DNA 1251-1-EX

COMPILATION OF LOCAL FALLOUT DATA FROM TEST DETONATIONS 1945-1962 EXTRACTED FROM DASA 1251

Volume I -Continental U.S. Tests

General Electric Company-TEMPO
DASIAC
816 State Street
Santa Barbara, California 93102

1 May 1979

Extract

CONTRACT No. DNA 001-79-C-0081

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REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1 REPORT NUMBER: DNA 1251-1-EX	2 GOVT ACCESSION NO	3 RECIPIENT'S CATALOG NUMBER
4 TITLE (and Subtitle): COMPILATION OF LOCAL FALLOUT DATA FROM TEST DETONATIONS 1945-1962 EXTRACTED FROM DASA 1251 Volume I—Continental U.S. Tests	5 TYPE OF REPORT & PERIOD COVERED: Extract 6 PERFORMING ORG REPORT NUMBER: DASIAC SR 179 VOL. I
7 AUTHOR(S): Howard A. Hawthorne, Editor	8 CONTRACT OR GRANT NUMBER(S): DNA 001-79-C-0082
9 PERFORMING ORGANIZATION NAME AND ADDRESS: General Electric Company—TEMPO DASIAC, 816 State Street Santa Barbara, California 93102	10 PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: Subtask P990MXDC008-09
11 CONTROLLING OFFICE NAME AND ADDRESS: Director Defense Nuclear Agency Washington, D.C. 20305	12 REPORT DATE: 1 May 1979 13 NUMBER OF PAGES: 619
14 MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	15 SECURITY CLASS (of this report): UNCLASSIFIED 15a DECLASSIFICATION DOWNGRADING SCHEDULE

16 DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17 DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18 SUPPLEMENTARY NOTES

This work sponsored by the Defense Nuclear Agency under RDT&E RMSS Code B337079464 P99QAXDC00800 H2590D.

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

Nuclear Weapons Testing
Fallout
Radiological Contamination
Nuclear Radiation
Carlsbad, New Mexico
Alamogordo, New Mexico
Nevada Test Site

20 ABSTRACT (Continue on reverse side if necessary and identify by block number)

Fallout patterns from U.S. continental nuclear weapons tests. Also given are time and place of test and ambient winds.

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PREFACE

This report has been prepared to serve as an unclassified source of information and data concerning the atmospheric nuclear test program conducted by the United States prior to 1963. The information contained herein was reproduced directly from the classified versions of the DASA 1251 series of reports. The classified material which was deleted to prepare this report was in accordance with the requirements of the Atomic Energy Act of 1954 and would not contribute to an understanding of the radiation interactions with personnel. All fallout plots and radiation contours are presented exactly as they appeared in the classified version of DASA 1251.

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INTRODUCTION

The objective of this report is to provide a ready reference of fallout patterns and related test data for those engaged in the analysis of fallout effects.

This compilation was extracted from DASA 1251 "Local Fallout from Nuclear Test Detonations" (U) Vol. 2 "Compilation of Fallout Patterns and Related Test Data" (U) Parts 1 through 3. DASA 1251 Vol. 2 was the work of Manfred Morgenthau, Harvy Meieran, Richard Showers, Jeffrey Morse, Norman Dombeck, and Arnoldo Garcia of the U.S. Army Nuclear Defense Laboratory under Defense Atomic Support Agency (now Defense Nuclear Agency) sponsorship.

Although local (early) fallout is emphasized, the data presented will be useful to those studying world-wide (delayed) fallout as well. In this report local fallout is defined as all fallout which consists principally of the larger particles that are deposited within 24 hours after the detonation. World-wide or delayed fallout is defined as fallout which consists of very small particles which descend very slowly over large areas of the earth's surface.

Data resulting from each U.S. detonation are presented chronologically. For each detonation, the basic information useful for an interpretation of the fallout data is tabulated first. This is followed by both on-site and off-site fallout patterns where available. A graph of the growth-rate of the cloud and stem is presented next. Wind speed and direction are then tabulated as a function of altitude, and hodographs are drawn from these data.

EXPLANATION COMMENTS ON DATA PRESENTED

Fallout Patterns

One or more fallout patterns are given for each event, except for those shots for which no significant residual radiation was observed downwind of GZ or for which no patterns were found in the literature. In the remarks included on the basic data sheet for each shot, the individual fallout patterns are discussed briefly; some comments are made for those shots for which no patterns were available. The dose-rate contours for the fallout patterns have been drawn to show the gamma dose rate in roentgens per hours, three feet above the ground, in terms of the one hour after burst reference time. The $t^{-1.2}$ approximation was used when no actual decay data was available to adjust radiation measurements to the one hour reference time. It is important to recognize the H+1 hour is used as a reference time, and that only the contours from low yield weapons are complete at one hour after burst. For high yield weapons, fallout over some parts of the vast areas shown does

not commence until many hours after the burst. The time of arrival of fallout is indicated on some of the fallout patterns by "dot-dash" lines. The time lines are intended to give only a rough average arrival time in hours as estimated from the wind reports and the available monitoring information.

Induced Activity Patterns

The contamination resulting from low air bursts is due primarily to the activity induced by neutrons which are captured by certain elements in the soil, notably sodium, manganese and aluminum. The resulting radiation field is circular and covers a limited area about ground zero. Weather conditions have very little influence on the location or shape of the induced radiation pattern. However, increasing the moisture content in soils can increase the induced activity levels. The rate of decay of the induced radiation field is different from the decay of fission products and depends on the composition of the soil over which the weapon was detonated. For Nevada soil, the sodium and manganese composition generally varies by a factor of 1.4 to 2 and the aluminum composition varies by a factor of 3 to 7 within and between test areas. For most induced activity patterns in this report, a general neutron-induced decay curve for Nevada soil was used to extrapolate the observed dose rates back to H+1 hour. For a few induced activity patterns, Na^{24} decay is used to extrapolate the observed dose rates to H+1 hour. This decay rate is not strictly applicable but it closely approximates the observed decay.

Wind Data

The tables of wind data give surface and upper air winds for heights up to at least the top of the nuclear cloud. These data are presented for times as close to shot time as possible and for several times after shot. Directions are in degrees from which the wind is blowing, and are measured clockwise from north. Velocities are in statute miles per hour. The height of the tropopause at shot time is given when available. Although the meteorological data were taken in close proximity to ground zero, they do not necessarily represent the wind field downwind from ground zero in space and time.

The hodographs are drawn for a constant balloon rise rate of 5,000 ft/hr and are presented for illustrative purposes only. The fall rates of particles vary considerably with altitude; therefore, errors will result from the use of a constant fall-rate hodograph for fallout prediction. In general, particles in higher altitudes levels fall faster and the percentage change in the falling rate is greater for larger particles. The numbers on the hodographs represent altitudes in thousands of feet. The associated points represent the locations on the surface where particles having a constant fall-rate of 5,000 ft/hr could land if they originated over GZ at the altitudes shown. The letter S on the hodographs stands for "Surface" and the number next to it in parenthesis (for the Nevada shots) is the site elevation of ground zero in feet above MSL.

OPERATION TRINITY

	MST	GMT
DATE:	16 Jul 1945	17 Jul 1945
TIME:	0529	1229

Sponsor: MED.

SITE: 57 miles Northwest of Alamogordo, New Mexico
Coordinates: 33° 40' 31" N
106° 28' 29" W
Site elevation: 1,674 ft

TOTAL YIELD: 19 kt

HEIGHT OF BURST: [illegible] ft.

TYPE OF BURST AND [illegible]:
Tower burst

CLOUD TOP HEIGHT: [illegible] ft. MSL
CLOUD BOTTOM HEIGHT: [illegible] ft. MSL

CRATER DATA: diameter: [illegible] ft
depth: [illegible] ft

RADIOLOGICAL DATA:
Time to 1st minimum: [illegible] MM
Time to 2nd maximum: [illegible] MM
Radius at 2nd maximum: [illegible] MM

REMARKS:

Extensive surveys were made [illegible] after the detonation to [illegible] survey meters. The measurements were used, [illegible] the inverse cube law to approximate the decay.

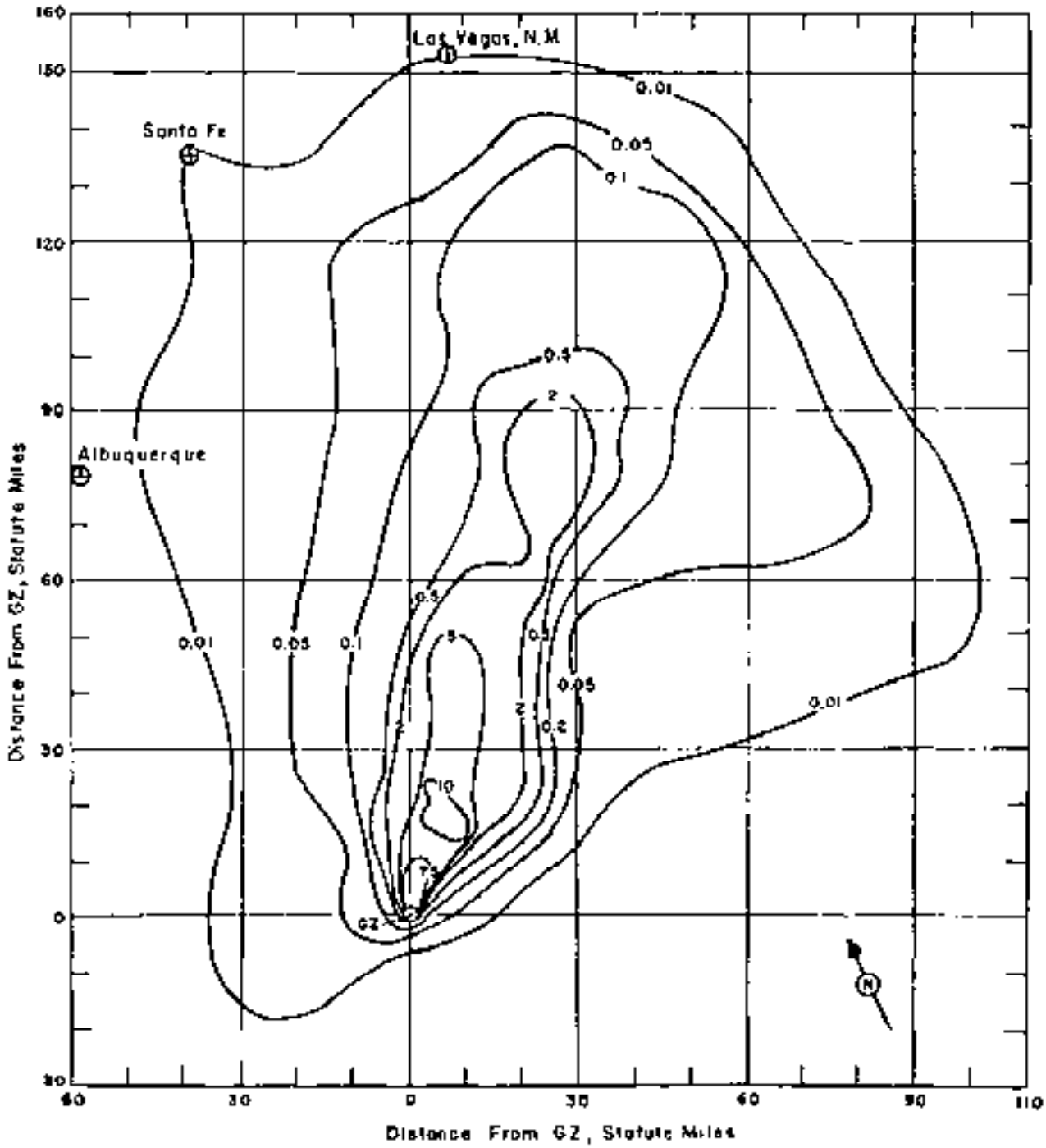


Figure 1. Operation TRINITY off-site dose rate contours in r/hr at H+1 hour.

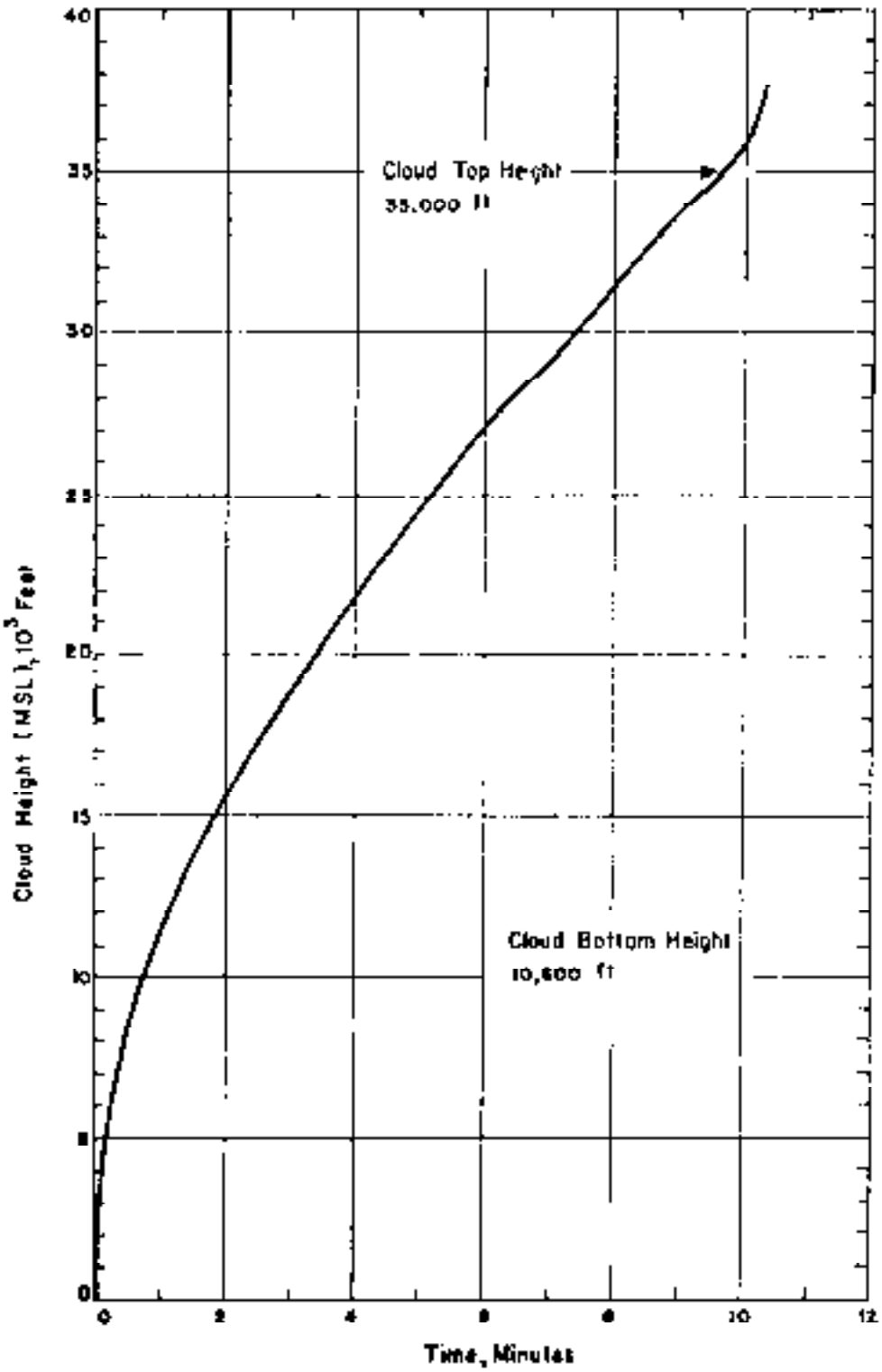


Figure 2. Cloud Dimensions: Operation TRINITY.

TABLE 1 ALAMOGORDO, NEW MEXICO WIND DATA FOR OPERATION TRINITY

Altitude (MSL)	H-hour		H+½ hours		H+4 hours		H+7 hours		H+10½ hours	
	Dir	Speed	Dir	Speed	Dir	Speed	Dir	Speed	Dir	Speed
feet	degrees	mph	degrees	mph	degrees	mph	degrees	mph	degrees	mph
5,100	110	04	---	--	---	--	---	--	---	--
5,300	160	07	330	04	160	03	240	01	140	09
6,000	200	06	260	03	150	03	120	02	100	04
6,700	230	07	230	04	140	03	140	05	100	03
7,300	250	08	250	04	160	03	130	07	140	05
7,900	250	10	270	03	160	05	130	07	150	07
8,500	240	06	250	04	150	05	130	06	170	07
9,100	230	07	230	04	170	05	130	08	[illegible]	07
9,700	220	08	230	07	190	07	140	10	[illegible]	06
10,300	220	12	230	10	210	10	150	10	170	05
10,900	220	11	230	13	200	11	150	08	180	04
11,500	200	08	220	12	180	11	150	05	070	02
12,100	190	07	170	10	170	11	190	03	310	03
12,700	170	09	160	11	180	12	240	03	310	06
13,300	170	12	160	12	190	11	240	04	320	04
13,900	160	12	170	14	210	12	250	06	310	05
14,500	150	13	180	16	200	13	270	08	290	06
15,100	140	13	180	15	180	13	280	10	280	05
15,700	130	16	190	13	170	16	280	08	290	06
16,300	120	16	190	12	170	16	270	05	280	07
16,900	140	12	190	07	190	11	250	04	290	05
17,500	160	10	160	07	210	03	240	05	270	03
17,600	150	13	---	--	---	--	---	--	---	--
18,100	---	--	170	05	320	02	260	05	270	03
18,600	150	12	---	--	---	--	---	--	---	--
18,700	---	--	210	04	280	02	260	06	270	01
19,300	---	--	220	03	270	03	250	06	130	03
19,600	180	04	---	--	---	--	---	--	---	--
19,900	---	--	---	--	270	02	250	06	180	05
20,600	250	04	---	--	---	--	---	--	---	--
21,600	240	08	---	--	---	--	---	--	---	--
21,700	---	--	---	--	---	--	220	11	210	08
22,600	220	11	---	--	---	--	---	--	---	--
22,900	---	--	---	--	---	--	190	17	210	16
23,600	220	15	---	--	---	--	---	--	---	--
24,600	220	15	---	--	---	--	---	--	---	--
29,600	230	16	---	--	---	--	---	--	---	--
34,600	230	27	---	--	---	--	---	--	---	--
39,600	240	19	---	--	---	--	---	--	---	--
44,600	290	18	---	--	---	--	---	--	---	--
48,600	280	11	---	--	---	--	---	--	---	--

Note: At H-hour the surface air pressure was 12.39 psi and the temperature 21.8°c,

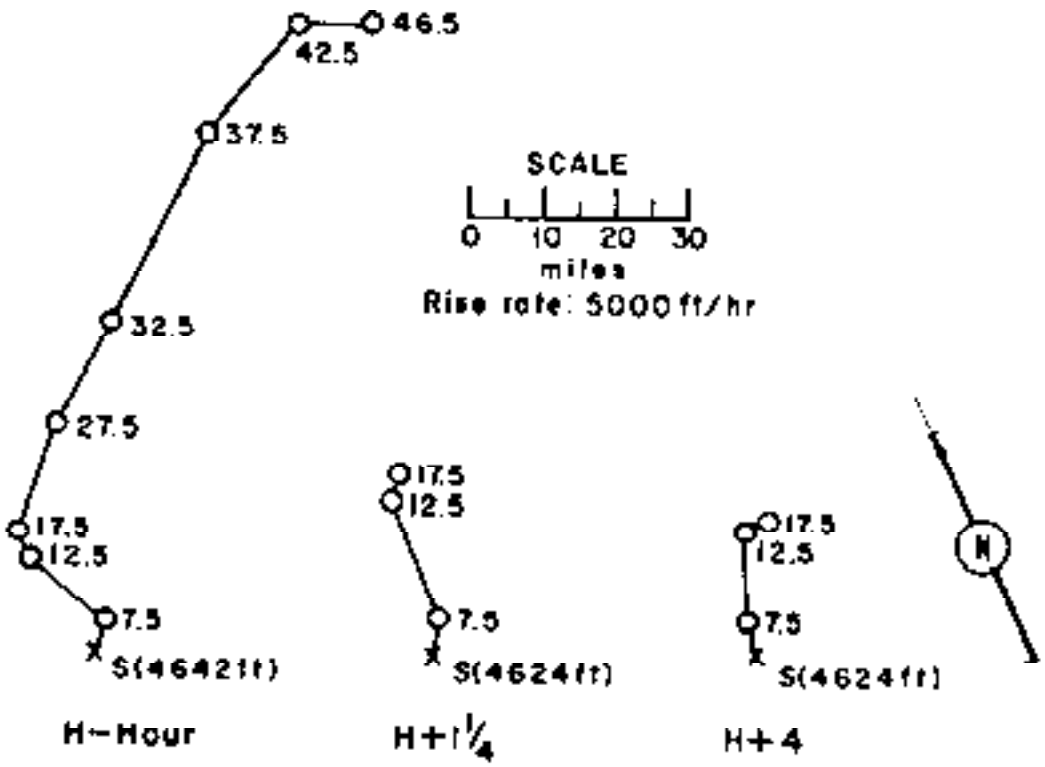


Figure 3. Hodographs for Operation TRINITY

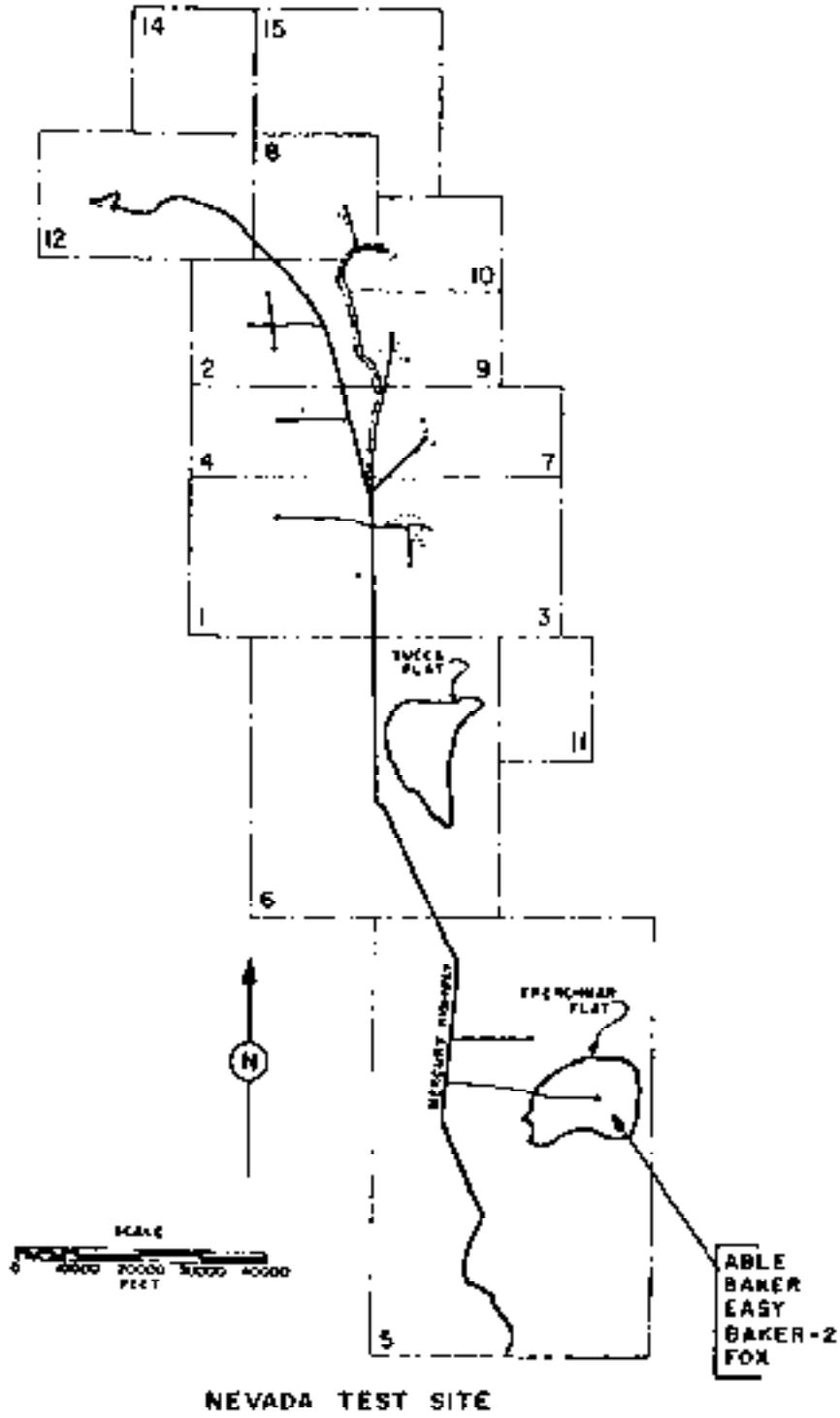


Figure 4 . Operation RANGER, Shot Locations.

OPERATION RANGER - Able

	PST	GMT
DATE:	27 Jan 1961	27 Jan 1961
TIME:	0545	1345

Sponsor: LASL

SITE: NTS - Frenchman Flat.
36° 48' N
115° 57' W
Site elevation: 2,142 ft

TOTAL YIELD: 1 kt

HEIGHT OF BURST: 1,060 ft

TYPE OF MEDIA AND PLACEMENT:
Air burst

FIREBALL DATA:
Time to 1st minimum: [illegible] msec
Time to 2nd maximum: NM
Radius at 2nd maximum: NM

CLOUD DOSE RATE: [illegible] r/hr at 1 hr
CLOUD BOTTOM HEIGHT: [illegible] ft radius

REMARKS:

No local fallout. An induced-activity pattern was established from readings taken from [illegible] to [illegible] miles along azimuths west and south of GZ. No decay information was taken. All the values below 20 mr/hr were measured with Geiger-Mueller type-PDR-6 survey instruments. The values above 20 mr/hr were measured with high- and low-range Juno ionization-type meters.

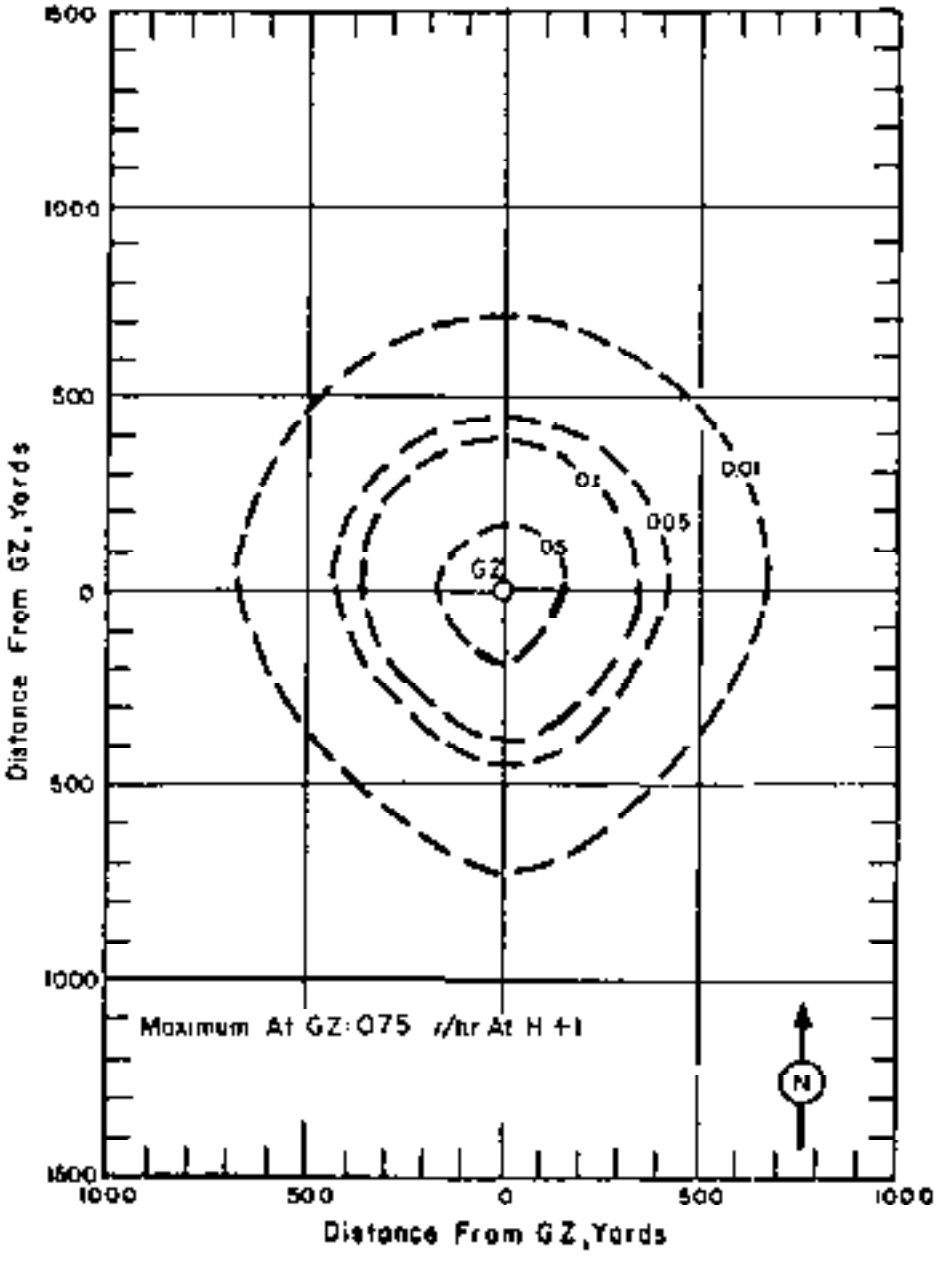


Figure 5. Operation RANGER - Able. On-site dose rate contours in r/hr at H+1 hour.

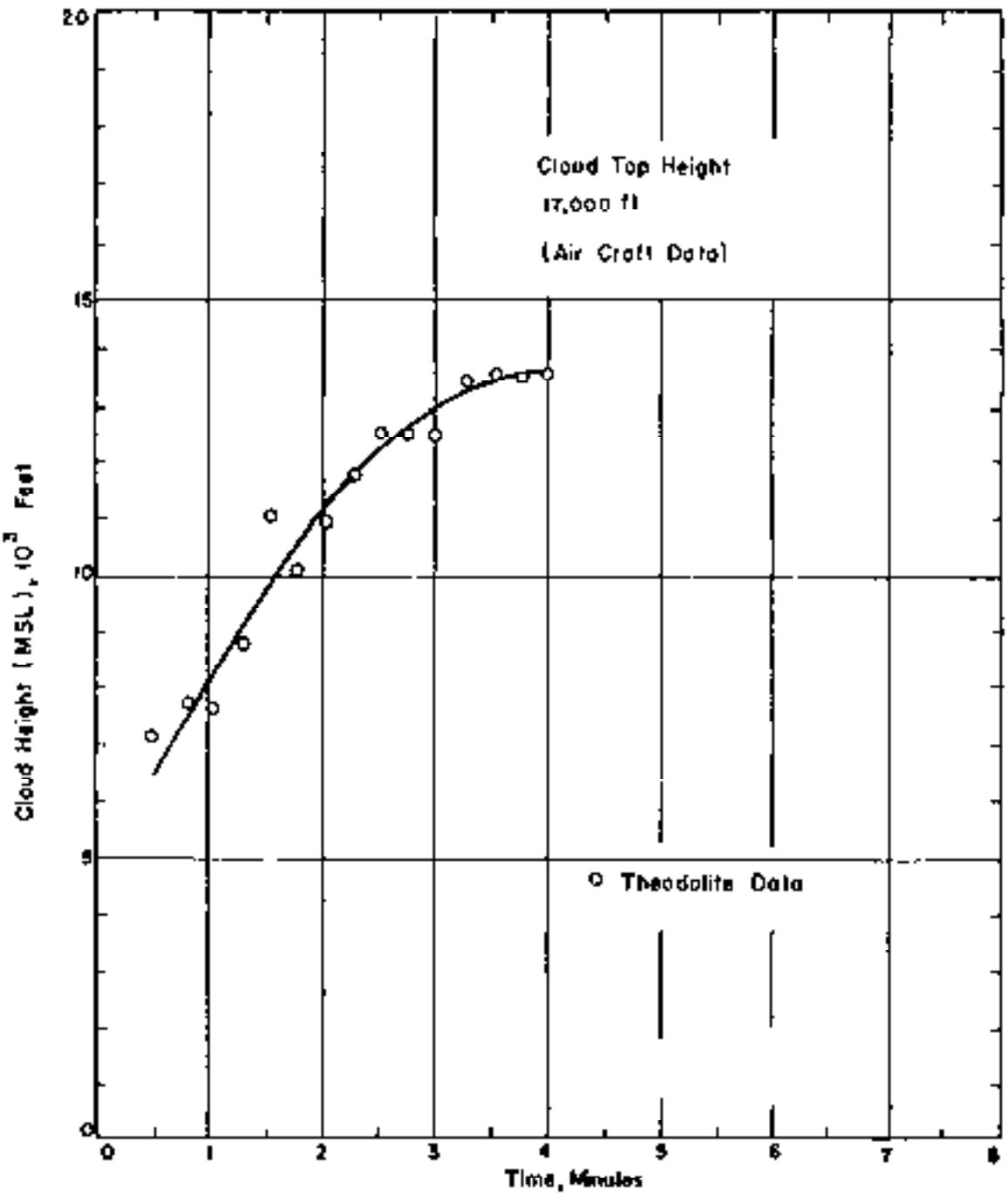


Figure 6. Cloud Dimensions: Operation RANGER - Able

TABLE 2 NEVADA WIND DATA FOR OPERATION RANGER - ABLE

Altitude (MSL)	H-1¾ hours		H-hour		H+1¼ hours	
	Dir	Speed	Dir	Speed	Dir	Speed
feet	degrees	mph	degrees	mph	degrees	mph
Surface	130	03	130	02	Calm	Calm
4,000	140	03	140	02	Calm	Calm
5,000	230	07	230	06	230	05
6,000	220	22	190	13	160	07
7,000	210	21	220	16	220	14
8,000	240	14	270	13	290	13
9,000	260	17	280	17	300	17
10,000	260	20	280	21	300	21
12,000	260	20	280	24	300	28
14,000	---	--	270	21	270	22
16,000	260	20	250	16	250	15
18,000	---	--	270	35	270	35
20,000	---	--	270	35	270	35

NOTES:

1. Wind data was obtained from the Ranger control point located on the slope of a mountain approximately 10 miles (in a southwesterly direction) from Frenchman Lake.
2. Tropopause height was 33,000 ft MSL.
3. H-hour values were determined by interpolation between the H-1¾ and H+1¼ hour values.
4. The surface air pressure was 13.10 psi, the temperature -2.0°C and the relative humidity 73%.

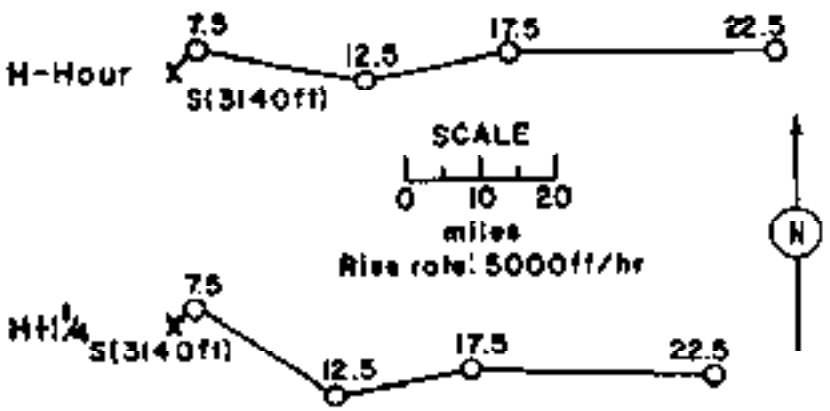


Figure 7. Hodographs for Operation Ranger - Able.

OPERATION RANGER - Baker-1

	PST	GMT
DATE:	28 Jan 1961	28 Jan 1961
TIME:	0512	1312

Sponsor: [AEC]

SITE: NTS - Frenchman Flat
36° 48' N
115° 57' W
Site elevation: 3,166 ft

TOTAL YIELD: 8 kt

HEIGHT OF BURST: 1,080 ft

TYPE OF BURST AND PLACEMENT:
Air burst

FIREBALL DATA:

Time to 1st minimum:	6.6 msec
Time to 2nd maximum:	NM
Radius at 2nd maximum:	NM

CLOUD TOP HEIGHT: 39,000 ft MSL
CLOUD BOTTOM HEIGHT: Not available

CRATER DATA: None

REMARKS:

No local fallout. An isodose-activity pattern was constructed from readings taken from 2½ hours and to 5½ hours along one azimuth west of GZ. No decay correction was given. All the values below 20 mr/hr were measured with Geiger-Mueller Type 26100A survey instruments. The values above 20 mr/hr were measured with high- and low-range Jano ionization-type meters.

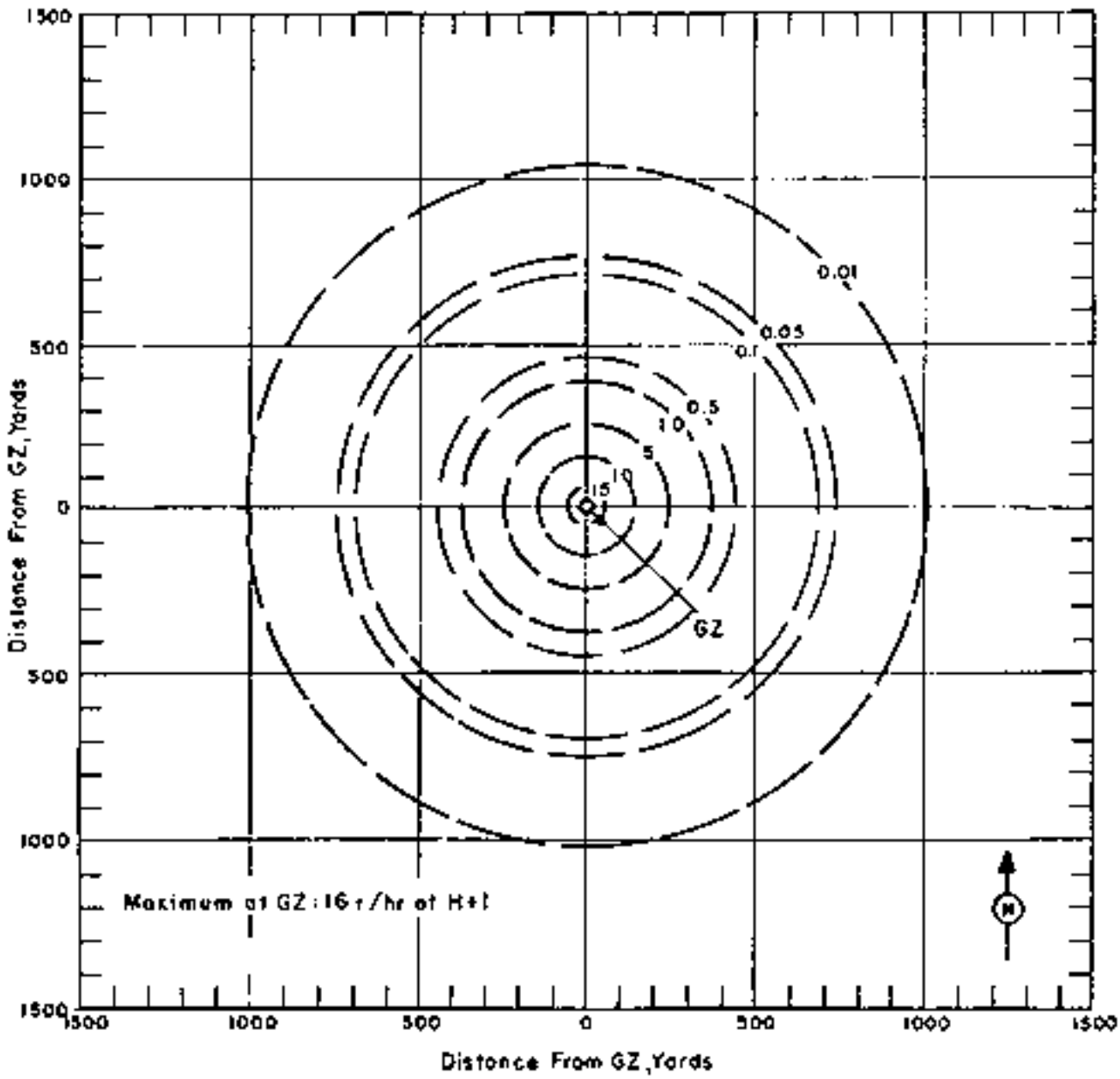


Figure 8. Operation RANGER - Baker. On-site dose rate contours in r/hr at H+1 hour.

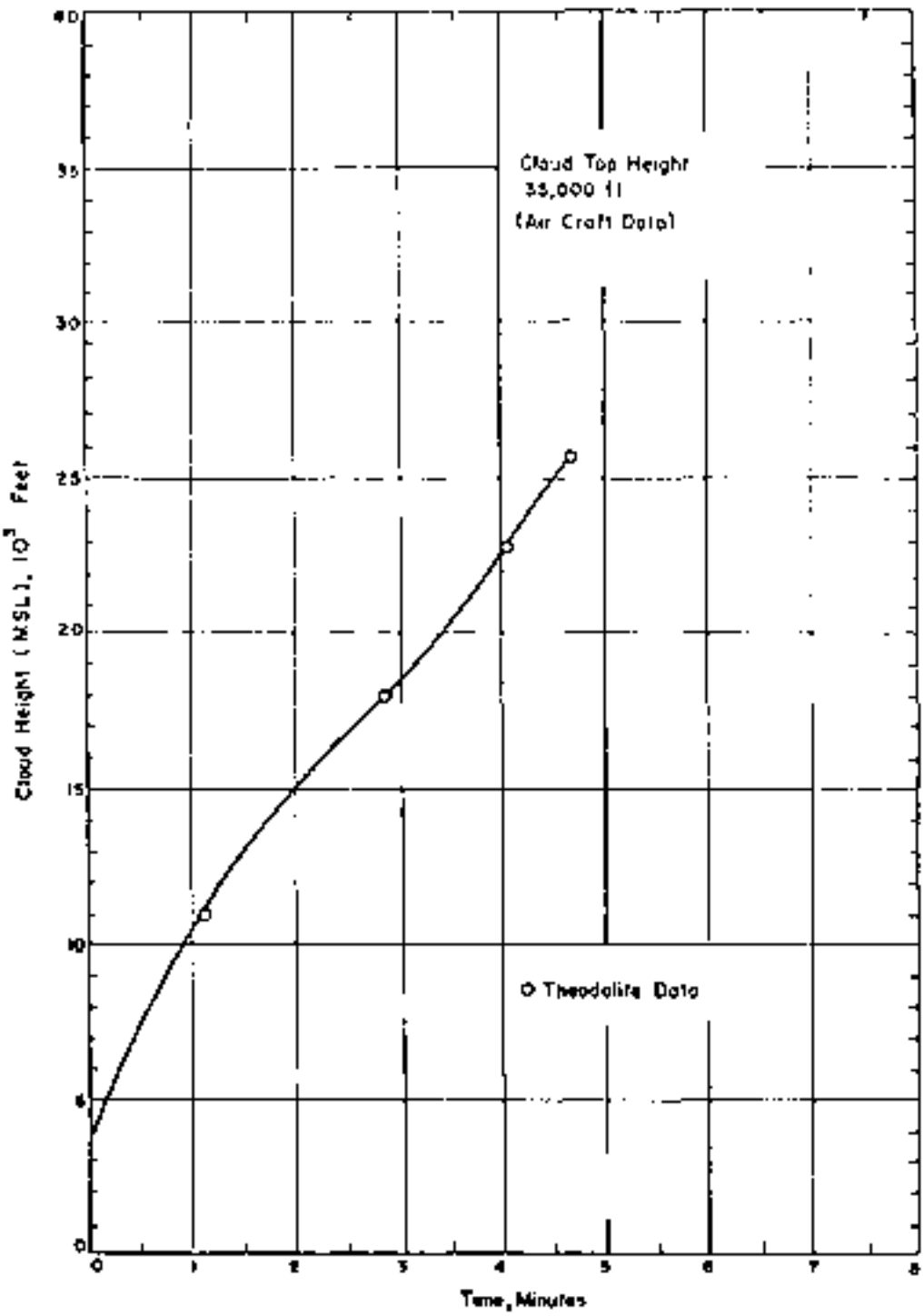


Figure 9. Cloud Dimensions: Operation RANGER - Baker 1.

TABLE 3 NEVADA WIND DATA FOR OPERATION RANGER BARGE-1

Altitude (MSL)	H-½ hours		H-hour		H+½ hours	
	Dir	Speed	Dir	Speed	Dir	Speed
Feet	degrees	mph	degrees	mph	degrees	mph
Surface	200	03	190	07	180	09
4,000	200	06	190	07	190	09
5,000	240	13	240	12	240	12
6,000	230	18	240	15	240	14
7,000	240	15	250	10	250	07
8,000	260	12	270	09	270	08
10,000	260	13	280	15	300	18
12,000	250	15	270	18	290	21
15,000	---	--	(310)	(23)	(310)	(23)
16,000	---	--	310	24	310	24
18,000	---	--	310	31	310	31
20,000	---	--	300	26	300	26
25,000	---	--	290	41	290	41
30,000	---	--	290	38	290	38

NOTES:

1. Numbers in parenthesis are estimated values.
2. Wind data was obtained from the Ranger control point located on the slope of a mountain approximately 10 miles (in a southwesterly direction) from Frenchman Lake.
3. Tropopause height was 32,000 ft MSL.
4. H-hour values were determined by interpolation between the H-½ and H+½ hour values.
5. The surface air pressure was 13.04 psi, the temperature -2.8°C, and the relative humidity 87%.

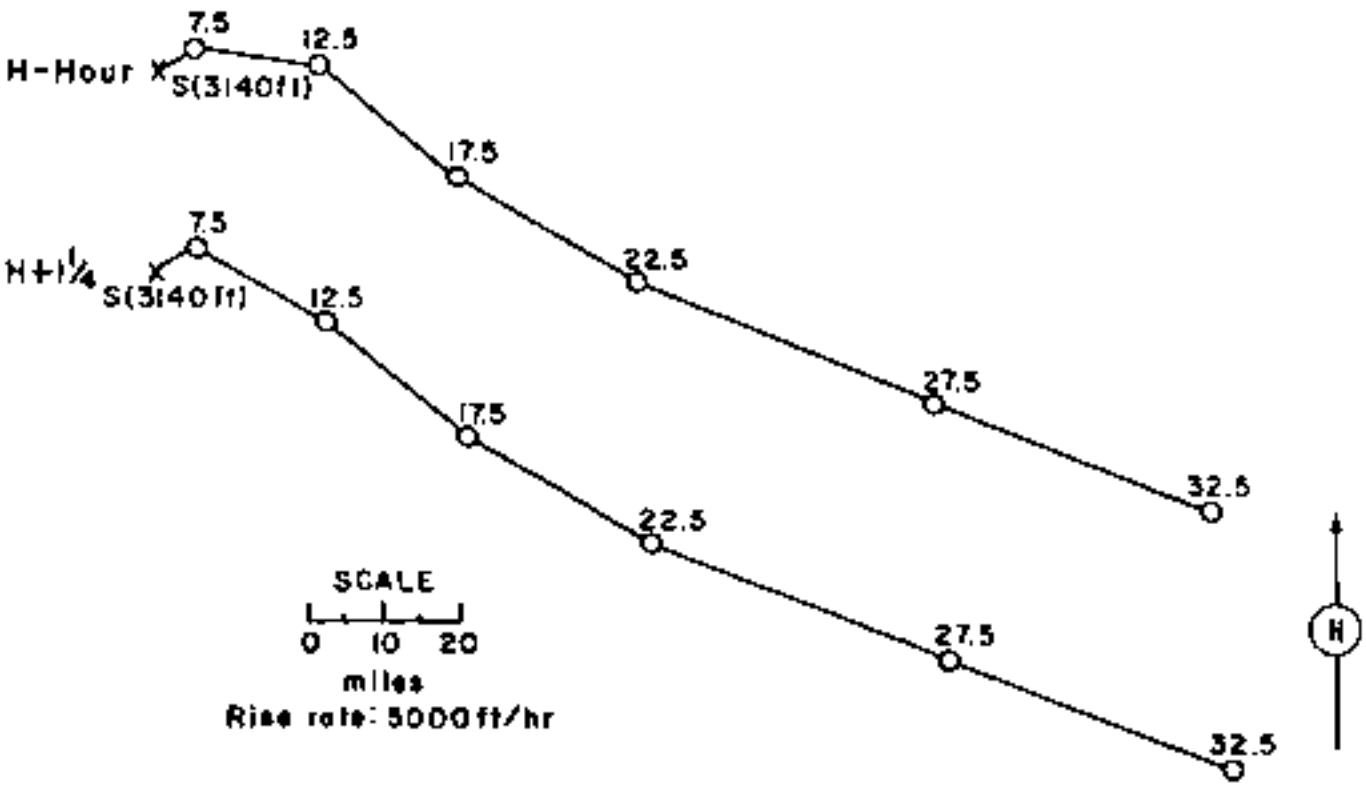


Figure 10. Hodographs for Operation RANGER - Baker-1.

OPERATION RANGER - Easy

	PST	GMT
DATE:	1 Feb 1951	1 Feb 1951
TIME:	0947	1747

TOTAL YIELD: 1 kt

Sponsor: LASL

SITE: NTS - Frenchman Flat
36° 48' N
115° 57' W
Site elevation: 3,140 ft

HEIGHT OF BURST: 1,080 ft

TYPE OF BURST AND PLACEMENT:
Air burst

FIREBALL DATA:
Time to 1st minimum: 5.0 msec
Time to 2nd maximum: NM
Radius at 2nd maximum: NM

CLOUD TOP HEIGHT: 12,500 ft MSL
CLOUD BOTTOM HEIGHT: Not available

CRATER DATA: No crater

REMARKS:

No local fallout. Induced activity pattern was constructed from readings taken from H+1 hour and to H+2½ hours along four azimuths: north, east, south, and west. No decay correction was used. All the values below 20 mr/hr were measured with Geiger-Mueller type 2612A survey instruments. The values above 20 mr/hr were measured with high- and low-range Juno ionization-type meters.

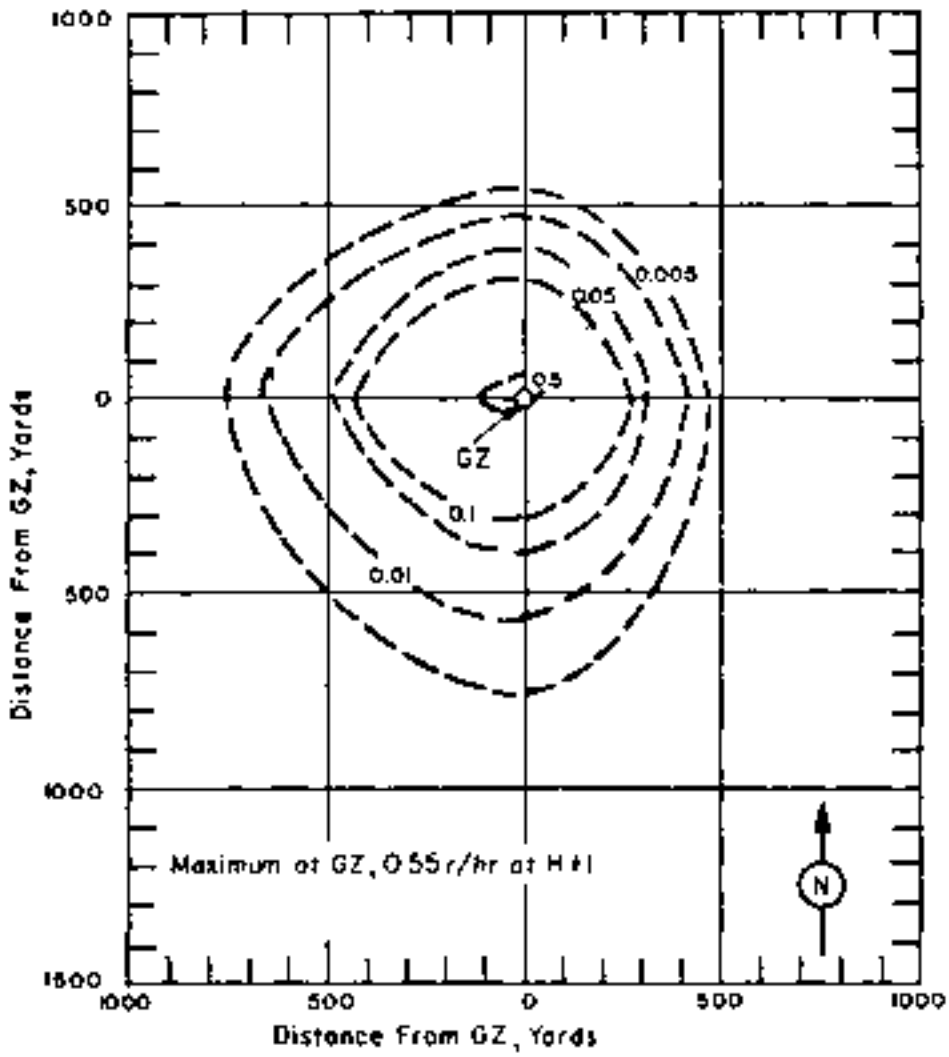


Figure 11. Operation RANGER - Easy. On-site dose rate contours in r/hr at H+1 hour.

TABLE 4 NEVADA WIND DATA FOR OPERATION ROUGH - RAGS

Altitude (MSL)	11-1/4 hours		12-hour		11+1/4 hours	
	Dir	Speed	Dir	Speed	Dir	Speed
feet	degrees	mph	degrees	mph	degrees	mph
Surface	020	03	010	02	Calm	Calm
4,000	020	05	010	02	Calm	Calm
5,000	020	17	030	11	040	06
6,000	100	09	060	10	010	10
7,000	050	16	360	16	340	21
8,000	360	23	340	29	330	32
9,000	340	31	340	26	340	24
10,000	340	26	340	30	340	32
12,000	330	26	340	49	340	62

NOTES:

1. 12-hour values were determined by interpolation between the 11-3/4 and 11+1/4 hour values.
2. Wind data was obtained from the Ranger control point located on the slope of a mountain approximately 17 miles (in a southwesterly direction) from Frenchman Lake.
3. Tropopause height was 35,000 ft MSL.
4. The surface air pressure was 13.33 psi, the temperature -11.5°C and the relative humidity 35%.

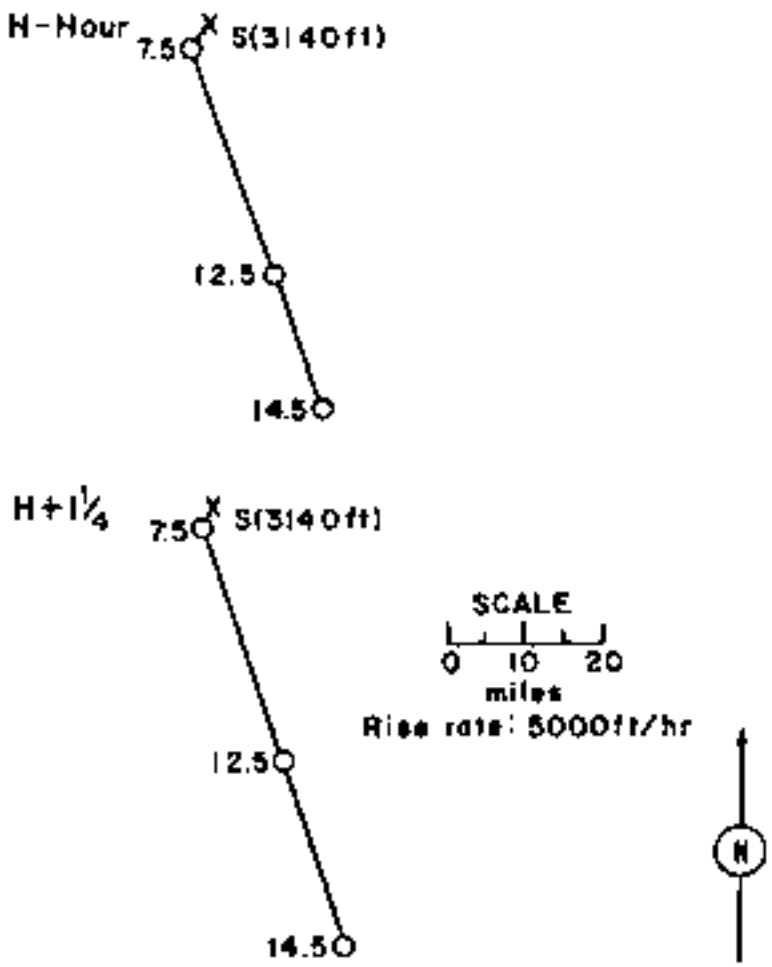


Figure 12. Hodographs for Operation RANGER - Easy.

OPERATION RANGER - Baker 2

	PST	GMT
DATE:	2 Feb 1951	2 Feb 1951
TIME:	0649	1349

Sponsor: LASL

SITE: NTS - Frenchman Flat
36° 48' N
115° 57' W
Site elevation: 3,140 ft

TOTAL YIELD: 8 kt

HEIGHT OF BURST: 1,100 ft

TYPE OF MOUNT AND PLACEMENT:
Air burst

FIREBALL DATA:
Time to 1st minimum: 8.9 to 9.2 msec
Time to 2nd maximum: NM
Radius at 2nd maximum: NM

CLOUD TOP HEIGHT: 25,000 ft MSL
CLOUD BOTTOM HEIGHT: Not available

CRATER DATA: No crater

REMARKS:

No local fallout. Induced-activity pattern was constructed from 8 surveys made from H+1 and to H+28 hours along stakes placed 100 yd apart on four azimuths, north, east, south, and west. Decay corrections were made from measurements along the west azimuth. All the values below 20 mr/hr were measured with Geiger-Mueller type 2610A survey instruments. The values above 20 mr/hr were measured with high- and low-range Juno ionization-type meters.

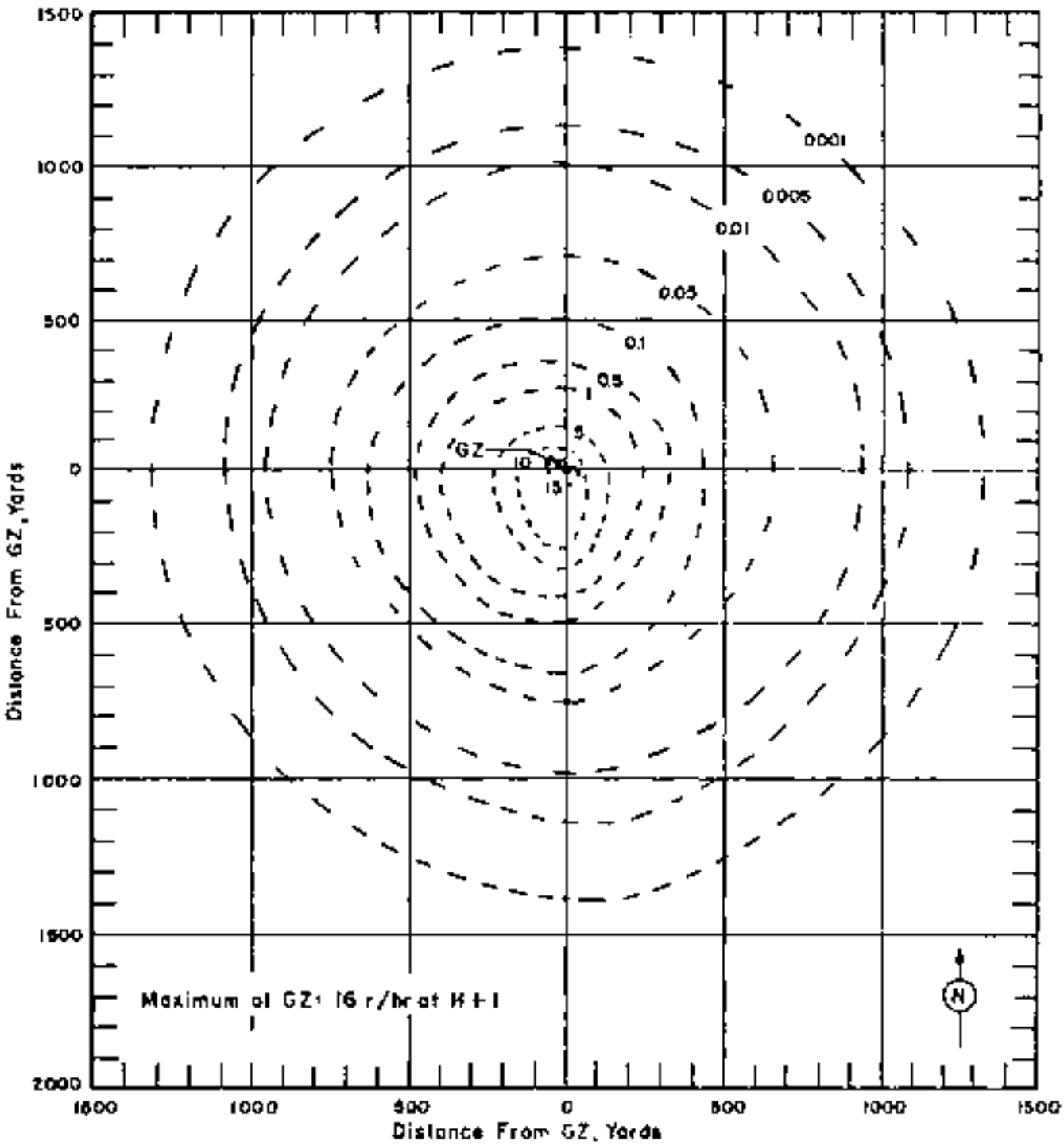


Figure 13. Operation RANGER - Baker 2. On-site dose rate contours in r/hr at H+1 hour.

TABLE 5 NEVADA WIND DATA FOR OPERATION RANGER — BAKER-2

Altitude (MSL.)	H-1½ hours		H-hour		H+1½ hours	
	Dir	Speed	Dir	Speed	Dir	Speed
feet	degrees	mph	degrees	mph	degrees	mph
Surface	Calm	Calm	Calm	Calm	Calm	Calm
4,000	Calm	Calm	Calm	Calm	Calm	Calm
5,000	180	02	190	02	190	02
6,000	240	01	230	05	220	07
7,000	190	10	210	19	220	17
8,000	190	22	210	26	230	30
9,000	240	26	250	26	260	26
10,000	260	24	260	25	270	28
12,000	280	29	290	33	290	36
14,000	290	22	290	35	290	43
15,000	---	--	(290)	(45)	(290)	(45)
16,000	---	--	290	57	290	57
18,000	---	--	280	43	280	43
20,000	---	--	290	51	290	51

NOTES:

1. Numbers in parentheses are estimated values.
2. Wind data was obtained from the Ranger control point located on the slope of a mountain approximately 12 miles (in a southwesterly direction) from Frenchman Lake.
3. H-hour values were determined by interpolating between the H-1½ and H+1½ hour values.
4. Tropopause height was 38,000 ft MSL.
5. The surface air pressure was 12.81 psi, the temperature -9.2°C and the relative humidity 79%.

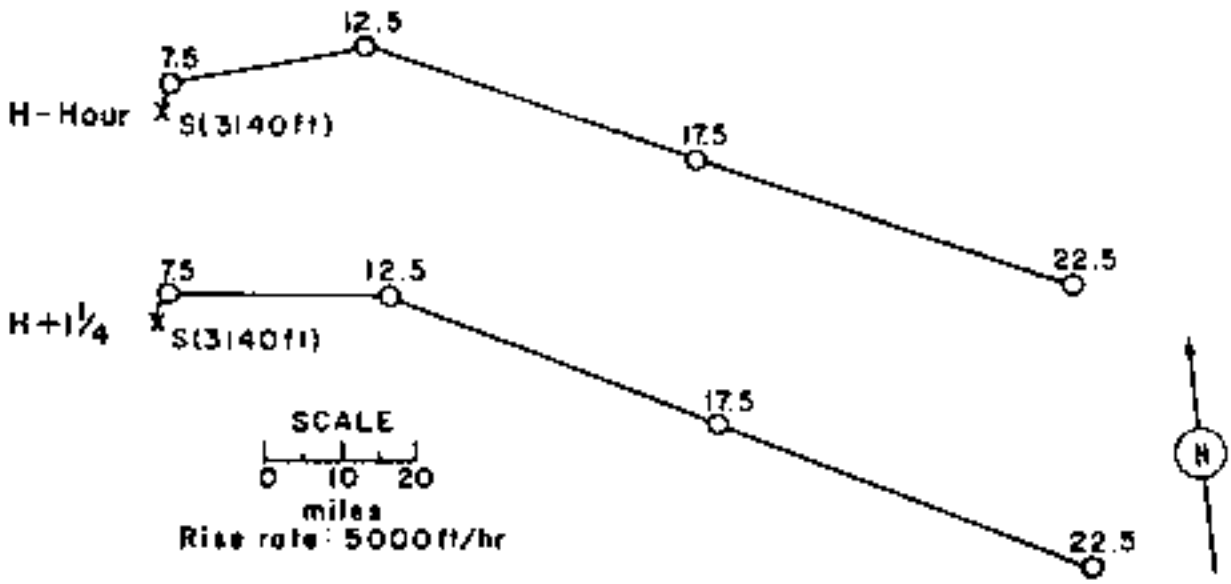


Figure 14. Hodographs for Operation RANGER - Baker-2.

OPERATION RANGER - Fox

	PST	GMT
DATE:	6 Feb 1951	6 Feb 1951
TIME:	0547	1347

Sponsor: LASL

SITE: NTS - Frenchman Flat
30° 48' N
115° 57' W
Site elevation: 3,140 ft

TOTAL YIELD: 22 kt

HEIGHT OF BURST: 1,435 ft

TYPE OF BURST AND PLACEMENT:
Air burst

FIREBALL DATA:
Time to 1st minimum: 7.6 to 15.4 msec
Time to 2nd maximum: NM
Radius at 2nd maximum: NM

CLOUD TOP HEIGHT: 43,000 ft MSL
CLOUD BOTTOM HEIGHT: 27,000 ft MSL

CRATER DATA: No Crater

REMARKS:

No local fallout. Induced-activity pattern was constructed from readings taken from H+$\frac{2}{3}$ hours and to H+1$\frac{1}{2}$ hours along azimuth. No decay correction was used. All the values below 20 mr/hr were measured with Geiger-Mueller type-261GA survey instruments. The values above 20 mr/hr were measured with high- and low-range Juno ionization-type meters.

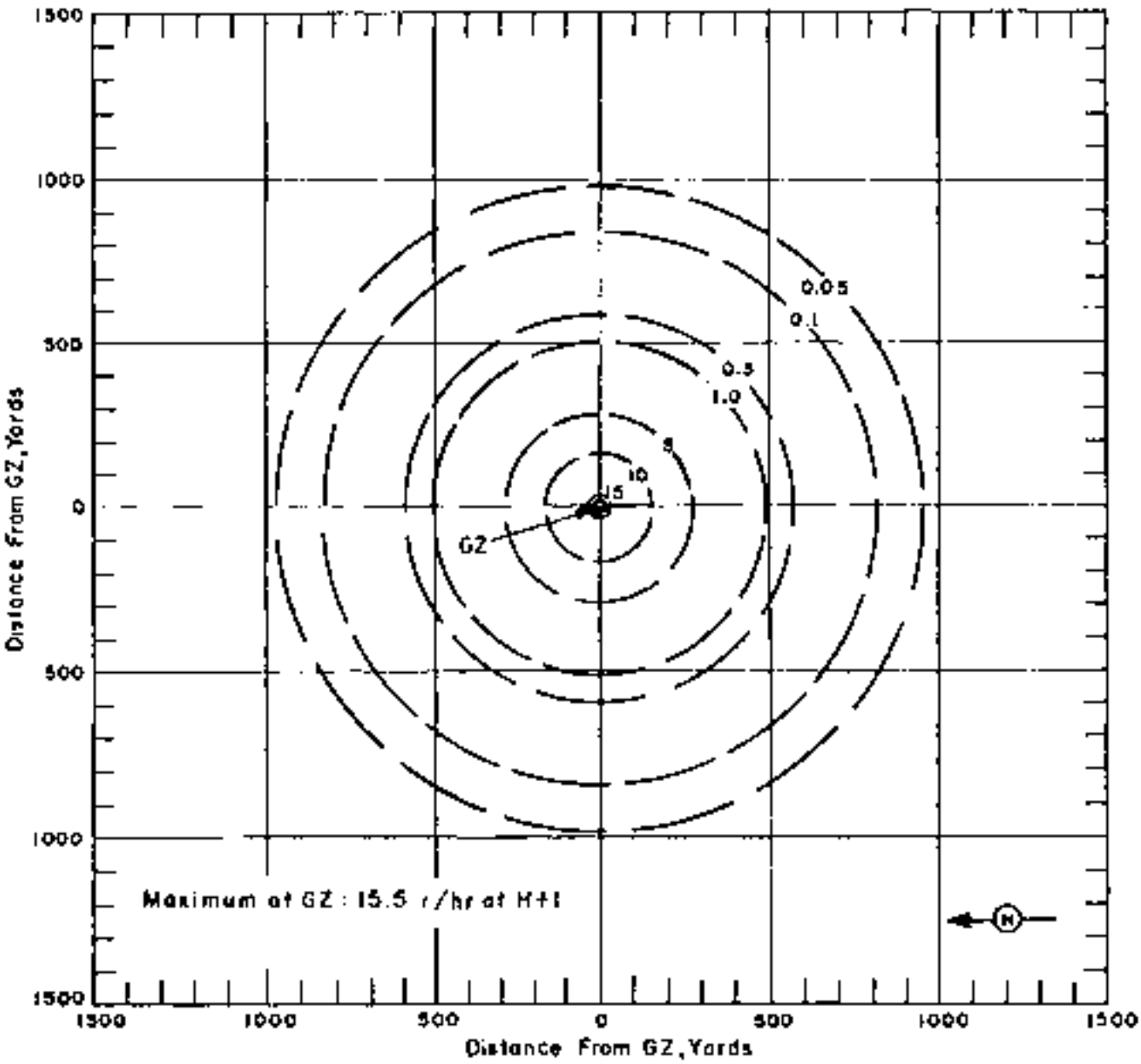


Figure 15. Operation RANGER - Fox. On-site dose rate contours in r/hr at H+1 hour.

TABLE 6 NEVADA WIND DATA FOR OPERATION RANGER FOX

Altitude (MSL)	H+½ hours	
	Dir	Speed
feet	degrees	mph
Surface	150	09
4,000	140	02
5,000	350	05
6,000	350	10
7,000	310	09
8,000	270	12
9,000	290	21
10,000	310	31
12,000	330	51
14,000	340	49
15,000	(340)	(53)
16,000	330	56
18,000	330	45
20,000	310	56
25,000	300	58
30,000	290	52

NOTES:

1. Numbers in parentheses are estimated values.
2. Wind data was obtained from the Ranger control point located on the slope of a mountain approximately 10 miles (in a southwesterly direction) from Frenchman Lake.
3. Tropopause height was 40,000 ft MSL.
4. The surface air pressure was 13.18 psi, the temperature -2.0°C and the relative humidity 85%.

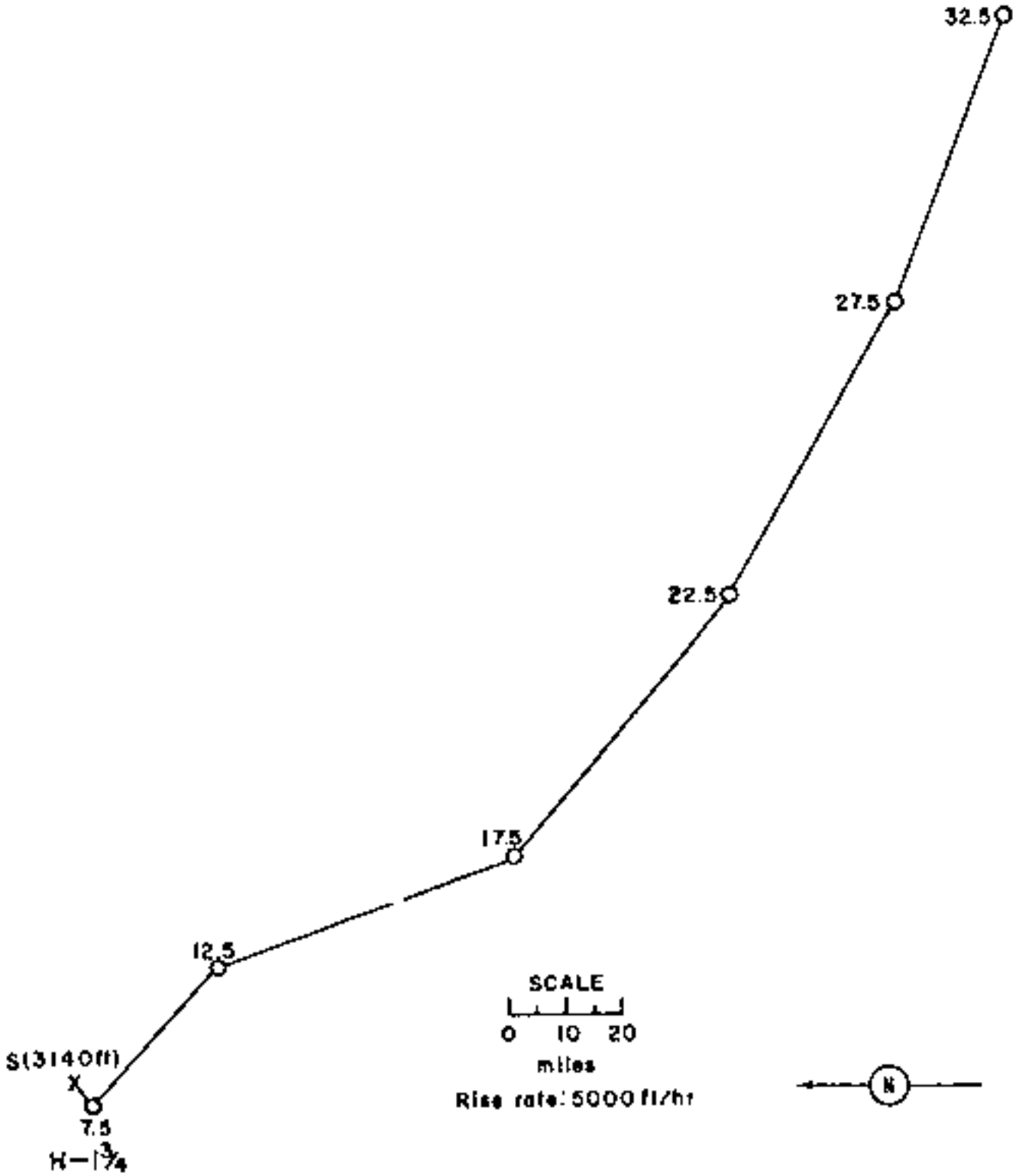
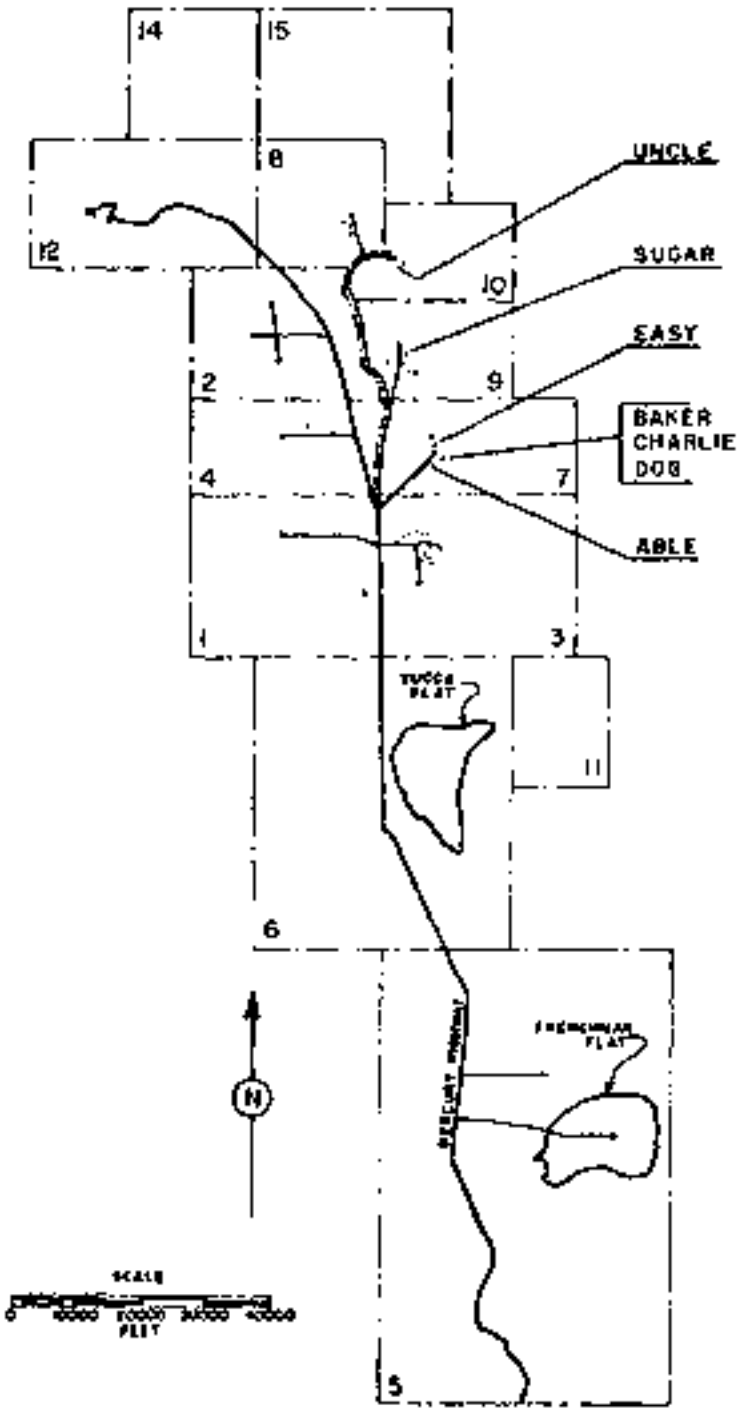


Figure 16. Hodograph for Operation RANGER - Fox.



NEVADA TEST SITE

Figure 17. Operation HUSTLER-JANGLE, Shot Locations.

OPERATION BUSTER - JANGLE - Able

	PST	GMT
DATE:	29 Oct 1951	29 Oct 1951
TIME:	0600	1400

Sponsor: LASL

SITE: NTS - Area 7 - Station 5
37° 05' 02" N
116° 01' 26" W
Site elevation: 4,169.17 ft

TOTAL YIELD: <0.1 kt

HEIGHT OF BURST: 100 ft

FIREBALL DATA:
Time to 1st minimum: NM
Time to 2nd maximum: NM
Radius at 2nd maximum: NM

TYPE OF BURST AND PLACEMENT:
Tower burst over Nevada soil

CRATER DATA: No crater

CLOUD TOP HEIGHT: 8,000 ft MSL
CLOUD BOTTOM HEIGHT: 6,700 ft MSL

REMARKS:

Gamma contamination was insignificant. The alpha contamination shown is based upon readings taken on 2 July and 7-1 and is reported in counts per minute with 50% geometry. Missiles were scattered over a 500-yard radius. Readings on some pieces were greater than 20,000 counts per minute.

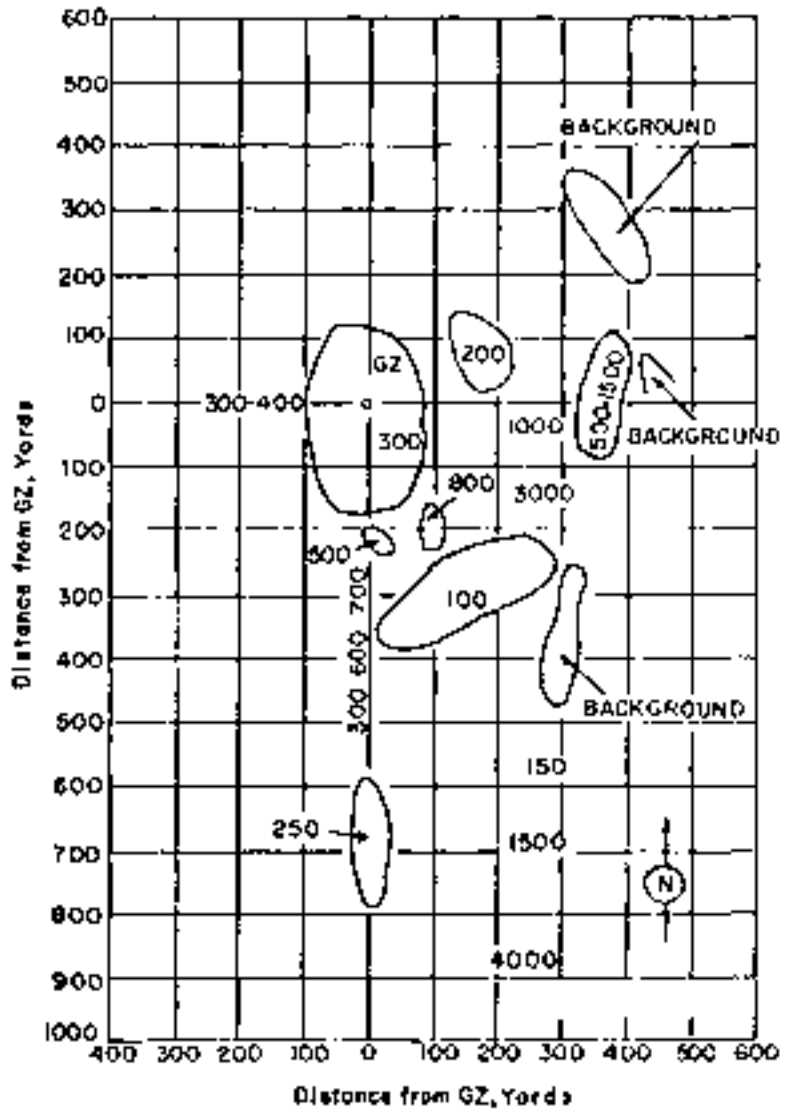


Figure 18. Operation BUSTER-JANGLE - Able.
Alpha contamination designated in counts per minute with 50% geometry.

TABLE 7 NEVADA WIND DATA FOR OPERATION BUSTER-JANGLE — ABLE

Altitude (MSL)	H-hour		H+1 hour		H+7 hours	
	Dir	Speed	Dir	Speed	Dir	Speed
feet	degrees	mph	degrees	mph	degrees	mph
Surface	320	06	320	09	270	07
5,000	320	10	320	10	320	07
6,000	310	17	310	17	320	05
7,000	310	20	310	20	330	03
8,000	310	20	310	20	330	06
9,000	310	21	310	21	320	07
10,000	300	20	300	20	300	07
12,000	320	29	320	29	320	22
14,000	320	39	320	39	320	33
15,000	---	--	320	41	310	38
16,000	320	54	320	54	310	43
18,000	320	55	320	55	310	39
20,000	320	47	320	47	320	57
23,000	---	--	320	55	---	--
25,000	320	61	---	--	320	87

NOTE:
Wind data was obtained by the Mercury Weather Station located at the C. P. At H-hour the pressure at ground zero was 874 mb, the temperature 5.8°C and the relative humidity 22 percent.

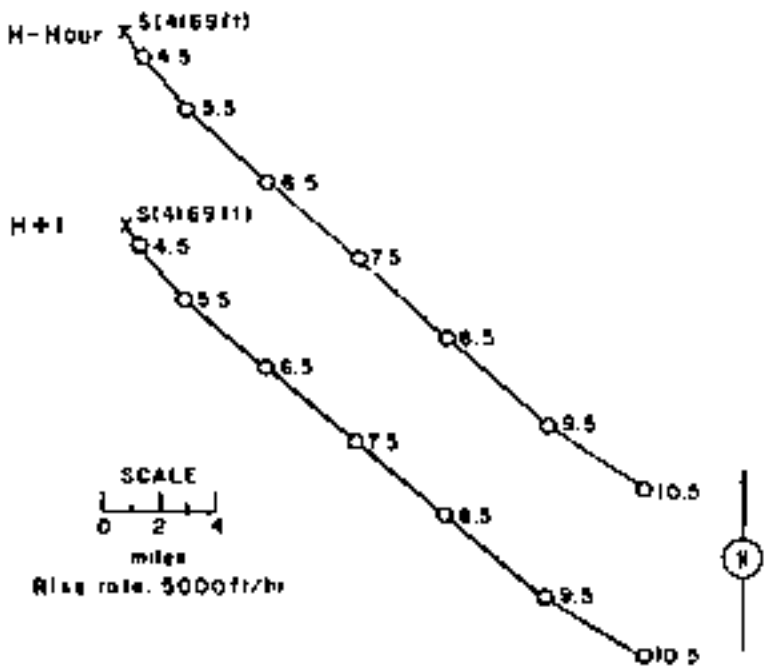


Figure 19. Hodographs for Operation BUSTER-JANGLE — Able.

OPERATION BUSTER-JANGLE - Baker

	PST	GCT
DATE:	28 Oct 1951	28 Oct 1951
TIME:	0720	1520

Sponsor: LASL

SITE: N25 - Area 7 - Station 3
37° 05' 06" N
116° 01' 12" W
Site elevation: 4,193 ft

TOTAL YIELD: 3.5 kt

HEIGHT OF BURST: 1,118 ft

CLOUD TOP HEIGHT: 31,700 ft MSL
CLOUD BOTTOM HEIGHT: 23,000 ft MSL

FIREBALL DATA:
Time to 1st minimum: 5.5 to 6.0 msec
Time to 2nd maximum: NM
Radius at 2nd maximum: NM

CRATER DATA: No crater

TYPE OF BURST AND PLACEMENT:
Air burst over Nevada soil

REMARKS:

The contours resulting from this shot were due primarily to neutron-induced activity. Readings were obtained by monitors during area surveys or recovery operations and were taken 3 ft above ground with TIB or CD-V-10 ionization-chamber survey meters. The pattern was obtained from readings taken at H+11 hours and corrected to H+1 hour, using the decay curve for neutron-induced activity in Nevada soil

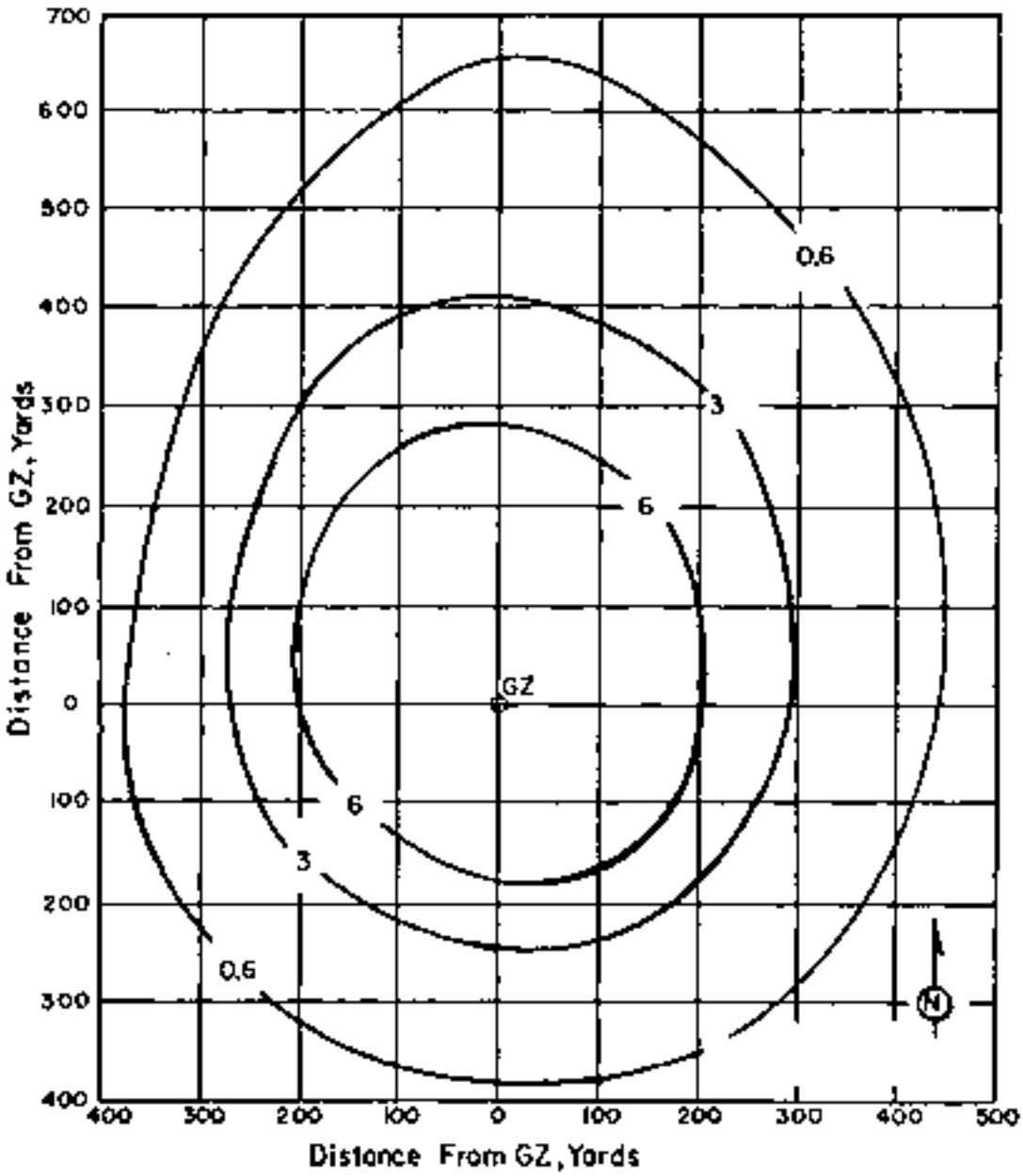


Figure 20. Operation BUSTER-JANGLE - Baker.
On-site dose rate contours in r/hr at H+1 hour.

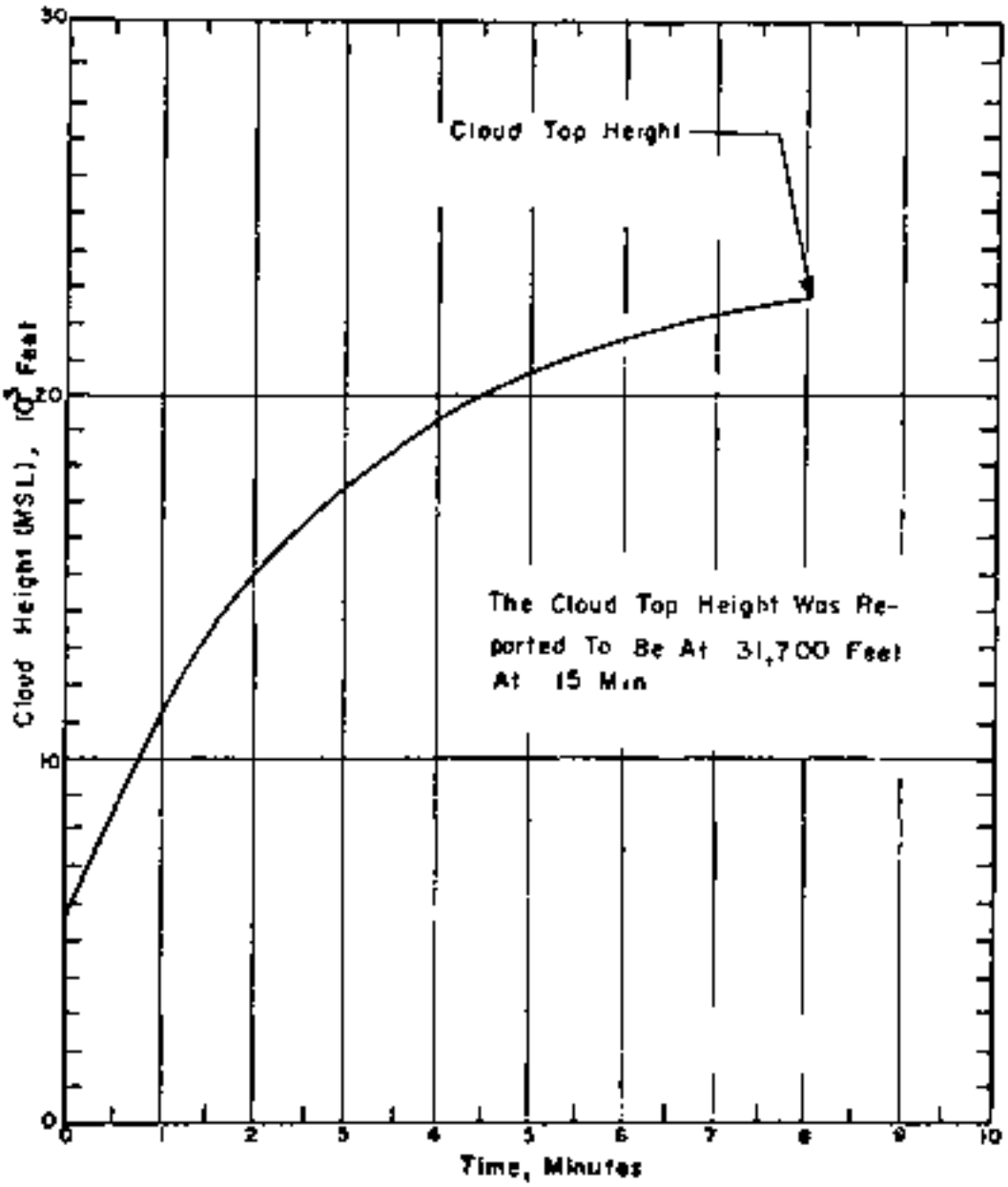


Figure 21. Cloud Dimensions: Operation BUSTER-JANGLE - Baker.

TABLE 8 NEVADA WIND DATA FOR OPERATION BUSTER-JANGLE BAKER

Altitude (MSL)	H-hour		H+20 hours	
	Dir	Speed	Dir	Speed
feet	degrees	mph	degrees	mph
Surface	320	10	340	07
5,000	---	--	020	14
6,000	030	23	040	18
7,000	---	--	060	23
8,000	050	29	040	25
9,000	---	--	040	25
10,000	070	17	030	20
12,000	100	16	090	09
14,000	050	17	080	13
15,000	(050)	(20)	(080)	(13)
16,000	050	21	070	14
18,000	050	25	060	18
20,000	050	26	050	26
23,000	050	32	---	--
25,000	050	44	050	24
30,000	060	50	050	22
35,000	060	63	---	--

NOTES:

1. Numbers in parentheses are estimated values.
2. Wind data was obtained by the Mercury Weather Station at the C. P.
3. Tropopause height was 39,000 ft MSL.
4. At H-hour the pressure at ground zero was 877 mb, the temperature 11.-°C and the relative humidity 28 percent.

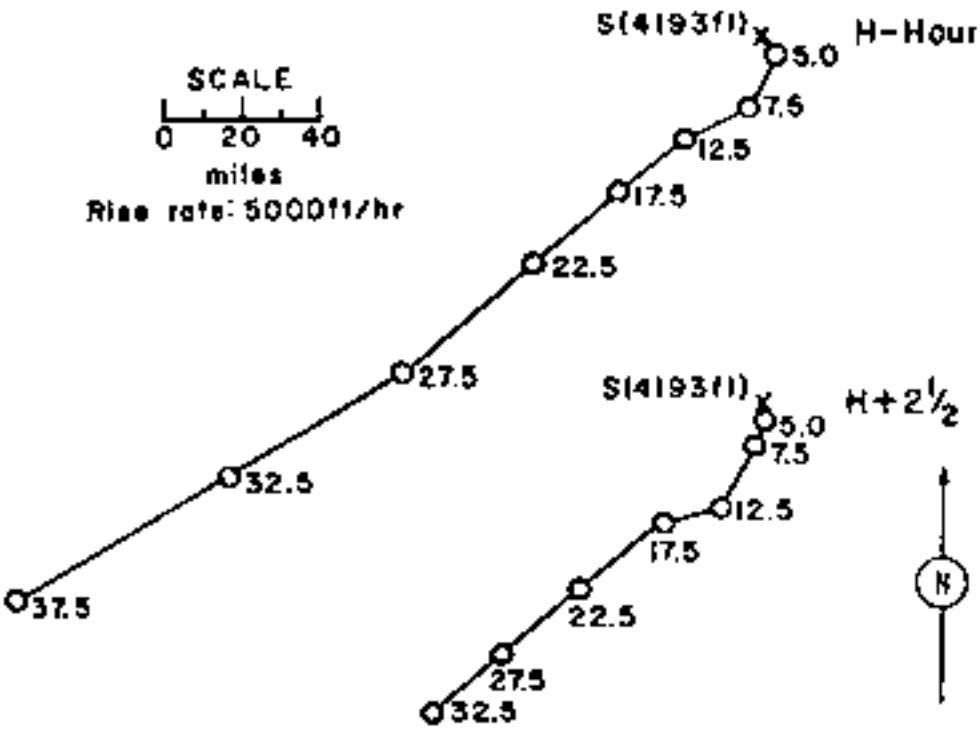


Figure 22. Hodographs for Operation BUSTER-JANGLE - Baker

OPERATION SUGAR-LOAF/LE - Charlie

	PST	GCT
DATE:	20 Oct 1971	20 Oct 1971
TIME:	0700	1500

Sponsor: LASL

SITE: NTS - Area 7 - Station 3
37° 05' 06" N
116° 01' 15" W
Site elevation: 4,195 ft

TOTAL YIELD: 14 kt

HEIGHT OF BURST: 1,132 ft

TYPE OF BURST AND PLACEMENT:
Air burst over Nevada soil

FIREBALL DATA:
Time to 1st minimum: 10.5 to 13.0 msec
Time to 2nd maximum: 120 to 135 msec
Radius at 2nd maximum: 2M

CRATER DATA: No crater

CLOUD TOP HEIGHT: 41,000 ft MSL
CLOUD BOTTOM HEIGHT: 27,700 ft MSL

REMARKS:

The contours resulting from this shot were due primarily to neutron-induced activity. Readings were obtained by monitors during area surveys or recovery operations and were taken 3 ft above ground with T1B or SU-1C ionization-chamber survey meters. The pattern was obtained from readings taken at H+9 hours and corrected to H+1 hour using the decay curve for neutron-induced activity in Nevada soil,

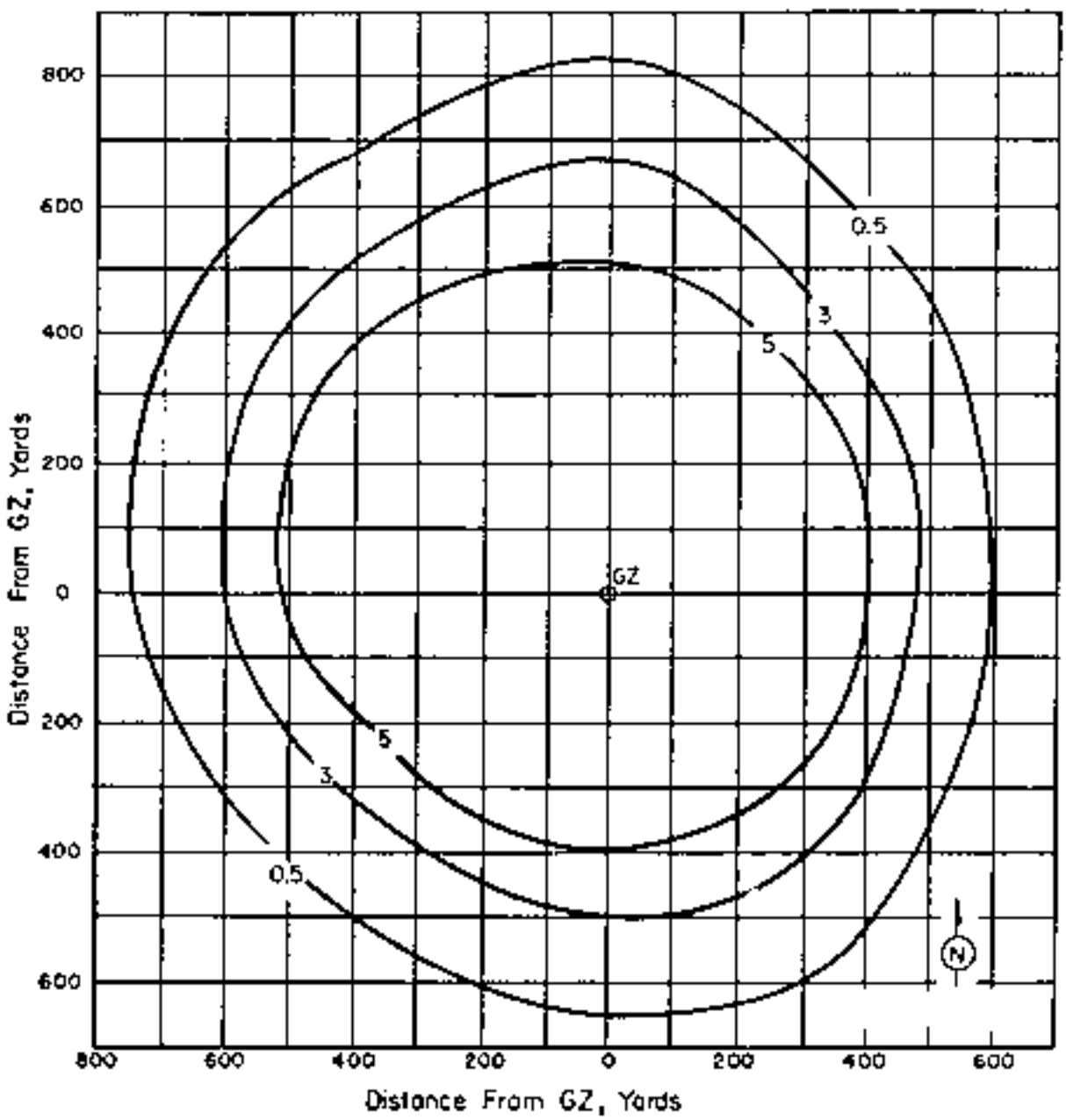


Figure 23. Operation BUSTER-JANGLE - Charlie.
On-site dose rate contours in r/hr at H+1 hour.

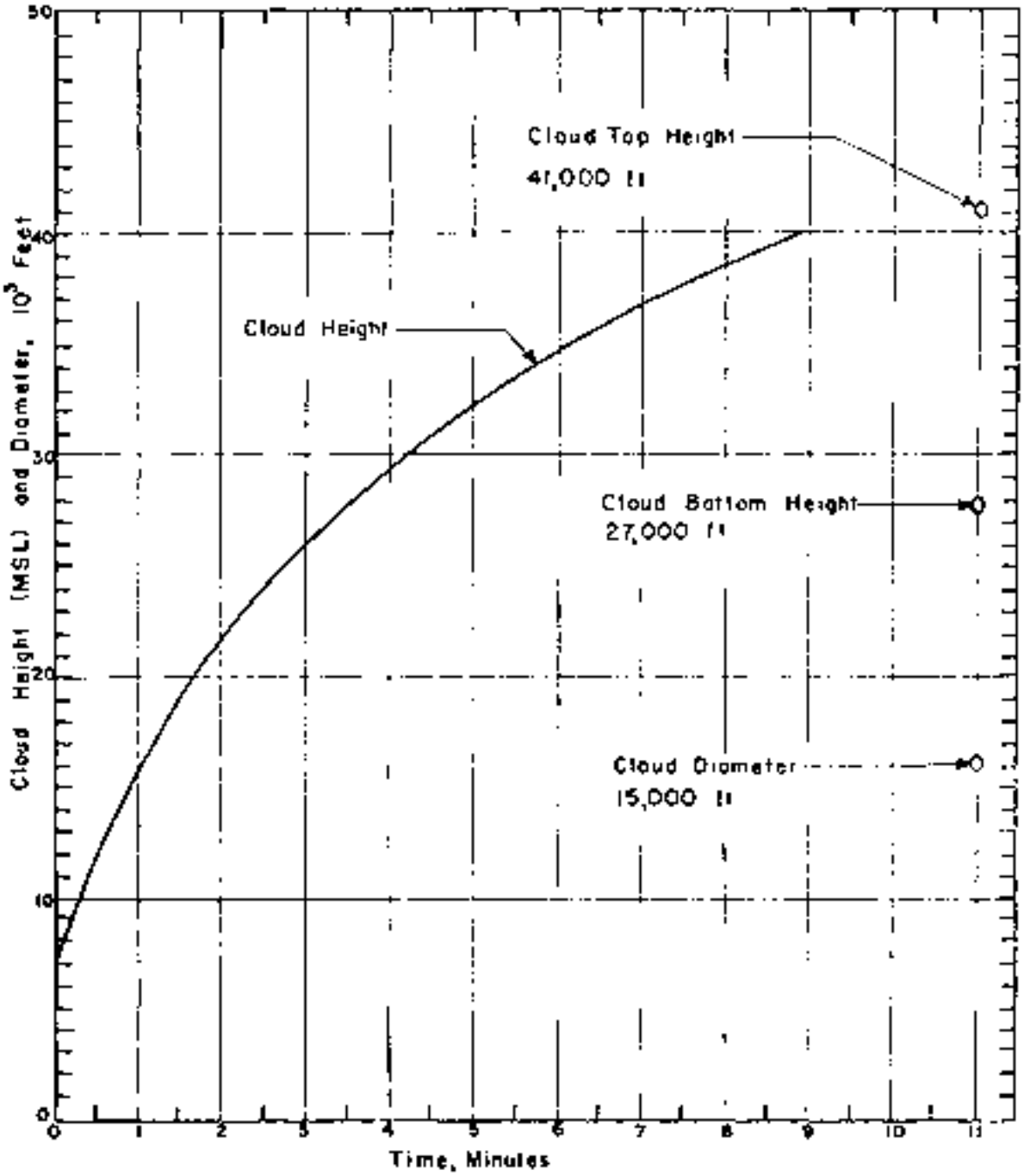


Figure 24. Cloud Dimensions: Operation DUSTER-JANGLE - Charlie.

TABLE 9 NEVADA WIND DATA FOR OPERATION BUSTER-JANGLE — CHARLIE

Altitude (MSL)	H-hour		H+1 hour		H+3 hours		H+6 hours	
	Dir	Speed	Dir	Speed	Dir	Speed	Dir	Speed
feet	degrees	mph	degrees	mph	degrees	mph	degrees	mph
Surface	360	06	360	06	310	05	090	06
5,000	---	--	340	07	Calm	Calm	040	03
6,000	290	05	290	05	Calm	Calm	030	05
7,000	---	--	290	06	Calm	Calm	350	05
8,000	290	12	290	12	260	08	300	08
9,000	---	--	270	13	270	09	280	08
10,000	230	06	230	06	250	05	290	05
12,000	130	07	130	07	180	06	090	03
14,000	080	09	060	09	100	05	070	05
15,000	(080)	(10)	070	07	090	09	040	10
16,000	080	12	080	12	070	13	050	15
18,000	090	20	090	20	060	20	060	13
20,000	070	24	070	24	050	16	090	10
23,000	060	29	---	--	---	--	---	--
25,000	050	32	050	32	060	25	040	18
30,000	050	35	---	--	050	38	050	28
35,000	050	29	---	--	060	31	030	20
40,000	030	10	---	--	---	--	020	12
45,000	---	--	---	--	---	--	020	05
50,000	---	--	---	--	---	--	290	17

NOTES:

1. Numbers in parentheses are estimated values.
2. Wind data was obtained by the Mercury Weather Station located at the C. P.
3. Tropopause height was 38,000 ft MSL.
4. At H-hour the pressure at ground zero was 872 mb, the temperature 5.3°C and the relative humidity 14 percent.

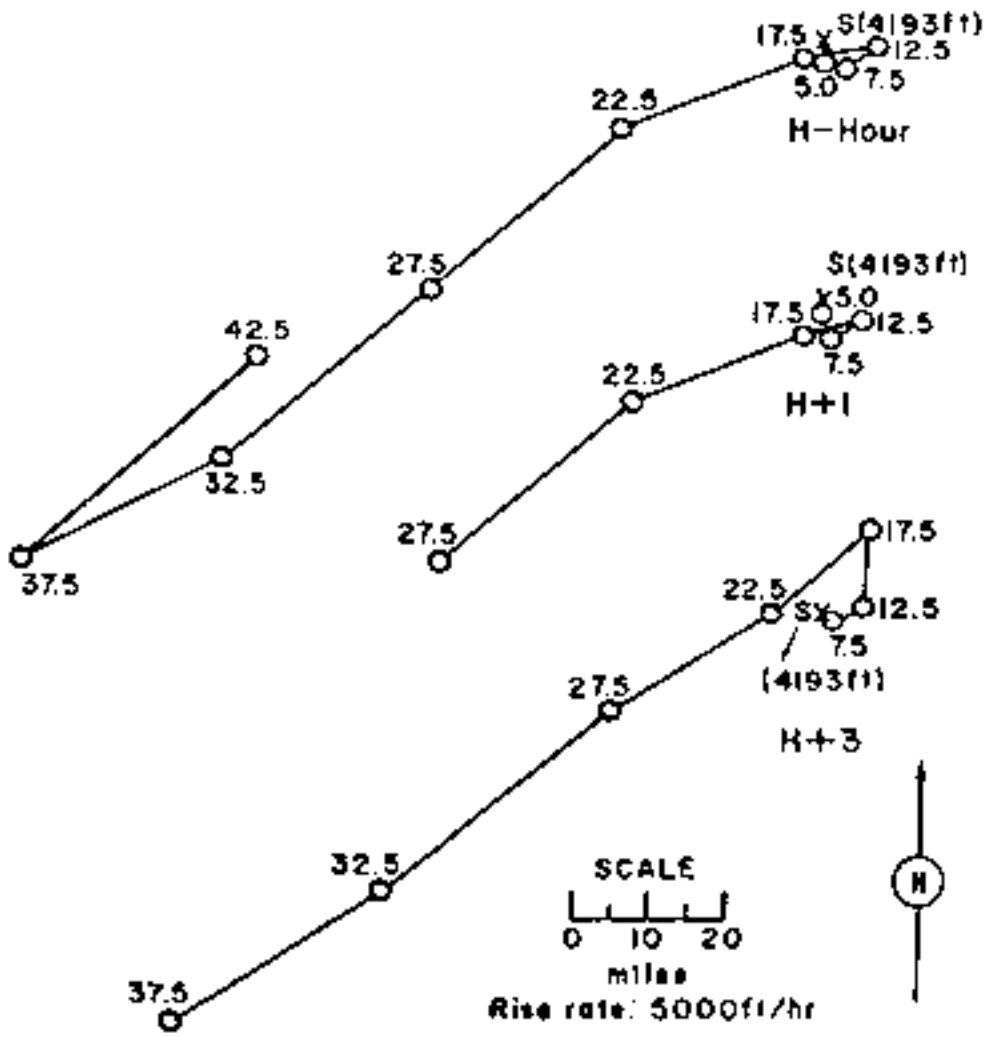


Figure 25 Hodographs for Operation BUSTER-JANGLE - Charlie.

OPERATION BUSTER-JANGLE - Dog

	PST	GCT
DATE:	1 Nov 1951	1 Nov 1951
TIME:	0730	1530

Sponsor: LASL

SITE: NTS - Area 7 - Station 3
37° 05' 39" N
116° 01" 11" W
Site elevation: 4,193 ft

TOTAL YIELD: 21 kt

HEIGHT OF BURST: 1,417 ft

FIREBALL DATA:
Time to 1st minimum: 35.6 msec
Time to 2nd maximum: 160 to 175 msec
Radius at 2nd maximum: 1?1

TYPE OF BURST AND PLACEMENT:
Air burst over Nevada soil

CRATER DATA: No crater

CLOUD TOP HEIGHT: 46,000 ft MSL
CLOUD BOTTOM HEIGHT: 31,000 ft MSL

REMARKS:

The contours resulting from this shot were due primarily to neutron-induced activity. Readings were obtained by monitors during area surveys or recovery operations and were taken 3 ft above ground with T1B or IU-10 ionization-chamber survey meters. The pattern was obtained from readings taken at H+29½ hours and corrected to H+1 hour using the decay curve for neutron-induced activity in Nevada soil

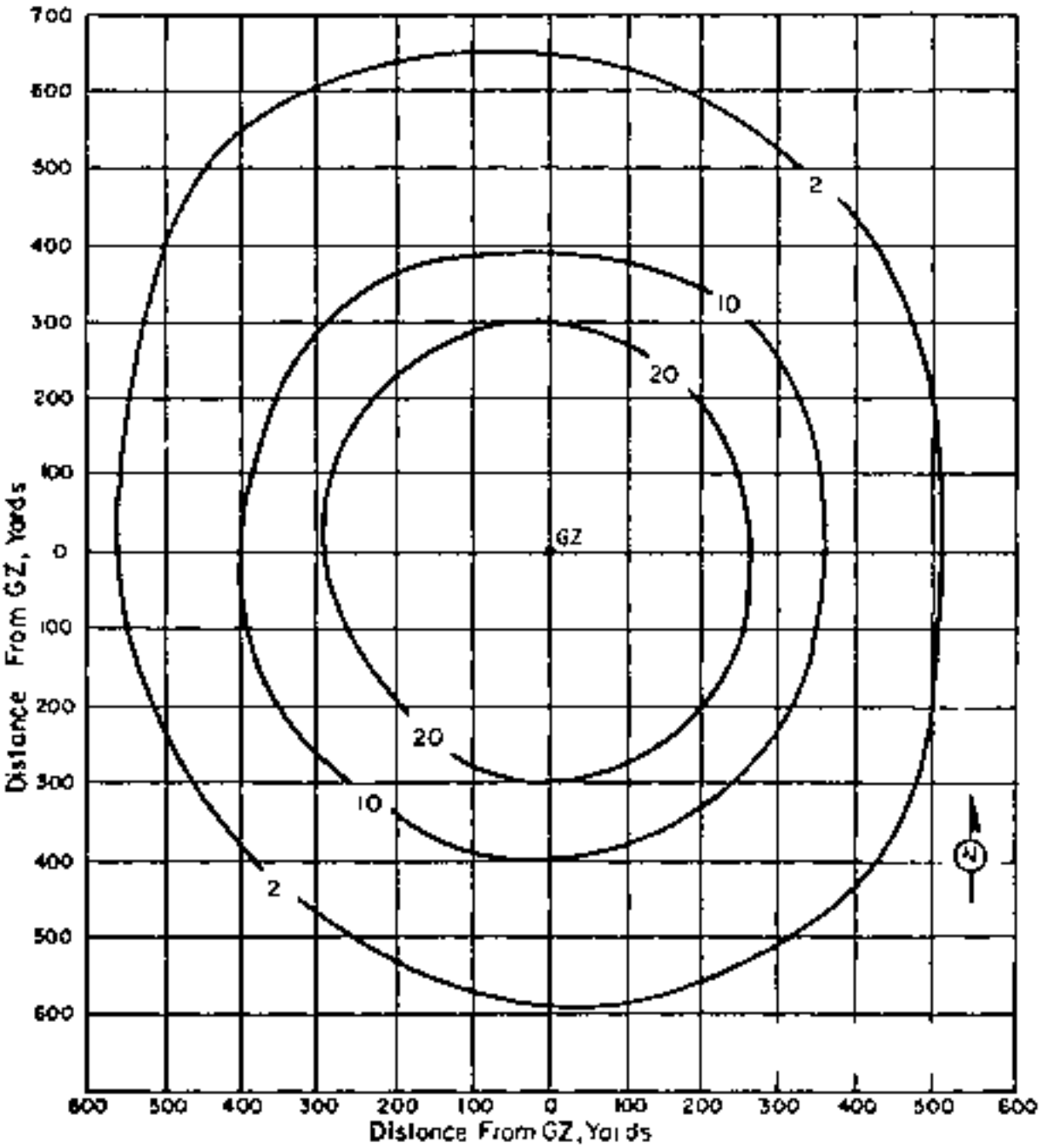


Figure 26. Operation BUSTER-JANGLE - Dog. On-site dose rate contours in r/hr at H+1 hour.

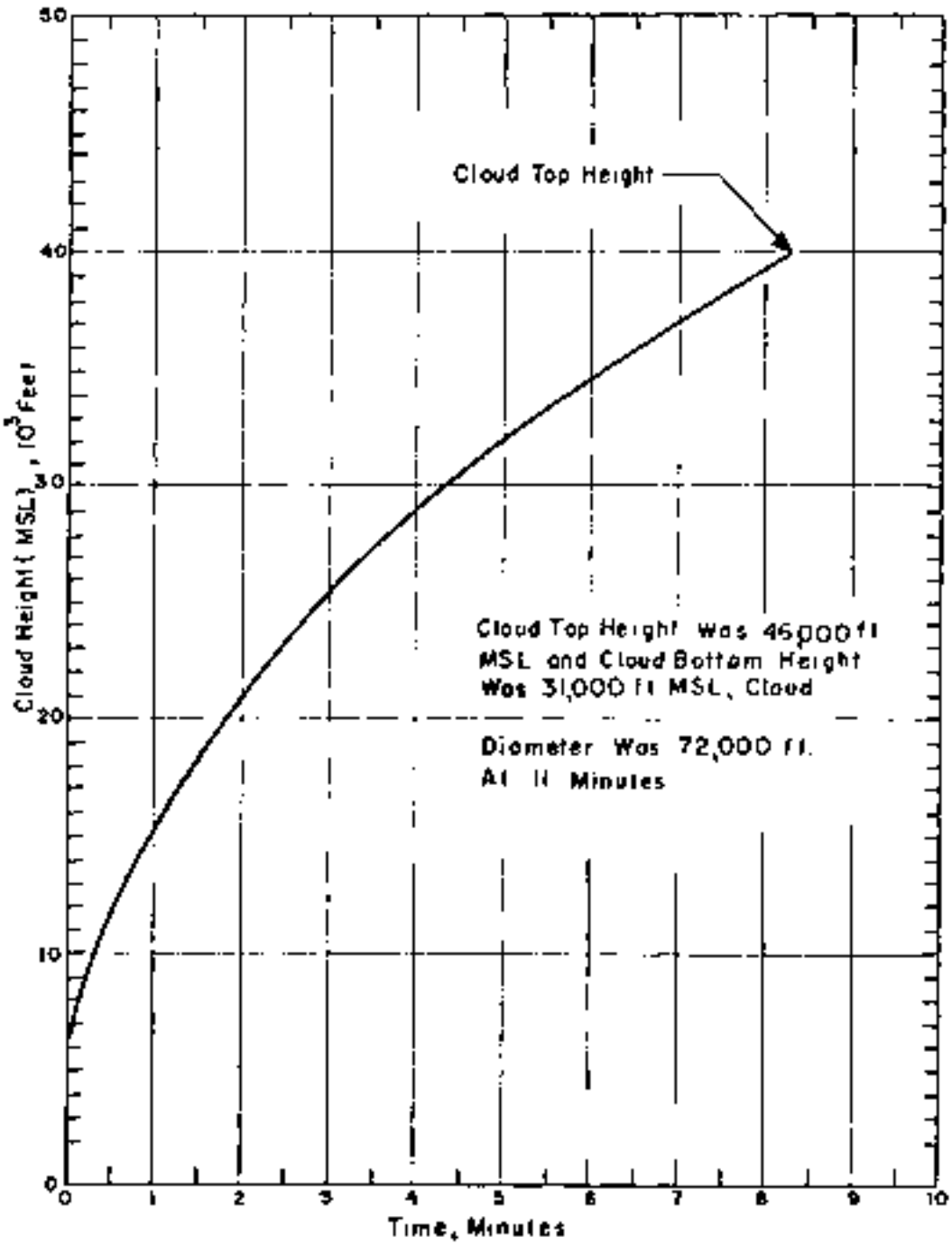


Figure 37. Cloud Dimensions: Operation BUSTER-JANGLE - Dog.

TABLE IC NEVADA WIND DATA FOR OPERATION NOUGAT-JANGLE — DOG

Altitude (MSL)	H-hour		H+1 hours		H+2 hours		H+4 hours	
	Dir	Speed	Dir	Speed	Dir	Speed	Dir	Speed
feet	degrees	mph	degrees	mph	degrees	mph	degrees	mph
Surface	340	02	040	07	350	17	360	08
5,000	---	--	360	07	360	17	020	08
6,000	320	14	330	10	350	19	030	10
7,000	---	--	340	17	330	10	010	15
8,000	320	35	350	24	330	13	350	17
9,000	---	--	350	20	310	18	320	12
10,000	320	37	350	18	340	20	320	16
12,000	320	28	320	21	340	48	340	3,
14,000	320	41	330	50	340	62	340	47
15,000	(320)	(46)	(330)	(46)	(340)	(50)	340	57
16,000	320	48	320	49	---	49	320	46
18,000	320	60	320	53	330	69	330	61
20,000	320	63	320	54	330	70	330	60
23,000	320	50	---	--	---	--	---	--
25,000	320	53	330	52	---	--	---	--
30,000	320	73	---	--	---	--	---	--
35,000	320	76	---	--	---	--	---	--
40,000	320	80	---	--	---	--	---	--

NOTES:

1. Numbers in parentheses are estimated values.
2. Wind data was obtained by the Mercury Weather Station located at the C. P.
3. Tropopause height was 38,000 ft MSL.
4. At H-hour the pressure at ground zero was 976 mb, the temperature 15.5°C and the relative humidity 43 percent.

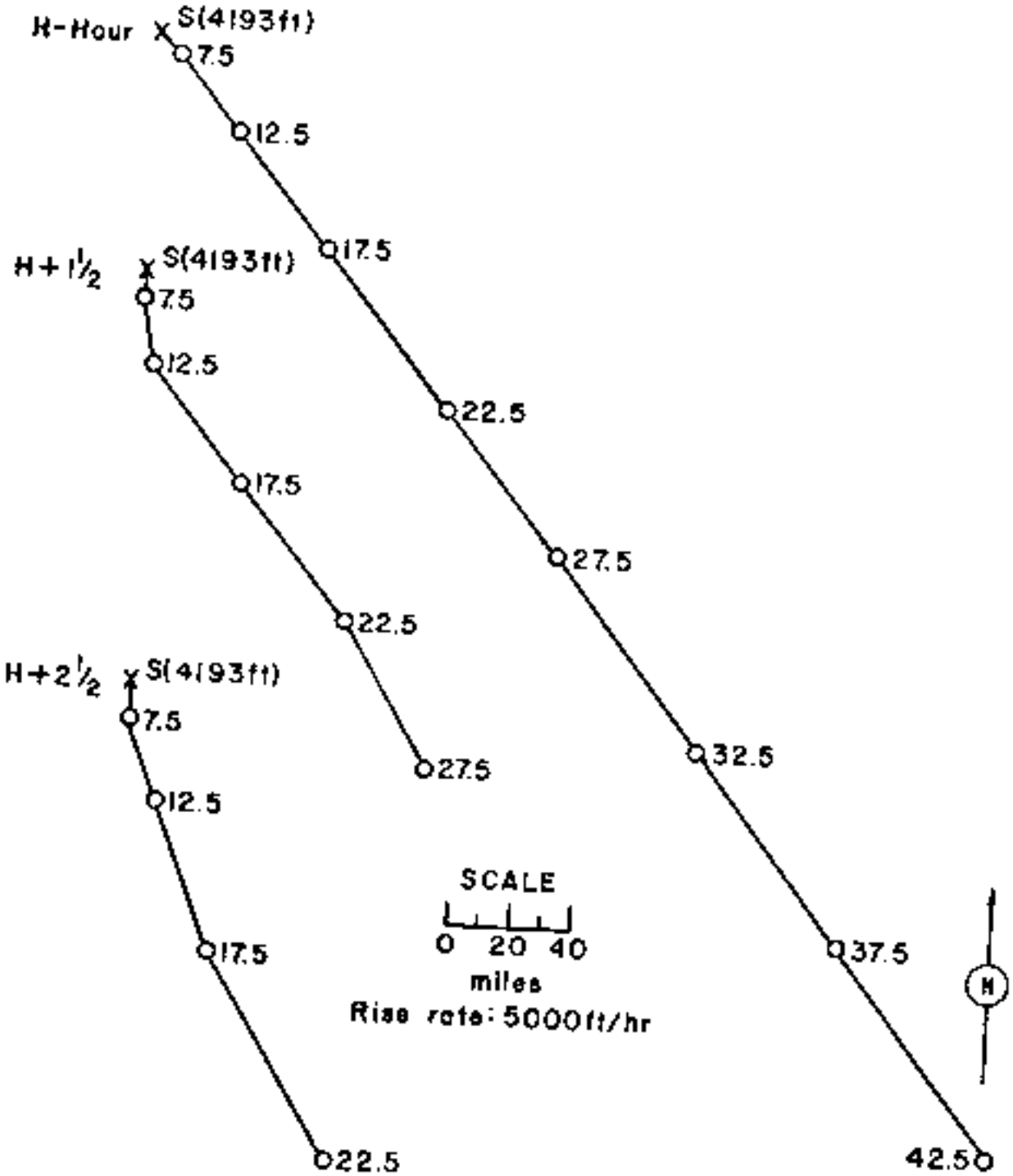


Figure 28. Holographs for Operation BUSTER-JANGLE - Dog.

OPERATION BUSTER-JANGLE - Easy

	PST	GCT
DATE:	5 Nov 1951	5 Nov 1951
TIME:	0830	1630

Sponsor: WASL

SITE: NTS - Area Y - Station 1
37° 05' 31" N
116° 01' 28" W
Site elevation: 3,224 ft

TOTAL YIELD: 31.0 kt

HEIGHT OF BURST: 1,514 ft

TYPE OF BURST AND PLACEMENT:
Air burst over Soviet-...

FIREBALL DATA:
Time to 1st minimum: 15 to 20 msec
Time to 2nd maximum: 190 to 210 msec
Radius at 2nd maximum: NM

CLOUD TOP HEIGHT: [illegible] ft MSL
CLOUD BOTTOM HEIGHT: [illegible] ft MSL

CRATER DATA: No crater

REMARKS:

The contours resulting from this shot were due primarily to neutron-induced activity. Readings were obtained by mobile land area survey or recovery operations and were taken 3 ft above ground with TIB or CDV-10 ionization chamber survey meters. The pattern was obtained from readings taken at H+24 hours and corrected to H+1 hour, using the decay curve for neutron-induced activity in Nevada soil

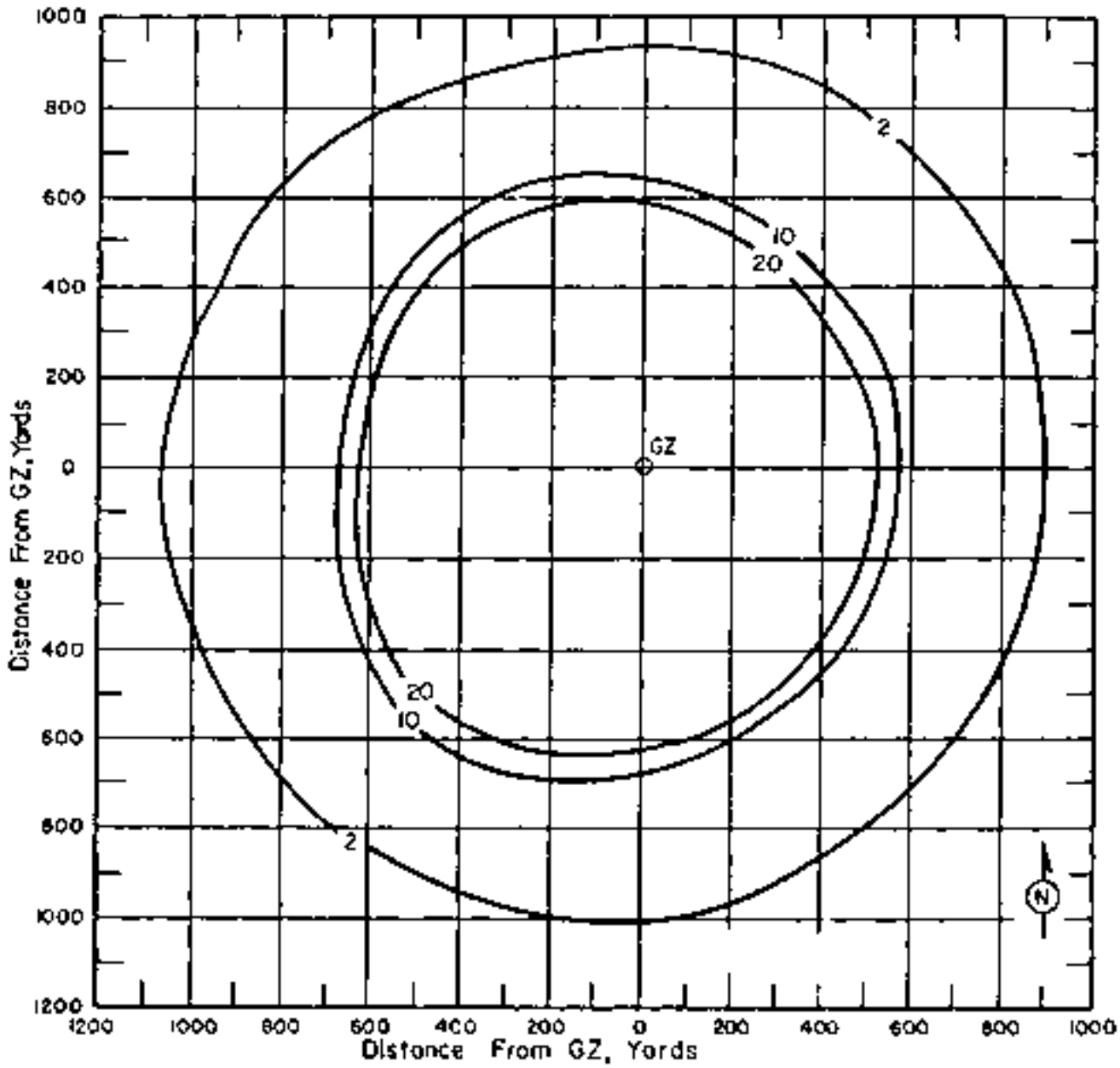


Figure 29. Operation BUSTER-JANGLE - Easy.
On-site dose rate contours in r/hr at H+1 hour.

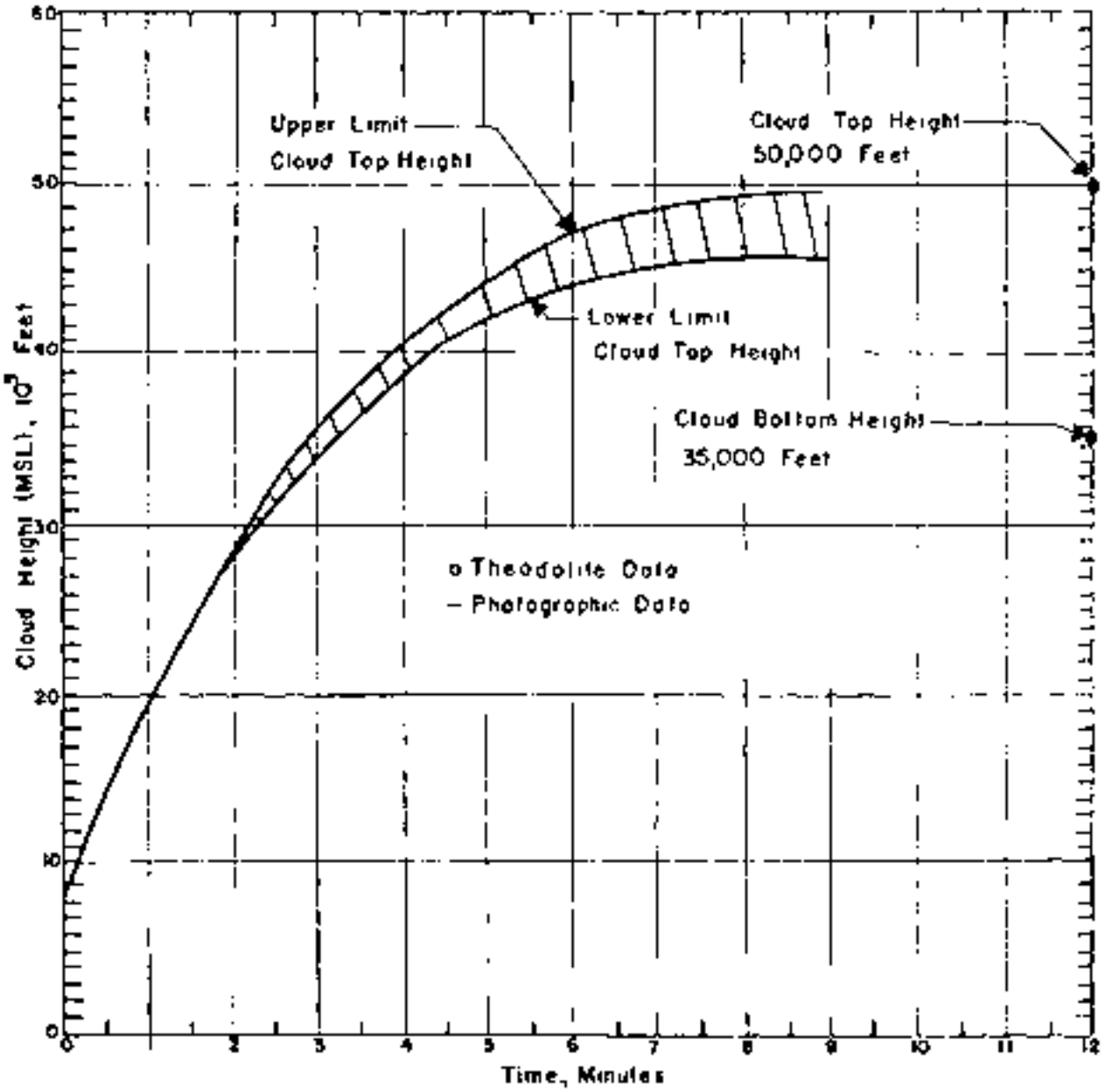


Figure 30. Cloud Dimensions: Operation BUSTER-JANGLE - Easy.

TABLE 11 NEVADA WIND DATA FOR OPERATION DOUBLE-DANGLE — SAGY

Altitude (MSL)	H-hour		H+1 hour	
	Dir	Speed	Dir	Speed
feet	degrees	mph	degrees	mph
Surface	020	15	020	10
5,000	---	--	020	16
6,000	010	29	010	18
7,000	---	--	360	18
8,000	020	18	020	14
9,000	---	--	040	18
10,000	050	21	070	22
12,000	040	25	040	2[illegible]
14,000	010	38	---	--
15,000	(360)	(37)	360	36
16,000	340	37	340	35
18,000	350	26	340	28
20,000	320	22	310	24
25,000	360	38	360	38
28,000	350	37	---	--
30,000	350	31	---	--
35,000	350	40	---	--
40,000	340	52	---	--
45,000	330	63	---	--

NOTES:

1. Numbers in parentheses are estimated values.
2. Wind data was obtained by the Mercury Weather Station located at the C. P.
3. Tropopause height was 35,000 ft MSL.
4. At H-hour the pressure at ground zero was 875 mb, the temperature 11.2°C and the relative humidity 17%.

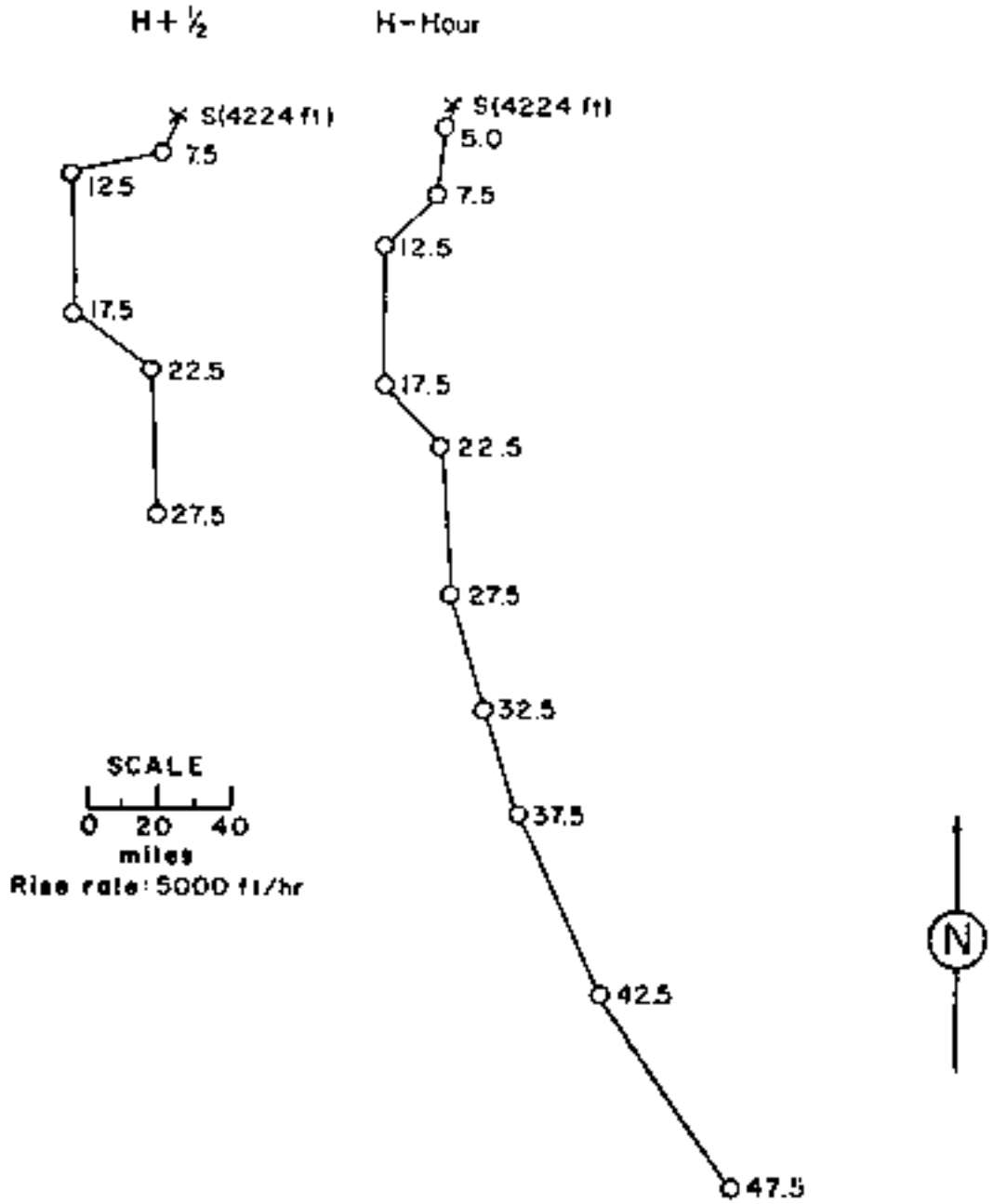


Figure 31. Hodographs for Operation BUSTER-JANGLE - Easy.

OPERATION BUSTER-JANGLE - Sugar

	PST	GMT
DATE:	19 Nov 1951	19 Nov 1951
TIME:	0900	1700

Sponsor: DOD

SITE: NTS - Area 9
37° 07' 54" N
116° 02' 10" W
Site elevation: 4,215 ft

TOTAL YIELD: 1.2 kt

HEIGHT OF BURST: 2.5 ft

TYPE OF BURST AND PLACEMENT:
Surface burst from platform on Nevada soil

FIREBALL DATA:
Time to 1st minimum: 6 - 7 msec
Time to 2nd maximum: NM
Radius at 2nd maximum: NM

CLOUD TOP HEIGHT: 15,000 ft MSL
CLOUD BOTTOM HEIGHT: 11,000 ft MSL

CRATER DATA: Diameter: 90 ft maximum dose rate: 7,500 r/hr at H+1 hour
Depth: 21 ft at crater lip
Volume: 50,000 ft^3

REMARKS:

The contamination resulting from this shot was well documented to several thousand yards. The on-site pattern was drawn from the data and maps of three scientific projects and can be considered reliable. Direct measurements of radiation fields at one hour after burst were obtained with constant-recording scintillation counters. Additional readings were taken with AN/PDR-T1B survey meters over the period 2- to 70 hours after burst. These readings were corrected to the reference time of one hour by the use of the $t^{-1.2}$ decay approximation. The off-site pattern is less reliable because only a limited number of readings were available.

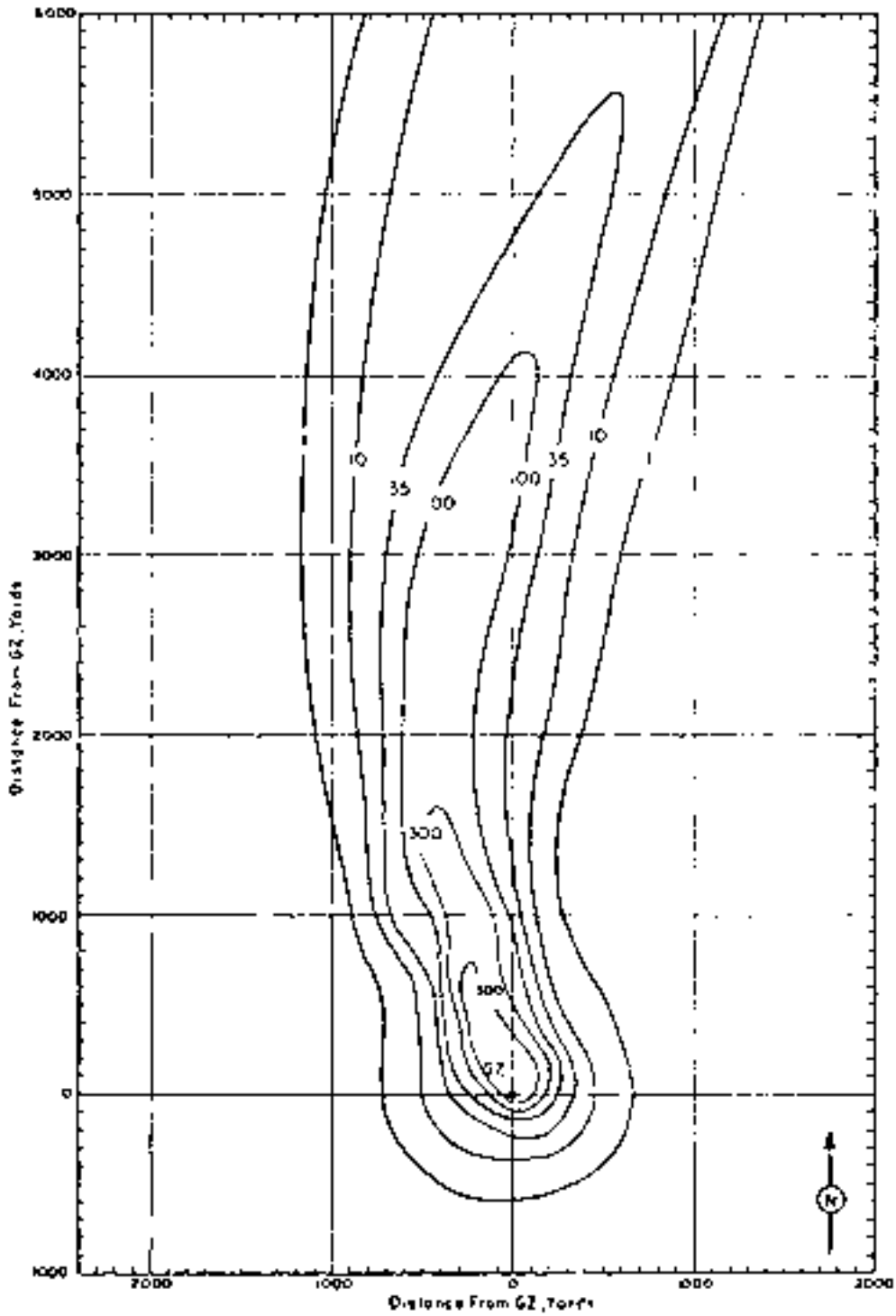


Figure 32. Operation EUSTER-JANGLE - Sugar.
On-site dose rate contours in r/hr at H+1 hour.

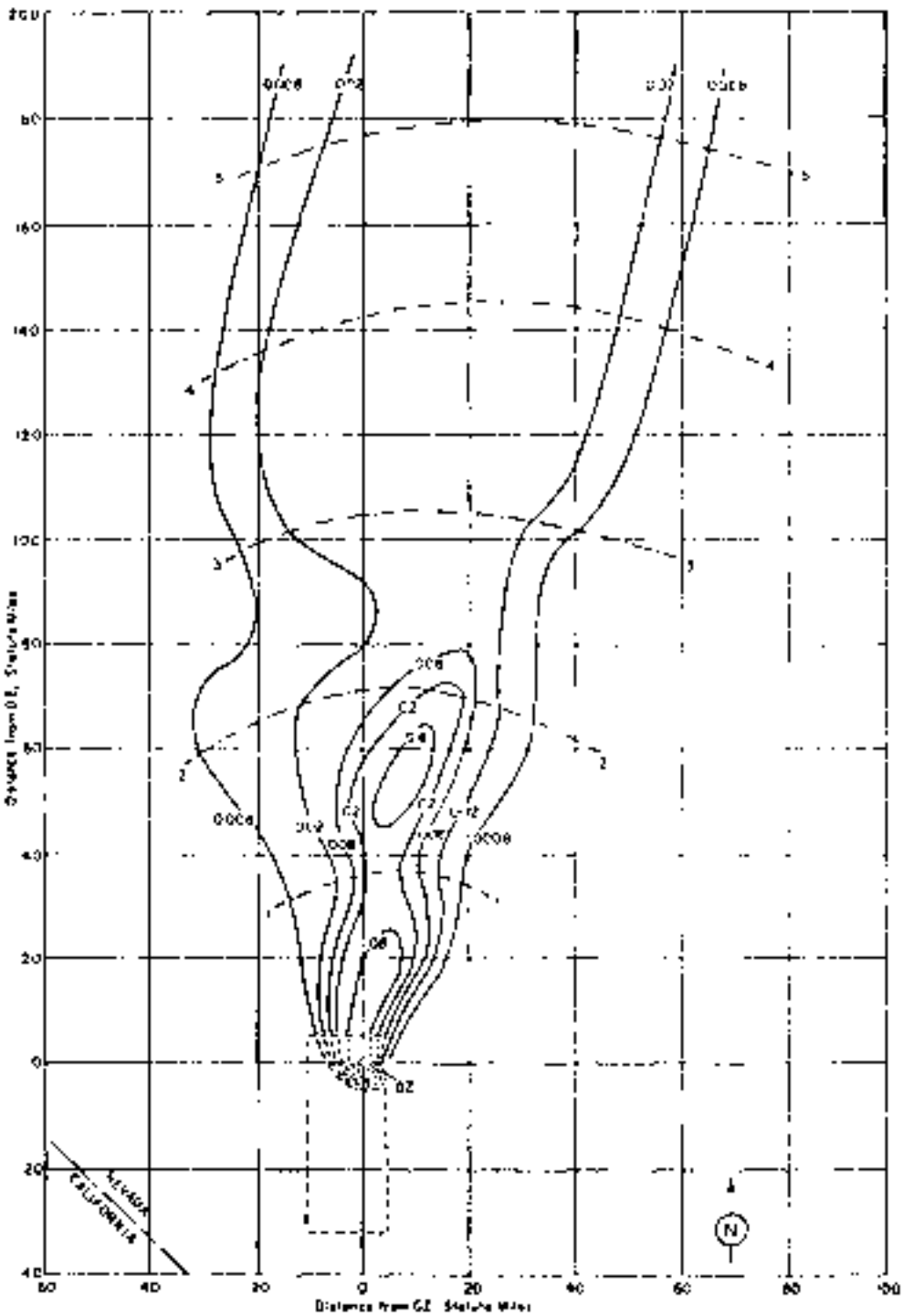


Figure 33. Operation BUSTER-JANGLE - Sugar.
Off-site dose rate contours in r/hr at H+1 hour.

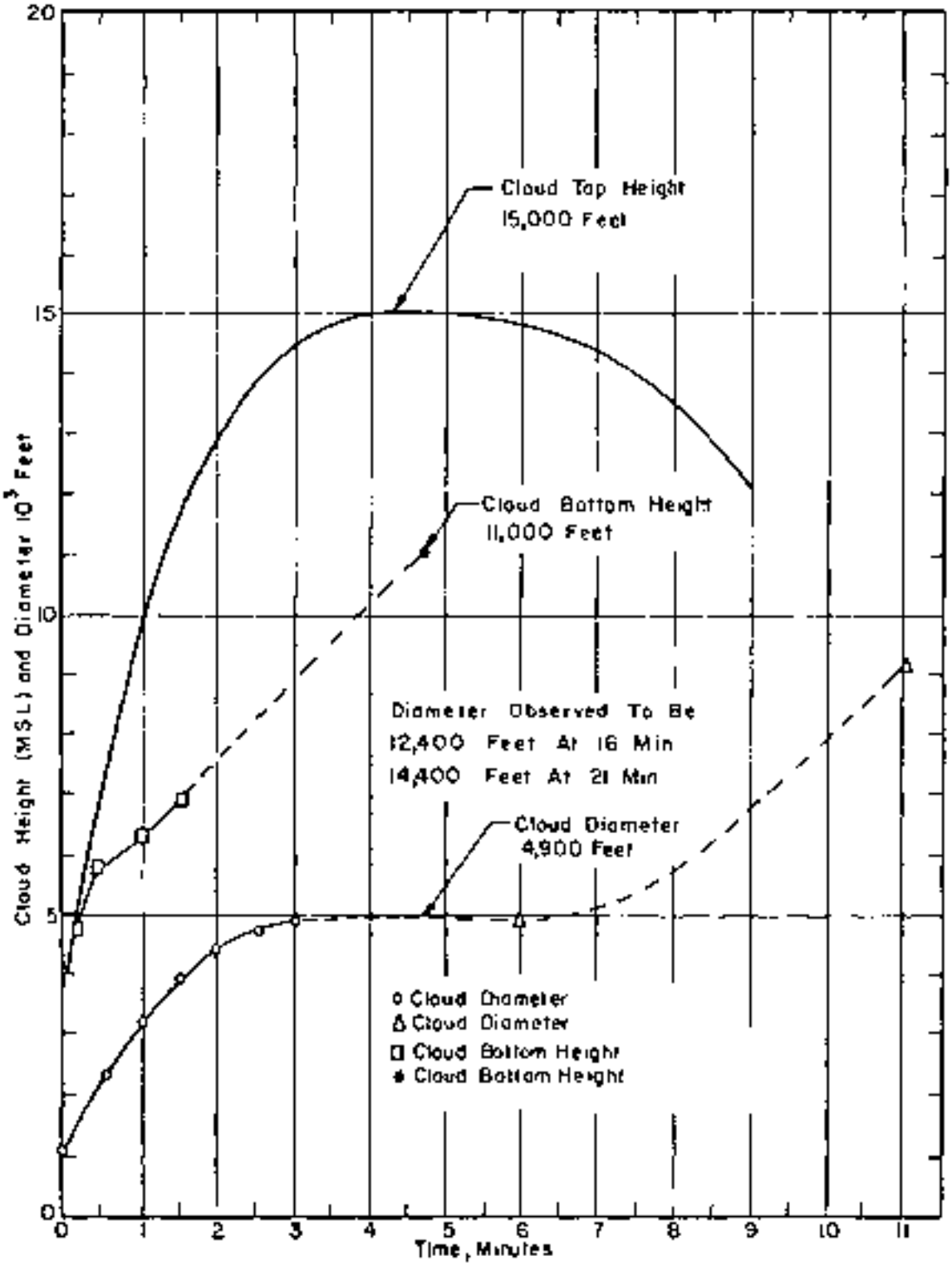


Figure 34. Cloud Dimensions; Operation BUSTER-JANGLE - Sugar.

TABLE 12 NEVADA WIND DATA FOR OPERATION BUSTER-JANGLE - SUGAR

Altitude (MSL.)	H-hour		H+12 hour		H+36 hours	
	Dir	Speed	Dir	Speed	Dir	Speed
feet	degrees	mph	degrees	mph	degrees	mph
Surface	190	02	Calm	Calm	180	09
5,000	---	--	Calm	Calm	170	12
6,000	170	15	170	15	170	18
7,000	---	--	180	23	180	26
8,000	180	30	180	30	180	31
9,000	---	--	200	32	180	35
10,000	200	37	200	37	190	42
12,000	200	42	200	42	210	51
14,000	210	46	210	46	210	44
15,000	---	--	210	47	210	45
16,000	210	51	210	51	200	66
18,000	200	72	200	72	200	55
20,000	200	62	200	62	190	69
25,000	210	71	---	--	---	--
30,000	210	80	---	--	---	--
35,000	210	90	---	--	---	--

NOTES:

1. Wind data was obtained by the Mercury Weather Station located at the C. P.
2. At H-hour the pressure of ground zero was 871.5 mb, the temperature 1°C and the relative humidity 47%.

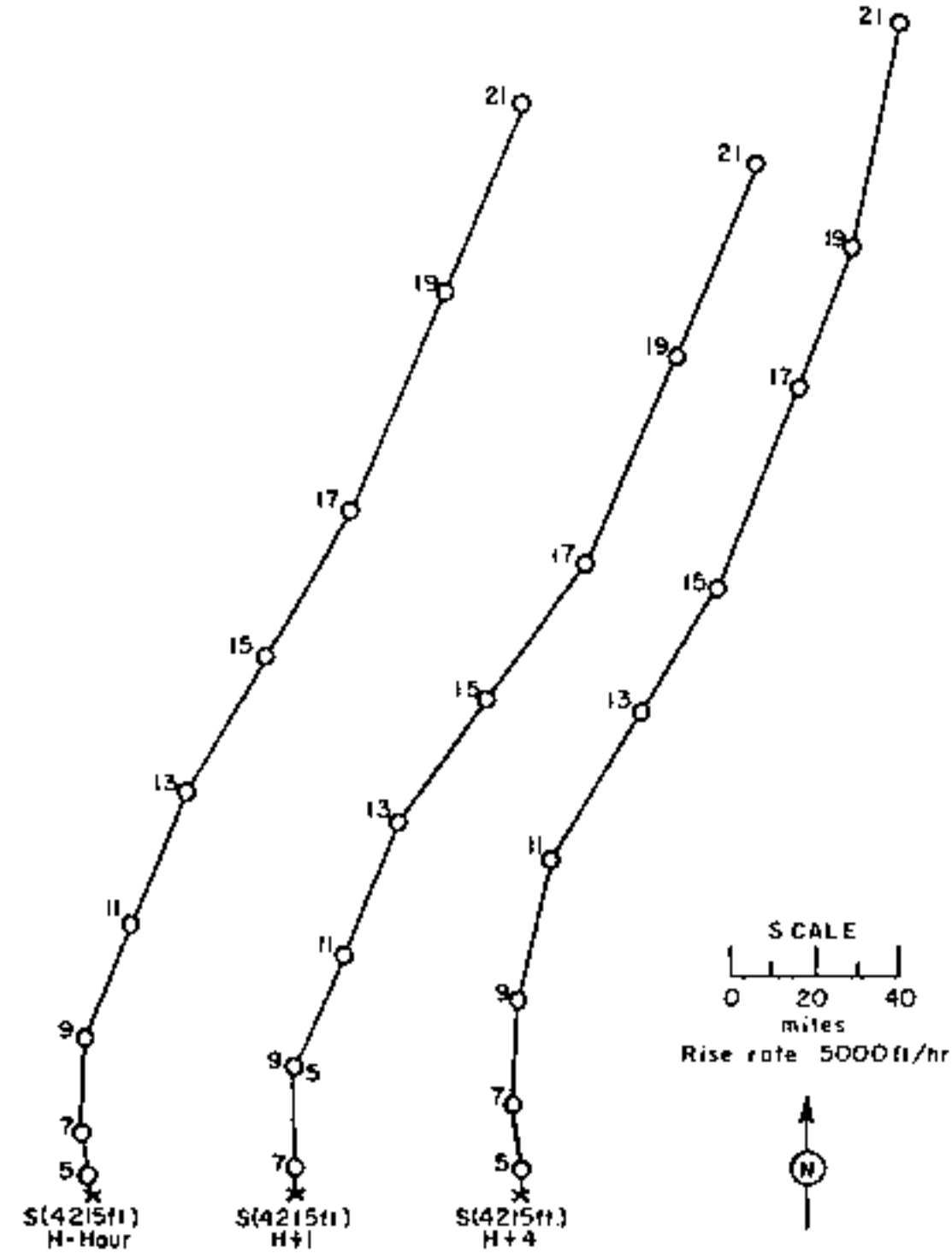


Figure 35. Hodographs for Operation BUSTER-JANGLE - Sugar.

OPERATION BUSTER-JANGLE - Uncle

	PST	GMT
DATE:	29 Nov 1951	29 Nov 1951
TIME:	1200	2000

TOTAL YIELD: 1.2 kt

Sponsor: DOD - LASL

SITE: NTS - Area 10
37° 10' 11" N
116° 02' 33" W
Site elevation: 4,295 ft

HEIGHT OF BURST: -17 ft
Underground

FIREBALL DATA:
Time to 1st minimum: NM
Time to 2nd maximum: NM
Radius at 2nd maximum: NM

TYPE OF BURST AND LOCATION:
Underground burst - Pitted shaft in Nevada soil

CLOUD TOP HEIGHT: 11,500 ft MSL
CLOUD BOTTOM HEIGHT: Not available

CRATER DATA: Diameter: 260 ft Maximum dose rate: ~7[illegible] r/hr at H+1 hour
Depth: 93 ft at crater lip
Volume: 980,000 yd³

REMARKS:

The contamination resulting from this shot was well documented to several thousand yards. The on-site pattern was drawn from the data and maps of three scientific projects and can be considered reliable. Direct measurements of radiation fields at one hour after burst were obtained with constant-recording scintillation counters. Additional readings were taken with AN/PDR-T1B survey meters over the period 24 to 70 hours after burst. These readings were corrected to the reference time of one hour by the use of the $t^{-1.2}$ decay approximation. The off-site pattern is less reliable because only a limited number of readings were available.

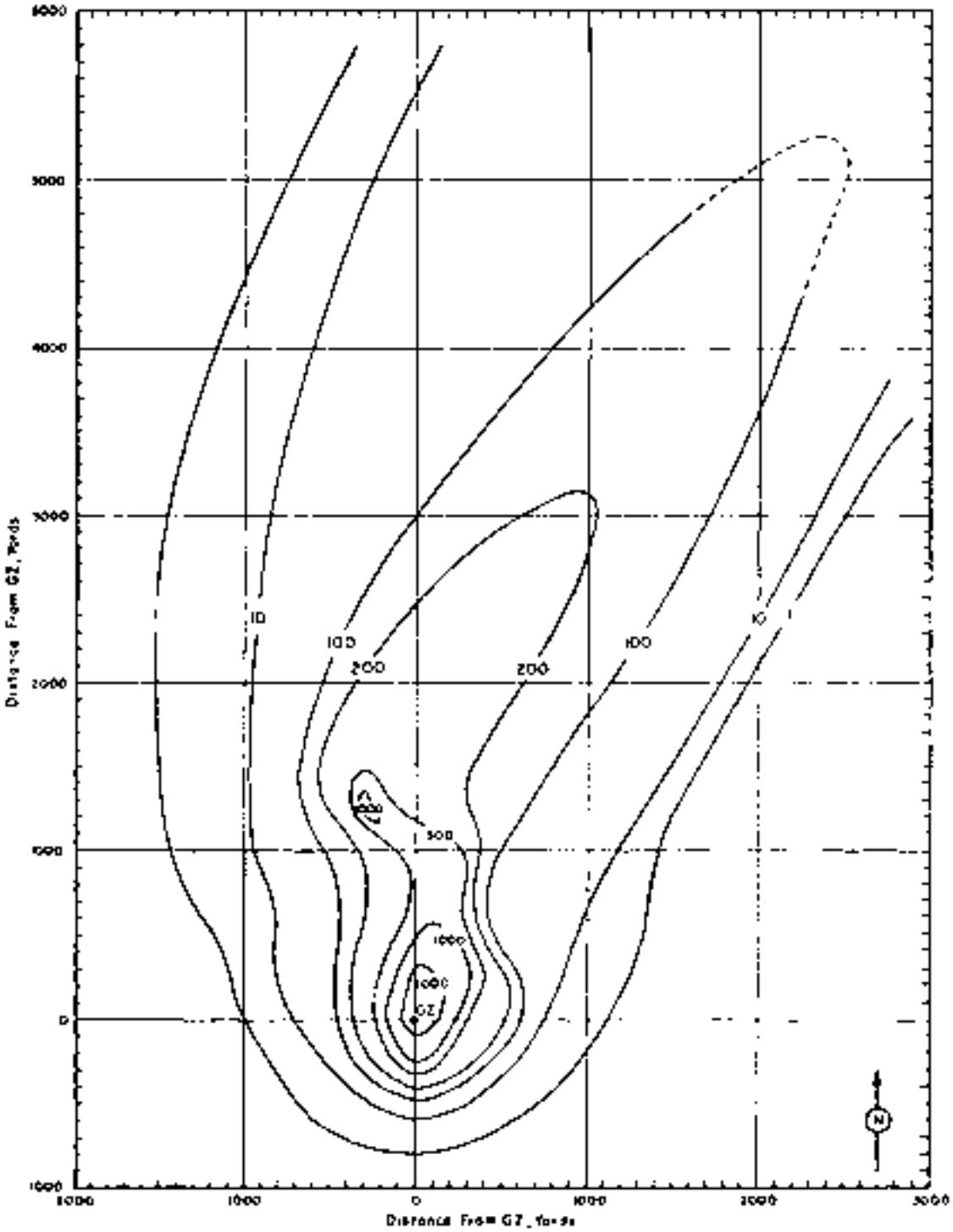


Figure 36. Operation BUSTER-JANGLE - Uncle.
On-site dose rate contours in r/hr at H+1 hour.

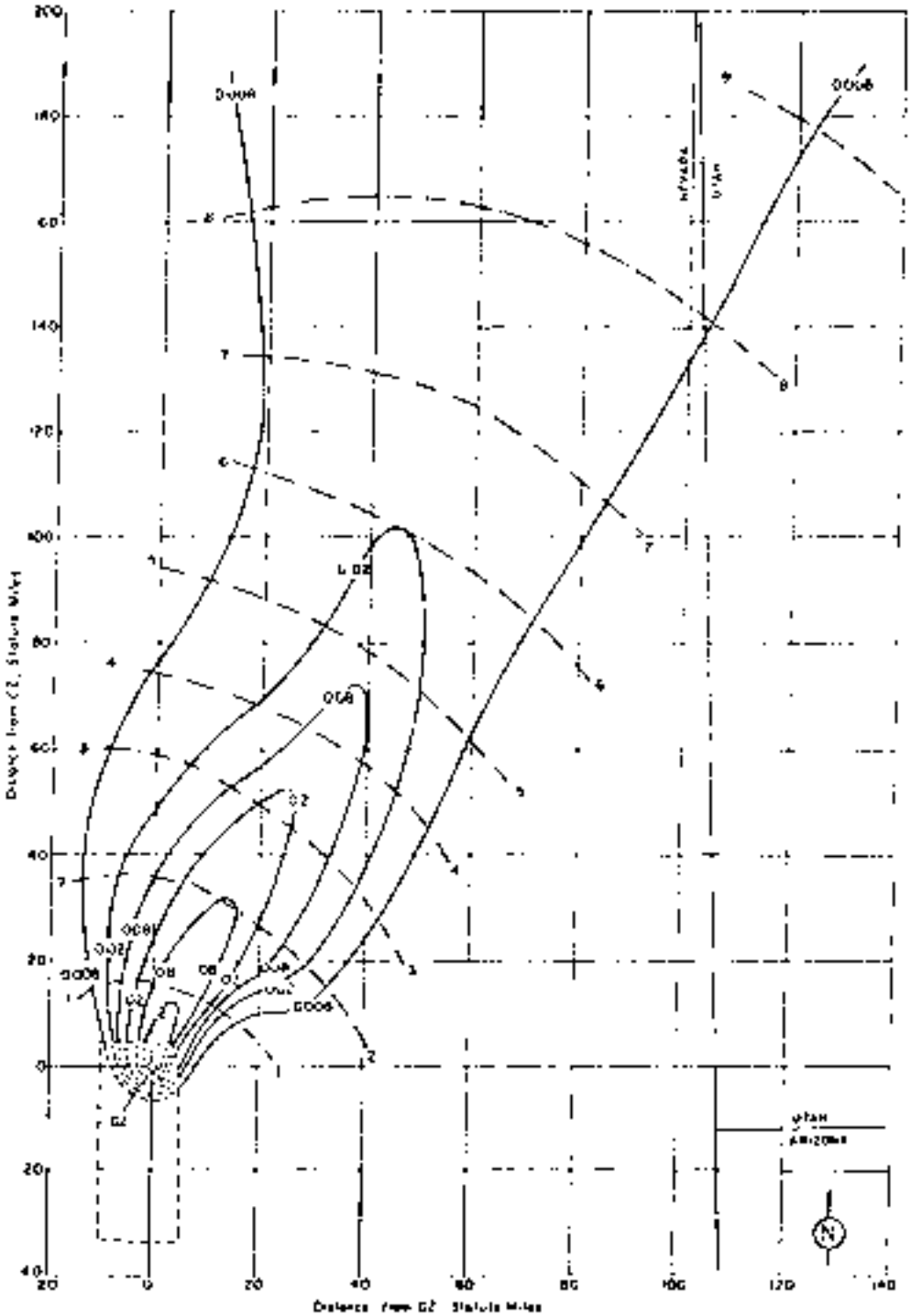


Figure 57. Operation BUSTER-JANGLE - Uncle.
Off-site dose rate contours in r/hr at H+1 hour.

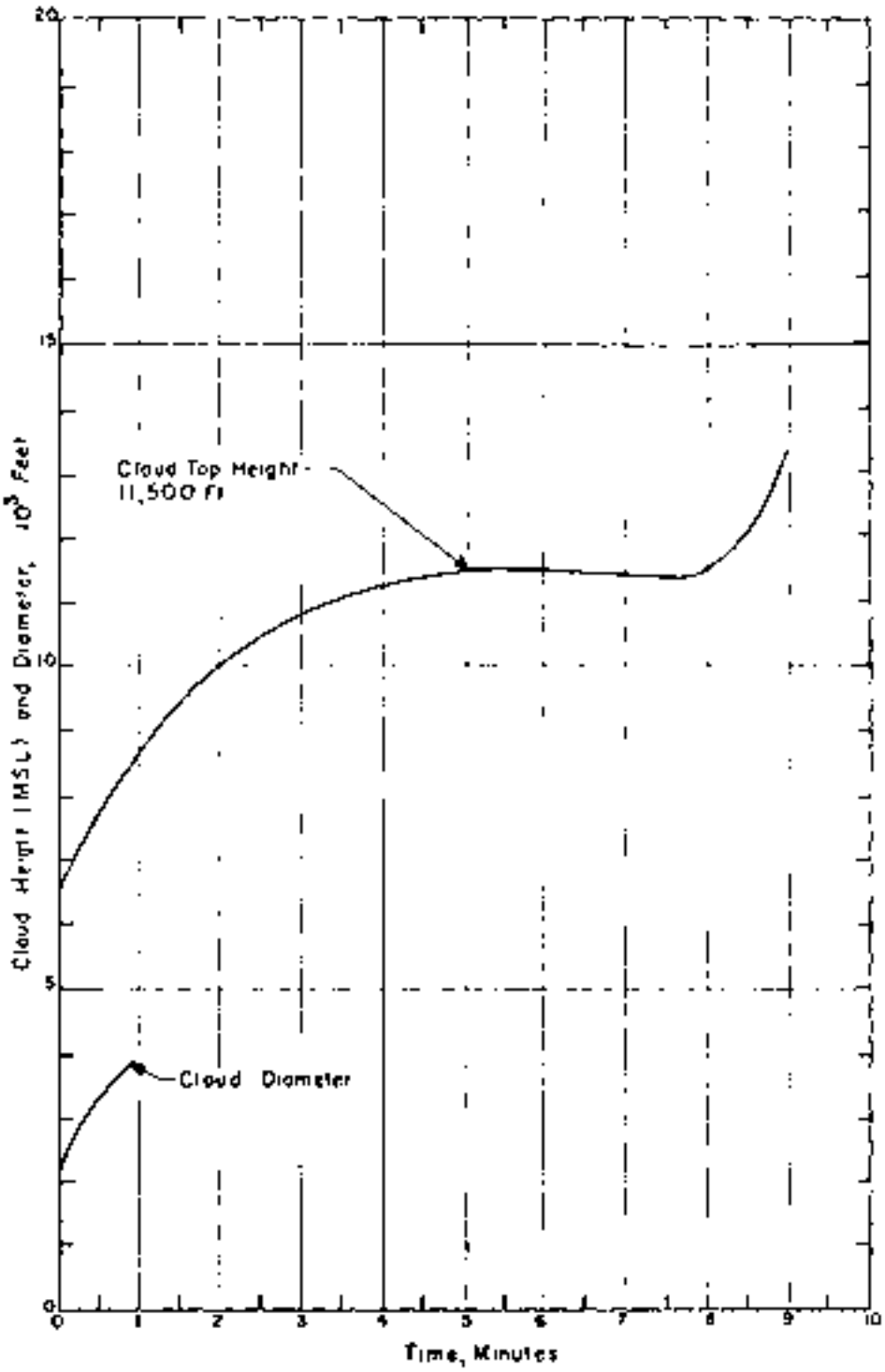


Figure 38. Cloud Dimensions; Operation BUSTER-JANGLE - Uncle.

TABLE 13 NEVADA WIND DATA FOR OPERATION BUSTER-JANGLE - UNCLE

Altitude (MSL)	H-hour		H+1 hour	
	Dir	Speed	Dir	Speed
feet	degrees	mph	degrees	mph
Surface	180	02	040	03
5,000	---	--	050	03
6,000	190	06	290	05
7,000	---	--	180	09
8,000	210	17	210	17
9,000	---	--	220	24
10,000	230	24	220	25
12,000	240	28	250	22
14,000	250	29	250	21
15,000	---	--	260	26
16,000	250	34	250	30
18,000	250	34	250	36
20,000	250	34	250	41
25,000	250	41	250	41
30,000	250	43	250	43

NOTES:

1. Wind data was obtained by the Mercury Weather Station located at the C. P.
2. At H-hour the pressure at GZ was 872 mb, the temperature 24.5°C and the relative humidity 35%.

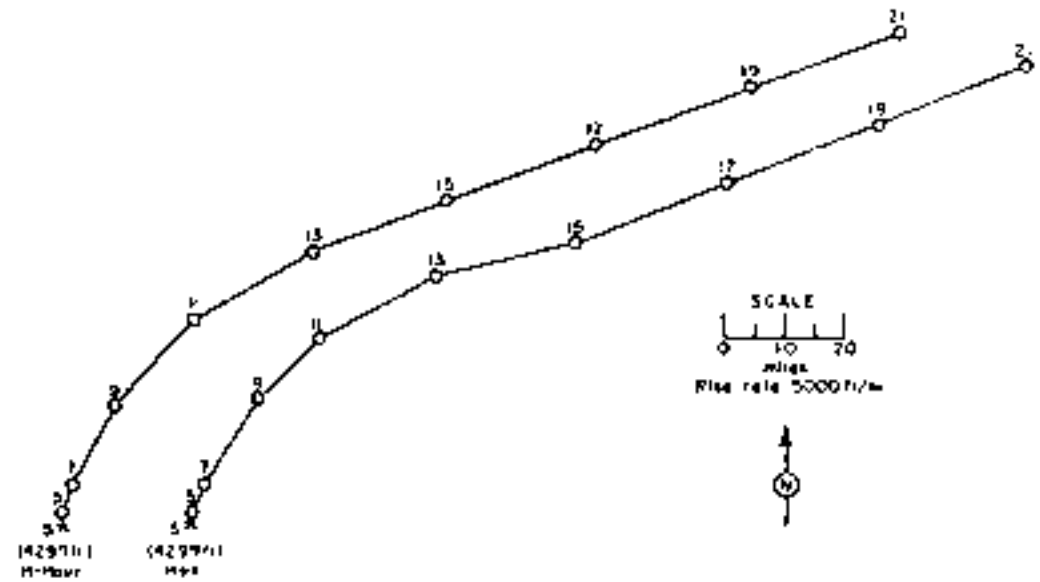


Figure 39. Hodographs for Operation BUSTER-JANGLE - Uncle.

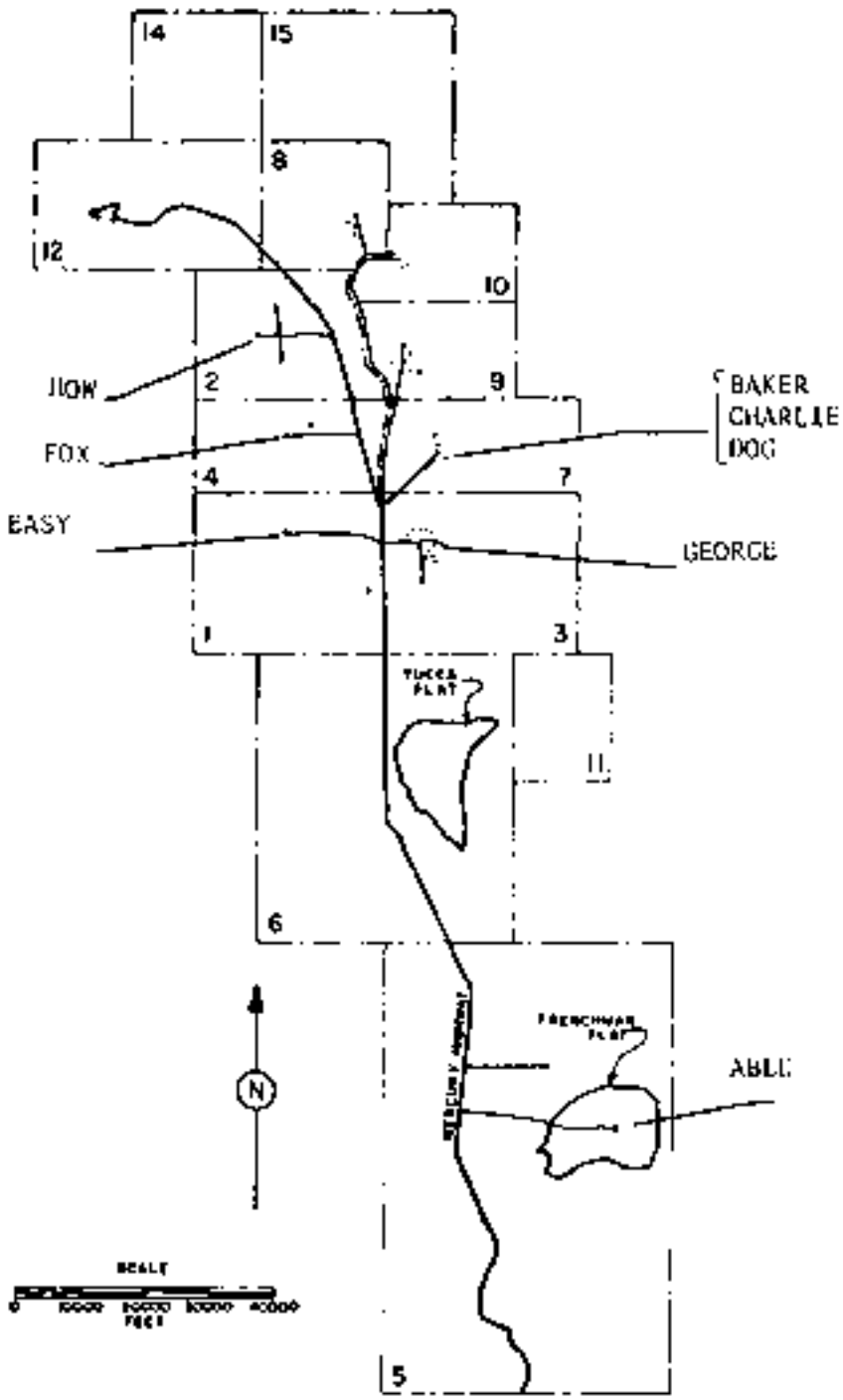


Figure 40. Operation TUMBLER-SNAPPER, Shot Locations.

OPERATION TUMBLER-SNAPPER - ABLE

	PST	GMT
DATE:	1 Apr 1952	2 Apr 1952
TIME:	0500	1700

TOTAL YIELD: 1 kt

FIREBALL DATA:
Time to 1st minimum: 2.85 to 3.5 msec
Time to 2nd maximum: 90 to 125 msec
Radius at 2nd maximum: NM

Sponsor: NOD - IASL

SITE: NTS - Frenchman Flat
36° 47' 54" N
115° 56' 08" W
Site elevation: 3,077 ft

HEIGHT OF BURST: 795 ft

TYPE OF BURST AND PLACEMENT:
Air burst over Nevada soil

CLOUD TOP HEIGHT: 16,200 ft MSL
CLOUD BOTTOM HEIGHT: Not available

CRATER DATA: No crater

REMARKS:

The contours resulting from this shot were due primarily to neutron-induced activity. Readings were taken by radiological safety survey teams working with test recovery parties on D day, D+1 day and D+2 day. These readings were extrapolated to H+1 hour, using the generalized decay curve for neutron-induced activity in Nevada soil

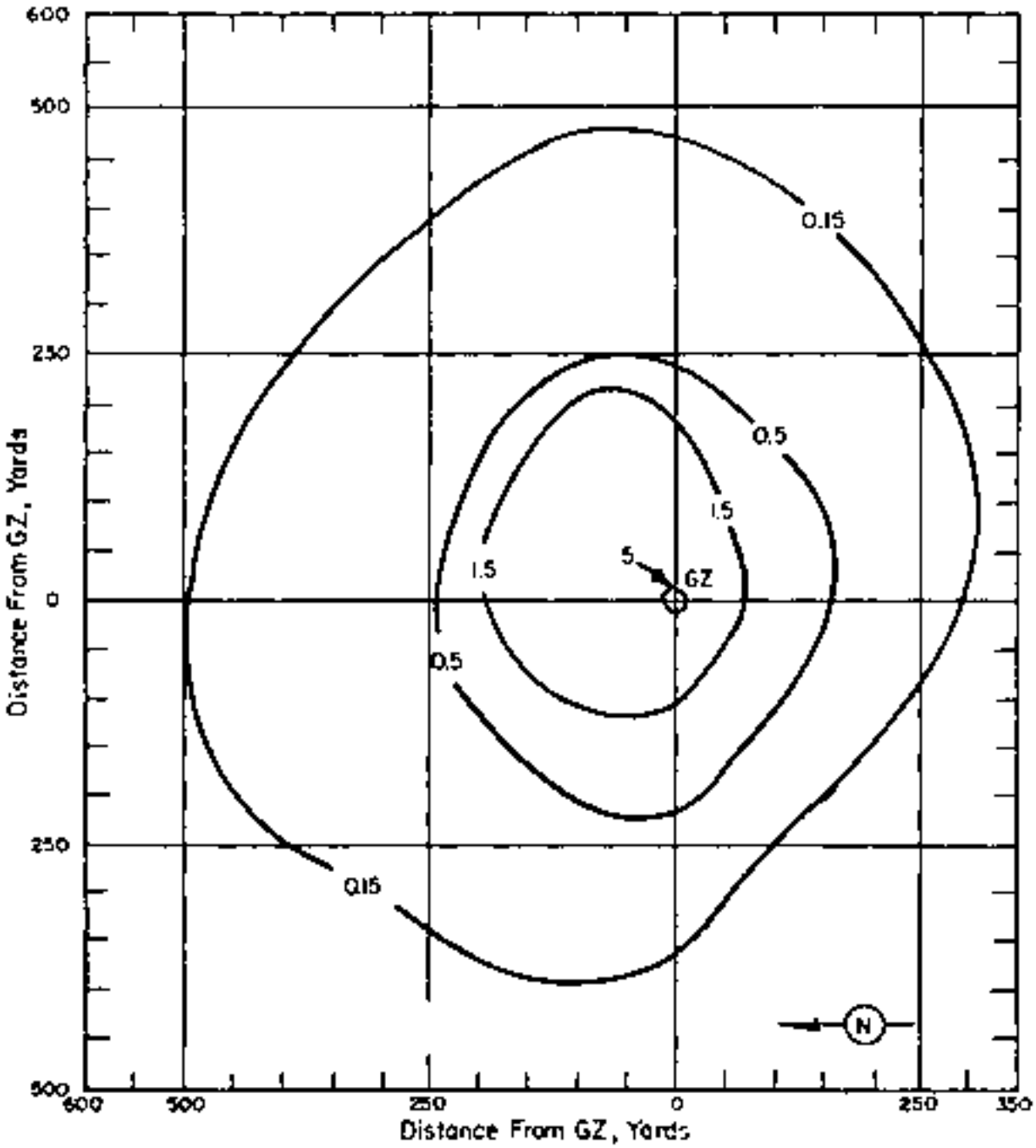


Figure 41. Operation TUMBLER-SNAPPER - ABLE On-site dose rate contours in r/hr at H+1 hour.

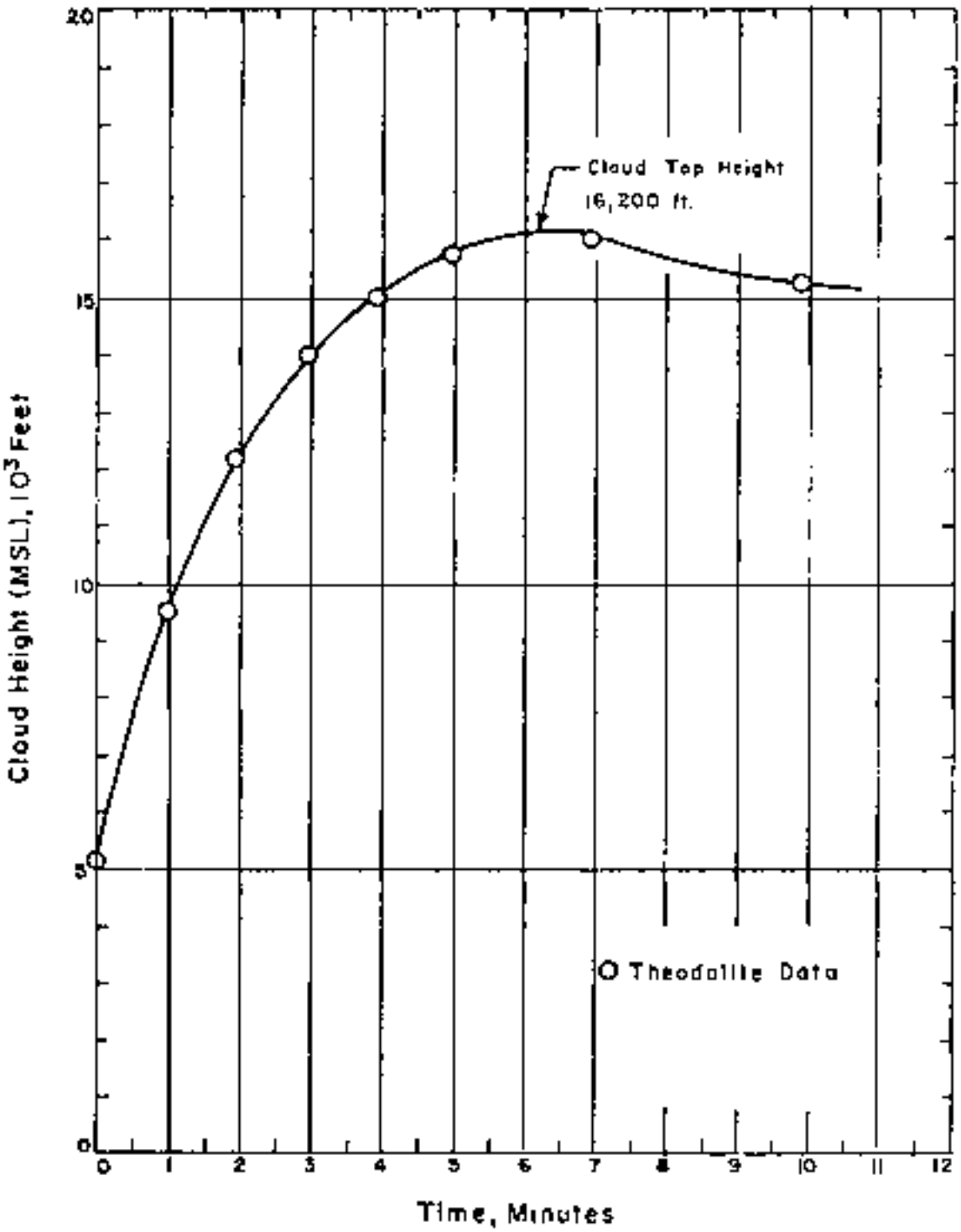


Figure 42. Cloud Dimensions: Operation TUMBLER-SNAPPER-ABLE

TABLE 14 NEVADA WIND DATA FOR OPERATION TUMBLER-SNAPPER -ABLE

Altitude (MSL)	H-hour	
	Dir	Speed
feet	degrees	mph
Surface	050	07
5,000	090	06
6,000	120	06
7,000	140	08
8,000	170	09
9,000	200	09
10,000	210	12
12,000	250	17
14,000	250	16
15,000	250	20
16,000	260	23
18,000	260	39
20,000	260	42
25,000	260	49
30,000	270	71

NOTES:
1. Wind data was obtained by the Mercury Weather Station located at the C. P.
2. Tropopause height was 42,000 ft MSL.
3. At H-hour the pressure at ground zero was 914 mb, the temperature 58°F and the relative humidity 25%.

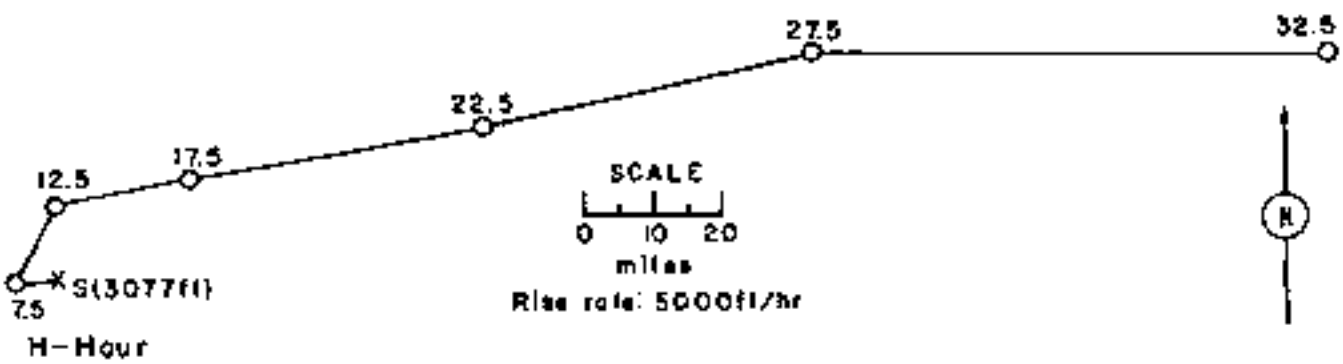


Figure 43. Hodograph for Operation TUMBLER-SNAPPER ABLE

OPERATION TUMBLER SNAPPER - BAKER

	PST	GMT
DATE:	19 Apr 1952	19 Apr 1952
TIME:	0930	1730

Sponsor: DOD - LASL

SITE: NTS - Area 7 - Target 3
37° 05' 03" N
116° 01' 10" W
Site elevation: 4,193 ft

TOTAL YIELD: 1 kt

HEIGHT OF BURST: 1,109 ft

TYPE OF BURST AND PLACEMENT:
Air burst over Nevada soil

CRATER DATA: No crater

FIREBALL DATA:

Time to 1st minimum:	3 to 5 msec
Time to 2nd maximum:	90 to 105 msec
Radius at 2nd maximum:	NM

CLOUD TOP HEIGHT: 25,700 ft MSL

CLOUD BOTTOM HEIGHT: 10,000 ft MSL

REMARKS:

The contours resulting from this shot were due primarily to neutron-induced activity. Readings were taken by radiological safety survey teams on D day, D+1 day, D+2 days, and D+3 days along eight radial lines of numbered wooden stakes placed 100 yards apart. The readings were extrapolated to H+1 hour using the decay curve for neutron-induced activity in Nevada soil

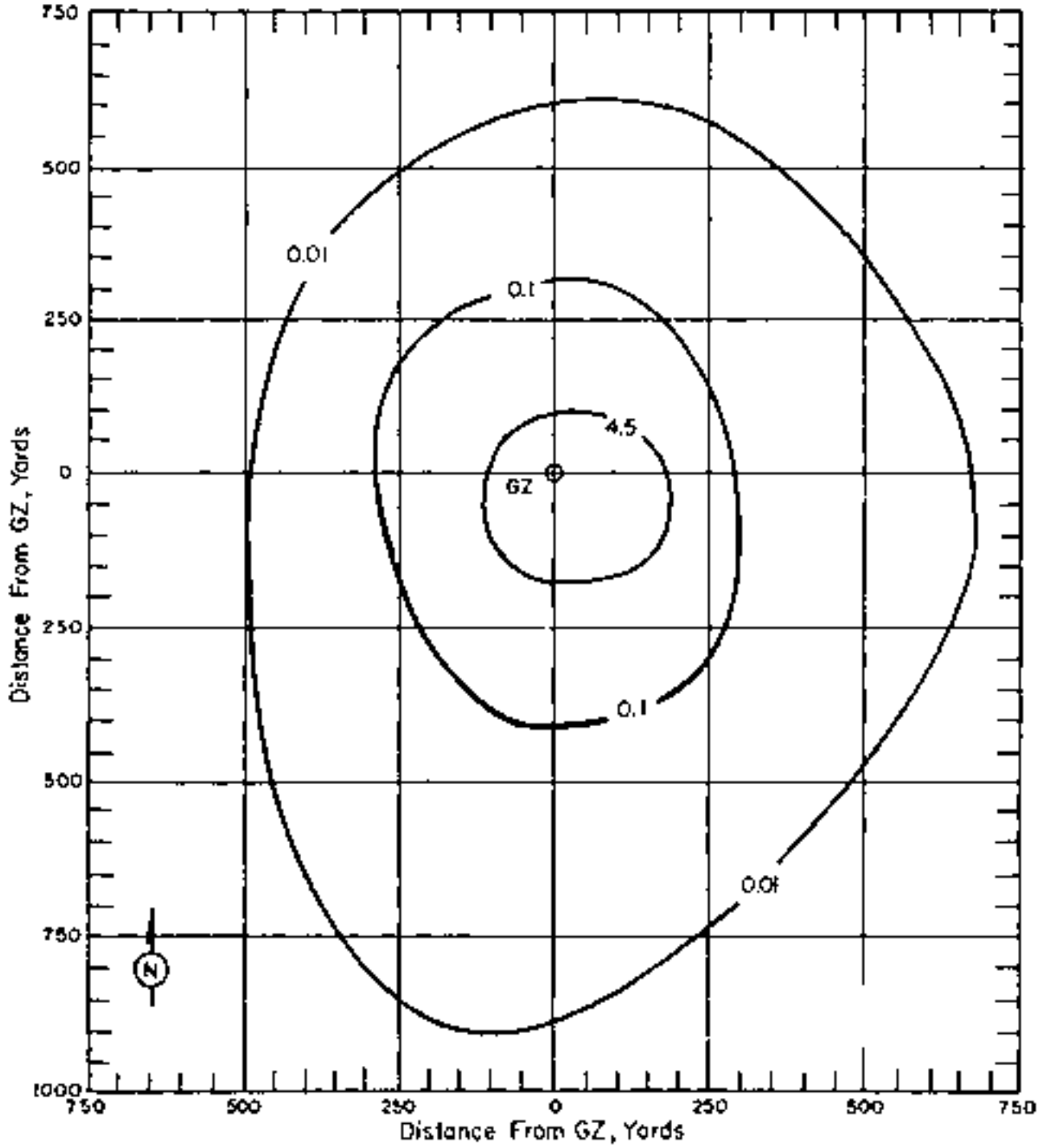


Figure 44. Operation TUMBLER-SNOWBALL - BAKER On-site dose rate contours in r/hr at H+1 hour.

