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AG-S-9531

Exercise DESERT ROCK VII and VIII
Final Report of Operations

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DEPARTMENT OF THE ARMY
OFFICE OF THE DEPUTY CHIEF OF STAFF FOR OPERATIONS AND PLANS
WASHINGTON, D.C. 20310

REPLY TO ATTENTION OF: DAMO-SSN

3 FEB 1978

SUBJECT: Review for Declassification of Department of Army and Marine Corps Reports Concerning Desert Rock Operations

Director
Defense Nuclear Agency
Washington, DC 20305

1. Reference your memorandum dated 1 February 1978, subject as above. Department of the Army has no objection to the declassification of the reports listed in the inclosure.

2. A sanitized version of the document "Report of Test Exercise Desert Rock II and III" (item number 2 on inclosure) has been prepared in accordance with the comments provided in your referenced memorandum.

3. This office has taken final declassification action on items 1, 2, 3, 4, 5, 6, 9, 14, 15, and 20, copies of which are in our possession.

FOR THE DEPUTY CHIEF OF STAFF FOR OPERATIONS AND PLANS:

1 Incl
as

LEE E. SURUT
Major General, GS
Director of Strategy,
Plans, and Policy

VINCENT E. FALTER
Brigadier General, GS
Deputy Director of Strategy,
Plans, and Policy

AMGCT-4 381 (25 Nov 57) 1st Ind
SUBJECT: Exercise DESERT ROCK VII and VIII

HQ SIXTH US ARMY, Presidio of San Francisco, California, 9 Jan 1958

TO: Commanding General, US Continental Army Command
Fort Monroe, Virginia

1. Concur in the conclusions, recommendations and trends, Part III, Sections I, II and III.

2. In addition, the following comments are made for consideration in planning future activities at Camp Desert Rock or other atomic training areas:

a. Army Regulation 55-720-2 dated 6 August 1951 prohibits the assignment of units on TDY for periods in excess of 19 weeks without obtaining Department of the Army approval. Due to the importance of the exercise held at Camp Desert Rock, the always uncertain shot schedule, and the acute shortage of critical MOS personnel required to support this activity, continuous TDY at Camp Desert Rock for the duration of the exercise should be authorized in essential cases by the Department of the Army in the planning phase.

b. In the conduct of troop exercises in conjunction with an atomic detonation, the weapon must be allocated for the specific use of troop support and be fired at the time and place desired to further the troop exercise. Tests must be conducted at a time of year which will minimize shot delays and preclude the additional expense of holding troops over for the shot. It is doubtful that such an arrangement with AEC can be made at the Nevada Test Site. Therefore, consideration should be given to establishing an atomic exercise site for use in training troops and units in the tactical employment of atomic weapons, and for testing current tactical doctrine under controllable conditions.

c. When troop tests are conducted at the Nevada Test Site in conjunction with an AEC shot, it is imperative that the service school promulgating the doctrine be given the specific responsibility of writing, conducting, and evaluating the test as a means of determining the validity of new thought and concepts, to avoid dual responsibility and to assure a staff of personnel who are currently abreast of the latest developments in this field. Early liaison must be established between the commander of the troop test unit and the service school concerned to coordinate training, reports and other requirements for the test unit.

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d. The present observer program provides excellent but limited orientation and indoctrination to commanders and staff officers. It is considered the following actions would benefit the observer program both from the standpoint of value to the observers and from economy:

(1) Eliminate the requirement for prior instructions at the observer's home station and conduct an orientation course at Camp Desert Rock utilizing a qualified instructor team. This course would assure uniformity of instruction and permit use of well-qualified instructors.

(2) Include in the course of instruction for observers an indoctrination course on radiological monitoring, to include a practical exercise in monitoring one of the detonations occurring during the observer's tour at Camp Desert Rock.

e. The Army is losing valuable practical experience in radiological monitoring by not requiring CBR teams and CBR officers throughout the Army areas to attend a course of instruction at Camp Desert Rock to gain valuable experience in monitoring a detonation as it occurs. This includes the training of both fixed and rotary winged aircraft monitor teams as well as vehicular mounted monitor teams.

f. This headquarters is currently making another study of the critical water situation for Camp Desert Rock, at the conclusion of which a project will be forwarded to Department of the Army for approval and funding.

g. To insure optimum success of projects being tested by the Technical Services, the Project Officer must make early coordination with Camp Desert Rock to indicate the support requirements and to personally determine the limitations of Desert Rock support imposed by its isolated location, nonpermanent status, limited station stocks and lead time for supply procurement.

3. Recommendations made by the Deputy Exercise Director concerning personnel and logistical support will be acted upon by this headquarters for the support of DESERT ROCK IX.

1 Incl
Final Report of
DR VII-VIII (20 cys)

L. MATHEWSON
Lieutenant General, USA
Commanding

[redacted]

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HEADQUARTERS
EXERCISE DESERT ROCK VII & VIII
Las Vegas, Nevada

AMCDR-S-3 25 November 1957

SUBJECT: Exercise Desert Rock VII & VIII (U)

THRU: Commanding General
Sixth United States Army
Presidio of San Francisco, California

TO: Commanding General
Continental Army Command
Fort Monroe, Virginia

1. Final report on Exercise Desert Rock VII and VIII is submitted in compliance with paragraph 21, letter AMGCT-4 354.21, Headquarters, Sixth United States Army, 27 March 1957, Subject: Directive for Exercise Desert Rock VII and VIII.

2. A total of fifteen different projects and tests were conducted at Camp Desert Rock in which the US Army, US Marine Corps, US Navy, US Air Force and the Canadian Army participated. Based on preliminary reports, all activities were successful.

3. Scientific and technical projects should be programmed and sponsored by the Armed Forces Special Weapons Project so that they can be better integrated with related research programs. This will facilitate, as well as reduce, the need for detailed scientific and technical liaison.

4. As a media of indoctrinating and training military personnel in the employment and effects of atomic weapons, the current program is of unquestioned but limited value. The training value of observer and troop participation would be enhanced by creating greater opportunities for active participation in actual planning and tactical employment of atomic weapons using delivery systems which would be employed in combat. Pertinent recommendations in this regard are contained in this report.

Walter A. Jensen
WALTER A. JENSEN
Brigadier General, USA
Deputy Exercise Director

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PART I (UNCLASSIFIED)

GENERAL SUMMARY OF EXERCISE

SECTION I - MISSION, RESPONSIBILITIES, COMMAND AND LIAISON

1. MISSION. The purpose of Exercise DESERT ROCK VII and VIII was to indoctrinate selected individuals in the effects of atomic weapons and to conduct certain specified troop and material tests of doctrine, tactics, techniques, and equipment related to atomic weapons.

2. RESPONSIBILITY. The Commanding General, Sixth United States Army, as Exercise Director, was responsible for overall supervision and coordination of the Army, Navy, and Air Force participation in the exercise and provided control, administration, and logistical support for all troops and observers. The Commanding General, Camp Irwin, was the Deputy Exercise Director and Camp Commander, Camp Desert Rock, and was directly responsible to the Exercise Director for the conduct of the exercise.

3. GENERAL COMMAND AND LIAISON RELATIONSHIP WITH AEC, CAMP MERCURY. "Operation PLUMBBOB", the atomic test series initially known as "Operation PILGRIM", was primarily a function of the Atomic Energy Commission. Military participation was permitted on a basis of non-interference with the many concurrent Atomic Energy Commission and Armed Forces Special Weapons Project activities within the Nevada Test Site. The Atomic Energy Commission command structure embodies a Test Manager and a Test Director with staffs composed of civilian specialists and military representatives (ANNEX A). Liaison between Exercise DESERT ROCK and the AEC was effected by military representatives from Field Command, AFSWP, Camp Mercury, who coordinated DESERT ROCK participation with appropriate AEC staff members since direct liaison between Exercise DESERT ROCK and AEC was not authorized. Each shot in the series was sponsored by one of the cooperating AEC Scientific Laboratories (the University of California Radiological Laboratory and the Los Alamos Scientific Laboratory). The final decision to fire a shot was made by the Test Manager after careful consideration of many factors, of which one of the most important is weather as it affects predicted radioactive fallout which must be such as not to endanger test personnel, observers or members of neighboring communities. Operations of DESERT ROCK personnel were completely dependent upon the Test Manager's decision for each shot.

SECTION II - SUMMARY OF EXERCISE

4. For planning purposes and finance and accounting activities, Exercise DESERT ROCK VII and VIII was phased as follows: Phase I - Advance Planning, 1 Jul 1956 to 22 Jan 1957; Phase II - Pre-Maneuver Training, 23 Jan to 14 May 1957; Phase III - Exercise, 15 May to 30 Sep 1957; and Phase IV - Closeout, 1 Oct to 1 Dec 1957. Delays in shot schedule, combined with project participation, required extending Phase III to 30 Sep 1957. A general summary of exercise by phase follows:

5. PHASE I - ADVANCE PLANNING (1 Jul 1956 to 22 Jan 1957). Pursuant to General Orders 165, Hq Sixth US Army, Hq Exercise DESERT ROCK VII and VIII was organized at Camp Irwin, Calif., effective 15 Aug 1956 from units within the Sixth US Army Area. The combined staff, Hq Exercise DESERT ROCK and Hq Camp Desert Rock began the planning and implementation immediately at Camp Irwin. Coordination with AFSWP was effected to determine the various technical projects scheduled to participate and their requirements. Preparations were made for the opening of Camp Desert Rock as a Class I installation on 2 Jan 1957 with a phase in of DESERT ROCK operating personnel and technical project troops and personnel to meet a first shot date indicated as 15 Mar 1957. However, on 21 Nov 1956 the first indicated shot day was postponed until 15 May 1957. To effect detailed planning a Provisional Unit Hq Planning Staff, Exercise DESERT ROCK was organized at Camp Irwin on 15 Nov 1956. The Exercise Manning Table was published 7 Feb 1957.

6. PHASE II - PRE-MANEUVER TRAINING (23 Jan to 14 May 1957). Although planning extended into this period, this phase was used to place Camp Desert Rock on an operational basis to refresh and orient staff personnel in special weapons and to send key staff personnel to Sandia Base for detailed orientation. Direct contact with project personnel scheduled to conduct tests at Camp Desert Rock was effected and arrangements were made to phase troops and project personnel into Camp Desert Rock as shown in density graph, ANNEX B. The build-up phase was completed prior to 15 May 1957. The organization of HQ CDR and the maneuver organization are shown in ANNEX C to this report.

7. PHASE III - EXERCISE (15 May to 30 Sep 1957).

a. Participation. Pursuant to letter ATTNG P&O 354/3 (11 Feb 57) HQ US Continental Army Command, the total allocation of observer spaces, including troop and test projects, was established at 11,886 personnel to witness a total of six shots of yield greater than 10 Kt. (see ANNEX D). The total participation by all who actually observed the various shots is shown in chart, ANNEX E. The considerable variance between the planned and actual quotas for many of the shots resulted from prolonged delays in firing of shots, curtailments of quotas due to shortage of funds, reductions in scope of projects and exercises, and troops and observers viewing more than one event.

b. Description of Exercise. From a functional standpoint, the exercise may be divided into four separate components: Troop-Observer Indoctrination Programs, Training Projects, Troop Tests, and Technical Services Test Projects.

(1) The Troop-Observer Indoctrination Program included a special weapons orientation course for those observers who had not received pre-exercise training at home stations, security and Rad-safe briefings, description of exercise, a pre-shot and post-shot visit to an equipment display area, and observation of an atomic detonation at the minimum safe distance in trenches or above ground. The maximum

indoctrination value is achieved when observers first experience an atomic detonation at minimum safe distance in trenches followed by an unrestricted observation of a shot from an above ground position located at minimum safe distance. Unfavorable weather conditions delayed or caused changes in shot schedules which precluded all observers from experiencing a shot from the trench system.

(2) The three Training Projects fall within the scope of radiological monitoring and training under actual test site conditions. Sixth US Army sponsored an extensive training program and successfully graduated 417 personnel from Camp Desert Rock Radiological Monitoring School. The majority of these personnel were from Sixth US Army Area. The US Navy Bureau of Yards and Docks sponsored Project 51.1 (Radiological Safety Monitoring) and successfully trained 120 personnel from Continental and Overseas Commands. The US Air Force sponsored Project 53.4 (Radiological Defense Training) in which 370 Air Force personnel received practical experience in radiological aspects of atomic operations. Although training objectives were achieved, the potential use of atomic test shots as a general or specific training medium remains to be fully exploited.

(3) The Troop Tests, conducted with the 4th Provisional Marine Brigade and 1st Battle Group, 12th Infantry, were designed to provide realistic training of command staff personnel in all phases of planning and conduct of operations supported by atomic fires; to familiarize personnel with such operations; to test and develop tactics and techniques related to atomic warfare; and to demonstrate to the public each service at its best. Within the compatible scope of the objectives enumerated, these exercises were conducted with success. Although shot delays, one misfire with Marines in trenches, and late finalization of troop test plans taxed the coordination capabilities of the DESERT ROCK personnel and the requirements of the Atomic Energy Commission, operations proceeded without complications. The troop tests are discussed in greater detail in Section V of this report.

(4) All Technical Service Test Projects were conducted by personnel from field test boards and laboratories of the Artillery and Guided Missiles Schools, Corps of Engineers, the Signal Corps, the Ordnance Corps, and the Chemical Corps. Based on preliminary reports (Section VI of this report), satisfactory results were obtained. Aside from late approval and arrival of one project which saturated the communication support capabilities of Camp Desert Rock, no major complications developed. A small Technical Staff Section would facilitate coordination of Camp Desert Rock technical projects and allied projects running concurrently at Camp Mercury.

8. PHASE IV - CLOSE OUT (1 Oct to 1 Dec 1957). Upon detonation on 31 August of the last event in which Army Troops participated, close out plans were put into effect. Concurrently with return of support troops to home stations, phase out of camp installations was accomplished enabling Camp Desert Rock to revert to standby status 1 Oct 1957. Original plans envisioned closing

the camp by 15 Sep 1957; however, due to the projects 50.3 and 50.8 operating until the 23rd of September, an extension of Phase III to 30 Sep 1957 was necessary.

PART II (UNCLASSIFIED EXCEPT AS INDICATED)

CONDUCT OF EXERCISE

SECTION I - GENERAL

9. This portion of the report briefs the operational, security, administrative, and logistical aspects of the exercise, summarizes project activities, and highlights the major problems encountered and methods employed for their solution.

SECTION II - CONDUCT OF EXERCISE

10. OPERATIONS. a. Operations Section planned, coordinated, and supervised the observer program, and operation and integration of special projects into each atomic test consistent with AEC requirements. Included in these activities were: a training program for those observers who did not have the required pre-exercise special weapons training; briefings; pre and post shot tours; and rostering and movement of troops and observers to trench and display areas. Daily coordination with the Atomic Energy Commission through the Army Liaison Officer, Department of Defense Operations in the Test Manager's Office, Camp Mercury was required to insure the uninterrupted operation of the various projects. Revisions of shot schedules constantly necessitated changes in project radio and radar sites, communications to locations manned by participants and observers, and routes of entry and exit. Detailed plans and orders for all military activities within the Nevada Test Site required one week's prior approval by AEC. Readjustments in AEC shot readiness dates and delays due to weather caused postponements and "pile-ups" with the result that two and sometimes three, shots would be scheduled on an "all" or "either or" basis. Because AEC announced the following day's schedules at the 1600 daily weather briefing.

b. Scheduling of Shots and Events. The PLUMBBOB Shot Schedule, as included in Annex F, included one air-delivered rocket. Since tower shots usually produced more contamination than balloon shots, they were delayed more often because of weather and fallout predictions. Originally, three balloon shots (Priscilla, Hood, Newton) and three tower shots (Diablo, Shasta, Smoky) were selected and scheduled for the joint military observer and troop program as Events I through VI which were keyed to the original readiness dates for each shot. Many weather and technical delays compressed the scheduled events so that the arrivals and departures of observers required substitution of similar alternate shots and rescheduling of events. To avoid overtaxing the limited housing capacity of the camp, observers were not called to report to Camp Desert Rock until completion of the previous event.

c. Balloon Shots. The PLUMBBOB Test Series marked the first extensive use of the balloon suspended detonating platform for test firing atomic devices. Although a remote possibility exists that a balloon shot may misfire, or accidentally escape in a surprise squall, operating safety practiced by the AEC Test Manager and Test Director limited this to an acceptable risk for military participation. In addition to eliminating costly steel structures, the balloon proved more adaptable to local atmospheric conditions and reduced the fallout associated with the vaporization of steel towers. Fewer delays because of weather and less residual contamination within the test area make balloon shots preferable for military participation.

d. Trenches were constructed to afford a minimum of 2 to 2½ feet of overhead protection, depending on the height of burst. An average trench depth between 5 and 5½ feet proved to be most satisfactory. Some trenches were dug to a depth of 6 feet, but it was found that this increased the danger from cave-ins. Soil conditions ranged from almost solid rock to loose, sandy soil. Trenches and above ground observation areas were positioned at minimum safe distances from ground zero as computed from AEC's established criteria of the reasonable upper limit (yield) for each shot, and the minimum safe distance tables (ANNEX H). Where possible, trenches were so located and oriented as to be usable for more than one shot. For two tests, old trenches from previous exercises were inspected and found to be adaptable. The trench-shot system for Exercise DESERT ROCK VII and VIII is illustrated in ANNEX G. Since AEC did not require the trenches to be filled, portions of this system should be usable in future tests.

e. To meet AEC security standards, special rostering and convoy procedures for entrance to and exit from the Nevada Test Site were required. Complications in these procedures resulting from shot delays, cancellations, and pile-up of shots were solved with the excellent cooperation of Department of Defense Security personnel. A detailed discussion of the S-3, S-2 procedures to meet these situations is contained in ANNEX I.

f. Radiological Safety, Monitoring and Decontamination.

(1) (SECRET) Operations were designed to avoid exceeding Department of Defense nuclear radiation safety criteria which limited maximum whole body gamma exposure to 5 roentgens at any one test, of which no more than 2 roentgens would be from prompt radiation. In addition, no individual was to receive more than 5 roentgens in any six months' period. Close cooperation with AEC Radiological Safety personnel, and rigid enforcement of all Rad-Safety measures and criteria prevented accidents which might have caused adverse public reaction to the tests. In order to measure the exposure to ionizing radiation of all personnel for purposes of permanent record, film badges were issued on the basis of one per individual. To assure prompt evaluation of the radiation exposures received by personnel operating in the forward areas of the test site and prevention of overexposure to these personnel, the Radiological Safety Section assumed responsibility for the dosimetry program. Approximately 33,000 film badges were developed during the exercise. (See ANNEX J for detailed report.)

(2) Monitoring. Whenever trenches or open observation areas were utilized, radiological monitors were utilized to insure the safety of participants from radioactive hazards. Fallout from three shots required emergency evacuation of troops and observers. This was effected without incident and the monitoring teams chartered the final movements of contaminated clouds. Prior to observers receiving equipment displays subjected to test shot blast, heat or radiation, motorized radio equipped RAD-SAFE monitor teams were dispatched from vehicle revetments adjacent to the trenches. While enroute to and within the display area, continuous monitoring was conducted and reports radioed to the Nuclear Engineer who plotted the radiological situation map in the command trench. At the 5r/hr line, monitor teams erected red cones connected by white engineer tape across the DESERT ROCK sector. Teams then surveyed back to the 20mr/hr line which was marked by yellow cones to indicate the forward limit for buses and personnel vehicles. The periphery of areas of high intensity contamination within the diplay area was marked by tape and red cones. At various other locations in the display area, yellow cones with black spots were erected. These contained contamination markers indicating dose rates for the information of observer personnel. Fallout from three shots required emergency evacuation of troops and observers.

(3) Decontamination. A decontamination station was established and operated on the east side of the Mercury highway approximately one-half mile north of Yucca Pass for the purpose of decontaminating personnel, vehicles, equipment, and rotary winged aircraft. Decontamination was required whenever the contamination exceeded an intensity of 7mr/hr. The primary means of decontamination employed was the sweeping of personnel and vehicles with brooms to remove contaminated dust. Facilities at the decontamination station also included showers for personnel and decontamination trucks for washing down vehicles and equipment. Out of a total of 6218 personnel, 838 vehicles and 48 aircraft monitored during the exercise, 7 personnel, 303 vehicles and 2 aircrart, in addition to unit mission equipment (radar vans, etc.) required decontamination.

g. (FOR OFFICIAL USE ONLY) Aviation. Two L-20, four L-19 aircraft, and four H-23b helicopters flew a total of 1800 hours in support of Exercise DESERT ROCK VII and VIII. Initially, missions were mainly administrative for passenger, courier, emergency and training purposes. Tactical missions, flown during July and August for the Infantry Troop Test, consisted of radio relay, message drops, and aerial surveillance for patrol action. All assigned pilots received proficiency training in desert operations at high density altitudes. The number of flights from the DESERT ROCK air strip varied from the average of 75 to as many as 300 daily during the Marine and Infantry troop exercises. Since Project 50.8, Detection of Atomic Bursts and Radioactive Fallout, conducted a series of aerial radiological survey test, the Camp Desert Rock Air Section was not given a duplicating responsibility for aerial radiological survey. Air operations for Exercise DESERT ROCK VII and VIII highlighted: the need for round-the-clock maintenance to support desert operations; the inadequacy of the H-23b helicopter to support desert operations at high density altitudes; the value of fixed-wing aircraft as radio relay for patrols and ground troops equipped with AN/PRC 510 Radio; the need for extreme caution in flying on the downwind side of mountains at

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low altitude and in making power approach landings; the need for all aircraft pilots to be qualified radiological monitors; and the tactical value of flying fixed wing and helicopter aircraft "on-the-deck" while supporting atomic warfare operations. (FOR OFFICIAL USE ONLY)

11. SECURITY AND INTELLIGENCE. a. The mission of the S-2 Section was to insure proper and adequate security safeguards for all classified material connected with Exercise DESERT ROCK VII and VIII and to insure that all participants, to include permanent party, observers, and project personnel, possessed the proper degree of security clearance for access to classified material, restricted data, and the restricted areas involved in the exercise.

b. A large number of permanent party and project personnel reported to Camp Desert Rock without the prerequisite SECRET security clearance necessary to obtain an AEC badge. A great deal of administrative time was consumed in processing such clearances.

c. Close liaison and cooperation between the Department of Defense Security personnel at Camp Mercury and the S-2 and S-3 of Camp Desert Rock was maintained to insure uninterrupted operations in the Nevada Test Site.

d. A supplementary intelligence and security report appears as ANNEX K.

12. ADMINISTRATION. Staff supervision of camp administrative and personnel matters was accomplished by the S-1 and AG sections.

a. The S-1 carried out the established personnel policies of the Camp Commander and supervised the camp activities relative to welfare, morale, law and order, and general police. The S-1 was also the Acting Inspector General and Safety Officer.

b. The AG directed and effected administration of military personnel actions, records, and reports; processed permanent party incoming and outgoing personnel; published orders and memoranda; processed official correspondence; operated administrative service activities to include central message center, reproduction, records management, and classified documents register; and provided complete postal and directory services.

c. Summary of Operations. (1) The initial task of screening and properly assigning the personnel sent to fill the spaces on the exercise manning table was complicated by: discrepancies between actual and specified grade, MOS and reporting date of individuals ordered on TDY to the exercise; orders not specifying the duty assignment for which the individual was selected; obvious lack of qualification for the position specified in the orders; and many individuals were potential losses because they were eligible for early release from active duty, POR qualified for overseas assignment or possessed basis for a hardship transfer or discharge. Twenty-five personnel required return to home stations because of security clearance denial and other personnel could not be assigned to sensitive jobs because processing of their clearances had not been completed. In addition to the difficulty of filling the positions at Camp Desert Rock, these complications necessitated the expenditure of additional TDY funds in order to obtain replacements.

