EXTRACTED VERSION

OPERATION UPSHOT-KNOTHOLE

Operational Summary

Nevada Proving Grounds
1 March-9 June 1953

Headquarters Field Command
Armed Forces Special Weapons Project
Sandia Base, Albuquerque, New Mexico

August 1953

NOTICE

This is an extract of OPERATION UPSHOT-KNOTHOLE, Operational Summary, which remains classified SECRET/RESTRICTED DATA as of this date.

Extract version prepared for:

Director
DEFENSE NUCLEAR AGENCY
Washington, D.C. 20305

1 AUGUST 1982

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This report has had the classified information removed and has been republished in unclassified form for public release. This work was performed by Kaman Tempo under contract DNA001-79-C-0455 with the close cooperation of the Classification Management Division of the Defense Nuclear Agency.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Operation Upshot-Knothole
Military Effects

20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report presents a summary of the military participation in Operation UPSHOT-KNOTHOLE conducted at the Nevada Proving Grounds during the period 1 March-9 June 1953. During this period a joint Atomic Energy Commission (AEC) - Department of Defense (DOD) organization was activitated with Mr. Carroll L. Tyler, Manager, Santa Fe Operations (SFO), AEC serving as Test Manager. This summary does not report on the technical findings of the military effects experiments. Preliminary reports have been distributed separately and final reports are in the process of preparation. Activities in preparation for the operational period have been previously recorded in Field Command History.

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FOREWORD

This report has had classified material removed in order to make the information available on an unclassified, open publication basis, to any interested parties. This effort to declassify this report has been accomplished specifically to support the Department of Defense Nuclear Test Personnel Review (NTPR) Program. The objective is to facilitate studies of the low levels of radiation received by some individuals during the atmospheric nuclear test program by making as much information as possible available to all interested parties.

The material which has been deleted is all currently classified as Restricted Data or Formerly Restricted Data under the provision of the Atomic Energy Act of 1954, (as amended) or is National Security Information.

This report has been reproduced directly from available copies of the original material. The locations from which material has been deleted is generally obvious by the spacings and "holes" in the text. Thus the context of the material deleted is identified to assist the reader in the determination of whether the deleted information is germane to his study.

It is the belief of the individuals who have participated in preparing this report by deleting the classified material and of the Defense Nuclear Agency that the report accurately portrays the contents of the original and that the deleted material is of little or no significance to studies into the amounts or types of radiation received by any individuals during the atmospheric nuclear test program.

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CHAPTER 1

GENERAL SUMMARY

1.1 INTRODUCTION

This report presents a summary of the military participation in Operation UPSHOT-KNOTHOLE conducted at the Nevada Proving Grounds during the period 1 March - 9 June 1953. During this period a joint Atomic Energy Commission (AEC) - Department of Defense (DOD) organization was activated with Mr. Carroll L. Tyler, Manager, Santa Fe Operations (SFO), AEC serving as the Test Manager.

This summary does not report on the technical findings of the military effects experiments. Preliminary reports have been distributed separately and final reports are in the process of preparation. Activities in preparation for the operational period have been previously recorded in the Field Command History.

1.2 MISSIONS

The missions of the military representation within the Test Organization were to conduct a series of military effects experiments, to assist the AEC in the conduct of operations and to coordinate military activities not falling within the purview of the Test Organization.

The responsibilities of Field Command, AFSWP, in Operation UPSHOT-KNOTHOLE were assigned by the Chief, AFSWP, to the CG, Field Command, AFSWP, Major General Leland S. Stranathan, USAF, in a letter subject "Augmentation of Responsibilities", dated 4 August 1952 (Fig. 1.1) supplemented by letter from the Chief, AFSWP, to the CG, Field Command, AFSWP, subject "Implementation of Operation UPSHOT-KNOTHOLE", dated 21 November 1952 (Fig. 1.2.).

1.3 DETONATION SCHEDULE

Eleven experimental devices and weapons were detonated, the first on 17 March 1953 and the last on 4 June 1953. Seven devices were detonated on towers, three were dropped from USAF bombardment type airplanes, and one was fired from the Army's 280-mm gun. Table 1.1 is a tabulation of dates, times, yields and other details of the detonation schedule.

1.4 ORGANIZATION

During the month of February, 1953, a memorandum of agreement summarizing the principles of DOD participation in the Nevada Proving Grounds operation was signed by the CG, Field Command, AFSWP, and by the Manager, SFO (see Fig. 1.3.). In keeping with this agreement and based on precedents established in earlier operations, AEC and DOD activities were merged into an integrated functional organization. An outline organization chart,

TABLE 1.1 SUMMARY DATA FOR ALL SHOTS

SHOT	DEVICE	CODE NAME	DATE	TIME	YIELD (KT)		HEIGHT OF BURST (Ft)	AREA	REMARKS
					PREDICTED	MEASURED*			
				PST					
1		Annie	17 Mar	0520	15	17	300 Tower	T-3	Open Shot
2		Nancy	24 Mar	0510	40	24	300 Tower	T-4	
3		Ruth	31 Mar	0500	3	0.2	300 Tower	T-7-5a	
4		Dixie	6 Apr	0730	11	11	6022 Air	T-7-3	
5		Badger	18 Apr	0435	35	27	300 Tower	T-2	Order reversed due to contamination from Shot 2.
6		Ray	11 Apr	0445	1/2-1	0.25	100 Tower	T-4a	
7		Simon	25 Apr	0430	33	51	300 Tower	T-1	
				PDT					
8		Harry	19 May	0505	37	32	300 Tower	T-3a	Area contaminated from Shot 7 so Shot 8 was preceded by Shot 9.
9		Encore	8 May	0830	31	26	2423 Air	FF	
10		Grable	25 May	0830	14	15	524 Air	FF	280-MM Gun
11		Climax	4 Jun	0415	70	61	1334 Air	T-7-3	Scheduled for 31 May Postponed - Weather

* As of 12 July 1953, not final yield values.

agreed to by the CG, Field Command, AFSWP, and by the Manager, SFO, AEC, is shown in Fig. 1.4. This organization as originally submitted was approved by the Chief, AFSWP, with minor modifications which are reflected in this figure.

1.5 MILITARY EFFECTS TESTS

Seventy-eight separate experiments, divided into nine programs, were conducted under the direction of Dr. Edward B. Doll of Stanford Research Institute, operating under contract to Hqs. AFSWP. Col Huntington K. Gilbert, USAF, served as his deputy. Prior to the operational period Dr. Doll headed the Office of the Technical Director (DWET) and reported directly to the Director, (WET). During the operational period, in keeping with the concept of the joint AEC-DOD functional organization, Dr. Doll became the Director of the Military Effects Group (MEG) and reported to Dr. Alvin C. Graves, Los Alamos Scientific Laboratory (LASL), the Technical Director.

The Military Effects Group participated in each of the 11 detonations. The main effort was, however, concentrated in Frenchman Flat in connection with Shot 9 (8 May), the air drop and Shot 10 (25 May), the detonation of a fired from the 280-mm gun. On completion of field tests all experimental personnel were retained at the Nevada Proving Grounds until the submission and approval of a preliminary report on each project. This action made possible the early publication and distribution of preliminary reports to interested agencies.

The operation of the MEG was characterized by the highest standards of professional achievement. Although the technical reports must be consulted for detailed information on results, the highlights of the effects program are summarized below.

The extensive effects phenomena measurements confirmed previous thermal radiation data, supported the currently accepted height-of-burst curves with minor exceptions, and provided information which should lead to a much better understanding of the odd blast effects in the precursor region produced by relatively low burst heights.

Drone aircraft obtained valuable information on the effects of blast and heat as they might apply under delivery conditions in addition to useful measurements of the radiation encountered in a penetration of the atomic cloud shortly after detonation.

The very extensive structures and equipment tests in Frenchman Flat produced considerable information on the effects of blast and thermal

radiation on many significant target types and elements. This program involved the use of some 200 motion picture cameras and approximately 1000 instrument channels on Shot 9. More than one-half of these cameras and instrument facilities were used again on Shot 10.

Perhaps the most significant outcome of this test program was the clear demonstration of the excessive damage effects in the precursor blast region peculiar to the low burst height used for Shot 10. Almost total destruction was obtained on target types to a radius of one-half mile, generally greatly exceeding predictions. It is evident that peak pressure alone is not a satisfactory damage criterion. For targets exposed to approximately the same maximum pressures on the two effects tests the damage inflicted by Shot 10 was markedly greater for some target types than that obtained from the high burst weapon. It is probable that the precursor effects may lead to a reconsideration of the relation between peak pressure and the effects of blast wave on targets, particularly on targets susceptible to drag or wind forces.

1.6 MILITARY ASSISTANCE TO THE AEC

In keeping with the directive of the three Chiefs of Services to the Chief, AFSWP, (Fig. 1.5) the principal military assistance to the AEC was provided by the Services on a mission basis at the request of AFSWP. The Air Force Special Weapons Center (AFSWC) provided aircraft required for bomb drops, cloud sampling, cloud tracking, courier, security patrols, and miscellaneous tasks. The AFSWC also assumed operational control of aircraft of other commands and services. These included Air Force and Navy drone aircraft, Tactical Air Command crew indoctrination aircraft, Strategic Air Command and Wright Air Development Center aircraft and Desert Rock Army and Marine Corps helicopters. One Navy drone aircraft was lost as a result of operations.

The Army's Chemical Training Command at Fort McClellan, Alabama, provided a radiological safety support unit. Sixth Army provided a motor maintenance detachment to assist in the maintenance of DOD vehicles. The Artillery Center at Fort Sill, Oklahoma, provided an artillery test unit for the firing of the 280-mm gun.

The Air Weather Service (4th Weather Group) provided a weather unit and the Air Pictorial and Charting Service (Lookout Mountain Laboratory) provided a documentary motion picture unit.

Other military assistance to the AEC included the loan of special purpose vehicles; the augmentation by military personnel of joint staff agencies such as the Visitors Bureau, Plans and Operations Division of the Test Director's staff; the Radiological Safety Staff Officer; joint usage of religious facilities; and miscellaneous assistance on a cooperative basis.

1.7 DESERT ROCK AND OTHER MILITARY PARTICIPATION

The Deputy for Military Operations was delegated authority by the

Test Manager to coordinate Desert Rock activities. The general pattern for Desert Rock operations was set forth in a joint AEC-DOD agreement which outlined Desert Rock maneuvers and specified that the DOD was responsible for the safety of the more than 17,000 troops and troop observers which participated. No particular difficulty was encountered in the area of normal troop operations. The full time of one staff officer was required to insure proper liaison between the staff of the Desert Rock Exercise Director, Brigadier General W. C. Bullock, USA, and the Test Organization.

Two aspects of Desert Rock operations not conducted in previous years required special attention. One was a volunteer program directed by Chief, Army Field Forces by which qualified officer volunteers were placed forward of troop positions. The other was a helicopter exercise directed by the Commandant of the Marine Corps designed to investigate the effects of detonations on tactical helicopters and crews.

Other military participation included visits of special groups of observers from AFSWC and Nellis Air Force Base. Non-essential requests from various military activities for permission to witness a shot were disapproved by the Deputy for Military Operations.

Liaison between Nellis AFB activities and the Test organization was effected through the Office of the Deputy for Military Operations. Nellis AFB provided dental and hospital facilities for DOD participants, payment of travel vouchers, club and PX privileges, and assistance to the artillery test unit in the handling and rail transportation of the 280-mm guns.

Hill Air Force Base, Ogden, Utah, supported the off-site monitoring activity by the provision of accommodations for 1 officer and 16 enlisted personnel from Lowry AFB, transport aircraft, and administrative facilities.

1.8 ADMINISTRATION AND LOGISTICS

1.8.1 General

A branch of Headquarters, Field Command, AFSWP, was established at Mercury to handle military administrative matters. The Director, Weapons Effects Tests, was delegated authority by the CG, Field Command, AFSWP, to act in his name when necessary. The Field Command Support Unit was organized with the mission of providing for the administrative needs of DOD personnel at the Nevada Proving Grounds and to support DOD activities logistically. The Field Command Support Unit was under the operational control of the Support Director. This arrangement permitted consistency of policy in billeting, safety, use of vehicles, etc. For matters pertaining to military administration, expenditures of funds, discipline, etc., the Chief FCSU reported to the Director, Weapons Effects Tests.

Despite the seeming awkwardness of these arrangements military administration and logistic support was provided the approximately 1300 DOD personnel without difficulty.

1.8.2 Fiscal

Initially a total of $5,940,000 of R&D funds and $4,205,000 of extra-military funds, for a total of $10,145,000, were programed to support DOD activities. This program was successively reduced to $5,242,400 of R&D funds and $2,925,000 extra-military, for a total of $8,167,400, which was $1,977,600 less than originally programed. It is expected that on receipt of final cost figures actual total expenditures will not exceed $7.6 million of which $4.8 million will be R&D and $2.8 million extra-military funds.

1.8.3 Construction

Facilities of the AEC, its architect-engineer contractor, bid contractors, and cost-plus-fixed-fee contractor were used to the fullest to provide for construction and for field assistance in the preparation of military effects experiments. In addition troop labor support was provided by Desert Rock in the interest of reducing expenditures of test appropriated money. A total of $1,211,908 of work was performed under bid contract. A total of $1,460,994 of work was performed under cost-plus-fixed-fee contract. A total of $8,182 was expended for materials used by troops to do an estimated $81,561 worth of work had it been performed by contract.

Since most of the construction performed in Frenchman Flat was for military effects experiments, the maximum latitude on layout and scheduling of construction was allowed. The military representative for Engineering and Construction enjoyed direct contact with the Operations Division of the Support Director. Timing and electrical power requirements for all DOD participating agencies were submitted through the staff electronics engineer of MED to the Test Director's J-6.

1.9 SECURITY AND CLASSIFICATION

Prior planning for the conduct of security operations at the Nevada Proving Grounds was deficient in that a clear understanding was not reached on the integration of military security officers into the Support Director's security staff agency. This fact, plus a shortage of space, resulted in the establishment of a separate military security office with a resultant lack of continuing, detailed coordination between AEC and DOD security activities.

Details of operations were based on precedents established during past operations. As tighter security measures became effective military security operations were modified accordingly. This included revision of methods of certifying Q clearances held by military personnel and the restriction of photography to that taken only by registered photographic groups of the Test Director's organization. In an effort to further tighten security in the future it was agreed that the Services should be advised that Q cleared photographers would be required.

Classification activities were handled efficiently by the Test Director's Classification Officer, Dr. Ralph Carlisle Smith of LASL. A military classification officer was assigned as Dr. Smith's assistant.

1.10 PUBLIC INFORMATION

Public information activities covering DOD activities were guided by a public information plan for Operation UPSHOT-KNOTHOLE published by the Office of Public Information, DOD, February 19, 1953; verbal instructions from the Acting Chief, AFSWP, regarding AFSWP policy; and verbal instructions from the Acting Chief, AFSWP, transmitting the policies of the Secretary of Defense. In general these verbal instructions called for conservatism and the avoidance of service competition for publicity.

Normal public relations functions were carried out by the Joint Test Information Office directed by Mr. Richard G. Elliott, SFO.

Liaison Officers from Desert Rock and AFSWC operated with the Test Information Office.

For the open shot, the first shot in the series, the Joint Test Information Office was superseded by a group of information representatives from the AEC, the FCDA, and the DOD under the direction of Mr. Morse Salisbury, AEC. Mr. Lee Hargus OPI, OSD represented the DOD. Due to the short time which elapsed between Presidential approval and the date of the first shot detailed plans were not available and arrangements were made extemporaneously.

The forward volunteer officer program of Desert Rock caused some difficulty in connection with Shot 5, the Marine Corps exercise. The Chief of Staff, Army, had instructed the CG, Desert Rock, not to reveal distances at which volunteers were exposed. The CG of the Marine Brigade was, however, authorized to reveal distances on Marine volunteers occupying the same trench with Army volunteers. The problem was resolved by the CG of the Marine Brigade declining to reveal distances on Marines.

The test of the 280-mm gun continued to be a subject of speculation by the press. Instructions received from OPI, OSD were, however, specific and no particular difficulties were encountered.

Department of Defense public relations activities were hampered by the non-availability of a full-time qualified military deputy to the Director of the Joint Test Information Office. Major William A. Hunter, USA, was originally assigned this duty but was relieved during active preparation for the open shot for compassionate reasons. Major Richard J. Wade, USAF, served from 5 April to 27 May.

1.11 VISITORS BUREAU

Visitors to the Proving Grounds during past operations were handled separately by the AEC and by the Armed Forces. Prior to Operation UPSHOT-KNOTHOLE the Manager, SFO, approved a suggestion that a joint visitors bureau be established and that all visitors be considered guests of the Test Manager.

Initially the official observer group arrived at Indian Springs AFB the evening of D-1, were briefed that evening in the Indian Springs Theater, viewed the shot, and departed on D-Day. In order to allow more time for pre-shot tours and to permit briefing at a more convenient hour by key Test Organization people, Washington AEC, and the Chief, AFSWP, approved a modification of the plan whereby visitors arrived on D-2. Early in April the Chairman of the Joint Congressional Committee on Atomic Energy invited all members of Congress to attend one of the last four scheduled shots. This resulted in increased Congressional visitors so that by the end of the operation, of the 1785 visitors who attended, 159 were from the Congress.

Special visitors to the Nevada Proving Grounds for Shot 9, the air drop in Frenchman Flat, included Mr. Roger W. Keys, Deputy Secretary of Defense, accompanied by Mr. James H. Douglas, Jr., Undersecretary of Air Force and Mr. Robert LeBaron, Assistant to the Secretary of Defense. The official observer group for this shot included 25 key executives from the aviation industry invited by the Chief of Staff, U. S. Air Force. For Shot 10 Mr. Charles E. Wilson, Secretary of Defense; Mr. Robert T. Stevens, Secretary of Army; Mr. Frank Nash, Assistant Secretary of Defense; Admiral Arthur W. Radford, USN, Chairman of the Joint Chiefs of Staff-Designate; and Mr. Robert LeBaron attended. Atomic Energy Commissioners Dr. Harry D. Smyth, Mr. Thomas E. Murray and Mr. Eugene M. Zuckert visited the Proving Grounds during the series.

1.12 GENERAL COMMENTS

The operation was characterized by excellent cooperation amongst the various elements which formed the Test Organization or which supported the Test Organization. The succeeding chapters of this report discuss in greater detail the military participation in Operation UPSHOT-KNOTHOLE.

DEPARTMENT OF DEFENSE
ARMED FORCES SPECIAL WEAPONS PROJECT
P.O. BOX 2610
Washington, D. C.

11071

SWPCG

4 August 1952

SUBJECT: Augmentation of Responsibilities

TO: Commanding General, Field Command
Armed Forces Special Weapons Project
P.O. Box 5100
Albuquerque, N. M.

1. Effective immediately, pursuant to General Order Number 10 of this headquarters, the responsibilities of the Field Command are augmented to include the following:

a. Exercise technical direction of weapons effects tests of primary concern to the Armed Forces and the weapons effects phases of the developmental or other tests of atomic weapons involving nuclear detonations within the Continental limits of the United States.

b. Coordinate military participation and assistance in support of the Atomic Energy Commission in the conduct of tests of atomic weapons involving nuclear detonations within the Continental limits of the United States.

2. The Chief, Armed Forces Special Weapons Project, will continue to budget for military participation in future atomic tests, will make preliminary plans and will present technical programs to the Research and Development Board (RDB) for approval. You will be charged with completion of detailed plans, preparation for and the conduct of the technical program and the submission of complete reports upon the conclusion of field operations.

3. In the detailed planning and preparation for the conduct of the tests, you will represent the Chief, Armed Forces Special Weapons project, as an agent of the Department of Defense for coordination with the Atomic Energy Commission, its contractors and any other Government agency participating in test activities. You are further directed to arrange with the Manager of the Santa Fe Operations Office for the implementation of the military effects programs and Service support

Fig. 1.1 Letter, Augmentation of Responsibilities

Subj: Augmentation of Responsibilities 4 August 1952
TO: CO, Field Command, AFSWP

and participation during the period of test operations, pursuant to such general agreements between the Atomic Energy Commission and the Department of Defense as are in effect at the time.

4. You are directed to coordinate the detailed planning of training participation by Service Forces. This coordination will commence upon notification by this headquarters that troop training participation programs have been approved by appropriate Service Chiefs.

5. Direct communications with all participating organizations are authorized. The Chief, AFSWP, will arrange for basic agreements with Service agencies conducting experimental projects. Such technical direction of their projects as is necessary to their efficient conduct and integration with other projects is vested in you. In the event that you consider projects not feasible, or that major changes in scope or objective are warranted, the matter will be referred to this headquarters.

/s/ Herbert B. Loper
HERBERT B. LOPER
Major General, USA
Chief, AFSWP

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AFOAT
Op-36

Fig. 1.1 (Continued)

DEPARTMENT OF DEFENSE
ARMED FORCES SPECIAL WEAPONS PROJECT
P.O. Box 2610
Washington, D. C.

WPWT/969 21 November 1952

SUBJECT: Implementation of Operation UPSHOT-KNOTHOLE

TO: Commanding General, Field Command, AFSWP, P.O. Box 5100
Albuquerque, N.M.

1. Reference is made to letter from Chief, Armed Forces Special Weapons Project to Commanding General, Field Command, AFSWP, file SWPCO, dated 4 August 1952, subject: "Augmentation of Responsibilities."

2. The Chief, Armed Forces Special Weapons Project has formulated a weapons effects test program which represents the integrated requirements of the Services for weapons effects information obtainable at Operation KNOTHOLE. A copy of an outline of this program was furnished to CG, Field Command, AFSWP on 23 September 1952.

3. On 22 September 1952 the Joint Chiefs of Staff approved this general program subject to the technical review of the Research and Development Board. They also approved military participation in Operation UPSHOT and the expenditure of one atomic bomb with a yield of about 30 KT for Operation KNOTHOLE. The RDB has approved the above-mentioned weapons effects technical program for Operation KNOTHOLE.

4. At their meeting on 10 October 1952, the Joint Chiefs of Staff

Further, they considered that the joint operation, UPSHOT-KNOTHOLE, will offer an appropriate opportunity for the conduct of the full-scale test. Accordingly, on 31 October 1952 the Chief of Staff, U.S. Army directed the Chief, AFSWP to integrate this test into the planning for an execution of KNOTHOLE.

5. Pursuant to the provisions of General Order No. 10, this headquarters dated 18 July 1952 and referenced letter, you are directed to take the following action:

Fig. 1.2 Letter, Implementation of Operation UPSHOT-KNOTHOLE

SWPWT/969
SUBJECT: Implementation of Operation UPSHOT-KNOTHOLE

a. Plan for and execute the military phases of UPSHOT-KNOTHOLE as a joint AEC-DOD operation in accordance with procedures already established.

b. Include in the planning for an execution of the KNOTHOLE portion of the Operation the full-scale test of the 280 mm gun atomic delivery system.

c. Include in the test of the 280mm gun those portions of the weapons effects test program for KNOTHOLE which are deemed necessary for the orderly and efficient execution of the operation as a whole.

d. Prior to the operational phase of Operation UPSHOT-KNOTHOLE coordinate military participation in the preparations for firing the projectile at the Nevada Proving Grounds and make the necessary arrangements with the Test Manager so that during the operational phase of the operation this firing will be under the operational control of the Test Manager to the extent necessary to insure that his responsibilities are carried out.