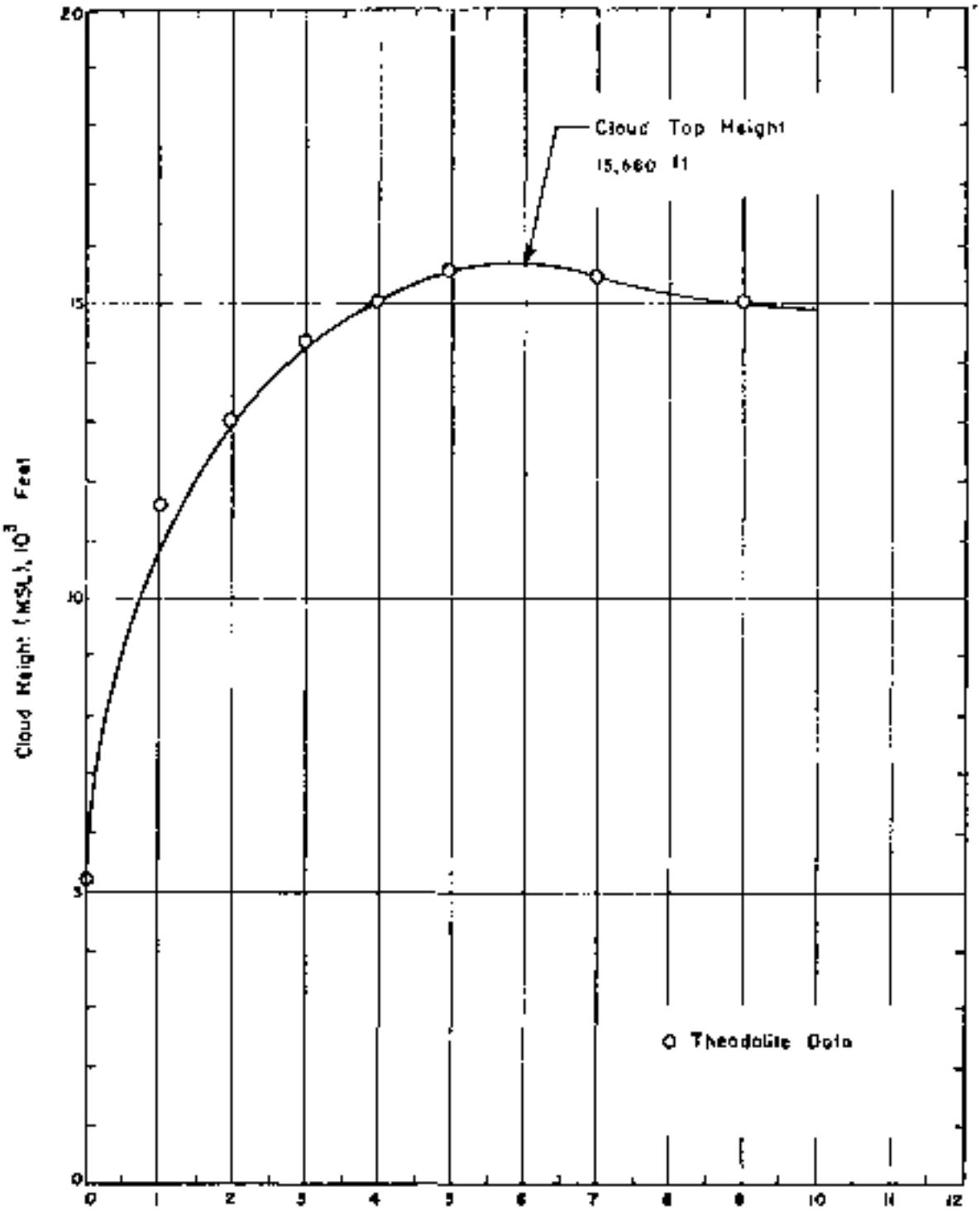


Figure 15. Cloud Dimensions: Operation TUMBLER-SNAPPER-BAKER

TABLE 15 NEVADA WIND DATA FOR OPERATION TUMBLER-SNAPPER- BAKER

Altitude (MSL.)	H-hour		Altitude (MSL.)	H-hour	
	Dir	Speed		Dir	Speed
feet	degrees	mph	feet	degrees	mph
Surface	050	07	16,000	310	21
5,000	040	07	18,000	310	21
6,000	040	07	20,000	300	29
7,000	050	10	25,000	270	35
8,000	040	14	30,000	260	40
9,000	030	14	35,000	260	25
10,000	360	10	40,000	270	32
12,000	340	09	45,000	270	46
14,000	320	10	50,000	270	46
15,000	310	16	55,000	270	26

NOTES:
1. Wind data was obtained by the Mercury Weather Station located at the C. P.
2. Tropopause height was 38,000 ft MSL.
3. At H-hour the pressure at ground zero was 878 mb, the temperature 52.8°F and the relative humidity 30%.

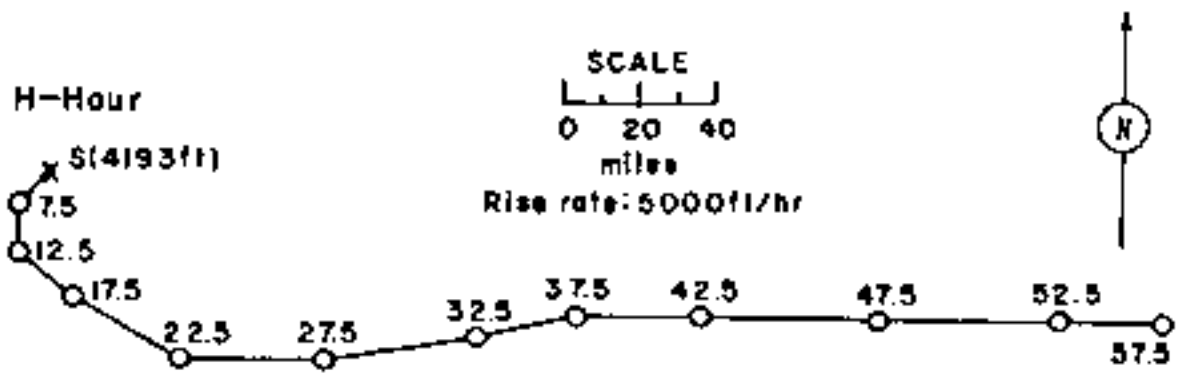


Figure 46. Hodograph for Operation - TUMBLER-SNAPPER- BAKER

OPERATION TUNNEL-CHAPPER - CHARLIE

	PST	GMT
DATE:	22 Apr 1952	22 Apr 1952
TIME:	0930	1730

Sponsor: DOD - LASL

SITE: NTS - Area 7 - Target 3
37° 05' 04" N
116° 01' 13" W
Site elevation: 4,193 ft

TOTAL YIELD: 31 kt

HEIGHT OF BURST: 3,447 ft

TYPE OF BURST AND PLACEMENT:
Air burst over Nevada soil

FIREBALL DATA:
Time to 1st minimum: 15 to 18.5 msec
Time to 2nd maximum: 150 to 190 msec
Radius at 2nd maximum: MM

CLOUD TOP HEIGHT: 42,000 ft MSL
CLOUD BOTTOM HEIGHT: 31,000 ft MSL

CRATER DATA: No crater

REMARKS:

The contours resulting from this shot were due primarily to neutron-induced activity. Readings were taken on D day and D+1 day by the radiological safety survey teams along eight radial lines of numbered wooden stakes placed 100 yards apart. These readings were extrapolated to D+1 hour, using the decay curve for neutron-induced activity in Nevada soil.

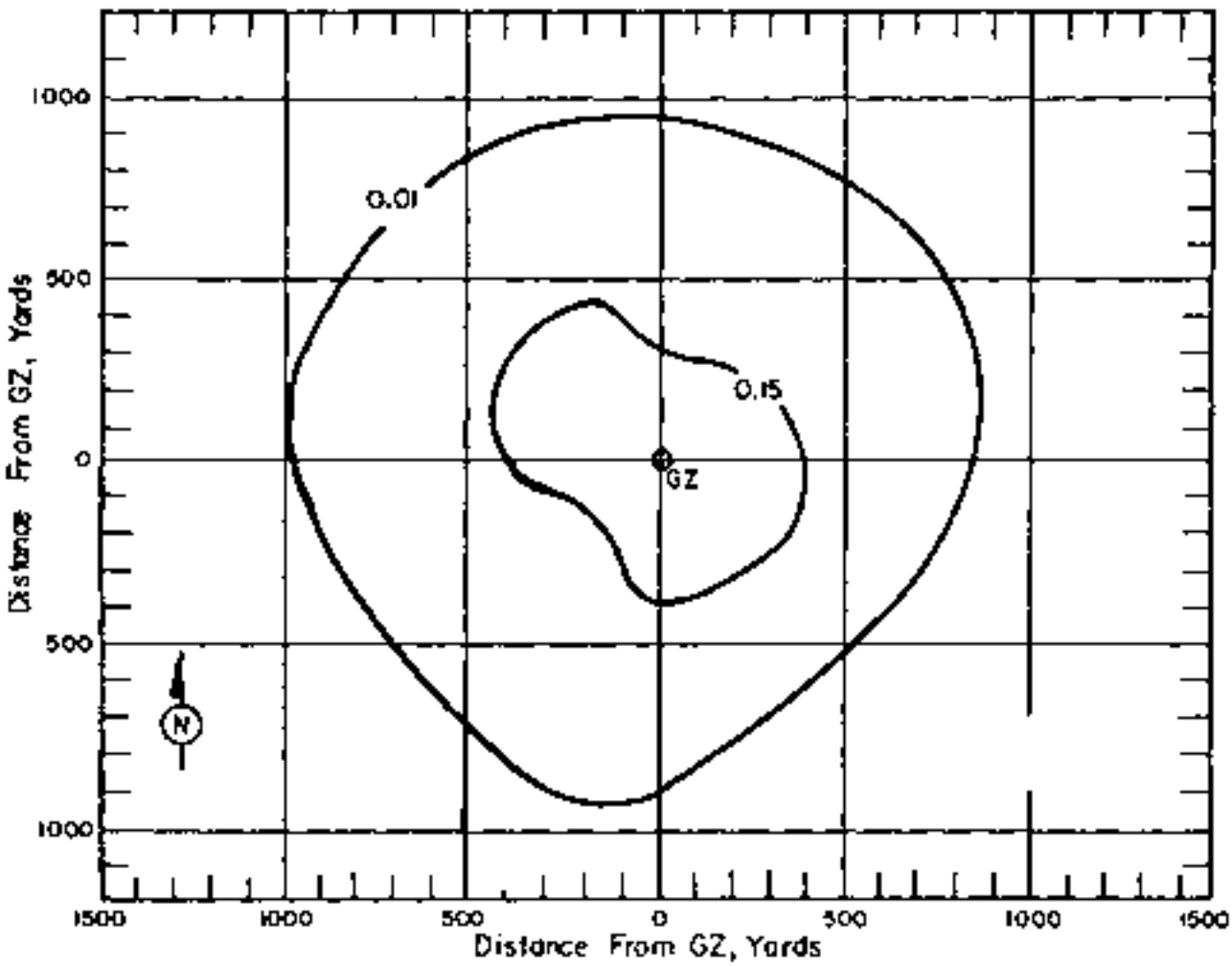


Figure 47. Operation TUMBLER-SNAPPER - CHARLIE On-site dose rate contours in r/hr at H+1 hour.

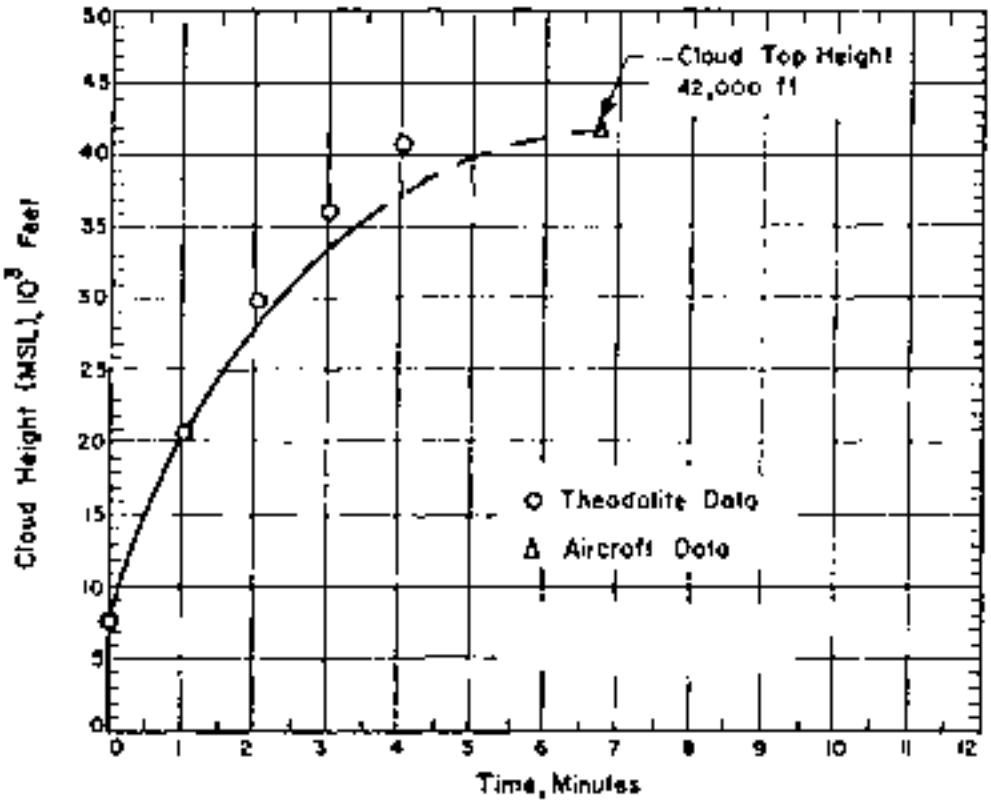


Figure 45. Cloud Dimensions: Operation TUMBLER-SNAPPER-CHARLIE.

TABLE 16 NEVADA WIND DATA FOR OPERATION TUMBLER-SNAPPER-CHARLIE

Altitude (MSL)	H-hour		Altitude (MSL)	H-hour	
	Dir	Speed		Dir	Speed
feet	degrees	mph	feet	degrees	mph
Surface	230	07	15,000	330	15
5,000	220	09	16,000	330	16
6,000	220	09	18,000	330	19
7,000	210	08	20,000	340	17
8,000	210	06	25,000	330	18
9,000	240	03	30,000	310	33
10,000	290	06	35,000	290	17
12,000	350	09	40,000	270	29
14,000	360	10	45,000	260	32

NOTES:

1. Wind data was obtained by the Mercury Weather Station located at the C. P.
2. Tropopause height was 38,000 ft MSL.
3. At H-hour the pressure at ground zero was 844 mb, the temperature 86.1°F and the relative humidity 30%.

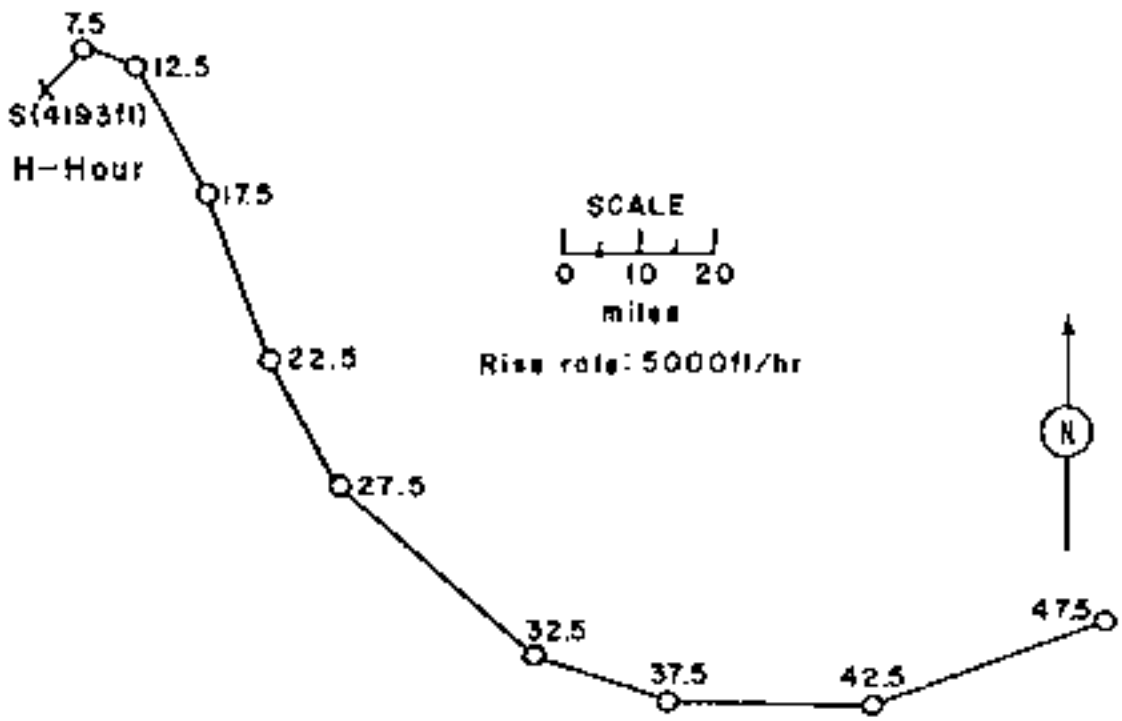


Figure 49. Hodograph for Operation TUMBLER-SNAPPER-CHARLIE

OPERATION TUMBLER-SNAPPER - DOG

	PST	GMT
DATE:	1 May 1952	1 May 1952
TIME:	0830	1630

Sponsor: LASL

Site: NTS - Area 7 - Target 3
37° 05' 03" N
116° 01' 13" W
Site elevation: 4,193 ft

TOTAL YIELD: 19 kt

HEIGHT OF BURST: 1,040 ft

TYPE OF BURST AND PLACEMENT:
Air burst over Nevada soil

FIREBALL DATA:
Time to 1st minimum: 12.5 to 15 msec
Time to 2nd maximum: 130 to 160 msec
Radius at 2nd maximum: 1M

CLOUD TOP HEIGHT: 36,000 ft MSL
CLOUD BOTTOM HEIGHT: 28,000 ft MSL

CRATER DATA: No crater

REMARKS:

The contours resulting from this shot were due primarily to neutron-induced activity. Readings were taken by radiological survey teams along eight radial lines of numbered wooden stakes placed 100 yards apart. These readings were taken between H+36 minutes and H+66 minutes. No decay corrections were made.

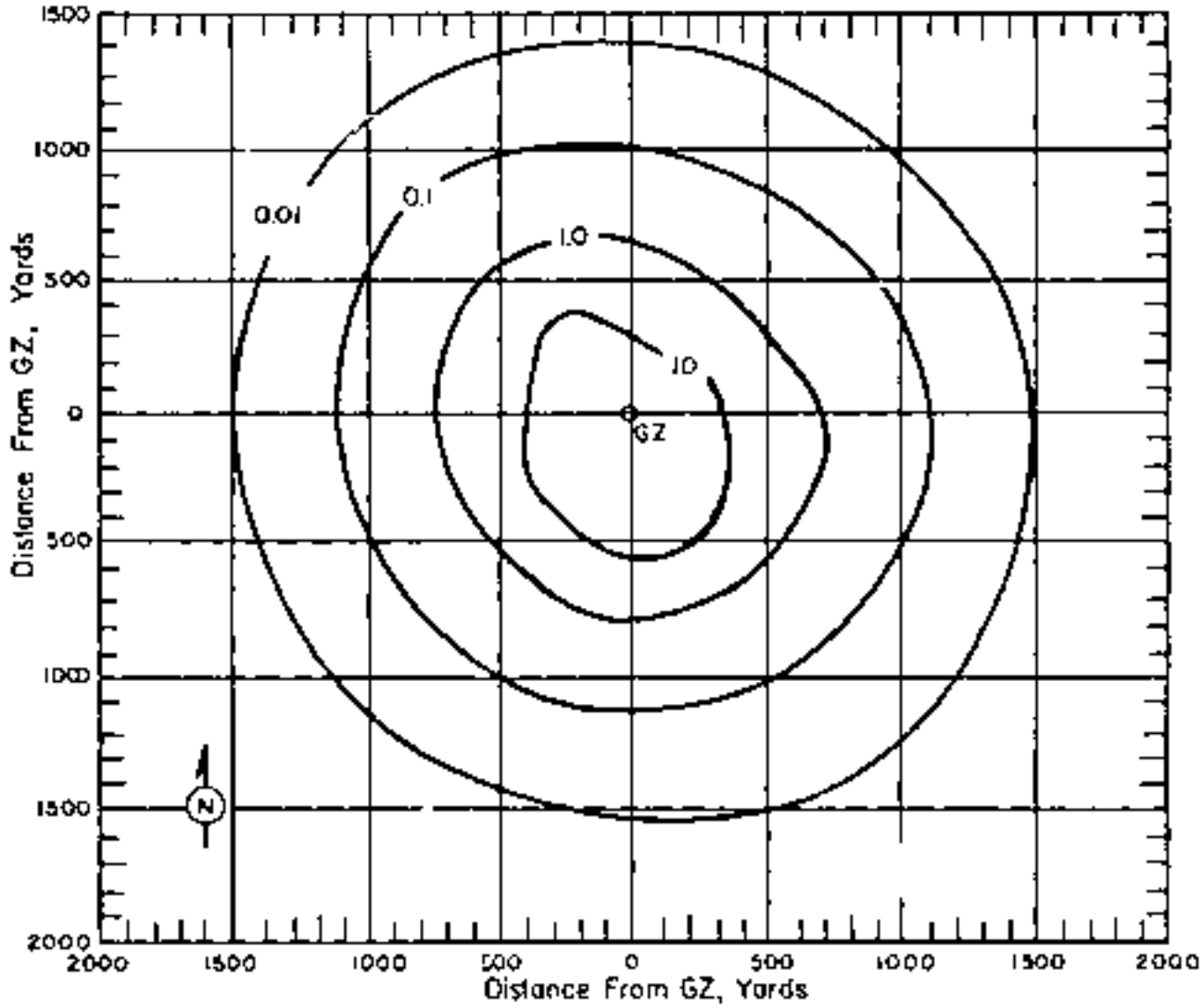


Figure 50. Operation TUMBLER-SNAPPER - 300 On-site dose rate contours in r/hr at H+1 hour.

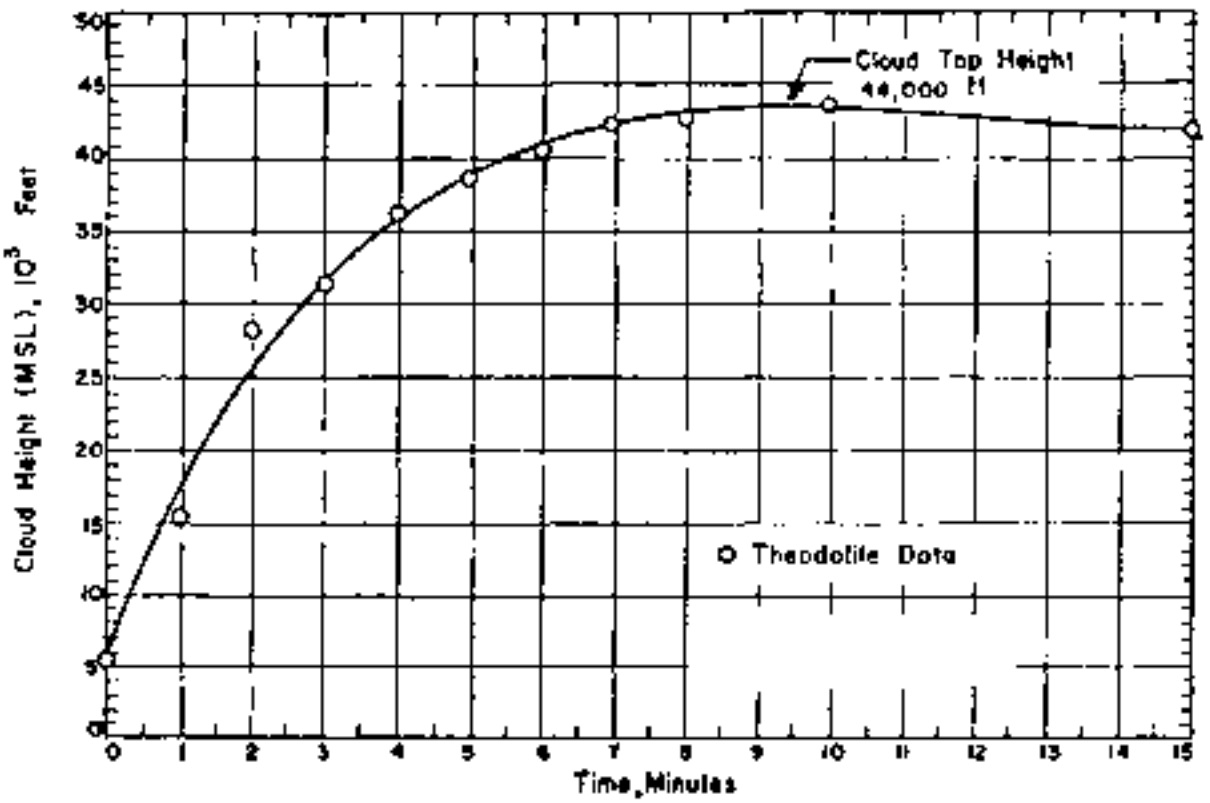


Figure 51. Cloud Dimensions; Operation TUMBLER-SNAPPER-DOG

TABLE 17 NEVADA WIND DATA FOR OPERATION TUMBLER-SNAPPER-DOG

Altitude (MSL.)	H-hour		Altitude (MSL.)	H-hour	
	Dir	Speed		Dir	Speed
feet	degrees	mph	feet	degrees	mph
Surface	020	03	14,000	250	14
5,000	240	05	15,000	260	18
6,000	210	07	16,000	280	22
7,000	200	10	18,000	270	30
8,000	190	13	20,000	260	36
9,000	180	14	25,000	260	2[illegible]
10,000	190	15	30,000	250	[illegible]
12,000	190	14	35,000	260	[illegible]

NOTES:

1. Wind data was obtained by the Mercury Weather Station located at the C. P.
2. Tropopause height was 38,000 ft MSL.
3. At H-hour the pressure at ground zero was 877 mb, the temperature 62.8°F and the relative humidity 47%.

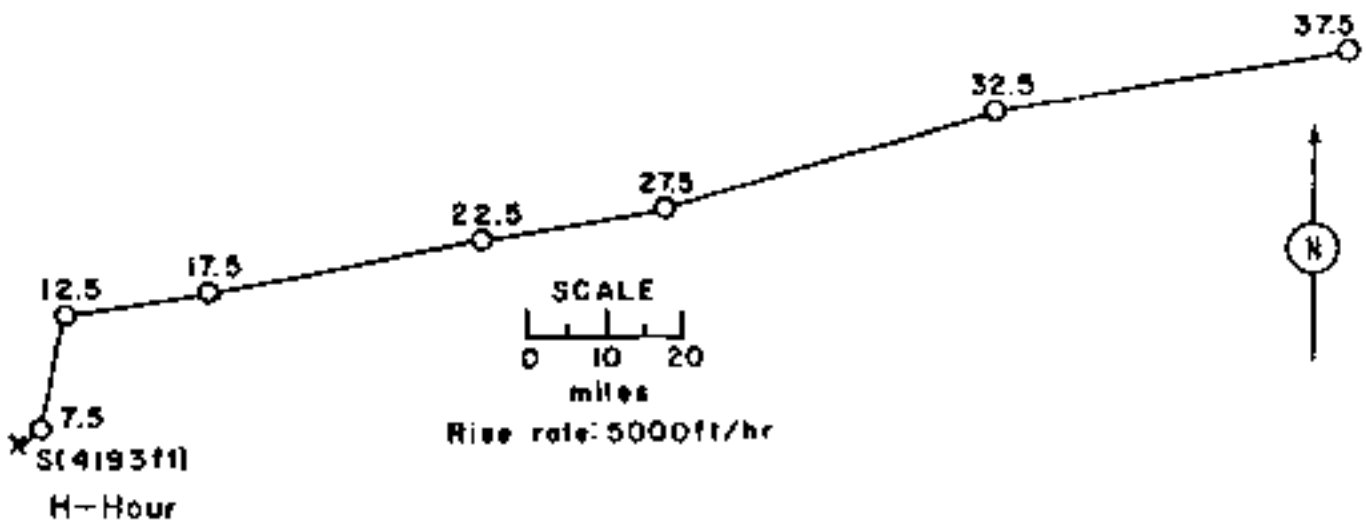


Figure 32. Hodograph for Operation TUMBLER-SNAPPER-DOG

OPERATION TUMBLER - SNAPPER - EASY

	PST	GMT
DATE:	7 May 1952	7 May 1952
TIME:	0415	1215

Sponsor: LASL

SITE: NTS - Area T-1
37° 03' 11" N
116° 06' 20" W
Site elevation: 4,329.25 ft

HEIGHT OF BURST: 300 ft.

TOTAL YIELD: 11 kt

TYPE OF BURST AND PLACEMENT:
Tower burst over Nevada soil

FIREBALL DATA:
Time to 1st minimum: 9.3 to 12.5 msec
Time to 2nd maximum: 95
Radius at 2nd maximum: NM

CLOUD TOP HEIGHT: 34,000 ft MSL
CLOUD BOTTOM HEIGHT: Not available

CRATER DATA: No crater

REMARKS:

The on-site fallout pattern was obtained from readings of radiological survey teams on D+1 day along eight radial lines of numbered stakes 300 feet apart. The stakes within approximately 1200 to 1500 feet of ground zero were destroyed or blown down so that they did not provide adequate reference points. The survey readings were extrapolated to H+1 hour by using the $t^{-1.2}$ decay approximation. The off-site readings were obtained by ground mobile monitors of the Radiological Safety organization on D-day. These readings were extrapolated to H+1 hour by using the $t^{-1.2}$ decay approximation.

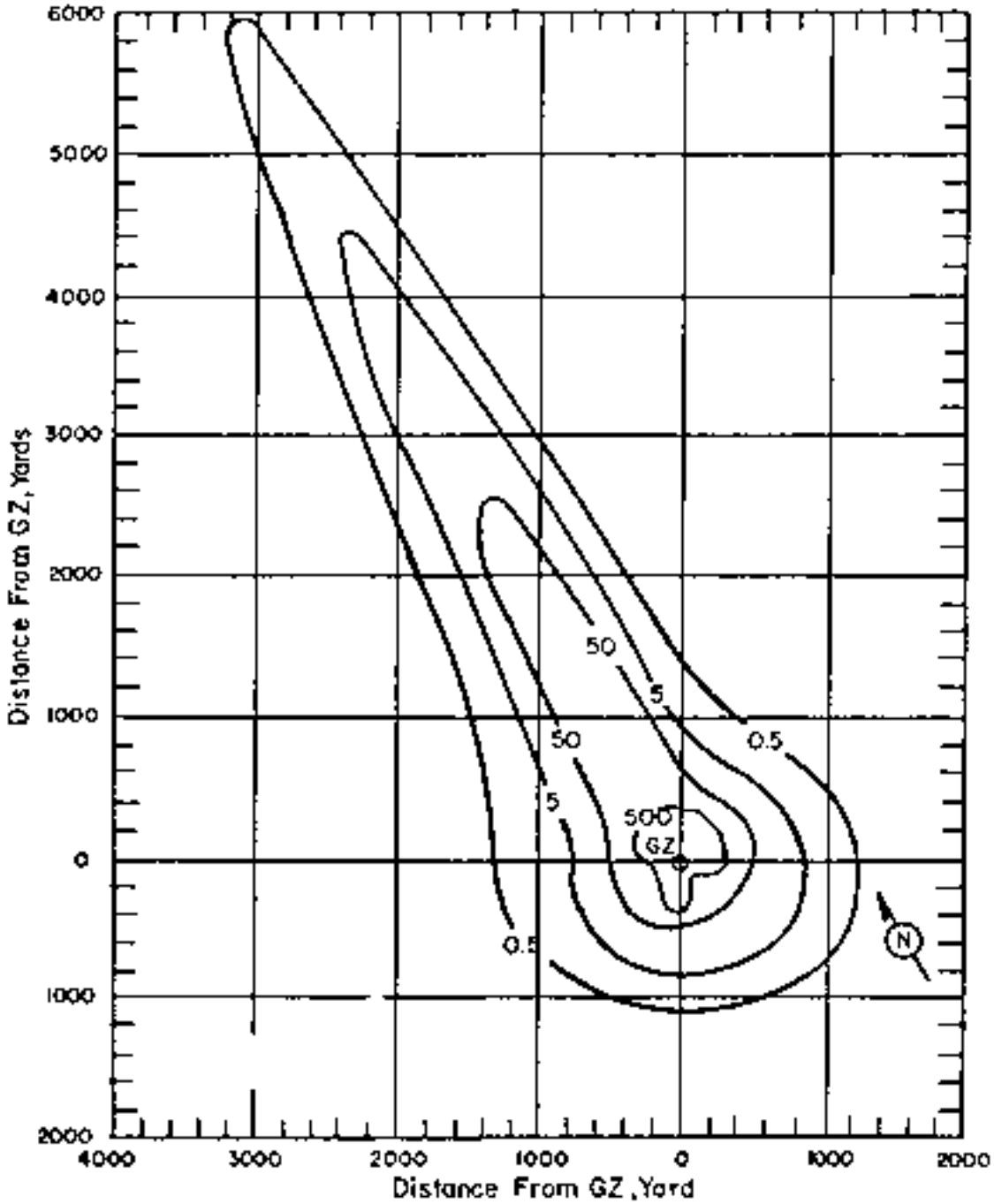


Figure 53. Operation TUMBLER-SNAPPER-EASY. On-site dose rate contours in r/hr at H+1 hour.

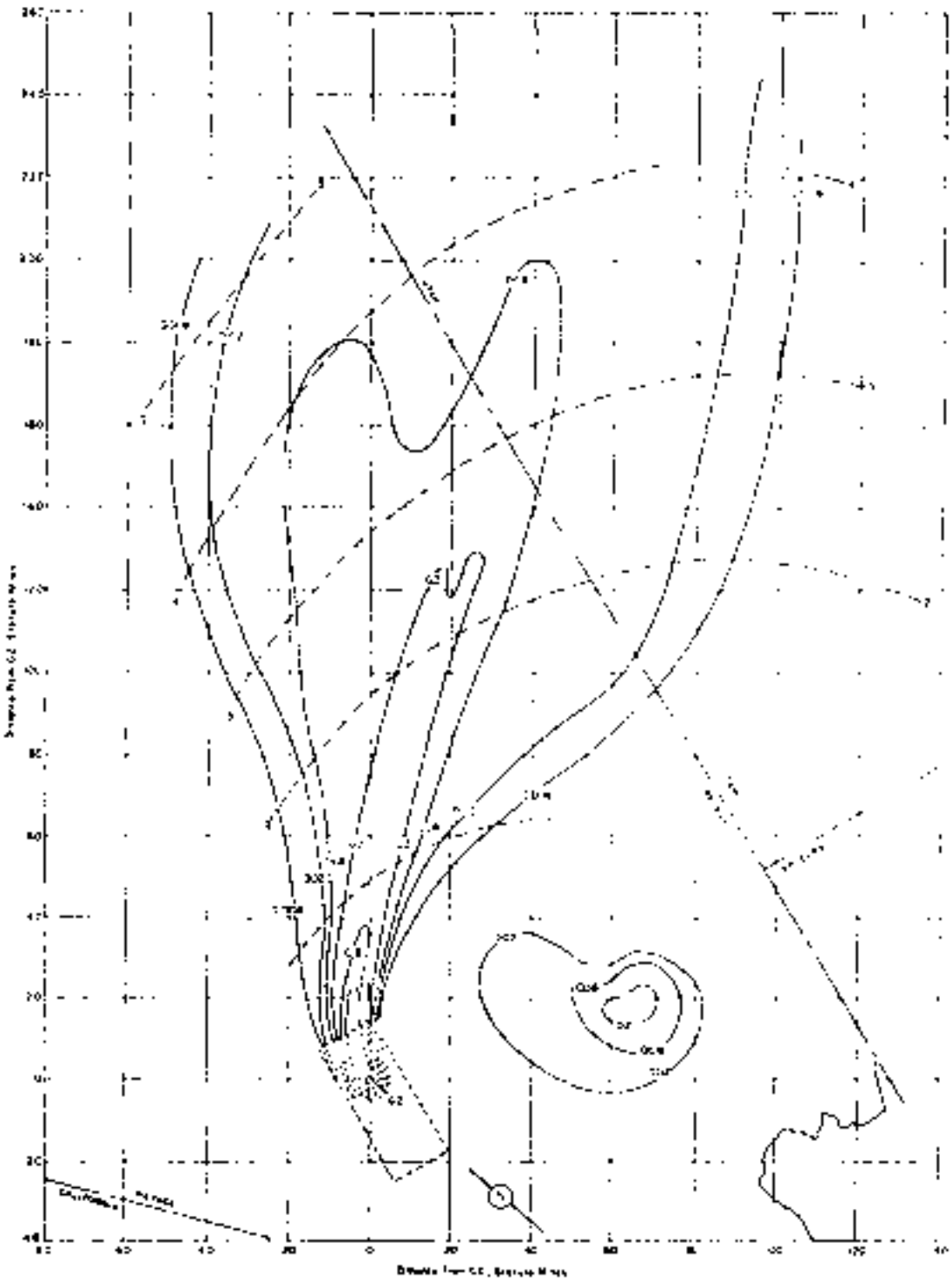


Figure 54. Operation TUMBLER-SNAPPER-EASY Off-site dose rate contours in r/hr at H+1 hour.

TABLE 15 NEVADA WIND DATA FOR OPERATION TUMBLER-SNAPPER- EASY

Altitude (MSL)	H-hour		Altitude (MSL)	H-hour	
	Dir	Speed		Dir	Speed
feet	degrees	mph	feet	degrees	mph
Surface	Calm	Calm	12,000	190	52
4,000	Calm	Calm	14,000	190	62
5,000	Calm	Calm	15,000	190	56
6,000	180	23	16,000	210	55
7,000	180	30	18,000	210	67
8,000	180	37	20,000	220	77
9,000	190	40	25,000	220	90
10,000	180	41	30,000	220	107

NOTES:

1. Wind data was obtained by the Mercury Weather Station located at the C. P.
2. Tropopause height was 41,000 ft MSL.
3. At H-hour the pressure at ground zero was 902 mb, the temperature 60.5°F and the relative humidity 40%.

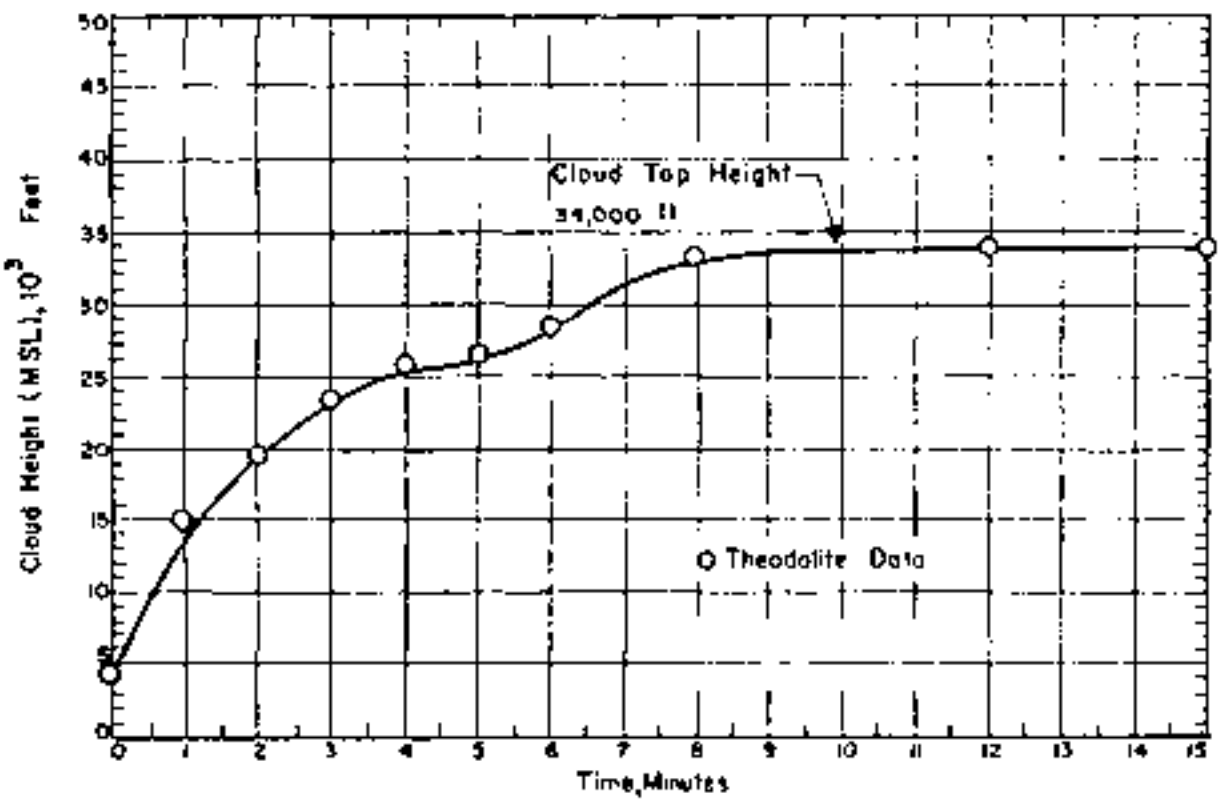


Figure 55. Cloud Dimensions: Operation TUMBLER-SNAPPER-EASY

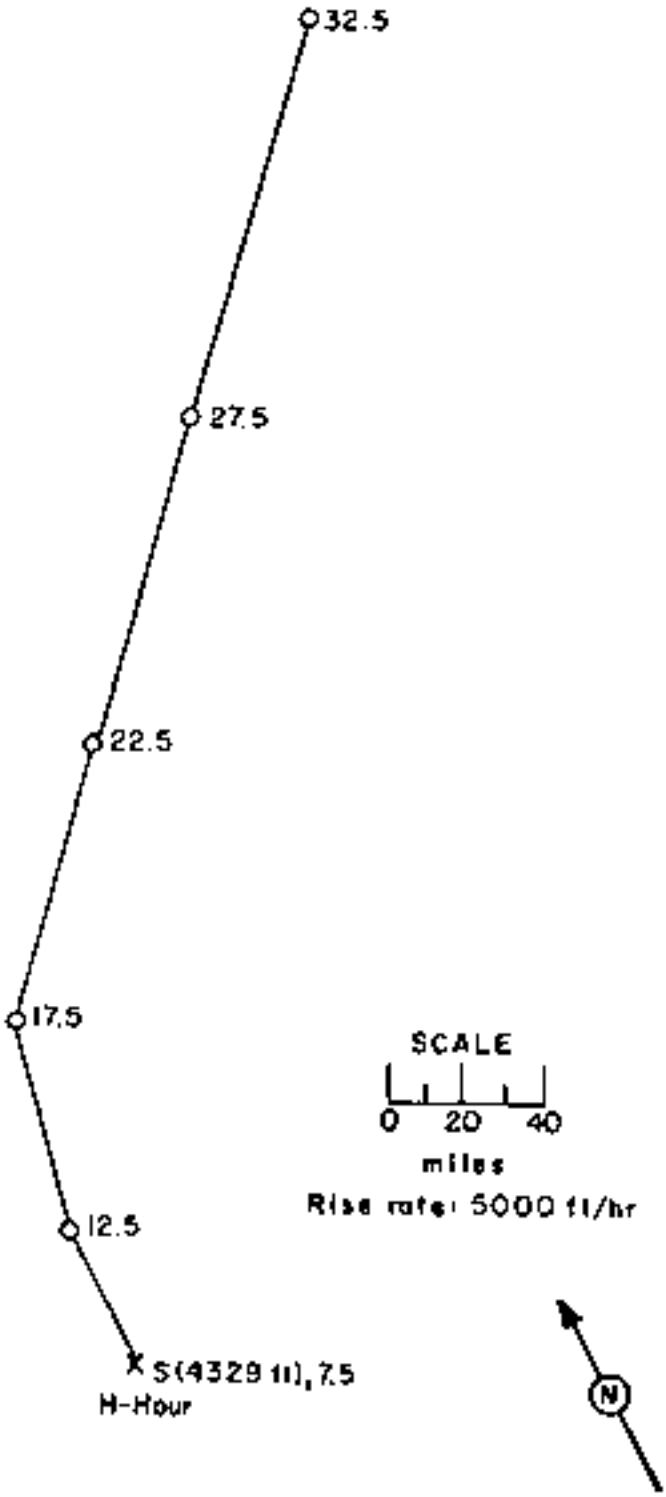


Figure 56. Hodograph for Operation TUMBLER-SNAPPER-EASY

OPERATION TUMBLER-SNAPPER - FOX

	PST	GMT
DATE:	25 May 1952	25 May 1952
TIME:	0400	1200

Sponsor: LASL

SITE: NTS - Area 4
37° 05' 44" N
116° 00' 00" W
Site elevation: 4,399 ft

TOTAL YIELD: 11 kt

HEIGHT OF BURST: 300 ft

TYPE OF BURST AND PLACEMENT:
Tower burst over ground zero

FIREBALL DATA:
Time to 1st maximum: 10 to 13 msec
Time to 2nd maximum: 120 msec
Radius at 2nd maximum: 2M

CLOUD TOP HEIGHT: ~3,000 ft MSL
CLOUD BOTTOM HEIGHT: Not available

CRATER DATA: No crater

REMARKS:

The on-site fallout pattern was obtained from readings of radiological survey teams from D-day through D+3 days along eight radial lines of numbered stakes, 300 feet apart. Although part of the contamination from this shot overlapped that resulting from the previous tower shot, the old contamination had a negligible influence on the dose rates. The survey readings were extrapolated to H+1 hour by using the $t^{-1.2}$ decay approximation. The off-site readings were obtained by ground mobile monitors of the Radiological Safety organization from D-day through D+2 days.

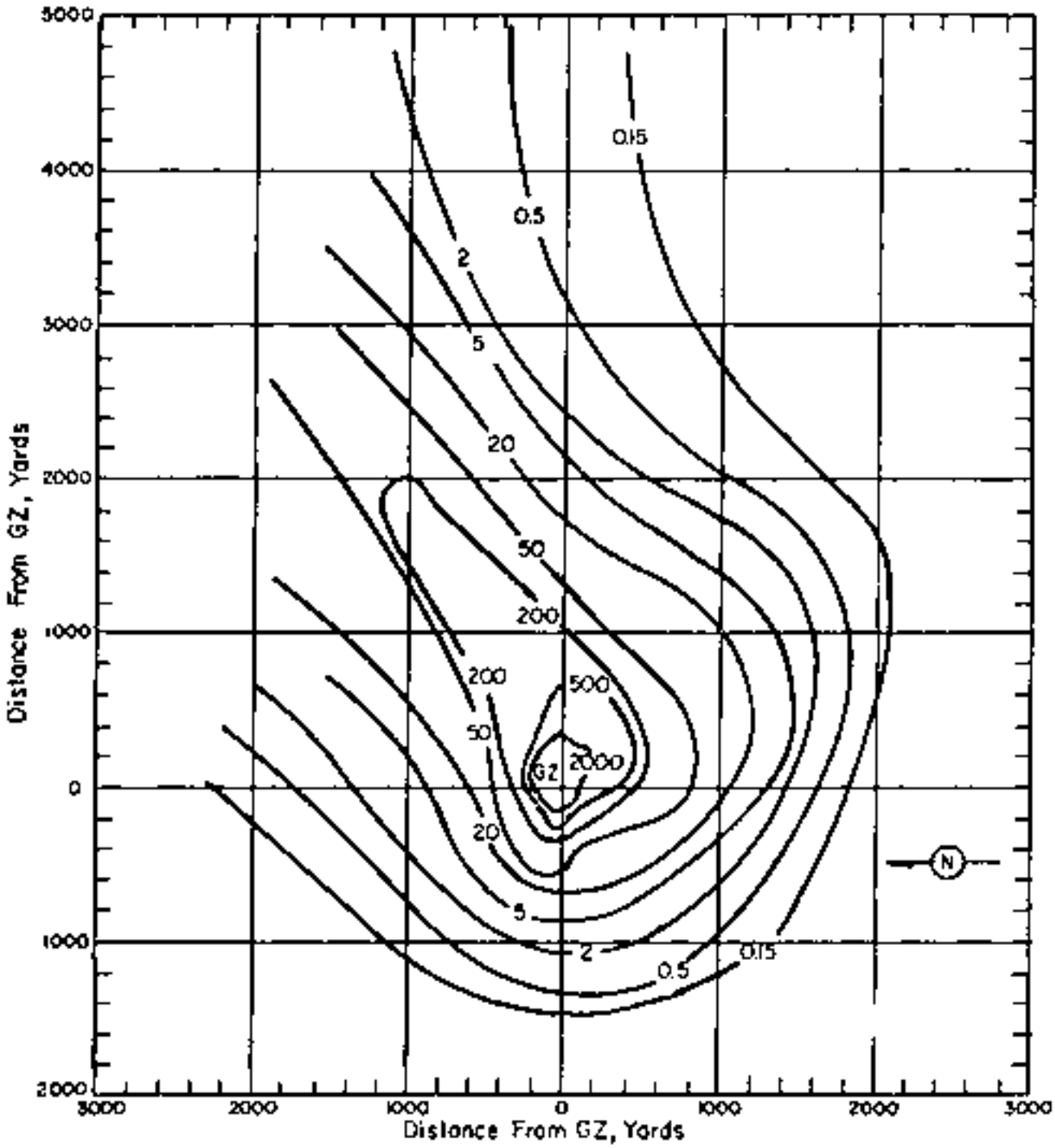


Figure 57. Operation TUMBLER-SNAPPER - FOX On-site dose rate contours in r/hr at H+1 hour.

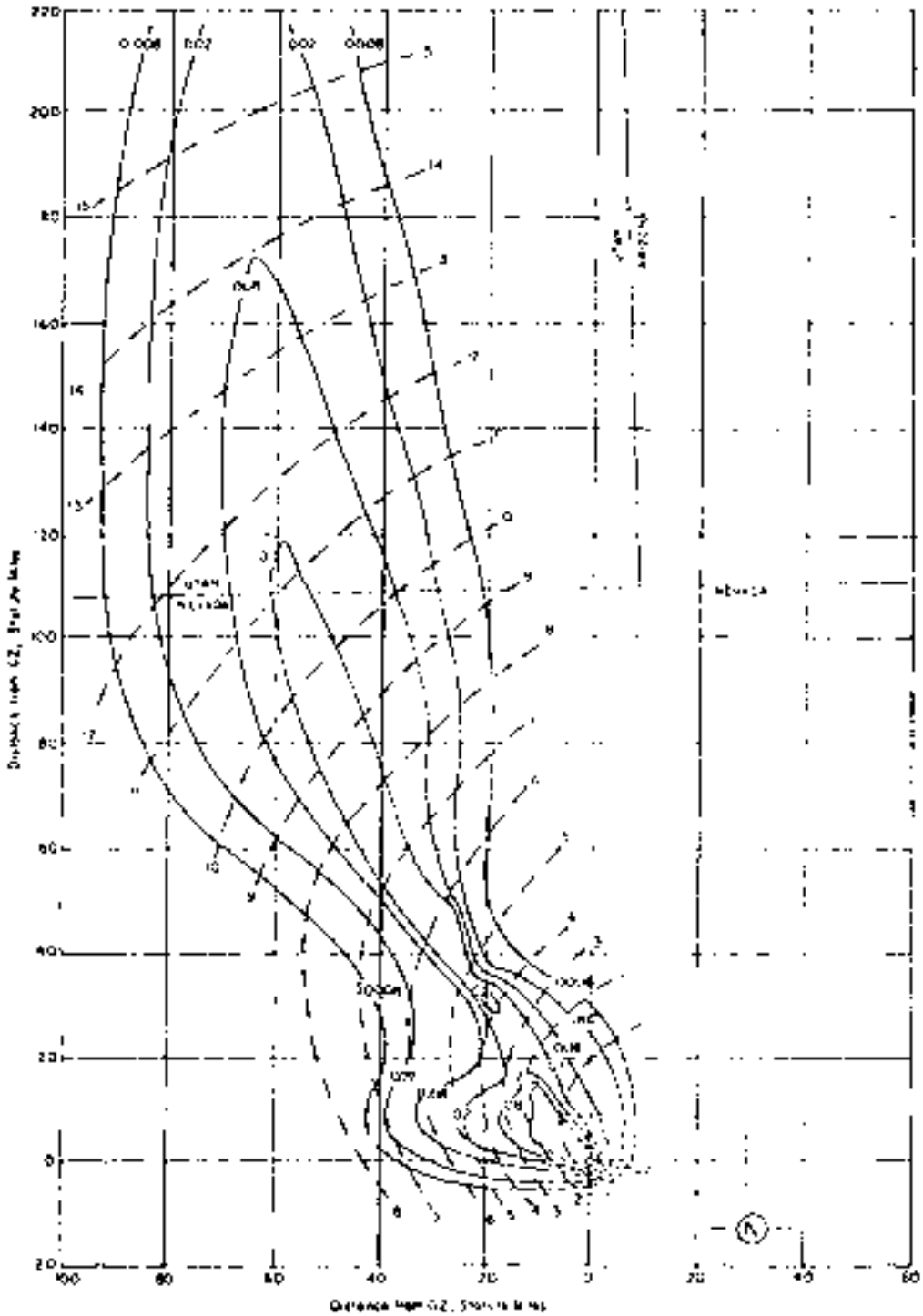


Figure 58. Operation TUMBLER-SNAPPER - FOX Off-site dose rate contours in r/hr at H+1 hour.

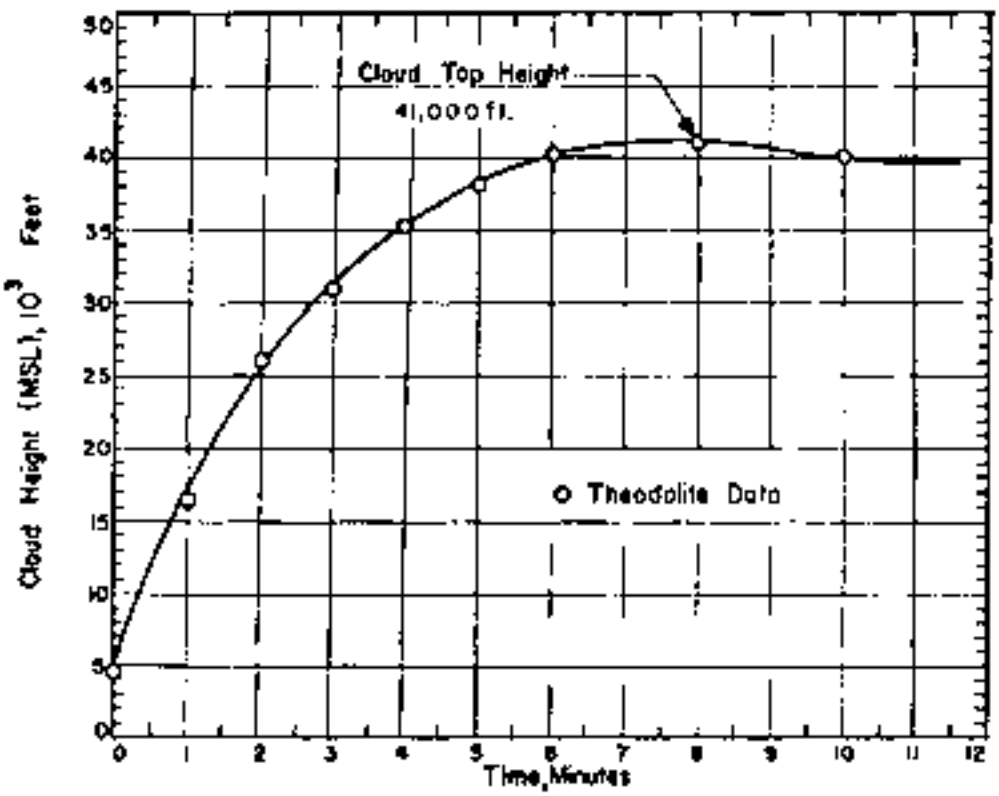


Figure 59. Cloud Dimensions: Operation TUMBLER-SNAPPER-FOX

TABLE 19 NEVADA WIND DATA FOR OPERATION TUMBLER-SNAPPER-FOX

Altitude (MSL)	H-hour		Altitude (MSL)	H-hour	
	Dir	Speed		Dir	Speed
feet	degrees	mph	feet	degrees	mph
Surface	Calm	Calm	14,000	200	07
5,000	210	02	15,000	150	05
6,000	210	09	16,000	120	07
7,000	220	13	18,000	140	10
8,000	220	13	20,000	220	09
9,000	220	13	25,000	240	26
10,000	220	12	30,000	230	29
12,000	210	10	35,000	240	40

NOTES:

1. Wind data was obtained by the Mercury Weather Station located at the C. P.
2. Tropopause height was 37,000 ft MSL.
3. At H-hour the pressure at ground zero was 860 mb, the temperature 57.1°F and the relative humidity 41%.

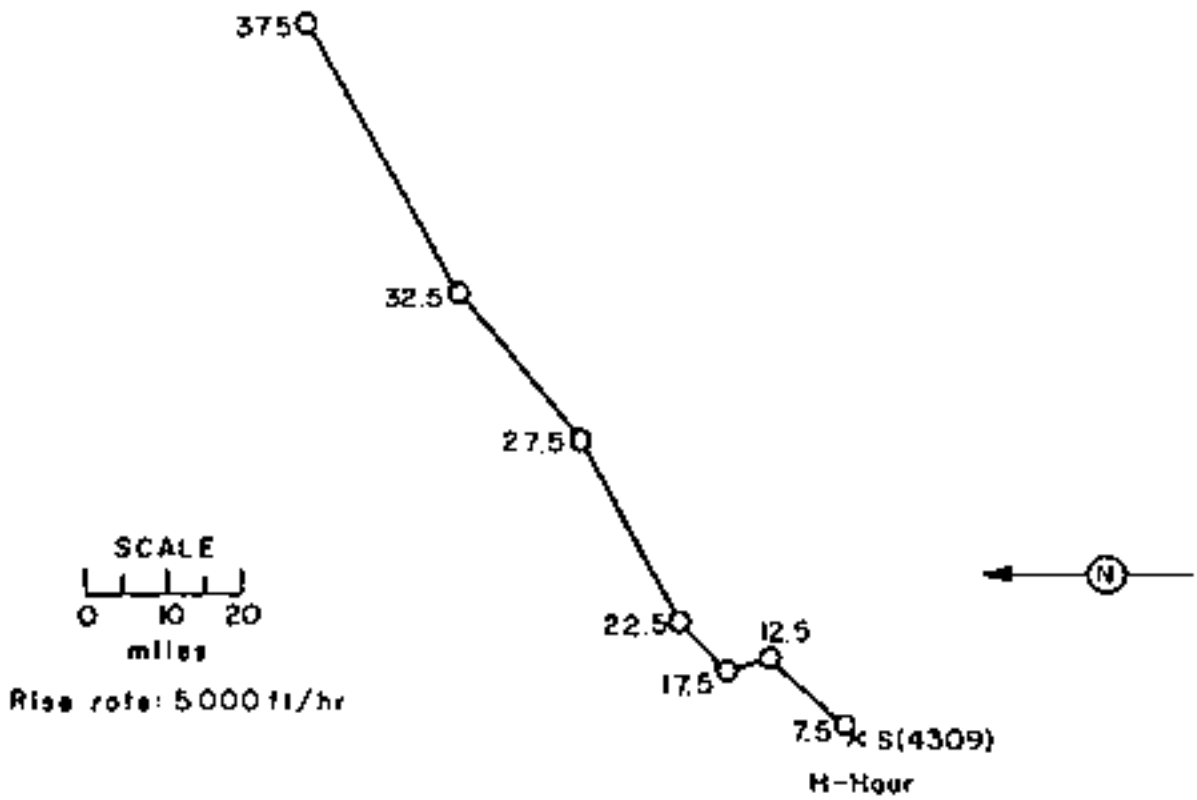


Figure 60. Hodograph for Operation TUMBLER-SNAPPER-FOX

OPERATION TUMBLER-SNAPPER—GEORGE

	PST	GMT
DATE:	1 Jun 1952	1 Jun 1952
TIME:	0355	1155

Sponsor: LASL

SITE: NTS - Area 3
37° 02' 53" N
116° 01' 26" W
Site elevation: 4,027.56 ft

TOTAL YIELD: 15 kt

HEIGHT OF BURST: 300 ft

FIREBALL DATA:
Time to 1st minimum: 8.5 to 14.5 msec
Time to 2nd maximum: 190 msec
Radius at 2nd maximum: NR

TYPE OF BURST AND PLACEMENT:
Tower burst over Nevada soil

CLOUD TOP HEIGHT: 37,000 ft MSL
CLOUD BOTTOM HEIGHT: Not available

CRATER DATA: No crater

REMARKS:

The on-site fallout pattern was obtained from readings of radiological survey teams from D-day through D+2 days along eight radial lines of numbered stakes 300 feet apart. These readings were extrapolated to H+1 hour by using the $t^{-1.2}$ decay approximation. The off-site fallout pattern was drawn from the readings taken by ground mobile monitors of the Radiological Safety organization on D-Day. The $t^{-1.2}$ decay approximation was used to extrapolate the dose-rate readings to H+1 hour.

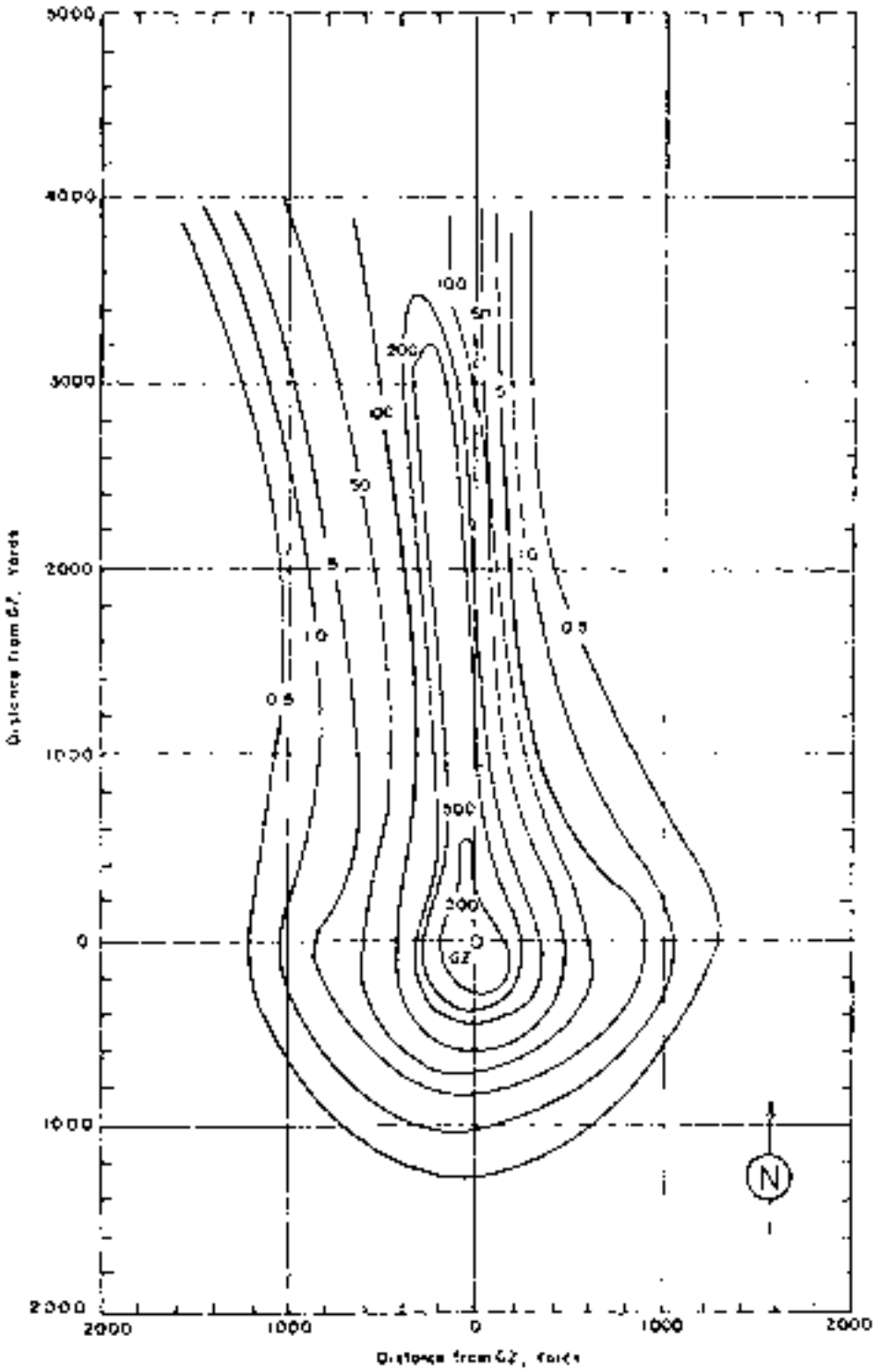


Figure 61. Operation TUMBLER-SNAPPER-GEORGE: On-site dose rate contours in r/hr at H+1 hour.

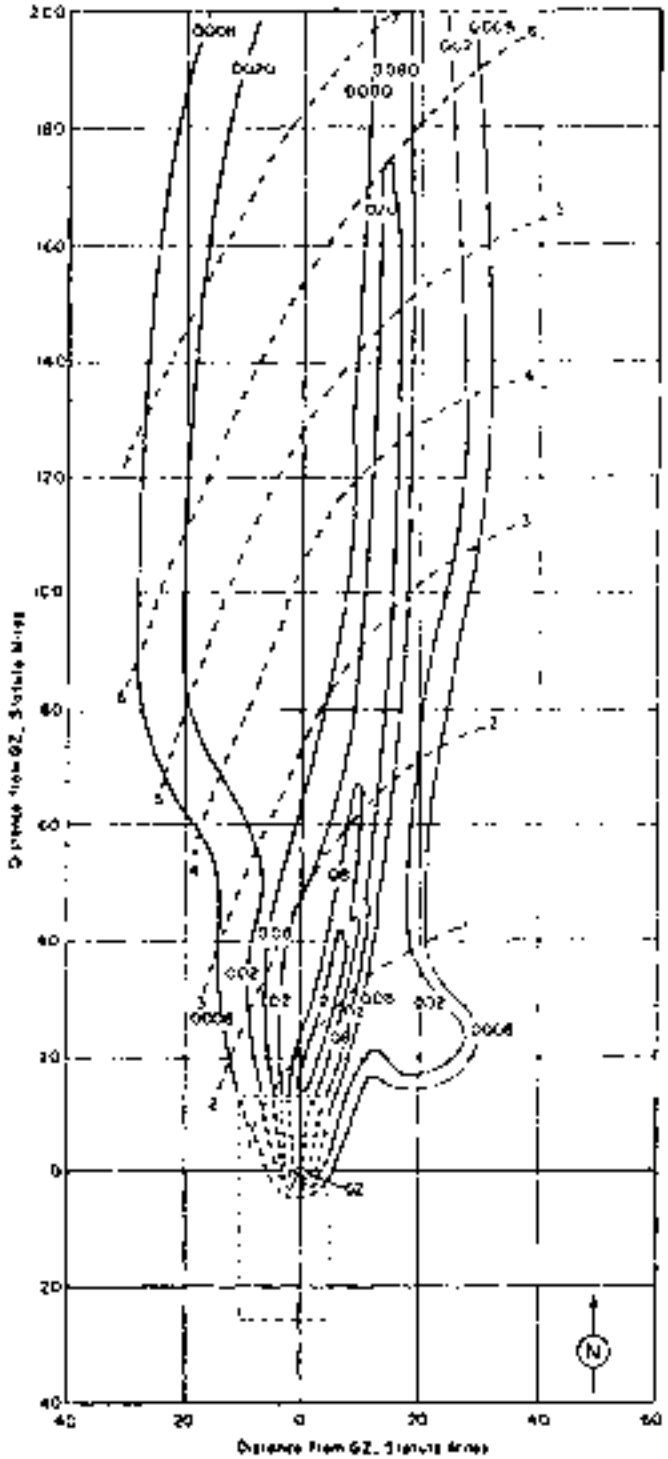


Figure 62. Operation TUMBLER-SNAPPER-GEORGE Off-site dose rate contours in r/hr at H+1 hour.

TABLE 20 NEVADA WIND DATA FOR OPERATION TUMBLER-SNAPPER-GEORGE

Altitude (MSL)	H-hour		Altitude (MSL)	H-hour	
	Dir	Speed		Dir	Speed
feet	degrees	mph	feet	degrees	mph
Surface	Calm	Calm	14,000	180	30
5,000	Calm	Calm	15,000	170	30
6,000	170	20	16,000	170	33
7,000	170	21	18,000	190	35
8,000	170	20	20,000	190	51
9,000	160	20	25,000	200	48
10,000	160	17	30,000	190	41
12,000	180	20			

NOTES:

1. Wind data was obtained by the Mercury Weather Station located at the C. P.
2. Tropopause height was 37,000 ft MSL.
3. At H-hour the pressure at ground zero was 872 mb, the temperature 52.6°F and the relative humidity 48%.

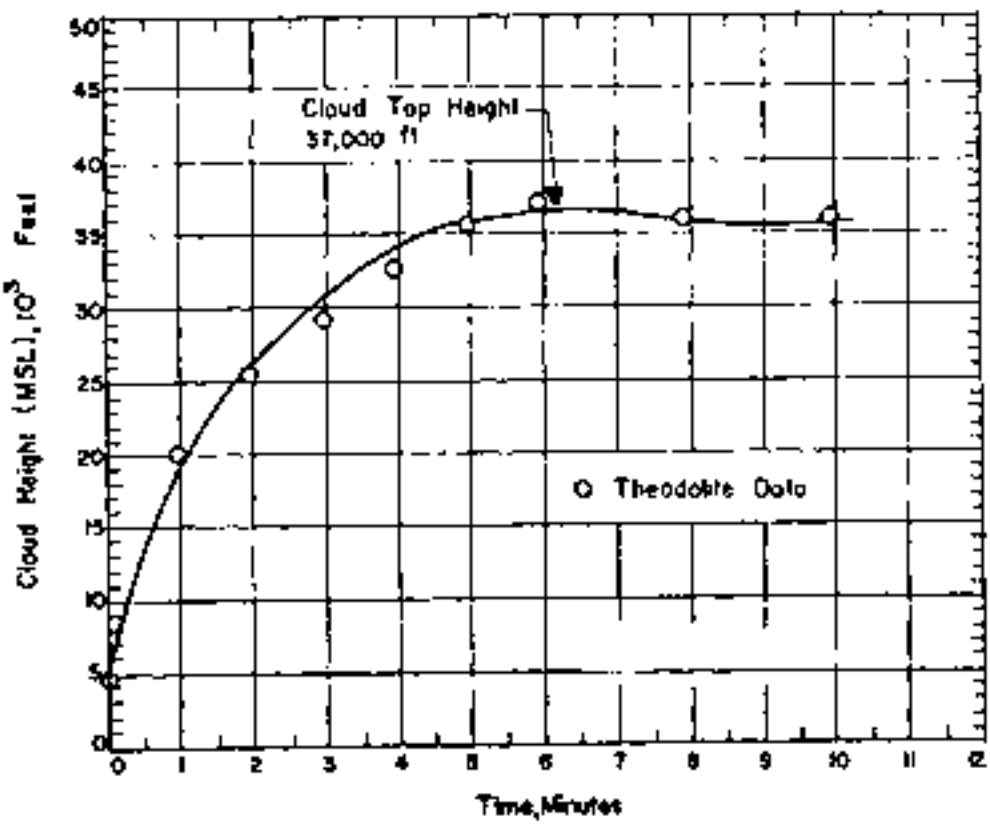


Figure 63. Cloud Dimensions: Operation TUMBLER-SNAPPER-GEORGE

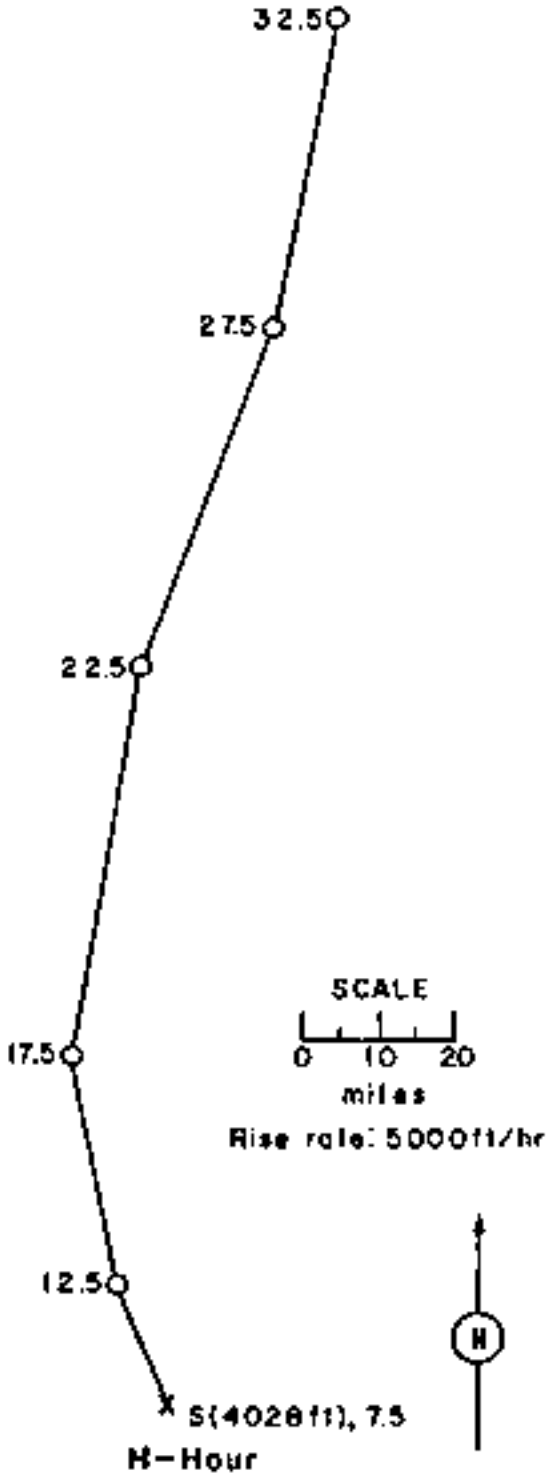


Figure 64. Hodograph for Operation TUMBLER-SNAPPER-GEORGE

OPERATION TUMBLER-SNAPPER - HOW

	PST	GMT
DATE:	5 Jun 1952	5 Jun 1952
TIME:	0355	1155

TOTAL YIELD: 1.1 kt

FIREBALL DATA:
Time to 1st minimum: 9 to 11 msec
Time to 2nd maximum: NM
Radius at 2nd maximum: NM

CRATER DATA: No crater

Sponsor: LASL

SITE: NTS - Area 2
37° 08' 19" N
116° 07' 04" W
Site elevation: 4,492 ft

HEIGHT OF BURST: 300 ft

TYPE OF BURST AND PLACEMENT:
Tower burst over Nevada soil

CLOUD TOP HEIGHT: ≈1,800 ft M.S.L.
CLOUD BOTTOM HEIGHT: Not available

REMARKS:

The on-site fallout pattern was obtained from readings of radiological survey teams from D-day through D+4 days along radial lines of numbered stakes 300 feet apart. These readings were extrapolated to H+1 hour by using the $t^{-1.2}$ decay approximation. The close-in fallout was deposited in the mountains, and, therefore, the on-site isointensity lines were not closed. The off-site fallout pattern was drawn from the readings taken on D-day by ground mobile monitors of the Radiological Safety organization, using the $t^{-1.2}$ decay approximation to extrapolate to H+1 hour.

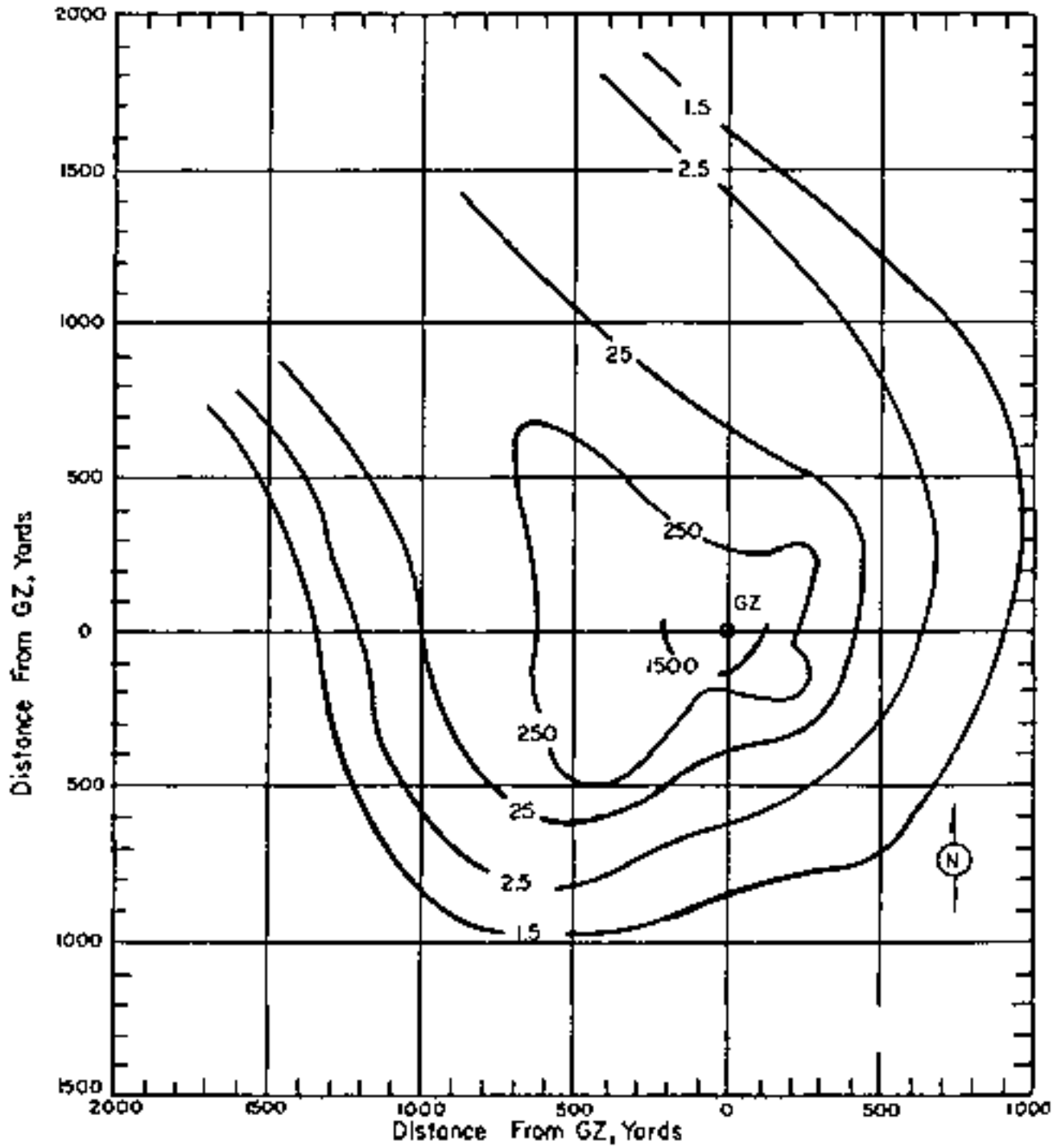


Figure 65. Operation TUMBLER-SNAPPER - HOW On-site dose rate contours in r/hr at H+1-hour.

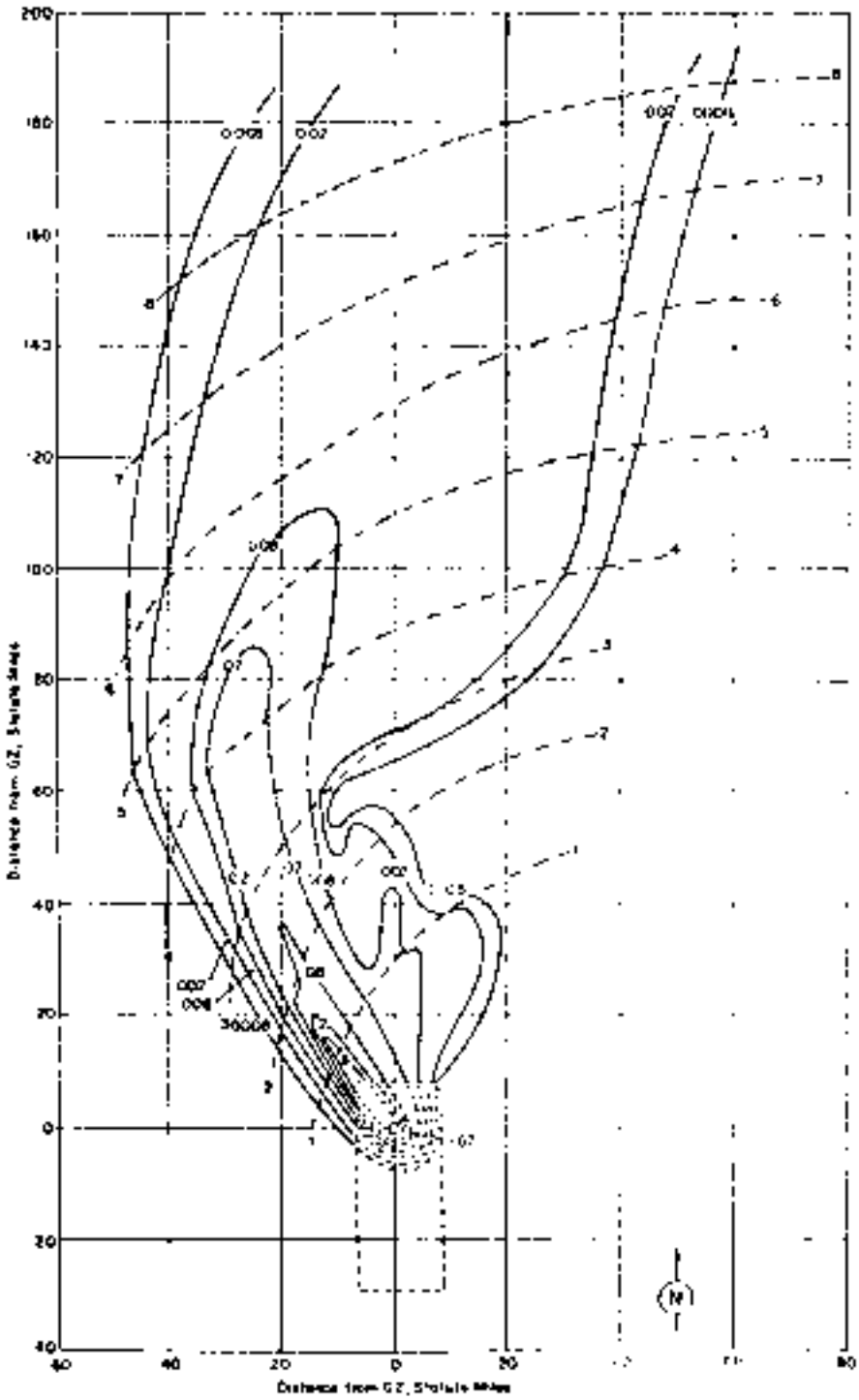


Figure 66. Operation TUMBLER-SNAPPER-HOW Off-site dose rate contours in r/hr at H+1 hour.

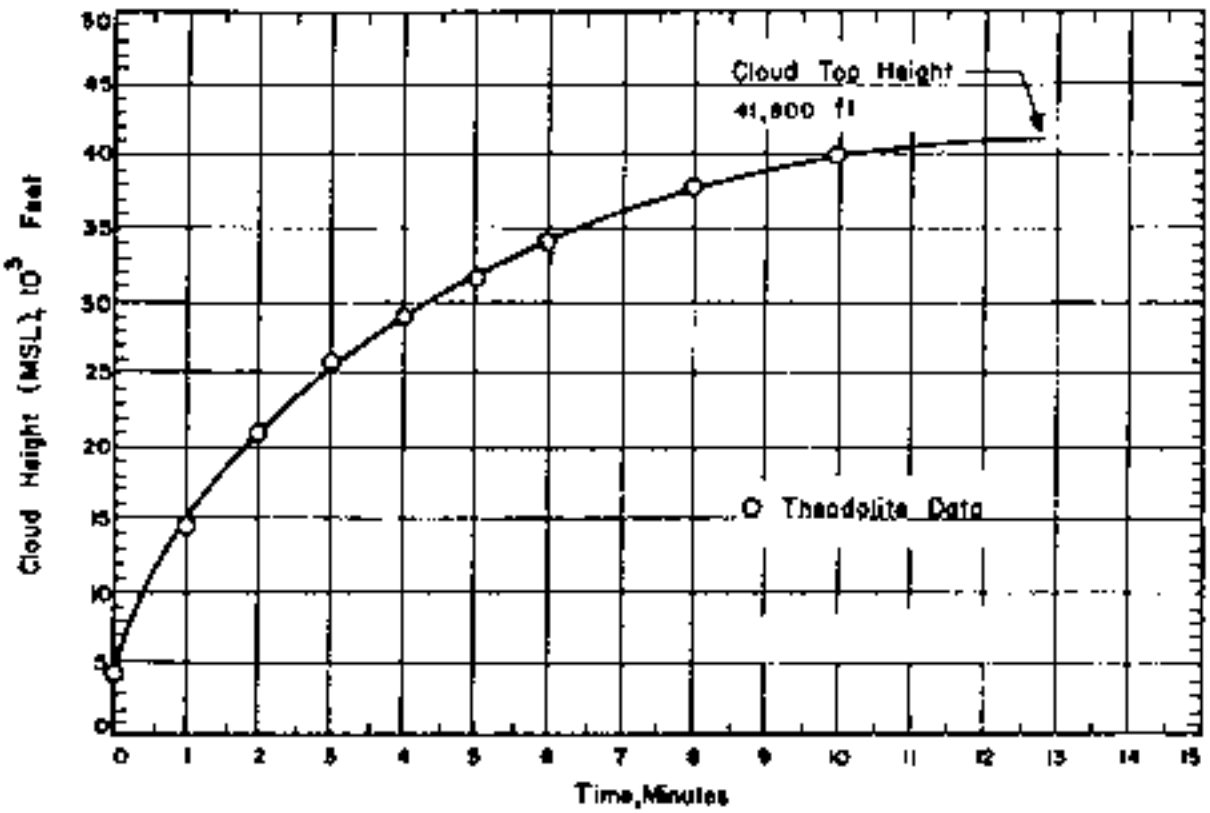


Figure 67. Cloud Dimensions: Operation TUMBLER-SNAPPER-HOW

TABLE 21 NEVADA WIND DATA FOR OPERATION TUMBLER-SNAPPER-IOW

Altitude (MSL)	H-hour		Altitude (MSL)	H-hour	
	Dir	Speed		Dir	Speed
feet	degrees	mph	feet	degrees	mph
Surface	Calm	Calm	14,000	120	29
5,000	Calm	Calm	15,000	120	28
6,000	210	06	16,000	120	25
7,000	170	07	18,000	150	22
8,000	150	07	20,000	150	17
9,000	140	13	25,000	160	25
10,000	140	15	30,000	150	29
12,000	130	20			

NOTES:

1. Wind data was obtained by the Mercury Weather Station located at the C. P.
2. Tropopause height was 40,000 ft MSL.
3. At H-hour the pressure at ground zero was 863 mb, the temperature 64.0°F and the relative humidity 40%.

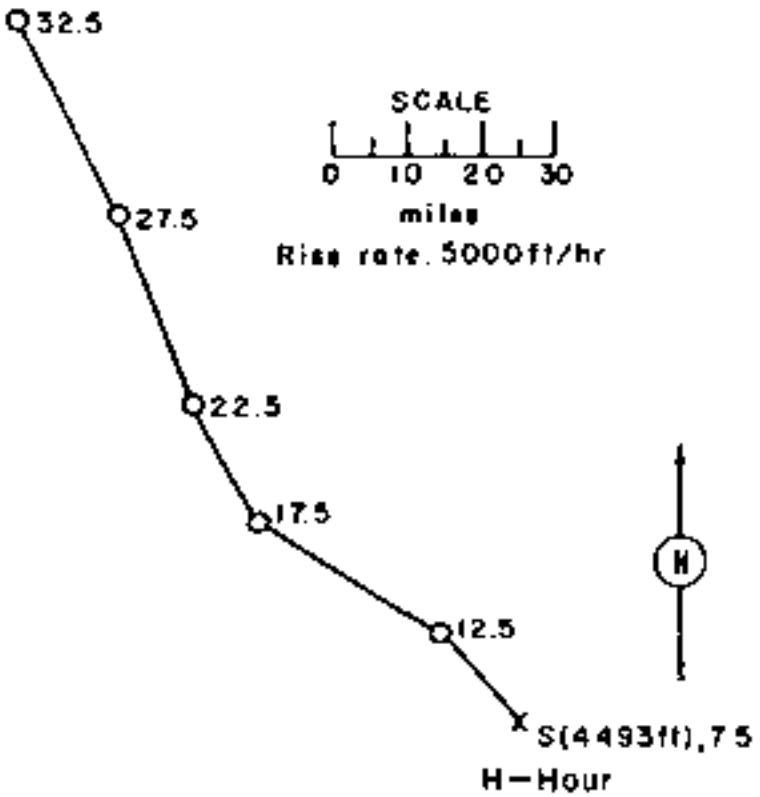


Figure 68. Hodograph for Operation TUMBLER-SNAPPER-IOW

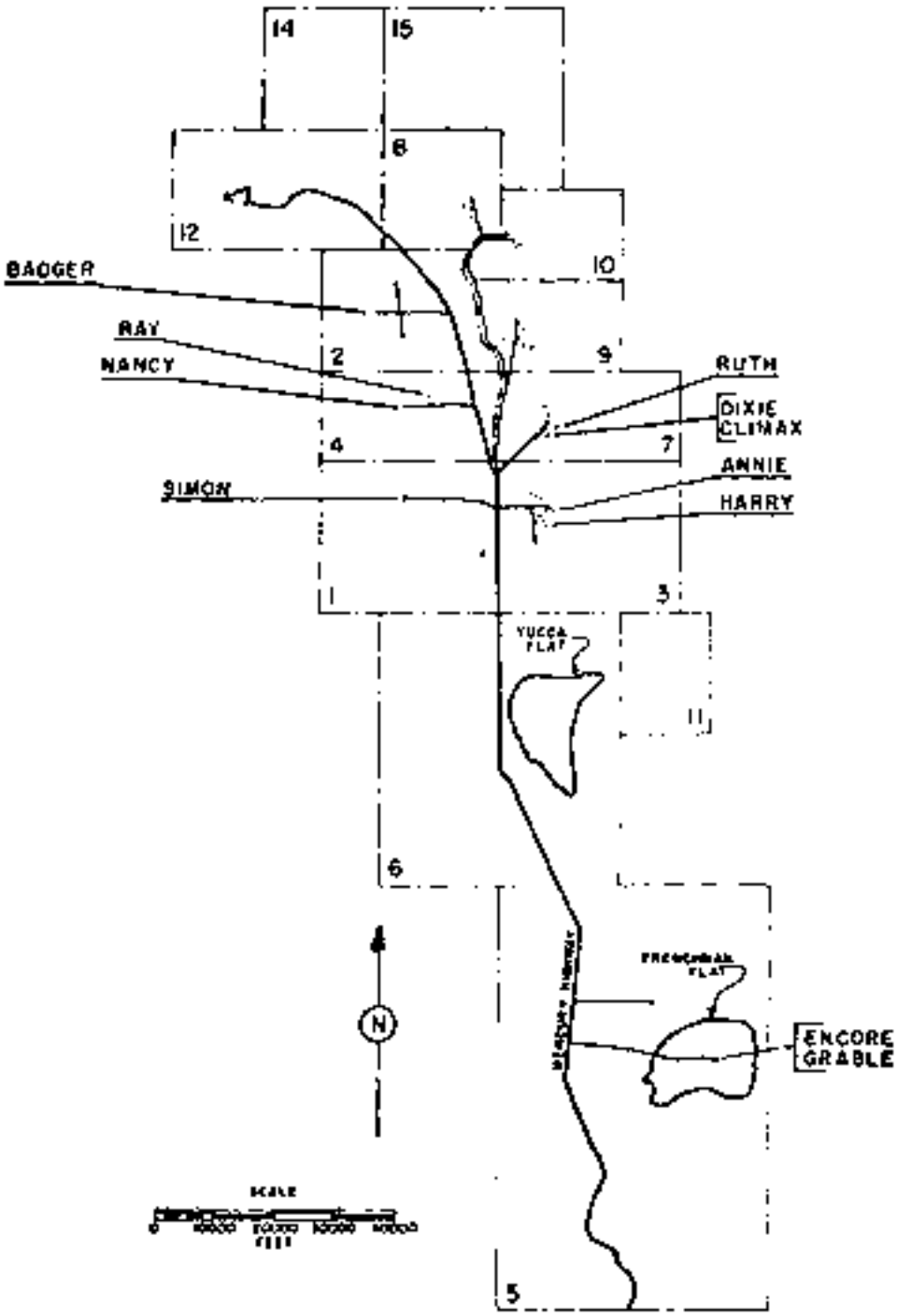


Figure 60. Operation UPSHOT-KNOTHOLE, Shot Locations.

OPERATION UPSHOT-KNOTHOLE - Annie

	PST	GMT
DATE:	1st Mar 1953	1st Mar 1953
TIME:	0520	1320

Sponsor: LASL

SITE: NTS - Area 3
37° 02' 52" N
116° 01' 16" W
Site elevation: 4,026 ft

TOTAL YIELD: 16 kt

HEIGHT OF BURST: 300 ft

TYPE OF BURST AND PLACEMENT:
Tower burst over Nevada soil

FIREBALL DATA:
Time to 1st minimum: 14.3 to 14.5 msec
Time to 2nd maximum: 122 msec
Radius to 2nd maximum: NM

CLOUD TOP HEIGHT: 41,000 ft MSL
CLOUD BOTTOM HEIGHT: 28,000 ft MSL

CRATER DATA: No crater

REMARKS:

The on-site fallout pattern is based upon readings obtained by radiological ground survey teams from D-day to D+3 days. The locations of the points at which readings were taken were approximated. The off-site fallout pattern was drawn from readings on D-day through D+3 day by ground mobile monitors of the Radiological Safety organization. The $t^{-1.2}$ decay approximation was used to extrapolate both the on-site and off-site dose rates to H+1 hour.

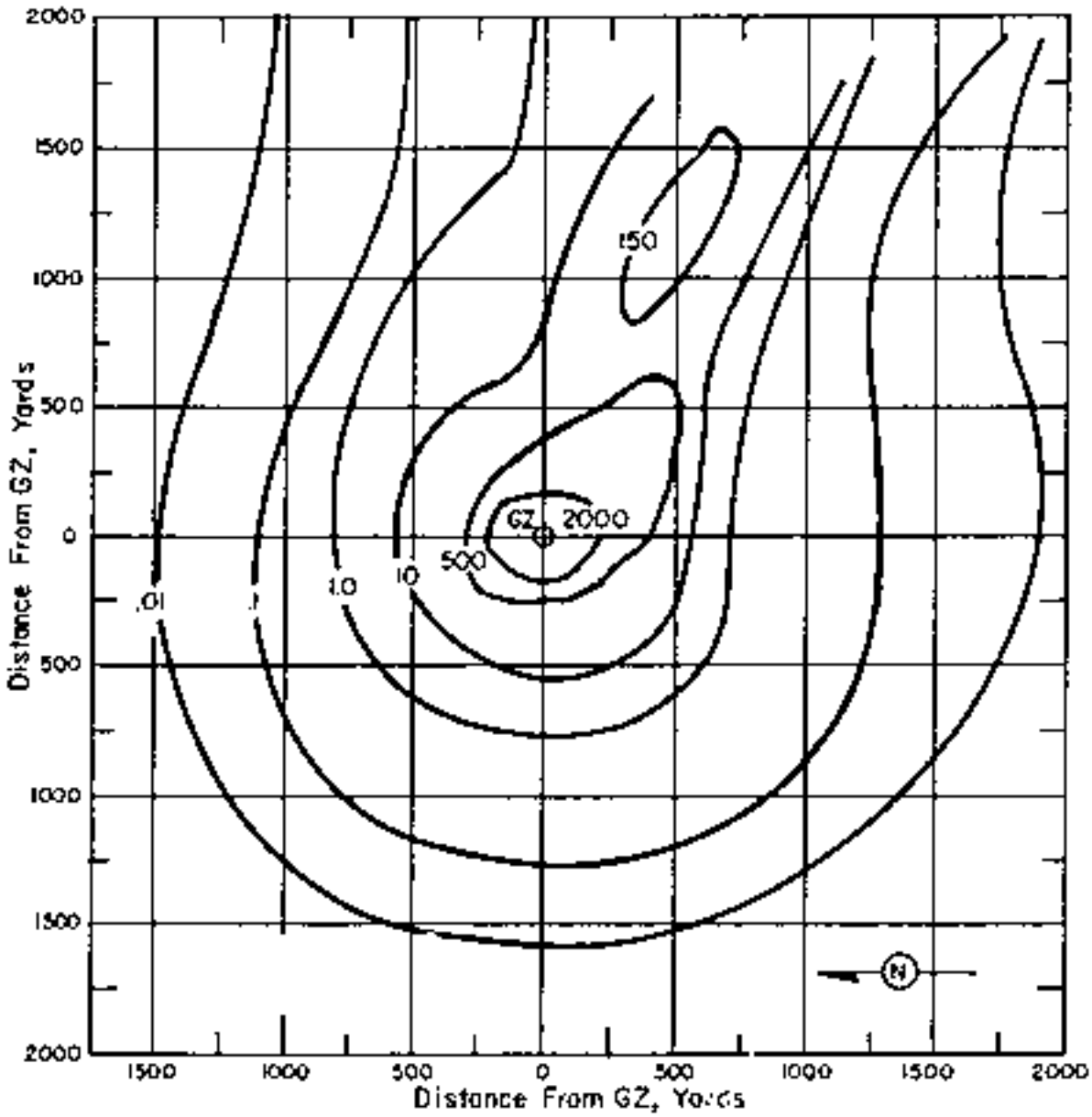


Figure 70. Operation UPSHOT-KNOTHOLE - Annie.
On-site dose rate contours in r/hr at R+1 hour.

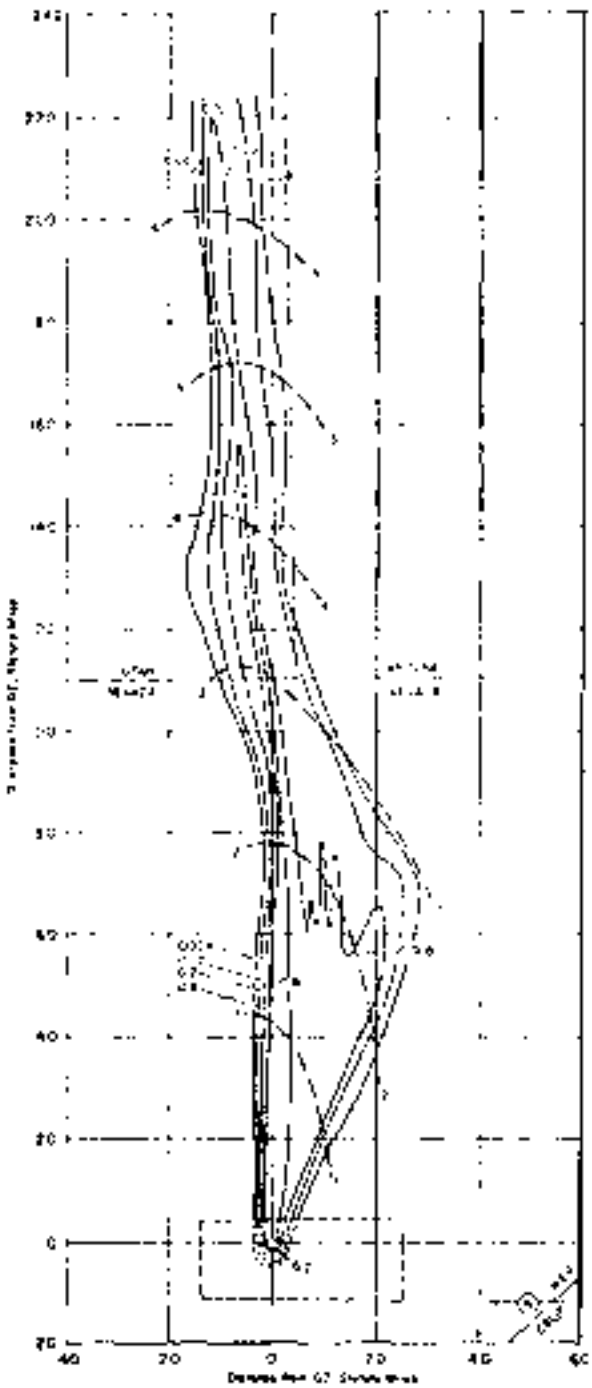


Figure 71. Operation [illegible] - Annie
Off-site dose rate contours in r/hr at H+1 hour.

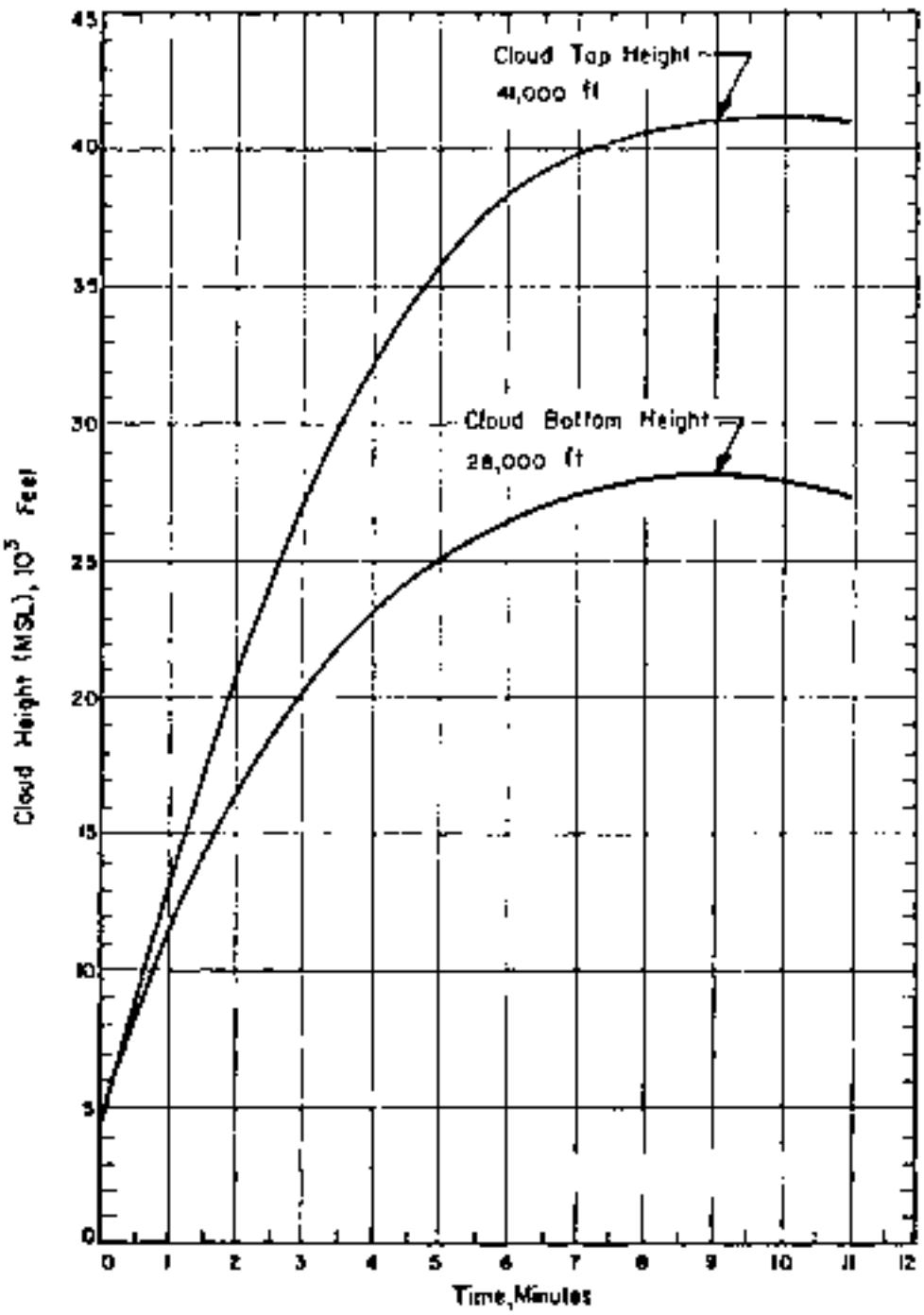


Figure 72. Cloud Dimensions: Operation UPSHOT-KNOTHOLE - Arnie.

TABLE 22 NEVADA WIND DATA FOR OPERATION UPSHOT-KNOTHOLE* ANNIE

Altitude (MSL)	H-hour		Altitude (MSL)	H-hour	
	Dir	Speed		Dir	Speed
feet	degrees	m.p.h.	feet	degrees	m.p.h.
Surface	Variable	Light	27,000	270	57
Burst Height	290	02	28,000	270	60
5,000	250	02	29,000	270	69
6,000	290	09	30,000	270	75
7,000	270	10	31,000	270	76
8,000	280	07	32,000	270	74
9,000	270	28	33,000	270	69
10,000	270	29	34,000	260	64
11,000	270	29	35,000	260	61
12,000	270	29	36,000	260	69
13,000	270	26	37,000	260	75
14,000	270	24	38,000	260	81
15,000	260	27	39,000	260	92
16,000	260	39	40,000	260	102
17,000	260	44	41,000	260	90
18,000	270	46	42,000	260	84
19,000	270	45	43,000	260	80
20,000	270	62	44,000	260	70
21,000	270	57	45,000	260	73
22,000	270	54	46,000	260	70
23,000	270	49	47,000	260	69
24,000	270	46	48,000	260	68
25,000	270	54	49,000	260	66
26,000	270	54	50,000	260	66

NOTES:

1. Tropopause height was 37,000 ft MSL at H-hour.
2. Surface wind data were obtained at the Control Point. Upper air data were obtained from the rawinsonde section located on Yucca Lake.
3. At H-hour the pressure at ground zero was 876 mb, the temperature 2.7°C, the dew point -8.9°C and the relative humidity 43%.

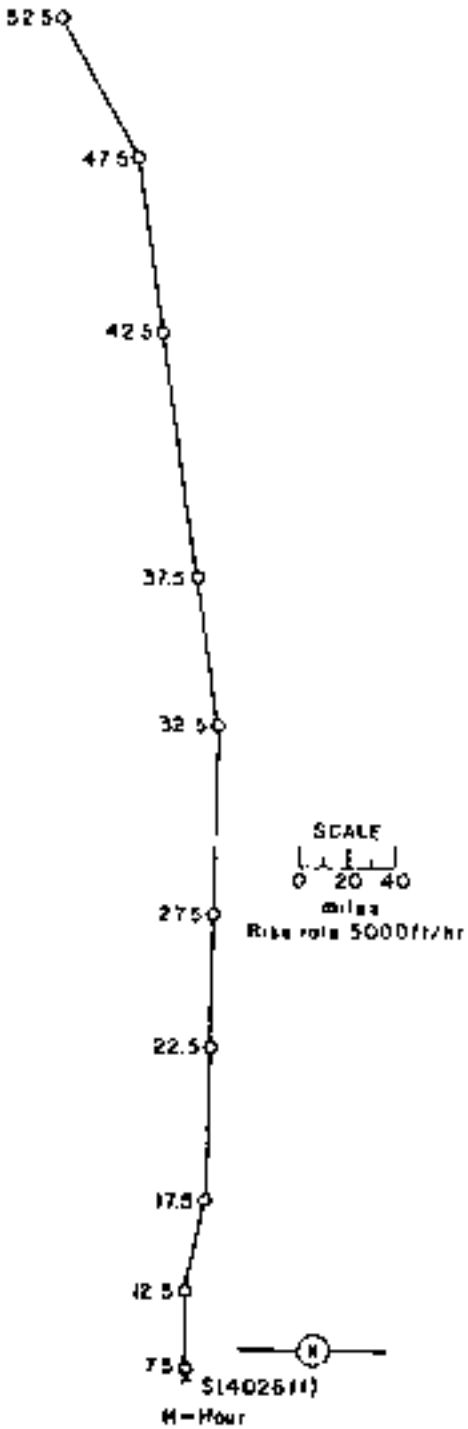


Figure 73. Hodograph for Operation UPSHOT-KNOTHOLE - Apple.

OPERATION UPSHOT-KNOTHOLE - Nancy

	PST	GMT
DATE:	24 Mar 1953	24 Mar 1953
TIME:	0510	1310

Sponsor: LASL

SITE: NTS - Area 5
37° 05' 22" N
116° 06' 10" W
Site elevation: 4,760 ft

TOTAL YIELD: 24 kt

HEIGHT OF BURST: 300 ft

TYPE OF BURST AND [illegible]:
Tower burst over [illegible]

FIREBALL DATA:
Time to 1st minimum: 17.5 to 18.5 msec
Time to 2nd maximum: 160 msec
Radius at 2nd maximum: NM

CLOUD TOP HEIGHT: 41,500 ft MSL
CLOUD BOTTOM HEIGHT: 26,000 ft MSL

CRATER DATA: No crater

REMARKS:

The on-site fallout pattern is based upon readings obtained by radiological ground survey teams on D-day. The off-site fallout pattern was drawn from D-day ground surveys made by the Radiological Safety organization. The $t^{-1.2}$ decay approximation was used to extrapolate the dose rates to H+1 hour for both the on-site and off-site patterns.

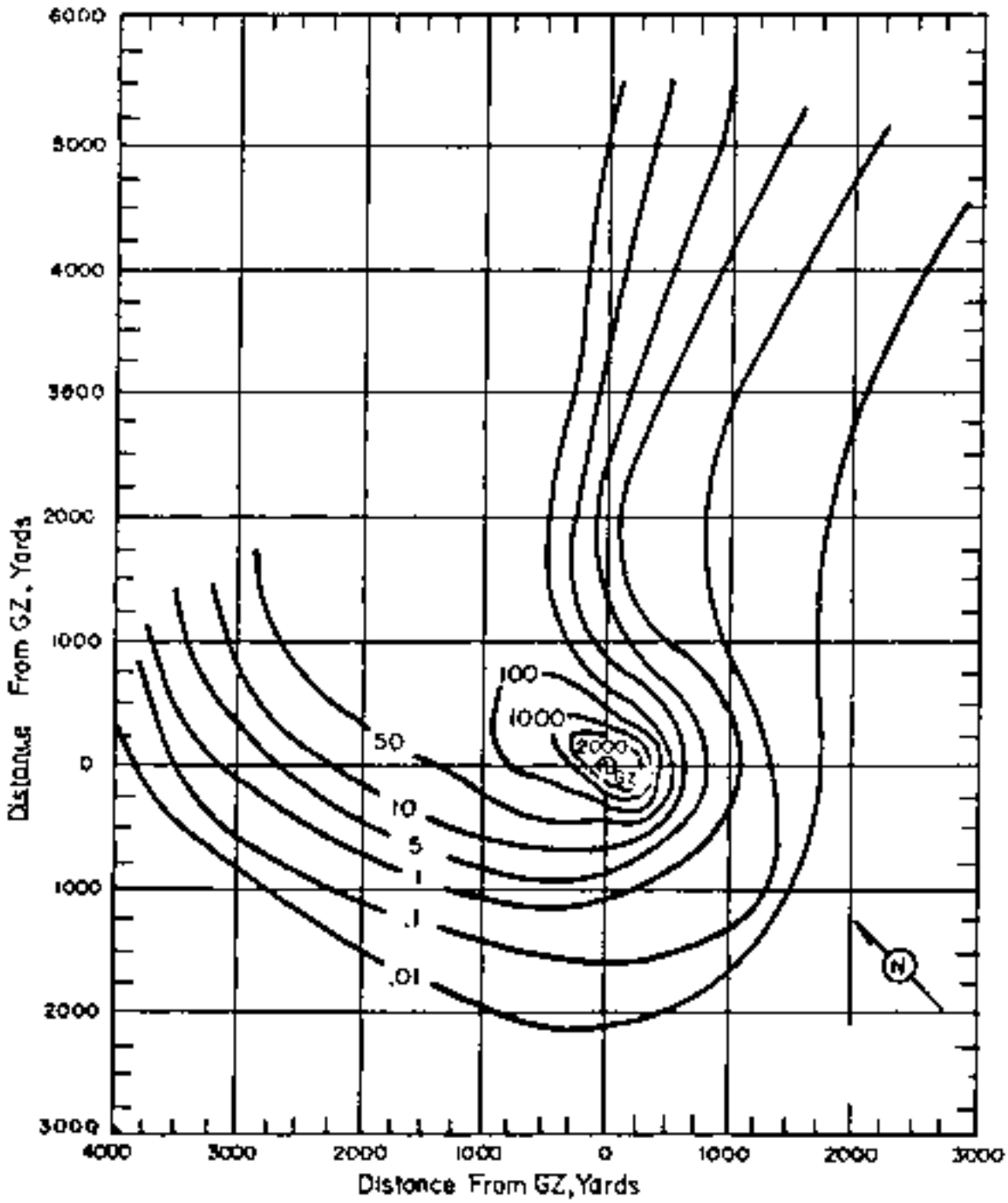


Figure 74. Operation UPSHOT-KNOTHOLE - Nancy.
On-site dose rate contours in r/hr at H+1 hour.

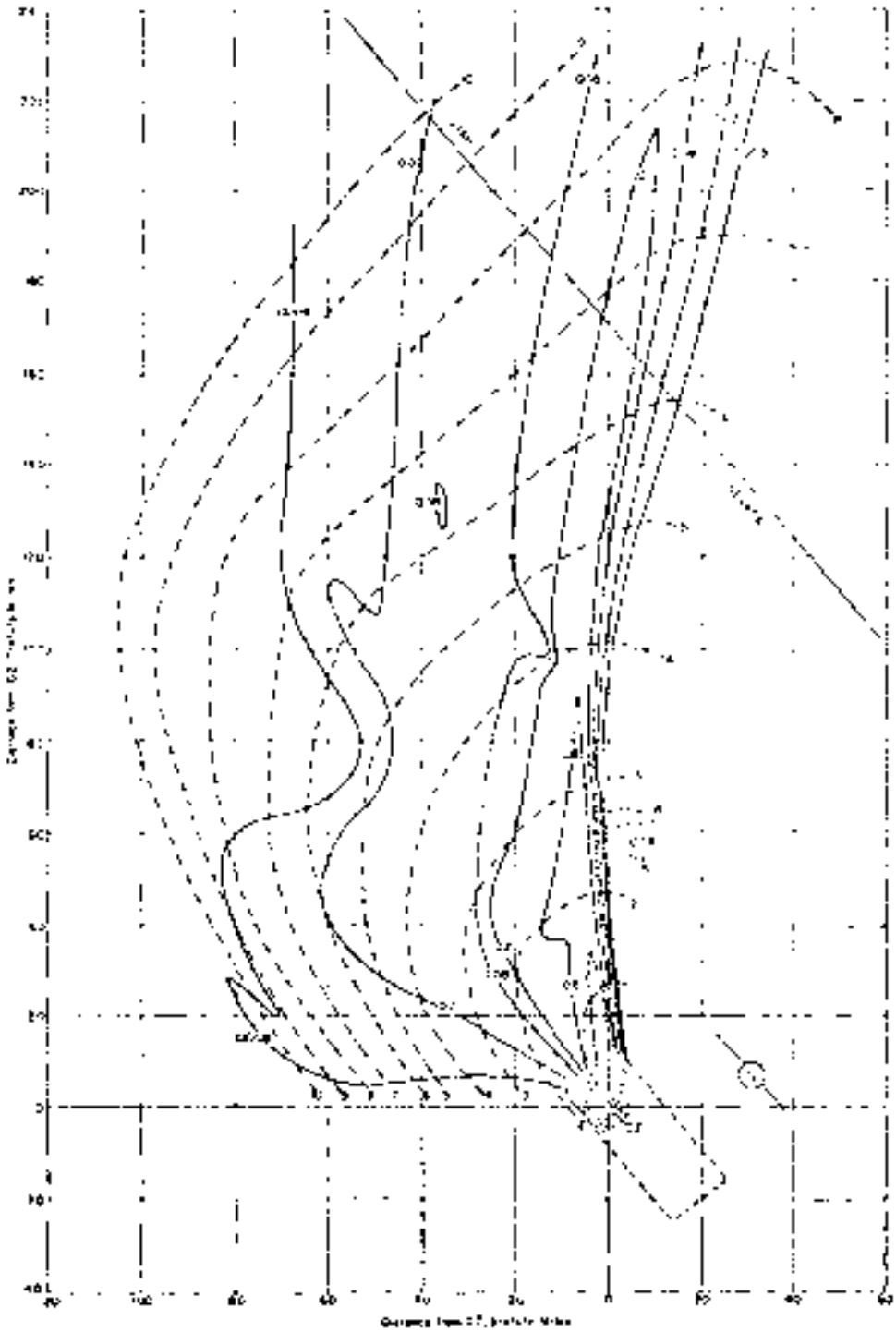


Figure 75. Operation UPSHOT-KNOTHOLE - Nancy.
Off-site dose rate contours in r/hr at H+1 hour.

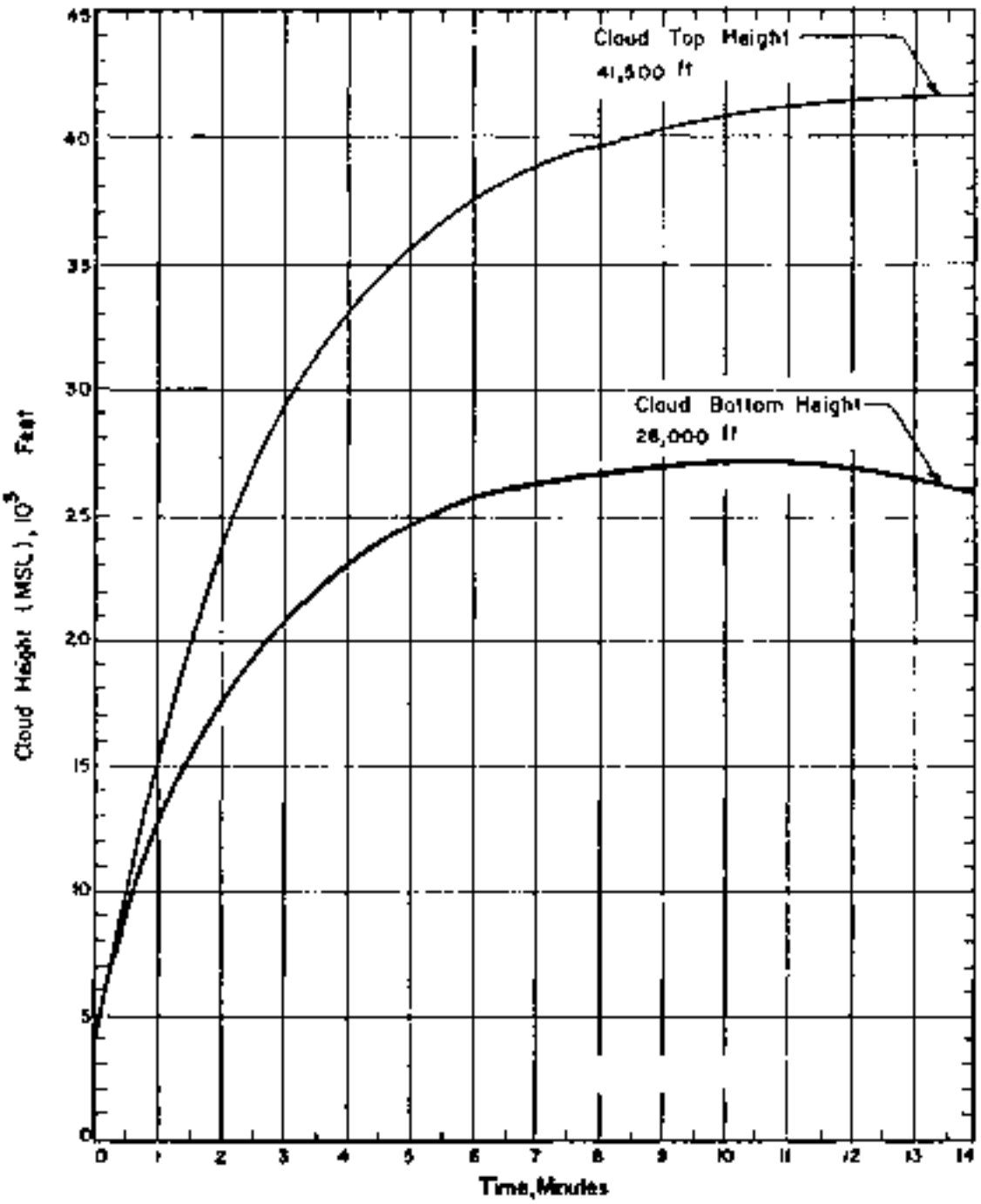


Figure 76 Cloud Dimensions: Operation UPSHOT-KNOTHOLE - Nancy.

TABLE 4.5 WIND DATA FOR OPERATION UNDER TUMBLER - SNAPPER

Alt (Msl.)	Test Site H-Hour Dir	Spd	Warm Springs, Nev H+2 Hours Dir	Spd
Feet	Degrees	mph	Degrees	mph
Surface	330	02	Calm	Calm
Parcel				
Height	Calm	Calm	---	--
5,000	Calm	Calm	---	--
6,000	210	15	Calm	Calm
7,000	150	14	180	09
8,000	150	15	160	17
9,000	150	14	---	--
10,000	150	14	150	25
11,000	160	15	160	33
12,000	170	20	150	29
13,000	200	21	---	--
14,000	200	21	200	32
15,000	220	14	200	31
16,000	210	16	200	30
17,000	210	14	---	--
18,000	190	13	200	26
19,000	190	17	---	--
20,000	210	23	200	35
21,000	220	29	---	--
22,000	220	24	190	34
23,000	230	29	---	--
24,000	210	29	200	44
25,000	210	29	200	41
26,000	210	29	---	--

Alt (Msl.)	Test Site H-Hour Dir	Spd	Warm Springs, Nev H+2 Hours Dir	Spd
Feet	Degrees	mph	Degrees	mph
27,000	220	29	---	--
28,000	210	32	220	37
29,000	230	29	---	--
30,000	220	36	200	37
31,000	230	39	---	--
32,000	230	34	---	--
33,000	220	33	---	--
34,000	220	26	---	--
35,000	210	31	210	50
36,000	210	32	---	--
37,000	220	31	---	--
38,000	220	35	---	--
39,000	220	37	---	--
40,000	220	37	210	50
41,000	220	37	---	--
42,000	220	43	---	--
43,000	220	45	---	--
44,000	220	36	---	--
45,000	220	42	210	50
46,000	220	40	---	--
47,000	220	37	200	52
48,000	220	32	---	--
49,000	230	31	---	--
50,000	230	29	---	--

NOTES:

1. Tropopause height was 39,300 ft MSL at H-hour.
2. H-hour surface wind data was obtained from the Control Point. H-hour upper air data was obtained from the rawinsonde section located on Yucca Lake. H+2 hour wind data was obtained from the pilot observation at Warm Springs.
3. At H-hour the pressure at ground zero was 870 mb, the temperature 9.9°C, the dew point -3.6°C and the relative humidity 39%.

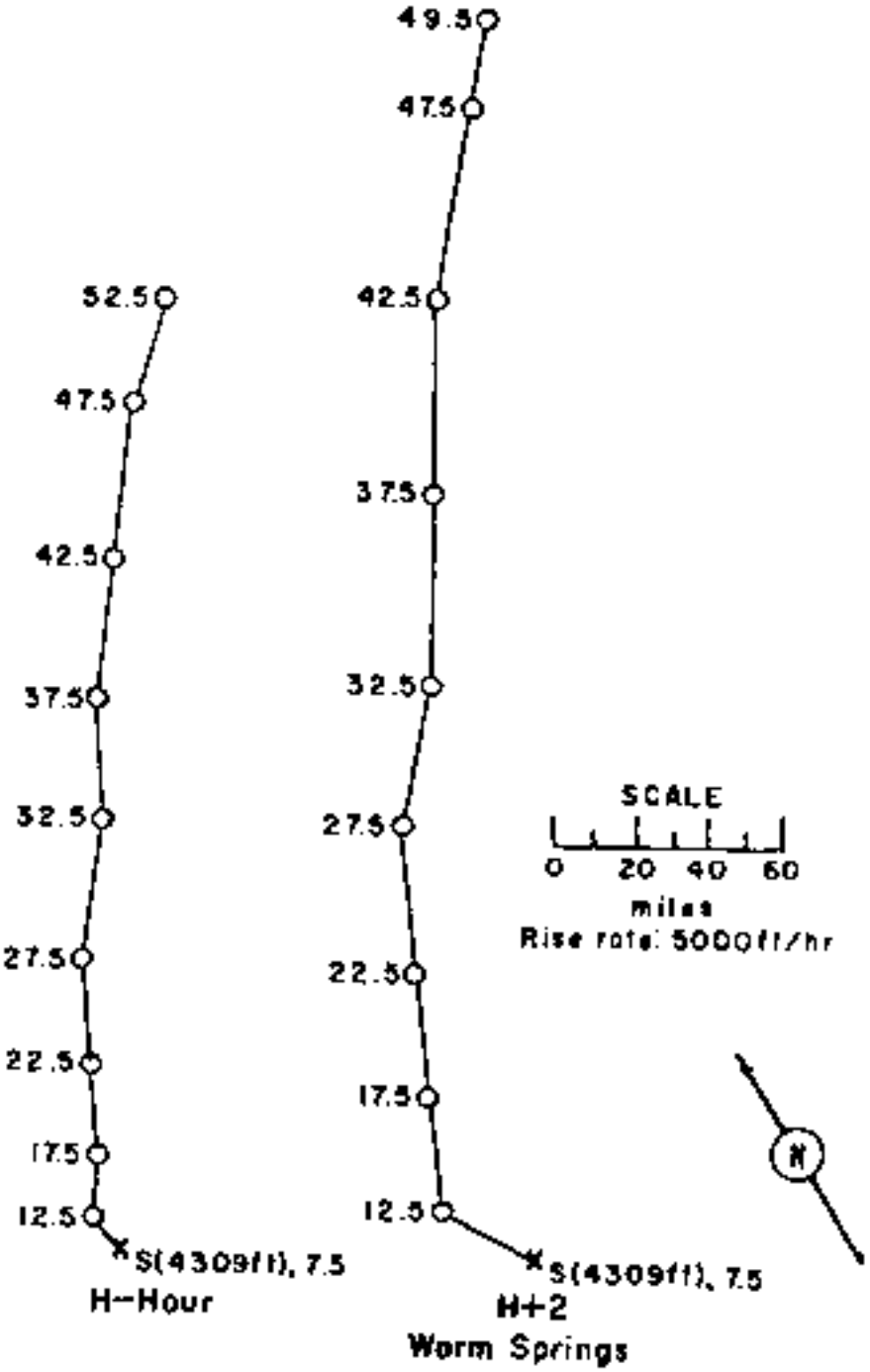


Figure 77. Hodographs for Operation UPSHOT-KNOTHOLE - Nancy.

OPERATION UPSHOT-KNOTHOLE - Nutz

	PST	GMT
DATE:	31 Mar 1953	31 Mar 1953
TIME:	0500	1300

TOTAL YIELD: 0.2 kt

FIREBALL DATA:
Time to 1st minimum: 7.0 msec
Time to 2nd maximum: 15 to 16 msec
Radius at 2nd maximum: 1KM

CRATER DATA: No crater

Sponsor: USNRL

GMT: MTS - Area 7 - 5a
37° 04' 58" N
116° 01' 20" W
Site elevation: 5,000 ft

HEIGHT OF BURST: 700 ft

TYPE OF BURST AND PLATFORM:
Tower burst over 2 rods of 1

CLOUD TOP HEIGHT: 1,500 ft MSL
CLOUD BOTTOM HEIGHT: 1,000 ft MSL

REMARKS:

The on-site fallout pattern was obtained using 24-hour readings of radiological survey teams. No decay correction was necessary. The off-site fallout pattern was drawn from 1-day readings of mobile ground-survey teams of the Radiological Safety organization. The $t^{-1.2}$ decay approximation was used to extrapolate the off-site dose rates to 24 hour.

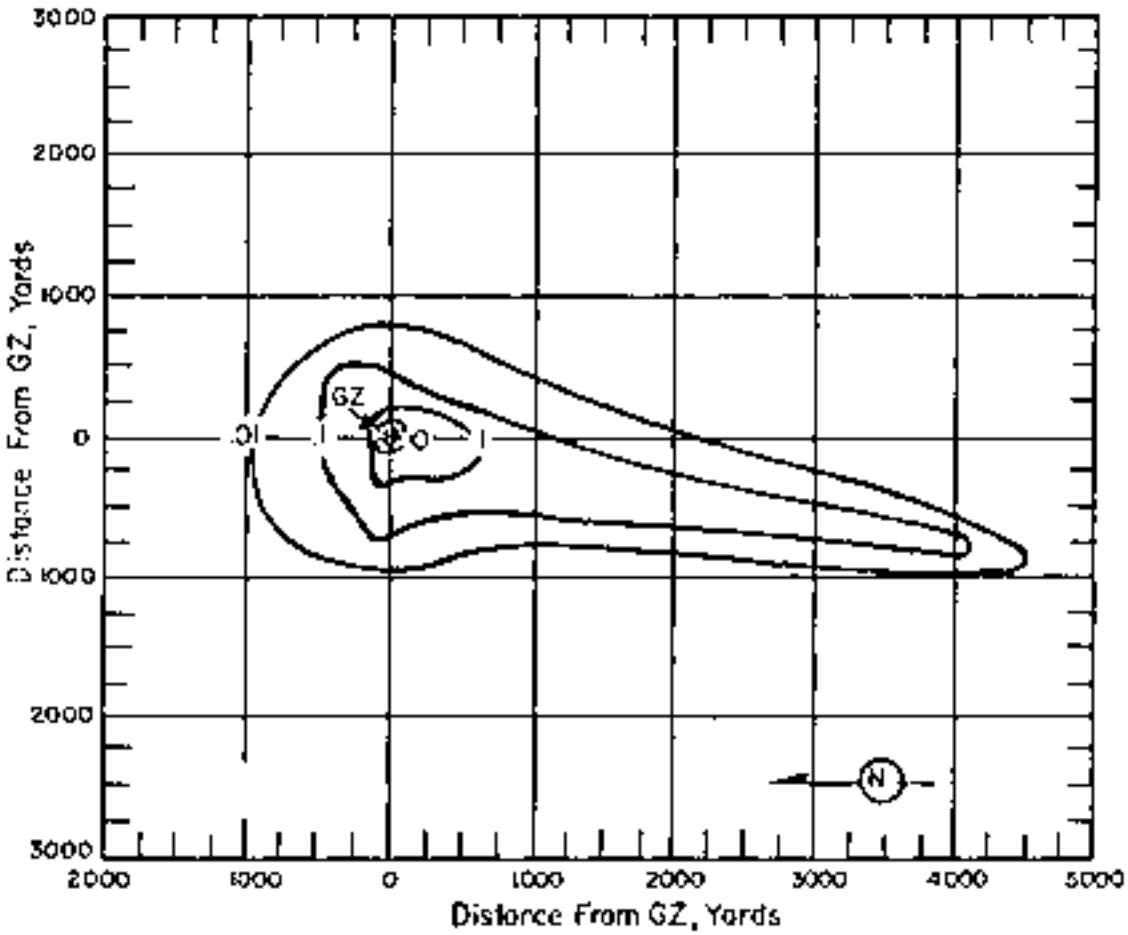


Figure 78. Operation UPSHOT-KNOTHOLE - Ruth.
On-site dose rate contours in r/hr at H+1 hour.

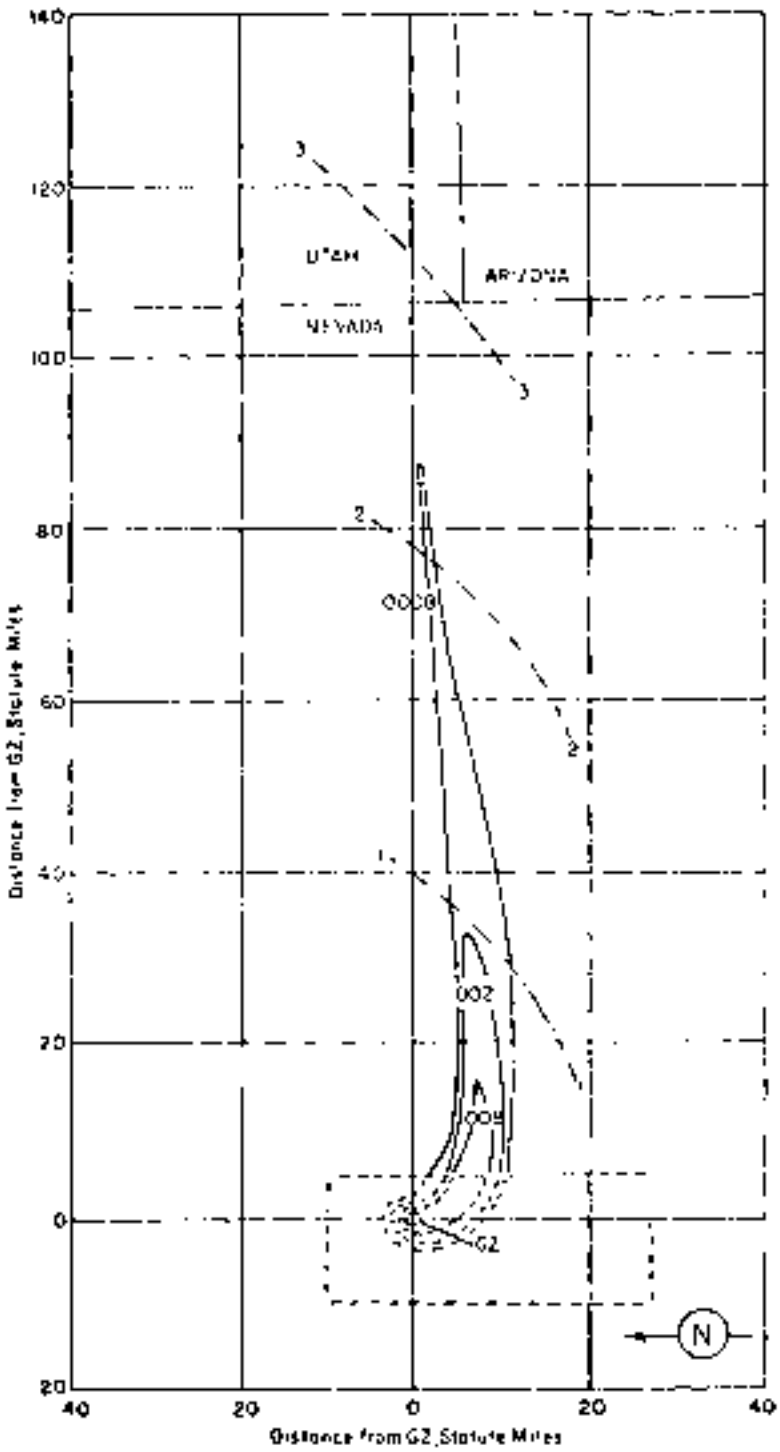


Figure 79. Operation UPSHOT-KNOTHOLE - Ruth.
Off-site dose rate contours in r/hr at H+1 hour.

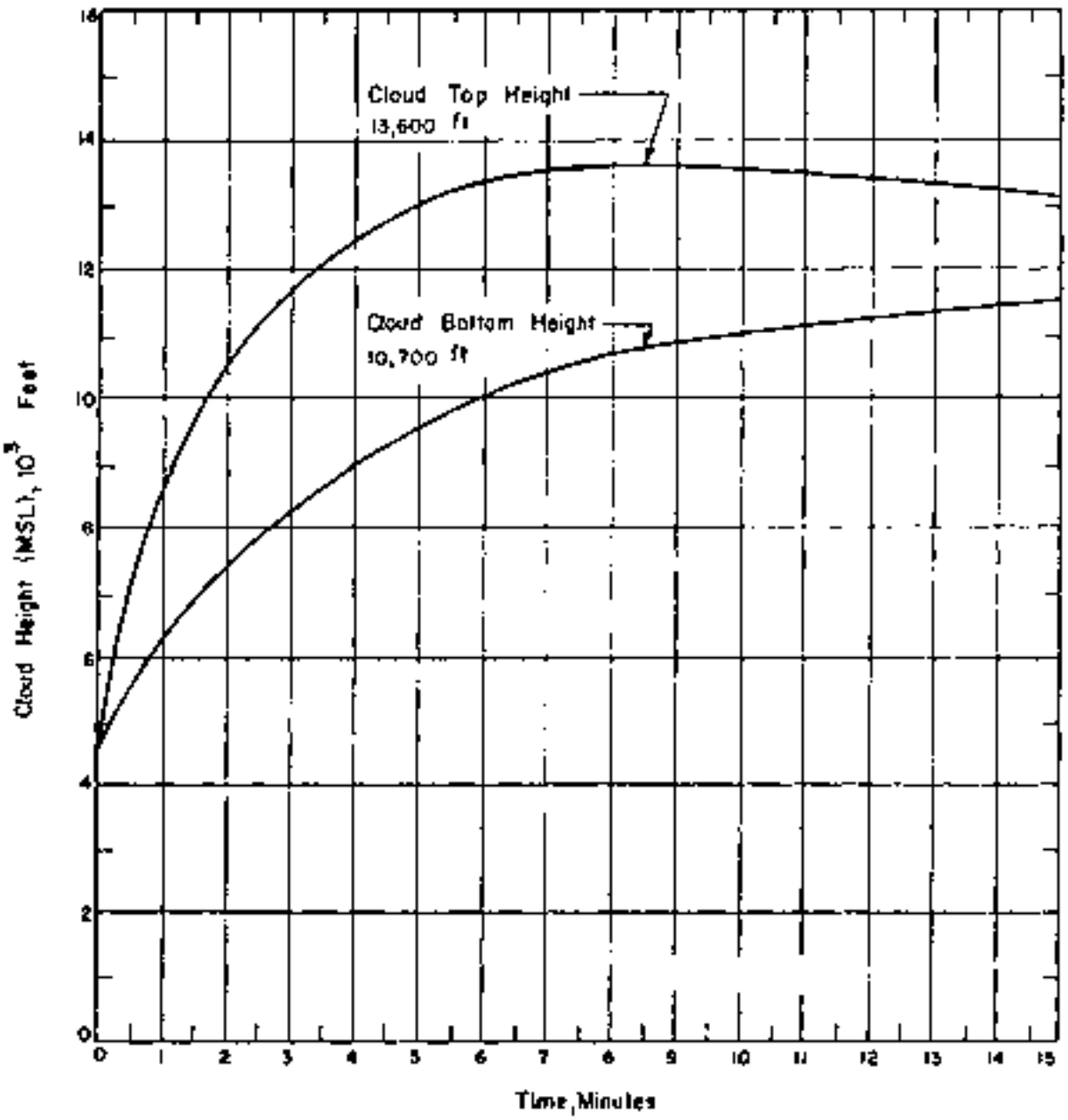


Figure 80. Cloud Dimensions: Operation UPSHOT-KNOTHOLE - Ruth.

TABLE 24 WIND DATA FOR OPERATION UPSHOT-KNOTHOLE- RUN2

Altitude (MSL)	Test Site H-hour Dir	Test Site H-hour Speed	St George, Nev. H+2 hours Dir	St George, Nev. H+2 hours Speed	Altitude (MSL)	Test Site H-hour Dir	Test Site H-hour Speed	St George, Nev. H+2 hours Dir	St George, Nev. H+2 hours Speed
feet	degrees	mph	degrees	mph	feet	degrees	mph	degrees	mph
Surface	360	05	Calm	Calm	27,000	330	39	---	--
Burst Height	020	08	---	--	28,000	330	39	210	3>
5,000	020	10	280	05	29,000	330	41	---	--
6,000	010	14	280	10	30,000	330	44	320	41
7,000	360	14	280	12	31,000	330	44	---	--
8,000	350	15	310	12	32,000	330	39	---	--
9,000	330	14	---	--	33,000	320	48	---	--
10,000	310	21	320	10	34,000	320	51	---	--
11,000	300	18	---	--	35,000	320	55	320	71
12,000	310	18	300	17	36,000	320	59	320	75
13,000	320	18	---	--	37,000	310	53	---	--
14,000	320	23	290	26	38,000	300	43	---	--
15,000	300	25	300	28	39,000	300	47	---	--
16,000	330	28	300	28	40,000	290	67	---	--
17,000	330	30	---	--	41,000	290	55	---	--
18,000	320	35	300	35	42,000	290	47	---	--
19,000	320	32	---	--	43,000	290	47	---	--
20,000	310	33	310	24	44,000	290	47	---	--
21,000	310	36	---	--	45,000	290	46	---	--
22,000	320	36	310	31	46,000	290	46	---	--
23,000	320	41	---	--	47,000	290	40	---	--
24,000	320	45	310	31	48,000	280	39	---	--
25,000	310	35	310	33	49,000	280	39	---	--
26,000	330	41	310	46	50,000	280	39	---	--

NOTES:

1. Tropopause height was 35,500 ft MSL at H-hour.
2. H-hour surface wind data was obtained at the Control Point. H-hour upper air data was obtained from the rawinsonde section located on Yucca Lake. H+2 hours wind data was obtained from the pibal observation at St. George.
3. At H-hour the pressure at ground zero was 873 mb, the temperature 4.4°C, the dew point - 5.3°C and the relative humidity 46%.

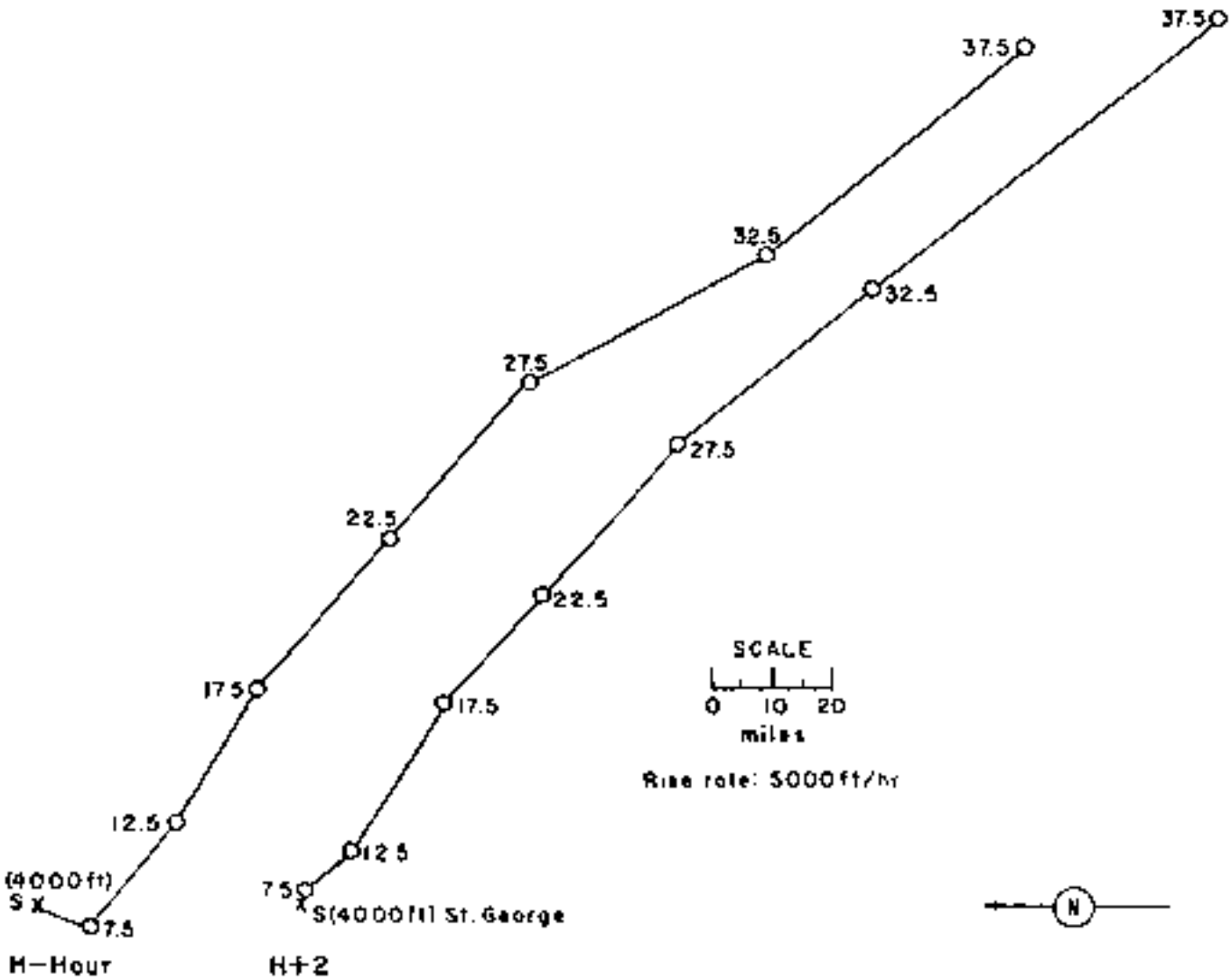


Figure 81. Hodographs for Operation UPSHOT-KNOTHOLE - Ruth.

OPERATION UPSHOT-KNOTHOLE - Dixie

	PST	GMT
DATE:	5 Apr 1953	6 Apr 1953
TIME:	0730	1530

Sponsor: LASL

SITE: NTS - Area 7 - 3
37° 05' 05" N
116° 01' 05" W
Site elevation: 4,095 ft

TOTAL YIELD: 11 kt

HEIGHT OF BURST: 6,092 ft

TYPE OF BURST AND PLACEMENT:
Air burst over Nevada soil

CLOUD TOP HEIGHT: 45,000 ft MSL
CLOUD BOTTOM HEIGHT: 33,000 ft MSL

FIREBALL DATA:
Time to 1st minimum: 10.5 to 11.2 msec
Time to 2nd maximum: 114 to 127 msec
Radius at 2nd maximum: NM

CRATER DATA: No crater

REMARKS:

The highest reading at ground zero was 1.5 mr/hr at H+1 hour.

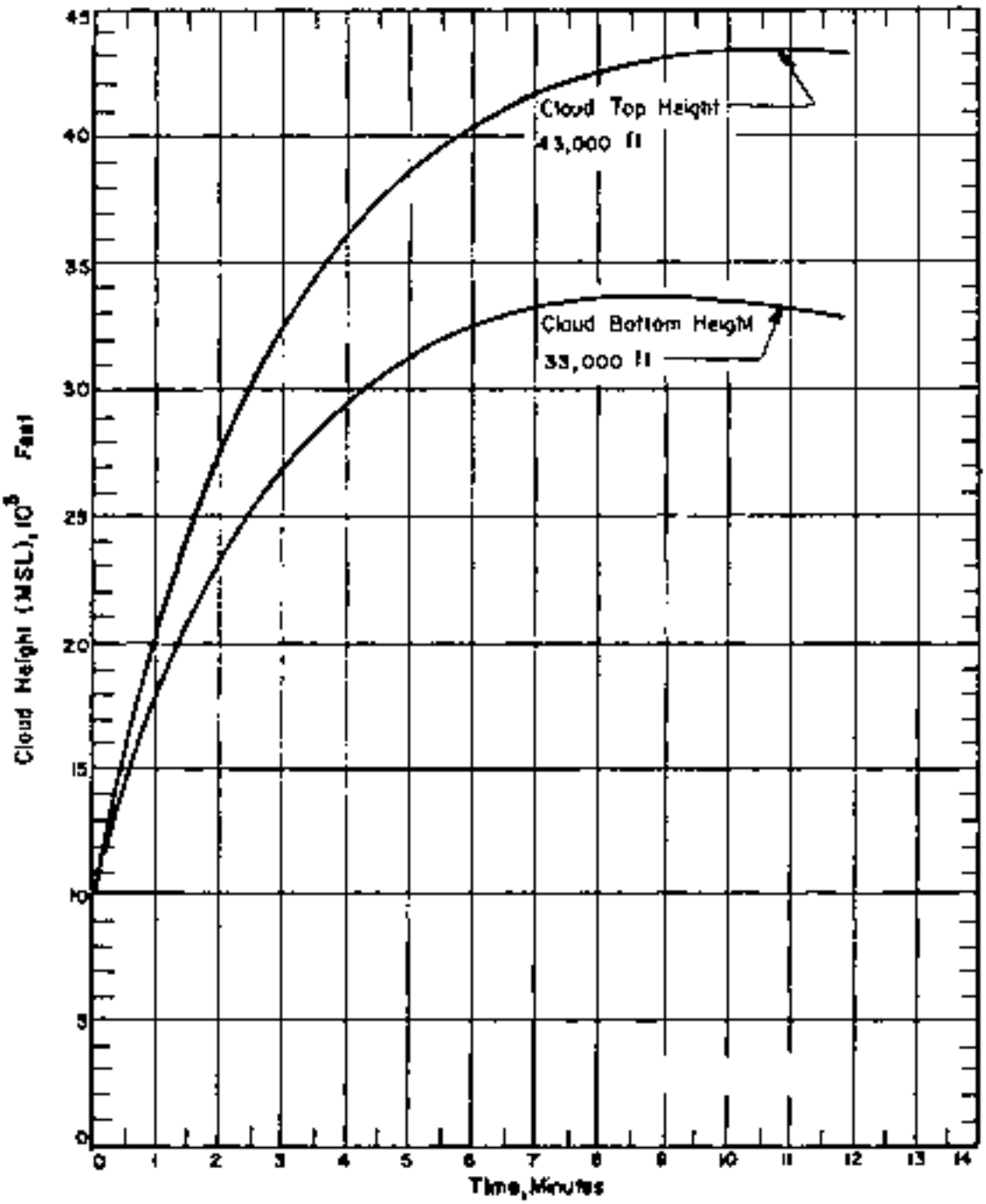


Figure 82. Cloud Dimensions: Operation UPSHOT-KNOTHOLE - Dixie.

TABLE 25 NEVADA WIND DATA FOR OPERATION UPSHOT-KNOTHOLE - DIXIE

Alt (MSL.)	H-hour	
	Dir	Speed
Feet	degrees	mph
Surface	015	08
5,000	030	02
6,000	300	03
7,000	310	12
8,000	310	15
9,000	280	24
10,000	280	32
Burst Height	280	33
11,000	280	36
12,000	280	38
13,000	280	52
14,000	280	55
15,000	280	56
16,000	280	59
17,000	280	62
18,000	290	73
19,000	290	83
20,000	290	83
21,000	290	90
22,000	290	98
23,000	290	84
24,000	290	84
25,000	290	78
26,000	290	65

Alt (MSL.)	H-hour	
	Dir	Speed
Feet	degrees	mph
27,000	290	69
28,000	290	95
29,000	290	108
30,000	290	106
31,000	290	111
32,000	290	122
33,000	290	92
34,000	290	82
35,000	290	78
36,000	290	74
37,000	290	84
38,000	290	115
39,000	290	135
40,000	290	140
41,000	290	140
42,000	290	138
43,000	290	131
44,000	290	142
45,000	290	137
46,000	290	119
47,000	290	107
48,000	290	92
49,000	290	90
50,000	290	90

NOTES:

1. Tropopause height was 38,500 ft MSL at H-hour.
2. Surface wind data was obtained at the Control Point. Upper air data was obtained from the rawinsonde section located on Yucca Lake.
3. At H-hour the pressure at ground zero was 861 mb, the temperature 15.5°C, the dew point -4.1°C and the relative humidity 25%.

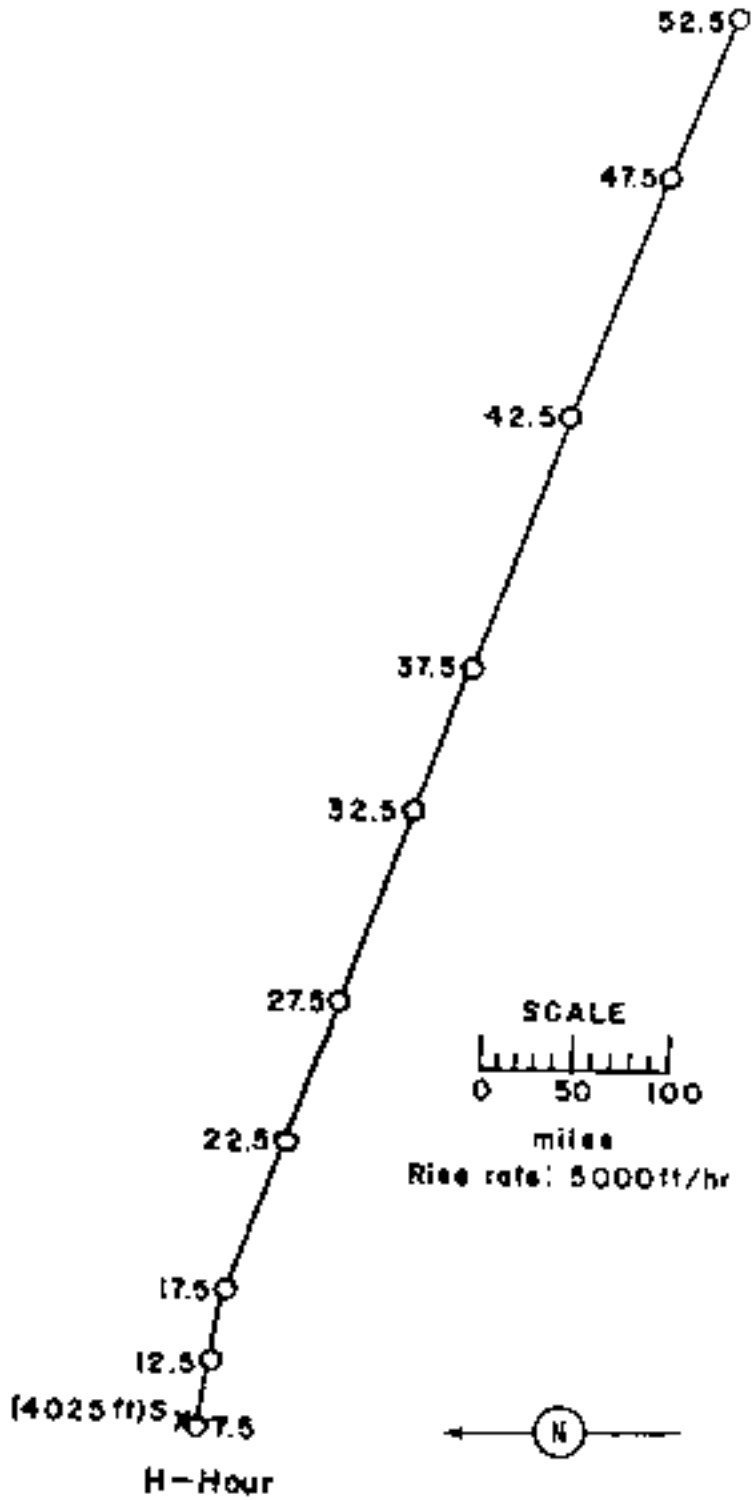


Figure 83. Hodograph for Operation UPSHOT-KNOTHOLE - Dixie

OPERATION UPSHOT-KNOTHOLE - Kay

	PST	GMT
DATE:	11 Apr 1953	11 Apr 1953
TIME:	0449	1249

TOTAL YIELD: 0.2 kt

FIREBALL DATA:
Time to 1st minimum: 18.2 msec
Time to 2nd maximum: 162 msec
Radius at 2nd maximum: NM

Sponsor: USAF

SITE: NTS - Area 4a
37° 05' 56" N
116° 05' 33" W
Site elevation: 4,026 ft

HEIGHT OF BURST: 100 ft

TYPE OF BURST AND PLACEMENT:
Tower burst over Nevada soil

CLOUD TOP HEIGHT: 12,800 ft MSL
CLOUD BOTTOM HEIGHT: 7,700 ft MSL

CRATER DATA: No crater

REMARKS:

The on-site fallout pattern is based upon readings taken at H+$\frac{3}{4}$ hours by radiological survey teams. The off-site fallout pattern was drawn from D-day readings of mobile ground-survey teams of the Radiological Safety organization. The $t^{-1.2}$ decay approximation was used to extrapolate the dose rates to H+1 hour. This shot is sometimes designated as UPSHOT-KNOTHOLE-6.

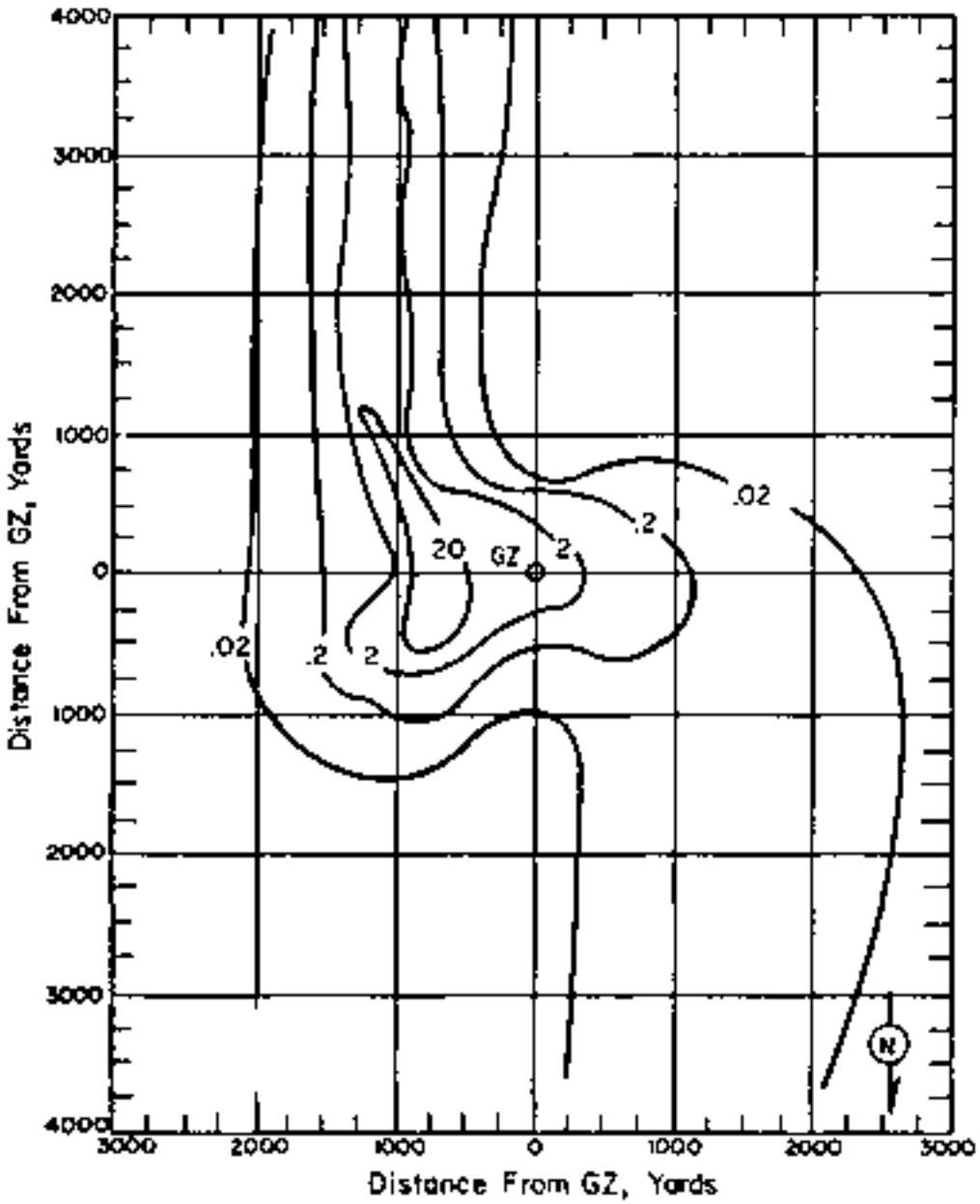


Figure 84. Operation UPSHOT-KNOTHOLE - Ray.
On-site dose rate contours in r/hr at H+1 hour.

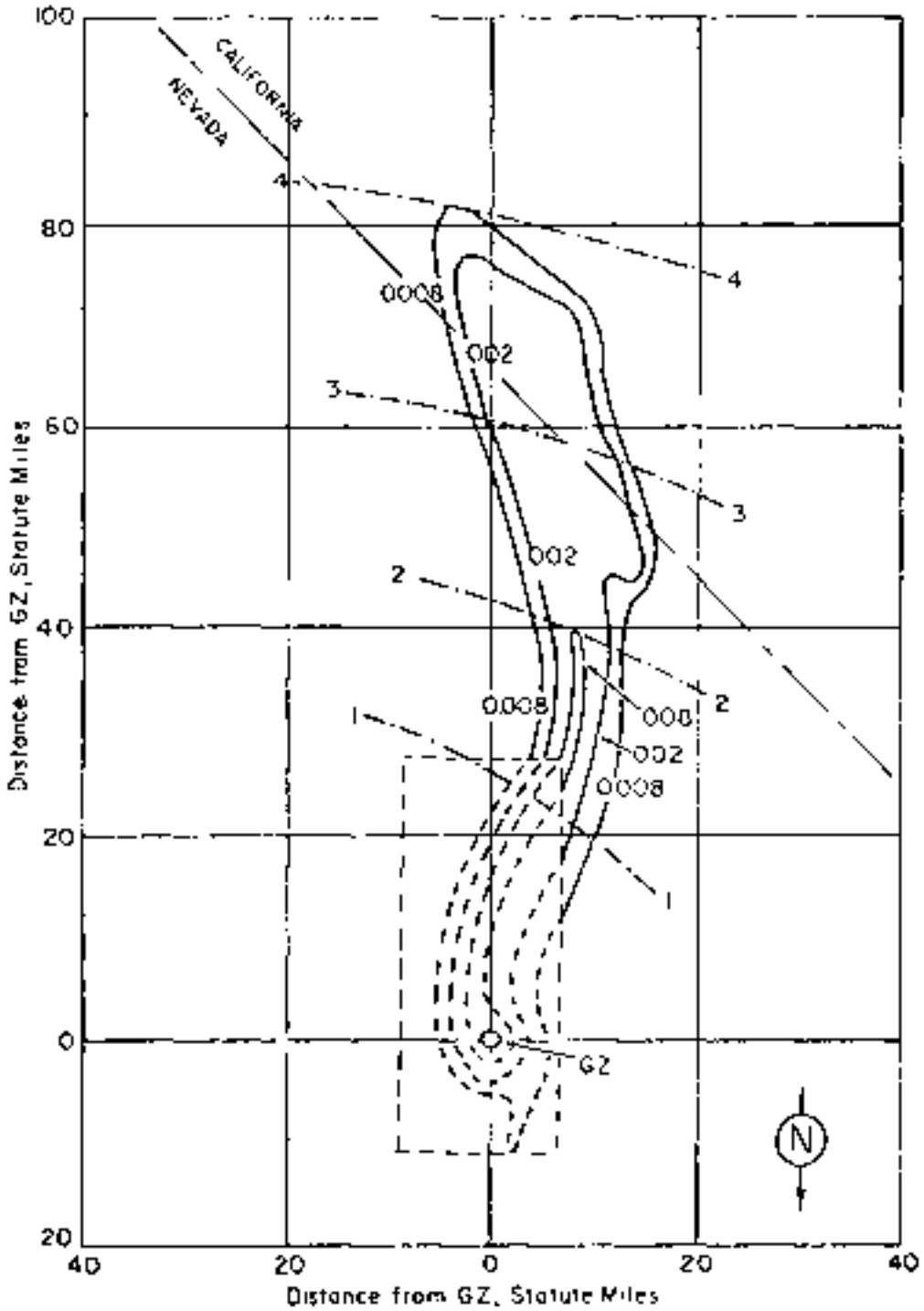


Figure 85. Operation UPSHOT-KNOTHOLE - Ray.
Off-site dose rate contours in r/hr at H+1 hour.

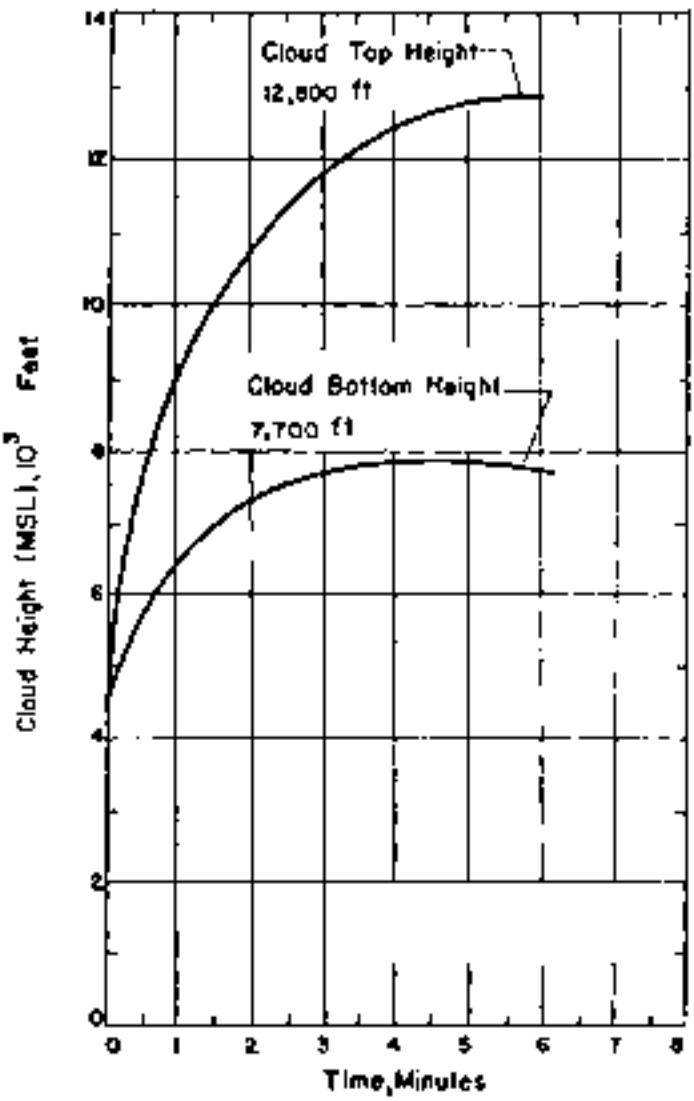


Figure 86. Cloud Dimensions: Operation UPSHOT-KNOTHOLE - Pay.

TABLE 26 WIND DATA FOR OPERATION UPSHOT-KNOTHOLE- MAY

Alt (MSL)	Test Site H-hour Dir	Test Site H-hour Speed	Beatty, Nev. H+2 hours Dir	Beatty, Nev. H+2 hours Speed	Alt (MSL)	Test Site H-hour Dir	Test Site H-hour Speed	Beatty, Nev. H+2 hours Dir	Beatty, Nev. H+2 hours Speed
feet	degrees	mph	degrees	mph	feet	degrees	mph	degrees	mph
Surface	045	06	010	15	27,000	290	155	---	--
Burst Height	030	08	---	--	28,000	290	173	---	--
5,000	010	17	360	16	29,000	290	207	---	--
6,000	360	21	360	22	30,000	280	212	---	--
7,000	360	26	360	25	31,000	280	198	---	--
8,000	360	36	360	23	32,000	280	185	---	--
9,000	360	41	350	21	33,000	290	132	---	--
10,000	360	36	340	20	34,000	290	138	---	--
11,000	360	26	---	--	35,000	280	154	---	--
12,000	360	26	330	18	36,000	270	166	---	--
13,000	350	30	---	--	37,000	270	175	---	--
14,000	350	26	330	24	38,000	270	161	---	--
15,000	310	32	320	29	39,000	260	193	---	--
16,000	300	38	330	35	40,000	260	199	---	--
17,000	300	56	---	--	41,000	260	195	---	--
18,000	300	56	310	46	42,000	260	133	---	--
19,000	300	53	---	--	43,000	270	121	---	--
20,000	300	51	300	63	44,000	270	115	---	--
21,000	300	72	---	--	45,000	260	132	---	--
22,000	300	95	300	92	46,000	280	170	---	--
23,000	300	109	---	--	47,000	280	195	---	--
24,000	300	122	---	--	48,000	280	212	---	--
25,000	300	129	290	112	49,000	280	224	---	--
26,000	290	139	290	112	50,000	280	234	---	--

NOTES:

1. Tropopause height was 38,330 ft MSL at H-hour.
2. H-hour surface wind data was obtained at the Control Point. H-hour upper air data was obtained from the rawinsonde section located on Yucca Lake. H+2 hour wind data was obtained from the pibal observation at Beatty.
3. At H-hour the pressure at ground zero was 869 mb, the temperature -0.3°C, the dew point -11.3°C, and the relative humidity 43%.

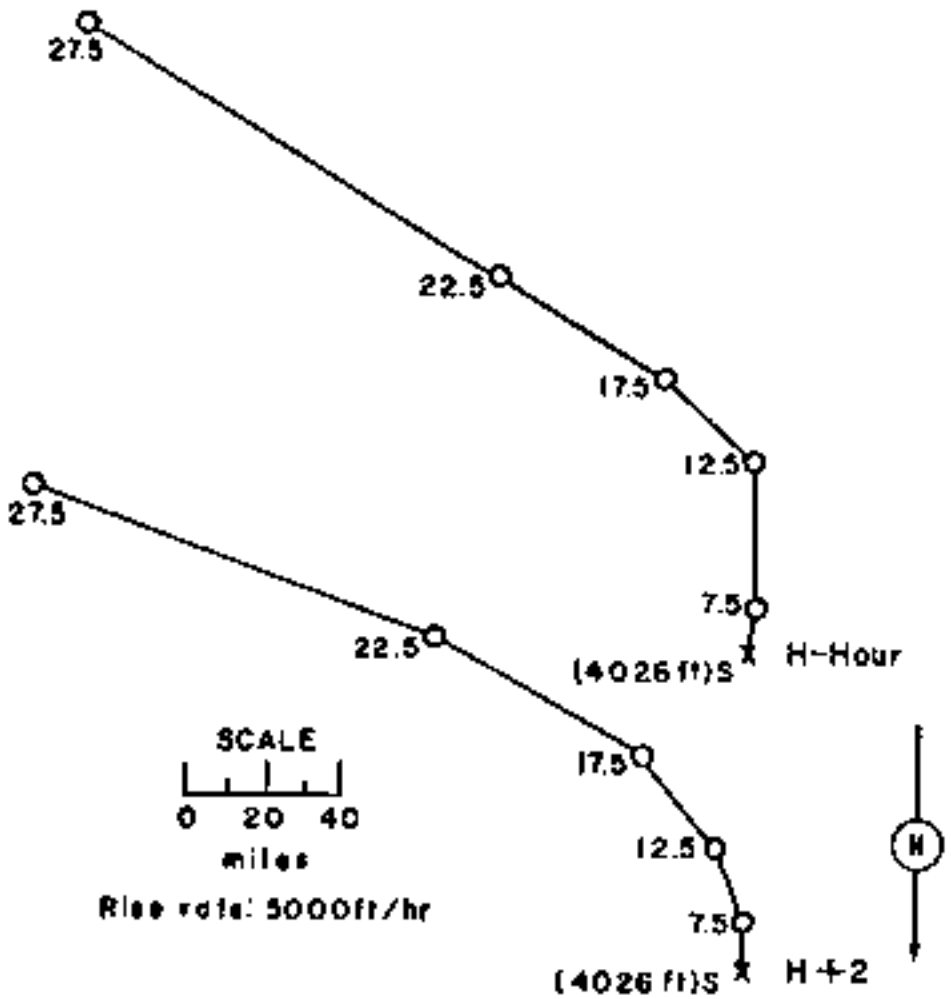


Figure 87. Hodographs for Operation UPSHOT-KNOTHOLE - Ray.

OPERATION [illegible] - Badger

	LOCAL	GMT
DATE:	18 Apr 1953	18 Apr 1953
TIME:	04:[illegible]	[illegible]

YIELD: [illegible] 23 kt

FALLOUT DATA:
Time to 1st arrival: [illegible] to [illegible] mins
Time to 2nd maximum: 2D
Radiation at 2nd maximum: 2D

DEATHS DUE TO: [illegible]

Sponsor: LASL

SITE: [illegible]
37° 02' 12" N
116° 07' 04" W
Site elevation: [illegible] ft

HEIGHT OF BURST: 300' GL

TYPE OF SOIL AND GEOLOGY:
[illegible]

CLOUD TOP HEIGHT: [illegible] ft MSL
CLOUD DIAMETER AT H+1: [illegible] mi

REMARKS:

The in-situ fallout patterns are based upon readings made on D-day and D+1 day by radiological survey teams. Because of heavy contamination, the highway in the main access road to the shot area could not be used, and, therefore, it was difficult to pinpoint the exact location of the readings. The off-site fallout pattern was drawn from D-day readings of mobile ground survey teams of the Radiological Safety organization. The $t^{-1.2}$ decay approximation was used to extrapolate the dose rates to H+1 hour. This shot is sometimes designated as UPSHOT-KNOTHOLE-[illegible].

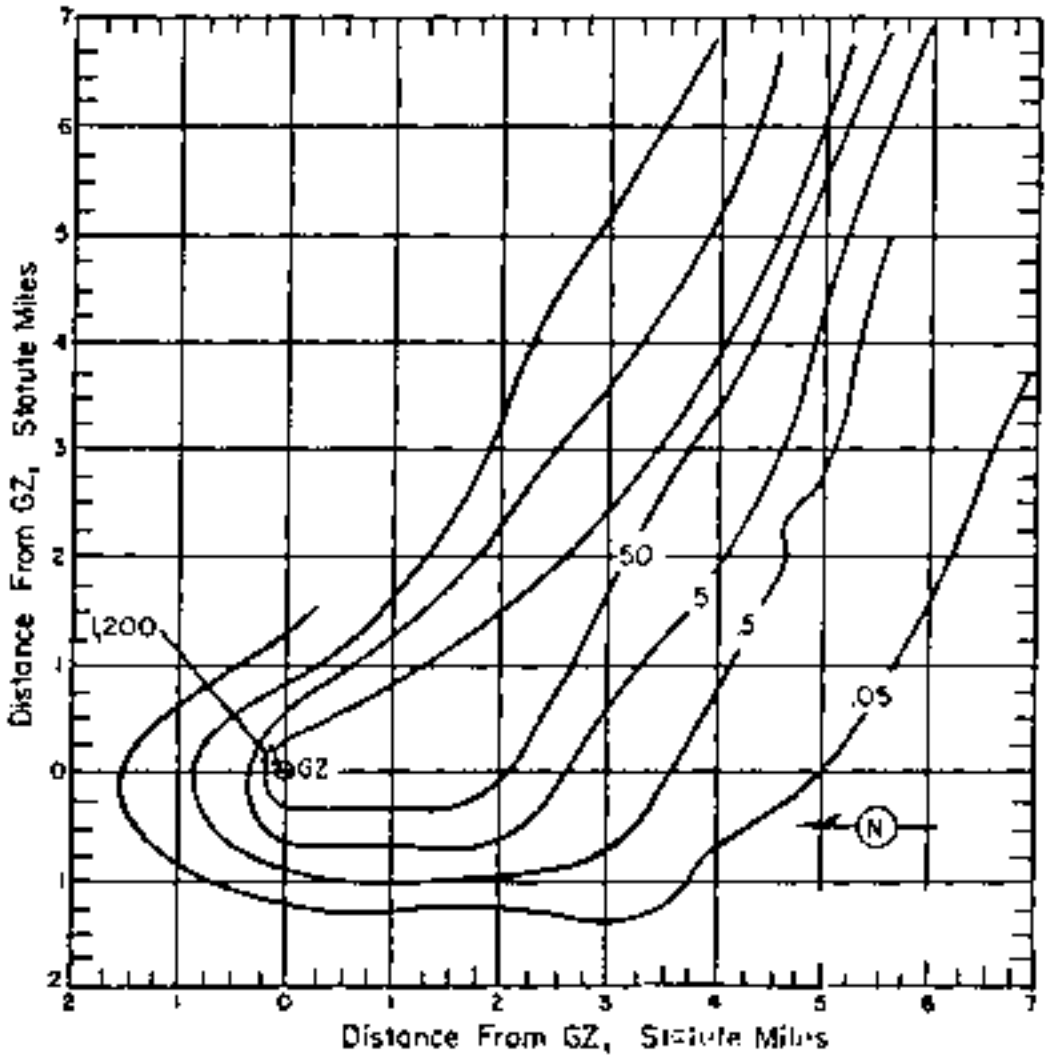


Figure 88. Operation UPSHOT-KNOTHOLE - Badger.
On-site dose rate contours in r/hr at H+1 hour.

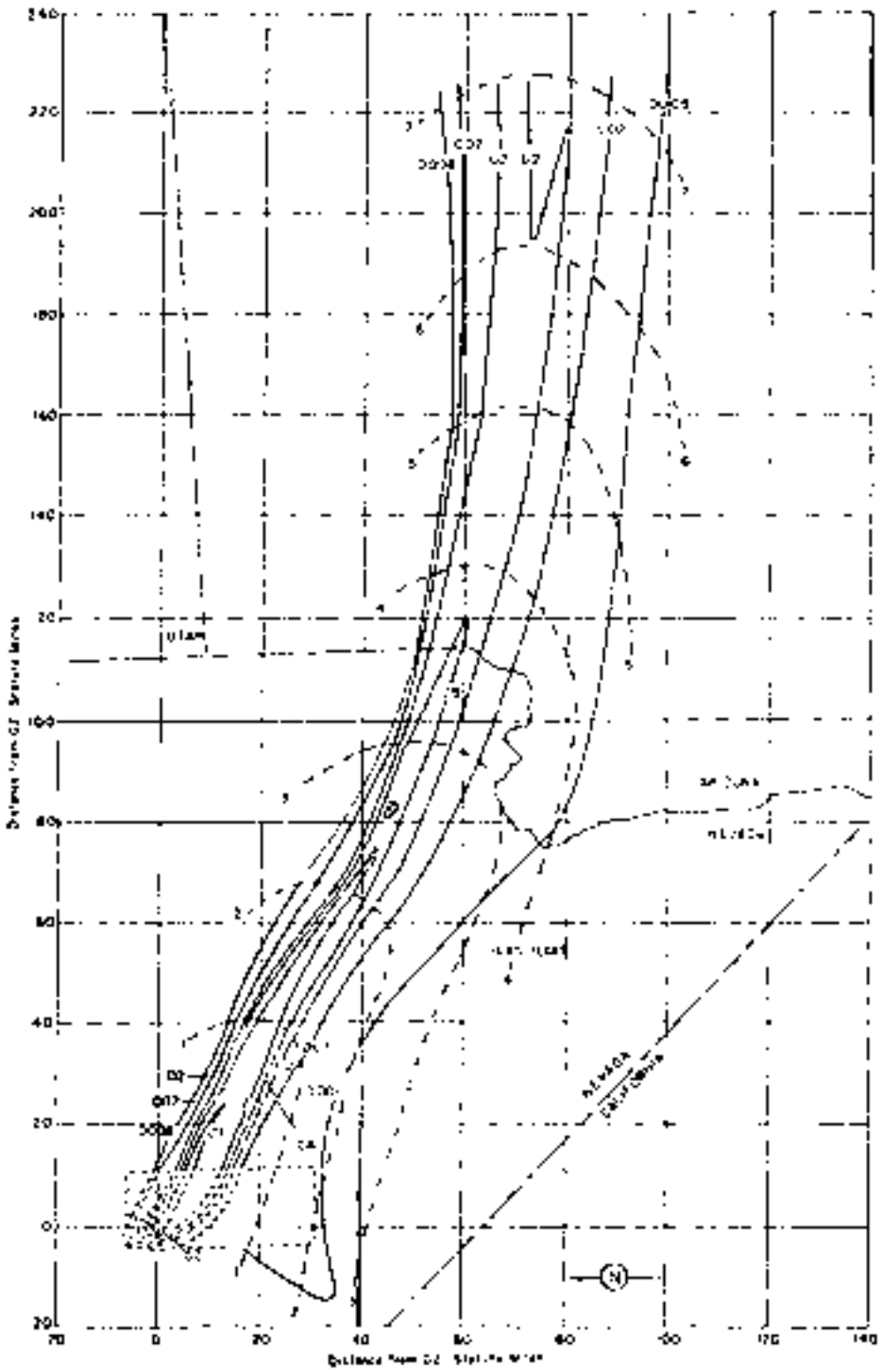


Figure 89. Operation [illegible] - Rudger.
Off-site dose rate contours in r/hr at H+1 hour.

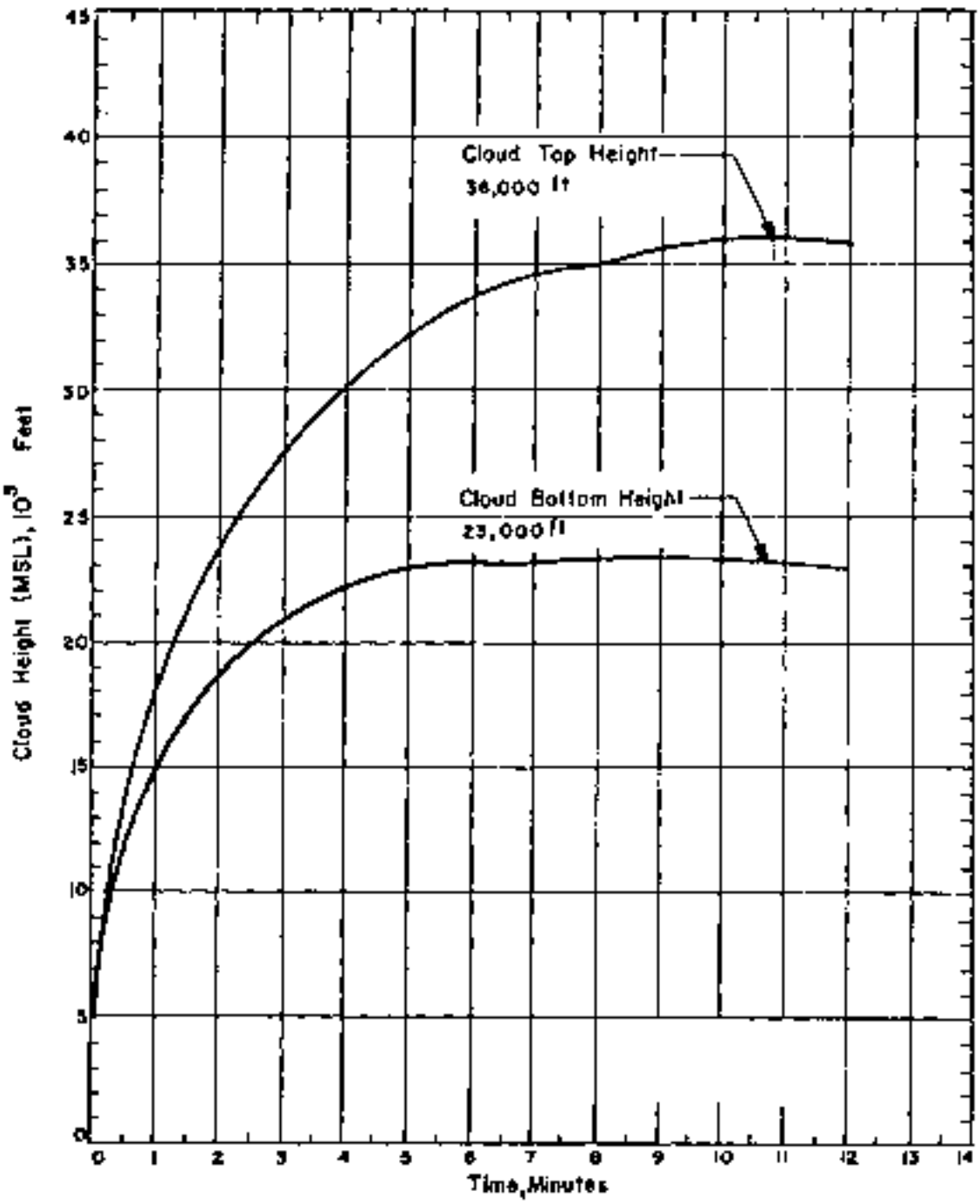


Figure 90 . Cloud Dimensions: Operation UPSHOT-KNOTHOLE - Badger.

TABLE 27 NEVADA WIND DATA FOR OPERATION UPSHOT-KNOTHOLE — [illegible]

Altitude (MSL)	H-hour		Altitude (MSL)	H-hour	
	Dir	Speed		Dir	Speed
Feet	degrees	mph	Feet	degrees	mph
Surface	360	10	27,000	300	46
Burst Height	360	14	28,000	300	49
5,000	010	23	29,000	310	46
6,000	010	25	30,000	310	53
7,000	360	22	31,000	300	67
8,000	350	07	32,000	300	69
9,000	270	10	33,000	300	65
10,000	270	20	34,000	300	57
11,000	270	26	35,000	300	62
12,000	260	30	36,000	300	56
13,000	300	33	37,000	290	49
14,000	310	35	38,000	290	54
15,000	320	35	39,000	300	69
16,000	310	35	40,000	300	78
17,000	310	36	41,000	300	90
18,000	300	38	42,000	300	78
19,000	290	40	43,000	290	69
20,000	290	40	44,000	290	51
21,000	290	43	45,000	280	60
22,000	290	49	46,000	280	69
23,000	290	57	47,000	280	70
24,000	290	57	48,000	280	78
25,000	290	49	49,000	290	84
26,000	300	49	50,000	290	90

NOTES:

1. Tropopause height was 39,300 ft MSL at H-hour.
2. Surface wind data was obtained at the Control Point. Upper air data was obtained from the rawinsonde section located on Yucca Lake.
3. At H-hour the pressure at ground zero was 867 mb, the temperature 7.7°C, the dew point -3.9°C, and the relative humidity 40 %.

