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RADIOLOGICAL SAFETY

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FINAL REPORT

OPERATION HARDTACK

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VOL. I

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FINAL REPORT ON RADIOLOGICAL SAFETY

OPERATION HARDTACK

1. General. The radiological safety program for Operation HARDTACK was divided into two parts, on-site and off-site. The on-site activities were conducted by the various task groups, with Task Group 7.1 given responsibility for all radsafe functions associated with diagnostic experimental programs and for dosimetry and other technical services to the entire Task Force. The operation of the off-site program and the coordination of the on-site activities were conducted by the RadSafe Office of Headquarters, Joint Task Force SEVEN.

2. On-Site RadSafe.

a. In planning the HARDTACK RadSafe Program, radiological safety was treated as a command responsibility. All of the task groups were directed to set up their own self-sufficient radsafe units. Each unit was designed to cope with routine radsafe matters and those problems unique to the function of the task group itself. In addition Task Groups 7.1, 7.3 and 7.4 were delegated special functions in which the designated group either had a direct interest or for the accomplishment of which it was particularly adapted. This delegation of responsibilities was contained in Annex K to CJTF-7 Operation Order 1-58.

b. The TG 7.1 RadSafe Unit (TU6) was charged with the major functions concerning on-site recovery operations. Specifically, the unit was designed to perform radsafe control of all working parties in contaminated areas. The principal problems in this function were the control of personnel engaged in recovery operations, post-shot clean-up, and making ready for the next event. Other special functions assigned to TG 7.1 included the photo-dosimetry program for the entire Task Force, laboratory radiochemical analysis of water and other samples, and assistance of the TG 7.5 radsafe unit during the on-site phase of the Operation.

Personnel. Radsafe functions, with the exception of staff and supervisory functions and those assigned to TU6, were performed as an additional duty by personnel of the various task groups. Since TU6 was assigned the major radsafe unit for on-site operations and given the responsibility for centralized and highly technical services, several manning problems had to be solved to assemble the necessary technicians. The U. S. Army's First Radiological Safety Support Unit, augmented by a small number of Navy and Air Force radsafe personnel, provided a fully qualified unit for manning of TU6. The unit numbered a total of 95 at peak strength, of which 8 were Navy personnel and 13 were Air Force. This number, a reduction of some 20 over the number utilized during Operation REDWING, was still further reduced to 78 by mid-operation. These reductions were a direct result of the adoption of machine photodosimetry and records-keeping.

[redacted]

[redacted]

d. Equipment and Maintenance. The military task groups were directed to procure radsafe equipment from service sources. Task Group 7.1 was directed to procure all standard military equipment from military stocks and the remainder, non-standard items, by purchase. The AEC had previously agreed to purchase all necessary items non-standard to the military services. However, due to funding difficulties, they were unable to carry out the agreement, and the Task Force procured a number of non-standard items by direct purchase. Maintenance and repair were individual task group responsibilities.

e. Training. Individual and group training for all task groups except TG 7.1 were conducted by staff and supervisory personnel within the task groups themselves. TU6 training was accomplished at the U. S. Army Chemical Corps Radiological Defense School, Fort McClellan, Alabama, during January and February of 1958. Each task group was assigned at least one nuclear safety engineer along with an appreciable number of technical personnel experienced in test operations.

f. Maximum Permissible Exposure. With concurrence of the Surgeon General, USA; the Chief, Bureau of Medicine and Surgery; the Surgeon General, USAF; and the Director, Division of Biology and Medicine, AEC, the maximum permissible radiation exposure was established at 3.75 roentgens per 13-week period, with a maximum of five roentgens for the entire Operation. Individual exposures in excess of the established MPE were authorized in advance by CJTF-7 for a very limited number of individuals where operational requirements provided justification. No incident of significant accidental over-exposure resulted from the test operation.

3. Off-Site RadSafe.

a. By JCS Directive dated 2 April 1958, JTF SEVEN was assigned the responsibility for the safety of the area adjacent to the EPG relative to hazards introduced by test operations. CJTF-7 was additionally directed to advise CINCPAC of special hazards and danger areas involved in the test and appropriate precautions required to insure the safety of units other than JTF SEVEN in the area within the purview of the Pacific Command.

b. The off-site radiological safety program was designed to provide protection against radiation hazards to populated areas outside the EPG, to obtain a complete record of radioactivity caused by the test to nearby populated areas, to assure the native population that all reasonable radiation safeguards were employed, and to provide data for investigating or refuting reports of incidents attributed to radioactivity from the tests. To carry out this, the Task Force operated an off-site program consisting of manned radsafe stations, radiation monitoring stations, and cloud tracking.

[redacted]

(1) Manned RadSafe Stations. The Task Force, through a contract with the Public Health Service, established fully equipped radsafe stations at Rongelap, Ujelang, Utirik and Wotho. These stations were operated by radiation health personnel of the Public Health Service. The stations were equipped with continuous background radiation monitoring equipment, high- and low-range radiation detection and measuring instruments, and continuous air and water sampling equipment; and they maintained two-way radio contact with the Headquarters. The radiation instruments, mostly non-standard, were provided by JTF-7. Each station complement consisted of approximately seven men. Of the seven, four were radio operators, two were camp operators, and one was a Public Health Service Officer.

(2) Monitoring Stations. In cooperation with the U. S. Weather Bureau, the U. S. Coast Guard, the Air Force Weather Service, the Hawaiian Sea Frontier, and the Hawaiian Territorial Health Department, in addition to the manned stations, a total of 15 radiation monitoring stations were established at existing weather and Public Health Service installations throughout the Pacific area. These stations were equipped with continuous background recorders and standard military radiac instruments. Arrangements were made for station personnel to log instrument readings and to report the observed radiation readings through weather or routine radio channels. In addition, any significant reading above background was to be reported promptly to Headquarters, JTF-7. The installation and servicing of this network was accomplished by Public Health Service personnel attached to the Headquarters.

(3) Cloud Tracking

(a) P2V aircraft based at Kwajalein were utilized for atomic cloud tracking on all events which were expected to produce hazardous radioactive fallout. The aircraft reported to the AOC at either Eniwetok or Bikini at shot time and were controlled by the Headquarters RadSafe Office through the use of direct telephone contact with the AOC. For shots where it was necessary to obtain information at altitudes and ranges beyond the capabilities of the P2V's, Task Group 7.4 WB-50's were employed for the missions. The number of tracking flights required depended mainly upon the fission magnitude of the shot and the stability of the existing wind field.

(b) In addition to the cloud tracking, P2V's were used for the initial terrain survey of the shot atoll, the first time that fixed-wing aircraft were utilized for this type of survey. Precise radiation readings were not obtainable using this method; however, surface radiation intensities accurate enough for safety operations were secured. This information permitted earlier re-entry and recovery than in the past.

[redacted]

[redacted]

(c) Radar cloud tracking, which provided a high degree of reliability and usefullness during the first 30 minutes after detonation, was employed to provide information on cloud size, tops, and general movements. Both ground and shipboard radar were used for tracking, and the information from the radar locations was relayed to Headquarters via direct telephone.

3. Other Safety Measures.

a. In order to assure the safety of Task Force and native populations and transient surface and air traffic, a number of other steps were taken. For example; concentrated aerial searches of the forecast fallout area were made on D-2 and D-1 Days to insure that the area was clear of transient shipping; and a constant emergency evacuation capability was maintained.

b. As far as can be determined from existing monitoring data and investigations of reported incidents, no hazardous fallout occurred to populated areas or to transient surface and air craft as a result of Operation HARDTACK.

[redacted]

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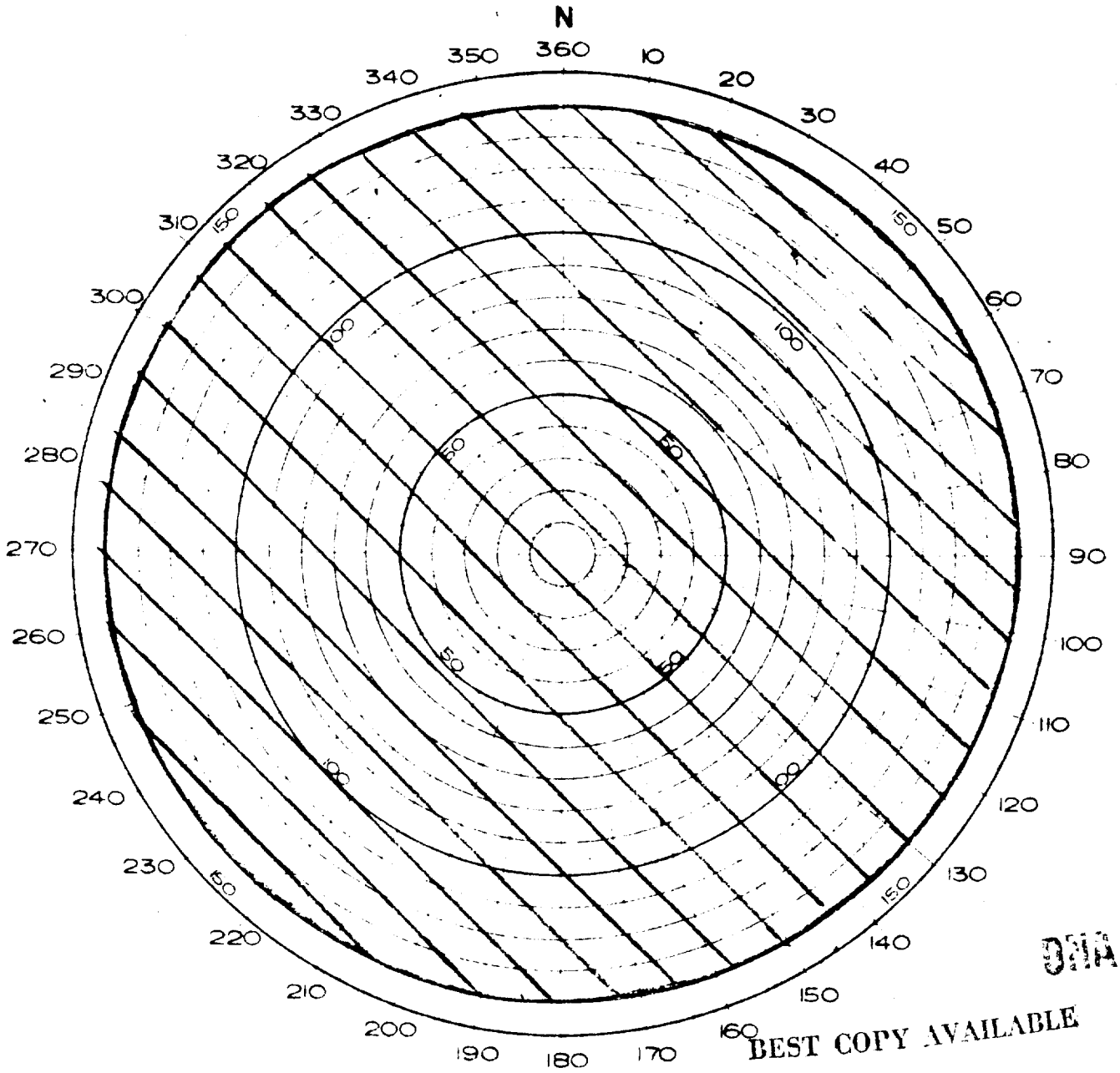
TAB

YUCCA EVENT

OPERATION HARDTACK

YUCCA was detonated to the northeast of Eniwetok Atoll at an estimated altitude of 87,000 feet at 1440M, 28 April 1958. No radiological hazards were anticipated, and none developed. Fallout composed of the device and its vehicle was considered insignificant. None of our stations reported a rise in background intensity. Flash effect was likewise considered insignificant.

HODOGRAPH
RESULTANT WINDS AND
SURFACE RADEX



YUCCA AIR & SURFACE RADEX
28 April 195

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TAB P

WEATHER CENTRAL ELEMENT, PROVISIONAL
TEST SERVICES UNIT, PROVISIONAL
APO 437, San Francisco, California

2 May 1958

YUCCA

ENIWETOK OBSERVED WEATHER FOR 28 APRIL 1958
AT DETONATION TIME
1440M

SURFACE WEATHER:

Sea Level Pressure	1011.5 mbs
Free Air Surface Temperature	78.2°F
Wet Bulb Temperature	72.2°F
Dew Point Temperature	69.6°F
Relative Humidity	75%
Surface Wind	055° 20 knots
Visibility	10 miles
Weather	Rain showers visible to the northwest.

CLOUDS:

3/10 cumulus bases 2,000 feet.
4/10 altocumulus bases 8,000 feet.

AREA WEATHER SUMMARY FROM AIRCRAFT:

Scattered cumulus bases 2,000 feet. Scattered (2/10) patches of altocumulus bases 8,000 feet. Scattered (3/10) cirrus bases 33,000 feet, tops 37,000 feet. Very thin cirrus bases 45,000 feet, tops 51,000 feet.

STATE OF THE SEA:

Open Sea: Wave Heights 4-5 feet, period 5 seconds, direction 070°, length 50 to 70 feet.

TAB C

EN[illegible]ETOK RADIOSONDE O[illegible]ERVATION:

Pressure (Millibars)	Height (Feet)	Temperature (°C)	Dew Point (°C)
1009	Surface	28.5	20.5
1000	280	27.8	20.5
919	2,690	20.5	17.2
892	3,609	18.8	13.2
850	4,910	16.2	12.2
840	5,249	15.5	11.8
805	6,463	17.2	- 4.2
790	6,988	18.2	0.5
740	8,792	12.5	1.5
700	10,310	10.2	- 0.5
638	12,894	6.2	1.2
600	14,470	2.8	- 2.2
578	15,518	0.5	- 4.2
564	16,142	0.5	- 6.8
532	17,651	- 1.5	- 6.2
500	19,250	- 3.8	-10.5
484	20,112	- 5.5	-18.8
446	22,310	- 7.8	-18.5
400	24,940	-14.5	-26.5
351	28,248	-20.5	-32.8
309	31,201	-29.2	-37.5
300	31,890	-30.5	-39.2
277	33,990	-34.5	-45.2
250	36,050	-40.0	M
200	40,930	-52.0	M
150	46,840	-66.1	M
111	52,965	-77.0	M
100	54,650	-77.0	M
090	56,958	-77.0	M
077	60,027	-75.0	M
069	62,370	-76.0	M
058	65,340	-68.0	M
050	67,960	-65.8	M
048	69,300	-62.0	M
039	73,414	-56.0	M
033	77,121	-56.0	M
028	80,619	-54.0	M
025	82,390	-51.2	M
011	100,980	-40.0	

[illegible]

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ENIWETOK WINDS ALOFT OBSERVATION

Height (Feet)	Direction (Degrees)	Velocity (Knots)
Surface	040	05
2,000	080	21
4,000	090	19
6,000	080	10
8,000	070	08
10,000	070	09
12,000	130	08
14,000	170	09
16,000	170	08
18,000	190	12
20,000	230	05
22,000	270	07
24,000	300	04
26,000	310	07
28,000	260*	14*
30,000	200*	12*
32,000	200*	17*
34,000	200*	23*
36,000	220*	21*
38,000	210*	23*
40,000	240*	24*
42,500	260	33
45,000	270	33
47,500	270	32
50,000	260	31
52,500	270	28
55,000	270	24
57,500	260	19
60,000	240	13
65,000	320	06
70,000	240	10
75,000	060	16
80,000	090	20
85,000	120	39
90,000	100	44
95,000	090	45
98,000	080	45

* Missing data -- Winds are estimated.

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TAB

[redacted]

CACTUS EVENT

OPERATION HARDTACK

1. CACTUS was detonated at 0615M, 6 May 1958, at the surface on the north end of Yvonne Island, Eniwetok Atoll. The cloud rose to 19,000 feet in the first ten minutes, then stabilized at 15,000 feet by H+20 minutes. Radar tracking was employed while the cloud was in the lagoon and indicated a general drift to the west-southwest. The main body split into two parts at H+23 minutes and continued movement towards the west-southwest at 18 knots. By H+1 hour the cloud stretched completely across the lagoon from Leroy Island (at 5,000 feet) to ground zero (at 10,000 feet). At this time a very thin dust cloud was noticed northeast of Yvonne at a high altitude but radar or aircraft reports were not obtainable. The cloud was well scattered by H+2 hours and almost completely dispersed by H+3 hours.

2. The initial helicopter survey at H+3 hours resulted in zero readings for all of the main atoll islands except Yvonne, Leroy, and Mack. A reading of 440 r was obtained over debris in the water immediately west of ground zero. Other readings at Yvonne were 1700 mr at mid-island and 5 mr at the southern tip. Leroy and Mack, which were directly in the cloud's path, indicated 850 mr and 100 mr, respectively.

3. One P2V (Wildroot 16) started a survey over Yvonne at H+3 hours. An island survey and vectored mission were flown over Eniwetok and Ujelang with the highest reading of 27 mr over Yvonne at 1,000 feet.

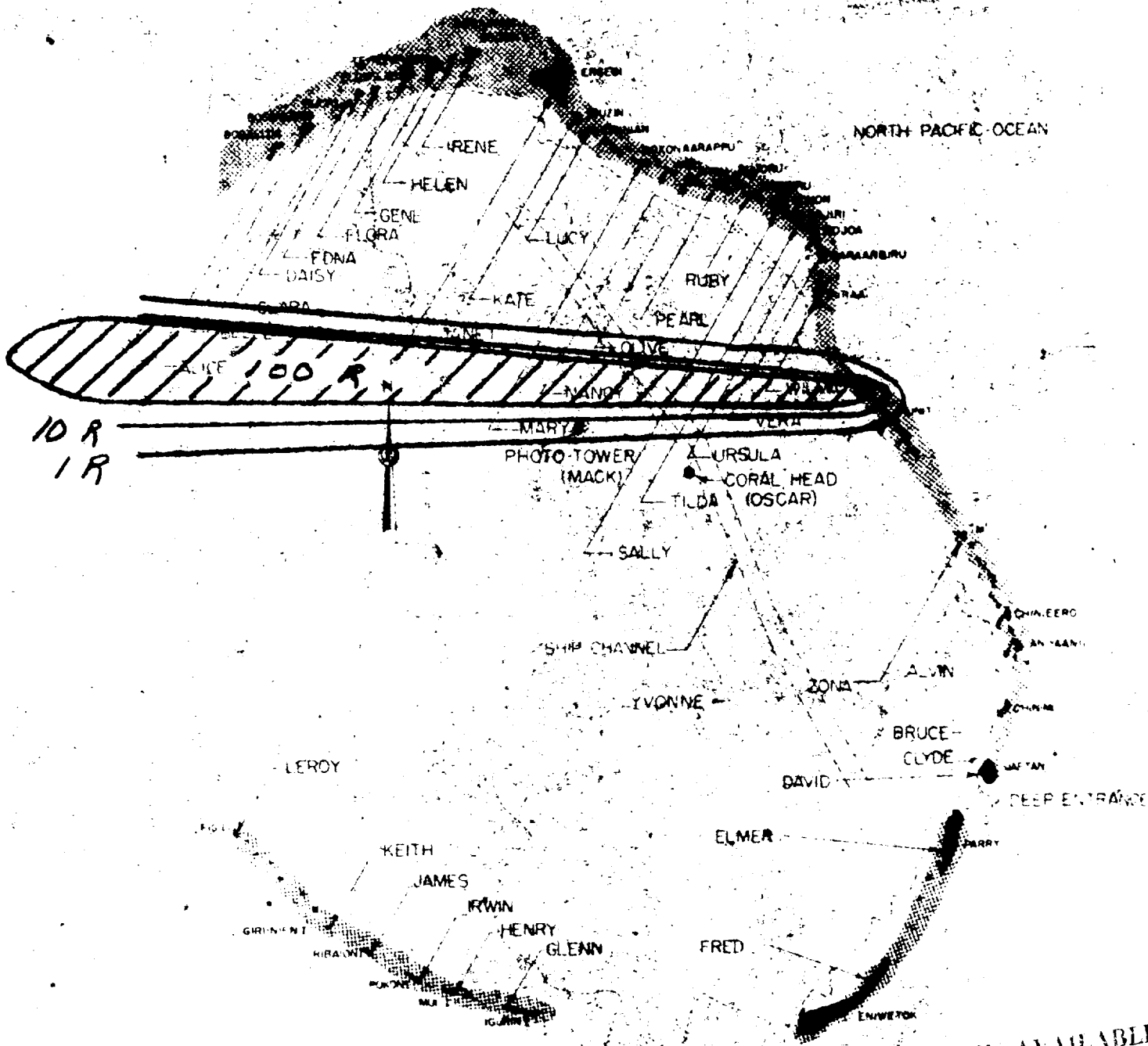
[redacted]

4. Fallout forecast was generally accurate in extent and intensity. The main axis of the cloud was forecast to lie across the lagoon at a 270-degree angle; the actual axis was along a bearing of approximately 250 degrees from ground zero.

5. Substantially all of the fallout dropped within the hazardous area announced on D-1 Day. Ujelang reported a background rise in intensity to 0.3 mr at D-Day +1, but this decreased to 0.15 mr by D+3 and reached the normal background of 0.02 mr by D+12.

[redacted]

[redacted]



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DNA

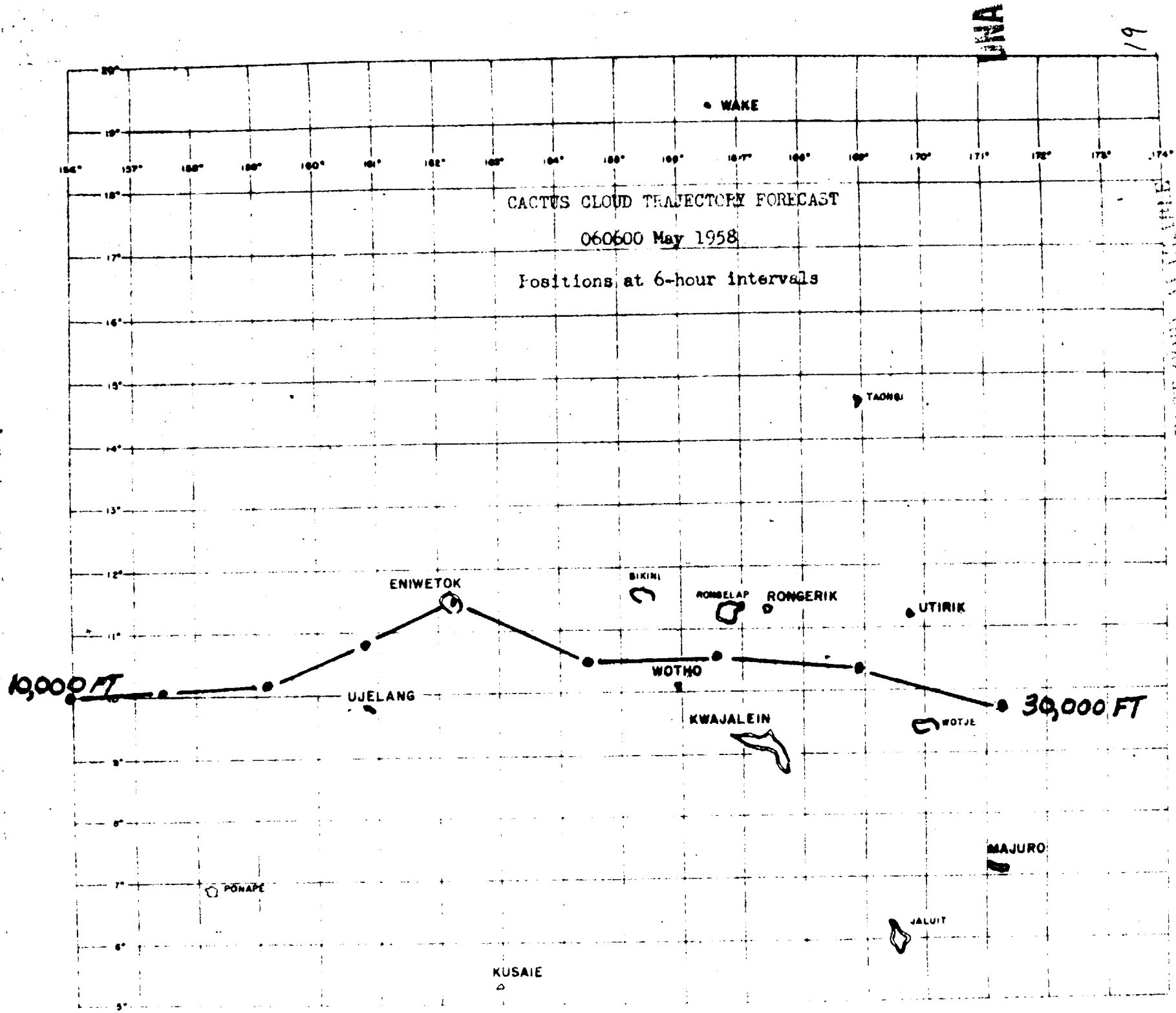
FORECAST FALLOUT PLOT - CACTUS

∞ Dose - Roentgens

Fcst 5/6/0100

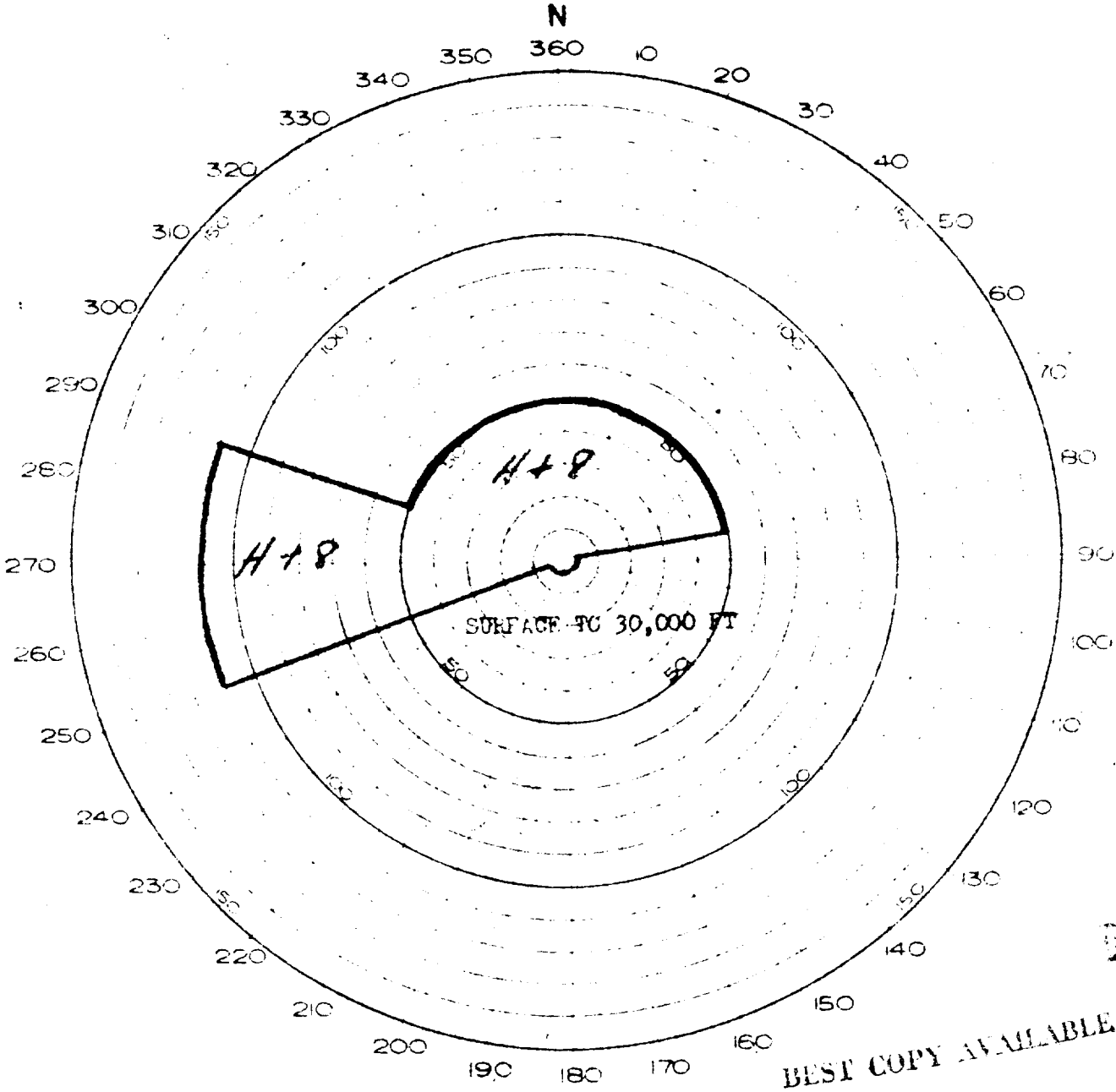
Valid 5/6/0600

TAB B


WAKE
CACTUS CLOUD TRAJECTORY FORECAST
060600 May 1958
Positions at 6-hour intervals
TAONGI
ENIWETOK
BIKINI
ROMBELAP
RONGERIK
UTIRIK
WOTHO
10,000 FT
UJELANG
KWAJALEIN
WOTJE
30,000 FT
MAJURO
PONAPE
JALUIT
KUSAIE

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



AIR & SURFACE RADEX - CACTUS
(H TO H/6 HRS)

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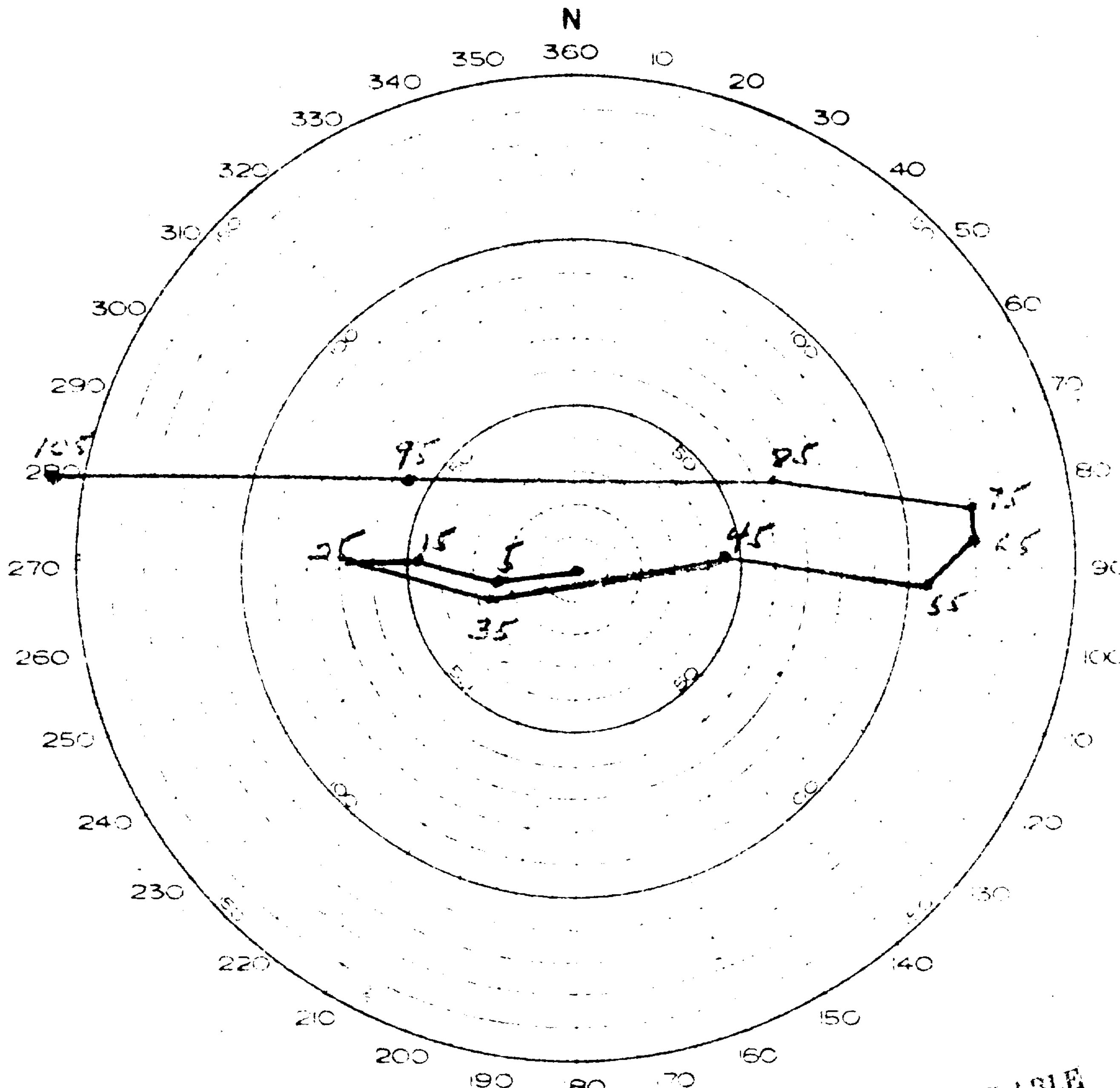
HODOGRAPH

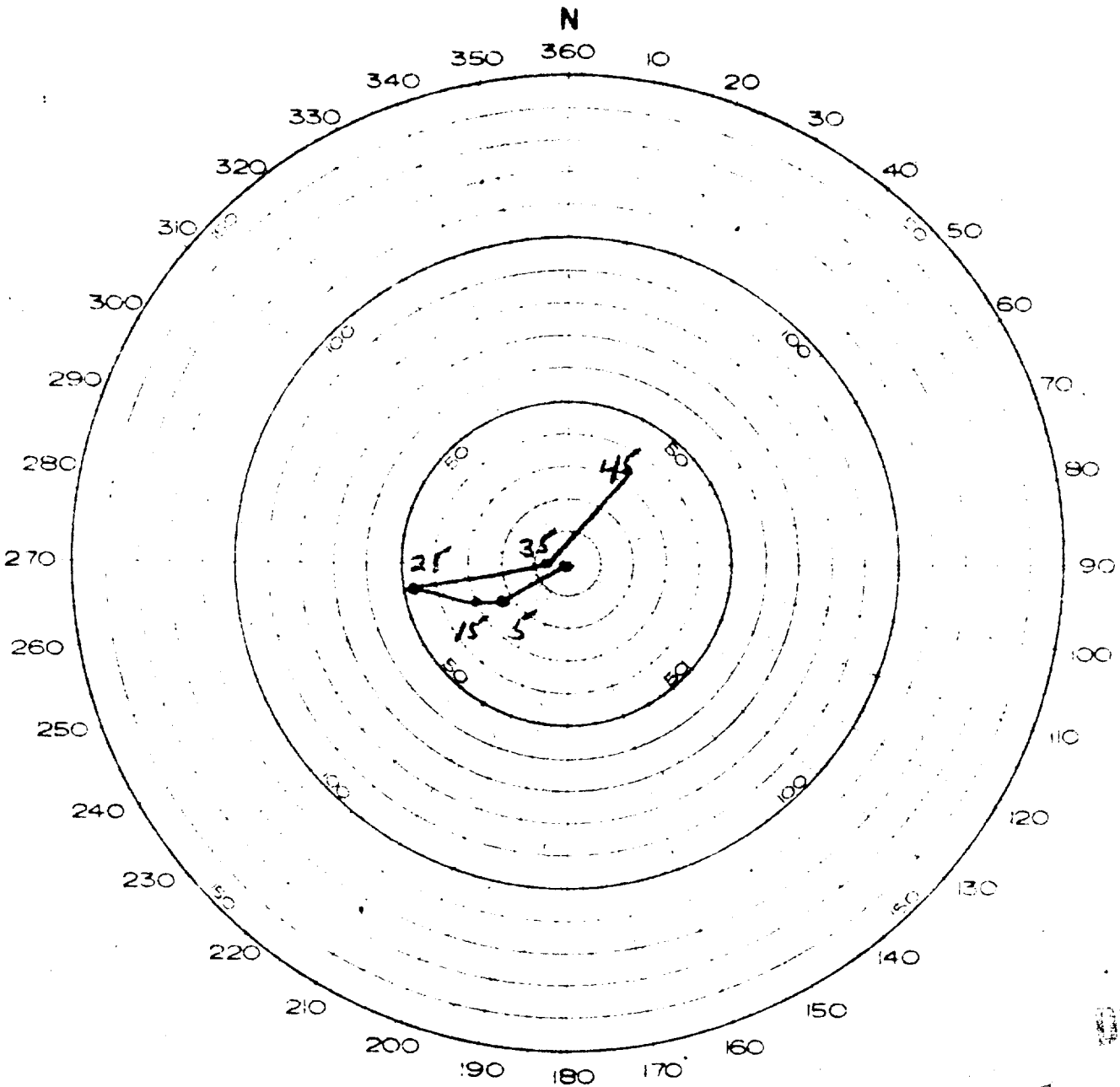
RESULTANT WINDS AND SURFACE RADEX



FORECAST FOR 060600 MAY 1958 - CACTUS

TAB E (1)

HODOGRAPH
RESULTANT WINDS AND
SURFACE RADEX



OBSERVED WINDS FOR 060600 MAY 1958
CACTUS

TAB E (2)

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

8 May 1958

CACTUS

ENIWETOK OBSERVED WEATHER FOR 6 MAY 1958
AT DETONATION TIME: 0615M

SURFACE WEATHER:

Sea Level Pressure	1010.5 mbs
Free Air Surface Temperature	80°F
Wet Bulb Temperature	74.4°F
Dew Point Temperature	72°F
Relative Humidity	76%
Surface Wind	070° 13 knots
Visibility	10 miles
Weather	None

CLOUDS:
Scattered (3/10) cumulus all quadrants, bases 1,800 feet, moving west. Thin overcast (10/10) of cirrostratus.

AREA WEATHER SUMMARY FROM AIRCRAFT:
Scattered variable to broken cumulus, bases 2,000 feet. Tops ragged 5,000 to 6,000 feet. At H +3 hours, the cirrostratus layer was reported as bases 47,000 to 48,000 feet.

RADAR (AN-CPS-9) OBSERVATION OF CLOUDS:
Scattered line of weak echoes, 5 miles wide from a point 270° 30 miles to a point 285° 30 miles. Scattered elliptical area of moderate echoes 18 miles wide, increasing slowly, axis from a point 170° 40 miles to a point 220° 40 miles, tops 12,000 feet.

STATE OF THE SEA:
Open Sea: Wave Height 6 feet, direction 070°, period 5-6 seconds, length 100 feet.
Lagoon: Near Yvonne, waves less than 1 foot, period 2-3 seconds, length 5-10 feet.

ENIW K RADIOSONDE OBSERVATION

Pressure (Millibars)	Height (Feet)	Temperature (°C)	Dew Point (°C)
1010	Surface	27.2	22.8
1000	310	26.5	22.2
858	4,719	16.5	12.2
850	4,940	16.5	10.2
816	5,905	16.2	0.5
768	7,874	14.5	- 5.2
700	10,300	8.2	- 7.2
682	10,488	6.5	- 7.2
670	11,024	7.5	-13.5
600	14,450	4.0	M
500	19,250	- 4.0	M
400	24,900	-16.0	M
300	31,830	-30.1	M
250	36,000	-40.0	M
200	40,920	-52.0	M
150	46,850	-65.4	M
106	50,820	-76.0	M
100	54,710	-76.3	M
073	61,050	-76.0	M
061	64,550	-72.0	M
056	66,230	-67.0	M
050	68,040	-66.0	M
042	71,940	-62.0	M
041	72,300	-58.0	M
032	77,650	-57.0	M
025	82,380	-53.5	M
013	97,370	-41.0	M

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ENIWE... WINDS ALOFT OBS...TION

Height (Feet)	Direction (Degrees)	Velocity (knots)
Surface	060	14
1,000	070	21
2,000	070	22
3,000	060	25
4,000	060	21
5,000	060	20
6,000	060	20
7,000	080	13
8,000	090	09
9,000	110	04
10,000	060	03
12,000	200	02
14,000	150	10
16,000	100	18
18,000	100	18
20,000	120	16
22,000	120	10
24,000	050	11
26,000	360	10
28,000	270	12
30,000	270	15
32,000	260	28
34,000	260	31
36,000	230	36
38,000	220	36
40,000	220	32
42,500	250	31
45,000	290	30
47,500	300	34
50,000	310	34
52,500	310	17
55,000	230	06
57,500	210	08
60,000	260	15
65,000	260	07
70,000	120	07
75,000	070	11
80,000	080	27
85,000	080	45
90,000	090	52
95,000	100	53
96,000	100	50

CACTUS - INTERPRETATION OF CLOUD MOVEMENT THROUGH RADAR FIXES AND AIRCRAFT REPORTS

TAB ■ (7)

Initial Helicopter Survey

H+3 Hours

CACTUS M.I.T

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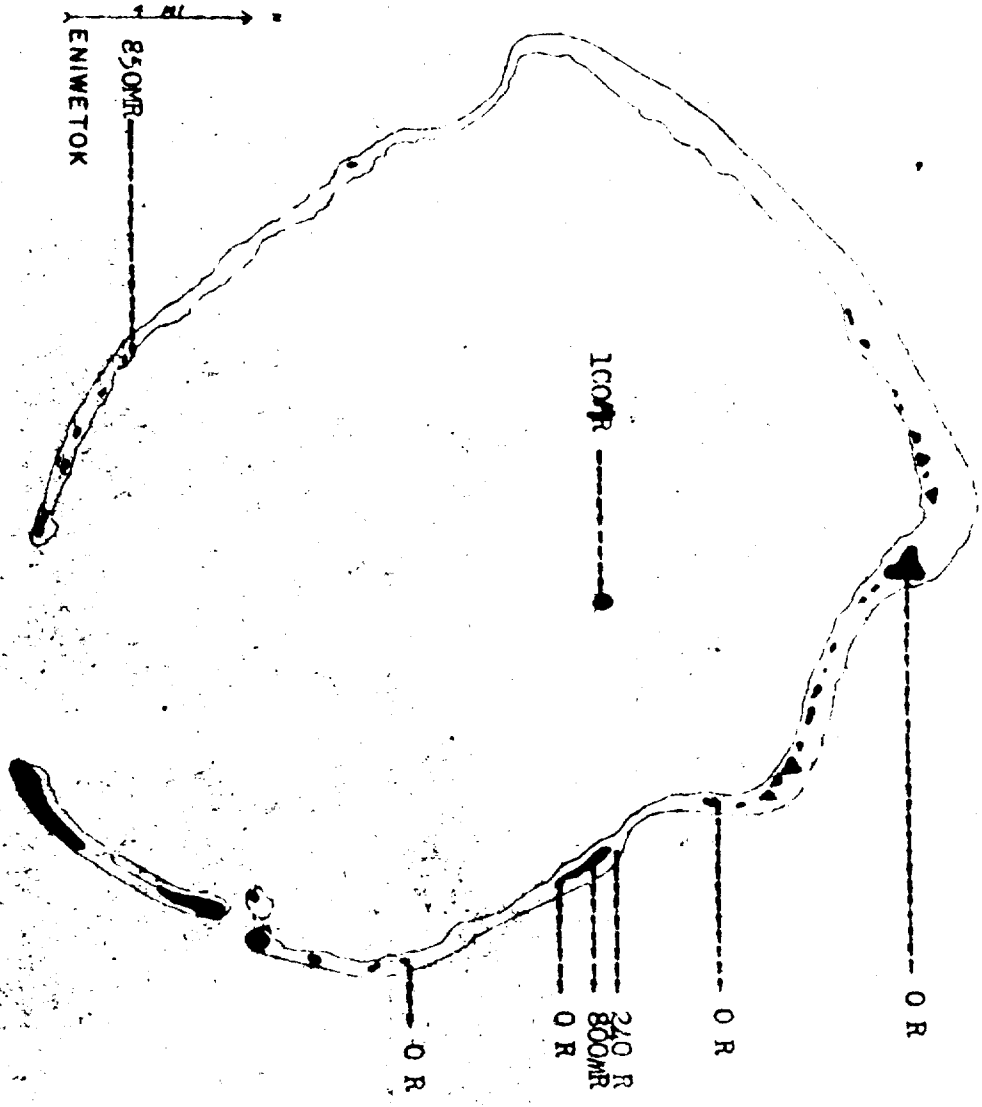

Initial Helicopter Survey

H+5 Hours

CACTUS EVENT

DNA

DNA

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TAB

[redacted]

FIR EVENT

OPERATION HARDTACK

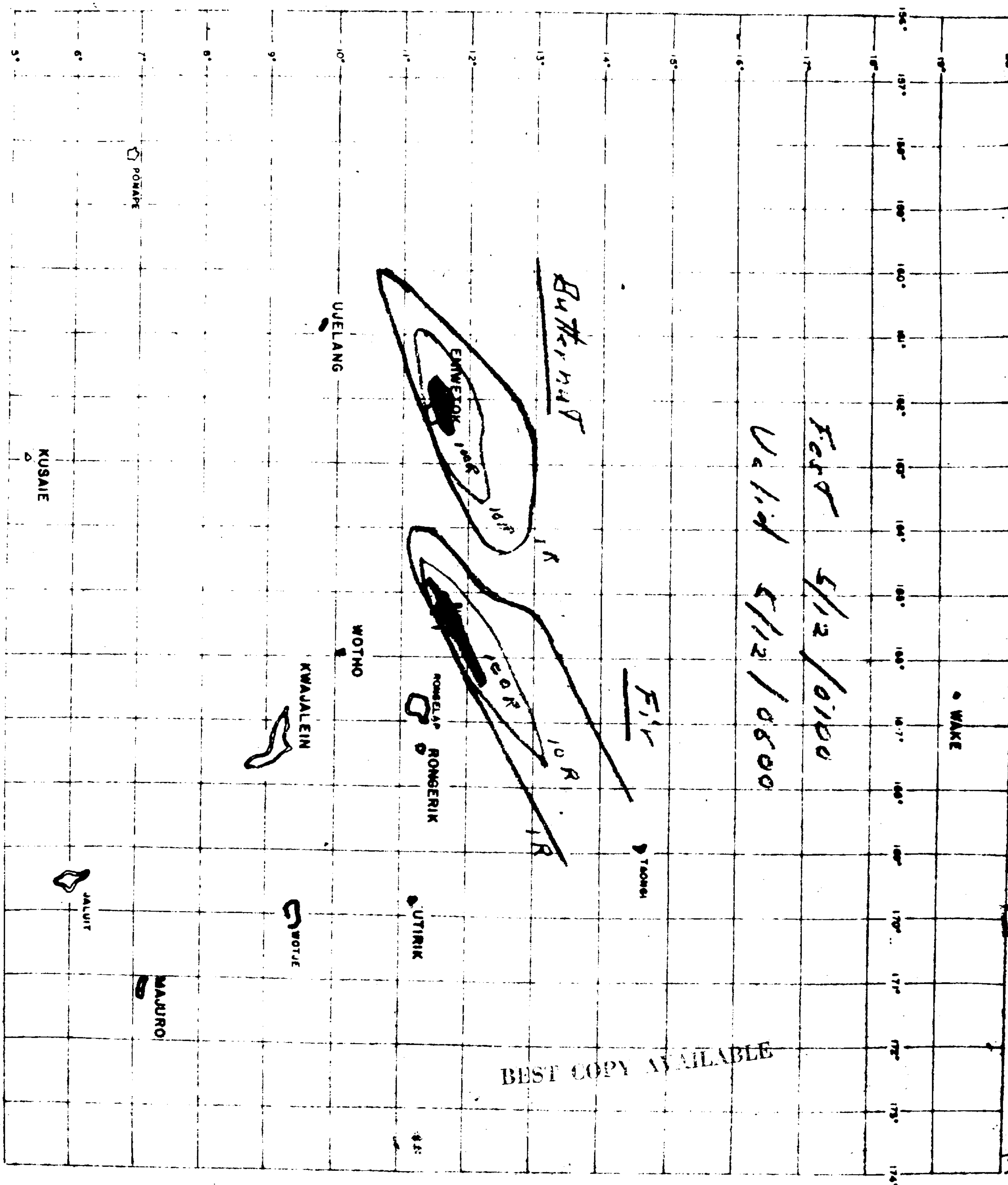
1. FIR was detonated at 0550M, 12 May 1958, on a barge off Charlie Island (Namu Island, [redacted] at Bikini Atoll). The cloud was reported by radar to have risen to 90,000 feet, then stabilized at 60,000 feet. Initial radar reports from the USS Boxer indicated the cloud moved on a bearing of 260 degrees at approximately 12 knots per hour within the first 12 minutes. At H+25 minutes, radar from Rongelap confirmed the bearing and height at 90,000 feet. Within one-half hour after the burst neither radar could track the cloud. A P2V reported over the USS Boxer at H+30 minutes for initial cloud tracking and radiological surveying, but owing to communication difficulties, no immediate information was obtainable.

2. Contact was resumed with the P2V, and at 0825M on a bearing of 240 degrees and 060 degrees from Oboe at 200 to 500 feet, .4 r/hr was reported. The P2V was directed to fly at 10,000 feet east of Nan. At 30 miles he reported 340 mr/hr at 1010M. At 1112M, 10 miles east of Nan at 2,500 feet, he reported 240 mr/hr. In general, the use of the P2V was ineffective because of initial communication difficulties.

3. A helicopter survey by TU-6 at Nan indicated 36 mr/hr at George at 0909M and indicated 370 mr/hr at Charlie at 0922M. Other islands (Uncle, William, Peter, Oboe, Tare, Nan and How) indicated only normal nominal background readings.

4. The fallout forecast was accurate, except that the spread was more northerly than predicted. The main axis was forecast 220 degrees through 040 degrees, and substantially all of the fallout fell within this area.

[redacted]



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TAB B

10,000
30,000
50,000
ENIWETOK
BIKINI
WOTHO
KWAJALEIN
RONGELAP
RONGERIK I
UTIRIK
WOTJE
JALUIT
MAJURO
UJELANG
PONAPE
KUSAIE
WAKE
TAONEI
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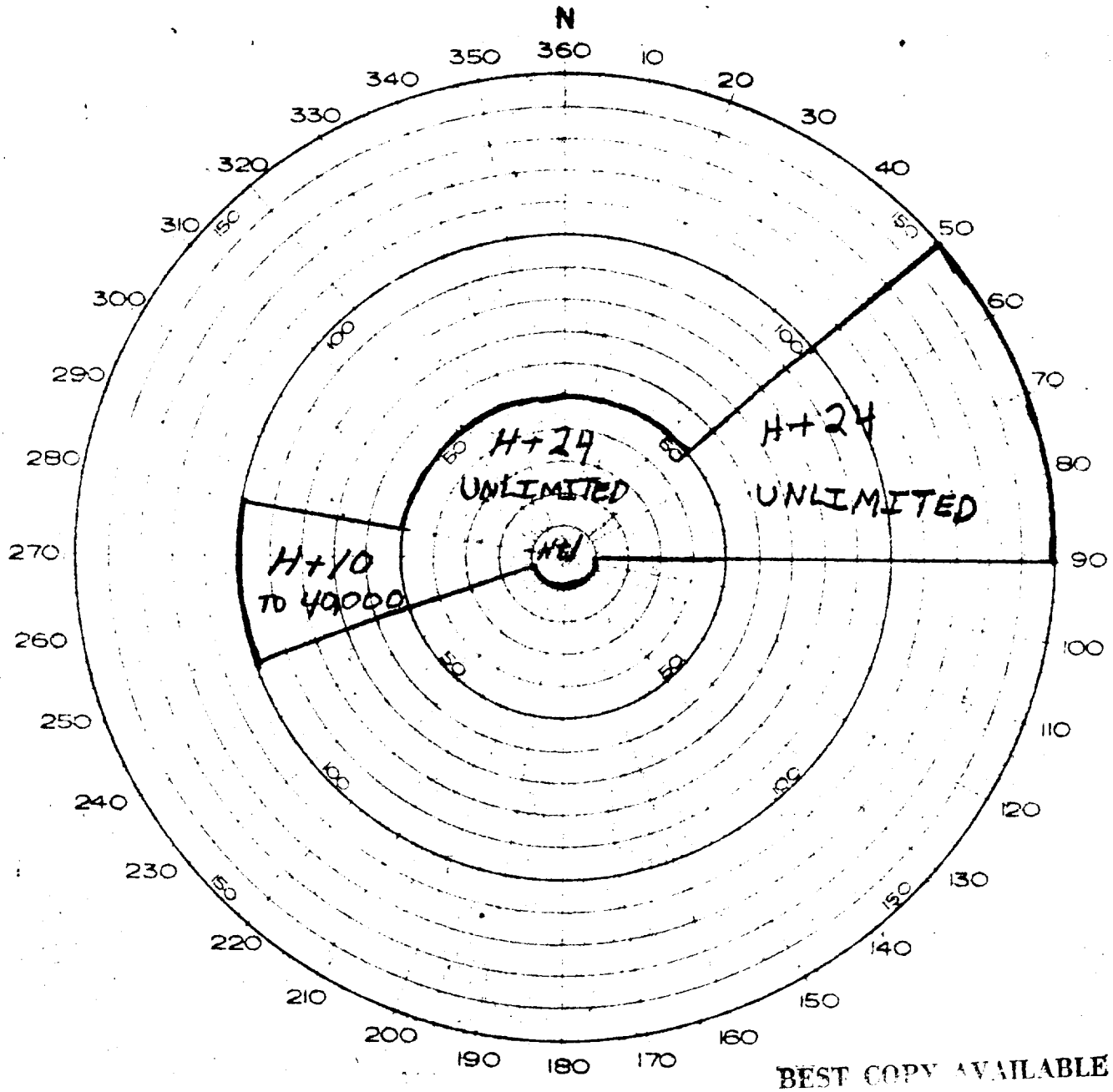
TAB C

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



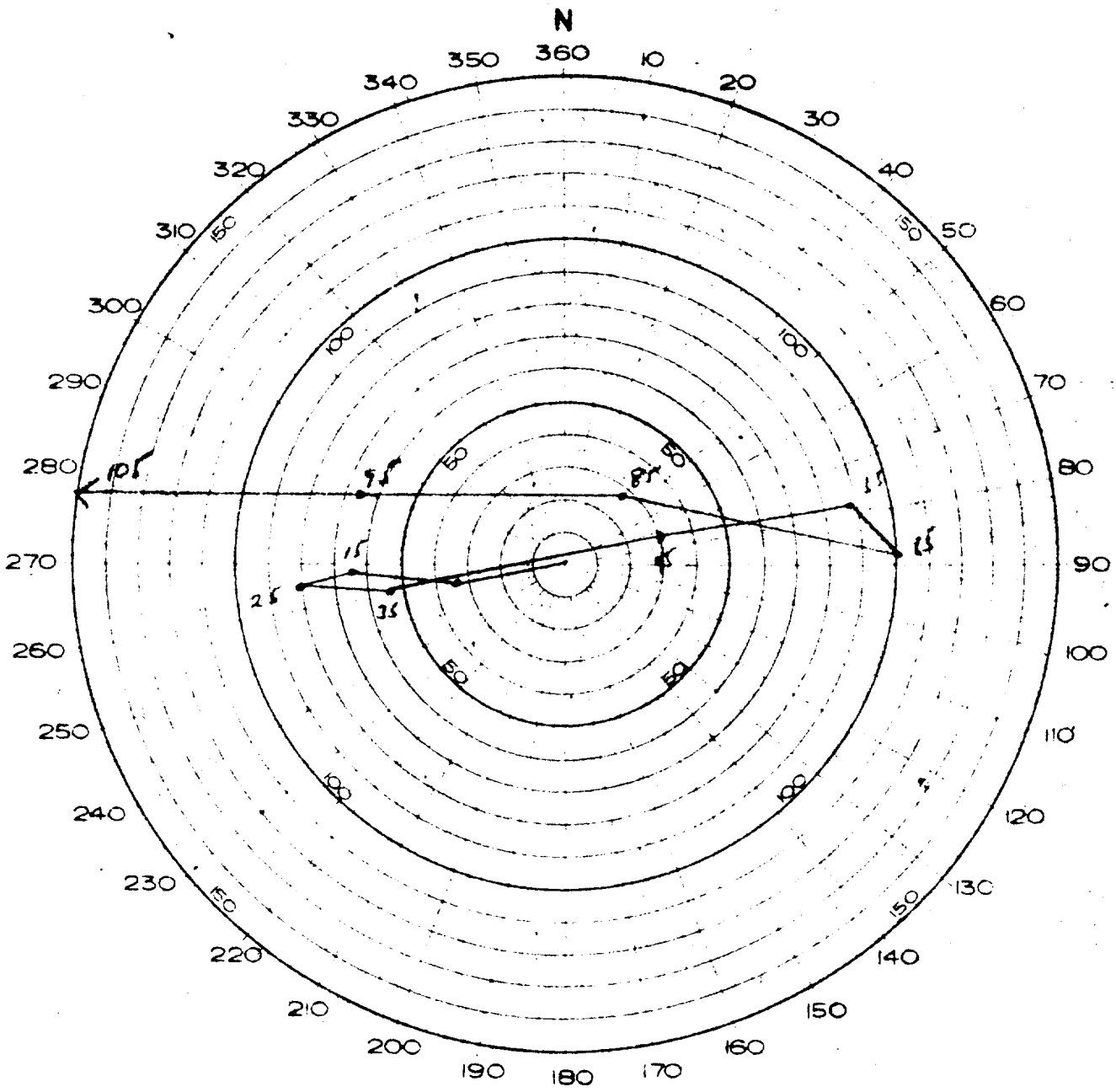
DNA

AIR & SURFACE RADEX - FIR

TAB D

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



DNA

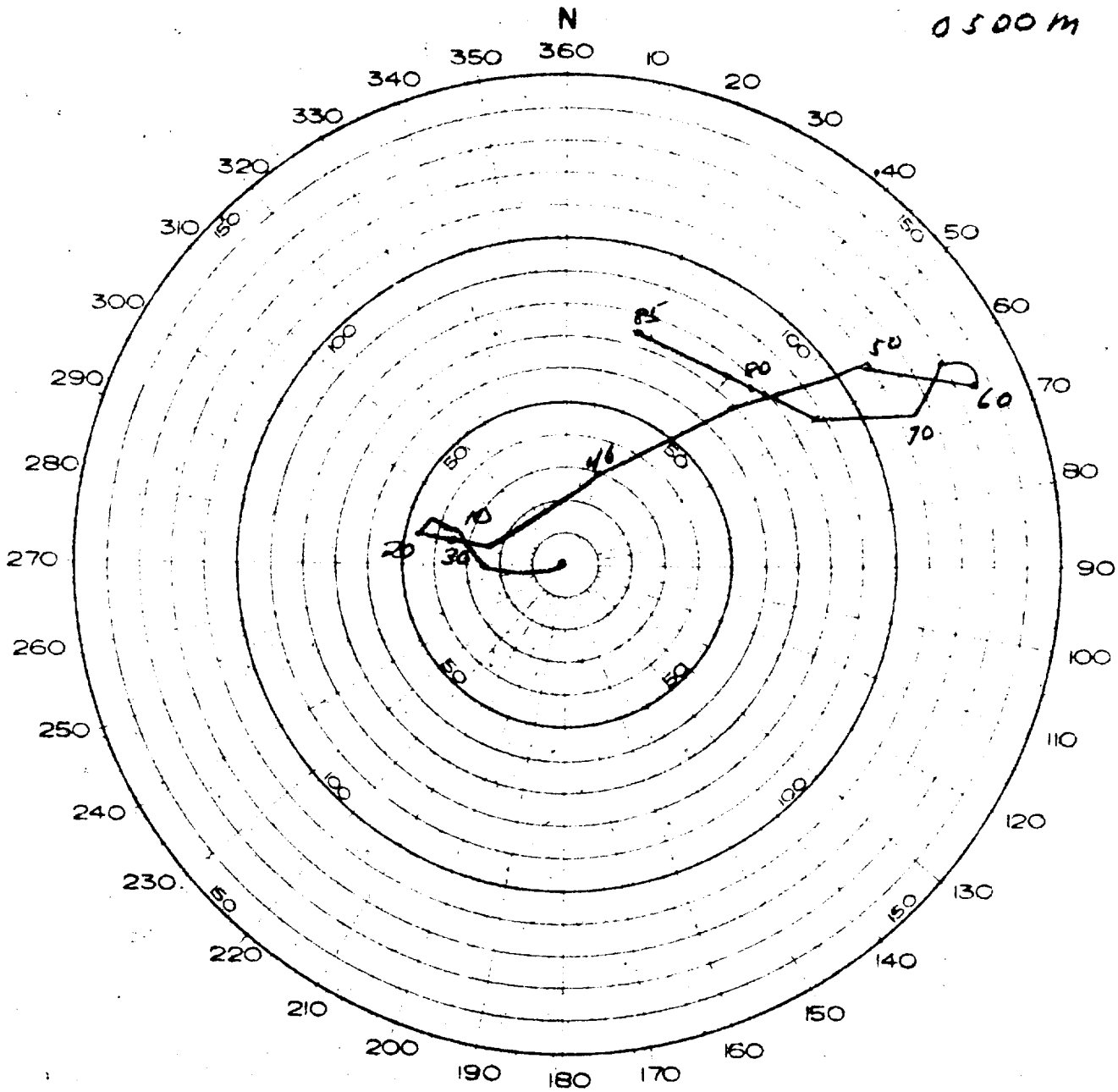
FIR FORECAST , 1118COM May 58

TAB E (1)

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX

F.T.
"Shot Time"
0500 M



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HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

14 May 1958

FIR

BIKINI OBSERVED WEATHER FOR 12 MAY 1958
AT DETONATION TIME: 0550M

SURFACE WEATHER:

Sea Level Pressure	1009.2 mbs
Free Air Surface Temperature	80.0°F
Wet Bulb Temperature	75.0°F
Dew Point Temperature	73.C°F
Relative Humidity	80%
Surface Wind	070° 17 knots
Visibility	10 miles
Weather	None

CLOUDS:
Scattered (3/10) cumulus, bases 1,800 feet. Scattered (1/10) stratocumulus, bases 3,000 feet. Broken (8/10) cirrus.

AREA WEATHER SUMMARY FROM AIRCRAFT:
4/10 low clouds. Broken to overcast cirrus bases 37,000 feet, tops 43,000 feet.

STATE OF THE SEA:
Open Sea: Wave height 7 feet, period 6 seconds, length 150 feet.
Lagoon near site Charlie: Wave height 1 foot, period 2 seconds, length 10 to 15 seconds.

FIR

BIKINI RADIOSONDE OBSERVATION

Pressure (Millibars)	Height (Feet)	Temperature (°C)	Dew Point (°C)
1009	Surface	26.8	22.2
1000	330	25.8	21.1
919	2,756	19.2	16.8
850	4,950	16.9	09.9
784	7,201	14.5	13.2
735	8,924	09.2	07.2
717	9,678	08.2	-03.5
700	10,270	09.5	-10.2
602	14,304	03.0	Miss
600	14,460	03.1	Miss
580	15,289	03.0	Miss
500	19,190	-04.5	Miss
400	24,860	-15.4	Miss
300	31,800	-28.5	Miss
250	35,990	-39.8	Miss
200	40,870	-52.1	Miss
150	46,770	-67.3	Miss
133	49,130	-74.0	Miss
100	54,490	-81.0	Miss
086	57,290	-78.0	Miss

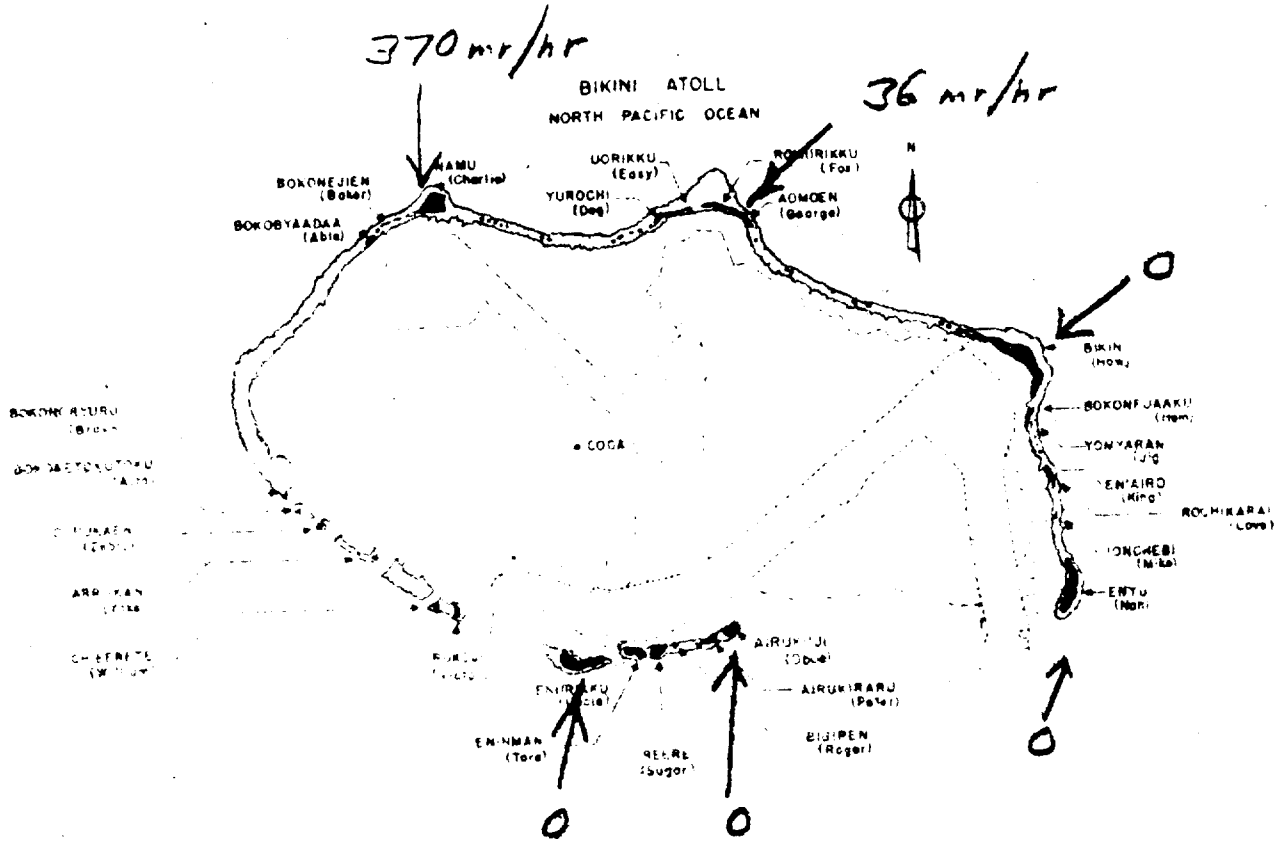
FIR

BIKINI WINDS ALOFT OBSERVATION

Height (Feet)	Direction (Degrees)	Velocity (knots)
Surface	090	20
1,000	070	23
2,000	080	23
3,000	080	19
4,000	090	23
5,000	090	31
6,000	110	23
7,000	130	20
8,000	130	15
9,000	150	15
10,000	170	13
12,000	120	07
14,000	110	07
16,000	070	12
18,000	060	06
20,000	050	06
22,000	090	04
24,000	130	04
26,000	220	06
28,000	280	10
30,000	280	17
32,000	280	31
34,000	260	23
36,000	240	34
38,000	230	40
40,000	230	42
42,500	240	40
45,000	240	49
47,500	250	44
50,000	260	39
52,500	270	31
55,000	270	18
57,500	240	03
60,000	210	04
65,000	080	05
70,000	040	17
75,000	080	23
80,000	120	23
85,000	110	35

[redacted]

Fir



DNA

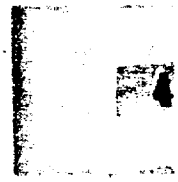
0900 H+3 Chopper Survey

12 May 58

[redacted]

4.0

Tab F



DNA

INDEX

TAB

[redacted]

BUTTERNUT EVENT

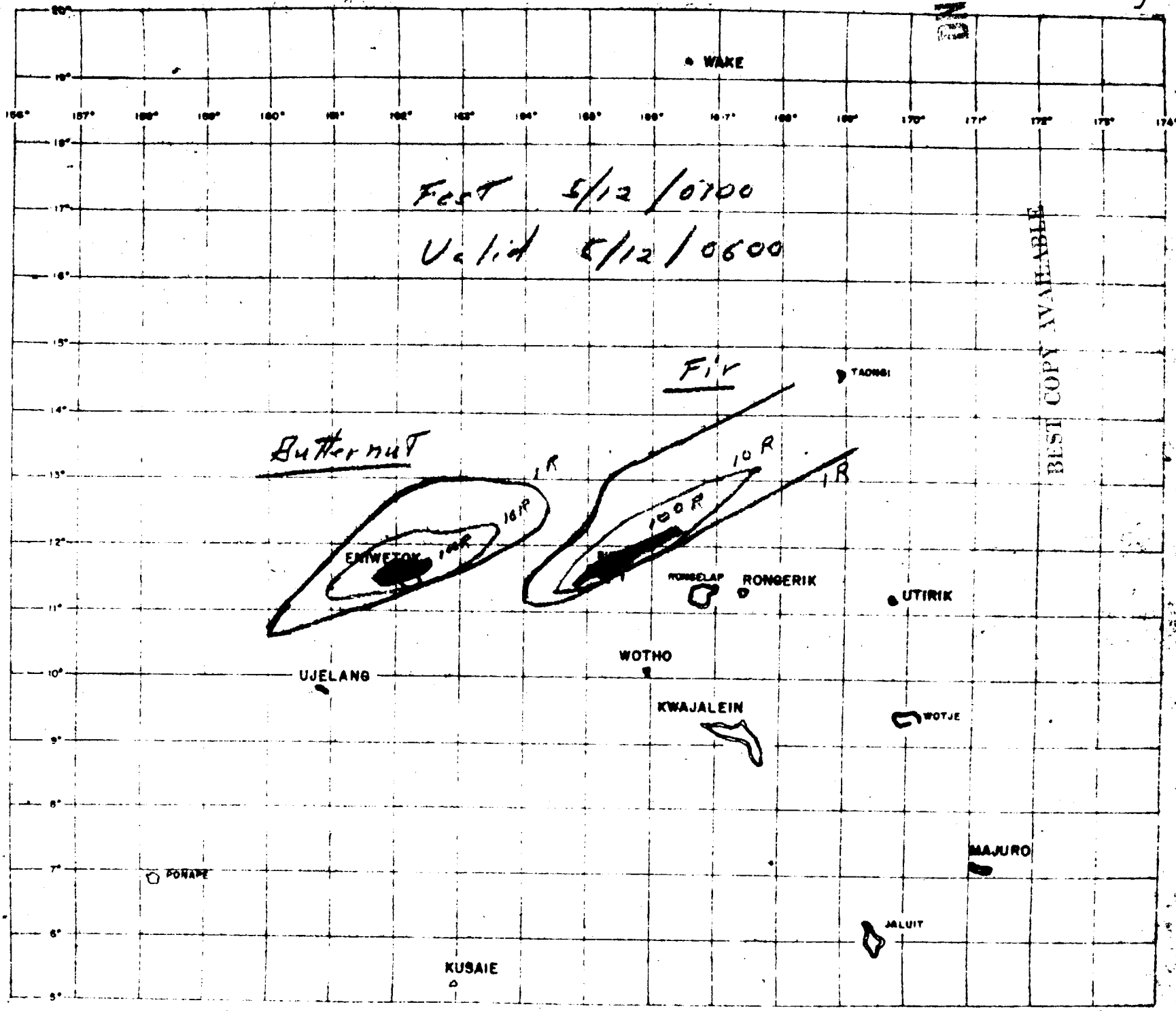
OPERATION HARDTACK

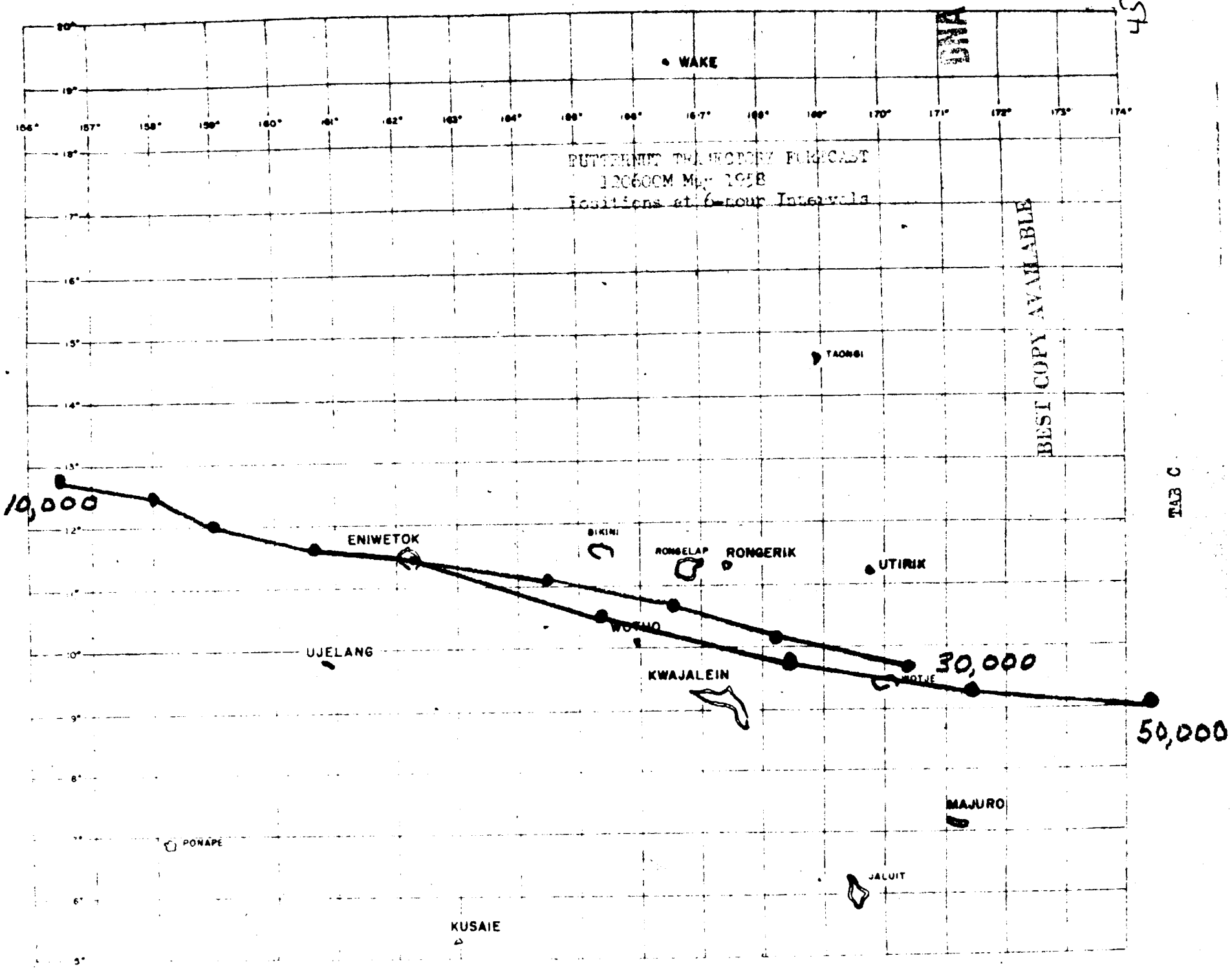
1. BUTTERNUT was a barge shot situated 4,000 feet west of Yvonne Island in the lagoon at Eniwetok. The device was detonated at 0615M, 12 May 1958, [redacted] The cloud rose to 35,000 feet, then stabilized at 30,000 feet. Main cloud movement was to the northwest, with most of the fallout deposited in the sea. The only islands receiving substantial contamination were Alice, with 650 mr, and Mack (directly in the cloud's path), with 30 r. Yvonne, less than a mile from ground zero, read 100 mr. All of the above readings were surface intensities corrected to H+3 hours.

