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OPERATION REDWING

A PRELIMINARY REPORT

OF

[redacted] (BLACKFOOT)

Submitted by Task Group 7.1

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INTRODUCTION

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PART I

GENERAL INFORMATION

Observed Weather at Shot Time

Fig. 0-1 - Eniwetok Atoll Map

Fig. 0-2 - Runit Island Map with Scientific Stations

Fig. 0-3 - RadSafe Survey, D-Day

[redacted]

[redacted]

[redacted] (BLACKFOOT)

ENIWETOK OBSERVED WEATHER FOR 12 JUNE 1956

AT DETONATION TIME 0626M

Sea Level Pressure	1012.5 mb
Free Air Surface Temperature	81.1°F
Wet Bulb Temperature	77.2°F
Dew Point Temperature	75.8°F
Relative Humidity	84.0%
Surface Wind	075° 10-14 knots
Visibility	10 miles

Clouds

2/10 cumulus; estimated at 1500 ft. Large cumulus with shower activity located 7½ miles bearing 060° from Eniwetok. Top of this cumulus measured by radar at 37,000 ft.

1/10 stratocumulus; base estimated at 4500 ft.

2/10 or more altocumulus; estimated at 9000 ft. (opaque)

8/10 cirrostratus; estimated at 30,000 ft. (thin) (4/10 transparent)

Area Weather Summary From Aircraft Reports

3/8-5/8 cumulus over Eniwetok area with bases at 1500 feet and tops generally at 5000-7000 feet. Cumulonimbus located south of GZ with top at 35,000 feet. Some cumulonimbus tops estimated at 45,000 feet to north-east and north of GZ (no distance estimated). A scattered line of cumulo-nimbus about 30 miles east of GZ with tops estimated at 40,000 feet.

8/10 altostratus; bases at 13,500 ft with tops at 15,000 feet.

8/10-9/10 cirrostratus (very thin); based at 30,000 feet which app-eared to be "breaking up" and dissipating.

Rain showers were observed to the east and west of GZ, no distances estimated.

[redacted]

6

[redacted]

State of Sea

Ocean Side: Wave heights 5 feet, period 6 seconds, direction 090°.

Lagoon Side: Wave heights less than 1 foot.

ENIWETOK UPPER AIR SOUNDING (111715Z)

Pressure (Millibars)	Height (Feet)	Temperature (°C)	Dew Point (°C)
1004	-	26.4	23.7
1000	364	26.3	23.6
850	5,016	17.7	13.3
748	8,530	11.0	05.4
700	10,380	09.0	01.0
684	10,991	08.3	-00.9
600	14,521	00.9	-08.3
572	15,748	-01.9	-11.1
506	18,963	-06.4	-15.4
500	19,258	-07.0	-16.2
446	22,146	-12.5	-24.2
424	23,425	-16.0	-28.5
400	24,856	-18.5	-30.5
300	31,680	-34.0	-44.5
298	31,791	-34.6	-45.1
247	36,089	-43.2	M
200	40,604	-55.0	M
165	44,587	-66.0	M
150	46,411	-71.0	M
138	M	-75.0	M
109	52,461	-81.8	M
103	53,445	-78.7	M
100	54,029	-78.8	M
90	56,069	-78.0	M
60	63,858	-64.1	M
50	67,513	-65.2	M
47	68,570	-65.8	M
41	71,496	-61.4	M

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[redacted]

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[redacted]

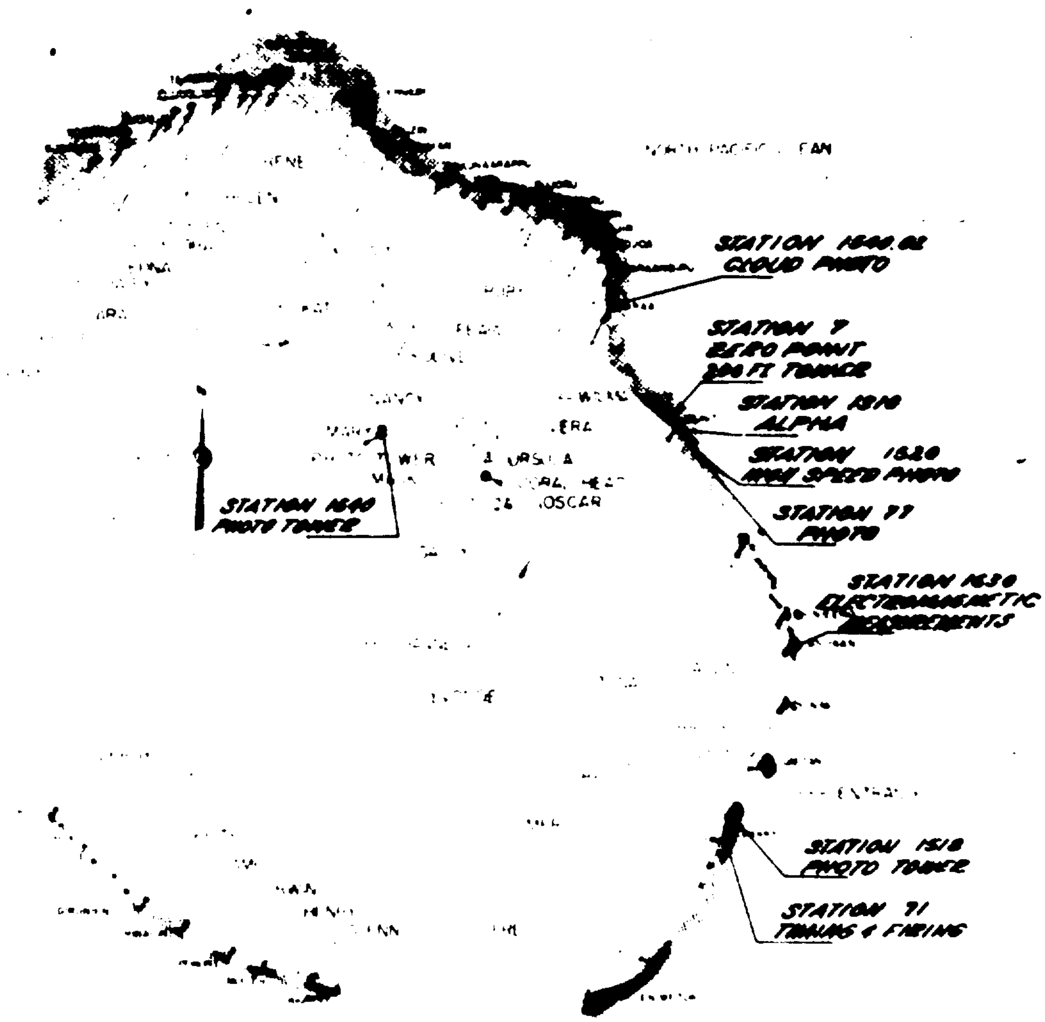
WINDS ALOFT (Release Time 111715Z)