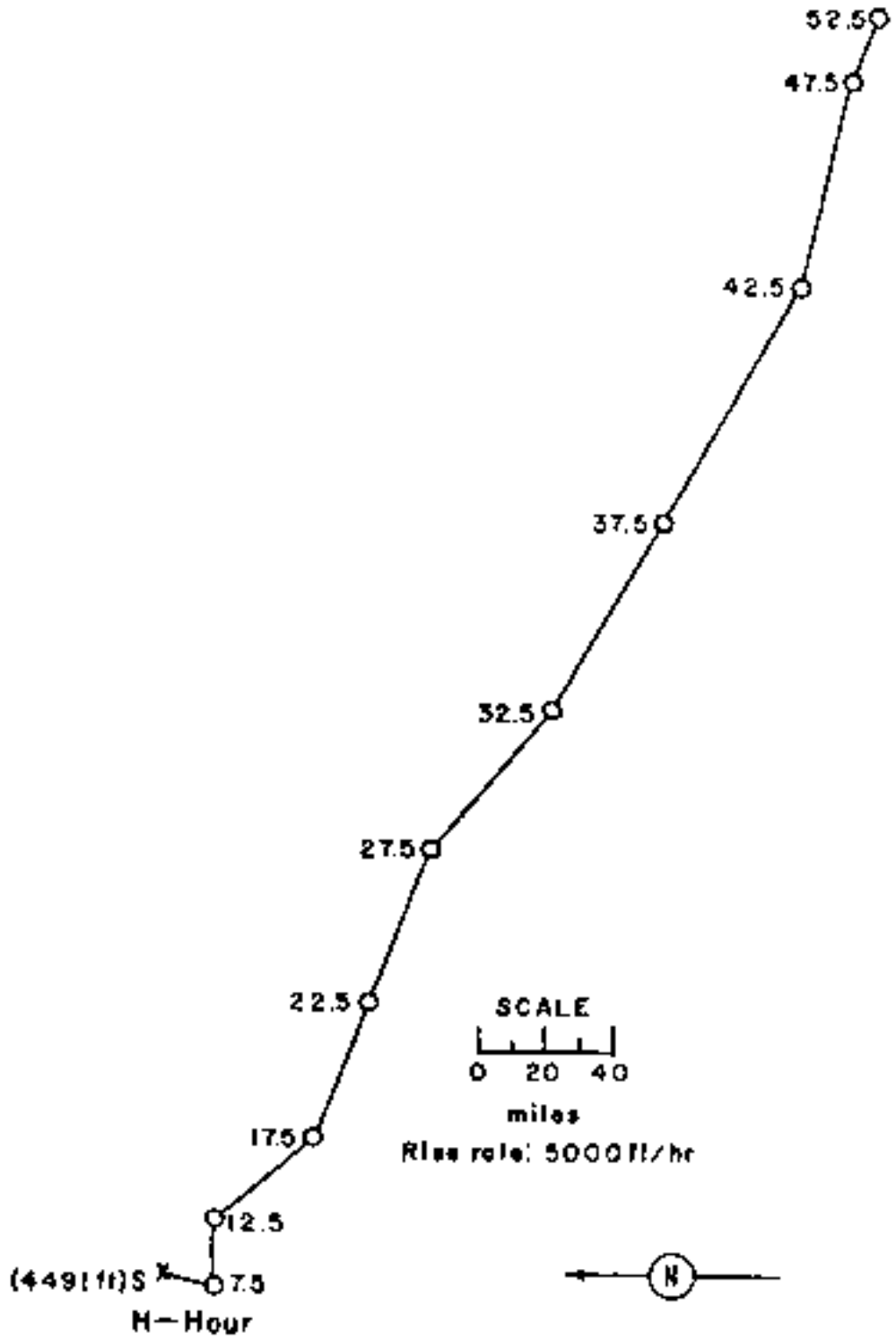


Figure 91. Hodograph for Operation [illegible] Badger.

[illegible]

	LST	GMT
DATE:	[illegible]	[illegible]
TIME:	[illegible]	[illegible]

Operation: [illegible]

SITE: [illegible]

TOTAL YIELD: 43 kt

[illegible]

[illegible]

[illegible]

[illegible]

REMARKS:

The on-site fallout pattern is based upon readings obtained at [illegible] hours by radiological survey teams. The off-site fallout pattern was drawn from 8-hour readings of mobile aerial-survey teams of the Radiological Safety organization. The changes in the anticipated fallout pattern necessitated movement of mobile personnel and equipment. This caused difficulties in pinpointing the exact location of the readings. The $t^{-1.2}$ decay approximation was used to extrapolate the dose rates to [illegible] hour for both the on-site and off-site patterns.

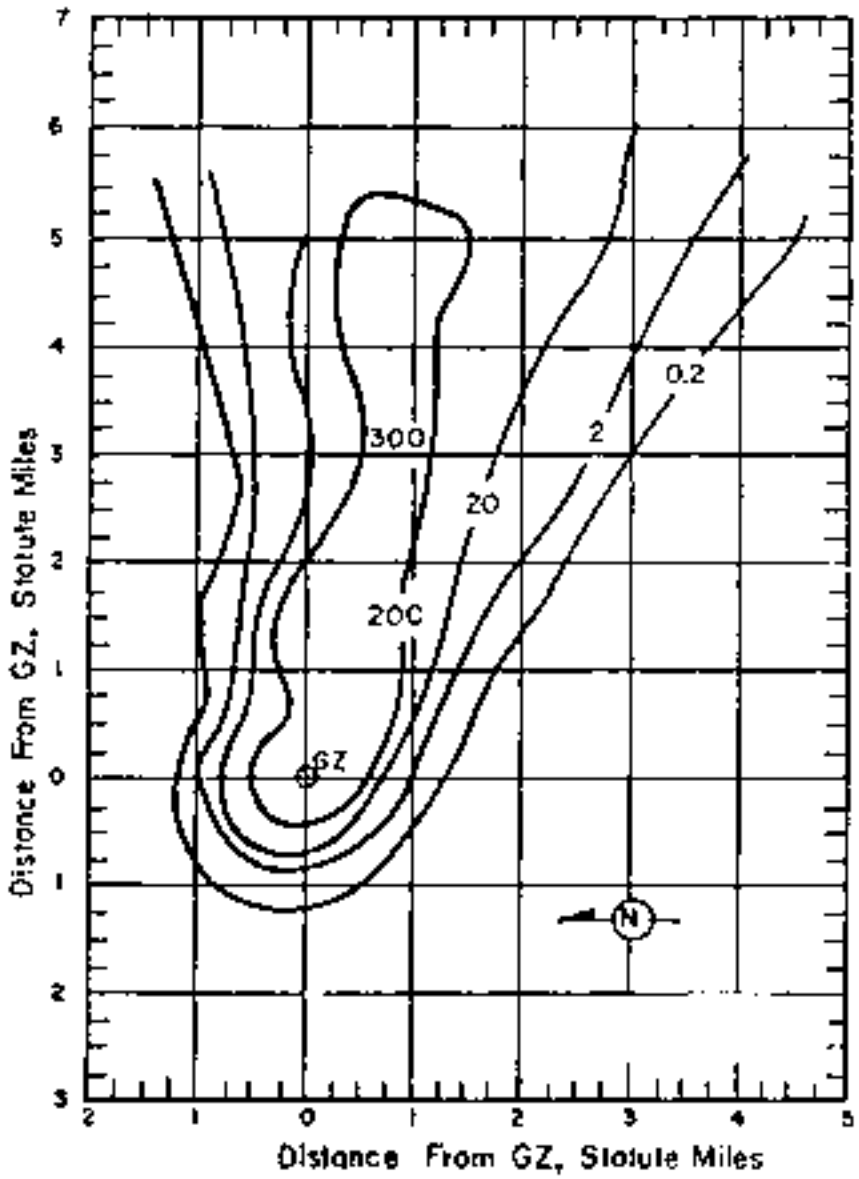


Figure 92. Operation UPSHOT-KNOTHOLE - Simon. On-site dose rate contours in r/hr at H+1 hour.

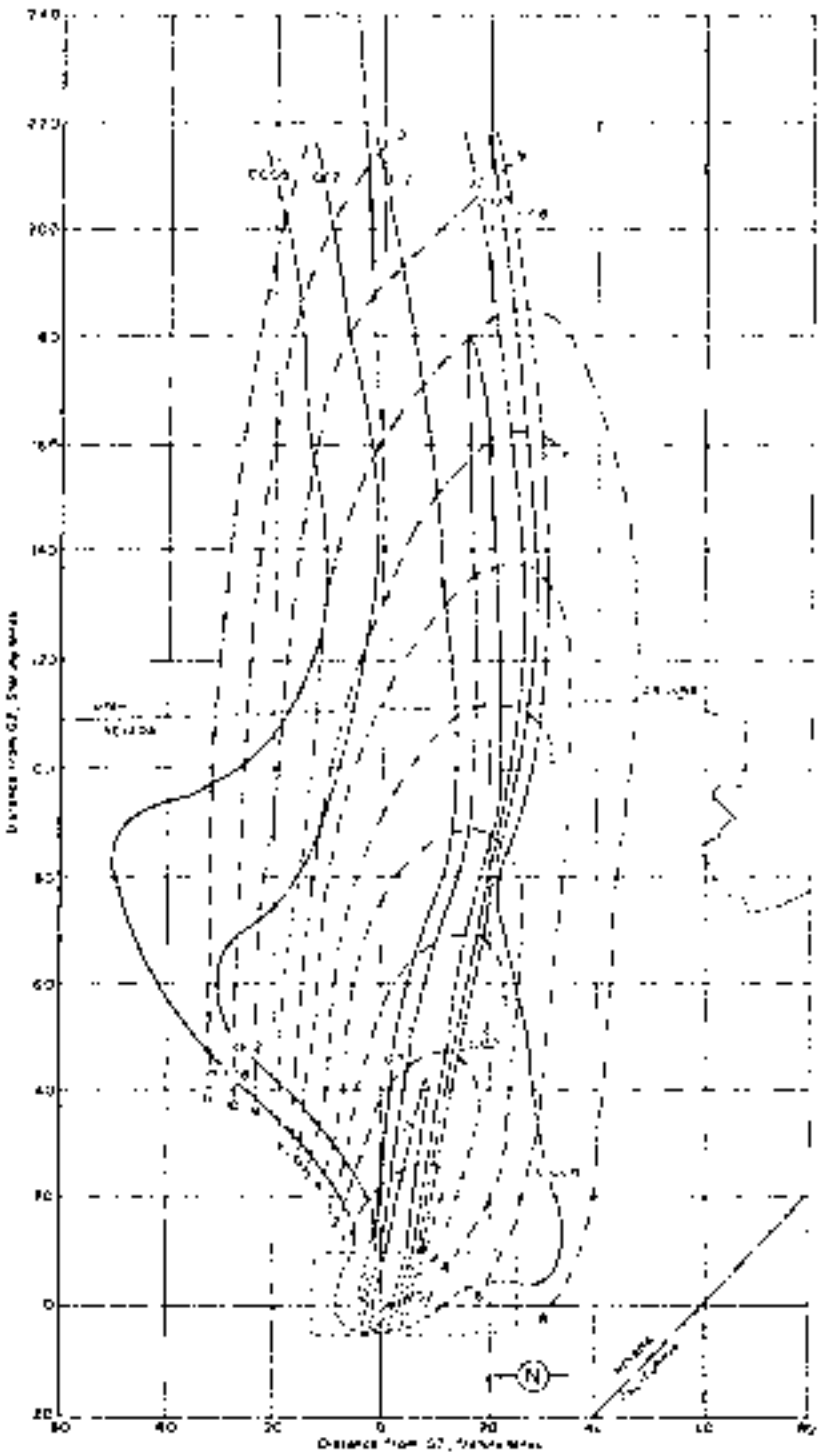


Figure 93. Operation UPSHOT-KNOTHOLE - Simon
Off-site dose rate contours in r/hr at H+1 hour.

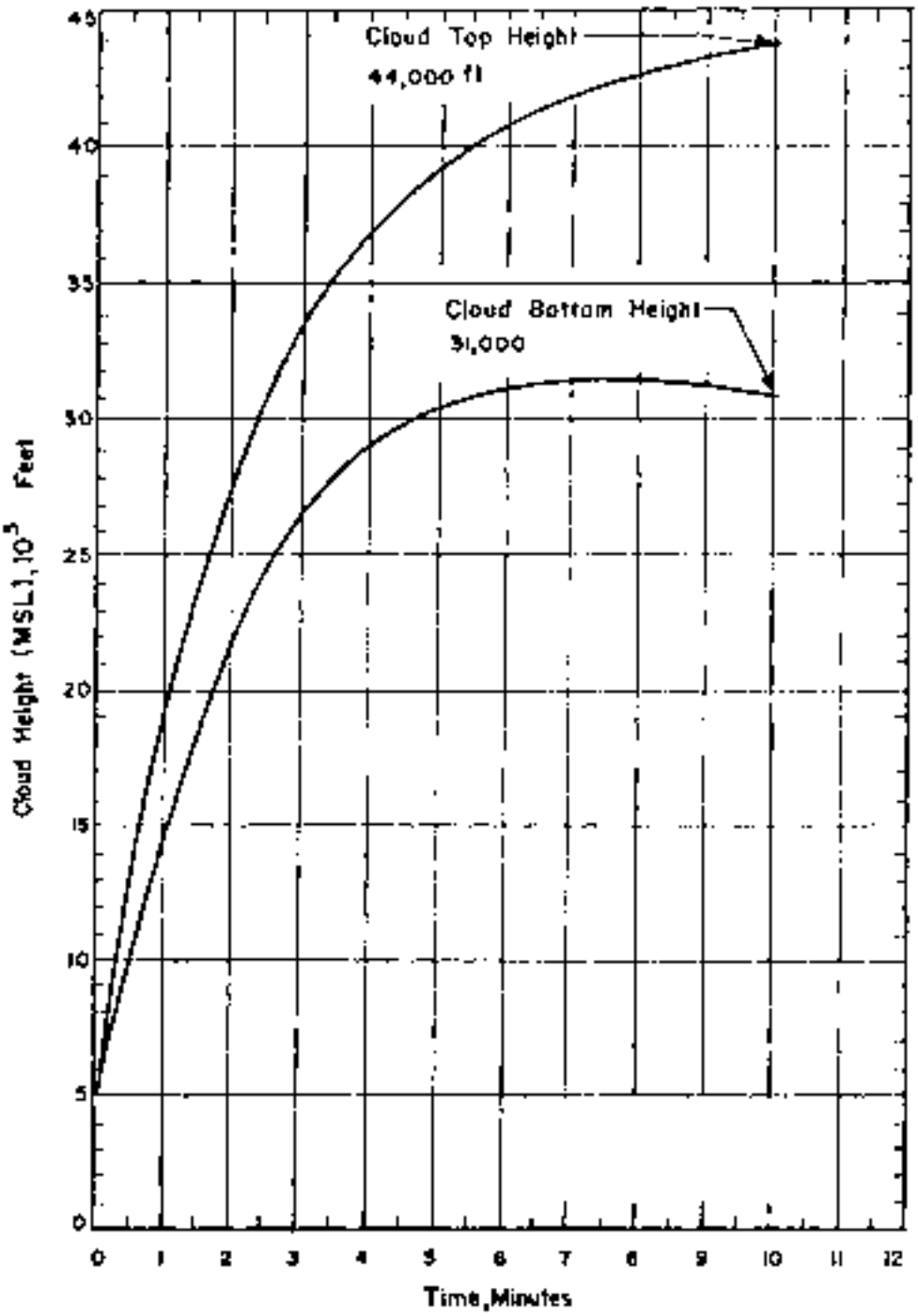


Figure 94. Cloud Dimensions: Operation UPSHOT-KNOTHOLE - Simon.

TABLE 28 WIND DATA FOR OPERATION UPSHOT-KNOTHOLE - [illegible]

Altitude (MSL)	H-hour	
	Dir	Speed
Feet	degrees	mph
Surface	[illegible]	06
Burst Height	[illegible]	08
5,000	010	09
6,000	030	09
7,000	040	05
8,000	070	03
9,000	160	05
10,000	200	10
11,000	270	13
12,000	280	14
13,000	270	17
14,000	270	13
15,000	290	10
16,000	280	09
17,000	270	10
18,000	270	30
19,000	280	14
20,000	280	30
21,000	280	31
22,000	280	26
23,000	280	29
24,000	280	25
25,000	280	24
26,000	280	26
27,000	280	33
28,000	280	30
29,000	270	32
30,000	260	37
31,000	280	40
32,000	260	45
33,000	260	48
34,000	280	46
35,000	280	41
36,000	270	40
37,000	270	47
38,000	270	49
39,000	270	48
40,000	270	55
41,000	270	57
42,000	270	55
43,000	270	46
44,000	270	30
45,000	270	31
46,000	270	28
47,000	270	25
48,000	270	25
49,000	270	29
50,000	270	28
54,000	---	--

NOTES:

1. Tropopause height was 39,350 ft MSL at H-hour.
2. H-hour surface wind data was obtained at the Control Point. K-hour upper air data was obtained from the rawinsonde section located on Yucca Lake.
3. At H-hour the pressure at ground zero was 870 mb, the temperature 11.7°C, the dew point -7.3°C and the relative humidity 26%.

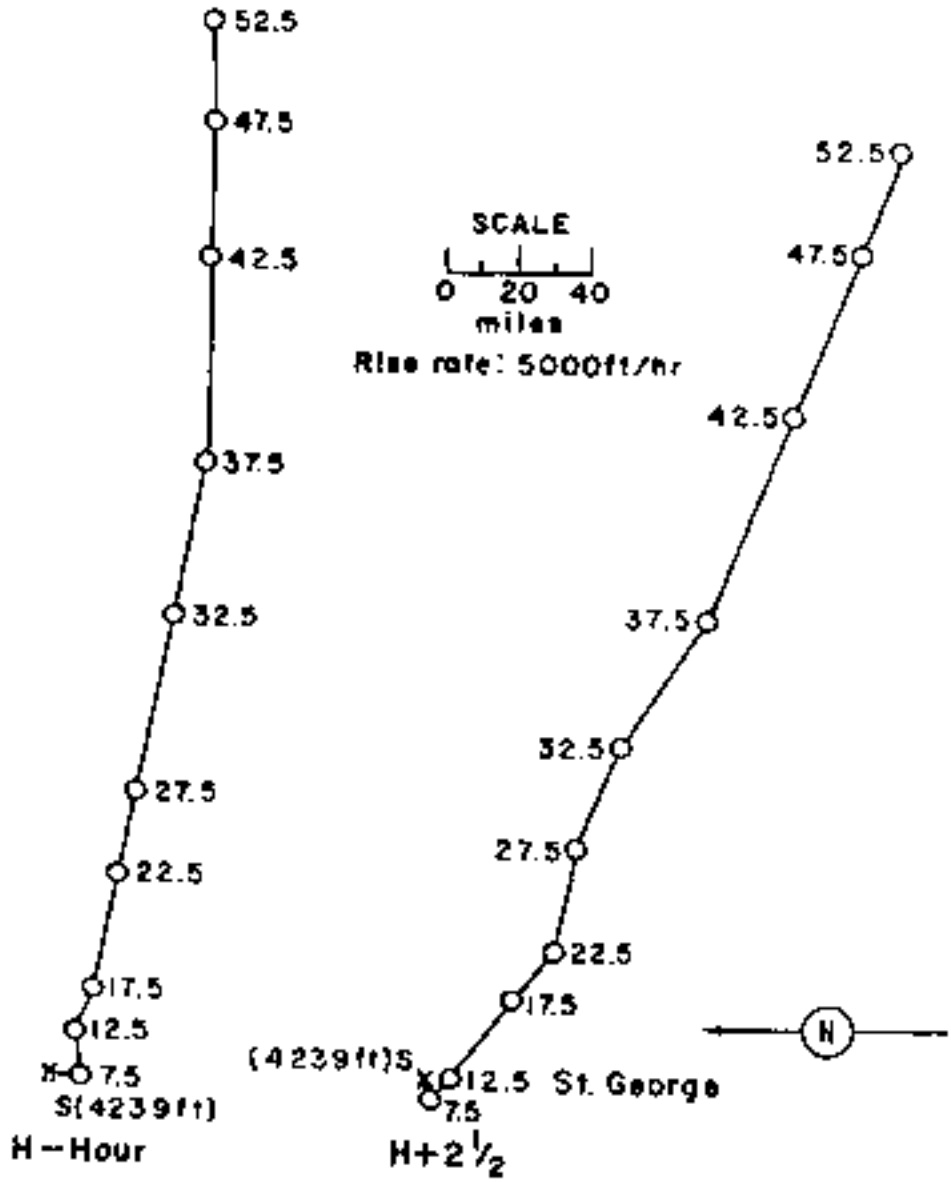


Figure 95. Hodographs for Operation UPSHOT-KNOTHOLE - Simon.

[illegible] - Encore

	PST	GMT
DATE:	[illegible]	[illegible]
TIME:	[illegible]	[illegible]

Spectrum: [illegible]

SITE: [illegible] - Kennebec River
36° [illegible] N
115° [illegible] W
Site elevation: [illegible] ft.

TOTAL YIELD: 20 kt

HEIGHT OF BURST: [illegible] ft.

RADIOACTIVITY DATA:
Time to 1st minimum: [illegible] to [illegible] hours
Time to 2nd maximum: [illegible] to [illegible] hours
Radius at 2nd maximum: [illegible]

GROUND ZERO HEIGHT: [illegible] ft MSL
CRATER DIMENSIONS: [illegible] ft MSL

CRATER DATA: [illegible]

TYPE OF EFFORT AND ATTACHMENT:
Air burst over Nevada [illegible]

REMARKS:

This shot is essentially [illegible] of the [illegible] - 4. There was no local fallout. The [illegible] was measured from readings taken at [illegible] hour and extrapolated to [illegible] hours. Under the prevailing [illegible] did not delay [illegible]

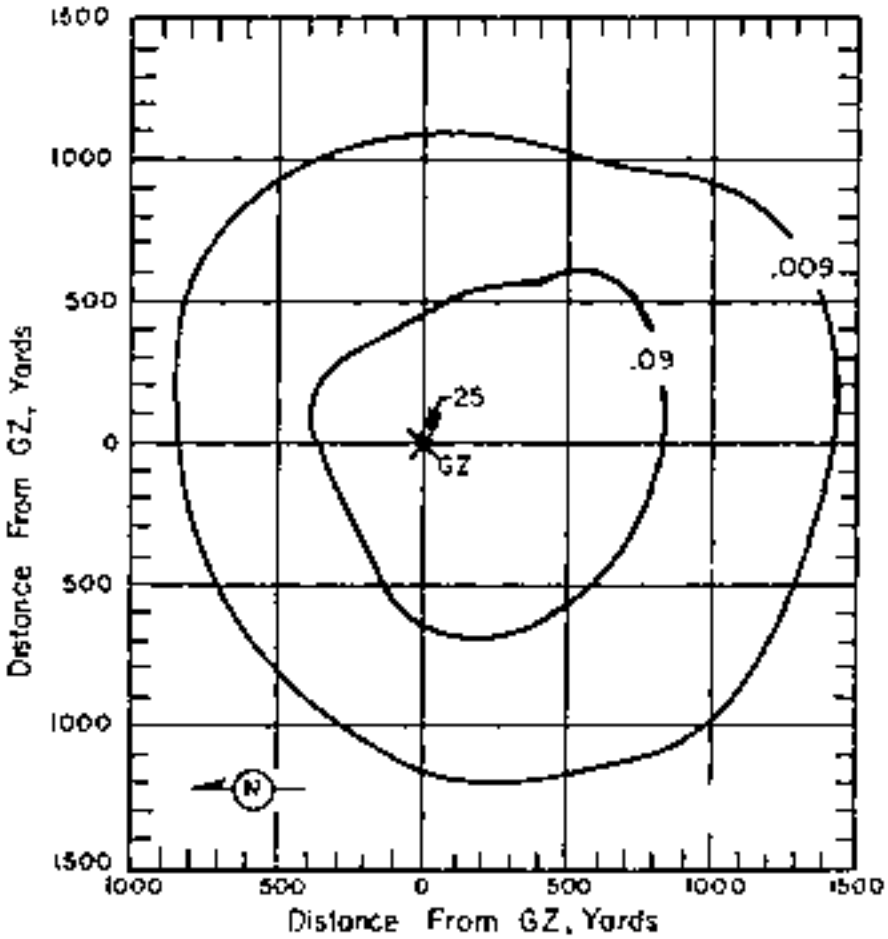


Figure 96. Operation GREENHOUSE - Encore.
On-site dose rate contours in r/hr at H+1 hour.

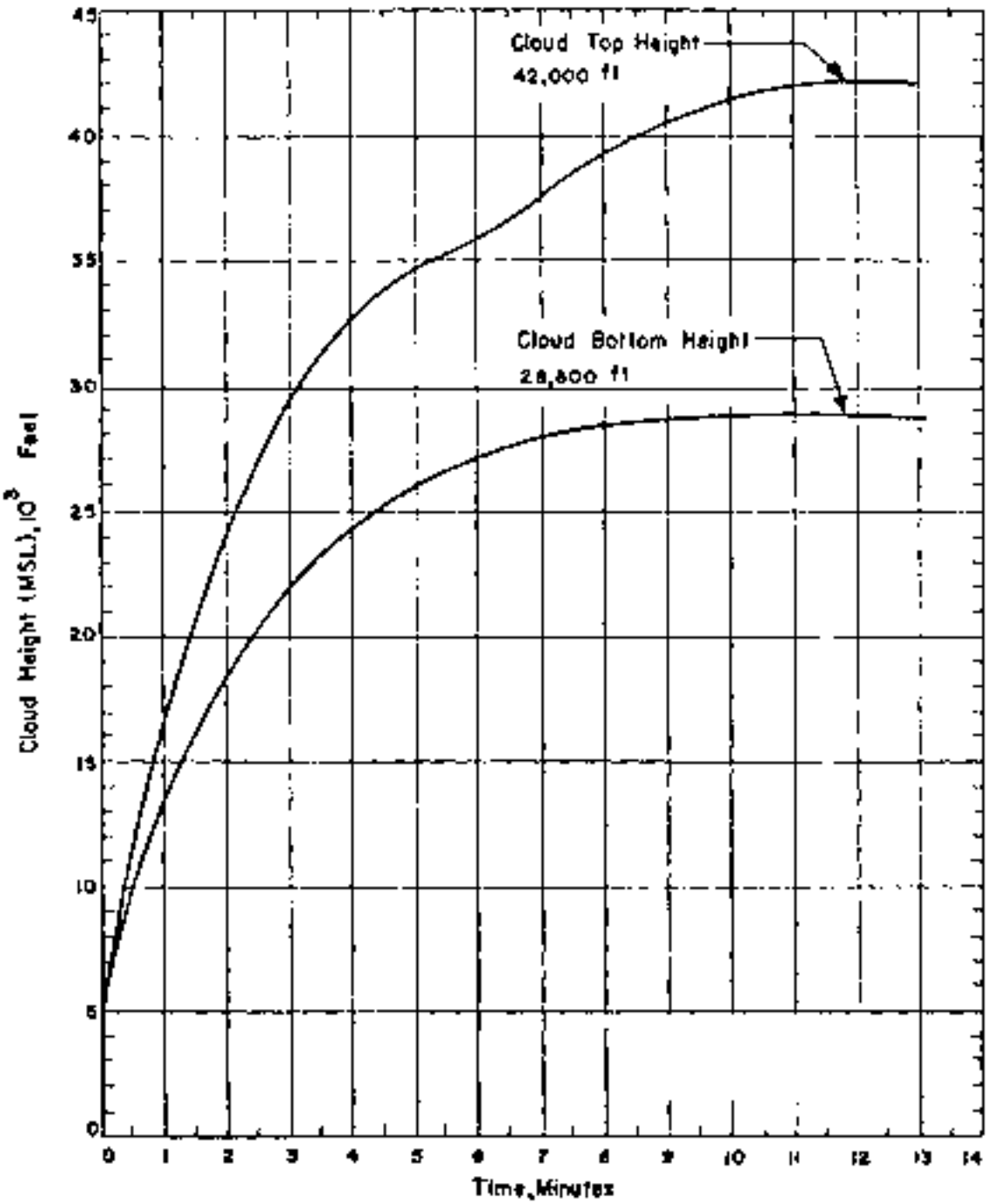


Figure 97. Cloud Dimensions: Operation UPSHOT-KNOTHOLE - Encore.

TABLE 39 NEVADA WIND DATA FOR OPERATION UPSHOT-KNOTHOLE — SECOND

Altitude (MSL.)	H-hour		Altitude (MSL.)	H-hour	
	Dir	Speed		Dir	Speed
feet	degrees	mph	feet	degrees	mph
Surface	190	06	23,000	290	71
Burst Height	290	06	24,000	290	78
5,000	230	07	25,000	290	90
6,000	270	06	26,000	290	93
7,000	310	12	27,000	290	96
8,000	330	12	28,000	290	110
9,000	320	12	29,000	290	125
10,000	260	14	30,000	290	128
11,000	250	23	31,000	290	119
12,000	250	30	32,000	290	127
13,000	260	35	33,000	290	128
14,000	260	40	34,000	290	140
15,000	260	50	35,000	290	139
16,000	250	55	36,000	290	119
17,000	250	61	37,000	290	142
18,000	250	66	38,000	290	162
19,000	250	64	39,000	290	174
20,000	250	65	40,000	290	168
21,000	250	58	41,000	290	173
22,000	250	59			

NOTES:

1. Tropopause height was 39,000 ft MSL at H-hour.
2. Surface wind data was obtained at the Control Point. Upper air data was obtained from the rawinsonde section located on Yucca Lake.
3. At H-hour the pressure at ground zero was [illegible] mb, the temperature 16.7°C, the dew point - 7.0°C and the relative humidity 19%.

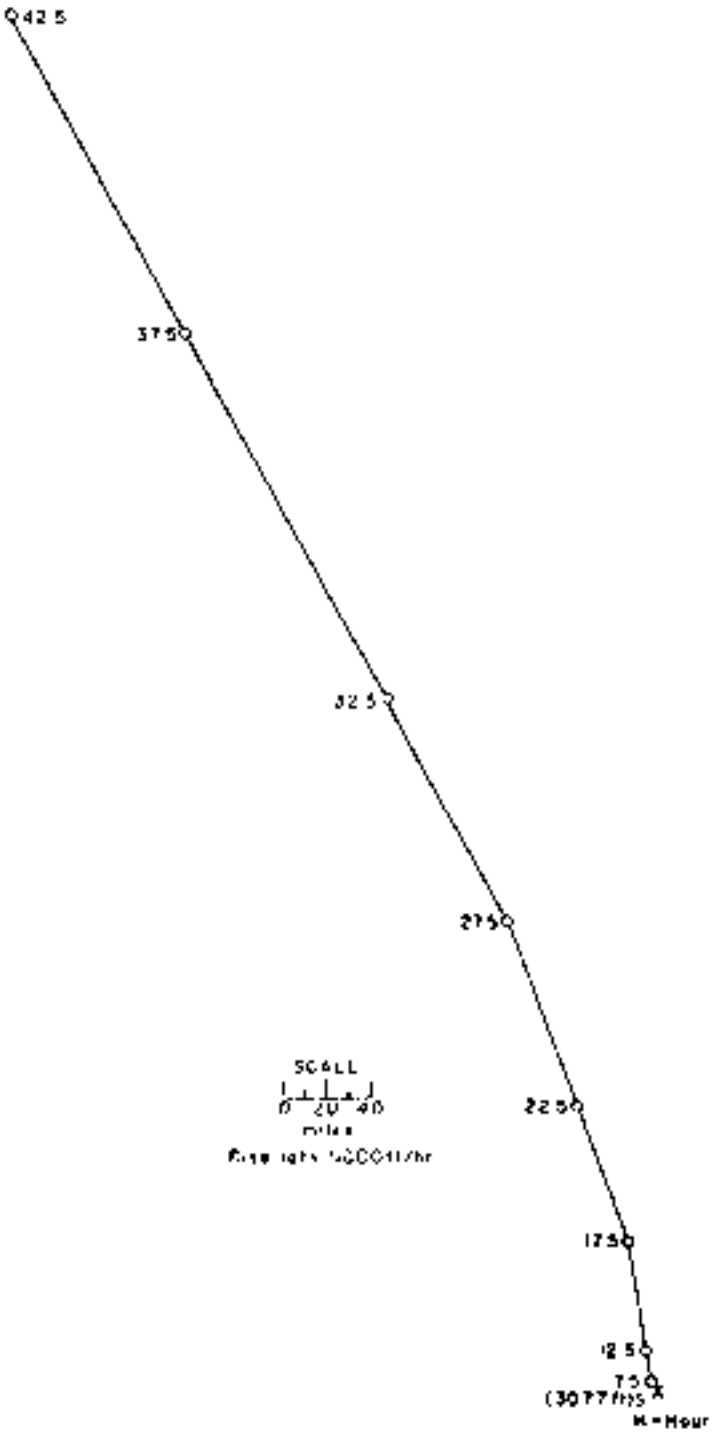


Figure 98. Hodograph for Operation UPSHOT-KNOTHOLE - Encore.

OPERATION [illegible] - Priory

	PST	GMT
DATE:	17 May	17 May 1955
TIME:	0600	1300

Operation: TASK

SITE: NTS - Area 3a
37° 03' 25" N
116° 01' 31" W
Site elevation: 4,006 ft

TOTAL YIELD: 32 kt

BIRTH OF FIREBALL:

FIREBALL DATA:
Time to 1st minimum: 14.9 to 19.0 msec
Time to 2nd maximum: 151 msec
Radius at 2nd maximum: 2M

TYPE OF BURST AND LOCATION:
Tower burst over [illegible] soil

CLOUD TOP HEIGHT: [illegible] ft MSL
CLOUD BOTTOM HEIGHT: [illegible] ft MSL

CRATER DATA: No crater

REMARKS:

The operation control station was obtained from readings at [illegible]. No decay correction were necessary. The off-site 2nd test point was drawn from Priory available public ground-survey [illegible] Safety organization. This shot is sometimes designated as Upshot-Knothole - Shot 8.

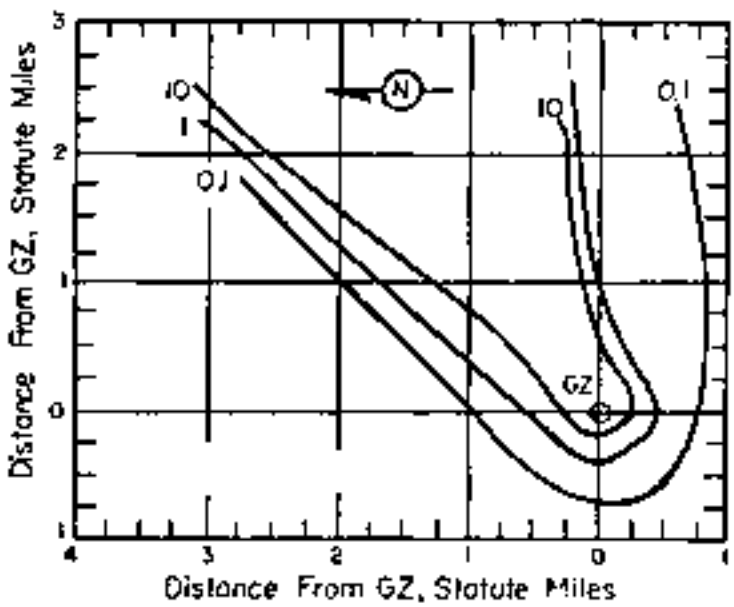


Figure 99. Operation UPSHOT-KNOTHOLE - Harry.
On-site dose rate contours in r/hr at H+1 hour.

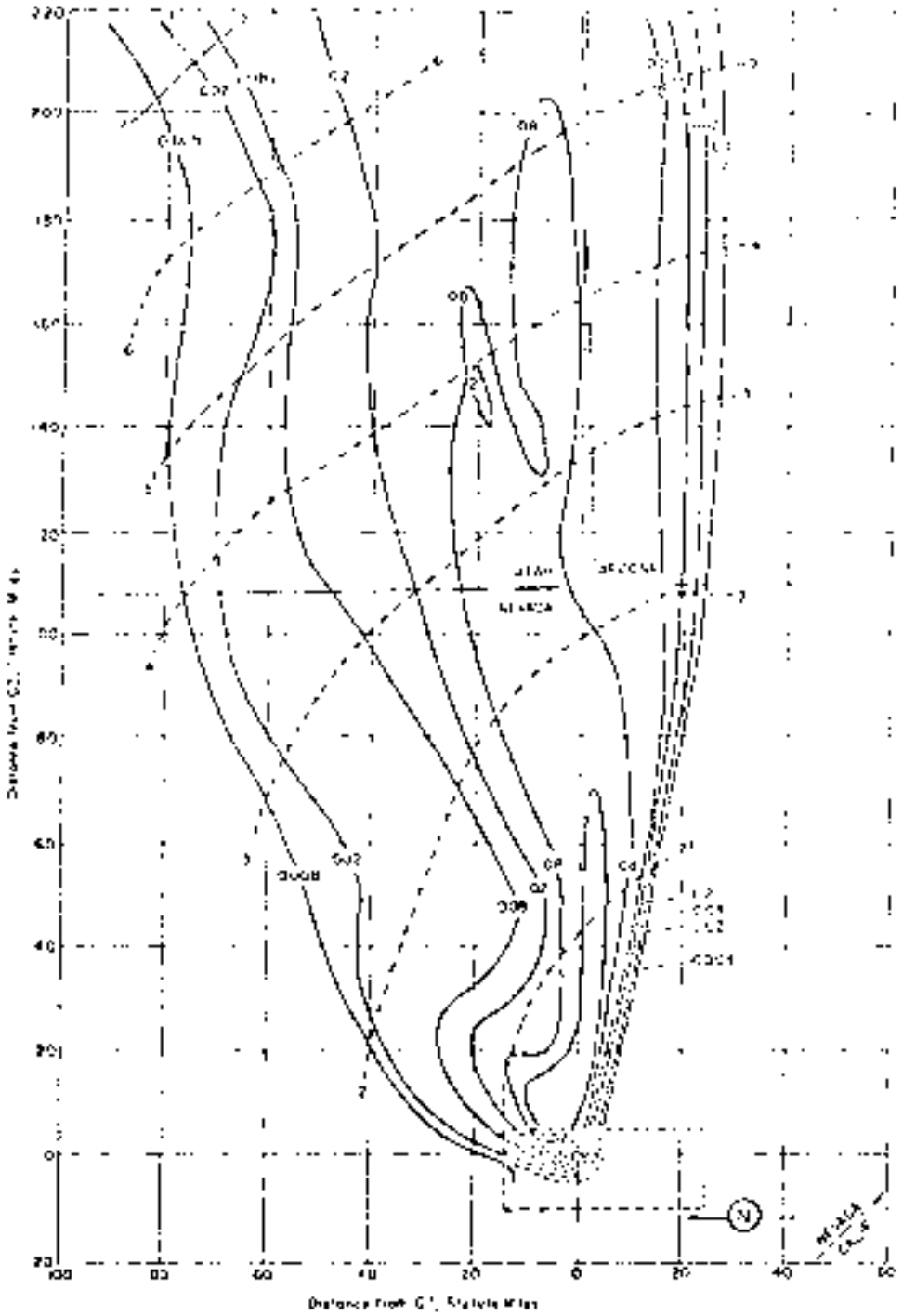


Figure 100. Operation UPSHOT-KNOTHOLE - Harry.
Off-site dose rate contours in r/hr at H+1 hour.

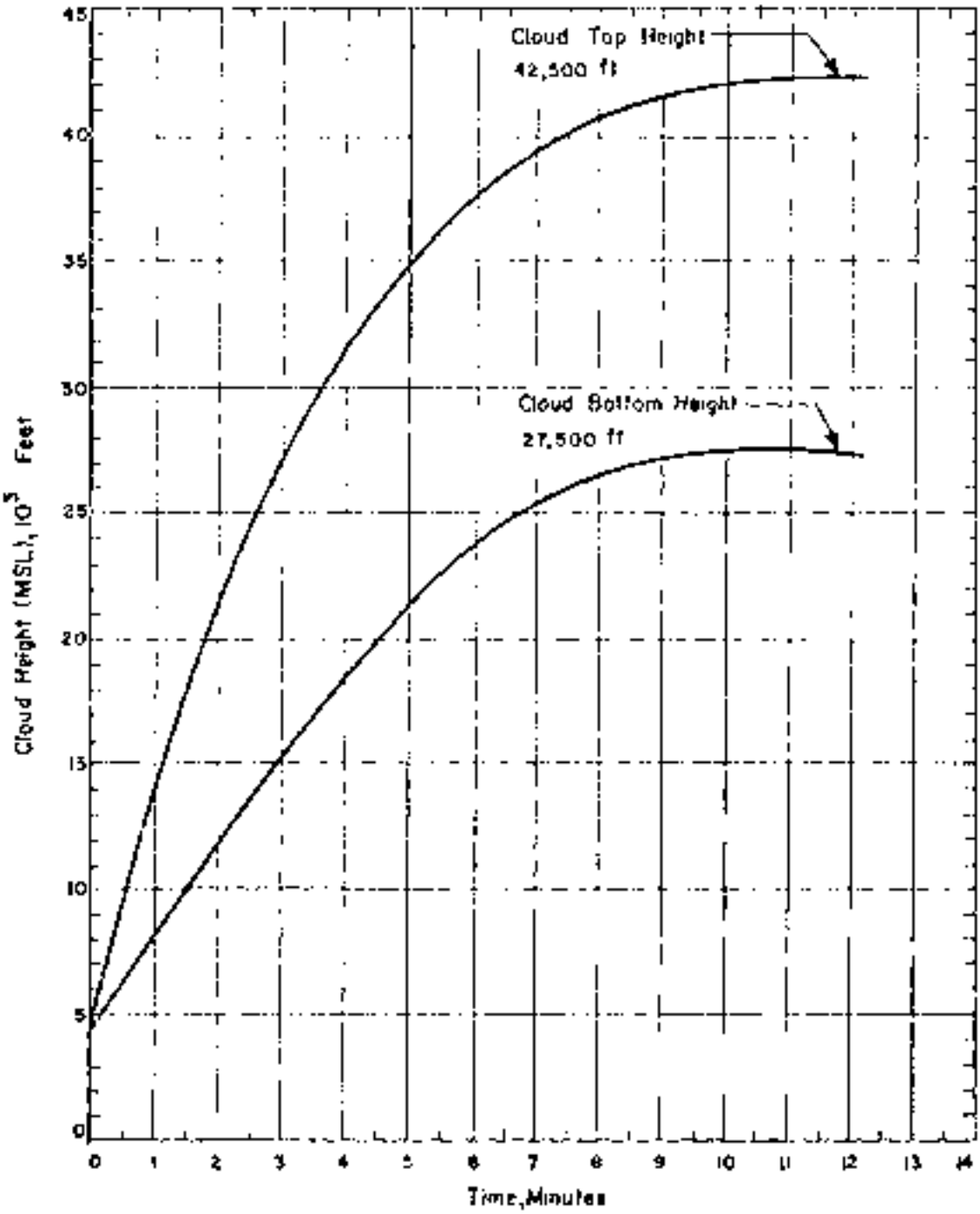


Figure 101. Cloud Dimensions: Operation [illegible] Henry.

TABLE 30 WIND DATA FOR OBSERVATION FLIGHT-NUMBER[1] - [illegible]

Altitude (MSL)	[illegible]	
	Dir	Speed
feet	degrees	mph
Surface	020	06
Burnt Hospital	000	06
5,000	200	12
6,000	230	24
7,000	250	29
8,000	260	30
9,000	270	26
10,000	270	21
11,000	270	17
12,000	260	17
13,000	270	17
14,000	220	20
15,000	230	24
16,000	260	35
17,000	270	40
18,000	270	43
19,000	270	49
20,000	280	46
21,000	280	46
22,000	280	50
23,000	280	57
24,000	280	63
25,000	280	62
26,000	290	57

Altitude (MSL)	[illegible]	
	Dir	Speed
feet	degrees	mph
27,000	290	53
28,000	290	51
29,000	290	57
30,000	290	60
31,000	290	61
32,000	290	67
33,000	290	76
34,000	290	74
35,000	290	72
36,000	290	74
37,000	290	77
38,000	290	74
39,000	290	80
40,000	290	77
41,000	290	69
42,000	290	91
43,000	290	96
44,000	290	87
45,000	290	89
46,000	290	77
47,000	290	87
48,000	290	92
49,000	290	94
50,000	290	92

NOTES:

1. Tropopause height was 40,000 ft MSL at T-hour.
2. H-hour surface wind data was obtained at the Control Point. H-hour upper air data was obtained from the rawinsonde unit located on Yucca Lake. H+3 hour wind data was obtained from pibal observation at Ft. George.
3. At H-hour the pressure at ground zero was 870 mb, the temperature 14.3°C, the dew point -0.6°C, and the relative humidity 32%.

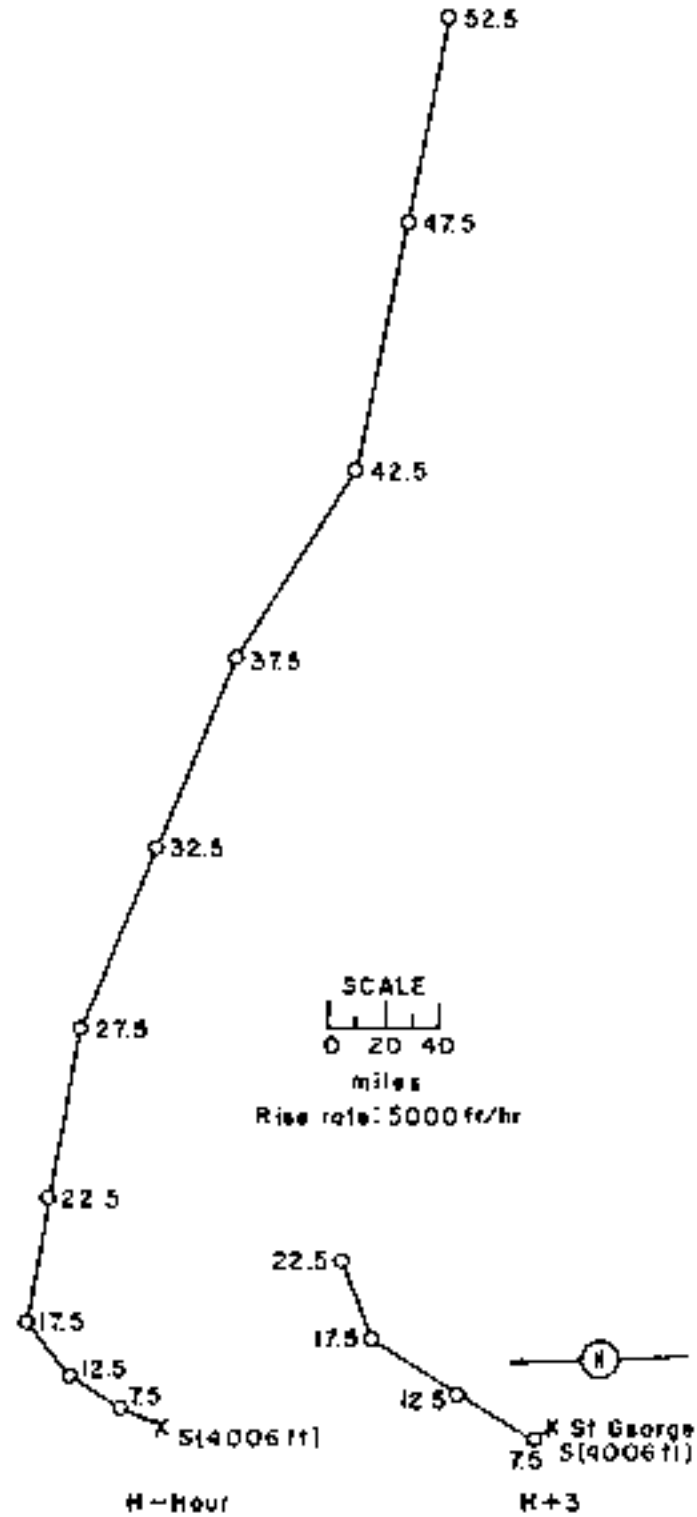


Figure 102. Hodographs for Operation UPSHOT-KNOTHOLE - Harry.

OPERATION UPSHOT-KNOTHOLE - Grable

	PST	GMT
DATE:	25 May 1953	25 May 1953
TIME:	0730	1530

Sponsor: LASL

SITE: NTS - Frenchman Flat
37° 47' 35" N
115° 54' 53" W
Site elevation: 3,077 ft

TOTAL YIELD: 15 kt

HEIGHT OF BURST: 524 ft

TYPE OF BURST AND PLACEMENT:
Airburst of gun-type weapon over Nevada soil

FIREBALL DATA:
Time to 1st minimum: 13.3 to 14.9 msec
Time to 2nd maximum: 122 to 138 msec
Radius at 2nd maximum: 557.6

CLOUD TOP HEIGHT: 35,000 ft MSL
CLOUD BOTTOM HEIGHT: 23,000 ft MSL

CRATER DATA: No crater

REMARKS:

The on-site fallout pattern is due primarily to neutron induced activity and was obtained by the Radiological Safety organization from ground-survey measurements between H+$\frac{1}{4}$ hour and H+$1\frac{1}{4}$ hours. No decay corrections were necessary. The off-site fallout pattern was drawn from D-day readings of mobile ground-survey teams of the Radiological Safety organization.

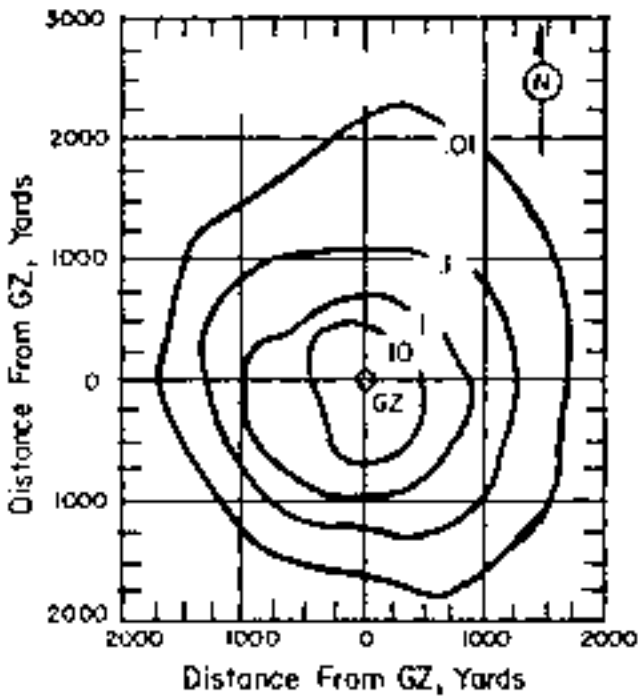


Figure 103. Operation UPSHOT-KNOTHOLE - Grable.
On-site dose rate contours in r/hr at d+1 hour.

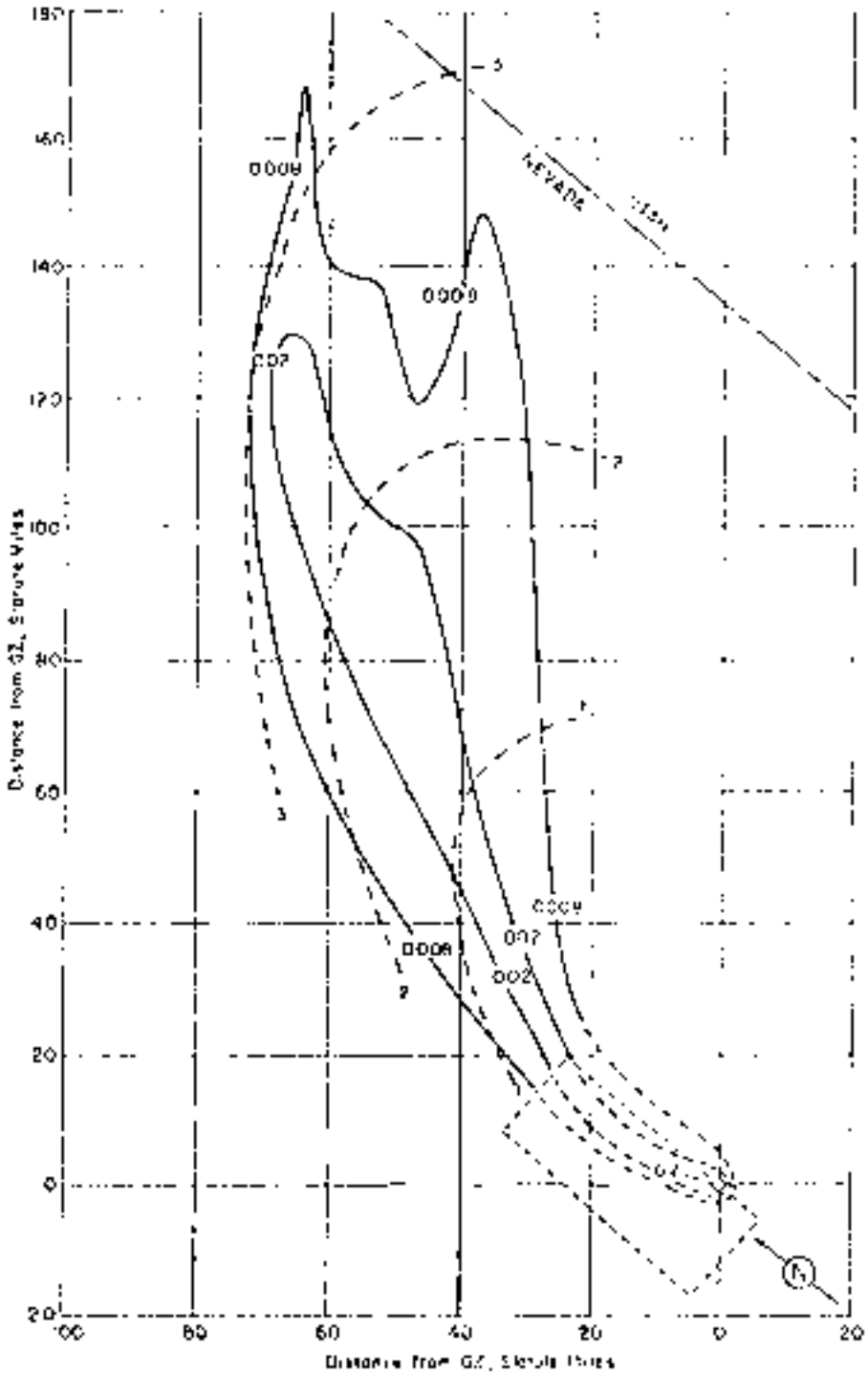


Figure 104. Operation UPSHOT-KNOTHOLE - Grable.
Off-site dose rate contours in r/hr at H+1 hour.

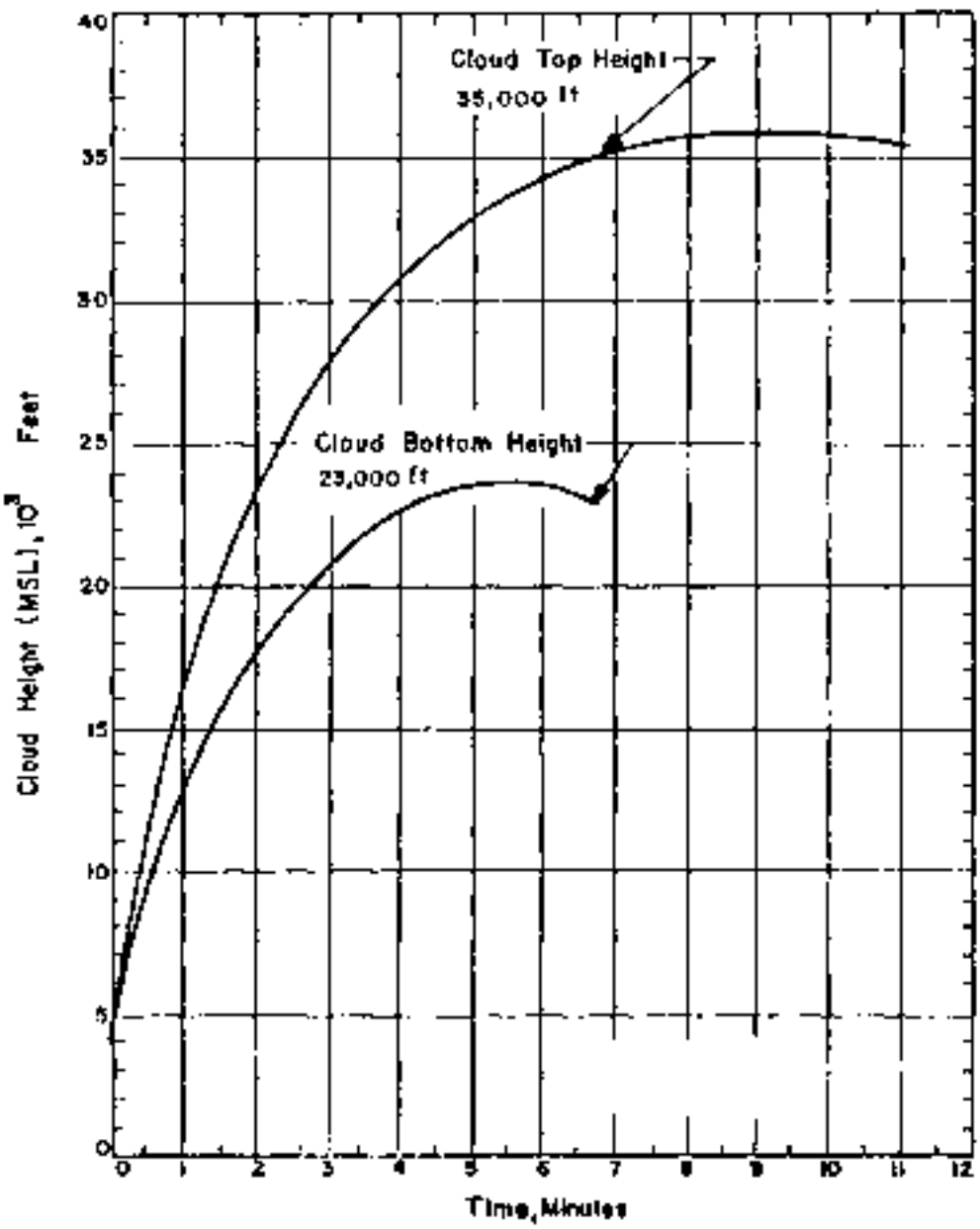


Figure 105. Cloud Dimensions: Operation UPSHOT-KNOTHOLE - Grable.

TABLE 31 NEVADA WIND DATA FOR OPERATION [illegible] - GRADY

Altitude (MSL)	H-hour		Altitude (MSL)	H-hour	
	Dir	Speed		Dir	Speed
feet	degrees	mph	feet	degrees	mph
Surface	300	06	27,000	220	102
Burst Height	220	08	28,000	220	102
4,000	220	12	29,000	220	92
5,000	220	16	30,000	220	98
6,000	190	24	31,000	220	124
7,000	180	35	32,000	220	126
8,000	190	24	33,000	220	125
9,000	190	24	34,000	220	120
10,000	200	35	35,000	220	138
11,000	200	35	36,000	220	140
12,000	200	36	37,000	220	100
13,000	200	37	38,000	220	103
14,000	200	38	39,000	220	95
15,000	200	40	40,000	220	79
16,000	200	55	41,000	220	85
17,000	210	63	42,000	220	92
18,000	210	85	43,000	220	72
19,000	210	85	44,000	220	61
20,000	220	85	45,000	220	69
21,000	220	86	46,000	220	64
22,000	220	87	47,000	220	63
23,000	220	94	48,000	220	77
24,000	220	101	49,000	220	60
25,000	220	75	50,000	220	38
26,000	220	63			

NOTES:

1. Tropopause height was 35,500 ft. MSL at H-hour.
2. Surface and lower level wind data was obtained at the Control Point. Upper air data was obtained from the rawinsonde station located on Yucca Lake.
3. At H-hour the pressure at ground zero was 901 mb, the temperature 24.8°C, the dew point -3.8°C and the relative humidity 30%.

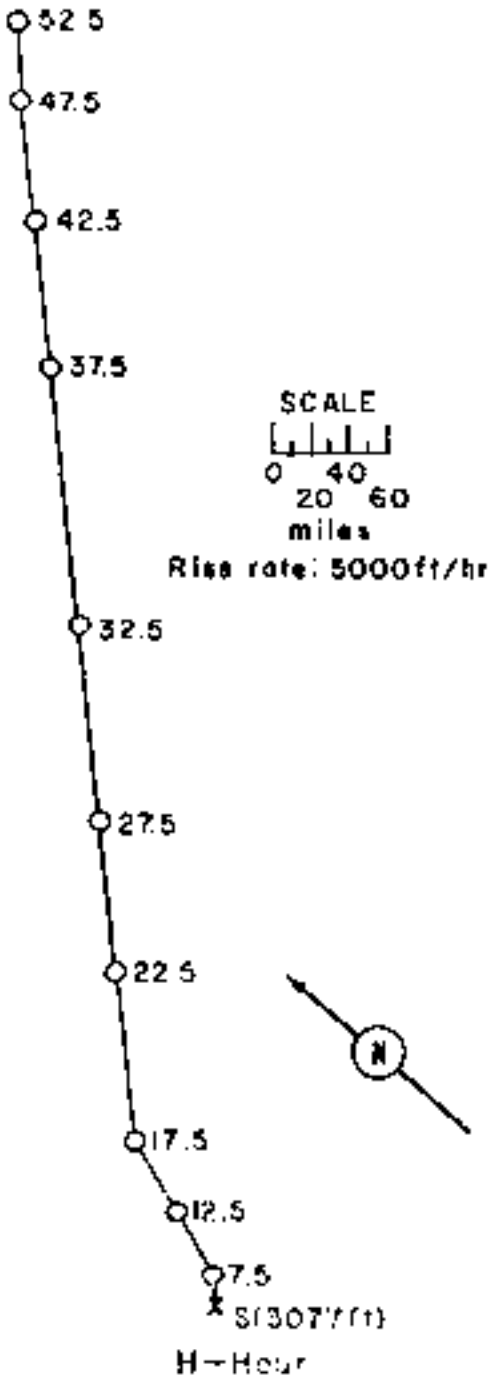


Figure 10b. Hodograph for Operation UPSHOT-KNOTHOLE - Grable

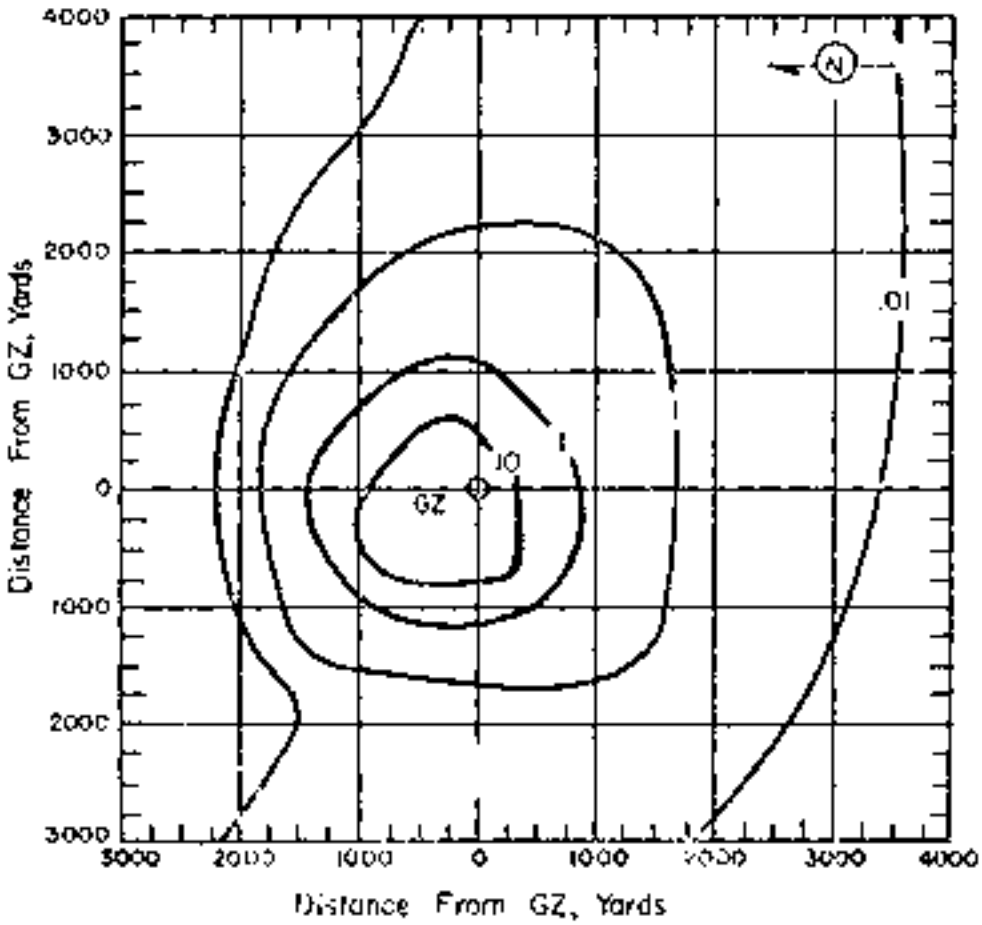


Figure 107. Operation [illegible] - Climax.
On-site dose rate contours in r/hr at H+1 hour.

TABLE 32 WIND DATA FOR DESERTION UPSHOT-KNOTHOLE- [illegible]

Altitude (MSL)	H-hour		Altitude (MSL)	H-hour	
	Dir	Speed		Dir	Speed
feet	degrees	mph	feet	degrees	mph
Surface	045	03	27,000	310	28
Burst Height	010	09	28,000	310	32
5,000	010	12	29,000	310	28
6,000	360	07	30,000	310	32
7,000	010	09	31,000	310	32
8,000	020	07	32,000	310	30
9,000	020	12	33,000	300	28
10,000	140	03	34,000	280	25
11,000	220	05	35,000	270	20
12,000	200	03	36,000	260	18
13,000	190	07	37,000	250	22
14,000	170	09	38,000	260	24
15,000	170	07	39,000	280	25
16,000	210	05	40,000	250	21
17,000	250	12	41,000	250	26
18,000	270	17	42,000	240	32
19,000	270	18	43,000	260	28
20,000	280	15	44,000	270	18
21,000	280	18	45,000	280	14
22,000	310	21	46,000	270	14
23,000	320	20	47,000	270	23
24,000	310	23	48,000	270	25
25,000	310	22	49,000	270	21
26,000	310	28	50,000	270	13

NOTES:

1. Tropopause height was 39,060 ft MSL at H-hour.
2. H-hour surface and lower level wind data was obtained at the Control Point. H-hour upper air data was obtained from the rawinsonde section located on Yucca Lake.
3. At H-hour the pressure at ground zero was 860 mb, the temperature 13.3°C, the dew point -3.9° and the relative humidity 30%.

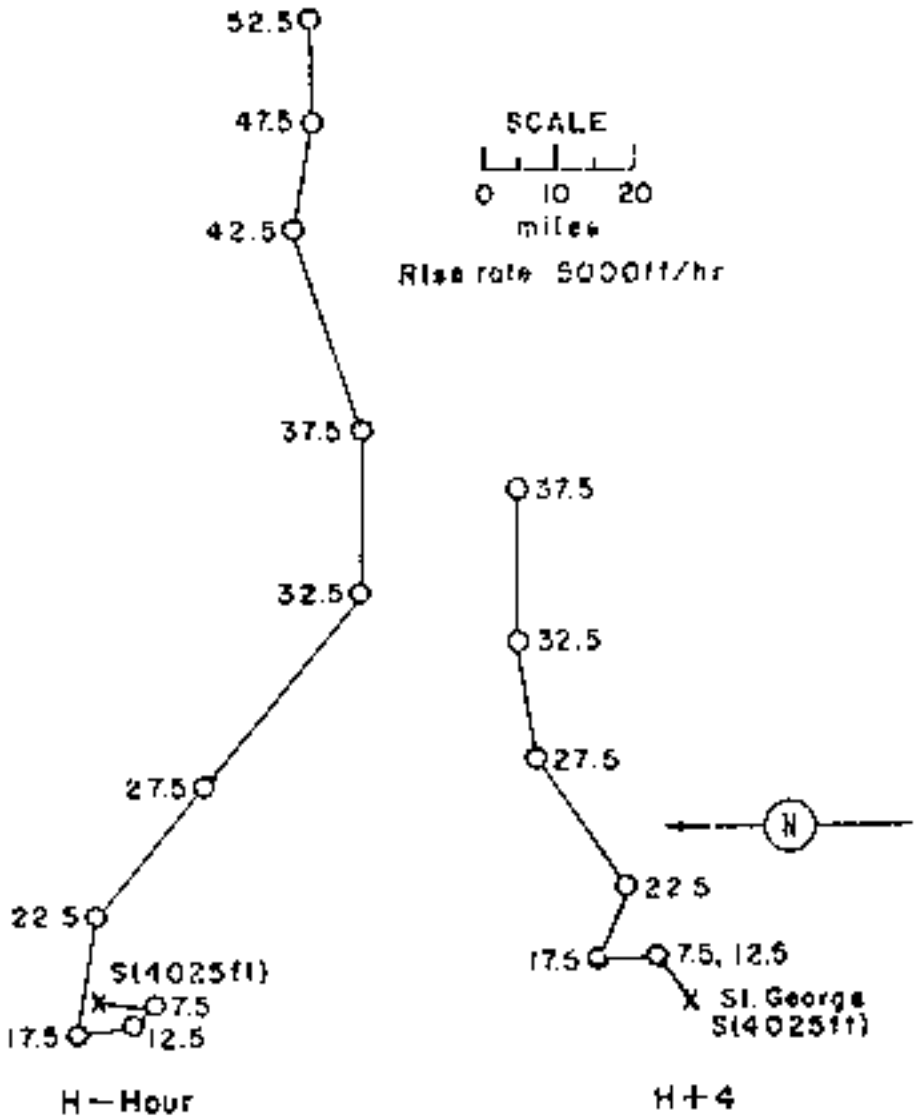
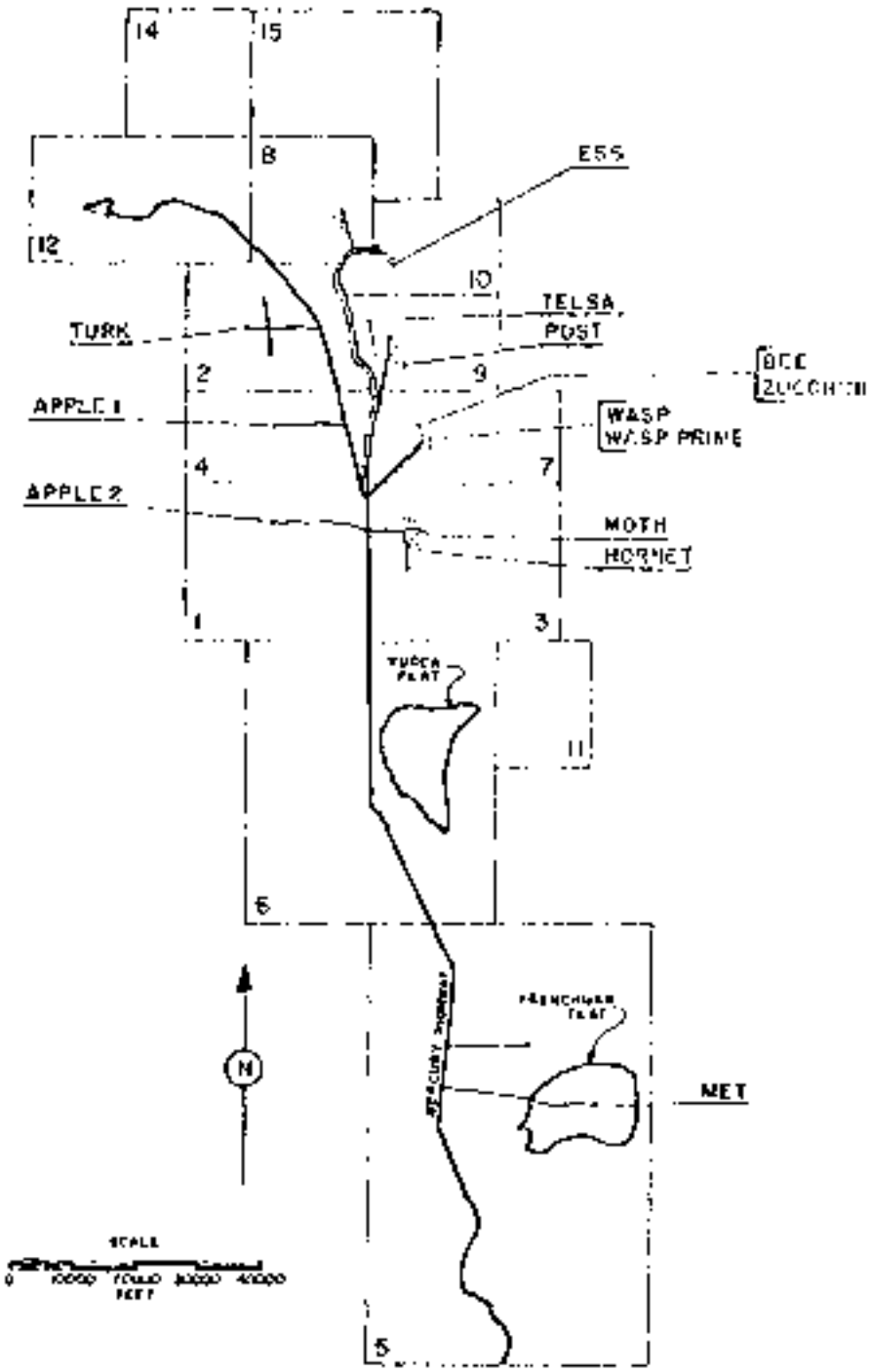


Figure 108. Isochrones for Operation [illegible] - Climax.



NEVADA TEST SITE

Figure 109. Operation PLOWSHARE, Shot locations.

OPERATION TRAIOT - Misp

	EST	GMT
DATE:	18 Feb 1955	18 Feb 1955
TIME:	1200	2000

Sponsor: LASL

SITE: NTS - Area T-7-4
37° 07' 12" N
116° 03' 03" W
Site elevation: 4,39? ft

TOTAL YIELD: ? kt

HEIGHT OF SHOT: 700 ft

TYPE OF BURST AND PLACEMENT:
Air burst over Nevada soil

CLOUD TOP HEIGHT: 21,500 ft MSL
CLOUD BOTTOM HEIGHT: 14,500 ft MSL

FIREBALL DATA:
Time to 1st minimum: 3.3 to 4 msec
Time to 2nd maximum: 44 to 48 msec
Radius at 2nd maximum: 196.8 ft

CRATER DATA: No crater

REMARKS:

The contours resulting from this shot were due primarily to neutron-induced activity. The on-site pattern was obtained from Rad-Safe readings at H+1 hour. No decay corrections were necessary. No offsite pattern is presented because of the low activity levels encountered.

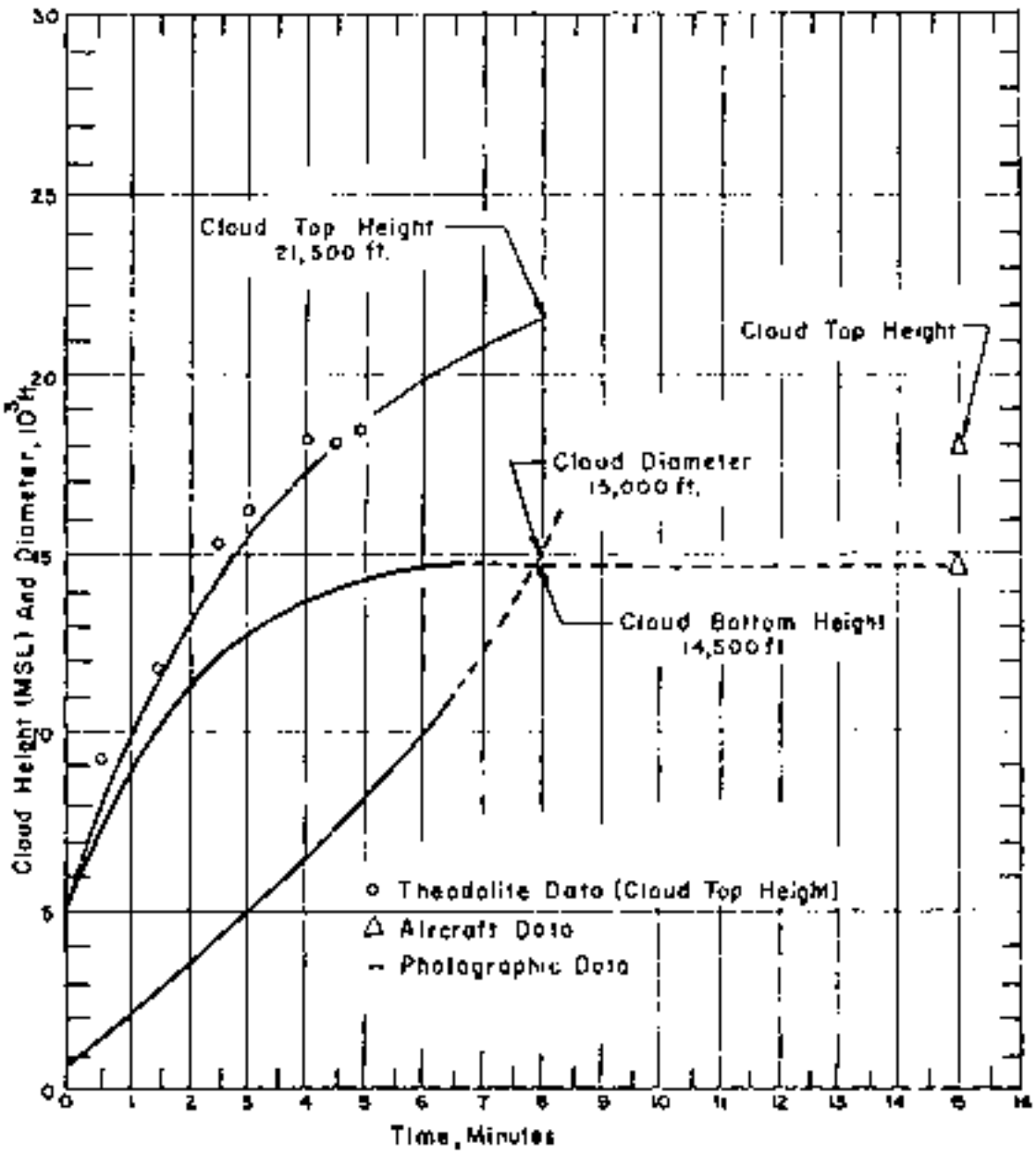


Figure 110. Operation TEAPOT - Mesa.
On-site dose rate contours in r/hr at H+1 hour.

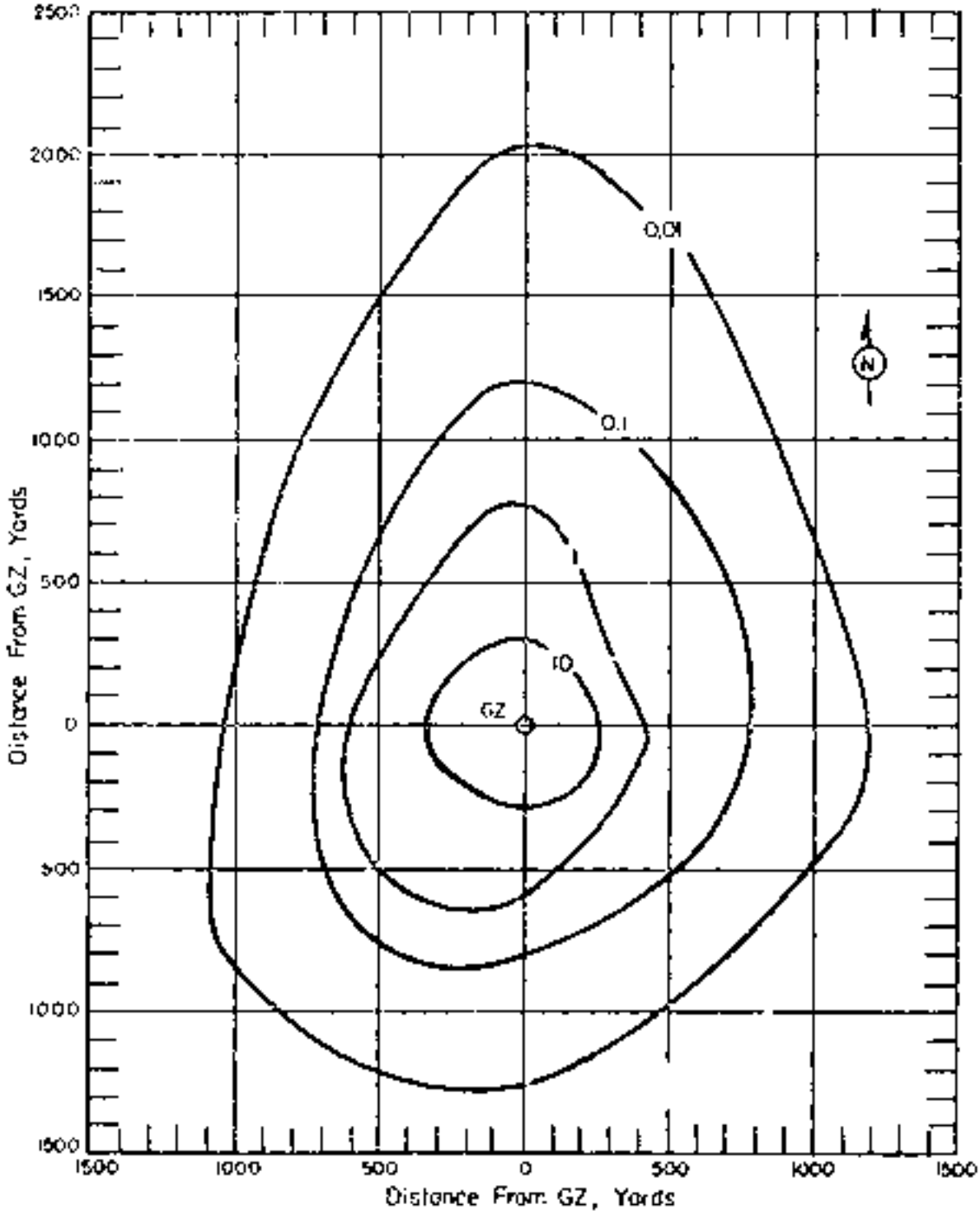


Figure III - Cloud Dimensions: Operation TEAPOT - Wasp.

[illegible]

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

[illegible]

1. [illegible]
2. [illegible]
   [illegible]

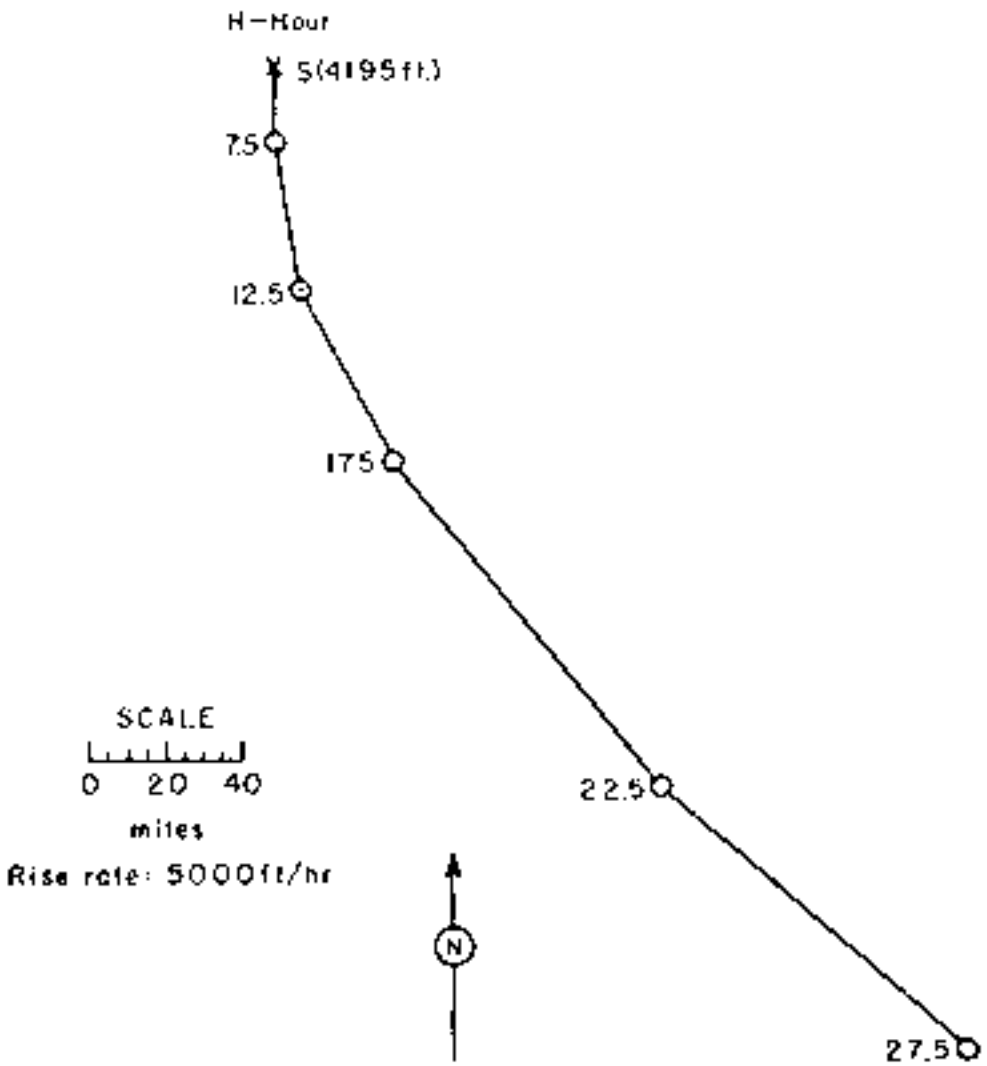


Figure 112. Hodograph for Operation TWIST - Korp.

CLIMATOLOGICAL DATA - Metro

	DAY	OFF
DAYS:	[illegible]	[illegible]
TIME:	0900	1900

Sp[illegible] LAGO

SIZE: NOW - Area A
[illegible]
[illegible]
Site [illegible]

TOTAL YIELD: 2 kt

HEIGHT OF BURST:

PEDIATRIC:
[illegible]
[illegible]
[illegible]

TYPE OF MEDICAL ATTENDANCE:
[illegible]

CLOUD COVER [illegible]:
CLOUD TOP [illegible]:

CHARTS [illegible]:

REMARKS:

The [illegible] fallout pattern was constructed from data [illegible] from six [illegible] of vertical surveys performed by the Biological Department [illegible] hour to 1400 hours. Additional [illegible] were made. Nine white lines (approximately radial) [illegible] several areas were [illegible] the survey teams [illegible]. The off-site fallout pattern was [illegible] from [illegible] taken by the off-site Radiological Safety organization. The 1-hr decay approximation was used to extrapolate the [illegible] to 24 hours for both on-site and off-site patterns.

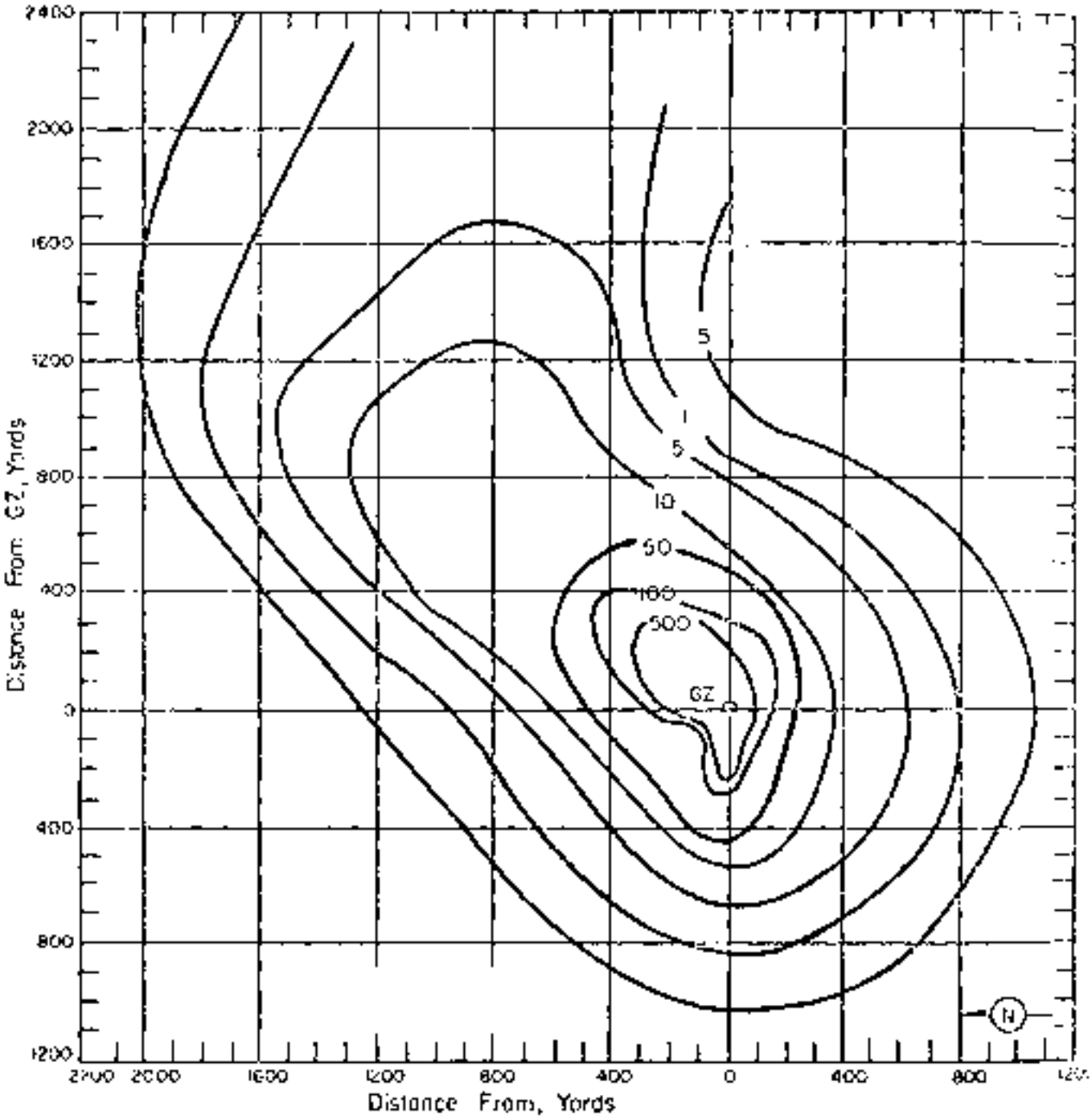


Figure 113. Operation CHASTITY - North.
On-site dose rate contours in r/hr at (+1 hour.

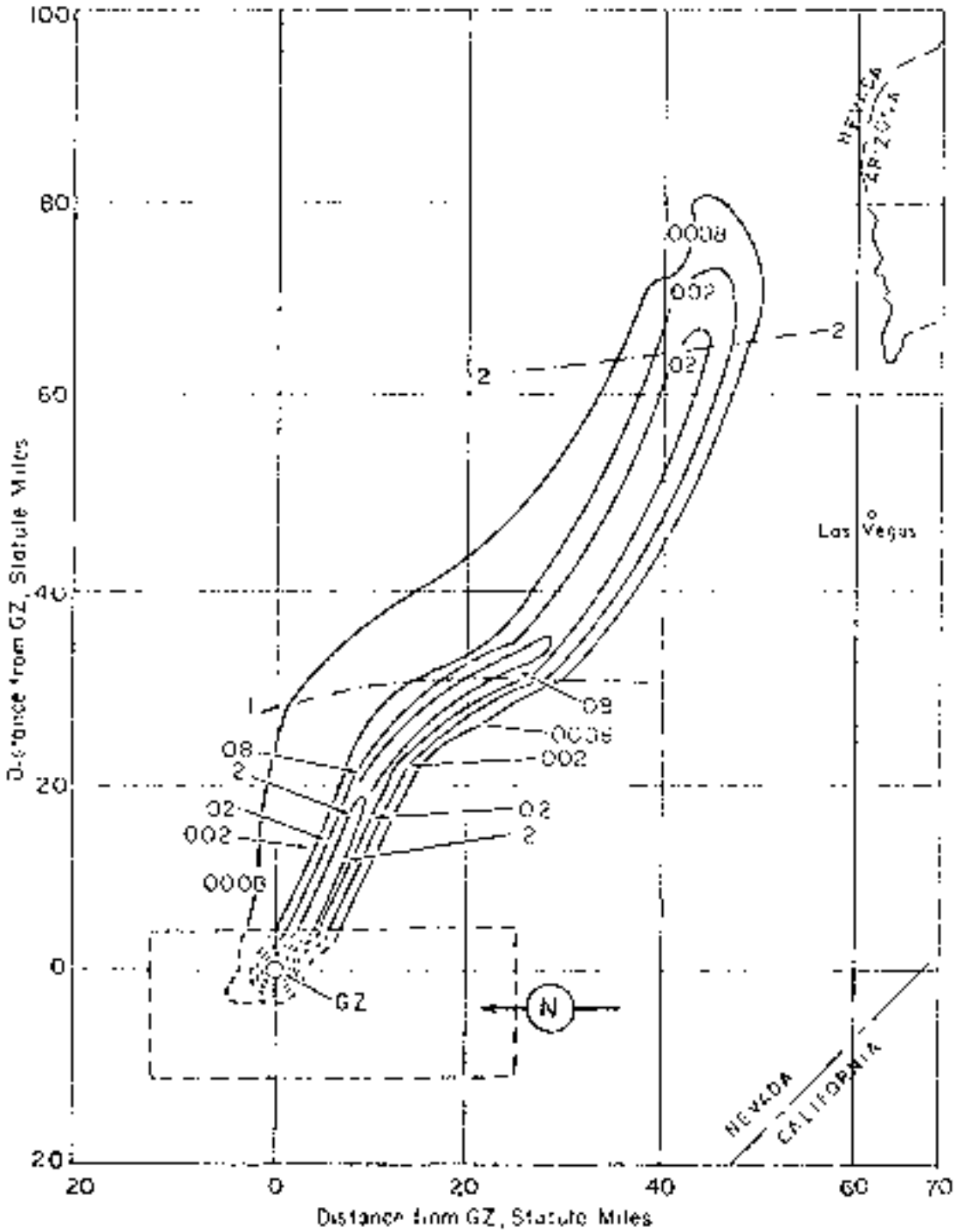


Figure 114. Operation TUMBLER - Noth.
Off-site dose rate contours in r/hr at H+1 hour.

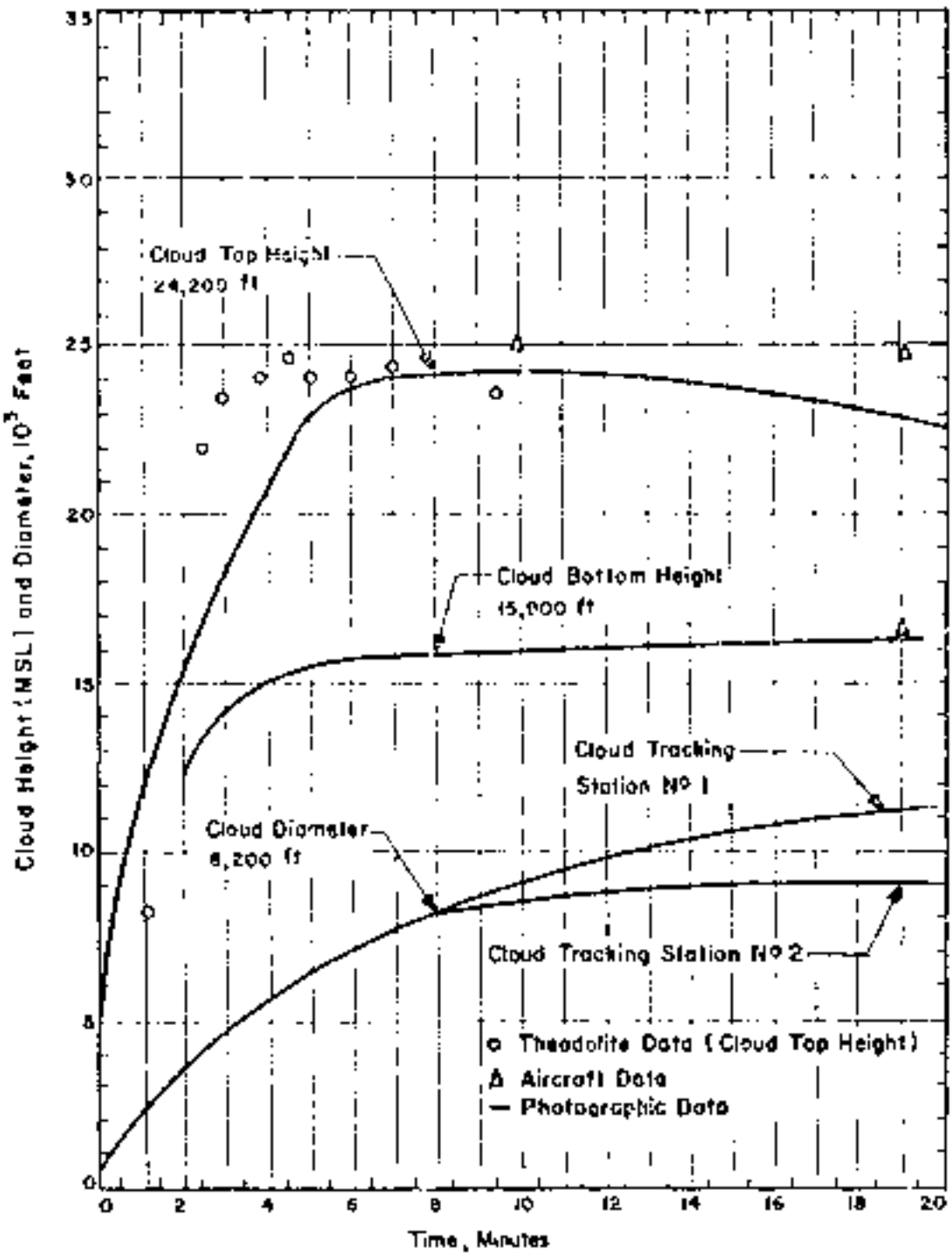


Figure 115. Cloud Dimensions: Operation CEDAR - Nevada
(Tracking Station No. 1 located 40 miles NE of G. Z.
and Tracking Station No. 2 located 50 miles SW of G.Z.)

TABLE 31 [illegible]

ALTITUDE (MSL)	[illegible]		ALTITUDE (MSL)	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Surface	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			[illegible]	[illegible]	[illegible]

NOTE: At this height the temperature was [illegible] mb.

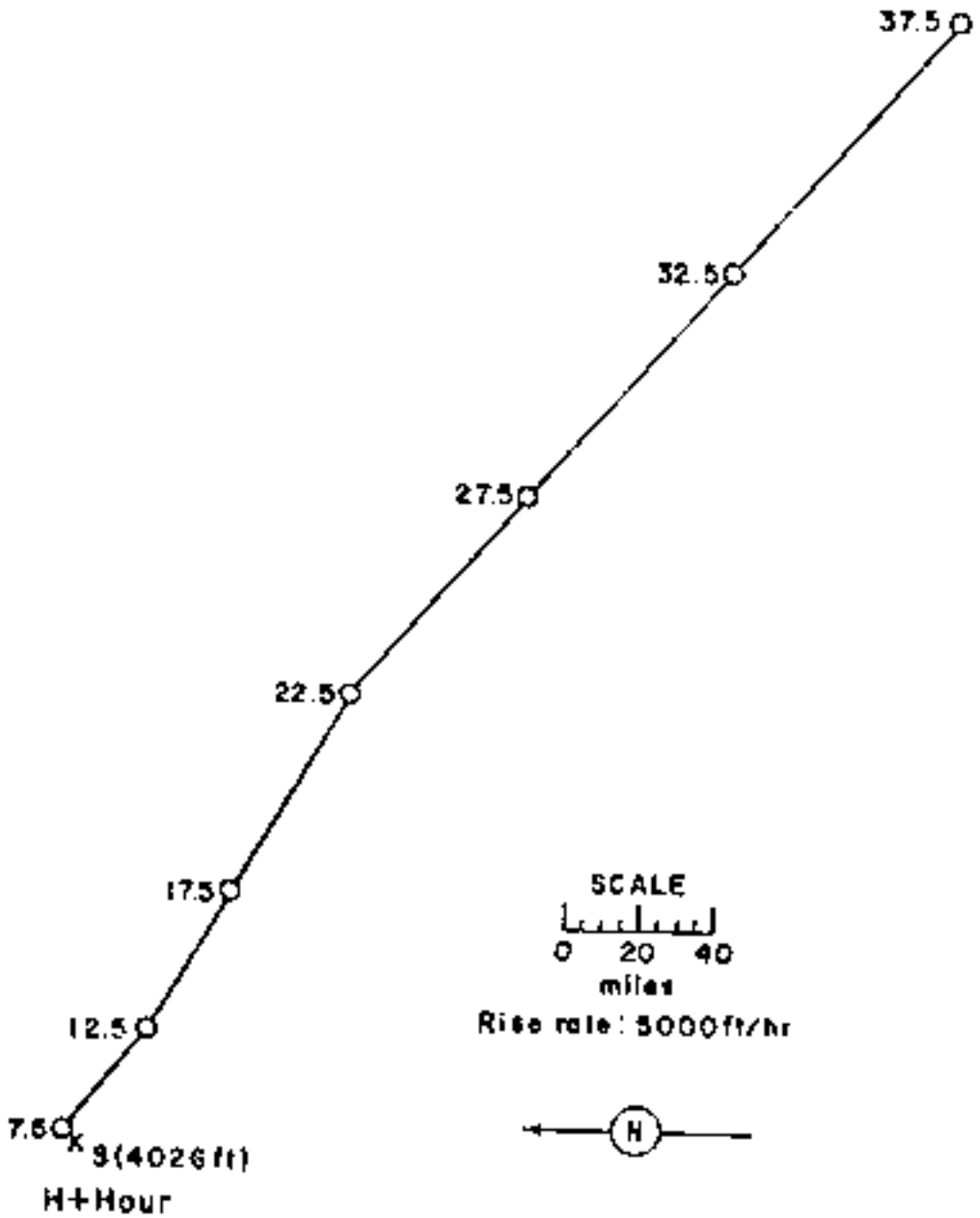
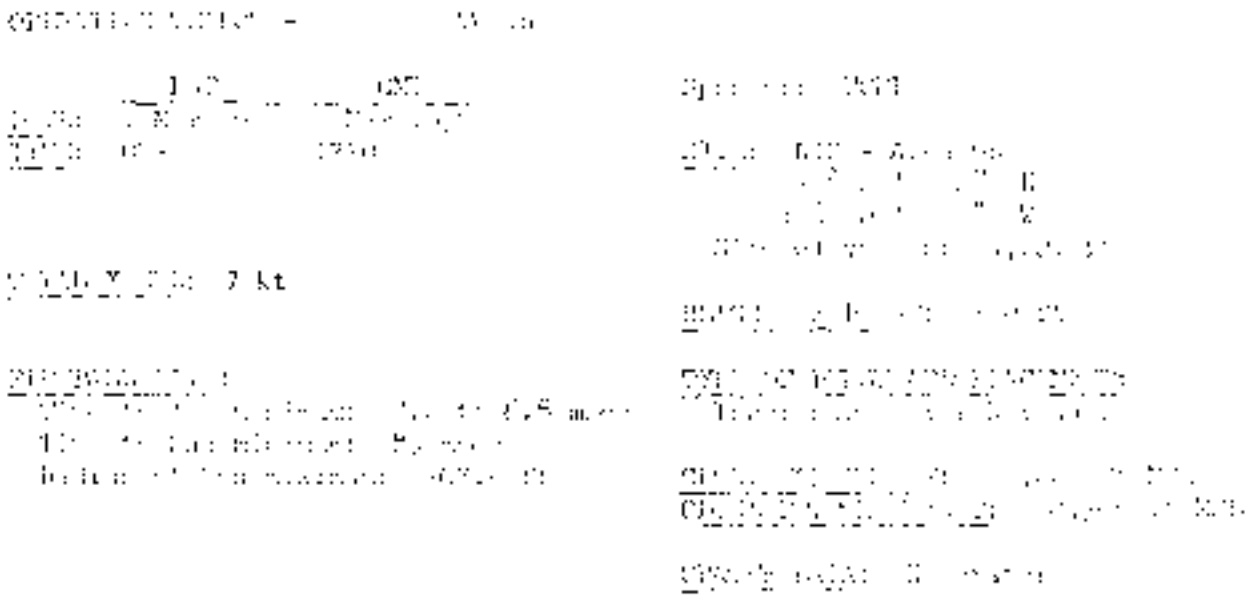
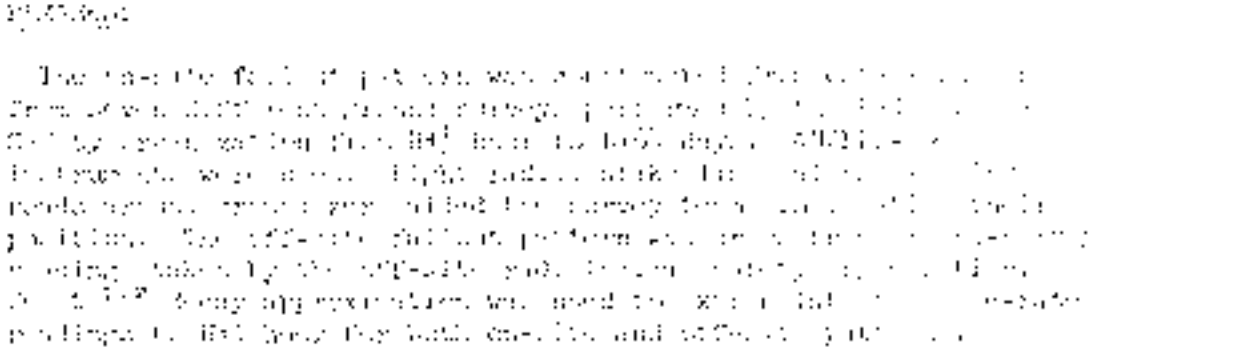


Figure 116. Hodograph for Operation SNAPOT - Nath.





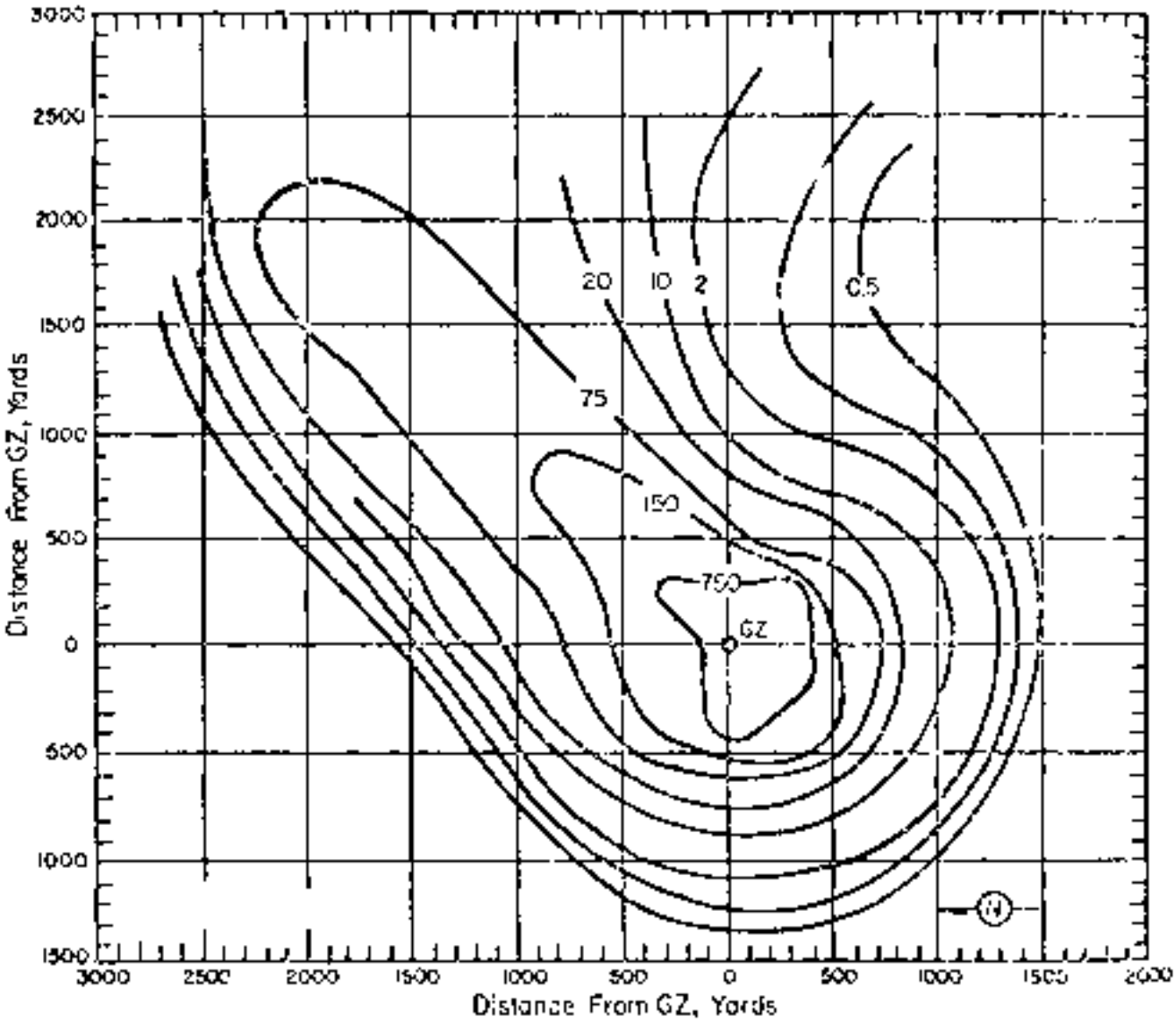


Figure 117. Operation TEAPOT - [illegible] Shelter. On-site dose rate contours in r/hr at 24 hour.

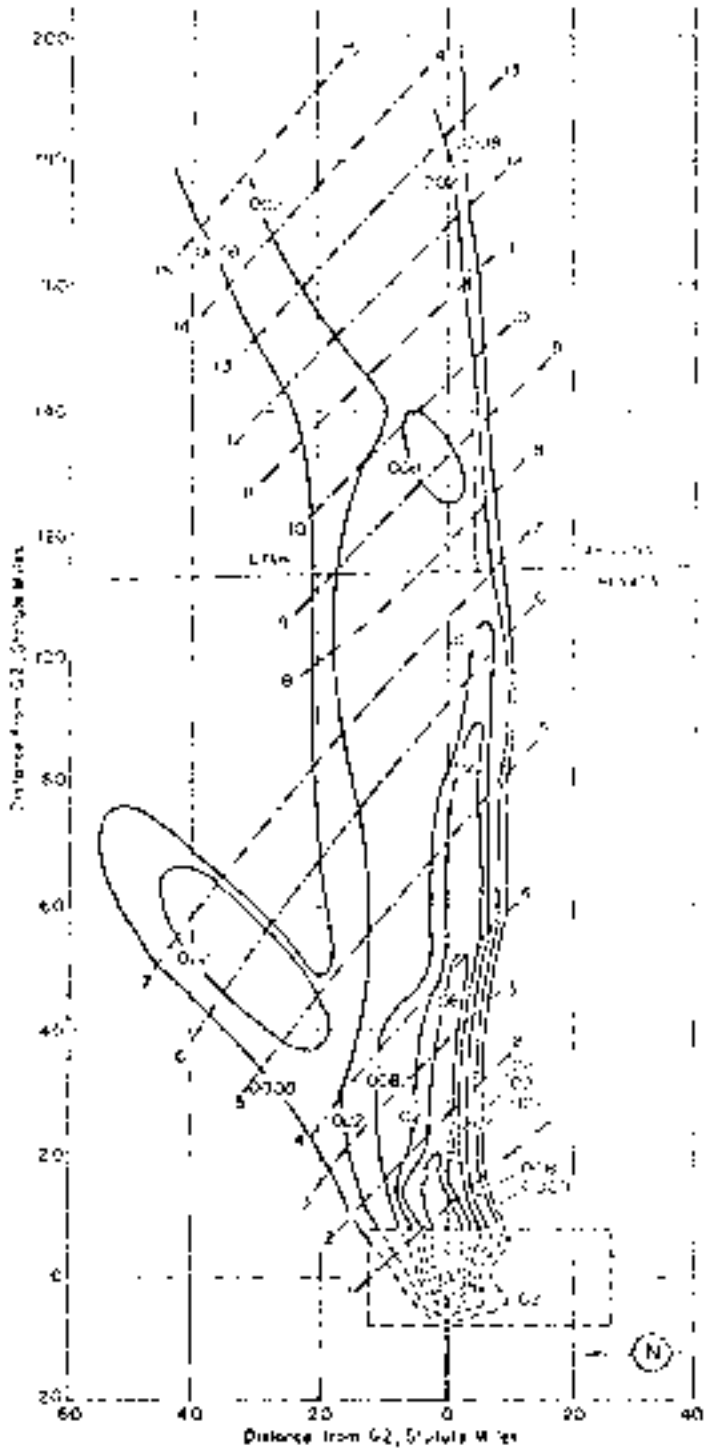


Figure 118. Operation TEAPOT - Tesla.
Off-site dose rate contours in r/hr at H+1 hour.

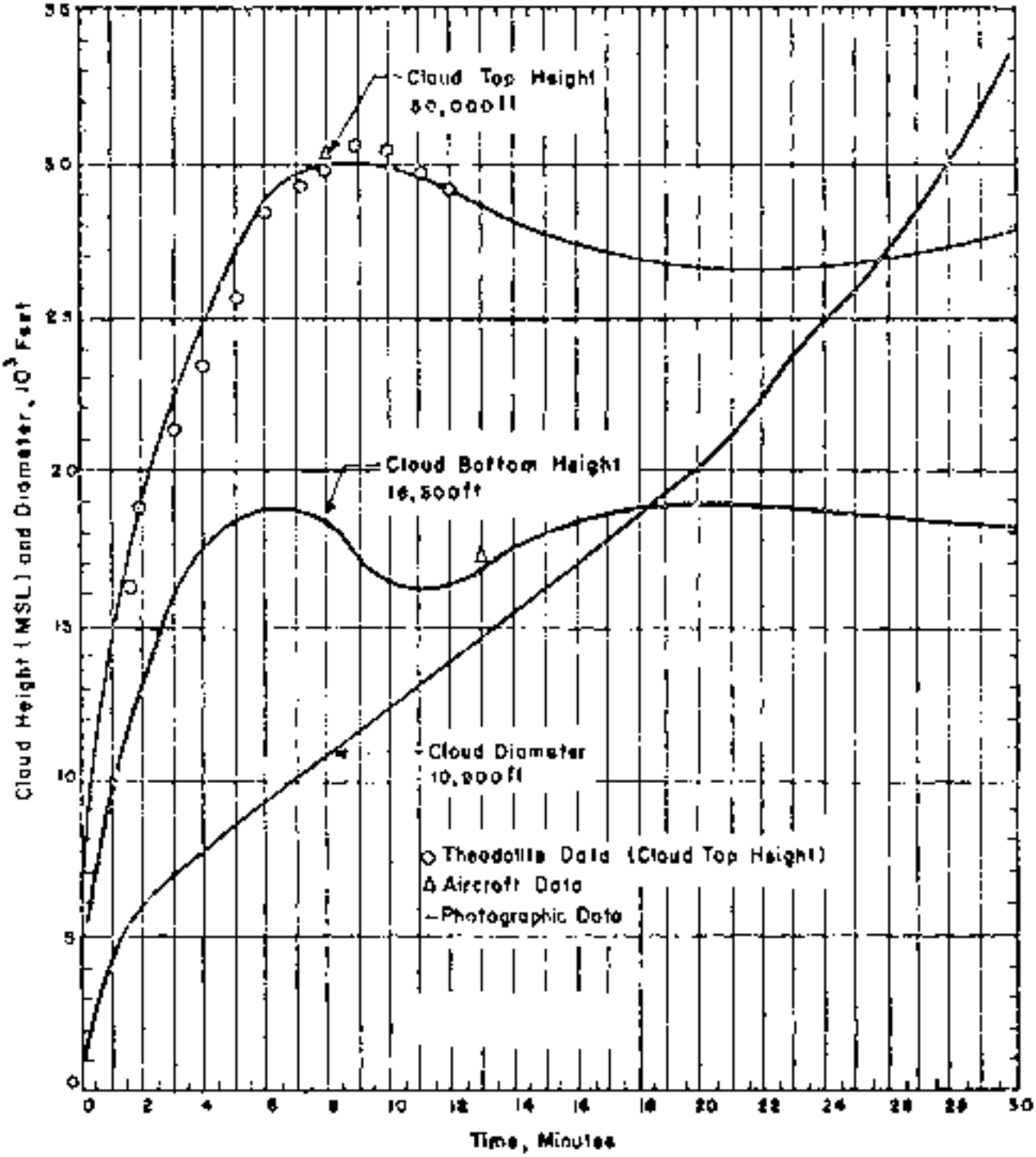


Figure 119. Cloud Dimensions: Operation TEAPOT - Tesla.

TABLE 35 UPPER WIND DATA FOR [illegible] [illegible]

Altitude (MSL)	Wind		Altitude (MSL)	Wind	
	Direction	Speed		Direction	Speed
feet	degrees	mph	feet	degrees	mph
Surface	Calm	Calm	23,000	[illegible]	[illegible]
5,[illegible]	Calm	Calm	24,000	[illegible]	[illegible]
6,000	Calm	Calm	25,000	270	[illegible]
7,000	Calm	Calm	26,000	[illegible]	[illegible]
8,000	[illegible]	1[illegible]	27,000	270	[illegible]
9,000	270	14	28,000	270	[illegible]
10,000	[illegible]	1[illegible]	29,000	[illegible]	[illegible]
11,000	[illegible]	[illegible]	30,000	[illegible]	[illegible]
12,000	[illegible]	[illegible]	31,000	[illegible]	[illegible]
13,000	[illegible]	26	32,000	[illegible]	[illegible]
14,000	[illegible]	16	33,000	[illegible]	[illegible]
15,000	[illegible]	1[illegible]	34,000	[illegible]	[illegible]
16,000	[illegible]	14	35,000	[illegible]	[illegible]
17,000	[illegible]	1[illegible]	36,000	[illegible]	[illegible]
18,000	[illegible]	[illegible]	37,000	[illegible]	40
19,000	[illegible]	[illegible]	38,000	[illegible]	[illegible]
20,000	[illegible]	30	39,000	[illegible]	[illegible]
21,000	[illegible]	33	40,000	[illegible]	[illegible]
22,000	270	30			

NOTES:

1. Tropopause height was [illegible] ft MSL.
2. At cloud height the temperature was [illegible] °C and the pressure was [illegible] mb.

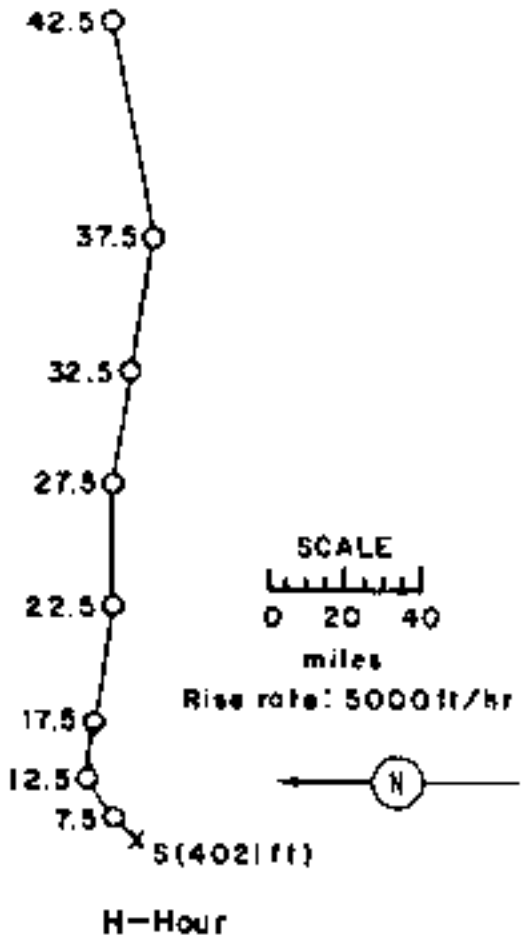


Figure 120. Hodograph for Operation TEAPOT - Tesla.

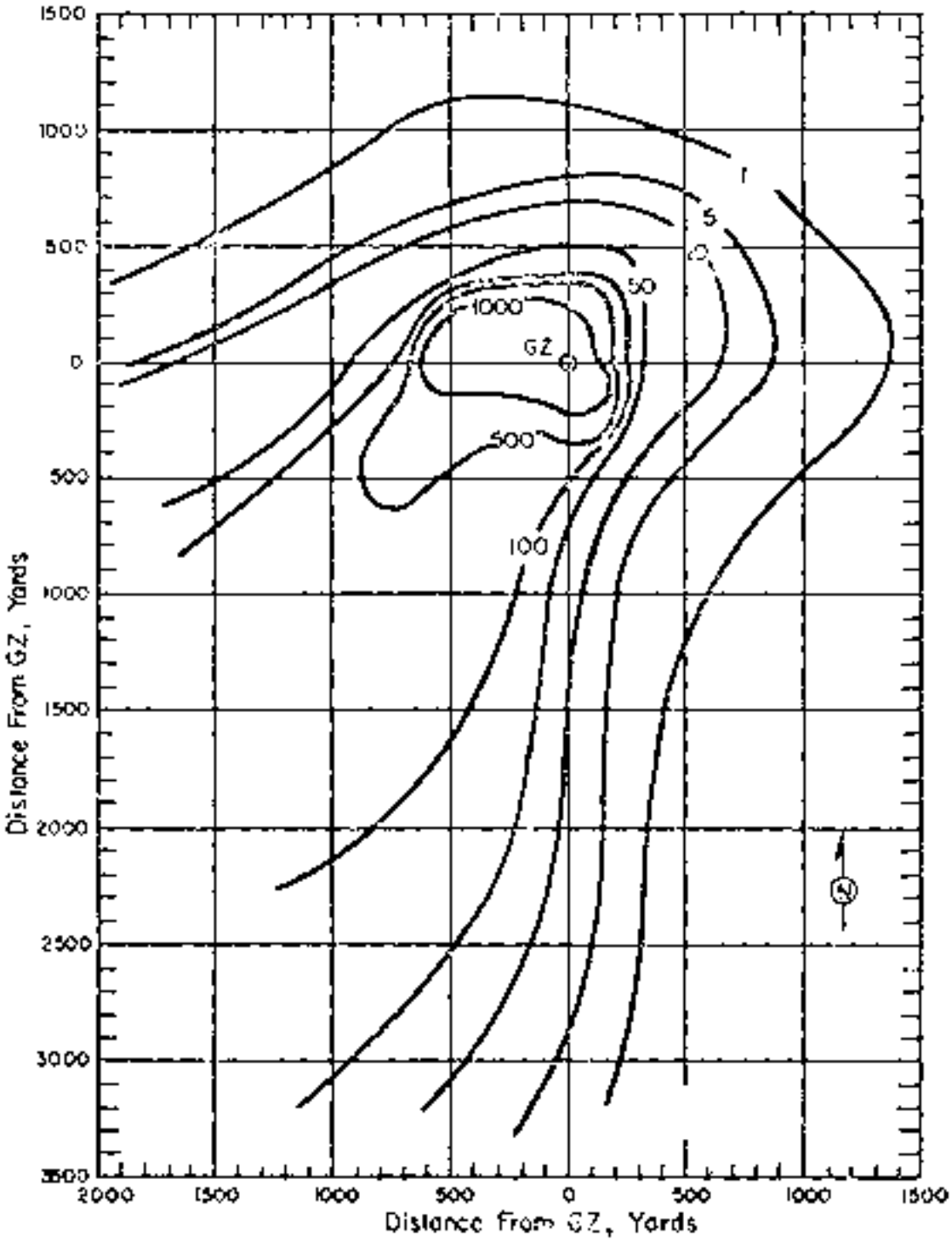


Figure 121. Operation TEAPOT - Turk.
On-site dose rate contours in r/hr at H+1 hour.

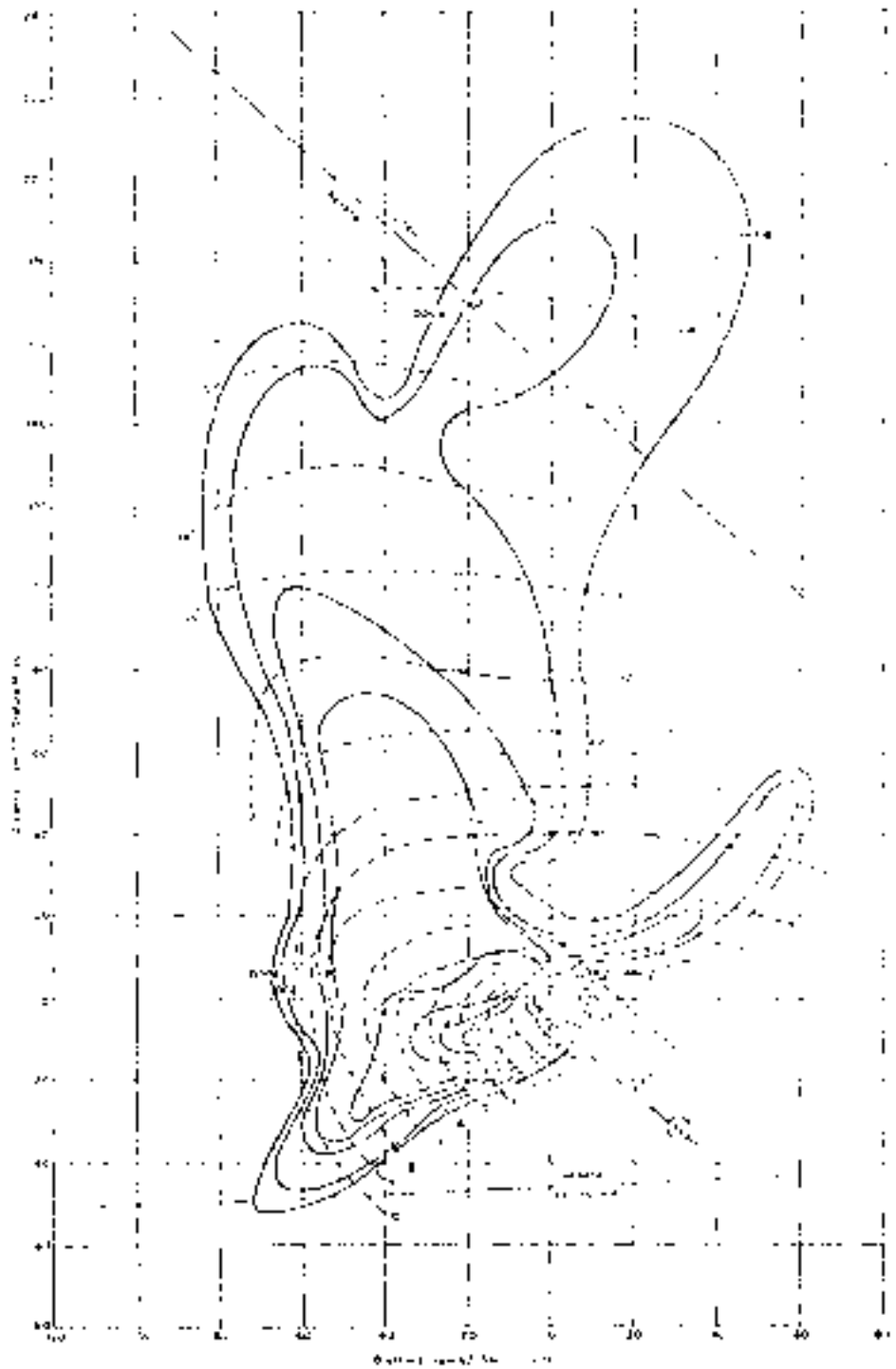


Figure 122. Operation TEAPOT - Park.
Off-site dose rate contours in r/hr at H+1 hour.

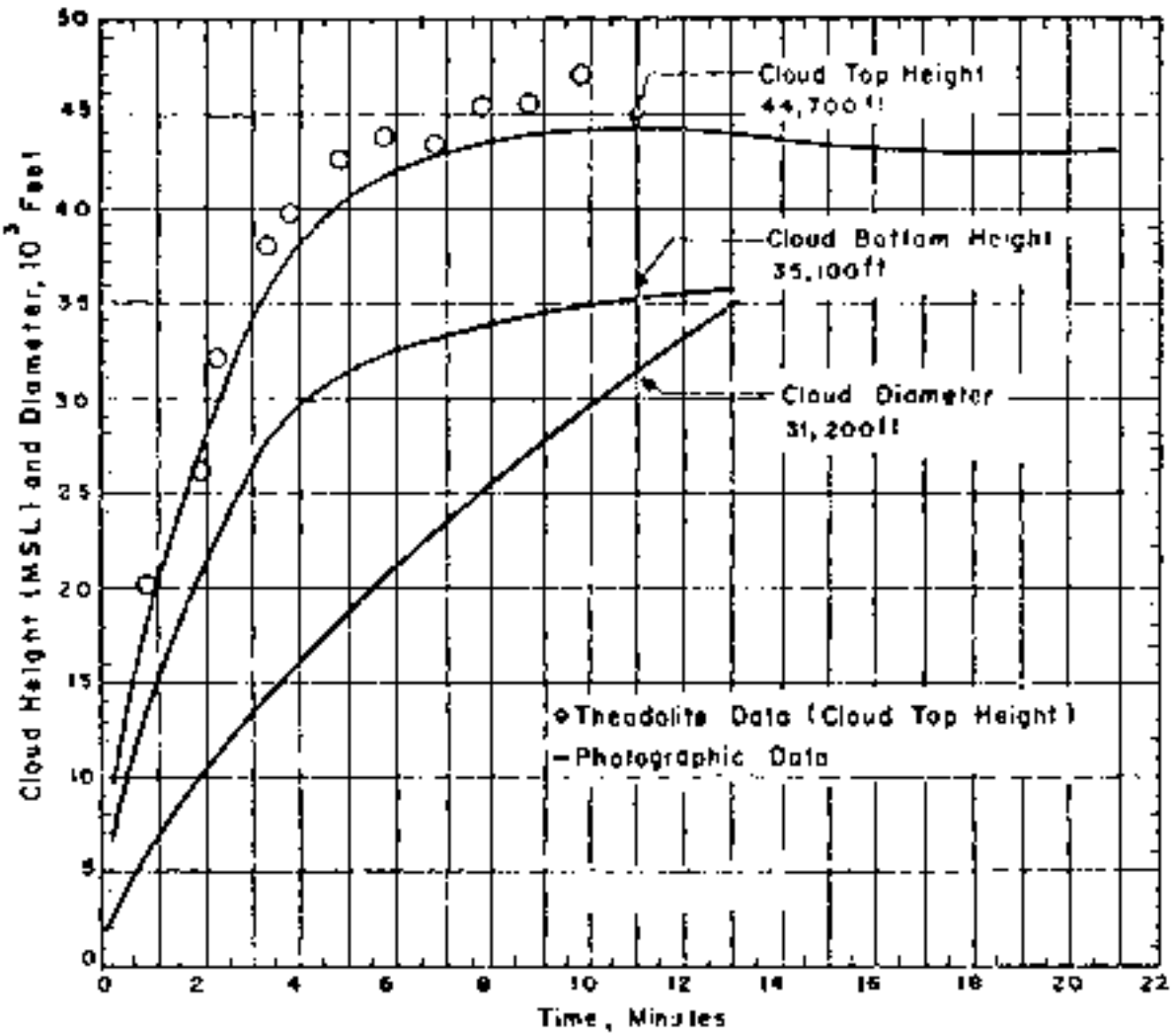


Figure 123. Cloud Dimensions: Operation TEAPOT - Turk.

TABLE 36 HOURLY WIND DATA FOR OPERATION TUMBLER – [illegible]

Altitude (MSL) feet	Heading degrees	Speed mph
Surface	310	17
5,000	010	22
6,000	030	24
7,000	030	23
8,000	050	17
9,000	030	08
10,000	350	02
11,000	310	03
12,000	130	05
13,000	140	06
14,000	130	08
15,000	140	07
16,000	090	06
17,000	070	07
18,000	070	09
19,000	060	12
20,000	060	16
21,000	070	12
22,000	060	10
23,000	070	09
24,000	080	08
25,000	090	07
26,000	100	08

Altitude (MSL)	Heading degrees	Speed mph
27,000	110	10
28,000	100	10
29,000	110	09
30,000	120	08
31,000	150	06
32,000	130	05
33,000	260	07
34,000	260	10
35,000	240	13
36,000	250	17
37,000	280	18
38,000	290	17
39,000	270	19
40,000	260	16
41,000	---	--
42,000	Calm	Calm
43,000	---	--
44,000	270	47
45,000	270	54
46,000	270	56
47,000	270	57
48,000	270	60
49,000	270	63
50,000	270	61

NOTES:

1. Tropopause height was 50,000 ft MSL at 0400Z.
2. At that height the temperature was -2.0°C and the pressure 69 mb.

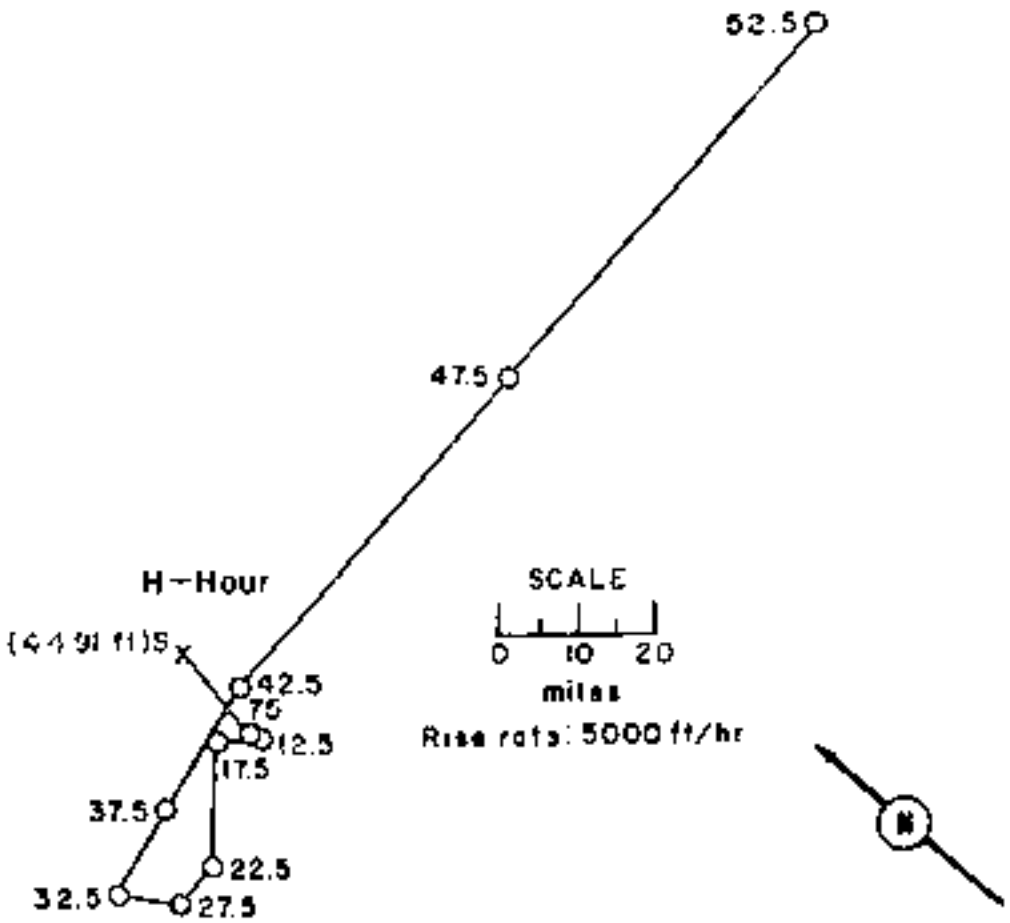


Figure 124. Hodograph for Operation TEAPOT - Turk

OPERATION DIABLO - Prepared

	DOE	DOD
DATE:	[illegible]	[illegible]
TIME:	0700	1500

Operation DIABLO

SITE: NTS - Area 10
37° 03' 22" N
116° 03' 31" W
Site elevation: 4,011 ft

YIELD RANGE: 4 kt

HEIGHT OF BURST: 35' GL

TYPE OF BURST: AIR PENETRATING
Tower burst - not [illegible]

FALLOUT PATTERN:
Time to 1st reading: 5.5 to 6.5 hours
Time to last reading: 60 to 71 hours
Radius of 1st reading: 30

CLOUD TOP HEIGHT: 37,000 ft MSL
CLOUD BOTTOM: [illegible] ft MSL

CENTER LINE: N. [illegible]

ASSUMPTIONS

The operation fallout pattern was constructed from [illegible] from over a 2000-mi ground coverage performed by the Lind-Air organization between H+1 hours to 2193 hours. All field measurements were used. Eight strike lines (approximately radial) using existing roads around ground zero aided the survey teams in locating their positions; many individual readings [illegible] were also utilized in drawing the patterns for this shot.

The off-site fallout pattern was drawn from ground-survey readings taken by the Off-Site Radiological Safety Organization. The t^-1.2 decay approximation was used to extrapolate the ground-survey readings to H+1 hour for both on-site and off-site patterns.

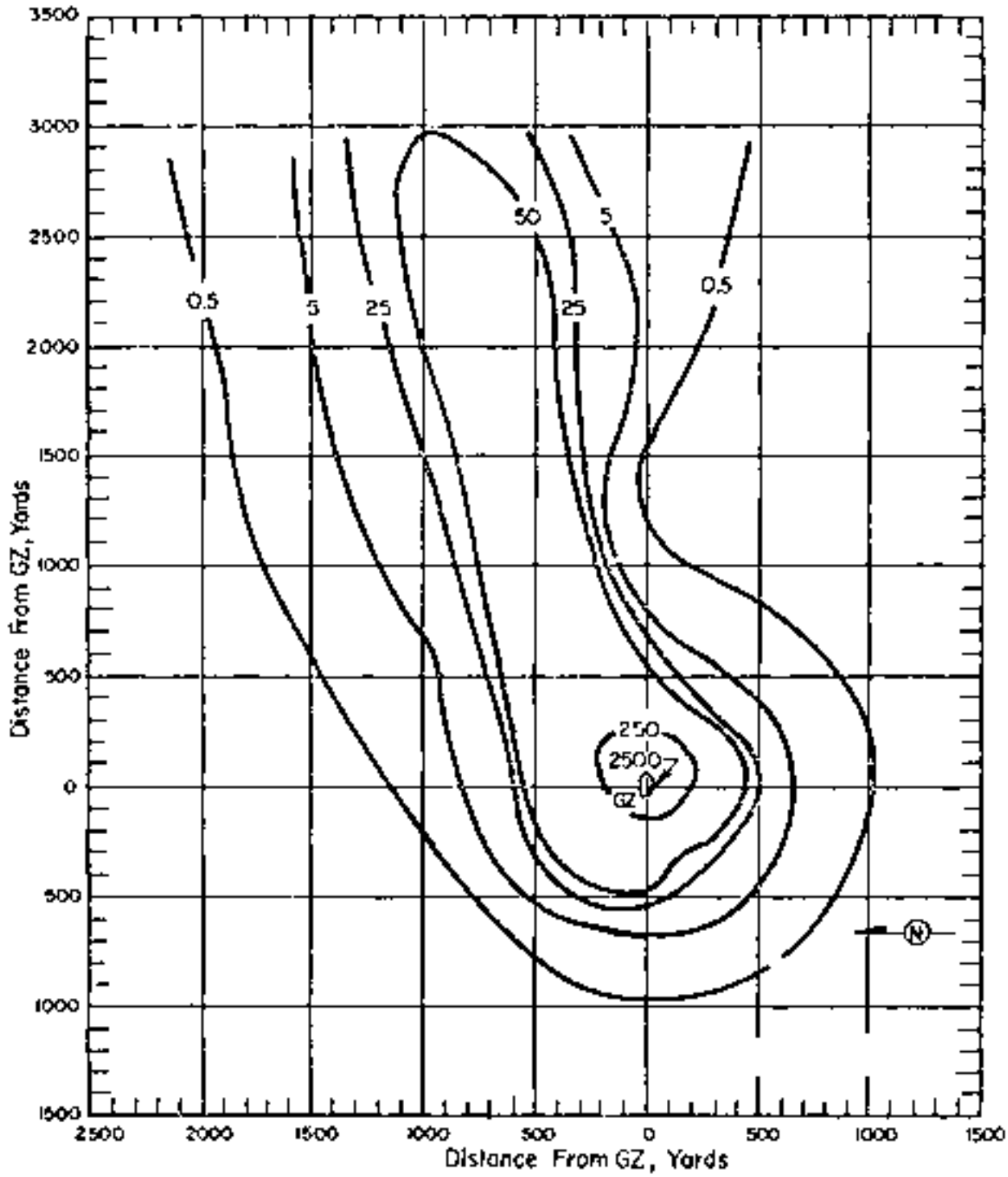


Figure 125. Operation TRIPOT - Hornet. On-site dose rate contours in r/hr at H+2 hour.

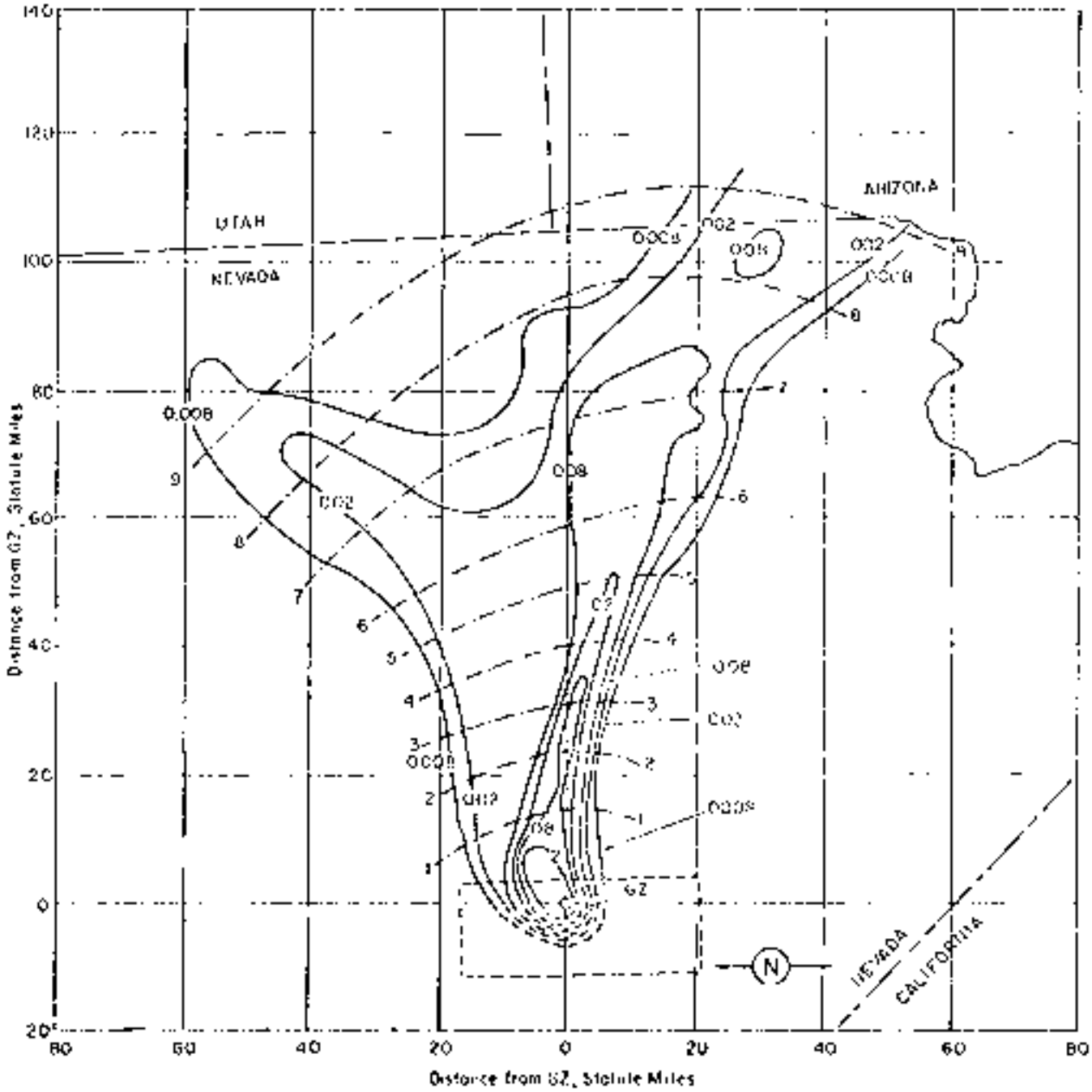


Figure 126. Operation TEAPOT - Bornet. Off-site dose rate contours in r/hr at H+1 hour.

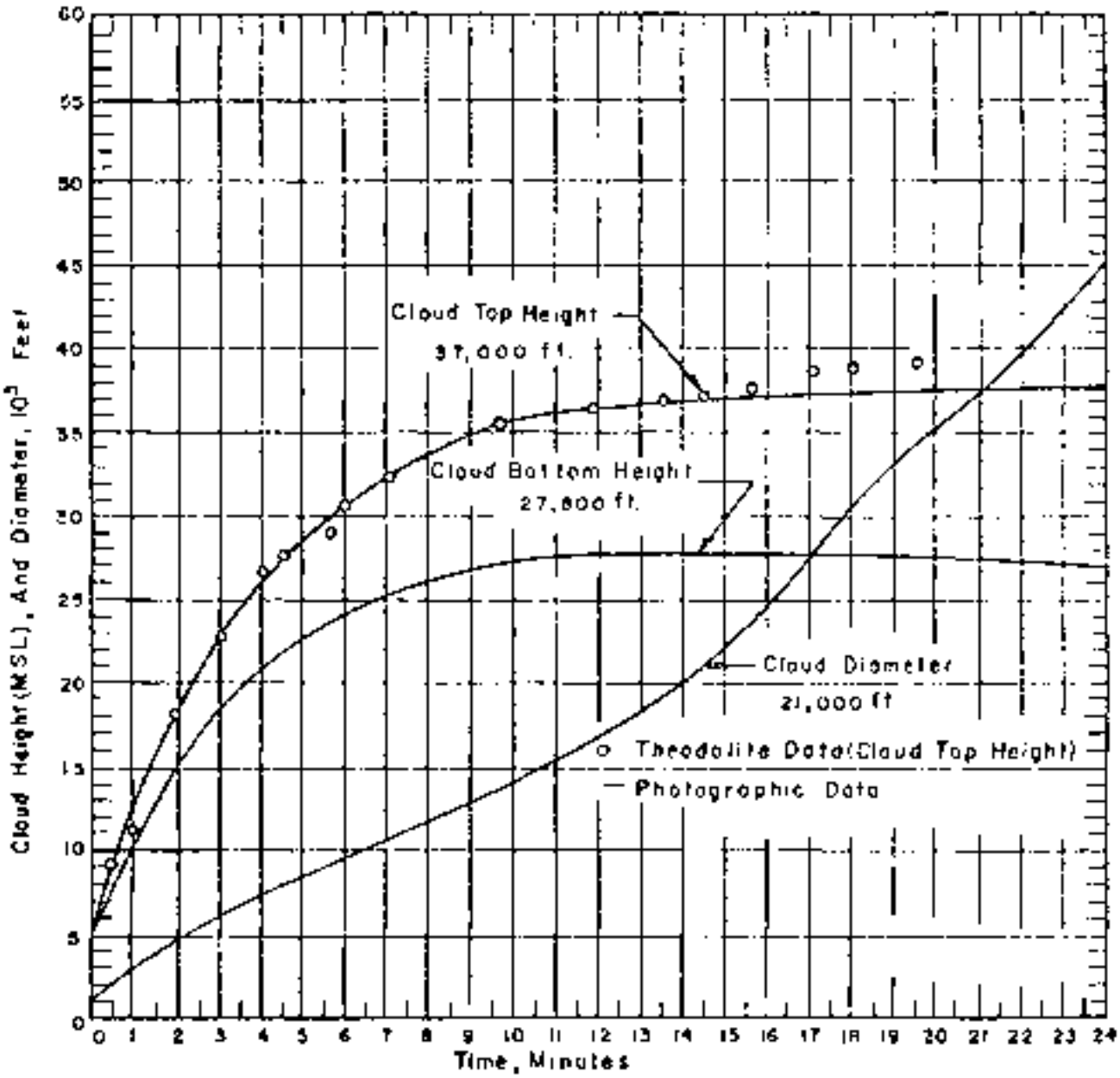


Figure 127. Cloud Dimensions: Operation TUMBLER - Marnet.

TABLE 57. [illegible] WIND DATA [illegible]

Altitude (MSL)	Wind		Altitude (MSL)	Wind	
	Dir	Speed		Dir	Speed
feet	degrees	mph	feet	degrees	mph
Surface	[illegible]	[illegible]	27,000	[illegible]	[illegible]
5,000	[illegible]	[illegible]	28,000	[illegible]	[illegible]
6,000	[illegible]	[illegible]	29,000	[illegible]	[illegible]
7,000	[illegible]	[illegible]	30,000	[illegible]	[illegible]
8,000	[illegible]	[illegible]	31,000	[illegible]	[illegible]
9,000	[illegible]	[illegible]	32,000	[illegible]	[illegible]
10,000	[illegible]	[illegible]	33,000	[illegible]	[illegible]
11,000	[illegible]	[illegible]	34,000	[illegible]	[illegible]
12,000	[illegible]	[illegible]	35,000	[illegible]	[illegible]
13,000	[illegible]	[illegible]	36,000	[illegible]	[illegible]
14,000	[illegible]	[illegible]	37,000	[illegible]	[illegible]
15,000	[illegible]	[illegible]	38,000	[illegible]	[illegible]
16,000	[illegible]	[illegible]	39,000	[illegible]	[illegible]
17,000	[illegible]	[illegible]	40,000	[illegible]	[illegible]
18,000	[illegible]	[illegible]	41,000	[illegible]	[illegible]
19,000	[illegible]	[illegible]	42,000	[illegible]	[illegible]
20,000	[illegible]	[illegible]	43,000	[illegible]	[illegible]
21,000	[illegible]	[illegible]	44,000	[illegible]	[illegible]
22,000	[illegible]	[illegible]	45,000	[illegible]	[illegible]
23,000	[illegible]	[illegible]	46,000	[illegible]	[illegible]
24,000	[illegible]	[illegible]	47,000	[illegible]	[illegible]
25,000	[illegible]	[illegible]	48,000	[illegible]	[illegible]
26,000	[illegible]	[illegible]	49,000	[illegible]	[illegible]
			50,000	[illegible]	[illegible]

NOTES:

1. Tropopause at [illegible] and [illegible] ft MSL.
2. At [illegible] the temperature was [illegible] and [illegible].

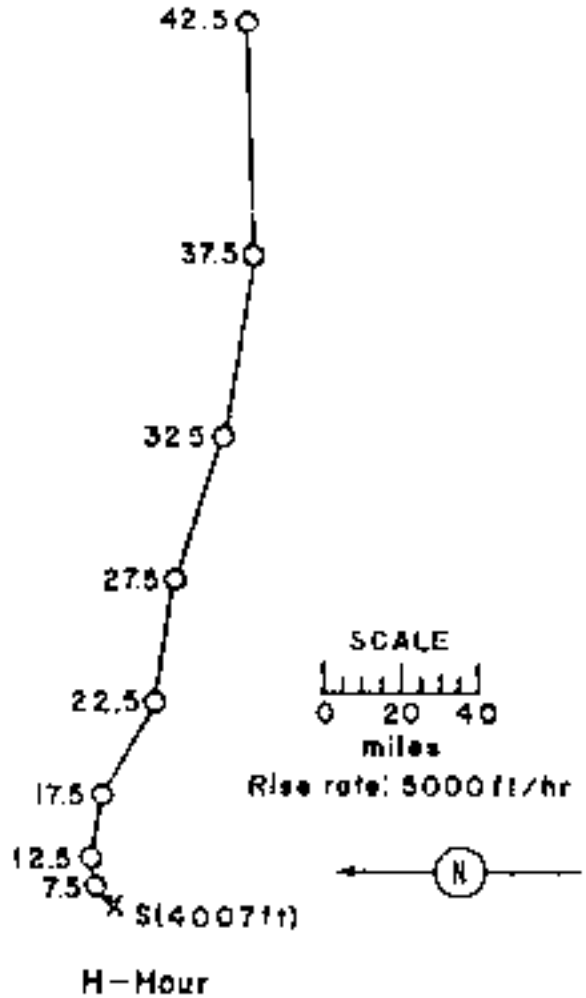


Figure 128. Hodograph for Operation TIMBER-Bonnet.

OPERATION UNKNOWN - Zebra

	PST	GMT
DATE:	19 Mar 1955	20 Mar 1955
TIME:	0600	1300

Sponsor: LASL

SITE: NTS - Area 7-11
37° 03' 01" N
116° 02' 26" W
Site elevation: 4,700 ft

TOTAL YIELD: 8 kt

WEIGHT OF TOWER: 300 ft

TYPE OF FUSE AND FIRING SYSTEM:
Tower burst, surface detonation

FIREBALL DATA:
Time to 1st maximum: 7.0 to 9 msec
Time to 2nd maximum: 101 msec
Radius at 2nd maximum: 410 ft

SECOND TIME INTERVAL: 2,700 ft (est.)
SECOND EXPOSURE RATE: 2,500 r/hr at H+1

CRATER DATA: No crater

REMARKS:

The on-site pattern was reconstructed from data recorded over five different ground surveys performed by the Radiological Safety organization from H+1 hour to D+6 days. AN/PDR-39 instruments were used. Seven stake lines (approximately radial) about restricted roads around ground zero aided the survey teams in locating their positions. The off-site fallout pattern was drawn from ground-survey readings taken by the off-site Radiological Safety organization. The $t^{-1.2}$ decay approximation was used to extrapolate the 24-hr-rate readings to H+1 hour for both on-site and off-site patterns.

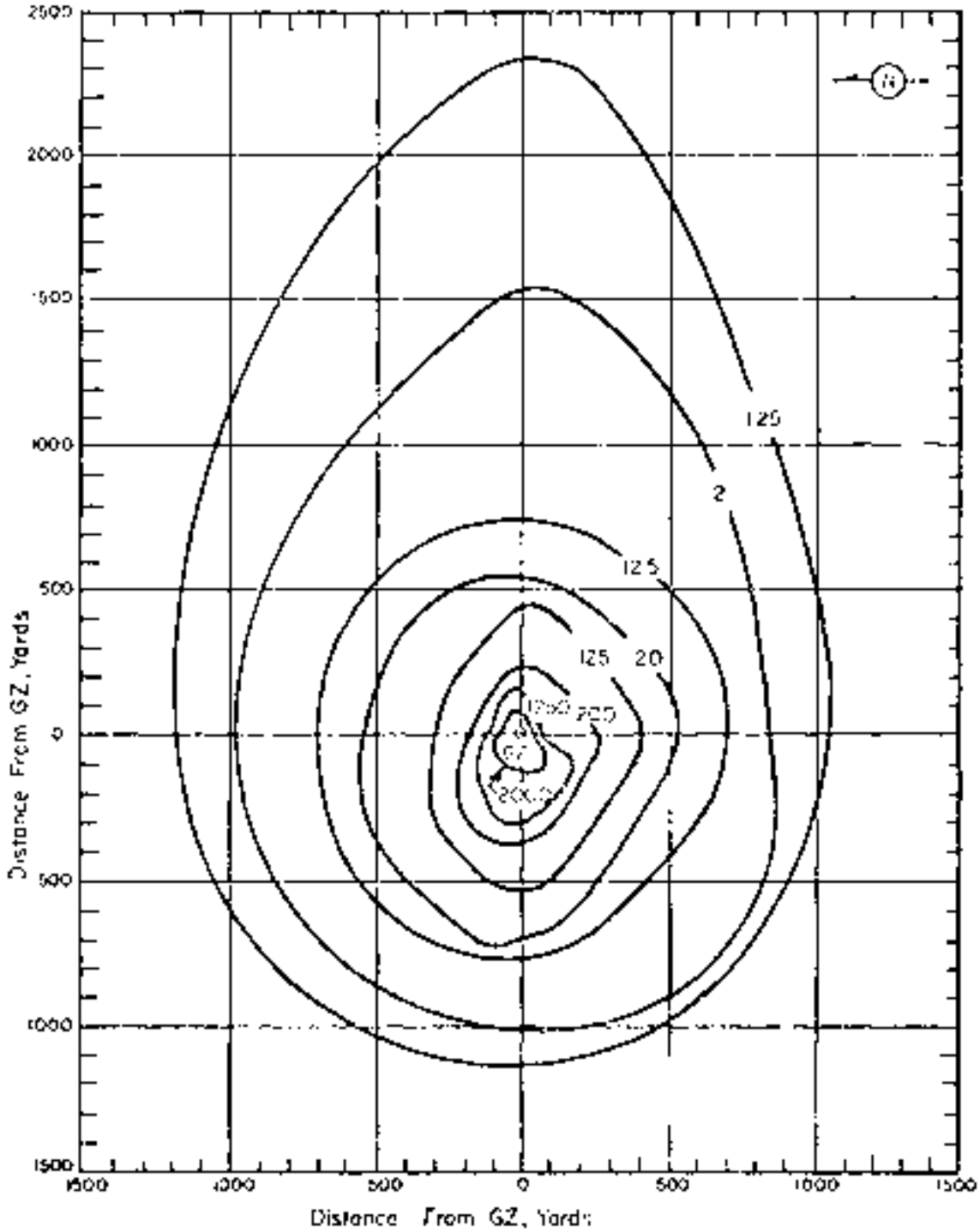


Figure 129. Operation TEAPOT - Poe. On-site dose rate contours in r/hr at 1+1 hour.

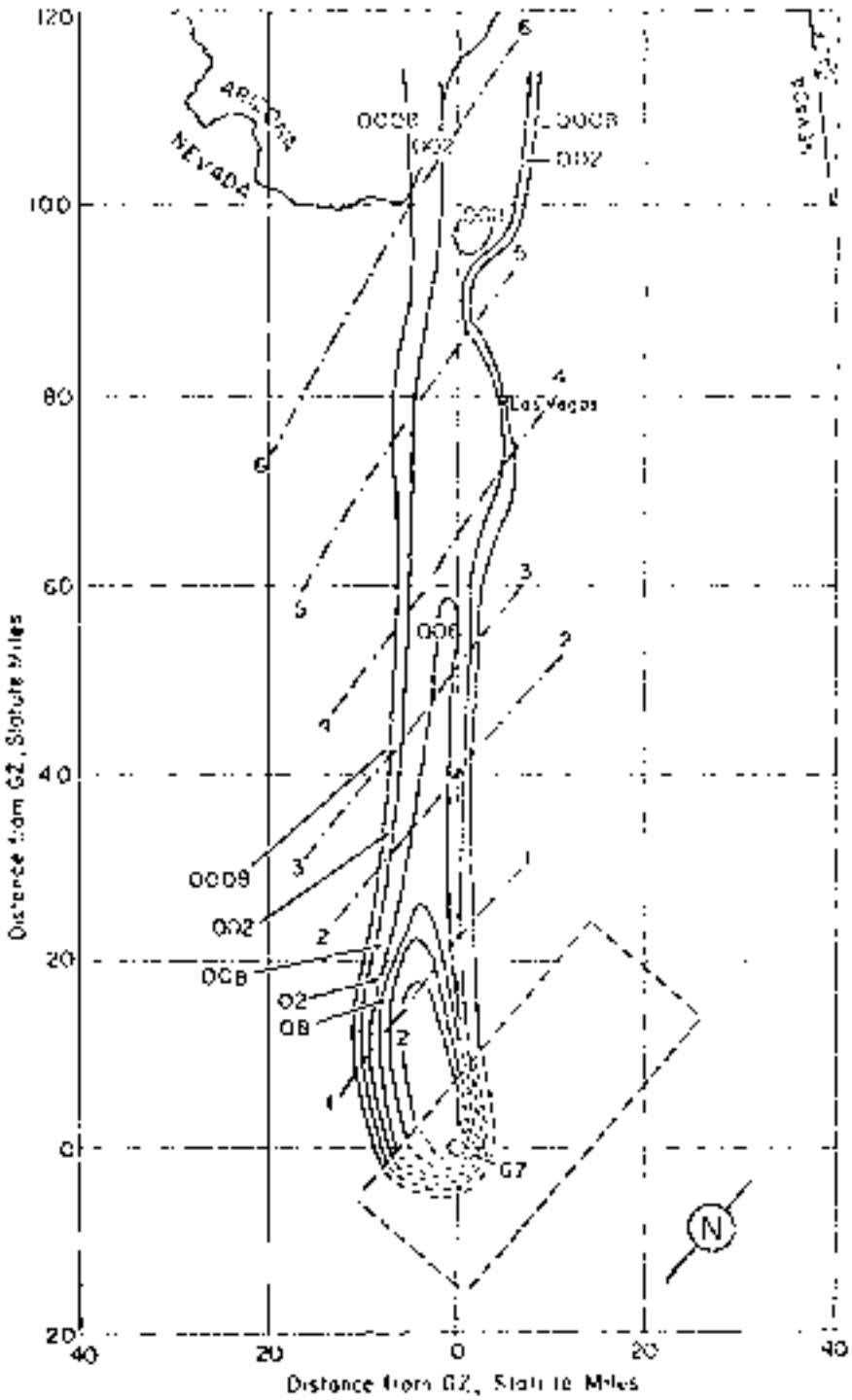


Figure 130. Operation TEAPOT - Rep. Off-site dose rate contours in r/hr at H+1 hour.

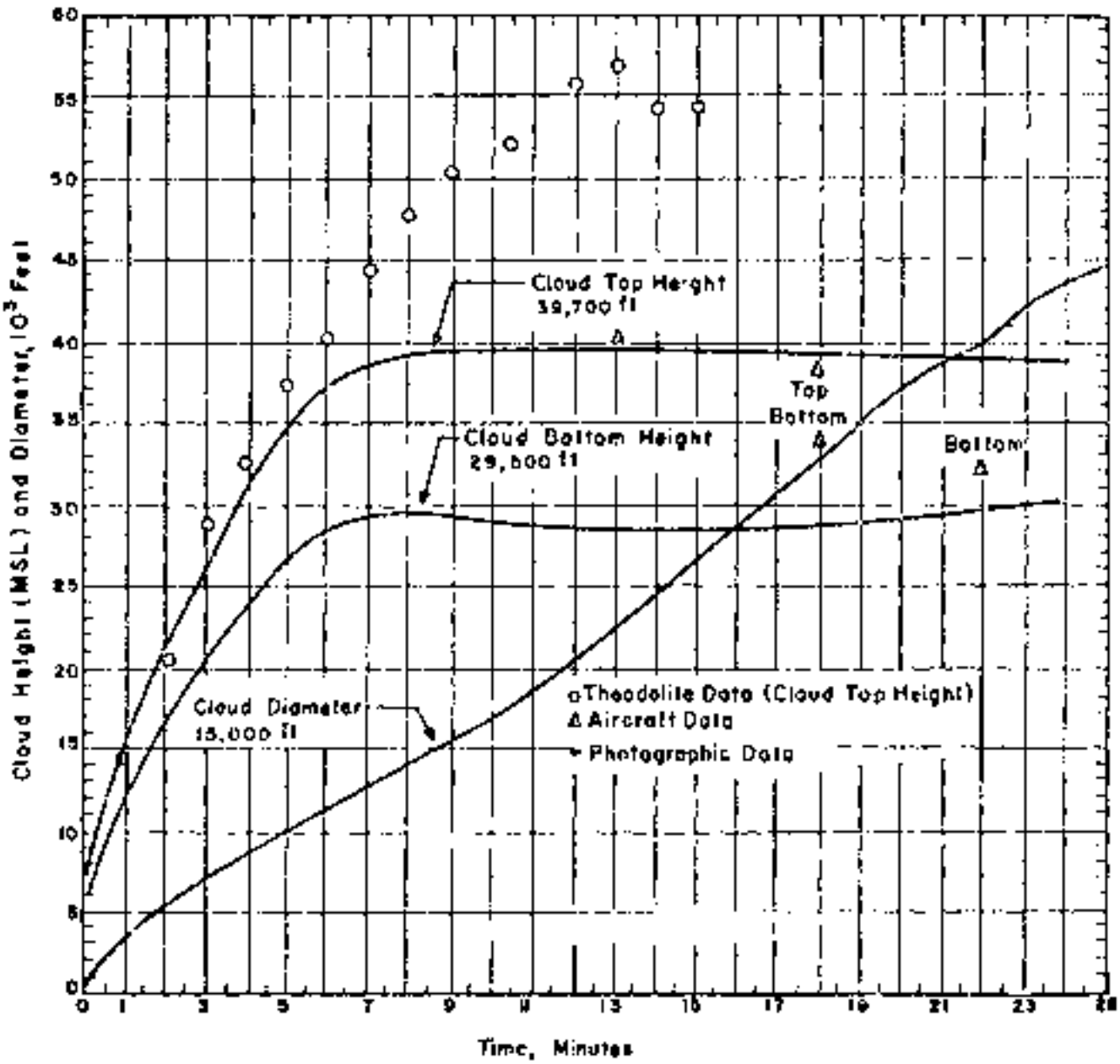


Figure 131. Cloud Dimensions: Operation TEJPOT - Bee.

TABLE 38 NEVADA WIND DATA FOR ORIENTATION TEST- [illegible]

Altitude (MSL.)	Heading		Altitude (MSL.)	Heading	
	Dir.	Speed		Dir.	Speed
Feet	degrees	mph	Feet	degrees	mph
Surface	Calm	Calm	27,000	320	48
5,000	260	02	28,000	320	48
6,000	260	07	29,000	320	45
7,000	260	09	30,000	320	46
8,000	260	09	31,000	320	48
9,000	260	15	32,000	320	47
10,000	300	21	33,000	320	47
11,000	310	27	34,000	320	47
12,000	320	29	35,000	320	51
13,000	320	31	36,000	320	48
14,000	330	33	37,000	320	49
15,000	330	36	38,000	320	49
16,000	320	38	39,000	320	48
17,000	320	39	40,000	320	48
18,000	320	41	41,000	320	49
19,000	320	42	42,000	320	48
20,000	320	43	43,000	320	47
21,000	320	45	44,000	320	46
22,000	320	45	45,000	320	45
23,000	320	45	46,000	320	45
24,000	320	45	47,000	320	46
25,000	320	45	48,000	320	45
26,000	320	47			

NOTES:

1. Tropopause height was 36,500 ft MSL at Hawthorne.
2. At that height the temperature was -63°C and the pressure 160 mb.

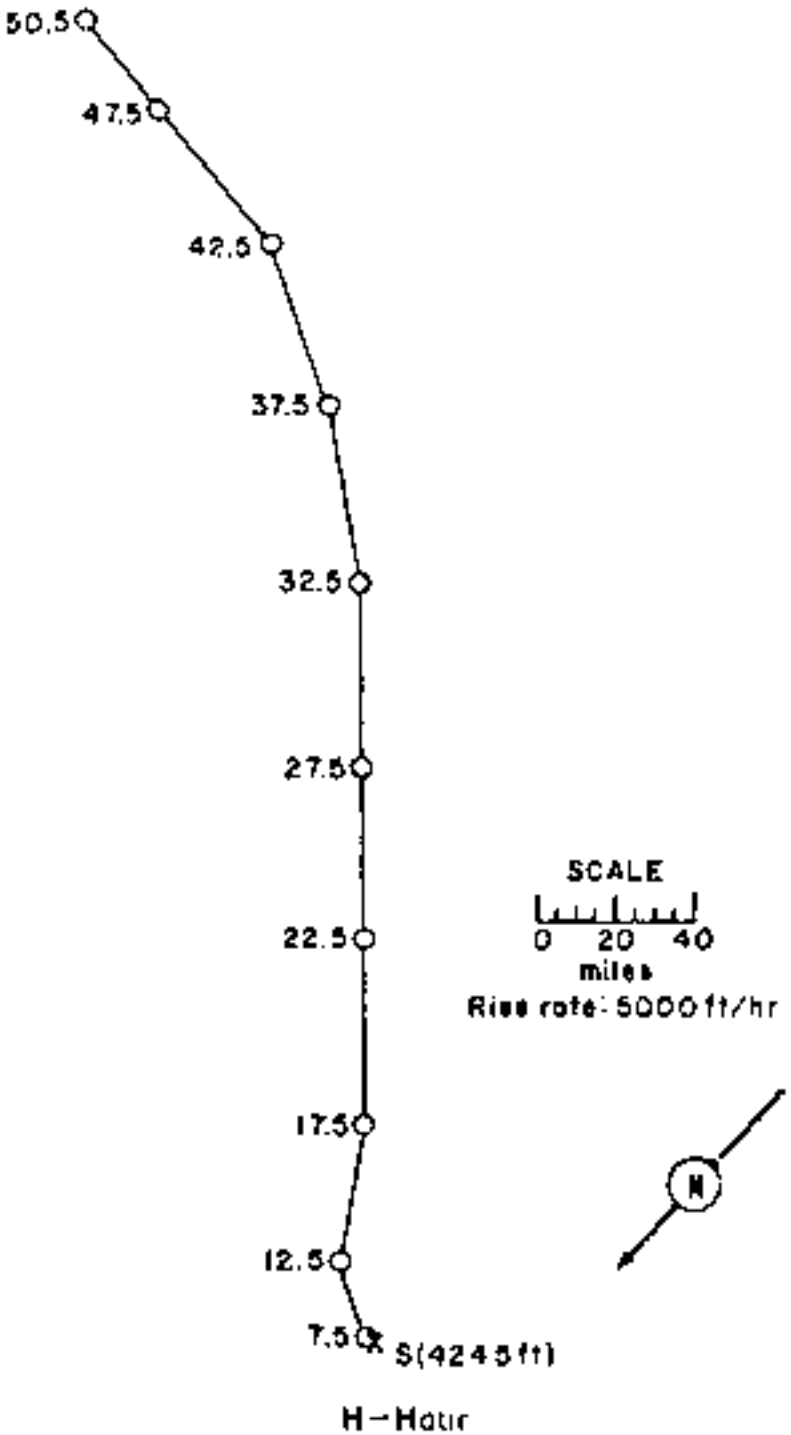
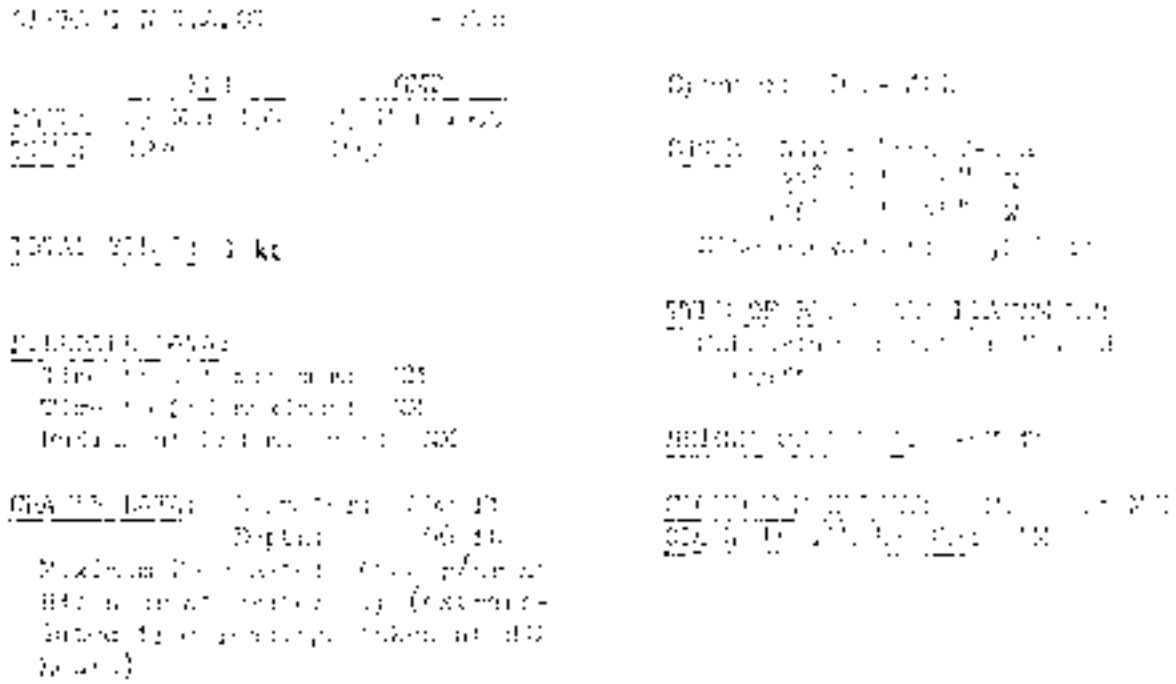


Figure 132. Hodograph for Operation TEAPOT - Rec.



Results

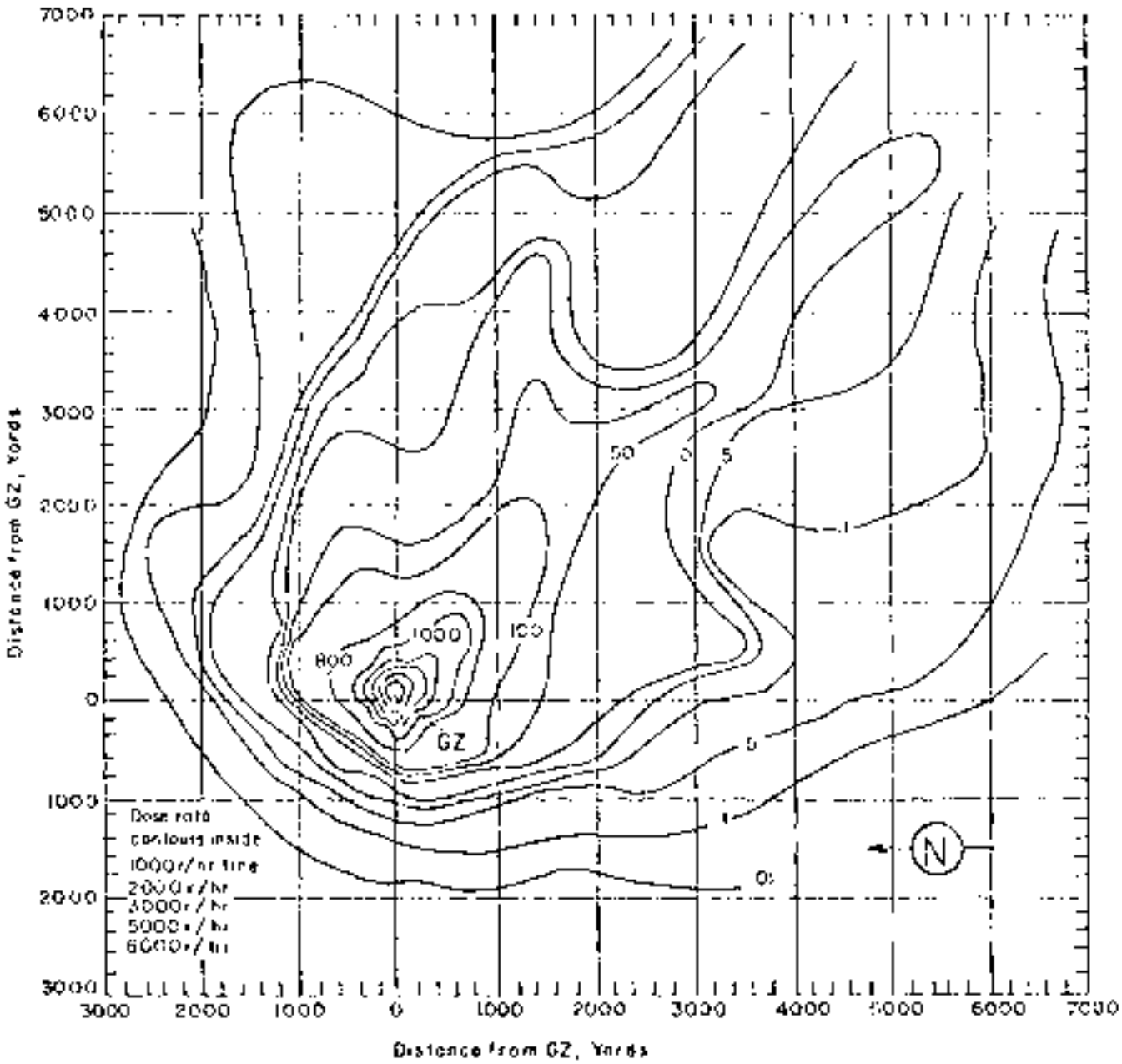


Figure 133 - Operation TEAPOT - Ess.
Close-in dose rate contours in r/hr at H+1 hour.

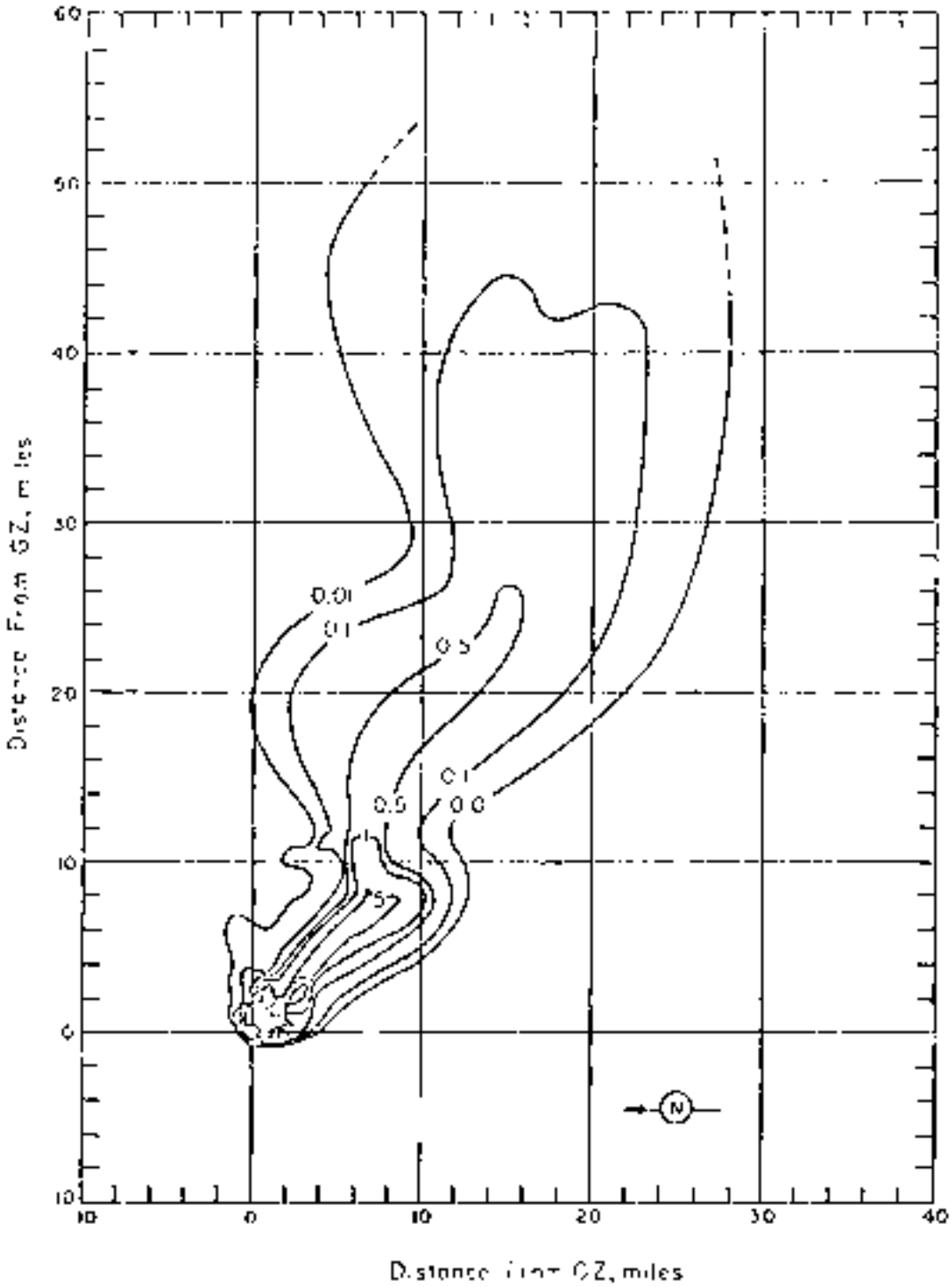


Figure 134. Operation [illegible] Shot
On-site dose rate contours in r/hr at H+1 hour.

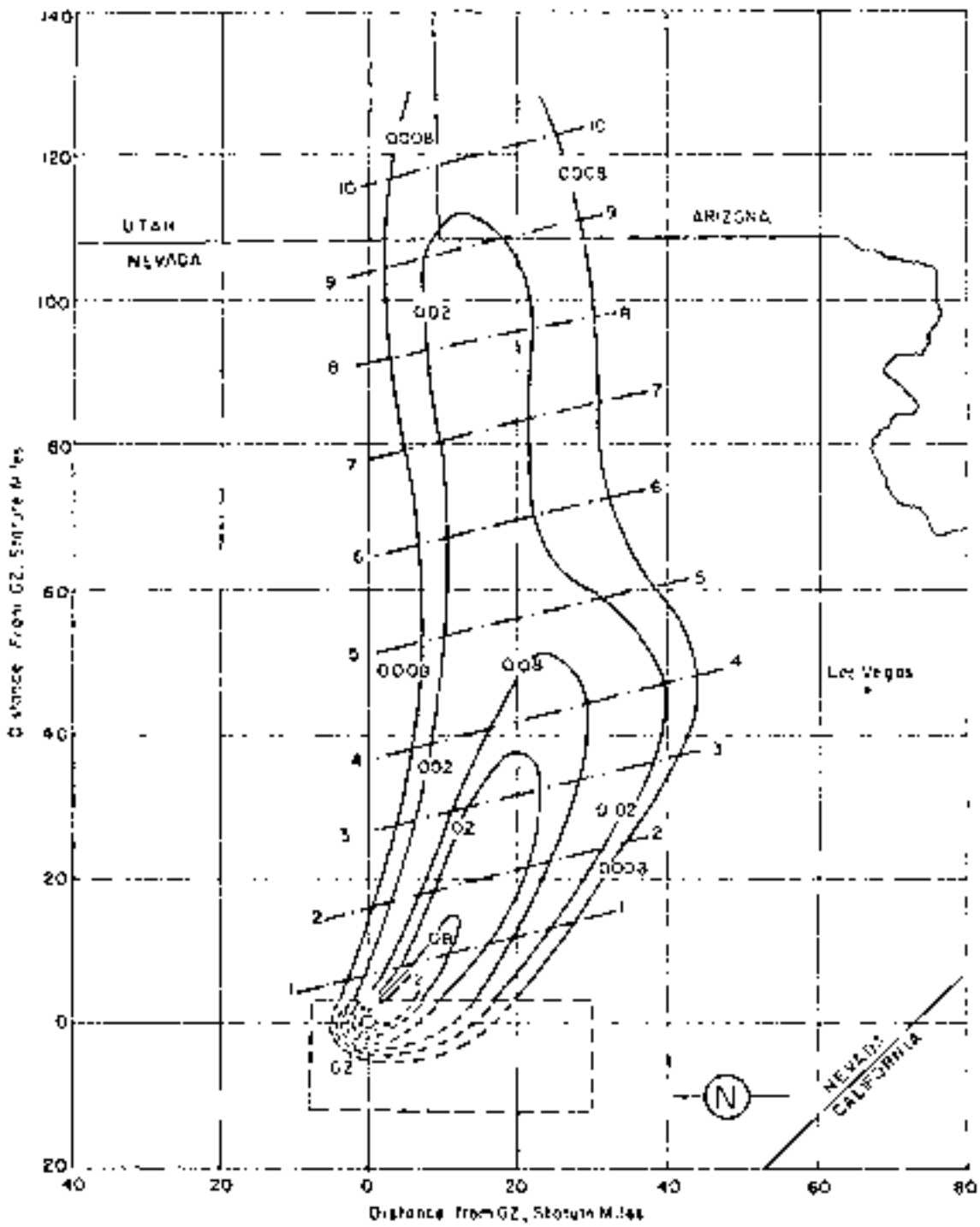


Figure 135. Operation CHARLOT - Shot.
Off-site dose rate contours in r/hr at H+1 hour.

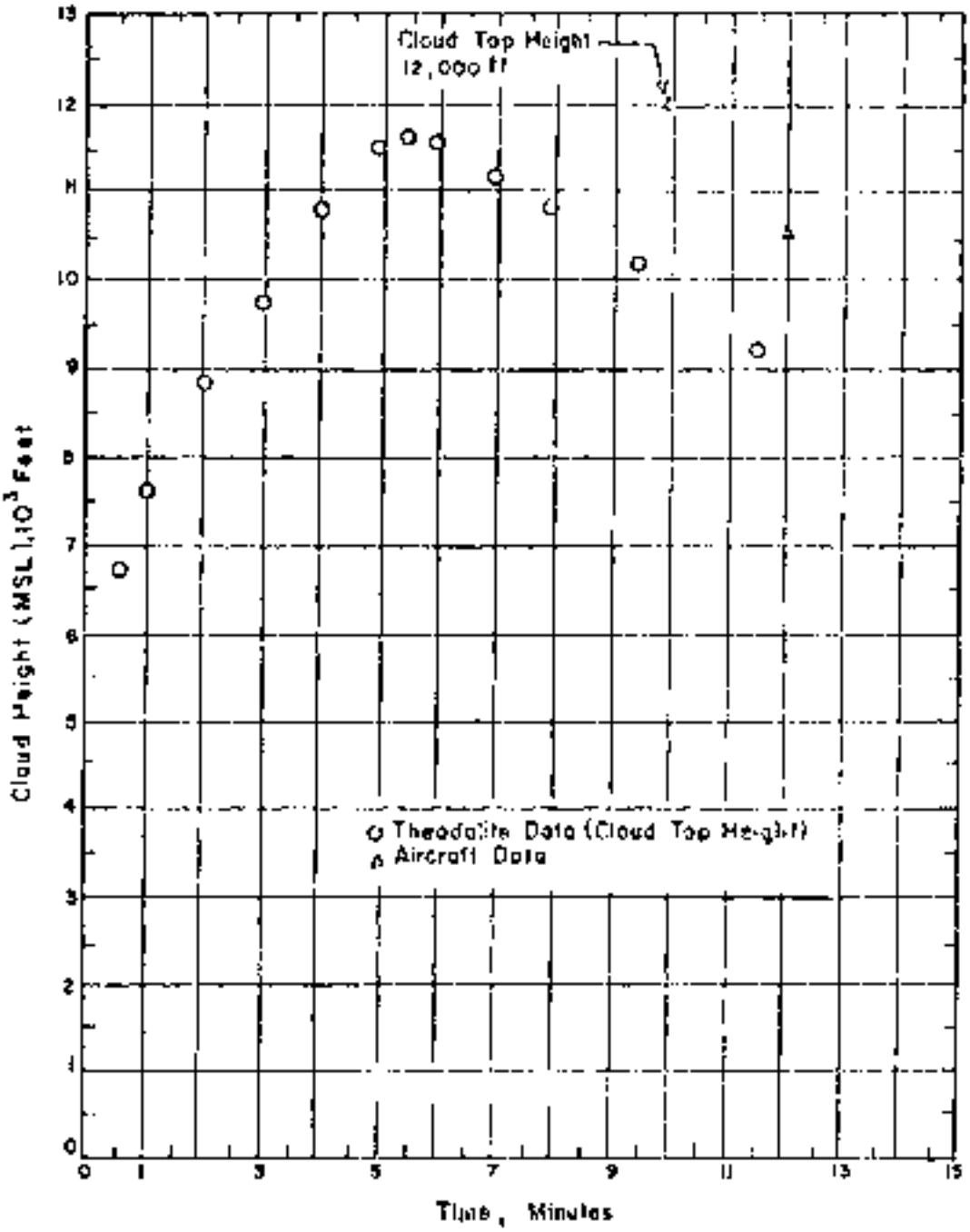


Figure 136. Cloud Dimensions: Operation TEAPOT - Ess.

