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EXPERIMENTAL DATA FROM COASTAL DIFFUSION TESTS

GILBERT S. RAYNOR, ROBERT M. BROWN AND S. SETHURAMAN

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October 1976

INFORMAL REPORT

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INFORMAL REPORT

BROOKHAVEN NATIONAL LABORATORY
ASSOCIATED UNIVERSITIES, INC.
UPTON, NEW YORK 11973

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Experimental Data from Coastal Diffusion Tests

Gilbert S. Raynor, Robert M. Brown and S. SethuRaman

INTRODUCTION

In 1972, a research program on coastal meteorology was started at Brookhaven National Laboratory under the auspices of the U. S. Atomic Energy Commission (now the U. S. Energy Research and Development Administration). A major portion of this program is a study of diffusion from a nearshore ocean site. The reasons for the program and the experimental and analytical methods used were described earlier[1] and will not be repeated here. Several descriptive and analytical papers have been published on the diffusion experiments and their results[1-5]. Other papers were published on results of purely meteorological studies at the coast and over the water[6-15]. Additional papers are planned since the program is expected to continue for some time and result in further significant information.

Since it is not possible to include in published papers all the potentially useful data collected, these data are reported here for the benefit of other researchers who may wish to utilize them for their own purposes. This should be regarded as an interim report since data obtained in future experiments will be reported later. This report includes seven types of data mostly arranged so that data from each run are grouped together.

1. Data on wind fluctuations including type of instrument, location, height, length of record, mean and standard deviation. Instruments included a Bendix-Frieze Aerovane, a MRI bivane, hot wire and hot film anemometers. The data from all runs are presented in a single table located after the introduction. Mean wind data from cup anemometers are given in the memoranda.

2. Copies of internal memoranda describing each test and including as much of the raw data as were available within a short time after the test. Some data requiring extensive chart reading and most data taken on magnetic tape were not analyzed until long after the test and are not included in the memoranda.

3. One or more smoke photographs taken during each test to illustrate the type of diffusion observed. Photographs were not obtained for a few tests. However, a qualitative description of smoke behavior is included in each memorandum.

4. Temperature data from the tower at Tiana Beach not included in the memoranda. In general, temperature profile data are of doubtful utility for lapse rate determinations since the lower levels of the tower were within the internal boundary layer created as air from over the ocean crossed the beach, while the upper levels were above this layer. A similar problem exists for the tower anemometer data but not for anemometer data taken on the mast at the water's edge.

5. Plots of smoke concentration as a function of crosswind distance for all passes across the plume during all tests.

6. Summaries of calculations of σ_y for each pass across the plume during all tests.

7. Copy of an internal memorandum summarizing the results of quantitative smoke measurements from all runs. This is located after the run memoranda. In a few tests, no smoke measurements were obtained due to wind direction or instrumental problems. However, these tests usually have photographs showing the character of the plume.

No analyses of these data are included in this report but much of the data were used in the papers referenced above. The data may be utilized freely by others provided proper credit is given in any publication to Brookhaven National Laboratory and the U. S. Energy Research and Development Administration. However, Brookhaven National Laboratory retains the right to further analyses and publication of any or all of the data regardless of prior use by others.

Data from other types of experiments made in the course of this research program are not included here since those experiments did not include diffusion measurements or observations. However, arrangements can be made to make these data available to qualified researchers also and some may be the subjects of separate reports. These experiments fall into six categories.

1. Wind runs in which meteorological data were taken on the beach without smoke releases. Thirty were obtained between May 1973 and June 1976. A few of these tests included aircraft data and a number included pilot balloon soundings.

2. Boundary layer flights in which the development of the internal boundary layer was investigated using instruments in two aircraft flying across Long Island during periods of onshore flow, including sea breezes. The experiments included pilot balloon soundings from the beach and from Brookhaven National Laboratory plus temperature measurements from the 420 foot tower at the Laboratory. Ten experiments were obtained between June 1974 and June 1976. None of the data have yet been published.

3. Buoy runs in which meteorological data were taken on a buoy anchored about three miles off Tiana Beach. These tests were usually accompanied by simultaneous wind runs on the beach. These data were taken

primarily for a study of air-sea interaction and to determine if data taken on the beach during onshore flows are representative of flow over the ocean.

4. IR flights to measure water and land surface temperatures using a remote sensing infrared thermometer. Such measurements made during diffusion tests are reported in the memoranda. Additional measurements were made during boundary layer flights and on numerous other selected occasions from July 1974 to the present.

5. Continuous measurements of wind speed and direction using Bendix-Frieze Aerovanes mounted at four locations (Raynor, et al., 1975). These measurements are taken for climatological studies on the effects of distance from the ocean on wind and turbulence. They are being analyzed by Brookhaven staff.

6. A series of experiments comparing diffusion from a small island and an undisturbed ocean site. These experiments were designed to study wake effects. The data are now being prepared for publication.

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Summary of Turbulence Measurements during Diffusion

Runs 1 to 24

Run No.	Date	Time(EST)	Ht.(m)	Instrument*	$\bar{u}$ msec^{-1}	σ_u msec^{-1}	σ_v msec^{-1}	σ_w msec^{-1}	σ_θ (deg.)	σ_ϕ (deg.)
1	8-11-72	1140-1228	16.0	A	5.00	0.80	-	-	10.4	-
		1250-1340	16.0	A	6.80	0.40	0.34	-	2.9	-
2	8-17-72	1015-1055	13.5	A	4.80	0.20	0.34	-	4.1	-
		1130-1239	13.5	A	5.90	0.70	0.22	-	2.1	-
3	8-31-72	1149-1202	16.0	A	5.10	0.60	-	-	1.5	-
		1420-1502	16.0	A	3.90	0.30	0.24	-	3.5	-
4	10-3-72	1128-1156	16.0	A	6.60	0.30	-	-	4.0	-
		1305-1416	16.0	A	6.06	0.20	0.43	-	4.1	-
5	11-7-72	1142-1217	16.0	A	5.40	0.50	-	-	15.4	-
		1301-1332	16.0	A	4.12	0.55	0.91	-	12.8	-
6	5-23-73	1000-1300	16.0	A	-	-	-	-	7.1	-
		1000-1300	16.0	B	4.70	1.00	-	-	7.4	2.1
		1045-1105	16.0	B	4.67	0.22	0.11	0.07	1.4	0.9
		1105-1135	16.0	B	4.69	0.22	0.14	0.18	1.7	2.2
		1150-1205	16.0	B	5.18	0.26	0.21	0.10	2.3	1.1
		1233-1253	16.0	B	5.91	0.30	0.25	0.07	2.4	0.7
7	6-1-73	1140-1340	16.0	A	9.90	0.50	-	-	4.6	-
		1140-1340	16.0	B	-	-	-	-	4.4	0.9
		1225-1300	16.0	B	9.96	0.29	0.34	-	2.0	-
8	6-15-73	0943-1043	16.0	A	7.20	1.00	-	-	15.8	-
		1127-1227	16.0	A	8.36	1.15	1.58	-	10.8	-
		0943-1043	16.0	B	5.90	1.10	-	-	-	4.0
		1127-1227	16.0	B	-	-	-	-	-	3.9

Summary of Turbulence Measurements during Diffusion Runs 1 to 24 (contd.)

Run No.	Date	Time(EST)	Ht.(m)	Instrument*	$\bar{u}$ msec^{-1}	σ_u msec^{-1}	σ_v msec^{-1}	σ_w msec^{-1}	σ_θ (deg.)	σ_ϕ (deg.)
9	7-13-73	1030-1120	16.0	A	7.60	0.60	-	-	4.2	-
		1230-1324	16.0	A	5.70	0.70	-	-	2.7	-
		1015-1040	16.0	B	7.60	0.60	-	-	5.3	1.2
		1035-1115	16.0	B	6.35	0.81	0.47	0.20	4.2	1.9
		1230-1300	16.0	B	5.76	0.53	0.13	0.14	1.3	1.4
		1035-1115	6.0	HW	5.76	0.51	-	-	-	-
10	9-20-73	1140-1229	16.0	A	10.20	0.60	-	-	3.9	-
		1313-1413	16.0	A	10.83	0.60	0.61	-	3.2	-
		1110-1155	16.0	B	7.73	0.64	-	-	4.9	2.1
		1230-1315	16.0	B	7.47	0.56	-	-	6.1	2.2
		1330-1415	16.0	B	8.25	0.62	-	-	3.6	2.0
		1110-1155	6.0	HW	8.43	0.73	-	-	-	-
		1230-1315	6.0	HW	8.16	0.69	-	-	-	-
		1330-1415	6.0	HW	8.94	0.74	-	-	-	-
11	4-11-74	1300-1350	16.0	B	8.39	1.50	1.93	0.73	13.3	5.0
		1345-1415	16.0	B	9.47	0.55	-	-	2.7	5.4
		1445-1510	16.0	B	9.26	0.80	-	-	2.0	5.9
12	5-14-74	0908-0938	16.0	B	3.56	0.20	0.19	0.17	3.1	2.7
		0938-1008	16.0	B	4.04	0.21	0.16	0.10	2.3	1.4
		1008-1038	16.0	B	4.44	0.24	0.14	0.12	1.8	1.5
		1108-1153	16.0	B	4.50	0.65	-	-	6.4	1.2
14	7-18-74	0952-1030	16.0	B	6.20	0.43	0.22	0.24	2.0	2.2
		1101-1130	16.0	B	8.21	0.61	0.38	0.37	2.7	2.6
		1142-1225	16.0	B	6.32	0.53	-	-	2.3	1.9
15	3-6-75	1130-1200	23.5	B	7.45	0.62	0.31	0.78	2.4	6.0
		1225-1255	23.5	B	7.99	0.63	0.45	0.59	3.2	4.2

Summary of Turbulence Measurements during Diffusion Runs 1 to 24 (contd.)

Run No.	Date	Time(EST)	Ht.(m)	Instrument*	$\bar{u}$ msec^{-1}	σ_u msec^{-1}	σ_v msec^{-1}	σ_w msec^{-1}	σ_θ (deg.)	σ_ϕ (deg.)
16	6-19-75	1245-1330	23.5	B	6.64	0.43	0.19	0.07	1.6	0.6
17	6-24-75	1100-1200	23.5	B	7.05	0.32	0.18	0.07	1.5	0.6
		1255-1325	23.5	B	7.00	0.29	0.24	0.05	2.0	0.4
18	9-11-75	1020-1050	23.5	B	6.27	0.37	0.31	0.27	2.8	2.5
		1050-1120	23.5	B	6.69	0.41	0.29	0.20	2.5	1.7
		1120-1200	23.5	B	7.32	0.48	0.54	0.21	4.2	1.6
19	9-18-75	1130-1210	23.5	B	7.25	0.55	0.49	0.25	3.9	2.0
		1210-1250	23.5	B	6.81	0.50	0.37	0.25	3.1	2.1
		1250-1330	23.5	B	6.26	0.45	0.47	0.24	4.3	2.2
21	2-26-76	1150-1230	23.5	B	6.99	0.31	0.34	0.14	2.8	1.1
		1303-1333	23.5	B	7.74	0.44	0.38	0.09	2.8	0.7
		1335-1400	23.5	B	6.04	0.36	0.43	0.08	4.1	0.8
22	5-11-76	1000-1040	23.5	B	10.33	0.57	0.38	0.26	2.1	1.4
23	6-4-76	1120-1155	23.5	B	6.31	0.37	0.36	0.09	3.3	0.8
		1155-1230	23.5	B	5.85	0.45	0.45	0.12	4.4	1.2
		1230-1305	23.5	B	5.91	0.39	0.33	0.13	3.2	1.3
		1305-1340	23.5	B	6.35	0.43	0.27	0.11	2.4	1.0
		1340-1415	23.5	B	5.79	0.55	0.60	0.12	5.9	1.2
24	6-8-76	1045-1245	23.5	B	7.09	0.72	0.51	0.07	4.1	0.6
		1330-1407	23.5	B	6.49	0.29	0.31	0.33	2.8	2.9

* A - Aerovane

B - Bivane

HW - Hot-wire Anemometer

Run No. 1
August 11, 1972

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: August 21, 1972

TO: Files

FROM: G. S. Raynor

SUBJECT: Offshore Dispersion Test No. 1

On August 11, 1972, the first overwater diffusion experiment was held to test equipment and techniques and to obtain photographic and observational data.

Jack Tuttle's boat, Liberty, was equipped with the smoke generator and stack. The stack was supported from the unloading boom and steadied by a single guy rope at each side. It remained in position throughout the experiment. A digital anemometer powered by dry cell batteries was mounted on an arm from the top of the mast and the counts recorded by a resetting counter. Thermometers were taken to record air and water temperatures. A 35 mm camera was also aboard. The equipment was operated by Mike Butler and John McNeil.

A Cessna 172 aircraft was manned by Ansel Tuthill who operated three 35 mm cameras with different types of film and one movie camera plus the temperature sensor.

The mobil van with a densitometer was manned by Bob Brown and Reid Terwilliger. The mobil tower equipped with an Aerovane at ___ feet was manned by Gilbert Raynor who also directed activities of the other teams by radio.

All personnel except Tuthill left BNL about 0830 E, drove the equipment to the boat at Shinnecock Inlet and assisted in installation which was completed about 1020 E. The boat left the dock shortly afterwards and was in position one mile off Tiana Beach about 1045 E.

Brown, Terwilliger and Raynor then mounted the Aerovane and erected the mobil tower at Tiana Beach. This was completed at 1055 E. Since these procedures took less time than was anticipated, it was necessary to wait for arrival of the aircraft.

Up to this time, the wind was northerly, between 4 and 5 mps on the beach. Scattered to broken cirrus was present. A high pressure area was centered just west of the region in the morning moving east. The sea was nearly calm.

A test smoke release was made for 2 minutes at 1120 E and photographs of the puff were taken from the boat. Continuous smoke was started at 1140 E as the aircraft was approaching. The smoke moved in a southerly direction for a short distance mostly rather close to the water but by 1150 E, the plume was turning to the west a ways south of the boat (Fig. 1). Photographs of this were taken from the beach. Smoke was visible for an estimated distance of a mile and a half. Smoke emission was terminated at 1207 after sufficient pictures were obtained from the aircraft.

The boat then proceeded to a position 2 miles out, still opposite Tiana Beach. Smoke was started from this position at 1225E and continued to 1248E. From this location, the smoke traveled towards the north and then turned to the east or northeast indicating a sea breeze front between the 1 and 2 mile positions (Fig. 1). By this time, the frontal position on the water was visible from the beach as a line of demarcation between a nearly calm sea inshore and small waves beyond the front. The line was not parallel to the beach but extended from about WNW to ESE. The sea breeze front evidentally reached the beach to the west earlier and moved eastward.

At 1237 E, the sea breeze reached Tiana resulting in a direction change of about 180° and an increase in speed. Speed runs were taken from 1140 to 1230 E in the northerly flow at 4-6 mps and from 1250 to 1344 E in the southerly flow at 6-8 mps. The chart was on normal speed during passage of the sea breeze front. The northerly flow was moderately turbulent but the sea breeze flow very stable in both speed and direction.

At 1248, the boat was directed to proceed about 1 mile west. Smoke emission was continued during the move which was completed at approximately 1305 E. Smoke from this position moved generally toward Tiana and could be seen to a short distance offshore but then apparently moved to the northeast under the influence of the sea breeze front which had not reached Ponquoque Beach as shown by the flag direction at that location. A traverse was made with the van from Tiana to Shinnecock Inlet and back but no smoke was detected. Smoke was terminated at 1345 E.

The boat was mostly unloaded at the Coast Guard Station but because of the high dock and very low tide, the oil barrel had to be unloaded at the dock near the inlet.

Wind and temperature measurements taken from the boat are listed in Table 1. Water temperature was 4 degrees colder at 1 mile than at 2 miles, a situation that needs further investigation. The tide was going out during the run with low tide at 1556 E. Thus, warmer bay water was flowing out into the ocean in the area of the experiment and may have affected water temperatures and possibly smoke diffusion.

Temperature soundings were taken from the aircraft at altitudes of 500 - 2500 feet over the ocean in the sea breeze flow and inland south of Riverhead north of the sea breeze (Table 2 and Fig. 2). At both places, the lapse rate was slightly less than adiabatic.

Observations from the beach and from the boat showed that the smoke descended to the surface of the ocean within a short distance. The plume remained narrow and cohesive with its base on the water for some distance, perhaps half a mile, and then diffused more widely both vertically and horizontally.

Smoke was emitted for 109 minutes. Seven gal. of oil were used giving an output rate of 3.85 gal./hr. The stack worked well with negligible loss at the entrance as long as the boat was aligned with the wind but some leakage occurred with a cross wind. However, it was possible to keep the boat headed in the desired direction. Some oil impacted and condensed on the interior of the stack but the oil lost in this way did not exceed half a pint.

Results of the photographic experiments from the aircraft were as follows:

The movie camera had black and white film. It was used briefly with no filter and with a K2 filter but mostly with a red filter which gave the best results.

One 35 mm camera with a skylight filter gave good results on Kodachrome X film. Another gave good results with Kodacolor X. The third 35 mm camera used infra-red film with an 87 C deep red filter. Some pictures are acceptable. Later tests at BNL indicated that this film is not good for cloudy days due to lack of infra-red light but is useful during sunny days. Black and white film with a deep red filter is recommended for cloudy weather.

Photographs were taken from the Liberty with high speed Ektachrome film in a 35 mm camera. Some were somewhat overexposed but most were satisfactory and document the behavior of the smoke near the boat.

All slides are numbered and catalogued and filed in plastic folders. Other data relating to the test such as fax maps and teletype reports are also filed. Original notes and data sheets are also included in the file.

GSR/lk

Table 1.

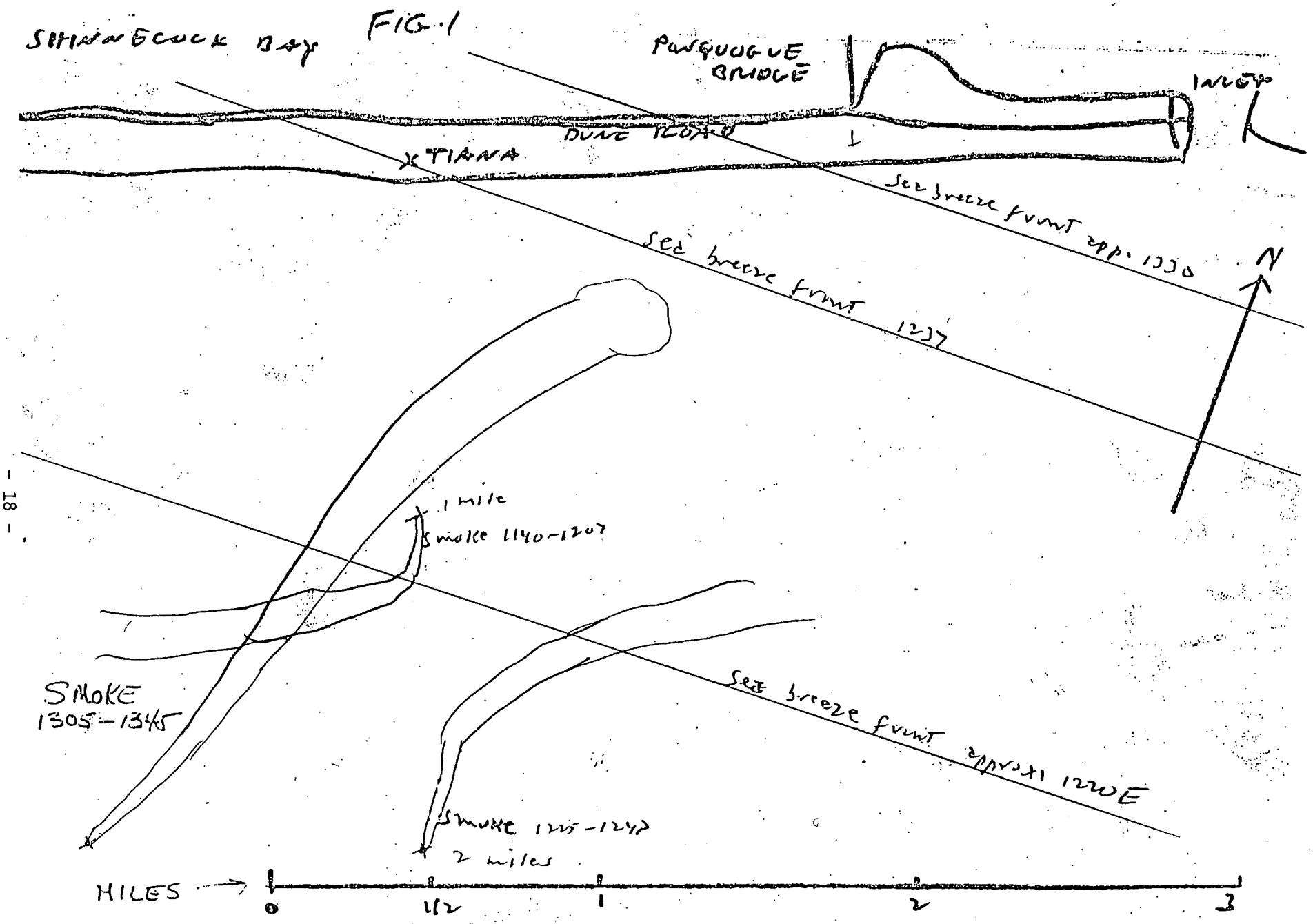
Meteorological Measurements from Boat

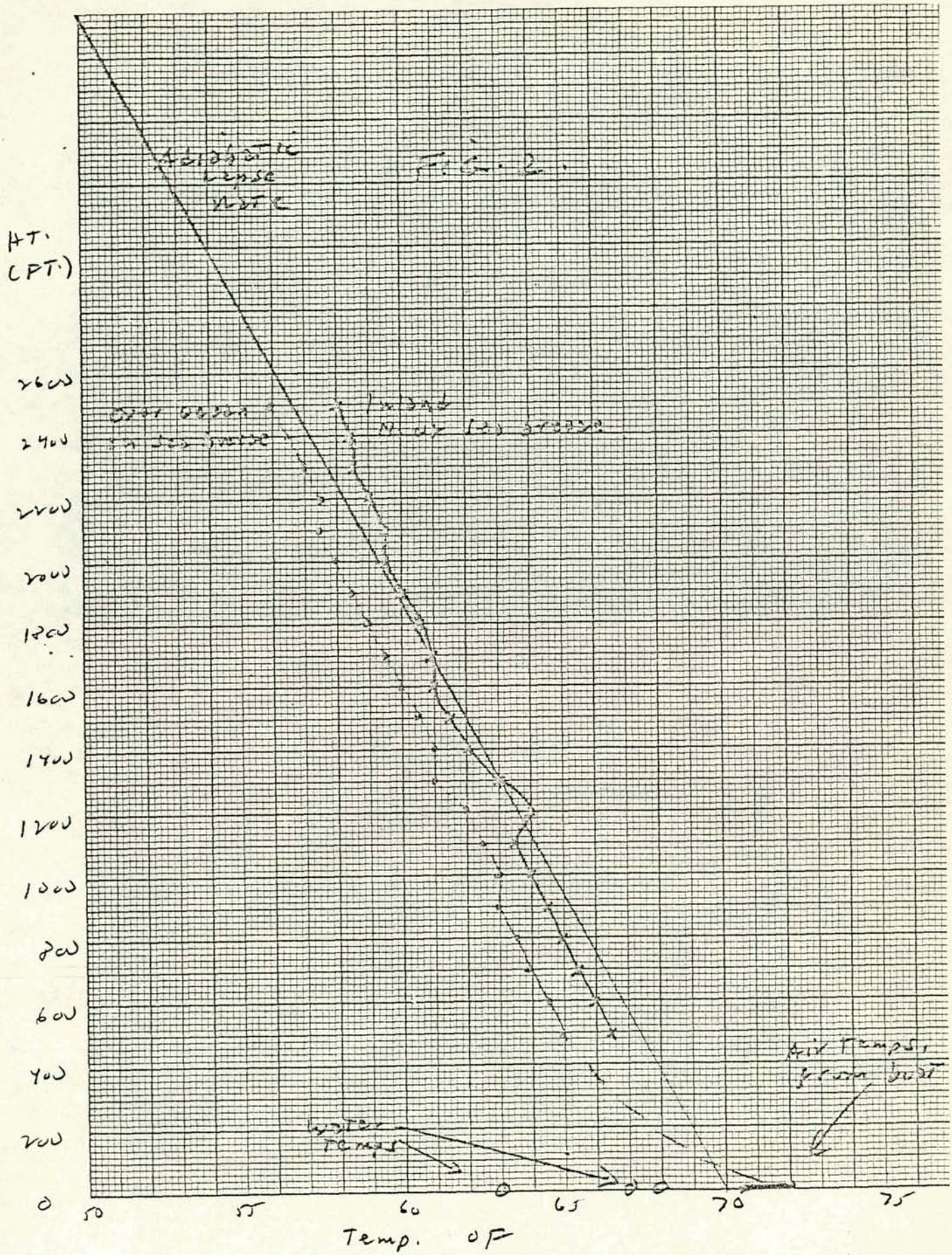
Position	Time (EST)	Speed (mps)	Dir.	Air Temp. (°F)	Water Temp. (°F)
1 mile off Tiana	1140-1155	3.26	Northerly	71	63
	1155-1205	4.06	"	70.5	
	1205-1208	3.85	"		
2 miles off Tiana	1220-1231	4.25	Southerly		
	1231-1241	4.79	"	72	67
	1241-1249	4.81	"		67
2 miles off Tiana and 1 mile west	1316-1327	5.45	Southwesterly		
	1327-1338	5.30	"		
	1338-1346	5.77	"		68

Table 2.

Aircraft Temperature Measurements

Height (ft)	1205-1210 E 1 mile out over ocean in sea breeze flow	1310-1315 E Over land south of Riverhead, North of sea breeze
500	65	66.5
600	64+	66
700	64	66-
800	64-	65
900	63	64.5
1000	63	64
1100	62+	63.5
1200	62	64
1300	61	63
1400	61	62
1500	60+	61.5
1600	60	61
1700	60-	61
1800	59	60-
1900	59-	60
2000	58	60-
2100	58-	59.5
2200	58-	59
2300	57	59-
2400	57-	58+
2500	56	58


SHINNECOCK BAY
FIG. 1
PUSQUOGUE BRIDGE
INLET
DUNE ROAD
TIANA
Sea breeze front app. 1330
Sea breeze front 1237
N
1 mile
Smoke 1140-1207
SMOKE 1305-1345
Sea breeze front approx 1200E
Smoke 1215-1242
2 miles
MILES
0
1/2
1
2
3


Adiabatic Lapse Rate
Fig. 2.
HT. (FT.)
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
50
55
60
65
70
75
Temp. °F
Air Temps. from Boat
Water Temps.

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: Oct. 25, 1972

TO: Files

FROM: G. S. Raynor

SUBJECT: Offshore Dispersion, Test 1.

Since writing the memo of August 21, 1972, it was found that the radar on the Liberty is calibrated in nautical rather than statute miles. Therefore the one mile position was 1.15 and the two mile position 2.30 statute miles from the beach. The source positions in Figure 1 should be adjusted to these distances but the patterns of the plumes remain the same.

Anemometer height on the Liberty was 20 feet, 2 inches above the water line. Anemometer height on the mobil tower was 52 feet, 4.5 inches above ground.

Figure 1. Aerial view of smoke plume from two-mile position, Run 1, 8-11-72.

Figure 2. Aerial view of smoke plume from two-mile position, Run 1, 8-11-72.

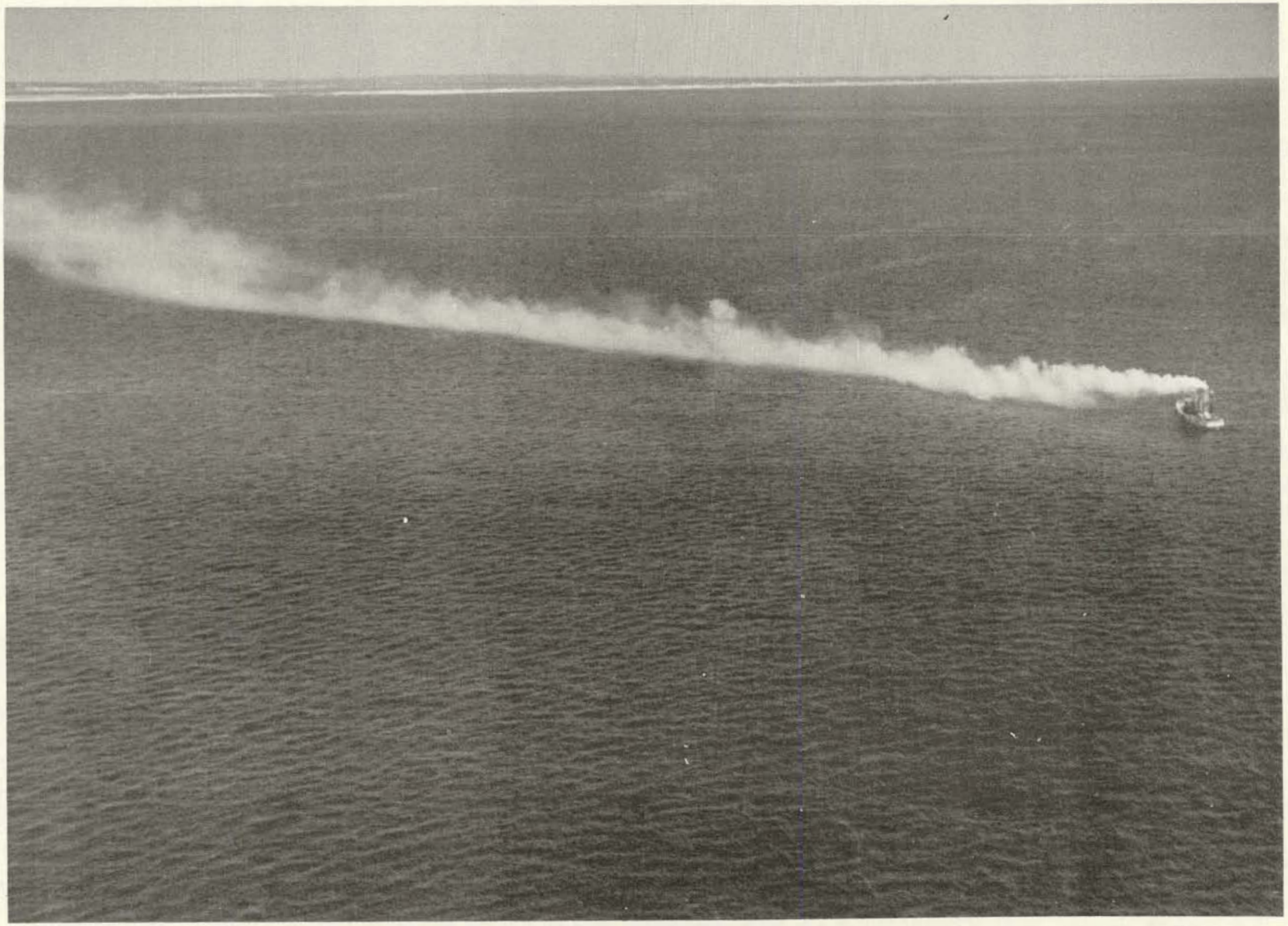


Figure 3. Aerial view of smoke plume from two-mile position, Run 1, 8-11-72.

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Run No. 2
August 17, 1972

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: September 5, 1972

TO: Files

FROM: G. S. Raynor

SUBJECT: Offshore Dispersion Test No. 2.

The second overwater dispersion test was held on August 17, 1972.

The Liberty again carried the smoke generator and stack, the digital anemometer and thermometers, all operated by Mike Butler. The anemometer is 20 feet 2 inches above the water line.

The Selma was used by Walter Jahnig who operated the movie camera with black and white film and the two 35 mm cameras operated simultaneously with Kodacolor and infra-red film. He also carried a thermometer for water temperatures.

The aircraft was manned by Ansel Tuthill and carried the temperature recorder, the variometer, a Bolex movie camera with black and white film and a 35 mm camera with Kodachrome X film.

The mobil van with the densitometer was manned by Bob Brown and Reid Terwilliger. The mobil tower equipped with an Aerovane was located at Tiana Beach and manned by Gilbert Raynor and John McNeil, who also took pibals. Activities of the other teams were coordinated from this location by Raynor. Difficulty was experienced in erecting the trailer tower so it was used with only about two feet of the inner section extended. The Aerovane height was about 44 ft 4.5 in. as compared to 52 ft 4.5 in. during Run No. 1.

Throughout the run, the sky was overcast with middle clouds. Lower clouds were present to the west. A weak warm front extended through western Pennsylvania and a flat high was located offshore. Wind direction was onshore ranging from SSE to S. The ocean had small waves. High tide occurred at 1336. Eastern Standard Time is used throughout this report.

Smoke was started from the 1 mile position at 0954. After a short period of observation, the boat was moved a short distance west and was in position SSE of Tiana at 1002. Smoke was continued until 1105. During this period, the boat was not anchored and drifted about 1/4 mile too close. It moved back to one mile from

1037-1040. At 1100, the boat was again 1/8 mile too close. Bearing to the boat at 1050 was 138.8°. Loran position was 2461 5266.

The smoke first reached the beach a short distance west of Tiana but at 1035 came directly to that location. By 1044, the smoke was somewhat east of Tiana as the mean wind direction shifted slightly. Smoke was clearly visible and could be seen as far as the hills north of Shinnecock Bay. The aircraft reported visible smoke to a location between the LIRR tracks and the Sunrise Highway construction, a distance of over four miles from the boat (Fig. 1). After termination of emission, the last visible smoke reached the beach at 1116, a rate of one mile in 11 minutes or 5.45 mph and about 2.4 mps. At 1122, the smoke was still visible over the mainland north of the bay.

Observation showed that the smoke reached the water very close to the boat and diffused upward slowly with distance. However, horizontal diffusion was very small and the plume had nearly a straight line edge, at least near water level.

Bearings were taken to several landmarks as follows: Coast Guard Station flagpole - 39.1°, red and white water tower near Quogue - 268.3°. These agree within a degree or two with angles measured on the topographical map.

The boat was then moved to a position 3 miles off Tiana and somewhat further west. The bearing was 152.1° and the loran position 2456 5260. Boat was on station and smoke started at 1129. Diffusion appeared similar to that from 1 mile until about 1155 when upward diffusion increased and the plume near the water appeared considerably thinner. At the same time, a lower deck of clouds was moving in from the west. These evidentally decreased solar heating so that the air temperature dropped and became close to that of the water thus making the lowest layer of air more unstable. At 1202, the aircraft reported the smoke top at 500 feet, 1.5 miles off shore and 1200-1300 feet over the beach with a continued rise to the north. However, the base of the smoke remained on the water and the edge remained sharp indicating little lateral diffusion. This was confirmed by densitometer measurements along Dune Road. Smoke was terminated at 1300. At 1314 a whiff of smoke was detected at Tiana although the plume had been crossing the beach to the east.

Four variometer runs were taken with the aircraft. Run 1, starting at 1025, went north at 500 feet from over the ocean to north of the LIRR tracks (Fig. 1). Air was smooth until turbulence started about 300 feet north of Pine Neck on the north shore of the bay.

Run 2 returned over the same track at 900 feet starting at 1135. Turbulence lasted to a point between the LIRR and the Montauk Highway.

Run 3 followed the same course northward at 800 feet starting at 1145. Turbulence was encountered halfway between the shore and Montauk Highway.

Run 4 started at 1155 and followed the return course at 1000 feet. Turbulence ceased at the railroad tracks. On the northward flights, the aircraft rose about 20-30 feet indicating upward moving air.

The boundary layer between the smooth and turbulent air is believed to represent the boundary between air modified by the land below and unmodified marine air above and is plotted in Fig. 2.

Temperatures and winds taken from the boat are listed in Table 1. Aircraft temperatures are listed in Table 2 and plotted in Fig. 3, along with the air and water temperatures from the boat. However, there is some question concerning the calibration of the aircraft temperature unit since it covers only a small span and is set with reference to the aircraft's temperature indicator. Thus, the low-level inversion may not be as great as indicated in Fig. 3. In future runs, the unit will be checked against a mercury thermometer.

The aircraft temperature soundings were taken from 200 to 3000 feet over the 1 mile position at 0945 and from 500 to 3000 feet at 1055 over the Sunrise Highway, at 1135 over the three mile position and at 1305 over Tiana Beach. All are essentially identical and show an adiabatic lapse rate (Fig. 3).

Four pibal soundings were taken at Tiana, one during the one mile emission and three during the three mile emission. These are plotted in Fig. 4. Computed data for each level are filed.

Speed runs were made on the Aerovane chart recorder during both emissions with the chart on normal speed during the remaining periods.

Pictures were taken from the Selma with the two 35 mm cameras operated simultaneously with Kodacolor and infra-red film. Pictures were also taken with the movie camera. Additional 35 mm pictures were taken from the aircraft. Movie pictures were also attempted from the aircraft using a Bolex camera borrowed from Photography but the film was overexposed and useless. One picture was taken from the beach. All slides are numbered, captioned and filed.

Oil consumption was 14.67 gal in 163 minutes giving a rate of 0.09 gal/min. However, an attempt was made to get maximum output with the result that much impacted and condensed on the inside of the stack. Estimated loss was 3 gallons in addition to that used.

Numerous traverses and centerline measurements were taken with the densitometer during both emissions. Results of these measurements will be reported separately.

GSR/lk

Table 1.

Meteorological Measurements from Boat

From Liberty

Position	Time (EST)	Speed (mps)	Air Temperature (°F)	Water Temp. (°F)
1 mile off Tiana	1005-1016	3.29	70.0 (near deck)	68.5
	1016-1031	3.06	71.3 "	68.3
	1013-1056	3.55	68.0 (hanging)	
	1056-1108	3.78	69.5 "	
3 miles off Tiana	1130-1145	4.64	69.0	
	1145-1200	4.38	68.2	69.0
	1200-1215	4.95		
	1215-1230	4.58		68.8
	1230-1245	4.37		
	1245-1300	5.15	68.0	68.7

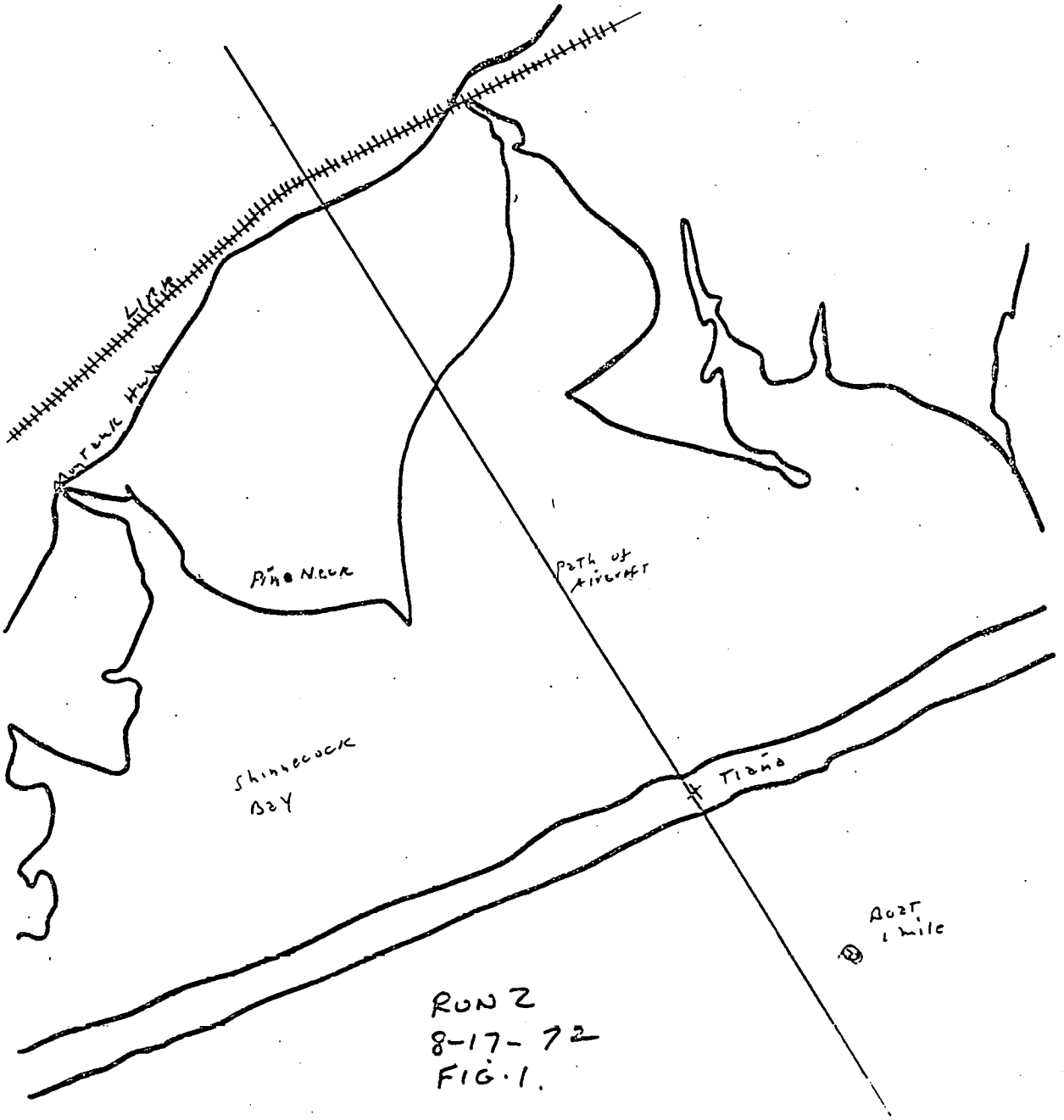
From Selma

1 mile off Tiana	1015		70.5	66.5
	1030		71.0	66.5
	1100		72.0	67.0
3 miles off Tiana	1145		71.0	67.0
Near beach	1245		67.0	66.5

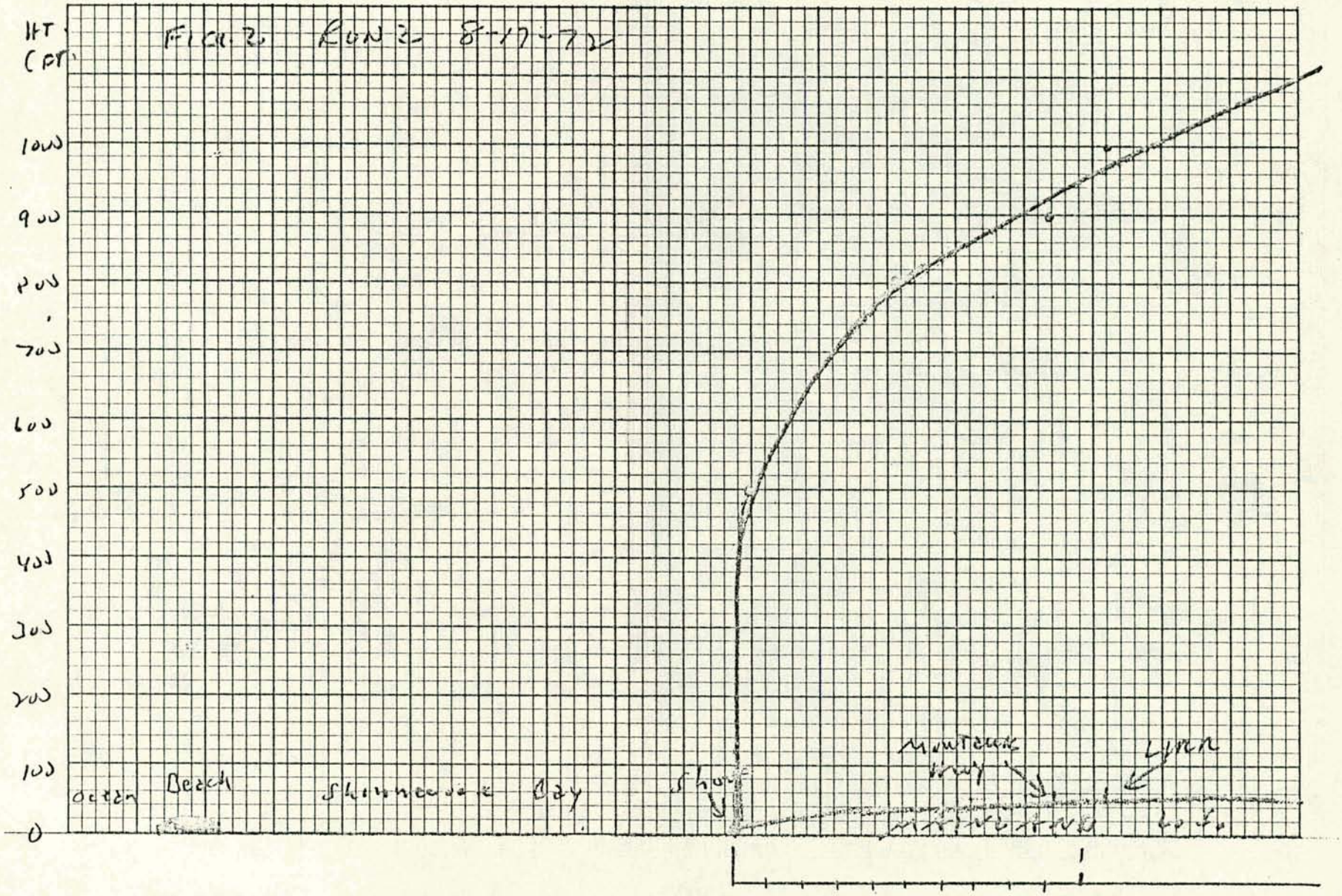
Table 2

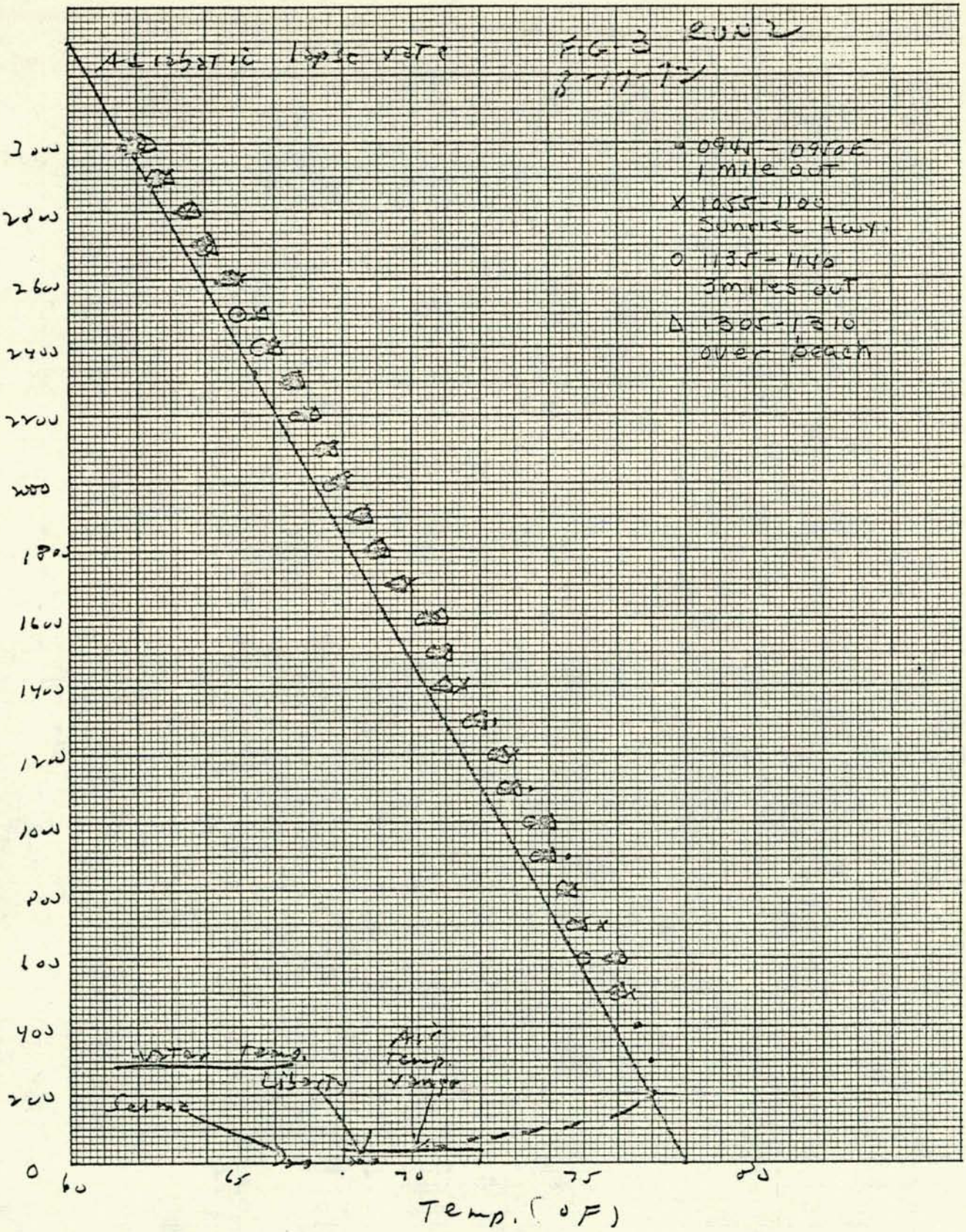
Aircraft Temperature Measurements

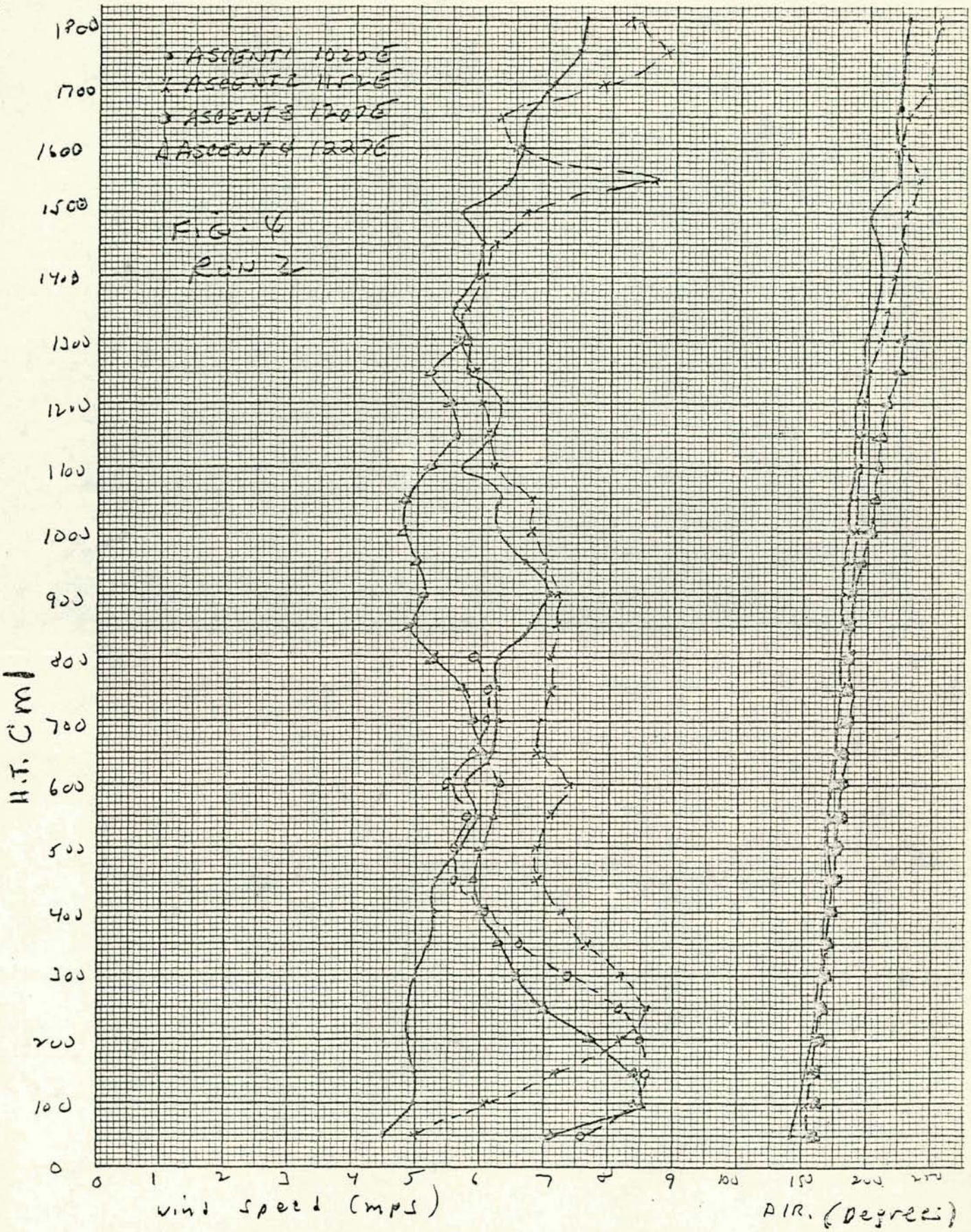
Ht. (Ft.)	0945-0950E 1 Mile Out	1055-1100E Sunrise Hwy.	1135-1140E 3 Miles Out	1305-1310E Over Tiana
200	77			
300	77			
400	76+			
500	76	76+	76	76
600	76	76	75	76
700	75	76-	75-	75
800	75-	74.5	74+	74.5
900	75-	74	74-	74
1000	74	74-	73+	74
1100	73+	73	73-	73
1200	73-	73	72+	72.5
1300	72+	72	72-	72
1400	72-	71+	71	71
1500	71	71	71-	71
1600	70+	70+	70+	70+
1700	70-	70	70-	70-
1800	69	69+	69	69
1900	68.5	69-	68+	68.5
2000	68	68	68-	68
2100	68-	68-	67+	67.5
2200	67	67	67-	67
2300	66+	66+	66+	66.5
2400	66-	66	66-	66
2500	65	65+	65	66-
2600	64+	65	64+	65-
2700	64	64	64	64
2800	63+	63.5	63+	64-
2900	62.5	62.5	62.5	63
3000	62	62	62	62



RUN 2
8-17-72
FIG. 1.


HT (FT)
1000
900
800
700
600
500
400
300
200
100
0
Ocean Beach
Shinnecock Bay
Shore
Montauk Hwy
Lyon


Adiabatic lapse rate
FIG. 3
0941 - 0940E
1 mile out
X 1055-1100
Sunrise Hwy.
O 1135 - 1140
3 miles out
Δ 1305-1310
over beach
Water temp.
Air temp.
Calma
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
60
65
70
75
80
Temp. (°F)


ASCENT 1 1020E
ASCENT 2 1152E
ASCENT 3 1202E
ASCENT 4 1227E
FIG. 4
EOIN 2
H.T. (M)
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
0 1 2 3 4 5 6 7 8 9 100 150 200 250
wind speed (mps)
DIR. (Degrees)

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: Oct. 25, 1972

TO: Files

FROM: G. S. Raynor

SUBJECT: Offshore Dispersion, Test 2.

The distances given in the memo of September 5, 1972 should be changed since the Liberty radar is calibrated in nautical miles. Thus, the one mile position is 1.15 and the three mile position 3.45 statute miles from the beach. Source positions in Figure 1 should be adjusted to the correct distances.

The speed of the smoke from the one mile position to the beach now becomes 6.26 mph or 2.76 mps.

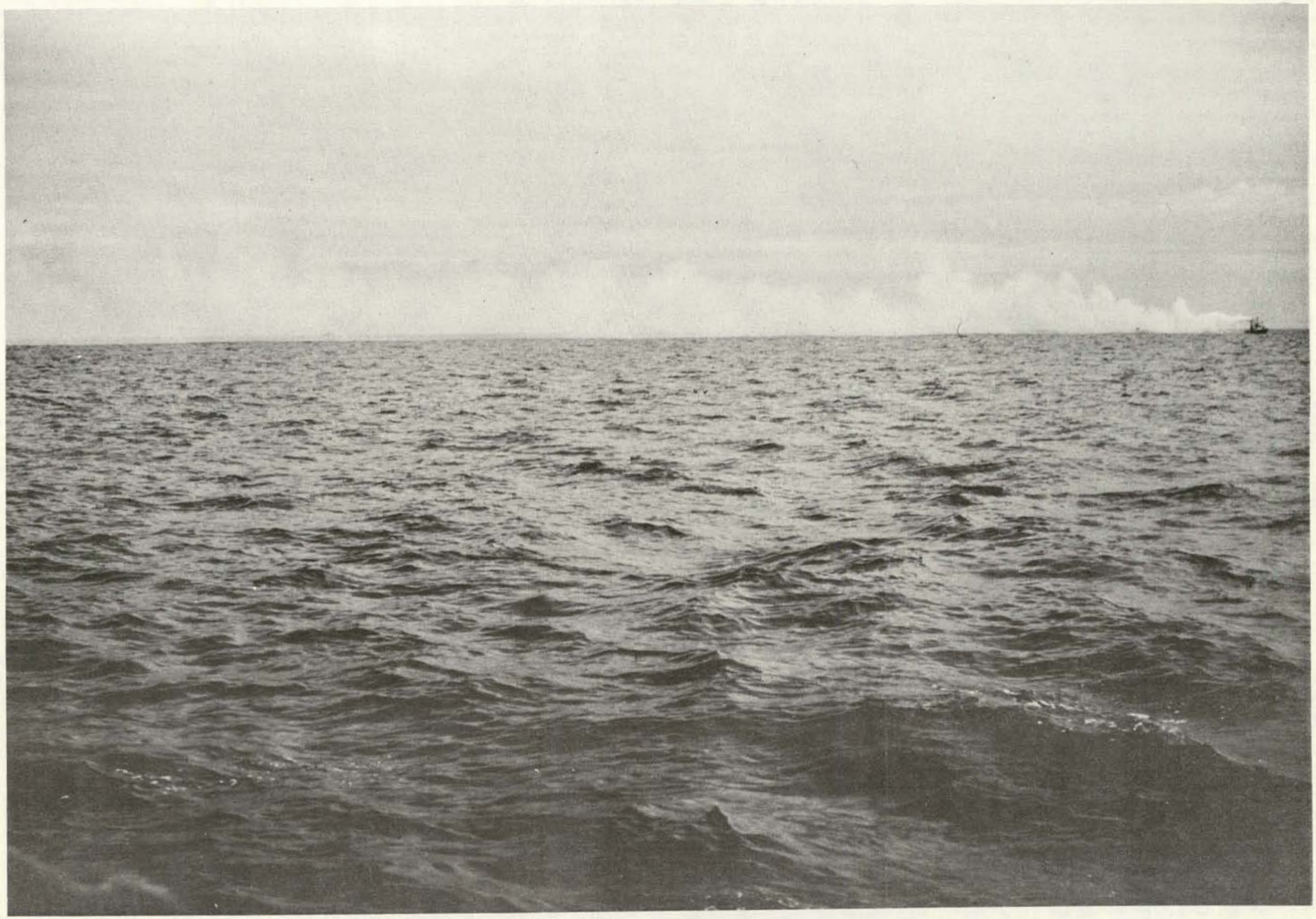


Figure 1. Smoke plume from one-mile position, Run 2, 8-17-72.

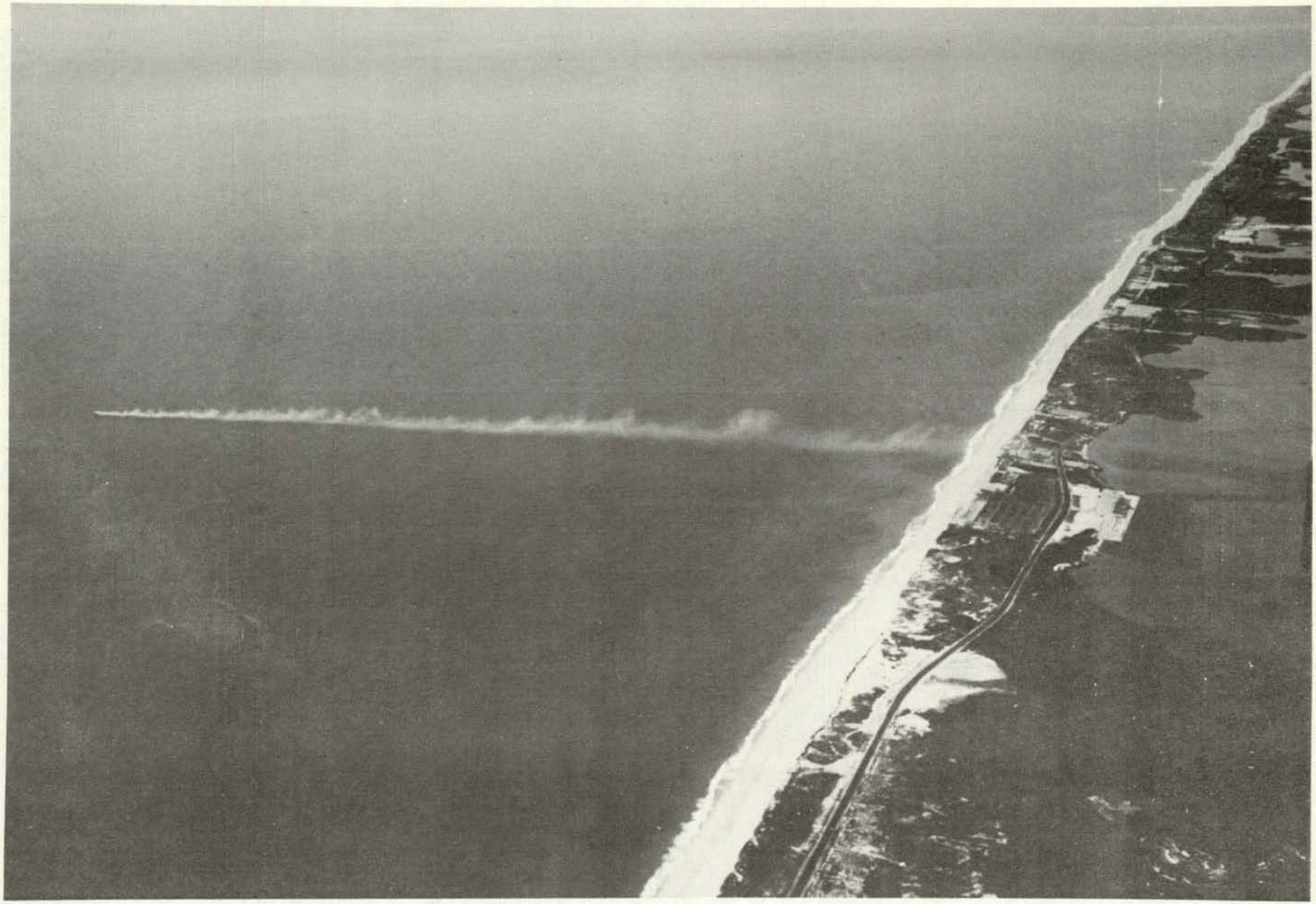
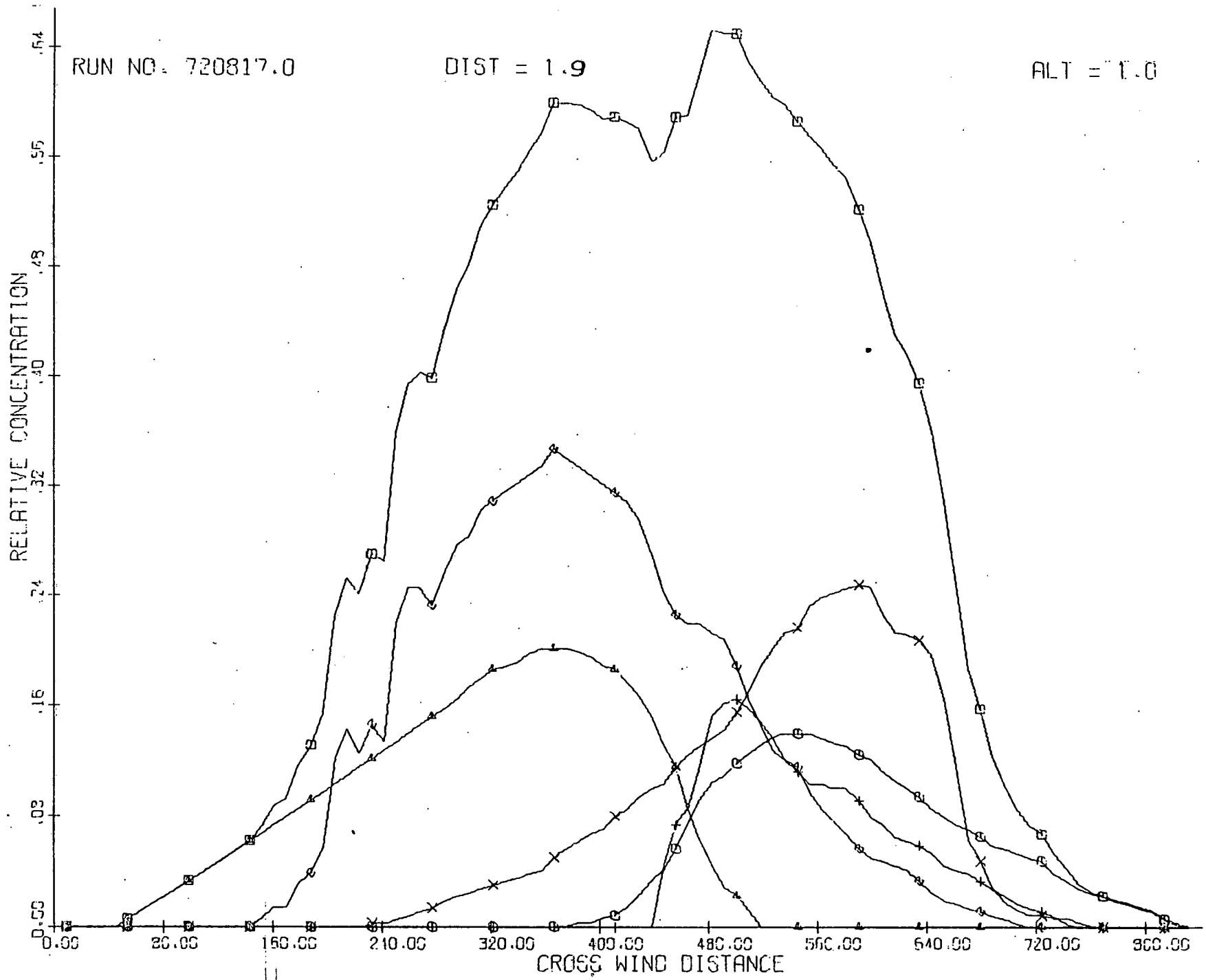


Figure 2. Aerial view of smoke plume from one-mile position, Run 2, 8-17-72.

Figure 3. Aerial view of smoke plume from three-mile position, Run 2, 8-17-72.

Figure 4. Aerial view of smoke plume from three-mile position, Run 2, 8-17-72.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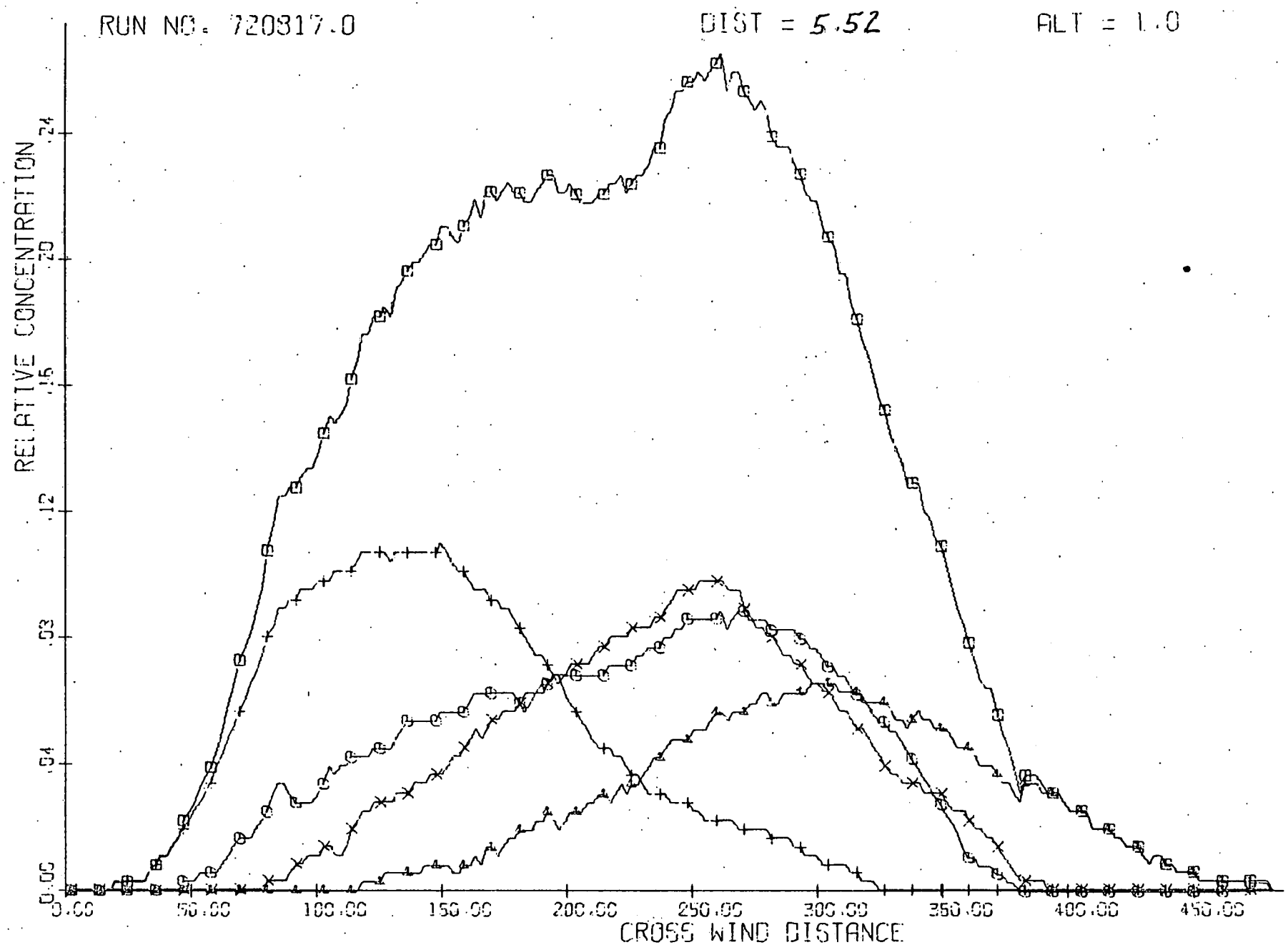
DIST = 1.9
ALT = 1.0
RELATIVE CONCENTRATION
.64
.56
.48
.40
.32
.24
.16
.08
0.00
0.00
80.00
160.00
240.00
320.00
400.00
480.00
560.00
640.00
720.00
800.00
CROSS WIND DISTANCE


RUN NO. 720317.0
DIST = 5.52
ALT = 1.0
RELATIVE CONCENTRATION
.24
.20
.16
.12
.08
.04
0.00
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
450.00
CROSS WIND DISTANCE

ON SHORE DENSITOMETER RUN
TRAVERSES AT ONE DISTANCE

RUN =720817./ DATE = 81772 /DISTANCE FROM STACK (KM)= 1.90
DIRECTION(DEG) = 177./TIME FROM 1020 TO 1043 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGND)
1.0	.306E+02	582.4	85.8			14.09
2.0	.521E+02	316.1	98.6			20.91
3.0	.235E+02	550.2	66.0			14.11
4.0	.525E+02	535.9	92.8			22.38
5.0	.917E+02	385.2	103.6			35.01
GRAND TOTAL	.250E+03	442.0	95.2	137.5	99.2	
Corrected for plume angle			91.0	131.5	94.8	

ON SHORE DENSITOMETER RUN
TRAVERSES AT ONE DISTANCE

RUN =720817./ DATE = 81772 /DISTANCE FROM STACK (KM)= 5.52
DIRECTION(DEG) = 177./TIME FROM 1205 TO 1300 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGND)
1.0	.172E+02	225.0	74.2			9.19
2.0	.111E+02	298.7	67.9			6.43
3.0	.161E+02	149.7	58.4			10.91
4.0	.152E+02	240.4	62.9			9.56
GRAND TOTAL	.597E+02	222.6	66.2	83.5	51.0	
Corrected for plume angle			63.3	79.8	48.8	

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Run No. 3
August 31, 1972

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: September 18, 1972

TO: Files

FROM: G. S. Raynor

SUBJECT: Offshore Dispersion Test No. 3

The third overwater dispersion test was held on August 31, 1972.

The Liberty was again manned by Mike Butler who operated the smoke generator and took air and water temperature measurements. An analogue anemometer was mounted on the boat but two inverters were blown out when connected to the boat's power supply so no wind data were obtained at sea.

The Selma was manned by Walter Jahnig, accompanied by Douglas Humphrey of the Photography Department. Jahnig operated the two 35-mm cameras with infra-red and Kodachrome X film. Humphrey operated the Bolex movie camera with black and white film. Thermometers were also taken for air and water temperatures.

The aircraft was manned by Ansel Tuthill and carried the temperature indicator which was set at the airport with a mercury thermometer. The variometer was not used because of troubles with the recorder. However, flights were made to determine the location of the boundary between smooth and turbulent air at various altitudes. Pictures were taken on black and white film with the Bell and Howell movie camera and on Kodachrome X with a 35-mm camera.

The mobil van with the densitometer and lidar was manned by Bob Brown and Paul Michael. The mobil tower was positioned at Tiana Beach and operated by Gilbert Raynor and John McNeil who also took pibals. Activities of all teams were coordinated from this location by Raynor. The Aerovane height with the tower fully extended was 52 feet, 4.5 inches. This height also applies to Run 1 but not to Run 2.

Weather was clear throughout the run although an east-west line of small scattered cumulus clouds over the mainland to the north apparently marked the position of the sea breeze front. A high with its long axis oriented NE-SW was centered just about over the area moving slowly eastward. The onshore flow was mostly sea breez

possibly reinforced by gradient wind later in the day. The ocean had only small waves. High tide occurred at 1203. Eastern standard time is used throughout this report.

Bearings were taken from Tiana to several landmarks with the theodolite. Results are as follows: White water tower at Hampton Bays, 000.4°. Red and white water tower at Quogue, 267.2°. Coast Guard Station flagpole, 37.9° and water tower at Southampton, 51.2°. The small differences between these readings and those reported for Run 2 are due to the inaccuracy of orienting the theodolite by magnetic compass each time.

Loading of the boats started at 0930. They left the Inlet at 1040 and test smoke was made offshore at 1126 to observe direction of travel. The aircraft arrived at 1043 and took temperature soundings and turbulence runs until the smoke was ready. Continuous smoke was started from the 1 mile position at 1132. The Liberty was anchored 1.25 miles ESE of Tiana at a bearing of 112.1° and loran position 2450 5272.

Smoke first reached the beach at 1145, a distance of 1 mile in 13 minutes, a rate of 4.51 mph or 2.01 mps. A speed run was taken on the Aerovane chart recorder from 1149-1202 and another during emission from the 3 mile position.

An attempt was made to obtain more quantitative photographs than in previous runs using the following plan. The Liberty was located by radar distance from the beach and by theodolite bearing from Tiana. The Selma started at Liberty's position and sailed landward along the smoke plume for a fixed distance. This direction of travel was recorded. She then made a right angle turn and travelled a distance in a westerly direction far enough to give a good view of a portion of the plume including the source boat. A bearing was then taken on Selma from Tiana and a radar distance from Liberty. Liberty also provided the distance from Selma to the beach, the bearing of Selma from Liberty and the angle between that bearing and the line of the plume. These data are listed in Table 1 but the values are only approximate due to the spacing of the range markers on the radar scope and the difficulty of getting a precise compass reading while sighting on a distant object.

When the values were charted, some uncertainty as to the exact position of Selma resulted since use of the various parameters gave different locations, all within the outlines shown in Fig. 1. The

bearings from Tiana and the distances from Liberty are considered the most accurate measurements and positions calculated from these are indicated by a dot within the ovals except for photo position 3 where the distance and the bearing could not coincide.

At each photo position a set of still pictures was taken with the two 35-mm cameras at one minute intervals with the camera aimed at a right angle to the smoke plume. The approximate distances to the plume from the three positions are 0.6, 0.55 and 0.52 miles. Moving pictures were taken by Humphrey but contain little of scientific value.

Photos were taken from position 1 from about 1208-1218. During the same period, a set of photos was taken from the aircraft.

At 1200, smoke was visible over Tiana Bay on the north side of Shinnecock Bay. From the beach, the smoke appeared to be first reaching the water from 4-5 boat lengths away. From the Selma, the distance appeared to be 3-4 boat lengths but from the Liberty the distance was estimated at 30-50 feet.

At 1227, the aircraft followed the top of the smoke plume from the boat to the beach and reported the altitude at 200 feet over the beach. The aircraft track coincided with the top of the visible plume as observed from Tiana. The vertical angle to the plane was measured by theodolite at 2.5°. The distance to the plume was 0.84 miles or 4435 feet as determined by the position of the centerline defined by the densitometer traverse at that time. These values give an altitude above the theodolite height at 193 feet but the height of the theodolite above sea level has not yet been determined and will be reported later.

Two other similar passes were made primarily for photographic purposes, the last at 1240. Theodolite angles were 2.5 and 2.1° and the reported altitude again 200 feet. Assuming the plume remained the same distance from Tiana, the 2.1° angle gives a height of 163 feet above the theodolite. However, the plume had probably moved to the east at this time.

By 1220, the smoke appeared to be somewhat more diffuse than earlier.

Selma reached photo position 2 at 1255 and finished a series of pictures at 1312. Simultaneous photos were taken from the aircraft. The smoke still had a sharp edge but appeared thinner close to the beach.

A fourth aircraft pass was made along the plume for photographic purposes but a height measurement was not taken. At 1317, a helicopter passed over the smoke at low altitude and created a hole in the plume.

Smoke was ended from the 1 mile position at 1327. The Liberty reached the 3 mile position at 1401 and started smoke at 1409. Bearing to Liberty from Tiana was 127.2°. Loran position was 2440 5271.

Pictures were taken from photo position 3 from 1428 to 1439. Photos were taken from the aircraft during the same period. Additional photos were taken to 1453 after which the plane was dismissed.

Smoke reached the beach from the 3 mile position at 1445, a distance of 3 miles in 34 minutes and a rate of 5.3 mph or 2.36 mps. Smoke was terminated at 1447 since the oil supply was exhausted. Unloading of the boats was completed by 1630.

Pibals were taken from Tiana at 1132 and 1353. Balloons were released from Selma at the three positions shown in Fig. 1 and tabulated in Table 1 with the release times. They were tracked by the theodolite at Tiana. Data from the releases on the beach are plotted in Fig. 2. Data from the offshore releases are not yet available and will be reported later.

Temperature soundings were taken from the aircraft as follows: At 1050 at Northville, north of the sea breeze from 500 to 2500 feet; at 1120, over the 1 mile position from 100 to 7000 feet and at 1440, over the 3 mile position from 500 to 3000 feet. Data are tabulated in Table 2 and plotted in Fig. 3. They show a low-level inversion over the water and a generally stable lapse rate higher up.

Means and standard deviations of the wind data taken on fast speed at Tiana are not yet computed and will be reported later along with those from the previous runs.

Temperature measurements from the boats are tabulated in Table 3 and plotted in Fig. 3. The difference in air temperature between

the two boats appears to be due to instrument exposure since a later check of the two thermometers showed them to give essentially identical readings in the instrument shelter. Water temperatures taken by two diverse methods show fairly good agreement.

A flight was made along the line shown in Fig. 4 to determine the location of the boundary between smooth and turbulent air which is shown to scale in Fig. 5. As the moving air penetrated inland, it evidentally became turbulent below the sloping boundary shown starting at the north edge of the bay. The bulge in the boundary at 2500 feet is believed to mark the return flow above the seabreeze.

Measurements of wet and dry bulb temperature were taken from the aircraft using a sling psychrometer at three locations. Data are presented in Table 4 with values of the dew point and relative humidity.

Densitometer traverses and centerline measurements were made during each smoke emission period. Results will be reported separately. The lidar was used experimentally to determine the height of the plume as it crossed the beach. Preliminary results indicate a height of 225 feet, in good agreement with the aircraft and theodolite measurements.

Oil consumption was about 0.08 gal/min. Loss was not as great as in Run 2.

In summary, the pibal data show the onshore sea breeze flow to be very shallow at the time of the first sounding but deepening somewhat during the experimental period. The aircraft temperature data indicate an inversion to about 300 feet and a stable lapse rate above. These conditions restricted vertical growth of the plume to only about 200 feet. Horizontal spread was also small as in previous tests.

TABLE 1. Run 3 8-31-72

SOURCE, PHOTO AND PIBAL RELEASE POSITIONS

		LIBERTY			SELMA						
Photo Series	Time (EST)	Distance from Beach	Distance from Tiana	Bearing from Tiana	Distance along Plume	Distance from Plume	Distance from Beach	Distance from Liberty	Bearing from Tiana	Bearing from Liberty	Angle from Plume
1	1210	1	1.25	112.0	1/2	?	1 1/8	7/8	143.6	265	72
2	1300	1	1.25	112.0	1/4	1/2	1	0.7*	136.4	265	63
3	1430	3	3.6*	127.2	1/4	1/2	3	5/8	138.0	260	78
Pibal Run					Distance from Tiana						
2	1245	1	1.25	112.0	1.35*			1/4	107.0	-	-
3	1329	1	1.25	112.0	1.28*		7/8	5/8	132.4	270	63
5	1459	3	-	127.2	2.00*		1.5	1.5	130.1	325	3

*Measured from map
Bearings from Tiana taken by theodolite
Other bearings and distances given by Liberty
Distances are in miles, bearings in degrees

TABLE 2 Run 3 8-31-72

Aircraft Temperature Measurements

Height (Ft)	N. of Sea Breeze Northville 1050-1055E	1 Mile Out 1120-1135	3 Miles Out 1440-1445
100		71	
200		72	
300		73-	
400		72	
500	73	72	73
600	73+	72-	72+
700	74-	71	74
800	72+	71	74
900	72+	71-	74
1000	72	71-	74
1100	71+	70.5	74-
1200	71	70+	73
1300	71	70+	73
1400	71	71+	72.5
1500	70+	71	72
1600	70-	70+	71
1700	69	70-	71-
1800	69-	69	70.5
1900	68+	69	70+
2000	68	69	70
2100	68-	69-	70-
2200	67.5	68.5	69+
2300	67+	68+	69-
2400	67	68	68+
2500	67-[a]	66.5	68
2600		66	67
2700		65.5	67-
2800		65-	66+
2900		64+	66
3000		64	65
3100		63.5	
3200		63	
3300		63	
3400		62-	
3500		61	
3600		60.5	
3700		60 [b]	
3800		60 [b]	
3900		60-[b]	
4000		59+[b]	
4100		59	
4200		59	
4300		58+	
4400		58	
4500		58	
4600		58+	
4700		58	
4800		58	
4900		58	
5000		58	
5100		58	
5200		58-	
5300		58	
5400		58	
5500		57.5	
5600		57.5	
5700		58-	
5800		57	
5900		56.5	
6000		56+	
6100		56	
6200		56-	
6300		55	
6400		54+	
6500		54	
6600		53	
6700		53-	
6800		53	
6900		52+	
7000		52	

[a] cu base about 2500 ft.

[b] turbulent layer

TABLE 3 Run 3 8-31-72

Temperature Measurements from Boats

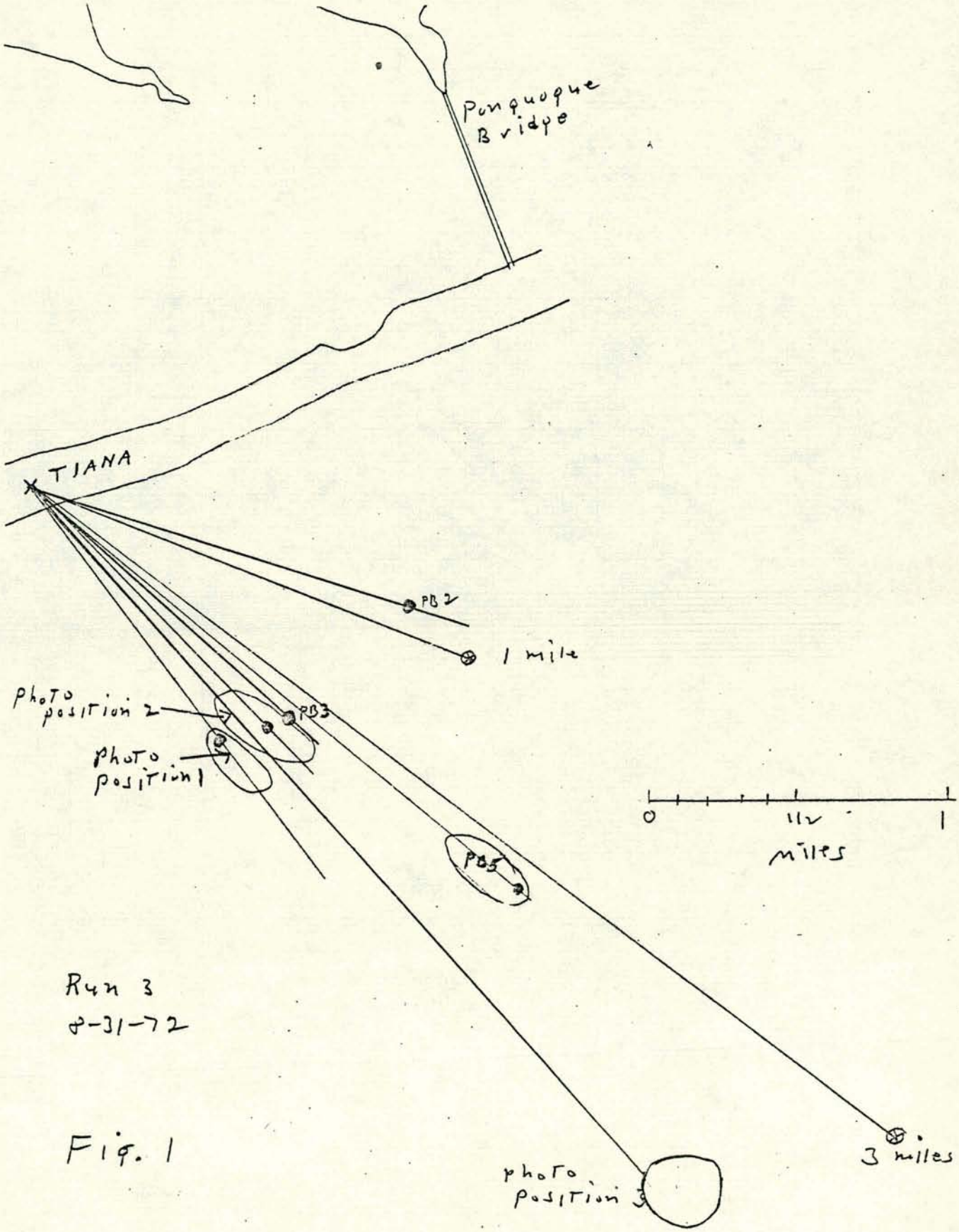
Position	Time (EST)	Boat	Air Temp. (°F)	Water Temp. (°F)
1 mile	1155	Liberty	69.5	
	1213	"	70.0	
	1225	"		71.0 (bucket in sun)
	1245	"		70.0 (bucket covered)
3 mile	1450	"		70.0
1 mile	1130	Selma	73.7	70.0
0.5 mile	1220	"	72.0	70.0
0.75 mile	1310	"	74.0	71.5
3 mile	1415	"	74.5	70.5
1.5 mile	1500	"	73.5	71.5

NOTE - Water temperature from Selma taken with modified soil thermometer and from Liberty with mercury thermometer in bucket of sea water.

