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OFFICE OF THE TEST DIRECTOR

J-DIVISION

LOS ALAMOS SCIENTIFIC LABORATORY

LOS ALAMOS, NEW MEXICO

Cover Page #1

for

OPERATION ORDER NO. 1-52 (TUMBLER-SNAPPER)

This document consists of 17 pages

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OFFICE OF THE TEST DIRECTOR
J-DIVISION
LOS ALAMOS SCIENTIFIC LABORATORY
P. O. BOX 1663
LOS ALAMOS, NEW MEXICO

2 February 1952

Operation Order 1-52 (TUMBLER-SNAPPER)

TASK ORGANIZATION:

a. Weapons Development Program (Programs 10-20)	Dr. W. E. Ogle, LASL
b. Military Effects Program (Programs 1-4, 6-9)	Lt. Col. G. B. Page, AFSWP, KAFB
c. Radiological Safety Unit	Lt. Col. P. S. Gwynn, AFSWP, KAFB
d. Weather Unit	Lt. Col. E. H. Karstens, SWC
e. Firing Party	Dr. J. C. Clark, LASL
f. Timing & Firing	Mr. H. E. Grier, EG&G, Boston
g. Documentary Photography	Mr. L. M. Gardner, LASL
h Weapons Assembly	Mr. W. E. Treibel, Sandia Corp.
i. Test Aircraft Unit	Lt. Col. P. H. Fackler, KAFB
j. Air Support Unit	Maj. J. H. Wood, KAFB
k. Rear Echelon	Mr. S. W. Burriss, LASL

1. General: The Manager Santa Fe Operations Office has been directed to conduct test operations TUMBLER and SNAPPER at the Nevada Test Site, and has appointed Dr. Alvin C. Graves, J-Division Leader, Los Alamos Scientific Laboratory, as Test Director.

Target dates are as follows:

Shot#*	Date	Approx. Time	Area	Ht. of Burst (ft.)
1	1 Apr.	0930	Frenchman Lake	~ 800
2	15 Apr.	0930	7 - Sta. 3	~ 1050
3	22 Apr.	0930	7 - Sta. 3	~ 4050
4	29 Apr.	0930	7 - Sta. 3	~ 1050
5	6 May	?	1	300' tower
6	13 May	?	4	"
7	20 May	?	2	"
8	27 May	?	3	"
9	4 June	?	7 - Sta. 1	"

*Tumbler is comprised of shots 1-4 and Snapper of shots 3-9.

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Changes in this schedule, because of weather or other reasons, and the exact time of H hour, the time of detonation of the designated weapon, will be announced separately.

The Commanding General, AFSWP, is responsible for providing military support for this operation.

The Field Manager, Nevada Test Site, is responsible for providing other support.

2. Mission (Test Director):

a. Prepare, assemble, transport, install, instrument, test and fire designated weapons on the command of the Manager of the Santa Fe Operations Office.

b. Prepare for and conduct the experimental programs.

c. Insure that proper safety precautions are observed by the Test Director's organization in connection with each shot.

d. Arrange with the Field Manager, Nevada Test Site, for local security measures for restricted and exclusion areas.

e. Review and authorize classification of all data generated in connection with the tests.

f. Keep the Director, LASL, (through Rear Echelon) informed of readiness for and progress of tests.

3. Tasks for Programs:

a. Weapons Development Program will:

(1) Install, calibrate and check, as appropriate, all instruments and test apparatus connected with Programs 10 through 20.

(2) Obtain measurements, samples, and data connected with Programs 10 through 20.

APPROVED PROJECTS OF PROGRAMS 10-20

Project Number	Title	Agency	Project Officer
10	Measurement of Alpha	NRL	E. H. Krause
11	Measurement of Transit Time		
11.1	Measurement of Transit Time	NRL	E. H. Krause
11.2	Remote Transit Time	Sandia Corp.	C. B. McCampbell
12	Technical Photography	LASL, J-15	G. Felt
12.1	Technical Photography	EG&G	H. E. Grier

12.1-a Burst position
12.1-b Ball-of-fire photography for yield
12.1-c Bhangmeters
12.1-d Mortar and jato photography) Blast Photography
12.1-e Rocket photography)
12.1-f Gun photography)