6. In the implementation of this directive, you are authorized direct communication with all agencies participating in or supporting the operation.

HERBERT B. LOPER
Major General, USA
Chief, AFSWP

Copies furnished:
DMA, AEC
MLC
G-3, DA
CAFF

Fig. 1.2 (Continued)

MEMORANDUM OF AGREEMENT
NEVADA PROVING GROUNDS OPERATION

1. PURPOSE:

The purpose of this agreement is to summarize the principles governing activities of the Department of Defense (DOD) in connection with operations at the Nevada Proving Grounds.

2. GENERAL:

a. The Nevada Proving Grounds is a facility of the Atomic Energy Commission (AEC) operated under the jurisdiction of the Manager, Santa Fe Operations (SFO) for the conduct of atomic weapons tests and associated experiments and demonstrations as required by the AEC, the DOD, and other government agencies.

b. During non-operational periods the Proving Grounds is under the immediate supervision of the Field Manager, Las Vegas Field Office (LVFO), AEC. During operational periods, the Manager, SFO, or some other designated AEC officer, in the capacity of Test Manager, assumes operational responsibility for all test activities within the Proving Ground. In addition to participating in and conducting experiments, the DOD assists and provides support to the AEC in the conduct of test operations.

3. SPECIFIC:

a. During non-operational periods the Commanding General, Field Command will maintain at Mercury a detachment to assist the Manager LVFO in facilitating visits by DOD personnel, to maintain DOD property, and to provide the AEC radsafe and such other services as are agreed.

b. During non-operational periods the Commanding General, Field Command (Director of Weapons Effects Tests) is responsible for the technical supervision of preparations for DOD-sponsored experiments, for coordinating other military participation, and for arranging for military assistance to the AEC. In fulfilling these responsibilities the Directorate of Weapons Effects Tests will coordinate actions with the Office of Test Operations, SFO, Los Alamos Scientific Laboratory and other appropriate agencies.

Fig. 1.3 Letter, Memorandum of Agreement
Nevada Proving Grounds Operation

c. For the execution of DOD-sponsored test operations, the Test Manager will report to the Chief, AFSWP through the Commanding General, Field Command. A Mutually satisfactory organization will be activated during operational phases in which DOD personnel are functionally integrated to the maximum practicable extent.

Military units engaged in test activities (exclusive of Desert Rock participation) will perform tasks on an agreed mission basis pursuant to the request of the Commanding General, Field Command. Once the scope and principles of Desert Rock exercises have been agreed between the DOD and the AEC, the Exercise Director will be permitted maximum lattitude in the conduct of his operations consistent with other test requirements.

d. The Commanding General, Field Command, will direct a senior officer, normally the Director of Weapons Effects Tests, to report to the Test Manager and serve as the Test Manager's Deputy for Military Operations. Matters involving military administration, accountability of DOD-owned equipment and supplies, and the expenditures of DOD funds, will be referred to the Commanding General, Field Command or to other DOD agencies by the Deputy for Military Operations without reference to the Test Manager unless matters of principle pertinent to the AEC are involved.

4. CHANGES:

a. Nothing in this agreement shall be construed to alter existing agreements covering security and fiscal matters. Additional agreements covering special subjects or formal concurrence in plans and procedure will augment this agreement as required.

b. The terms and conditions of this agreement may be changed at any time by mutual agreement between the Manager, SFO and the Commanding General, Field Command.

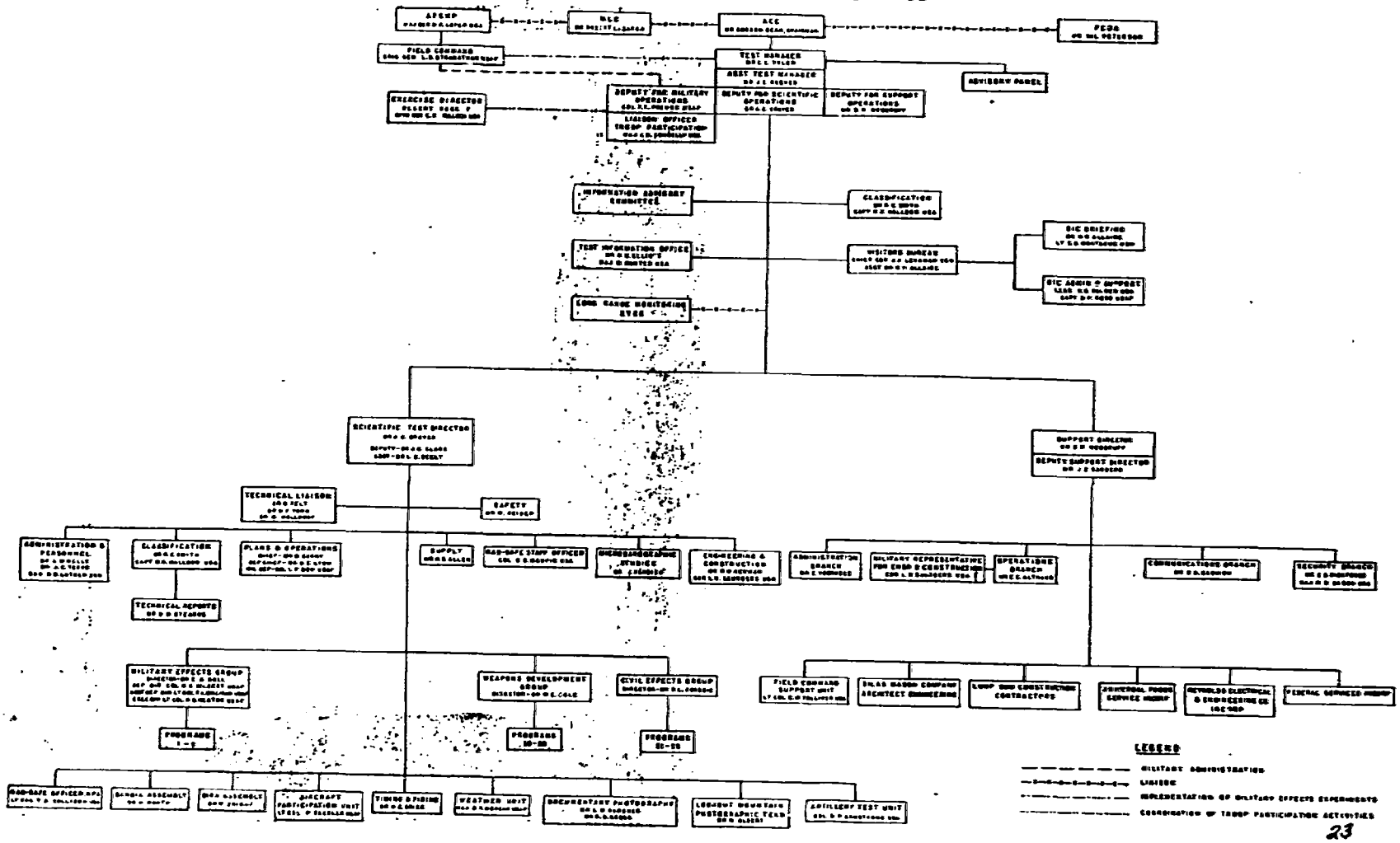
APPROVED:

/s/
Carroll L. Tyler
Manager, Santa Fe Operations
U. S. Atomic Energy Commission

/s/
Leland S. Stranathan, Brig Gen, USAF
Commanding General
Field Command, AFSWP

Fig. 1.3 (Continued)

ORGANIZATIONAL CHART
NEVADA PROVING GROUNDS OPERATIONAL PHASE



COPY

18 January 1952

MEMORANDUM FOR THE CHIEF, ARMED FORCES SPECIAL WEAPONS PROJECT

Subject: Atomic Weapons Testing

1. The Joint Chiefs of Staff have approved the following general policy for future military participation in field tests of atomic devices and weapons:

a. For tests involving nuclear detonations and conducted within the continental United States, the Chief, Armed Forces Special Weapons Project (AFSWP) will:

1. Exercise technical direction of weapons effects tests of primary concern to the Armed Forces and the weapons effects phases of development or other tests of atomic weapons.

2. Coordinate military participation and assistance in support of the Atomic Energy Commission in the conduct of tests of atomic weapons.

b. Individuals provided by the Services to assist in the conduct of such tests will normally be attached to the AFSWP for the preparatory, operational and roll-up phases. Military organizations required for preparatory, operational and roll-up tasks will remain under the command of their appropriate services and will perform their assigned tasks on a mission basis pursuant to requests from the Chief, AFSWP to the Services concerned.

2. In the performance of these functions the Chief, AFSWP will:

a. Continue to have responsibility for preliminary plans and budgets for military phases of atomic tests.

b. Make such arrangements, through established channels, as may be necessary to coordinate plans and operations with the Atomic Energy Commission.

c. Submit recommendations to the Chiefs of the Services as to assistance required.

Fig. 1.5 Letter, Atomic Weapons Testing

3. The Joint Chiefs of Staff have approved military participation in Operation SNAPPER. The test program and expenditure of funds which you submitted to the Chiefs of the Services by letter, dated 8 November 1951, have been approved, subject to such adjustments as may be made by the Research and Development Board. The Joint Chiefs of Staff have also recommended that the Services assign appropriate priorities to the projects under their jurisdiction to facilitate the procurement of equipment, personnel, and supplies for the conduct of SNAPPER.

4. The responsibilities outlined in paragraph 1 above, apply to the special test to determine the air blast effects of atomic weapons, as well as to Operation SNAPPER.

/s/ J. Lawton Collins
J. LAWTON COLLINS
Chief of Staff, U.S. Army

/s/ W. M. Fechteler
W. M. FECHTELER
Chief of Naval Operations

/s/ Hoyt S. Vandenberg
HOYT S. VANDENBERG
Chief of Staff, U. S. Air Force

Copy to:
Secretary of Defense.
Chairman, Military Liaison Committee to the Atomic Energy Commission.

Fig. 1.5 (Continued)

(The official copy of this letter is on file in the Directive Book in the office of the Chief of Staff, AFSWP)

CHAPTER 2

MILITARY EFFECTS GROUP (MEG)

2.1 INTRODUCTION

The Office of the Technical Director, DNET, became the MEG upon movement to the Nevada Proving Grounds and upon activation of the AEC-DOD Test Organization. The organization of the MEG is shown in Fig 2.1. The mission of this group during the series of 11 detonations was to obtain experimental information which would give a better understanding of the militarily useful effects of atomic weapons for offensive and defensive purposes. These experiments were divided into three categories:

(1) Basic measurements of those output characteristics of atomic explosions which were of principal importance in producing effects of military interest, such as blast, thermal, and nuclear radiation.

(2) Tests to determine blast and thermal effects on structures, equipment, and material. Projects were included to obtain data to permit the development of analytical and laboratory techniques for determining the effects on the large body of targets of interest which cannot be tested in prototype form.

(3) Operational tests which permitted the development and evaluation of techniques and equipment unique to atomic warfare, such as indirect bomb damage assessment systems (IBDA), radiological survey techniques, etc.

Program directors were responsible to the Director, MEG, and were delegated wide authority. The basic experimental unit was the project. The entire test organization was devoted to supporting the project officers, since they obtained the basic experimental data desired from a test series. The Test Director's support units and staff sections were set up to provide the project officers with the help they needed.

2.2 PROGRAMS

Table 2.1 is a list of experimental projects together with an indication of shot participation.

2.2.1 Program 1 - Blast Measurements

Program 1 was devoted to the investigation of basic blast phenomena in continuation of experiments conducted in previous tests. These experiments were designed to determine the optimum height of burst for various yields and to determine the related blast parameters such as positive phase duration, peak overpressure, air density, and the path of the mach stem which assist in assessing and predicting the damaging effect of the blast wave. The several experiments included measurements of:

(1) Peak overpressures vs time as a function of horizontal and vertical distance from ground zero.

(2) Blast induced earth accelerations and pressures vs time for various distances from ground zero.

(3) Air drag, temperature, density, and wind velocity during the passage of the blast wave.

(4) Effects of terrain features on blast characteristics.

(5) Effects of thermal absorbing and thermal scattering smoke layers on blast propagation.

The maximum effort of this program was exerted for Shots 9 and 10 in order to obtain the greatest possible coverage of blast phenomena principally for use of projects in Program 3.

2.2.2 Program 2 - Nuclear Measurements and Effects

This program covered measurements of neutron radiation, prompt gamma radiation, gamma radiation from the dust cloud and base surge, and residual ground radiation. Particle size, particle distribution, specific activity of the cloud and its biological effects were also determined. This program was directed toward the evaluation of the military significance of these phenomena.

Neutron measurements were made with emphasis on neutron characteristics of a gun-type weapon. This project involved measurements of energy spectrum vs distance and the attenuation and energy degradation effected by gamma ray shields. Energy spectrum measurements of the residual radiation were made to supply basic information necessary in design of radiation measuring equipment.

2.2.3 Program 3 - Structures, Materiel, and Equipment

This program was designed to determine the effects of atomic weapons on structures, military field installations, and military equipment. Three additional projects were combined to provide the necessary air pressure, earth pressure, strain deflection and panel time of break instrumentation to record the loading and responses of the structures as a function of time.

The structures projects included:

(1) Study of basic loading and diffraction phenomenon for rigid parallelopipeds, non-deformable cylinders emulating penstocks, and other rigid structures with emphasis on the acquisition of results which could be scaled to laboratory models.

(2) Typical sections of railroad truss and plate girder bridges to obtain drag coefficients of structural elements.

(3) Wall panel and roof panel structures.

(4) Personnel shelters of both the corrugated iron and precast concrete types; with and without earth covers.

(5) Buried structures designed to determine basic data relative to load transmission through earth cover.

(6) Buried structures designed to determine the effects of various entryways and vents upon the configuration of the blast wave.

(7) Protection of a load bearing brick wall structure with precast concrete panels.

(8) Typical precast concrete and light steel frame warehouses strengthened to be blast resistant.

(9) Test of various types of glazing and window construction.

(10) Forest Stands.

The projects to test military field installations and equipment included:

(1) Various especially designed field fortifications, including foxholes instrumented for blast and reflected thermal energy.

(2) A minefield containing both live and indicator mines for minefield clearance studies.

(3) Bailey Bridges.

(4) Railroad rolling stock, military vehicles, Marine Corps LVT's and ordnance equipment in tests designed for statistical analysis of effects.

(5) Tactical communications systems.

(6) POL installations.

(7) Field medical installations.

Instrumentation of structures was accomplished by the Ballistics Research Laboratories, Naval Ordnance Laboratory, and the Stanford Research Institute. Together they operated 670 channels of instrumentation on Shot 9 and 510 on Shot 10.

2.2.4 Program 4 - Bio-medical Effects

This program consisted of five projects covering a diverse group of bio-medical effects of nuclear weapons.

Briefly the operations of this program involved the following:

(1) Flying of animals (two monkeys and 60 mice confined in the pressurized cockpit of each of two QF-80 drone aircraft) through the cloud of an atomic detonation to determine the relative hazard from inhaled fission products and integrated external gamma radiation.

(2) Exposure of instrumented phantoms simulating a clothed man to the residual radiation of a contaminated ground surface to determine the relative hazard from beta and gamma radiation.

(3) Exposure of statistical numbers of mice to the neutron field eminating from the gun type weapon detonated on this series to evaluate their biological significance.

(4) Subjecting 12 human volunteers and 700 rabbits to the initial light flash from six atomic detonations to investigate its effect on the visual function of human eyes and to determine the burn injury processes in the dark adapted rabbit eye.

(5) Subjecting 56 dogs and 900 rats to the blast wave from two atomic detonations (Shots 9 and 10) to study direct air blast injury in the pressure range of 20 to 50 psi.

2.2.5 Program 5 - Aircraft Structures Tests

This program studied the blast and thermal effects on aircraft in flight. Navy drones were exposed to relatively severe effects where safety requirements would not permit manned aircraft. The Air Force flew manned bombardment-type aircraft in a region expected to produce useful information but without extensive damage to the aircraft.

The Navy AD-2 type drone aircraft participated in five detonations, two manned and three drone flights. The AD-2, in drone operation, was destroyed by severe thermal and blast effects on Shot 7 and the standby XBTD-1 drone substituted for Shots 8 and 9. The conditions obtained by the test aircraft will permit a successful evaluation of thermal and blast effects on AD type aircraft following delivery of an atomic weapon.

Three instrumented and manned B-50D aircraft in a flight pattern simulating that of a bomb dropping aircraft participated in Shots 4 and 9. Attainment of approximately 75 per cent horizontal stabilizer design limit load on Shot 9 provided sufficiently precise structural data to enable accurate definition of minimum operational parameters for atomic weapon delivery by B-50 aircraft.

In Shot 9 a B-36 aircraft was positioned to obtain a predicted 100 per cent design limit tail load in the up direction. Preliminary indications are that less than expected loads were obtained, however, data collected were sufficient to permit the correlation, verification and/or revision of the present blast load theory.

2.2.6 Program 6 - Tests of Service Equipment and Operations

The mission of Program 6 was to test service equipment and operational techniques in conjunction with nuclear detonations. It should be emphasized that this program tested the operation of equipment and not the ability of equipment to withstand the blast and thermal effects of an atomic detonation.

The service equipment and operational techniques tested in this program are described as follows:

(1) Radar techniques of indirect bomb damage assessment and fireball studies.

(2) Field testing of existing IBDA equipment.

(3) Evaluation of chemical dosimeters which measure radiation to which personnel have been exposed.

(4) Determination of the electromagnetic radiation over the radio spectrum arising from a nuclear detonation.

(5) Evaluation of radiac equipment - airborne and ground - and techniques employed.

(6) Rapid aerial radiological survey techniques for delineating radioactive areas.

(7) Operational training of Tactical Air Command crews by simulating delivery of an atomic bomb by seven T-33 aircraft in conjunction with two nuclear detonations.

(8) Evaluation of seismic, sound, flash and photographic systems for determination of height of burst, yield and ground zero.

2.2.7 Program 7 - Long Range Detection

The general objective of Program 7 experiments in this test series was the improvement of present techniques and development of new techniques for the gathering of intelligence concerning foreign atomic energy events. The experiments were generally designed to accomplish this objective at locations remote from the event; however, measurements for calibration purposes were made within and close to the Nevada Proving Grounds. Thus, the experimental program consisted of both special test efforts and the use of existing Atomic Energy Detection System equipment and procedures.

2.2.8 Program 8 - Thermal Measurements and Effects

Program 8 accomplished a series of measurements on the thermal output characteristics of a nuclear detonation and their effects on specific thermal sensitive items.

Basic thermal radiation measurements were performed with five principal objectives in mind:

(1) To provide basic thermal radiation data for interpretation of results of thermal effects.

(2) To obtain additional thermal radiation data required for scaling to larger yield weapons.

(3) To study the spectral characteristics, absorption and reflection by the ground, and scattering of the thermal radiation.

(4) To determine the part played by thermal radiation with respect to initiating and sustaining the so-called precursor shock wave.

(5) To determine the sound velocity and the velocity of particles associated with the shock wave.

The effects of thermal radiation on materials were studied to determine the following:

(1) Effects of thermal radiation on fabrics and aircraft sections.

(2) Effects of thermal radiation on animals clothed in replicas of service uniforms.

(3) Primary fires initiated in combustibles found in urban areas.

In addition the effects of a layer of black absorbing smoke on blast and precursor phenomena were studied.

2.2.9 Program 9 - Technical Photography

2.2.9.1 Project 9.1 Photography

Technical photography and interpretation of visible phenomena of each shot were carefully analyzed to discover the column and cloud, base surge, if any, surface ground waves, and structural response.

Photographic data obtained include the recording of the precursor wave, the triple point, effects on structures, effects on various materials and small animals.

To obtain such data varied types of cameras and films were employed, such as oscillograms, high speed motion picture photography up to 3000 frames/sec, normal speed motion picture photography and still photography. Both black and white and color films were used.

Some projects required photographic coverage during the actual explosions while other projects required pre- and post-shot photography to determine effects and other data.

2.2.9.2 Project 9.7 Experimental Stabilization

This project was designed to compare the performance of several types of stabilized surfaces using materials and specifications which were not used in the production stabilization effort. On the basis of previously conducted laboratory studies, several promising stabilizing agents were tested including sand-cement, sodium silicate, and lignin.

The sand-cement test panels showed no damage to the effects of Shots 9 and 10.

Sodium silicate proved its value as a mechanical stabilizing agent in regions where the peak overpressure was less than 15 psi.

Lignin proved its value as a mechanical stabilizing agent in regions where the peak overpressure was less than 20 psi.

Evaluation of these materials from a thermal standpoint must await study of motion picture film.

2.2.9.3 Project 9.6 Production Stabilization

This project was employed in an effort to reduce to a minimum the clouds of dust and smoke that arise in the vicinity of an atomic detonation and interfere with motion picture coverage of targets within this area. To accomplish this, approximately 700,000 sq yds of sand-cement mat of 2 in. thickness utilizing two sacks of cement per cubic yard of compacted sand were laid down in the ground range from 2000 to 12,000 ft from ground zero.

As far as construction was concerned the sand-cement stabilization was a practical operation and was accomplished in a minimum period of time.

Evaluation of the effectiveness of the stabilization in aiding in the procurement of motion picture coverage of the targets exposed must await evaluation of the motion picture film.

2.3 ELECTRONICS AND TIMING

The Electronics Engineer on the staff of the Technical Director, MEG, was charged with the responsibility of coordinating all timing signal requirements as received from the individual projects.

The J-6 Division of the Test Director's staff acted as the coordinating agency for the three test groups involved in the operation. The Silas Mason Company was the contractor responsible for drawing up the route line chart and installing the timing lines and EG&G was the agency which placed the signals and relays on the lines.

Prior to each test detonation all signal requirements were again checked to insure that no project requesting timing signals was inadvertently left out and that the correct signals were delivered to the projects concerned. Dry runs were provided from D-4, in most cases, until the morning of D-1 when

the final dry run for timing signals was held. Zero time in all cases was at 1000 and 1500 hours each day. As each dry run was completed any project officer of the MEG who encountered any difficulty with his timing signals contacted the Electronics Engineer who arranged for the necessary corrective action to be taken.

By the time that Shot 2 of the series had been detonated, on 24 March 1953, the timing requirements for Shots 9 and 10 in Frenchman Flat were largely completed and the route line chart for the installation of the necessary lines approved. The trenches in which the timing lines were buried, 2 ft deep, were dug and timing lines installed. This installation was completed on 27 April 1953 and dry runs began on 30 April 1953. Because of the large number of signals used in Frenchman Flat, close check had to be made of each project to make sure that the signals requested were provided.

After completion of the operation all timing lines were tagged and an "as built" drawing prepared. This drawing is on file with the Directorate of Weapons Effects Tests at Sandia Base, Albuquerque, New Mexico.