TABLE 4 Run 3 8-31-72

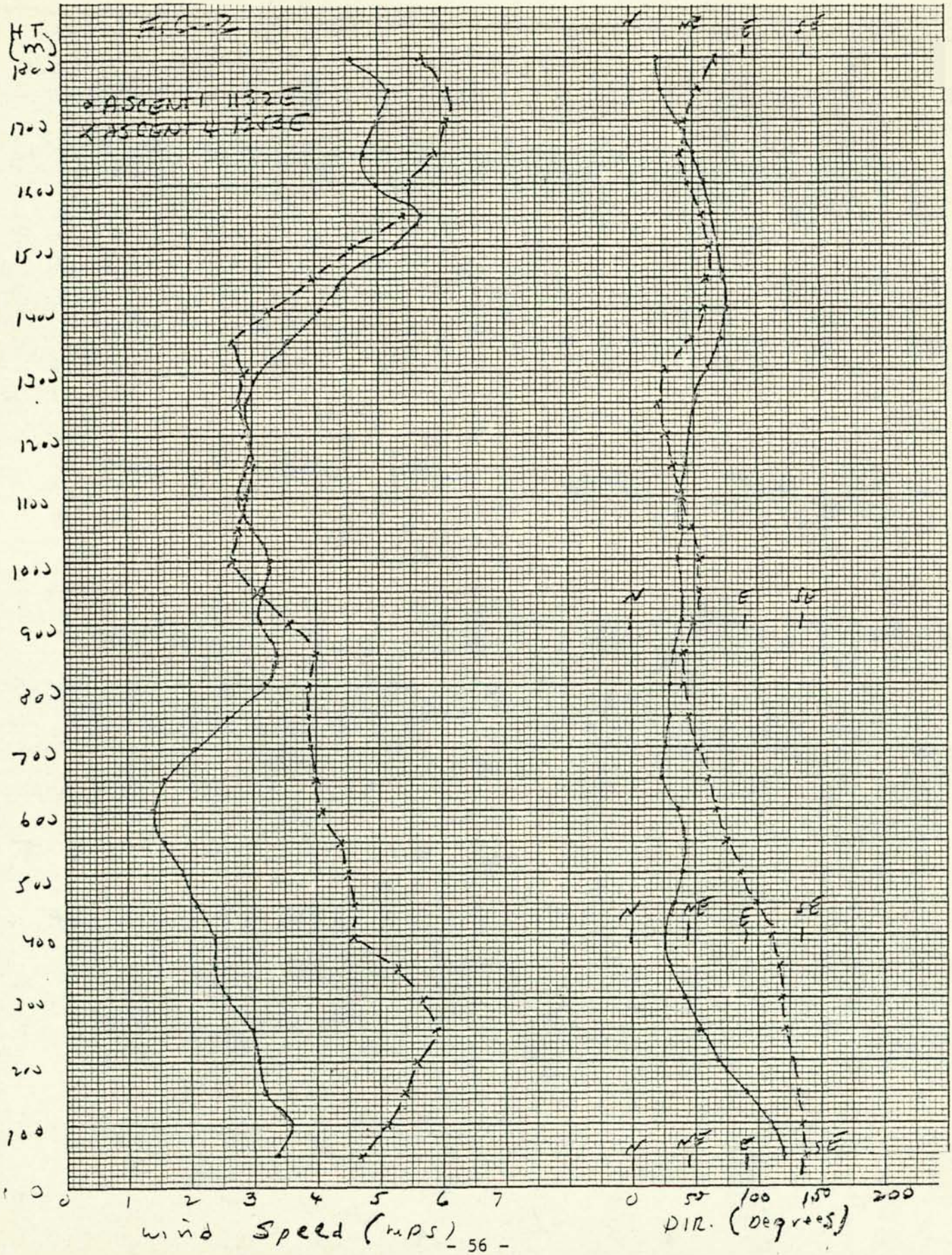
Humidity Measurements from Aircraft

Location	Height (Ft)	Time	Dry Bulb	Wet Bulb	Dew Point	RH (%)
Northville	7000	1128	54	42.5	27	35
Over Ocean	200	1250	73	66	62.3	69
3 Miles Out	500	1410	73	63	57	57

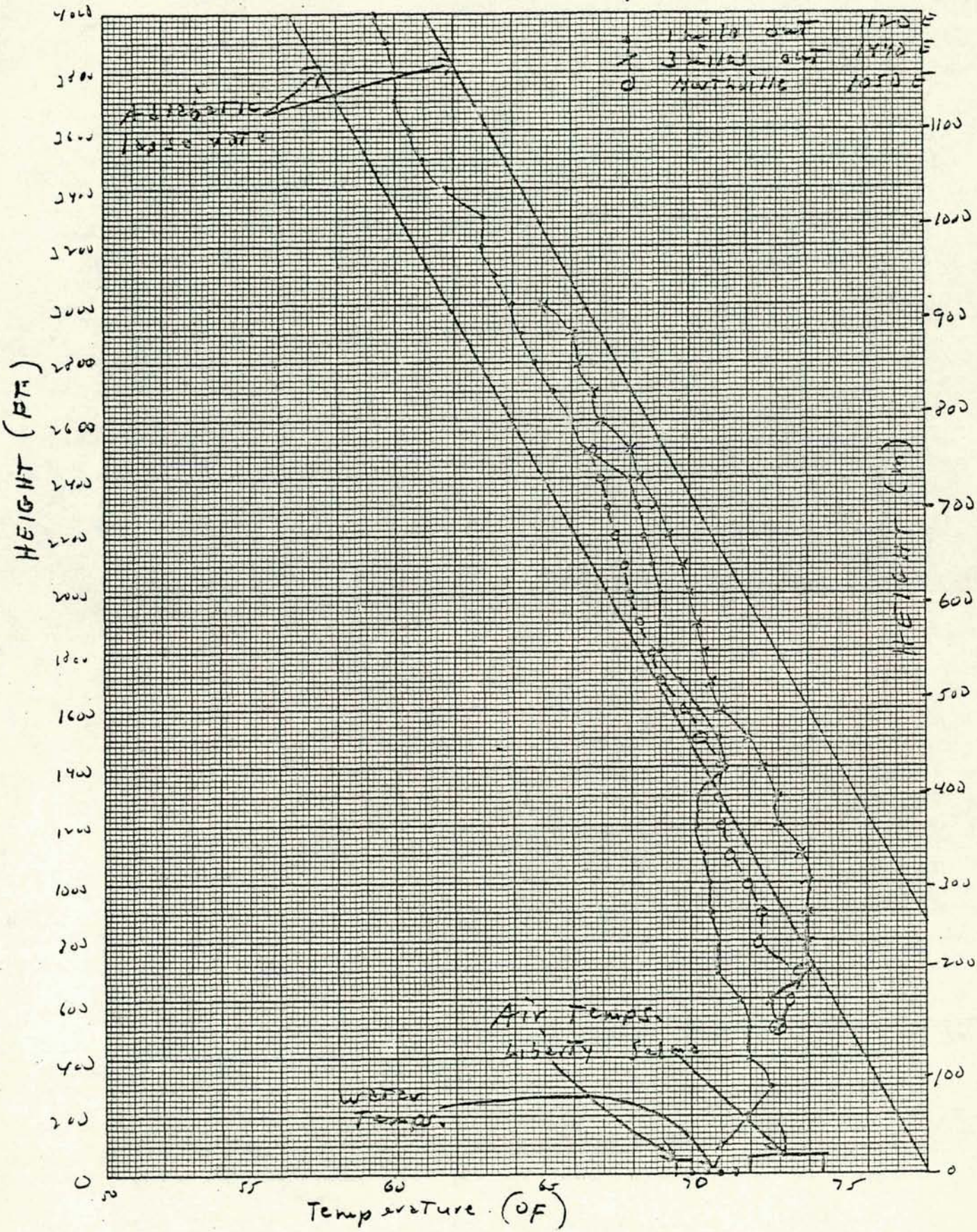


Run 3
8-31-72

Fig. 1


HT. (m)
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
ASCENT 1 1152E
ASCENT 4 1253E
0 1 2 3 4 5 6 7
Wind Speed (mps)
N NE E SE
0 50 100 150 200
DIR. (Degrees)

Run 3 8-31-72 Fig. 3



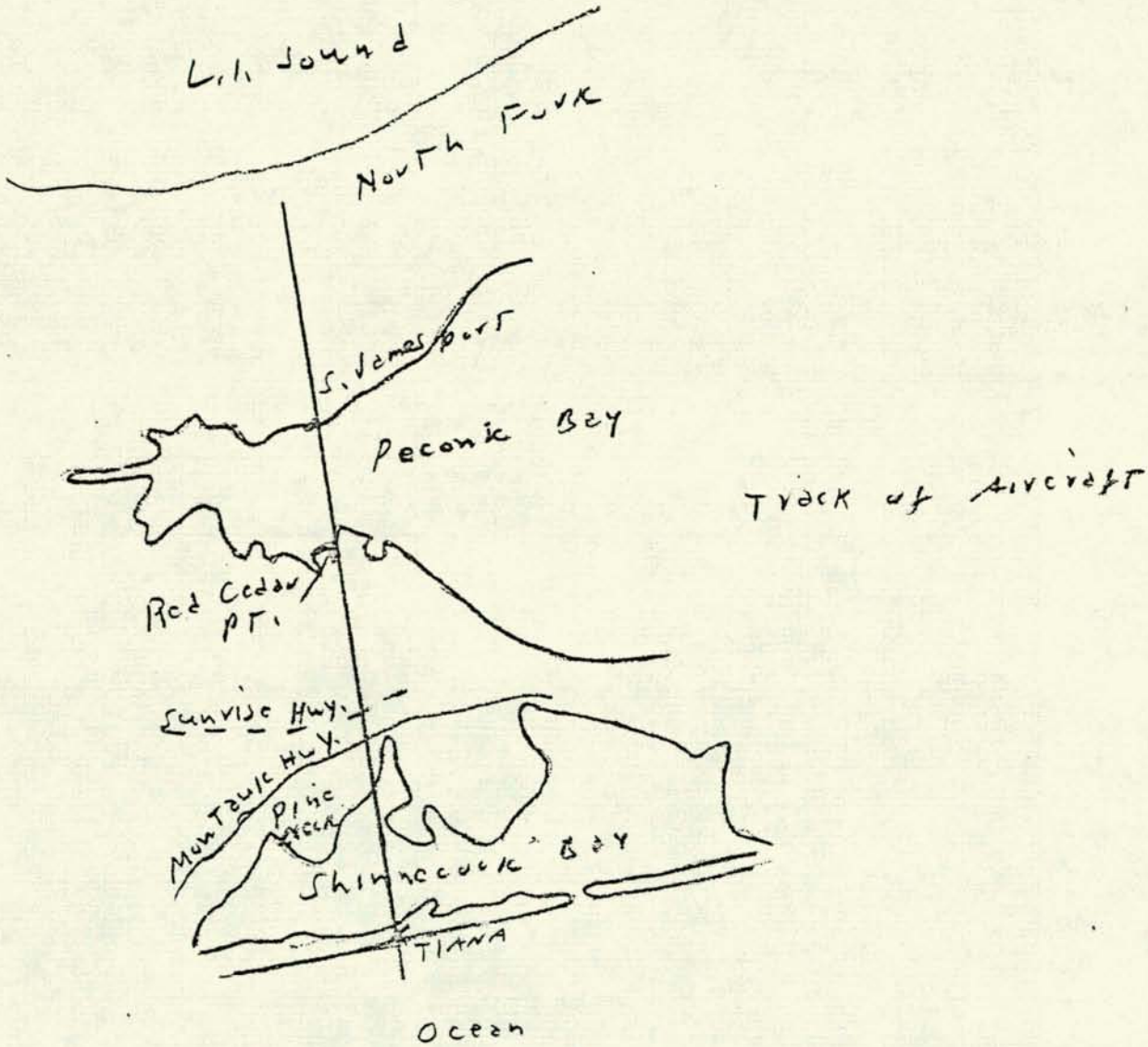


Fig. 4 Run 3 8-31-72

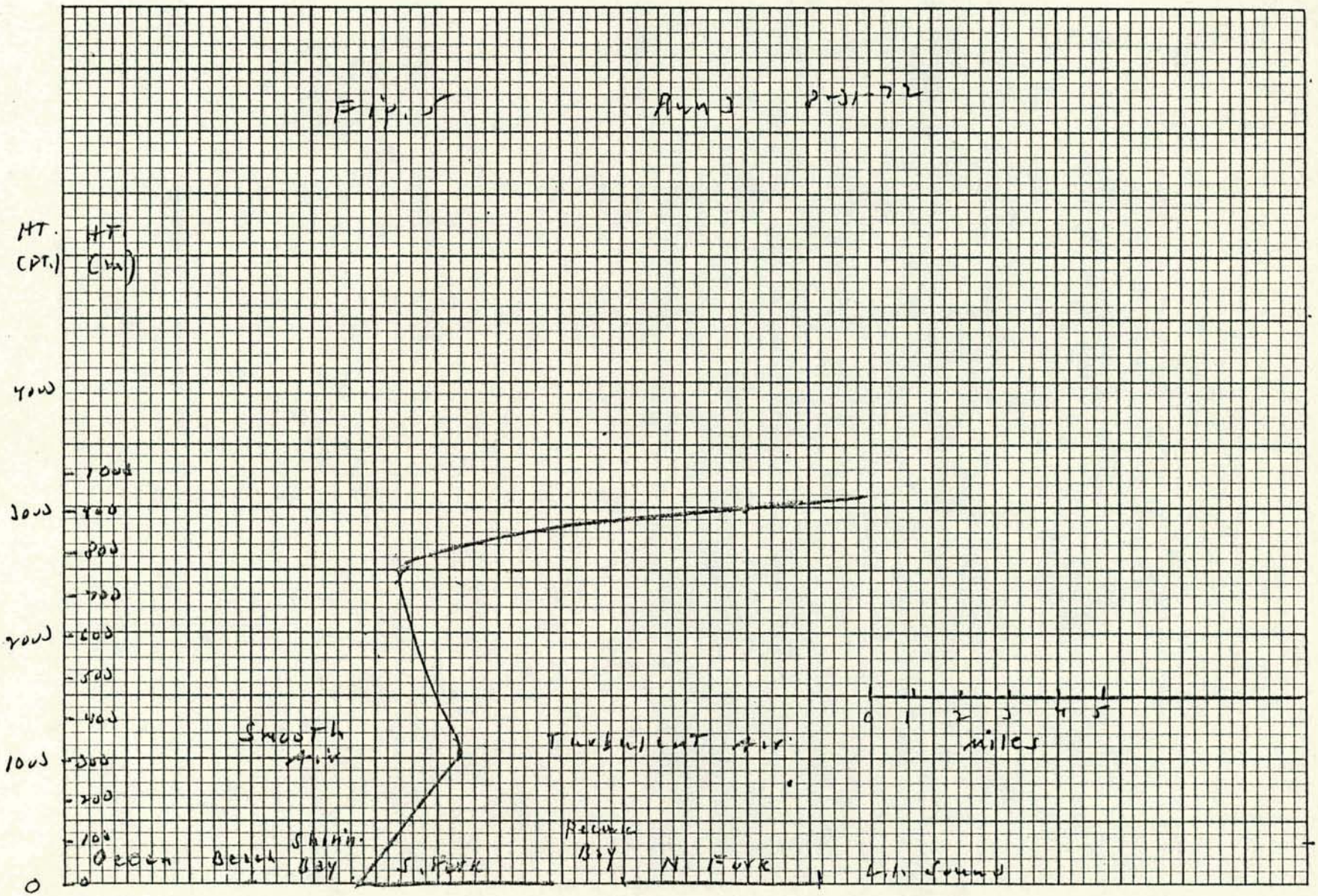


Fig. 5
Run 3
HT. (FT.)
HT (km)
4000
3000
2000
1000
0
1000
900
800
700
600
500
400
300
200
100
0
Smooth air
Turbulent air
0 1 2 3 4 5
miles
Ocean
Beach
Shinn. Bay
S. Fork
Pecuic Bay
N Fork
L.I. Sound

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: Oct. 25, 1972

TO: Files

FROM: G. S. Raynor

SUBJECT: Offshore Dispersion, Test 3.

The distances given in the memo of September 18, 1972 should be changed since the radar on Liberty is calibrated in nautical miles. Revised versions of Table 1 and Fig. 1 are attached.

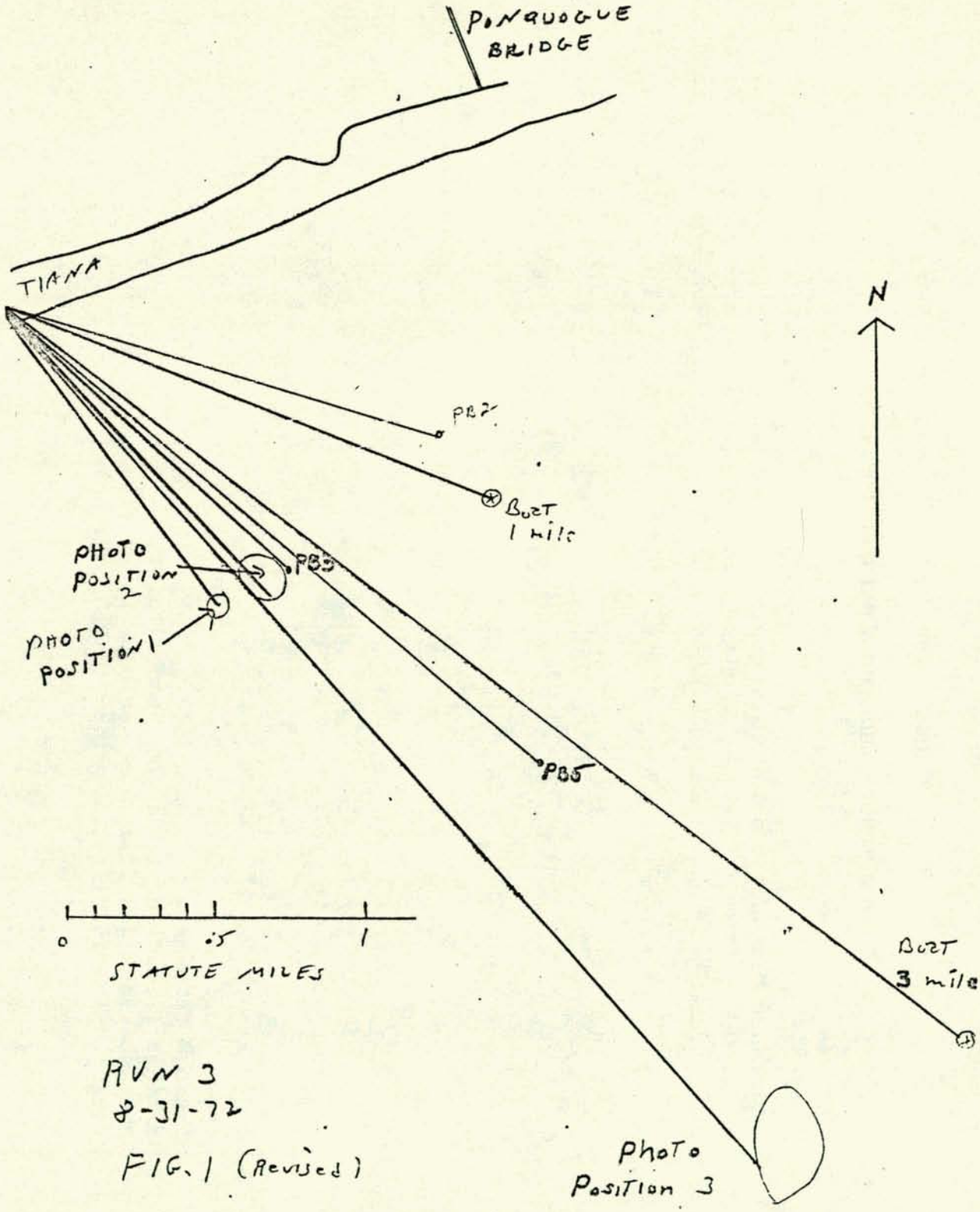
The speed of the smoke from the one mile release point to the beach is now 5.2 mph or 2.31 mps. Its speed from the three mile position is 6.09 mph or 2.71 mps.

TABLE 1 (Revised) Run 3 8-31-72

SOURCE, PHOTO AND PIBAL RELEASE POSITIONS

		LIBERTY					SELMA				
Photo Series	Time (EST)	Distance from Beach	Distance from Tiana	Bearing from Tiana	Distance along Plume	Distance from Plume	Distance from Beach	Distance from Liberty	Bearing from Tiana	Bearing from Liberty	Angle from Plume
1	1210	1.15	1.44	112.0	0.58	0.85	1.44	1.0	143.6	265	72
2	1300	1.15	1.44	112.0	0.29	0.58	1.15	0.75*	136.4	265	63
3	1430	3.45	4.08*	127.0	0.29	0.58	3.45	0.72	138.0	260	78
Pibal Run					Distance from Tiana						
2	1245	1.15	1.44	112.0	1.56*			0.29	107.0	-	-
3	1329	1.15	1.44	112.0	1.34*		1.0	0.72	132.4	270	63
5	1459	3.45	-	127.2	2.40*		1.72	1.72	130.1	325	3

*Measured from map.
Bearings from Tiana taken by theodolite.
Other bearings and distances given by Liberty.
Distances are in miles, bearings in degrees.



RUN 3
8-31-72
FIG. 1 (Revised)

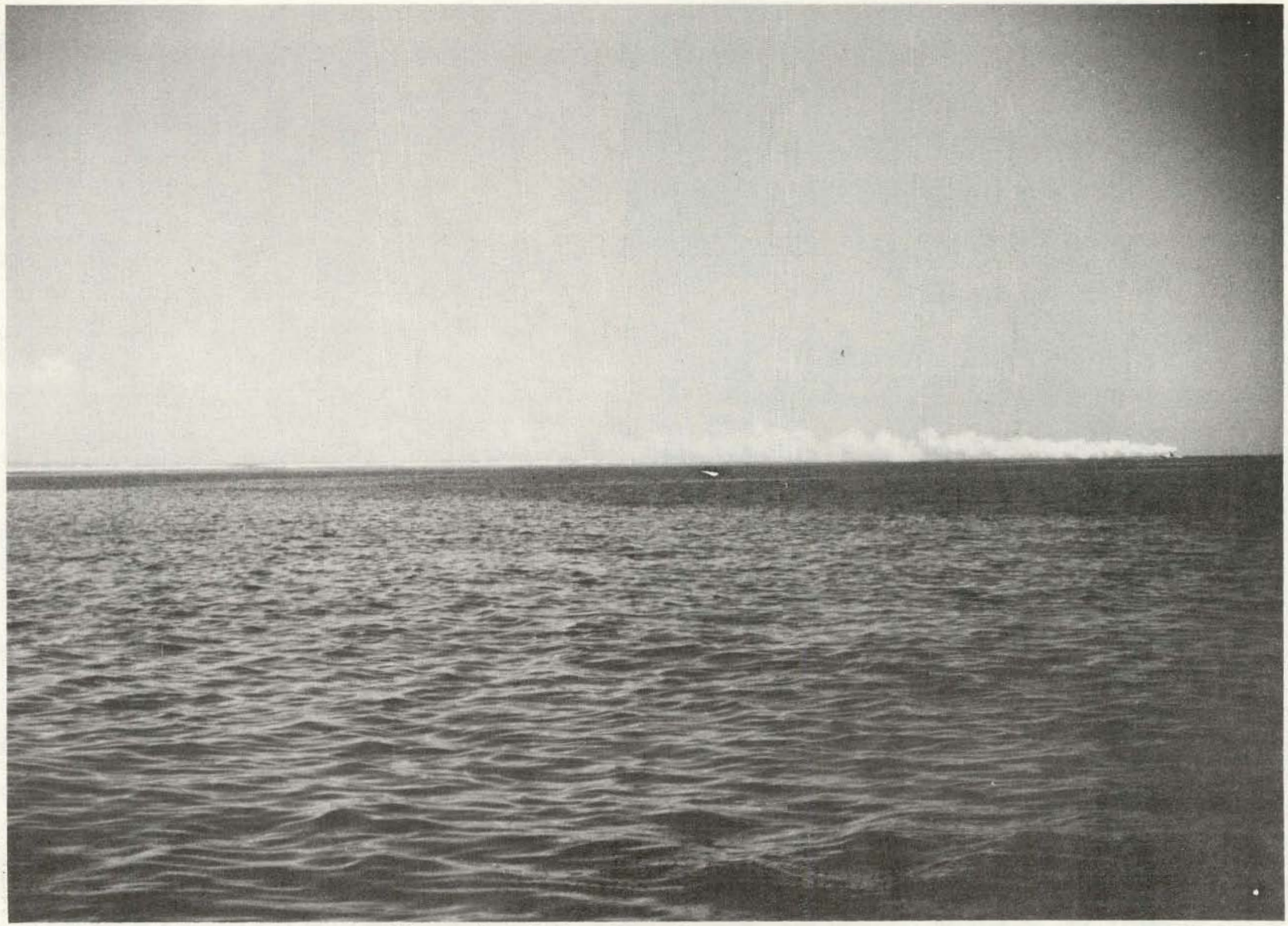


Figure 1. Smoke plume from one-mile position, Run 3, 8-31-72.

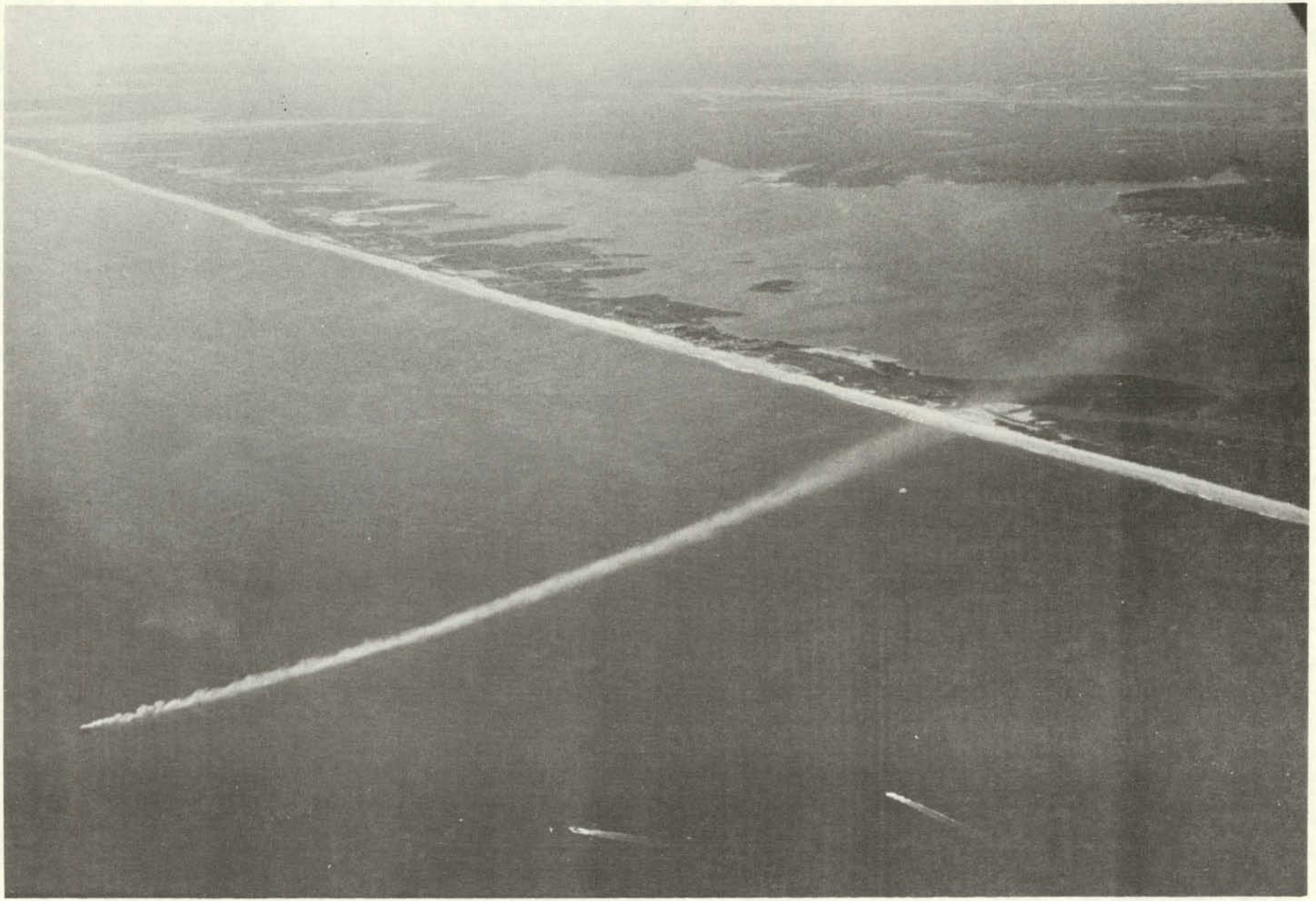
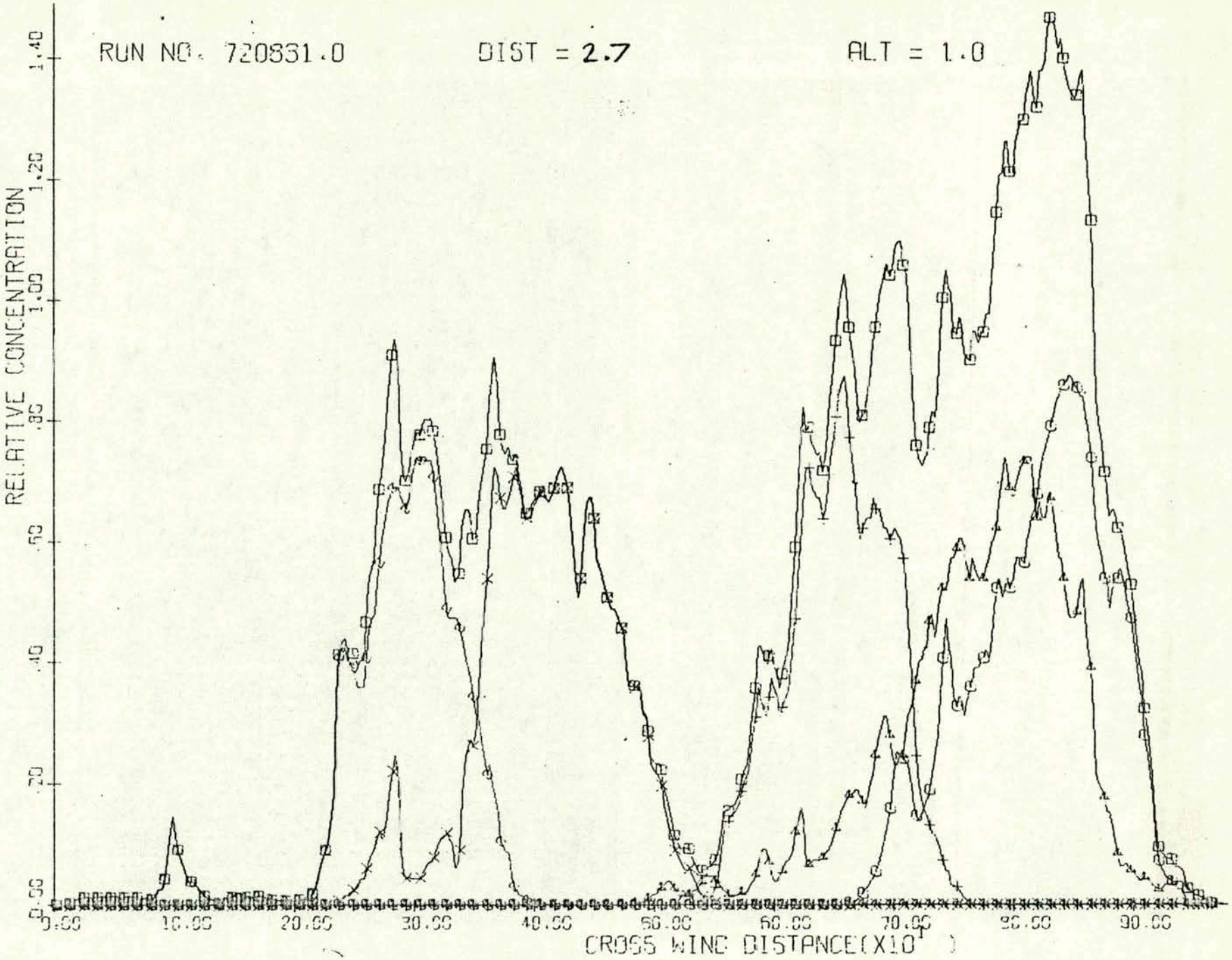
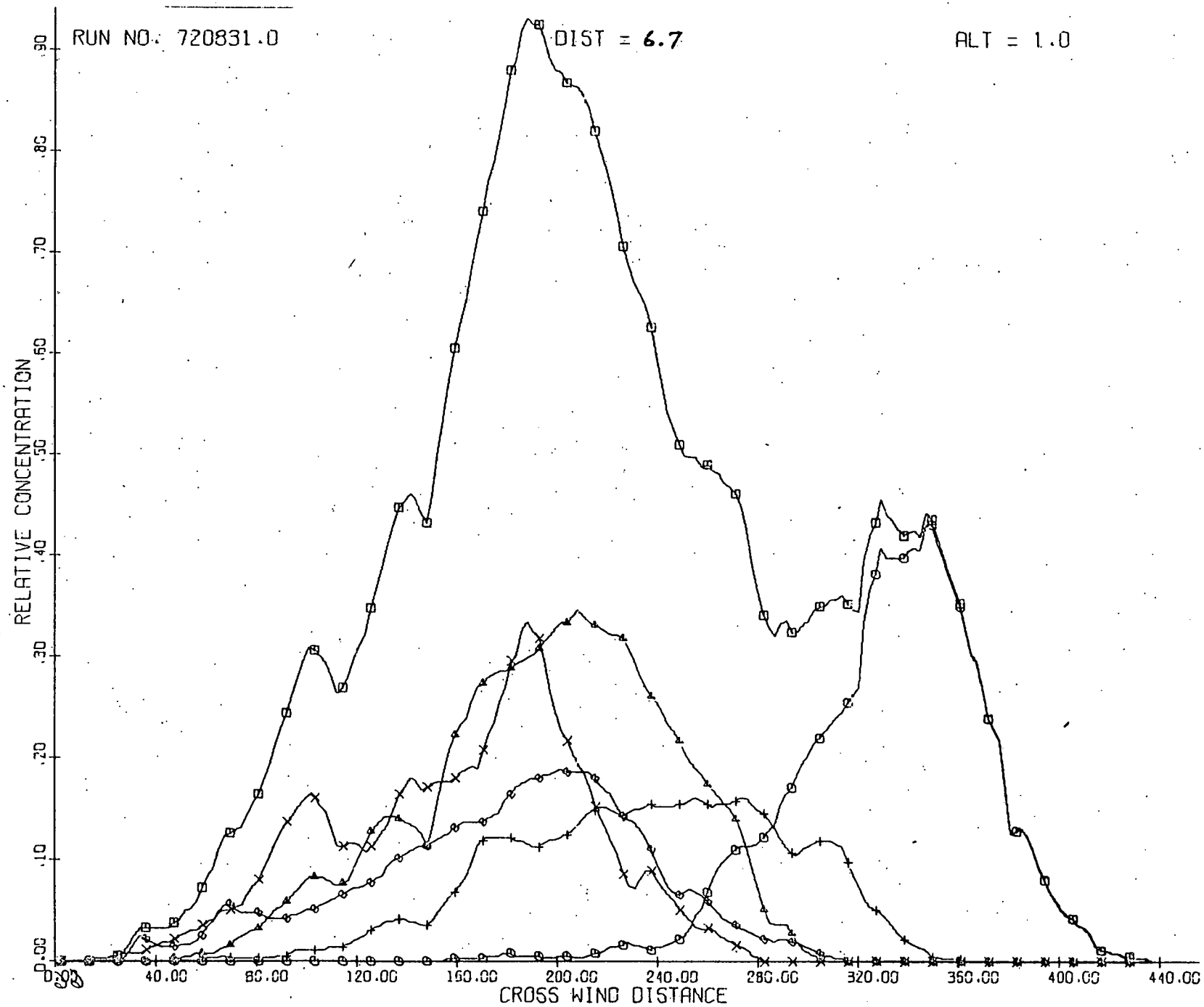


Figure 2. Aerial view of smoke plume from one-mile position, Run 3, 8-31-72.

Figure 3. Aerial view of smoke plume from three-mile position, Run 3, 8-31-72.


RUN NO. 720831.0
DIST = 2.7
ALT = 1.0
RELATIVE CONCENTRATION
1.40
1.20
1.00
.80
.60
.40
.20
0.00
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
CROSS WIND DISTANCE(X10)


RUN NO. 720831.0
DIST = 6.7
ALT = 1.0
RELATIVE CONCENTRATION
.00
.10
.20
.30
.40
.50
.60
.70
.80
.90
0.00
40.00
80.00
120.00
160.00
200.00
240.00
280.00
320.00
360.00
400.00
440.00
CROSS WIND DISTANCE

ON SHORE DENSITOMETER RUN
TRAVERSES AT ONE DISTANCE

RUN =720831./ DATE = 83172 /DISTANCE FROM STACK (KM) = 2.70
DIRECTION(DEG) = 120./TIME FROM 1153 TO 1224 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGND)
1.0	.111E+03	821.8	56.3			24.07
2.0	.113E+03	771.6	73.4			18.88
3.0	.870E+02	653.5	42.7			24.96
4.0	.992E+02	410.4	56.0			21.66
5.0	.748E+02	288.3	56.5			16.20
GRAND TOTAL	.485E+03	613.5	58.7	210.3	201.9	
Corrected for plume angle			44.9	161.1	154.7	

ON SHORE DENSITOMETER RUN
TRAVERSES AT ONE DISTANCE

RUN =720831./ DATE = 83172 /DISTANCE FROM STACK (KM) = 6.70
DIRECTION(DEG) = 129./TIME FROM 1450 TO 1508 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGND)
1.0	.347E+02	332.5	37.8			36.27
2.0	.406E+02	195.5	48.2			33.33
3.0	.242E+02	235.7	54.6			17.56
4.0	.303E+02	161.9	49.0			24.04
5.0	.231E+02	179.1	55.6			16.42
GRAND TOTAL	.153E+03	223.8	48.7	79.7	63.1	
Corrected for plume angle			41.7	68.3	54.1	

Run No. 4
October 3, 1972

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: October 12, 1972

TO: Files

FROM: G. S. Raynor

SUBJECT: Offshore Dispersion Test No. 4.

The fourth overwater dispersion test was held on October 3, 1972.

The Liberty was manned by Mike Butler who operated the smoke generator. The analogue anemometer was mounted at 20 ft, 2 inches above the water. Wind speeds were recorded on a chart recorder at a nominal speed of 3 inches/hour.

The Selma was manned by Walter Jahnig who operated two 35-mm cameras rigged for simultaneous operation. One had black and white film and a yellow filter and the other Kodachrome film with a polarizing filter. He also operated the Bolex movie camera on the gimbal-mounted tripod and took air and water temperatures. A densitometer was also aboard the Selma but mechanical damage prior to loading on the boat rendered it inoperative.

The aircraft was manned by Ansel Tuthill and carried the temperature indicator which remained at the calibration set prior to Run #3 with a mercury thermometer. The variometer had been connected to an EA recorder but the aircraft had no opening for the connections between the sensor and the recorder so the instrument could not be installed. The former aircraft (505) has been sold and a new Cessna 172 (09G) was used. However, flights were made to locate the boundary between smooth and turbulent air. Pictures were taken on black and white film with a 35-mm camera and the Bell and Howell movie camera.

The mobil van with the densitometer and lidar was operated by Bob Brown and Sy Fink but the lidar did not operate properly and no data were obtained with it. The mobil tower with an aerovane at 52 ft, 4.5 in. was positioned at Tiana Beach. John McNeil and Anne Kokinelis took pibals and theodolite bearings and Gilbert Raynor coordinated activities from that location.

Scattered to broken cirrus clouds and slight haze were present during the run. A high with its long axis NE-SW was centered just east of the area. The onshore flow was mostly gradient although it

may have been reinforced by some sea breeze effect. The ocean had small waves from the SW and a swell from the SE. Low tide occurred at 0930 and high tide at 1525. Thus, the tide was rising during the run. Eastern standard time is used through this report.

Bearings were taken from Tiana to several landmarks with the theodolite as follows: White water tower at Hampton Bays, 3.5°; red and white water tower at Quogue, 270.2° and Coast Guard station flagpole, 40.9°. The Hampton Bays water tower was later located accurately on the map and true bearings determined as follows: Quogue water tower, 271.0°; Hampton Bays water tower, 4.4° and Coast Guard flagpole, 41.7°. Positions given below for Liberty and Selma are based on true bearings.

Loading of the boats started about 0900. They left the Inlet about 1030. The aircraft arrived at 1040. Test smoke from a position off Tiana was started at 1056 and continued for several minutes. Rapid diffusion of the plume was noted so a decision was made to emit from one mile offshore instead of three miles as had been planned if the plume resembled those of the two previous tests.

The Liberty anchored one nautical mile off shore and about 3/4 mile west of Tiana at 1110. Continuous smoke was started at 1120 and maintained until the end of the experimental period. The plume was too diffuse to time its approach to the beach as in previous runs. Bearings were taken from Tiana and from the road one mile west by theodolite. Bearings and distances are given in Table 1 and plotted in Fig. 1.

The plume was observed to meander frequently in direction but remained fairly narrow in the horizontal plane. It also remained quite low vertically for 1/4 to 1/2 of the distance to shore but then much ascending motion took place accompanied by rapid dilution. The plume sometimes looped but at other times individual segements were carried aloft while intervening sections remained low. At times, minor looping was observed closer to the source. Most of the time, the plume seemed to reach the water several boat lengths away. Later in the run, meandering decreased and the plume came to shore in a more nearly straight line but other characteristics remained the same. During most of the run, the surface portion of the plume crossed the beach a short distance west of Tiana but late in the day, a wind shift brought it ashore just east of the parking lot.

The Selma was directed to take photo position 1 by sailing 1/4 mile along the plume from Liberty and then turning west to a point giving a good view of the plume. Bearings were taken from Tiana and from the road one mile west by theodolite. The location is given in Table 1 and Fig. 1. The boat drifted during the photography period so positions are given at beginning and end of the period. An attempt was made to take time lapse movie pictures and some were obtained at 1 second intervals although the counterweight on the gimbal mount oscillated excessively. A series of pictures was taken with the 35-mm cameras. Photo period 1 lasted from 1153 to 1205.

35-mm pictures were also taken from the aircraft during photo period 1. Prior to this time, temperature soundings were taken over the one mile position, and over an inland position north of the Sunrise Highway. North-south traverses at several altitudes were also made to locate the boundary between smooth and turbulent air.

After completing photo series 1, the Selma was directed to make a series of crosswind traverses with the densitometer at several distances from the source. However, the instrument failed to operate and mechanical damage to the range switch was found which could not be repaired despite efforts by both Jahnig and Butler. The damage apparently occurred prior to loading the instrument on the boat, probably while loading it in the van. Considerable time was spent attempting to operate and repair the instrument but when it became evident that repairs were impossible at sea, the Selma was directed to photo position 2 (Table 1 and Fig. 1) west of the plume.

Pictures were taken from here between 1428 and 1442 with the 35-mm camera. A short run of movies at 16 frames/sec was also taken. The Selma then proceeded to photo position 3 (Table 1 and Fig. 1) east of the plume to obtain pictures with the plume backlighted by the sun. 35-mm pictures were taken from 1457 to 1507. Lighting conditions made movies impossible.

Smoke was terminated at 1510 and the boats returned to port. Unloading was completed about 1645.

Pibals were taken from the beach at 1121, 1250 and 1445. Releases from the Selma were made at 1235 and 1400. Release positions are given in Table 1 and Fig. 1. Soundings from the beach are plotted in Fig. 2. Soundings from the Selma are not yet processed and will be reported later.

The analogue anemometer recorder was operated at a nominal speed of 3 inches/hr but the chart ran at a faster rate apparently due to the voltage supplied by the batteries. Mean wind speed was about 3 mps with fluctuations from 0.2 to 5.2 mps. Little variation occurred in mean speed or in character of the trace during the run. Temperatures taken from the Selma are listed in Table 2 and plotted in Fig. 3.

Aircraft temperature soundings were taken over the 1 mile position from 200 to 4000 feet at 1040 and from 200 to 9000 feet at 1354. Another sounding was taken inland north of the Sunrise Highway at 1052. All soundings indicate a neutral lapse rate with small inversions at several heights. Temperatures are tabulated in Table 3 and plotted in Fig. 3.

The path of the turbulence traverses made about 1100 is shown in Fig. 4 and the boundary between smooth and turbulent air is illustrated in Fig. 5. An additional traverse was made at 1415 and essentially the same pattern was found except that a small amount of turbulence was noted at 500 feet over the beach and a small amount over the north part of the bay. No turbulence was found at 1000 feet over the beach.

The aircraft made three runs along the top of the plume but the top was so diffuse and so hard to observe that the results are not useful. Smoke was found to 400 feet between the source and the beach but only at lower altitudes over the beach. This may be the result of looping at that particular time or merely diffusion.

Two speed runs were taken on the aerovane chart recorder at Tiana with the chart on normal speed during the remainder of the experiment. Means and standard deviations of the wind data will be reported later.

No trouble was experienced with the smoke generator and loss of oil was small (0.4 gal.) but the flow rate as measured by the newly installed meter increased somewhat during the run. Total consumption was 14.86 gal., an average rate of 0.0645 gal/min. However, the rate varied from 0.052 to 0.070 gal/min. over shorter time periods.

Densitometer measurements made from the van on Dune Road will be reported separately. However, good measurements were obtained. Attempts to measure the height of the smoke with the lidar were unsuccessful as the instrument failed to operate properly.

In summary, the plume behavior was quite different from that in previous runs. Considerable horizontal meandering and pronounced upward diffusion were observed. Although water temperatures measured near the source were below air temperatures, they may have been higher closer to shore causing the vertical motion observed. Although lapse rates above 200 feet were mostly less than adiabatic, the combined aircraft and boat measured temperatures indicate a super-adiabatic lapse rate in the lower layers.

TABLE 1. Run 4 10-3-72

SOURCE, PHOTO AND PIBAL RELEASE POSITIONS

Boat	Position	Distance from Beach	Distance from Tiana	Bearing from Tiana	Bearing from 1 mi West	Distance from Liberty	Distance along Plume	Distance from Plume
Liberty	Source	1.15	1.46*	196.0	154.8	-	-	-
Selma	Photo 1	-	1.47 to 1.74*	220.8 to 223.3	185.2 to 199.0	0.92	0.287	0.55 to 0.8*
"	Photo 2	-	1.60 to 1.65*	214.1 to 218.2	-	0.51 to 0.67	0.287	0.55 to 0.60*
"	Photo 3	-	1.1 to 1.2*	172.8 to 170.4	-	0.57 to 0.67	0.287	0.5 to 0.55*
"	Pibal 2	-	1.72*	232.7	-	1.01	-	-
"	Pibal 4	-	1.26*	207.9	-	0.31	-	-

Distances in statute miles

* measured from map

TABLE 2. Run 4 10-3-72

METEOROLOGICAL MEASUREMENTS FROM BOATS

Position	Time (EST)	Air Temp. (°F)	Water Temp. (°F)	Wind Speed (mps)
1 mile out	1135	64.8	64.0	
3/4 mile out	1225	64.5	62.5	
3/4 mile out	1445	64.5	62.5	
1 mile out	1118 to 1510			3.0

NOTE-distances in nautical miles = 1.15 statute miles.

TABLE 3 Run 4 10-3-72

AIRCRAFT TEMPERATURE MEASUREMENTS

Height (Ft)	1040E 1 Mile Out	1052 N. of Sunrise Hwy.	1354 1 Mile Out
100			
200	62.5		63+
300	62.5	65	62
400	62	63	62
500	62-	62+	62
600	61-	62	62-
700	60	62	61
800	59	62-	60+
900	58.5	62-	60-
1000	59	60	59
1100	59	59-	60-
1200	59	58	60+
1300	59-	58	60
1400	58	58	60-
1500	57	58+	58.5
1600	56+	58	58
1700	56-	58	58
1800	55	57	58
1900	55-	56+	58-
2000	55-	56	57+
2100	55	56-	57-
2200	55-	55	56.5
2300	55-	55+	56
2400	56	55	56.5
2500	56	54	56
2600	55-	53	56-
2700	54	53	54.5
2800	54	53	54
2900	53	54	54-
3000	53-	54+	53
3100	52	54-	53+
3200	52+	52.5	53+
3300	52+	52	53
3400	52	52-	52
3500	51	51+	51
3600	50	51+	51
3700	49.5	51+	50.5
3800	49	51-	51
3900	49-	50	51
4000	49-		50
4100			50-
4200			48.5
4300			48
4400			48
4500			48-
4600			47.5
4700			47
4800			47
4900			46
5000			46
5100			45
5200			45
5300			44
5400			45+
5500			44+
5600			44+
5700			44
5800			43
5900			42.5
6000			43
6100			42.5
6200			44-
6300			44
6400			45
6500			44.5
6600			44
6700			42.5
6800			43
6900			42
7000			42+
7100			43
7200			44.5
7300			44.5
7400			44
7500			44
7600			43
7700			44
7800			44+
7900			45-
8000			45-
8100			44
8200			43
8300			42+
8400			42-
8500			41+
8600			41
8700			40.5
8800			40+
8900			40
9000			40

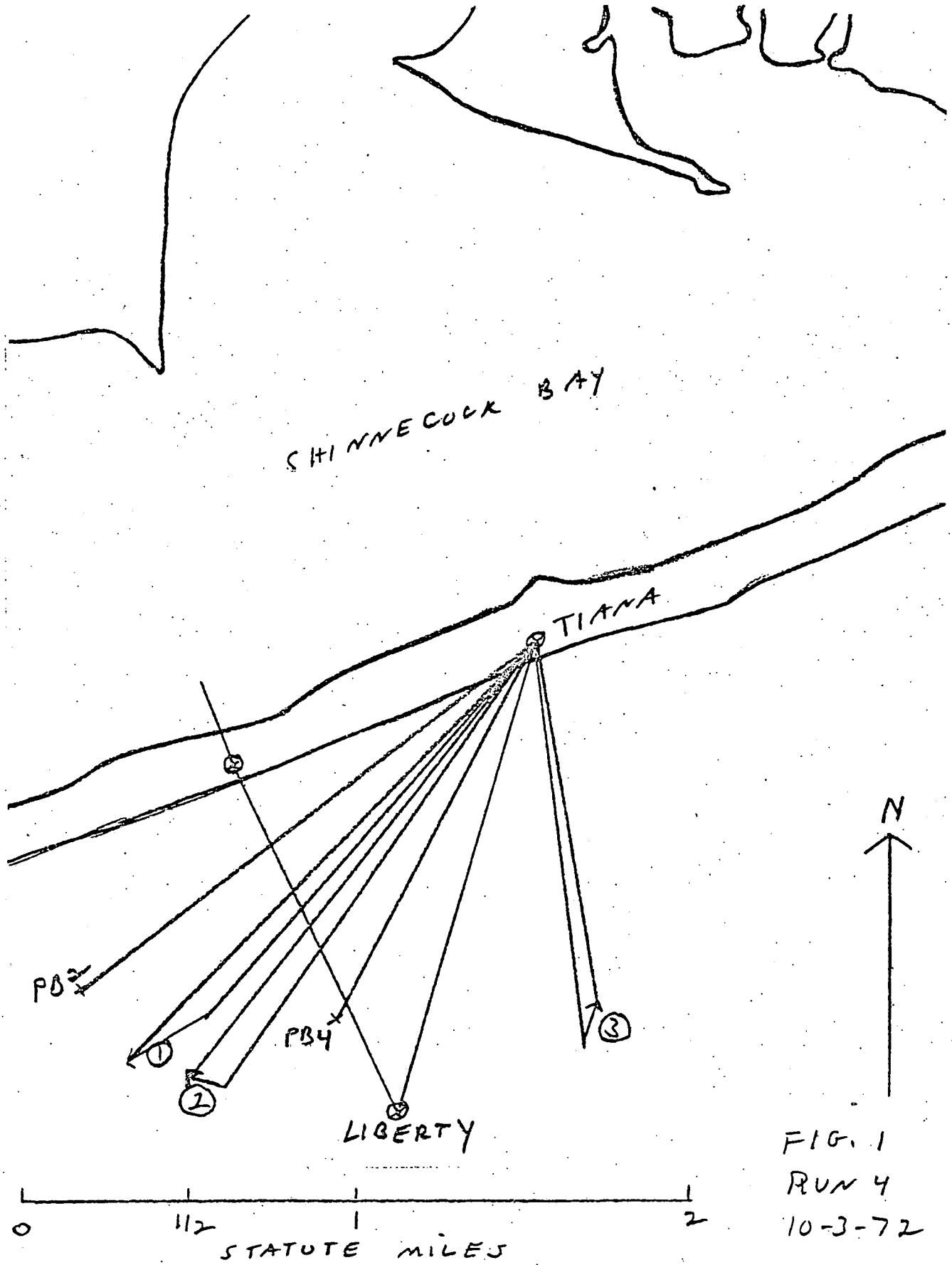
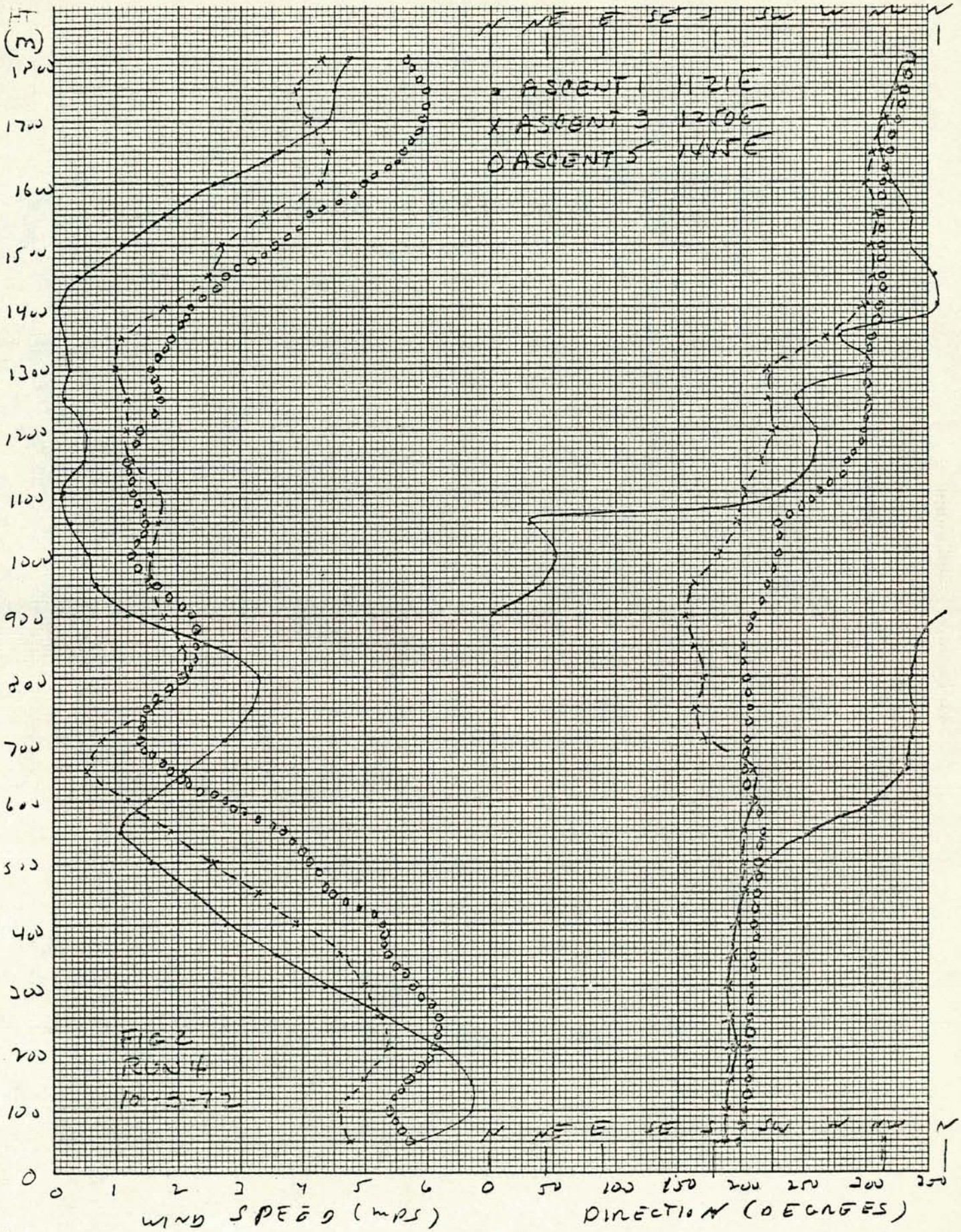
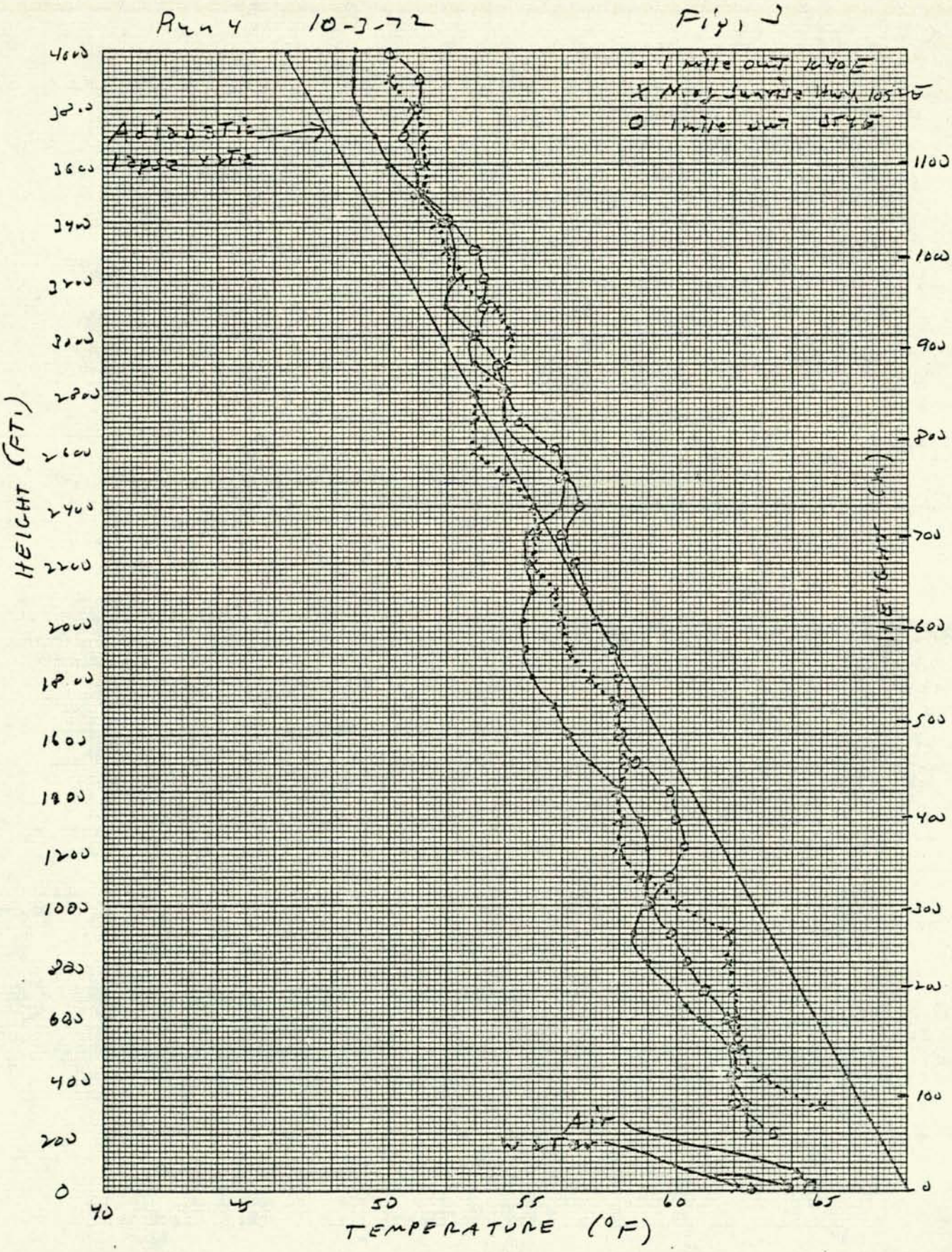


FIG. 1
RUN 4
10-3-72


HT (m)
ASCENT 1 1121E
ASCENT 3 1206E
ASCENT 5 1415E
FIG 2
RUN 4
10-3-72
WIND SPEED (mps)
DIRECTION (DEGREES)


Run 4 10-3-72
Fig. 3
Adiabatic lapse rate
Air
HEIGHT (FT.)
TEMPERATURE (°F)
HEIGHT (M)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
3400
3600
3800
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500
600
700
800
900
1000
1100

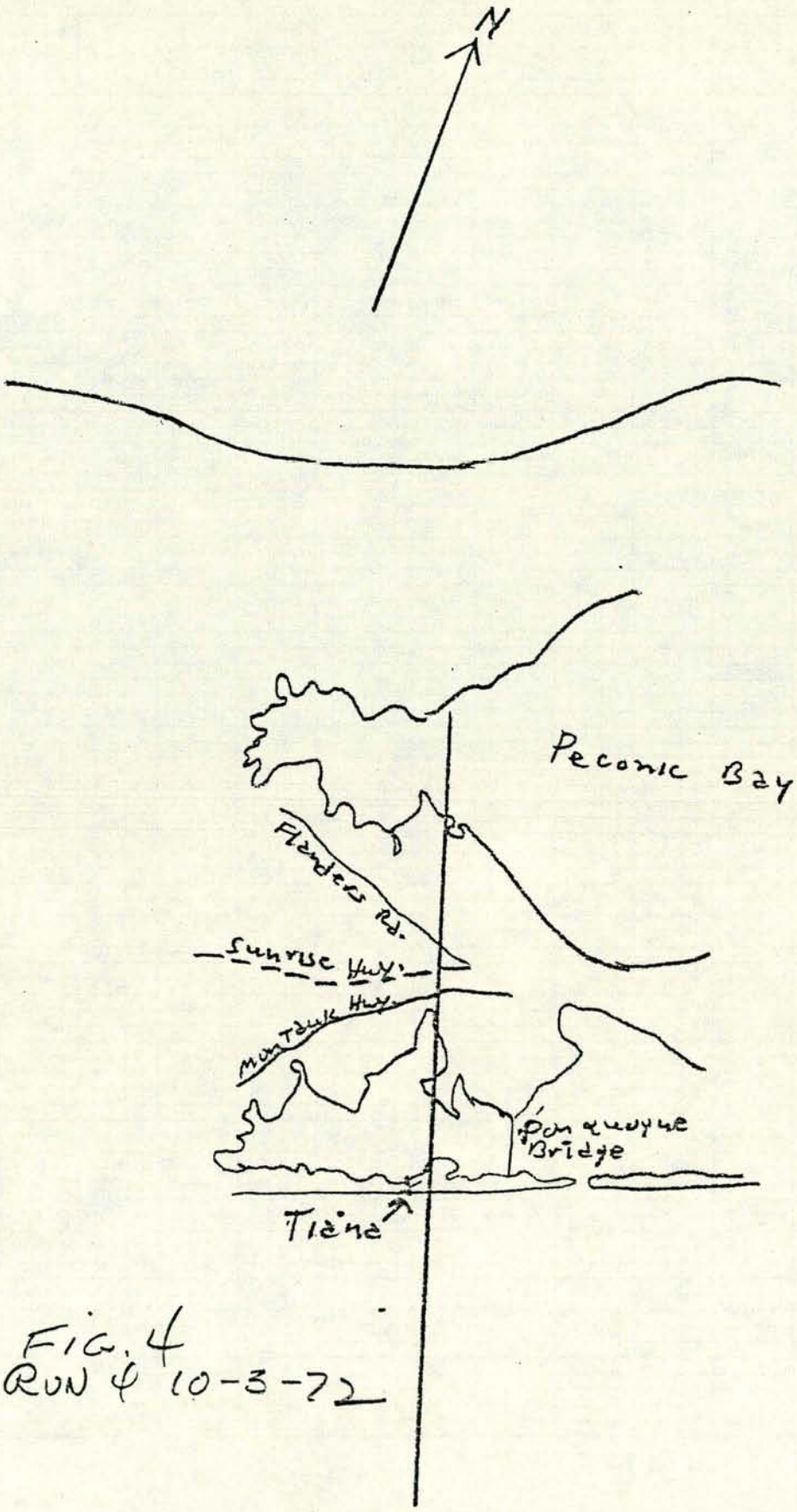


FIG. 4
RUN # 10-3-72

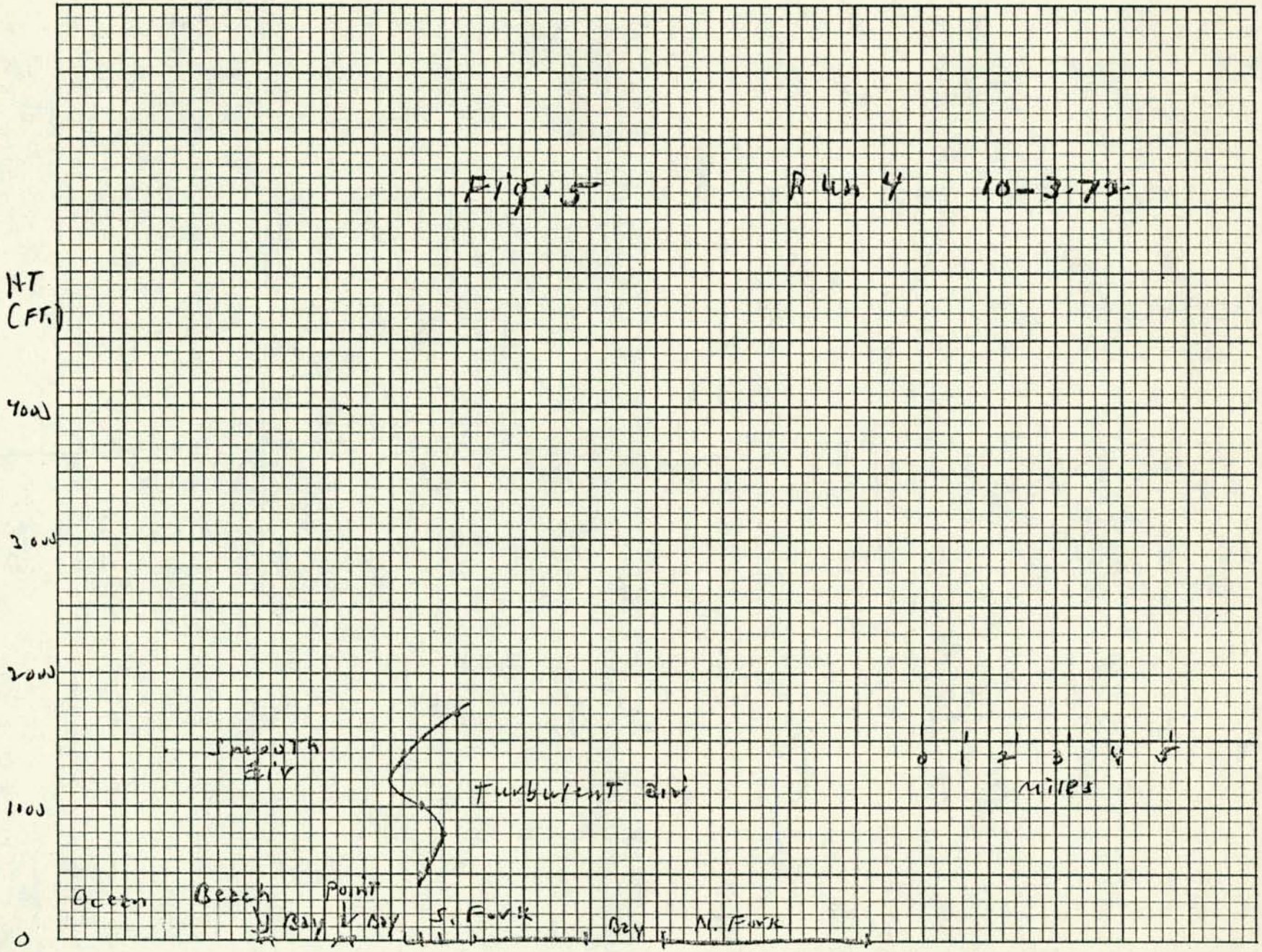


Fig. 5
Run 4
10-3-73
HT (FT.)
400
300
200
100
0
Smooth air
Turbulent air
0 1 2 3 4 5
Miles
Ocean
Beach
Bay
Point
Bay
S. Fork
Bay
N. Fork

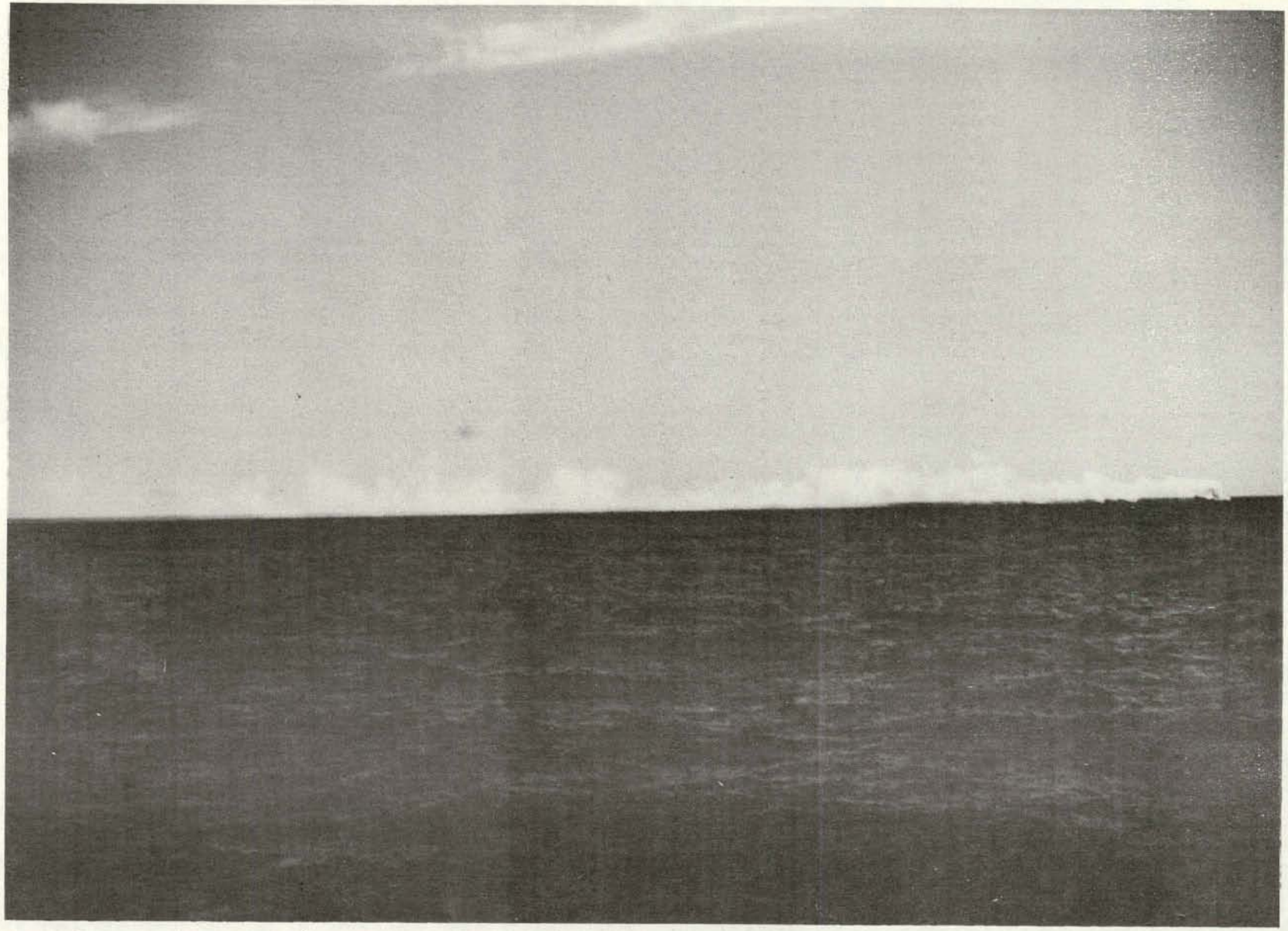


Figure 1. Smoke plume, Run 4, 10-3-72.

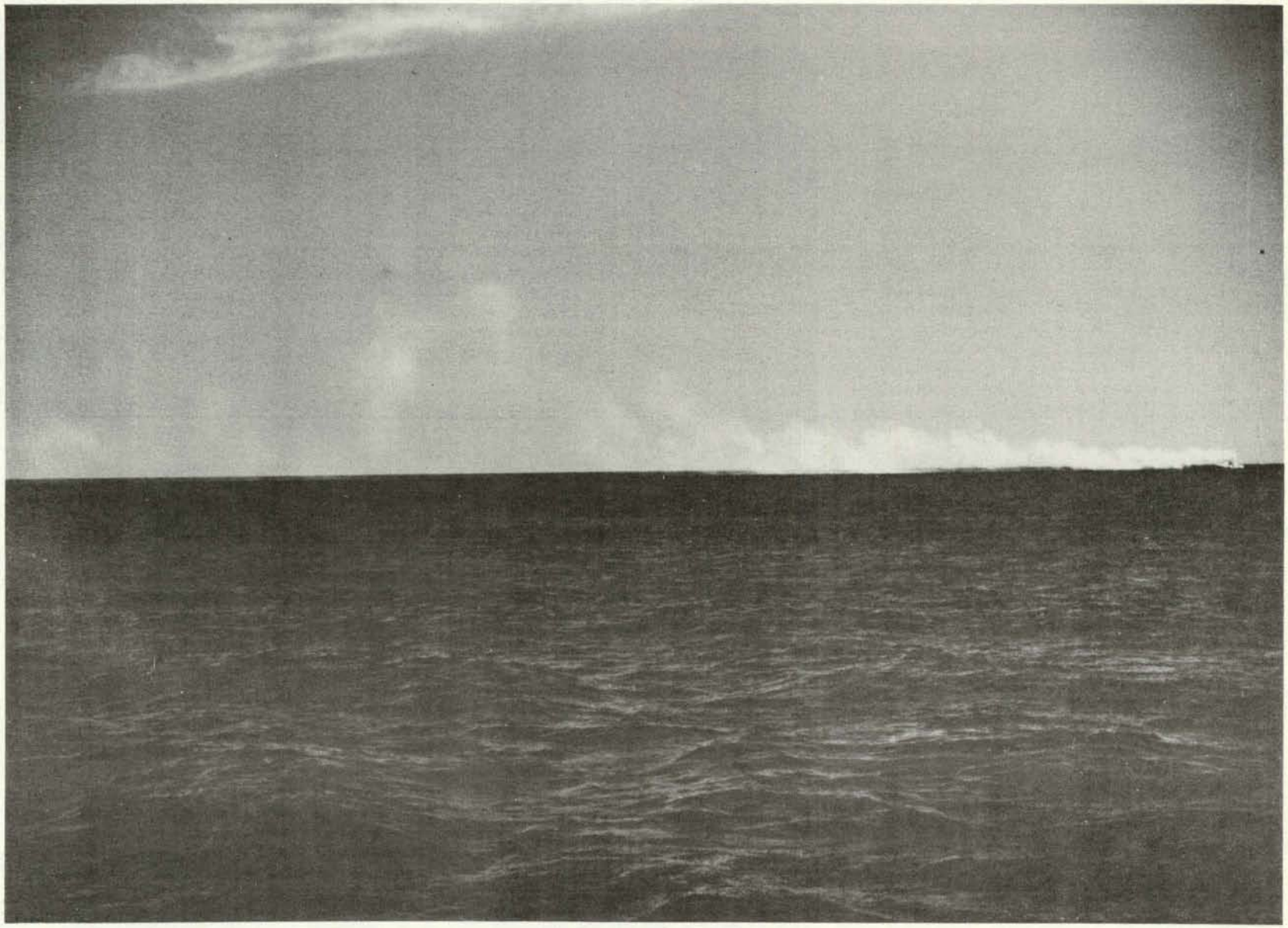


Figure 2. Smoke plume, Run 4, 10-3-72.

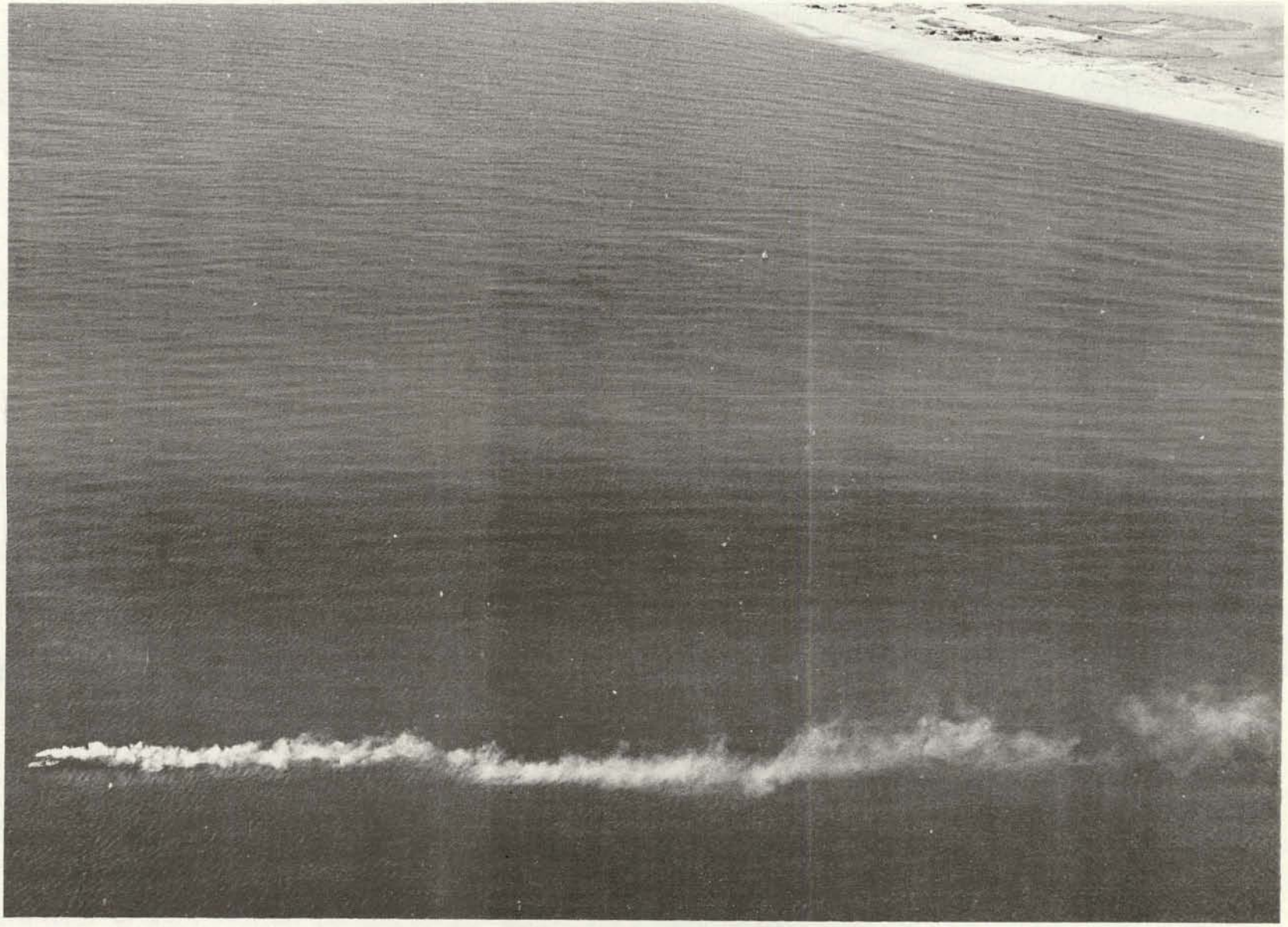
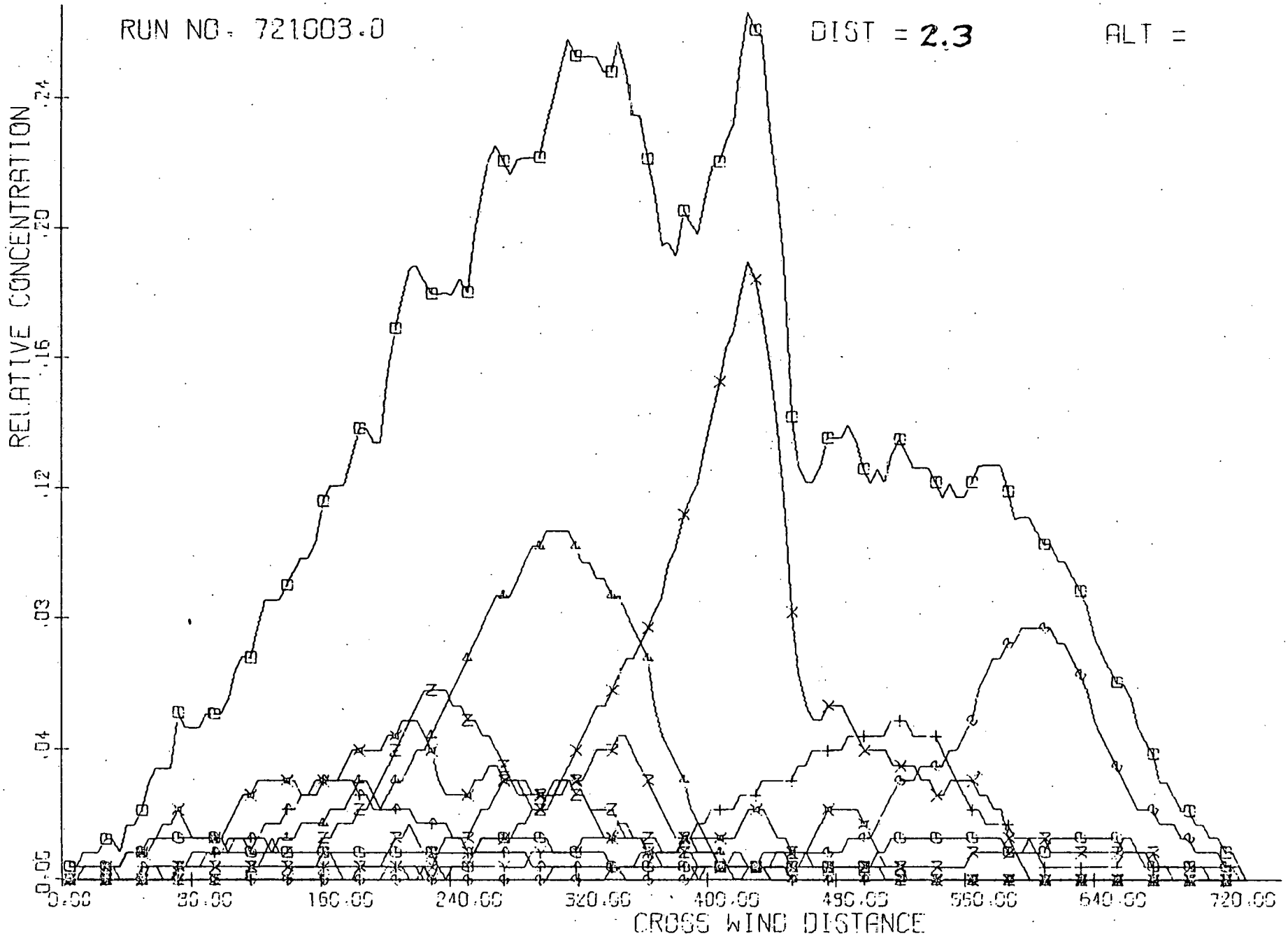


Figure 3. Aerial view of smoke plume,
Run 4, 10-3-72.

Figure 4. Aerial view of smoke plume,
Run 4, 10-3-72.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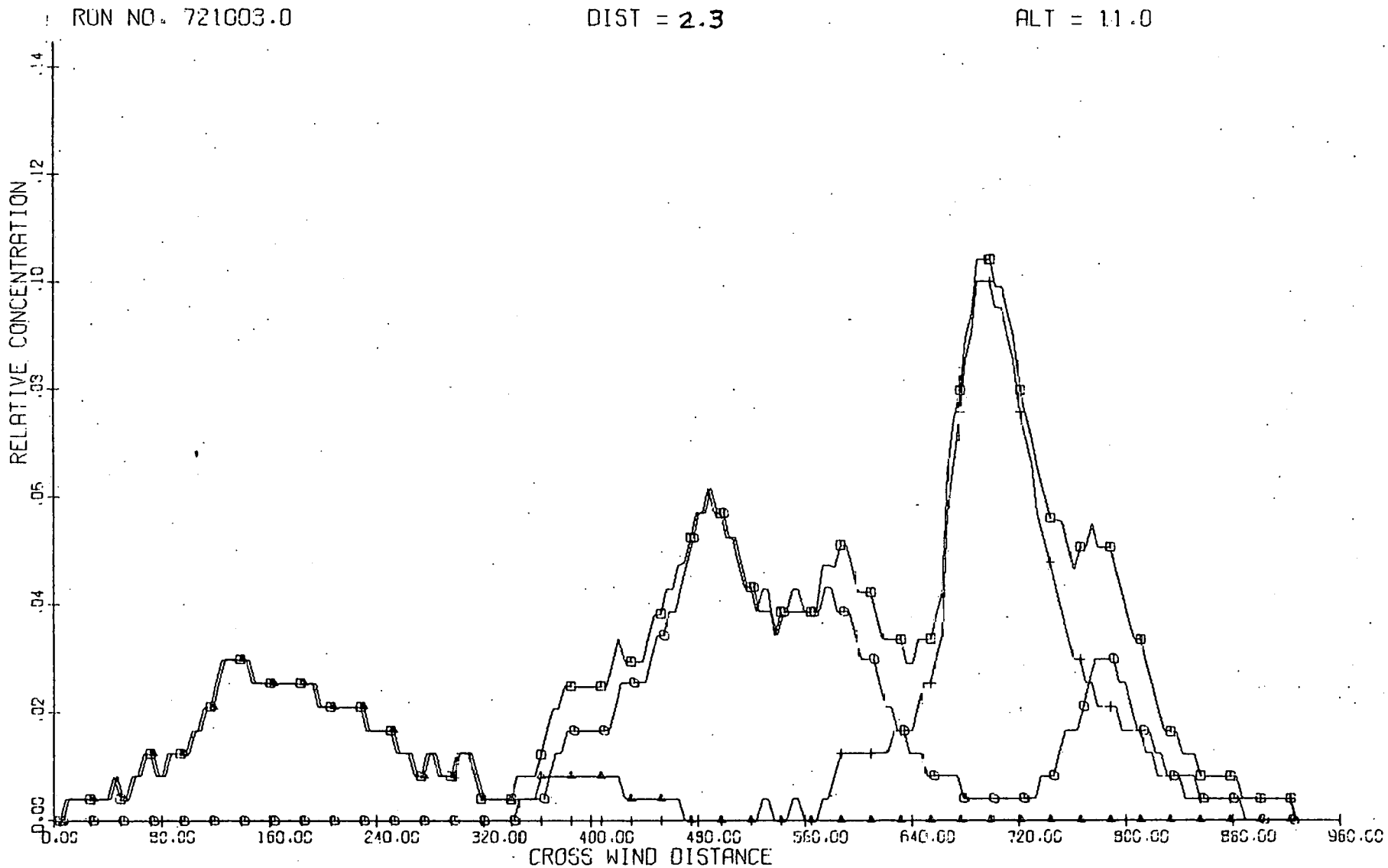
ALT =
RELATIVE CONCENTRATION
.24
.20
.16
.12
.08
.04
0.00
0.00
80.00
160.00
240.00
320.00
400.00
480.00
560.00
640.00
720.00
CROSS WIND DISTANCE


RUN NO. 721003.0
DIST = 2.3
ALT = 11.0
RELATIVE CONCENTRATION
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.12
.10
.08
.06
.04
.02
0.00
0.00
80.00
160.00
240.00
320.00
400.00
480.00
560.00
640.00
720.00
800.00
880.00
960.00
CROSS WIND DISTANCE

ON SHORE DENSITOMETER RUN
TRAVERSES AT ONE DISTANCE

RUN =721003./ DATE =100372 /DISTANCE FROM STACK (KM)= 2.30
DIRECTION(DEG) = 195./TIME FROM 1156 TO 1323 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGND)
1.0	.593E+01	358.9	211.2			.57
2.0	.158E+02	282.6	69.5			4.63
3.0	.786E+01	486.4	87.8			1.82
4.0	.221E+02	410.1	82.1			5.49
5.0	.977E+01	589.1	61.8			3.22
6.0	.429E+01	206.1	83.0			1.05
7.0	.713E+01	366.8	146.4			.99
8.0	.771E+01	269.7	78.7			2.00
9.0	.168E+01	329.2	62.9			.55
10.0	.108E+02	252.2	120.6			1.83
GRAND TOTAL	.931E+02	366.3	102.7	148.7	107.6	

Corrected for plume angle 84.1 121.8 88.1

ON SHORE DENSITOMETER RUN
TRAVERSES AT ONE DISTANCE

RUN =721003./ DATE =100372 /DISTANCE FROM STACK (KM)= 2.30
DIRECTION(DEG) = 204./TIME FROM 1455 TO 1515 HRS

ALTITUDE	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGND)
11.0	.118E+02	566.8	125.7			2.30
12.0	.574E+01	206.2	102.5			1.37
13.0	.102E+02	713.3	60.9			4.11
GRAND TOTAL	.277E+02	546.2	101.2	211.2	185.4	

Corrected for plume angle 72.8 151.9 133.3

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Run No. 5
November 7, 1972

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: Nov. 22, 1972

TO: Files

FROM: G. S. Raynor

SUBJECT: Offshore Dispersion Test No. 5.

The fifth overwater dispersion test was held on November 7, 1972.

The Liberty was manned by Mike Butler and Sy Fink who operated the smoke generator. The analogue anemometer was mounted at 20 ft., 2 in. (6.15 m) above the water. Wind speeds were recorded on a chart recorder at a nominal speed of 3 inches/hr. but the recorder ran fast apparently due to too high frequency produced by the generator used.

The Selma was manned by Walter Jahnig who operated two 35-mm cameras rigged for simultaneous operation. One was loaded with black and white film and used a yellow filter. The other used Kodachrome X film and a polarizing filter. The Bolex movie camera was taken but not used since rolling of the boat made the tripod unusable. A densitometer and thermometer for air and water temperatures were also aboard.

The aircraft was manned by Ansel Tuthill. Pictures were taken on black and white film with a 35-mm camera pointed downward through a hole cut for this purpose in the floor of the aircraft. Due to time spent on the morning of the run cutting the hole and flight testing the aircraft, no time was left for mounting the variometer package. However, flights were made, as in previous runs, to locate the boundary between smooth and turbulent air and three temperature soundings were taken. The temperature indicator was checked with a mercury thermometer prior to the run.

The mobil van with the densitometer was operated by Bob Brown and Ed Cote. The mobil tower at Tiana Beach failed to extend fully so the Aerovane was at 32 ft., 3 in. (9.85 m) above the ground. A vertical angle and a distance to the water's edge gave the height of the parking lot as 6.5 m. Thus the Aerovane was 16.3 m above

the water. A cup anemometer recording on a printing counter at 12 min. intervals was mounted 3 m above the ground or 9.5 m above the water. A mercury thermometer was mounted at the tower for air temperature measurements. John McNeil and Anne Kokinelis took pibals and theodolite bearings. Gilbert Raynor coordinated activities of all groups from the same location.

The sky was overcast with stratocumulus clouds at about 3000 feet. A few small, thin spots were observed during the day. At 1344, the clouds started to break and reached about half sky coverage with cirrus above at 1350. However, data collection was complete by this time. A north-south high pressure ridge was located just east of the area and a large low in lower Michigan. Winds were gradient southwesterly (mean 210°) but variable in direction, varying from 176 to 258° on the Aerovane chart. The ocean had only small waves but a pronounced swell. High tide occurred at 0719 and low tide at 1329. Thus, flow was out of the Inlet during the run. Eastern standard time is used throughout this report.

Loading of the boats started about 0845. They left the Inlet about 1020. Test smoke was started at 1056 and ended at 1110. Diffusion was rapid so the Liberty was directed to a position SW of Tiana and one nautical mile off shore (Table 1 and Fig. 1). Continuous smoke was started at 1139 and continued until 1314 when trouble with the smoke generator forced shutdown.

The plume diffused very rapidly in the vertical but with less looping than in the previous run. It meandered greatly in the horizontal as the wind direction shifted frequently but horizontal diffusion did not appear excessive, about like a B_1 case over land. However, including the meandering, the plume behaved more like a B_2 plume over land. Visibility of the plume was poor against the cloudy sky and it could be seen for only about 1/4 mile from the Selma. It was visible almost to the beach in some of the aerial photographs although, most of the time, it was lost by half-way in. The mean plume direction brought the smoke to the beach just west of Tiana but so much was aloft that only a few puffs were detected by the densitometer. At times, the plume was almost parallel to the beach and did not reach shore.

The Selma was directed to photo position 1 (Table 1 & Fig. 1) and took a series of ten 35-mm pictures from 1230 to 1241. Although the Selma

drifted somewhat during this period because its anchor would not hold, its position was determined at beginning and end by double theodolite triangulation. The same technique was used to locate the Liberty and excellent agreement was found between its distance from the beach determined by this method and the distance determined by radar. However, the position of the smoke plume varied considerably during the photo period so the computed distance to the plume is only approximate. No movies were taken due to the roll of the boat. No pictures were attempted at greater distances from the source due to inability to see the smoke. Photos were taken from the aircraft before and during the photo period both with and without a red filter.

The Selma was then directed to take densitometer traverses across the plume at one-quarter mile downwind. The actual distance was 5/16 mile (540 m) downwind as measured by Liberty's radar. The first pass was started at 1307 and three were completed before failure of the smoke generator terminated these measurements. Results are given in a Nov. 8 memo from Bob Brown. Since the generator could not be repaired at sea, the run was ended at 1405. Both boats were unloaded by 1540.

Speed runs were taken on the Aerovane chart from 1145 to 1218, and 1301 to 1331. The chart was on normal speed the remainder of the time. Wind speed measurements taken at two heights on the tower and on the Liberty are listed in Table 2 and plotted in Fig.2. Air and water temperatures are listed in Table 3 and plotted in Fig. 3. Water temperatures were lower near shore as suggested by fewer measurements in previous runs. Air temperatures were quite uniform until late in the run when the clouds became broken but were generally lower than the water temperatures. Temperatures aloft are tabulated in Table 4 and plotted in Fig. 3. Pibals were taken from Tiana at 1126, 1255 and 1323 and are plotted in Fig. 4. Note that direction is plotted on a more expanded scale than in previous reports. All ascents terminated at cloud level. No balloon releases were made off shore.

Aircraft turbulence flights were made at several levels from 1000 to 2500 feet along the track shown in Fig, 5. The shape of the boundary between smooth and turbulent air is shown in Fig. 6.

Oil consumption was only 0.05 gal/min. despite earlier removal of the flowmeter to increase flow. The colder temperatures which

increase the viscosity of the oil are believed responsible for the low flow rate. An experiment will be conducted to determine if a lighter oil can be substituted for that now used.

In summary, the plume diffused much more rapidly than in any previous run although this condition was anticipated at this time of year. The aircraft soundings showed an adiabatic lapse rate but water temperatures were warmer than low-level air temperatures causing vigorous vertical diffusion. Although wind speeds were not too much lower than in previous runs and the synoptic situation was similar, the wind direction was much more variable causing pronounced meandering of the plume. The low-level wind profile had a much greater slope than anticipated and indicated a surprisingly large roughness length. The mean of the three 50-m pibal wind speeds is lower than the mean from the Aerovane but represents only three instantaneous measurements.

Table 1 Run 5 11-7-72

Source and Photo Positions

Boat	Position	Distance from Beach	Distance from Tiana	Bearing from Tiana	Bearing from Triton La	Distance from Liberty	Distance along Plume	Distance from Plume
Liberty	Source	1810	3050	210.8	182.1	-	-	-
Selma	Photo 1	1360-1400	2900-2980	218.6-219.3	189.8-192.5	440	140-90	340-380

NOTE - Distances in meters
Bearings in degrees

Table 2 Run 5 11-7-72

Mean Wind Speed Measurements (mps)

Time (EST)	Liberty 6.15 m	Beach 9.5 m	Beach 16.3 m
1112-1124		3.5	4.8
1124-1136		3.8	5.2
1136-1148		3.9	5.8
1148-1200	2.7	3.5	
1200-1212	2.2	3.5	
1212-1224	2.9	3.4	
1224-1236	2.8	3.7	5.0
1236-1248	2.4	3.2	4.8
1248-1300	2.0	3.4	4.8
1300-1312	1.6	2.9	
1312-1324	2.4	2.6	
1324-1336	1.6	2.9	
1336-1348	1.6	3.0	4.0
Mean	2.2	3.3	4.9

NOTE - Heights given are above water.
Tiana is 6.5 m above water.

Table 3 Run 5 11-7-72

Air and Water Temperatures

Time (EST)	Distance from Shore (Statute miles)	(m)	Air Temp. (°F)	Water Temp (°F)	Temp on Beach (°F)
1100					55.0
1116	1.01	1620	53.5	54.8	55.0
1140	0.72	1156	53.5	54.5	
1150	0.43	691	54.0	53.5	54.1
1228	-	-			55.0
1248	-	-			54.6
1315	-	-			54.5
1327	0.86	1380	54.0	54.0	55.1
1335	1.26	2022	54.8	55.0	55.2
1347	1.73	2780	55.9	55.0	
1355	-	-			57.1

Table 4 Run 5 11-7-72

Aircraft Temperature Measurements

Height (Ft.)	1150-1155 1 mile out	1200-1205 Shinnecock Hills	1340-1345 1 mile out
200	(53) (46.5)		(54) (46.5)
200	53	54-	54
300	53	53	54
400	53	52.5	54-
500	52+	52	53
600	52	51	52+
700	51	50.5	52
800	51-	50	51+
900	50	50-	51
1000	50-	49	51-
1100	49	48+	50
1200	48+	48	49.5
1300	48	47	48.5
1400	47	46.5	48
1500	46+	46	48-
1600	46	45.5	47
1700	46-	45	46+
1800	45	44+	46
1900	44+	44-	45
2000	44	43	44.5
2100	43+	42.5	44
2200	42.5	42+	43+
2300	42	42-	43-
2400	41.5	41	42.5
2500	41	40+	42
2600	40.5	40-	41
2700	40+	39	41-
2800	40-	38.5	40
2900	39	38	40-
3000	38+	37	39
3000	(39) (37)		(40-) (37.5)

NOTE - Temperatures in parentheses are dry and wet bulb taken with sling psychrometer.

Base of clouds at about 3000 feet.