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Project Number	Title	Agency	Project Officer
	12.1-g Pre-shock turbulence)		
	12.1-h Mirage effects)		
	12.1-i Dust photography) Blast Photography		
	12.1-j Light absorption)		
	12.1-k Shock front photography)		
	12.1-l Airborne disc cameras		
	12.1-m Cloud phenomena		
12.2	Extra High Speed Photography	LASL, GMX-9	B. Brixner
13	Radiochemistry	LASL, J-11	H. F. Plank
14	External Initiator Measurements	LASL, W-5	V. Josephson
15	Delayed Gamma Ray Measurements	LASL, J-13	J. S. Malik
15.1	Gamma Intensity as a Function of Time	LASL, J-13	J. S. Malik
15.2	Total Dose (Film Badges)	LASL, H-6	E. Storm
15.3	Radiation Monitoring	LASL, J-16	J. S. Malik
16	Electromagnetic Effect	LASL, J-12	C. Cowan
17	Neutron Measurements	LASL, J-12	C. Cowan
17.1	Integral Neutron Measurements	LASL, J-12	C. Cowan
17.2	Neutrons as a Function of Time	LASL, J-12	C. Cowan
18	Thermal Radiation Measurements	NRL	H. Stewart
18.1	Total Thermal Radiation	NRL	H. Stewart
18.2	Power as a Function of Time	NRL	H. Stewart
18.3	Spectra	NRL	H. Stewart
18.4	Cancelled		
18.5	Air Temperature vs Time	NRL	H. Stewart
18.6	Light Absorption Characteristics of Region Surrounding Fireball	NRL	H. Stewart
19	Blast Measurements		
19.1	Blast Measurements	Sandia	H. E. Lerander
	19.1-a Pressure vs Time (Wiaucko gauges)		
	19.1-b Remote microbarographic measurements		
	19.1-c Shock wind and afterwind measurements		
	19.1-d Sound velocity		
	19.1-e Blast diffraction effects		
	19.1-f Air pressure, Preshock		

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Project Number	Title	Agency	Project Officer
19.2	Blast Measurements	LASL, J-10	F. B. Porzel
19.2-a	Low altitude peak overpressure and air motion (Mortars and Jatos)		
19.2-b	High Altitude free-air peak overpressure and air motion (Guns)		
19.2-c	Density vs time (B densitometer)		
19.2-d	Pressure vs time (Buck gauges)		
19.2-e	Air pressure - Pre-shock		
19.2-f	Acoustic Interferometer		
20	Timing and Firing	EG&G	H. E. Grier

b. Military Effects Program will:

(1) Install, calibrate, and check, as appropriate, all instruments and test apparatus, and position and recover animals and plants in connection with Programs 1, 2, 3, 4, 6, 7, 8, 9.

(2) Obtain measurements, samples, and data connected with Programs 1, 2, 3, 4, 6, 7, 8, 9.

APPROVED PROJECTS OF PROGRAMS 1-9

PROGRAM 1 Blast Measurements — Program Director, Commander Campbell

Project Number	Title	Agency	Project Officer
1.1	Free Air Blast Pressure Patterns (Parachute Gauges)	AFCRC	Major Vann
1.2	Air Pressure vs Time (0', 10', 50', Wianko Gauges)	ONR-SRI	Dr. Doll
1.3	Pressure vs Time (0', Bendix Gauges)	NOL	Dr. Aronson
1.4	Time of Shock Arrival (0', 10', 50', Blast Switches)	BRL	Dr. Minor
1.5	Free Air Pressure (0', to 3000', Rockets)	NOL-EG&G	Dr. Aronson
	a. Time of arrival b. Particle velocity		
1.6	Ground Accelerations (ERA Gauges)	BRL	Dr. Minor
1.7	Ground Accelerations (Wianko Gauges)	ONR-SRI	Dr. Doll
	a. Vertical ground accelerations (5' depth) b. Vertical, horizontal and transverse accelerations (5' depth) c. Vertical and horizontal accelerations (50' depth)		
1.8	Geophysical and Seismic Survey	USGS	
1.9	Pre-shock Dust (0', 10')	ACC	Dr. Lindewarm
1.10	HE - Air Pressure vs Time	Sandia Corp.	Dr. Corritt
1.11	HE - Ground Accelerations	ONR-SRI	Dr. Doll

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PROGRAM 2 — Nuclear Measurements and Effects — Program Director, Lt. Col. Forbes