TABLE 39 [illegible]

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Surface	410	10
5,000	420	10
10,000	430	11
15,000	440	11
20,000	450	12
25,000	460	12
30,000	470	13
35,000	480	13
40,000	490	14
45,000	500	14
50,000	510	15
55,000	520	15
60,000	530	16
65,000	540	16
70,000	550	17
75,000	560	17
80,000	570	18
85,000	580	18
90,000	590	19
95,000	600	19
100,000	610	20
105,000	620	20

NOTES:

1. Tropopause height was 39,000 ft MSL.
2. At the surface the temperature was 18°C and the pressure 985 mb.

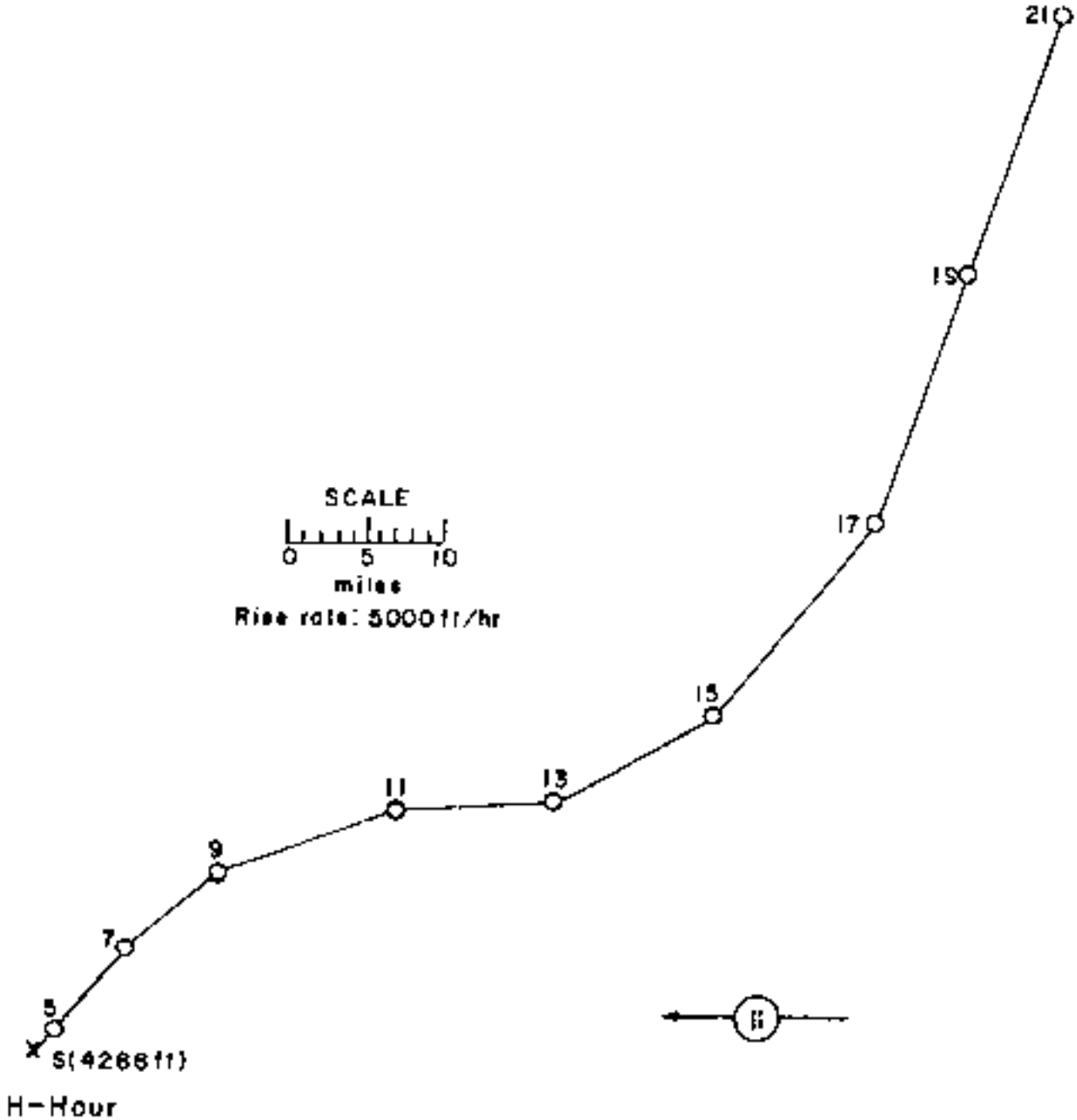
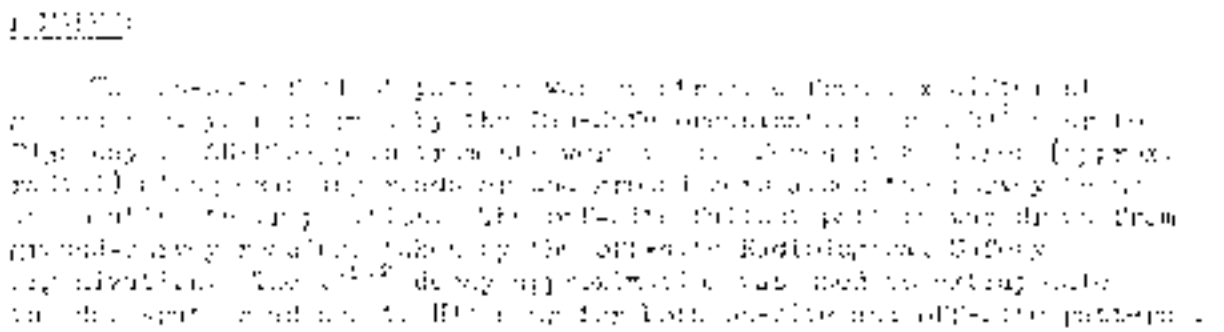


Figure 137. Hodograph for Operation TRIPOD - Yrs.



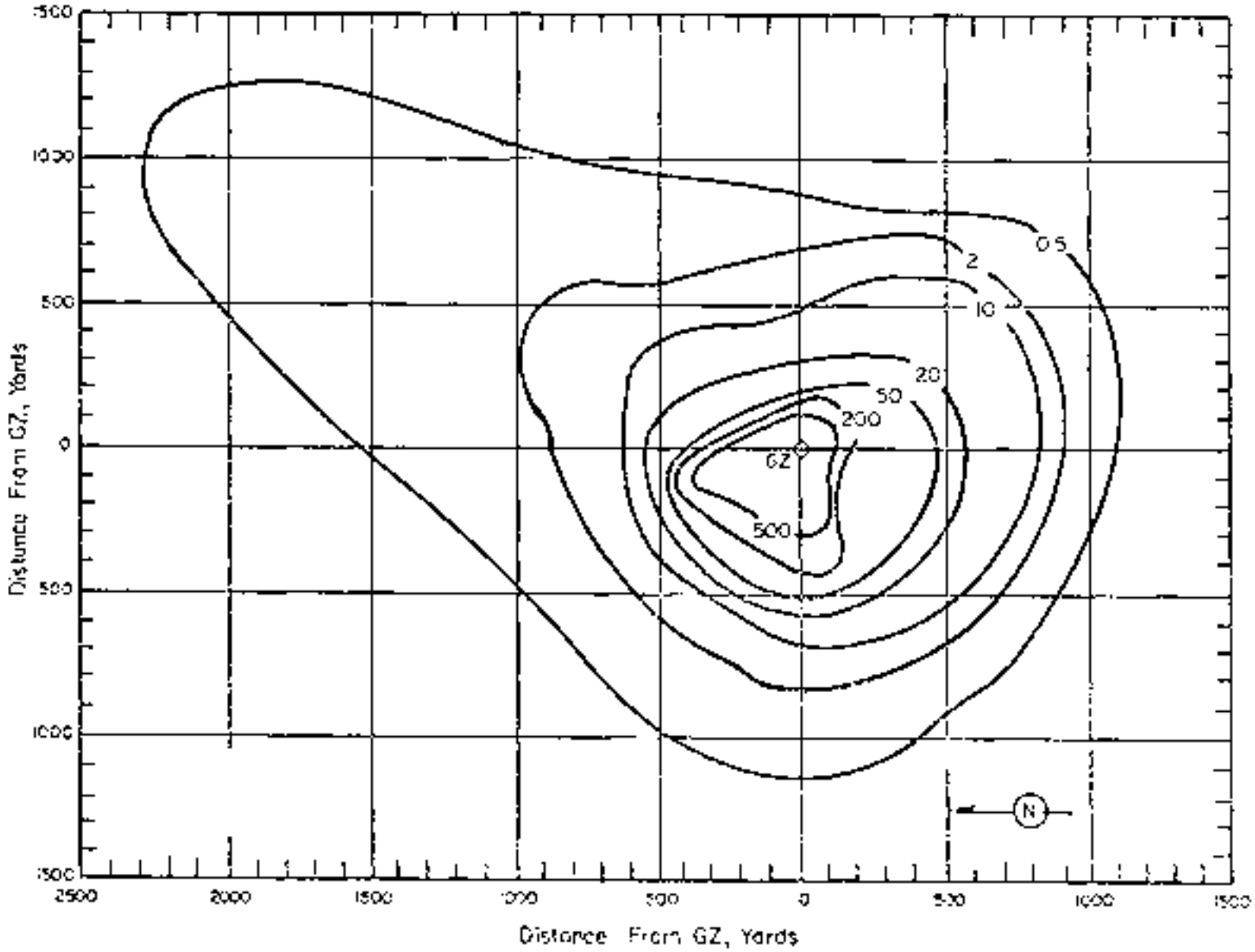


Figure 138. Operation [illegible] - Apple I. Gamma dose rate contours in r/hr at H+1 hour.

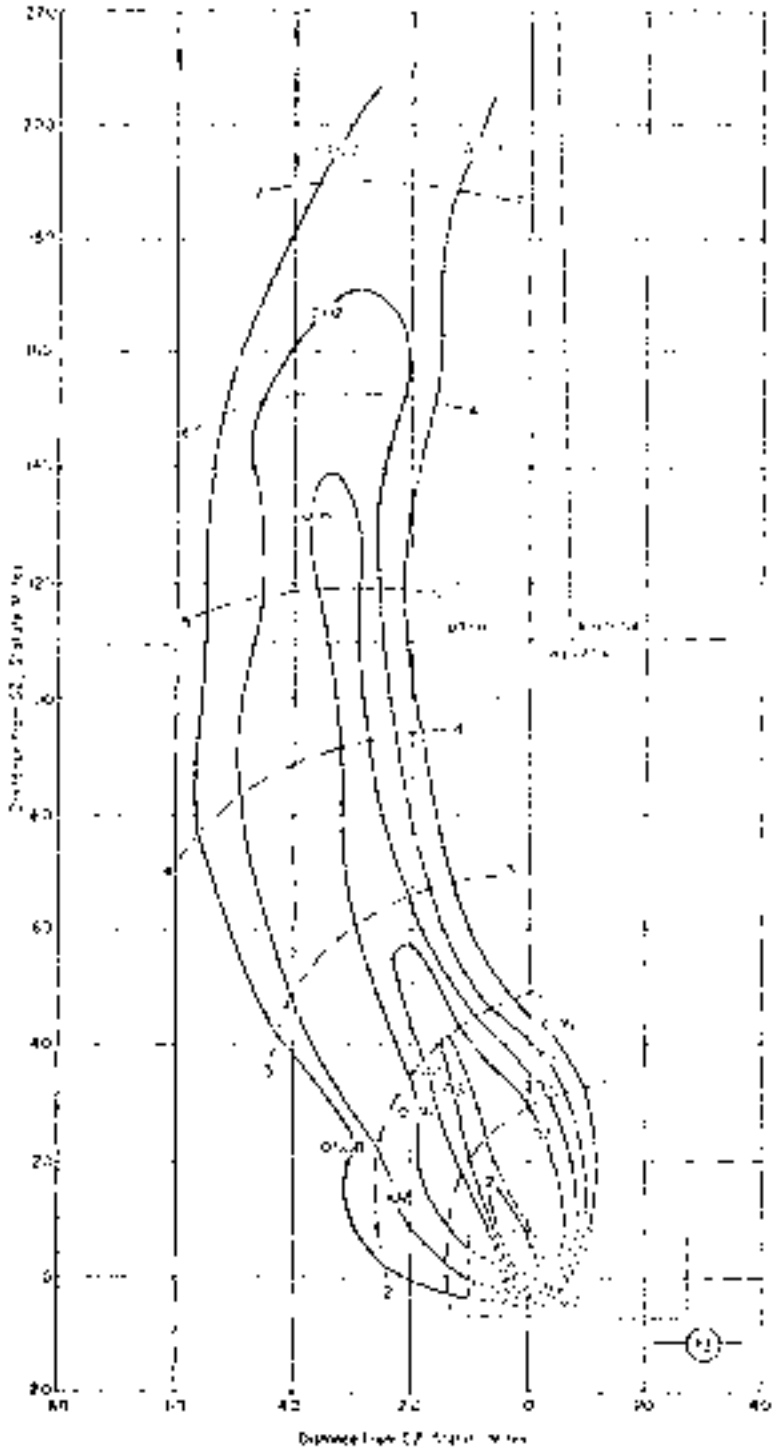


Figure 139. Operation TAPOT - Apple I. Off-site dose rate contours in r/hr at H+1 hour.

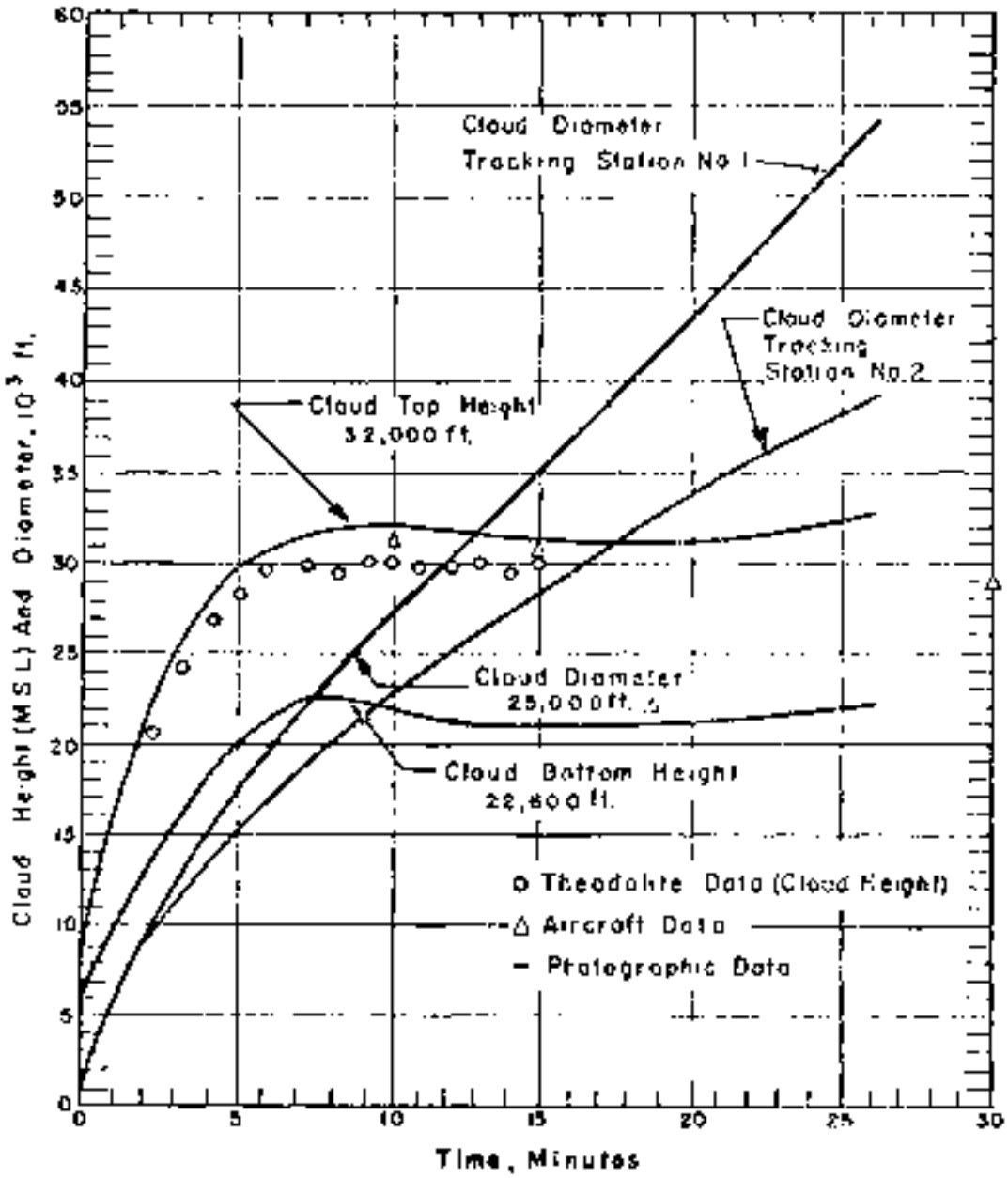


Figure 140. Cloud Dimensions: Operation [illegible] Apple I. (Tracking Station No. 1 located 18 miles SE of C. P. and Tracking Station No. 2 50 miles SW of C. P.)

TABLE 40 [illegible]

Altitude (feet)	Wind		Wind		Altitude (feet)	Wind		Wind	
	Direction (degrees)	Speed (kts)	Direction (degrees)	Speed (kts)		Direction (degrees)	Speed (kts)	Direction (degrees)	Speed (kts)
Surface	260	03	200	19	27,000	260	47	---	--
5,000	200	10	190	19	28,000	260	52	---	--
6,000	190	14	---	--	29,000	270	53	---	--
7,000	190	18	---	--	30,000	270	53	250	73
8,000	190	23	---	--	31,000	270	53	---	--
9,000	190	25	---	--	32,000	270	54	---	--
10,000	190	22	230	29	33,000	270	54	---	--
11,000	200	17	---	--	34,000	270	55	---	--
12,000	240	17	---	--	35,000	270	55	250	68
13,000	260	21	---	--	36,000	270	55	---	--
14,000	260	26	---	--	37,000	270	56	---	--
15,000	260	22	240	44	38,000	270	56	---	--
16,000	260	23	---	--	39,000	270	57	---	--
17,000	260	29	---	--	40,000	270	58	250	69
18,000	260	31	---	--	41,000	270	59	---	--
19,000	270	36	---	--	42,000	270	57	---	--
20,000	270	37	250	52	43,000	270	57	---	--
21,000	270	41	---	--	44,000	260	59	---	--
22,000	270	41	---	--	45,000	260	62	---	--
23,000	270	44	---	--	46,000	260	64	---	--
24,000	270	39	---	--	47,000	260	66	---	--
25,000	270	44	260	61	48,000	260	67	---	--
26,000	260	47	---	--	49,000	260	66	---	--
					50,000	260	64	---	--

NOTES:

1. Tropopause height was 39,000 ft MSL.
2. At shot height the temperature was 0.3°C and the pressure 952 mb.

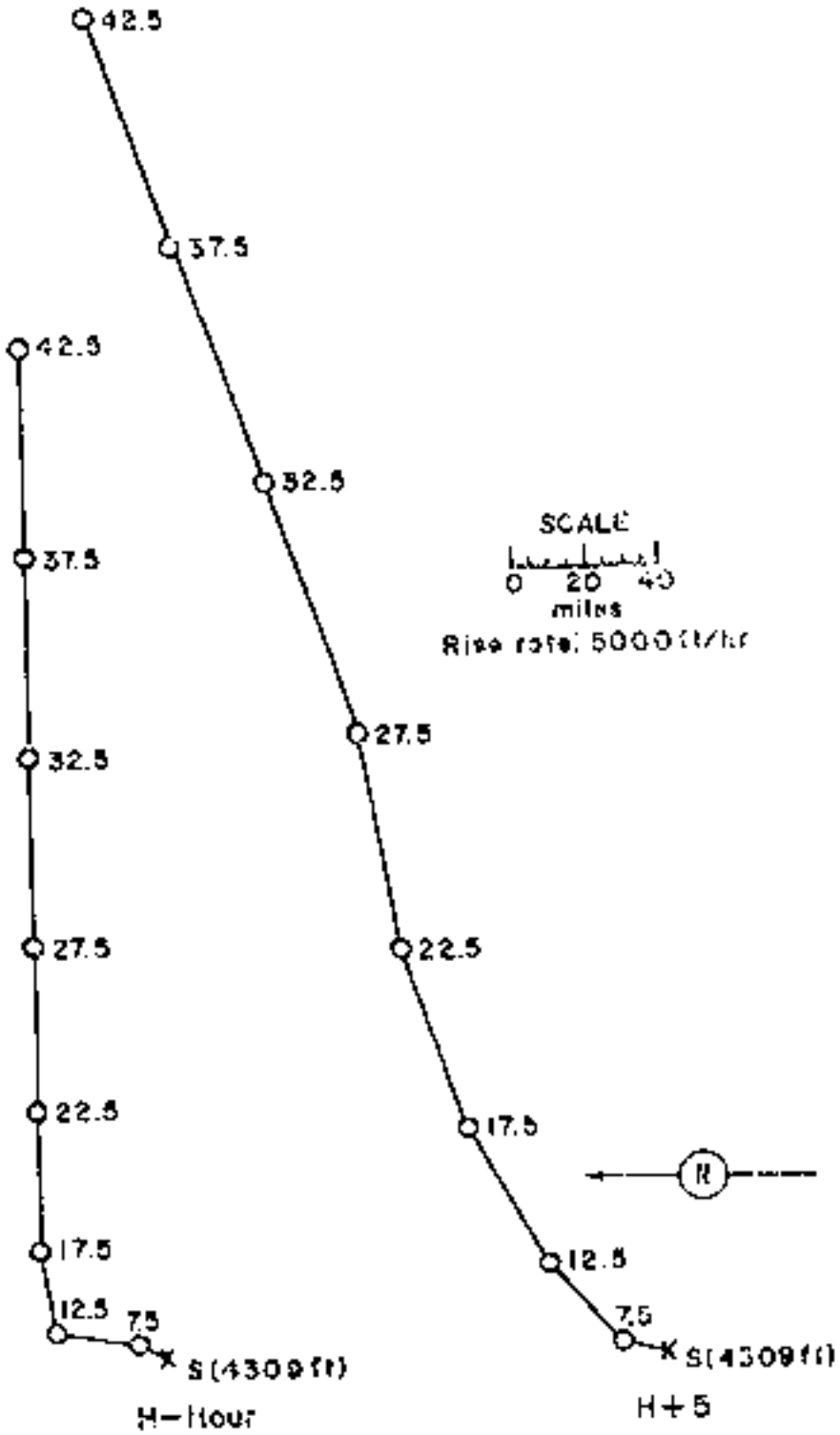


Figure 14: Histograms for Operation TEAPOT - Apple I.

OPERATION TEAPOT - Wasp Prime

	PST	GMT
DATE:	29 Mar 1955	29 Mar 1955
TIME:	1000	1800

TOTAL YIELD: 3 kt

Sponsor: LASL

SITE: NTS - Area T-7-4
37° 05' [illegible]" N
116° 0[illegible]' [illegible]" W
Site elevation: 4,1[illegible] ft

FIREBALL DATA:
Time to 1st minimum: 5.0 to 6.1 msec
Time to 2nd maximum: 64 to 7[illegible] msec
Radius at 2nd maximum: NA

HEIGHT OF BURST: 740 ft

TYPE OF BURST AND PLACEMENT:
Air drop over Yucca Flat

CRATER DATA: No crater

CLOUD TOP HEIGHT: [illegible]0,000 ft MSL
CLOUD BOTTOM HEIGHT: NA

REMARKS:

The contours resulting from this shot were due primarily to neutron-induced activity. The local fallout pattern was drawn from ground-survey readings taken at H+1 hour by the Rad-Safe organization with AN/PDR 39 and MX-5 instruments. No decay corrections were necessary.

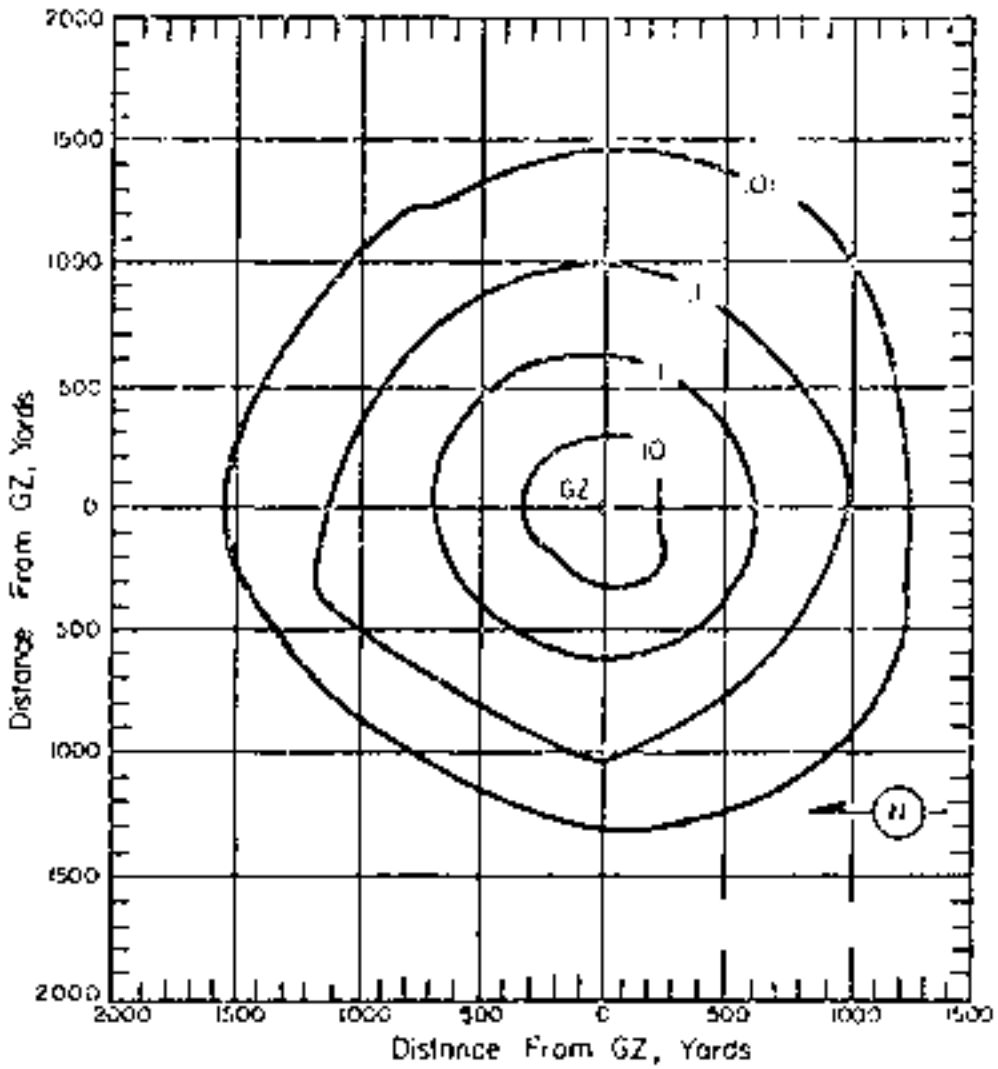


Figure 142. Operation TEAPOT - Nimp Event.
On-site dose rate contours in r/hr at H+1 hour.

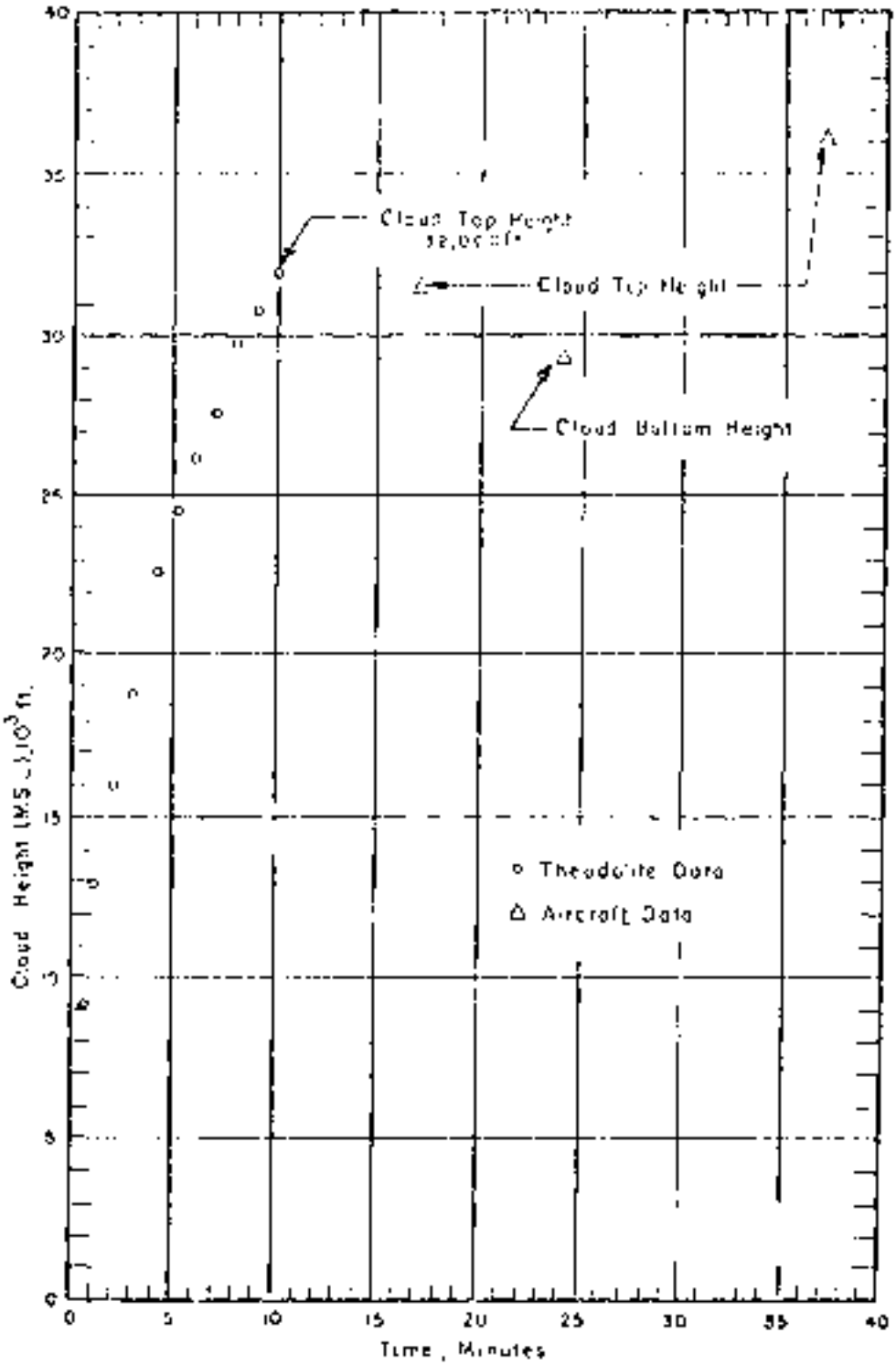


Figure 143. Cloud Dimensions: Operation TRAPOT - Weap Prime.

TABLE 41 [illegible]

Altitude (MSL)	Wind Dir	Wind Speed	Altitude (MSL)	Wind Dir	Wind Speed
feet	degrees	mph	feet	degrees	mph
Surface	200	18	27,000	[illegible]	[illegible]
5,000	190	19	28,000	[illegible]	[illegible]
6,000	[illegible]	[illegible]	29,000	[illegible]	[illegible]
7,000	[illegible]	[illegible]	30,000	[illegible]	[illegible]
8,000	[illegible]	[illegible]	31,000	[illegible]	[illegible]
9,000	[illegible]	33	32,000	[illegible]	[illegible]
10,000	[illegible]	[illegible]	33,000	[illegible]	[illegible]
11,000	[illegible]	36	34,000	[illegible]	[illegible]
12,000	[illegible]	41	35,000	[illegible]	[illegible]
13,000	[illegible]	[illegible]	36,000	[illegible]	70
14,000	[illegible]	51	37,000	[illegible]	[illegible]
15,000	[illegible]	[illegible]	38,000	[illegible]	[illegible]
16,000	[illegible]	[illegible]	39,000	[illegible]	[illegible]
17,000	[illegible]	58	40,000	[illegible]	[illegible]
18,000	[illegible]	[illegible]	41,000	[illegible]	[illegible]
19,000	[illegible]	48	42,000	[illegible]	[illegible]
20,000	[illegible]	[illegible]	43,000	[illegible]	[illegible]
21,000	260	[illegible]	44,000	[illegible]	[illegible]
22,000	260	58	45,000	[illegible]	[illegible]
23,000	260	57	46,000	[illegible]	[illegible]
24,000	[illegible]	54	47,000	[illegible]	[illegible]
25,000	260	61	48,000	[illegible]	[illegible]
26,000	250	66	49,000	[illegible]	[illegible]
			50,000	[illegible]	[illegible]

NOTES:

1. The ground height was [illegible] ft MSL.
2. At that height the temperature was [illegible]° C and the pressure [illegible] mb.

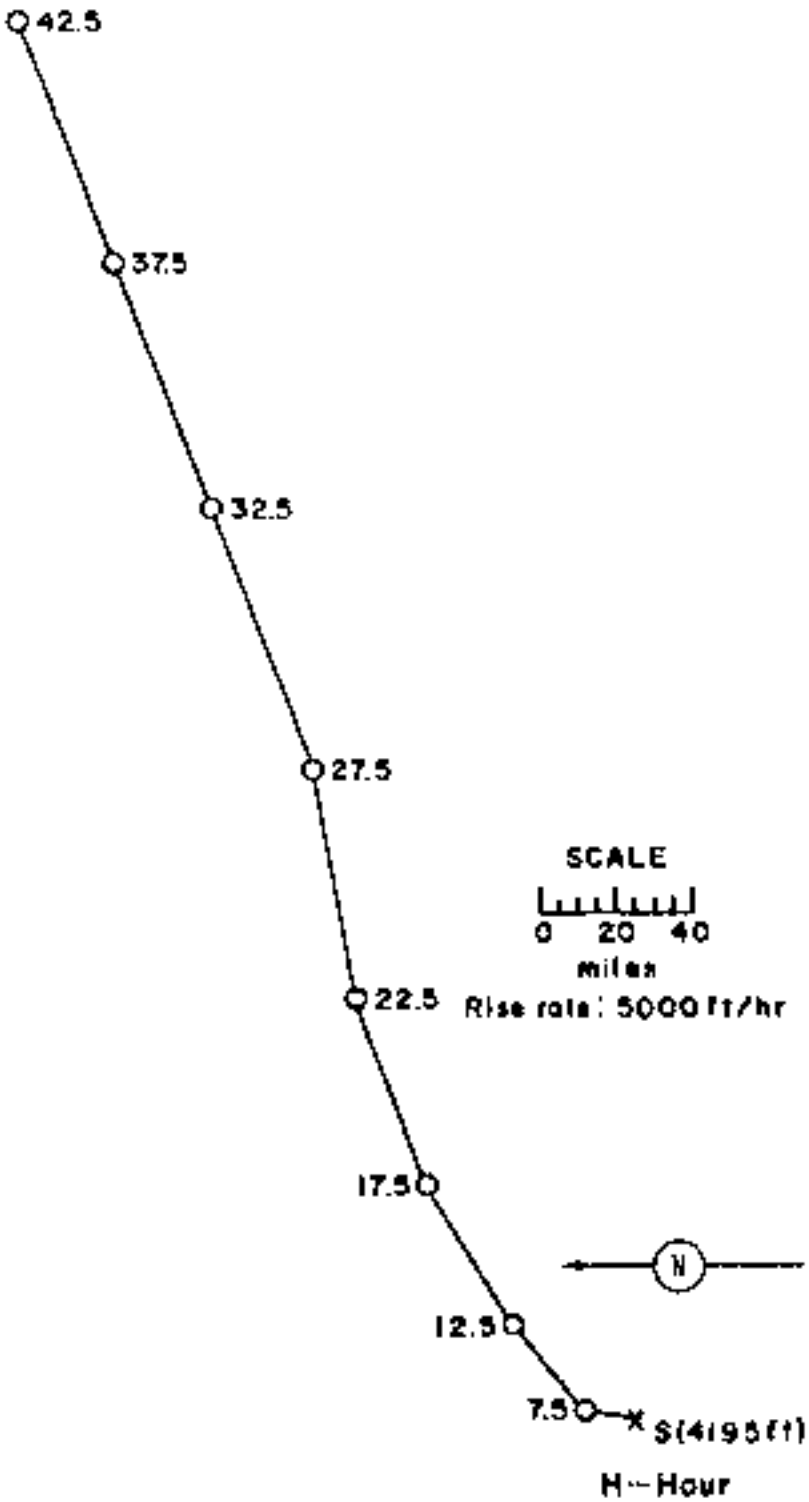


Figure 144. Hodograph for Operation TEMPO - Yoop Prime.

OPERATION CROSSROADS - BIKINI

	PST	GMT
DATE:	6 April 1946	6 April 1946
TIME:	0530	1030

Sponsors: DOD

SITE: BIKINI - Area C-2
11° 01' 53" N
165° 03' 15" W
Site elevation: 6 feet

BRIEFING OFFICER: [illegible]
Air burst over Bikini Lagoon

TOTAL YIELD: 3 kt

FIREBALL DATA:
Time to 1st minimum: 4.5 to 5.6 msec
Time to 2nd maximum: 42.5 to 60 msec
Radius at 2nd maximum: 2M

CLOUD TOP HEIGHT: 56,000 ft (est)
CLOUD DIAMETER (maximum): 2M

CRATER DATA: No crater

REMARKS:

No significant fallout or induced activity was observed.

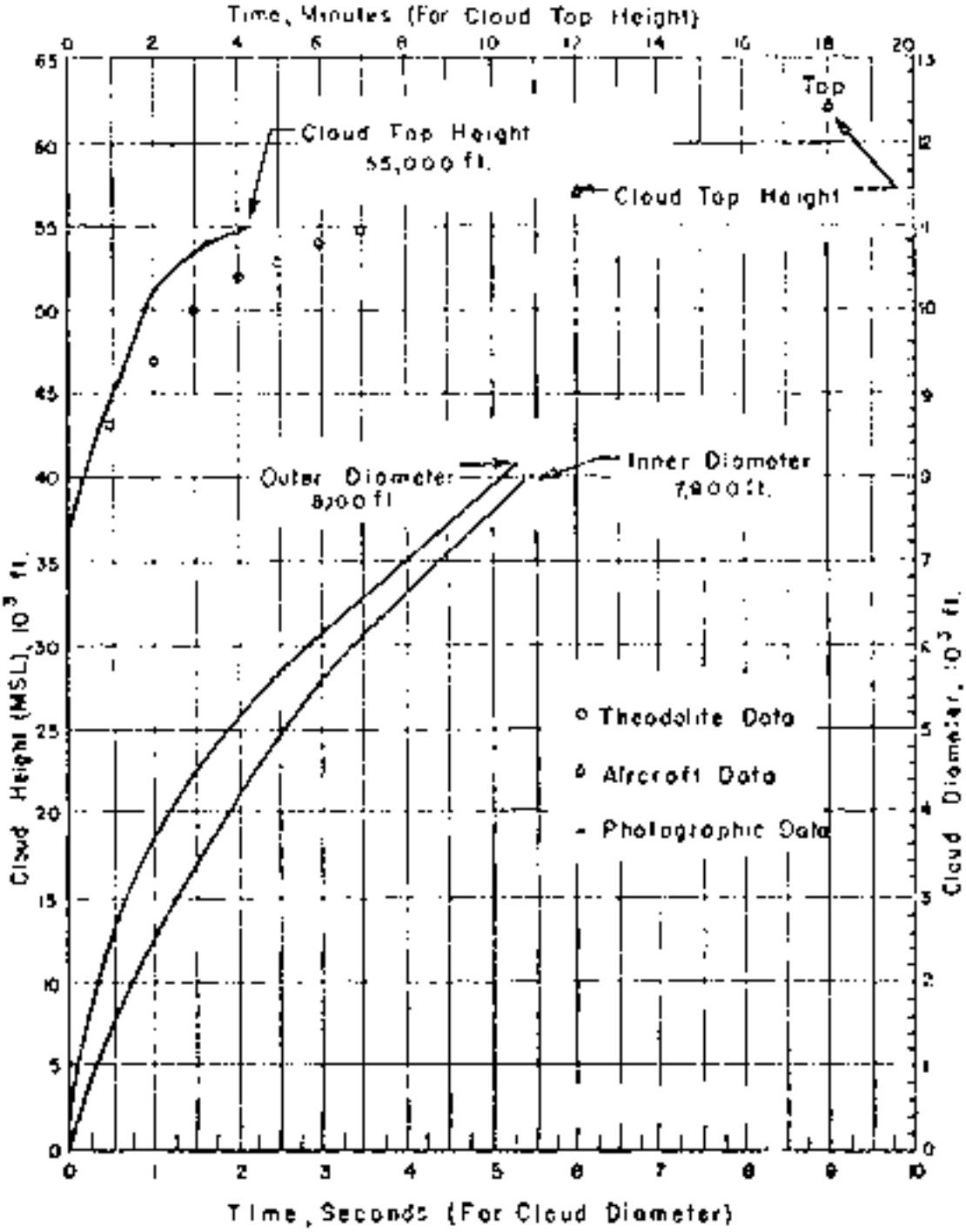


Figure 145 . Cloud Dimensions: Operation TEAPOT - HA.

TABLE 42 [illegible]

Altitude (ft)	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
70,000	010	21
69,000	06	23
68,000	007	25
67,000	013	28
66,000	020	32
65,000	028	37
64,000	038	42
63,000	049	48
62,000	062	54
61,000	078	61
60,000	096	68
59,000	117	76
58,000	140	84
57,000	167	93
56,000	197	102
55,000	230	112
54,000	267	122
53,000	307	133
52,000	351	144
51,000	398	156
50,000	449	168
49,000	504	181
48,000	563	194
47,000	626	208
46,000	693	222
45,000	764	237
44,000	839	252
43,000	918	268
42,000	1001	284
41,000	1088	301
40,000	1179	318
39,000	1274	336
38,000	1373	354
37,000	1476	373
36,000	1583	392
35,000	1694	411
34,000	1809	431
33,000	1928	451
32,000	2051	471
31,000	2178	492
30,000	2309	513
29,000	2444	534
28,000	2583	555
27,000	2726	577
26,000	2873	599
25,000	3024	621
24,000	3179	643
23,000	3338	665
22,000	3501	688
21,000	3668	710
20,000	3839	733
19,000	4014	756
18,000	4193	779
17,000	4376	802
16,000	4563	825
15,000	4754	848
14,000	4949	871
13,000	5148	894
12,000	5351	917
11,000	5558	940
10,000	5769	963
9,000	5984	986
8,000	6203	1009
7,000	6426	1032
6,000	6653	1055
5,000	6884	1078
4,000	7119	1101
3,000	7358	1124
2,000	7601	1147
1,000	7848	1170
Sea level	8099	1193

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
70,000	1.1	1.1
69,000	1.1	1.1
68,000	1.1	1.1
67,000	1.1	1.1
66,000	1.1	1.1
65,000	1.1	1.1
64,000	1.1	1.1
63,000	1.1	1.1
62,000	1.1	1.1
61,000	1.1	1.1
60,000	1.1	1.1
59,000	1.1	1.1
58,000	1.1	1.1
57,000	1.1	1.1
56,000	1.1	1.1
55,000	1.1	1.1
54,000	1.1	1.1
53,000	1.1	1.1
52,000	1.1	1.1
51,000	1.1	1.1
50,000	1.1	1.1
49,000	1.1	1.1
48,000	1.1	1.1
47,000	1.1	1.1
46,000	1.1	1.1
45,000	1.1	1.1
44,000	1.1	1.1
43,000	1.1	1.1
42,000	1.1	1.1
41,000	1.1	1.1
40,000	1.1	1.1
39,000	1.1	1.1
38,000	1.1	1.1
37,000	1.1	1.1
36,000	1.1	1.1
35,000	1.1	1.1
34,000	1.1	1.1
33,000	1.1	1.1
32,000	1.1	1.1
31,000	1.1	1.1
30,000	1.1	1.1
29,000	1.1	1.1
28,000	1.1	1.1
27,000	1.1	1.1
26,000	1.1	1.1
25,000	1.1	1.1
24,000	1.1	1.1
23,000	1.1	1.1
22,000	1.1	1.1
21,000	1.1	1.1
20,000	1.1	1.1
19,000	1.1	1.1
18,000	1.1	1.1
17,000	1.1	1.1
16,000	1.1	1.1
15,000	1.1	1.1
14,000	1.1	1.1
13,000	1.1	1.1
12,000	1.1	1.1
11,000	1.1	1.1
10,000	1.1	1.1
9,000	1.1	1.1
8,000	1.1	1.1
7,000	1.1	1.1
6,000	1.1	1.1
5,000	1.1	1.1
4,000	1.1	1.1
3,000	1.1	1.1
2,000	1.1	1.1
1,000	1.1	1.1
Sea level	1.1	1.1

NOTES:

1. Tropopause height was 32,000 ft MSL.
2. Altitude height for temperature was -67.2°C and the pressure 227 mb.

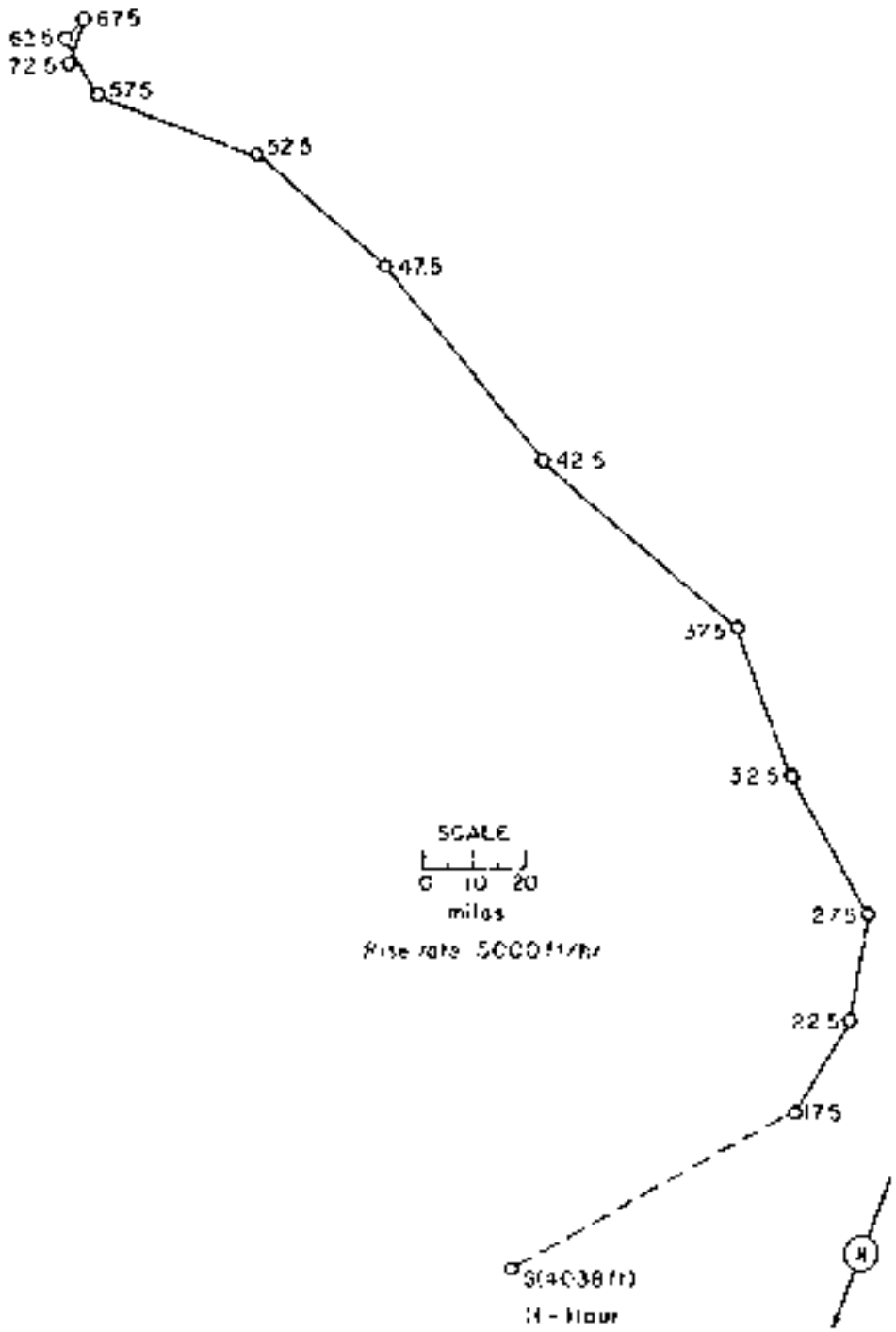


Figure 146. Cartographic Set Operation: TARGET - [illegible]

OPERATION UPSHOT - Post

	EST	SEC
DATE:	[illegible]	[illegible]
TIME:	0430	1150

Operator: SGM

DIGS: NW - Area - 9.
[illegible]
[illegible]
Site elevation: 4,250 ft

TOTAL YIELD: 2 kt

HEIGHT OF BURST: 200 ft

FIREBALL DATA:
Time to 1st minimum: 3.7 msec
Time to 2nd maximum: 40.3 msec
Radius at 2nd maximum: 1M

TYPE OF PIT T AND I FACILITIES:
Tower but 1 tower burned to soil

CRATER DIMENSIONS: [illegible] ft MSL
CRATER RIM HEIGHT: [illegible] ft MSL

CRATER DATA: No crater

REMARKS:

The on-site contamination was due primarily to neutron-induced activity. The pattern was drawn in a fine dirt on ground zero made by the Rad-Safe organization between H+1 hour and 24 hours. The general decay curve for Nevada soil was used to extrapolate the data to H+1 hour. The off-site fall-out pattern was drawn from precipitation readings taken by the off-site Rad-Safety organization. The $t^{-1.2}$ decay approximation was used to extrapolate the dose-rate readings to H+1 hour.

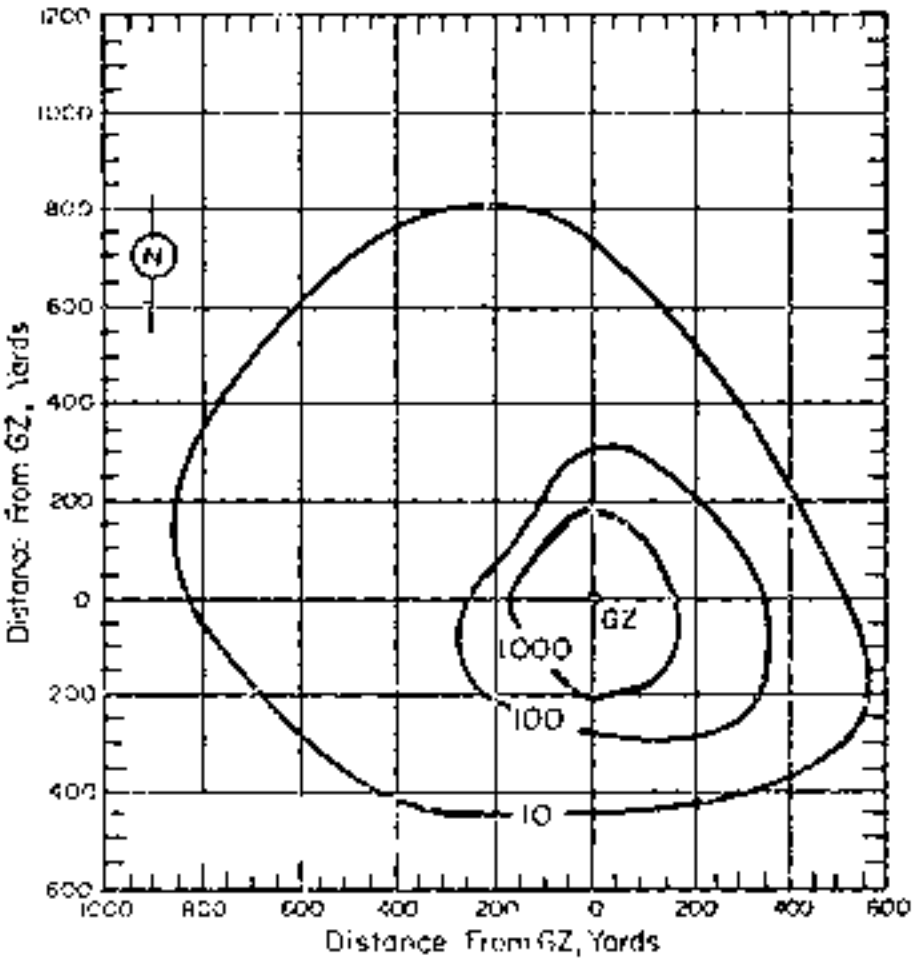

1000
800
600
400
200
0
200
400
600
1000
800
600
400
200
0
200
400
600
N
GZ
1000
100
10
Distance From GZ, Yards
Distance From GZ, Yards

Figure 147. [illegible]

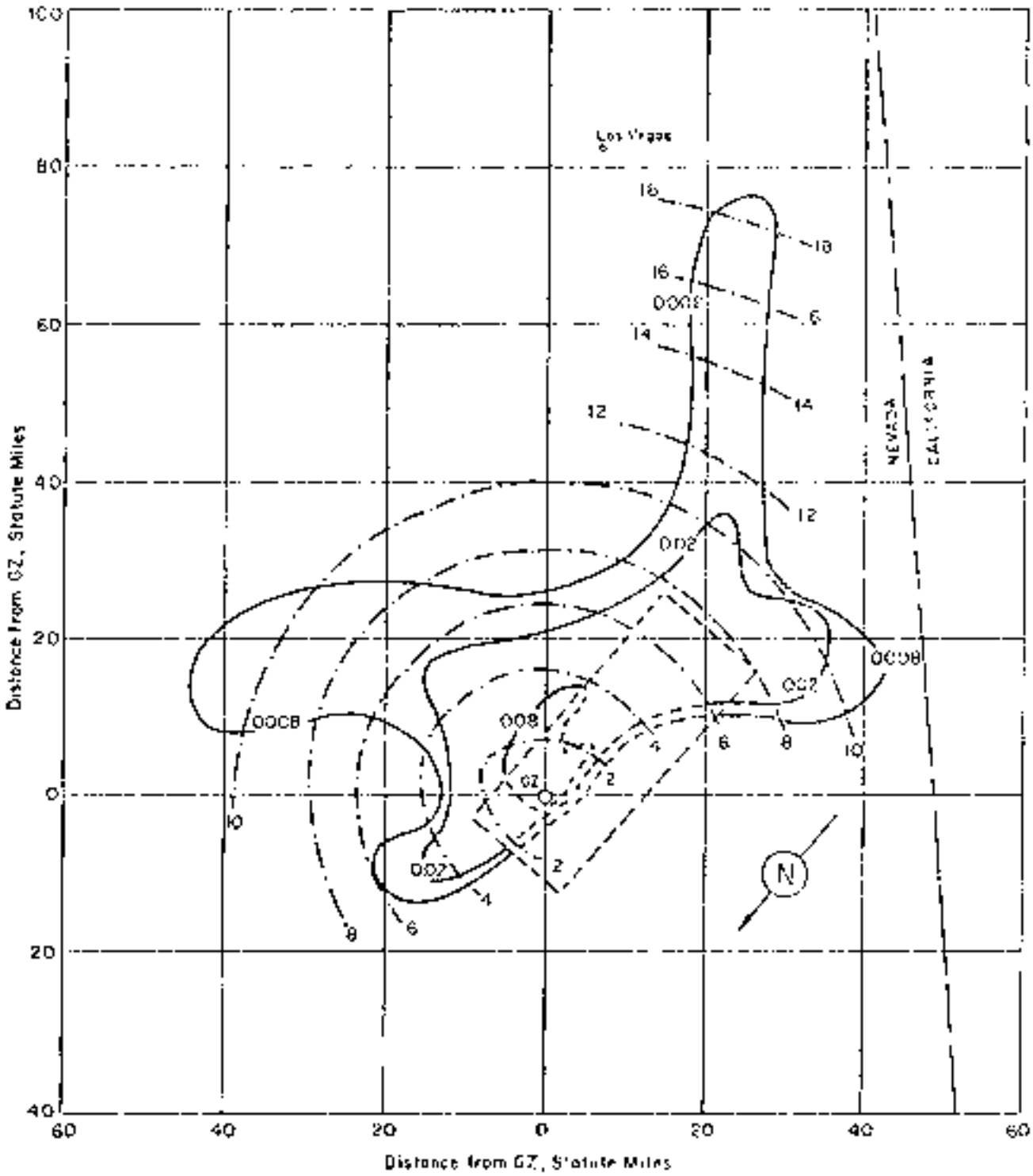


Figure 148. OPERATION TEAPOT - [illegible] fect. Off-site dose rate contours in r/hr at [illegible] hours.

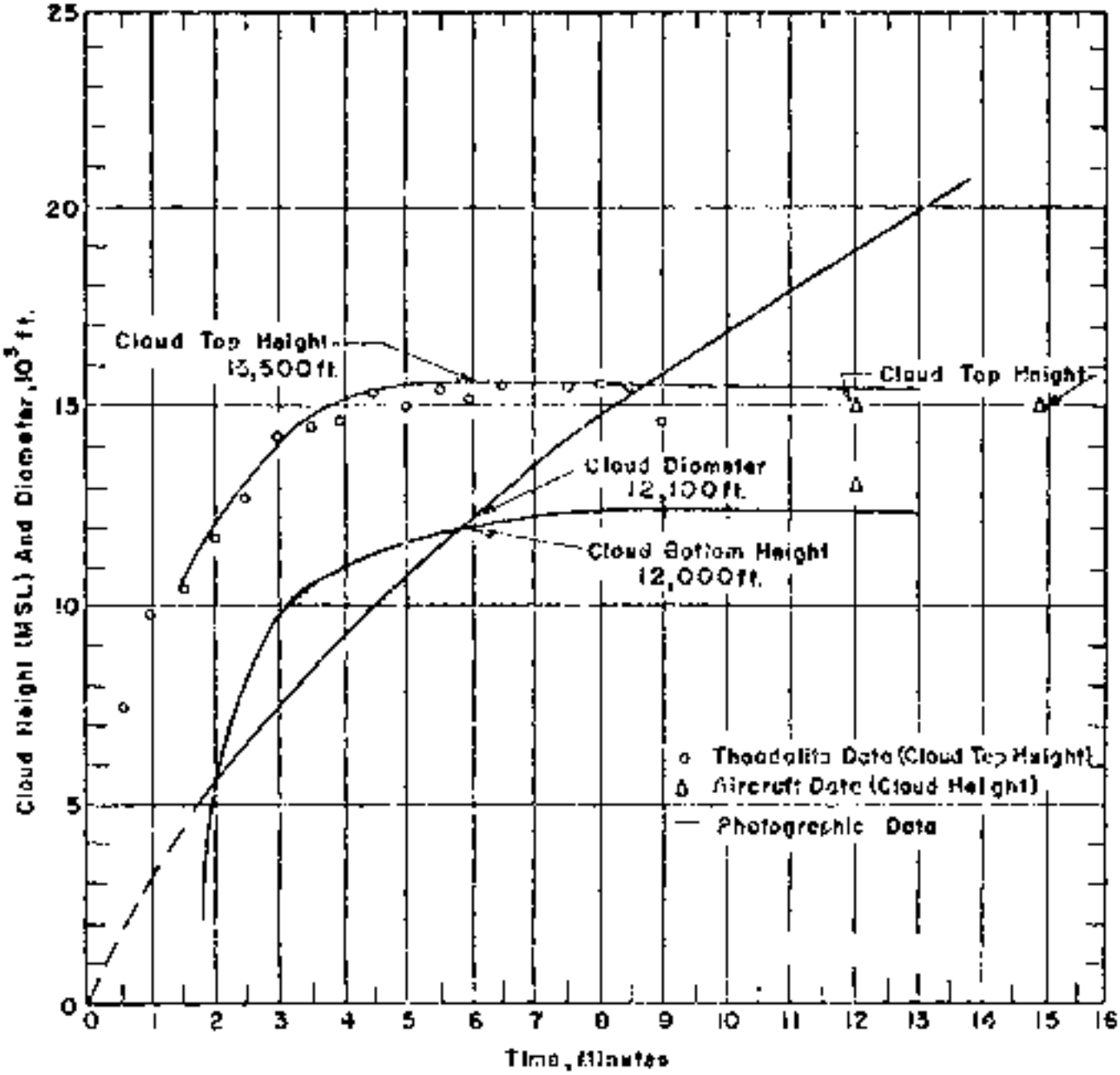


Figure 149. Cloud Dimensions: Operation PROJECT [illegible] Data.

TABLE 45 BALLOON WIND DATA FOR OPERATION TEAPOT - POST

Altitude (MSL)	Balloon	
	Dir	Speed
feet	degrees	mph
Surface	Calm	Calm
5,000	Calm	Calm
6,000	Calm	Calm
7,000	Calm	Calm
8,000	Calm	Calm
9,000	Calm	Calm
10,000	Calm	Calm
11,000	Calm	Calm
12,000	Calm	Calm
13,000	Calm	Calm
14,000	330	08
16,000	330	09
18,000	330	12
20,000	350	15
23,000	010	23
25,000	350	29
30,000	350	31
35,000	010	41
40,000	360	40
45,000	320	24
50,000	250	29

NOTE: At burst height the temperature was -4.5°C and the pressure 85 mb.

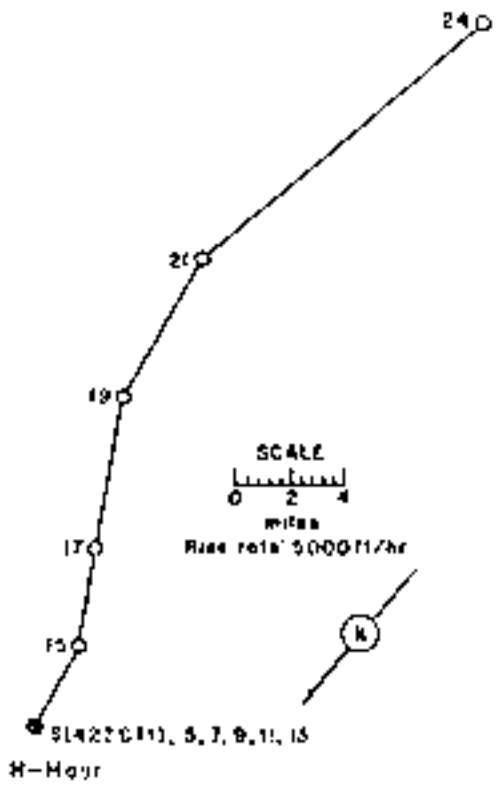


Figure 150. Hodograph for Operation TEAPOT - Post.

OPERATION TEAPOT - Met

	PST	GMT
DATE:	15 April 1955	15 April 1955
TIME:	1115	1915

TOTAL YIELD: 22 kt

FIREBALL DATA:
Time to 1st minimum: 17.2 msec
Time to 2nd maximum: NM
Radius at 2nd maximum: NM

CRATER DATA: No crater

Sponsor: DOD - IASL

SITE: NTS - Area 7F
36° 47' 53" N
115° 55' 46" W
Sit. elevation: 3,078 ft

HEIGHT OF BURST: 400 ft

TYPE OF BURST AND PLACEMENT:
Tower burst over Nevada soil

CLOUD TOP HEIGHT: 40,300 ft MSL
CLOUD BOTTOM HEIGHT: 31,800 ft MSL

REMARKS:

The on-site fallout pattern was constructed from surveys performed by Rad-Safe organization between 8½ hour and 8½ hours. AN/PDR-39 instruments were used. Eight stake lines (approximately radial) along existing roads around ground zero aided the survey teams in locating their position. No decay corrections were made. The off-site fallout pattern was drawn from ground-survey readings taken by the off-site radiological safety organization. The $t^{-1.2}$ decay approximation was used to extrapolate the dose-rate readings to 8½ hour.

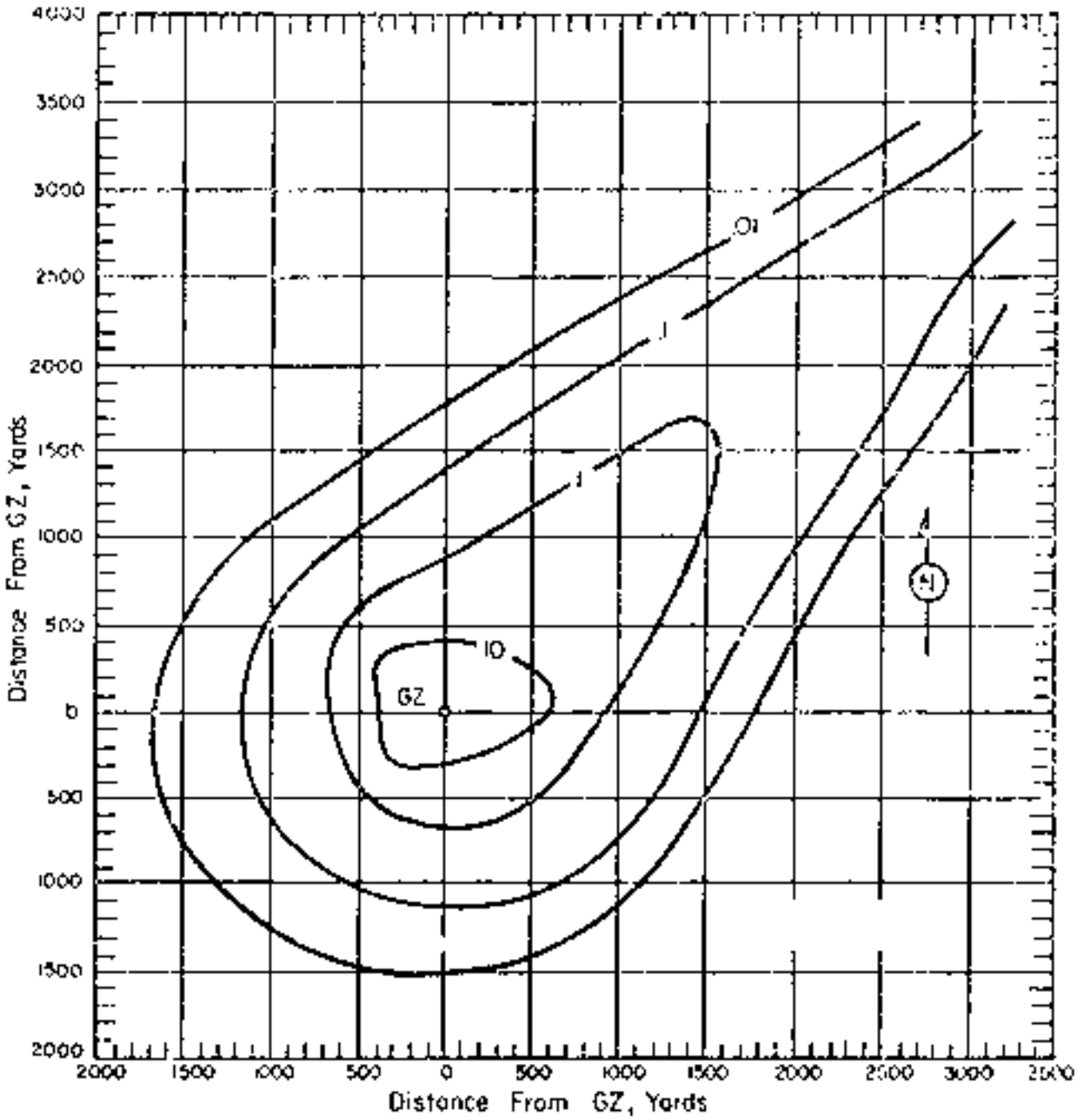


Figure 151. Operation TEAPOT - [illegible] Operation dose rate contours in r/hr at H+1 hours.

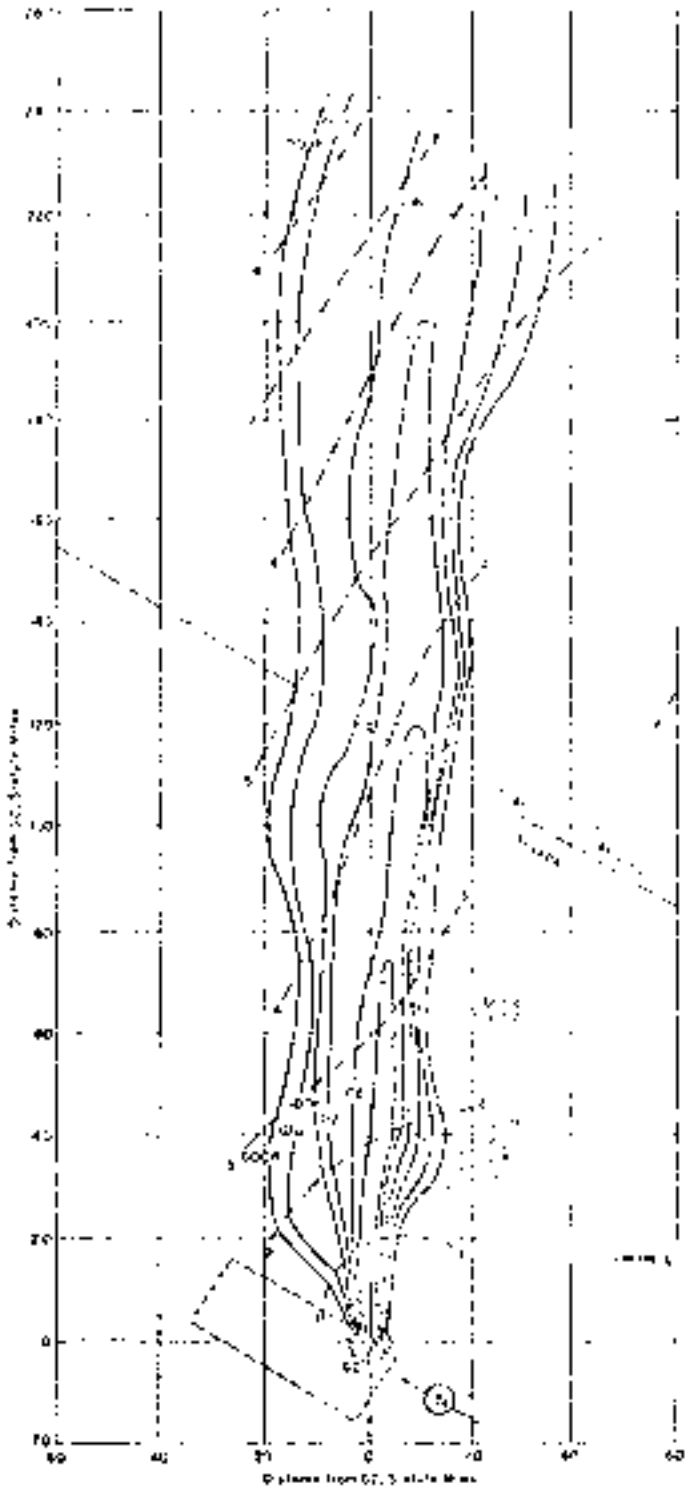


Figure 152. Operation [illegible] - Nat. Off-site dose rate contours in r/hr at H+1 hour.

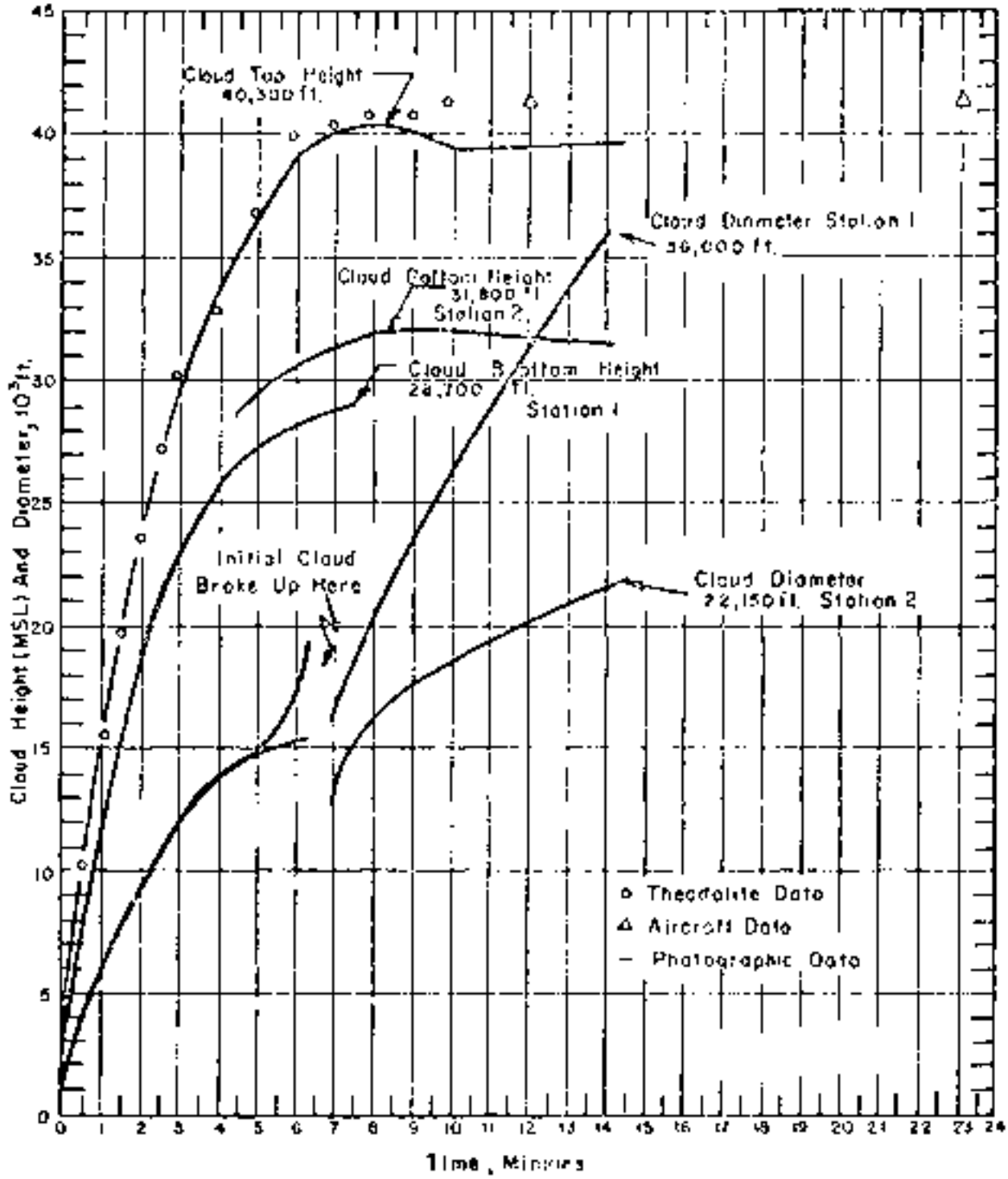


Figure 153. Cloud Dimensions, Operation TYPHOON – Met. (Station No. 1 located 66 miles SW of C. P. and Station No. 2 located 50 miles SW of C. P.).

[illegible] 4[illegible] [illegible] WIND [illegible] [illegible] [illegible] [illegible] [illegible] MST

ALTITUDE (MSL) feet	WIND Direction degrees	WIND Speed mph	ALTITUDE (MSL) ft	WIND Dir degrees	WIND Speed mph
Surface	200	[illegible]	27,000	250	67
5,000	[illegible]	[illegible]	28,000	250	71
6,000	200	[illegible]	29,000	250	73
7,000	[illegible]	[illegible]	30,000	[illegible]	75
8,000	220	18	31,000	250	75
9,000	[illegible]	16	32,000	250	74
10,000	[illegible]	17	33,000	240	76
11,000	[illegible]	[illegible]	34,000	240	80
12,000	[illegible]	[illegible]	35,000	250	[illegible]
13,000	[illegible]	[illegible]	36,000	240	80
14,000	162	[illegible]	37,000	240	87
15,000	[illegible]	33	38,000	240	81
16,000	[illegible]	[illegible]	39,000	240	86
17,000	240	40	40,000	240	84
18,000	240	37	41,000	240	80
19,000	240	43	42,000	250	80
20,000	240	38	43,000	240	73
21,000	250	[illegible]	44,000	240	75
22,000	250	46	45,000	240	77
23,000	250	[illegible]	46,000	240	83
24,000	250	57	47,000	240	85
25,000	250	61	48,000	240	87
26,000	250	67	49,000	240	90
			50,000	240	88

NOTES:

1. Tropopause height was 47,000 ft MSL.
2. At that height the temperature was [illegible]°C and the pressure [illegible] mb.

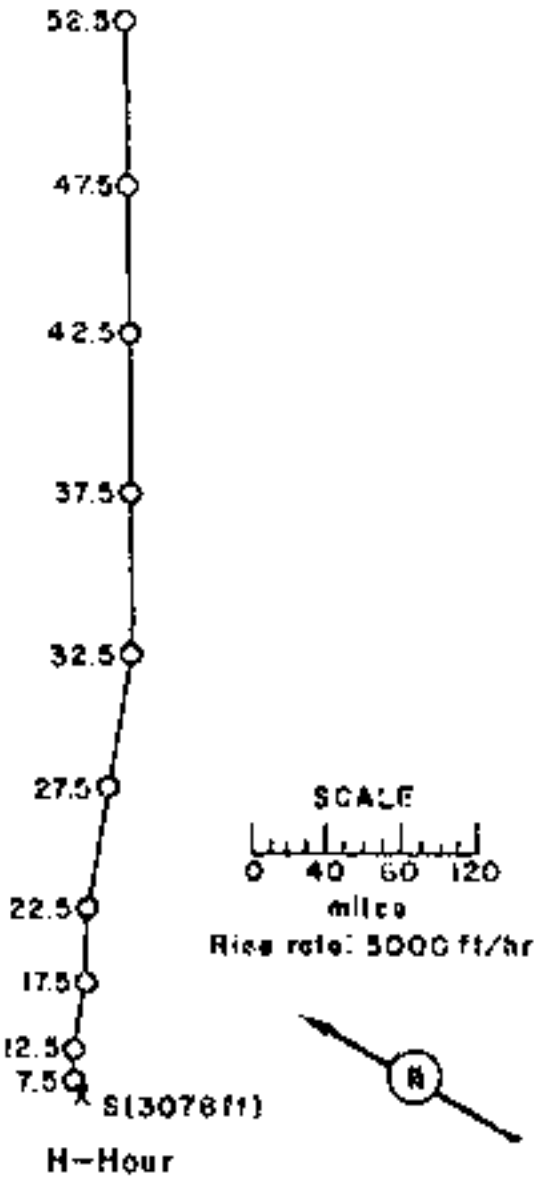


Figure 154. Radiograph for Operation TWINPOT - Mod.

OPERATION TEAPOT - Apple II

	PDT	GMT
DATE:	5 May 1955	5 May 1955
TIME:	0510	1210

YIELD: 29 kt

FIREBALL DATA:
Time to 1st minimum: [illegible]
Time to 2nd maximum: NM
Radius at 2nd maximum: NM

Sponsor: LASL

SITE: Area 1 - [illegible] - 1
37° [illegible]' [illegible]" N
116° [illegible]' [illegible]" W
Site elevation: [illegible] ft

HEIGHT OF BURST: [illegible] ft

TYPE OF BURST AND PLACEMENT:
Tower [illegible]

CLOUD TOP HEIGHT: [illegible]
CLOUD BOTTOM HEIGHT: [illegible]

REMARKS:

The on-site fallout pattern was constructed from three different ground surveys performed by the Rad-Safe organization between H+1 hour and D+4 days. AN/PDR-39 instruments were used. Eight stake lines (approximately radial) along existing roads around ground zero aided the survey teams in locating their positions. The off-site fallout pattern was drawn from ground-survey readings taken by the off-site Radiological Safety organization. The $t^{-1.2}$ decay approximation was used to extrapolate the dose-rate readings to H+1 hour for both on-site and off-site patterns.

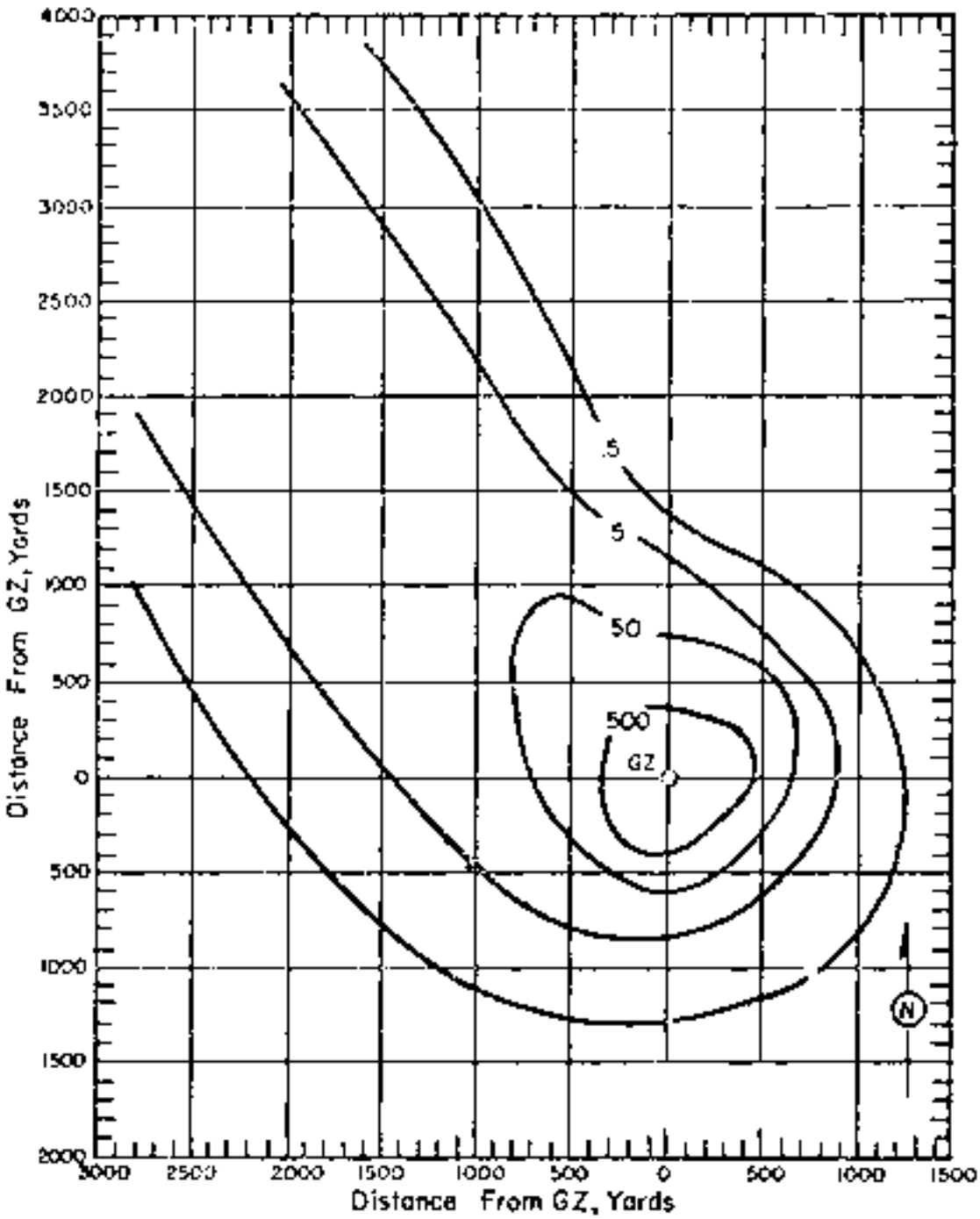


Figure 155. Operation [illegible] - Apple II On-site dose rate contours in r/hr at H+1 hour.

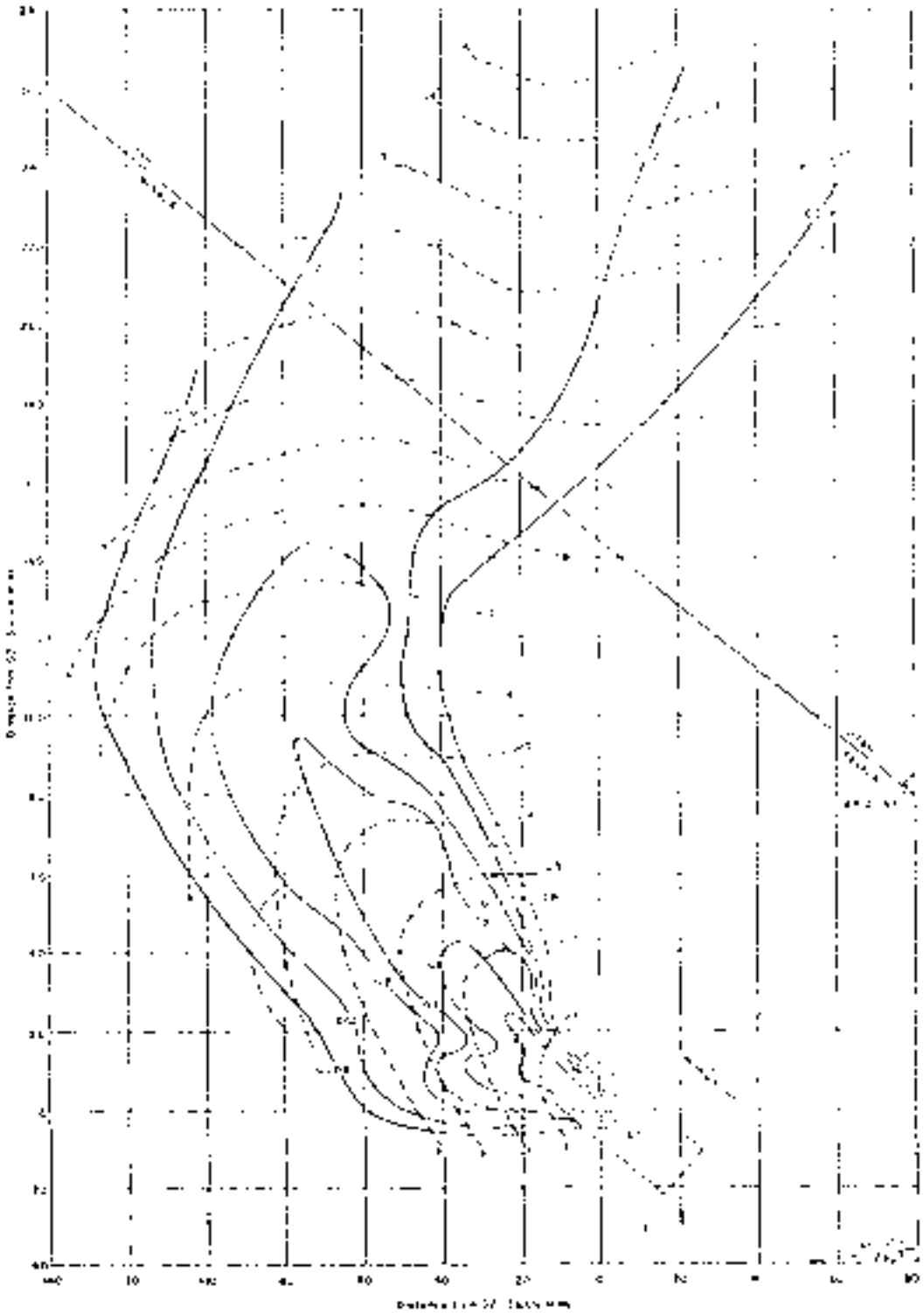


Figure 156. Operation TEAPOT - Apple II.
Off-site dose rate contours in r/hr at H+1 hour.

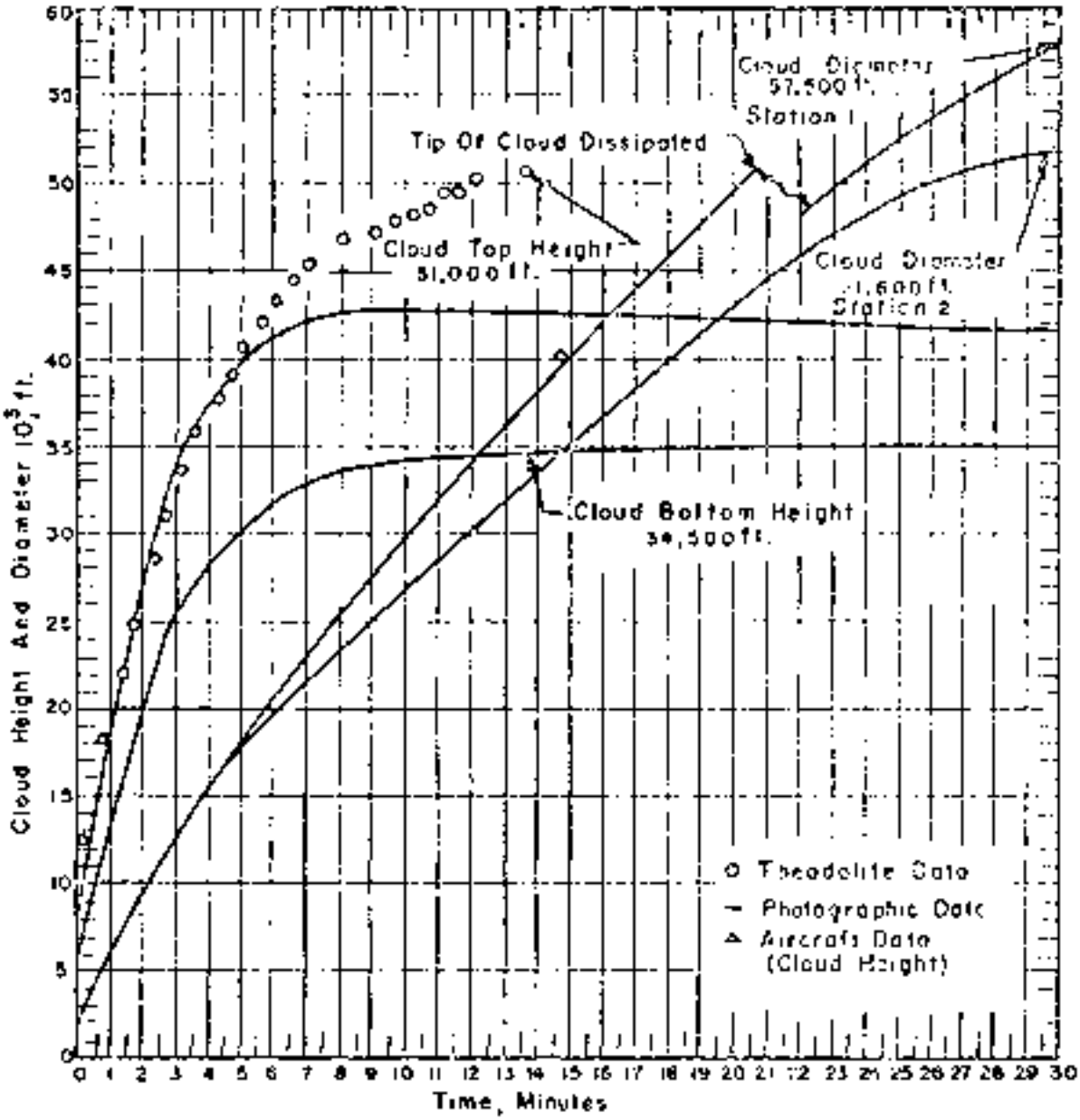


Figure 157. Cloud Dimensions: Operation TEAPOT - Apple II.
(Tracking Station No. 1 located 45 miles SE of G. P.
and Tracking Station No. 2 50 miles SW of G. P.).

TABLE 45 UPPER WIND DATA FOR [illegible]

Altitude (MSL) feet	Wind Direction degrees	Wind Speed knots	Altitude (MSL) feet	Wind Direction degrees	Wind Speed knots
Surface	Calm	Calm	27,000	[illegible]	[illegible]
5,000	Calm	Calm	28,000	[illegible]	[illegible]
6,000	Calm	Calm	29,000	[illegible]	[illegible]
7,000	[illegible]	[illegible]	30,000	[illegible]	[illegible]
8,000	[illegible]	[illegible]	31,000	[illegible]	[illegible]
9,000	[illegible]	[illegible]	32,000	[illegible]	[illegible]
10,000	[illegible]	[illegible]	33,000	[illegible]	[illegible]
11,000	[illegible]	[illegible]	34,000	[illegible]	[illegible]
12,000	[illegible]	[illegible]	35,000	[illegible]	[illegible]
13,000	[illegible]	[illegible]	36,000	[illegible]	[illegible]
14,000	[illegible]	[illegible]	37,000	[illegible]	[illegible]
15,000	170	[illegible]	38,000	[illegible]	[illegible]
16,000	[illegible]	[illegible]	39,000	[illegible]	[illegible]
17,000	200	[illegible]	40,000	[illegible]	[illegible]
18,000	200	[illegible]	41,000	[illegible]	[illegible]
19,000	180	[illegible]	42,000	[illegible]	[illegible]
20,000	[illegible]	[illegible]	43,000	210	[illegible]
21,000	200	[illegible]	44,000	210	[illegible]
22,000	180	[illegible]	45,000	210	[illegible]
23,000	180	[illegible]	46,000	210	[illegible]
24,000	[illegible]	[illegible]	47,000	210	[illegible]
25,000	[illegible]	[illegible]	48,000	[illegible]	[illegible]
26,000	[illegible]	[illegible]	49,000	220	[illegible]
			50,000	[illegible]	41

NOTES:

1. Tropopause height was 41,000 ft MSL at H-hour.
2. At shot height the temperature was 15.0°C and the pressure 8.5 mb.

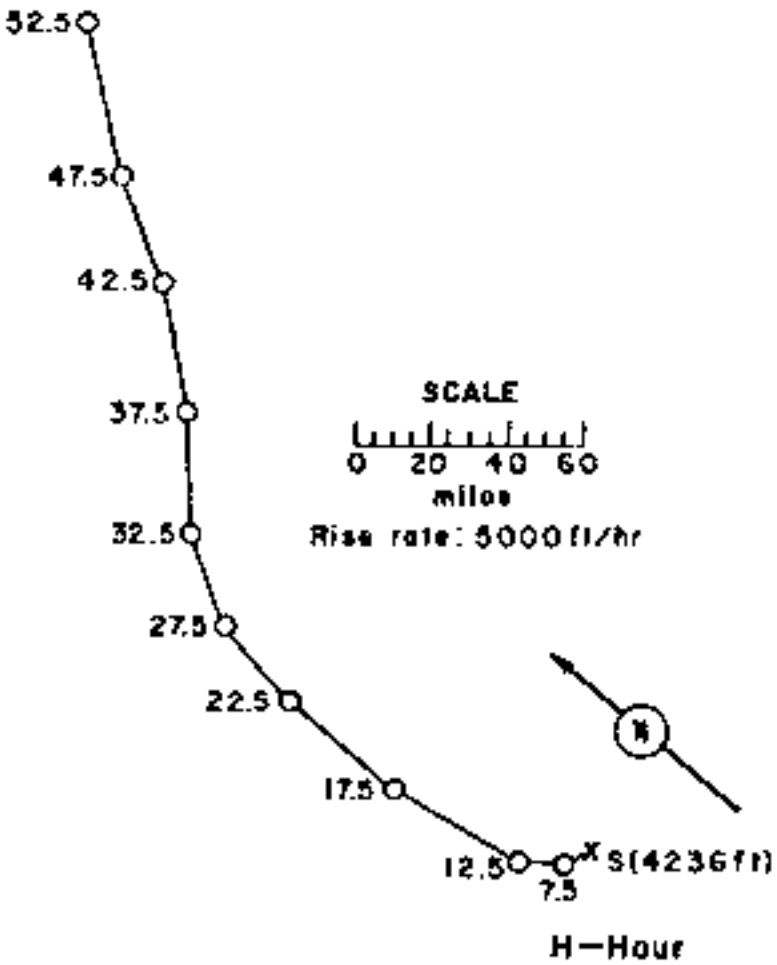
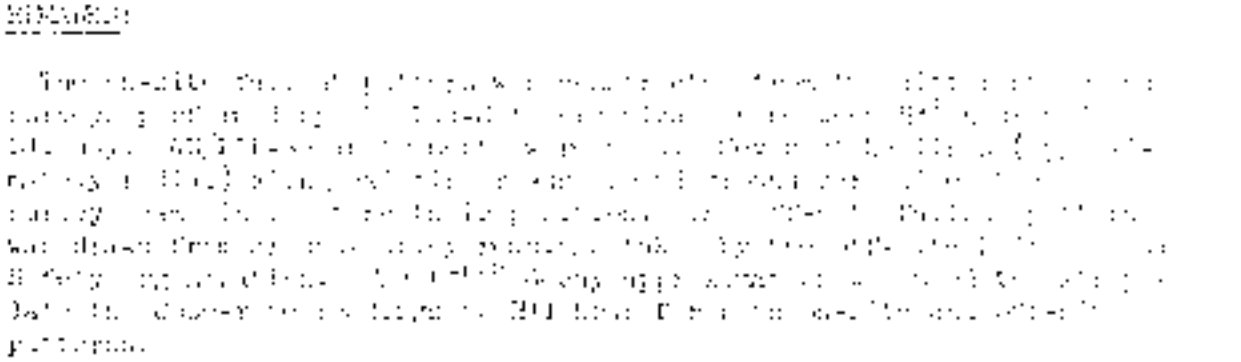


Figure 158 - Radiograph for Operation TUMBLER - Apple II.



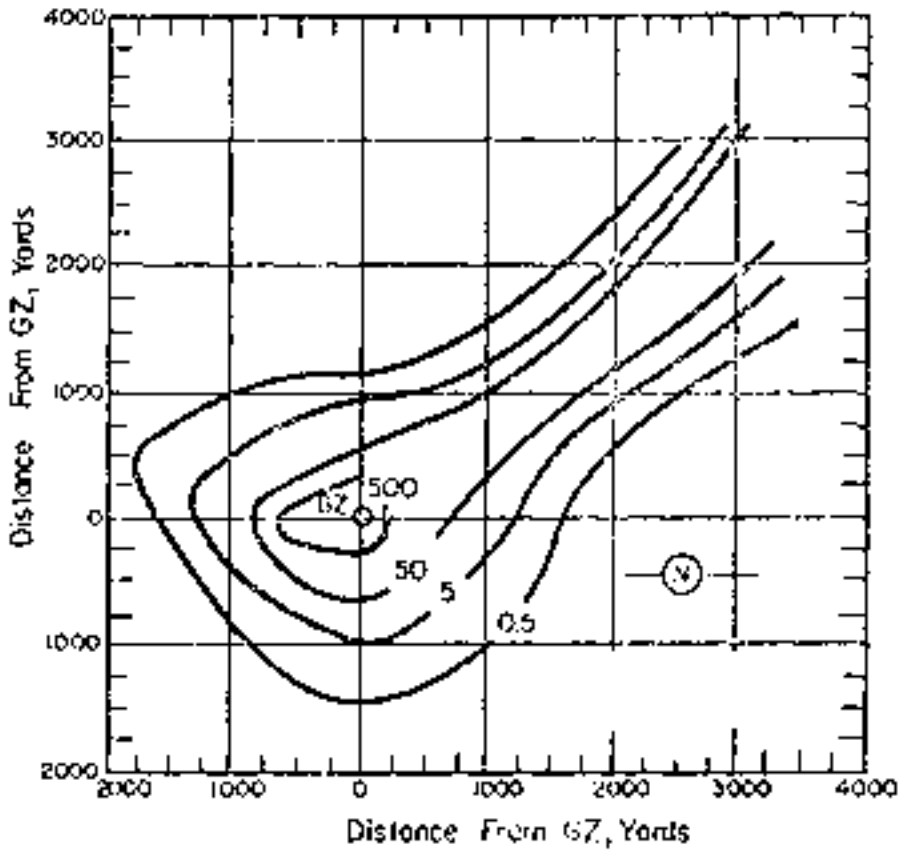


Figure 159. Operation TEAPOT - Zucchini.
On-site dose rate contours in r/hr at H+1 hour.

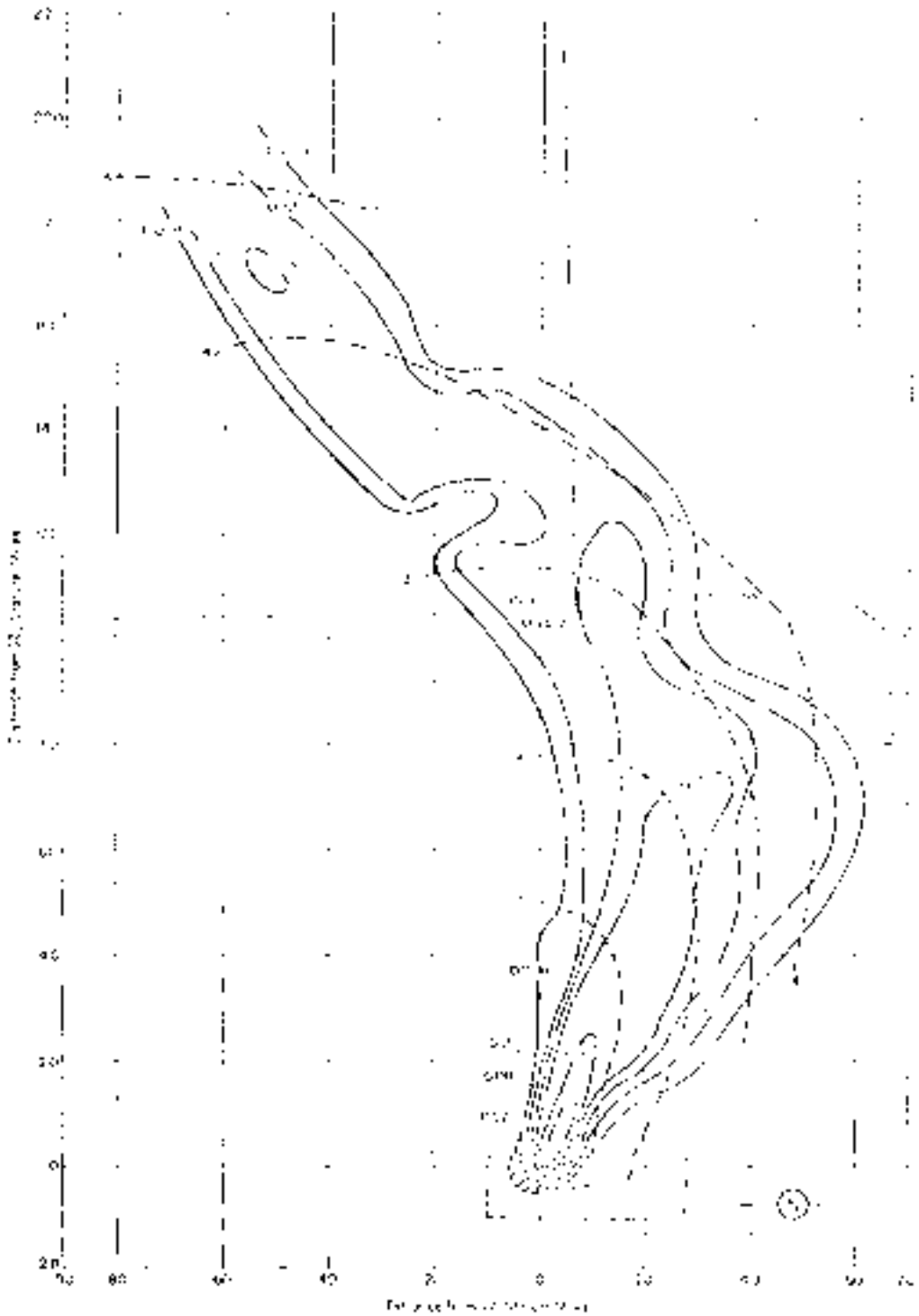


Figure 160. Operation [illegible] - [illegible] Downwind, Off-site case rate contours in r/hr at H+1 hour.

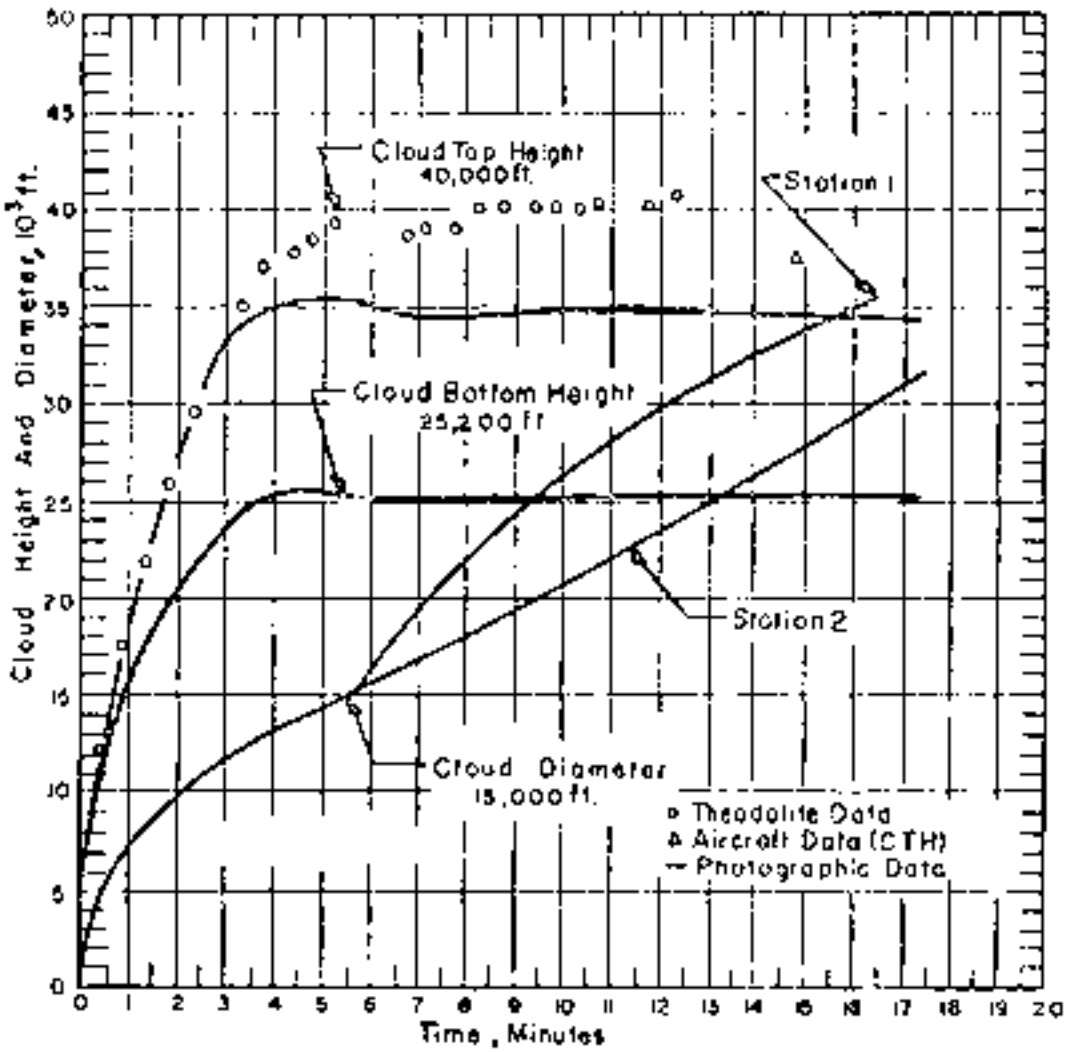


Figure 161. Cloud Dimensions: Operation TRAPCT - Zucchini.

TABLE 4a. [illegible]

[illegible] (mi)	[illegible]		[illegible] (mi)	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

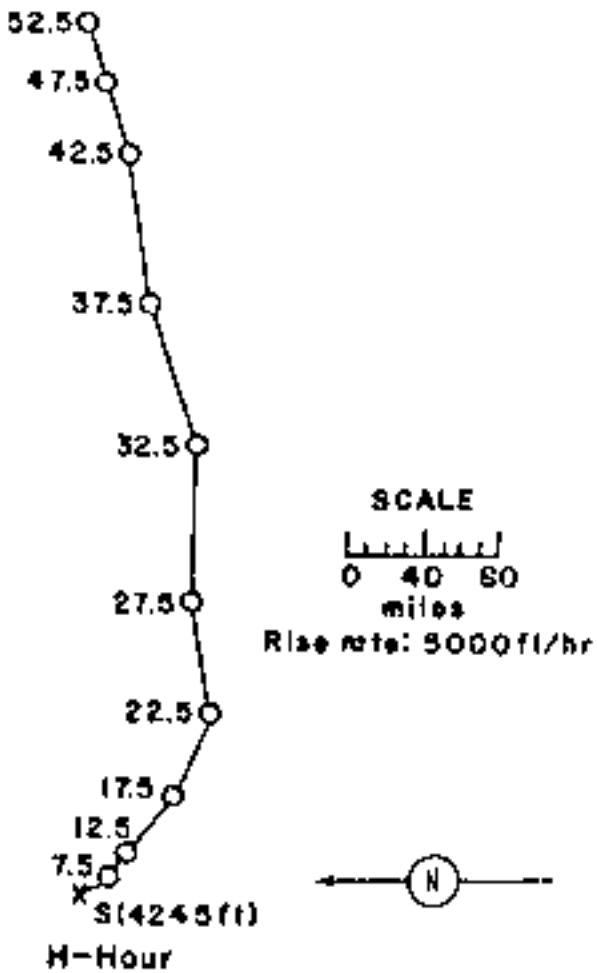


Figure 162. Hodograph for Operation [illegible] - Nuclear.

[illegible] - Safety Experiment No. 1

	PST	GMT
DATE:	[illegible]	[illegible]
TIME:	[illegible]	[illegible]

Sponsor: [illegible]

SITE: [illegible]
[illegible]

HEIGHT OF BURST: [illegible]

YIELD OF [illegible]
[illegible]

CLOUD TOP: [illegible]
CLOUD BOTTOM: [illegible]

REMARKS:

No fission product fallout resulted from this test. Alpha contamination contours [illegible] extended about [illegible] from [illegible] apparently in all directions. At one point, [illegible] ground zero, alpha readings of [illegible] to [illegible] [illegible] on [illegible] very [illegible] and [illegible]. The alpha [illegible] were [illegible] with the "[illegible]" [illegible] survey meter. This [illegible] battery operated proportional counter with [illegible] probe which has a steel grid over 0.85-mil mylar with an [illegible] area of 55 cm².

[illegible] - Safety Experiment No. 2

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

REMARKS:

[illegible]

[illegible] -Safety Experiment No. 5

[illegible]

[illegible]

REMARKS:

No significant [illegible] product fall[illegible] [illegible] [illegible] [illegible] [illegible] "A [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] of the test pit. The [illegible] decreased rapidly [illegible] [illegible] of approximately [illegible] feet from the center."

"Alpha [illegible] [illegible] [illegible] [illegible] [illegible] than [illegible] [illegible] [illegible] with [illegible] [illegible] higher readings than the metal, as before."

[illegible] -Safety Experiment No. 4

	[illegible]	[illegible]
DATE:	[illegible] 1957	15 Jan 1958
TIME:	[illegible]	[illegible]

[illegible]

SITE: [illegible]

[illegible]

[illegible]

[illegible]

REMARKS:

The results fallout pattern was obtained by ground survey and by scientific projects [illegible] thoroughly masked [illegible] The $t^{-1.2}$ decay approximation was used to extrapolate [illegible] H+1 hour. Extensive alpha contamination was encountered. An alpha concentration of 1,000 dis/min/ft^2 correlated with the [illegible] r/hr at H+1 hour [illegible] station 8 [illegible], and also with the 10 mr/hr at H+1 hour ground contour further [illegible].

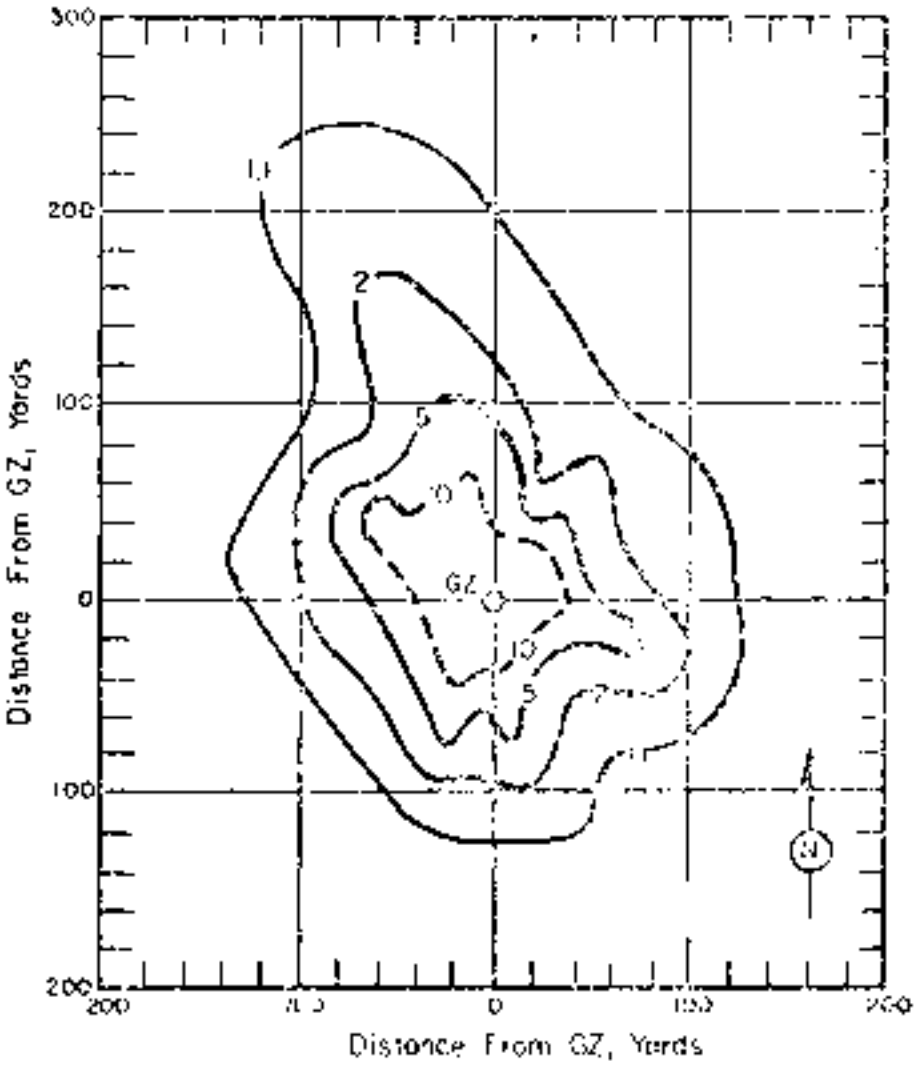
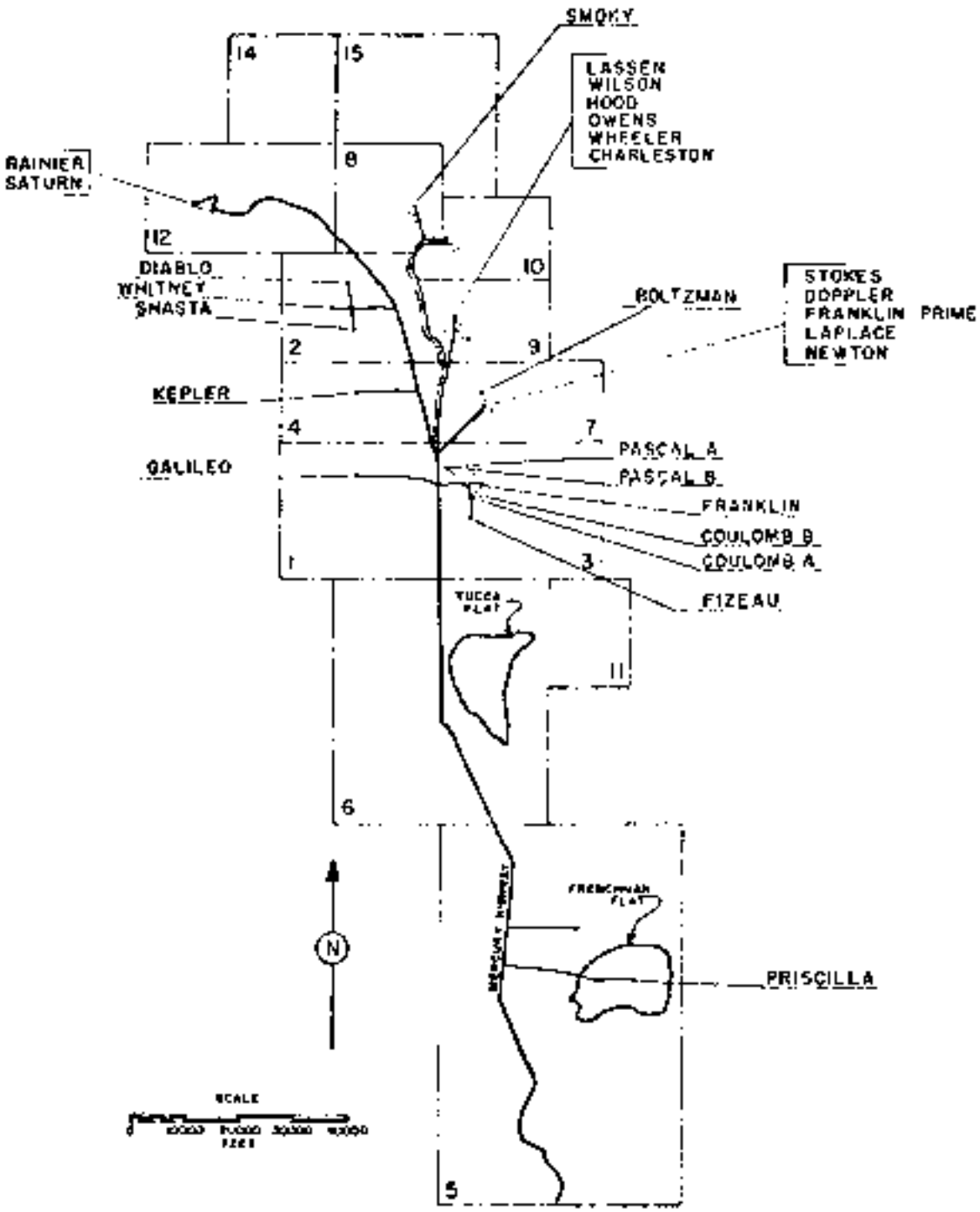


Figure 163. [illegible] - Safety Experiment No. 4 [illegible]
[illegible]



NEVADA TEST SITE

Figure 1o4. Operation PLUMBBOB, Shot Locations.

OPERATION PLUMBBOB - Safety Experiment No. 5 - 57 Test Group

	PDT	GMT
DATE:	24 April 1957	24 April 1957
TIME:	0627	1327

Sponsor: [illegible] - DOD

SITE: NTS - Area 13

Site elevation: [illegible]

HEIGHT OF BURST: Surface

TYPE OF NUCLEAR DETONATION:

Surface [illegible]

CLOUD TOP HEIGHT: [illegible]

CLOUD BOTTOM HEIGHT: [illegible]

REMARKS:

Only alpha contamination was [illegible]. This survey was made with the project's [illegible] (PAC-1S) [illegible]. The concrete pads were placed over [illegible]. The [illegible] survey [illegible] were [illegible] analyses of the [illegible].

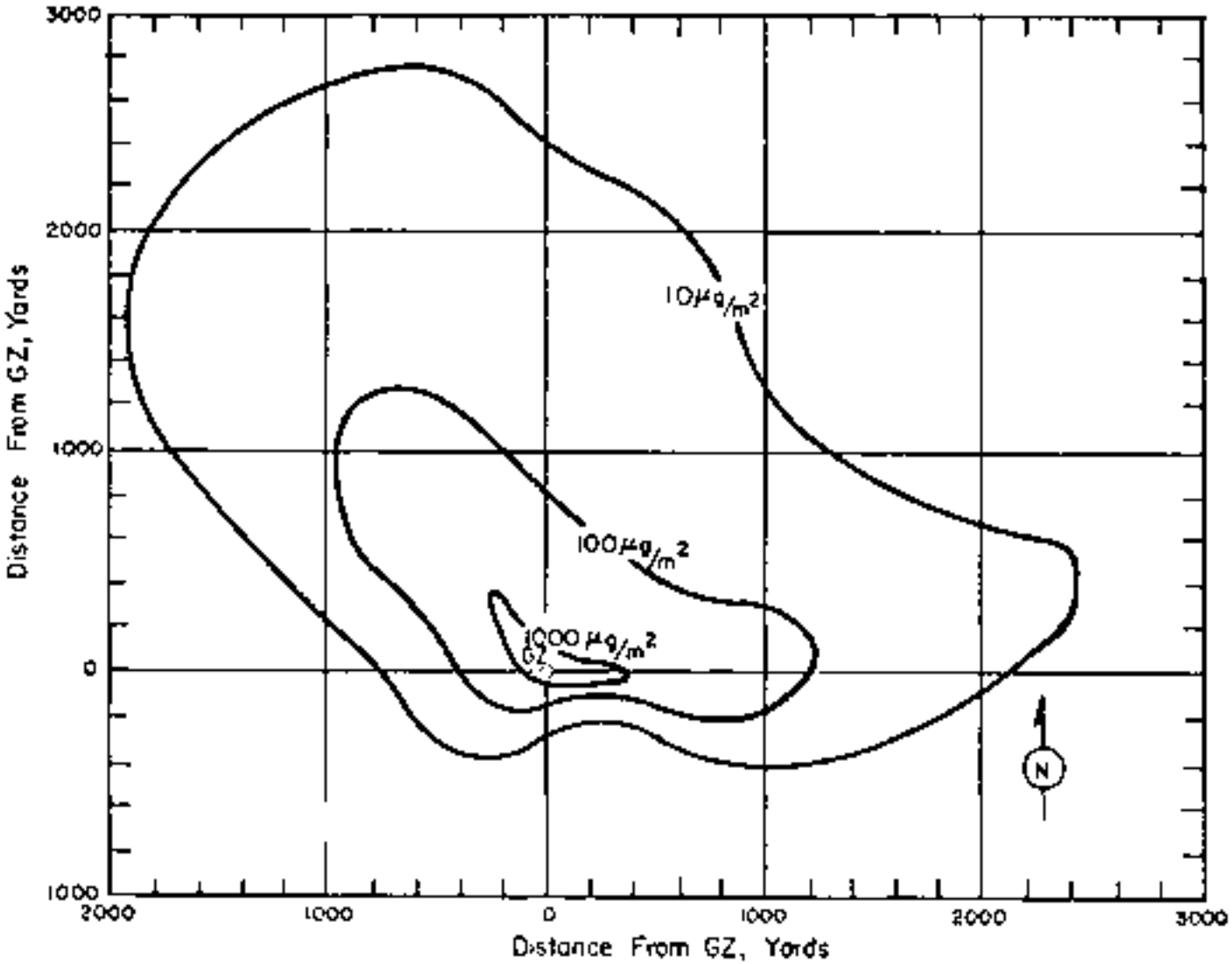


Figure 106. Operation PLUMBBOB - Safety Experiment No. 5 - 57 Test Group. On-site alpha contamination in micrograms per square meter.

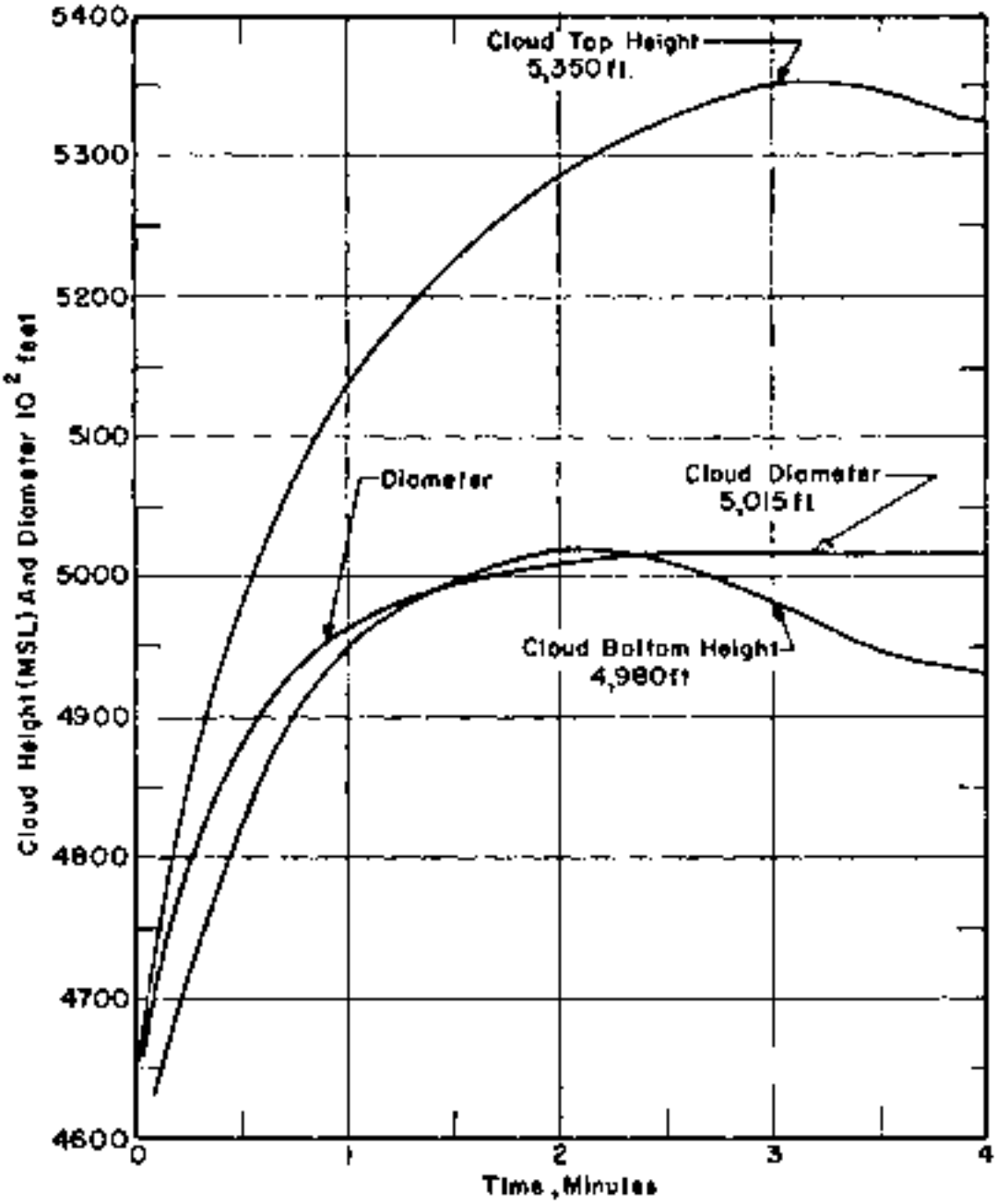


Figure 166. Cloud Dimensions: Operation PLUMBOB
Safety Experiment No. 5 - 57 Test Group

Wind velocities were measured using theodolites at two stations during the period H-2 hours to H+1 hours. Light winds (2 to 6 miles per hour) and high shear existed during the period of observation for the height curve, surface to 100,000 feet. The resulting hodographs from the two stations differ markedly from each other and are not correlated with the observed nuclear contamination pattern. Probably the best description of the wind structure is provided by a reconstruction based upon ground and aerial photography of the cloud. The hodograph shown in Figure 27 is based upon these photographic observations.

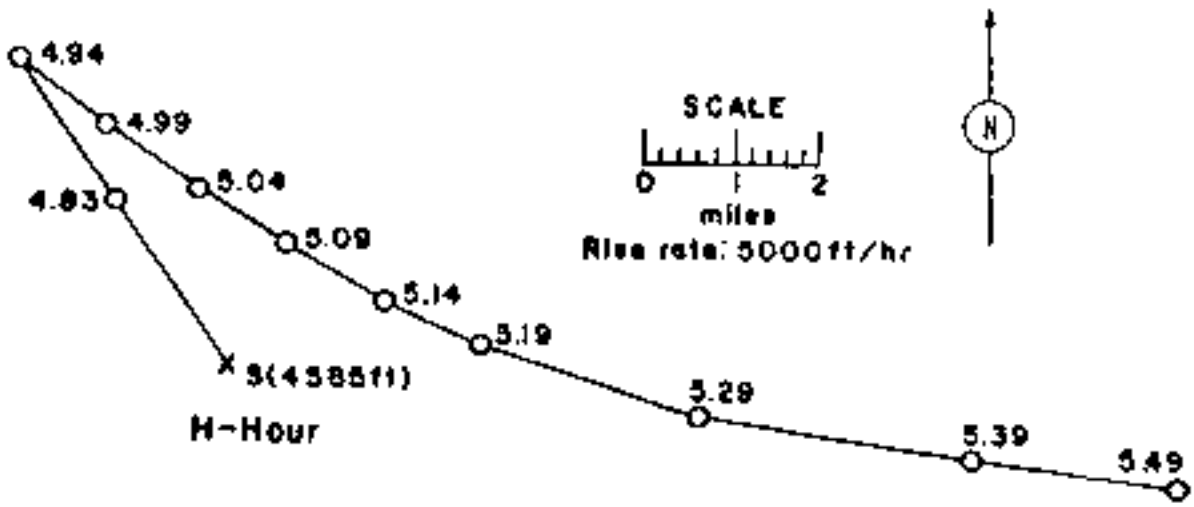


Figure 107. Hodograph for Operation FLINTLOCK
Safety Experiment No. 5 - 57 Test Group.

OPERATION [illegible] - [illegible]

	PDT	GMT
DATE:	[illegible]	[illegible] May [illegible]
TIME:	[illegible]	[illegible]

TOTAL YIELD: 12 kt

FIREBALL DATA: [illegible]

[illegible]

[illegible]

Sponsor: [illegible]

SITE: [illegible]

[illegible] N

[illegible] W

Site elevation: [illegible]

HEIGHT OF BURST: [illegible]

TYPE OF DETONATION: [illegible]

Tower [illegible]

CLOUD TOP HEIGHT: [illegible]

CLOUD BOTTOM HEIGHT: [illegible]

[illegible]: [illegible]

REMARKS:

[illegible] by the [illegible] survey [illegible] approximately [illegible] decay rates.

The off-site fallout pattern was analyzed by [illegible]. Actual survey data were used to plot the [illegible]. The $t^{-1.2}$ decay approximation was used by [illegible] readings to [illegible]. The [illegible] iso-intensity contours from [illegible]. The [illegible] "hot spot", [illegible] ately downwind of [illegible] vicinity at the time the fallout occurred.

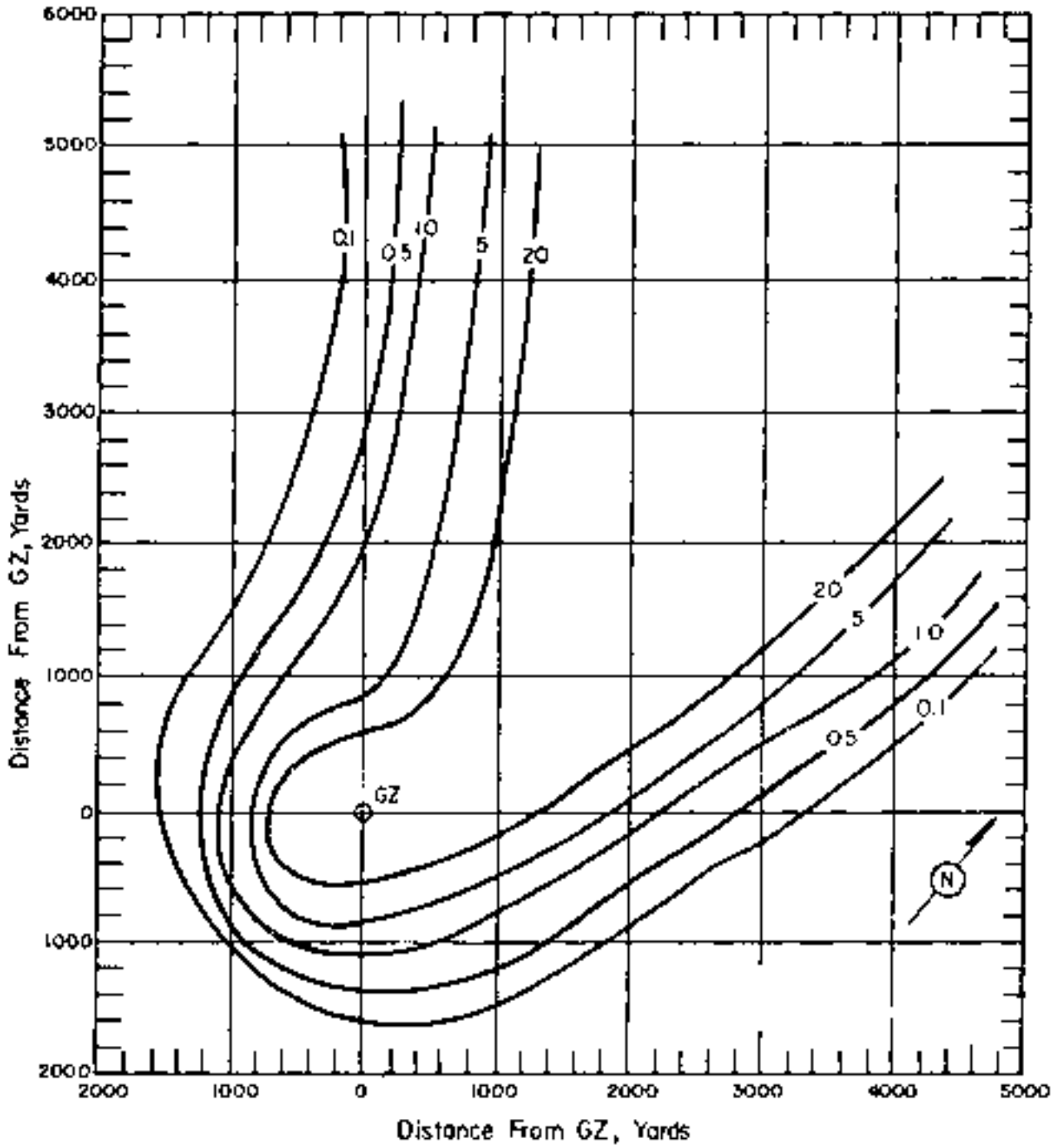


Figure 168. Operation PLUMBBOB - Boltzmann.
On-site dose rate contours in r/hr at [illegible] hour.

Figure 10f. Operation PLUMBBOB - Boltzmann. Off-site dose rate contours in r/hr at H+1 hour.

TABLE 47 NEVADA WIND DATA FOR OPERATION [illegible] SOLITAIRE

Altitude (MSL)	Wind				Altitude (MSL)	Wind			
Feet	Direction	Knots	Velocity	Mph	Feet	Direction	Knots	Velocity	Mph
Surface	Calm	Calm	210	60	28,000	[illegible]	15	---	--
5,000	Calm	Calm	230	67	29,000	[illegible]	17	---	--
6,000	Calm	Calm	240	77	30,000	[illegible]	24	160	15
7,000	Calm	Calm	250	63	31,000	[illegible]	25	---	--
8,000	200	1	250	69	32,000	[illegible]	29	---	--
9,000	190	15	250	14	33,000	[illegible]	28	---	--
10,000	190	7	240	15	34,000	[illegible]	27	---	--
11,000	190	17	---	--	35,000	[illegible]	29	5	10
12,000	190	19	190	16	36,000	[illegible]	30	---	--
13,000	200	20	---	--	37,000	[illegible]	31	---	--
14,000	190	21	190	25	38,000	[illegible]	32	---	--
15,000	190	24	(170)	(24)	39,000	[illegible]	33	---	--
16,000	190	25	190	30	40,000	[illegible]	34	210	21
17,000	190	24	---	--	41,000	[illegible]	35	---	--
18,000	190	23	180	33	42,000	[illegible]	36	---	--
19,000	190	26	---	--	43,000	[illegible]	37	---	--
20,000	190	28	190	29	44,000	[illegible]	38	---	--
21,000	190	29	---	--	45,000	[illegible]	39	290	37
22,000	190	30	---	--	46,000	[illegible]	40	---	--
23,000	190	29	190	26	47,000	[illegible]	39	---	--
24,000	190	30	---	--	48,000	[illegible]	38	---	--
25,000	190	32	190	22	49,000	[illegible]	37	---	--
26,000	190	31	---	--	50,000	[illegible]	35	310	32
27,000	190	33	---	--	51,000	[illegible]	34	---	--

NOTES:

1. Numbers in parentheses are estimated values.
2. Wind data was obtained from the Yucca weather station.
3. Tropopause height was 51,000 ft MSL.
4. At detonation the surface air pressure was 841 mb, the temperature 18.1°C, the dew point -4.5°C and the relative humidity 4%.

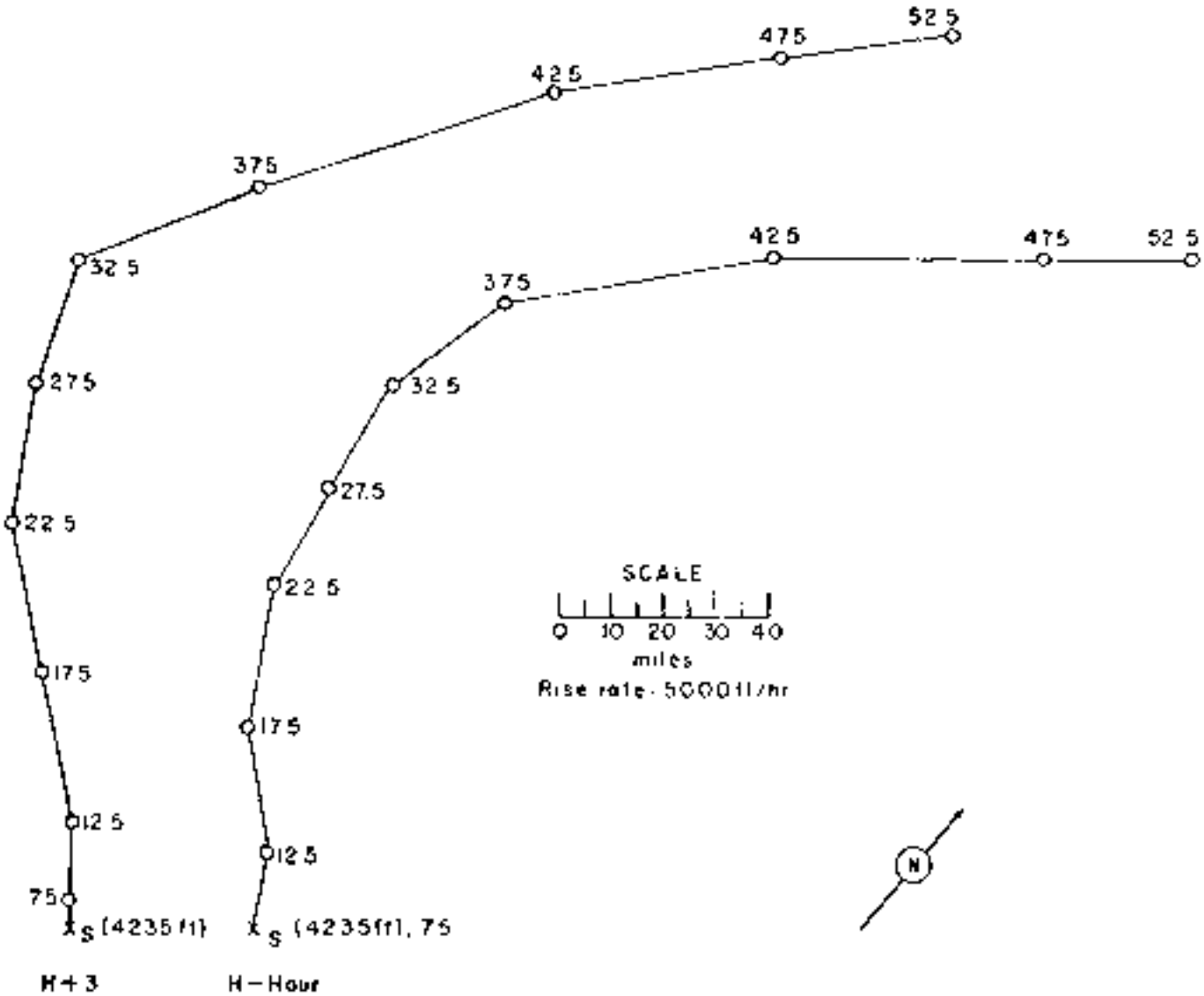


Figure 170. Hodographs for Operation HUMBOB - Boltzmann.

OPERATION PLUMBBOB - Franklin

	PST	GMT
DATE:	2 Jun 1957	2 Jun 1957
TIME:	0355	1155

TOTAL YIELD: 140 tons

FIREBALL DATA:
Time to 1st minimum: NM
Time to 2nd maximum: NM
Radius at 2nd maximum: NM

Sponsor: LASL

SITE: NTS - [illegible]
[illegible]
[illegible]
[illegible]

HEIGHT OF BURST: [illegible]

TYPE OF [illegible]:
[illegible]

CLOUD TOP HEIGHT: [illegible]
CLOUD BOTTOM HEIGHT: [illegible]

CRATER DATA: [illegible]

REMARKS:

The pattern was [illegible] Safety [illegible] AN/PDR [illegible] radiation [illegible]. The dose-rate [illegible] H+1 hour using actual dose-rate decay data.

No offsite fallout was observed.

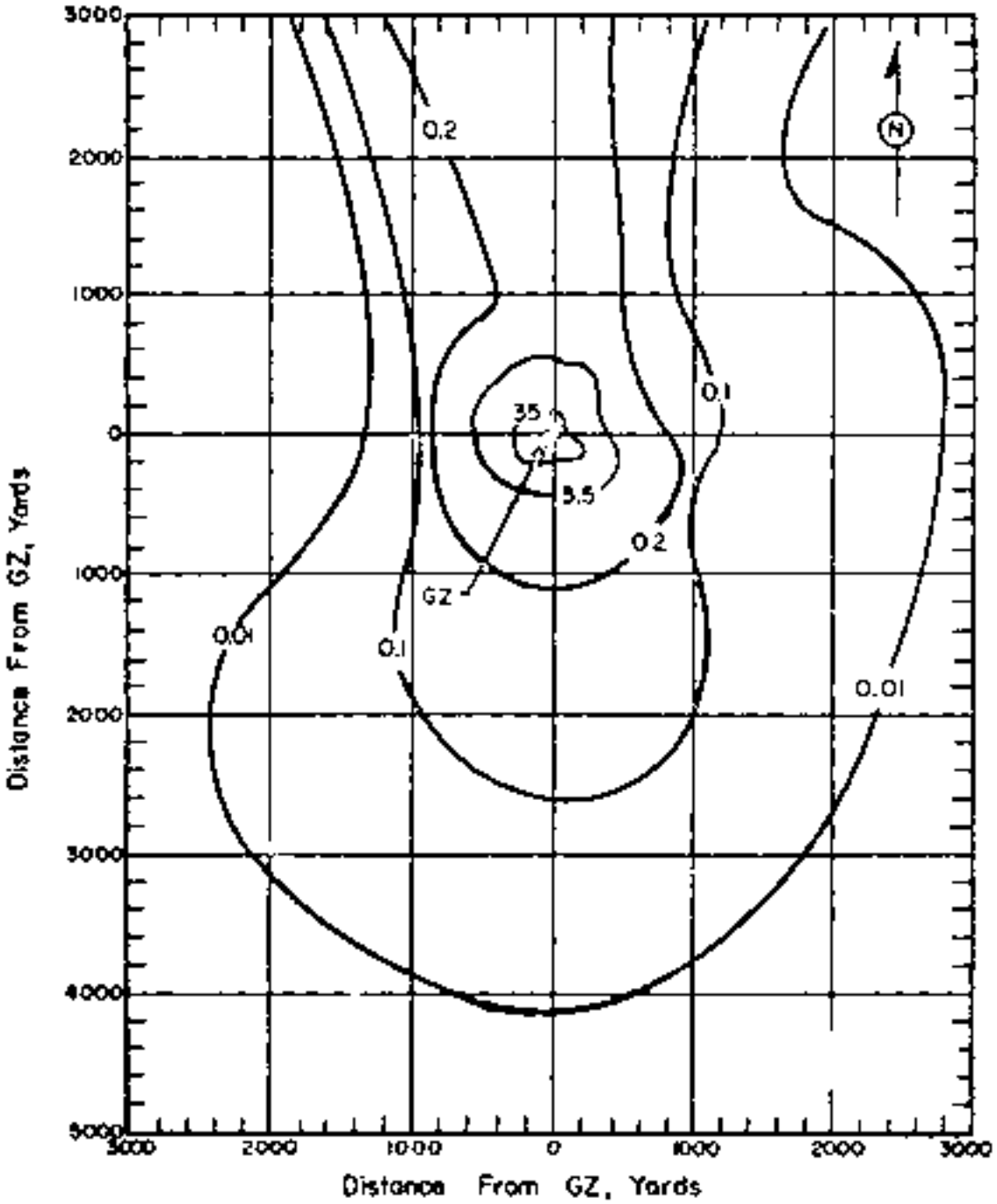


Figure 171. Operation [illegible] - Franklin
On-site dose rate contours in r/hr at H+1 hour.

TABLE #8 [illegible]

Altitude (MSL) Feet	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible] degrees	[illegible]	[illegible]	[illegible]
Surface	[illegible]	[illegible]	[illegible]	[illegible]
5,000	[illegible]	[illegible]	[illegible]	[illegible]
6,000	[illegible]	[illegible]	[illegible]	[illegible]
7,000	[illegible]	[illegible]	[illegible]	[illegible]
8,000	[illegible]	[illegible]	[illegible]	[illegible]
9,000	[illegible]	[illegible]	[illegible]	[illegible]
10,000	[illegible]	[illegible]	[illegible]	[illegible]
11,000	[illegible]	[illegible]	[illegible]	[illegible]
12,000	[illegible]	[illegible]	[illegible]	[illegible]
13,000	[illegible]	[illegible]	[illegible]	[illegible]
14,000	[illegible]	[illegible]	[illegible]	[illegible]
15,000	[illegible]	[illegible]	[illegible]	[illegible]
16,000	[illegible]	[illegible]	[illegible]	[illegible]
17,000	[illegible]	[illegible]	[illegible]	[illegible]
18,000	[illegible]	[illegible]	[illegible]	[illegible]
19,000	[illegible]	[illegible]	[illegible]	[illegible]
20,000	[illegible]	[illegible]	[illegible]	[illegible]
21,000	[illegible]	[illegible]	[illegible]	[illegible]
22,000	[illegible]	[illegible]	[illegible]	[illegible]
23,000	[illegible]	[illegible]	[illegible]	[illegible]
24,000	[illegible]	[illegible]	[illegible]	[illegible]
25,000	[illegible]	[illegible]	[illegible]	[illegible]
26,000	[illegible]	[illegible]	[illegible]	[illegible]
27,000	[illegible]	[illegible]	[illegible]	[illegible]
28,000	[illegible]	[illegible]	[illegible]	[illegible]
29,000	[illegible]	[illegible]	[illegible]	[illegible]
30,000	300	29	300	21
40,000	320	31	320	20
50,000	280	34	290	31

NOTES:

1. [illegible]
2. Wind data was obtained from the Denver weather station.
3. At the station [illegible] the pressure was 24.92 in., the temperature 14.0°C, the dew point 3.0°C, and the relative humidity [illegible].

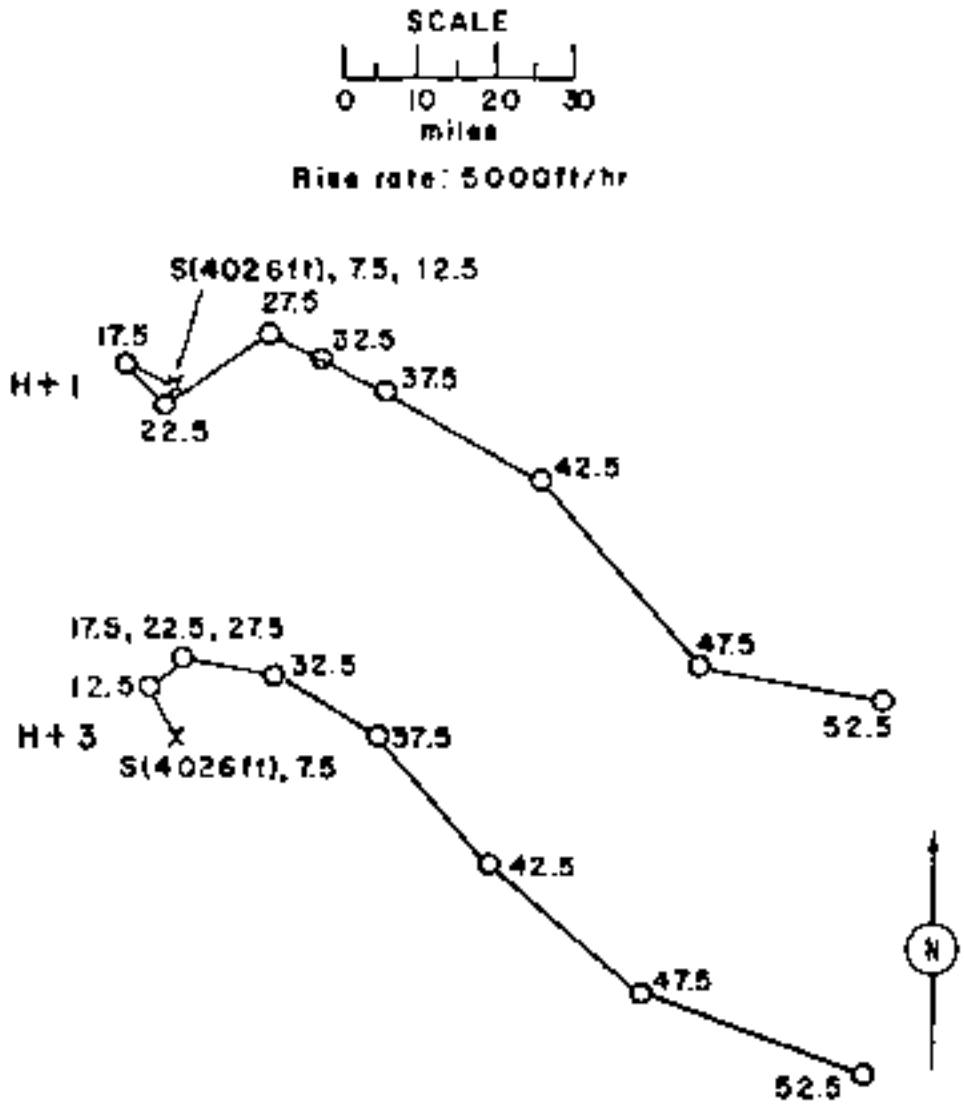


Figure 172. Hodographs for Operation PLUMBOB - Franklin.

OPERATION PLUMBBOB - Lassen

	PDT	GMT
DATE:	5 Jun 1957	5 Jun 1957
TIME:	[illegible]	1145

TOTAL YIELD: 0.5 tons

FIREBALL DATA:
Time to 1st minimum: NR
Time to 2nd maximum: NR
Radius at 2nd maximum: NR

CLOUD DATA: Not reported

Sponsor: UCRL

SITE: NTS - Area 9
37° [illegible] N
116° [illegible] W
Site [illegible]

HEIGHT OF BURST: [illegible]

TYPE OF [illegible]:
[illegible]
[illegible]

SCALED [illegible]: [illegible]
SCALED [illegible]: NR

REMARKS:

The activity is primarily induced activity. The on-site pattern was obtained from H+1 hr to ground survey readings of the Radiological Safety Division of Reynolds Electrical and Engineering Co., Inc., using AN/PDR-39 and AN/PDR-[illegible] survey instruments. No decay corrections were necessary. The pattern is fairly reliable.

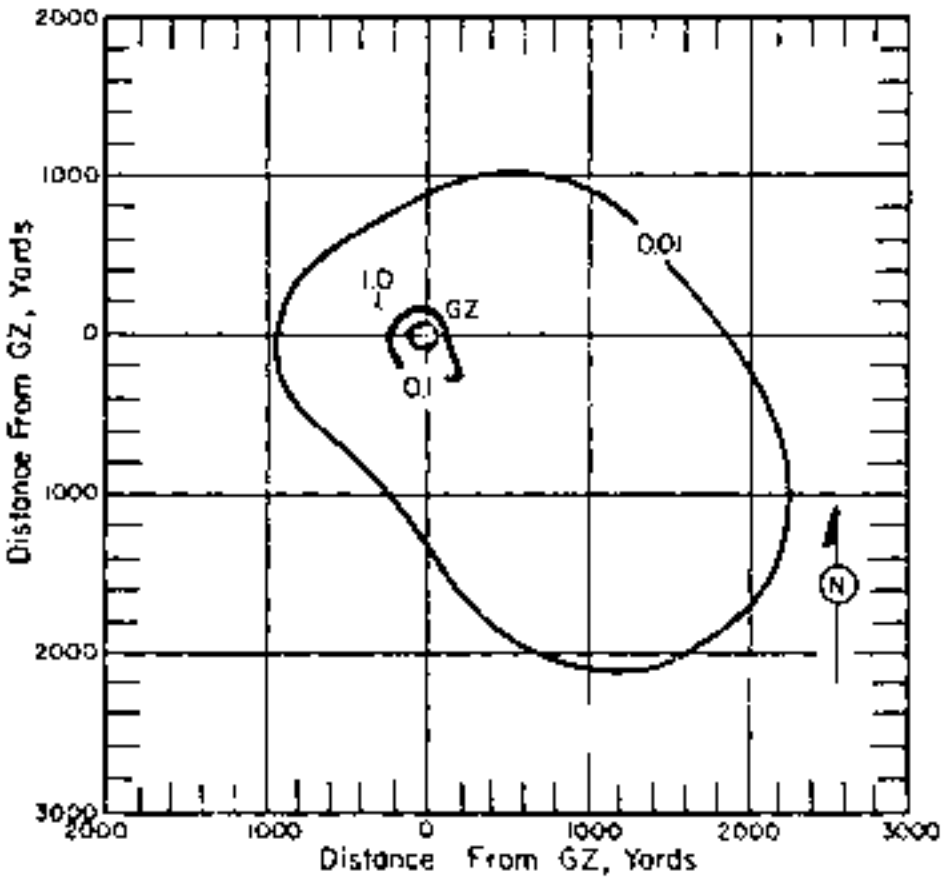


Figure 173. Operation [illegible] - [illegible] On-site dose rate contours in r/hr at 3+1 hours.

TABLE 49 NEVADA WIND DATA FOR OBLIGATION TECHNIQUE- [illegible]

Altitude (MSL)	8-hour		20 Minute	
	Direction	Velocity	Direction	Velocity
Surface	Calm	Calm	Calm	Calm
4,700	290	06	---	--
5,000	290	07	330	08
6,000	290	09	300	17
7,000	270	09	290	16
8,000	270	09	270	16
9,000	270	09	290	17
10,000	270	09	290	17
11,000	270	10	(270)	(17)
12,000	270	09	270	31
13,000	270	07	---	--
14,000	270	08	280	21
15,000	270	07	---	--
16,000	270	07	260	20
17,000	180	07	---	--
18,000	270	07	290	14
19,000	270	10	---	--
20,000	270	10	270	21
21,000	270	11	---	--
22,000	270	11	---	--
23,000	260	13	270	23
24,000	270	16	---	--
25,000	270	16	260	25
30,000	270	16	---	--
35,000	260	18	---	--
40,000	250	26	---	--
45,000	300	29	---	--
50,000	300	34	---	--

NOTES:

1. Numbers in parentheses are estimated values.
2. Tropopause height was 42,000 ft MSL at 8-hour.
3. Wind Data was obtained from the Yucca weather station.
4. At 8:01 hour the surface air pressure was 8.3 mb, the temperature 23.3°C, the dew point 9.5°C and the relative humidity 40%.

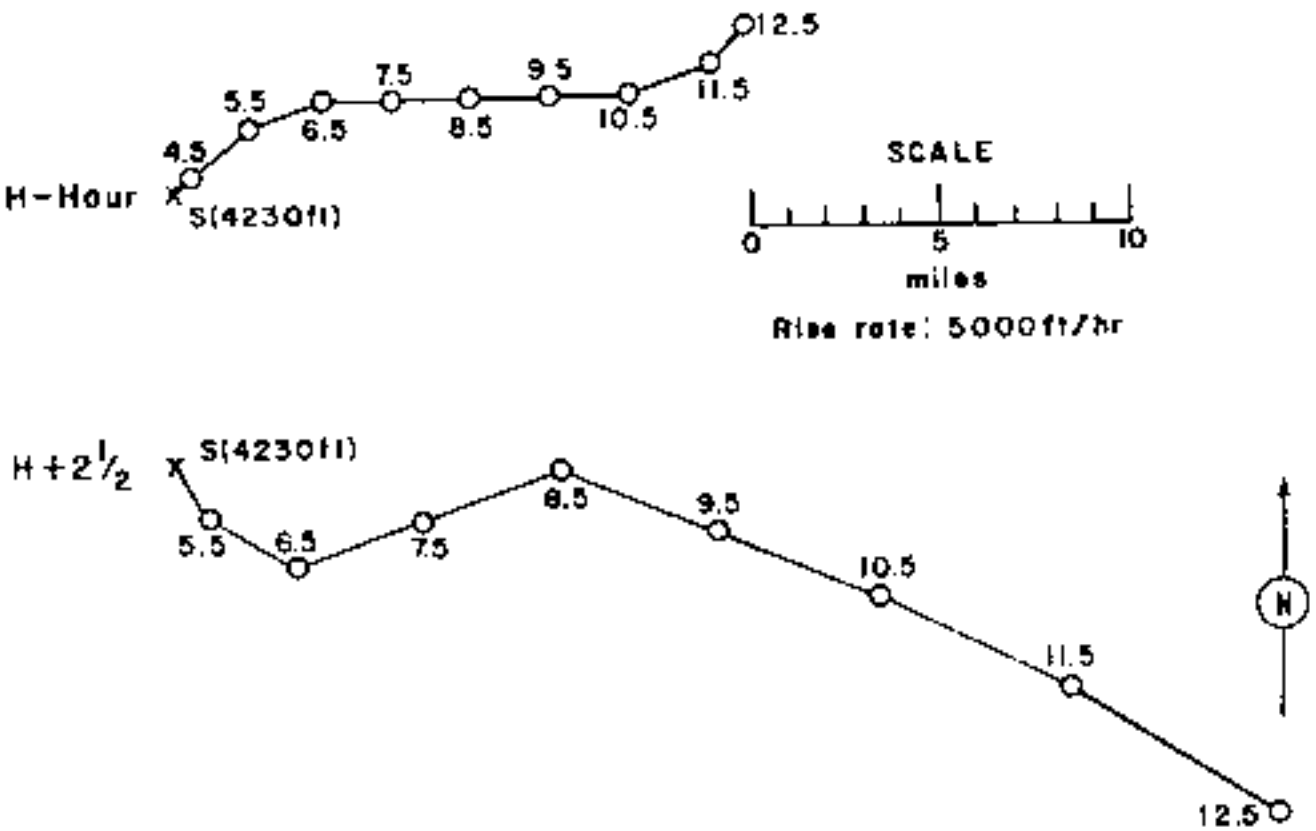


Figure 174. Radiograph for Operation FLUMMOX - Lassen.

OPERATION PLUMBBOB - Wilson

	PDT	GMT
DATE:	18 Jun 1957	18 Jun 1957
TIME:	0445	1145

TOTAL YIELD: 10 kt

FIREBALL DATA:
Time to 1st minimum: NA
Time to 2nd maximum: [illegible] msec
Radius at 2nd max: NA

CRATER DATA: No crater

Sponsor: UCRL

SITE: NTS - Area 9
37° [illegible] N
116° [illegible] W
Site elevation: [illegible] ft

HEIGHT OF BURST: [illegible] ft

TYPE OF SOIL AT GROUND ZERO:
[illegible]
Nevada [illegible]

CLOUD TOP HEIGHT: [illegible] ft MSL
CLOUD BOTTOM HEIGHT: [illegible] ft MSL

SUMMARY:

On-site contamination was primarily due to induced activity. The on-site pattern was obtained from ground survey readings of the Radiological Safety Division of Reynolds Electrical and Engineering Co., Inc., using AN/PDR-39 and AN/PDR-T1B survey instruments. The readings were taken at H+1 hours, D+1 day, D+2 days and D+3 days along the radial roads to determine radiation exclusion areas. The H+1 hour readings are not reliable because the induced-activity decay curve is not strictly applicable to a mixture of fission products and induced activities. Decay measurements indicated a decay rate similar to $t^{-1.4}$ for distances out to 1,200 yards from GZ. The off-site fallout was analyzed by Program 37 of UCRL and the USWB Special Projects Section. They used actual decay data to plot the H+12 hour dose-rate contours. The $t^{-1.2}$ decay approximation was used by USWB to extrapolate the H+12 hour dose-rate contours to H+1 hour. The times of arrival were estimated from the wind data.

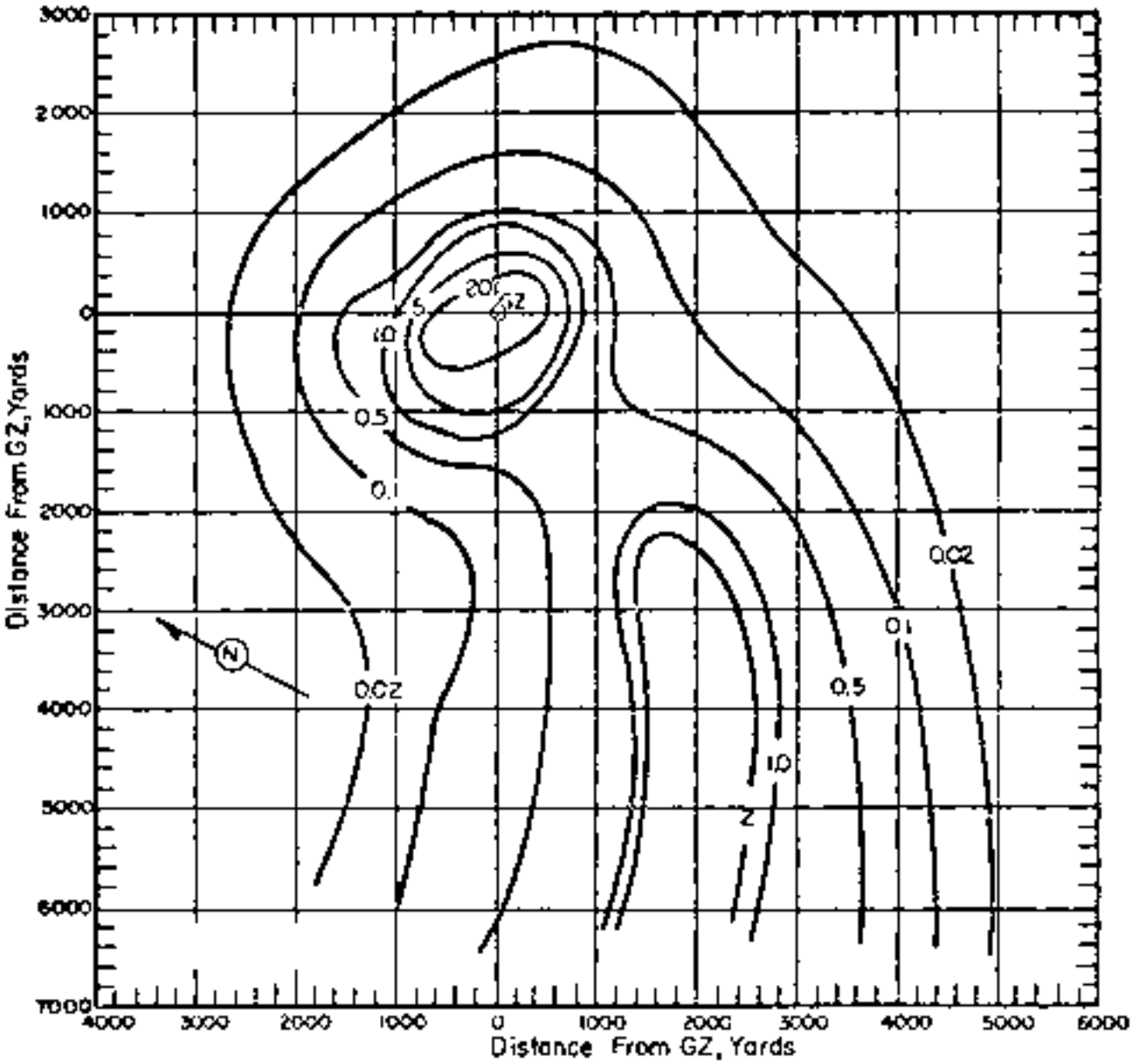


Figure 175. Operation PLUMBBOB - Wilson. On-site dose rate contours in r/hr at H+1 hour.

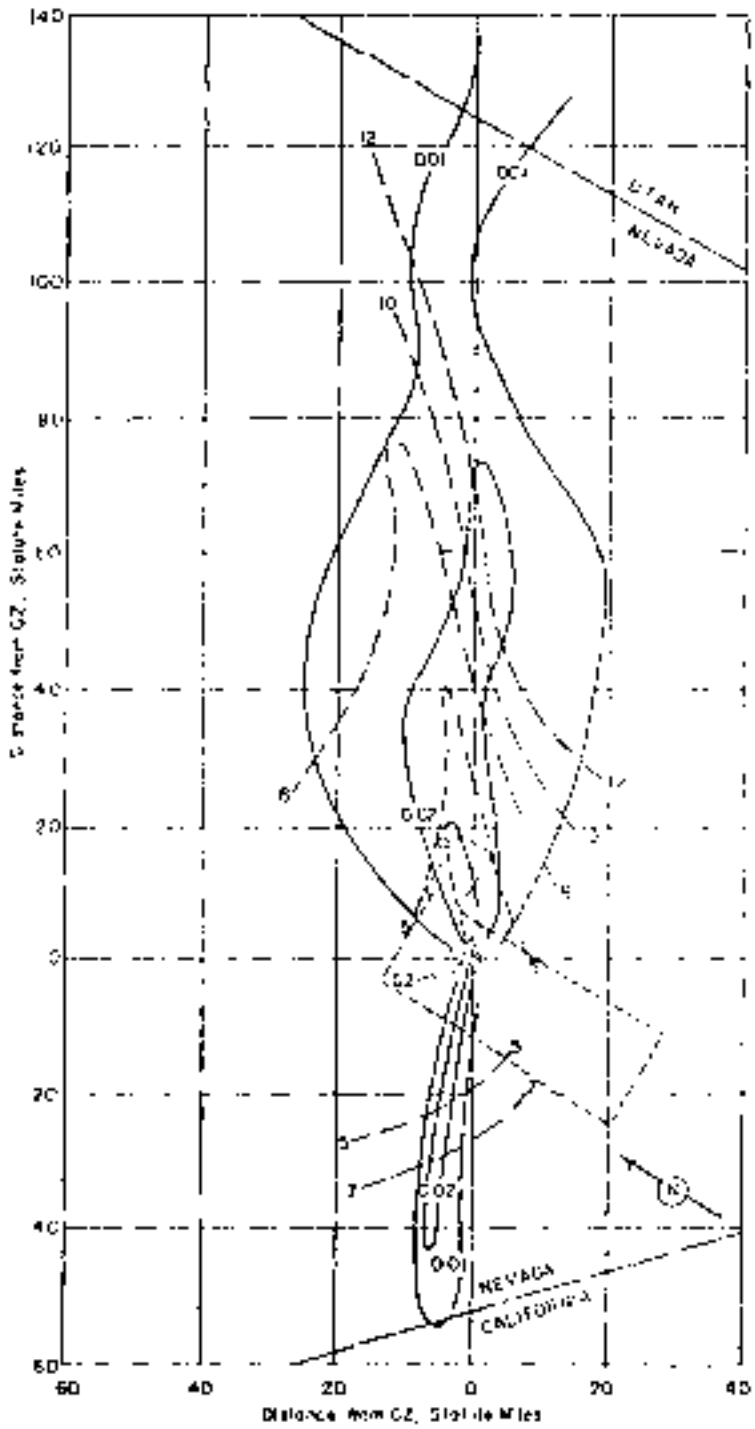


Figure 176. Operation FLUMBROOK - Wilson. Off-site dose rate contours in r/hr at 141 hour.

TABLE 50 SUMMARY OF DATA ON SELECTED PESTICIDES [illegible]

Pesticide	Soil		Crop		Animal				
	Number of samples	Number of positives	Number of samples	Number of positives	Number of samples	Number of positives	Maximum concentration found	Geometric mean	Arithmetic mean
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

NOTES:

1/ Number of positive samples with quantifiable residues.

2/ Total number of samples analyzed for presence of pesticide residues.

3/ Highest concentration found in positive samples, expressed in parts per million (ppm).

4/ Geometric mean and arithmetic mean concentrations are calculated only for positive samples.

5/ Not detected at the limit of sensitivity of the analytical method used.

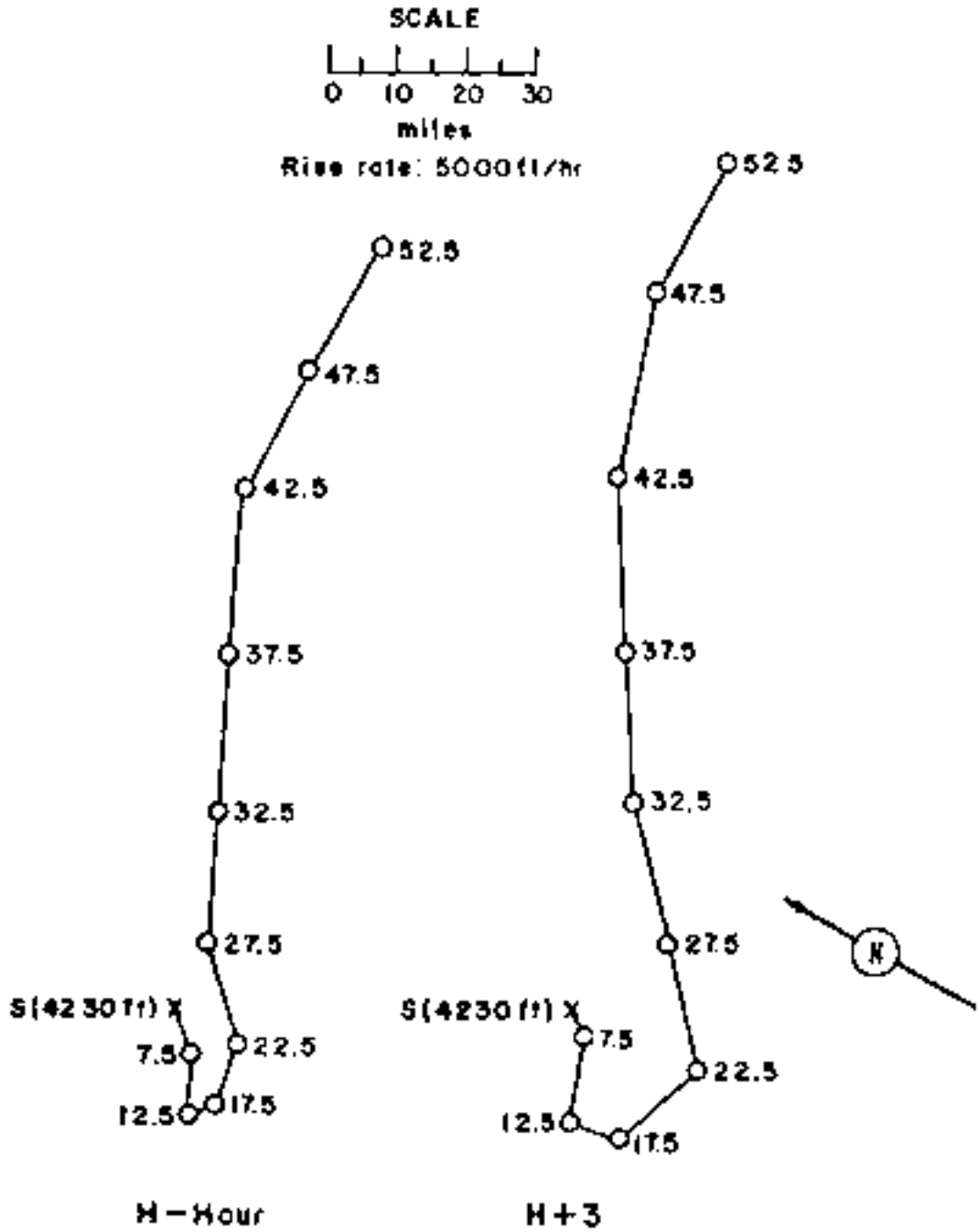


Figure 177. Hodographs for Operation [illegible] - Wilson.

OPERATION PLUMBBOB - Priscilla

	PDT	GMT
DATE:	24 June 1957	24 June 1957
TIME:	0630	1330

TOTAL YIELD: 37 kt

FIREBALL DATA:
Time to 1st maximum: [illegible]
Time to 2nd maximum: [illegible]
Radius at 2nd maximum: [illegible]

CRATER DATA: No crater

Sponsor: LASL - DOD

SITE: [illegible]
[illegible]
[illegible]
[illegible]

HEIGHT: [illegible]

[illegible]:
[illegible]
[illegible]

CLOUD TOP HEIGHT: [illegible]
CLOUD BOTTOM HEIGHT: [illegible]

REMARKS:

On-site contamination was [illegible] primarily [illegible]. The [illegible] dose-rate contours were obtained from [illegible] surveys [illegible] Safety Division of Reynolds Electrical and Engineering Company, Inc., and from aerial surveys of [illegible] program using AN/PDR-[illegible] and AN/PDR-[illegible] survey instruments. The readings were taken at [illegible] D+[illegible] days and D+7 days along eight radial [illegible] to determine [illegible] areas. The [illegible] activity decay [illegible] was used to extrapolate the dose-rate readings to H+1 hour. The dose-rate readings are not reliable because the [illegible] activity decay [illegible] is not strictly applicable to a mixture of fission products and induced activities. Decay measurements indicated a decay rate similar to Na^{24} for distances out to 1,700 yards from ground zero.

The off-site fallout was analyzed by Program [illegible] of [illegible] and the USPHS Special Projects Section. They used actual decay data to plot the H+1-hour dose-rate contours. The $t^{-1.2}$ decay approximation was used by [illegible] to extrapolate the H+[illegible] hour dose-rate contours to H+1 hour. The intensity contours are based on ground and aerial survey data, but the shapes of the [illegible] contours were estimated due to lack of data. The estimation of time of arrival was done by using measured arrival times at known points.

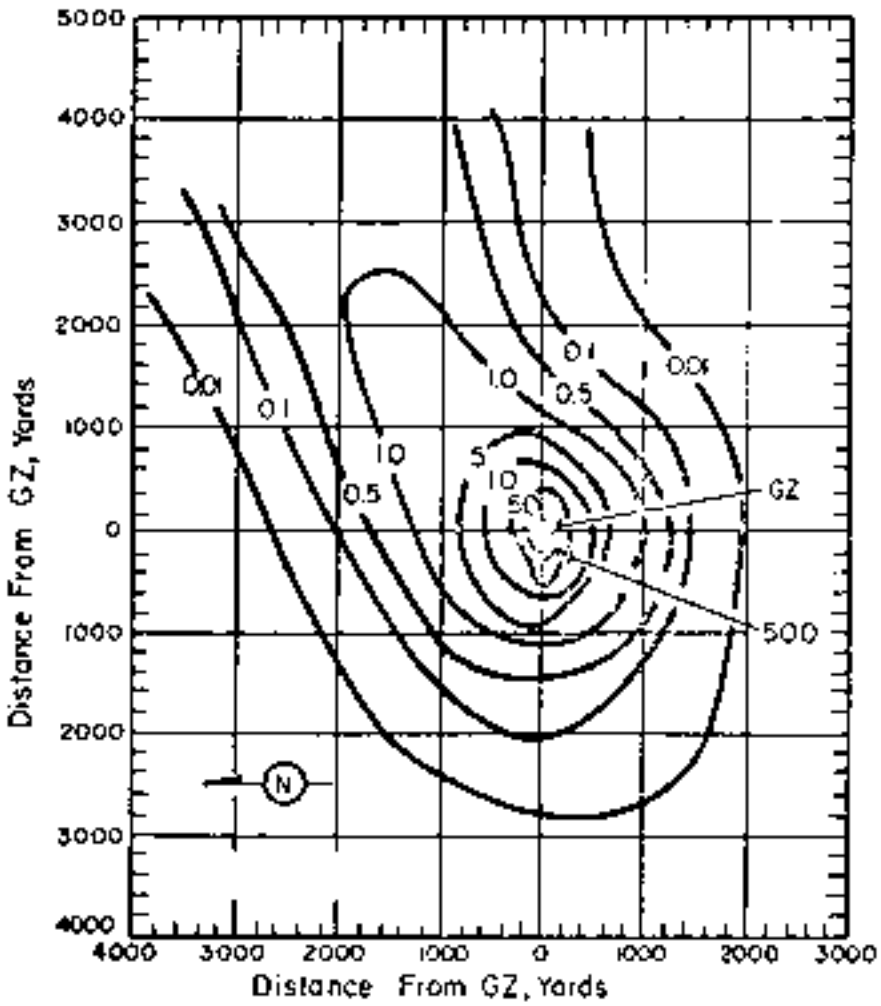


Figure 178. Operation PLUMBBOB - Priscilla. On-site dose rate contours in r/hr at H+1 hour.

Figure 179. Operation PLUMBBOB - Priscilla. Off-site dose rate contours in r/hr at H+2 hour.

TABLE 51 [illegible]

Altitude (MSL)	[illegible]		[illegible]	
Feet	[illegible]	[illegible]	[illegible]	[illegible]
Overhead	Calm	Calm	280	05
5,000	Calm	Calm	280	09
5,000	270	03	290	02
6,000	310	07	310	09
7,000	320	07	290	07
8,000	290	04	280	07
9,000	310	04	310	07
10,000	290	09	310	09
11,000	290	07	---	--
12,000	280	07	280	07
13,000	270	07	---	--
14,000	270	04	280	07
15,000	270	07	(270)	(06)
16,000	270	07	270	07
17,000	270	11	---	--
18,000	270	13	270	10
19,000	270	09	270	14
20,000	270	11	---	--
21,000	270	11	---	--
22,000	270	11	270	14
23,000	270	13	---	--
24,000	270	14	270	16
25,000	270	13	---	--
27,000	270	16	---	--
28,000	270	17	---	--

Altitude (MSL)	[illegible]		[illegible]	
Feet	[illegible]	[illegible]	[illegible]	[illegible]
29,000	270	17	---	--
30,000	270	17	270	17
31,000	270	17	---	--
32,000	270	17	---	--
34,000	270	17	---	--
35,000	270	17	---	--
36,000	270	17	---	--
37,000	270	17	---	--
38,000	270	17	---	--
39,000	270	17	---	--
40,000	270	17	270	17
41,000	270	17	---	--
42,000	270	17	---	--
43,000	270	17	---	--
44,000	270	17	---	--
45,000	270	17	---	--
46,000	270	17	---	--
47,000	270	17	---	--
48,000	270	17	---	--
49,000	270	17	---	--
50,000	270	17	---	--
53,000	270	17	---	--
54,000	270	17	---	--

NOTES:

1. Numbers in parentheses are estimated values.
2. Geographic coordinates are 41,01[illegible] N 90[illegible] W at Hebron.
3. Wind data was obtained from radiosonde observations at the Upper Montgomery Station and this data was supplemented by observations below 5,000 ft MSL over ground level.
4. At Hebron the surface air pressure was 29.[illegible] mb, the temperature was 27° ± 1°C, the dew point was 6.6°C and the relative humidity 24%.

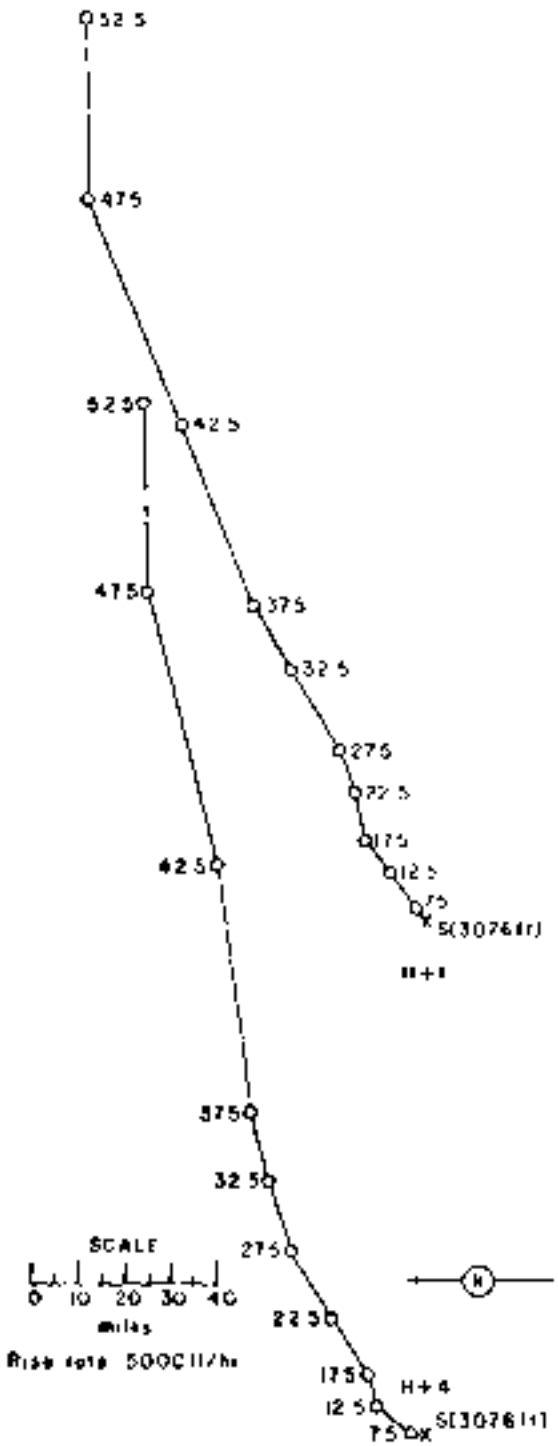


Figure 180. Hodographs for Operation PLUMBOB - Priscilla.

OPERATION [illegible] - Coulomb A Safety Experiment

Sponsor: LAS[illegible]

DATE: 1 JUL 195[illegible] 1 JUL 195[illegible]
TIME: [illegible] [illegible]

SITE: NTS - Area [illegible]
3[illegible]° [illegible]' [illegible]" N
11[illegible]° 0[illegible]' [illegible]" W
Site elevation [illegible] 4,0[illegible] ft

HEIGHT OF BURST: [illegible]

TYPE OF DETONATION: [illegible]
[illegible]

CLASS. [illegible]
CLASS. [illegible]

REMARKS:

An [illegible] in this area.

OPERATIONAL SUMMARY - [illegible]

	PST	GMT
DATE:	[illegible]	[illegible]
TIME:	[illegible]	[illegible]

TOTAL VALUE: 74 kt

PARTIAL LOSS:
Tie [illegible] elevation: 30
Tie [illegible] maximum: 25% to 50% above
height of [illegible] maximum: 30

CHARTER TOTAL: [illegible]

Sponsored [illegible]

SITE: [illegible] - Arizona
[illegible]° [illegible]' N
110° [illegible]' W
Site elevation: [illegible]

RECORD OF EVENTS: [illegible]

[illegible] AND ASSESSMENT
Assumption [illegible]
Network [illegible]

DATE [illegible]
[illegible]

REMARKS:

On-site contamination was due primarily to [illegible]. The on-site clean-up was [illegible] of Region [illegible] and Engineering Company, [illegible] for [illegible] and [illegible]. The remedial [illegible] was [illegible] days. The [illegible] was [illegible] hour. The results were taken to the north and west of [illegible] because of [illegible] to not [illegible] than [illegible] by the detonation. The off-site fallout was analyzed by Personnel [illegible] and the DOE Special Projects Section. They used actual survey data to plot the [illegible] contours. The 1.5 [illegible] was used by DOE to extrapolate the [illegible] hour dose-rate contours to [illegible] hours. The fallout pattern is based on ground and aerial survey data.

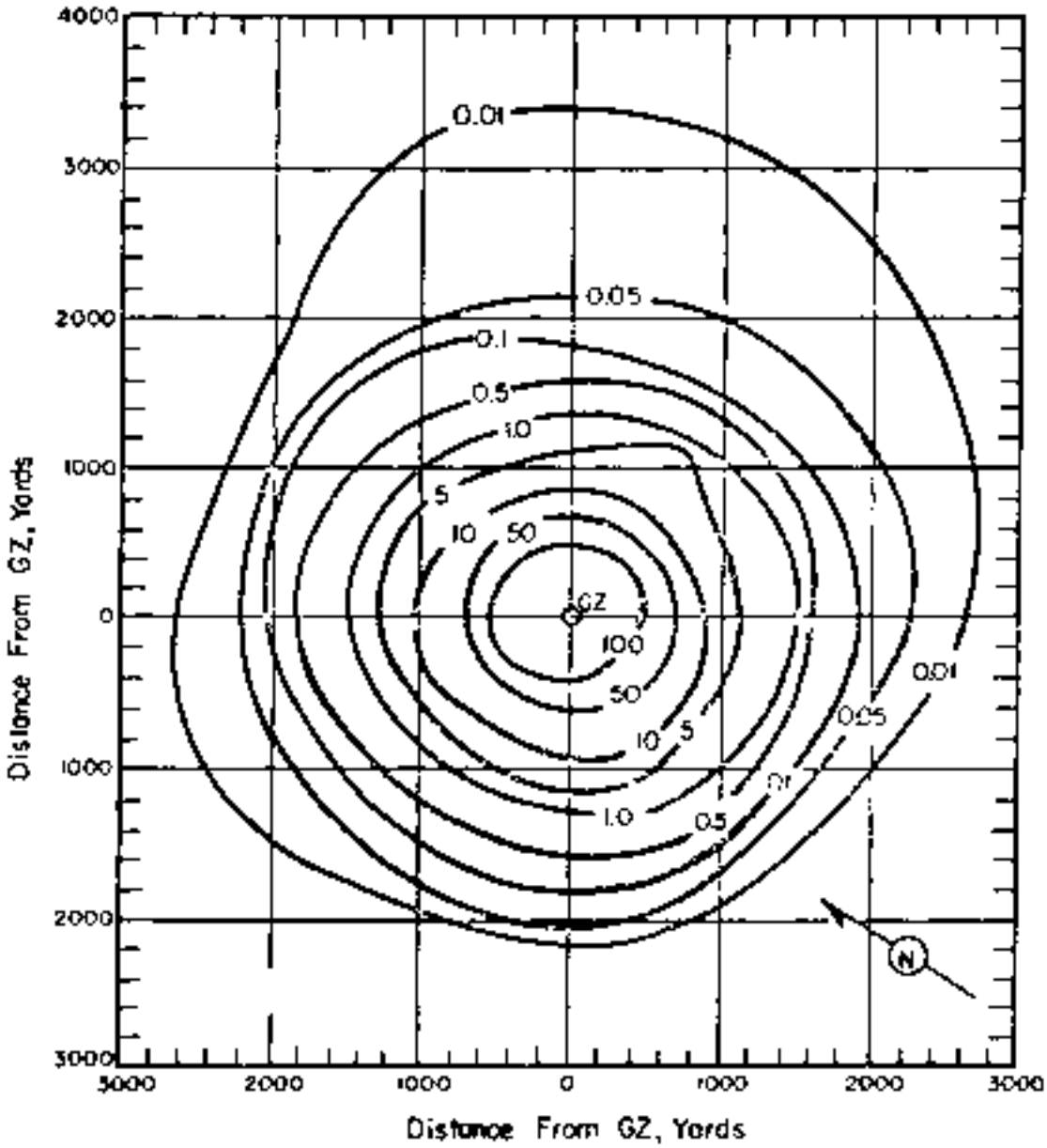


Figure 181. Operation PLUMBBOB - [illegible] Total On-site dose rate contours in r/hr at 24 hours.

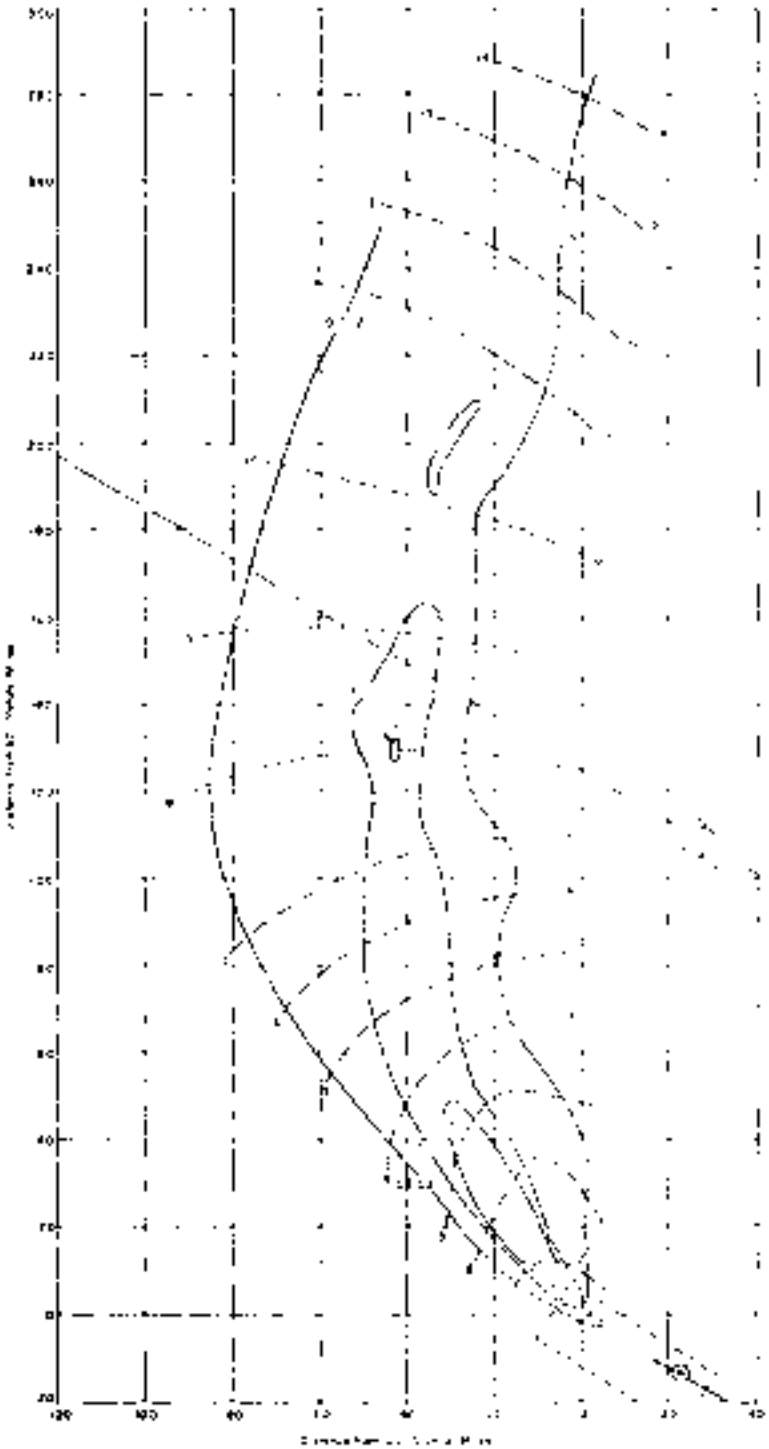


Figure 181. Operation PLUMBBOB - Hood. Off-site dose rate contours in r/hr at 1+2 hour.