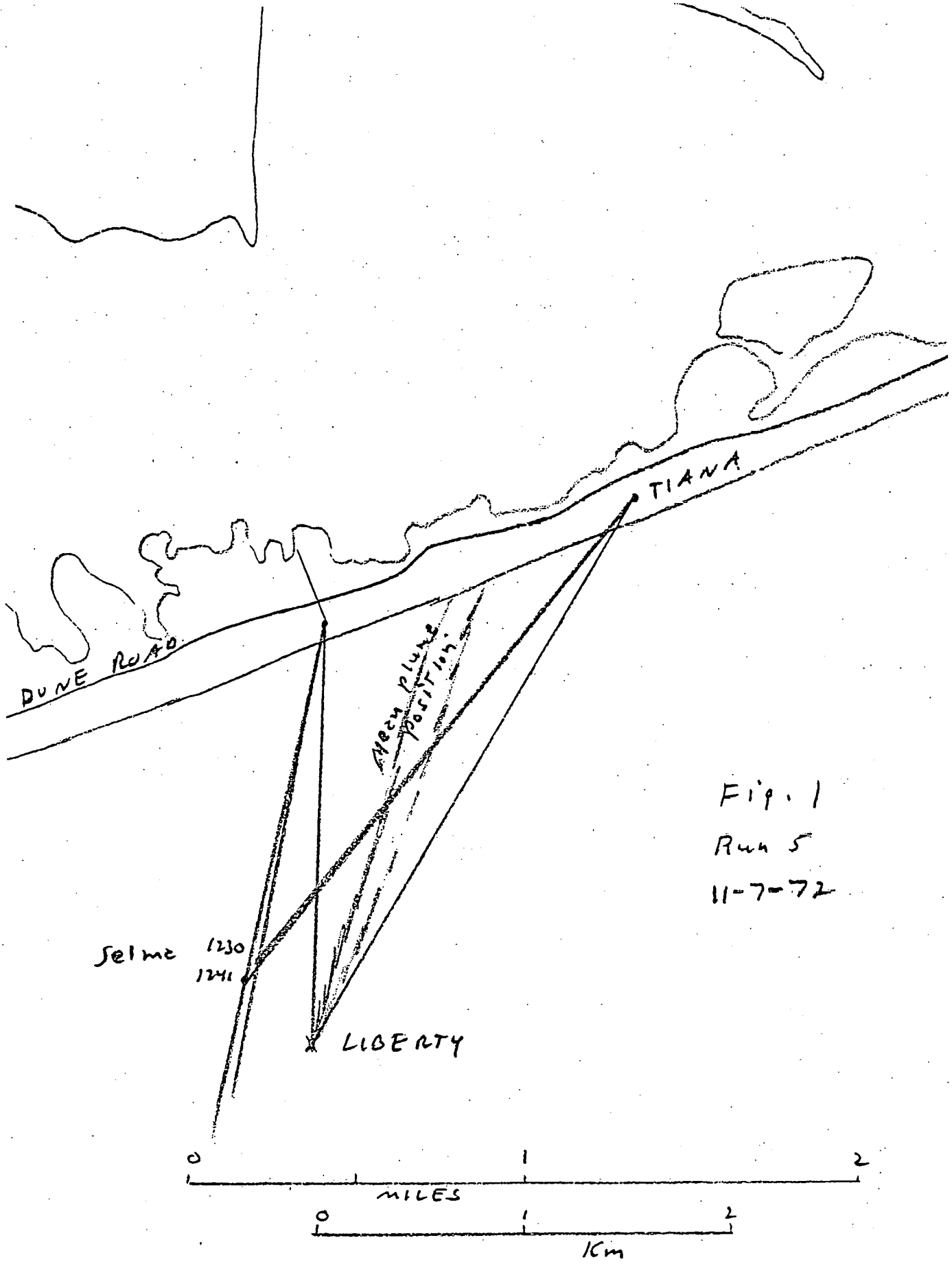
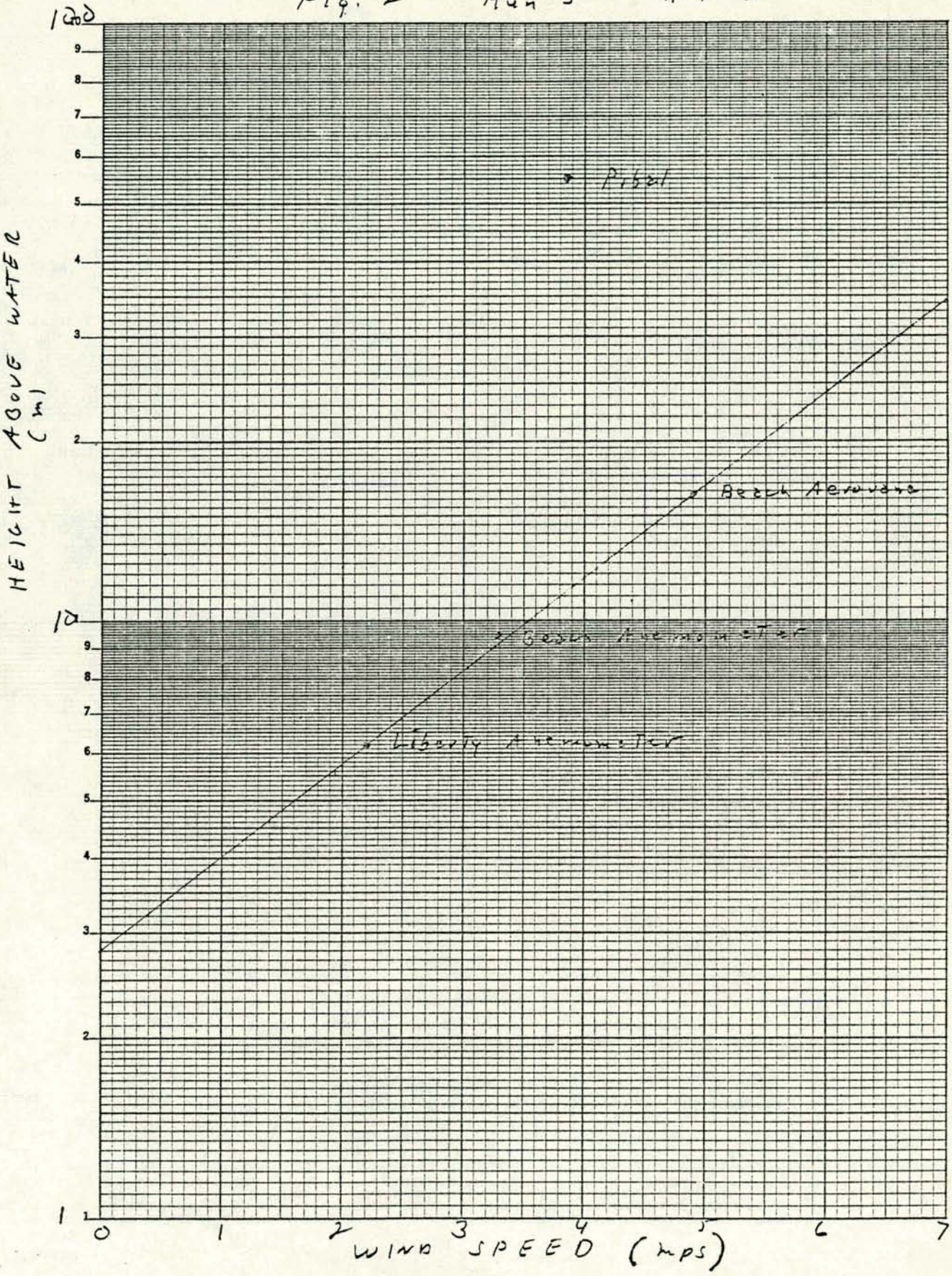
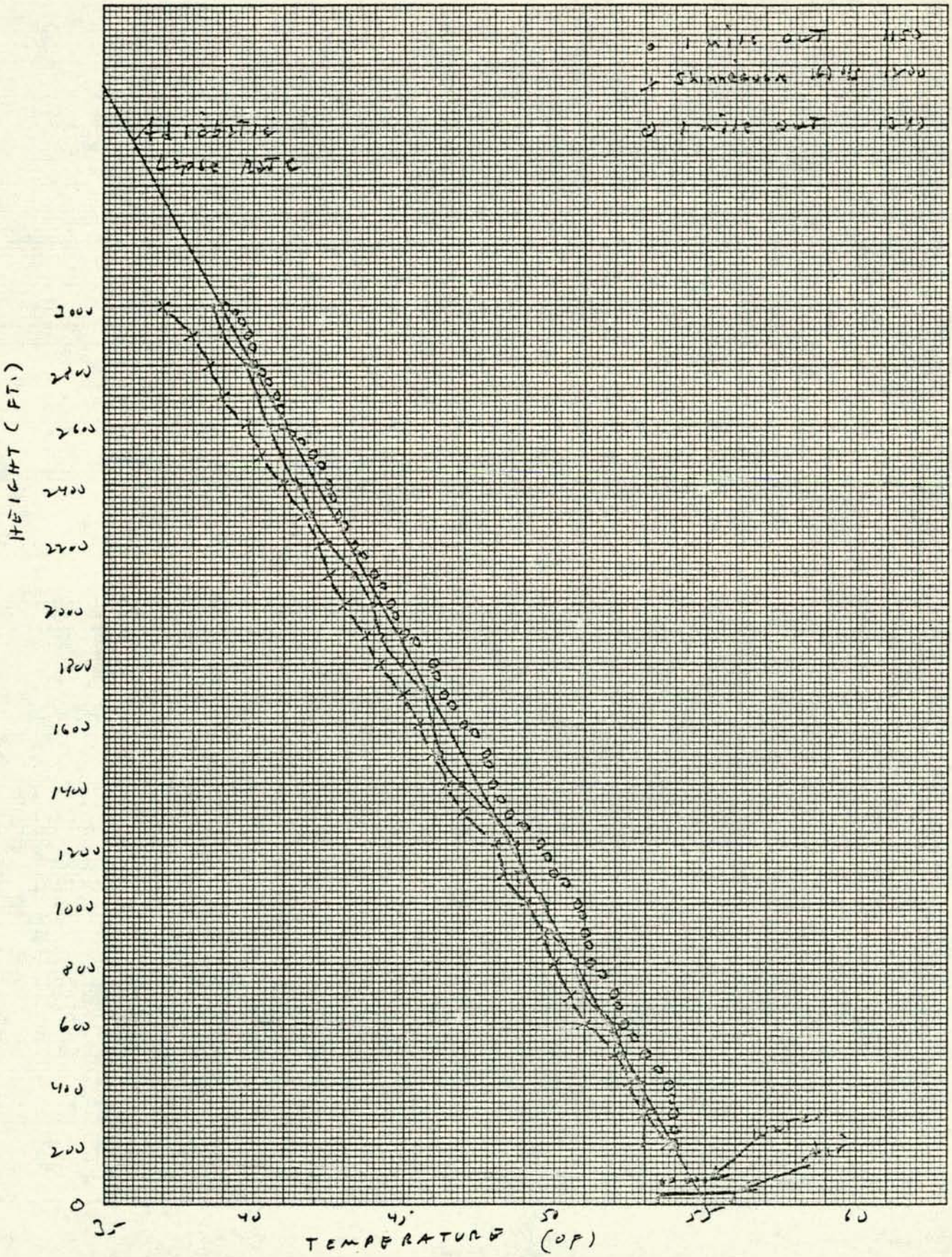


Fig. 1
Run 5
11-7-72

Fig. 2 Run 5 11-7-72



Run 5 11-7-72 Fig 3



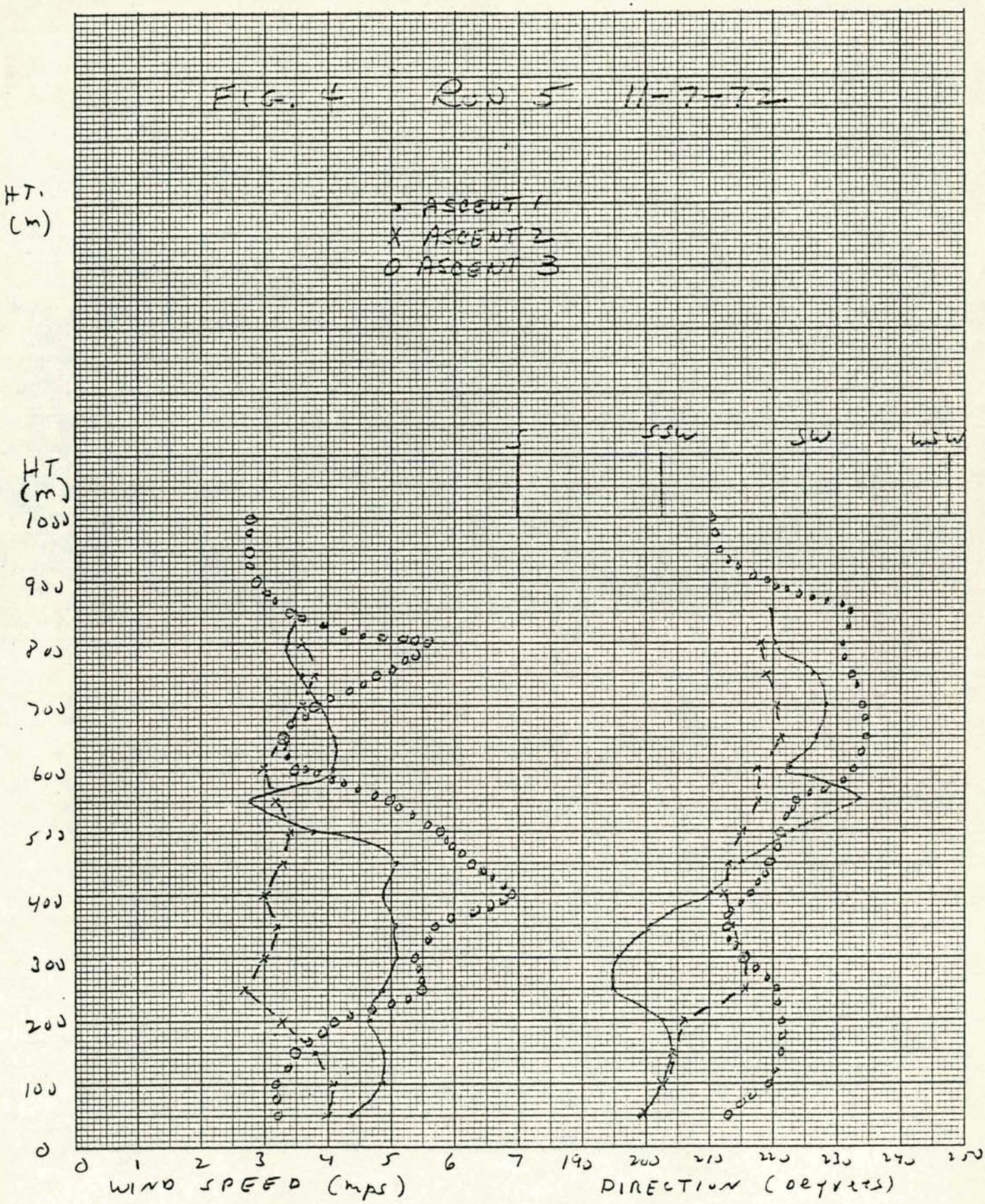


FIG. 4 RUN 5 11-7-72
HT. (m)
• ASCENT 1
X ASCENT 2
O ASCENT 3
S
SSW
SW
WSW
HT (m)
1000
900
800
700
600
500
400
300
200
100
0
0 1 2 3 4 5 6 7
190 200 210 220 230 240 250
WIND SPEED (mps)
DIRECTION (DEGREES)

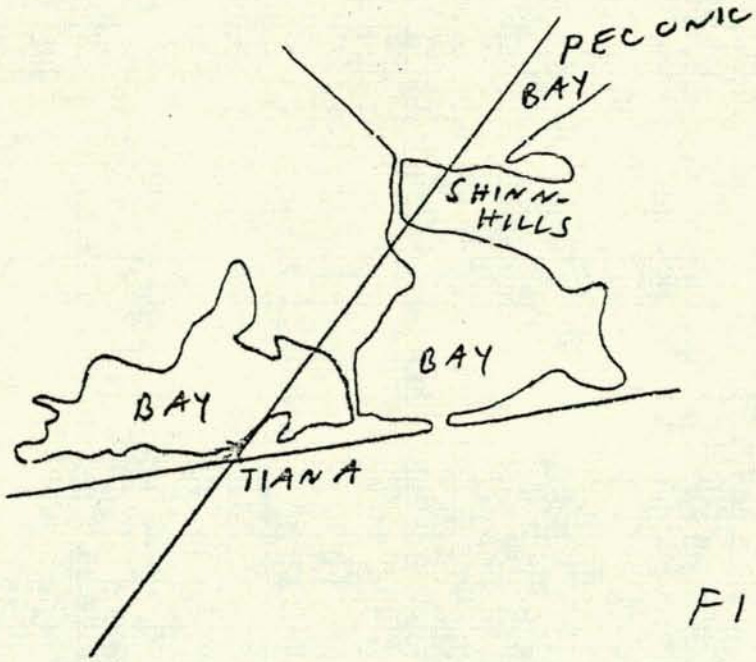


FIG. 5

RUN 5

11-7-72

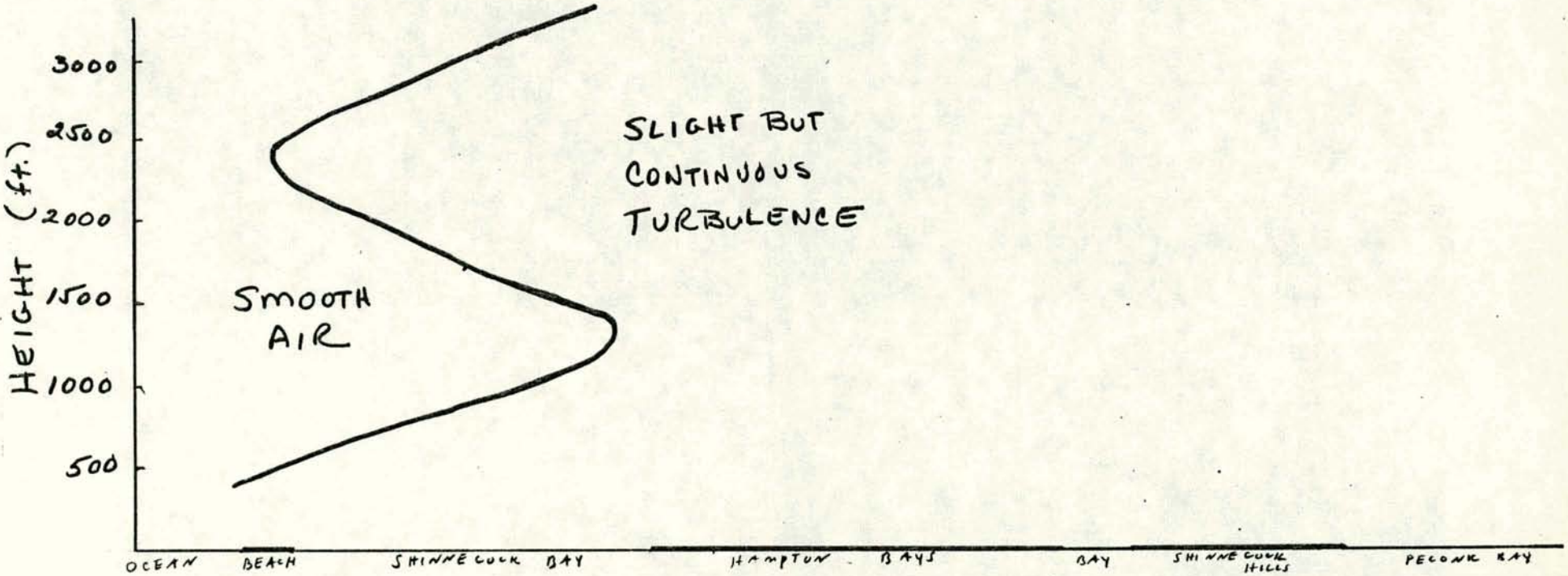


FIG. 6 RUN 5 11-7-72

Figure 1. Smoke plume, Run 5, 11-7-72.

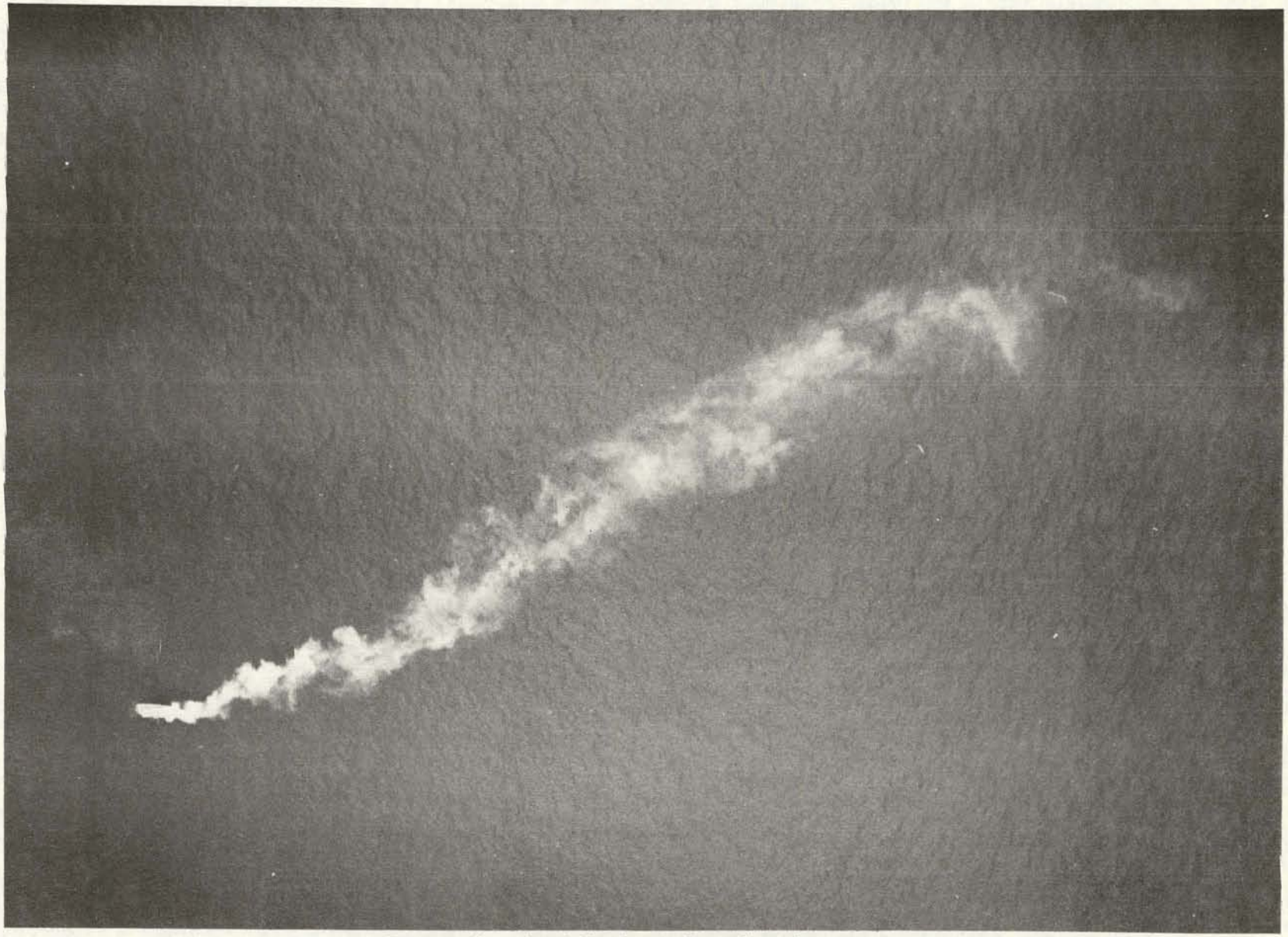


Figure 2. Aerial view of smoke plume,
Run 5, 11-7-72.

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Run No. 6
May 23, 1973

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: June 4, 1973

TO: Files

FROM: G. S. Raynor

SUBJECT: Offshore Test No. 6

The sixth overwater dispersion test was held on May 23, 1973. The sky was overcast at about 5000 feet and light rain fell throughout the period. Winds were gradient southeasterly. The direction meandered but not greatly. A low pressure center was located in Ohio with a warm front eastward through Maryland. The ocean had small waves from the SE and a slight swell from the SW. High tide occurred at 0959 and low at 1445. Thus, flow was out of the inlet during the run. Eastern standard time is used throughout this report.

The Liberty was manned by Sy Fink who operated the smoke generator. The analogue anemometer was mounted on the mast but not used since the fuse in the motor generator blew out each time it was connected to the boat's batteries. The kytoon and temperature system were taken but not used due to the rain.

The Selma was manned by Walter Jahnig. Due to the rain and the poor visibility of the plume against the clouds, only a few pictures were taken for illustrative purposes using a 50-mm lens and Kodachrome film. The movie camera was not used. The thermocouple temperature system, including the small boat, worked well except that the thermocouples in the air became wet and presumably gave wet bulb temperatures. Air and water temperatures were also taken with mercury thermometers. Densitometer traverses were taken at 1/4, 1/2 and 1 nautical mile from the source. Further details will be reported separately.

The aircraft was manned by Ansel Tuthill. Temperature soundings were taken above the boat at 1130 from 300 to 3000 feet and over land north of Sunrise Highway at 1150 from 600 to 3000 feet. The indicator was compared to mercury thermometer no. 3 and found 0.9°F too low. The correction was applied to the data tabulated in Table 1 and graphed in Figure 1. The accuracy of this sensor in the rain is unknown but the relative profile should be correct.

Files
Offshore Test No. 6
G. S. Raynor

June 4, 1973

Four variometer runs were made along a SE-NW track from the boat to Flanders at 75 mph as follows:

1. SE to NW at 500 feet, 1200 to 1203. Recorder on 1 mv/division scale. Trace partially off scale but mostly usable.

2. NW to SE at 1000 feet, 1205 to 1213. Recorder on 10 mv/division scale. Trace good.

3. SE to NW at 1500 feet, 1215 to 1221. Recorder on 10 mv/division scale. Trace good.

4. NW to SE at 2000 feet, 1225 to 1234. Recorder on 10 mv/division scale. Trace good.

Two photo runs were made over the plume at about 1100, the first at 1500 feet and the second at 1000 feet. However, both are unusable since the film was overexposed. Two more runs were made at 1200 at 1000 feet. Both are good although the plane was somewhat to the side of the plume in the first. All pictures were taken straight down on black and white film with a 28-mm wide angle lens at 3 second intervals at an air speed of 75 mph.

The mobil van with the densitometer was manned by Bob Brown and S. Sethuraman. Numerous densitometer traverses were made and will be reported separately. The lidar was not used because of the rain.

The mobil tower at Tiana extended properly. The aerovane and an MRI bivane were mounted at 16 m and cup anemometers at 2, 6 and 11 m. The small mast was placed near the tower with cup anemometers at 1, 3 and 4 m. A mercury thermometer was used for a low-level air temperature measurement. John McNeil and Joan Glassman took pibals at 1220 and 1242 (Figures 2 and 3). They also took bearings on the Liberty and on the new Coast Guard radio tower which is at 38.7 degrees. The instrument trailer was parked near the tower and housed all recorders and counters. The hot wire and hot film anemometers were not used because of the rain. Gilbert Raynor coordinated activities from Tiana but radios worked very poorly and communications with the Selma were relayed through Liberty.

Files
Offshore Test No. 6
G. S. Raynor

June 4, 1973

The crew left BNL at 0710, arrived at Tiana at 0750 and at the boat at 0810. The Liberty left the Inlet at about 0930. Smoke was started at 0955 and the Liberty was directed to a position 1 nautical mile off shore in line with Ponquoque bridge and 2.2 statute miles (3.54 km) SE of Tiana at a bearing of 102.6° (Figure 4). The smoke plume crossed the beach about 0.3 miles (0.48 km) east of Tiana most of the time but meandered somewhat. Smoke was stopped from 1158 to 1215 to put gasoline in the generator anf finally terminated at 1307. The crew returned to BNL by 1530.

The plume was typical of stable conditions with little vertical or horizontal diffusion but some meandering. The aircraft observer estimated the top at less than 200 feet over the beach but no quantitative vertical measurements were obtained because of the rain.

A speed run was taken on the aerovane and bivane recorders from 1000 to 1310. However, the pen from the aerovane speed recorder was used on the densitometer recorder much of the time since the latter pen had been broken. The bivane was leveled before the tower was erected and both vanes were oriented. Anemometer counts were taken from 1000 to 1310, giving a total of 38 readings at 5 minute intervals for the 3 anemometers on the tower. The three on the small mast operated from 1035 to 1310 giving a total of 31 readings. Results are tabulated in Table 2 and graphed in Fig. 5.

Low-level temperatures are tabulated in Table 3 and plotted in Fig. 1. The thermocouples were calibrated in a water bath on May 31 and found to be 1°C too high in contrast to an earlier calibration in room air. This correction was applied to the values in Table 3. Since the three sensors gave nearly identical readings and the three traces were difficult to identify on the chart, only selected points were read as reported. However, good agreement was found between thermocouple and thermometer readings. The air averaged somewhat lower than the water but this may be due to wet bulb readings. Both levels were about the same.

Oil consumption is plotted in Fig. 6. It averaged 5.95×10^{-2} gal/min during most of the run with drum pressure at 12 PSI but dropped to 3.76×10^{-2} gal/min after the shutdown with pressure at 11 PSI.

Files
Offshore Test No. 6
G. S. Raynor

June 4, 1973

Although this was the first run taken during rain and air temperature measurements were not reliable, conditions were obviously stable as shown by the wind instruments and the shape of the plume. The wind profiles at the parking lot show the same acceleration at 2 m as during the instrument test of May 17. The pibal data show a rapid increase in wind speed above the tower level reaching a maximum at about 200 m although the flow was completely gradient.

GSR/lk

Table 1 Run #6 5-23-73

Corrected Aircraft Temperatures

Ht. (m)	Over water °F	Over water °C	Over land °F	Over land °C
92.0	53.7	12.1		
122.7	53.8	12.1		
153.3	54.7	12.6		
184.0	54.6	12.6	54.0	12.2
214.7	54.4	12.4	53.9	12.2
245.4	54.4	12.4	53.5	11.9
276.1	53.9	12.2	53.6	12.0
306.7	53.4	11.9	53.2	11.8
337.4	53.1	11.7	-	-
368.1	52.8	11.6	52.6	11.4
398.8	52.7	11.5	51.7	10.9
429.4	52.0	11.1	51.4	10.8
460.1	51.7	10.9	50.9	10.5
490.8	51.2	10.7	50.7	10.4
521.5	51.1	10.6	50.8	10.4
552.1	50.6	10.3	50.5	10.3
582.8	49.7	9.7	50.5	10.3
613.5	49.7	9.7	49.9	9.9
644.2	49.7	9.7	49.4	9.7
674.8	48.7	9.3	48.9	9.4
705.5	48.3	9.1	48.7	9.3
736.2	48.1	8.9	48.3	9.1
766.9	48.3	9.1	48.1	8.9
797.6	47.9	8.8	47.5	8.6
828.2	48.1	8.9	47.7	8.7
858.8	48.2	9.0	47.7	8.7
889.5	48.1	8.9	48.2	9.0
920.2	47.9	8.8	48.3	9.1

Table 2 Run #6 5-23-73

Anemometer Wind Speeds
(m/sec)

Time (EST)	Parking Lot 1 m	2 m	3 m	4 m	6 m	11 m
1000-1005		1.89			2.11	2.21
1005-1010		2.26			2.46	2.45
1010-1015		2.23			2.49	2.50
1015-1020		2.26			2.61	2.57
1020-1025		2.74			3.03	2.98
1025-1030		2.80			3.15	3.21
1030-1035		2.98			3.34	3.34
1035-1040	3.23	3.39	3.44	3.49	3.63	3.60
1040-1045	3.47	3.75	3.65	3.69	3.80	3.78
1045-1050	3.59	4.03	3.76	3.84	3.94	4.06
1050-1055	3.50	3.93	3.67	3.77	3.91	3.97
1055-1100	3.51	3.91	3.70	3.81	3.89	3.91
1100-1105	3.68	4.14	3.84	3.93	4.09	4.11
1105-1110	3.56	3.83	3.70	3.78	3.94	4.01
1110-1115	3.64	3.96	3.85	3.89	3.96	3.93
1115-1120	3.60	4.02	3.79	3.87	4.02	3.97
1120-1125	3.78	4.27	3.95	4.02	4.12	4.19
1125-1130	3.81	4.11	3.93	4.01	4.18	4.18
1130-1135	3.72	4.03	3.89	3.97	4.01	4.03
1135-1140	3.73	4.09	3.90	4.66	4.08	4.14
1140-1145	4.01	4.64	4.22	4.31	4.45	4.35
1145-1150	3.97	4.64	4.17	4.94	4.42	4.43
1150-1155	3.95	4.41	4.11	4.17	4.32	4.33
1155-1200	4.00	4.46	4.23	4.34	4.45	4.47
1200-1205	4.14	4.69	4.31	4.36	4.57	4.58
1205-1210	4.32	5.11	4.53	4.62	4.84	4.85
1210-1215	4.17	4.88	4.30	4.38	4.65	4.72
1215-1220	4.13	4.60	4.31	4.41	4.58	4.71
1220-1225	4.43	5.09	4.55	4.66	4.78	4.90
1225-1230	4.43	5.01	4.57	4.65	4.84	4.93
1230-1235	4.70	5.50	4.86	4.94	5.09	5.22
1235-1240	4.38	5.10	4.55	4.62	4.83	5.06
1240-1245	4.62	5.46	4.84	4.92	5.14	5.30
1245-1250	4.20	4.77	4.45	4.51	4.72	4.89
1250-1255	3.84	4.40	4.03	4.11	4.36	4.63
1255-1300	4.01	4.69	4.29	4.38	4.60	4.85
1300-1305	3.97	4.58	4.19	4.31	4.49	4.62
1305-1310	3.99	4.37	4.23	4.31	4.51	4.65
1035-1310	3.94	4.44	4.12	4.20	4.36	4.43
1035-1140	3.61	3.95	3.78	3.85	3.95	3.99
1145-1225	4.14	4.73	4.31	4.40	4.58	4.62

Table 3

Temperature Measurements Run #6 5-23-73

Selma Position	Air °C Thermocouple	Air °C Mercury	Water °C Thermocouple	Water °C Mercury
Inlet 0935	13.0		11.2	
S. of Inlet	12.9 to 13.2		12.8	
Buoy at 1.5 mile	12.7		12.7	
1 mile 1037	12.5	12.7	12.5	13.4
1 mile 1145	12.3	12.2	12.3	12.3
1 mile 1225	12.0	12.3	12.7	12.0
1/4 mile 1310	12.2	12.0	12.4	12.7
Beach 1/2 meter		13.0		

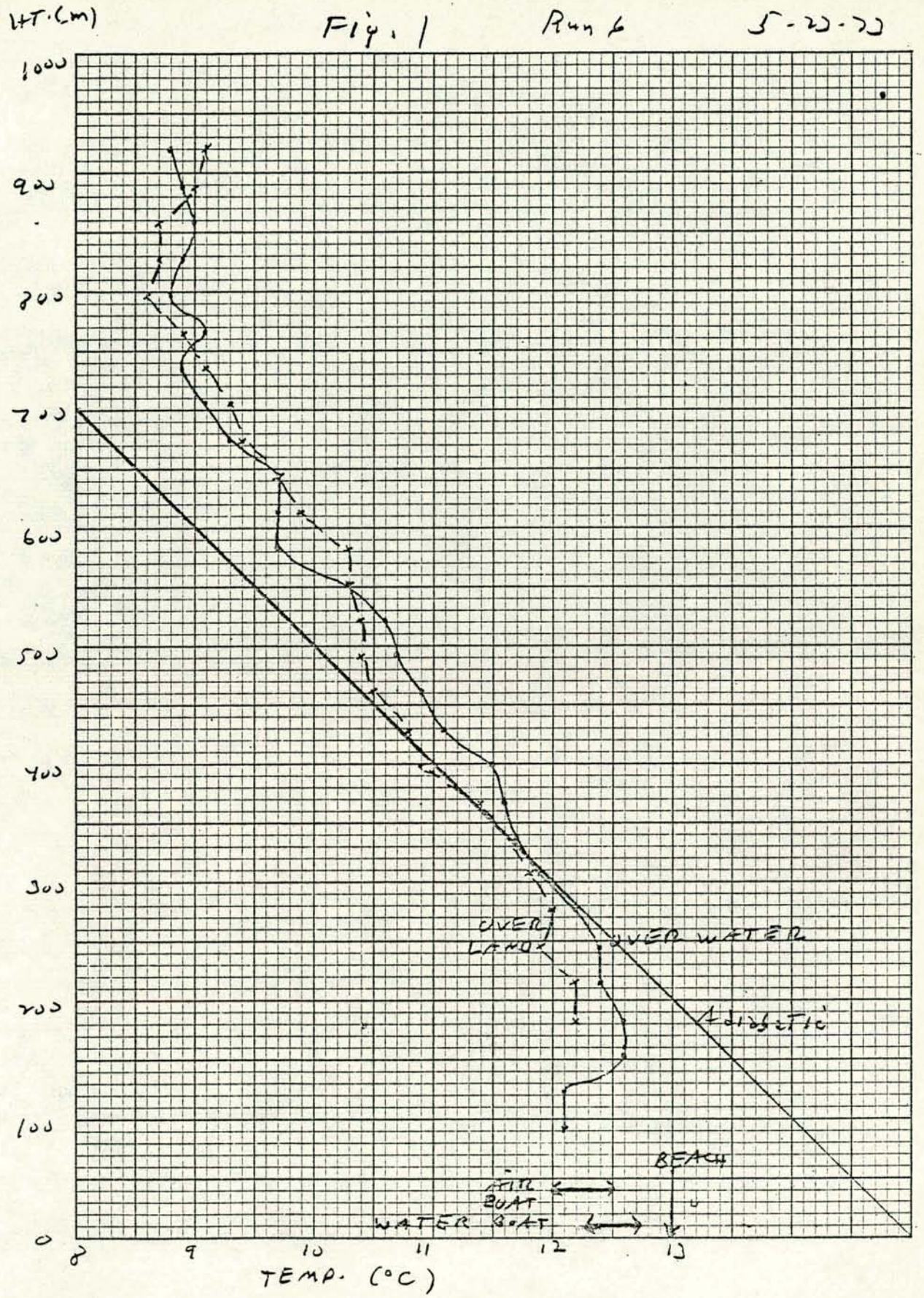

HT. (m)
Fig. 1
Run 6
5-23-73
1000
900
800
700
600
500
400
300
200
100
0
8
9
10
11
12
13
TEMP. (°C)
OVER LAND
OVER WATER
Adiabatic
BEACH
FIRE BOAT
WATER BOAT

Fig. 2 Run 6 5-23-73

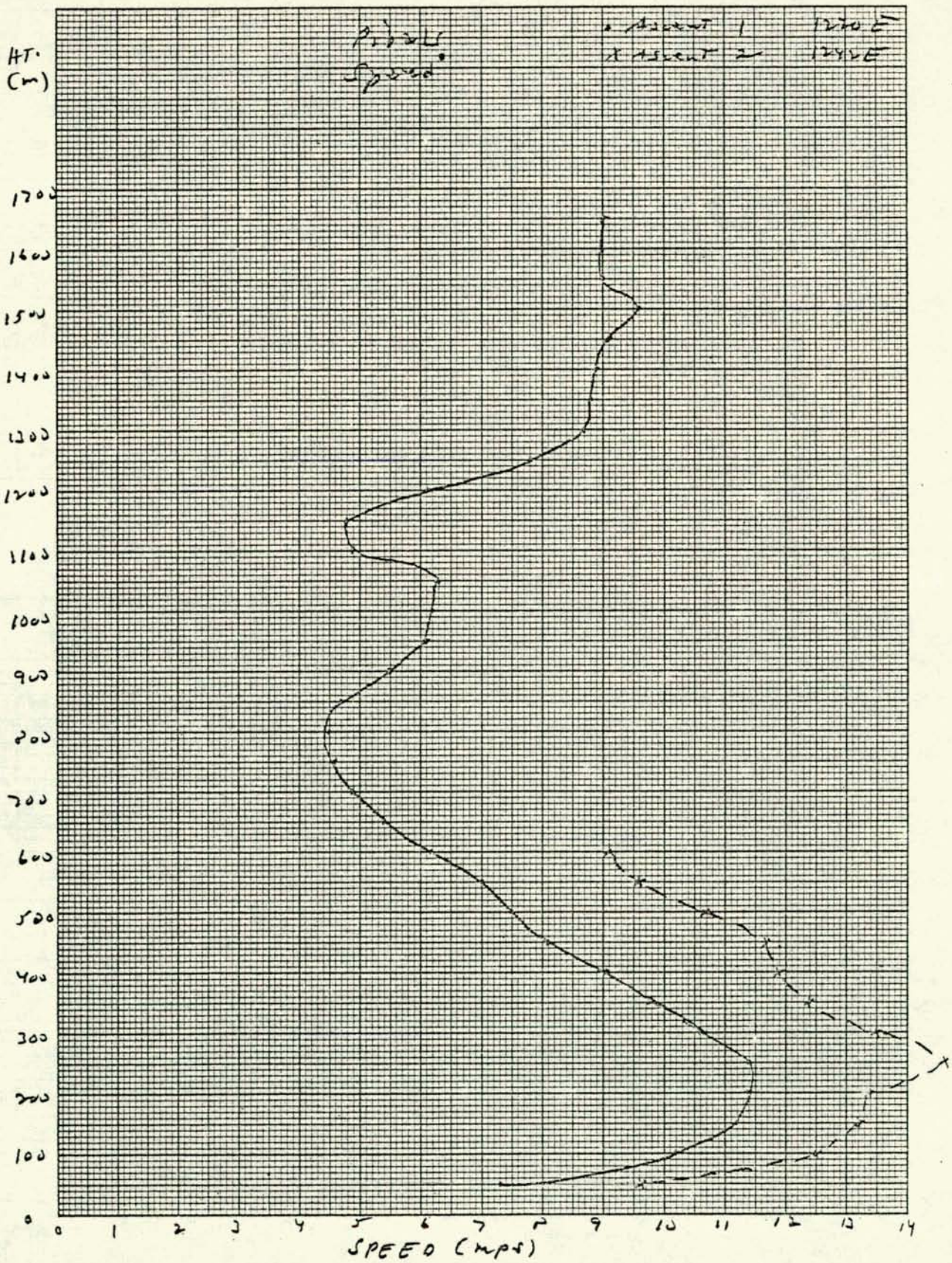
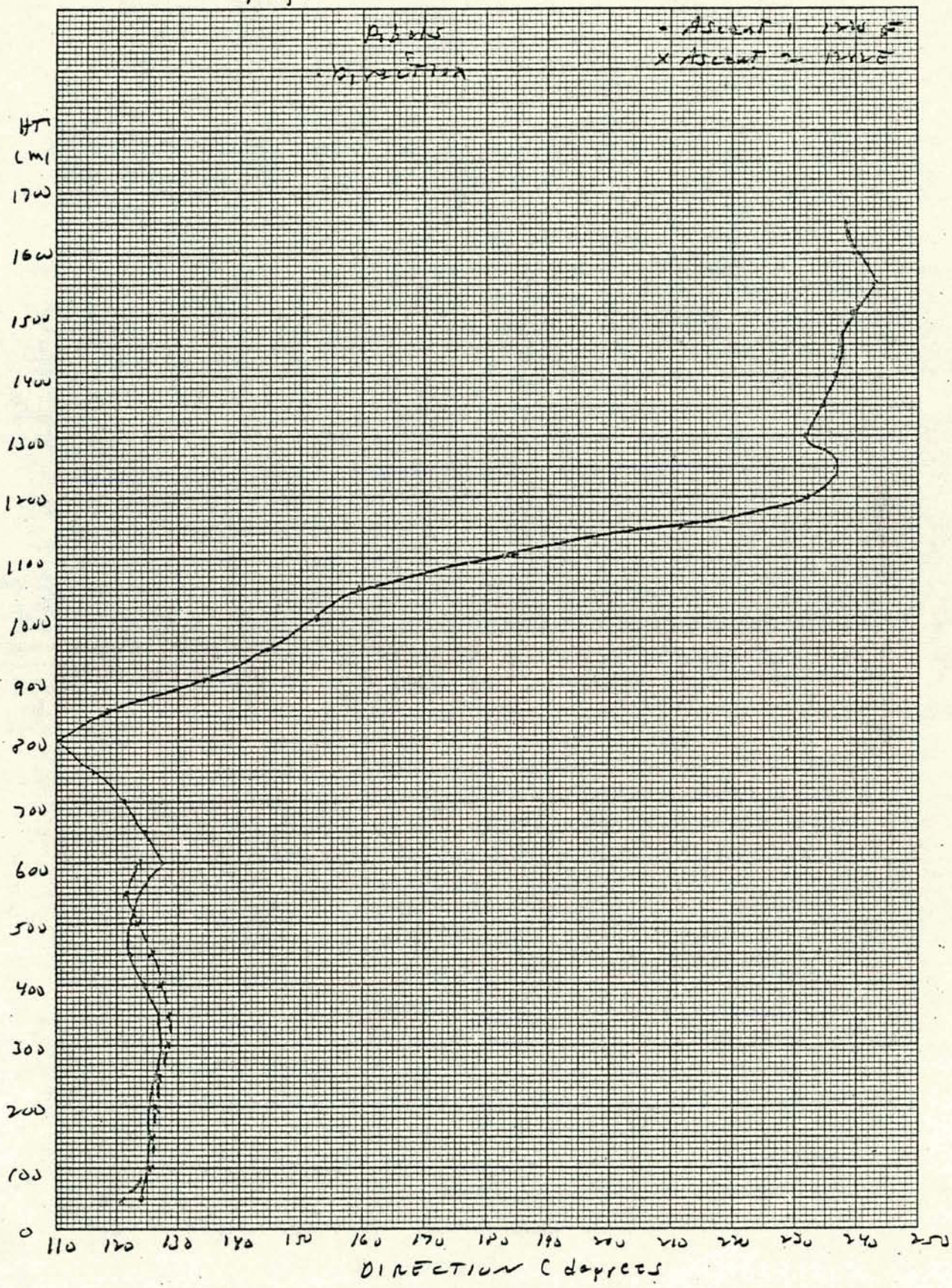


Fig. 3 Run 6 5-20-70



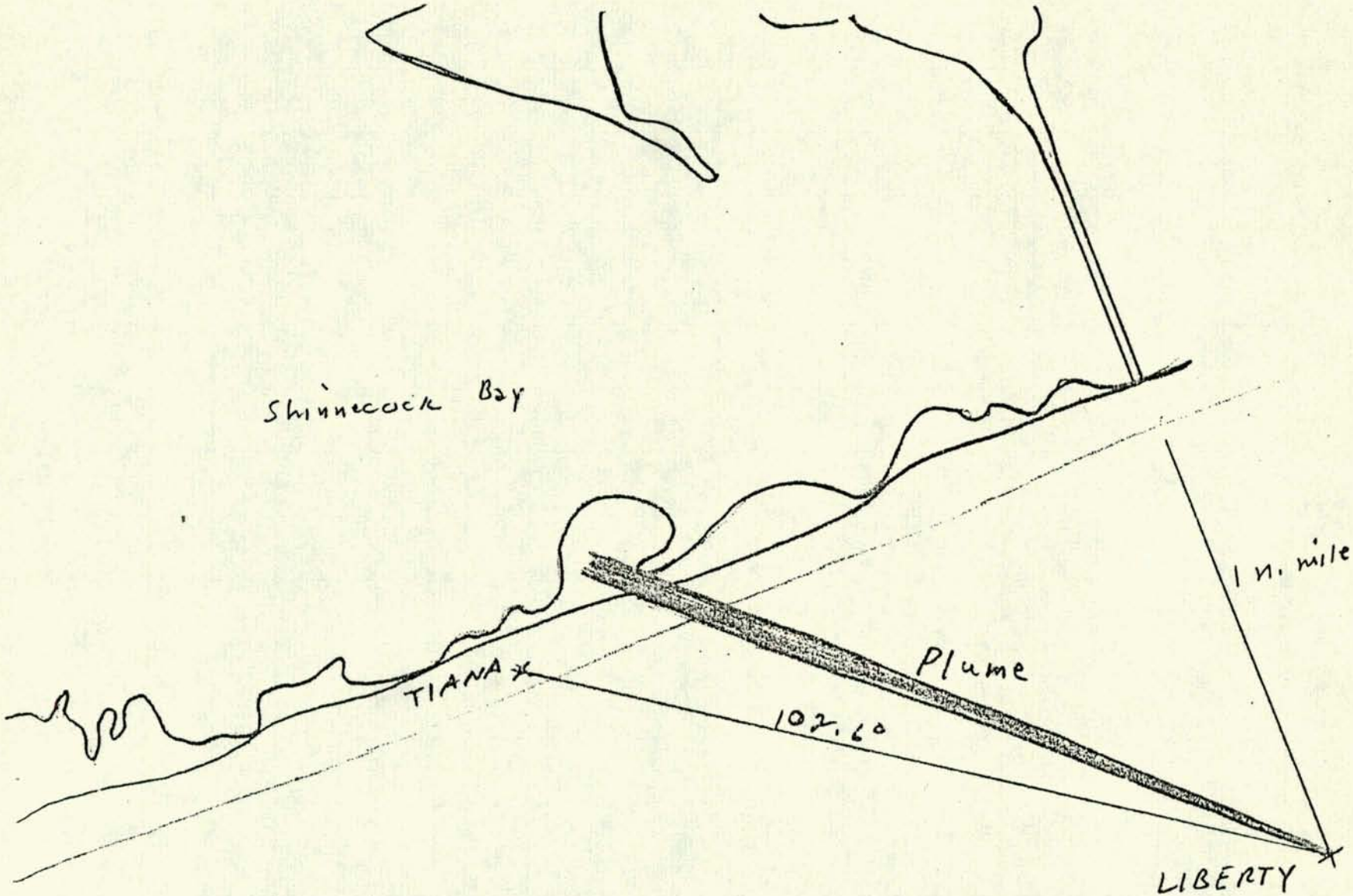


Figure 4 Run 6 5-23-73

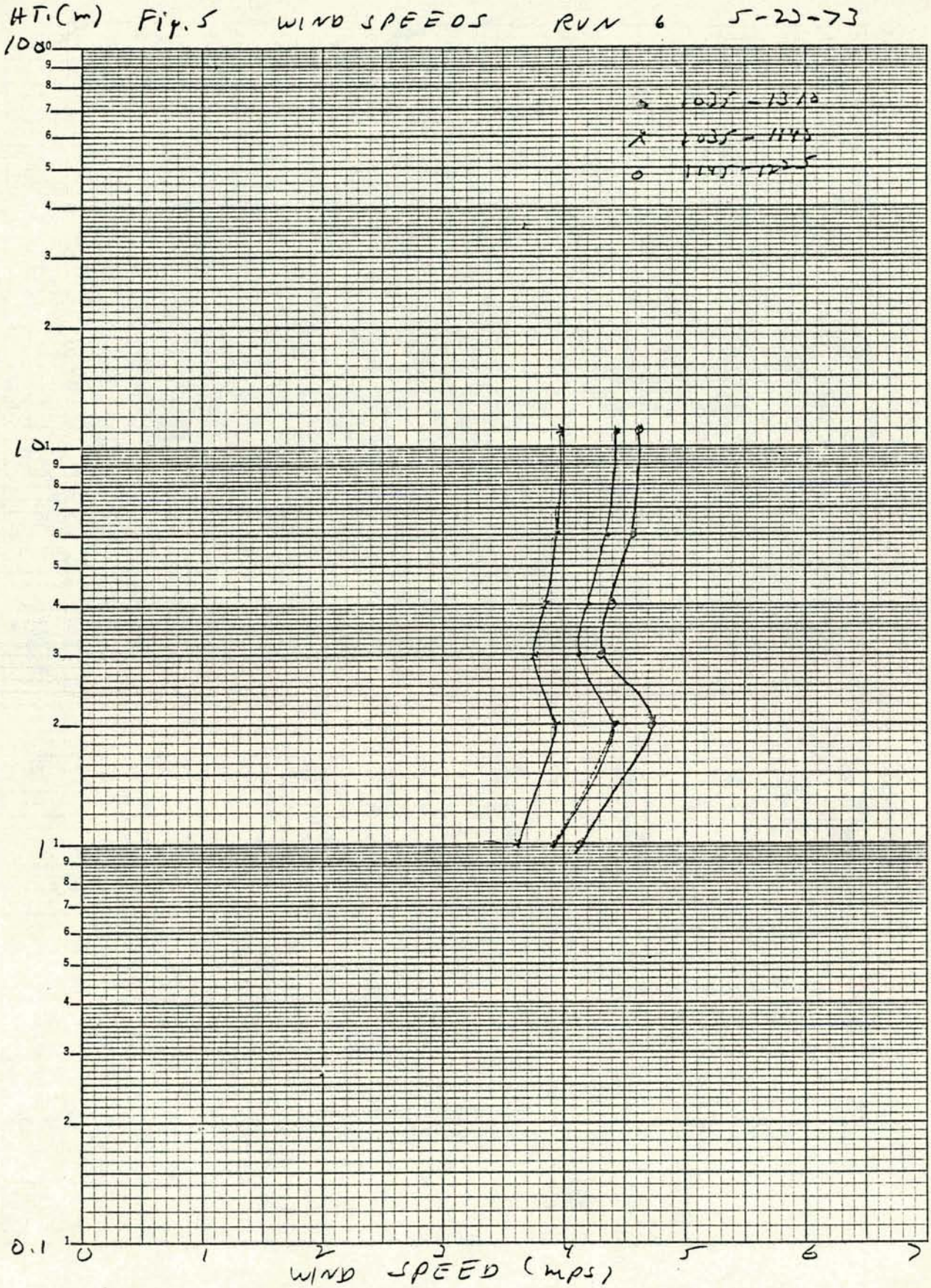
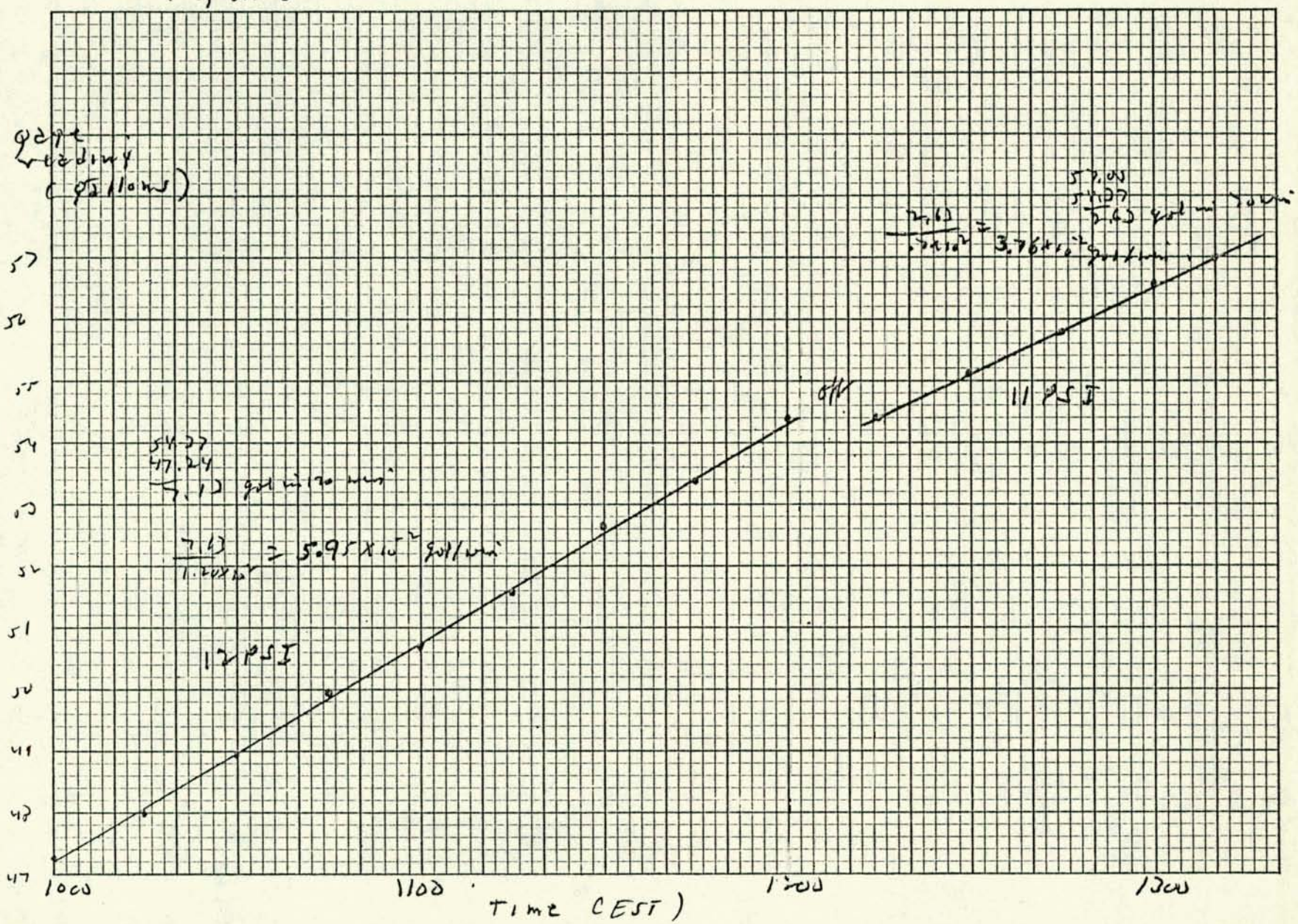

HT.(m) Fig. 5 WIND SPEEDS RUN 6 5-23-73
1000
100
10
1
0.1
0
1
2
3
4
5
6
7
WIND SPEED (mps)

Figure 6 Oil Consumption Run 6 5-28-73



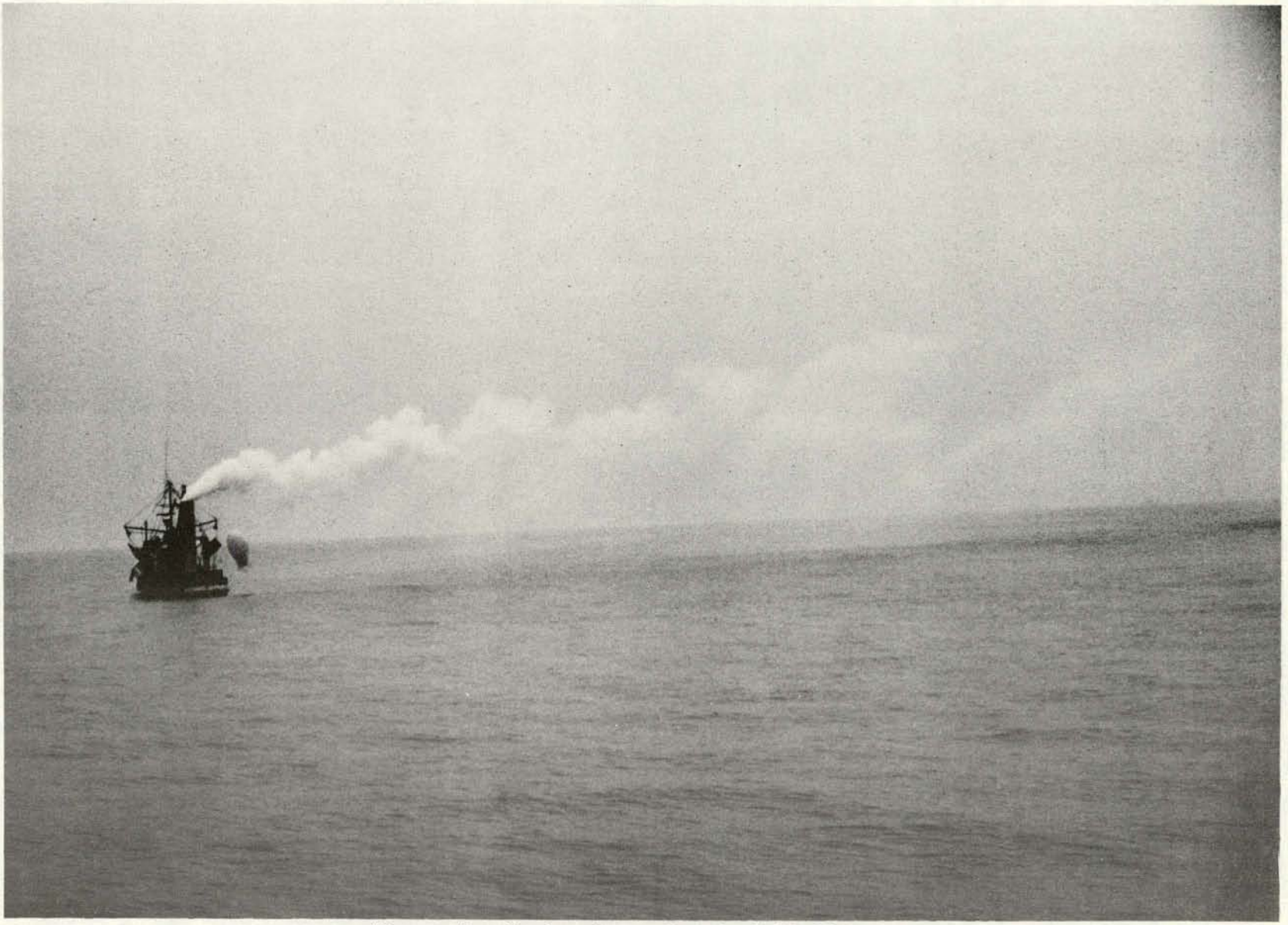


Figure 1. Smoke plume, Run 6, 5-23-73.

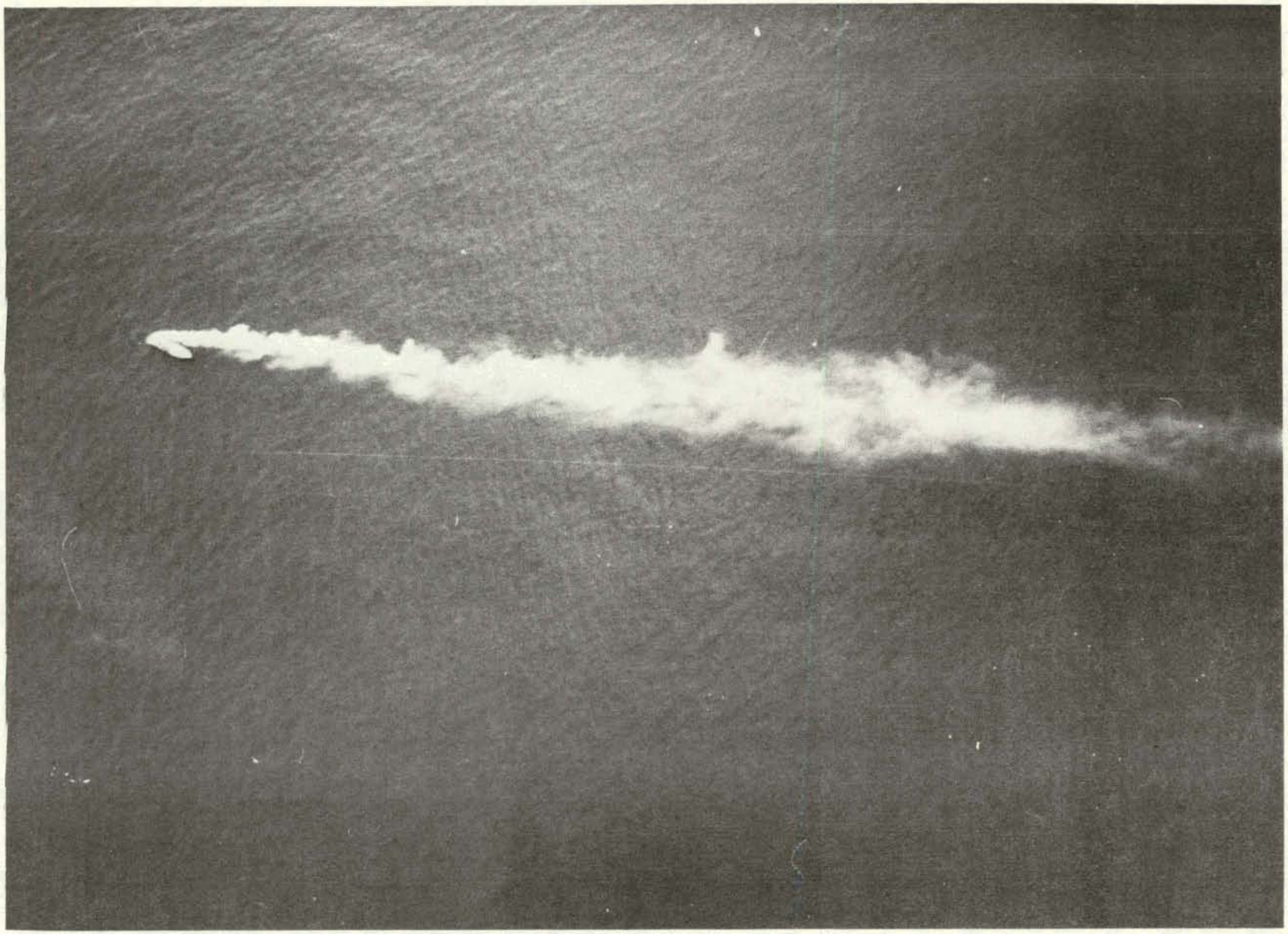
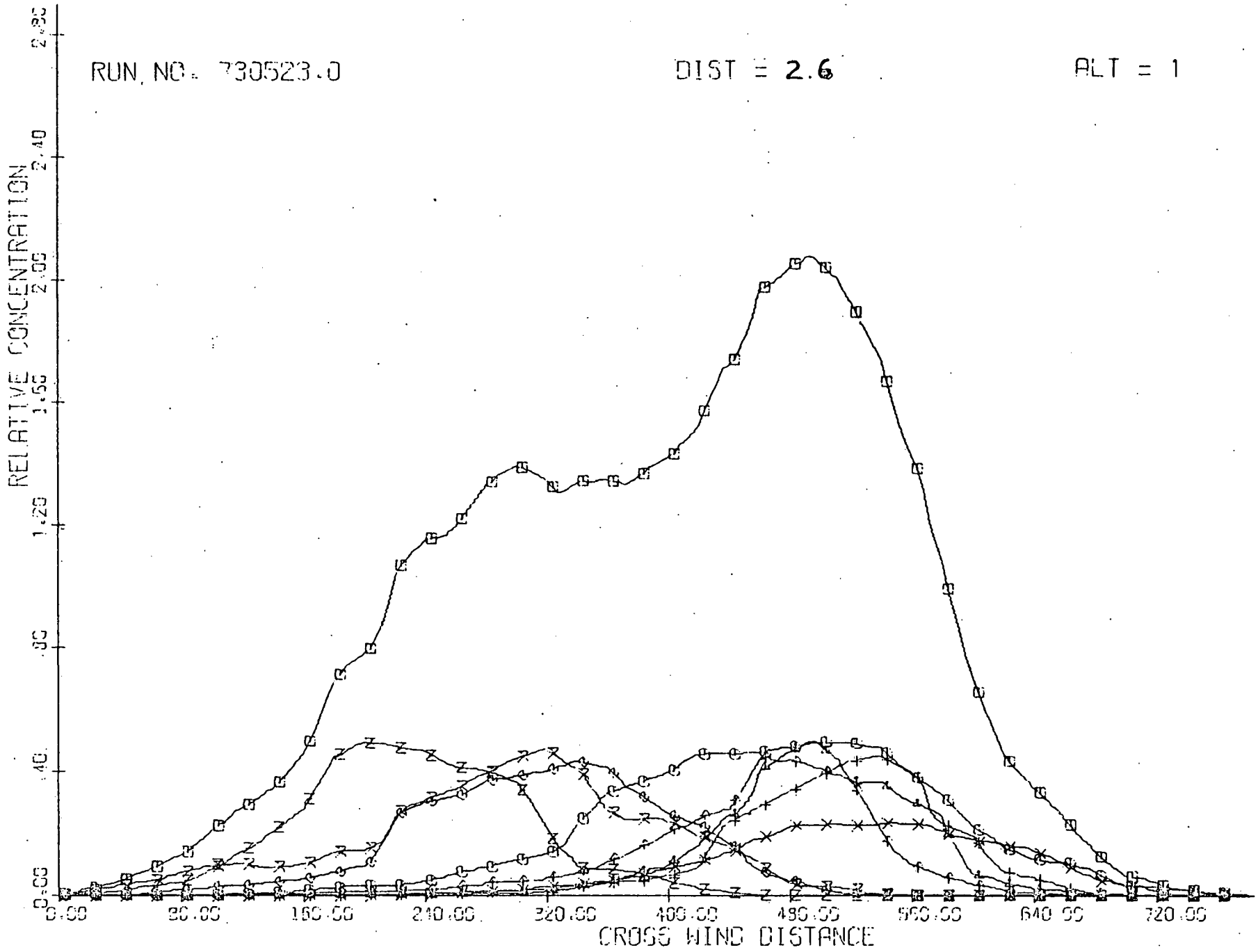


Figure 2. Aerial view of smoke plume,
Run 6, 5-23-73.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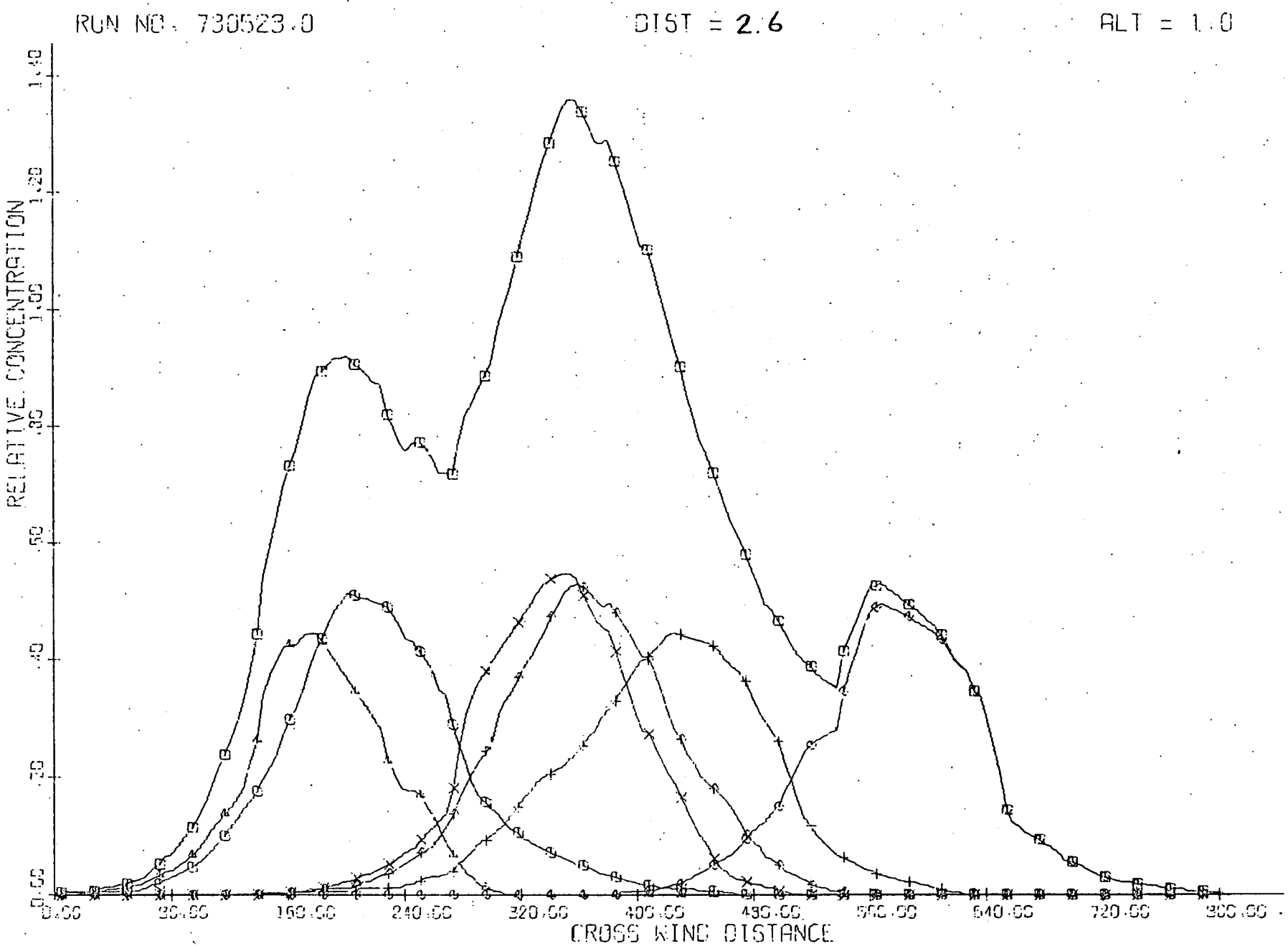
.80
1.20
1.60
2.00
2.40
2.80
0.00
80.00
160.00
240.00
320.00
400.00
480.00
560.00
640.00
720.00
CROSS WIND DISTANCE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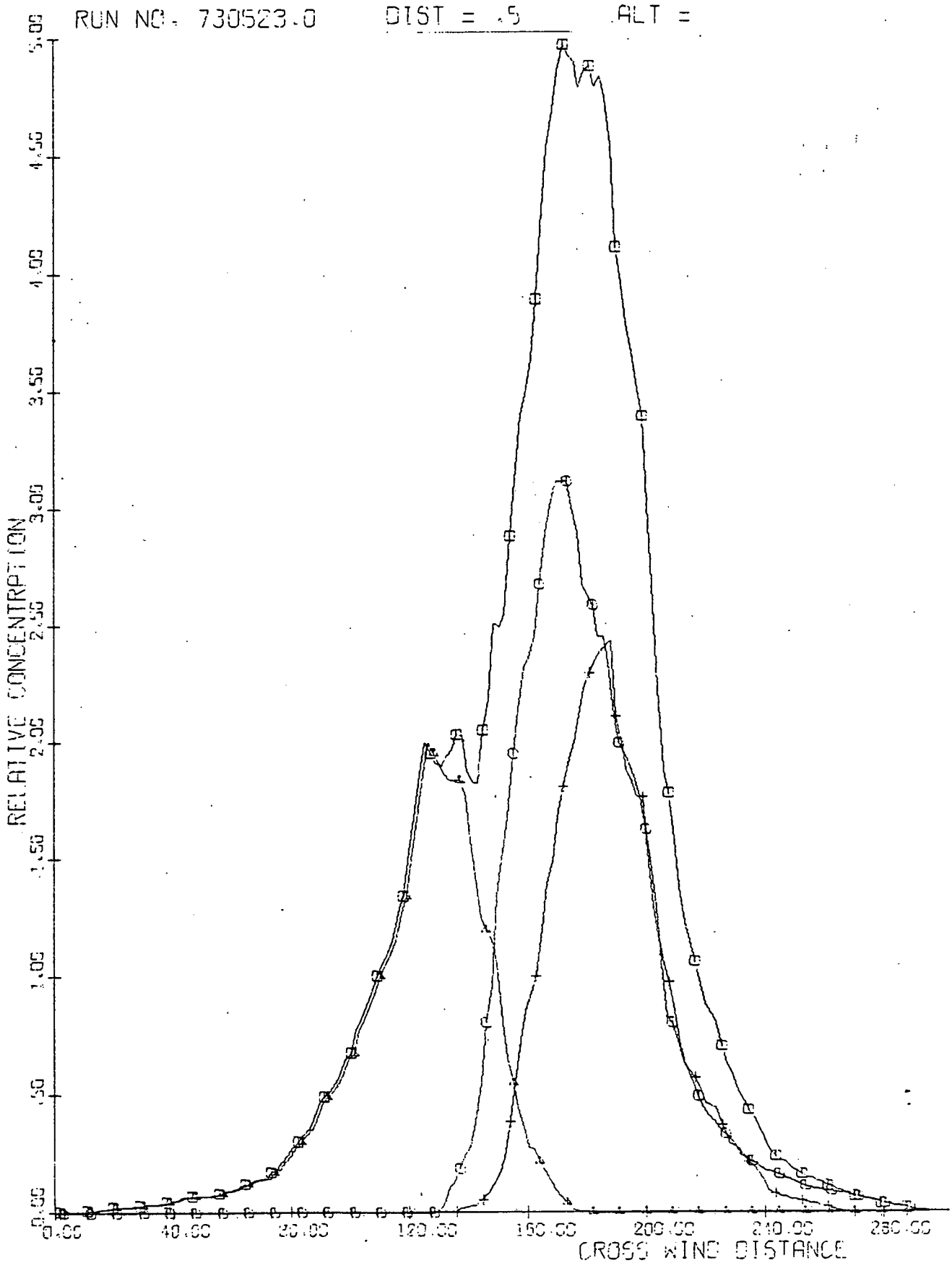
RELATIVE CONCENTRATION
CROSS WIND DISTANCE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ALT =
RELATIVE CONCENTRATION
CROSS WIND DISTANCE
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80.00
120.00
160.00
200.00
240.00
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1.00
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2.00
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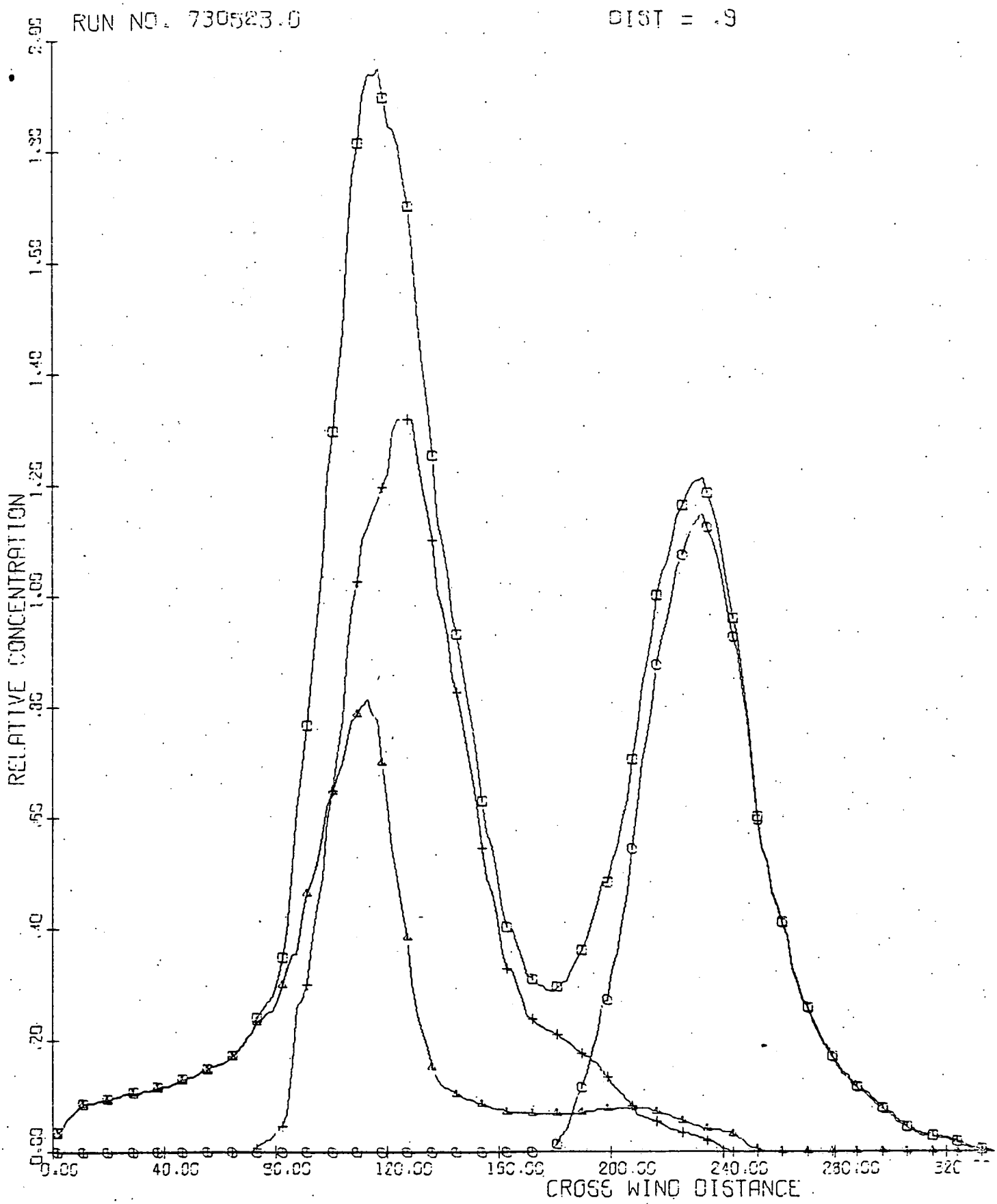
3.00
3.50
4.00
4.50
5.00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RELATIVE CONCENTRATION
CROSS WIND DISTANCE
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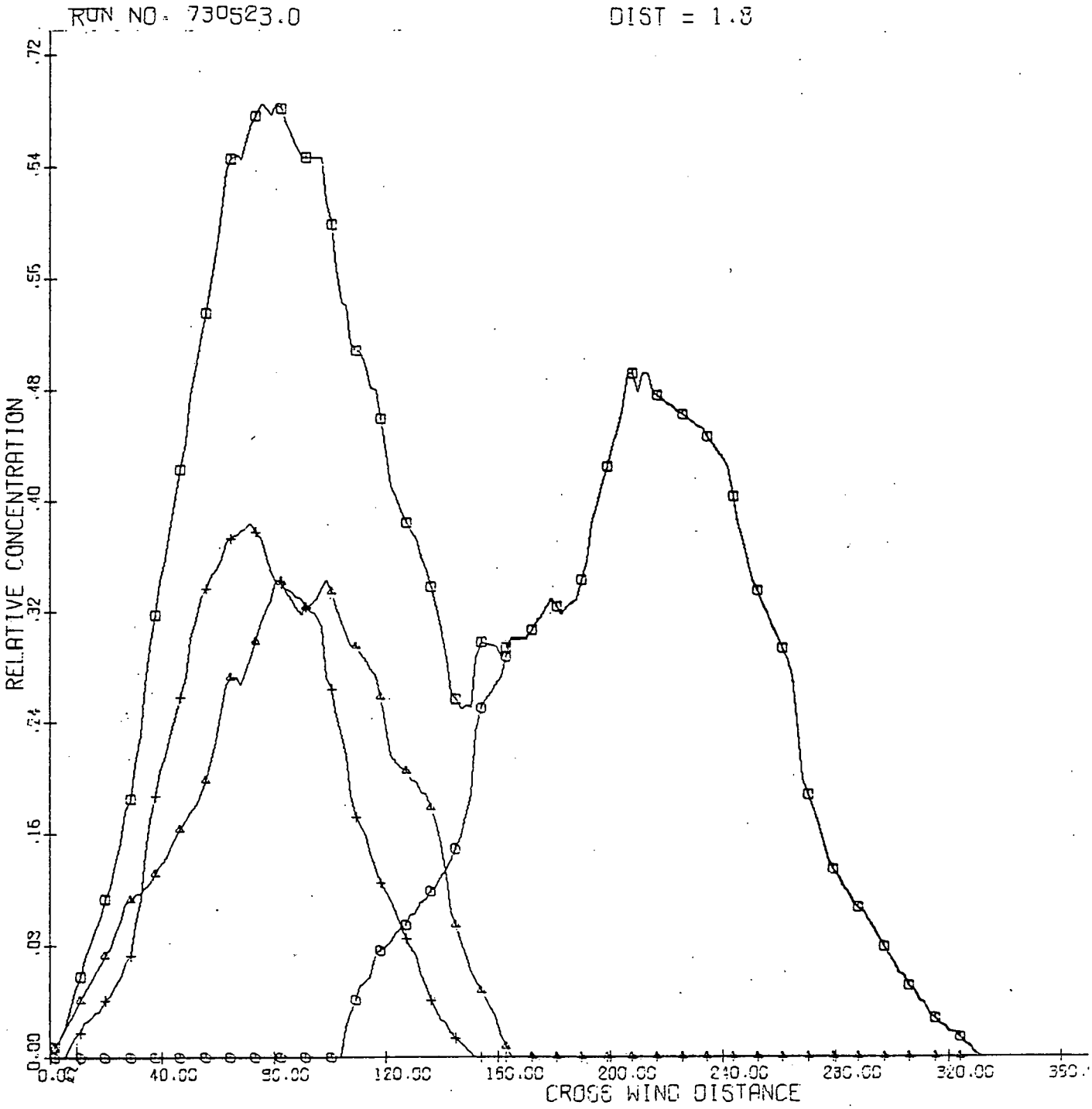
80.00
120.00
160.00
200.00
240.00
280.00
320


RUN NO. 730523.0
DIST = 1.8
RELATIVE CONCENTRATION
.72
.54
.55
.48
.40
.32
.24
.16
.08
0.00
0.00
40.00
80.00
120.00
160.00
200.00
240.00
280.00
320.00
360.
CROSS WIND DISTANCE

OH SHORE DENSITOMETER RUN
TRAVERSES AT ONE DISTANCE

RUN =730523./ DATE =****** /DISTANCE FROM STACK (KM)= 2.60
DIRECTION(DEG) = 110./TIME FROM 1047 TO 1137 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIGMA*BKGND)
1.0	.133E+03	469.6	102.3			24.55
2.0	.696E+02	496.7	62.0			24.00
3.0	.695E+02	510.0	70.0			21.23
4.0	.573E+02	524.0	94.5			12.97
5.0	.874E+02	318.3	80.5			23.23
6.0	.679E+02	454.5	78.4			21.28
7.0	.947E+02	295.1	97.4			23.59
8.0	.883E+02	230.9	71.2			35.77
GRAND TOTAL	.668E+03	403.6	85.2	135.2	105.0	

Corrected for plume angle 54.8 86.9 67.5

OH SHORE DENSITOMETER RUN
TRAVERSES AT ONE DISTANCE

RUN =730523./ DATE = 52373 /DISTANCE FROM STACK (KM)= 2.60
DIRECTION(DEG) = 110./TIME FROM 1242 TO 1318 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIGMA*BKGND)
1.0	.723E+02	222.2	62.7			33.23
2.0	.496E+02	180.7	46.3			30.93
3.0	.730E+02	419.2	69.1			30.50
4.0	.720E+02	344.5	53.0			39.21
5.0	.680E+02	531.5	59.2			33.13
6.0	.756E+02	365.6	59.7			36.58
GRAND TOTAL	.411E+03	359.5	59.4	139.8	126.6	

Corrected for plume angle 38.2 89.9 81.4

ON SHORE DENSITOMETER RUN FROM BOAT
TRAVERSES AT ONE DISTANCE

RUN =730523./ DATE = 52373 /DISTANCE FROM STACK (KM)= .46
DIRECTION(DEG) = 110./TIME FROM 1037 TO 1056 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGRND)
1.0	.154E+03	179.9	23.9			164.94
2.0	.906E+02	121.5	24.3			95.40
3.0	.104E+03	188.1	19.4			137.50
GRAND TOTAL	.349E+03	157.2	22.8	35.5	27.3	

ON SHORE DENSITOMETER RUN FROM BOAT
TRAVERSES AT ONE DISTANCE

RUN =730523./ DATE = 52373 /DISTANCE FROM STACK (KM)= .93
DIRECTION(DEG) = 110./TIME FROM 1145 TO 1153 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGRND)
1.0	.599E+02	235.9	23.9			64.23
2.0	.477E+02	107.4	45.6			26.75
3.0	.747E+02	133.1	27.6			69.41
GRAND TOTAL	.182E+03	160.2	32.3	62.9	54.0	

ON SHORE DENSITOMETER RUN FROM BOAT
TRAVERSES AT ONE DISTANCE

RUN =730523./ DATE = 52373 /DISTANCE FROM STACK (KM)= 1.84
DIRECTION(DEG) = 110./TIME FROM 1225 TO 1244 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGRND)
1.0	.528E+02	211.9	43.1			31.37
2.0	.300E+02	87.0	33.5			22.99
3.0	.273E+02	75.6	26.7			25.09
GRAND TOTAL	.110E+03	144.1	37.1	75.1	65.3	

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Run No. 7
June 1, 1973

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: June 27, 1973

TO: Files

FROM: G. S. Raynor

SUBJECT: OFFSHORE TEST NO. 7

The seventh overwater dispersion test was held on June 1, 1973. Scattered cirrus clouds and heavy haze were present plus a few scattered cumulus clouds to the north. Gradient winds were from the WSW. A small high was centered over Virginia with a cold front along the Saint Lawrence River and through the Great Lakes. Waves were 1 to 2 feet and the swell from 4 to 5 feet, both from the southwest. High tides occurred at 0544 and 1801 and low tide at 1051. Thus, the tide was rising during all except the early part of the test. Eastern standard time is used in this report.

The crew left BNL at 0645 and arrived at Tiana at 0715 and at the docks at 0745. The Liberty left the Inlet at 0845. However, the Selma had a weak battery and would not start. A different battery was installed and the Selma left the Inlet about 1000. Instruments were set up at Tiana at 0920.

The Liberty was manned by Sy Fink and Robert Sick who operated the smoke generator. The analogue anemometer recorder did not work. A loose card was later found. The anemometer height was measured at 22 feet (6.7 m) above the water. The kytoon temperature system was also taken.

The Selma was manned by Walter Jahnig. The densitometer could not be used because of fluctuating voltage from the boat's batteries. No temperatures were taken since both mercury thermometers were broken when the boat rocked badly in the Inlet. The thermocouples also failed to work due to the effect of the voltage on the recorder. They were measured at 22,25 and 7.75 feet (6.8 and 2.36 m)above the water. However, some pictures were taken. A gasoline-powered generator has been obtained to provide power on the Selma in future tests.

Before the smoke test, the Liberty was anchored 1 nautical mile from the sea buoy and the Selma made an E-W and a W-E run at 700 revolutions per minute to determine the speed maintained during

densitometer passes. Time on the second pass was 16 minutes. Time on the first pass was longer due to heading into the wind and waves but was not recorded due to communications trouble with the radios. The second pass gives a rate of 4.41 miles/hour or 1.97 m/sec or 3.75 knots. However, it has been decided to use a marker on each side of the plume in future runs and determine their positions by triangulation from the shore.

The mobil tower at Tiana extended fully. The aerovane and MRI bivane were mounted at 16 m and cup anemometers mounted at 2, 6 and 11 m. The small mast was placed about 11.2 m from the water at a height of about 1 m with anemometers at 2, 4 and 6 m. The hot wire anemometer was mounted at 6 m on the trailer tower and the hot film anemometer at 3 m. The trailer tower was oriented about 15° west of north so a correction should be applied to the direction charts to obtain true direction. The bivane was leveled before extending the tower.

The bivane and aerovane charts were run on speed from 0930 to 1015 and from 1140 to 1340. The anemometer counters were started at 0930 and stopped at 1330 giving 52 counts at 5 minute intervals. No temperatures were taken on the beach.

Pibals were taken by John McNeil with the automatic theodolite at 0952 and 1255. Data were recorded at 15 second intervals. Gilbert Raynor coordinated activities from Tiana but radios again failed to work and communication with the boats was impossible most of the test.

The mobil van with the densitometer and lidar was manned by Bob Brown and S. SethuRaman. Densitometer traverses were made but will be reported separately. Lidar measurements were also taken from Triton Lane, 1 mile west of Tiana.

The aircraft was manned by Ansel Tuthill. Temperature ascents were made from 300 to 3000 feet over the water and from 500 to 3000 feet inland (Table 1 and Fig. 1). The temperature indicator was set with a thermometer. Twelve variometer runs were made, all at 70 mph with the chart on 100 mv/division. All gave good traces.

Offshore Run No. 7 June 27, 1973

1. West to east offshore from west of Moriches Inlet to east of Shinnecock Inlet, 1100-1112 at 1000 feet, (0.305 km).

2. East to west inland from Shinnecock Indian Reservation along the north shore of the south fork to Riverhead and westerly along the L.I. Expressway, 1115-1130, start at 1000 feet and end at 2200 feet, (0.305 to 0.67 km).

North -south runs were made from offshore near Tiana to a point on Peconic Bay east of Red Cedar Point as follows:

Run No.	Heading	Height Ft.	Height km	Time	Length of Record (min).
3	N	3100	0.95	1205	5.5
4	S	2800	0.85	1215	5.0
5	N	2600	0.79	1221	5.5
6	S	2300	0.70	1228	5.0
7	N	2000	0.61	1234	5.0
8	S	1650	0.50	1241	5.5
9	N	1300	0.40	1248	5.0
10	S	1000	0.31	1255	6.5
11	N	800	0.24	1303	4.5
12	S	600	0.18	1310	6.5

Photography runs over the plume were made at 1330 and 1342, the first at 1000 feet and the second at 3900. Speed was 70 mph. During the first run, pictures were taken at 3 second intervals on black and white film with a 28-mm wide angle lens. During the second run, only two pictures were taken at unknown intervals. The smoke plume was lined up with the glare of the sun on the water so definition may be poor. A few pictures of the whole plume were also taken from the side. Prints were made with an enlargement factor of 7.5X.

Test smoke was started at 1111. The Liberty was positioned as shown in Fig. 2 at 1155. Smoke was terminated at 1350. The plume was again typical of stable conditions and the kytoon and aircraft temperature measurements indicate a low-level inversion over the water. Kytoon temperatures are listed in Table 2 and plotted in Fig. 1. No other low-level temperatures were obtained.

Offshore Run No. 7 June 27, 1973

Wind speeds were higher than in any previous test (Table 3 and Fig. 3). The cause of the profile on the beach during period 2 is not known although it might result from the direction which was along the beach during this period. A calibration of both anemometers and counters after the test showed no mechanical or electrical problems. Wind direction varied by about 20 degrees during the run.

Data from the pibal ascents are plotted in Fig. 4. For the first time readings were taken at 15 second intervals but apparent small inaccuracies in the azimuth and elevation angles caused large and unrealistic fluctuations in the computed speeds and directions. Experiments are being conducted with the program to overcome this problem and greater care will be taken to keep the crosshairs of the theodolite on the balloon.

The aircraft variometer measurements showed the turbulence pattern aloft diagrammed in Fig. 5.