Project Number	Title	Agency	Project Officer
2.1	Total Gamma Radiation Dosage vs Distance and Gamma Dose Rate vs Time.	ESL	Capt. Dempsey
2.2	Measurement of Gamma Spectrum of Fission Products.	ESL	Lt. Col. Forbes
2.3	Total Neutron Flux and Energy vs Distance.	NRL	J. T. Smith

PROGRAM 3 — Structures — Program Director, Lt. Col. Colligan

3.1	The Effects of an A-Bomb on Parked Aircraft.	WADC	Mr. Briedenbach
3.3	Effects of Blast on Trees	ORO Forest Service	Mr. Arnold
3.4	Mine Field Clearance	ERDL	Mr. Reitman

PROGRAM 4 — Bio Medical — Program Director, Colonel Maxwell

4.2	Animal Exposure Containers	NMRI	Capt. Draeger
4.3	Neutron Dosimetry	NRDL	Lt (jg) Carter
4.4	Gamma Ray Depth Dose Measurement in Unit Density Material	NMRI	Cdr. Chambers
4.5	Flash Blindness	Valley Forge Gen. Hospital	Lt. Col. Maloney
4.6	Thermal Radiation Effects	AEC-UofR	Dr. Pearse

PROGRAM 6 — Tests of Equipment and Operations — Prog. Dir., Lt. Col. Forbes

6.1	Testing of Radiac Equipment a. Survey Instruments b. Dosimetry	ESL, ACC BuShips	Lt. Sisk
6.2	Testing of Airborne Radiac Equipment.	WADC	Major Kee
6.3	Evaluation of Filtration Systems for Aircraft	ACC	Mr. Cooke
6.4	Operational Tests of Radar and Photographic Techniques for IBDA	WADC	Lt. Col. Boone
6.5	Decontamination of Aircraft	WADC	Mr. Teres
6.6	Operational Decontamination Devices (with RadSafe)	ACC	Mr. Durrell
6.7	Evaluation of Air Monitoring	ACC	Dr. Mahoney

PROGRAM 7 — Long Range Detection — Prog. Director. Major Hormats

7.1	Electromagnetic Radiation	AFOAT-1	M. H. Oleson
7.2	Acoustic Pressure Waves from A-Bombs	AFOAT-1	C. B. Olmstead
7.3	Analysis of Bomb Debris	AFOAT-1	D. Curry
7.4	Propagation of Seismic Waves	AFOAT-1	Allen Crocker

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PROGRAM 8 — Thermal Measurements and Effects — Prog. Dir , Lt. Preston

Project Number	Title	Agency	Project Officer
8.1	Thermal Effects of Atomic Explosions on Forests	ORO-Forestry Service	Mr. Arnold
8.2	Preshock Air Temperature vs Time (0', 10', 50')	NRDL	Dr. Guthrie
8.3	Characteristics of Thermal Radiation (0', 10', 50') a. Total Thermal Energy b. Thermal Energy vs Time	NRDL	Dr. Guthrie
8.4	Basic Thermal Measurements	NML	Mr. Derkson
8.5	Blast Effects on Persistence of Fires	AFSWP-Forestry Service	Mr. Bruce
8.6	Acoustic Velocity	NEL	Dr. Pickens

PROGRAM 9 — Supporting Measurements -- Program Director, Lt. Col. Forbes

9.1	Technical and Training Photography	ESL	Capt. Dempsey
9.2	Meteorological Documentation	AWS	Lt. Col. Karstens
9.4	Effects of Blast on the Radio Spectrum and the Resulting Propagation in the Ionosphere	ESL	Major Hutchsinson
9.5	Electromagnetic Radiation over Radio Spectrum	ESL	Major Hutchinson

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4. Tasks for Subordinate Units

a. Rad Safe Unit will:

(1) Provide all ground monitoring services at the Nevada Test Site other than those required for the decontamination of aircraft.

(2) Provide peripheral monitoring by ground and air teams up to a radius of not less than 200 miles from the target area.

(3) Plot and disseminate to interested units the Surface and Air Radexes.

(4) Provide final responsibility for monitoring and decontamination operations conducted by Project 6.5.

(5) Decontaminate personnel, vehicles, test materials and equipment at the test site and in the fall-out areas.

(6) Furnish Rad Safe clothing and other necessary equipment for personnel entering into contaminated areas.