2. Fallout prediction was generally accurate, except that only the northwest quadrant of the atoll received substantial contamination instead of the whole northern half, as forecast. Nearly all of the fallout fell between the radials of 260 degrees to 300 degrees from ground zero. Length of the radials is approximated at 110 miles; however, no direct observations are available to bear out this estimate. No fallout was detected outside the hazard area announced on D-1.

TAB A

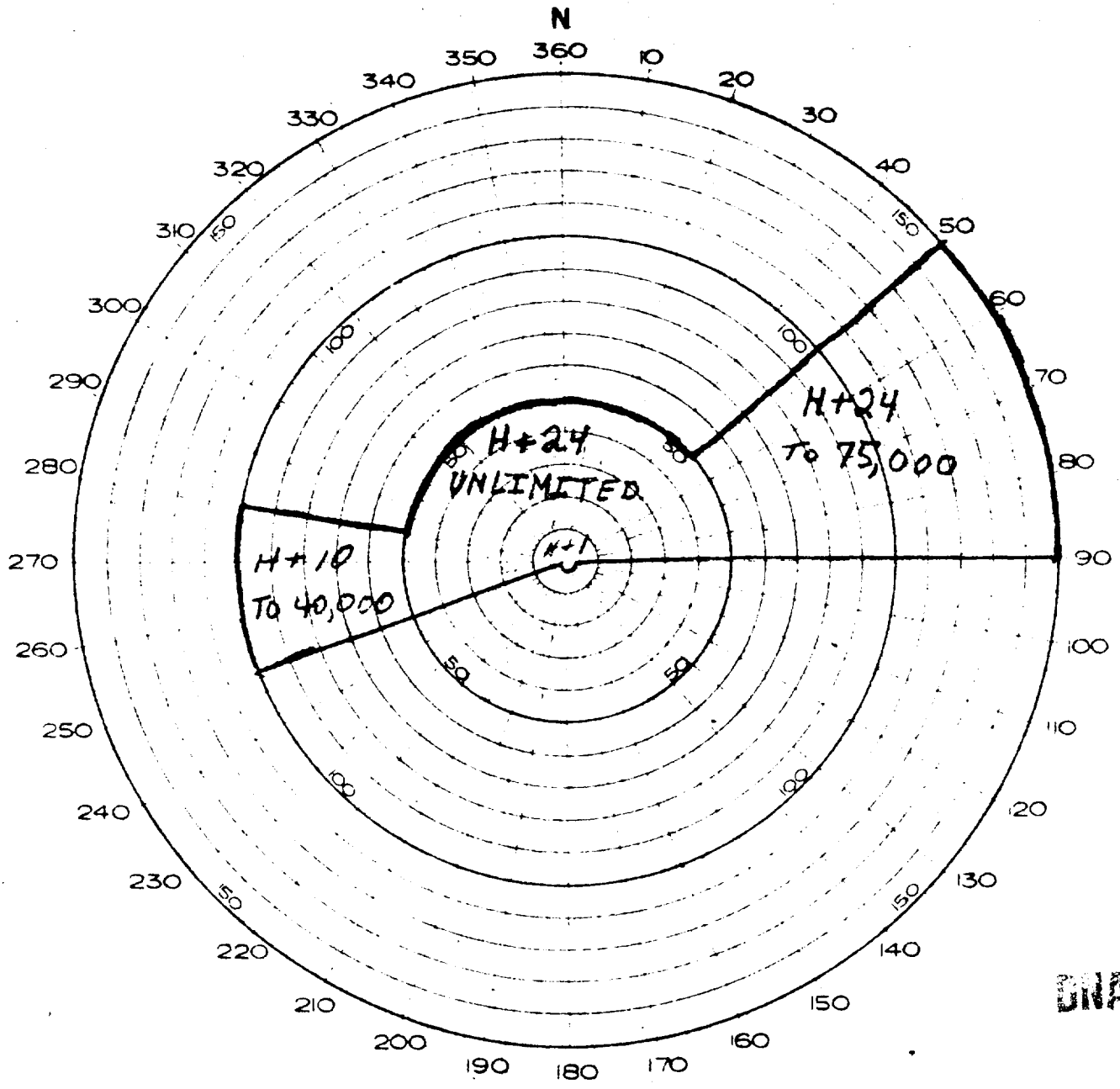
[redacted]




WAKE
DATA
BUTTERNUT TYPHOON FORECAST
120600M May 1958
Positions at 6-hour Intervals
BEST COPY AVAILABLE
TAB C
TAORGI
10,000
ENIWETOK
BIKINI
RONGELAP
RONGERIK
UTIRIK
WOTHO
UJELANG
KWAJALEIN
30,000
50,000
MAJURO
PONAPE
JALUIT
KUSAIE

HODOGRAPH

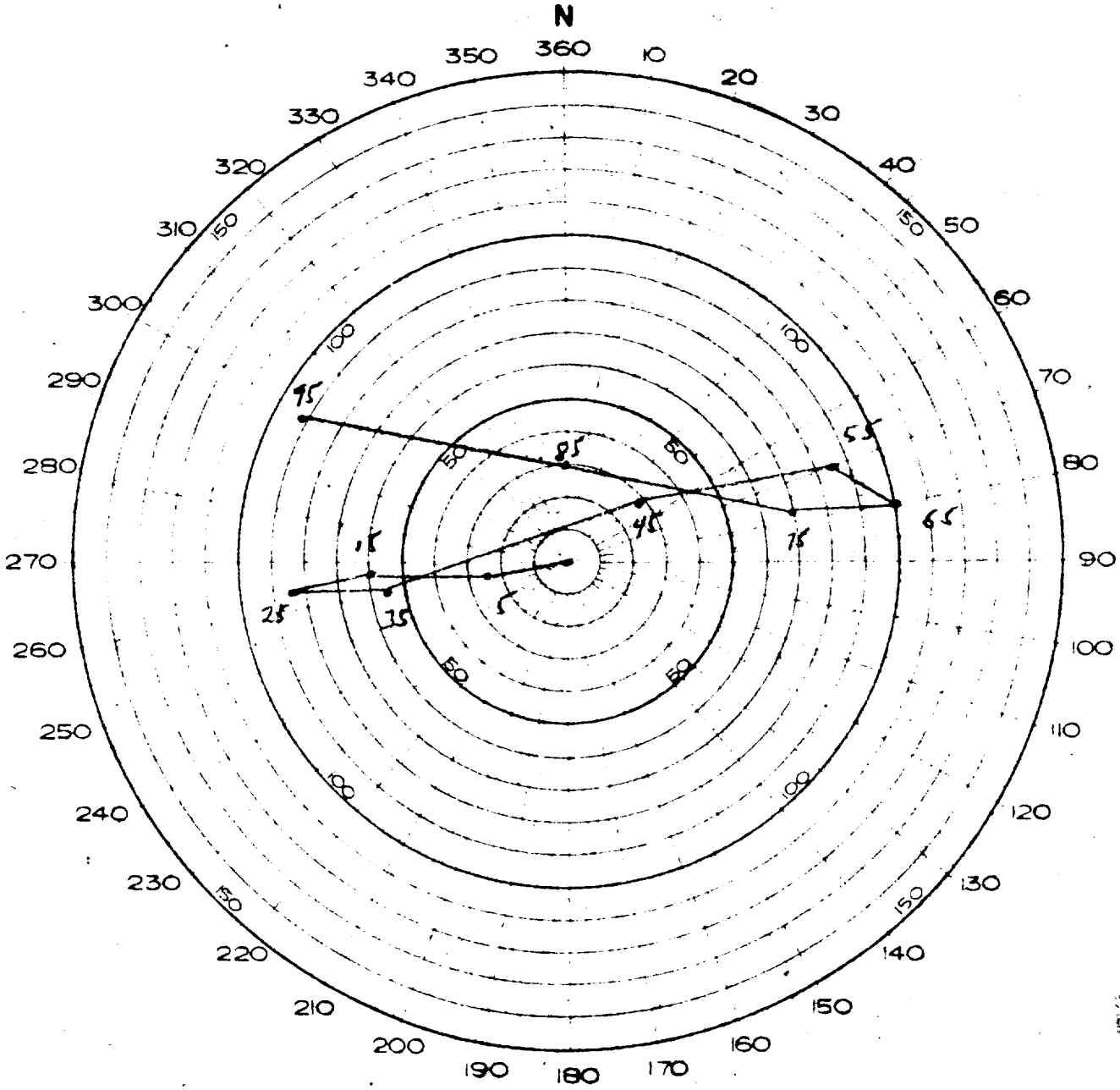
RESULTANT WINDS AND SURFACE RADEX



DNA

AIR & SURFACE RADEX - BUTTERNUT

HODOGRAPH
RESULTANT WINDS AND
SURFACE RADEX

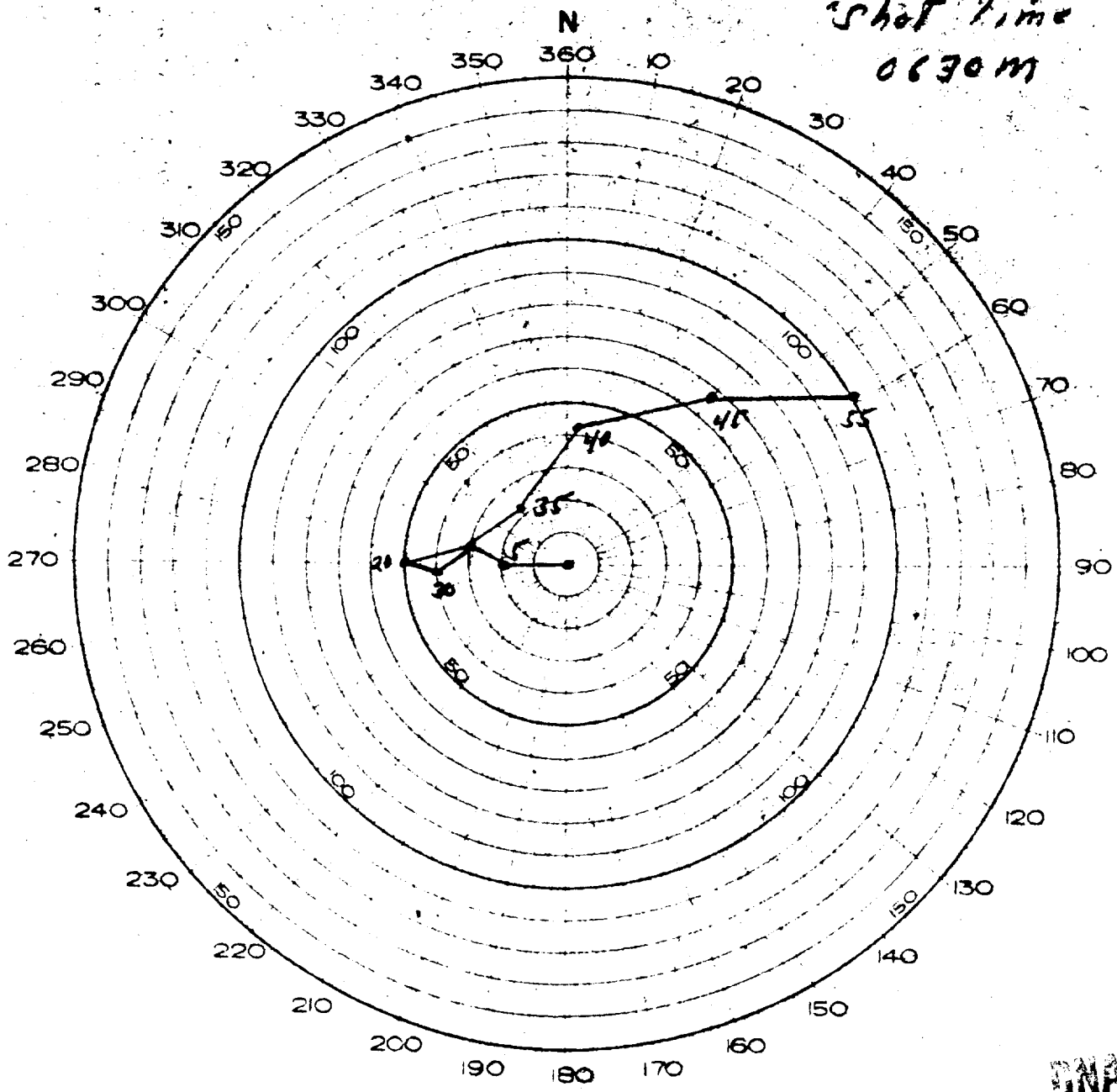


BUTTERNUT FORECAST, 111800M May 58

DNA

HODOGRAPH
RESULTANT WINDS AND SURFACE RADEX

Buttermilk "Shot Time" 0630 m



DNA

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HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

14 May 1958

BUTTERNUT

ENIWETOK OBSERVED WEATHER FOR 12 MAY 1958
AT DETONATION TIME: 0615M

SURFACE WEATHER:

Sea Level Pressure	1008.6 mbs
Free Air Surface Temperature	80.6°F
Wet Bulb Temperature	75.6°F
Dew Point Temperature	74.0°F
Relative Humidity	80%
Surface Wind	090° 12 knots
Visibility	10 miles
Weather	None

CLOUDS:
Scattered (2/10) cumulus, bases 2,100 feet, broken (8/10) cirrus, 5/10 opaque.

AREA WEATHER SUMMARY FROM AIRCRAFT:
4/10 cumulus tops generally 4,500 feet, with occasional tops to 7,000 feet. Occasional light turbulence at 8,000 feet. High thin cirrus bases 45,000 feet tops 48,000 feet, thickening to the east.

STATE OF THE SEA:
Open Sea: Wave height 6 feet, period 5 to 6 seconds, length 100 feet.
Lagoon near Yvonne: Wave height 0.75 to 1 foot, period 1 to 2 seconds, length 8 to 12 feet.

BUTTERNUT

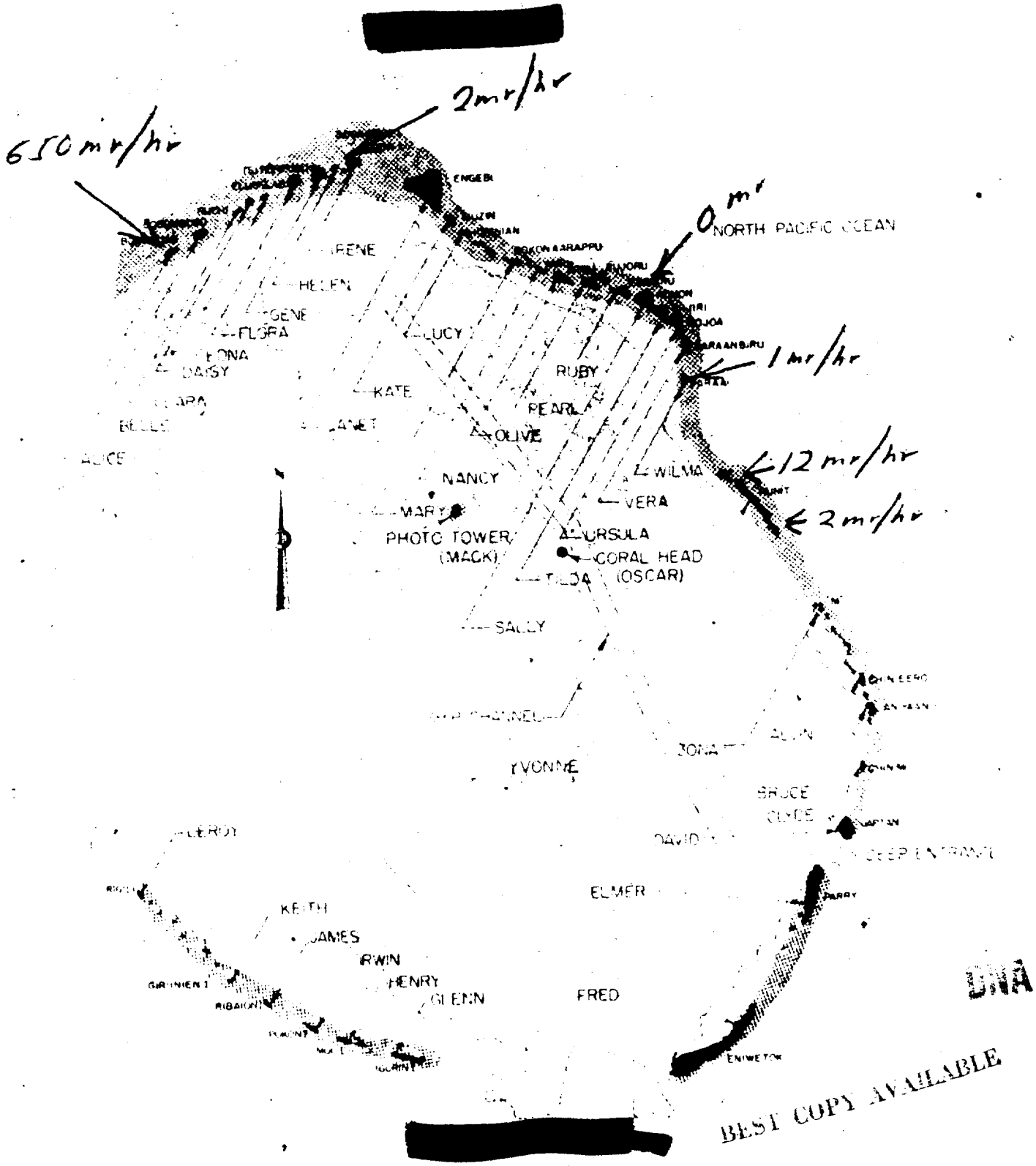
ENIWETOK RADIOSONDE OBSERVATION

Pressure (Millibars)	Height (Feet)	Temperature (°C)	Dew Point (°C)
1008	Surface	27.2	22.8
1000	250	26.8	22.5
850	4,890	16.5	11.2
735	8,924	10.2	-12.5
712	9,777	12.0	Miss
700	10,230	11.0	Miss
614	13,780	04.0	Miss
600	14,390	05.0	Miss
500	19,200	-08.5	Miss
400	24,880	-15.0	Miss
300	31,830	-29.8	Miss
250	35,999	-41.3	Miss
200	40,820	-53.4	Miss
150	46,680	-68.0	Miss
110	52,899	-80.0	Miss
100	54,380	-79.2	Miss
080	58,872	-79.0	Miss
060	64,482	-65.0	Miss
050	67,780	-62.0	Miss
045	70,389	-57.0	Miss
036	75,240	-56.0	Miss
027	81,444	-47.0	Miss
023	84,711	-47.0	Miss
025	82,420	-48.0	Miss

BUTTERNUT

ENIWETOK WINDS ALOFT OBSERVATION

Height (Feet)	Direction (Degrees)	Velocity (knots)
Surface	080	12
1,000	090	21
2,000	090	23
3,000	090	22
4,000	100	18
5,000	120	16
6,000	120	16
7,000	150	14
8,000	150	11
9,000	130	08
10,000	100	09
12,000	090	08
14,000	080	08
16,000	070	16
18,000	100	10
20,000	100	08
22,000	100	08
24,000	140	04
26,000	Calm	Calm
28,000	290	14
30,000	280	19
32,000	250	29
34,000	240	39
36,000	210	43
38,000	220	40
40,000	230	37
42,500	250	41
45,000	260	41
47,500	270	38
50,000	250	35
52,500	270	28
55,000	310	12
57,500	080	08
60,000	200	04
65,000	060	11
70,000	080	13
75,000	090	21
80,000	100	32
84,000	100	31



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H+3 Initial Survey
12 May, 0915 m

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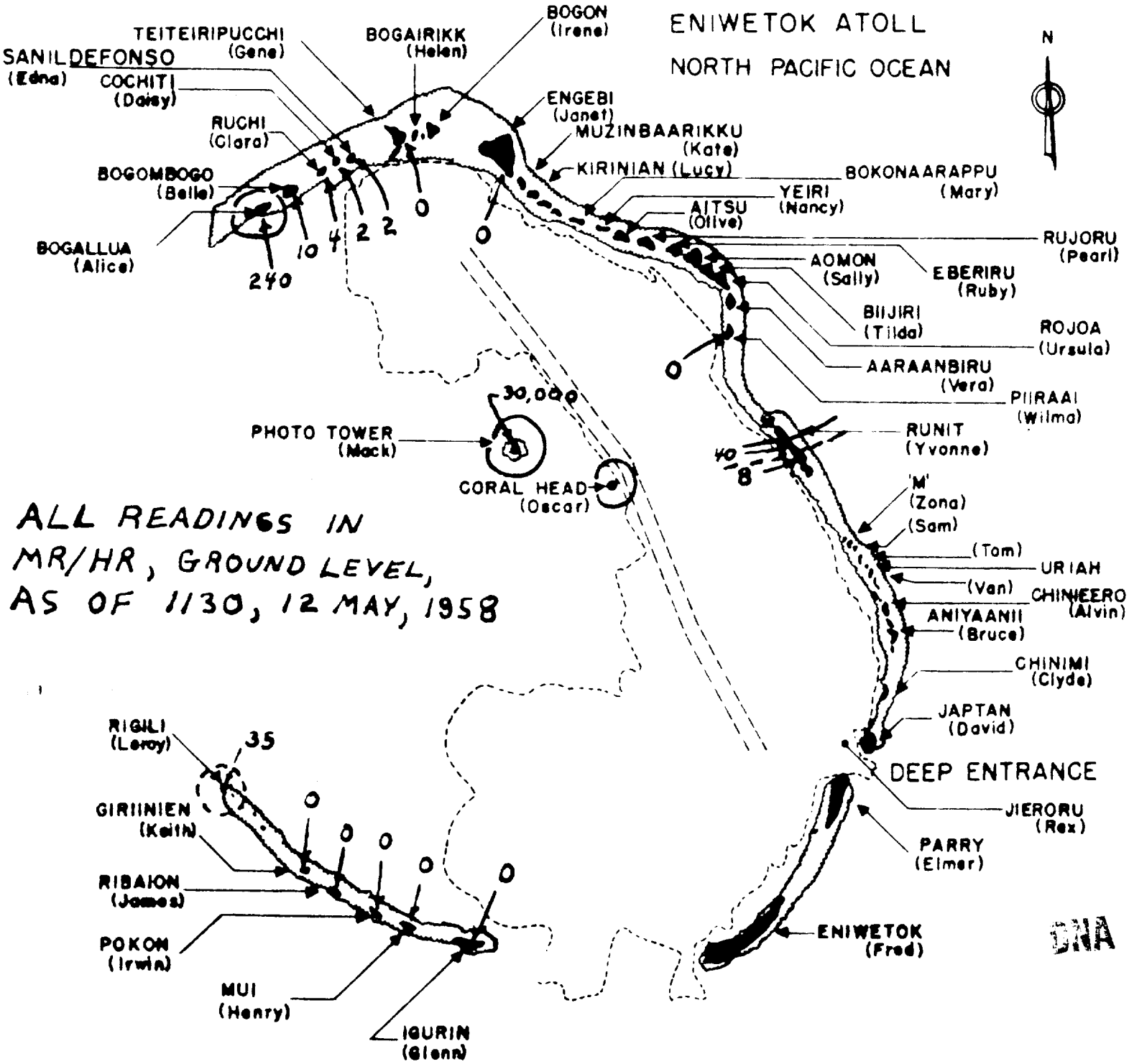

ALL READINGS IN MR/HR, GROUND LEVEL, AS OF 1130, 12 MAY, 1958

---- LIMITED RADEX

——— FULL RADEX

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[redacted]

DNA

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TAB

[redacted]

KOA EVENT

OPERATION HARDTACK

1. The KOA device was a land surface shot detonated at 0630M, 13 May 1958, at the west end of Gene Island, Eniwetok Atoll. The approximate yield was 1.25 MT. Radar established the cloud height at 60,000 feet at 0637M, to the northwest of Gene. The main segment of the cloud moved in a northerly direction and topped at 30,000 feet within thee first hour.

2. The P2V aircraft (Wildroot 2) reported over Eniwetok at 0800M, and, using Yvonne as an axis, it was vectored along thirty-mile radials commencing with 240 degrees and increasing by 10-degree increments. Initial runs recorded slight increases in background intensity. Maximum intensity was recorded over Janet at 1010M, with 460 mr/hr at 1,500 feet. The entire lagoon area was surveyed and the aircraft released at 1300M.

3. R-Hour was declared at 1000M, and the initial helicopter survey was completed at 1030M. Maximum ground reading was 40,000 mr/hr recorded on Alice. Other north-atoll islands ranged from 130 mr/hr on Sally to 14,000 mr/hr on Irene.

4. Fallout forecast was generally accurate in extent and intensity. The main axis of the cloud was forecast to extend northeast of Gene on a bearing of 50 degrees.

DNA

5. It is estimated that all fallout dropped within the forecast area. Within twenty-four hours background in this area commenced to rise,

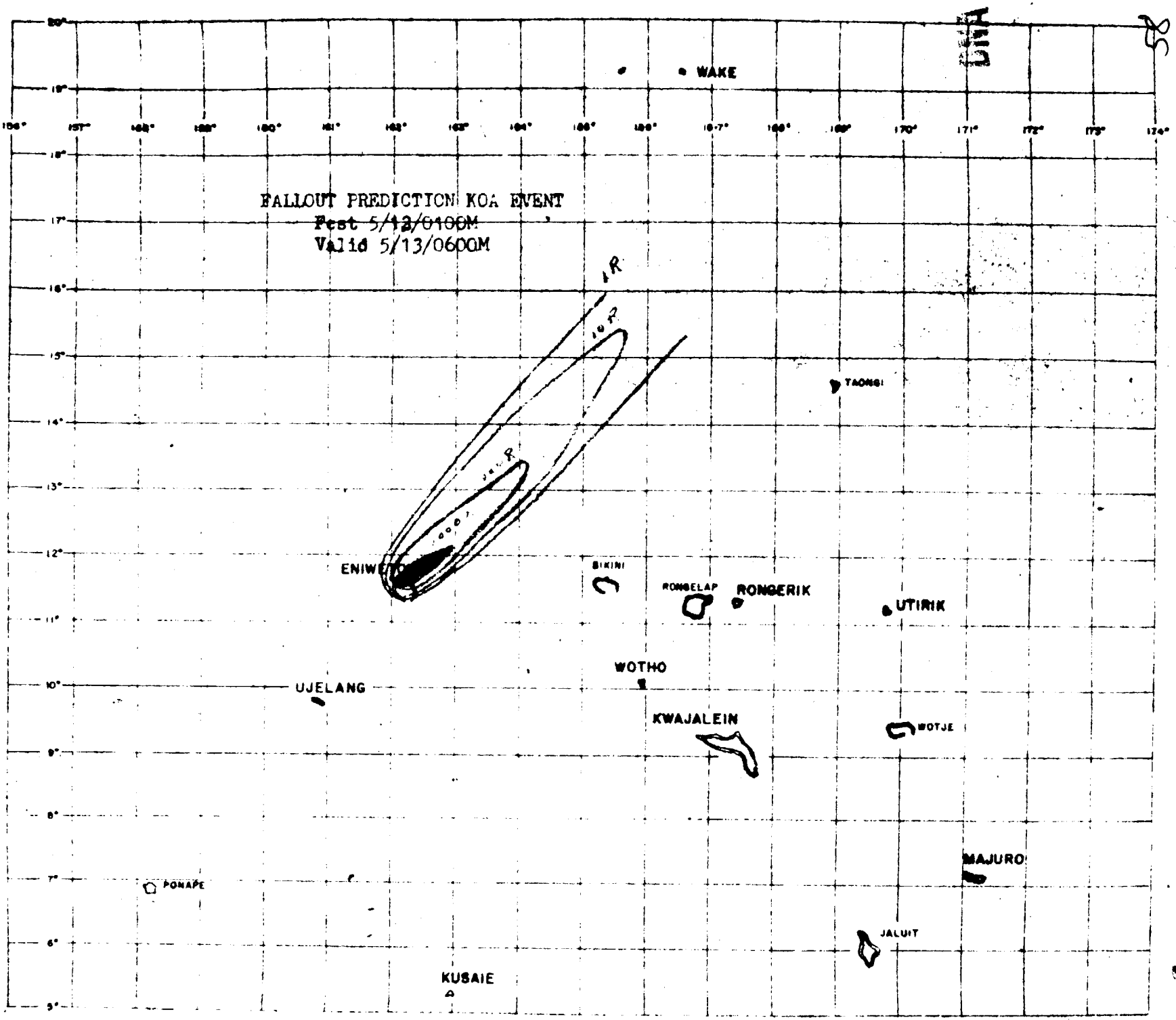
[redacted]

[redacted]

but it has not been determined if the fallout was generated by FIR or by a combination of FIR and KOA. Eniwetok Atoll rose to a maximum of 19 mr/hr. The maximum off-site recording was made at Rongelap, with 1.5 mr/hr.

DNA

[redacted]



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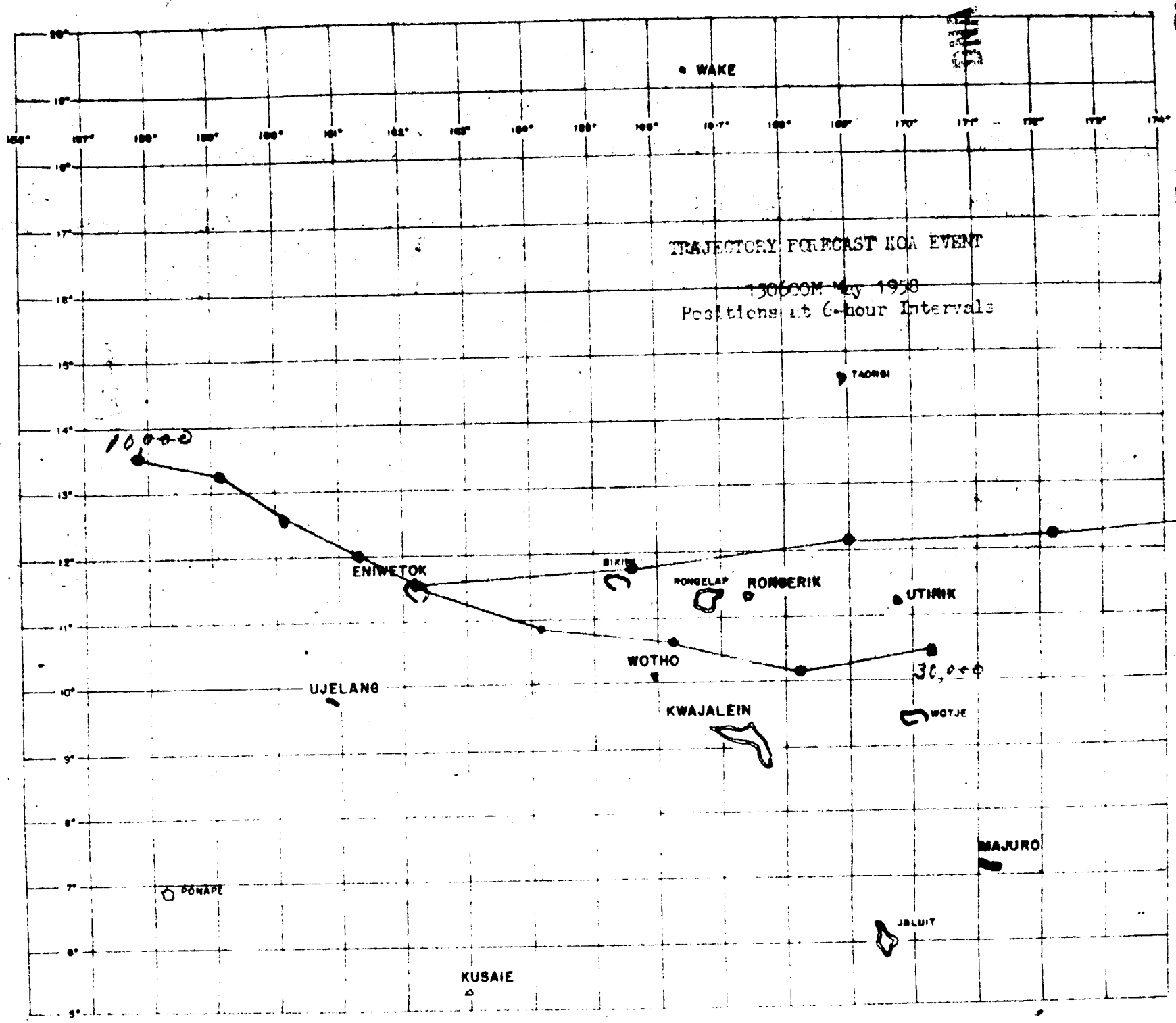

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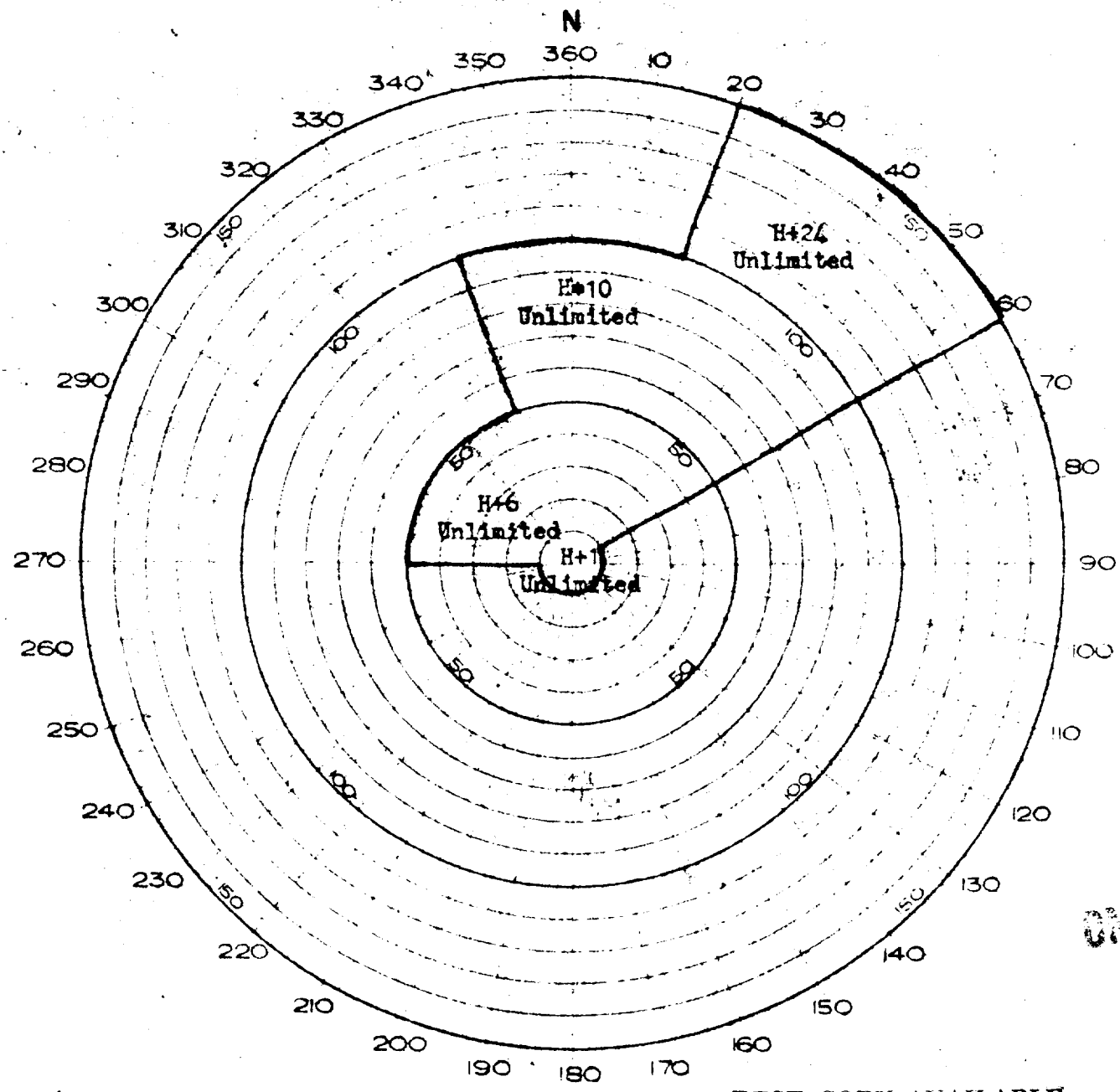
TAB C

HODOGRAPH
RESULTANT WINDS AND
SURFACE RADEX



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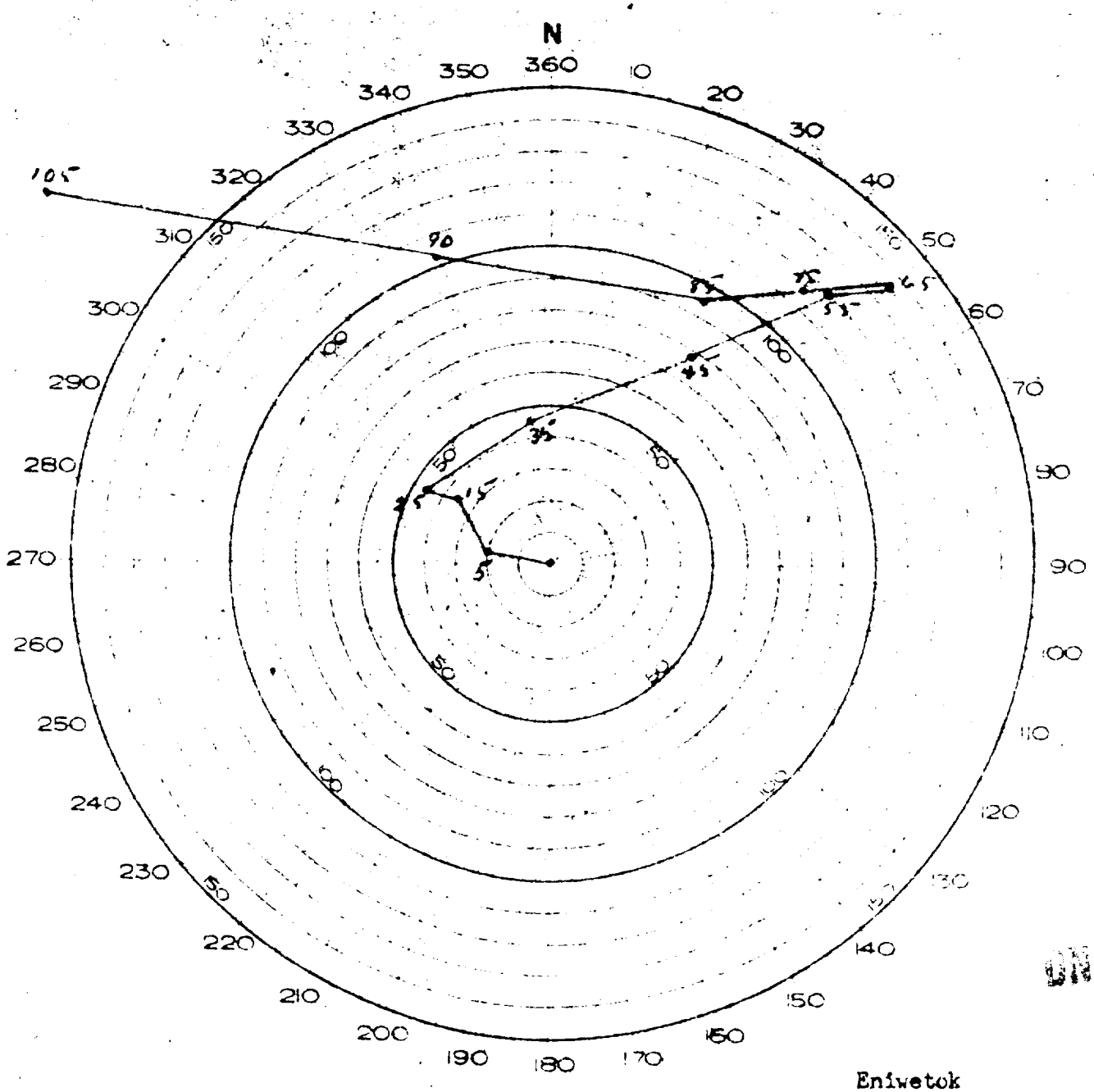
KOA EVENT

130600M

Surface and Air Radex

TAB D

HODOGRAPH
RESULTANT WINDS AND
SURFACE RADEX



DNA

Eniwetok
Fost 13060CM

KOA EVENT

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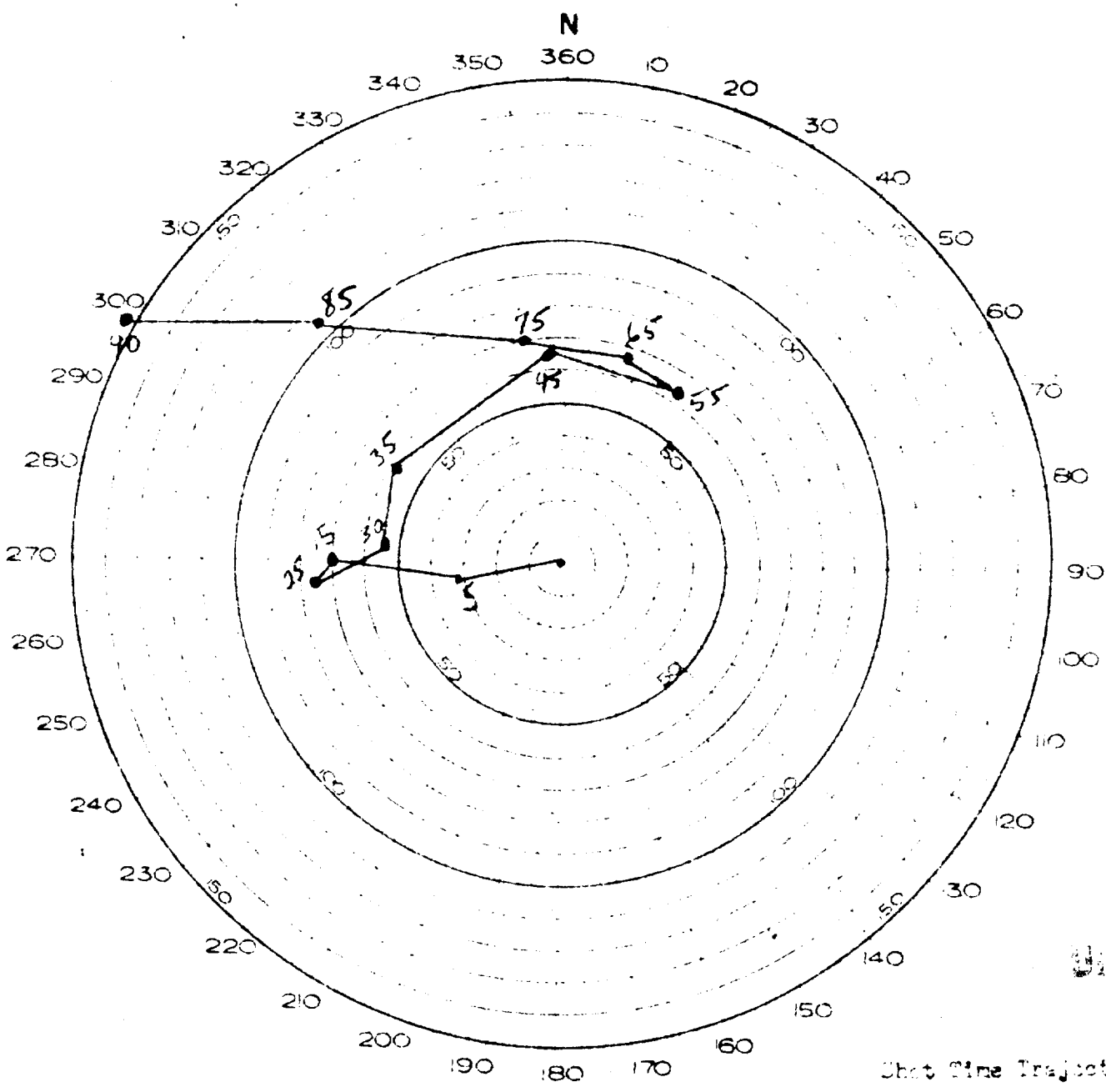
HODOGRAPH
RESULTANT WINDS AND
SURFACE RADEX



Shot Time Trajectory

May 1958

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HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

14 May 1958

KOA

ENIWETOK OBSERVED WEATHER FOR 15 MAY 1958
AT DETONATION TIME: 0630M

SURFACE WEATHER:

Sea Level Pressure	1010.5 mbs
Free Air Surface Temperature	81.0°F
Wet Bulb Temperature	76.0°F
Dew Point Temperature	74.0°F
Relative Humidity	79%
Surface Wind	050° 16 Knots
Visibility	10 miles
Weather	None

CLOUDS:
Scattered (4/10) cumulus, bases 1,800 feet, moving west. Scattered (3/10) altostratus, bases 8,000 feet, moving west. Overcast (10/10) cirrus, (9/10) opaque.

AREA WEATHER SUMMARY FROM AIRCRAFT:
Scattered cumulus bases 1,900 feet, tops generally 7,000 feet, a few tops to 16,000 feet. Light to moderate turbulence in clouds. Broken to overcast cirrus, bases 35,000 feet, tops 40,000 feet. High thin cirrus layer above. Light turbulence in lower cirrus layer.

STATE OF THE SEA:
Open Sea, site Genex Waves from 080°, 5 feet high, period 4 to 5 seconds, length 70 to 80 feet. NOTE: Waves increasing in height at time of firing.
Lagoon, site Gene: Waves 1 foot high, period 0.5 to 1 second, length 3 to 5 feet.

KOA

ENIWETOK RADIOSONDE OBSERVATION

Pressure (Millibars)	Height (Feet)	Temperature (°C)	Dew Point (°C)
1010	Surface	27.8	22.8
1000	310	26.8	22.2
936	2,231	21.5	19.2
850	4,950	17.2	14.8
766	7,874	11.5	11.2
700	10,310	09.5	05.2
600	14,450	02.5	01.2
548	16,929	-00.5	-01.5
520	18,209	-02.5	-12.2
503	19,095	-04.2	-07.5
500	19,240	-04.2	-10.8
494	19,554	-04.2	-22.2
400	24,920	-14.2	-29.5
369	26,903	-18.2	-24.5
335	29,331	-23.5	-34.2
311	31,070	-28.1	-33.2
300	31,870	-30.2	-34.2
253	36,036	-39.8	-42.2
250	36,050	-40.2	Miss
200	40,930	-51.8	Miss
150	46,850	-65.2	Miss
118	51,810	-75.0	Miss
100	54,680	-77.7	Miss
091	56,859	-79.0	Miss
087	57,684	-75.0	Miss
075	60,621	-74.0	Miss
066	63,030	-77.0	Miss
061	64,482	-62.0	Miss
050	68,120	-63.8	Miss
039	73,656	-56.0	Miss
030	79,167	-57.0	Miss
025	82,540	-50.0	Miss
015	94,149	-45.0	Miss

KOA

ENIWETOK WINDS ALOFT OBSERVATION

Height (Feet)	Direction (Degrees)	Velocity (Knots)
Surface	040	10
2,000	070	27
4,000	080	31
6,000	100	25
8,000	100	27
10,000	090	22
12,000	100	25
14,000	110	22
16,000	120	12
18,000	110	10
20,000	070	07
22,000	050	04
24,000	170	10
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30,000	250	21
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53,000	270	24
55,000	280	11
58,000	180	07
60,000	140	15
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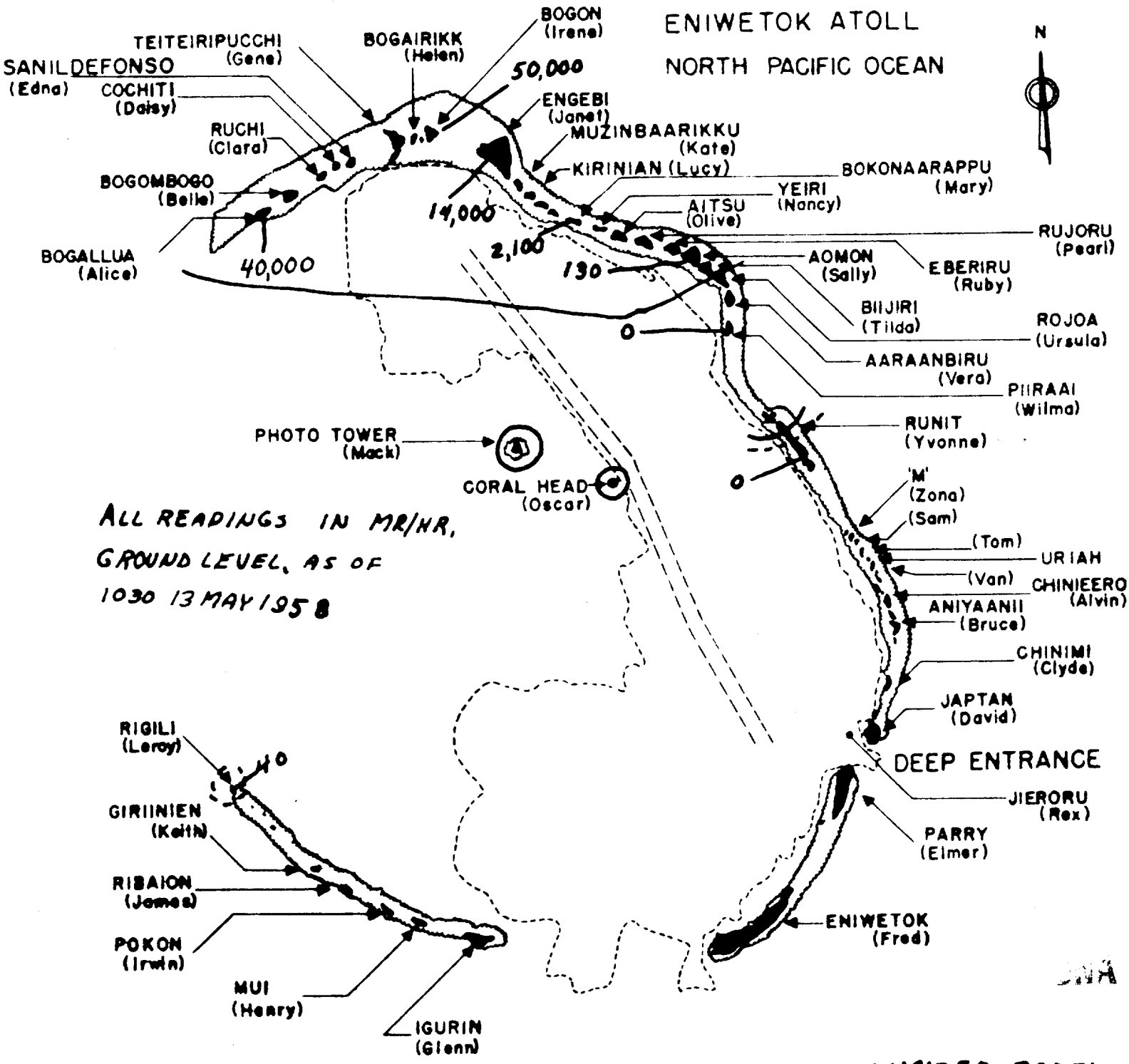
80,000	100	27
85,000	090	36
90,000	090	51
92,000	090	56


ENIWETOK ATOLL
NORTH PACIFIC OCEAN
N
BOGON (Irene)
TEITEIRIPUCCHI (Gene)
BOGAIRIKK (Helen)
SANILDEFONSO (Edna)
COCHITI (Daisy)
50,000
ENGEBI (Janet)
RUCHI (Clara)
MUZINBAARIKKU (Kate)
KIRINIAN (Lucy)
BOKONAARAPPU (Mary)
BOGOMBOGO (Belle)
YEIRI (Nancy)
14,000
AITSU (Olive)
RUJORU (Pearl)
2,100
BOGALLUA (Alice)
40,000
130
AOMON (Sally)
EBERIRU (Ruby)
BIIJIRI (Tilda)
ROJOA (Ursula)
0
AARAANBIRU (Vera)
PIIRAAI (Wilma)
PHOTO TOWER (Mack)
RUNIT (Yvonne)
CORAL HEAD (Oscar)
'M' (Zona)
(Sam)
(Tom)
URIAH
(Van)
CHINIEERO (Alvin)
ANIYAANII (Bruce)
CHINIMI (Clyde)
JAPTAN (David)
RIGILI (Leroy)
DEEP ENTRANCE
GIRIINIEN (Keith)
JIERORU (Rex)
RIBAION (James)
PARRY (Elmer)
POKON (Irwin)
ENIWETOK (Fred)
MUI (Henry)
IGURIN (Glenn)
ALL READINGS IN MR/HR, GROUND LEVEL, AS OF 1030 13 MAY 1958
------ LIMITED RADEX
FULL RADEX
NOTE: HOLLY MOOR - 70 MR/HR AT 25'
YELLOW WOOD MOOR - 250 MR/HR AT 25'
IRENE PINEX RECOVERY AREA - 5,000-10,000 MR/HR AT 25'

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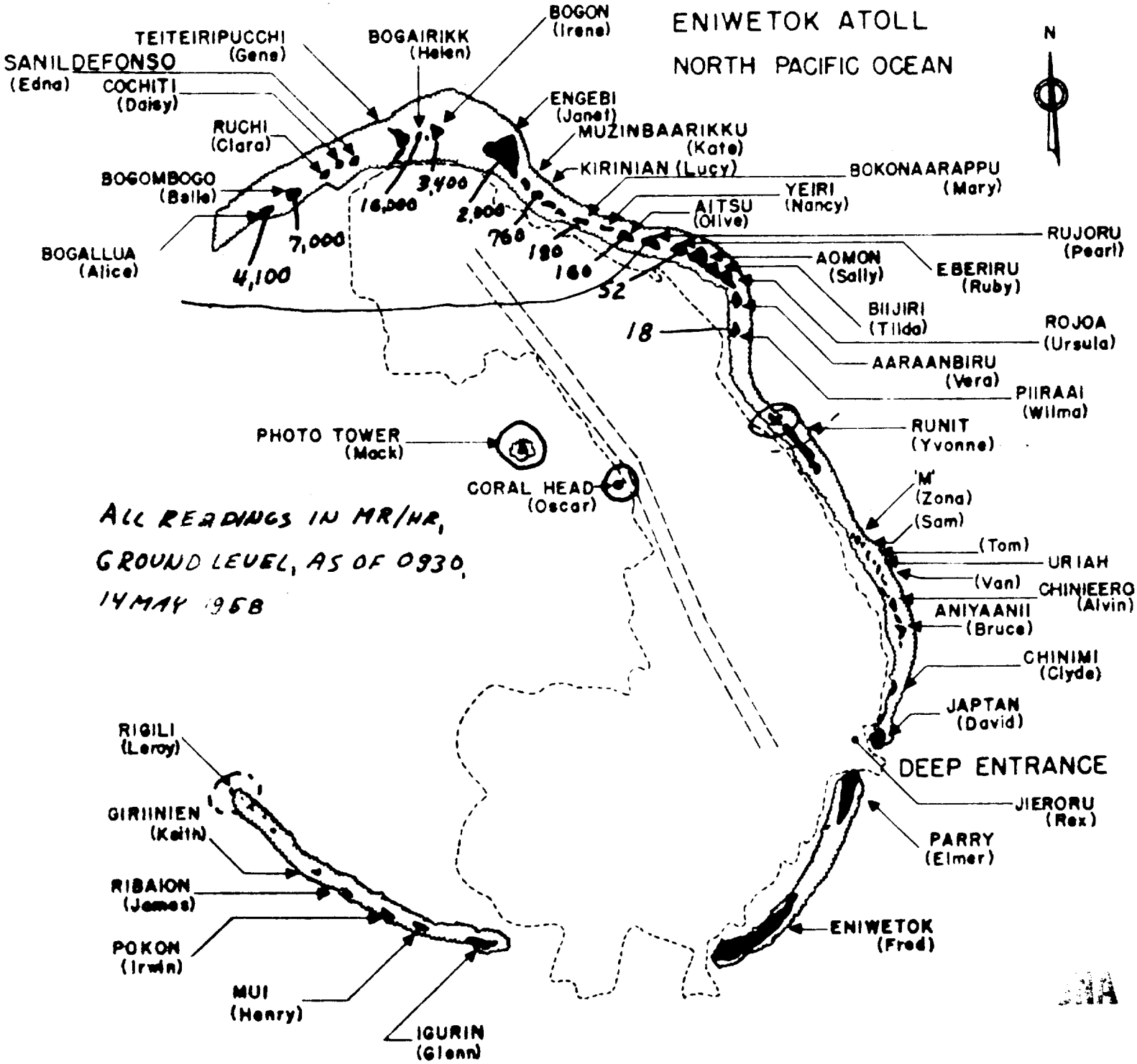
ENIWETOK ATOLL
NORTH PACIFIC OCEAN
N
SANIL DEFONSO (Edna)
TEITEIRIPUCCHI (Gene)
BOGAIRIKK (Helen)
BOGON (Irene)
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DEEP ENTRANCE
RIGILI (Leroy)
JIERORU (Rex)
GIRIINIEN (Keith)
PARRY (Elmer)
RIBAION (James)
POKON (Irwin)
ENIWETOK (Fred)
MUI (Henry)
IGURIN (Glenn)
16,000
3,400
2,000
7,000
4,100
760
180
160
52
18
ALL READINGS IN MR/HR, GROUND LEVEL, AS OF 0930, 14 MAY 58
LIMITED RADEX
FULL RADEX

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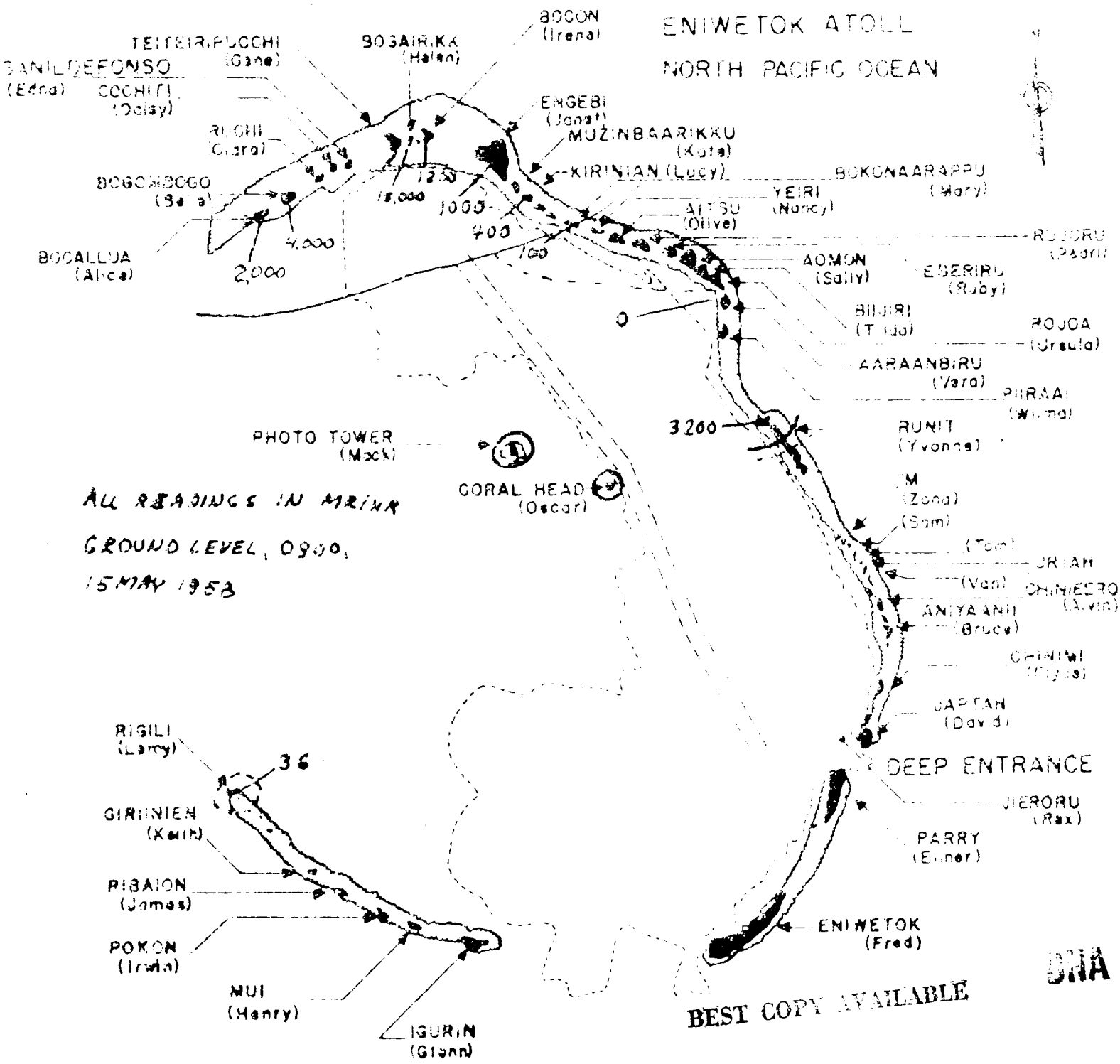
ENIWETOK ATOLL
NORTH PACIFIC OCEAN
BOCON (Irene)
BOGAIRIKK (Helen)
TEITEIRIPUCCHI (Gene)
DANIEL(EFONSO (Edna)
COCHITI (Daisy)
RUCHI (Clara)
BOGOMBOGO (Sa a)
BOCALLUA (Alice)
ENGEBI (Jane)
MUZINBAARIKKU (Kate)
KIRINIAN (Lucy)
BOKONAARAPPU (Mary)
YEIRI (Nancy)
AITSU (Olive)
RUJORU (Pearl)
AOMON (Sally)
ESERIRU (Ruby)
BIJIRI (Tilda)
ROJOA (Ursula)
AARAANBIRU (Vera)
PIIRAAI (Wilma)
RUNIT (Yvonne)
PHOTO TOWER (Mack)
CORAL HEAD (Oscar)
M (Zona) (Sam)
(Tom)
(Van)
ANIYAANI (Bruce)
JAPTAN (David)
DEEP ENTRANCE
JIERORU (Rex)
PARRY (Elmer)
ENIWETOK (Fred)
RIGILI (Larry)
GIRINIEN (Kevin)
RIBAION (James)
POKON (Irwin)
MUI (Henry)
IGURIN (Glenn)
ALL READINGS IN MRINA
GROUND LEVEL, 0900,
15 MAY 1958
BEST COPY AVAILABLE
LIMITED RADEX
FULL RADEX

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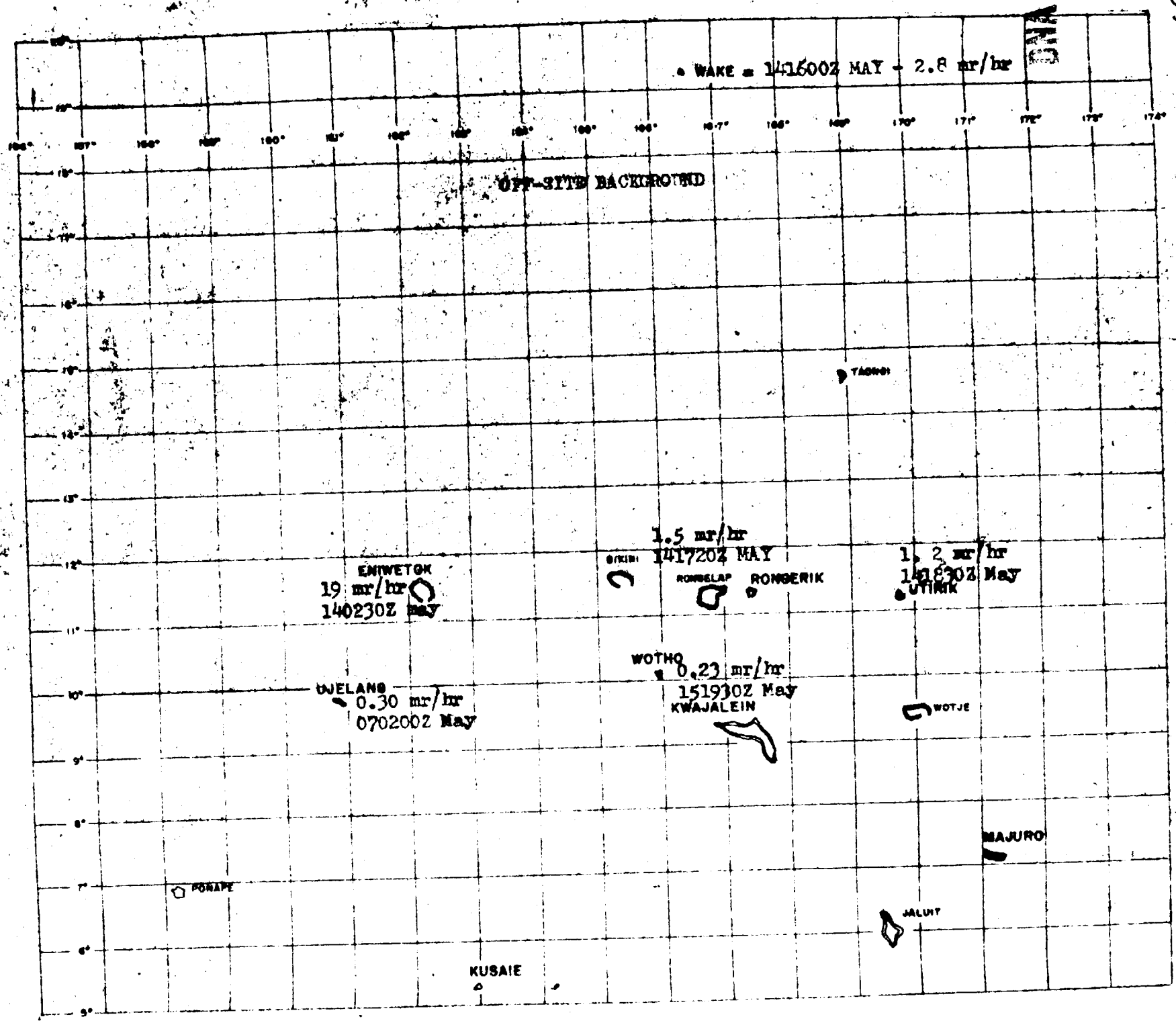


INDEX

TAB

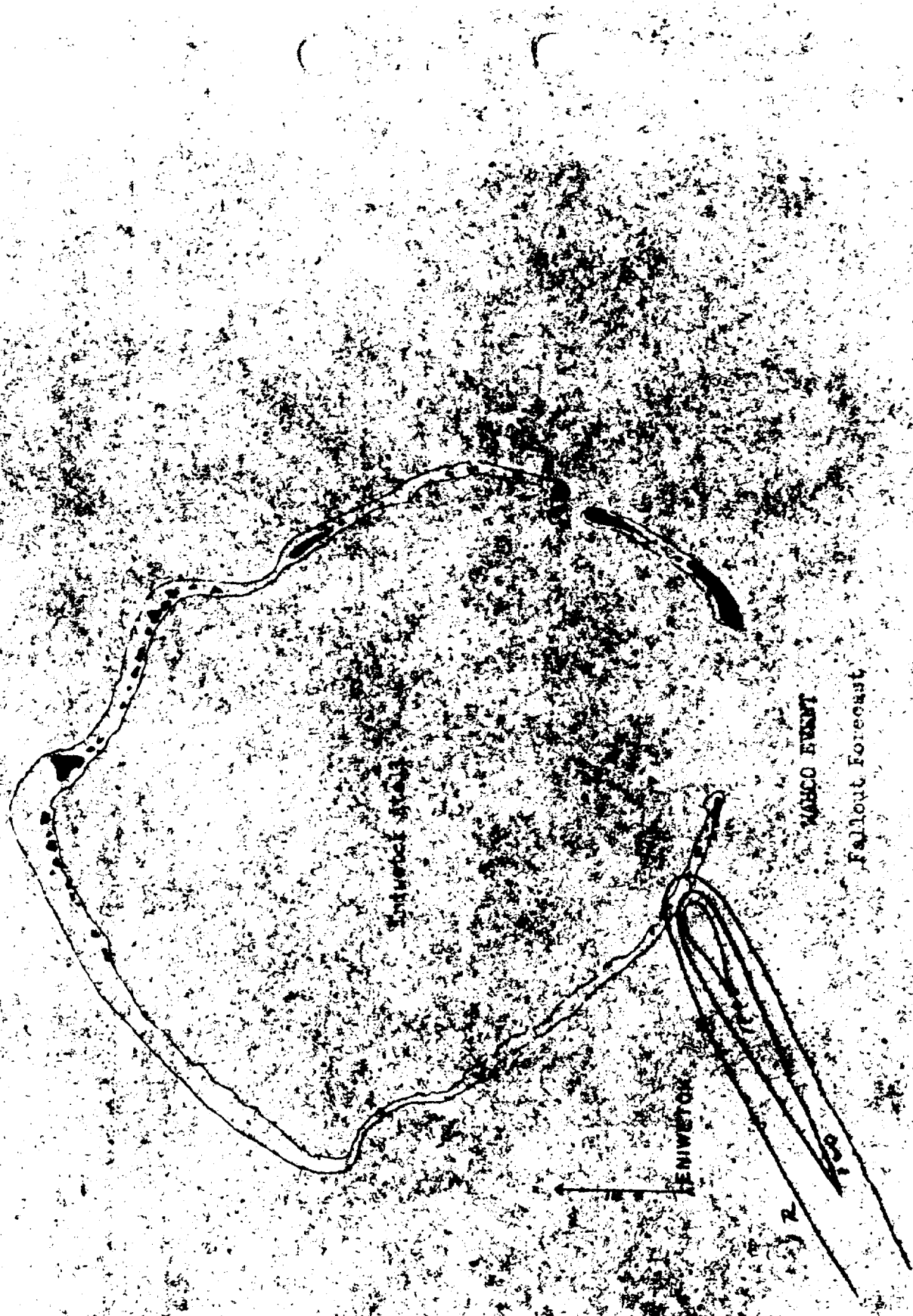
[redacted]

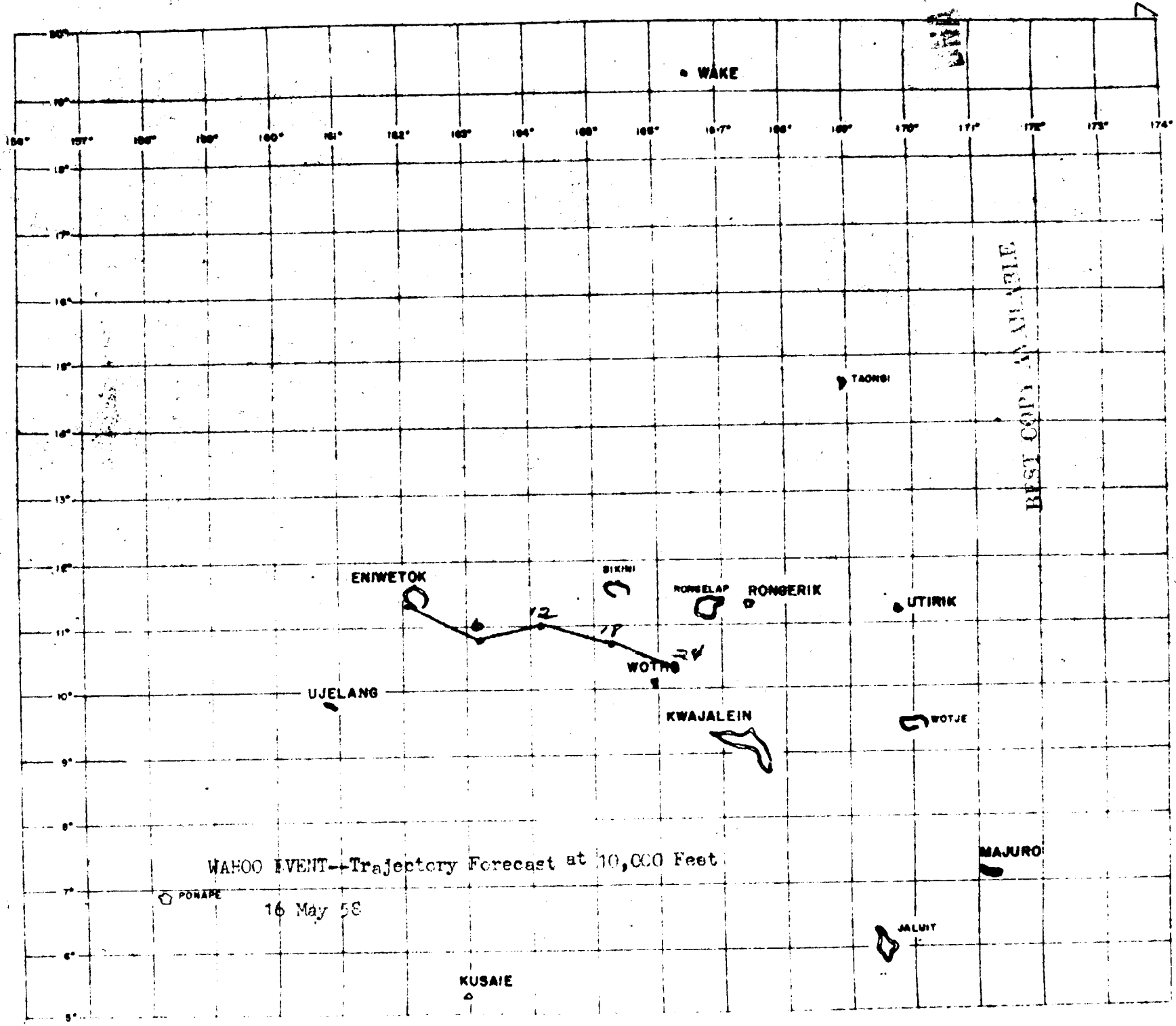
WAHOO EVENT

OPERATION HARDTACK

The WAHOO underwater detonation took place at 1330M, 16 May 1958. The device was positioned 500 feet below the surface, two miles southwest of Keith Island, Eniwetok Atoll. The water column rose immediately to between 1,200 feet and 1,500 feet, followed by a base surge to approximately 1,700 feet, and fell back into the sea, leaving no visible cloud. Fallout and contaminated surface water remained well within the forecast fallout area and published radex. Re-entry hour was declared one minute after the shot. A helicopter survey was made at H+4 hours with moderate readings encountered along the southwestern chain. Maximum intensity was 30 mr/hr, recorded on Leroy Island.