The smoke plume crossed the beach just west of Ponquoque early in the run and at Tiana late in the test. However, during the period of densitometer traverses it occupied a position about midway between these extremes (Fig. 2).

A set of 17 pictures at 30 second intervals were taken from the Selma from about 1329 to 1340 using a 50-mm lens and Kodachrome film. The boat position is given by the small arrow in Fig. 2. Drift was to the NE but average distance from the plume was about 0.65 statute miles or 1.05 km. Aircraft photos were nearly simultaneous.

Oil consumption was quite steady and somewhat greater than during the previous run. It averaged 6.78×10^{-2} gallons/min. (Fig. 6) with the drum pressure at 12 PSI. Oil loss was about one gallon.

The run was terminated at 1350. Equipment was returned to the Coast Guard Station and the boats unloaded by 1510. Personnel arrived at BNL about 1600.

In summary, gradient winds were nearly parallel to the shore and somewhat stronger than in previous runs. Temperature measurements indicate a strong inversion in the lowest 100 m over the water with an adiabatic lapse rate above 200 m. The plume was again typical of stable conditions.

Table 1

Ht. (m)	Aircraft Temperatures Over Water 1155-1200 °F	°C	Run 7 6-1-73 Over Land 1145-1150 °F	°C
91.4	67.4	19.7		
121.9	68.8	20.4		
152.4	68.8	20.4	69.8	21.0
182.9	68.7	20.4	68.9	20.5
213.4	68.7	20.4	68.2	20.1
243.8	68.0	20.0	68.4	20.2
274.3	67.7	19.8	67.8	19.9
304.8	67.2	19.6	67.4	19.7
335.3	66.9	19.4	66.8	19.3
365.8	66.4	19.1	66.0	18.9
396.2	66.0	18.9	65.4	18.6
426.7	65.5	18.6	64.8	18.2
457.2	64.6	18.1	64.7	18.2
487.7	64.7	18.2	64.8	18.2
518.2	64.2	17.9	64.3	18.0
548.6	63.8	17.7	63.8	17.7
579.1	63.2	17.3	63.2	17.3
609.6	62.9	17.2	62.8	17.1
640.1	62.4	16.9	62.0	16.7
670.6	62.0	16.7	61.5	16.4
701.0	61.4	16.3	60.8	16.0
731.5	60.8	16.0	60.4	15.8
762.0	60.4	15.8	59.9	15.5
792.5	59.6	15.3	59.8	15.4
823.0	59.3	15.2	59.1	15.1
853.4	58.8	14.9	58.7	14.8
883.9	58.5	14.7	58.1	14.5
914.4	58.0	14.4	57.8	14.3

Table 2

Kytoon Temperatures Run 7 6-1-73

Length Cable (m)	Time	Temp °F	Temp °C	
0	1205	65.0	18.3	(over deck)
10	1207	61.0	16.1	
20	1208	61.0	16.1	
30	1208	61.0	16.1	
40	1209	61.5	16.4	
50	1210	61.5	16.4	
60	1211	61.8	16.6	
70	1217	60.0	15.6	
80	1219	59.9	15.5	
90	1220	60.0	15.6	
100	1222	59.9	15.5	
110	1235	59.9	15.5	

Table 3

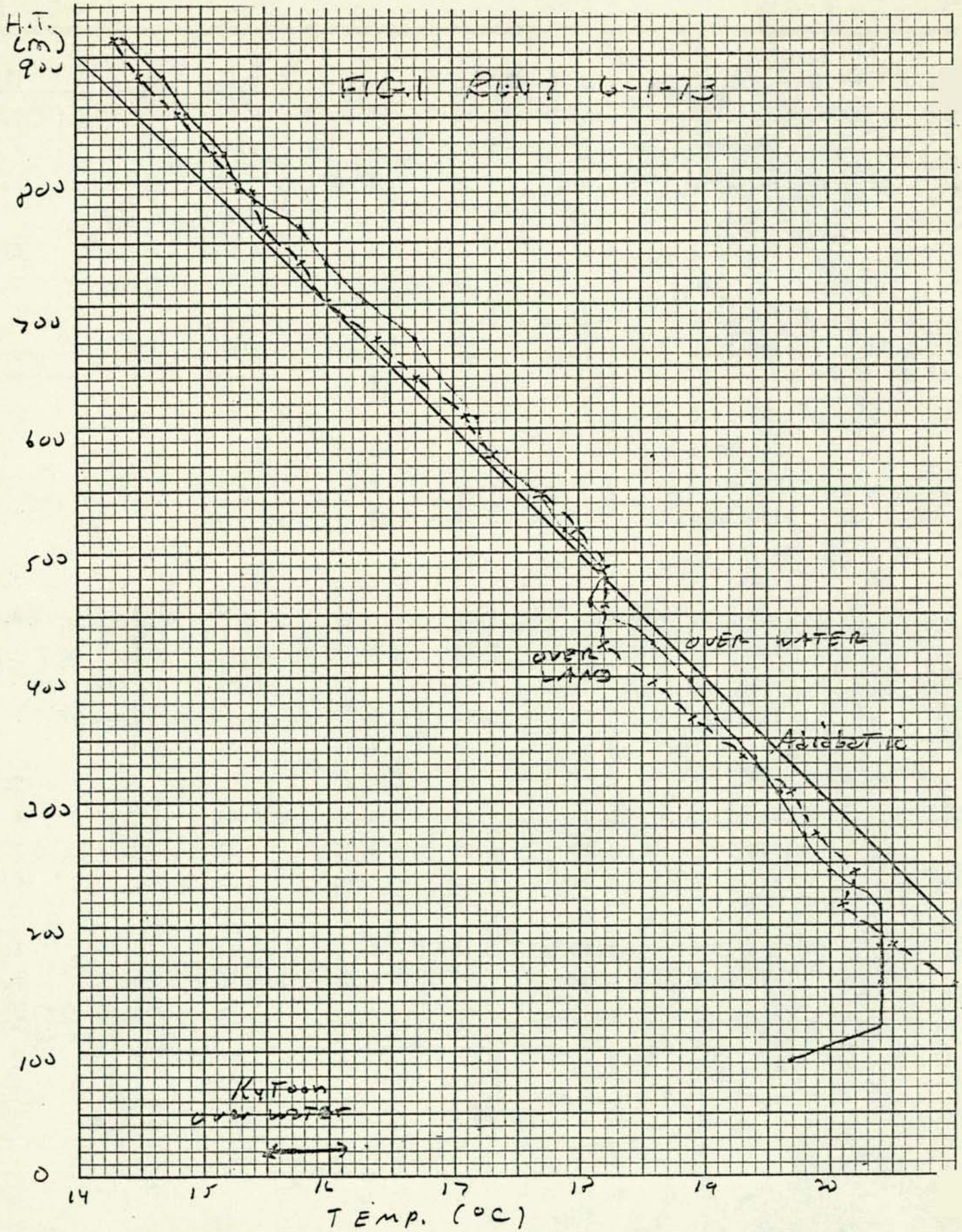
Cup Anemometer Wind Speeds Run # 7 6-1-73

(m/sec)

Time (EST)	Beach 2 m	Beach 4 m	Beach 6 m	Parking Lot 2 m	Parking Lot 6 m	Parking Lot 11 m
0930-0935	5.46	5.87	6.07	4.63	6.52	6.94
0935-0940	5.54	5.97	6.20	4.87	6.58	7.15
0940-0945	5.44	5.92	6.23	4.53	6.55	7.83
0945-0950	5.20	5.73	5.98	4.60	6.33	6.86
0950-0955	5.04	5.52	5.81	4.75	6.10	6.62
0955-1000	4.80	5.24	5.51	4.10	5.76	6.18
1000-1005	4.66	4.99	5.32	4.18	5.52	6.09
1005-1010	4.92	5.31	5.57	4.50	5.97	6.44
1010-1015	4.52	4.87	5.22	4.34	5.68	6.17
1015-1020	5.30	5.53	6.00	4.98	6.43	6.95
1020-1025	5.55	5.80	6.32	5.11	6.73	7.18
1025-1030	4.93	5.16	5.60	4.77	6.05	6.38
1030-1035	4.45	4.77	4.99	4.32	5.33	5.73
1035-1040	6.89	7.83	6.44	5.81	7.01	6.38
1040-1045	7.44	8.44	6.87	6.09	7.47	7.84
1045-1050	7.76	9.41	6.90	5.99	7.45	7.89
1050-1055	6.65	6.86	6.85	5.68	7.24	7.80
1055-1100	6.13	6.88	6.22	5.37	6.75	7.14
1100-1105	5.78	6.39	6.03	5.10	6.51	7.03
1105-1110	5.62	6.04	6.07	5.12	6.52	6.97
1110-1115	6.58	7.86	6.37	5.45	6.88	7.41
1115-1120	6.12	6.93	6.43	5.31	6.78	7.31
1120-1125	5.84	6.44	6.24	5.23	6.69	7.85
1125-1130	5.82	6.51	6.11	5.00	6.54	6.96
1130-1135	6.09	6.88	6.53	5.56	6.97	7.51
1135-1140	5.69	6.21	6.24	5.62	6.79	7.21
1140-1145	5.73	6.11	6.11	4.88	6.63	7.05
1145-1150	7.16	8.06	7.32	5.90	8.01	8.39

Table 3 continued:

Time (EST)	Beach 2 m	Beach 4 m	Beach 6 m	Parking Lot 2 m	Parking Lot 6 m	Parking Lot 11 m
1150-1155	6.79	7.76	7.00	5.86	7.53	7.90
1155-1200	6.47	7.44	6.72	5.57	7.23	7.67
1200-1205	5.87	6.45	6.29	5.29	6.81	7.21
1205-1210	6.15	7.06	6.41	4.94	6.69	7.21
1210-1215	6.07	6.96	6.16	4.59	6.31	6.86
1215-1220	5.80	6.48	6.24	4.79	6.62	7.05
1220-1225	5.69	6.18	6.24	5.14	6.59	7.00
1225-1230	5.82	6.29	6.43	5.46	6.98	7.39
1230-1235	6.17	6.64	6.65	5.69	7.07	7.52
1235-1240	6.32	6.84	6.70	5.82	7.30	7.70
1240-1245	6.19	6.71	6.68	5.71	7.29	7.74
1245-1250	6.94	7.75	7.17	6.12	7.70	8.10
1250-1255	7.32	8.87	7.19	5.99	7.76	8.23
1255-1300	6.58	7.42	6.91	5.51	7.32	7.91
1300-1305	6.61	7.25	7.00	5.54	7.33	7.91
1305-1310	6.51	7.30	6.90	5.98	7.57	8.00
1310-1315	6.87	7.68	6.86	5.92	7.45	7.87
1315-1320	5.90	6.46	6.66	5.82	7.15	7.67
1320-1325	5.71	6.13	6.39	5.80	7.15	7.48
1325-1330	6.14	6.52	6.58	6.18	7.49	7.86
1330-1335	6.44	7.01	6.89	6.09	7.71	8.10
1335-1340	6.03	6.50	6.70	6.01	7.60	8.05
1340-1345	6.20	6.59	6.70	6.15	7.36	7.82
1345-1350	5.84	6.29	6.50	5.61	7.26	7.70
0930-1035	5.06	5.44	5.76	4.59	6.12	6.66
1035-1315	6.36	7.12	6.57	5.50	7.06	7.50
1315-1350	6.04	6.50	6.63	5.59	7.39	7.81
0930-1350	5.99	6.62	6.38	5.33	6.87	7.33


H.T. (m)
900
800
700
600
500
400
300
200
100
0
14
15
16
17
18
19
20
TEMP. (°C)
OVER LAND
OVER WATER
Adiabatic
Kytoon over water

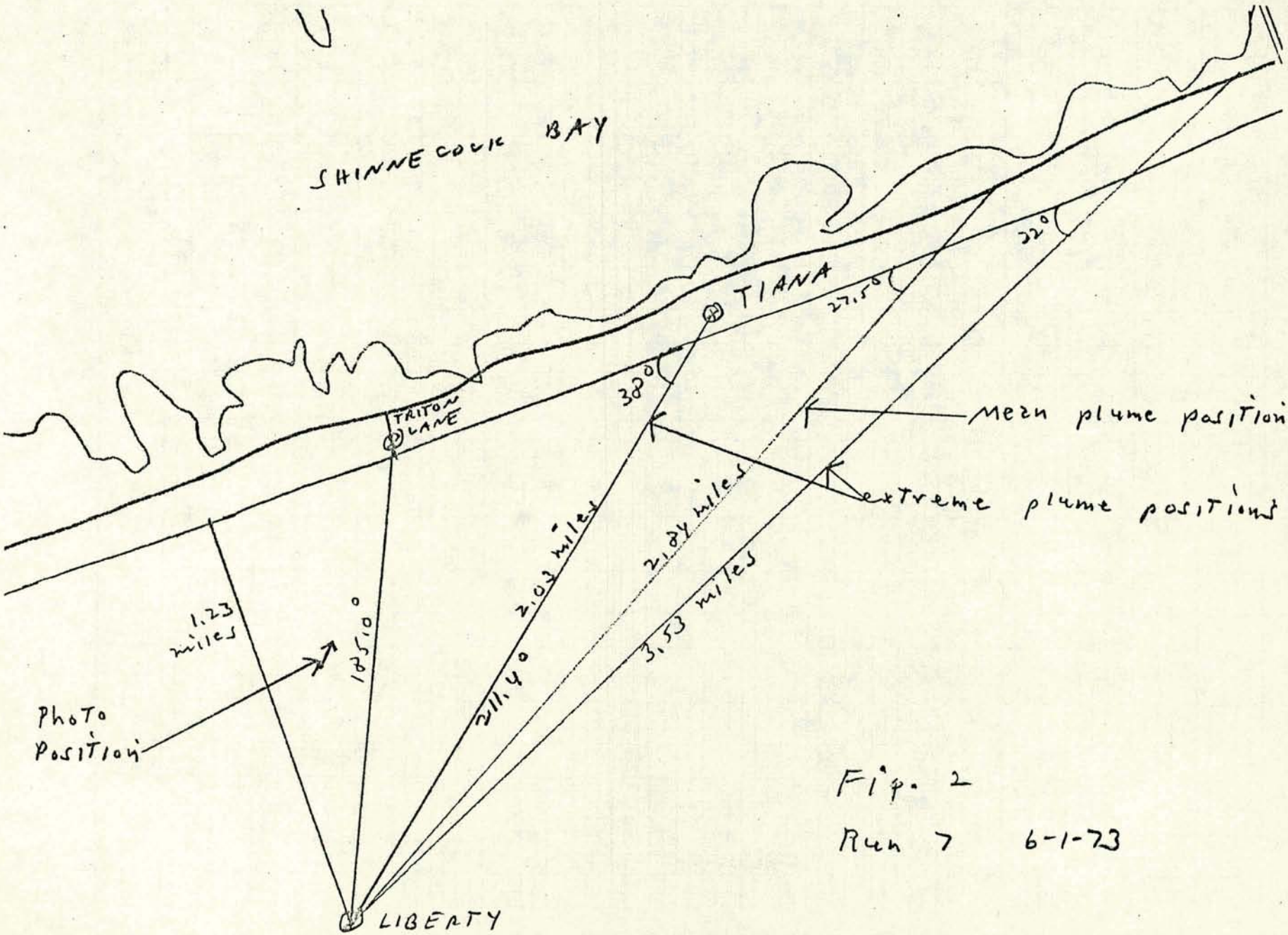


Fig. 2

Run 7 6-1-73

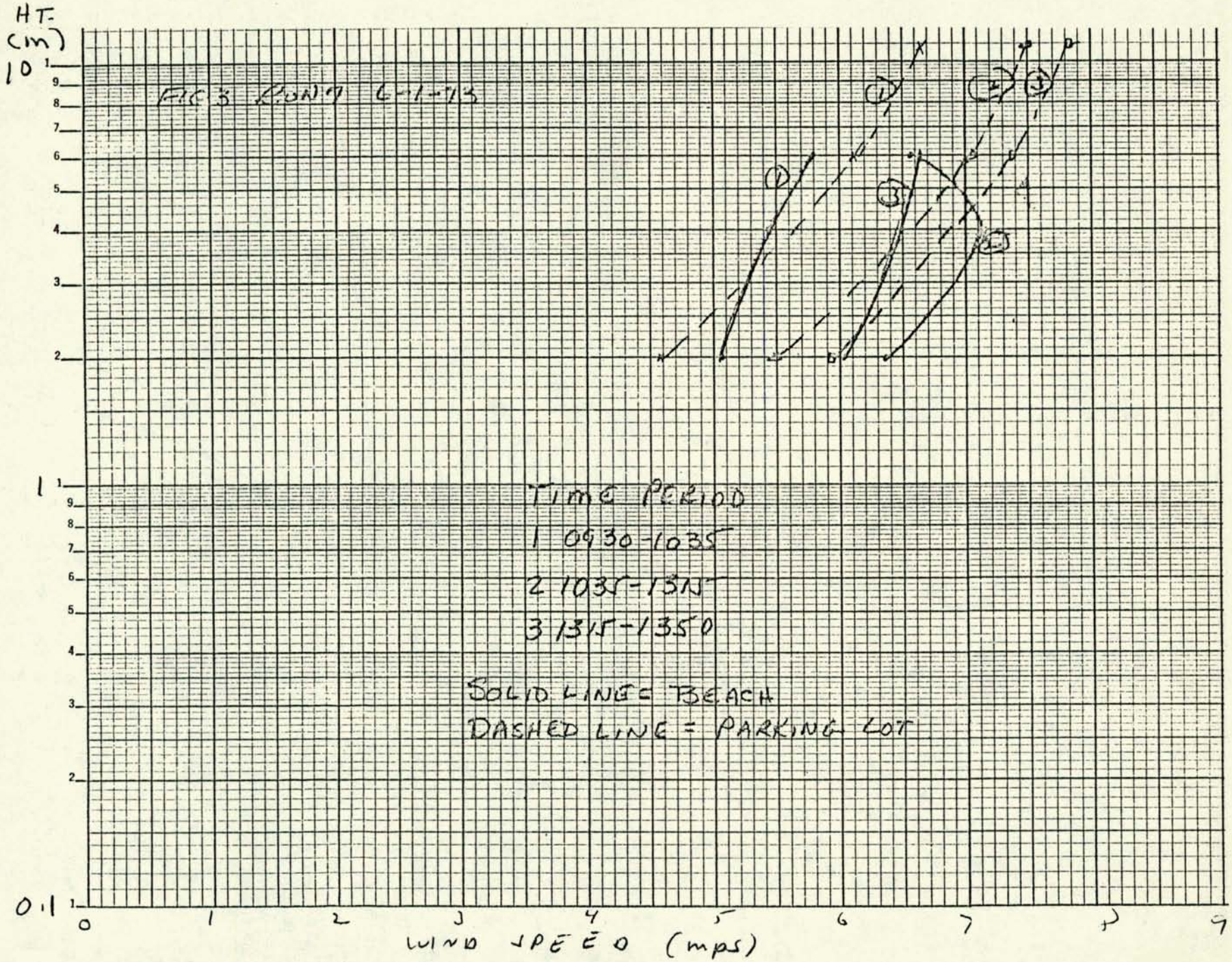
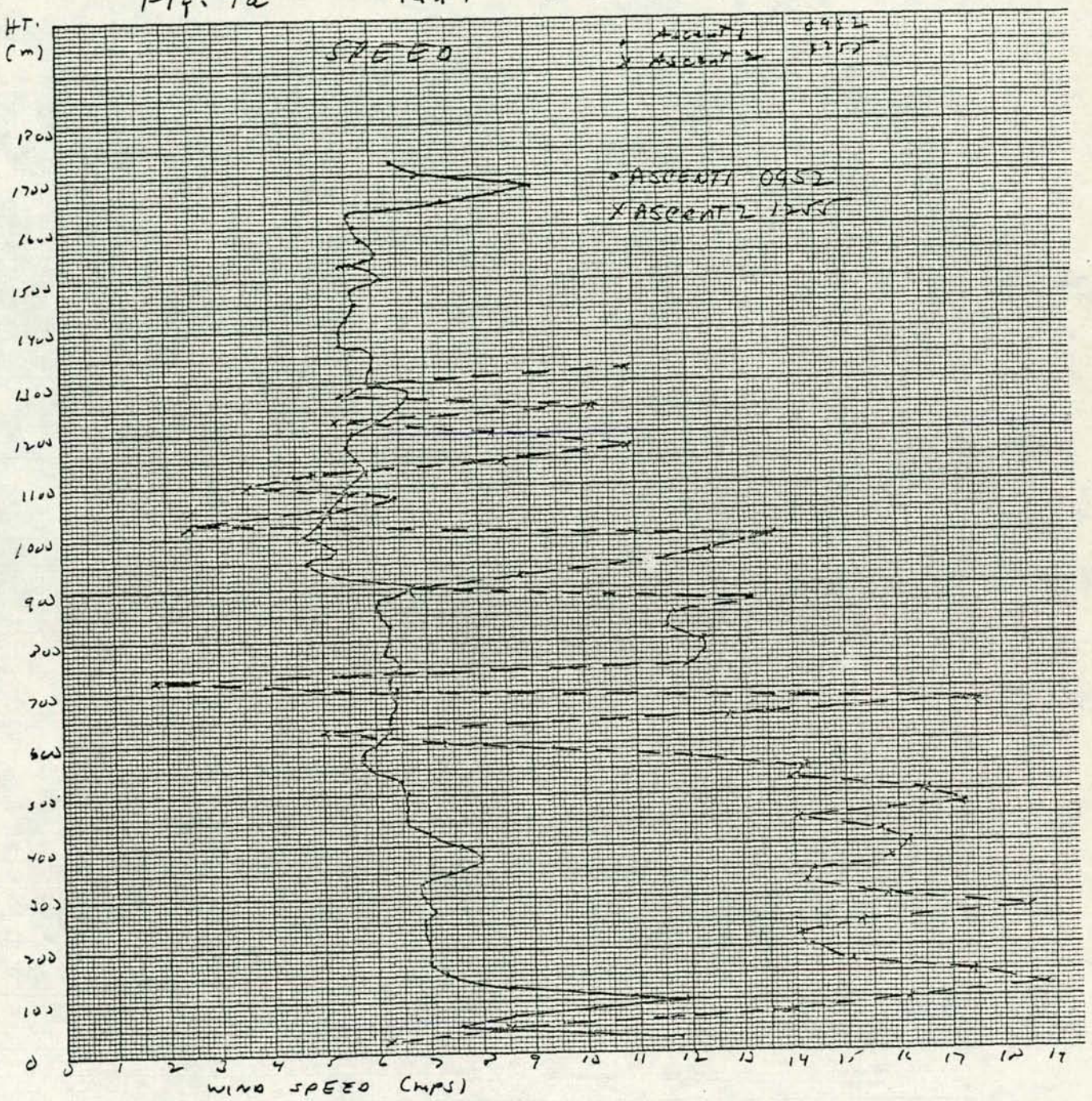

HT. (m)
10
1
0.1
FIG 3 RUN 9 6-1-73
TIME PERIOD
1 0930-1035
2 1035-1315
3 1315-1350
SOLID LINE = BEACH
DASHED LINE = PARKING LOT
0
1
2
3
4
5
6
7
8
9
WIND SPEED (mps)

Fig. 4a Run 7 6-1-73



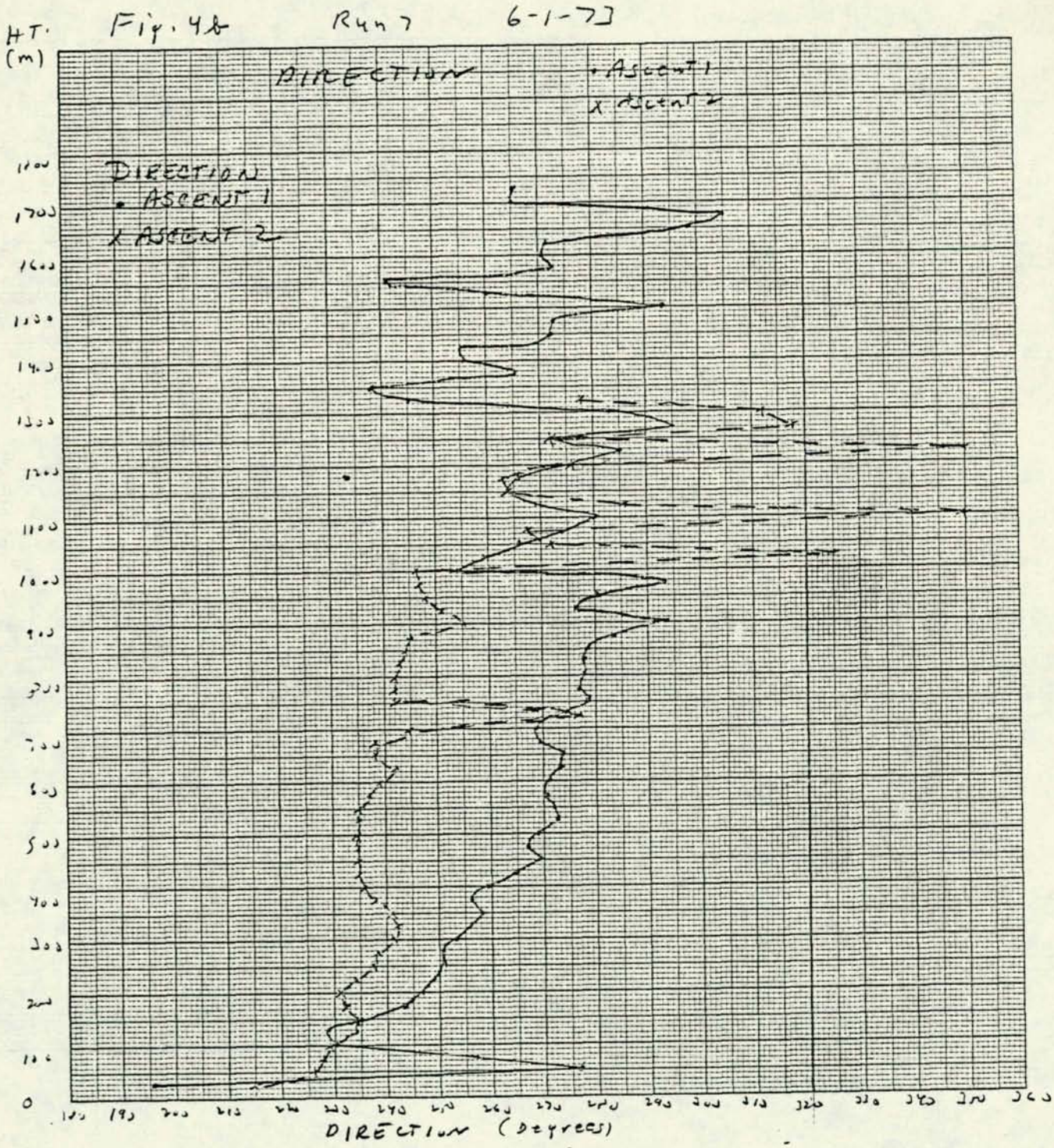
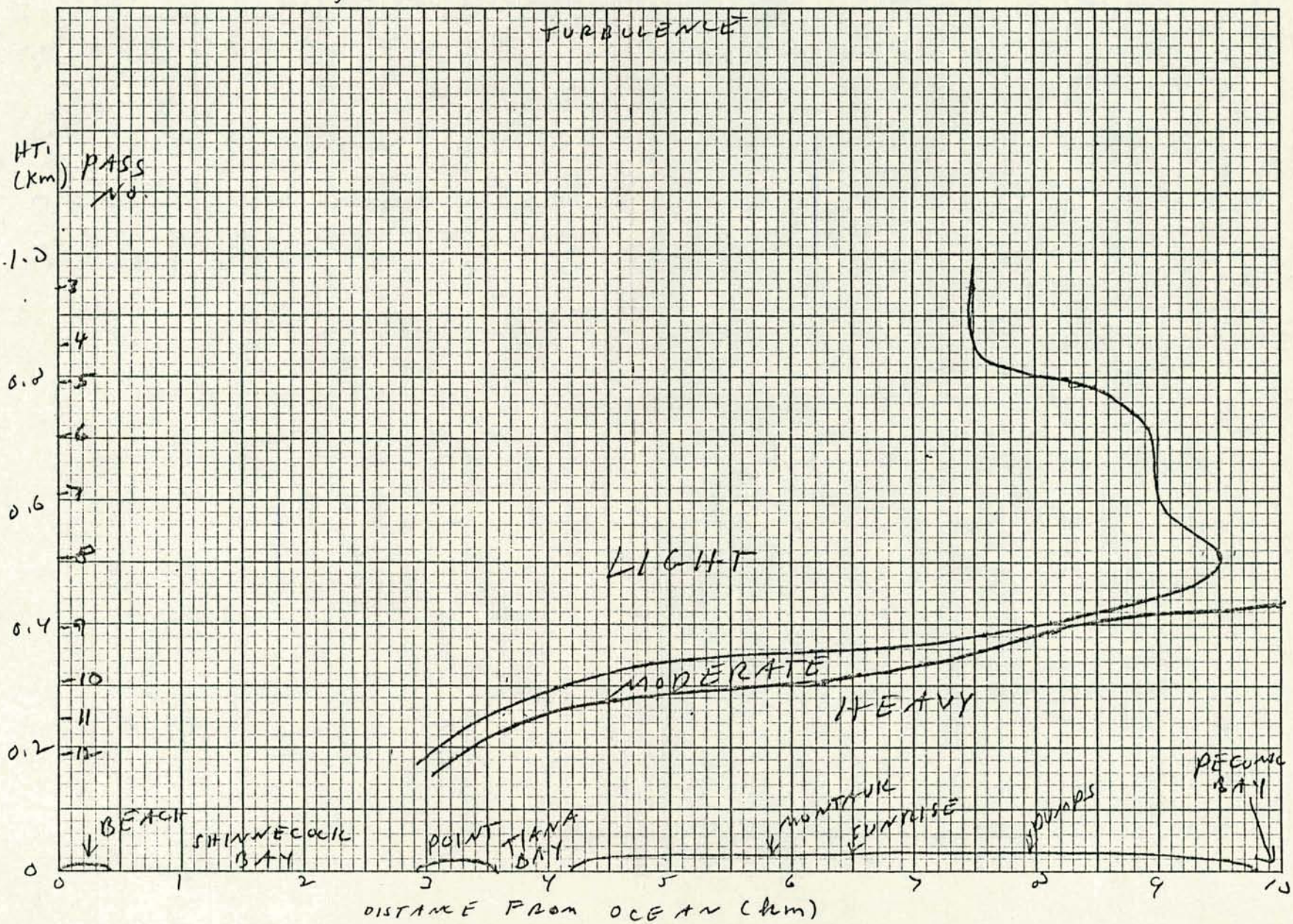

HT. (m)
Fig. 4b
Run 7
6-1-73
DIRECTION
• ASCENT 1
x ASCENT 2
DIRECTION
• ASCENT 1
x ASCENT 2
DIRECTION (Degrees)

Fig. 5 Run 7 6-1-73



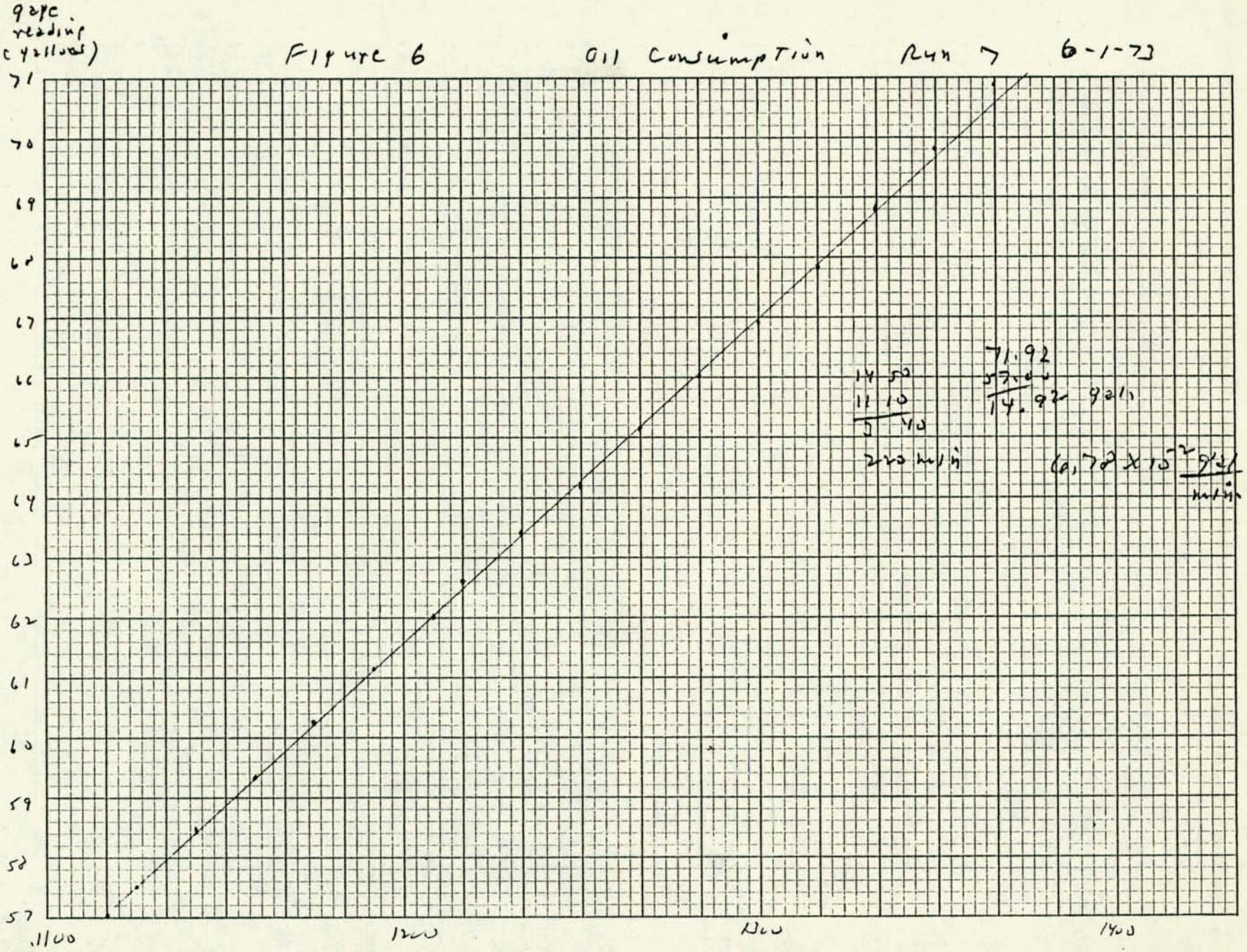
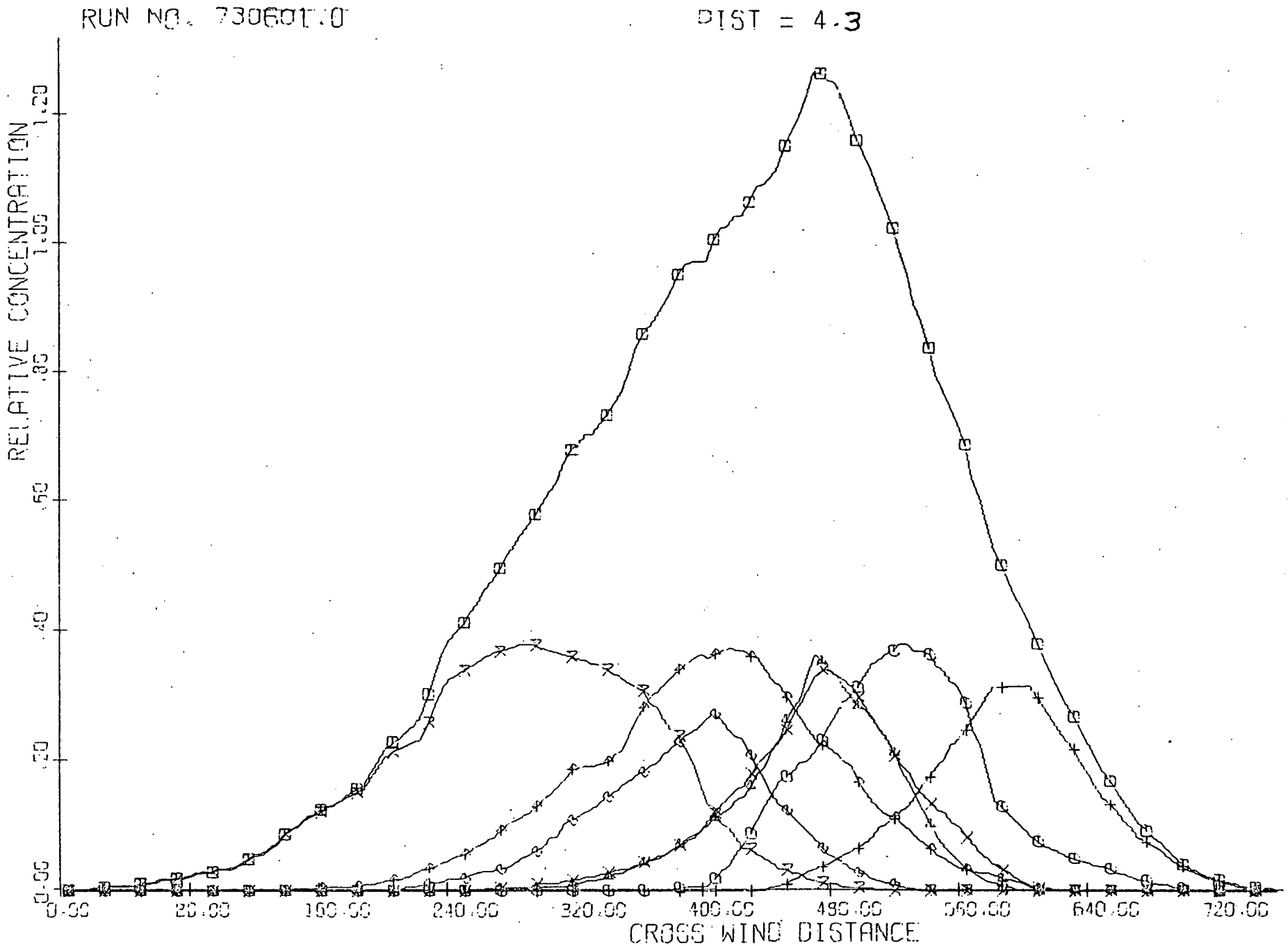

gage reading (gallons)
Figure 6
Oil Consumption
Run 7
6-1-73
71
70
69
68
67
66
65
64
63
62
61
60
59
58
57
1100
1200
1300
1400
14.50
11.10
3.40
220 min
71.92
57.00
14.92 gal
6.78 x 10^-2 gal/min

Figure 1. Smoke plume, Run 7, 6-1-73.

Figure 2. Aerial view of smoke plume,
Run 7, 6-1-73.


RUN NO. 730601.0
DIST = 4.3
RELATIVE CONCENTRATION
0.00
.20
.40
.60
.80
1.00
1.20
0.00
80.00
160.00
240.00
320.00
400.00
480.00
560.00
640.00
720.00
CROSS WIND DISTANCE

ON SHORE DENSITOMETER RUN
TRAVERSES AT ONE DISTANCE

RUN =730601./ DATE = 60173 /DISTANCE FROM STACK (KM) = 4.30
DIRECTION(DEG) = 221./TIME FROM 1228 TO 1258 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIGMA*SQRT(2))
1.0	.484E+02	524.6	52.8			10.45
2.0	.379E+02	469.7	51.4			8.81
3.0	.390E+02	590.7	52.4			8.90
4.0	.407E+02	472.2	56.2			8.64
5.0	.331E+02	387.8	55.0			7.19
6.0	.665E+02	400.9	74.7			10.62
7.0	.780E+02	285.5	79.4			11.73
GRAND TOTAL	.344E+03	428.7	64.6	117.3	47.9	
Corrected for plume angle			31.3	56.9	47.5	

Run No. 8
June 15, 1973

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: July 26, 1973

TO: Files

FROM: G. S. Raynor

SUBJECT: Offshore Test No. 8

The eighth overwater dispersion test was held on June 15, 1973. Clouds increased from scattered cirrus to broken cirrus and altocumulus. A sea breeze had been expected but gradient winds continued from the northwest. A small high moved from southeast to south of Long Island during the day while a low over Nova Scotia reinforced the gradient. Waves were small and swell about 3 feet from the south. High tides occurred at 0526 and 1741 and low at 1032. Thus, the tide was rising and flowing into the Inlet during most of the run. Eastern standard time is used in this report.

Personnel left BNL at 0645 and arrived at Tiana and at the dock at about 0730. The Liberty left the Inlet at 0845 and the Selma at 0910. All instruments at Tiana were operative by 0940 except the beach mast which was set up at 1015.

The Liberty was manned by Sy Fink and Jack Amaro who operated the smoke generator and the analogue anemometer. The kytoon was not used because the bladder broke during inflation on the dock. The kytoon temperature element was mounted on the anemometer arm at 6.7 m but, unfortunately, was removed from its housing and therefore exposed to the sun. Temperatures were several degrees higher than those measured at the same elevation on the Selma and are not used.

The Selma was manned by Walter Jahnig. A gasoline powered generator was used to power the instruments. Both the densitometer and the thermocouple temperature system worked correctly. Thermocouples were located at 2.4 and 6.8 m and in the water. Two marker buoys were taken and used to guide densitometer traverses. Pictures were taken from three locations.

The mobil tower at Tiana extended fully. The aerovane and MRI bivane were mounted at 16 m and cup anemometers at 2, 6 and 11 m. The hot wire anemometer was mounted at 5 m. The hot film anemometer was not working properly and was not used. The beach mast was positioned about 15 m from and about 2 m above the water with

anemometers at 2, 4 and 6 m. The trailer tower and the vanes were oriented correctly. The bivane was leveled before extending the tower.

The bivane and aerovane charts were started at 0943 and ended at 1432. Speed runs were taken from 0943 to 1045 and 1127 to 1302. Because of the wind direction, no recording was obtained on the bivane direction chart. Hot wire anemometer data were taken during two periods between 0945 and 1321.

The counters for the tower anemometers were started at 0943 and turned off at 1432. The counter for the beach anemometers was started at 1016 and off at 1304. However, it was discovered that the counters for the tower anemometers did not operate correctly when the beach counter was turned off due to interaction through the recently installed timing circuit. The timer to the beach counters was disconnected at about 1330 so that the mast counters operated correctly until the end of the run. Data are used only for the periods 1041 to 1301 and 1331 to 1411.

Pibals were taken by John McNeil at 1303 and 1424 with the automatic theodolite. Readings were taken at 15 second intervals. He also took theodolite bearings on the boats and the marker buoys from Ponquoque and Triton Lane. Gilbert Raynor coordinated activities from Tiana. Two radios failed but communication with the boats was maintained by use of the radio recently installed in the van. However, it was impossible to communicate with McNeil at the other beach locations. The mobil van was not used since no smoke came ashore. Bob Brown and S. SethuRaman assised at Tiana.

The aircraft was manned by Ansel Tuthill. Temperature ascents were made from 500 to 3000 feet over the water at 1100 and over the dumps north of Sunrise Highway at 1115 (Table 1 and Figure 1). The temperature recorder was set with a mercury thermometer before use.

Two variometer runs were made at 80 mph with the recorder chart at 100 mv/div. The first started inland near the dumps at 1000 feet and ended about 10 miles at sea. The aircraft rose to 1400 feet in the last few miles. The second run returned along the same path starting at 2000 feet but rising to 2300 feet in the first few miles. The rest of the flight remained near that altitude.

Turbulence was high over the land, decreased somewhat about 2 miles out and decreased further at 8 miles, particularly at the lower altitude. However, the air was definitely unstable out to 10 miles.

Files July 26, 1973
G. S. Raynor
Offshore Test No. 8

Five photo runs were made over the plume, all at 80 mph and at 5 second intervals, as follows:

Run No.	Height (ft)	Time	No. of pictures
1	1500	1130	4
2	1500	1135	9
3	1500	1140	8
4	2000	1220	9
5	1000	1225	10

Only the first few in each set are usable due to sun glare on the water. Additional photos of the plume were taken from the side. Prints were made with an enlargement factor of 7.5X.

Test smoke was made from near Tiana Beach from 0920 to 0940. The plume was unstable and moved off shore. Twenty-three pictures were taken from the Selma as it circled the Liberty and others from the beach by Brown, Michael and Raynor. The Liberty was then moved to a position 1/2 nautical mile out (Fig. 2) and emitted smoke from 0956 to 1030. Eleven pictures were taken from the Selma from photo position 2 at 1 minute intervals from 1020 to 1030.

The Liberty was then moved to a position one nautical mile out and emitted smoke from 1045 to 1317 and from 1333 to 1431. Thirteen pictures were taken from the Selma from photo position 3 (Fig. 2) at 1 minute intervals from about 1103 to 1113. Five additional photos were taken during densitometer traverses.

The plume was generally unstable and meandered considerably. However, it became somewhat less unstable further out and during periods when the wind had a longer fetch over the water.

Seven densitometer traverses were made with the Selma at 3/4 mile (1.40 km) downwind from the source from 1207 to about 1300. A marker buoy was anchored on either side of the plume and their positions determined by triangulation from the beach. Traverses were made at constant speed along the line between the buoys and beyond when the plume meandered past a buoy. During two traverses, the time of passage between the buoys was recorded from the beach as 7 minutes, 35 seconds for eastbound pass 2 and 7 minutes, 20 seconds for westbound pass 5.

The buoys were then moved closer to the source and six traverses made at about 1/4 mile (0.46 km) downwind. Densitometer results will be reported separately.

The range and mean of the temperature measurements taken on the Selma are shown in Fig. 1. The sensors were calibrated the day before the run and the correction applied to the readings. These, with the aircraft temperature measurements, indicate a low-level inversion over the water. The two air temperature traces are difficult or impossible to follow on the recorder chart so the mean temperatures are computed from only 8 short portions of the trace when Jahnig identified the traces on the chart. The water temperature mean is tabulated from 34 equally spaced readings. An air temperature measurement was then at 1230 in the shade at 10 cm over the parking lot and gave 24.5°C.

Anemometer data are tabulated in Table 2 and plotted in Fig. 3. Wind speed at a height of 6.7 m on the Liberty while in the one mile position averaged about 7.4 mps and ranged from 2.5 to over 10.0 mps. Pibal data are shown in Fig. 4. Results aresimilar to those of Run 7.

Oil consumption was steady but higher than in previous runs. After allowing for oil loss of about 1.5 gallons, consumptionn averaged 10.28×10^{-2} and 10.40×10^{-2} gal/min. during the two densitometer traverse periods (Fig. 5). The run was terminated at 1432. Personnel left Tiana at 1500 and the boats at 1545.

In summary, gradient offshore winds gave an unstable plume despite an apparent temperature inversion at low levels. However, degree of instability appeared inversely related to the length of fetch over the water.

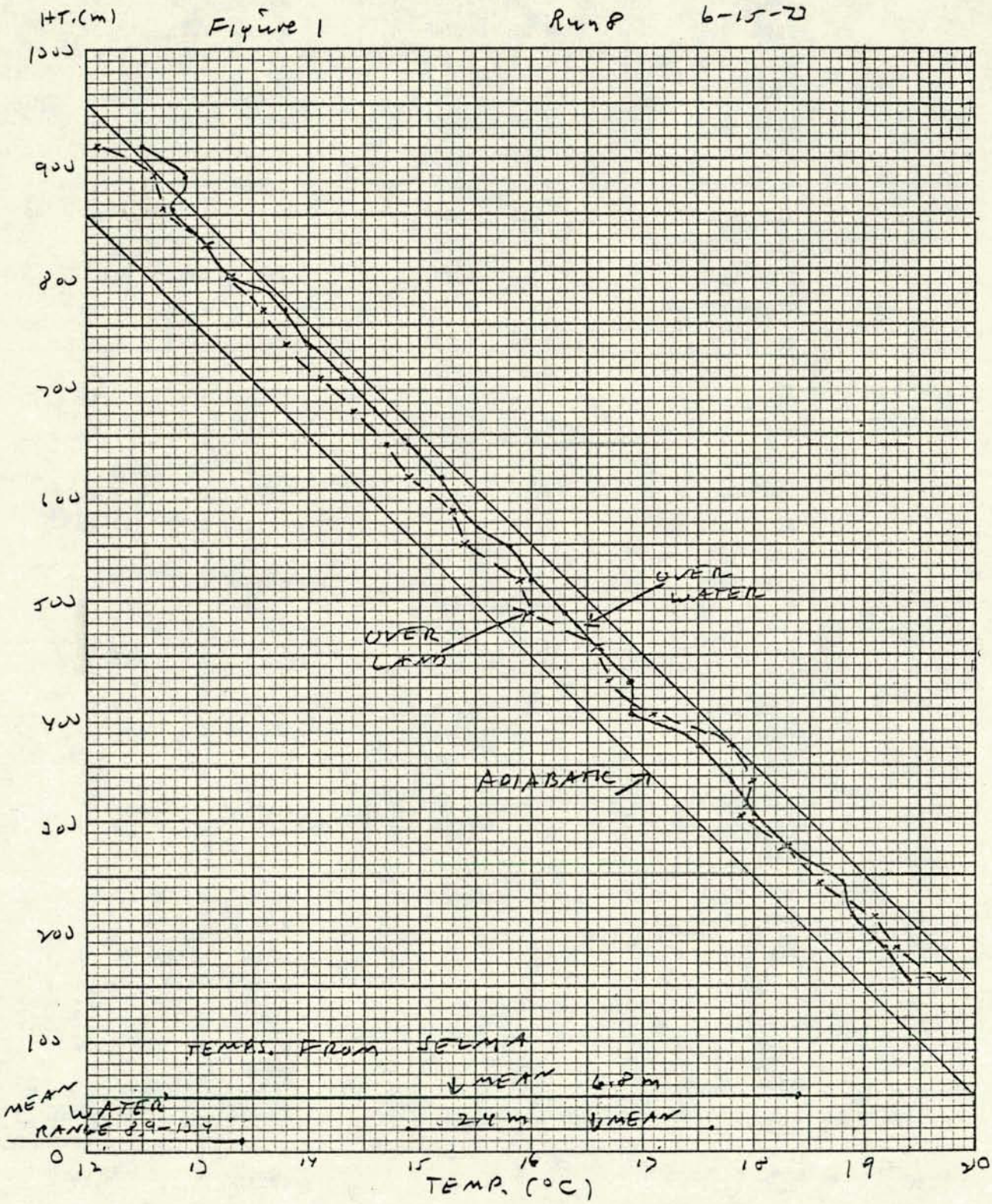
GSR/lk

Table 1
Aircraft Temperatures Run 8 6-15-73

Ht. (m)	Over Water 1100E		Over Land 1115E	
	°F	°C	°F	°C
152.4	67.0	19.4	67.4	19.7
182.9	66.5	19.2	66.8	19.3
213.4	66.0	18.9	66.4	19.1
243.8	65.8	18.8	65.4	18.6
274.3	64.9	18.3	64.9	18.3
304.8	64.4	18.0	64.2	17.9
335.3	64.0	17.8	64.5	18.0
365.8	63.5	17.5	64.0	17.8
396.2	62.4	16.9	62.8	17.1
426.7	62.4	16.9	62.0	16.7
457.2	61.8	16.6	61.8	16.6
487.7	61.4	16.3	60.8	16.0
518.2	60.8	16.0	60.7	15.9
548.6	60.4	15.8	59.8	15.4
579.1	59.8	15.4	59.5	15.2
609.6	59.3	15.2	58.8	14.9
640.1	58.8	14.9	58.4	14.7
670.6	58.3	14.6	58.0	14.4
701.0	57.8	14.3	57.3	14.1
731.5	57.2	14.0	56.9	13.8
762.0	56.8	13.8	56.4	13.6
792.5	56.0	13.3	56.0	13.3
823.0	55.5	13.1	55.6	13.1
853.4	55.1	12.8	54.8	12.7
883.9	55.2	12.9	54.6	12.6
914.4	54.5	12.5	53.8	12.1

Table 2
Anemometer Wind Speeds (mps) Run # 8 6-15-73

TIME (EST)	BEACH			PARKING LOT		
	2 m	4 m	6 m	2 m	6 m	11 m
1041-1046	3.57	3.76	4.30	3.18	4.76	5.92
1046-1051	4.23	4.24	4.57	3.22	4.17	5.00
1051-1056	2.93	3.27		3.17	3.16	6.02
1056-1101	3.56	4.18		3.16	4.09	7.27
1101-1106	3.29	3.41		2.98	4.58	6.08
1106-1111	3.44	3.58		3.24	5.82	6.43
1111-1116	4.02	4.23		3.91	6.83	7.41
1116-1121	3.66	3.87		2.97	4.95	6.84
1121-1126	3.87	3.76		3.20	5.89	6.46
1126-1131	4.58	4.53		3.58	6.58	7.51
1131-1136	3.06	3.46		3.63	4.28	6.59
1136-1141	3.32	3.55		3.35	5.02	6.53
1141-1146	4.24	4.00		3.54	5.16	6.25
1146-1151	4.25	4.24		3.40	5.24	6.60
1151-1156	3.77	3.95		3.34	4.84	6.30
1156-1201	4.03	4.04		3.95	5.69	6.55
1201-1206	4.39	4.61		3.76	6.07	7.67
1206-1211	4.48	4.48		3.76	5.99	7.12
1211-1216	4.45	4.56		4.11	6.38	7.48
1216-1221	2.95	3.11		2.70	5.17	7.01
1221-1226	3.69	4.11		3.46	6.44	7.42
1226-1231	3.88	3.93		3.44	5.92	6.47
1231-1236	5.79	5.91		5.24	6.99	8.07
1236-1241	4.04	4.48		3.43	6.03	8.65
1241-1246	4.73	4.71		4.18	7.54	8.57
1246-1251	4.50	4.71		4.02	6.72	7.90
1251-1256	5.17	5.31		5.38	7.11	7.52
1256-1301	4.43	4.96		4.02	7.14	8.69
1331-1336				4.13	7.61	9.77
1336-1341				3.83	7.24	9.86
1341-1346				3.85	6.79	11.21
1346-1351				3.95	7.36	9.70
1351-1356				4.19	7.72	8.61
1356-1401				3.82	7.29	9.59
1401-1406				4.37	8.74	8.64
1406-1411				4.13	8.52	7.77
Means						
1041-1301	4.01	4.18	-	3.62	5.66	7.01
1331-1411	-	-	-	4.03	7.66	9.39


HT. (m)
Figure 1
Run 8
6-15-73
1000
900
800
700
600
500
400
300
200
100
0
OVER WATER
OVER LAND
ADIABATIC
TEMPS. FROM SELMA
MEAN
6.8 m
MEAN WATER RANGE 8.9-13.4
2.4 m
MEAN
12
13
14
15
16
17
18
19
20
TEMP. (°C)

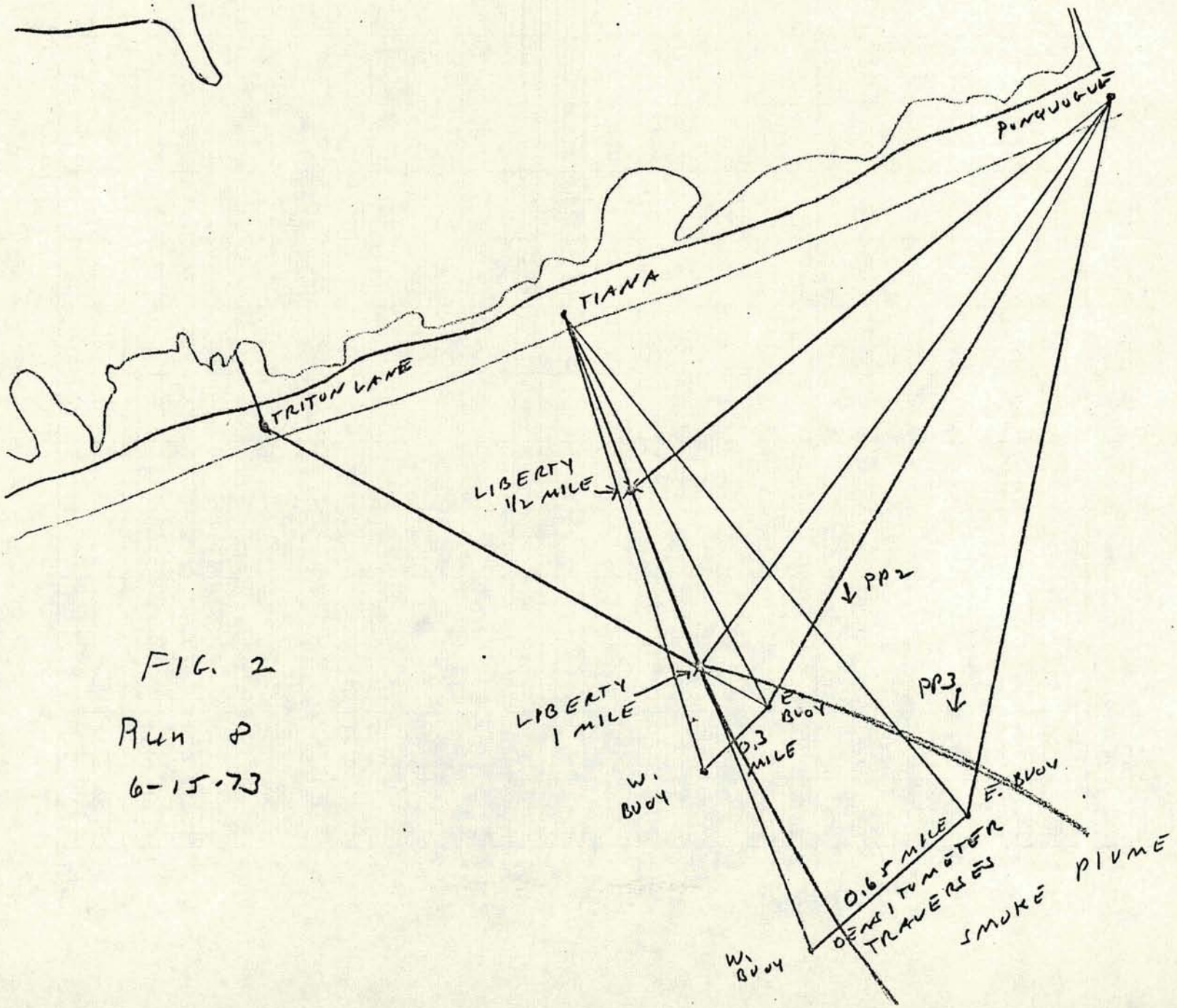
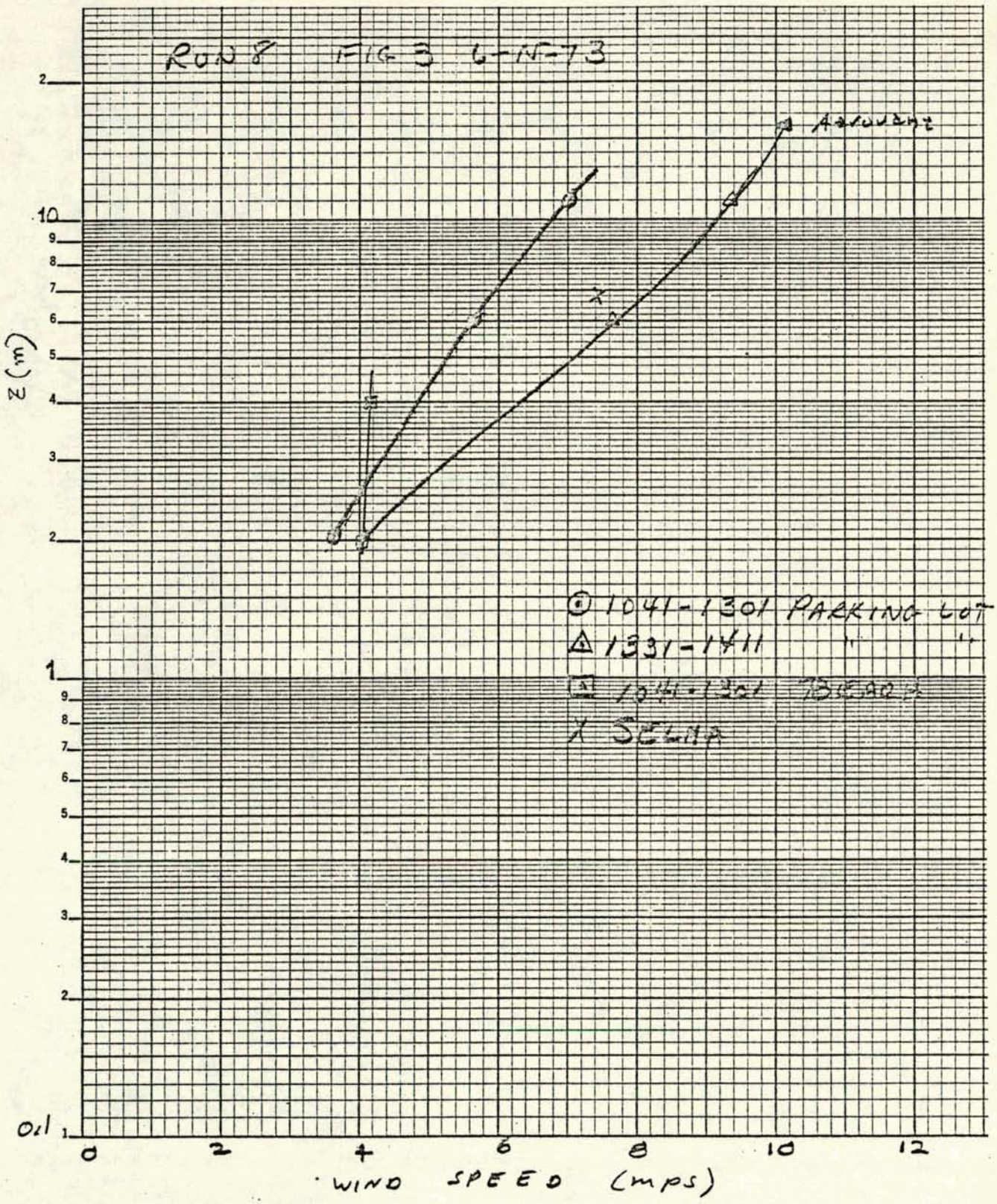


FIG. 2

Run 8

6-15-73


RUN 8 FIG 3 6-IV-73
ARROWHEAD
1041-1301 PARKING LOT
1331-1411 " "
1344-1301 TOSCO
X SELNA
Z (m)
WIND SPEED (mps)

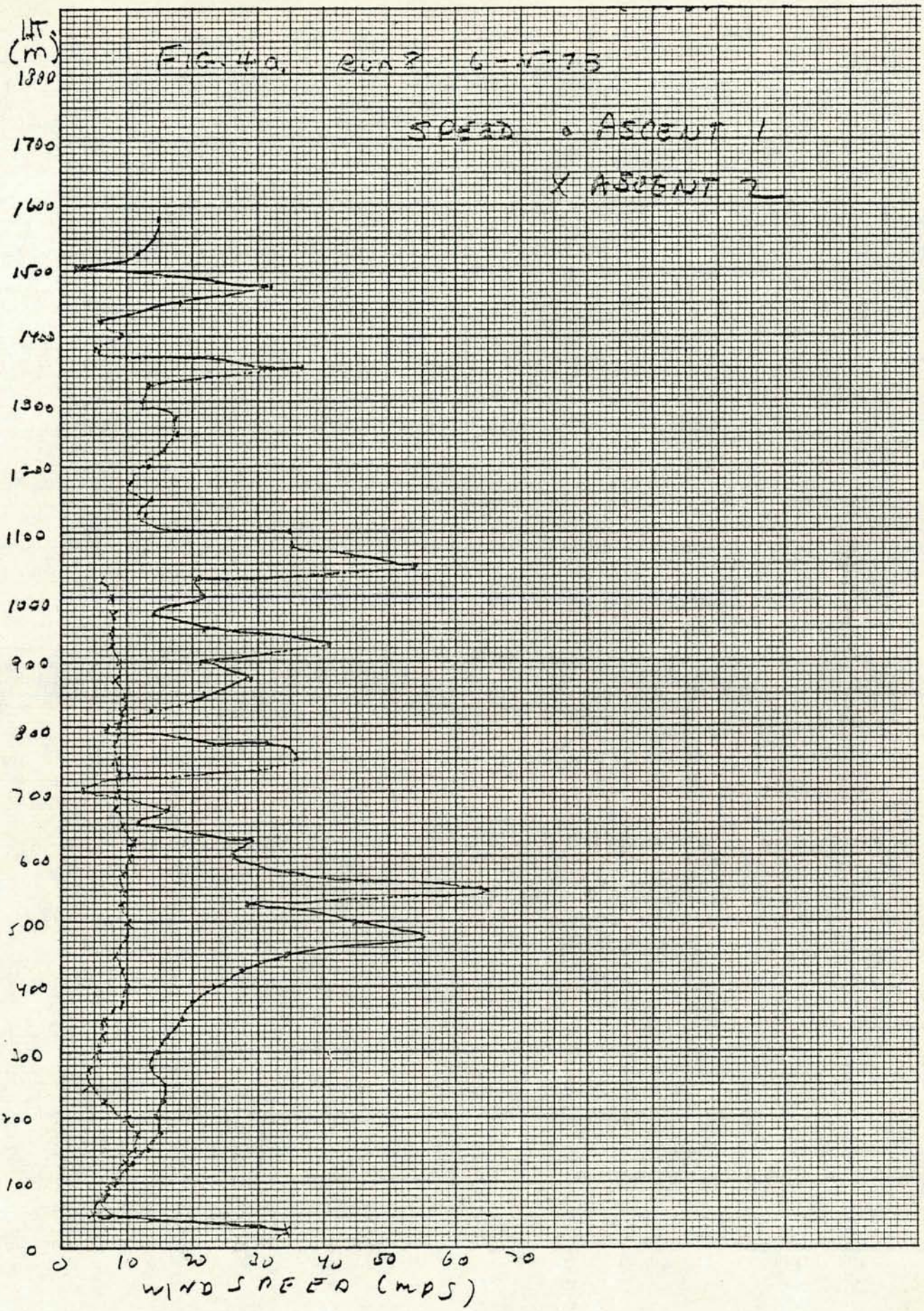
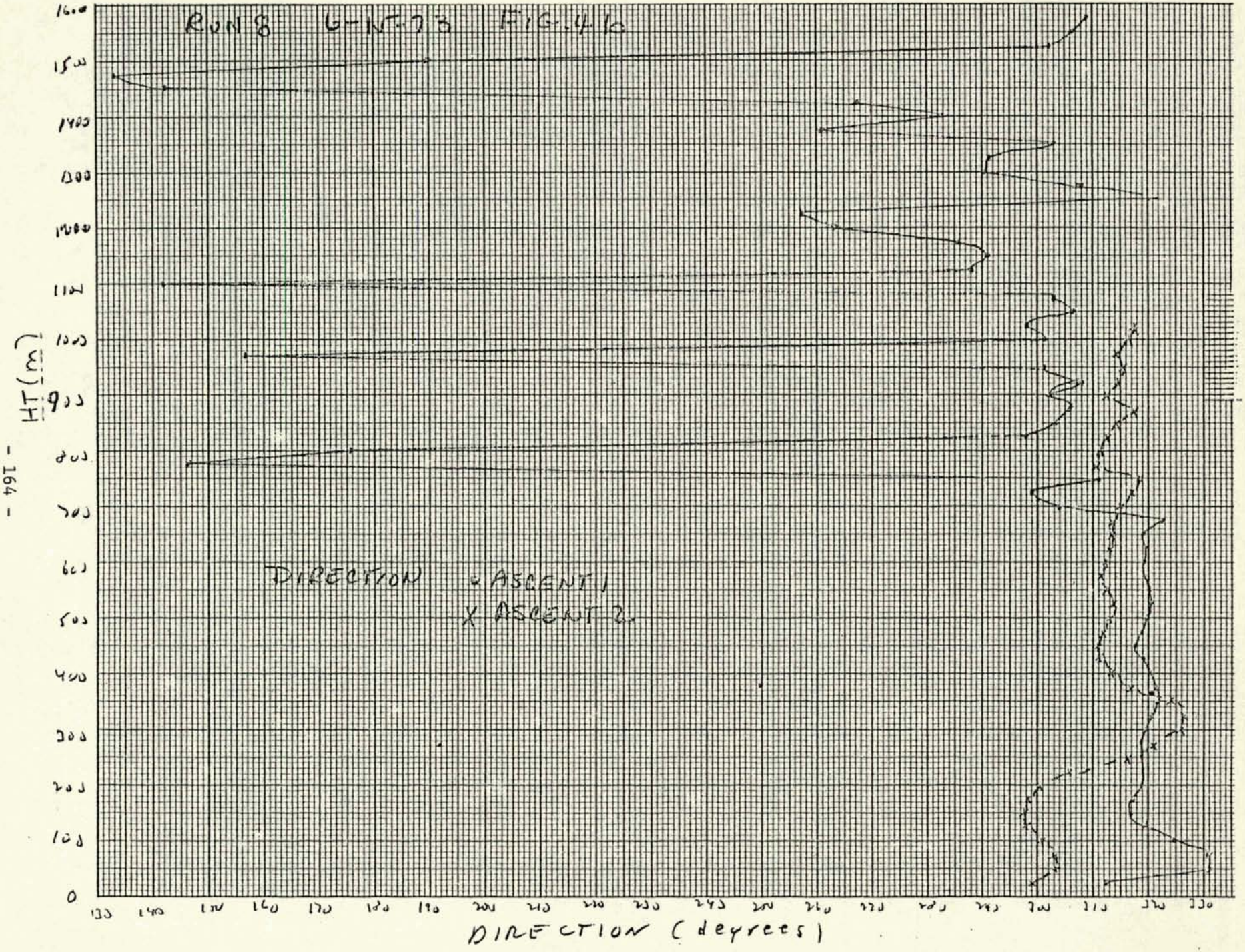


FIG. 4a. RUN 2 6-17-75
SPEED ∘ ASCENT 1
X ASCENT 2
HT. (m)
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
0 10 20 30 40 50 60 70
WIND SPEED (MPS)


RUN 8 6-NOV-73 FIG. 4b
DIRECTION
ASCENT 1
X ASCENT 2
HT (m)
DIRECTION (degrees)

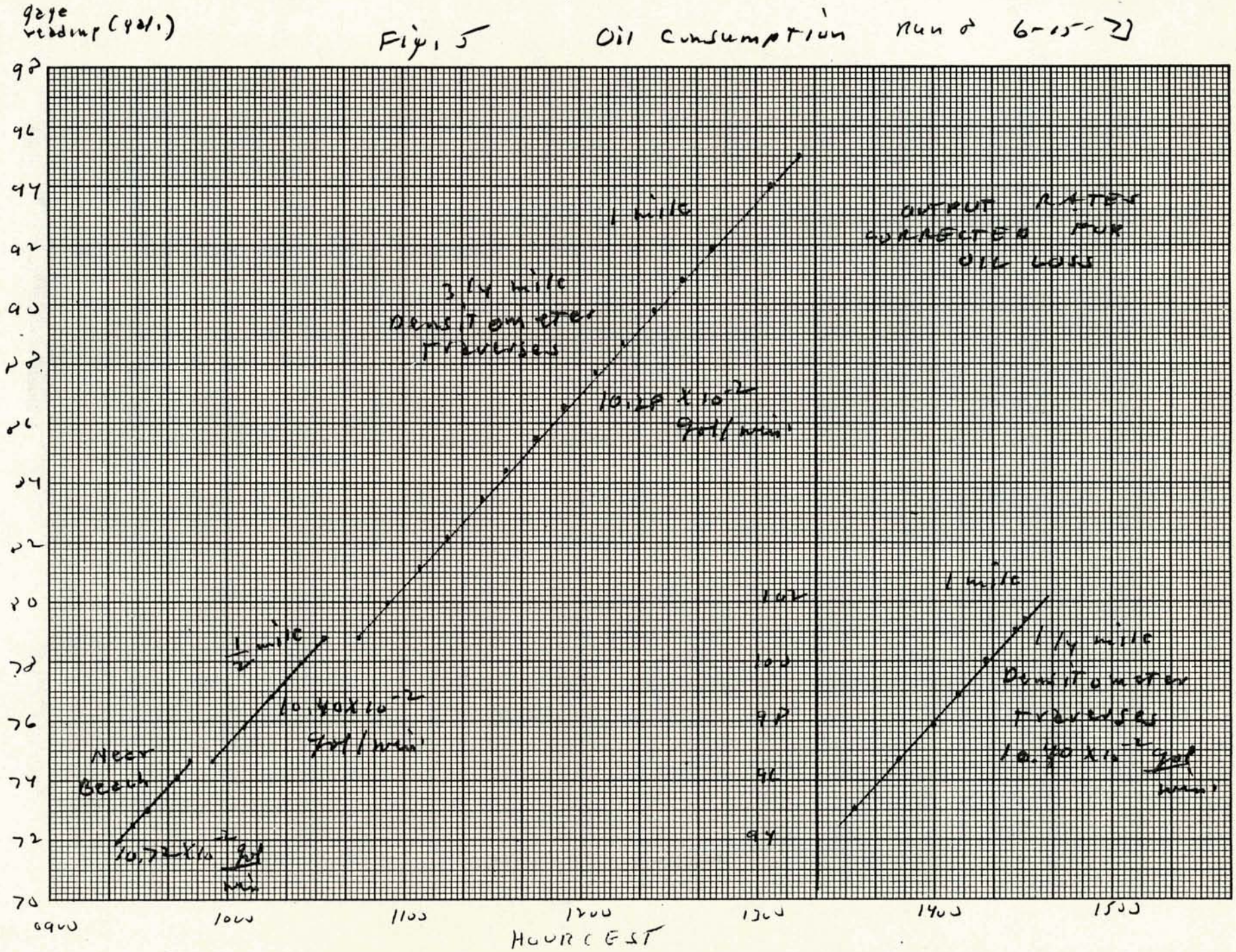

gage reading (gal.)
Fig. 5 Oil consumption run of 6-15-71
98
96
94
92
90
88
86
84
82
80
78
76
74
72
70
0900
1000
1100
1200
1300
1400
1500
HOUR EST
1 mile
3 1/4 mile
Densitometer
Traverses
10.28 X 10^-2
gal/min
1/2 mile
10.40 X 10^-2
gal/min
Near
Beach
10.72 X 10^-2 gal/min
1 mile
1 1/4 mile
Densitometer
Traverses
10.50 X 10^-2 gal/min
OUTPUT RATES
CORRECTED FOR
OIL LOSS

Figure 1. Smoke plume, Run 8, 6-15-73.

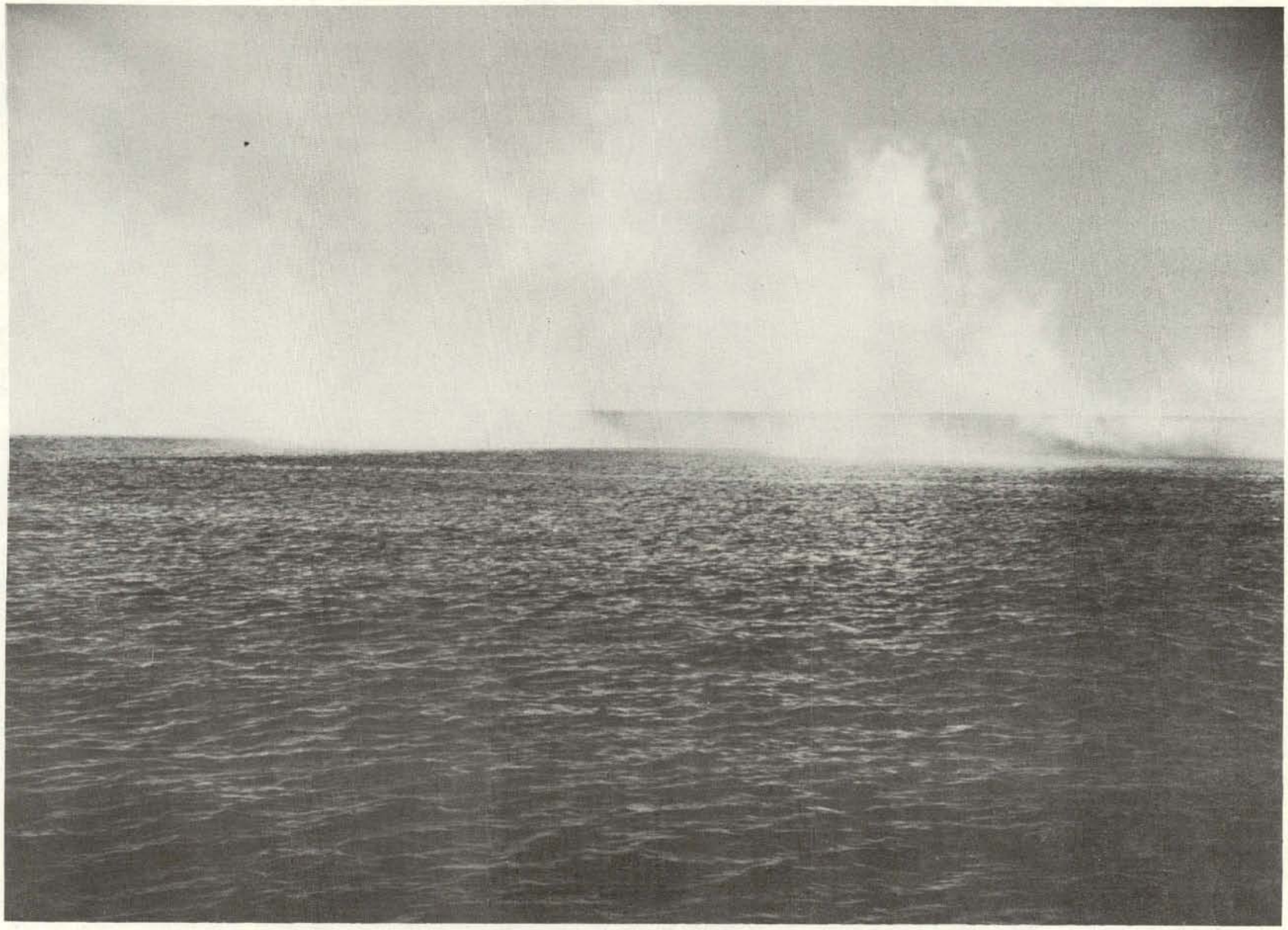


Figure 2. Smoke plume, Run 8, 6-15-73.

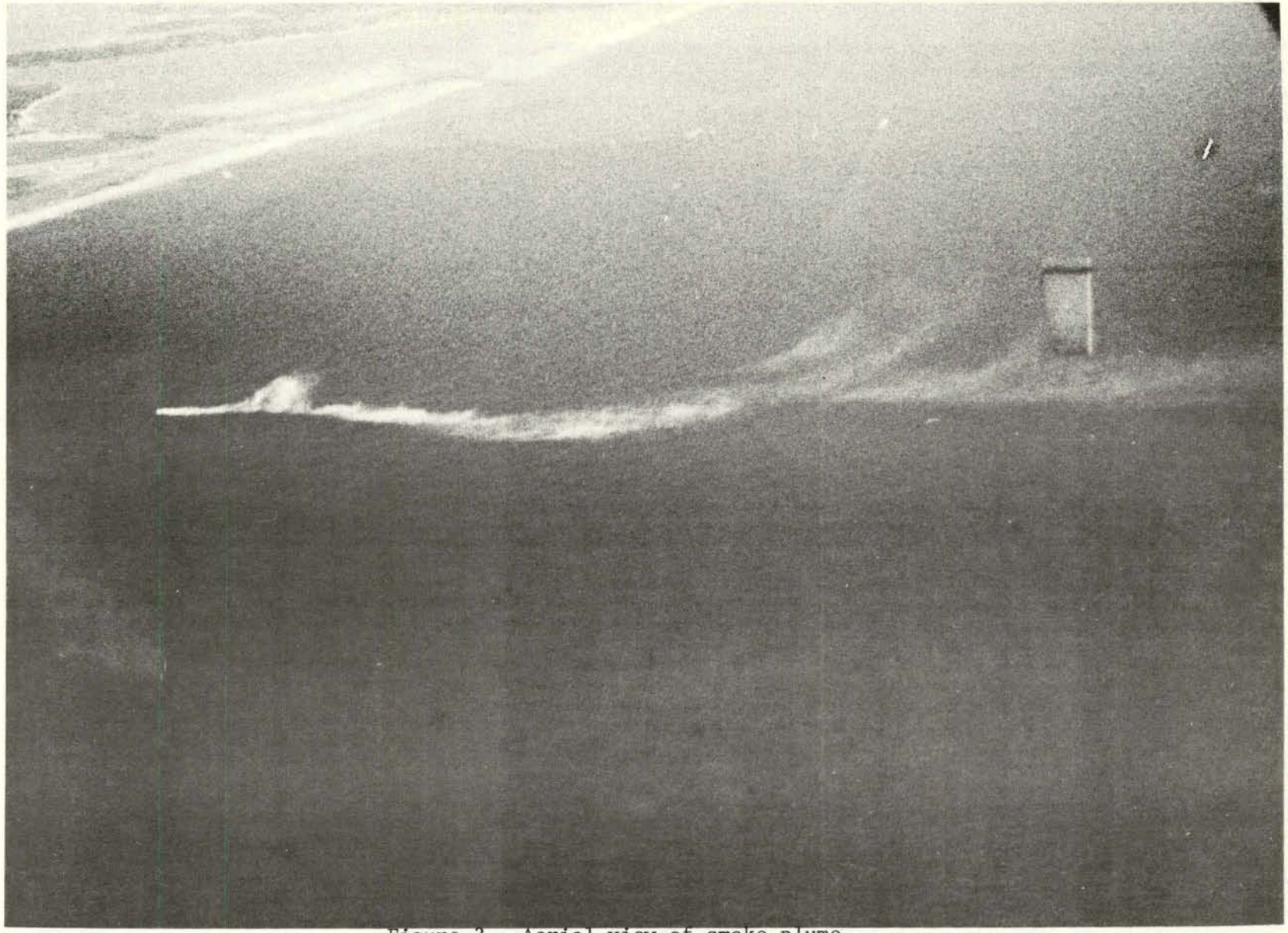


Figure 3. Aerial view of smoke plume,
Run 8, 6-15-73.

Figure 4. Aerial view of smoke plume,
Run 8, 6-15-73.

ON SHORE DENSITOMETER RUN FROM BOAT
TRAVERSES AT ONE DISTANCE

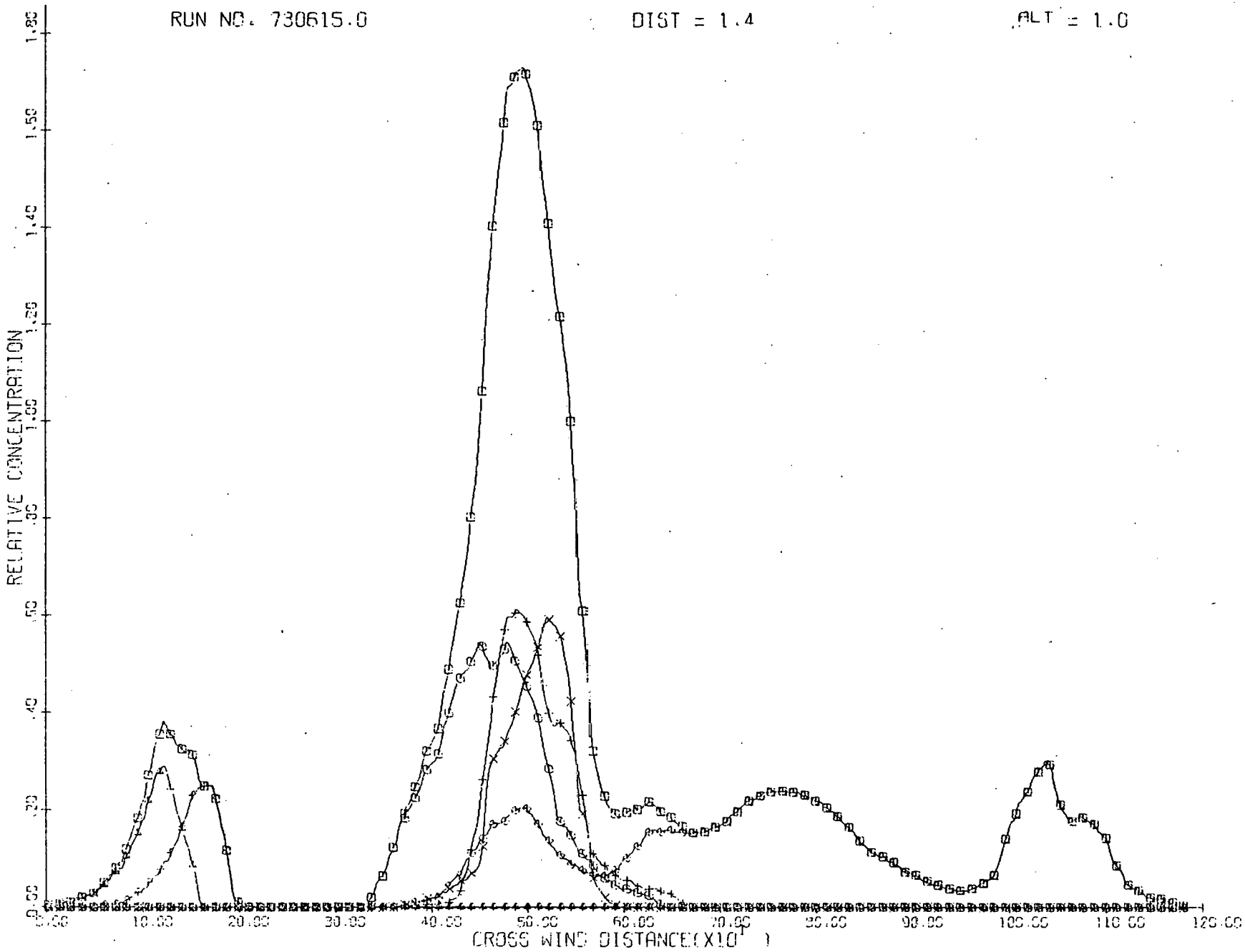
RUN =730615./ DATE = 61573 /DISTANCE FROM STACK (KM) = 1.38
DIRECTION(DEG) = 330./TIME FROM 1210 TO 1320 HRS

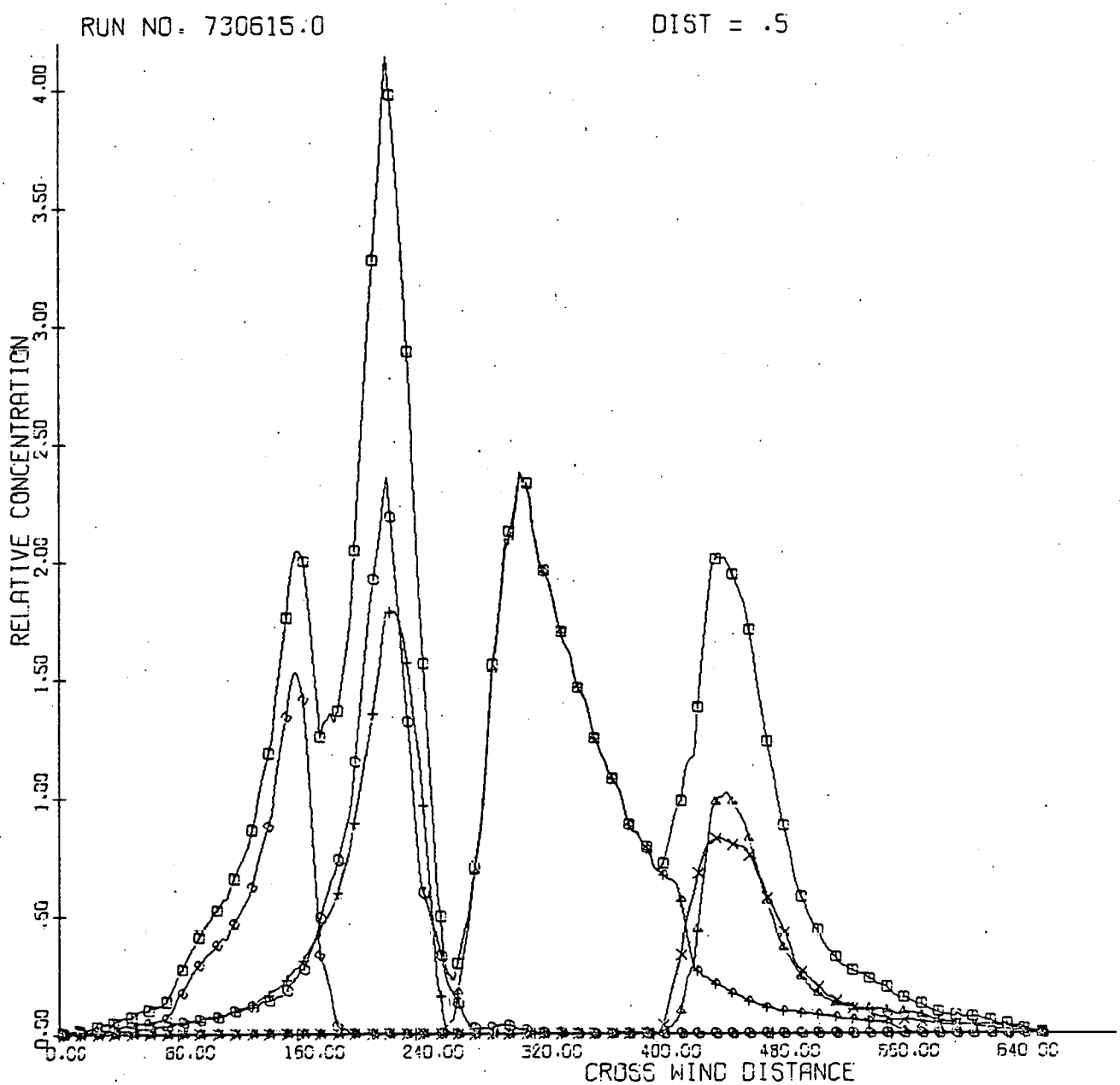
PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y REMNDER	CWI/(SIG*BKGND)
1.0	.752E+02	462.8	55.2			34.88
2.0	.165E+02	109.6	27.9			15.16
3.0	.571E+02	508.1	42.9			34.14
4.0	.492E+02	506.2	34.3			36.67
5.0	.103E+03	777.1	203.7			12.95
6.0	.147E+02	152.2	25.2			14.92
GRAND TOTAL	.316E+03	547.4	121.9	227.2	141.8	

ON SHORE DENSITOMETER RUN FROM BOAT
TRAVERSES AT ONE DISTANCE

RUN =730615./ DATE = 61573 /DISTANCE FROM STACK (KM) = .46
DIRECTION(DEG) = 330./TIME FROM 1347 TO 1416 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y REMNDER	CWI/(SIG*BKGND)
1.0	.117E+03	207.1	37.0			80.71
2.0	.626E+02	473.0	42.5			37.68
3.0	.103E+03	206.3	36.2			73.02
4.0	.642E+02	469.7	43.7			37.59
5.0	.716E+02	140.0	28.1			65.19
6.0	.212E+03	346.7	51.1			106.39
GRAND TOTAL	.630E+03	299.5	42.5	120.0	112.2	


RUN NO. 730615.0
DIST = 1.4
ALT = 1.0
RELATIVE CONCENTRATION
CROSS WIND DISTANCE(X10)
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
110.00
120.00
.20
.40
.60
.80
1.00
1.20
1.40
1.60
1.80


RUN NO. 730615.0
DIST = .5
RELATIVE CONCENTRATION
0.00
.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
0.00
80.00
160.00
240.00
320.00
400.00
480.00
560.00
640.00
CROSS WIND DISTANCE

Run No. 9
July 13, 1973

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: August 10, 1973

TO: Files

FROM: G. Raynor and S. SethuRaman

SUBJECT: Offshore Test No. 9

The 9th overwater dispersion test was held on July 13, 1973. Scattered strato cumulus clouds over the land and scattered cirrus clouds over the ocean were present. A high pressure system was centered over southeastern Virginia during the beginning of this run and was moving eastward. Gradient winds were from the SW. Eastern Standard Time is used in this report.

Waves were 1 to 1.5 feet from the SW and swells 4 to 5 feet from the southeast. High tides occurred at 0520 and 1742 and low at 1023. Thus, tide was coming in during the experimental period.

The staff, consisting of Robert Brown, Cy Fink, Walter Jahnig, John McNeil, S. SethuRaman and Jack Amaro, left BNL at 0705 and arrived at Tiana at 0745. Liberty and Selma left the docks at 0915. Instruments were installed on the tower by 1000.

The Liberty was manned by Cy Fink and Jack Amaro who operated the smoke generator and the analogue anemometer which was mounted 6.7 m above the water. They also operated the kytoon temperature system.

The Selma was manned by Walter Jahnig. The densitometer failed to work apparently because of water or moisture in the system. The thermocouple temperature system also failed to operate properly, possibly because of salt spray on the sensors. Air and water temperatures were taken with a mercury thermometer. Pictures were taken from one location.

The mobil tower at Tiana extended fully. The aerovane, the MRI bivane and a cup anemometer were mounted at 16 m and other cup anemometers at 3 and 11 m. The hot wire anemometer was mounted at 6 m. The beach mast was located about 1 m above and 10 m from the water with anemometers at 2, 4, and 6 m.

Files August 10, 1973
G. Raynor and S. SethuRaman
Offshore Test No. 9

Cup anemometers were operated from 1035 to 1340. Speed runs were taken from 1035 to 1125 and from 1230 to 1315. The bivane speed chart was on the 0-80 mph range. The bivane and hot wire anemometer outputs were recorded on tape. All instruments worked correctly.

Pibals were taken by John McNeil with the manual theodolite but readings were taken every 15 seconds. Ascents were started at 1109 and 1345.

The mobil van with the densitometer was operated by Bob Brown and S. SethuRaman. Five traverses were made with the smoke coming ashore near Ponquoque. Details will be reported separately. The lidar was not used.