(7) Provide film badge service for personnel.

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b. Weather Unit will:

(1) Provide and coordinate all meteorological services required for the tests.

c. Firing Party will:

(1) Test and activate the firing system, and fire the designated

c. (1) cont'd

weapons on the other than air shots, on the command of the Manager, Santa Fe Operations Office.

(2) Check the timing system on the air drops.

d. Timing & Firing Unit will:

(1) Provide and test the timing systems for all shots and the firing system for the other than air shots.

e. Documentary Photography Unit will:

(1) Provide documentary and technical photographic services as required by the various units and projects.

f. Weapons Assembly Unit will:

(1) Assemble all weapons; and transport and install the weapons designated for other than air shots.

(2) Deliver to the strike plane the weapons designated for air shots.

g. Test Aircraft Unit will:

(1) For the air shots, transport the designated weapon from Kirtland AFB to the test site area and detonate it at a time and position designated by the Manager, Santa Fe Operations Office.

(2) Provide a disaster plane to accompany the strike plane.

h. Air Support Unit will:

(1) Provide, maintain, and operate planes required for test purposes.

(2) Provide, maintain, and operate courier and logistic support planes.

(3) Provide, maintain, and operate helicopters required for Rad Safe, security, and other purposes.

i. Rear Echelon will:

(1) Provide and coordinate support in the Los Alamos - Sandia area during test operations.

x. Provision of this paragraph pertain to all task units.

(1) Days related to shot days will be expressed as follows: D-1, D+2, etc. Hours related to H hour will be expressed as follows: H-1 hour, H-5 minutes, H-10 seconds, H+2 hours 30 minutes, etc. Hours expressed in relation to local (Pacific Standard) clock time will be expressed in terms of 0 to 24 hours as follows: 0800 (8 A.M.), 2316 (11:16 P.M.), etc.

(2) Units will conduct partial rehearsals as necessary and complete rehearsals as scheduled by the Test Director to insure readiness for the shots.

(3) Units will muster and position personnel in accordance with Annex M, Muster Plan.

(4) Units will insure that proper safety precautions are taken in accordance with Annex M, Muster Plan and Annex R, Radiological Safety.

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(5) Units will prepare and submit by 17 March 1952 such operation orders, instructions, schedules of events, and check-off lists, as are necessary to implement this Operation Order and its Annexes.

5. Administration:

See Administrative Order No. 1 (to be issued shortly)

6. Command:

a. Command Post.

The Test Director will be at the Los Alamos Scientific Laboratory until shortly before the beginning of the tests, when he will move to Control Point Building No. 1, Nevada Test Site. Interested units will be informed of this move by dispatch. Advance headquarters will be set up in that building at about D-10 days of Shot #1.

b. Unit Headquarters.

Unit headquarters will be at the locations shown in the Test Organization until shortly before the beginning of the tests, when they will move to locations indicated below:

(1) Weapons Development Program	Control Point Bldg. No. 1
(2) Military Effects Program	" " " " "
(3) Rad Safe Unit	" " " " 2
(4) Documentary Photography Unit	Parking Area adjacent to Control Point Bldg. No. 1
(5) Weapons Assembly Unit (Advance Headquarters)	Control Point Area, Bldg. 10
(6) Timing & Firing Unit	Control Point Bldg. No. 1
(7) Weather Unit	" " " " "
(8) Firing Party	" " " " "
(9) Test Aircraft Unit	" " " " "
(10) Air Support Unit	Indian Springs AFB, Indian Springs, Nevada
(11) Rear Echelon	J-Division, Los Alamos, N. M.

c. Time.

Pacific Standard Time will be used during the tests for all operations based at the Nevada Test Site. For operations based in other time zones, local or Greenwich time may be used in addition to Pacific Standard Time.

ALVIN C. GRAVES
Test Director

WWD:bhh

OFFICIAL:

Duncan Curry Jr.

DUNCAN CURRY, JR.
Plans & Operations

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ANNEXES: Please see next page.

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A. Special Instructions, Shot 1*

B. " " " 2*

C. " " " 3*

D. " " " 4*

E. " " " 5*

F. " " " 6*

G. " " " 7*

H. " " " 8*

I. " " " 9*

M. Muster Plan*

P. Photography Plan

R. Radiological Safety*

* Will be issued later.

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