2.4 REPORTS BRANCH

A Reports Branch was organized in the Office of the Technical Director, DWET, on 2 February 1953 with the primary function of supervising the preparation of technical reports of weapons effects tests. The Branch consisted of a Branch Chief, a Technical Editor, and an Analysis Officer. To expedite the publishing of preliminary technical reports for UPSHOT-KNOTHOLE the Director of the Military Effects Group requested that the Reports Branch move to the Nevada Proving Grounds for the duration of the operation. The preliminary project reports were submitted at the Nevada Proving Grounds at the earliest possible date following the completion of project test activity and prior to the departure of the project organization from the Nevada Proving Grounds.

A total of 73 reports, consisting of 3568 book pages, were reproduced and distributed by Technical Information Service, AEC, Oak Ridge, Tennessee, during the period 12 June to 15 July 1953. Sixty-six of these reports were distributed and the bulk of them in the hands of the recipients by 1 July.

The dissemination of this information at any early date not only expedited the publishing of final technical reports for this operation but it greatly facilitated the planning for future tests.

Table 2.1 Projects and Shot Participation

Projects and Agencies	Shots										
	1	2	3	4	5	6	7	8	9	10	11
1.1a-Basic Air Blast Measurements (NOL)								x	x	x	
1.1b-Basic Air Blast Measurements (SRI)			x	x					x	x	x
1.1c-Basic Air Blast Measurements (SC)	x						x				
1.1d-Basic Air Blast Supporting Measurements (SC)									x	x	
1.2 -Air Blast Measurements (NOL)	x			x					x	x	x
1.3 -Free-Air Blast Pressure Measurements (AFCRC)				x					x		
1.4a-Earth Measurements (SC)	x								x	x	
1.4b-Earth Components (SC)									x	x	
2.1 -Studies of Airborne Particulate Material (ACC)				x					x		
2.2a-Residual Gamma Spectrum of Fission Products (SCEL)		x	x	x	x		x	x	x	x	x
2.2b-Residual Gamma Depth Dose Measurement in Unit Density Material (NMRI)					x		x		x	x	
2.3 -Neutron Flux & Spectrum vs Range (NRL)								x	x	x	
3.1 -Test on Loading of Building and Equipment Shapes (AMC)									x	x	
3.3 -Test of Horizontal Cylindrical Shapes (AMC)									x	x	
3.4 -Tests of Truss Systems Common to Open Frame Structures (AMC)									x	x	
3.5 -Tests of Wall & Roof Panels (AMC)									x		
3.6 -Test of Railroad Equipment (TC) (AMC)										x	
3.7 -Effectiveness of Blast Baffles at Shelter Entrances, Air Intakes and/or Outlets (OCE)									x	x	
3.8 -Effects of Air Blast on Buried Structures (OCE)									x	x	
3.9 -Design & Location of Field Fortification (ERDL)									x	x	
3.11-Protective Measures for Existing Construction; Light Steel Frame Structures (BuDocks)									x		
3.12-Protective Measures for Existing Construction; External Protective Measures (BuDocks)									x		
3.13-Precast Cable Shelter (BuDocks)									x	x	
3.14-Precast Warehouse (BuDocks)									x	x	
3.15-Armco Steel Magazine (BuDocks)									x	x	
3.16-Tests of Glazing &Window Construction (BuDocks)									x	x	
3.18-Minefield Clearance (ERDL)										x	
3.19-Effects of Atomic Explosion on Trees in Forest Stands (US Dept of Agriculture)									x	x	
3.20-Vulnerability of a Typical Tactical Comm Sys to Atomic Attack (SCEL)									x	x	

Projects and Agencies	Shots										
	1	2	3	4	5	6	7	8	9	10	11
3.21 -Statistical Determination of Damage Criteria for Critical Items of Military Equipment and Supplies (BRL)									x	x	
3.22 -Effects on Engineer Bridging Equipment (ERDL)									x	x	
3.24 -Blast Effects on LVT's (NRDL)									x	x	
3.26.1-Effects on POL Installations - Drum & Can Storage (AMC)									x	x	
3.26.2-Effects on POL Installations - Systems & Hazards from Spillage (QMC)									x	x	
3.26.3-Effects on POL Installations - Bulk Storage (USMC)									x	x	
3.27 -Effects of Atomic Weapons on Field Medical Installations (MedFSS)									x		
3.28.1-Structures Instrumentation (BRL)									x	x	
3.28.2-Structures Instrumentation (NOL)									x	x	
3.28.3-Structures Instrumentation (SRI)									x	x	
3.29 -Tests of Four Curtain-Wall and Partition Structures (FCDA)									x		
3.30 -Air Blast Gage Studies (BRL)							x	x	x	x	x
4.1 -Evaluation of Hazard from Flying Through the Atomic Cloud (AFCRC				x					x		
4.2 -Air Blast Injuries (NMRI)								x	x	x	
4.5 -Flash Blindness (SAM)	x	x			x		x	x			
4.7 -Measurement of Beta Hazard in Bomb Contaminated Areas (WR Army Med Cen)		x						x	x	x	x
4.8 -Biological Effects of Neutrons (NRDL)										x	
5.1 -Naval Aircraft Structures (BuAer)	x	x					x	x	x		
5.2 -Blast, Thermal and Gust Effects on Aircraft in Flight (WADC)				x					x		
5.3 -Blast & Gust Effects on B-36 in Flight (WADC)									x		
6.2 -Tests of Radar Techniques for Accomplishing Indirect Bomb Damage Assessment (WADC) (VITRO)	x	x	x	x	x	x	x	x	x	x	x
6.3 -Field Tests of IBDA (SAC)	x	x		x	x		x	x	x	x	x
6.4 -Evaluation of the Chemical Dosimeter (ACC)							x		x		
6.7 -Electromagnetic Radiation over the Radio Spectrum (SCEL)	x	x	x	x	x	x	x		x	x	x
6.8 -Evaluation of Radiac Instrumentation, Equipment & Operational Techniques (SCEL) (BuShips)	x	x	x	x	x	x	x	x	x	x	
6.9 -Evaluation of Airborne Radiac Equipment (BuAer)	x	x	x		x		x				
6.10 -Rapid Aerial Radiological Survey (SCEL)	x	x	x		x		x	x	x	x	
6.11 -Operational Training for Tactical Air Command Crews (ARDC & TAC)										x	

Projects and Agencies	Shots 1	2	3	4	5	6	7	8	9	10	11
6.12 -Determination of Height of Burst and Ground Zero (AFTB#1) (SCEL)	x	x	x	x	x	x	x	x	x	x	x
6.13 -Effectiveness of Fast Scan Radar for Rapid BDA (NEL)							x	x	x	x	
7.1 -Electromagnetic Effects of Nuclear Explosions	x	x	x	x	x	x	x	x	x	x	x
7.3 -Detection of Airborne Low Frequency Sound from Atomic Explosions	x	x	x	x	x	x	x	x	x	x	x
7.4 -Seismic Measurements	x	x	x	x	x	x	x	x	x	x	x
7.5 -Calibration Analysis of A-Bomb Debris	x	x	x	x	x	x	x	x	x	x	x
8.1 -Aircraft Structures Test (WADC)	x		x		x	x	x	x	x	x	
8.2 -Measurements of Total Thermal Radiation by Means of Radiation Pressure Phenomena (AFCRC)	x	x	x	x	x	x	x	x	x	x	
8.4 -Attenuation of Thermal Radiation (ACC)									x	x	
8.5 -Degree and Extent of Burns under Service Uniforms (QMC)		x							x	x	
8.6 -Thermal Effects on Clothing, Materials, Panel Tests (QMC)									x	x	
8.9 -Effects of Thermal Radiation on Materials (NML)									x	x	x
8.10 -Measurement of Basic Characteristics of Thermal Radiation (NRDL)			x	x					x	x	x
8.11a-Initiation & Persistence of Primary Fires (Structures & Interior of Structures) (FPL)									x	x	
8.11b-Initiation & Persistence of Primary Fires (Ignitable Litter) (Calif-F&RES)				x					x	x	
8.12a-Measurement of Velocity of Sound (NEL)							x		x	x	
8.12b-Precursor Shock Study (DTMB)									x	x	
8.13 -Study of Fire Retardant Paints (ERDL)									x		
9.1 -Technical Photography (EG&G)	x	x	x	x	x	x	x	x	x	x	x
9.6 -Blast & Thermal Stabilization (AFSWP)										x	x
9.7 -Experimental Soil Stabilization (AFSWP)										x	x

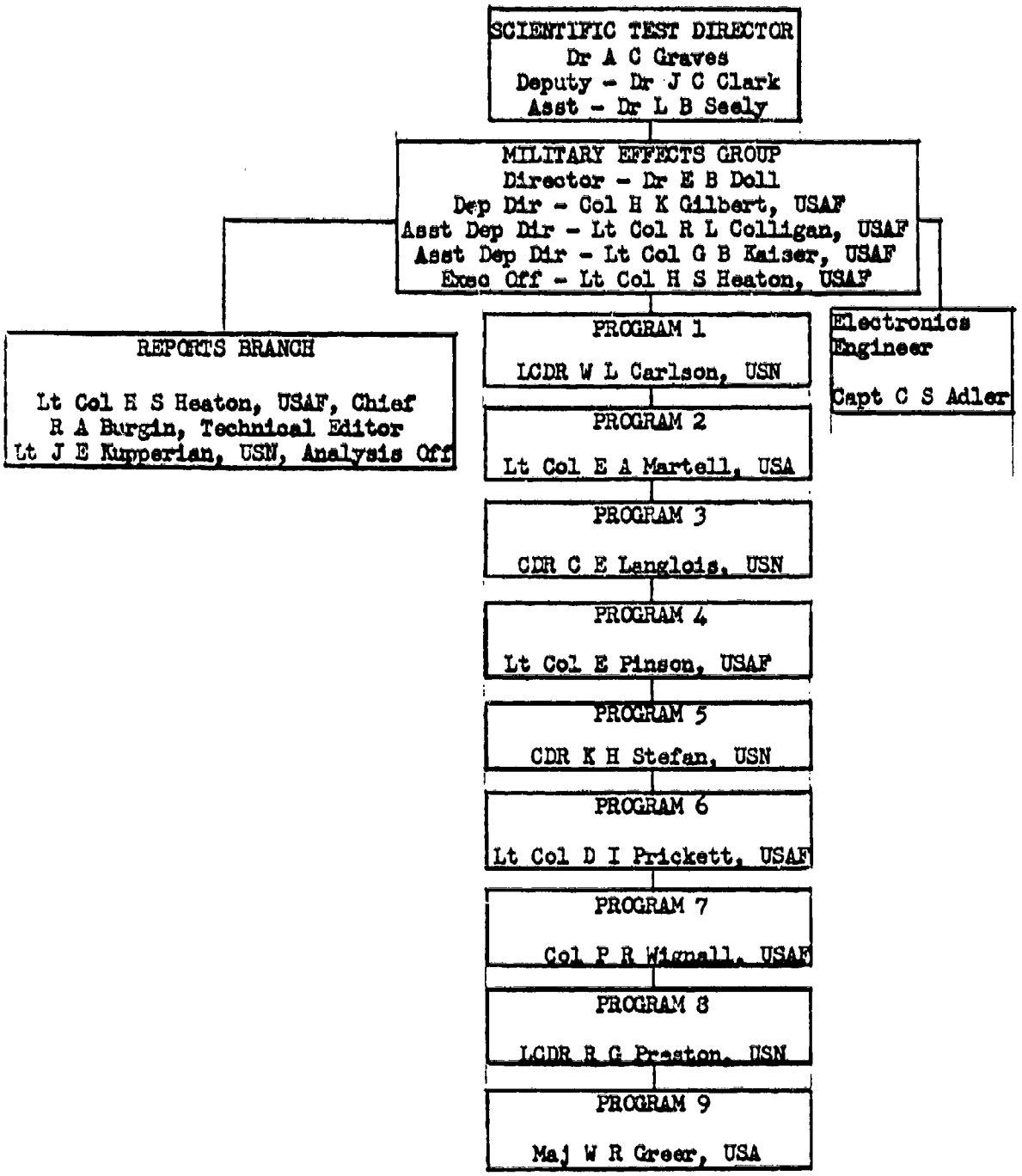


Fig. 2.1 Military Effects Group

CHAPTER 3

PLANS AND OPERATIONS

The Test Director's Plans and Operations Division was under the direction of Mr. Duncan Curry, LASL. Mr. Curry's principal assistant was Mr. B. Carl Lyon, LASL. Col Leonard F. Dow, USAF, of DWET was assigned as Military Deputy. Other personnel included Lt Col Raymond R. Spurgeon, USAF, of DWET and Capt Richard J. Pitzer, USA, and Capt John Onderko, USA, both assigned to JTF-7 with duty at Los Alamos. The organization of the Plans and Operations Division is shown in Fig. 3.1.

The functions of the Plans and Operations Division were:

a. The preparation of operational plans and orders.

b. General supervision of the execution of operational plans and orders.

c. The administration of a system of status reports concerning the various activities involved in each shot.

d. The ascertainment and coordination of operational and support requirements for vehicles, radio equipment, frequencies, photography, aircraft, courier and radiological safety services.

e. The management and control of vehicles allocated to the Test Director's organization.

f. The ascertainment and coordination of certain program and project participation for each detonation such as manned station locations, post-shot area entries, access lists and communications facilities.

g. Coordination of operations with the Civil Aeronautics Administration, Camp Desert Rock, and Nellis AFB.

At the beginning of the operation each person within the Division was primarily responsible for those areas of activity with which he was most familiar as a result of pre-test responsibilities for coordination and planning. The DWET personnel were originally to have acted for the Test Director only on subjects directly pertaining to military affairs. This practice was discarded as soon as each person became acquainted with the various P&O Division functions. The Division became versatile in that LASL personnel could adequately handle military agency coordination and the DWET military representatives acted in areas and on problems that were formerly exclusively handled by the LASL members. The initial minor confusion might have been avoided if operations personnel had visited each other more

frequently prior to the operational period and had become intimately acquainted with details of operational planning and concepts of operations.

During the normal course of planning prior to the operational period, all broad aspects of operations were discussed between DWET and J-Division, LASL. Just prior to the operation, Operation Order No. 1-53 (UPSHOT-KNOTHOLE) was issued by the Test Director. This order reflected the results of this prior planning. It contained a statement of the mission of each participating group operating under the Test Director; it established the Test Director's organization, firing schedule, and project participation; and it contained special instructions on radiological safety, photography and preparation of reports.

Prior to each shot a separate annex to the operations order was issued which contained special instructions for that particular shot. These instructions confirmed project participation and aircraft participation; established special personnel control measures; communication and power control; Desert Rock and Observer movements; and listed a schedule of events from D-1 through D-Day.

The coordination of the military supporting agencies who were performing their functions on a mission basis was a major function. This included monitoring the Rad-Safe Support Unit, the Weather Unit, the Aircraft Participation Unit, the Lookout Mountain Photo Team, and the Artillery Test Unit. In addition in coordination with the Liaison Officer for Troop Participation, Desert Rock operations were integrated into the over-all operational plan.

Generally the actions of the above units were monitored only to assure that no conflicts would arise, that the plans of the different units were complete and that operations would adhere to the standards of safety, personnel control, and security.

Immediately prior to, during, and immediately after each detonation, the P&O Division was temporarily augmented by the following:

(1) Maj John B. Connelly, USA, Liaison Officer, Troop Participation, who had direct contact with the Desert Rock Control Trench to keep the Test Manager informed of troop operations. The primary purpose of this direct contact was one of personnel safety and control, and to pass and/or receive pertinent information.

(2) Lt Col Warren A. Fackenthal, USAF, Chief, Communication Branch, Field Command Support Unit, performed a communication check on all communications systems between the Control Point and the various manned stations. His duty was to assure the P&O Division that all communication facilities were working during the critical period, and to be available to fully utilize the radio and line facilities to pass instructions to the manned station personnel, especially in event of an emergency.

(3) Mr. Harold G. Greenleaf of the Salt Lake City, Utah, CAA Center, acted as direct liaison with CAA to insure control of and warnings to all air traffic which might be affected by the movement of the atomic cloud.

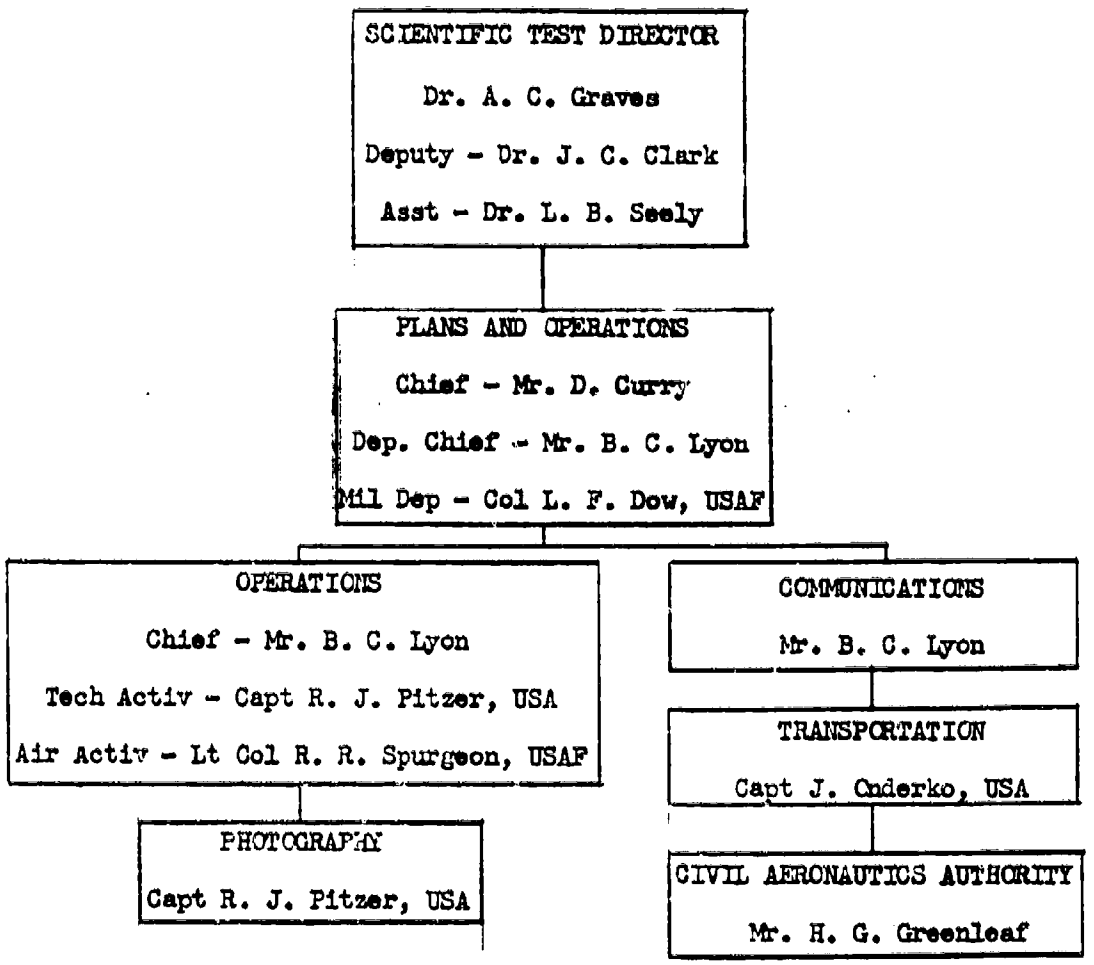


Fig. 3.1 Plans and Operations Organization

CHAPTER 4

AIR OPERATIONS

4.1 INTRODUCTION

The Air Force Special Weapons Center, Kirtland Air Force Base, commanded by Maj Gen John S. Mills, USAF, provided the bulk of aircraft required for the air operations during UPSHOT-KNOTHOLE on a mission basis. In addition to providing aircraft from its own resources the AFSWC assumed operational control of aircraft of other Air Force commands and Services participating in the operation. Col James E. Starkey, USAF, served as the AFSWC Project Officer.

The AFSWC operated from three locations - Kirtland AFB, commanded by Col Henry G. Hamby, Jr., Indian Springs AFB, commanded by Lt Col Marion R. Mc Crackin, USAF, and from the Control Point where a small staff under the direction of Lt Col Paul H. Fackler, USAF, directed air operations in the immediate vicinity of the Proving Grounds.

Three categories of aircraft operations, - test aircraft, courier aircraft, and support aircraft are discussed in the following paragraphs.

4.2 TEST AIRCRAFT PARTICIPATION

The primary purpose and mission of test aircraft in UPSHOT-KNOTHOLE are summarized in the following paragraphs. No attempt is made to discuss the degree of success attained or details of positioning, effects, etc., of aircraft used in specific weapons effects experiments as this information will be accurately developed in the final technical report by the experimental project concerned. Information given includes the participation planned for each shot and major operational difficulties encountered. A tabulation of test aircraft participation by project and shot is given in Table 4.1.

4.2.1 Drop Aircraft

The Test Director utilized aircraft to drop three atomic weapons. Aircraft were provided by the 4925th Test Group (Atomic) commanded by Col O. J. Ritland, USAF. Aircraft of the types indicated dropped atomic weapons in the shots listed below. The drop aircraft in each instance employed two C-47 disaster aircraft which stood-by at Kirtland AFB and Indian Springs AFB with radiological safety and security teams.

Table 4.1

Test Aircraft Participation

Project	Agency	Aircraft No	Aircraft Type	Title	Shot 1	2	3	4	5	6	7	8	9	10	11
Test Dir	LASL	1 1	B-50 B-36	Drop A/C				X					X		X
Test Mgr	SFO	2 1	B-29 B-25	Cloud Tracking A/C	X	X	X	X	X	X	X	X	X	X	X
Test Mgr	SFO	1 2 1 1	C-47 L-20 H-5 H-18	Terrain Survey A/C	X	X	X	X	X	X	X	X	X	X	X
1.3	AFSWC	2	B-29	Free Air Blast Pressure Measurements				X					X		
2.1	ACC	See 4.1 Drone		Studies of Airborne Particulate Material				X					X	X	
4.1	AFCRC	1 1	B-50 B-47	Evaluation of Hazard of Flying through Atomic Cloud				X					X	X	
4.1	AFCRC	4 5 4 1	QF-80 DT-33 F-86 B-17	Evaluation of Hazard of Flying through Atomic Cloud				X					X	X	
5.1	BuAer	3 2 3	F8F AD2 AD4	Navy Aircraft Structures	X	X			X		X	X	X		
5.2	WADC SAC	1 2	B-50 B-50	Blast, Thermal, and Gust Effects on A/C in Flight				X					X		
5.3	WADC	1	B-36	Blast, Thermal, and Gust Effects on A/C in Flight									X		

Table 4.1 (Cont'd)

Test Aircraft Participation

Project	Agency	Aircraft No	Aircraft Type	Title	Shot 1	2	3	4	5	6	7	8	9	10	11
6.2	WADC	3	B-29	Tests of Radar Techniques for IBDA	X	X	X	X	X		X	X	X	X	X
6.3	SAC	12	B-29 B-50 B-47 B-36	Field Test of IBDA	X	X		X	X		X	X	X	X	X
6.3	SAC	8	F-84	Crew Indoctrination									X	X	
6.9	BuAer	1	P2V2	Evaluation of Airborne Radiac Equipment	X	X	X		X	X	X				
6.10	SCEL	1	C-45 or H-19	Rapid Aerial Radiological Survey	X	X	X		X		X	X	X	X	
6.11	TAC	7	T-33	Operational Training for TAC Crews				X					X		
6.11	TAC	3	RF-80	Photo Reconnaissance									X		
7.5	AF	2	B-29	Calibration Analysis of A-Bomb Debris		X	X	X	X	X	X	X			
8.1	WADC	Misc A/C		Aircraft Structures Tests	X		X				X	X	X	X	
13.1	LASL	9 1	F-84 B-50	Cloud Sampling Sampling Control	X	X	X	X	X	X	X	X	X	X	X
4925th	AFSWC	2	C-47	Disaster				X					X		X
LML	DNET	1	C-47	Documentary Photo	X	X	X	X	X		X	X	X	X	X
USMC	DR	4	HRS2	Landing Test		X		X	X	X	X	X	X		
USMC	DR	39	HRS2	Assault Test					X						

Table 4.2 - Drop Aircraft

SHOT	TYPE AIRCRAFT	ERROR
4	B-50	72'N, 565'E
9	B-50	937'S, 15'W
11	B-36	232'N, 172'W

On a dry run prior to Shot 9 an HE weapon could not be released due to difficulty in the aircraft electrical systems.