TABLE 5.2 WIND DATA FOR THE [illegible] OBSERVATION STATION [illegible]

Altitude (ASL)	Header	
Feet	[illegible]	[illegible]
Surface	Calm	Calm
2,000	[illegible]	08
4,000	[illegible]	05
6,000	[illegible]	08
8,000	[illegible]	09
10,000	[illegible]	12
12,000	[illegible]	11
14,000	[illegible]	14
16,000	[illegible]	17
18,000	[illegible]	23
20,000	[illegible]	20
22,000	[illegible]	33
24,000	[illegible]	34
26,000	[illegible]	26
28,000	[illegible]	[illegible]
30,000	[illegible]	12
32,000	[illegible]	29
34,000	[illegible]	09
36,000	[illegible]	12
38,000	[illegible]	13
40,000	[illegible]	10
42,000	[illegible]	10
44,000	[illegible]	12
46,000	[illegible]	14

Altitude (MSL)	Header	
Feet	[illegible]	[illegible]
49,000	[illegible]	10
50,000	[illegible]	[illegible]
51,000	[illegible]	04
52,000	[illegible]	06
53,000	[illegible]	01
54,000	[illegible]	01
55,000	[illegible]	02
56,000	[illegible]	04
57,000	[illegible]	05
58,000	[illegible]	06
59,000	[illegible]	05
60,000	[illegible]	04
61,000	[illegible]	03
62,000	[illegible]	02
63,000	[illegible]	02
64,000	[illegible]	02
65,000	[illegible]	02
66,000	[illegible]	02
67,000	[illegible]	02
68,000	[illegible]	02
69,000	[illegible]	02
70,000	[illegible]	02

NOTES:

1. Tropopause height was 53,150 ft MSL at Hickam.
2. Wind data was obtained from the Koko weather station.
3. At Hickam, the surface air pressure was 30.0 mb, the temperature 21.0°C, the dew point -3.3°C and the relative humidity 19%.

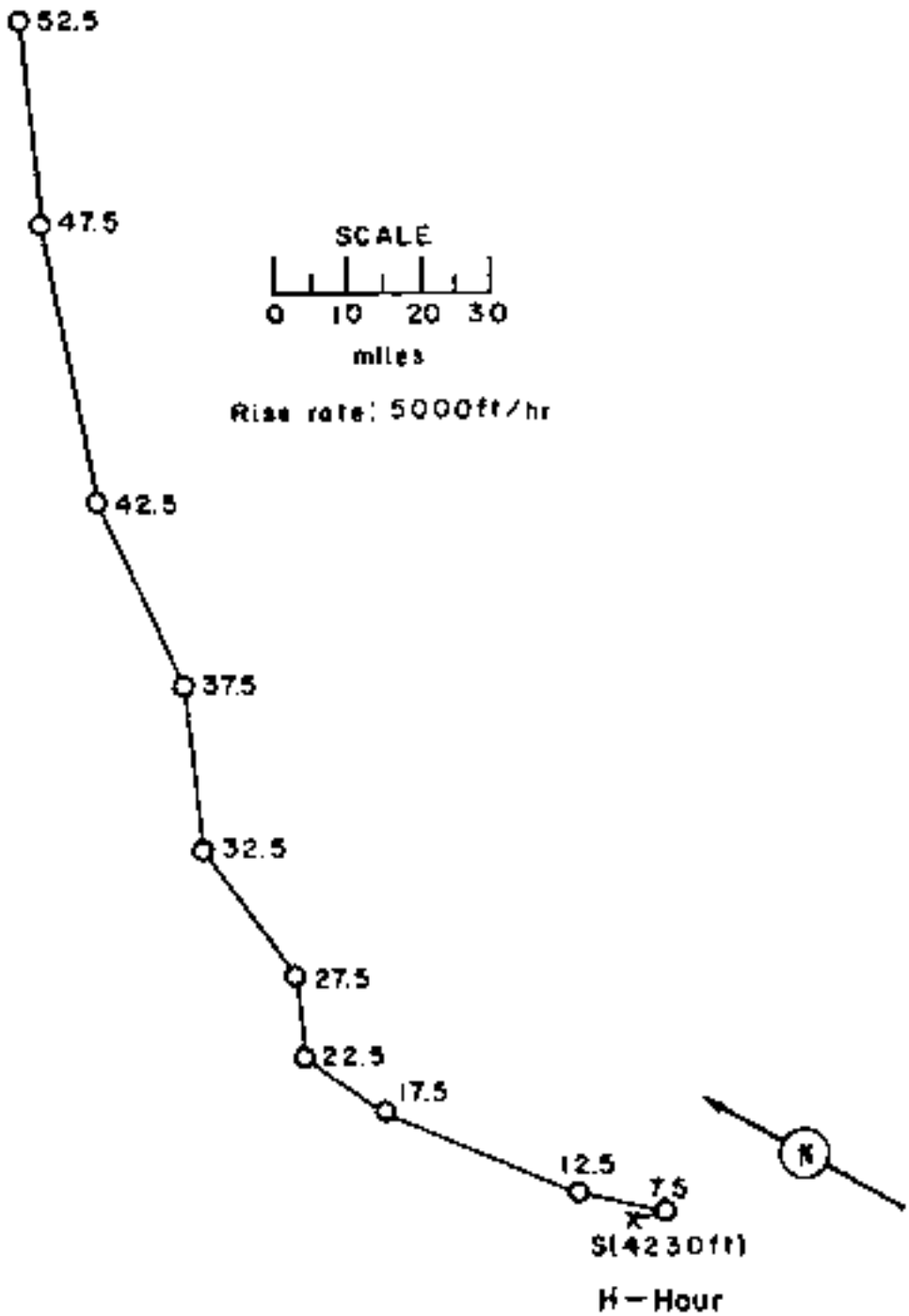


Figure 185. Hodograph for Operation PLUMBBOB - Hood.

OPERATION NUMBER: Diablo

	PDT	GMT
DATE:	[illegible]	[illegible]
TIME:	[illegible]	[illegible]

Sponsor: USGS

TOTAL YIELD: 17 kt

SITE: NTS - Area [illegible]
[illegible]
[illegible]
Site elevation: [illegible]

FIREBALL DATA:
Time [illegible]
Time to 1st maximum: 10s (+ [illegible] more
Radius of 1st maximum: 3M

WEIGHT OF SOIL: [illegible]

TYPE OF EFFECT ON STRUCTURES:
[illegible]

CRATER DATA: [illegible]

CLOUD DATA: [illegible]
CLOUD DOSAGE AT [illegible]: [illegible]

REMARKS:

No on-site fallout data was obtained from the Project Shot Diablo. Data obtained by the Nevada Test Safety Organization (NTSO) [illegible] and AN/PDR-27 survey instruments. The predicted and measured fallout rates at Mercury [illegible] are [illegible] and [illegible] hours, 1R/hr and 1R/hr, and [illegible] hours, 1R/hr and 1R/hr, respectively. The [illegible] dosage rate was used by DOE to extrapolate the dose-rate contours to [illegible] hours.

The off-site fallout was analyzed by program AT of DNA. Arrival decay data were used to plot the H+10-hour dose-rate contours. The t^-1.2 decay approximation was used by DOE to extrapolate the dose-rate readings to H+1 hour. "The edge of the fallout pattern in the western edge was estimated and may be too far to the west. The lack of roads and soil removal activities precluded the collection of data in this area. Arrival times after six hours were estimated on the basis of the measured arrival times and the use of calculated decay rates."

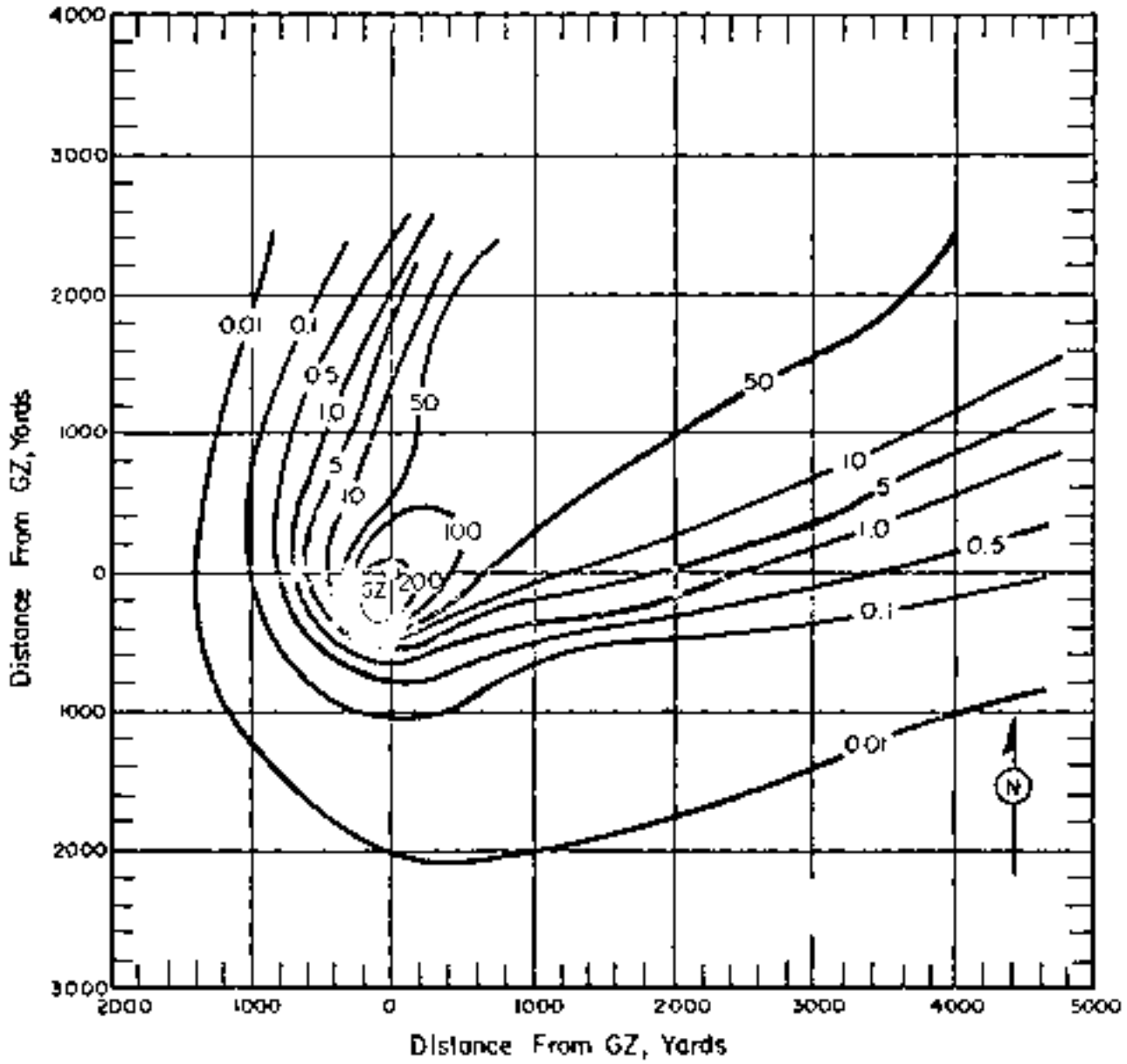


Figure 184. Operation PLUMBBOB - Diablo.
On-site dose rate contours in r/hr at H+1 hour.

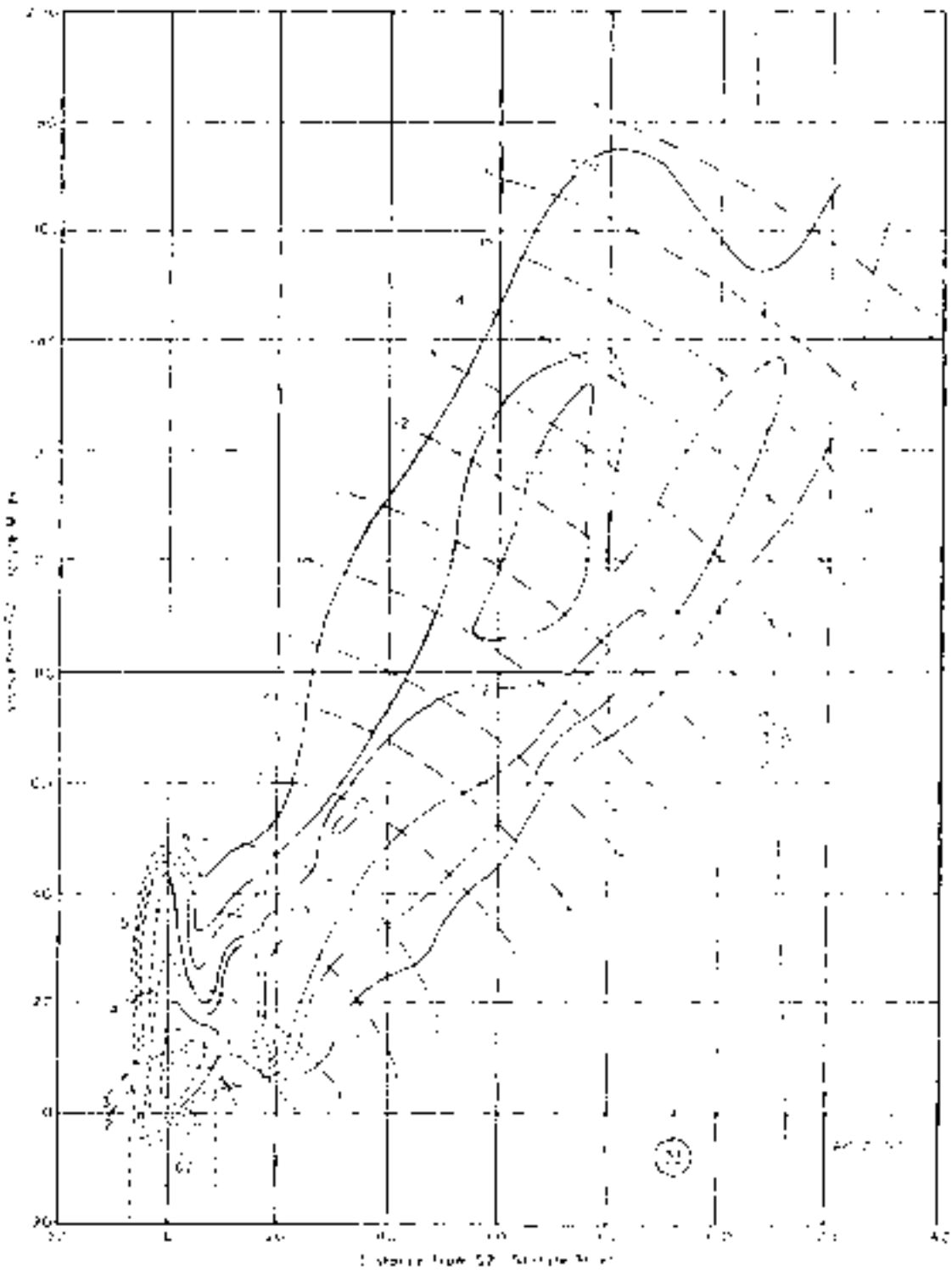


Figure 185. Operation PLUMBBOB - Diablo.
Off-site dose rate contours in r/hr at H+1 hour.

TABLE 33 RAWINSONDE WIND DATA FOR CHEYENNE WYOMING-- DAY 210

Altitude (MSL)	0600 GMT		1800 GMT	
	Wind		Wind	
Feet	direction (deg)	speed (kts)	direction (deg)	speed (kts)
Surface	Calm	Calm	Calm	Calm
5,000	270	05	270	02
6,000	270	07	260	06
7,000	280	08	190	07
8,000	290	11	180	08
9,000	310	08	360	11
10,000	340	07	010	10
11,000	350	07	---	--
12,000	340	07	180	09
13,000	280	07	---	--
14,000	230	09	230	13
15,000	240	09	(210)	(11)
16,000	210	07	230	09
17,000	210	07	---	--
18,000	210	07	230	10
19,000	220	07	---	--
20,000	220	09	230	09
21,000	210	09	---	--
22,000	180	08	---	--
23,000	190	07	260	07
24,000	310	07	---	--
25,000	320	10	290	08
26,000	310	14	---	--
27,000	300	17	---	--
28,000	300	18	---	--
29,000	290	18	---	--
30,000	280	20	30	25
31,000	270	19	---	--
32,000	270	19	---	--
33,000	270	18	---	--
34,000	270	18	---	--
35,000	270	18	270	09
36,000	270	18	---	--
37,000	270	17	---	--
38,000	270	17	---	--
39,000	270	17	---	--
40,000	270	17	---	--
41,000	270	17	---	--
42,000	270	17	---	--
43,000	270	17	---	--
44,000	270	17	---	--
45,000	270	17	---	--
46,000	270	17	---	--
47,000	270	17	---	--
48,000	270	17	---	--
49,000	270	17	---	--
50,000	260	16	250	06
51,000	240	15	---	--
52,000	230	14	---	--
53,000	220	13	---	--
54,000	210	12	---	--
55,000	190	07	---	--

NOTES:

1. Numbers in parentheses are estimated values.
2. Tropopause was 51,000 ft MSL at 0600 GMT.
3. Wind data was obtained from the Laramie weather station.
4. At 0600 GMT the surface air pressure was 860 mb, the temperature 23.1°C, the dew point -0.6°C and the relative humidity 21%.

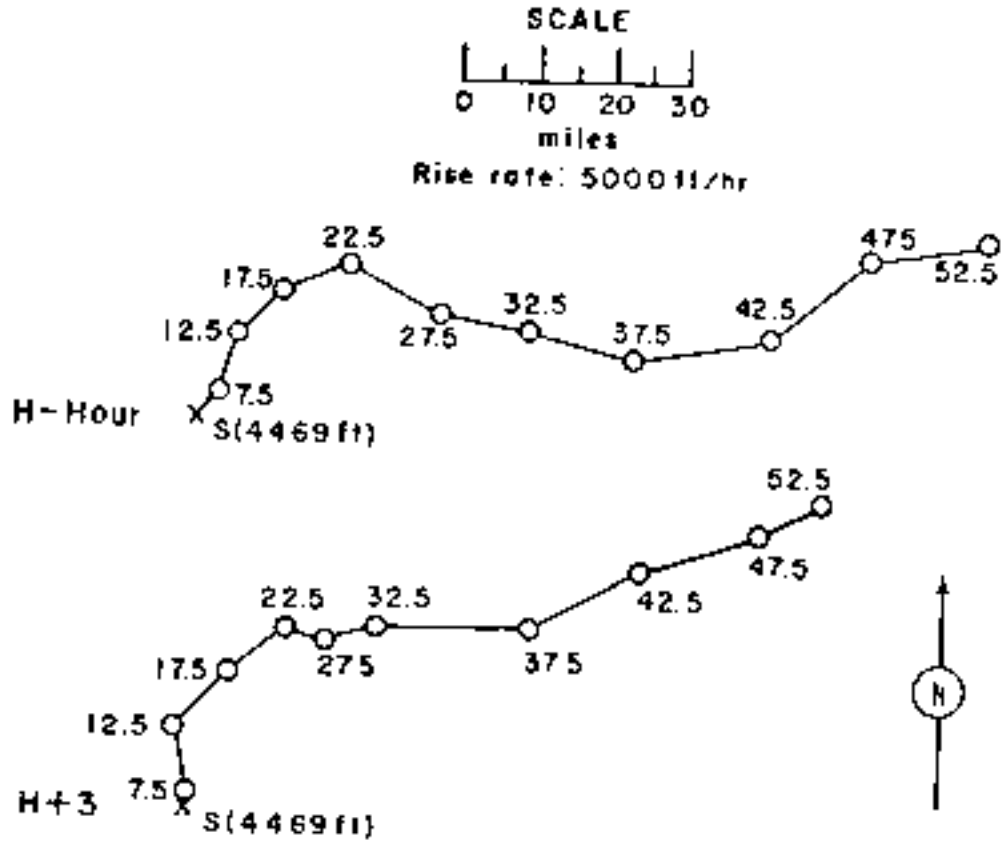


Figure 186. Hodographs for Operation [illegible] - Shot 10.

	FIG	GAS
DATE:	[illegible]	[illegible]
TIME:	[illegible]	[illegible]

WORK ORDER: [illegible]

PLEASE ATTACH
Claim [illegible] this form
Time [illegible] maximum [illegible]
Receipts [illegible] maximum [illegible] $24

CHECK ONE: [illegible]

Operator: JCT

SIGN: [illegible]
[illegible]
DIG [illegible]
[illegible]

REQUIRED [illegible]

USE [illegible] AND [illegible]
[illegible]
[illegible]

CLOSE [illegible]
CHECK [illegible]

REMOVE [illegible]

TABLE 54 [illegible]

Altitude (m)	[illegible]	[illegible]	[illegible]	[illegible]	Altitude (m)	[illegible]	[illegible]	[illegible]	[illegible]
Surface	[illegible]	[illegible]	[illegible]	24	29,000	[illegible]	5%	---	--
1,000	15	[illegible]	[illegible]	16	30,000	[illegible]	[illegible]	[illegible]	[illegible]
2,000	[illegible]	[illegible]	[illegible]	20	32,000	[illegible]	[illegible]	---	--
3,000	[illegible]	[illegible]	[illegible]	20	34,000	[illegible]	[illegible]	---	--
4,000	[illegible]	[illegible]	[illegible]	20	36,000	[illegible]	[illegible]	---	--
5,000	[illegible]	[illegible]	[illegible]	20	38,000	[illegible]	[illegible]	---	--
6,000	[illegible]	[illegible]	[illegible]	20	40,000	[illegible]	[illegible]	---	--
7,000	[illegible]	[illegible]	[illegible]	20	42,000	[illegible]	[illegible]	---	--
8,000	[illegible]	[illegible]	[illegible]	20	44,000	[illegible]	[illegible]	---	--
9,000	[illegible]	[illegible]	[illegible]	20	46,000	[illegible]	[illegible]	---	--
10,000	[illegible]	[illegible]	[illegible]	20	48,000	[illegible]	[illegible]	---	--
11,000	[illegible]	[illegible]	---	--	50,000	[illegible]	[illegible]	---	--
12,000	[illegible]	[illegible]	[illegible]	20	52,000	[illegible]	[illegible]	---	--
13,000	[illegible]	[illegible]	---	--	54,000	[illegible]	[illegible]	---	--
14,000	[illegible]	[illegible]	[illegible]	20	56,000	[illegible]	[illegible]	---	--
15,000	[illegible]	[illegible]	(calm)	(20)	58,000	[illegible]	[illegible]	[illegible]	[illegible]
16,000	[illegible]	[illegible]	[illegible]	20	60,000	[illegible]	[illegible]	---	--
17,000	[illegible]	[illegible]	---	--	62,000	[illegible]	[illegible]	---	--
18,000	[illegible]	[illegible]	[illegible]	20	64,000	[illegible]	[illegible]	---	--
19,000	[illegible]	[illegible]	---	--	66,000	[illegible]	[illegible]	---	--
20,000	[illegible]	[illegible]	[illegible]	20	68,000	[illegible]	[illegible]	[illegible]	[illegible]
21,000	[illegible]	[illegible]	---	--	70,000	[illegible]	[illegible]	---	--
22,000	[illegible]	[illegible]	---	--	72,000	[illegible]	[illegible]	---	--
23,000	[illegible]	[illegible]	[illegible]	20	74,000	[illegible]	[illegible]	---	--
24,000	[illegible]	[illegible]	--	--	76,000	[illegible]	[illegible]	---	--
25,000	[illegible]	[illegible]	[illegible]	21	78,000	[illegible]	[illegible]	[illegible]	[illegible]
26,000	[illegible]	21	---	--	80,000	[illegible]	[illegible]	---	--
27,000	[illegible]	[illegible]	---	--	82,000	[illegible]	[illegible]	---	--
28,000	[illegible]	23	---	--	84,000	[illegible]	[illegible]	---	--

NOTES:

1. [illegible]
2. Precipitation [illegible] was 17,500 ft MSL at 0400 hrs.
3. Wind data was obtained from the Yukon weather station.
4. At 0400, the surface air pressure was 850 mb, the temperature 22.1°C, the dew point 1.3°C and the relative humidity [illegible]%.

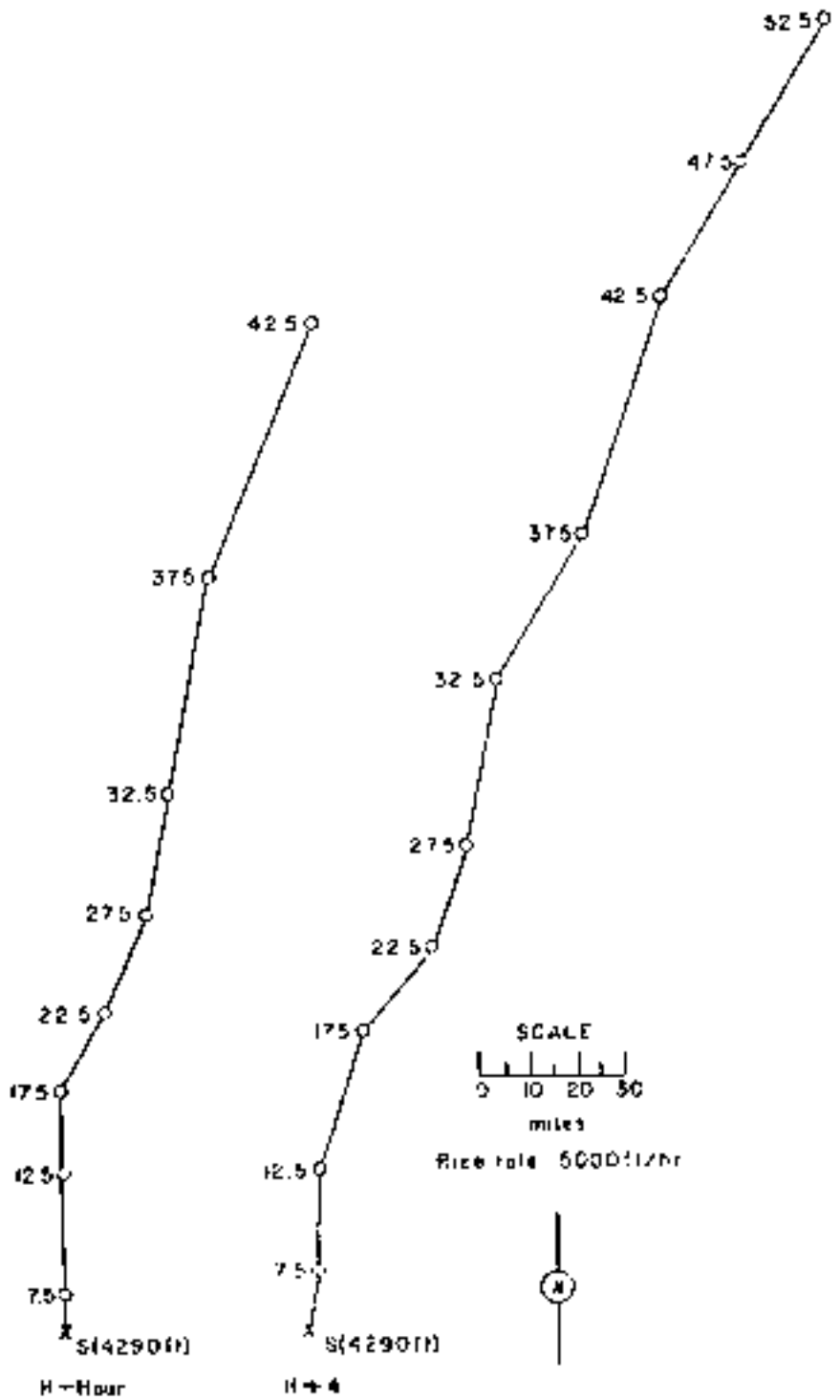


Figure 187. Hodographs for Operation PLUMBBOB - John.

OPERATION TUMBLER - Kepler

	PST	GMT
DATE:	[illegible]	[illegible]
TIME:	[illegible]	1150

TOTAL YIELD: 10 kt

Operation [illegible]

SITE: [illegible]
[illegible]
[illegible]
Site elevation: [illegible]

FIREBALL DATA:
Time to first minimum: [illegible]
Time to first maximum: [illegible]
Height at first maximum: [illegible]

HEIGHT OF BURST: [illegible]

CRATER DATA: [illegible]

EFFECTS ON [illegible]
[illegible]

CLOUD DOSE [illegible]
CLOUD ASSESSMENT [illegible]

RESULTS:

The operation pattern was obtained from [illegible] by overlaying [illegible] the Radiological Safety Division of Reynolds Electrical & Engineering Co., Inc., Mercury, Nevada (REECO) [illegible] of survey instruments. The readings were taken at 8:00 a.m. on the 1st day, 2nd day, 3rd day, 4th day, 5th day, 6th day, 7th day, 8th day, 9th day, 10th day, 11th day, 12th day, 13th day, 14th day, 15th day, 16th day, 17th day, 18th day, 19th day, 20th day, 21st day, 22nd day, 23rd day, 24th day, 25th day, 26th day, 27th day, 28th day, 29th day, 30th day, 31st day, 32nd day, 33rd day, 34th day, 35th day, 36th day, 37th day, 38th day, 39th day, 40th day, 41st day, 42nd day, 43rd day, 44th day, 45th day, 46th day, 47th day, 48th day, 49th day, 50th day, 51st day, 52nd day, 53rd day, 54th day, 55th day, 56th day, 57th day, 58th day, 59th day, 60th day, 61st day, 62nd day, 63rd day, 64th day, 65th day, 66th day, 67th day, 68th day, 69th day, 70th day, 71st day, 72nd day, 73rd day, 74th day, 75th day, 76th day, 77th day, 78th day, 79th day, 80th day, 81st day, 82nd day, 83rd day, 84th day, 85th day, 86th day, 87th day, 88th day, 89th day, 90th day, 91st day, 92nd day, 93rd day, 94th day, 95th day, 96th day, 97th 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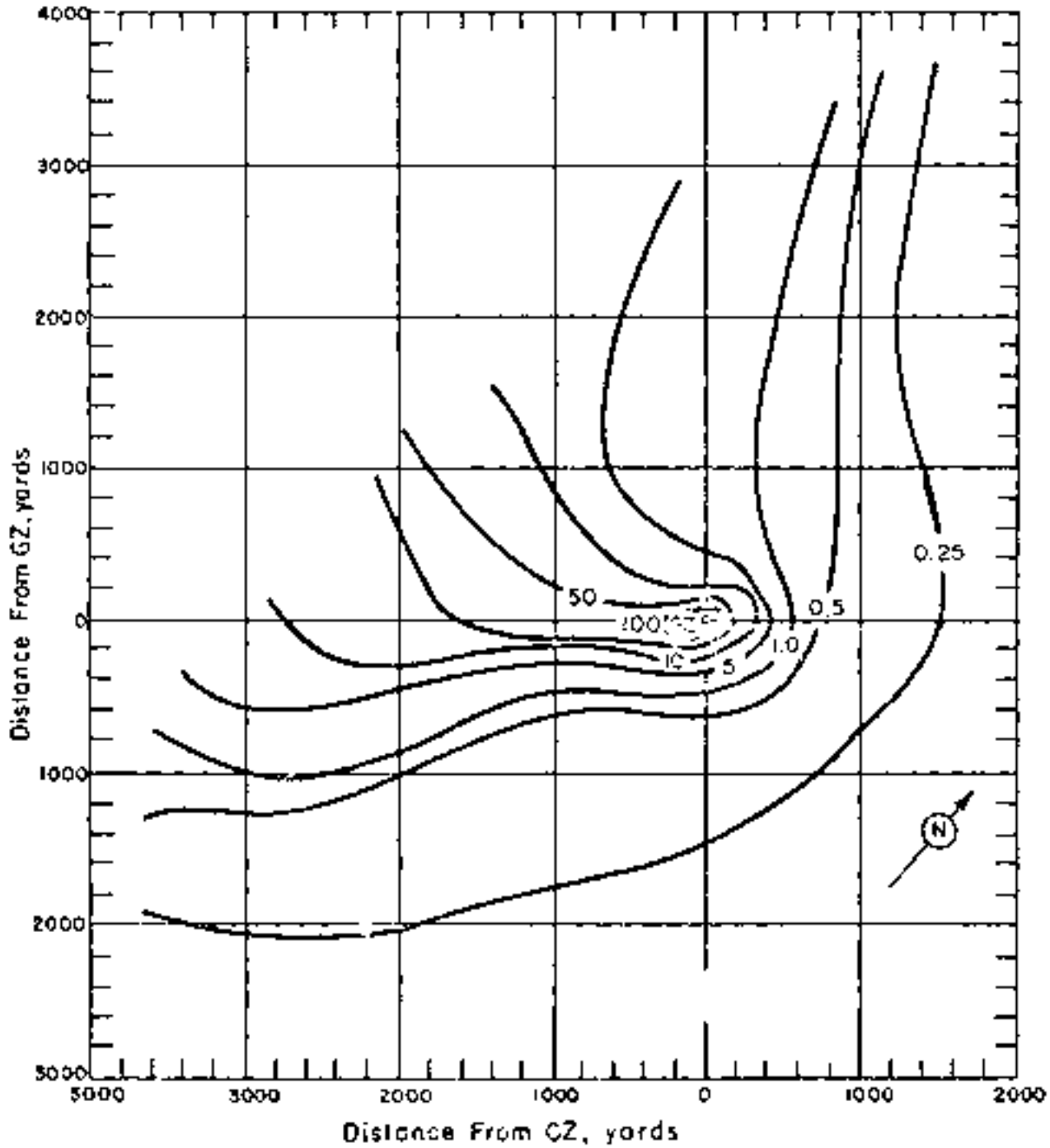


Figure 188. Operation PLUMBBOB - Kepler.
On-site dose rate contours in r/hr at 24 hour.

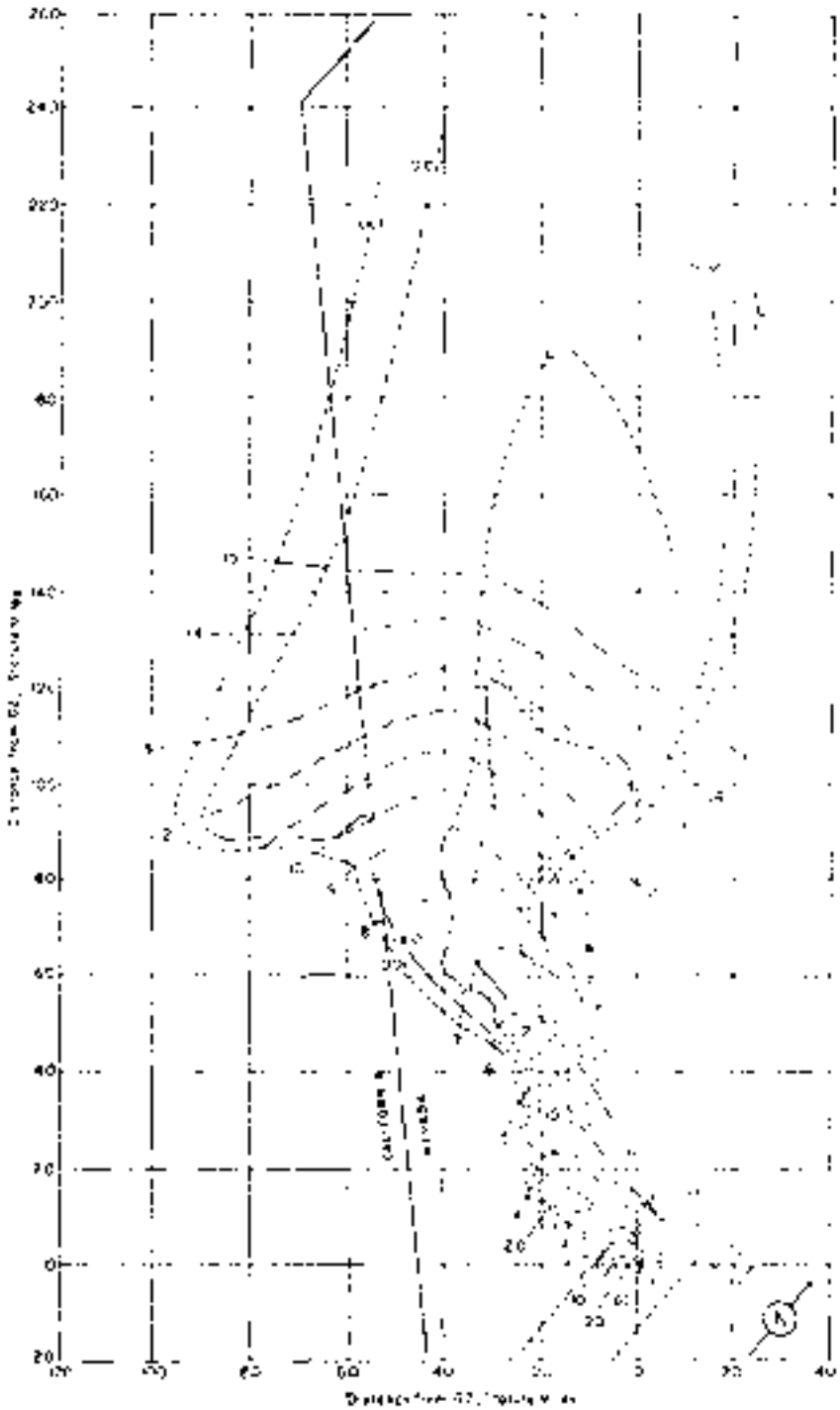


Figure 189. Operation PLUMBBOB - Kepler.
Off-site dose rate contours in r/hr at 24 hours.

TABLE 35 NUMERICAL WIND DATA FOR CIRCULATION [CONTD.]-2- KOLKATA

Altitude (AMSL)	Wind		Temperature (°C)	
feet	direction (°)	speed (kts)		
Surface	Calm	Calm	31	25
1,000	09	03	29	24
2,000	07	07	28	24
3,000	270	05	28	24
4,000	11	09	26	17
5,000	270	06	25	16
6,000	09	07	24	15
7,000	14	07	---	--
8,000	270	10	19	05
9,000	18	07	---	--
10,000	270	10	16	10
11,000	14	07	---	--
12,000	270	10	13	05
13,000	18	07	---	--
14,000	270	10	10	08
15,000	04	10	(-1)	(-1)
16,000	07	10	-05	-11
17,000	360	10	---	--
18,000	11	07	-20	-24
19,000	11	05	---	--
20,000	270	07	-40	-43
21,000	11	07	---	--
22,000	11	10	---	--
23,000	270	20	-60	-56
24,000	270	05	---	--
25,000	14	20	-60	-56
26,000	270	12	---	--
27,000	11	1	---	--
28,000	270	05	---	--
29,000	14	10	---	--
30,000	270	20	-60	-60

Altitude (AMSL)	Wind		Temperature (°C)	
feet	direction (°)	speed (kts)		
31,000	270	10	---	--
32,000	14	05	---	--
33,000	09	10	---	--
34,000	11	10	---	--
35,000	11	10	-61	-64
36,000	11	05	---	--
37,000	14	10	---	--
38,000	14	05	---	--
39,000	14	10	---	--
40,000	14	10	---	--
41,000	14	05	---	--
42,000	14	10	---	--
43,000	14	05	---	--
44,000	14	10	---	--
45,000	14	10	-64	-67
46,000	14	05	---	--
47,000	14	10	---	--
48,000	14	10	---	--
49,000	14	10	---	--
50,000	14	10	-64	-67
51,000	14	05	---	--
52,000	14	10	---	--
53,000	14	10	---	--
54,000	14	10	-64	-67

NOTES:

1. Numbers in parentheses are not plotted.
2. Tropopause height was 16,500 ft MSL at 0600 UTC.
3. Wind data was obtained from the Kolkata Weather Station.
4. At 0600 UTC the surface air pressure was 1001 mb, the temperature 31.0°C, the dew point 25.0°C and the relative humidity 71%.

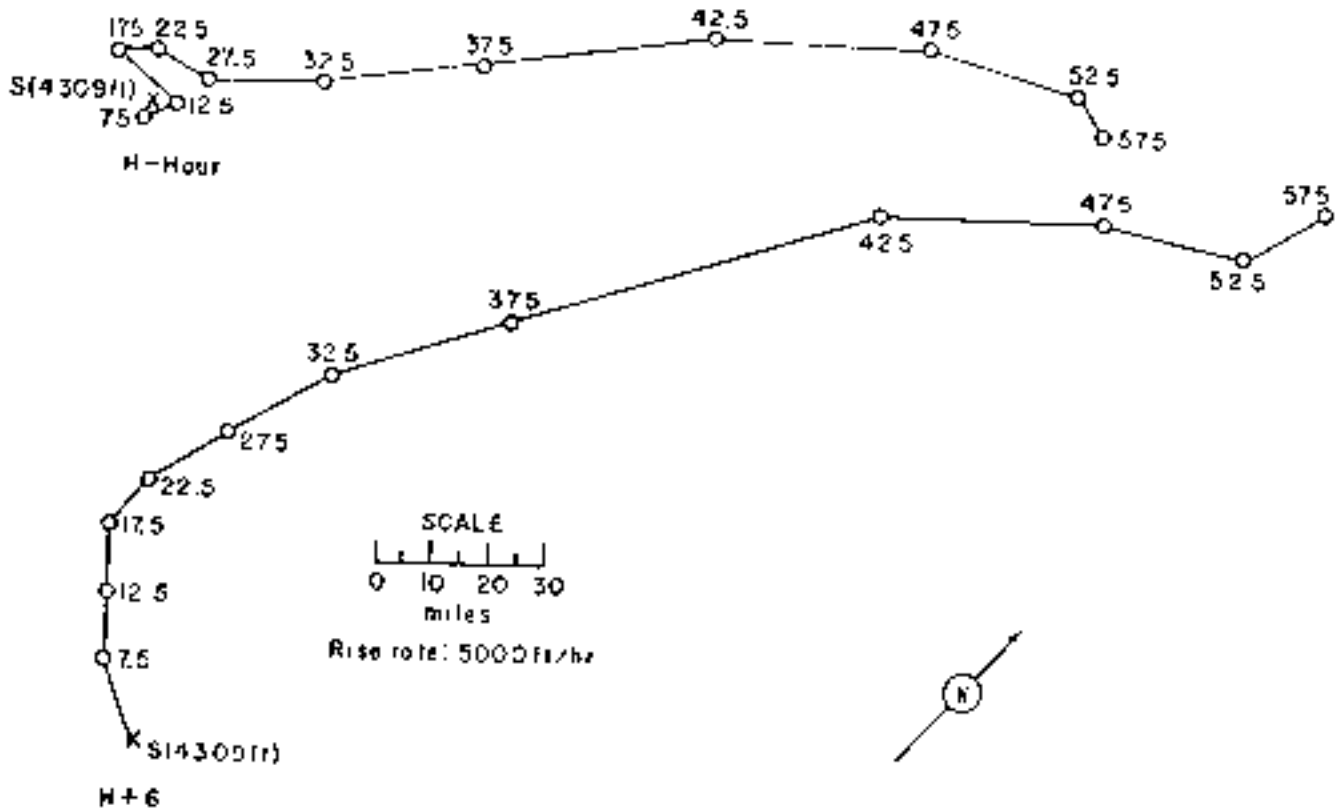


Figure 190. Hodographs for Operation PLUMBOB - Kepler.

OPERATION PLUMBBOB - Owens

	PDT	GMT
DATE:	[illegible] July [illegible]	[illegible] July [illegible]
TIME:	[illegible]	[illegible]

Sponsor: [illegible]

SITE: [illegible]

TOTAL YIELD: 9.7 kt

HEIGHT [illegible]: [illegible]

FALLOUT [illegible]:
Time [illegible]
Time [illegible]
Radius [illegible]

[illegible]

COVERAGE [illegible]

[illegible]

REMARKS:

One [illegible] primarily [illegible] was obtained from [illegible] of Physical [illegible] AN/TIB [illegible] hours, D+1 day, D+2 days [illegible] to determine [illegible] trapped [illegible] activity in Nevada [illegible] are not very accurate [illegible].

The off-site fallout was [illegible]. The [illegible] to H+1 hours. Most of the pattern [illegible] relatively free from [illegible] west and [illegible] fallout [illegible] occurred [illegible] of Nevada on July [illegible].

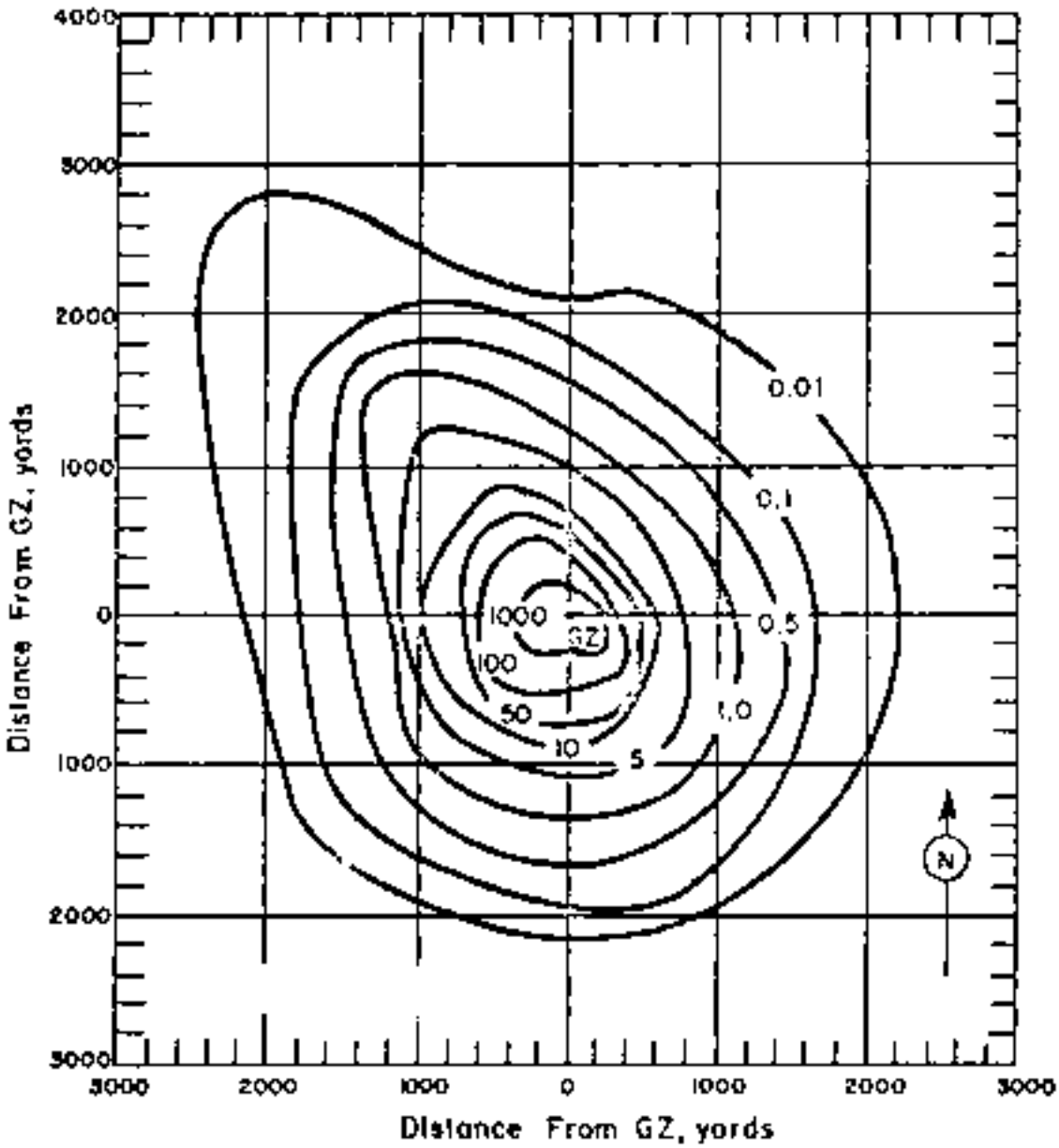


Figure 191. Operation PLUMBBOB - Owens.
On-site dose rate contours in r/hr at H+1 hour.

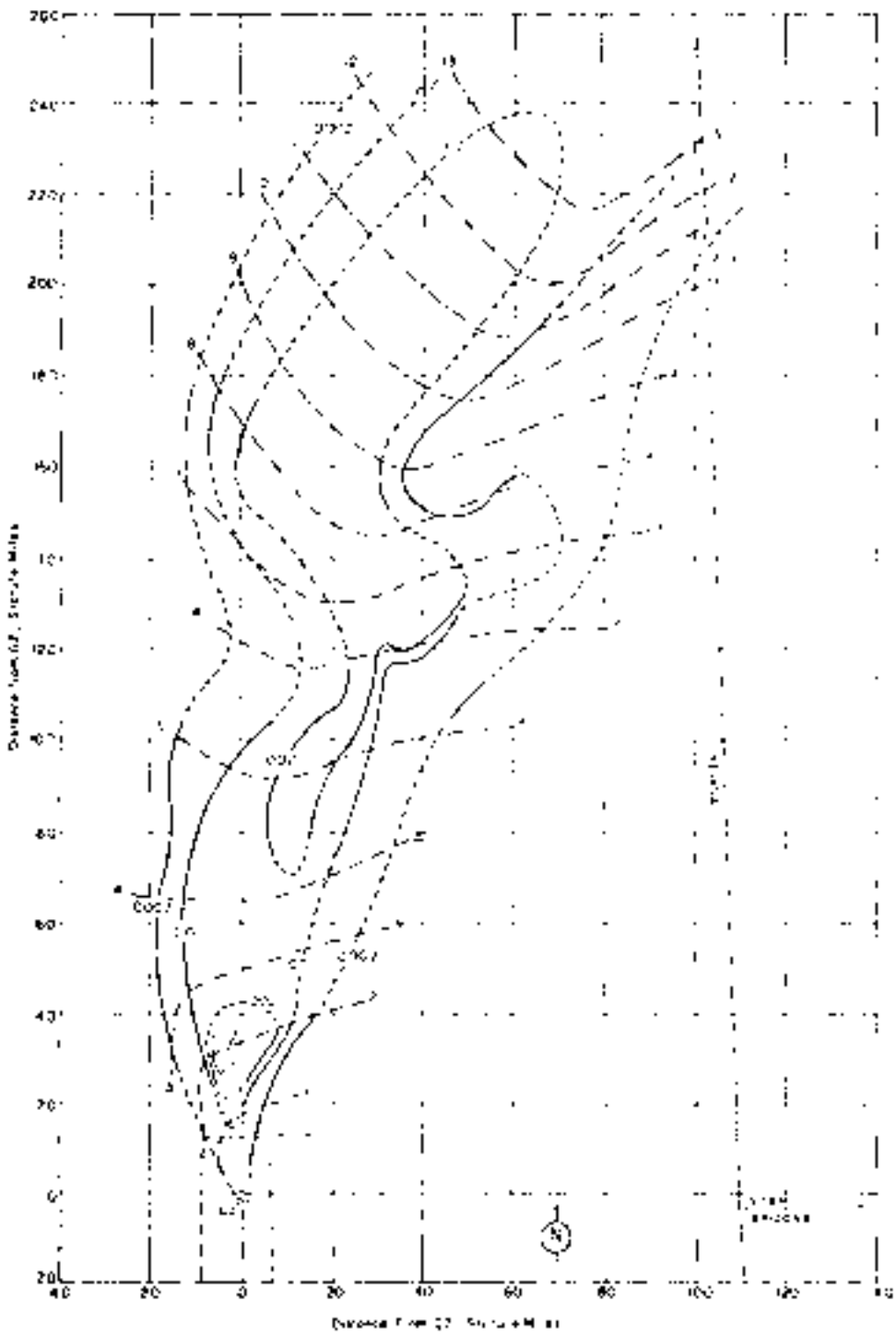


Figure 102. Operation PLUMBBOB - Owens.
Off-site dose rate contours in r/hr at H+1 hour.

TABLE 56 NEVADA WIND DATA FOR OPERATION PLUMBBOB— (U)(CD)

Altitude (MSL)	Helium		Hydrogen		Altitude (MSL)	Helium		Hydrogen	
	Dir	Spd	Dir	Spd		Dir	Spd	Dir	Spd
Feet	degrees	kts	degrees	kts	Feet	degrees	kts	degrees	kts
Surface	Calm	Calm	170	05	30,000	270	33	---	--
5,000	320	03	160	09	32,000	260	20	---	--
6,000	040	01	170	05	32,200	210	29	---	--
7,000	360	06	210	07	33,000	210	31	---	--
8,000	160	08	210	07	34,000	220	38	---	--
9,000	170	14	210	12	35,000	210	49	210	15
10,000	170	16	210	17	36,000	210	52	---	--
11,000	170	20	---	--	37,000	210	40	---	--
12,000	170	12	200	09	38,000	220	44	---	--
13,000	170	09	---	--	39,000	210	51	---	--
14,000	160	12	190	06	40,000	220	63	230	31
15,000	160	08	(160)	(21)	41,000	230	50	---	--
16,000	160	04	170	24	42,000	230	46	---	--
17,000	160	04	---	--	43,000	230	37	---	--
18,000	170	07	170	04	44,000	230	29	---	--
19,000	170	03	---	--	45,000	230	40	240	31
20,000	160	00	180	03	46,000	230	41	---	--
21,000	210	10	---	--	47,000	240	41	---	--
22,000	210	15	---	--	48,000	240	43	---	--
23,000	200	16	180	17	49,000	240	46	---	--
24,000	210	17	---	--	50,000	240	31	240	24
25,000	210	18	200	17	51,000	240	17	---	--
26,000	220	18	---	--	52,000	180	09	---	--
27,000	220	20	---	--	53,000	170	15	---	--
28,000	220	20	---	--	55,000	---	--	220	19
29,000	220	20	---	--					

NOTES:

1. Numbers in parentheses are estimated values.
2. Tropopause height was 40,300 ft MSL at Hanson.
3. Wind data was obtained from the Yucca weather station.
4. At H-hour the surface air pressure was 871 mb, the temperature 20.0°C, the dew point -3.6°C and the relative humidity 20%.

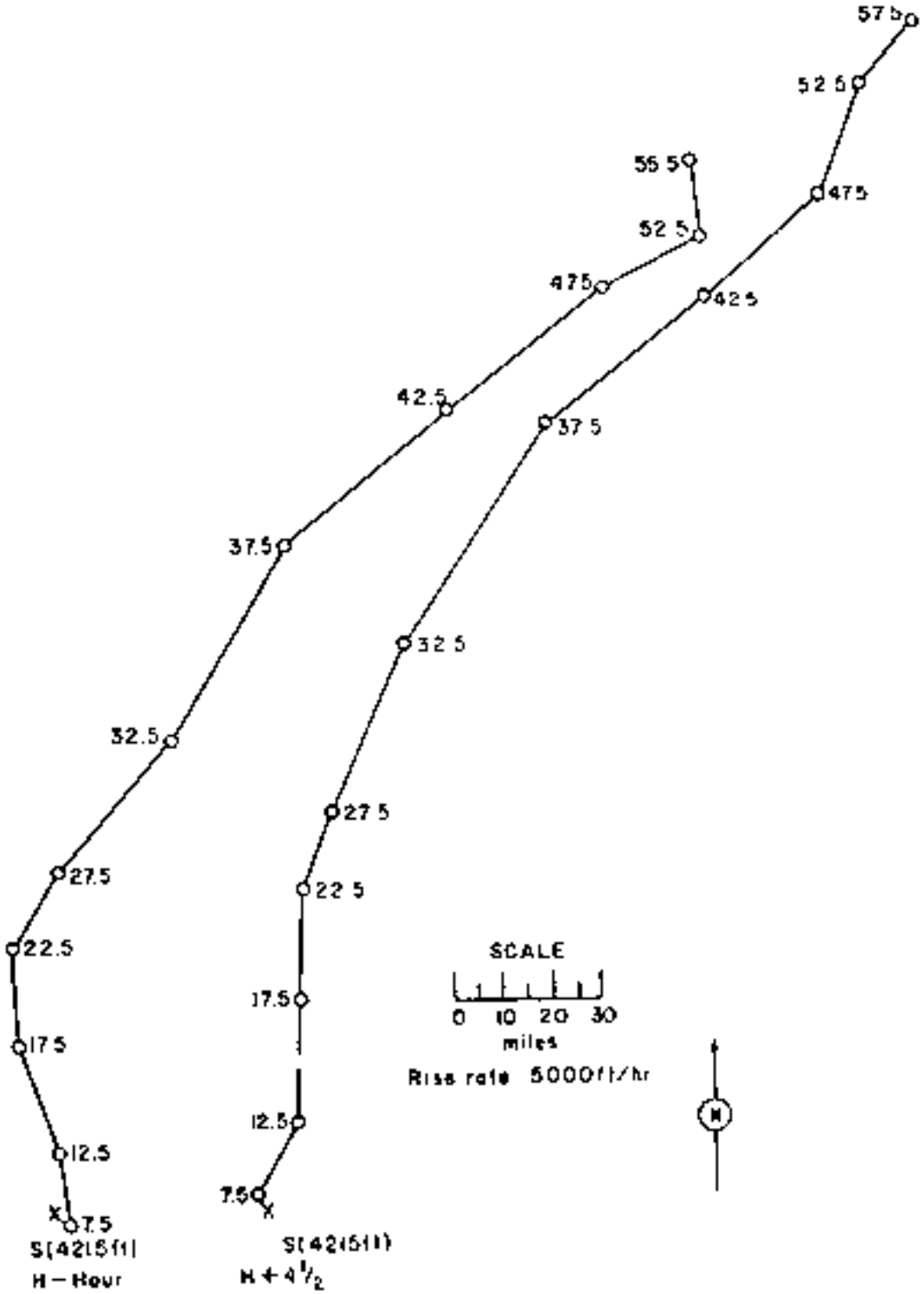


Figure 193. Hodographs for Operation PLUMBBOB - Owens.

OPERATION [illegible] - Pascal A Safety Experiment

	PST	GMT
DATE:	[illegible]	[illegible]
TIME:	[illegible]	[illegible]

Sponsor: [illegible]

SITE: [illegible]
[illegible]
[illegible]
Site elevation: [illegible]

HEIGHT OF DETONATION - [illegible]
[illegible]

TYPE OF MATERIAL ON BURNING BED:
[illegible]

CLOUD TOP HEIGHT: [illegible]
CLOUD DIAMETER: [illegible]

REMARKS:

The crucial fall of particles was obtained from [illegible] of the Radiation Safety Division of Pegasus [illegible] Co., Inc., using AN/PDR-27 and AN/PDR-43 survey [illegible] were taken at 1045 hrs, 1445 hrs, and 1940 hrs. [illegible] determine radiation exposure rates. The 1940 hrs [illegible] used to extrapolate the dose-rate readings to 24 hours. [illegible] is not possible to make only a few readings. [illegible] contamination was detected in a strip about 200 yards wide [illegible] long within the 12 mile contour.

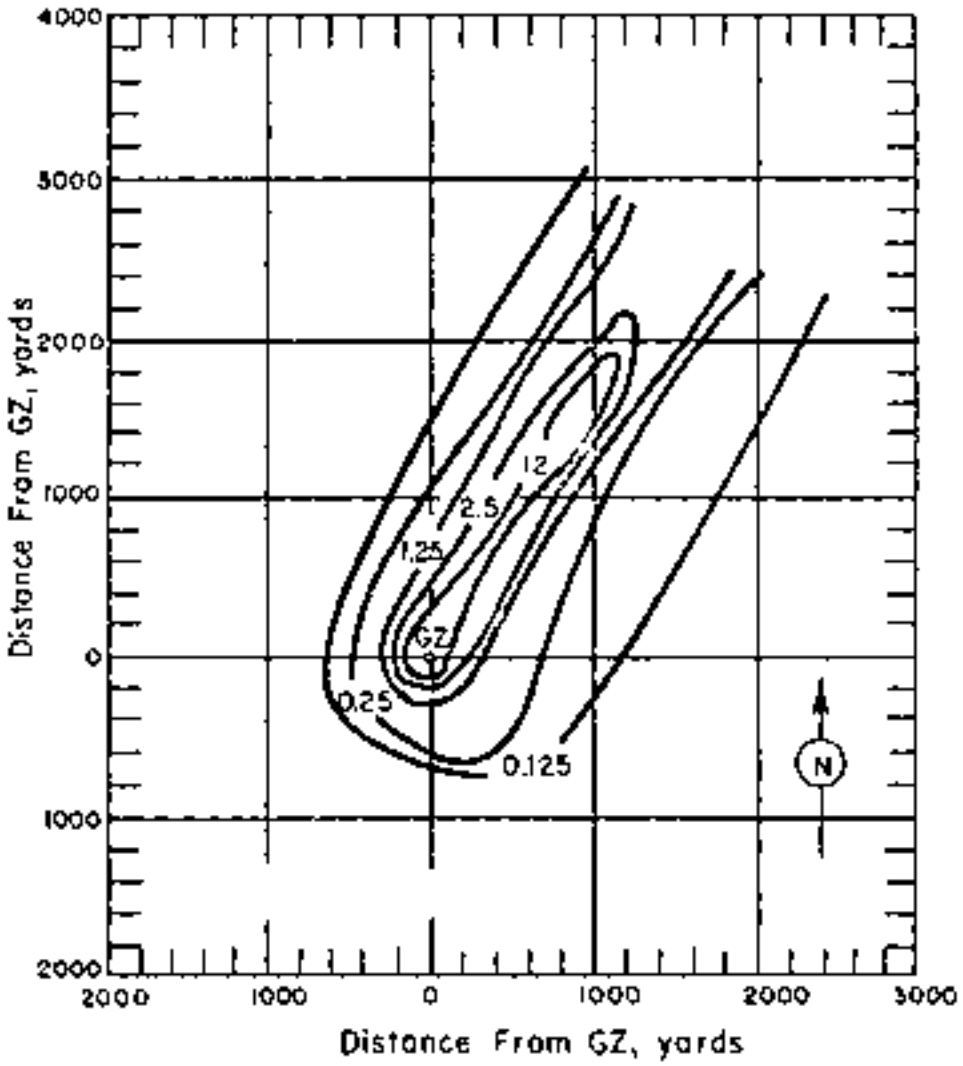


Figure 194. Operation PLUMBBOB - Pascal A.
On-site dose rate contours in r/hr at H+1 hour.

OPERATION PLUMBBOB - Stokes

	PST	GMT
DATE	[illegible]	[illegible]
TIME	[illegible]	[illegible]

TOTAL YIELD: [illegible] kt

METEOROLOGICAL DATA:
[illegible]

CRATER DATA: [illegible]

Sponsor: [illegible]

SITE: NTS - Area [illegible]
37° [illegible]' [illegible]" N
116° [illegible]' [illegible]" W
Site elevation [illegible] ft.

HEIGHT OF BURST: [illegible] ft.

TYPE OF FIRING AND CLASSIFICATION:
Air [illegible]
Nevada [illegible]

CLOUD TOP HEIGHT: [illegible] ft. MSL
CLOUD BOTTOM HEIGHT: [illegible] ft. MSL

RESULTS:
Outside contamination was due primarily to [illegible]. The pattern was obtained from [illegible] prior to the Radiological Safety Division at [illegible] and Nellis AFB, Nev., [illegible] and AN/PDR-[illegible] survey instruments. The readings were taken at [illegible] hour, [illegible] hours, [illegible] day, [illegible] days, [illegible] days and [illegible] days after [illegible] to determine radiological conditions over [illegible]. The dose-rate readings were extrapolated to H+1 hour by the general inverse decay curve for Nevada soil.

The off-site fallout was analyzed by the USWB Special Projects Section. The $t^{-1.2}$ decay approximation was used to extrapolate the dose-rate readings to H+1 hour. "The fallout pattern attributed to Test Stokes is on the fringes of fallout from two previous tower shots (Boltzmann and Diablo) and is rather uncertain."

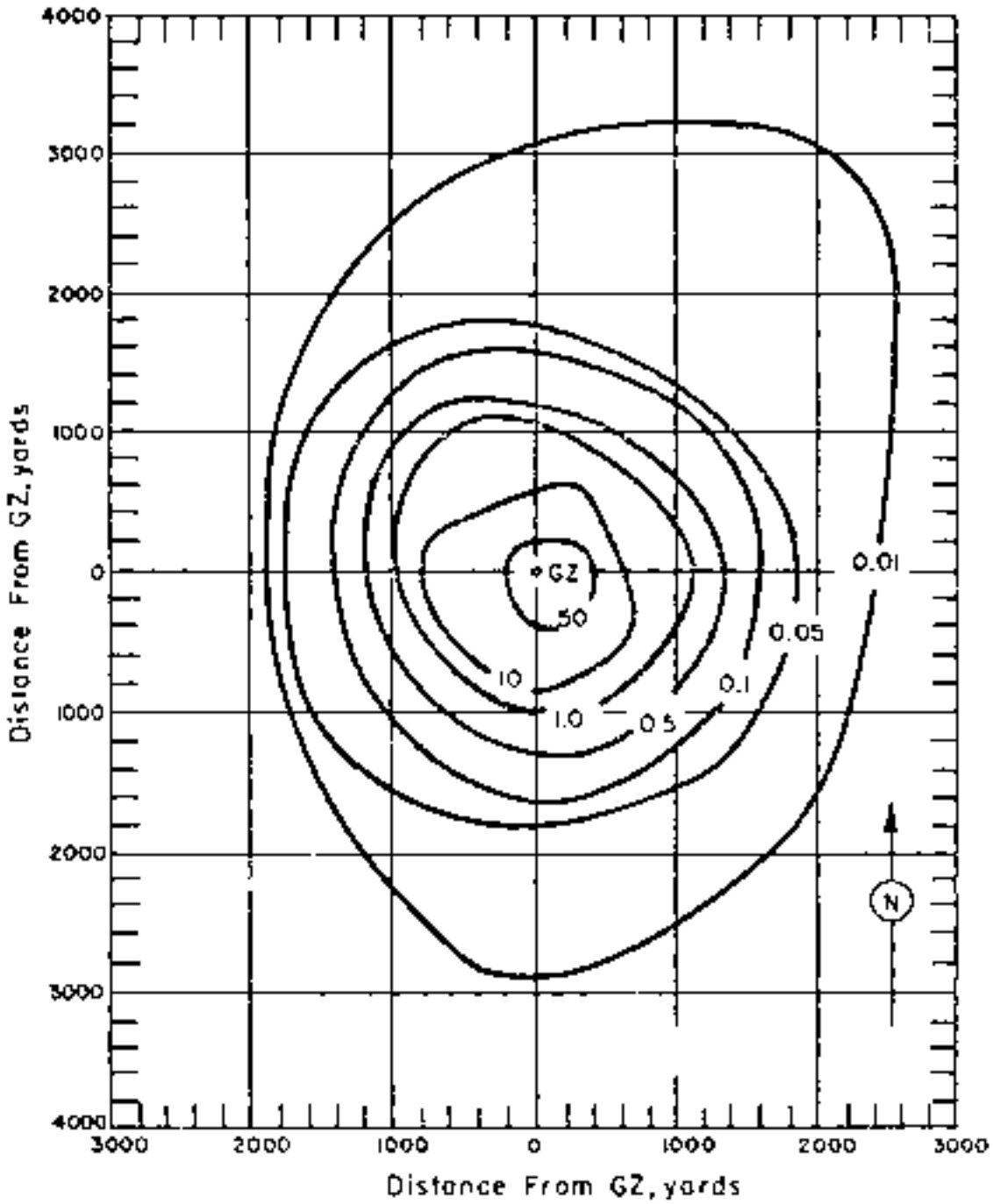


Figure 195. Operation [illegible] - [illegible] Shrimp.
On-site dose rate contours in r/hr at 1+1 hour.

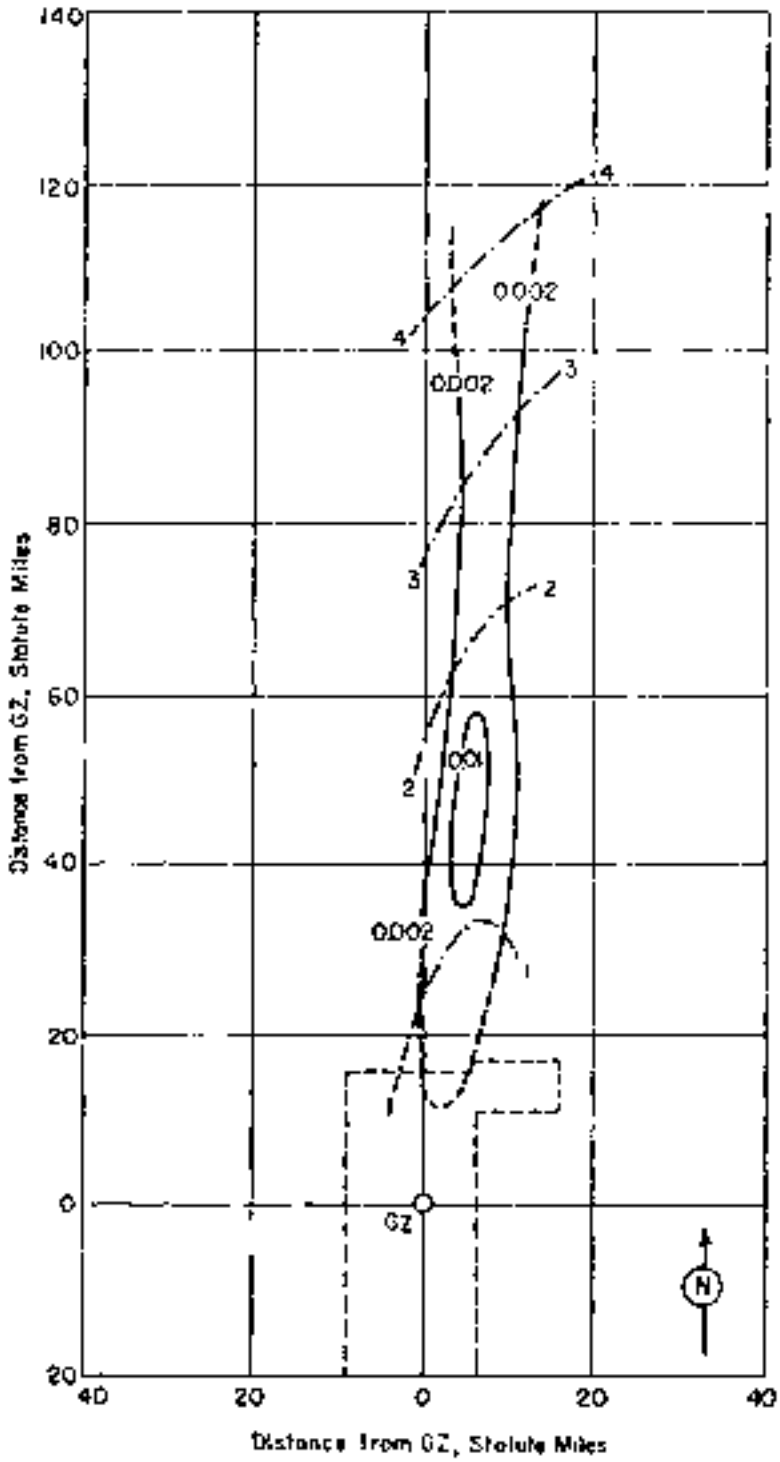


Figure 196. Operation PLUMBOB - Stokes
Off-site dose rate contours in r/hr at H+1 hour.

TABLE 37 NEVADA WIND DATA FOR OPERATION [illegible]

Altitude (MSL)	Wind, 0400		Altitude (MSL)	Wind, 0400	
	Dir	Speed		Dir	Speed
Feet	degrees	mph	Feet	degrees	mph
Surface	Calm	Calm	29,000	[illegible]	[illegible]
5,000	[illegible]	02	30,000	[illegible]	[illegible]
6,000	[illegible]	06	31,000	[illegible]	[illegible]
7,000	[illegible]	07	32,000	[illegible]	26
8,000	[illegible]	09	33,000	[illegible]	[illegible]
9,000	[illegible]	07	34,000	[illegible]	[illegible]
10,000	[illegible]	01	35,000	[illegible]	20
11,000	[illegible]	19	36,000	[illegible]	[illegible]
12,000	[illegible]	17	37,000	[illegible]	[illegible]
13,000	[illegible]	20	38,000	[illegible]	[illegible]
14,000	[illegible]	29	39,000	[illegible]	01
15,000	[illegible]	31	40,000	[illegible]	16
16,000	[illegible]	38	41,000	[illegible]	[illegible]
17,000	[illegible]	39	42,000	[illegible]	[illegible]
18,000	[illegible]	44	43,000	[illegible]	[illegible]
19,000	[illegible]	46	44,000	[illegible]	[illegible]
20,000	[illegible]	47	45,000	[illegible]	[illegible]
21,000	[illegible]	49	46,000	[illegible]	[illegible]
22,000	[illegible]	53	47,000	[illegible]	[illegible]
23,000	[illegible]	50	48,000	[illegible]	[illegible]
24,000	[illegible]	52	49,000	[illegible]	[illegible]
25,000	[illegible]	55	50,000	[illegible]	[illegible]
26,000	[illegible]	61	51,000	[illegible]	25
27,000	[illegible]	69			
28,000	[illegible]	73			

NOTES:

1. Tropopause height was 46,000 ft MSL at 0400 hours.
2. Wind data was obtained from the Yucca weather station.
3. At 0400 hours the surface air pressure was [illegible] mb, the temperature 16.8°C, the dew point -4.5°C and the relative humidity [illegible]%.

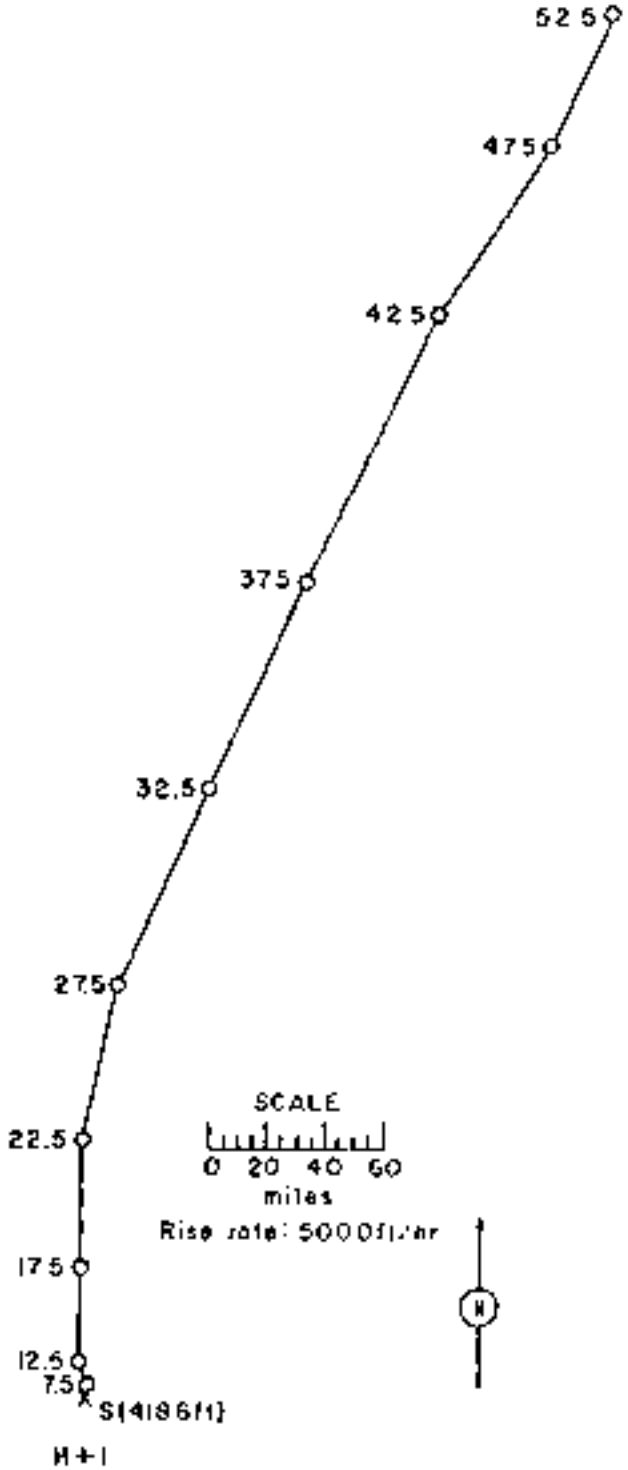


Figure 197. Hodograph for Operation PLUMBBOB - Stokes.

OPERATION PLUMBOB - Saturn Safety Experiment

	DOP	GMT
DATE:	9 Aug [illegible]	[illegible]
TIME:	1900	0100

Sponsored: USAF.

SITE: NTS - Area 10-c
37° 13' 38" N
116° 03' 06" W

HEIGHT OF BURST: -186 ft

TYPE OF BURST AND YIELD:
Subsurface [illegible]
in Nevada, rock.

CLOUD TOP HEIGHT: 2M
CLOUD BOTTOM HEIGHT: 1M

REMARKS:

No fallout.

OPERATION RADIOLOG - Phase 1

	PDT	GMT
DATE:	[illegible]	[illegible]
TIME:	[illegible]	1200

TOTAL YIELD: 17 kt

MIDPOINT DATA:
Time of fall-out initiation: 12M
Time of fall-out cessation: [illegible] ± 5% mins
Radius of fall-out region: 2M

CRATER DATA: No crater

Operation RADL

SITE: NTS - Area 3
[illegible]
DOE [illegible]
Site elevation: [illegible]

HEIGHT OF BURST: [illegible]

TYPE OF BURST [illegible]
[illegible]

CLOUD TOP [illegible]
CLOUD BOTTOM [illegible]

REMARKS:

The complete fallout pattern was obtained from aerial [illegible] at the Radiological Survey Division of Reynolds Electrical and Engineering Co., Inc., using AN/AVQ-10 and AN/AVQ-2 survey instruments. Flights were flown at 500 knots, 500 knots, 540 mph, 540 kph and 540 kph for 6 radial lines to determine an initial exposure rate. The entire survey approximately 4 hours after the detonation.

The offsite fallout was analyzed by Division 5 of DOE and by Bendix Special Projects Section. They used actual decay data to plot [illegible] hour decay-rate contours. The $t^{-1.2}$ decay approximation was used by DOE to extrapolate the 0.1 hour dose-rate contours to 1 hour. Personnel assigned to the Atomic Energy Commission as well as to the Livermore Base Area. The fallout pattern is the result of the subjective [illegible] residual activities from measured data. Arrival times after six hours were estimated from the wind data.

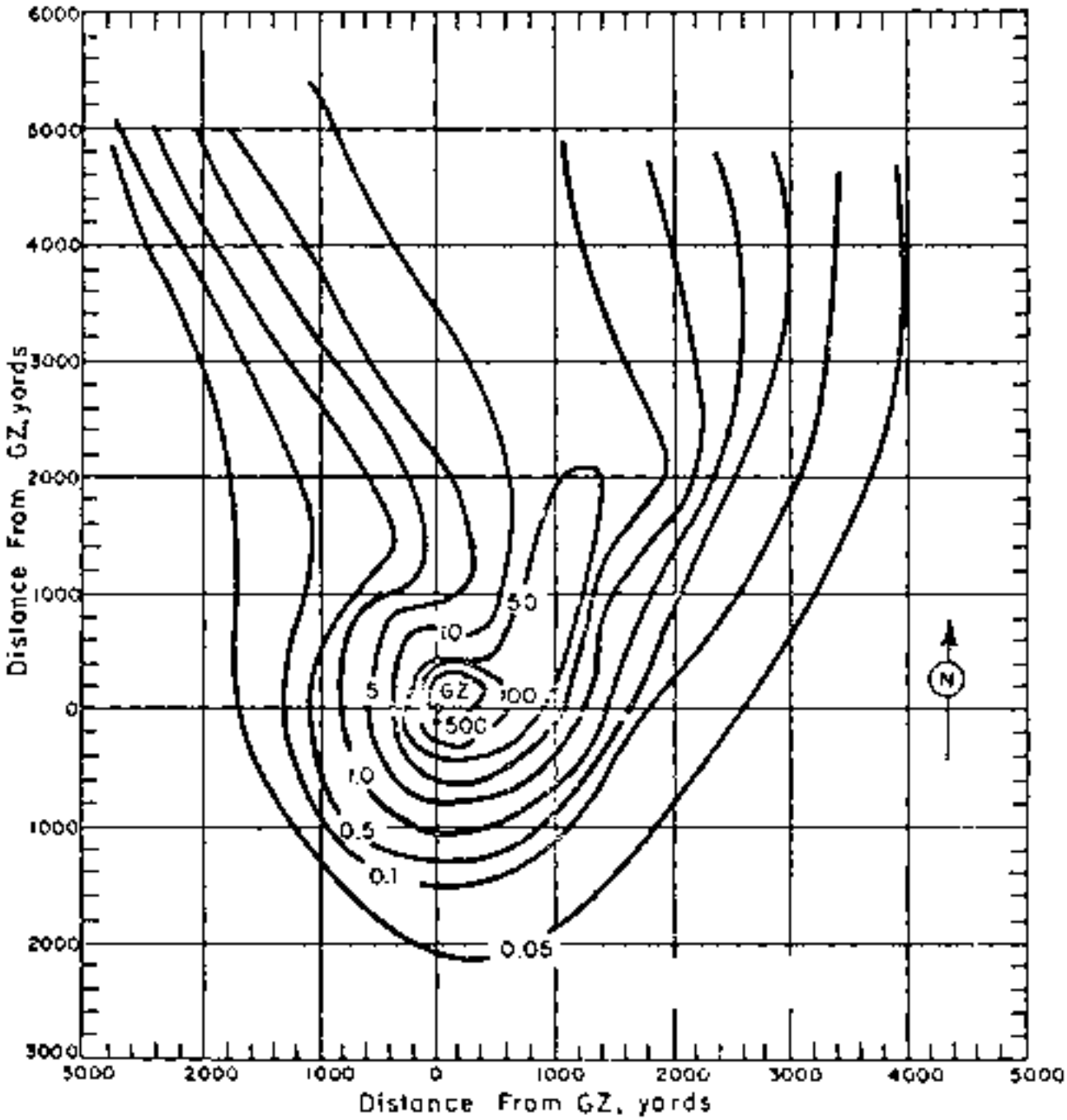


Figure 198. Operation PLUMBBOB - Shasta.
On-site dose rate contours in r/hr at H+1 hour.

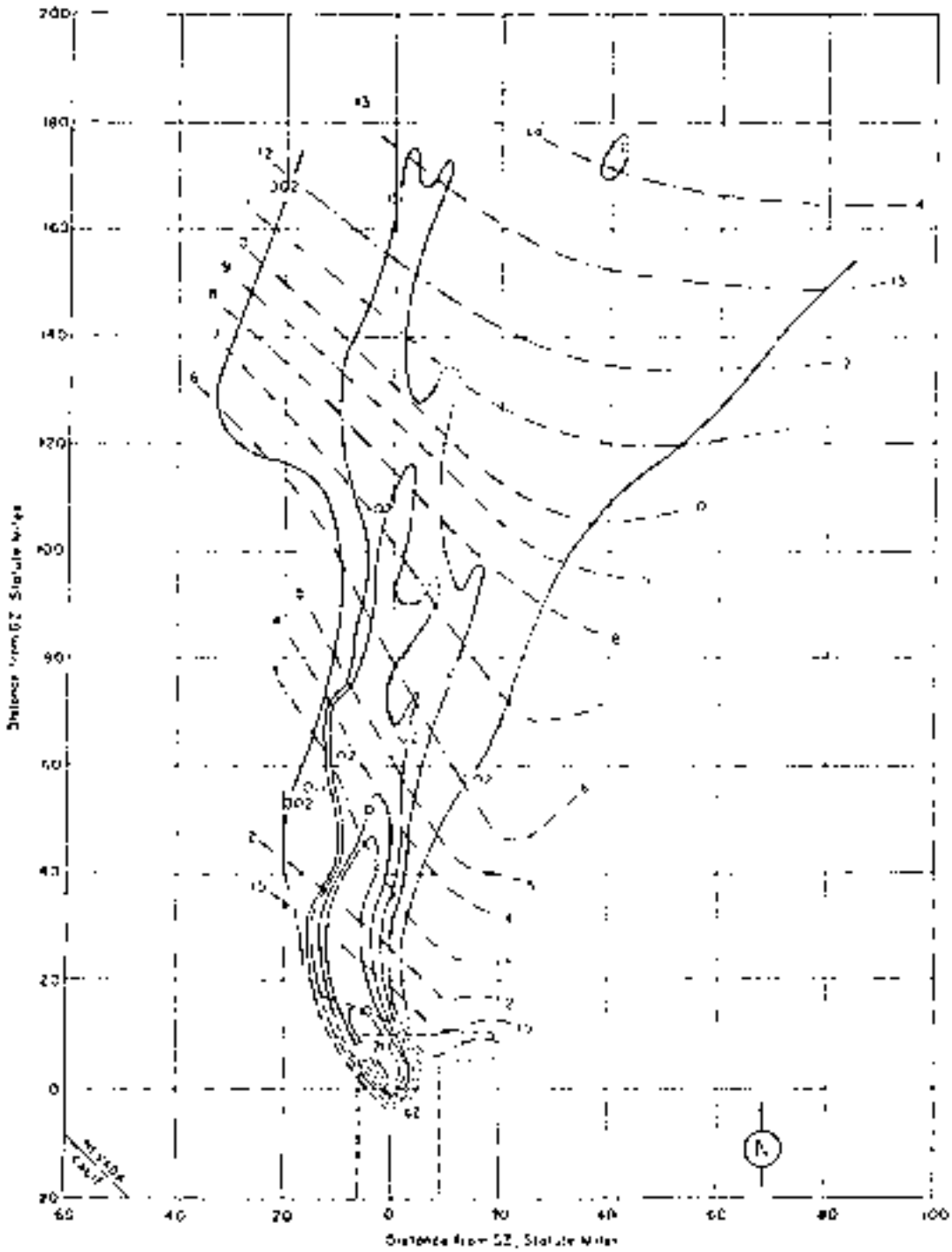


Figure 109. Operation PLUMBBOB - Cercle.
Off-site dose rate contours in r/hr at 1 hour.

TABLE 38 NOVEMBER WIND DATA FOR OKLAHOMA CITY, OKLAHOMA

Altitude (MSL) feet	Direction degrees	Speed knots	Speed mph	Speed m/s
Surface	Calm	Calm	1[illegible]	[illegible]
1,000	[illegible]	[illegible]	1[illegible]	[illegible]
2,000	[illegible]	[illegible]	[illegible]	[illegible]
3,000	[illegible]	[illegible]	[illegible]	[illegible]
4,000	[illegible]	[illegible]	[illegible]	[illegible]
5,000	[illegible]	[illegible]	[illegible]	[illegible]
6,000	[illegible]	[illegible]	[illegible]	[illegible]
7,000	[illegible]	[illegible]	[illegible]	[illegible]
8,000	[illegible]	[illegible]	[illegible]	[illegible]
9,000	[illegible]	[illegible]	[illegible]	[illegible]
10,000	[illegible]	[illegible]	[illegible]	[illegible]
11,000	[illegible]	[illegible]	[illegible]	[illegible]
12,000	[illegible]	[illegible]	[illegible]	[illegible]
13,000	[illegible]	[illegible]	[illegible]	[illegible]
14,000	[illegible]	[illegible]	[illegible]	[illegible]
15,000	[illegible]	[illegible]	[illegible]	[illegible]
16,000	[illegible]	[illegible]	[illegible]	[illegible]
17,000	[illegible]	[illegible]	[illegible]	[illegible]
18,000	[illegible]	[illegible]	[illegible]	[illegible]
19,000	[illegible]	[illegible]	[illegible]	[illegible]
20,000	[illegible]	[illegible]	[illegible]	[illegible]
21,000	[illegible]	[illegible]	[illegible]	[illegible]
22,000	[illegible]	[illegible]	[illegible]	[illegible]
23,000	[illegible]	[illegible]	[illegible]	[illegible]
24,000	[illegible]	[illegible]	[illegible]	[illegible]
25,000	[illegible]	[illegible]	[illegible]	[illegible]
26,000	[illegible]	[illegible]	[illegible]	[illegible]
27,000	[illegible]	[illegible]	[illegible]	[illegible]
28,000	[illegible]	[illegible]	[illegible]	[illegible]
29,000	[illegible]	[illegible]	[illegible]	[illegible]

Altitude (MSL) feet	Direction degrees	Speed knots	Speed mph	Speed m/s
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

NOTES:

1. Numbers in parentheses are [illegible].
2. Tropopause height was [illegible] ft MSL at [illegible].
3. Wind data was obtained from the Yukon weather station.
4. At [illegible] the surface air pressure was [illegible] mb, the temperature [illegible]°C, the dew point [illegible]°C and the relative humidity 33%.

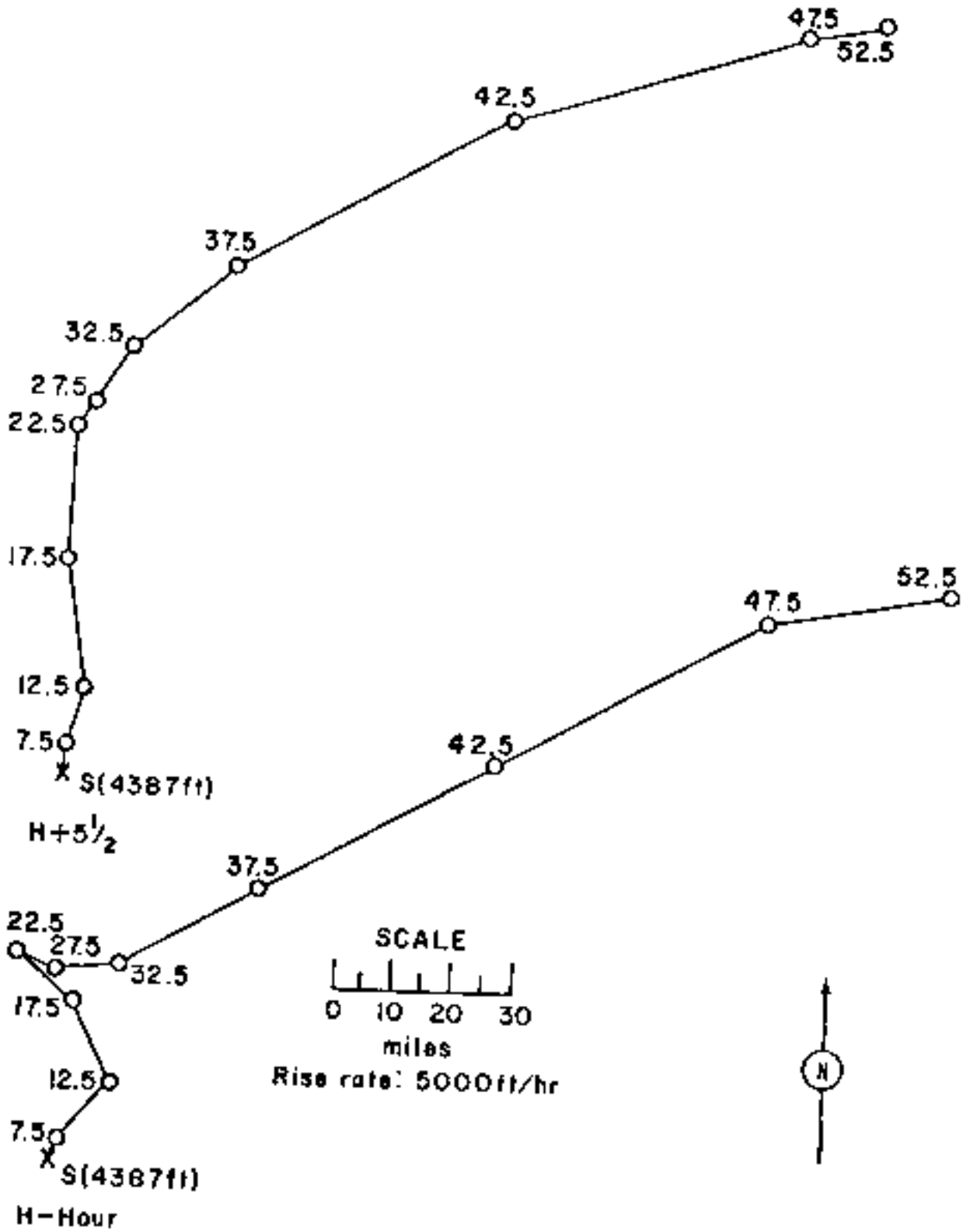


Figure 200. Hodographs for Operation PLUMBOB - Shasta.

OPERATION PLUMBBOB - Doppler

	PDT	GMT
DATE:	[illegible]	[illegible]
TIME:	[illegible]	

TOTAL YIELD: 11 kt

Sponsor: LASL

SITE: NTS - Area [illegible]
37° 09' [illegible]" N
116° 01' [illegible]" W
Date established: [illegible]

HEIGHT OF BURST: 1,200 ft

FALLOUT DATA:
Time of [illegible] radiation: 1M
Time of last measurement used: [illegible] hours
Radiation at last measurement: 1R

TYPE OF LOCAL AND TROPOSPHERIC:
Air burst, [illegible]
Scrubber unit

CLOUD TOP HEIGHT: [illegible] ft MSL
CLOUD BASE HEIGHT: [illegible] ft MSL

REMARKS:
The contamination was due primarily to induced activity. The fallout pattern was obtained from ground survey readings of the Radiological Safety Division of Holmes & Narver, Inc., Las Vegas, using AN/PDR 39 and AN/PDR 43 survey instruments. The readings were taken at H+4 hours, H+6 hours, D+1 day and D+3 days along eight radial roads to determine radiation exposure rates. The base-rate readings were extrapolated to H+1 hour by the general induced activity-decay curve for Nevada soil.

The off-site fallout was analyzed by the USWB Special Projects Section. The $t^{-1.2}$ decay approximation was used to extrapolate the base-rate readings to H+1 hour. "Some of the radioactivity is believed to be from Shot Charlie. The pattern interpolated between the burst site and the Nevada Route 95 (approximately 50 miles downwind) can only be a rough approximation in the absence of measurements, but its orientation, at least, is consistent with the wind analysis."

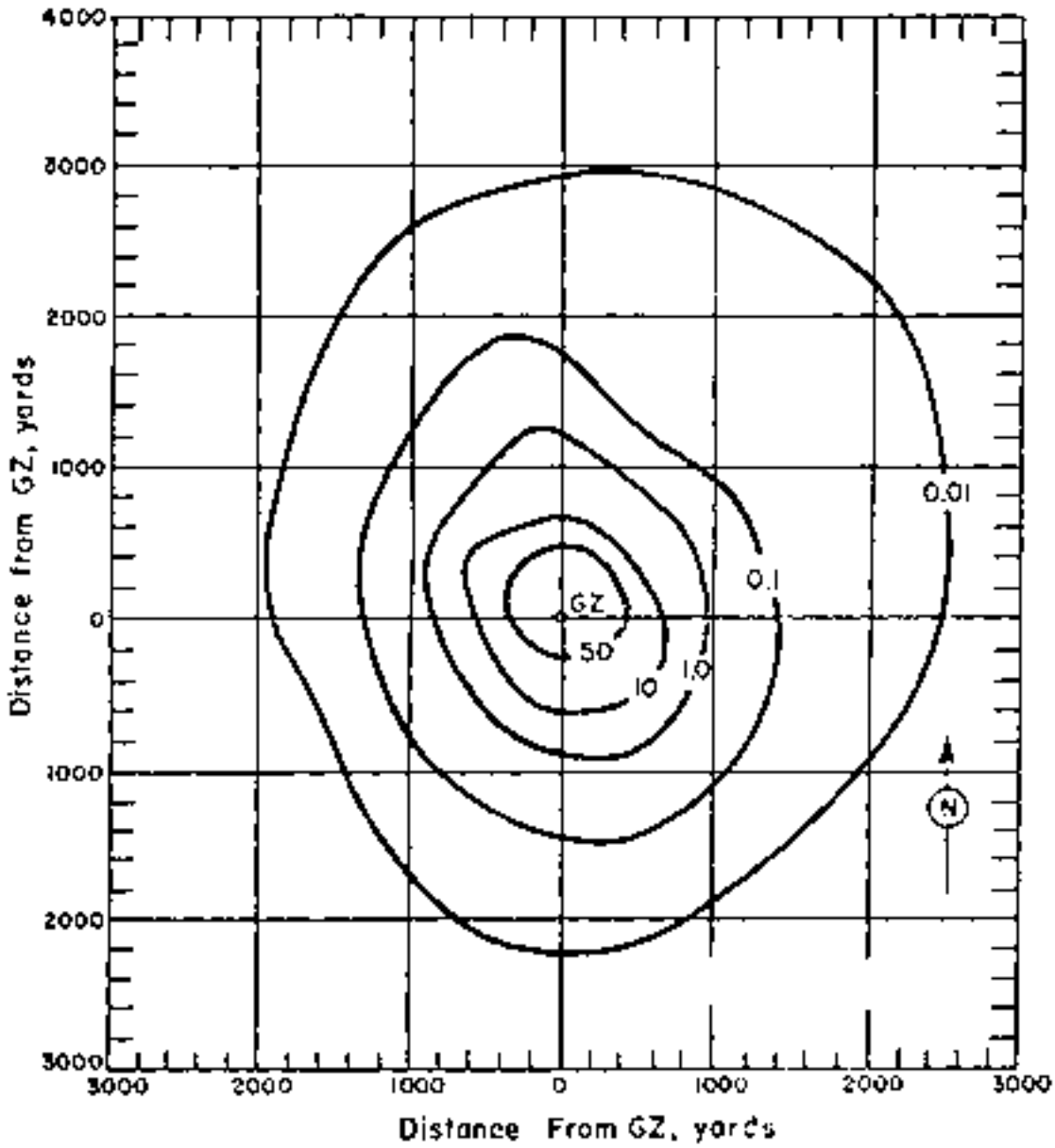


Figure 204. Operation PLUMBBOB - Doppler.
On-site dose rate contours in r/hr at H+1 hour.

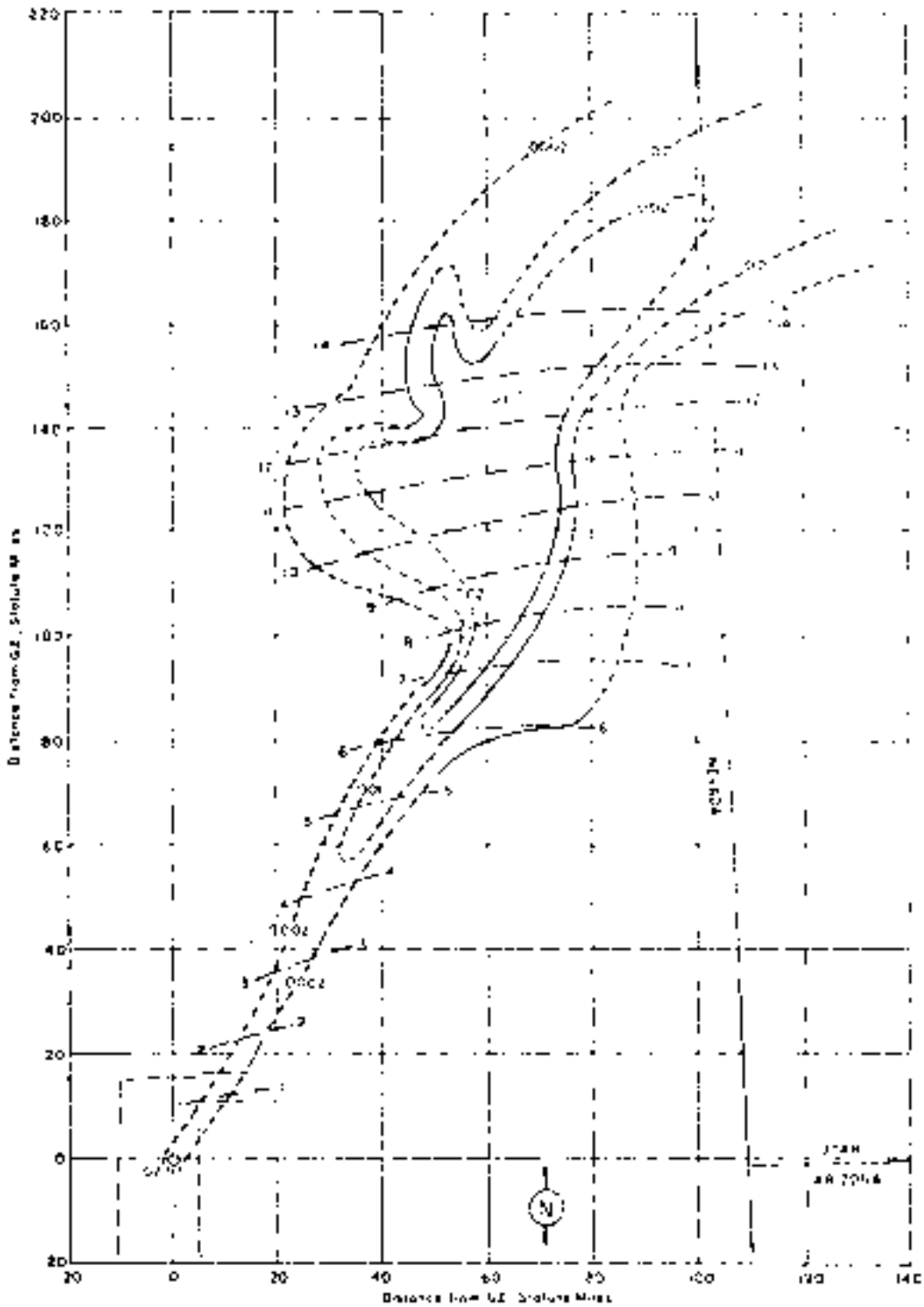


Figure 302. Operation PLUMBBOB - Doppler.
Off-site dose rate contours in r/hr at H+1 hour.

TABLE 4A - SURFACE WIND DATA FOR VARIATION STUDIES -

Airport (Ref.)	Runway	Wind Speed (kts)	Wind Direction (°)	Variation (°)
Stockton	29L	10	290	15E
	29R	10	290	15E
Sacramento (HP)	16	12	---	--
	34	12	350	15E
Travis	21	8	220	15E
Oakland	27	15	270	15E
San Jose	30	10	---	--
Monterey	28	8	---	--
Fresno	29	14	290	15E
Bakersfield	30	12	---	--
Los Angeles	25L	18	250	14E
	25R	18	250	14E
Long Beach	30	15	---	--
Ontario	26	20	---	--
San Diego	27	12	---	--
Palm Springs	31	10	---	--
Las Vegas	25	18	---	--
Reno	34	22	---	--
Phoenix	26	14	---	--
Tucson	29	10	---	--
Albuquerque	21	16	---	--
El Paso	26	12	---	--
Denver	35	18	---	--
Salt Lake City	34	14	---	--
Boise	28	10	---	--
Portland	28	08	280	15E
Seattle	34	12	---	--
Spokane	21	10	210	15E
Billings	28	14	---	--
Minneapolis	30	16	---	--
Chicago (O'Hare)	27L	20	---	--
Detroit	21	12	---	--
Cleveland	24L	14	---	--
Pittsburgh	28	10	---	--
Boston	22L	18	---	--
New York (JFK)	31L	22	---	--
Philadelphia	27L	16	---	--
Washington (Dulles)	30	14	---	--
Atlanta	26L	12	---	--
Miami	27	10	---	--
Tampa	36	08	---	--
New Orleans	19	14	---	--
Houston (Hobby)	30	12	---	--
Dallas (Love)	31L	16	---	--
Kansas City	27	18	---	--
St. Louis	30L	20	---	--

NOTES:

1. Variation is positive (E) or negative (W) as indicated.
2. Temperature is given in °C; dew point in °C. Relative humidity in %.
3. Wind data was obtained from the nearest reporting station.
4. At the time of observation, the pressure was [illegible] hPa, the temperature was 21.4°C, the dew point 13.2°C, and the relative humidity [illegible]%.

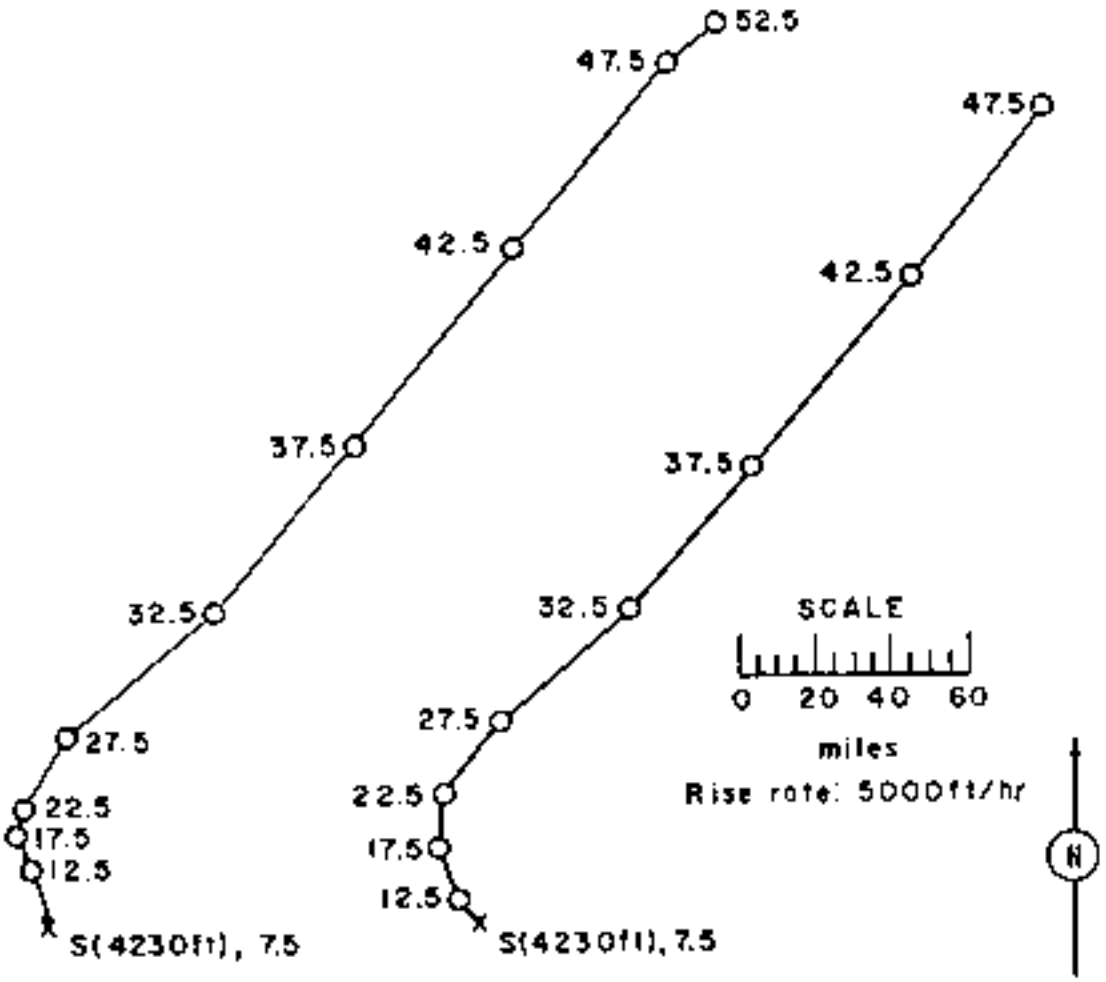


Figure 203. Hodographs for Operation PLUMBBOB - Doppler.

OPERATION [illegible] - Pascal B Safety Experiment

	PDT	GMT
DATE:	[illegible]	[illegible]
TIME:	[illegible]	2055

Sponsor: [illegible]

DROP: [illegible]
[illegible]
[illegible]
Site elevation: [illegible]

WEIGHT OF DEVICE: [illegible]
[illegible]

TYPE OF [illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]

REMARKS:

No [illegible]. Results of the [illegible] will be [illegible] of [illegible] [illegible] sensitivity of the [illegible].

OPERATION PLUMBBOB - Franklin Prime

	PDT	GMT
DATE:	[illegible]	[illegible]
TIME:	[illegible]	[illegible]

TOTAL YIELD: [illegible] kt

FIREBALL DATA:
Time of 1st maximum: [illegible]
Time to 2nd maximum: [illegible]
Radius at 2nd maximum: [illegible]

CRATER DATA: No crater

Sponsor: LASL

SITE: [illegible]

HEIGHT OF BURST: [illegible]

TYPE OF DETONATION: [illegible]

CLOUD TOP HEIGHT: [illegible]
CLOUD BOTTOM HEIGHT: [illegible]

REMARKS:
The contamination was due primarily to induced activity. The on-site pattern was obtained from ground survey data of the Radiological Safety Division of Reynolds Electrical and Engineering Co., Inc., using AN/PDR-39 and AN/PDR-[illegible] survey instruments. The [illegible] were made at H+1 hour, H+[illegible], 24 hours and 48 hours [illegible] to determine [illegible]. The [illegible] extrapolated to H+1 hour by the [illegible] induced activity decay factor for Nevada soil. The extrapolated data [illegible] are not very accurate because the induced activity decay factor is not strictly applicable.

The off-site fallout was analyzed by the USPHS Special Projects Division. The $t^{-1.2}$ decay approximation was used in extrapolating later field readings to H+1 hour. "A considerable amount of the radioactivity observed following Franklin Prime can be attributed to residual debris from previous tower shots, primarily Smoky and Galileo. This residual activity had to be subtracted from the activity observed. The resulting [illegible] should be [illegible] only as an approximation.

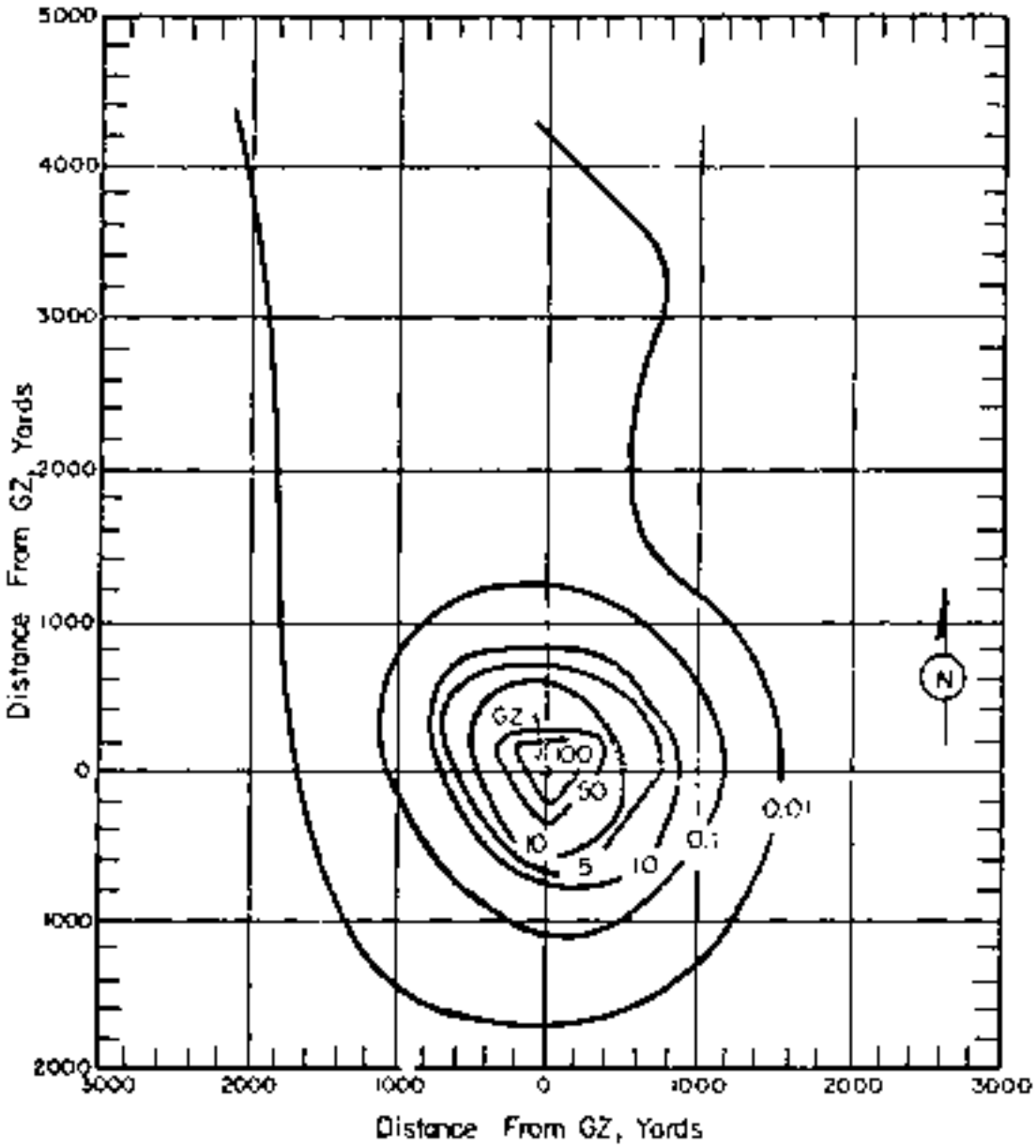


Figure 204. Operation PLUMBBOB - Franklin Prime.
On-site dose rate contours in r/hr at H+1 hour.

TABLE 6d NEVADA WIND DATA FOR GENERATION PLANNING - HOURLY DATA

Altitude (MSL)	0400 Speed	0400 Direction	1600 Speed	1600 Direction	Altitude (MSL)	0400 Speed	0400 Direction	1600 Speed	1600 Direction
Feet	Knots	Mils	Knots	Mils	Feet	Knots	Mils	Knots	Mils
Surface	Calm	Calm	Calm	Calm	19,000	25	46	---	--
4,950(ft)	04	47	---	--	20,000	14	54	020	01
5,000	13	02	180	02	21,000	10	44	---	--
6,000	21	06	230	05	22,000	10	51	---	--
7,000	20	12	230	09	23,000	09	51	---	--
8,000	19	24	220	14	24,000	11	51	---	--
9,000	17	31	250	16	25,000	12	52	010	01
10,000	16	36	270	18	26,000	14	52	---	--
11,000	15	41	---	--	27,000	15	53	---	--
12,000	13	45	270	24	28,000	17	49	---	--
13,000	14	49	---	--	29,000	19	52	---	--
14,000	18	49	280	30	30,000	21	54	010	01
15,000	20	47	(280)	(30)	31,000	22	54	---	--
16,000	19	45	290	31	32,000	23	53	---	--
17,000	20	49	---	--	34,000	24	54	---	--
18,000	19	51	270	28	36,000	25	55	---	--
19,000	20	50	---	--	40,000	30	55	020	01
20,000	21	50	270	36	46,000	30	55	---	--
21,000	21	51	---	--	47,000	31	57	---	--
22,000	20	53	---	--	48,000	30	46	---	--
23,000	20	51	310	33	49,000	29	51	---	--
24,000	20	51	---	--	50,000	30	58	010	01
25,000	20	51	250	36	52,000	31	61	---	--
26,000	21	49	---	--	52,000	30	58	---	--
27,000	20	50	---	--	53,000	29	59	---	--
28,000	20	54	---	--					

NOTES:

1. Numbers in parentheses are estimated values.
2. Tropopause height was 37,000 ft MSL at 0400 hour.
3. Wind data was obtained from the Yucca weather station.
4. At 0400 hours the surface air pressure was 868 mb, the temperature 11.0°C, the dew point -3.7°C and the relative humidity 35%.

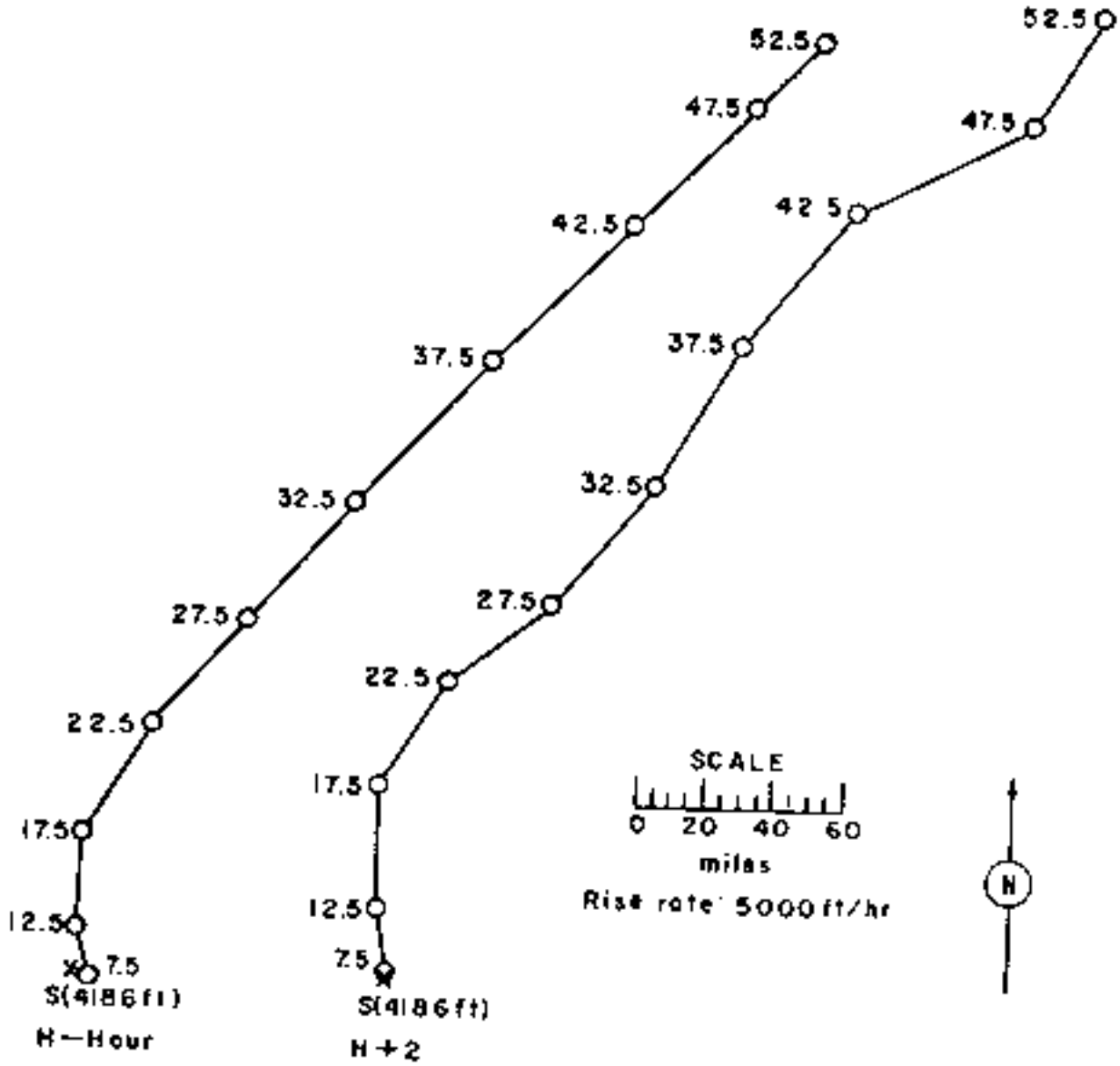


Figure 205. Hodographs for Operation PLUMBBOB - Franklin Prime.

OPERATION [illegible] -

	PST	GMT
DATE:	[illegible]	[illegible]
TIME:	[illegible]	1730

Sponsors: [illegible]

TOTAL [illegible]

AUTH: [illegible]

PRELIMINARY [illegible]

[illegible]

REGISTRATION [illegible]

[illegible]

CLOUD [illegible]

OTHER [illegible]

REMARKS:

The [illegible] was [illegible] the Radiological Defense [illegible] Co., Inc., using AN/PDR [illegible] were taken at [illegible] radial [illegible] approximation was used to extrapolate [illegible] The higher dose rates [illegible] before such readings were taken.

The off-site fallout pattern was obtained by "The Joint Manpower Committee for the Evaluation of Radiation Doses." This committee analyzed all available data and used the actual decay data obtained by the "ESSA School of Medicine Atomic Survey [illegible]. The $t^{-1.2}$ decay approximation was used to extrapolate the 24-hour dose-rate contours to 744 hours. The patterns are based on ground and aerial survey data. The time of arrival was estimated by using measured times at known points.

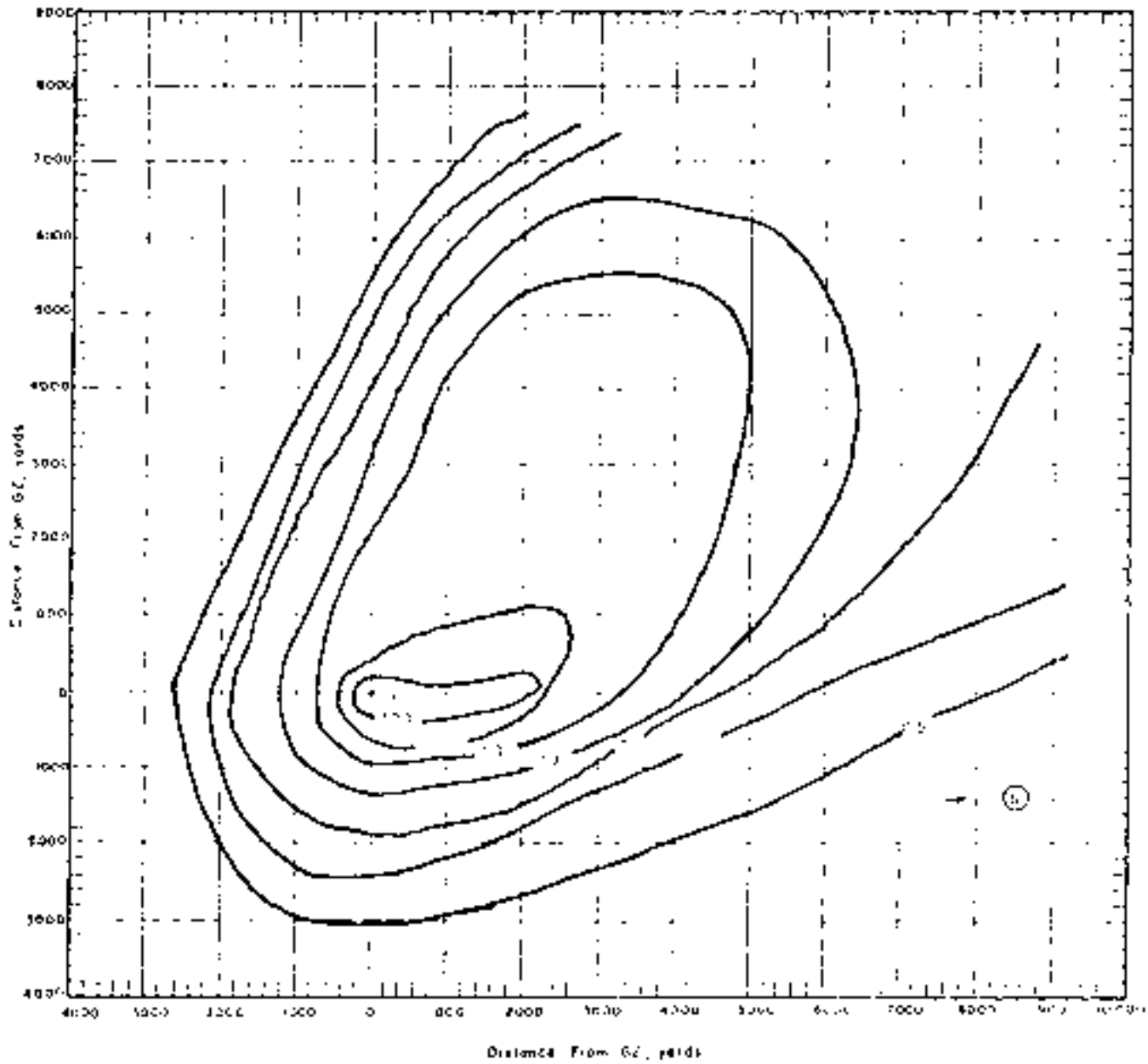


Figure 21b. Operation PLUMBBOB - Smoky.
On-site dose rate contours in r/hr at H+1 hour.

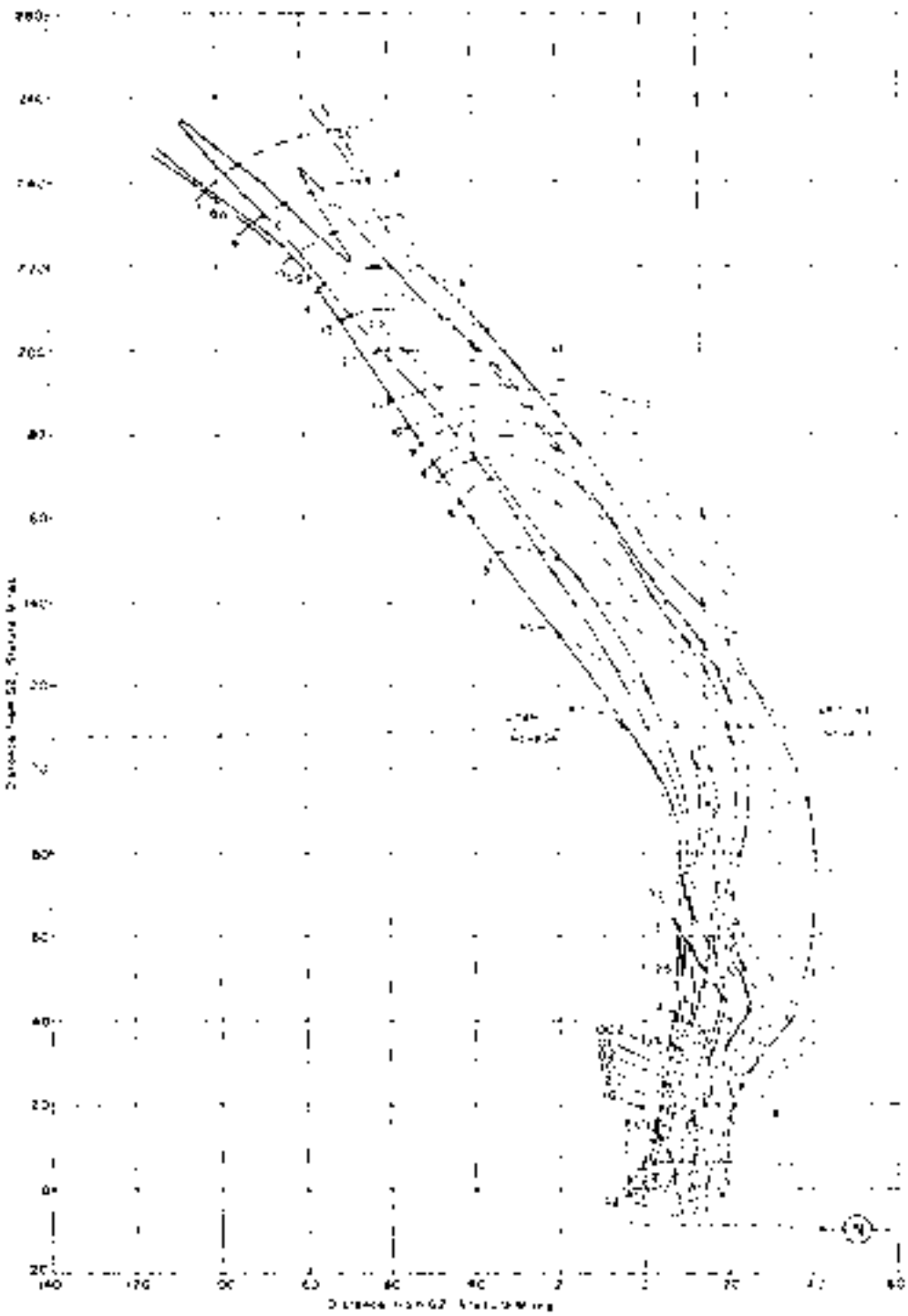


Figure 207. Operation PLUMBBOB - Smoky
Off-site dose rate contours in r/hr at H+1 hour.

TABLE 61 NEVADA WIND DATA FOR OPERATION [illegible] — [illegible]

Altitude (MSL)	8-hour		20-hour	
	Direction	Speed	Direction	Speed
Surface	Calm	Calm	Calm	Calm
5,000	Calm	Calm	5%	0%
5,179 (ZZ)	Calm	Calm	---	--
6,000	36%	4%	3,%	0%
7,000	03%	7%	20%	0%
8,000	0.%	0%	08%	0%
9,000	01%	2%	0%%	0%
10,000	7.%	5%	36%	0%
11,000	4%	3%	---	--
12,000	5--%	4%	3%%	0%
13,000	4%	3%	---	--
14,000	0%	---	2%%	0%
15,000	340	--	(1%)	(1%)
16,000	3%	1%	2%%	1%
17,000	0%%	1%	---	--
18,000	3%	1%	2%%	1%
19,000	1%	0%	---	--
20,000	1%	1%	3%%	1%
21,000	1%%	1%	---	--
22,000	1%%	2%	---	--
23,000	2%	2%	2%	1%
24,000	2%	1%	---	--
25,000	2%	3%	2%%	1%
26,000	2%%	3%	---	--
27,000	2%	3%	---	--
28,000	2%%	3%	---	--

Altitude (MSL)	8-hour		20-hour	
	Direction	Speed	Direction	Speed
Surface	2%%	4%	---	--
30,000	1%%	3%	30%	3%
31,000	2%%	4%	---	--
32,000	2%	3%	---	--
33,000	2%%	3%	---	--
34,000	2%%	3%	---	--
35,000	2%	3%	---	2
36,000	2%	3%	---	--
37,000	2%	4%	---	--
38,000	2%	3%	---	--
39,000	2%	4%	---	--
40,000	2%	4%	2%	2%
41,000	2%	4%	---	--
42,000	1%	3%	---	--
43,000	1%	3%	---	--
44,000	1%	3%	---	--
45,000	1%	3%	---	--
46,000	1%	3%	---	--
47,000	1%	3%	---	--
48,000	1%	3%	---	--
49,000	1%	3%	---	--
50,000	1%	3%	---	--

NOTES:

1. Numbers in parentheses are estimated values.
2. Tropopause height was 55,000 ft MSL at 8-hours.
3. Wind data was obtained from the Yucca weather [illegible].
4. At 8-hour the air pressure was 87.6 mb, the temperature -7°C, the dew point -3.6°C and the relative humidity 91%.

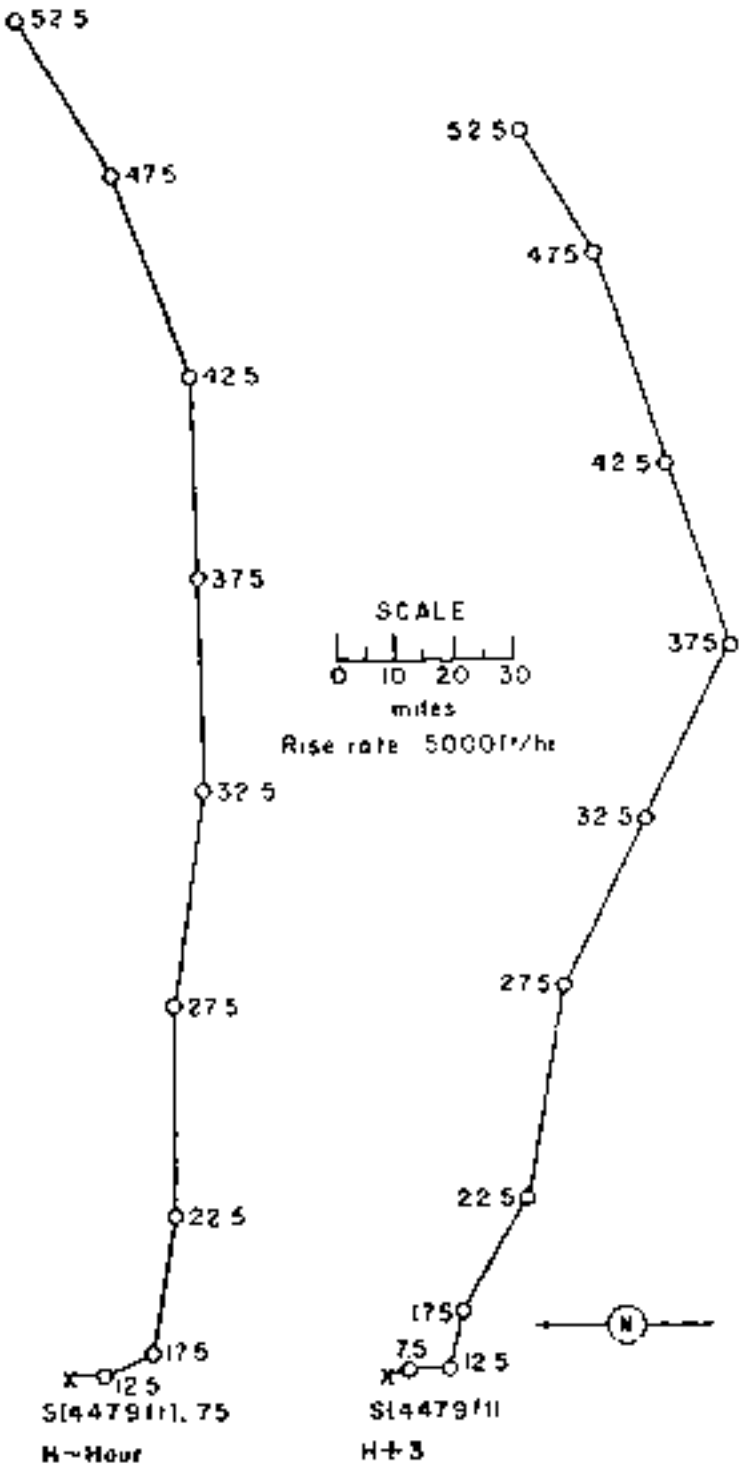


Figure 208. Hodographs for Operation PLUMBOB - Smoky.

OPERATION PLUMBBOB - Galileo

	LST	GMT
DATE:	[illegible]	[illegible]
TIME:	0540	1240

Sponsor: DASA

TOTAL YIELD: 11 kt

SITE: [illegible] - Area 1
[illegible]
[illegible]
Site elevation: [illegible]

FIREBALL DATA:
Time to first minimum: [illegible]
Time to first maximum: [illegible]
Radius at first minimum: [illegible]

HEIGHT OF BURST: [illegible]

CRATER DATA: [illegible]

TYPE OF SURFACE AND CONDITIONS:
[illegible]

DIAMETER: [illegible]
DEPTH: [illegible]

REMARKS:

The on-site pattern was obtained from ground survey readings of the Radiological Safety Division of Reynolds Electrical and Engineering Co., Inc., using AN/PPS-3 and AN/PPS-4 survey instruments. The readings were taken at H+1 hour, H+6 hours, H+1 day, H+2 days and H+3 days after eight patrol roads to determine contour areas. The dose-rate readings were extrapolated to H+1 hour by the $t^{-1.2}$ decay approximation.

The off-site fallout was analyzed by Program 37 of DCPA. Aerial decay data was used to plot the H+12-hour dose-rate contours. The $t^{-1.2}$ decay approximation was used by NTS to extrapolate the H+12-hour dose-rate readings to H+1 hour. The pattern is based on ground and aerial survey data. "The west edge and the close-in portion of this pattern was estimated due to the lack of data"

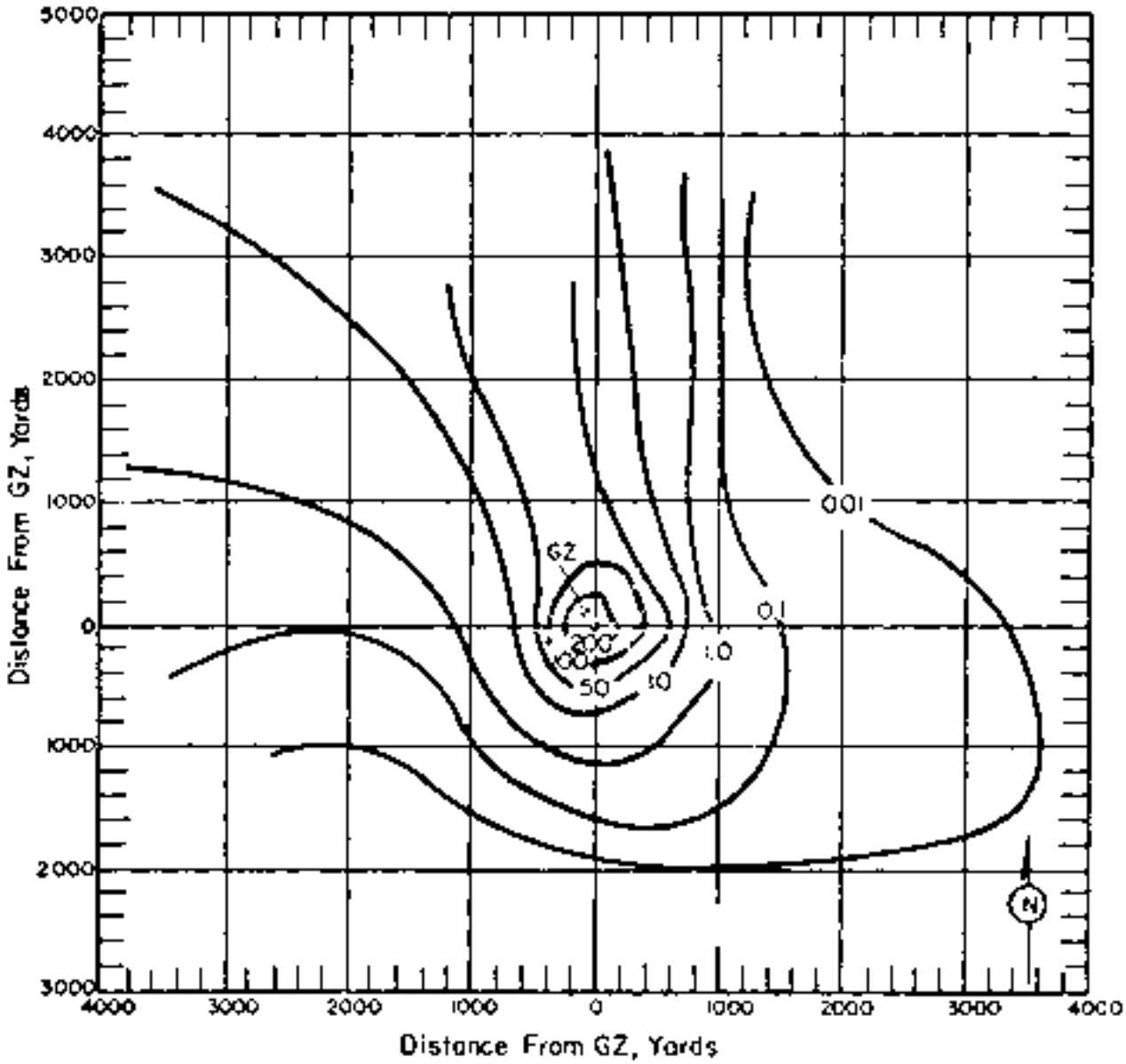


Figure 400. Operation PLUMBBOB - Galileo.
On-site dose rate contours in r/hr at H+1 hour.

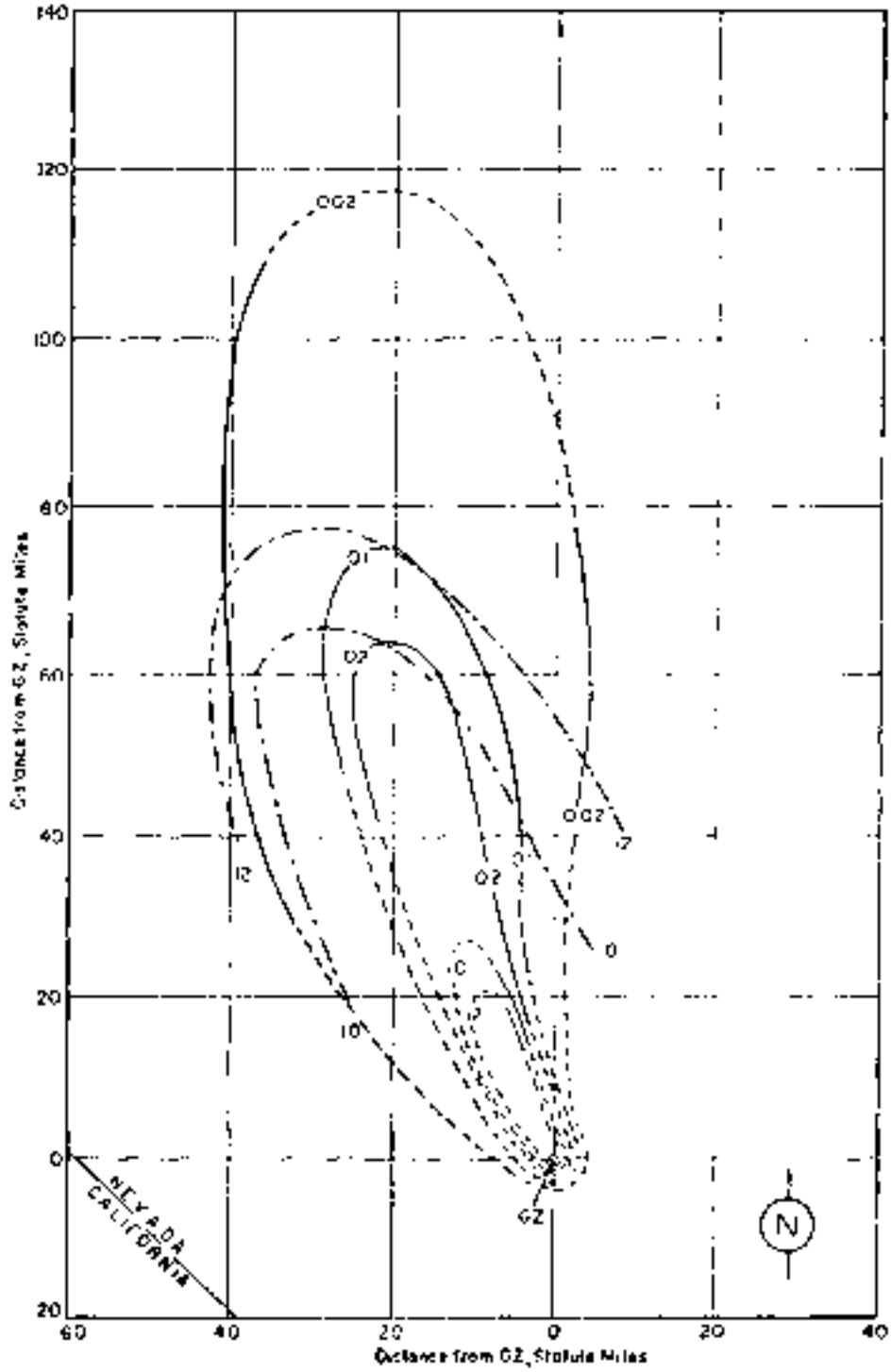


Figure 210. Operation PLUMBOB - Cactus.
Off-site dose rate contours in r/hr at H+1 hour.

TABLE 62 [illegible]

Altitude (Feet)	[illegible]		[illegible]		[illegible]	
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Surface	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4,740(1)	[illegible]	[illegible]	---	---	---	--
5,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6,000	230	01	[illegible]	[illegible]	[illegible]	[illegible]
7,000	280	02	[illegible]	[illegible]	[illegible]	12
8,000	270	06	120	02	150	10
9,000	190	04	140	03	160	08
10,000	200	05	140	03	160	07
11,000	250	07	---	--	---	--
12,000	160	09	150	03	180	09
13,000	200	09	---	--	---	--
14,000	160	07	160	03	180	09
15,000	160	08	(150)	(03)	(180)	(10)
16,000	200	09	150	03	170	09
17,000	130	09	---	--	---	--
18,000	170	10	150	03	160	09
19,000	170	10	---	--	---	--
20,000	080	09	110	02	130	08
21,000	010	06	---	--	---	--
22,000	020	07	---	--	---	--
23,000	010	07	040	09	030	07
24,000	030	07	---	--	---	--
25,000	070	09	180	02	110	06
26,000	040	06	---	--	---	--
27,000	070	12	---	--	---	--
28,000	070	10	---	--	---	--
29,000	070	06	---	--	---	--
30,000	070	07	040	02	040	06
31,000	060	07	---	--	---	--
32,000	040	08	---	--	---	--
33,000	010	12	---	--	---	--
34,000	010	12	---	--	---	--
35,000	040	12	020	02	020	07
36,000	050	13	---	--	---	--
37,000	010	14	---	--	---	--
38,000	360	14	---	--	---	--
39,000	340	12	---	--	---	--
40,000	330	07	290	09	270	08
45,000	240	38	240	25	240	21
50,000	260	36	190	29	250	32

NOTES:

1. Numbers in parentheses are estimated values.
2. Tropopause height was 39,300 ft MSL at 0400 hours.
3. Wind data was obtained from the Yuma weather station.
4. At 0-hour the surface air pressure was 870 mb, the temperature 15.8°C, the dew point -1.5°C and the relative humidity 34%.

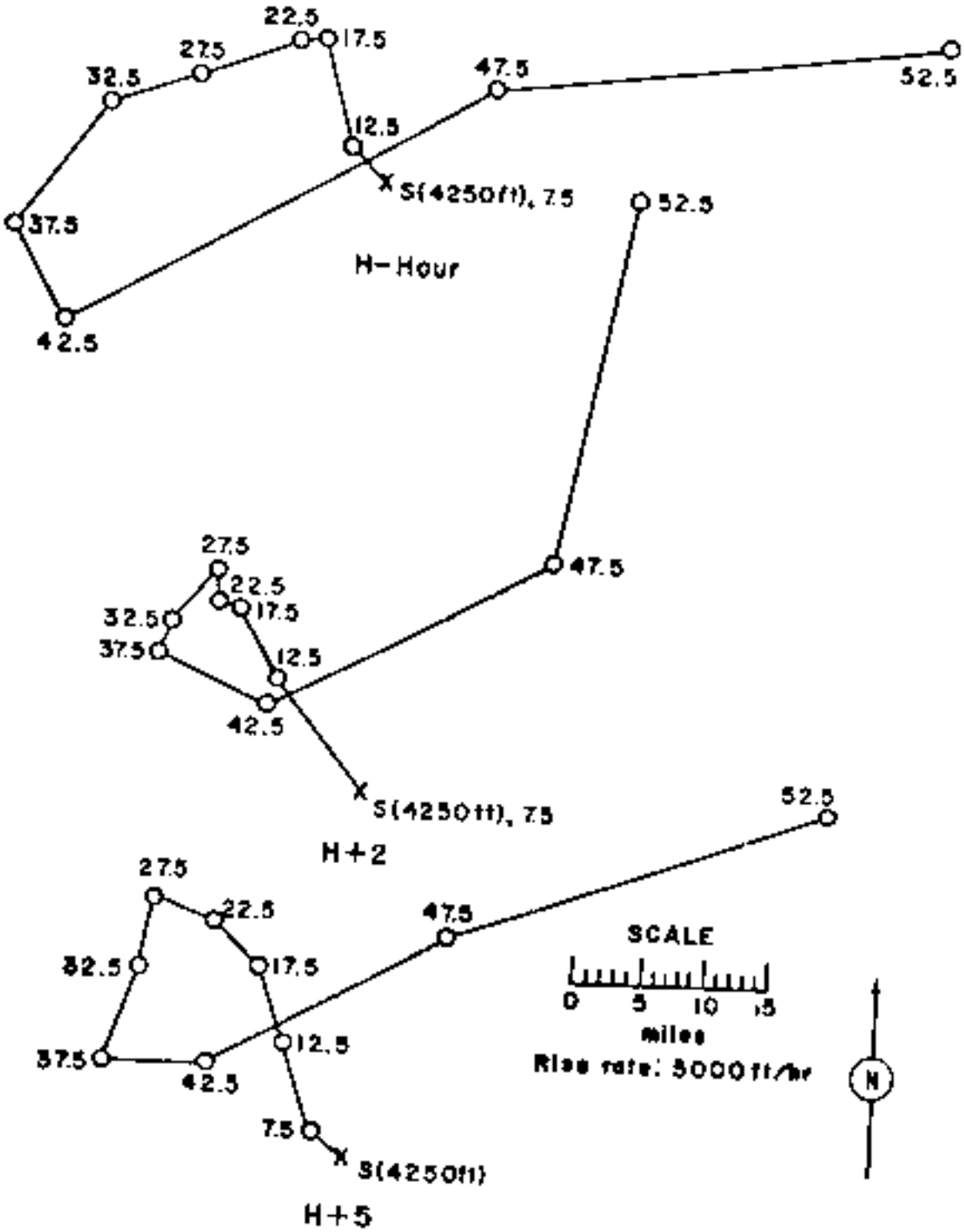


Figure 211. Hodographs for Operation PLUMBOB - Galileo.

OPERATION HARDTACK I - Wheeler

	PST	GMT
DATE:	[illegible]	[illegible]
TIME:	0[illegible]	[illegible]

TOTAL YIELD: [illegible] tons

FIREBALL DATA:
[illegible]
Time to [illegible]
Radius at last [illegible]

CRATER DATA: [illegible]

Sponsors: [illegible]

SITE: NTS - Area [illegible]
37° 06' [illegible]" N
116° 02' 27" W
Site elevation [illegible]

HEIGHT OF BURST: [illegible]

TYPICAL EFFECTS AT [illegible]:
Air blast [illegible]
Shock [illegible]

CLOUD: [illegible]
CRATER [illegible]

Radiation:

The contamination was due primarily to induced activity. The radiation pattern was observed from ground surveys provided by the Radiological Safety Division of Reynolds Electrical and Engineering Co. Two low-level AN/PDR 39 and AN PDR 43 surveys in transmitter. The greatest exposure rates at 8+1 hours, 210 R/hr; 24 hours, 84 R/hr; 48 hours, 34 R/hr without radical shift in isocontour position or individual values. The 2 or more readings were extrapolated to 84 hours by the modified inverse-logarithmic-decay curve for Nevada soils. The pattern is not available. The measurements include some residual radiation from previous shots.

The fallout detected by the off-site survey could not be definitely attributed to Wheeler, but may well have been from previous shots.

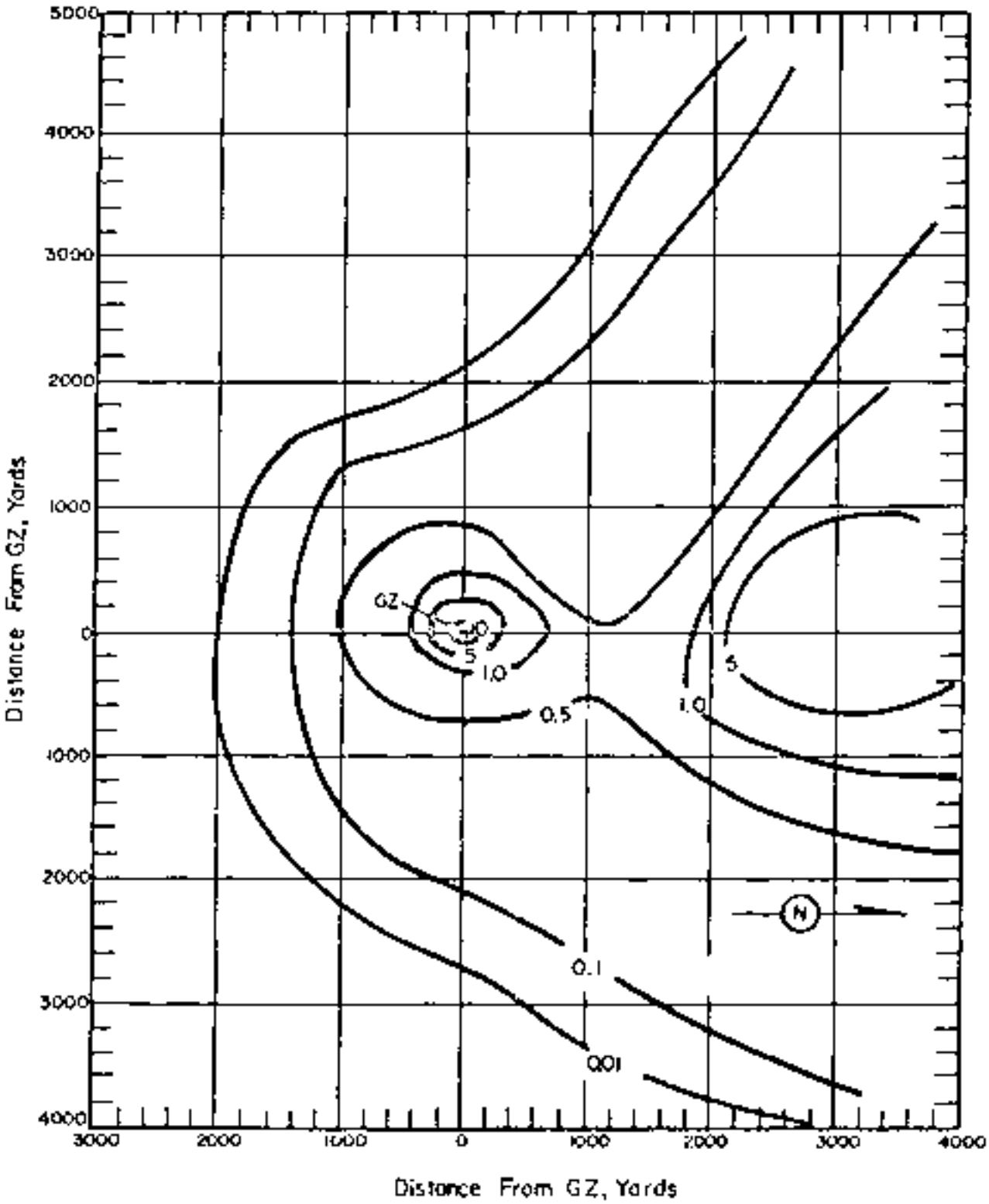


Figure 212. Operation [illegible] - [illegible] Wheeler.
On-site dose rate contours in r/hr at H+1 hour.

TABLE 63 NEVADA WIND DATA FOR CLIMATOLOGY STATIONS [illegible]

Altitude (MSL)	0400 hours				1400 hours				Annual	Annual	Annual	Annual	Annual
	Dir.	Speed	Dir.	Speed					Dir.	Speed			
Feet	Degrees	mph	Degrees	mph					Degrees	mph			
Surface	Calm	Calm	Calm	Calm					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4,715 (BH)	[illegible]	[illegible]	---	---					[illegible]	[illegible]	[illegible]	---	---
5,000	[illegible]	[illegible]	[illegible]	[illegible]					[illegible]	[illegible]	[illegible]	---	---
6,000	[illegible]	[illegible]	[illegible]	[illegible]					[illegible]	[illegible]	[illegible]	---	---
7,000	[illegible]	[illegible]	[illegible]	[illegible]					[illegible]	[illegible]	[illegible]	---	---
8,000	[illegible]	[illegible]	[illegible]	[illegible]					[illegible]	[illegible]	[illegible]	---	---
9,000	[illegible]	[illegible]	[illegible]	[illegible]					[illegible]	[illegible]	[illegible]	[illegible]	
10,000	[illegible]	[illegible]	[illegible]	[illegible]					[illegible]	[illegible]	[illegible]	---	---
11,000	[illegible]	[illegible]	---	---					[illegible]	[illegible]	[illegible]	---	---
12,000	[illegible]	[illegible]	[illegible]	[illegible]					[illegible]	[illegible]	[illegible]	---	---
13,000	[illegible]	[illegible]	---	---					[illegible]	[illegible]	[illegible]	---	---
14,000	[illegible]	[illegible]	[illegible]	[illegible]					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
15,000	[illegible]	[illegible]	(Calm)	(Calm)					[illegible]	[illegible]	[illegible]	---	---
16,000	[illegible]	[illegible]	[illegible]	[illegible]					[illegible]	[illegible]	[illegible]	---	---
17,000	[illegible]	[illegible]	---	---					[illegible]	[illegible]	[illegible]	---	---
18,000	[illegible]	[illegible]	[illegible]	[illegible]					[illegible]	[illegible]	[illegible]	---	---
19,000	[illegible]	[illegible]	---	---					[illegible]	[illegible]	[illegible]	---	---
20,000	[illegible]	[illegible]	[illegible]	[illegible]					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
21,000	[illegible]	[illegible]	---	---					[illegible]	[illegible]	[illegible]	---	---
22,000	[illegible]	[illegible]	---	---					[illegible]	[illegible]	[illegible]	---	---
23,000	[illegible]	[illegible]	[illegible]	[illegible]					[illegible]	[illegible]	[illegible]	---	---
24,000	[illegible]	[illegible]	---	---					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
25,000	[illegible]	[illegible]	[illegible]	[illegible]					[illegible]	[illegible]	[illegible]	---	---
26,000	[illegible]	[illegible]	---	---					[illegible]	[illegible]	[illegible]	---	---
27,000	[illegible]	[illegible]	---	---					[illegible]	[illegible]	[illegible]	---	---
28,000	[illegible]	[illegible]	---	---									

NOTES:

1. Numbers in parentheses are additional stations.
2. Temperature [illegible] at 5,000 ft MSL or higher.
3. Wind data was obtained from [illegible] upper winds [illegible].
4. At H-hour the surface pressure was [illegible] mb, the temperature was [illegible]°C, the dew point [illegible]°C and the relative humidity [illegible]%.

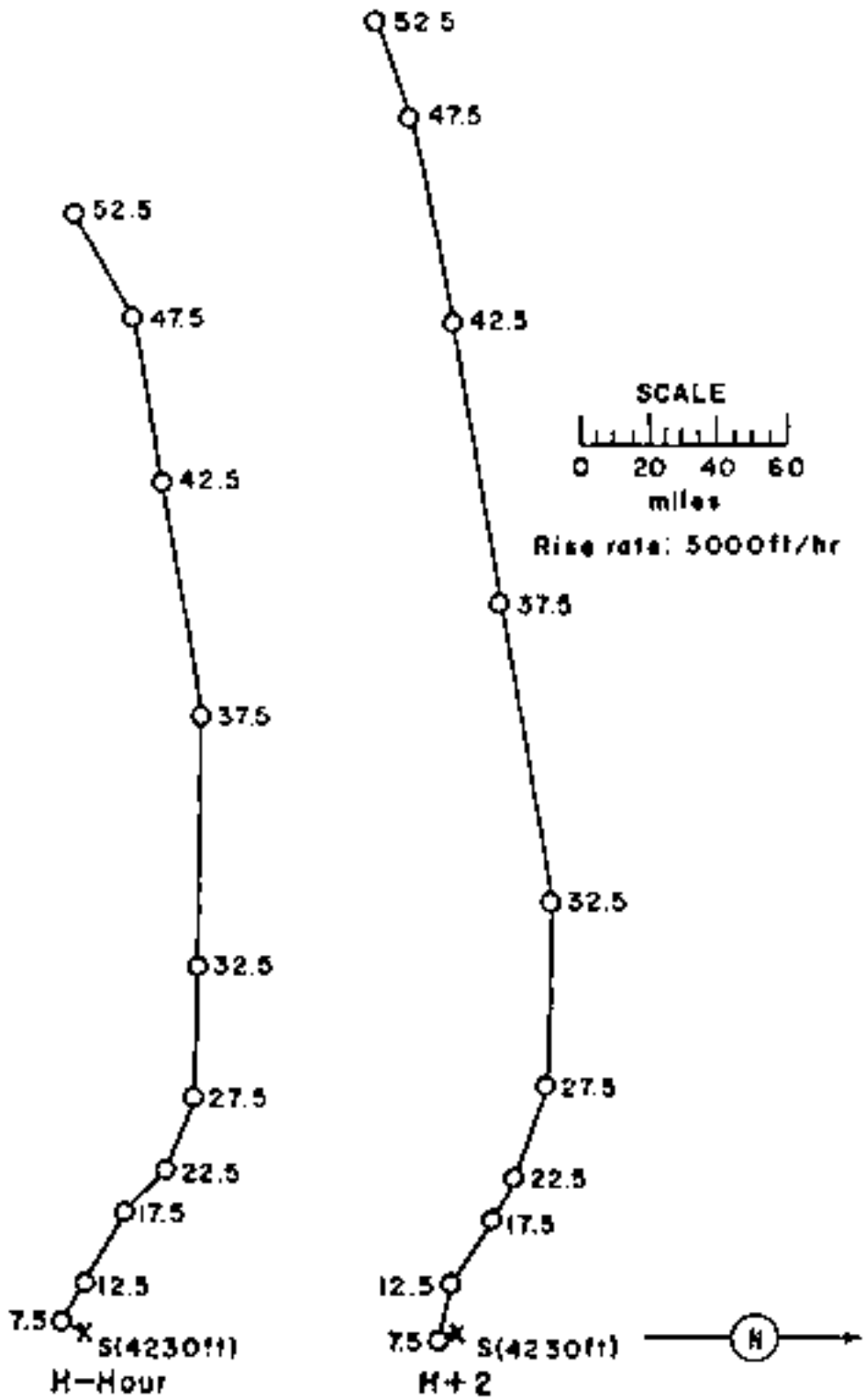


Figure 213. Hodographs for Operation PLUMBBOB - Wheeler.

OPERATION [illegible] - Coulomb B Safety Experiment

	FOF	GMT
DATE:	[illegible]	[illegible]
TIME:	[illegible]	[illegible]

TOTAL YIELD: 0.5 kt

FIREBALL DATA:
Time to first maximum: [illegible]
Time to first minimum: [illegible]
Radius at first maximum: [illegible]

CLOUD TOP HEIGHT: [illegible] at [illegible] min.
CLOUD BOTTOM HEIGHT: [illegible]

Sponsor: LASL

SITE: [illegible] - Area 5c
37° 08' 30" N
116° 04' 51" W
Site elevation: [illegible]

METHOD OF BURST: [illegible]

TYPE OF EVENT AND PLACEMENT:
[illegible]

REMARKS:

[illegible]

[illegible]

The [illegible] dosage approximately [illegible] maximum dose-rate readings in [illegible] hours. Due to light winds, a narrow part of the fall-out was probably deposited between GZ and the nearest off-site points for which monitoring data were available.

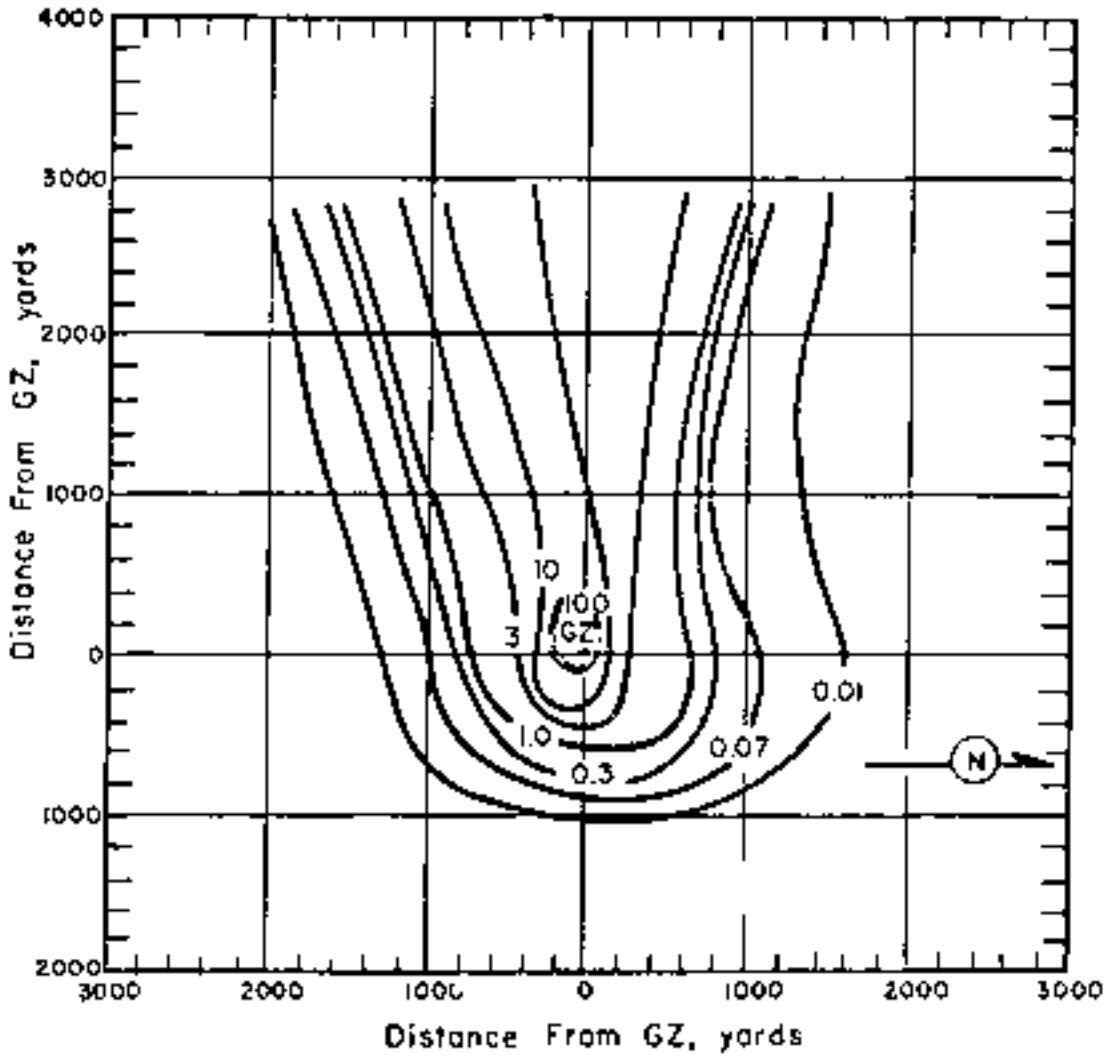


Figure 214. Operation PLUMBBOB - Coulomb B.
On-site dose rate contours in r/hr at H+1 hour.

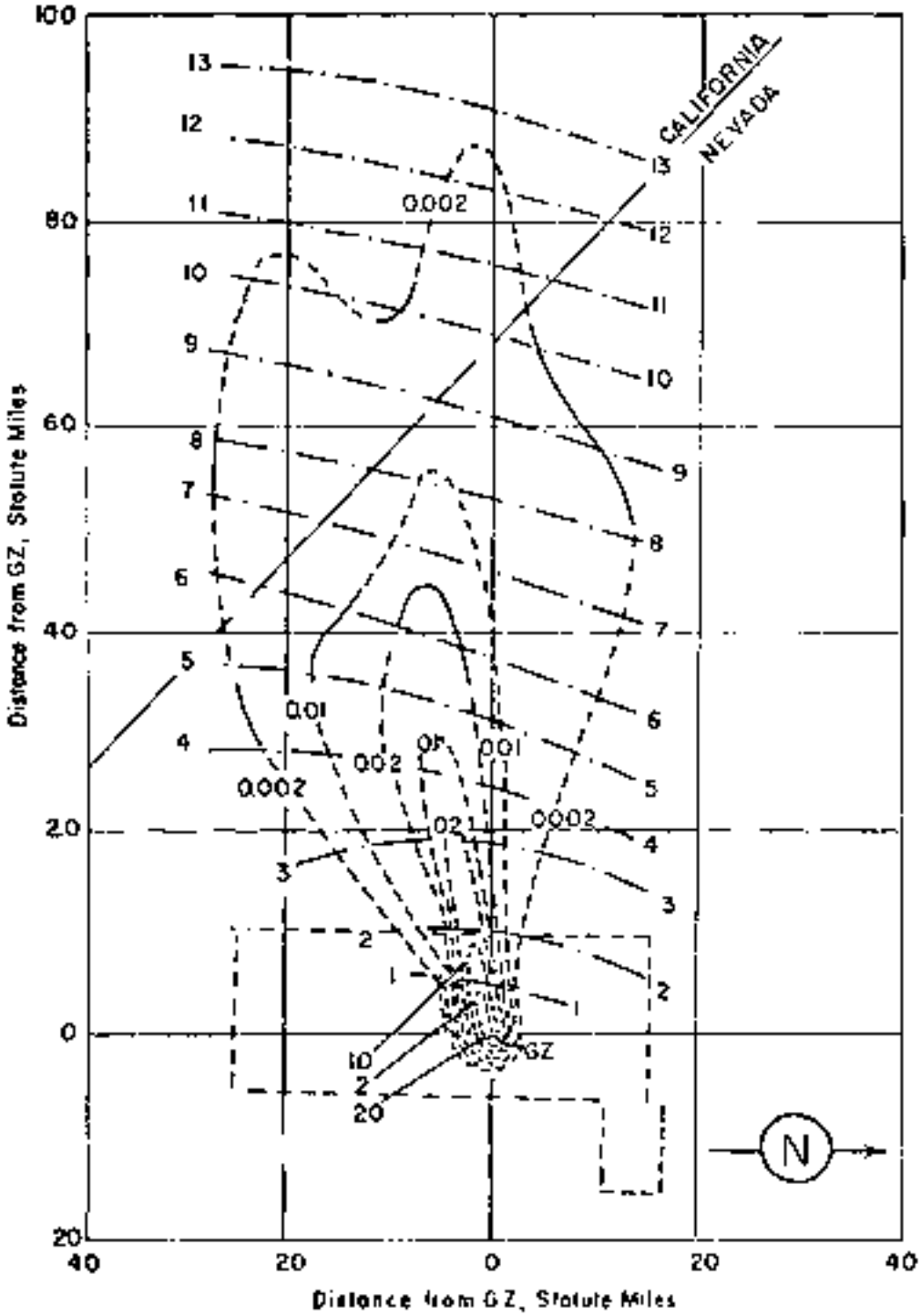


Figure 215. Operation PLUMBBOB - Coulomb F.
Off-site dose rate contours in r/hr at H+1 hour.

TABLE 64 NEWARK WIND DATA FOR CHEMICAL PLUME MODEL- CONTINUED

Altitude (MSL)	Summer		Winter	
	Dir	Speed	Dir	Speed
Ground	Unstable	mph	Unstable	mph
1,000	050	06	210	04
2,000	050	06	190	05
3,000	060	09	180	06
4,000	070	09	190	07
5,000	090	09	210	09
6,000	090	10	220	10
7,000	090	13	240	12
8,000	090	15	250	13
9,000	090	15	260	14
10,000	090	15	260	15
12,000	090	16	270	17
14,000	090	21	270	19
15,000	(090)	(20)	(270)	(20)
16,000	090	19	270	21
18,000	090	18	270	23
20,000	100	20	270	25
22,000	270	21	270	26
24,000	270	21	270	26
26,000	270	22	270	27
28,000	270	23	270	28
30,000	270	23	270	29
32,000	270	24	270	30
34,000	270	24	270	31
36,000	270	25	270	32
38,000	270	25	270	33
40,000	270	26	270	34
42,000	270	26	270	35
44,000	270	27	270	36
46,000	270	27	270	37
48,000	270	28	270	38
50,000	270	28	270	39

NOTES:

1. Numbers in parentheses are estimated values.
2. Wind data were obtained from the Newark weather station.
3. Crop yield (wheat) was 19,000 lb MSL.

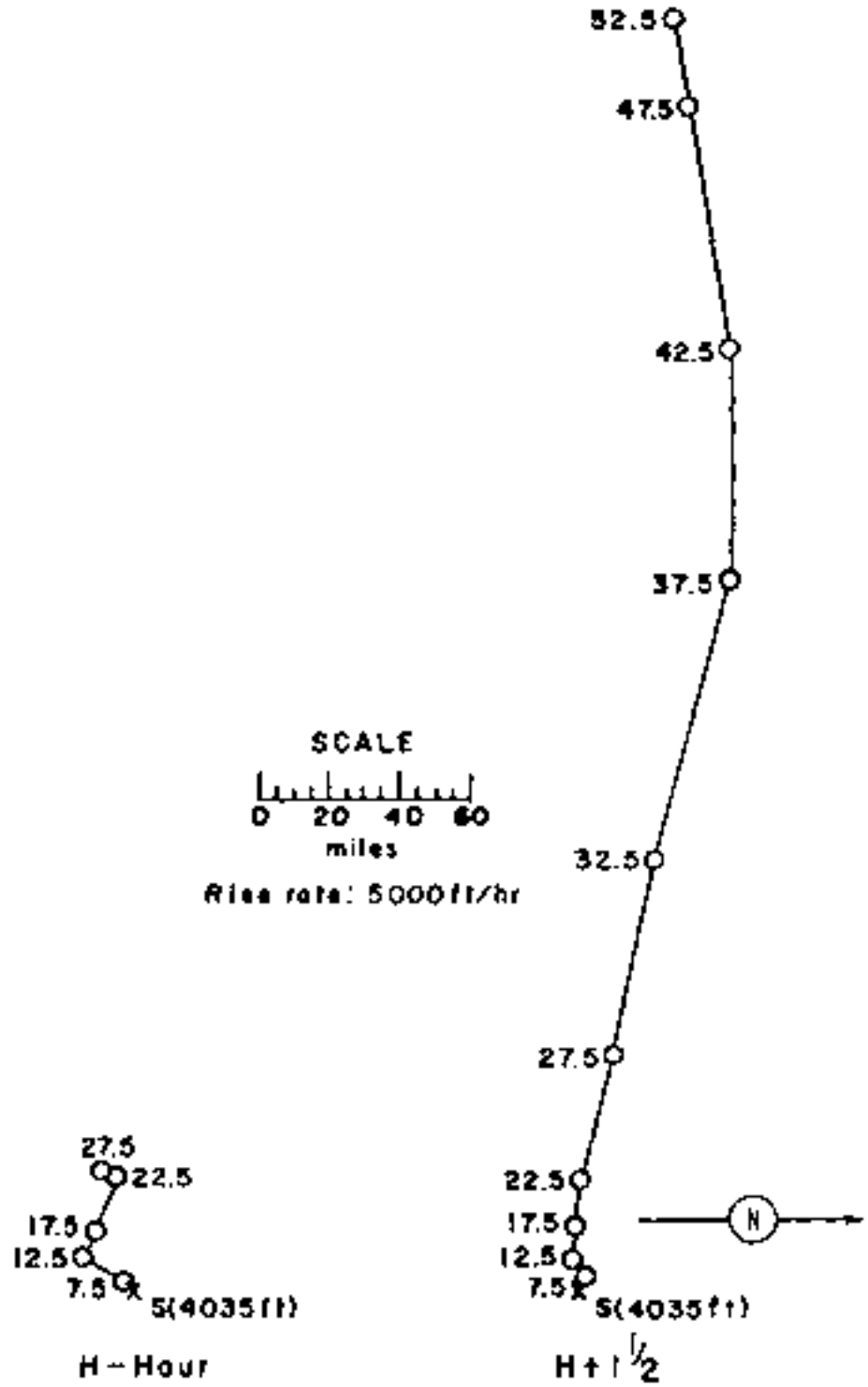


Figure 316. Hodographs for Operation PLUMBOB - Coulomb-B.

OPERATION PLUMBBOB - [illegible]

	POT	GMT
DATE:	[illegible]	[illegible]
TIME:	[illegible]	[illegible]

TOTAL YIELD: [illegible] kt

FIREBALL DATA:
Time to 1st minimum: [illegible]
Time to 2nd maximum: [illegible]
Radius at 2nd maximum: [illegible]

CRATER DATA: No crater

Sponsor: LASL

SITE: NTS - Area [illegible]
[illegible]
Site elevation [illegible] ft

HEIGHT OF BURST: [illegible]

TYPE OF BURST AND LOCATION:
Air burst over [illegible]
Nevada soil

CLOUD TOP HEIGHT: [illegible] ft MSL
CLOUD BOTTOM HEIGHT: [illegible] ft MSL

RESULTS:

The contamination was due primarily to induced activity. The fallout pattern was obtained from a radiological survey conducted by the Health and Safety Division of Reynolds Electrical and Engineering Company, Inc., using AN/TPQR 3) and AN/PDR -3 survey instruments. The readings were taken at H+1 hour, H+6 hours, D+1 day, D+2 days, and D+3 days using eight radial roads to determine radiation contours for areas. The data readings were extrapolated to H+1 hour by the normal fallout-decay-activity curve for Nevada soil.

No off-site fallout was observed. The off-site monitors obtained only a few readings slightly above background.

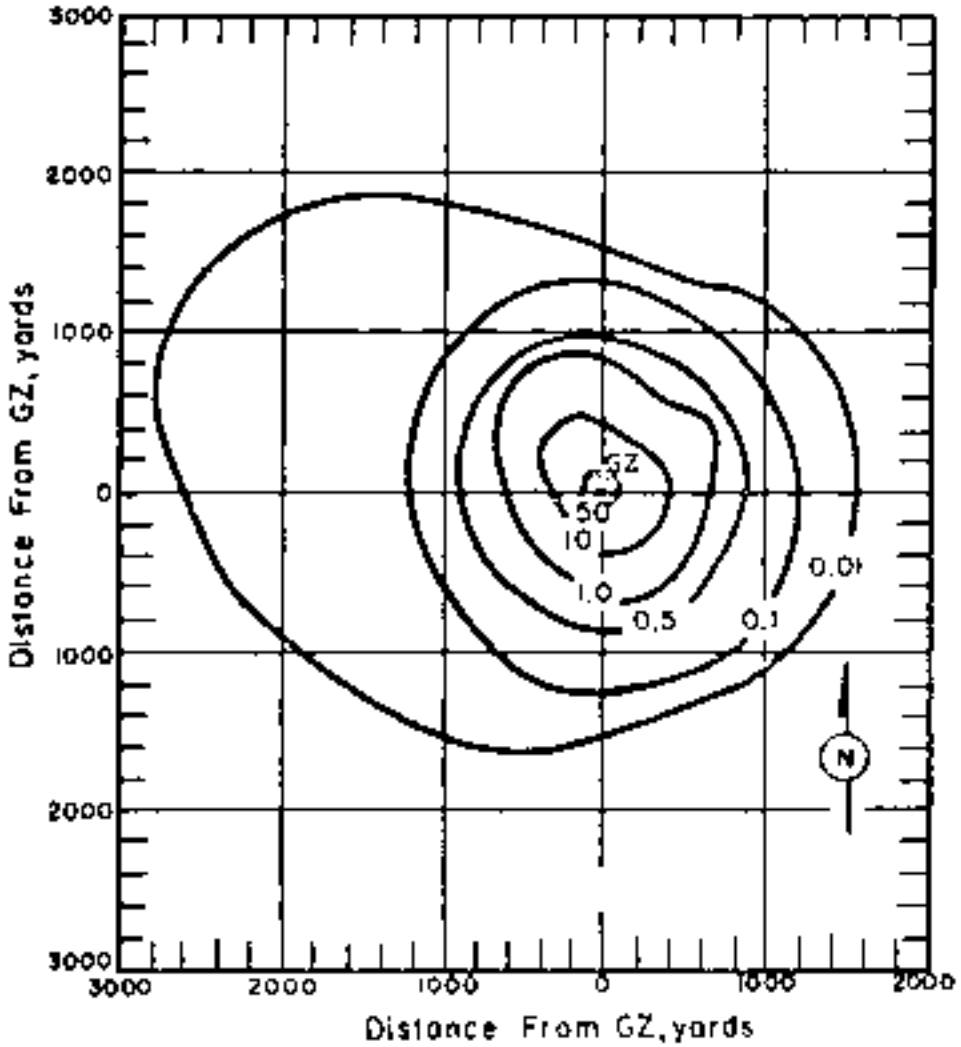


Figure 217. Operation [illegible] - [illegible] Laflace.
On-site dose rate contours in r/hr at H+1 hour.

TABLE 65 NEVADA WIND DATA FOR OPERATION MINIMUM - [illegible]

Altitude above surface (MSL)	Direction	Speed	Shear (knots per 1,000 ft)	Duration (hours)
Surface	Calm	Calm	Calm	Calm
1,200 (Fill)	[illegible]	[illegible]	---	--
2,000	[illegible]	[illegible]	[illegible]	03
3,000	[illegible]	[illegible]	[illegible]	07
4,000	[illegible]	[illegible]	[illegible]	20
5,000	[illegible]	[illegible]	[illegible]	16
6,000	[illegible]	[illegible]	[illegible]	15
7,000	[illegible]	[illegible]	[illegible]	15
8,000	[illegible]	[illegible]	---	--
9,000	[illegible]	[illegible]	[illegible]	07
10,000	[illegible]	[illegible]	---	--
11,000	[illegible]	[illegible]	[illegible]	05
12,000	[illegible]	[illegible]	(Calm)	(07)
13,000	[illegible]	[illegible]	[illegible]	09
14,000	[illegible]	[illegible]	---	--
15,000	[illegible]	[illegible]	[illegible]	03
16,000	[illegible]	[illegible]	---	--
17,000	[illegible]	[illegible]	[illegible]	09
18,000	[illegible]	[illegible]	---	--
19,000	[illegible]	[illegible]	---	--
20,000	[illegible]	[illegible]	---	--
21,000	[illegible]	[illegible]	---	--
22,000	[illegible]	[illegible]	---	--
23,000	[illegible]	[illegible]	[illegible]	16
24,000	[illegible]	[illegible]	---	--
25,000	[illegible]	[illegible]	[illegible]	07
26,000	[illegible]	[illegible]	---	--
27,000	[illegible]	[illegible]	---	--
28,000	[illegible]	[illegible]	---	--

Altitude above surface (MSL)	Direction	Speed	Shear (knots per 1,000 ft)	Duration (hours)
29,000	[illegible]	[illegible]	---	--
30,000	[illegible]	[illegible]	[illegible]	24
31,000	[illegible]	[illegible]	---	--
32,000	[illegible]	[illegible]	---	--
33,000	[illegible]	[illegible]	---	--
34,000	[illegible]	[illegible]	---	--
35,000	[illegible]	[illegible]	[illegible]	16
36,000	[illegible]	[illegible]	---	--
37,000	[illegible]	[illegible]	---	--
38,000	[illegible]	[illegible]	---	--
39,000	[illegible]	[illegible]	---	--
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	---	--
[illegible]	[illegible]	[illegible]	---	--
[illegible]	[illegible]	[illegible]	---	--
[illegible]	[illegible]	[illegible]	---	--
[illegible]	[illegible]	[illegible]	---	--
[illegible]	[illegible]	[illegible]	---	--
[illegible]	[illegible]	[illegible]	---	--
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

NOTES:

1. Numbers in parentheses are estimated values.
2. Tropopause height was 54,000 ft MSL on 8 March.
3. Wind data was obtained from the Yucca weather station.
4. At H-hour the surface air pressure was 875 mb, the temperature 19.0°C, the dew point 1.2°C and the relative humidity 30%.

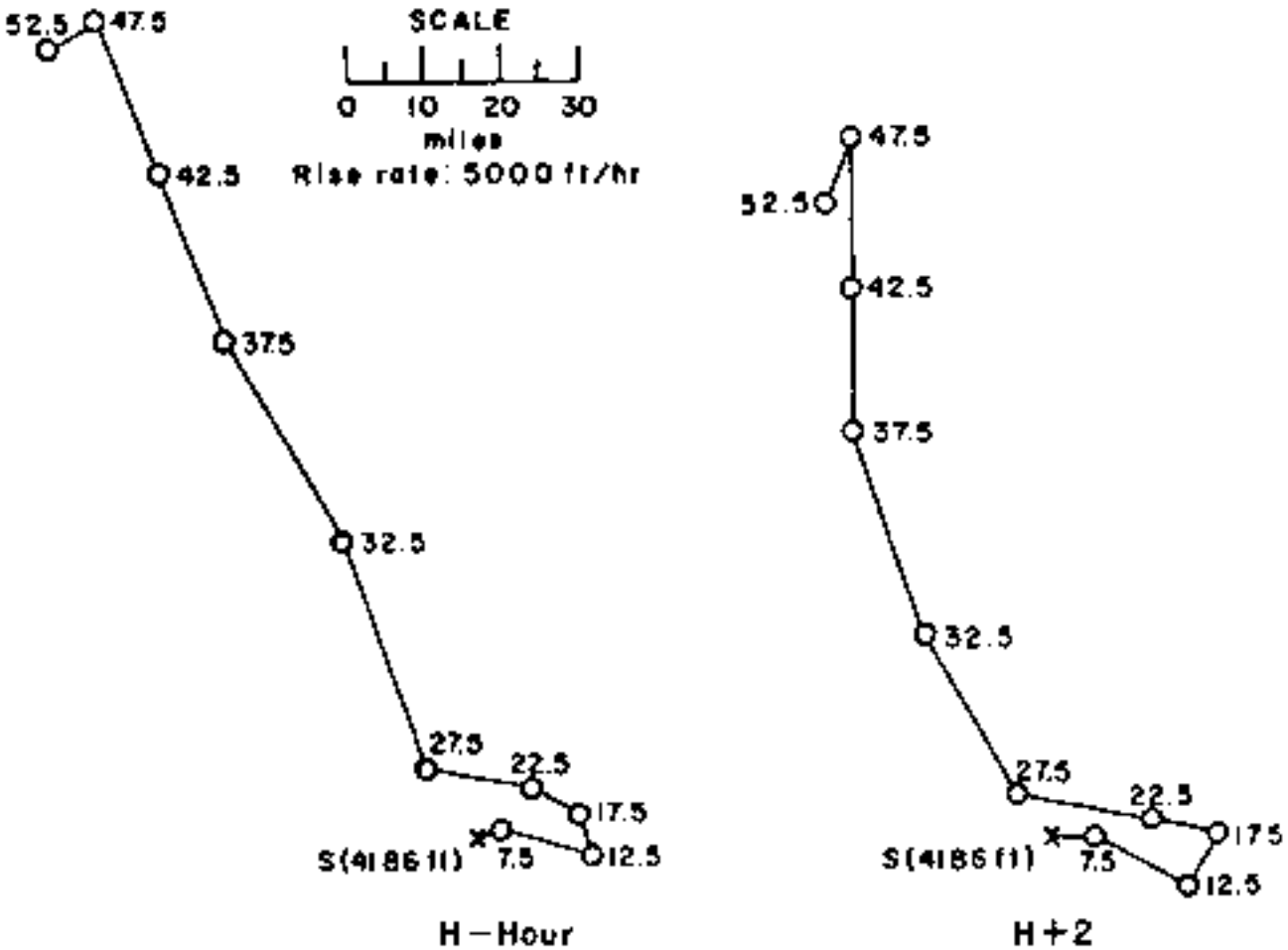


Figure 218. Hodographs for Operation PLUMBBOB - LaPlace.

OPERATION PLUMBBOB - Pisces

	PST	GMT
DATE:	19 Sept 1957	20 Sept 1957
TIME:	0945	1645

Sponsor: [AEC]

TOTAL YIELD: 11 kt

SITE: NTS - Area 7b
37° 02' 01" N
116° 01' 49" W
Site elevation: 3,600 ft

FIREBALL DATA:
Time to 1st minimum: [N]
Time to 2nd maximum: [N]
Radius at final maximum: [N]

HEIGHT OF BURST: [N] ft

TYPE OF FIRST AID [EVACUATION]:
Tower burst over [N] crater [N]

CRATER DATA: No crater

CLOUD TOP [HEIGHT]: [N] ft MSL
CLOUD BOTTOM [HEIGHT]: [N] ft MSL

REMARKS:

The on-site [N] was obtained from ground survey readings of the Radiological Safety Division of Reynolds Electrical and Engineering Co., Inc., using AN/PDR-39 and AN/PDS-[N] survey instruments. Dose readings were taken at H+1 hour, H+3 hours, D+1 day and D+2 days along eight radial roads to determine radiation exposure areas. The dose-rate readings were extrapolated to H+1 hour by the $t^{-1.2}$ decay approximations.