Height (Feet)	Direction (Degrees)	Speed (Knots)	Height (Feet)	Direction (Degrees)	Speed (Knots)
1,000	090	12	28,000	060	10
2,000	090	13	30,000	050	07
3,000	100	21	32,000	330	04
4,000	100	16	34,000	290	06
5,000	100	13	35,000	280	12
6,000	100	11	36,000	250	16
7,000	100	10	38,000	250	39
8,000	100	10	40,000	240	30
9,000	090	08	42,500	240	26
10,000	070	08	45,000	240	20
12,000	080	08	47,500	270	19
14,000	090	07	50,000	310	19
16,000	090	08	52,500	010	12
18,000	070	14	55,000	090	17
20,000	070	08	57,500	100	27
22,000	050	06	60,000	120	23
24,000	080	08	65,000	060	15
25,000	090	08	70,000	090	31
26,000	090	10	71,000	090	31

[redacted]

8

[redacted]



[redacted]

Fig. O-1 – Eniwetok Atoll Map

[redacted]

[redacted]

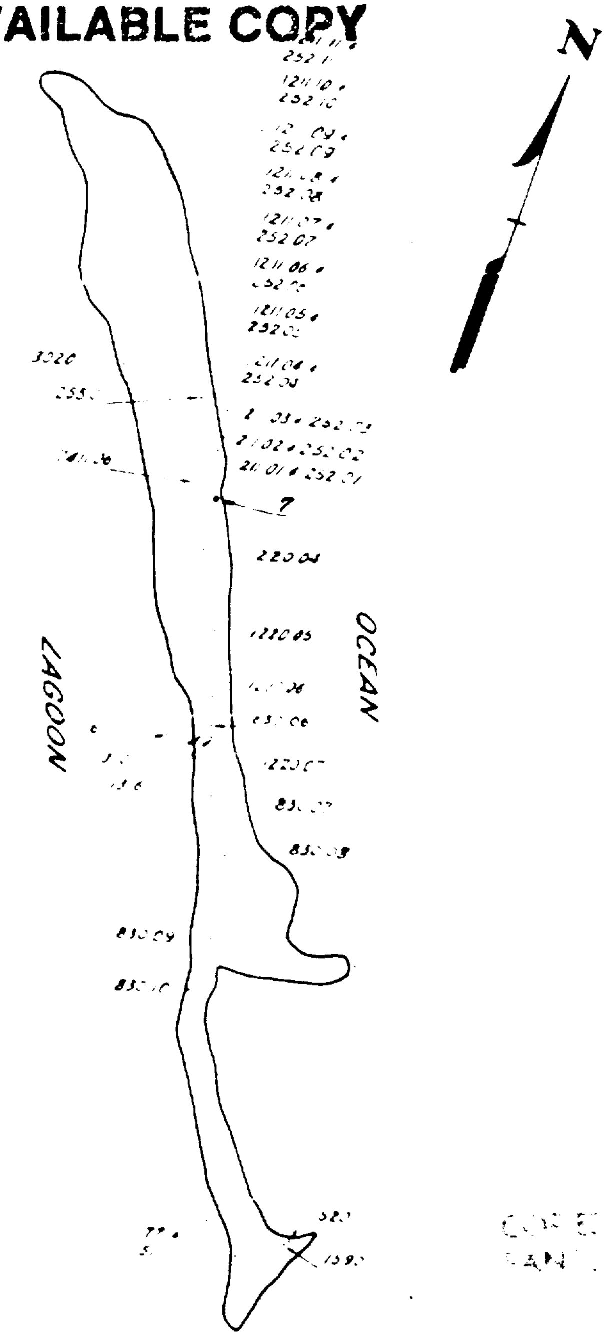
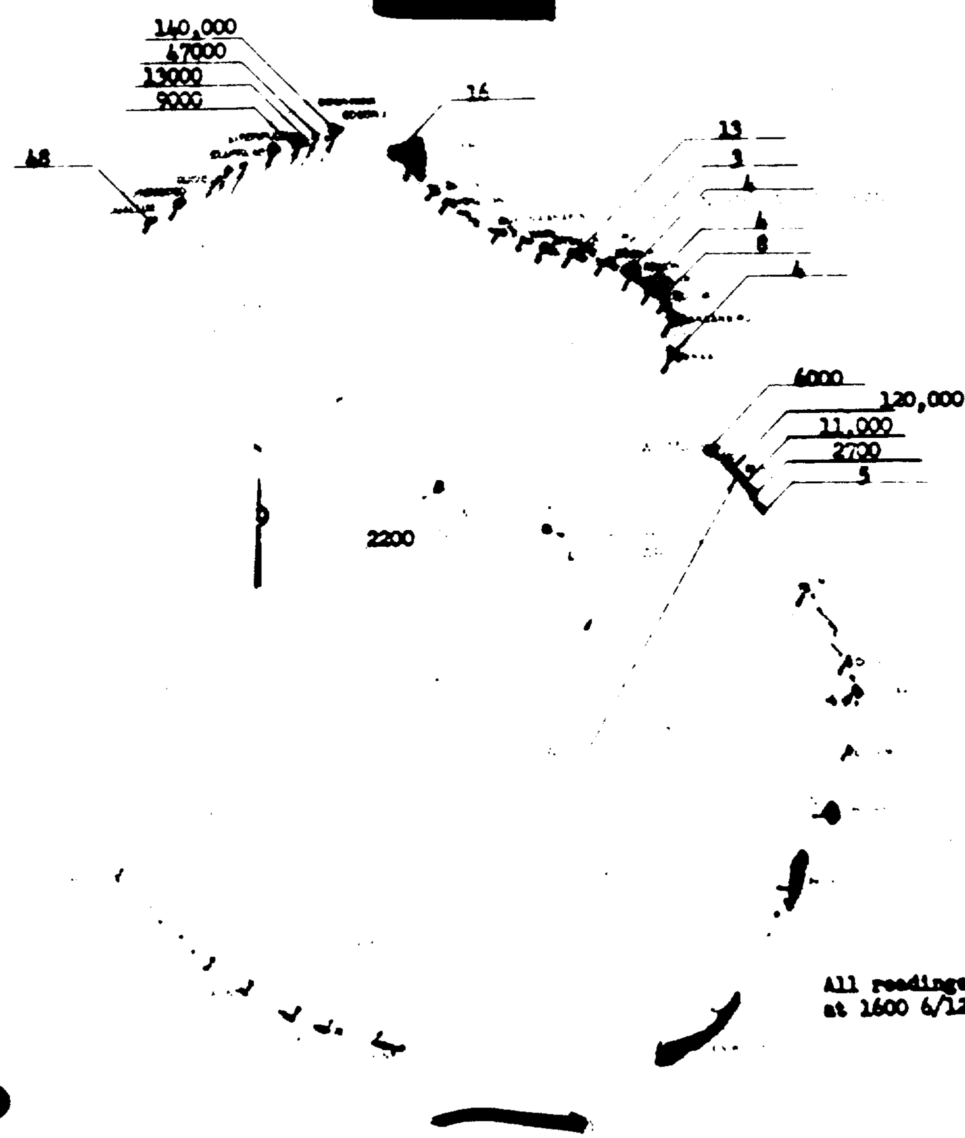


Fig. 0-2 - Runit Island Map with Scientific Stations

[redacted]

[redacted]



All readings in mr/hr at 1600 6/12/56

Fig. 0-3 - RadSafe Survey, D-Day

[redacted]

PART II

TASK UNIT 3

DOD PROGRAMS

K. D. Coleman
Col. K. D. Coleman
CTU-3

Program 1 - Blast and Shock Measurements		Maj. H. T. Bingham
Program 2 - Nuclear Radiation and Effects		CDR D. C. Campbell
Program 6 - Tests of Service Equipment and Materials		Lt Col C. W. Bankes

[redacted]

[redacted] (BLACKFOOT)

Project 1.9 - Water Wave Studies - L. W. Kidd

OBJECTIVES AND INSTRUMENTATION

Studies of water wave action generated by the detonation of large yield [redacted] nuclear devices are made at relatively close ranges and at several distant island stations by Project 1.9. Four shore recording wave measuring stations (of the Mark VIII type) were active in Bikini Lagoon for [redacted] (Blackfoot). In addition, Project 1.9 constructed and installed four new type long period wave recorders on Eniwetok, Ailinginae, Wake, and Johnston Islands. These recorders are designed to document long period, low amplitude deep ocean waves of the tsunami type. The recorders operate continuously but only receive significant signals from the large shots at Bikini. In addition to the above instrumentation, a tide gage was active at Ailinginae Atoll, and Sandia Corporation microbarographic stations were operated by Project 1.9 at Wake and Johnston.