On Shot 11 weather conditions necessitated postponing the shot after the drop aircraft was airborne and the B-36 returned to Kirtland AFB and landed with the weapon. On shot day a B-50 dropped an HE weapon to assist in calculating blast effects at H-0:35. The B-36 dropped two practice 500 lb bombs with spotting charges prior to dropping the test weapon.

4.2.2 Cloud Tracking

The Test Manager utilized aircraft to track and observe the movement of the atomic cloud for airway clearance purposes. Two B-29's for high level and one B-25 for low level cloud tracking were used on each shot as the situation required.

4.2.3 Radiological Safety Terrain Survey

The Test Manager utilized aircraft on each shot to assist in monitoring radioactivity resulting from the detonation of atomic weapons by making aerial surveys and transporting survey personnel. Aircraft of the following types were used as the situation required: C-47, L-20, H-5, H-18 and H-19.

4.2.4 Project 1.3, Free Air Blast Pressure Measurements

The Air Force Cambridge Research Center utilized aircraft to assist in determining air blast pressures. Two B-29 aircraft operating from Kirtland AFB flew in loose formation and dropped vertical arrays of from 7 to 10 parachute canisters at a time just prior to H Hour and south of ground zero. The canisters telemetered pressure-time data to a ground station.

Table 4.3 - Cannister Aircraft Positions

SHOT	A/C ALTITUDE-MSL	A/C POSITION-GZ
4	20,000	9000 ft south
9	17,500	5000 ft south

4.2.5 Project 4.1. Evaluation of Hazard of Flying Through Atomic Cloud

The Air Force Cambridge Research Center utilized aircraft to assist in determining the gamma radiation and inhalation hazards to personnel flying through an atomic cloud. Two phases were conducted:

A B-47 operating from Kirtland AFB and a B-50 operating from Indian Springs AFB each dropped five parachute canisters at a time to penetrate the cloud at 25 and 40,000 ft MSL. The canisters telemetered gamma radiation measurements to a ground station.

Two QF-80 drones accompanied by four DT-33 mother control aircraft, four F-86 armed fighter escort aircraft, and one B-17 frequency monitoring aircraft carried animals and radiation measuring equipment. They operated from Indian Springs AFB and flew through the cloud with ground radar control assistance.

Table 4.4 - Project 4.1 Aircraft Data

SHOT	ALTITUDE-MSL/RESULTS (ft)		
	B-47	B-50	QF-80's
4	49,000/all missed	25,000/all missed	28,000/missed
9	49,000/no drop	25,000 3,4 & 5 hit	30,000/hit 2nd pass 32,000/hit 2nd pass
10	49,000/cancelled	25,000/no drop	30,000 cancelled 32,000 cancelled

On Shot 9 the B-47 could not get its bomb bay doors open and therefore did not drop its canisters. On Shot 10 southerly winds prevented drone take-offs, the B-50 flew but did not drop its canisters, due to scattered cloud coverage over the target area and the B-47 was cancelled prior to take off, also due to cloud coverage. The drones did not participate due to operational take-off difficulties caused by southerly winds.

The QF-80 drones carried cascade impactors film badges and ionization chambers for Projects 2.1 and 4.1.

4.2.6 Project 5.1, Navy Aircraft Structures

The Navy Bureau of Aeronautics utilized aircraft to determine blast and thermal effects on aircraft structures. One AD-2 drone employing two F8F mother control aircraft and three AD-4 armed fighter escort aircraft operated from Indian Springs AFB. The AD-2 drone was positioned by ground control radar in a tail-on attitude close to the design limits of thermal and blast tolerance.

Table 4.5 - Project 5.1 Aircraft Data

SHOT	ALTITUDE MSL (ft)	HORIZONTAL RANGE (ft)	REMARKS
1	17,200	6540	Manned
2	10,800	5500	Drone
5	11,000	3000	Drone
7	9,500	2700	Drone crashed
9	21,935	2000	Manned
8	11,000	2300	Drone

On Shot 1 the drone was manned due to difficulties in radio control. On Shot 7 the drone crashed due to excessive thermal and blast energies. On Shot 9 the drone was manned and flown in formation with the drop aircraft.

4.2.7 Project 5.2, Blast, Thermal and Gust Effects on Aircraft in Flight

The Wright Air Development Center utilized aircraft to determine blast, thermal, and gust effects on manned aircraft in flight. Three B-50 aircraft operating from Kirtland AFB were positioned to receive desired overpressures by flying a loose formation with the drop aircraft.

Table 4.6 - Project 5.2 Aircraft Data

SHOT	ALTITUDE MSL (ft)	POSITION ON DROP AIRCRAFT	
		BELOW (ft)	BEHIND (ft)
4	30,193	3000	3000
9	21,935	200	200

On Shot 4 only two B-50 aircraft participated.

4.2.8 Project 5.3, Blast, Thermal and Gust Effects on Aircraft in Flight

The Wright Air Development Center operated a B-36 for blast, thermal and gust tests. The B-36 aircraft operating from Kirtland AFB was positioned at 25,000 ft MSL and 5800 ft in front of the drop aircraft on Shot 9.

4.2.9 Project 6.2, Tests of Radar Technique for IBDA

Wright Air Development Center utilized aircraft to secure data for indirect bomb damage assessment purposes. The B-29 aircraft operating from Kirtland AFB and equipped with the latest IBDA systems participated as indicated below in each shot except Shot 6. Aircraft were positioned at each of the following points and at altitudes ranging from 19,000 to 25,000 ft MSL depending on the shot yield.

5 Miles South of Ground Zero

7 Miles East of Ground Zero

5 Miles North of Ground Zero

Three aircraft participated in all shots with the exception of Shots 2, 4 and 5 when only two aircraft participated due to mechanical trouble on the third aircraft.

4.2.10 Project 6.3, Field Test of IBDA

The Strategic Air Command utilized aircraft for air crew indoctrination and IBDA purposes. Bomber and fighter type aircraft operated from bases and in the numbers indicated in Table 4.7. All fighter aircraft staged through George AFB, California. The aircraft flew in formation to simulate strike and support problems. One weather reconnaissance aircraft preceded the formations to determine wind data and to observe weather.

Table 4.7 - IBDA Aircraft Data

SHOT	BASE	AIRCRAFT	BASE ALTITUDE MSL (ft)
1	Travis	13 B-29	25,000
2	Carswell	13 B-36	30,000
4	McDill	12 B-47	37,000
5	Castle	13 B-50	25,000

Table 4.7 - IBDA Aircraft Data (Cont'd)

SHOT	BASE	AIRCRAFT	BASE ALTITUDE MSL (ft)
7	Hunter	6 B-50	25,000
	McDill	6 B-47	37,000
9	Fairchild	13 B-36	37,000
	Turner	8 F-84	37,000
8	Roswell	13 B-50	25,000
10	Carswell	12 B-36	37,000
	Bergstrom	8 F-84	37,000
11	Fairchild	6 B-36	33,000
	Carswell	1 B-36	33,000

On Shot 8 two aircraft aborted due to mechanical trouble. On Shot 10 the fighters were cancelled prior to take-off and the bombers were 1 hour late due to failure of SAC organizations to schedule the mission on Pacific Daylight instead of Pacific Standard Time.

4.2.11 Project 6.9, Evaluation of Airborne Radiac Equipment

The Navy Bureau of Aeronautics utilized aircraft to evaluate airborne radiological equipment. One P2V2 aircraft operating from Kirtland AFB entered the Nevada Proving Grounds on shot days when conditions permitted and performed an on-site radiac survey testing equipment. The aircraft landed at Indian Springs and continued the survey the following morning. Participation was in Shots 1, 2, 3, 5, 6 and 7.

4.2.12 Project 6.10, Rapid Aerial Radiological Survey

The Signal Corps Engineering Laboratories utilized aircraft to improve the techniques of a rapid aerial radiological survey. One aircraft or helicopter was used in each shot. The survey was conducted as soon after a shot as conditions permitted.

Table 4.8 - Project 6.10 Aircraft Data

SHOT	TYPE A/C	OPERATING BASE
1	C-45	Indian Springs AFB
2	C-45	Indian Springs AFB
3	H-23	Desert Rock
5	HRS-2	Yucca Airstrip
7	HRS-2	Yucca Airstrip
9	HRS-2	Desert Rock
8	HRS-2	Yucca Airstrip
10	C-45	Indian Springs AFB

4.2.13 Project 6.11, Operation Training for TAC Crews

The Tactical Air Command utilized aircraft for aircrew indoctrination and to study effects on aircraft in a tactical delivery of a weapon. Seven T-33 aircraft operating from George AFB were positioned by flying formation on the drop aircraft and diving after release of the weapon to a position on a simulated delivery curve.

Table 4.9 - Project 6.11 Aircraft Data

SHOT	PROCEDURE
4	Performed 1 1/2 G turn to 110° and 27,193 ft MSL
9	Dove straight ahead to 17,000 ft MSL

Three RF-80 made photo reconnaissance runs over ground zero on Shot 9 two hours after H-hour.

4.2.14 Project 7.5, Calibration Analysis of A-Bomb Debris

Program 7 (Long Range Detection) utilized aircraft to procure A-Bomb debris particles for analysis. Two B-29 aircraft operating from Indian Springs AFB were scheduled to perform sampling missions in Shots 2, 3, 4, 5, 6, 7 and 8.

4.2.15 Project 13.1, Radiochemistry

Los Alamos Scientific Laboratories utilized aircraft to obtain cloud samples for analysis. One B-50 aircraft observed the cloud and directed the sampling operations of nine A-3A sampling aircraft which were

called individually from Indian Springs AFB as the situation warranted. One F-84 was used to determine the altitude of the upper and lower limits of the main portion of the cloud. These aircraft also obtained samples for Project 7.5 and Project 13.2.

Sampling operations were conducted on all shots and all aircraft operated from Indian Springs AFB.

4.2.16 Miscellaneous

The Air Force Lookout Mountain Laboratory utilized one C-47 aircraft to obtain documentary photography of the detonation of the weapons. This airplane operated from Indian Springs AFB on all shots except No. 6.

The Marine Corps utilized helicopters in tests to advance troops to the area of ground zero and to determine effects of blast on helicopters on the ground and in various flight attitudes.

Thirty-nine HRS-2 helicopters operating from Yucca Lake advanced after the blast to the troop entrenchment area, and when conditions permitted transported troops to a pre-selected area close to ground zero on Shot 5.

Four HRS-2 helicopters operating from pre-selected areas for Shots 2, 4, 6, 7, 9 and 8 were positioned in various flight attitudes and on the ground ready for takeoff. These helicopters advanced toward ground zero after the passage of the shock wave.

4.3 COURIER AIRCRAFT PARTICIPATION

Aircraft were utilized to provide rapid transportation of samples, materials, and animals to laboratories after each shot that required expeditious movement due to their perishable nature or that could not be transported otherwise. The AFSWC provided C-47 and B-25 aircraft and crews to meet these requirements with the exception of Project 4.5 and Project 23.17 who furnished their own aircraft and crews. In addition to the sensitive samples the courier aircraft provided transportation for numerous personnel and quantities of material to their destinations and points enroute. A tabulation of the courier aircraft flights made for each project by shot is given in Table 4.10. All courier requirements listed are those occurring within 24 hours of H-hour.

4.4 SUPPORT AIRCRAFT PARTICIPATION

The AFSWC provided aircraft through the facilities of Indian Springs AFB to meet miscellaneous test and support requirements.

4.4.1 Indian Springs AFB Shuttle

An aircraft shuttle utilizing C-47 aircraft made a daily round trip between Kirtland AFB and Indian Springs AFB carrying personnel, supplies and equipment to Indian Springs AFB for all participating organizations. In many instances additional aircraft were provided when the requirements for transportation exceeded the capabilities of one aircraft.

4.4.2 Special Airlift

Many flights were provided to all parts of the United States to transport personnel in connection with UPSHOT-KNOTHOLE activities. Special flights were also made to procure supplies urgently needed or to transport materials that could not be moved by the other modes of transportation.

4.4.3 Minimum Individual Training

Indian Springs AFB provided aircraft to meet requirements of AFR 60-4 Instrument Certificate; accomplish a proportionate share of MIT requirements of AFR 60-2, Flying Requirements and Minimum Annual Flying Requirements; and to maintain aircraft proficiency for rated personnel assigned to Nevada Proving Grounds.

4.4.4 Fall-Out Monitoring

Hill AFB provided aircraft with crews to transport personnel and equipment to locations within an area from 200 to 600 miles radius of the Nevada Proving Grounds in connection with the AEC New York Operations Office fall-out monitoring activities.

4.4.5 Security Surveillance

Indian Springs AFB provided aircraft and personnel to conduct aerial security surveillance flights of the Nevada Proving Grounds and adjacent area twice daily.

4.4.6 Miscellaneous Test Activities

Indian Springs AFB provided aircraft as required to support technical and documentary photography requirements, conduct search, instrument, sample recovery missions, post-shot reconnaissance flights and transport of personnel and supplies. The USMC Detachment at Camp Desert Rock contributed significantly to assist in the conduct of these missions with their HRS-2 helicopters.

Table 4.10

Courier Aircraft

Project	Agency	Material	A/C	From - To	Shot 1	2	3	4	5	6	7	8	9	10	11
2.1	ACC	Filters	C-47 *	Indian Spngs AFB,Nev Phillips Field, Md				x					x	x	
2.3	NRL	Activated Samples	C-47 *	Indian Spngs AFB,Nev Bolling AFB, DC								x	x	x	
4.1	AFCRC	Mice Monkeys	C-47	Indian Spngs AFB, Nev Santa Fe Munl, N.M.				x					x	x	
4.5	SAM	Rabbits	C-47	Indian Spngs AFB, Nev Randolph AFB, Texas	x	x			x		x	x			
6.2	WADC	Film	I.S. Shtl	Indian Spngs AFB, Nev Kirtland AFB, N.M.	x	x	x	x	x	x	x	x	x	x	x
7.5	AF	Filter Papers Gas Samples	C-47 *	Indian Spngs AFB, Nev McClellan AFB, Calif O'Hare Intl, Ill. Logan Field, Mass	x	x	x	x	x	x	x	x	x	x	x
13.1	LASL	Filter Papers	B-25 (2)	Indian Spngs AFB, Nev Kirtland AFB, N.M.	x	x	x	x	x	x	x	x	x	x	x
13.2	UCRL	Filter Papers Gas Samples	B-25	Indian Spngs AFB, Nev Oakland Munl, Calif			x		x	x		x			
17.1	LASL	Thresh-old De-tectors	B-25	Yucca Airstrip, Nev Santa Fe Munl, N.M.	x	x			x	x	x			x	
23.4	FCDA	Mice	C-47	Indian Spngs AFB, Nev Knoxville Munl, Tenn	x										
23.4	FCDA	Thresh-old De-tectors	C-47 *	Indian Spngs AFB, Nev Bolling AFB, DC	x										
23.17	NRDL	Mice	TBM	Indian Spngs AFB, Nev NAS, Alameda, Calif	x		x	x				x		x	

* Utilized Same Aircraft

CHAPTER 5

RADIOLOGICAL SAFETY

5.1 RESPONSIBILITIES

The Rad-Safe Unit was responsible to the Test Director for: (1) the radiological control and protection of personnel within a radius of 200 miles of the test areas; (2) furnishing all ground monitoring services required for scientific programs; (3) the delineation of the off-site contamination within a radius of 200 miles of the Nevada Proving Grounds after each shot by air and ground surveys; (4) the tracking of the atomic cloud and advising the Test Director in the closing of air lanes; (5) the recording of and dissemination of individual exposure records; (6) decontamination of vehicles and equipment used on the test site and the decontamination of personnel and clothing; and (7) the proper packaging of radiologically active material for shipment.

5.2 ORGANIZATION

The organization of the Rad-Safe Unit for the first two shots of the series is shown in Fig. 5.1. A reorganization of the Unit was effected after the second shot, with the departure of the executive officer of the Rad-Safe Support Unit who had been On-Site Operations Officer. The Commanding Officer of the Support Unit assumed the duties of the On-Site Operations Officer. The reorganization is shown in Fig. 5.2. This reorganization, although resulting from the departure of a key officer, facilitated operational procedures. It centralized control of the Rad-Safe Unit and placed the Commanding Officer of the Support Unit in a direct supervisory position with respect to the greater portion of his assigned personnel.

5.3 PERSONNEL

The majority of the personnel of the Rad-Safe Unit were provided by the Chemical Corps Training Command by the temporary assignment to Mercury of the 9778 TSU Rad-Safe Support Unit. This unit had a maximum strength during the operation of 26 officers and 144 enlisted men. Five Navy enlisted men, five Air Force officers and 12 airmen were assigned TDY to Mercury to augment this Unit. Two Los Alamos Scientific Laboratory civilians, 15 Public Health Service officers, and 2 officers and one enlisted man assigned to DWET also augmented the unit. All were organized into the Rad-Safe Unit under the direction of the Rad-Safe Officer, Lt Col Tom D. Collison, USA.

Prior to 15 February the Rad-Safe Group at the Nevada Proving Grounds consisted of an interim detachment of one officer and nine enlisted men. On 15 February an advance party arrived consisting of the Commanding Officer, 9778th, Lt Col Frank N. Milburn, USA, four of his administrative

and supply personnel and the Rad-Safe Officer, bringing the total strength to 22 men. The main body of the Support Unit arrived on 1 March and brought the over-all strength to 180 men. The arrival of augmentation personnel, Air Force, Navy, and Public Health Service, between 1 March and 17 March, brought the unit to its maximum strength.

Rotation and separation of personnel resulted in constant fluctuation of the unit's strength throughout the test period. However, the unit strength steadily decreased after the ninth shot as personnel who had received their total permissible radiation dosage were returned to their home stations. By 15 June the return of personnel had been completed with the exception of the three officers and the 20 enlisted men who were to remain during the interim period.

5.4 AIR SUPPORT

Air support for the Rad-Safe Unit was provided by AFSWC. The aircraft consisted of two B-29s and one B-25 for cloud tracking, one C-47 and two L-20s for the low level terrain survey, and one helicopter for on-site surveys.

5.5 SUPPLY

All supplies needed for the operation that were not already on hand from previous operations were furnished by the AEC. Shortages in critical items that did not arrive prior to the first shot were borrowed from the Evans Signal Laboratory. The 35,000 film badges for the operation were purchased from DuPont.

5.6 OPERATIONS

Prior to the operational phase an Operation Order assigning the responsibilities and outlining the detailed functioning of the sections of the unit was published in draft form. Functioning of the organization was checked in numerous dry runs during the period 1 to 16 March. The unit was operationally ready for the first shot. The order was published in final form after the start of the test series.

Program and project requirements were met by appointing an officer monitor for each program who coordinated the program's radiological safety requirements during the test series, assisted in preparation of the Schedule of Events for the Test Director's Operation Order and attended all rehearsals of the program personnel prior to each test.

The operational peculiarities for each shot; data including on-site, off-site, air participation; and logistics are included in detail in the draft Radiological Safety Report submitted to the Test Director at the completion of the operation.

Prior to each shot weather conferences were called by the Test Manager to discuss forecast conditions for the shot. One consideration presented was the direction and intensity of radioactive fall-out. Fall-out was expressed in terms of an infinite dose, the total integrated outside activity over an infinite period of time based on the $t^{-1.2}$ decay law. This predicted infinite dose became a primary consideration of the Test Manager's Advisory Panel during the latter part of the series as the predicted direction of fall-out was generally in an easterly direction and dosage is cumulative. The reader is cautioned that the infinite dose is the maximum dosage a person in the community could receive if he stayed outside in the area of fall-out for an infinite period of time and there were no decrease in activity due to dispersion by winds and rain. Experience indicates that there is a decrease in activity due to dispersion by weather, and that activity inside buildings is generally 1/2 to 1/3 of the outside activity. Thus the infinite dose figures in this report are relative only and it is not considered possible that any persons could receive the total computed dosage.

The UPSHOT-KNOTHOLE series of atomic tests presented radiological safety problems which varied from almost nothing for the high air burst, to the greatest problems ever presented at continental tests for the larger tower shots. Shot 7 is an example of the radiological problem produced by a high yield tower shot. The infinite gamma dose for this shot at 200 miles distance from ground zero was 5 roentgens. Moving vehicles as far east as Glendale and Mesquite, Nevada, were found to be contaminated in a few cases to a radiation intensity as high as 500mr/hr. This required the establishment of roadblocks and decontamination stations in these areas to monitor and decontaminate vehicles and personnel. This particular shot differed from some of the other larger tower shots in that it not only presented a large heavily contaminated area across the test site, across the approach routes of recovery personnel, and heavy off-site contamination, but it also presented an unusual dosage ratio when the pocket dosimeter and film badges readings were compared. Film badge readings were approximately twice as high as dosimeter readings and dosages computed by survey meters. Since test personnel and monitors relied on the dosage indicated by their pocket dosimeter and survey meters, 39 personnel received an exposure in excess of the 3.9 r limit established by the Test Manager.

Shot 8 presented a considerable off-site problem. Fall-out occurred over a wide section with the highest levels being recorded on U.S. Highway 93, between Alamo, Nevada, Glendale Junction, Nevada, and St. George, Hurricane, and Kanab, Utah. For this shot the 1 r infinity isodose line extended as far as 250 miles from ground zero and was more than 50 miles wide. Personnel in St. George were requested to take cover at 0925, four hours and 20 minutes after shot time. Many complaints were received from people in the fall-out area. Complaints ranged from goats turning blue to miners suffering radiation sickness.