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(2) Although the manning table for all sections of the Headquarters for Camp Desert Rock appeared adequate, many consolidations of activities took place which resulted in overburdening certain sections. In S-1, the additional duties of Acting Inspector General and Safety Officer generated requirements for additional administrative and clerical assistance.

(3) During the exercise, the following key personnel were relieved from TDY for reassignment, separation, or other cogent reasons and replacements were obtained: S-1, S-3, PM, TO, JA, PIO, P&C, and Engr. In addition, a number of Company Grade officer and enlisted personnel within the staff sections were relieved from TDY for similar reasons.

(4) It is estimated that 15 percent of the enlisted personnel reported for duty without having performed previous duty in MOS for which selected. A check of Enlisted Qualification Records revealed that in some cases the primary MOS had been awarded merely to meet quotas. Throughout the exercise, a number of enlisted personnel requested relief from TDY for compassionate reasons. Red Cross investigations disclosed that in most cases the individual had a large family necessitating his presence while in others the wife was in ill health and unable to care for children.

d. Inspector General. Delegation of the S-1 to act as Inspector General raised the question of compatibility of duties. The majority of the cases coming to the attention of the IG consisted of complaints relative to duty assignments, pay and hardship. The duty requirements during the shot period were heavy and gave rise to numerous complaints. Another item of concern to the command was the high rate of unstable individuals assigned to this isolated camp. Such individuals cannot adjust themselves properly to the isolation and eventually become disciplinary problems of the command.

e. Safety Officer. The S-1 Safety Sub-section investigated and reported all accidents involving Camp Desert Rock personnel or Army property, conducted Safety inspections, published memoranda prescribing the Exercise Safety Program, and accident reporting procedures, and recorded and reported accident exposure data. During the exercise, a total of 50 accidents, only one of which resulted in a fatality, were reported. Information copies of reports were forwarded to home stations of personnel involved. The temporary nature of the camp and the extreme weather conditions experienced were factors conducive to high accident rates. The 60 mile stretch of US Highway 95 between Camp Desert Rock and Las Vegas, Nevada, accounted for 15 of the accidents occurring during the exercise.

f. Postal Section. The Postal Section, composed of one officer and seven enlisted postal specialists, provided complete postal service to all personnel and units stationed at Camp Desert Rock. This allocation of personnel did not allow for peak work load periods in the mail branch on Monday and Tuesday of each week when the mail is 10 times greater than on other days, in the financial section on and following pay day when the

amount of service is one hundred times normal volume, and in the locator branch during arrivals and departure of observers. The following figures represent the total volume of the Postal Section from 29 April 57 through 30 August 1957:

	Number	Value	Fees	Total
Money Orders Issued	7998	$333,895.54	$2,026.85	$335,922.39
Money Orders Cashed	712	21,915.36		
Treasury Checks Cashed	385	39,485.12		
Postage Stamp Sales		6,280.80		
C.O.D. Parcels Received	108	1,567.13		

g. Chaplain. Religious services were held each week in the post theater for Protestant and Catholic personnel. Jewish personnel were provided transportation to services in Las Vegas. After 1 June, no Catholic Chaplain was assigned to Camp Desert Rock, but assistance was given by the Catholic Chaplain at Camp Mercury. A Protestant mid-week worship program was coordinated with the personnel of Camp Mercury and the two groups together participated in many activities. A ministry of counseling was established and each month fifty to eighty men were given assistance. The Chaplain and Special Service Sections working together established a visitation program to provide activities for the troops. The Red Cross Office was adjacent to the Chaplain's office and twice each week a Red Cross representative from Nellis Air Force Base would come to Camp Desert Rock to assist personnel. Close coordination between the Chaplain and Red Cross representatives was maintained in solving personal problems. The religious program, however, was handicapped somewhat by the lack of a Chapel and a full time Catholic Chaplain.

h. Special Services. A theater providing two shows nightly, athletic equipment, a softball league, tours to places of interest, live shows, a small library service, band concerts every other week, and amateur hours were made available by the Special Services Program. This live show program, providing name entertainers, was arranged for the entertainment of Camp Desert Rock personnel by Sixth US Army and the Variety Club, Tent 39, of Las Vegas. These shows were most successful, many being given in Las Vegas, since the Special Services Program was handicapped by lack of an air-cooled building of sufficient size.

i. Provost Marshal. The Provost Marshal Section was organized under the post, camp, and station concept. Town Patrols were established in Las Vegas and excellent liaison was maintained with Civil Authorities. MP operations emphasized the need for flexibility to support alternate and emergency evacuation plans, intensive CBR training prior to reporting to CDR, the development of RAD-SAFE monitoring capability, and superior

communications. Two signal relays were maintained on Angel's Peak and Smoky Mountain which permitted transmission from Camp Desert Rock to Las Vegas and to northern limits of the Nevada Test Site.

j. HQ Commandant and Special Troops.

(1) In addition to usual duties, the HQ Commandant also effectively commanded Special Troops, consisting of small units. Observers were received and processed by the Headquarters Commandant Section. Billets, messing facilities, and limited supply support including issue of field equipment were provided. Setting up of accommodations in Las Vegas hotels and motels was accomplished for a limited number of observers.

(2) The Visitors' Bureau received and processed observers and guided them to the S-2 Section for security processing. Visitors' Bureau processing consisted of signing in, assignment of billets and messes, preparation of locator cards, issuance of film badges and a check to ascertain that each observer had return reservations to home station. Baggage handling service was provided. Senior observers were messed in the VIP mess (capacity 88 with two sittings) and billeted in the 47 air cooled trailers. Other observers messed in two 600 man consolidated messes (emergency capacity 1000) and were billeted in the 41 observer BOQ's. (See ANNEX L.)

k. Judge Advocate. The Judge Advocate advised the commander and staff on all legal matters, maintained and administered military justice, supervised and reviewed claims and rendered legal assistance to all military personnel. The Staff Judge Advocate also acted as claims officer, but this disqualified him from reviewing the claims. Investigative and legal procedures were handicapped by the lack of a temporary confinement facility at Camp Desert Rock, the fact that Special and Summary Courts-Martial jurisdiction was granted to Commander, Camp Irwin, rather than Commander, DESERT ROCK. For statistical treatment of legal functions, see ANNEX M.

13. LOGISTICS. a. The mission of the Post S-4 was to advise on all logistical matters and exercise staff supervision of the logistical activities of support units, technical staff agencies, participating troops, and test projects.

b. Summary of Operations. (1) General. The initial planning and coordination for the general support of Camp Desert Rock was inadequate with the one exception - special test projects. Planning did not provide for or require project officers to make a clear delineation of project funds, special materials required, or the scope of supply responsibility and support expected from Camp Desert Rock. As a result, some project

officers came logistically unprepared and/or gave no consideration to their requirements until arrival of their projects at Camp Desert Rock. Numerous project officers were of the opinion that the logistical support at Camp Desert Rock would be the same as their home stations.

(2) Logistical support consisted of providing field equipment for observers, equipment and materials for display purposes, construction materials for trenches, bunkers, and gun emplacements, heavy construction equipment, medical service, communications, and transportation of observers.

(3) Obtaining the many different supplies, equipment and items needed to support the exercise was difficult because the technical services were not authorized and did not maintain station stock levels. The supplies accumulated at the start of the exercise were based on estimates of requirements established by Camp Irwin and on a strength basis as could be estimated from the initial instructions from HQ Sixth US Army and US Continental Army Command. Changes in plans caused estimated strengths to be exceeded at times and the many and varied requirements of separate projects supported by Camp Desert Rock necessitated a change in supply requirements and justified some local purchasing.

(4) Water Supply. Although Sixth US Army Engineers drilled the proposed Camp Desert Rock well to a depth of 1200 feet, no local source of water became available. In volume of material hauled, water was by far the largest. Water requirements necessitated a 24 hour hauling water operation by truck and trailer from Indian Springs Air Force Base, Indian Springs Rach (Mr. Fred Bartley) 22 miles and Camp Mercury 5 miles away. The estimated direct and indirect cost of the water hauled was one-half cent per gallon. Since a new housing development is being built at Indian Springs Air Force Base II, it is questionable whether future exercises will be able to obtain water from this source.

c. Transportation. A Transportation Battalion (Truck), augmented by thirty-four additional commercial traffic trained personnel, was found to be sufficient to support Exercise DESERT ROCK VII and VIII. The principal requirements included transporting observers to and from the forward areas, support of troop and project participants, and absorbing the administrative and logistical support of Camp Desert Rock. Of the latter, the largest and most difficult single requirement was the round-the-clock water haul using obsolete equipment to bring water from wells and pumps inadequate for the amount of water pumped. Since adequate commercial transportation is not available between Las Vegas and CDR, the logistical and recreational requirements were considerable. Operations involving the transportation

units highlighted the need for: flexibility in planning and operations; 24 hour - 7 day week operational capability; training and qualification of drivers and mechanics to drive all types of vehicles up to 5-ton tractors and trailers; SECRET security clearance and badging of all drivers and mechanics; radio communications and strict convoy discipline to meet alternate or emergency plans with exacting march schedules; and exceptionally high standards of maintenance. Vehicles over five years old proved to be a definite handicap due to frequent major engine and power train failures.

d. Engineers. In addition to the normal post, camp, and station functions, the Engineers furnished extensive support to special projects in the Nevada Test Site. Twenty-seven emplacements and 22 field fortifications were completed by 17 May, and over 22,277 feet of trench system was constructed prior to 17 August 1957. Engineer operations emphasized: the need for the early arrival of engineers to renovate the camp; the importance of prior planning and integration of trench systems for more than one shot; the importance of terrain and soil reconnaissance before coordinating and finalizing construction plans with AEC; and the utilization of old trenches in some areas.

e. Signal. Adequate wire and radio communications were provided within the test area and Camp Desert Rock by a Signal Support Company at full TO&E strength augmented by one Photo Team, two maintenance teams (one wire and one radio) and one Signal Supply Team. Signal operations emphasized the need for: negotiating requirements for long lease lines at least six months in advance of exercise and for radio frequencies three months in advance of exercise; the special projects being supported by Camp Desert Rock to establish their communication requirements prior to the time Signal Support Troops are selected for the exercise; establishing terminal strips at strategic locations in the forward area in order to permit rapid shifting and connections to support alternate plans; and the development of thermal-proof wire to support atomic operations.

f. Quartermaster. The normal quartermaster services and supplies were provided. Due to extreme heat and danger of contamination, C-rations rather than sack lunches were issued troops and personnel participating in forward area activities. Fluctuations in strength figures complicated requisitioning, particularly of perishable items. Standby power for refrigeration and curtains hung inside ice boxes to retain cold air while doors are open were innovated. Two shipments of butter, fish, ham, and bacon arriving in non-refrigerated vans were refused because inside temperature ranged from 75-85° F. Extreme heat required increasing daily supply of ice from 1/2 pound to 3 pounds per man. Wind storms occurring during the exercise caused considerable damage to tentage and other canvas. Approximately 38% of all

canvas tents had to be salvaged at the close of the exercise.

g. Medical. (1) Adequate medical and dental outpatient support was provided. The health of the command was excellent, with only six cases of heat exhaustion, and no cases of snake-bite reported. There were 3,551 separate visits to the dispensary, of which 240 were admitted to the Holding Ward on a quarters disposition status and 37 evacuated to Nellis Air Force Base Hospital for major surgery and inpatient care.

(2) DD Forms 1141, "Record of Exposure to Ionizing Radiation", were initiated on all permanent party personnel. Dosimetry readings on observers were forwarded to home stations by AG Section. During the exercise seven permanent party personnel received between 5,000 and 7,000 milliroentgens of Gamma radiation. Laboratory tests performed on these individuals showed no abnormal blood findings.

h. Ordnance. (1) The Ordnance mission was to provide ordnance supply and maintenance support for all units stationed at Camp Desert Rock and to provide emplacement and recovery of all equipment used as display items in the atomic tests.

(2) Normal requisitioning procedures were found in most instances to be inadequate for Camp Desert Rock as the time lag between date requisitioned and the date delivered was in most instances about 30 days. This delay resulted in a large number of vehicles being deadlined awaiting parts. The above situation was combatted by fabrication of parts wherever possible, by local purchase of some small items, and by substitution of unserviceable for serviceable parts and assemblies on equipment to be used as displays in the atomic tests.

(3) (FOR OFFICIAL USE ONLY) Considerable difficulty was experienced with non-standard equipment. Primary source of trouble was the truck tractor, International M425.

(4) Operations throughout the exercise emphasized the need to maintain high standards of driver training discipline, and first echelon maintenance to prolong engine life in desert operations.

i. Purchasing and Contracting. Pending arrival of firm funding programs from the various projects, stations, and from the Sixth US Army Comptroller, Camp Irwin funds were utilized for initial support of Camp Desert Rock. Difficulties experienced during this period were soon resolved. Because of the 30 day time lag in requisitions, practically all purchases for Camp Desert Rock, once the exercise began, were of an emergency nature which placed a burden on vendors and resulted in higher prices paid on merchandise. Had there been more lead time for procurement this could have been avoided.

Charge accounts were established with 27 vendors for Exercise DESERT ROCK VII and VIII. Services and relations were excellent. Following is a breakdown of purchases made by P&C Section, Camp Desert Rock:

	Purchase Requests Issued	Purchase Requests Emergency	Total Purchase Orders Issued	Expenditures
Engineer R&U	14	1	68	$30,566.45
Engineer TS	6	0	42	12,121.13
Ordnance	10	8	10	1,682.57
Quartermaster POL	27	2	78	114,391.73
Quartermaster Misc.	19	16	16	1,421.84
Signal	23	16	16	1,935.58
Transportation Misc	9	1	44	26,802.55
Transportation Tires	5	0	11	5,993.21
Project 51.1	1	1	1	793.06
Project 50.3	10	9	11	2,090.70
Project 50.8	10	6	30	9,055.77
Adjutant General	1	0	1	497.98
TOTAL	135	60	328	$ 207,352.57

j. Post Exchange. The facilities of the Camp Desert Rock Exchange consisted of: main store, beer bar, barber shop, dry cleaning and laundry concession, office and warehouse located in prefabricated buildings and quonset huts. Monthly sales figures for the exchange were as follows:

Jan and Feb. .	$2,861.04	June	$33,097.39
March	2,693.51	July	35,136.40
April	7,348.86	August	40,574.93
May	18,539.84	September . . .	6,775.87
		GRAND TOTAL	$147,027.84

SECTION III - THE OBSERVER PROGRAM

14. PROGRAM.

a. (FOR OFFICIAL USE ONLY) Participation. The observer program, Project 50.2, sponsored by Continental Army Command, called for approximately 4181 observers from all services to witness six primary shots (ANNEX E). There were three associated projects: The Marine Troop Observers, Project 52.2, which called for 50 observers to witness each of the shots: Priscilla, Diablo, Hood, and Shasta (total 150); the Air Defense Command Air Crew Observers, Project 53.3 (total 300); and the Canadian Army observer program, which called for a total of 430 Canadians to participate in Hood, Shasta, Newton, and Smoky. Also included in this overall observer program was a requirement that all personnel of the troop test units, permanent party, and projects participating in Exercise DESERT ROCK VII and VIII would observe an appropriate shot from the trenches if possible.

b. (FOR OFFICIAL USE ONLY) Activities. Observers were originally scheduled to participate in one of the six primary shots from minimum safe distance in trenches in accordance with established criteria (ANNEX H). Personnel began arriving three days prior to each shot to receive special weapons orientation followed by briefings on the shot program, project participation, security, radiological safety, pre-shot and post-shot visits to the equipment display area, and also to previous shot areas. All Canadian observers were cleared for CONFIDENTIAL only without RESTRICTED DATA and were briefed separately.

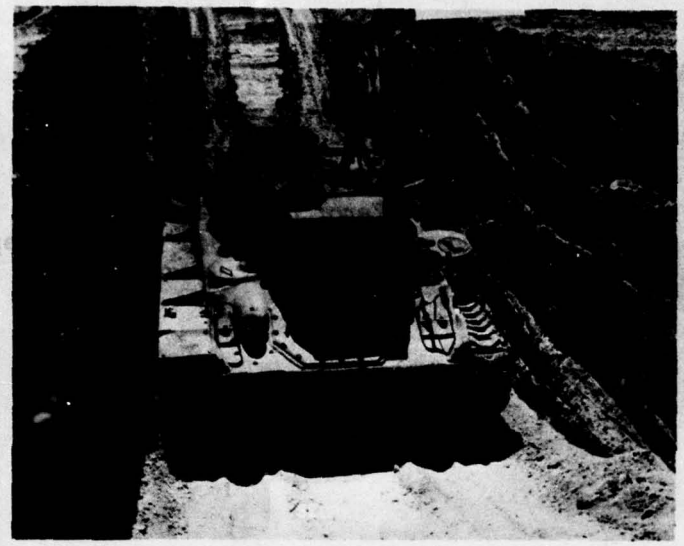
c. (UNCLASSIFIED). Instruction. Special weapons instruction, field arrangement and display of equipment for weapons effects, and conduct of pre and post shot tours for all observers were handled by the Instructor Group. Both an eight hour orientation in special weapons and a course in special advanced subjects were presented to observers as required. The eight hour orientation was mandatory for those observers not having received pre-exercise training at their home stations. The special subjects were voluntary for all observers. The total attendance at special weapons classes by observer personnel was 3,048. Of this total, 1,435 observers attended the mandatory eight hour pre-exercise training class and 1,613 attended the voluntary special weapons classes (ANNEX U).

d. (SECRET) Shot John. The Commander, Army Air Defense Command, accepting the responsibility, requested and received permission to place six observers at ground zero at H hour for Shot John. This was an air delivered rocket detonated at an air zero elevation of 18,080 feet (mean sea level). Prior to the shot, all observers attended a combined technical briefing at Indian Springs Air Force Base. No adverse effects to the observers were noted.

e. (UNCLASSIFIED) Equipment Displays. Sixty items of field equipment were positioned around ground zero for shot Priscilla (24 Jun) and 120 items were displayed for shot Smoky. The Marine Corps equipment display was adapted to shot Hood after the Diablo misfire. Equipment was also displayed for shot Shasta, but due to the many delays was removed. The before and after photographs, pages 17 through 32 of this report, are considered to be most representative of those witnessed by the observers. Detailed damage comparison data is furnished in a separate ANNEX L (Damage Comparison Chart) to this report.

f. (FOR OFFICIAL USE ONLY) Comments. The observer program comprised one of the most important aspects of the test series, for it directly acquainted a cross section of our service structure with the destructive capabilities of atomic weapons. Unforeseen delays caused some observers to witness only a low yield weapon from distances which allowed little or no effects to be felt. A few observers departed without seeing a shot, while others observed more than one shot. Observers were about equally divided as to preference of seeing a shot in the trenches versus above ground. Observers in the trenches experienced the greatest shock effect, but their observation was usually limited by the extreme dust, whereas observers above ground experienced a minor shock wave with greatly improved overall observation of the phenomena. Many observers indicated a preference to experience one shot from the trenches and to see one above ground. A few observers indicated a desire for more active participation in test shots and felt that they would learn more if they actually had to plan and fire the test shot with Army Atomic Units. Of greatest value to all observers was banishment of fear of the unknown. The usual reaction of those in trenches was that they had expected something far worse than they experienced.

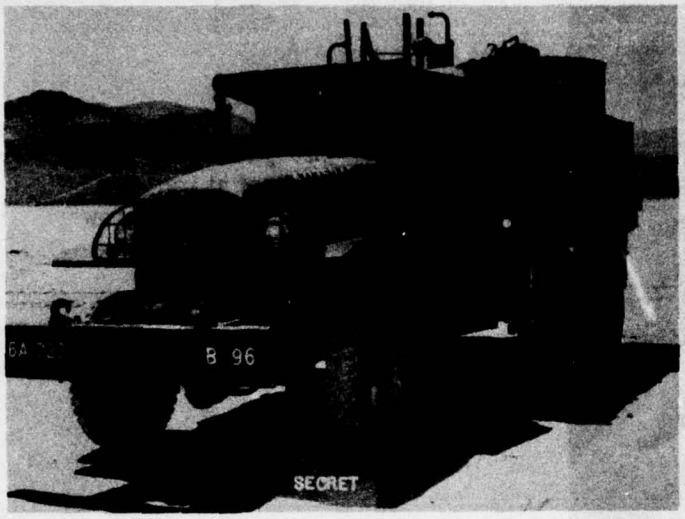
UNCLASSIFIED



BEFORE
Tank, M-24; 345 yds from Ground Zero; orientation and protection: 45° dug in below surface; predicted damage: severe.

PRISCILLA SHOT

AFTER
Severely damaged; turret blown 50 feet; tracks blown off; whole frame caved in.



BEFORE
Truck, 2½ ton, Flame Thrower; 515 yds from Ground Zero; orientation and protection: head on, surface; predicted damage: severe.

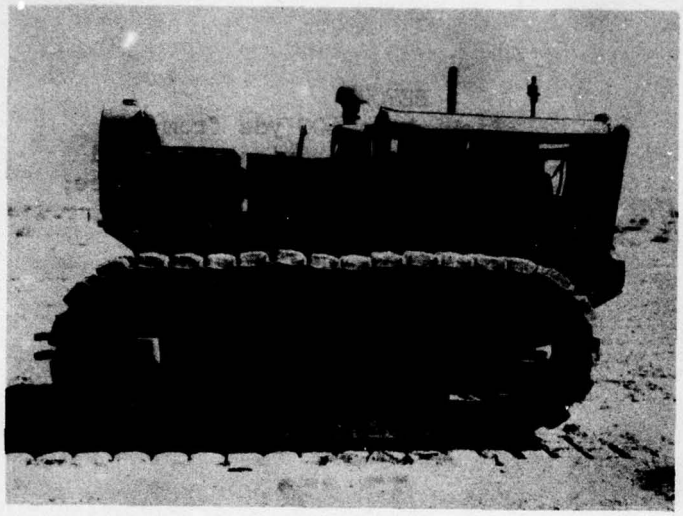
PRISCILLA SHOT

AFTER
Severely damaged; demolished, scattered 100 yards.

BEFORE
Tank, M-4; 600 yds from Ground Zero; orientation and protection: head on, surface; predicted damage: moderate.

PRISCILLA SHOT

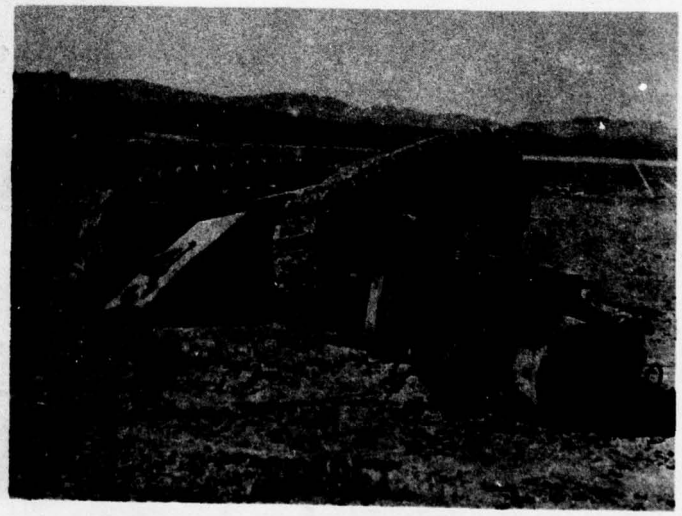
AFTER
Damage was light; Tank displaced approximately 10 feet; paint scorched on Ground Zero side and front; front fenders bent in; tank reusable.