RESULTS

The water wave stations were operating for this shot, but significant wave action was not observed.

[redacted]

13 B

[redacted]

[redacted] (BLACKFOOT)

Project 2.51 - Neutron Flux Measurements and Shielding Studies -

C. W. Luke

OBJECTIVE

To measure the neutron flux as a function of distance from the point of detonation of a [redacted] device. Also to establish the nonvariance of the neutron-energy spectrum with increasing distance from the point of detonation.

To measure the relative attenuation of neutrons and gamma rays by various mixtures of concrete, borax, and sulfur.

RESULTS

As of this date no results are available. Lengthy counting procedures will prevent submission of definitive data until the Preliminary report is published.

[redacted]

[redacted]

[redacted] (BLACKFOOT)

Project 6.1 - Accurate Location of Electromagnetic Pulse Source -

F. A. Lewis

OBJECTIVE

To utilise the electromagnetic signal originating from nuclear weapon detonations to determine ground zero of detonation. Secondarily to obtain the yield data that is available in the bomb pulse.

PROCEDURE

Location of Ground Zero is made by use of an inverse Loran principle. The exact time the bomb pulse is received at various stations is recorded. The exact time difference in receipt of the electromagnetic pulse between two stations will be used to determine a hyperbolic curve which runs through ground zero. The point of intersection of two or more curves determines ground zero.

There are two systems. One of the systems is known as the long base line system and the other, the short base line system. Each system has two sets of stations. The long base line has one set of stations located in the Hawaiian Islands (Midway, Palmyra and Maui) with synchronising antenna station at Haiku, Maui, and the other set of stations in the States (Harlingen, Texas; Blytheville, Arkansas; Kinross, Michigan and Rome, New York) with synchronising antenna station at Cape Fear, North Carolina. The short base lines have one set of stations located in the Hawaiian area (Kona, Hawaii; Papa, Hawaii; and Red Hill, Maui) the other set in California (Pittsburg, Woodland, and Maryville).

[redacted]

RESULTS

Short Base Line

Hawaii - All stations in the Kona net received and recorded electromagnetic pulse emanating from bomb detonation. Line positioning error was 6 nautical miles. Maximum field strength was 0.3 volts per meter.

California - All stations in the Woodland net received and recorded the electromagnetic pulse emanating from the bomb detonation. Line of positioning error was 4 nautical miles. Maximum field strength was .3 volts per meter.

Long Base Line

Hawaii - All stations in the Lahaina net received and recorded the electromagnetic pulse emanating from bomb detonation. The fix error was 480 yards.

Stateside - All stations in the Harlingen net received and recorded the electromagnetic pulse emanating from the bomb detonation.

Griffiss AFB equipment operated satisfactorily.

The above line of position errors may change considerably during further examination of the data.

[redacted]

[redacted] (BLACKFOOT)

Project 6.3 - Effects of Atomic Explosions on the Ionosphere - M. Hawn

OBJECTIVE

The objective of Project 6.3 is to obtain data on the effects of high yield nuclear explosions on the Ionosphere. Principally, to investigate the area of absorption, probably due to the high altitude radioactive particles, and to study the effect of orientation relative to the earth's magnetic field on F2 layer effects.

INSTRUMENTATION

The system comprises:

Two Ionosphere recorders, type C-2, operating on pulse transmission, installed in 6 ton trailer vans, one located at Rongerik Atoll and one located at Kusaie in the Caroline Islands.

One Ionosphere recorder, type C-3, operating on pulse transmission, installed in a C-97 plane based at Eniwetok Island.

RESULTS

All stations operated successfully during this test. Ground records were taken by the C-97 as it was grounded at Kwajalein while a new engine was being installed.

There were no noticeable effects on the ionosphere from this test.

[redacted]

[redacted] (BLACKFOOT)

Project 6.4 - Determination of Characteristics of Airborne Flush Mounted Antennas and Photo Tubes for Yield Determination at Extended Ground-to-Air Ranges - A. J. Waters

OBJECTIVES

To determine the effectiveness of flush mounted airborne antennas and phototubes at various ground-to-air ranges in detecting characteristic low frequency electromagnetic radiation and visible radiation, respectively.

To determine the temporal and amplitude characteristics of the low frequency electromagnetic radiation at various ground-to-air ranges.

To determine the temporal and intensity characteristics of visible radiation at various ground-to-air ranges.

To determine the effects of ambient conditions upon the satisfactory measurement of the parameters specified in items 1 and 2 above.

INSTRUMENTATION

2 fiducial antennas

1 synchroniser

1 DuMont Scope (dual beam)

1 scope camera

TECHNIQUE

Signal is received by antenna fed through an amplifier and then to the scope. The signal is then photographed. Photohead output is let directly to the recorder. The sequence camera photographs the blast directly for use in correlation of previous data. Distance was approximately 10 miles.

RESULTS

Equipment was removed from plane and set up at Parry Island on

[redacted]

the ground. Because of limited time available to remove equipment from the airplane and put it aboard transport plane, only certain portions were taken.

Equipment was set up, checked and was in operating condition. Signal was received by each antenna and seen on the scope. However, due to camera difficulty, the picture did not come out.