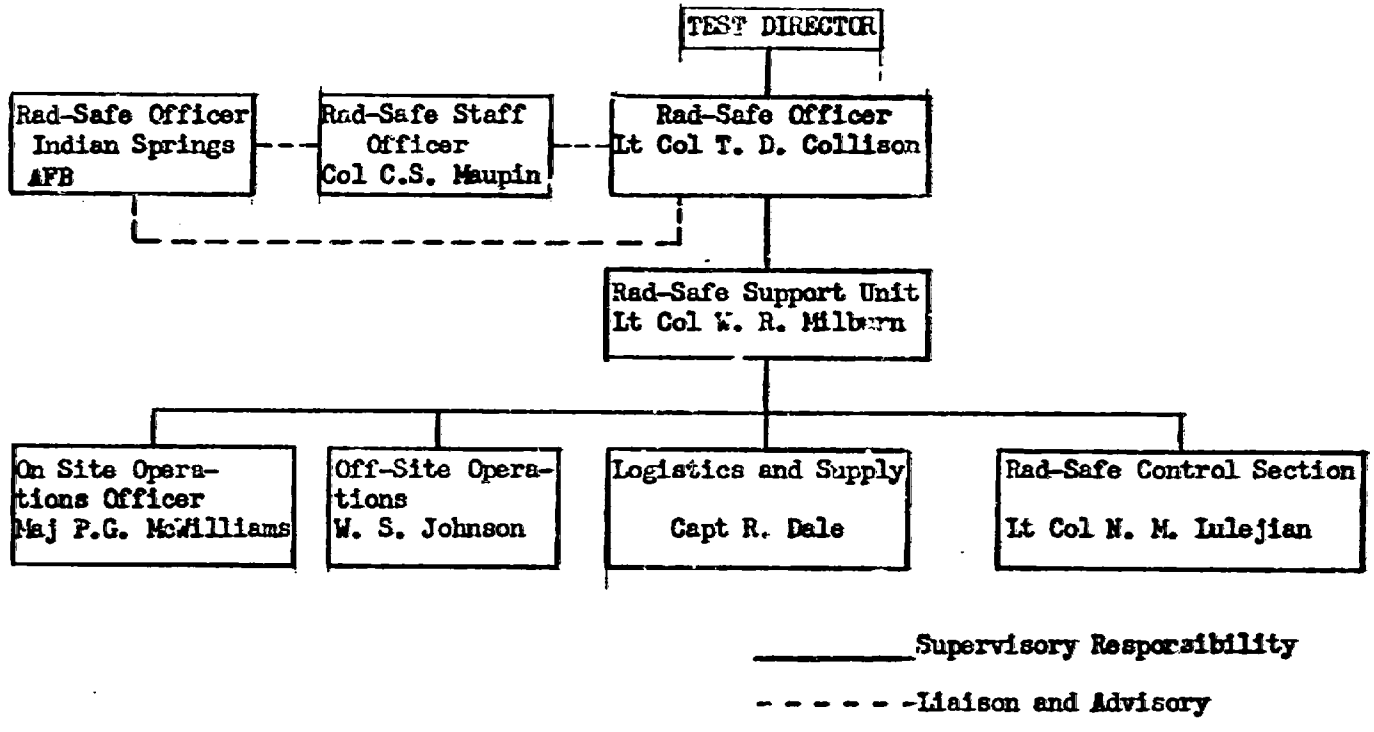


Fig. 5.1 Initial Organization of the Rad-Safe Unit

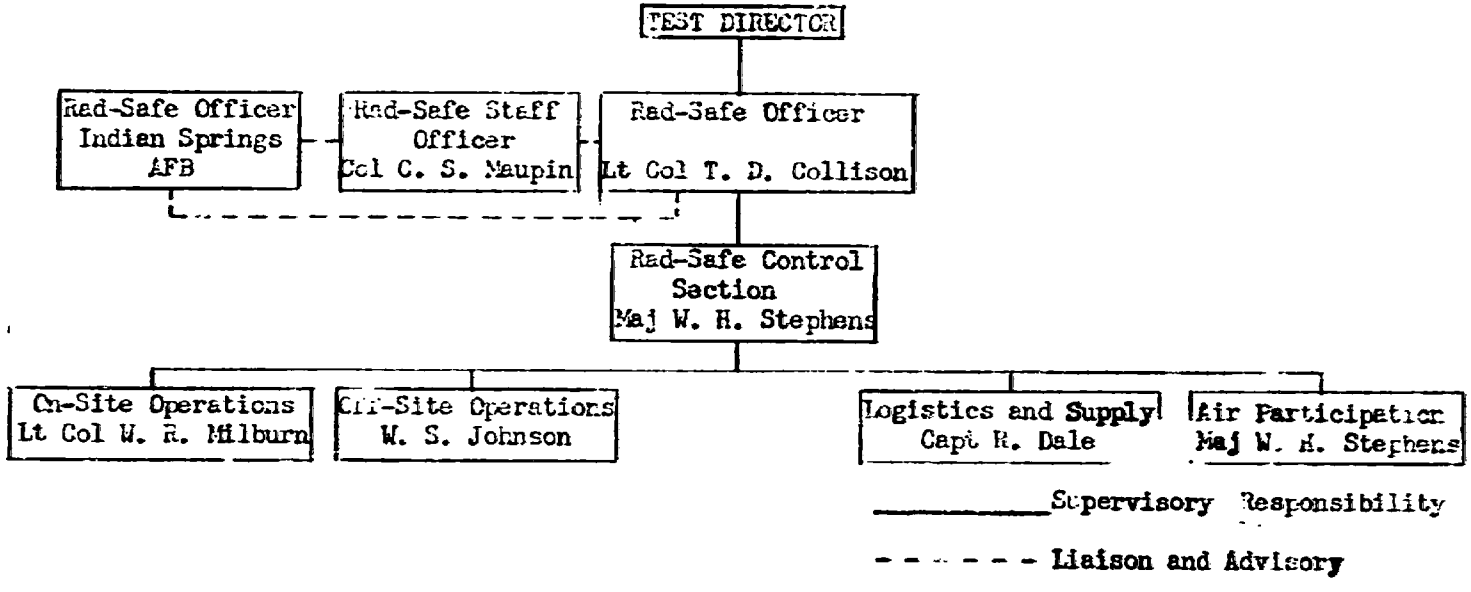


Fig. 5.2 Organization of Rad-Safe Unit After Shot 2

Table 5.1

Total Dosage Received by Communities in the Fall-out Area During the Test Series

Population Center	Approximate Population	Infinite Dose (r)
Alamo, Nev.	-	0
Bunkerville, Nev.	202	5 to 8
Caliente, Nev.	1000	0.15
Cedar City, Utah	-	0.5
Crystal, Nev.	7	7.0
Crystal Spring, Nev.	1200 in valley	0
Dry Lake, Nev.	35 plus	0.6
Glendale, Nev.	15	0
Groom Mine, Nev.	3	0.6
Hiko, Nev.	6	0
Hurricane Utah	1500	7.7
Lincoln Mine, Nev.	270	3.5
Littlefield, Arizona	50	1.8
Logandale, Nev.	350	0
Mesquite, Nev.	600	1.9
Moapa Reservation, Nev.	250	0
Overton, Nev.	600	0
Overton Landing, Nev.	150	0.01
Panaca, Nev.	300 plus schools	0.25
Pioche, Nev.	2000	0
Riverside Cabins, Nev.	14	12-15
Rockville, Utah	300	6.0
St. George, Utah	5000	4.75

Table 5.2

On-Site Operations Statistics

Period	Shot	Shot Time	Recovery Hour	No. Parties Cleared for Entry	No. Film Badges Processed	No. Vehicles Decontaminated
16-22 March	1	0520 17 Mar	Limited 0640 General 0715	113	1500	50
23-29 March	2	0510 24 Mar	General 0710	93	1880	52
30 March 4 April	3	0500 31 Mar	General 0615	73	1200	152
5-9 April	4	0730 6 April	General 0812	60	1100	6
17-23 April	5	0435 18 April	Limited 0630 General 0710	133	1600	92
10-16 April	6	0445 11 April	General 0624	118	1100	66
24 April 2 May	7	0430 25 April	Limited 0700 General 1230	262	1800	102
16-24 May	8	0505 19 May	General 0631	350	1400	85
3-15 May	9	0830 8 May	General 0919	890	4500	104
25-30 May	10	0830 25 May	Limited 0900 General 0952	497	3000	51
31 May 6 June	11	0415 4 June	General 0532	136	1230	14

Investigations were made of all these claims by members of the Off-Site Rad-Safe Section and by members of the Test Manager's staff. However, none were of a nature to indicate that they were caused directly by radiation from fall-out.

Lincoln Mine was in the area of heavy fall-out on Shot 2. Off-site monitors requested the inhabitants there to remain inside during the morning of the shot. Fall-out was first detected at Lincoln Mine at 0650 with a reading of 3mr/hr. At 0707 a peak reading of 580mr/hr was recorded. The total outside infinite dose was 3.4 r.

As a point of interest the total infinite dose received by the inhabited areas is shown in Table 5.1, and Table 5.2 indicates the work load of on-site operations and the logistics section.

5.7 NEW YORK OPERATIONS OFFICE

The New York Operations Office of the AEC was responsible for monitoring fall-out within the area from 200 to 500 miles radius of the test site. A military liaison officer and a detachment of 16 airmen from Lowry AFB were arranged for by DWET to assist the AEC in this mission. This unit was stationed at Hill AFB.

CHAPTER 6

WEATHER

The Mercury Weather Station, manned on a mission basis by the 4th Weather Group, began full-scale operations on 2 March 1953. The Weather Detachment was headed by Lt Col D. N. Morgan who also had primary responsibility for the forecasts and briefings. He was assisted by Lt Col W. H. Wyatt, the 4th Weather Group's Western Coordinator, who handled many of the Detachment's routine problems and also assisted in the analysis, forecasting and briefing activities.

By 10 March all the off-site observation stations for weather measurements were in operation. These were located at the following places and were of the type stations indicated:

LOCATION	TYPE
Beatty, Nev.	Pibal
Caliente, Nev.	Pibal
Currant, Nev.	Pibal
St. George, Utah	Pibal
Tonopah, Nev.	Rawinsonde
Warm Springs, Nev.	Pibal
Yucca Lake (NPG)	Rawinsonde

The principal function of the Weather Detachment was to furnish the Test Director and the Test Manager weather forecasts for the Nevada Proving Grounds and surrounding areas. Detailed forecasts with primary emphasis on winds aloft and cloud cover were required. The decisions to proceed with the shots were largely based on the forecast fall-out path of radioactive particles. As the atomic cloud from most of the detonations rose to the tropopause and above, winds aloft forecasts were made from the surface to around 40,000 ft MSL.

Cloud cover at altitudes up to 35,000 and 40,000 ft MSL was of critical importance. Such cloud conditions affected visual air drops, aircraft cloud sampling and tracking, and the activities of many other participating program aircraft. Probable downstream precipitation was another element of weather necessary to consider in relation to the Test Manager's decision.

Twenty-four hour trajectories at 10,000, 20,000, 30,000 and 40,000 ft MSL were prepared. Based on the latter information, CAA closed certain air lanes and areas to all air traffic for specified periods of time or until it had been determined that danger of aircraft contamination had passed.

Due to the length of time required for consultation and preparation of the forecasts, the 48-hour forecast was not available until approximately minus 36 hours and the 24-hour forecast not until some 10 hours before shot time. The 48-hour forecast was given informally to the Test Director on the day it was prepared. This forecast, with indicated modifications, was given to the Test Director and key operating personnel in a formal briefing at approximately 0800 hours on D-1 day, at which time a decision was made on the

advisability of proceeding with test preparations. The 24-hour forecast was presented at the evening briefing (usually at 2100) to the Test Manager and his staff. For planning purposes, particularly if any elements of the 24-hour forecast were unfavorable, a 48-hour outlook was also given at that time.

Briefing aids in the form of basic meteorological charts were held to a minimum. Generally the map discussion was restricted to significant features and expected developments on the 500 millibar chart which was presented as a streamline analysis.

The following tabulation of on-site observation facilities indicates the location, type of data, and observing schedules.

TYPE OF DATA	LOCATION	SCHEDULE
Standard surface observations	Control Point	Hourly (24 per day plus specials at H Hour).
Rawinsonde observations	Yucca Lake	4 per day plus 3-hourly specials from H-6 to H+24 including one at H Hour.
Surface winds, temperatures and relative humidity	Yucca Flat (EG&G Shelter) (#351)	Continuous, automatic recording.
Surface winds, temperatures and relative humidity	Frenchman Flat (EG&G Shelter) (#370)	Continuous, automatic recording.

The instrumentation for obtaining surface data in the Yucca and Frenchman shot areas consisted of Friez Aerovane wind equipment remoted to the Control Point and Friez hygrothermographs installed in standard Air Force instrument shelters.

The fixed observations were supplemented in several ways. On Shots 9 and 10 in Frenchman Flat a set of Beckman-Whitley surface wind equipment was installed at approximately 1500 ft from ground zero and remoted to the Control Point. This was for smoke experiment (Project 8.4) control purposes rather than for meteorological effects on experiments.

For each of the tower shots in Yucca Flat, EG&G supplied and installed in the tower cab remote indicating temperature (wet and dry bulb) and pressure equipment which was calibrated by weather station personnel on D-2 day using a standard aneroid barometer and a sling psychrometer. These instruments were remoted to the control room in the Control Point.

Plans were made to take wiresonde data in Frenchman Flat for the two shots scheduled in that area. Because of strong surface winds on shot days it was impossible to operate this equipment. The desirability of having these

data from the surface to at least 1000 ft is obvious since the Rawinsonde Section was located north on Yucca Lake at an elevation of approximately 850 ft above that of Frenchman Flat ground zero.

As on previous tests the network of six upper air observing stations established at the selected points surrounding the Proving Grounds furnished supplementary data over those normally available from Air Force and Weather Bureau stations.

The data from these stations served a two-fold purpose. They were used primarily by Rad-Safe personnel to compute accurate post-shot trajectories by streamline methods. Data were also valuable for monitoring the winds aloft forecast during the few hours preceding shot time. The Rawinsonde data proved very useful in weather analysis and forecasting.

Figure 6.1 is the organizational chart of the weather detachment. In all there were approximately 70 officers and airmen involved in the operation. The Forecast Section consisted of 10 officers, the Observation Section of two officers (CWO's) and 14 airmen, the two Rawinsonde Sections, one at Yucca Flat and one at Tonopah, of 15 and 11 airmen respectively. There was one OIC over these sections plus the five Pibal Sections (stations) which had 3 airmen each.

Weather forecasts for Shots 1 through 7 and for Shot 10 were favorable and accurate within acceptable limits.

On Shot 9 a 24 hour delay due to weather was experienced. This particular weather situation was a difficult one and the forecasts were made with less confidence than normal. A complex situation existed which generally lacked precedent and that, combined with quite rapid and extensive changes, created many potentials. As it turned out, however, even though there were some heavy fall-outs, due to counter clockwise upper wind shifts, on St. George, Hurricane and Kanab, the decision to shoot was based on a calculated risk considering the relatively unstable conditions.

Shot 8 had three days of postponements and was finally detonated under weather conditions below ideal. The weather forecast itself was average or better as to the predicted conditions, being within about 10 degrees on winds at 15,000 ft and above. The cloud cover before shot time was better than anticipated but did not hold for long and some difficulty was experienced in cloud sampling. The winds apparently shifted because the main fall-out moved some 10 degrees to the north from that given by the fall-out plotting technique. It is believed this shift was attributed to increased wind speeds in the low levels (SW) and the passage of a ridge below 15,000 ft at shot time.

Shot 11 was first delayed 24 hours because of forecast cloud cover. The forecast for 2 June indicated remote possibilities of rain-out on Salt Lake City but the decision was made to go ahead. At 0245, with the bombing aircraft airborne, the shot was postponed because of the probability of rain over Salt Lake City coupled with a shift of wind trajectory toward Salt Lake. Since the aircraft were airborne a 48 hour postponement was required. The weather for shot day turned out almost ideal with clear skies and light winds fairly close to forecast conditions. Fortunately a shear in winds scattered the radioactive cloud quite thin.

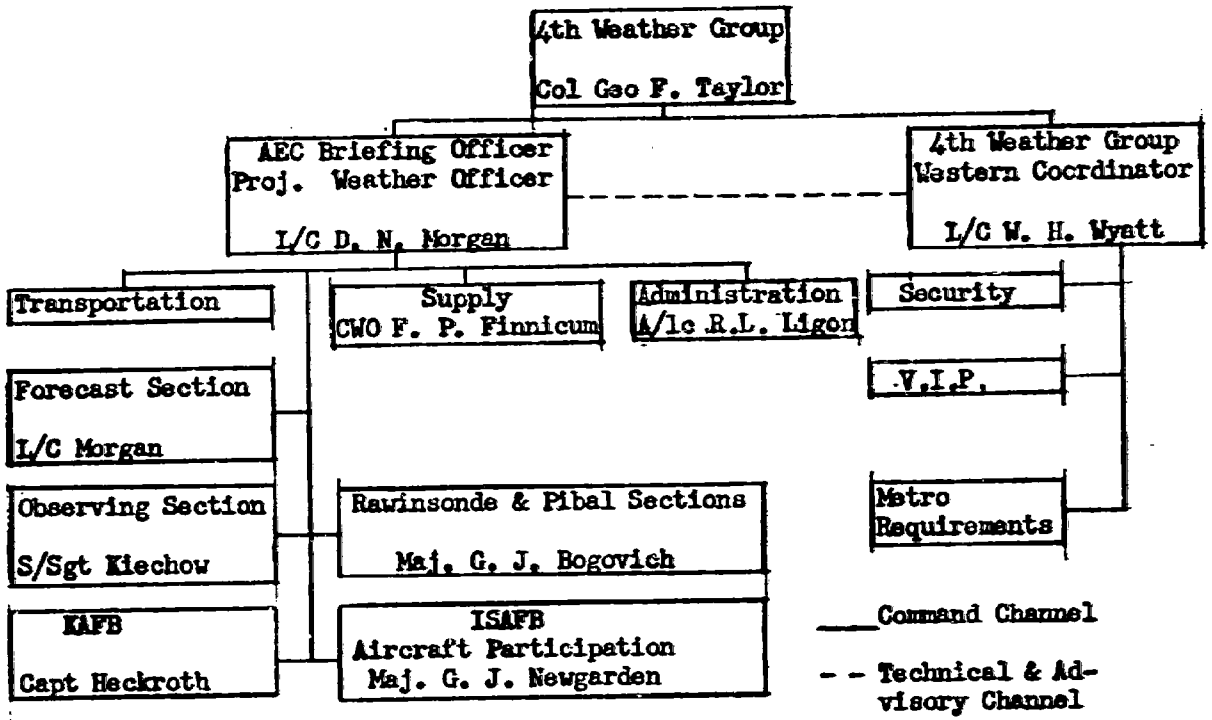


Fig. 6.1 Organization of The Weather Detachment

CHAPTER 7

LOOKOUT MOUNTAIN PHOTOGRAPHIC UNIT

The Air Force Lookout Mountain Laboratory (LML) began its operational phase activity on 5 March with the arrival at Nevada Proving Grounds of Mr. Doug Wood who made final arrangements for the facilities LML used during the operation.

On 8 March the LML Photo Unit, consisting of 11 people, arrived and established their operation in Quonset 21. Mr. Hal Albert was in charge of this unit.

The shooting script was delivered to the Deputy for Military Operations on the following day and approved as a guide for field operations.

The Lookout Mountain Laboratory Photo Unit's primary mission was to accomplish the photography necessary to produce the UPSHOT-KNOTHOLE documentary motion picture scheduled for release in late summer-early fall 1953. On 10 March the first footage was taken in accomplishment of this mission. However, other requirements were previously agreed on and new missions were requested at the Proving Grounds.

Prior to the operational period arrangements were made to accomplish certain photography for The Artillery Center which was to be incorporated into the film, Weapons of the Artillery. This requirement was superseded by and included in the Army requirement discussed below.

Early in April it became apparent to the Deputy for Military Operations that the Chief Signal Officer had referred to Desert Rock, both formally and informally, certain requirements for various motion picture coverage to service the needs of several agencies of the Army. In view of the tightening of security, by which it had been agreed that all DOD requirements for photography would be met by one of the photographic units of the Test Organization, the Deputy for Military Operations reported these facts to the Chief, AFSWP.

After several conferences between Chief, AFSWP, and G-3 Army a directive was issued by G-3 to interested Army agencies directing the Chief Signal Officer to consolidate requirements to be placed on the Chief, AFSWP, who, in turn, would direct their accomplishment in the field. Army requirements were set forth in a letter 17 April from the Chief Signal Officer. These included coverage required to complete a film, Fundamentals of Atomic Warfare, additional footage to be incorporated in the Public Information-sponsored Report to the Army and coverage of the 280-mm gun to be incorporated in the previously mentioned film, Weapons of the Artillery.

This consolidated list of requirements was assigned as an added mission to the LML unit and the unit augmented by three Signal Corps photographers from Desert Rock. Arrangements were also made that LML be furnished the necessary film for the mission and that the exposed film be couried to and processed by the Signal Corps Photo Center. In the accomplishment of this mission approximately 20,000 ft of 35-mm film were utilized. This included 4150 ft of

Ansco color which was to be used jointly in the films, Fundamentals of Atomic Warfare, and Report to the Army. For the film, Weapons of the Artillery, 8000 ft of Ansco and about 7500 ft of black and white were exposed.

On Shot 10 LML took public releasable stills from the ATU's gun position since LML personnel were in position for official motion picture documentation. These were printed by LML and released, after classification, to the news media at the request of Mr. Lee Hargus, PIO, Office Secretary of Defense. These prints were given nationwide circulation by the news media.

In addition to the above, LML accomplished a considerable amount of other photography. Requests from the FCDA resulted in broad coverage of FCDA houses and automobiles in stills, 35-mm black and white, and 16-mm color.

Photography was also accomplished for ultimate use in projected AEC film, Why Nevada, which LML has under contract with the AEC for production.

Lookout Mountain Laboratory arrived at the Nevada Proving Grounds with their own vehicles and radio equipment. Utilizing this equipment, manned camera stations were set up on all shots except No. 1. Usually there were five positions selected on the approved manned station list. These were controlled from the LML command vehicle via the LML radio net from the CP area.

Lookout Mountain Laboratory personnel on hand at the Nevada Proving Grounds varied from 10 to 18, depending on the workload and the particular coverage called for by the shooting script at a particular time.

Aerial photography for all detonations except Shot 6 was taken from a C-47 airplane especially modified for cameras and allied equipment. The position of the aircraft was the same on all shots—10,000 ft MSL, 10 miles south of the detonation point.

CHAPTER 8

ARTILLERY TEST UNIT

8.1 INTRODUCTION

The Artillery Test Unit (ATU) under the command of Col Devere P. Armstrong, USA, was formed and trained at The Artillery Center, Fort Sill, Oklahoma. The Artillery Test Unit (265 officers, enlisted men, and civilians) arrived at Camp Desert Rock on 7 May 1953. Although stationed at Camp Desert Rock for administrative and logistical support, the Artillery Test Unit operated as a unit within the organization of the Test Director and was charged with the firing of the atomic shell in conjunction with Shot 10.