[redacted]



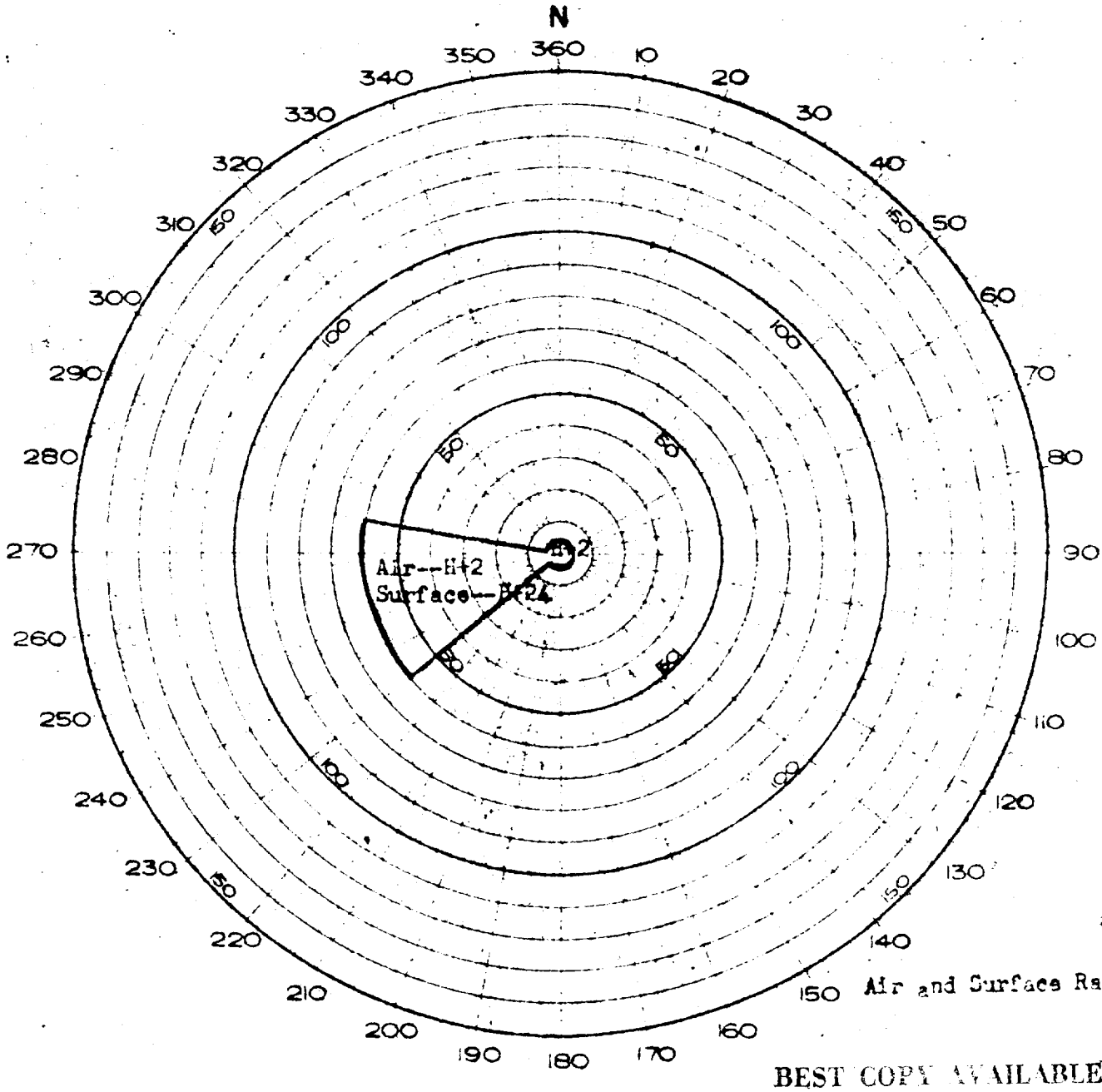


WAHOO EVENT--Trajectory Forecast at 10,000 Feet

16 May 58

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



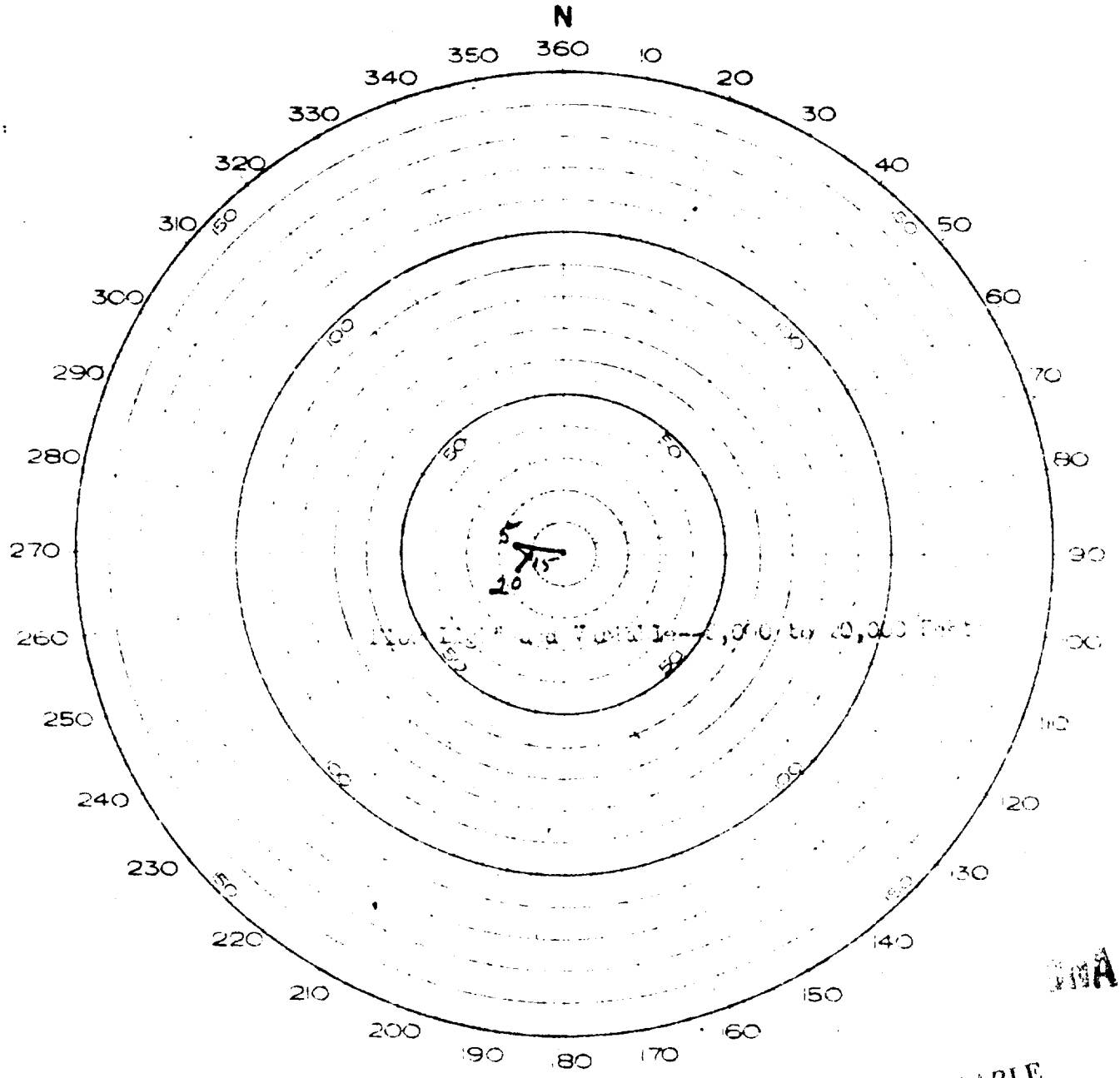
Air and Surface Radex

WAHOO EVENT

Air to 13,000 Feet

TAB D

HODOGRAPH
RESULTANT WINDS AND SURFACE RADEX



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TAB E (1)

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

19 May 1958

WAHCO

ENIWETOK OBSERVED WEATHER FOR 16 MAY 1958
AT DETONATION TIME: 1330M

SURFACE WEATHER:

Sea Level Pressure	1013.1 mbs
Free Air Surface Temperature	87.5°F
Wet Bulb Temperature	77.3°F
Dew Point Temperature	73.0°F
Relative Humidity	63%
Surface Wind	090° 15 knots
Visibility	10 miles
Weather	None

CLOUDS:
Scattered (3/10) cumulus, bases 2,300 feet. Overcast (10/10) cirrus.

AREA WEATHER SUMMARY FROM AIRCRAFT:
3 to 4/10 cumulus, bases 2,000 feet, tops 4,000 feet. Broken high cirrus, thicker to the north.

STATE OF THE SEA:
At Shot Site: Waves from 070°, 3 feet high, period 4 seconds.
Lagoon side of Reef: Waves from 070°, 1 to 2 feet high, period 2 to 3 seconds. Water depth over reef 3 feet.

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WAHOO

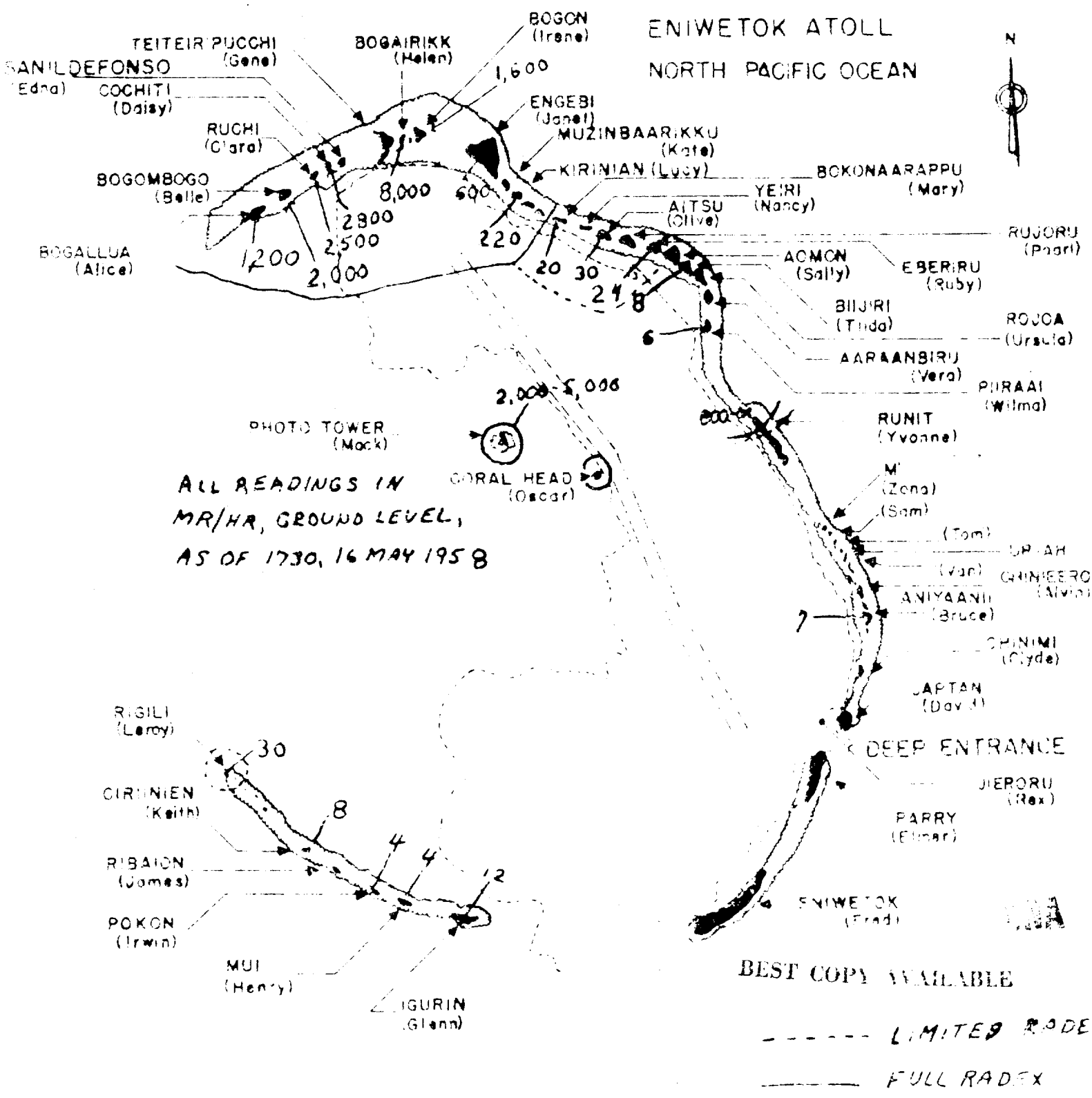
ENIWETOK RADIOSONDE OBSERVATION

Pressure (Millibars)	Height (Feet)	Temperature (°C)	Dew Point (°C)
1013	Surface	27.2	20.8
1000	390	26.2	20.5
913	2,953	19.2	16.5
874	4,232	18.5	07.8
851	4,987	16.8	11.5
850	5,010	16.8	11.3
838	5,381	16.8	05.2
808	6,398	14.5	07.2
784	7,251	13.5	05.5
772	7,677	13.1	01.1
766	7,874	14.8	-08.2
760	8,137	15.8	-05.2
721	9,513	12.8	-07.2
700	10,390	09.8	-05.2
683	11,089	07.5	-04.2
663	11,909	08.1	-13.1
600	14,550	04.1	Miss
537	17,487	02.0	Miss
500	19,360	-03.4	Miss
400	25,030	-14.7	Miss
300	32,010	-27.6	Miss
250	36,200	-39.3	Miss
200	41,090	-51.2	Miss
150	47,020	-65.9	Miss
100	54,830	-78.3	Miss
083	58,041	-80.0	Miss
061	64,680	-64.0	Miss
055	66,726	-66.0	Miss
050	68,250	-63.0	Miss
037	75,240	-55.0	Miss
033	77,616	-46.0	Miss
026	82,830	-46.0	Miss
025	82,960	-43.9	Miss
018	90,849	-36.0	Miss

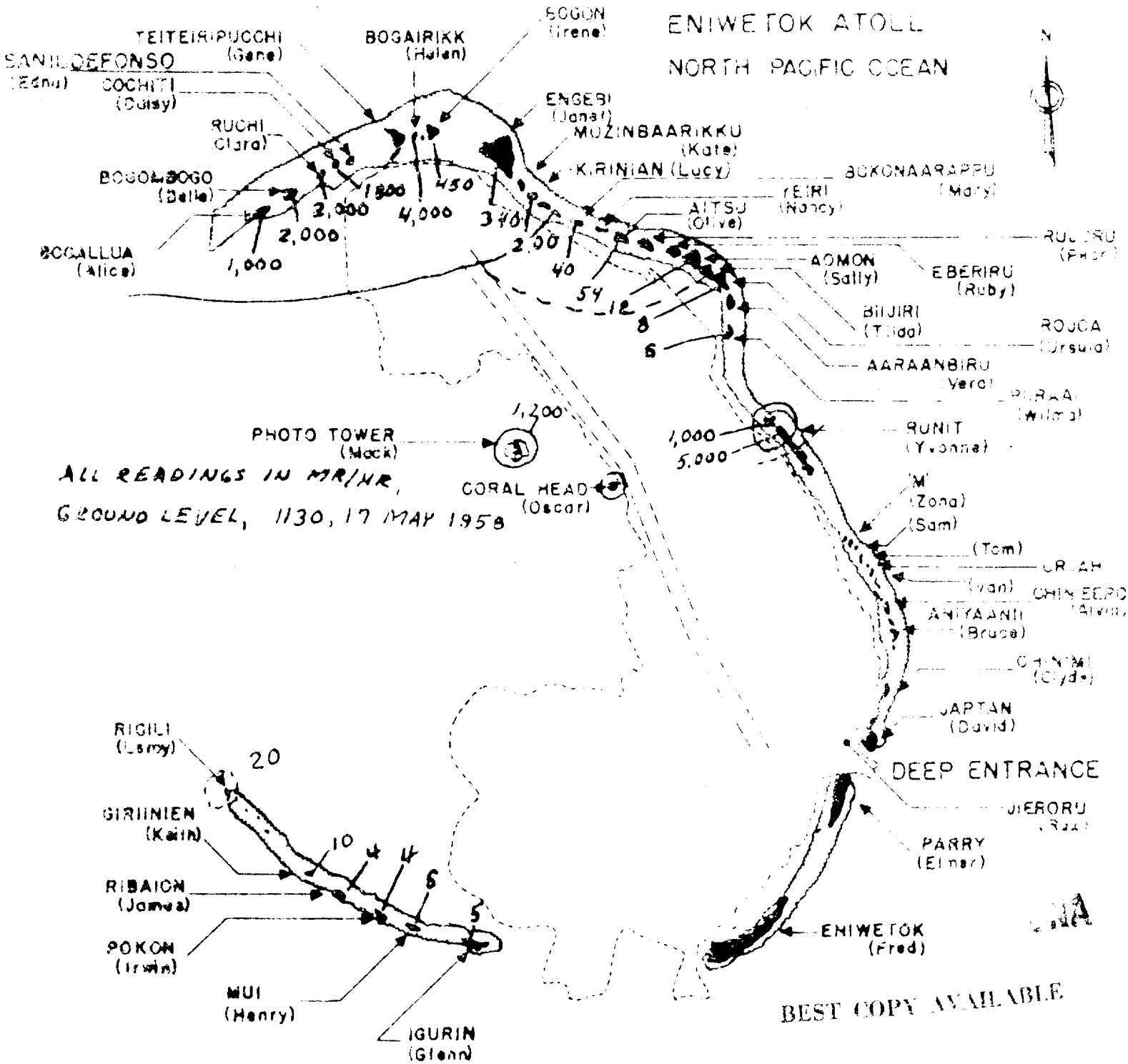
WAHCO

ENIWETOK WINDS ALOFT OBSERVATION

Height (Feet)	Direction (Degrees)	Velocity (Knots)
Surface	090	10
1,000	090	19
2,000	090	19
3,000	090	17
4,000	090	15
5,000	070	11
6,000	040	07
7,000	330	06
8,000	280	10
9,000	290	15
10,000	280	18
12,000	320	14
14,000	290	08
16,000	020	06
18,000	040	12
20,000	040	07
22,000	030	04
24,000	150	03
26,000	240	04
28,000	280	05
30,000	290	13
32,000	280	21
34,000	280	26
36,000	250	29
38,000	260	23
40,000	270	22
42,500	280	24
45,000	280	25
47,500	300	21
50,000	340	13
52,500	020	04
55,000	070	05
57,500	080	08
60,000	060	13
65,000	090	15
70,000	090	10
75,000	090	39
80,000	100	52
85,000	090	50
90,000	090	50


ENIWETOK ATOLL
NORTH PACIFIC OCEAN
N
TEITEIR PUCCHI (Gene)
BOGAIRIKK (Helen)
BOGON (Irene)
1,600
ENGEBI (Janet)
MUZINBAARIKKU (Kate)
KIRINIAN (Lucy)
BOKONAARAPPU (Mary)
YEIRI (Nancy)
AITSU (Olive)
RUJORU (Pearl)
ACMON (Sally)
EBERIRU (Ruby)
BIJIRI (Linda)
ROJOA (Ursula)
AARAANBIRU (Vera)
PIJRAAI (Wilma)
RUNIT (Yvonne)
M (Zena)
(Sam)
(Tom)
(Van)
ANIYAANII (Bruce)
CHINIMI (Clyde)
JAPTAN (David)
DEEP ENTRANCE
JIERORU (Rex)
PARRY (Elmer)
ENIWETOK (Fred)
COCHITI (Daisy)
RUCHI (Clara)
BOGOMBOGO (Belle)
BOGALLUA (Alice)
8,000
600
2800
2,500
2,000
1200
220
20
30
24
8
6
7
2,000
5,000
PHOTO TOWER (Mack)
CORAL HEAD (Oscar)
ALL READINGS IN MR/HR, GROUND LEVEL, AS OF 1730, 16 MAY 1958
RIGILI (Leroy)
30
CIRINIEN (Keith)
8
4
4
12
RIBAION (James)
POKON (Irwin)
MUI (Henry)
IGURIN (Glenn)
BEST COPY AVAILABLE
LIMITED RADEX
FULL RADEX

80


ENIWETOK ATOLL
NORTH PACIFIC OCEAN
N
TEITEIRIPUCCHI (Gene)
BOGAIRIKK (Helen)
SOGON (Irene)
SANILOEFONSO (Edna)
COCHITI (Daisy)
ENGEBI (Jane)
RUCHI (Clara)
MUZINBAARIKKU (Kate)
KIRINIAN (Lucy)
BOKONAARAPPU (Mary)
BOGOMBOGO (Belle)
EIRI (Nancy)
AITSU (Olive)
BOGALLUA (Alice)
AOMON (Sally)
EBERIRU (Ruby)
BIJIRI (Tilda)
ROJOA (Ursula)
AARAANBIRU (Vera)
PHOTO TOWER (Mack)
RUNIT (Yvonne)
CORAL HEAD (Oscar)
ALL READINGS IN MR/HR, GROUND LEVEL, 1130, 17 MAY 1958
(Zona)
(Sam)
(Tom)
(Van)
ANIYAANII (Bruce)
JAPTAN (David)
DEEP ENTRANCE
PARRY (Elmer)
RIGILI (Lenny)
GIRIINIEN (Kelin)
RIBAION (James)
POKON (Irwin)
MUI (Henry)
IGURIN (Glenn)
ENIWETOK (Fred)
BEST COPY AVAILABLE
FULL RADEX
LIMITED RADEX

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TAB

[redacted]

HOLLY EVENT

OPERATION HARDTACK

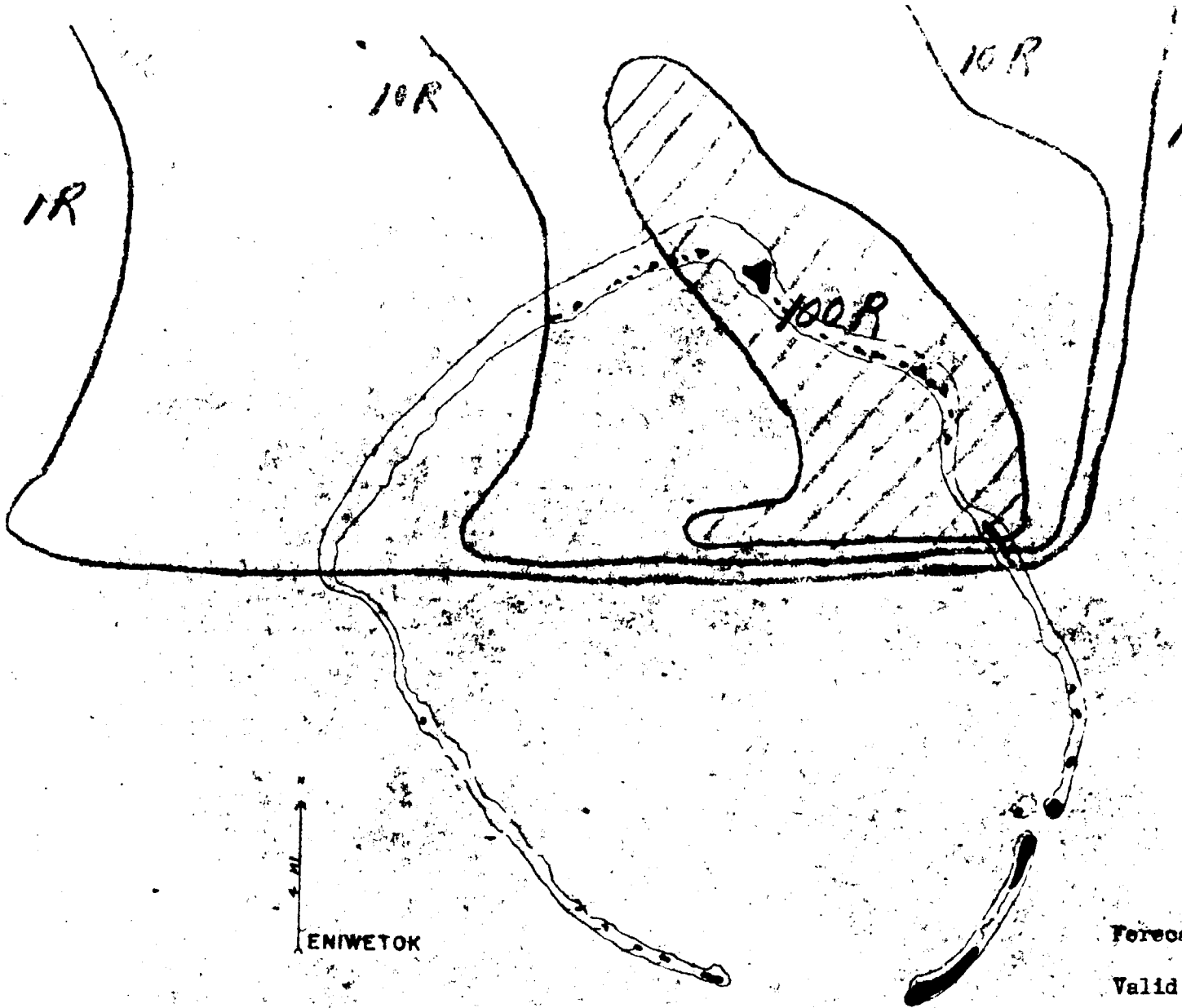
1. HOLLY was detonated at 0630M, 21 May 1958. This was a barge shot, positioned 4,000 feet west of Yvonne. The first fix was obtained at H+14 minutes, when aircraft reports indicated that the cloud was still within a few miles of ground zero and was starting to move to the southwest very slowly. Maximum cloud height was 15,000 feet. The cloud became stabilized by H+15 minutes with the top at 12,000 feet and the base at 7,500 feet. At H+30 minutes, the cloud top had descended to 9,000 feet, with general movement to the west-southwest. Before the hour was up, the cloud became too diffused for radar or visual tracking.

2. The P2V barrier patrol reported on time and shuttled between Bruce and Leroy Islands. At H+55 minutes, he contacted the southern edge of the cloud over Leroy at 5,000 feet and reported 500 mr/hr.

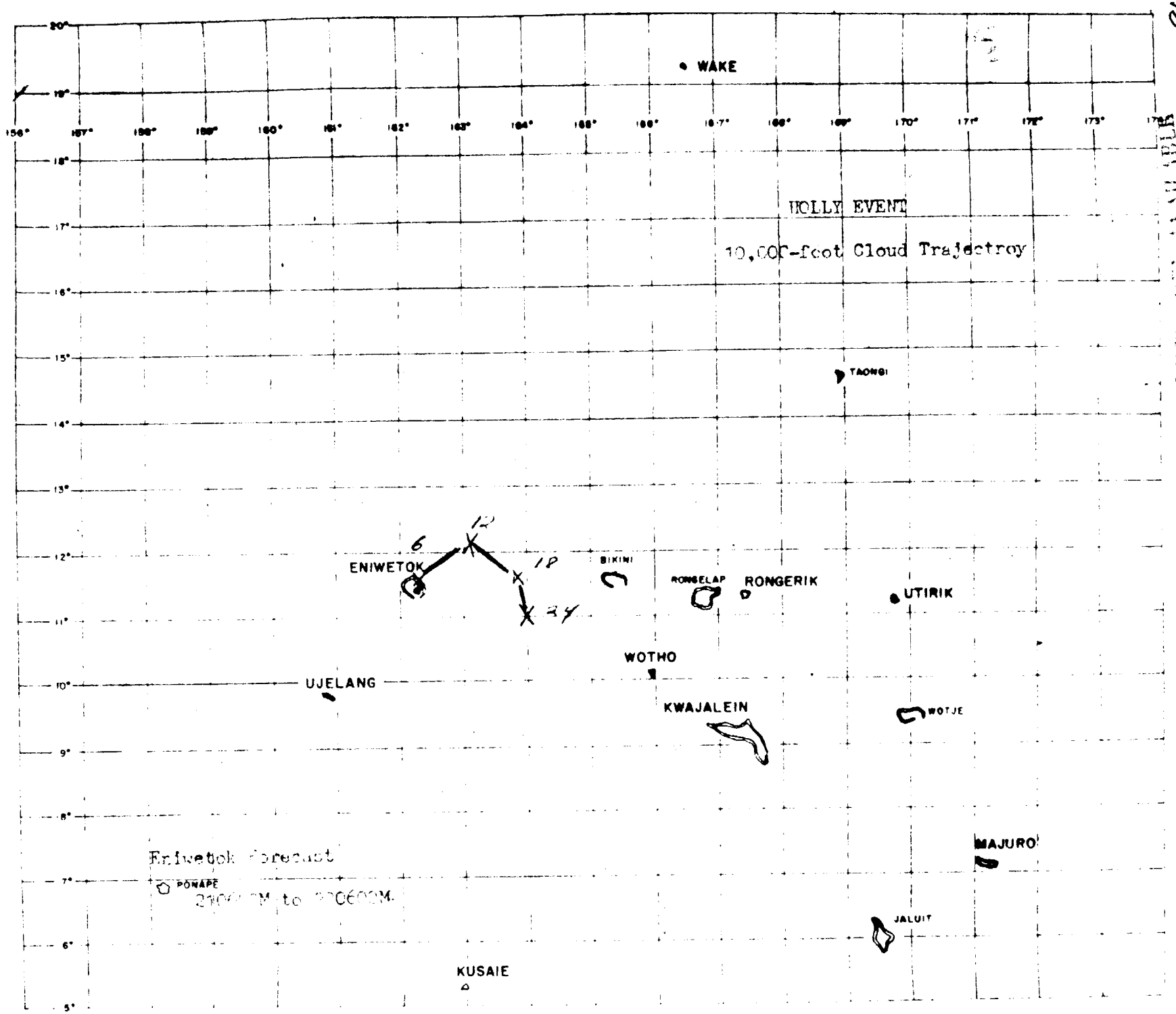
3. A helicopter survey was initiated at 0630M along the east and north islands of Eniwetok. A maximum reading of 5,900 mr/hr was recorded at 100 feet above ground zero.

4. FOPU had predicted that the islands in the northeast quadrant would lie within the 100R dose area; however, the unexpectedly low stabilized cloud height caused almost all the fallout to remain in the trade wind levels. This caused the fallout pattern to lie within the radials 230 degrees to 320 degrees, with radial distance of approximately 35 miles. With the exception of Yvonne, only Janet, Leroy and the islands in between received substantial fallout.

[redacted]

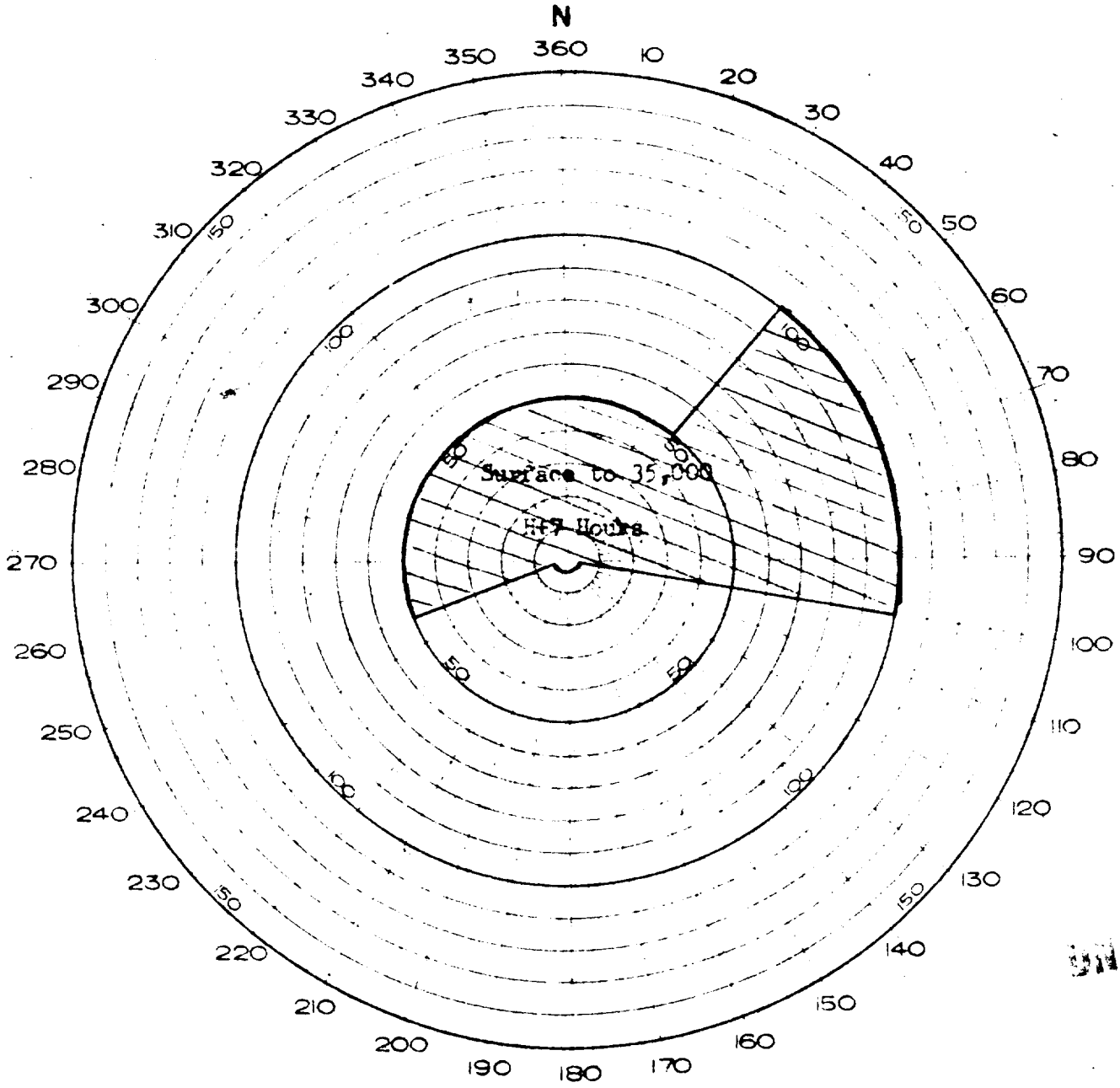


HOLLY EVENT
Fallout Forecast


WAKE
HOLLY EVENT
10,000-foot Cloud Trajectroy
TAONGI
ENIWETOK
6
12
18
24
BIKINI
RONGELAP
RONGERIK
UTIRIK
WOTHO
UJELANG
KWAJALEIN
WOTJE
MAJURO
Eniwetok forecast
PONAPE
JALUIT
KUSAIE

TAB C

HODOGRAPH
RESULTANT WINDS AND
SURFACE RADEX



HOLLY EVENT

Radex

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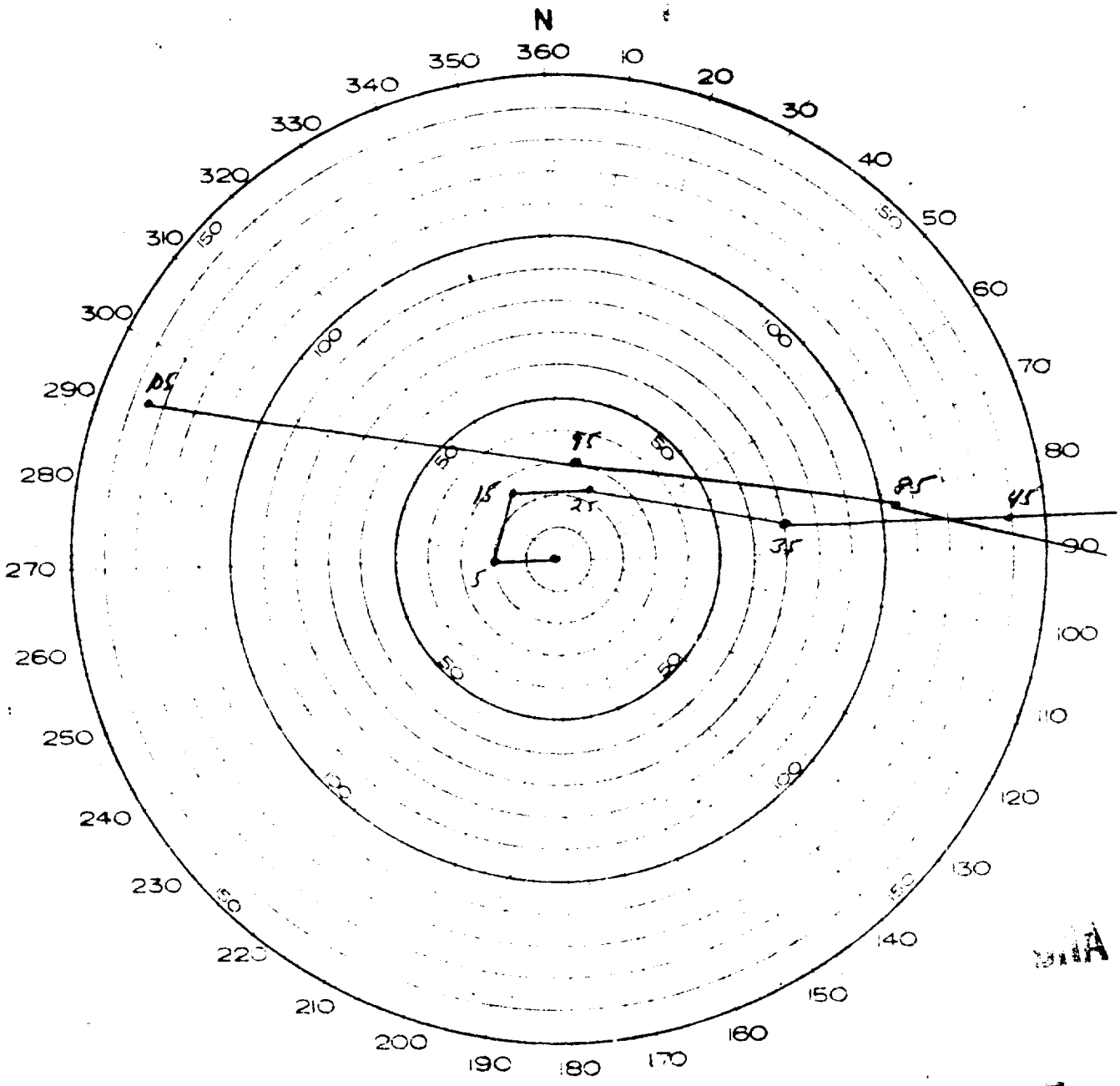
TAB D

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



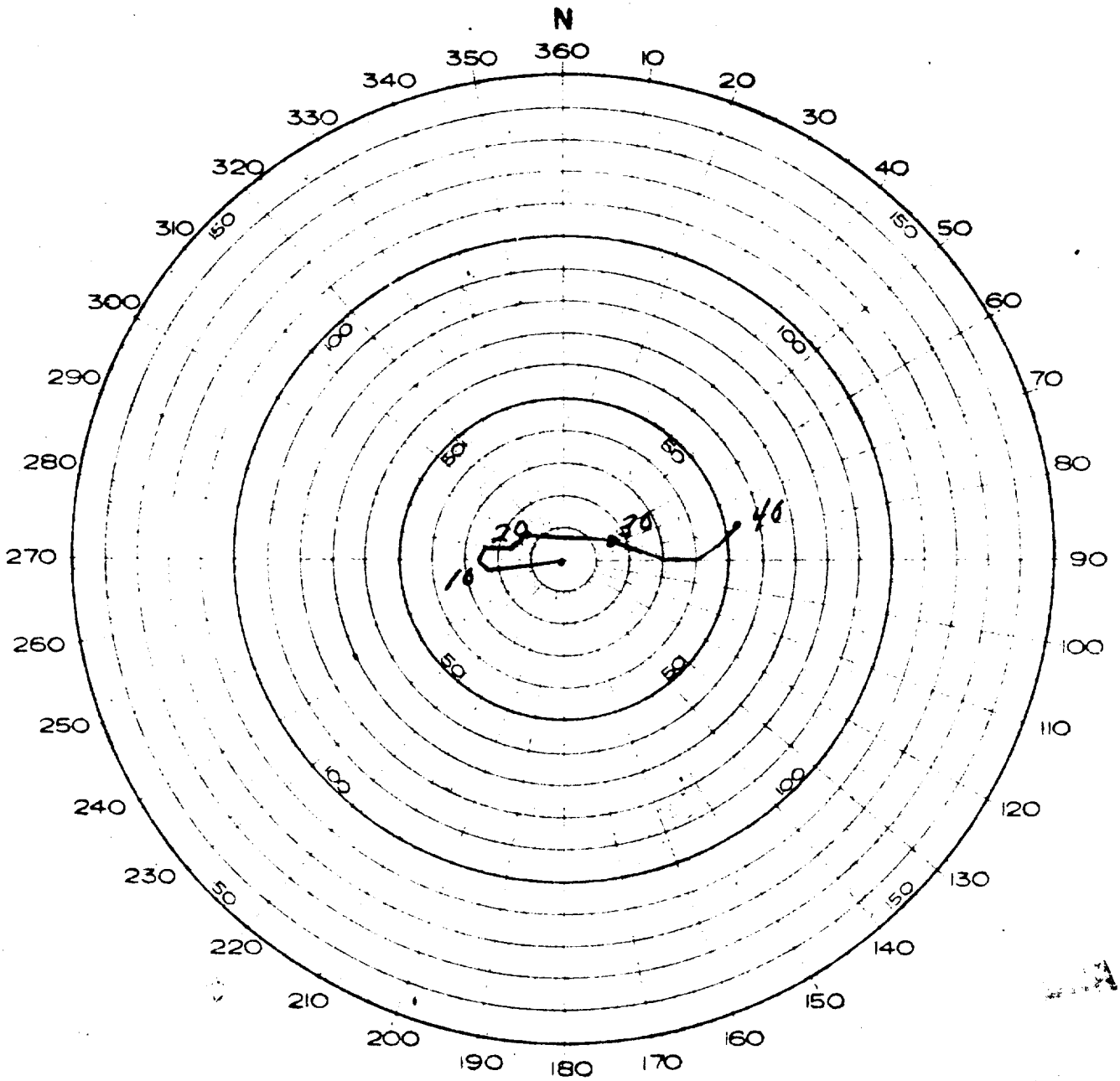
HOLLY EVENT

FORECAST HODOGRAPH 210600M

Eniwetok

TAB E-1

HODOGRAPH
RESULTANT WINDS AND SURFACE RADEX



HOLLY EVENT

Shot-time Hodograph 210630M

Eniwetok

TAB E-2

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

22 May 1958

HOLLY

ENIWETOK OBSERVED WEATHER FOR 21 MAY 1958
AT DETONATION TIME: 0630M

SURFACE WEATHER:

Sea Level Pressure	1010.2 mbs
Free Air Surface Temperature	80.6° F
Wet Bulb Temperature	76.6° F
Dew Point Temperature	75.0° F
Relative Humidity	83%
Surface Wind	090° 16 knots
Visibility	10 miles
Weather	None

CLOUDS:
Scattered (3/10) cumulus, bases 1,800 feet. Scattered cirrus.

AREA WEATHER SUMMARY FROM AIRCRAFT
Scattered (3/10 to 4/10) cumulus, bases 1,800 feet, tops 8,000 feet (no reports on height of cirrus).

STATE OF THE SEA:
Open Sea: Waves 3 feet high, period 4 seconds length 30 to 40 feet.
Lagoon side: Waves less than 1 foot high, period 1 - 2 seconds.

A

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HOLLY

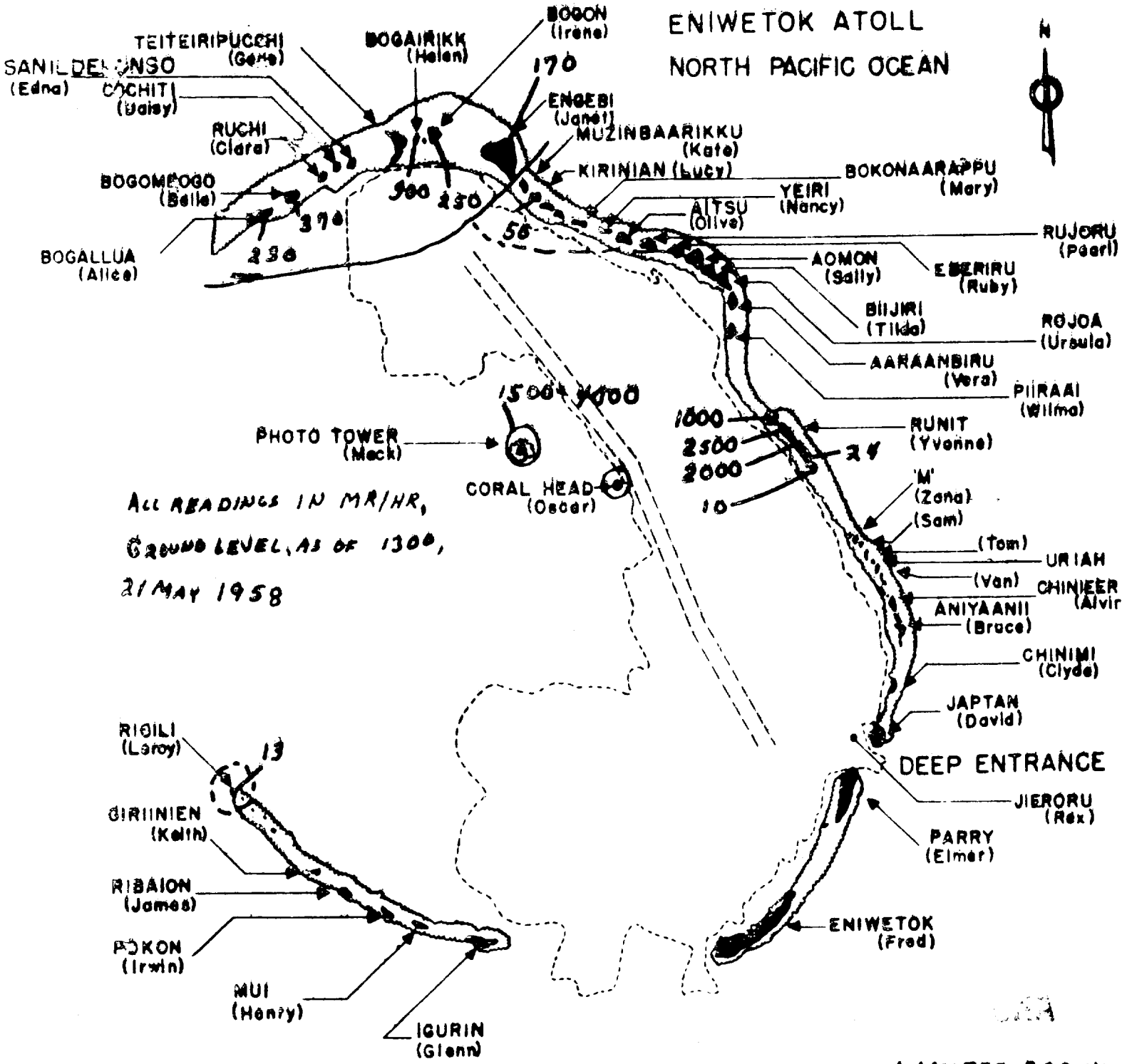
ENIWETOK RADIOSONDE OBSERVATION

Pressure (Millibars)	Height (Feet)	Temperature (°C)	Dew Point (°C)
1010	Surface	26.5	23.2
1000	310	26.2	22.5
850	4,950	17.0	13.0
782	7,612	14.5	04.5
700	10,310	07.5	02.2
682	11,056	07.5	-12.2
664	11,778	09.0	Miss
600	14,460	03.3	Miss
500	19,250	-04.9	Miss
400	24,900	-15.5	Miss
360	27,493	-18.0	Miss
300	31,860	-29.0	Miss
250	36,080	-40.6	Miss
200	40,880	-52.9	Miss
150	46,780	-66.9	Miss
115	51,980	-79.0	Miss
100	54,500	-78.8	Miss
088	57,123	-81.0	Miss
081	58,740	-76.0	Miss
076	60,060	-79.0	Miss
070	61,710	-70.0	Miss
050	67,870	-64.0	Miss
039	73,326	-56.0	Miss
030	78,870	-52.8	Miss

HOLLY

ENIWETOK WINDS ALOFT OBSERVATION

Height (Feet)	Direction (Degrees)	Velocity (Knots)
Surface	~~000~~ 080	~~10~~ 14
1,000	080	21
2,000	080	23
3,000	080	23
4,000	080	21
5,000	080	~~18~~ 20
6,000	090	~~14~~ 12
7,000	100	09
8,000	120	10
9,000	150	10
10,000	~~100~~ 180	10
12,000	~~200~~ 210	04
14,000	280	09
16,000	~~270~~ 250	~~00~~ 04
18,000	220	04
20,000	220	~~03~~ 08
22,000	250	10
24,000	280	09
26,000	270	12
28,000	280	17
30,000	280	21
32,000	290	23
34,000	280	21
36,000	270	21
38,000	250	21
40,000	220	19
43,000	220	18
45,000	210	~~30~~ 33
48,000	210	25
50,000	230	17
53,000	270	13
55,000	290	10
58,000	320	11
60,000	360	08
65,000	100	13
70,000	080	19
77,000	100	27


ENIWETOK ATOLL
NORTH PACIFIC OCEAN
N
BOGON (Irene)
TEITEIRIPUCCHI (Gene)
BOGAIRIKK (Helen)
SANILDELONSO (Edna)
COCHIT (Daisy)
170
ENGEBI (Janet)
RUCHI (Clara)
MUZINBAARIKKU (Kate)
KIRINIAN (Lucy)
BOKONAARAPPU (Mary)
BOGOMEOGO (Belle)
300
250
YEIRI (Nancy)
370
AITSU (Olive)
RUJORU (Pearl)
BOGALLUA (Alice)
250
50
AOMON (Sally)
EBERIRU (Ruby)
BIIJIRI (Tilda)
ROJOA (Ursula)
AARAANBIRU (Vera)
PIIRAAI (Wilma)
1500+4000
1000
RUNIT (Yvonne)
PHOTO TOWER (Mack)
2500
2000
24
CORAL HEAD (Oscar)
10
'M' (Zona)
(Sam)
(Tom)
URIAH
(Van)
CHINIEER (Alvin)
ANIYAANII (Bruce)
CHINIMI (Clyde)
JAPTAN (David)
RIGILI (Leroy)
13
DEEP ENTRANCE
JIERORU (Rex)
GIRIINIEN (Kelin)
PARRY (Elmer)
RIBAION (James)
ENIWETOK (Fred)
ROKON (Irwin)
MUI (Henry)
IGURIN (Glenn)
ALL READINGS IN MR/HR,
GROUND LEVEL, AS OF 1300,
21 MAY 1958
---- LIMITED RADEX
—— FULL RADEX
NOTE: HOLLY G.2. - 5400 MR/HR
YVONNE FULL RADEX EXCEPT FROM THE AIRSTRIP SOUTH.
MACK READING AS OF 1000 HRS

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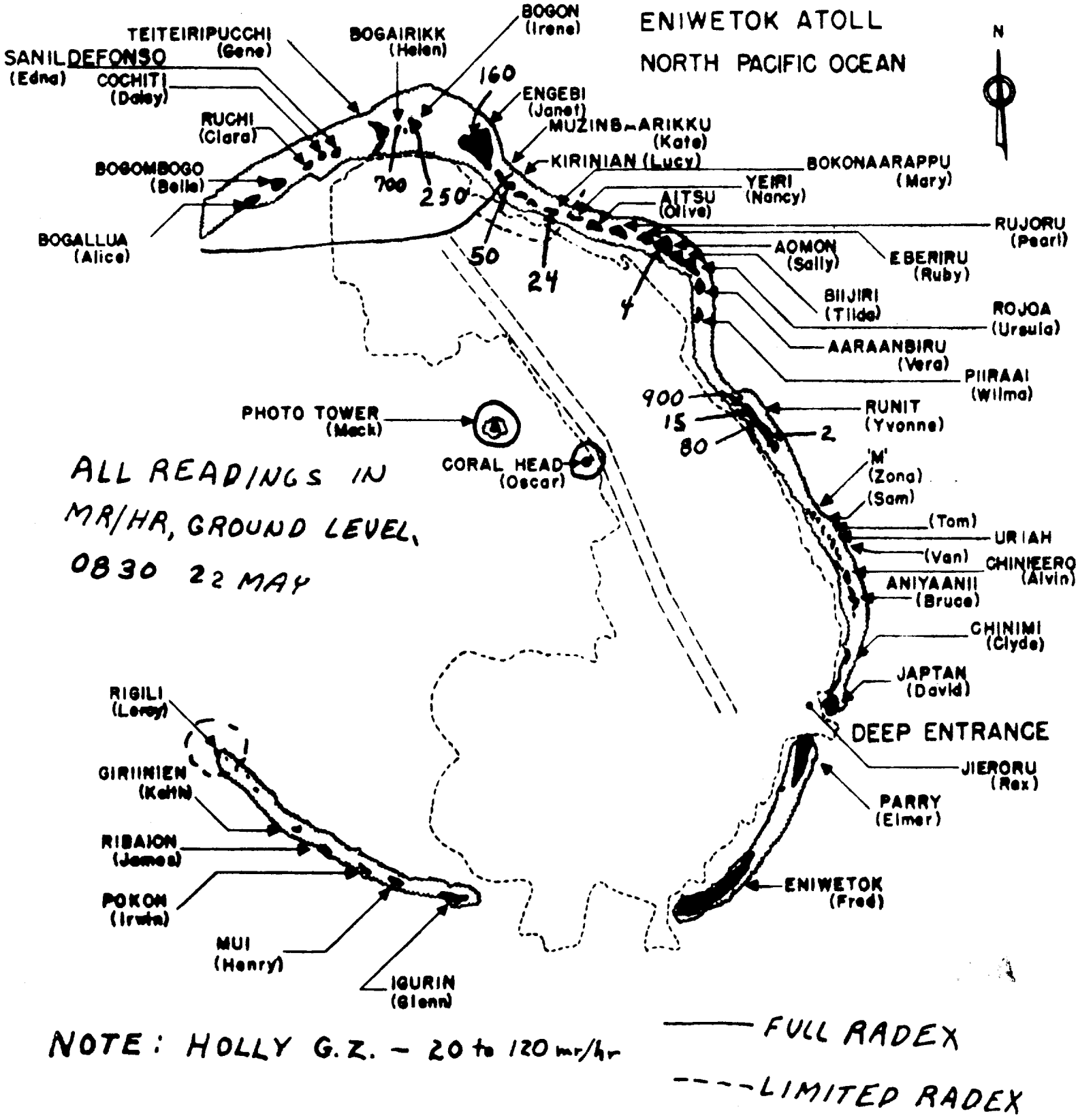
ENIWETOK ATOLL
NORTH PACIFIC OCEAN
N
SANIL DEFONSO (Edna)
TEITEIRIPUCCHI (Gene)
BOGAIRIKK (Helen)
BOGON (Irene)
COCHITI (Daley)
RUCHI (Clara)
BOGOMBOGO (Belle)
BOGALLUA (Alice)
160
ENGEBI (Janet)
MUZINB-ARIKKU (Kate)
KIRINIAN (Lucy)
BOKONAARAPPU (Mary)
YEIRI (Nancy)
AITSU (Olive)
RUJORU (Pearl)
AOMON (Sally)
EBERIRU (Ruby)
BIIJIRI (Tilda)
ROJOA (Ursula)
AARAANBIRU (Vera)
PIIRAAI (Wilma)
RUNIT (Yvonne)
'M' (Zona)
(Sam)
(Tom)
URIAH
(Van)
CHINEERO (Alvin)
ANIYAANII (Bruce)
CHINIMI (Clyde)
JAPTAN (David)
DEEP ENTRANCE
JIERORU (Rex)
PARRY (Elmer)
ENIWETOK (Fred)
700
250
50
24
4
900
15
80
2
PHOTO TOWER (Mack)
CORAL HEAD (Oscar)
ALL READINGS IN MR/HR, GROUND LEVEL, 0830 22 MAY
RIGILI (Leroy)
GIRIINIEN (Kelly)
RIBAION (James)
POKON (Irwin)
MUI (Henry)
IGURIN (Glenn)
NOTE: HOLLY G.Z. – 20 to 120 mr/hr
FULL RADEX
LIMITED RADEX

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TAB

[redacted]

NUTMEG EVENT

OPERATION HARDTACK

1. NUTMEG was detonated at 0920M, 22 May 1958, off the west end of Tare Island at Bikini Atoll. At 0926M the cloud had stabilized at 20,000 feet and was breaking up. Radar from the USS Boxer confirmed the cloud's position of 264 degrees true bearing from ground zero, moving 6 knots per hour at 0940M. After this time the cloud dissipated.

2. The P2V aircraft reported over the USS Boxer, and it was directed on a course bearing 170 degrees from George Island at 5,000 feet. A reading of 0.1 mr/hr was read, and altitude was dropped to 1,000 feet. Several north-south sectors recorded only minor radiation levels. At 1045M the P2V was vectored along the northern chain and at 1100M along the southern chain. Maximum intensity was recorded over Tare at 1105M, at 400 mr/hr. The P2V was vectored to the west of Bikini 60 miles out, where maximum readings of 140 mr/hr were recorded.

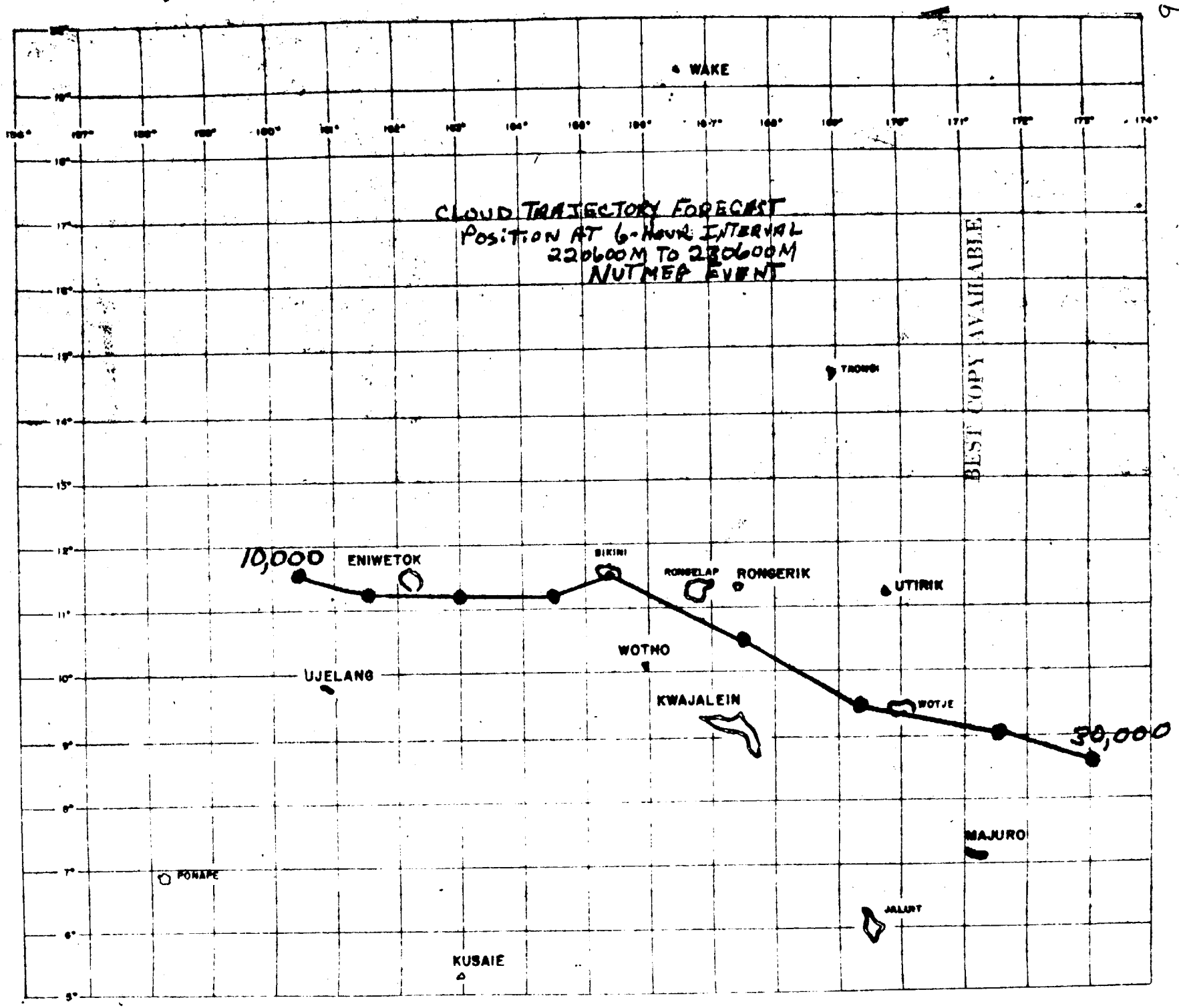
3. Two helicopter surveys were initiated by TU-6 at 1030M. A maximum reading of 4 mr/hr was recorded at Charlie Island at 1105M by one flight. The other flight, over the western chain, recorded 30,000 mr/hr over ground zero at 1050M and 3,000 mr/hr at William.

4. Fallout forecast was on a bearing of 270 degrees from ground zero. It is estimated that the fallout pattern was more to the northwest and that the southern forecast was not fulfilled.

TAB A

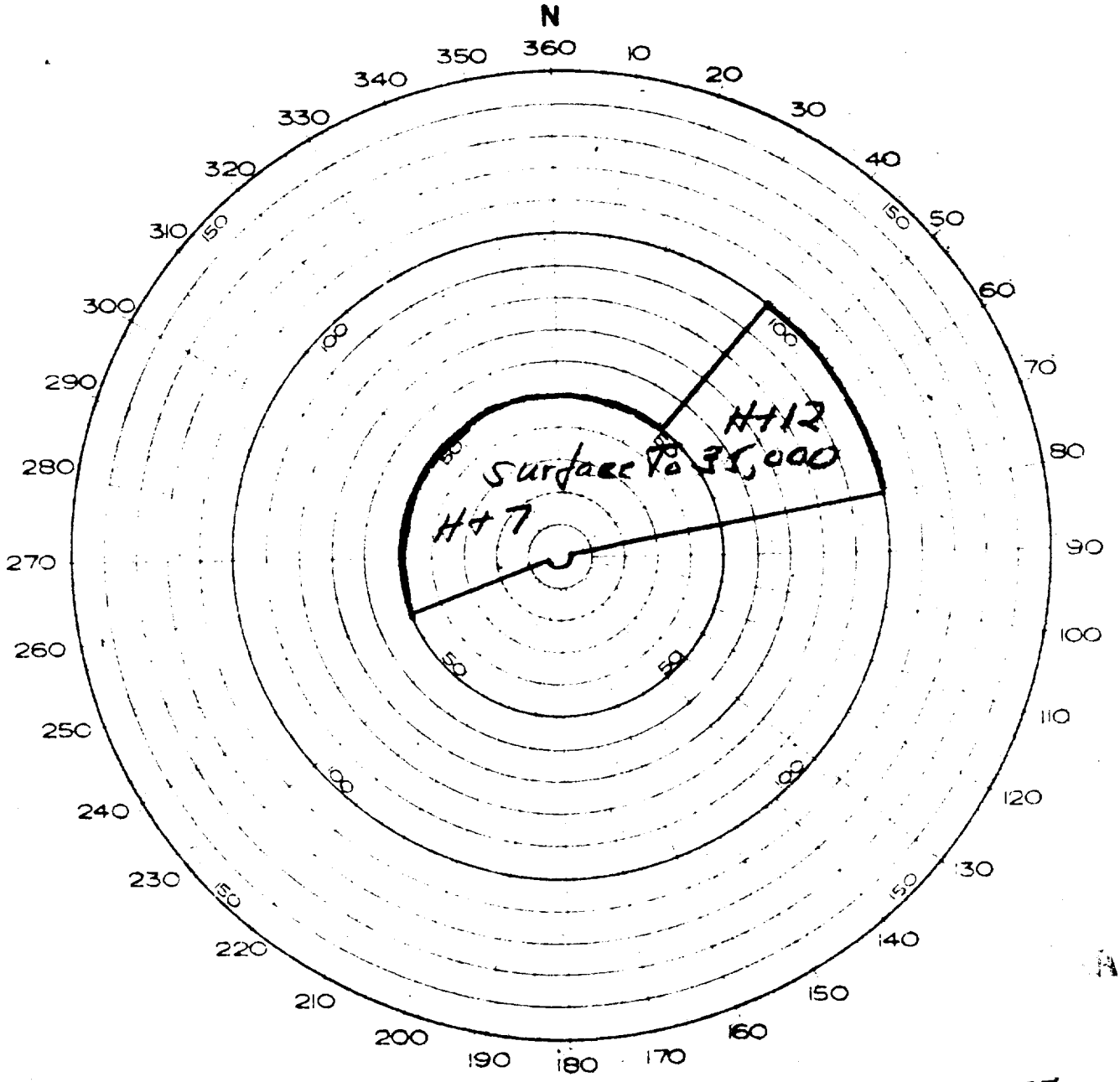
[redacted]

TAB B



HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX

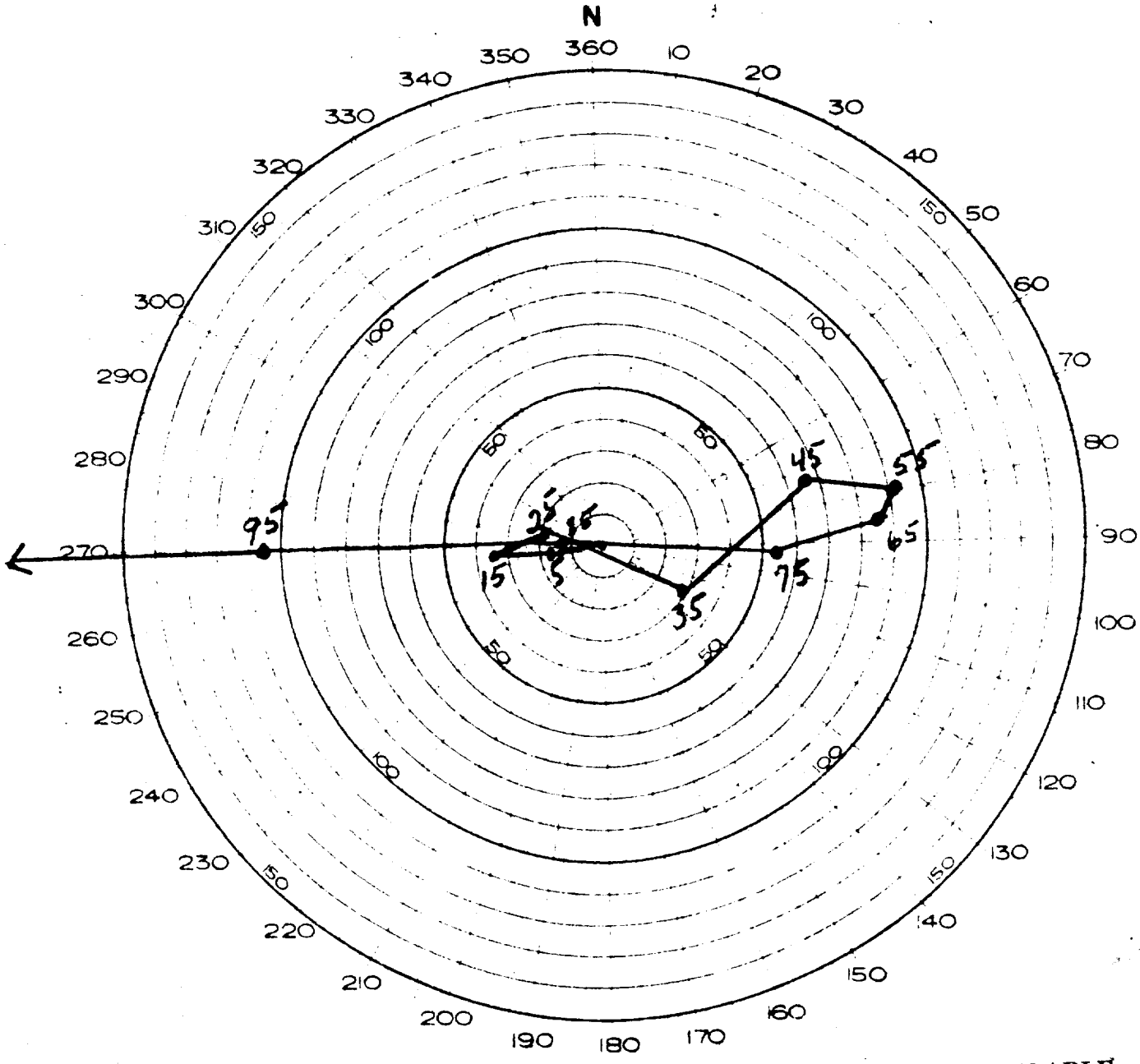


NUTMEG EVENT

Surface and Air Radex

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



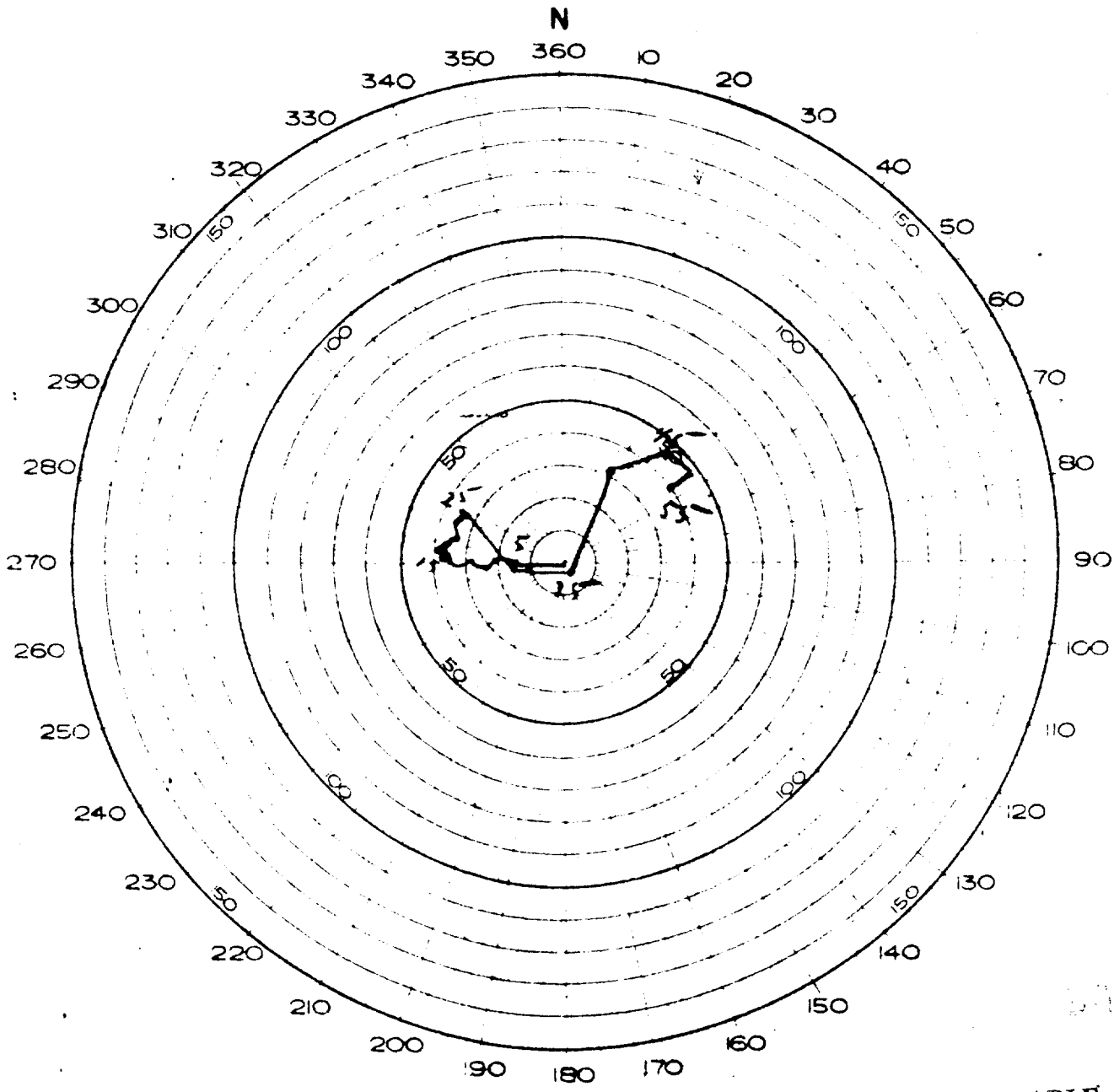
NUTMEG EVENT

Forecast Trajectory 220900M
Bikini Atoll

TAB E-1

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



NUTMEG EVENT

Shot-time Trajectory 220920M

TAB E-2

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

26 May 1958

NUTMEG

BIKINI OBSERVED WEATHER FOR 22 MAY 1958
AT DETONATION TIME: 0920

SURFACE WEATHER:

Sea Level Pressure	1012.5 mbs
Free Air Surface Temperature	81.3°F
Wet Bulb Temperature	75.1°F
Dew Point Temperature	72.5°F
Relative Humidity	76%
Surface Wind	080° 11 knots
Visibility	10 miles
Weather	None

CLOUDS:
Scattered (2/10) cumulus, bases 1,800 feet, Scattered (3/10) altocumulus, bases 13,000 feet. Scattered (4/10) cirrus and cirrocumulus.

AREA WEATHER SUMMARY FROM AIRCRAFT:
Scattered cumulus (3 to 4/10) bases 1,800 feet, tops 7,000 feet.
Scattered (4/10) altocumulus bases 13,000 feet, tops 14,000 feet.
Scattered (4/10) altocumulus bases 21,000 feet, tops 22,000 feet.
Scattered (4/10) cirrus bases 28,000 feet, tops 29,000 feet.

STATE OF THE SEA:
Open Sea: Waves from 080° period 4 seconds, height 3 feet.
Lagoon Side: Waves from 080° period 3 - 4 seconds, height 2 feet.

NUTMEG

BIKINI RADIOSONDE OBSERVATION

Pressure (Millibars)	Height (Feet)	Temperature (°C)	Dew Point (°C)
1011	Surface	27.5	22.5
1000	390	26.5	21.8
850	5,000	14.2	10.8
836	5,446	13.5	10.2
811	6,266	16.2	-02.5
751	8,432	11.5	02.5
700	10,350	08.2	-04.2
660	11,909	05.5	02.2
600	14,460	00.2	-01.8
582	15,256	-01.5	-03.2
563	16,142	00.2	-17.8
534	17,487	-03.0	Miss
511	18,635	-05.8	-21.5
500	19,210	-06.8	-19.2
448	21,949	-11.8	-15.2
400	24,820	-17.5	-20.2
392	25,230	-19.5	-22.2
366	26,903	-21.8	-33.2
346	28,314	-22.5	-34.8
300	31,750	-28.8	Miss
250	35,920	-40.7	Miss
200	40,780	-53.3	Miss
150	46,640	-69.8	Miss
100	54,290	-84.6	Miss
054	66,330	-64.0	Miss

NUTMEG

BIKINI WINDS ALOFT OBSERVATION

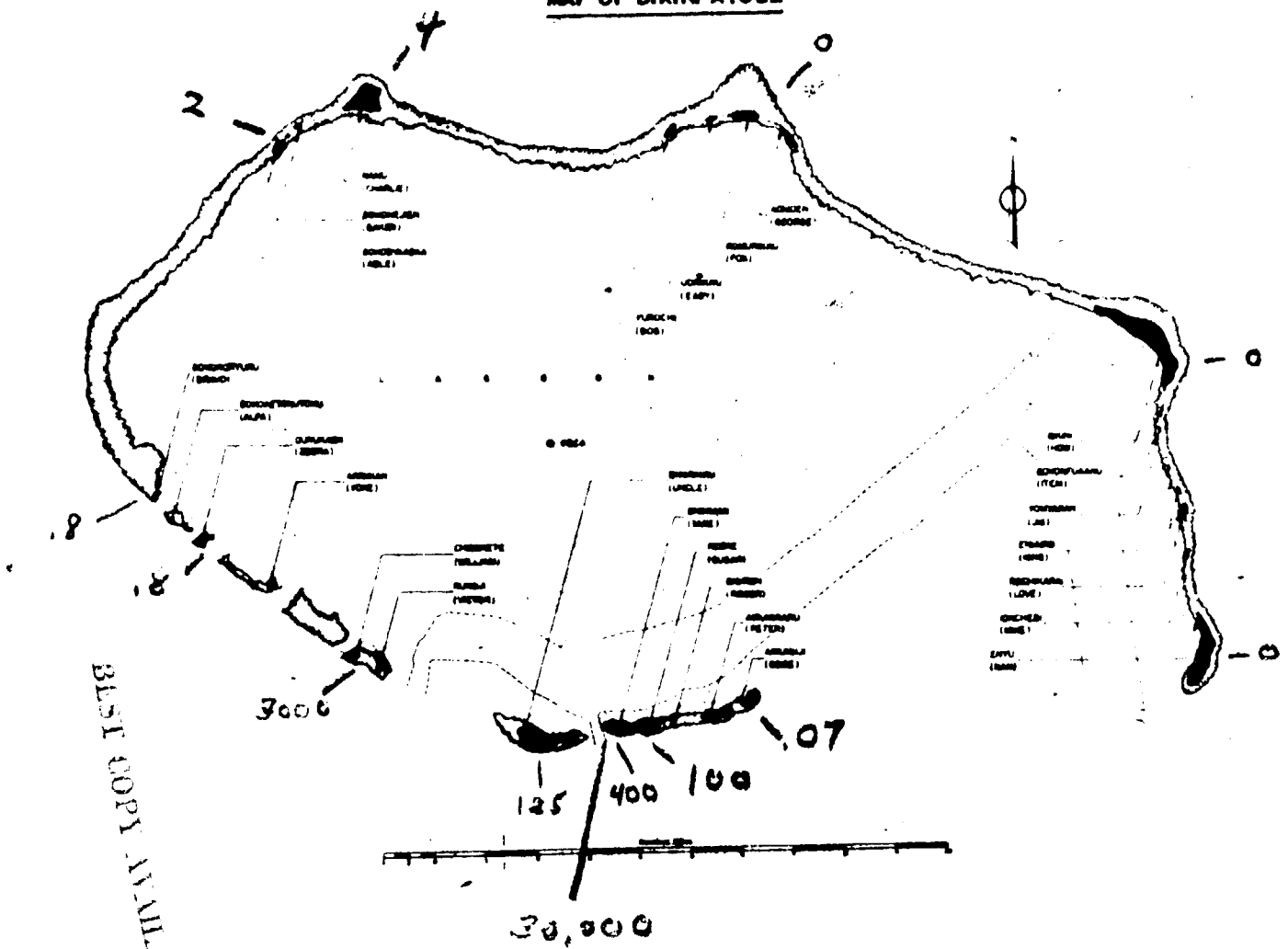
Height (Feet)	Direction (Degrees)	Velocity (Knots)
Surface	090	14
1,000	090	14
2,000	090	13
3,000	090	16
4,000	090	16
5,000	090	14
6,000	100	15
7,000	090	16
8,000	070	16
9,000	090	16
10,000	100	15
12,000	080	09
14,000	120	09
16,000	110	10
18,000	220	10
20,000	240	07
22,000	190	12
24,000	210	08
26,000	250	09
28,000	310	14
30,000	310	21
32,000	270	16
34,000	300	18
36,000	220	20
38,000	210	25
40,000	200	30
42,500	230	25
45,000	250	20
47,500	260	18
50,000	320	09
52,500	360	09
55,000	050	07
57,500	100	07
60,000	200	05
65,000	090	08
70,000	110	10
75,000	080	22
80,000	090	31
85,000	090	45

H+1 SURVEY

NUTMEG EVENT

Readings at ground level
in mr/hr

MAP OF BIKINI ATOLL



TAB F

INDEX

TAB

[redacted]

YELLOWWOOD EVENT

OPERATION HARDTACK

1. The YELLOWWOOD device was detonated at 1400M, 26 May 1958, at a position 5,000 feet southwest of Janet Island, Eniwetok Atoll. Initial radar reports were unreliable. Pilot reports from sampler aircraft estimated the cloud height at 50,000 feet, cloud base at 30,000 feet, with initial direction true bearing 250 degrees at 20 to 25 knots.