The aircraft was manned by Ansel Tuthill. Temperature ascents were made from 500 to 3000 feet over the water at 1100 and inland at 1110 (Table 1 and Figure 1). The indicator was checked with a mercury thermometer and a correction applied to the readings.

Five variometer passes were made along a line from halfway between Tiana and Ponquoque to a point just east of Red Creek Road on the Peconic Bay shore. Flights were made at 600, 1000, 1300, 1600, and 1900 feet with the recorder on a scale of 100 mv/div. All traces are good. A qualitative diagram of the turbulence pattern is given in Figure 2.

Test smoke was started at 1045. The Liberty was then stationed one nautical mile south of Triton Lane (Figure 3) and emitted smoke from 1135 to 1335. During the test smoke period, the plume came ashore near Tiana but during the remainder of the run it crossed the beach near Ponquoque making an angle of about 22° with the shoreline. The plume was typical of stable conditions with little lateral or vertical diffusion.

A series of ten photographs at 1 minute intervals was taken from the Selma from 1145 to 1155 with the boat at photo position 1 (Figure 1) about 0.45 km from the plume. This position may be slightly in error since radio failure prevented taking simultaneous bearings from Tiana and Triton Lane.

Files August 10, 1973
G. Raynor and S. SethuRaman
Offshore Test No. 9

The aircraft made two photography passes over the plume at 80 mph taking pictures on black and white film at 5 second intervals. The first at 1200 at 1500 feet gave 26 pictures and the second at 1207 at 5000 feet gave 11. No pictures of the plume were taken from the side. Prints were made with an enlargement factor of 7.5 X. At 1215, moving pictures were taken of the plume on black and white film using the 16 mm Bell and Howell camera.

Anemometer data taken during the run are tabulated in Table 2 and plotted in Figure 4 which also shows the mean wind speed given by the anemometer on Liberty.

Kytoon temperature measurements were taken from the Liberty at 1015 about 3/4 mile south of Tiana. The system had been calibrated with the quartz crystal thermometer and adjusted the day before. Angles to the kytoon were taken with the sextant but the rangefinder was not used to determine distances. However, a description of the line curvature allowed calculation of the approximate heights shown in Table 3. Data are plotted on Figure 1 with the aircraft temperatures.

Temperatures taken on the Selma are also shown in Figure 1. The water temperatures look reasonable but the air temperatures are probably influenced by the boat. No temperatures were taken on the beach.

Data from the pibal ascents are plotted in Figure 5.

Oil consumption during the test smoke period averaged 11.59×10^{-2} gallons/minute. Water was discovered in the oil drum and the smoke generator shut down from 1106 to 1130. Oil loss was about 1.5 gallons after the shutdown. Oil consumption was quite steady at 6.45×10^{-2} gallons/minute during the remainder of the run after correction for loss. Drum pressure was held at 10 psi and generator pressure at 12 psi before shutdown and 10.5 psi afterwards.

The run was terminated at 1341. Personnel left Tiana at 1430 and the docks at 1515. They reached BNL at 1600.

In summary, gradient winds were nearly parallel to the shore and rather strong. Temperature measurements indicated a strong inversion over the water with isothermal conditions near the surface The plume was again typical of stable conditions.

TABLE 1 Run #9 7-13-73

Aircraft Temperatures

Ht. (m)	Over Water 1100-1105 °F	°C	Over Land 1110-1115 °F	°C
152.4	65.2	18.4	68.2	20.1
182.9	66.0	18.9	67.9	19.9
213.4	66.3	19.1	67.6	19.8
243.8	66.6	19.2	67.2	19.6
274.3	67.2	19.6	67.1	19.5
304.8	67.5	19.7	67.0	19.4
335.3	67.8	19.9	66.0	18.9
365.8	67.6	19.8	65.8	18.8
396.2	67.5	19.7	66.5	19.2
426.7	67.0	19.4	66.7	19.3
457.2	66.6	19.2	66.2	19.0
487.7	66.3	19.1	65.9	18.8
518.2	65.9	18.8	65.5	18.6
548.6	65.6	18.7	65.3	18.5
579.1	65.0	18.3	65.0	18.3
609.6	64.6	18.1	64.6	18.1
640.1	64.2	17.9	64.4	18.0
670.6	63.6	17.6	63.6	17.6
701.0	63.4	17.4	63.4	17.4
731.5	62.9	17.2	63.0	17.2
762.0	62.6	17.0	62.4	16.9
792.5	62.3	16.8	62.0	16.7
823.0	61.7	16.5	61.6	16.4
853.4	61.2	16.2	61.4	16.3
883.9	60.9	16.1	60.9	16.1
914.4	60.2	15.7	60.6	15.9

TABLE 2 Run #9 7-13-73

Anemometer Wind Speeds
(m/sec)

TIME (EST)	Parking Lot 3 m	Parking Lot 11 m	Parking Lot 16 m	Beach 2 m	Beach 4 m	Beach 6 m
1035-1040	6.84	7.86	8.55	6.52	6.80	7.09
1040-1045	6.28	7.01	8.15	5.71	6.05	6.32
1045-1050	6.07	6.76	7.34	5.66	5.88	6.13
1050-1055	5.99	6.79	7.34	5.71	5.99	6.29
1055-1100	6.00	6.60	7.15	5.40	5.69	6.00
1100-1105	6.15	6.70	7.19	5.38	5.58	5.85
1105-1110	6.22	6.94	7.46	5.74	5.99	6.29
1110-1115	6.13	6.90	7.54	5.81	6.04	6.33
1115-1120	5.96	6.62	7.15	5.38	5.66	5.96
1120-1125	5.74	6.45	6.93	5.21	5.52	5.79
1125-1130	6.28	6.98	7.54	5.83	6.13	6.46
1130-1135	6.37	7.17	7.76	5.91	6.27	6.60
1135-1140	6.40	7.25	7.92	5.86	6.13	6.47
1140-1145	6.36	7.21	7.87	6.06	6.35	6.67
1145-1150	6.23	7.09	7.78	5.85	6.15	6.53
1150-1155	5.85	6.78	7.48	5.47	5.80	6.12
1155-1200	5.45	6.25	6.76	4.95	5.21	5.47
1200-1205	4.85	5.79	6.30	4.61	4.89	5.10
1205-1210	4.97	5.76	6.16	4.70	4.98	5.10
1210-1215	4.56	5.58	6.05	4.65	4.91	5.12
			[illegible]	4.88	4.66	4.85

TABLE 3 Run #9 7-13-73

Kytoon Temperatures

Length Cable	Angle (degrees)	Est. Ht. (m)	Temp. °F	Temp. °C
10	-	9.0	65.9	18.8
20	54.0	16.5	65.0	18.3
30	50.5	24.0	65.0	18.3
40	49.5	31.0	64.9	18.3
50	44.0	35.0	65.0	18.3
60	43.0	39.0	65.0	18.3
70	41.0	44.0	65.0	18.3
80	38.0	48.5	64.9	18.3
90	35.0	52.0	64.0 ?	17.8 ?
100	34.0	55.0	65.0	18.3

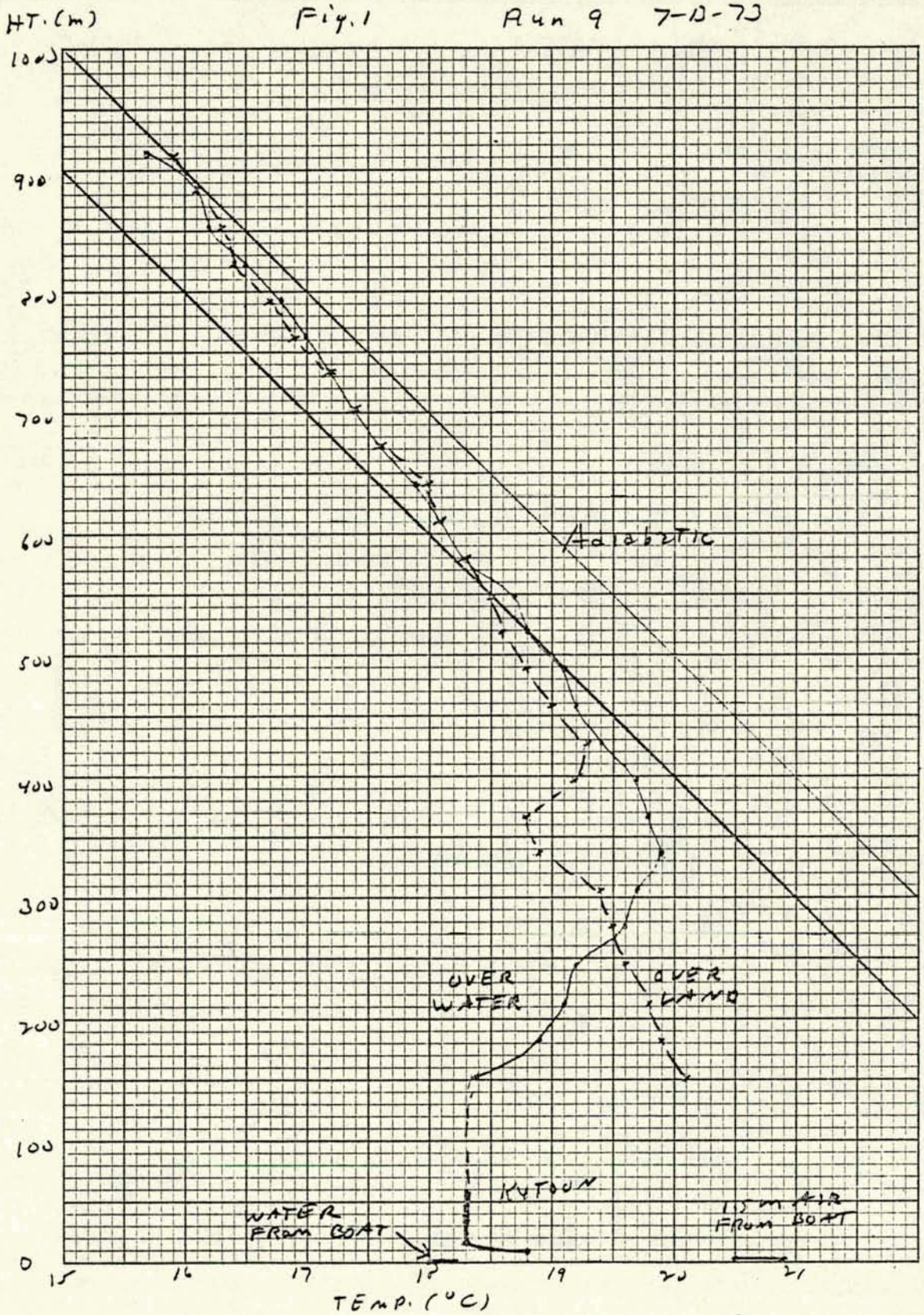
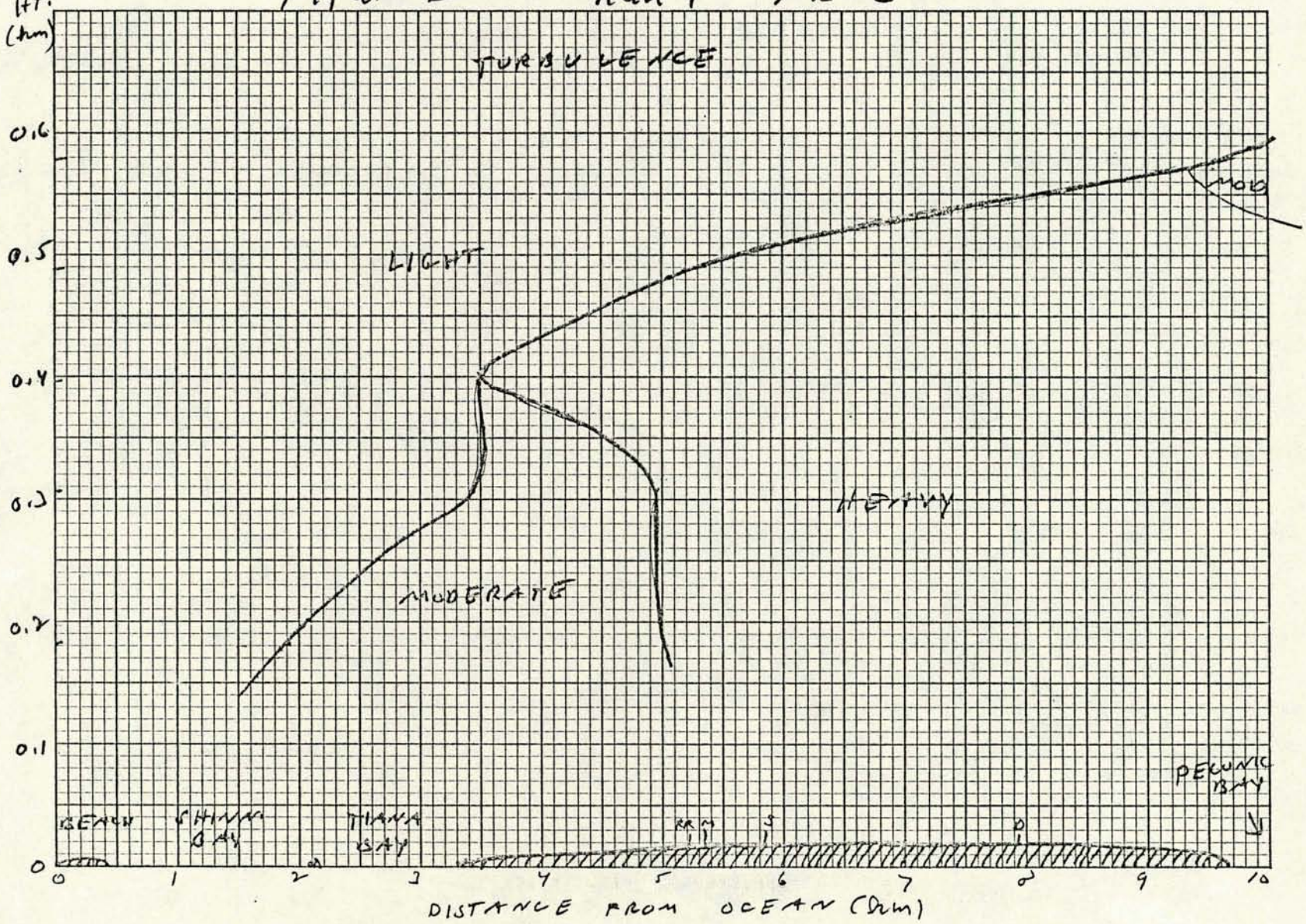

HT. (m)
Fig. 1
Run 9 7-13-73
1000
900
800
700
600
500
400
300
200
100
0
Adiabatic
OVER WATER
OVER LAND
KYTOON
WATER FROM BOAT
1.5 m AIR FROM BOAT
15
16
17
18
19
20
21
TEMP. (°C)

Figure 2 Run 9 7-13-73



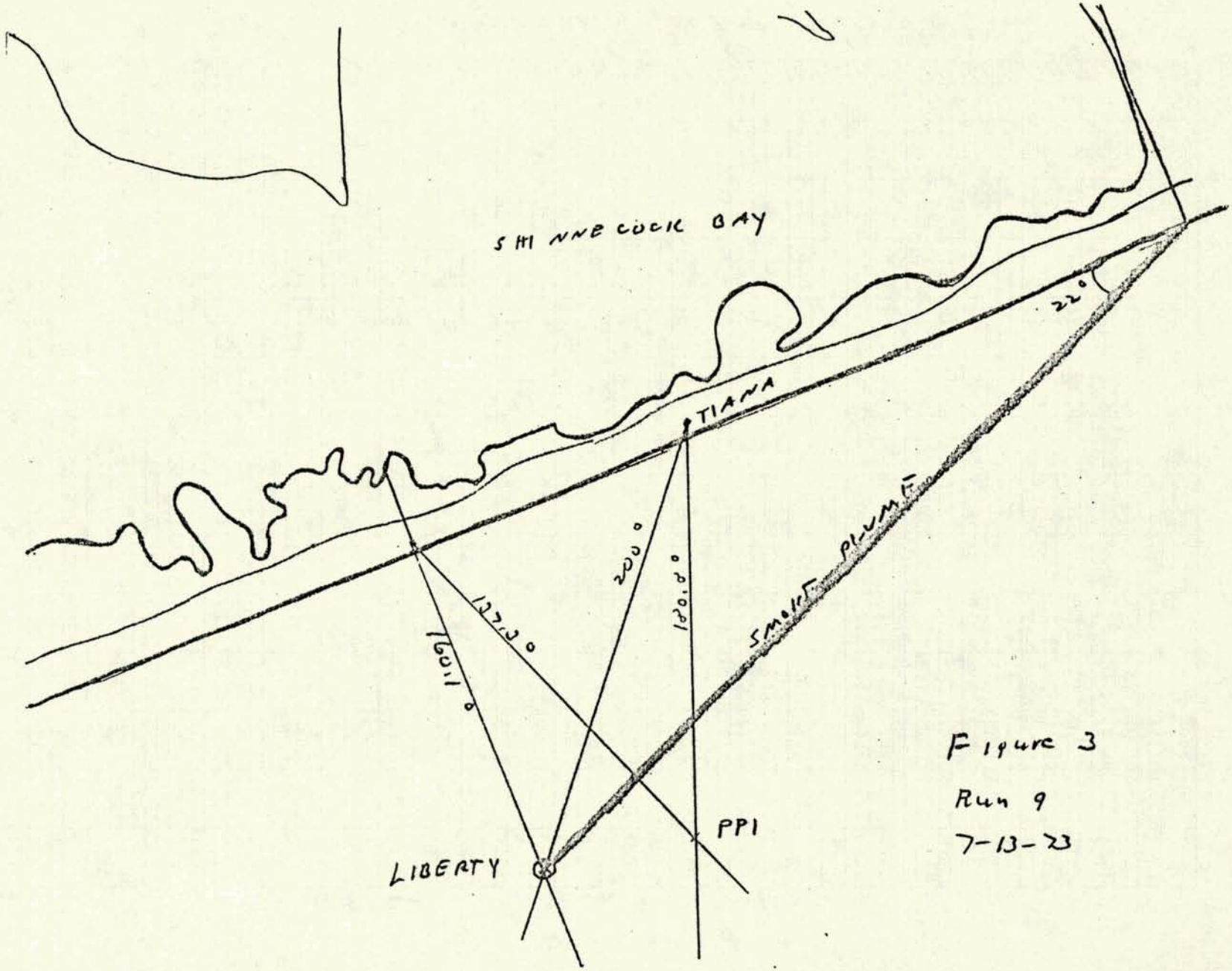


Figure 3
Run 9
7-13-23

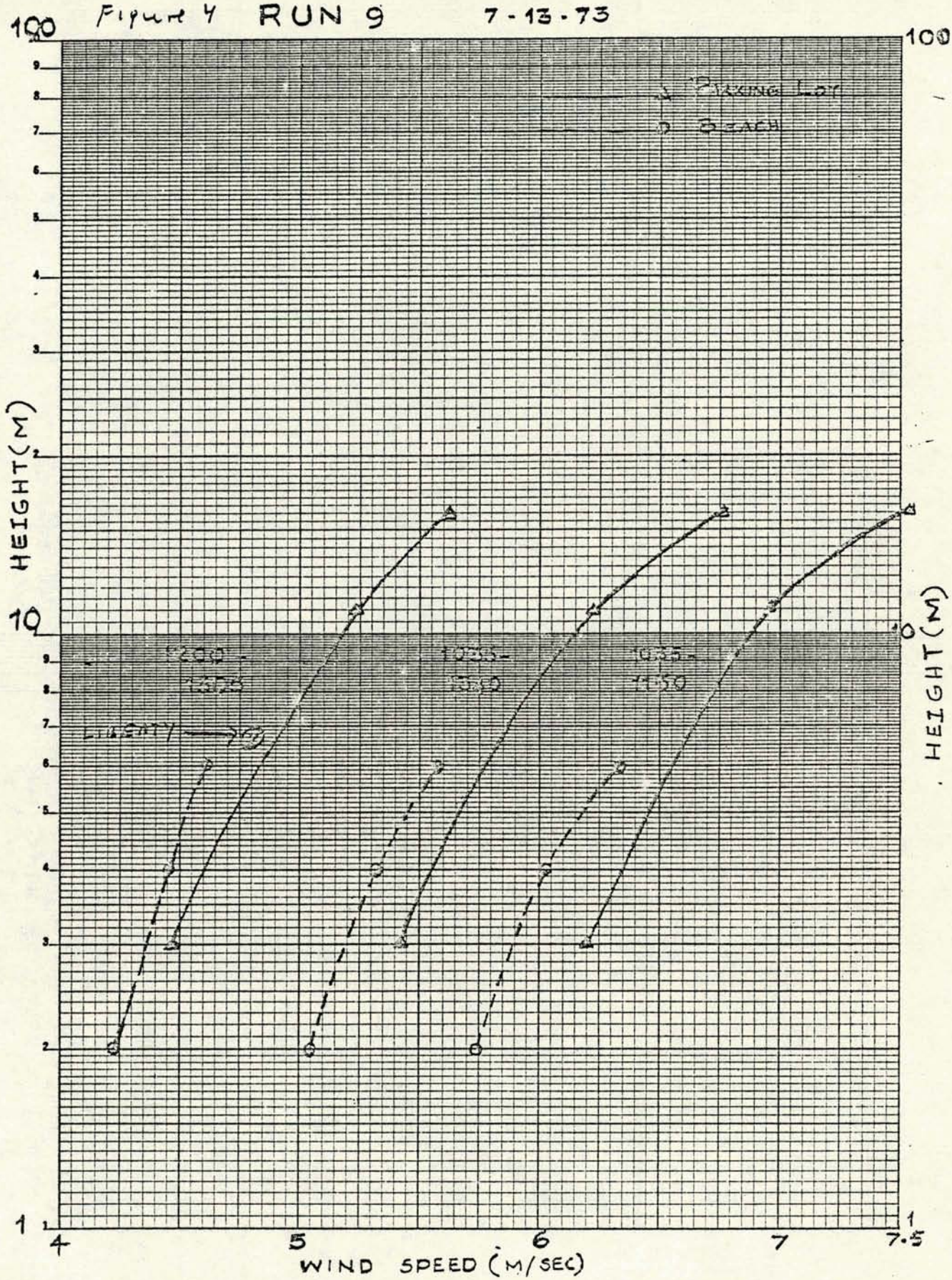


Figure 4 RUN 9 7-13-73
PARKING LOT
BEACH
HEIGHT (M)
WIND SPEED (M/SEC)
LIBERTY
1200-1325
1335-1350
1335-1350
100
10
1
4
5
6
7
7.5

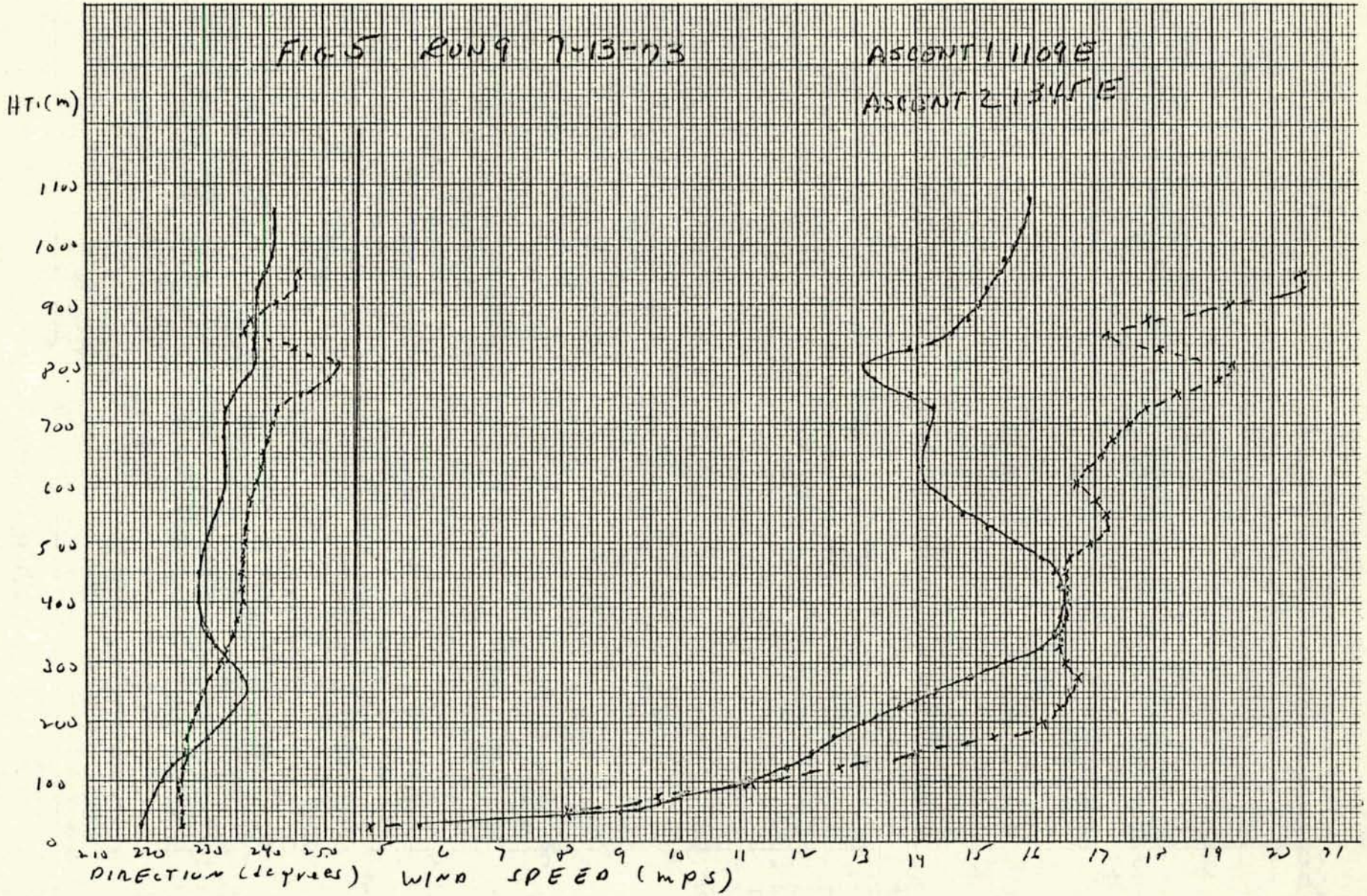


FIG 5 RUN 9 7-13-73
ASCENT 1 1109E
ASCENT 2 1145E
HT. (m)
1100
1000
900
800
700
600
500
400
300
200
100
0
210 220 230 240 250
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
DIRECTION (degrees)
WIND SPEED (mps)

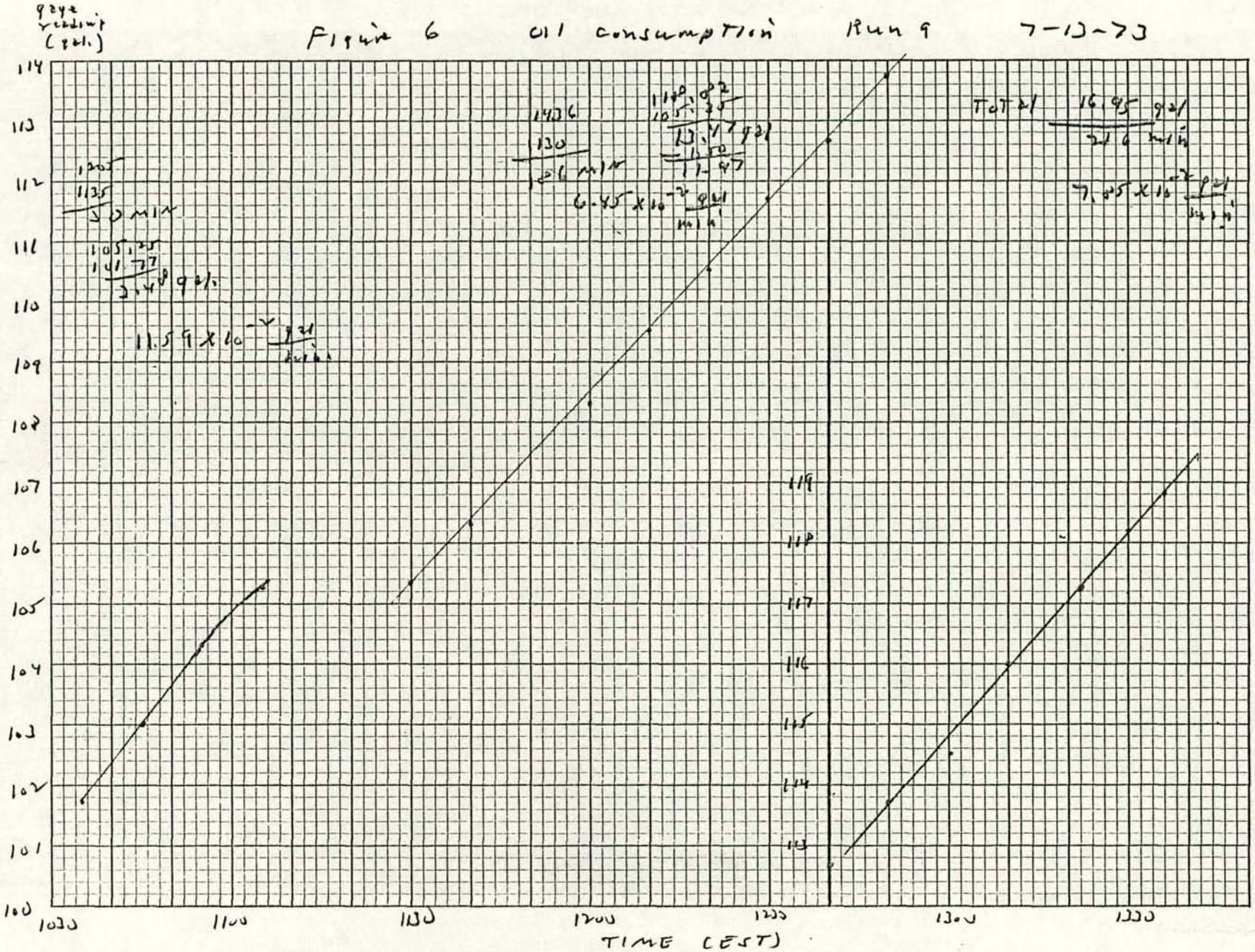


Figure 6 Oil consumption Run 9 7-13-73
TIME (EST)
TOTAL 16.95 gal / 216 min
7.85 x 10^-2 gal/min
1436
1330
106 min
6.45 x 10^-2 gal/min
1100.92
105.35
13.57 gal
1.50
11.57
1205
1135
50 min
105.125
101.77
3.48 gal
11.59 x 10^-2 gal/min

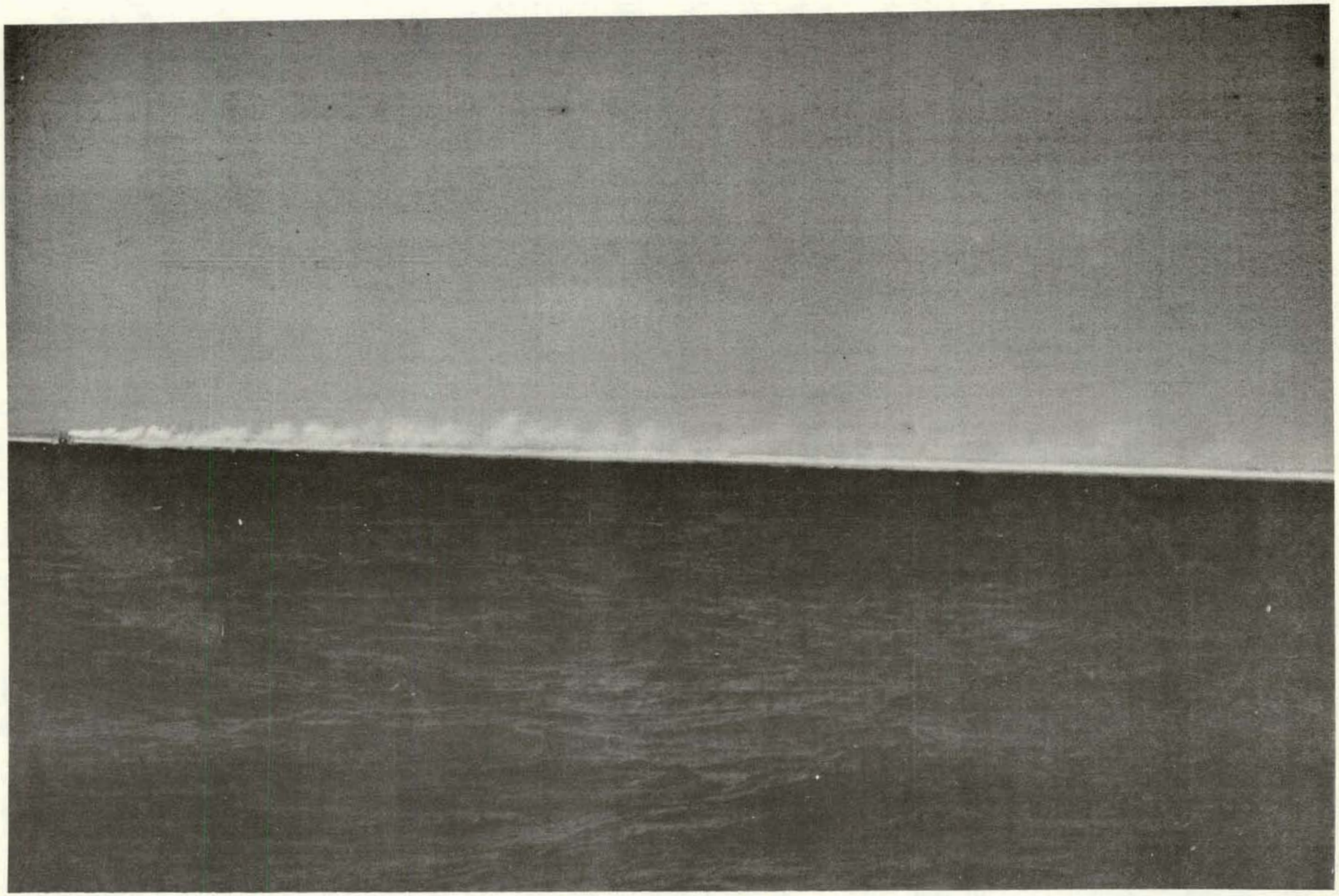


Figure 1. Smoke plume, Run 9, 7-13-73.

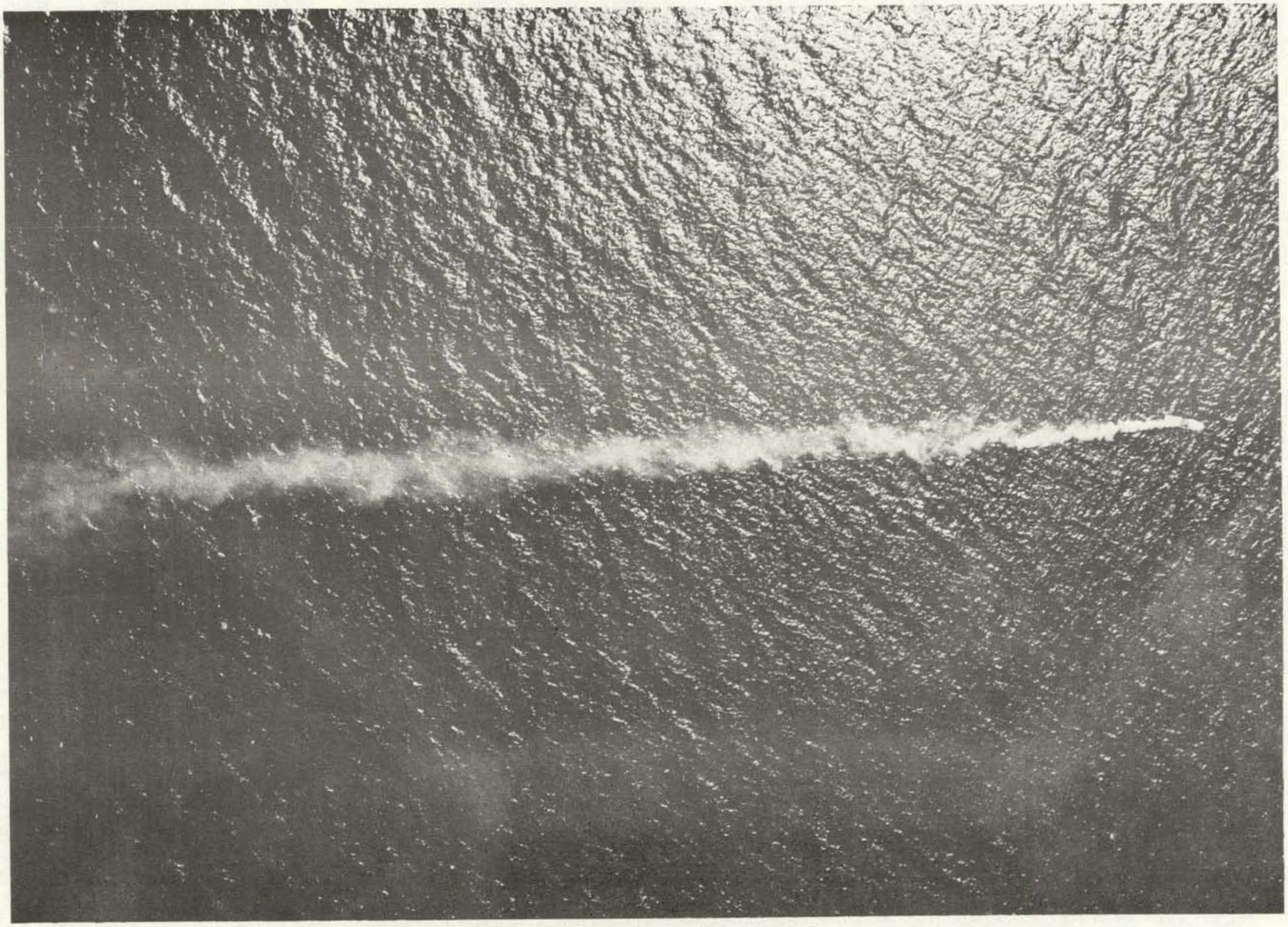


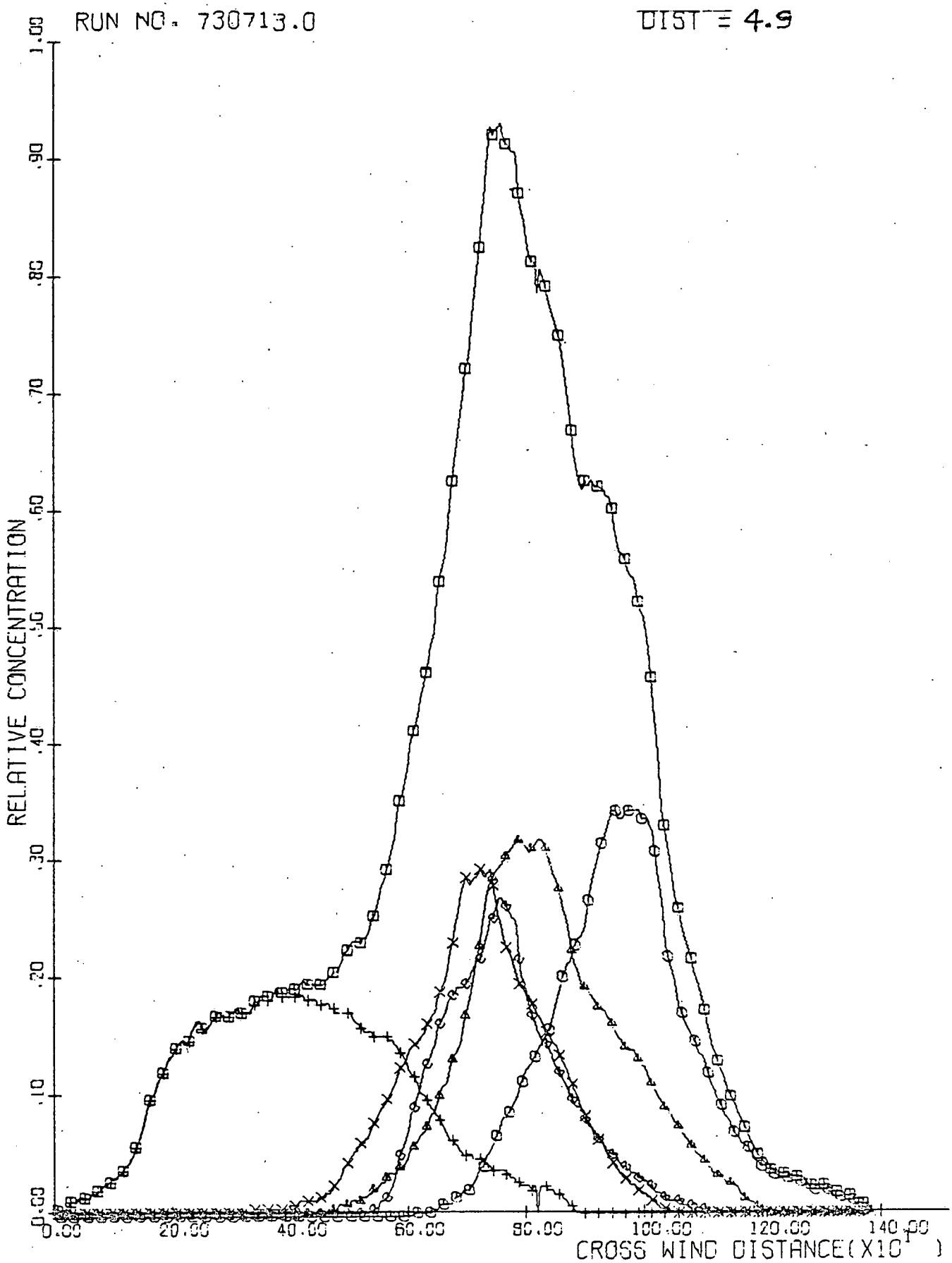
Figure 2. Aerial view of smoke plume,
Run 9, 7-13-73.

ON SHORE DENSITOMETER RUN FROM VAN
TRAVERSES AT ONE DISTANCE

RUN =730713./ DATE = 71373./DISTANCE FROM STACK (KM)= 4.90
DIRECTION(DEG) = 230./TIME FROM 1303 TO 1335 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGND)
1.0	.921E+02	963.1	123.5			8.98
2.0	.943E+02	830.7	129.3			6.71
3.0	.884E+02	416.5	170.0			4.78
4.0	.728E+02	723.7	113.7			5.90
5.0	.583E+02	764.6	100.4			5.34
GRAND TOTAL	.406E+03	741.8	131.9	231.3	190.1	
Corrected for plume angle			45.1	79.1	65.0	

3


RUN NO. 730713.0
DIST = 4.9
RELATIVE CONCENTRATION
1.00
.90
.80
.70
.60
.50
.40
.30
.20
.10
0.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
CROSS WIND DISTANCE(X10)

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Run No. 10
September 20, 1973

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: October 9, 1973

TO: Files

FROM: G. S. Raynor

SUBJECT: Offshore Test No. 10

The tenth overwater dispersion test was held on September 20, 1973. Clouds were scattered cirrus and cumulus during most of the run but increased to broken cirrus, altostratus and cumulus during the afternoon as a cold front approached. A small high was located east of Long Island. A weak NE-SW cold front was located in western New York at 1200z and passed Tiana soon after termination of the run with no precipitation. Waves were about 4 feet from the WSW and swells about 4-5 feet from the SE. High tide occurred at 0741 and low at 1300. Thus, the tide changed during the middle of the run. Eastern standard time is used throughout this report.

Personnel left BNL at 0810 and arrived at Tiana at 0900 and at the docks at 0915. The LSM and the Selma left the Inlet about 1100. All instruments were set up by 1110 at Tiana.

The LSM was manned by Walter Jahnig, Cy Fink and Dave Wales. The stack now extends 7.09 m above the water. The cup anemometer is mounted at 7.0 m. The new, larger kytoon was taken for temperature measurements but was lost when the line between the kytoon and temperature sensor parted after reaching 20 m due to the high winds. Water temperature was measured with a mercury thermometer. No trouble was experienced with the LCM which held position very steadily with one anchor. Test smoke was started at 1135. The boat was anchored by 1200. Smoke was produced from 1210 to 1407. Transfer of Jahnig to the Selma for densitometer measurements and photography was planned but not accomplished due to the rough seas. Thus, no data were obtained from the Selma which was dismissed at 1245.

The mobil tower at Tiana extended fully and was carefully oriented and leveled. The aerovane, bivane and hot film anemometer were mounted at 16.1 m. Cup anemometers were mounted at 3, 6 and 11 m. Thermocouple temperature sensors were mounted at 3, 6, 11

and 16.1 m. The hot wire anemometer was mounted at 6 m. Speed runs were taken on the charts from 1110-1155 and from 1313-1443, and on the tape recorder from 1110-1155, 1230-1315 and 1330-1415. The last speed run was coincident with densitometer traverses. The bivane was on the 0-80 mph range.

The beach mast was positioned about 2 m above and 12 m from the water. Anemometers were mounted at 2, 4 and 6 m. The 4-m counter failed at 1300 and was replaced but counts were lost for a short time. All counters were operated continuously from 1110 to 1443. Data are given in Table 1 and Figure 1. The beach profile again showed a maximum at 4 m.

Pibals were taken at 1210 and 1319 by John McNeil using the manual theodolite. Readings were taken at 30 second intervals, (Figures 2 and 3). Theodolite bearings on the LSM were taken from Tiana and Triton Lane. Gilbert Raynor coordinated activities from Tiana. The new radios worked well and no difficulty was experienced with communications. The lidar was used to take measurements of the plume from the west end of the Tiana parking lot. Five densitometer traverses were made from 1336 to 1419 by Bob Brown and S. SethuRaman with the plume crossing the beach at a 20° angle about 3/4 of the way from Tiana to Ponquogue. Distance from the source to the road at this point is 3.93 km (Figure 4). Earlier, the plume crossed somewhat further east.

The aircraft was manned by Ansel Tuthill. Temperature ascents were made from 500 to 3000 feet over the water from 1145-1155 and inland from 1200-1210. Lapse rates were near adiabatic or slightly less (Table 2 and Figure 5). The kytoon measurements at 10 and 20 m and the single water temperature measurement are also shown and suggest the presence of a small inversion close to the water. The aircraft temperature indicator was set with the mercury thermometer before use.

East-west variometer runs about 1/4 mile off shore were made from Smith Point to Shinnecock Inlet from 1133 to 1233 at about 2000 feet at 80 mph and from Shinnecock Inlet to Moriches Inlet at 500 feet at 80 mph from 1450 to 1459.

Six NW-SE runs were made along a line from a point over the ocean about 1/2 mile east of Tiana to a point on Flanders Bay about halfway between Goose Creek Point and Red Cedar Point. Flights were made as follows at 75 mph:

Offshore Test No. 10 October 9, 1973

Run No.	Heading	Height ft.	Height km	Time	Length of Record (min.)
1	NW	500	0.15	1235	4.3
2	SE	1000	0.31	1240	5.8
3	NW	1500	0.46	1246	4.5
4	SE	2000	0.61	1253	5.8
5	NW	2500	0.77	1300	4.8
6	SE	3000	0.92	1307	4.5

All variometer runs were made with the chart on 100 mv/div. The turbulence pattern is diagrammed in Figure 6.

Photography runs over the plume were made at 1225 and 1320, both at 2000 feet at 75 mph with pictures at 5 second intervals. Additional pictures were taken from the side.

Since no photographs of the plume were obtained at sea, a number were taken from the beach to document the appearance of the plume. Five were taken from the west end of Tiana parking lot at 1 minute intervals from 1226 to 1230 and four from Triton Lane at 1 minute intervals from 1257 to 1300. After termination of the run, the LSM emitted smoke while drifting close offshore past Tiana. A number of additional photos were taken during this period. A few other pictures were taken of equipment on the trailer tower and on the LSM.

The plume was slightly unstable but was quite straight with little meander and fairly narrow. Some upward diffusion took place most of the time and some looping was observed particularly late in the run when air temperatures probably decreased slightly. The plume was not quite as unstable as that of run 4 on October 3, 1972.

Oil consumption was reasonably steady (Figure 7) and after allowing for loss averaged 0.103 gallons/minute. Drum pressure was held at 12 psi and generator pressure at 9.5 psi.

The run was terminated at 1443. Personnel left Tiana at 1540 and the beach at 1550. They reached BNL before 1700.

In summary, gradient WSW winds with only a small inversion in the lowest levels over the water and somewhat less than adiabatic lapse rates above contributed to a slightly unstable plume.

GSR/lk

Table 1
Cup Anemometer Wind Speeds Run No. 10 9-20-73
(m/sec)

Gradient Wind from Southwest

Time (EST)	Beach			Parking Lot		
	2 m	4 m	6 m	3 m	6 m	11 m
1110-1115	7.02	8.38	7.84	6.57	7.84	8.16
1115-1120	7.00	8.38	7.67	6.38	7.68	8.00
1120-1125	7.30	8.72	7.99	6.69	8.16	8.11
1125-1130	6.79	8.14	7.61	6.25	7.70	7.84
1130-1135	7.10	8.39	7.67	6.36	7.95	8.18
1135-1140	7.39	8.80	8.25	7.06	8.38	8.43
1140-1145	7.40	8.75	8.21	6.94	8.55	8.32
1145-1150	7.72	9.20	8.56	7.53	8.78	8.89
1150-1155	7.28	8.71	8.14	7.46	8.46	8.25
1155-1200	6.67	8.06	7.53	6.91	7.72	7.74
1200-1205	7.15	8.52	7.84	6.51	8.04	8.14
1205-1210	7.14	8.12	8.23	7.09	8.28	8.37
1210-1215	6.99	8.46	7.95	7.05	8.13	8.25
1215-1220	7.28	8.85	8.35	7.33	8.31	8.50
1220-1225	7.39	8.81	8.30	6.87	8.26	8.45
1225-1230	6.95	8.43	8.01	7.14	7.95	8.13
1230-1235	6.98	8.43	7.97	6.39	7.68	8.06
1235-1240	6.95	8.47	8.04	6.92	7.96	8.26
1240-1245	7.13	8.63	8.19	7.37	7.98	8.32
1245-1250	7.08	8.48	7.95	7.66	8.17	8.34
1250-1255	6.96	8.41	7.95	7.57	7.99	8.04
1255-1300	6.88	8.30	7.80	7.20	7.98	7.82
1300-1305	6.72	-	7.79	7.20	7.80	8.00
1305-1310	7.14	-	8.06	7.52	7.90	8.15
1310-1315	7.07	-	8.08	7.94	8.27	8.44
1315-1320	7.12	-	8.07	7.94	8.23	8.43
1320-1325	7.63	9.10	8.57	8.31	8.94	8.81
1325-1330	7.72	9.18	8.56	8.01	8.58	8.69
1330-1335	7.37	8.90	8.37	8.03	9.14	8.76
1335-1340	7.30	8.82	8.34	7.99	8.60	8.76
1340-1345	7.46	8.90	8.43	8.18	8.57	8.74
1345-1350	8.07	9.62	9.01	8.41	9.01	9.22
1350-1355	7.27	8.74	8.24	7.93	8.71	8.62
1355-1400	7.96	9.55	8.92	8.76	9.49	9.40
1400-1405	7.68	9.20	8.59	8.61	9.01	9.02
1405-1410	7.83	9.37	8.77	8.28	8.86	8.96
1410-1415	7.60	9.13	8.60	8.39	9.05	9.15
1415-1420	8.16	9.73	9.16	8.06	8.97	9.07
1420-1425	7.77	9.20	8.68	7.46	8.65	8.84
1425-1430	8.16	9.72	9.10	8.27	9.27	9.39
1430-1435	7.55	9.19	8.43	7.55	8.60	8.97
1435-1440	7.73	9.27	8.72	8.29	8.99	9.13
1440-1445	7.96	9.60	9.06	8.55	9.48	9.59
MEAN						
1110-1445	7.34	8.83	8.27	7.51	8.42	8.53

Table 2

Aircraft Temperatures

Run No. 10 9-20-73

Ht. (m)	1145 - 1155 E Over Water °F	°C	1200 - 1210 E Over Land °F	°C
153.3	63.3	17.4	66.0	18.9
184.0	62.8	17.1	65.8	18.8
214.7	62.6	17.0	64.4	18.0
245.4	62.1	16.7	64.4	18.0
276.1	61.6	16.4	63.4	17.4
306.7	61.0	16.1	63.0	17.2
337.4	60.8	16.0	62.1	16.7
368.1	60.0	15.6	61.8	16.6
398.8	59.5	15.3	60.8	16.0
429.4	58.8	14.9	60.7	15.9
460.1	58.6	14.8	60.2	15.7
490.8	58.4	14.7	59.4	15.2
521.5	57.7	14.3	58.8	14.9
552.1	57.1	13.9	58.6	14.8
582.8	56.5	13.6	57.8	14.3
613.5	55.8	13.2	57.3	14.1
644.2	55.4	13.0	56.3	13.5
674.8	55.2	12.9	55.8	13.2
705.5	54.9	12.7	55.8	13.2
736.2	54.8	12.7	55.2	12.9
766.9	54.7	12.6	54.8	12.7
797.6	54.2	12.3	54.3	12.4
828.2	53.8	12.1	53.8	12.1
858.8	53.2	11.8	53.4	11.9
889.5	53.0	11.7	52.8	11.6
920.2	52.5	11.4	52.0	11.1

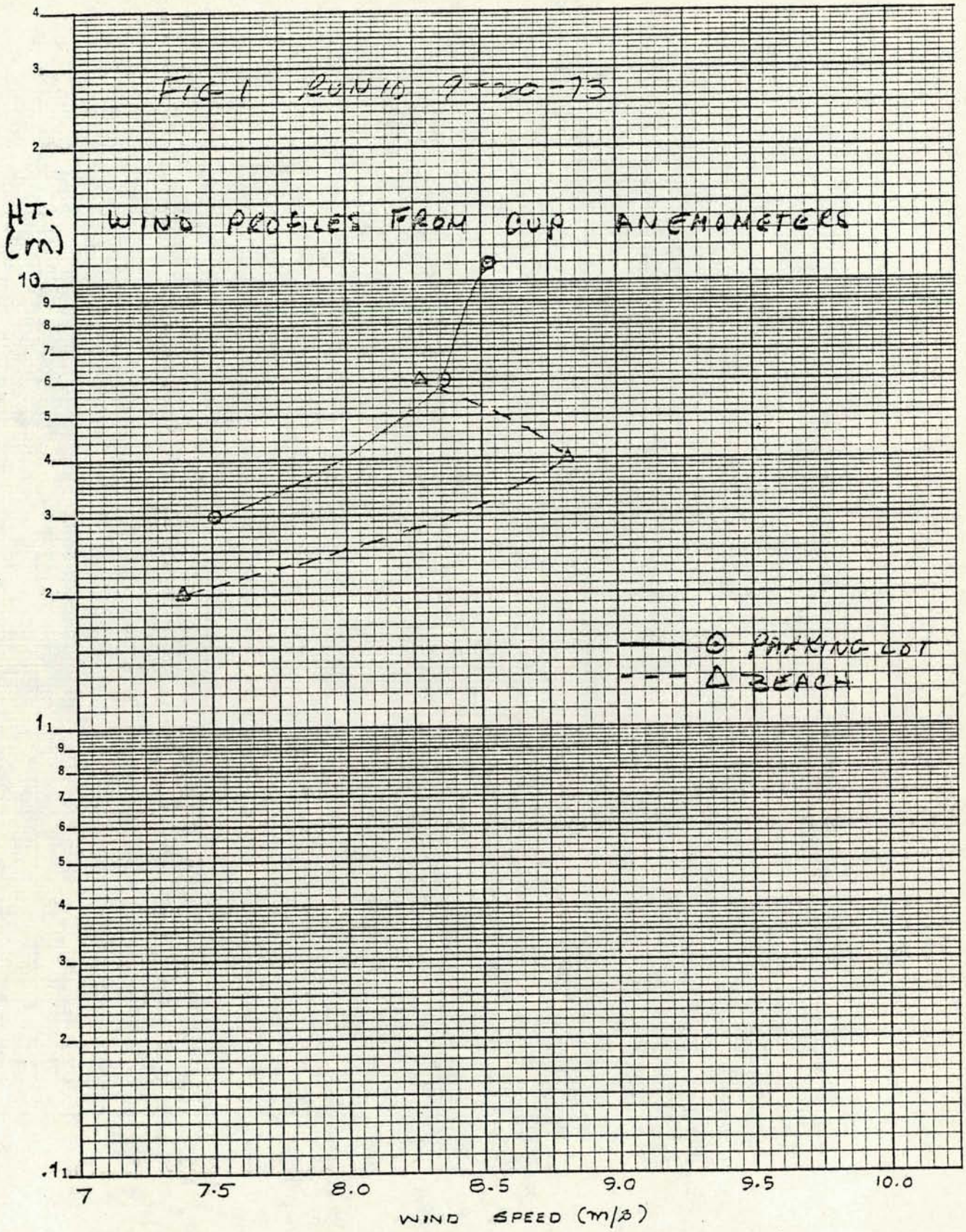
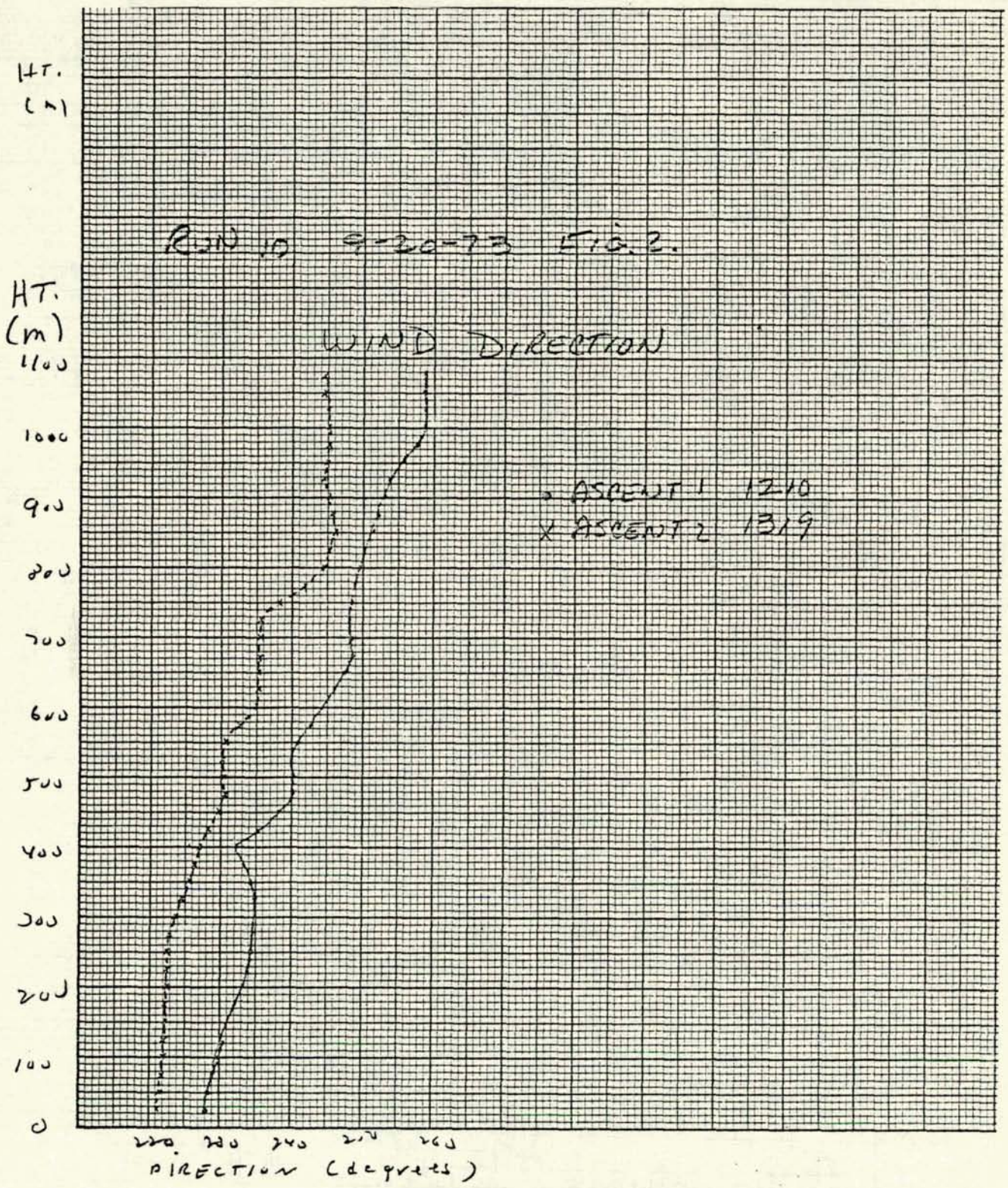
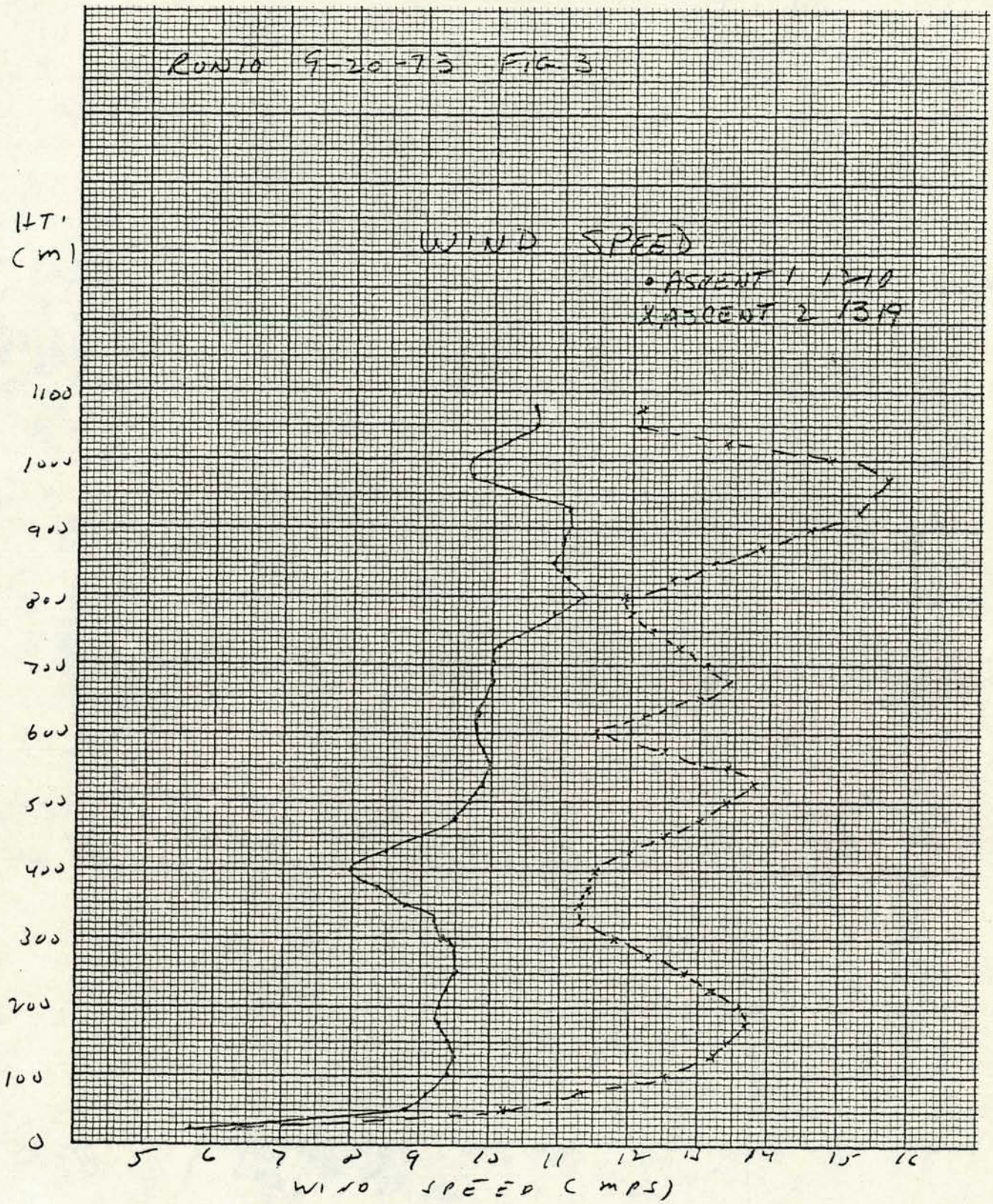


FIG 1 RUN 10 9-20-73
WIND PROFILES FROM CUP ANEMOMETERS
HT. (m)
10
1
.1
7
7.5
8.0
8.5
9.0
9.5
10.0
WIND SPEED (m/s)
PARKING LOT
BEACH


HT. (m)
RUN 10 9-20-73 FIG. 2.
WIND DIRECTION
HT. (m)
1100
1000
900
800
700
600
500
400
300
200
100
0
. ASCENT 1 1210
X ASCENT 2 1319
220 240 260
DIRECTION (degrees)


RUN 10 9-20-73 FIG 3.
WIND SPEED
• ASCENT 1 1218
X ASCENT 2 1314
HT (m)
1100
1000
900
800
700
600
500
400
300
200
100
0
5 6 7 8 9 10 11 12 13 14 15 16
WIND SPEED (MPS)

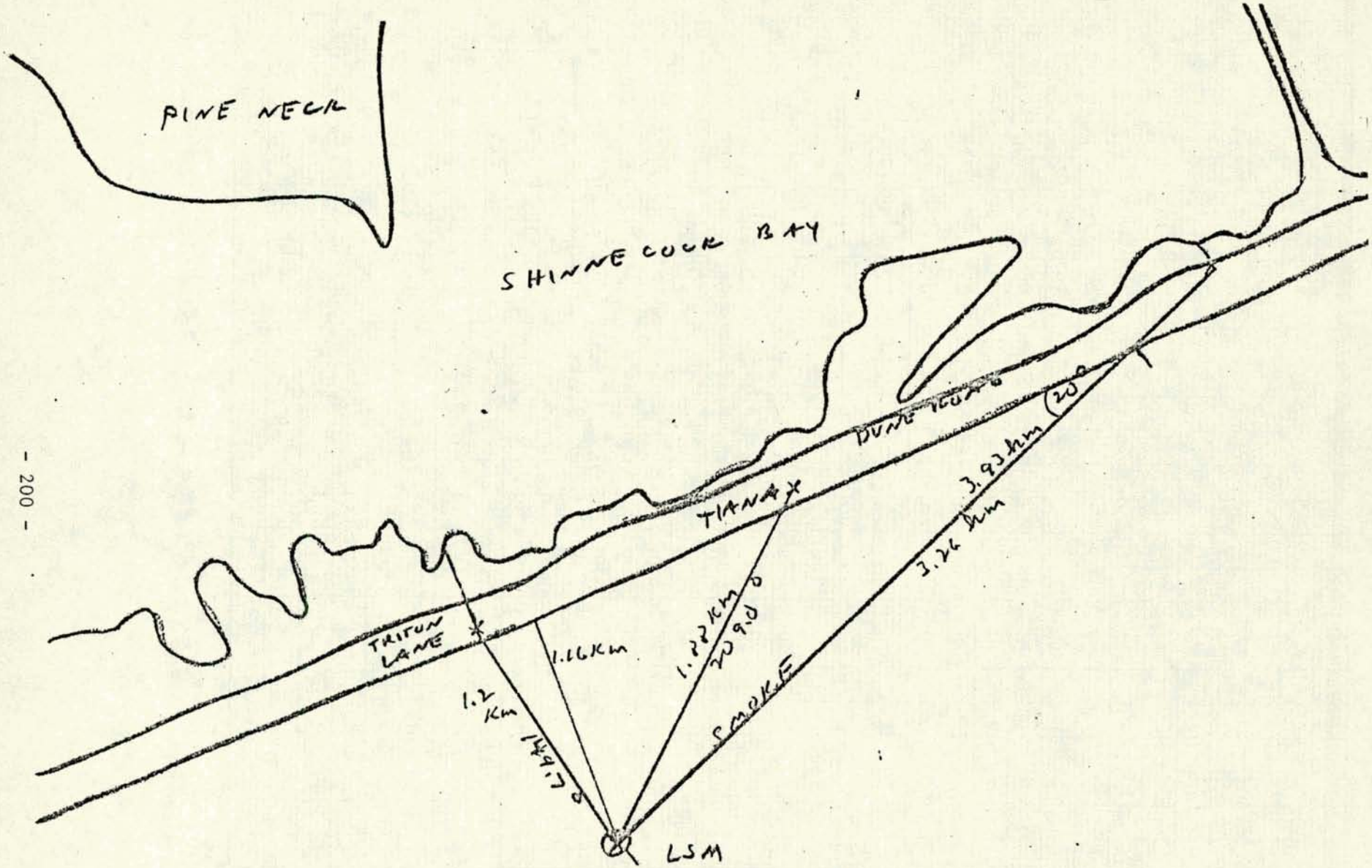
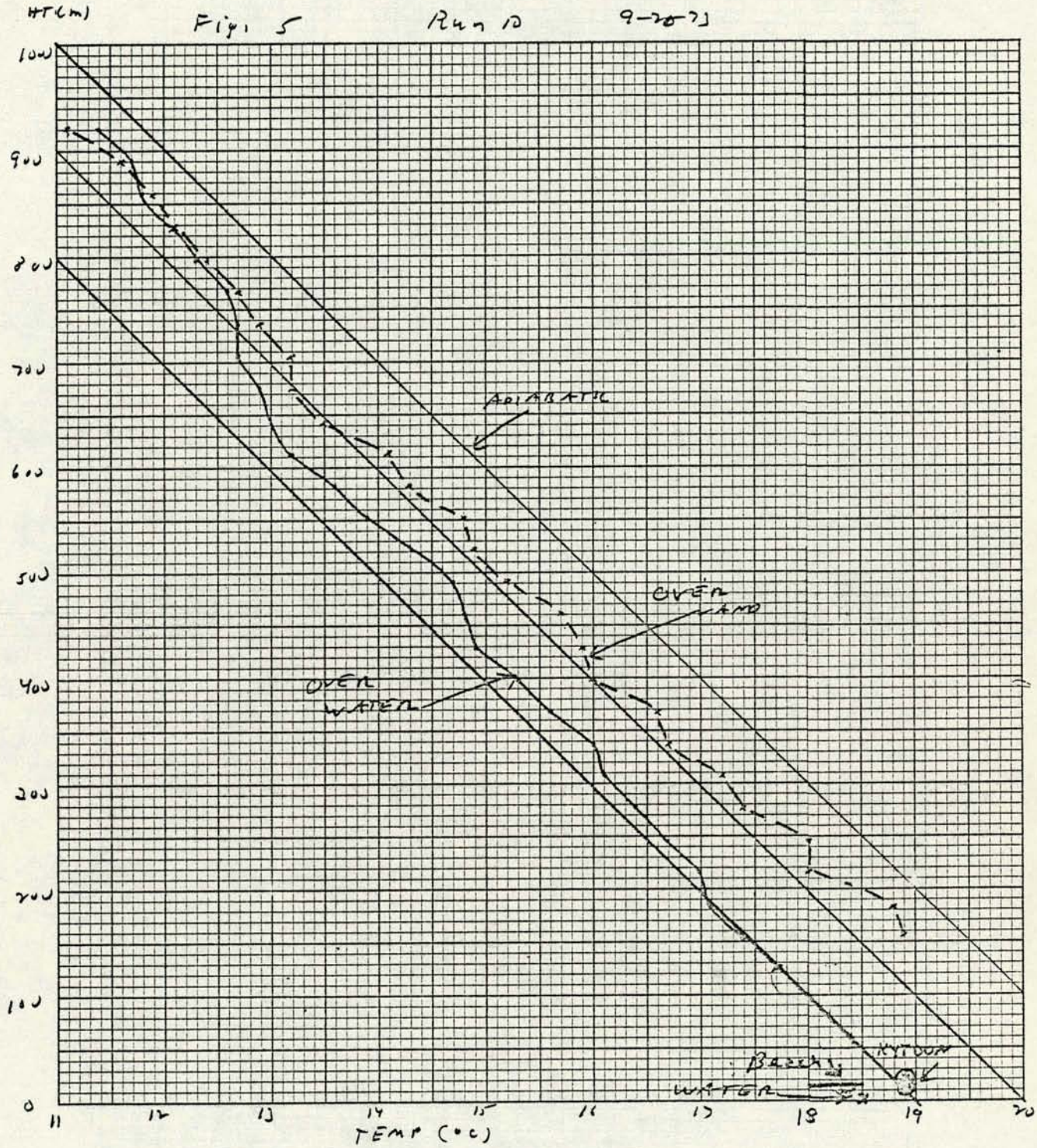


Fig. 4 Run 10 9-20-73


HT(m)
Fig. 5
Run 10
9-20-73
1000
900
800
700
600
500
400
300
200
100
0
11
12
13
14
15
16
17
18
19
20
TEMP (°C)
ADIABATIC
OVER LAND
OVER WATER
BASEL
WATER
KYTOON

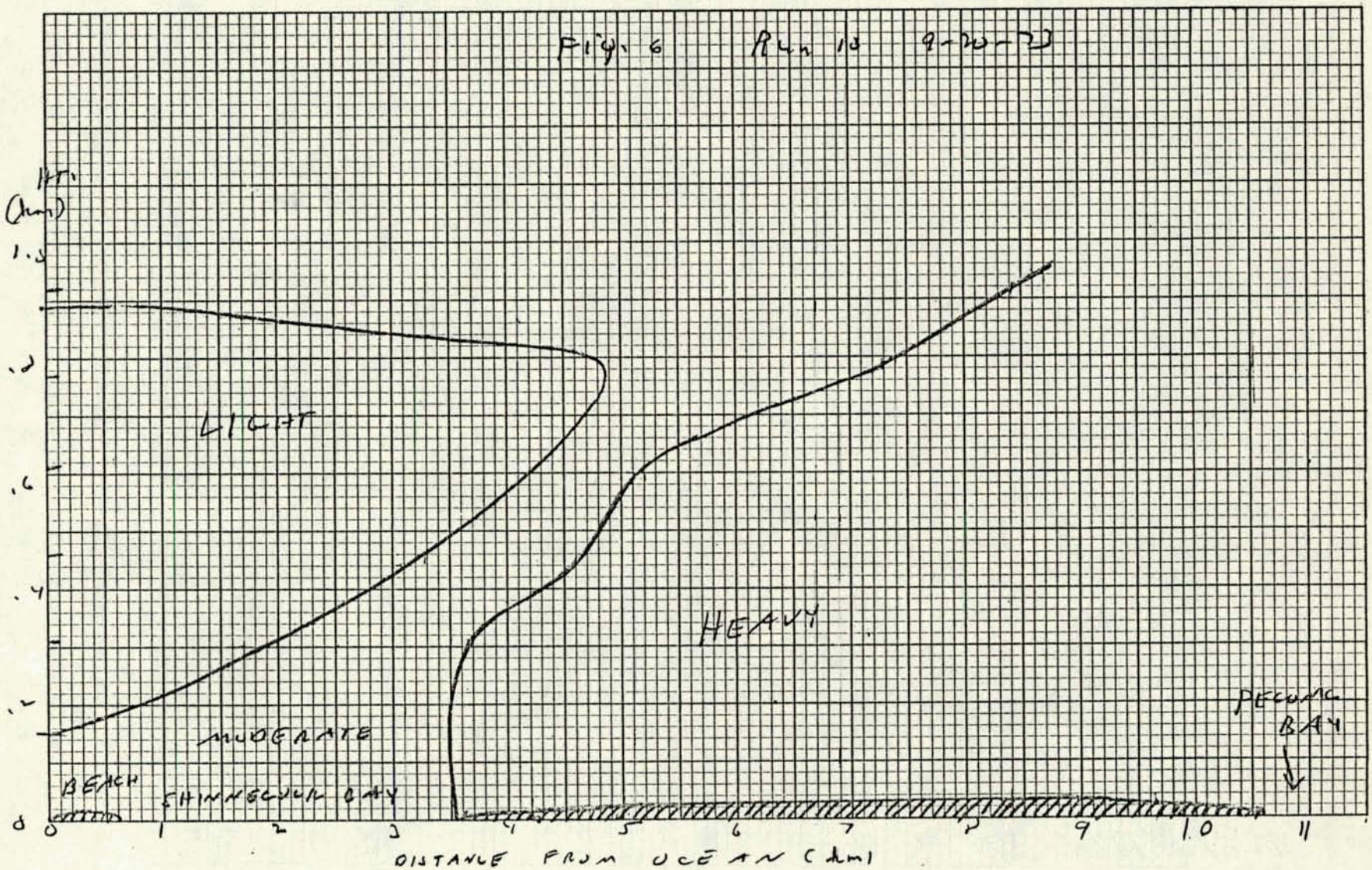
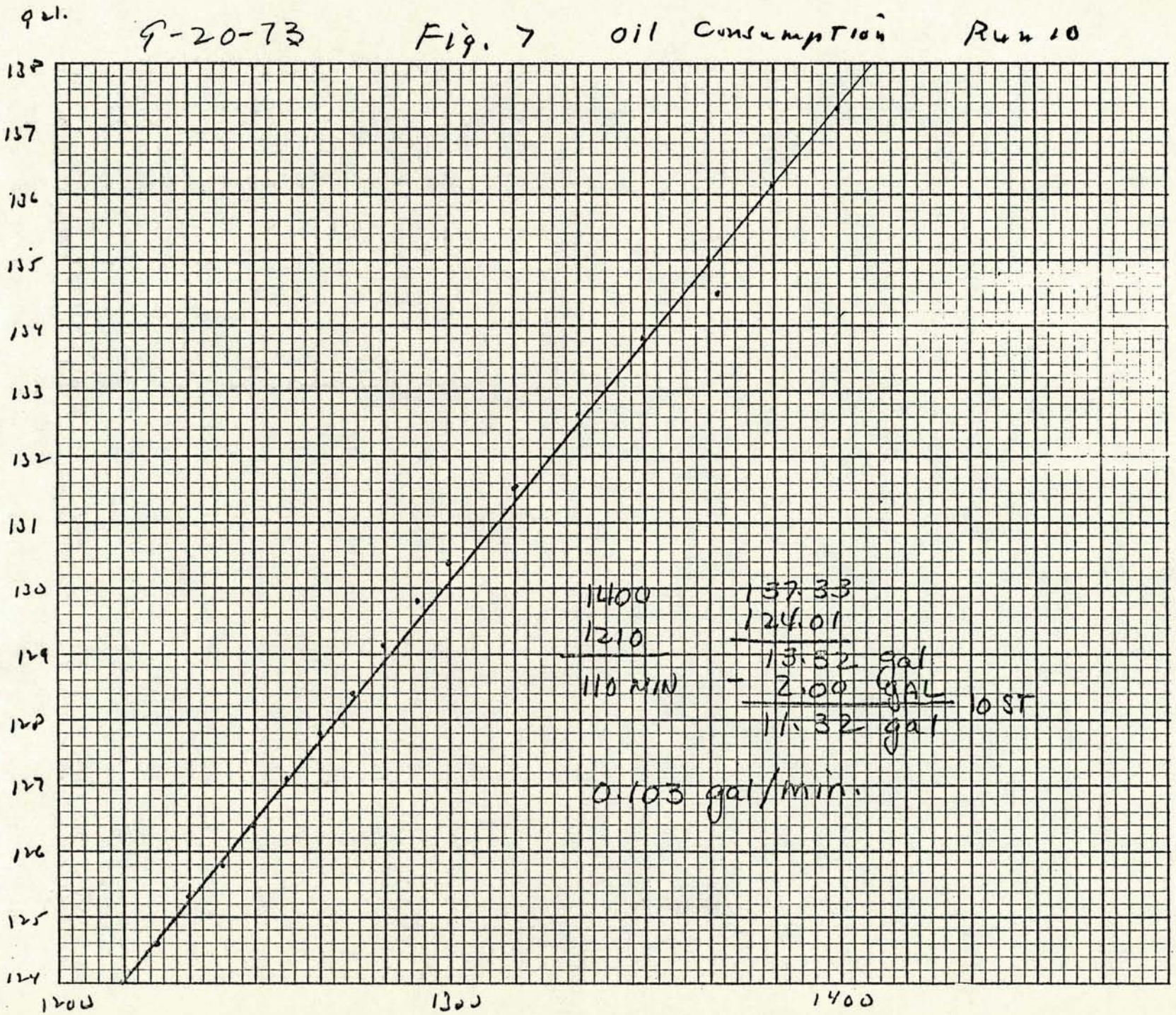


Fig. 6 Run 18 9-20-73
HT. (km)
1.0
.8
.6
.4
.2
0
LIGHT
HEAVY
MODERATE
BEACH
SHINNECOCK BAY
PECONIC BAY
0
1
2
3
4
5
6
7
8
9
10
11
DISTANCE FROM OCEAN (km)


gal.
9-20-73
Fig. 7 Oil Consumption Run 10
138
137
136
135
134
133
132
131
130
129
128
127
126
125
124
1200
1300
1400
1400
1210
110 MIN
137.33
124.01
13.32 gal
- 2.00 gal
11.32 gal
OST
0.103 gal/min.

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: July 28, 1976

TO: Files

FROM: G. Raynor

SUBJECT: Offshore Test No. 10

Temperature data from the mobile tower at Tiana were omitted from the Memo of October 9, 1973. The chart has now been read and mean values for the period from 1110 - 1443 E are as follows:

3 m	19.0 °C
6 m	18.4
11 m	18.3
16 m	18.2

GR:mlk

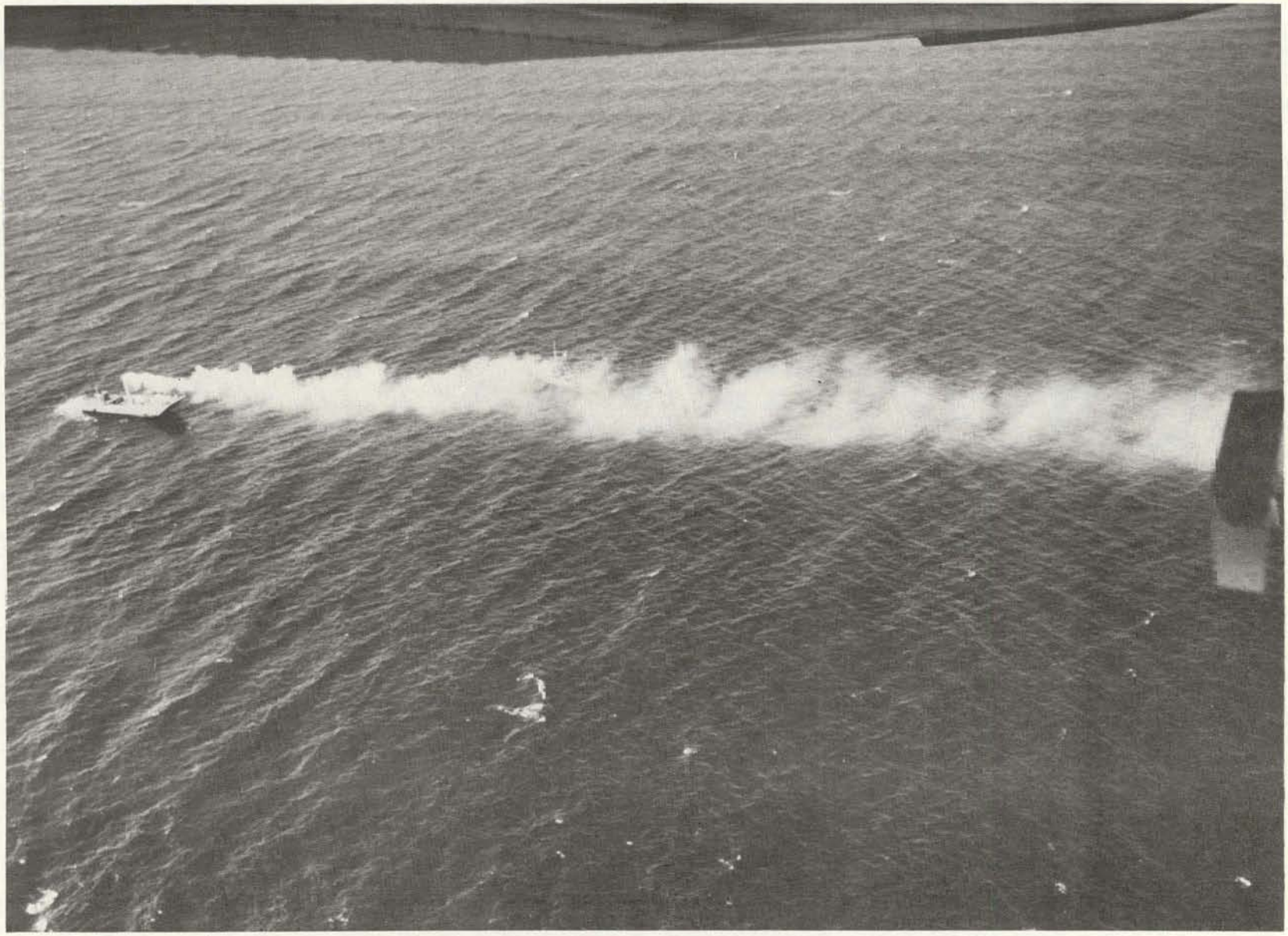


Figure 1. Aerial view of smoke plume,
Run 10, 9-20-73.

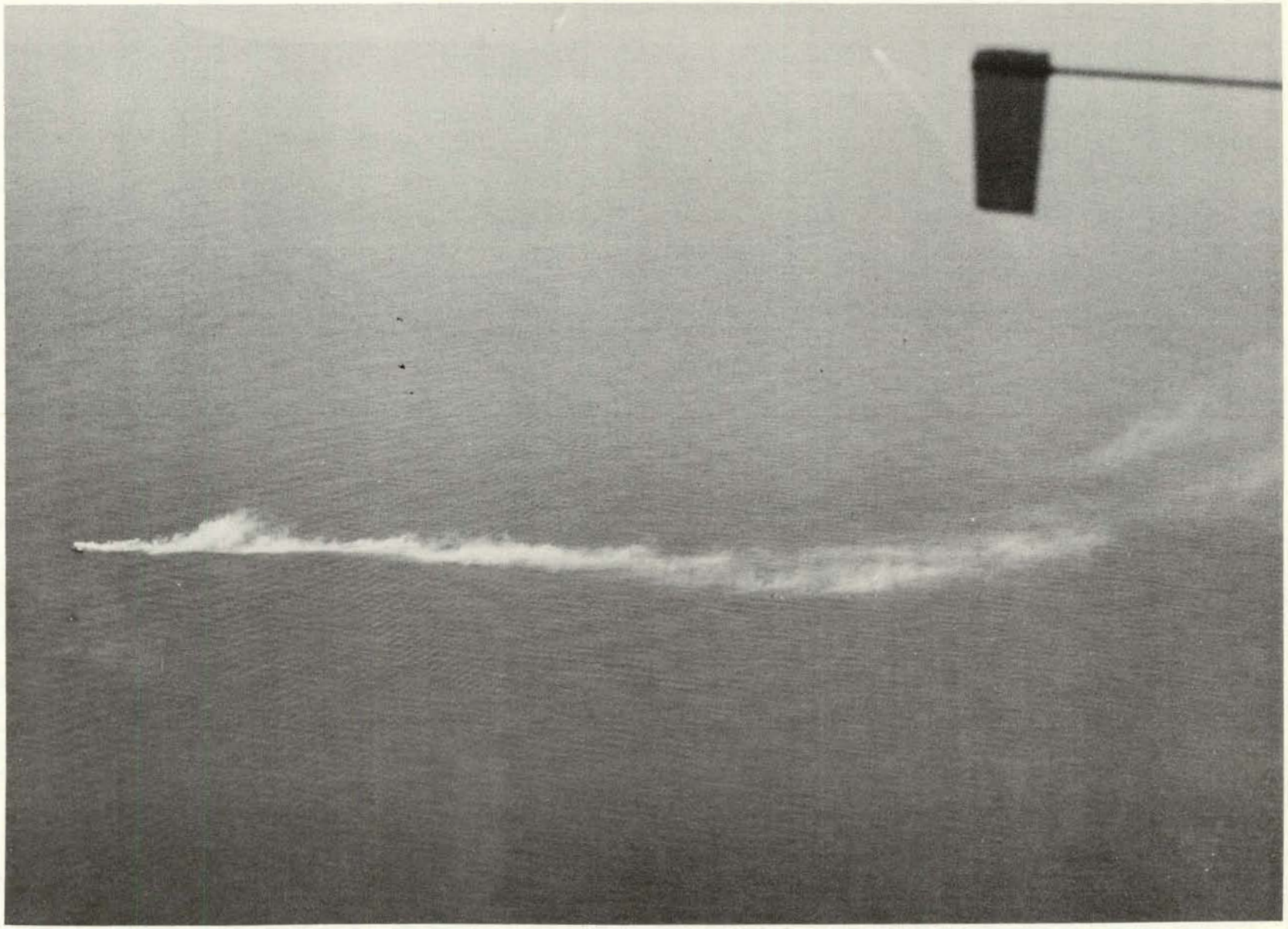
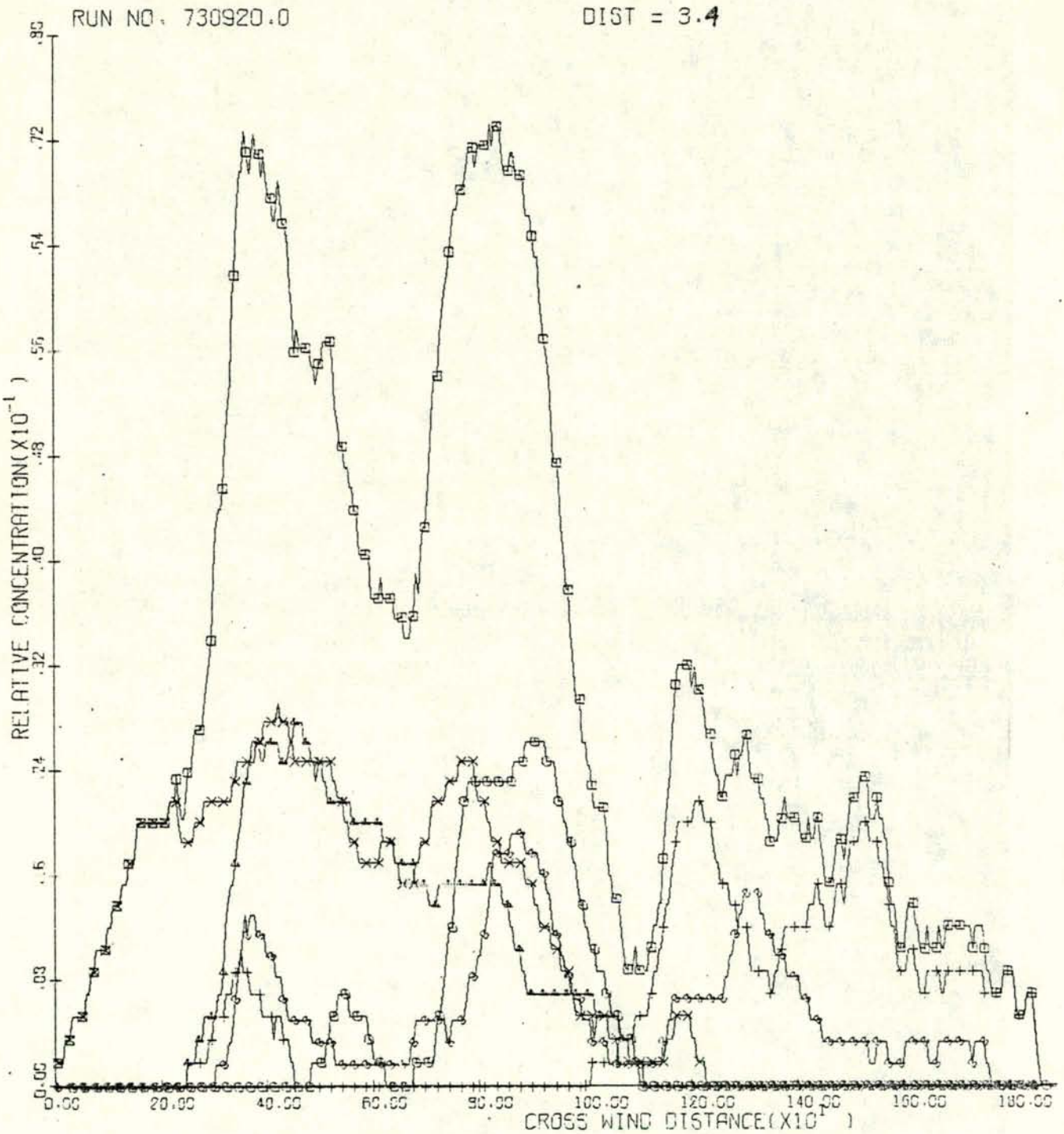


Figure 2. Aerial view of smoke plume,
Run 10, 9-20-73.

Figure 3. Aerial view of smoke plume,
Run 10, 9-20-73.