[redacted]

[redacted] (BLACKFOOT)

Project 6.5 - Analysis of Electromagnetic Pulse Produced by Nuclear Explosion - C. J. Ong

OBJECTIVE

The objective of Project 6.5 is to obtain waveforms of the electromagnetic radiation for all the detonations during Operation REDWING. This data is to be used in connection with a continuing study relating the waveform parameters to the height and yield of the detonation.

INSTRUMENTATION

Two identical stations are used to record data, one at Eniwetok and one at Kwajalein.

The instrumentation consists of a wide-band receiver with separate outputs connected to each of the three oscilloscopes. Mounted on each oscilloscope is a Polaroid Land Camera for recording the transient display.

The wide-band receiver consists of one primary and four secondary cathode follower amplifiers. An antenna, frequency insensitive in the range of interest is fed directly into the primary cathode follower. The primary cathode follower is then connected to four individual cathode followers by a 50-ohm coaxial cable. Only three secondary cathode followers are utilized, the fourth serving as a spare.

The number one and two cathode followers feed oscilloscopes with sweep speeds of approximately 30 microseconds per centimeter and 10 microseconds/centimeter respectively. The number three cathode follower is connected to the third oscilloscope through a 2 microsecond delay line. The third oscilloscope has a sweep speed of 1.0 microseconds/centimeter. All oscilloscopes were triggered simultaneously by the

DC trigger device located in the primary cathode follower and connected directly to the receiving antenna. The 2 microsecond delay line was added to permit the leading edge of the waveform to be recorded.

In order to establish a definite time relationship between the reception of the signal and the triggering of a given device such as a counter or transmitter, a time marker pip, generated by the delay trigger from one of the oscilloscopes, is fed through the 2 microsecond delay line and superimposed on the initial portion of the received waveform.

PROCEDURE

All oscilloscopes are calibrated against a known frequency standard for sweep linearity.

The cathode follower triggering system is set to trigger approximately 6db. above the noise level. The vertical deflector of the oscilloscopes are set to receive the predicted field strength.

RESULTS

Station A - Parry Island

No data obtained for this shot since oscilloscopes had already been triggered by signal from FLATHEAD.

Station B - Kwajalein

Since there are two traces present in the photo it is assumed that both FLATHEAD and BLACKFOOT traces are present. Since the oscilloscope sensitivities had been set for FLATHEAD, the trace of BLACKFOOT is of such a small amplitude that it is of questionable value. One scope did not trigger.

[redacted]

[redacted] (BLACKFOOT)

Project 6.6 - Electromagnetic Attenuation Measurements - T.D. Hanscome

OBJECTIVE

To make electromagnetic attenuation measurements as a function of time at S-band (2160 MC) and X-band (9400 MC).

PROCEDURE

Equipment used at this shot consisted of a transmitter installed at approximately 5000' from the tower on a line to the receiver in a tower on Parry. The receiver output was delayed 2 microseconds and displayed on oscilloscopes having sweep speed of 5 microseconds per centimeter, 50 microseconds per centimeter, 200 microseconds per centimeter and on a Brush recorder (resolving time 10 milliseconds). Sweeps were triggered by "blue box" signals. One receiving antenna was aimed at the shot tower to observe direct electromagnetic effect. The receiver scope on this system was swept at 5 microseconds per centimeter.

RESULTS

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[redacted]

PART III

TASK UNIT 1

LASL PROGRAMS

Keith Boyer
Advisory Group

Program 10 -	Thermal Radiation and Hydrodynamics	H. Hoerlin
Program 11 -	Radiochemistry	G. Cowan
Program 12 -	External Neutron Measurement and High Energy Gamma Measurement	R. L. Aamodt
Program 13 -	Fission Reaction Measurements	J. S. Malik
Program 15 -	Photo-Physics	G. L. Felt
Program 16 -	Physics & Electronics & Reaction History	R. E. Watt

[redacted]

Project 10.1 Fireball Hydrodynamics - J. F. Mullaney

L. W. Blumberg & J. F. Mullaney

The hydrodynamic yield of the [redacted] was determined on the basis of diameter-time data from three Eastman films as

[redacted]

The data consisted of one film from each of three stations; Parry (35429), Mack (35423), and Piiraai (35435). Values of yield obtained from individual frames of a given film are in good agreement with one another; the maximum variation for Mack was +1.5% and -1.0%, for Piiraai +0.5% and -0.5%, and for Parry +0.5% and -9.0%. The maximum variation in yield between the three films was about +5% to -7%.

Results of computation using the integral, differential, and Mach-number scaling methods, as described in previous reports, are presented in Table 10.1-1. The Bethe-Fuchs Mass Treatment has been used in all computations. These methods have reduced the scatter of resulting yields to about ± 2% among the three films. Because of sufficient uncertainty in the amount of mass vaporized by the fireball and capable of influencing the hydrodynamic growth of the shock front, the effects of three possible mass distributions is presented. The inclusion of 46,400 pounds weight corresponds to the cab material with massive structural beams omitted; the 68,900 pound distribution includes in addition about one-half of the heavy beams, while the 91,400 pound distribution considers the entire cab plus about ten feet of the adjacent tower. Further work of a more fundamental nature is planned to obtain more accurate estimates of the mass effect.

