	4	5	6		7	8	9	10	11	12		
Mileage	10	36	30	27	31	20	154	29	30	17	36	24	11	147	301
Gasoline per mile 1/ 3/ (Aver. per tk)(gals)	5.1	4.2	4.9	4.6	4.0	5.3	4.6	3.8	3.6	4.5	3.4	4.5	6.9 2/	4.1 2/	4.2 2/
Operational Hours (Aver. per tk) (Actual movement time)	1.5	4.5	3.4	3.9	3.9	2.4	19.6	2.8	3.1	1.9	3.7	3.2	1.3	16.0	35.6
Rate (Miles per hr)	6.6	8.1	9.1	7.0	7.9	8.1	7.9	10.2	9.8	8.8	10.1	7.7	8.9	8.9	8.5
Average Mileage Between Refueling Halts							25.7							24.5	25
Average Daily Hours of Operation							4:9							5.3	5.1
Longest Day's March							58							76	76

1/. Five-gallon cans were used to refuel the tanks, and the fuel consumption figures shown above were based on 5 gallons per can. Actually, some cans were not full. Opinions of several officers and men of the task force, as well as inspection of cans at refueling halts, indicate than an average of 4 to 4.5 gallons per can would be close to reality. The following figures are based on 4 and 4.5 gal per can:

	4.5 gal per can	4 gal per can
Total, trip up:	4.1 (gal per mile)	3.7
Total, trip back:	3.7	3.3
Total, trip	3.8	3.4

2/. The figure of 6.9 gallons per mile for this stretch--flat, open terrain, partly downhill--is undoubtedly incorrect. Possibly the tanks were not filled at halt Nr 11, which would be reflected in the refueling of halt Nr 12. In any case, the over-all figure for total gas consumption--up, back, and for the trip--was computed from the total cans recorded by each tank crew for the total trip, or trip up and back, divided by the number of miles traveled. We are fairly safe in assuming that the tanks were filled at the start, at the end of the trip up, just before the trip back, and at the end of the entire march. A particular point had been made by ORO, the Fort Knox contingent, and by the battalion officers that tanks be filled at each halt--and certainly prior to and at the end of each half of the trip.

3/. This includes idling time.

NOTE: This table was extracted from "Preliminary Report, Tank Fuel Consumption, Tank Breakdowns, DESERT ROCK VI" published by ORO, The Johns Hopkins University, on 26 May 1955.

PART III

ANNEX D

COMMUNICATIONS

1. PURPOSE. To evaluate the effectiveness of the organic communication system of a reinforced tank battalion on an extended cross-country march, culminating with an attack through an area devastated by an atomic blast.

2. GENERAL.

a. During the armored task force participation in DESERT ROCK VI, the following specific areas relative to the functioning of the communication system of a reinforced tank battalion operating independently over extended distances were observed:

(1) The effects of weather and terrain on communication.

(2) The employment of the organic communication equipment to include its systems, operations, and maintenance.

(3) The effects of a nuclear detonation on radio transmissions and installed signal equipment.

b. The communication portion of this test was studied for the purpose of recommending changes in Armor communication doctrine and changes or modifications of equipment for armored units when employed in tactical situations characterized by the use of atomic weapons.

c. While preparing for the exercise, the battalion had solved an important communication netting problem, by turning in all Armor band radios organic to the reinforcing units and replacing them with Infantry band sets. This action facilitated the command and control of the task force but would be unrealistic when applied to an actual combat situation.

d. The task force was fully equipped with all major authorized items of signal equipment. In addition to the authorized equipment, the battalion took along a surplus of radio equipment. The over abundance of signal equipment permitted some units to have access to radio channels, which under normal operating conditions, they would not have had. This gave the "over equipped" units an immediate replacement of some radio components without having to resort to the normal supply and maintenance facilities. The excess signal equipment in the task force invalidated the evaluation of resupply and maintenance problems.

3. OVERLAND MARCH.

a. Weather conditions encountered during the cross-country phase ranged from moderate heat to freezing and with winds up to 80 knots per hour. The dust caused by the tracked vehicles and high winds was at times very severe. Even with the severity of the conditions encountered, FM voice communication continued to function as under normal conditions with no adverse effects.

b. The terrain operated over included flat desert valleys, rocky plateaus, varied rock formations, and mountain passes. The FM voice communication functioned well in the high rocky areas, but a decrease in range was noted in low valleys. In some areas, the range of the medium-power FM equipment was reduced to approximately 7 miles, which should be considered the planning range in these areas.

c. Some difficulties were experienced in communicating with the organic and attached light aircraft. These aircraft were equipped with the AN/PRC-10. These difficulties could have been overcome by proper maintenance and installation by experienced radio repairmen.

d. Third echelon signal maintenance support was furnished to the task force by a team from the Post Signal Detachment, Camp Irwin. This team operated from a repair van which accompanied the task force. Most of the maintenance performed by this team during the period of the exercise was second echelon. This fact prevented a true interpretation of the battalion maintenance ability.

4. ATOMIC TEST.

a. The Atomic Energy Commission imposed a limitation on frequencies for the task force. During the exploitation through the shot area, three frequencies were used: one for the task force command net, one for the rad-safe net, and one for the supporting Army aviation company. All remaining radios in the task force were operated in the command net. By operating all radios on one frequency, initial control of the task force was dependent upon one commander, who in order to exercise this command had to have constant control of this frequency. This situation is of the utmost and greatest danger because all command and control can be nullified, interrupted, or thrown into chaos by the simple expedient of jamming the command frequency. In addition, company commanders and platoon leaders cannot give immediate orders for the execution of a separate mission. The limitation of frequencies during this phase of the test simplified command and control since the mission of the task force was well defined and known by all personnel. However, this limitation did prevent the actual testing of Armor communication doctrine under atomic conditions.

b. The use of the rad-safe net during this test indicates that it should be adopted for normal employment during an atomic attack. Since the duration of its use is so short, however, it should not alter the present doctrine for armor radio nets. In this connection, the battalion headquarters or logistical frequency could be used as a rad-safe frequency during an atomic attack and until normal operations are resumed. Because of the distance involved in the tactical employment of a reinforced tank battalion, the radio best suited for the rad-safe net is the medium-power set of the AN/GRC-3 through -8 series. In a controlled test situation, and while operating over flat open terrain, the number two set of this series would be suited for the rad-safe set. However, under conditions of actual combat, the limited range of this set would preclude its adoption for the standard rad-safe set.

c. After the vehicles were placed in the shot area, wire communication was established between all vehicles as a control and safety measure. The Atomic Energy Commission imposed a strict radio silence during the actual atomic blast. All radios were turned off 30 minutes before the shot and turned on immediately thereafter. This radio silence

imposed by the AEC prevented a true evaluation of the effects on communication and equipment during the actual nuclear detonation. After the blast, radio communication was re-established with no difficulty. The FM voice radio operated efficiently during the remainder of the test with no effects noted on equipment or transmissions.

5. CONCLUSIONS.

a. The test was not valid for the purpose of recommending changes or modifications of signal equipment.

b. The atomic detonation has no adverse effect on signal communication.

c. This test indicates present organic FM radio equipment for armored units will function satisfactorily under most conditions encountered on the atomic battlefield.

d. A radio net is needed for rad-safe purposes during an attack through an area contaminated by radioactive material.

6. RECOMMENDATIONS.

a. During future atomic tests in which Armor participates, all radios remain on during the actual atomic blast.

b. Only authorized equipment and standard radio nets be used, in order to obtain a valid test of the effects of atomic radiation on armored radio communications.

c. The logistical net be adopted for rad-safe use during an atomic attack.