2. The P2V's cleared into the area at 1430M. One P2V was vectored over the northeast islands to determine whether or not the sampling rockets had been fired. The second P2V was vectored between Yvonne and Leroy. As the cloud moved west-southwest of the lagoon, one P2V was used to survey the northern section of the lagoon. The area was generally clear, and reentry was declared at 1530M. The activities of the office were greatly hampered by slow communications with the tracking aircraft through Manhunt.

3. The survey helicopter took off at 1604M. The highest reading was made at Alice: 200 r. Other readings along the northern chain averaged from 4 mr/hr to 10 mr/hr.

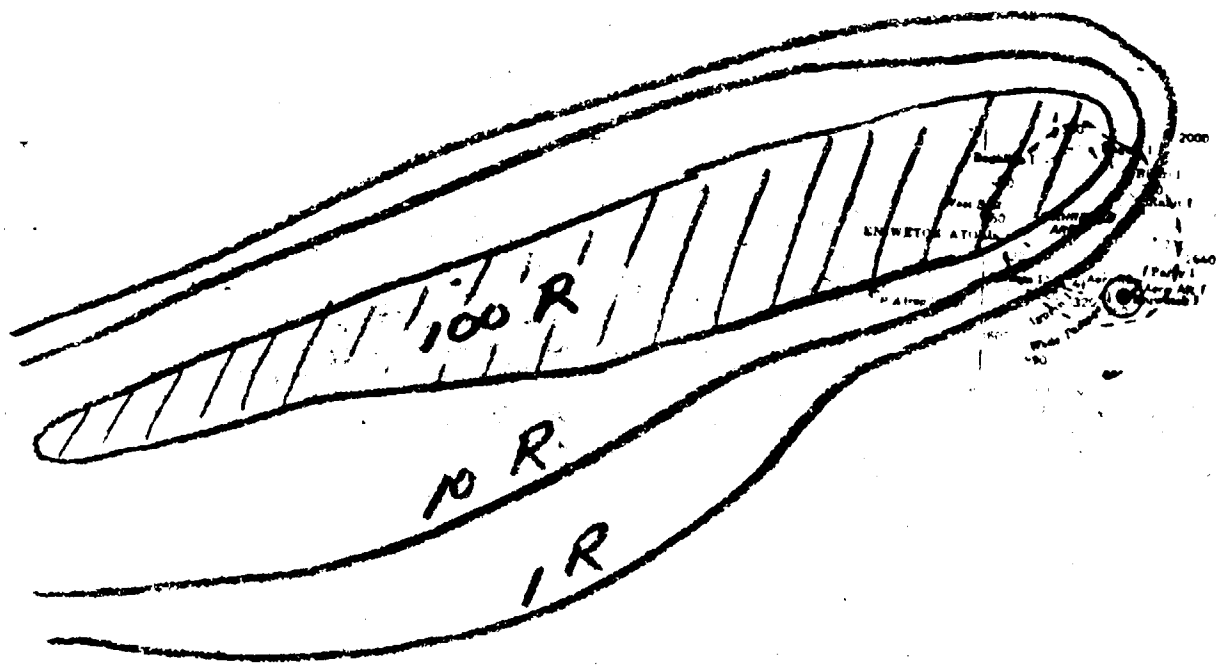
4. The fallout had been predicted to fall along a bearing of 260 degrees for 200 miles; however, [redacted] the actual fallout pattern extended to only 150 miles.

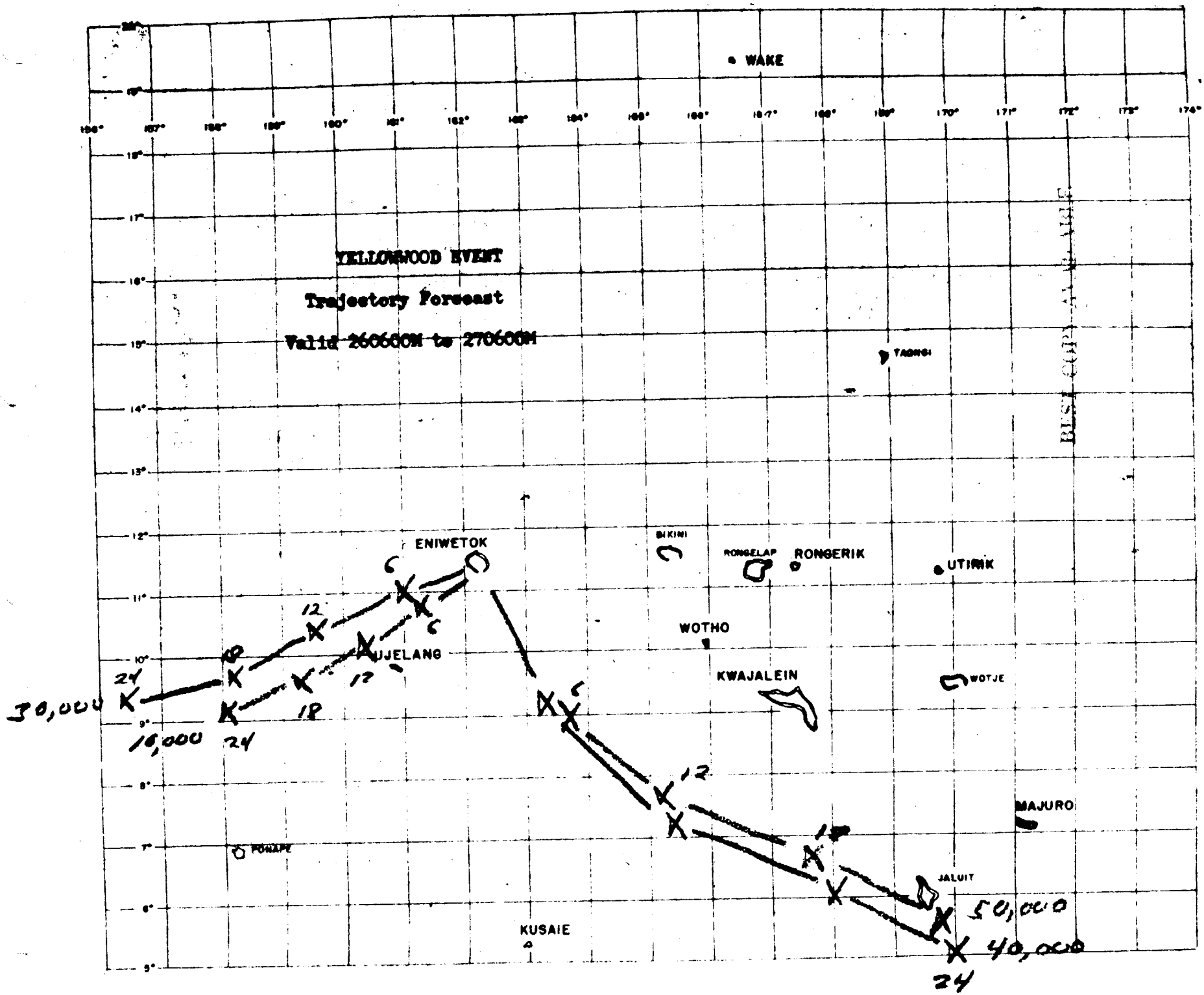
TAB A

[redacted]

YELLOWWOOD EVENT

Fallout Forecast




WAKE
YELLOWWOOD EVENT
Trajectory Forecast
Valid 260600M to 270600M
TAGNGI
BIKINI
RONGELAP
RONGERIK
UTIRIK
ENIWETOK
UJELANG
WOTHO
KWAJALEIN
WOTJE
MAJURO
JALUIT
KUSAIE
PONAPE
30,000
16,000
50,000
40,000
24
12
18
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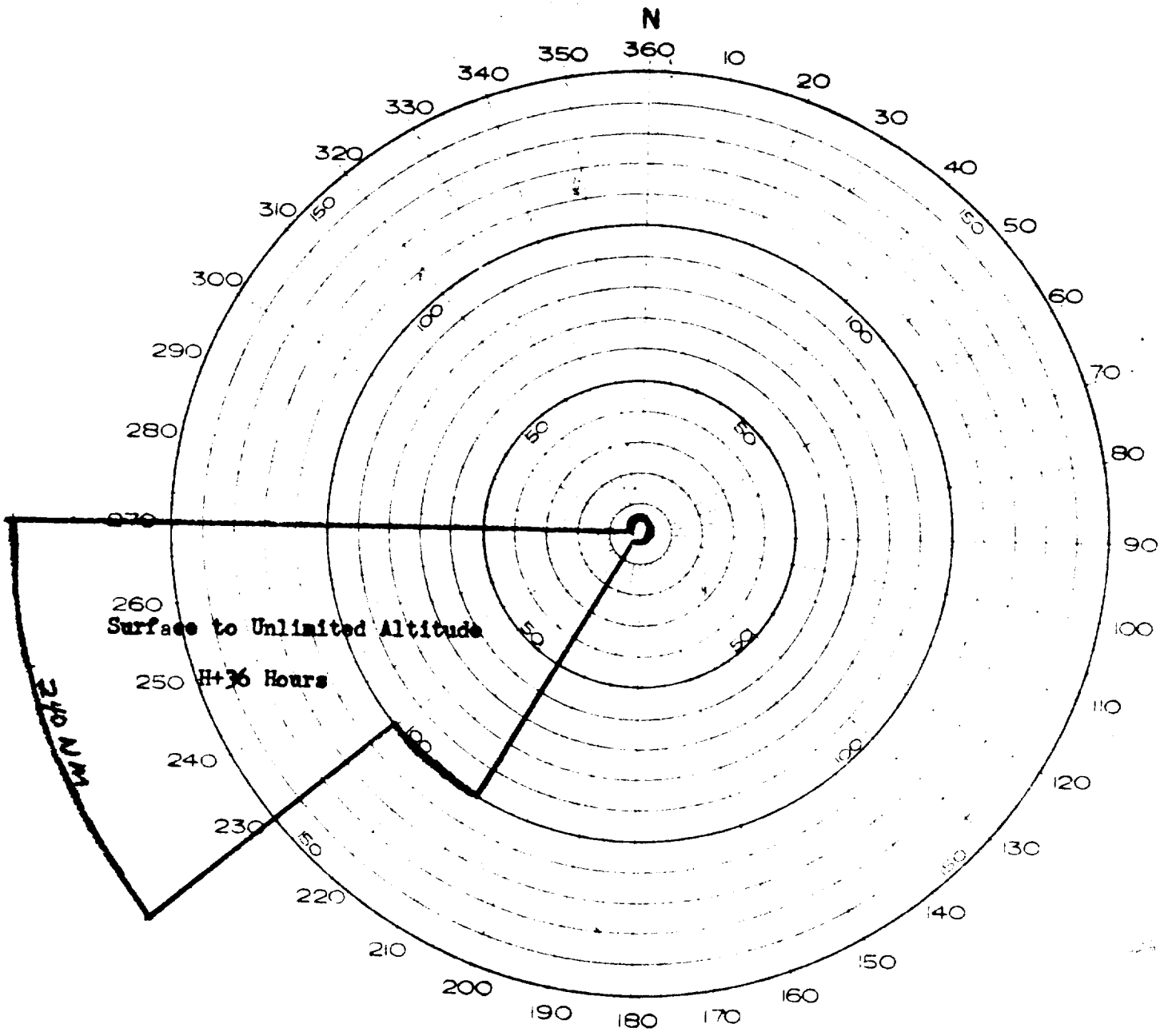
TAB C

HODOGRAPH
RESULTANT WINDS AND SURFACE RADEX

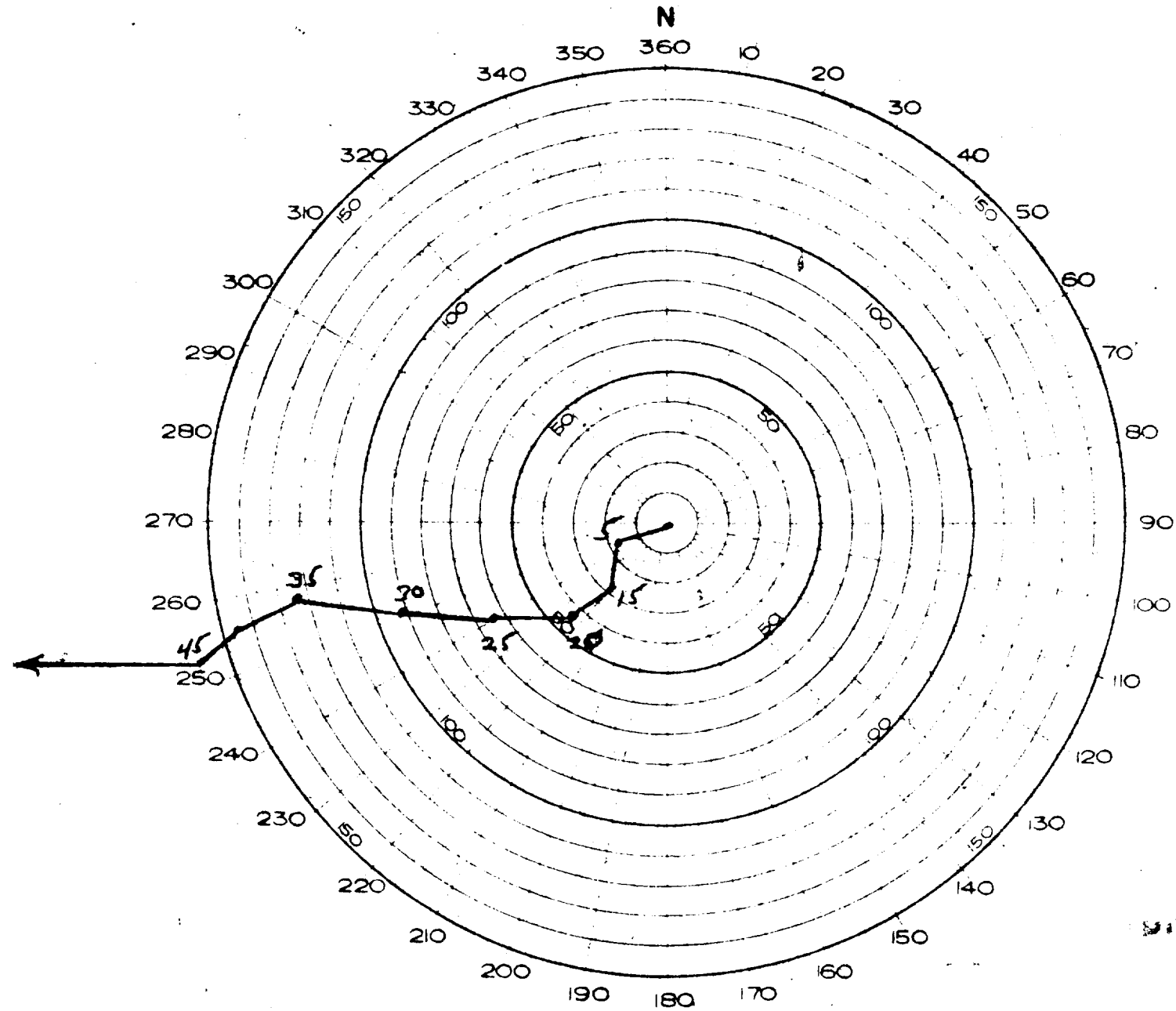


YELLOWWOOD EVENT

Surface and Air Radex

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



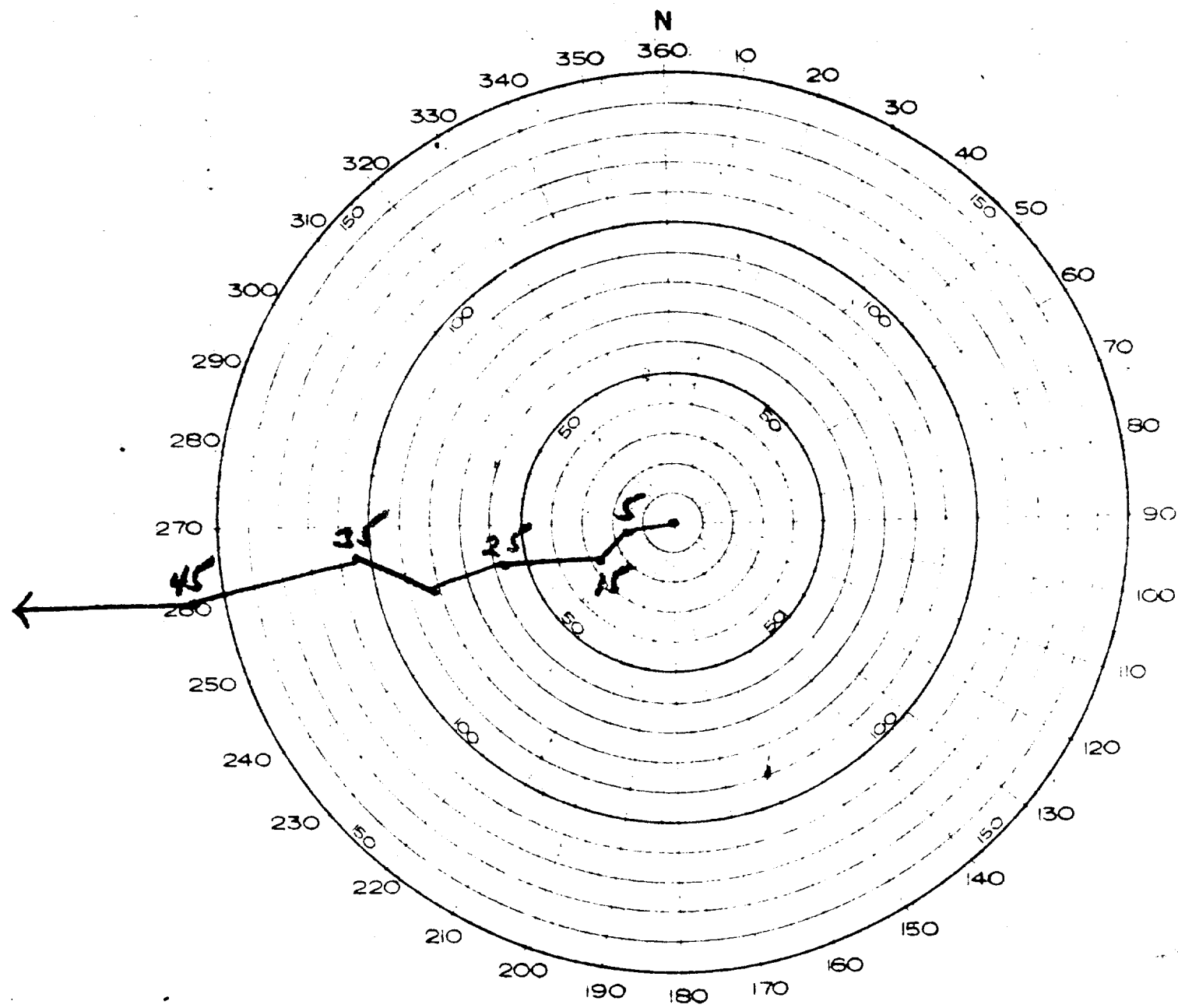
YELLOWWOOD EVENT

Forecast Hodograph

261400M

TAB E-1

HODOGRAPH
RESULTANT WINDS AND SURFACE RADEX



YELLOWWOOD EVENT

Shot-time Hodograph
260200Z May

TAB E-2

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

27 May 1958

YELLOWOOD

ENIWETOK OBSERVED WEATHER FOR 26 MAY 1958
AT DETONATION TIME: 1400M

SURFACE WEATHER:

Sea Level Pressure	1010.8 mbs
Free Air Surface Temperature	87.0°F
Wet Bulb Temperature	77.0°F
Dew Point Temperature	73.0°F
Relative Humidity	63%
Surface Wind	090° 14 knots
Visibility	10 miles
Weather	None

CLOUDS:
Scattered cumulus (4/10) bases 2,000 feet.

AREA WEATHER SUMMARY FROM AIRCRAFT:
Scattered cumulus (4/10) bases 1,800 feet, tops 4,000 feet. Moderate turbulence at 4,000 feet.

STATE OF THE SEA:
OPEN SEA: Wave height 3 feet, period 4 seconds, length 30 to 50 feet.
LAGOON: Wave height less than 1 foot, period and length negligible.

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YELLOWOOD

ENIWETOK RADIOSONDE OBSERVATION

Pressure (Millibars)	Height (Feet)	Temperature (°C)	Dew Point (°C)
1011	Surface	27.5	19.5
1000	340	26.8	19.2
920	2,756	19.8	15.2
873	4,200	17.2	08.2
850	4,960	17.5	00.8
765	7,972	13.8	-11.5
718	9,679	12.1	Miss
700	10,320	11.1	Miss
660	12,008	08.5	-15.2
644	12,730	07.0	-07.0
633	13,156	06.2	~~-10.6~~ -15.0
600	14,490	04.2	-17.5
546	17,060	00.8	-10.2
500	19,300	-02.5	-19.2
488	19,980	-03.5	-22.8
400	24,990	-13.0	Miss
300	31,930	-31.9	Miss
250	36,070	-42.2	Miss
200	40,920	-52.0	Miss
150	46,850	-65.2	Miss
100	54,710	-77.0	Miss
077	60,060	-79.0	Miss
069	62,205	-72.0	Miss
066	63,096	-73.0	Miss
059	65,109	-70.0	Miss
057	65,934	-65.0	Miss
050	68,040	-63.7	Miss
041	72,600	-62.0	Miss
039	73,590	-58.0	Miss
034	76,494	-58.0	Miss
025	82,380	-51.1	Miss
004	123,057	-30.3	Miss

YELLOWOOD

ENIWETOK WINDS ALOFT OBSERVATION

Height (Feet)	Direction (Degrees)	Velocity (Knots)
Surface	090	12
1,000	090	14
2,000	090	14
3,000	090	16
4,000	080	15
5,000	080	14
6,000	070	11
7,000	060	11
8,000	050	08
9,000	050	09
10,000	050	07
12,000	040	10
14,000	050	06
16,000	070	06
18,000	060	17
20,000	070	26
22,000	090	15
23,000	090	16
24,000	090	18
26,000	110	19
28,000	100	21
30,000	080	25
32,000	080	28
34,000	100	26
35,000	110	26
36,000	100	29
38,000	090	24
40,000	070	27
42,500	080	25
45,000	080	28
47,500	090	24
50,000	090	21
52,500	070	16
55,000	050	21
57,500	070	21
60,000	070	20
65,000	060	08
70,000	090	06
75,000	080	37
80,000	100	43
85,000	100	44
90,000	100	50
95,000	100	55
100,000	090	66
105,000	080	75
110,000	080	69
115,000	100	91
120,000	110	97
123,000	110	98

INDEX

TAB

[redacted]

MAGNOLIA EVENT

OPERATION HARDTACK

1. The MAGNOLIA device was detonated at 0600M, 27 May 1958, 3,000 feet southwest of the center of Yvonne Island. The cloud rose immediately to 44,000 feet and stabilized at 41,000 feet with the base at 15,000 feet. Radar confirmed this position, and the initial cloud movement was westerly. The middle segment remained over ground zero, and the upper and lower levels moved on a bearing of 250 degrees.

2. The P2V aircraft was vectored from Alvin to Keith at 0633M, and it reported readings of Zero at 500 feet. The northern chain was then surveyed, with the highest reading recorded over Alice: 5 mr/hr, at 0647M. The lagoon area was swept in 10-degree increments, and in the center of the lagoon at 500 feet, 7 r was recorded at 0735M. The aircraft was considered contaminated and was instructed to wash down at Fred. Reentry was declared at 0730M.

3. A helicopter ground survey was initiated at 0745M. The highest reading was recorded at Alice, with 22,000 mr/hr, which is attributed to the YELLOWWOOD event. Other islands in the northern chain ranged from 2 mr/hr to 120 mr/hr, with Yvonne reading 1,200 to 2,000 mr/hr.

4. A second helicopter survey was made at 1430M. The southern chain indicated only background with the exception of Leroy, which read 35,000 mr/rh at twenty-five feet. This high reading is attributed to a small section of the cloud which did not move out of the lagoon as anticipated. This high reading accounted for the contamination of the P2V.

[redacted]

[redacted]

5. Fallout fell within the forecast area. Ujelang was monitored closely, but no increase in background was recorded.

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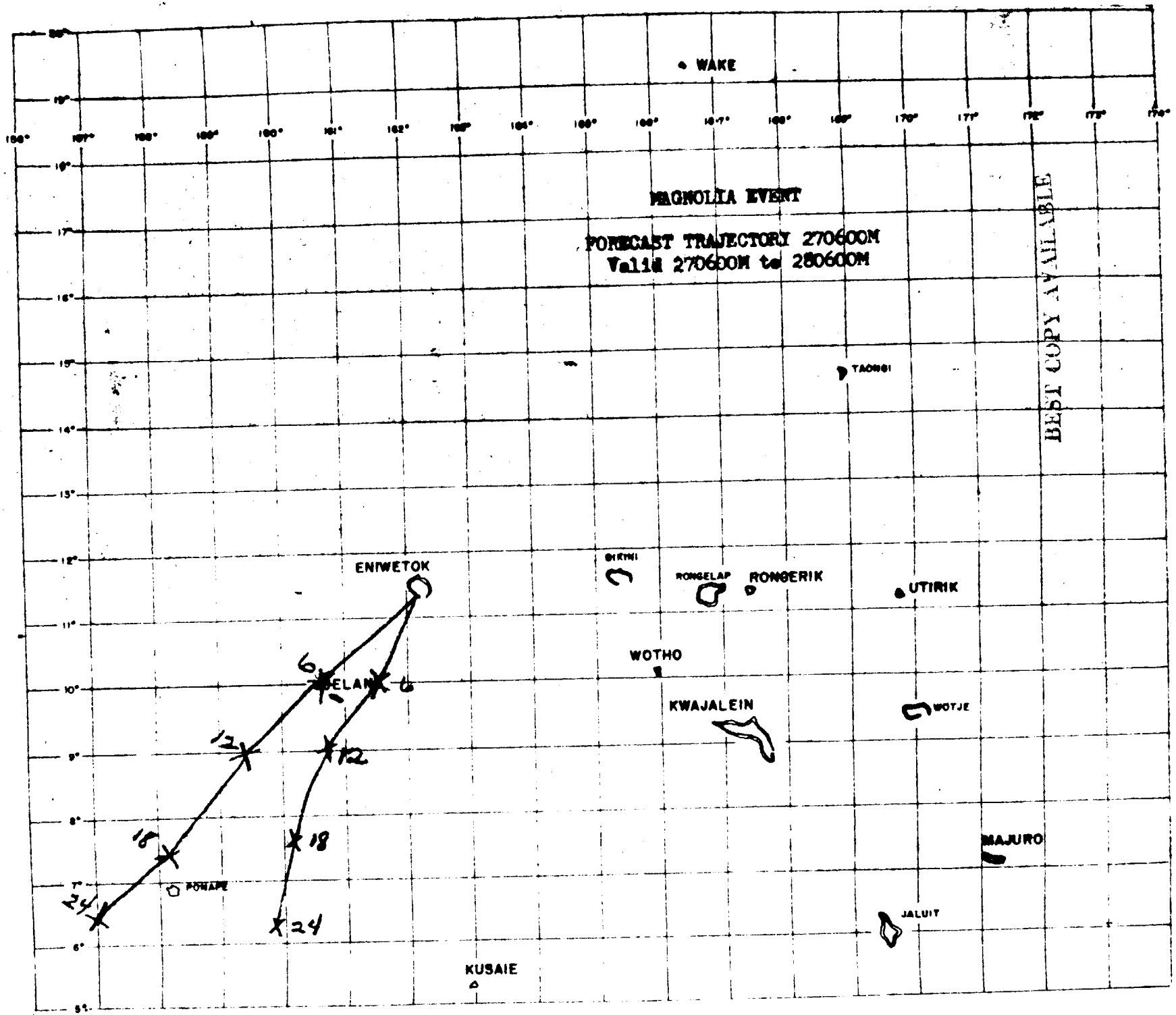
[redacted]

MAGNOLIA EVENT

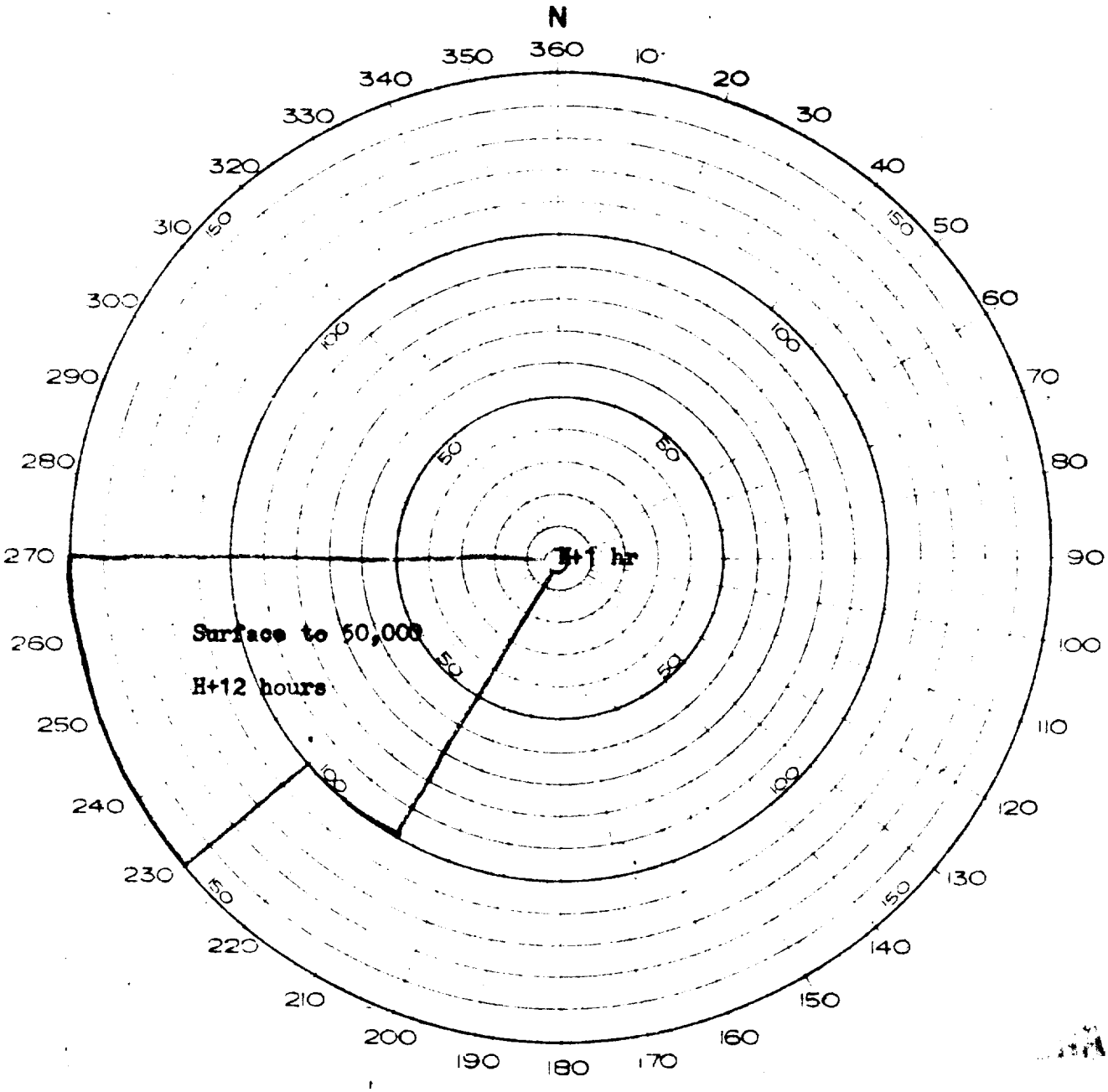
Fallout Forecast



TAB O

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX

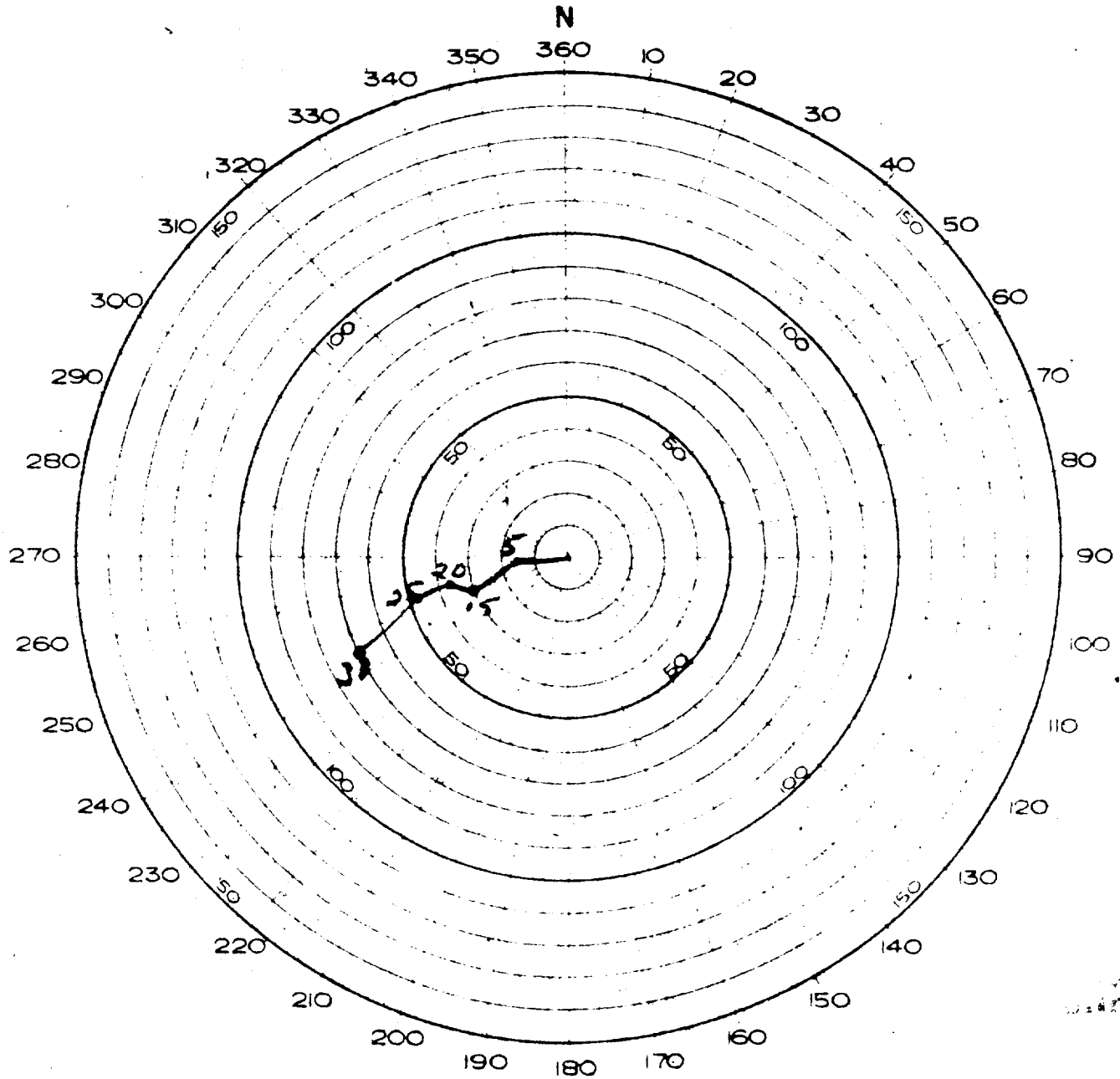


MAGNOLIA EVENT

Surface and Air Radex

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



MAGNOLIA EVENT

Forecast Hodograph
270600M May

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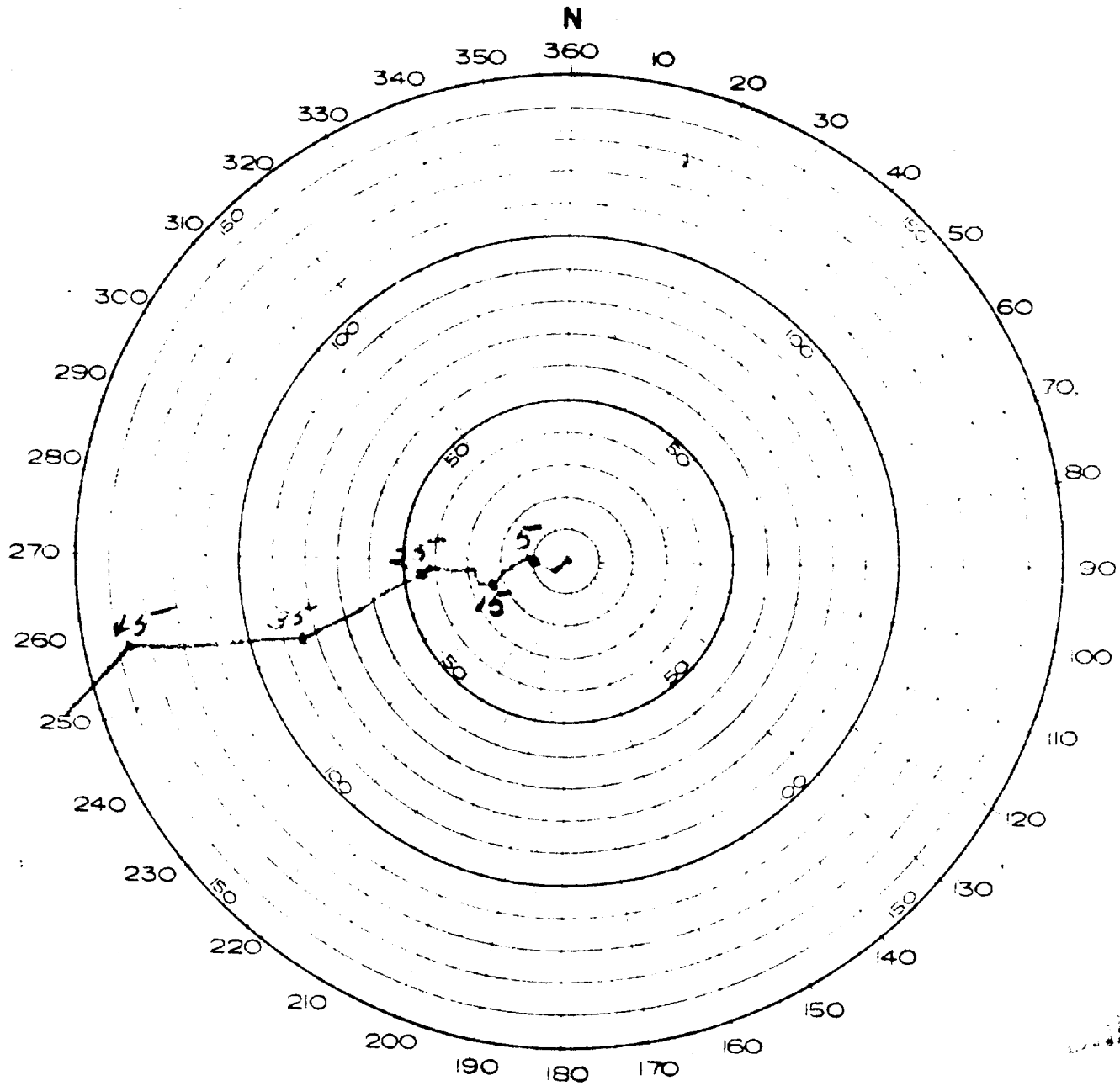
TAB E-1

HODOGRAPH
RESULTANT WINDS AND SURFACE RADEX



MAGNOLIA EVENT

Shot-time Hodograph
270600M May

TAB E-2

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

28 May 1958

MAGNOLIA

ENIWETOK OBSERVED WEATHER FOR 27 MAY 1958
AT DETONATION TIME: 0600M

SURFACE WEATHER:

Sea Level Pressure	1010.5 mbs
Free Air Surface Temperature	80.0°F
Wet Bulb Temperature	74.2°F
Dew Point Temperature	72.0°F
Relative Humidity	76%
Surface Wind	090° 14 knots
Visibility	10 miles
Weather	None

CLOUDS:
Scattered (2/10) cumulus bases 1,800 feet to 2,000 feet. Scattered (2/10) cirriform, bases unknown.

AREA WEATHER SUMMARY FROM AIRCRAFT:
Scattered (2/10) cumulus bases 2,000 feet, tops generally 3,500 to 4,000 feet with occasional tops to 8,000 feet. Cirrus bases unknown. Contrails at 35,000 feet and upward.

STATE OF THE SEA:
Open Sea: Wave height 3 feet, period 4 seconds, length 30 to 40 feet.
Lagoon side: Wave heigh less than 1 foot. Light swell height less than 1 foot, period 4 seconds, length 60 to 80 feet.

MAGNOLIA

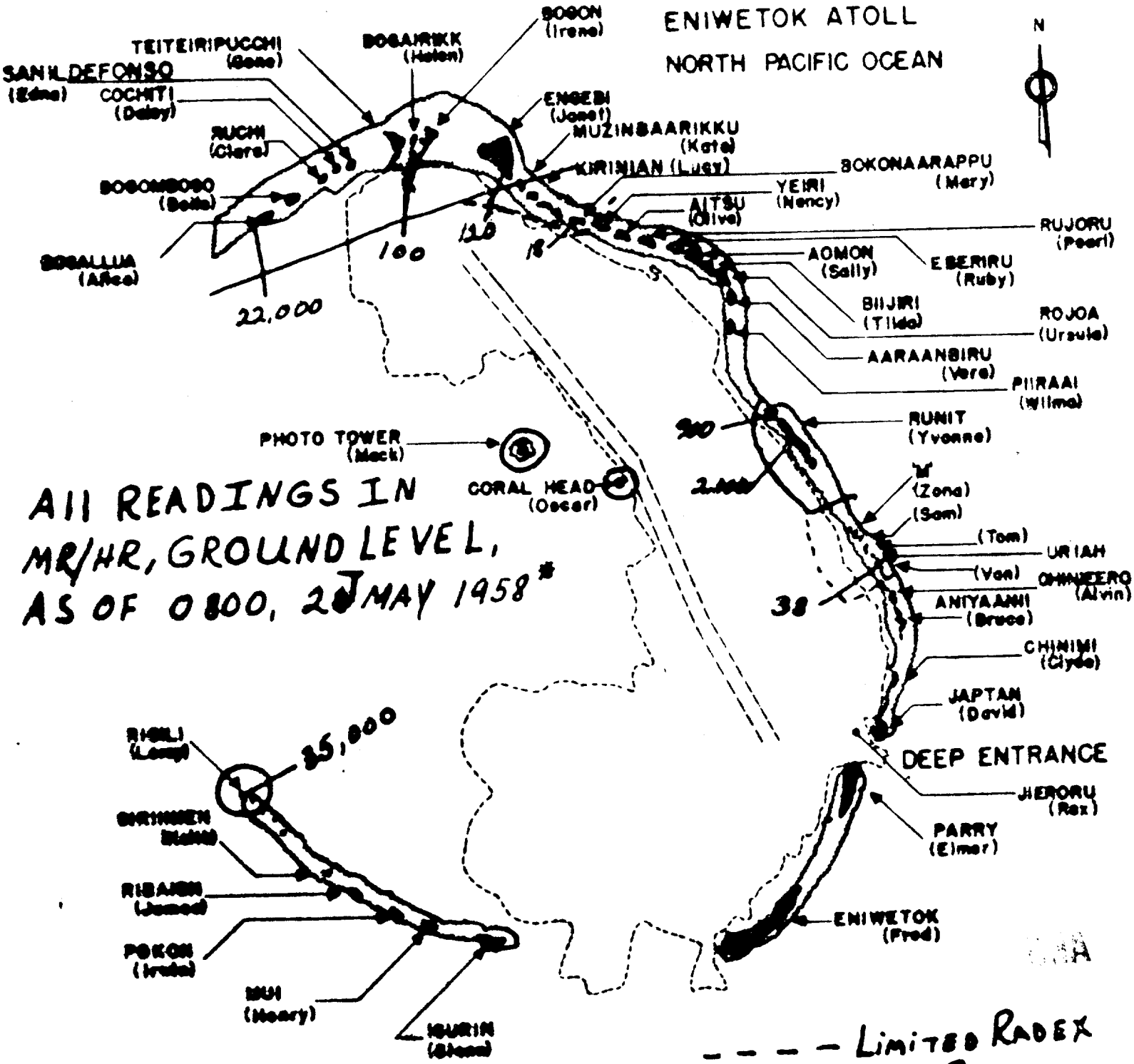
ENIWETOK RADIOSONDE OBSERVATION

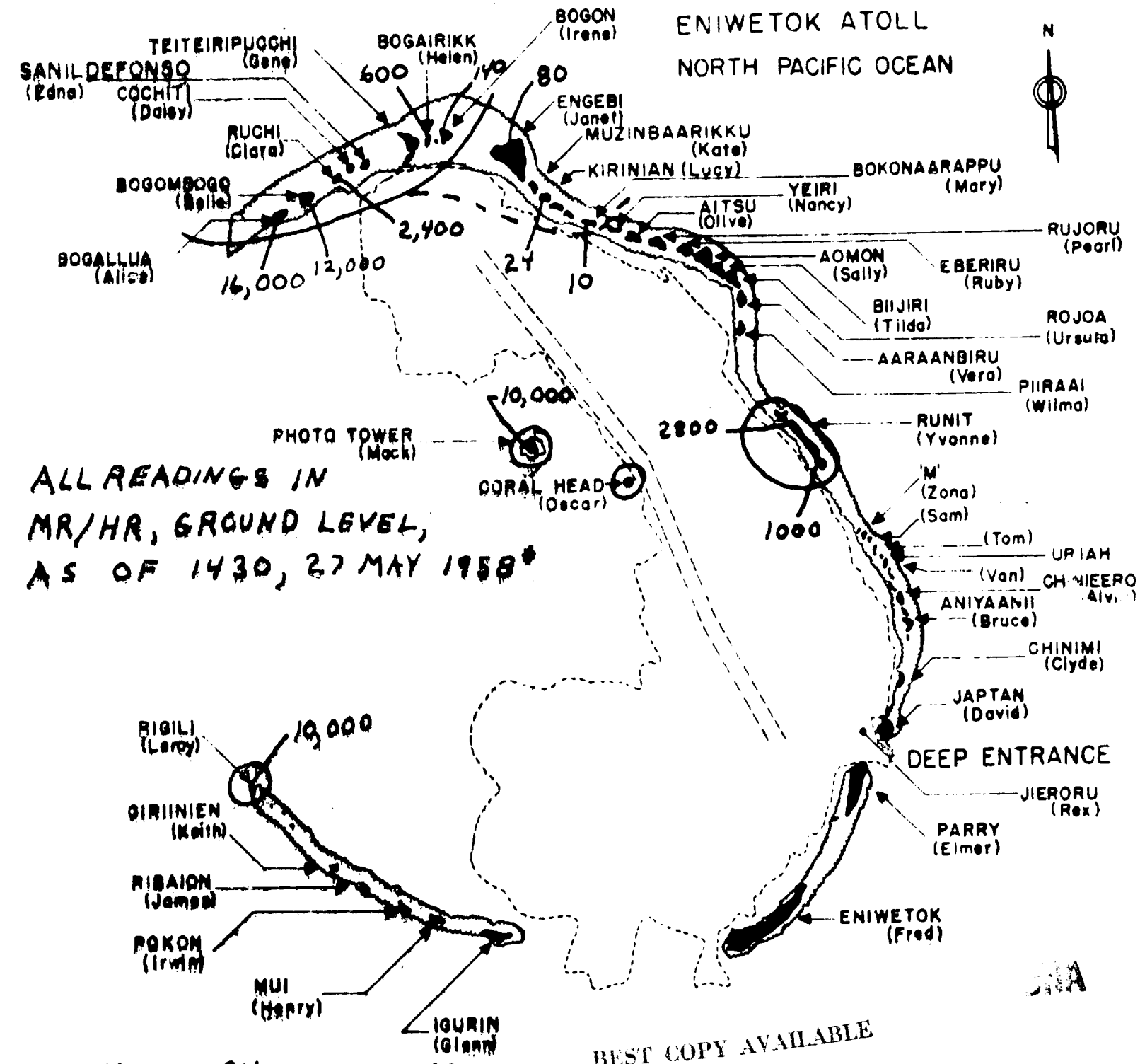
Pressure (Millibars)	Height (Feet)	Temperature (°C)	Dew Point (°C)
1010	Surface	26.5	21.8
1000	310	26.2	21.2
850	4,940	16.2	12.8
840	5,315	15.5	12.2
810	6,299	16.2	-05.2
700	10,320	11.2	-05.8
642	12,664	05.2	-05.8
600	14,470	03.8	-12.2
516	18,471	~~-11.8~~ -01.9	-19.8
500	19,270	-03.2	Miss
400	24,960	-14.5	Miss
300	31,890	-31.0	Miss
500	19,270	-03.2	Miss
400	24,960	-14.5	Miss
300	31,890	-31.0	Miss
250	36,~~000~~ 040	-41.2	Miss
200	40,890	-52.8	Miss
150	46,800	-65.5	Miss
100	54,590	-80.5	Miss
077	59,895	-83.0	Miss
075	60,390	-76.0	Miss
071	61,446	-78.0	Miss
065	63,030	-69.0	Miss
060	64,515	-69.0	Miss
057	65,604	-65.0	Miss
050	67,820	-64.5	Miss
~~020~~ 025	82,080	-55.0	Miss
015	93,621	-43.0	Miss

MAGNOLIA

ENIWETOK WINDS ALOFT OBSERVATION

Height (Feet)	Direction (Degrees)	Velocity (Knots)
Surface	090	~~10~~ 14
1,000	080	12
2,000	080	12
3,000	090	12
4,000	100	13
5,000	120	09
6,000	120	06
7,000	080	04
8,000	070	07
9,000	070	08
10,000	070	08
12,000	060	08
14,000	040	10
16,000	050	04
18,000	100	08
20,000	130	08
22,000	090	17
24,000	090	11
26,000	070	12
28,000	070	21
30,000	060	27
32,000	060	27
34,000	060	22
36,000	060	23
38,000	080	22
40,000	080	21
42,500	090	24
45,000	090	34
47,500	060	17
50,000	040	21
52,500	050	29
55,000	050	20
57,500	040	26
60,000	060	27
65,000	100	13
70,000	080	16
75,000	090	32
80,000	090	43
85,000	090	62
90,000	090	69
91,000	090	68




ENIWETOK ATOLL
NORTH PACIFIC OCEAN
N
BOGON (Irene)
TEITEIRIPUCCHI (Gene)
BOGAIRIKK (Helen)
SANIL DEFONSO (Edna)
COCHIT (Daisy)
600
140
80
ENGEBI (Janet)
RUCHI (Clara)
MUZINBAARIKKU (Kate)
KIRINIAN (Lucy)
BOKONAARAPPU (Mary)
BOGOMBOGO (Belle)
YEIRI (Nancy)
AITSU (Olive)
2,400
RUJORU (Pearl)
BOGALLUA (Alice)
16,000
12,000
24
10
AOMON (Sally)
EBERIRU (Ruby)
BIIJIRI (Tilda)
ROJOA (Ursula)
AARAANBIRU (Vera)
PIIRAAI (Wilma)
10,000
PHOTO TOWER (Mack)
2800
RUNIT (Yvonne)
CORAL HEAD (Oscar)
'M' (Zona)
(Sam)
1000
(Tom)
URIAH
(Van)
CHIEERO
ANIYAANII (Bruce)
CHINIMI (Clyde)
JAPTAN (David)
RIGILI (Leroy)
10,000
DEEP ENTRANCE
JIERORU (Rex)
GIRIINIEN (Keith)
PARRY (Elmer)
RIBAION (James)
POKON (Irwin)
ENIWETOK (Fred)
MUI (Harry)
IGURIN (Glenn)
ALL READINGS IN MR/HR, GROUND LEVEL, AS OF 1430, 27 MAY 1958*
* MACK PHOTO TOWER AS OF 1100.
YELLOWWOOD G. Z. — 10 MR/HR.
BEST COPY AVAILABLE
- - - - LIMITED RADEX
——— FULL RADEX

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TAB

[redacted]

HOLLY EVENT

OPERATION HARDTACK

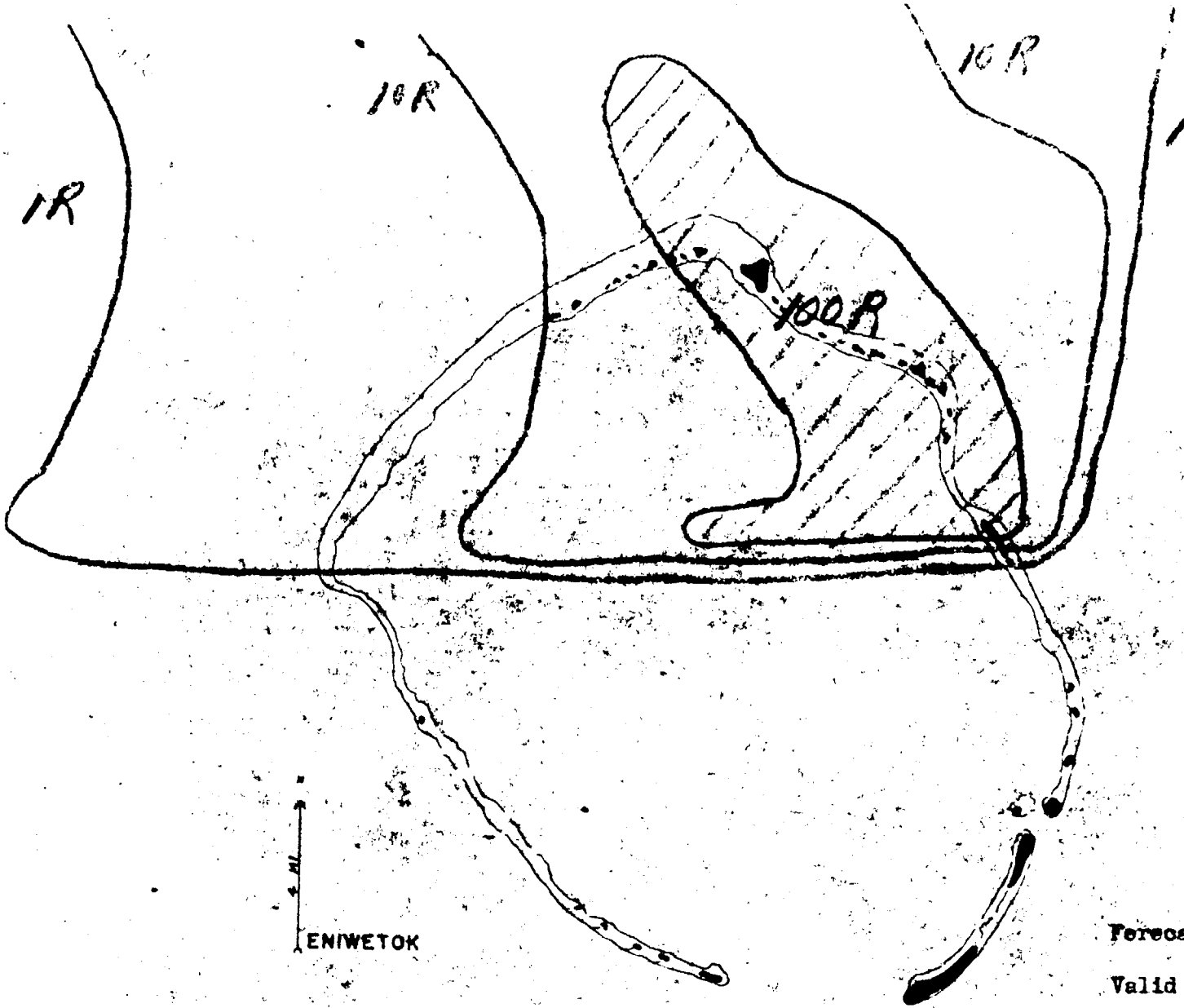
1. HOLLY was detonated at 0630M, 21 May 1958. This was a barge shot, positioned 4,000 feet west of Yvonne. The first fix was obtained at H+14 minutes, when aircraft reports indicated that the cloud was still within a few miles of ground zero and was starting to move to the southwest very slowly. Maximum cloud height was 15,000 feet. The cloud became stabilized by H+15 minutes with the top at 12,000 feet and the base at 7,500 feet. At H+30 minutes, the cloud top had descended to 9,000 feet, with general movement to the west-southwest. Before the hour was up, the cloud became too diffused for radar or visual tracking.

2. The P2V barrier patrol reported on time and shuttled between Bruce and Leroy Islands. At H+55 minutes, he contacted the southern edge of the cloud over Leroy at 5,000 feet and reported 500 mr/hr.

3. A helicopter survey was initiated at 0630M along the east and north islands of Eniwetok. A maximum reading of 5,900 mr/hr was recorded at 100 feet above ground zero.

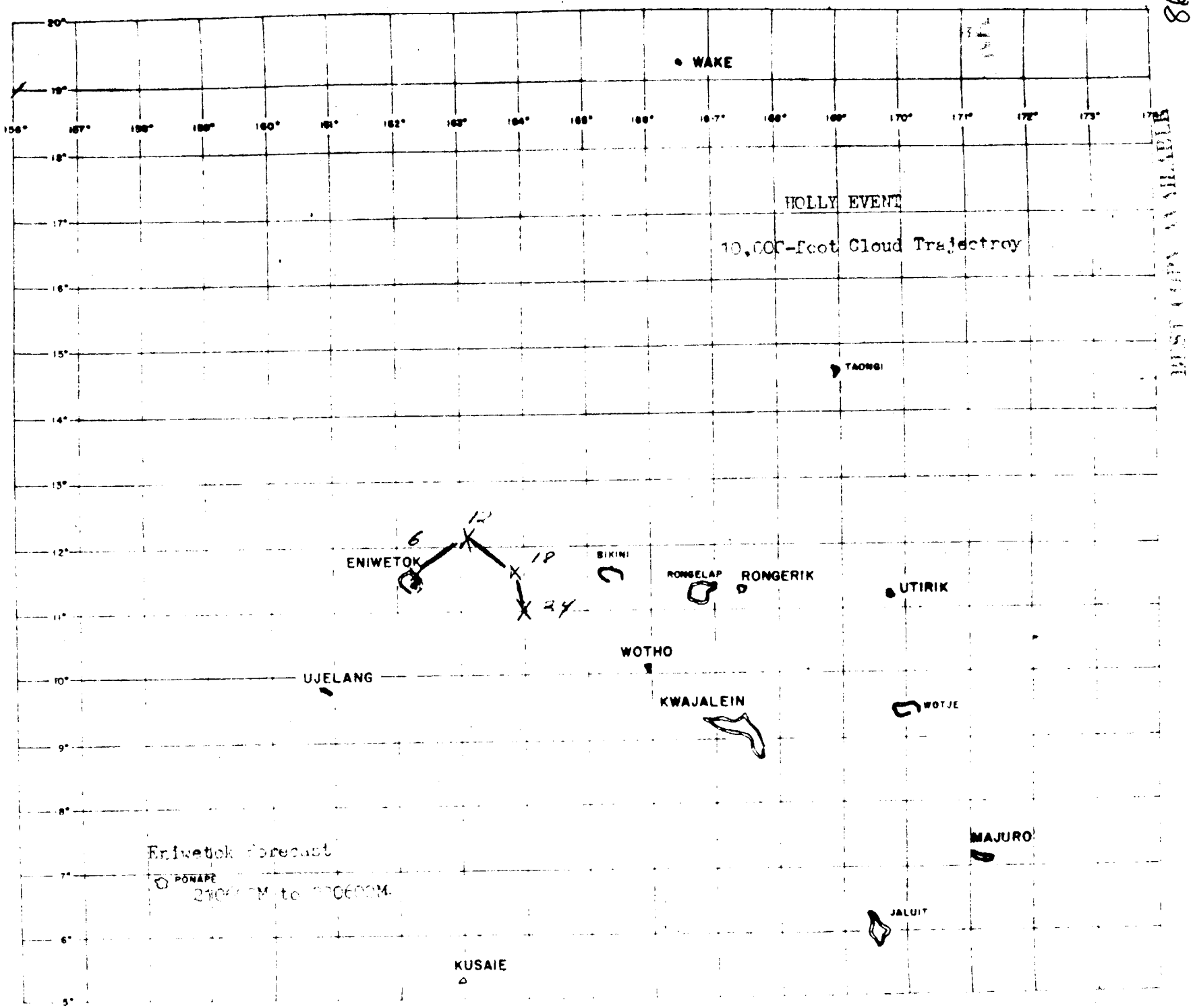
4. FOPU had predicted that the islands in the northeast quadrant would lie within the 100R dose area; however, the unexpectedly low stabilized cloud height caused almost all the fallout to remain in the trade wind levels. This caused the fallout pattern to lie within the radials 230 degrees to 320 degrees, with radial distance of approximately 35 miles. With the exception of Yvonne, only Janet, Leroy and the islands in between received substantial fallout.

[redacted]



HOLLY EVENT
Fallout Forecast

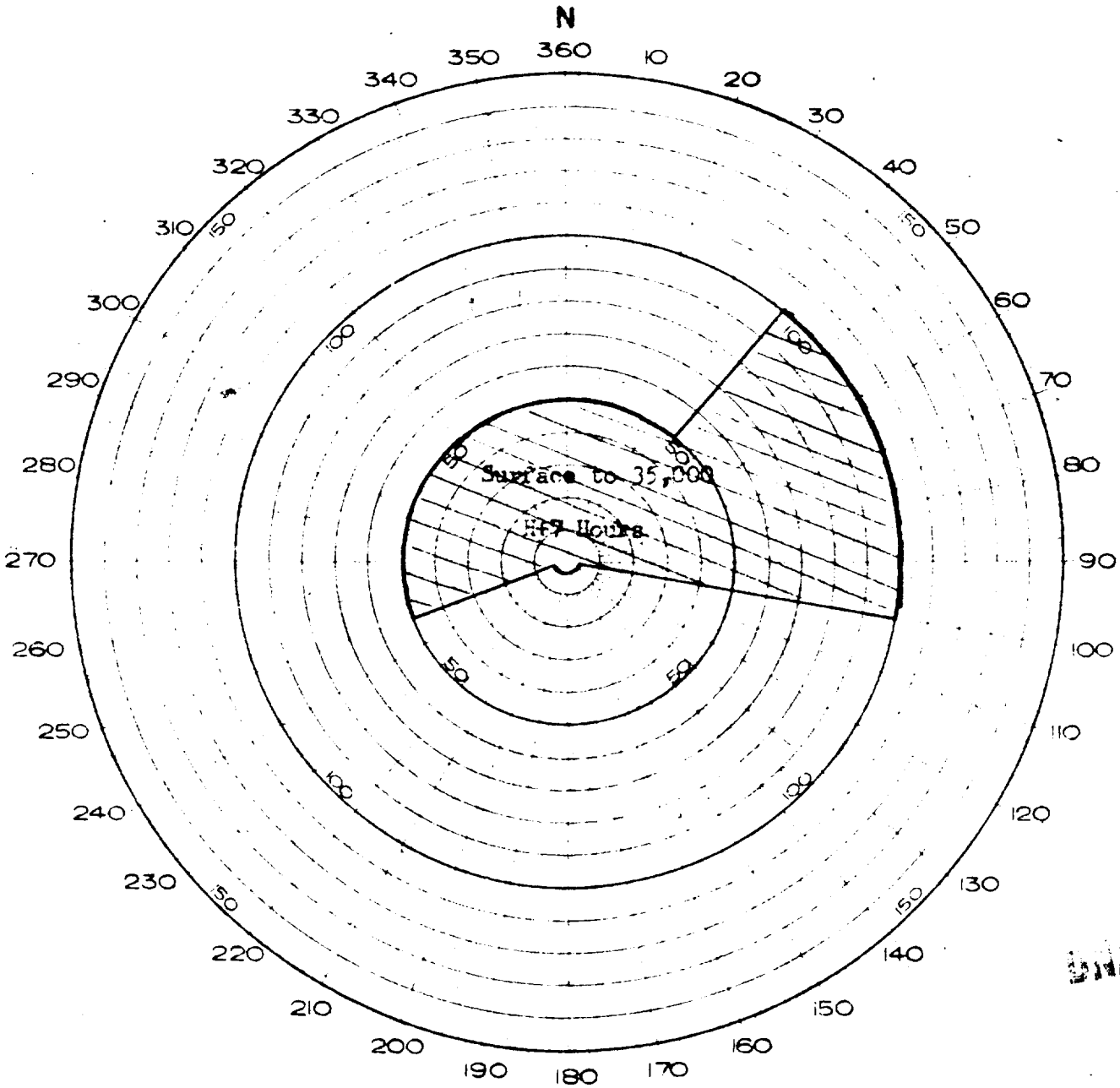
TAB B


WAKE
HOLLY EVENT
10,000-foot Cloud Trajectroy
TAONGI
6
12
18
24
ENIWETOK
BIKINI
RONGELAP
RONGERIK
UTIRIK
WOTHO
UJELANG
KWAJALEIN
WOTJE
MAJURO
JALUIT
KUSAIE
PONAPE
Eniwetok forecast

TAB C

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



DNA

HOLLY EVENT

Radex

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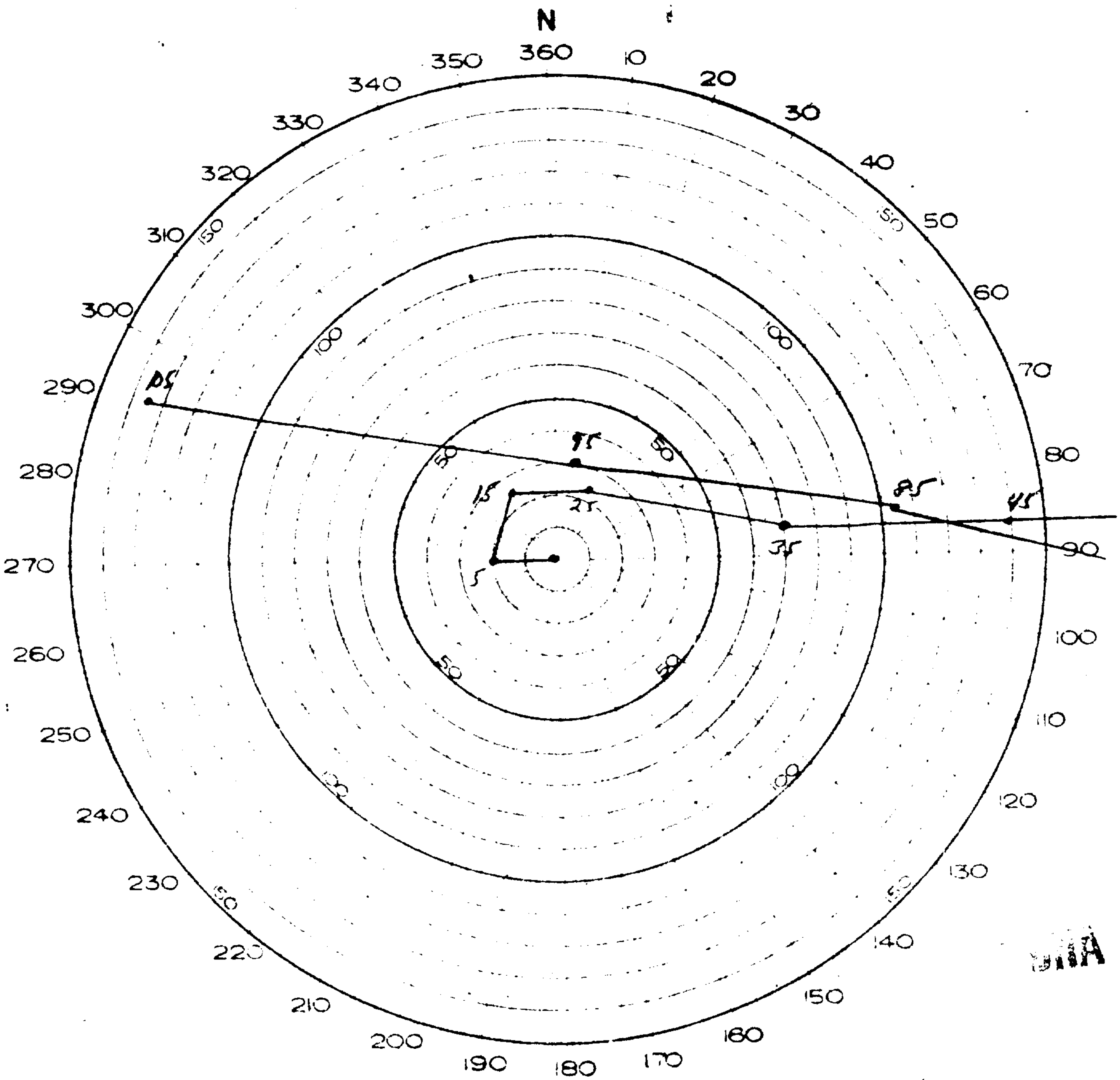
TAB D

HODOGRAPH
RESULTANT WINDS AND SURFACE RADEX



HOLLY EVENT

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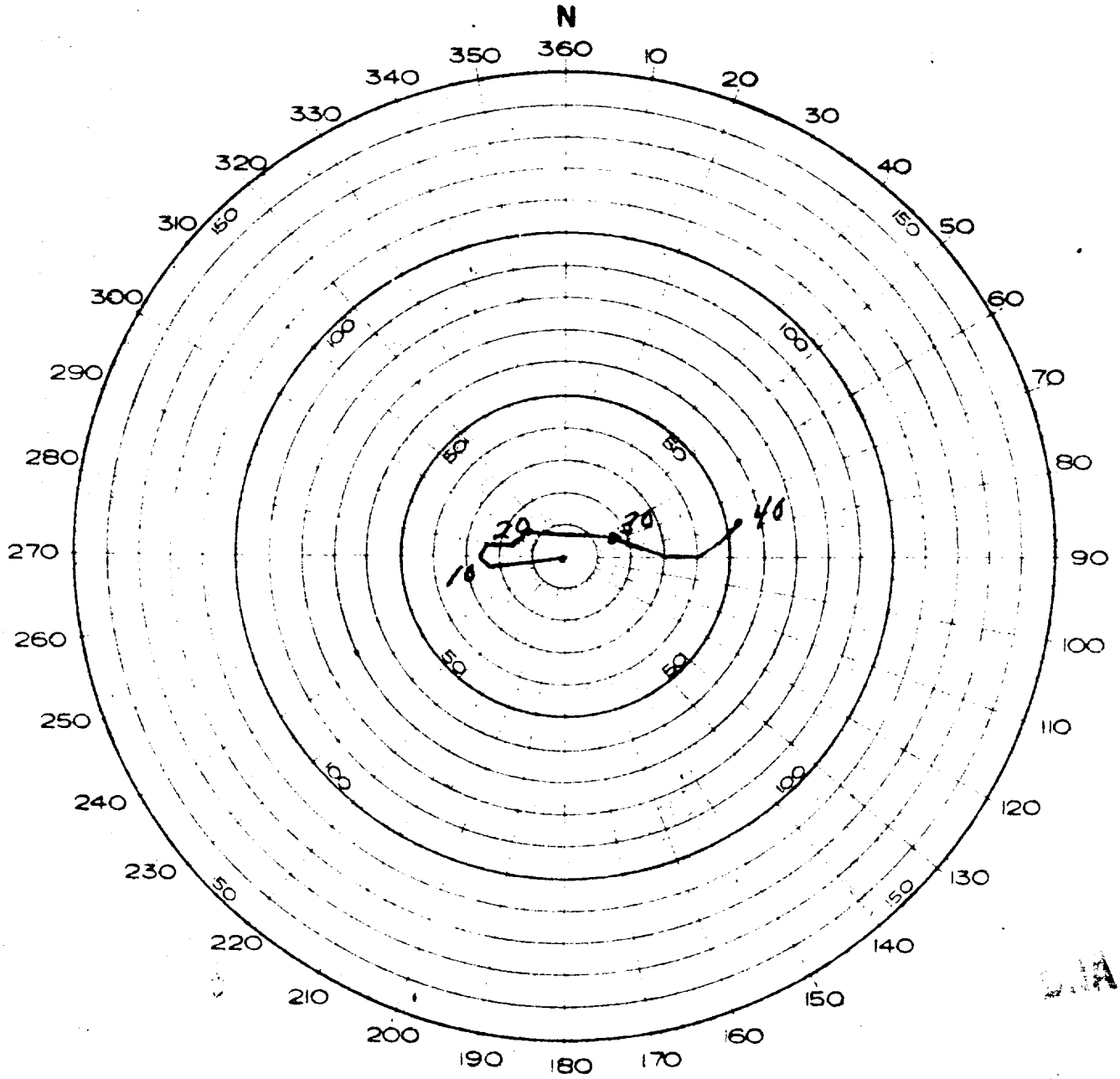
FORECAST HODOGRAPH 210600M

Eniwetok

TAB E-1

HODOGRAPH
RESULTANT WINDS AND SURFACE RADEX



HOLLY EVENT

Shot-time Hodograph 210630M

Eniwetok

TAB E-2

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

22 May 1958

HOLLY

ENIWETOK OBSERVED WEATHER FOR 21 MAY 1958
AT DETONATION TIME: 0630M

SURFACE WEATHER:

Sea Level Pressure	1010.2 mbs
Free Air Surface Temperature	80.6° F
Wet Bulb Temperature	76.6° F
Dew Point Temperature	75.0° F
Relative Humidity	83%
Surface Wind	090° 16 knots
Visibility	10 miles
Weather	None

CLOUDS:
Scattered (3/10) cumulus, bases 1,800 feet. Scattered cirrus.