Lou Oatt of Group T-1 assisted in the reduction of data and computation of results

TABLE 10.1-1

Weight of Vaporized Material (Pounds)	Yield Differential Method (Kilotons)	Integral Method	Mach Scaling Method

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[redacted]

[redacted] (BLACKFOOT)

Project 10.2 - Time of Arrival - J. F. Mullaney

L. N. Blumberg

Atmospheric conditions of interest, provided by Weather Central (ENIWETOK) at shot time, are:

Pressure: 1012.5 mb

Temperature: 81.0°F

Wind: 14 Knots from 070°

Dew Point: 75.0°F

From these data, a sound speed of 1146.0 fps was calculated. The results of the time-of-arrival calculation are presented in Table 10.2-1.

TABLE 10.2-1

STATION	RANGE (ft)	BEARING	RANGE, WIND-CORRECTED (ft)	TIME INTERVAL (Seconds)	YIELD (KT)
Sta. 71, Parry	51,179	172° 01'	50,967.8	[redacted]	[redacted]

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[redacted]

[redacted]

[redacted] (BLACKFOOT)

Project 11.1 - Radiochemical Analysis - C. Cowan

The fission yields for the [redacted] are as follows:

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[redacted]

[redacted] (BLACKFOOT)

Project 11.2 - Sampling - H. F. Plank

P. F. Moore

EQUIPMENT

Seven aircraft equipped for cloud sampling as described in the [redacted] Report were used on this mission: "A" flight, Tiger White I (F-84); "B" flight, Tiger White II (F-84); "C" flight, Tiger Blue I and II (2-F-84's); "D" flight, Tiger Yellow I and II (2-F-84's); and Cassidy II (B-57) the control aircraft.

WEATHER

The wind pattern was in general suitable for sampling, with winds blowing from the East at velocities up to 17 knots at expected sampling altitudes but with very little change in direction or velocity, i.e., a favorable wind shear. As zero time approached, Cassidy II observed a large cumulus cloud structure running up to about 32,000 feet sitting over ground zero, which could have completely obscured the bomb cloud for sampling purposes. The 10 minute delay in shot time allowed a big hole in the cloud system to move over ground zero and the bomb cloud went into this hole and remained visible throughout the sampling operation.

CLOUD DESCRIPTION

The bomb cloud rose in an anvil headed column to about 32,000 feet (10,000 feet higher than the prediction) and spread out into the hole in the natural cloud structure. The top of the bomb cloud penetrated into a solid overcast at 31,000 feet and the bottom of the bomb cloud emerged from the top of another overcast at 15,000 feet. Big cumulus columns were ranked about, joining the undercast and the overcast and forming a larged closed amphitheatre within which aircraft could fly and still easily see the bomb cloud standing in the middle.

[redacted]

By sampling time, the bomb cloud had separated into three major portions: the top portion rubbing up against the bottom of the overcast at 30,000 feet, a middle portion centered at 25,000 feet and the lower portion appearing to the eye like red dirt shoveled over the top of the undercast at 15,000 feet. All portions of the bomb cloud maintained a strong reddish brown color and although semi-transparent in appearance, were always readily visible; particularly with the aid of brown sunglasses or helmet visors.

SAMPLING MISSION

Because of the apparent thinness of the cloud, Tiger White I was directed in at 30,000 feet and plus 50 minutes for a brief sniff and reported radiation intensity averaging 40 roentgens per hour. About this time, the landing field was closed by heavy rain so White I was held off for 23 minutes before being put into the same portion for his sampling run. Cloud intensities had dropped by a factor of 4 to 5 in this comparatively brief time. Tiger White II was put in at 25,000 feet and plus 98 minutes and found radiation intensities about the same. Blue I and II were directed into the visible bottom of the cloud spread along the undercast at 15,000 feet and collected a required sample with no difficulty, even though the activity encountered was in spots and patches. Yellow I and II were directed into the middle portion of the cloud at 2 hours after burst and encountered radiation intensities averaging from 4 to 5 roentgens per hour, about as expected for that time.

NUMBER RATIOS

The number of fissions measured in the samples by Radio-Chemistry at Los Alamos averaged about 77% of the number predicted at PPG from observation of radiation levels of sample papers as removed from the aircraft. The discrepancy was more than compensated for, by the pre-planned increase in pilots dosage based on experience from preceding REDWING shots.

[redacted]

[redacted] (BLACKFOOT)

Project 12.1 - Threshold Detectors - W. A. Biggers

R. L. Aamodt

Zirconium detectors were placed along a line parallel to the axis of the [redacted] Device (line I) and also along a line parallel to the equatorial plane (line II). A sample was also placed at 300 meters slant range on a line at 45 degrees to lines I and II.

The number of 14.1 Mev neutrons external to the bomb which would give the observed activations is measured from line I to be [redacted] and from line II to be [redacted] (Fig. 12.1-1, note graph values to be multiplied by 4π).