The off-site fallout was analyzed by Program [N] of UCLA. Actual decay data were used to plot the H+12-hour dose-rate contours. The $t^{-1.2}$ decay approximation was used by NDL to extrapolate the H+12-hour dose-rate readings to H+1 hour. "On-site Rad-Safety supplied data relative to the intensities in Yucca Flat from this shot. Further away, the west wind is estimated since no information was available in this region"

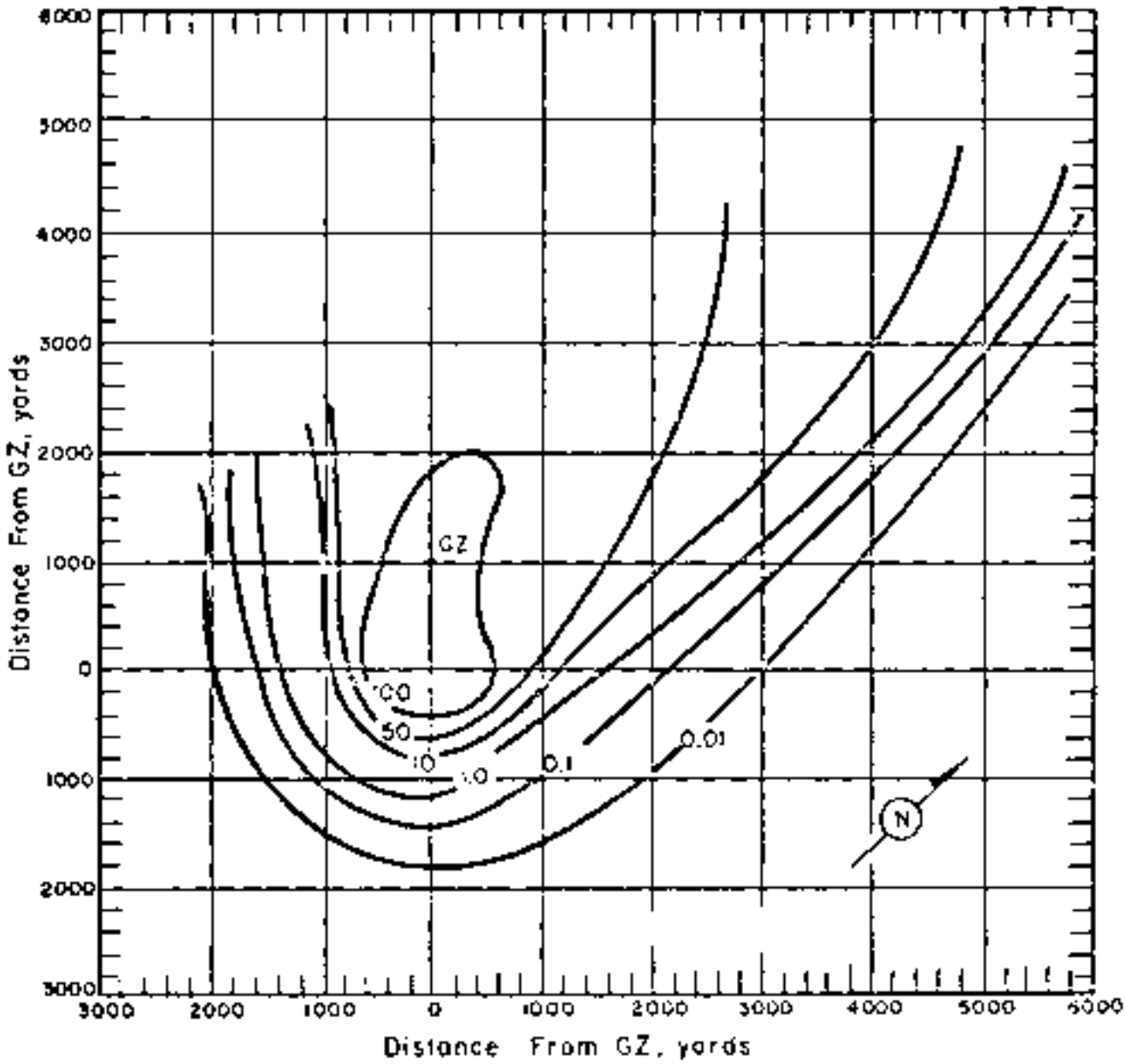


Figure 119. Operation PLUMBBOB - Pigeon.
On-site dose rate contours in r/hr at M+1 hour.

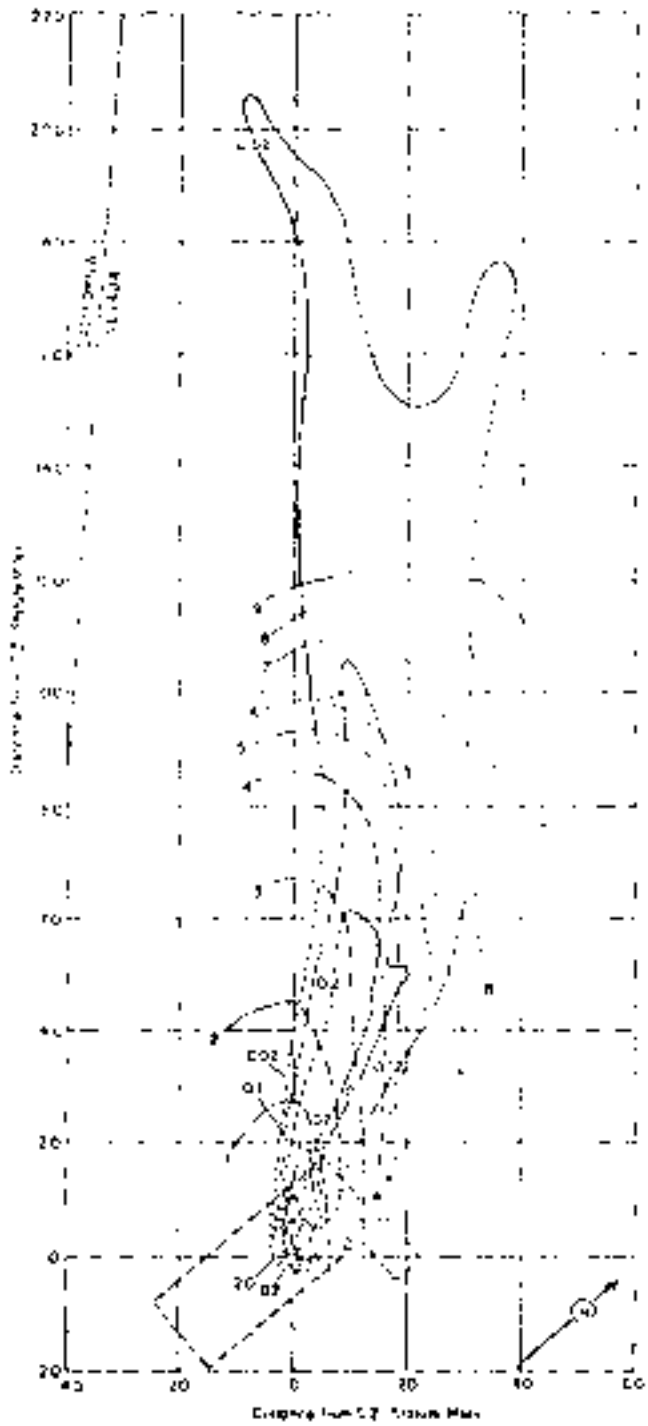


Figure 220. Operation PLUMBBOB - Pizmo.
Off-site dose rate contours in r/hr at H+1 hour.

TABLE 66 [illegible]

Altitude (MSL)	[illegible]		[illegible]		[illegible]	
	[illegible]		[illegible]		[illegible]	
Feet	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Surface	[illegible]	[illegible]	[illegible]	[illegible]	180	01
4,597(est)	[illegible]	[illegible]	---	--	---	--
5,000	050	05	050	04	140	07
6,000	070	04	070	01	140	01
7,000	070	03	070	03	210	05
8,000	080	02	080	02	240	06
9,000	090	01	090	02	240	10
10,000	110	04	110	04	240	14
11,000	140	07	---	--	---	--
12,000	160	08	160	07	190	09
13,000	210	07	---	--	---	--
14,000	190	12	190	14	150	16
15,000	180	13	(180)	(15)	(150)	(17)
16,000	150	13	180	13	140	09
17,000	170	10	---	--	---	--
18,000	190	09	190	09	160	11
19,000	190	14	---	--	---	--
20,000	190	17	190	17	190	16
21,000	190	18	---	--	---	--
22,000	110	10	---	--	---	--
23,000	190	12	190	12	190	21
24,000	190	21	---	--	---	--
25,000	150	22	150	12	160	12
26,000	190	27	---	--	---	--
27,000	110	20	---	--	---	--
28,000	110	22	---	--	---	--
29,000	120	26	---	--	---	--
30,000	190	29	190	29	190	32
31,000	110	29	---	--	---	--
32,000	110	26	---	--	---	--
33,000	120	24	---	--	---	--
34,000	120	22	---	--	---	--
35,000	120	17	120	17	140	21
36,000	190	15	---	--	---	--
37,000	140	14	---	--	---	--
38,000	150	13	---	--	---	--
39,000	190	14	---	--	---	--
40,000	210	14	210	14	180	17
45,000	220	10	220	10	240	25
50,000	240	12	240	12	270	15

NOTES:

1. Numbers in parentheses are estimated values.
2. Tropopause height was 43,000 ft MSL at 0-hour.
3. Wind data was obtained from the Yuma weather station.
4. At 0-hour the surface air pressure was 830 mb, the temperature 25.1°C, the dew point -1.9°C, and the relative humidity 17%.

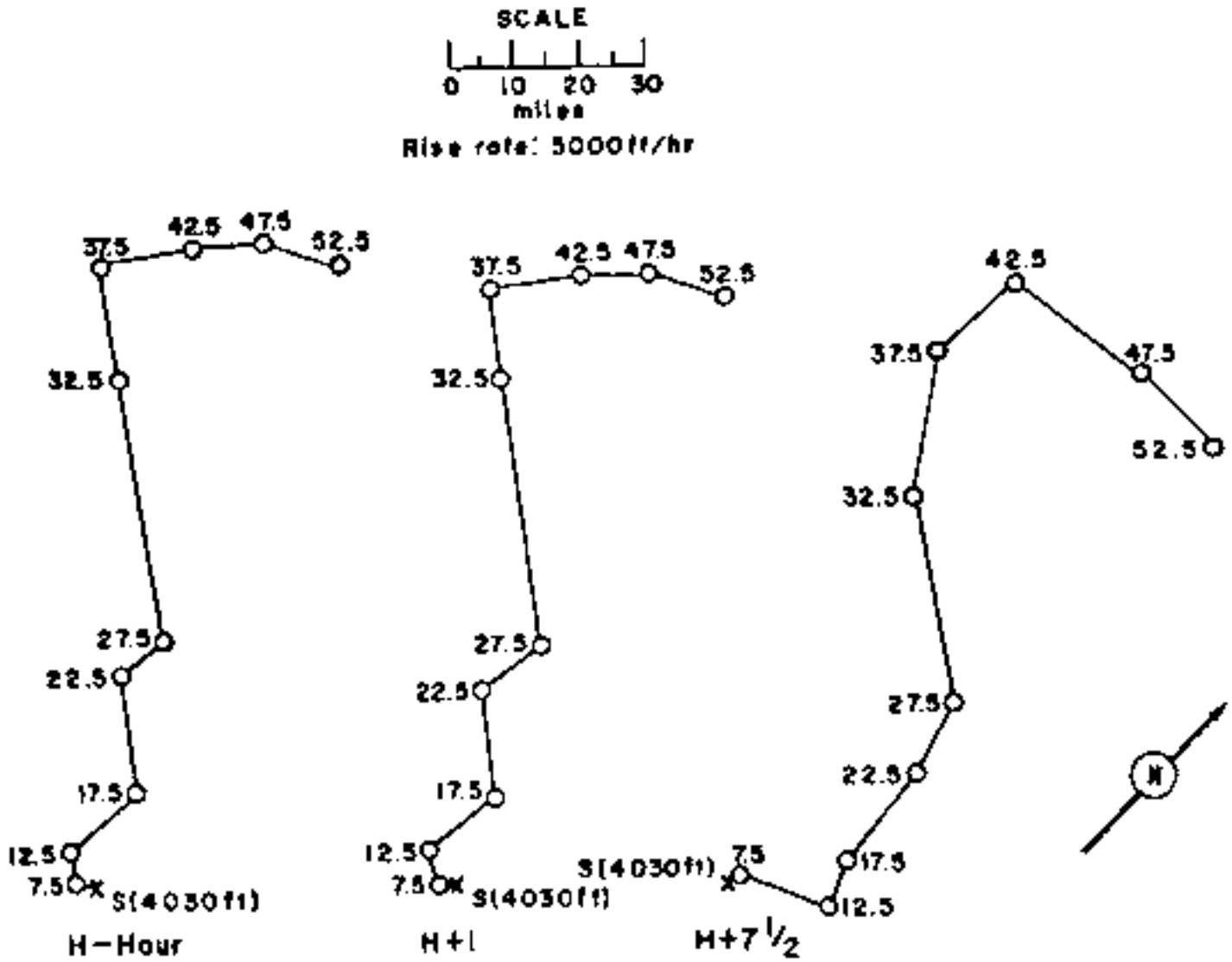


Figure 221. Hodographs for Operation PLUMBBOB - Fizeau.

OPERATION PLUMBBOB - Newton

	PDT	GMT
DATE:	[illegible]	[illegible]
TIME:	[illegible]	12[illegible]

TOTAL YIELD: 12 kt

Sponsor: LASL

SITE: NTS - Area 7b
[illegible] N
116° [illegible] W
Site elevation: [illegible] ft

HEIGHT OF BURST: [illegible]

FIREBALL DATA:
Time to first maximum: [illegible]
Time to final maximum: [illegible]
Radius at [illegible] maximum: [illegible]

TYPE OF DETONATION:
Airburst [illegible]
Nevada [illegible]

STATUS: [illegible]

CLOUD TOP HEIGHT: [illegible] ft MSL
CLOUD BOTTOM HEIGHT: [illegible] ft MSL

REMARKS:

The contamination was due primarily to induced activity. The onsite pattern was obtained from ground survey readings of the Radiological Safety Division of Reynolds Electrical and Engineering Co., Inc., using AN/PDR 39 and AN/PDR 27 survey instruments. The readings were taken at H+1 hours, H+[illegible] hours, D+1 day, D+[illegible] days and D+[illegible] days [illegible] readings [illegible] were extrapolated to H+1 hour by the [illegible] decay curve for Nevada soil. The extrapolated dose rates are not accurate because the decay factor used is not strictly applicable.

The off-site fallout was analyzed by Program 37 of UCLA. Actual decay data were used to plot the H+12-hour dose-rate contours. The $t^{-1.2}$ decay approximation was used by NDL to extrapolate the H+12-hour dose-rate readings to H+1 hour. Since very little reliable data were available, this pattern is basically an estimate.

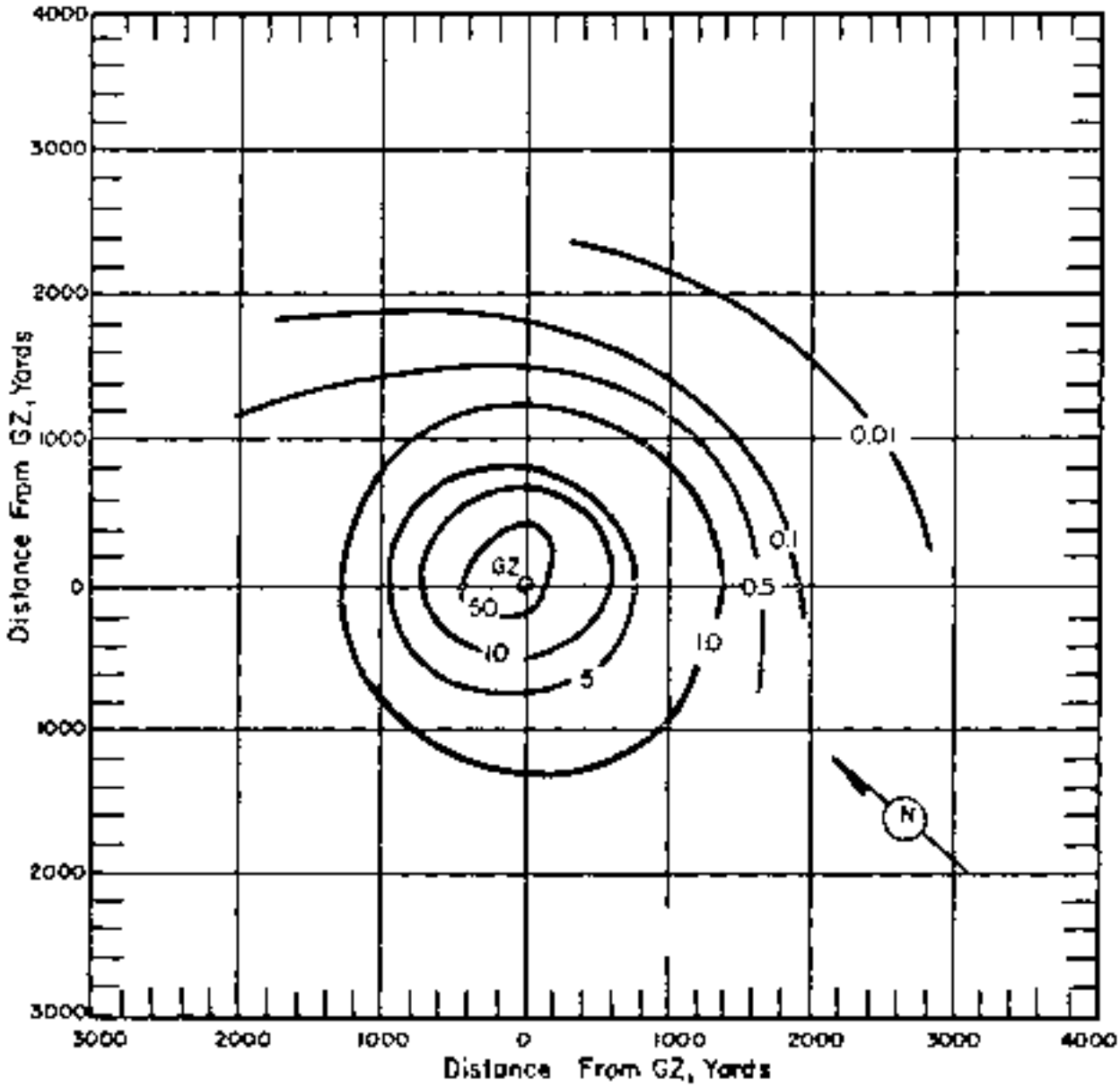


Figure 22.2. Operation PLUMBBOB - Newton.
On-site dose rate contours in r/hr at H+1 hour.

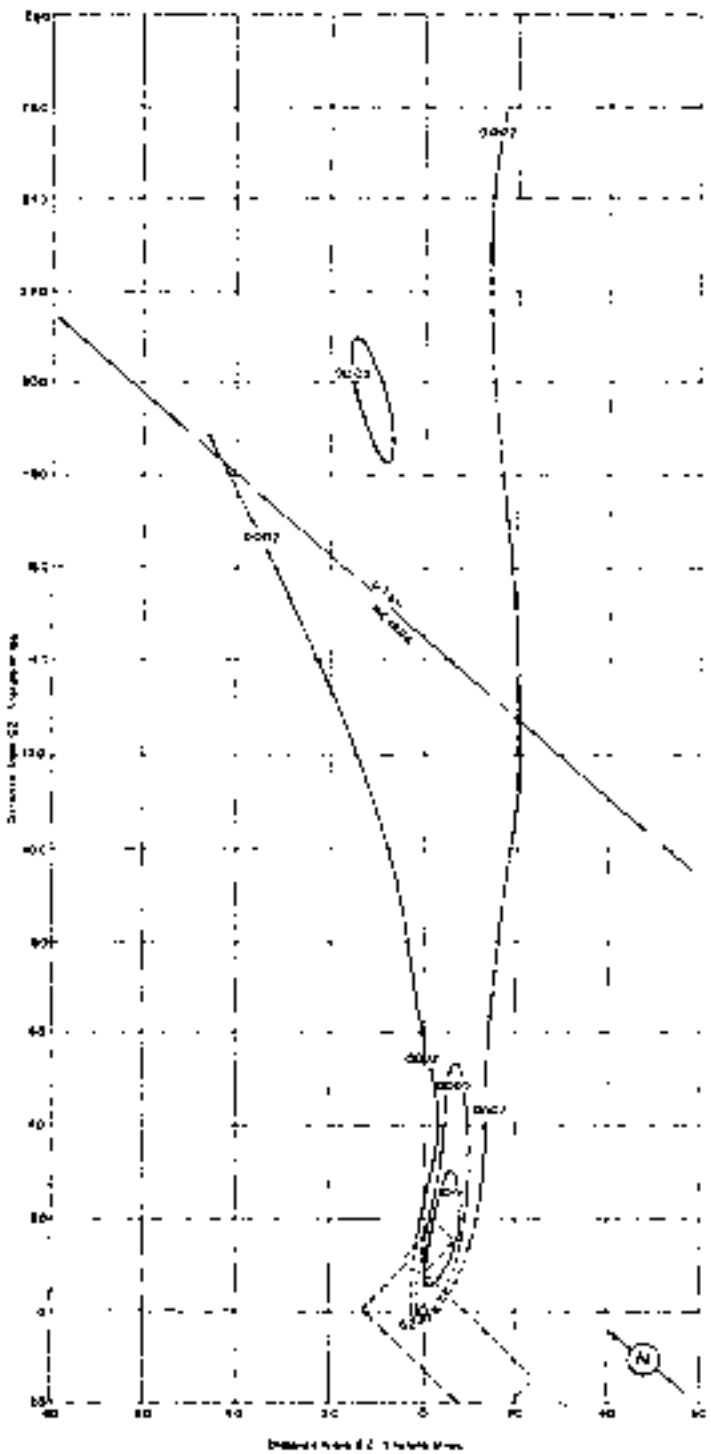


Figure 223. Operation PLUMBOB - Newton.
Off-site dose rate contours in r/hr at H+1 hour.

TABLE 67 NEVADA WIND DATA FOR OPERATION [illegible]

Altitude (MSL)	E-hour		[illegible]		[illegible]	
	Dir	Speed	Dir	[illegible]	Dir	[illegible]
Feet	degrees	mph	[illegible]	mph	degrees	mph
Surface	Calm	Calm	Calm	Calm	Calm	Calm
5,000	200	05	200	05	180	05
5,686(MSL)	200	06	---	--	---	--
6,000	190	09	190	10	180	07
7,000	190	17	190	17	180	18
8,000	190	20	190	20	180	22
9,000	200	18	200	17	190	22
10,000	200	20	200	20	190	22
11,000	200	18	---	--	---	--
12,000	200	18	210	22	210	22
13,000	210	21	---	--	---	--
14,000	220	22	220	22	240	22
15,000	240	22	(230)	(23)	(240)	(23)
16,000	240	22	240	22	240	23
17,000	250	25	---	--	---	--
18,000	250	25	250	25	260	28
19,000	250	28	---	--	---	--
20,000	250	32	250	32	240	29
21,000	250	33	---	--	---	--
22,000	250	32	---	--	---	--
23,000	250	45	250	45	240	37
24,000	250	47	---	--	---	--
25,000	250	48	250	48	250	51
26,000	250	51	---	--	---	--
27,000	260	50	---	--	---	--
28,000	260	66	---	--	---	--
29,000	260	74	---	--	---	--
30,000	260	80	260	82	260	96
31,000	260	73	---	--	---	--
32,000	260	70	---	--	---	--
33,000	250	76	---	--	---	--
34,000	250	77	---	--	---	--
35,000	250	70	250	75	260	89
36,000	250	68	---	--	---	--
37,000	250	66	---	--	---	--
38,000	250	64	---	--	---	--
39,000	250	67	---	--	---	--
40,000	250	58	250	58	250	71
45,000	250	69	250	60	250	64
50,000	250	38	250	35	250	38

NOTES:

1. Numbers in parentheses are estimated values.
2. Drogue use height was 52,[illegible] ft MSL at E-hour.
3. Wind data was obtained from the Nora venting station.
4. At E-hour, the surface air pressure was 860 mb, the temperature 13.2°C, the dew point -5.0°C, and the relative humidity 27%.

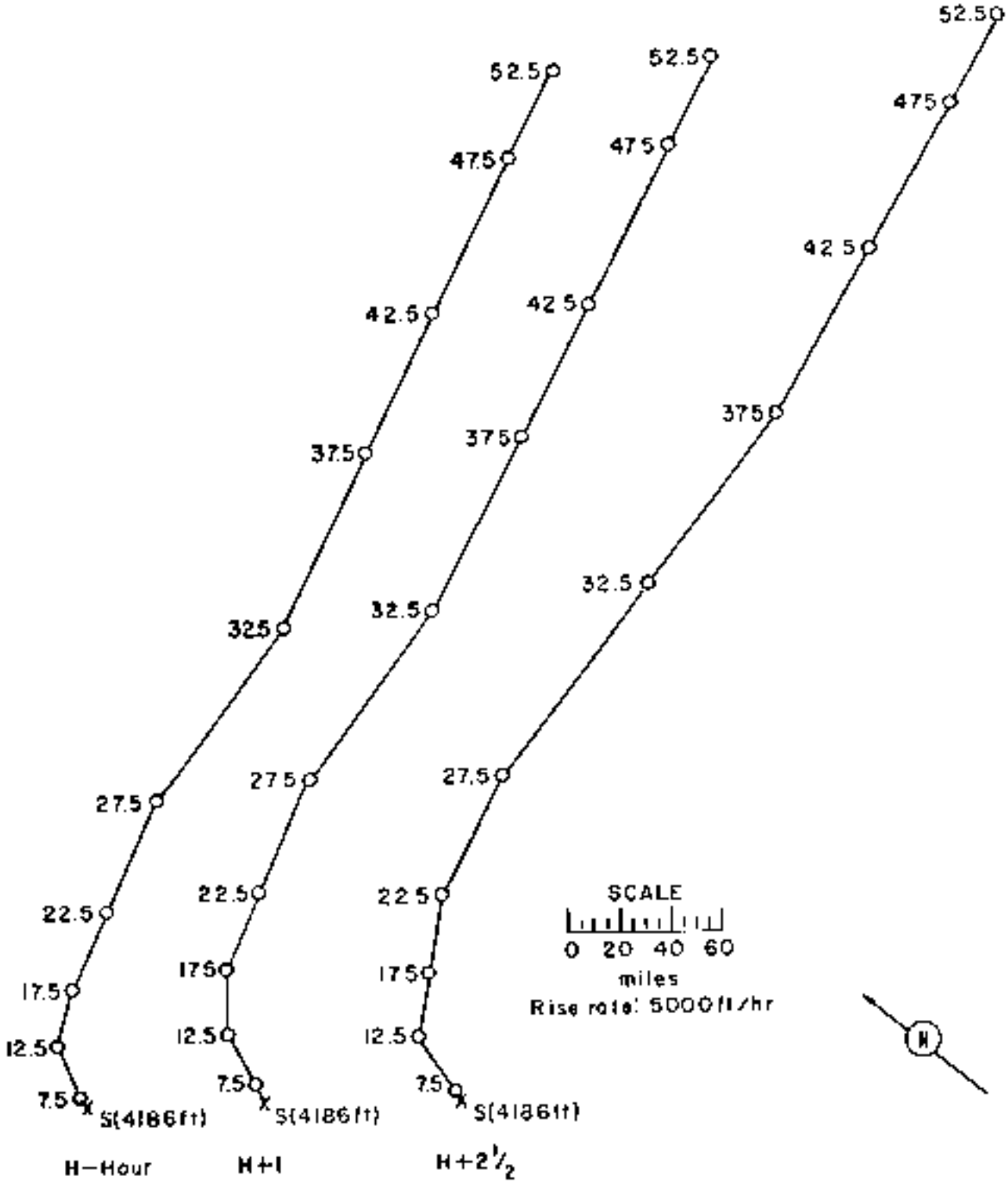


Figure 224. Hodographs for Operation PLUMBOB - Newton.

OPERATION [illegible] [illegible]

	PDT	GMT
DATE:	[illegible]	[illegible]
TIME:	[illegible]	[illegible]

TOTAL YIELD: 1.7 kt

FIREBALL DATA:
Time [illegible] NA
Time [illegible] NA
Radius [illegible] NA

CRATER DATA:
The crater [illegible] contained
[illegible]

Sponsor: [illegible]

SITE: NTS - Area [illegible]
[illegible]
[illegible] W
[illegible]

[illegible] - [illegible]
[illegible]
[illegible]
[illegible]

TYPE OF [illegible]:
[illegible]

REMARKS:

[illegible] tunnel wall and [illegible] radiation was [illegible]

OPERATION PLUMBBOB - Whitney

	PST	GMT
DATE:	[illegible]	[illegible]
TIME:	0530	1230

Sponsor: USAF

TOTAL YIELD: 19 kt

SITE: JTF - Area 7
37° 03' 12" N
116° 07' 05" W
Site elevation: 4,456 ft

FIREBALL DATA:
Time to first minimum: [illegible]
Time to 2nd maximum: [illegible]
Radius at 2nd maximum: [illegible]

HEIGHT OF BURST: [illegible]

TYPE OF MESA AND FOUNDATION:
Tower type [illegible]

CRATER DATA: No crater

CLOUD TOP STABILIZED [illegible] ft MSL
CLOUD BASE AT STABILIZATION [illegible] ft MSL

REMARKS:

The on-site fallout pattern was obtained from aerial survey readings of the Radiol plotted by Division of Industrial Participation, Bendix Corp., Inglewood, under AEC/DOE by and AEC/DOE by survey instruments. The patterns were taken at [illegible] hours, 24 hours, 48 hours, [illegible] days and [illegible] days after which radiological [illegible] were available. The $t^{-1.2}$ decay approximation was used to extrapolate the 1-hour reading to 61 hours.

The off-site fallout was analyzed by Program 37 of UCLA. Actual decay data were used to plot the 24-hour isoexposure contours. The $t^{-1.2}$ decay approximation was used by NOL to extrapolate the 24-hour dose-rate readings to 61 hours. "This pattern was based on ground and aerial data, but the southern-most portion of the pattern was based on aerial data only. There was no information relative to the close-in levels and this portion was estimated."

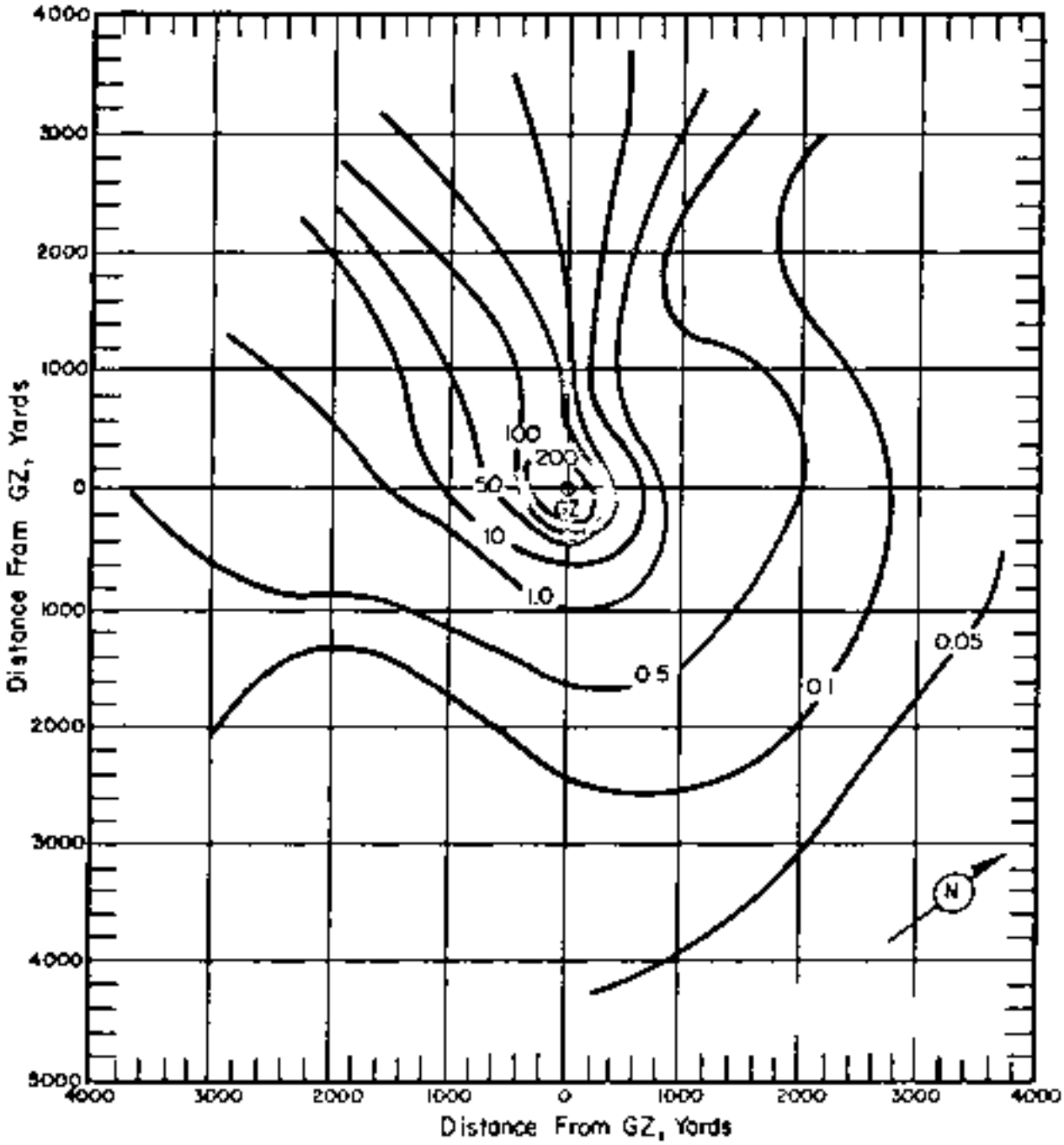


Figure 225. Operation PLUMBBOB - Whitney.
On-site dose rate contours in r/hr at H+1 hour.

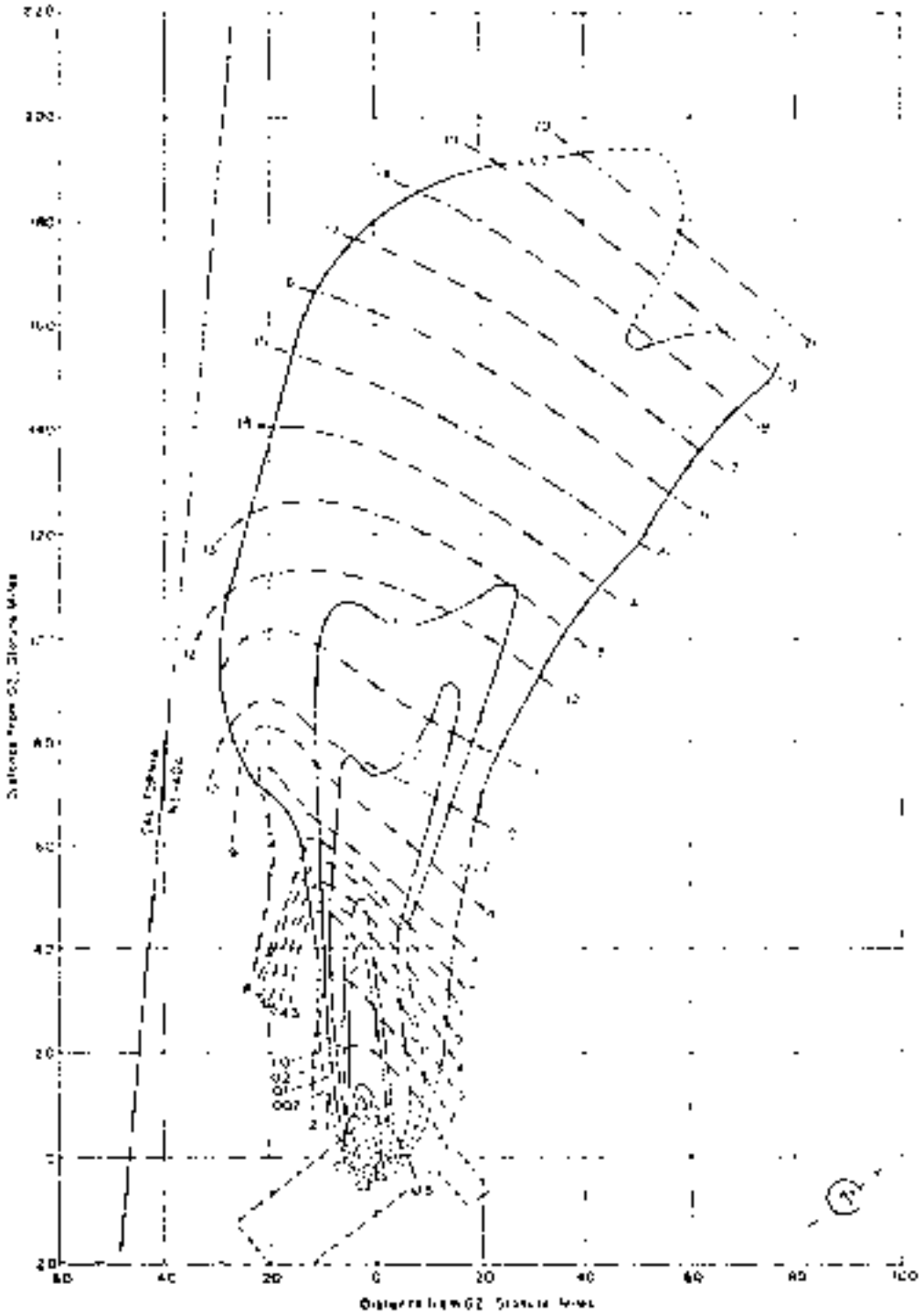


Figure 220. Operation PLUMBBOB – [illegible] Gateway.
Off-site dose rate contours in r/hr at H+1 hour.

TABLE 6S NEVADA WIND DATA FOR OPERATION PLUMBBOB— WILDCAT

Altitude (MSL)	H-hour		H+1 hours	
	Dir	Speed	Dir	Speed
Feet	degrees	mph	degrees	mph
Surface	Calm	Calm	360	05
4,967 (ft)	Calm	Calm	---	--
5,000	060	09	050	08
6,000	070	10	060	09
7,000	100	13	090	09
8,000	120	12	140	14
9,000	140	12	150	13
10,000	160	09	170	08
11,000	190	12	---	--
12,000	170	10	160	12
13,000	120	16	---	--
14,000	120	16	120	14
15,000	120	12	(110)	(14)
16,000	110	12	100	13
17,000	100	09	---	--
18,000	090	12	090	09
19,000	090	12	---	--
20,000	090	09	080	09
21,000	090	12	---	--
22,000	080	12	---	--
23,000	070	12	070	12
24,000	060	10	---	--
25,000	060	08	070	09
26,000	060	06	---	--
27,000	070	09	---	--
28,000	090	12	---	--
29,000	090	13	---	--

Altitude (MSL)	H-hour		H+1 hours	
	Dir	Speed	Dir	Speed
Feet	degrees	mph	degrees	mph
30,000	080	13	100	09
31,000	070	09	---	--
32,000	060	06	---	--
33,000	340	06	---	--
34,000	340	10	---	--
35,000	290	12	280	08
36,000	290	10	---	--
37,000	290	09	---	--
38,000	290	09	---	--
39,000	280	13	---	--
40,000	270	14	270	13
41,000	270	18	---	--
42,000	280	20	---	--
43,000	280	16	---	--
44,000	280	14	---	--
45,000	280	21	290	21
46,000	280	21	---	--
47,000	270	18	---	--
48,000	270	21	---	--
49,000	260	21	---	--
50,000	260	18	270	20
51,000	260	17	---	--
52,000	270	16	---	--
53,000	270	15	---	--

NOTES:

1. Numbers in parentheses are estimated values.
2. Tropopause height was 53,100 ft MSL at H-hour.
3. Wind data was obtained from the Yucca weather station.
4. At H-hour the surface air pressure was 807 mb, the temperature 16.1°C, the dew point -3.6°C and the relative humidity 25%.

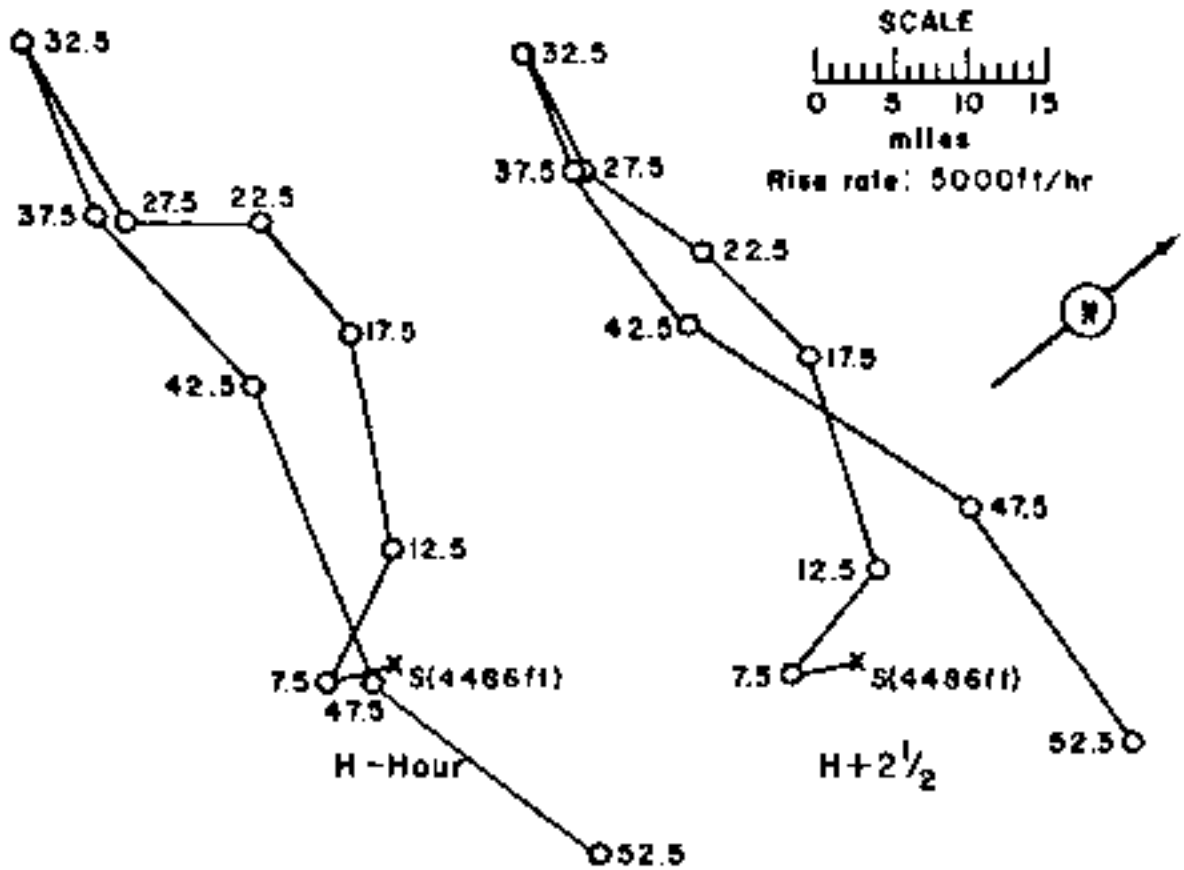


Figure 127. Hodographs for Operation PLUMBOB - Whitney.

OPERATION FLUMMOX - Charleston

	PST	EST
DATE:	28 Sep 1957	29 Sep 1957
TIME:	0400	1300

Sponsor: UCRL

TOTAL YIELD: 12 kt

SITE: NTS - Area 6a
37° 08' 45" N
116° 02' 00" W
Site elevation: 4,215 ft

PERSONNEL DATA:
Time to 1st maximum: 30m
Time to 2nd maximum: 3h
Radius of 2nd maximum: 30m

HEIGHT OF BURST: 1,7 0' 2"

TYPE OF FUNCT AND FACILITIES:
Air burst from balloon over Nevada soil

CLOUD TOP HEIGHT: 50,000 ft MSL
CLOUD STABILIZATION TIME: 1[illegible],000 ft MSL

CRATER DATA: No crater

REMARKS:

The contamination was due primarily to induced activity. The activity pattern was obtained from [illegible] survey readings of the Radiological Safety Division of Reynolds Electrical and Engineering Co., Inc., using AN/PDR 39 and AN/PDR -3 survey instruments. The readings were taken at H+1 hour, H+6 hours, D+1 day, D+2 days and D+3 days along eight radial roads to determine radiation exclusion areas. The accurate readings were extrapolated to H+1 hour by the general Integrated-activity-decay curve for Nevada soil

The monitors did not detect any off-site fallout which can be attributed to this shot.

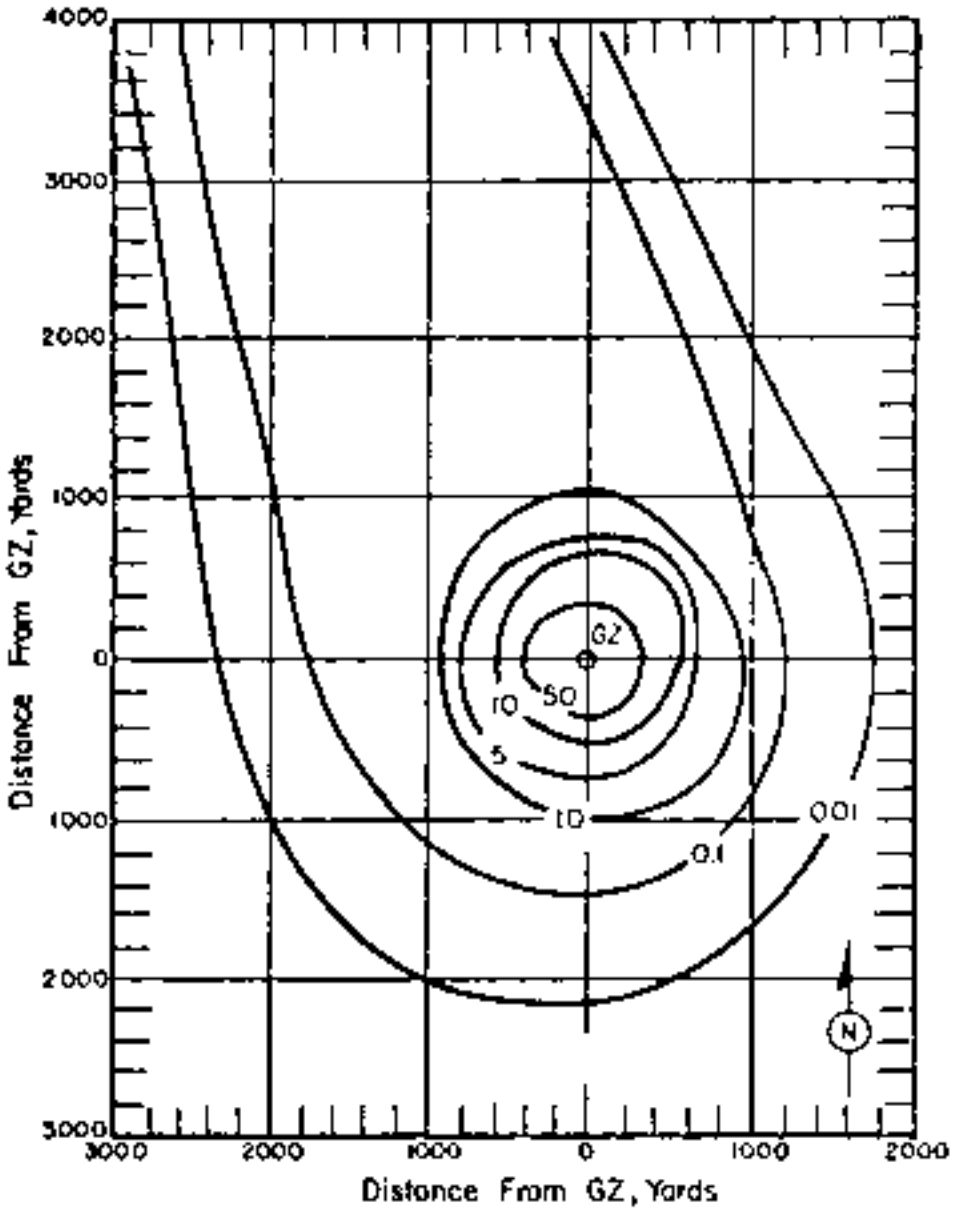


Figure 228. Operation PLUMBBOB - Charleston.
On-site dose rate contours in r/hr at H+1 hour.

TABLE (b) NATURAL WIND DATA FOR OBSERVATION [illegible] – CHARLESTON

Altitude (MSL)	[illegible]		[illegible]		[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Surface	Calm	Calm	Calm	Calm	Calm	Calm
5,000	180	05	180	05	180	05
5,721 (BE)	---	--	---	--	180	07
6,000	150	16	180	10	190	10
7,000	180	20	180	14	180	15
8,000	190	22	190	21	190	20
9,000	180	24	190	25	190	27
10,000	190	23	210	21	21	21
11,000	---	--	---	--	210	20
12,000	190	23	190	31	190	37
13,000	---	--	---	--	190	41
14,000	190	42	190	41	190	43
15,000	(190)	(38)	(190)	(34)	190	46
16,000	190	35	190	43	190	44
17,000	---	--	---	--	190	41
18,000	180	46	180	41	180	43
19,000	---	--	---	--	180	40
20,000	190	30	180	37	180	37
21,000	---	--	---	--	180	31
22,000	---	--	---	--	180	27
23,000	190	41	190	43	190	43
24,000	---	--	---	--	190	41
25,000	190	40	190	45	190	47
26,000	---	--	---	--	190	50
27,000	---	--	---	--	190	51
28,000	---	--	---	--	190	50
29,000	---	--	---	--	190	50
30,000	190	44	190	51	190	51
31,000	---	--	---	--	190	46
32,000	---	--	---	--	190	50
33,000	---	--	---	--	190	46
34,000	---	--	---	--	200	43
35,000	200	47	200	38	210	41
40,000	210	45	210	41	220	48
45,000	220	52	210	52	220	52
50,000	220	40	210	40	230	40
60,000	260	07	020	03	---	--

NOTES:

1. Data in parentheses are estimated values.
2. Tropopause height was 44,830 ft MSL at Charleston.
3. Wind data was obtained from the Tacan weather station.

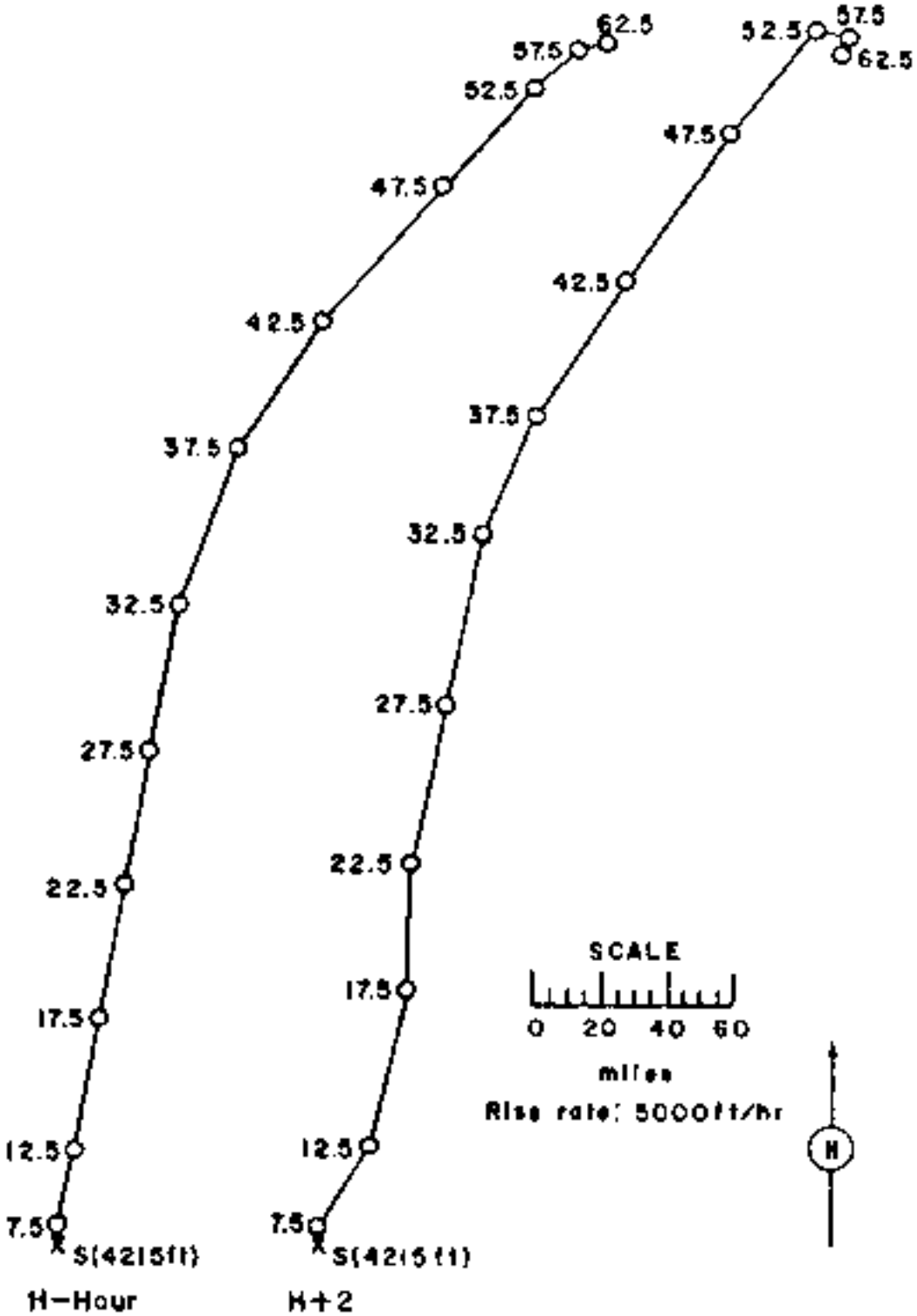


Figure 229. Hodographs for Operation PLUMBBOB - Charleston.

OPERATION HUMBOLDT - Morgan

	PST	GMT
DATE:	7 Oct 1957	7 Oct 1957
TIME:	0900	1300

Sponsor: NOPO.

TOTAL YIELD: 8 kt

SITE: NTS - Area 5a
37° 08' 0.7" N
116° 02' 27" W
Site elevation: 4,218 ft

HEIGHT OF BURST: 140 ft.

FIREBALL DATA:
Time to 1st minimum: NM
Time to 2nd maximum: NM
Radius at 2nd maximum: NM

TYPE OF BURST AND FUNCTION:
Air burst for ballistics over Nevada soil

CRATER DATA: No crater

CLOUD TOP HEIGHT: 54,000 ft MSL
CLOUD BOTTOM HEIGHT: 47,000 ft MSL

REMARKS:

The contamination was due primarily to induced activity. The on-site pattern was obtained from ground survey readings of the Reynolds Electrical and Engineering Company, Inc., using AN/PIAC-1 and AN/PIAC-2 survey meters. The readings were taken at H+2 hour, H+5 hours, H+1 day, D+2 days and D+5 days along eight radial roads to determine radiation exclusion areas. The dose-rate readings were extrapolated to H+1 hour by the general induced-activity-decay curve for Nevada soil.

The off-site fallout was analyzed by the USWB Special Projects Section. The $t^{-1.2}$ decay approximation was used to extrapolate the dose-rate readings to H+1 hour. "The Morgan debris apparently fell over or near residual debris from Smoky, but the uncertainties in the decay law and in the effects of weathering make it impossible to determine the Morgan pattern with any certainty."

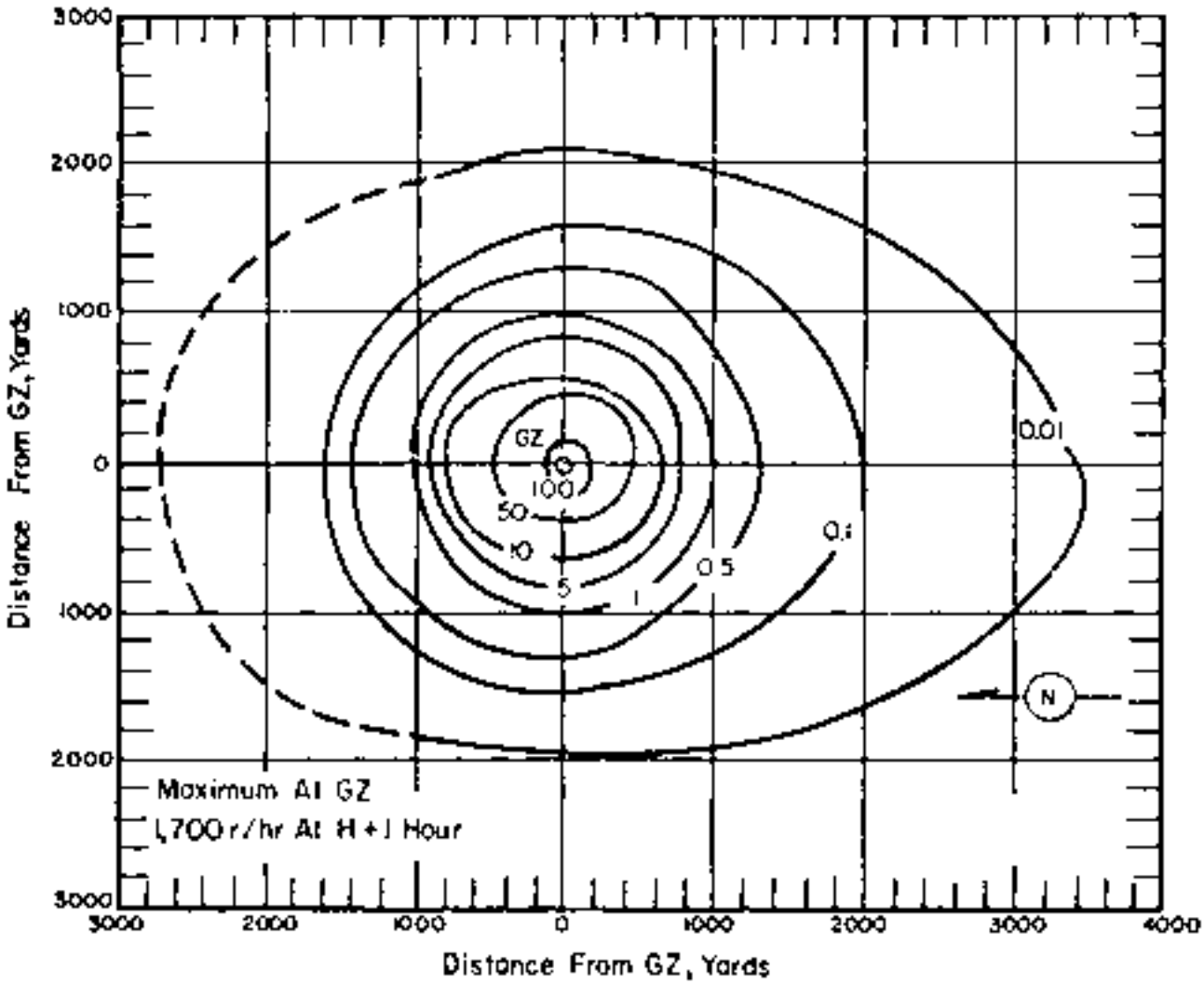


Figure 230. Operation PLUMBBOB - Morgan.
On-site dose rate contours in r/hr at H+1 hour.

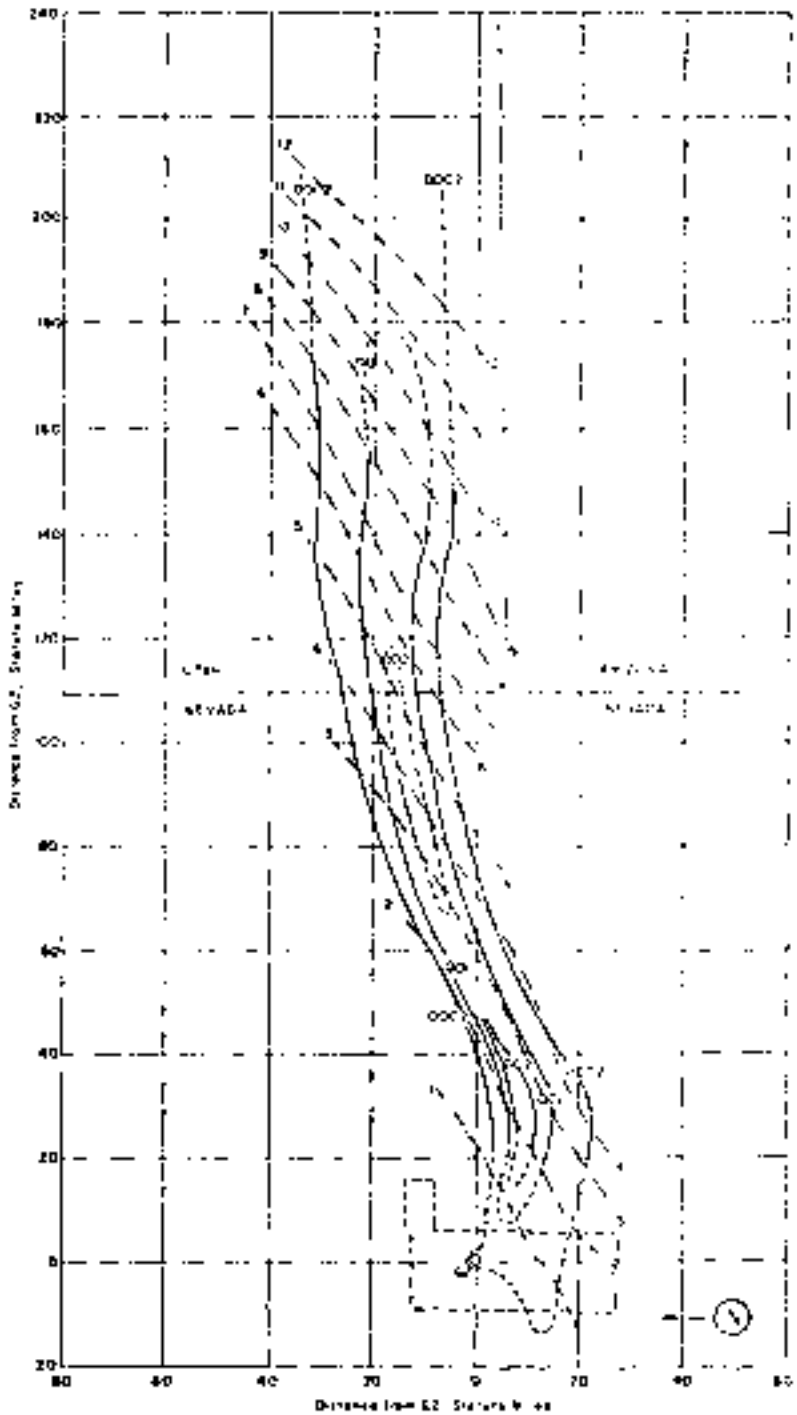


Figure 351. Operation PLUMBBOB - Morgan.
Off-site dose rate contours in r/hr at H+2 hour.

TABLE 70 NEVADA WIND DATA FOR OPERATION PLUMBBOB- MORGAN

Altitude (MSL)	H-hour		H+6 hours	
	Dir	Speed	Dir	Speed
Feet	Degrees	mph	Degrees	mph
Surface	Calm	Calm	Calm	Calm
4,715(DH)	290	08	---	--
5,000	290	12	300	12
6,000	310	14	360	20
7,000	270	09	010	17
8,000	030	05	030	08
9,000	320	09	020	06
10,000	300	14	280	07
11,000	300	14	---	--
12,000	290	12	270	12
13,000	280	09	---	--
14,000	280	13	270	14
15,000	290	18	(270)	(16)
16,000	270	21	280	15
17,000	270	24	---	--
18,000	280	31	290	26
19,000	280	36	---	--
20,000	270	35	270	30
21,000	270	35	---	--
22,000	270	41	---	--
23,000	260	43	270	41
24,000	260	46	---	--
25,000	270	43	270	41
26,000	270	41	---	--
27,000	270	40	---	--
28,000	270	41	---	--
29,000	280	45	---	--
30,000	290	47	280	41
31,000	280	52	---	--
32,000	280	51	---	--
33,000	280	50	---	--
34,000	280	53	---	--
35,000	270	55	270	50
36,000	270	54	---	--
37,000	260	52	---	--
38,000	260	51	---	--
39,000	250	52	---	--
40,000	250	55	250	59
41,000	250	60	---	--
42,000	250	59	---	--
43,000	260	56	---	--
44,000	260	58	---	--
45,000	260	55	250	50
46,000	260	56	---	--
47,000	260	53	---	--

NOTES:

1. Numbers in parentheses are estimated values.
2. Tropopause height was 51,500 ft MSL at H-hour.
3. Wind data was obtained from the Yucca weather station.
4. At H-hour the surface air pressure was 860 mb, the temperature 7.3°C, the dew point -5.9°C and the relative humidity 58%.

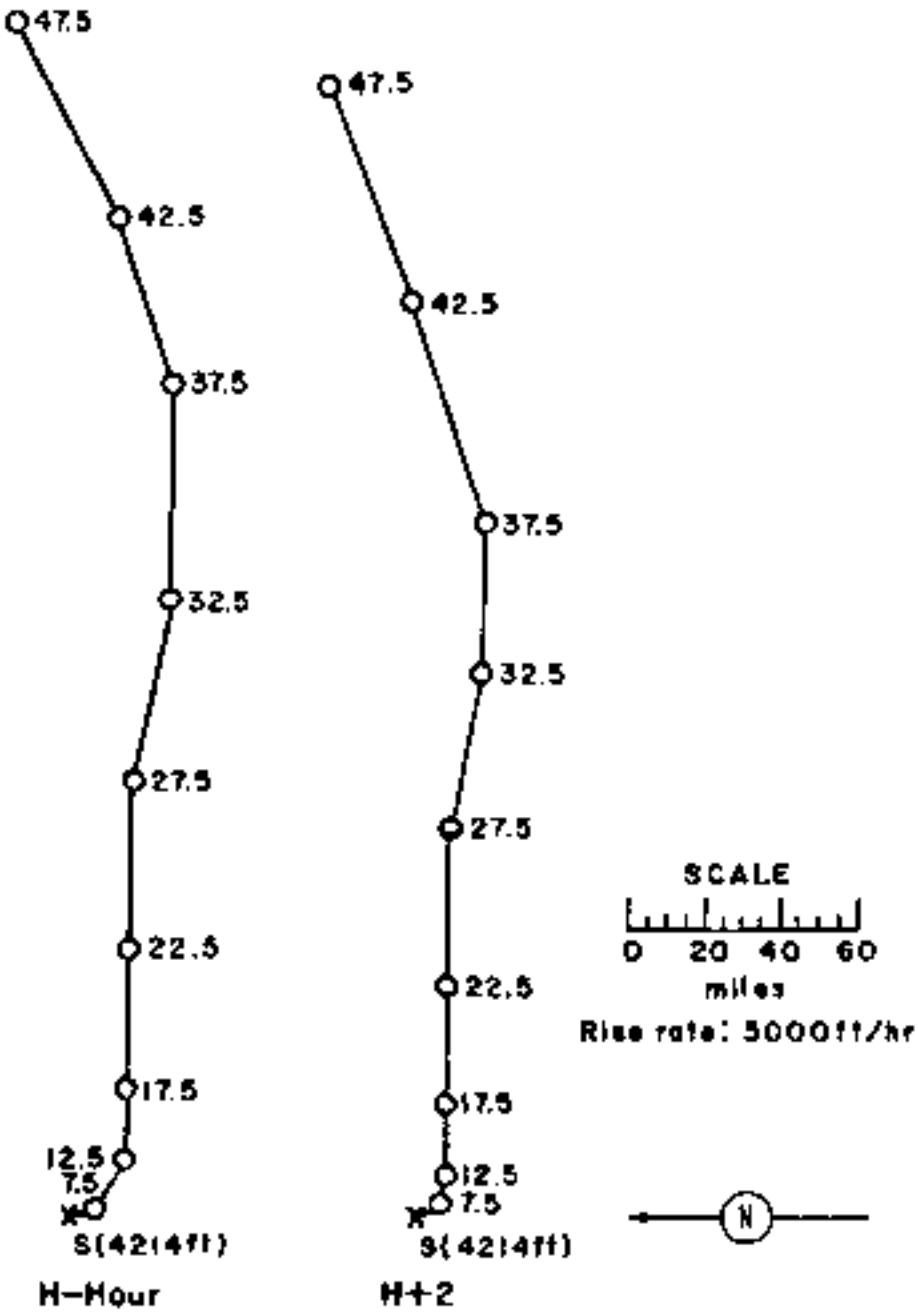
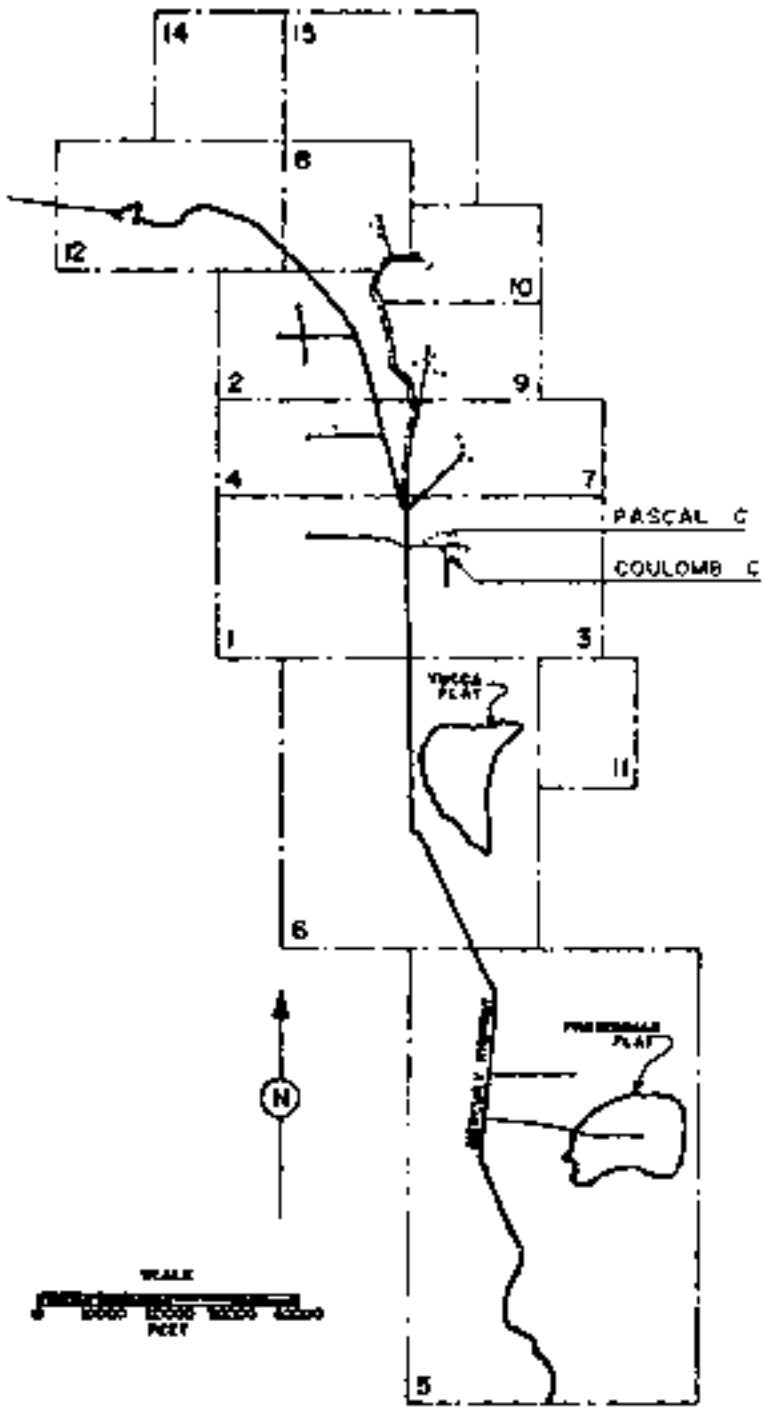


Figure 232. Hodographs for Operation PLUMBBOB - Morgan.



NEVADA TEST SITE

Figure 233. Project 58 Shot Locations.

58 PROJECT - Pascal C Safety Experiment

	PST	CST
DATE:	6 Dec 19[illegible]	6 Dec 19[illegible]
TIME:	1[illegible]	2015

Sponsor: DASA

SITE: [illegible] - Area [illegible]
[illegible]
[illegible]
Site elevation [illegible]

HEIGHT OF BURST: [illegible]

TYPE OF [illegible]
[illegible]
[illegible]
will [illegible]
bottom of [illegible]
with a [illegible]
[illegible]
to a [illegible]

CLOUD DIA (MAXIMUM): [illegible]
CLOUD BOTTOM (MINIMUM): [illegible]

REMARKS: Slight on-site contamination was produced.

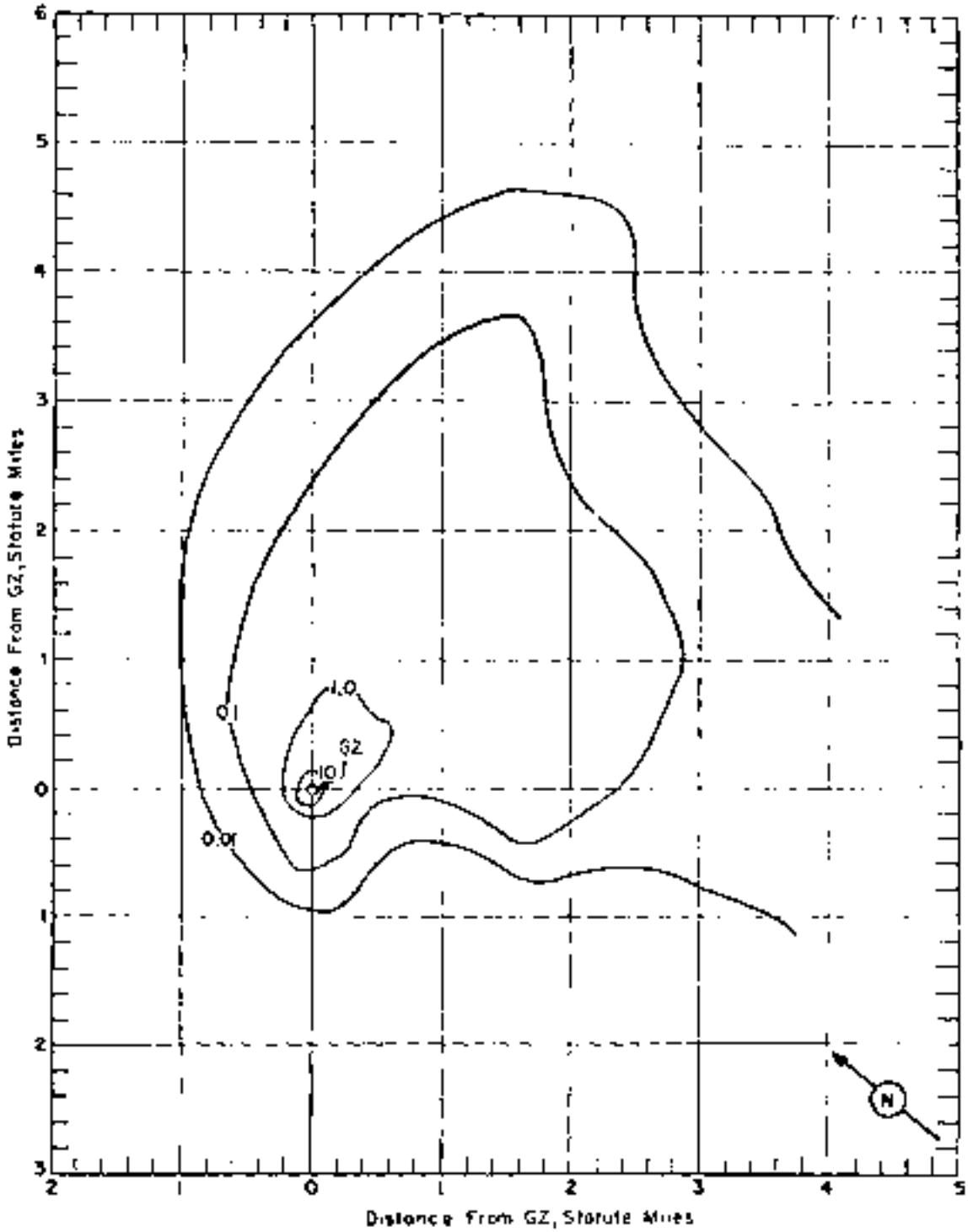


Figure 234. 58 Project - Pascal C.
On-site dose rate contours in r/hr at H+1 hour.

TABLE 71 NEVADA WIND DATA FOR OPERATION 58 PROJECT - PASCAL-C

Altitude (MSL)	H-Hour	
	Dir	Speed
feet	degrees	mph
Surface	---	--
4,290	150	03
4,790	180	07
5,290	190	04
5,790	240	02
6,290	340	04
6,790	310	08
7,290	290	11
7,790	300	14
8,290	300	13

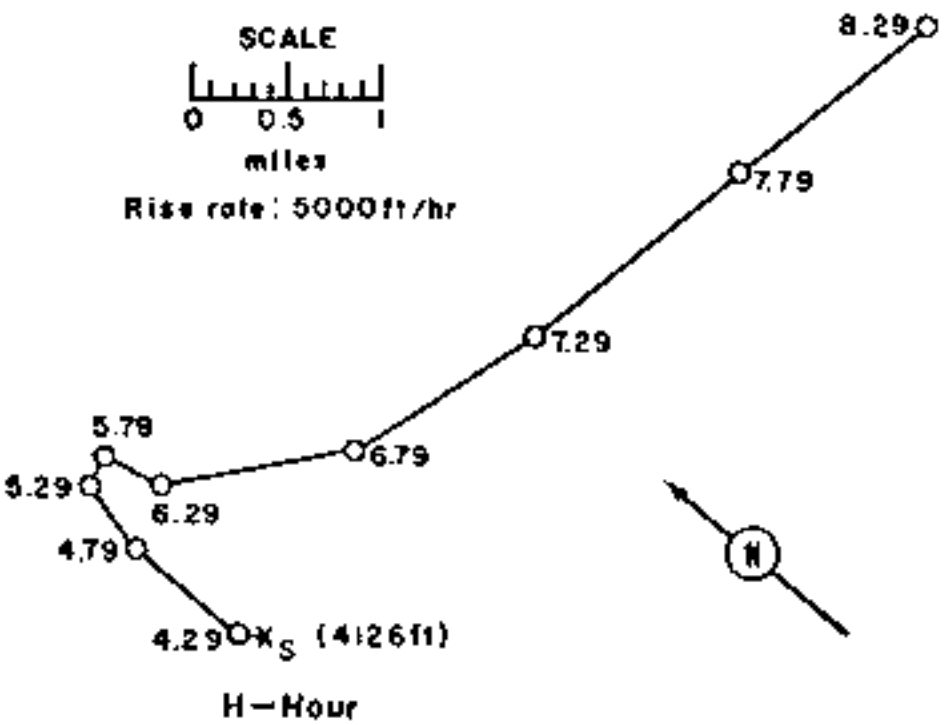


Figure 233. Hodograph for Operation 58 Project - Pascal-C.

58 PROJECT - Coulomb [illegible] Safety Experiment

	PST	GMT
DATE:	[illegible]	[illegible]
TIME:	[illegible]	2000

TOTAL YIELD: 0.5 kt

PUBLIC DATA:
Time of first detection: 2M
Time of last maximum: 2M
Period of [illegible] maximum: 2M

CLOUD ID [illegible]: [illegible] MSL
CLOUD TOPS/BASE [illegible]: 2M

Sponsor: LASL

SITE: 37N - Area 3
37° 09' [illegible]" N
116° 01' [illegible]" W
Site elevation: [illegible] FT

HEIGHT OF BURST: Surface

TYPE OF [illegible] - Cratering Shot
Surface burst - Coupling [illegible] soil

CRATER DATA: 2M

REMARKS:

The Caliente yield was known from [illegible] and by a scientific project and is well defined and reliable.

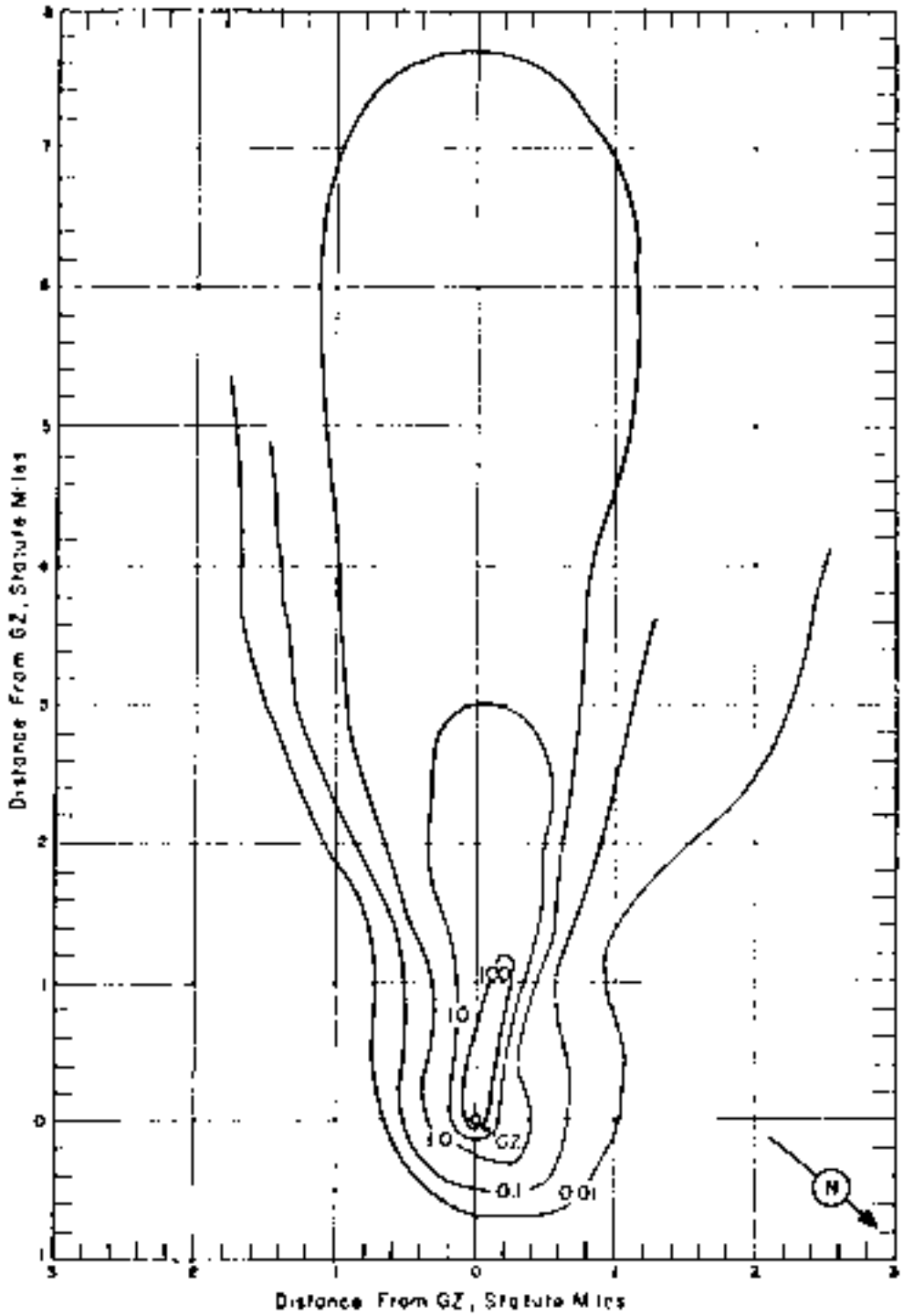


Figure 136. 58 Project - Coulomb-C.
On-site dose rate contours in r/hr at H+1 hour.

TABLE 7.2 NEVADA WIND DATA FOR OPERATION 5B PROJECT - COULOMB-C

Altitude (MSL)	H-hour	
	Dir	Speed
feet	degrees	mph
Surface	---	--
5,000	030	11
6,000	020	13
7,000	020	07
8,000	090	07
9,000	050	04
10,000	040	06
11,000	120	03
12,000	140	05
13,000	150	13
14,000	140	23
15,000	140	18
16,000	150	16
17,000	170	14
18,000	160	13
19,000	140	09
20,000	180	03

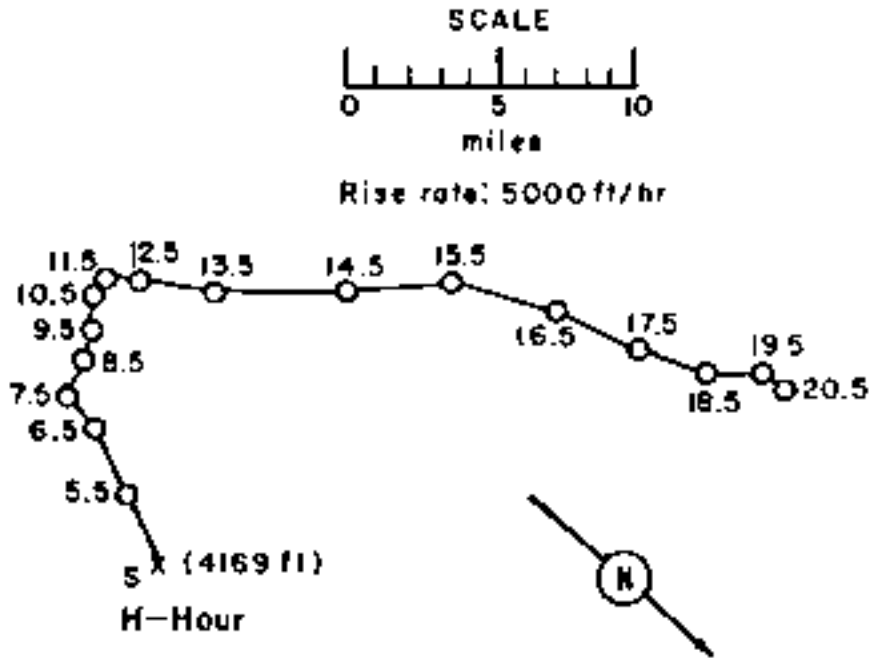


Figure 237. Hodograph for Operation 5B Project - Coulomb-C.

58 PROJECT - Venus Safety Experiment

	PST	GMT
DATE:	22 Feb 1963	23 Feb 1963
TIME:	1700	0100

Sponsor: UCRL

SITE: NTS - Area [illegible]
37° 11' 32" N
116° 11' 49" W

TYPE OF SHOT AND [illegible]
Subsurface [illegible]

CLOUD TYP[illegible]

CLOUD [illegible]

HEIGHT OF [illegible]

58 PROJECT - Uranus Safety Experiment

	PST	GMT
DATE:	[illegible]	[illegible]
TIME:	[illegible]	[illegible]

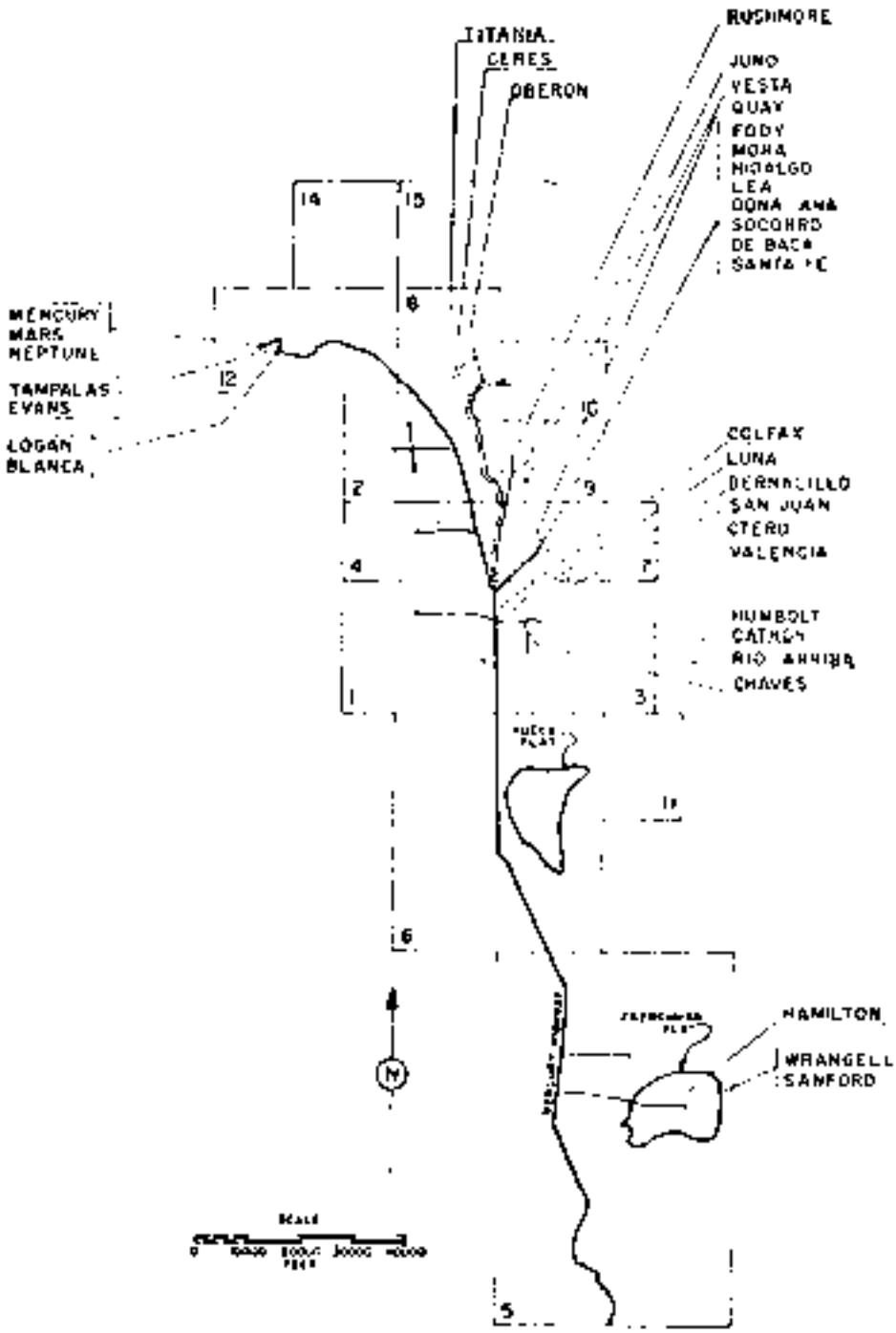
Sponsor: [illegible]

SITE: [illegible]
[illegible]
[illegible]

TYPE OF [illegible]
Submarine [illegible]

CLOUD [illegible]
CLASS [illegible]

[illegible]



NEVADA TEST SITE

Figure 238. Operation HARDTACK II, Shot Locations.

OPERATION [illegible] II - Utero Safety Experiment

	EST	GMT
DATE:	[illegible]	[illegible]
TIME:	1300	2000

Sponsor: DASA

FISSION YIELD: 38 tons

SITE: NTS Area 3g
[illegible]
[illegible]
Site elevation: 4,035 ft

FIREBALL DATA:
Time to 1st minimum: 12s
Time to 2nd maximum: 30s
Radius at 1st maximum: 2Km

Weight of yield: [illegible]

TYPE OF BURST AND DISCHARGE:
Subsurface burst - deep well

CLOUD TOP HEIGHT: 4,600 ft MSL
CLOUD BASE HEIGHT: 2Km

CRATER DATA: Not available

REMARKS:

The on-site fallout documentation was provided by the Radiological Safety Division of the Nevada Operations Office primarily for personnel safety. Readings were taken with AN/PDR-27 or Tracerlab CP-2a instruments at 0+1 hour, 0+3 hr, 0+6 hr, 0+12 hr, 0+24 hr, 0+2 days and 0+3 days. The position of the patterns is primarily shown by solid lines to the edge of the plotted data. The dotted portion is an approximation in the absence of measurements. The $t^{-1.2}$ decay approximation was used to extrapolate the dose-rate readings to 24 hours.

The off-site fallout documentation was performed with Victoreen 330-5 and AN/PDR-27 instruments by the U. S. Public Health Service for purposes of public safety. The portion of the pattern indicated by solid lines is fairly reliable. The $t^{-1.2}$ decay approximation was used to extrapolate the dose-rate readings to 24 hours.

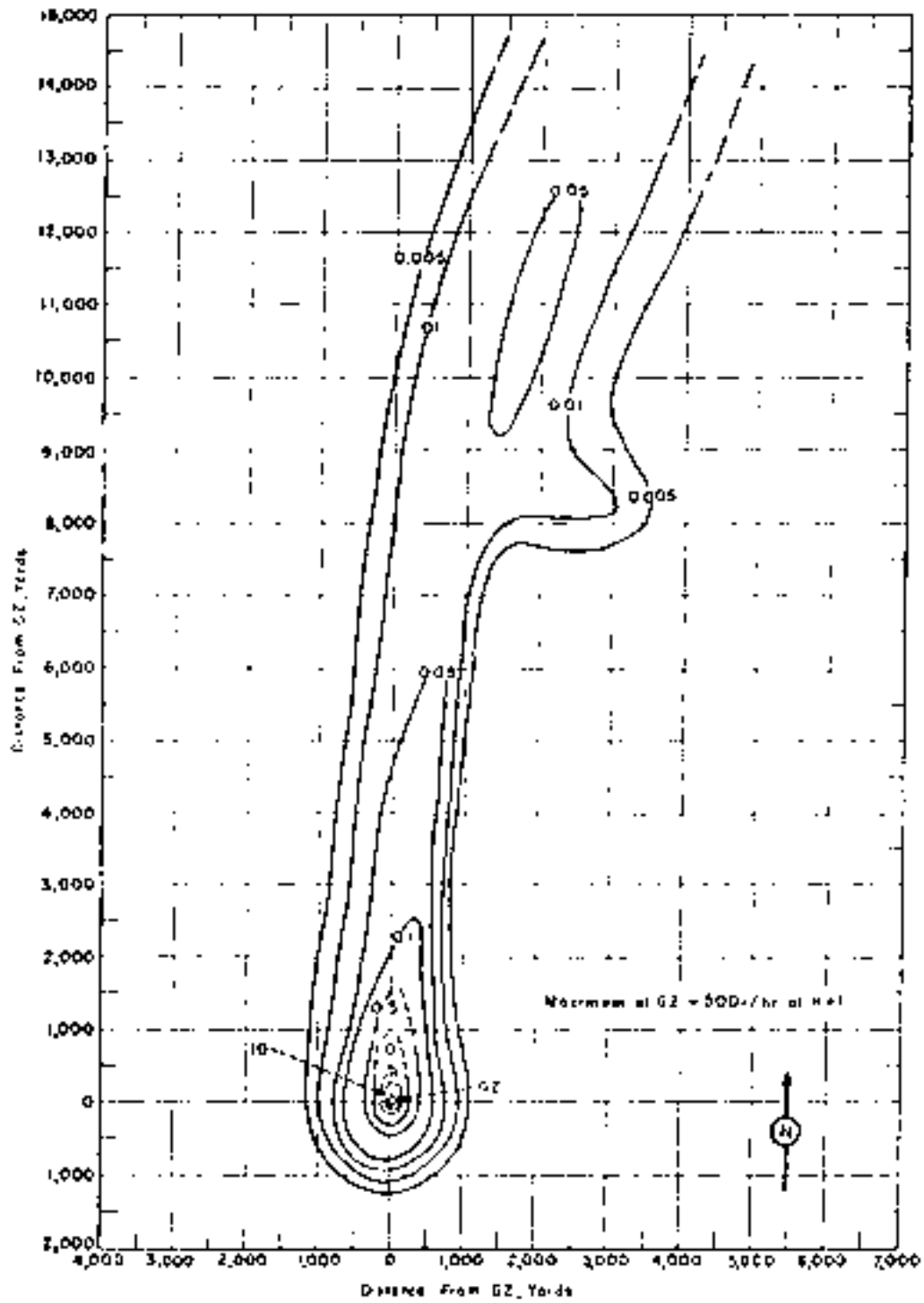


Figure 239. Operation HARDTACK II - Otero.
On-site dose rate contours in r/hr at H+1 hour.

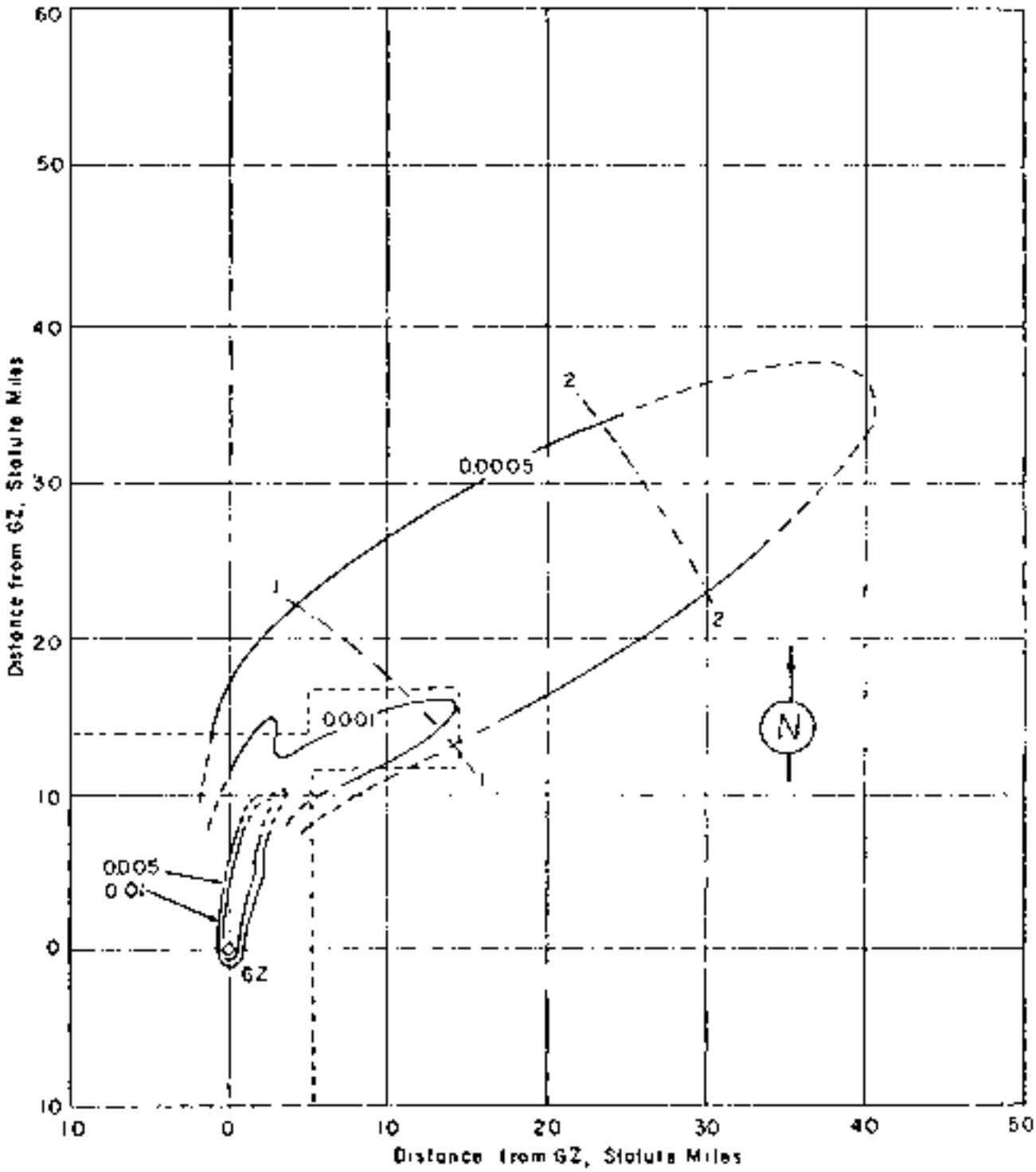


Figure 210. Operation HARDTACK II - Otero.
Off-site dose rate contours in r/hr at H+1 hour.

TABLE 73 SUMMARY WIND DATA FOR OPERATION HARDTACK II - OCTAVE

Altitude (MSL)	Winds	
	Dir	Vel
Feet	degrees	kts
Surface	180	29
5,000	180	31
6,000	150	36
7,000	190	28
8,000	190	30
9,000	200	28
10,000	210	31
11,000	210	40
12,000	220	54

NOTE: Wind data was obtained from [illegible] observation.

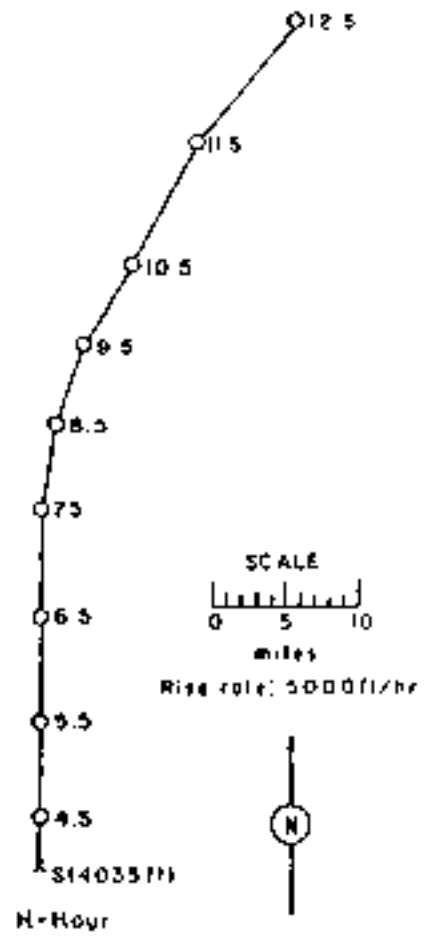


Figure 241. Radiograph for Operation HARDTACK II - Otero.

OPERATION DOMINIC II - Bernalillo Safety Experiment

	PDT	GMT
DATE:	[illegible]	[illegible]
TIME:	1030	1730

Sponsor: LASL

SITE: NTS - Area 5a
37° 02' 28" N
116° 01' 39" W
Site elevation: 4,030 ft

TOTAL YIELD: 15 tons

HEIGHT OF BURST: -456 ft

FIREBALL DATA:
Time to 1st minimum: UK
Time to 2nd maximum: UK
Radius at 2nd maximum: UK

TYPE OF BALLOON AND LIFTING GAS:
Substantial [illegible] - mylar w[illegible]

CLOUD TOP HEIGHT: [illegible] ft MSL

CRATER DATA: Not available

CLOUD BOTTOM HEIGHT: [illegible] ft MSL

REMARKS:

The on-site fallout documentation was performed by the Radiation Safety Division of the Reynolds Electrical and Engineering Company for purposes of personnel safety. Readings were taken with AN/PDR-27 or Tracerlab TU-13 instruments at 1m, 1ft, 3ft, 6ft, 9ft, 12ft, 15ft, 18ft, 21ft, 24ft, 27ft, 30ft, 33ft, 36ft, 39ft, 42ft, 45ft, 48ft, 51ft, 54ft, 57ft, 60ft, 63ft, 66ft, 69ft, 72ft, 75ft, 78ft, 81ft, 84ft, 87ft, 90ft, 93ft, 96ft, 99ft, 102ft, 105ft, 108ft, 111ft, 114ft, 117ft, 120ft,

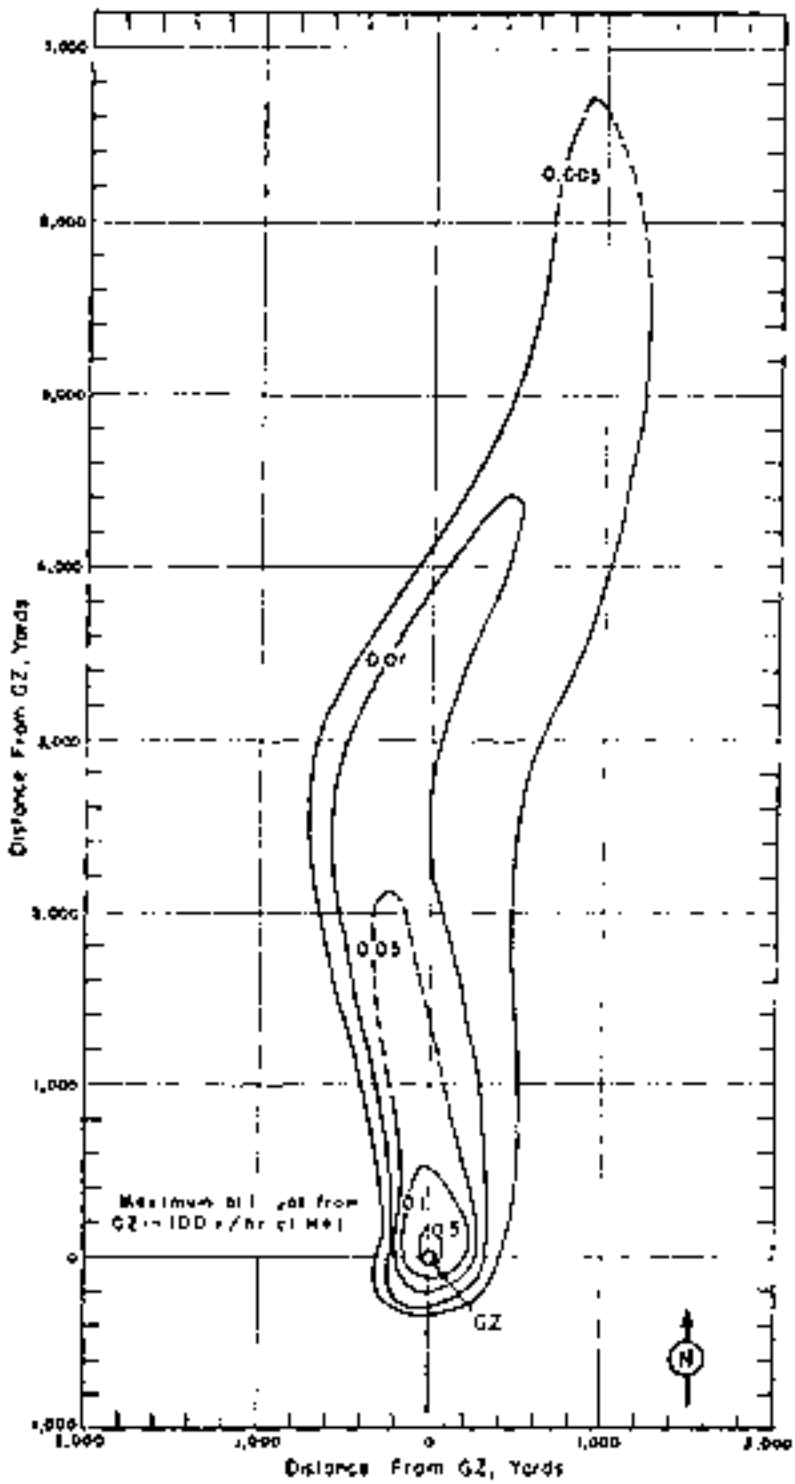


Figure 242. Operation HARDTACK II - Bernalillo.
On-site dose rate contours in r/hr at H+1 hour.

TABLE 7.1 NOMINAL WIND DATA FOR OPERATION [illegible]

Altitude (MSL)	Direction	Speed
feet	degrees	kts
Surface	180	15
5,000	180	20
6,000	180	25
7,000	230	20
8,000	210	17
9,000	210	17
10,000	210	16

NOTE: Wind data [illegible]

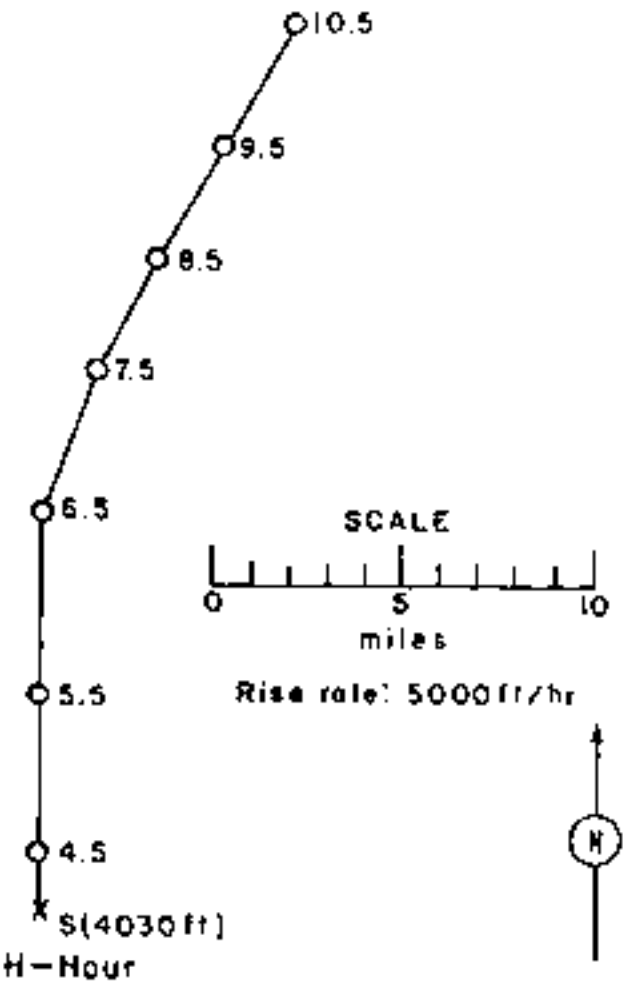


Figure 3.3. Hodograph for Operation [illegible]

OPERATION HARDTACK II — Eddy

	PDT	GMT
DATE:	[illegible]	[illegible]
TIME:	[illegible]	[illegible]

Sponsor: L.A.S.L.

SITE: NTS - Area 7
[illegible]
[illegible]
Site elevation: [illegible] ft

YIELD: [illegible] 83 tons

HEIGHT OF BURST: [illegible] ft

FIREBALL DATA:
Time [illegible] minimum: UNK
Time to second maximum: UNK
Radius at second maximum: UNK

TYPE OF DETONATION: Airburst [illegible]
Nevada [illegible]

CRATER DATA: [illegible]

CLOUD TOP HEIGHT: [illegible] ft MSL
CLOUD BOTTOM HEIGHT: [illegible] ft MSL

REMARKS:

The on-site fallout documentation was performed by the Radiological Safety Division of the Reynolds Electrical and Engineering Company for purposes of on-site safety. Readings were taken with AN/PDR-39 [illegible] Tracerlab [illegible] instruments at H+1 hour, H+[illegible], H+[illegible] days, H+[illegible] days, and H+[illegible] days along radial roads. The observed decay rate was used to extrapolate the dose-rate readings to H+1 hour. This decay rate is not strictly applicable although it closely approximates the observed decay.

The off-site fallout documentation was performed with Beckman MX-5 and AN/PDR-39 instruments by the U. S. Public Health Service for purposes of public safety. Readings were taken at about 10 mile intervals except in populated places or when the dose rate varied considerably with distance. "The far northerly portion of the pattern may be in error. No airborne activity above background was detected in this general area. The easterly portion of the pattern was interpolated. The rest of the pattern was well documented and should be fairly reliable." The $t^{-1.2}$ decay approximation was used to extrapolate the dose-rate readings to H+1 hour.

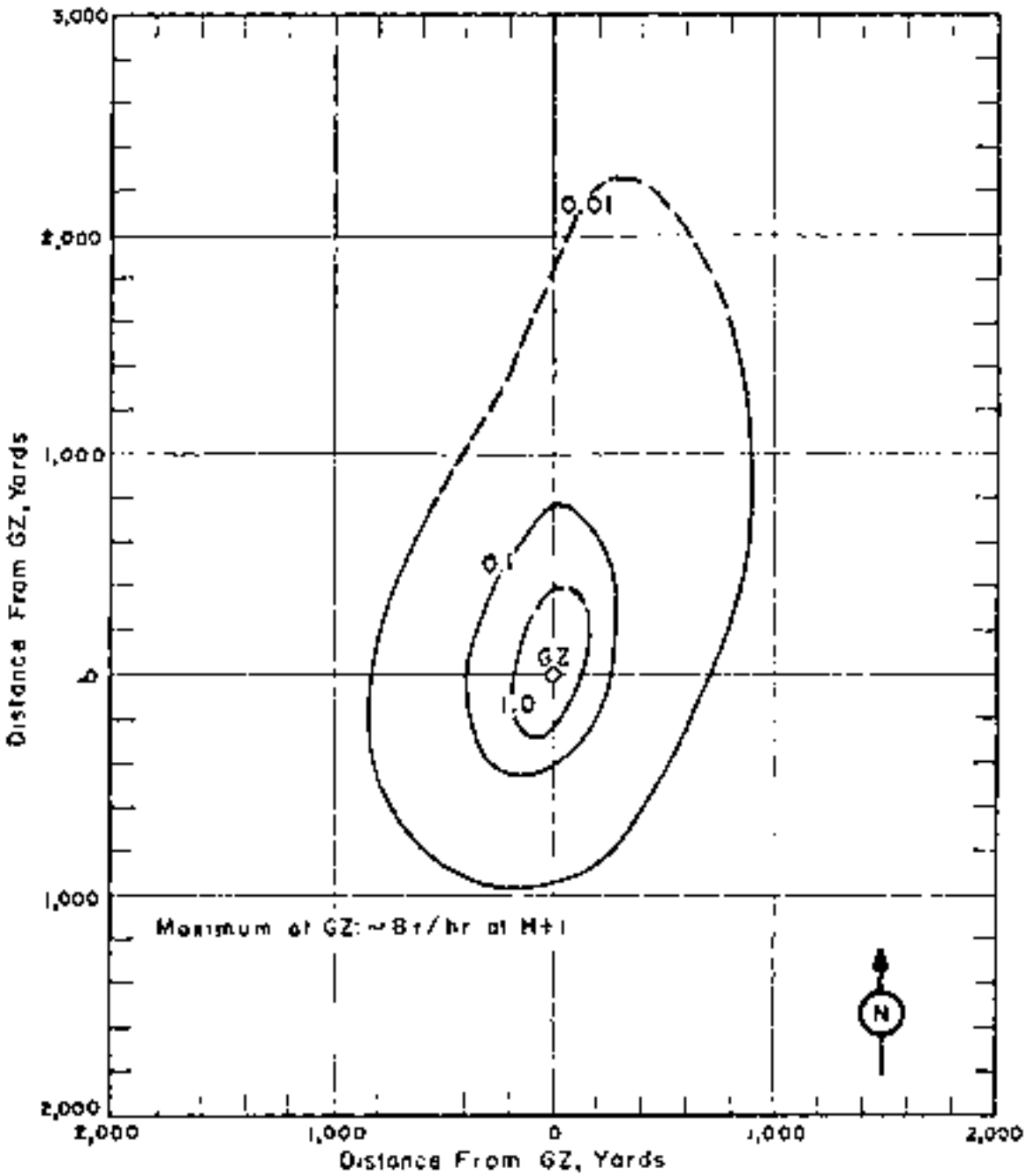


Figure 244. Operation MARSHACK II - Eddy.
On-site dose rate contours in r/hr at H+1 hour.

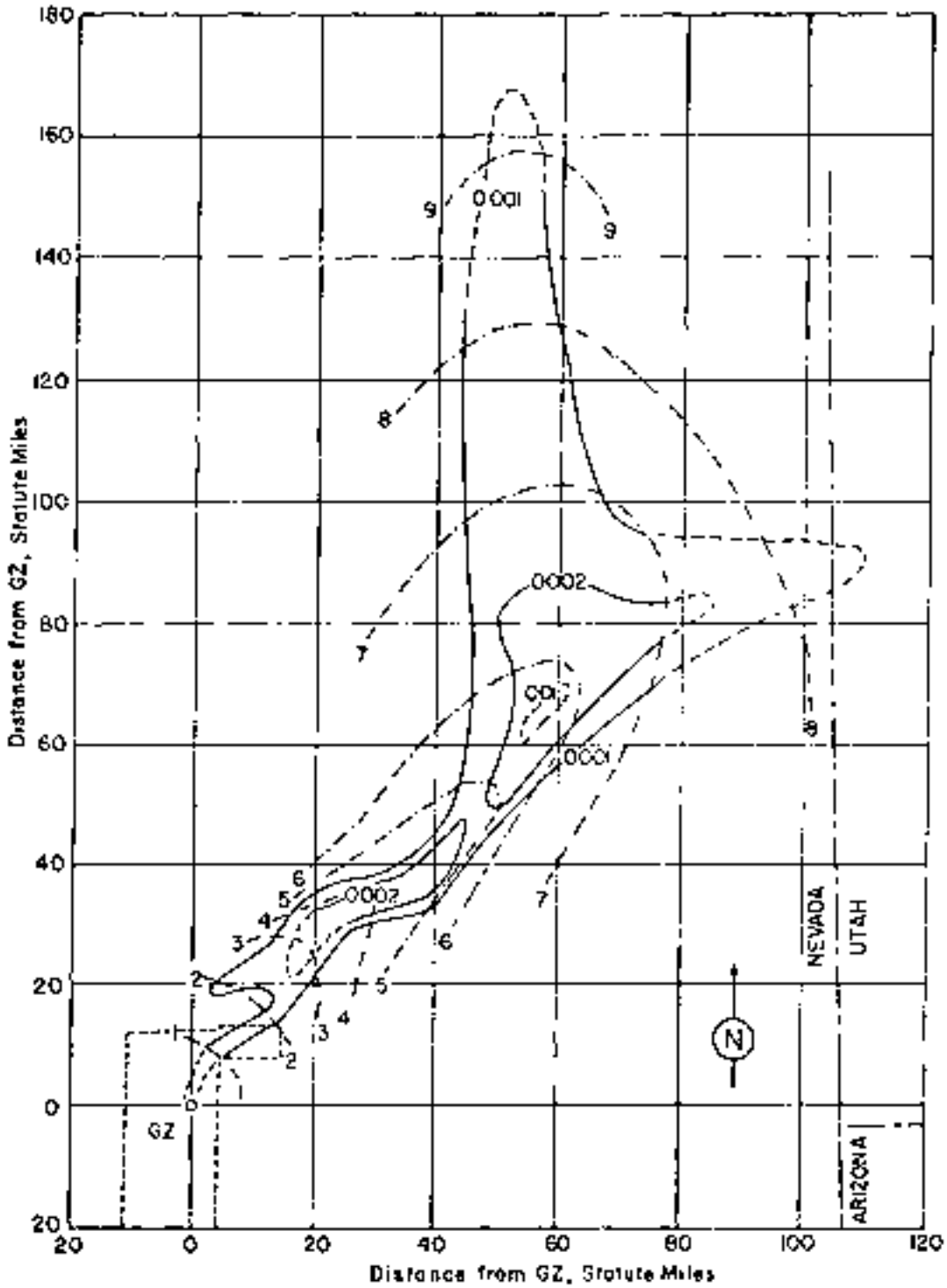


Figure 245. Operation HARDTACK II - Eddy.
Off-site dose rate contours in r/hr at H+1 hour.

TABLE 75 NEVADA WIND DATA FOR OPERATION HARDTACK II – [illegible]

Altitude (MSL)	Direction	Velocity
feet	deg/mils	mph
Surface	Calm	Calm
5,000	240	08
6,000	220	13
7,000	220	13
8,000	210	14
9,000	210	14
10,000	190	13
11,000	180	10
12,000	170	06

NOTES:
1. Wind data was obtained from the Yucca weather station.
2. Tropopause height was 40,000 ft MSL.
3. The surface air pressure was 28.69 psi, the temperature 54.2°F, the dew point 47.0 F, and the relative humidity 21%.

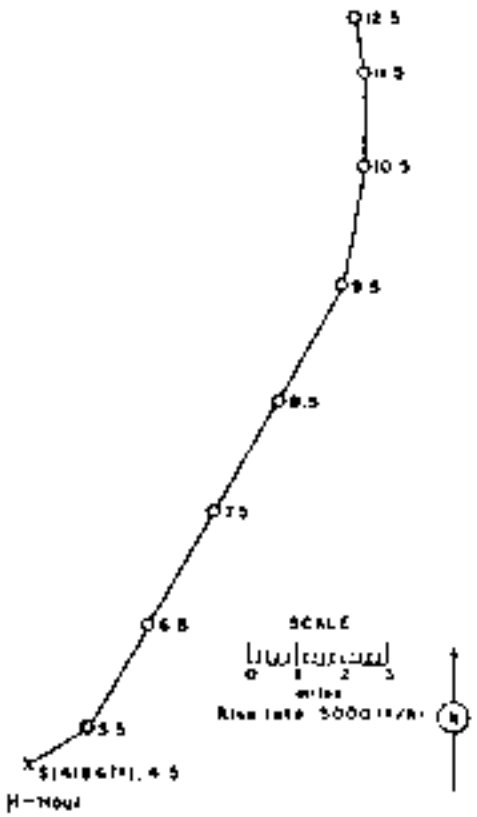


Figure No. Hodograph for Operation HARDTACK II – Eddy.

OPERATION HARDTACK II - Luna Safety Experiment

	PDT	GMT
DATE:	21 Sep 1958	21 Sep 1958
TIME:	[illegible]	[illegible]

TOTAL YIELD: 1.5 tons

FIREBALL DATA:
Time to 1st minimum: NA
Time to 2nd maximum: NA
Radius at 2nd maximum: NA

CRATER DATA: Not available

Sponsor: LASL

SITE: NTS - Area [illegible]
[illegible] N
[illegible] W
Site elevation: [illegible]

HEIGHT OF [illegible]:
[illegible]
below surface in [illegible]

CLOUD TOP HEIGHT: NA
CLOUD BOTTOM HEIGHT: NA

REMARKS:

The on-site fallout documentation was performed by the Radiological Safety Division of the Reynolds Electrical and Engineering Company for purposes of operational safety. Readings were [illegible] or Tracerlab [illegible] instruments at [illegible] hour, [illegible] [illegible] and [illegible] days [illegible] radial roads. [illegible] few readings in the area where fallout should have [illegible] the wind data it is difficult to draw a pattern with any confidence. The $t^{-1.2}$ decay approximation was used to extrapolate the dose rate readings to H+1 hour.

There were no readings above background reported off-site.

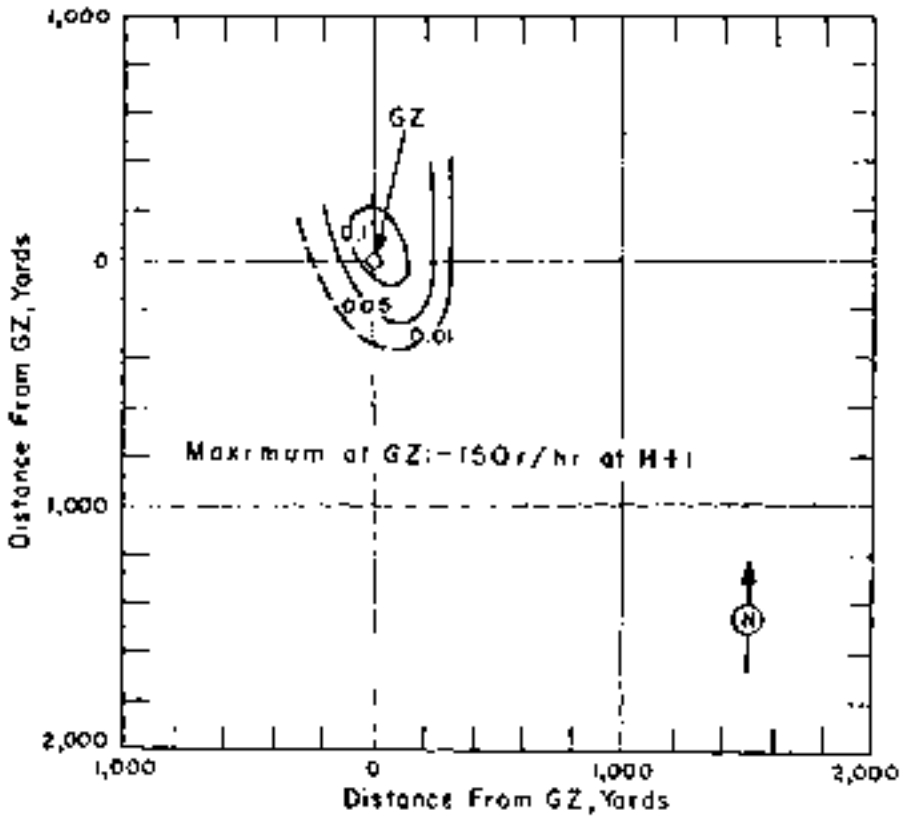


Figure 247. Operation HARDTACK II - [illegible] Dome.
On-site dose rate contours in r/hr at H+1 hour.

TABLE 76 NEVADA WIND DATA FOR OPERATION HARDTACK II - LUNA

Altitude (MSL)	H-hour	
	Dir	Speed
feet	degrees	mph
Surface	160	05
5,000	170	09
6,000	180	10
7,000	180	13
8,000	190	16
9,000	190	21

NOTE: Wind data was obtained from the Yucca weather station.

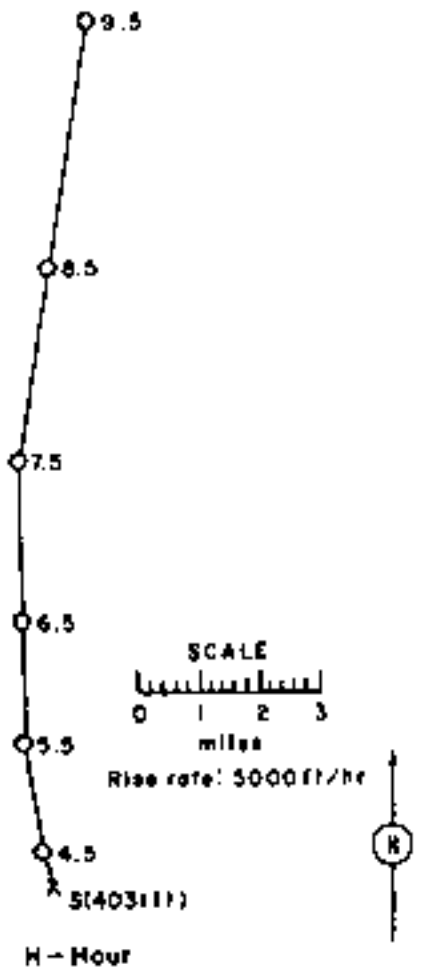


Figure 248. Hodograph for Operation HARDTACK II - Luna.

OPERATION BUMPBACK II - Mercury Safety Experiment

	EDT		GMT	
DATE:	[illegible]		[illegible]	
TIME:	1000		2000	

Sponsor: DOD

PILOT: USN - Astronaut
ST [illegible] N
[illegible] W
Pilot [illegible]

PRIMARY OBJECTIVE: Test ff

TYPE OF [illegible]
[illegible]
Normal [illegible]

CLOUD COVER AT [illegible]
CLOUD FORMATION [illegible]

REMARKS:
Sensor [illegible] was [illegible] by [illegible] [illegible] atmosphere was observed. Clear [illegible] in the main tunnel.

OPERATION BANDSTAND II - Valencia Safety Experiment

DATE: [illegible]
TIME: [illegible]

TOTAL YIELD: 3 tons

FIRING DATA:
Time of first detonation: [illegible]
Time of final detonation: [illegible]
Radius of [illegible]

SHOCK WAVE: [illegible]

Sponsor: [illegible]

SIZE: [illegible]

HEIGHT OF BURST: [illegible]

TYPE OF [illegible]
[illegible]

RESULTS:

[illegible]

[illegible]

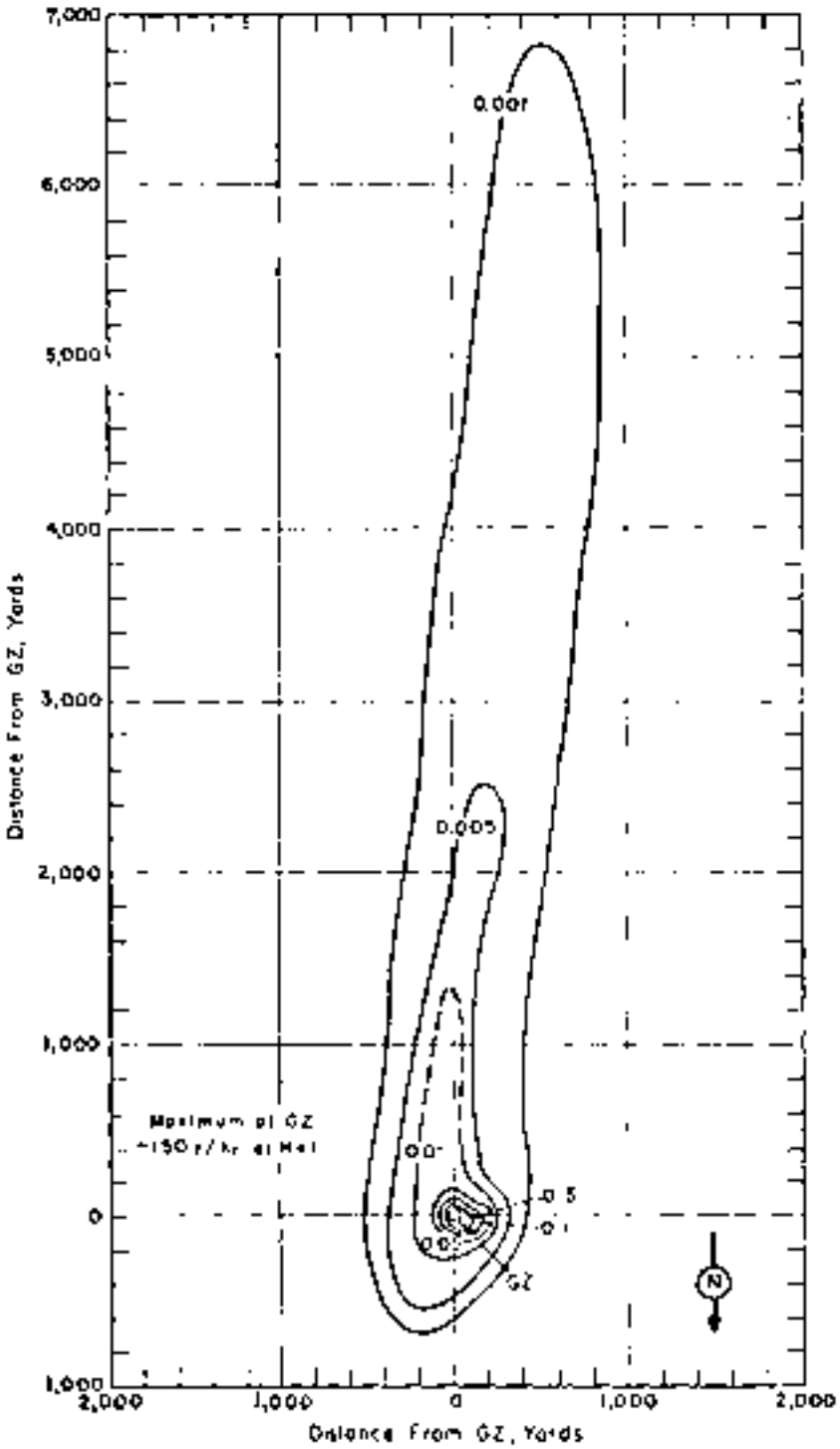


Figure 249. Operation BARSTACK II - Valencia.
On-site dose rates in r/hr at H+1 hour.

TABLE 77 NEVADA WIND DATA FOR OPERATION HARDTACK II - VALENCIA

Altitude (MSL)	H-hour	
	Dir	Speed
feet	degrees	mph
Surface	20	17
5,000	10	20
6,000	20	21
7,000	30	21
8,000	30	20

NOTE : Wind data was obtained from the Yucca weather station.

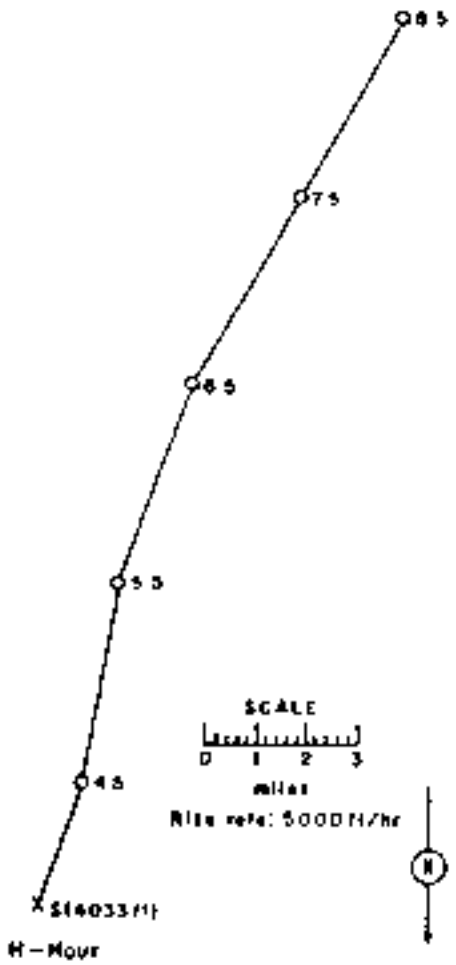


Figure 250. Hodograph for Operation HARDTACK II - Valencia.

OPERATION HARDTACK II - Mars - Safety Experiment

	PDT	GMT
DATE:	[illegible] Sep 1958	[illegible] Sep 1958
TIME:	[illegible]	0000

TOTAL YIELD: 13 tons

FIREBALL DATA:
Time to first minimum: NM
Time to 2nd maximum: NM
Radius at 2nd maximum: NM

CLOUD TOP HEIGHT: NM
CLOUD BOTTOM HEIGHT: NM

Sponsor: UCRL

SITE: NTS - Area [illegible]
37° [illegible]' [illegible]" N
116° [illegible]' [illegible]" W
Site elevation: [illegible] ft

HEIGHT OF BURST: [illegible] ft

TYPE OF DETONATION AND PLACEMENT:
[illegible]
[illegible]

REMARKS:
The on-site fall [illegible] was [illegible] by the [illegible] Safety Division [illegible] for purposes of [illegible] AEC [illegible] ("The only [illegible] was the Area 13 [illegible]") [illegible] to only [illegible] extrapolat[illegible]

No radioactivity above [illegible] was detected off-site.

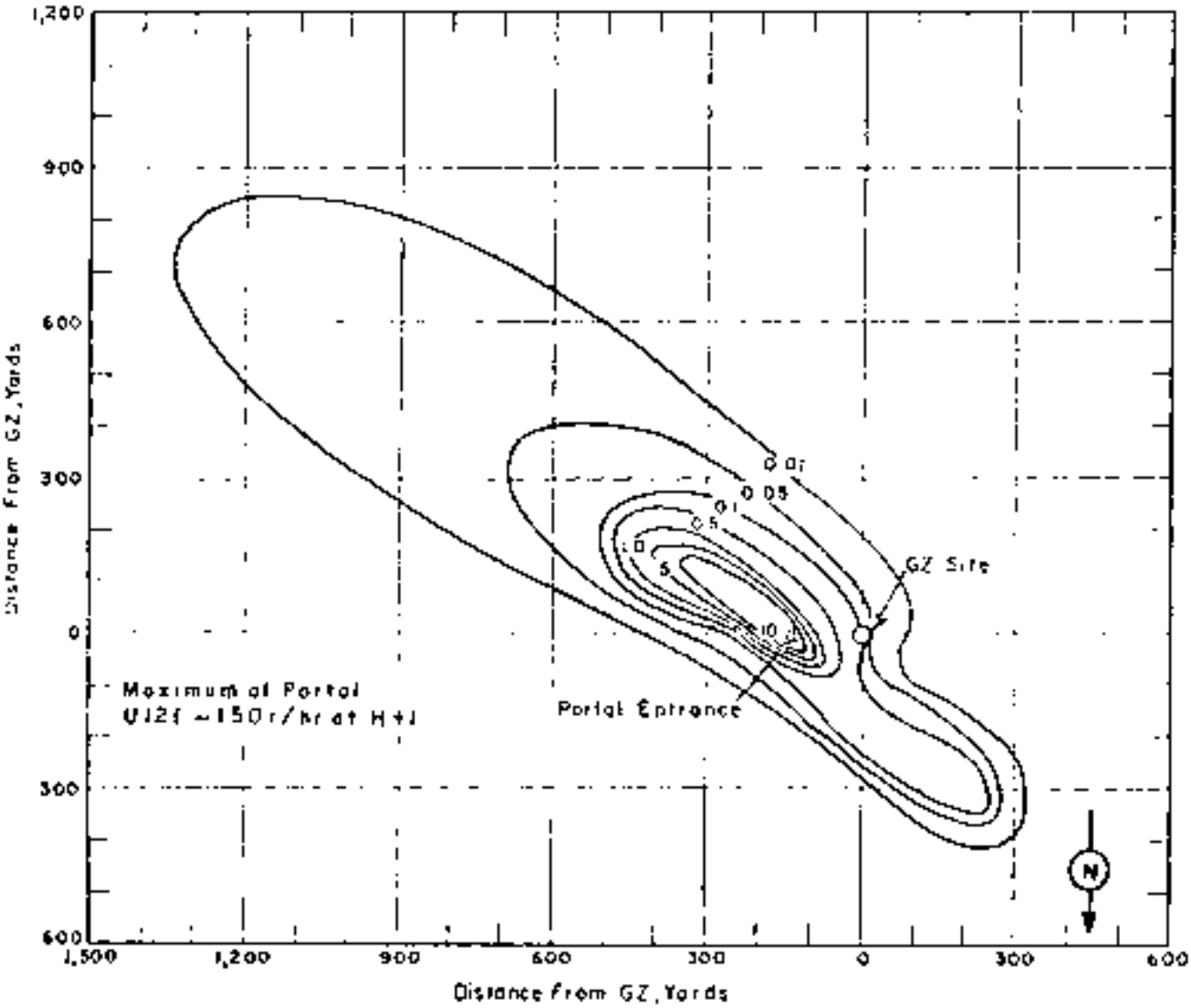


Figure 251. Operation HANDCUFF II - Yucca.
On-site dose rate contours in r/hr at H+1 hour.

TABLE 78 [illegible]

TIME	SURFACE WINDS			
	9 Foot Tower Slope Crest (Above 6,700 ft MSL)		100 Foot Tower Mountain Crest (Above 7,400 ft MSL)	
	Dir	Speed	Dir	Speed
	degrees	Kts	degrees	Kts
H-hour	040	2	50	5
H+1 hour	320	8	25	21
H+2 hours	330	6	35	21
H+3 hours	320	5	45	20

OPERATION BANEBERRY II - Mora

	PST	GMT
DATE:	27 Sep 1970	28 Sep 1970
TIME:	0600	1400

Sponsor: DNA

TOTAL YIELD: 7.6 kt

GIVE: NTS - Area 7B
37° 01' 12" N
116° 01' 24" W
Site elevation: 4,184 ft

FIREBALL DATA:
Time to 1st minimum: NM
Time to 2nd maximum: NM
Radius at 2nd maximum: NM

HEIGHT OF BURST: 1,116 ft

TYPE OF BURST AND PLACEMENT:
Air burst from a balloon over
Nevada soil

CLOUD TOP HEIGHT: 18,000 ft MSL
CLOUD BOTTOM HEIGHT: 10,000 ft MSL

CRATER DATA: No crater

REMARKS:

The on-site fallout documentation was performed by the Radiological Safety Division of the Reynolds Electrical and Engineering Company for purposes of personnel safety. Readings were taken with AN/PDR-43 or Tracerlab SU-10 instruments at H+3 hour, H+9 hours, D+1 day, D+2 days and D+3 days along eight radial roads. At shot time a dust cloud was formed and was observed to move toward the west over the Mercury Highway producing some activity. Since this event was fairly well documented, there is considerable confidence in the pattern presented. The sodium-24 decay rate was used to extrapolate the dose-rate readings to H+1 hour. This decay rate is not strictly applicable although it closely approximates the observed decay.

Only small areas of low level of radioactivity relative to background radiation were detected off site.

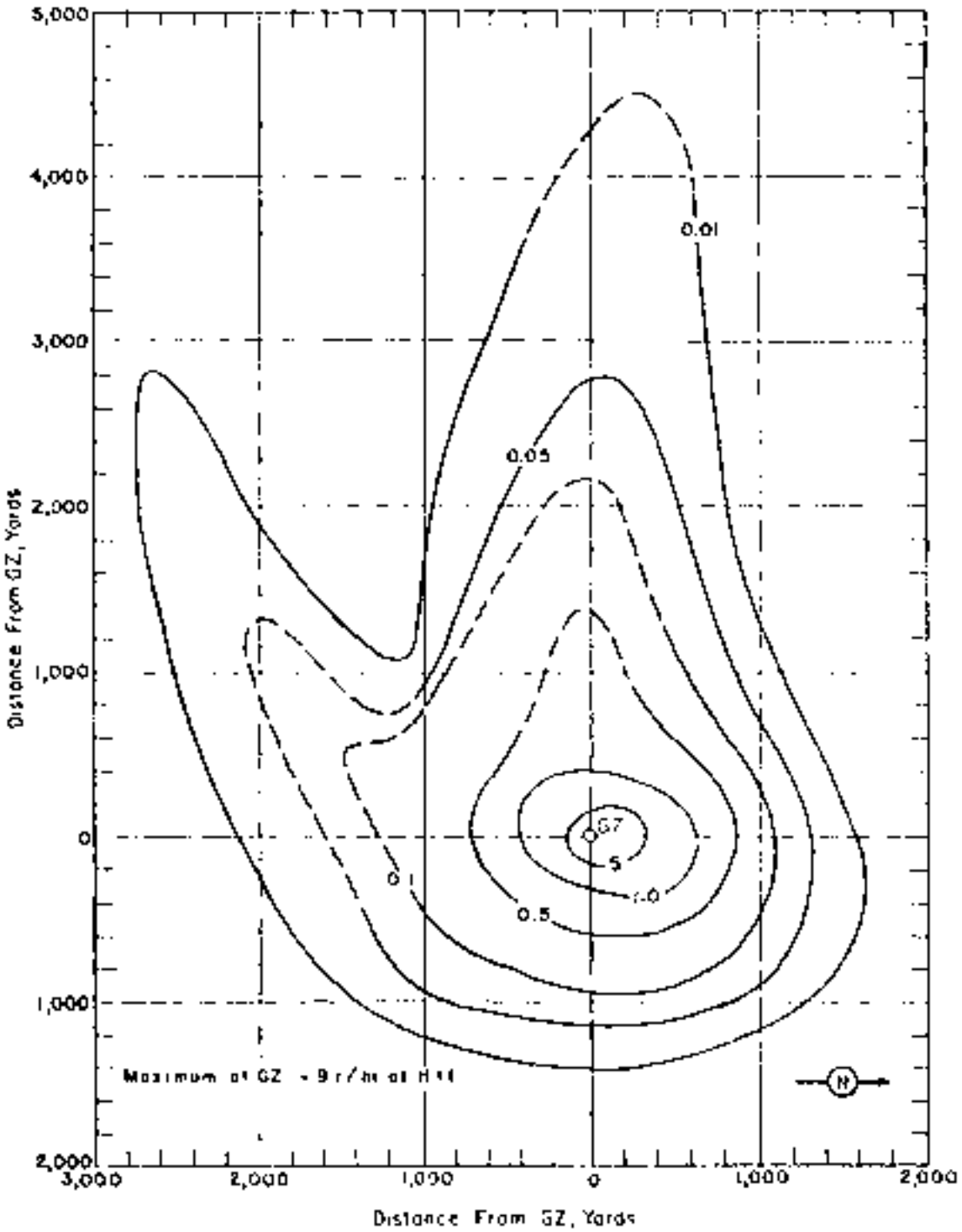


Figure 252 - Operation HARDTACK II - Nora.
On-site dose rate contours in r/hr at H+1 hour.

TABLE 79 REVISED WIND DATA FOR OPERATION BARRACK II - MORA

Altitude (MSL)	H-hour	
	Dir	Speed
feet	degrees	mph
Surface	Calm	Calm
5,000	320	02
6,000	340	05
7,000	360	09
8,000	020	11
9,000	030	15
10,000	020	15
11,000	010	15
12,000	350	18
13,000	350	20
14,000	360	23
15,000	020	24
16,000	010	28
17,000	010	31
18,000	020	33
19,000	020	35
20,000	020	36

NOTES:
1. Wind data was obtained from the Yuma weather station.
2. Projected burst was 40,000 ft MSL.
3. The surface air pressure was 12.2 psi, the temperature 11.8°C, the dew point 6.5°C, and the relative humidity 70%.

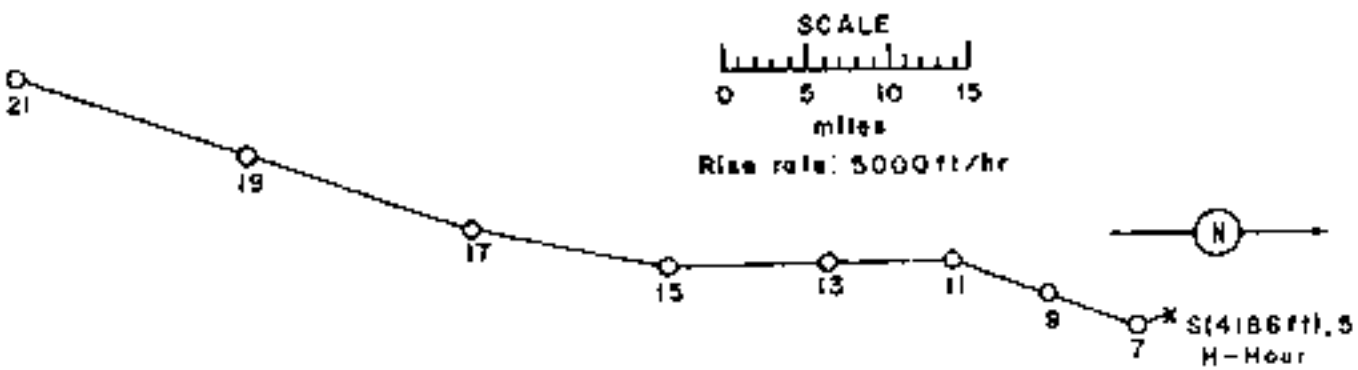


Figure 253. Hodograph for Operation BARRACK II - Mora.

OPERATION BARNACK II - Hidalgo Safety Experiment

	PST	GMT
DATE:	5 Oct 1967	6 Oct 1967
TIME:	0810	1510

Sponsor: LASL

SITE: NTS - Area 7b
37° 05' 12" N
116° 01' 25" W
Site elevation: 4,196 ft

TOTAL YIELD: 77 tons

FIREBALL DATA:
Time to 1st minimum: NM
Time to 1st maximum: NM
Radius at 2nd maximum: NM

HEIGHT OF BURST: 577 ft

TYPE OF MEDIA AND LOCATION:
Air burst from a balloon
Nevada soil

CRATER DATA: No crater

CLOUD TOP HEIGHT: 17,500 ft MSL
CLOUD BOTTOM HEIGHT: 14,000 ft MSL

REMARKS:

The on-site fallout documentation was performed by the Radiological Safety Division of the Reynolds Electrical and Engineering Company for purposes of personnel safety. Readings were taken with AN/PDR-39 or Tracerlab SU-1G instruments at H+3 hours, H+6 hours, D+1 day, D+2 days and D+3 days along eight radial roads. The sodium-24 decay rate was used to extrapolate the dose-rate readings to H+1 hour. This decay rate is not strictly applicable although it closely approximates the observed decay.

The initial off-site survey did not reveal any activity above background. Approximately 24 hours after shot time, readings in the Mike-Alamo-Caliente area indicated activity 2 to 4 times background levels.

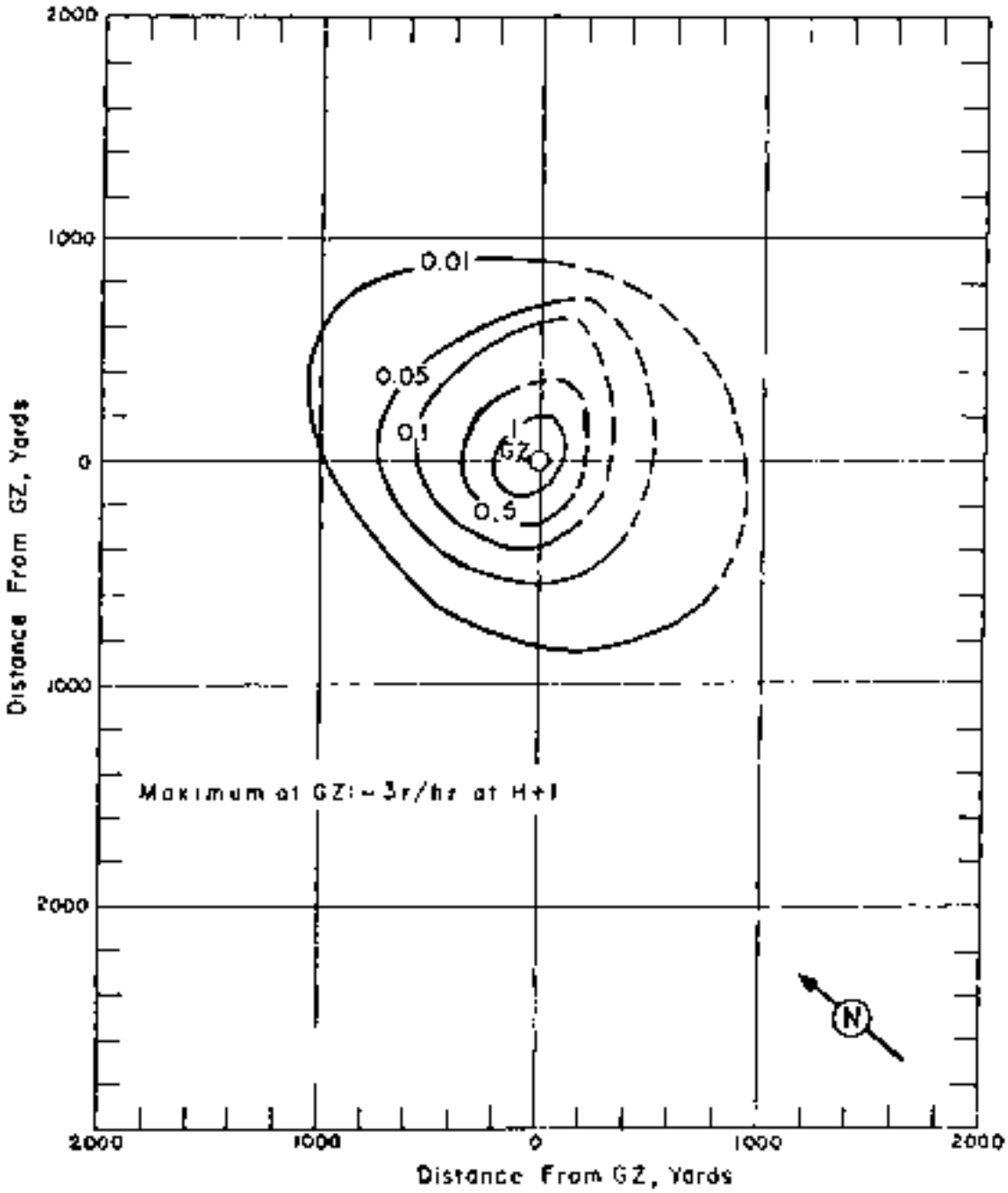


Figure 254. Operation HARDTACK II - Hidalgo.
On-site dose rate contours in r/hr at H+1 hour.

TABLE 80 [illegible]

Altitude (MSL)	[illegible]		[illegible]	
	Dir		Spd	
Feet	Degrees	mph	Degrees	mph
Surface	040	01	110	02
5,000	300	06	280	06
6,000	240	12	280	13
7,000	230	15	230	16
8,000	250	07	250	11
9,000	270	02	---	--
10,000	290	06	---	--
11,000	270	04	---	--
12,000	270	01	---	--

NOTE: [illegible]

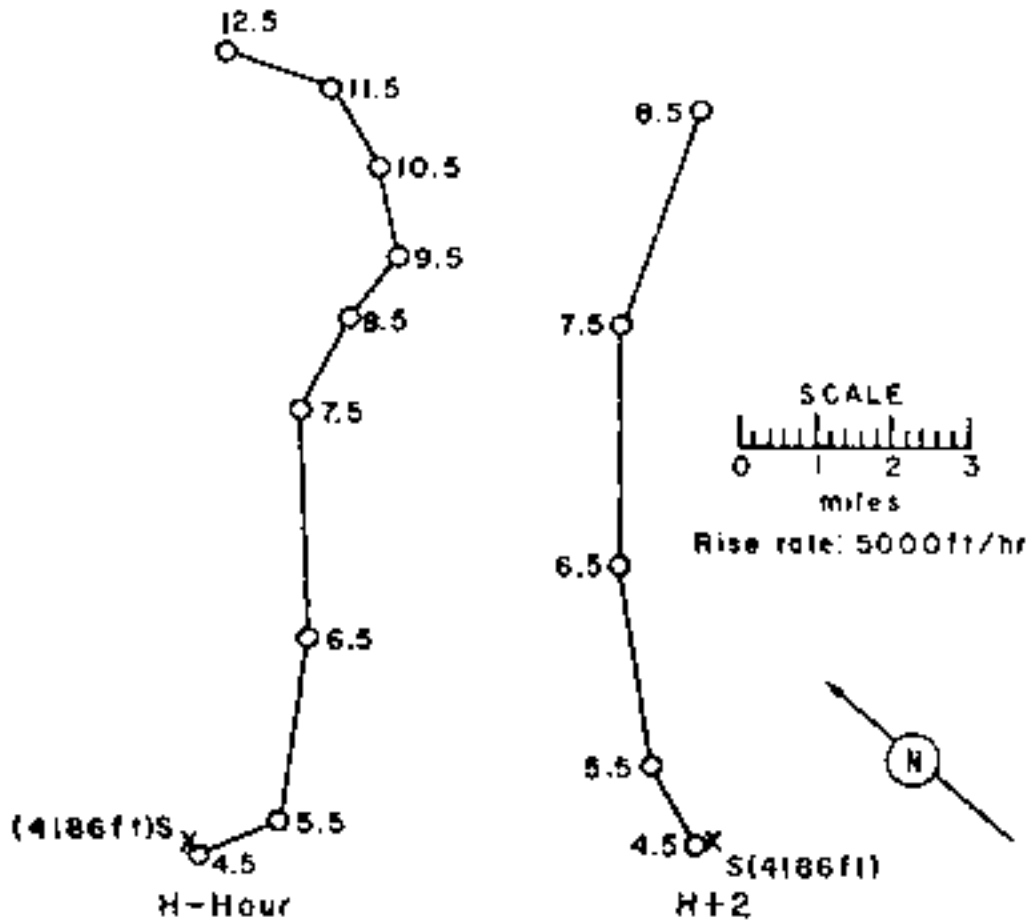


Figure 255. Hodographs for Operation SAFEBACK II - [illegible]

OPERATION HARDTACK II - Colfax Safety Experiment

	PST	GMT
DATE:	5 Oct 1958	6 Oct 1958
TIME:	0715	1615

Sponsor: IASL

SITE: NTS - Area 3
37° 20' 14" N
116° 30' 03" W
Site elevation: 4,193 ft

TOTAL YIELD: 3.5 tons

FIREBALL DATA:
Time to 1st minimum: 2M
Time to 2nd maximum: 3M
Radius at 2nd maximum: 1M

WEIGHT OF TOWER: [illegible]

TYPE OF DEVICE: [illegible]
Implosion system - [illegible]
Nuclear unit

CLOUD TOP HEIGHT: [illegible] ft MSL
CLOUD BOTTOM HEIGHT: [illegible] ft MSL

CRATER DATA: Not available

REMARKS:

The on-site fallout documentation was performed by the Radiological Safety Division of the Reynolds Electrical & Engineering Company for purposes of personnel safety. Readings were taken with AN/PPS-1 or Victoreen CDV-7 instruments at H+1 hour, the time of first DOP data. The $t^{-1.2}$ decay approximation was used to project the dose-rate readings to H+1 hour. There was insufficient fallout data to obtain information from which to draw a complete pattern.

No off-site fallout.

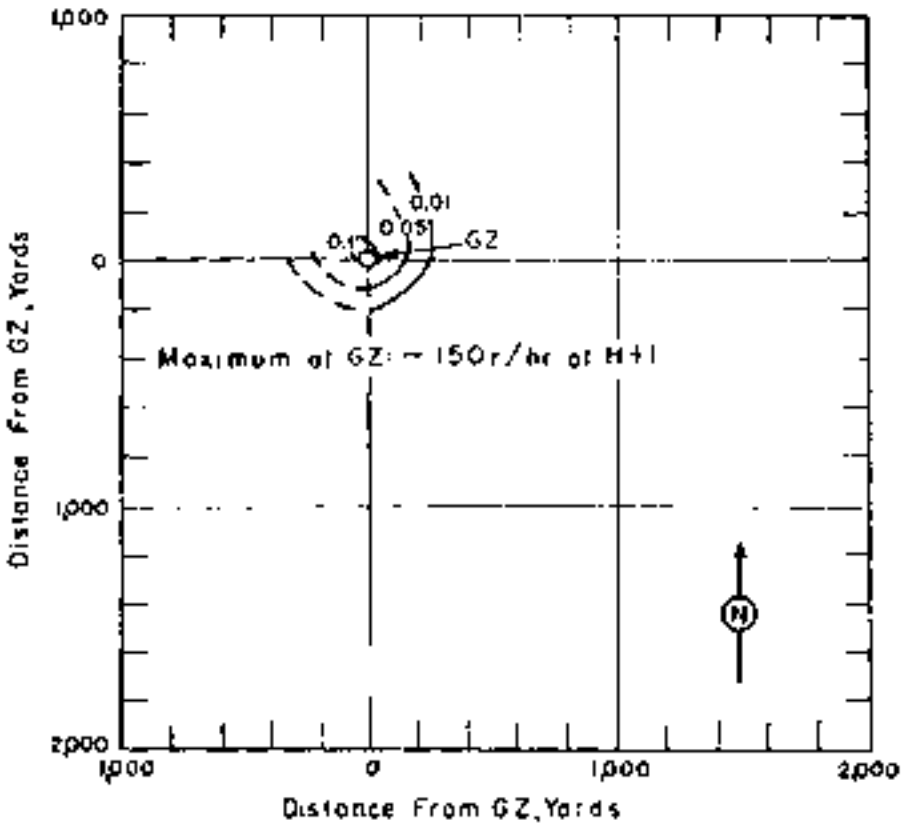


Figure 256. Operation HARDTACK II - Callaway.
On-site dose rate contours in r/hr at H+1 hour.

TABLE 51 NEVADA WIND DATA FOR OPERATION HARDTACK II - COLFAX

Altitude (MSL.)	H-Hour	
	Dir	Speed
feet	degrees	mph
Surface	110	02
5,000	200	06
6,000	220	13
7,000	230	16
8,000	250	1[illegible]

NOTE: Wind data was obtained from the Yucca, Nevada station.

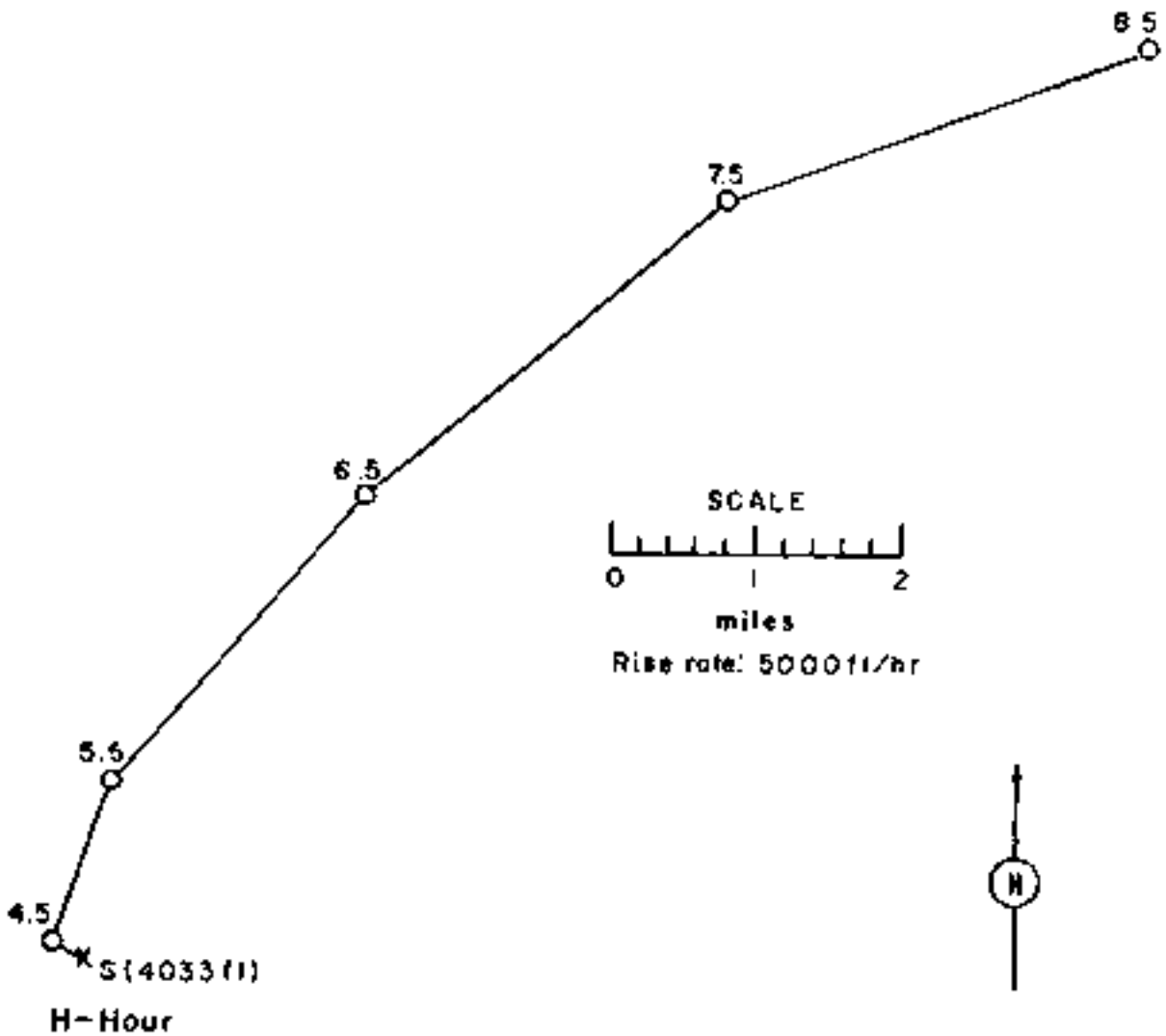


Figure 257. Hodograph for Operation HARDTACK II - Colfax.

OPERATION HIGHROCK II -

Tunnel [illegible]

	PST	GMT
DATE:	5 Oct [illegible]	[illegible] Oct [illegible]
TIME:	[illegible]	[illegible]

Sponsor: DCPA

TOTAL YIELD: 72 tons

SITE: [illegible] - Area [illegible]
[illegible]° [illegible]' [illegible]" W
[illegible]° [illegible]' [illegible]" N
Site elevation: [illegible] ft

FIRING DATA:
Time to 1st explosion: 0[illegible]
Time to 2nd explosion: 0[illegible]
Radius at 1st explosion: [illegible]

WEIGHT OF [illegible]: Weighed [illegible]
NOT Full Stemming [illegible]
measured surface [illegible]

CRATER DATA: Not available

WEIGHT OF [illegible] AND [illegible]:
Sub[illegible] - Stemming - Canister - [illegible]
Seconds [illegible]

CLOUD TOP HEIGHT: [illegible]
CLOUD [illegible]: [illegible]

REMARKS:

The [illegible] Project was performed by the Radiological Safety Division of the Nevada Operations Office, Energy Research and Development Administration, for purposes of personnel safety. Radiation was [illegible] with AN/PDR-[illegible] or Technical [illegible]. [illegible] of the event. Air sampling [illegible] decay was performed. Ground [illegible] was [illegible] the tunnel muzzle. A report [illegible] the [illegible] by the Safety Division [illegible].

No activity above background was detected off-site.

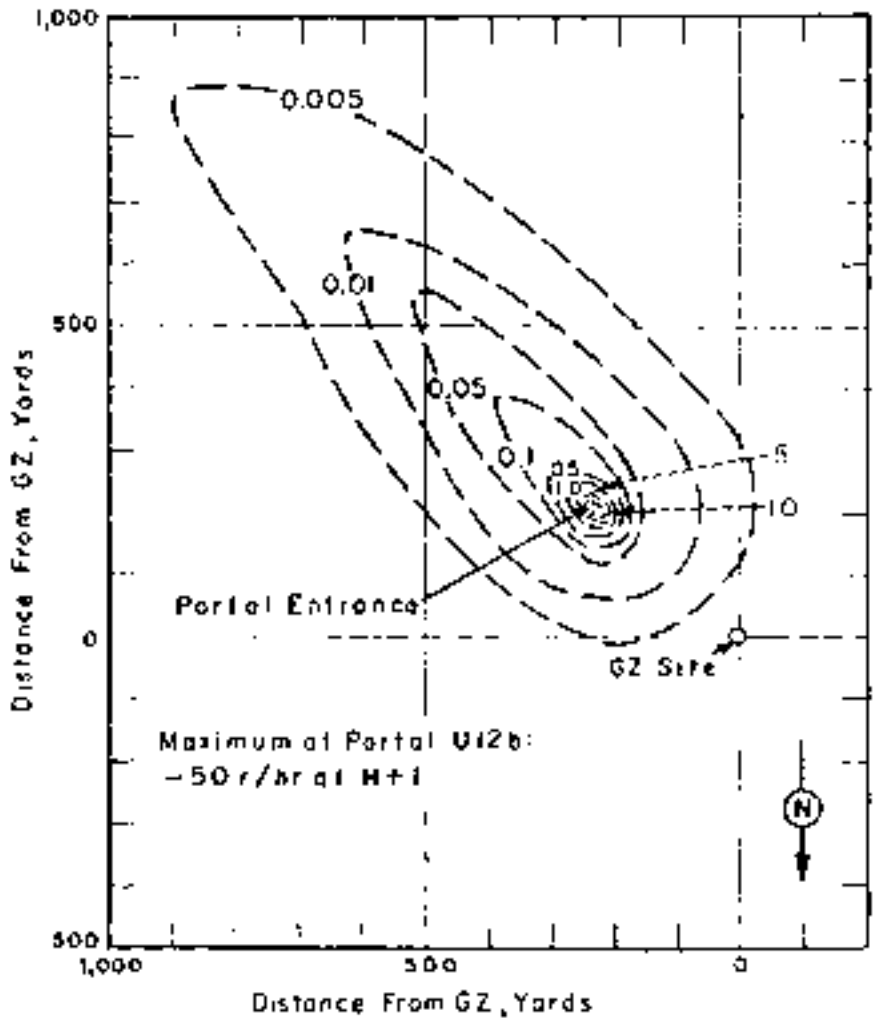


Figure 2.58. Operation [illegible] - [illegible]
On-site dose rate contours in rads per hour at H+1 hours.

TABLE 82 NEVADA WIND DATA FOR OPERATION HARDTACK II— DANAILING

TIME	SURFACE WINDS			
	9 foot Mesa Slope Tower (Elev. 6,279 ft MSL)		100 foot Mesa Mountain Tower (Elev. 7,465 ft MSL)	
	Dir	Speed	Dir	Speed
	degrees	mph	degrees	mph
H-hour	360	9	270	17
H+1 hour	360	9	290	27
H+2 hours	360	6	270	28

OPERATION HARDTACK II - Quay

	PST	GMT
DATE:	10 Oct 1958	10 Oct 1958
TIME:	0630	1430

TOTAL YIELD: 79 tons

Sponsor: LASL

SITE: NTS - Area 7e
37° 05' 41" N
116° 01' 25" W
Site elevation: 4,209 ft

FIREBALL DATA:
Time to 1st maximum: NM
Time to 2nd maximum: NM
Radius at 2nd maximum: NM

HEIGHT OF BURST: 150 ft

TYPE OF BURST AND PLACEMENT:
Tower burst over Nevada soil

CRATER DATA: No crater

CLOUD TOP HEIGHT: 1,[illegible] ft MSL
CLOUD BOTTOM HEIGHT: [illegible],000 ft MSL

REMARKS:

The on-site fallout documentation was performed by the Radiological Safety Division of the Reynolds Electrical and Engineering Company for purposes of personnel safety. Readings were taken with AN/PDR-39 or Tracerlab SU-1B instruments at H+1 hour, H+6 hours, D+1 day and D+2 days along eight radial roads. The $t^{-1.2}$ decay approximation was used to extrapolate the dose-rate readings to H+1 hour. The fallout was well documented and the pattern is considered fairly reliable.

The off-site fallout documentation was performed with Beckman MX-5 and AN/PDR-39 instruments by the U. S. Public Health Service for purposes of public safety. Readings were taken at about 10-mile intervals except in populated places or when the dose rate varied considerably with distance. The $t^{-1.2}$ decay approximation was used to extrapolate the dose-rate readings to H+1 hour. Since this event was well documented, the pattern is considered to be reliable.

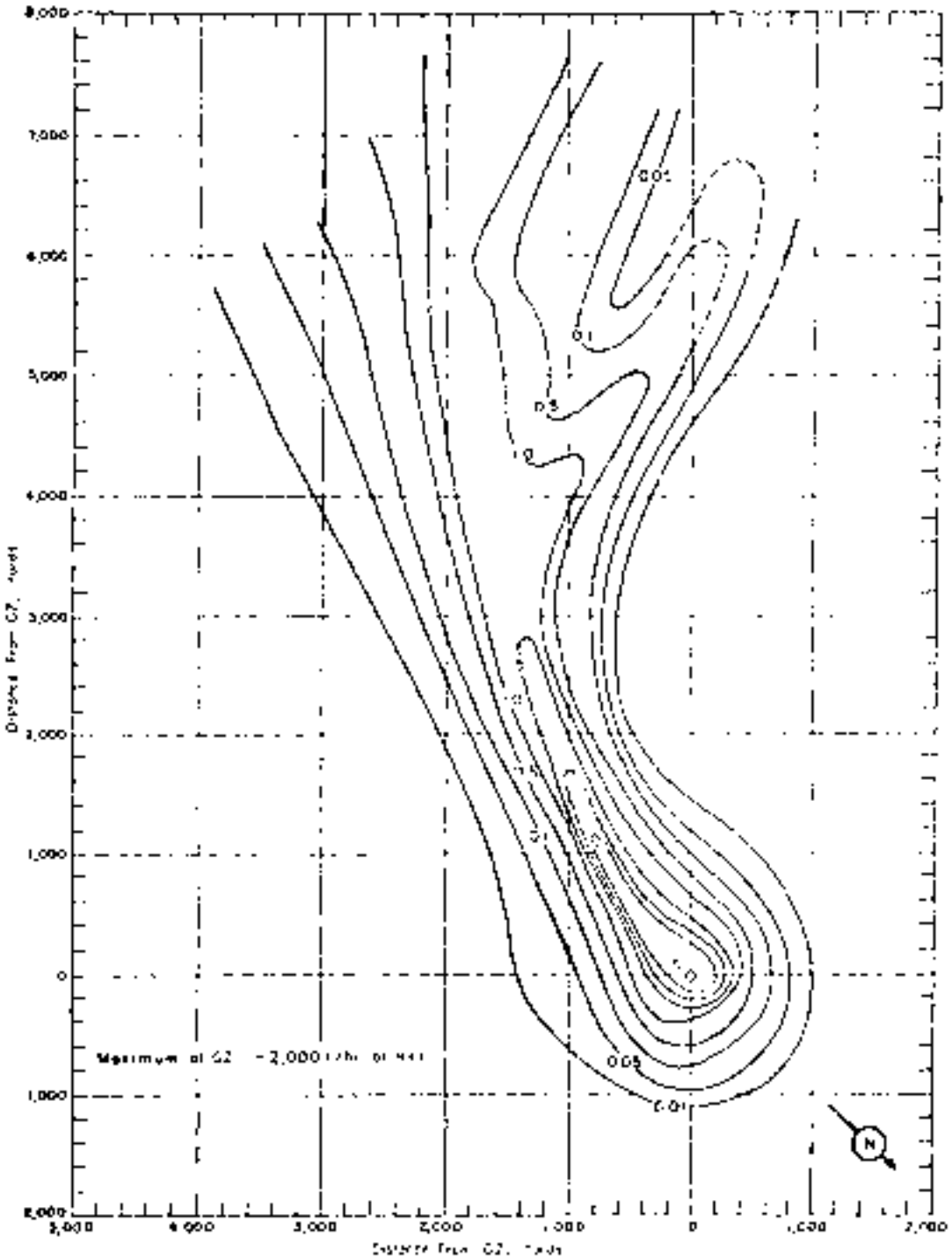


Figure 3.9. Operation [illegible] - [illegible] Shot.
On-site dose rate contours in r/hr at H+1 hour.

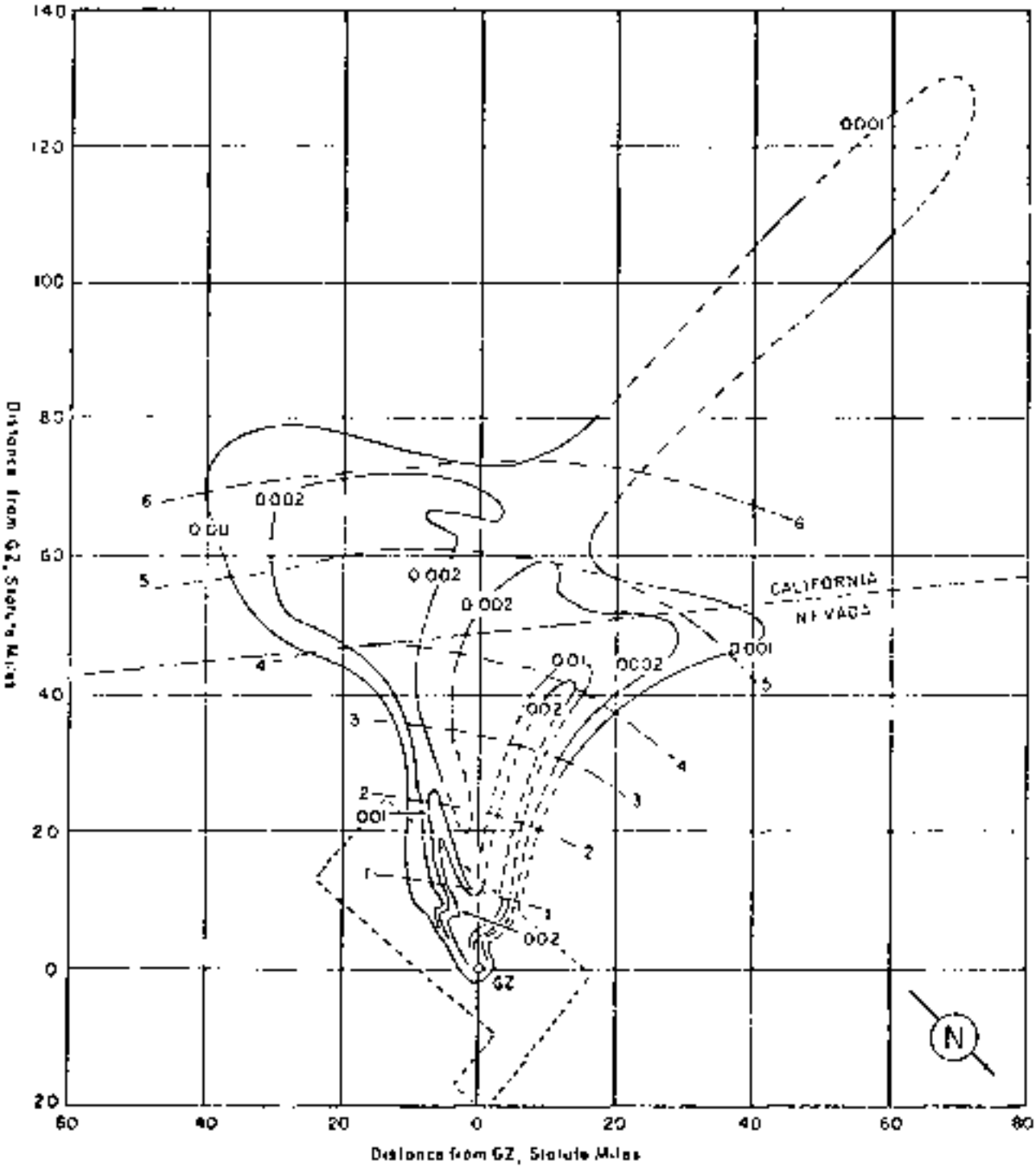


Figure 260. Operation HARDTACK II - Quay.
Off-site dose rate contours in r/hr at H+1 hour.

TABLE 83 NEVADA WIND DATA FOR OPERATION HARDTACK II - QUAY

Altitude (MSL)	H-hour	
	Dir	Speed
feet	degrees	mph
Surface	300	08
5,000	020	18
6,000	030	22
7,000	040	22
8,000	070	14
9,000	090	09
10,000	060	15
11,000	020	13
12,000	020	0*

NOTES:
1. Wind data was obtained from the Tucson weather station.
2. The surface air pressure was 12.70 psi, the temperature 15.0°C, the dew point 2.7°C, and the relative humidity 29%.

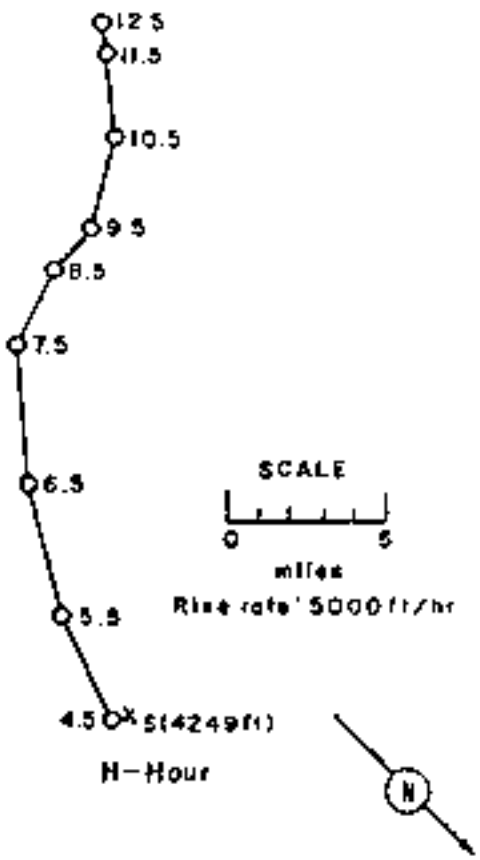


Figure 261. Hodograph for Operation HARDTACK II - Quay.

OPERATION SUNDOCK II - Lea

	PST	GMT
DATE:	13 Oct 1958	13 Oct 1958
TIME:	0520	1320

TOTAL YIELD:

FIREBALL DATA:
Time to 1st minimum: NM
Time to 2nd maximum: NM
Radius at 2nd maximum: NM

CRATER DATA: No crater

Sponsor: LASL

SITE: NTS - Area 7b
37° 05' 12" N
116° 01' 05" W
Site elevation: 4,186 ft

HEIGHT OF BURST: 1,750 ft

TYPE OF BURST AND LOCATION:
Airburst from tail of [illegible]
Newton rail

CLOUD TOP HEIGHT: [illegible] ft MSL
CLOUD BOTTOM HEIGHT: [illegible] ft MSL

REMARKS:

The on-site fallout documentation was performed by the Radiological Safety Division of the Reynolds Electrical and Engineering Company for purposes of personnel safety. Readings were taken with AN/PDR-39 or Tracerlab SU-10 instruments at H+½ hour, H+6 hours, D+1 day and D+2 days along eight radial roads. The sodium-24 decay rate was used to extrapolate the dose-rate readings to H+1 hour. This decay rate is not strictly applicable although it closely approximates the observed decay.

The off-site fallout documentation was performed with Beckman MX-5 and AN/PDR-39 instruments by the U. S. Public Health Service for purposes of public safety. Readings were taken at about 10-mile intervals except in populated places or when the dose rate varied considerably with distance. The $t^{-1.2}$ decay approximation was used to extrapolate the dose-rate readings to H+1 hour. The pattern is not reliable.

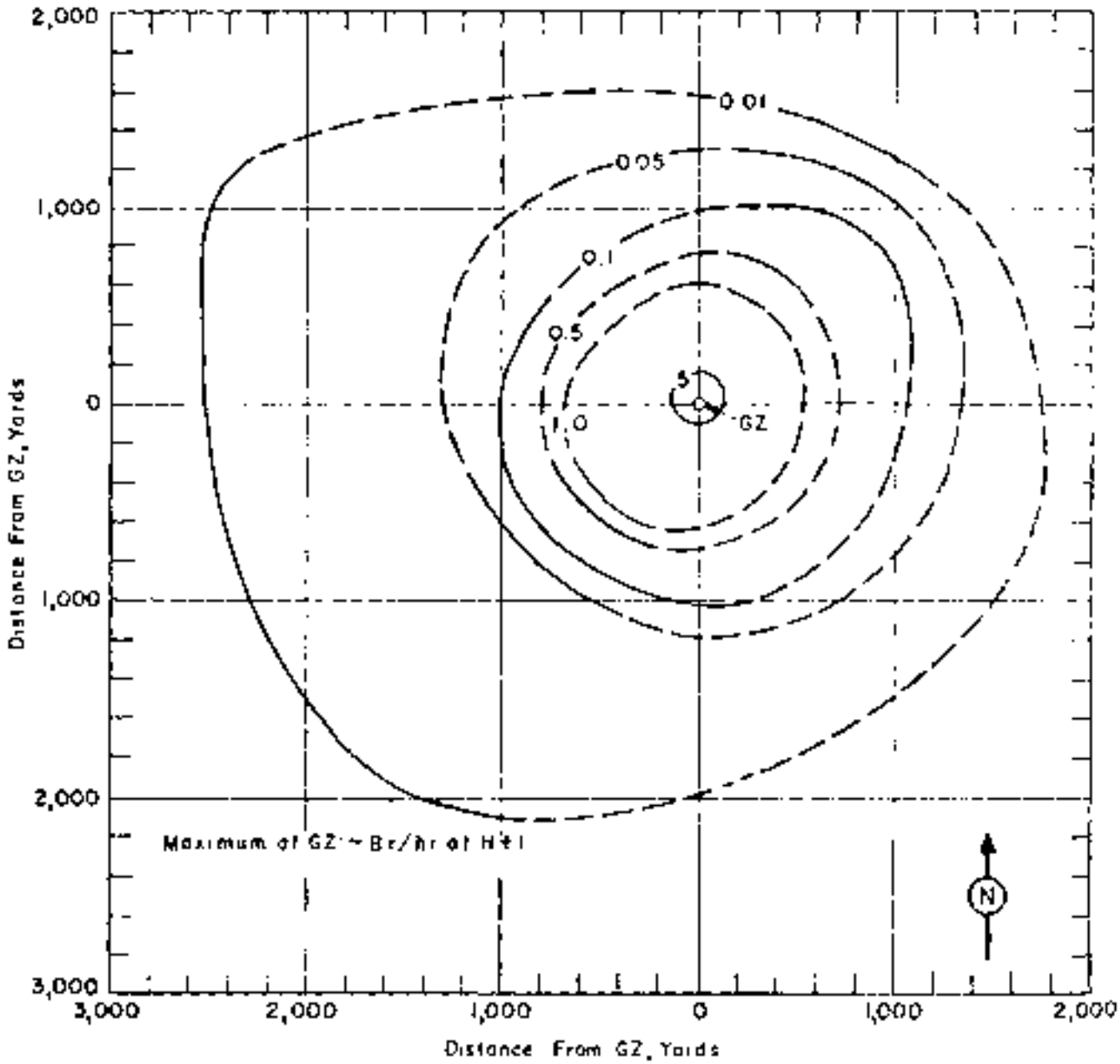


Figure 3.1. Operation HARDTACK II - [illegible] Lea.
On-site dose rate contours in r/hr at H+1 hour.

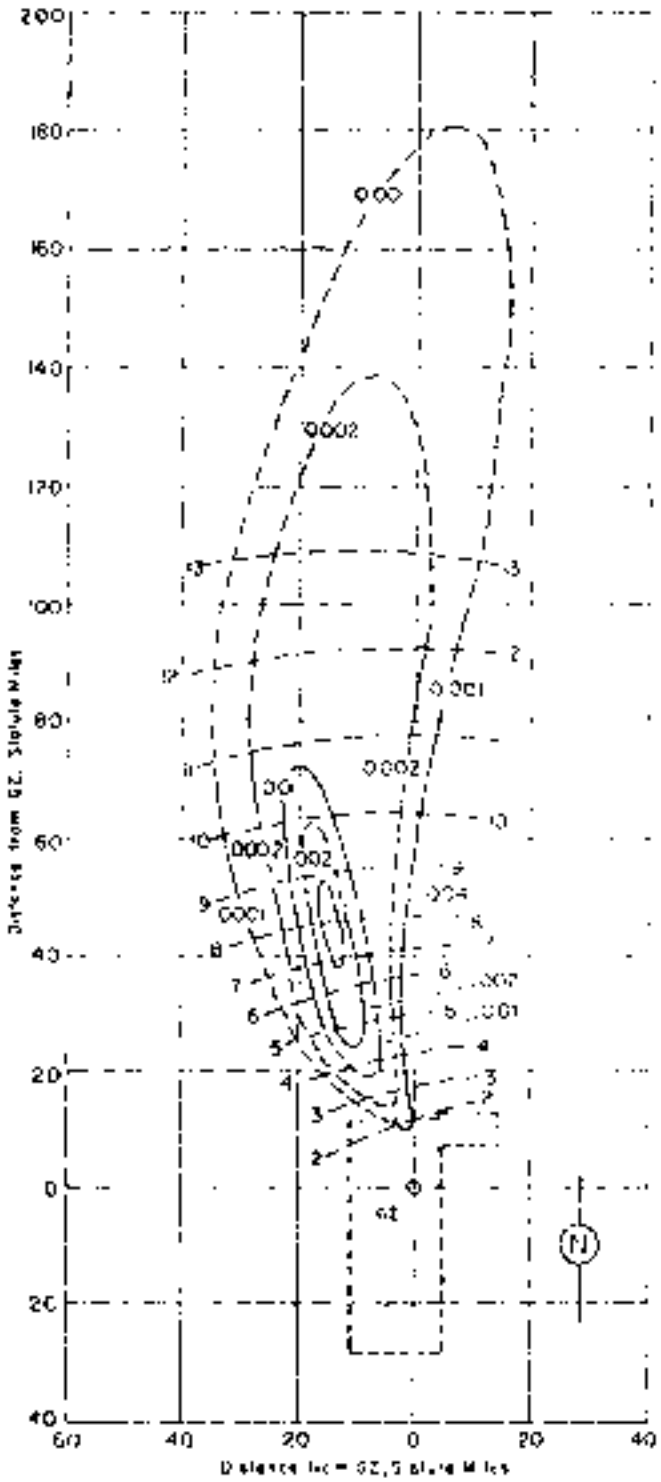


Figure 263. Operation HARDTACK II – Lea.
Off-site dose rate contours in r/hr at H+1 hour.

TABLE 84 NEVADA WIND DATA FOR OPERATION SANDDACK II- LEA

Altitude (MSL)	H-hour	
	Dir	Speed
feet	degrees	mph
Surface	200	01
5,000	330	03
6,000	170	03
7,000	180	09
8,000	190	10
9,000	200	09
10,000	190	10
11,000	170	09
12,000	150	07
13,000	130	05
14,000	110	03
15,000	080	03
16,000	020	06
17,000	360	12
18,000	360	14
19,000	350	14
20,000	360	16

NOTES:

1. Wind data was obtained from the Yucca weather stations.
2. The surface air pressure was 12.73 psi, the temperature 13.4°C, the dew point 4.3°C, and the relative humidity 29%.

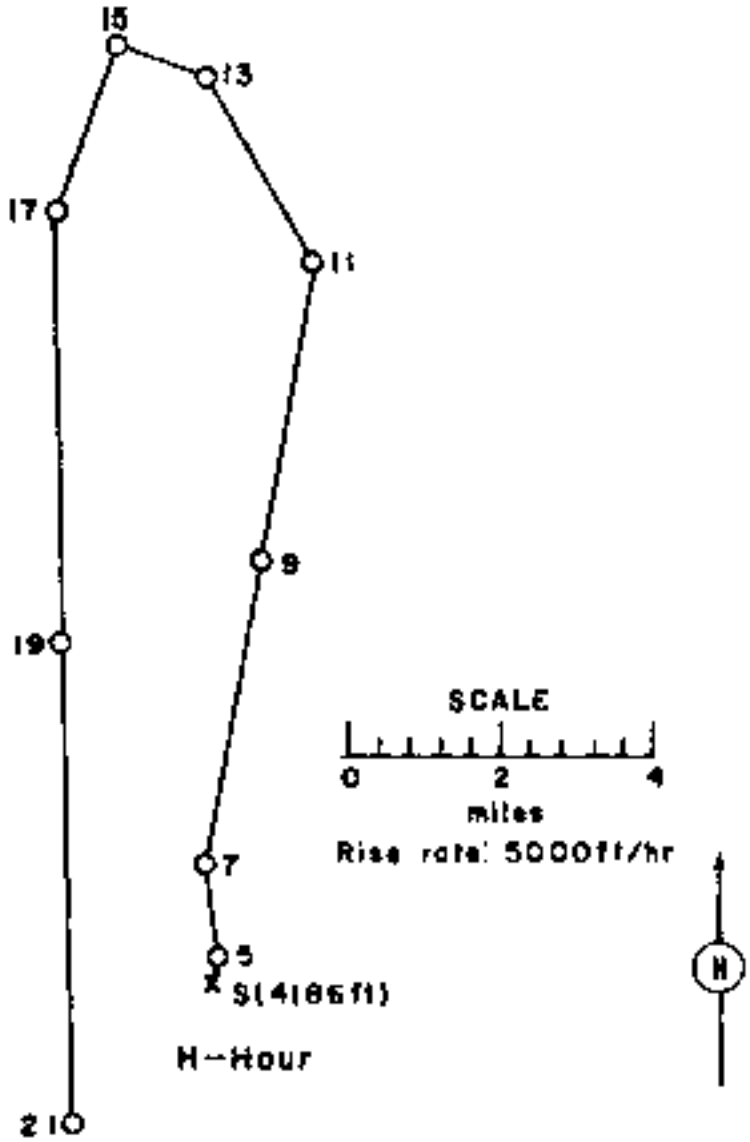


Figure 2c4. Hodograph for Operation HARDTACK II - Lea-

OPERATION HARDTACK II - Neptune Safety Experiment

	PST	GMT
DATE:	14 Oct 1958	14 Oct 1958
TIME:	1700	2400

Sponsor: DOD.