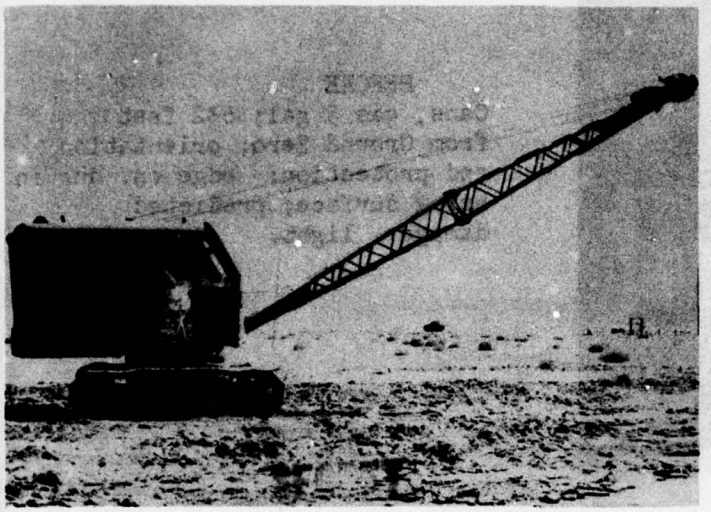


BEFORE
Tractor D-8, full track; 602 yds from Ground Zero; orientation and protection: side on, surface; predicted damage: severe.

PRISCILLA SHOT

AFTER
Severely damaged; tractor displaced 100 ft and tipped upside down; engine blown free of chassis; parts of tractor blown from 650 yd. marker to 900 yd. marker.



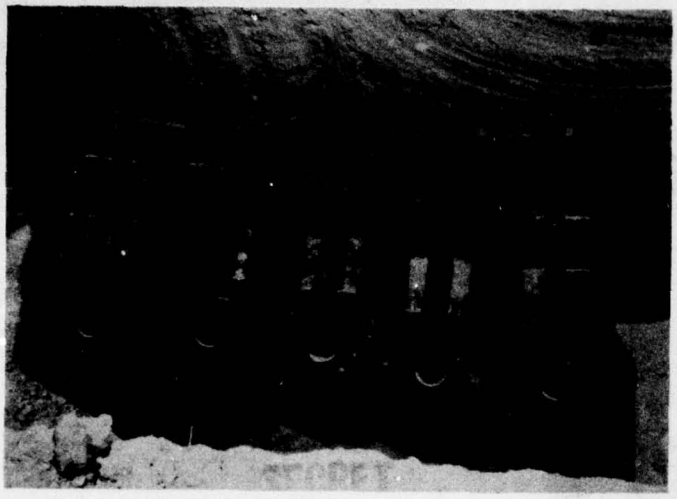


BEFORE
Crane, shovel; 618 yds from Ground Zero; orientation and protection: side on, surface; predicted damage: severe.

PRISCILLA SHOT

AFTER
Severely damaged; main portion of crane assembly displaced approximately 50 feet; one track blown off; super structure collapsed; cab blown into sections and displaced up to 400 yds; operator seat displaced 50 yds; main assembly upside down; crane sections displaced up to 200 yds.

[redacted]

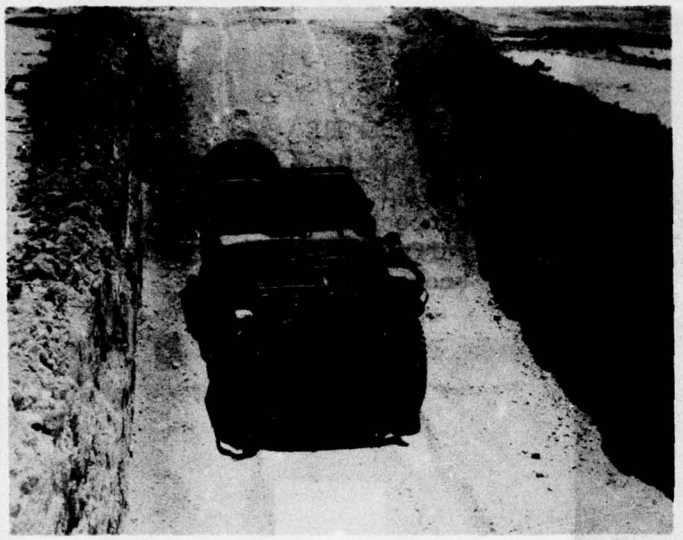


BEFORE
Cans, gas 5 gal; 632 feet from Ground Zero; orientation and protection: edge on, dug in below surface; predicted damage: light.

PRISCILLA SHOT

AFTER
Damage was light; hole filled in; no noticeable damage.

[redacted]



BEFORE
Truck, 1/4 Ton; 922 yds from Ground Zero; orientation and protection: head on, dug in below surface; predicted damage: light.

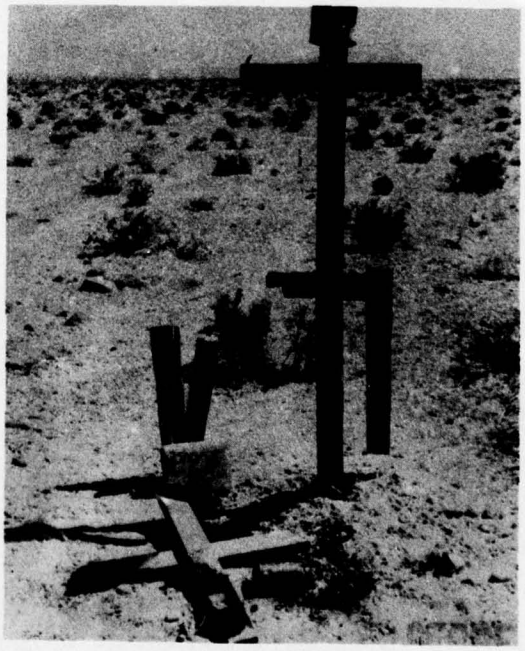
PRISCILLA SHOT

AFTER
Damage was light; hood open and bent; windshield bent back; hole filled with 2 feet of dirt.

BEFORE
Mannequin; 2500 yds from Ground Zero; orientation and protection: face on, upright, surface; predicted damage: scorched.

PRISCILLA SHOT

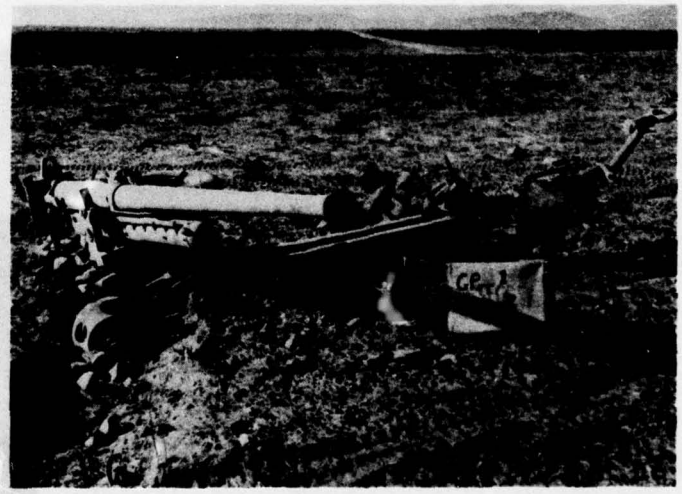
AFTER
Destroyed; no clothing left nor evidence of being blown away; gas mask completely burned up except cannister and eye lens cloth container, only metal first aid packet left; 2x4 cross badly burned on Ground Zero side; canteen cover burned on top; helmet displaced 35 feet.

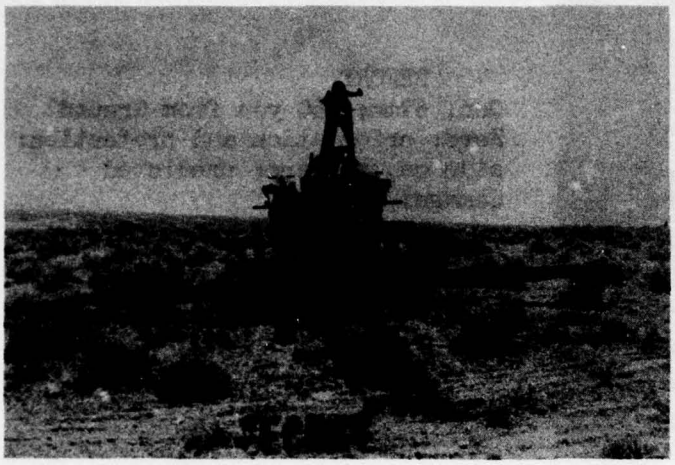


BEFORE
Gun, 57mm; 450 yds from Ground Zero; orientation and protection: side on, surface; predicted damage: severe.

SMOKY SHOT

AFTER
Severely damaged, wheels and operating handles blown off; one spade bent out of position; displaced 45 yards.





BEFORE
Gun, 90mm; 450 yds from Ground Zero; orientation and protection: head on, surface; predicted damage: severe.

SMOKY SHOT

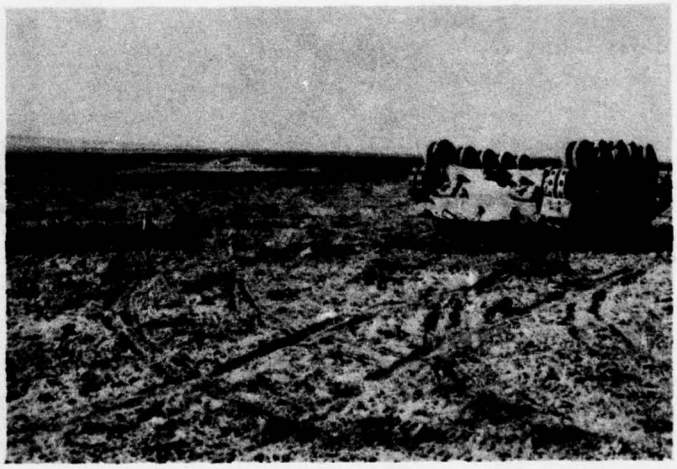
AFTER
Severely damaged; destroyed; one wheel missing - remaining torn apart; outrigger leg blown off and the other distorted; displaced 100 yards; tube and part of mechanism displaced 50 yards farther away from carriage.

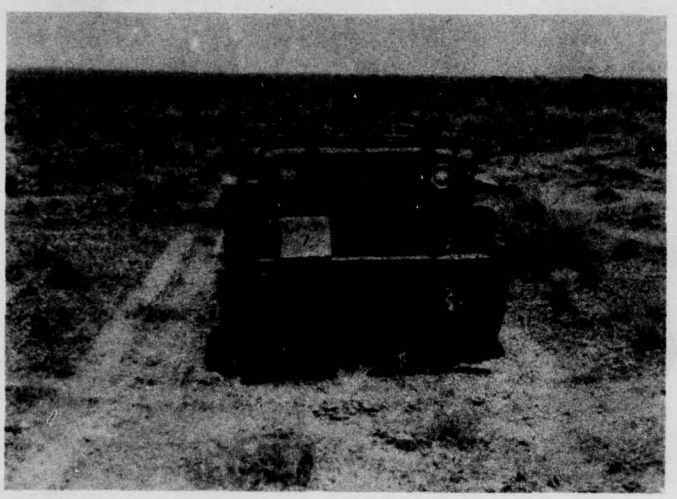
[redacted]

BEFORE
Tank, M-24; 450 yds from Ground Zero; orientation and protection: side on, surface; predicted damage: severe.

SMOKY SHOT

AFTER
Severely damaged; track blown off and found in 4 parts within a 50 yard radius; tank overturned; bogie wheel bent out of line; drive sprocket bent out of line; tank turret blown off and displaced 100 yards; gun tube torn loose from turret and lying 20 yards away; tank displaced 15 yards.

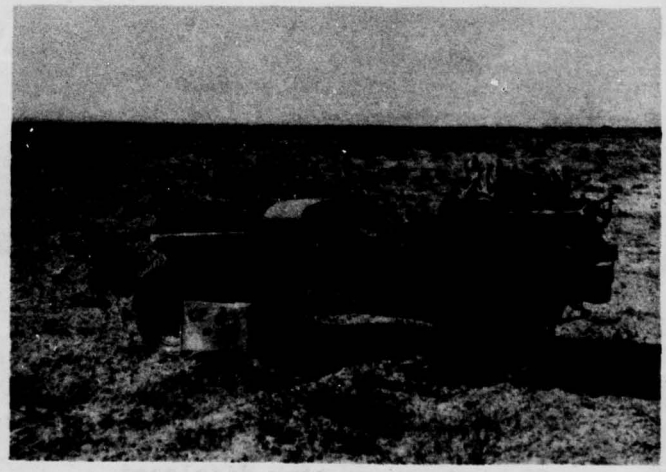




BEFORE
Truck, 1/4 ton; 900 yards from Ground Zero; orientation and protection: head on, surface; predicted damage: severe.

SMOKY SHOT

AFTER
Severely damaged; hood torn off; seats ripped out; paint scorched; engine parts cracked and require replacing; displaced 25 yards.

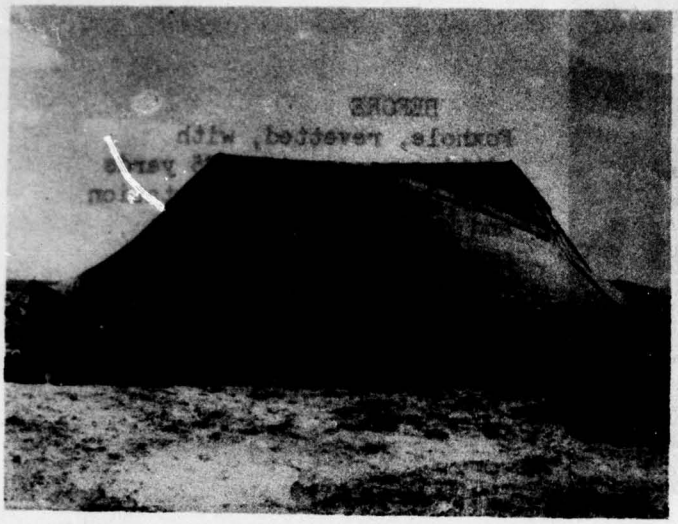


BEFORE
Foxhole, revetted, with sitting mannequin; 885 yards from Ground Zero; orientation and protection: head on; predicted damage: none.

SMOKY SHOT

AFTER
Damage was light-none; sand bags burned on top and blackened to 3 feet depth inside; a little dirt fell in from burned sand bags on side away from Ground Zero; mannequin in good condition.

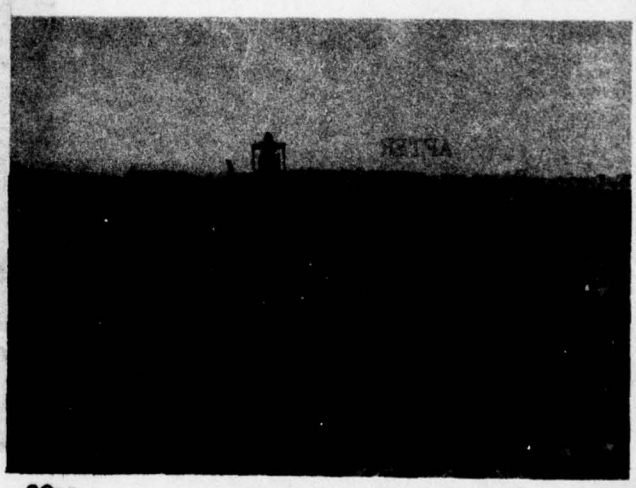
[redacted]



BEFORE
Tent, Squad, and Signal Equipment; 2500 yds from Ground Zero; orientation and protection: side on, surface; predicted damage: severe.

SMOKY SHOT

AFTER
Severely damaged; tent blown 100 feet; evidence of burning and shredding; cots spot burned and blown 50 feet; duplicating machine burned and melted; gas cans slightly scorched; commo equipment scorched; canvas covers scorched; small fires within tent area severely damaged most equipment except bales, cans and drums.

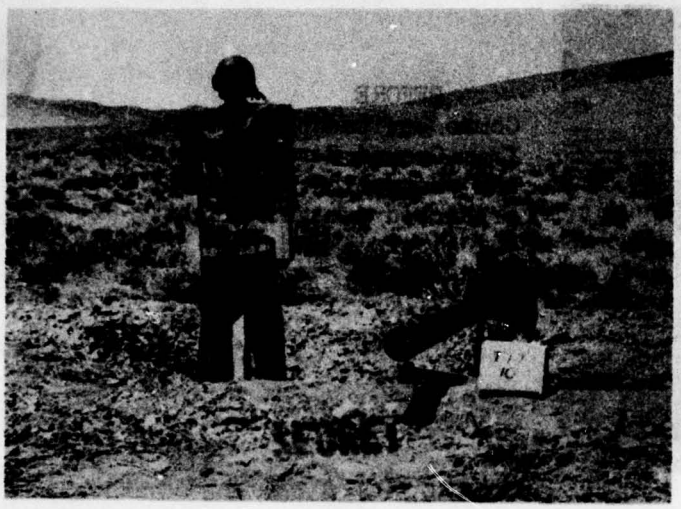


[redacted]

BEFORE
Commo equipment; 1150 yds from Ground Zero; orientation and protection: side on; predicted damage: light.

SMOKY SHOT

AFTER
Damage was moderate; radio: microphone shattered; dial broken; radio blown into hole. Telephone: no visible damage; blown into hole.



BEFORE
106mm Recoiless Rifle with Mannequin; 1150 yards from Ground Zero; orientation and protection: side on, dug in tactically; predicted damage: light/destroyed.

SMOKY SHOT

AFTER
Damage: light/destroyed; muzzle moved to the right; paint scorched; mannequin disintegrated; bits of cloth noticed 10 to 50 yards from original position.

SECTION IV - TRAINING PROJECTS (FOR OFFICIAL USE ONLY)

15. Three radiological training projects were established to take advantage of the excellent opportunity for practical application of monitoring techniques in the contaminated areas at the Nevada Test Site. These projects operated under supervision of the Rad-Safe Section.

a. CDR Rad-Safe School. The Rad-Safe section conducted a radiological monitoring school in which the following number of personnel were trained as qualified monitors:

UNIT	NUMBER OF PERSONNEL
CDR Personnel	84
Sixth US Army CBR Survey Teams	89
4th Marine Corps Prov Brigade	180
1st Battle Group 12th Infantry	30
2nd Battalion 5th Marine Division	16
Canadian Infantry (Queens Own Rifles)	3
XVIII ABN Corps (506th Pathfinders)	14
Atomic Energy Commission	1
TOTAL	417

Nine (9) Sixth Army CBR Survey Teams were given practical instruction and field experience in conducting radiological surveys. Both civilian and military personnel were included in this training. All Chemical Corps officer observers were afforded an opportunity to participate in radiological reconnaissance and safety operations of the Rad-Safe section while at Camp Desert Rock. Approximately six (6) officer observers participated. In addition four (4) Chemical Corps Reserve Officers on 15 day active duty tours performed on-the-job training in Rad-Safe operations. Details of training program are being made the subject of a separate report.

b. US Navy Radiological Safety monitoring (Project 51.1): This project, sponsored by the US Navy Bureau of Yards and Docks, brought approximately 120 individuals from all parts of the world to participate in this training in connection with shot Boltzman. The pro-longed delay of this shot necessitated adapting and conducting this training in an area of low contamination containing debris from the 1955 test series. All participants in this project, with the exception of three, had to depart without witnessing a shot.

c. USAF Radiological Defense Training (Project 53.4): This training was sponsored by the Radiological Defense School located at Lowery Air Base, Denver, Colorado. Instructors were stationed at Nellis Air Force Base. Students from CONUS Air Bases attended classes at Nellis Air Base, viewed a shot at the Nevada Test Site, and conducted Radiological Survey monitoring after their participating shot. The method utilized was to stake out the area to be surveyed. Monitors would proceed down the staked sector toward ground zero reporting Dose Rates

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encountered at the mileages indicated on the vehicle odometer. The readings were relayed to the control stations by radio and plotted on a map. Desert Rock Rad-Safe personnel were present to enforce the radiological safety criteria and to provide technical assistance as required.

d. Conclusions.

(1) Training of Sixth US Army CBR Survey Teams demonstrated that in order to achieve proficiency in performing radiological hazard assessment, training under the realistic conditions available only at atomic tests is necessary.

(2) Monitors should be considered trained only when they can convert radiac instrument readings into appropriate actions or recommendations.

(3) Maximum potential use of atomic tests as training ground for radiological safety and defense training is not being realized.

e. Recommendations.

(1) Radiological monitor training should be conducted at Camp Desert Rock for all support troops and assigned projects prior to the start of the exercise.

(2) Training of CBR Survey Teams should be continued and expanded to include all Army areas during future exercises. Coordination with HQ Armed Forces Special Weapons Project should be effected at an early date since the Air Force, Navy, Marines and Canadians have indicated informally that this program should be continued if possible.

(3) Chemical Corps officers of other commands and Army Areas should be given on-the-job training quotas with Radiological Safety Sections since radiological safety is a function of the Chemical Corps.

(4) Military and Civilian organizations should be encouraged to take greater advantage of realistic training opportunities afforded by atomic tests.

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SECTION V TROOP TESTS (UNCLASSIFIED)

16. PARTICIPATING TROOPS. a. Marine Brigade Exercise - 4th Marine Corps Provisional Atomic Exercise Brigade.

b. Infantry Troop Test - Exercise DESERT ROCK VII and VIII.

(1) Hq Co (-) 1st Battle Group 12th Inf, Ft Lewis.
(2) Co C (-) 1st Battle Group 12th Inf.
(3) Rifle Platoon Co A 1st Battle Group 12th Inf.
(4) Rifle Platoon Co D 1st Battle Group 12th Inf.
(5) Wpns Platoon Co B 1st Battle Group 12th Inf.
(6) Mortar Btry 1st Battle Group 12th Inf.
(7) Co A 704th Ord Bn (-) (Attached).
(8) 7th Platoon 2d Bn Queens Own Rifles (Attached) (Canadians).
(9) HQ & HQ Det 3d Bn (Hcptr) (Army), Ft Benning, Georgia
(10) 8th Trans (Hcptr) Co (H-21) Ft Bragg, N. C.
(11) 31st Trans Co (Lt Hcptr) (H-34) Ft Benning, Ga.
(12) 138th Trans Det (CHFM) Ft Benning, Ga.
(13) 140th Trans Det (CHFM) Ft Bragg, N. C.
(14) 506th Pathfinder Team.
(15) Prov. Co, 82d Airborne Div.

c. HumRRO Troop Test - HumRRO Team - Office of Research and Development, Department of Army.

Provisional Company, 82d Airborne Division.

17. MARINE BRIGADE EXERCISE - Shot Diablo-Hood 26 Jun - 5 Jul. a. Purpose. To provide realistic training, particularly for command and staff personnel in all phases of planning and conducting operations supported by atomic fires; to test and evaluate doctrine, develop new tactics and techniques relative to the exploitation of atomic fires; and to familiarize personnel with the effects of and passive defensive measures against atomic weapons.

b. Concept and Conduct of Test. The field exercise was scheduled in conjunction with Shot Diablo, which misfired 28 Jun. It was adapted on short notice to Shot Hood, detonated 0440 5 Jul 1957. As planned, the ground operations commenced at Mike Hour (H + 15 minutes). The tactical maneuver involved the helicopter lifting of elements of a battalion attacking to seize an objective which for safety reasons was some distance removed from ground zero. MAG-15 provided 24 jet aircraft as tactical air support. Helicopters used to conduct the troop lift were initially positioned at minimum safe distance from ground zero. As soon as the large cloud of dust cleared at H + 85 minutes, they made the initial lift from this position. All subsequent lifts were made from the troop loading zone in the vicinity

of the Hood trenches, where all ground troops observed the shot. After the explosion, one company moved to within safe distance (400 yds) of ground zero and later returned to the helicopter loading zone behind the trench area to await helicopter lift to landing zones; one company moved directly from trenches to loading zone for helicopter lift, and one company of the battalion moved from the trenches, mounted LVTP5s and, supported by a platoon of ONTO's, attacked toward the ground objectives where they linked with the helicopter borne force at 050900T Jul.

c. Conclusions. In the absence of a readily available organized unit to plan, train, and conduct troop tests at Camp Desert Rock, the Marine Corps method of appointing well in advance a provisional commander and staff to plan, train the units, and conduct the troop test provides greater continuity of effort and is the most desirable method to effect troop test exercises at Camp Desert Rock and the Nevada Test Site.

d. Recommendations. A resumé of pertinent recommendations made by the 4th Marine Corps Provisional Atomic Exercise Brigade is contained in ANNEX V.