The two 280-mm guns arrived at Nellis AFB by rail on 3 May 1953 where they were assembled. The guns arrived in convoy at the Nevada Proving Grounds on 9 May 1953. Prior to the arrival of the main body of the ATU, advance groups ran surveys in the forward area for the firing battery and completed the detailed planning and coordination for the selection of battery positions, security, communications including timing signals, troop labor, stabilization of the gun area, and photographic matters.

8.2 OPERATION

The following firing was conducted at the Nevada Proving Grounds during the period 15-25 May in preparation for the test of the projectile:

	GUN #1		GUN #2	
DATE	Rounds	Type	Rounds	Type
15 May	5	T-122	4	T-123
	6	T-123		
	1			
22 May	7	T-123		
	1			
23 May			15	T-123 E1
			7	T-123
25 May	7	T-123		
	1			

The T-122 rounds were initially used as warm-up rounds but were discontinued after 15 May on the advice of Aberdeen Proving Ground technicians. These rounds were high explosive shells using a charge 3. The T-123 type shell, on the other hand, was a spotting round and a normal charge was used for the Nevada Proving Grounds firing.

The Artillery Test Unit conducted a series of briefings on the 280-mm gun for various groups of the Test Organization, troops and troop observers of Camp Desert Rock including the Chief of Staff of the Army, Congressional, Official, and Technical Observer Groups.

At the request of Sandia Corporation, approved by the Manager, SFO, and the Commanding General, The Artillery Center, the ATU was retained after Shot 10 to fire additional rounds modified with telemetering devices to record inner functionings of the shell. Two T-122 and one T-124 type projectiles on 28 May; and four T-122 and three T-124 type projectiles were fired on 27 May; two T-122 and five T-124 type projectiles on 28 May; and four T-122 and three T-124 type projectiles on 29 May for a total of 17 rounds. The range was 18,300 yds.

8.3 OPERATION DUMBFOUND

Associated with the full-scale test of the atomic shell the Army conducted tests of transportation procedures. Camp Desert Rock was charged with receiving at Nellis AFB, from the Commanding General, Fourth Army, two maneuver and five OST rounds and two sets of dummy nuclear components; transferring the above to the Nevada Proving Grounds via military helicopter; transporting the seven shells over 50 miles of secondary roads within the Nevada Proving Grounds; and subsequently transferring custody of the seven shells to the 136th Ordnance Special Weapons Direct Support Company (OSWDS Co.). This entire operation was given the unclassified title Operation Dumbfound.

For assistance in the accomplishment of the above mission the 506th Transport Helicopter Company and the 152nd Transport Helicopter Field Maintenance Detachment were attached to Camp Desert Rock for the operation. The seven shells and the two sets of dummy nuclear components arrived at Nellis AFB in a sealed refrigerator car from Sandia Base on 2 May. On the morning of 4 May the components were loaded in helicopters (13 H-19 type) and flown to the airstrip in Yucca Flat within the Nevada Proving Grounds and thence moved by truck to the storage building northwest of the Control

Point. After an inspection by the 135th OSWDS Company on 5 May the seven shells were loaded and braced on 2½ ton 6x6 trucks preparatory to the 50 mile trip within the Nevada Proving Grounds which was accomplished on 6 May. Following the 50 mile road trip the shells were again inspected and officially turned over to the 136th OSWDS Company.

The test was successful and indicated that the components could be moved by helicopter (H-19 type) and by 2½ ton 6x6 trucks over secondary roads when properly blocked.

CHAPTER 9

FIELD COMMAND SUPPORT UNIT (FCSU)

9.1 GENERAL

The Director, Weapons Effects Tests, Headquarters Field Command, AFSWP, Col P. T. Preuss, USAF, served in two capacities at the Nevada Proving Grounds: (1) Deputy Test Manager (for Military Operations), Joint AEC-DOD Organization, (2) Senior representative of the Commanding General, Field Command. In this latter capacity Col Preuss acted as a military commander of all DOD units and personnel on duty within the Nevada Proving Grounds.

The Field Command Support Unit (Fig. 9.1), headed by Lt Col E. M. Tolliver, USA, operated under Col Preuss in the implementation of the command, logistical, and administrative functions for which Col Preuss was responsible in his various capacities.

As an intregal part of the Joint AEC-DOD Test Organization the Field Command Support Unit (FCSU) operated as an agency of the Support Director, Joint AEC-DOD Test Organization, (Mr. Woodruff-AEC) in over-all support of the joint undertaking.

As an agent of the CG, Field Command, under the direction of Col Preuss, the FCSU cited Field Command funds, implemented Field Command disciplinary and court-martial jurisdiction, and accomplished supply and procurement action. The FCSU also authenticated communications and orders by authority of the CG Field Command through Assistant Adjutant Generals. The letterhead "Headquarters, Field Command, AFSWP, Directorate of Weapons Effects Tests, Mercury, Nevada" was authorized for use during the operational period.

As a "Base Command", under authority delegated by Col Preuss, the FCSU exercised command and police jurisdiction over all military personnel within the Nevada Proving Grounds to the extent such command and jurisdiction could not appropriately be handled by AEC agencies. This included matters such as accidents involving military property and alleged misconduct of military personnel.

Most regulations and procedures governing operations and personnel within the Nevada Proving Grounds were published by the AEC, with DOD concurrence when appropriate. Directives applicable exclusively to DOD personnel and activities were published by authority of the Deputy Test Manager for Military Operations, Col Preuss, or the CG, Field Command, as applicable.

9.2 PARTICIPATING DOD PERSONNEL

9.2.1 Strength - AFSWP Sponsored

The maximum number of AFSWP sponsored personnel stationed at the Nevada Proving Grounds at any one time was 1334 accounted for as follows:

	Officers	EM	Civilians	Total
Military Effects Group	179	265	343	787
Field Command Support Unit	24	93	1	118
Units on Mission Basis:				
Rad Safety	31	161	17	209
Air Weather	19	51		70
Motor Maint	1	29		30
Others Integrated in Joint AEC-DOD Staff	22	21	2	45
Total Operational	276	620	363	1259
Technical Observers	75			75
TOTAL	351	620	363	1334

9.2.2 Strength - Non-AFSWP Sponsored

The following military personnel assisted non-DOD agencies within the Nevada Proving Grounds under arrangements made other than through AFSWP:

	Officers	EM	Total
Weapons Development Group (AEC)	22	16	38
Civil Effects Group	3	31	34
TOTAL	25	47	72

9.2.3 Strength - Associated Installations

The strength of associated installations during the test period, exclusive of observers and trainees, was approximately:

	Officers	EM	Civilians	Total
Artillery Test Unit	46	210	9	265
Camp Desert Rock (Army)	145	1980		2125
Indian Springs AFB	30	410	10	450
TOTAL	221	2600	19	2840

9.2.4 Billeting

Billeting of AFSWP sponsored DOD personnel (see 9.2.1) at the Nevada Proving Grounds during the period of 1 March to 15 June was handled by the Administrative Services Branch of the FCSU. In general, the objectives of the billeting policy were to house DOD personnel in compatible groups, maintain units in compact areas, and to minimize movement of personnel. The following space was allocated by the AEC for AFSWP sponsored DOD personnel:

5 barracks, capacity 55 each
95 hutments, capacity 4 each
77 hutments, capacity 8 each
Total Space - 1277 Beds

The Military Effects Group was allocated four barracks of this space for assignment of program and project personnel. Officers and civilians were assigned barracks space insofar as possible. The Hutment Area was divided into two major areas: Officer-Civilian and Enlisted. Space within the two major areas was subdivided into smaller areas so that individual units and projects could be grouped together. The barracks rooms were increased from six beds to eight beds to allow space for technical observers.

The above procedure worked to the general satisfaction of all concerned, considering the over-all crowded conditions.

9.2.5 Pay of Personnel

Arrangements were made with Nellis AFB for payment by check of per diem vouchers prepared by the FCSU. Field Command furnished an average of two augmentation fiscal clerks to assist Nellis AFB. Payment was generally accomplished within one week, except during civilian pay periods, when the work load generated within Nellis AFB was so great that the payment of Mercury per diem vouchers took two weeks or more. All personnel obtained their regular pay from their home stations. The above arrangements were satisfactory due largely to the cooperation of specific individuals at Nellis AFB. A total of 970 per diem vouchers were prepared and processed.

9.3 DISCIPLINE, LEGAL AND PROVOST MATTERS

These matters were handled by the assignment of additional duty to one officer as Legal and Provost Officer, the assignment of one NCO as a Military Policeman, the appointment of two Summary Court Officers from each service and the operation of a Field Command OD and CQ system during off-duty hours.

Throughout the operation morale remained exceptionally good considering the circumstances, and disciplinary cases requiring formal legal action were at a minimum as indicated below.

The following legal and disciplinary cases were handled:

2 Claims arising from vehicle accidents.
1 AF Summary Courts.
2 AW 15 cases.
4 Incident investigations.
6 Formal investigations such as those involving alleged theft.
2 Formal investigations for Courts-Martial.

In addition, approximately 10 individual legal assistance problems were handled.

9.4 MORALE

9.4.1 Religious Activities

An active religious program for all personnel, both AEC and DOD, was conducted by two military chaplains. The Protestant Chaplain, Maj Raymond T. Mattheson, USAF, conducted two Sunday Services with an average attendance during the peak period of 75 persons. Daily Morning Devotions were also held. The Catholic Chaplain, Lt Patrick A. Killeen, USN, said Mass twice each Sunday with an average attendance of 130 and also said daily Mass and conducted evening devotions three times a week.

The chaplains arranged for the conversion of a temporary hut into an appropriate small chapel for private devotions. This conversion supplemented the theater space used for major services and thereby permitted the holding of two religious services concurrently. Private contributions augmenting $300 of AEC funds made possible the acquisition of an electric organ.

Chaplains at Mercury also conducted numerous services at Camp Desert Rock and Indian Springs AFB, insofar as those installations lacked adequate religious coverage during most of the operational period.

9.4.2 Special Services

An adequate Special Services Program was operated by the part time assignment of one officer (additional duty as Safety Officer) and one full-time enlisted man. Special Services equipment was obtained basically through an allocation of Sandia Base equipment supplemented to the extent of approximately $100 by contributions made at the Nevada Proving Grounds. Bus recreational trips to Las Vegas were scheduled two to seven nights per week, depending on the test operational schedule,

and on Sundays to points of interest including Hoover Dam and Death Valley. In addition, a bus was dispatched to any point within 100 miles at any time for recreational purposes when approximately 20 or more people were interested. Moving pictures were shown each evening with approximately 50 per cent of the films (maximum obtainable) being furnished by the Armed Forces Motion Picture Service and the remainder being rented on a profit/risk basis by a group of officers and enlisted men. It is apparent, from experience during the operation, that additional Special Services athletic equipment could have been utilized and that a more comfortable and efficient structure is required for motion pictures.

9.5 ADJUTANT GENERAL FUNCTIONS

Full Field Command AG authority, with the exception of authority to issue regular leave orders, was delegated to the FCSU. This authority permitted the prompt dispatch of official communications and the prompt issuance of travel orders. Both classified and unclassified wire messages were dispatched through AEC facilities which were supplemented by the assignment of one military Cryptographic Operator.

The following statistics indicate the scope of Field Command AG operations at Mercury:

Wire Messages received	2000
Wire Messages dispatched	600
Incoming Letters and Documents	950
Outgoing F.C. Letters and Documents	145
Document Control Numbers assigned (Secret and higher)	211
Letter Orders Written	165

9.6 COMPTROLLER ACTIVITIES

The purpose and scope of Comptroller activities at the Nevada Proving Grounds under Lt W. S. Berkshire, USN, was to perform thereat the functions necessary to expedite transactions requiring the citation of funds; to keep the Director, MEG, fully informed at all times as to the status of fund commitments; and to coordinate all cost accounting and fiscal matters with local AEC authorities.

Through the use of Obligation Authority the Comptroller, Field Command delegated to the FCSU authority to cite test funds on letter orders, reimbursable requisitions, bills of lading, and local procurement actions. A cost accounting system was maintained showing fund and programming status by Project and Program. The Field Command echelon at Mercury dealt directly with Headquarters, AFSWP, relative to fund programing matters and through Comptroller, Field Command, with regard to all fiscal matters.

The joint AEC-DOD Cost Agreement for UPSHOT-KNOTHOLE, negotiated prior to the beginning of the operation, proved to be of considerable value. However, this Cost Agreement could have been more useful if provision had been made for the submission by AEC of fiscal costs of cost-plus-fixed-fee (CPFF) contractor work within a specified time after completion of work.

The reliability of commitment figures during the early part of the operation remained uncertain due to lack of final cost reports. As of 15 April, for example, Field Command had issued work orders for CPFF assistance with an estimated cost of approximately $2,000,000. Since no final cost figures had at that time been received even for work completed several months previously, it was deemed necessary to maintain a 20 per cent reserve, $400,000, against the possibility that CPFF estimates would prove to be substantially inaccurate. By the early part of May, AEC had given assurance that CPFF estimates were relatively firm. Re-estimates aimed toward return of funds were commenced, and by 19 May, two such returns to Headquarters, AFSWP were made: $500,000 of R & D Funds and $880,000 of Extra Military Funds. A total of $700,000 R & D and $1,280,000 Extra Military funds were returned to Hq AFSWP prior to the end of FY 53.

An item which proved troublesome was the absence of a fixed DOD test and test support budget structure at the time negotiations with the AEC were being made as to the format of cost reporting. For example, the AEC was requested to report costs of cabling and trenching under cost code 32.13. It turned out, however, that the Director, MEG, required costs by projects and the 32.13 code had to be distributed among projects on the basis of the best estimate. Such items as trenching and shelter construction, shared by several projects, would be budgeted more simply if they were included in the Engineering and Construction portion of the general support budget as separate items.

9.7 SUPPLY

9.7.1 Procurement

Procurement was accomplished by the Accountable Officer, Army (AFSWP) Account 6-2697, mainly through requisitions on Army Depots and Purchase Requests to the Indian Springs AFB P&C office located in Las Vegas, Nevada. A few specialized items were procured from Air Force and Navy supply activities. Additional minor items were obtained from AEC stocks at Mercury on a reimbursable basis.

9.7.2 Distribution

Distribution was accomplished principally through the FCSU Supply Section which obtained items from the Accountable Officer and issued to individuals and agencies on hand receipt. In addition to the normal classes of supply, field jackets and caps were distributed to DOD personnel as needed.

9.7.3 Statistics

The following statistics indicate the nature and scope of the Supply Operation:

Number of Requisitions on Depots by Accountable Officer	150
Total Line items on Requisitions	6000
Dollar Value of Requisitioned items	$150,000
Number of Local Purchases	550
Total Line items on Local Purchases	1582
Dollar Value of Local Purchases	$95,000

9.7.4 Personnel

FCSU Supply activities, under Maj C. T. Burns, were staffed as follows:

Activity	Officers	EM
Staff Supply	2	
Supply Office	2	4
Accountable Officer	1	14

9.8 TRANSPORTATION

9.8.1 Vehicular

Field Command DNET vehicular resources at the Nevada Proving Grounds consisted of 206 vehicles of all types, plus eight jeeps on loan from other Field Command agencies. Of these, 105 were permanently assigned to the MEG, 11 were assigned to other DOD agencies, 24 (military multi-wheel drive) to AEC, and 3 to Rad Safe Operations. Of the remaining vehicles, a majority were of special types not suitable for use by individuals, e.g., busses, truck tractors, and ambulances. In addition to the above, 135 vehicles of all types were brought to the Nevada Proving Grounds by DOD projects. The policy of permanently assigning to technical projects a substantial number of all common type vehicles proved to be an efficient solution to the vehicle utilization problem. The AFSWP vehicles traveled approximately 900,000 miles, with only one accident exceeding 25 dollars.

9.8.2 Maintenance

The AFSWP Mercury Maintenance Shop was operated by one officer and three enlisted men as permanent party, augmented by a motor maintenance detachment of one officer and 30 enlisted men from Sixth Army on a mission basis. The average deadline was less than 1 per cent, partially because of the accumulation of spare parts prior to the operation.

9.8.3 Motor Pool Operations

By utilization of maintenance and clerical personnel as drivers during peak periods, the Motor Pool was operated satisfactorily with 16 drivers, 3 dispatchers, 4 gasoline-station attendants (24 hour service), and one Motor Transportation Officer. Project and other personnel were encouraged to drive vehicles utilized by them. In addition, the Motor Pool serviced and performed first and second echelon maintenance on approximately 70 gasoline and diesel generators in various locations throughout the test area.

9.8.4 Commercial Transportation

The Commercial Transportation Office was operated by one officer and one enlisted man. Approximately 200 Government Bills of Lading and 450 Transportation Requests were issued. Seventeen hundred reservations on public carriers were made during the operational period.

9.9 MEDICAL CARE

Col Clinton S. Maupin, USA, Staff Surgeon, Field Command, performed the following functions:

(1) Supervised the medical service for military personnel and DOD civilians stationed at and visiting Camp Mercury.

(2) Acted as advisor to the Deputy for Military Operations on matters of health, sanitation, and radiological safety.

(3) As Radiological Safety Staff Officer on the staff of the Test Director, advised the Test Director and Test Manager on health and radiological safety. This included investigations of health and psychological implications of radioactive fall-out in off-site areas, briefing of Congressmen and Military Observers on management of the radiological safety program, and assistance in planning on these aspects for individual tests.

(4) Acted as advisor to the Radiological Safety Officer and assisted in maintaining continuity between that officer and the Test Director.

9.9.1 Objective

The medical objective was to provide medical treatment at the dispensary level of out-patient care for all DOD personnel at the Nevada Proving Grounds.

9.9.2 Hospitalization

No hospitalisation or treatment in quarters was attempted at the Nevada Proving Grounds. Hospitalization for DOD personnal was provided at Nellis AFB Hospital, the nearest Military Medical Installation.

9.9.3 Evacuation

Evacuation of DOD personnal was accomplished by Dispensary personnal using DOD and AEC ambulances.

9.9.4 Personnel

Medical command and supervisory control of the Dispensary was accomplished by Col Maupin and Maj W. M. Murray (MC) USA of Field Command, AFSWP. The officer complement rendering medical service was supplied through the cooperation of the Surgeons General of the three services who provided 13 officers, each serving approximately two weeks. Although these officers were basically assigned for the purpose of rendering medical service, they acquired substantial experience in an on-site atomic test program. The majority of these officers had had post-graduate training in radiological defense.

9.9.5 Medical Service Rendered

Dispensary and ambulance service was available 24 hours per day, 7 days a week. A total of 672 treatments were rendered from 26 February to 26 May of which 323 were Army, 168 were Air Force, 81 were Navy, and 100 were DOD civilians. A total of 28 personnal were hospitalized of which 17 were Army, 6 were Air Force, 3 were Navy, and 2 were civilian. Dental service was rendered by the Dental Clinic at Nellis AFB Hospital and Camp Desert Rock. There were a total of 29 dental treatments rendered of which Camp Desert Rock supplied 6 and Nellis AFB Hospital supplied 23.

9.9.6 Supply

The Dispensary building and permanent medical and office equipment were supplied by the AEC. A 90 day level of expendable medical supplies were obtained by the Field Command Property Account at Mercury on direct requisition from an Army Medical Depot. This 90 day level was maintained by periodic procurement of expendable supplies from Nellis AFB on the basis of weekly strength reports.

9.9.7 Records

The basic document used in the Dispensary was WDAGO Form 8-24 on which all record of treatment was made. For Air Force personnal, all data were transcribed from the 8-24 to the AF Form 277. In case of

hospitalization of Air Force personnel, all records required to be inserted in the Field Medical Record Group were sent direct by Nellis AFB to the facility holding the individual's personnel records. In case of Navy personnel, all pertinent data were transcribed to the Nav-Med Form H-10. At the conclusion of the operation all necessary records were forwarded to the appropriate facilities at Sandia Base to be incorporated in the personnel or Medical files as required by the Service concerned.

9.9.8 X-Ray and Laboratory

All X-Ray and laboratory work was accomplished by the Nellis AFB Hospital.

9.9.9 Sanitary Inspections

At the request of the AEC and the Deputy for Military Operations, a Medical Officer was assigned to accompany the inspection teams which weekly checked sanitation in the kitchens, cafeteria, recreation hall, and barracks. No outbreak of disease traceable to sanitary defects was observed.

9.9.10 First Aid

A first-aid room in the Rad-Safe building was equipped and staffed by the Dispensary. It was open at all shots and at other times when enough personnel were present to warrant medical support. Ambulances, medical officers, and corpsmen were present at all observer sites on all shots and at the gun site in the testing of the 280-mm gun.

9.10 COMMUNICATION DIVISION

The Communication Division of two officers and nine men was organized to effect coordination and liaison between the Test Director's office and the MEG, to provide for internal communication requirements of the FCSU, and to install and maintain field telephone facilities to augment the dial telephone system provided by the AEC.

9.10.1 Radio

The AEC provided and maintained the basic radio systems and equipment through contract with the Reynolds Electric Company. However, several of the programs and projects also provided their own equipment for communication nets as well as the equipment used in the experimental operations. Lookout Mountain Laboratory provided and maintained their own equipment consisting of five mobile and one fixed base station operating in the 6 meter band. This system was most satisfactory and gave complete coverage of the test area.

Desert Rock, the Artillery Test Unit, and Project 6.12 also established and maintained radio communication nets.

The VHF FM system provided by the AEC was unsatisfactory during the first two months of the operation due to technical difficulties. The repeater station had been moved from Mt. Charleston to the vicinity of the control point in the Proving Grounds and many technical problems resulting from the move had not been worked out. This system was established with five separate nets with 50 kilocycle separation between the net frequencies, and considerable cross modulation between nets was experienced. This difficulty was finally solved by utilizing 50 watt transmitters in place of the original 250 watt equipment.

The Military Effects Net on the VHF FM system consisted of 15 mobile and 9 base stations with 3 of the base stations being located at Indian Springs AFB.

The Communications Division, FCSU, was called on to provide crystals and technical assistance to Army aircraft stationed at Desert Rock so that they could be tuned to the proper frequency to operate within the Proving Grounds. This Division also provided and maintained the VHF AM equipment used by programs and projects for radio count down where wire service was not practical. During the peak operational period there were ten SCR 624 sets in operation for this purpose. These sets proved to be very satisfactory although the receiver section was all that was needed and a smaller and more compact unit would have been more practical.

It is estimated that a saving of approximately $20,000 was realized by using the radio count down for timing purposes rather than long runs of wire. The equipment for UHF air ground radio control was furnished by Kirtland AFB and installed by the Communications Division, FCSU.

9.10.2 Telephone

The basic telephone system was provided by the AEC through contract with the Pacific Telephone and Telegraph Company. Only minimum facilities were installed under this contract and it was necessary to maintain constant liaison with the using agencies to effect maximum utilization of the available facilities. A total of 75 lines were used. The Communications Division, FCSU, installed and maintained a field switchboard and field telephones in Frenchman Flat to supplement the commercial facility. However, this was not completely satisfactory because the mobile construction work in the area made it very difficult to provide and maintain telephone lines.