AREA WEATHER SUMMARY FROM AIRCRAFT
Scattered (3/10 to 4/10) cumulus, bases 1,800 feet, tops 8,000 feet (no reports on height of cirrus).

STATE OF THE SEA:
Open Sea: Waves 3 feet high, period 4 seconds length 30 to 40 feet.
Lagoon side: Waves less than 1 foot high, period 1 - 2 seconds.

90

HOLLY

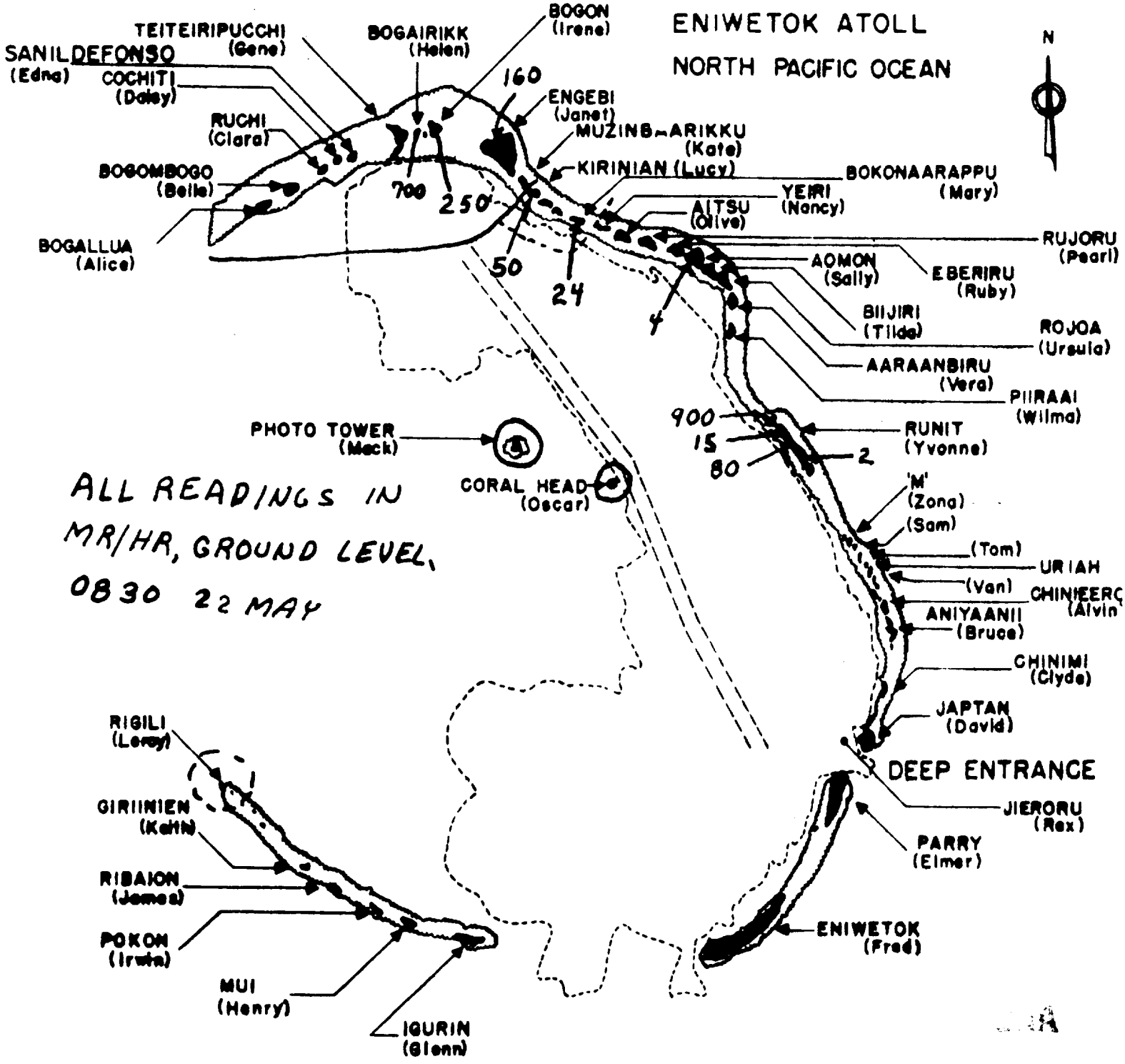
ENIWETOK RADIOSONDE OBSERVATION

Pressure (Millibars)	Height (Feet)	Temperature (°C)	Dew Point (°C)
1010	Surface	26.5	23.2
1000	310	26.2	22.5
850	4,950	17.0	13.0
782	7,612	14.5	04.5
700	10,310	07.5	02.2
682	11,056	07.5	-12.2
664	11,778	09.0	Miss
600	14,460	03.3	Miss
500	19,250	-04.9	Miss
400	24,900	-15.5	Miss
360	27,493	-18.0	Miss
300	31,860	-29.0	Miss
250	36,070	-40.6	Miss
200	40,880	-52.9	Miss
150	46,780	-66.9	Miss
115	51,980	-79.0	Miss
100	54,500	-78.8	Miss
088	57,123	-81.0	Miss
081	58,740	-76.0	Miss
076	60,060	-79.0	Miss
070	61,710	-70.0	Miss
050	67,870	-64.0	Miss
039	73,326	-56.0	Miss
030	78,870	-52.8	Miss

HOLLY

ENIWETOK WINDS ALOFT OBSERVATION

Height (Feet)	Direction (Degrees)	Velocity (Knots)
Surface	~~090~~ 080	~~10~~ 14
1,000	080	21
2,000	080	23
3,000	080	23
4,000	080	21
5,000	080	~~12~~ 20
6,000	090	~~12~~ 12
7,000	100	09
8,000	120	10
9,000	150	10
10,000	~~100~~ 180	10
12,000	~~220~~ 210	04
14,000	280	09
16,000	~~270~~ 250	~~09~~ 04
18,000	220	04
20,000	220	~~03~~ 08
22,000	250	10
24,000	280	09
26,000	270	12
28,000	280	17
30,000	280	21
32,000	290	23
34,000	280	21
36,000	270	21
38,000	250	21
40,000	220	19
43,000	220	18
45,000	210	~~32~~ 33
48,000	210	25
50,000	230	17
53,000	270	13
55,000	290	10
58,000	320	11
60,000	360	08
65,000	100	13
70,000	080	19
77,000	100	27


ENIWETOK ATOLL
NORTH PACIFIC OCEAN
N
SANIL DEFONSO (Edna)
TEITEIRIPUCCHI (Gene)
BOGAIRIKK (Helen)
BOGON (Irene)
COCHITI (Daisy)
RUCHI (Clara)
ENGEBI (Janet)
MUZINB-ARIKKU (Kate)
BOGOMBOGO (Belle)
KIRINIAN (Lucy)
BOKONAARAPPU (Mary)
YEIRI (Nancy)
AITSU (Olive)
BOGALLUA (Alice)
RUJORU (Pearl)
AOMON (Sally)
EBERIRU (Ruby)
BIIJIRI (Tilda)
ROJOA (Ursula)
AARAANBIRU (Vera)
PIIRAAI (Wilma)
160
700
250
50
24
4
900
15
80
2
PHOTO TOWER (Mack)
CORAL HEAD (Oscar)
RUNIT (Yvonne)
'M' (Zona)
(Sam)
(Tom)
URIAH
(Van)
CHINIEERO (Alvin)
ANIYAANII (Bruce)
CHINIMI (Clyde)
JAPTAN (David)
DEEP ENTRANCE
JIERORU (Rex)
PARRY (Elmer)
ENIWETOK (Fred)
RIGILI (Lucy)
GIRIINIEN (Kelly)
RIBAION (James)
POKON (Irwin)
MUI (Henry)
IGURIN (Glenn)
ALL READINGS IN MR/HR, GROUND LEVEL, 0830 22 MAY
NOTE: HOLLY G.Z. - 20 to 120 mr/hr
FULL RADEX
LIMITED RADEX

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TAB

[redacted]

NUTMEG EVENT

OPERATION HARDTACK

1. NUTMEG was detonated at 0920M, 22 May 1958, off the west end of Tare Island at Bikini Atoll. At 0926M the cloud had stabilized at 20,000 feet and was breaking up. Radar from the USS Boxer confirmed the cloud's position of 264 degrees true bearing from ground zero, moving 6 knots per hour at 0940M. After this time the cloud dissipated.

2. The P2V aircraft reported over the USS Boxer, and it was directed on a course bearing 170 degrees from George Island at 5,000 feet. A reading of 0.1 mr/hr was read, and altitude was dropped to 1,000 feet. Several north-south sectors recorded only minor radiation levels. At 1045M the P2V was vectored along the northern chain and at 1100M along the southern chain. Maximum intensity was recorded over Tare at 1105M, at 400 mr/hr. The P2V was vectored to the west of Bikini 60 miles out, where maximum readings of 140 mr/hr were recorded.

3. Two helicopter surveys were initiated by TU-6 at 1030M. A maximum reading of 4 mr/hr was recorded at Charlie Island at 1105M by one flight. The other flight, over the western chain, recorded 30,000 mr/hr over ground zero at 1050M and 3,000 mr/hr at William.

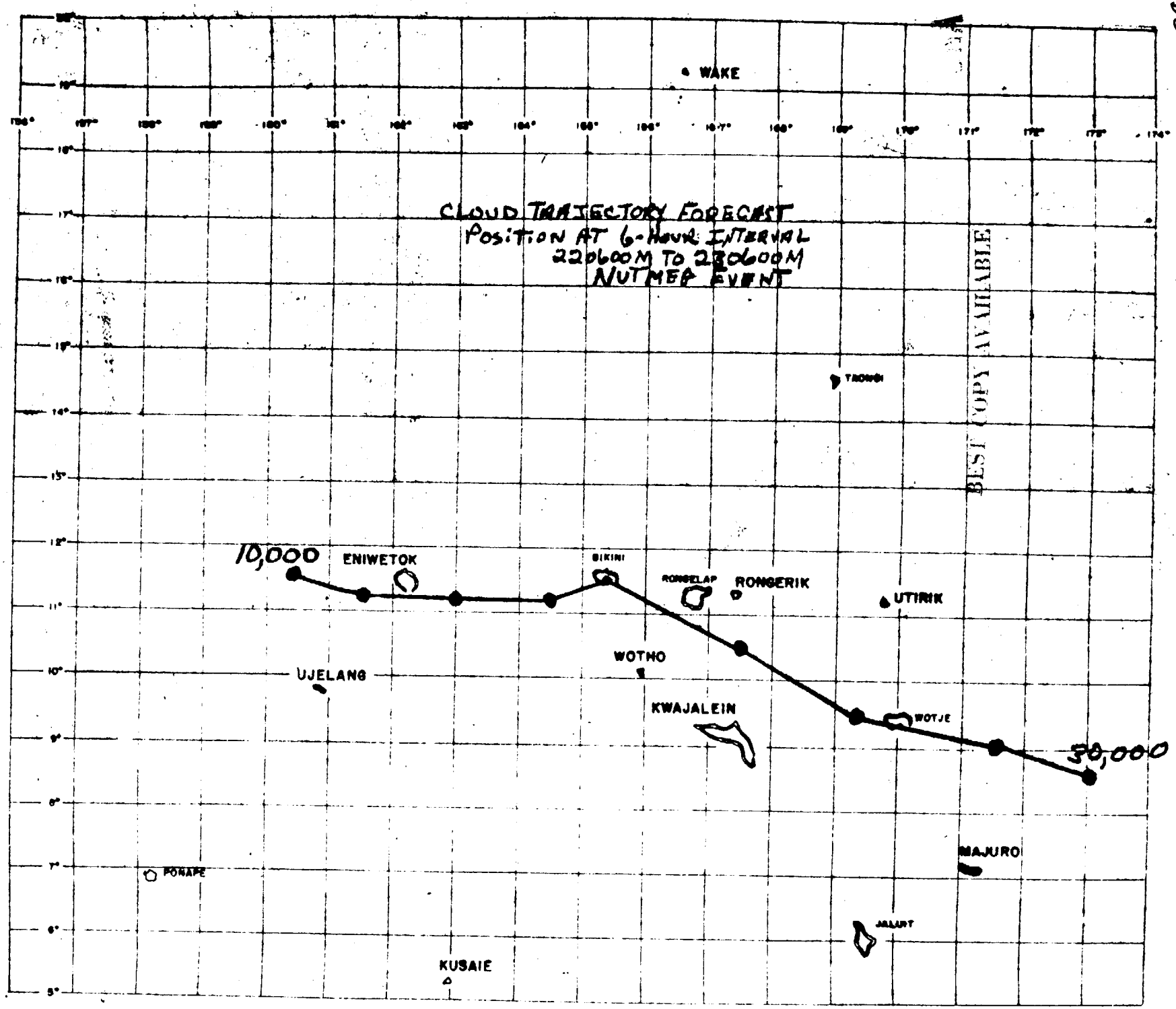
4. Fallout forecast was on a bearing of 270 degrees from ground zero. It is estimated that the fallout pattern was more to the northwest and that the southern forecast was not fulfilled.

TAB A

[redacted]

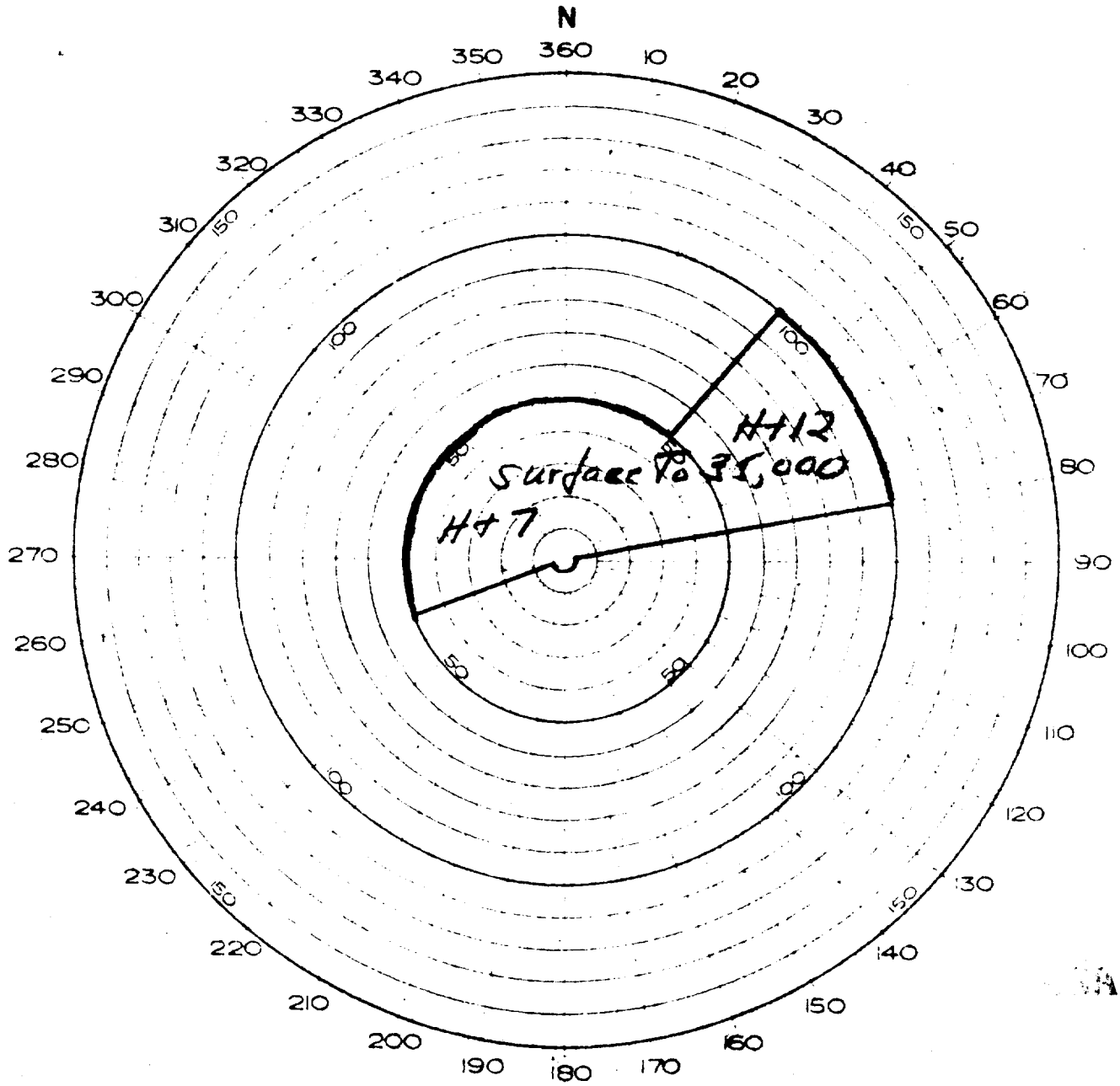
BEST COPY AVAILABLE

TAB B


WAKE
CLOUD TRAJECTORY FORECAST
POSITION AT 6-HOUR INTERVAL
220600M TO 230600M
NUTMEG EVENT
BEST COPY AVAILABLE
TRUK
10,000
ENIWETOK
BIKINI
RONGELAP
RONGERIK
UTIRIK
WOTHO
UJELANG
KWAJALEIN
WOTJE
30,000
MAJURO
POHAPE
JALUIT
KUSAIE

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX

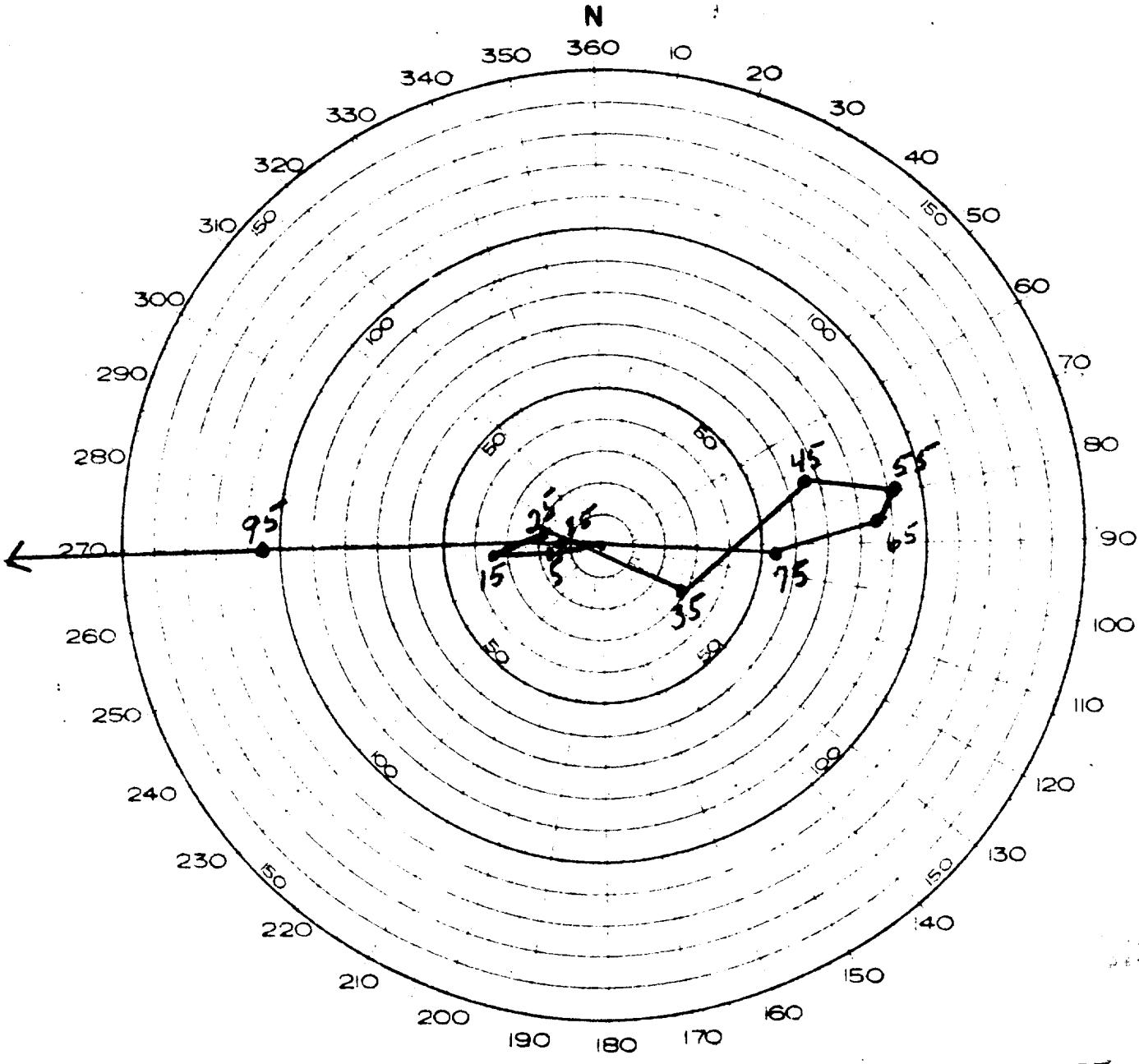


NUTMEG EVENT

Surface and Air Radex

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



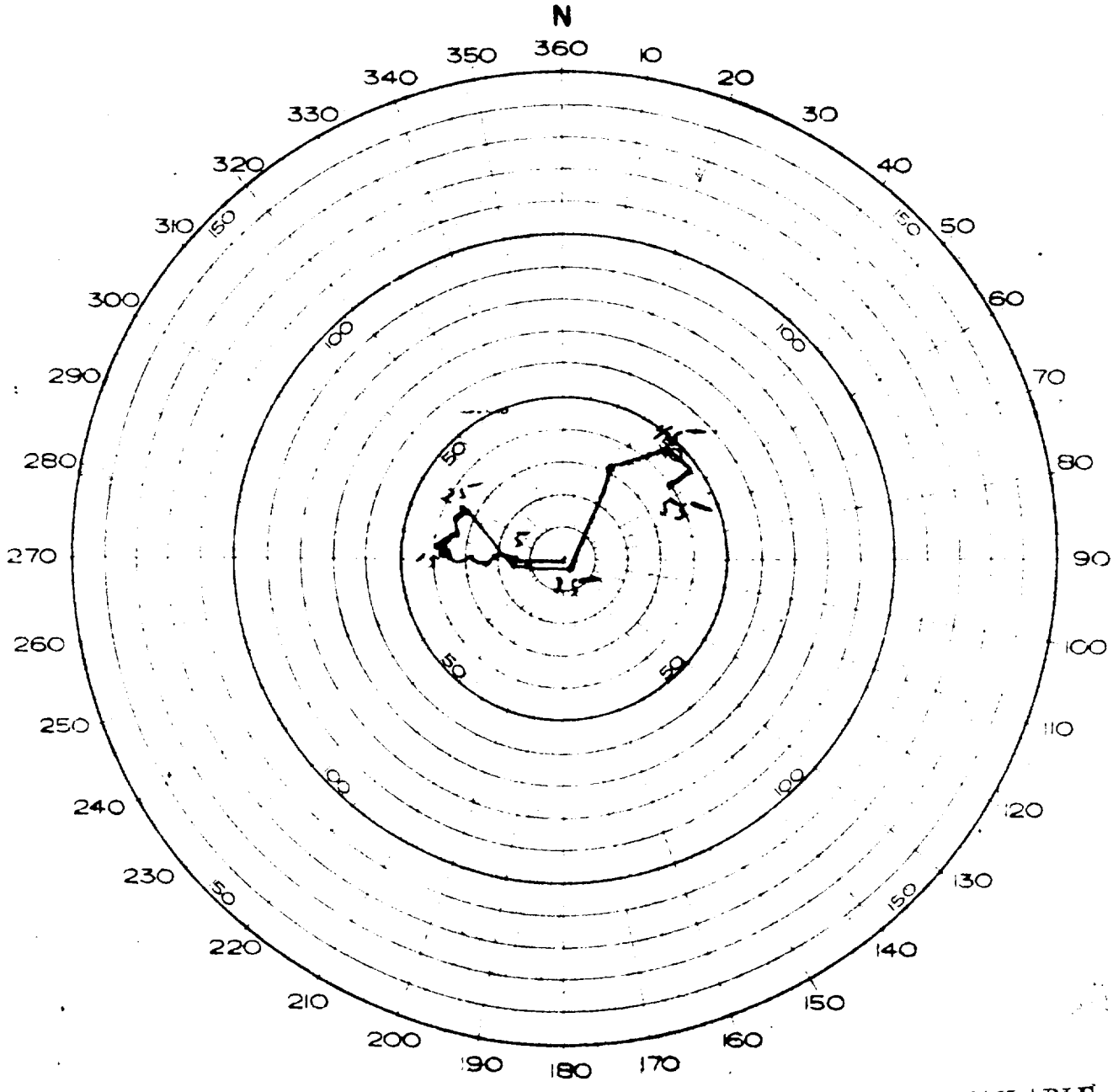
NUTMEG EVENT

Forecast Trajectory 220900M
Bikini Atoll

TAB E-1

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



NUTMEG EVENT

Shot-time Trajectory 220920M

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

26 May 1958

NUTMEG

BIKINI OBSERVED WEATHER FOR 22 MAY 1958
AT DETONATION TIME: 0920

SURFACE WEATHER:

Sea Level Pressure	1012.5 mbs
Free Air Surface Temperature	81.3°F
Wet Bulb Temperature	75.1°F
Dew Point Temperature	72.5°F
Relative Humidity	76%
Surface Wind	080° 11 knots
Visibility	10 miles
Weather	None

CLOUDS:
Scattered (2/10) cumulus, bases 1,800 feet, Scattered (3/10) altocumulus, bases 13,000 feet. Scattered (4/10) cirrus and cirrocumulus.

AREA WEATHER SUMMARY FROM AIRCRAFT:
Scattered cumulus (3 to 4/10) bases 1,800 feet, tops 7,000 feet.
Scattered (4/10) altocumulus bases 13,000 feet, tops 14,000 feet.
Scattered (4/10) altocumulus bases 21,000 feet, tops 22,000 feet.
Scattered (4/10) cirrus bases 28,000 feet, tops 29,000 feet.

STATE OF THE SEA:
Open Sea: Waves from 080° period 4 seconds, height 3 feet.
Lagoon Side: Waves from 080° period 3 - 4 seconds, height 2 feet.

NUTMEG

BIKINI RADIOSONDE OBSERVATION

Pressure (Millibars)	Height (Feet)	Temperature (°C)	Dew Point (°C)
1011	Surface	27.5	22.5
1000	390	26.5	21.8
850	5,000	14.2	10.8
836	5,446	13.5	10.2
811	6,266	16.2	-02.5
751	8,432	11.5	02.5
700	10,350	08.2	-04.2
660	11,909	05.5	02.2
600	14,460	00.2	-01.8
582	15,256	-01.5	-03.2
563	16,142	00.2	-17.8
534	17,487	-03.0	Miss
511	18,635	-05.8	-21.5
500	19,210	-06.8	-19.2
448	21,949	-11.8	-15.2
400	24,820	-17.5	-20.2
392	25,230	-19.5	-22.2
366	26,903	-21.8	-33.2
346	28,314	-22.5	-34.8
300	31,750	-28.8	Miss
250	35,920	-40.7	Miss
200	40,780	-53.3	Miss
150	46,640	-69.8	Miss
100	54,290	-84.6	Miss
054	66,330	-64.0	Miss

NUTMEG

BIKINI WINDS ALOFT OBSERVATION

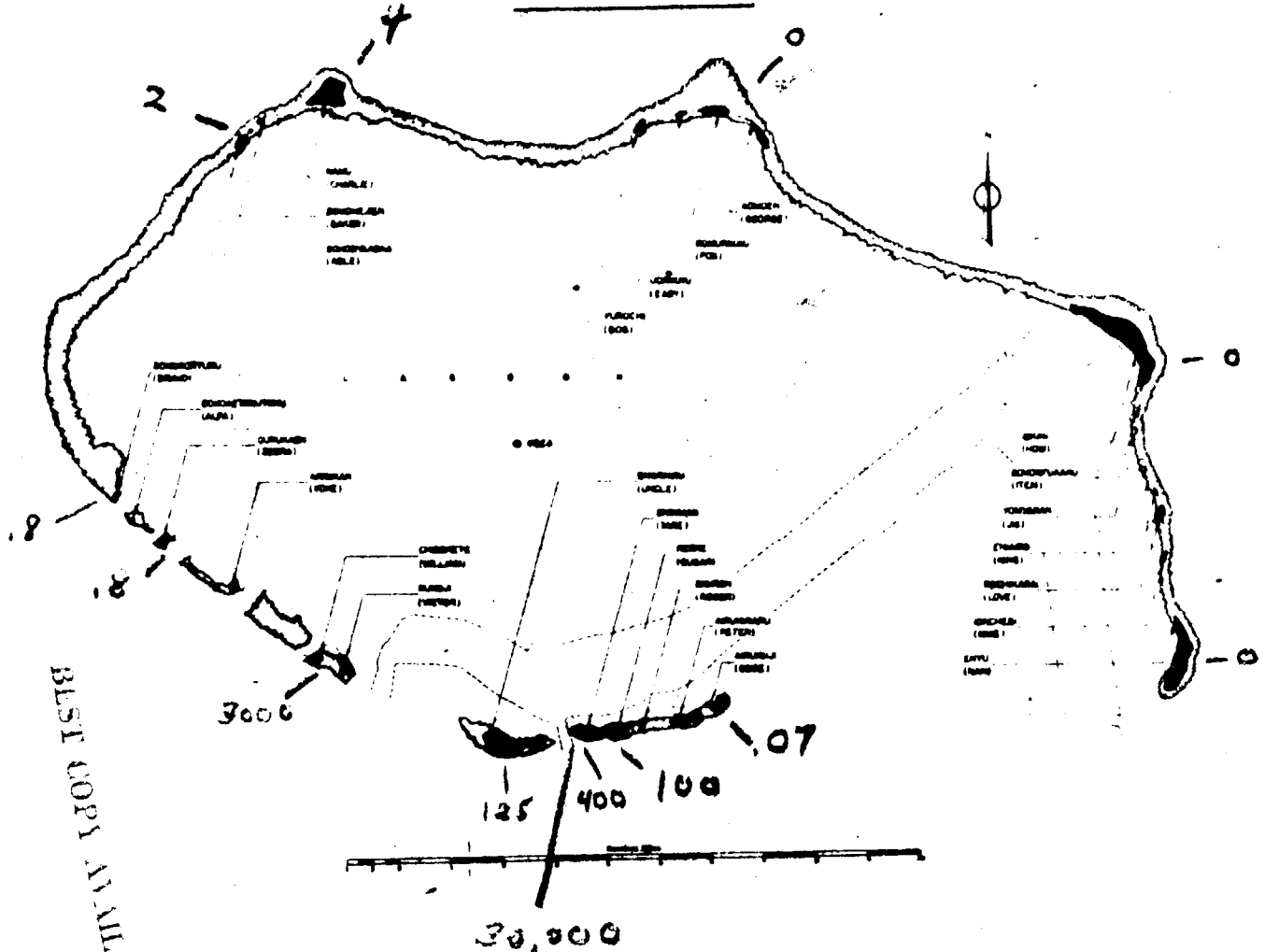
Height (Feet)	Direction (Degrees)	Velocity (Knots)
Surface	090	14
1,000	090	14
2,000	090	13
3,000	090	16
4,000	090	16
5,000	090	14
6,000	100	15
7,000	090	16
8,000	070	16
9,000	090	16
10,000	100	15
12,000	080	09
14,000	120	09
16,000	110	10
18,000	220	10
20,000	240	07
22,000	190	12
24,000	210	08
26,000	250	09
28,000	310	14
30,000	310	21
32,000	270	16
34,000	300	18
36,000	220	20
38,000	210	25
40,000	200	30
42,500	230	25
45,000	250	20
47,500	260	18
50,000	320	09
52,500	360	09
55,000	050	07
57,500	100	07
60,000	200	05
65,000	090	08
70,000	110	10
75,000	080	22
80,000	090	31
85,000	090	45

H+1 SURVEY

NUTMEG EVENT

Readings at ground level
in mr/hr

MAP OF BIKINI ATOLL



TAB F

INDEX

TAB

[redacted]

YELLOWWOOD EVENT

OPERATION HARDTACK

1. The YELLOWWOOD device was detonated at 1400M, 26 May 1958, at a position 5,000 feet southwest of Janet Island, Eniwetok Atoll. Initial radar reports were unreliable. Pilot reports from sampler aircraft estimated the cloud height at 50,000 feet, cloud base at 30,000 feet, with initial direction true bearing 250 degrees at 20 to 25 knots.

2. The P2V's cleared into the area at 1430M. One P2V was vectored over the northeast islands to determine whether or not the sampling rockets had been fired. The second P2V was vectored between Yvonne and Leroy. As the cloud moved west-southwest of the lagoon, one P2V was used to survey the northern section of the lagoon. The area was generally clear, and reentry was declared at 1530M. The activities of the office were greatly hampered by slow communications with the tracking aircraft through Manhunt.

3. The survey helicopter took off at 1604M. The highest reading was made at Alice: 200 r. Other readings along the northern chain averaged from 4 mr/hr to 10 mr/hr.

4. The fallout had been predicted to fall along a bearing of 260 degrees for 200 miles; however, [redacted] the actual fallout pattern extended to only 150 miles.

[redacted]

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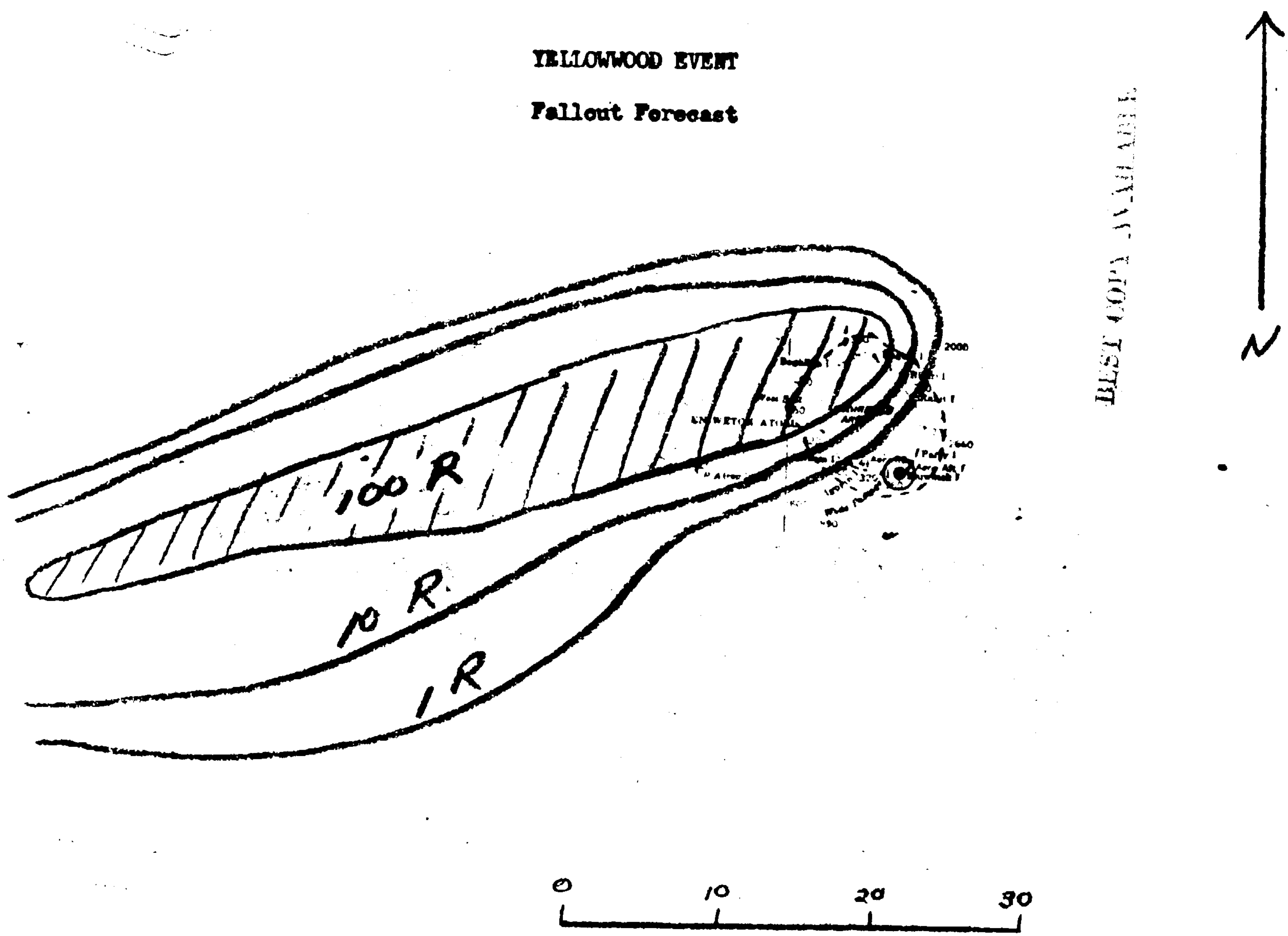
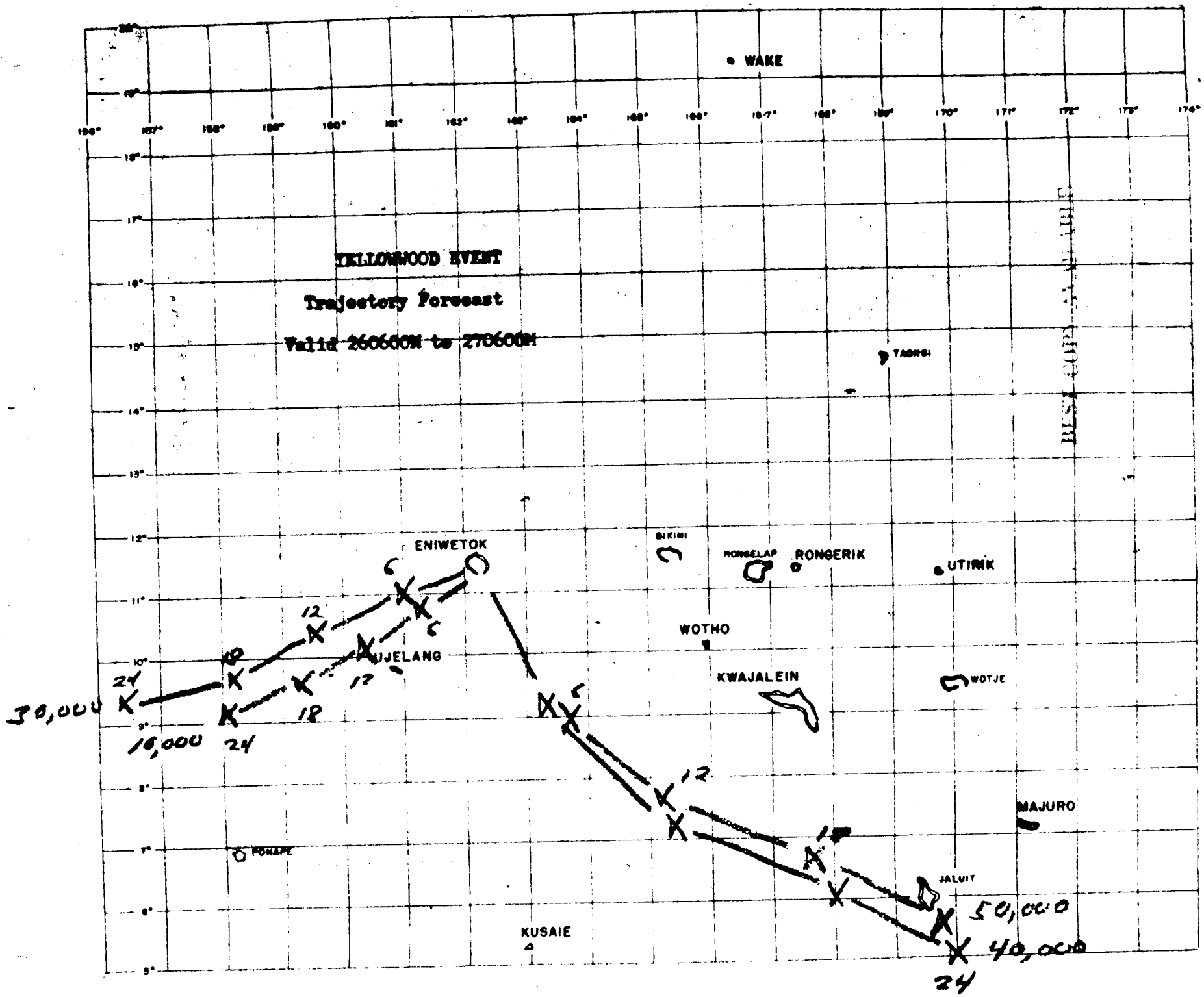
YELLOWWOOD EVENT

Fallout Forecast

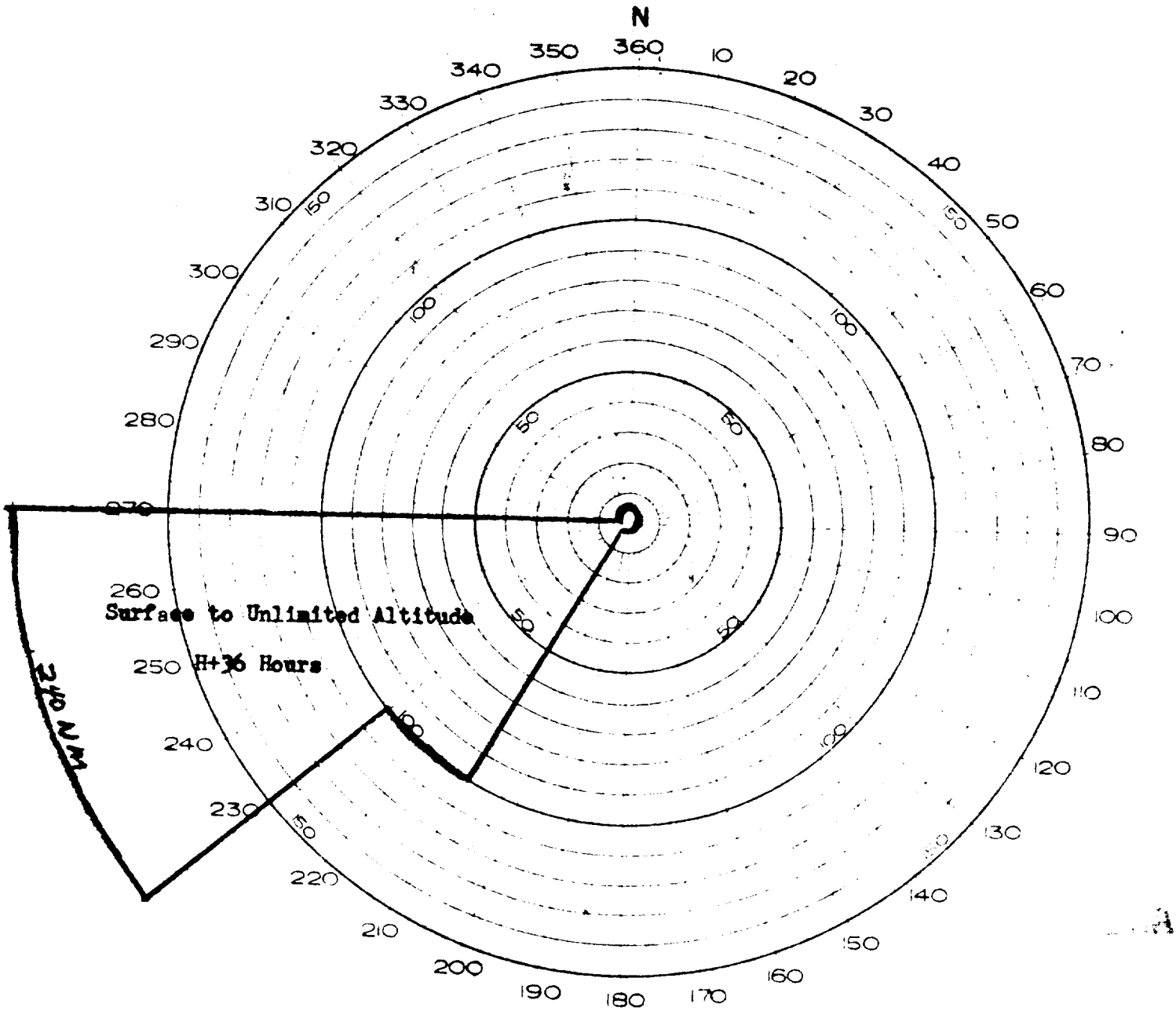


TAB R


WAKE
YELLOWWOOD EVENT
Trajectory Forecast
Valid 260600M to 270600M
TAGNGI
BIKINI
RONGELAP
RONGERIK
UTIRIK
ENIWETOK
WOTHO
KWAJALEIN
WOTJE
MAJURO
JALUIT
KUSAIE
PONAPE
30,000
16,000
50,000
40,000
24
18
12
6
0

TAB C

HODOGRAPH
RESULTANT WINDS AND SURFACE RADEX

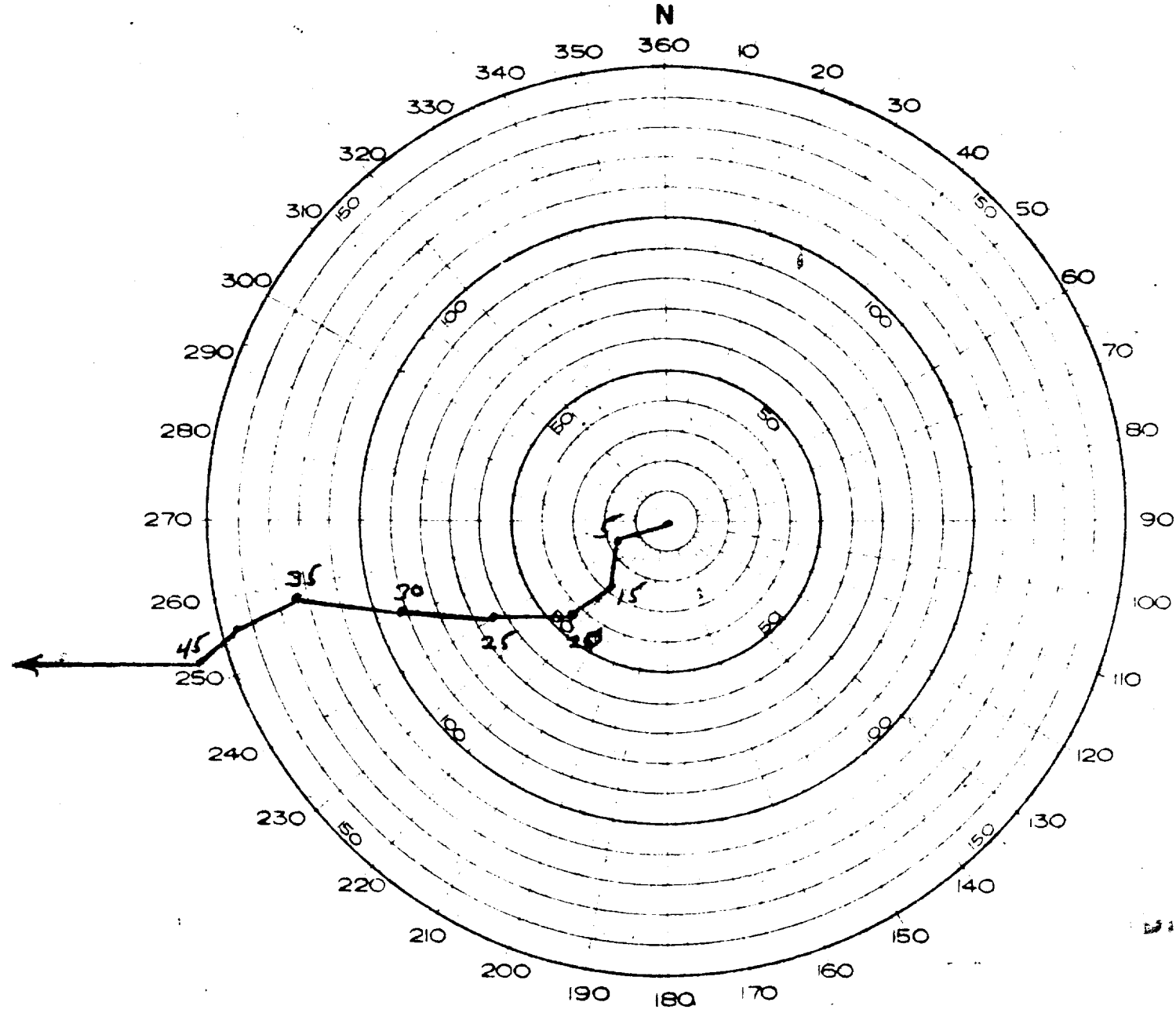


YELLOWWOOD EVENT

Surface and Air Radex

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



YELLOWWOOD EVENT

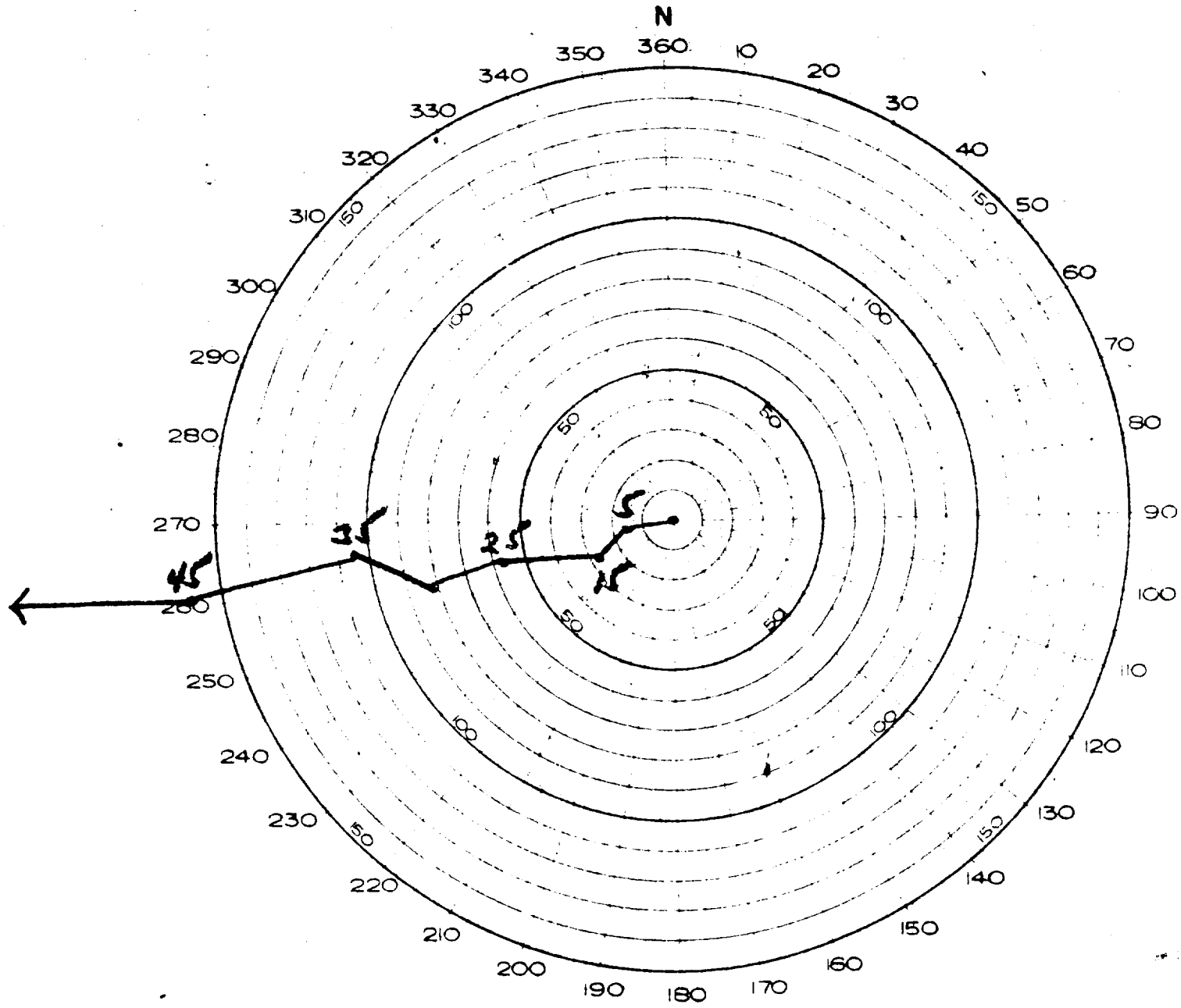
Forecast Hodograph

261400M

TAB E-1

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



YELLOWWOOD EVENT

Shot-time Hodograph
260200Z May

TAB E-2

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

27 May 1958

YELLOWOOD

ENIWETOK OBSERVED WEATHER FOR 26 MAY 1958
AT DETONATION TIME: 1400M

SURFACE WEATHER:

Sea Level Pressure	1010.8 mbs
Free Air Surface Temperature	87.0°F
Wet Bulb Temperature	77.0°F
Dew Point Temperature	73.0°F
Relative Humidity	63%
Surface Wind	090° 14 knots
Visibility	10 miles
Weather	None

CLOUDS:
Scattered cumulus (4/10) bases 2,000 feet.

AREA WEATHER SUMMARY FROM AIRCRAFT:
Scattered cumulus (4/10) bases 1,800 feet, tops 4,000 feet. Moderate turbulence at 4,000 feet.

STATE OF THE SEA:
OPEN SEA: Wave height 3 feet, period 4 seconds, length 30 to 50 feet.
LAGOON: Wave height less than 1 foot, period and length negligible.

YELLOWOOD

ENIWETOK RADIOSONDE OBSERVATION

Pressure (Millibars)	Height (Feet)	Temperature (°C)	Dew Point (°C)
1011	Surface	27.5	19.5
1000	340	26.8	19.2
920	2,756	19.8	15.2
873	4,200	17.2	08.2
850	4,960	17.5	00.8
765	7,972	13.8	-11.5
718	9,679	12.1	Miss
700	10,320	11.1	Miss
660	12,008	08.5	-15.2
644	12,730	07.0	-07.0
633	13,156	06.2	~~-10.6~~ -15.0
600	14,490	04.2	-17.5
546	17,060	00.8	-10.2
500	19,300	-02.5	-19.2
488	19,980	-03.5	-22.8
400	24,990	-13.0	Miss
300	31,930	-31.9	Miss
250	36,070	-42.2	Miss
200	40,920	-52.0	Miss
150	46,850	-65.2	Miss
100	54,710	-77.0	Miss
077	60,060	-79.0	Miss
069	62,205	-72.0	Miss
066	63,096	-73.0	Miss
059	65,109	-70.0	Miss
057	65,934	-65.0	Miss
050	68,040	-63.7	Miss
041	72,600	-62.0	Miss
039	73,590	-58.0	Miss
034	76,494	-58.0	Miss
025	82,380	-51.1	Miss
004	123,057	-30.3	Miss

YELLOWOOD

ENIWETOK WINDS ALOFT OBSERVATION

Height (Feet)	Direction (Degrees)	Velocity (Knots)
Surface	090	12
1,000	090	14
2,000	090	14
3,000	090	16
4,000	080	15
5,000	080	14
6,000	070	11
7,000	060	11
8,000	050	08
9,000	050	09
10,000	050	07
12,000	040	10
14,000	050	06
16,000	070	06
18,000	060	17
20,000	070	26
22,000	090	15
23,000	090	16
24,000	090	18
26,000	110	19
28,000	100	21
30,000	080	25
32,000	080	28
34,000	100	26
35,000	110	26
36,000	100	29
38,000	090	24
40,000	070	27
42,500	080	25
45,000	080	28
47,500	090	24
50,000	090	21
52,500	070	16
55,000	050	21
57,500	070	21
60,000	070	20
65,000	060	08
70,000	090	06
75,000	080	37
80,000	100	43
85,000	100	44
90,000	100	50
95,000	100	55
100,000	090	66
105,000	080	75
110,000	080	69
115,000	100	91
120,000	110	97
123,000	110	98

ENIWETOK ATOLL
NORTH PACIFIC OCEAN
N
TEITEIRIPUCCHI (Bone)
BOGAHRIKK (Helen)
BOSON (Irene)
SANIL DEFONSO (Edna)
COCHIT (Daisy)
200
ENGEBI (Jane)
RUCHI (Clara)
MUZINBAARIKKU (Kate)
KIRINIAN (Lucy)
BOKONAARAPPU (Mary)
BOGOMBOGO (Belle)
YERI (Nancy)
AITSU (Olive)
RUJORU (Pearl)
BOGALLUA (Alice)
200,000
120
AOMON (Sally)
EBERIRU (Ruby)
10
4
4
4
BIJIRI (Tilda)
ROJOA (Ursula)
2
AARAANBIRU (Vera)
PIIRAAI (Wilma)
RUNIT (Yvonne)
PHOTO TOWER (Mack)
CORAL HEAD (Oscar)
(Zona)
(Sam)
(Tom)
URIAH
(Van)
ANIYAANI (Bruce)
CHINIINI (Clyde)
JAPTAN (David)
DEEP ENTRANCE
JIERORU (Rex)
PARRY (Elmer)
ENIWETOK (Fred)
ALL READINGS IN MR/HR, GROUND LEVEL, AS OF 1630, 26 MAY 1958
BEST COPY AVAILABLE
- - - - LIMITED RADEX
——— FULL RADEX

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TAB

[redacted]

MAGNOLIA EVENT

OPERATION HARDTACK

1. The MAGNOLIA device was detonated at 0600M, 27 May 1958, 3,000 feet southwest of the center of Yvonne Island. The cloud rose immediately to 44,000 feet and stabilized at 41,000 feet with the base at 15,000 feet. Radar confirmed this position, and the initial cloud movement was westerly. The middle segment remained over ground zero, and the upper and lower levels moved on a bearing of 250 degrees.

2. The P2V aircraft was vectored from Alvin to Keith at 0633M, and it reported readings of Zero at 500 feet. The northern chain was then surveyed, with the highest reading recorded over Alice: 5 mr/hr, at 0647M. The lagoon area was swept in 10-degree increments, and in the center of the lagoon at 500 feet, 7 r was recorded at 0735M. The aircraft was considered contaminated and was instructed to wash down at Fred. Reentry was declared at 0730M.

3. A helicopter ground survey was initiated at 0745M. The highest reading was recorded at Alice, with 22,000 mr/hr, which is attributed to the YELLOWWOOD event. Other islands in the northern chain ranged from 2 mr/hr to 120 mr/hr, with Yvonne reading 1,200 to 2,000 mr/hr.

4. A second helicopter survey was made at 1430M. The southern chain indicated only background with the exception of Leroy, which read 35,000 mr/rh at twenty-five feet. This high reading is attributed to a small section of the cloud which did not move out of the lagoon as anticipated. This high reading accounted for the contamination of the P2V.

[redacted]

[redacted]

5. Fallout fell within the forecast area. Ujelang was monitored closely, but no increase in background was recorded.

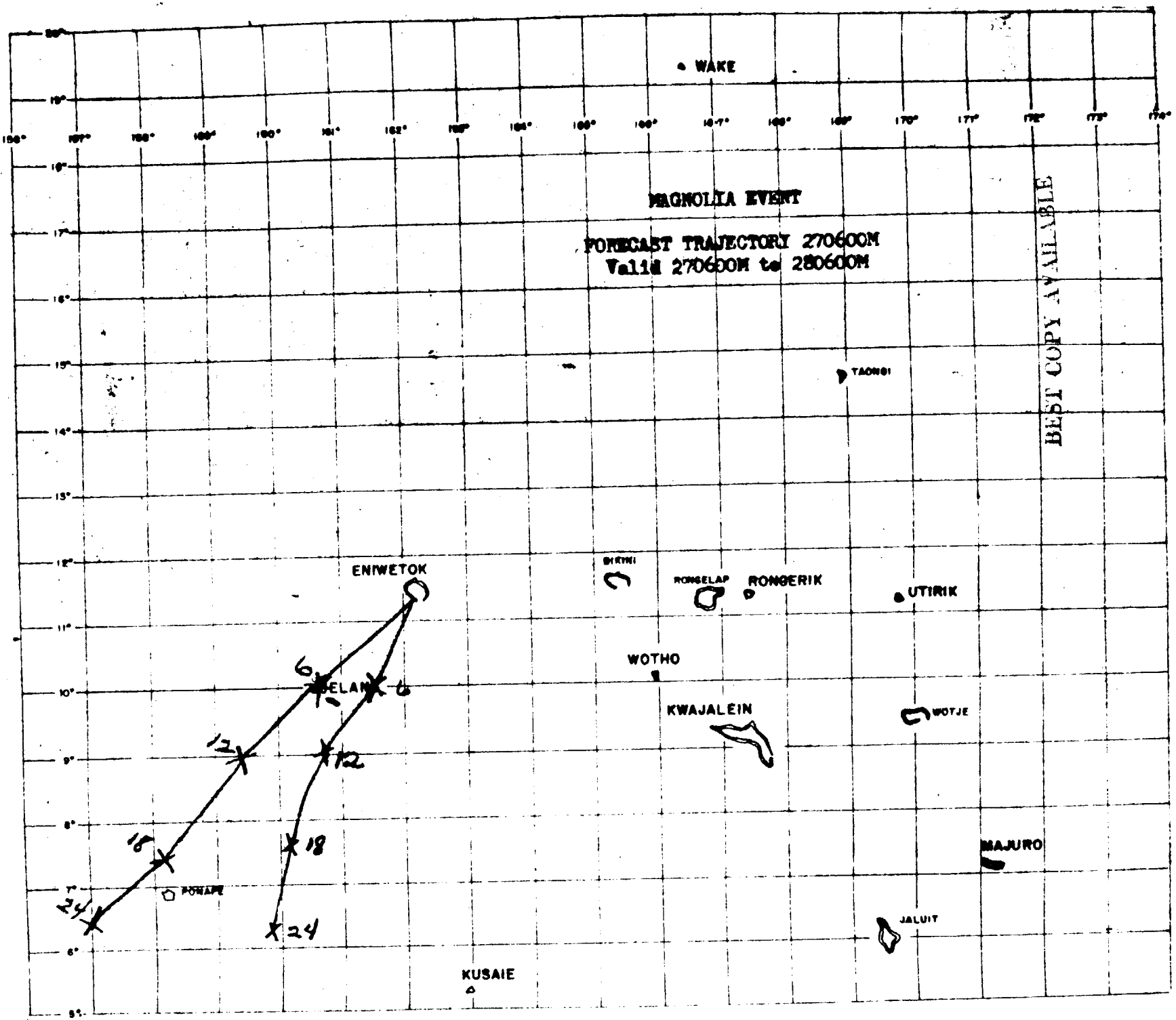
122

[redacted]

MAGNOLIA EVENT

Fallout Forecast

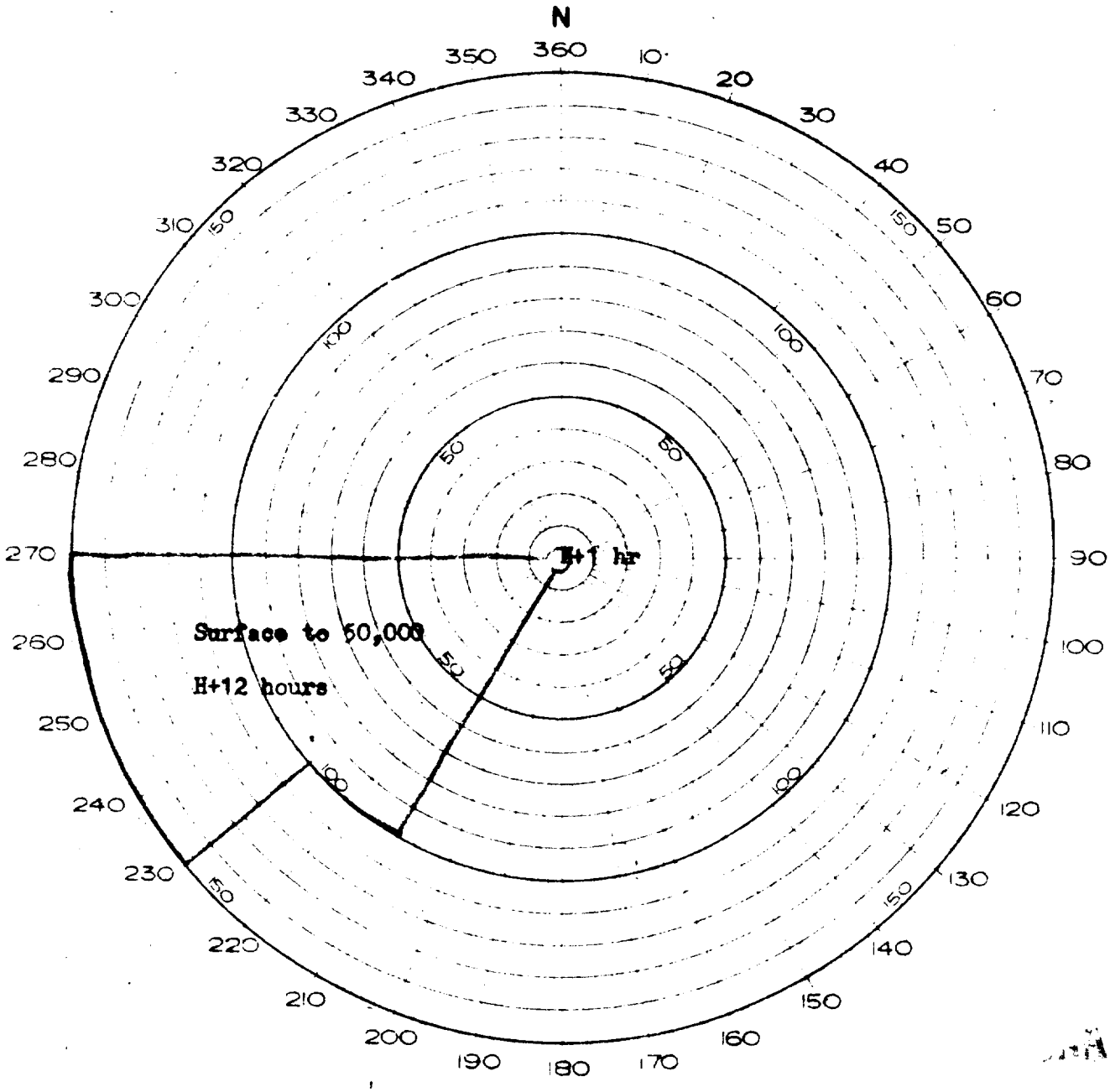
DNA


WAKE
MAGNOLIA EVENT
FORECAST TRAJECTORY 270600M
Valid 270600M to 280600M
BEST COPY AVAILABLE
TAONGI
BIKINI
RONGELAP
RONGERIK
UTIRIK
ENIWETOK
WOTHO
KWAJALEIN
WOTJE
MAJURO
JALUIT
PONAPE
KUSAIE
6
12
18
24

TAB C

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX

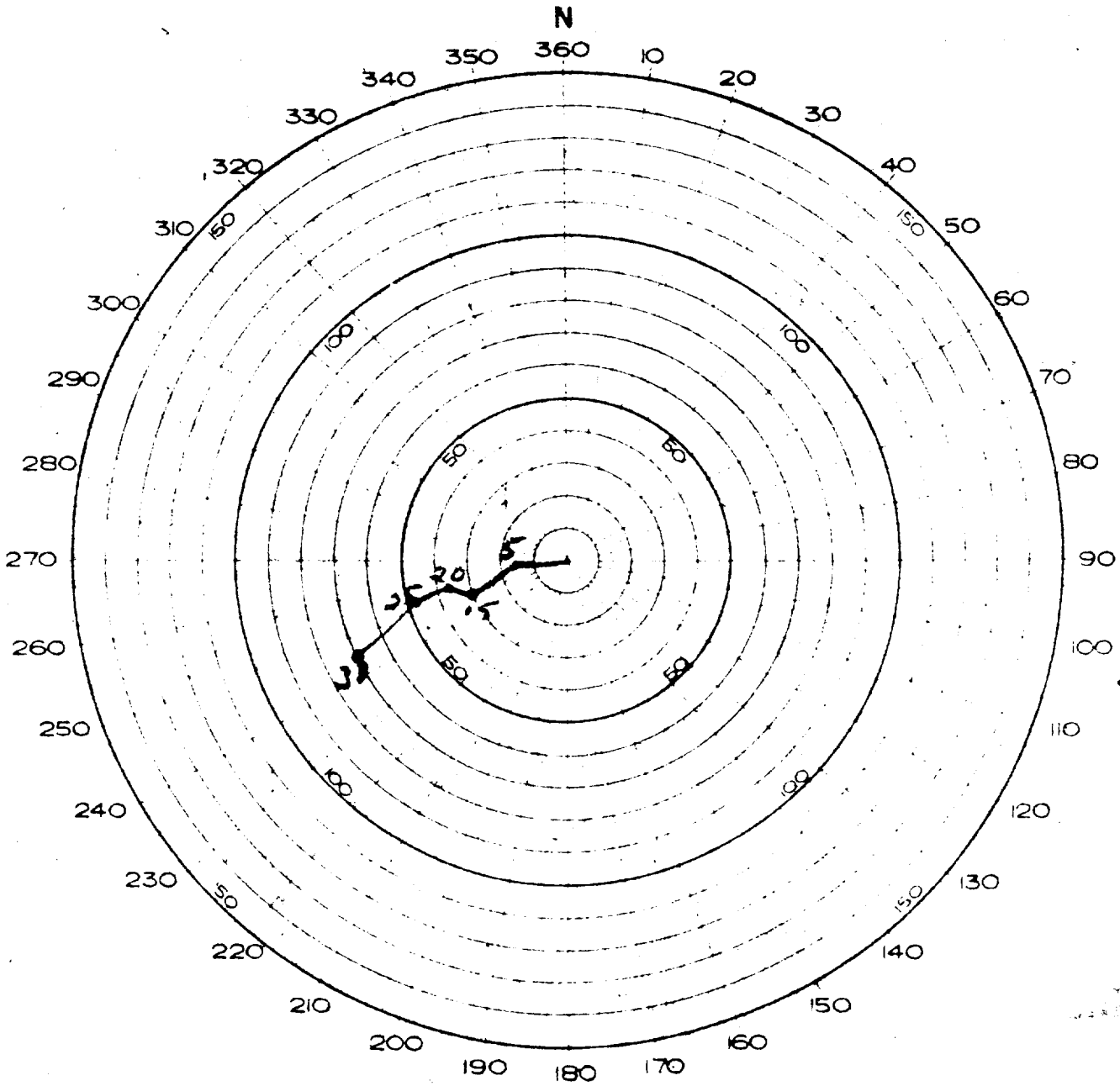


MAGNOLIA EVENT

Surface and Air Radex

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX

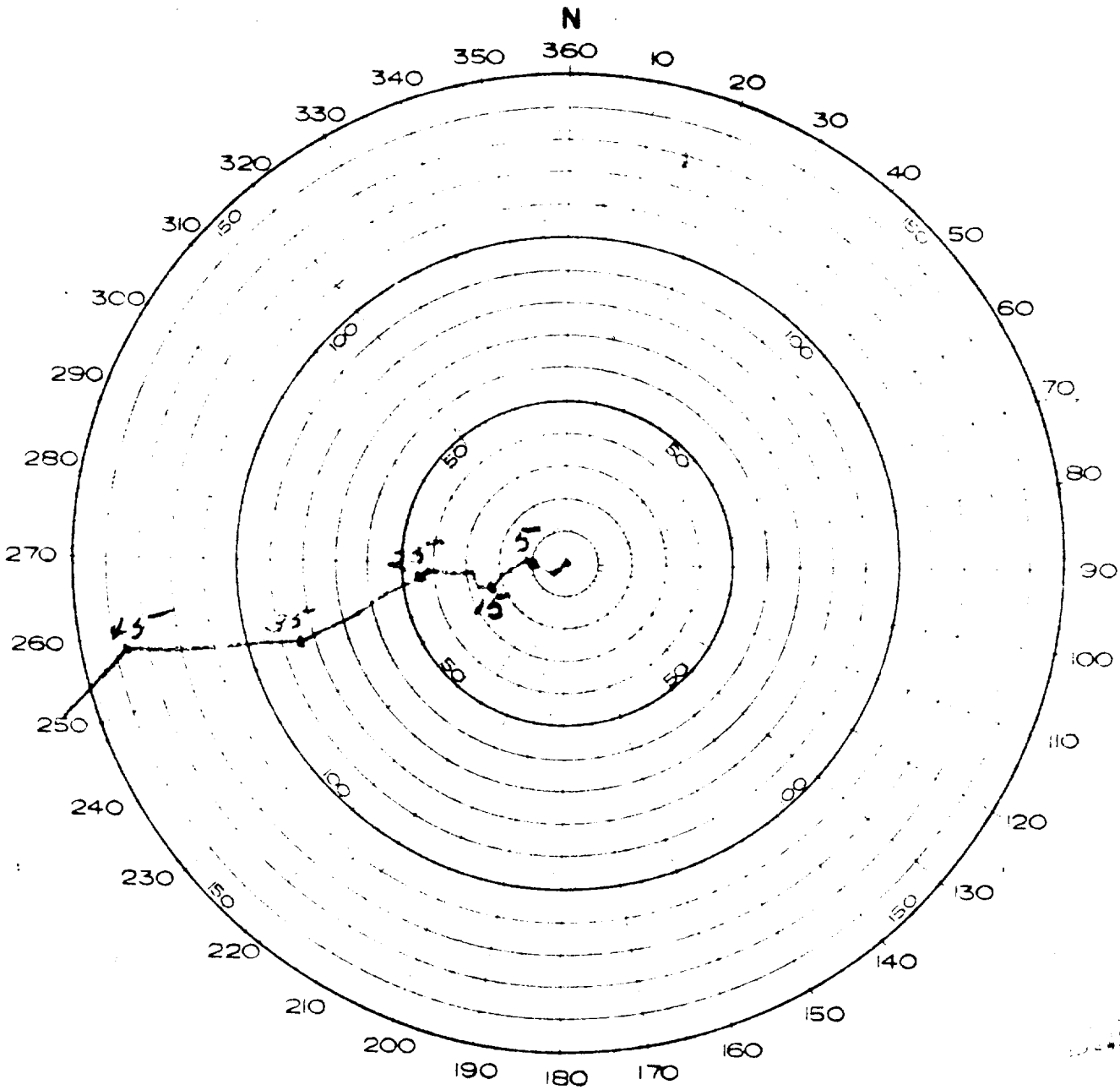


MAGNOLIA EVENT

Forecast Hodograph
270600M May

TAB E-1

HODOGRAPH
RESULTANT WINDS AND SURFACE RADEX



MAGNOLIA EVENT

Shot-time Hodograph
270600M May

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TAB E-2

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

28 May 1958

MAGNOLIA

ENIWETOK OBSERVED WEATHER FOR 27 MAY 1958
AT DETONATION TIME: 0600M

SURFACE WEATHER:

Sea Level Pressure	1010.5 mbs
Free Air Surface Temperature	80.0°F
Wet Bulb Temperature	74.2°F
Dew Point Temperature	72.0°F
Relative Humidity	76%
Surface Wind	090° 14 knots
Visibility	10 miles
Weather	None

CLOUDS:
Scattered (2/10) cumulus bases 1,800 feet to 2,000 feet. Scattered (2/10) cirriform, bases unknown.

AREA WEATHER SUMMARY FROM AIRCRAFT:
Scattered (2/10) cumulus bases 2,000 feet, tops generally 3,500 to 4,000 feet with occasional tops to 8,000 feet. Cirrus bases unknown. Contrails at 35,000 feet and upward.