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TABLE 12.1-1

Transmission Calculations

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[redacted]

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[redacted] (BLACKFOOT)

Project 12.2 - Phonex - D. Phillips

The same type of concrete and paraffin shield was already constructed for BLACKFOOT as had been designed for [redacted] (FRIF). The necessary modifications were also similar except that there was a little more time available. One of the three phonex stations for [redacted] (BLACKFOOT) was eliminated (600 yds.), leaving the 300 yd. and 450 yd. stations. The line of sight to the 300 yd. station was through a 3" I. D. transite pipe with ½" wall. This pipe was removed from the concrete and paraffin shield. The only thick wall heavy material tubing available was a piece of stainless steel 2" I. D. with 3/4" wall. This was wrapped with 1/8" lead sheet, leaving approximately 1/8" clearance between the lead and concrete or paraffin. This space was filled, after careful alignment, with a thin concrete grout. The plywood liner of the rectangular aperture was also removed and the same type of 3/4" wall stainless steel tube wrapped with 1/8" lead was carefully fixed in position. A thinner walled tube was placed along the J-13 line of sight through the shield. The space around these pipes was then filled with concrete grout.

No particular precautions were taken with the 450 yd. station except that it was extensively sand bagged. Every effort was made to reduce the blackening of the C2 emulsions at the 300 yd. station. Four inches of lead shielding was constructed on top, front and both sides of the collimator block. This was built from 1100 lead bricks with lead wool chinking.

The front blast plate had three 1¼" I. D. tubes 6" long welded

[redacted]

perpendicular to the plate. The lines of sight of the three collimator tubes passed through these three extensions. Thirty-two pieces of 1/8" lead sheet were cut so as to fit over the front blast plate, leaving three holes for the lines of sight. The line of sight was of course not entirely clear, having to pass through the 3/8" steel blast plate as well as 3/4" of B^{10}.

An old phonex collimator block which had broken into three pieces was used for additional shielding. One section was placed on edge along each side of the station and the third section was placed across the top of the collimator. This section was rotated through 90° so that it was flush with the front of the station but projected about 10" over each side. The whole station was then covered with sand bags.

In addition to extra shielding, two bar magnets were fastened one on each side of the radiator so that the magnetic field between them was perpendicular to the axis of the camera. It was hoped by this method to reduce blackening of the plates by Compton electrons. This method had been shown to reduce blackening of emulsions in phonex cameras at the Nevada Test Site. All cameras at the 300 yd. station were equipped with these magnets. Furthermore, a two inch lead plug was placed in the $1\frac{1}{2}$" pipe in front of the top collimator tube, so as to reduce the gamma ray flux down the collimator tube.

Recovery was made by Allen, Frye and two H & N men (Brennan and Kaneshire) late in the afternoon of B-day. Helicopter recovery had been used after had been used after [redacted] (ERIE), but after [redacted] (BLACKFOOT) a 6 x 6 truck was landed from a T-boat. The truck carried a heavy recovery box with 3" of lead shielding all around it, and space inside for six phonex cameras. Recovery from the 300 yd. station was made first, where the radiation field was 10 r/hr. The cameras were placed in the lead box and the truck driven to the 450 yd. station where the radiation field was only 1 r/hr. and the cameras from this station were then recovered.

The following day, development of the plates from two of the cameras at the 300 yd. station and from one of the cameras at the 450 yd. station were started.

Each of the [redacted] (BLACKFOOT) cameras contained four plates with C2 emulsions, all at rear positions. Two plates with E1 emulsions were placed at forward raised positions.

The C2 emulsions from the 300 yd. station look to be readable. They cannot be analysed on the microscope that we have here (Parry Island). There is no water cell to cool the illuminating beam. The heat from the intense light beam required pits the emulsion.

Four hundred and eighteen tracks were measured on one of the C2 plates from the 450 yd. station by Glen Frye. The results of this analysis are shown in Table 12.2-1 and the neutron energy spectrum extrapolated back to the outside of the bomb is shown in Fig. 12.2-1.

It should be emphasized that these data are preliminary. Attention is called to the number of tracks recorded for each half mev energy interval as shown in the table.

We wish to thank J. Hill, R. Newman and R. Blossom for their assistance in making last minute changes. Also we would like to state our appreciation of the cooperation which we have received from Buddy Schutz and the other machinists.

[redacted] (BLACKFOOT)

TABLE 12.2-1

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[redacted]

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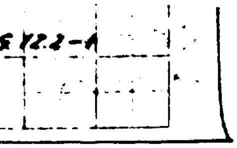

FIG 12.2-A

 S[redacted]

[redacted]

[redacted] (BLACKFOOT)

Project 13.1 - Measurement of Alpha and Boost - H. Grier

J. Malik

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A total of eleven detectors were used - two of Neher's photo multiplier detectors were used to cover the early part of the curve and the remainder of the data were obtained from nine of EG&G's standard photocell detectors. The detectors used to measure the boost region were collimated to an angle of one in twenty at the detector to reduce time smear from air scattering and also viewed the source through a 1 7/8" diameter hole in a 2.5 ft. thick paraffin-concrete shield located in the tower cab; the shield prevented the detectors from seeing most of the H.R. and nearby materials which might have caused time smear through neutron time of flight before conversion to gamma rays.

Table 13.1-1 is a summary of the data obtained in the region prior to the boost. The indicator numbering convention lists the detector number in the tens position and the scope number in the units position (1 is EG&G 3343, 2 is K-1421, 3 is K-1409). The conversion from roentgens to neutrons was obtained through use of Watt's Program 5 code (LA-1984) considering all neutrons as equivalent and the cross sections for gamma ray production by neutrons on

[redacted]

plutonium to be the same as for uranium (this assumption probably makes the neutron rates quoted high by a factor like 2.5). First order least squares fits to the data were made by Goodwin (J-13) and Harper (T-1) and are listed together with values obtained by EG&G using graphical base-line and difference methods.