To insure communications between Lincoln Mine and the Test Site for Rad-Safe off-site monitoring, the telephone line between Lincoln Mine and Groom Mine was rehabilitated and kept in operation by the FCSU Communication Division. This line was originally installed by the AEC during the TUMBLER-SNAPPER operation and was approximately 48 miles in length. The line was rerouted during this operation and reduced in length to approximately 35 miles.

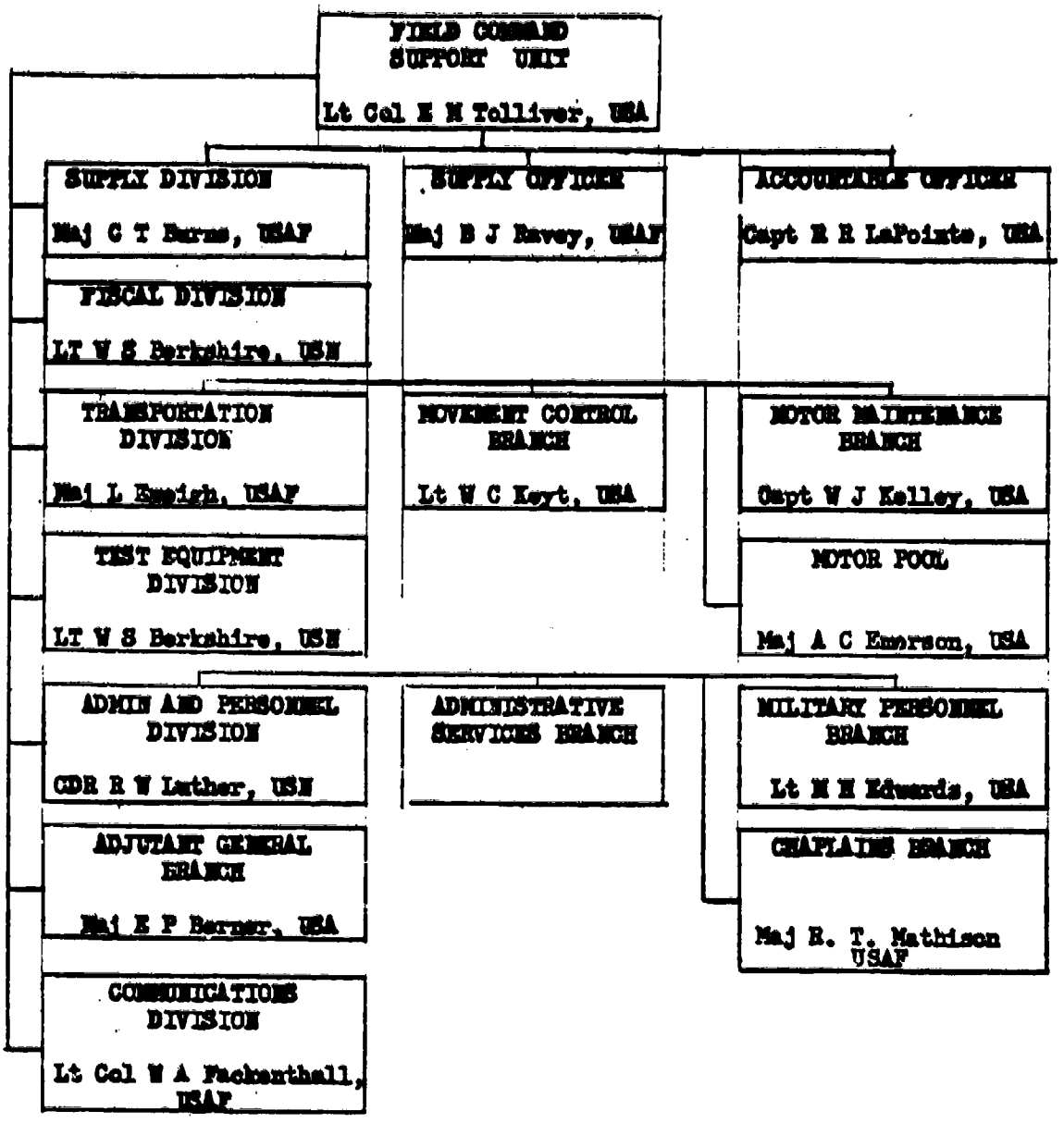


Fig. 9.1 Field Command Support Unit Organization

In all, this Division installed and maintained approximately 200 miles of field telephone lines.

9.10.3 Teletype

The AEC maintained and operated all on-line teletype facilities. A Model 19 machine was installed in the FCSU Message Center and operated off-line with the AEC Communications Center.

Two commercial TWX circuits and one ACAN circuit (UMLDS) were available for on-line operation of the AEC Communication Center.

9.10.4 Telenote

Arrangements were made with the AEC Communications Center to handle telenotes in accordance with AFSWP policy.

9.10.5 Crypto

The AEC provided crypto facilities for handling traffic up to and including Confidential during normal working hours (0800 to 1700). One crypto operator was provided by FCSU Communication Division to handle military traffic classified higher than Confidential.

9.11 GROUND SAFETY

The officer assigned, with additional duty as Special Services Officer, assisted the AEC Safety Engineer in safety matters. Close contact was also maintained with LASL safety engineers in order to have complete coverage of operations in which DOD personnal participated. An agreement was made with the AEC Safety Engineer for the Safety Officer to handle all safety matters involving DOD personnal, projects, and activities. This agreement proved most satisfactory, and cooperation between AEC and DOD safety sections was excellant.

In addition to usual ground safety problems, difficulties were experienced in keeping fire lanes within the Quonset Area clear of vehicles and debris.

A total of 13 accidents were reported to Safety Office through medical channels. Of these accidents, only three injuries were serious enough for injured to lose time from duty.

CHAPTER 10

ENGINEERING AND CONSTRUCTION

10.1 ORGANIZATION

Staff responsibilities for DOD engineering and administration were assigned to the Military Representative for Engineering and Construction, CDR Louis N. Saunders, Jr., CEC, USN. CDR Saunders was assisted by Lt Col John J. Haley, CE, USA. On 16 March 1953, CDR Walter E. Pantle, CEC, USNR, reported as CDR Saunders replacement. Lt Col Haley assumed responsibility for the office.

10.2 TEST STRUCTURES AND FACILITIES - CONTRACT

Requirements for construction received from the participating DOD agencies were consolidated, reviewed and forwarded to the AEC's architect and Engineer (Silas-Mason Company of Las Vegas, Nevada) who took the necessary action to place them under AEC contract.

Three major contractors carried out the DOD lump sum work. These contractors and their portion of the work were:

A. Lembke, Clough & King of Las Vegas, Nevada, under Contract No. AT(29-2)-164, carried out the following construction:

(1) Building and Equipment Shapes for Project 3.1.
(2) Horizontal Cylinders for Project 3.3.
(3) Underground Structures for Projects 3.7 and 3.8.
(4) Erection of the modified Butler Buildings for Project 3.11.
(5) Masonry Structure and Protective Precast Panels for Project 3.12.
(6) Precast Concrete Gable Bent Structures for Project 3.13.
(7) Precast Concrete Structure for Project 3.14.
(8) Armco Magazine for Project 3.15.
(9) Window Test Structures for Project 3.16.
(10) Model Tanks and POL Bulk Storage Tanks for Project 3.26.
(11) Reinforced Concrete and Timber Instrument Shelters for Project 3.28.

Cost of this work was $726,877.

B. Dodge Construction Company of Fallon, Nevada, under Contract No. AT(29-2)-141, carried out the following construction:

(1) DOD additions to the FCDA Structures and Roof and Panel Test Structures for Project 3.5.

(2) Instrument Shelters and Display Pads for Project 8.1.

Cost of this work was $204,421.

C. Vinnell Company, Inc., of Baldwin Park, California, under Contract No. AT(29-2)-166, fabricated and erected the Test Bridge Sections for Project 3.4.

Cost of this work was $180,595.

The cost-plus-fixed-fee contractor retained by the AEC was the Reynolds Electrical & Engineering Company of Albuquerque. This contractor carried out those jobs which were not feasible to include under lump sum contract. Major test construction work under this contract amounted to $907,600.

Construction practices were, in general, about average. There were some violations of good construction practices which were corrected. Except for failure to meet project desired tolerances in some cases, the end results were satisfactory. Work for all projects was completed prior to scheduled tests.

10.3 TEST CONSTRUCTION - ENGINEER TROOPS

The 412th Engineer Construction Battalion was made available by Sixth Army to carry out construction in support of certain experimental projects. Prior to the initiation of this work the list of projects was screened by AEC officials to insure that labor unions would not seriously object. One project, laying of railroad track sections, was deleted from the troop list. This project was accomplished by CPFF at a cost of $17,754. Work performed is summarized as follows:

(1) Construction of Field Fortifications for Project 3.9.
(2) Laying and Fencing of Test Minefield for Project 3.18.
(3) Placing of Military Vehicles and Equipment for Project 3.21.
(4) Erection of two Bailey Bridges with Concrete Footings and other Test Sections for Project 3.22.
(5) Preparation and Stacking of POL Drums, Erection of two Bulk Storage Tanks for Project 3.26.
(6) Construction of Revetted Excavations for Hospital Tents for Project 3.27.
(7) Preparation of Areas and Framed Tents for Project 5.1.
(8) Construction of Portable Shelters for Project 6.2.
(9) Excavation of Instrument Pits for Projects 8.2 and 4.8.

A total of $24,951 of materials were required by the 412th Engineer Construction Battalion. The cost of this work, if accomplished by contract, would have totaled $81,561. The quality of the work was satisfactory. All projects were completed on schedule.

10.4 SUPPORT STRUCTURES AND FACILITIES

Power requirements in the test area were met by the provision of central power or by portable units. Central power was provided to only the main permanent instrument shelters. All other power was supplied by portable gasoline or diesel driven generators.

The recovery of precast concrete instrument shelters from the JANGLE area and their use resulted in a considerable economy in time and money. Wherever possible existing structures were used. The layout of the test area was arranged with this thought in mind. Some economies in construction could have been achieved had the photographic requirements, including stabilization, been furnished at an early date to allow a more economical layout of affected structures.

10.5 CHANGES, INSPECTION AND ACCEPTANCE

Major design work was nearly completed prior to the operational period. Numerous subsequent changes and additional design work were required and carried out either by the Military Representative or by the Silas-Mason Company during the actual operational period. The amount of this work and the necessary changes to the contracts resulted in increased costs and some confusion. In order to alleviate this condition and to close the contracts some items were deleted from the lump sum contracts and completed by the cost-plus-fixed-fee contractor.

By agreement with AEC and the Architect and Engineer, (A&E), contract construction inspection procedures were established as follows:

(1) Over-all inspection responsibility was retained by the A & E as the AEC's agent.
(2) Factory inspection for special design test structures was carried out by the sponsoring agencies with the A & E reserving the right to oversee such inspection.
(3) Normal factory inspection such as fabrication of steel was the responsibility of the A & E.
(4) Inspection on the site was the responsibility of the A & E. DOD and project agency inspectors were allowed, with the provision that they report discrepancies to the A & E's inspectors and, in effect, operate as the A & E's inspectors.

Acceptance of completed construction was accomplished by joint inspection by AEC, A & E and DOD representatives.

CHAPTER 11

SECURITY AND CLASSIFICATION

11.1 SECURITY

Prior test planning for the conduct of security operations was deficient in that a clear understanding was not reached on the relationships between AEC and military security representatives. This fact plus limitations on space resulted in the establishment of a separate military security office reporting in most instances to the Deputy for Military Operations rather than an integrated AEC-DOD Security Office, which experience has shown would have been more desirable.

Two military security officers were assigned full time, Maj M. D. Pasom, USA, and Capt K. B. Throckmorton, USAF. Capt H. R. Halldow, USA, was assigned as an assistant to Dr. R. C. Smith, LASL, who was both the Classification Officer for the Test Director and for the Test Manager. Capt Halldow served in this capacity as his primary duty. However, the workload in this assignment was not sufficient to warrant his full-time services so that he served part time as an additional security officer within the Military Security Office.

During UPSHOT-KNOTHOLE the functions of the Military Security Office were to:

(1) Maintain records of all military and Q type clearances for DOD personnel at the Nevada Proving Grounds.
(2) Prepare badge requests (permanent and temporary) for all DOD personnel serving at or visiting the Nevada Proving Grounds.
(3) Prepare correspondence to verify all Q clearances through the Washington Area Security Office, AEC, or Headquarters, AFSWP.
(4) Obtain Security Acknowledgement Statements and Security Termination Statements from all DOD personnel reporting to the Nevada Proving Grounds.
(5) Issue and receive upon termination all Nevada Proving Grounds badges for DOD personnel.
(6) Publish security directives pertaining to: safe combinations, security practices within the DOD Area (A), classified trash disposal and termination procedures.
(7) Make periodic security inspections of the DOD Area (A).
(8) Assist in processing Camp Desert Rock convoys through the gates within the Nevada Proving Grounds on rehearsals and on shot days.
(9) Prepare and operate a pass system for Camp Desert Rock personnel who were not badged.
(10) Investigate facts and circumstances surrounding "hold" and "invite" cases on Q clearances of DOD personnel and submit recommendations as required.

11.1.1 Operations

Prior to and during the early part of the operation, the Military Security Office accepted certified Q clearances from program and project officers, and submitted badge requests based on that certification. It became apparent that the various headquarters supporting the participating groups were not informing the Military Security Office when Q clearances were terminated. Action to correct this was taken by first verifying all Q clearances through AEC, Washington, prior to accepting them as active and requesting Q type badges for the personnel concerned. In addition a memorandum was dispatched to all participating agencies requesting them to notify the Military Security Office, Nevada Proving Grounds, when Q clearances were terminated.

The following tabulation outlines briefly the workload of this office with reference to badges and passes:

A.	Camp Desert Rock		
	Permanent badges issued	1,743	
	Temporary Passes	6,523	
	Desert Rock Observers	3,838	
	Members of Battalion Combat Teams processed	13,600	
	Total	25,704	25,704
B.	Camp Mercury		
	Camp Mercury operation personnel including Indian Springs, Kirtland and Nellis personnel	3,470	
	Official Observers	431	
	Congressional Observers	149	
	Technical and Employee Observers	1,138	
	Total	5,188	5,188
	Grand total:		30,892

The grand total figure is an aggregate total of badges processed and is not to be construed as a total of 30,892 different individuals, since, in the case of many Desert Rock Personnel the same individual may have been processed many times under the Desert Rock Non-Resident Military Pass.

11.1.2 Physical Security

The DOD physical security problem was relatively small. The entire Nevada Proving Grounds is a restricted area. All DOD installations were within the Nevada Proving Grounds and required that a person hold a valid area badge before entry was permitted. The DOD Area (A), housing the FSCU and the MEG, was a controlled area and required a minimum of Military

Secret clearance for access. Twenty-four hour guard posts were established to maintain this control. Three shifts of two AEC contractor inspectors were employed at the two gates to Area A throughout the operational period.

The following classified areas were established within the Nevada Proving Grounds:

Area A, DOD Offices and Laboratories.	.SECRET
Area B, LASL.	.Q
Area C, Frenchman Flat	.SECRET
Area D, Control Point.	.Q
Area E, Bldg 4, Storage Bldg within the CP Area..	.Q
Area F, Bldg 10, Assembly Bldg adjacent to the CP Area.	.Q
Area G, Bldg 11, Storage Bldg adjacent to the CP Area.	.Q
Area H, Yucca Flat.	.Q

The shipment security problem was solved in the normal manner by appointing official couriers on orders to accompany classified shipments to their destination.

11.1.3 Miscellaneous

Identification of DOD personnel presented some difficulty in that some reported to the Nevada Proving Grounds without proper I.D. cards. Temporary cards had to be prepared for them prior to issuance of Nevada Proving Grounds badges.

Miscellaneous incidents occurring at the Nevada Proving Grounds were:

(1) A survey party of DOD personnel was stopped by a warning shot by a member of the AEC Security Office. This incident was due to lack of coordination between elements of the security system inasmuch as the survey party had advised the Military Security Office prior to their departure that they would be working in the area in which they were stopped. The Military Security Office advised the headquarters of the guard force verbally.

(2) The theft of a radio transmitter from the test area was referred to the Federal Bureau of Investigation. The radio transmitter was recovered and the Desert Rock personnel responsible for the theft were apprehended.

(3) An incident alleged to be theft of automotive parts from FCDA test vehicles located in the test area was dropped since official investigation revealed insufficient proof of theft.

11.2 CLASSIFICATION

Department of Defense classification actions which included reports, technical photographs, the majority of public releasable photographs, and public information releases were processed by Capt Halldov. Capt Halldov's

position as a member of Dr. Smith's staff proved most satisfactory in the accomplishment of classification problems arising within the Nevada Proving Grounds.

CHAPTER 12

TROOP PARTICIPATION

12.1 INTRODUCTION

The Deputy for Military Operations was charged by the Test Manager with the responsibility for the coordination of all troop participation activities. To assist in the discharge of this responsibility Maj John B. Connelly, USA, was appointed in a full-time capacity as the Liaison Officer for Troop Participation.

By agreement between the DCD and the AEC the DCD assumed, for the first time in a Desert Rock exercise, full responsibility for the safety of troops and troop observers. The safety criteria established was 5 psi of overpressure; 6 r in any one series, of which no more than 3 r was prompt, whole body radiation (a maximum of 6 r in any six month period); and 1 cal/sq cm of thermal radiation.

In view of the safety criteria established and the freedom of movement granted Camp Desert Rock personnel within the maneuvering area, the Deputy for Military Operations provided the Test Manager with a troop participation summary on each shot to include the number of participating troops and observers, the number of volunteers, the location of troop and volunteer entrenchment areas with respect to ground zero, the scheme of maneuver, and the expected troop exposure.

12.2 SHOT PARTICIPATION

See Table 12.1 for a tabulation of troop and troop observer participation. Field Command, AFSWP, troop observer participation is included by Service in the tabulation with 24 observers on Shot 1, 49 on Shot 2, 50 on Shot 7, 119 on Shot 8, 64 on Shot 9, and 17 on Shot 10 for a total of 323 observers.

Each troop maneuver included the use of two Battalion Combat Teams (BCTs) which advanced toward objectives in the vicinity of ground zero, the first 1500 yds of advance being tactical movement by squad rushes and the remainder of the advance by march firing. After reaching the objective the troops joined the troop observers in an administrative walk through the Desert Rock display area for indoctrinational purposes. The display area contained military equipment, standard field fortifications, and a number of sheep for each shot in which troops participated except Shot 1. Located at positions both above and below the ground at distances from ground zero to 3500 yds were such items as an M3A4 tank, a 105 howitzer gun, a 90-mm AA Gun, a 57-mm gun, trucks (¼ and 2½ ton),

rocket launchers, light and heavy machine guns, 60-mm and 80-mm mortars, a 57-mm recoilless rifle, a flame thrower, a SCR-300 radio, a shelter tent, and sheep. The equipment and animal displays were observed both on a pre-shot and post-shot tour of the display area. Furthermore, each shot of the series in which troops participated was considered to simulate an actual atomic weapon employed to facilitate troop advance. Ground zero was assumed to be 1500 yds in rear of the aggressor lines. Friendly troops were positioned in prepared trenches at 3500, 4000, 5000 and 9800 yds for various shots depending on the size and the type of delivery.

The maneuver conducted on Shot 2 is considered typical and is described in detail herein (see Fig. 12.1). For this maneuver a complete rehearsal was conducted on 22 March. The full-scale maneuver followed the detonation in Area T-4 at 0510 PST on 24 March. Participating troops included 2349 troops from the Second, Third, Fifth, and Sixth Army Areas and 515 troop observers representing all the Services. Soon after the detonation the wind increased from 2 to 4 knots/hr and then to 6 knots/hr from the north. By direction of the Test Manager, information of this increase in wind velocity was passed to the Exercise Director. Despite the increase in wind and the great amount of dust present, the troops attacked at 0533 PST toward the objectives 4000 yds to the north and the troops were able to advance to within 500 yds of ground zero. At 0631 PST the observer group departed the trenches to join the troops in a tour of the equipment and animal display. Two Army H-23 helicopters were also used for Desert Rock Rad-Safe reconnaissance and evacuation standby. All troops left the forward area at 0800 PST for the return to Camp Desert Rock. The average troop participant received approximately 2.5 r.

A Marine Helicopter Detachment with four HRS-2 type aircraft also participated in Shot 2, the first of eight similar operational exercises directed by the Commandant of the Marine Corps to: (a) develop and recommend tactics and techniques for the employment of helicopters in conjunction with atomic fire support; and (b) further the study of the limitations imposed by dust and residual radiation. Essentially all such maneuvers consisted of the placement of the aircraft (either on the ground or in the air) in an area to receive not greater than ½ psi overpressure followed by an immediate advance to the vicinity of ground zero or to the edge of the dust cloud. This detachment did not operate on Shots 1, 10 and 11.

The remaining shots of Exercise Desert Rock V proceeded generally as scheduled. Because of AFSWC and Office Chief Army Field Forces (OCAFF) safety restrictions, the troop and troop observers were entrenched 9800 yds southwest of ground zero for Shot 9. In Shot 4, an air drop, only a limited number of observers participated; there was no troop maneuver involved. For Shot 10, utilizing the 280-mm gun, the troops were likewise limited in location and maneuvering. The entrenchment area was located 5000 yds east of ground zero with part of the maneuvering area cutting through the military effects tests area. In Shot 5,

primarily a Marine participating shot, the two Marine BCTs simulated a beachhead assault. A feature of this maneuver was the use of 39 helicopters (HRS-2 type) which airlifted one company of Marines to an objective west of ground zero.

12.3 OFFICER VOLUNTEER PROGRAM

In compliance with CCAFF directives the Exercise Director, Camp Desert Rock, conducted an Officer Volunteer Program in conjunction with the general troop participation. In this program selected officer volunteers, trained in calculating the effects of atomic weapons, were positioned in trenches at 2500 and 2000 yds from ground zero on Shots 2, 5 and 7 (see Fig. 12.1). The location of the trench in each case was based on the determination of the safe distance by the participating volunteers. This distance was calculated using data in TM 23-200, Capabilities of Atomic Weapons, dated 1 October 1952. Criteria for the program was 8 psi overpressure; 10 r in any one test of which no more than 5 r was prompt whole body radiation and with the further limitation that no volunteer would take more than 25 r in this series of tests; and 1 cal/sq cm of thermal radiation. The average radiation received by the nine volunteers on Shot 2 was 0.5 r; the 12 volunteers on Shot 5, 6.1 r; and the eight volunteers on Shot 7, 13.6 r. Only one officer volunteer participated in more than one of the three shots and he received a total radiation dosage of 26.6 r.