TOTAL YIELD: 115 tons

FIREBALL DATA:
Time to 1st minimum: NR
Time to 2nd maximum: NR
Radius at 2nd maximum: NR

CRATER DATA:
Mean Diameter: 250 ft
Maximum Depth: 9 ft
Crater located on a 30° slope

SITE: NTS - Area 10[illegible] S
37° 1[illegible]' -8" N
116° 11' 2[illegible]' W
Site elev. 6[illegible]0 ft

HEIGHT OF BURST: [illegible] m
Below [illegible]
distance [illegible]

TYPE OF [illegible]
Sub[illegible]
Nevada [illegible]

CLOUD TOP HEIGHT: [illegible]
CLOUD BOTTOM HEIGHT: NR

REMARKS:

The on-site fallout documentation was performed by the Radiological Safety Division of the Reynolds Electrical and Engineering Company for purposes of personnel safety. Readings were taken with AN/PIB-1 or Tracerlab SU-1 instruments. The $t^{-1.2}$ decay approximation was used to extrapolate the dose-rate readings to H+1 hour. The Neptune explosion vented through the mesa slope at an elevation of about 6,800 feet. The pattern is considered fairly reliable.

No activity above background levels was reported off site.

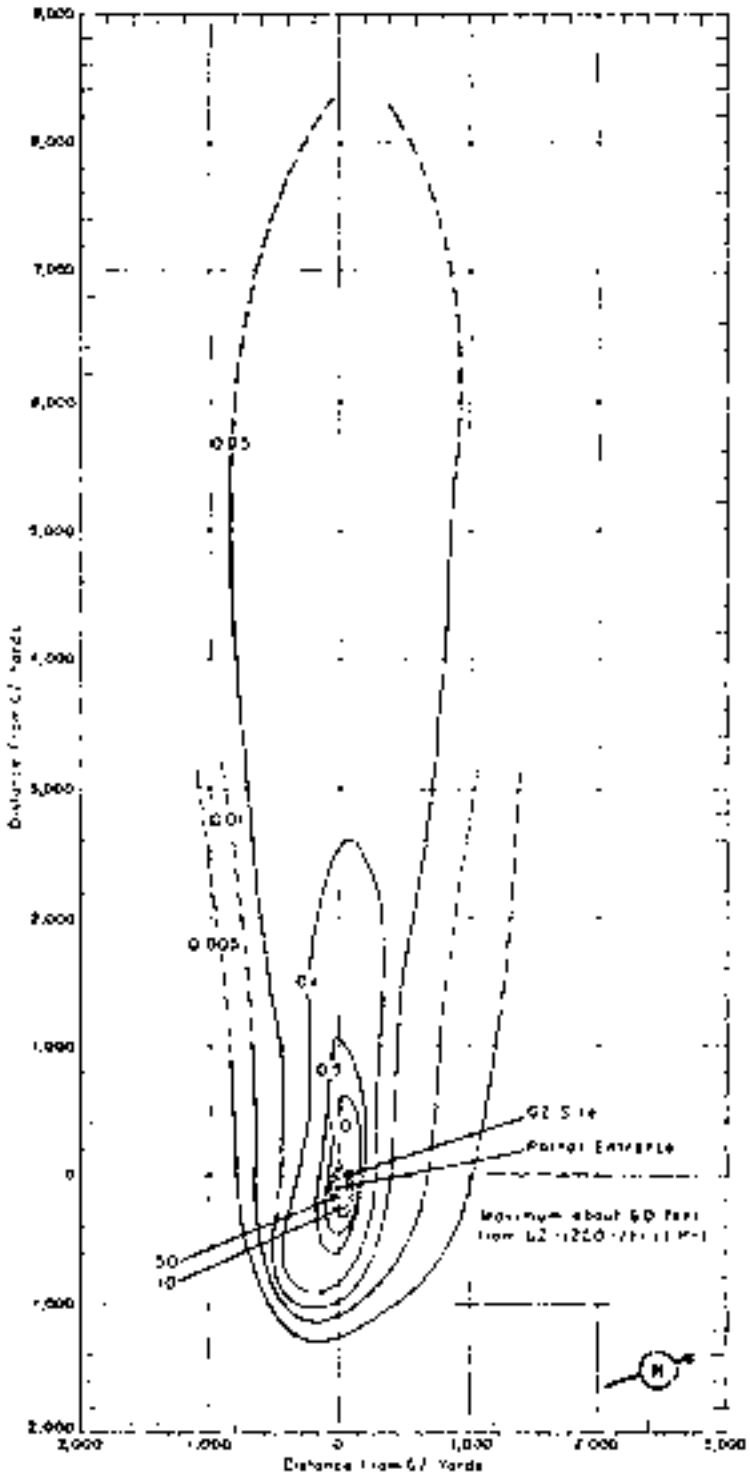


Figure 365. Operation HARDTACK II - Neptune.
On-site dose rate contours in r/hr at H+1 hour.

TABLE 85 NEVADA WIND DATA FOR OPERATION HARDTACK II- NEPTUNE

Altitude (MSL)	H-hour	
	Dir	Speed
Feet	degrees	mph
Surface	060	02
5,000	080	03
6,000	110	07
7,000	150	09
8,000	160	08
9,000	150	08
10,000	130	12
11,000	140	13
12,000	150	13

NOTE: Wind data was obtained from the Yucca weather station.

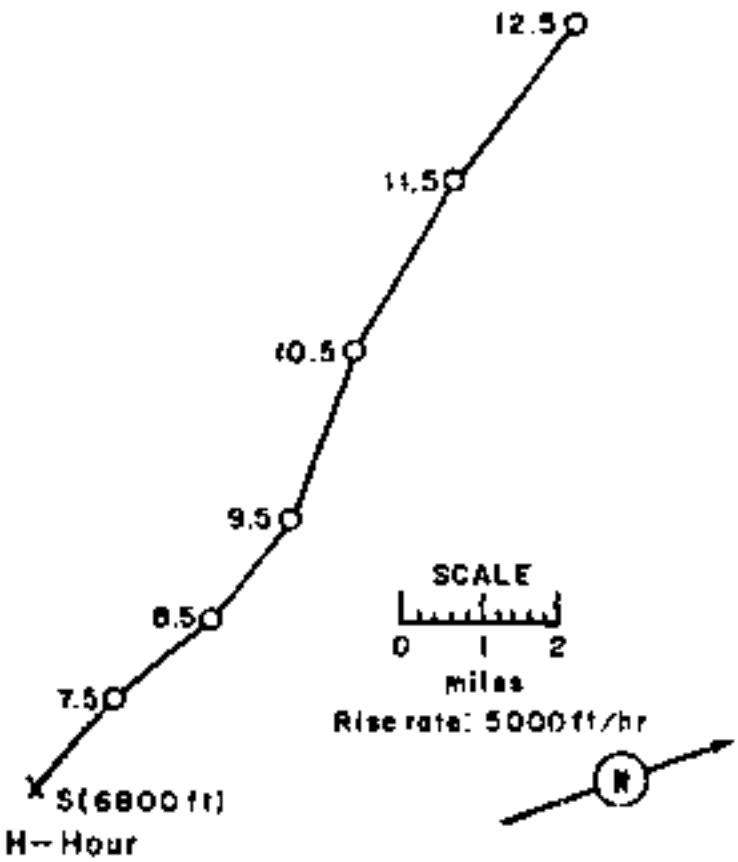


Figure 200. Hodograph for Operation HARDTACK II - Neptune.

OPERATION HARDTACK II - Humilton

	PST	GMT
DATE:	15 Oct 1958	15 Oct 1958
TIME:	0900	1600

Sponsor: UCRL - DOD

TOTAL YIELD: 1.2 tons

SITE: NTS - Area 3
30° 40' 40" N
115° 55' 56" W
Site elevation: 3,532 ft

FIREBALL DATA:
Time to 1st minimum: NM
Time to 2nd maximum: NM
Radius at 2nd maximum: NM

HEIGHT OF BURST: 90 ft

TYPE OF BURST AND PLACEMENT:
Tower burst over Nevada soil

CRATER DATA: No crater

CLOUD TOP HEIGHT: 6,000 ft MSL
CLOUD BOTTOM HEIGHT: 4,000 ft MSL

REMARKS:

The close-in fallout documentation was performed by the 52nd Radiological Safety Support Unit. Measurements were made with AN/PDR-39 instruments along 12 equally spaced radial lines with GZ at the center. Survey points were determined by stakes placed at 100 yd intervals on each line out to 800 yd. The experimental field gamma-decay curves were utilized to construct the 24-hour dose-rate contours. The field gamma dose-rate decay curves indicated the presence of significant fission-product contamination. The gamma dose-rate at H+1 hour from the neutron - induced activity was estimated to be from 20% to 30% of the total dose rate. The pattern presented is reliable. The downward extent of the .01 r/hr contour shown in figure 445 is uncertain but the rest of the pattern is considered to be reliable.

The off-site fallout documentation was performed with Beckman MX-5 and AN/PDR-39 instruments by the U. S. Public Health Service for purposes of public safety. "The pattern was relatively well documented and is consistent with the wind analysis" (Reference 138). The $t^{-1.2}$ decay approximation was used to extrapolate the dose-rate readings to H+1 hour.

The alpha contamination pattern was obtained from survey readings taken with Eberline E5 instruments.

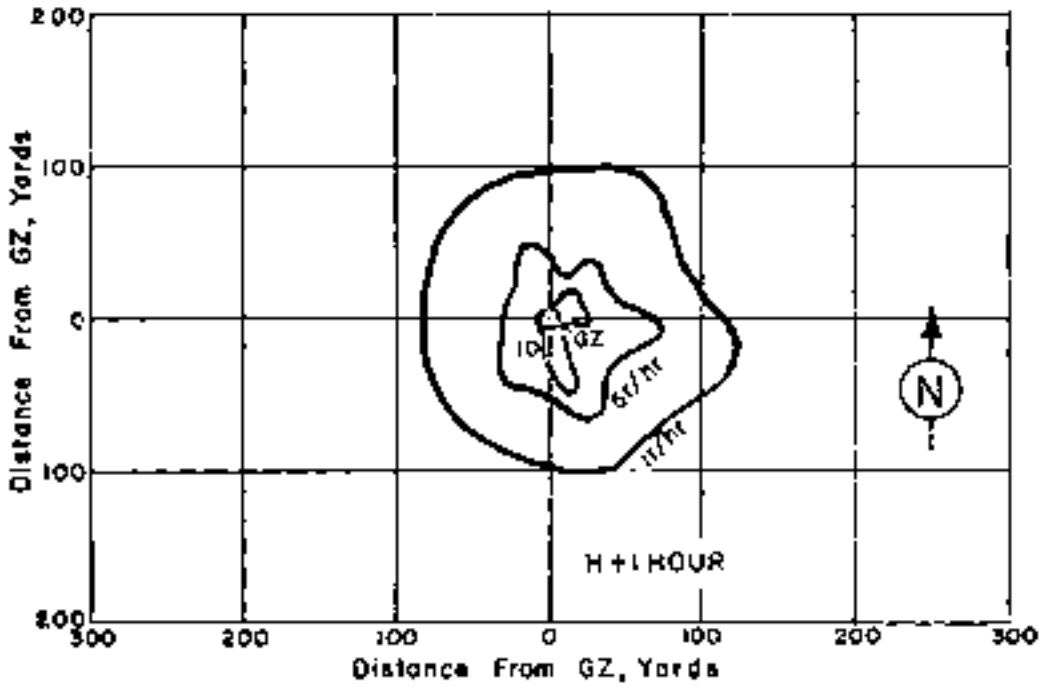


Figure 207. Operation HARDTACK II - [illegible] Detonation.
On-site dose rate contours in r/hr at H+1 hour.

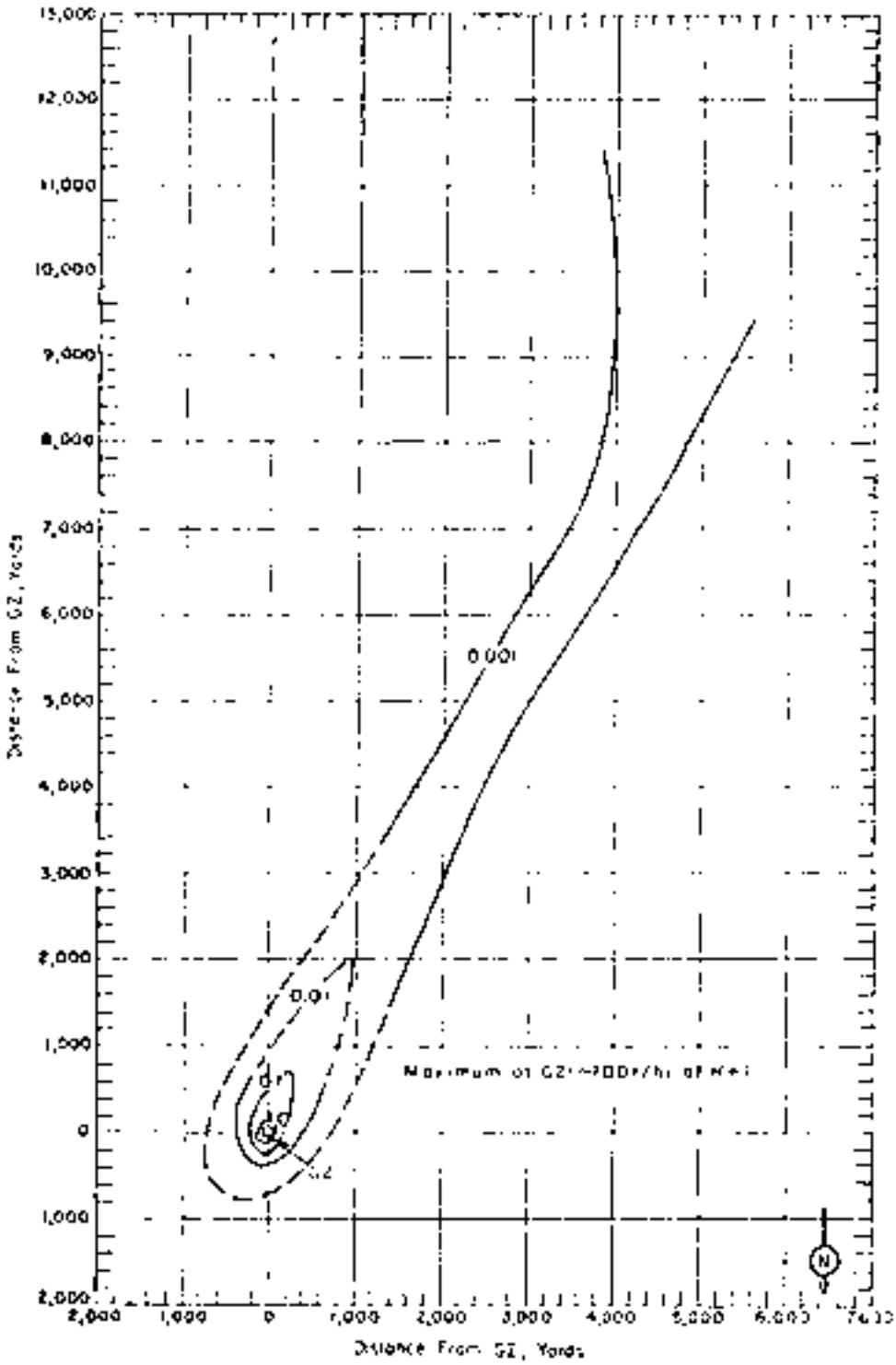


Figure 268 - Operation HARDTACK II - Hamilton.
Gamma dose rate contours in r/hr at H+1 hour.

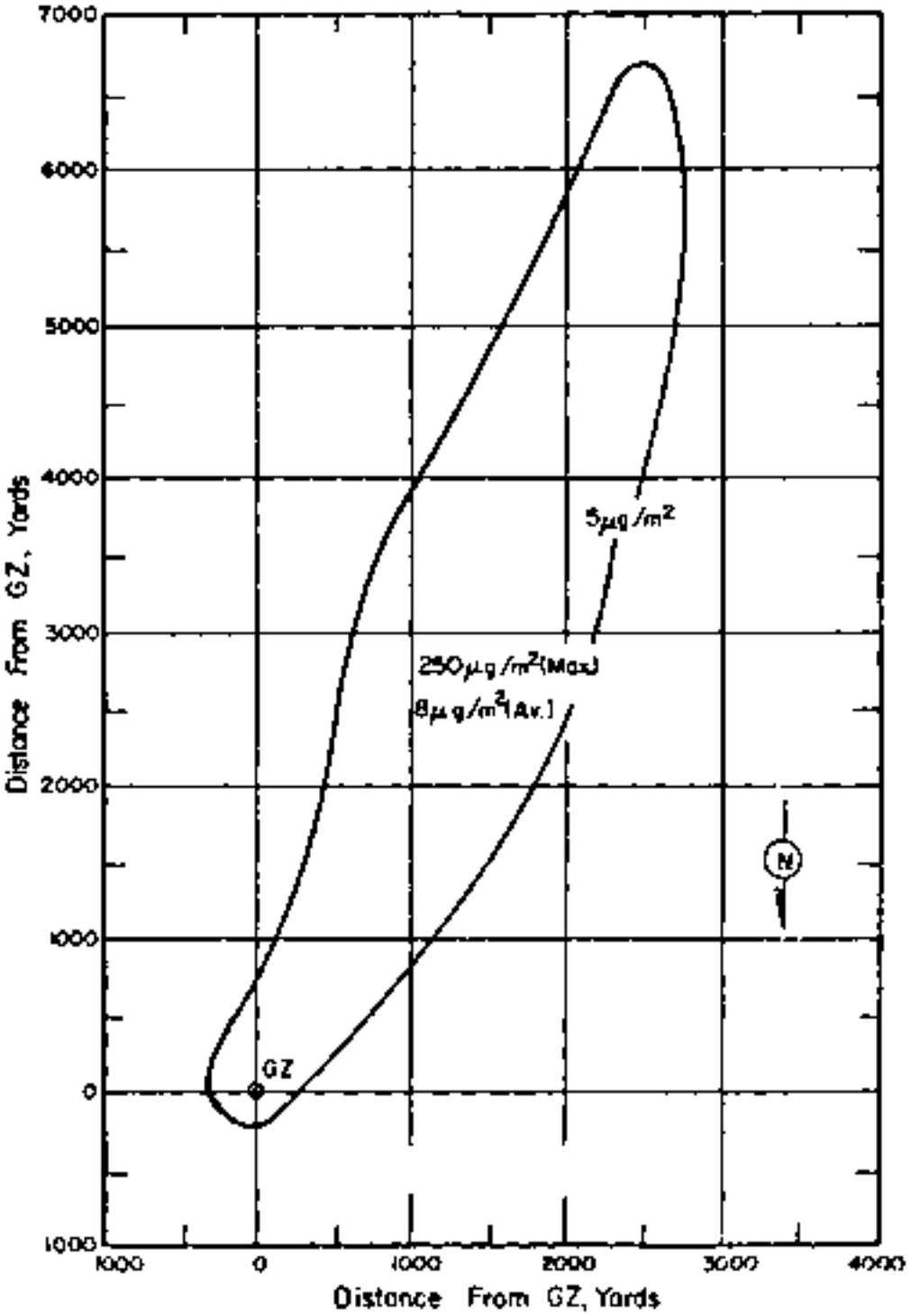


Figure 269. Operation HARDTACK II – Hamilton.
Alpha contamination in micrograms per square meter.

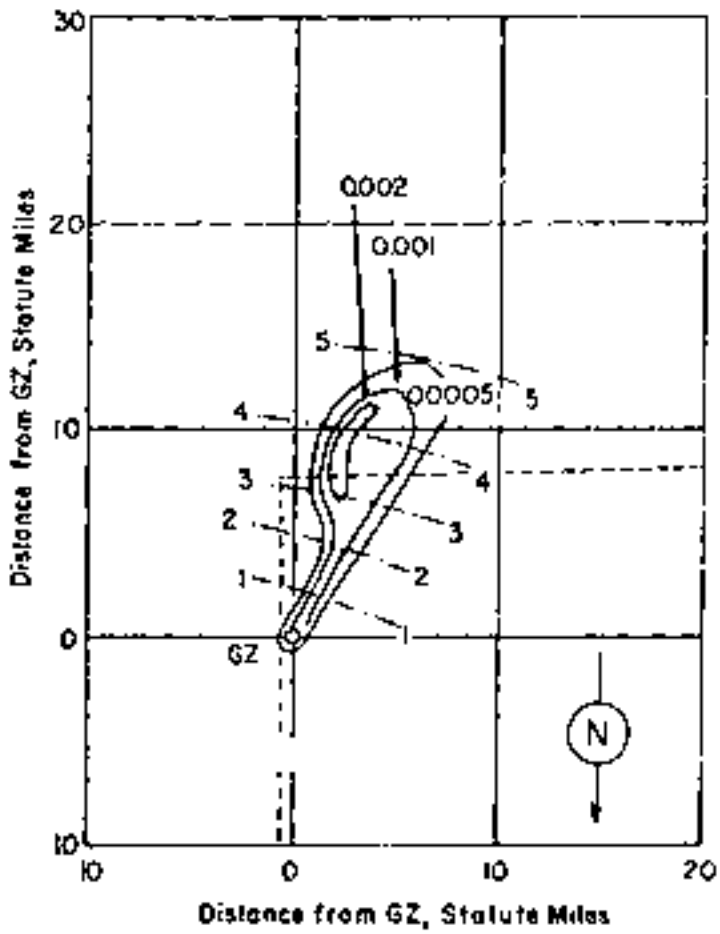


Figure 270. Operation HANDJACK II - Hamilton.
Off-site dose rate contours in r/hr at H+1 hour.

TABLE 8c NEVADA WIND DATA FOR OPERATION [illegible] - [illegible]

Altitude (MSL)	H-Hour		H+2 hours		H+4.5 hours	
	Dir	Spd	Dir	Spd	Dir	Spd
Feet	degrees	kts	degrees	kts	degrees	kts
Surface	Calm	Calm	Calm	Calm	210	03
4,000	360	02	360	09	190	05
5,000	020	02	330	03	010	04
6,000	100	03	060	04	110	05
7,000	160	05	---	--	---	--
8,000	190	07	---	--	---	--

NOTE: Wind data was obtained from the Nevada weather station, and may not be representative of the winds at Frenchman Flat.

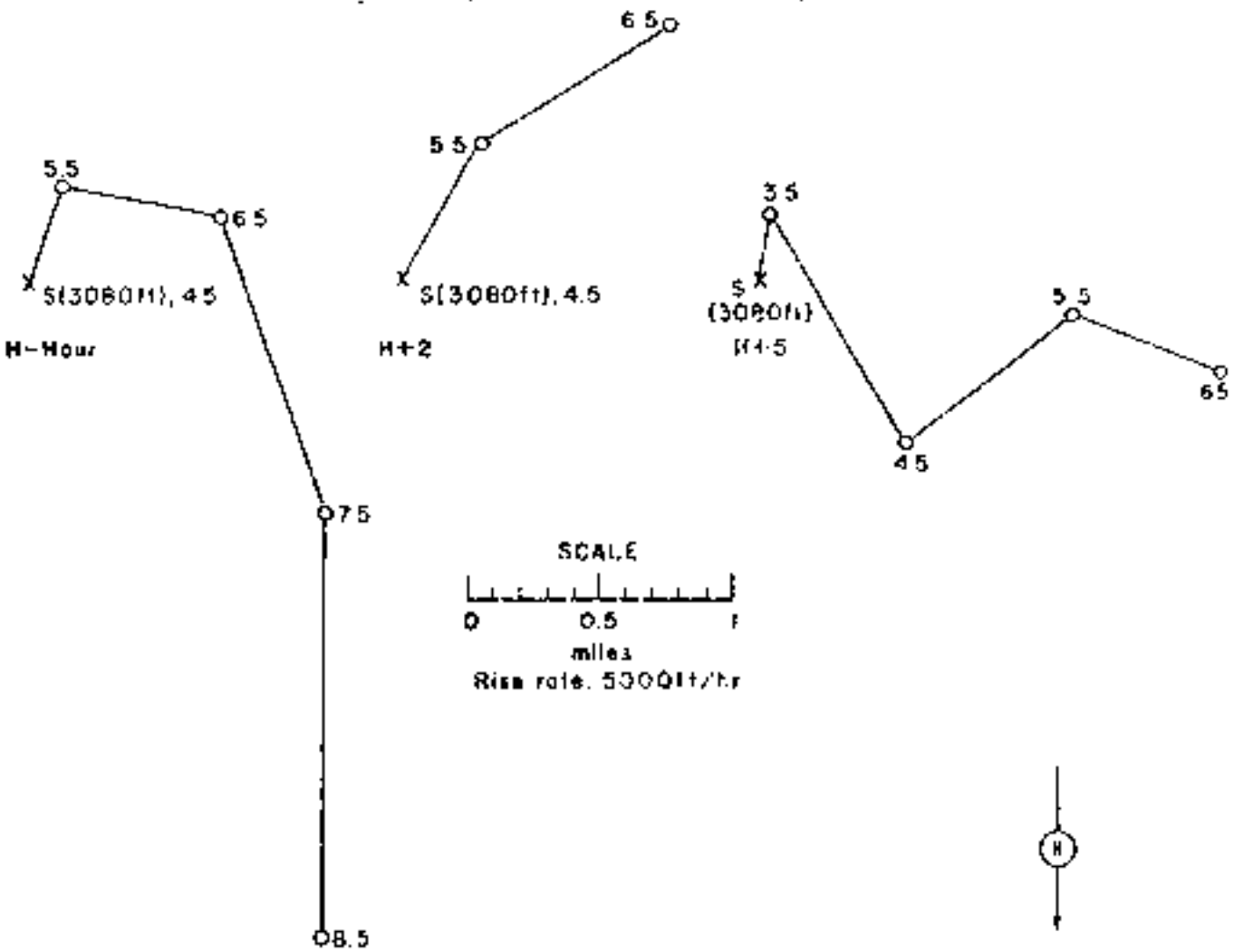


Figure 171. Hodographs for Operation RANDDACK II - [illegible] Hamilton.

OPERATION HARDTACK II - Logan

	PST	GMT
DATE:	15 Oct [illegible]	16 Oct [illegible]
TIME:	2200	0600

Sponsor: DOD

TOTAL YIELD: [illegible] kt

SITE: ETC - [illegible]
37° 11' [illegible]" N
116° 10' [illegible]" W
Site elevation: [illegible]

HEIGHT OF BURST: [illegible]
[illegible]
937 ft

PERIODIC DATA:
Time to 1st minimum: NR
Time to 2nd maximum: NR
Ratio of 2nd maximum: NR

TYPE OF [illegible] (DESCRIPTION):
Subsurface burst - [illegible]
Waves in soil

CRATER DATA: Not available

REMARKS:

The Logan burst was [illegible] and [illegible] to produce the collapse from which [illegible] was released into the air.

OPERATION HARDTACK II - Dona Ann

	PST	GMT
DATE:	30 Oct 1958	10 Oct 1958
TIME:	0620	1420

Sponsor: LASL

TOTAL YIELD: 37 tons

SITE: T7G - Area 7b
37° 02' 12" N
116° 01' 29" W
Site elevation: 4,126 ft.

FIREBALL DATA:
Time to 1st minimum: NM
Time to 2nd maximum: NM
Radius at 2nd maximum: NM

HEIGHT OF BURST: 450 ft

TYPE OF BURST AND PLACEMENT:
Air burst from balloon
Nevada soil

CRATER DATA: No crater

CLOUD TOP HEIGHT: 11,000 ft MSL
CLOUD BOTTOM HEIGHT: [illegible] MSL

REMARKS:

The on-site fallout documentation was performed by the Radiological Safety Division of the Reynolds Electrical and Engineering Company for purposes of personnel safety. Readings were taken at H+½ hour, H+8 hours and D+1 day along eight radial roads. The pattern is not reliable since the downwind extent of most of the isodose lines is not known and the area to the east of ground zero was not monitored. The sodium-24 decay rate was used to extrapolate the dose-rate readings to H+1 hour. This decay rate is not strictly applicable although it approximates the observed decay.

The off-site fallout documentation was performed with Beckman MX-5 and AN/PDR-39 instruments by the U. S. Public Health Service for purposes of public safety. The pattern as drawn is not considered to be very reliable because of the uncertainties in dealing with activity only two or three times the background value. The $t^{-1.2}$ decay approximation was used to extrapolate the dose-rate readings to H+1 hour.

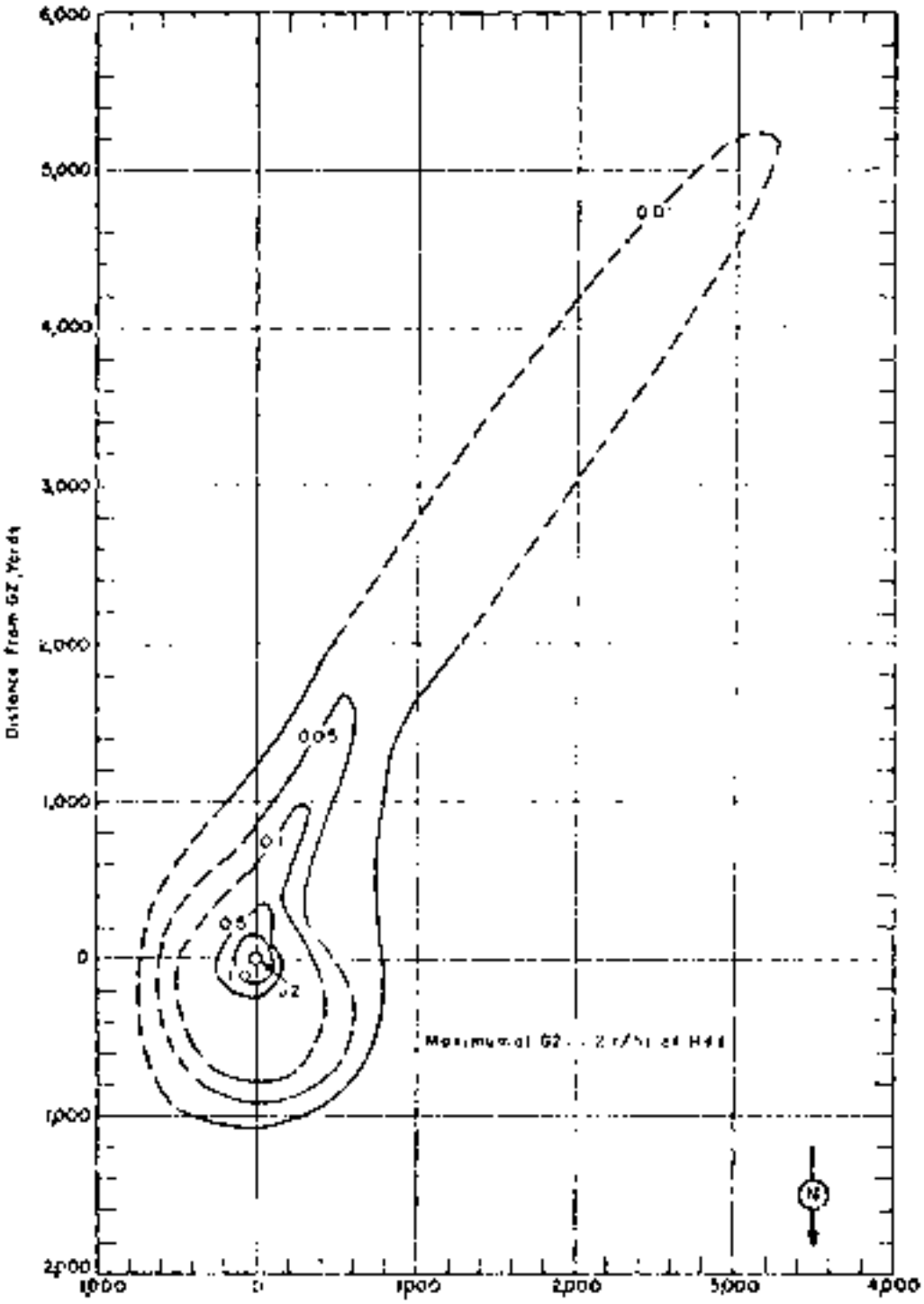


Figure 271. Operation HARDTACK II - Dona Ana.
On-site dose rate contours in r/hr at H+1 hour.

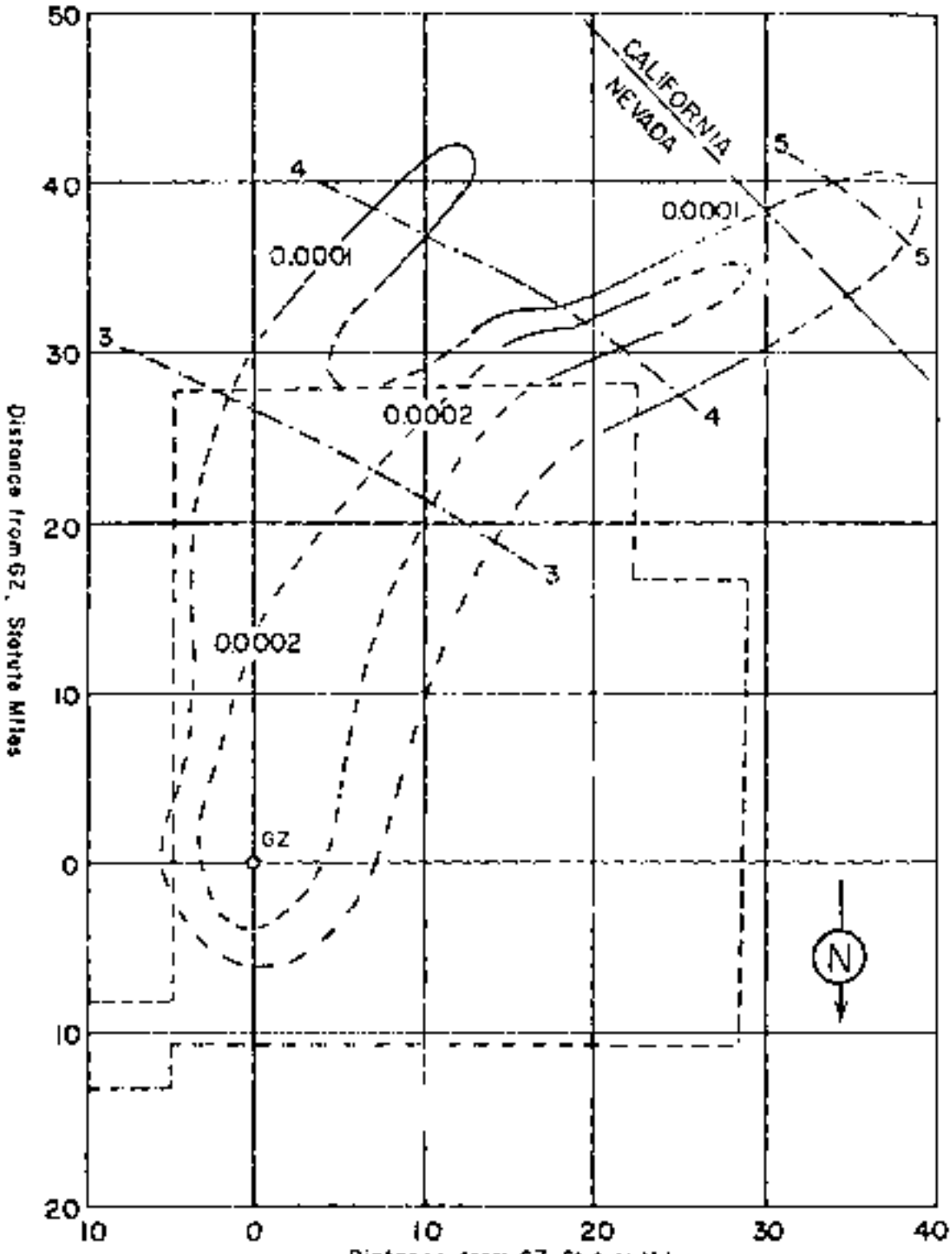


Figure 275. Operation HARDTACK II - Yucca Flat.
Close-in dose rate contours in r/hr at H+1 hour.

TABLE 87 NEVADA WIND DATA FOR OPERATION HARDTACK II – DOM Ann.

Altitude (MSL)	H-hour	
	Dir	Speed
feet	degrees	mph
Surface	360	02
5,000	020	09
6,000	030	10
7,000	040	07
8,000	080	05
9,000	240	03
10,000	140	01
11,000	140	09
12,000	140	07

NOTES:
1. Wind data was obtained from the Yucca weather station.
2. Tropopause height was 43,000 ft MSL.
3. The surface air pressure was 26.[illegible] psia, the temperature was 13.7°C, the dew point -0.7°C, and the relative humidity [illegible]%.

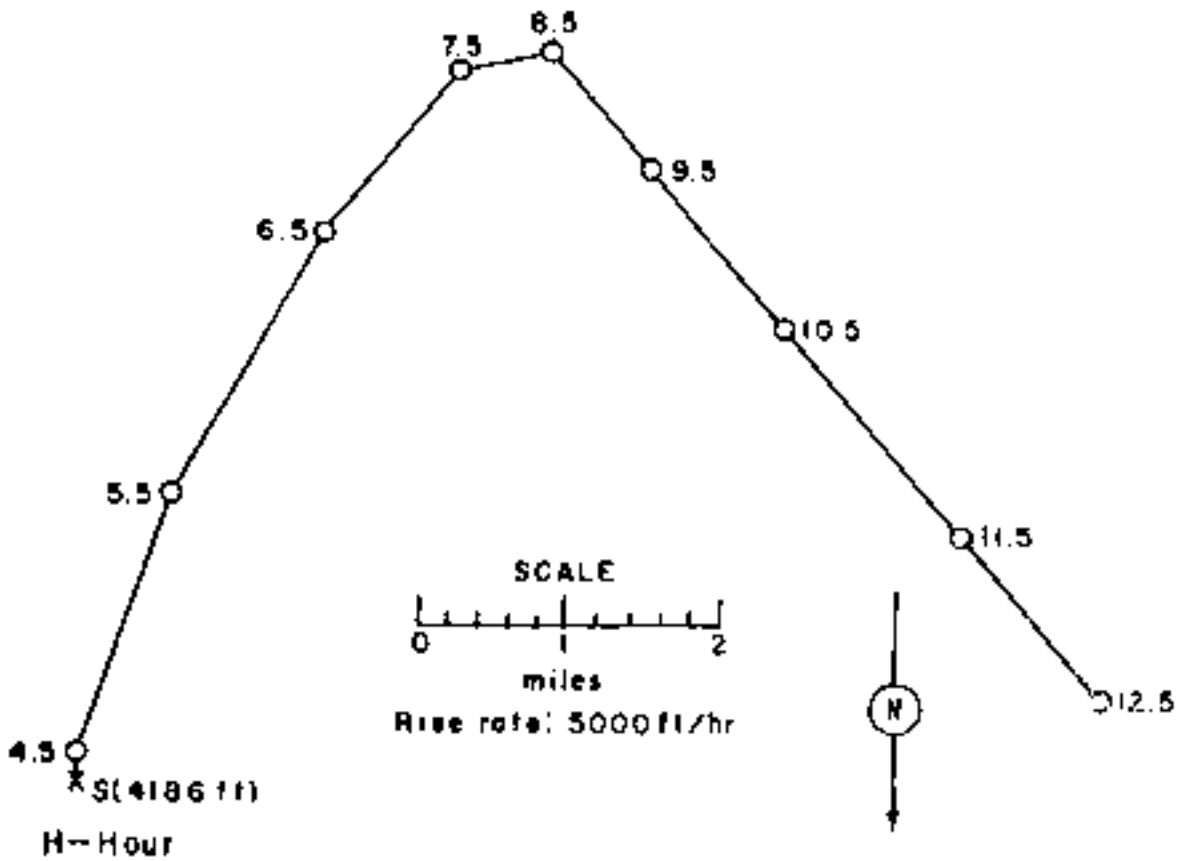


Figure 274. Hodograph for Operation HARDTACK II – Dom Ann.

OPERATION HARDTACK II - Vesta Safety Experiment

	PST	GMT
DATE:	17 Oct 1958	17 Oct 1958
TIME:	1500	2200

Sponsor: UCRL

SITE: NTS - Area 9c
37° 07' 21" N
116° 02' 05" W
Site elevation: 4,200 ft.

TOTAL YIELD: 24 tons

FIREBALL DATA:
Time to 1st minimum: NM
Time to 2nd maximum: NM
Radius at 2nd maximum: NM

HEIGHT OF BURST: Zero ft

TYPE OF BURST AND PLACEMENT:
Surface burst in wooden
building with 60 ft of
gravel over the building

CRATER DATA: Not available

CLOUD TOP HEIGHT: 50,000 ft MSL
CLOUD BOTTOM HEIGHT: NA

REMARKS:

The on-site fallout documentation was performed by the Radiological Safety Division of the Reynolds Electrical and Engineering Company for purposes of personnel safety. Readings were taken with AN/PDR-T1B or Tracerlab CD-V-700 instruments at H+1 hours, D+1 day and D+2 days. The pattern was well documented and should be reliable. The $t^{-1.2}$ decay approximation was used to extrapolate the dose-rate readings to H+1 hour.

The off-site fallout documentation was performed with Beckman MX-5 and AN/PDR-39 instruments by the U. S. Public Health Service for purposes of public safety. The fallout pattern is considered rather uncertain, since there were few exposure measurements. The $t^{-1.2}$ decay approximation was used to extrapolate the dose-rate readings to H+1 hour.

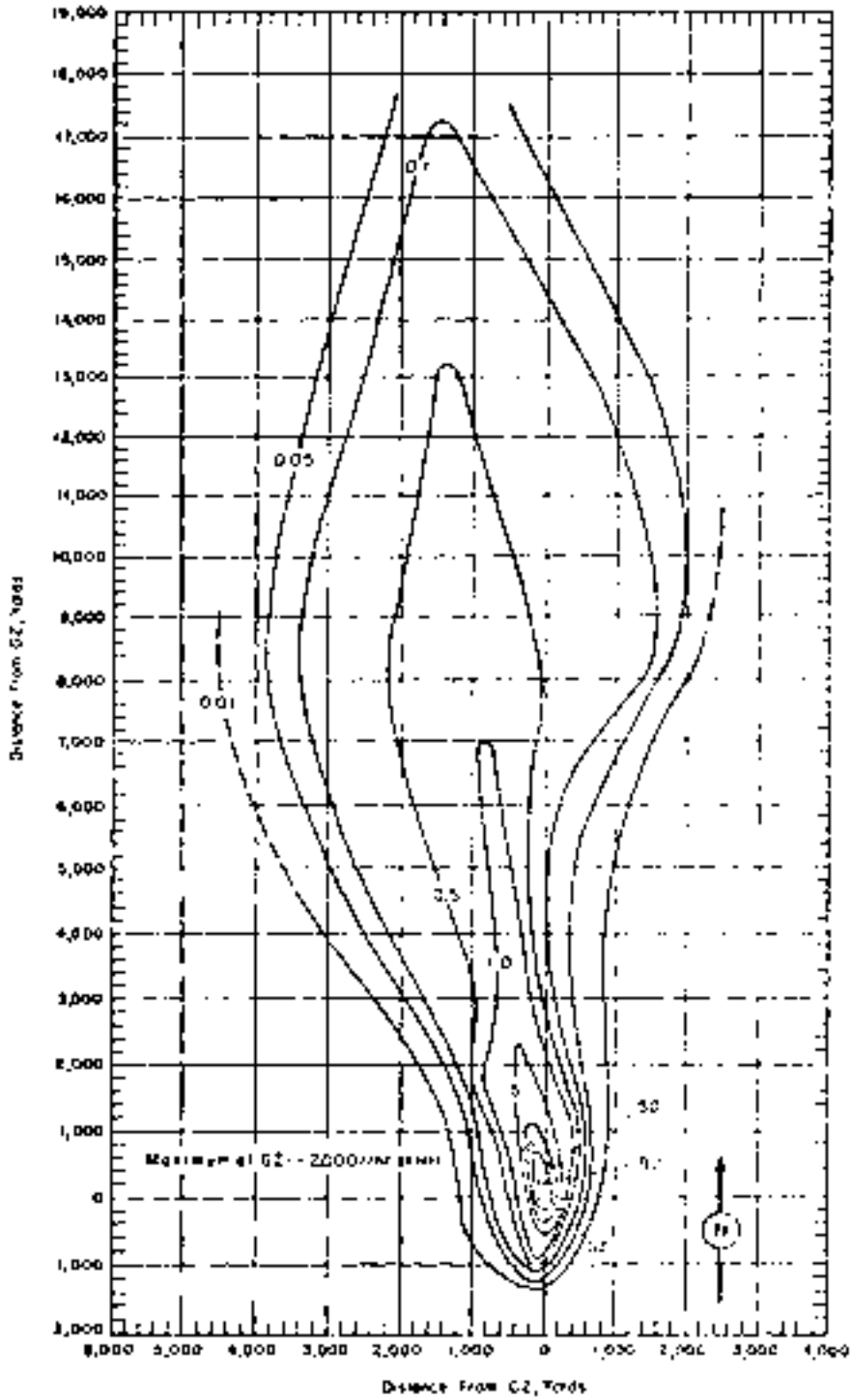


Figure 275. Operation HARDTACK II - Yuma.
On-site dose rate contours in r/hr at H+1 hour.

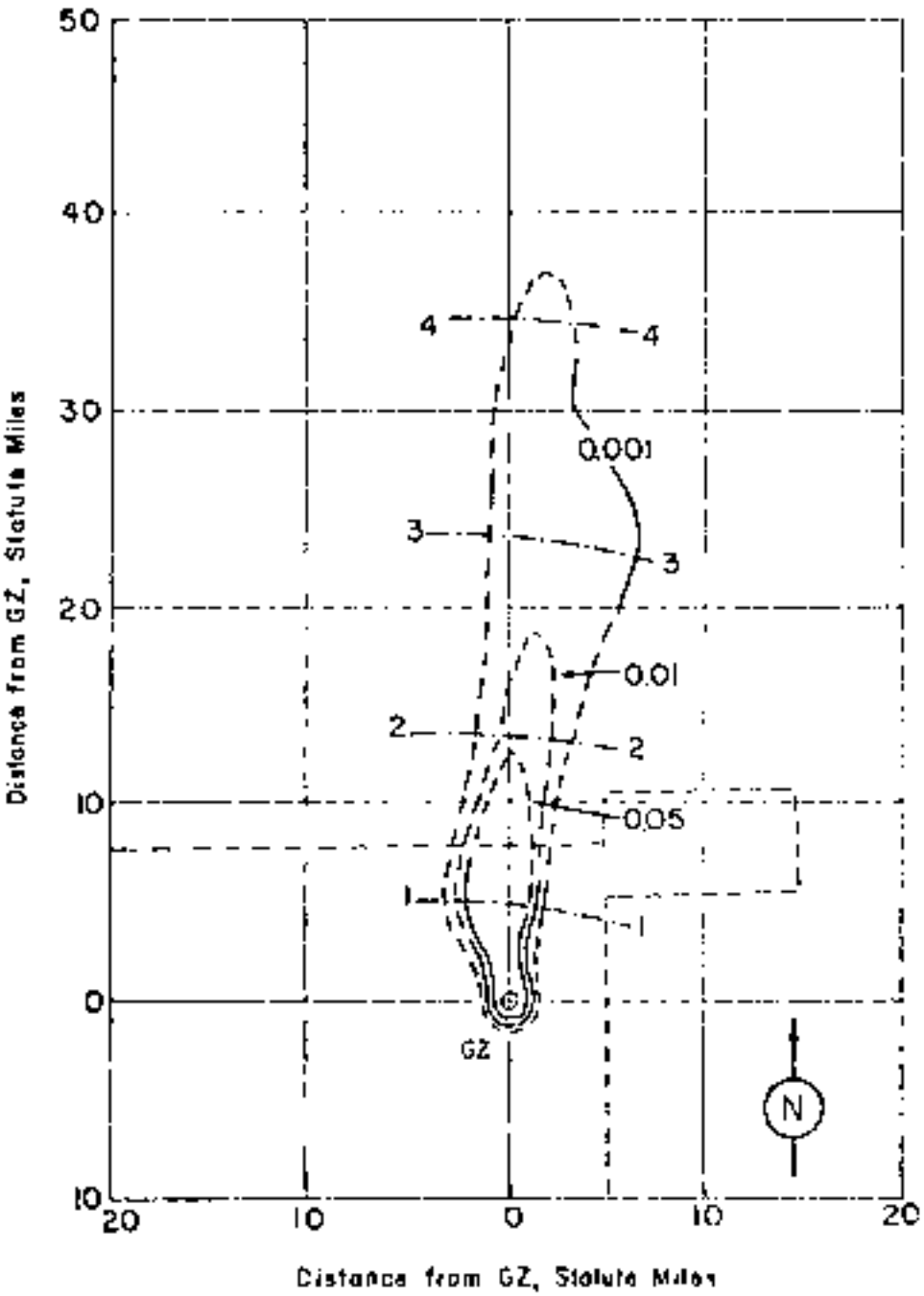


Figure [illegible]. Operation [illegible] - Waste.
Off-site dose rate contours in r/hr at 1+1 hour.

TABLE 55 NEVADA WIND DATA FOR OPERATION HARDTACK II- Yucca

Altitude (MSL)	11-Hour	
	Dir	Speed
feet	degrees	mph
Surface	160	07
5,000	180	12
6,000	190	16
7,000	190	14
8,000	200	12
9,000	210	10
10,000	210	08
11,000	200	09
12,000	180	07

NOTE: Wind data was obtained from the Yucca weather station.

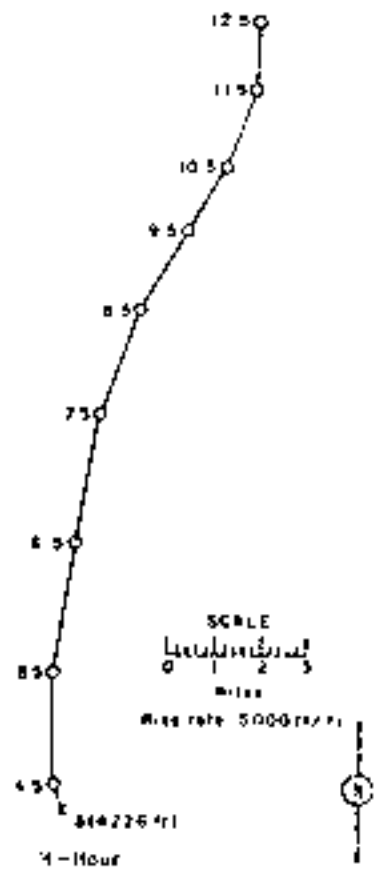


Figure 277. Hodograph for Operation HARDTACK II - Yucca

OPERATION HARDTACK II - Rio Arriba

	PST	GMT
DATE:	18 Oct 1958	18 Oct 1958
TIME:	0625	1425

TOTAL YIELD: 90 tons

FIREBALL DATA:
Time to 1st minimum: NM
Time to 2nd maximum: NM
Radius at 2nd maximum: NM

CRATER DATA: Not available

Sponsor: LASL

SITE: NTS - Area 3s
37° 02' 28" N
116° 01' 33" W
Site elevation: 4,010 ft

HEIGHT OF BURST: 712.5 ft

TYPE OF BURST AND PLACEMENT:
Tower burst over Nevada soil

CLOUD TOP HEIGHT: 12,500 ft MSL
CLOUD BOTTOM HEIGHT: 11,000 ft MSL

REMARKS:

The on-site fallout documentation was performed by the Radiological Safety Division of the Reynolds Electrical and Engineering Company for purposes of personnel safety. Readings were taken with AN/PDR-39 or Tracerlab SU-1C instruments at H+1 hour, H+6 hours, D+1 day, D+2 days and D+3 days along eight radial roads. The fallout was well documented and the pattern presented is considered to be reliable. The $t^{-1.2}$ decay approximation was used to extrapolate the dose-rate readings to H+1 hour.

The off-site fallout documentation was performed with Victoreen MX-5 and AN/PDR-39 instruments by the U. S. Public Health Service for purposes of public safety. Readings were taken at about 10-mile intervals except in populated places or when the dose-rate varied considerably with distance. The downwind extent of the 1.0 and 0.01 r/hr isodose rate lines is uncertain. The rest of the pattern was well documented and is reliable. The $t^{-1.2}$ decay approximation was used to extrapolate the dose-rate readings to H+1 hour.

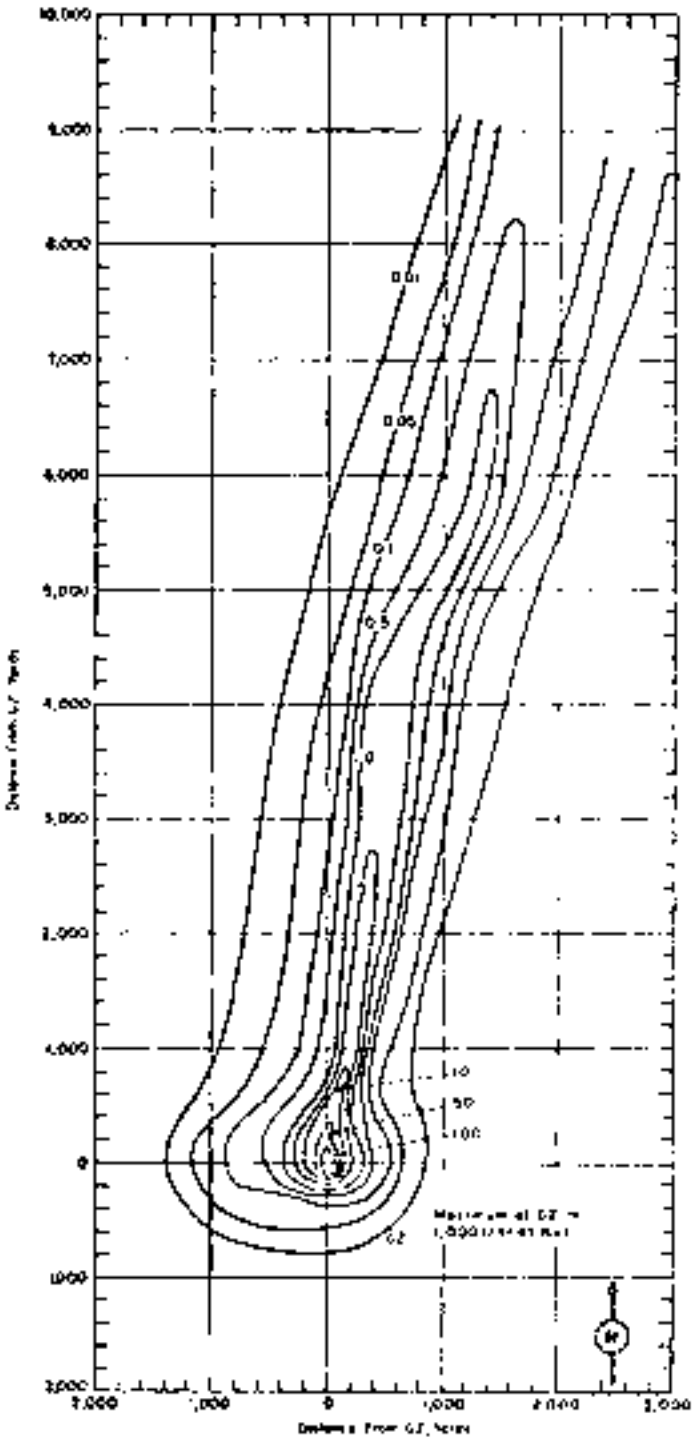


Figure 278. Operation HARDTACK II - Rio Arriba.
On-site dose rate contours in r/hr at H+1 hour.

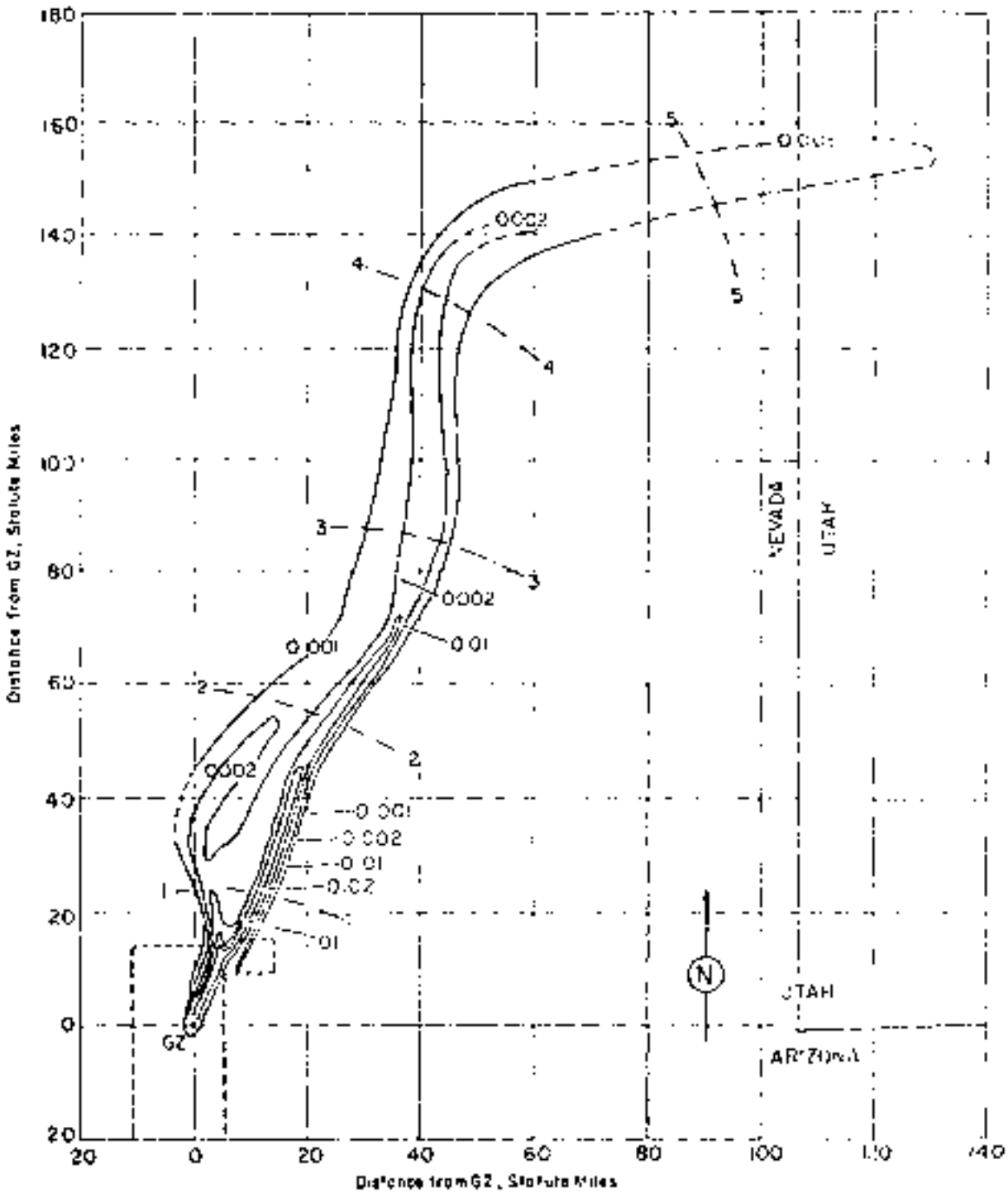


Figure 279. Operation HARDTACK II - Rio Arriba.
Off-site dose rate contours in r/hr at H+1 hour.

TABLE 89 NEVADA WIND DATA FOR OPERATION HARDTACK II - RIO ARRIBA

Altitude (MSL)	H-hour	
	Dir	Speed
feet	degrees	mph
Surface	170	02
5,000	180	09
6,000	200	24
7,000	200	35
8,000	200	37
9,000	200	33
10,000	210	35
11,000	210	38
12,000	210	40
13,000	210	40
14,000	210	38
15,000	210	36

NOTES:

1. Wind data was obtained from the Yucca weather station.
2. The surface air pressure was 12.71 psi, the temperature 9.3°C, the dew point -10.3°C, and the relative humidity 2%.

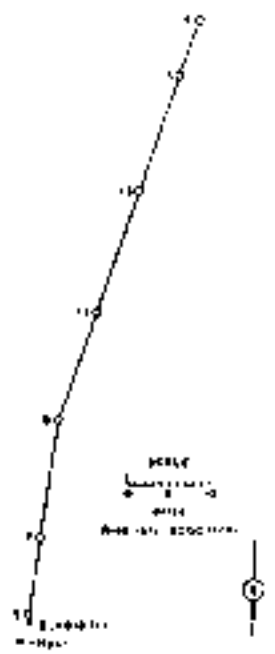


Figure 280 - Hodograph for Operation HARDTACK II - Rio Arriba.

OPERATION HARDTACK II - San Juan Safety Experiment

	PST	GMT
DATE:	20 Oct 1958	20 Oct 1958
TIME:	0630	1430

Sponsor: LASL

SITE: NTS - Area 3p
37° 03' 0" N
116° 01' 50" W
Site elevation: 4,033 ft

HEIGHT OF BURST: +234 ft

TYPE OF BURST AND EMPLACEMENT:
Subsurface burst - Well in Nevada soil

CLOUD TOP HEIGHT: [illegible]
CLOUD BOTTOM HEIGHT: [illegible]

REMARKS:

"There was essentially no nuclear yield from the San Juan explosion, and no visible venting occurred. There was, however, some alpha contamination detected in the immediate vicinity of the well in which this device was detonated"

OPERATION HARDTACK II - Socorro

	PST	GMT
DATE:	22 Oct 1958	22 Oct 1958
TIME:	0530	1330

TOTAL YIELD: 6 kt

Sponsor: LASL

SITE: NTS - Area 7b
37° 06' 12" N
116° 01' 25" W
Site elevation: 4,186 ft

HEIGHT OF BURST: 1,440 ft

TYPE OF BURST AND PLACEMENT:
Air burst from balloon over
Nevada soil

FIREBALL DATA:
Time to 1st minimum: NA
Time to 2nd maximum: NA
Radius at 2nd maximum: NM

CLOUD TOP HEIGHT: 50,000 ft MSL
CLOUD BOTTOM HEIGHT: 30,000 ft MSL

REMARKS:

The contamination was due primarily to induced activity. The on-site measurements were performed by the Radiological Safety Division of the Reynolds Electrical and Engineering Company for purposes of personnel safety. Readings were taken with AN/PDR-27 or Victoreen 555-10 instruments at H+1 hour and D+3 days. The sodium-24 decay rate was used to extrapolate the dose-rate readings to H+1 hour. The pattern was relatively well documented and is considered to be fairly reliable. The decay rate used is not strictly applicable although it closely approximates the observed decay.

Socorro was the first of three nuclear detonations to occur on the same day. The trajectory analysis for these three events indicated that all the clouds should have been transported in the same general direction; therefore, no off-site pattern is presented for this shot.

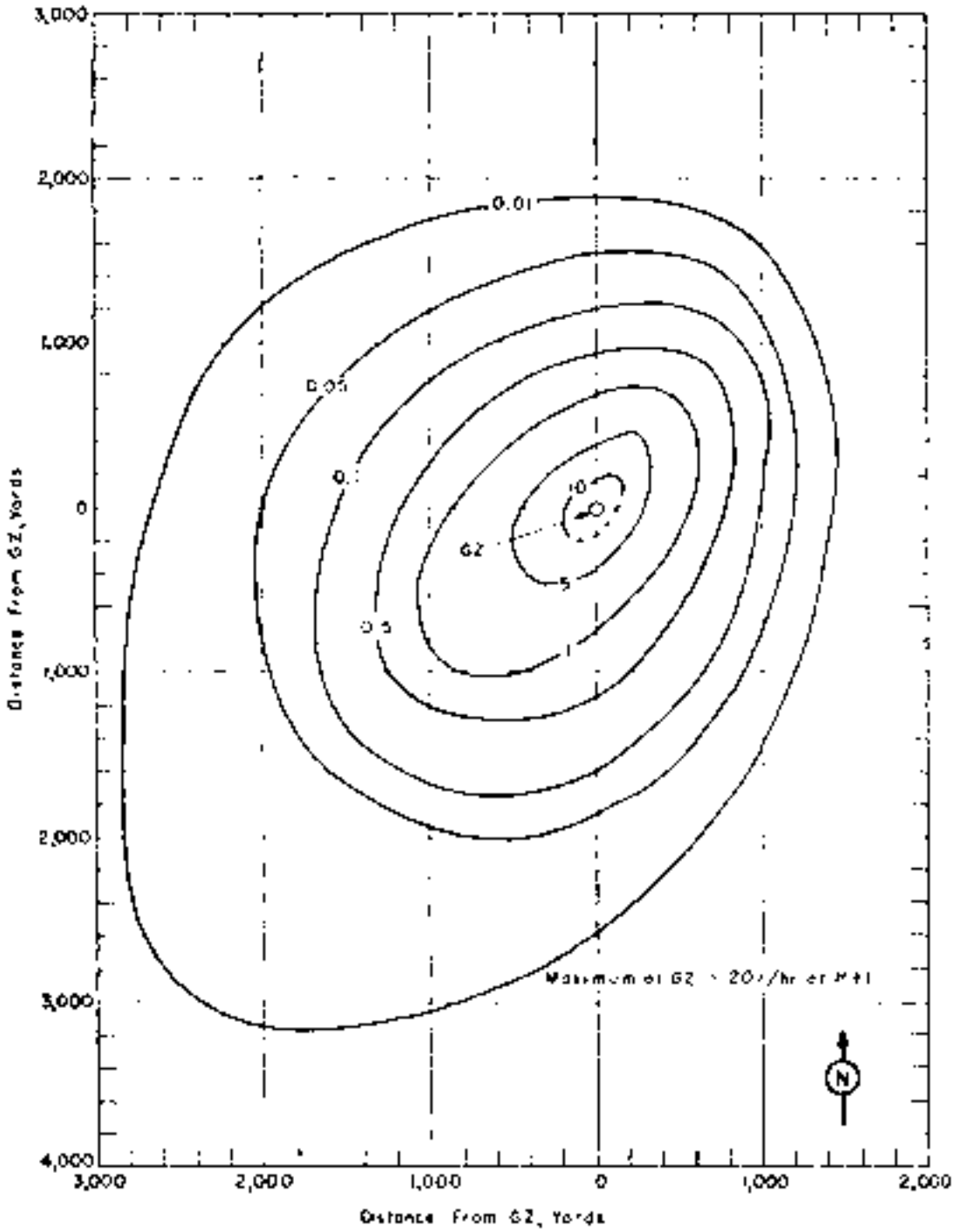


Figure [illegible]. Operation HARDTACK II - [illegible] Socorro.
On-site dose rate contours in r/hr at H+1 hour.

TABLE 9: NEVADA WIND DATA FOR OBSERVATION HANDBOOK II — DOCUMENT

Altitude (MSL)	Relative		Real		Grid	
	Dir	Speed	Dir	Speed	Dir	Speed
Feet	degrees	mph	degrees	mph	degrees	mph
Surface	290	03	090	09	150	05
5,000	110	06	060	09	170	08
6,000	130	07	---	--	---	--
7,000	130	09	---	--	---	--
8,000	110	10	---	--	---	--
9,000	100	10	---	--	---	--
10,000	140	15	210	17	230	19
11,000	190	13	---	--	---	--
12,000	230	15	230	17	201	20
13,000	250	18	---	--	---	--
14,000	260	17	---	--	---	--
15,000	270	17	---	--	---	--
16,000	280	16	---	--	---	--
17,000	270	19	---	--	---	--
18,000	260	18	---	--	---	--
19,000	250	17	---	--	---	--
20,000	230	16	---	--	---	--
21,000	220	20	---	--	---	--
22,000	200	18	---	--	---	--
23,000	210	19	---	--	---	--
24,000	210	23	---	--	---	--
25,000	220	23	---	--	---	--
26,000	220	25	---	--	---	--
27,000	230	24	---	--	---	--

NOTES:

1. Wind data was obtained from the Yucca weather station.
2. The surface air pressure was 12.68 psi, the temperature 4.7°C, the dew point -14.7°C, and the relative humidity 15%.

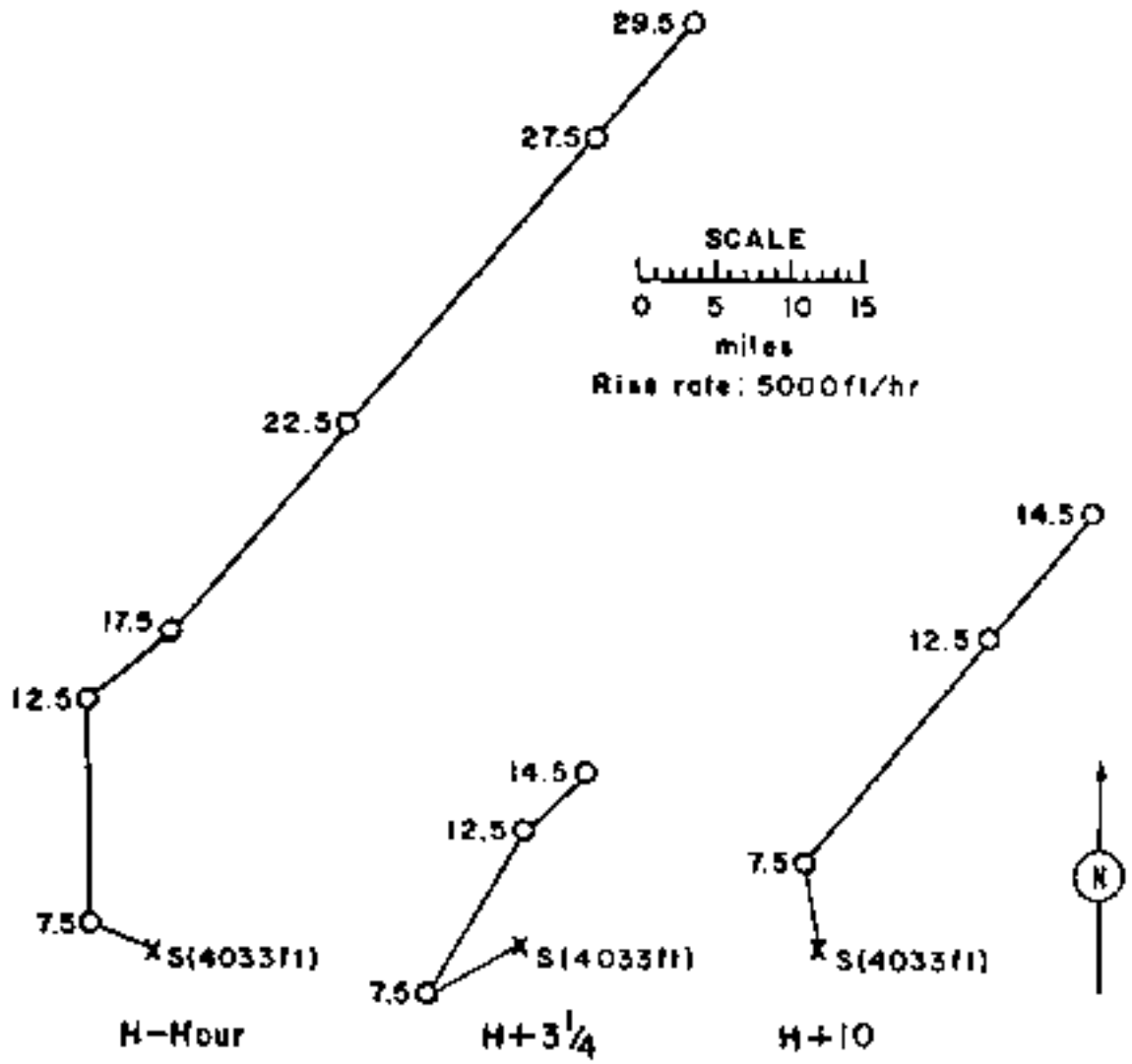


Figure 282. Hodographs for Operation HARDTACK II - Socorro.

OPERATION HARDTACK II - Wrangell

	PST	GMT
DATE:	22 Oct 1958	22 Oct 1958
TIME:	0950	1650

Sponsor: USCEC

TOTAL YIELD: 115 tons

SITE: NTS - Area 9a
36° 47' 53" N
115° 59' 44" W
Site elevation: 3,677 ft

HEIGHT OF BURST: 1,500 ft

FIREBALL DATA:
Time to 1st minimum: NM
Time to 2nd maximum: NM
Radius at 2nd maximum: NM

TYPE OF BURST AND ENVIRONMENT:
Air burst from balloon over Nevada soil

CRATER DATA: No crater

CLOUD TOP HEIGHT: 1[illegible],500 ft MSL
CLOUD BOTTOM HEIGHT: [illegible],900 ft MSL

REMARKS:

The contamination was due primarily to induced activity. The on-site measurements were performed by the Radiological Safety Division of Reynolds Electrical and Engineering Company for purposes of personnel safety. Readings were taken with AN/PDR-39 or Ludlum 2241 instruments. The sodium-24 decay rate was used to extrapolate the dose-rate readings to H+1 hour. This decay rate is not entirely applicable although it closely approximates the observed decay. Because of the lack of data in some areas around ground zero there is not a high degree of confidence in the analysis of the on-site pattern.

The off-site fallout documentation was performed with Beckman NX-5 and AN/PDR-39 instruments by the U. S. Public Health Service for purposes of public safety. Three nuclear detonations occurred on the same day. Since the trajectories for these three events were in the same general direction, there was some difficulty in determining from which shots the observed fallout originated; therefore, no off-site pattern is presented for this shot.

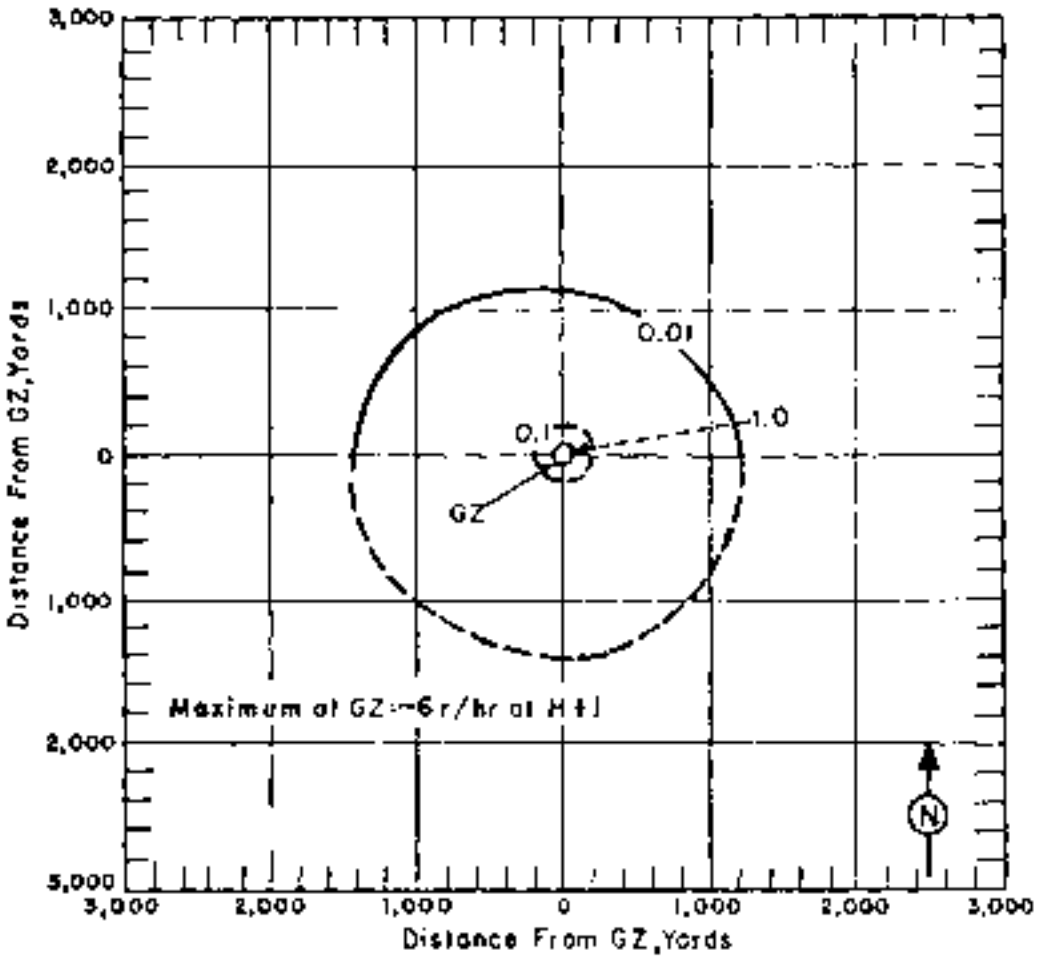


Figure 255. Operation HARDTACK II - Orange 12.
On-site dose rate contours in r/hr at H+1 hour.

TABLE 11 NEVADA WIND DATA FOR OPERATION RANIACK II - VRANGELL

Altitude (MSL)	H-hour		H+3 hours	
	Dir	Speed	Dir	Speed
feet	degrees	mph	degrees	mph
Surface	090	02	140	0;
5,000	060	09	170	08
6,000	110	14	190	10
7,000	140	14	210	13
8,000	170	13	220	15
9,000	190	13	230	17
10,000	210	13	220	19
11,000	220	14	220	23
12,000	230	12	220	2;

NOTE: Wind data was obtained from the Yucca weather station.

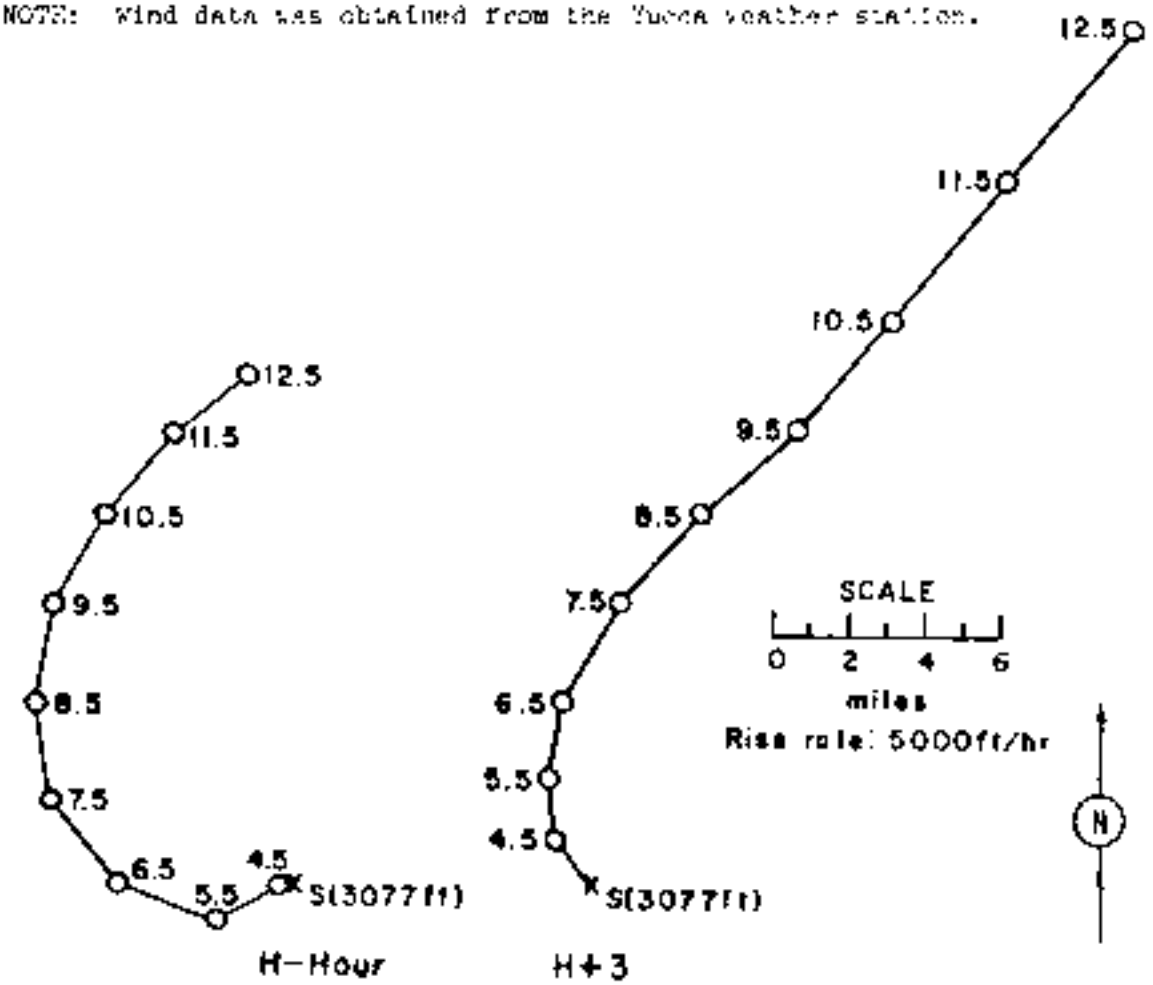


Figure 284. Hodographs for Operation RANIACK II - Vrangell.

OPERATION HARDTACK II - Oberon Safety Experiment

	PST	GMT
DATE:	22 Oct 1958	22 Oct 1958
TIME:	1230	2030

Sponsor: UCRL

SITE: NTS - Area 8a
37° 10' 42" N
116° 04' 03" W
Site elevation: 4,446 ft

HEIGHT OF BURST: 20 ft

TYPE OF BURST AND ENVIRONMENT:
Tower burst over Nevada soil

CLOUD TOP HEIGHT: Very low
CLOUD BOTTOM HEIGHT: NA

REMARKS:

No fallout - some alpha contamination.

OPERATION NUTMEG II - Rushmore

	PST	GMT
DATE:	30 Oct 1968	31 Oct 1968
TIME:	1540	2340

Sponsor: UCRL

TOTAL YIELD: 188 tons

SITE: NTS - Area 9a
37° 08' 09" N
116° 09' 27" W
Site elevation: 4,244 ft

FIREBALL DATA:
Time to 1st minimum: 2 msec
Time to 2nd maximum: 21 msec
Radius at 2nd maximum: 1M

HEIGHT OF BURST: 500 ft

TYPE OF MEDIUM AND PLACEMENT:
Air burst from balloon over
Nevada soil

CRATER DATA: No crater

CLOUD TOP HEIGHT: 1,140 ft MSL
CLOUD TOP/STEM RADIUS: 10% available

REMARKS:

The contamination is due primarily to induced activity. The on-site measurements were performed by the Radiological Safety Division of Reynolds Electrical and Engineering Company for purposes of personnel safety. Readings were taken with AN/PDR or Victoreen 30-A instruments at 24 hour, 168 day and 240 days. The radiation decay rate was used to extrapolate the dose-rate readings to 24 hour. This decay rate is not strictly applicable although it closely approximates the observed decay. Because of the lack of data in some areas around ground zero, there is not a high degree of confidence in the pattern.

Three nuclear detonations occurred on the same day. Since the trajectories for these three events were in the same general direction, there was some difficulty in determining from which shots the observed fallout originated; therefore no off-site pattern is presented for this shot.

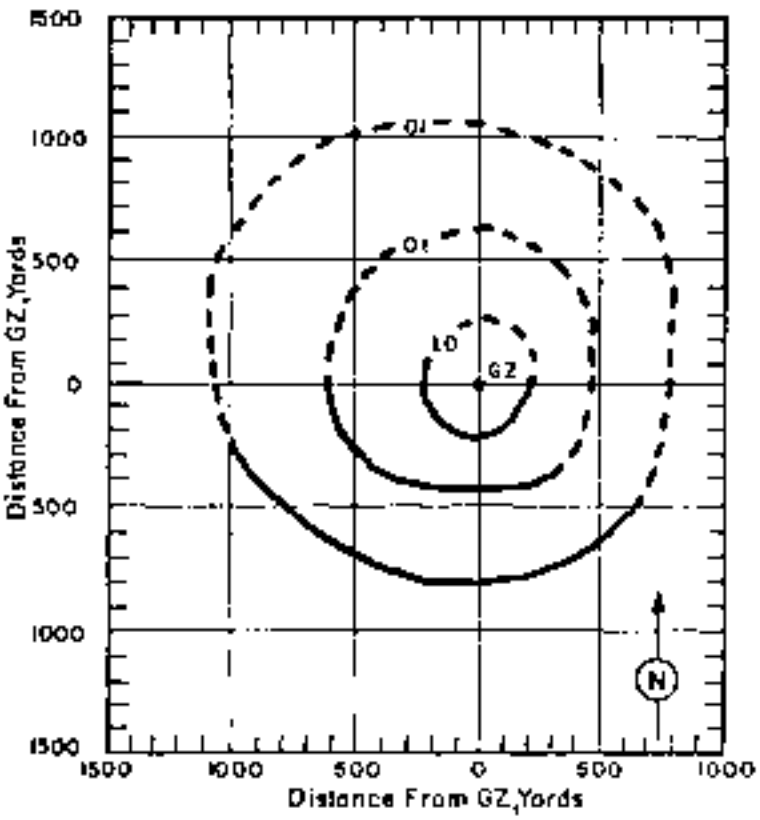


Figure 2X5. Operation HARDTACK II - Rushmore.
On-site dose rate contours in r/hr at H+1 hour.

TABLE 9.2 NEVADA WIND DATA FOR OPERATION HARDTACK II - RUSHMORE

Altitude (MSL)	H-hour	
	Dir	Speed
feet	degrees	mph
Surface	140	05
5,000	170	08
6,000	190	10
7,000	210	14
8,000	220	16
9,000	230	17
10,000	220	19
11,000	220	23
12,000	220	25

NOTES:

1. Wind data was obtained from the Yucca weather station.
2. Tropopause height was 42,000 ft MSL.
3. The surface air pressure was 12.66 psi, the temperature 17.8°C, and the relative humidity 12%.

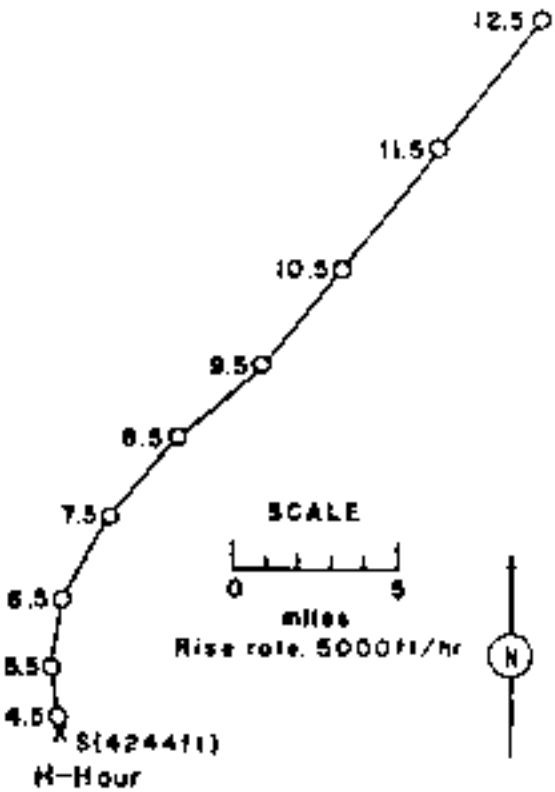


Figure 28a. Hodograph for Operation HARDTACK II - Rushmore.

OPERATION HARDTACK II - Cactus Safety Experiment

	PST	GMT
DATE:	24 Oct 1958	24 Oct 1958
TIME:	0700	1500

Sponsor: LASL

TOTAL YIELD: 21 tons

SITE: NTS - Area 3
37° 09' 35" N
116° 01' 37" W

FIREBALL DATA:
Time to 1st minimum: [illegible]
Time to 2nd maximum: [illegible]
Radius at 2nd maximum: [illegible]

HEIGHT OF BURST: 1125 ft

TYPE OF BURST AND EMPLACEMENT:
Tower burst over Double Gap

CLOUD TOP HEIGHT: 9,000 ft MSL
CLOUD BOTTOM HEIGHT: 4,000 ft MSL

REMARKS:

The on-site fallout documentation was performed by the Radiological Safety Division of the Reynolds Electrical and Engineering Company for purposes of personnel safety. Readings were taken with AN/PDR-39 or Tracerlab SU-16 instruments at H+1 hour, H+6 hours, D+1 day and D+2 days. The $t^{-1.2}$ decay approximation was used to extrapolate the dose-rate readings to H+1 hour. The overall fallout from Cactus was well documented and the pattern presented is considered to be reliable.
A special on-site survey was very helpful in distinguishing between the Cactus fallout and the June fallout.

The off-site fallout documentation was performed with Berkeley MX-5 and AN/PDR-39 instruments by the U. S. Public Health Service for purposes of public safety. The $t^{-1.2}$ decay approximation was used to extrapolate the dose-rate readings to H+1 hour. There is a great deal of uncertainty in the off-site fallout pattern because of the lack of data.

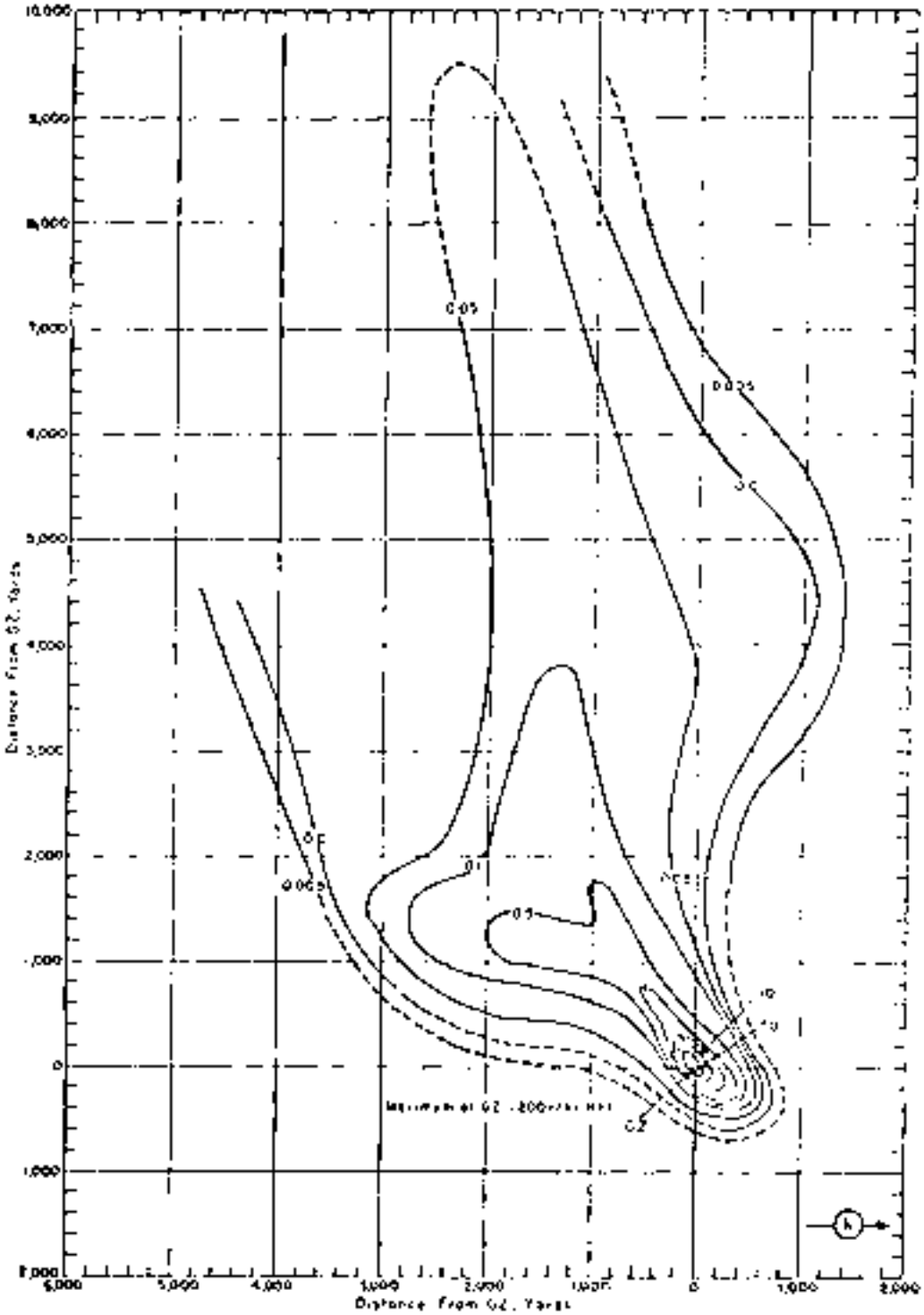


Figure 287. Operation HARDTACK II - Cutron.
On-site dose rate contours in r/hr at H+1 hour.

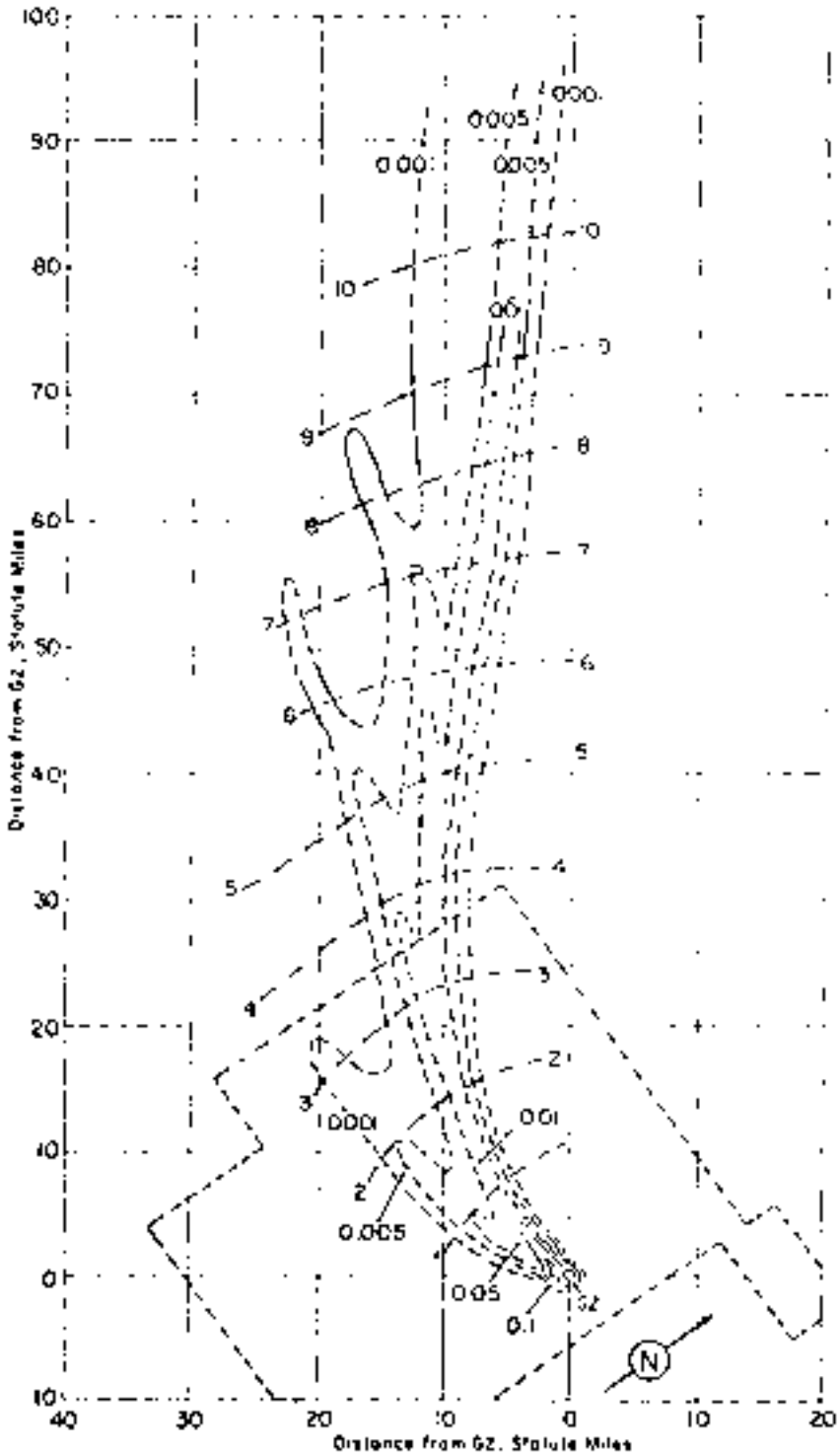


Figure 288. Operation HARDTACK II - Cactus.
Off-site dose rate contours in r/hr at H+1 hour.

TABLE 93 NEVADA WIND DATA FOR OPERATION HARDTACK II - CATRON

Altitude (MSL)	H-hour		H+1½ hours	
	Dir	Speed	Dir	Speed
feet	degrees	mph	degrees	mph
Surface	030	02	360	05
5,000	040	09	030	07
6,000	050	09	070	05
7,000	070	09	100	10
8,000	110	12	110	14
9,000	120	16	120	15
10,000	120	18	120	17

NOTE: Wind data was obtained from the Yucca weather station.

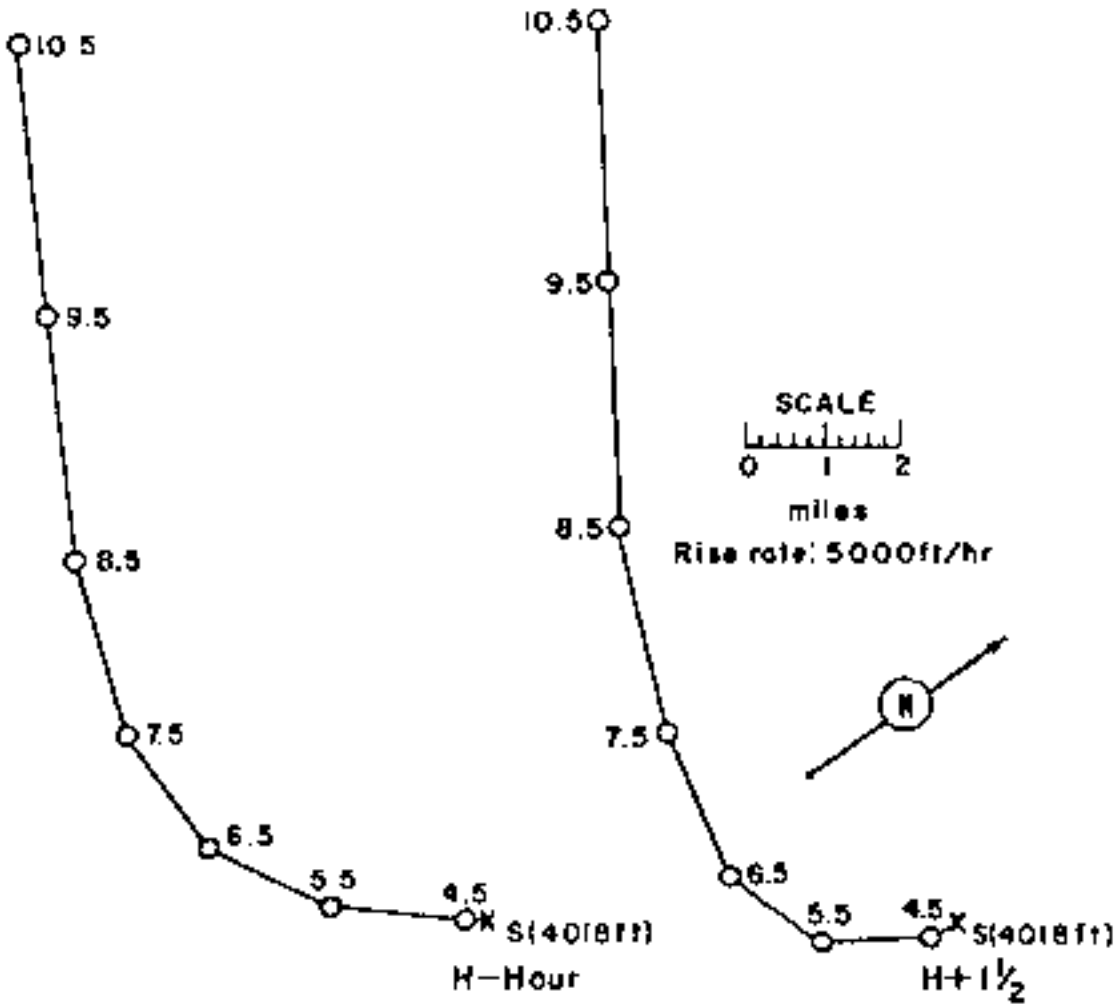


Figure 289. Hodographs for Operation HARDTACK II - Catron.

OPERATION SHREDDER II - Jumbo Safety Experiment

	PST	GMT
DATE:	24 Oct 1965	24 Oct 1965
TIME:	0801	1601

Sponsor: DCNA

SITE: NTS - Area 9?
37° 07' 24" N
116° 02' 16" W
Site elevation: 4,210 ft

TOTAL YIELD: 1.7 tons

FIREBALL DATA:
Time to 1st minimum: XX
Time to 2nd maximum: XX
Radius at 2nd maximum: XX

HEIGHT OF BURST: Surface

TYPE OF BURST AND EMPLACEMENT:
Surface burst in a steel and concrete building with 20 ft of gravel over the building

CRATER DATA: Not available

CLOUD TOP HEIGHT: 4,210 ft MSL
CLOUD BOTTOM HEIGHT: XX

REMARKS:

The on-site fallout documentation was performed by the Radiological Safety Division of the Reynolds Electrical and Engineering Company for purposes of personnel safety. Readings were taken with AN/PDR-[illegible] or Victoreen 440-B instruments at H+? hours, D+1 day and D+? days. Conventional decay extrapolation was used to extrapolate low dose-rate readings to H+1 hour. The on-site fallout was well documented and the pattern presented is considered to be reliable.

"No significant off-site radioactivity was reported that could be attributed to the Jumbo event".

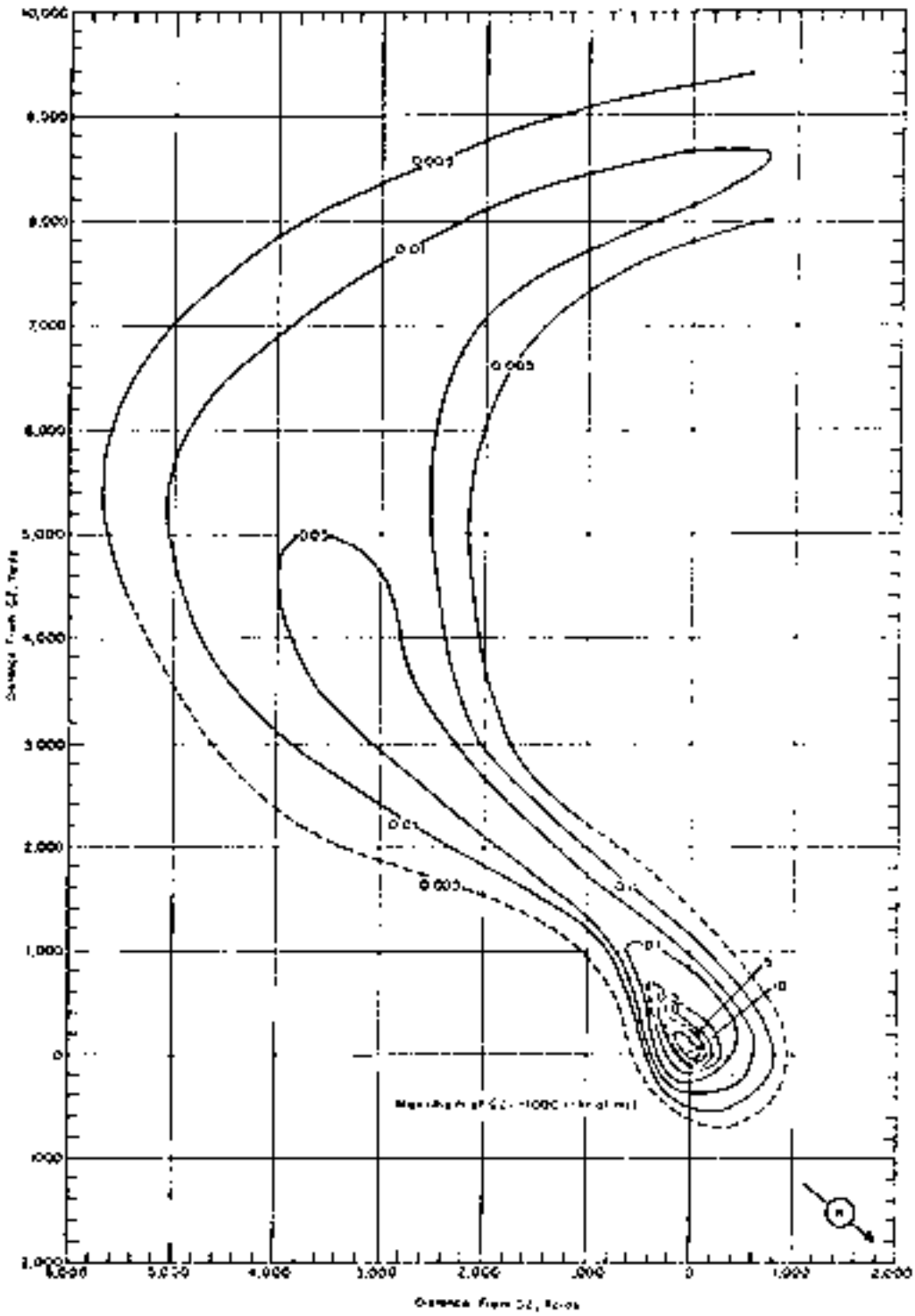


Figure 290. Operation HARDTACK II - June.
On-site dose rate contours in r/hr at H+1 hour.

TABLE 94 NEVADA WIND DATA FOR OPERATION HARDTACK II (JUNE)

Altitude (MSL)	1st hour	
	Dir	Speed
feet	degrees	mph
Surface	360	05
5,000	030	07
6,000	070	08
7,000	100	10
8,000	110	14
9,000	120	16
10,000	120	[illegible]

NOTE: Wind data was obtained from the Indian Springs station.

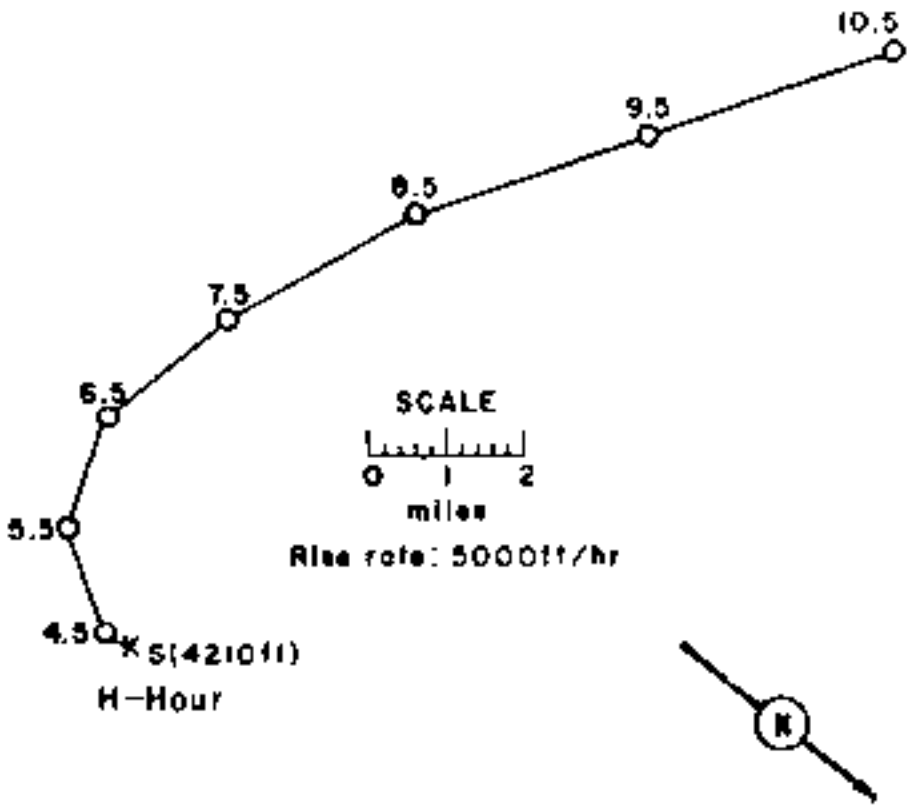


Figure 94. Hodograph for Operation HARDTACK II - June.

OPERATION HARDTACK II - Cerus Safety Experiment

	TST	GMT
DATE:	29 Oct 1958	30 Oct 1958
TIME:	2000	0400

Sponsor: USAEC

SITE: NTS - Area 9b
37° 10' 31" N
116° 04' 37" W
Site elevation: 4,603 ft

TOTAL YIELD: 0.7 tons

FIREBALL DATA:
Time to 1st minimum: 3M
Time to 2nd maximum: 5M
Radius at 2nd maximum: 1M

HEIGHT OF BURST: 91 ft

TYPE OF BURST AND LOCATION:
Tower burst over Cerus mill

CLOUD TOP HEIGHT: 4,1[illegible] ft MSL
CLOUD BOTTOM HEIGHT: 3[illegible] ft

RESULTS:

The on-site radiation measurements were performed by the Test Control Safety Division of the Republic Electrical and Manufacturing Company for purposes of personnel safety. Readings were taken with AN/PIC-1 or Technilab PIC-1 instruments at H+1 hour and 8-10 hours. Due to the decay approximation it was used to extrapolate but the values are not to H+1 hour. The pattern is not reliable. A possible explanation of the discrepancy between the observed radiation fields and the fallout field is that, since the wind speed was light, the gamma rays at the Yucca Lake Weather Station were probably not representative.

Off-site measurements detected no radioactivity above background.

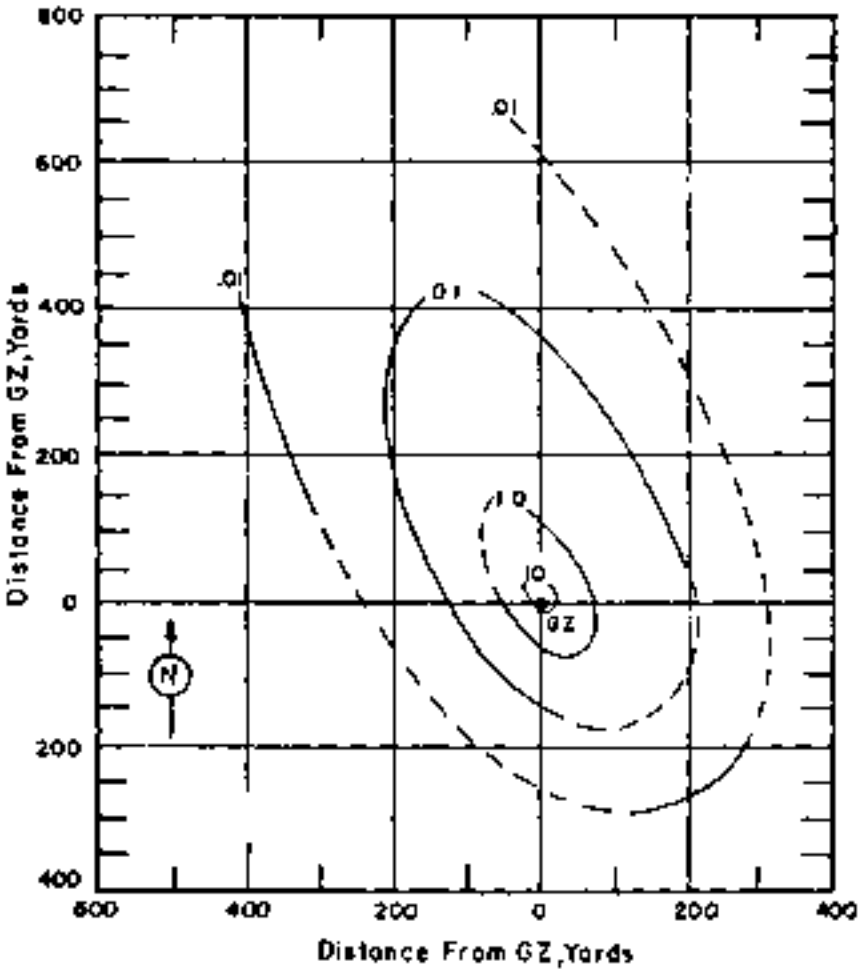


Figure 292. Operation HARDTACK II - Ceres.
On-site dose rate contours in r/hr at H+1 hour.

TABLE 95 NEVADA WIND DATA FOR OPERATION HARDTACK II — CHICO

Altitude (MSL)	H-hour		H+1 hour	
	Dir	Speed	Dir	Speed
feet	degrees	mph	degrees	mph
Surface	330	2	310	6
5,000	220	5	---	-
6,000	200	6	---	-
7,000	160	7	---	-
8,000	140	7	---	-

NOTE: Wind data was obtained from the Yucca weather station.

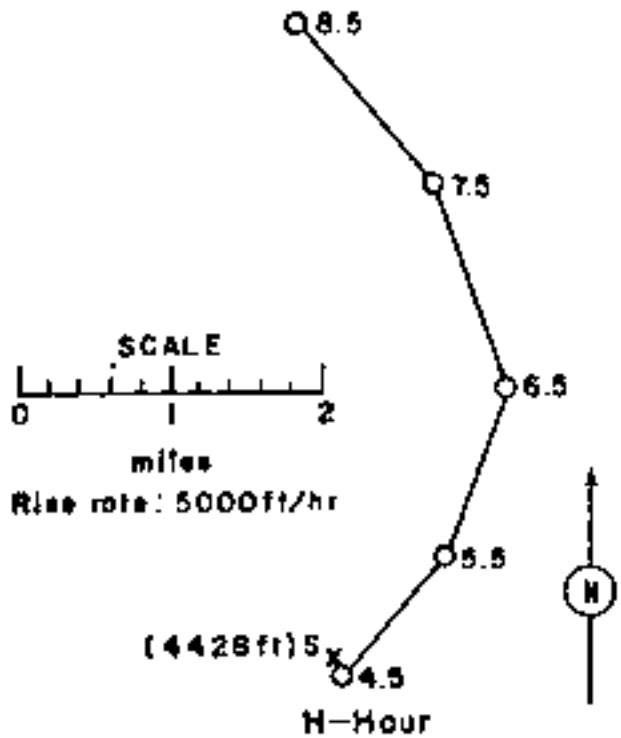


Figure 293. Hodograph for Operation HARDTACK II — Ceres.

OPERATION HARDSCRAB II - Sanford

	PST	GMT
DATE:	[illegible]	[illegible]
TIME:	[illegible]	[illegible]

Sponsor: USGS

TOTAL YIELD: 4.9 kt

SITE: NTS - Area [illegible]
[illegible]
[illegible] W
Site elevation: [illegible] ft

FIREBALL DATA:
Time to 1st maximum: [illegible]
Time to 2nd maximum: [illegible]
Radius at 1st maximum: [illegible]

HEIGHT OF BURST: [illegible] ft

TYPE OF BURST AND BURST ID:
Airburst [illegible]
Seismic [illegible]

CRATER DATA: No crater

DIAM [illegible]: [illegible] ft
DEPTH [illegible]: [illegible] ft

REMARKS:

The contamination was [illegible] limited to the on-site [illegible] were predominantly the Test Controller Group Division of the Nuclear Weapons [illegible] Department of Energy purposes of personnel [illegible] were taken with [illegible] or fractional [illegible] of H+1 hour, H+1 hour, H+4 hours and H+8 hours. The [illegible] decay rate was [illegible] the dose-rate readings to H+1 hour. This decay rate is not strictly applicable although it closely approximates the [illegible] decay. "Because of the lack of data for much of the area around ground zero, there is not a very high degree of confidence in the analysis of the on-site patterns".

Very little radioactivity above background was detected off-site.

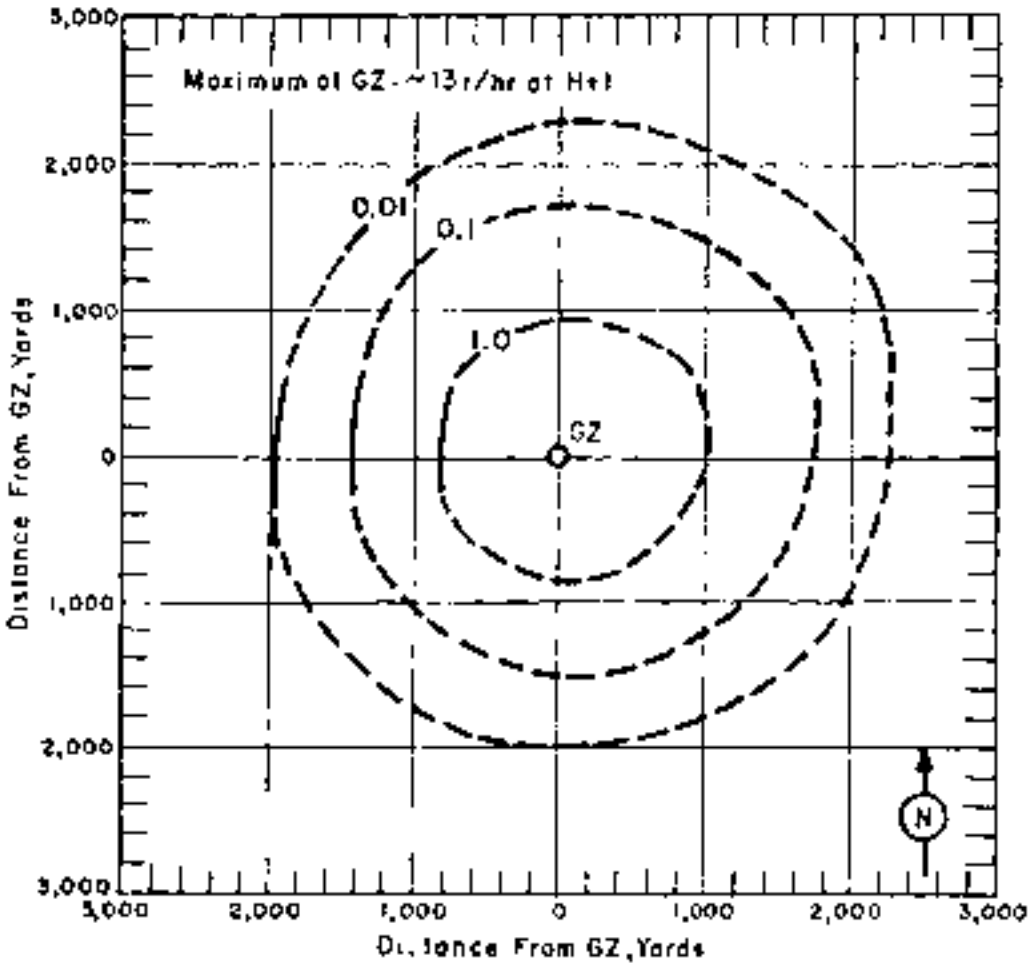


Figure 294. Operation HARDTACK II - Sanford
On-site dose rate contours in r/hr at H+1 hour.

TABLE 96 NEVADA WIND DATA FOR OPERATION HARDTACK II – CANNON

Altitude (MSL)	6-hour		[illegible]	
	Dir	Speed	Dir	Speed
feet	degrees	mph	degrees	mph
Surface	140	01	Calm	Calm
5,000	010	03	010	02
6,000	110	02	---	--
7,000	100	02	---	--
8,000	180	08	---	--
9,000	150	09	---	--
10,000	120	08	210	07
11,000	120	10	---	--
12,000	100	07	---	--
13,000	090	12	---	--
14,000	250	21	---	--
15,000	250	21	270	12
16,000	250	24	---	--
17,000	240	23	---	--
18,000	240	29	---	--
19,000	230	32	---	--
20,000	230	26	240	22
21,000	230	39	---	--
22,000	230	36	---	--
23,000	230	49	---	--
24,000	220	41	---	--
25,000	220	35	---	--
26,000	210	33	---	--
27,000	210	36	---	--

NOTE: Wind data was obtained from the Yucca weather station.

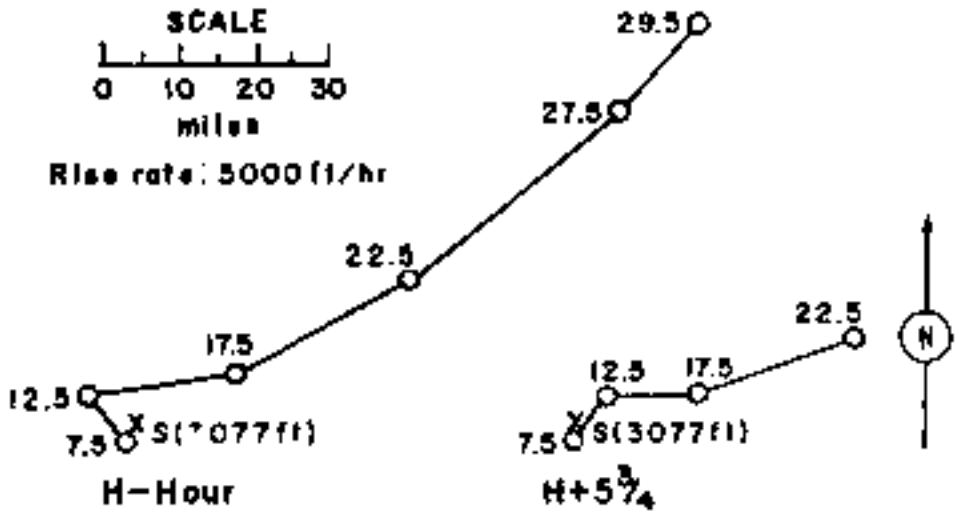


Figure 295. Hodographs for Operation HARDTACK II - Sanford.

OPERATION [illegible] - Data

	PRE	AIR
DATE:	[illegible]	[illegible]
TIME:	[illegible]	[illegible]

TOTAL YIELD: [illegible] kt

FISSION YIELD:
[illegible]

SHOT [illegible]

Operation [illegible]

SITE: NTS - Area [illegible]
[illegible]
[illegible]
Site elevation [illegible]

[illegible]

TYPE OF [illegible]
Air burst [illegible]
Nevada [illegible]

CLOUD [illegible]
CLOUD [illegible]

REMARKS:

The contamination was due primarily to induced activity. The on-site operation was performed by the Weapons Effects Division of the [illegible] Directorate of Weapons Effects Programs for purposes of joint test safety. Participating were [illegible] of Transvaal [illegible] at H+1 hour, Ben Nevis, 241 key and 242 dugout. The 7-hour-fit decay rate was used to extrapolate the dose-rate readings to H+1 hour. This decay rate is not strictly applicable although it closely approximates the true decay. Because of the lack of data in most cases around ground zero the pattern is unreliable.

Very little radioactivity above background was detected off-site.

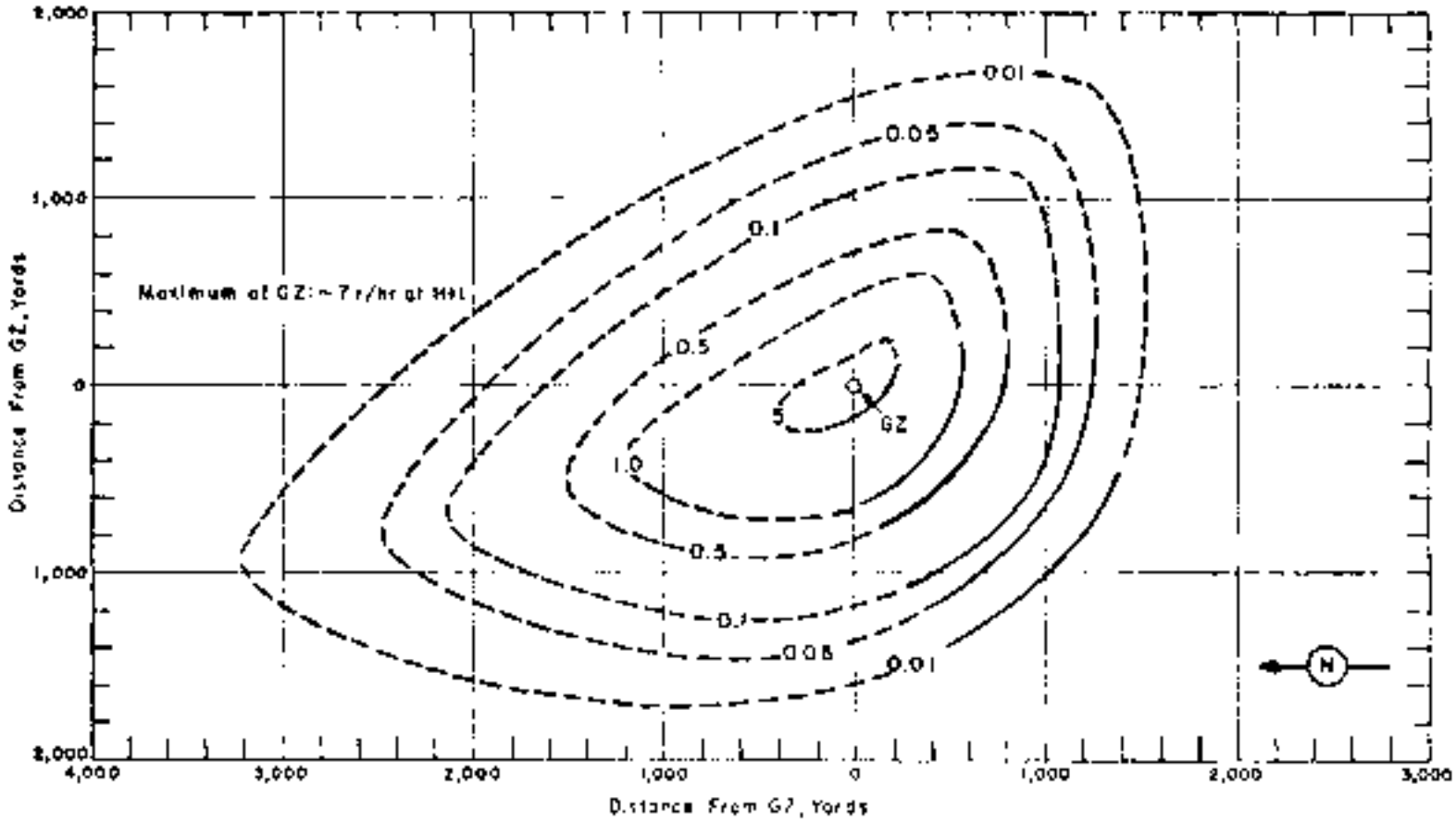


Figure 290. Operation [illegible] - DeSoto.
On-site dose rate contours in r/hr at H+1 hour.

TABLE 97 NEVADA WIND DATA FOR OPERATION HARDTACK II - DE BACA

Altitude (MSL)	H-hour		Altitude (MSL)	H-hour	
	Dir	Speed		Dir	Speed
feet	degrees	mph	feet	degrees	mph
Surface	Calm	Calm	12,000	260	14
5,000	010	02	13,000	270	14
6,000	030	02	14,000	280	13
7,000	020	01	15,000	270	12
8,000	070	02	16,000	260	13
9,000	130	03	17,000	200	17
10,000	210	07	18,000	230	21
11,000	250	12	19,000	240	22
			20,000	240	22

NOTES:

1. Wind data was obtained from the Yucca weather station.
2. The surface air pressure was 12.75 psi, the temperature 8.3°C, the dew point 5.1°C, and the relative humidity 80%.

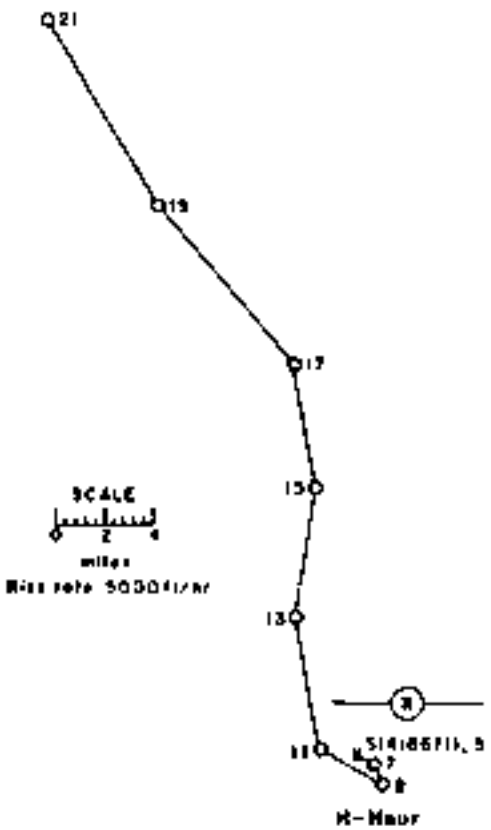


Figure 297. Hodograph for Operation HARDTACK II - De Baca.

OPERATION HANDTACK II - Chaves

	PST	GMT
DATE:	27 Oct 1958	27 Oct 1958
TIME:	0630	1430

Sponsor: LASL

SITE: NTS - Area 3u
37° 02' 41" N
116° 01' 47" W
Site elevation: 4,025 ft

TOTAL YIELD: 0.6 tons

FIREBALL DATA:
Time to 1st minimum: NM
Time to 2nd maximum: NM
Radius at 2nd maximum: NM

HEIGHT OF BURST: 92.5 ft

TYPE OF BURST AND FACILITIES:
Tower 100 ft over bedrock dome.

CLOUD TOP HEIGHT: 4,400 ft MSL
CLOUD BOTTOM HEIGHT: ND

REMARKS:

The on-site radiological documentation was performed by the Radiological Safety Division of the Reynolds Electrical and Engineering Company for purposes of personnel safety. Readings were taken with AN/PDR-T or Victoreen 555 instruments at 24 hours, 48 hours, and 96 days. The $t^{-1.2}$ decay approximation was used to 24 hours. "The downwind extent of the activity is only a rough approximation because of the limited number of readings taken. The rest of the pattern was relatively well documented and should be fairly reliable."

No pattern is presented of the off-site fallout because of the limited area that was monitored and the relatively low readings obtained.

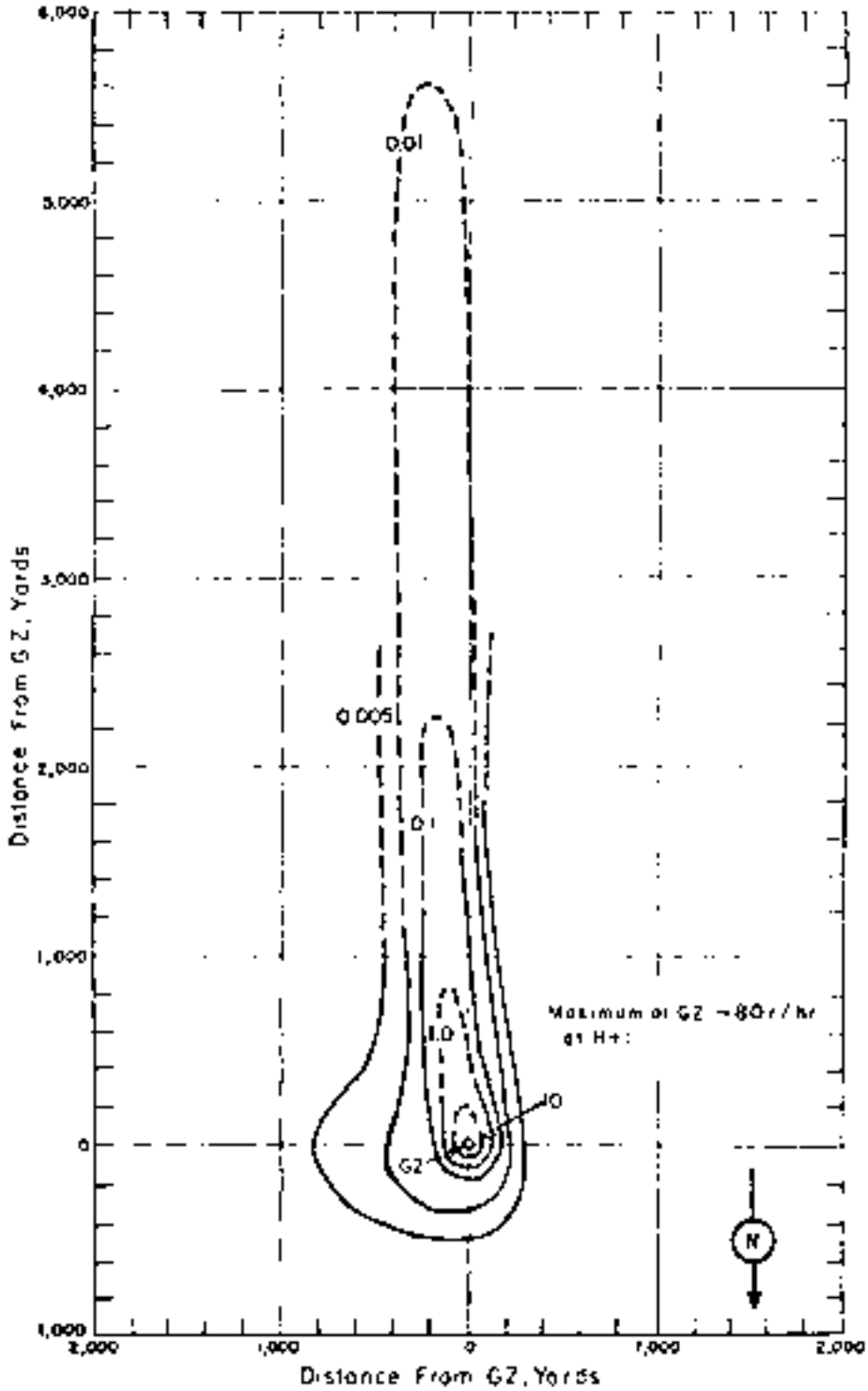


Figure 30s. Operation HARDTACK II - Chaves.
On-site dose rate contours in r/hr at H+1 hour.

TABLE 99. SURFACE WIND DATA FOR OPERATION HARDTACK II - CHAVES

Altitude (MSL)	Direction	Speed
feet	degrees	mph
Surface	350	07
5,000	360	16
6,000	010	28
7,000	030	18
8,000	030	16

NOTE: Wind data was obtained from the Tonopah weather station.

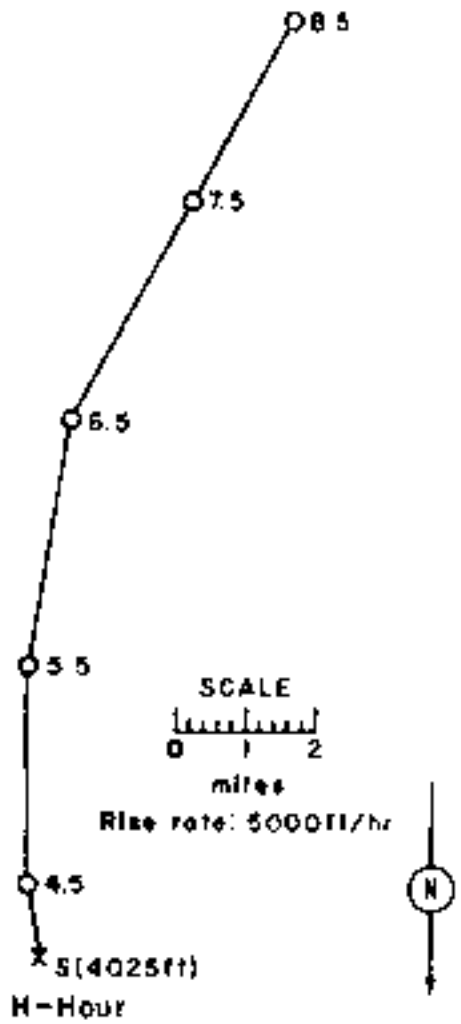


Figure 290. Hodograph for Operation HARDTACK II - Chaves.

OPERATION HARDTACK II - Events

	PST	GMT
DATE:	28 Oct 1958	29 Oct 1958
TIME:	1600	2400

Sponsor: UCRL

SITE: NTS - Area 10, C-h
37° 11' 42" N
116° 12' 17" W
Site elevation: 6,600 ft

TOTAL YIELD: 55 tons

HEIGHT OF BURST: Slant distance
848 ft. Vertical depth 844 ft

FIREBALL DATA:
Time to 1st minimum: NA
Time to the maximum: NA
Radius at 2nd maximum: NA

TYPE OF EVENT AND LOCATION:
Subsurface - tunnel - tunnel in,
Nevada test

CRATER DATA: Not available

REMARKS:

A small amount of smoke was seen to exit from the portal. This vented material produced very low levels of radiation at a few isolated points.

TABLE 99 NEVADA WIND DATA FOR OPERATION HARDTACK II — EVANS

TIME	SURFACE WINDS			
	9 foot Mesa Slope Tower (Elev. 6,725 ft MSL)		100 foot Mesa Mountain Tower (Elev. 7,162 ft MSL)	
	Dir degrees	Speed mph	Dir degrees	Speed mph
H-hour	290	8	360	Missing
H+1 hour	280	8	360	Missing
H+2 hours	260	5	360	Missing

NOTE: Wind data was obtained from the Yucca weather station.

OPERATION HARDTACK II - Humboldt

	PST	GMT
DATE:	29 Oct 1958	29 Oct 1958
TIME:	0645	1445

TOTAL YIELD: 7.8 tons

Sponsor: USAEC - DOD

SITE: NTS - Area 3W
37° 02' 52" N
116° 01' 29" W
Site elevation: 4,029 ft

FIREBALL DATA:
Time to 1st minimum: NM
Time to 2nd maximum: NM
Radius at 2nd maximum: NM

HEIGHT OF BURST: 0 ft

TYPE OF BURST AND STABILIZATION:
Tower burst over Nevada Test...

CRATER DATA: Not available

CLOUD TOP (MAXIMUM): 41,000 ft MSL
CLOUD TOP (STABILIZED): 41,000 ft MSL

REMARKS:

The on-site fallout documentation was severely limited by changes in the GZ location and the operational firing schedule. Readings for the very close-in patterns were taken by the Chemical Corps Radiological Safety Support Unit at points along the north, south, and west radial lines at times between 1/2 and 1/2 hours. Separate decay-rate decay curves were used to extrapolate the readings to H+1 hour. Readings for the on-site fallout pattern were taken at H+1 hour, H+7 hours, H+27 hours and D+2 days. The $t^{-1.2}$ decay approximation was used to extrapolate the dose-rate readings to H+1 hour. "The on-site fallout from Humboldt was well documented and the pattern is considered reliable."

The off-site fallout documentation was performed with Bendix PDR-5 and AN/PDR-39 instruments by the U. S. Public Health Service for purposes of public safety. The $t^{-1.2}$ decay approximation was used to extrapolate the dose-rate readings to H+1 hour. "Although there is some uncertainty in the downwind extent of some of the isolines, there is fair confidence in the width of the pattern and in the orientation of the fallout, which is consistent with the wind analysis".

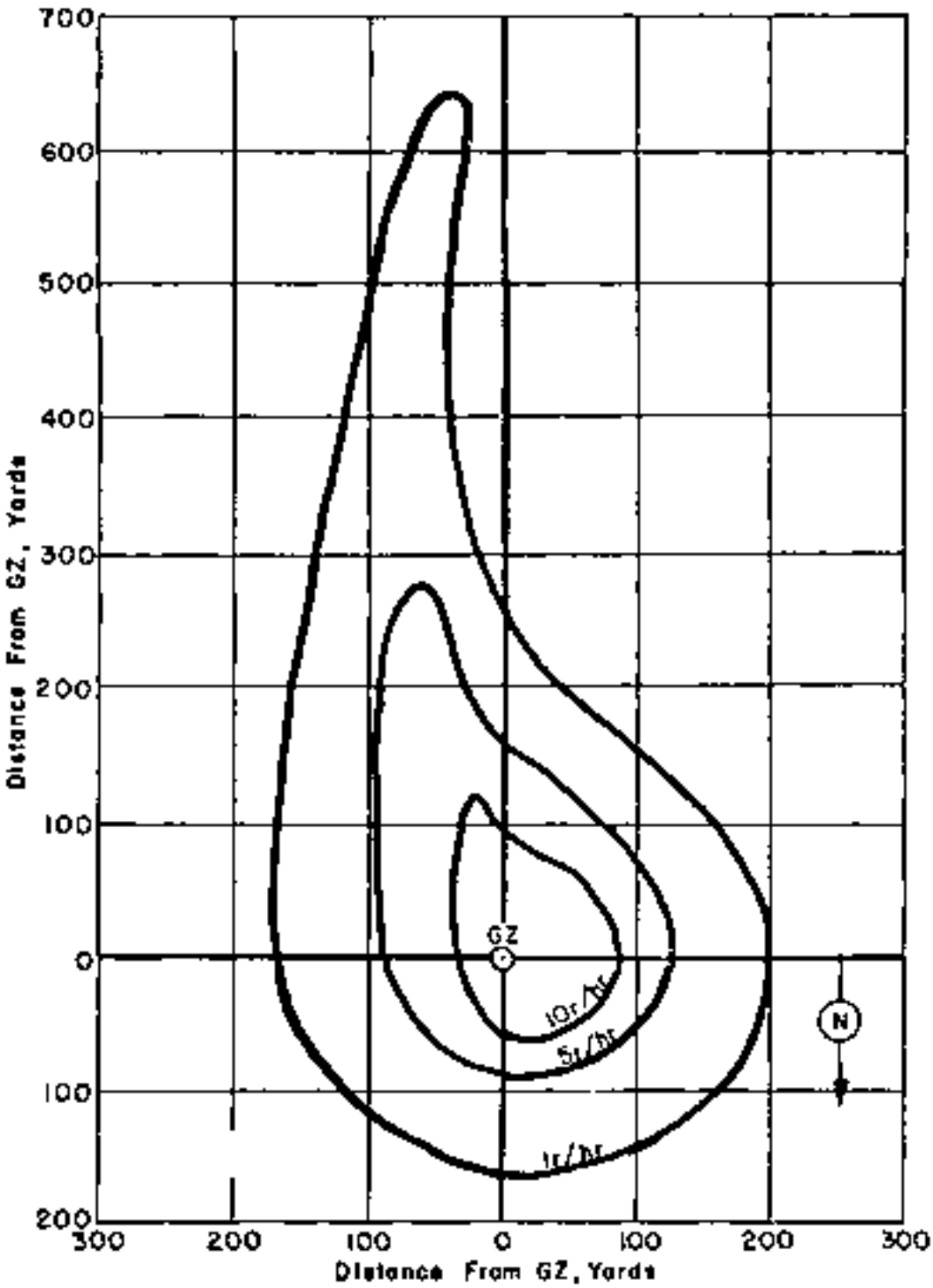


Figure 300. Operation HARDTACK II - Humboldt.
Very close-in dose rate contours in r/hr at H+1 hour.

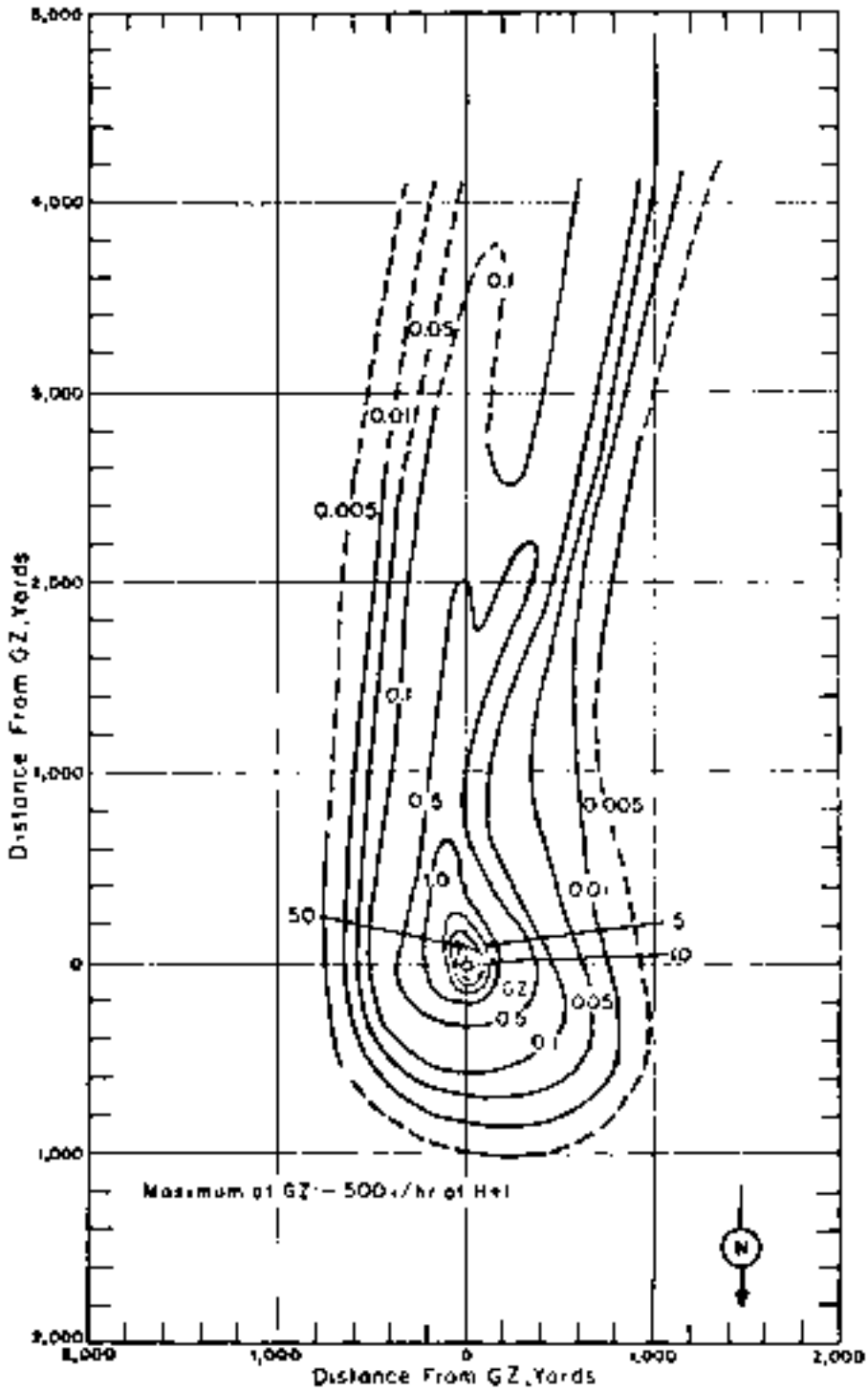


Figure 301. Operation FARTACK II - Humboldt.
On-site dose rate contours in r/hr at H+1 hour.

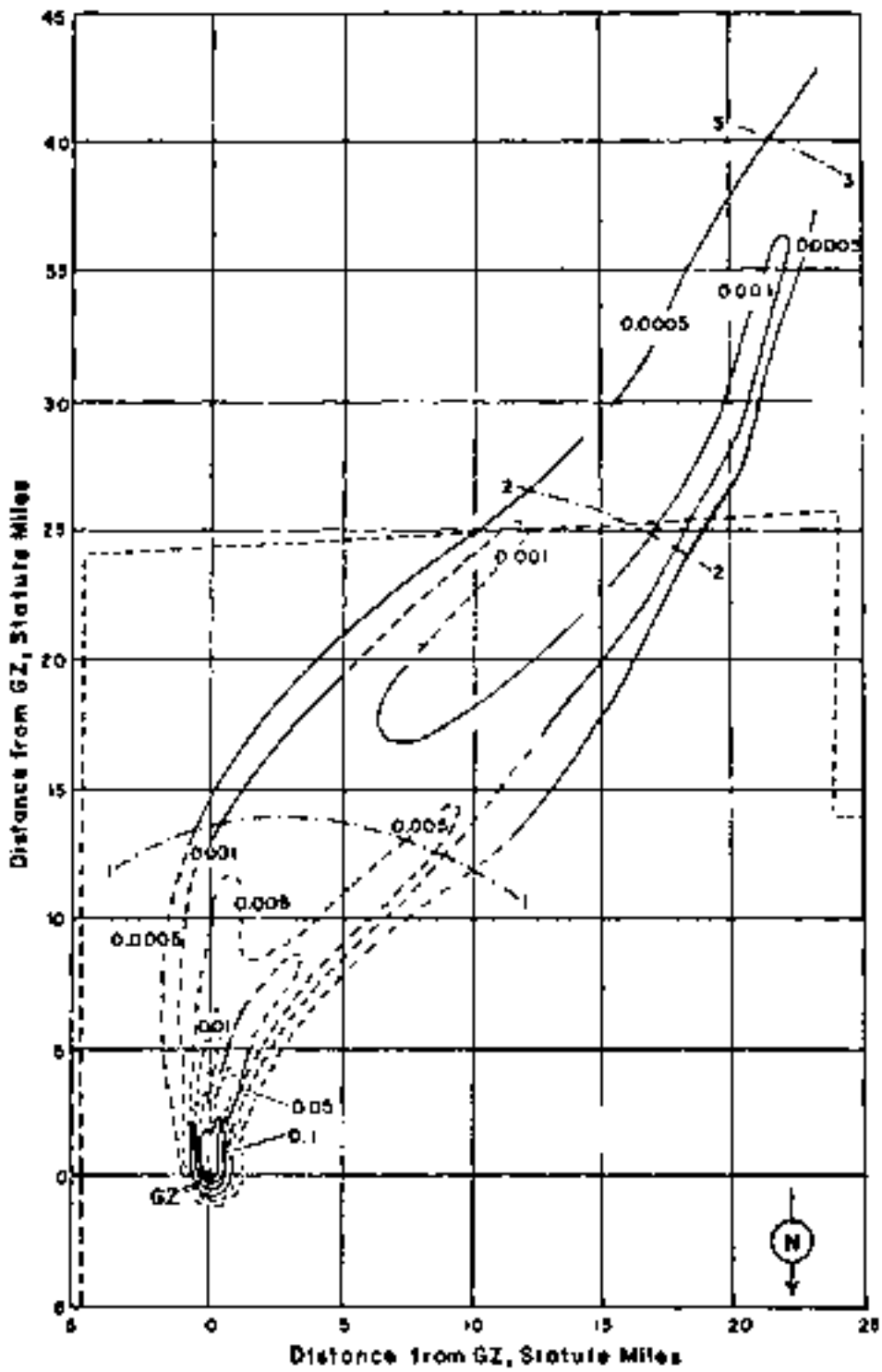


Figure 302. Operation HARDTACK_II - Humboldt.
Off-site dose rate contours in r/hr at H+1 hour.

TABLE 300 NEVADA WIND DATA FOR OPERATION HARDTACK II – HUMBOLDT

Altitude (MSL)	H-hour	
	Dir	Speed
feet	degrees	mph
Surface	340	07
5,000	010	29
6,000	020	30
7,000	030	37
8,000	030	33
9,000	030	22
10,000	040	15

NOTES:

1. Wind data was obtained from the Yucca weather station.
2. The surface air pressure was 12.85 psi, the temperature 7.4°C, the dew point -3.2°C, and the relative humidity 46%.

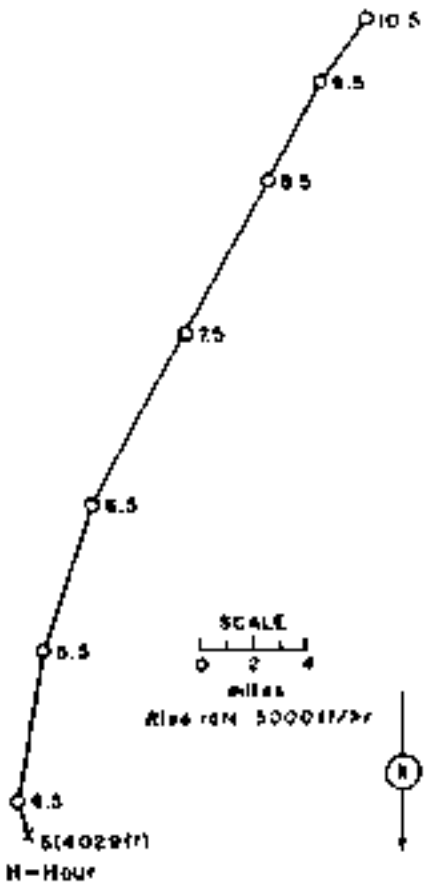


Figure 305. Hodograph for Operation HARDTACK II – Humboldt

OPERATION HARDTACK II - Santa Fe

	PST	GMT
DATE:	29 Oct 1958	30 Oct 1958
TIME:	1004	0304

Sponsor: LASL

TOTAL YIELD: 1.5 kt

SITE: NTS - Area 7b
37° 05' 12" N
116° 01' 29" W
Site elevation: 5,286 ft

FIREBALL DATA:
Time to 1st minimum: 0%
Time to 2nd maximum: 0%
Radius at 2nd maximum: 0%

HEIGHT OF BURST: 1,500 ft

TYPE OF BURST AND MECHANISM:
Air burst from balloon over Nevada soil

CRATER DATA: No crater

CLOUD TOP HEIGHT: 15,000 ft MSL
CLOUD BOTTOM HEIGHT: 12,000 ft MSL

REMARKS:

The contamination was due primarily to induced activity. The on-site measurements were performed by the Radiological Safety Division of the Reynolds Electrical and Engineering Company for purposes of personnel safety. Readings were taken with AN/PDR-39 or Victoreen 555-B instruments at H+1 hour, H+16 hours, D+2 days and D+3 days. The usual t^-1.2 decay rate was used to extrapolate the dose-rate readings to H+1 hour. This decay rate is not strictly applicable although it closely approximates the observed decay.

The off-site fallout was very light and no pattern is presented.

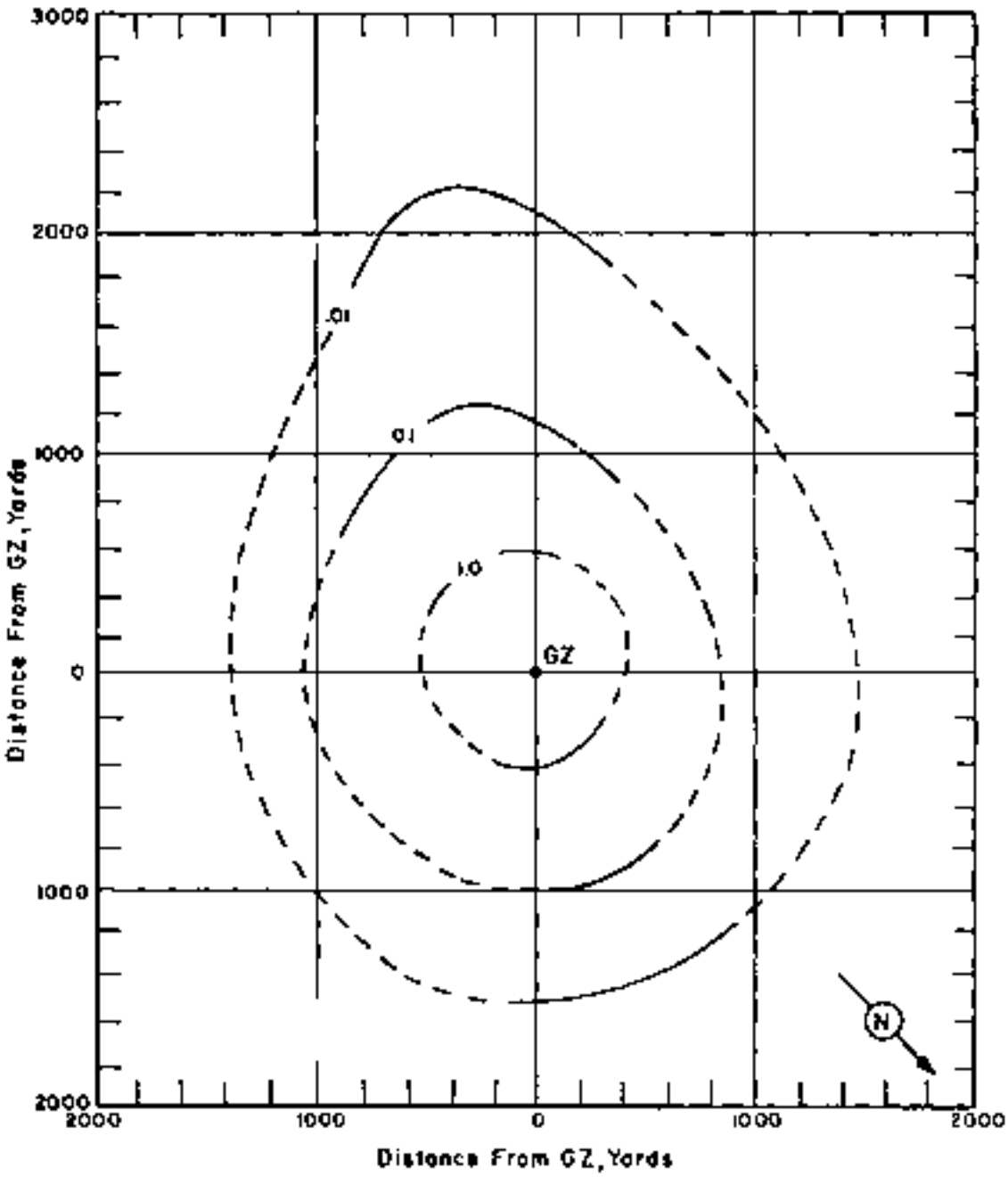


Figure 304. Operation HARDTACK II - Santa Fe.
On-site dose rate contours in r/hr at H+2 hour.

TABLE 101 NEVADA WIND DATA FOR OPERATION HARDTACK II - SANTA FE

Altitude (MSL)	H-hour		Altitude (MSL)	H-hour	
	Dir	Speed		Dir	Speed
feet	degrees	mph	feet	degrees	mph
Surface	350	04	13,000	030	36
5,000	018	13	14,000	040	40
6,000	040	17	15,000	040	43
7,000	040	20	16,000	040	43
8,000	040	22	17,000	030	44
9,000	040	25	18,000	030	44
10,000	030	28	19,000	028	46
11,000	020	28	20,000	020	51
12,000	030	31			

NOTES:

1. Wind data was obtained from the Yucca weather station.
2. Tropopause height was 39,000 ft MSL.
3. The surface air pressure was 12.70 psi, the temperature 12.1°C, the dew point -7.4°C, and the relative humidity 25%.

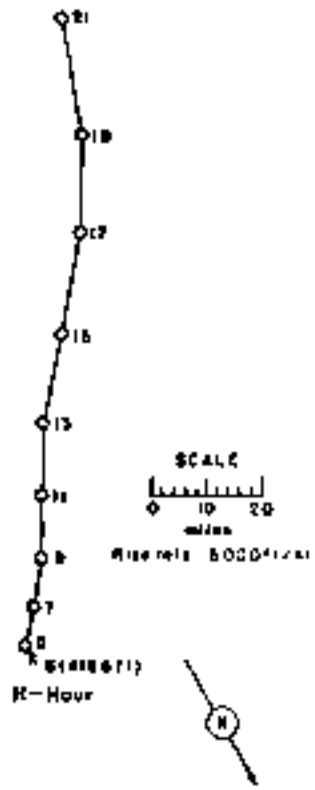


Figure 305. Hodograph for Operation HARDTACK II - Santa Fe.

OPERATION BARRACK II - Ganymede Safety Experiment

	/PST	GMT
DATE:	30 Oct 1978	31 Oct 1978
TIME:	0700	1100

Operation: DOE

SITE: STO - Area 52
37° 05' 24" N
Site elevation: 4,210 ft

ORIGIN OF ROCKET: Surface

TYPE OF ROCKET AND CLASSIFICATION:
Surface to surface, ballistic
building with [illegible] of
ground burst Sub Kiloton

CLOUD TOP HEIGHT: 70
CLOUD DIAMETER: 10

REMARKS:

Troops were [illegible] from the [illegible]. There was little [illegible] contamination in the [illegible] of the [illegible].

OPERATION HARDTACK II - Blanca

	PST	GMT
DATE:	30 Oct 1958	30 Oct 1958
TIME:	0700	1500

Sponsor: UCRL

TOTAL YIELD: 19 kt

SITE: NTS - Area 120.05
37° 11' 09" N
116° 12' 07" W
Site elevation: 7,120 ft

FIREBALL DATA:
Time to 1st minimum: [illegible]
Time to 2nd maximum: [illegible]
Radius at 2nd maximum: [illegible]

HEIGHT OF BURST: -835 ft
Slant Distance, Vertical depth 937 ft.

TYPE OF BURST AND PLACEMENT:
Subsurface event - Tunnel in Nevada tuff

CRATER DATA: Not available

CLOUD TOP HEIGHT: [illegible] ft
CLOUD BOTTOM HEIGHT: [illegible] ft

REMARKS:

The on-site fallout documentation was performed by the Radiological Safety Division of the Reynolds Electrical and Engineering Company for purposes of personnel safety. Readings were taken with AN/PDR-39 or Technical 2B-20 instruments at H+½ hour, H+6 hours, D+1 day and D+7 days. Due to inadequate mapping and the scarcity of good reference points there is considerable uncertainty in the dose-rate lines. A resurvey was made 7 months later with reference stakes available at half-mile intervals, so that the location of the fallout detected is much more certain than in the initial survey. However, because of the probable reduction in radiation by weathering and the errors probably attendant in assuming the $t^{-1.2}$ decay approximation to be valid for such a long period, the H+1 dose rates were estimated from the initial survey. There is an order of magnitude discrepancy in the estimation of the H+1 hour dose rates from the early to late survey; therefore there is very little confidence in the accuracy of the pattern.

Off-site air sampling showed a significant increase in alpha activity. The beta measurements indicate that some light fallout did occur off site.

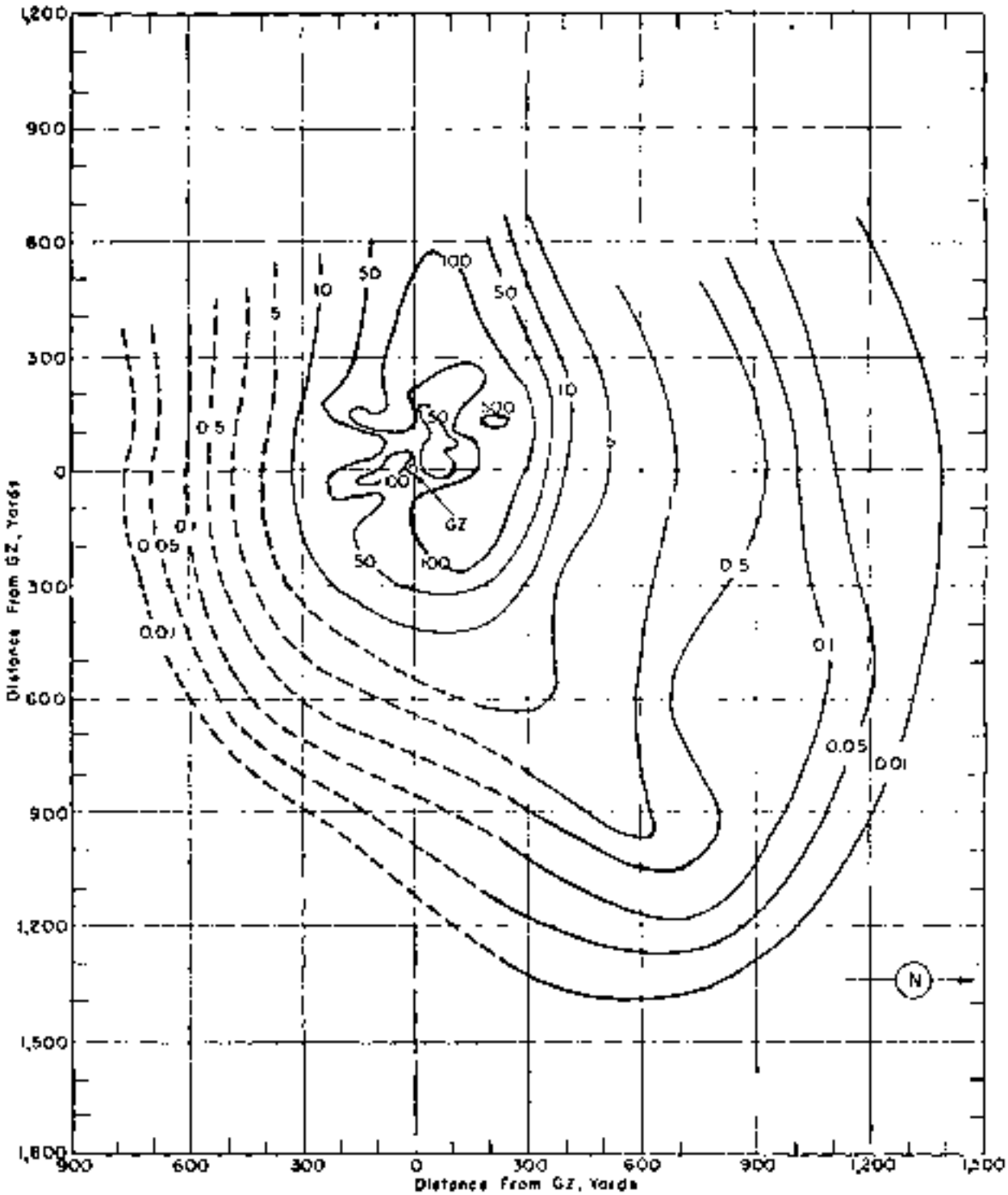


Figure 306. Operation HARDTACK II - Blanca.
Close-in dose rate contours in r/hr at H+1 hour.

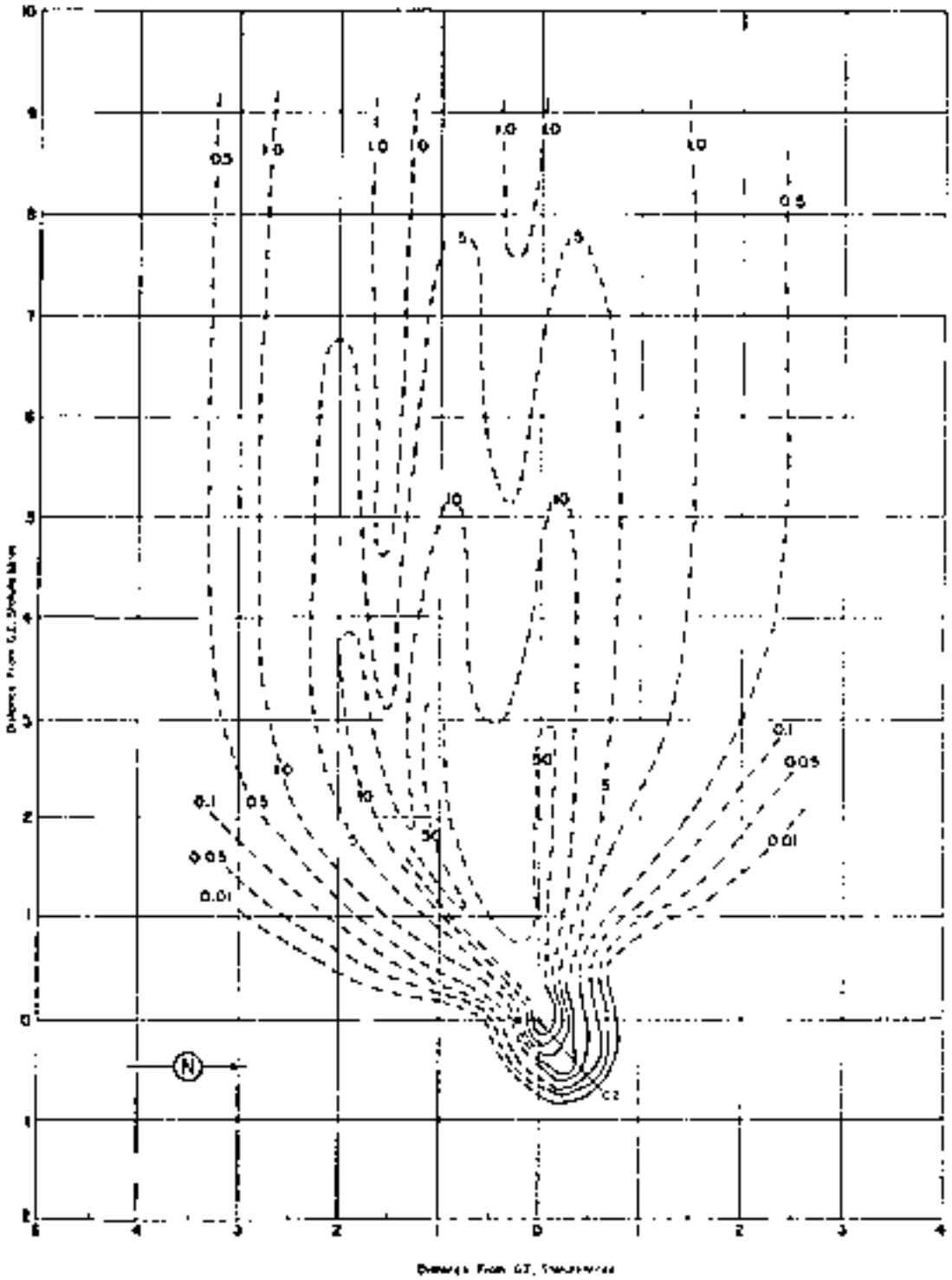


Figure 307. Operation HARDTACK II - Blanca.
On-site dose rate contours in r/hr at H+1 hour.

TABLE 10J NEVADA WIND DATA FOR OPERATION WARDTACK II — NANCA

Altitude (MSL)	H+5½ hours	
	Dir	Speed
feet	degrees	mph
Surface	80	09
5,000	60	15
6,000	60	15
7,000	60	14
8,000	70	13

NOTE: Wind data was obtained from the Yucca weather station.

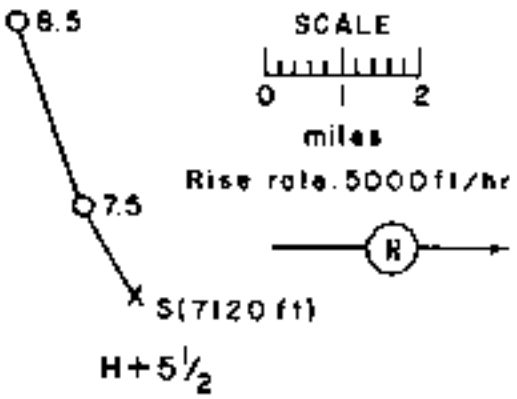


Figure 30S. Hodograph for WARDTACK II - Nancy.

OPERATION HARDTACK II - Titania Safety Experiment

	PST	GMT
DATE:	30 Oct 1956	31 Oct 1956
TIME:	1730	0030

Sponsor: UCRL

TOTAL YIELD: 0.2 tons

FIREBALL DATA:
Time to 1st minimum: NA
Time to 2nd maximum: NA
Radius at 1st maximum: NA

SITE: NTS - Area 8c
37° 10' 32" N
116° 04' 04" W
Site elevation: 4,400 ft

HEIGHT OF BURST: NA ft

TYPE OF SURFACE AND ELEVATION:
Tower shot, 700 foot tower

CLOUD TOP HEIGHT: [illegible] ft MSL
CLOUD BOTTOM HEIGHT: NA

REMARKS:

The on-site fallout determination was performed by the Radiological Safety Division of the Reynolds Electrical and Engineering Company for purposes of personnel safety. Readings were taken with AN/PDR-T1 or T1A(V) instruments at 8½ hours. The $t^{-1.2}$ decay approximation was used to extrapolate the readings to 1 hour. The pattern presented is not reliable.

No off-site contamination was detected.

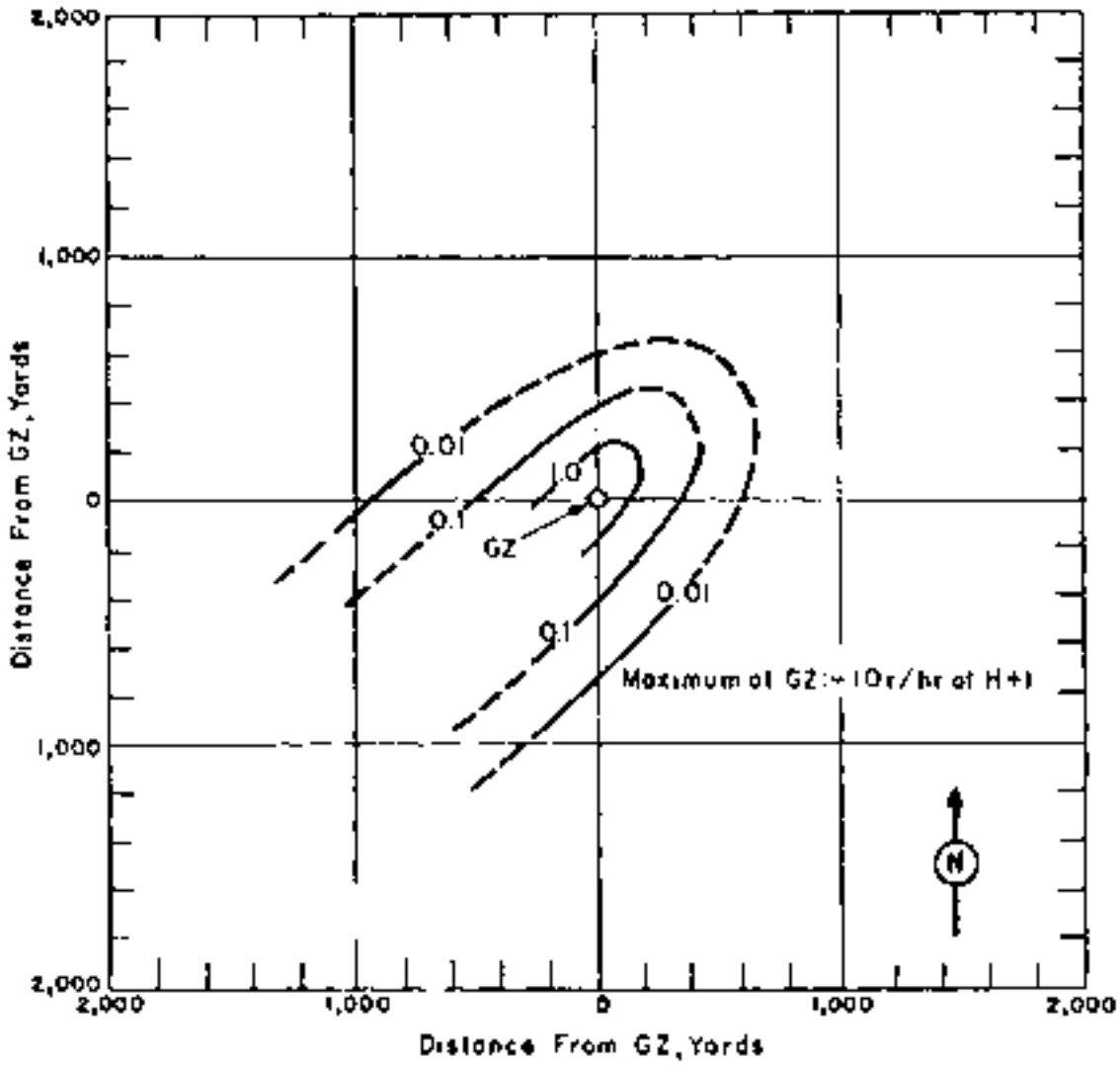


Figure 309. Operation HARDTACK II - Titania.
On-site dose rate contours in r/hr at H+1 hour.

TABLE 103 NEVADA WIND DATA FOR OPERATION HARDTACK II - TITANIA

Altitude (MSL)	H-hour		H+½ hour		H+1½ hours	
	Dir	Speed	Dir	Speed	Dir	Speed
feet	degrees	mph	degrees	mph	degrees	mph
Surface	80	09	80	12	90	11
5,000	60	15	--	--	--	--
6,000	60	15	--	--	--	--
7,000	60	14	--	--	--	--
8,000	70	13	--	--	--	--

NOTES:

1. H-hour data taken from Yucca Lake Weather Station (Elevation 3,924 ft MSL).
2. H+½ hour and H+1½ hours data from 20-foot tower at Station 355 (Surface Elevation about 4,325 ft MSL).

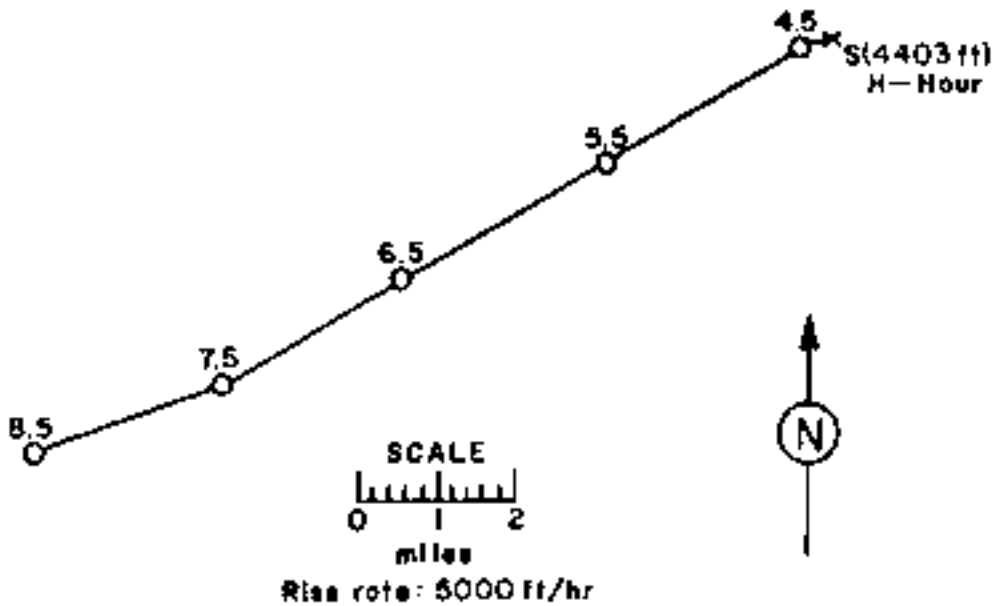


Figure 310. Hodograph for Operation HARDTACK II - Titania.

OPERATION DESCRIPTION - Auxiliary

	PST	GMT
DATE:	15 Sep 1961	15 Sep 1961
TIME:	[illegible]	[illegible]

TOTAL YIELD: 2.4 kt

EXPLOSION DATA: On crater

SPONSOR: LLL

SITE: JOS - 2 (Jorn)
37° 11' 16.104" N
116° 03' 27.024" W
SITE ELEVATION: 7408 ft MSL

DEPTH OF BURST: 1500 ft

TYPE OF DUCT, AND PLUGGING:
Tunnel, [illegible]

STRUCTURAL DAMAGE:

Tunnel - Portal [illegible] to cause [illegible] and blocked [illegible]

VENTING:

Venting started at the tunnel portal at 042 seconds for an [illegible] duration. A [illegible] was observed for 8 to 10 minutes following the detonation.

The peak [illegible] at the tunnel portal, normalized to 1 kt yield, was 50 R/hr. The estimated total release, normalized to 1 kt yield, was 5x10[illegible] and contained the following isotopes: I[illegible], I[illegible], I[illegible], Kr[illegible].

REMARKS:

Some radioactivity was detected in off-site areas. No radiation was detected at the surface or any other location, from releases of gases or radioactivity during post-shot drilling or tunnel recovery operations.

OPERATION NOUGAT - Storax

	PST	GMT
DATE:	16 Sep 1961	16 Sep 1961
TIME:	1145	1945

SPONSOR: LASL

SITE: NTS - U3ax
37° 02' 54.432" N
116° 01' 29.5016" W

DEPTH OF BURST: 372 ft

TYPE OF SOIL AND PLACEMENT:
Underground, in alluvium consolidated alluvium

VENTING:

This event released small visible quantities of radioactive steam and/or gases.

REMARKS:

Radiation was detected on-site from radioactivity released by this detonation, but no radiation levels above background were detected off the NTS in populated areas. No radiation was detected at the worksite or any other location, from releases of gaseous radioactivity during post-shot drilling.

OPERATION NOUGAT - Chena

	PST	GMT
DATE:	10 Oct 1961	10 Oct 1961
TIME:	1000	1800

SPONSOR: LRL

SITE: NTS - U12n.03
37° 11' 39.4413" N
116° 12' 25.2736" W

SITE ELEVATION: 7472 ft MSL

DEPTH OF BURST: 838 ft

TYPE OF BURST AND PLACEMENT:
Tunnel, in slightly unsaturated tuff

VENTING:

Venting occurred at the tunnel portal at H+2 seconds and continued for approximately 20 minutes.

The estimated dose rate at the tunnel portal, normalized to H+1 hour, was 35 R/hr. The estimated total release, normalized to H+1 minute, was 2×10^{0} curies. The identities of the release products are not available.

REMARKS:

No radiation levels above background were detected off the NTS in populated areas from radioactivity released by this detonation. No radiation was detected at the worksite or at any other location, from releases of gaseous radioactivity during post-shot drilling or tunnel re-entry operations.

OPERATION NOUGAT - Miwok

	PST	GMT
DATE:	29 Oct 1961	29 Oct 1961
TIME:	1030	1830

SPONSOR: LASL

SITE: NTS - U3ac
37° 02' 56.8432" N
116° 01' 51.9491" W

SITE ELEVATION: 4025 ft MSL

DEPTH OF SHOT: 630 ft
DEPTH OF EMPLACEMENT HOLE: 640 ft
TYPE OF TEST AND PLACEMENT:
Underground, in alluvium

VENTING:

Some gas seepage was evidenced at 0425 minutes.

REMARKS:

Radiation was detected on-site from radioactivity released by this detonation. Produced measurable contamination of off-site milk supplies caused levels of contamination in milk in Hiko, Nevada, to jump to 720 pc/l, 4 days after the shot. Some radiation was detected in the areas surrounding S2 from gaseous radioactivity released during post-shot drilling. No radiation was detected off the NTS from post-shot operations.

[illegible] [illegible] [illegible] - [illegible]

	LOCAL	GMT
DATE:	[illegible]	[illegible]
TIME:	[illegible]	[illegible]

TOTAL YIELD: 13.5 kt

EMPLACEMENT:
[illegible]
Diameter: [illegible]
Depth: 70 ft

SPONSOR: [illegible]

SITE: [illegible]
37° [illegible]
116° [illegible] W

[illegible]: [illegible]

TYPE [illegible]:
[illegible]

VENTING:

This event released small visible quantities of radioactive [illegible] [illegible].

REMARKS:

Radiation was detected on-site from radioactivity released by this detonation. [illegible] in populated areas from radioactivity [illegible].

Some radiation was detected in the [illegible] radioactivity released during post-shot drilling.

PROJECT GNOME

	MST	GCT
DATE:	10 December 1961	10 Dec 1961
TIME:	1200	1900

YIELD: 3.1 kt

SPONSOR: USAEC

SITE: Near Carlsbad, New Mexico
32° 15' 49" N
103° 54' 57" W

SITE ELEVATION: 3990 ft MSL

DEPTH OF BURST: 1154 ft

TYPE OF BURST AND PLATFORM:
Underground, in bedded rock salt

CRATER DATA:
No crater

VENTING:

Radiation was detected at the blast door at the bottom of the shaft less than one minute following the explosion; and at the shaft collar, 1 minute and 40 seconds after the detonation. At approximately 7 minutes after the detonation, gray smoke, steam, and associated radioactivity surged from the shaft opening. By 11 minutes following the explosion, copious quantities of steam were issuing from both shaft and ventilation pipes. A large flow continued for about 30 minutes before gradually decreasing. A small flow was still detected the following day. The radioactive elements that vented through the shaft were volatile and noble gases.

RESULTS:

Figure 8 shows the measured cloud pattern and times of measurement. All readings are gross gamma measured inside the aircraft. Attenuation of radiation by the aircraft structure was not determined, but was probably in the range of 30 to 50 percent.

Meteorological Information:

Wind at the surface: 150 degrees - 4.6 mph
Wind at 200 feet: 140 degrees - 16 mph
Surface air temperature: 46.3°F
Surface relative humidity: 72%
Surface atmospheric pressure: 26.74 inches of mercury

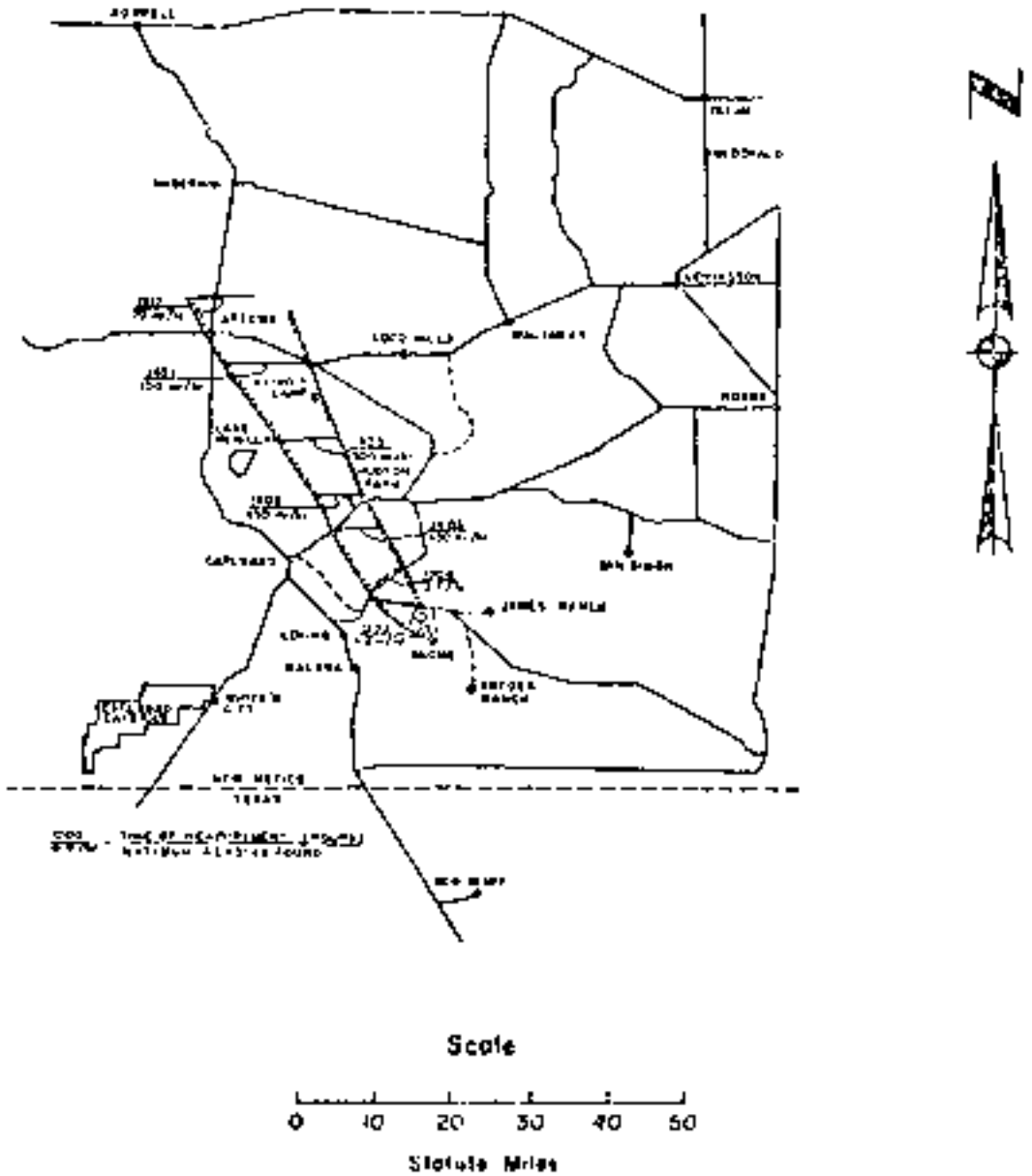


Figure 311. Project Gnome - Cloud pattern as found by Aerial Monitoring

OPERATION NOUGAT – Mud

	PST	GMT
DATE:	13 Dec 1961	13 Dec 1961
TIME:	1000	1600

TOTAL YIELD: 0.43 kt

CRATER DATA: No crater

SPONSOR: LRL

SITE: NTS - U9a
37° 07' 35.77" N
116° 02' 54.54" W

DEPTH OF BURST: 594 ft

TYPE OF BURST AND PLACEMENT:
Underground, in slightly consolidated alluvium

VENTING:

This event released small visible quantities of radioactive steam and/or gases.

REMARKS:

Radiation was detected on-site from radioactivity released by this detonation. No radiation levels above background were detected off the NTS in populated areas from radioactivity released by this detonation.

No radiation was detected at the worksite or any other location, from releases of gaseous radioactivity during post-shot drilling.

OPERATION NOUGAT – Ringtail

	PST	GMT
DATE:	17 Dec 1961	17 Dec 1961
TIME:	0835	1635

SPONSOR: LASL

SITE: NTS - U3ak
37° 02' 35.38" N
116° 01' 31.13" W

DEPTH OF BURST: 1197 ft

TYPE OF BURST AND PLACEMENT:
Underground, in alluvium

VENTING:

This event released small visible quantities of radioactive steam and/or gases.

REMARKS:

Radiation was detected on-site from radioactivity released by this detonation. No radiation levels above background were detected off the NTS in populated areas, from radioactivity released by this detonation.

No radiation was detected at the worksite or any other location from releases of gaseous radioactivity during post-shot drilling.