RUN NO. 730920.0
DIST = 3.4
RELATIVE CONCENTRATION(X10^{-1})
.00
.03
.6
.24
.32
.40
.48
.56
.64
.72
.80
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
CROSS WIND DISTANCE(X10^{1})

ON SHORE DENSITOMETER RUN FROM VAN
TRAVERSES AT ONE DISTANCE

RUN =730920./ DATE = 92073 /DISTANCE FROM STACK (KM)= 3.43
DIRECTION(DEG) = 230./TIME FROM 1336 TO 1419 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGND)
1.0	.714E+01	827.4	122.9			1.45
2.0	.125E+02	586.8	200.9			1.56
3.0	.103E+02	1318.5	376.7			.68
4.0	.189E+02	528.3	269.7			1.76
5.0	.909E+01	988.6	371.8			.52
GRAND TOTAL	.580E+02	790.1	284.9	410.3	295.3	
Corrected for plume angle			97.4	140.3	101.0	

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Run No. 11
April 11, 1974

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: April 23, 1974

TO: Files

FROM: G. S. Raynor

SUBJECT: Offshore Test No. 11

The eleventh overwater dispersion test was held on April 11, 1974. Scattered cirrus increased to broken cirrus and cirrostratus during the day. Light haze was present. A large low was located over eastern Canada with a high ridge from Hudson Bay to Cape Hatteras. The ridge had two centers, one near James Bay and the other in Virginia with a weak trough between over northern New York. Winds were expected to be westerly in the morning shifting to SW as the ridge moved east. The shift to SW occurred near noon but lasted only an hour or so before the wind swung back to WSW at 1305. Waves were about 3 feet from the SW. No appreciable swell was noted. High tide occurred at 0957. Thus, the tide was going out throughout the run. Eastern standard time is used throughout this report.

Personnel left BNL at 0855, arrived at the LCM at 0945 and at Tiana at 1000. The boats left the Inlet about 1045. All instruments were up at Tiana by 1200.

The LCM was manned by Walter Jahnig, Ed Divis and Ron Meyers plus a visitor. After inspecting the spar buoy, test smoke was started at 1130. The LCM was then positioned 1 nautical mile off shore about 1.5 miles west of Tiana (Figure 1). Smoke was restarted at about 1200, shut down at 1415 for refueling and emitted again from 1430 to 1512.

The boat anemometer recorder was operated on fast speed throughout the run. Mean speed at 7 m was 7.4 mps, somewhat lower than at the same level on the beach. During the period of SW flow, it averaged 6.0 mps and after the shift to WSW, 7.9 mps.

A kytoon ascent for temperature measurements was made at 1240 but angles were not measured with the sextant until the last three heights and the concurrent rangefinder measurements are incorrect. Thus, heights were estimated from length of line and heights obtained with the same lengths on previous ascents. When the wind shifted,

the kytoon dived into the water and became wet so further ascents could not be made. Water and low-level air temperatures were measured with a mercury thermometer using a bucket for the water temperatures.

The Liberty was manned by Sy Fink. A series of ten pictures at 30 second intervals was taken of the plume from the photo position (PP) shown in Figure 1 from 1248-1253. However, the exact position of the smoke during that period was not recorded so quantitative σ_z measurements may not be possible. Other still and moving pictures were taken of the LCM and the plume.

Marker buoys were set out in the positions shown in Figure 1 and, starting at 1305, five densitometer traverses were made at 1/2 mile and five at 1 mile downwind after the wind shifted parallel to the shore. An earlier attempt while the plume was headed toward Tiana failed when the wind shifted.

Tiana Beach was manned by Brown, McNeil, Michael, Raynor and SethuRaman. Two visitors were present as observers. The mobil tower extended fully and was carefully oriented and leveled. The Aerovane, bivane, a cup anemometer, temperature sensor and thermistor heat flux probe were mounted at 16.1 m. Cup anemometers and temperature sensors were also mounted at 3, 6 and 11 m. The beach mast was placed about 15 m from and 1/2 m above the water but by the end of the run it was about 35 m from and about 1 m above the edge. Cup anemometers were mounted at 1, 2, 3 and 4 m and the hot wire anemometer at 4 m.

Beginning of data collection was delayed since damage to the wires to the building had cut power to our outlet. A town employee was called so that we could plug in inside the building. Beach anemometers were started at 1110 and those on the trailer tower at 1200. Charts were also started at 1200 and put on speed at 1255. Data from the bivane and hot wire anemometer were recorded on tape. All instruments operated properly. The run was terminated at 1514. Anemometer data are tabulated in Table 1 and plotted in Figure 2.

No densitometer measurements were made on the beach due to the wind shift. The plume originally hit the beach near Ponquogue, then shifted to slightly west of Tiana. Before traverses could be made, it shifted out to sea. Near the end of the run, it was reported from the aircraft to be crossing the tip of the east breakwater at Shinnecock Inlet.

Pibal ascents were made at 1317 and 1440 (Figures 3 and 4). Triangulation measurements on the boats, the marker buoys and the spar buoy were made from Tiana and Triton Lane.

The aircraft was manned by Ansel Tuthill. Temperature soundings from 500-2000 feet were taken over the ocean at 1110 and 1430 and inland at 1125 and 1425 (Table 2 and Figure 5). Lapse rates were near adiabatic inland and slightly stable over the water. The second sounding showed a small inversion to 300 m. However, low-level air and water temperature measurements indicate a larger, low-level inversion. Kytoon temperature measurements are given in Table 3 and plotted in both Figures 5 and 6. Tower temperature measurements for the periods before and after the wind shift and air and water temperatures from the LCM are also shown in Figure 6.

North-south variometer traverses were made farther east than usual to avoid the effect of Shinnecock Bay. Five passes were made from 1240-1310 from Lake Agawam in Southampton to the mouth of North Sea Harbor at 80 mph with the recorder on the 100 mv/ div. scale. Data were also recorded on tape. Due to the wind shift, the flight path was most nearly at right angles than parallel with the wind. Passes were made as follows:

Pass	Heading	Ht. (m)	Length of record (min)
1	S	610	3.3
2	N	488	4.0
3	S	391	4.0
4	N	305	4.1
5	S	213	4.7

The turbulence pattern is more complex than observed previously (Figure 7). Since the flow was from WSW, the area of light turbulence near the north shore was undoubtedly caused by air flowing across Peconic Bay north of the Shinnecock Canal area. The height of the area of very light turbulence to the south agrees fairly well with the height of the inversion over the ocean. The local boundary layer was apparently below the lowest flight altitude.

Photo passes over the plume were made as follows at 80 mph:

Pass	Height (m)	Interval	Direction
1	305	5 sec.	Boat to beach
2	305	5 sec.	Beach to boat
3	610	10 sec.	Boat to beach
4	610	10 sec.	Boat to beach

A few additional 35 mm and black and white movies were taken. During boat densitometer traverses nos. 4 and 5 at the 1 mile distance, pictures were taken while the Liberty was traversing the plume. At pass 4, the plane was at 305 m and during pass 5 at 457 m. These will allow a direct comparison of σ_y computed from the photos with those from the densitometer.

Oil consumption rate decreased slightly during the run (Figure 8) but averaged 7.35×10^{-2} gal/min. after correction for small losses in the stack.

The run was terminated at 1514. Personnel left Tiana at 1620 and the boats at 1700. They reached BNL at 1745.

In summary, the plume was stable but a little more uneven in the vertical than during the very stable earlier runs. In spite of the rather high wind speeds, considerable meander occurred in addition to the wind direction shifts.

GSR/lk

TABLE 1

Cup Anemometer Wind Speeds Run 11 4-11-74

	Beach Mast				Parking Lot			
TIME (EST)	1 m	2 m	4 m	6 m	3 m	6 m	11 m	16 m
1110-1115	6.66	7.03	7.42	8.41				
1115-1120	6.49	6.84	7.21	8.26				
1120-1125	6.18	6.52	6.87	7.86				
1125-1130	5.91	6.24	6.59	7.55				
1130-1135	5.84	6.15	6.51	7.51				
1135-1140	5.95	6.29	6.60	7.51				
1140-1145	6.35	6.69	7.10	8.04				
1145-1150	6.05	6.39	6.78	7.75				
1150-1155	5.93	6.28	6.62	7.55				
1155-1200	5.91	6.23	6.61	7.52	-	-	-	-
1200-1205	6.14	6.42	6.80	7.79	6.71	7.51	8.60	9.10
1205-1210	5.83	6.19	-	7.48	6.98	7.48	8.59	9.11
1210-1215	5.68	6.03	-	7.27	6.87	7.34	8.30	8.81
1215-1220	6.19	6.55	-	7.94	7.25	7.82	9.20	9.76
1220-1225	6.05	6.34	-	7.63	7.30	7.47	8.81	9.45
1225-1230	5.60	5.93	6.32	7.32	7.32	7.36	8.53	9.05
1230-1235	5.98	6.32	6.70	7.56	7.39	7.55	8.55	8.98
1235-1240	5.76	6.09	6.48	7.40	7.15	7.41	8.38	8.86
1240-1245	5.53	5.87	6.26	7.13	7.23	7.45	8.38	8.89
1245-1250	5.36	5.73	6.07	6.92	7.04	7.03	8.01	8.47
1250-1255	5.36	5.73	6.10	6.96	7.19	7.31	8.10	8.61
1255-1300	5.23	5.56	5.95	6.78	6.86	7.00	7.68	8.08
1300-1305	4.86	5.19	5.59	6.32	6.51	6.56	7.35	7.72
1305-1310	4.94	5.26	5.57	6.31	6.30	6.43	7.27	7.52
1310-1315	4.70	5.00	5.32	5.99	5.92	5.97	6.53	6.71
1315-1320	4.91	5.20	5.47	6.19	5.61	6.17	6.96	7.30
1320-1325	8.38	8.93	9.23	10.27	7.96	9.59	10.79	11.24
1325-1330	8.43	8.87	9.21	10.29	7.81	9.47	10.72	11.20
1330-1335	7.95	8.36	8.59	9.67	7.71	9.51	10.51	10.99
1335-1340	7.64	8.00	8.26	9.31	6.92	8.47	9.94	10.38
1340-1345	7.53	7.85	8.17	9.18	6.80	8.74	9.96	10.45
1345-1350	7.45	7.81	8.19	9.28	7.30	8.41	9.99	10.43
1350-1355	7.67	8.05	8.33	9.39	6.82	8.53	9.94	10.48
1355-1400	7.87	8.22	8.55	9.59	7.54	8.83	10.17	10.96
1400-1405	7.67	8.09	8.41	9.51	8.35	9.17	10.46	11.00
1405-1410	7.74	8.10	8.40	9.45	8.23	9.01	10.26	10.69
1410-1415	6.96	7.28	7.59	8.52	7.29	8.42	9.55	9.92
1415-1420	7.06	7.37	7.61	8.59	7.51	8.00	9.39	9.84
1420-1425	7.08	7.43	7.74	8.69	7.19	8.28	9.42	9.97
1425-1430	7.69	8.12	8.45	9.55	7.38	8.77	10.43	10.97
1430-1435	7.88	8.24	8.50	9.58	7.83	9.02	10.43	11.05
1435-1440	7.35	7.74	8.02	9.10	7.92	8.48	10.09	10.55
1440-1445	6.93	7.30	7.66	8.67	7.62	8.45	9.48	11.48
1445-1450	7.33	7.60	7.80	8.90	7.13	8.33	9.74	10.32
1450-1455	8.18	8.67	9.00	10.13	7.33	9.28	10.90	11.61
1455-1500	7.99	8.34	8.64	9.71	6.72	8.30	10.27	10.91
1500-1505	7.35	7.68	7.90	8.91	6.57	8.01	9.67	10.18
1505-1510	6.53	6.79	7.02	7.88	5.98	6.99	8.67	9.21
1510-1515	6.41	6.67	6.92	7.80	5.97	7.58	8.75	9.23
1200-1515	6.69	7.05	7.45	8.34	7.13	8.00	9.20	9.69

TABLE 2 Run 11 4-11-74

Aircraft Temperatures (°C)

Height (m)	1110E Over Ocean	1125E Over Land	1425E Over Land	1430E Over Ocean
152.4	9.1	-	11.2	10.0
182.9	8.8	11.0	10.9	9.7
213.4	8.6	10.8	10.7	9.9
243.8	8.6	10.8	10.5	9.8
274.3	8.5	10.4	10.1	10.0
304.8	8.4	10.1	10.3	10.3
335.3	8.1	9.6	10.3	10.1
365.8	7.9	9.5	10.1	9.9
396.2	7.6	9.6	10.2	9.6
426.7	7.6	8.6	10.2	9.4
457.2	7.1	8.4	9.8	9.2
487.7	7.0	8.3	9.9	8.9
518.2	6.9	8.0	9.8	8.8
548.6	6.4	7.7	9.4	8.6
579.1	6.1	7.0	9.4	8.3
609.6	5.9	7.2	8.7	8.1
640.1	5.8	7.0	8.3	7.9
670.6	5.3	6.9	8.1	7.6
701.0	5.3	6.4	7.9	7.7
731.5	4.8	6.3	7.8	7.6
762.0	4.6	5.8	7.6	7.4

Table 3

Kytoon Temperatures (^{o}C) Run 11 4-11-74

Ht. (m)	Temp. (^{o}C)
8	7.8
14	8.1
20	8.3
26	8.1
31	7.8
36	8.1
40	8.1
44	7.8
46	7.8
48	7.8
49	7.5
52	7.2

Run 11 4-11-74 Figure 1

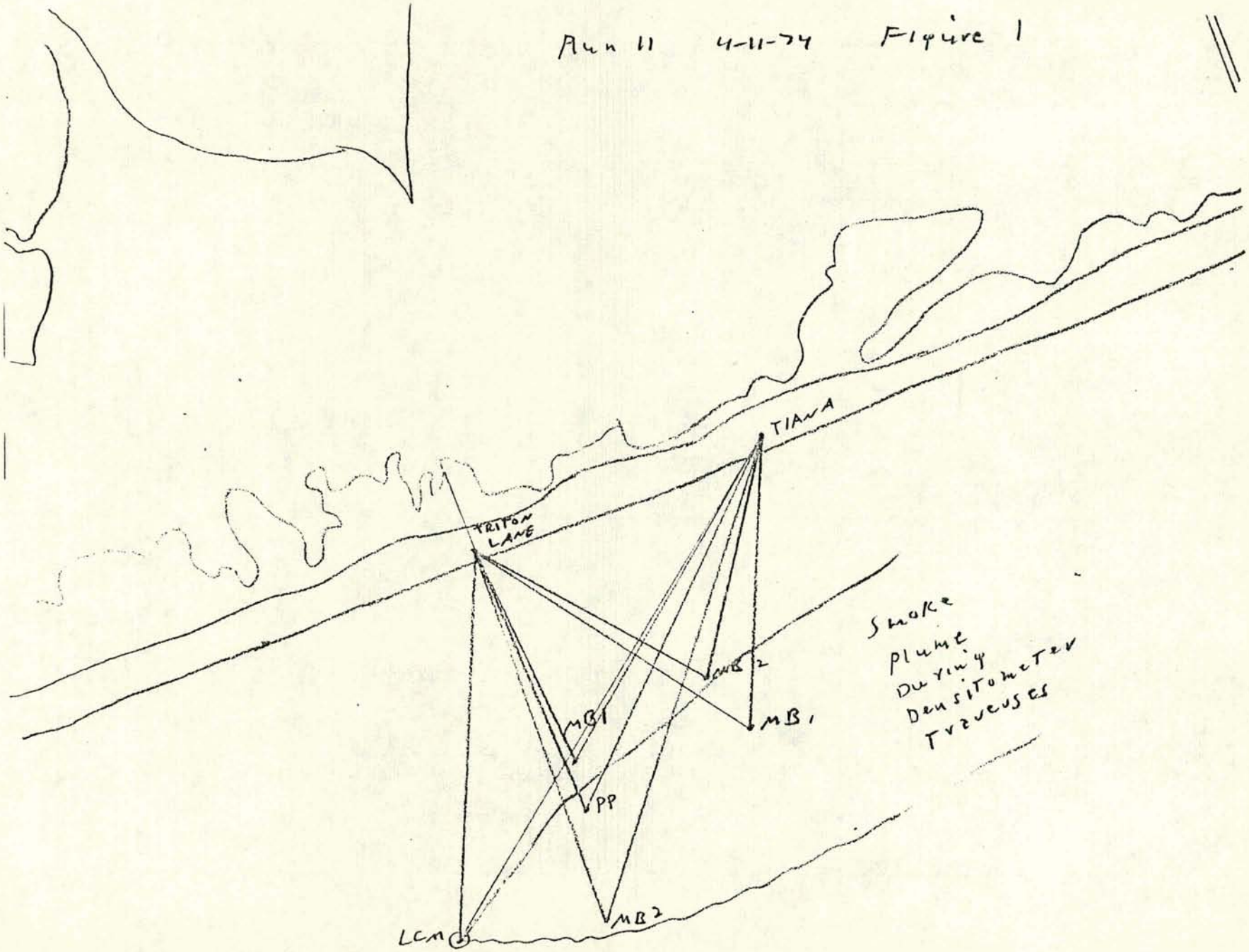
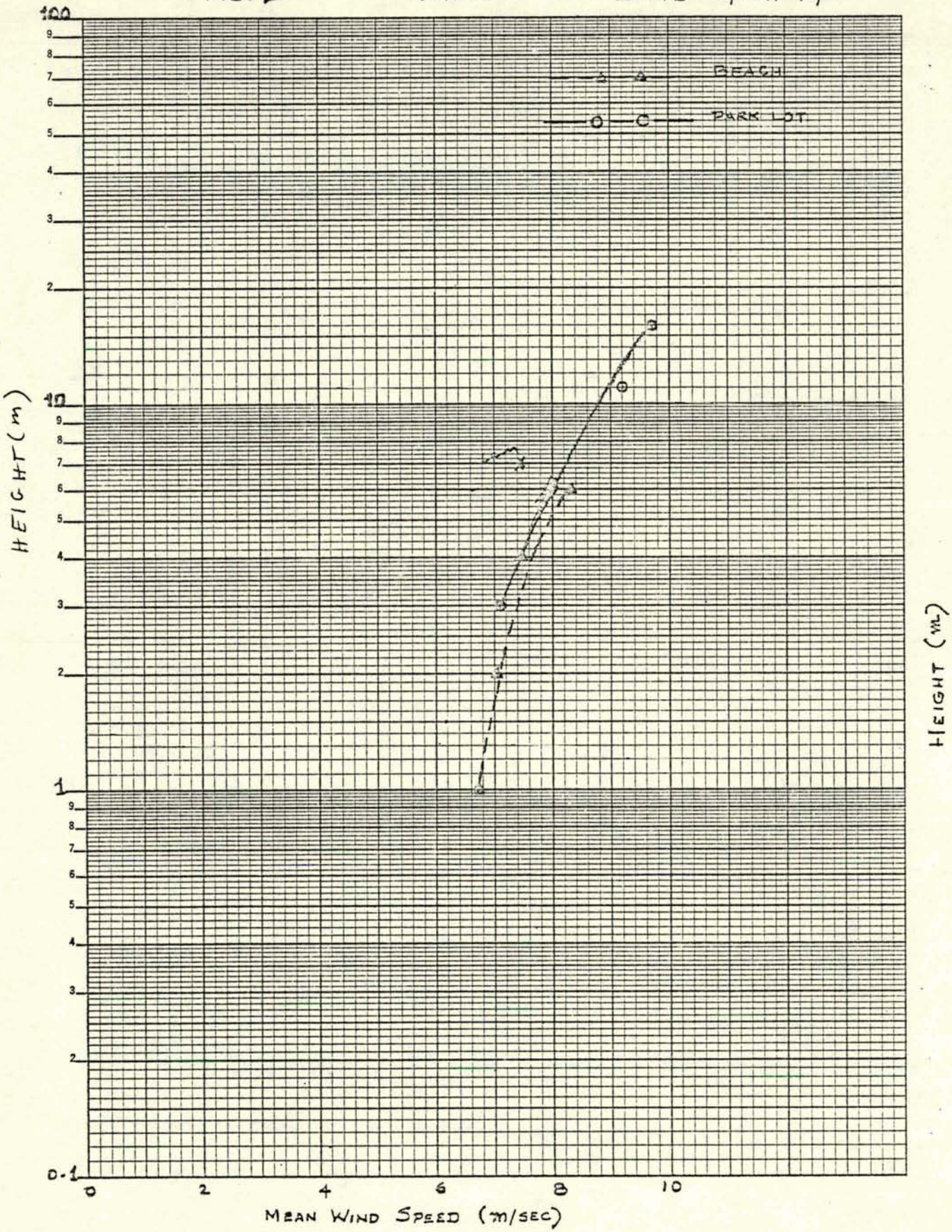


FIG. 2 RUN 11 DATE 4-11-74



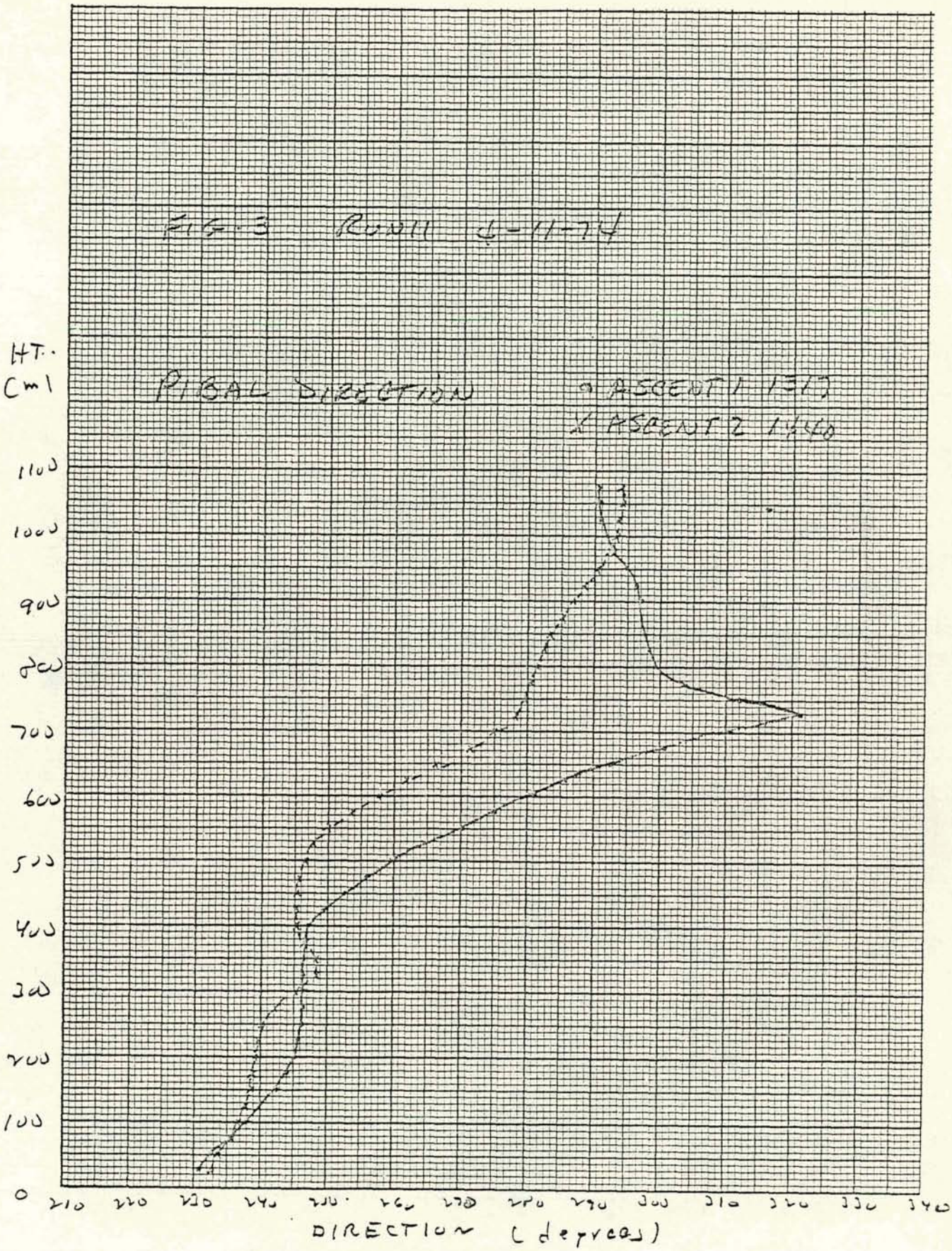


FIG. 3 RUN 11 4-11-74
HT. (m)
PIBAL DIRECTION
ASCENT 1 1513
ASCENT 2 1440
1100
1000
900
800
700
600
500
400
300
200
100
0
DIRECTION (degrees)

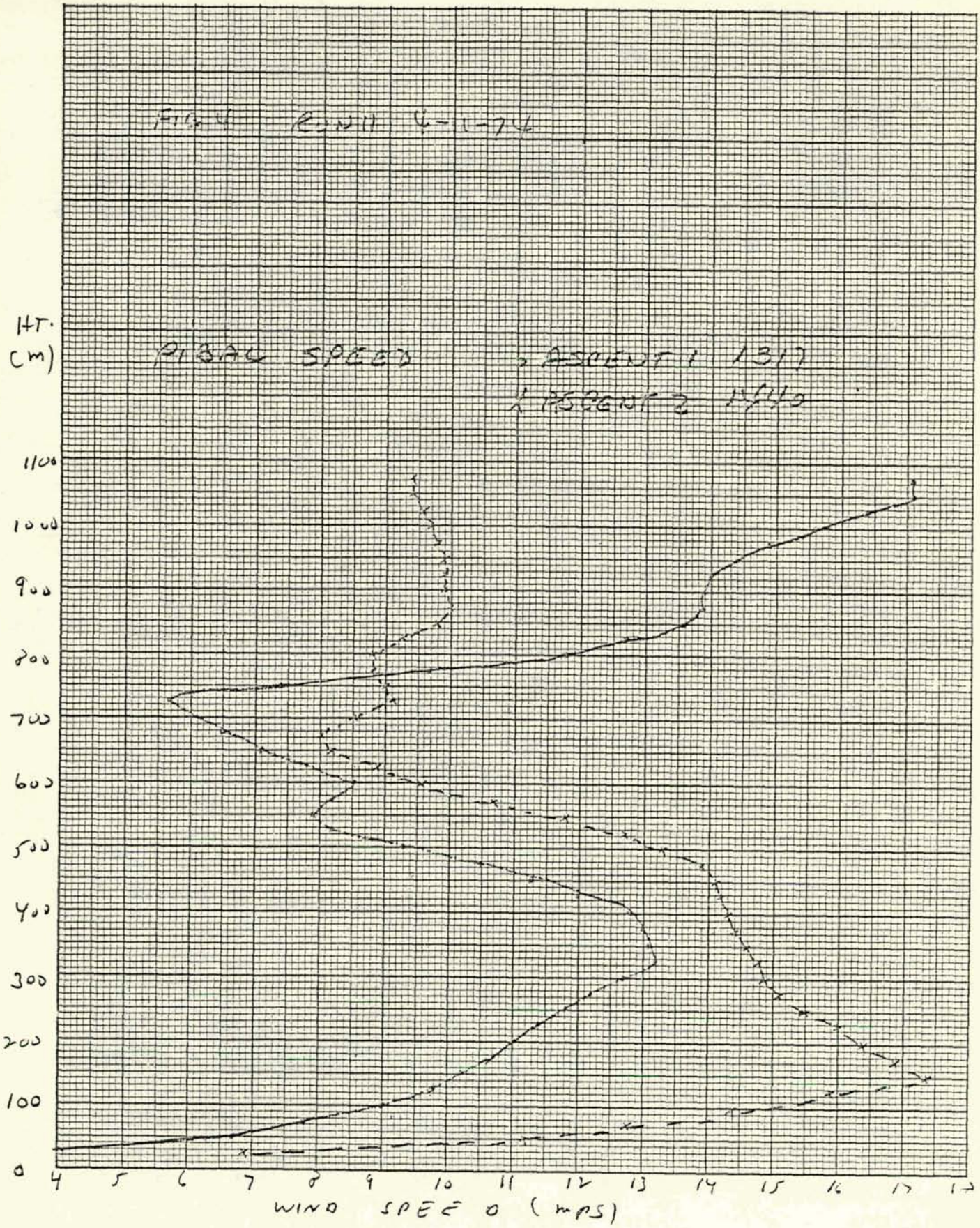
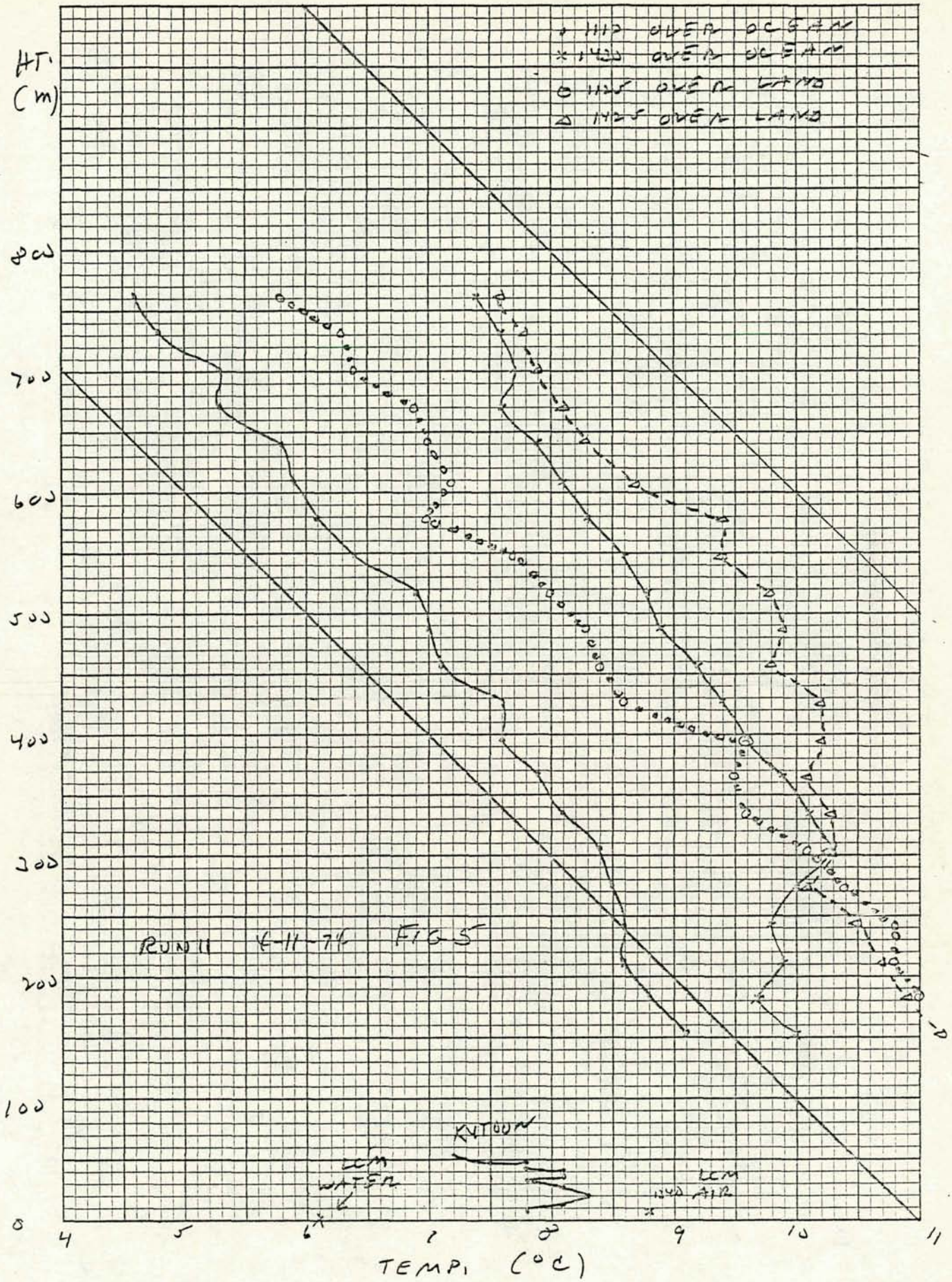
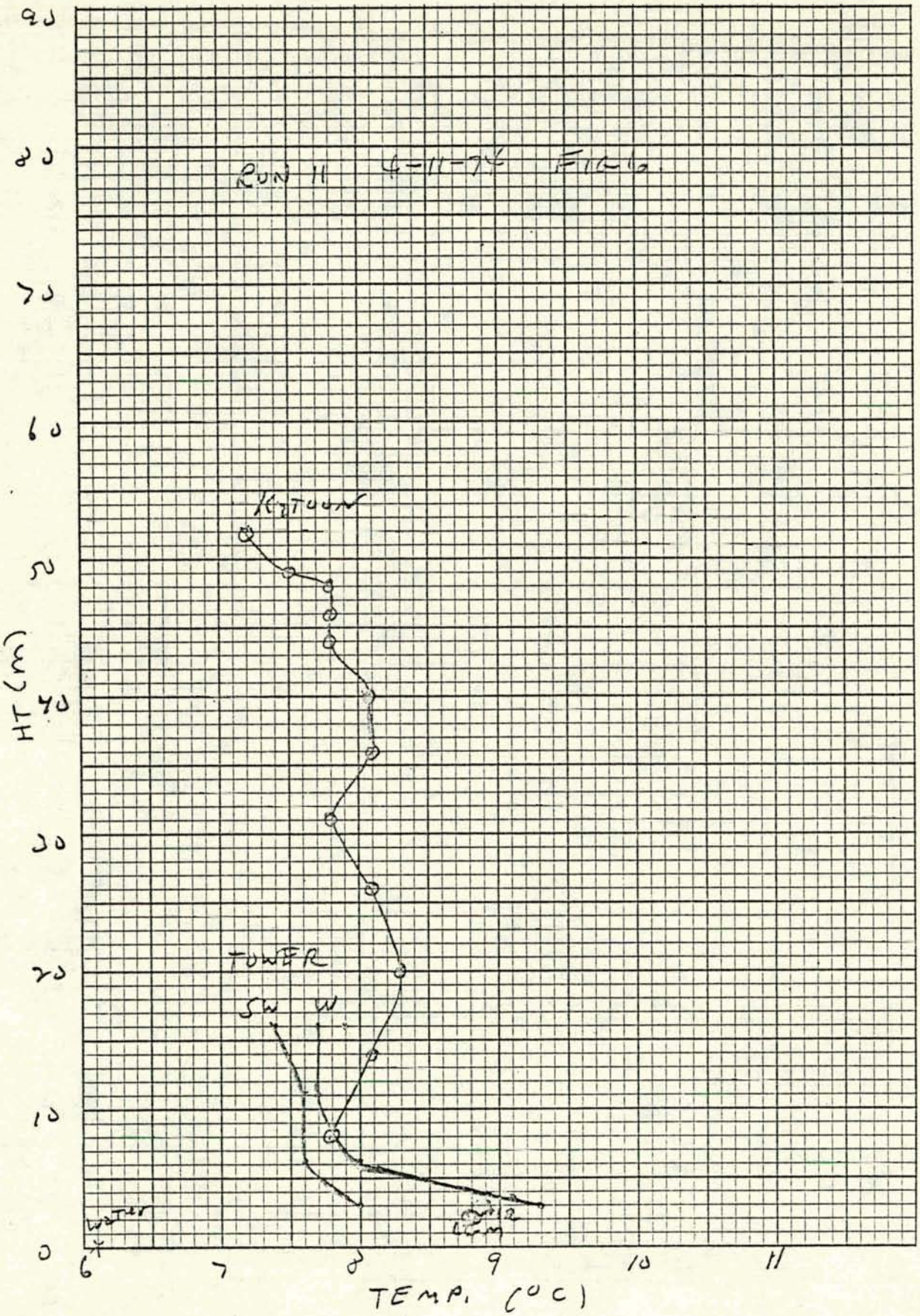
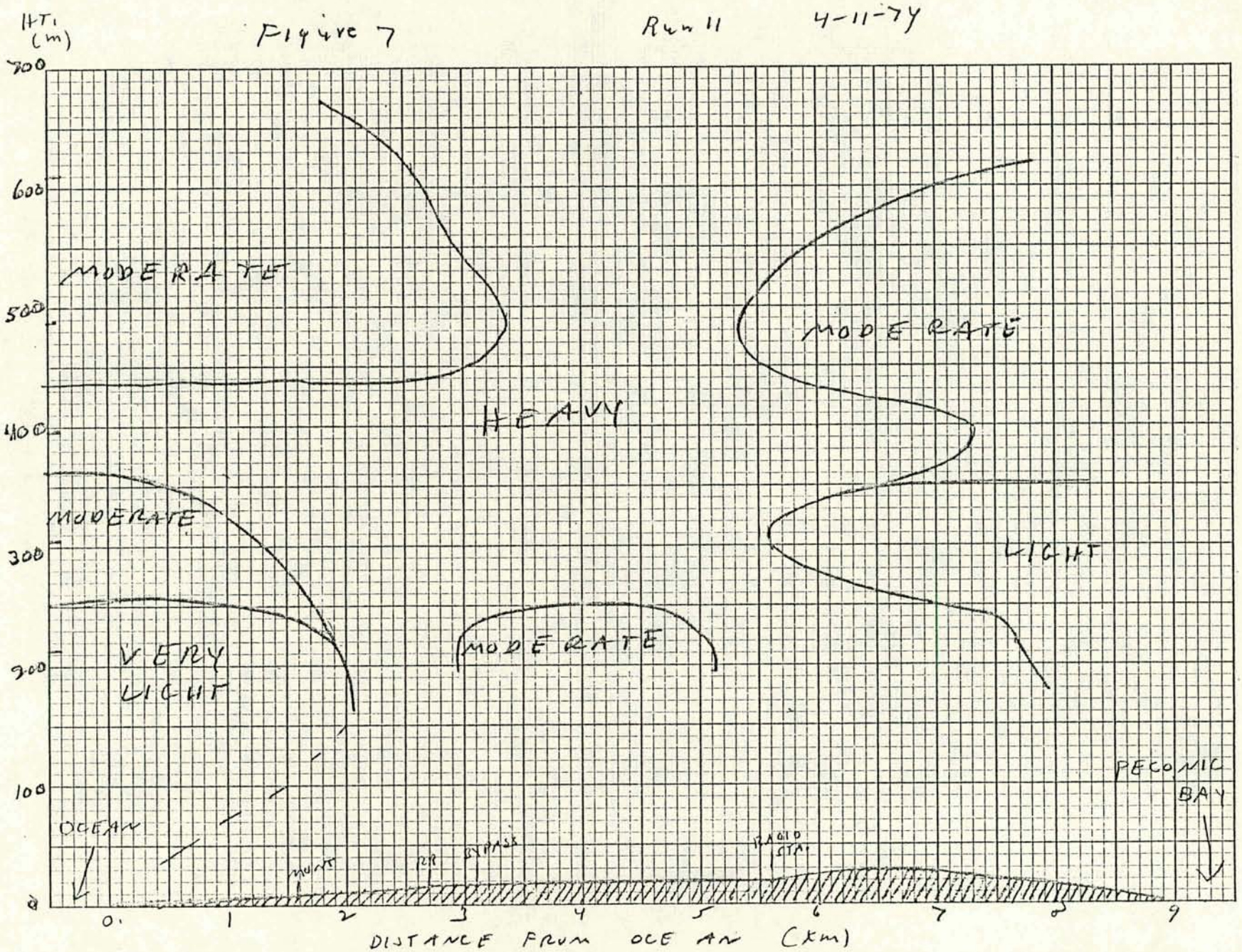
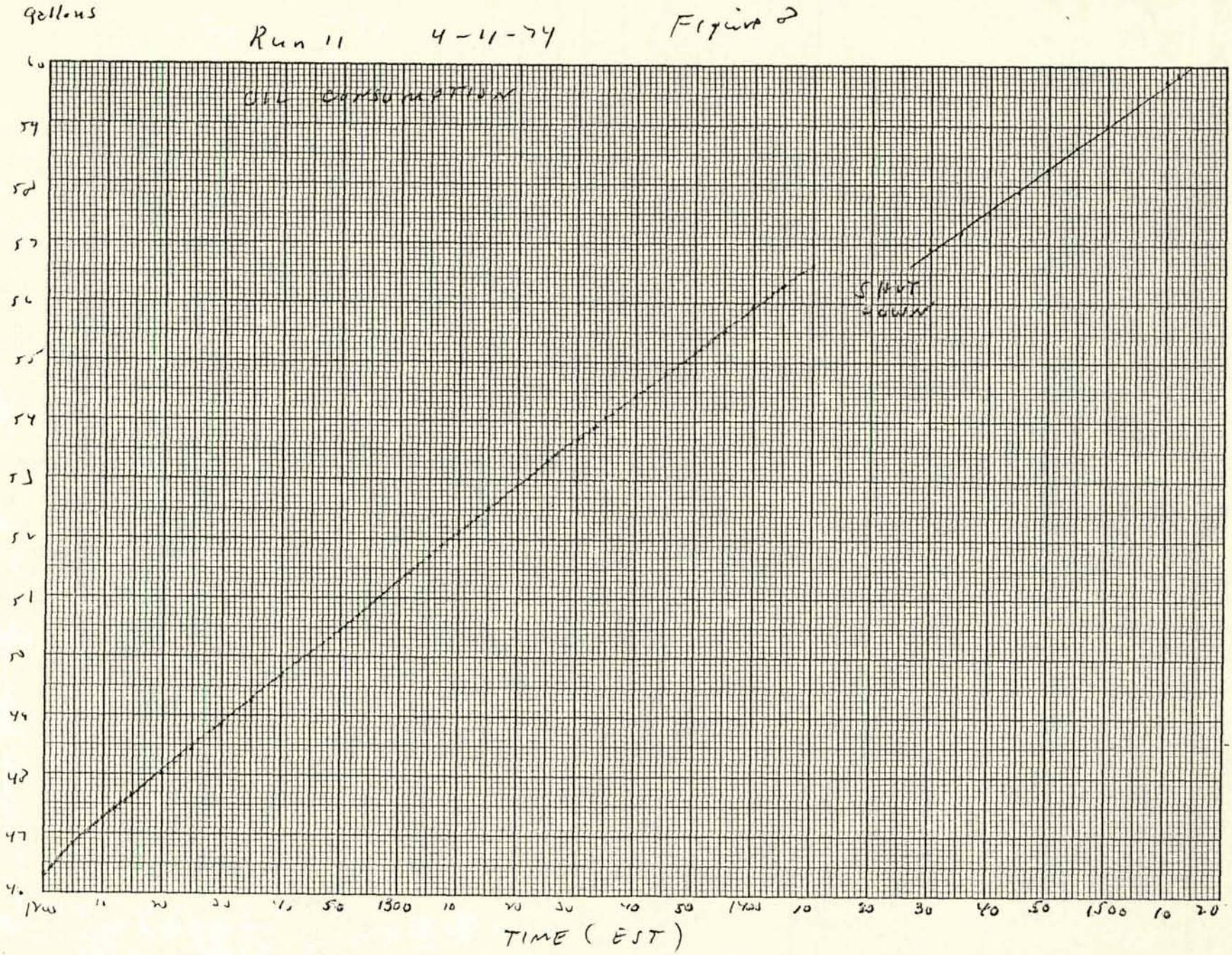


FIG 4 CONT 4-1-74
HT. (m)
RISAL SPEED
ASCENT 1 1317
DESCENT 2 1440
1100
1000
900
800
700
600
500
400
300
200
100
0
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
WIND SPEED (MPS)


HT. (m)
800
700
600
500
400
300
200
100
0
4
5
6
7
8
9
10
11
TEMP. (°C)
RUN 11 6-11-74 FIG 5
KNTOUN
LCM WATER
LCM AIR


RUN 11 4-11-74 FIG 6.
KITTOON
TOWER
SW
W
WATER
HT (M)
TEMP. (°C)
0
10
20
30
40
50
60
70
80
90
6
7
8
9
10
11


HT. (m)
Figure 7
Run 11
4-11-74
700
600
500
400
300
200
100
0
MODERATE
HEAVY
MODERATE
MODERATE
LIGHT
VERY LIGHT
MODERATE
OCEAN
RECONIC BAY
MOUTH
RR
BYPASS
RADIO STAT
0
1
2
3
4
5
6
7
8
9
DISTANCE FROM OCEAN (km)


gallons
Run 11 4-11-74
Figure 2
OIL CONSUMPTION
SHUT DOWN
TIME (EST)

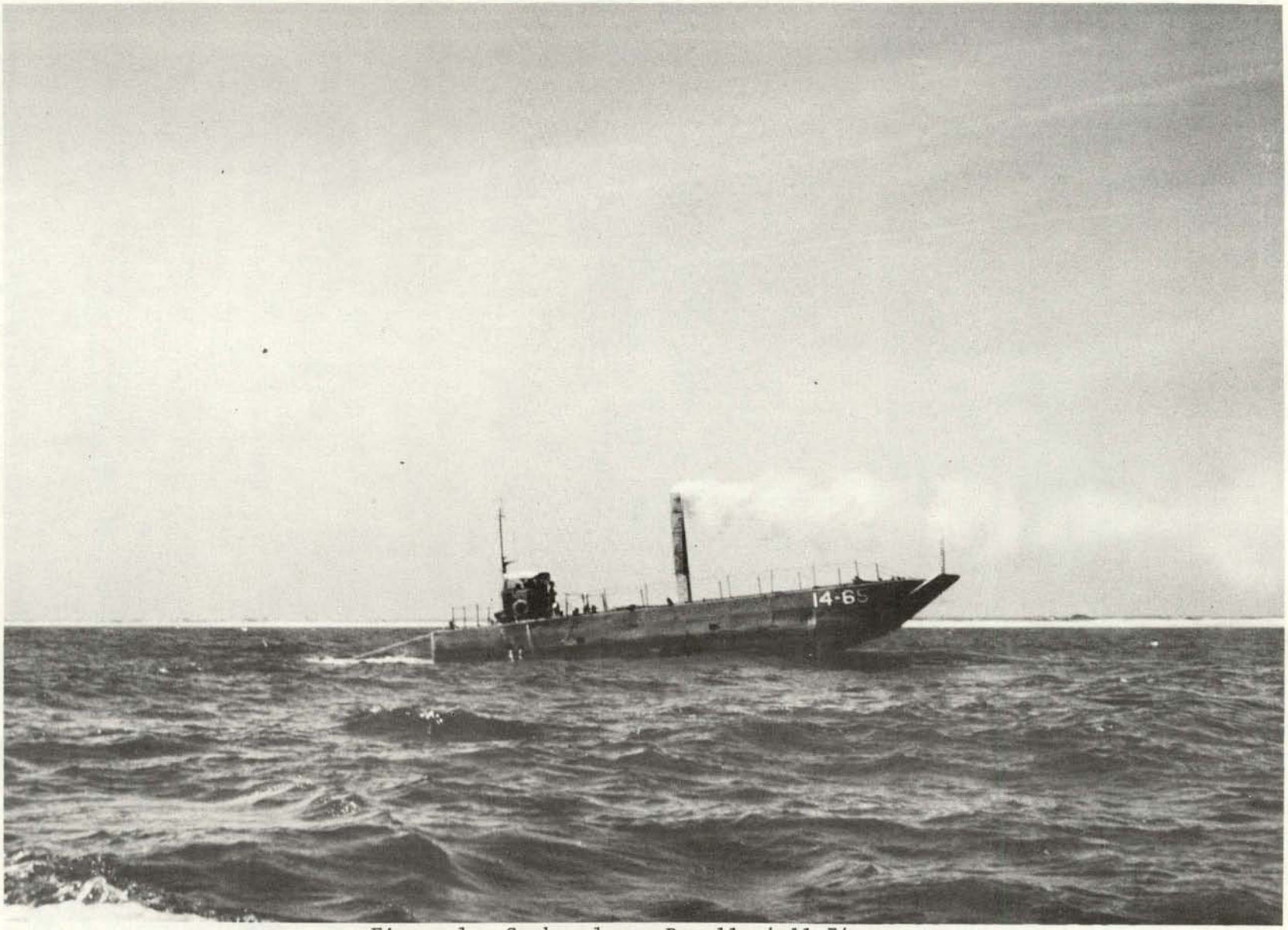


Figure 1. Smoke plume, Run 11, 4-11-74.

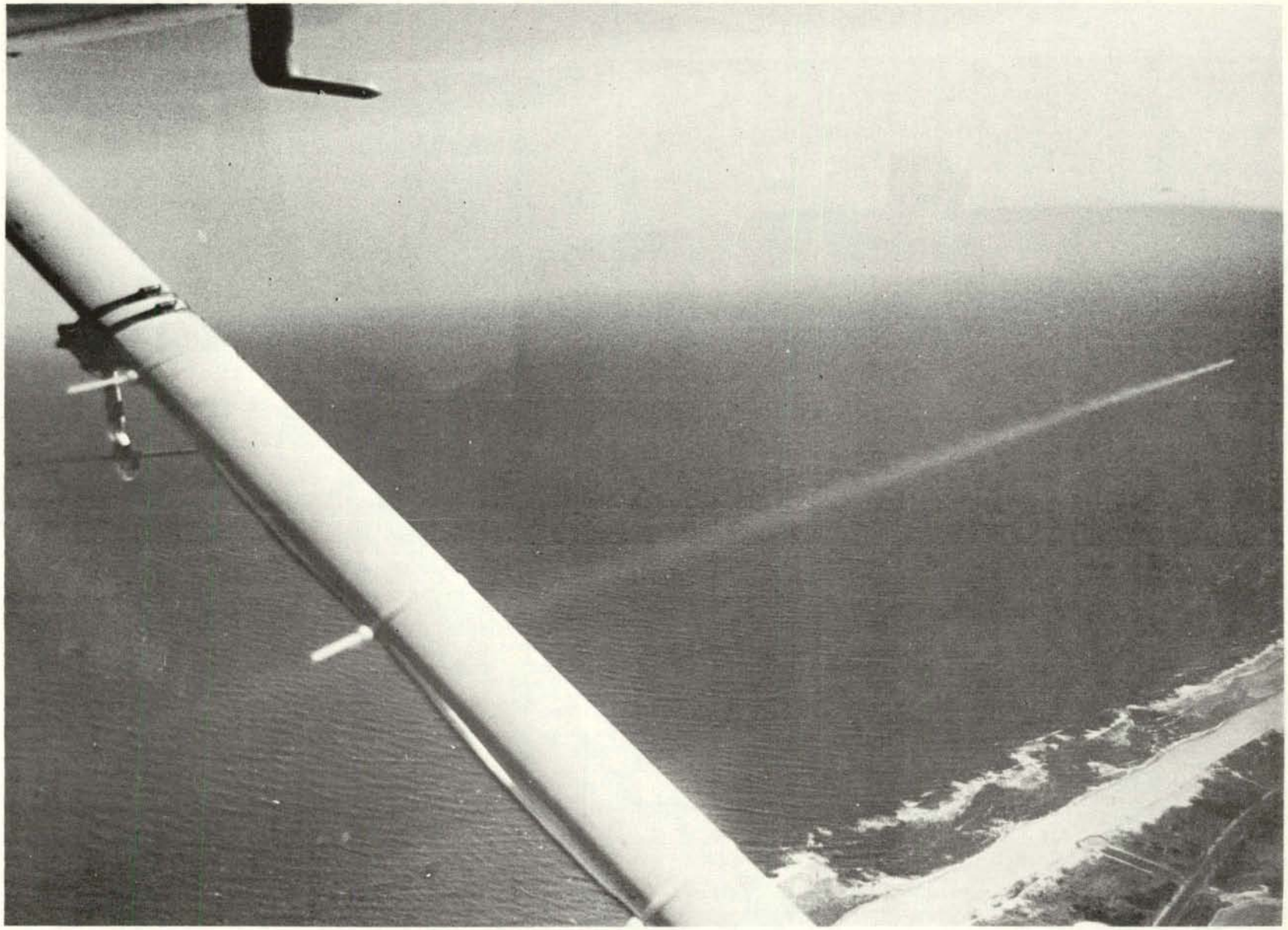
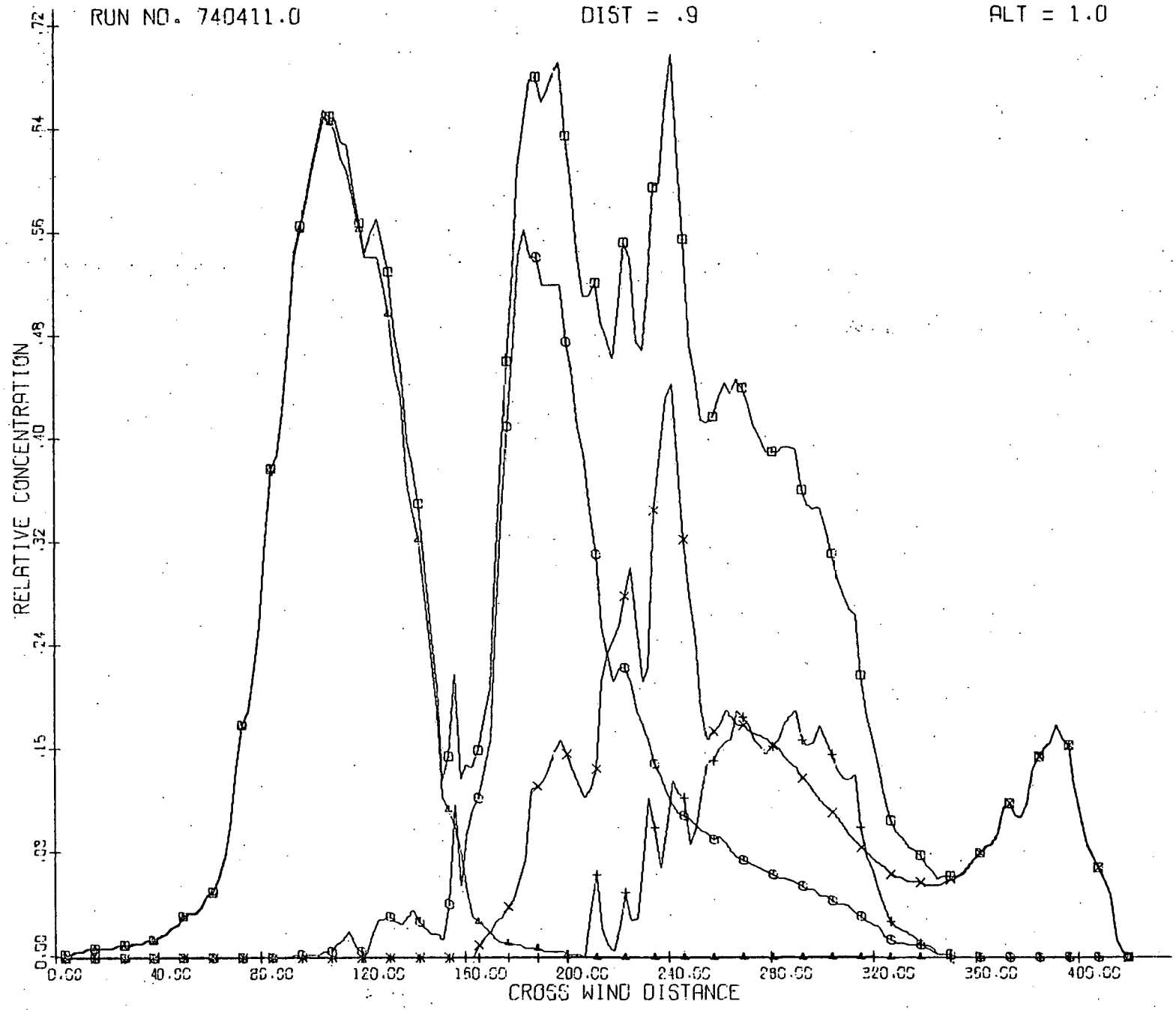
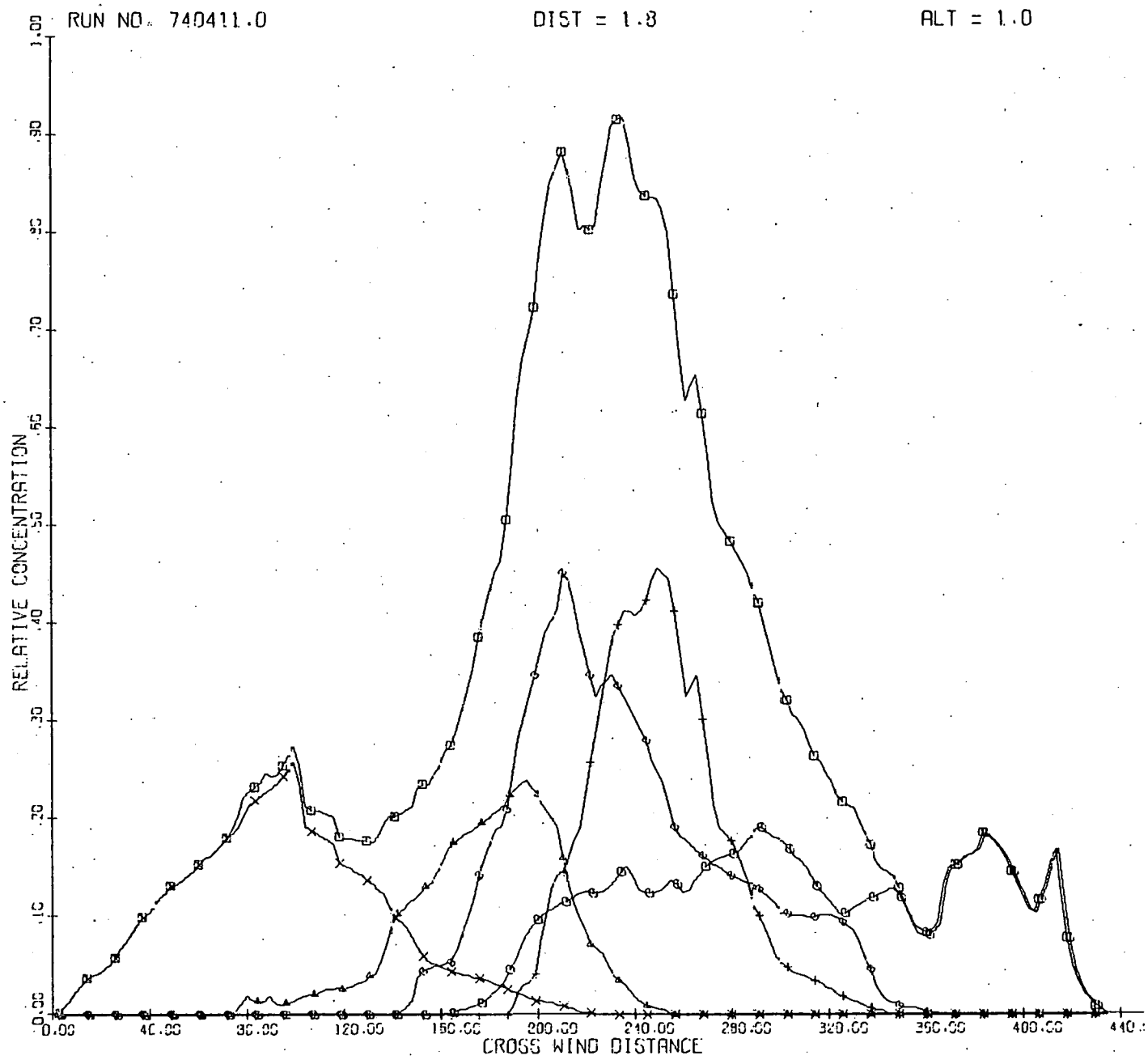


Figure 2. Aerial view of smoke plume,
Run 11, 4-11-74.


RUN NO. 740411.0
DIST = .9
ALT = 1.0
RELATIVE CONCENTRATION
0.00
.08
.16
.24
.32
.40
.48
.56
.64
.72
0.00
40.00
80.00
120.00
160.00
200.00
240.00
280.00
320.00
360.00
400.00
CROSS WIND DISTANCE


RUN NO. 740411.0
DIST = 1.8
ALT = 1.0
RELATIVE CONCENTRATION
CROSS WIND DISTANCE
0.00
.10
.20
.30
.40
.50
.60
.70
.80
.90
1.00
0.00
40.00
80.00
120.00
160.00
200.00
240.00
280.00
320.00
360.00
400.00

ON SHORE DENSITOMETER RUN FROM BOAT
TRAVERSES AT ONE DISTANCE

RUN =740411./ DATE = 41174 /DISTANCE FROM STACK (KM)= .86
DIRECTION(DEG) = 230./TIME FROM 1345 TO 1411 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGND)
1.0	.329E+02	207.0	38.4			13.83
2.0	.390E+02	109.3	24.5			25.68
3.0	.143E+02	274.6	28.1			8.24
4.0	.349E+02	275.3	64.3			8.76
GRAND TOTAL	.121E+03	203.2	43.3	82.6	70.3	

ON SHORE DENSITOMETER RUN FROM BOAT
TRAVERSES AT ONE DISTANCE

RUN =740411./ DATE = 41174 /DISTANCE FROM STACK (KM)= 1.85
DIRECTION(DEG) = 230./TIME FROM 1445 TO 1511 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGND)
1.0	.314E+02	305.9	66.1			12.28
2.0	.168E+02	177.9	31.1			13.94
3.0	.274E+02	249.5	26.0			27.37
4.0	.220E+02	94.3	40.4			14.12
5.0	.368E+02	235.2	42.8			22.27
GRAND TOTAL	.134E+03	224.4	45.2	82.5	68.9	

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Run No. 12
May 14, 1974

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: May 31, 1974

TO: Files

FROM: G. S. Raynor

SUBJECT: Offshore Test No. 12

The twelfth overwater dispersion test was held on May 14, 1974. Scattered cirrus was present in the morning but skies were clear in the afternoon. Moderate haze was present limiting visibility to less than 4 miles. A high was centered east of Virginia and a low near Lake Michigan, giving a gradient SW wind which increased in speed during the afternoon. Waves were very small in the morning but measured 2 to 3 feet from the SW by the end of the run. Swell was about 2 feet from the south. Low tide occurred at 0542 and high tide at 1444. Thus, the tide was coming in throughout the test. Eastern standard time is used throughout this report.

Personnel left BNL at 0630, arrived at the boats about 0710 and at Tiana from 0730 to 0745. The boats left the Inlet about 0925. All instruments were up at Tiana by 0855.

The LCM was manned by Walter Jahnig, John McNeil, and Ron Meyers. W. Ohmstede was aboard as a visitor. Test smoke was made from 0952 - 1000. The LCM was then stationed two nautical miles offshore about a mile west of Tiana (Figure 1). Smoke was emitted from 1025 to about 1230. The LCM was then moved to a position 1 nautical mile offshore, the same distance west and emitted smoke from 1305 to 1405 when the run was terminated.

The boat anemometer recorder was operated on fast speed from 1019 - 1210 and from 1300 - 1405. Mean wind speed at 2 m was 4.40 mps during the first period and 8.20 during the second period.

A kytoon ascent for temperature measurements was made from about 1230 to 1250. Although the rangefinder had been adjusted after the previous run, distances measured were still slightly large. However, angles were measured and heights could be estimated reasonably well. Due to an error in temperature scale conversion, the setting of the indicator was probably wrong and the measurements appear too high. Low level air and water

temperatures were taken with a mercury thermometer using a bucket for the water temperatures.

The Liberty was manned by Sy Fink and Dave Watts. A series of 10 pictures was taken from photo position 1 from 1053 - 1057. Distance to the plume was 0.45 km. A second series was taken from photo position 2 from 1314 - 1320. Distance to the plume was 0.33 km (Figure 1). Other 35-mm pictures were taken of the LCM and the plume. Marker buoys were set out as shown in Figure 1, and 5 densitometer traverses made but damage to the densitometer prevented usable measurements. Low level air and water temperatures were taken with a mercury thermometer using a bucket for the water temperatures.

Tiana Beach was manned by Brown, Michael, Raynor and Sethu-Raman. McNeil helped set up instruments before boarding the LCM. Earl Markee was present as an observer. The mobil tower extended fully and was carefully oriented and leveled. The Aerovane, bi-vane, a cup anemometer, temperature sensor and thermistor heat flux probe were mounted at 16.1 m. Cup anemometers and temperature sensors were also mounted at 3, 6 and 11 m. The beach mast was placed 15 m from and about 1/2 m above the water. With the rising tide, the waves reached the base and the mast was moved 6 m up the beach at 1234. The tide later went down leaving the mast about 10 m from the edge of the end of the run. Cup anemometers were mounted at 1, 2, 4 and 6 m.

Anemometer counters and charts were started at 0855. Speed runs were taken on the chart recorders and the tape recorder from 0908 - 0944, 1058 - 1205 and 1320 - 1408. All instruments worked properly except that the 11 m temperature was obviously too high. The cause is not yet known but may be physical contact with the bolt supporting the housing. Data collection was terminated at 1408.

During emission from the 2 mile position, smoke crossed the beach from 0.5 to 1.9 miles east of Tiana but the plume was narrow. Ten densitometer traverses were made. During photo period 1, the position of the plume on the beach was determined as 0.9 miles east of Tiana.

May 31, 1974

During emission from the 1 mile position, the plume remained steady about 0.2 miles east of Tiana. Ten additional traverses were made.

Anemometer data are tabulated in Table 1 and plotted in Figure 2. Aircraft temperatures are tabulated in Table 2 and lower level temperatures in Table 3. The aircraft was manned by Ansel Tuthill. Temperature soundings were taken as shown in Table 2. Those on the line from Lake Sagaponack to east of Sag Harbor were designed to give a cross section across the island in a location not affected by large bays. Results are shown in Figure 4. The reason for the cold area over Lake Sagaponack is not known. The profiles show an inversion over the ocean to about 200 m and a stable lapse rate above.

One picture-taking pass was made over the plume at 1055, flying at 80 mph at 1200 feet. Pictures were taken at 5 sec. intervals. Failure of the radio at Tiana prevented communication with the aircraft.

Pibal ascents were made at Tiana at 1207 and 1305 (Figures 5 and 6). The data near 500 m on ascent 1 are believed erroneous.

North-south variometer traverses were made along a line from the east edge of Lake Sagaponack to east of Sag Harbor. Passes were made as follows, all at 80 mph with the recorder on the 100 mv/div. scale. Data were also recorded on tape.

Pass	Heading	Time	Ht. Ft.	Ht. m	Length of record (min)
1	N	1100 - 1105	500	152.4	4.5
2	S	1110 - 1120	800	243.8	6.6
3	N	1125 - 1130	1100	335.3	4.5
4	S	1130 - 1140	1400	426.7	6.8
5	N	1140 - 1145	1700	518.2	4.1
6	S	1148 - 1154	2000	609.6	6.6
7	N	1155 - 1200	2300	701.0	4.8

The turbulence pattern observed is plotted in Figure 7. In addition to the general pattern, an isolated turbulent column was encountered at several levels as diagrammed. Another pass was made offshore from Tiana to Cupsoque Beach at 125 ft (38.1 m) starting at 1300 and ending at 1312.

May 31, 1974

Oil consumption is shown in Figure 8. It averaged 7.54 x 10^{-2} gal/min during the 2 mile emission and 6.73 x 10^{-2} gal/min during the 1 mile emission after correcting for loss.

The run was terminated at 1408. Personnel left Tiana at 1500 and the docks at 1630, arriving at BNL at 1730. The trailer tower was brought to BNL for addition of safety equipment and welding of the 16-m arm.

In summary, the plume was stable with considerable meander while winds were light but constant in direction after winds increased.

GSR/lk

TABLE 1

ANEMOMETER MEAN WIND SPEEDS (m sec^{-1}) Run 12 5-14-74

Time (EST)	BEACH MAST 1 m	2 m	4 m	6 m	PARKING LOT 3 m	6 m	11 m	16 m
0835-0840	2.94	3.35	3.66	3.90				
0840-0845	2.80	3.18	3.50	3.73				
0845-0850	2.88	3.26	3.62	3.88				
0850-0855	2.79	3.20	3.49	3.75				
0855-0900	2.71	3.03	3.32	3.58				
0900-0905	2.47	2.84	3.06	3.28				
0905-0910	2.35	2.73	2.86	3.03				
0910-0915	2.34	2.66	2.85	3.09	3.50	3.84	4.16	4.22
0915-0920	2.61	3.00	3.22	3.46	3.94	4.28	4.62	4.67
0920-0925	2.65	3.04	3.30	3.49	4.12	4.42	4.73	4.81
0925-0930	2.73	3.14	3.34	3.60	4.13	4.49	4.87	4.91
0930-0935	2.92	3.34	3.56	3.78	4.36	4.68	5.00	5.01
0935-0940	2.63	3.04	3.22	3.50	4.00	4.39	4.77	4.81
0940-0945	2.90	3.31	3.53	3.74	4.28	4.65	5.00	4.96
0945-0950	2.62	3.02	3.20	3.42	3.89	4.27	4.63	4.67
0950-0955	2.69	3.09	3.29	3.53	3.89	4.30	4.71	4.78
0955-1000	2.89	3.37	3.72	3.96	4.37	4.85	5.27	5.29
1000-1005	3.19	3.70	3.98	4.19	4.73	5.16	5.42	5.36
1005-1010	3.22	3.71	3.96	4.15	4.83	5.08	5.36	5.35
1010-1015	3.20	3.71	3.99	4.24	5.15	5.42	5.72	5.65
1015-1020	3.18	3.66	3.94	4.19	5.01	5.28	5.57	5.52
1020-1025	3.10	3.62	3.89	4.10	4.92	5.19	5.45	5.45
1025-1030	3.30	3.02	4.09	4.32	5.16	5.48	5.75	5.67
1030-1035	3.03	3.56	3.82	4.03	4.91	5.16	5.46	5.39
1035-1040	3.03	3.47	3.74	3.93	4.76	4.97	5.24	5.20
1040-1045	3.11	3.57	3.84	4.04	4.86	5.12	5.49	5.47
1045-1050	3.48	3.99	4.30	4.51	5.27	5.64	6.01	6.01
1050-1055	3.34	3.84	4.14	4.37	5.11	5.46	5.86	5.88
1055-1100	3.29	3.81	4.15	4.38	5.05	5.42	5.84	5.85
1100-1105	3.35	3.88	4.18	4.41	5.18	5.53	5.94	5.91
1105-1110	-	3.43	3.71	3.96	4.79	5.08	5.39	5.37
1110-1115	2.78	3.24	3.51	3.72	4.51	4.80	5.10	5.06
1115-1120	2.83	3.34	3.55	3.75	4.59	4.84	5.15	5.17
1120-1125	3.05	3.50	3.74	3.96	4.91	5.19	5.41	5.44
1125-1130	3.23	3.75	3.99	4.19	5.05	5.26	5.63	5.58
1130-1135	3.38	3.89	4.21	4.43	5.14	5.48	5.81	5.79
1135-1140	3.42	3.84	4.13	4.33	5.02	5.45	5.81	5.86
1140-1145	3.84	4.34	4.76	4.98	5.59	6.00	6.52	6.49
1145-1150	4.35	4.91	5.36	5.54	6.42	6.79	7.23	7.12
1150-1155	4.61	5.27	5.70	5.87	6.67	7.13	7.59	7.47
1155-1200	4.62	5.28	5.81	6.02	6.83	7.26	7.73	7.66
1200-1205	4.87	5.39	5.79	5.99	6.76	7.21	7.71	7.59
1205-1210	4.60	5.24	5.70	5.88	6.49	6.99	7.59	7.51
1210-1215	4.45	5.03	5.44	5.64	6.66	7.04	7.34	7.24
1215-1220	4.74	5.39	5.84	6.00	6.76	7.16	7.53	7.40
1220-1225	4.67	5.29	5.80	5.94	7.03	7.43	7.07	7.91
1225-1230	4.59	5.22	5.63	5.81	6.77	7.12	7.60	7.54
1230-1235	4.52	5.19	5.63	5.84	6.76	7.19	7.67	7.53
1235-1240	4.81	5.41	5.89	6.07	7.30	7.68	8.13	7.94
1240-1245	5.16	5.75	6.21	6.42	7.51	7.93	8.43	8.28
1245-1250	5.33	5.94	6.52	6.74	7.93	8.31	8.81	8.64
1250-1255	6.00	5.70	7.26	7.45	8.61	9.07	9.73	9.50
1255-1300	6.39	7.12	7.85	8.05	9.24	9.88	10.53	10.29
1300-1305	6.00	6.76	7.44	7.66	8.92	9.37	9.95	9.66
1305-1310	5.51	6.23	6.73	6.93	8.36	8.77	9.18	9.02
1310-1315	5.83	6.62	7.33	7.52	9.15	9.48	10.04	9.78
1315-1320	6.53	7.33	7.99	8.15	9.26	9.98	10.54	10.29
1320-1325	6.22	7.00	7.70	7.85	9.55	9.92	10.53	10.32
1325-1330	6.22	6.98	7.66	7.79	9.35	9.77	10.36	10.15
1330-1335	6.47	7.19	7.81	7.94	9.72	10.18	10.77	10.56
1335-1340	6.60	7.39	8.05	8.25	9.93	10.31	10.92	10.66
1340-1345	6.56	7.34	7.99	8.12	9.80	10.18	10.85	10.62
1345-1350	6.96	7.78	8.45	8.60	10.27	10.70	11.33	11.02
1350-1355	7.00	7.81	8.59	8.82	10.80	11.26	11.91	11.49
1355-1400	7.47	8.40	9.22	9.46	11.25	11.67	12.29	11.88
1400-1405	7.60	8.43	9.20	9.49	11.47	12.01	12.63	12.20
1405-1410	7.38	8.23	9.00	9.19	11.13	11.51	12.15	11.81
0910-1410	4.40	4.91	5.31	5.54	6.54	6.90	7.35	7.24

TABLE 2

AIRCRAFT TEMPERATURES Run 12 5-14-74

Height (m)	1025 Over Ocean S of Tiana	1037 N. of Hampton Bays	1200 E of Sag Harbor	1215 W of Easthampton Airport	1230 N. end Lake Sagaponack	1245 Over Ocean S. of Sagaponack
61.0	13.7					
91.4	13.8					
121.9	13.8					
152.4	14.2	15.5	16.4	16.0	13.7	14.7
182.9	14.4	15.2	15.8	15.9	14.2	14.7
213.4	14.4	15.2	15.5	15.4	14.6	14.7
243.8	14.3	14.8	15.3	14.9	14.2	14.6
274.3	14.1	14.8	15.2	14.7	14.2	14.4
304.8	14.0	14.8	15.0	14.4	13.9	14.3
335.3	13.8	14.7	14.6	13.6	13.8	14.0
365.8	13.7	14.2	14.2	13.7	13.6	13.9
396.2	13.6	14.1	14.3	13.6	13.4	13.6
426.7	13.4	13.7	14.0	13.4	13.1	13.3
457.2	13.2	13.8	13.4	13.0	13.0	13.1
487.7	13.1	13.5	13.0	13.2	12.6	12.8
518.2	12.9	13.3	13.1	13.0	12.6	12.6
548.6	12.7	13.3	12.8	12.9	12.4	12.4
579.1	12.5	13.2	13.1	12.6	12.2	12.2
609.6	12.4	13.1	13.3	12.6	12.0	12.0
640.1	12.1	12.9	13.1	12.2	11.9	11.9
670.6	12.2	12.6	13.0	12.2	11.8	11.8
701.0	12.2	12.5	12.8	12.1	11.8	11.7
731.5	12.1	12.2	12.8	12.0	11.9	11.6
762.0	12.1	12.2	12.5	12.2	11.9	11.7

TABLE 3

TEMPERATURE MEASUREMENTS Run 12 5-14-74

TOWER Ht. (m)	(Temp. °C)	KYTOON Over Ocean Ht. (m)	(Temp. °C)
3	12.20	8.0	15.7
6	12.10	15.8	15.6
11	-	23.0	15.5
16	12.10	30.5	15.8
		36.0	16.2
		43.0	16.3
		48.0	16.5
		54.0	16.5
		61.0	16.8
		66.0	16.8
		73.0	17.1
		81.0	17.3

	Water	Air
LCM (2 mile) 1035	11.9	16.2
(1 mile) 1314	11.6	15.1
Liberty (2 mile) 1030	11.1	16.5
(2 mile) 1215	11.2	15.2

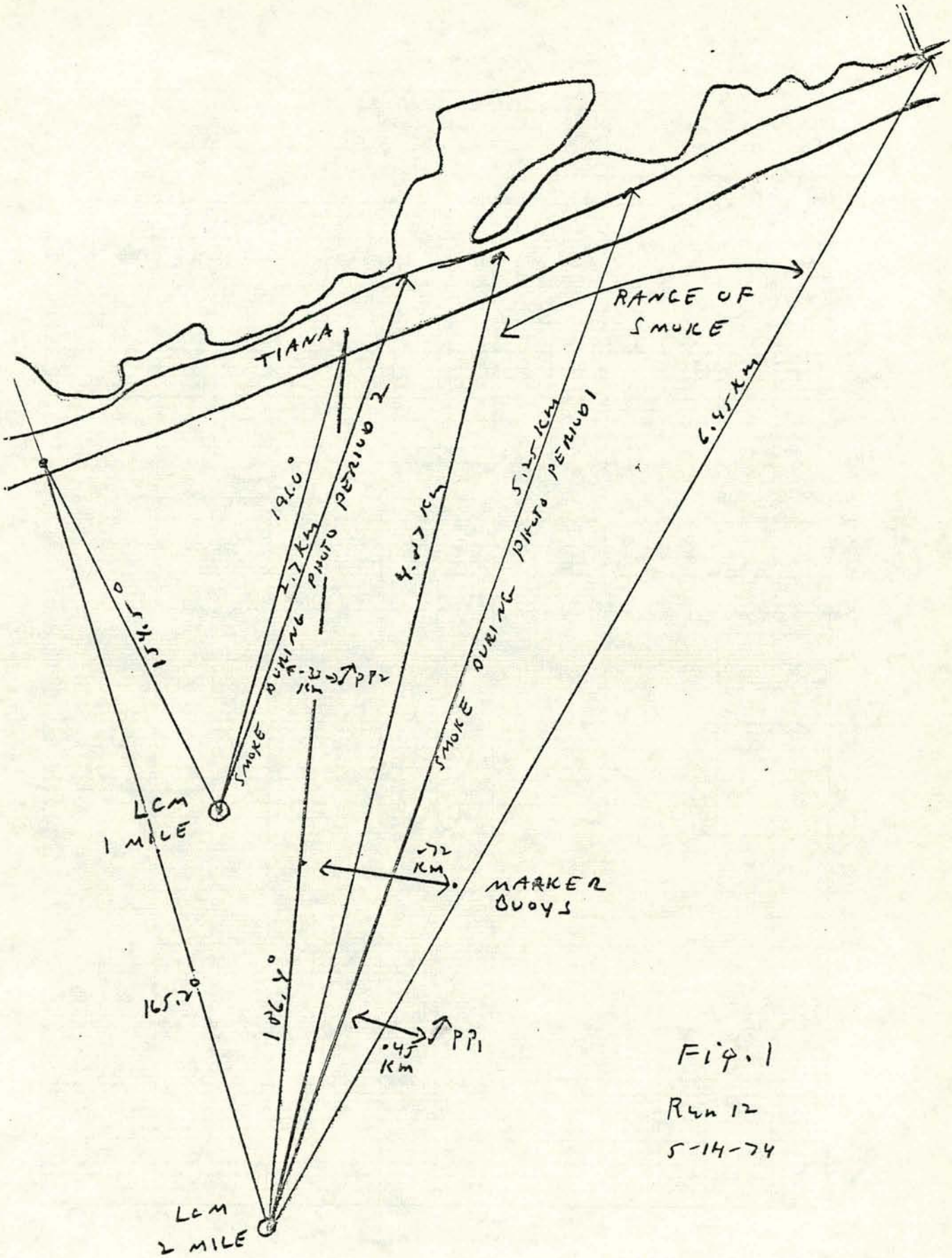


Fig. 1

Run 12

5-14-74

Figure 2

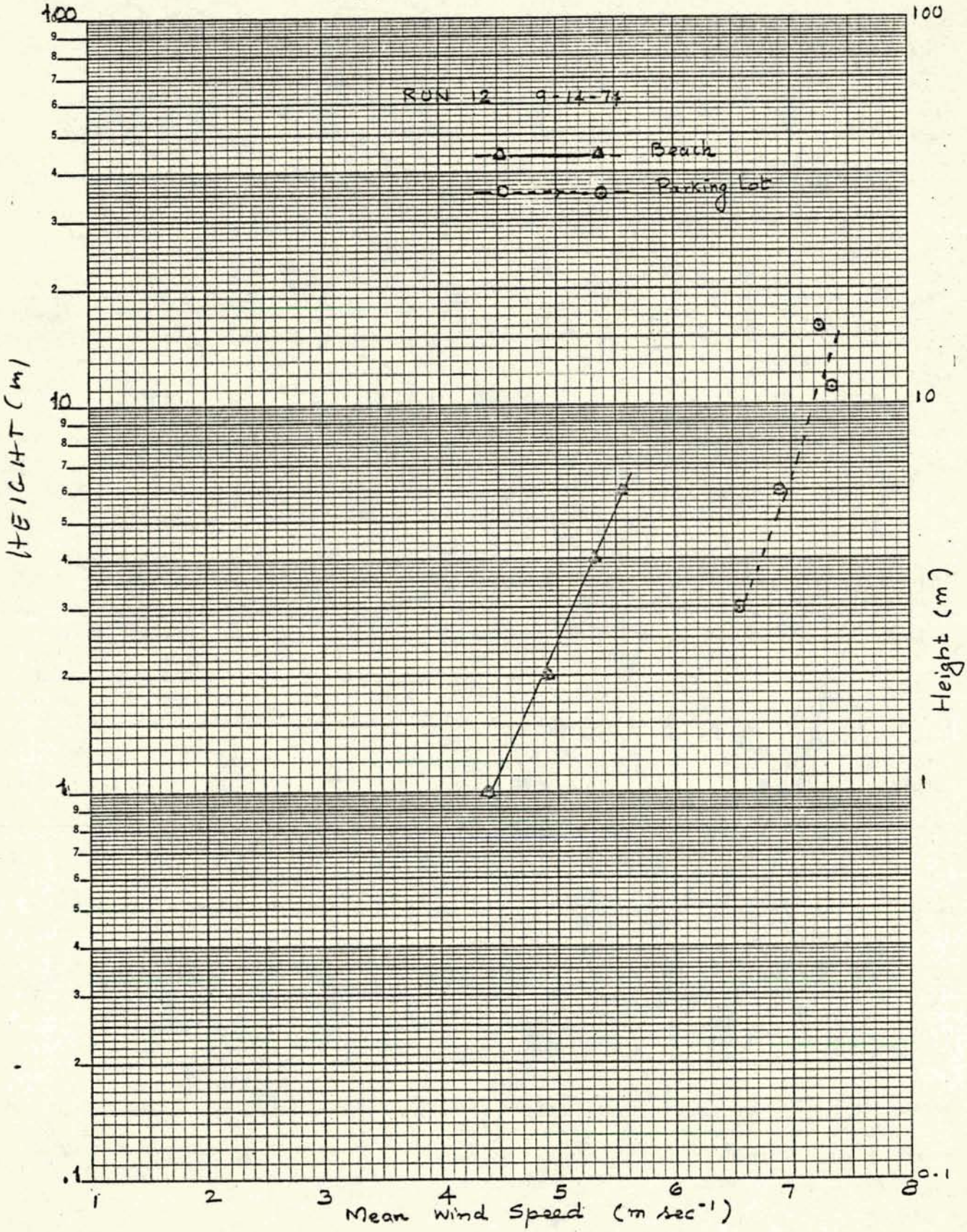

RUN 12 9-14-74
Beach
Parking Lot
HEIGHT (m)
Height (m)
Mean Wind Speed (m sec⁻¹)
100
10
1
0.1
1
2
3
4
5
6
7
8

FIG. 3 RUN 12 5-14-74

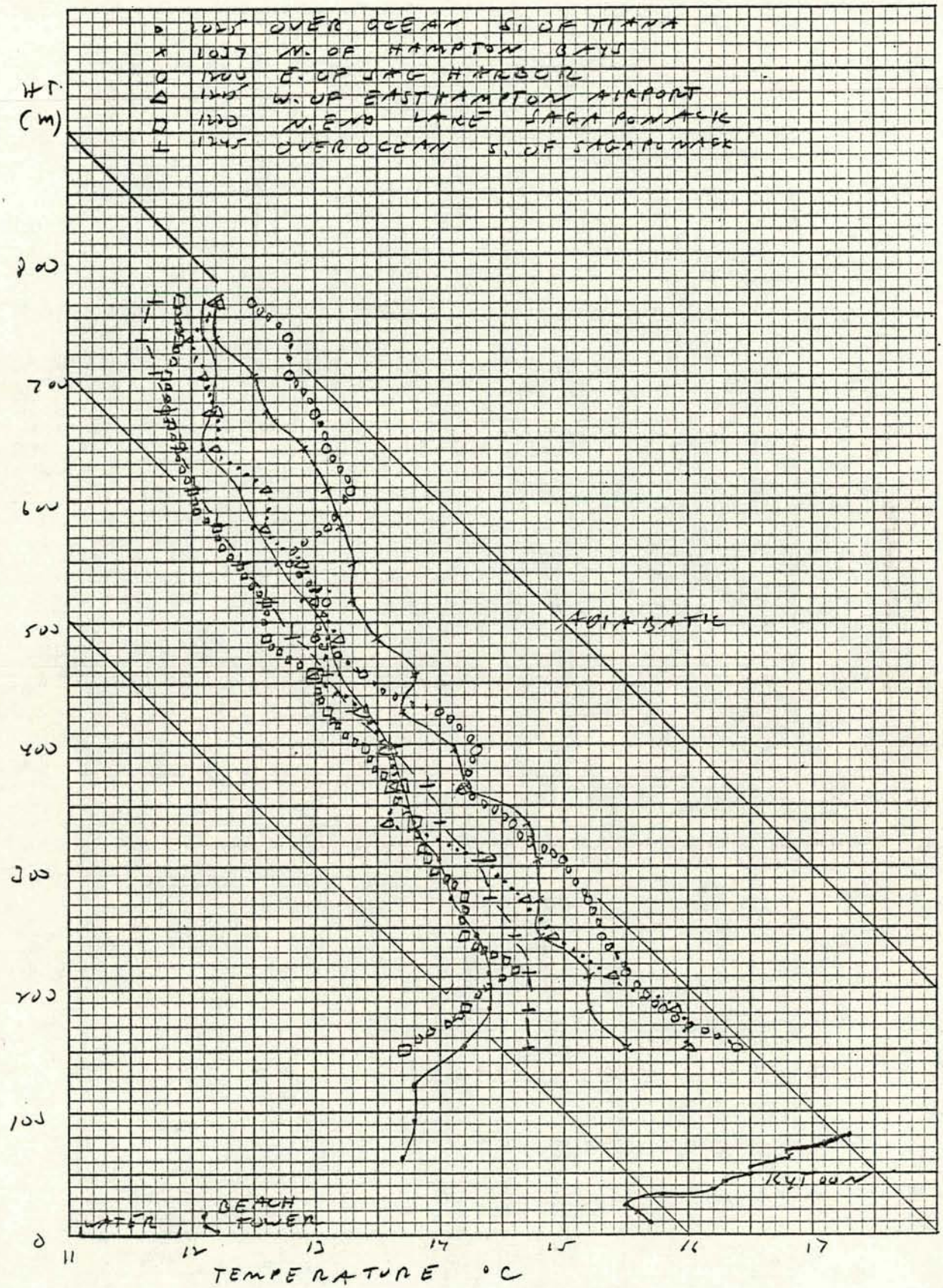


Figure 4

Run 12 5-147

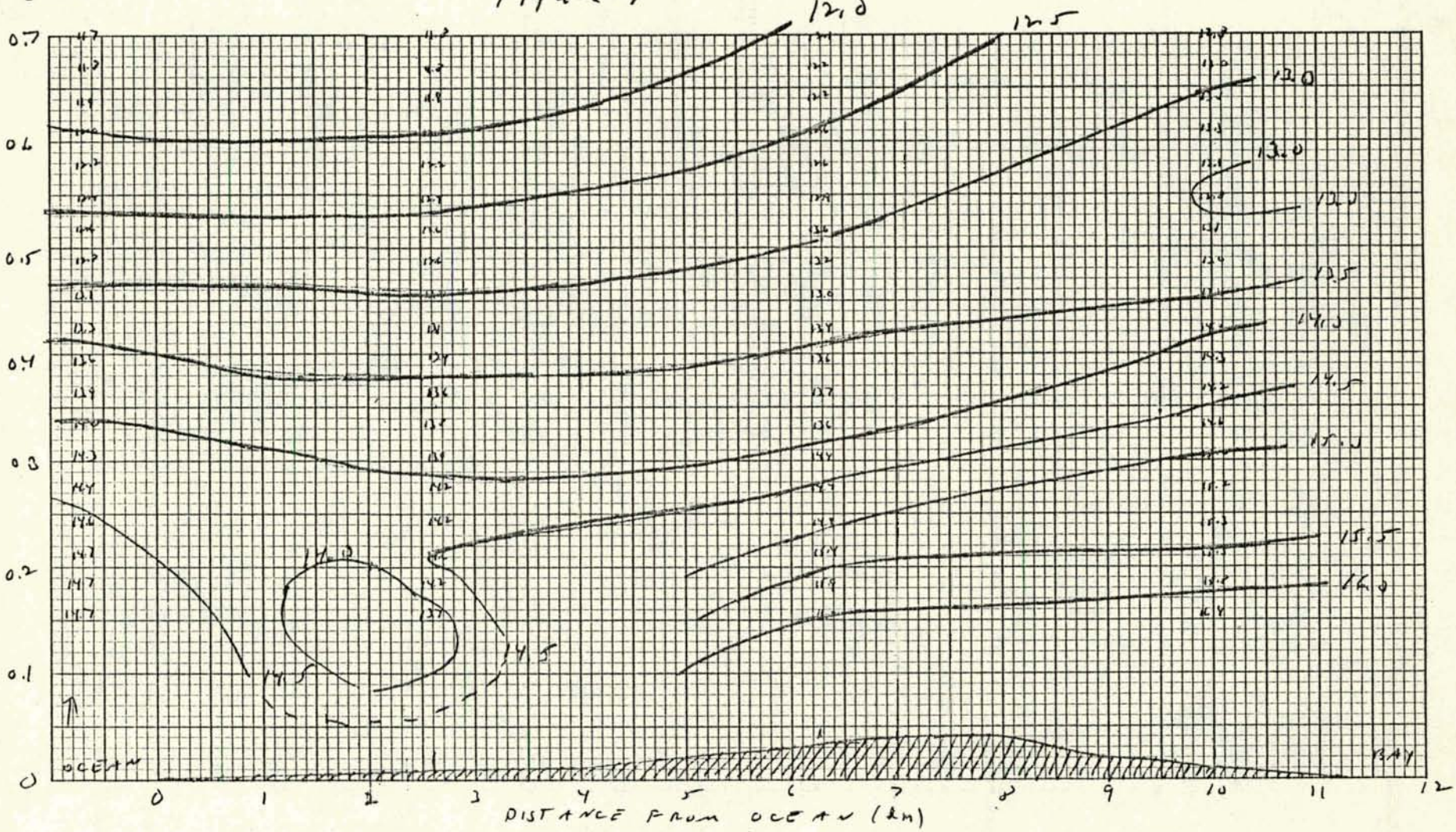


Fig. 5 Run 12 5-14-74

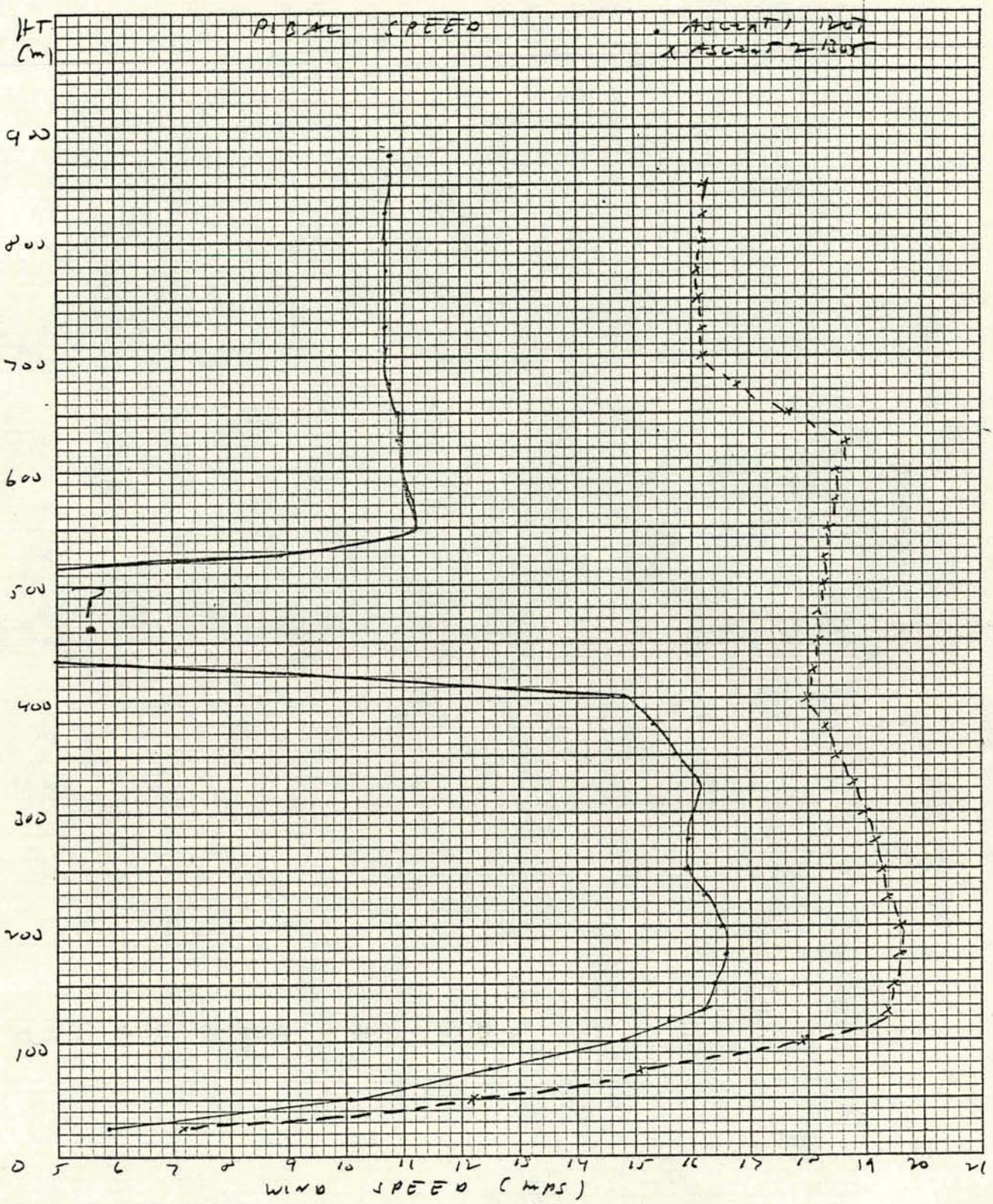
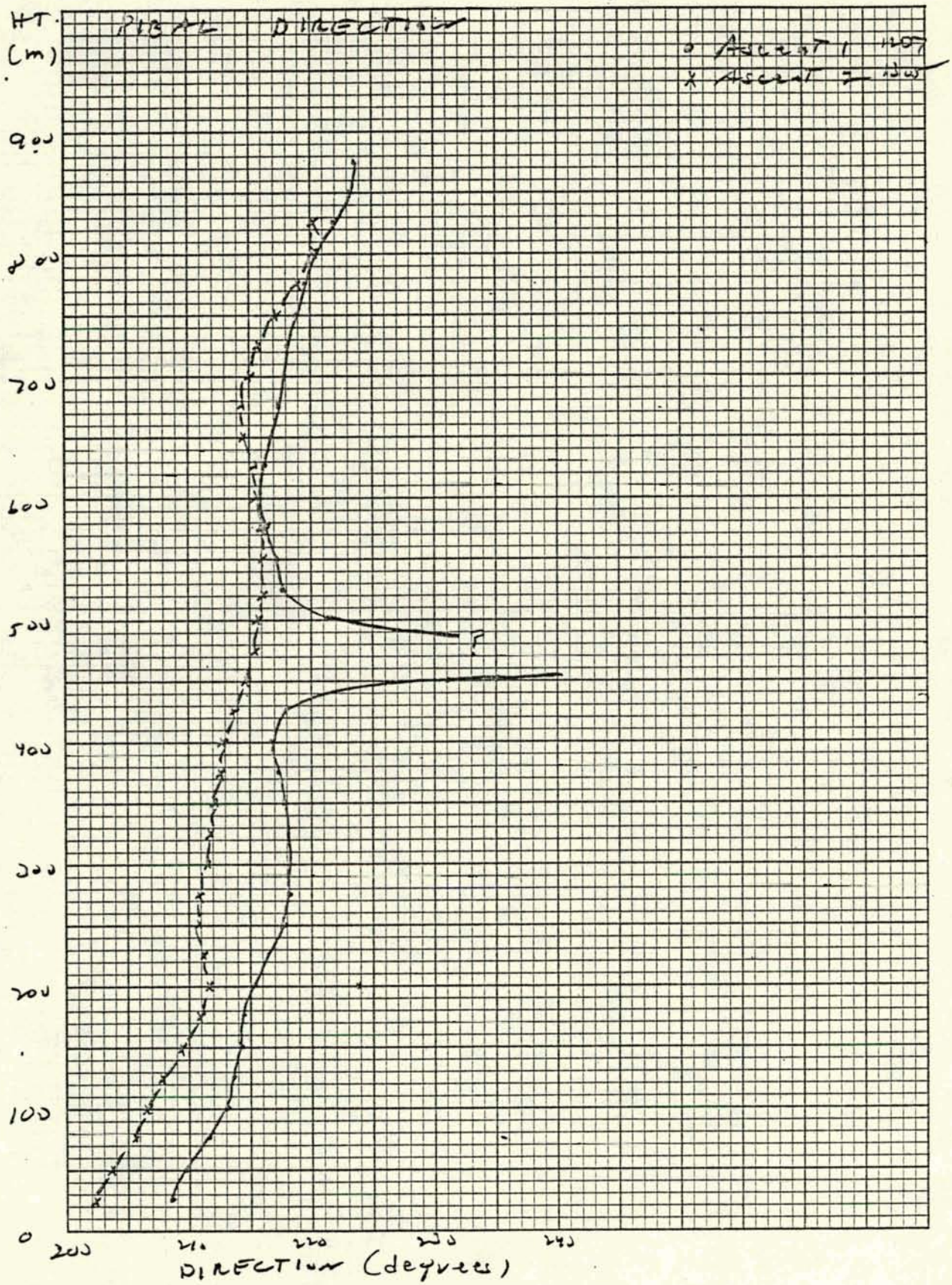