STATE OF THE SEA:
Open Sea: Wave height 3 feet, period 4 seconds, length 30 to 40 feet.
Lagoon side: Wave heigh less than 1 foot. Light swell height less than 1 foot, period 4 seconds, length 60 to 80 feet.

MAGNOLIA

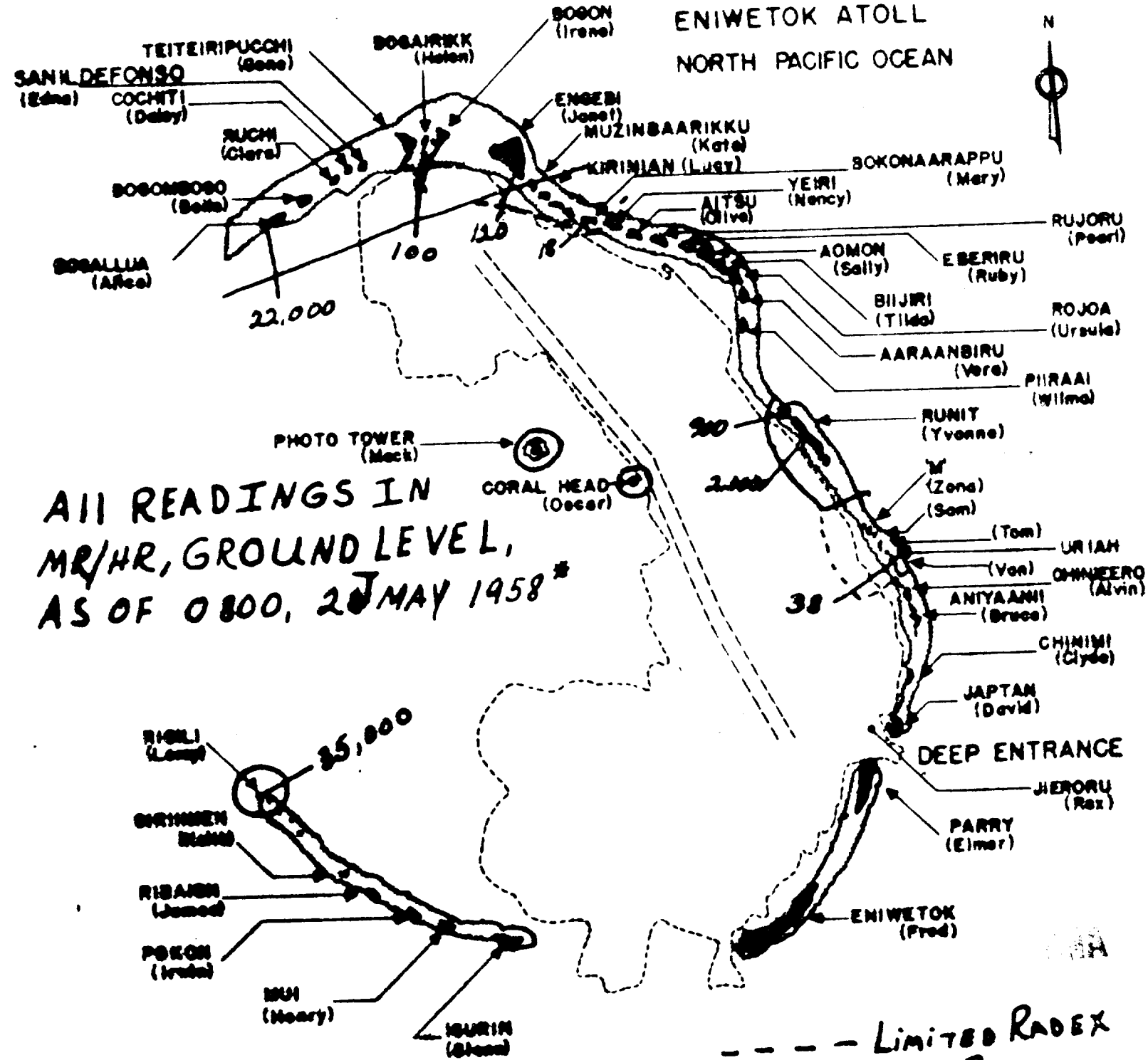
ENIWETOK RADIOSONDE OBSERVATION

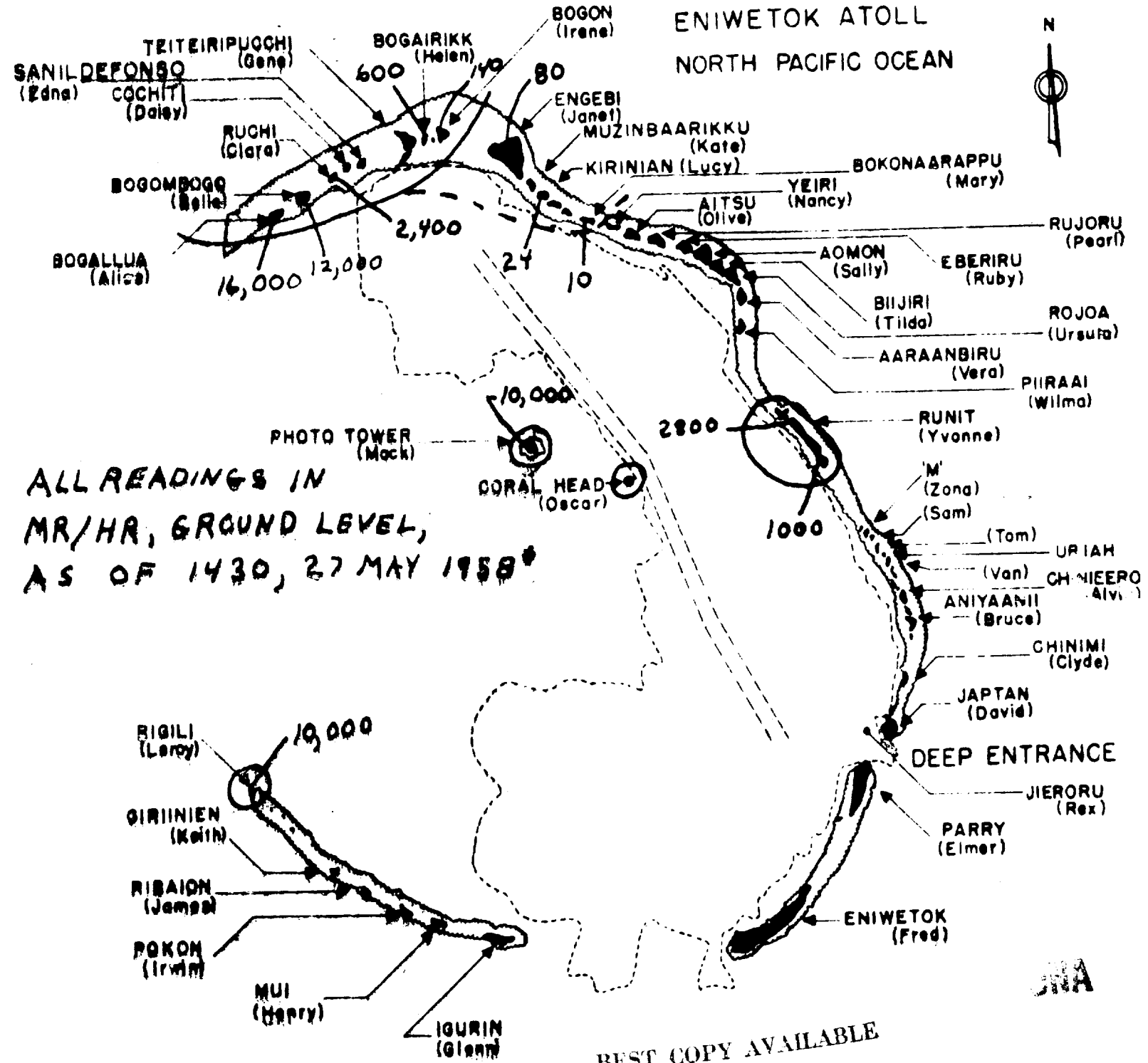
Pressure (Millibars)	Height (Feet)	Temperature (°C)	Dew Point (°C)
1010	Surface	26.5	21.8
1000	310	26.2	21.2
850	4,940	16.2	12.8
840	5,315	15.5	12.2
810	6,299	16.2	-05.2
700	10,320	11.2	-05.8
642	12,664	05.2	-05.8
600	14,470	03.8	-12.2
516	18,471	~~-11.8~~ -01.7	-19.8
500	19,270	-03.2	Miss
400	24,960	-14.5	Miss
300	31,890	-31.0	Miss
500	19,270	-03.2	Miss
400	24,960	-14.5	Miss
300	31,890	-31.0	Miss
250	36,~~200~~ 040	-41.2	Miss
200	40,890	-52.8	Miss
150	46,800	-65.5	Miss
100	54,590	-80.5	Miss
077	59,895	-83.0	Miss
075	60,390	-76.0	Miss
071	61,446	-78.0	Miss
065	63,030	-69.0	Miss
060	64,515	-69.0	Miss
057	65,604	-65.0	Miss
050	67,820	-61.5	Miss
~~020~~ 025	82,080	-55.0	Miss
015	93,621	-43.0	Miss

MAGNOLIA

ENIWETOK WINDS ALOFT OBSERVATION

Height (Feet)	Direction (Degrees)	Velocity (Knots)
Surface	090	14
1,000	080	12
2,000	080	12
3,000	090	12
4,000	100	13
5,000	120	09
6,000	120	06
7,000	080	04
8,000	070	07
9,000	070	08
10,000	070	08
12,000	060	08
14,000	040	10
16,000	050	04
18,000	100	08
20,000	130	08
22,000	090	17
24,000	090	11
26,000	070	12
28,000	070	21
30,000	060	27
32,000	060	27
34,000	060	22
36,000	060	23
38,000	080	22
40,000	080	21
42,500	090	24
45,000	090	34
47,500	060	17
50,000	040	21
52,500	050	29
55,000	050	20
57,500	040	26
60,000	060	27
65,000	100	13
70,000	080	16
75,000	090	32
80,000	090	43
85,000	090	62
90,000	090	69
91,000	090	68





ALL READINGS IN MR/HR, GROUND LEVEL, AS OF 1430, 27 MAY 1958*

*MACK PHOTO TOWER AS OF 1100.

YELLOWWOOD G. Z. — 10 MR/HR.

- - - - LIMITED RADEX

——— FULL RADEX

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TAB

A—Summary, TOBACCO Event, Operation HARDTACK

B—Forecast Fallout Plot

C—Trajectory Plot

D—Air and Surface Radex

E—1. Forecast Hodograph

2. Shot-time Hodograph

3. Weather Summary

F—Radiological Surface Survey, H+2 Hours

[redacted]

TOBACCO EVENT

OPERATION HARDTACK

1. The TOBACCO device was detonated 3,000 feet northwest of Janet Island Eniwetok Atoll, at 1415M, 30 May 1958. [redacted] the cloud rose only to 18,000 feet, then stabilized at 16,000 feet at 1430M. The portion of the cloud below 10,000 feet moved in the direction of 280 degrees at 22 knots. The upper portion moved in the direction of 325 degrees at 10 knots.

2. The P2V reported over Fred at 1515M, and it was placed on barrier patrol between Yvonne and Leroy. Readings of Zero were obtained on this line, so the aircraft was vectored northward in 10-degree increments from Leroy. No significant readings were obtained on this sweep. The plane was then vectored at 1630M on a track of 280 degrees from Leroy for 20 miles. No significant readings were found on this leg either, so the aircraft was released.

3. The helicopter survey was initiated at two hours after shot time. It was interrupted over Yvonne by low clouds and rain, but the survey was resumed by 1620M. The highest reading was recorded on Janet: 120 mr/hr. Other readings along the northern chain ranged from Zero on Wilma to 16 mr/hr on Mary.

4. Fallout fell well within the confines of the forecast fallout plot.

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TAB A

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[redacted]

TOBACCO EVENT

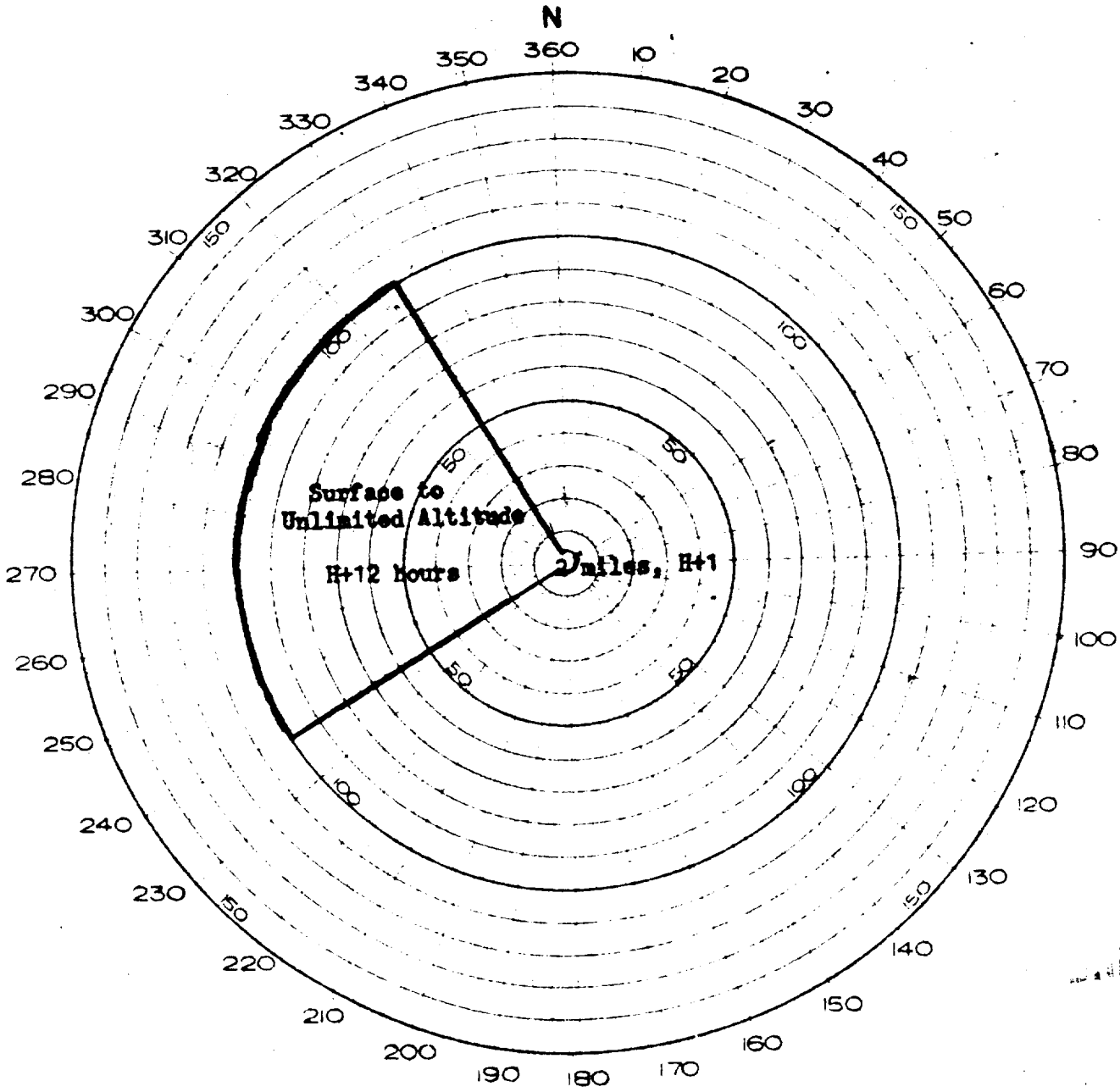
Fallout Forecast

TAB B

TAB C

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



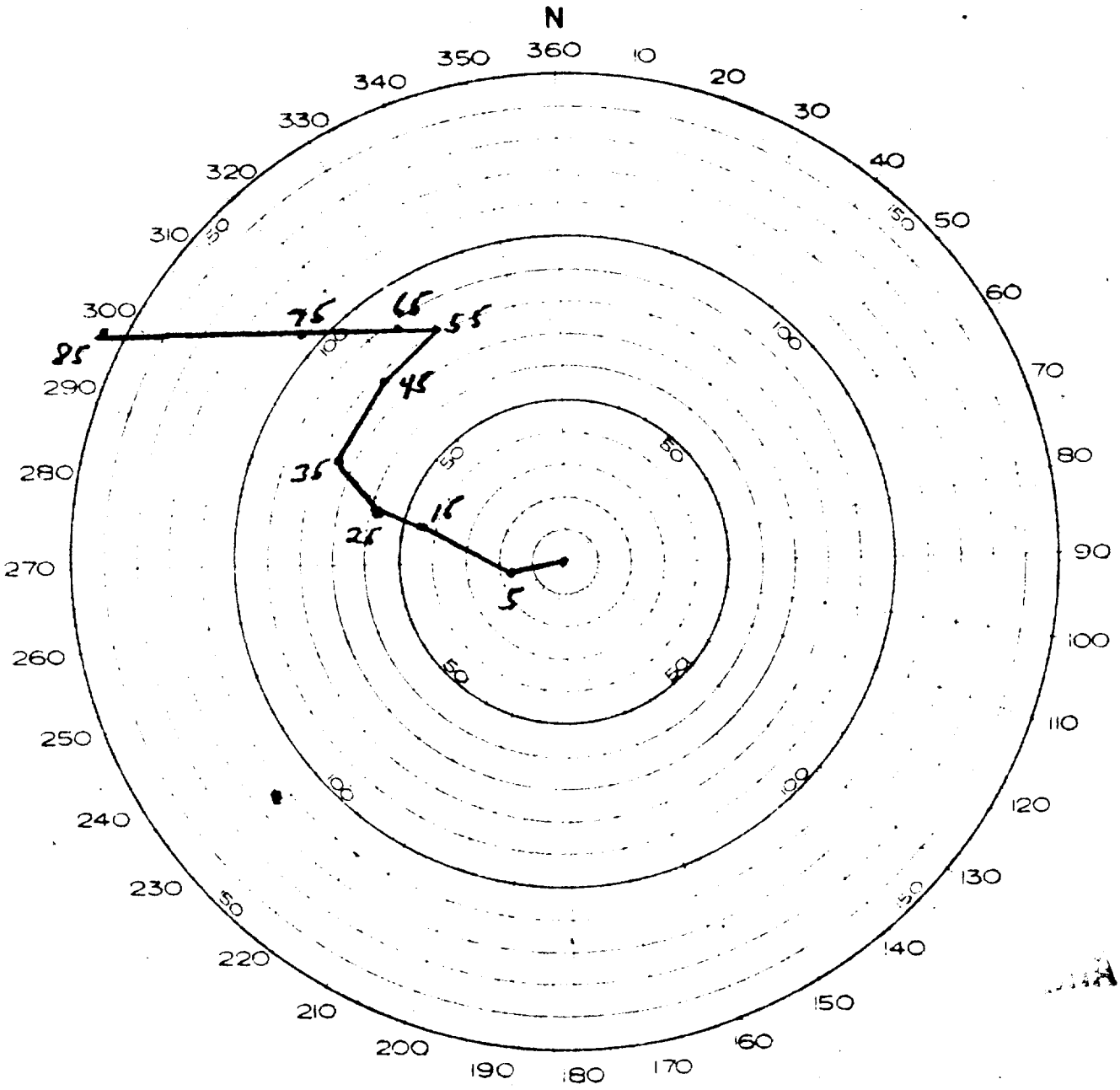
TOBACCO EVENT

Surface and Air Radex

TAB D

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



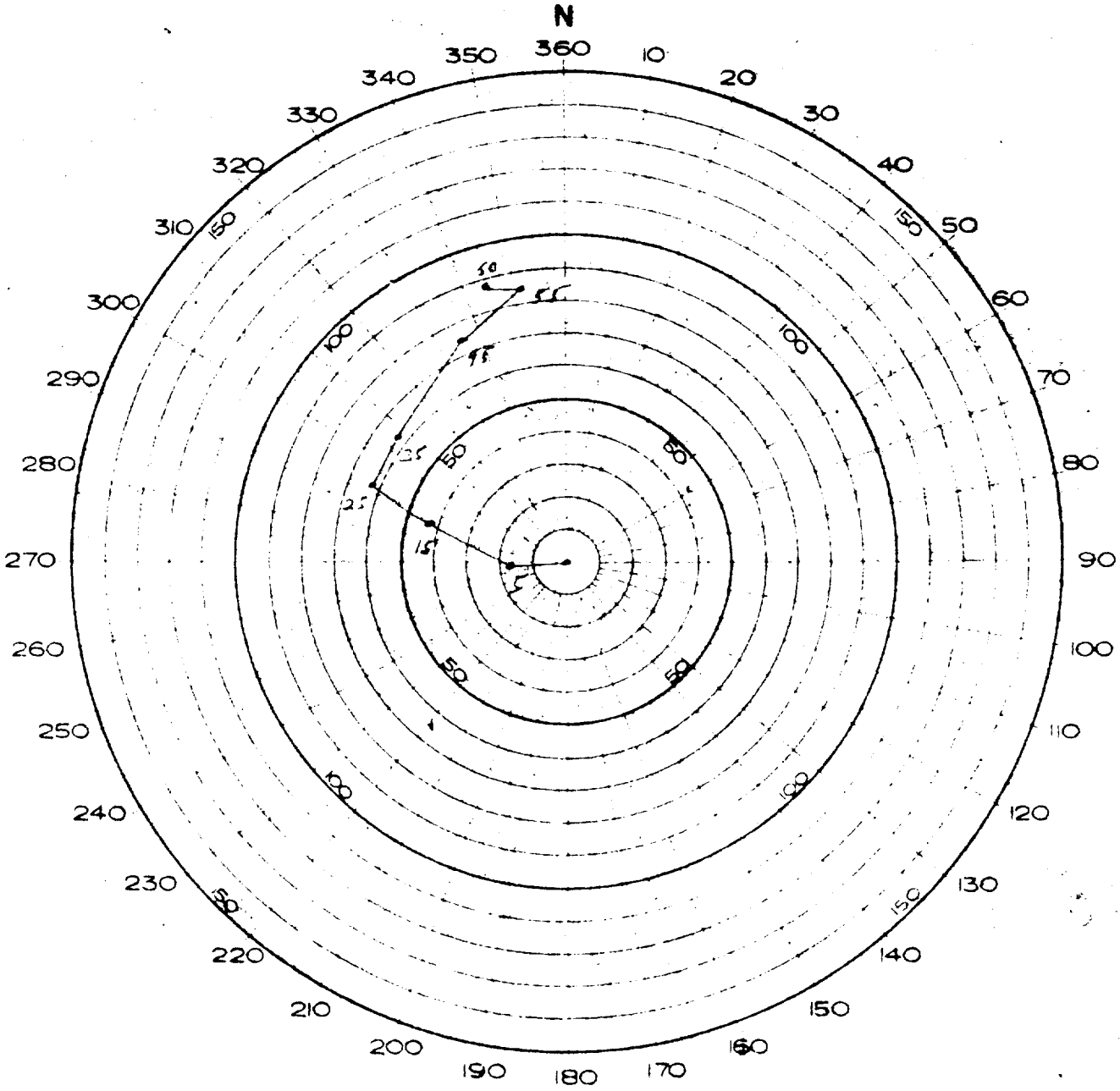
TOBACCO EVENT

Forecast Hodograph
301400M May

TAB E-1

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



TOBACCO EVENT

Shot-time Hodograph

TAB E-2

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

2 June 1958

TOBACCO

ENIWETOK OBSERVED WEATHER FOR 30 MAY 1958
AT DETONATION TIME: 1400M

SURFACE WEATHER

Sea Level Pressure	1010.2 mbs
Free Air Surface Temperature	84.0° F
Wet Bulb Temperature	77.4° F
Dew Point Temperature	75.0° F
Relative Humidity	74%
Surface Wind	080° 12 knots
Visibility	7 miles

Weather: Towering cumulus all quads. Rainshowers northeast through southeast, intensity unknown.

CLOUDS:
Broken cumulus (6/10), bases 2,000 feet to 2,500 feet. Scattered (1/10 to 4/10) cirrus, bases unknown.

AREA WEATHER SUMMARY FROM AIRCRAFT:

Broken cumulus (6/10) bases and tops unknown, moderate turbulence and rain in clouds. Cirrus estimated at 37,000 feet.

STATE OF THE SEA:
Open Sea: Waves from 090°, height 3 feet, period 3 - 4 seconds, length 30 - 50 feet.
Lagoon side: Waves less than 1 foot high.

TOBACCO

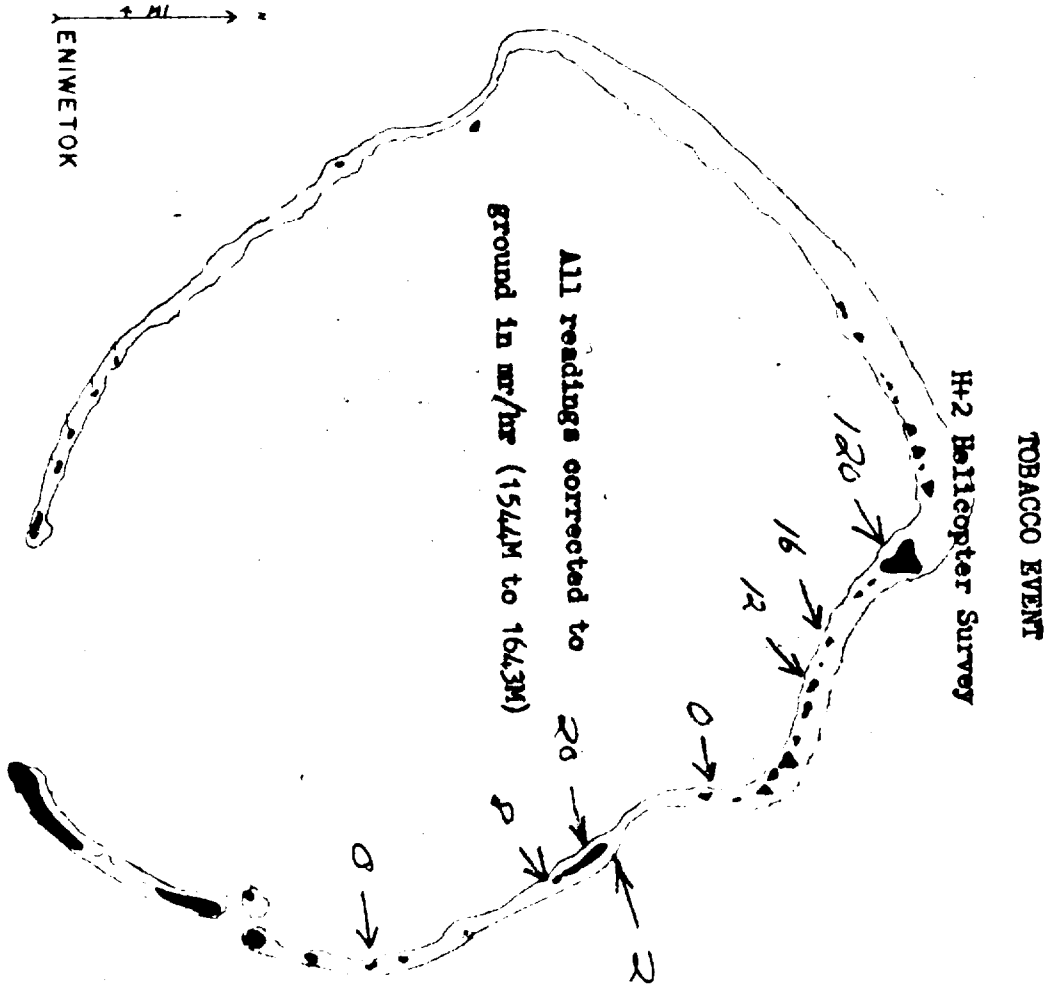
ENIWETOK RADIOSONDE OBSERVATION

Pressure (Millibars)	Height (Feet)	Temperature (°C)	Dew Point (°C)
1010	Surface	26.2	22.2
1000	310	25.8	21.8
850	4,960	17.6	14.5
788	7,119	13.9	11.4
700	10,340	09.5	03.2
628	13,385	05.5	01.5
600	14,510	04.0	-14.8
594	14,829	04.2	-07.8
563	16,306	02.2	-19.2
500	19,330	-03.5	Miss
400	25,020	-13.8	Miss
300	31,980	-28.8	Miss
250	36,170	-39.8	Miss
200	41,030	-53.5	Miss
150	46,900	-66.8	Miss
100	54,730	-77.5	Miss
084	58,374	-78.0	Miss
062	64,515	-66.0	Miss
057	66,165	-68.0	Miss
050	68,140	-65.2	Miss
042	72,270	-62.0	Miss
041	72,600	-59.0	Miss
025	82,390	-54.8	Miss

TOBACCO

ENIWETOK WINDS ALOFT OBSERVATION

Height (Feet)	Direction (Degrees)	Velocity (Knots)
Surface	080	12
1,000	080	21
2,000	080	31
3,000	090	18
4,000	090	14
5,000	090	12
6,000	090	15
7,000	090	19
8,000	100	18
9,000	110	16
10,000	130	17
12,000	140	12
14,000	130	09
16,000	140	11
18,000	120	10
20,000	120	10
22,000	120	12
24,000	130	11
26,000	130	11
28,000	160	11
30,000	190	06
32,000	250	09
34,000	260	13
36,000	220	15
38,000	200	17
40,000	200	15
42,500	200	15
45,000	200	15
47,500	210	17
50,000	230	15
52,500	280	09
55,000	290	06
57,500	360	04
60,000	070	07
65,000	130	20
70,000	110	15
75,000	090	30
80,000	090	42
85,000	100	57
90,000	100	60
95,000	100	62
100,000	100	67
105,000	100	63
110,000	090	67
118,000	090	83



TOBACCO EVENT

H+2 Helicopter Survey

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TAB F

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TAB

[redacted]

SYCAMORE EVENT

OPERATION HARDTACK

1. The SYCAMORE DEVICE was detonated at 1500M, 31 May 1958, on a barge off Namu (Charlie) Island, [redacted] at Bikini Atoll. The cloud rose to 46,000 feet within the first 22 minutes, according to aircraft reports received through ACC. Communications difficulties and lack of early radar cloud information detracted from our effective control of the situation.

2. P2V control was not accomplished until H+1 hour. Initial search was How to Choe, and from Choe across the lagoon on the 30-degree radial, increasing the range of the search in 10-degree increments. Negative readings were obtained. The P2V was vectored across the western portion of the lagoon and along the south and north island chain. The highest reading, 5,000 mr/hr, was obtained in the vicinity of ground zero. The P2V was then vectored east of Bikini for 120 miles. A second P2V arrived at 1800M, and it was vectored on a bearing of 280 degrees for 120 miles from Bikini, followed by a line on the 20-degree radial for 120 miles. No significant readings were encountered.

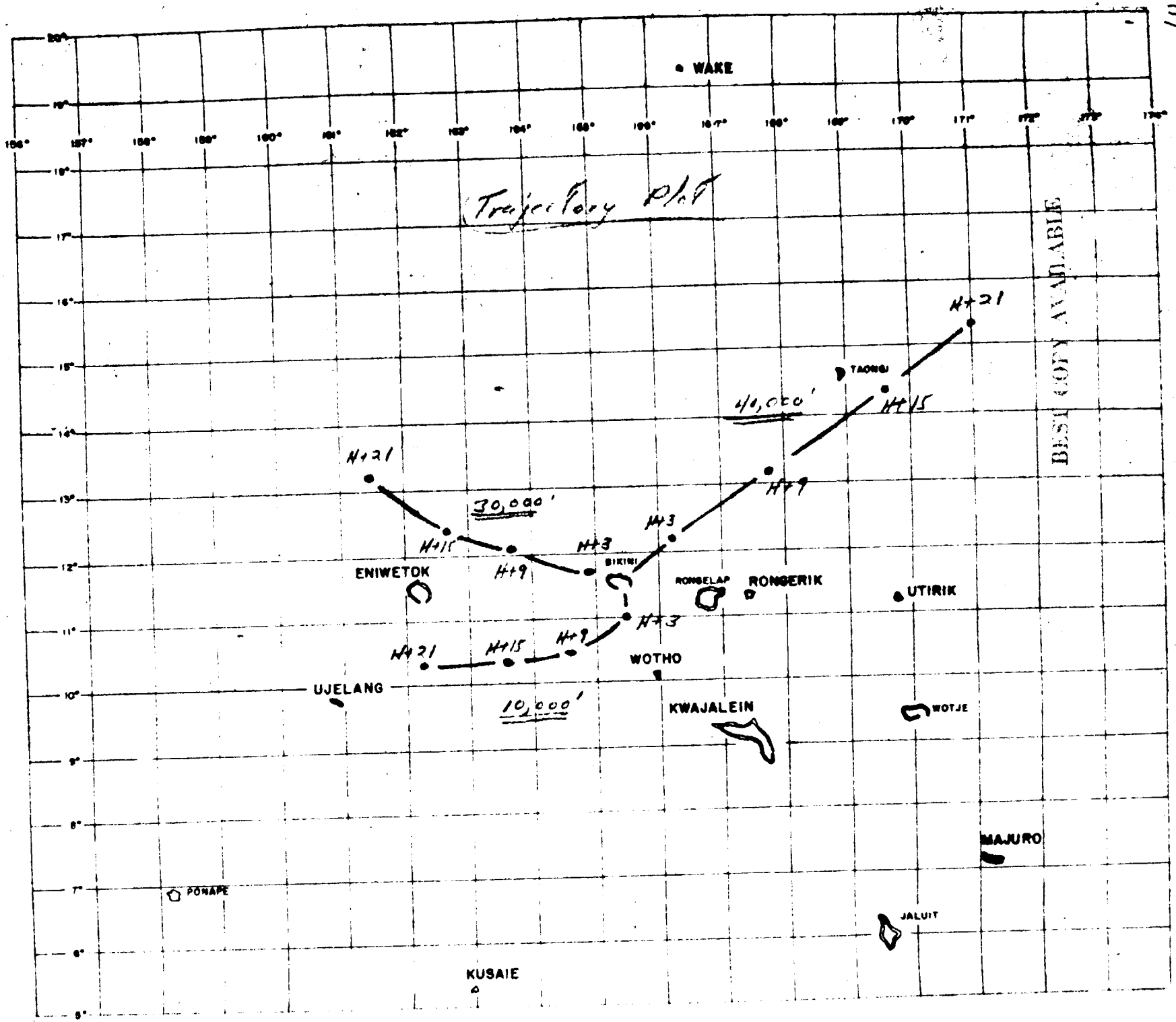
3. The helicopter survey was commenced at 1545M. The highest reading attributed to this shot was recorded on Charlie Island: 10,000 mr/hr.

4. Fallout forecast predicted the heaviest concentration between the 300-degree and the 340-degree radials. It is estimated that all fallout fell within the forecast area, [redacted] Some fallout was detected to the northeast due to a small segment of the cloud which moved in an easterly direction, but this was not considered significant.

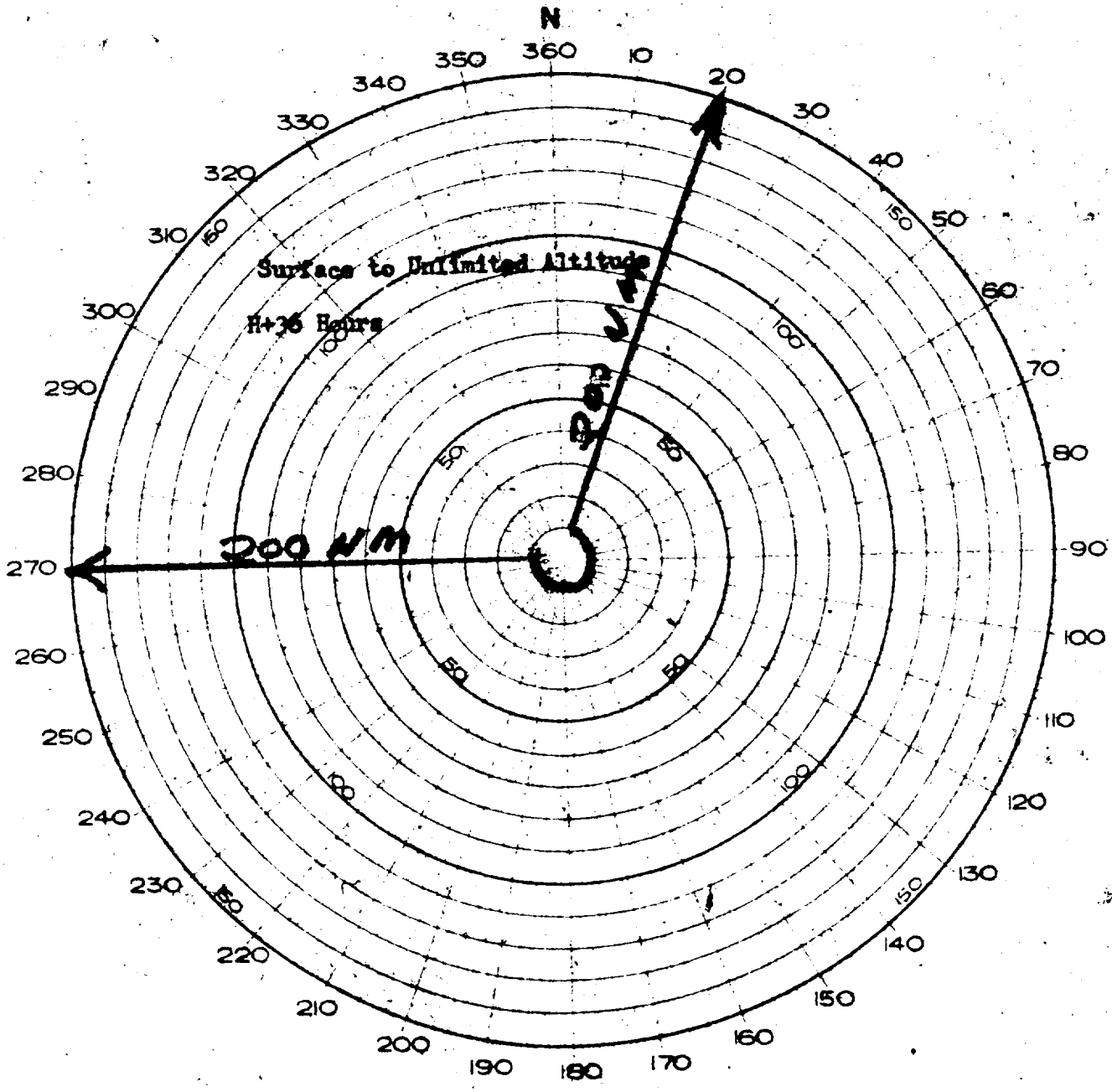
[redacted]

TAB A

[redacted]



HODOGRAPH
RESULTANT WINDS AND SURFACE RADEX



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SYCAMORE EVENT

Surface and Air Radex

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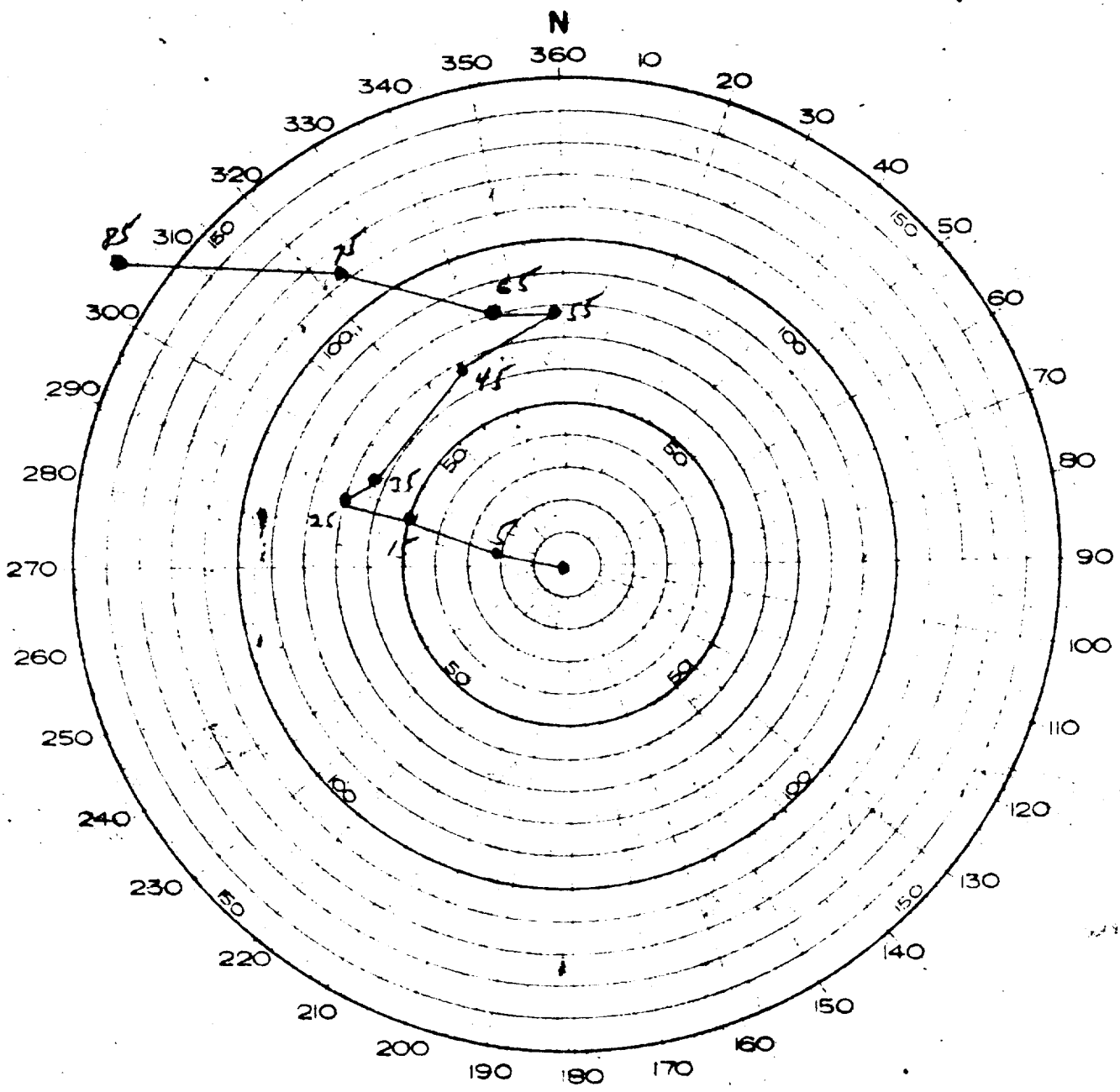
TAB D

HODOGRAPH
RESULTANT WINDS AND SURFACE RADEX



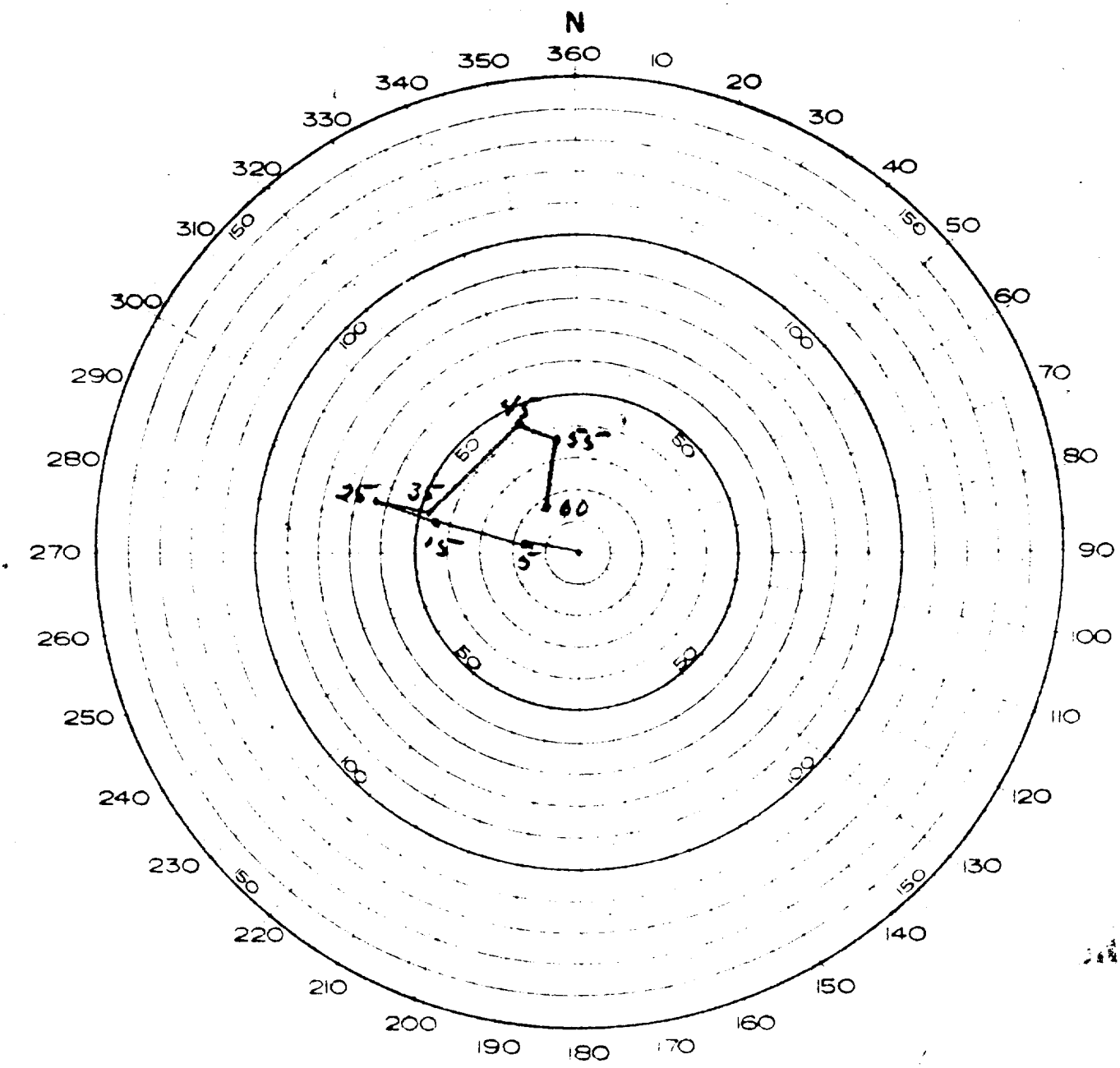
SYCAMORE EVENT

Forecast Hodograph
311500M May

TAB B-1

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



SYCAMORE EVENT

Shot-time Hodograph
311500M May

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TAB E-2

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

4 June 1958

SYCAMORE
BIKINI OBSERVED WEATHER FOR 31 MAY 1958
AT DETONATION TIME: 1500M

SURFACE WEATHER

Sea level Pressure	1008.1 mbs
Free Air Surface Temperature	83.4° F
Wet Bulb Temperature	76.6° F
Dew Point Temperature	74.0° F
Relative Humidity	73 %
Surface Wind	080° 15 kts
Visibility	10 miles
Weather	None

CLOUDS:

Scattered (2/10) cumulus, bases 2,000 feet. Scattered (1/10) altocumulus, bases 8,000 feet. Scattered (2/10) cirrus.

STATE OF THE SEA

Open Sea: Waves from 080 deg, height 4 feet, period 4 sec, length 50-60 feet.

Lagoon: Waves less than 1 foot high with swell 2-3 feet high, length 30-50 feet.

SYCAMORE

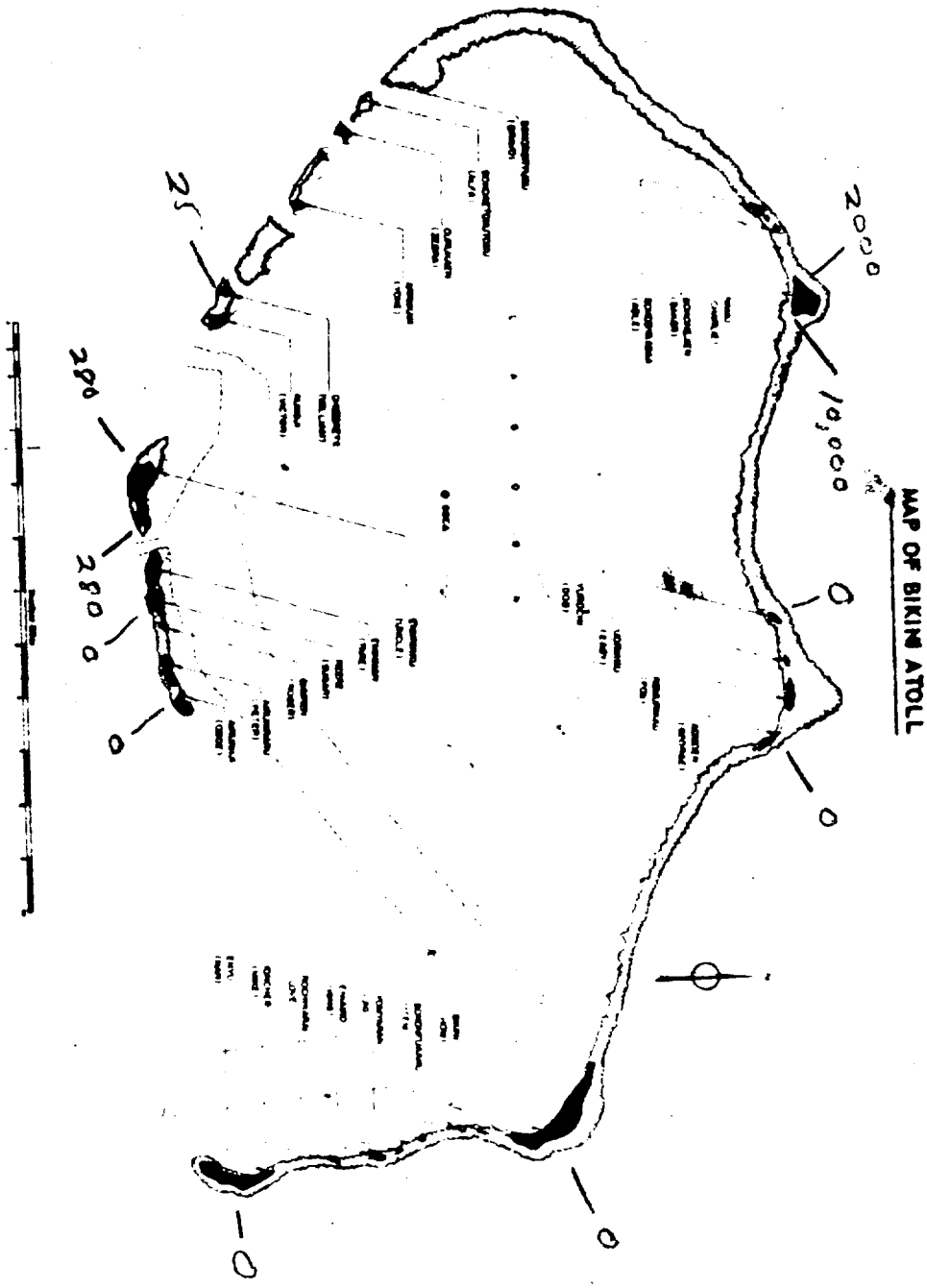
BIKINI RADIOSONDE OBSERVATION

Pressure (Millibars)	Height (Feet)	Temperature (°C)	Dew Point (°C)
1009	Surface	28.2	23.2
1000	330	27.5	22.5
922	2,657	20.5	17.8
850	4,960	18.8	06.2
848	5,052	18.5	05.5
811	6,266	18.2	09.2
754	8,333	13.2	07.5
700	10,361	10.1	00.8
638	12,894	06.5	-08.2
614	13,927	04.8	-04.4
600	14,530	03.8	-06.2
538	17,388	-01.2	-18.5
517	18,405	-01.2	-20.8
500	19,320	-03.1	Miss
400	25,010	-12.9	Miss
318	30,577	-25.8	Miss
300	31,980	-29.0	Miss
250	36,170	-39.2	Miss
200	41,060	-52.0	Miss
174	43,963	-59.9	Miss
152	46,752	-66.3	Miss
150	46,970	-66.9	Miss
100	54,730	-79.4	Miss
087	57,283	-81.0	Miss
068	62,008	-69.0	Miss
062	63,793	-70.0	Miss

SYCAMORE

BIKINI WINDS ALOFT OBSERVATION

Height (Feet)	Direction (Degrees)	Velocity (Knots)
Surface	090	10
1,000	110	19
2,000	100	20
3,000	110	24
4,000	110	21
5,000	110	16
6,000	110	12
7,000	100	15
8,000	100	06
9,000	110	12
10,000	120	12
12,000	120	14
14,000	080	13
16,000	090	10
18,000	120	11
20,000	130	16
22,000	150	10
24,000	150	13
26,000	140	16
28,000	090	06
30,000	010	08
32,000	320	06
34,000	270	13
36,000	260	21
38,000	260	27
40,000	220	23
42,500	220	25
45,000	230	21
47,500	260	20
50,000	280	16
52,500	310	09
55,000	060	15
57,500	100	30
60,000	120	23
65,000	080	14
70,000	100	21
75,000	090	33
80,000	100	48
81,000	100	50



MAP OF BIKINI ATOLL

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TAB

[redacted]

ROSE EVENT

OPERATION HARDTACK

1. ROSE was detonated off Yvonne Island, Eniwetok Atoll, at 0645M, 3 June 1958. The cloud rose to 17,000 feet; the base was measured at 5,000 feet. The cloud moved in a westerly direction, but the top hovered overhead.

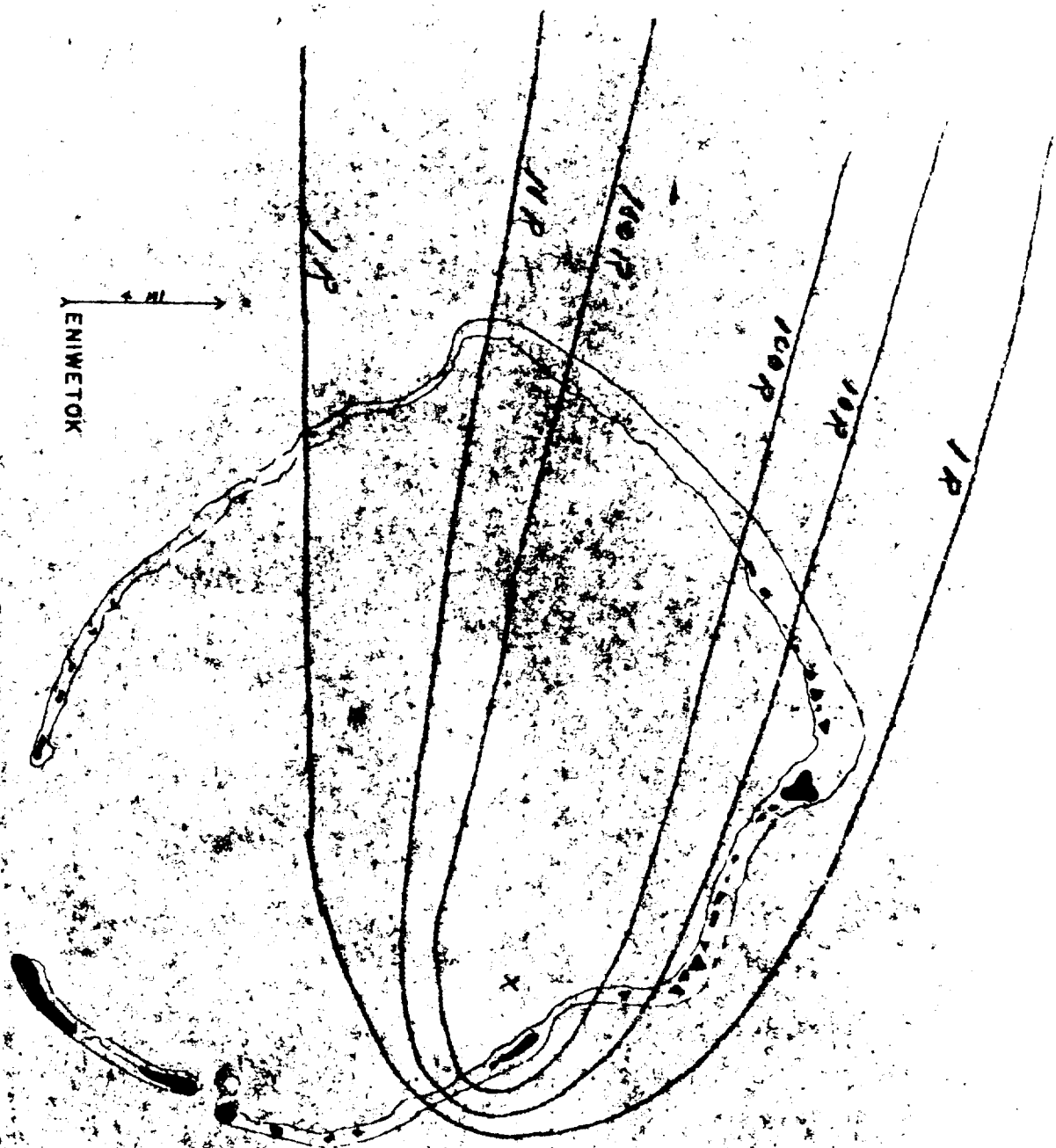
2. The P2V aircraft arrived, and it was vectored from David to Keith at 0720M. No readings were obtained on this run, so the aircraft was vectored up the island chain to Janet. A reading of 500 mr/hr was recorded over Yvonne at 0735M. Other readings were insignificant. The P2V was then vectored across the lagoon in 10-degree increments. The only significant readings were recorded on a line west of the point of detonation. Re-entry hour was declared at 0745M except for the western reef area, which was held until 0845M.

3. The helicopter survey was initiated at 0825M. The only recorded readings were made on Janet: 50 mr/hr; Yvonne: 8 mr/hr; and near the ground zero at twenty-five feet: 1200 mr/hr.

4. Fallout was estimated to have fallen well within the forecast fallout area.

TAB A

[redacted]



Fallout Forecast Plot

ROSE EVENT

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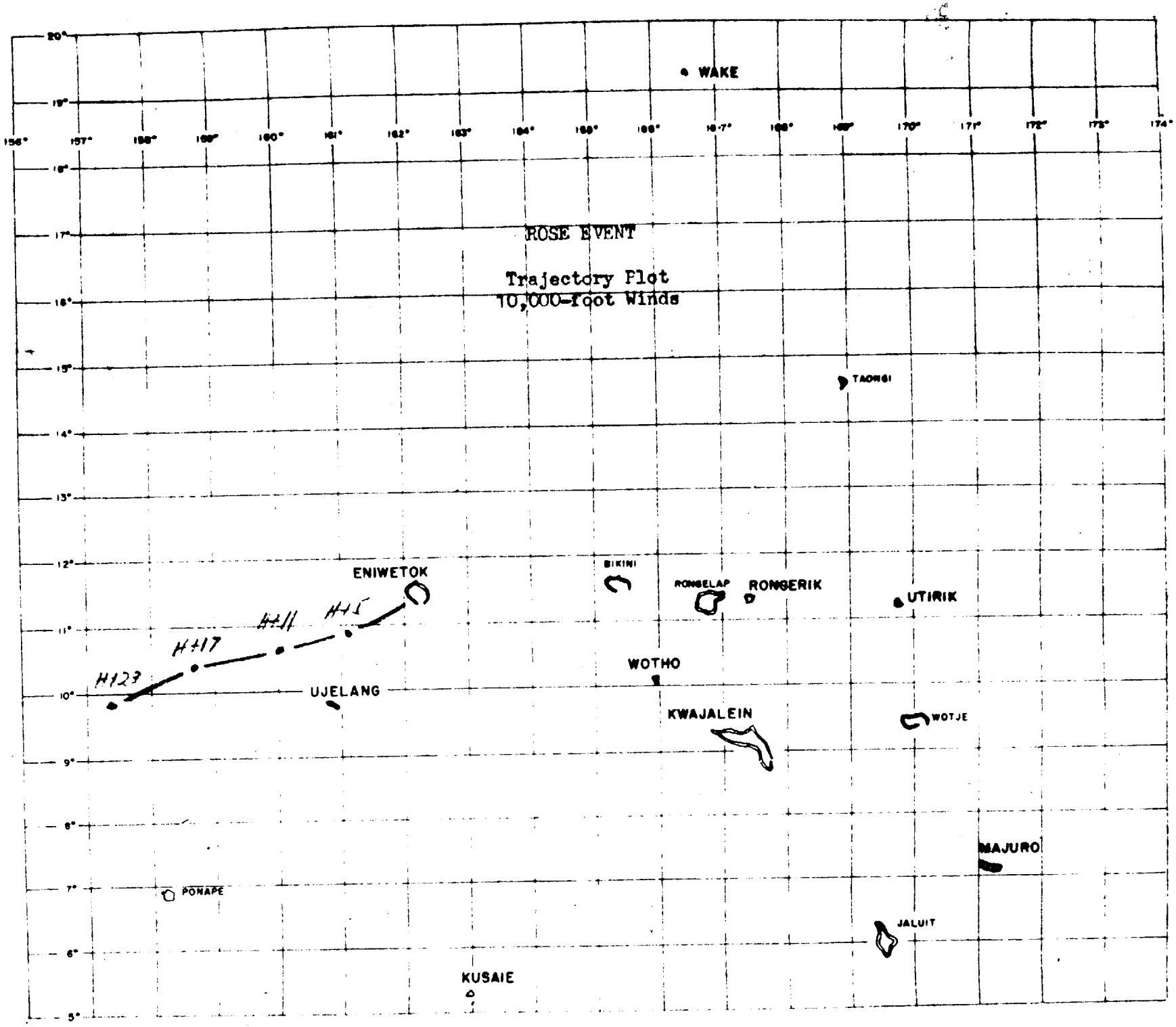

TAB C BEST COPY AVAILABLE

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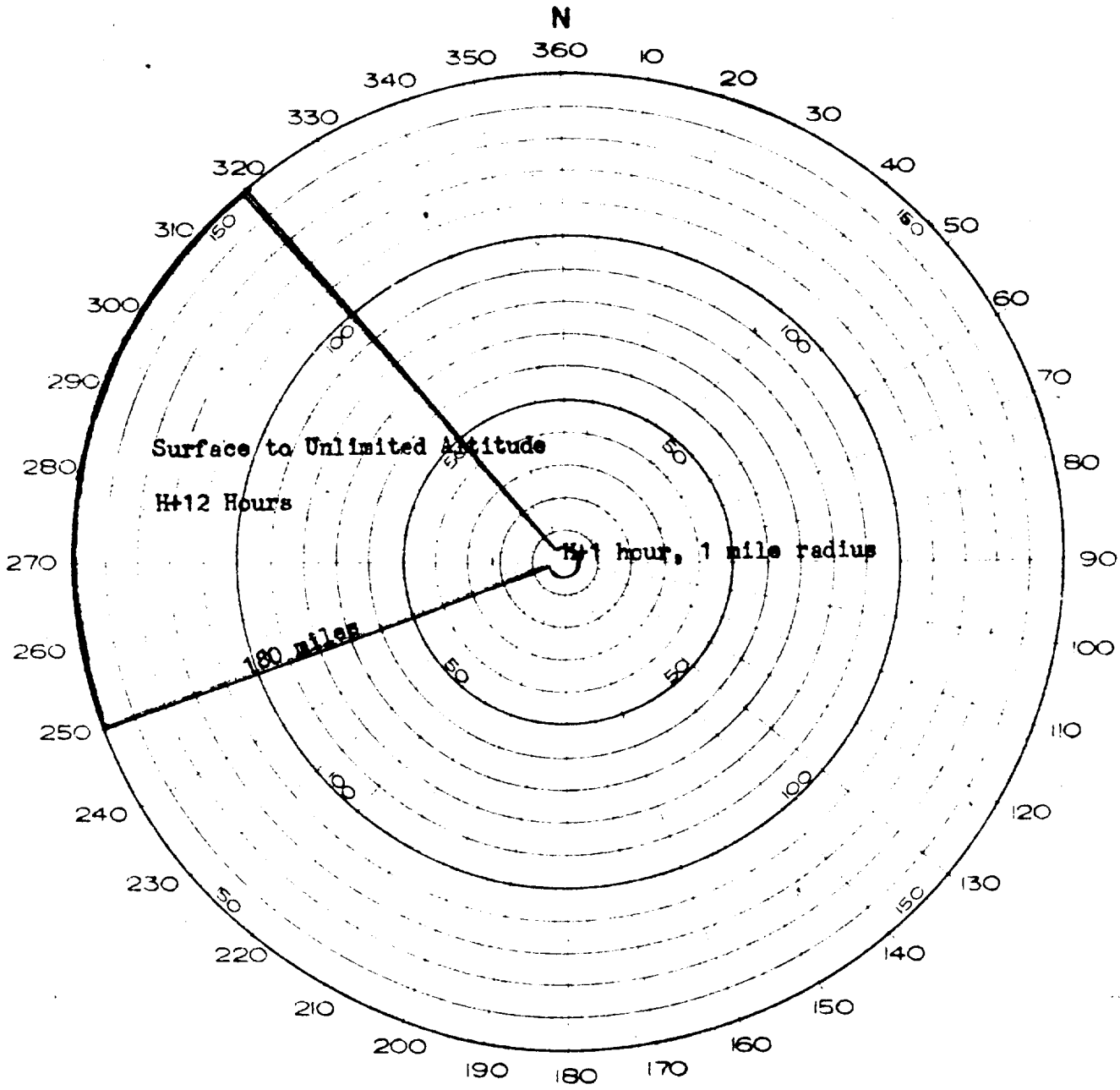
HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX

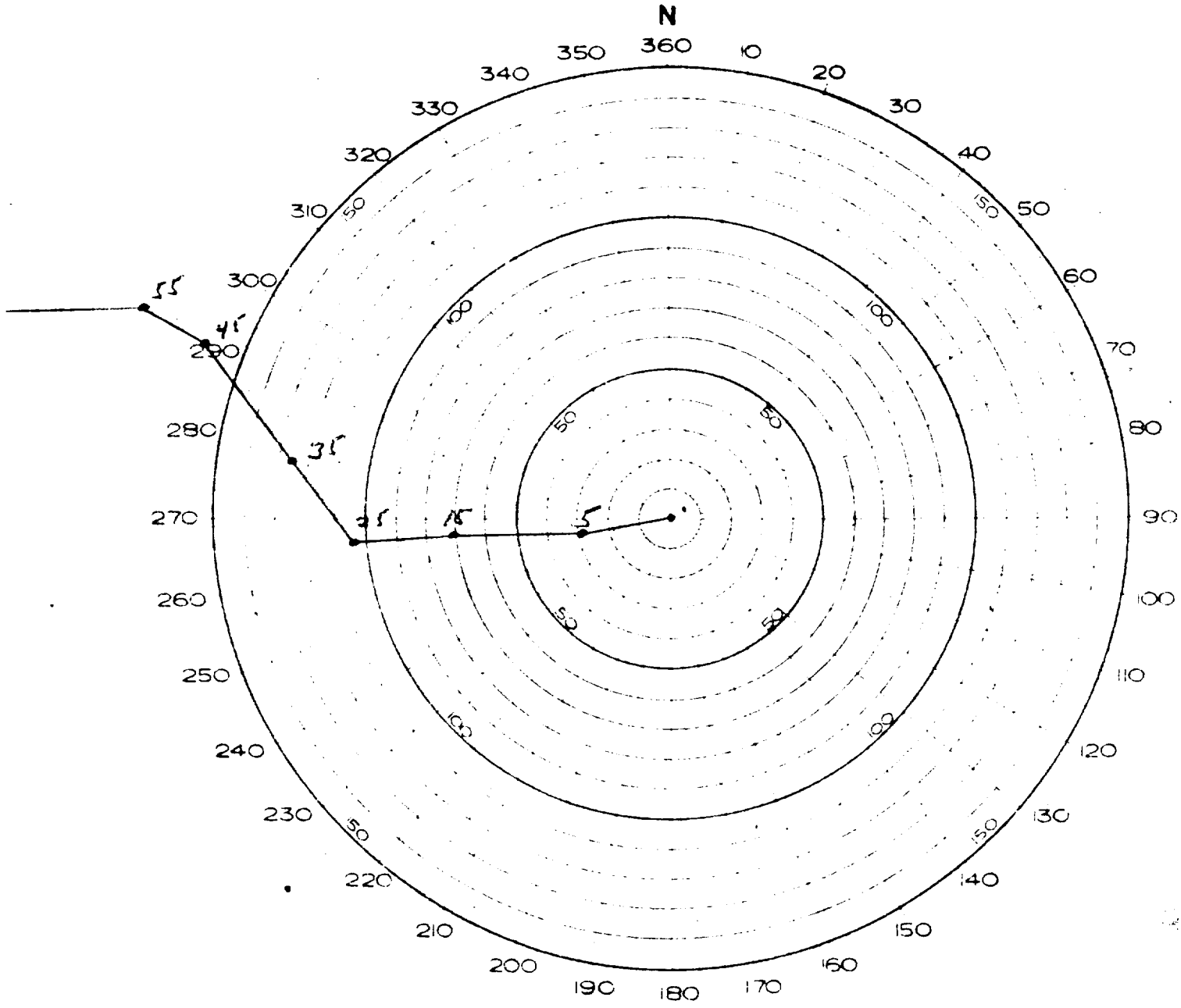


ROSE EVENT

Surface and Air Radex

TAB D

HODOGRAPH
RESULTANT WINDS AND SURFACE RADEX



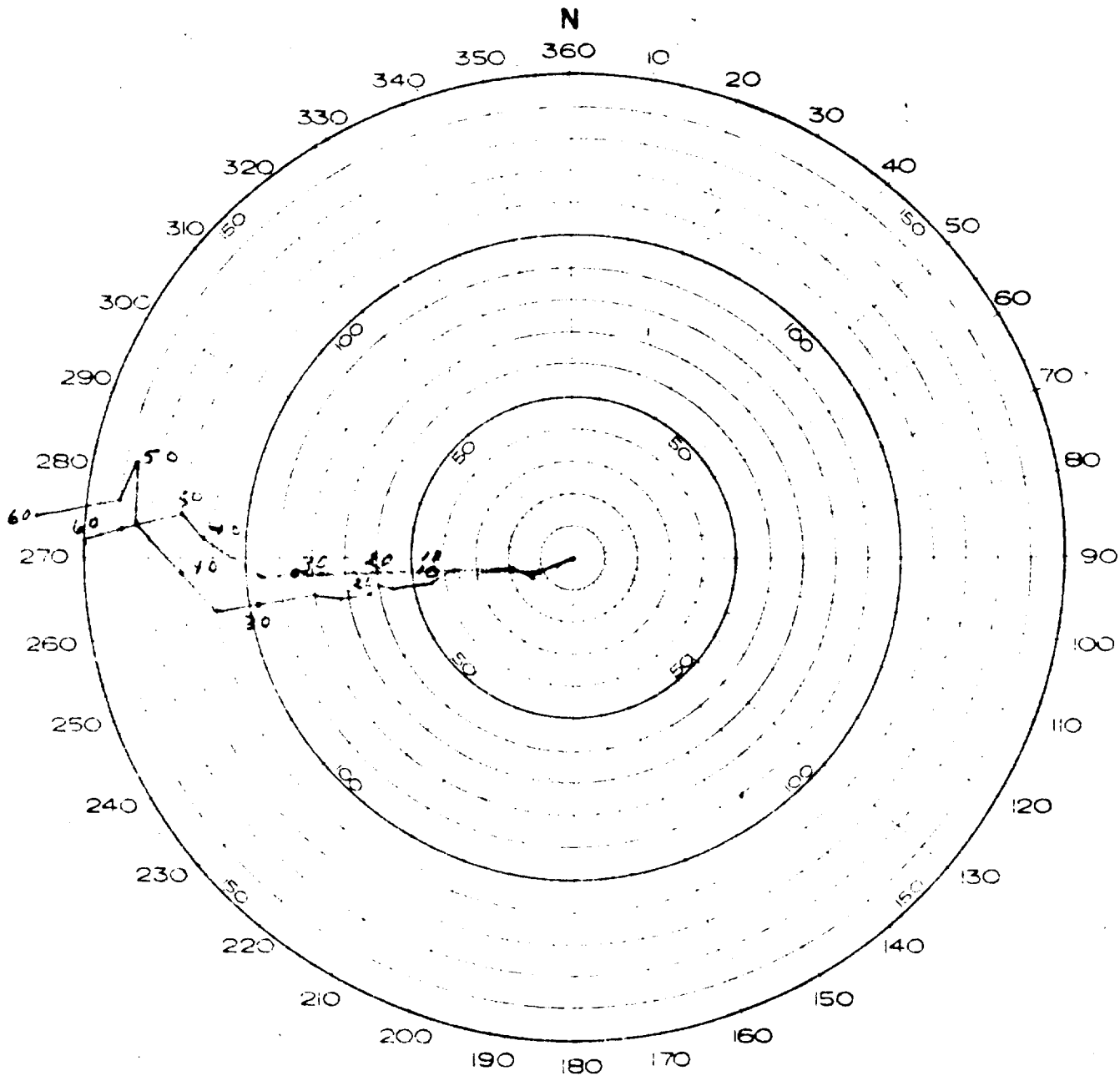
ROSE EVENT

FCRECAST HODOGRAPH
020600M June

TAB E-1

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



ROSE EVENT

Shot-time Hodograph
020600M June

TAB E-2

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

3 June 1958

ROSE
ENIWETOK OBSERVED WEATHER FOR 2 JUNE 1958
AT DETONATION TIME: 0645M

SURFACE WEATHER

Sea Level Pressure	1008.1 mbs
Free Air Temperature	80.9° F
Wet Bulb Temperature	75.9° F
Dew Point Temperature	74.0° F
Relative Humidity	79 %
Surface Wind	090° 22 kts
Visibility	10 miles
Weather	None

CLOUDS:
Scattered cumulus and stratocumulus (3/10-4/10) bases 1,300 to 1700 feet, tops 5,000 to 7,000 feet. Scattered cirrus (3/10-5/10) bases unknown.

AREA WEATHER SUMMARY FROM AIRCRAFT
North of an East-West line lying between Elmer and Fred Islands, overcast (10/10) cumulus and stratocumulus, bases 1,500 to 1,700 feet, tops 5,000 to 7,000 feet. Broken (6/10) cumulus south of this line. Moderate turbulence and light rain in clouds at 3,000 to 4,000 feet. Clear at 11,000 to 13,000 feet. Scattered cirrus, bases unknown.

STATE OF THE SEA
Open Sea: Wave height 4 feet., period 4-5 seconds, length 50-80 feet.
Lagoon near Site Yvonne: Wave height, less than 1/2 foot, period 4 seconds, length 60-80 feet.