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[redacted] (BLACKFOOT) SUMMARY SHEET

TABLE 13.1-1

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[redacted]

[redacted] (BLACKFOOT) SUMMARY SHEET

TABLE 13.1-1

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DELETED

[redacted]

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[redacted]

DELETED

44

DELETED

45

[redacted]

DELETED

DELETED

 [redacted]

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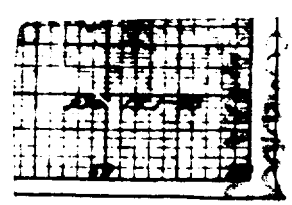

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[redacted]

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[redacted]

[redacted] (BLACKFOOT)

Project 13.3 - EMS Monitoring - D. Henry

J. Malik

Monitoring of the S-units used to detonate the device was performed by Sandia (Mc Campbell) using their microwave telemetering system. The results of their measurements are:

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SECRET

550

[redacted]

55

[redacted]

[redacted] (BLACKFOOT)

Project 15.1 - FC&G Photography, Fireball and Bhangmeter - H. Grier

D. J. Barnes

FIREBALL

Yields for the [redacted] were computed from three films, one each from Parry, Piiraai, and Mack. The ∅ and yield for each were:

Parry ∅ =

Mack ∅ = DELETED

Piiraai ∅ =

The preliminary fireball yield is [redacted] The Runit station film ran through but had no images, apparently because it started early.

BHANGMETERS

Four Bhangmeters at the control point gave time-to-minimum readings of [redacted] with a resultant yield of [redacted] using the $W = 0.1t^2$ formula.

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[redacted]

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Project 15.2 - HIGH SPEED PHOTOGRAPHY - G. L. Felt

EARLY FIREBALL GROWTH

The observations to be made on the [redacted]ing high speed photography, were fireball growth for the first 150 microseconds. The cameras used were two Model 100 streak cameras at 500 rps, two at 1,000 rps, two at 4,000 rps, and two framing cameras. The two fastest streak cameras and the framing camera with 16 shakes per frame used HPS film. All other cameras were loaded with the Eastman color film, and the color frame camera wrote at 30 shakes per frame. The black and white framing camera had the three sided model 8 mirror that gives 15 shakes per frame. All cameras had 80 inch lenses on them except for the two very slow streak cameras which used 40 inch lenses. Because of the elevation of the tower, the horizontal camera slits projected on the cab to an angle about two degrees from horizontal.

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Developments for the HPS film were in the Berry developer, BD7B, for 15 minutes. The color film was developed for 5 minutes in D-76, except for the frame camera film which was pushed hard to get all the sensitivity possible with 20 minute D-76 development.

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[redacted]

Measurements have been made of the fireball expansion and are given in Table 15.2-1.

No color development of Project 15.2 films, for any of the REDWING shots, has been done. Only the first development has been done. When this is done, it will be possible to make quantitative measurements of color temperature of the various fronts.

TABLE 15.2-1

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[redacted]

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[redacted]

[redacted]

DELETED

[redacted]

[redacted]

564

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[redacted]

DELETED

DELETED

DELETED

Figure 15.2-8

Frame Camera Record

Bank 2

[redacted]

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[redacted]

[redacted](BLACKFOOT)

Project 16.3 - Electromagnetic Measurements - R. Partridge

Project 16.3 measures the time interval between the primary and secondary reactions in multi-stage devices by direct oscilloscopic recording of the electromagnetic radiation in the radio frequency range. In addition, methods of obtaining other diagnostic information from this signal are investigated.

Since the [redacted](BLACKFOOT) and [redacted](FLATHEAD) were fired simultaneously, the sensitivity of the time interval equipment was set to record the [redacted](FLATHEAD). Since the [redacted](BLACKFOOT) was much closer, its signal was well off scale. It would have been desirable to record the [redacted] signal in order to allow accurate prediction of the field strength to be expected from the [redacted] Unfortunately, this would have jeopardized the [redacted] time interval data.

The alpha recording system was set up for the [redacted] but the signal does not appear to be truly exponential in shape. Severe radio interference required reducing the gain drastically during the last 30 seconds. The rise time does correspond roughly to the predicted alpha. This signal will require more careful study later.

[redacted]

73 A

PART IV

TASK UNIT 4

SC PROGRAMS

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E. L. Jenkins
CTU-4

Program 31 - Microbarography R. Heppelwhite

[redacted]

[redacted] (BLACKFOOT)

Project 31.1 - Microbarograph - W. A. Gustafson

The purpose of this project was to measure winds in ozone layer of the atmosphere. This was accomplished by measuring at several sites the arrival times of the shock wave reflected from the ozone layer. Four sites were operated: Ujelang, Wotho, Rongerik, and Eniwetok. At each site two stations were operated about one mile apart. The difference in arrival times gives the angle of incidence of the shock and information from several stations may be combined to give the winds.

On [redacted] (BLACKFOOT) good shot records were obtained from all stations except Rongerik, which had high ambient wind noise. However enough directions are available for the Bikini shot to allow ozonosphere wind and temperature resolution, but this has not yet been accomplished.

[redacted]

[redacted]

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