18. INFANTRY TROOP TEST - Shot Smoky - 19-30 August 1957. a. Purpose. To portray to the public the Army at its best employing ROCID organization in operations under atomic warfare conditions in order to determine the following within limits of helicopter lift and troop participation:

(1) The troop support, materiel, and equipment required to construct a defensive position adequate for protection from the effects of an atomic explosion.

(2) The validity of tactical doctrine, organization, planning data, and helicopter requirements for the movement by helicopter of a reinforced company task force to seize an objective in conjunction with the use of an atomic weapon.

(3) The suitability of techniques and procedures to effect resupply, by helicopter, of a reinforced company task force.

b. Concept. The test was conducted in three phases:

(1) Phase I - The passive defense against an atomic detonation of a hastily prepared position constructed in four hours by elements of an Infantry Battle group. The position, located within the effects of radii of shot Smoky, was to be prepared in accordance with US doctrine with realistic adaptation to terrain and troop participation, and with adjustments in amount of equipment effected to provide adequate spectator interest and evaluation to the degree practicable.

(2) Phase II - Aerial Movement of a Task Force, in which a reinforced company task force, initially disposed in a defensive area, is assembled and moved approximately 8 miles by helicopter to seize an objective (blocking position) and establish a patrol base utilizing fixed wing and helicopter borne patrols for surveillance of a division area of operations.

(3) Phase III - Aerial Resupply of a Task Force in which the task force was resupplied exclusively by helicopter until the termination of the exercise.

c. Conduct of Test. (1) Pre-Exercise Training at Camp Desert Rock: Units began arriving during the last week in July. Severe storms and maintenance problems delayed the arrival of helicopters from Fort Benning and Fort Bragg and precluded commencement of training prior to 29 July. Detailed planning, gathering of experience data for desert operations, training, rehearsal of participating troops; coordination and integration of the revised exercise plan into AEC operations and issuance of the necessary orders for implementing the test were accomplished prior to 15 August 1957.

(2) Phase I - Fortifications prepared included 115 type emplacement positions for three rifle platoons, a weapons platoon, rifle company command post, two 4.2 inch mortars, and a portion of a battle group command post. Locations of emplacements ranged from 2,575 ft to 5,210 ft from ground zero. Only tools organic to the battle group were employed. No fortification materials other than sandbags and what could be improvised locally were provided. A total of 7½ hours was devoted to digging. Then, to provide a defensive position suitable for spectator interest, additional time was devoted to dressing up the position. The estimated degree of completion of all positions was 60%. Residual contamination of the battle position after detonation prevented personnel from visiting the position for several days.

(3) Phases II and III - (a) At 2200 hours 30 August, adverse wind and predicted fallout patterns dictated implementation of an alternate plan (one of four) in which the task force initially occupied and witnessed the atomic detonation from a position approximately eight miles from ground zero on the extreme left of Yucca Flat instead of on the right, as originally planned, from vicinity of Banded Mountain 8809. Because of heavy fall-out pattern, no observers or troops were permitted to occupy the Smoky trenches. The intermediate helicopter assembly area and the loading area were changed accordingly. Transport aviation units and the pathfinder team were located in the helicopter assembly area approximately 18 miles from ground zero. Supplies were located at a division distribution point approximately 16 miles from ground zero and the objective area.

(b) Smoky H-hour was 0530. The pathfinder serial started motors at H / 5 minutes, departed assembly area at H / 15 minutes, conducted

preliminary aerial radiological survey, landed in the objective area at H ∕ 45 minutes and reported, in coordination with Rad-Safe personnel, that the landing zone was safe for task force operations at H ∕ 59 minutes.

(c) Helicopters for troop lift departed assembly area H ∕ 51 minutes, landed in intermediate assembly area with engines running at H ∕ 70 minutes, moved out five minutes later and landed in loading area at H ∕ 92 minutes.

(d) The first lift of four serials, carrying three rifle platoons and a weapons platoon, began departing loading area four minutes later at H ∕ 96 minutes, arriving in the landing zone H ∕ 105 minutes. All of the initial objectives were seized by H ∕ 130 minutes.

(e) The second lift began departing the loading area at H ∕ 121 minutes and completed the troop lift by H ∕ 164 minutes.

(f) The task force attacked out of its landing zone at H ∕ 179 minutes to seize its assigned objective. Initial helicopter borne patrols 1 and 3 were dispatched by H ∕ 185 minutes. At H ∕ 225 minutes, the Task Force Commander reported he had advanced to points permitted by Rad-Safe personnel and had been halted just prior to seizure of Objective 2 (Quartzite Mountain). No injuries to personnel were reported.

(g) Aerial resupply and evacuation began at H ∕ 154 minutes with delivery of three helicopter sling loads of ammunition and water. Automatic and on call resupply was effected within the telescoped nature of the exercise for maximum observer interest. Sling loads were used to the maximum for speed of delivery as well as spectator interest.

d. Conclusions. (1) Air and ground units selected for conducting a one-shot troop test in the Nevada Test Site should have recent task force experience in desert operations prior to arrival at Camp Desert Rock. This training should include a complete familiarization with all aspects of the tactical doctrine, organization, and details of the test to be conducted.

(2) To assure unity of command and continuity in the planning, training and conduct of future troop tests, and organized headquarters staff should be designated. In the event suitable organizations are not available, a provisional commander and staff should be formed.

(3) The development and testing of doctrine, tactics, and organization based on a one-atomic-shot basis may be misleading. Consideration should be given to extending important troop tests over a series of two or more atomic tests, especially if conducted within the restrictive frame work of the Nevada Test Site.

(4) Phase I. Under the terrain and climatic conditions encountered in the Nevada Test Site, a hasty defense of the type which can be developed in four hours would not provide an effective defense or a suitable degree of protection to personnel and weapons against an atomic explosion of the yield and position employed in this exercise.

(5) Phase II. Within the administrative limitations of the Nevada Test Site, the demonstrational aspects of the exercise and peacetime safety criteria imposed by predicted and actual fall-out patterns, dust, and other factors affecting visibility, there were no indications that Army Airborne tactics and techniques are not valid. They provide a suitable guide for use in planning operations to seize an objective in conjunction with the use of an atomic weapon.

(6) Phase III. The aerial logistical organization and system employed in this exercise was feasible within the framework under which employed.

e. Recommendations. (1) It is recommended that doctrine and procedures for battle group defense, airborne tactics, techniques and logistical organization be subjected to further testing where administrative restrictions are not as binding as they are in the Nevada Test Site and where greater freedom of action is permissible for developing and evaluating test situations.

(2) Further specific recommendations concerning the infantry troop test are contained in a report of test submitted separately.

19. HumRRO Troop Test. a. Objective. The objectives of the test plan required proving three measures of troop performance.

(1) The ability of men to field strip a rifle immediately after the initial witnessing of an atomic explosion.

(2) The ability of men to sweep a dummy minefield shortly after witnessing the explosion.

(3) The ability of men to navigate a combat course and throw dummy grenades in radiologically contaminated terrain.

b. Summary of Operations. The plan for the test was designed to be executed in conjunction with shot Smoky for which extensive control data was compiled. An alternate plan was also prepared for shot Wheeler. Since this test was designed to take place in a contaminated area, and neither the HumRRO personnel nor the troops being tested were qualified as radiological monitors, DESERT ROCK Rad-Safe personnel were assigned for the safety of personnel participating in this project. The adverse wind and predicted

fall-out pattern which required implementation of an alternate plan for shot Smoky, precluded use of the Smoky trenches for HumRRO test mission. Contamination of the Wheeler test area by shot Smoky also prevented adoption of the Wheeler alternate plan. Rescheduling of shot Galileo, 2 September, and permission to enter the Smoky area on the same date, permitted testing the troops on assembly and disassembly of the M1 rifle in the open immediately after experiencing the detonation at a minimum safe distance of 4,500 yards from Galileo's ground zero. Immediately after this test the troops were transported to the Smoky test area where they completed the test, Penetration of Wire Barrier.

c. Results of Test. No preliminary findings can be submitted because the control data established for the tests will have to be carefully reevaluated to determine the feasibility of its adaptation to the changed test conditions. Since troops had already witnessed shot Smoky, the opportunity of testing troops during their initial exposure to atomic explosion was lost.

SECTION VI - TECHNICAL PROJECTS (SECRET)

20. GENERAL. In the previous exercise, Exercise Desert Rock VI, the technical projects were originally under the responsibility of Field Command, AFSWP, but were later removed and placed under the supervision of the Director, Exercise Desert Rock VI. In Exercise Desert Rock VII and VIII, certain Technical Services Projects were assigned to Camp Desert Rock and the Exercise Director was responsible for the over-all supervision, coordination, and general administrative and logistical support of the tests. The chief of the respective technical service or agency was responsible for the detailed planning, supervision of the test, and evaluation of the test results. Project Officers appointed by the technical services directed the conduct of the tests. Observers received a general orientation covering the test projects and then were permitted direct follow-up contact on a need to know basis. Direct scientific and technical liaison between Camp Desert Rock projects and AEC scientific personnel and projects was not authorized.

21. PARTICIPATING PROJECTS AND SPONSORING AGENCIES. a. Evaluation of Medium Range Detonation and Cloud Tracking Systems (Project 50.3) Sponsor: Chief Signal Officer, US Army.

b. Evaluation of Water Decontamination Methods (Project 50.4) Sponsor: Office of Chief Engineer, US Army.

c. Field Evaluation of Shielding for Engineer Heavy Equipment (Poject 50.5) Sponsor: Office of Chief Engineer, US Army.

d. Test of Field Fortifications (Project 50.6) Sponsor: Office of Chief Engineer, US Army.

e. Test of Ordnance Materiel (Project 50.7) Sponsor: Chief of Ordnance, US Army.

f. Detection of Atomic Burst and Radioactive Fallout (Project 50.8) Sponsor: US Army Artillery and Guided Missile School.

22. PRELIMINARY REPORT: EVALUATION OF MEDIUM RANGE DETONATION AND CLOUD TRACKING SYSTEM (Project 50.3). a. Mission. The twofold purpose of this project was to conduct research necessary to test the Army's capability of evaluating atomic detonations and tracking radioactive clouds, and to test fallout prediction methods and instruments developed by the United States Army Signal Engineering Laboratory.

b. Summary of Operations. For operational purposes the project was organized into a Radar section and a Fallout Prediction section team.

(1) Radar Section. The function of the Radar Section was to detect and track the cloud formed by an atomic detonation; locate ground zero; collect data to determine the dependence of cloud detection on radar frequencies; record fireball growth; record stable cloud dimensions; determine the rate rise of cloud; determine the height of burst; and determine the yield. The data was collected by three X-band radar sets, one L-band set, and by photographing the scopes of the equipment located on Angel's Peak. Ground zeros on shots are being determined by azimuth and range indicated on radar equipment. Radar scopes were recorded on file to show the ability of the various radars to detect and track the atomic clouds. The mushroom portion of the clouds was photographed on some shots, while the stems of all shots were recorded. The rise times of shots were recorded to determine a possible correlation between rise time and yield. Measurements of the radar return from various parts of the atomic cloud as it is formed with both L-Band and X-Band equipment was attempted. Efforts were also made to determine the best operating procedure to detect atomic explosions under normal operating conditions within the range of weather radar equipment.

(2) On 12 May 1957 the radar equipment was positioned at (893872) SE of Yucca Lake where it operated for ten shots. After the third shot an AFSWP project claimed the AN/PRC-9 was interferring with its operation. As a result, the AN/PRC-9 Radar Set was not permitted to radiate at H-hour, but could operate after H + 15 seconds. This interference did not occur on all shots and did not cause serious loss of data. Because of early results, the AN/MPG-1 and the AN/TPS-1D were relocated in approximate minimum safe range areas to try to improve reception. For shots Franklin Prime, Galelio, and Smoky the AN/PRC-9 radar was moved 40 miles east of the site to a test area near the town of Hiko. Results of these shots caused its relocation to Railroad Pass near Boulder City, approximately 100 miles east of the test area.

c. Fallout Team. This team sought to develop for Army use, an operational technique which involves the successful prognostication of fallout using upper wind data.

(1) The fallout prediction method developed at the US Army Signal Engineer Laboratory was tested and efforts were made to improve this method under actual detonation conditions. The feasibility of using various seasonal models (based on height of tropopause) to compute fallout patterns was investigated. Efforts, were made to refine and improve the fallout computation techniques. The feasibility of incorporating the effects of time and space wind variability in the fallout predicitions was investigated.

(2) The fallout prediction team operated in an M-109 mobile van. This van contained the necessary teletype and facsimile

recording equipment for the reception of the required meteorological data, and a fallout plotting prediction and analysis center. The fallout van, operating in the Camp Mercury Area next to the weather station, was the center of activity for the fallout team. Rawin equipment AN/GMD-1 was used to supplement the weather data received from Camp Mercury. Beginning 15 June, the Met team operated from a site near Alamo, Nevada.

(3) The fallout team also participated in a wind variability test with CONARC which used all the AN/GMD equipment of CONARC and the AN/GMD of Project 50.3. This test required 6 wind runs in a 24 hour period at the Alamo site, and a 36 hour period of runs at Camp Desert Rock.

d. Conclusions (Preliminary)- Radar. (1) Radar. (a) The AN/PRC-9 radar set can detect and track atomic detonations at ranges beyond 100 miles under the conditions of the Nevada Test Site.

(b) Ground zero can be located.

(c) The rate of rise of the cloud can be determined.

(d) Further analysis of the data collected is required before further conclusions can be made of the radar operation.

(2) (Preliminary) Fallout. The Fallout Team made improvements on the prediction model to the extent that the direction of fallout compared favorably with actual fallout patterns. The dose rate at H + 1 also compared favorably with existing types of models. This model, therefore, could be used for tactical use because of speed and accuracy of computation.

e. Recommendations. (1) For scientific projects, arrangements should be made for project personnel to make direct contacts with AEC personnel at Camp Mercury.

(2) The Project Officer should be alloted funds and allowed to make local purchases for the project without prior approval of other services.

23. PRELIMINARY REPORT: PROJECT 50.4 - WATER CONTAMINATION FOLLOWING A NUCLEAR DETONATION AND ITS REMOVAL. a. Purpose. To study the water solubility characteristics of radioactive bomb debris and to evaluate a number of procedures for removing these contaminants from water.

b. Summary of Operations. Operations in the field were begun on 3 June 1957 and completed 25 July 1957. The project was confined solely to shot "PRISCILLA", a 40 KT device detonated on 24 June 1957.

Soil samples were taken at ten (10) stations located at from 1500 to 3000 yards from ground zero and at four (4) points located at 30, 50, 125, and 200 yards northeast of ground zero. Field and laboratory procedures will be described in detail in final reports submitted through Engineer Research distribution channels. All laboratory work in the field was accomplished in mobile units of the Engineer Research and Development Laboratory. Additional work including radio chemical analysis of certain low level samples will be done at Oak Ridge National Laboratory and at Fort Belvoir.

c. Discussion and Results. While the results have not been completely evaluated, the following results and observations are not likely to be modified by subsequent review or laboratory analysis:

(1) Solubility of the debris appeared to increase as the pH of water was lowered. Solubility increased sharply below pH 3.2. Of the radioactive materials dissolved at pH 6.0, approximately 14 percent was strontium.

(2) Solubility of debris was found to vary only slightly with time of contact at constant rate of agitation and soil dosage. Material in solution after one (1) minute of contact was 77 percent as great as that in solution after one (1) hour. No increase in the amount of dissolved material was noted after two (2) hours of contact with either tap water or distilled water. Results of a ten (10) day leaching study without agitation showed no significant increase in dissolved radioactivity after one (1) hour of contact.

(3) Hydrochloric acid was found to be slightly less effective than nitric acid in dissolving the contamination.

(4) The contaminated soil was separated into 3 size factions: greater than 50 Microns, from 50 to 5 Microns, and less than 5 Microns in particle size. It was found that the Fraction 5 to 50 Microns contained more activity per gram than either of the other two fractions.

(5) Under favorable conditions of pH, a significant amount of the contaminant was present as colloids. The colloids were filterable only through a biological filter. These were effectively removed by coa gulation with ferric chloride and pulverized limestone followed by filtration.

(6) In that radioactivity was associated with large amounts of soil, it was not possible to contaminate water with this mixture without clay treating the water at the same time. The activity in solution was that material which was not readily removed by clay. It was noted that this dissolved material was not removed significantly by coagulants nor with further dosage of uncontaminated clay.

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(7) ION exchange resins were also used to decontaminate water. These included DOWEX 50X8, DOWEX 2-X7.5 and MB-3. Results were uniformly good, essentially 100 percent removal being obtained in each test. Of the numerous methods and materials used, none approached the performance of ION exchange demineralization in contaminant removal from water. In one test using water from a ditch 250 feet from ground zero it was demonstrated that squad type filtration and demineralization equipment is feasible under unusual conditions and requirements.

d. Conclusions. (1) Project 50.4 has significantly extended the knowledge concerning water contamination resulting from atomic weapons debris. Results in the field are in agreement with the past and present equipment development program of the Army Corps of Engineers.

(2) A number of laboratory experiments are suggested by the field findings and these are being conducted at the Oak Ridge National Laboratory.

(3) The tests conducted emphasize the importance of removing all suspended matter from contaminated water since this represents the majority of the contaminant. It must be noted, however, that colliods are included and complete water treatment is required. These results also point up the fact that complete removal of radioactive contaminants is not achieved by any process that does not remove essentially all of the dissolved minerals in the water. This represents only two choices: distillation or ION exchange. For military use, both methods are practical under proper conditions. Distillation equipment is available to the US Army. A mobile ION exchange unit is under development by the Corps of Engineers at this time.

(4) For use in forward areas there is presently available Water Purifications Knapsack, Pad Type, ¼ gpm. This unit was designed for use at squad level. The results of this project suggest that an expendable ION exchange unit could be readily designed to supplement this item.

(5) A high order of water clarification is so fundamental to the removal of suspended radioactive contaminants as to fully justify the expediting the procurement and issue of the recently developed new family of engineer water purification equipment.

e. Recommendations. (1) Development of ION exchange equipment by the Corps of Engineers, now in progress, be expedited, and that the Engineer tests of such equipment include a field test using radioactive bomb debris.

(2) A study be conducted by appropriate authority to determine if a military requirement exists for water decontamination at squad or small detachment level.

24. PROJECT 50.5 - FIELD EVALUATION OF SHIELDED CORPS OF ENGINEERS HEAVY EQUIPMENT (PRELIMINARY REPORT). a. Purpose. To determine the attenuation of residual gamma radiation by shielded heavy equipment operation in a large uniformly contaminated field and to evaluate the ability of operators to decontaminate land areas with shielded equipment.

b. Summary of Operations. Test with a lead shielded operator cab on a D8 Caterpillar Tractor was conducted during the period 21 May to 1 July 1957 at the Nevada Test Site. Two atomic detonations were utilized for the test: shots "BOLTZMAN" and "WILSON". On June 18, the shielded dozer was run into and out of "WILSON" GZ at H + 9 hours. On D + 1 day areas 100' by 100' and 30' by 100' were decontaminated. In the "BOLTZMAN" area, similar areas were decontaminated on D + 8 days and D + 9 days respectively.

c. Conclusions and Results. The following data was obtained and conclusions drawn as a result of above operations:

(1) Data obtained:

OPERATION	BOLTZMAN	WILSON
GZ Region Traversal		
Maximum Indicated Outside Intensity - r/hr	-	90
Maximum Indicated Inside Intensity - r/hr	-	10
Total Operator Dosage - r	-	1.4
20 Hour Exposure to 500 mr Free Field		
Outside free field dosage - r	-	970
Outside dosage on tractor - r	-	840
Inside dosage at operator's position - r	-	80 X
Decontamination		
Average intensity in 100' x 100' Area before - r/hr	1.5	0.336
Average intensity in 100' x 100' Area after - r/hr	.44	.306
Average intensity in 30' x 100' Area before - r/hr	2.6	.412
Average intensity in 30' x 100' Area after - r/hr	1.35	.374
Direct measurement		
Free Field intensity - r/hr	-	0.42

Direct Measurement - Cont'd.

Intensity inside cab - r/hr	-	.0235
Intensity on hood - r/hr	-	.23

(2) Preliminary analysis of the data yielded the following tentative results:

PROTECTION FACTOR*	BOLTZMAN	WILSON
GZ Region Traversal - near GZ	-	13
2500' out	-	16
20 Hour Exposure to 500 mr	-	12
Free field		
Decontamination Operations	-	14.5
Direct Measurements	-	18
DECONTAMINATION FACTOR**		
100' x 100' Area	0.29	0.91
30' x 100' Area	.52	.91

*PF equals outside dose rate/inside dose rate.

**DF equals average dose rate after/average dose rate before.

(3) Additional data obtained by direct measurements and by placement of film badges on equipment agree reasonably well. The predicted protection factor of 10 for shielded D8 in neutron induced gamma field of 2.0 MEV proved to be quite conservative.

(4) Heat build-up in the cab was not as severe as expected and at no time did the cab become untenable. Detailed studies showed that with the blower in operation the cab temperature never rose more than two degrees above ambient. Visibility proved to be good in all directions except to the rear and this deficiency would be largely eliminated if the cab were enlarged so that the operator could swivel his seat easily. Operator acceptibility was poor, primarily because of the extremely restricting space within the cab. By increasing the cubage in the cab 50 percent a completely acceptable cab could be produced.

(5) The shielded D8 proved completely satisfactory in providing a high degree of protection to the operator in radioactive fields. Decontamination of land areas near ground zero was very successful, particularly in fallout areas. (See Figure 1, Page 62.)

d. Recommendations. (1) The protective cab should be redesigned to permit easier and more efficient operation of the equipment.

(2) New or improved models of shielded engineer equipment should be tested in further atomic tests.

25. PROJECT 50.6 - PROTECTION AFFORDED BY FIELD FORTIFICATIONS AGAINST NUCLEAR WEAPONS EFFECTS. a. Purpose. To determine the protection afforded against atomic weapons effects by various types of field fortifications.

b. Summary of Operations. (1) Twenty-seven (27) emplacements were constructed for measurements of effects as a result of atomic detonation (PRISCILLA which occurred on 24 of June 1957). These twenty-seven (27) emplacements were composed of the following:

FORTIFICATION	NUMBER
Machine Gune Emplacement	5
Two Man Foxhole	10
Modified Two Man Foxhole	2
Offset Foxhole, covered	5
Offset Foxhole, open	3
Hasty Shelter	2

(2) Balistic Research Laboratory pressure-time gages were installed in the machine gun emplacements and in the horizontal tunnel of the covered off-set foxholes that were revetted with sections of oil drums. All of the emplacements were instrumented for nuclear radiation by AFSWP Project 2.4, Shielding Studies. In addition AFSWP Project placed a pig in the entrance structure of each machine gun emplacement.

(3) Because no radiation data and only a few blast measurements are available for this preliminary report the information given herein will principally concern blast damage to the emplacements. Final report on entire operations will be rendered at a later date through normal Engineer channels.

c. Conclusions and Results. (1) Preliminary blast line data revealed dynamic pressure of approximately 175, 117, 47, and 2 psi at the distances from ground zero where fortifications were exposed.

(2) The hasty emplacements withstood the blast effects about as expected; however, these fortifications were positioned at distance from ground zero where blast damage would not be severe since the principal objective was to obtain measurements of nuclear radiation from which attenuation factors for the various cover conditions could be determined.

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(3) Even at low over pressures (9 and 11 psi) it was obvious that the offset foxholes (round) were more blast resistant than the conventional rectangular ones. The fact that some horizontal tunnels did not collapse should be accepted with the understanding that Frenchman Flat soil is quite stable in the undisturbed state.