ROSE

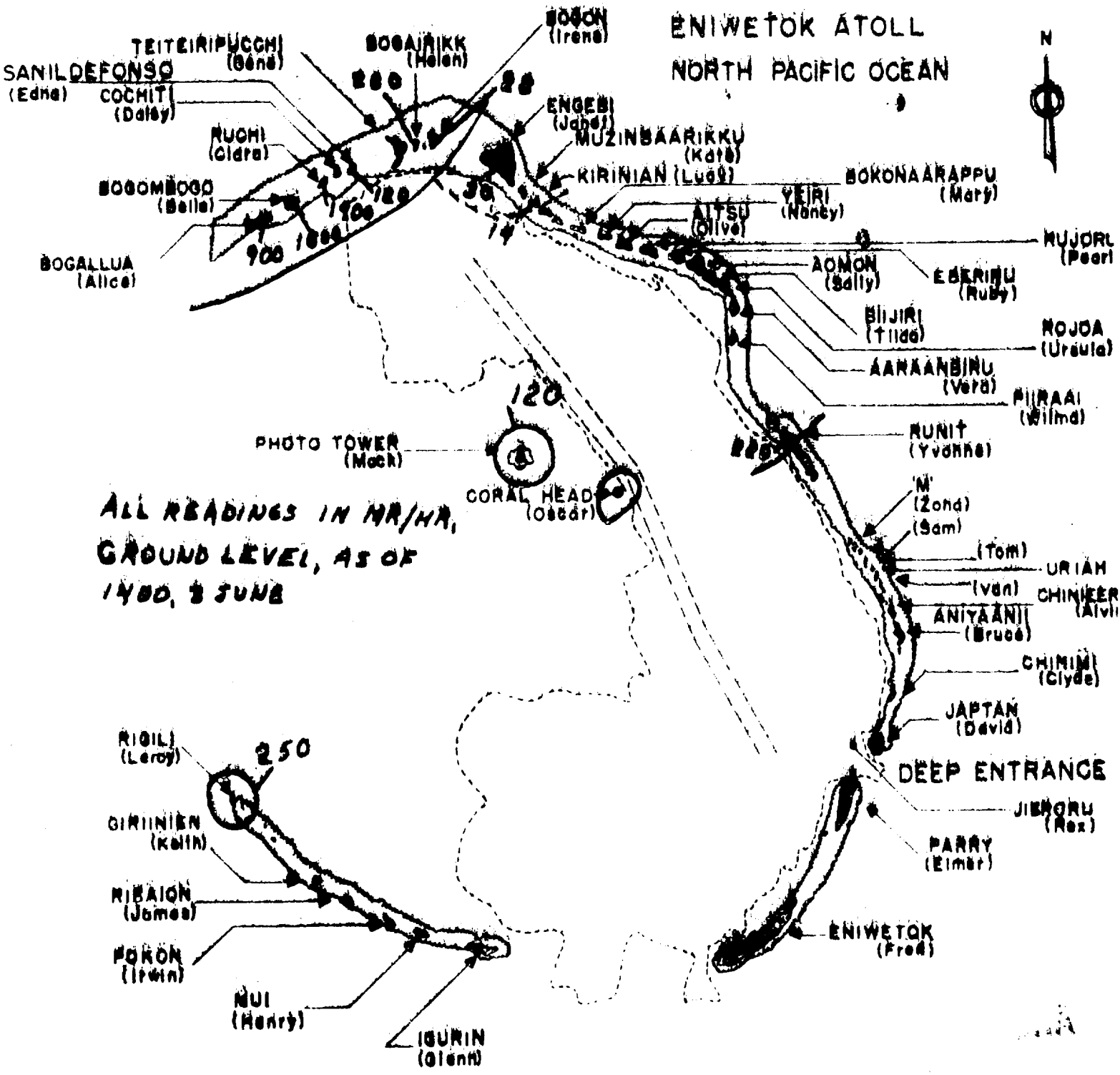
ENIWETOK RAOIOSONDE OBSERVATION

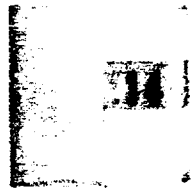
Pressure (Millibars)	Height (Feet)	Temperature (°C)	Dew Point (°C)
1008	Surface	26.5	23.5
1000	250	26.2	Miss
850	4,870	18.0	Miss
788	6,988	18.0	Miss
700	10,260	10.5	Miss
648	12,336	06.0	Miss
600	14,410	03.0	Miss
582	15,190	01.0	Miss
544	16,995	02.0	Miss
500	19,210	-02.8	Miss
400	24,900	-13.2	Miss
300	31,840	-30.5	Miss
250	36,010	-40.8	Miss
200	40,860	-52.8	Miss
150	46,750	-66.5	Miss
124	50,721	~~-66.0~~ -74.6	Miss
100	54,530	-78.8	Miss
091	56,595	-81.0	Miss
069	61,875	-72.0	Miss
067	62,535	-67.0	Miss
063	63,591	-70.0	Miss
050	67,850	-64.2	Miss
045	70,389	-63.0	Miss
036	75,240	-54.0	Miss
030	78,870	-52.0	Miss

ROSE

ENIWETOK WINDS ALOFT OBSERVATIONS

Height (Feet)	Direction (Degrees)	Velocity (Knots)
Surface	~~000~~ 080	~~10~~ 22
1,000	070	23
2,000	070	23
3,000	060	21
4,000	080	18
5,000	080	17
6,000	090	19
7,000	080	24
8,000	~~000~~ 070	25
9,000	070	22
10,000	070	20
12,000	070	09
14,000	060	02
16,000	080	06
18,000	110	10
20,000	130	08
22,000	100	19
24,000	100	20
26,000	100	18
28,000	090	14
30,000	090	~~15~~ 13
32,000	100	11
34,000	120	09
36,000	150	11
38,000	150	19
40,000	~~150~~ 180	25
42,500	150	22
45,000	160	18
47,500	160	11
50,000	240	06
52,500	030	10
55,000	~~020~~ 060	~~09~~ 21
57,500	090	20
60,000	100	24
65,000	050	19
70,000	090	29
75,000	110	31
~~78,000~~ 72,000	110	39


ENIWETOK ATOLL
NORTH PACIFIC OCEAN
N
BOGON (Irene)
TEITEIRIPUCCHI (Bene)
BOGAIRIKK (Helen)
SANILDEFONSO (Edna)
COCHIT (Daisy)
ENGEBI (Jane)
MUZINBAARIKKU (Kate)
NUCHI (Clara)
KIRINIAN (Lucy)
BOKONAARAPPU (Mary)
BOGOMBOGO (Belle)
YEIRI (Nancy)
AITSU (Olive)
BOGALLUA (Alice)
NUJORI (Pearl)
AOMON (Sally)
EBERIRU (Ruby)
BIJIRI (Tilda)
ROJOA (Ursula)
AANAANBINU (Vera)
PIJRAAI (Wilma)
120
PHOTO TOWER (Mack)
RUNIT (Yvonne)
CORAL HEAD (Oscar)
ALL READINGS IN MR/HR, GROUND LEVEL, AS OF 1400, 8 JUNE
'M' (Zond)
(Sam)
(Tom)
URIAH
(Van)
CHINIKER (Alvi
ANIYAANI (Bruce)
CHIMINI (Clyde)
JAPTAN (David)
RIGIL (Leroy)
250
DEEP ENTRANCE
JIEMORU (Rex)
GIRIINIEN (Kelly)
PARRY (Elmer)
NIBAION (James)
ENIWETOK (Fred)
POKON (Irwin)
NUI (Henry)
IGURIN (Glenn)
NOTE: MACK TOWER READING AS OF 1000, 8 JUNE
FULL RADEX
LIMITED RADEX



INDEX

TAB

[redacted]

UMBRELLA EVENT

OPERATION HARDTACK

1. The UMBRELLA device was detonated approximately three miles east of Keith Island, Eniwetok Atoll, 150 feet below the surface, at 1115M, 9 June 1958. The water cloud rose to 2,000 feet. As it settled, a base surge cloud of several thousand yards in diameter formed. Within a few minutes, all visible moisture settled to the surface.

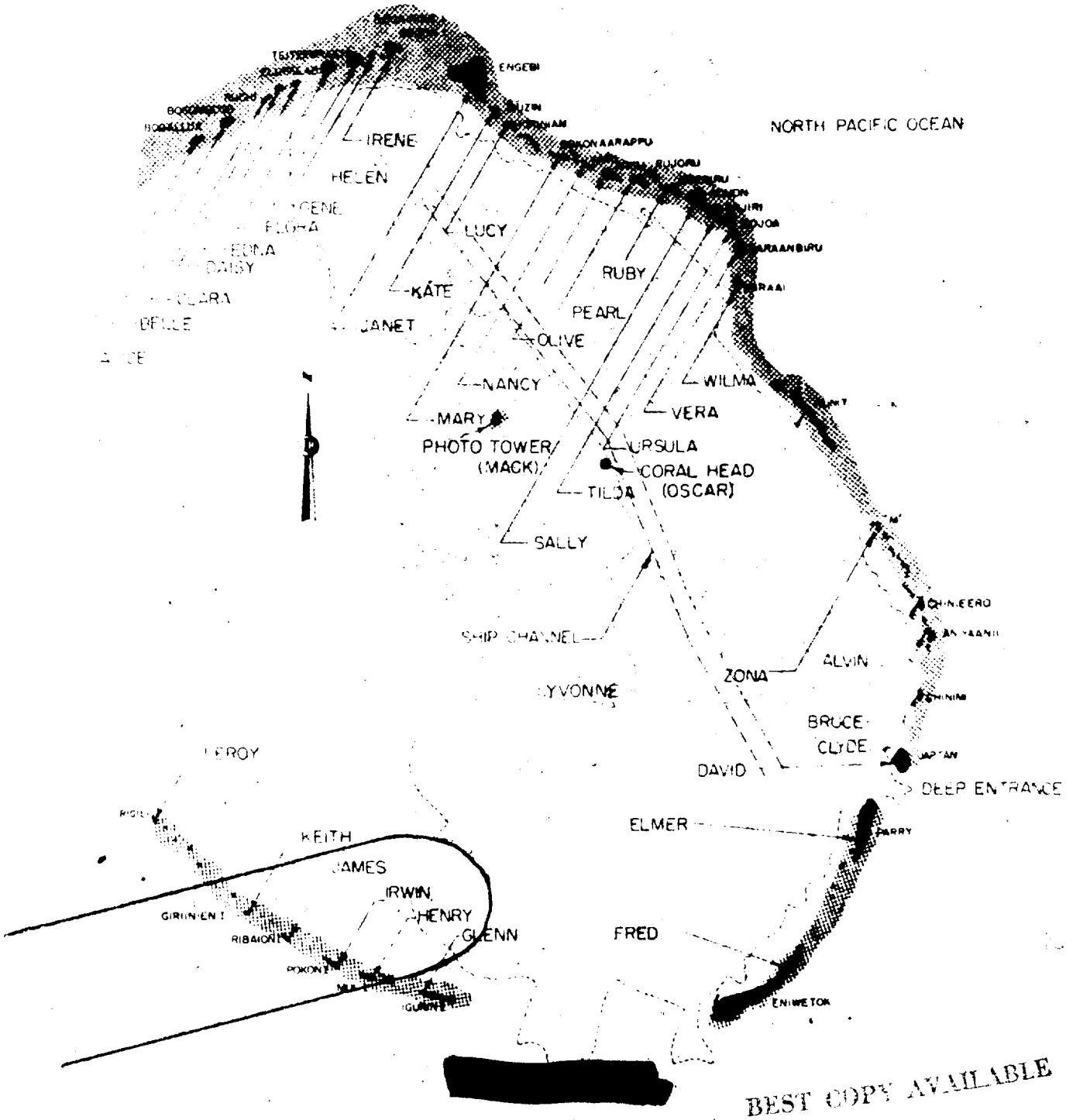
2. A P2V aircraft (Wildroot 7) reported over Glenn at H+20 minutes. It was vectored on radials of 360 degrees, 340 degrees, 300 degrees, and 280 degrees for four miles, at 1,500 feet. The highest reading was made over ground zero at 1137M: 350 mr/hr. All other readings were insignificant, and R-Hour was declared at 1145M, with the exception of the area west of the lagoon. A final radial from Glenn of 270 degrees for ten miles was flown, and 0.9 mr/hr was the maximum reading at 1150M.

3. Two RadSafe boats entered the target area from the direction of Glenn at 1200M. High readings of extremely short duration were encountered as the RadSafe boats surveyed the six major vessels in the target array. The highest recorded readings were made off the stern of the EC-2 at 1225M: 1.5 r/hr. This operation was controlled from the USS Monticello, and by 1315M, the area was declared sufficiently clear to allow the project recovery operations to commence.

4. It is estimated that all fallout fell within the first hour on a bearing of 260 degrees. This was well within the forecast fallout plot.

[redacted]

[redacted]



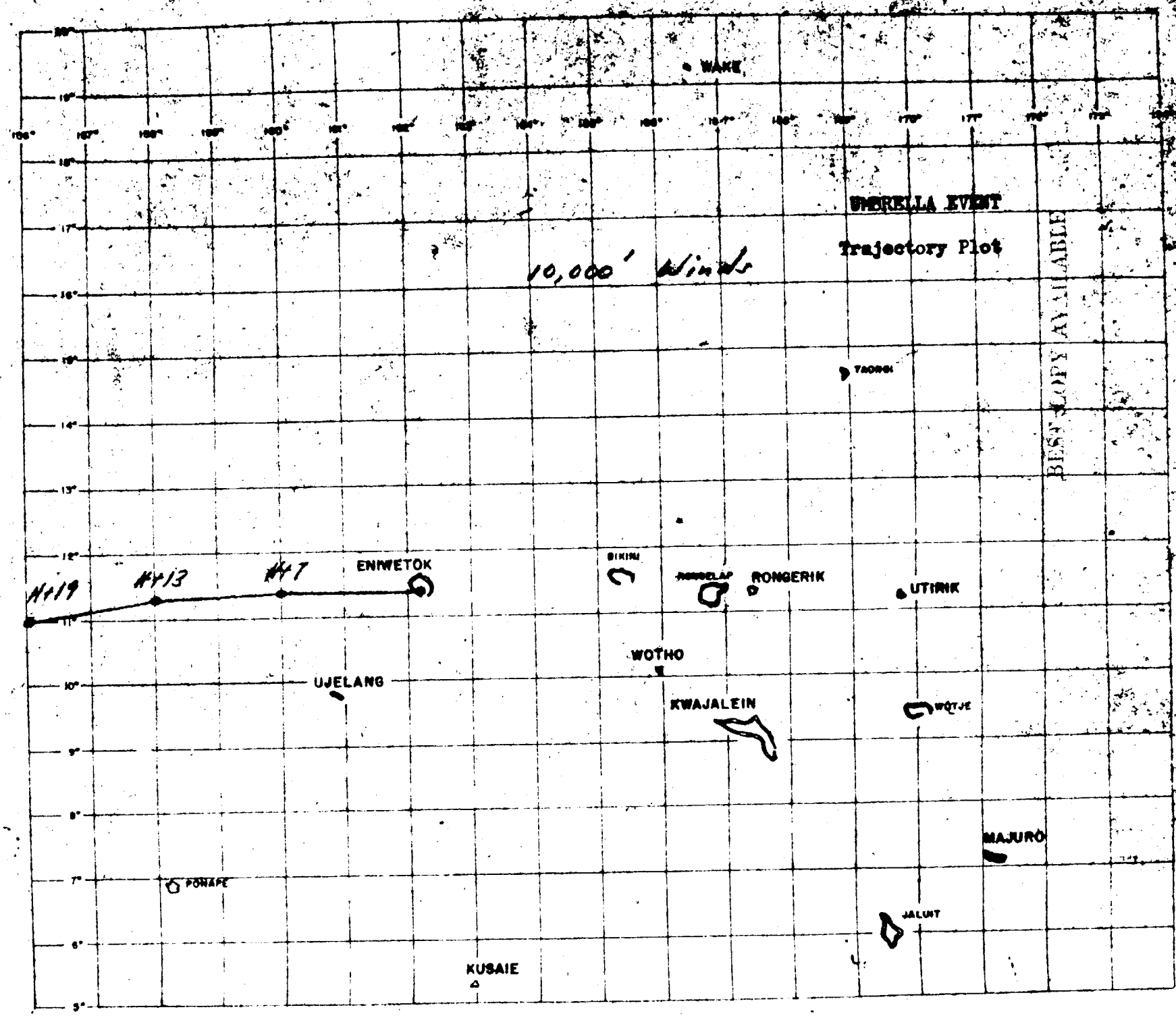
[redacted]

FORECAST FALLOUT PLOT

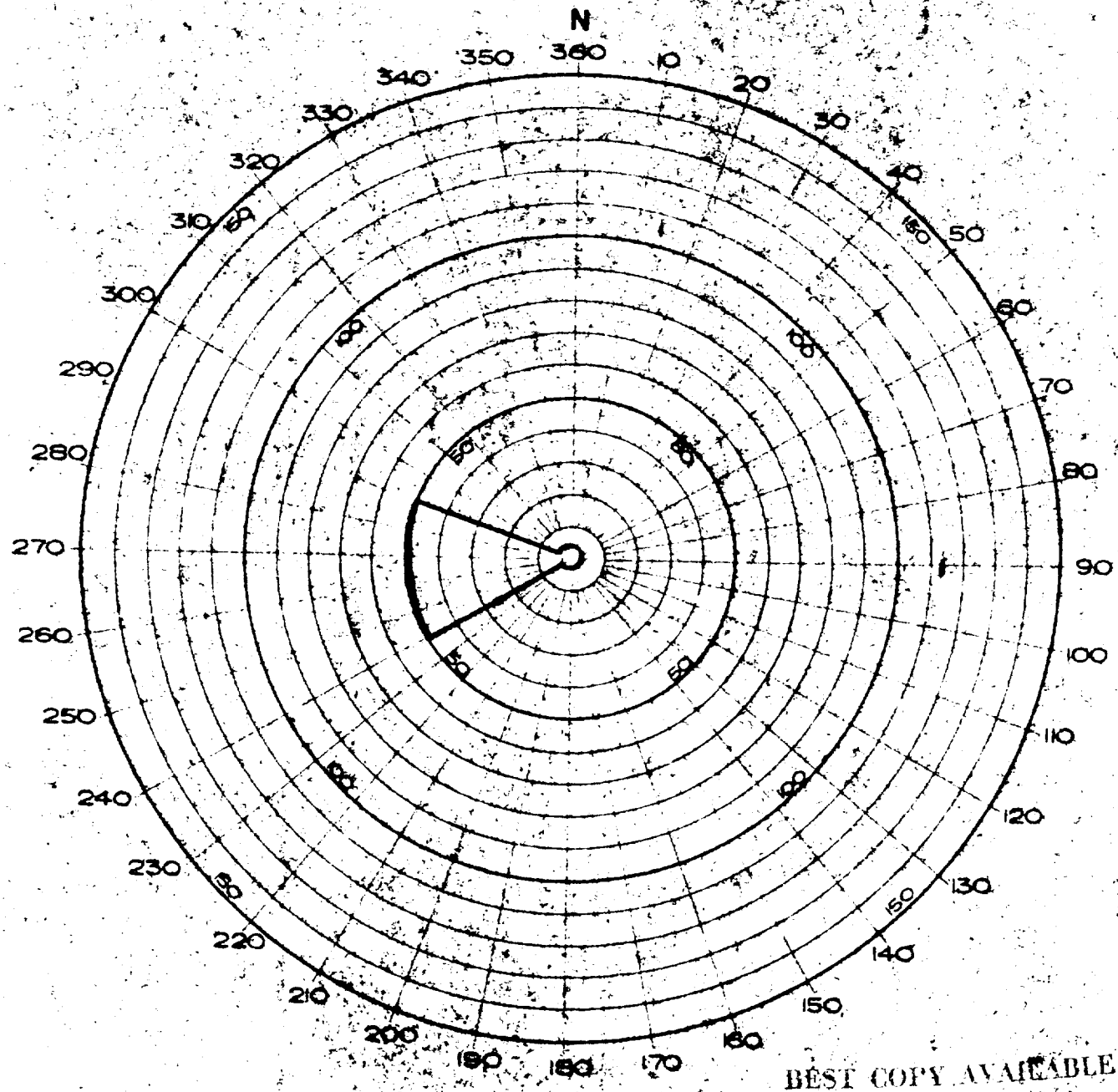
UMBRELLA EVENT

12e

TAB B


WAKE
UMBRELLA EVENT
Trajectory Plot
10,000' winds
BEST COPY AVAILABLE
TAORIK
BIKINI
RONGERIK
UTIRIK
#19
#13
#7
ENIWETOK
WOTHO
UJELANG
KWAJALEIN
WOTJE
MAJURO
PONAPE
JALUIT
KUSAIE

HODOGRAPH
RESULTANT WINDS AND SURFACE RADEX



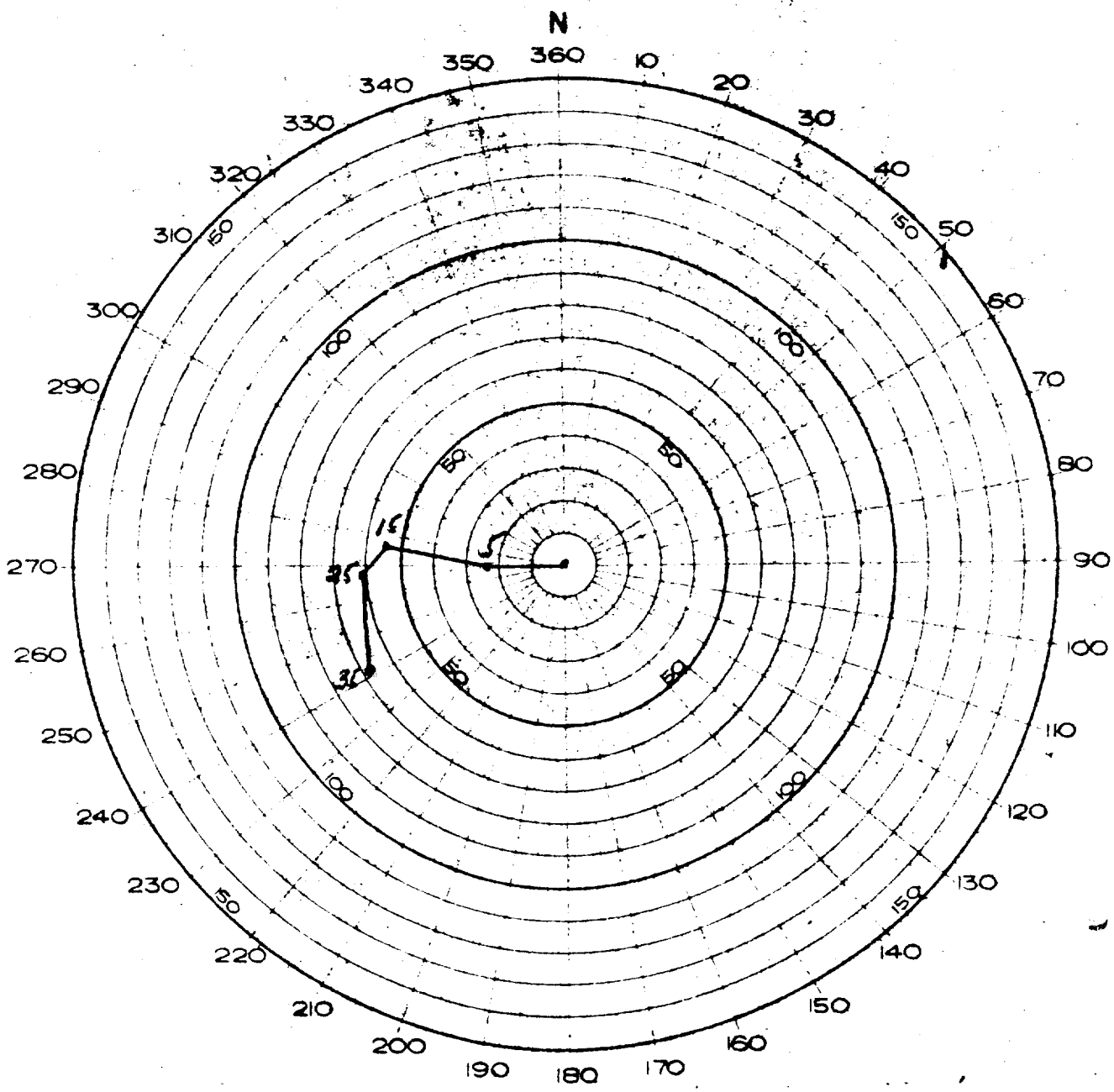
AIR AND SURFACE RADEX

UMBRELLA EVENT

TAB D

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX

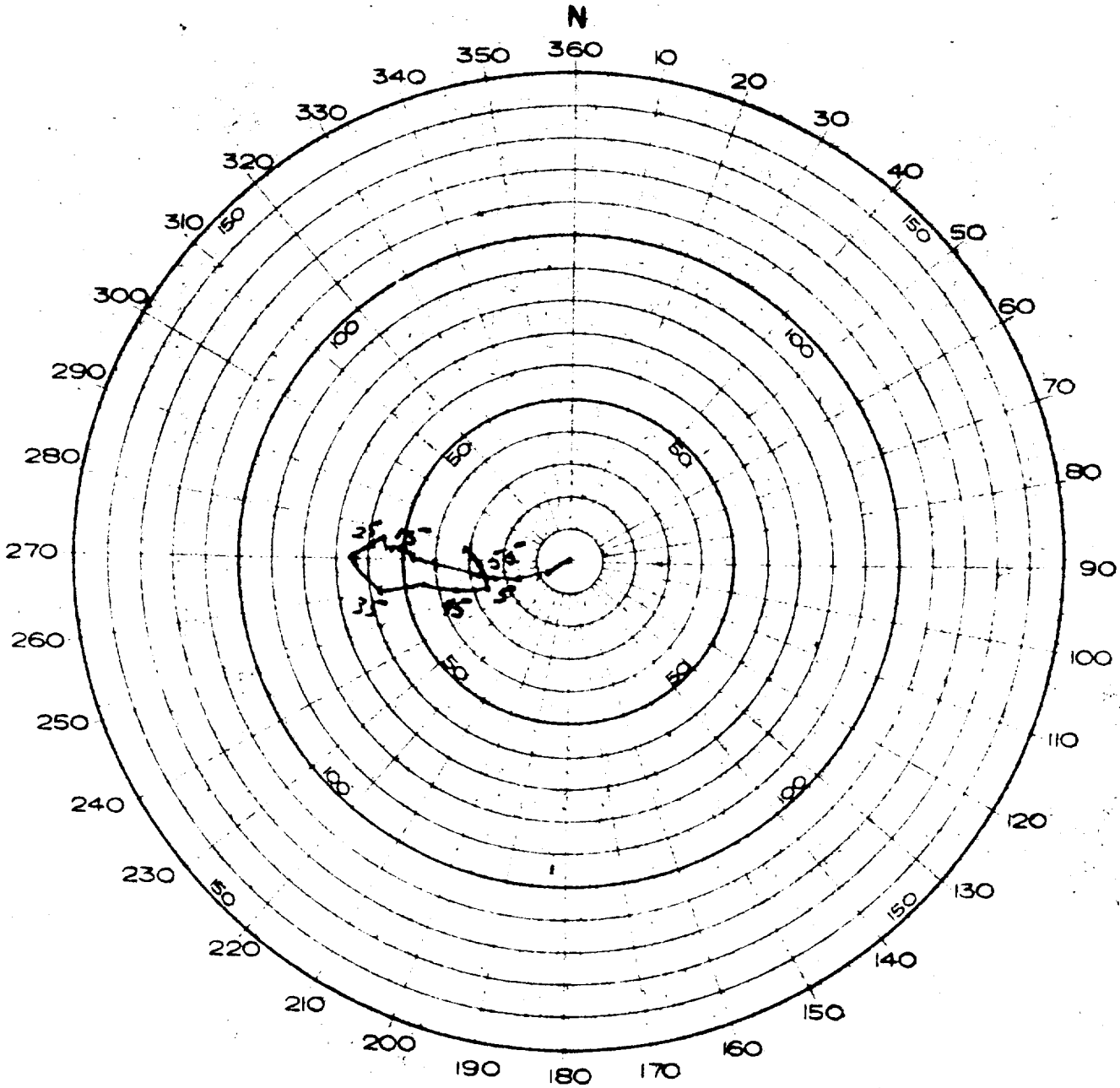


FORECAST HODOGRAPH

UMBRELLA EVENT

TAB E-1

HODOGRAPH
RESULTANT WINDS AND
SURFACE RADEX



UMBRELLA EVENT

Shot-time Hodograph
1115M June

TAB E-2

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

10 June 1958

UMBRELLA

ENIWETOK OBSERVED WEATHER FOR 9 JUNE 1958
AT DETONATION TIME: 1115M

SURFACE WEATHER:

Sea Level Pressure	1010.8 mbs
Free Air Surface Temperature	83.0° F
Wet Bulb Temperature	78.0° F
Dew Point Temperature	72.0° F
Relative Humidity	65%
Surface Wind	050° 20 knots
Visibility	10 miles
Weather	None

CLOUDS:
Scattered cumulus (2/10) bases 2,000 to 2,100 feet. Scatter (1/10) altostratus bases approximately 10,000 feet. Broken (6/10) cirrus and cirrostratus, bases unknown.

AREA WEATHER SUMMARY FROM AIRCRAFT:
Widely scattered cumulus, bases 2,000 feet, tops 3,000 to 4,000 feet.

STATE OF THE SEA:
Lagoon Side: Wave height 2 feet, period 3 - 4 seconds, length 30 - 50 feet.

UMBRELLA

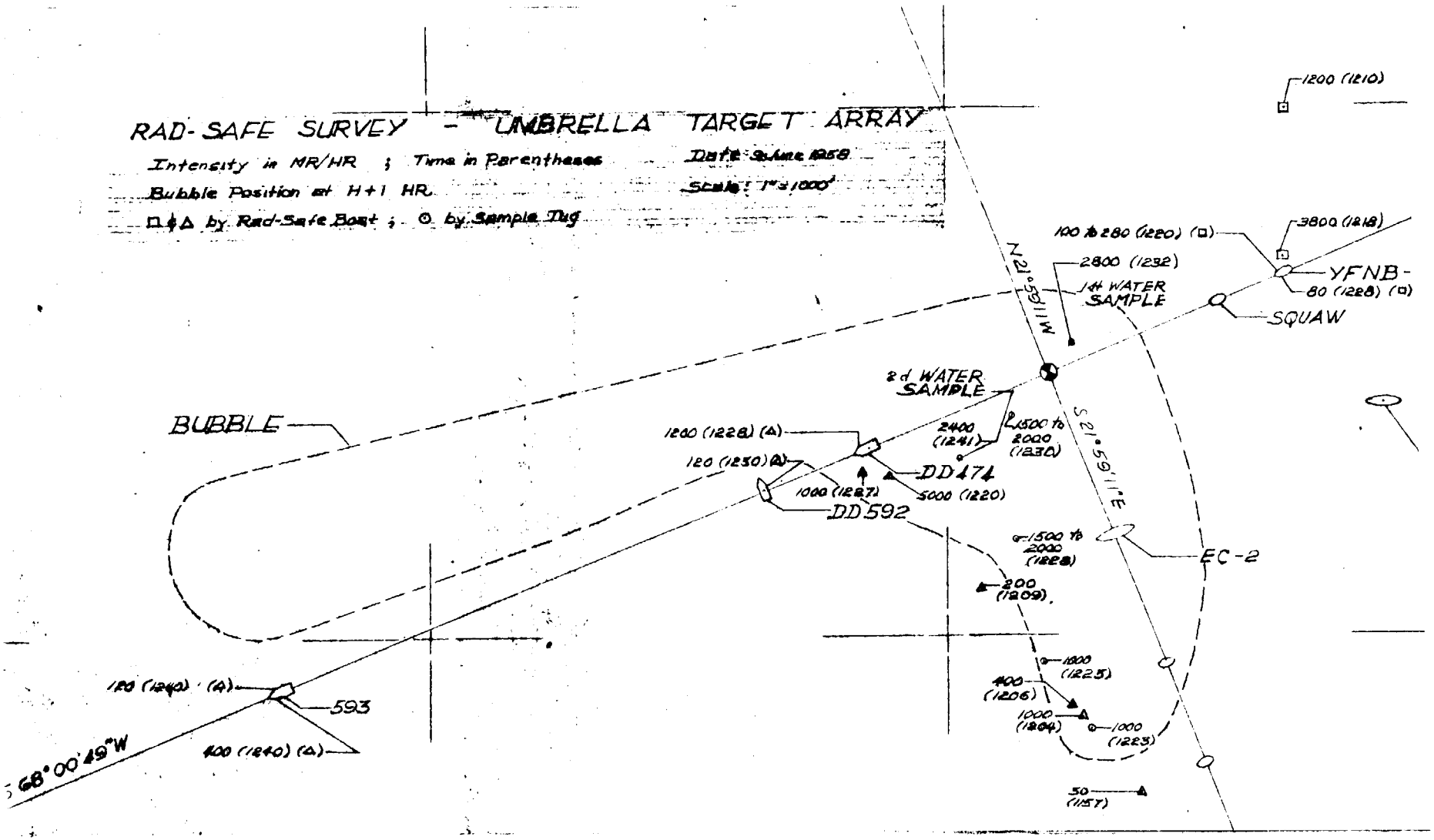
ENIWETOK RADIOSONDE OBSERVATION

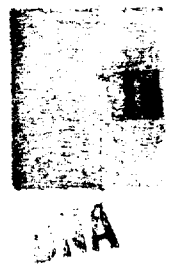
Pressure (Millibars)	Height (Feet)	Temperature (°C)	Dew Point (°C)
1010	Surface	30.2	22.8
1000	310	24.5	18.2
911	2,986	19.8	16.5
873	4,200	19.8	13.2
850	4,940	19.2	04.2
845	5,118	19.2	01.2
786	7,152	16.2	09.8
700	10,340	10.2	04.2
667	11,680	07.8	-01.2
630	13,222	04.2	01.2
600	14,490	02.8	-02.5
577	15,518	01.5	-17.8
531	17,717	-03.5	-14.2
507	18,963	-04.5	-21.8
500	19,260	-04.8	Miss
400	24,940	-14.5	Miss
300	31,880	-29.8	Miss
250	36,050	-40.2	Miss
200	40,910	-52.0	Miss
150	46,810	-66.0	Miss
101	54,450	-80.0	Miss
100	54,600	-78.8	Miss
073	61,050	-72.0	Miss
069	62,205	-67.0	Miss
060	64,845	-67.0	Miss
050	68,130	-61.2	Miss
047	69,930	-59.0	Miss
036	75,174	-58.0	Miss
025	82,~~260~~ 620	-48.2	Miss

UMBRELLA

ENIWETOK WINDS ALOFT OBSERVATION

Height (Feet)	Direction (Degrees)	Velocity (Knots)
Surface	~~000~~ 060	20
1,000	050	23
2,000	060	21
3,000	070	21
4,000	080	22
5,000	080	24
6,000	090	24
7,000	100	18
8,000	100	15
9,000	100	17
10,000	100	21
12,000	110	16
14,000	120	13
16,000	100	08
18,000	180	04
20,000	070	06
22,000	100	02
24,000	090	02
26,000	060	05
28,000	050	06
30,000	050	05
32,000	330	08
34,000	330	11
36,000	280	07
38,000	210	18
40,000	260	12
42,500	290	14
45,000	270	13
47,500	280	12
50,000	280	09
52,500	290	04
55,000	130	07
57,500	130	07
60,000	~~130~~ 140	~~07~~ 06
65,000	~~080~~ 090	21
70,000	100	17
75,000	100	39
80,000	100	50
85,000	090	50
90,000	090	54
95,000	090	55
100,000	090	52
105,000	090	51


RAD-SAFE SURVEY - UMBRELLA TARGET ARRAY
Intensity in MR/HR ; Time in Parentheses
Bubble Position at H+1 HR.
□ ◊ △ by Rad-Safe Boat ; ⊙ by Sample Tug
Date: June 1958
Scale: 1"=1000'
1200 (1210)
100 to 280 (1220) (□)
3800 (1218)
2800 (1232)
1st WATER SAMPLE
YFNB-
80 (1228) (□)
SQUAW
N 21° 59' 11" W
2nd WATER SAMPLE
BUBBLE
1200 (1228) (△)
120 (1230) (△)
2400 (1241)
1500 to 2000 (1230)
DD 474
1000 (1227)
5000 (1220)
DD 592
S 21° 59' 11" E
1500 to 2000 (1228)
EC-2
200 (1209)
1800 (1225)
400 (1206)
1000 (1224)
1000 (1223)
50 (1157)
120 (1240) (△)
593
400 (1240) (△)
68° 00' 49" W



INDEX

TAB

A

[redacted]

MAPLE EVENT

OPERATION HARDTACK

1. The MAPLE device was detonated south of Fox Island, Bikini Atoll, at 0530M, 11 June 1958. The cloud rose immediately to 40,000 feet, and it was tracked by radar from the USS Benner. By H+20 minutes, aircraft reported the top at 52,000 feet. Radar cloud information was excellent, and by H+30 minutes a definite shear was noticed. The upper portion of the cloud, from 15,200 feet to 47,000 feet, moved east and spread south. The smaller, lower portion of the cloud had definite westerly movement.

2. A P2V aircraft (Wildroot 10) reported over Nan at H+30 minutes, and it was vectored from Nan to How to Oboe to Uncle to William to How. Only background was recorded. Tracks from How to Bravo and from How due west were made. At the extreme west, a field of 1,500 mr/hr was encountered, which gave the sampler an estimated 100 mr/hr continuous background reading. Since the upper cloud movement to the east constitued a possible hazard to Nan, another P2V aircraft (Wildrcot 15) was scrambled at 0710M. The first P2V was placed in an orbit east of Nan by 10 miles. Fallout from the east never did materialize, and re-entry hour was declared at 0945M. The area west of the lagoon was placed under radex control and surveyed by the second P2V until 1200M.

3. Helicopter surveys were initiated at 0700M by TU-6 at Nan. Negative readings were obtained along the southern chain, but readings of from 28 r to 480 r were recorded on the islands adjacent to ground zero.

TAB A

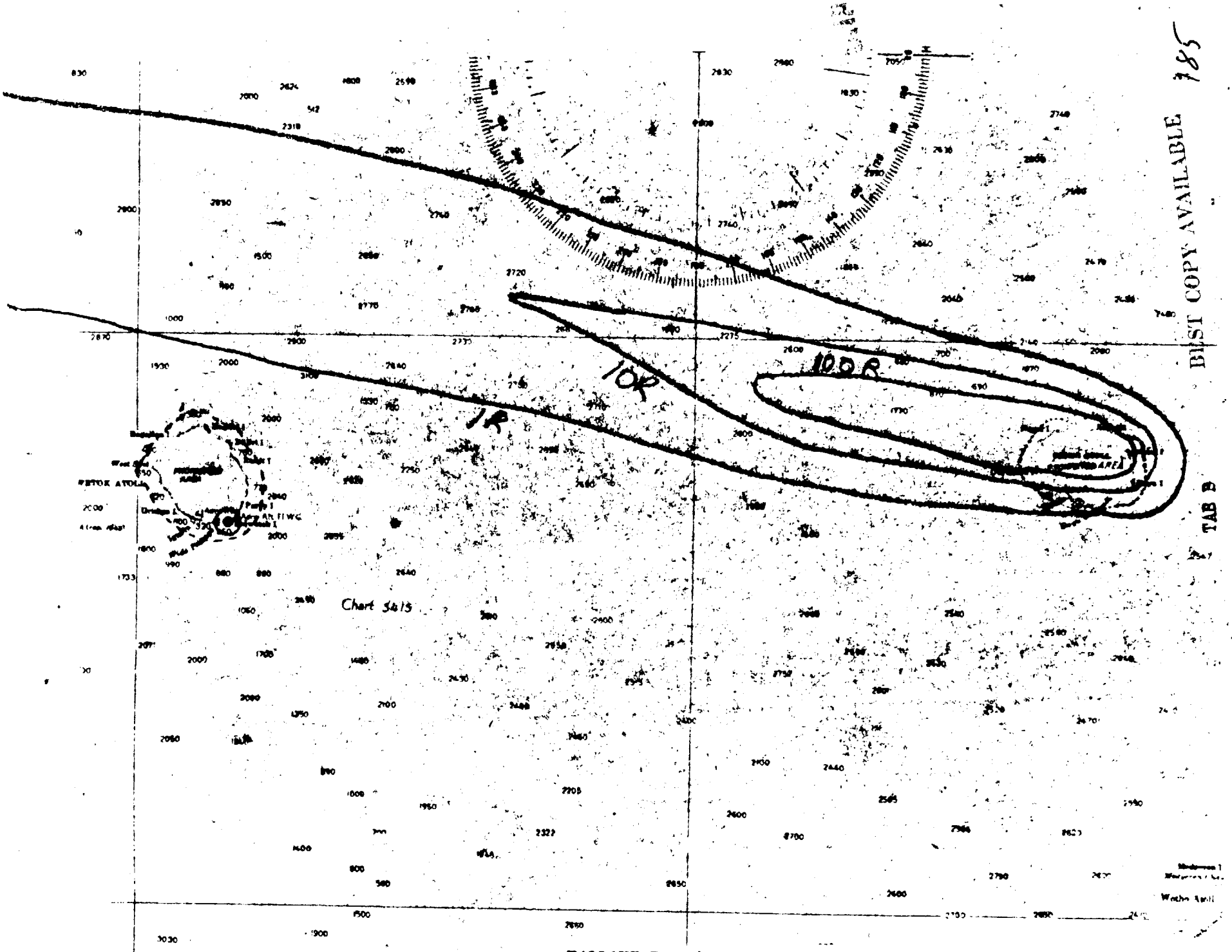
[redacted]

[redacted]

4. It is estimated that all fallout fell within the forecast fallout area. The fallout plot was oriented on a true bearing from ground zero of 280 degrees. Considerable rain shower activity through H+24 hours diminished the carrying effect of the lower trade winds.

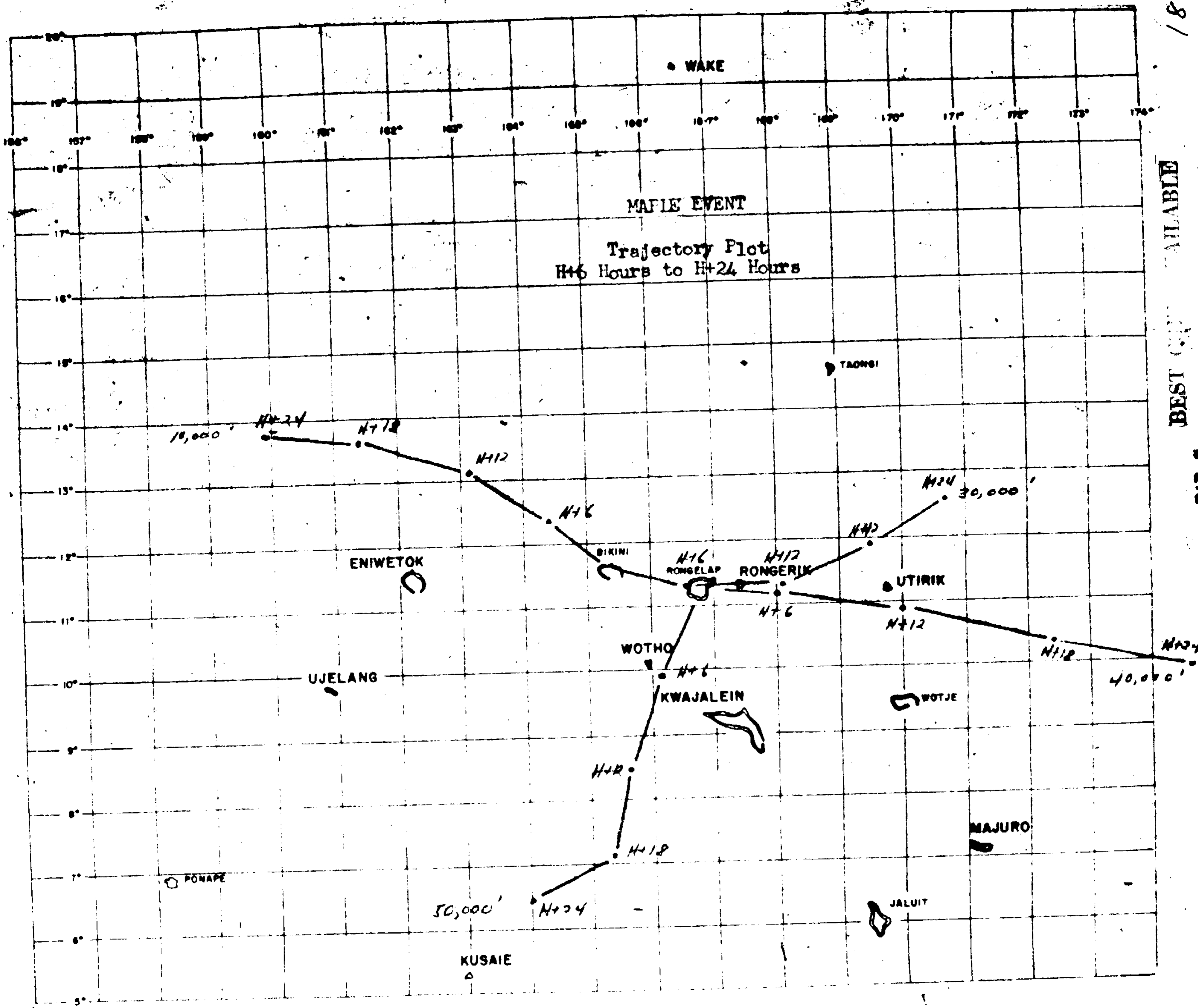
5. Excellent communications, well-defined radar cloud information, and positive aircraft (P_2V) control contributed to the success of this operation.

[redacted]



FALLOUT FORECAST

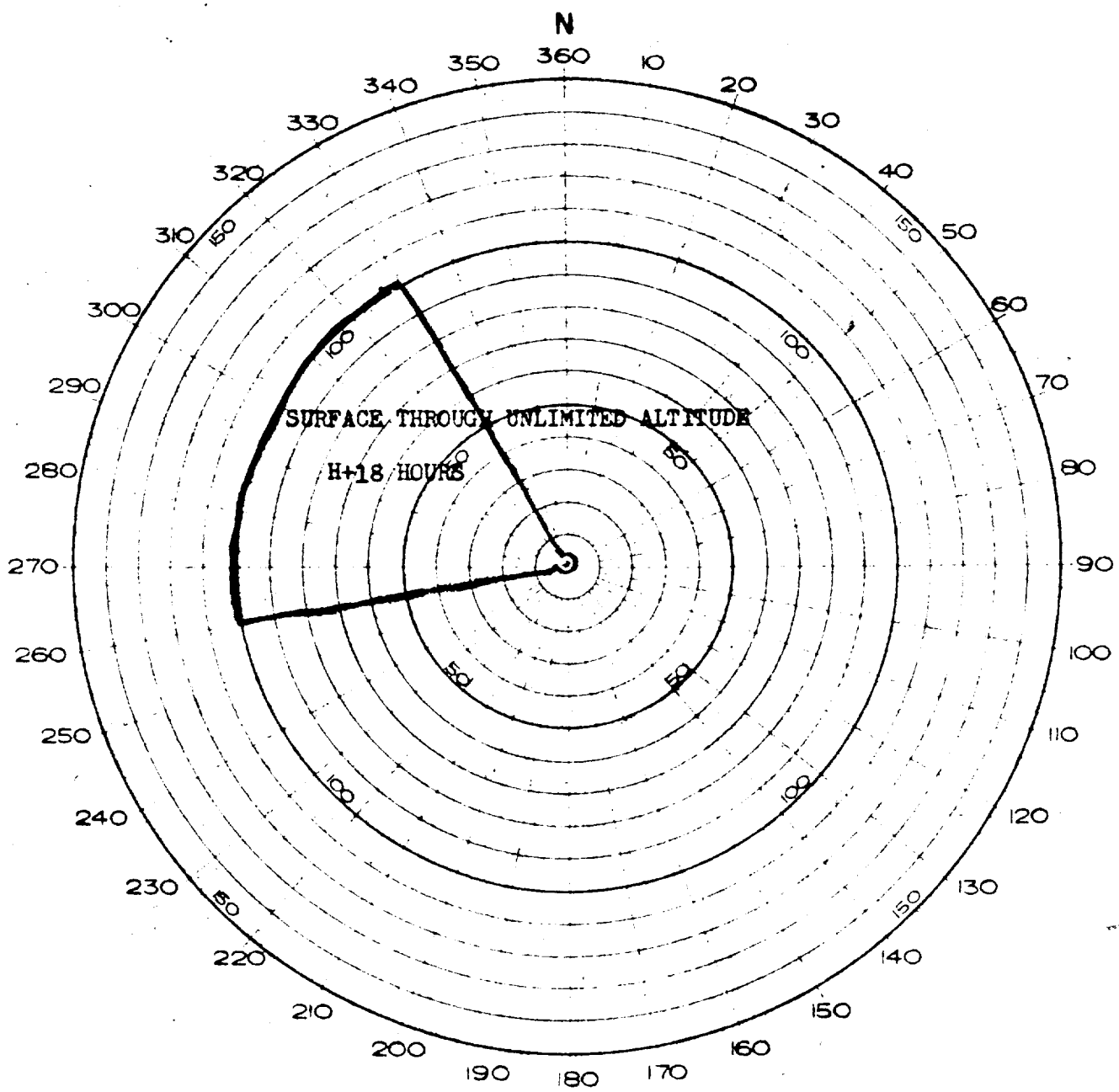
MAPLE EVENT



BEST C... AILABLE

TAB G

HODOGRAPH
RESULTANT WINDS AND
SURFACE RADEX



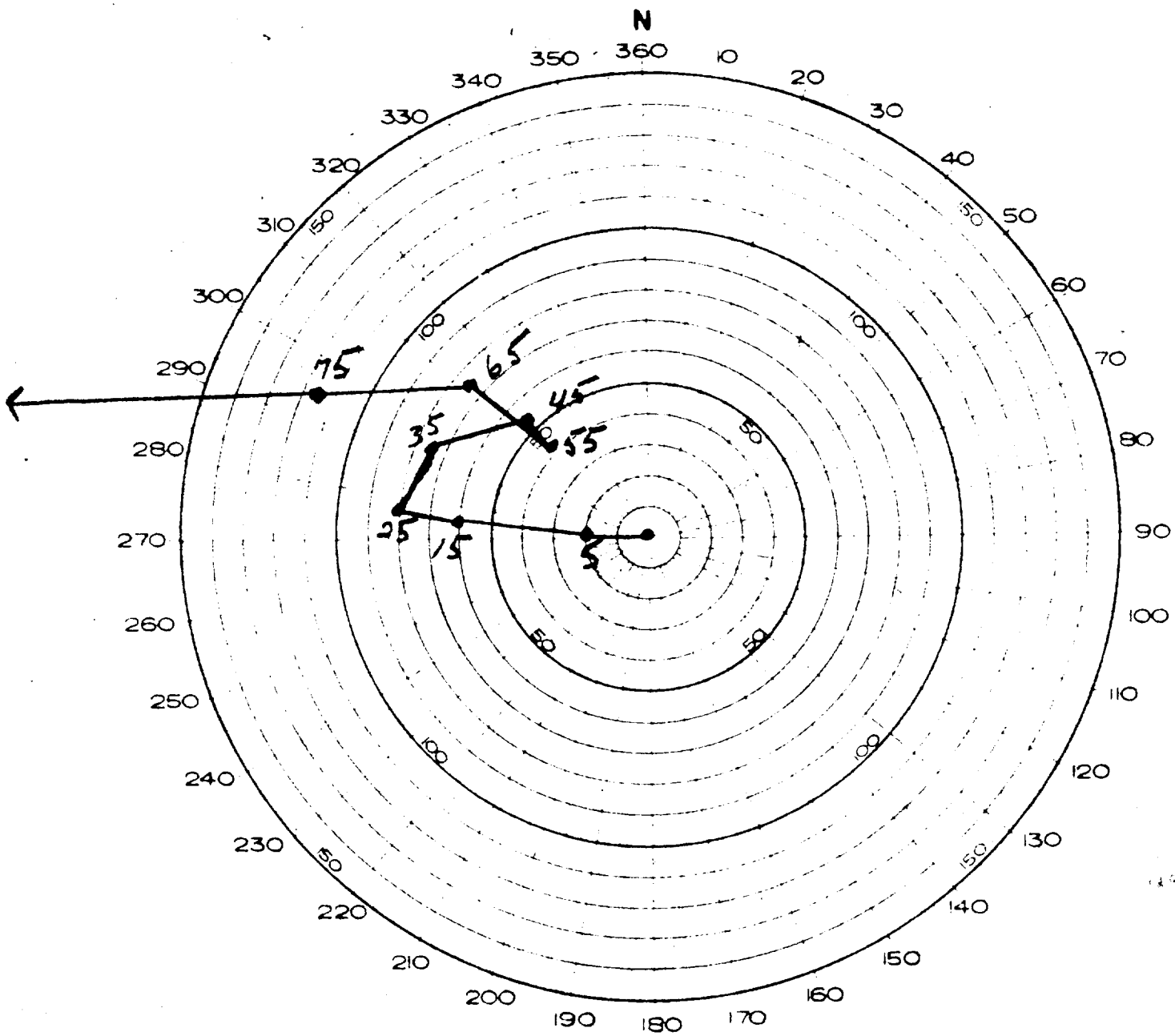
AIR & SURFACE RADEX

MAPLE EVENT

TAB D

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



FORECAST HODOGRAPH

110600M JUNE

MAPLE EVENT

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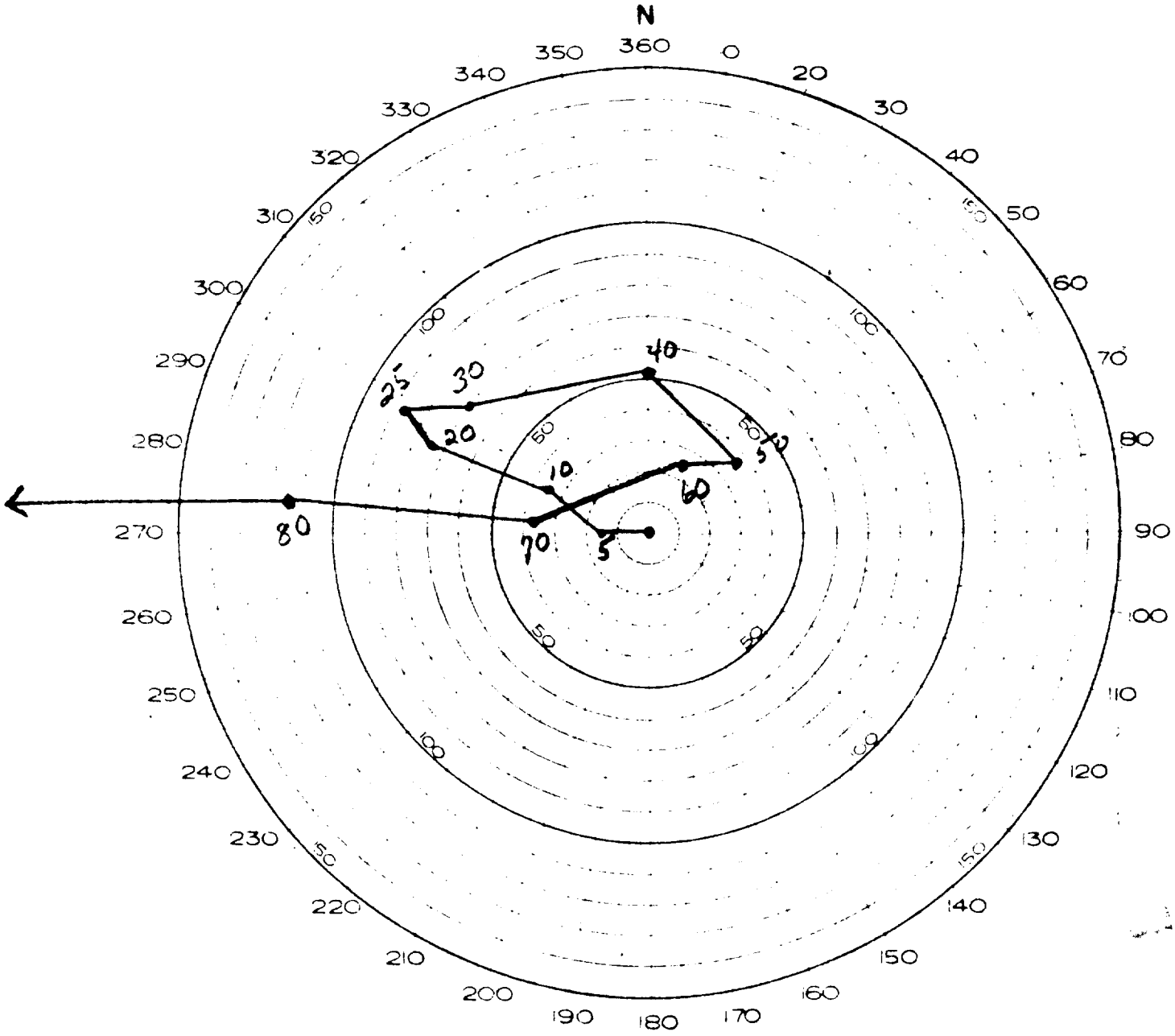
TAB E-1

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



SHOT-TIME HODOGRAPH

110600M JUNE

MAPLE EVENT

TAB E-2

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

13 June 1958

MAPLE

BIKINI OBSERVED WEATHER FOR 11 JUNE 1958

SURFACE WEATHER:

Sea Level Pressure	1010.5 mbs
Free Air Surface Temperature	80.7° F
Wet Bulb Temperature	76.0° F
Dew Point Temperature	74.0° F
Relative Humidity	81%
Surface Wind	070° 22 knots
Visibility	10 miles
Weather	None

CLOUDS:
Scattered (4/10) cumulus, bases 2,000 feet. Scattered (2/10) altocumulus, bases 8,000 feet. Scattered (3/10) cirrostratus.

STATE OF THE SEA:
Open Sea: Waves from 070°, height 5 feet, period 5 seconds, length 80 to 100 feet.
Lagoon near Fox: Waves from 070°, height less than 1 foot, period 1 to 2 seconds.
Sea Water Temperature: 82° F.

MAPLE

BIKINI RADIOSONDE OBSERVATION

Pressure (Millibars)	Height (Feet)	Temperature (°C)	Dew Point (°C)
1011	Surface	26.8	23.5
1000	360	25.8	22.5
938	2,231	20.5	19.2
850	4,990	16.8	14.8
820	6,004	15.2	13.2
794	6,923	16.2	09.8
720	9,580	11.5	-11.8
700	10,390	10.2	-07.2
620	13,648	02.8	-01.2
600	14,530	~~10.2~~ 01.0	-02.8
516	18,405	-06.8	-09.8
500	19,270	-07.2	-13.2
478	20,274	-07.5	-19.5
458	21,489	-09.5	-24.5
432	22,933	-13.2	-18.2
400	24,890	-16.2	-30.2
398	24,951	-16.5	-32.2
~~334~~ 367	26,~~500~~ 936	-18.9	Miss
345	28,478	-22.8	-46.2
300	31,~~800~~ 920	-30.8	-41.2
262	34,902	-38.8	-43.5

DNA

MAPLE

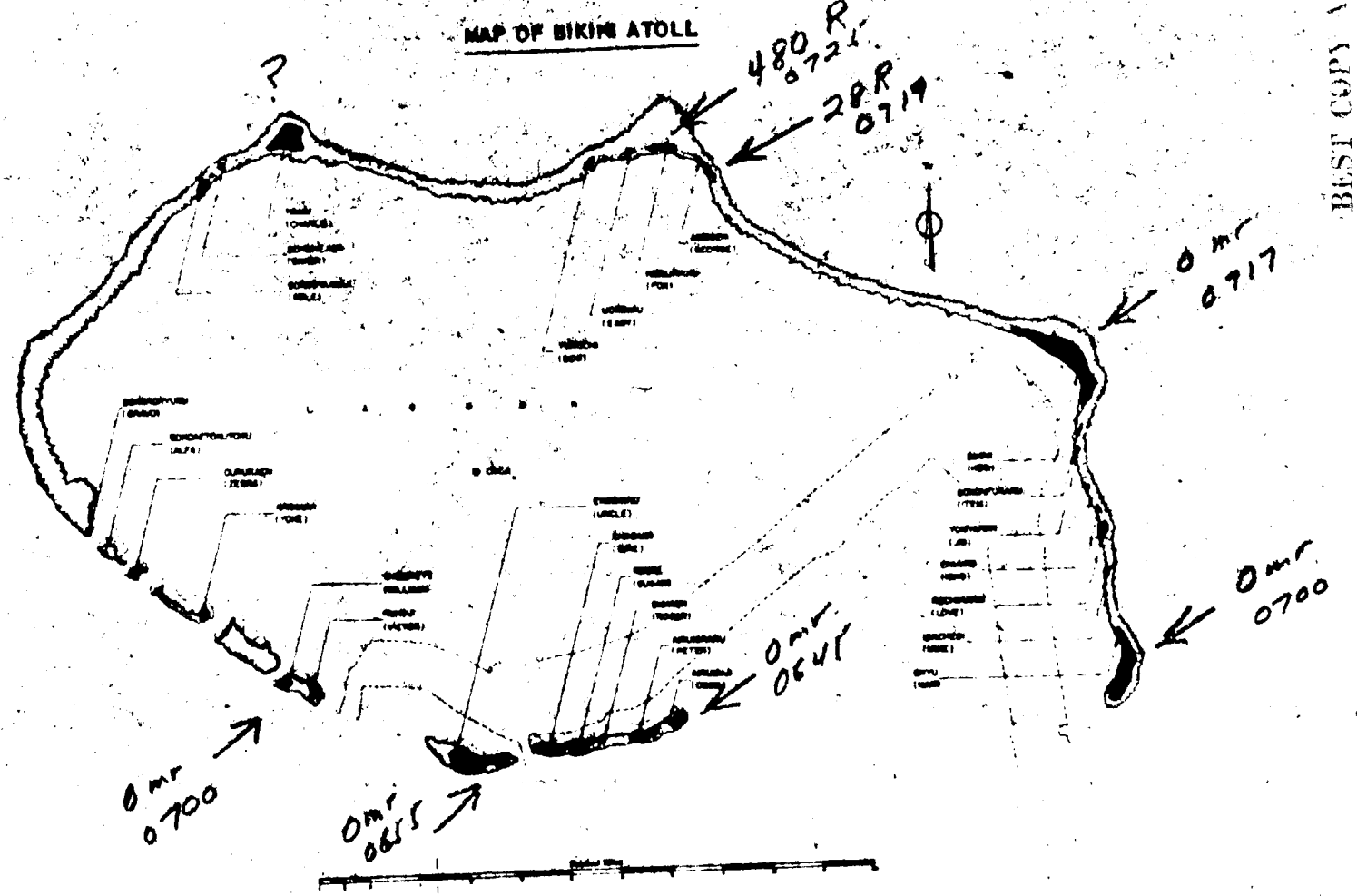
BIKINI WINDS ALOFT OBSERVATION

Height (Feet)	Direction (Degrees)	Velocity (Knots)
1,000	080	20
2,000	080	21
3,000	~~000~~ 080	20
4,000	100	19
5,000	110	19
6,000	120	19
7,000	130	16
8,000	140	17
9,000	130	17
10,000	130	16
12,000	100	21
14,000	080	18
16,000	080	21
18,000	140	25
20,000	140	24
22,000	150	23
24,000	130	11
26,000	250	10
28,000	230	16
30,000	270	17
32,000	280	21
34,000	280	28
36,000	250	28
38,000	270	20
40,000	270	29
42,500	230	20
45,000	310	21
47,500	340	18
50,000	330	17
52,500	340	11
55,000	080	04
57,500	090	08
60,000	100	12
65,000	070	29
70,000	090	18
75,000	090	28
80,000	090	50
85,000	090	60
90,000	090	69

MAPLE EVE

Initial Helicopter Survey
H+1 Hour

MAP OF BIKINI ATOLL



110630M to 110735M
June

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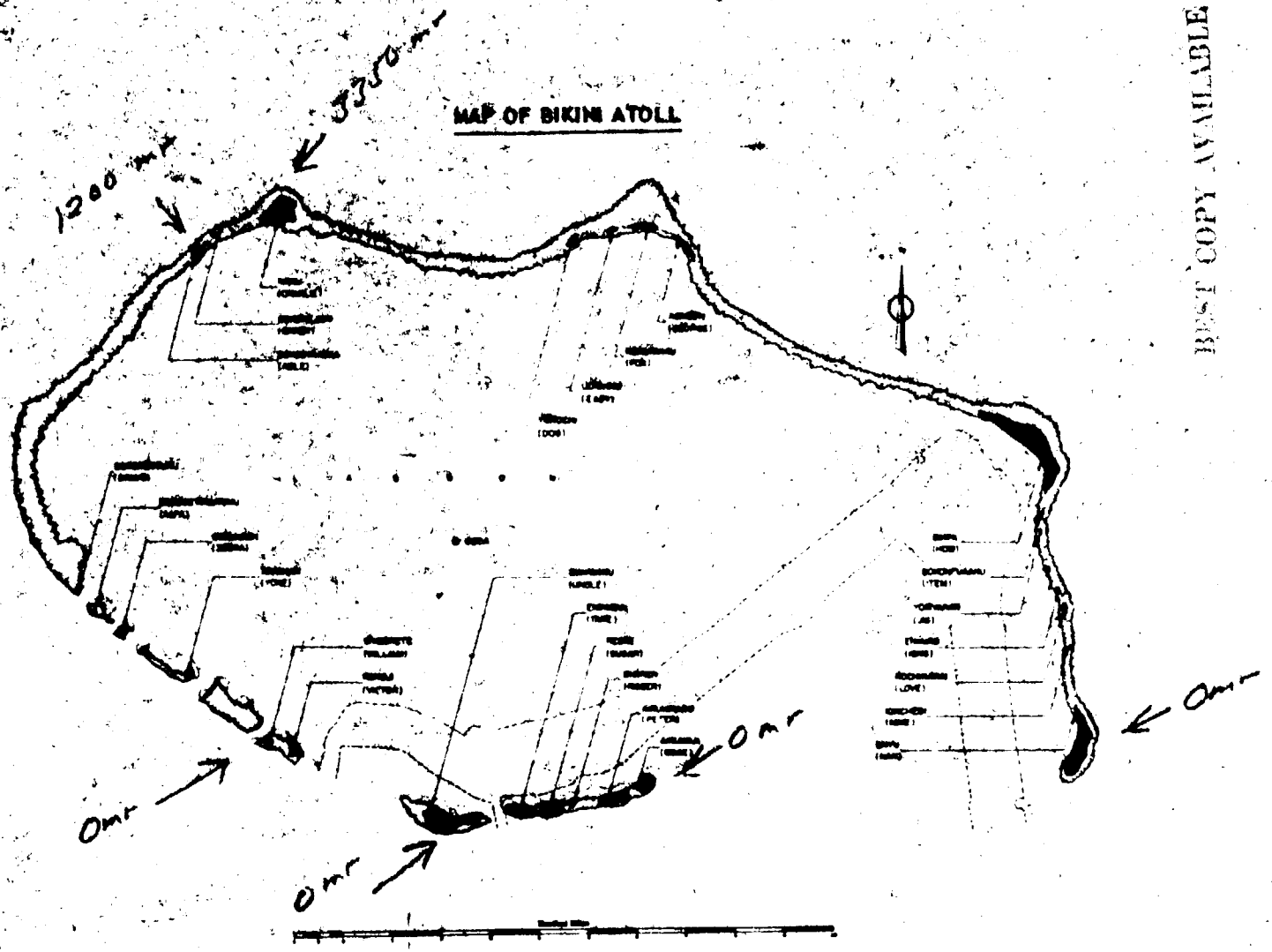
TAB F-1

MAPLE EVENT

Second Helicopter Survey, H+10 Hours



111630M June

INDEX

TAB

[redacted]

ASPEN EVENT

OPERATION HARDTACK

1. The ASPEN device was detonated on a barge 3,000 feet southwest of Charlie Island, Bikini Atoll, at 0530M, 15 June 1958. Radar established the cloud height at 48,600 feet; aircraft estimated the top at 55,000 feet. Within thirty minutes the cloud had moved well to the northwest of the lagoon.

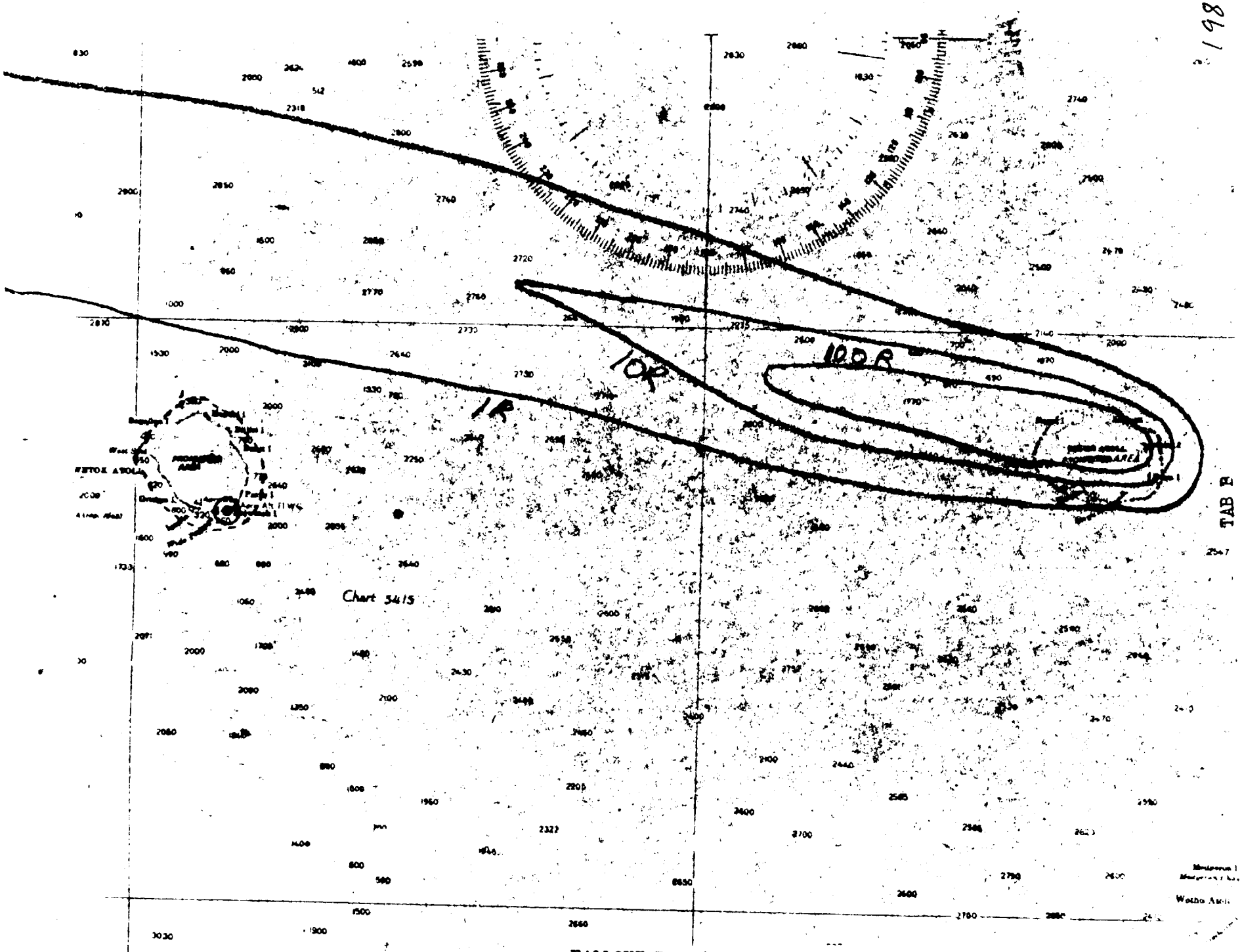
2. A P2V aircraft (Wildroot 11) reported over Nan at H+30 minutes, and it was vectored across the eastern section of the lagoon. Only background readings were recorded. At 0645M, the P2V had searched the entire lagoon, and the highest reading was made two miles east of ground zero: 5.5 mr/hr. Re-entry hour was declared at 0700M.

3. Two helicopters took off from Nan at 0730M, and negative readings were reported at William and How. A second detailed survey was conducted at H+7 hours.

4. Fallout was predicted along a true bearing of 300 degrees for a distance of 200 miles. It is estimated that all fallout fell within this area.