Fig. 6 Run 12 5-14-74



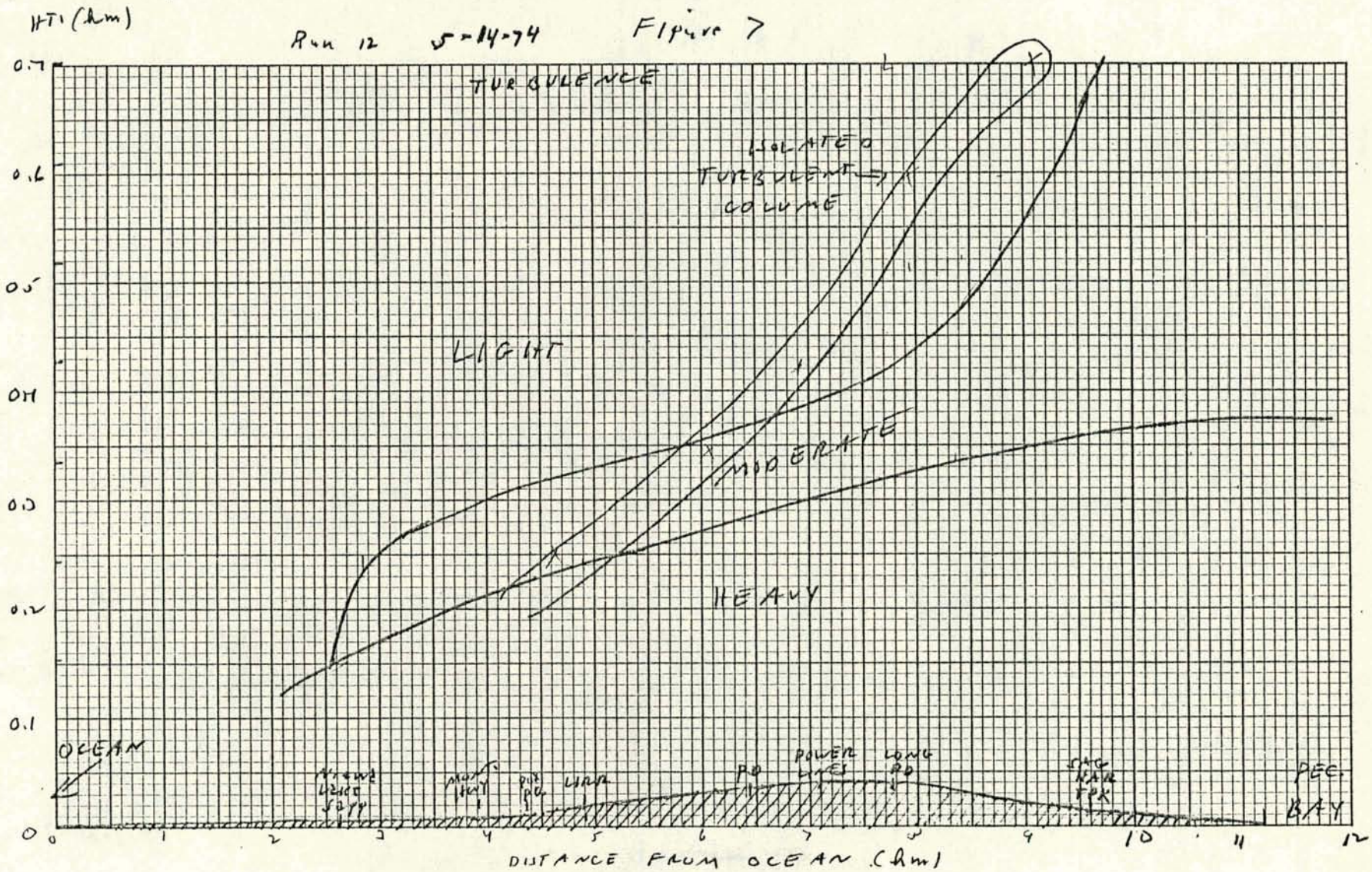
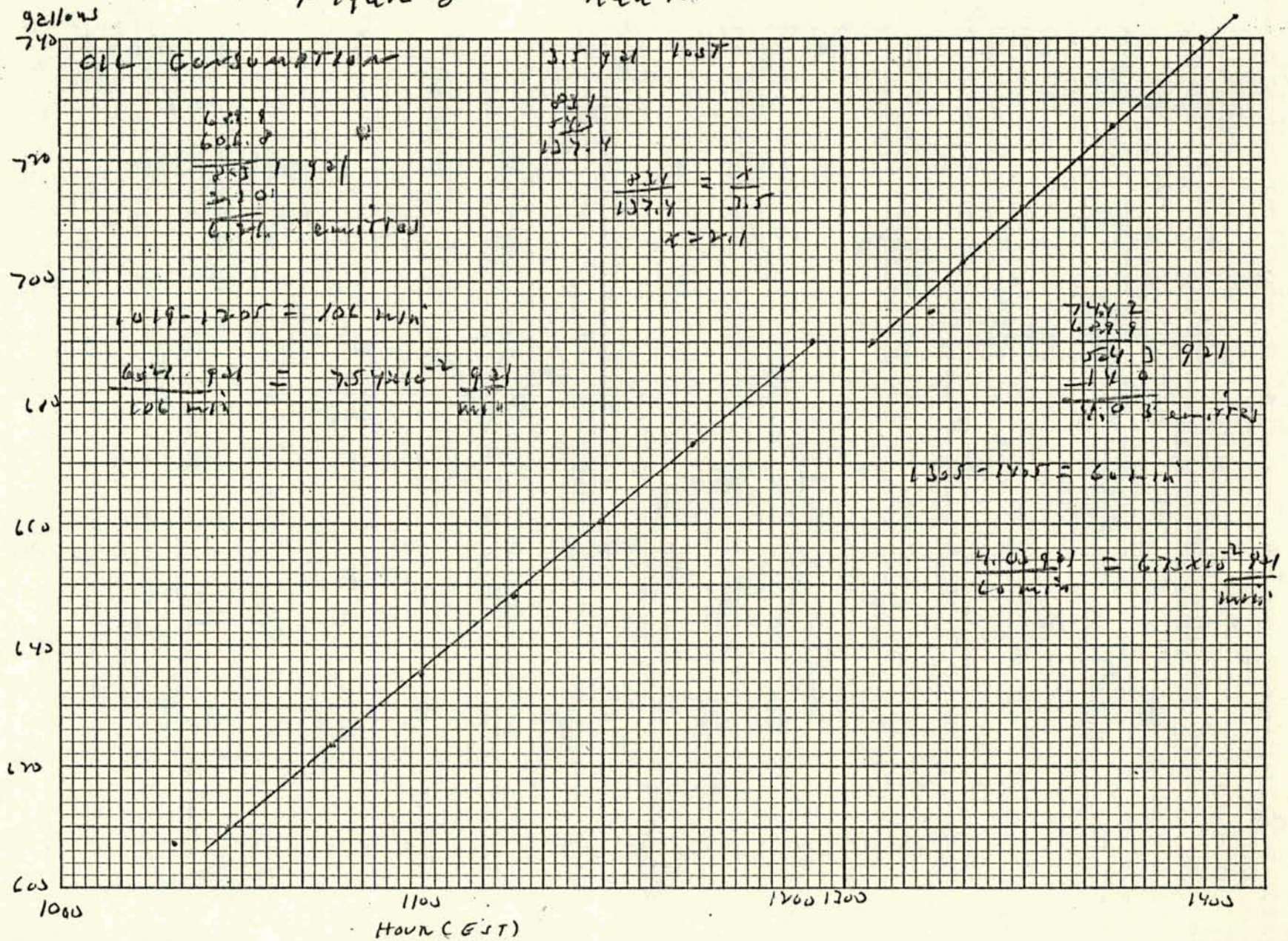

HT1 (km)
Run 12 5-14-74
Figure 7
TURBULENCE
ISOLATED TURBULENT COLUMNE
LIGHT
MODERATE
HEAVY
OCEAN
PEC. BAY
DISTANCE FROM OCEAN (km)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
1
2
3
4
5
6
7
8
9
10
11
12

Figure 2 Run 12 5-14-74



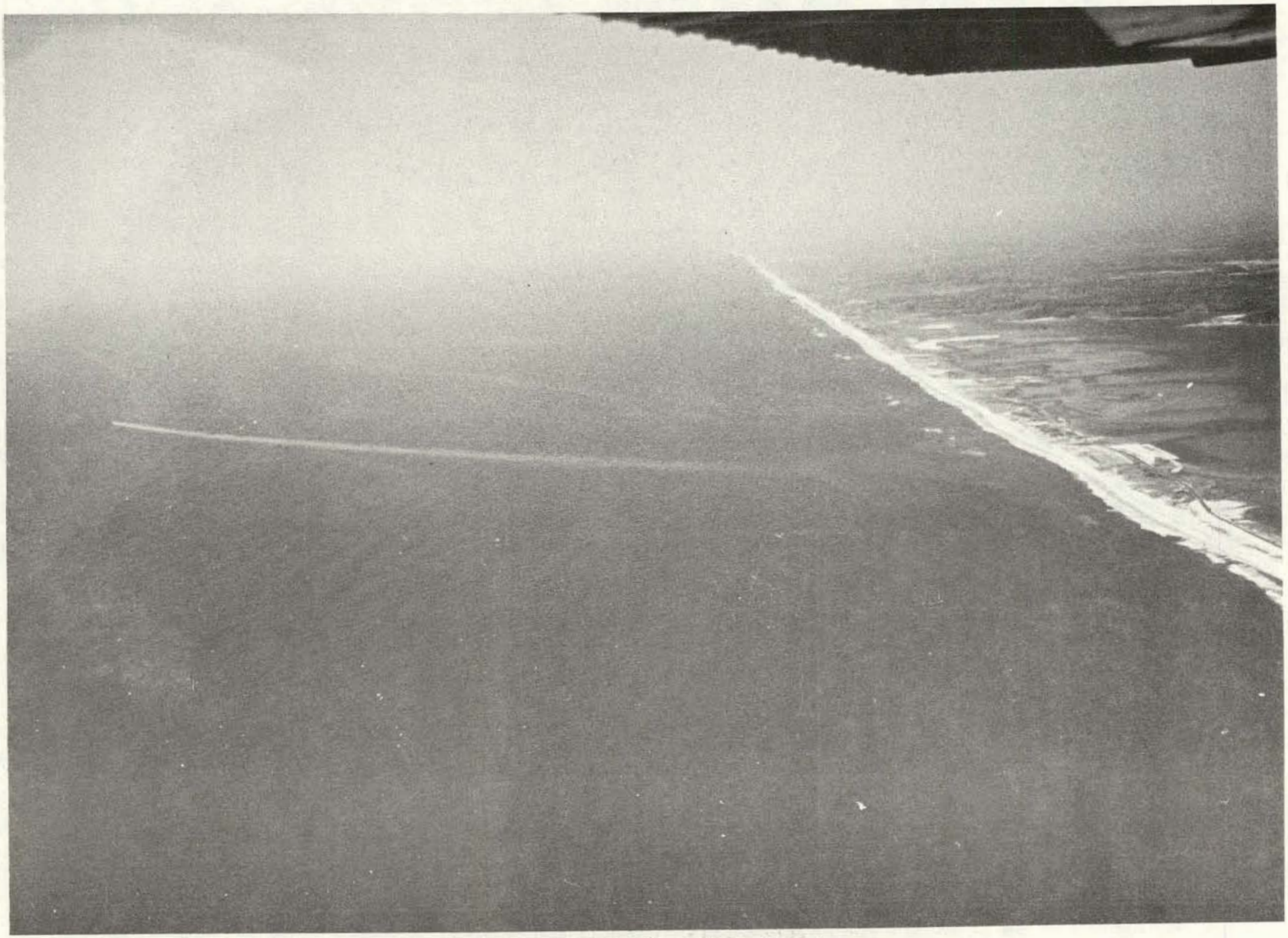
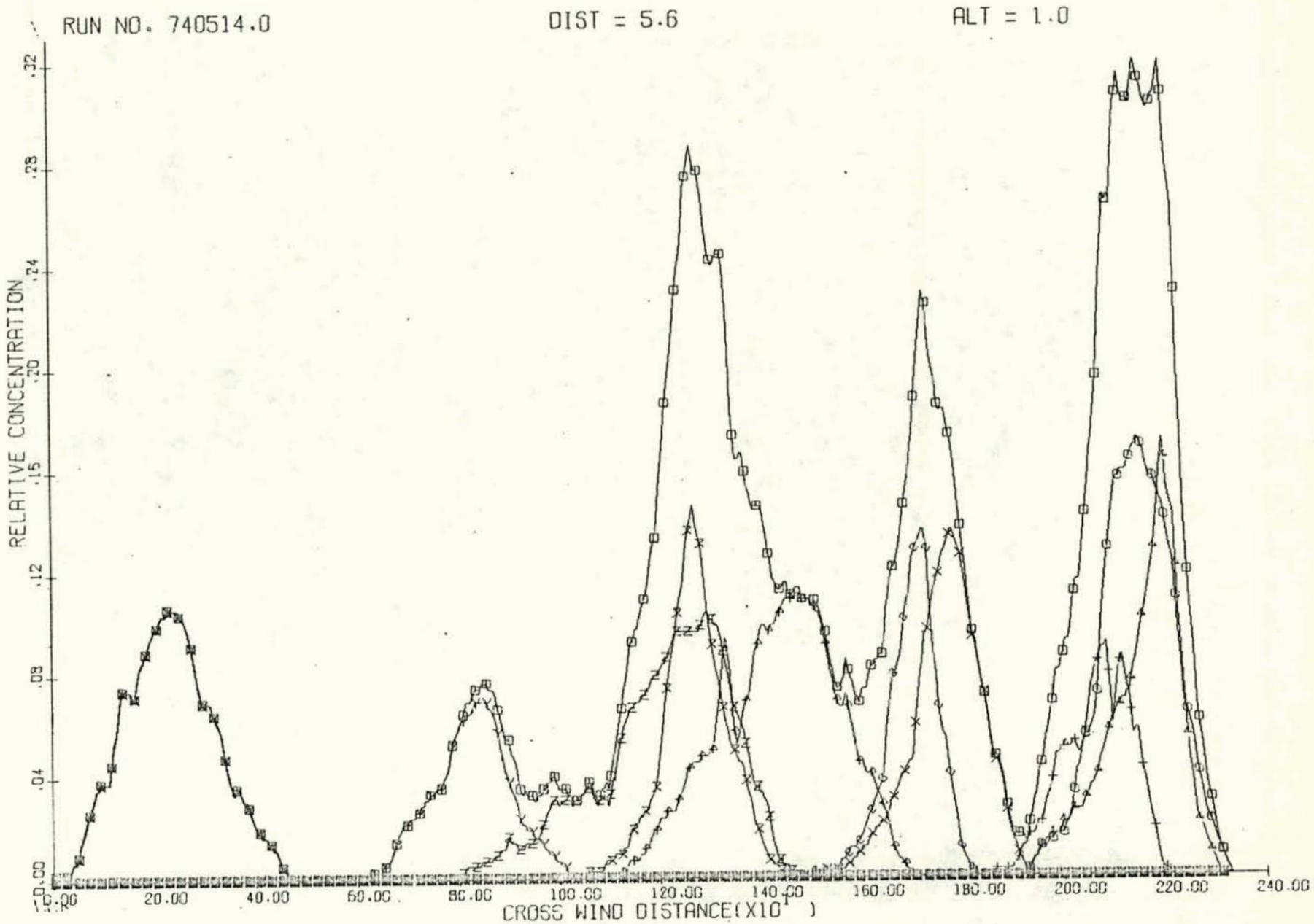
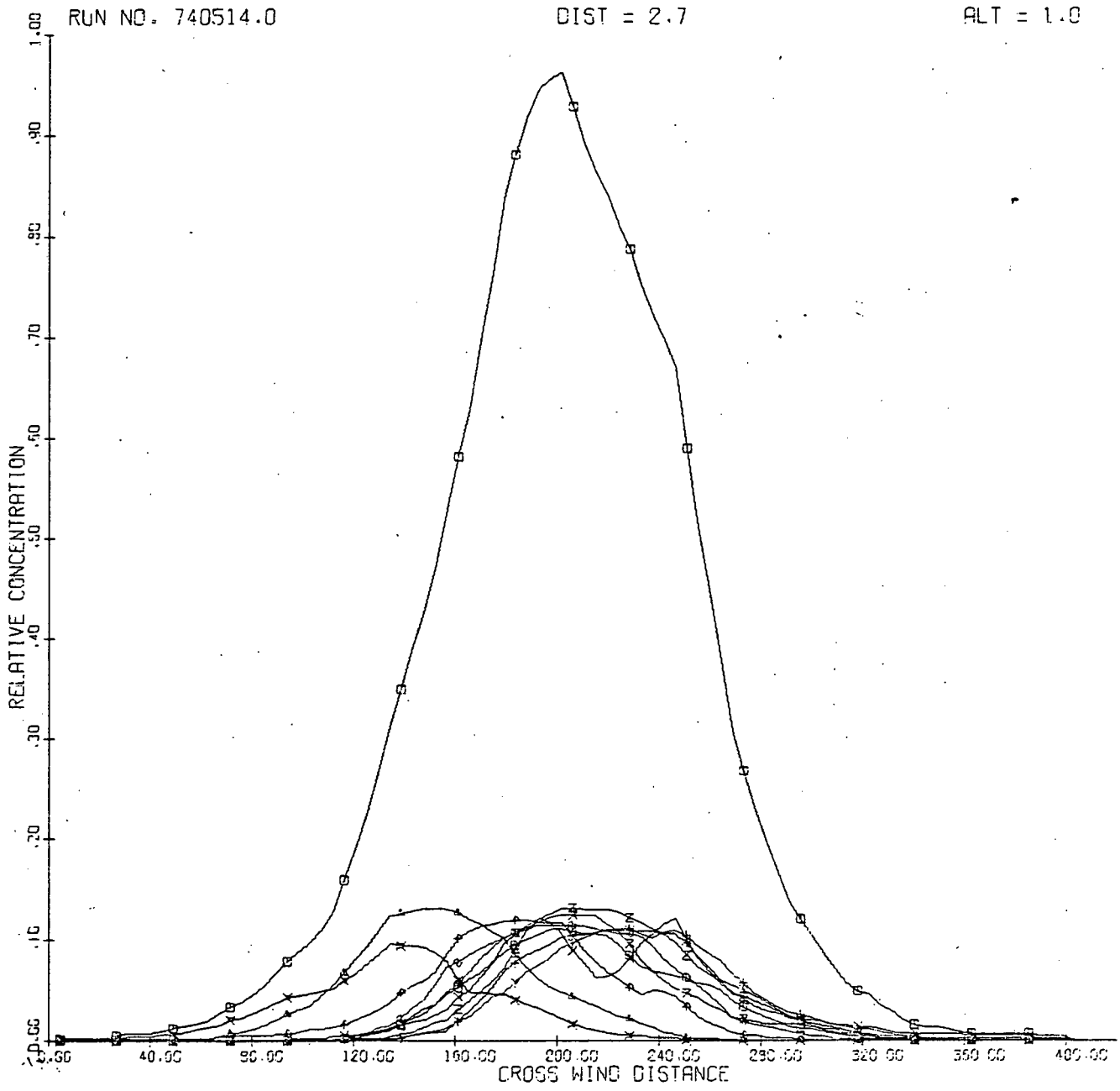


Figure 1. Aerial view of smoke plume,
Run 12, 5-14-74.


RUN NO. 740514.0
DIST = 5.6
ALT = 1.0
RELATIVE CONCENTRATION
.32
.28
.24
.20
.15
.12
.08
.04
0.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
220.00
240.00
CROSS WIND DISTANCE(X10)


RUN NO. 740514.0
DIST = 2.7
ALT = 1.0
RELATIVE CONCENTRATION
CROSS WIND DISTANCE
1.00
.90
.80
.70
.60
.50
.40
.30
.20
.10
.00
-10.00
40.00
80.00
120.00
160.00
200.00
240.00
280.00
320.00
360.00
400.00

ON SHORE DENSITOMETER RUN FROM VAN
TRAVERSES AT ONE DISTANCE

RUN =740514./ DATE = 51474 /DISTANCE FROM STACK (KM)= 5.65
DIRECTION(DEG) = 200./TIME FROM 1100 TO 1146 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGND)
1.0	.305E+02	2145.4	69.8			9.93
2.0	.212E+02	2153.9	72.4			6.65
3.0	.138E+02	2063.9	65.1			4.44
4.0	.204E+02	1766.9	67.1			6.90
5.0	.147E+02	1699.3	50.2			5.63
6.0	.320E+02	1433.1	114.5			6.35
7.0	.184E+02	1269.6	63.1			6.61
8.0	.292E+02	1206.9	129.7			5.12
9.0	.123E+02	826.7	75.5			3.71
10.0	.234E+02	232.5	87.2			6.09
GRAND TOTAL	.216E+03	1485.5	88.2	595.6	589.1	

Corrected for plume angle	67.6	456.2	451.3

ON SHORE DENSITOMETER RUN FROM VAN
TRAVERSES AT ONE DISTANCE

RUN =740514./ DATE = 51474 /DISTANCE FROM STACK (KM)= 2.70
DIRECTION(DEG) = 200./TIME FROM 1320 TO 1357 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGND)
1.0	.106E+02	213.0	39.3			6.12
2.0	.112E+02	155.5	34.7			7.34
3.0	.114E+02	230.5	38.1			6.77
4.0	.113E+02	217.4	41.1			6.26
5.0	.116E+02	206.1	36.4			7.25
6.0	.109E+02	184.5	39.4			6.30
7.0	.112E+02	211.9	42.3			6.01
8.0	.119E+02	220.1	35.2			7.68
9.0	.108E+02	234.5	43.8			5.61
10.0	.791E+01	135.9	39.6			4.54
GRAND TOTAL	.109E+03	203.0	39.0	48.7	29.0	

Corrected for plume angle	29.9	37.3	22.2

Run No. 13
June 14, 1974

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: August 1, 1974

TO: Files

FROM: G. S. Raynor

SUBJECT: Offshore Test No. 13

Offshore test no. 13 was held on June 14, 1974. Scattered cirrus was present. An elongated NE-SW high was located over the east coast from eastern Canada to the Gulf Coast with the center over the Long Island-Southern New England area. The gradient winds were from the SE. Waves were about 2-3 feet from the SSE with no appreciable swell. Low tide occurred at 0635 and high at 1344. Thus, the tide was rising during the run. Eastern standard time is used throughout this report.

Personnel left BNL at 0755, arrived at the boats about 0900 and at Tiana from 0900 to 0915. The LCM left the Inlet at 0945 and the Liberty at 1010. At Tiana, the beach mast was instrumented by 0935 and the trailer tower at 1047.

The LCM was manned by Walter Jahnig, Ed Divis and Bert Pade. Test smoke was produced from 1010-1018. The LCM was then stationed three nautical miles offshore slightly east of Shinnecock Inlet (Figure 1). Smoke was emitted from 1045 to 1321. However, oil dripping from the new stack ignited several times at one nozzle so one burner was shut down at 1205. Excessive oil loss and threat of additional fires caused shut down at 1321, somewhat earlier than planned.

The boat anemometer recorder was operated on fast speed from 1100 to 1227 when the chart paper ran out. Mean wind speed during this period was 1.62 mps at 7.0 m. (A typographical error in the report on test 12 gives this height at 2.0 m. Please correct your copy.) Since the speed was increasing somewhat during the test, a true mean for the entire test period would be somewhat higher, probably about 1.8 mps.

Kytoon ascents for temperature measurements were made at 1130 and 1330. Due to the low wind speeds, the maximum height reached was 34 m. Low-level air and water temperatures were

taken with a mercury thermometer using a bucket for the water temperatures.

The Liberty was manned by Sy Fink and Arthur Tingle. A series of 11 pictures was taken from photo position 1 (Figure 1) at 30 sec. intervals from about 1142-1150. A later series was planned but cancelled due to the early shut down. Distance to the plume from pp 1 was about 160 m. The plume was about 550 m from the source. Other 35-mm pictures were taken of the boat and the plume.

Marker buoys were set out as shown in Figure 1, first at about 1 mile from the source and later at about 2 miles. Five traverses were made at the first distance and 3 at the second before the smoke was terminated. Air and water temperatures were taken at one location.

Tiana Beach was manned by Brown, McNeil, Raynor, Dennis Carlson and John Mikutowicz. The mobil tower extended fully and was carefully leveled and oriented. The Aerovane, MRI bivane, a cup anemometer, temperature sensor and thermistor were mounted at 16.1 m. Cup anemometers and temperature sensors were also mounted at 3.6 and 11 m. The beach mast was located about 8 m from and 2 m above the water since the lower beach rose steeply at that location. By 1210, the water had reached the base of the mast which was moved 16 m up the beach between 1215 and 1220. The base was then about 0.5 m above the water. Little change occurred during the rest of the run. Anemometers were mounted at 1, 2, 4 and 6 m.

The beach anemometer counters were started at 0935 and those from the tower at 1050. All were terminated at 1400. Chart recorders were started at about 1050 and left on fast speed until 1400. The Aerovane output and the thermistor signal were also recorded on the large tape recorder throughout this period. Three 45-min. runs were taken of the bivane output on the TEAC tape recorder. However, the vertical angle record did not appear correct and a bare wire was later found which apparently affected the signal. This has been repaired. All other instruments including the temperature sensors appeared to work correctly. Anemometer data are tabulated in Table 1 and plotted in Figure 2. The poor profiles cannot be explained since corrections were made according to a recent anemometer calibration.

Files
G. S. Raynor
Offshore Test No. 13 August 1, 1974

The smoke plume was observed to loop frequently in the vertical but diffusion in the horizontal was small. It was also observed to spread out in both directions at some altitude as if up against an inversion lid. Little meander was observed although the direction slowly shifted to more southerly during the test. Two sets of densitometer traverses were made along the road, seven from 1200 to 1247 and five from 1320-1355. The locations are shown on Figure 1. During the first set, the plume was moving slowly eastward through the sector shown. During photo period 1, the plume was at the westward edge of the sector.

The aircraft was manned by Ansel Tuthill. A temperature sounding was taken over the boat from 100 to 2500 feet at 1105-1115 (Table 2, Figure 3). Additional soundings were planned but prevented by failure of the sensor. This has since been repaired.

Picture-taking passes were made over the plume at 1000 feet at 1115 and 2000 feet at 1125 at 80 mph. Pictures were taken at 5 sec. intervals.

The newly-acquired Barnes PRT-5 infrared thermometer was flown for the first time. A pass was made at 2000 feet from the boat to Red Cedar Point and return at 1000 feet. Data were recorded on the strip chart recorder. A third pass was taken over the smoke plume and the bay. Results are encouraging in that the instrument clearly distinguishes between different types of surfaces and no wind-induced, electrical or mechanical errors are evident. However, the instrument is now being calibrated and the chart analyzed. More detailed results will be reported later.

Northwest-southeast variometer traverses were made along a line from south of Lake Sagaponack to Jessups Neck. Passes were made as follows, all at 80 mph with the recorder on the 100 mv/division scale. Data were also recorded on the TEAC tape recorder.

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G. S. Raynor
Offshore Test No. 13 August 1, 1974

Pass	Heading	Time	Height Ft.	Height m	Length of record (min)
1	N	1234-1240	500	152	5.7
2	S	1241-1248	800	244	6.8
3	N	1248-1254	1100	335	5.8
4	S	1254-1302	1400	427	7.5
5	N	1305-1312	1700	518	6.3
6	S	1313-1320	2000	610	6.9
7	N	1323-1331	2500	762	7.1

Another pass was made about 1340 offshore parallel to the beach at 800 feet (244 m) from Lake Sagaponack to Ponquogue. The first portion of this did not record on the chart but is on the tape.

The turbulence data observed is plotted in Figure 4. The pattern is simple with heavy turbulence within the boundary layer and light turbulence above. The area of moderate turbulence on the north shore is due to the pond and marshes at the base of Jessups Neck.

Temperatures taken on the trailer tower, from the boats and from the kytoon are tabulated in Table 3 and plotted in Figure 3 except the kytoon temperatures which are believed high.

Pibals were taken at Tiana at 1228 and 1345 and are plotted in Figures 4 and 5.

Oil consumption is shown in Figure 7. The rate decreased only from 8.32×10^{-2} to 6.85×10^{-2} gal/min. after one nozzle was shut down. These figures are corrected for oilloss in the stack assuming loss was proportional to flow rate during the two halves of the run. This small change in output confirms visual observations from the boats that the appearance of the plume changed little. This event indicates that oil flow from the drum to the point where it divides to the two nozzles is limited by too small a pipe or fitting diameter and that greater smoke output might be obtained by removing the restriction.

The run was terminated at 1400. The tower and instruments at Tiana were disassembled at 1440. Personnel reached BNL about 1630.

Files
G.S. Raynor
Offshore Test No. 13 August 1, 1974

In summary, low-level air temperatures were quite close to water temperatures allowing appreciable vertical looping although horizontal diffusion remained small.

GSR/lk

Table 1

Anemometer Wind Speeds (m/sec) Run #13 6-14-74

Time (EST)	Beach Mast 1 m	2 m	4 m	6 m	Parking Lot 3 m	6 m	11 m	16 m
0940-0945	2.17	2.21	2.17	2.16				
0945-0950	2.19	2.24	2.17	2.13				
0950-0955	2.17	2.23	2.24	2.19				
0955-1000	2.46	2.54	2.49	2.48				
1000-1005	3.26	3.36	3.39	3.31				
1005-1010	3.29	3.40	3.43	3.39				
1010-1015	3.26	3.36	3.42	3.34				
1015-1020	3.00	3.05	3.06	3.05				
1020-1025	2.87	2.95	2.97	2.96				
1025-1030	3.10	3.20	3.22	3.18				
1030-1035	3.20	3.31	3.36	3.32				
1035-1040	2.93	2.99	2.95	2.92				
1040-1045	2.93	3.03	3.05	3.02				
1045-1050	2.95	3.02	2.99	3.00				
1050-1055	2.81	2.91	2.96	2.92				
1055-1100	3.32	3.43	3.45	3.46				
1100-1105	3.00	3.09	3.14	3.11	3.52	3.28	3.64	3.45
1105-1110	2.80	2.86	2.88	2.85	3.24	2.92	3.34	3.18
1110-1115	2.66	2.74	2.74	2.73	3.01	2.70	3.19	3.17
1115-1120	2.80	2.90	2.90	2.83	3.16	2.84	3.28	3.11
1120-1125	2.61	2.67	2.65	2.59	2.86	2.45	2.95	2.81
1125-1130	2.37	2.42	2.40	2.34	2.75	2.26	2.75	2.58
1130-1135	2.10	2.12	2.06	1.99	2.37	1.78	2.38	2.25
1135-1140	1.92	1.95	1.88	1.89	2.42	1.81	2.41	2.26
1140-1145	2.14	2.14	2.11	2.08	2.50	1.94	2.51	2.35
1145-1150	2.09	2.11	2.06	2.04	2.45	1.86	2.46	2.32
1150-1155	2.06	2.08	1.98	1.98	2.43	1.85	2.43	2.28
1155-1200	2.20	2.24	2.19	2.19	2.66	2.17	2.67	2.54
1200-1205	2.50	2.54	2.49	2.47	2.95	2.53	2.96	2.79
1205-1210	2.84	2.89	2.85	2.80	3.34	2.93	3.31	3.17
1210-1215	2.91	2.98	2.93	2.90	3.36	2.96	3.37	3.24
1215-1220	2.50	2.69	2.63	2.69	3.54	2.82	3.56	3.43
1220-1225	2.63	2.74	2.72	2.75	3.29	2.87	3.35	3.20
1225-1230	2.60	2.70	2.67	2.66	3.21	2.76	3.27	3.13
1230-1235	2.47	2.53	2.47	2.46	2.98	2.51	3.05	2.93
1235-1240	2.75	2.86	2.85	2.83	3.37	3.00	3.50	3.41
1240-1245	2.92	3.08	3.11	3.15	3.73	3.42	3.88	3.78
1245-1250	2.86	2.97	3.00	3.02	3.71	3.43	3.79	3.67
1250-1255	2.93	3.07	3.12	3.17	3.73	3.70	4.02	3.95
1255-1300	3.21	3.35	3.38	3.41	3.83	3.75	4.08	4.03
1300-1305	3.19	3.34	3.39	3.48	3.94	3.92	4.25	4.15
1305-1310	3.16	3.30	3.32	3.35	3.75	3.69	4.02	3.95
1310-1315	2.80	2.97	3.00	3.04	3.47	3.38	3.80	3.76
1315-1320	2.83	2.95	2.98	3.01	3.54	3.42	3.81	3.75
1320-1325	2.49	2.58	2.57	2.61	3.13	2.83	3.42	3.36
1325-1330	2.08	2.15	2.14	2.18	2.72	2.22	3.02	2.96
1330-1335	1.92	1.97	1.93	1.99	2.47	1.83	2.71	2.65
1335-1340	1.86	1.94	1.88	1.94	2.36	1.56	2.57	2.55
1340-1345	1.75	1.80	1.72	1.73	2.12	1.23	2.27	2.22
1345-1350	2.56	2.64	2.65	2.70	3.09	2.75	3.39	3.28
1350-1355	2.83	3.00	2.99	3.05	3.49	3.43	3.92	3.84
1355-1400	2.96	3.06	3.03	3.11	3.55	3.56	3.98	3.80
1100-1400	2.56	2.65	2.63	2.64	3.11	2.73	3.26	3.15

Table 2

Aircraft Temperatures Run 13 6-14-74

Height (m)	1105-1115E Over Ocean
31	17.2
61	17.4
91	17.9
122	18.6
152	18.7
183	18.6
213	18.6
244	18.4
274	18.3
305	18.1
335	17.9
366	17.6
396	17.4
427	17.2
457	16.9
488	16.8
518	16.4
549	16.3
579	16.1
610	16.0
640	16.0
671	16.0
701	16.0
732	15.9
762	15.7

Table 3

Low-level Temperature Measurements Run 13 6-14-74
(°C)

Tower		Kytoon from LCM-8			
		Ascent 1 1130E		Ascent 2 1330E	
Ht. (m)	Temp.	Ht. (m)	Temp.	Ht. (m)	Temp.
3	17.72	Surface	21.9	Surface	24.9
6	17.28	9.5	22.1	9.5	24.7
11	17.20	18.2	22.5	18.5	23.6
16	17.18	25.5	22.5	26.5	23.9
				34.0	23.6

	Temperature	
	Water	Air
LCM (3 miles)		
1107	17.1	19.8
1300	17.4	24.2
Liberty (3 miles)	17.4	17.8

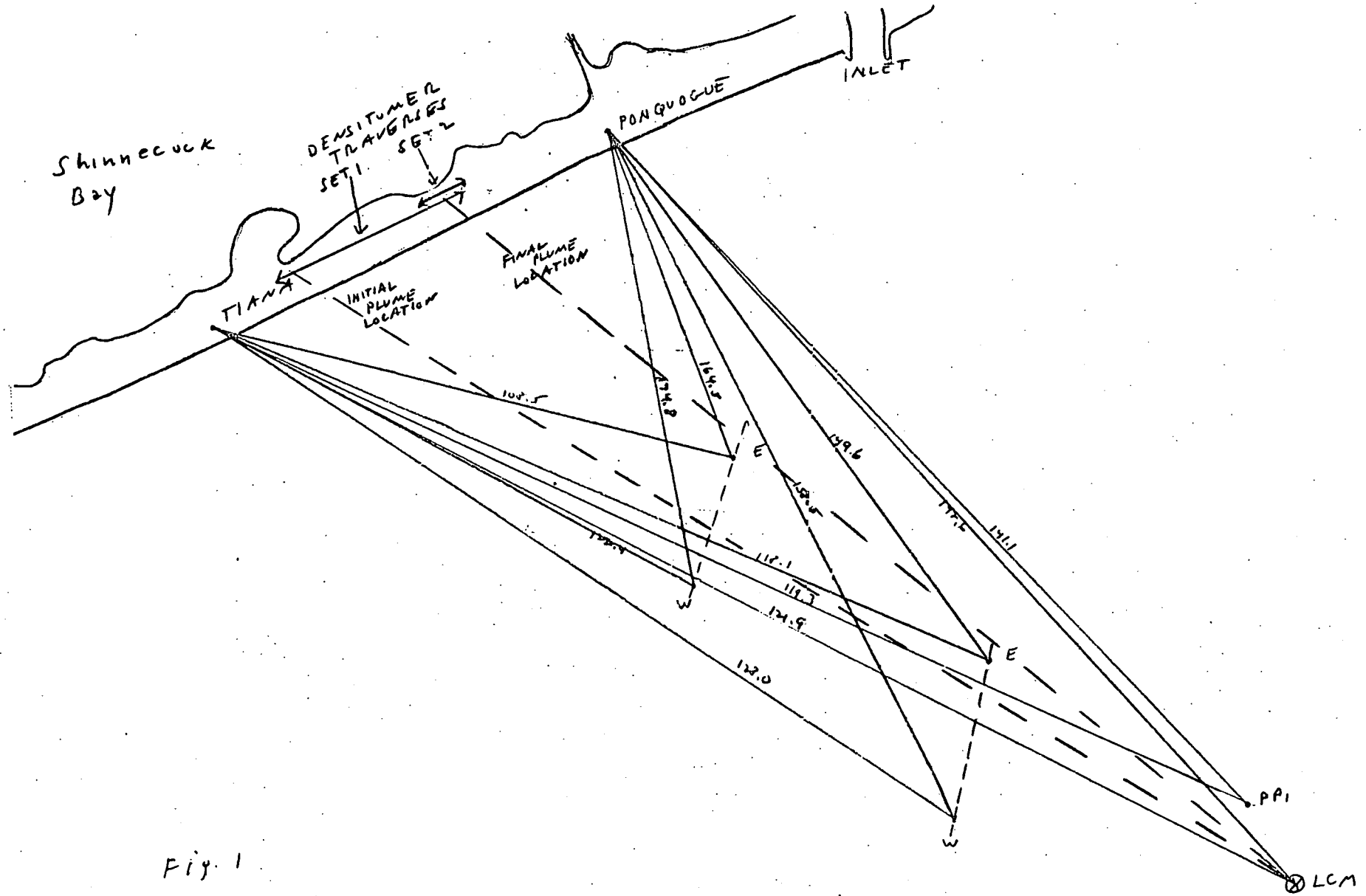
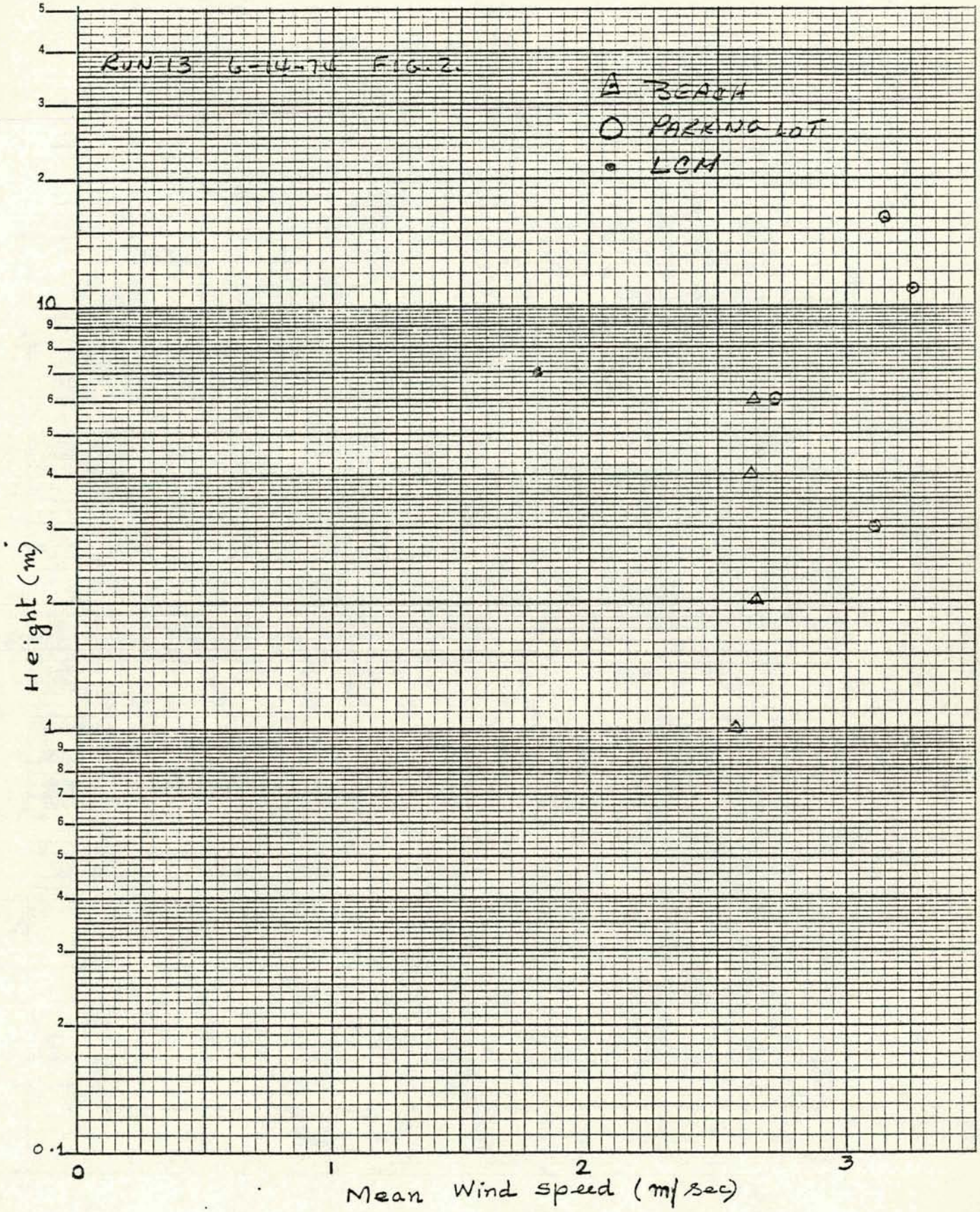
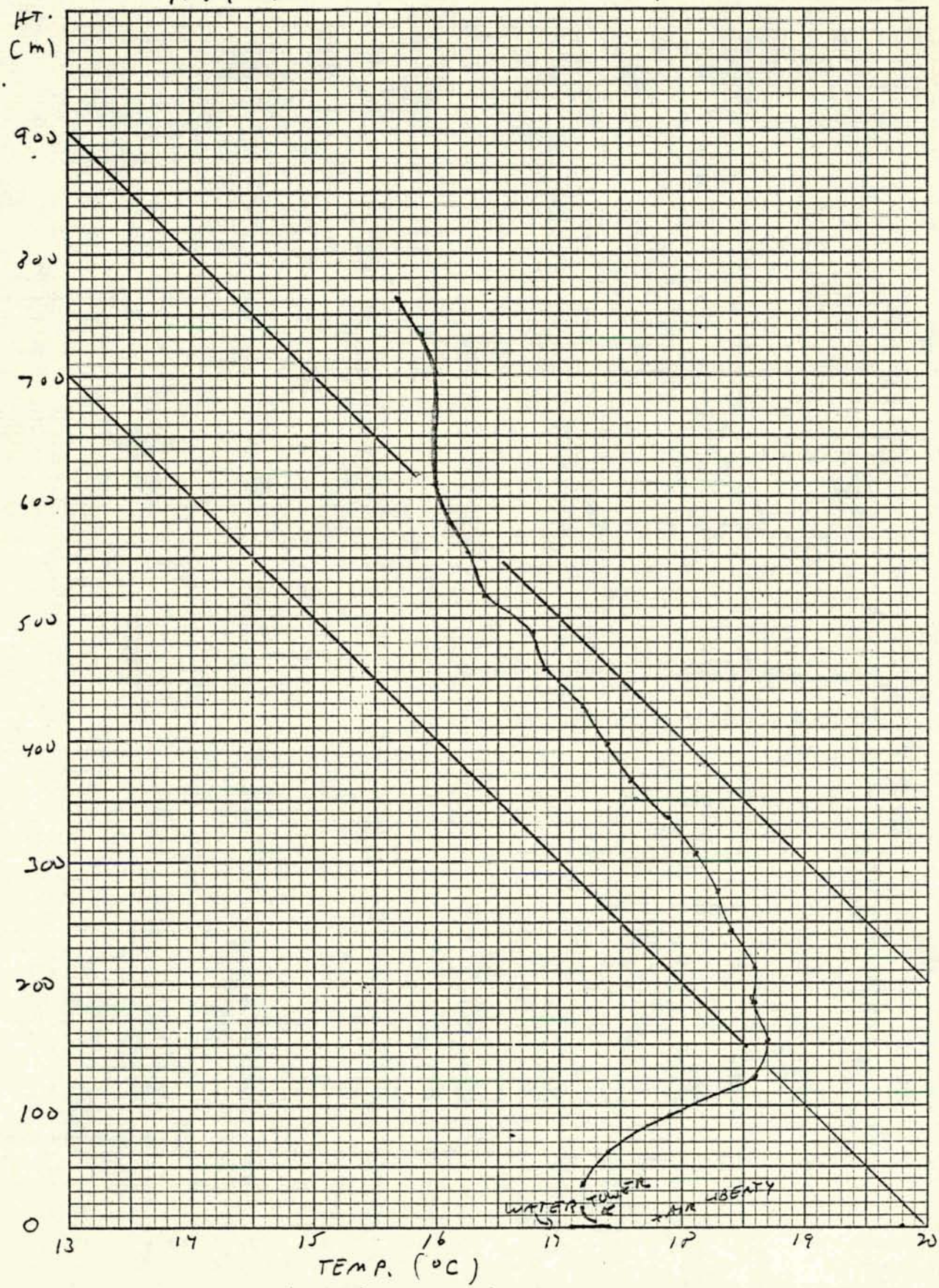
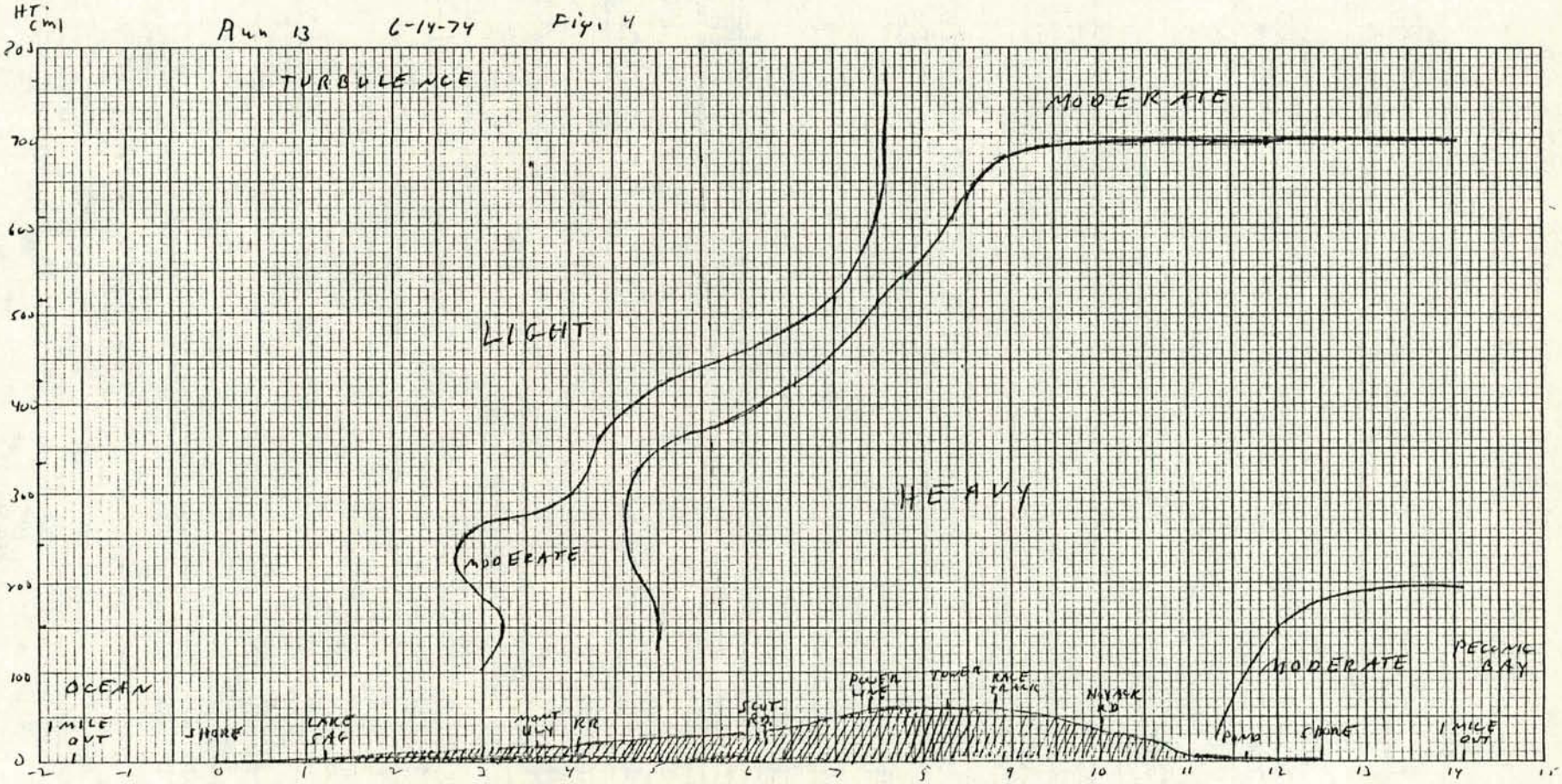


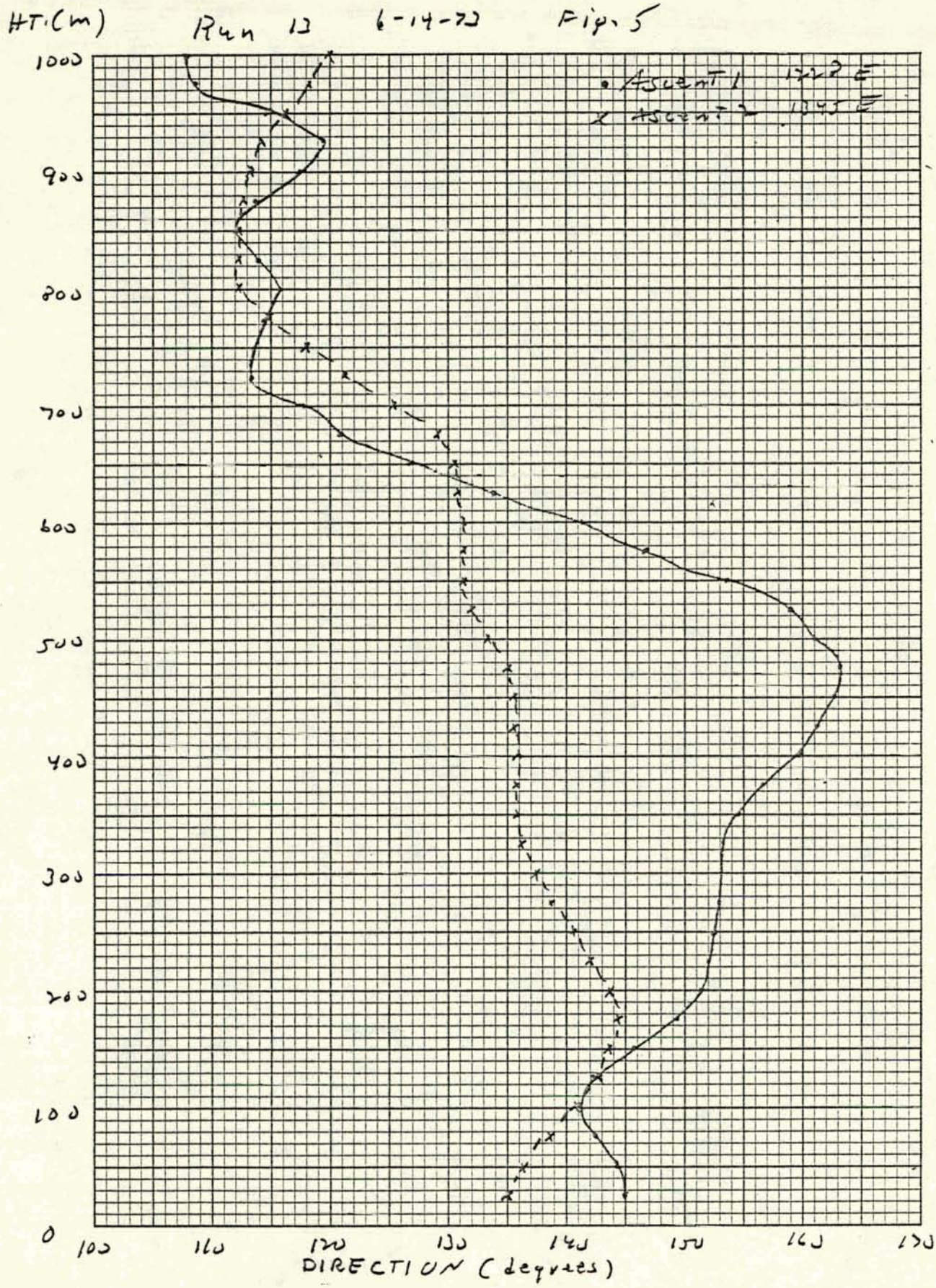
Fig. 1
Run 13
6-14-78

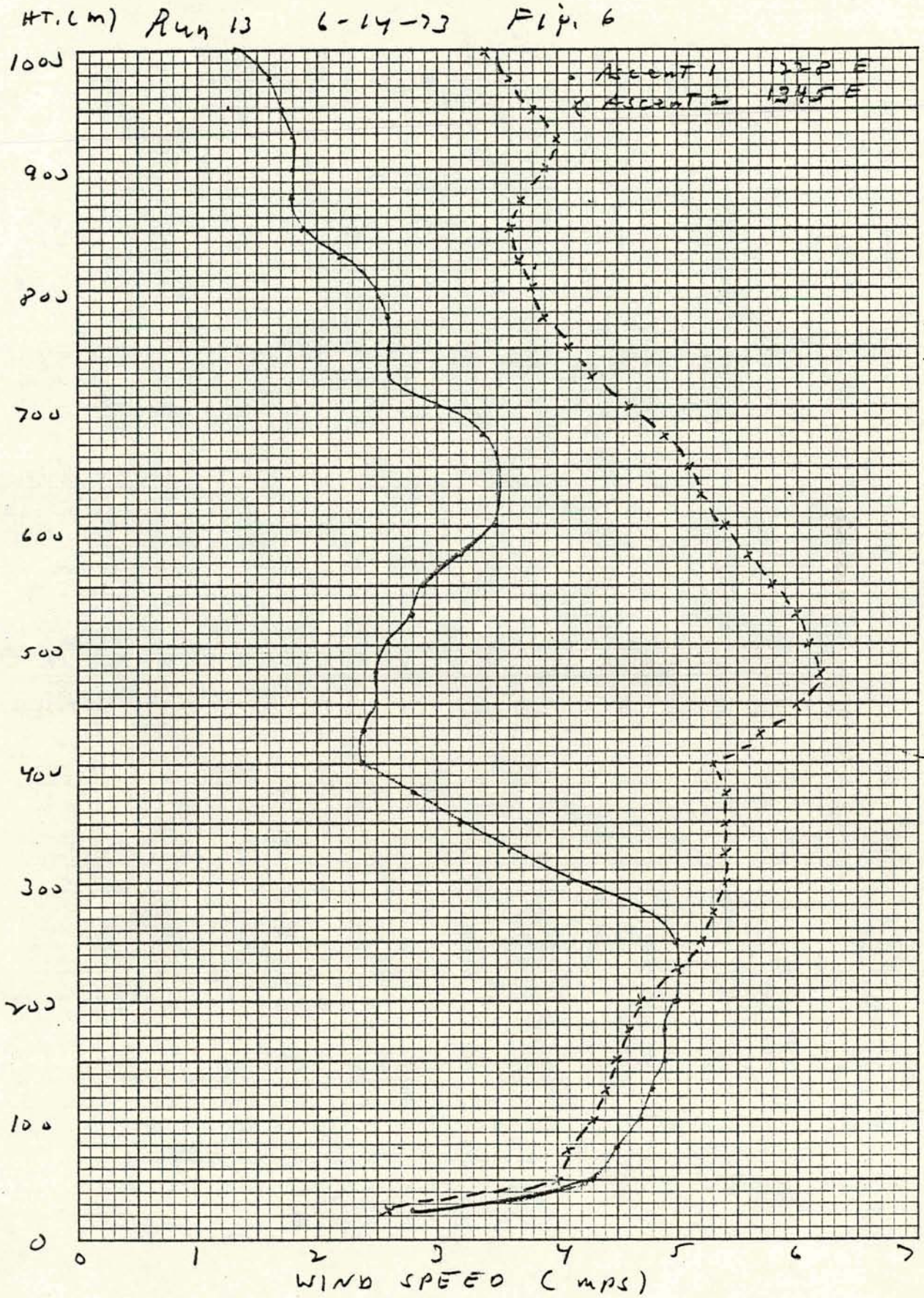

RUN 13 6-14-74 FIG. 2.
△ BEACH
○ PARKING LOT
• LCM
Height (m)
Mean Wind speed (m/sec)
0
1
2
3
0.1
1
2
3
4
5
6
7
8
9
10

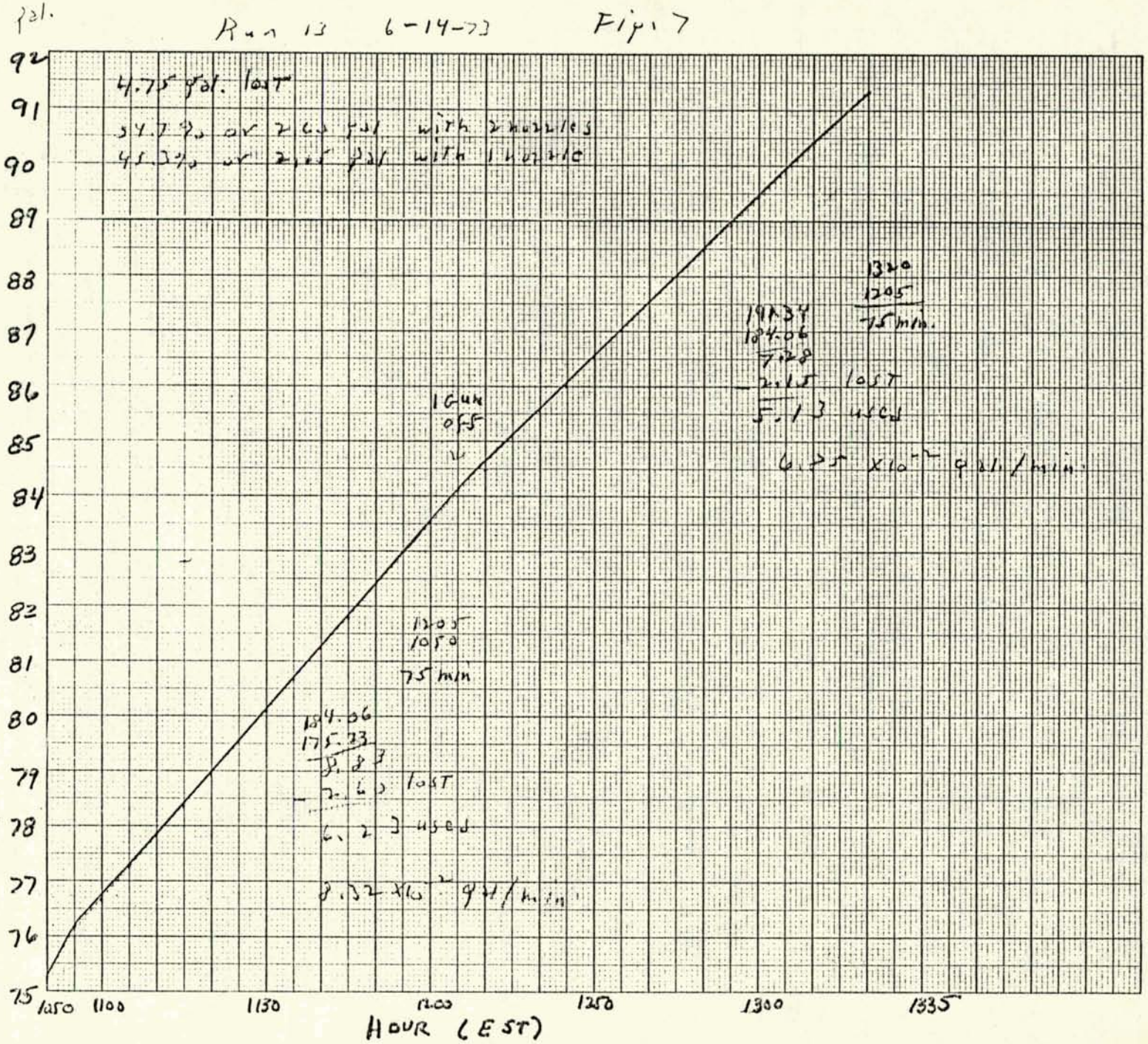
Run 13 6-14-74 Figure 3




HT. (cm)
Run 13
6-14-74
Fig. 4
TURBULENCE
MODERATE
LIGHT
HEAVY
MODERATE
MODERATE
OCEAN
1 MILE OUT
SHORE
LAKE SAG
MONT ULY
RR
SCUT. RD.
POWER LINE
TOWER
RACE TRACK
NAVASK RD
POND
SHORE
1 MILE OUT
PECONIC BAY
200
700
600
500
400
300
200
100
0
-2
-1
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15


HT. (m)
Run 13 6-14-72 Fig. 5
• Ascent 1 1742 E
x Ascent 2 1845 E
1000
900
800
700
600
500
400
300
200
100
0
100
110
120
130
140
150
160
170
DIRECTION (degrees)


HT. (m) Run 13 6-14-73 Fig. 6
• Ascent 1 1322 E
x Ascent 2 1345 E
1000
900
800
700
600
500
400
300
200
100
0
0
1
2
3
4
5
6
7
WIND SPEED (mps)


gal.
Run 13 6-14-73
Fig. 7
4.75 gal. lost
34.7% or 2.65 gal with 2 nozzles
45.3% or 2.65 gal with 1 nozzle
1 GUN OFF
1205
1050
75 min
184.06
175.33
8.73
- 2.65 lost
6.23 used
8.32 x10⁻² gal/min
1320
1205
75 min.
194.34
184.06
7.28
- 2.15 lost
5.13 used
6.85 x10⁻² gal/min
92
91
90
89
88
87
86
85
84
83
82
81
80
79
78
77
76
75
1050
1100
1130
1200
1250
1300
1335
HOUR (EST)

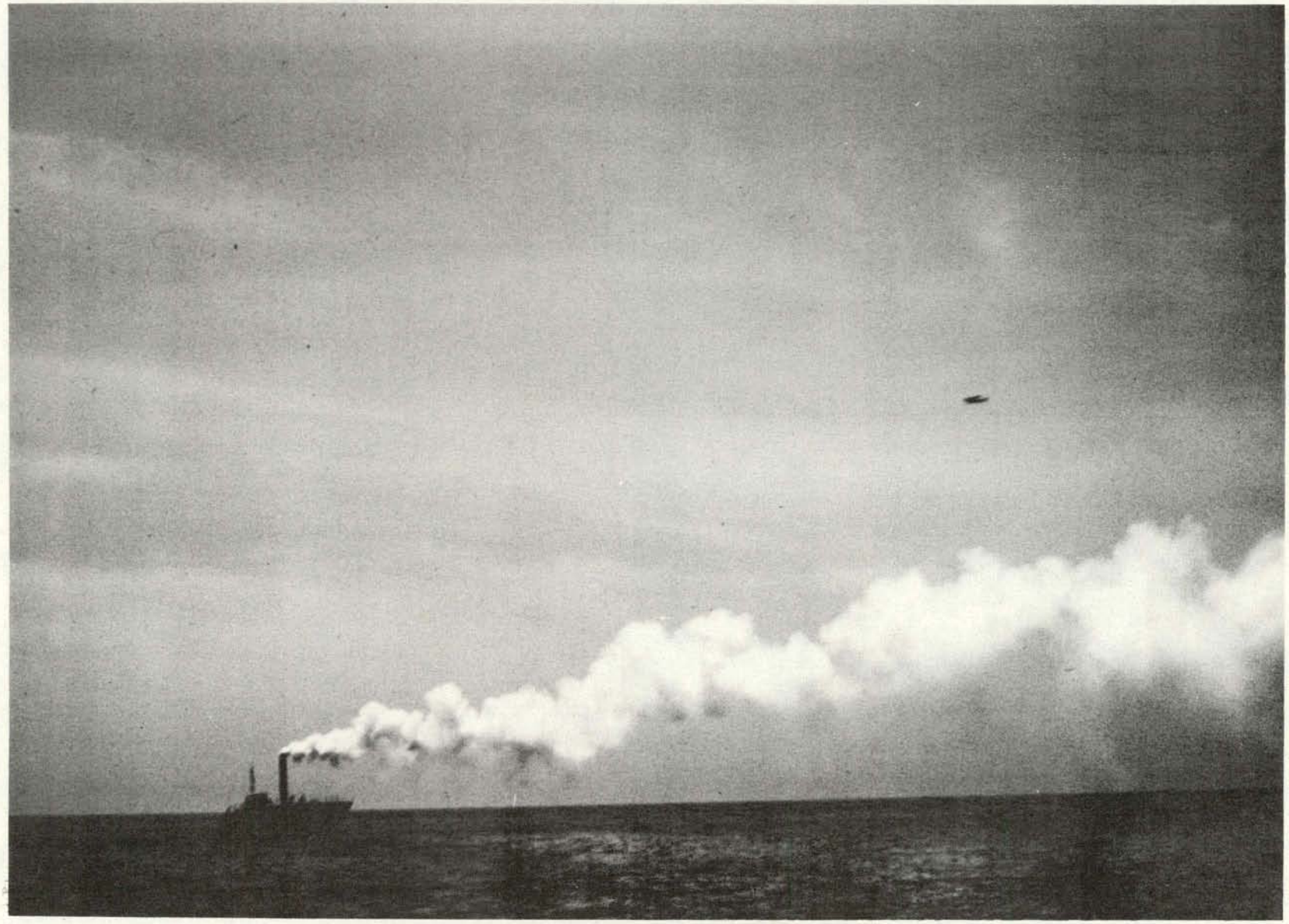
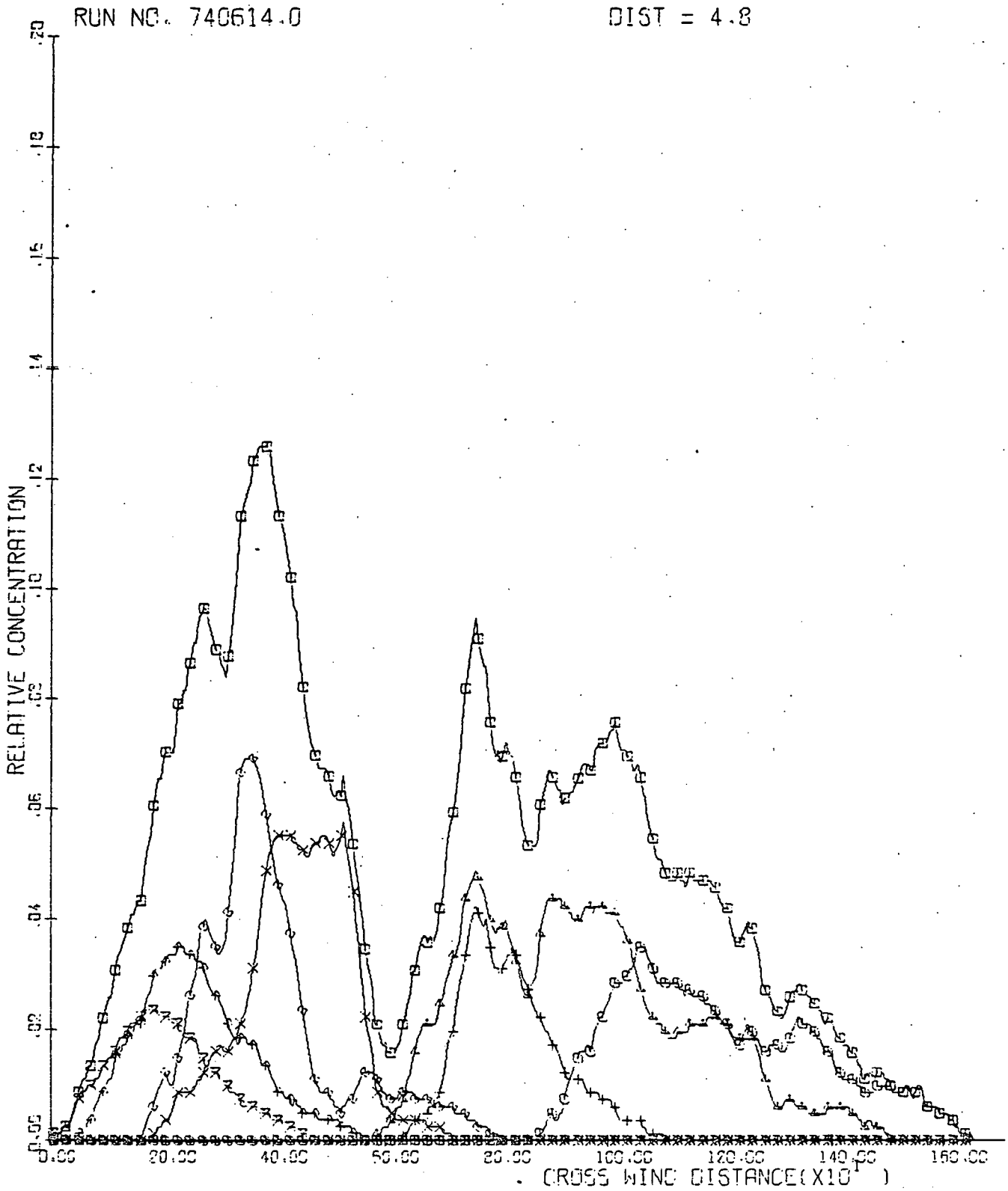


Figure 1. Smoke plume, Run 13, 6-14-74.

Figure 2. Aerial view of smoke plume,
Run 13, 6-14-74.


RUN NO. 740614.0
DIST = 4.8
RELATIVE CONCENTRATION
.20
.18
.16
.14
.12
.10
.08
.06
.04
.02
0.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
CROSS WIND DISTANCE(X10)

ON SHORE DENSITOMETER RUN FROM VAN TR
AVERSES AT ONE DISTANCE

RUN =740614./ DATE = 61474 /DISTANCE FROM STACK (KM)= 4.80
DIRECTION(DEG) = 140./TIME FROM 1210 TO 1247 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGND)
1.0	.128E+02	1200.8	175.9			6.19
2.0	.206E+02	954.6	191.1			9.19
3.0	.748E+01	824.6	87.0			7.31
4.0	.130E+02	443.4	90.9			12.21
5.0	.130E+02	392.3	121.8			9.05
6.0	.802E+01	259.9	98.6			6.92
7.0	.533E+01	206.1	91.7			4.95
GRAND TOTAL	.803E+02	688.8	142.5	373.9	345.7	
Corrected for plume angle			133.9	351.5	324.9	

Run No. 14
July 18, 1974

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: August 7, 1974

TO: Files

FROM: G. S. Raynor

SUBJECT: Offshore Test No. 14

Offshore test no. 14 was held on July 18, 1974. Clouds were overcast altostratus and altocumulus at 8000 feet (2400 m) with a few brief breaks. Heavy haze was present and restricted visibility to about 3 miles. A high was centered well off shore to the SE. A low was located near James Bay with a warm front eastward and a cold front to the SW through Lake Michigan. The gradient wind was from the SW. Waves were 2-3 feet early in the run but increased to 4-5 feet as wind speeds increased. No appreciable swell was noted. High tides occurred at 0537 and 1742 and low at 1121. Thus, the tide changed from outgoing to incoming during the run. Eastern standard time is used throughout this report.

Personnel left BNL at 0640, arrived at Tiana at 0740 and at the boats at 0750. Both boats left the Inlet at about 0935. At Tiana, the beach mast was instrumented by 0840 and the trailer tower by 0945.

The LCM was manned by Walter Jahnig, Mark Powell and Dwight Dieterle. Test smoke was produced at 1011 and 1038. Due to the poor visibility, the LCM was then stationed 1.5 nautical miles off shore, about 1.5 miles west of Tiana (Figure 1). Smoke was emitted from 1110-1325. The smoke generator nozzles were not positioned as far into the stack as during Run 13 and little oil was lost.

The boat anemometer recorder was operated on fast speed during the run. Mean wind speed at the 7.0 m level was 7.25 mps. The chart record was affected by both radio transmissions and operation of the radar both of which added spikes to the trace. Damage to the kytoon prevented temperature measurements aloft. Air temperatures taken with a mercury thermometer and water temperatures taken with the new bucket thermometer are listed in Table 1.

Files
G. S. Raynor
Offshore Test No. 14 August 7, 1974

The Liberty was manned by Sy Fink and Art Tingle. No pictures were taken due to poor contrast between the smoke and the clouds. Two sets of densitometer traverses were taken at about 1/2 mile and 1 mile downwind from the source. The position of the marker buoys is shown in Figure 1. Measured distances to the center of each track are 0.85 and 1.77 km. Five traverses were made at the nearer distance and 8 at the other. Except for some trouble with moisture, the densitometer worked properly. Temperatures taken from the Liberty are also listed in Table 1. Temperatures taken from the two boats agree well.

Tiana Beach was manned by Brown, McNeil, Raynor and Dave Watts. The trailer tower extended fully and was carefully oriented and leveled. The Aerovane, MRI bivane, a cup anemometer, a temperature sensor and the thermistor were mounted at 16.1 m. Cup anemometers and temperature sensors were also mounted at 3, 6 and 11 m. The beach mast was located about 18 m from and 1 m above the water with anemometers at 1, 2, 4 and 6 m.

The beach anemometer counters were started at 0843 and the tower anemometer counters and charts at 0948. The charts were on fast speed from 0948-1338. The large tape recorder was operated for the same period recording the bivane and the thermistor output. Several tapes were taken on the TEAC tape recorder of the Aerovane output.

All instruments appeared to work correctly. However, the arm supporting the 16 m instruments had apparently rotated several degrees so that the bivane was leaning backwards about 5 degrees which will cause an error in the vertical angle.

Anemometer data are tabulated in Table 2 and plotted in Figure 2. Pibals were taken at Tiana at 1004 and 1245. Data are plotted in Figures 3 and 4.

The smoke plume was hard to observe because of the haze but appeared to be quite stable with smooth edges and little vertical diffusion. No meander took place and only a minor wind direction change during the run. The smoke crossed the beach just west of Tiana (Figure 1). Distance from the source to the road was 3.85 km during the first set of traverses and 3.57 km during the second.

The aircraft was manned by Ansel Tuthill. Since the radio used for communication with the aircraft was not yet repaired, a walky-talky radio was taken in the plane but communication was poor. A temperature sounding was taken over the boat and four along a line from south of Lake Sagaponack to east of Sag Harbor. Data are tabulated in Table 3. Temperature profiles are plotted in Figure 5 and a cross section in Figure 6. Lapse rates aloft were slightly less than adiabatic with a marine inversion extending to around 200 m. In Figure 6, the penetration of the warmer air at the top of the marine inversion is evident to about 6 km. Heating over the land is minor and confined to the northern part of the island.

North-south variometer passes at 80 mph were made at seven altitudes (Table 4). Data were recorded on both chart and tape recorders. Qualitative data are plotted in Figure 7. The boundary layer remained quite low, probably due to the overcast condition which minimized surface heating. An unusual feature is the penetration of heavy turbulence into the upper layer of light turbulence in four separate towers. No east-west passes were made.

Two picture-taking passes were made over the plume at about 1250 both at 100 feet and 80 mph with pictures at 5 second intervals. They coincided with the boat traverses at the 1 mile distance.

Due to lack of space, the infrared thermometer was not taken.

Oil consumption is shown in Figure 8 and averaged 6.86 x 10^{-2} gallons/minute. After the preceding run, a restriction was removed from the line but it was found that operation at the usual drum pressure of 10 psi caused emission of unvaporized oil. During this run, drum pressure was held at 5 psi so that no increase in smoke production occurred. In future tests, an intermediate pressure will be tried in an effort to increase smoke output.

The run was terminated at 1338. The tower and instruments at Tiana were disassembled at 1420. Personnel left the boats at 1500 and reached BNL about 1545.

In summary, the water was somewhat colder than the low-level air and conditions were quite stable.

Table 1

Water and Low-level Air Temperatures (^{o}C)

			Run 14	7-18-74
Time	Boat	Location	Water	Air
0930	LCM	Bay, E. of C.G. Station	20.2	
1420	"	"	22.8	
1120	"	Smoke position	20.1	21.8
1227		"	21.1	22.1
1318		"	21.2	21.9
1115	Liberty	E. marker, 1/2 mile	21.1	
1120	"	W. marker, 1/2 mile	21.1	
1130				21.9
1311				21.9
1330		W. marker, 1 mile	20.9	
1335		E. marker, 1 mile	20.9	
1400		1/2 mile off Inlet	21.5	
1407		Mouth of Inlet	21.9	

Trailer Tower 0950 - 1338

Ht.	Temp.
3	21.36
6	21.01
11	20.98
16	20.94

Table 2

Anemometer Wind Speeds (m/sec) Run 14 7-19-74

Time (EST)	Beach Mast 1 m	2 m	4 m	6 m	Parking Lot 3 m	6 m	11 m	16 m
0843-0848	4.46	4.98	5.20	5.17				
0848-0853	4.45	4.92	5.22	5.13				
0853-0858	4.80	5.26	5.62	5.57				
0858-0903	4.78	5.24	5.57	5.52				
0903-0908	-	5.31	5.69	5.66				
0908-0913	4.86	5.32	5.70	5.67				
0913-0918	5.08	5.54	5.92	5.87				
0918-0923	4.95	5.42	5.74	5.66				
0923-0928	5.15	5.66	5.97	5.91				
0928-0933	5.14	5.66	6.04	5.92				
0933-0938	5.26	5.75	6.09	6.02				
0938-0943	5.43	6.00	6.39	6.37				
0943-0948	5.09	5.57	6.01	5.99				
0948-0953	5.14	5.67	6.12	6.09	6.01	6.43	6.58	6.18
0953-0958	5.22	5.72	6.10	6.06	6.14	6.60	6.74	7.00
0958-1003	4.93	5.38	5.75	5.72	5.94	6.38	6.58	6.93
1003-1008	5.07	5.55	5.96	5.97	5.87	6.29	6.49	6.91
1008-1013	5.23	5.77	6.23	6.23	6.09	6.55	6.81	7.20
1013-1018	5.22	5.78	6.20	6.19	6.31	6.67	6.90	7.18
1018-1023	5.29	5.83	6.29	6.23	6.29	6.57	6.95	7.17
1023-1028	5.40	5.90	6.41	6.37	6.76	7.10	7.41	7.80
1028-1033	5.86	6.41	6.92	6.90	7.18	7.53	7.76	8.03
1033-1038	6.13	6.77	7.25	7.28	7.18	7.65	7.90	8.27
1038-1043	6.15	6.67	7.17	7.14	7.20	7.65	7.84	8.21
1043-1048	5.96	6.53	6.96	6.88	7.19	7.53	7.66	8.00
1048-1053	5.89	6.44	6.81	6.80	7.32	7.74	7.84	8.12
1053-1058	6.24	6.83	7.25	7.20	7.04	7.44	7.63	8.05
1058-1103	5.92	6.45	6.96	6.93	7.44	7.81	7.98	8.25
1103-1108	5.79	6.08	6.70	6.70	7.41	7.74	7.91	8.31
1108-1113	5.94	6.41	6.96	6.93	7.23	7.67	7.96	8.33
1113-1118	6.15	6.78	7.36	7.30	7.44	7.78	7.96	8.32
1118-1123	5.82	6.34	6.81	6.82	7.55	7.92	8.08	8.37
1123-1128	6.36	6.96	7.46	7.42	7.50	7.90	8.10	8.39
1128-1133	6.34	6.95	7.43	7.35	7.62	8.05	8.30	8.63
1133-1138	6.23	6.84	7.28	7.18	7.69	7.97	8.12	8.48
1138-1143	6.49	7.11	7.62	7.58	7.80	8.17	8.39	8.70
1143-1148	6.74	7.37	7.90	7.86	8.01	8.37	8.53	8.89
1148-1153	6.94	7.59	8.14	8.18	8.28	8.65	8.89	9.24
1153-1158	7.23	7.90	8.40	8.41	8.54	8.97	9.17	9.55
1158-1203	7.16	7.77	8.31	8.20	8.63	9.21	9.45	9.74
1203-1208	7.02	7.71	8.31	8.33	8.56	8.91	9.10	9.43
1208-1213	6.99	7.66	8.29	8.25	8.31	8.67	8.99	9.31
1213-1218	6.98	7.63	8.13	8.03	8.65	9.00	9.15	9.35
1218-1223	6.89	7.24	7.95	7.92	8.71	9.00	9.24	9.54
1223-1228	6.81	7.41	7.97	7.98	8.72	9.02	9.25	9.53
1228-1233	7.04	7.70	8.23	8.19	8.51	8.86	9.15	9.31
1233-1238	6.79	7.42	8.03	7.98	8.78	9.08	9.29	9.49
1238-1243	7.24	7.91	8.41	8.35	8.95	9.26	9.47	9.66
1243-1248	7.29	7.09	8.49	8.36	8.55	8.86	9.10	9.36
1248-1253	7.18	7.85	8.46	8.39	8.63	8.94	9.18	9.31
1253-1258	6.99	7.49	8.26	8.30	8.65	9.13	9.36	9.49
1258-1303	6.75	7.34	7.93	7.86	8.46	8.79	9.04	9.20
1303-1308	6.65	7.25	7.73	7.64	8.29	8.51	8.68	8.87
1308-1313	6.16	-	7.17	7.13	7.49	7.95	8.04	8.31
1313-1318	6.28	6.93	7.45	7.39	8.02	8.31	8.42	8.44
1318-1323	6.60	7.06	7.86	7.89	7.97	8.39	8.52	8.60
1323-1328	6.45	6.60	7.63	7.60	7.92	8.16	8.41	8.62
1328-1333	6.68	6.37	7.91	7.85	8.10	8.49	8.49	8.91
1333-1338	6.51	6.32	7.74	7.71	7.97	8.35	8.49	8.70
Average Wind Speed	6.11	6.70	7.41	7.37	7.68	8.04	8.25	8.51

Table 3

Aircraft Temperatures Run 14 7-18-74

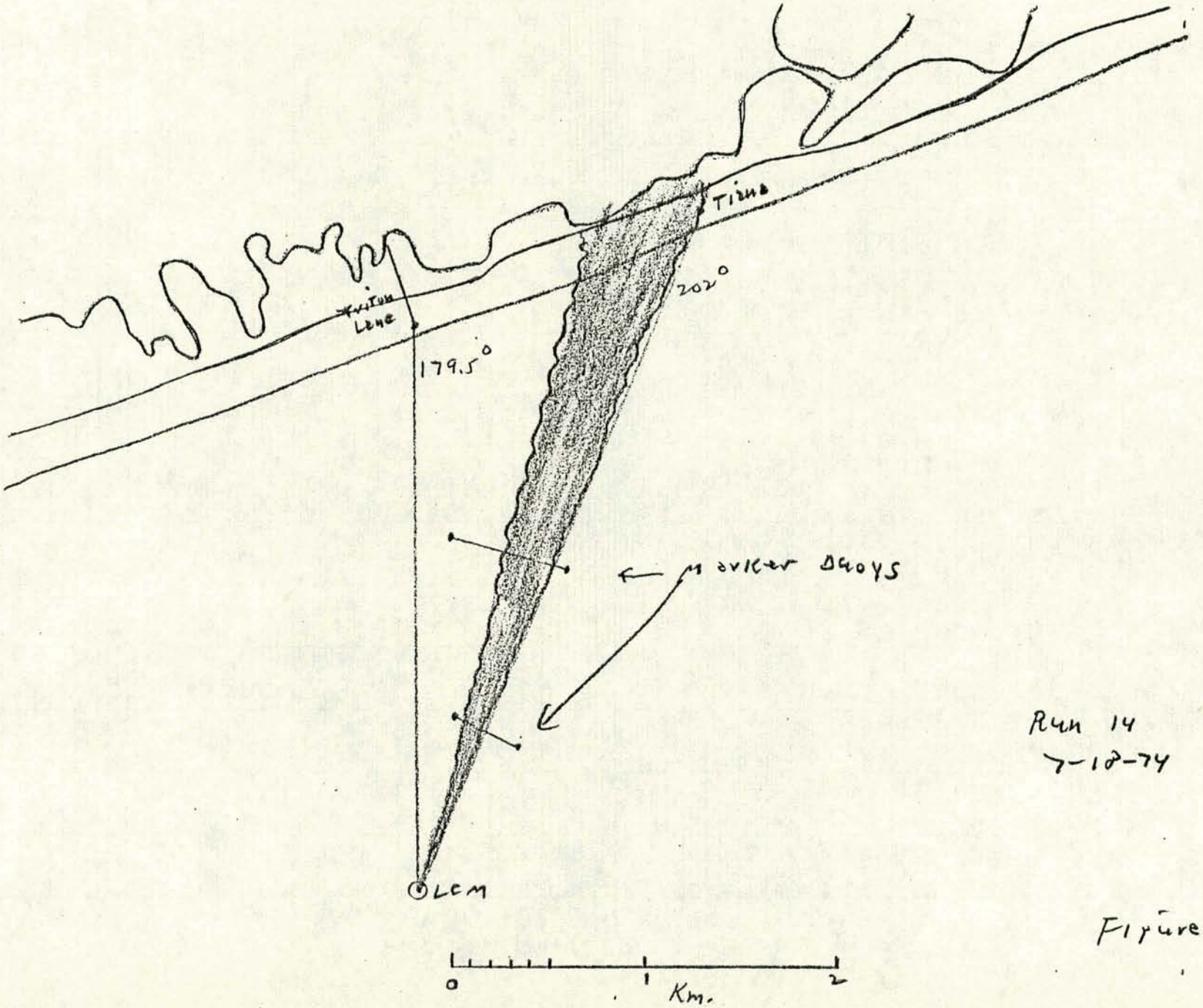
Ht. (m)	1100E Ocean S. of Tiana	1114E Ocean S. of Sagaponack	1122E Poxaboque Pond	1130E Long Pond	1138E E. of Sag Harbor
61	22.2				
91	21.7				
122	21.8				
152	22.0	22.4	21.6	21.9	22.5
183	22.7	22.4	21.3	21.8	22.1
213	22.8	22.2	21.4	21.6	22.0
244	22.8	22.1	22.0	21.8	21.8
274	22.6	22.1	21.9	21.4	21.2
305	22.4	21.8	21.6	21.4	21.6
335	22.0	21.6	21.4	21.4	21.6
366	21.9	21.0	21.3	20.9	21.3
396	21.6	21.0	21.0	20.8	21.1
427	21.4	20.9	20.9	20.6	20.9
457	21.1	20.7	20.8	20.4	20.8
488	21.0	20.3	20.6	20.4	20.8
518	20.8	20.2	20.5	20.2	20.6
549	20.3	20.0	20.3	20.1	20.3
579	20.2	19.9	20.2	19.6	20.2
610	19.8	19.7	19.8	19.7	19.8
640	19.6	19.4	19.7	19.3	19.6
671	19.2	19.3	19.2	19.1	19.4
701	19.1	19.0	19.2	18.9	19.3
732	18.7	18.8	18.9	18.8	19.2
762	18.5	18.4	18.7	18.8	19.2

Table 4

Variometer Passes Run 14 7-18-74

Pass No.	Heading	Ht. Ft.	Ht. m	Length of Record (min.)
1	S	2300	701	6.7
2	N	2000	610	4.3
3	S	1700	518	7.1
4	N	1400	427	4.3
5	S	1100	335	6.9
6	N	800	244	4.5
7	S	500	152	4.6

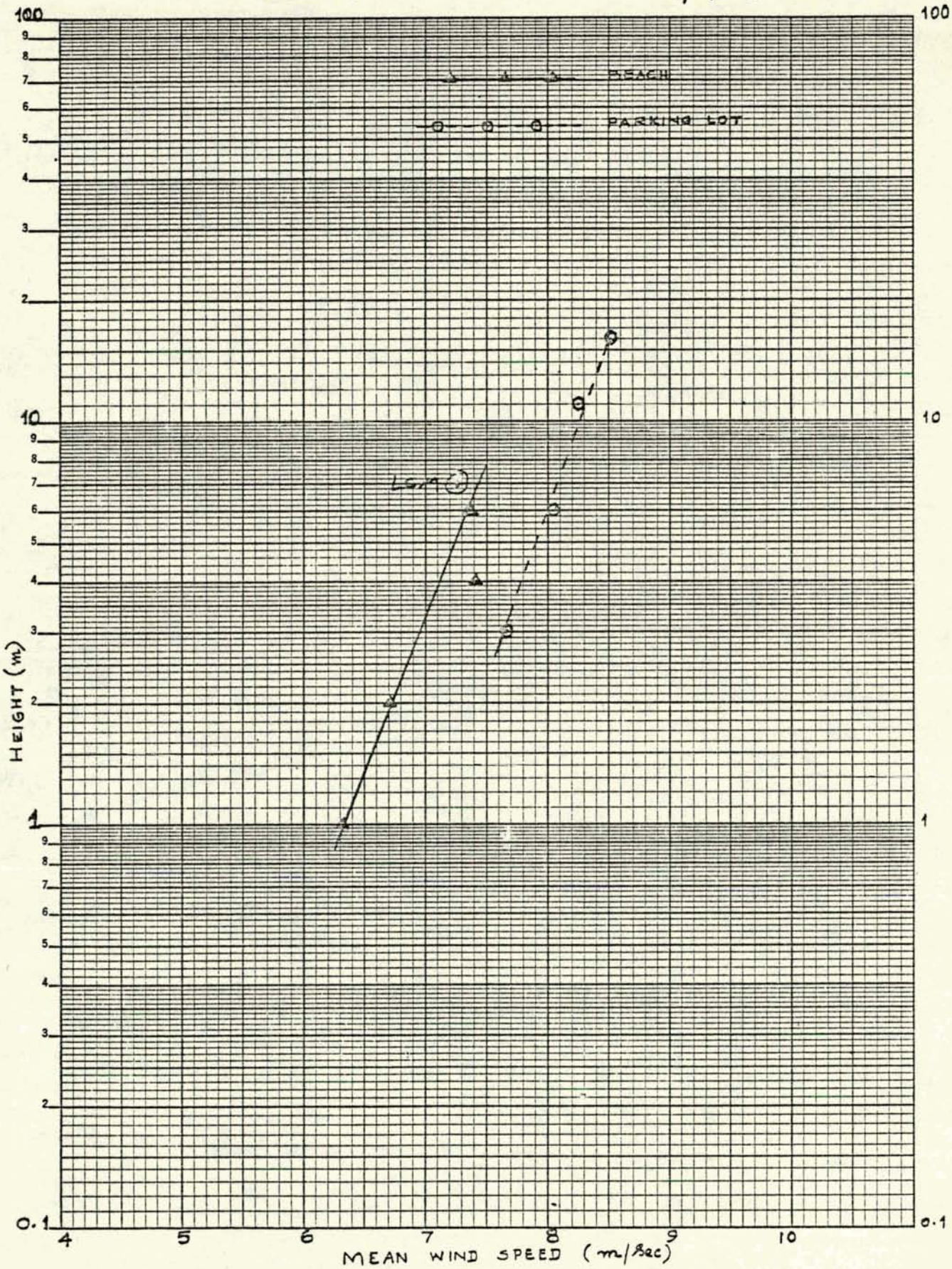
NOTE: Variometer traverses were along a line from south of Lake Sagaponack to Peconic Bay east of Sag Harbor.