OPERATION NOUGAT - Feather

	PST	GMT
DATE:	22 Dec 1961	22 Dec 1961
TIME:	0830	1630

SPONSOR: LRL

SITE: NTS - Hidalgo
37° 11' 41.76" N
116° 12' 29.84" W

SITE ELEVATION: 7449 ft MSL

DEPTH OF BURST: 812 ft

TYPE OF BURST AND PLACEMENT:
Tunnel, in competent to incompetent tuff.

VENTING:

At H hour a small cloud which appeared to be typical gas-venting, rose from a tunnel portal and vent pipes on top of the mesa and endured for 11 minutes.

The estimated dose rate at the tunnel portal, normalized to H+1 hour, was 18 R/hr. The estimated total release, normalized to H+1 minute, was 1×10^6 curies. The isotope identities are not available.

REMARKS:

At H+30 minutes a branch tunnel was monitored at 40 mR/hr, and a location 1/2 mile southwest and downwind from the venting origin was monitored to be 100 mR/hr at the same time.

Some radioactivity was detected in off-site areas. No radiation was detected at the worksite or any other location, from releases of gaseous radioactivity during post-shot drilling or tunnel re-entry operations.

OPERATION NOUGAT -- Stoat

	PST	GMT
DATE:	9 Jan 1962	9 Jan 1962
TIME:	0830	1630

TOTAL YIELD: 4.5 kt

CRATER DATA:
Subsidence crater
Diameter: 350 ft
Depth: 7 ft

VENTING:
Vented

SPONSOR: LASL

SITE: NTS - U3ap
37° 02' 40.70" N
116° 02' 06.23" W

DEPTH OF BURST: 992 ft

TYPE OF BURST AND PLACEMENT:
Underground, in alluvium

REMARKS:

Radiation was detected on-site from radioactivity released by this detonation. No radiation levels above background were detected off the NTS in populated areas, from radioactivity released by this detonation.

Some radiation was detected in the area surrounding, SZ from gaseous radioactivity released during post-shot drilling. No radioactivity was detected off the NTS from post-shot operations.

OPERATION KOUGAT - Agouti

	PST	GMT
DATE:	18 Jan 1962	18 Jan 1962
TIME:	1000	1800

TOTAL YIELD: 5.9 kt

CRATER DATA:
Subsidence crater
Diameter: 500 ft
Depth: 50 ft

VENTING:
None

SPONSOR: LASL

SITE: NTS - UJac
37° 02' 50.08" N
116° 02' 03.69" W

DEPTH OF BURST: 856 ft

TYPE OF BURST AND PLACEMENT:
Underground, in alluvium

REMARKS:

No radiation levels above background were detected on or off the NTS, from radioactivity released by this detonation.

No radiation was detected at the worksite or any other location, from releases of gaseous radioactivity during post-shot drilling.

OPERATION NOUGAT - Dormouse

	PST	GMT
DATE:	30 Jan 1962	30 Jan 1962
TIME:	1000	1600

SPONSOR: LASL

SITE: NTS - U3aq
37° 02' 48.64" N
116° 02' 22.14" W

DEPTH OF BURST: 1191 ft

TYPE OF BURST AND PLACEMENT:
Underground, in alluvium

VENTING:

This event released small visible quantities of radioactive steam and/or gases.

REMARKS:

Radiation was detected on-site from radioactivity released by this detonation. No radiation levels above background were detected off the NTS in populated areas from radioactivity released by this detonation.

Some radiation was detected in the area surrounding SZ from gaseous radioactivity released during post-shot drilling. No radioactivity was detected off the NTS from post-shot operations.

OPERATION NOUGAT - Stillwater

	PST	GMT
DATE:	8 Feb 1962	8 Feb 1962
TIME:	1000	1600

TOTAL YIELD: 2.7 kt

CRATER DATA:
Subsidence crater
Diameter: 450 ft
Depth: 32 ft

VENTING:
None, except during post-shot drilling

SPONSOR: LRL

SITE: NTS - U9r
37° 07' 38.09" N
116° 03' 09.15" W

SITE ELEVATION: 4208 ft MSL

DEPTH OF BURST: 625 ft

TYPE OF BURST AND PLACEMENT:
Underground, in slightly consolidated alluvium

REMARKS:

No radiation levels were detected above background on or off the NTS, from radioactivity released by this detonation.

Some radiation was detected in the area surrounding SZ from gaseous radioactivity released during post-shot drilling. No radioactivity was detected off the NTS from post-shot operations.

OPERATION NOUGAT - Armadillo

	PST	GMT
DATE:	9 Feb 1962	9 Feb 1962
TIME:	1030	1800

TOTAL YIELD: 6.6 kt

CRATER DATA:
Subsidence crater
Diameter: 500 ft
Depth: 95 ft

VENTING:
Vented

SPONSOR: LASL

SITE: NTS - U3ar
37° 02' 30.68" N
116° 02' 20.24" W

DEPTH OF BURST: 786 ft

TYPE OF BURST AND PLACEMENT:
Underground, in alluvium

REMARKS:

Radiation was detected on-site from radioactivity released by this detonation. No radiation levels above background were detected off the NTS in populated areas from radioactivity released by this detonation.

Some radiation was detected in the area surrounding S7 from gaseous radioactivity released during post-shot drilling. No radioactivity was detected off the NTS from post-shot operations.

OPERATION NOUGAT – Hardhat

	PST	GMT
DATE:	15 Feb 1962	15 Feb 1962
TIME:	1000	1800

TOTAL YIELD: 5.9 kt

CRATER DATA:
No crater

VENTING:
Vented

SPONSOR: DOD

SITE: NTS – U15a
37° 13' 34.7340" N
116° 03' 33.5236" W

SITE ELEVATION: 5114 ft MSL

DEPTH OF BURST: 944 ft

TYPE OF BURST AND PLACEMENT:
Underground, bottom of 36-inch diameter shaft in granodiorite

REMARKS:

Radiation was detected on-site from radioactivity released by this detonation. No radiation levels above background were detected off the NTS in populated areas from radioactivity released by this detonation.

Some radiation was detected in the area surrounding SZ from gaseous radioactivity released during post-shot drilling. No radioactivity was detected off the NTS from post-shot operations.

OPERATION NOUGAT - Chinchilla I

	PST	GMT
DATE:	19 Feb 1962	19 Feb 1962
TIME:	0830	1630

TOTAL YIELD: 1.8 kt

CRATER DATA:
Subsidence crater
Diameter: 300 ft
Depth: 50 ft

SPONSOR: LASL

SITE: NTS - U3ag
37° 02' 56.5909" N
116° 04' 46.3128" W

DEPTH OF BURST: 492 ft

TYPE OF BURST AND PLACEMENT:
Underground, in alluvium

VENTING:

This event released small visible quantities of radioactive steam and/or gases.

REMARKS:

Radiation was detected on-site from radioactivity released by this detonation. No radiation levels above background were detected off the NTS in populated areas from radioactivity released by this detonation.

Some radiation was detected in the area surrounding SZ from gaseous radioactivity released during post-shot drilling. No radioactivity was detected off the NTS from post-shot operations

OPERATION NOUGAT - Cudsaw

	PST	GMT
DATE:	19 Feb 1962	19 Feb 1962
TIME:	0950	1750

SPONSOR: LRL

SITE: NTS - U9g
37° 07' 38.8308" N
116° 02' 13.63" W

SITE ELEVATION: 4218 ft MSL

DEPTH OF BURST: 696 ft

TYPE OF BURST AND EMPLACEMENT:
Underground, in semiwelded tuff

VENTING:
Vented

REMARKS:

Radiation levels were detected near SZ, above normal background, from radioactivity released by this detonation. No other radiation levels were detected on or off the NTS, from radioactivity released by this detonation.

No radiation was detected at the worksite or any other location from releases of gaseous radioactivity during post-shot drilling.

OPERATION NOUGAT - Charleston

	PST	GMT
DATE:	23 Feb 1962	23 Feb 1962
TIME:	1000	1800

TOTAL YIELD: 11.2 kt

CRATER DATA:
Subsidence crater
Diameter: 500 ft
Depth: 40 ft

VENTING:
None except during post-shot drilling

SPONSOR: LRL

SITE: NTS - U9s
37° 07' 43.88" N
116° 02' 53.91" W

SITE ELEVATION: 4208 ft MSL

DEPTH OF BURST: 1000 ft

TYPE OF BURST AND PLACEMENT:
Underground, in slightly consolidated alluvium

REMARKS:

No radiation levels above background were detected on or off the NTS, from radioactivity released by this detonation.

Some radiation was detected in the area surrounding SZ from gaseous radioactivity released during post-shot drilling. No radioactivity was detected off the NTS, from post-shot operations.

OPERATION NOUGAT - Platypus

	PST	GMT
DATE:	24 Feb 1962	24 Feb 1962
TIME:	0830	1630

SPONSOR: LASL

SITE: NTS - Buggy
37° 02' 54" N
116° 01' 54.85" W

DEPTH OF BURST: 190 ft

TYPE OF BURST AND PLACEMENT:
Underground, in alluvium

VENTING:
Vented

REMARKS:

Radiation was detected on-site from radioactivity released by this detonation. No radiation levels above background were detected off the NTS in populated areas from radioactivity released by this detonation.

No radiation was detected at the worksite or any other location from releases of gaseous radioactivity during post-shot drilling.

OPERATION NOUGAT - Pampas

	PST	GMT
DATE:	1 Mar 1962	1 Mar 1962
TIME:	1110	1910

SPONSOR: LASL/UK

SITE: NTS - U3al
37° 02' 30.54" N
116° 01' 44.799" W

SITE ELEVATION: 4012 ft MSL

DEPTH OF BURST: 1191 ft

DEPTH OF EMPLACEMENT POLE: 1201 ft

TYPE OF BURST AND PLACEMENT: Underground, in alluvium

VENTING:

Immediately after detonation, two small clouds floated around in Area 3.

REMARKS:

A maximum dose rate reading of 37 mR/hr at 0445 minutes was evidenced at the BUSTER JANGLE Y (BJY) of the NTS road network, [illegible] radioactivity was detected in off-site areas. Some radiation was detected in the area surrounding U2 from gaseous radioactivity released during post-shot drilling. No radioactivity was detected off the NTS from post-shot operations.

OPERATION NOUGAT — Danny Boy

	PST	GMT
DATE:	5 Mar 1962	5 Mar 1962
TIME:	2015	1815

TOTAL YIELD: 0.42 kt

CRATER DATA:
Diameter: 214 ft
Depth: 62 ft

SPONSOR: LRL/DNA

SITE: NTS - Area 18
37° 06' 30.79" N
116° 21' 53.82" W

SITE ELEVATION: 5477 ft MSL

DEPTH OF BURST: 110 ft

TYPE OF BURST AND PLACEMENT:
Underground, in basalt

VENTING:

A persistent cloud was produced containing appreciable quantities of radioactivity associated with particulates

REMARKS:

The close-in and distant fallout documentation (Figures 1 and 2) was performed by the NOL. AN/PDR-39A ion-chamber instruments were used to measure field gamma dose rates. Most of the measurements from 2,500 ft to 25,000 ft from GZ were accomplished from 0+2 hours to 0+29 hours. Ground surveys beyond 2,500 ft downwind from GZ continued through D+9 days. The area from GZ to a distance of 2,500 ft downwind was surveyed at later times. The dose-rate readings were extrapolated to H+1 hour using a decay approximation. The dotted portions of the patterns indicate uncertainty.

The off-site patterns (Figs.314 & 315) were constructed from aerial survey measurements performed by EG&G and the USGS. The EG&G survey which took place from H+5 to H+7 hours, defines the pattern from miles to approximately 25 miles. Two days later the long-range survey out to 140 miles was made by the USGS.

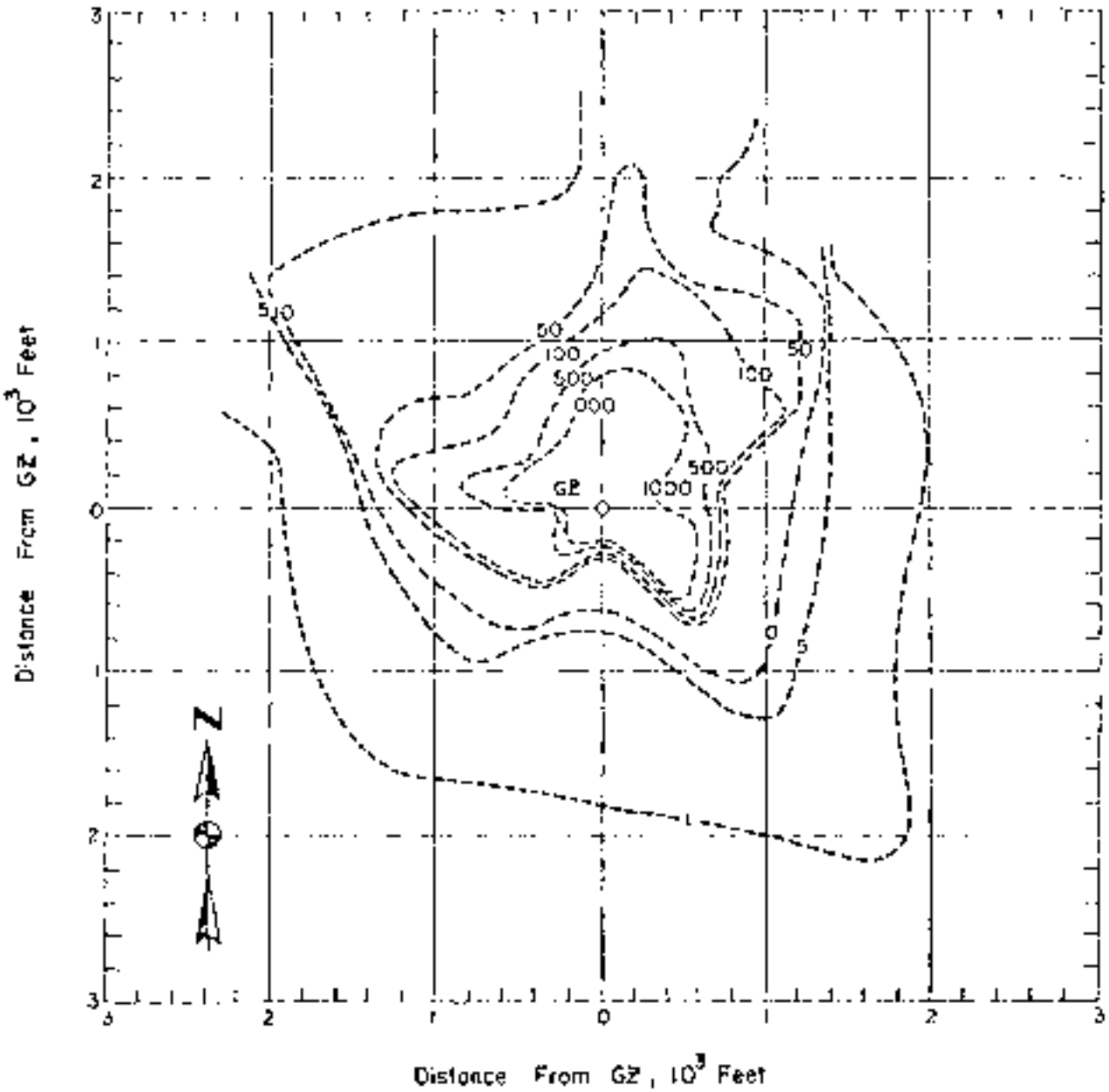


Figure 312 OPERATION NOUGAT - Danny Boy contours of residual radiation in R/hr at H+1 hour to 2,000 feet downwind

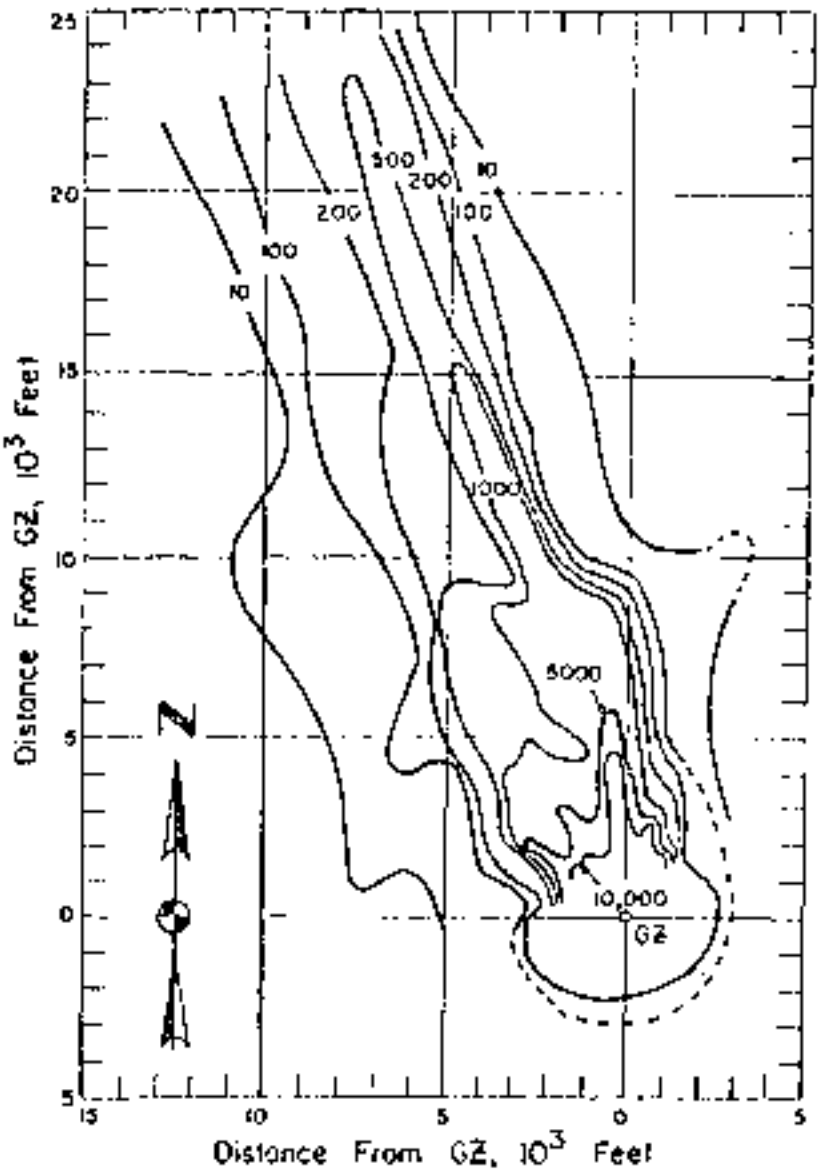


Figure313 OPERATION NOUGAT - Donny Boy contours of residual gamma radiation in mR/hr at H+1 hour to 25,000 feet downwind

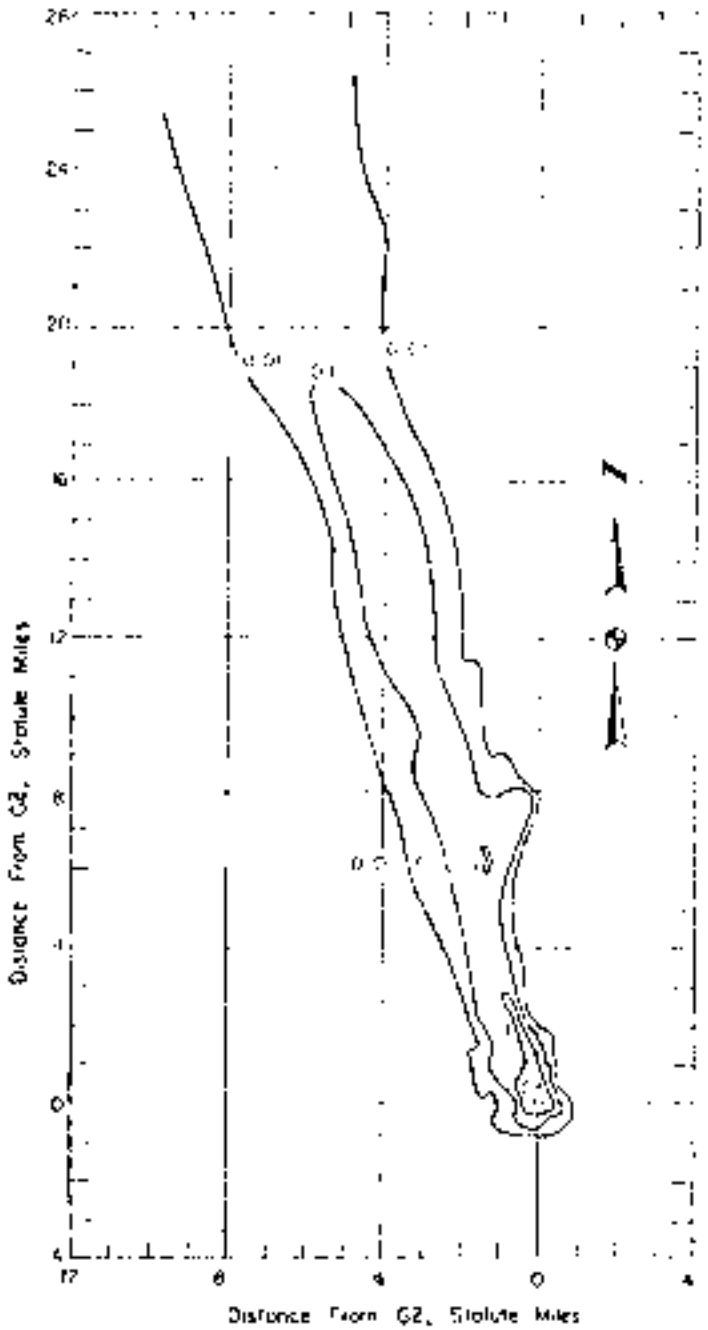


Figure 5.1 OPERATIONS NOMOGAT - Decay flow relationship of residual gate evaluation at Pila at the lower 20 miles downriver.

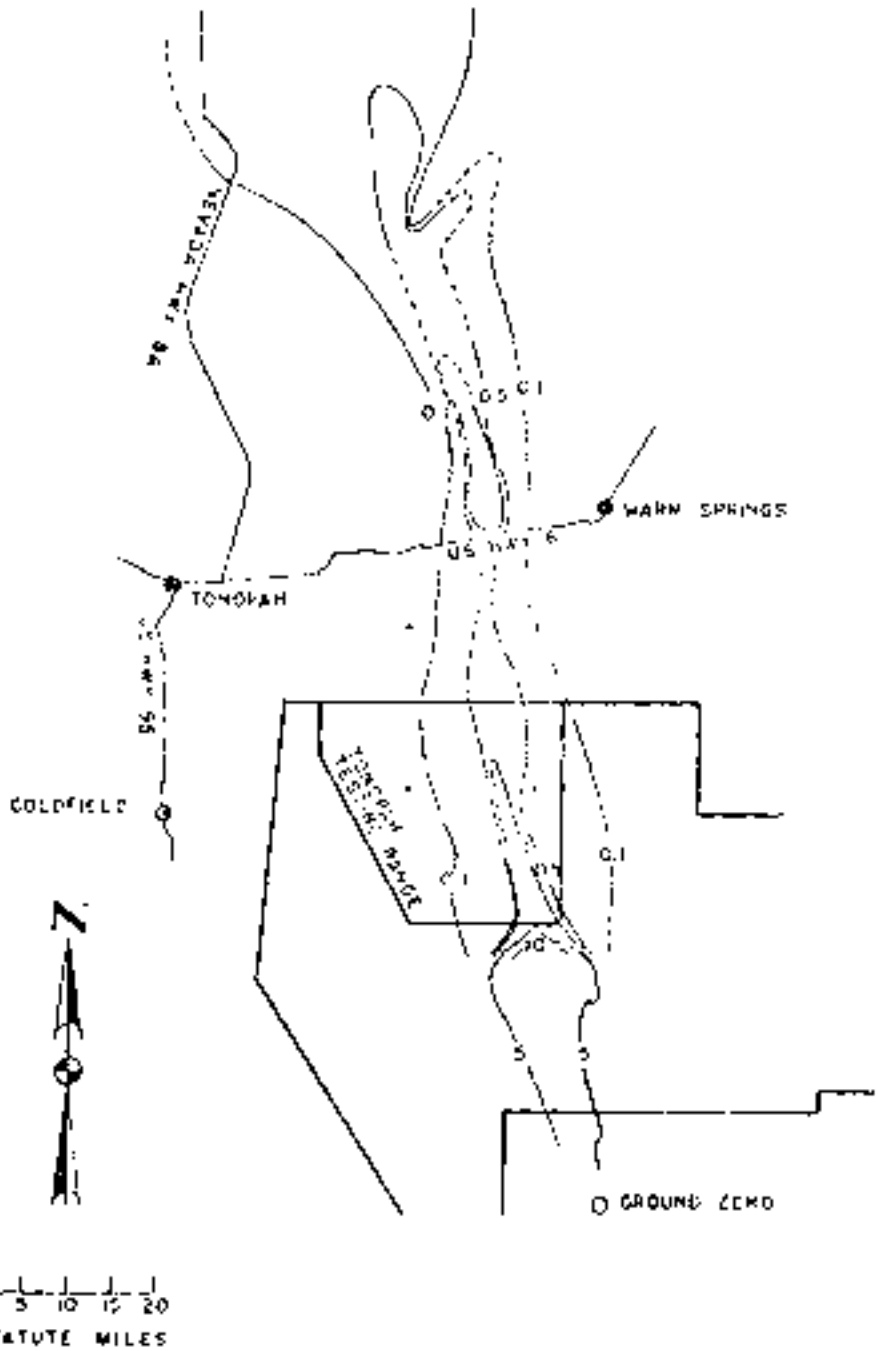


Figure 51. OPERATION NOUGAT - Danny Boy contours of residual gamma radiation in mR/hr at H+1 hour to 140 miles downwind

TABLE 104 NEVADA WIND DATA FOR OPERATION NOUGAT – DANNY BOY

Altitude (MSL)	8+10 minutes	
	Direction	Speed
feet	degrees	mph
5,477	170	13.8
6,000	171	15.0
7,000	178	17.3
8,000	184	23.0
9,000	190	31.2
10,000	192	34.5
11,000	195	39.1
12,000	199	42.6
13,000	202	52.9
14,000	206	54.1

Notes

1. Observations made at Area 18 radar site.

2. Atmospheric pressure was 832 millibars, the temperature was 5.3°C, the dew point temperature was -19.2°C, and the relative humidity was 27% at GZ at 1015 PST.

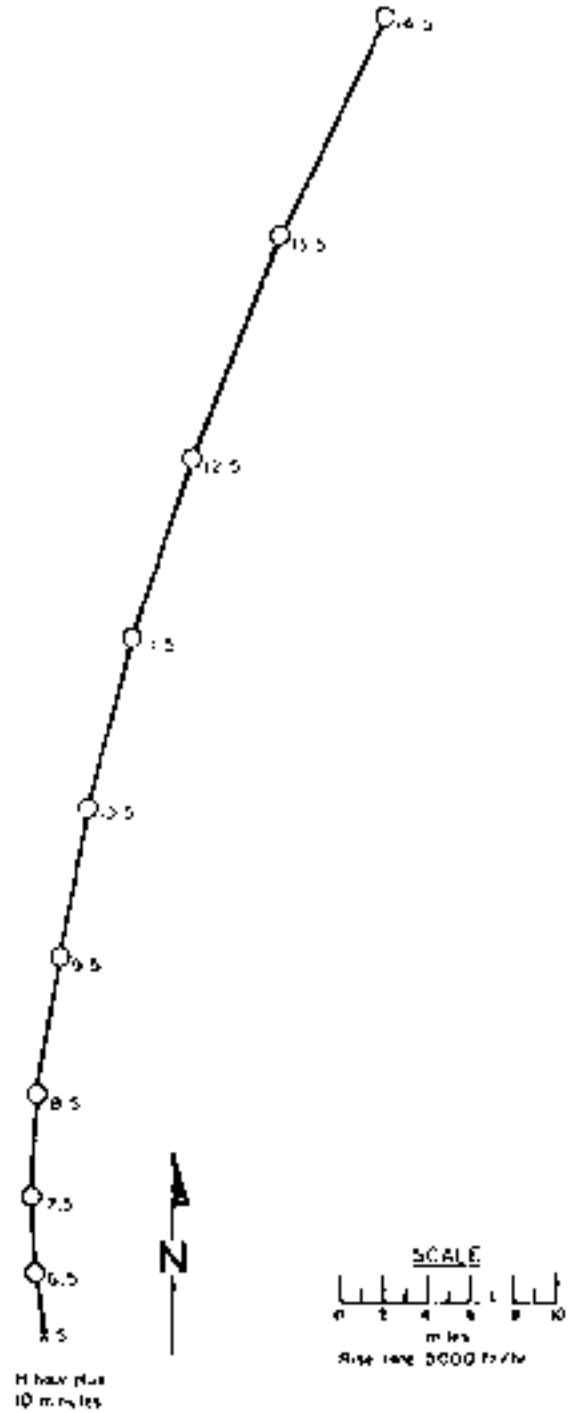


Figure 316. Hodograph for OPERATION NOUGAT – Dummy Day.

OPERATION DIGGER - Byrnes

	PST	GMT
Date:	6 Mar 1962	6 Mar 1962
Time:	0400	1000

SUBSURFACE: LASL

SITE: NTS - Yucca
37° 02' 54.2±5" N
116° 02' 01.0±1" W

DEPTH OF FIRE: 240 ft

TYPE OF MUSSEL AVAILABILITY
Decay, fixed, in effect.

YIELD:
Below threshold during post-shot drilling.

RADIATION:

No radiation levels were detected above background found on or off the site for a radioactivity released by this detonation.

Some radiation was detected in the area surrounding GZ for the subsurface radioactivity released during post-shot drilling. The radioactivity was diluted off the NTS from post-shot operations.

OPERATION NAME: Brazos

	PST	GMT
DATE:	8 Mar 1962	8 Mar 1962
TIME:	1000	1800

TOTAL YIELD: 7.6 kt

SPONSOR: LRL

SITE: NTS - J-13
37° 07' 19.7891" N
116° 02' 55.0678" W

SELF-ELEVATION: 4701 ft MSL

DEPTH OF BURST: 861 ft

TYPE OF BURST AND PLACEMENT:
Underground, in slightly consolidated alluvium

CRATER DATA:
Subsidence crater
Diameter: 450 ft
Depth: 40 ft

VENTING:

This event released small visible quantities of radioactive steam and/or gases.

REMARKS:

Radiation was detected on-site from radioactivity released by this detonation. No radiation levels above background were detected off the NTS in populated areas from radioactivity released by this detonation. Some radiation was detected in the area surrounding SP from gaseous radioactivity released during post-shot drilling. No radioactivity was released from post-shot operations.

OPERATION HOOCAH - Diagnose

	PST	GMT
DATE:	15 Mar 1962	15 Mar 1962
TIME:	0830	1630

SPONSOR: LASL

SITE: NTS - U3.ii
37° 02' 38.269" N
116° 01' 51.774" W

DEPTH OF BURST: 789 ft

TYPE OF BURST AND PLACEMENT:
Underground, in alluvium

VENTING:
None except during post-shot drilling

REMARKS:

No radiation levels were detected above background on or off the NTS from radioactivity released by this detonation. Some radiation was detected in the area surrounding SZ from gaseous radioactivity released during post-shot drilling. No radioactivity was detected off the NTS from post-shot operations.

OPERATION: NOUGAT – Nonsic

	PST	GMT
DATE:	28 Mar 1962	28 Mar 1962
TIME:	1000	1800

TOTAL YIELD: 3 kt

CRATER DATA:
Subsidence crater
Diameter: 310 ft
Depth: 25.3 ft

SPONSOR: LRL

SITE: NTS - U9j
37° 07' 27.5474" N
116° 02' 01.9685" W

SITE ELEVATION: 4291 ft MSL

DEPTH OF BURST: 616 ft

TYPE OF BURST AND PLACEMENT:
Underground, in tuff below alluvium

VENTING:
None except during post-shot drilling

REMARKS:

No radiation levels were detected above background on or off the NTS from radioactivity released by this detonation. Some radiation was detected in the area surrounding SZ from gaseous radioactivity released during post-shot drilling. No radioactivity was detected off the NTS from post-shot operations.

OPERATION NOUGAT - Shrimp III

	PST	GCT
DATE:	15 May 1962	15 May 1962
TIME:	1040	1840

SPONSOR: LASL

SITE: NTS - Climax
37° 02' 56.57" N.
116° 02' 12.17" W

SITE ELEVATION: 6,400 ft MSL

REPORT ELEVATION: 6400 ft

REPORTING ORGANIZATION:
ASL ft

CLOUD TOP HEIGHT: 5600 to MSL

TYPE OF EMISSION: VHF Voice Transmission
Photographic, Instrumentation

VENTING:
A dust cloud was observed at 0 hour.

REMARKS:

A maximum radiation reading of 20 mR/hr was located at SZ at 044 minutes. Some other radiation levels above normal background were detected near SZ. No other radiation levels were detected on or off the NTS from radioactivity released by this detonation. Some radiation was detected in the area surrounding SZ from previous radioactivity released during post-shot drilling. No radioactivity was detected off the NTS from post-shot operations.

OPERATION BOXCAR - Dormouse II

	PST	GMT
DATE:	5 Apr 1962	5 Apr 1962
TIME:	1000	1800

SPONSOR: LASL

SITE: NTS - C3az
37° 03' 40.219" N
116° 01' 24.728" W

TOTAL YIELD: 10 kt

DEPTH OF BURST: 526 ft

CRATER DATA:
Subsidence crater
Diameter: 560 ft
Depth: 87 ft

TYPE OF BURST AND PLACEMENT:
Underground, in alluvium

VENTING:
None except during post-shot drilling

RETARD:

No radiation levels were detected above background on or off the NTS from radioactivity released by this detonation. Some radiation was detected in the area surrounding S2 from gaseous radioactivity released during post-shot drilling. No radioactivity was detected off the NTS from post-shot operations.

OPERATION HOUGAT - Passaic

	PST	GMT
DATE:	6 Apr 1962	6 Apr 1962
TIME:	1000	1800

SPONSOR: LRL

SITE: NTS-U9i
37° 07' 03.6276" N
116° 02' 38.4413" W

SITE ELEVATION: 4183 ft MSL

DEPTH OF BURST: 764 ft

TYPE OF BURST AND PLACEMENT:
Underground, alluvium
tuff contact

VENTING:
None, except during
post-shot drilling

REMARKS:

No radiation levels were detected above background on or off the NTS, from radioactivity released by this detonation. Some radiation was detected in the area surrounding SZ from gaseous radioactivity released during post-shot drilling. No radioactivity was detected off the NTS from post-shot operations.

OPERATION NOUGAT - Hudson

	PST	GMT
DATE:	12 Apr 1962	12 Apr 1962
TIME:	1000	1800

SPONSOR: LRL

SITE: NTS - U9h
37° 07' 37.8426" N
116° 02' 41.5226" W

SITE ELEVATION: 4700 ft MSL

DEPTH OF BURST: 480 ft

VENTING:
None, except during post-shot drilling

TYPE OF BURST AND PLACEMENT:
Underground, in slightly consolidated alluvium

REMARKS:

No radiation levels were detected above background on or off the NTS from radioactivity released by this detonation. Some radiation was detected in the area surrounding SZ from gaseous radioactivity released during post-shot drilling. No radioactivity was detected off the NTS from post-shot operations.

OPERATION DOMINIC - Platter

	PST	GMT
DATE:	26 Apr 1962	27 Apr 1962
TIME:	1600	2300

SPONSOR: DOE

SITE: Base = [illegible]
[illegible]

TOTAL YIELD: 1.7 kt

SHOT TYPE: [illegible]

GROUND ZERO: No station

SHOT DEPTH: [illegible]

CLOUD AT H+1 HOUR: 8,000 ft MSL

STABILITY: [illegible]

TYPE [illegible]
[illegible]
[illegible]

SOIL CONTAMINATION:

Tunnel - [illegible] brown sandy [illegible] and yellow gray [illegible]

VENTING:

Venting occurred at the tunnel portal, through the [illegible], at a vent rate at H+1.5 hours [illegible]. No fixation was [illegible] the crib of the shot, the radial winds toward [illegible].
A per cent cloud was [illegible] quantities of radioactivity associated with particles [illegible] dose rate at the tunnel portal, normalized to one hour, was [illegible] and the estimated total release, corrected to 100 hours, was [illegible]. The volume products contained the following known isotopes: $Pr^{[illegible]}$, $Nd^{[illegible]}$, $Zr\text{-}Nb^{[illegible]}$, $Cr^{[illegible]}$, $Ce^{[illegible]}$, $Kr^{[illegible]}$, $I^{[illegible]}$, $I^{[illegible]}$, $I^{[illegible]}$, $Te^{[illegible]}$,

REMARKS:

The cloud drifted in a northerly direction. The radiation level at H+4.5 hours extended upwind approximately one mile from [illegible] and was contained at 10 mR/hr. [illegible] radioactivity was detected in off-site areas. No radiation was detected at the worksite or any other location from releases of gaseous radioactivity during post-shot drilling or tunnel re-entry operations.

OPERATION NOUGAT - Dead

	PST	GMT
DATE:	21 Apr 1962	21 Apr 1962
TIME:	1040	1840

SPONSOR: LRL

SITE: NTS - U9x
37° 07' 08.4176" N
116° 01' 54.4847" W

SITE ELEVATION: 4361 ft MSL

DEPTH OF BURST: 634 ft

TYPE OF BURST AND PLACEMENT:
Underground, in alluvium

VENTING:
None, except during post-shot drilling

REMARKS:

No radiation levels were detected above background on or off the NTS from radioactivity released by this detonation. Some radiation was detected in the area surrounding SZ from gaseous radioactivity released during post-shot drilling. No radioactivity was detected off the NTS from post-shot operations.

OPERATION NOUGAT - Black

	PST	GMT
DATE:	27 Apr 1962	27 Apr 1962
TIME:	1000	1800

SPONSOR: LRL

SITE: NTS-U9p
37° 07' 06.4610" N
116° 07' 35.9730" W

SITE ELEVATION: 6217 ft MSL

DEPTH OF BURST: 714 ft

TYPE OF BURST AND PLACEMENT:
Underground, in tuff
below alluvium

VENTING:
None, except during
post-shot drilling

REMARKS:

No radiation levels were detected above background on or off the NTS from radioactivity released by this detonation. Some radiation was detected in the area surrounding SZ from gaseous radioactivity released during post-shot drilling. No radioactivity was detected off the NTS from post-shot operations.

OPERATION BOWGAT - Paca

	PST	GMT
DATE:	7 May 1962	7 May 1962
TIME:	1133	1933

SPONSOR: LASL

SITE: NTS - Uyak
37° 02' 47.6237" N
116° 01' 30.0318" W

DEPTH OF BURST: 848 ft

TYPE OF BURST AND PLACEMENT:
Underground, in alluvium

VENTING:
None, except during post-shot drilling

REMARKS:

No radiation levels were detected above background on or off the NTS from radioactivity released by this detonation. Some radiation was detected in the area surrounding S2 from gaseous radioactivity released during post-shot drilling. No radioactivity was detected off the NTS from post-shot operation.

OPERATION NOUGAT - Aardvark

	PST	GCT
DATE:	12 May 1962	12 May 1962
TIME:	1100	1900

TOTAL YIELD: 38 kt

CRATER DATA:
Subsidence crater
Diameter: 950 ft
Depth: 75 ft

VENTING:
Vented

SPONSOR: LASL

SITE: [illegible]
37° 03' 54.6970" N
116° 01' 40.3656" W

DEPTH OF BURST: 1424 ft

TYPE OF BURST AND PLACEMENT:
Underground, in tuff

REMARKS:

Radiation was detected on-site from radioactivity released by this detonation. No radiation levels above background were detected off the NTS in populated areas from radioactivity released by this detonation. Some radiation was detected in the area surrounding SZ from gaseous radioactivity released during post-shot drilling. No radioactivity was detected off the NTS from post-shot operations.

DETONATION REPORT - Eel

	PST	GMT
DATE:	19 May 1962	20 May 1962
TIME:	0700	1400

SPONSOR: LRL

SITE: NTS - U9n
37° 07' 21.8" N
116° 02' 40.956" W

SITE ELEVATION: 4199 ft MSL

DEPTH OF BURST: 714 ft

TYPE OF BURST AND PLACEMENT:
Underground, in alluvium

VENTING:

Venting in the form of a geyser, occurred at H+10 seconds at vent hole U9n-2 and continued steadily until H+19 minutes 42 seconds. A similar venting occurred at H+15 seconds at vent hole U9-m3 and lasted until H+41 minutes. The venting ceased with crater subsidence.

The normalized H+1 hour estimated dose rate at 50k feet from SZ and the normalized H+1 minute estimated total released radioactivity are: 7 R/hr and 5×10^5 curies. The known isotopes are: Zr^{95}, Zr^{97}, Rh^{105}, $Nb-Zr^{97}$, Ce^{141}, Ce^{144}, I^{131}, I^{132}, I^{133}, Te^{132}, and $Ba-La^{140}$.

REMARKS:

Some radioactivity was detected in off-site areas. No radiation was detected at the worksite or any other location from releases of gaseous radioactivity during post-shot drilling. At H+30 minutes readings at 1000 feet from SZ varied between 250 and 500 mR/hr with the exception of a location 1000 feet north of SZ where readings continued at more than 100 R/hr contrary to prediction.

OPERATION NOUGAT - White

	PST	GMT
DATE:	25 May 1962	25 May 1962
TIME:	0700	1500

SPONSOR: LRL

SITE: [illegible]
37° 07' 29.4725" N
116° 03' 07.1518" W

SITE ELEVATION: 4200 ft MSL

DEPTH OF BURST: 635 ft

TYPE OF BURST AND PLACEMENT:
Underground, in alluvium (Leff)

VENTING:
None, except during post-shot drilling

REMARKS:

No radiation levels were detected above background on or off the NTS from radioactivity released by this detonation. Some radiation was detected in the area surrounding SZ from gaseous radioactivity released during post-shot drilling. No radioactivity was detected off the NTS from post-shot operations.

OPERATION NOUGAT - Raccoon

	PST	GMT
DATE:	1 Jun 1962	1 Jun 1962
TIME:	0900	1700

SPONSOR: LASL

SITE: NTS - Yucca
37° 02' 44.206" N
116° 02' 04.059" W

DEPTH OF BURST: 539 ft

TYPE OF BURST AND PLACEMENT:
Underground, in alluvium

VENTING:
None

REMARKS:

No radiation levels were detected above background on or off the NTS from radioactivity released by this detonation. No radiation was detected at the worksite or any other location from releases of gaseous radioactivity during post-shot drilling.

OPERATION NOUGAT - Packrat

	PST	GMT
DATE:	6 Jan 1962	6 Jan 1962
TIME:	0900	1700

SPONSOR: LASL

SITE: NTS - U3ow
37° 02' 44.1761" N
116° 02' 01.4312" W

DEPTH OF BURST: 860 ft

TYPE OF BURST AND PLACEMENT:
Underground, in alluvium

VENTING:
Vented

REMARKS:

Radiation levels were detected near SZ above normal background from radioactivity released by this detonation. No other radiation levels were detected on or off the NTS from radioactivity released by this detonation. Some radiation was detected in the area surrounding SZ from gaseous radioactivity released during post-shot drilling. No radioactivity was detected all the NTS from post-shot operations.

OPERATION NOUGAT - Des Moines

	PST	GST
DATE:	13 Jun 1962	13 Jun 1962
TIME:	1300	2100

SPONSOR: LRL

SITE: NTS - U12j.01
37° 13' 20.00" N
116° 09' 43.78" W

SITE ELEVATION: 6 401 ft MSL

DEPTH OF BURST: 660 ft

SLANT DEPTH: 610 ft

TYPE OF BURST AND PLACEMENT:
Tunnel, in weakly consolidated tuff

VENTING:

Venting began at H+0.2 seconds on top of the hill at SZ, then from a vent hole on the face of the hill and finally through the portal. The duration of the release was approximately 5 minutes.

The estimated dose rate at Access Road normalized to H+1 hour, was 100 R/hr, and the estimated total release, normalized to H+1 minute, was 3×10^{3} curies. The release products contained the following isotopes: I^{131}, Ba^{135}, I^{135}, Te^{132}, Ru^{103}, $Ba\text{-}La^{140}$, and $Ru\text{-}Rh^{106}$. Remote radiation measurements just inside the trailer shelter (see REMARKS) indicate about 100 R/hr at H+2.5 hours and 45 R/hr at H+0.5 hours. The maximum reading a short distance from the portal at H+1 minutes was 30 R/hr.

REMARKS:

The shot vented out of the tunnel mouth with sufficient pressure and flow rate that radioactive debris was projected entirely across the canyon and deposited on the slope behind a trailer shelter. This shelter was not shielded from fallout. The entrance to the shelter faced away from the tunnel but the door was open.

OPERATION [illegible] - Des Moines

The shot caused I^{131} milk contamination in the following locations: Adavan, Nevada, 300 pc/ℓ on 20 June; Elko, Nevada, 610 pc/ℓ on 22 June; and Spokane, Washington, 1,240 pc/ℓ on 20 June. All measurements were made from samples taken from fresh milk except those at Spokane which were made from pooled milk at a pasteurizing plant.

Figure 317 shows contours of residual gamma radiation in units of thousands of counts per second at 500 feet above the ground and are dashed where estimated. Pre-Des Moines background is assumed to be 1,000 counts per second. The aerial surveys were performed by AMES-1 (USGS) on 27, 28, and 30 June 1962.

No radiation was detected at the worksite or any other location from releases of gaseous radioactivity during post-shot drilling and tunnel re-entry operations.

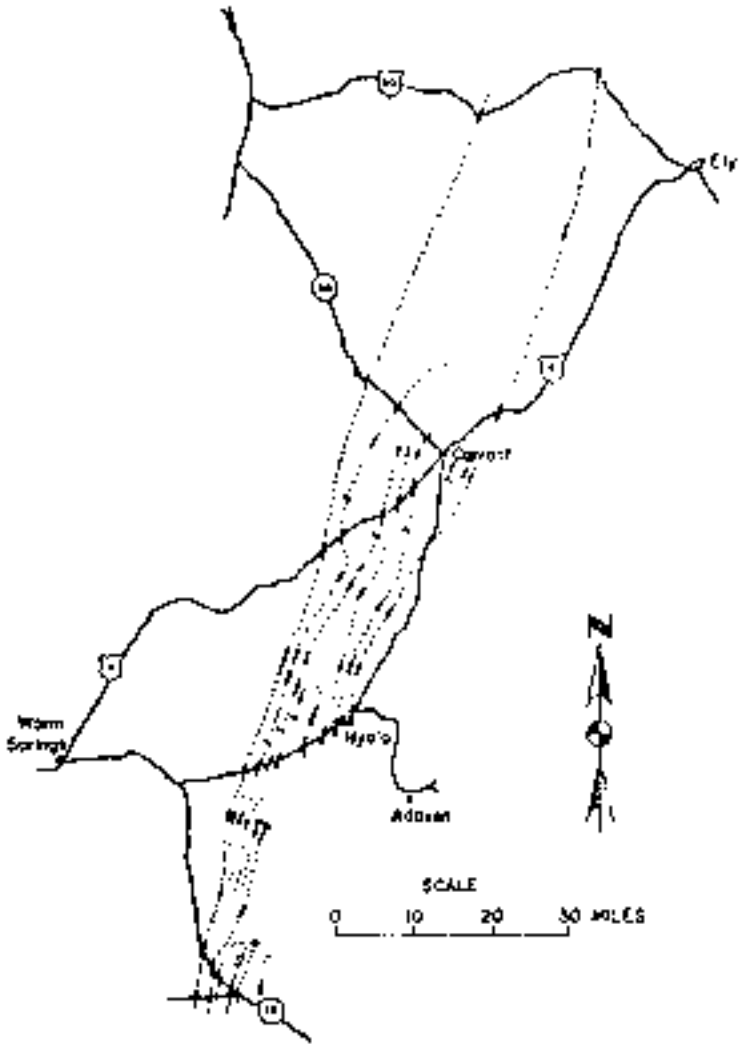


Figure 317 OPERATION NOUGAT – Dos Rotues contours of residual gamma radiation in thousands of counts per second at 300 feet above the ground at H+14 days

TABLE 105 NEVADA WIND DATA FOR OPERATION NOUGAT - [illegible] DOS MOINES

Altitude (MSL)	H-hour (Note 1)	
	Direction	Speed
feet	degrees	mph
5,635	204	32.2
6,000	200	32.2
7,000	198	33.4
8,000	200	33.4
9,000	204	29.9
10,000	206	29.9
11,000	206	29.9
12,000	204	29.9
13,000	205	28.8
14,000	206	28.8
15,000	206	29.9

Notes

1. Observations made at Yucca weather station.

2. Surface data (from RAD9) at level of GZ over Area 12, H-hour: Atmospheric pressure 819 millibars, temperature 20.3°C, relative humidity 12%.

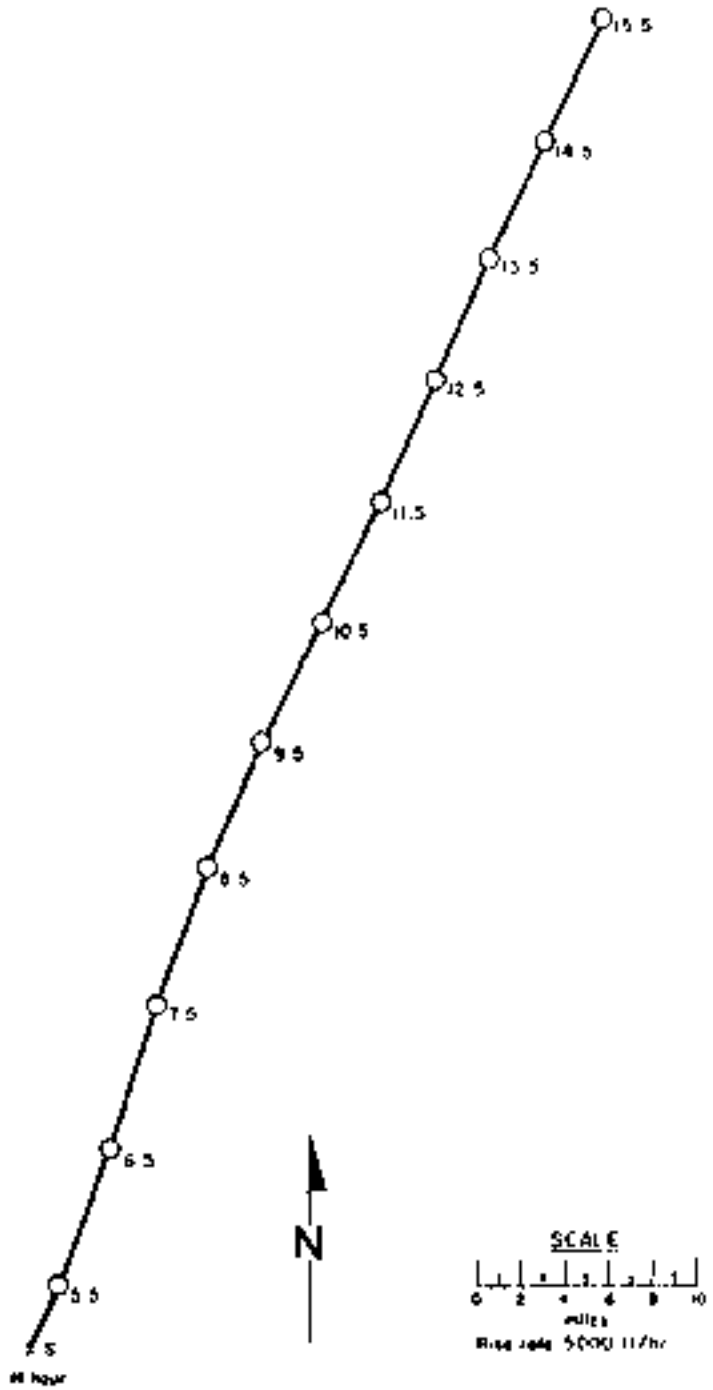


Figure 318. Hodograph for OPERATION NOUGAT - Des Moines

OPERATION SUNBEAM – Danny I

	PST	GMT
DATE:	21 Jun 1962	21 Jun 1962
TIME:	0900	1700

SPONSOR: LASL

SITE: NTS – U3he
37° 02' 45.0325" N
116° 01' 49.9090" W

DEPTH OF BURST: 854 ft

TYPE OF BURST AND PLACEMENT:
Underground, in alluvium

VENTING:
Vented

REMARKS:

Radiation levels were detected near SZ above normal background from radioactivity released by this detonation. No other radiation levels were detected on or off the NTS from radioactivity released by this detonation. Some radiation was detected in the area surrounding SZ, from gaseous radioactivity released during post-shot drilling. No radioactivity was detected off the NTS from post-shot operations.

OPERATION NOUGAT – Haymaker

	PST	GMT
DATE:	27 Jun 1962	27 Jun 1962
TIME:	1000	1800

TOTAL YIELD: 56 kt

CRATER DATA:
Subsidence crater
Diameter: 950 ft
Depth: 70 ft

SPONSOR: LASL

SITE: NTS – Climax
37° 02' 29.7466" N
116° 02' 06.8626" W

DEPTH OF BURST: 1340 ft

TYPE OF BURST AND PLACEMENT:
Underground, in alluvium

VENTING:

Small visible quantities of radioactive steam and/or gas were released.

REMARKS:

Fractionation of debris made analysis of yield difficult.

Some radiation was detected on-site from radioactivity released by this detonation. The shot produced detectable I^{131} contamination in milk. It produced levels of 180 pc/ℓ in milk on 30 June at Austin, Nevada

Some radiation was detected in the area surrounding SZ from gaseous radioactivity released during post-shot drilling. No radioactivity was detected off the NTS from post-shot operations.

OPERATION NOUGAT – Marshmallow

	PST	GMT
DATE:	28 Jun 1962	28 Jun 1962
TIME:	0900	1700

SPONSOR: DOD

SITE: NTS - U16a
37° 00' 32.7636" N
116° 12' 03.7573" W

SITE ELEVATION: 6543 ft, MSL

DEPTH OF BURST: 1050 ft

SLANT DEPTH: 900 ft

VENTING:
Vented

TYPE OF BURST AND PLACEMENT:
Tunnel, in semiwelded tuff

REMARKS:

Radiation was detected on-site from radioactivity released by this detonation. No radiation levels above background were detected off the NTS in populated areas from radioactivity by this detonation. No radiation was detected at the worksite or any other location from releases of gaseous radioactivity during post-shot drilling and tunnel re-entry operations.

OPERATION NOUGAT - Sacramento

	PST	GMT
DATE:	30 Jun 1962	30 Jun 1962
TIME:	1330	2130

SPONSOR: LRL

SITE: NTS - U9v
37° 07' 02.6885" N
116° 02' 50.6975" W

SITE ELEVATION: 4176 ft MSL

DEPTH OF BURST: 500 ft

TYPE OF BURST AND PLACEMENT:
Underground, in slightly consolidated alluvium

VENTING:
None

REMARKS:

No radiation levels were detected above background on or off the NTS from radioactivity released by this detonation. No radiation was detected at the worksite or any other location from releases of gaseous radioactivity during post-shot drilling.

PROJECT SEDAN

	PST	GMT
DATE:	6 Jul 1962	6 Jul 1962
TIME:	0900	1700

TOTAL YIELD: 119 kt

SPONSOR: LRL

SITE: NTS – U10h
37° 10' 37.2269" N
116° 02' 43.3503" W

SITE ELEVATION: 4317 ft MSL

DEPTH OF BURST: 635 ft

TYPE OF BURST AND PLACEMENT:
Underground, in alluvium

CRATER DATA:
Diameter: 1214 ±15 ft.
Depth: 320 ft

CLOUD TOP HEIGHT:
16,000 ft MSL

STEMMING MATERIAL:

A 16-inch diameter cased drill hole backfilled with dry sand

VENTING:

A persistent cloud was produced containing appreciable quantities of radioactivity associated with particulates.

REMARKS:

The fallout was documented to a distance of approximately 140 statute miles downwind. The bulk of the data was taken in the period H+20 to H+28 hours and, since the decay was unknown, by referencing these data to H+24 hours using $t^{-1.2}$ decay, the error introduced is relatively small. The values thus obtained are considered reasonably reliable both on-site and off-site.

The significant contributors to the H+24-hour gamma dose rate were fission products, W^{187}, and Na^{24}. Approximately 42% of the gamma dose rate (H+24 hour) was due to fission products, 55% due to W^{187}, 2% due to Na^{24} and <1% due to W^{181}, W^{188}, Be^{7}, Mn^{54} and trocets.
It was assumed that there was no fractionation and that like fractions of components escaped from the crater.

Figs.319 & 320 present the gamma dose-rate contours at H+1 hour for the close-in and distant areas respectively. Dashed portions of contours indicate uncertainty. The patterns were reduced to show dose rate from fission products at H+1 hour, by multiplying the H+24-hour contour values by 0.42 and extrapolating those values to H+1 hour.

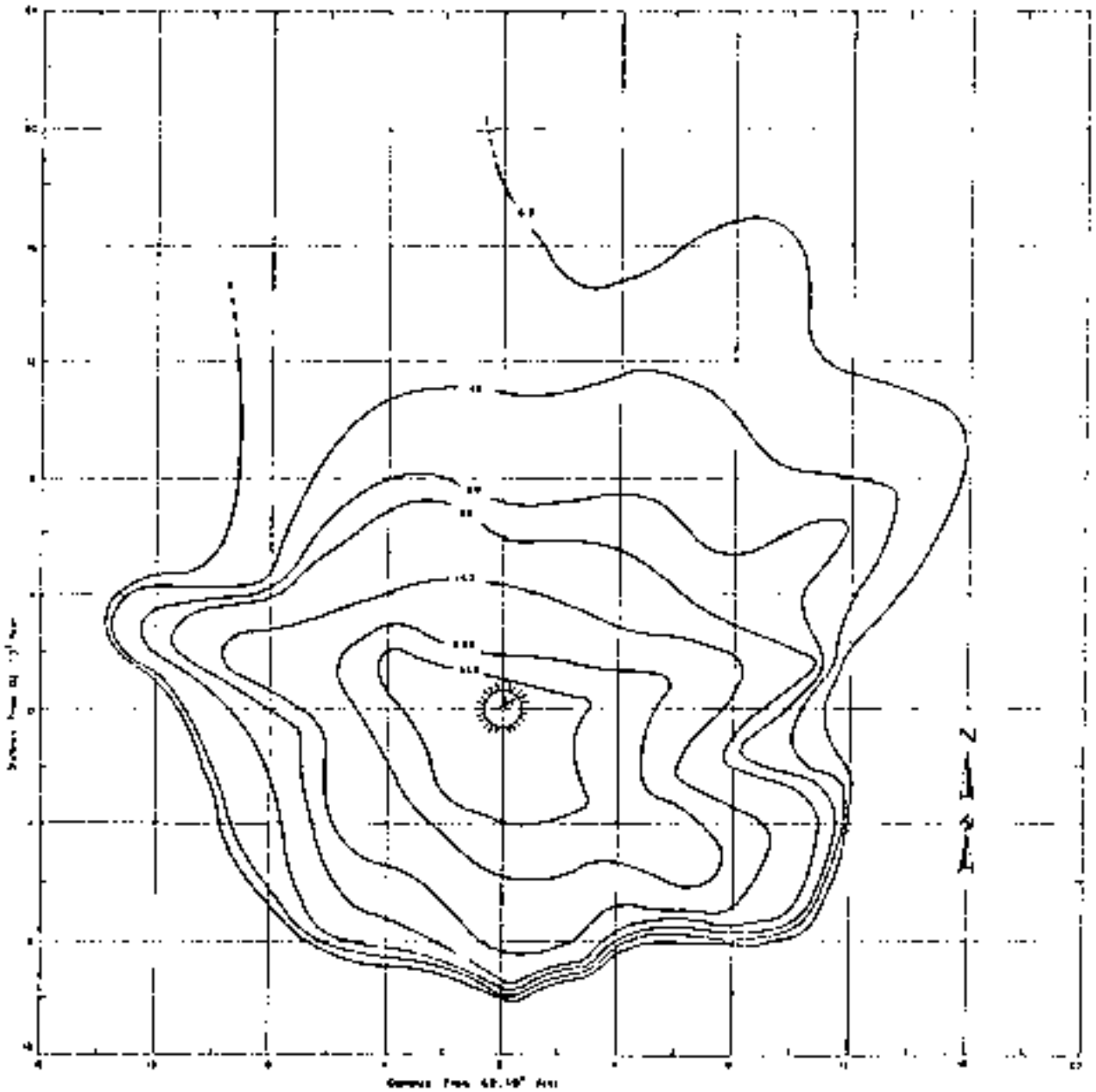


Figure 319 Project Sedan - Contours of residual gamma radiation (for fission products) in R/hr at H+1 hour to 20,000 feet

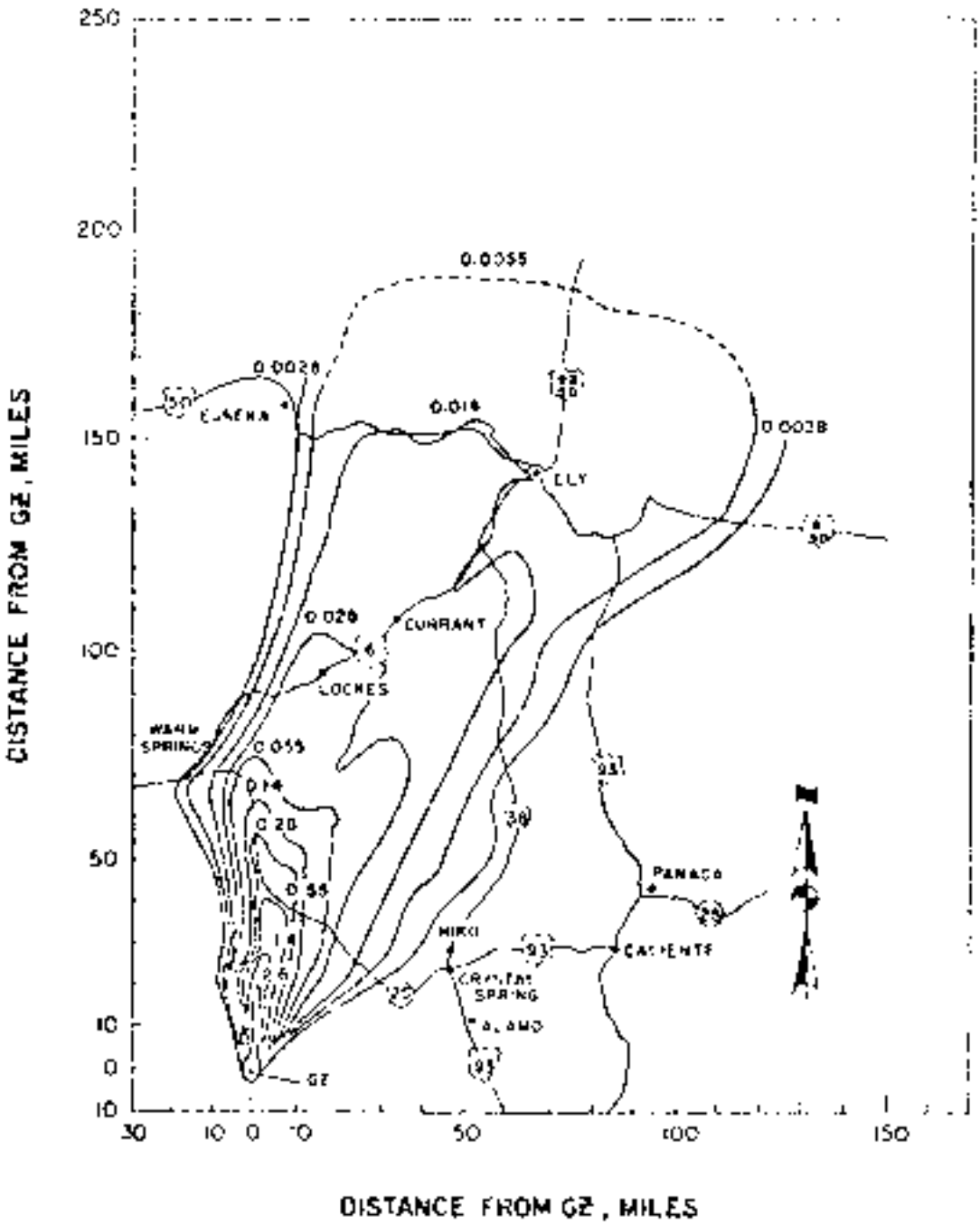


Figure 5.2(1) Project Sedan - Contours of residual gamma radiation (for fission products) in R/hr at 1 hour to 140 miles downwind

TABLE 106 NEVADA WIND DATA AT B-7 FOR PROJECT SEDAN

Altitude (MSL)	H+13 minutes	
	Direction	Speed
feet	degrees	mph
Surface	160	11.5
5,000	150	11.5
6,000	170	10.4
7,000	200	10.4
8,000	210	12.7
9,000	220	15.0
10,000	210	18.4
11,000	200	23.0
12,000	200	30.0
13,000	190	26.5
14,000	190	19.6
15,000	190	15.0
16,000	180	9.2
17,000	220	6.9
18,000	220	6.9
19,000	250	6.9

Notes

1. Observation point: B-7, 4076 ft MSL; 4200 ft south of GZ.

2. Surface data for Area 10 at H+22 minutes:

Atmospheric pressure: 868 millibars
Temperature: 28.5°C
Dew point temperature: below instrumental threshold.
Relative humidity: below instrumental threshold.

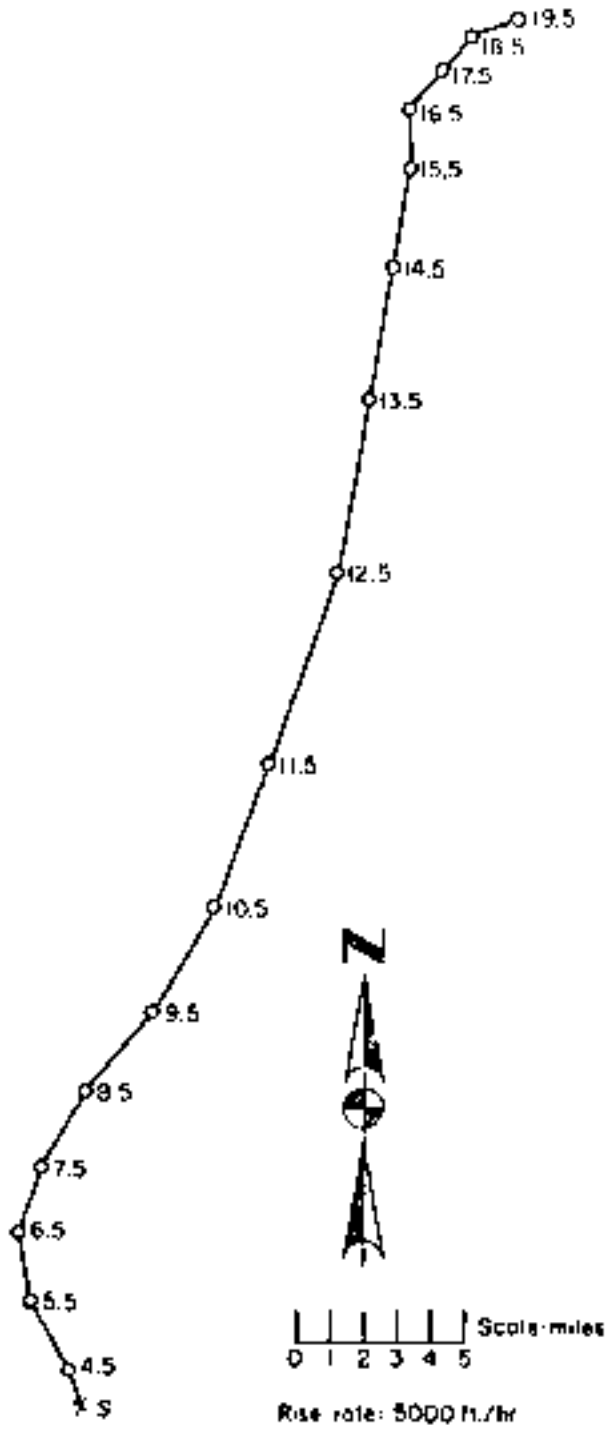


Figure 321. Hodograph for project Sedan

OPERATION SUNBEAM - Little Feller II

	PST	GMT
DATE:	7 Jul 1962	7 Jul 1962
TIME:	1100	1900

SPONSOR: DOD

SITE: NTS - Area 18
37° 07' 09.2411" N
116° 18' 10.3321" W

SITE ELEVATION: 5129 ft MSL

HEIGHT OF BURST: 3 ft

TYPE OF BURST AND PLACEMENT:
Near-surface, over Nevada soil. Device supported by a cable suspended between two posts.

CLOUD TOP HEIGHT:
11,000 ft MSL

REMARKS:

The close-in and distant contours of residual radiation are shown in Figures 322 thru 324. All the contours are considered reliable. The contours in Figures 322 thru 324 were supplemented by data from REECo Rad-Safe Group and other projects.

The REECo D-Day and D+1 day data used were corrected to H+1 hour. Dashed portions of contours indicate uncertainty.

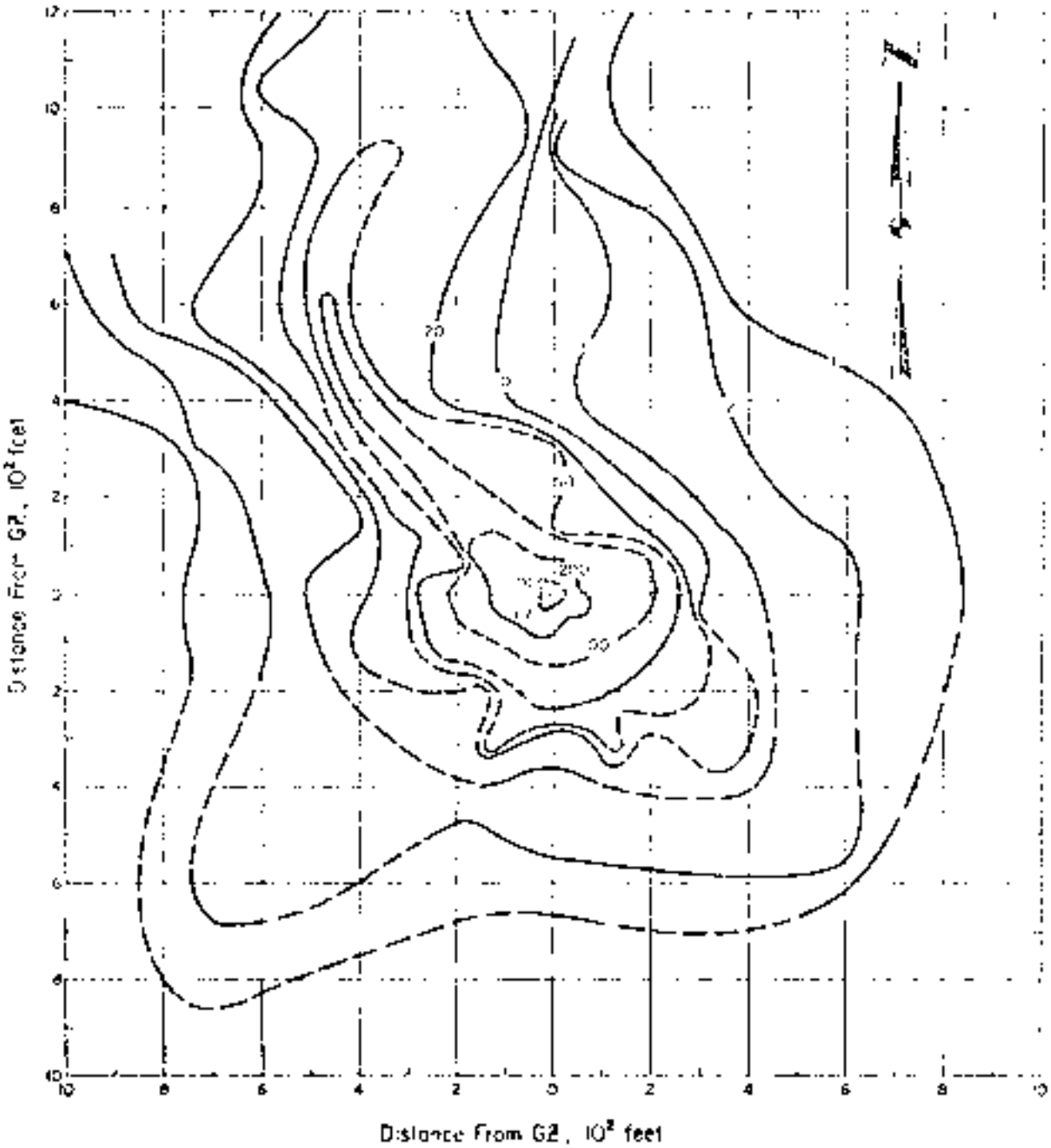


Figure 322. OPERATION SUNBEAM - Little Feller II contours of residual ground radiation in R/hr at 01 hour to 1,200 feet downwind

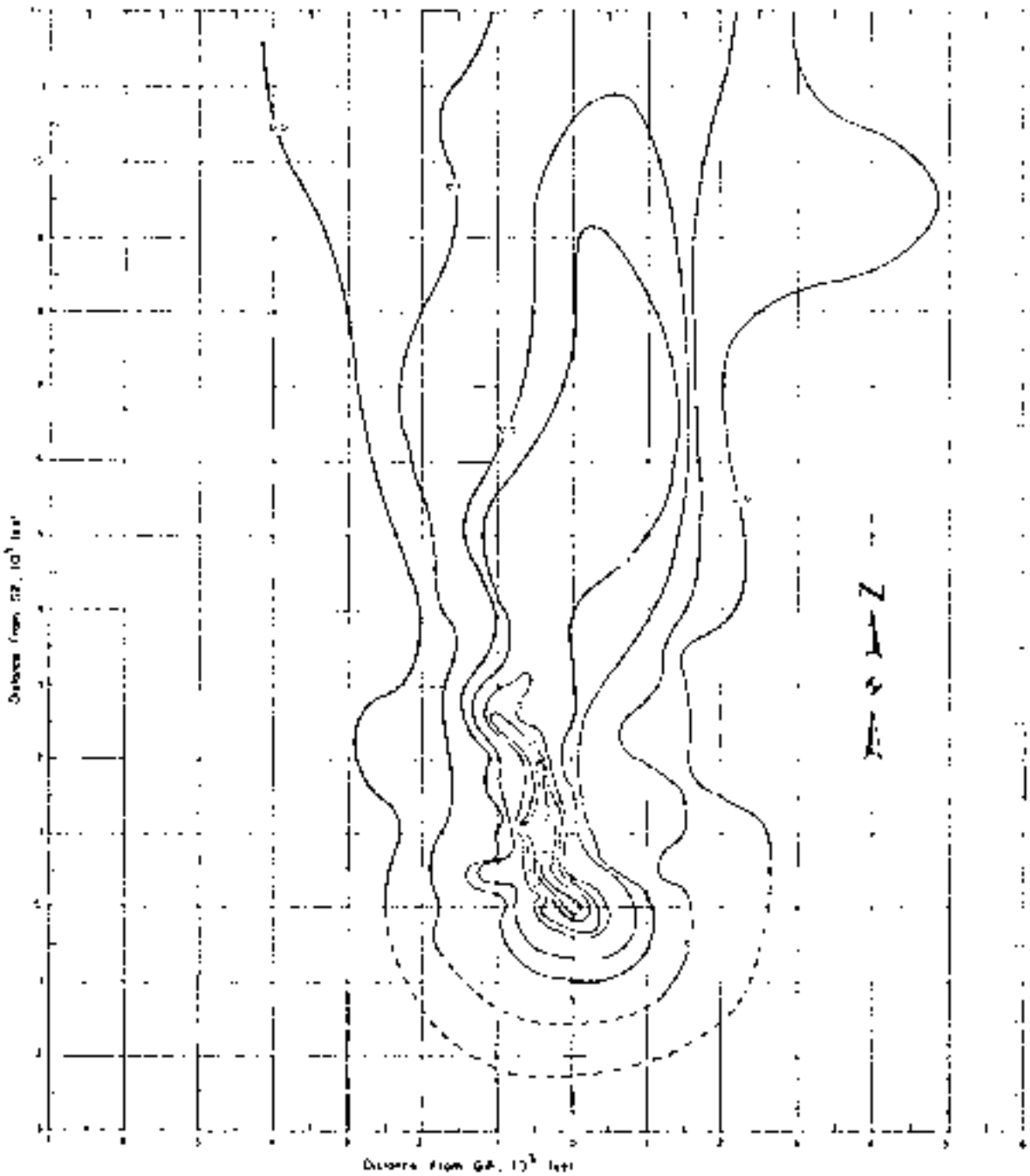


Figure 5.5. OPERATION DOMINIC - Little Feller II contours of residual gamma radiation in R/hr at H+1 hour to 12,000 feet downwind

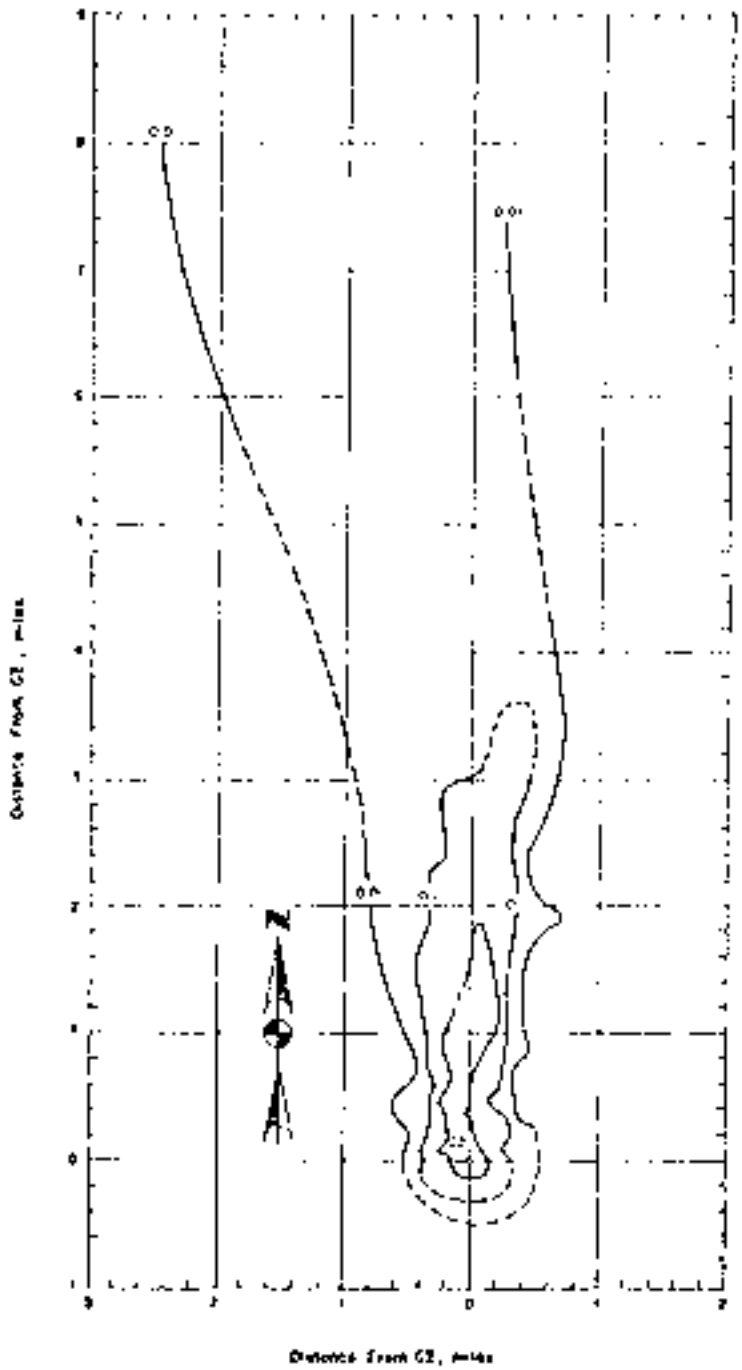


Figure 324. OPERATION SUNBEAM -- Little Feller II contours of residual gamma radiation in R/hr at H+1 hour to 8 miles downwind

TABLE 107 NEVADA WIND DATA FOR OPERATION SUNBEAM — [illegible]

Altitude (MSL)	H-hour	
	Direction	Speed
feet	degrees	mph
Surface	171	8.1
6,000	190	16.1
7,000	180	19.6
8,000	180	15.0
9,000	180	13.5
10,000	180	11.5
11,000	140	8.1
12,000	190	15.0
13,000	110	21.9
14,000	100	18.4
15,000	90	10.4
16,000	140	3.5
17,000	200	8.1
18,000	200	9.2

Notes:

1. Observations made at forward control point, Area 18.

2. Air temperature at the surface was 35.5°C, and the relative humidity was too low to measure.

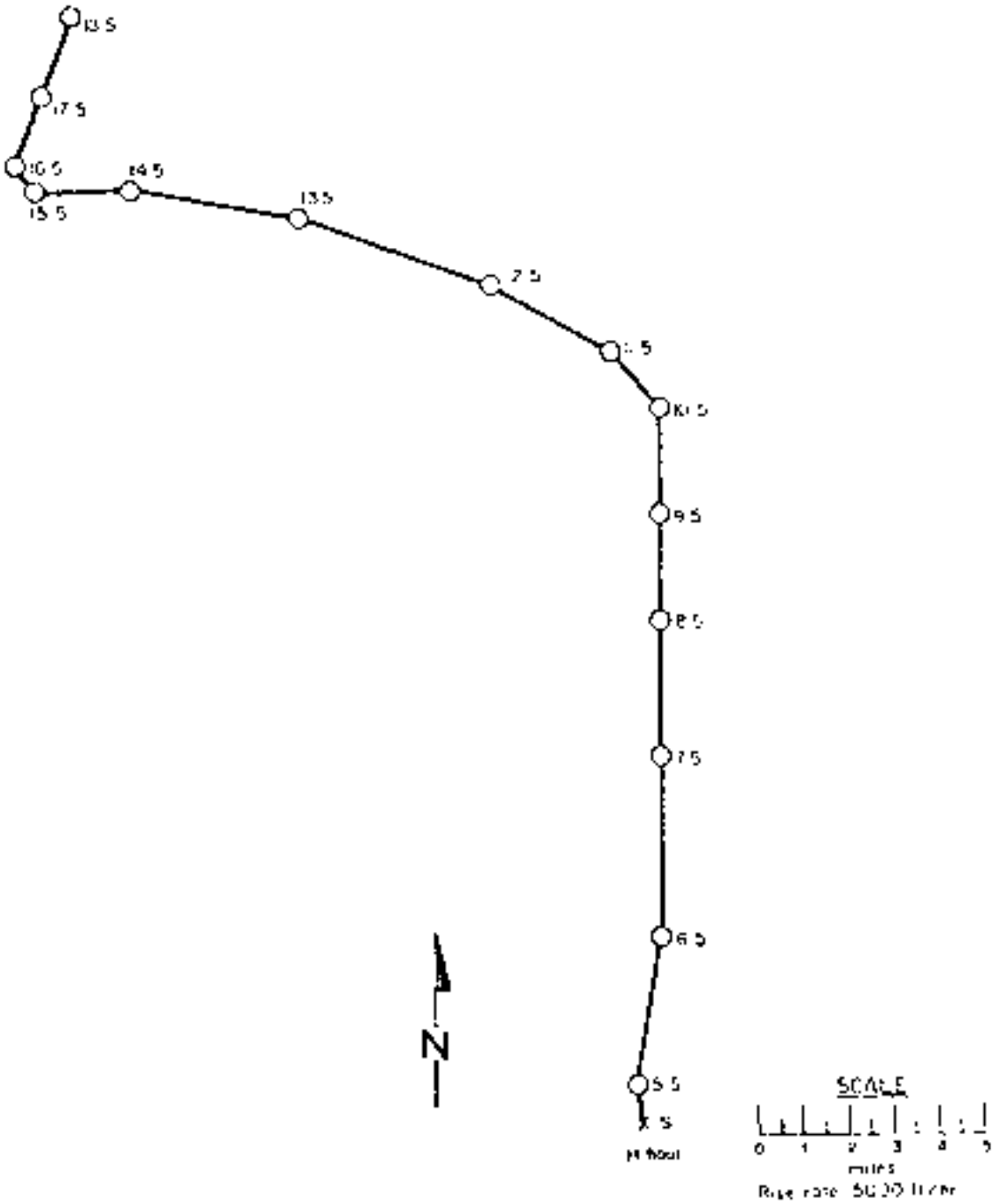


Figure 325. Hodograph for OPERATION SUNBEAM - Feller II.

OPERATION STORAX - Johnie Boy

	PST	GST
DATE:	15 Jul 1962	11 Jul 1962
TIME:	0815	1645

TOTAL YIELD: 0.5 Kt

CRATER DATA:
Diameter: 122 ft
Depth: 30.6 ft

CLOUD TOP HEIGHT: 17,000 ft MSL

CLOUD BOTTOM HEIGHT: 12,500 ft MSL

SPONSOR: DOD

SITE: NTS - Area 15
37° 07' 20.9852" N
116° 19' 58.9362" W

SITE ELEVATION: 5153 ft MSL

DEPTH OF BURST: 23 inches

TYPE OF BURST AND PLACEMENT:
Shallow underground, in Nevada soil

VENTING:

A persistent cloud was produced containing appreciable quantities of radioactivity associated with particulates.

REMARKS:

The close in and distant contours of residual radiation are shown in Figures 326 & 327. Both contours are considered reliable. The close-in pattern of Figure 326 was supplemented by data from NRDL Project 2.9, SRL Project 2.20, and the REECo Rad-Safe unit. Decay corrections were made using the composite decay curve.

Figure 327 was supplemented in the distant portion by REECo Rad-Safe Group data taken on D-day and by the Public Health Service on D+1 day. Decay corrections in the distant regions were made using a decay exponent of 1.2.

Dashed portions of contours indicate uncertainty.

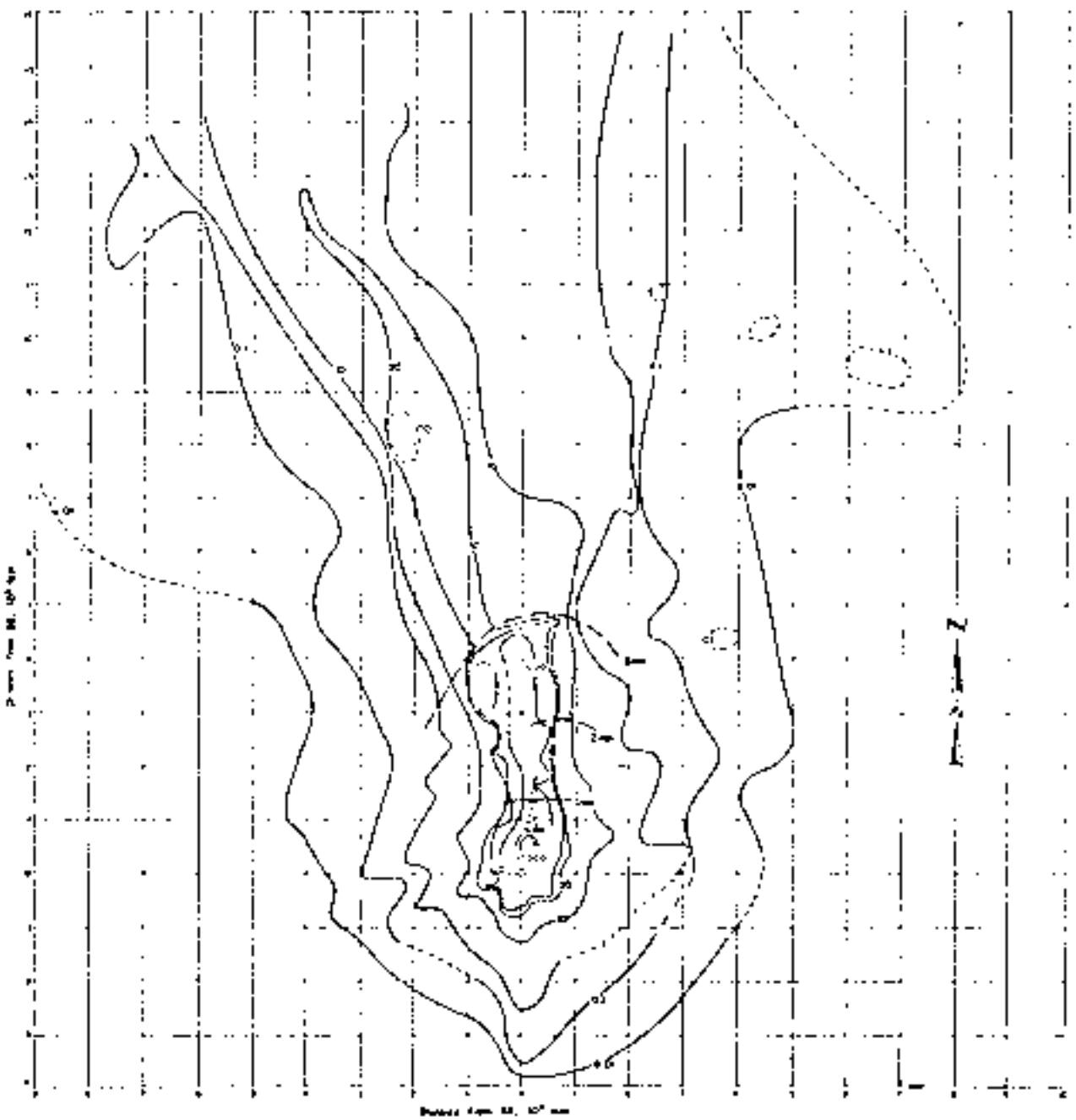


Figure 326. OPERATION SUNBEAM— Johnie Boy contours of residual gamma radiation in R/hr at H+ 1 hour to 16,000 feet downwind, together with times of arrival based on experimental data

Figure 327. OPERATION SUNBEAM - Johnie Boy contours of residual gamma radiation in mR/hr at H+1 hour to 100 miles downwind

TABLE 10S NEVADA WIND DATA FOR OPERATION SUNBEAM - JOHNIE BOY

Altitude (MSL)	H-hour		[illegible] hour	
	Direction	Speed	Direction	Speed
feet	degrees	mph	degrees	mph
Surface	195	8.1	210	12.1
6,000	170	8.1	210	11.5
7,000	160	8.1	190	10.4
8,000	160	12.7	190	12.7
9,000	160	18.4	190	17.7
10,000	170	17.3	190	16.5
11,000	180	13.8	200	11.5
12,000	180	17.3	200	17.3
13,000	190	20.0	200	25.3
14,000	200	24.2	200	25.3
15,000	200	25.3	210	29.9
16,000	200	25.3	210	29.9
17,000	200	31.1		
18,000	200	31.1		
19,000	210	29.9		
20,000	200	26.5		

Notes:

1. Observations made at forward control point, Area 18.

2. Air temperature at the surface was 24.3°C and the relative humidity was 12%.

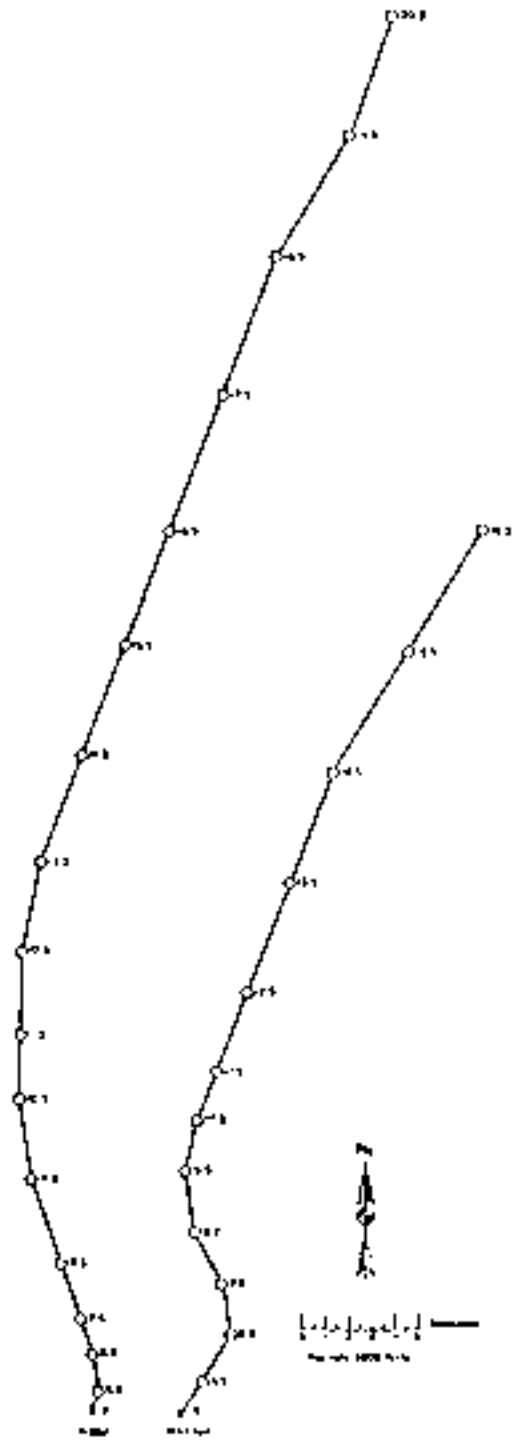


Figure 328. Holograph for OPPENHEIM, SUSILLA — Johnnie Ivy

OPERATION PLUMBBOB - Morrimac

	PST	MST
DATE:	19 Jun 1957	19 Jun 1957
TIME:	0900	1600

SPONSOR: LRL

SITE: NTS - U3bd
37° 05' 25.1551" N
116° 02' 00.1109" W

SURF ELEVATION: 4,060 ft MSL

DEPTH OF BURST: 1,965 ft

TYPE OF SOIL AND FORMATION:
Dry, unsaturated, unconsolidated
conglomeratic alluvium.

YIELDING:

This event released small visible quantities of radioactive steam and/or gases.

RADIATION:

Radiation was detected on-site from radioactivity released by this detonation. No radiation levels above background were detected off the NTS in populated areas from radioactivity released by this detonation.

Some radiation was detected in the area surrounding GZ, from previous radioactivity released during post-shot drilling. No radioactivity was detected off the NTS from post-shot operations.

OPERATION SUNBEAM – Small Boy

	PST	GMT
DATE:	14 Jul 1962	14 Jul 1962
TIME:	1030	1830

SPONSOR: DOD

SITE: NTS – Area 5
36° 48' 08.9942" N
115° 55' 89.2038" W

SITE ELEVATION: 3070 ft MSL

HEIGHT OF BURST:

TYPE OF BURST AND PLACEMENT:
Tower, over Nevada soil

CLOUD TOP HEIGHT: 19,000 ft MSL

REMARKS:

The close-in and distant contours of residual radiation are shown in Figures 329 thru 332. The estimated Small Boy GZ contours of Figure 329 are based on data taken from D-day to D+2 days by NDL, NRDL, and REECo. The composite decay curve of NDL Project 2.8 was used to correct the data to H+1 hour. The close-in contours of Figure 330 are revisions of those with data from NDL Project 2.11 included and supplemented by data from the REECo Rad Safe Group and NDL Project 2.9.

The two off-site contour patterns are shown in Figure 331 (out to 29 miles) and Figure 332 (out to 300 miles). The middle portion of Figure 331 (around 15 miles downwind) was constructed using data from NDL, UCLA, NRDL, and the PHS. The portion farthest downwind was constructed from data obtained by NDL and UCLA. The contours were corrected to H+1 hour using a decay constant of 1.27. Figure 332 is based almost entirely on ground monitor surveys conducted by NDL, UCLA, and the PHS, supplemented by aerial surveys by CEPO Project 62.80. The data were extrapolated back to H+1 hour by $t^{-1.2}$. The fallout started arriving at 25: to 400 miles downwind sometime in the latter part of D+1 day reaching a peak at D+2 days. Figure 333 shows the probable path of the Small Boy cloud as determined by exposure rate measurements as far as western Nebraska.

In all the figures the dashed portions indicate uncertainty.

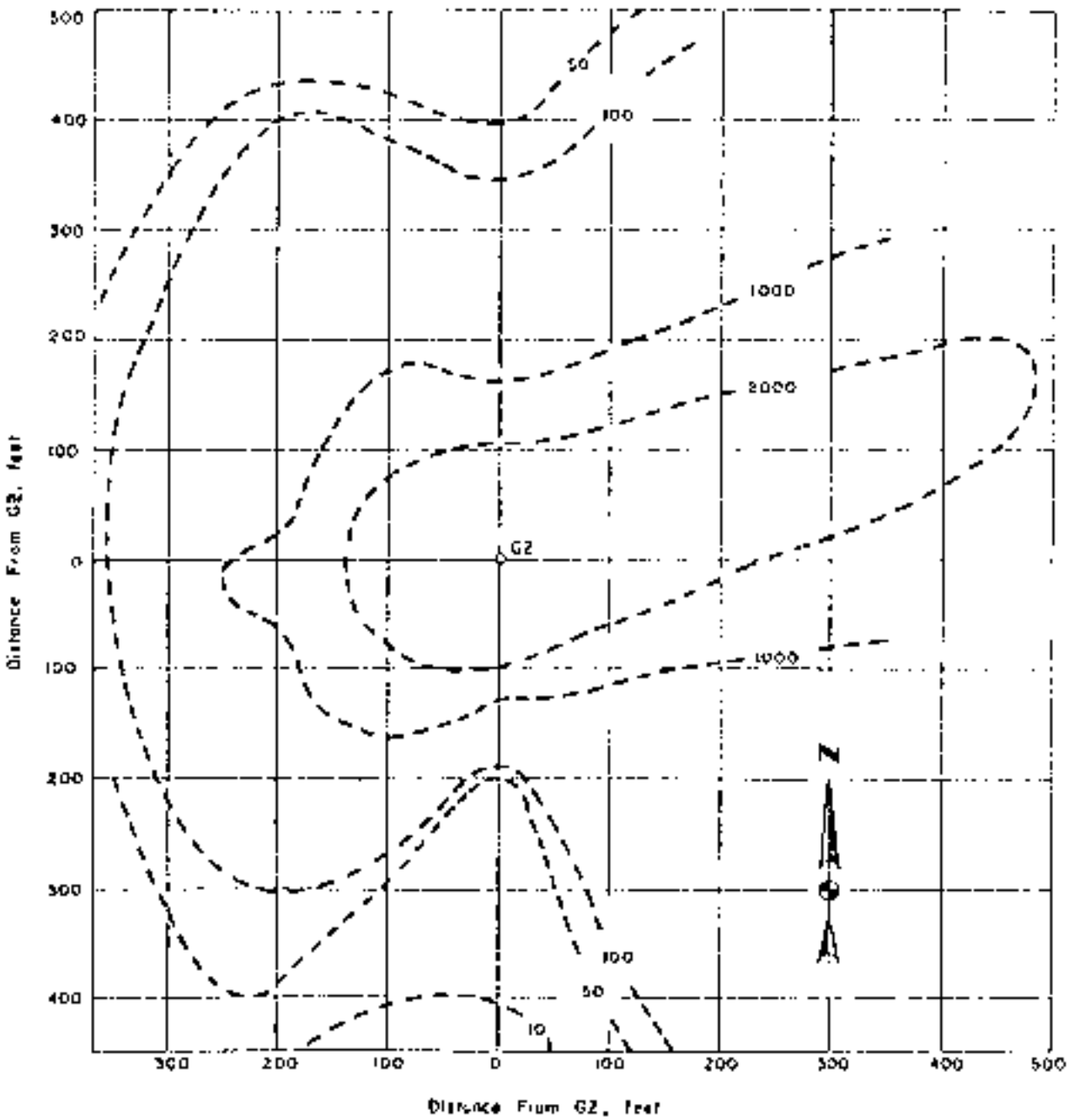


Figure 329. OPERATION SUNBEAM - Small Boy GZ area
contours in R/hr at R+1 hour

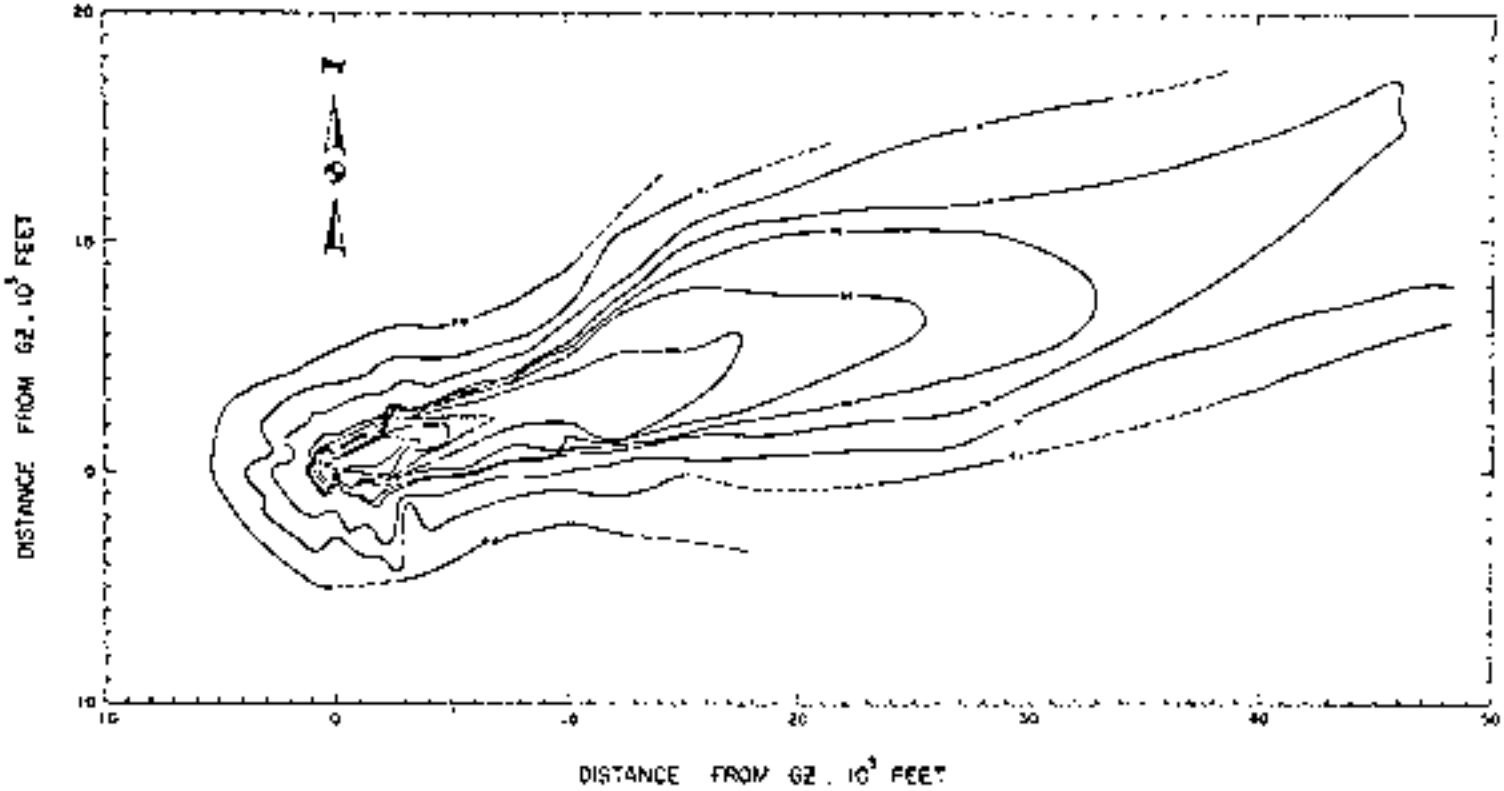


Figure 330-OPERATION SUNBEAM - Small Boy contours of residual gamma radiation in R/hr at H+1 hour to 50,000 feet downwind

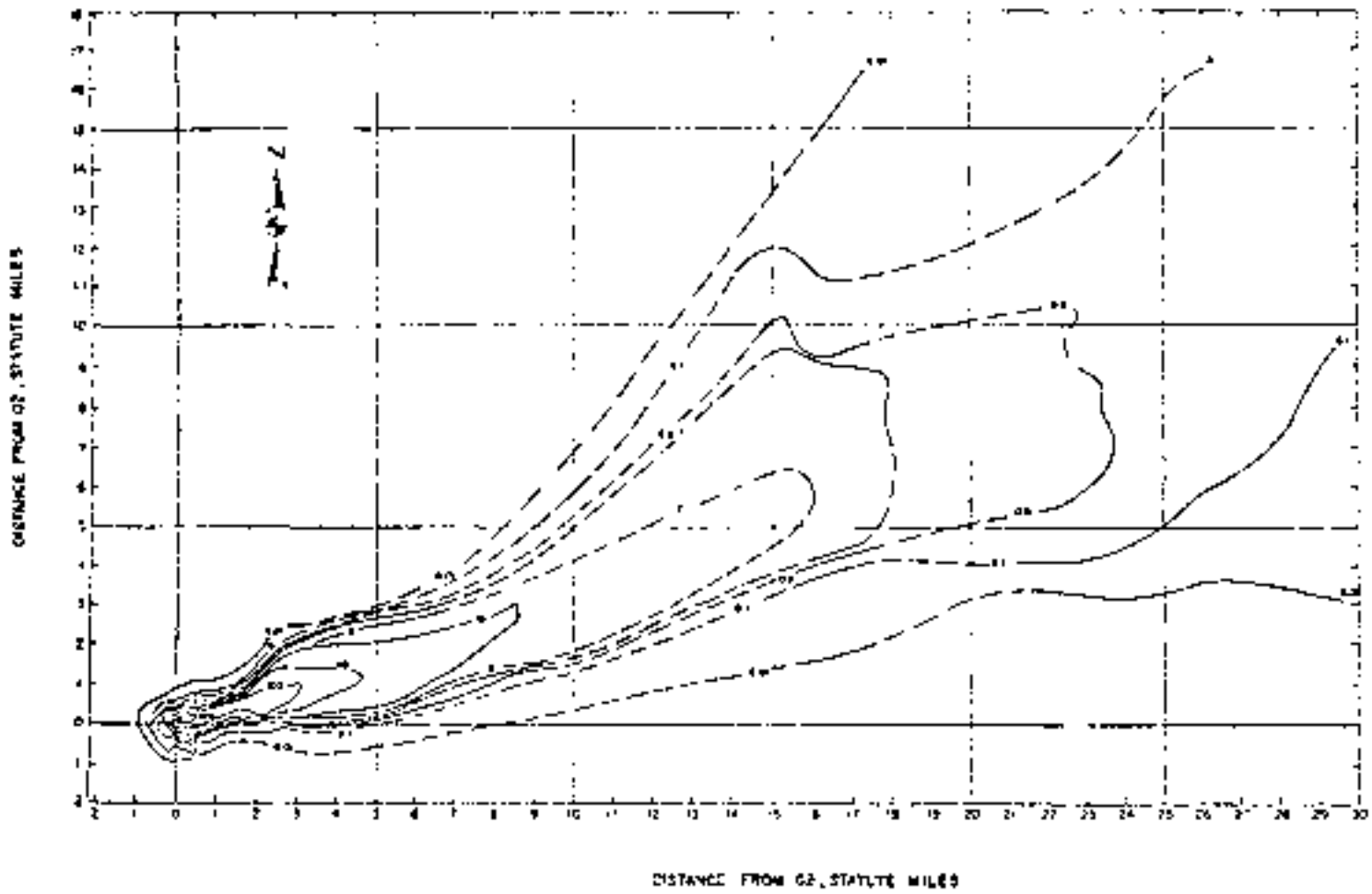


Figure 331. OPERATION SUNBEAM - Small Boy contours of residual gamma radiation in R/hr at H+1 hour to 29 miles downwind

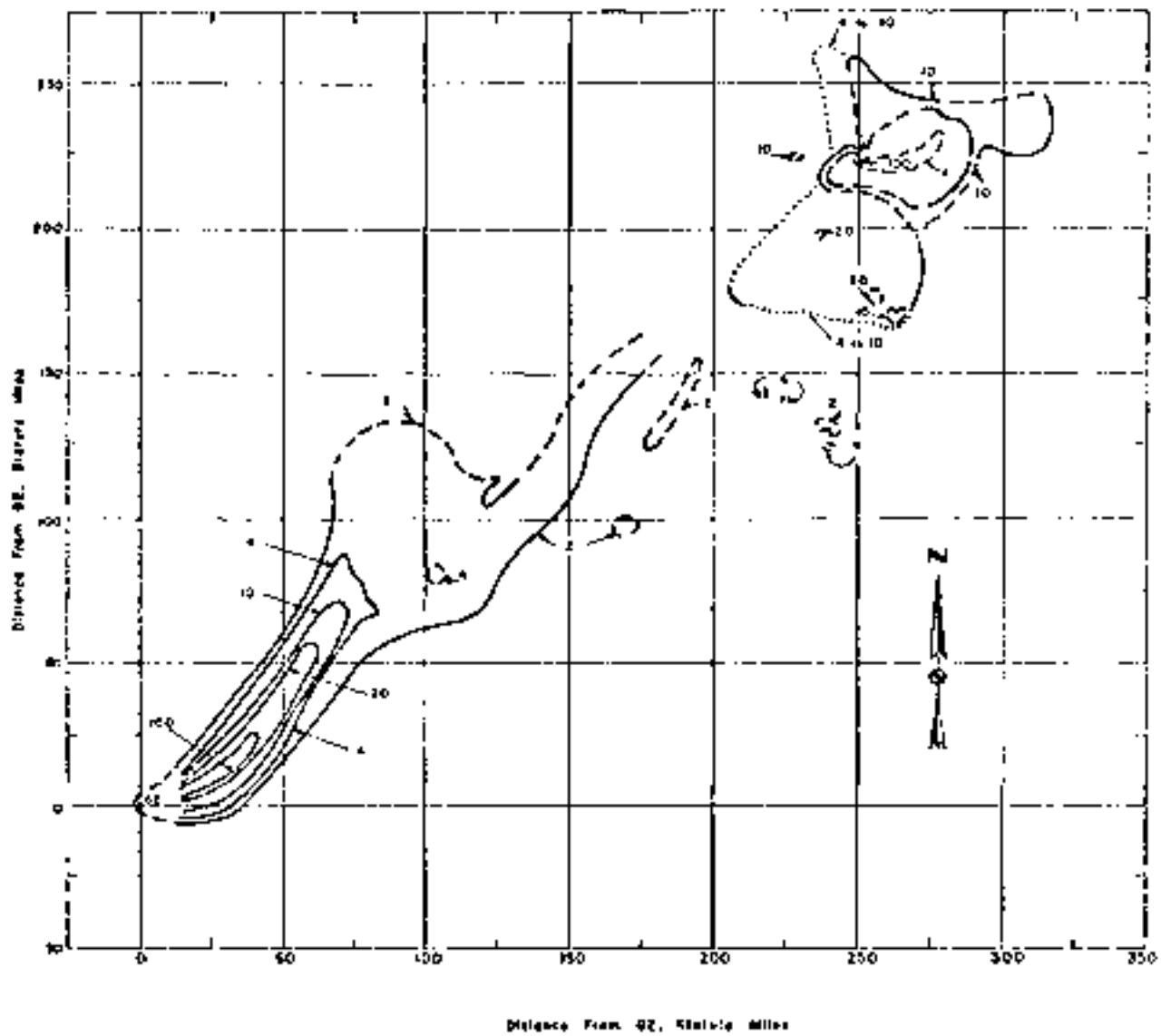


Figure 332. OPERATION SUNBEAM - Small Boy contours of residual gamma radiation in R/hr at H+1 hour to 300 miles downwind

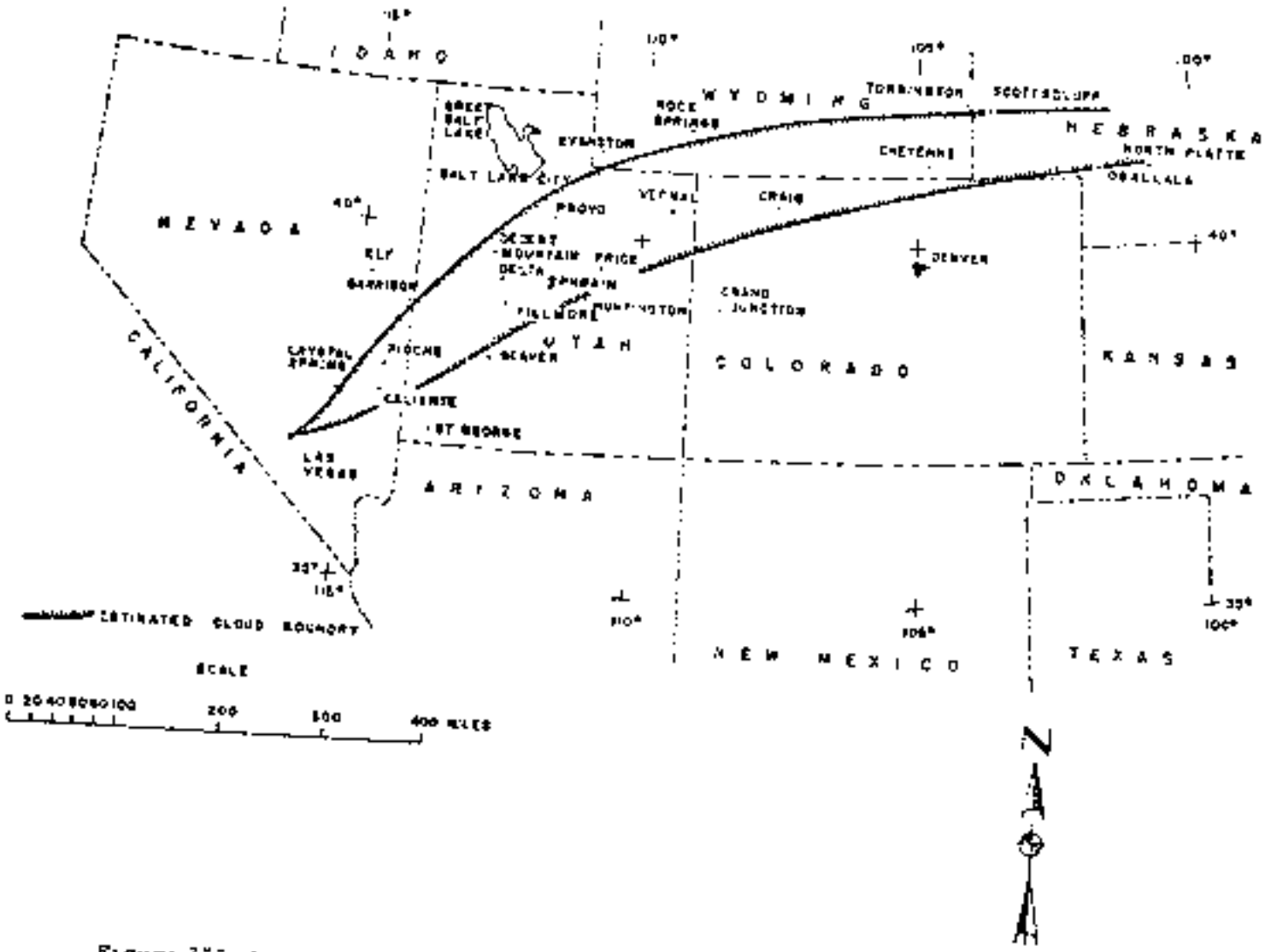


Figure 353. OPERATION SUNBEAM - Small Boy cloud path

TABLE 109 NEVADA WIND DATA FOR OPERATION SUNBEAM - SMALL BOY

Altitude (MSL)	H+5 Minutes		H+1/4 Hour		H+70 Minutes	
	Direction	Speed	Direction	Speed	Direction	Speed
feet	degrees	mph	degrees	mph	degrees	mph
3,078	135	2.3	120	12.3	180	6.9
4,000	300	1.2	145	4.6	185	6.9
5,000	310	4.2	170	5.8	188	8.1
6,000	330	2.3	180	6.9	212	9.2
7,000	280	2.3	170	6.9	224	11.5
8,000	250	6.9	180	3.5	237	11.5
9,000	240	13.8	230	5.8	245	12.7
10,000	240	18.4	240	12.7	240	15.0
12,000	240	9.2	235	10.4	225	9.2
14,000	240	9.2	230	9.2	280	8.1
15,000	-	-	-	-	265	4.6
16,000	240	9.2	230	8.1		
18,000	280	16.1	260	15.0		
20,000	280	28.8	280	26.5		

Notes:

1. Observations made at Frenchman's Flat.

2. Air temperature at the surface was 31.7°C; the relative humidity was 16%.

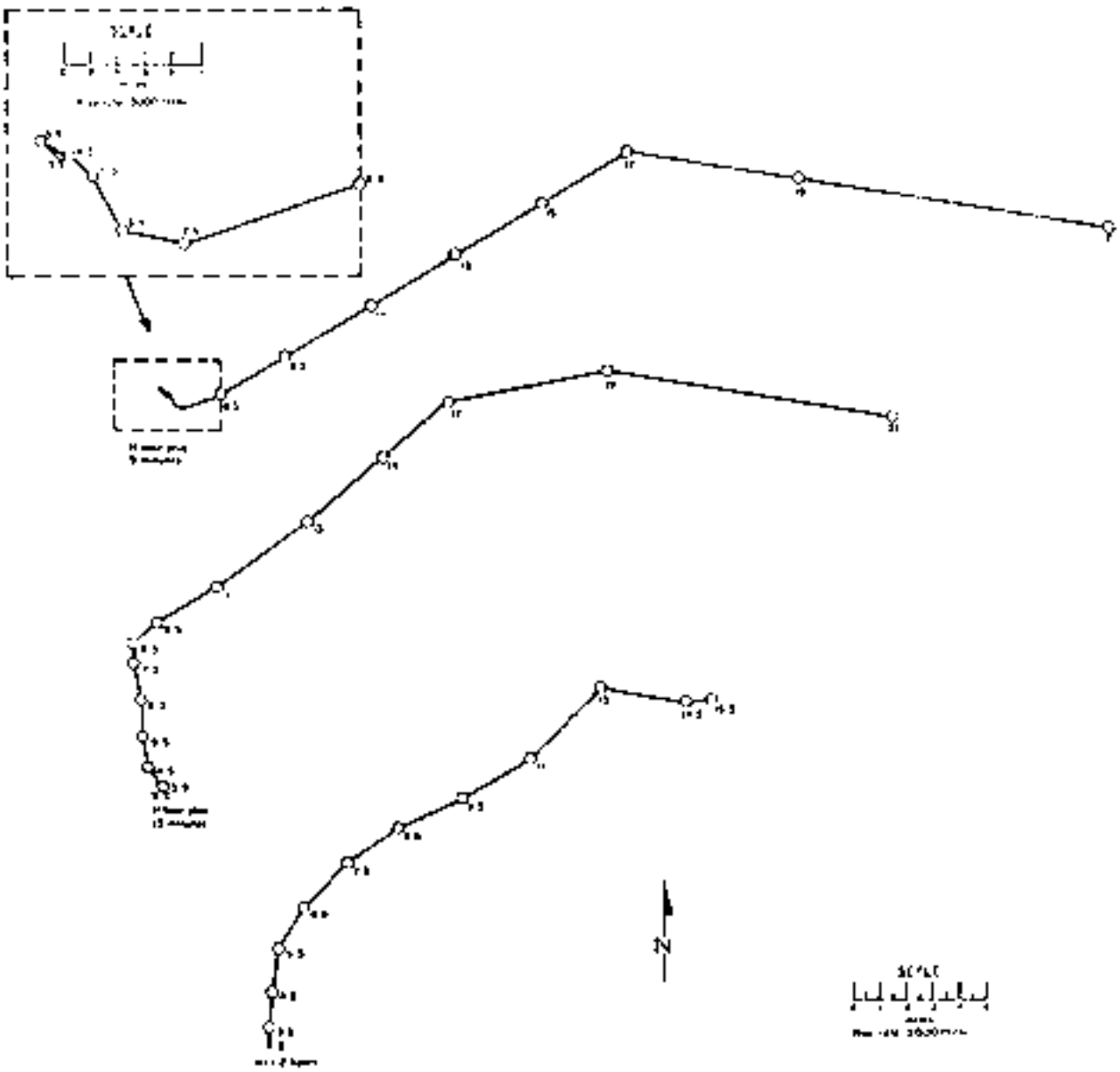


Figure 334. Hodograph for OPERATION SUNBEAM - Small Boy.

OPERATION SUNSHINE - Little Feller I

	PST	GMT
DATE:	17 Jul 1962	17 Jul 1962
TIME:	0900	1700

DESIGNED: DOD

SITE: NTS - Area 3F
37° 03' 30.7715" N
116° 19' 02.3773" W

SITE ELEVATION: 5194 ft MSL

HEIGHT OF BURST:

TYPE OF BURST AND PLACEMENT:
Near surface, over bedrock soil. Warhead fired from Davy Crockett weapon system.

CLOUD TOP HEIGHT: 11,000 ft MSL

REMARKS:

The close-in and distant contours of residual radiation are shown in Figures 335 thru 338. The very close-in contours are shown in Figure 335. Figure 337 shows contours of residual gamma radiation at H+1 hours to 10,000 feet downwind. The earliest readings were not taken until approximately H+4 hours because troop exercises were conducted in the area of interest at earlier times. The application of an average decay exponent to the overall pattern or representative portions of the pattern did not appear to be justified; therefore the H+1-hour patterns are presented as two basic patterns and are considered reliable. The 1-hour patterns were constructed from data obtained by DNA, REECo Rad Safe Group remote units, and EG&G off-site surveys. Figures 336 and 338 are the result of arbitrarily applying a decay exponent of 1.2 to previous H+1-hour patterns. These patterns are given only to represent the order of magnitude of the H+1-hour dose rates and are considered to be much less reliable than the ones representing H+4 hours.

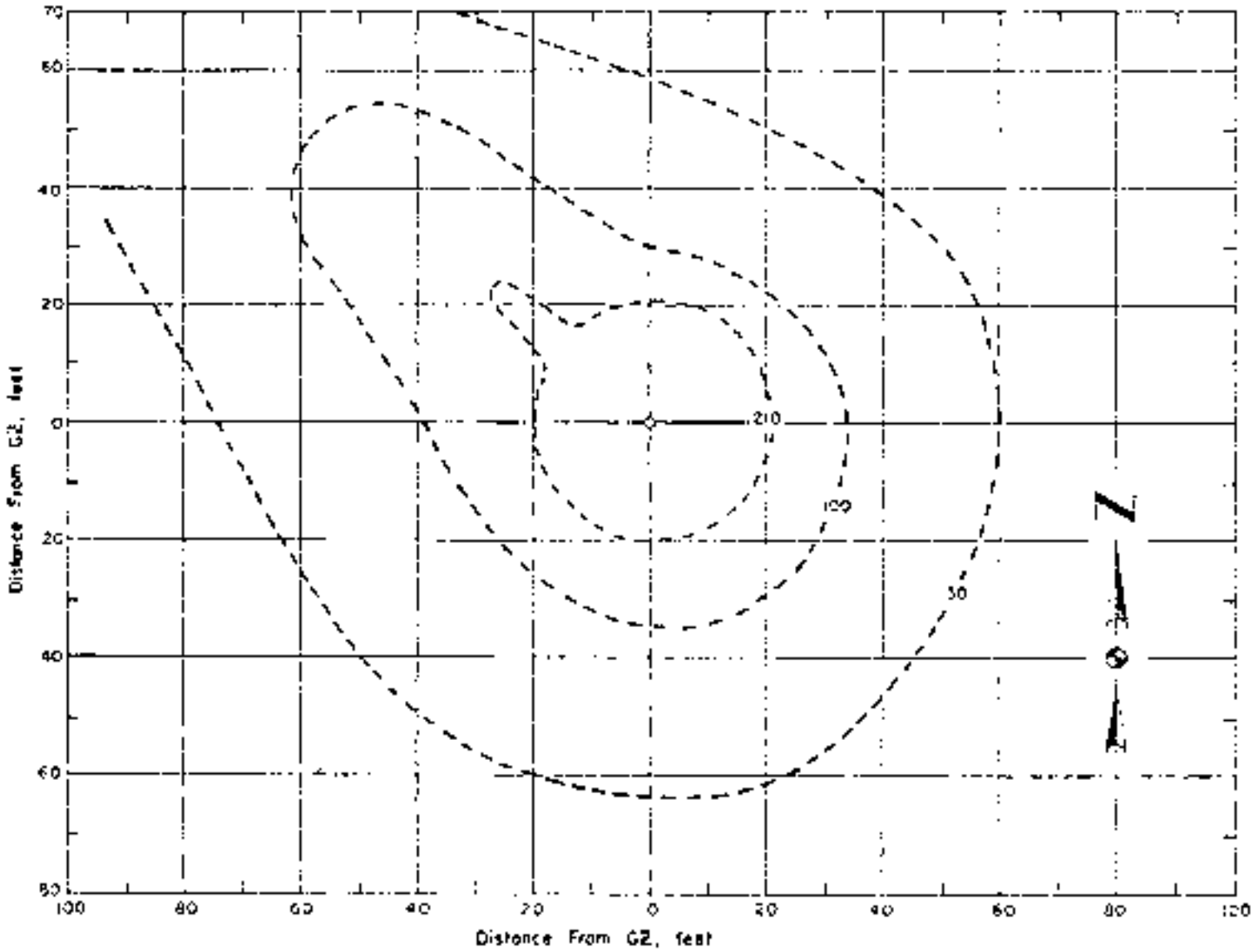


Figure 335. OPERATION SUNBEAM - Little Feller I contours of residual gamma radiation in R/hr at 0.3 hours to 70 feet downwind.

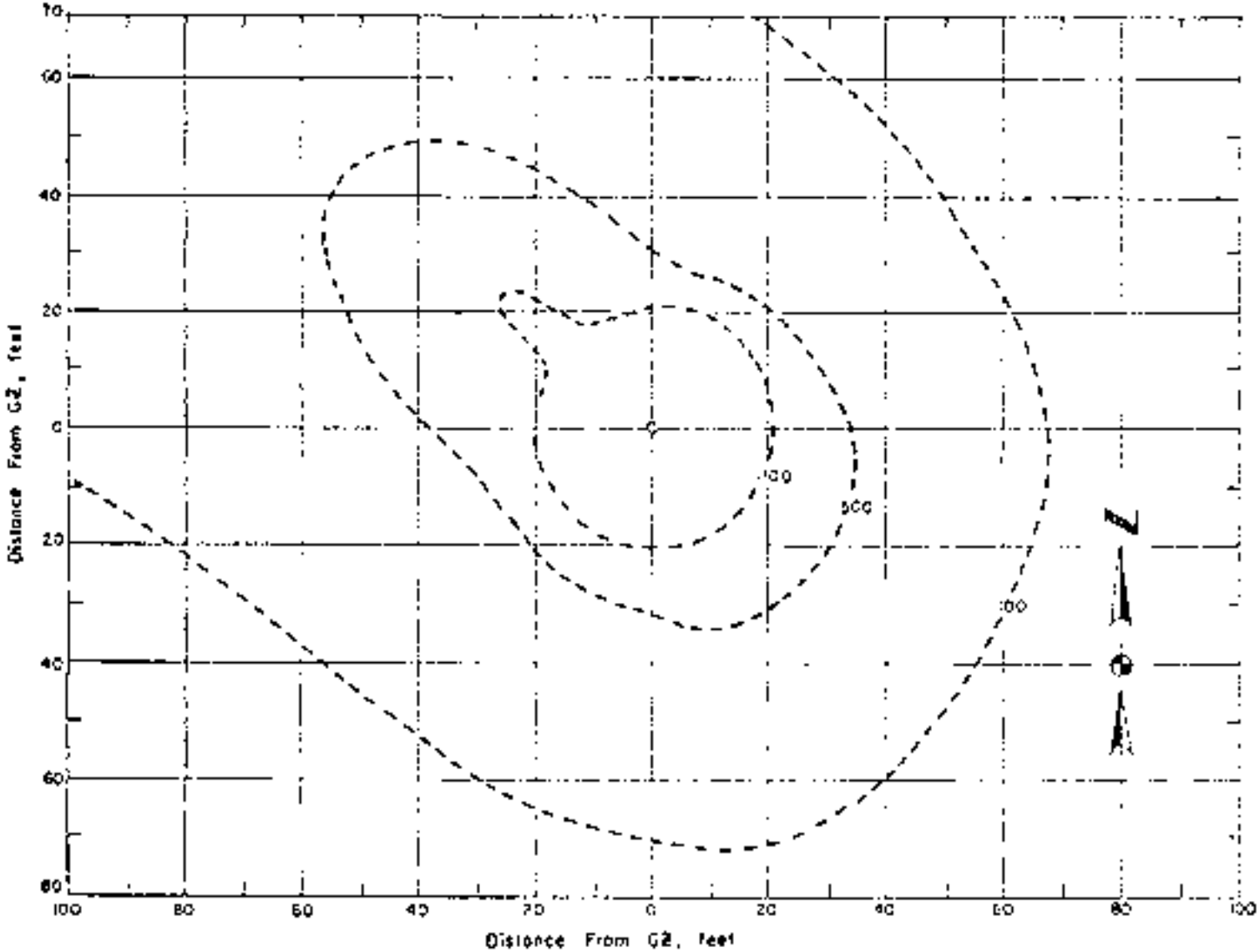


Figure 336. OPERATION SUNBEAM - Little Feller I contours of residual gamma radiation in R/hr at H+1 hour to 70 feet.

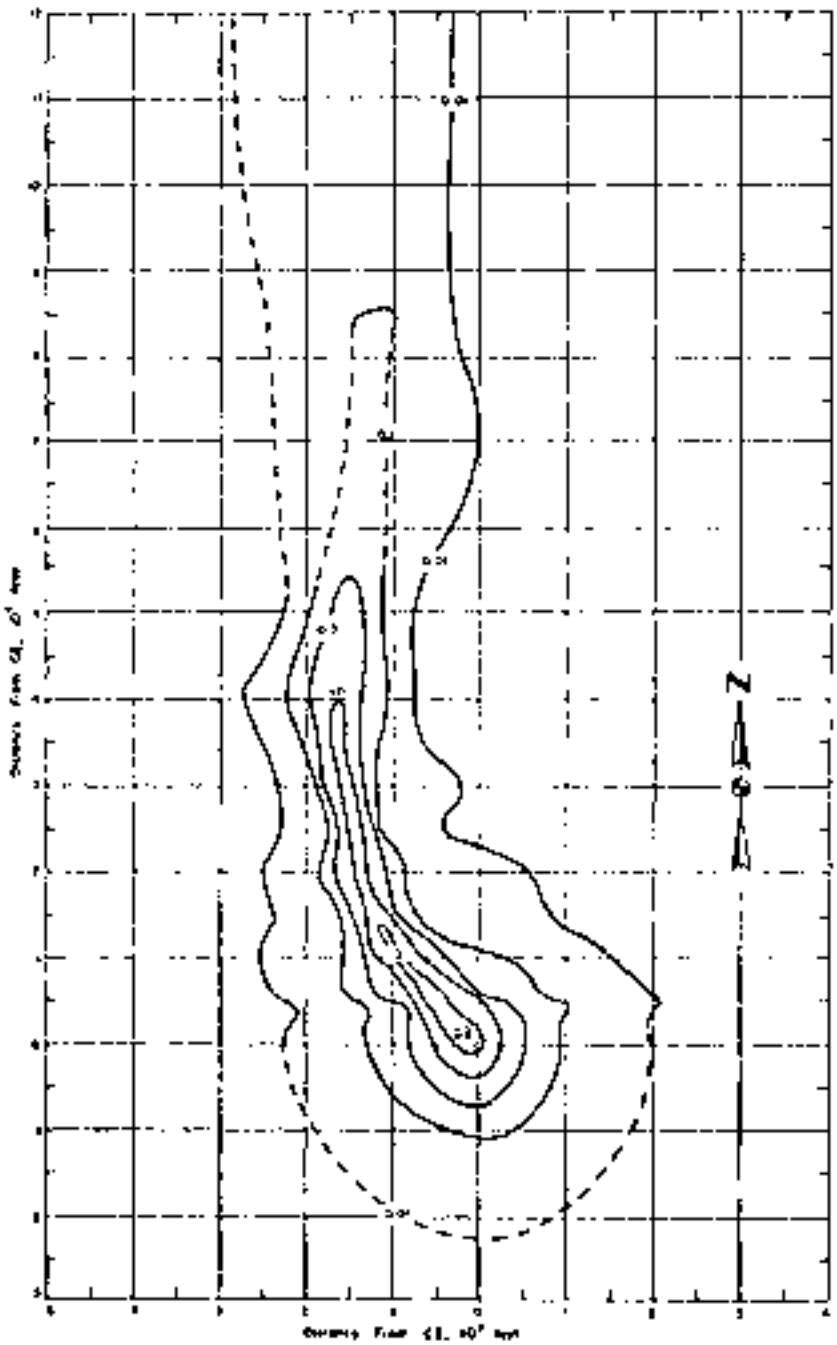


Figure 337. OPERATION SUNBEAM - Little Feller I contours of residual gamma radiation in R/hr at 0+4 hours to 12,000 feet downwind.

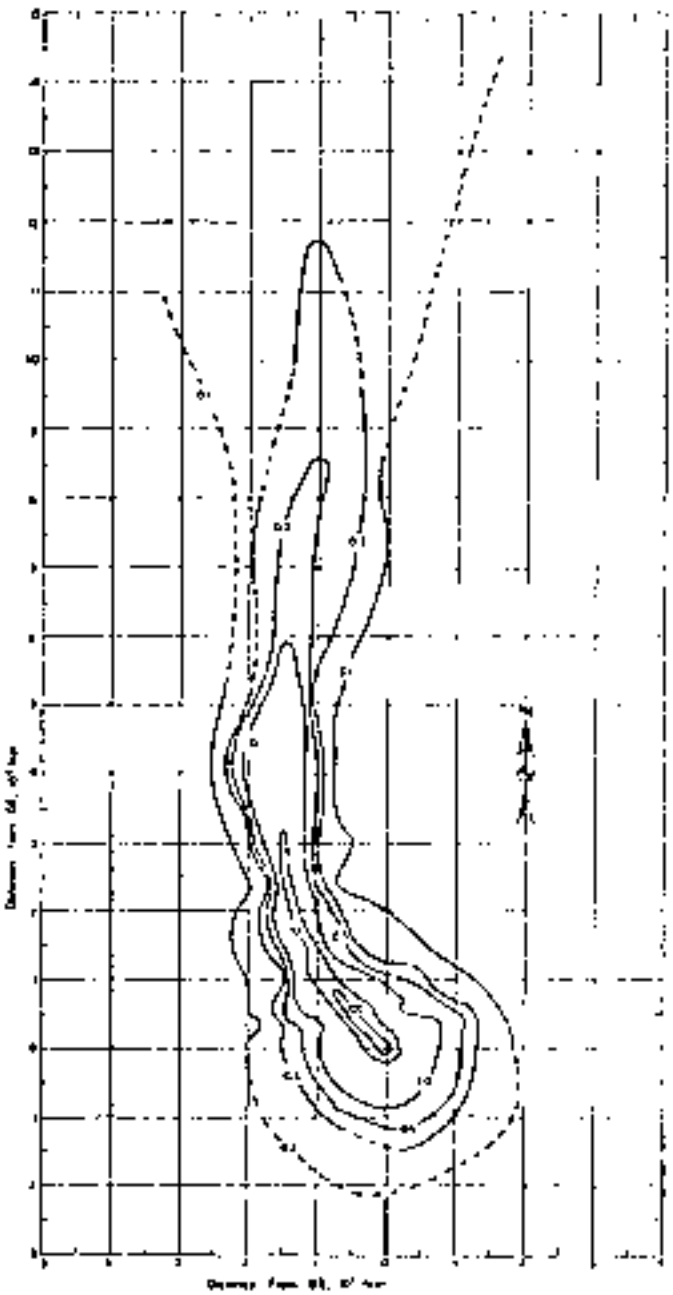


Figure 338. OPERATION SUNBEAM - Little Feller I contours of residual gamma radiation in R/hr at H+1 hour to 12,000 feet downwind.

TABLE 110 NEVADA WIND DATA FOR OPERATION SUNBEAM - LITTLE FELLER I

Altitude (MSL)	H-Hour	
	Direction	Speed
feet	degrees	mph
Surface	200	17.3
6,000	200	15.0
7,000	190	13.8
8,000	170	13.8
9,000	170	12.7
10,000	150	12.7
11,000	140	12.7
12,000	150	15.0
13,000	180	17.3
14,000	160	23.0
15,000	180	26.5
16,000	190	28.8

Notes:

1. Observations made at forward control point, Area 18.

2. Air temperature at the surface was 29.7°C and the relative humidity was 17 percent.

Figure 330. Hodograph for OPERATION SUNBEAM - Little Feller I.

OPERATION STORAX - Wichita

	PST	GMT
DATE:	27 Jul 1962	27 Jul 1962
TIME:	1700	2100

SPONSOR: LRL

SITE: NTS - U9y
37° 07' 46.9592" N
116° 03' 23.3114" W

SITE ELEVATION: 4238 ft MSL

DEPTH OF BURST: 693 ft

TYPE OF BURST AND PLACEMENT:
Underground, in slightly consolidated alluvium.

VENTING:

Low-velocity venting was observed at H+0.5 second with an initial height of 200-500 feet. At H+76 seconds, gas vented from a fissure in the earth approximately 50 feet north of the emplacement hole and continued for 5 minutes. The estimated dose rate at 500 feet from GZ, normalized to H+1 hour was > 10 R/hr, and the estimated total release normalized to H+1 minute was 2×10^{7} curies. The only isotope identified in the release products was I^{131}.

REMARKS:

Radiation was detected on-site from radioactivity released by this detonation. No radiation levels above background were detected off the NTS in populated areas from radioactivity released by this detonation. No radiation was detected at the worksite or any other location from releases of gaseous radioactivity during post shot drilling.

DIRECTION STATION - York

	PST	GMT
DATE:	24 Aug 1962	24 Aug 1962
TIME:	0700	1500

SPONSOR: LRL

SITE: NTS-Yucca
37° 07' 07.095" N
116° 02' 22.145" W

SITE ELEVATION: 4908 ft MSL

DEPTH OF BURST: 747 ft

TYPE OF BURST AND PLACEMENT:
Underground, in alluvium

VENTING:
None, except during post-shot drilling

REMARKS:

No radiation levels were detected above background on or off the NTS from radioactivity released by this detonation. Some radiation was detected in the area surrounding SE from gaseous radioactivity released during post-shot drilling. No radioactivity was detected off the NTS from post-shot operations.

[illegible] [illegible] - Hole 2

	Zn	Cu
DATE:	[illegible]	[illegible]
TIME:	[illegible]	[illegible]

DIRECTION: [illegible]

SIZE: [illegible]
[illegible]
[illegible]

DEPTH OF PLUG: [illegible]

TYPE OF PLUG: [illegible]
[illegible]

COMMENTS:
None, except that
post-shot drilling

OBSERVED:

No radiation levels above background were observed in the [illegible] Test. Radioactivity is locally [illegible] pre-shot values. Some residual activity was detected in the area surrounding GZ [illegible] activity was found during post-shot drilling. No radioactivity was carried off the [illegible] from post-shot drilling. No radioactivity was found in the [illegible] post-shot operations.

OPERATION STORAX - Hyrax

	PST	GMT
DATE:	15 Sep 1962	16 Sep 1962
TIME:	0900	1700

SPONSOR: LASL

SITE: NTS - U3bb
37° 02' 30.1654" N
116° 01' 16.0105" W

DEPTH OF BURST: 709 ft

TYPE OF BURST AND PLACEMENT:
Underground, in alluvium

VENTING:
Vented

REMARKS:

Radiation levels were detected near SZ above normal background from radioactivity released by this detonation. No other radiation levels were detected on or off the NTS, from radioactivity released by this detonation. Some radiation was detected in the area surrounding SZ from gaseous radioactivity released during post-shot drilling. No radioactivity was detected off the NTS from post-shot operation

OPERATION STORAX - [illegible]

	PST	GMT
DATE:	[illegible]	[illegible]
TIME:	0900	1700

SPONSOR: LASL

SITE: NTS - U8x
37° 04' 08.10" N
116° 01' 46.41" W

DEPTH OF BURST: [illegible]

TYPE OF BURST AND LOCATION:
Underground, in [illegible]

VENTING:
No venting

OPERATION STORAX - Alleghany

	PST	GMT
DATE:	29 Sep 1962	29 Sep 1962
TIME:	0900	1700

SPONSOR: LASL

SITE: NTS - U8x
37° 04' 08.10" N
116° 01' 46.41" W

SITE ELEVATION: [illegible] ft MSL

DEPTH OF BURST: [illegible] ft

TYPE OF BURST AND LOCATION:
Underground, in [illegible] tuff

VENTING:

This event released small visible quantities of radioactive steam and/or gases

REMARKS:

Radiation was detected on-site from radioactivity released by this detonation. No radiation levels above background were detected off the NTS in populated areas from radioactivity released by this detonation. No radiation was detected at the worksite or any other location from releases of gaseous radioactivity during post-shot drilling

OPERATION STORAX - Mississippi

	PST	GMT
DATE:	5 Oct 1962	5 Oct 1962
TIME:	0500	1700

TOTAL YIELD: 110 kt

CRATER DATA:
Subsidence crater
Diameter: 900 ft
Depth: 160 ft

VENTING:
None, except during post-shot drilling

SPONSOR: LRL

SITE: NTS - U9ad
37° 08' 21.8546" N
116° 03' 01.1677" W

SITE ELEVATION: 4236 ft MSL

DEPTH OF BURST: 1622 ft

TYPE OF BURST AND PLACEMENT:
Underground, in consolidated tuff

REMARKS:

No radiation levels were detected above background on or off the NTS from radioactivity released by this detonation. Some radiation was detected in the area surrounding S2, from gaseous radioactivity released during post-shot drilling. No radioactivity was detected off the NTS from post-shot operations

OPERATION PICCAN - Revenge

	[illegible]	[illegible]
DATE:	[illegible]	[illegible]
TIME:	[illegible]	[illegible]

SHOT NO: [illegible]

BOMB: [illegible]
[illegible]
[illegible]

GMT ZERO: [illegible]

POINT OF AIM: [illegible]

TYPE OF TOWER AND DATA [illegible]
[illegible]

WEATHER:

One-eighth cloud cover prevailed over the [illegible] Ground visibility was [illegible] miles. Surface winds were [illegible] knots. Winds aloft were [illegible] knots at 10,000 feet, [illegible] knots at 20,000 feet, and [illegible] knots at 30,000 feet. Relative humidity was [illegible] percent at the surface, [illegible] percent at 10,000 feet, [illegible] percent at 20,000 feet, and [illegible] percent at 30,000 feet. Temperature was [illegible] degrees Fahrenheit at the surface, [illegible] degrees at 10,000 feet, [illegible] degrees at 20,000 feet, and [illegible] degrees at 30,000 feet.

RESULTS:

No other radiation levels were detected on or off the ATOLL from radioactivity released by this detonation. Not radiation was detected in the area surrounding GZ from gaseous radioactivity released during post-shot drilling. No radioactivity was also released off the ATOLL from post-shot operations.

OPERATION STORAX - Bandicoot

	PST	GMT
DATE:	19 Oct 1962	19 Oct 1962
TIME:	1016	1816

SPONSOR: LASL

SITE: NTS - U7b
37° 02' 22.3431" N
116° 01' 16.1267" W

SITE ELEVATION: 4039 ft MSL

DEPTH OF BURST: 792 ft

DEPTH OF EMPLACEMENT HOLE: 811 ft

TYPE OF BURST AND PLACEMENT:
Underground, in alluvium

CLOUD TOP HEIGHT: 10,500 ft MSL

VENTING:

Immediately following the event a persistent cloud was produced containing appreciable quantities of radioactivity associated with particulates

The intensity of the 11-hour release activity was > 7500 R/hr. This value was reduced in 5 hours to a minimum of 150 R/hr. The cloud diffused to the north and south and deposited a maximum dose rate of 20 mR/hr at 1410 hours at Area 16 and was reduced to 9 mR/hr at 1445 hours. The Camp Mercury maximum dose rate was 5.75 mR/hr at 1335 hours and was reduced to 1.5 mR/hr at 1450 hours.

CROSS-SECTIONAL VIEW - Participant

REMARKS:

The radioactive cloud split into two portions. The lower portion of the cloud traveled in a NNE direction to Area 9 where it remained stagnant, then went slowly across Flat Top Mesa and north to the Area 12 compound. The cloud dispersed in the valleys north of the test site and no exposures to people were detected.

The upper portion of the cloud traveled in a southern direction and traversed a course over the CP Compound, Camp Mercury, Cactus Springs, Indian Springs, Lathrop Wells and Highway 95. The cloud was first detected over Highway 95 at H+2 hours. Upon crossing Highway 95, the cloud was 9 miles wide, was diffusing rapidly, and was proceeding SW. The intensity at ground level was approximately twice background. A maximum intensity of 50 mR/hr was detected at 4 miles west of the Mercury junction on Highway 95. A 20-mR/hr dose rate was recorded 7 miles west of the Mercury junction at H+3.5 hours. Maximum intensities by portable instruments (3 feet aboveground) were recorded for Jubuta, 12 mR/hr; Ash Meadows, 16 mR/hr; Death Valley Junction, 3 mR/hr and Camp Mercury, 5 mR/hr. No radiation was detected off-site at Area 51, Indian Springs and Pahrump. The highest reading at ground level at Cactus Springs (30 miles from SZ) was approximately 0.6 mR/hr.

Figure 340 shows contours of residual gamma activity in mR/hr for a midtime of H+24 hours. The contours were constructed from Rad Safe Group survey performed by the REECo.

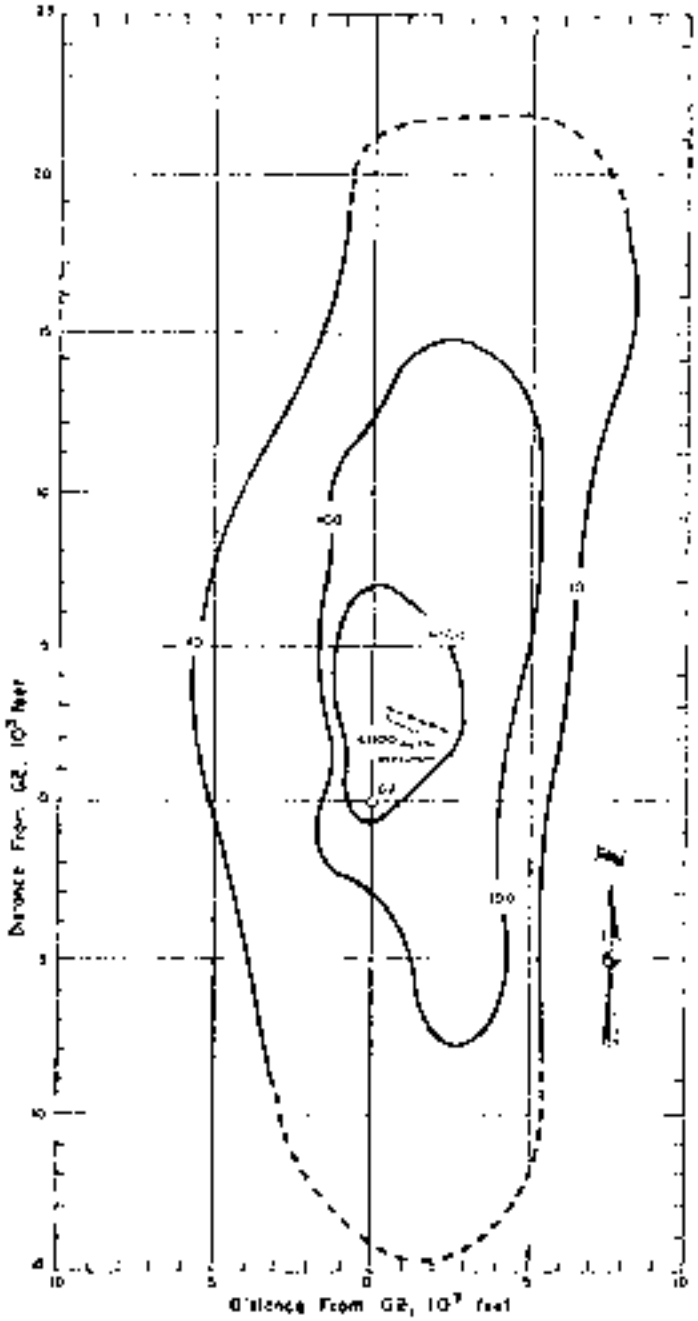


Figure 340. OPERATION STORAX - Isoroentgen contours of residual gamma radiation in mR/hr at a uniform of H+24 hours to 22,000 feet downwind.

TABLE III NUVAJA WIND DATA FOR OPERATION STORAX - [illegible]

Altitude (MSL)	11-hour (Note 1)	
	Direction	Speed
feet	degrees	mph
4,000	calm	calm
5,000	191	2.5
6,000	305	6.6
7,000	353	12.7
8,000	10	17.3
9,000	9	20.7
10,000	14	24.5
11,000	23	26.9
12,000	27	28.0
13,000	27	35.0
14,000	22	30.1
15,000	24	39.1

Notes:

1. Observations made at Yucca weather station.

2. Surface data (from RACE) at level of 62 over Area 3, 11-hour: Atmospheric pressure 878 millibars, temperature 12.0°C, dew point temperature 9.8°C, relative humidity 94%.

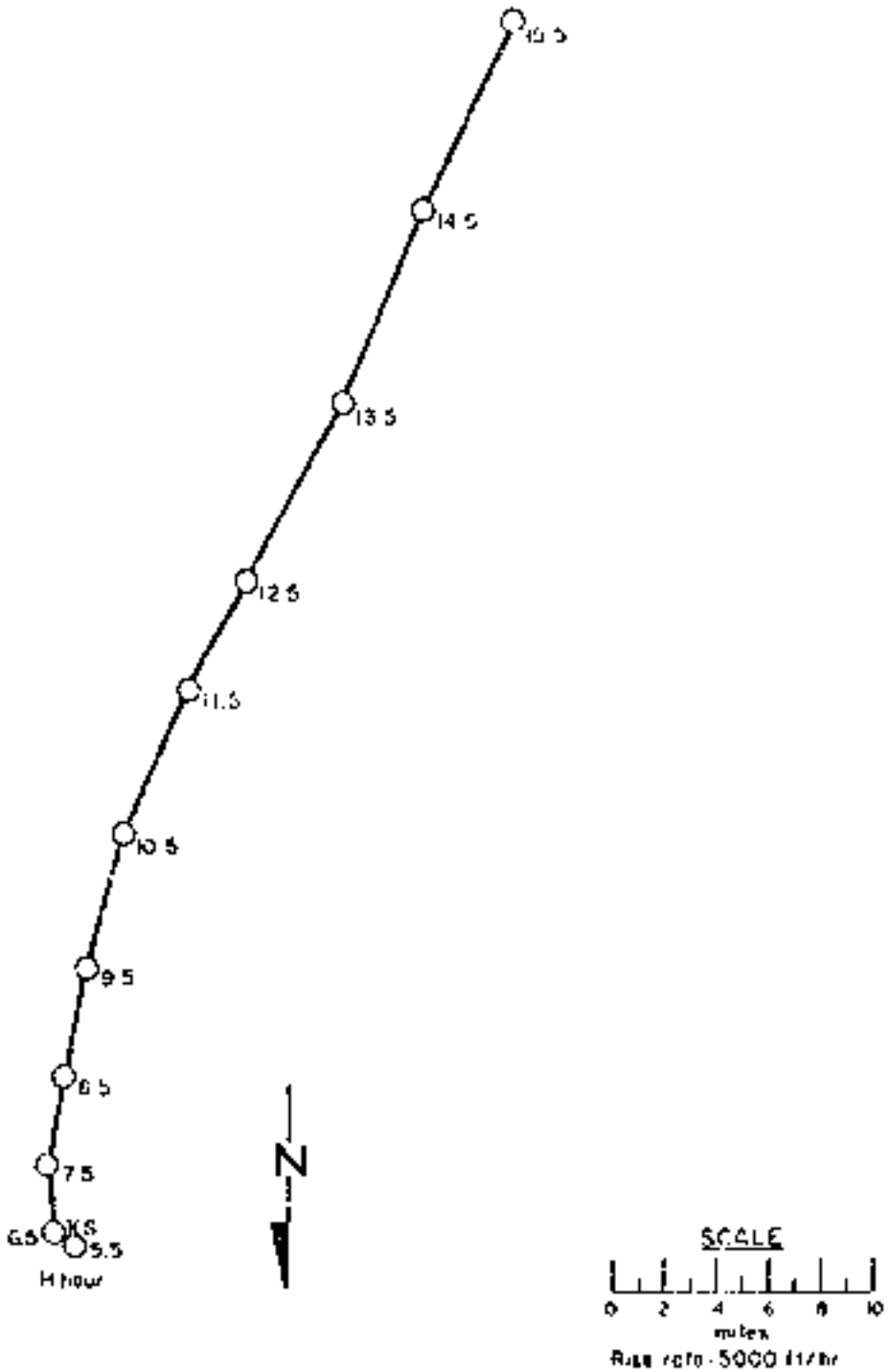


Figure 141. Hodograph for OPERATION SYDAX - Bandclock

OPERATION STORAX - Sunlee

	PST	GMT
DATE:	27 Oct 1962	27 Oct 1962
TIME:	0700	1500

SPONSOR: LRL

SITE: NTS - P10I
37° 08' 57.5068" N
116° 07' 12.6102" W

SITE ELEVATION: 4254 ft MSL

DEPTH OF BURST: 1048 ft

TYPE OF BURST AND PLACEMENT:
Underground, in alluvium

VENTING:
None, except during post-shot drilling

REMARKS:

No radiation levels were detected above background on or off the NTS from radioactivity released by this detonation. Some radiation was detected in the area surrounding SZ from gaseous radioactivity released during post-shot drilling. No radioactivity was detected off the NTS from post-shot operations

OPERATION STORAX - Anacostia

	PST	GMT
DATE:	27 Nov 1962	27 Nov 1962
TIME:	1000	1800

SPONSOR: LRL

SITE: NTS - U9i
37° 07' 22.1140" N
116° 01' 44.4795" W

SITE ELEVATION: 4268 ft MSL

DEPTH OF BURST: 740 ft

TYPE OF BURST AND PLACEMENT:
Underground, in semisolded tuff

VENTING:

Venting occurred at H+8 seconds at the radiochemistry sampling area and at H+35 seconds between the emplacement pipe and the prompt sampling pipe. The release endured for 23.7 minutes

The estimated dose rate at SZ normalized to H+1 hour, was 8.1 R/hr and the estimated total release, normalized to H+1 minute, was 5×10^3 curies. The isotope identities are not available.

REMARKS:

The effluent gas gave a maximum reading of 95 mR/hr on the ground one mile downwind from SZ at H+0.5 hour. The most significant radiation was confined to the crater and radiochemistry sampling area

OPERATION CROSSX - Tendrac

	PST	GMT
DATE:	7 Dec 1962	7 Dec 1962
TIME:	1100	1900

SPONSOR: LASL/DOE

SITE: NTS - U3ba
37° 06' 06.2914" N
116° 01' 46.5161" W

SITE ELEVATION: 4670 ft MSL

DEPTH OF BURST: 1001 ft

TYPE OF BURST PLACEMENT:
Underground, in alluvium

VENTING:
None

OPERATION: PIKE - Bikini

	Test	Control
DATE:	[illegible]	[illegible]
TIME:	0600	1700

SPONSOR: U.S.

SITE: [illegible]

SHOT TIME (Z): [illegible]

WIDTH OF DETECTOR: [illegible] ft.

SHOT DESIGN: [illegible]

TYPE OF [illegible] AND [illegible]:
[illegible]

REMARKS:

Radiation levels were detected near 5Z after several barges had [illegible] radioactivity released by this detonation. No other radiation levels were detected on or off the ATO from radioactivity released by this detonation. Some radiation was detected in the area corresponding 5Z from previous radioactivity released during previous [illegible] Monday operations. No radioactivity was detected off the ATO from past shot operations.

OPERATION STORM - Device 2

	PST	GMT
DATE:	[illegible]	[illegible]
TIME:	1010	1810

SPONSOR: LASL

SITE: NTS - Yucca
37° 03' 49.71" N
116° 03' 36.0301" W

SITE ELEVATION: [illegible]

DEPTH OF BURST: [illegible]

TYPE OF BURST AND YIELD:
Underground, [illegible]

VENTING:
Vented

REMARKS:

Radiation levels were detected over 82 shots conducted at the NTS and the radioactivity released by this detonation. No other nuclear [illegible] detected on or off the NTS. Some variations over the levels in the surrounding 82 from natural radioactivity released during post-shot drilling. No radioactivity was detected off the NTS from post-shot operations.

APPENDIX A

Announced United States Nuclear Detonations

Yields are listed as: Low (less than 20 kt)
Intermediate (20 to 999 kt inclusive)
Low Megaton (one to several megatons).

Prior to October 1958, testing was conducted on an intermittent basis and each series of tests was designated by a series name, such as OPERATION CROSSROADS. The United States conducted no tests from October 30, 1958 to September 1961. After resumption of testing, tests were conducted year around and were listed by fiscal year. For example, all NTS tests during FY-1962, which ended June 30, 1962, were in the OPERATION NOUGAT series except for four surface tests (Little Feller I and II, Small Boy and Johnny Boy) designated DOMINIC II, which were a continuation of the DOMINIC I series conducted in the Pacific.

ANNOUNCED UNITED STATES NUCLEAR DETONATIONS

EVENT NAME	DATE(GCT)	LOCATION	TYPE	PURPOSE	YIELD RANGE
TRINITY	07/16/45	ALAMOGORDO	TOWER	WEAPONS RELATED	19KT
FIRST TEST OF AN A-BOMB					
WORLD WAR II	08/05/45	JAPAN	AIRDROP	COMBAT	13 KT
FIRST COMBAT USE-HIROSHIMA					
WORLD WAR II	08/09/45	JAPAN	AIRDROP	COMBAT	23 KT
SECOND COMBAT USE-NAGASAKI					
		OPERATION CROSSROADS			
ABLE	06/30/46	BIKINI	AIRDROP	WEAPONS RELATED	23 KT
BAKER	07/24/46	BIKINI	UW	WEAPONS RELATED	23 KT
		OPERATION SANDSTONE			
X-RAY	04/14/48	ENIWETOK	TOWER	WEAPONS RELATED	37KT
YOKE	04/30/48	ENIWETOK	TOWER	WEAPONS RELATED	49KT
ZEBRA	05/15/48	ENIWETOK	TOWER	WEAPONS RELATED	18KT
		OPERATION RANGER			
ABLE	01/27/51	NTS	AIRDROP	WEAPONS RELATED	1KT
BAKER	01/28/51	NTS	AIRDROP	WEAPONS RELATED	8KT
EASY	02/01/51	NTS	AIRDROP	WEAPONS RELATED	1KT
BAKER-2	02/02/51	NTS	AIRDROP	WEAPONS RELATED	8KT
FOX	02/06/51	NTS	AIRDROP	WEAPONS RELATED	22KT
		OPERATION GREENHOUSE			
DOG	04/07/51	ENIWETOK	TOWER	WEAPONS RELATED	
EASY	04/20/51	ENIWETOK	TOWER	WEAPONS RELATED	47KT
GEORGE	05/08/51	ENIWETOK	TOWER	WEAPONS RELATED	
ITEM	05/24/51	ENIWETOK	TOWER	WEAPONS RELATED	
		OPERATION BUSTER-JANGLE			
ABLE	10/22/51	NTS	TOWER	WEAPONS RELATED	LESS THAN 0.1KT
BAKER	10/28/51	NTS	AIRDROP	WEAPONS RELATED	3.5KT
CHARLIE	10/30/51	NTS	AIRDROP	WEAPONS RELATED	14KT
DOG	11/01/51	NTS	AIRDROP	WEAPONS RELATED	21KT
EASY	11/05/51	NTS	AIRDROP	WEAPONS RELATED	31KT
SUGAR	11/19/51	NTS	SURFACE	WEAPONS RELATED	1.2KT

ANNOUNCED UNITED STATES NUCLEAR DETONATIONS

EVENT NAME	DATE (GCT)	LOCATION	TYPE	PURPOSE	YIELD RANGE
UNCLE	11/29/51	NTS	CRATER	WEAPONS RELATED	1.2KT
		OPERATION TUMBLER-SNAPPER			
ABLE	04/01/52	NTS	AIRDROP	WEAPONS RELATED	1KT
BAKER	04/15/52	NTS	AIRDROP	WEAPONS RELATED	1KT
CHARLIE	04/22/52	NTS	AIRDROP	WEAPONS RELATED	31KT
DOG	05/01/52	NTS	AIRDROP	WEAPONS RELATED	19KT
EASY	05/07/52	NTS	TOWER	WEAPONS RELATED	12KT
FOX	05/25/52	NTS	TOWER	WEAPONS RELATED	11KT
GEORGE	06/01/52	NTS	TOWER	WEAPONS RELATED	15KT
HOW	06/05/52	NTS	TOWER	WEAPONS RELATED	14KT
		OPERATION IVY			
MIKE	10/31/52	ENIWETOK	SURFACE	WEAPONS RELATED	10.4MT
EXPERIMENTAL THERMONUCLEAR DEVICE					
KING	11/15/52	ENIWETOK	AIRDROP	WEAPONS RELATED	500 KT
		OPERATION UPSHOT-KNOTHOLE			
ANNIE	03/17/53	NTS	TOWER	WEAPONS RELATED	16KT
NANCY	03/24/53	NTS	TOWER	WEAPONS RELATED	24KT
RUTH	03/31/53	NTS	TOWER	WEAPONS RELATED	0.2KT
DIXIE	04/06/53	NTS	AIRDROP	WEAPONS RELATED	11KT
RAY	04/11/53	NTS	TOWER	WEAPONS RELATED	0.2KT
BADGER	04/18/53	NTS	TOWER	WEAPONS RELATED	23KT
SIMON	04/25/53	NTS	TOWER	WEAPONS RELATED	43KT
ENCORE	05/08/53	NTS	AIRDROP	WEAPONS RELATED	27KT
HARRY	05/19/53	NTS	TOWER	WEAPONS RELATED	32KT
GRABLE	05/25/53	NTS	GUN	WEAPONS RELATED	15KT
FIRED FROM 280MM GUN					
CLIMAX	06/04/53	NTS	AIRDROP	WEAPONS RELATED	61KT
		OPERATION CASTLE			
BRAVO	02/28/54	BIKINI	SURFACE	WEAPONS RELATED	15MT
EXPERIMENTAL THERMONUCLEAR DEVICE					

ANNOUNCED UNITED STATES NUCLEAR DETONATIONS

EVENT NAME	DATE (GCT)	LOCATION	TYPE	PURPOSE	YIELD RANGE
ROMEO	03/26/54	BIKINI	BARGE	WEAPONS RELATED	11 MT
KOON	04/06/54	BIKINI	SURFACE	WEAPONS RELATED	110 KT
UNION	04/25/54	BIKINI	BARGE	WEAPONS RELATED	6.9 MT
YANKEE	05/04/54	BIKINI	BARGE	WEAPONS RELATED	13.5 MT
NECTAR	05/13/54	ENIWETOK	BARGE	WEAPONS RELATED	1.69 MT
		OPERATION TEAPOT			
WASP	02/18/55	NTS	AIRDROP	WEAPONS RELATED	1KT
MOTH	02/22/55	NTS	TOWER	WEAPONS RELATED	2KT
TESLA	03/01/55	NTS	TOWER	WEAPONS RELATED	7KT
TURK	03/07/55	NTS	TOWER	WEAPONS RELATED	43KT
HORNET	03/12/55	NTS	TOWER	WEAPONS RELATED	4KT
BEE	03/22/55	NTS	TOWER	WEAPONS RELATED	8KT
ESS	03/23/55	NTS	CRATER	WEAPONS RELATED	1KT
APPLE-1	03/29/55	NTS	TOWER	WEAPONS RELATED	14KT
WASP PRIME	03/29/55	NTS	AIRDROP	WEAPONS RELATED	3KT
HA	04/06/55	NTS	AIRDROP	WEAPONS RELATED	1KT
POST	04/09/55	NTS	TOWER	WEAPONS RELATED	2KT
MET	04/15/55	NTS	TOWER	WEAPONS RELATED	22KT
APPLE-2	05/05/55	NTS	TOWER	WEAPONS RELATED	29KT
ZUCCHINI	05/15/55	NTS	TOWER	WEAPONS RELATED	28KT
		OPERATION WIGWAM			
WIGWAM 29 DEGREES N-126 DEGREES W	05/14/55		UW	WEAPONS RELATED	30KT
		OPERATION REDWING			
LACROSSE	05/04/56	ENIWETOK	SURFACE	WEAPONS RELATED	40 KT
CHEROKEE FIRST AIR DROP BY U.S. OF A THERMONUCLEAR WEAPON	05/20/56	BIKINI	AIRDROP	WEAPONS RELATED	SEVERAL MT
ZUNI	05/27/56	BIKINI	SURFACE	WEAPONS RELATED	3.5 MT
YUMA	06/27/56	ENIWETOK		WEAPONS RELATED	

ANNOUNCED UNITED STATES NUCLEAR DETONATIONS

EVENT NAME	DATE (GCT)	LOCATION	TYPE	PURPOSE	YIELD RANGE
ERIE	05/30/56	ENIWETOK	TOWER	WEAPONS RELATED	
SEMINOLE	06/06/56	ENIWETOK	SURFACE	WEAPONS RELATED	
FLATHEAD	06/11/56	BIKINI	BARGE	WEAPONS RELATED	
BLACKFOOT	06/11/56	ENIWETOK	TOWER	WEAPONS RELATED	
KICKAPOO	06/13/56	ENIWETOK		WEAPONS RELATED	
OSAGE	06/16/56	ENIWETOK	AIRDROP	WEAPONS RELATED	
INCA	06/21/56	ENIWETOK		WEAPONS RELATED	
DAKOTA	06/25/56	BIKINI	BARGE	WEAPONS RELATED	
MOHAWK	07/02/56	ENIWETOK		WEAPONS RELATED	
APACHE	07/08/56	ENIWETOK	BARGE	WEAPONS RELATED	
NAVAJO	07/10/56	BIKINI	BARGE	WEAPONS RELATED	
TEWA	07/20/56	BIKINI	BARGE	WEAPONS RELATED	5 MT
HURON	07/21/56	ENIWETOK	BARGE	WEAPONS RELATED	
		OPERATION PLUMBBOB			
BOLTZMAN	05/28/57	NTS	TOWER	WEAPONS RELATED	12KT
FRANKLIN	06/02/57	NTS	TOWER	WEAPONS RELATED	140TONS
LASSEN	06/05/57	NTS	BALLOON	WEAPONS RELATED	3.5 TONS
WILSON	06/18/57	NTS	BALLOON	WEAPONS RELATED	10KT
PRISCILLA	06/24/57	NTS	BALLOON	WEAPONS RELATED	37KT
HOOD	07/05/57	NTS	BALLOON	WEAPONS RELATED	74KT
DIABLO	07/15/57	NTS	TOWER	WEAPONS RELATED	17KT
JOHN	07/19/57	NTS	ROCKET	WEAPONS RELATED	ABOUT 2KT
KEPLER	07/24/57	NTS	TOWER	WEAPONS RELATED	10KT
OWENS	07/25/57	NTS	BALLOON	WEAPONS RELATED	9.7KT
STOKES	08/07/57	NTS	BALLOON	WEAPONS RELATED	19KT
SHASTA	08/18/57	NTS	TOWER	WEAPONS RELATED	17KT
DOPPLER	08/23/57	NTS	BALLOON	WEAPONS RELATED	LESS

ANNOUNCED UNITED STATES NUCLEAR DETONATIONS

EVENT NAME	DATE (GCT)	LOCATION	TYPE	PURPOSE	YIELD RANGE
FRANKLIN PRIME	08/30/57	NTS	BALLOON	WEAPONS RELATED	6.7KT
SMOKY	08/31/57	NTS	TOWER	WEAPONS RELATED	44KT
GALILEO	09/02/57	NTS	TOWER	WEAPONS RELATED	11KT
WHEELER	09/06/57	NTS	BALLOON	WEAPONS RELATED	197 TONS
LAPLACE	09/08/57	NTS	BALLOON	WEAPONS RELATED	1KT
FIZEAU	09/14/57	NTS	TOWER	WEAPONS RELATED	11KT
WENTON	09/16/57	NTS	BALLOON	WEAPONS RELATED	12KT
RAINIER	09/19/57	NTS	TUNNEL	WEAPONS RELATED	1.7KT
FIRST TUNNEL EMPLACEMEN					
WHITNEY	09/23/57	NTS	TOWER	WEAPONS RELATED	19KT
CHARLESTON	09/28/57	NTS	BALLOON	WEAPONS RELATED	12KT
MORGAN	10/07/57	NTS	BALLOON	WEAPONS RELATED	8KT
		OPERATION HARDTACK I			
TUCCA	04/28/58		BALLOON	WEAPONS RELATED	
12 DEGREES 39 MIN N-163 DEGREES 01 MIN E					
CACTUS	05/05/58	ENIWETOK	SURFACE	WEAPONS RELATED	18 KT
FIR	05/11/58	BIKINI	BARGE	WEAPONS RELATED	
BUTTERNUT	05/11/58	ENIWETOK	BARGE	WEAPONS RELATED	
KOA	05/12/58	ENIWETOK	SURFACE	WEAPONS RELATED	1.37 MT
WAHOO	05/16/58	ENIWETOK	UW	WEAPONS RELATED	
HOLLY	05/20/58	ENIWETOK	BARGE	WEAPONS RELATED	
NUTMEG	05/21/58	BIKINI	BARGE	WEAPONS RELATED	
YELLOWWOOD	05/26/58	ENIWETOK	BARGE	WEAPONS RELATED	
MAGNOLIA	05/26/58	ENIWETOK	BARGE	WEAPONS RELATED	
TOBACCO	05/30/58	ENIWETOK	BARGE	WEAPONS RELATED	
SYCAMORE	05/31/58	BIKINI	BARGE	WEAPONS RELATED	
ROSE	06/02/58	ENIWETOK	BARGE	WEAPONS RELATED	
UMBRELLA	06/08/58	ENIWETOK	UW	WEAPONS RELATED	

ANNOUNCED UNITED STATES NUCLEAR DETONATIONS

EVENT NAME	DATE (GCT)	LOCATION	TYPE	PURPOSE	YIELD RANGE
MAPLE	05/10/58	BIKINI	BARGE	WEAPONS RELATED	
ASPEN	05/14/58	BIKINI	BARGE	WEAPONS RELATED	
WALNUT	05/14/58	ENIWETOK	BARGE	WEAPONS RELATED	
LINDEN	05/18/58	ENIWETOK	BARGE	WEAPONS RELATED	
REDWOOD	05/27/58	BIKINI	BARGE	WEAPONS RELATED	
ELDER	05/27/58	ENIWETOK	BARGE	WEAPONS RELATED	
OAK	05/28/58	ENIWETOK	BARGE	WEAPONS RELATED	8.9 MT
HICKORY	05/29/58	BIKINI	BARGE	WEAPONS RELATED	
SEQUOIA	07/01/58	ENIWETOK	BARGE	WEAPONS RELATED	
CEDAR	07/02/58	BIKINI	BARGE	WEAPONS RELATED	
DOGWOOD	07/05/58	ENIWETOK	BARGE	WEAPONS RELATED	
POPLAR	07/12/58	BIKINI	BARGE	WEAPONS RELATED	
PISONIA	07/17/58	ENIWETOK		WEAPONS RELATED	
JUNIPER	07/22/58	BIKINI	BARGE	WEAPONS RELATED	
OLIVE	07/22/58	ENIWETOK	BARGE	WEAPONS RELATED	
PINE	07/26/58	ENIWETOK	BARGE	WEAPONS RELATED	
TEAK	08/01/58	JOHNSTON ISL AREA	ROCKET	WEAPONS RELATED	MEGATON RANGE
QUINCE	08/06/58	ENIWETOK		WEAPONS RELATED	
ORANGE	08/12/58	JOHNSTON ISL AREA	ROCKET	WEAPONS RELATED	MEGATON RANGE
FIG	08/18/58	ENIWETOK		WEAPONS RELATED	
		OPERATION ARGUS			
ARGUS I ABOUT 300 MILES ALTITUDE	08/27/58	SOUTH ATLANTIC	ROCKET	WEAPONS RELATED	1-2KT
ARGUS II ABOUT 300 MILES ALTITUDE	08/30/58	SOUTH ATLANTIC	ROCKET	WEAPONS RELATED	1-2KT
ARGUS III ABOUT 300 MILES ALTITUDE	09/06/58	SOUTH ATLANTIC	ROCKET	WEAPONS RELATED	1-2KT
		OPERATION HARDTACK II			
ROOT	09/19/58	NTS	BALLOON	WEAPONS RELATED	83 TONS

ANNOUNCED UNITED STATES NUCLEAR DETONATIONS

EVENT NAME	DATE(GCT)	LOCATION	TYPE	PURPOSE	YIELD RANGE
MORA	09/29/58	NTS	BALLOON	WEAPONS RELATED	2KT
CANALPAIS SLIGHT VENTING	10/08/58	NTS	TUNNEL	WEAPONS RELATED	72 TONS
QUAY	10/10/58	NTS	TOWER	WEAPONS RELATED	19 TONS
LEA	10/13/58	NTS	BALLOON	WEAPONS RELATED	1.4KT
HAMILTON	10/15/58	NTS	TOWER	WEAPONS RELATED	1.2 TONS
LOGAN	10/16/58	NTS	TUNNEL	WEAPONS RELATED	5KT
DONA ANA	10/16/58	NTS	BALLOON	WEAPONS RELATED	37 TONS
RIO ARRIBA	10/18/58	NTS	TOWER	WEAPONS RELATED	90 TONS
SOCORRO	10/22/58	NTS	BALLOON	WEAPONS RELATED	8KT
WRANGELL	10/22/58	NTS	BALLOON	WEAPONS RELATED	115 TONS
KUSHMORE	10/22/58	NTS	BALLOON	WEAPONS RELATED	188 TONS
SANFORD	10/26/58	NTS	BALLOON	WEAPONS RELATED	4.9KT
OF BACA	10/26/58	NTS	BALLOON	WEAPONS RELATED	2.2KT
EVANS VENTING	10/29/58	NTS	TUNNEL	WEAPONS RELATED	55 TONS
HUMBOLDT	10/29/58	NTS	TOWER	WEAPONS RELATED	7.8 TONS
SANTA FE	10/30/58	NTS	BALLOON	WEAPONS RELATED	1.3KT
BLANCA SLIGHT VENTING	10/30/58	NTS	TUNNEL	WEAPONS RELATED	19KT
		OPERATION NOUGAT			
ANTLER	09/15/61	NTS	TUNNEL	WEAPONS RELATED	2.4KT
SHREW LOW YIELD MEANS LESS THAN 20KT	09/16/61	NTS	SHAFT	WEAPONS RELATED	LOW
CHENA	10/10/61	NTS	TUNNEL	WEAPONS RELATED	LOW
MINK	10/29/61	NTS	SHAFT	WEAPONS RELATED	LOW
FISHER	12/03/61	NTS	SHAFT	WEAPONS RELATED	13.5KT
GNOME MULTIPLE-PURPOSE EXPERIMENT IN SALT-FORMED CAVITY 160-170 FT.DIAMETER 60-80 FT.HIGH	12/10/61	CARLSBAD	SHAFT	PLOWSHARE	3.1KT

ANNOUNCED UNITED STATES NUCLEAR DETONATIONS

EVENT NAME	DATE(GCT)	LOCATION	TYPE	PURPOSE	YIELD RANGE
MAD	12/13/61	NTS	SHAFT	WEAPONS RELATED	0.45KT
RINGTAIL	12/17/61	NTS	SHAFT	WEAPONS RELATED	LOW
FEATHER	12/22/61	NTS	TUNNEL	WEAPONS RELATED	LOW
STOAT	01/09/62	NTS	SHAFT	WEAPONS RELATED	4.5KT
AGOUTI	01/18/62	NTS	SHAFT	WEAPONS RELATED	5.9KT
DORMOUSE	01/30/62	NTS	SHAFT	WEAPONS RELATED	LOW
STILLWATER	02/08/62	NTS	SHAFT	WEAPONS RELATED	2.7KT
ARMADILLO	02/09/62	NTS	SHAFT	WEAPONS RELATED	6.6KT
HARDHAT GRANITE	02/15/62	NTS	SHAFT	WEAPONS RELATED	5.9KT
CHINCHILLA	02/19/62	NTS	SHAFT	WEAPONS RELATED	1.6KT
COOSAW	02/19/62	NTS	SHAFT	WEAPONS RELATED	LOW
CIMARRON	02/23/62	NTS	SHAFT	WEAPONS RELATED	11.2KT
PLATYPUS	02/24/62	NTS	SHAFT	WEAPONS RELATED	LOW
PAMPAS	03/01/62	NTS	SHAFT	JOINT US-UK	LOW
DANNY BOY CRATER DIAMETER 265 FT. DEPTH 84 FT, IN BASALT	03/05/62	NTS	CRATER	WEAPONS RELATED	0.42KT
ERMINE	03/06/62	NTS	SHAFT	WEAPONS RELATED	LOW
BRAZOS	03/08/62	NTS	SHAFT	WEAPONS RELATED	7.6KT
HOGNOSE	03/15/62	NTS	SHAFT	WEAPONS RELATED	LOW
HOOSIC	03/28/62	NTS	SHAFT	WEAPONS RELATED	3KT
CHINCHILLA II	03/31/62	NTS	SHAFT	WEAPONS RELATED	LOW
DORMOUSE II	04/05/62	NTS	SHAFT	WEAPONS RELATED	10KT
PASSAIC	04/06/62	NTS	SHAFT	WEAPONS RELATED	LOW
HUDSON	04/12/62	NTS	SHAFT	WEAPONS RELATED	LOW
PLATTE	04/14/62	NTS	TUNNEL	WEAPONS RELATED	1.7KT
DEAD	04/21/62	NTS	SHAFT	WEAPONS RELATED	LOW

ANNOUNCED UNITED STATES NUCLEAR DETONATIONS

EVENT NAME	DATE(GCT)	LOCATION	TYPE	PURPOSE	YIELD RANGE
1962 PACIFIC TESTS WERE DESIGNATED OPERATION DOMINIC I					
ADOBE	04/25/62	CHRISTMAS ISL AREA	AIRDROP	WEAPONS RELATED	INTERMEDIATE
INTERMEDIATE MEANS 20 TO 1000 KT					
AZTEC	04/27/62	CHRISTMAS ISL AREA	AIRDROP	WEAPONS RELATED	INTERMEDIATE
BLACK	04/27/62	NTS	SHAFT	WEAPONS RELATED	LOW
ARKANSAS	05/02/62	CHRISTMAS ISL AREA	AIRDROP	WEAPONS RELATED	LOW MEGATON
OUESTA	05/04/62	CHRISTMAS ISL AREA	AIRDROP	WEAPONS RELATED	INTERMEDIATE
FRIGATE BIRD	05/06/62	CHRISTMAS ISL AREA	MISSILE	WEAPONS RELATED	
WARHEAD IN MISSILE LAUNCHED FROM POLARIS SUBMARINE					
PACA	05/07/62	NTS	SHAFT	WEAPONS RELATED	LOW
YUKON	05/08/62	CHRISTMAS ISL AREA	AIRDROP	WEAPONS RELATED	INTERMEDIATE
MESILLA	05/09/62	CHRISTMAS ISL AREA	AIRDROP	WEAPONS RELATED	INTERMEDIATE
MUSKEGON	05/11/62	CHRISTMAS ISL AREA	AIRDROP	WEAPONS RELATED	INTERMEDIATE
SWORDFISH	05/11/62	EASTERN PACIFIC	UW	WEAPONS RELATED	LOW
ANTISUBMARINE ROCKET /ASROC/ SYSTEM PROOF TEST					
ENCINO	05/12/62	CHRISTMAS ISL AREA	AIRDROP	WEAPONS RELATED	INTERMEDIATE
AARDVARK	05/12/62	NTS	SHAFT	WEAPONS RELATED	18KT
SWANEE	05/16/62	CHRISTMAS ISL AREA	AIRDROP	WEAPONS RELATED	INTERMEDIATE
EEL	05/19/62	NTS	SHAFT	WEAPONS RELATED	LOW
CHILCO	05/19/62	CHRISTMAS ISL AREA	AIRDROP	WEAPONS RELATED	INTERMEDIATE
WHITE	05/25/62	NTS	SHAFT	WEAPONS RELATED	LOW
TAMANA	05/26/62	CHRISTMAS ISL AREA	AIRDROP	WEAPONS RELATED	LOW
NANOE	05/27/62	CHRISTMAS ISL AREA	AIRDROP	WEAPONS RELATED	INTERMEDIATE
RACCOON	06/01/62	NTS	SHAFT	WEAPONS RELATED	LOW
PACKRAT	06/06/62	NTS	SHAFT	WEAPONS RELATED	LOW
ALMA	06/08/62	CHRISTMAS ISL AREA	AIRDROP	WEAPONS RELATED	INTERMEDIATE
TRUCKEE	06/09/62	CHRISTMAS ISL AREA	AIRDROP	WEAPONS RELATED	INTERMEDIATE
YESO	06/10/62	CHRISTMAS ISL AREA	AIRDROP	WEAPONS RELATED	LOW MEGATON
HANLEY	06/12/62	CHRISTMAS ISL AREA	AIRDROP	WEAPONS RELATED	INTERMEDIATE

ANNOUNCED UNITED STATES NUCLEAR DETONATIONS

EVENT NAME	DATE(GCT)	LOCATION	TYPE	PURPOSE	YIELD RANGE
DES MOINES	06/13/62	NTS	TUNNEL	WEAPONS RELATED	LOW
RINCONADA	06/15/62	CHRISTMAS ISL AREA	AIRDROP	WEAPONS RELATED	INTERMEDIATE
DULCE	06/17/62	CHRISTMAS ISL AREA	AIRDROP	WEAPONS RELATED	INTERMEDIATE
PETIT	06/19/62	CHRISTMAS ISL AREA	AIRDROP	WEAPONS RELATED	LOW
DAMAN I	06/21/62	NTS	SHAFT	WEAPONS RELATED	LOW
OTOMI	06/22/62	CHRISTMAS ISL AREA	AIRDROP	WEAPONS RELATED	INTERMEDIATE
BIGHORN	06/27/62	CHRISTMAS ISL AREA	AIRDROP	WEAPONS RELATED	MEGATON RANGE
HAYMAKER	06/27/62	NTS	SHAFT	WEAPONS RELATED	56KT
MARSHMALLOW DOD EVENT	06/28/62	NTS	TUNNEL	WEAPONS RELATED	LOW
BLUESTONE	06/30/62	CHRISTMAS ISL AREA	AIRDROP	WEAPONS RELATED	LOW MEGATON
SACRAMENTO	06/30/62	NTS	SHAFT	WEAPONS RELATED	LOW
		OPERATION STORAX			
SEDAN	07/06/62	NTS	CRATER	PLOWSHARE	100KT
EXCAVATION EXPERIMENT-CRATER 1280 FT.DIAM 320 FT.DEEP-THERMOMECLEAR DEV.					
LITTLE FELLER II	07/07/62	NTS	SURFACE	WEAPONS RELATED	LOW
SLIGHTLY ABOVE GROUND. DOMINIC II SERIES.					
STARFISH PRIME	07/09/62	JOHNSTON ISL AREA	ROCKET	WEAPONS RELATED	1.4 MEGATONS
HIGH ALTITUDE-400 KM					
SUNSET	07/10/62	CHRISTMAS ISL AREA	AIRDROP	WEAPONS RELATED	INTERMEDIATE
PAMLICO	07/11/62	CHRISTMAS ISL AREA	AIRDROP	WEAPONS RELATED	LOW MEGATON
JOHNNY BOY	07/11/62	NTS	SURFACE	WEAPONS RELATED	0.5
SLIGHTLY ABOVE GROUND. DOMINIC II SERIES.					
MERRIMAC	07/13/62	NTS	SHAFT	WEAPONS RELATED	LOW
SMALL BOY	07/14/62	NTS	SURFACE	WEAPONS RELATED	LOW
SLIGHTLY ABOVE GROUND. DOMINIC II SERIES.					
LITILE FELLER I	07/17/62	NTS	SURFACE	WEAPONS RELATED	LOW
TROOP PARTICIPATION. SLIGHTLY ABOVE GROUND. DOMINIC II SERIES.					
WICHITA	07/27/62	NTS	SHAFT	WEAPONS RELATED	LOW
YORK	08/26/62	NTS	SHAFT	WEAPONS RELATED	LOW
ROBBC	09/24/62	NTS	SHAFT	WEAPONS RELATED	LOW

ANNOUNCED UNITED STATES NUCLEAR DETONATIONS

EVENT NAME	DATE (GCT)	LOCATION	TYPE	PURPOSE	YIELD RANGE
HYRAX	09/14/62	NTS	SHAFT	WEAPONS RELATED	LOW
PEBA	09/20/62	NTS	SHAFT	WEAPONS RELATED	LOW
ALLEGHENY	09/29/62	NTS	SHAFT	WEAPONS RELATED	LOW
ANDROSCOGGIN	10/02/62	JOHNSTON ISL AREA	AIRDROP	WEAPONS RELATED	INTERMEDIATE
MISSISSIPPI	10/05/62	NTS	SHAFT	WEAPONS RELATED	110 KT
BUMPING	10/06/62	JOHNSTON ISL AREA	AIRDROP	WEAPONS RELATED	LOW
ROANOKE	10/12/62	NTS	SHAFT	WEAPONS RELATED	LOW
CHAMA	10/16/62	JOHNSTON ISL AREA	AIRDROP	WEAPONS RELATED	LOW MEGATON
BANDICOOT	10/19/62	NTS	SHAFT	WEAPONS RELATED	LOW
CHECKMATE HIGH ALTITUDE - TENS OF KMS	10/20/62	JOHNSTON ISL AREA	ROCKET	WEAPONS RELATED	LOW
BLUEGILL SPRIME HIGH ALTITUDE - TENS OF KMS	10/26/62	JOHNSTON ISL AREA	ROCKET	WEAPONS RELATED	SUBMEGATON
SANTEE	10/27/62	NTS	SHAFT	WEAPONS RELATED	LOW
CALAMITY	10/27/62	JOHNSTON ISL AREA	AIRDROP	WEAPONS RELATED	INTERMEDIATE
HOUSATONIC	10/30/62	JOHNSTON ISL AREA	AIRDROP	WEAPONS RELATED	MEGATON RANGE
KINGFISH HIGH ALTITUDE - TENS OF KMS	11/01/62	JOHNSTON ISL AREA	ROCKET	WEAPONS RELATED	SUBMEGATON
TIGHTROPE HIGH ALTITUDE - TENS OF KMS	11/04/62	JOHNSTON ISL AREA	ROCKET	WEAPONS RELATED	LOW
ANACOSTIA DEVICE DEVELOPMENT	11/27/62	NTS	SHAFT	PLOWSHARE	LOW
TENORAC	12/07/62	NTS	SHAFT	JOINT US-UK	LOW
MADISON	12/12/62	NTS	TUNNEL	WEAPONS RELATED	LOW
HUNGAT	12/12/62	NTS	SHAFT	WEAPONS RELATED	LOW

SAFETY EXPERIMENTS

Since 1955, the U.S. Atomic Energy Commission has conducted a number of safety experiments at the Nevada Test Site to determine the safety of nuclear weapons in case of accident. The following list includes those experiments which resulted in a measurable nuclear yield.

Name	Date (G.T.)	Time (P.S.T.)	Location of Shot	Height of Burst (Feet)	Type of Burst	Meteorological Data (Feet) Cloud Type	Cloud Base	Temperature	Yield	Remarks
[illegible]	09/01/57	0730	Nevada		Surface					
PLUMBBOB										
Pascal A	09/07/57	0700	Nevada		[illegible]		4,000			Slight nuclear yield
Coulomb A	09/09/57	0900	Nevada		Surface		35,000	50,000	0.2 KT	
Pascal B	09/12/57	0815	Nevada		Vertical Shaft					Slight yield
Coulomb B	09/22/57	0900	Nevada		Surface				0.5 KT	
HARDTACK PHASE I										
Otero	10/04/58	0600	Nevada	463	[illegible]		9,000		58 KT	
Scandium	10/09/58	0930	Nevada	456	[illegible]		7,500	9,500	11 KT	
Tuna	10/09/58	0900	Nevada	481	[illegible]	Low	Diffuse cloud		1.5 KT	
Yellowwood	10/14/58	0430	Nevada	481	[illegible]		5,500		2 KT	
Wasp	10/18/58	0900	Nevada		[illegible]	Low	Diffuse cloud		1.5 KT	Not vented through [illegible]
Umbrella	10/30/58	0410	Nevada	531	Balloon		17,500	8,000	8 KT	
Koa	11/04/58	0815	Nevada	550	[illegible]		5,500	8,500	8.9 KT	
Cactus	11/20/58	0800	Nevada	941.5	[illegible]		15,000		18 KT	Shot vented
Yucca	11/26/58	2100	Nevada		Surface		10,000		36 KT	
Dakota	11/26/58	1500	Nevada	97.5	Tower		8,500	9,000	81 KT	
Tobacco	12/02/58	0801	Nevada		Surface		5,500		1.7 KT	
Quince	12/10/58	0700	Nevada	45	Tower		4,500		0.2 KT	
Chama	12/16/58	1100	Nevada	97.5	Tower		4,500		0.7 KT	
Fisher	12/22/58	2015	Nevada	25	Tower		4,500		0.2 KT	

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