5. Excellent communications with the USS Benner contributed to the success of this event.

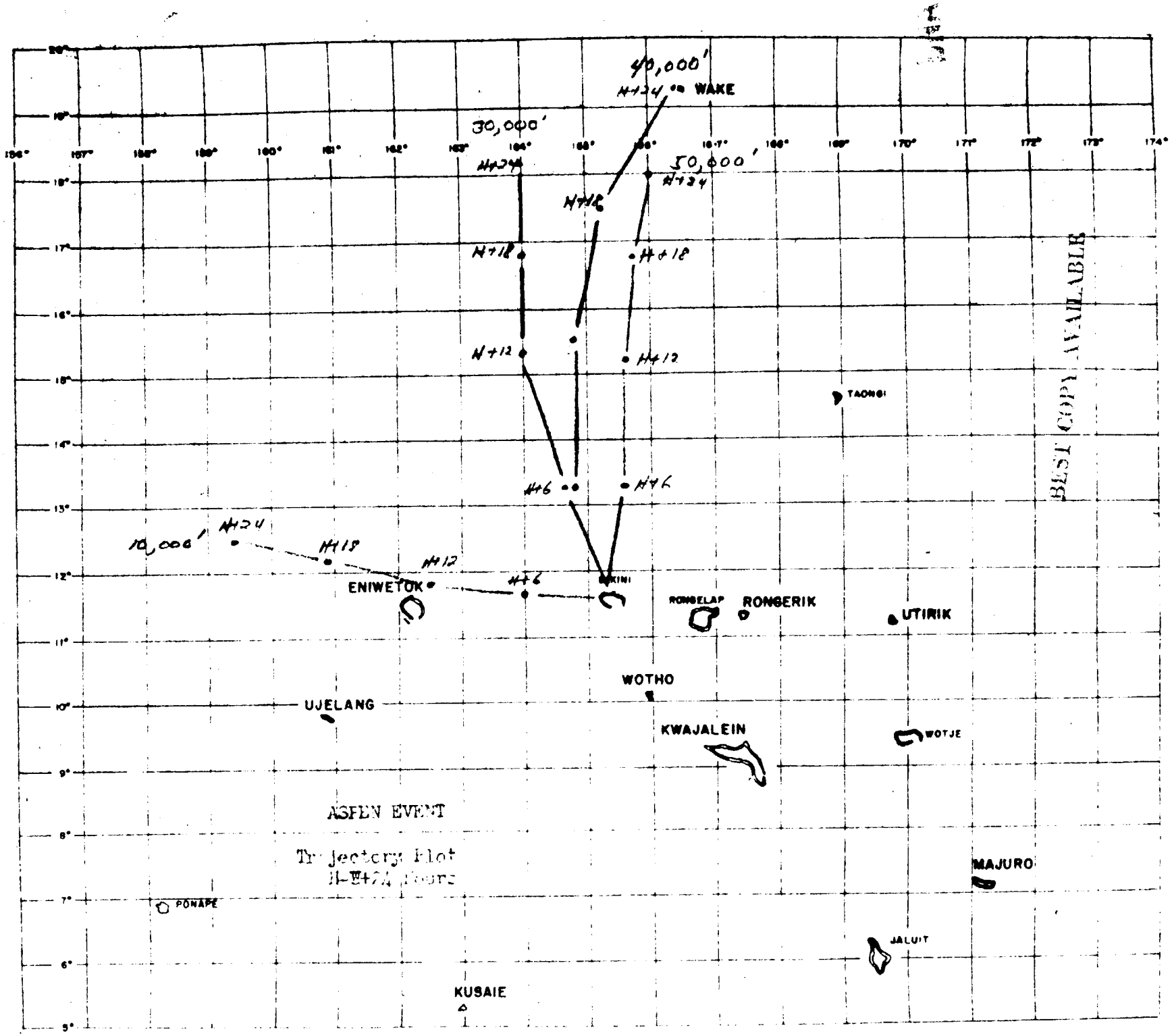
[redacted]



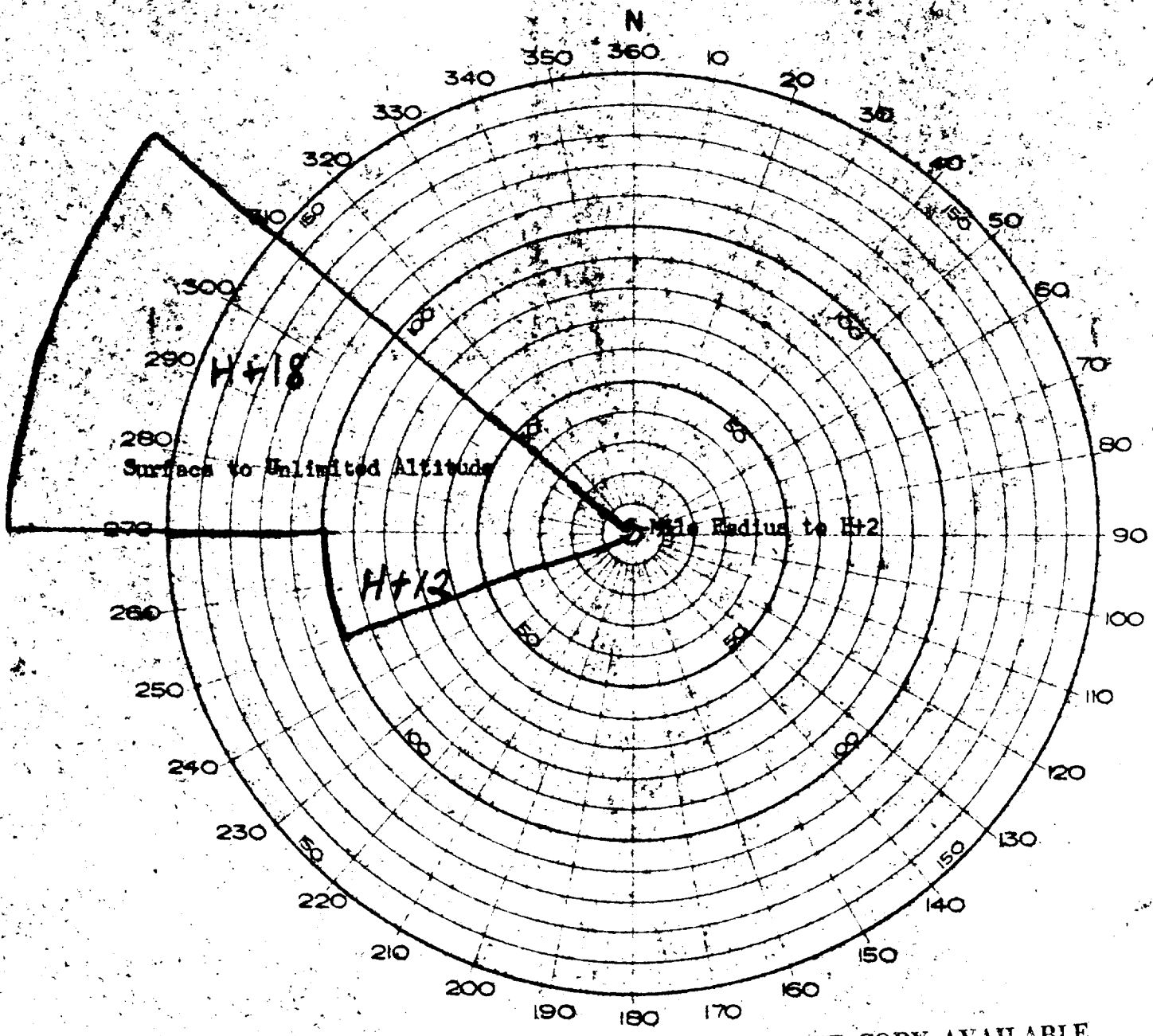
FALLOUT FORECAST

MAPLE EVENT

TAB B


40,000'
H+24
WAKE
30,000'
H+24
50,000'
H+24
H+18
H+18
H+18
H+12
H+12
H+12
TAONGI
H+6
H+6
H+6
10,000'
H+24
H+18
H+12
ENIWETOK
H+6
BIKINI
RONGELAP
RONGERIK
UTIRIK
WOTHO
UJELANG
KWAJALEIN
WOTJE
ASPEN EVENT
Trajectory Plot
H-H+24 Hours
MAJURO
PONAPE
JALUIT
KUSAIE
BEST COPY AVAILABLE

HODOGRAPH
RESULTANT WINDS AND SURFACE RADEX



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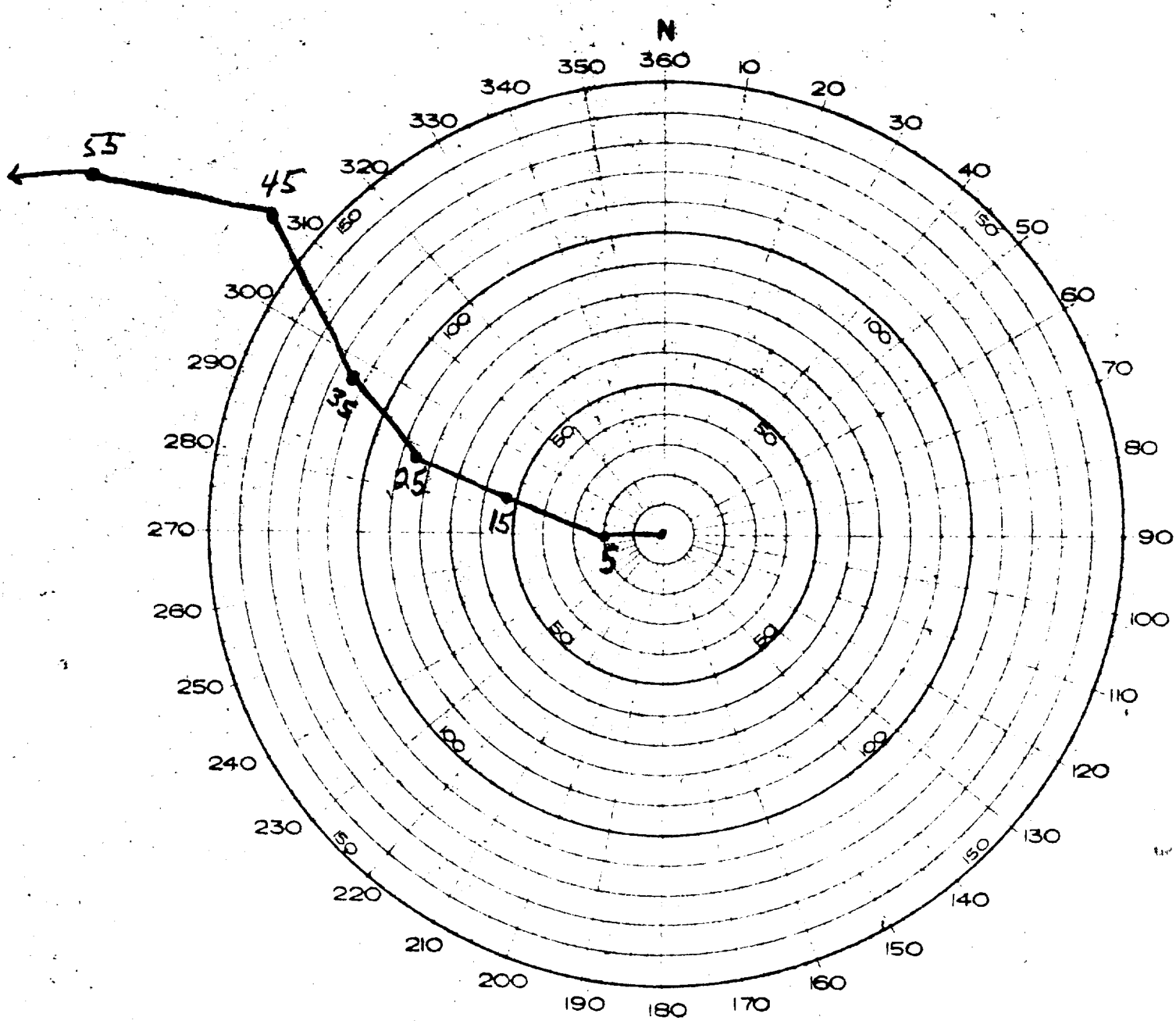
ASPEN EVENT

Surface and Air Radex

HODOGRAPH
RESULTANT WINDS AND SURFACE RADEX

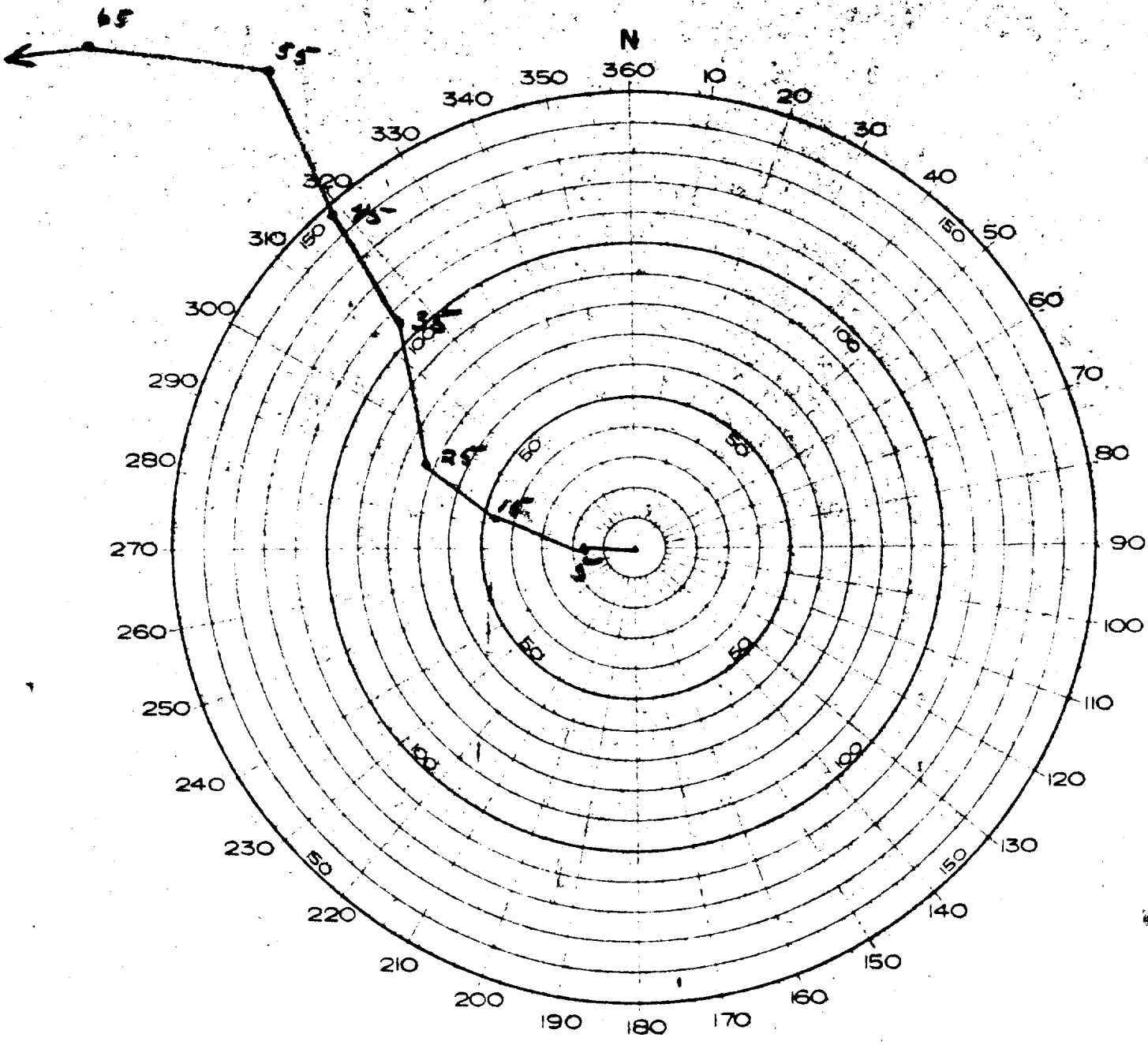


ASPEN EVENT

Forecast Hodograph
150530M June

TAB E-1

HODOGRAPH
RESULTANT WINDS AND SURFACE RADEX



ASPEN EVENT

Shot-time Hodograph
1506COM June

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 457, San Francisco, California

16 June 1958

ASPEN

BIKINI OBSERVED WEATHER FOR 15 JUNE 1958

SURFACE WEATHER:

Sea Level Pressure	1011.1 mbs
Free Air Surface Temperature	81.3° F
Wet Bulb Temperature	75.9° F
Dew Point Temperature	74.0° F
Relative Humidity	78%
Surface Wind	050° 18 knots
Visibility	10 miles
Weather	None

CLOUDS:
Scattered (3/10) cumulus, bases 2,000 feet. Scattered (1/10) stratocumulus, bases 4,000 feet. Scattered (1/10) altocumulus, bases 8,000 feet. Scattered (2/10) cirrus, height unknown.

AREA WEATHER SUMMARY FOR AIRCRAFT:
Normal trade cumulus, clear above. Aircraft too high for reading of base and tops.

STATE OF THE SEA:
Open Sea: Waves from 070°, height 4 feet, period 4 seconds, length 50 feet.
Lagoon: Waves from 070°, height 3 feet, period 4 seconds, length 30 feet.

ASPEN

BIKINI RADIOSONDE OBSERVATION

Pressure (Millibars)	Height (Feet)	Temperature (°C)	Dew Point (°C)
1009	Surface	26.9	23.2
1000	331	26.1	22.8
920	2,723	20.1	18.8
850	4,977	17.1	15.1
756	8,268	12.7	09.0
722	9,514	09.4	02.9
700	10,318	08.2	-00.5
682	11,122	07.5	01.2
613	13,976	02.0	-08.2
600	14,446	01.2	-06.2
588	15,092	00.5	-05.5
552	16,716	-01.2	-20.5
513	18,602	-05.2	-15.2
500	19,203	-06.2	-17.5
466	21,030	-09.2	-26.2
400	24,813	-18.5	-23.2
377	26,293	-22.2	-25.2
300	31,650	-32.8	-42.5
265	34,482	-39.5	-47.2
250	35,774	-43.0	Miss
200	40,571	-56.0	Miss
150	46,378	-70.2	Miss
110	52,411	-80.0	Miss
100	54,058	-78.8	Miss
068	61,368	-77.0	Miss
065	62,254	-72.0	Miss
056	65,108	-67.0	Miss
050	67,365	-66.6	Miss
028	79,304	-54.0	Miss

ASPEN

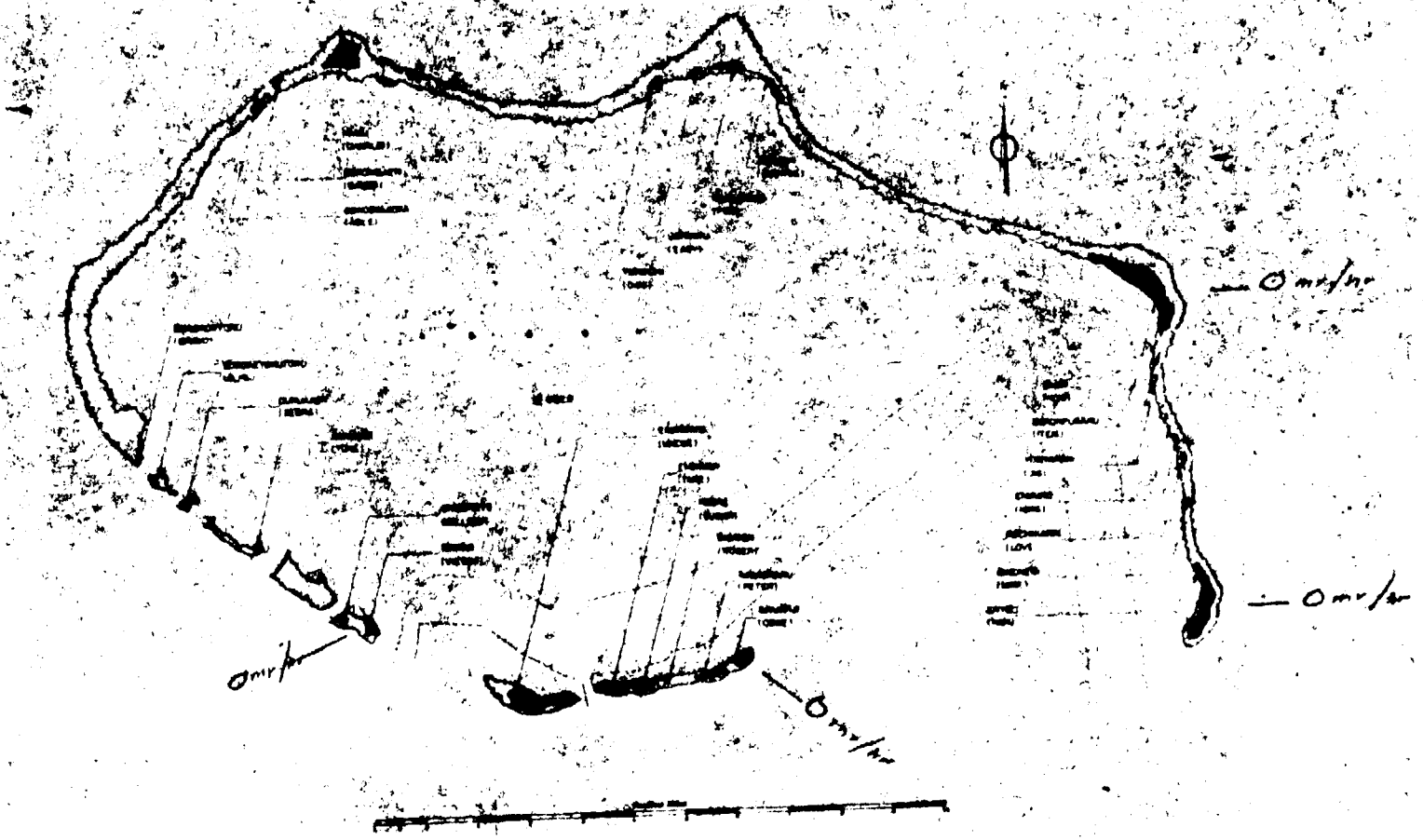
BIKINI WINDS ALOFT OBSERVATION

Height (Feet)	Direction (Degrees)	Velocity (Knots)
Surface	050	18
1,000	070	19
2,000	080	18
3,000	090	18
4,000	090	18
5,000	090	17
6,000	100	19
7,000	110	19
8,000	110	19
9,000	120	20
10,000	110	~~12~~ 12
12,000	110	14
14,000	120	09
16,000	110	11
18,000	120	11
20,000	120	11
22,000	140	16
24,000	150	19
26,000	150	21
28,000	150	21
30,000	160	23
32,000	170	25
34,000	170	25
36,000	170	25
38,000	170	23
40,000	150	23
42,500	170	24
45,000	160	20
47,500	180	23
50,000	190	23
52,500	160	20
55,000	110	14
57,500	180	07
60,000	150	~~05~~ 07
65,000	090	23
70,000	090	25

ASPEN EVENT

Radiological Surface Survey, H+2 Hours

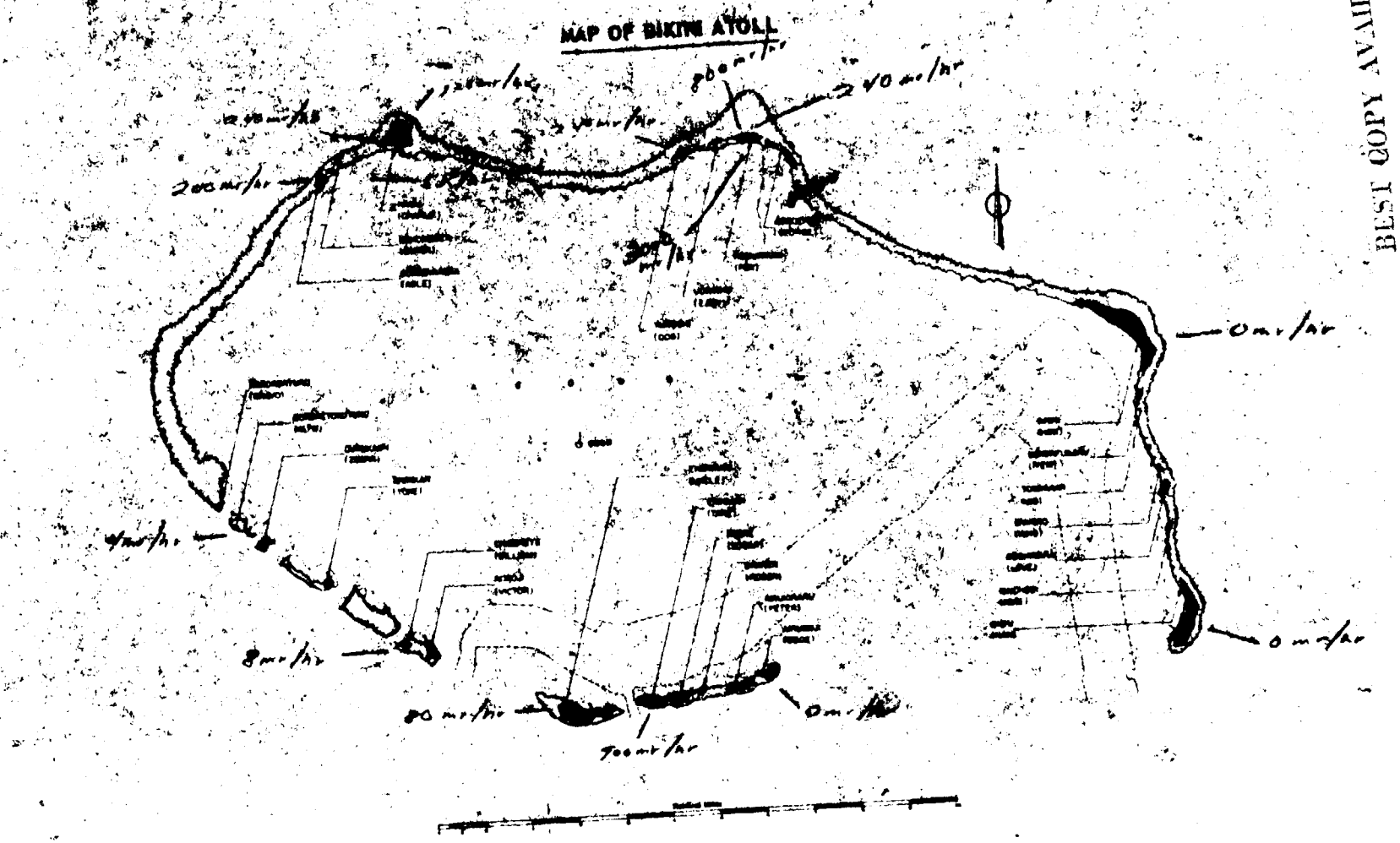
MAP OF BIKINI ATOLL



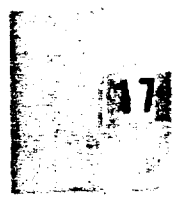
Search Made by Two Helicopters

ASPEN EVENT

Radiological Surface Survey, H+7 Hours



Two Helicopters Used



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TAB

[redacted]

WALNUT EVENT

OPERATION HARDTACK

1. The WALNUT device was detonated on a barge 5,000 feet southwest of Janet Island, Eniwetok Atoll, at 0630M, 15 June 1958. Cloud height information and control of the P2V was ineffective during the first half hour because of lack of cooperation from Eniwetok AOC. Cloud height was established at 61,000 feet by aircraft report, at H+30 minutes. Radar cloud information was not available.

2. The P2V aircraft (Wildroot 2) was released by AOC to perform the search at H+1 hour. A quick search of the lower lagoon area was made, and two tracks from Leroy (040 degrees and 350 degrees) were accomplished to permit nose cone recovery operations to commence. The highest reading was made over the reef three miles southwest of Alice: 2 r at 0755M. The cloud had moved rapidly to the northwest and re-entry hour was declared at 0830M.

3. The helicopter survey commenced at 0905M. Only background was recorded with the exception of the northwest chain, which ranged from 500 mr/hr to 30 mr/hr in the water near Edna.

4. The P2V was vectored to the west for fifty miles, then placed in an orbit east of Eniwetok for two hours.

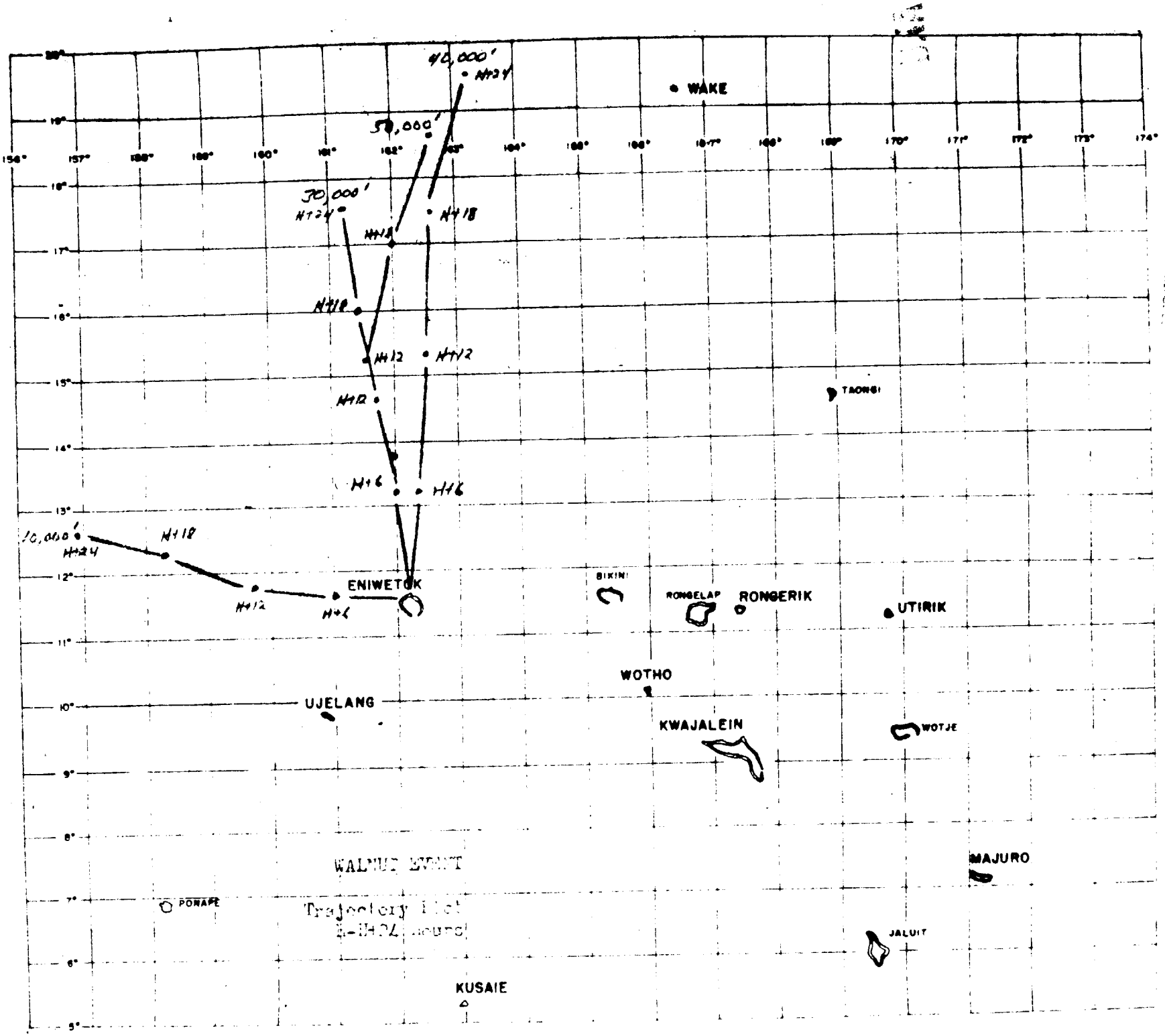
5. It is estimated that all fallout fell within the predicted area.

TAB A

[redacted]

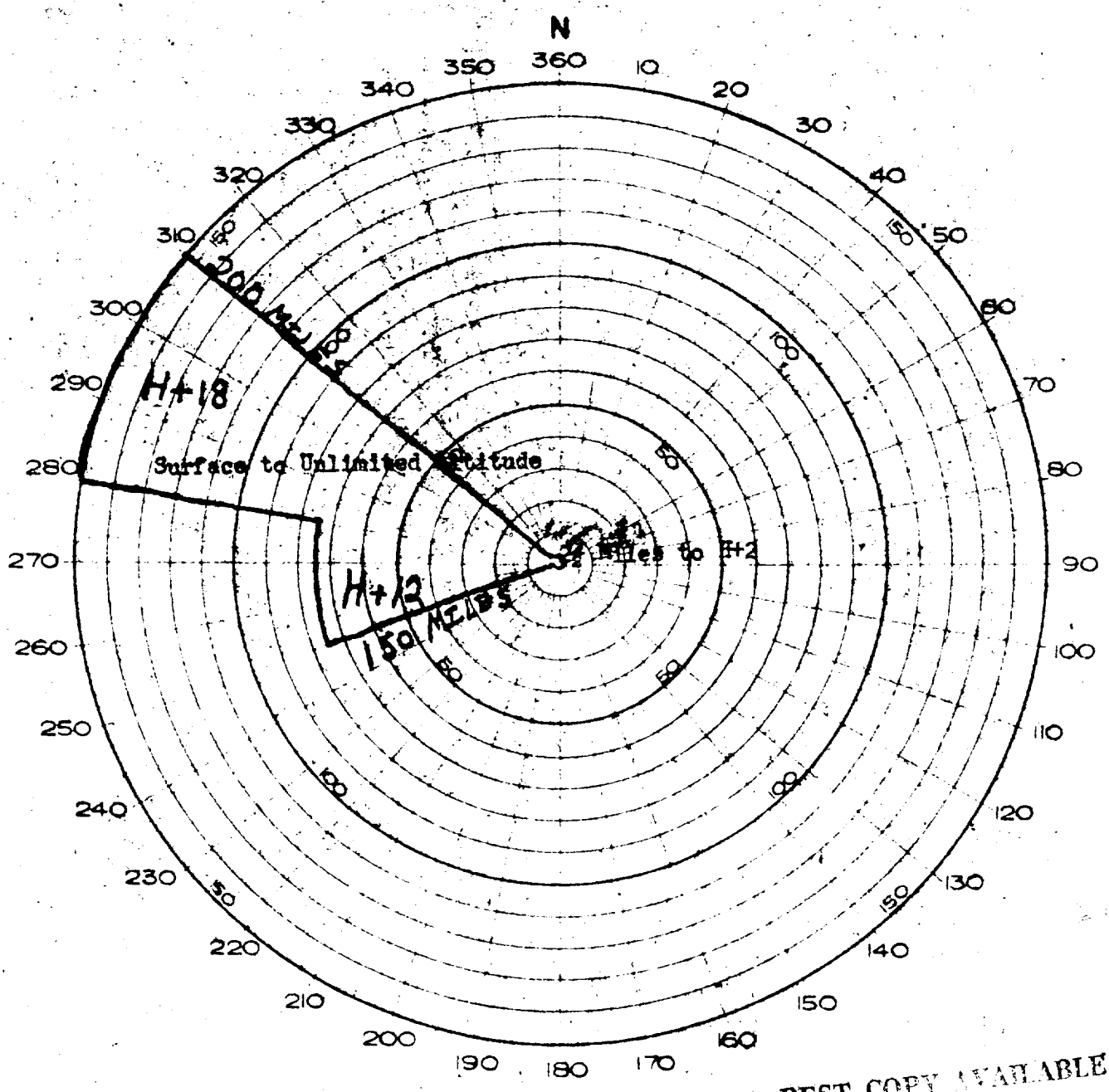
BEST COPY AVAILABLE

TAB B


40,000'
H+24
WAKE
50,000'
30,000'
H+24
H+18
H+18
H+18
H+12
H+12
H+12
TAONGI
H+6
H+6
10,000'
H+24
H+18
H+12
H+6
ENIWETOK
BIKINI
RONGELAP
RONGERIK
UTIRIK
WOTHO
UJELANG
KWAJALEIN
WOTJE
MAJURO
PONAPE
JALUIT
KUSAIE
Trajectory
H-H+24 hours

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX

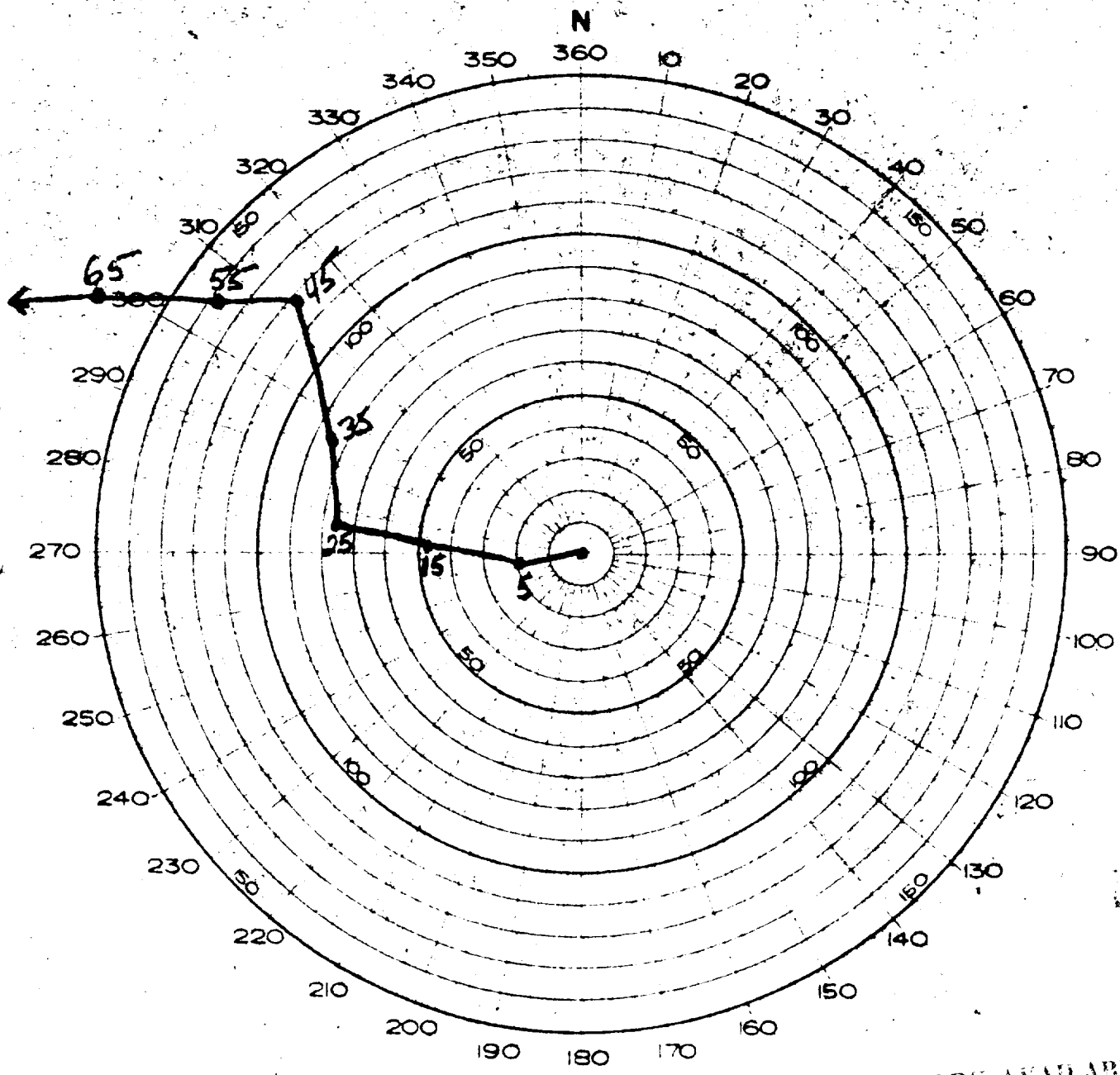


WALNUT EVENT

Surface and Air Radex

TAB D

HODOGRAPH
RESULTANT WINDS AND SURFACE RADEX

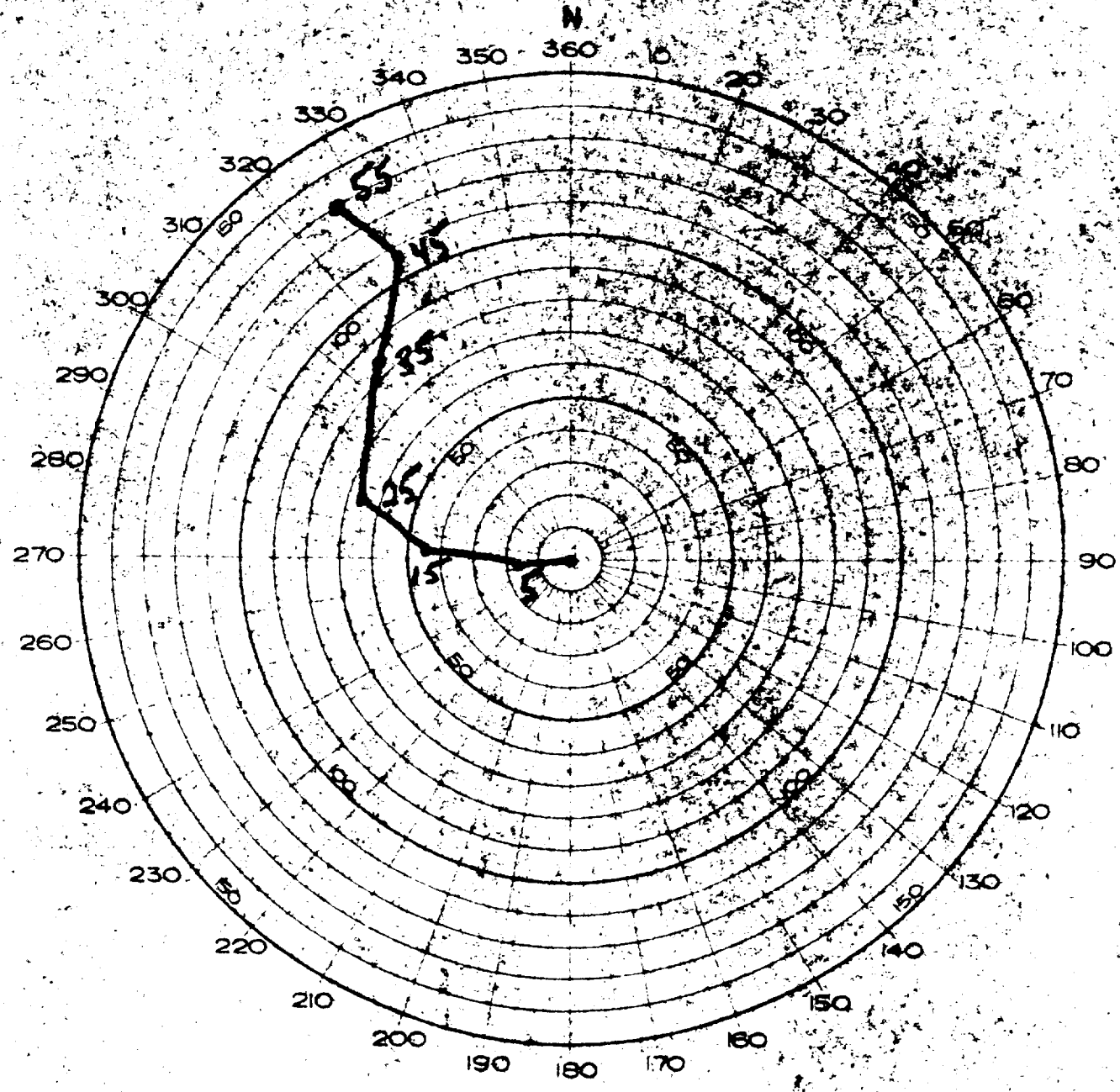


WALNUT EVENT

Forecast Hodograph
150630M June

TAB E-1

HODOGRAPH
RESULTANT WINDS AND
SURFACE RADEX



WALNUT EVENT

Shot-time Hodograph
150600M June

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TAB E-2

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

13 June 1958

WALNUT

ENIWETOK OBSERVED WEATHER FOR 15 JUNE 1958

SURFACE WEATHER:	
Sea Level Pressure	1011.0 mbs
Free Air Surface Temperature	80.8° F
Wet Bulb Temperature	77.0° F
Dew Point Temperature	76.0° F
Relative Humidity	84%
Surface Wind	080° 17 knots
Visibility	10 miles
Weather	None

CLOUDS:
Scattered (4/10)-cumulus, bases 1,800 feet. Broken (7/10) altostratus-altocumulus, bases, estimated 8,000 feet.

AREA WEATHER SUMMARY FROM AIRCRAFT:
Broken (6/10) fractocumulus and fractostrata, bases 1,200, tops 3,500. Broken (6/10 - 7/10) cumulus and stratocumulus, bases 1,300, tops 7,000 to 8,000 feet. Broken (7/10) altostratus and altocumulus, bases 20,000, tops 2,1000 feet. Broken (6/10 - 7/10) cirrus, bases 30,000, tops 35,000 feet. Moderate turbulence and St Elmo's fire.

STATE OF THE SEA:
Open Sea: Waves from 080°, height 3 feet, period 4 seconds, length 30 to 40 feet.
Lagoon near Janet: Waves ½ foot high, period 1 - 2 seconds. Swell ½ foot - 1 foot, period 4 seconds, length 80 to 100 feet.

WALNUT

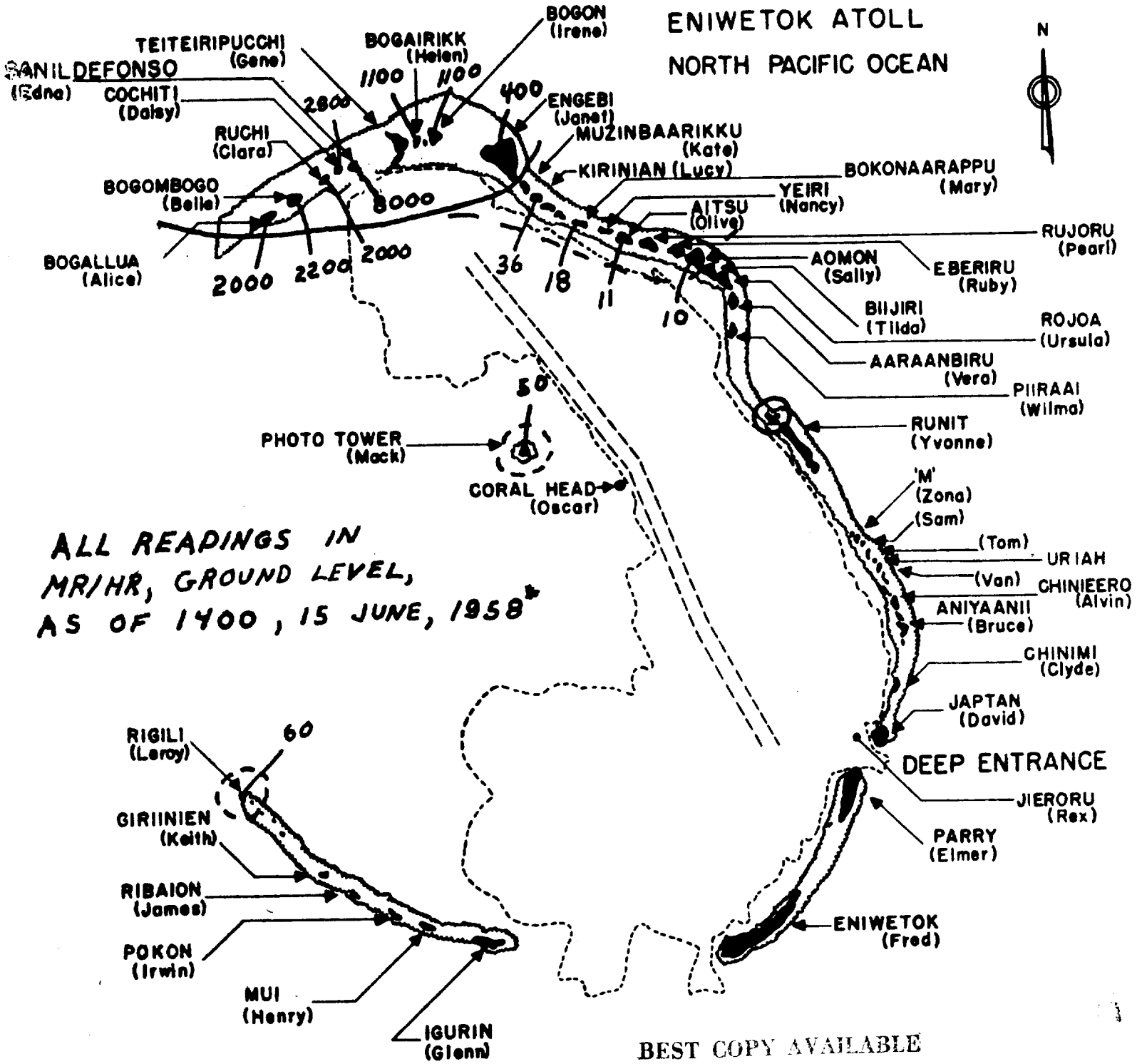
ENIWETOK RADIOSONDE OBSERVATION

Pressure (Millibars)	Height (Feet)	Temperature (°C)	Dew Point (°C)	
1010	Surface	25.2	22.5	
1000	310	24.2	21.8	
850	4,910	14.8	13.2	
798	5,348	12.0	04.5	
756	8,202	09.8	08.8	
700	10,240	07.2	-01.2	
672	11,417	05.5	-10.8	
629	13,123	02.5	-04.2	
600	14,350	00.5	-07.5	
558	16,240	~~-02.8~~	-06.8	
500	19,080	-08.5	-11.5	
400	24,~~6~~30	-19.2	-28.2	
300	31,440	-34.5	-42.2	
270	34,056	-40.2	~~-50.0~~	MISS
250	35,550	-44.0	Miss	
200	40,330	-57.0	Miss	
150	46,140	-68.0	Miss	
104	53,460	-79.0	Miss	
100	53,~~900~~ 870	-78.0	Miss	
084	57,618	-76.0	Miss	
072	60,555	-79.0	Miss	
070	61,083	-~~6~~8.0	Miss	
058	64,080	-70.0	Miss	
055	65,703	-~~6~~6.0	Miss	
050	67,~~370~~ 240	-6~~6~~.8	Miss	
043	69,300	-67.0	Miss	
044	70,257	-62.0	Miss	
037	73,920	-63.0	Miss	
033	76,197	-~~6~~0.0	Miss	
029	78,804	-62.0	Miss	
028	79,629	-56.0	Miss	
025	81,~~860~~ 360	-54.0	Miss	
013	96,947	-42.0	Miss	

WALNUT

ENIWETOK WINDS ALOFT OBSERVATION

Height (Feet)	Direction (Degrees)	Velocity (Knots)
Surface	~~000~~ 070	~~10~~ 14
1,000	070	~~10~~ 19
2,000	080	19
3,000	090	19
4,000	090	19
5,000	090	17
6,000	090	15
7,000	090	13
8,000	090	13
9,000	100	13
10,000	100	13
12,000	090	13
14,000	110	15
16,000	110	20
18,000	110	20
20,000	110	18
22,000	150	13
24,000	190	09
26,000	200	13
28,000	190	19
30,000	180	25
32,000	170	28
34,000	180	23
36,000	190	20
38,000	200	23
40,000	210	23
42,500	190	17
45,000	150	14
47,500	130	12
50,000	140	14
52,500	130	12
55,000	110	08
57,500	100	11
60,000	080	17
65,000	100	23
70,000	090	25
75,000	090	42
80,000	090	50
85,000	090	60
90,000	090	64
~~95,000~~ 94,000	090	64



ALL READINGS IN MR/HR, GROUND LEVEL, AS OF 1400, 15 JUNE, 1958*

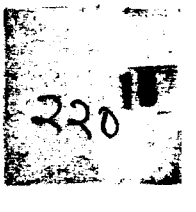
* Reading for Mack Photo Tower as of 1000, 15 June.

— — — — LIMITED RADEX

——— FULL RADEX

WALNUT EVENT

Radiological Surface Surveys, H+8 Hours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TAB

[redacted]

LINDEN EVENT

OPERATION HARDTACK

1. LINDEN was detonated at 1500M, 18 June 1958, on a barge located one mile west of Yvonne Island. [redacted] the cloud to rise to 20,000 feet, then to stabilize at 19,000 feet. The weather radar on Fred and the cloud sampling aircraft were both used to follow the cloud movement.

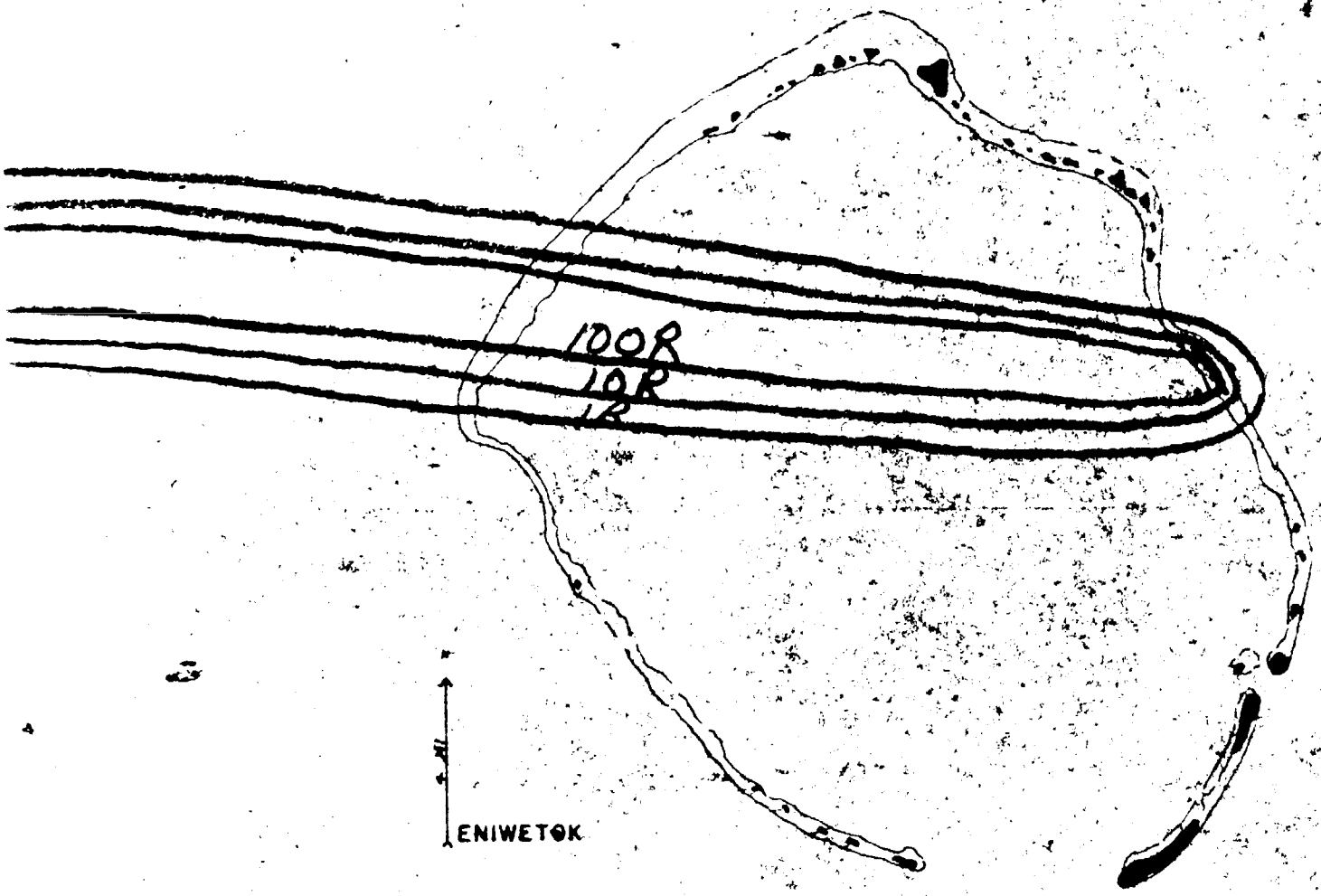
2. The main body of the cloud moved northwesterly, passing over Mack and the northwestern islands from Alice to Janet. Net movement was only seven knots in speed, with the result that the lagoon was not cleared until H+2½, when Re-entry Hour was declared. The P2V was used to follow the south edge of the cloud as it moved off. The plane was then vectored for a final sweep of the northern half of the atoll just before Re-entry Hour, and the only significant readings obtained were near ground zero.

3. The initial helicopter survey was cut short due to approaching darkness. A detailed survey was made at 0815M the next morning, and significant readings were obtained only at the islands mentioned above. They ranged from 10 r at Mack to 24 mr at Janet.

4. The predicted fallout plot was in a very narrow area along an axis of 280 degrees from ground zero. The actual area was somewhat wider and fell between the radials 270 degrees and 320 degrees, for a distance of approximately forty miles. All significant fallout fell within the published hazard area.

TAB A

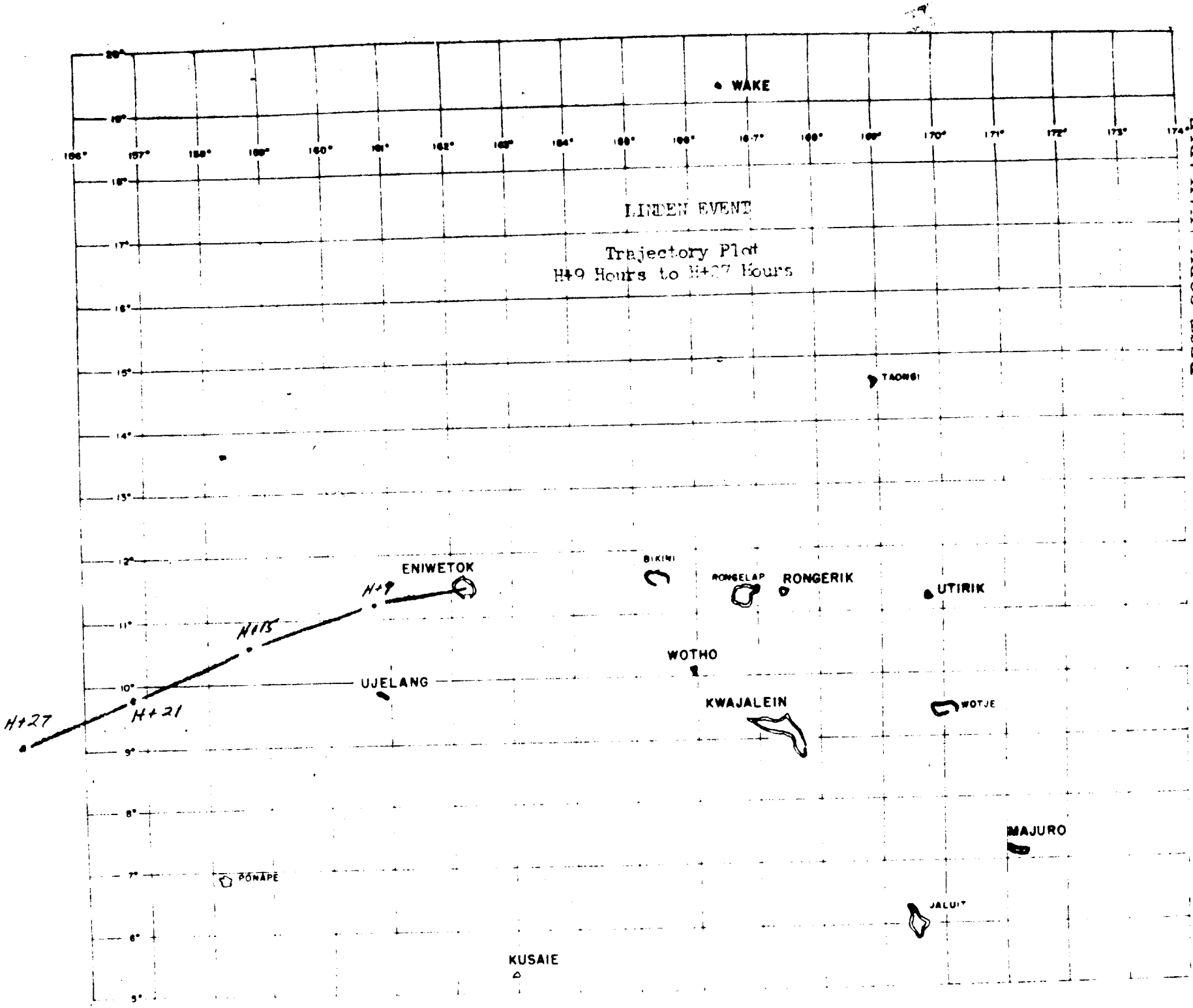
[redacted]



LINDEN EVENT

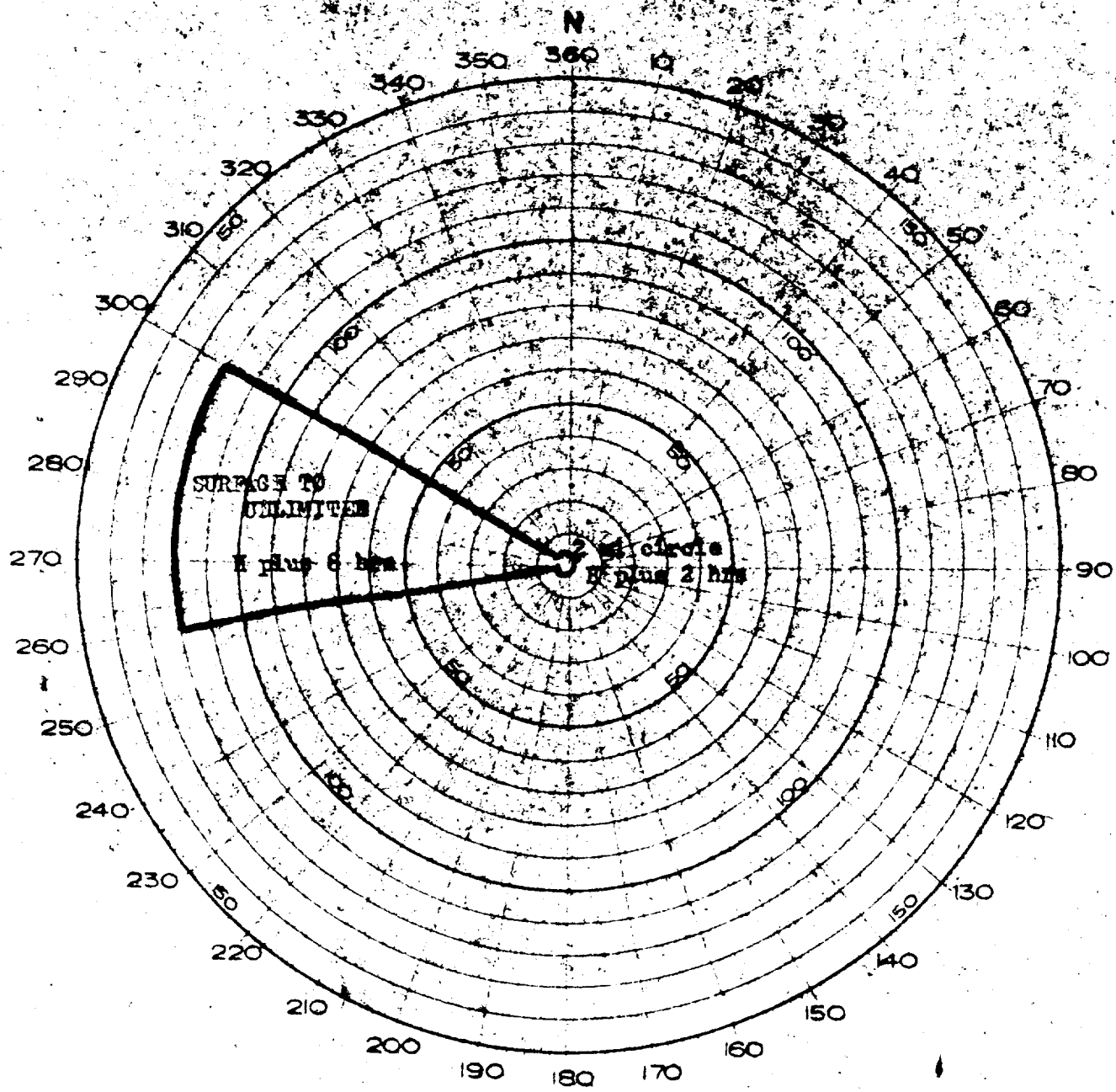
FORECAST FALLOUT PLOT

VALID 181500M JUNE



TAB C

HODOGRAPH
RESULTANT WINDS AND SURFACE RADEX

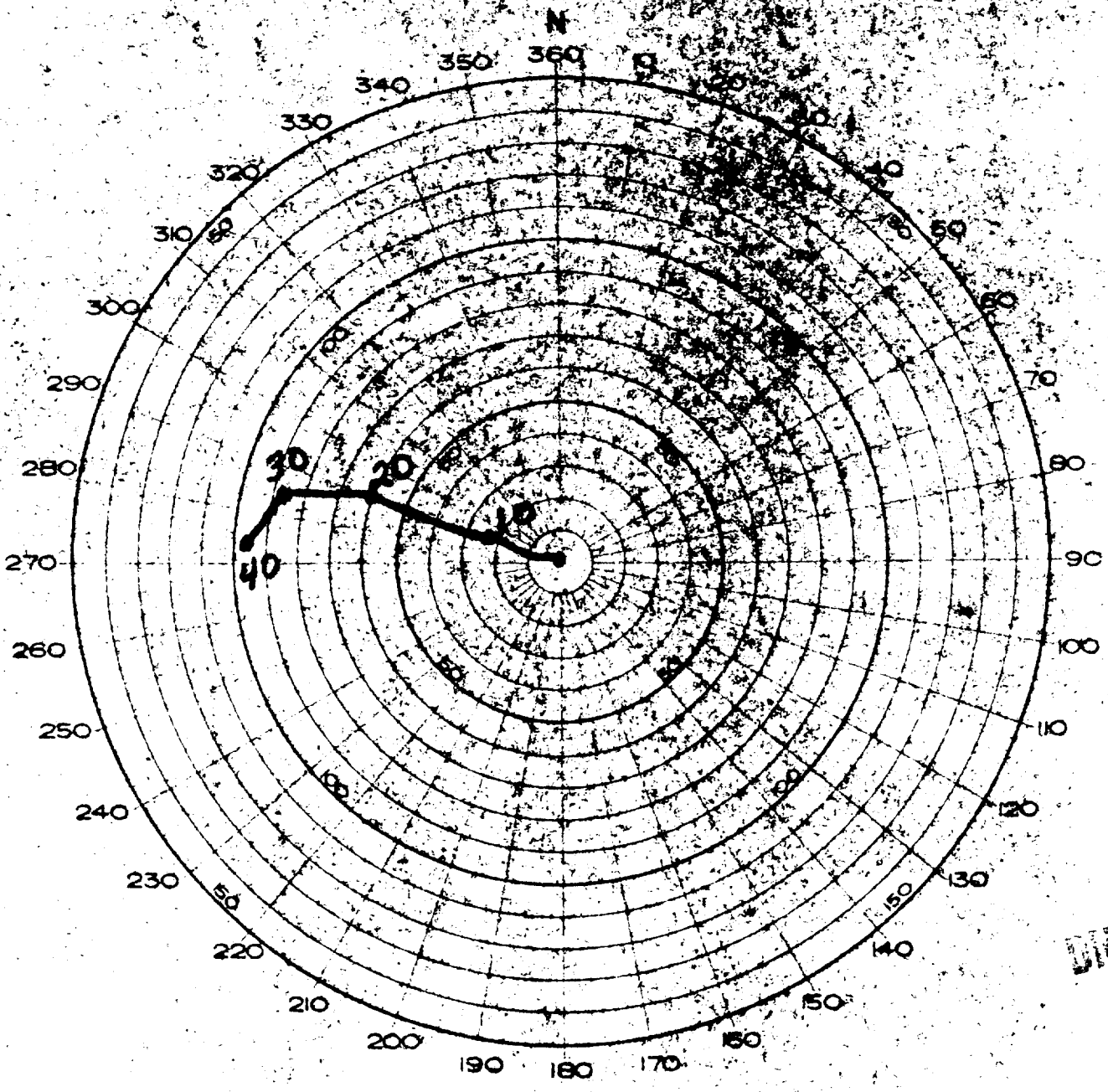


SURFACE AND AIR RADEX

LINDEN EVENT

TAB D

HODOGRAPH
RESULTANT WINDS AND SURFACE RADEX



FORECAST HODOGRAPH

LINDEN EVENT

VALID 181500M JUNE

DNA

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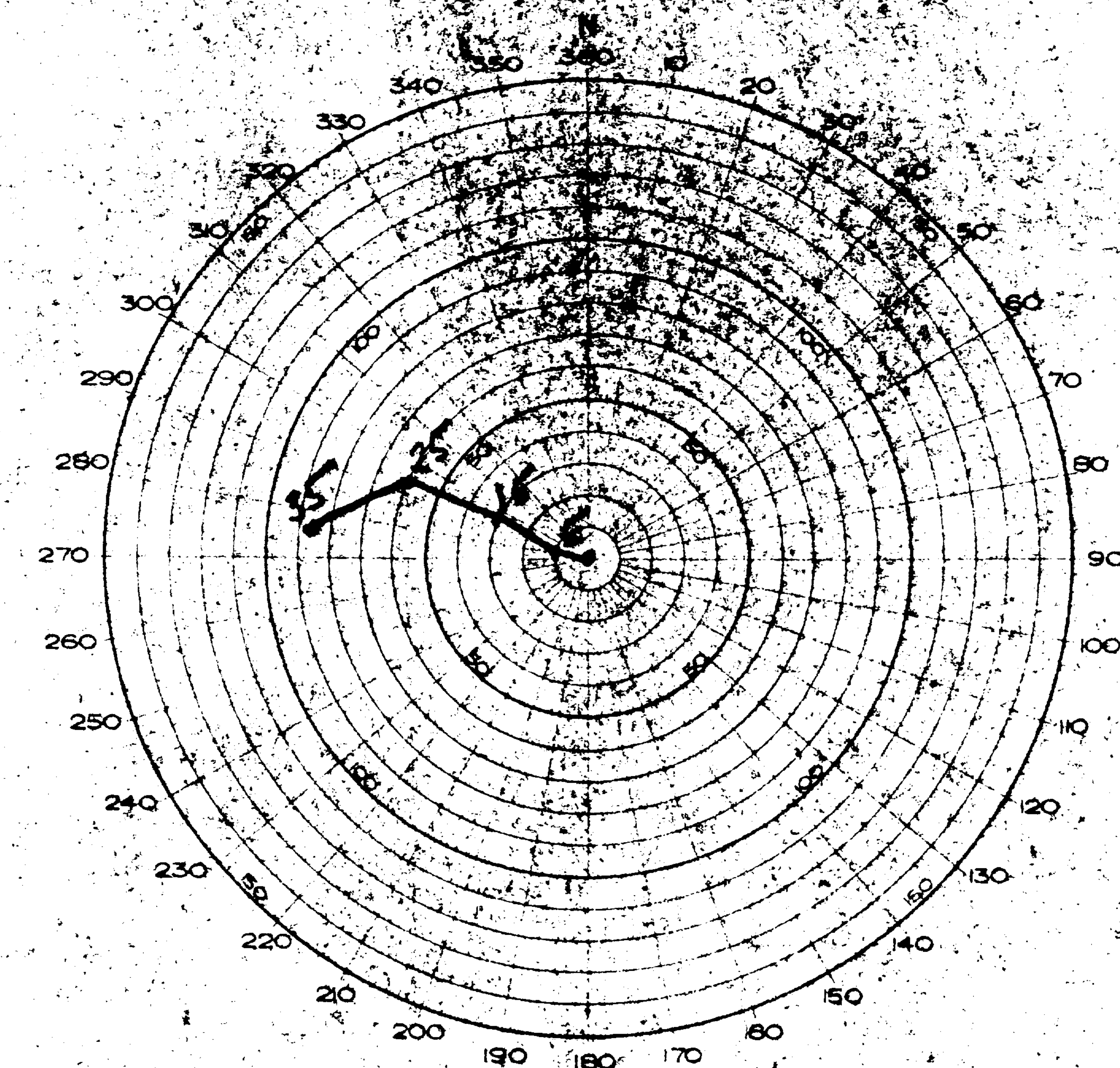
HODOGRAPH RESULTANT WINDS AND SURFACE RADEX



'Shot Time Hodograph'
Linden Event

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HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 457, San Francisco, California

19 June 1958

LINDEN

ENIWETOK OBSERVED WEATHER FOR 18 JUNE 1958

SURFACE WEATHER:

Sea Level Pressure	1010.2 mbs
Free Air Surface Temperature	88.1° F
Wet Bulb Temperature	77.7° F
Dew Point Temperature	77.5° F
Relative Humidity	71%
Surface Wind	090° 13 knots
Visibility	10 miles
Weather	None

CLOUDS:
Scattered (4/10) cumulus bases 1,800 feet. Scattered (1/10) cirrus, bases unknown.

AREA WEATHER SUMMARY FROM AIRCRAFT:
Scattered cumulus, bases 2,200 feet, tops 5,000 feet with occasional tops to 7,000 feet.

STATE OF THE SEA:
Open Sea: Waves from 080°, height 3 feet, length 30 to 40 feet, period 4 seconds.
Lagoon: Sea waves negligible, swell less than 6 inches high, period 4 seconds, length 50 to 80 feet.

LI'DEN

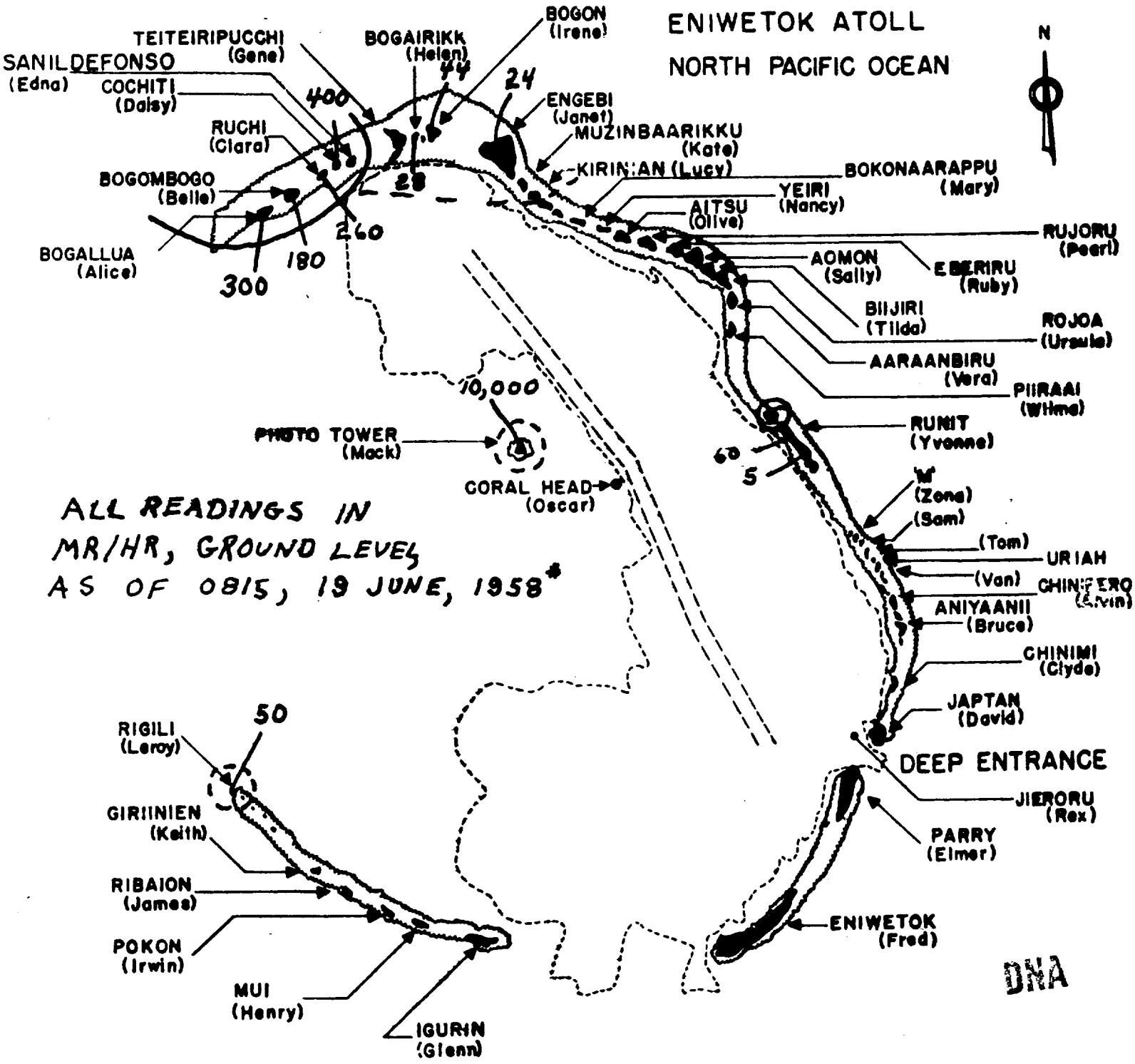
ENIWETOK RADIOSONDE OBSERVATION

Pressure (Millibars)	Height (Feet)	Temperature (°C)	Dew Point (°C)
1010	Surface	28.2	23.2
1000	310	27.5	22.5
890	3,642	19.2	16.5
850	4,950	18.2	14.5
704	10,171	10.5	02.5
700	10,340	10.5	00.5
692	10,630	10.5	-07.2
645	12,566	06.2	-09.2
621	13,550	04.2	-13.8
618	13,714	03.5	-06.5
600	14,490	02.8	-06.2
589	14,961	02.2	-05.8
567	15,978	01.2	-19.2
500	19,260	~~-04.7~~	Miss
424	23,425	~~-15~~.2	-29.8
404	24,639	-15.8	-24.2
400	24,910	-16.2	-25.8
366	27,074	-20.2	-35.2
300	31,800	~~-30.7~~ 31.7	Miss
250	35,950	-41.4	Miss
200	40,790	~~-58.6~~ -53.2	Miss
150	48,~~710~~ 690	~~-65.7~~ -66.7	Miss
104	53,806	-80.0	Miss
100	54,~~500~~ 490	-77.3	Miss
~~088~~ 094	55,643	-73.0	Miss
080	58,766	-76.0	Miss
050	68,060	-57.3	Miss
037	74,278	-60.0	Miss
025	82,450	-53.0	Miss

LINDEN

ENIWETOK WINDS ALOFT OBSERVATION

Height (Feet)	Direction (Degrees)	Velocity (Knots)
Surface	~~000~~ 110	~~10~~ 14
1,000	090	15
2,000	100	12
3,000	120	10
4,000	120	10
5,000	120	08
6,000	120	08
7,000	120	04
8,000	120	04
9,000	~~110~~ 110	~~110~~ 06
10,000	100	13
12,000	110	12
14,000	140	10
16,000	130	15
18,000	110	21
20,000	100	17
22,000	100	15
24,000	120	10
26,000	140	12
28,000	080	13
30,000	060	13
32,000	030	13
34,000	040	16
36,000	070	18
38,000	050	10
40,000	320	06
42,500	260	07
45,000	~~330~~ 340	~~22~~ 11
47,500	340	11
50,000	030	06
52,500	090	09
55,000	120	13
57,500	120	10
60,000	100	14
65,000	090	32
70,000	100	33
75,000	120	35
80,000	100	42
85,000	090	55
90,000	090	60
95,000	090	74
100,000	100	96
105,000	090	76
110,000	090	112
115,000	090	120
120,000	090	122
125,000	090	123
130,000	090	117
135,000	090	108



* Mack Photo Tower As OF 1700, 18 June, 1958.

LINDEN EVENT

Radiological Surface Survey, H+2 Hours

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TAB F