(4) Machine gun emplacements were damaged more than was expected for their respective orientation. The laminated roofs on all emplacements withstood the vertical pressures, but the method of fastening them to the caps was inadequate to cope with lateral loading even in the rear-on to ground zero orientation. The entrance structures showed promise on all five structures as evidenced by recovery of the pigs in fair condition.

d. Recommendations. Preliminary examination of available results indicate that the test was successful, but since effects measurements inside emplacements are not available at this time, no recommendations can be made until evaluation of all data has been completed.

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26. PROJECT 50.8 - DETECTION OF ATOMIC BURSTS AND RADIOACTIVE FALLOUT. a. Purpose. To determine the suitability of equipment now in US Army units, or available for user tests to detect the horizontal location, height of burst, and yield of atomic detonations. Test the capability of army units to predict and monitor radioactive fallout using equipment organic or equipment available for user test. Determine the organization and equipment required at Army, Corps, and Division level necessary to predict and monitor radiological fallout. Obtain specific requirements for weather data. Determine ability of radar to detect, acquire and track targets and guided missiles through an atomic cloud and fireball.

b. Summary of Operations. (1) Project 50.8 became fully operational on 10 June 1957 and since that date participated in test shots as follows:

SHOT	DATE	PARTICIPATING AGENCY
WILSON	18 June	Air Defense Board, Artillery Board (with limited optical instruments)
PRISCILLA	24 June	Full Participation (ADB, Arty Bd Cml Corps, Tactical Support Center, Arty Metro Sections and Air Weather Service Detachment)

SHOT	DATE	PARTICIPATING AGENCY
COULOMB A	1 July	Arty Bd (Optical Instruments only)
HOOD	5 July	Full Participation
DIABLO	15 July	Full Participation
JOHN	19 July	ADB, Arty Bd.
KEPLER	24 July	Full Participation
OWENS	25 July	Full Participation (Except Cml Corps)
PASCAL A	26 July	Arty Bd (Sound Ranging Only)
STOKES	7 August	Full Participation
SHASTA	18 August	Full Participation
DOPPLER	23 August	ADB

(2) The following agencies had direct responsibilities for specific portions of the test as follows:

(a) The US Army Artillery and Missile Center.

1. Developed plan of test.

2. Provided Tactical Support Center/Fire Support Control Center which would normally be available to collect the necessary meterological data and weapon information in order to provide radiological fallout prediction. Dissemination of the predicted data.

3. Provided an observation battery reinforced with necessary communications, ballistic meterological sections, operating personnel and army aviation personnel to support the test requirements.

(b) US Army Artillery Board.

Tested the capabilities of equipment organic to the observation battalion and equipment available for user test.

[redacted]

(c) US Army Air Defense Center.

Provided the personnel and equipment as required to supplement the resources of the Army Air Defense Board.

(d) Air Weather Service Detachment.

Provided general weather evaluation, technical advice and assistance normally available from a tactical weather station at corps level.

(e) Chemical Corps School.

Provided ground and aerial teams to monitor radiological fall-out.

(3) There were 38 officers, 21 Warrant Officers and 498 Enlisted Men associated with Project 50.8.

(4) The following fall-out systems were tested:

US Radiological Defense Laboratory Method
US Air Force - Air Weather Service Method
TM 23-200, Capabilities of Atomic Weapons Method
Chemical Corps School Method
Command and General School Method
US Weather Bureau Method.

(5) Fall-out Prediction Procedure:

(a) The TSC Detachment tested the following fall-out systems: US Naval Radiological Defense Laboratory, US Air Force - Air Weather Service, TM 23-200, Chemical Corps School, Command and General Staff School and the US Weather Bureau methods. All of the systems tested, with the exception of the TM 23-200 method, gave good qualitative but poor quantitative results.

(b) The United States Naval Radiological Defense Laboratories system plots the fall rate and path of various size particles. The result of the plot is a "hot line" of expected contamination.

(c) The Air Weather Service method plots 10,000 feet wind vectors from the "ground zero" point and encloses the area between the extreme end of the vectors. Arrival times are computed by extending each vector a distance equal to the first hour's plot for succeeding times. The system had fair results in predicting the area covered by fall-out. Arrival times after the first few hours were very inaccurate.

(d) The TM 23-200 Method plots elipses from the "ground zero" point which are based on one scaled wind vector from the surface to the top of the cloud. Results were not very good, either qualitatively or quantitatively.

(e) The Chemical Corps system assumes a uniform cloud distribution and plots separate elipses for each 5000 foot wind level. Higher intensity values are assigned to areas where two or more elipses overlap. Qualitative results were good but quantitative results were only fair.

(f) The Command and General Staff College method scales wind direction and average wind speed up to the center of the cloud. Density contours taken from FM 101-31A are superimposed on the resulting wind hodograph. Good results for direction and area were achieved, but because of the low radiation readings on this test series, quantitative results were inconclusive.

(g) The United States Weather Bureau plots resultant wind vectors in increments of 10,000 feet from the ground to succeeding levels, i.e.: 0 to 10,000, 0 to 20,000, 0 to 30,000, etc. The area inclosed by these separate vectors represent the fallout area. Qualitative results were fair.

(6) Specific tests. (a) Chemical Corps Radiological Group. This group participated in shots Priscilla, Hood, Diablo, Kepler, and Shasta. Ground Monitoring was conducted on all shots to establish dose rate contour lines and intermediate intensities. The Aerial radiological surveys relied primarily on the Jordan 10 KSG surveys instrument with remote probe mounted externally. Both ground and aerial teams operated simultaneously to permit comparison of data obtained. Aerial teams monitored 100 to 150 square miles per hour.

(b) Air Weather Service Detachment.

As an aid in determining weather requirements the detachment collected weather data from single stations at varying distances up to 200 miles from GZ. Obtained composite wind message based on 3 to 4 rawinsonde stations. Data from a dense network of weather stations other than these organic to the detachment.

(c) Artillery Ballistic Meteorological Sections.

1. Three electronic metro sections were assigned to the project to assist in measurement of weather in the test site area, and to determine whether sections were capable of providing special weather data required for fallout predictions.

[redacted]

2. The sections provided measurements of weather parameters, computed artillery ballistic metro messages on a 2 hour schedule, determined mean winds in 5000 foot increments, and special weather data for Sound Ranging requirements. In addition, weather data was collected to determine time and space variability factors.

(d) Field Artillery Equipment Test.

The Army Artillery board tested the BC Scope and M2 Aiming Circle on shot location readings on dust columns. The XE-3 models of AN/TVS-1 Cameras to provide location and height of burst data. The AN/GAS-1, an infra-red, photo-electric, light detecting mil. An AN/ASH-4 Bhangmeter to produce an intensity versus time graph from which yield may be computed, A Sound Ranging Set GR-8 placed from 40,000 to 65,000 meters from GZ to locate points of detonation. An AN/MPQ-10 Radar Set to locate point of burst. An AN/MPQ-21 Radar Set, an experimental fire adjustment radar, to detect burst point and track the resulting atomic cloud together with measurement of fire-ball radius.

(e) US Army Anti-Aircraft Artillery Board Test.

The Anti-Aircraft Artillery Board emplaced the AN/TPS-10 Radar, AN/FCS-n-33 Radar (2 sets), NIKE-AJAX System, AN/FPS-36 Radar, AN/MTQ-1 Operation Center, and the NIKE-AJAX Guidance Packages (3 sets) to detect an atomic burst, and acquire and track atomic clouds. Tracking ability appeared to be a function of range, with sets about 10 to 20 miles from bursts meeting with most success.

c. Conclusions and Results (Tentative). (1) Horizontal locations of atomic detonations can be made by flash and sound equipment. In the special case of radar tracking of atomic projectiles, horizontal location can be made by radar also. These are limited to ranges of approximately 50 miles.

(2) Height of burst can be determined by the AN/TVS-1 Camera with line of sight. Range Capability is estimated at under 25 miles.

(3) Yield can be determined by the AN/ASH-4 Bhangmeter, but this item requires considerable development.

[redacted]

(4) While the FA Radar sets AN/MPQ-21 have some technical capabilities to detect and track atomic clouds, no corrections with yield or fallout were reliable. The same results can be obtained with relatively inexpensive optical equipment.

(5) A suitable tactical method exists to provide a qualitative fallout pattern for small yield weapons (below 40 KT).

(6) No suitable tactical method exists to provide quantitative fallout isodose patterns.

(7) A quantitative system of fallout prediction must consider time and space of variation of the wind and large scale vertical motions of the atmosphere.

(8) The atomic cloud should not cause too much difficulty with regard to attenuation of, or into reference with, radar signals. This applies only to bursts which are essentially air bursts.

(9) Ground survey gives more detailed results than aerial survey but is severely limited in the area that can be monitored in a given time.

(10) Aerial surveys will be required to provide rapid determination of fallout direction and contamination.

(11) Present standard military instruments are unsatisfactory for use in aerial survey due to the slow response time in a rapidly changing intensity area.

d. Recommendations. None can be made at this time. Data compiled as a result of tests will be subjected to detailed study and analysis by each of the participating agencies at its home station before any definite recommendations can be made.

[redacted]

27. TEST OF ORDNANCE MATERIAL (PROJECT 50.7).

a. Mission. To test items of ordnance equipment under blast, thermal and radioactive effects of nuclear explosions. Although these equipment tests were not of a nature to be included in the AFSWP programs, the tests were, in several instances, extensions of AFSWP programs.

b. Summary of Operations.

(1) The following equipment was tested by participating army organizations as indicated below:

(a) Ballistic Research Laboratories (BRL). M-48 tanks (supplied by BRL) were fitted with complex radiation detecting gages and measurements of the gamma and neutron radiation were obtained. Four hemispheres constructed both of conventional and proposed types of tank armor (two each) were exposed to radiation from nuclear detonations. Radiation detectors, similar to those used in M-48 tanks, were enclosed at the center of each hemisphere to measure the radiation entering from any direction. Five ONTOS vehicles were also instrumented for radiation studies. A test of vehicle damage caused by small tactical weapons was made concurrently with other tests.

(b) Continental Army Command (CONARC). A test was to be made of the protective value of tanks placed over revetted and un-revetted foxholes. The comparative danger to troops in protected and un-protected foxholes of the two types was to be determined by means of measuring devices. Standard foxholes were used, both face-on, (FO) and side-on (SO), to the blast wave. For each test, six foxholes (three protected and three unprotected) were required. The protection was afforded by tanks and ONTOS vehicles positioned over the foxholes oriented at FO, SO, and RO (rear-on) to the blast wave.

(c) Diamond Ordnance Fuze Laboratories (DOFL). The effects of neutron radiation on the component parts of rocket fuzes and shell fuzes was tested. About sixty test items (primarily shell and rocket noses) were exposed at three distances on Shot Priscilla. Emplacement of the items consisted of digging trenches from 8 inches to 12 inches deep, securing the test items in the trenches and back filling the trenches.

(d) Detroit Arsenal. Five ONTOS vehicles were exposed to increasing blast pressures in order to determine the type of damage inflicted on these vehicles

c. Procedure and Results.

(1) Radiation Studies

(a) For each nuclear detonation an array consisting of 3 tanks, 3 ONTOS vehicles, 2 solid-armor hemispheres, and 2 laminated armor hemispheres was placed at the same radial distance from GZ. For Shots Franklin, Lassen and Wilson the radial distance was 1800 feet, for Shot Hood it was 3,000 feet. See Figure 2. Instrumentation was obtained and installed by the personnel of AFSWP Project 2.4. Tanks and ONTOS vehicles were instrumented with gamma ray detectors, neutron detectors (covering low, medium and high energy levels) gamma sensitive film badges, and gamma-neutron dosimeters. Rods supporting the instruments were attached to the seats of each crew member of the tanks and to the gunner's seat in the ONTOS vehicles. A detector giving a record of gamma intensity versus time was mounted in the radio shack of the face-on tank

(b) Preliminary Results.

1. Because of compartively small absorption area of dector vs absorbent size of the human body, results of experiments are only indicative of the true personnel radiation dosage received within the armored vehicles. Also the error of a specific detector ranges from ±15 to ±20%.

2. The desired data was a transmission factor, i.e., a factor obtained by dividing the inside dose (of gamma and neutrons) by the outside dose of the same radiation.

3. Gamma radiation data was measured on shots Franklin, Wilson and Hood. Good correlation between gamma ray transmission factors for the tanks and hemispheres has been noted on these shots. Results of neutron radiation require laboratory analysis and are not available for this report.

(2) Foxhole Studies

(a) An investigation of the protective effects of tanks placed over standard two-man foxholes was made. The experiment did not follow the original suggestion that both revetted and unrevetted foxholes be tested. The injurious effects to be received by the occupants of a foxhole were expected to be results of thermal and nuclear radiations, blast pressure, and missiles propelled by the high velocity winds following the shock wave front. It was felt that any of the materials which might normally be used in revetting a foxhole (wood or light sheet metal) would have negligible protective value against the above mentioned effects, especially those due to blast or missiles. This reduced the number of foxholes required by about one-half.

(b) On Shot Wilson tests were made on two-man foxholes. Three foxholes were dug end-on and three were dug side-on to ground zero. One of the end-on foxholes was left uncovered, a rear-on (RO) tank covered the second and a face-on (FO) ONTOS vehicle covered the third. One of the side-on foxholes was left uncovered, a side-on (SO) tank covered the second, and a face-on (FO) tank covered the third. The uncovered foxholes served as standards while the others were designed to demonstrate the effects of

foxhole-vehicle orientation and vehicle type. The tanks were representative of heavy armored vehicles, while the ONTOS were representative of light armored vehicles. On Shot Hood two-man foxholes were again utilized. Here two were oriented side-on and four were oriented end-on. Over one of the side-on foxholes a FO tank was placed, the other was left uncovered. One end-on foxhole was left open and the others were covered by a SO tank, a RO tank, and a RO Ontos. To detect any tendency toward lowered blast pressures in or around the foxholes, self-contained pressure-recording gages designed by BRL were placed at the bottom of each foxhole. Also, a check was made to compare the relative damage to the edges of the foxholes, for at higher blast pressures, caving-in of these edges should be more pronounced. Measures of neutron radiation were taken using the dosimeters, which were securely placed against the pressure recording gages at the bottom and center of each foxhole. Indications of the effects of the tank in changing the missile bombardment of inhabitants of the foxhole were obtained from comparisons of the number of missiles found after the shot in the protected foxholes with the number found in the unprotected foxholes. The foxholes were dug in hard clay as found in the test area.

(c) Results.

1. Shot Wilson

a. Pressures. The pressures measured inside the foxholes, covered and uncovered, were not significantly different from those measured on the surface at the same ground range.

b. Thermal. No scorching of the cloth patches was observed in any of the foxholes, covered or uncovered, so that no conclusions could be drawn from the experiment as to the actual protective value of the tank as a thermal shield. This experiment was not repeated on Shot Hood.

c. Radiation. The radiation dosimeters, while chosen according to the information given in TM-23-200, were of too low a range for the radiation they actually received. Laboratory analysis of the dosimeters will be required before the radiation results are known*.

d. Damage. The following damage was observed in the foxholes of Shot Wilson: Side-on, covered with RO tank - sides caved in, approximately 50% silted; Side-on, uncovered - no indicated cave in of the sides, approximately 15% silted; Side-on, covered with SO tank - sides caved in, almost completely silted; End-on, uncovered - sides caved in, approximately 50% silted; End-on, covered with FO tank - no damage, very small

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* When radiation is within a limited range, the dosimeters may be quickly analyzed for dose by using an optical densitometer. When this range is exceeded, chemical titration methods are required.

*(b) Orientation of the tanks was dictated by the requirements of the radiation experiments (see Radiation Studies Section).

amount of silt inside; End-on, covered with FO Ontos - no damage, no silt inside.

e. Remarks. It should be mentioned that foxhole (3) caved in because the blast pressure caused the SO tank to slide, one track dragging across the opening. Other foxholes apparently caved in because of the blast pressure acting around their perimeter. Foxhole (6) was in perfect condition.

2. The results from Shot Hood are as follows:

a. Pressure. The pressures measured inside the foxholes, both covered and uncovered were not significantly different from those measured on the surface at the same ground range.

b. Radiation. Radiation dosimeters were overranged, as in Shot Wilson, and required laboratory analysis.

c. Damage. The damage observed in the foxholes, 1 through 6 of Shot Hood is illustrated by the series of photographs on page 65 . (Figure 3)

d. Remarks. Again, as noted in Shot Wilson, foxhole (3) caved in because of the SO tank dragging across the hole. Other foxholes apparently caved in because of the blast pressure acting around their perimeters. Considerable silt was deposited in the foxholes, which obscured any missile evaluation and the degree that the foxholes were filled by the sides being caved in.

e. Trends. Some trends indicated by the foxhole experiment are:

1. Occupants of foxholes are jeopardized by SO Tank cover. Having this orientation, a tank is more easily caused to slide, due to the larger area presented to the blast wave.

2. Silting and/or caving in of the foxholes that were covered with FO or RO tracked vehicles was not prevented and may be aggravated by presence of the vehicles.

3. Both tests using Ontos vehicles as covers indicated that these vehicles are effective in preventing caving in of the side-walls. In the Hood Shot where silting was prevalent, little residue was found in the Ontos covered foxhole. However, some evidence points to the uneven silt distribution in the blast wave as the cause.

4. For detonations at and below the elevation angle obtained on Shot Wilson, the armored vehicle cover probably would not add to the protection of the foxhole itself against scorching or burning

[redacted]

5. Where Ontos was placed FO over an end-on foxhole, better protection of the foxhole from caving-in and silting was noticed, as compared to a tank under similar conditions. Some evidence points to a lower silt distribution in the foxhole with this orientation than at the other orientations tested.

6. Air blast effects, as indicated by peak blast over-pressure, are not significantly diminished by the armored vehicle covers. This was noticed for both the end-on and side-on foxholes for all vehicle orientation.

7. The value of armored vehicle cover for radiation protection can not be determined until laboratory analysis has been completed of the chemical dosimeters and film badges.

8. Additional data should be obtained before a complete analysis of the advantages or detriments of vehicle cover can be ascertained.

(3) Fuze Tests.

(a) A test of bomb fuzes, rocket fuzes, artillery fuzes, and hand-grenade fuzes was made to determine the effects of neutron radiation These were located on Frenchmen Flat for Shot Priscilla.

(b) All except the hand-grenade fuzes contained electronic components which are to be tested for change of qualities on their return to the Diamond Ordnance Fuze Laboratories. The hand-grenades contained barium titanate electrical initiators which will be tested in live grenades to investigate the effects of neutron radiation on their stability. During the development of these grenade initiators, instability of the barium titanate caused erratic operation of the grenades. Since then this trouble has been cured, but it was desirable to ascertain that neutron radiation as would be experienced during their storage in the vicinity of nuclear warfare would not reintroduce similar instability.

(c) The test procedure consisted of burying the test items in shallow trenches. Each fuze was attached to a steel stake and this, in conjunction with a light earth cover, prevented the equipment from being blown away by the blast. Trenches were dug at distances of 1200 ft., 2400 ft., and 3500 ft., and were located close to the neutron detector line of AFSWP Project 2.3.

(d) Results. The results of these tests will depend on laboratory and firing tests to be conducted at DOFL.

(4) Vehicle Damage Tests.

(a) In addition to being employed in radiation studies, the Ontos vehicles were also positioned on various shots to obtain blast

damage to the vehicles. Interest was centered on both direct blast damage and secondary damage caused by overturning of the vehicle. Although the primary function of tanks was for radiation information, some blast damage was obtained on Shots Wilson, Hood and Smoky. There was no jeep damage data obtained.

(b) Shots Franklin and Lassen produced no damage of any kind, although the vehicles were placed at ranges predicted to give severe damage. The weapons employed for these shots detonated far below their expected yield value. Shot Wilson, however, fulfilled the expectations and three Ontos were damaged to varying degrees. An Ontos placed SO at 1000 feet was immediately stripped of its armor by the blast. It was then thrown into the air, flipped lengthwise, and rolled so that it landed on its tracks pointing in a direction opposite to its original heading. The distance it was thrown was 60 feet and the damage was so severe as to preclude repair. An Ontos placed SO at 1250 feet was thrown into the air and flipped lengthwise so that it landed on its back 120 feet away. All guns and the turret were stripped from this vehicle and the armor was bent when it landed. A preliminary inspection indicated that extensive repair would place this vehicle into operation. An Ontos placed SO at 1800 feet was overturned. The guns were broken loose from the turret and the hydraulic system for turret operation was damaged. The vehicle could be put back into operation after several hours of repair time. Shot Hood extended the damage information for Ontos vehicles. The tanks and remaining Ontos were placed in accordance with the field layout shown in Figure 2. A more complete damage analysis of the Ontos vehicles of Shot Hood is given in Figure 4. Ontos Number 4 (Face-on), Range 2400 feet, not shown in Figure 4, was missing the turret and guns before Shot Hood. This vehicle was displaced 20 feet and was not turned over. No further damage occurred to this vehicle. No further damage to the three M-48 tanks occurred.

(c) Damage to tanks placed in gullies and protected by hills was examined on Shot Smoky. Two tanks were set out on this shot, both being placed SO to the blast wave and both put in a gulley. One tank at 2840 feet from GZ did not suffer any damage at all. The other tank at 1231 feet from GZ was rolled over on its top and was severely burned. The engine completely burned and was dropped out of its housing. All the rubber track pads, wires, and control cables were burned out. The tank was not economically repairable.

d. Conclusions. (1) Radiation studies are incomplete.

(2) Foxhole Studies. (a) Definite conclusions cannot be found until further analysis has been completed.

(b) The data indicates that armored vehicles are ineffective and in some cases detrimental in protecting personnel from air

blast effects. There appeared more silting in the Hood foxholes than the Wilson foxholes, although the over pressures were equivalent. This may have been due to the Wilson Shot loosening the earth prior to the Hood Shot, and also to the longer durations of the Hood Shot blast wave The vehicles may be of value in some cases as a shield from thermal radiation. Determination of their value in shielding personnel against nuclear radiation depends on forthcoming analysis of the chemical dosimeters and film badges.

(3) Fuze Tests - Incomplete.

(4) Vehicle Damage Conclusions:

(a) Ontos Vehicles - Damage to the vehicle's armor plate and running gear occurs only after the vehicle is overturned or thrown about. There was no evidence to show that the armor plates buckled prior to overturning. The external guns, gun mounts, turret, headlights, track, etc., were heavily damaged when the vehicles were overturned. An Ontos with SO orientation is more easily affected by blast pressure as compared to either FO or RO orientation.

(b) Tanks - A tank will receive the most damage when in a SO position to the blast wave, similar to the ONTOS. It is more easily overturned with this orientation because of the larger presented area to the blast wave, as compared to the FO or RO orientation Up until the point of overturning, a tank receives light damage to its exterior components only. Some of the external components like radio aerials, periscopes, etc., may be blown away, broken, bent or other wise damaged by blast to prevent their usage. After damage of this type a tank can easily be put back into combat usable condition More serious damage occurs, however, after the tank is overturned. The degree of damage depends upon the dynamic pressure, positive duration of this type of pressure, type of soil, etc , felt by the tank. All periscopes, gun sights, and vision slots facing toward the detonation were darkened, and to a lesser degree the same damage was noticed to those facing away from GZ. This apparently is caused by the high thermal energy of an atomic detonation.

e. Recommendations. Opportunity should be taken in future test to investigate further the:

(1) Radiation effects to obtain the store of statistical data required for a complete analysis of the radiation shielding of tanks, armored vehicles and other more complicated shapes.

(2) Protective value of vehicles covering foxholes with emphasis on those phases in which the data obtained during Operation Plumbob has not been definite.

(3) Darkening of the glass periscopes, gunsights and vision slots in armored vehicles. Further, modifications on some of the external components of armored vehicles which would make them easier to resist blast damage should be examined.