TABLE 12.1 ACTUAL TROOP PARTICIPATION - EXERCISE DESERT ROCK V

SHOT	TROOP POS (DIR/YDS FROM GZ)	ARMY	NAVY	AIR FORCE	MARINE	CIVILIAN	TOTAL	
1	SW/3500	303 1181	152	41	9	30	Observers Troops	535 1181
2	SW/4000	312 2349(75)	90	80	17	16(5)	Observers Troops	515(5) 2349(75)
3	NO TROOP PARTICIPATION							
4	News Mob	60(5)			75		Observers	135(5)
5	SW/4000	266(60)	122	101	112 2084(15)	10	Observers Troops	611(60) 2084(15)
6	News Mob	33(15)	1	4	25(20)		Observers	63(35)
7	S/4000	205 2450(65)	14	340	1	24(2)	Observers Troops	584(2) 2450(65)
8	SW/4000	99 526(50)	14	255	2	7	Observers Troops	377 526(50)
9	SW/9800	315 2149(60)	92	439	12	21(2)	Observers Troops	879(2) 2149(60)
10	E/5000	446 2670(85)	70	13	29	31(2)	Observers Troops	589(2) 2670(85)
11	NO TROOP PARTICIPATION							
	Observers Troops	2039(80) 11325(355)	555	1273	282(20) 2084(15)	139(11)		4288(111) 13409(350) 17697(461)

NOTE: (1) Figures in parentheses indicate "repeat" observers.

(2) Officer Volunteer Program - Shot 2 (4 Army, 4 Navy, 1 Air Force - 2500 yds on 200° AZ from GZ) Shot 5 (6 Army, 6 Marines - 2000 yds on 195° AZ from GZ); Shot 7 (7 Army, 1 Navy - 2000 yds on 180° AZ from GZ)

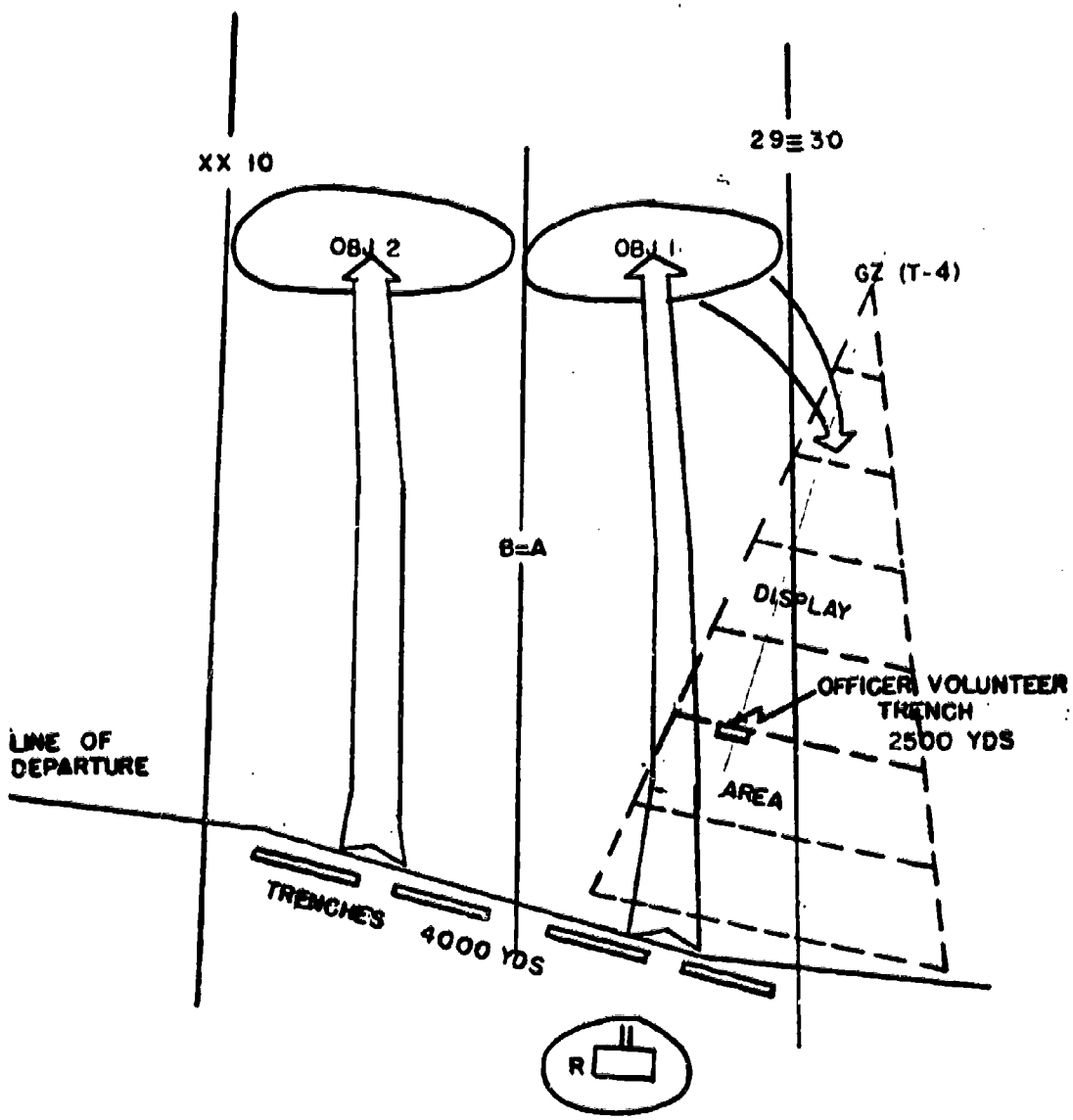


FIG 12.1 EXERCISE DESERT ROCK V, SHOT 2

CHAPTER 13

PUBLIC INFORMATION

13.1 GENERAL

On 19 February 1953, the public information plan for UPSHOT-KNOTHOLE was issued by the Office of Public Information, Department of Defense. This plan set forth the purpose, responsibilities, and general instructions for the conduct of public information activities relating to DOD activities. This plan was prepared to implement an overall AEC plan dated 6 February 1953 which had been concurred in by the DOD. Additional instructions were issued verbally by the Acting Chief, AFSWP, covering the following: mention of the three Services as opposed to stressing the role of AFSWP; in discussion of the role of AFSWF, Field Command should be mentioned, de-emphasizing functions of Hq, AFSWP; care should be taken not to discuss activities of AFSWP other than test activities. In subsequent verbal instructions, the Acting Chief, AFSWP, directed compliance with the policy of the Secretary of Defense to de-emphasize publicity aspects of DOD participation and to achieve a balance between the three Services, avoiding appearances of competition for publicity.

13.2 ORGANIZATION

The Joint Test Information Office of the Test Organization was under the direction of Mr. Richard G. Elliott, Director of Information, SFOO. Initially Major William R. Hunter, USA, was assigned as a Deputy Director representing DOD. Major Hunter was relieved for compassionate reasons on 14 March. Since this was the period of the open shot discussed below, DOD representation was assumed by Mr. Lee Hargus, OPI, OSD. During the period of the open shot Lt Col Jay P. Dawley, Deputy Director of Program 3, was assigned to assist Mr. Hargus. On Mr. Hargus' departure, 20 March, the position of Deputy Director was vacant until 5 April at which time Major Richard J. Wade, USAF, was assigned from Sandia Base. Major Wade was relieved 27 May. Mr. Hargus was again present in Las Vegas from 21 May until 29 May, the period covering Shot 10. Maj Boyd H. Arnold, USA, and Maj Sherman W. Pratt, USA, alternated as liaison officers to the Joint Test Information Office from Camp Desert Rock. Maj Milan A. Chiba, USAF, served as liaison officer from AFSWC during shot periods. Lt Col Marle T. Whatton, USMC, served as Marine Corps Liaison Officer during the period 9 April through 20 April covering Marine Corps participation in Shot 5. Two enlisted men served full time in the Joint Test Information Office. Normal operating costs were shared between AEC and DOD.

13.3 OPEN SHOT

The Joint Test Information Office was superseded shortly after

commencement of the operational period by a special organization established for the conduct of the open shot in accordance with a separate plan approved by the AEC in coordination with the DOD. Mr. Morse Salisbury, Director of Information for AEC, Washington, was appointed Coordinator of Information, the senior operating official in public information activities for the open shot. Mr. Salisbury was assisted by a deputy from AEC; a deputy from FCDA; Mr. Hargus, a deputy representing DOD interests; and Mr. Elliott, a deputy representing the Test Organization's interests. Brigadier General Frank Dorn, Deputy Chief of Information, Office of Chief of Staff, Army, was present at Desert Rock. This organization was active until 20 March at which time the public relations activities reverted to the Joint Test Information Office.

During the period of the open shot the military representation within the Joint Test Organization was called on to assist public relations activities by the provision of transportation, clerical assistance, escort officers, classification advice, factual information, and policy guidance. At the request of Mr. Hargus, the Commanding General, Field Command, AFSWP, represented the DOD in welcoming approximately 250 representatives of the news media and 360 FCDA invited observers at a briefing in Las Vegas on 16 March. Advantage was taken of these welcoming remarks to release the fact that the DOD had assumed full responsibility for the safety of troops and troop participants in Desert Rock exercises. This briefing also included a description of the Test Organization activities by members of the Test Organization. The Deputy for Military Operations described in broad terms weapons effects tests including Navy drone aircraft operations.

In connection with the open shot, in coordination with Mr. Hargus, action was taken to cancel exposure of sheep in Desert Rock maneuvers and the volunteer officer program. At the request of DOD representatives, approved by the AEC, FCDA representatives and a pooled press observer group accompanied troops into the trenches. At the request of the Air Force, action was taken to declassify the fact that the F-84G could carry an atomic bomb. The F-84G was shown at an open house at Indian Springs AFB. Department of Defense instructions were received that in the future it may be mentioned that Navy and Marines also have aircraft capable of atomic weapon delivery.

At the request of Mr. Hargus, the CG, Field Command, AFSWP, the Deputy for Military Operations, and the Director of MEG kept themselves available for possible appearances on television broadcasts. The Deputy for Military Operations made a brief appearance on a pooled television network coverage immediately following the shot and again in company with Dr. Doll on a CBS TV interview the evening of 17 March.

A summary of the background information released to the press on the open shot has been compiled by the Test Information Office and issued in an undated pamphlet, Background Information on Continental Nuclear Tests, Nevada Proving Grounds and Military Installations.

13.4 SUBSEQUENT OPERATIONS

The normal procedure for each shot subsequent to the open shot consisted of a pre-shot announcement, a pre-shot press conference, and a post-shot announcement. In each of these cases DOD activities were reported in broad terms. Camp Desert Rock, in coordination with the Joint Test Information Office, released material for hometown publications covering individual troops and troop activities.

Commencing with Shot 2, in keeping with the policy of the Test Manager to improve security, responsibility for the taking, processing, and clearing of public releasable photographs of Desert Rock maneuvers was transferred from the CG, Desert Rock to the Director of Program 9, MEG. Twelve photographs were taken for each operation. Distribution of prints in quantity was made by the Desert Sea News Bureau.

As a result of the publicity given to the Army Volunteer Program in connection with Shot 2, the Chief of Staff, USA, directed that no further releases be made of the distances at which volunteers were exposed. This resulted in some unfavorable comment on the part of the press since this reversal of policy could not be satisfactorily explained by the Joint Test Information Office. The Chief of Staff's action also posed a special problem for the Test Organization in connection with the Marine Corps participation on Shot 5. Department of Defense policy permitted the release of distance on Marine Corps volunteers who were in the same trench as the Army volunteers. This problem was resolved in the field when Brig Gen William S. Brown, USMC, CG, Second Marine Corps Provisional Atomic Exercise Brigade, declined to take advantage of his prerogative of releasing information on Marine Corps volunteers.

In connection with Shot 5 the Marine Corps Brigade included a photographic unit of 30 people. In keeping with security policies of the Test Manager, this unit was placed under the operational control of the Director, Program 9, who was responsible that their photographic activities adhered to the Test Director's photographic plan.

Throughout the series there was continued speculation on the firing of the 280-mm gun and on the possibility of the test of the gun being opened to the press. Specific instructions governing treatment of the 280-mm gun test were received from Chief, AFSWP, and from the Office of Public Information, DOD. The responsibility of the Joint Test Information Office for information on the guns began when the guns reached the city limits of Las Vegas. No special provisions were made for public information concerning the guns aside from the issuance of a simple background statement. The guns were viewed by the public as they moved from Nellis AFB to the Nevada Proving Grounds. The public information photographic coverage of the actual firing of the gun was handled by the Lookout Mountain Laboratory Photographic Unit since this unit had personnel in position at the gun site for official documentary photography.

On the day following the test of the gun, at the request of Mr. Hargus, action was taken to select and declassify color stills at Lookout Mountain Laboratory which were released to the press.

The DOD Information Plan approved in advance the handling of possible sensitive questions such as use of drones and the use of animals. Experience proved the value of this provision. Problems in the field arose generally from operations not anticipated or in areas in which early agreement could not be reached, such as the volunteer forward troop observers.

CHAPTER 14

AEC-DOD VISITORS BUREAU

14.1 GENERAL

A joint AEC-DOD Visitors Bureau was organized in contrast to previous tests wherein the AEC and the DOD each had separate programs and organizations for visitors. The Visitors Bureau consisted of five military officers, one AEC civilian, and five military enlisted personnel operating directly under the Test Manager. During the latter part of the series, two military officers and five enlisted men were added to assist in the stepped-up visitors program. See Fig. 14.1 for organization and key personnel.

The mission of the bureau was to assist the Test Manager in the reception, billeting, briefing, and orientation of visitors to the Nevada Proving Grounds. The Visitors Bureau was not charged with handling the press and FCDA-invited guests on the open shot. Organized visitor attendance was of the categories described below. Attendance is tabulated in Table 14.1.

14.2 OBSERVERS

14.2.1 Official

These personnel were normally of "Very Important Person" status attending a test through an invitation extended by the Secretary of Defense, Chairman of the AEC, or Chiefs of the Three Services. Allotment of spaces was made to departments, agencies, and services by Headquarters, AFSWP, and AEC. These personnel were normally billeted at Indian Springs AFB, had a clearance status of not less than Top Secret; and remained for the most part, as a controlled group during the visit to the Nevada Proving Grounds.

14.2.2 Congressional

Spaces were included for Congressional Observers within the established quotas for Official Observers. Early in April the Chairman of the Joint Congressional Committee on Atomic Energy invited all members of Congress to attend one of the remaining detonations. The first Congressional Group attended Shot 3 and was integrated with the Official Observers. In anticipation of increased numbers of Congressmen for subsequent shots, it was decided to make the Congressional Observers a separate category of observers.

14.2.3 Technical

This category consisted of DOD personnel invited by the Director of the Military Effects Group. Those invited came primarily from laboratories and military commands which had project groups participating in the military effects program. These personnel were all billeted at Camp Mercury; had a clearance status of Secret or Q; and remained in a semi-controlled status permitting maximum freedom of movement and consultation with personnel engaged in projects of specific interest to them.

14.2.4 Employee

The Employee Observer Program was entirely an AEC program by which personnel of the AEC and its contractors, who on a length of service point basis, were invited to attend a test at government expense. These personnel normally had a Q clearance.

14.2.5 Casual

This category consisted primarily of Q cleared employees of the AEC or its contractors who did not have sufficient points to qualify under the employee observer program but who were permitted to witness a detonation at no expense to the government.

14.3 ACTIVITIES

Prior to the beginning of the operational period at the Nevada Proving Grounds, meetings were held between officials of the SFOO and DWET, regarding the mission and functions of the Visitors Bureau. On 15 January, the designated Chief of the Visitors Bureau reported to Chief, AFSWP, to complete plans for the publication of a handbook to present official observers.

By 1 March all personnel had reported to the Nevada Proving Grounds and began detailed planning for the first observer program on 17 March. The Visitors Bureau offices were located in the AEC Administration Building 101. Within the Support Director's staff an office was established through which all support requirements of the Visitors Bureau were submitted. Requirements for support were filled from both AEC and DOD resources.

The first shot of the series was attended by a moderate number in each category and no particular problems were encountered. Official Observers arrived on D-1 and were briefed in the theater at Indian Springs AFB. Other categories of visitors were briefed in the Conference Room in Building 101 at the Nevada Proving Grounds. High radiation in the test area did not permit a post-shot tour of the FCDA displays prepared especially for the open shot.

The second shot presented no particular difficulties; however, it was felt that an adequate observer program could not be conducted with Official Observers arriving as late as D-1. A recommendation was made through channels to Washington AEC and to the Chief, AFSWP, that observers arrive on D-2. The recommendation was approved and, on Shot 6, an expanded program was conducted. The earlier arrival gave an opportunity to brief personnel on the morning of D-1 followed by a pre-shot tour of the Proving Grounds. The new program placed a larger burden on transportation, but both the AEC and DOD motor pools were able to meet the requirements. The new program made it possible to give all observers a reasonably broad picture of the Nevada Proving Grounds activities and its purpose.

Beginning with Shot 7 Congressmen attended in larger numbers. No serious problems were encountered and the only minor problem was the lack of adequate sedans to handle individual or small group requests.

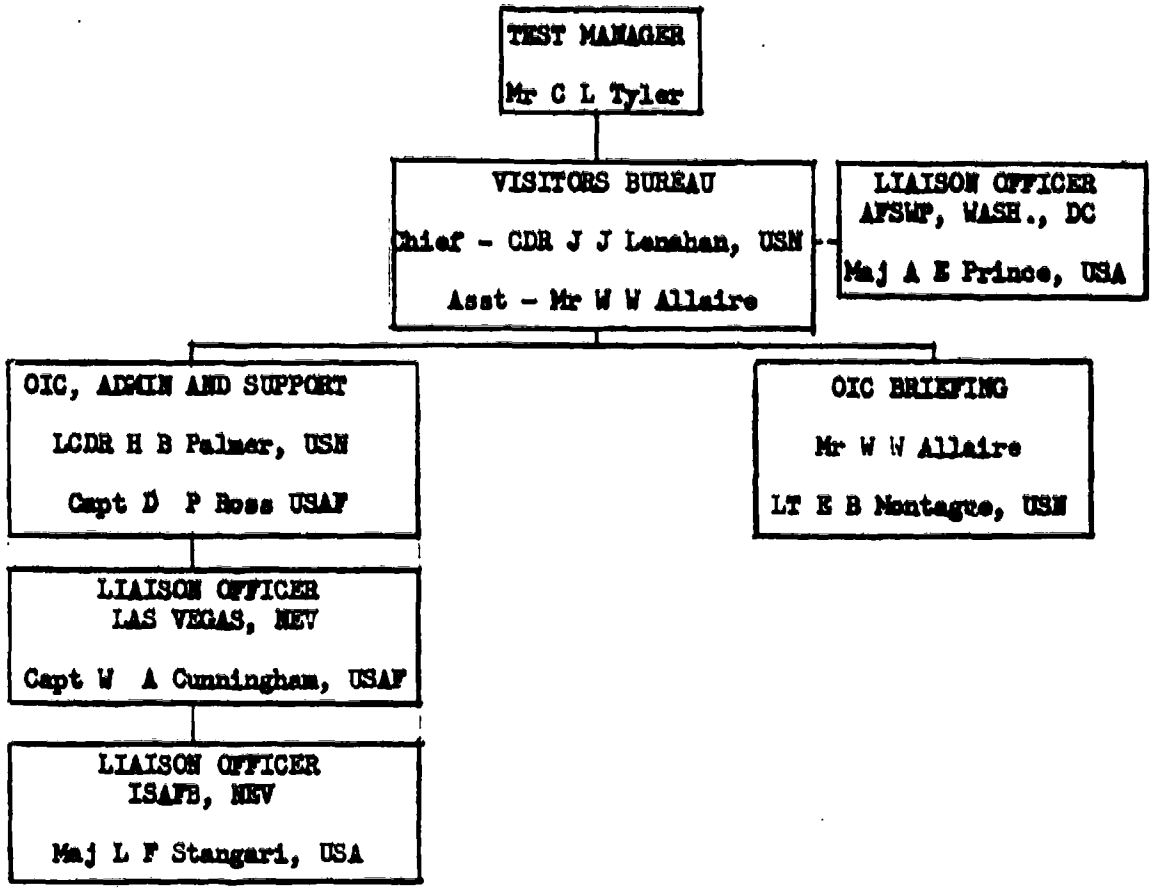


Fig. 14.1 Visitors Bureau Organizational Chart

Table 14.1 Visitor Attendance

SHOT	CONG OBS	OFF OBS	TECH OBS	EMP OBS	CAS OBS	TOTAL
1	1	46	18	47	30	142
2	1	48	55	55	14	173
3			17			17
4			8	113	70	191
5			9		7	16
6	1	51	22	63	120	257
7	15	49	33	65	59	221
8	44	33	15	64	67	223
9	15	83	33	63	25	219
10	82	70	75	58	41	326
TOTAL	159	380	285	528	433	1785
					GRAND TOTAL	1785

NOTE: There was no formal visitors program on Shot 11.

The Visitors Bureau Liaison Office in Las Vegas occupied space in the AEC Field Office building at 1235 So. Main Street. In the earlier part of the series one officer and one enlisted man were able to handle the situation with the addition of two extra sedans on D-1 Day and D-Day. With the increased number of observers, two additional officers and one additional sedan were necessary. By increasing the number of personnel at the Las Vegas Office, it was possible to man the office on a 24-hour basis from D-2 through D-Day.

Briefing material was designed to familiarize observers with the general aspects of continental tests, including relationship of full-scale tests to the over-all weapons program, joint participation by various agencies and the functioning of the Test Organization. The general briefing for Congressional and Official Observers was presented by the Test Manager (Mr. C. L. Tyler); the Deputy for Military Operations (Col P. T. Preuss, USAF); the Director of Civil Effects Group (Mr. R. L. Corsbie); and Dr. R. C. Smith of LASL who discussed classification and security measures briefly. Slides prepared by Field Command's Technical Training Group and by Lookout Mountain Laboratory were used in the briefings. On Shot 10, Col C. S. Maupin, USA (MC), Rad-Safe Staff Officer, presented a discussion on rad-safe operations off-site as a result of increased public speculation over fall-out; and Col Devere P. Armstrong, USA (FA), Commanding Officer of the Artillery Test Unit discussed the operation of his unit.

Commentary was provided by members of the Test Organization at the Observer area immediately preceding and following the detonations. Display boards depicting general layouts of the various tests areas were used.

A comprehensive tour of both Frenchman Flat and Yucca Flat was conducted on the day before the scheduled detonation. In general, this tour consisted of a visit to Frenchman Flat, target area, a timing station at a Yucca Flat Tower area, and the FCDA residences. Members of the Test Organization provided appropriate explanation at these points. On Shot 8 the party visited the gun position and witnessed firing of two test rounds. On Shot 10 the observer party also visited the gun position and witnessed a gun drill, but the weapon was not fired. On Shots 9 and 10 those members of the Congressional and Official Observer party who wished were taken into the test area the early afternoon following the shot to enable them to observe briefly the more obvious effects to targets and displays. Dr. Doll and Col Gilbert provided the commentary on both the pre- and post-shot visits to Frenchman Flat on Shots 9 and 10.

On Shots 8, 9, and 10 the Congressional Observers met with the Test Manager and the Scientific Test Director after the shot in an informal discussion. Following the discussion period the party was shown through the Control Room, Rad-Safe Operations Office, and Weather Central of the Control Point.