[redacted]

FIGURE NO. 1

Driver in lead shielded operator cab on D8 Caterpillar Tractor receives instructions by radio as he clears a path through contaminated area. YUCCA FLAT, NEVADA (Project 50.5)

[redacted]

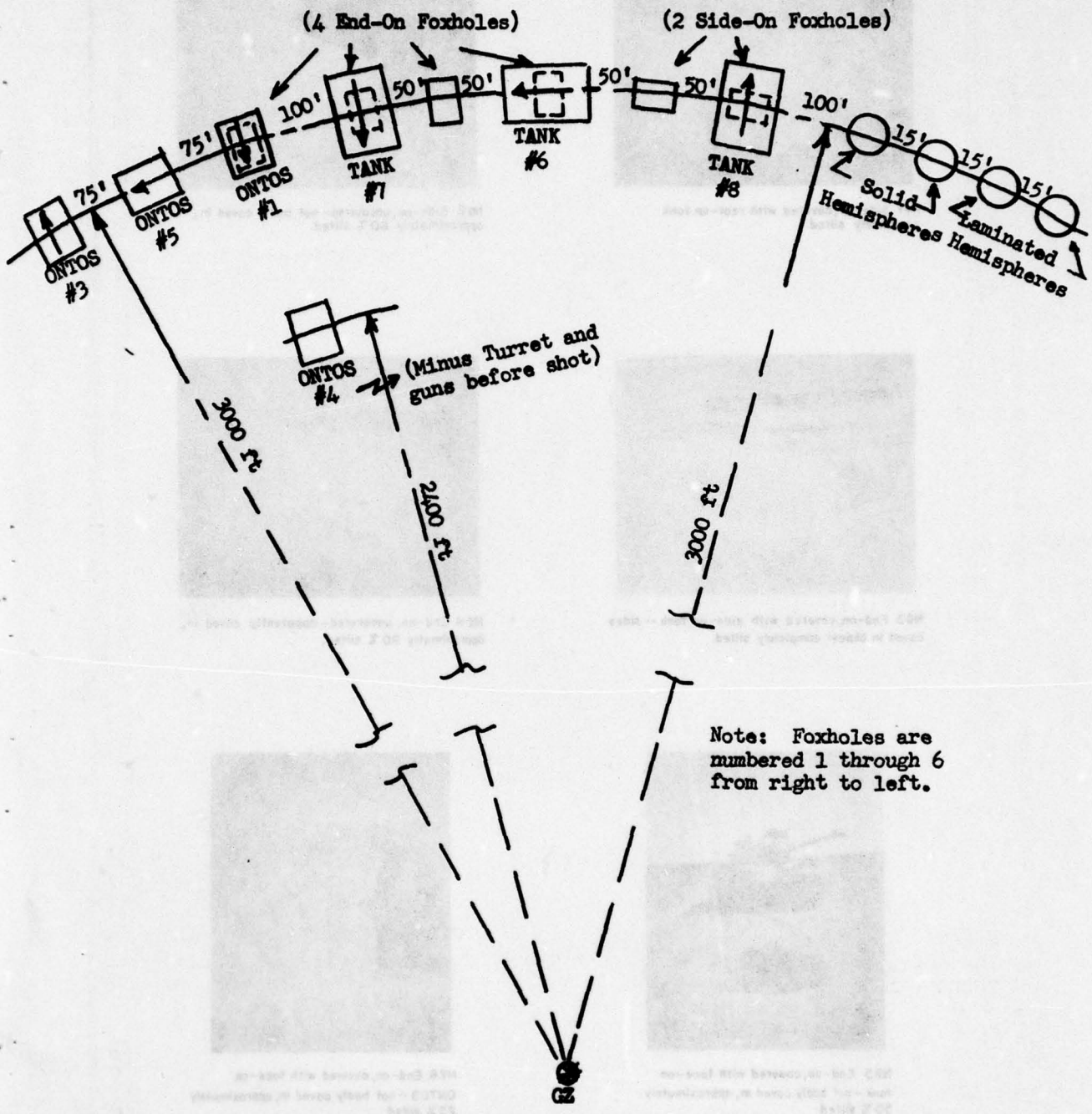


FIGURE 2 - FIELD LAYOUT - SHOT HOOD

№1 Side-on, covered with rear-on tank completely silted.

№2 Side-on, uncovered- not badly caved in, approximately 60 % silted.

№3 End-on, covered with side-on tank – sides caved in almost completely silted.

№4 End-on, uncovered- apparently caved in, approximatly 90 % silted.

№5 End-on, covered with face-on tank – not badly caved in, approximately 50 % silted.

№6 End-on, covered with face-on ONTOS – not badly caved in, approximately 25 % silted.

FIGURE 3 - FOXHOLE DAMAGE (POST SHOT HOOD)
For schematic foxhole layout, refer to Figure 2

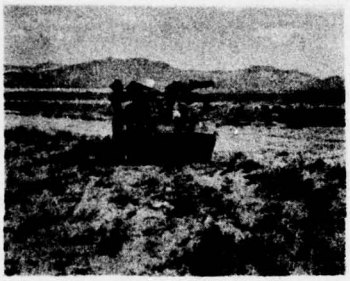
BEFORE		AFTER
	ONTOS No. 1	
Face-on, Range 3000 ft.		Vehicle moved 35 yds—gun were blown up to 100 yds; turned over on top—appears to have turned over only one time; All guns torn off—broken clamp; drivers hatch blown off, muffler damaged; batteries broken; traversing & elevating mechanism broken; turret ring bent; fenders bent; gun lock bent; all electric and hydraulic cables broken.
	ONTOS No 3	
Rear-on, Range 3000 ft.		Vehicle displaced 27 yds—turret torn off—guns torn from mount—all electric & hydraulic cables broken, headlights & periscopes broken out.
	ONTOS No 5	
Side-on, Range 3000 ft		Vehicle displaced 90 yds - turret & guns 50 yd—turret torn off—guns broken away from mount—gun lock torn off—muffler smashed—slave receptacle torn off—right side rear road wheel broken off—right side suspension side channel bent—right track blown off but not broken.

FIGURE 4 - ONTOS POSITION AND DAMAGE (PRE AND POST SHOT HOOD)

PART III (UNCLASSIFIED, EXCEPT AS INDICATED)

CONCLUSIONS, RECOMMENDATIONS, AND TRENDS

SECTION I - CONCLUSIONS

28. (UNCLASSIFIED) S-1. Careful monitoring and screening of personnel assigned to Camp Desert Rock are essential to assure quality, continuity of effort and elimination of unnecessary cost of TDY funds. Replacements for officer and enlisted personnel relieved from TDY prior to completion of exercise for separation, transfer overseas, levies, and other cogent reasons created additional travel expense and reduced the overall efficiency of the operating sections.

29. (UNCLASSIFIED) S-2. a. A significant number of permanent party, project personnel, and troop participants were not properly cleared prior to departing home stations for assignment to Camp Desert Rock.

b. To insure that proper security and clearance procedures are followed, future exercise S-2's should continue to be given a minimum of one week's training with Sandia Base Security Agencies and/or DOD Security at Camp Mercury.

30. S-3. a. (UNCLASSIFIED) S-3 Section. (1) As a media of indoctrinating military personnel in the effects of an atomic weapon, the present observer program is of unquestioned but limited value in some respects. Continuing effort should be devoted to developing a more realistic program.

(2) The value of troop and observer participation would be enhanced by creating greater opportunities for active participation in actual planning and tactical employment of atomic weapons using delivery systems which would be employed in combat.

(3) Technical service projects should be programmed and sponsored by AFSWP whenever possible. Necessary planning and coordination should be accomplished sufficiently in advance to achieve this purpose. This would preclude unnecessary duplication of test effort and would insure continuous scientific and technical coordination and liaison with the Atomic Energy Commission.

(4) Camp Desert Rock should continue to provide necessary administrative and logistical support for those technical service projects that cannot be accommodated at Camp Mercury.

(5) Responsibilities for the planning, preparation, conduct, support and evaluation of troop tests should be clearly and specifically defined and delineated.

(6) Equipment displays in the vicnity of the atomic detonation should be utilized to the maximum to fill any gaps in damage criteria that may exist.

(7) One of the best methods of indoctrinating observers is to give them training in radiological monitoring.

b. (UNCLASSIFIED) Air Section. (1) The aircraft available were adequate to fulfill the missions assigned with the exception of the H-23 helicopter. The H-23 has insufficient power to operate at high density altitude.

(2) Airfield and aircraft maintenance facilities were inadequate.

c. Instructor Group. (1) (UNCLASSIFIED) The eight hour orientation conducted at Camp Desert Rock was beneficial to all observers in attendance who had not received pre-exercise training at their home station.

(2) (UNCLASSIFIED) The pre and post shot tours through the equipment display areas were worthwhile and were enthusiastically received by observers.

(3) (UNCLASSIFIED) Instructors should be graduates of a recognized special weapons course.

(4) (UNCLASSIFIED) The integration of instructors from other services (1 Air Force and 1 Navy) should be continued in future exercises.

(5) (SECRET) Evaluation of predicted and actual damage levels indicated scaling laws and iso-damage curves in TM 23-200 are extremely reliable.

(6) (UNCLASSIFIED) Greater variety in types of emplacements, together with a more representative group of field equipment would have been of more benefit for indoctrination of observers. The limited number and types of equipment did not allow as comprehensive a display as desired.

d. (UNCLASSIFIED) Radiological Safety. (1) Radiological safety policies, procedures, and operations were effective.

(2) Troop support provided by the 50th Chemical Platoon (Svc) for operational use by the Radiological Safety Officer was adequate. This unit was activated and trained under Sixth US Army to support the Radiological Safety mission of Camp Desert Rock.

(3) Camp Desert Rock needs its own dosimetry section to support the Rad-Safe function because of the frequent processing required plus the large number of personnel participating in the exercise. This should be

[redacted]

organized under the Rad-Safety Officer for staff supervision.

(4) The film badge provided by Lexington Signal Depot was an excellent badge that measured both gamma and beta exposure for personnel. It was evident from the number of lost film badges, however, that a different clip will be needed for future field operations if this badge is to be used again. The difficulty experienced was the ease with which the alligator clip of the film badge could be removed from the individual's articles of clothing, particularly when on a working detail.

(5) Radiological monitors should be considered trained only when Radiac instrument readings will indicate to the monitor an appropriate action or recommendation.

(6) Because of its relatively limited range, Radio Set AN/PRC-10 was found to be inadequate for use by mobile Rad-Safe survey parties unless supported by aerial relay. (Requirement was for 8-15 miles for Rad-Safe operations. Satisfactory operation of radios was obtained for only 3-5 miles over level terrain, and 10 miles when elevated above masking terrain features and with favorable weather conditions.)

(7) Radiac Sets AN/PDR-T1B and AN/PDR-27 for use in Camp Desert Rock operations were adequate in number, but required extensive maintenance. In addition to these sets, there is a need for approximately 20 high intensity instruments for normal Rad-Safe operations.

(8) As in this exercise, the Radiological Safety Officer, or his representative, should attend all AEC weather briefings for shots involving Desert Rock participation.

31. (UNCLASSIFIED) S-4. a. The S-4 section and technical service chiefs with their staffs should report to Camp Desert Rock a minimum of 30 days prior to the first event to plan and develop policies, coordinate requisitioning requirements, establish P&C functions, and organize the many responsibilities of the S-4.

b. The present source and system of supplying water is unsatisfactory. Unless the existing well can be made productive, the availability of water from sources under AEC control should be explored.

32. (UNCLASSIFIED) ENGINEER. a. The engineer support assigned to perform the mission at Camp Desert Rock was adequate.

b. Training received by performing work of varied nature was excellent.

33. (UNCLASSIFIED) SIGNAL. Adequate Signal support was provided; the operational plans are sound and require no notable changes for future exercises.

34. (UNCLASSIFIED) QUARTERMASTER. The Quartermaster functions were considered normal. Support units assigned were adequate and would support future exercises of a like nature.

35. (UNCLASSIFIED) ORDNANCE. a. Due to extended supply lines, non-standard and limited standard items of equipment should not be included in future exercises.

b. Ordnance maintenance shop facilities at Camp Desert Rock are inadequate.

36. (UNCLASSIFIED) TRANSPORTATION. Vehicles over five years old are a definite handicap in this desert area due to frequent engine and power train failures. This was particularly noted in the performance of buses, sedans, and older TO/E vehicles.

37. (UNCLASSIFIED) MEDICAL. Medical support was adequate.

38. (UNCLASSIFIED) HEADQUARTERS COMMANDANT. All planning and operations must be extremely flexible to conform to delays, changes in shot schedule, and overlapping of observers.

39. (UNCLASSIFIED) JUDGE ADVOCATE GENERAL. Judge Advocate activities were considered normal.

40. (UNCLASSIFIED) INSPECTOR GENERAL. The duties of Acting Inspector General were discharged effectively by the S-1, who was in the position to take immediate action on the majority of the justified complaints received.

41. (UNCLASSIFIED) PUBLIC INFORMATION. Adequate and timely news coverage of all activities pertaining to the exercise was made and the public was well informed.

42. (UNCLASSIFIED) COMPTROLLER. The Class B Agent office at Camp Desert Rock operated effectively.

43. (UNCLASSIFIED) FINANCE. Functions of the Finance Section were normal. No operational difficulties were encountered.

SECTION II - RECOMMENDATIONS (UNCLASSIFIED)

44. S-1. a. In future exercises every effort should be made to stabilize the tours of duty for all personnel assigned.

b. Commands furnishing permanent party personnel to Camp Desert Rock should be required to specify in the orders the primary and secondary MOS of the individual being placed on TDY, the requisition code number, length of service remaining degree of security clearance, and the position individual was selected to fill.

45. S-2. Assignment of personnel to Camp Desert Rock for any purpose should be carefully monitored by responsible agencies to insure compliance with existing security directives.

46. S-3. a. S-3 Section. (1) Planning should be directed toward the conduct of realistic training and troop tests involving the actual employment of low-yield atomic weapons delivered by tactical delivery systems under the control and at the will of the commander.

(2) As a minimum, practical field exercises and troop tests should be conducted on the Nevada Test Site employing reliable tactical delivery means and utilizing stock-pile weapons or other devices not requiring extensive instrumentation by the AEC, so as to minimize restrictions on troop employment. However, the use of the Nevada Test Site should be considered as an interim measure only since the available terrain is extremely limited and inhibiting restrictions by the AEC are unavoidable.

(3 As a long range objective, the feasibility of conducting such training on a military reservation should be explored. The objective should be the integration of atomic training into annual training programs on a regularly scheduled basis at an atomic training center.

(4) Responsibility for and supervision of the preparation, conduct, and evaluation of troop tests, including rendition of final reports thereon, should be assigned to the sponsoring Service School or other appropriate agencies of the Army.

(5) The commander and staff should be designated and, in coordination with the Service School concerned, made responsible for training the troops involved, execution of the tactical plans, and rendition of required reports.

(6) Responsibility for the administrative and logistical support of troop tests, including the necessary coordination with the AEC, based upon the concept and detailed plan of test, should be assigned to the Deputy Exercise Director.

(7) Every effort should be made to insure that maximum advantage is taken of equipment displays to fill any existing gaps in damage criteria.

(8) All observers in future exercises should be given a short practical course in radiological monitoring at Camp Desert Rock.

b. Air Section. (1) All helicopters assigned to Camp Desert Rock should be capable of operating safely and efficiently at the high density altitudes encountered.

(2) Adequate aircraft maintenance facilities should be provided at the Camp Desert Rock airfield.

(3) The North-South runway should be hard topped and lights installed the entire length of runway for night operations and emergencies.

c. Instructor Group. (1) All instructors should be graduates of a recognized service school special weapons course.

(2) Instructors representing the Air Force and Navy should be assigned to the Instructor Group on a full time basis and billeted at Camp Desert Rock.

(3) The entire Instructor Group should be ordered to Camp Desert Rock a minimum of 30 days prior to the date of the first scheduled instruction.

(4) Display of various types of equipment for purposes of observer orientation should be continued in future exercises.

(5) A greater variety of equipment should be made available for display purposes in future exercises.

d. Radiological Safety. (1) For training purposes a small yield surface detonation should be scheduled early in the next Nevada Test Site Operation in an area where personnel from Camp Desert Rock could utilize the resultant contaminated area for practical training in radiological monitoring and safety without interfering with AEC or other project operations. This training should be made mandatory for all observers reporting to Desert Rock for purposes of observing a shot.

(2) Training of CBR Survey Teams and Chemical Corps officers from all Army Areas should be conducted during future exercises. Coordination with Headquarters, Armed Forces Special Weapons Project should be effected at an early date since the Air Force, Navy, Marines and Canadians indicated a continuing interest in their programs for future exercises.

(3) Radiological monitor training with helicopters and fixed wing aircraft should be conducted as a standard practice in future exercises in order to give CBR Survey Teams and pilots training in the specialized techniques required for aerial radiological surveys.

(4) Criteria for the maximum limits to which Department of Defense personnel will be exposed when participating in training and troop tests should be established early so that a proper type film badge can be arranged for and procured.

(5) The Lexington Signal Depot team should continue to perform dosimetry for Camp Desert Rock, and should be augmented by the number of military personnel required on a full-time basis.

(6) A conference should be held with the Nucleonics Branch of the Lexington Signal Depot several months before the next exercise to decide upon the type of film badge to be used, procedures of issue and turn-in, and the procedures by which evaluation data will be reported.

(7) The Army field decontamination station in the Nevada Test Site should be of semi-permanent construction. Squad tents cannot withstand the high winds of this area for any length of time.

47. S-4. a. Sixth US Army should continue to give high priority to resolving the water problem at Camp Desert Rock. If the existing well cannot be made productive, the procurement of water from sources under AEC control should be explored.

b. The plans and directives for future exercises involving test projects should provide clear delineation of project funds, special materials required, and responsibilities involving logistical support to be provided by the project's home station and those to be provided by Camp Desert Rock.

48. ENGINEER. a. Necessary action should be taken to provide adequate electric power for Camp Desert Rock.

b. Both exterior and interior wiring of Camp Desert Rock should be renovated and rebalanced.

c. A cut-out switch should be installed on the main line in order that service of the Camp may be disconnected without interrupting service to Camp Mercury.

d. A new Imhoff Tank capable of supporting the anticipated peak load should be installed and leaching beds should be doubled in size.

e. Permanent traps should be installed in all pit type latrines to prevent debris from entering main sewage lines.

f. Improved site facilities should be constructed to accommodate troop units of battalion or larger size.

g. Culverts should be increased to 24" diameter.

h. Additional surfacing of storage, shop, parking areas and roads should be accomplished.

49. SIGNAL. a. Negotiation for long lease lines required through the Nevada Telephone System should be initiated six months prior to the beginning of any future exercise.

b. The four position switchboard (WE 605) should be replaced with a mobile unit SWIT C-7.

c. A minimum of two direct wire lines to Las Vegas should be provided for the transportation section if observer requirements for future exercises are the same.

d. All plans involving radio frequencies should be prepared and frequency clearance requests to AEC should be initiated at least three months prior to the exercise.

e. Signal Supply requirements of projects and participating troop units should be submitted three months in advance to provide proper lead time for requisitioning.

f. All radio and wire personnel operating in the forward area should be given a course in Radiological Safety.

50. QUARTERMASTER. a. Auxiliary power units should be available for refrigeration units as standby during failure of commercial power.

b. Refrigerated storage space should be made available for reserve storage of approximately 1000 lbs of ice.

c. Heavy duty pumps should be installed in the gas station.

d. Two semi-trailers, refrigerated, 10 ton should be included in the GTA vehicle allocation.

51. ORDNANCE. a. Non-standard and limited standard items of equipment should be excluded from future exercises.

b. In addition to truck, tractor, and trailer, M-123, two tank retrievers M-74 should be authorized to facilitate recovery work of display equipment in forward areas.

c. Adequate maintenance shop facilities should be constructed.

52. TRANSPORTATION. a. Installations shipping vehicles to Camp Desert Rock should thoroughly inspect vehicles to preclude shipment of unserviceable equipment.

b. All truck drivers participating in future exercises should be fully qualified to operate all vehicles up to five-ton tractors and trailers.

53. MEDICAL. a. All personnel on TDY to this station in support of the exercise should be required to bring health records. (DD Forms 722 and 722-1).

b. All medical personnel scheduled to participate in Camp Desert Rock exercises should be required to attend a radiological safety training school prior to arrival.

54. PUBLIC INFORMATION. In future exercises, Reserve Officers utilized for public information duties should spend the entire period of active duty at Camp Desert Rock.

55. COMPTROLLER. Headquarters Sixth US Army should furnish funds well in advance for Camp Desert Rock operations.

SECTION III - TRENDS (SECRET)

56. The problems involved in learning to fight both an atomic and conventional war were highlighted in the planning and conduct of operations at Camp Desert Rock. Among these problems are: target acquisition procedures and requirements; prediction and measurement of radiological fallout from friendly and enemy nuclear detonations; coordination, timing, notification and warning of troops; planning for, handling and control of mass casualties and refugees; need for a jam and atomic proof communications system; expansion of our radiological monitoring and safety capability; increased requirements for liaison and dissemination of technical information for planning and operational purposes; and increased emphasis on developing a greater alternate planning and communications capability to attain requisite flexibility of operations. These problems must be continuously balanced against an ever present need to attain simplicity in the individual and unit self-sufficiency necessary to fight both a conventional and atomic war. Even though many of these problems are interrelated, the normal tendency is to run separate tests to solve each problem without looking for common denominators to resolve the many.

57. DESERT ROCK VII and VIII operations evidenced a greater need for cross-training of individuals and units. To broaden and give depth to our radiological monitoring and safety capability, every officer, medical aid man, military policeman, pilot, reconnaissance specialist, key NCO, and meterological specialist should be trained as a radiological monitor. The entire Army and Service structure should be examined for cross-training and cross support capabilities to provide greater depth to our overall atomic warfare capability. Medical and dental units should be cross-trained and equipped to provide a dosimetry capability as far forward as possible.

58. Also evident is a requirement for adopting a forward area operational grid system, integrated air-ground information-liaison-communications teams and a monitoring and warning net for providing assistance to commanders and their staffs as they plan and move their units from sector to sector. These teams with highly cross-trained personnel would serve as sector information-communication terminals, and have integrated meteorological-radiological-reconnaissance-prediction-monitoring and general warning capabilities. Adoption of an air-ground forward area operational grid system would also lend itself to a corridor-grid concept to facilitate coordinating the employment of ground and air delivered atomic weapons. Combined with authority to employ atomic weapons, this would give both ground and air commanders greater freedom of action for employing prearranged and on-call missions within their respective areas of responsibility.

[redacted]

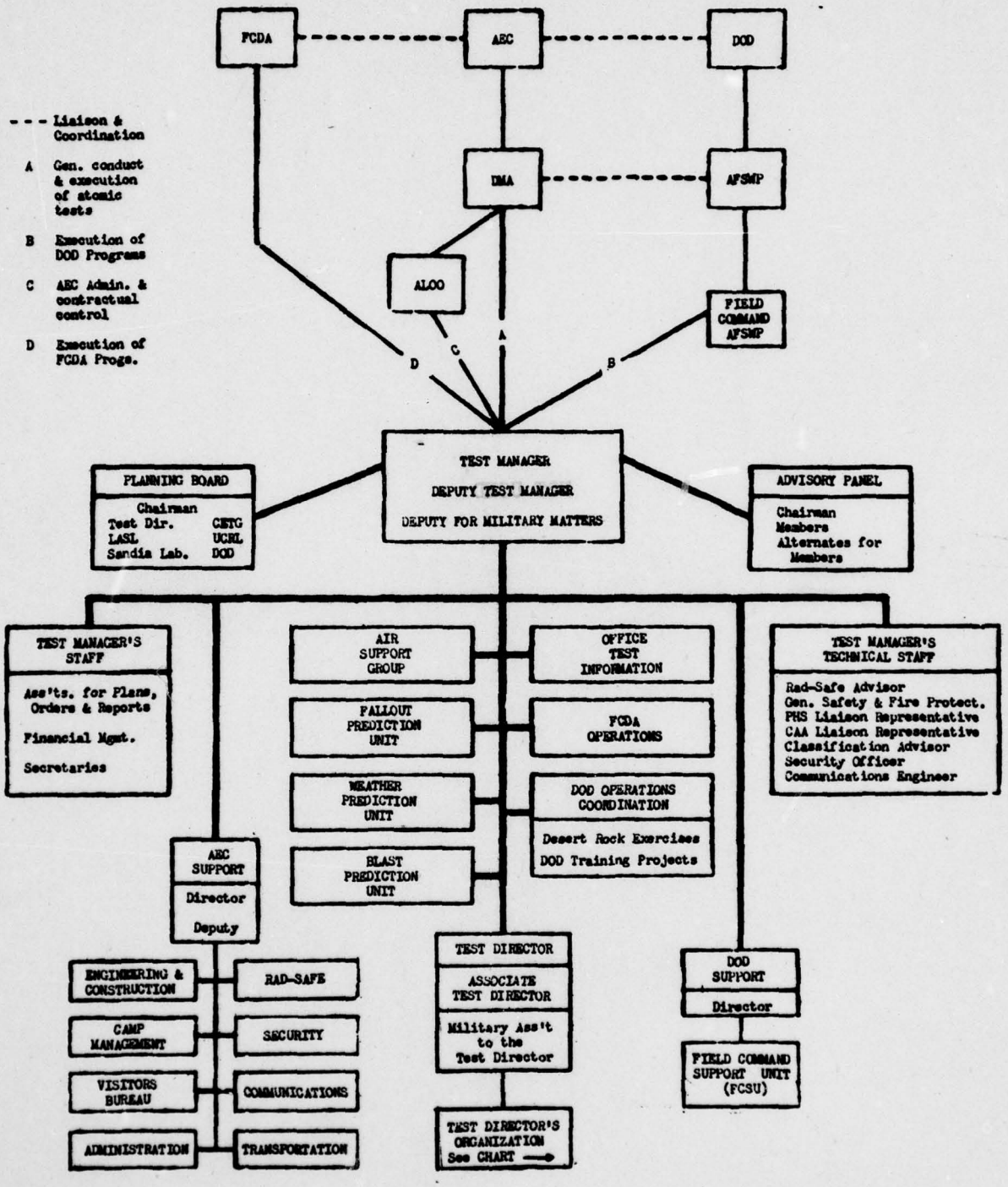
59. The significance of thermal radiation should be given increased consideration especially in the design of equipment such as signal wire that has good built-in blast resistance. In the Nevada Test Site, signal wire survived blast effects on many occasions only to be fused and destroyed by thermal radiation. Tentage and vehicles also should be given like consideration to improve thermal radiation resistance.

60. Another problem highlighted during the exercise was the need for some effective means of preventing blindness and/or eye damage as a result of viewing an atomic detonation. Goggles should be developed as an item of issue to protect the eyes from flash and thermal effects and still permit clear vision.

61. Of greatest importance, however, is the apparent need for more realistic training in atomic warfare. To witness an atomic detonation is valuable training, but much more is needed. Training and troop tests should involve the actual employment of low-yield atomic weapons delivered by tactical means under the control of and at the will of the commander. Toward this end, planning should commence without delay. A suitable area (or areas) should be developed where this type of training can be conducted on a regularly scheduled annual basis. Necessary coordination should be accomplished between the governmental agencies involved to determine the feasibility of such training.

NOT USED

ANNEX A - OPERATION OF NEVADA TEST ORGANIZATION



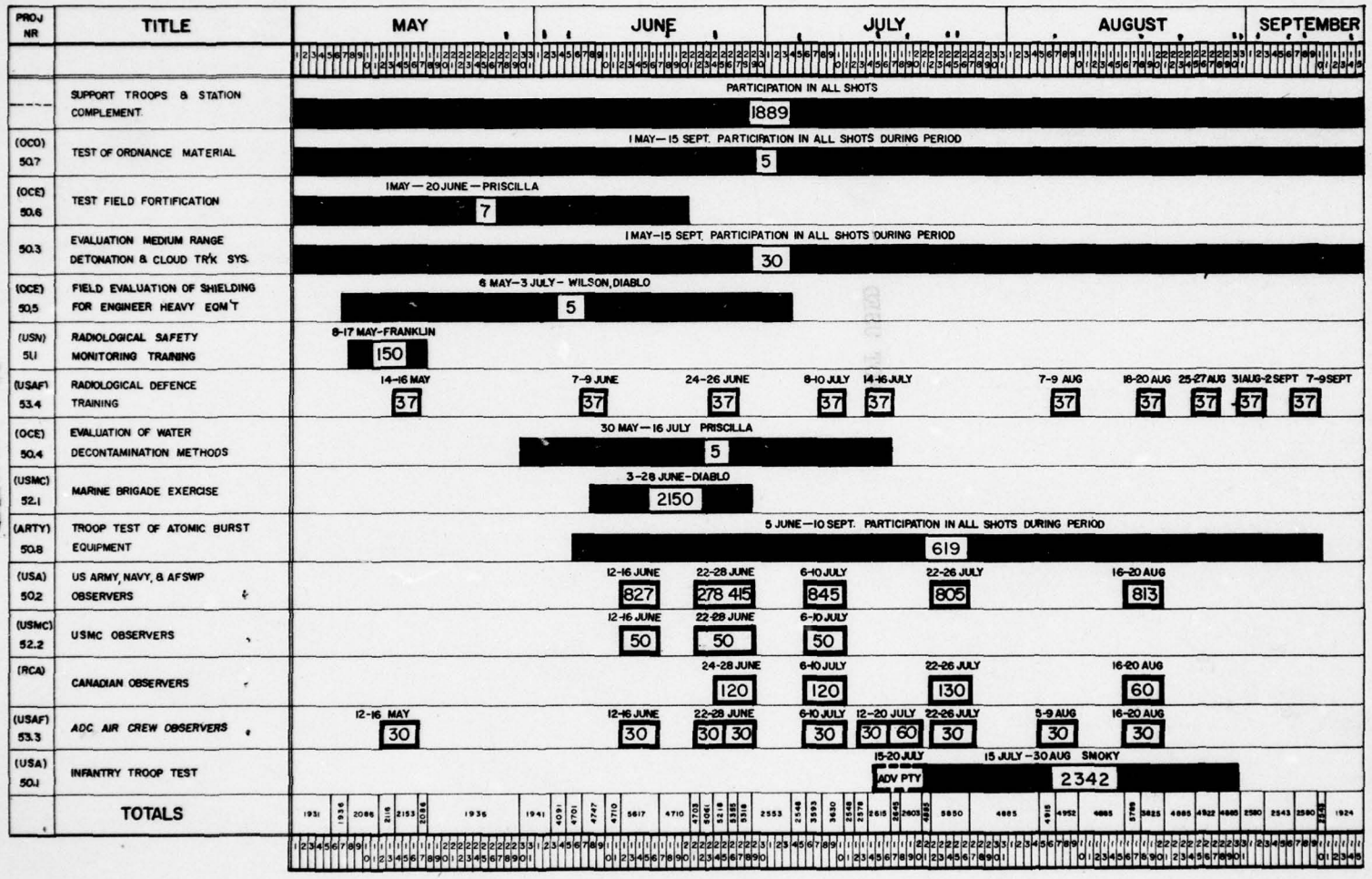
ANNEX A – OPERATION OF NEVADA TEST ORGANIZATION

ANNEX-B

FOR OFFICIAL USE ONLY

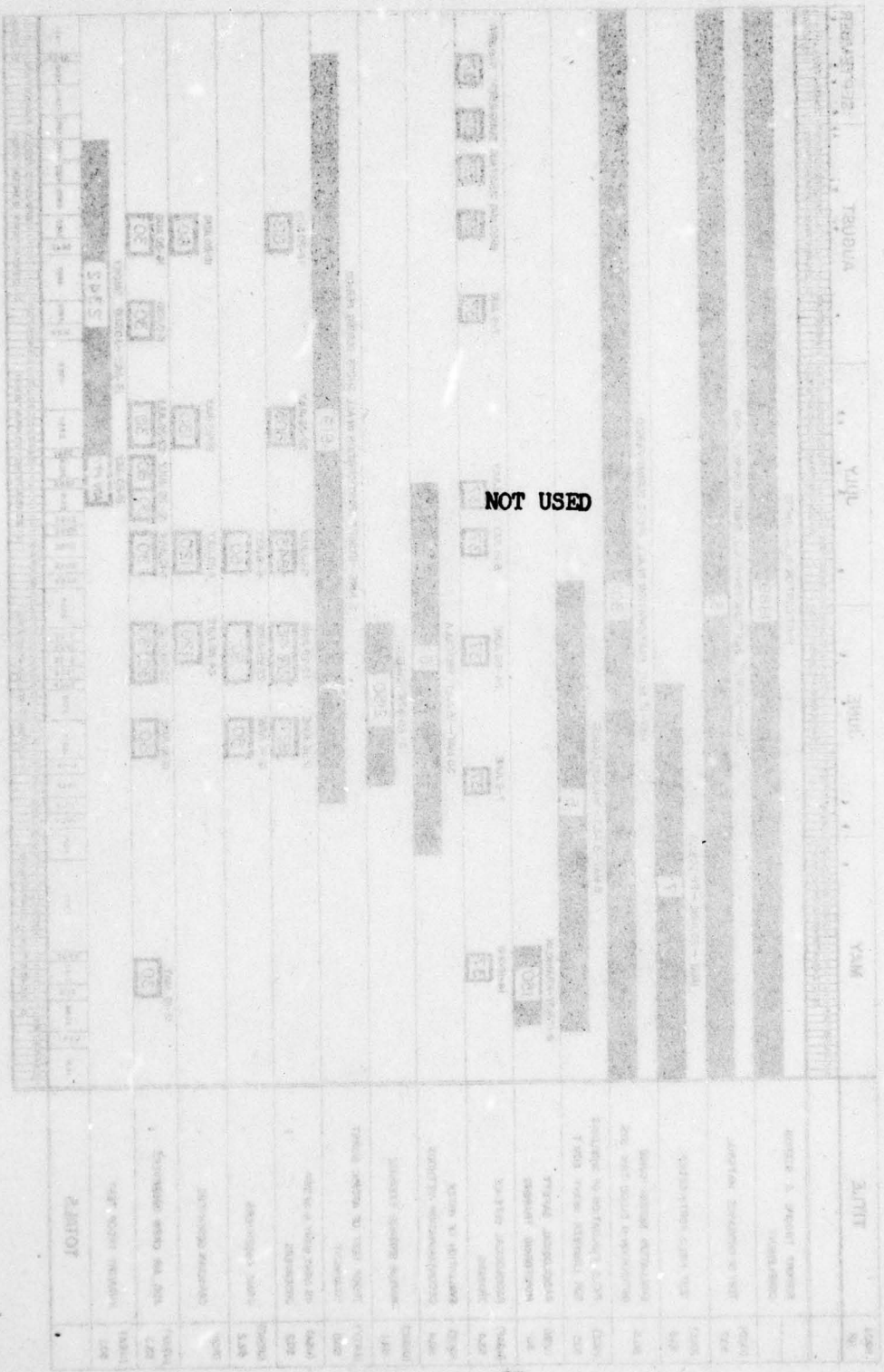
1 MAY '57

DENSITY GRAPH
CAMP DESERT ROCK
NEVADA



ANNEX B - DENSITY GRAPH, CAMP DESERT ROCK, NEVADA

UNCLASSIFIED
FOR OFFICIAL USE ONLY

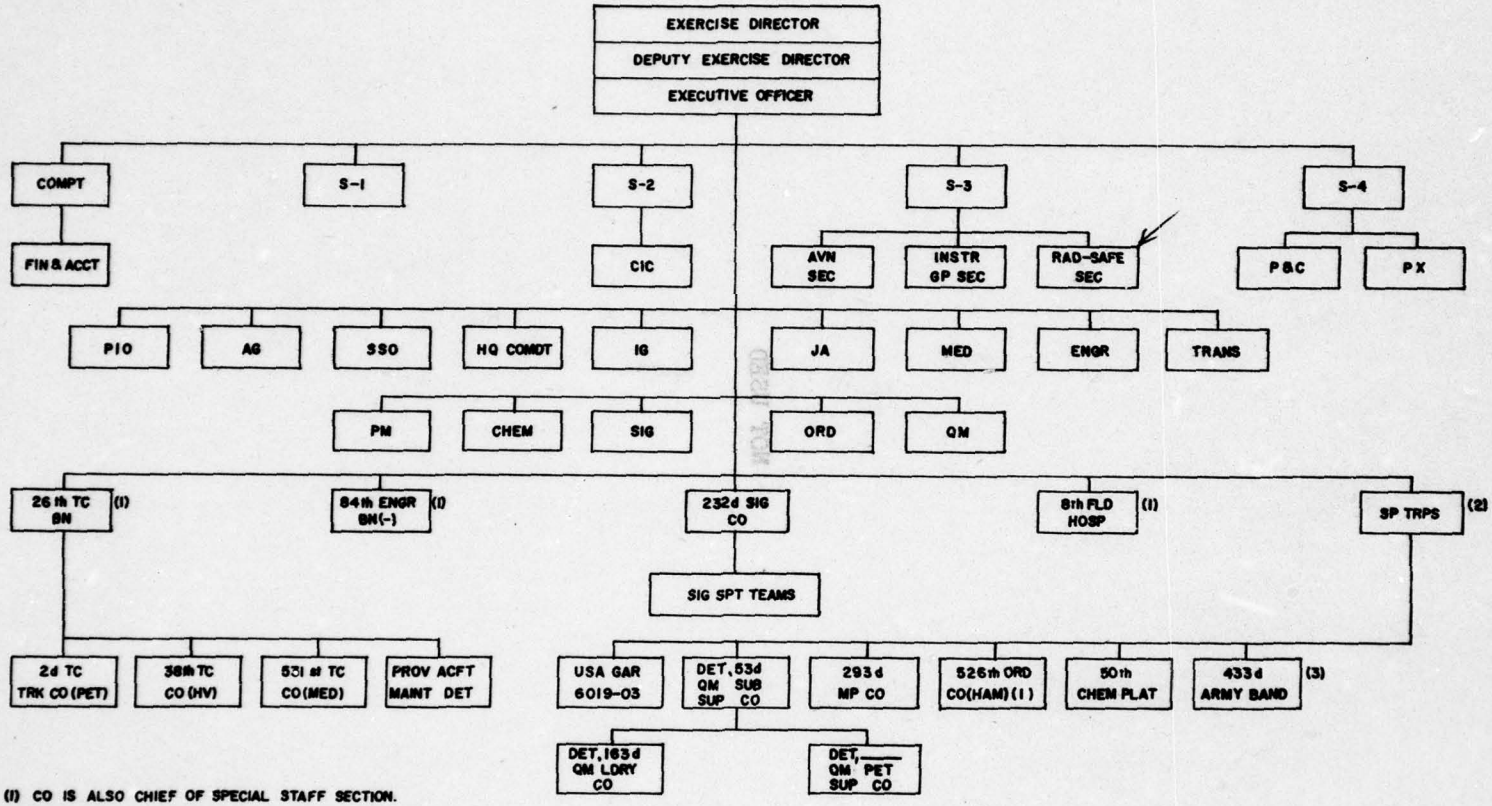


NOT USED

ANNEX-C

ORGANIZATIONAL CHART

CAMP DESERT ROCK



(1) CO IS ALSO CHIEF OF SPECIAL STAFF SECTION.

(2) CO IS ALSO HQ COMDT.

(3) ON CALL FROM CAMP IRWIN

NOT USED

APPENDIX I TO ANNEX C
MANEUVER ORGANIZATION

Station Complement, Camp Desert Rock	Home Station
US Army Garrison (6019-03)	Camp Irwin
84th Engr Bn (Const) (-)	Ft Ord
Co B (Augmented)	Ft Ord
Co C (Augmented)	Ft Ord
Hosp Unit 8th Field Hosp (-)	Ft Lewis
293d MP Co.	Ft Ord
232d Sig Co.	Ft. Huachuca
Wire Det 232d Sig Co.	Ft. Huachuca
Sig Sup Team (KA Team)	Ft. Huachuca
Sig Maint Teams (GK and RD Teams)	Ft. Huachuca
Comm Center (232d Sig Co.)	Ft. Huachuca
Sig Pictorial Teams (AB, FC, FH, and FF teams)	Army Pictorial Center L.I., N.Y.
Photo Dosimetry Team	Lexington Sig Depot, Lexington, Kentucky
50th Chemical Platoon	Ft Ord
26th TC Bn (-)	Ft Ord
HQ & HQ Co.	Ft Ord
38th TC Co (Hv)	Ft Ord
2d TC Trunk Co (Pet)	Ft Ord
531st TC Co (Med)	Ft Riley
Det, 53d QM Sub Sup Co	Ft Ord
Det, 163d Ldry Co	Ft Lewis
QM Petrol Sup Co (-)	Ft Lee, Va.

526th Ord Co (HAM) (-)	Camp Irwin
Det, 526th Ord Co (HAM)	Camp Irwin
Prov Aircraft Maint Det	Sharpe Gen Depot
433d Army Band	Camp Irwin
Canadian Administrative Group	Canada
<u>Special Projects</u>	
Project 50.8	Ft Sill
Det., US Army Artillery and Missile Center	Ft Sill
Battery C, 285th FABN (Observation)	Ft Bragg
Battery D, 495th AAA Bn (Nike)	Ft Bliss
Det., US Army Chemical Corps School	Ft McClellan
Project 50.4	
Det, Engr Research and Development Laboratories	Ft Belvoir
Project 50.7	
Det, Aberdeen Proving Grounds	Aberdeen Proving Ground
Project 53.4	
Radiological Defense School Nellis Air Force Base	Lowery Air Force Base
Project 51.1	
US Navy Bureau of Yards and Docks	Wash., D. C.
Project 50.5	
Det, Engr Research and Development Laboratories	Ft Belvoir
Project 50.6	
Det, Engr Research and Development Laboratories	Ft Belvoir
Project 50.3	
Det, Signal Corps Laboratory	Ft Monmouth

AD-A077 515 EXERCISE DESERT ROCK 7TH AND 8TH LAS VEGAS NV F/G 15/6
EXERCISE DESERT ROCK VII AND VIII.(U)
JAN 58

UNCLASSIFIED NL

2 OF 2
ADA 077515

END
DATE FILMED
1 -80
DDC

Project 50.7	
Det, Aberdeen Proving Grounds	Aberdeen Proving Grounds
Troop Tests	
4th Marine Corps Provisional Atomic Exercise Brigade	Camp Pendleton, Calif.
Hq Co (-) 1st Bat Gp 12th Inf.	Ft Lewis
Co. C (-)	Ft Lewis
Rifle Plt, Co. A	Ft Lewis
Wpns Plt Co B	Ft Lewis
Mortar Btry	Ft Lewis
Co A 704th Ord Bn (-) (Attchd)	Ft Lewis
7th Plt 2nd Bn Queens Own Rifles (Attchd)	Canada
85th Avn Bn (Prov)	Ft Benning
HQ & HQ Det 3d Bn (Hcptr) (Army)	Ft Benning
31st Trans Co (Hcptr) H-34	Ft Benning
138th Maint Det	Ft Benning
8th Trans (Hcptro) (H-21)	Ft Bragg
140th CHFM Det (Maint)	Ft Bragg
506th Pathfinder Team	Ft Bragg
Prov Co 82d Airborne Div.	Ft Bragg
HumRRO Team Office of Research and Development	Depart of Army
Observer Program	
Project Unnumbered	
Canadian Observers	Canada
Project 50.2	
United States Observers	CONARC
Project 52.2	
Marine Observers	USMC

ANNEX-D
PROPOSED
TROOP & OBSERVER PARTICIPATION
EXERCISE DESERT ROCK VII & VIII

	TROOP PARTICIPATION					OBSERVER PARTICIPATION					
	ARMY	NAVY	AIR FORCE	MARINE	TOTAL	ARMY	NAVY	AIR FORCE	AFSWP	MARINE	TOTAL
BOLTZMAN											
FRANKLIN											
LASSEN											
WILSON											
•PRISCILLA•	619		35		654	718	50	30	200	50	1048
DIABLO (misfire)	619		35		654	77	50*	30	100*		107
•HOOD•	619		35	2150	2804	148	(50)	30	(100)		328
•DIABLO II•											
JOHN											
KEPLER											
OWENS											
STOKES											
• SHASTA •	619		35		654	709	50	30	100	50	939
DOPPLER											
FRANKLIN PRIME											
• SMOKY •	2290		35		2285	731		30	100		861
GALILEO											
WHEELER											
LA PLACE											
FIZEAU											
• NEWTON •	619		35		654	718		30	100	50	898
RAINIER											
WHITNEY											
CHARLESTON											
MORGAN											
SUB TOTALS	5345		210	2150	7705	3101	150	180	600	150	4181
GRAND TOTALS	5345		210	2150	7705						4181

* DENOTES OBSERVERS WITNESSING TWO EVENTS.
••DENOTES ORIGINALLY SCHEDULED OBSERVER SHOTS, CANADIAN PARTICIPATION NOT SHOWN.

ANNEX D - PROPOSED TROOP AND OBSERVER PARTICIPATION

UNCLASSIFIED

ANNEX-E
ACTUAL PARTICIPATION FROM ALL SOURCES
OBSERVERS-TROOPS-PROJECTS
EXERCISE DESERT ROCK VII & VIII

	OBSERVERS							TROOP UNITS							PROJECTS •								TOTAL PARTICIPANTS EACH SHOT
	ARMY	NAVY	CIV.	AIR FORCE	MARINE	CANADIAN	TOTAL	CDR	ARMY	NAVY	AIR FORCE	MARINE	CANADIAN	TOTAL	50.3	50.4	50.5	50.6	50.7	50.8	53.4	PROJECT TOTAL	
BOLTZMAN		74		63			137	176						176							34	34	347
FRANKLIN							0							0	25				3			28	28
LASSEN								205						205	25	5	4		3			37	242
WILSON	41		7	26	15		89	164						164	25	5	4	2	3	557	24	620	873
PRISCILLA	540	5	10	17	38	107	717	105				311		416	25	5	4	2	3	557	0	596	1729
DIABLO (misfire)	91	6	8	45		25	175	170				1703		1873	25	5	4	2	3	557	36	632	2680
HOOD	308	1	1	5		2	317	299				1517		1816	25	5	4	2	2	557	36	631	2764
DIABLO II	566	3	8	9	28	7	621	81						81	25	5	2	2	2	557	46	639	1341
JOHN	30	1	2	38	11		82	17						17	25	5	2	1	2	557	0	592	691
KEPLER	708		11	25	5	108	857	88						88	25	5	2	1	2	557	30	622	1567
OWENS	77		3	1		24	105	21						21	25	5	2	1	2	557	0	592	718
STOKES	95		3				98	99	499				40	638	25	5	1	0	3	557	36	626	1362
SHASTA								9	11					20	25	5	1	0	3	557		591	611
DOPPLER	9			2			11	66	492					558	25				1	557	56	639	1208
# FRANKLIN PRIME								49	121				3	173	25				1	557	48	631	804
SMOKY	384	3	3	15	9	43	457	51	1104				40	1195	25				1	557		583	2235
GALILEO								18	177					195	23					105		128	323
WHEELER								12						12	23					105		128	140
LA PLACE								7						7	23					105		128	135
FIZEAU								10						10	28					105		133	143
NEWTON															28					50		78	78
RAINIER															28							28	28
WHITNEY															28							28	28
CHARLESTON															28							28	28
MORGAN																							
SUB-TOTALS	2849	93	86	246	106	316	3886	1647	2404	0	0	3531	83	7665	684	55	30	13	34	7711	345	8772	20,103

OBSERVED BY SMOKY OBSERVERS

• SAME PERSONNEL ACCUMULATIVE TOTAL

UNCLASSIFIED

ANNEX- F

PLUMBBOB SCHEDULE

SHOT NO.	G. Z. * LOCATION	ORIGINAL READINESS DATE	ACTUAL FIRING DATE	TIME OF FIRING	CODE NAME	METHOD OF DELIVERY	SPONSORING LABORATORY	ESTIMATED YIELD	REASONABLE UPPER ** LIMIT	ACTUAL KT YIELD
1.	①	15 MAY	28 MAY	0445	BOLTZMAN	500' T	LASL	11 KT	12.5 KT	11.5±.8
2.	②	15 MAY	2 JUNE	0445	FRANKLIN	300' T	LASL	2 KT	4 KT	.138±.006
3.	Ⓐ	2 JUNE	5 JUNE	0445	LASSEN	500' B	UCRL	.6 KT	NEGLIGIBLE	.55±.08 tons
4.	Ⓐ	8 JUNE	18 JUNE	0445	WILSON	500' B	UCRL	8 KT	20 KT	10± 5%
5.	⑤	15 JUNE	24 JUNE	0630	PRISCILLA	700' B	FCWT, LASL	40 KT	40 KT	38
6.	Ⓐ	27 JUNE	5 JULY	0440	HOOD	1500' B	UCRL	60-70 KT	110 KT	77
7.	⑦	25 JUNE • 12 JULY	15 JULY	0430	DIABLO	500' T	UCRL	11-13 KT	25 KT	17±5%
8.	⑧	19 JULY	19 JULY	0700	JOHN	AIR MSL 20,000'	FCWT	1.7 KT	NOT AVAILABLE	1.7±.1
9.	⑨	15 JULY	24 JULY	0450	KEPLER•	500' T	LASL	11 KT	15 KT	10±1
10.	Ⓐ	5 JULY	25 JULY	0630	OWENS	500' B	UCRL	2-5 KT	15 KT	9.2±.5
11.	Ⓒ	17 AUG	7 AUG	0525	STOKES	1500' B	NOT AVAILABLE	10-20 KT	22 KT	18.5±1
12	⑫	9 JULY 16 AUG	18 AUG	0429	SHASTA	500' T	UCRL	11-13 KT	25 KT	16±.5
13	Ⓒ	15 JULY 5 AUG	23 AUG	0530	DOPPLER	1500' B	LASL	11 KT	15 KT	10.5±1
14	Ⓒ	16 AUG	30 AUG	0540	FRANKLIN PRIME	750' B	LASL	2 KT	6 KT	4.75±.20
15	⑮	19 AUG	31 AUG	0530	SMOKY	700' T	UCRL	45 KT	60 KT	48.1
16	⑯	1 SEP	2 SEP	0540	GALILEO	500' T	LASL	11 KT	12 KT	15.5
17	Ⓐ	6 SEP	6 SEP	0530	WHEELER	500' B	NOT AVAILABLE	.6-.8 KT	NOT AVAILABLE	.199±.01
18	Ⓒ	6 SEP	8 SEP	0600	LAPLACE	750' B	LASL	2 KT	NOT AVAILABLE	1.25±.2
19	⑲	8 SEP	14 SEP	0945	FIZEAU	500' T	LASL	10 KT	12 KT	11± 20%
20	Ⓒ	25 JULY	16 SEP	0550	NEWTON	1500' B	LASL	50 KT	50 KT	NOT AVAILABLE
21	㉑	3 SEP	19 SEP	1000	RAINIER	UNDERGROUND	UCRL	1.8 KT	NOT AVAILABLE	NOT AVAILABLE
22	㉒	8 AUG	21 SEP	0530	WHITNEY	500' T	UCRL	15 KT	20 KT	18±10%
23	Ⓐ	15 SEP	28 SEP	0600	CHARLESTON	1500' B	UCRL	10-100 KT	NOT AVAILABLE	NOT AVAILABLE
24	Ⓐ	10 SEP	7 OCT	NOT AVAILABLE	MORGAN	500' B	UCRL	2-5 KT	15 KT	NOT AVAILABLE

* TO COORDINATE GROUND ZERO LOCATIONS IN TEST AREA; SEE ANNEX G

** YIELD USED IN DETERMING SAFETY CRITERIA FOR POSITIONING TROOPS.

T- DENOTES TOWER

B- DENOTES BALLOON

•- MISFIRED

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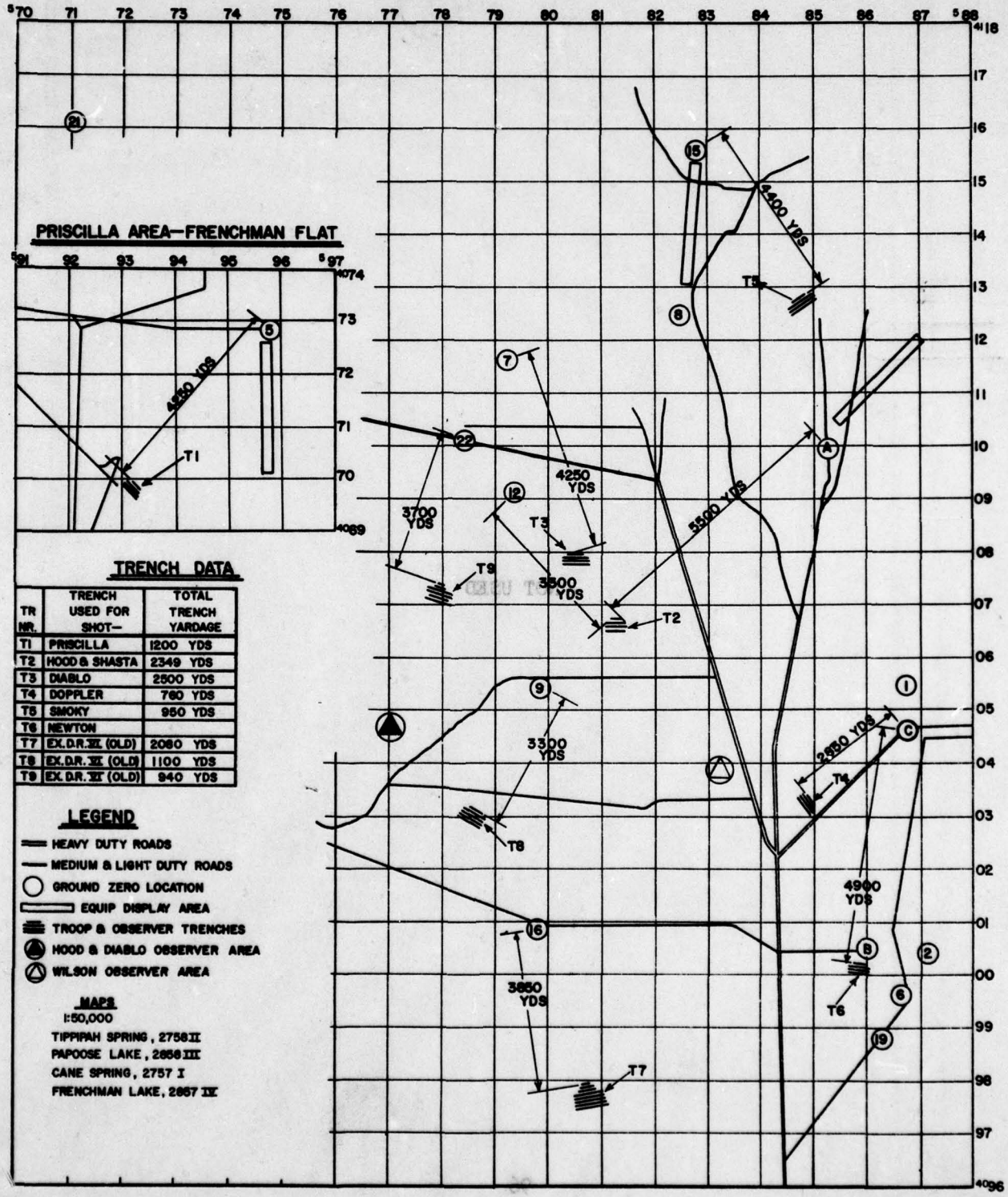
ANNEX G - TRENCH SYSTEM



TRENCH DATA

TR NR.	TRENCH USED FOR SHOT—	TOTAL TRENCH YARDAGE
T1	PRISCILLA	1200 YDS
T2	HOOD & SHASTA	2349 YDS
T3	DIABLO	2500 YDS
T4	DOPPLER	760 YDS
T5	SMOKY	950 YDS
T6	NEWTON	
T7	EX. D.R. XI (OLD)	2080 YDS
T8	EX. D.R. X (OLD)	1100 YDS
T9	EX. D.R. IX (OLD)	940 YDS

CRITERIA FOR POSITIONING OF DA TROOPS AND OBSERVERS AT CONTINENTAL ATOMIC TESTS

1. The following criteria are established as the maximum limits to which Department of the Army personnel will be exposed when participating in peacetime training and troop tests conducted in conjunction with atomic weapons tests.

a. Overpressure: three (3) pounds per square inch.

b. Nuclear radiation: five (5) roentgen equivalent mammal (rem) at any one test of which no more than two (2) rem is prompt, whole body radiation provided further that no individual will receive more than five (5) rem in any six months period. (Exposure refers to gamma only. As long as limit of 5 roentgens gamma is observed, alpha, beta and neutron radiation will not be included until such time as AEC may prescribe safety criteria for one or more of these last three.)*

c. Thermal radiation: two-thirds times the calories per square centimeter (2/3 Q) necessary for a first degree burn on bare skin.

2. On the basis of the above exposure limits the following troop positioning criteria will be used for Department of the Army personnel:

a. For tower or balloon shots.**

Max Predicated Yield (KT)	Troops in Open (yds)	Troops in Trenches (yds)	Troops in Armored Vehicles (yds)
0.1	1700	1400	1600
0.5	2100	1700	2000
1	2300	1900	2200
2	2500	2100	2300
5	3000	2300	2600
10	4000	2600	2800
20	5200	3100	3100
30	6200	3500	3500
40	7000	3900	3900
50	7600	4200	4200
60	8200	4400	4400
70	8700	4700	4700
80	9200	4900	4900
90	9600	5100	5100
100	10,200	5300	5300

* 1st Ind (C), letter, ATSWD-S 354 (C) (5 Jun 57), subject: "Criteria for Positioning of DA Troops and Observers at Continental Atomic Tests (U)"

** Distances given to be measures from intended ground zero (IGZ)

b. For aircraft delivered devices (excluding air launched rocket) add three (3) times the circular error probable (CEP) for the aircraft delivery system to the positioning criteria given in paragraph 2a.

c. These distances are not applicable to rocket or guided missile delivered devices (including air launched rocket).

d. Troop positions will be located so that an aircraft delivered device is delivered along a line in front of and parallel to the positions.

e. Trenches provided for troops and observers must be at least six (6) feet deep and all participants will be instructed to keep below a point at least two (2) feet below ground level.

f. Positioning distances for troops in armored vehicles are for enclosed vehicles and are not valid for armored vehicles having an average armor thickness less than the M-59 or M-75 armored infantry vehicle.

g. Troop and authorized observer positioning is based upon effects data contained in FM 101-31A, Aug 1956, and TM 23-200, 1 June 1955, including C1, 1 April 56, and C2, 17 Oct 1956. Upon publication of a revision of the effects data of either of these manuals the authorization is automatically suspended until changes in distance are made.

3. The Exercise Director is not authorized to position personnel closer to ground zero than provided in paragraph 2 above. The Exercise Director is authorized to station all or part of the troops and troop observers at distances from ground zero greater than provided in paragraph 2 under the following circumstances:

a. In the event an adequate evacuation plan cannot be implemented from the positions specified.

b. In the event special circumstances arise at the test site which, in the opinion of the Exercise Director, would jeopardize the safety of personnel if located at the specified positions.

[redacted]

ANNEX I (UNCLASSIFIED)

STANDARD OBSERVER GROUPING, ROSTERING AND CONVOY PROCEDURES FOR CAMP DESERT ROCK

1. ROSTERING

a. Staff supervision of grouping and rostering observers was considered a dual responsibility of S-2 and S-3. S-2 was responsible that all rostered observers had the proper security clearance. S-3 was responsible that all properly cleared observers were grouped and rostered to see a shot.

b. The following procedure was found to be the most effective:

(1) Prior to arrival of observers, S-3 estimated the number of briefing groups required and the anticipated vehicle requirements for each shot, provided S-2 with a break-out of convoy serials to include respective vehicle numbers and capacities. The size of the briefing or orientation groups was dictated by the seating capacity (600) of the auditorium and the size of training aids being used.

(2) From this information, S-2 prepared security identification cards with space for observer's signature, briefing group number and vehicle number. Cards were filed in vehicle order.

(3) As observers reported, they were initially processed through Visitors Bureau and into S-2 office. Each observer gave S-2 an official copy of his orders and signed his identification card with grouping and vehicle numbers.

(4) The orders were filed in vehicle bundles, from which stenciled rosters were prepared with escort officer's name added. Stencils were proofed and certified by S-2 to insure proper clearance. Approximately eight copies of each roster were needed for each convoy movement into the Nevada Test Site.

(5) In the event it was necessary to re-roster for special situations, observers were re-routed through S-2.

2. CONVOY PROCEDURES: A physical check of personnel in each convoy moving into and out of the Nevada Test Site was accomplished by the Camp Mercury Security personnel.

a. To save time and avoid congestion at the entrance to the Test Site, DOD personnel adopted the practice of checking the convoys at Camp Desert Rock and escorting them through gates 1 and 2 at Camp Mercury.

b. The following procedures were found to be most effective in controlling convoys to the forward area:

(1) Five copies of all rosters were required to be turned in to DOD Security a minimum of six hours prior to the departure of the convoy.

(2) Vehicles were spotted in convoy order with ten by ten inch signs A-1, A-2, etc., taped in the right front windshield of each vehicle. Designated escort officers for each vehicle were briefed thirty minutes prior to loading time and given two copies of the vehicle roster.

(3) As observers loaded, each Escort Officer checked off individual names. At the announced time, Escort Officers red lined names of absentees on both copies of the rosters. Since no changes could be made on the rosters, anyone arriving after this time could not go with the convoy. Escort Officers added names of drivers (who were all badged) and entered the total number present on the two rosters.

(4) As the DOD Security representative came by to check the bus, one copy of the roster was presented to him, and the other copy was retained by the Escort Officer until his return from the forward area and then turned over to S-3 as a permanent record.

(5) In case of vehicle breakdowns, personnel could be loaded into a spare vehicle by merely exchanging vehicle numbers. Vehicle loads could also be consolidated by grouping rosters and vehicle numbers on the one vehicle being used for consolidation.

Ops officer

ANNEX J (UNCLASSIFIED)

RADIOLOGICAL SAFETY SECTION

1. MISSION. To advise the Deputy Exercise Director and his staff on all radiological safety and chemical matters that pertain to Camp Desert Rock operations; establish and conduct the radiological safety program; train selected personnel of project and support units as augmentation radiological monitors; provide radiological survey training for CBR survey teams; conduct specified tests; and orient official observers in Radiological Safety.

2. SUMMARY OF OPERATIONS. a. Radiological Safety. (1) The Radiological Safety Section provided the directives, facilities, personnel, equipment and materials necessary for implementing the radiological safety policies of the Deputy Exercise Director; established, maintained and enforced operating procedures that insured minimum exposure of personnel to radiation hazards; surveyed and checked the suitability and safety of trenches and observer areas with respect to ground zeros, maintained a storage area for radioactive sources and assumed responsibility for the dosimetry program.

(2) Film badges, issued on the basis of one per individual, were processed and developed by a dosimetry team from the Nucleonics Branch, Lexington Signal Depot, Lexington, Kentucky. Two specially equipped vans for use during the exercise were shipped from Lexington to give Camp Desert Rock a dosimetry capability.

(3) Dosimetry support was the responsibility of Sixth US Army Signal. Six personnel plus clerks and typewriters were promised the Lexington Dosimetry Team by Sixth US Army Signal for developing and densitometer work; however, these people were never made available, thus creating a problem of insufficient personnel for dosimetry operation. The Camp Desert Rock Signal Officer was not able to supervise the dosimetry function due to a shortage of Signal personnel, but did provide three (3) enlisted personnel to help alleviate the situation. Due to these conditions and the danger of overexposure to personnel operating in forward areas, the Radiological Safety Section assumed the responsibility for the dosimetry program.

b. Training. See Section IV of basic report. A detailed separate report is being prepared on training conducted at Camp Desert Rock.

c. General Monitoring. See Section II of basic report.

d. A standby emergency monitoring team patrolled the camp area immediately after the shot until such time as the final movement of the contaminated cloud had been determined. This standby team was prepared to support the camp's emergency evacuation plan.

e. In addition to providing monitoring assistance to all projects and activities, the Rad-Safe section maintained radiological situation maps showing isodose lines of 10 mr/hr, 100 mr/hr, and 1r/hr inradiac meter for Project 2.6 (Evaluation of Radiac Instruments); assisted Project 2.3 (Neutron Flux Measurements) in calibration and evaluation of radiac equipment and the gathering of decay data for various soil samples; assisted Project 6.1 (Minefield Clearance by Nuclear Weapons) in decontamination of an area using a Power-driven Decontamination Apparatus M3A2; participated in Program 73, Project 57 (Alpha Monitoring); instructed two classes of visitors from the Civil-Effects Test Group on field decontamination procedures; provided escort officers for Project RCA (Canadian observers); conducted a Sixth US Army Cloud Measurement; and provided escort officers and film badge service for Project 53.4 (USAF Radiological Defense Training in their operations in the forward area.

3. LESSONS LEARNED. a. The initial planning and coordination for conduct of the Camp Desert Rock Radiological Safety Program did not require the Rad-Safe Section to operate and supervise the dosimetry program, or to furnish escort officers for projects operating in contaminated areas of the test site; consequently, the number of personnel assigned to the Rad-Safe Section was inadequate. For operational efficiency, the Rad-Safety Officer should exercise staff supervision over the dosimetry program for this type of field exercise; and personnel from the Medical, Signal and AG Sections performing administrative support for the dosimetry program should be attached to the Radiological Safety Section for duty so as to be under the direct supervision of the Rad-Safety Officer.

b. In order to comply with provisions of the Desert Rock Radiological Safety Program, troop support units and Desert Rock Projects operating in the forward area of the test site must have radiological monitors trained prior to the first test shot in which they are required to participate. To satisfy this requirement, attendance of selected personnel at the Camp Desert Rock Radiological Monitor School should be accomplished at the earliest possible date.

c. Due to the interest shown by many observers and the lack of knowledge on their part of radiological operations in the field, display boards showing the Rad-Safe function, how it is conducted, and how it applies to field operations would be both useful and educational for future exercises.

d. All permanent party personnel should be required to have as a minimum a two hour orientation on the Rad-Safe Program, functions, and operations.

e. Individual film badge requests are required for a smooth dosimetry operation due to the many varied duties among permanent party and project personnel. Assistance given to Camp Mercury projects by the Desert Rock Rad-Safety organization was returned many fold and fostered friendly cooperation.

f. Squad tents utilized for the field decontamination station in the Nevada Test Site were not satisfactory. Due to high winds, semi-permanent construction is more suitable for use as a decontamination station.

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ANNEX K (UNCLASSIFIED)

SUMMARY OF PERTINENT MARINE CORPS PROV ATOMIC EXERCISE BRIGADE'S RECOMMENDATIONS PERTAINING TO MARINE BRIGADE EXERCISE, EXERCISE DESERT ROCK VII AND VIII

1. That, in future exercises of this nature, the badging and security section be composed of an experienced counter-intelligence team, as a part of the G-2 Section. The complexities attendant to badging and security for this type exercise are not such as to warrant the formation of a special staff section. Early liaison with the security agencies at Camp Desert Rock, Nevada, and Camp Mercury, Nevada, is paramount for maximum coordination and efficient operation.

2. That the Marine Corps continue to send organized units to Camp Desert Rock for the purpose of witnessing such future tests as may be conducted in the Nevada Test Site by the Atomic Energy Commission.

3. That investigation be conducted at the departmental level to determine the feasibility of conducting a maneuver within the NTS supported by delivery or detonation of a stockpile atomic weapon rather than the scientific testing of an atomic device.

4. That the Marine Corps substantially increase the number of observers program at Camp Desert Rock to the end that all infantry Battalion Commanders and Regimental Commanders may observe an atomic detonation.

5. That, in future exercises of this type, consideration be given to placing about half the personnel in trenches and the balance in an observation post for purposes of viewing the atomic detonation.

6. That study of LFB 2 and LFM 24 be made to determine if the contents of these publications do in fact consider the effects the dust clouds raised by atomic explosion have on large scale Helicopter operations.

7. The unit separation concept contained in LFB 2 should be examined critically in the light of possible use by an enemy of weapons with a yield of two to four times that of a nominal weapon.

8. The CPX phase should be eliminated from future Desert Rock exercises.

9. Field test should be conducted at the NTS to determine exactly what peak overpressures Marine Corps helicopters can withstand and still be operable.

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10. That the Headquarters Marine Corps Representative to the staff of the Office of Test Information be ordered to report to Las Vegas at a time sufficiently in advance of the scheduled shot so that he may assist the Brigade Commander during the planning phase.

11. That the Headquarters Marine Corps Representative be ordered to the staff of OTI be of equal military rank to those of the staff representing the Army and Air Force.

12. That when a shot has been declared "Open" to civilian news media representatives, military photographers and information men be granted the same freedom as that granted to civilian newsmen in the release to the public of their stories and photographs.

13. That for news stories and photographs of strictly Brigade activities, i.e.: training and preparation, off the Test Site, that Headquarters obtain permission for these to be released by the Brigade directly without the requirement of approval by OTI.

14. That the Marine Corps investigate the feasibility of establishing a photo-dosimetry section within the Medical Battalion. This could be accomplished with equipment and personnel organic to the Marine Division plus the addition of a photodensitometer (approximate cost $250.00) and sufficient film badge holders to furnish one per twelve men.

15. Provided the field exercise is conducted during the period June-September, that plans be made for use of type "C" field rations rather than box lunches.

16. Medical Supplies. As the Army was not prepared for complete medical resupply, supplies adequate for the entire period should be carried. Allowance should be made for the fact that the exercise may be extended because of unforeseen delay. In addition to supplies for the field exercise, supplies for routine sick call major and minor, including heat stroke and exhaustion, sunburn, epistaxis and pharyngitis, are needed. Administration. That an administrative officer of the Medical Service Corps be assigned, at least for the period at the test site to assist the Brigade Surgeon. An HMC should be assigned to supervise the personnel at the Brigade Aid Station. In addition to field records, routine records including NavMed H-10s and DD form 600s should be kept.

17. In view of the fact that Brigade Headquarters and the Camp Detachment were provisional units of the Brigade, it is considered that a single detachment from the Service Battalion of the Division could have performed all missions of supply, maintenance and camp support both at Camp Pendleton and at Camp Desert Rock in a more efficient manner.

18. That two (2) cross-servicing agreements be executed with the U.S. Army prior to departure from Camp Pendleton when the exercise is planned near the end of a fiscal year, and that the agreement contain detail data concerning costs of supplies and services to be furnished.

19. Recommendations resulting from CPX:

a. That the Package and Strip Alert Concepts be adopted as accepted principles of weapon employment.

b. That a separate atomic warning net be established.

c. That a separate allocation of weapons, with authority to expend, be given to the Wing.

d. That a Division-Wing atomic exercise be initiated to test logistics and timing.

e. That target acquisition procedures be revamped and strengthened. Verifications of the existence of a target should be done in 30 minutes. To this end, development is recommended of aerial photograph equipment and procedures which will permit this.

f. That an agenda be prepared by Headquarters, U.S. Marine Corps, and that all Division and Wing Weapons Employment Officers, including FSCC Coordinators, throughout the FMF be assembled at some convenient locality (preferable MCS, Quantico) to exchange ideas on weapons employed and to come up with acceptable solutions that can be the basis of future policy for atomic employment.