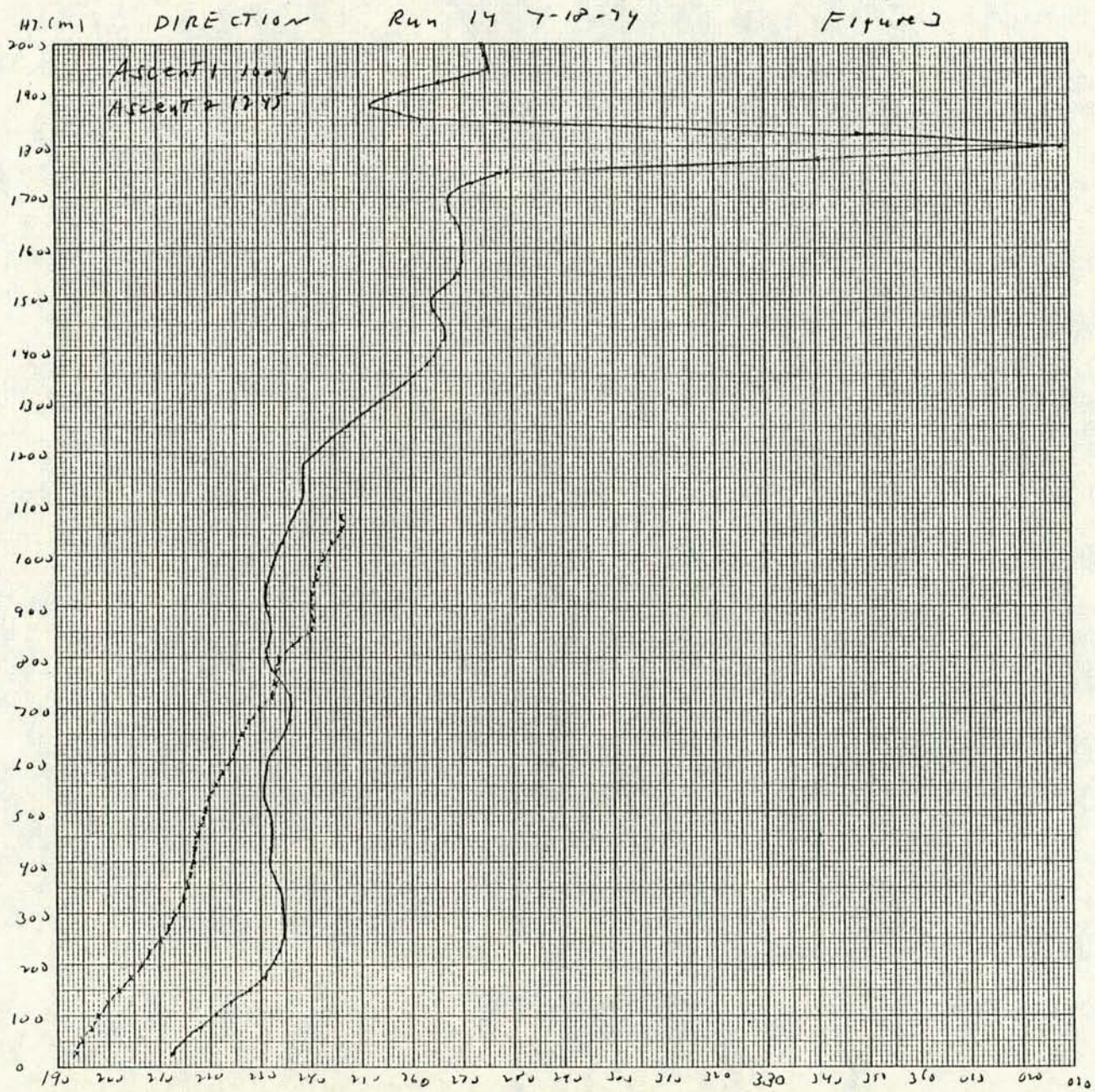


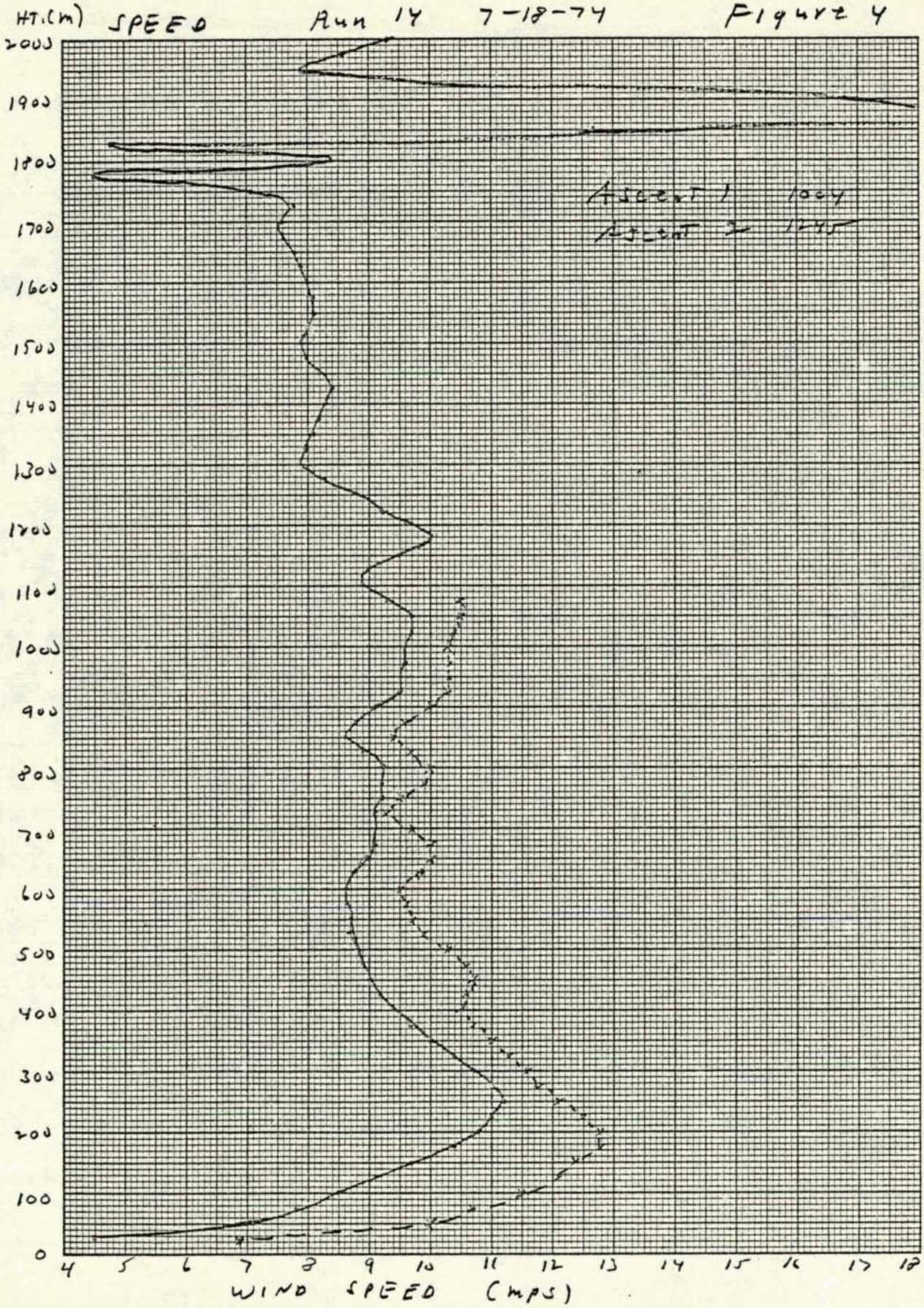
Run 14
7-18-74

Figure 1

Run 14 - 7-18-74 Figure 2

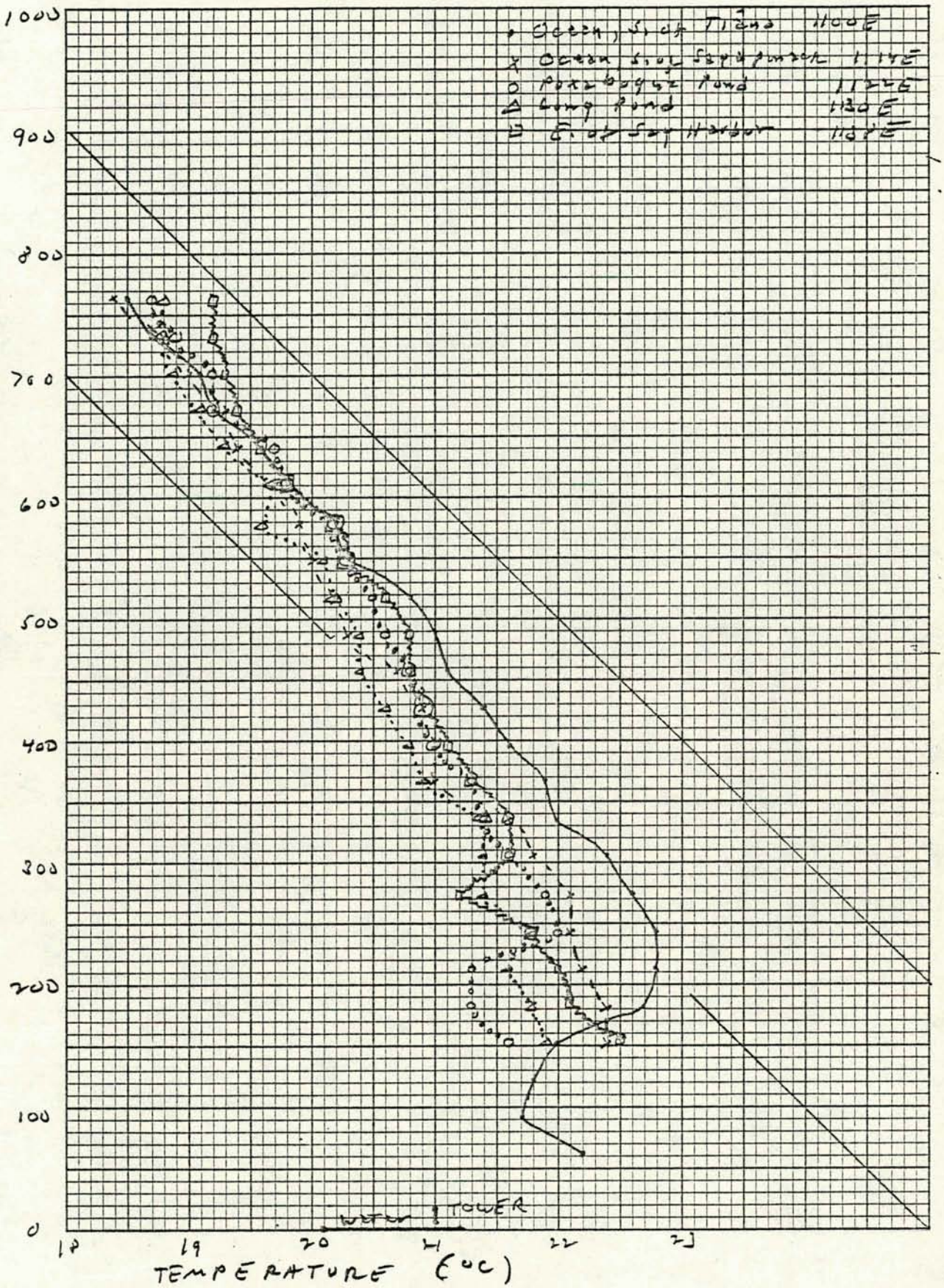



HT. (m)
DIRECTION
Run 14 7-18-74
Figure 3
ASCENT 1 1004
ASCENT 2 1745
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
190
200
210
220
230
240
250
260
270
280
290
300
310
320
330
340
350
360
010
020
030

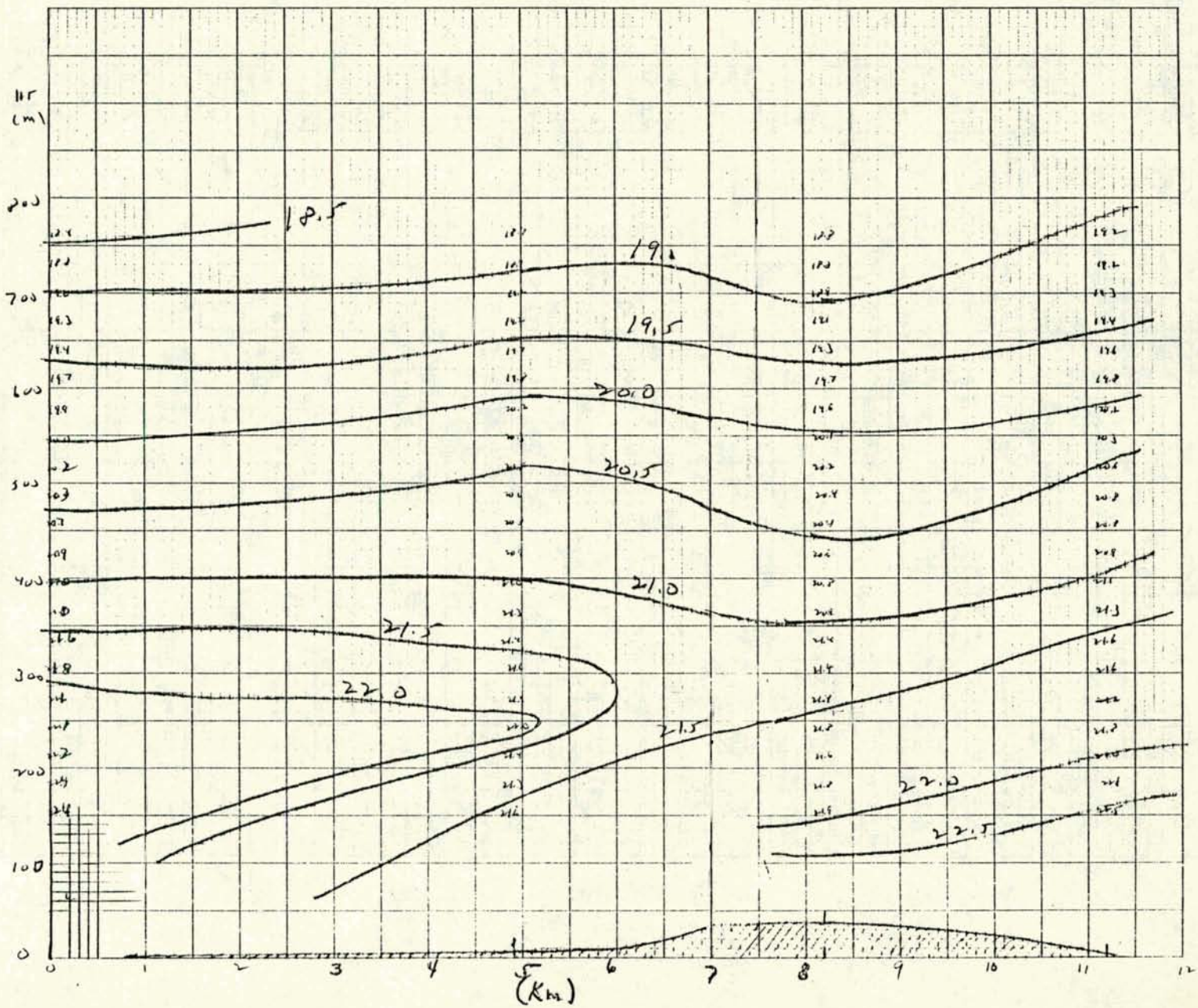

HT.(m) SPEED
Run 14 7-18-74
Figure 4
ASCENT 1 1004
ASCENT 2 1245
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
WIND SPEED (mps)

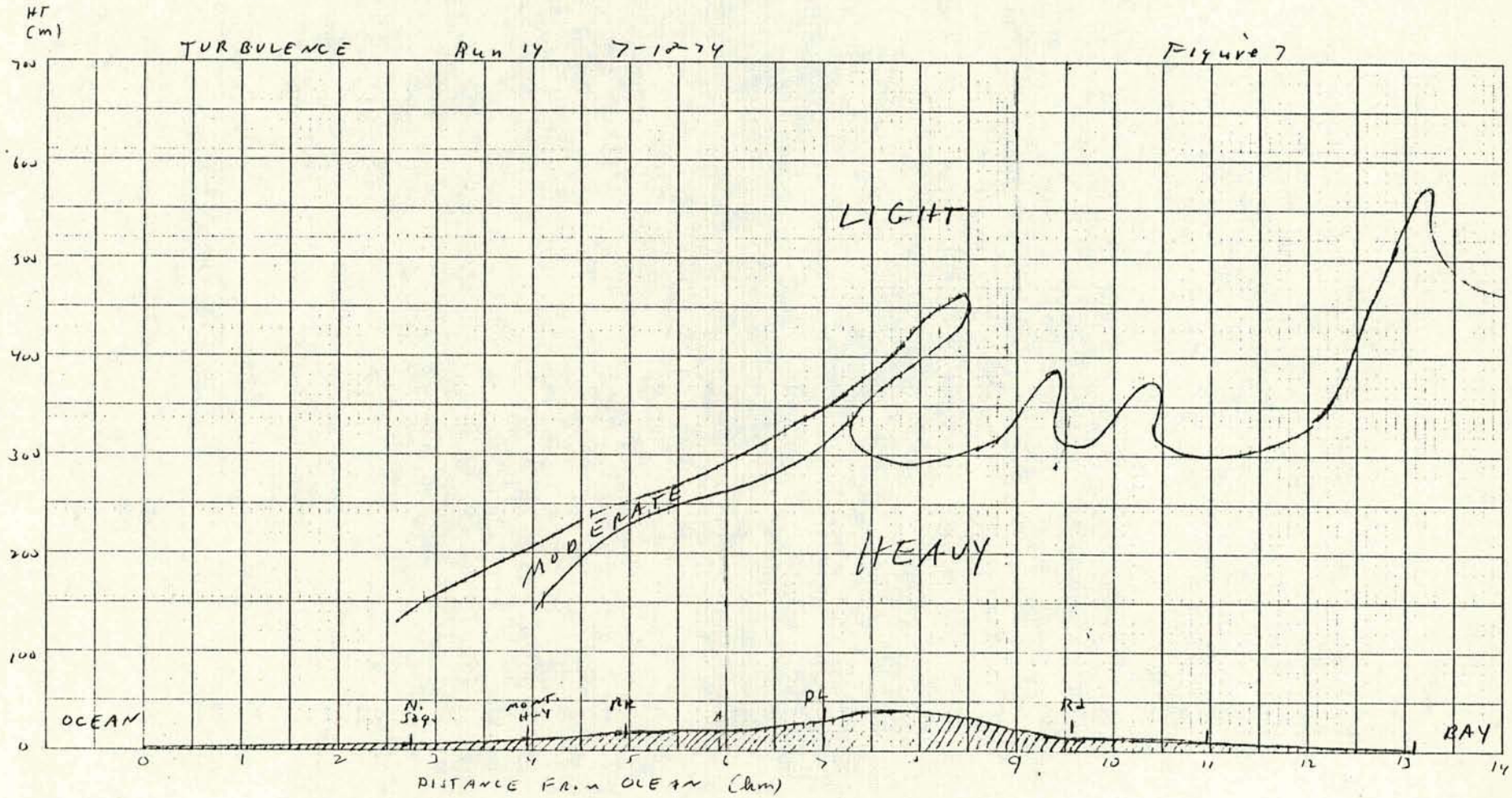
4

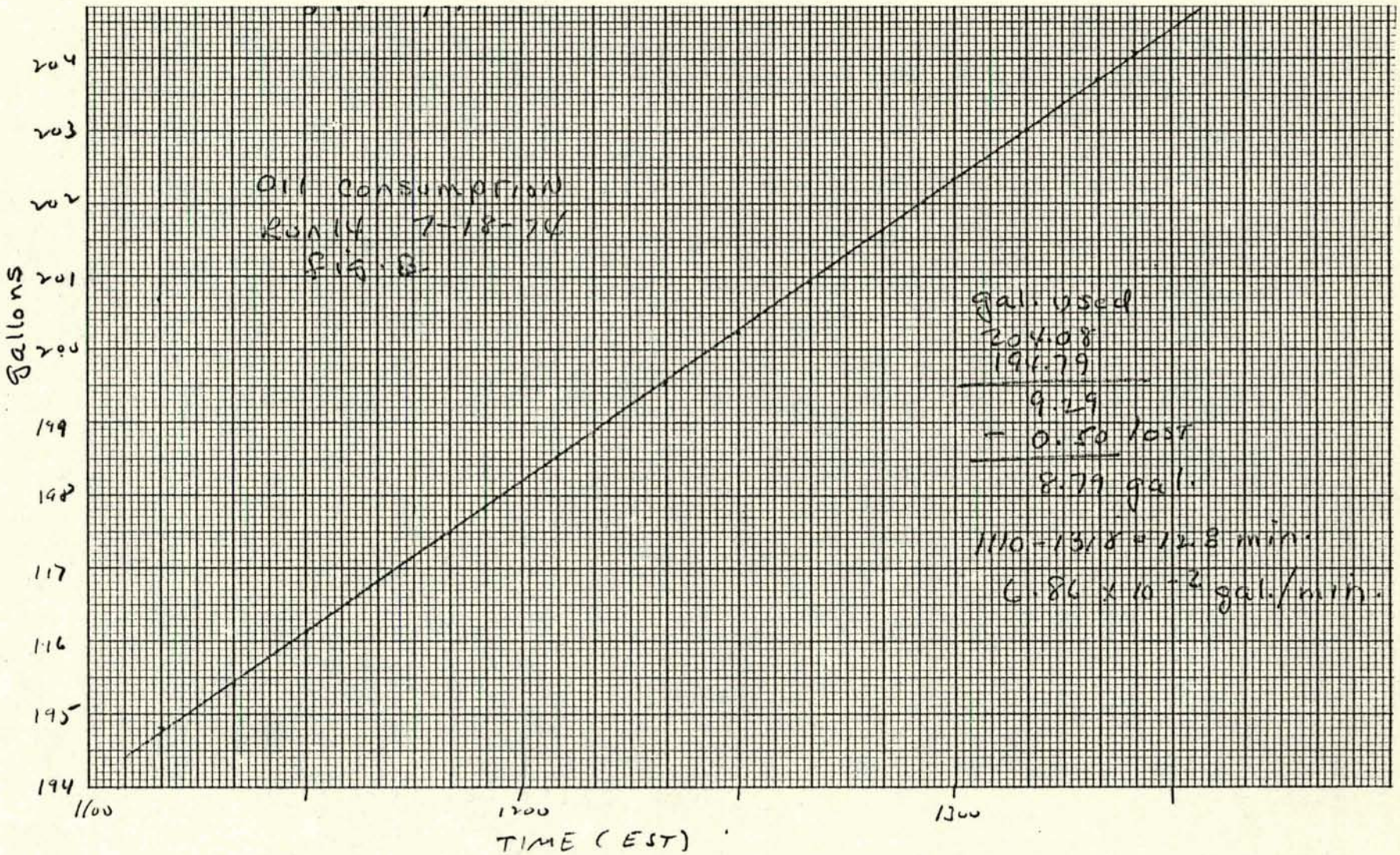
HT (m) TEMPERATURE PROFILES Run 14 7-18-74 Figure 5



TEMPERATURES Run 14 7-12-74 Figure 6




HT (m)
TURBULENCE
Run 14
7-12-74
Figure 7
700
600
500
400
300
200
100
0
LIGHT
MODERATE
HEAVY
OCEAN
RAY
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
DISTANCE FROM OCEAN (km)


Oil consumption
Run 14 7-18-74
Fig. 8.
Gallons
204
203
202
201
200
199
198
117
116
195
194
1100
1200
1300
TIME (EST)
gal. used
204.08
194.79
9.29
- 0.50 lost
8.79 gal.
1110-1318 = 128 min.
6.86 x 10^-2 gal./min.

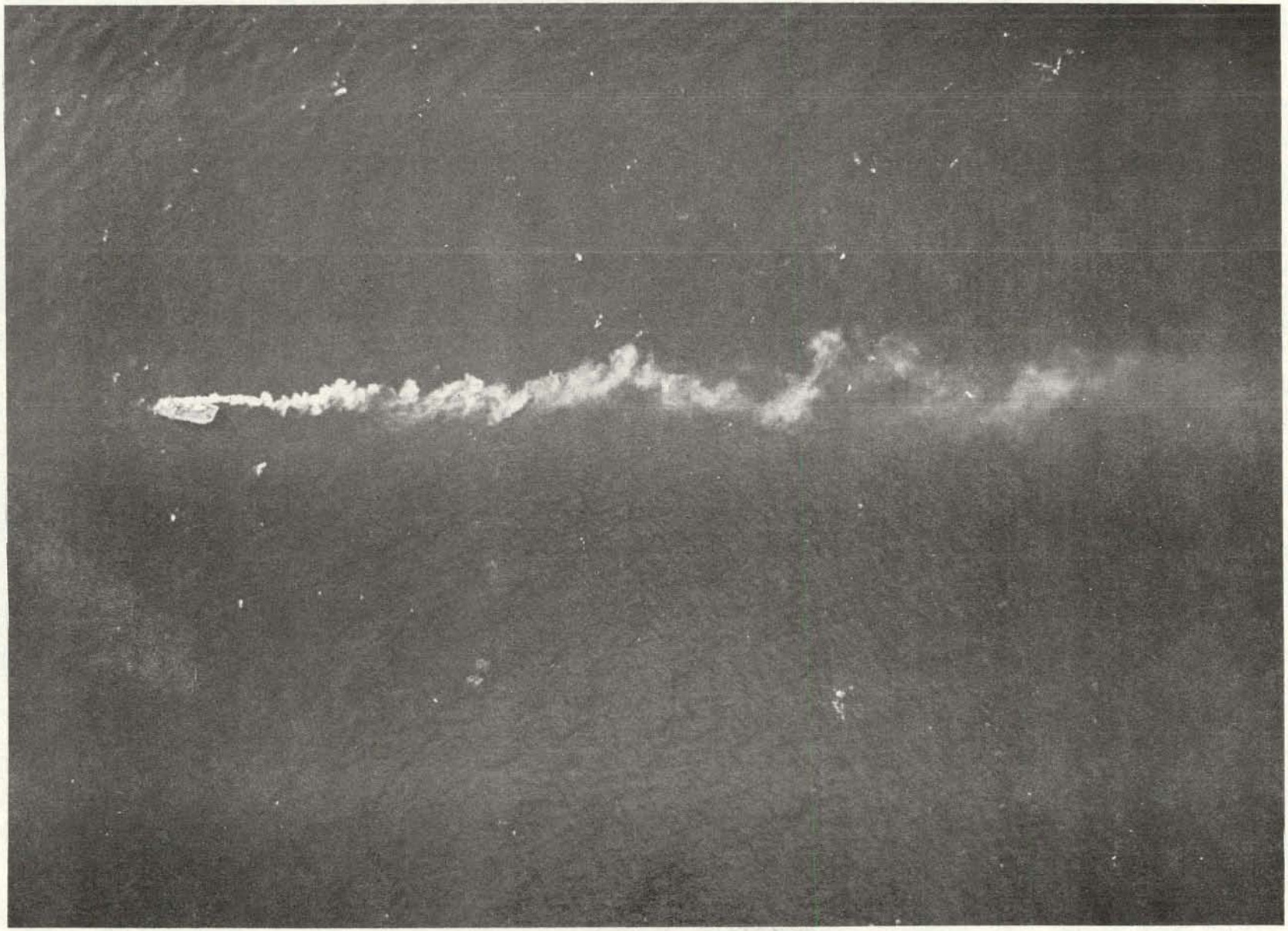
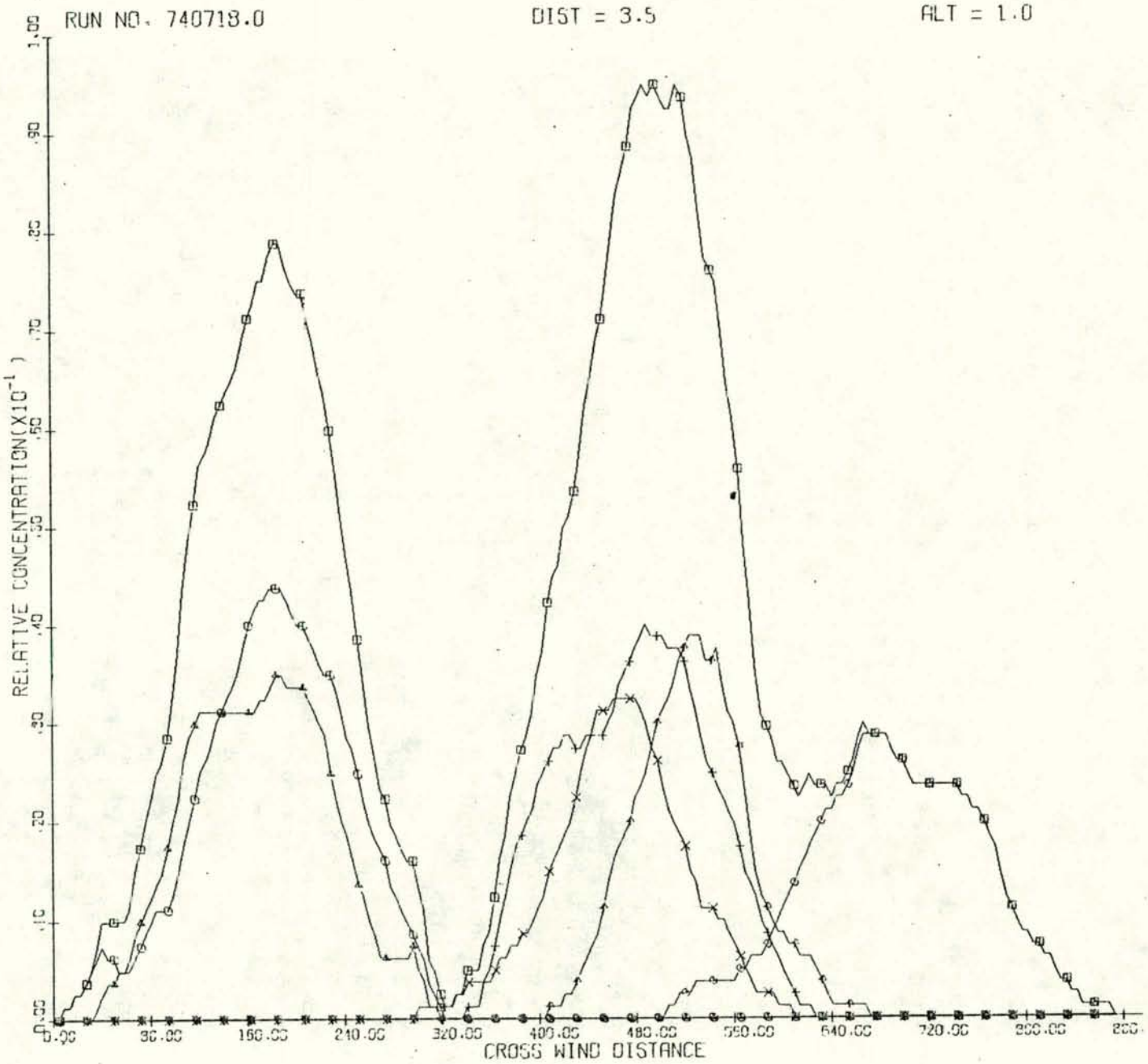


Figure 1. Aerial view of smoke plume,
Run 14, 7-18-74.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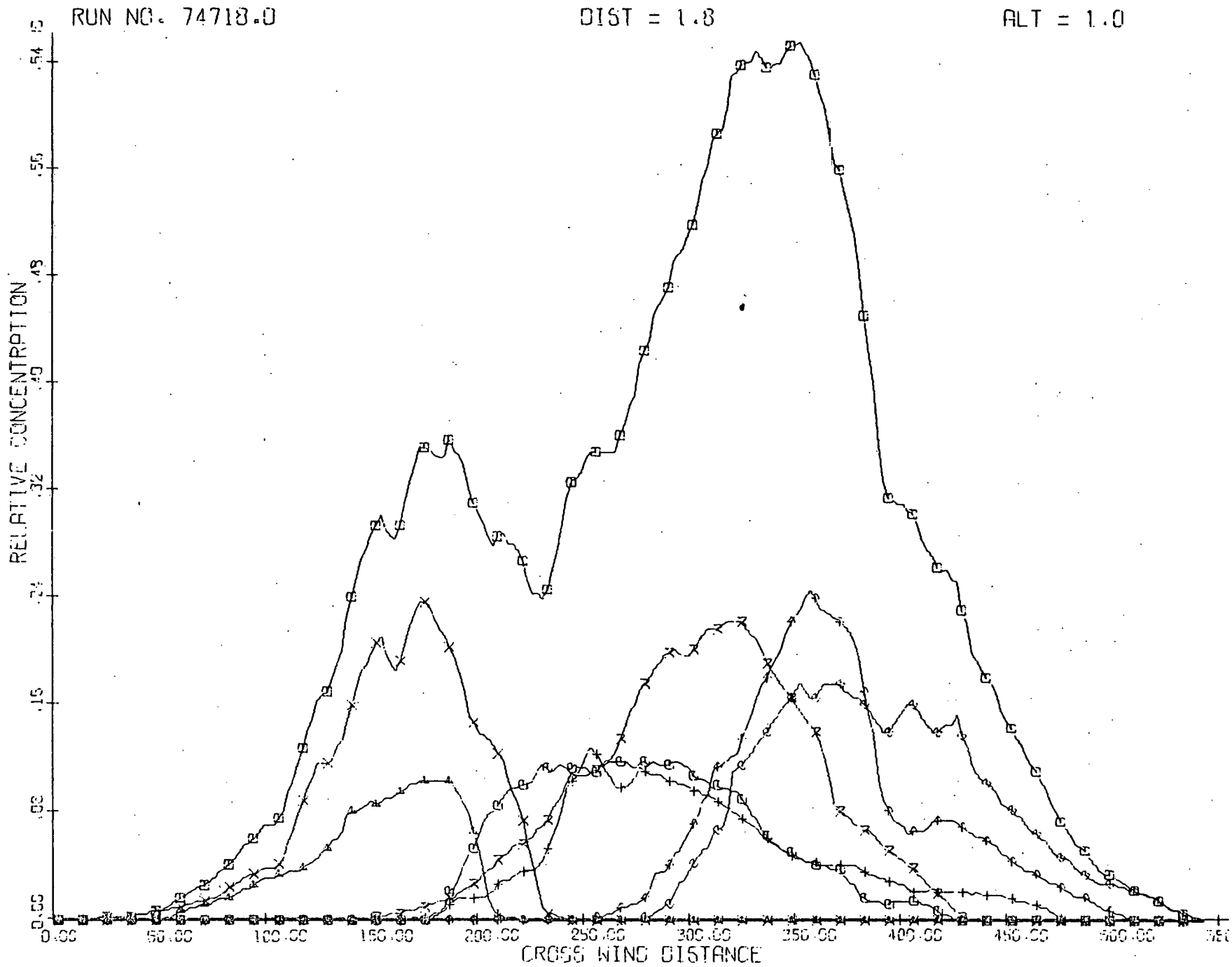
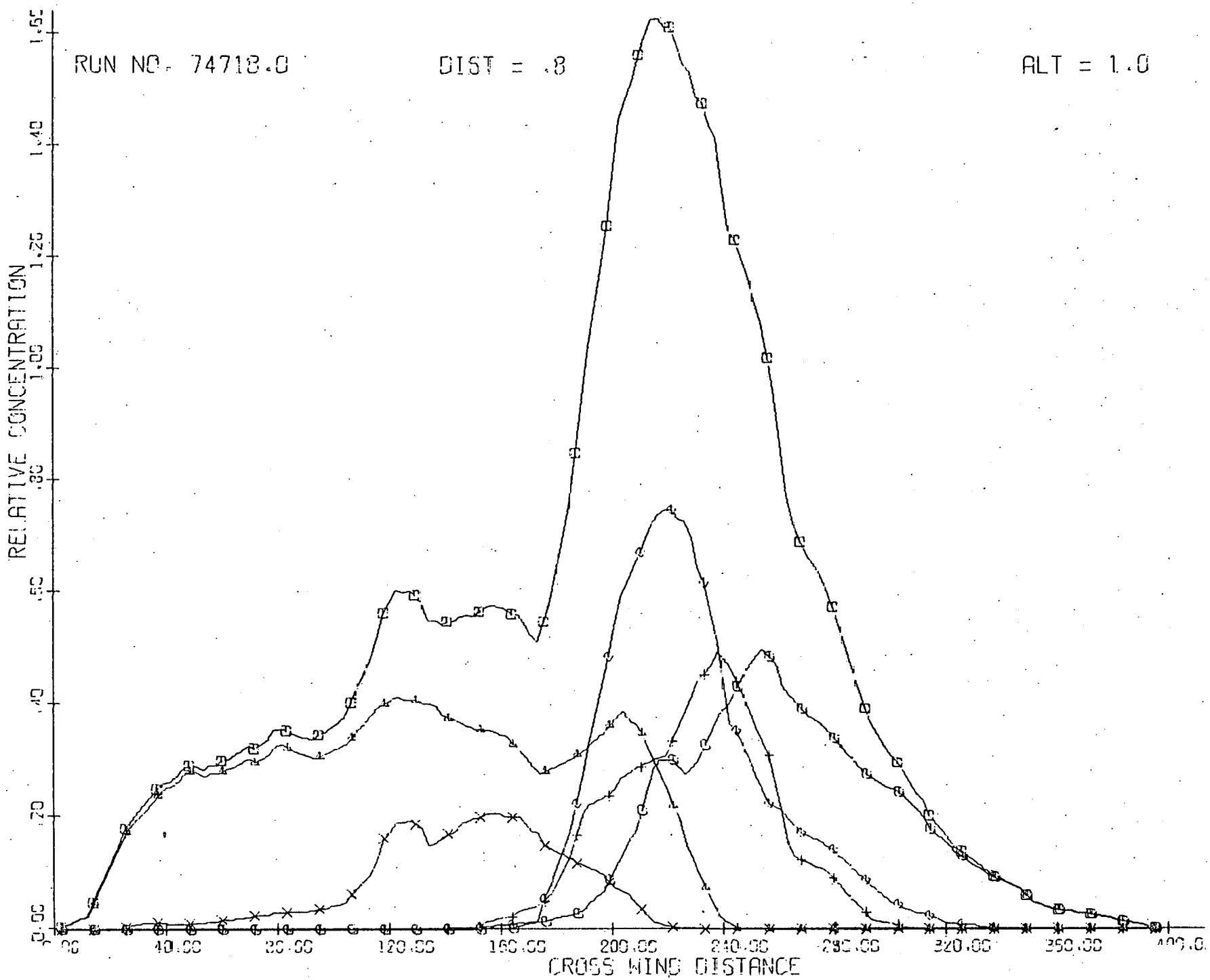
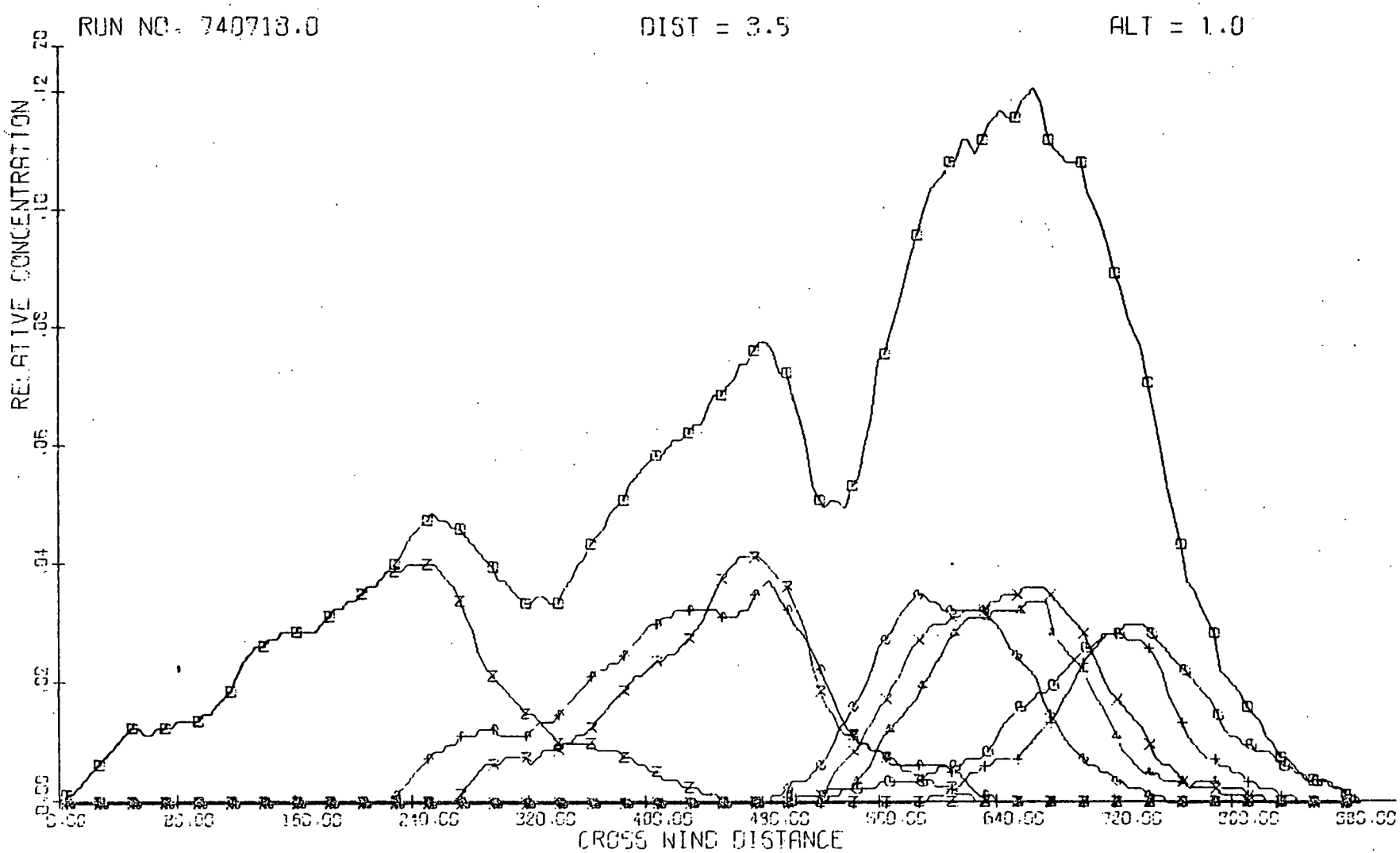
.90
.80
.70
.60
.50
.40
.30
.20
.10
.00
0.00
80.00
160.00
240.00
320.00
400.00
480.00
560.00
640.00
720.00
800.00
CROSS WIND DISTANCE


RUN NO. 74718.0
DIST = 1.8
ALT = 1.0
RELATIVE CONCENTRATION
CROSS WIND DISTANCE
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
450.00
500.00
.15
.48
.56
.64


RUN NO. 74718.0
DIST = .8
ALT = 1.0
RELATIVE CONCENTRATION
CROSS WIND DISTANCE
0.00
.20
.40
.60
.80
1.00
1.25
1.50
1.75
40.00
80.00
120.00
160.00
200.00
240.00
280.00
320.00
360.00
400.0


RUN NO. 740713.0
DIST = 3.5
ALT = 1.0
RELATIVE CONCENTRATION
.00
.02
.04
.06
.08
.10
.12
.20
0.00
80.00
160.00
240.00
320.00
400.00
480.00
560.00
640.00
720.00
800.00
880.00
CROSS WIND DISTANCE

ON SHORE DENSITOMETER RUN FROM VAN
TRAVERSES AT ONE DISTANCE

RUN =740718./ DATE = 71874 /DISTANCE FROM STACK (KM)= 3.50
DIRECTION(DEG) = 202./TIME FROM 1210 TO 1242 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGND)
1.0	.649E+01	181.9	59.9			5.68
2.0	.543E+01	170.5	56.1			5.07
3.0	.615E+01	477.8	58.5			5.51
4.0	.404E+01	465.1	53.4			3.96
5.0	.493E+01	692.5	68.4			3.78
6.0	.423E+01	526.3	45.2			4.91
GRAND TOTAL	.313E+02	401.8	57.9	199.4	190.8	

Corrected for plume angle 43.0 148.2 141.8

ON SHORE DENSITOMETER RUN FROM VAN
TRAVERSES AT ONE DISTANCE

RUN =740718./ DATE = 71874 /DISTANCE FROM STACK (KM)= 3.50
DIRECTION(DEG) = 202./TIME FROM 1257 TO 1332 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGND)
1.0	.461E+01	715.9	69.8			3.47
2.0	.461E+01	649.2	54.0			4.47
3.0	.300E+01	719.3	45.5			3.45
4.0	.564E+01	647.1	56.7			5.22
5.0	.458E+01	611.0	49.3			4.87
6.0	.716E+01	430.6	83.8			4.48
7.0	.591E+01	450.0	66.7			4.65
8.0	.827E+01	213.1	88.0			4.93
GRAND TOTAL	.438E+02	511.7	69.6	189.7	176.5	

Corrected for plume angle 51.7 140.9 131.1

ON SHORE DENSITOMETER RUN FROM BOAT
TRAVERSES AT ONE DISTANCE

RUN = 74718./ DATE = 71874 /DISTANCE FROM STACK (KM) = .85
DIRECTION(DEG) = 202./TIME FROM 1137 TO 1208 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGND)
1.0	.425E+02	265.4	39.4			15.99
2.0	.666E+02	128.1	57.4			12.69
3.0	.296E+02	229.8	26.6			10.04
4.0	.173E+02	146.9	35.1			5.39
5.0	.448E+02	227.5	28.1			23.59
GRAND TOTAL	.201E+03	196.0	42.5	70.4	56.1	

ON SHORE DENSITOMETER RUN FROM BOAT
TRAVERSES AT ONE DISTANCE

RUN = 74718./ DATE = 71874 /DISTANCE FROM STACK (KM) = 1.77
DIRECTION(DEG) = 202./TIME FROM 1231 TO 1318 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGND)
1.0	.173E+02	279.9	51.0			4.14
2.0	.843E+01	153.6	33.5			2.62
3.0	.153E+02	304.6	61.2			2.4[illegible]
4.0	.196E+02	162.6	36.1			5.13
5.0	.235E+02	391.1	50.7			3.6[illegible]
6.0	.220E+02	367.3	45.2			4.[illegible]
7.0	.274E+02	306.7	50.3			4.5[illegible]
GRAND TOTAL	.134E+03	297.0	48.4	93.4	79.9	

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Run No. 15
March 6, 1975

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: Apr. 8, 1975

TO: Files

FROM: G. S. Raynor

SUBJECT: Offshore Test No. 15

Offshore test no. 15 was held on March 6, 1975. Clouds were broken cirrus and altocumulus at the beginning but became overcast altostratus and altocumulus and finally broken cirrus and altostratus. A high extended from the Atlantic into South Carolina and Georgia. A low was located north of Lake Ontario with a cold front to the southwest. Another high was located south of Nova Scotia. The gradient wind was from the south shifting towards the southwest later in the day. Waves were about 3-4 feet from 190° in the morning but increased to 4-5 feet in the afternoon. No noticeable swell was present. High tides occurred at 0355 and 1627 and low tides at 1017 and 2230. Thus, the tide was coming in during the test. Eastern standard time is used throughout this report.

Personnel left BNL at 0715E and arrived at Tiana and at the boats an hour later. The boats left the Inlet about 0920. At Tiana, the permanent tower was used for the first time. Various delays were encountered in instrumenting the tower and the 10-m mast but the first anemometer data were started at 0930 and all were counting by 1009. Equipment was set up near the permanent tower rather than near the pavilion as in previous runs.

The beach was manned by Raynor, Brown, SethuRaman, McNeil and Dieterle. Cup anemometers were mounted at heights of 3.4, 7.0, 10.7, 14.3, 18.0 and 23.5 m on the permanent tower and at heights of 1, 2, 4, 6, 8 and 10 m on the beach mast. However, the 4-m anemometer did not work and the 1-m anemometer failed to work until fixed well into the run. The MRI bivane was mounted at 16.2 m on the permanent tower but not used until 1120 due to a wiring problem in the trailer. The Thermosystems platinum wire temperature fluctuation sensor was aspirated and mounted at 16.2 m. The Thunder Scientific relative humidity sensor was mounted at the same level. No temperature measurements were taken on the tower. Bivane data were recorded at slow speed on the EA recorders and on the large tape recorder with data from the temperatu

and humidity sensors starting at 1120. The tape was stopped at 1300 and the charts and anemometer counters at 1417.

A pibal sounding was taken at 1250E and a kytoon temperature sounding at 1300E using the new Thermistor temperature unit. The kytoon burst after 80 m of line were let out terminating the ascent.

The LCM was manned by Walter Jahnig and Dennis Carlson. Two other DAS personnel were aboard to test zooplankton sampling equipment. Test smoke was produced at 1010. The LCM was stationed one mile out about south of Tiana (Figure 1). Smoke was started at 1040 and produced intermittently until about 1400. Icing of the orifice caused frequent shutdowns so that the longest period of continuous smoke was about 25 minutes but part of the time with only one burner.

The boat anemometer was not used due to damage earlier. Air and water temperatures were taken.

The lobster boat, COBOLT, was manned by Sy Fink and Art Tingle. Due to the clouds and the intermittent smoke, no pictures for measurement of σ_z were taken but a few shots were taken to document the appearance of the plume. Ten densitometer passes were made but the west marker buoy was lost after the first pass and compass headings were used thereafter. Distance from the source was 0.48 km. A water temperature was also taken.

The plume was narrow with no meander but diffused somewhat vertically, particularly close to the source. It came ashore just west of the Tiana pavilion during most of the run but a small wind shift late in the run brought it over the east end of the parking lot. Distance from the source to the road was 2.05 km during the first six traverses along the road and 2.1 km during the last traverse which was discarded because the smoke gave out.

Anemometer data are tabulated in Table 1 and are believed correct except for the 23.5-m level where the anemometer was obviously giving extra counts. The data for the 1215-1325 period are plotted in Figure 2. The higher speeds on the tower are apparently caused by acceleration of the air by the steep bluff. The curvature above the 14.3-m level is probably not real although overcounting during this period was apparently less than earlier in the run.

Pibal data are plotted in Figures 3 and 4. The wind became more southwesterly with height and showed a large increase with height in speed with a maximum at 275 m.

Water temperatures, low level air temperatures and temperatures from the kytoon sounding are listed in Table 2 and plotted in Figure 5. The LCM air temperature is probably too high. The other data suggest a very low level inversion.

The aircraft temperature data are listed in Table 3 and plotted as profiles in Figure 6. Measurements fit well with the kytoon data. Lapse rates were neutral with a small inversion at about 500 m over the LCM and 550 m inland. Farther east, the inversion was noticeable only north of Mecox Bay.

The four soundings taken along the line from south of Mecox Bay to Noyack are plotted as a cross section in Figure 7. The sawtooth pattern of the isotherms indicates slow response of the sensor since temperatures are higher on the ascents than on the descents. This is believed due to the mounting rather than the sensor and corrective measures will be taken. Correction of the temperatures for this error would leave a pattern with essentially horizontal isotherms.

Infrared surface temperature measurements were taken from a height of 1000 ft. over the ocean from w. of Moriches Inlet to Tiana and over the beach, Shinnecock Bay and Tiana Bay using the sensitive scale. Data were referenced to the water temperature measured by the boats. Data are summarized in Table 4. Ocean temperatures varied with location from 2.5 to 4.9°C. Bay temperatures were somewhat colder from 1.8 to 3.0°C. The beach temperature was above 8.0°C, the edge of the scale. No measurements were obtained inland.

Variometer passes are described in Table 5. The turbulence cross section along the same track as the temperature measurements shows the most complex pattern yet observed primarly due to the moderate turbulence at low levels over the ocean (Figure 8). However, moderate to heavy turbulence was also found around 600 m over the ocean which is about the inversion level. The band of light turbulence from 200 to 400 m over the ocean was modified after penetrating more than halfway across the south fork. The heavy turbulence on the northern part of the land was advected out over Peconic Bay.

Files
G. S. Raynor
Offshore Test No. 15 April 8, 1975

No pictures were taken of the plume from the air because of the intermittent release of the smoke.

Oil flow data were plotted and appeared to average about 4.12×10^{-2} gal/min. while the generator was operating with both nozzles. The rate with one nozzle seemed about the same but reading of the flowmeter did not usually coincide with stoppage of one or both nozzles so accurate rates cannot be calculated. At least 5 stoppages of one or both nozzles occurred between 1055 and 1220.

The run was terminated at 1417 although the boats were dismissed earlier. Personnel reached BNL about 1530.

In summary, a very low level inversion over the water with neutral lapse rates above resulted in a very narrow plume with no meander. However, diffusion in the vertical exceeded that in the horizontal and some looping of the plume occurred particularly close to the source. Its more stable character closer to shore may have been caused by colder water temperatures nearer the beach.

GSR/lk

Table 1

Anemometer Wind Speeds - Run 15 3-6-75

	Height - Tiana Tower					Height - Beach Mast				
Time (EST)	3.4 m	7.0 m	10.7 m	14.3	23.5 m	1 m	2 m	6 m	8 m	10 m
0930-1015	8.28	8.43	8.86	9.06	15.53*	-	-	-	-	-
1015-1215	8.19	8.36	8.73	8.91	16.67*	-	6.41	6.92	7.21	7.30
1215-1325	9.00	9.33	9.60	9.76	11.20*	6.18	6.72	7.33	7.79	7.95

* There is a possibility that the anemometer may have been extra counting.

Table 2

Low-level Temperatures- Run 15 3-6-75

Location	Ht. (m)	Time	Temperature	
LCM		1100	4.3	Water
			6.7	Air
			5.1	Wet bulb
Cobolt		1130	4.5	Water
Kytoon	7.0	1300	5.8	Air
	13.5		5.9	"
	20.5		5.9	"
	27.0		6.0	"
	32.0		6.1	"
	40.0		6.0	"
	46.5		5.9	"
	52.0		6.0	"

Table 3

Aircraft Temperatures - Run 15 3-6-75

Ht. (m)	Over Dumps	Over LCM	Ocean	1135 - LIRR	1158E Power Line	North Shore
152	5.0	4.8	5.1	5.3	5.1	5.4
183	4.9	4.4	4.8	5.1	4.6	5.1
213	4.8	4.2	4.5	4.9	4.3	4.8
244	4.3	4.0	4.2	4.6	4.1	4.7
274	4.0	3.7	3.9	4.4	3.9	4.3
305	3.6	3.5	3.7	4.1	3.7	4.2
335	3.4	3.1	3.4	3.9	3.4	4.0
366	3.1	3.0	3.0	3.6	3.2	3.8
396	2.9	2.8	2.9	3.4	3.0	3.6
427	2.7	2.6	2.8	3.2	2.7	3.2
457	2.4	2.6	2.7	2.9	2.5	3.0
488	-	2.4	2.6	2.7	2.3	2.9
518	1.9	2.4	2.3	2.6	2.1	2.8
549	1.7	2.5	2.2	2.5	1.9	2.8
579	2.0	2.6	2.0	2.3	1.8	2.8
610	2.1	2.6	1.8	2.0	1.7	2.7
640	2.1	2.6	1.7	1.9	1.6	2.5
671	2.1	2.5	1.4	-	1.5	2.4
701	2.1	2.5	1.3	2.3	1.4	2.3
732	2.0	2.4	1.5	1.8	1.4	2.2
762	1.9	2.2	1.3	1.6	1.4	2.0
792	1.6	1.8				
823	1.5	1.7				
853	1.3	1.5				
884	1.1	1.4				
914	1.1	1.2				

Table 4

Surface Temperatures from IR Thermometer
Run 15 3-6-75

Location	Temperature range (^{o}C)
W. of Moriches Inlet	2.5 - 2.5
Just E. of Moriches Inlet	Sudden increase to 4.9
Moriches Inlet to W. Groin	Gradual decrease, 4.7 to 3.9
W. groin to E. groin	4.2 - 4.5
E. groin to Round Dune	3.5 - 4.3
Round Dune to Tiana	3.7 - 4.3
Tiana	3.4
Boat (1 mile out)	4.4
Beyond boat	Increase to 4.9
Boat to Beach	4.4 to 4.2
Beach	Off scale, above 8.0
Shinnecock Bay	2.0 - 3.0
Tiana Bay	1.8 - 2.2
Range in Ocean	2.5 - 4.9
Range in Bays	1.8 - 3.0

Table 5

Variometer Passes - Run 15 3-6-75

1045-1150E

Pass No.	Heading	Ht. Ft.	Ht. m	Length of record (min.)
1	N	500	152	4.8
2	S	800	244	9.0
3	N	1100	335	4.7
4	S	1400	427	8.8
5	N	1700	518	4.9
6	S	2000	610	10.8
7	W	500	152	11.5

NOTE - Passes 1- 6 along line from SW corner of Mecox Bay to east of Jessup's Neck.

Pass 7 parallel to beach from Tiana to Moriches Inlet.

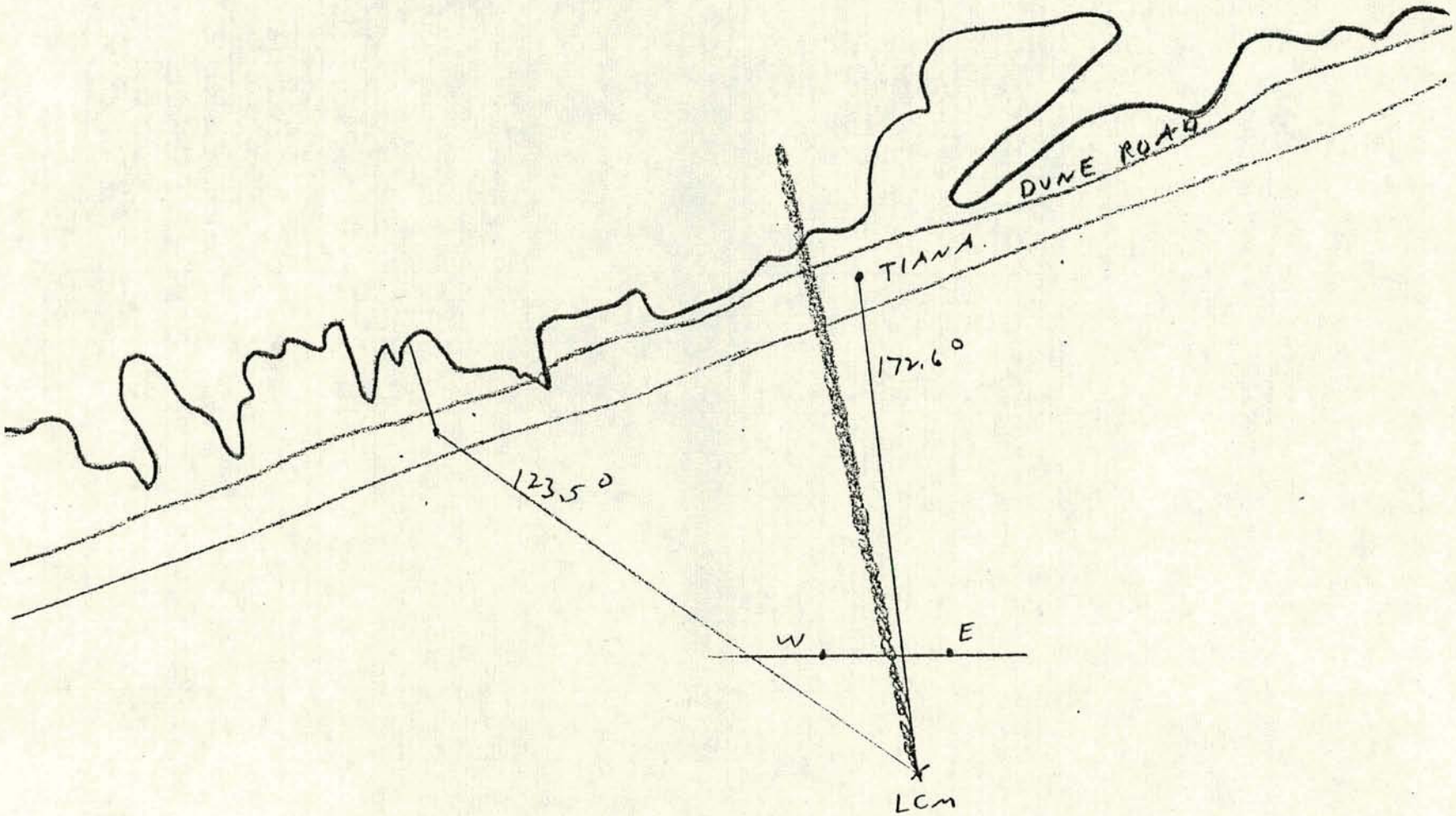
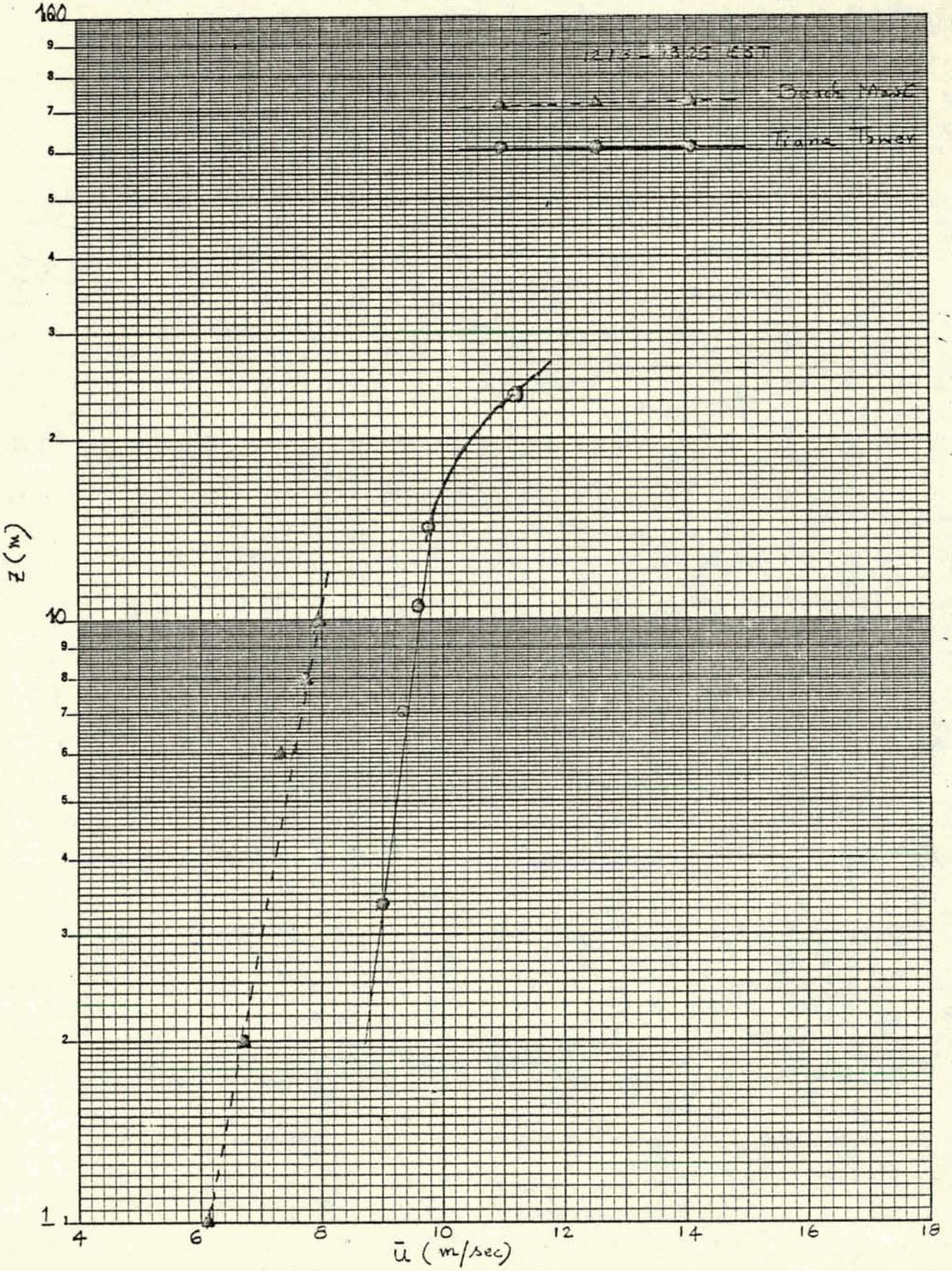


Figure 1
Run 15
3-6-75

Run 15 6 March 1975 Figure 2



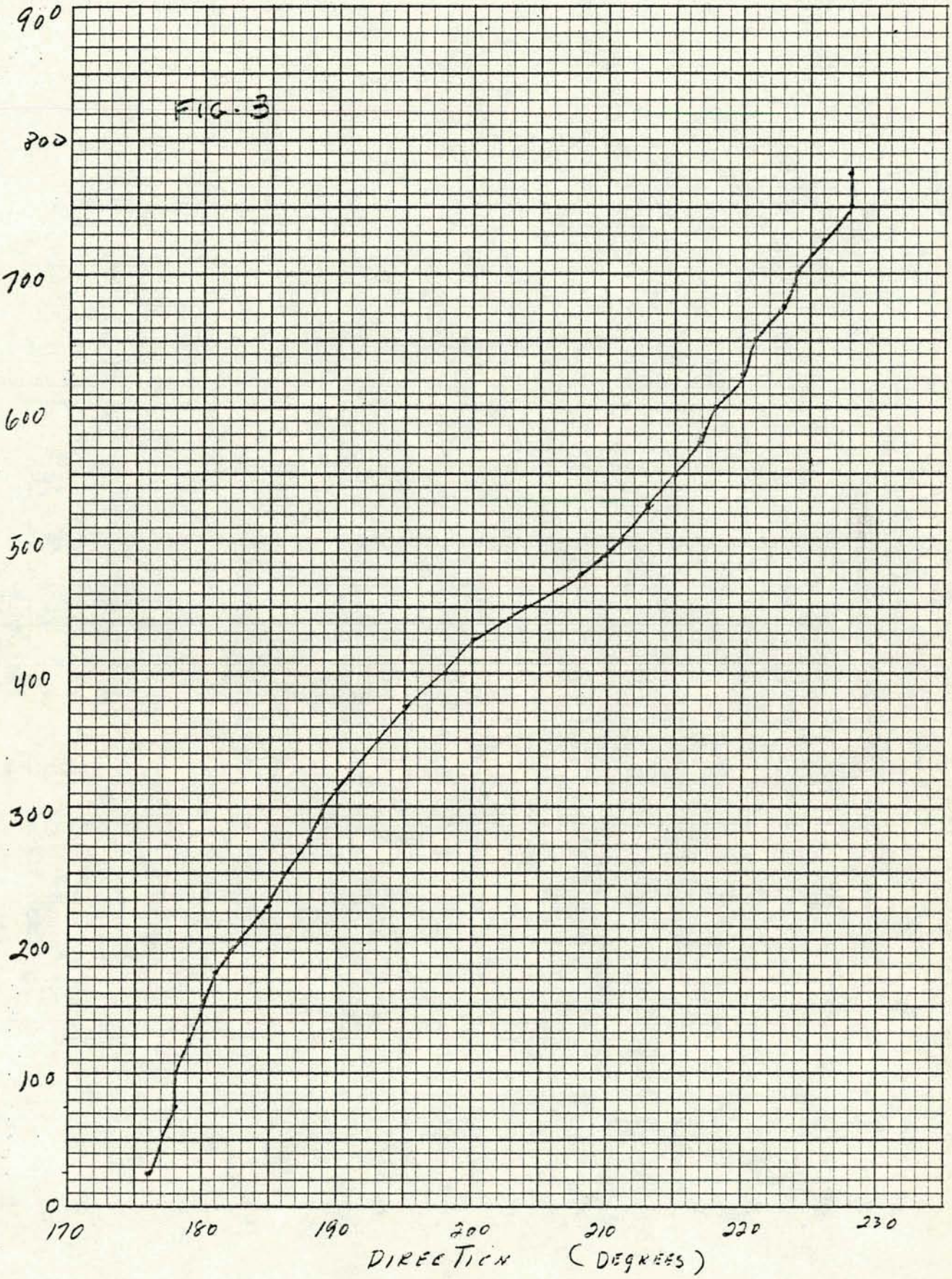
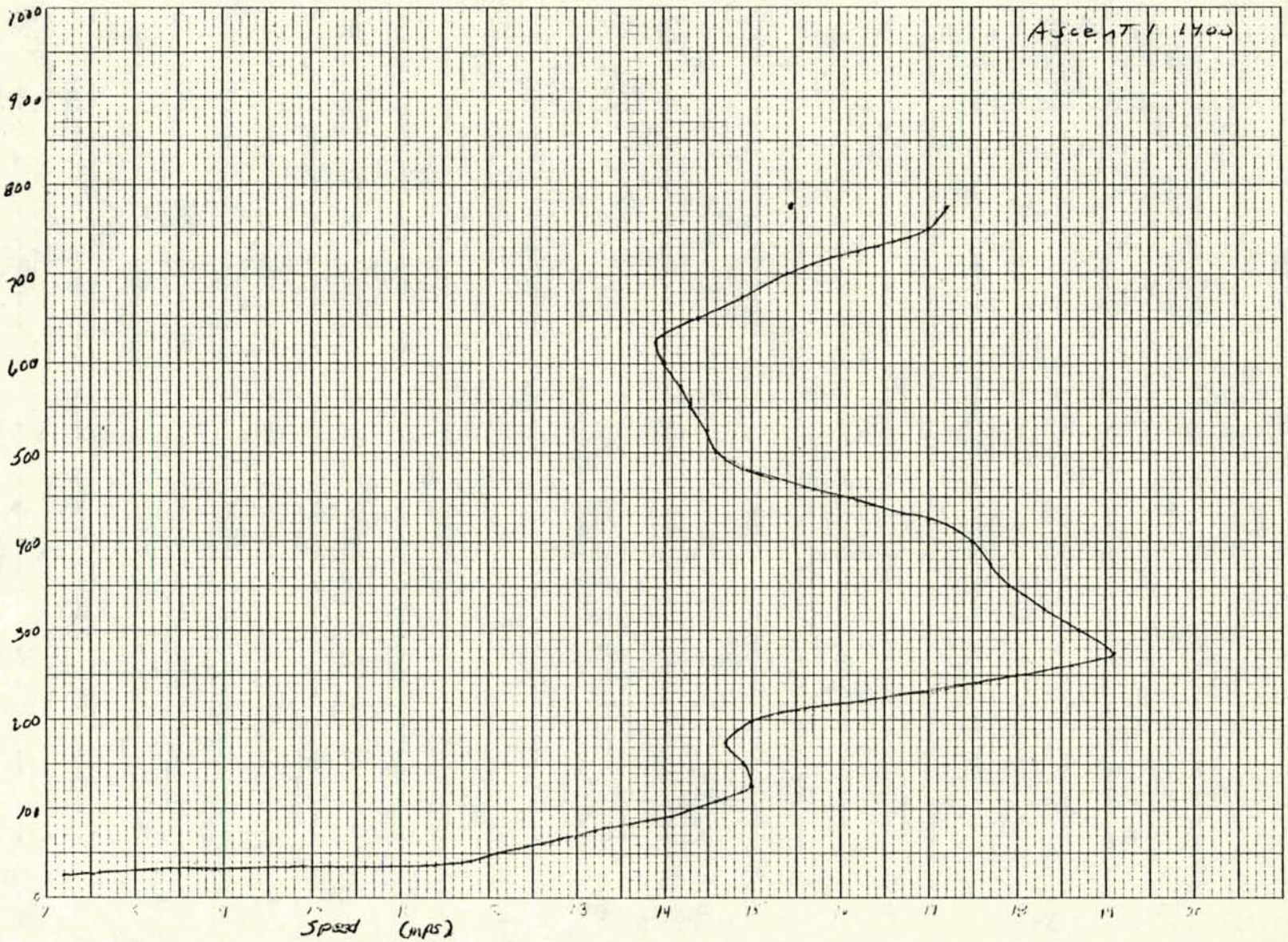
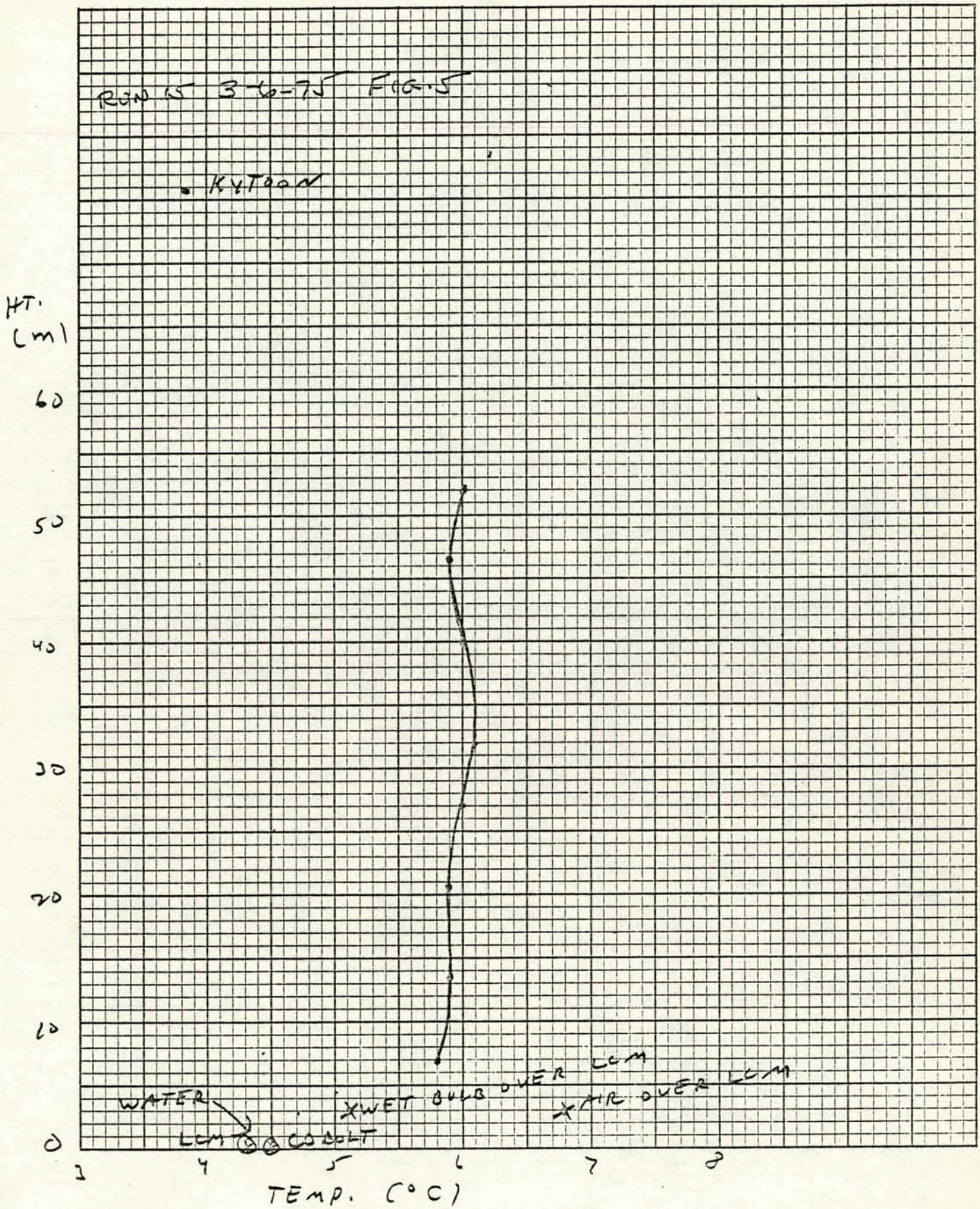


FIG. 3
900
800
700
600
500
400
300
200
100
0
170
180
190
200
210
220
230
DIRECTION (DEGREES)

Run 15 3-6-75 Figure 4




RUN 15 3-6-75 FIG. 5
• KYTOON
HT. (m)
60
50
40
30
20
10
0
WATER
LCM
COBALT
WET BULB OVER LCM
AIR OVER LCM
3
4
5
6
7
8
TEMP. (°C)

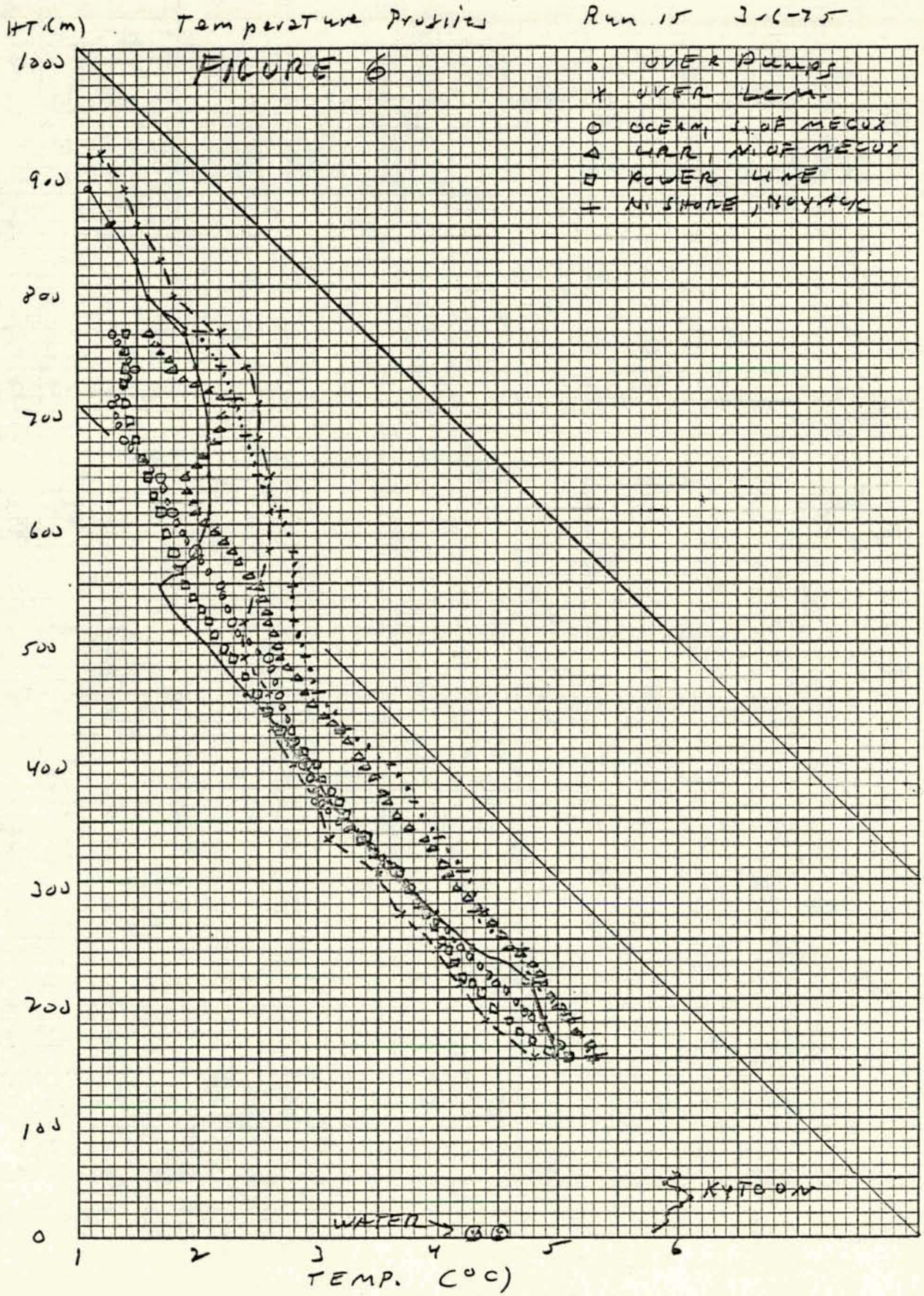

HT (m)
Temperature Profiles
Run 15 3-6-75
FIGURE 6
OVER PUMPS
OVER LEM
OCEAN, S. OF MECUX
LAR, N. OF MECUX
POWER LINE
N. SHORE, NOYACK
1000
900
800
700
600
500
400
300
200
100
0
WATER
KYTOON
1
2
3
4
5
6
TEMP. (°C)

FIGURE 7 TEMPERATURE CROSS SECTION RUN 15 3-6-75

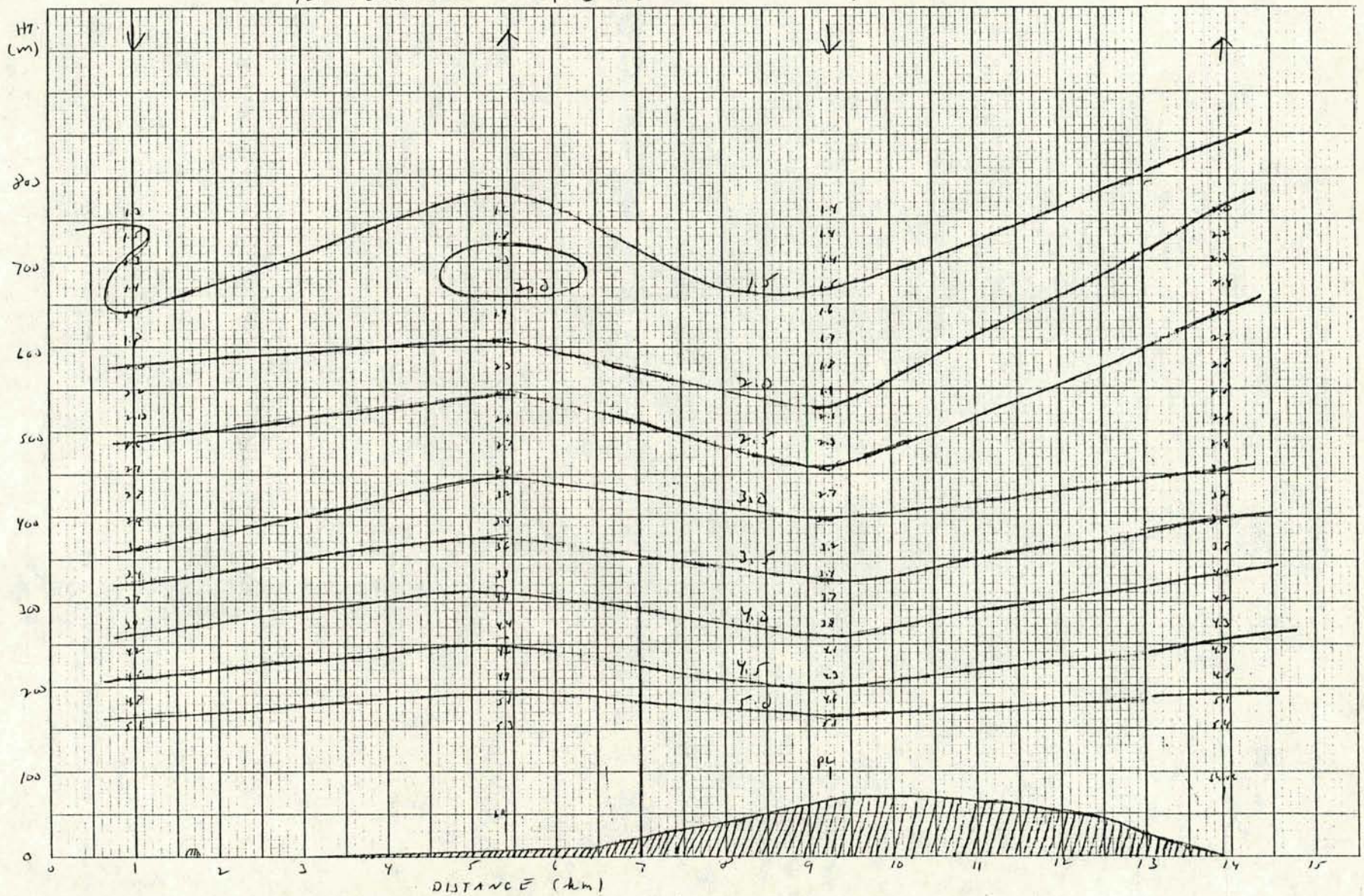
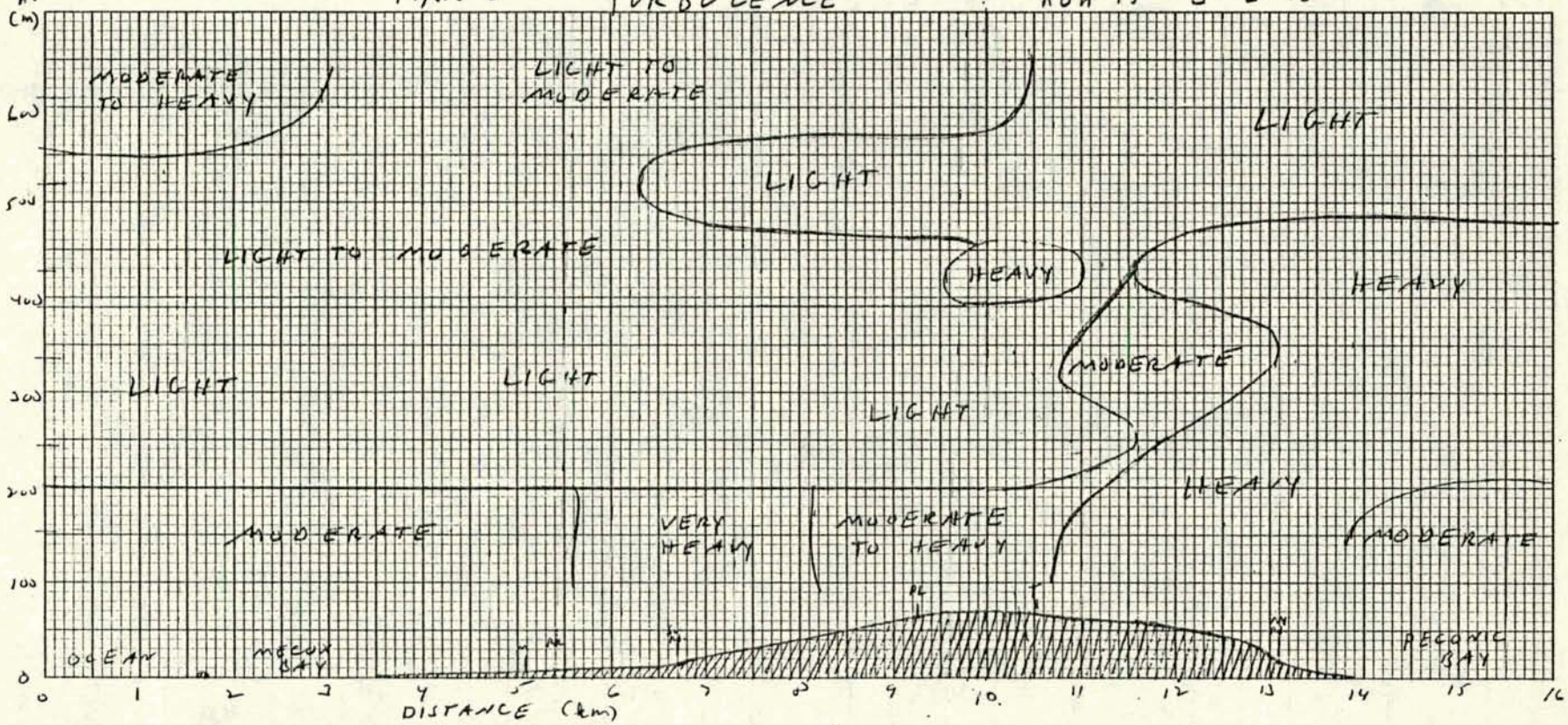
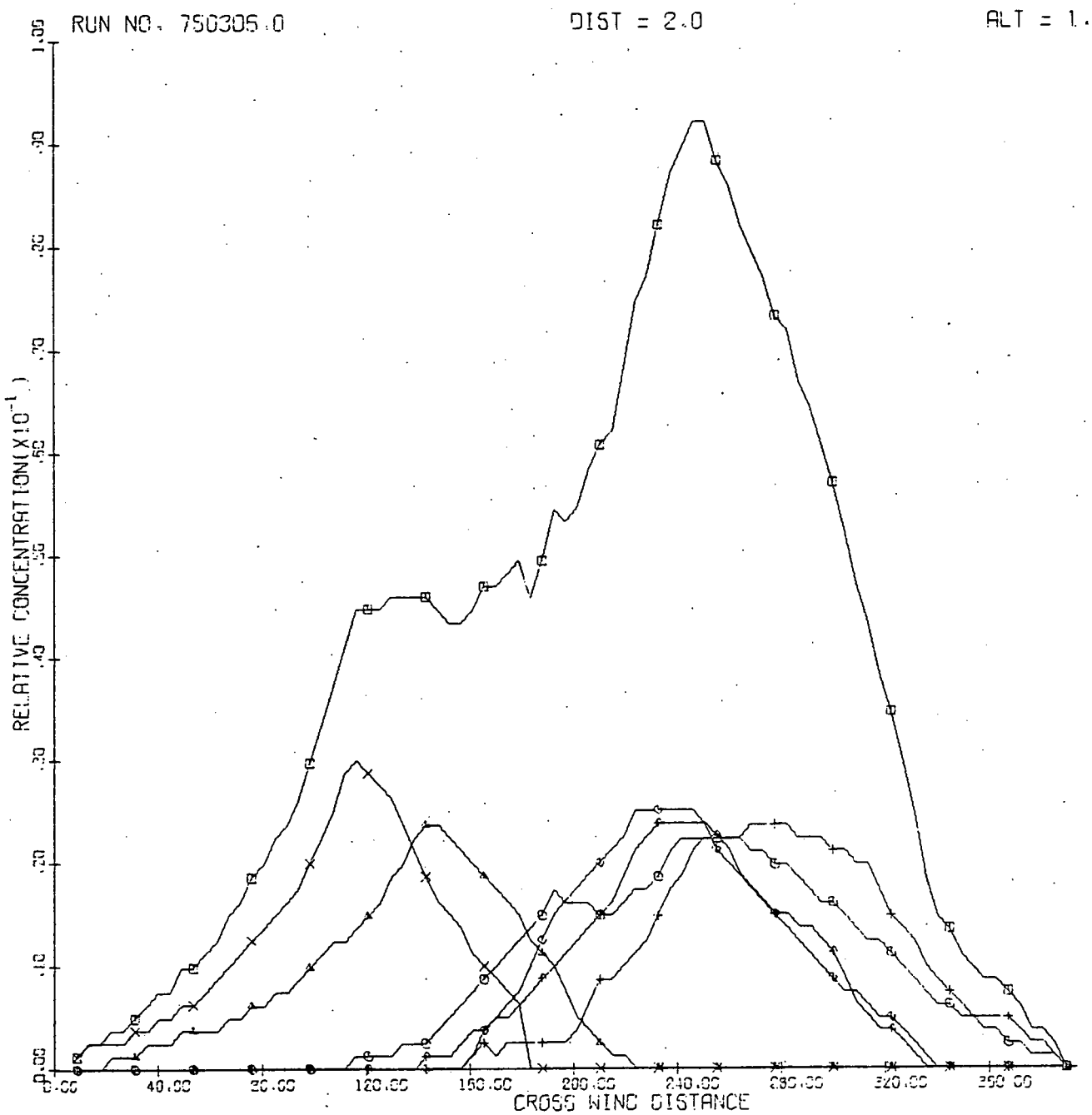
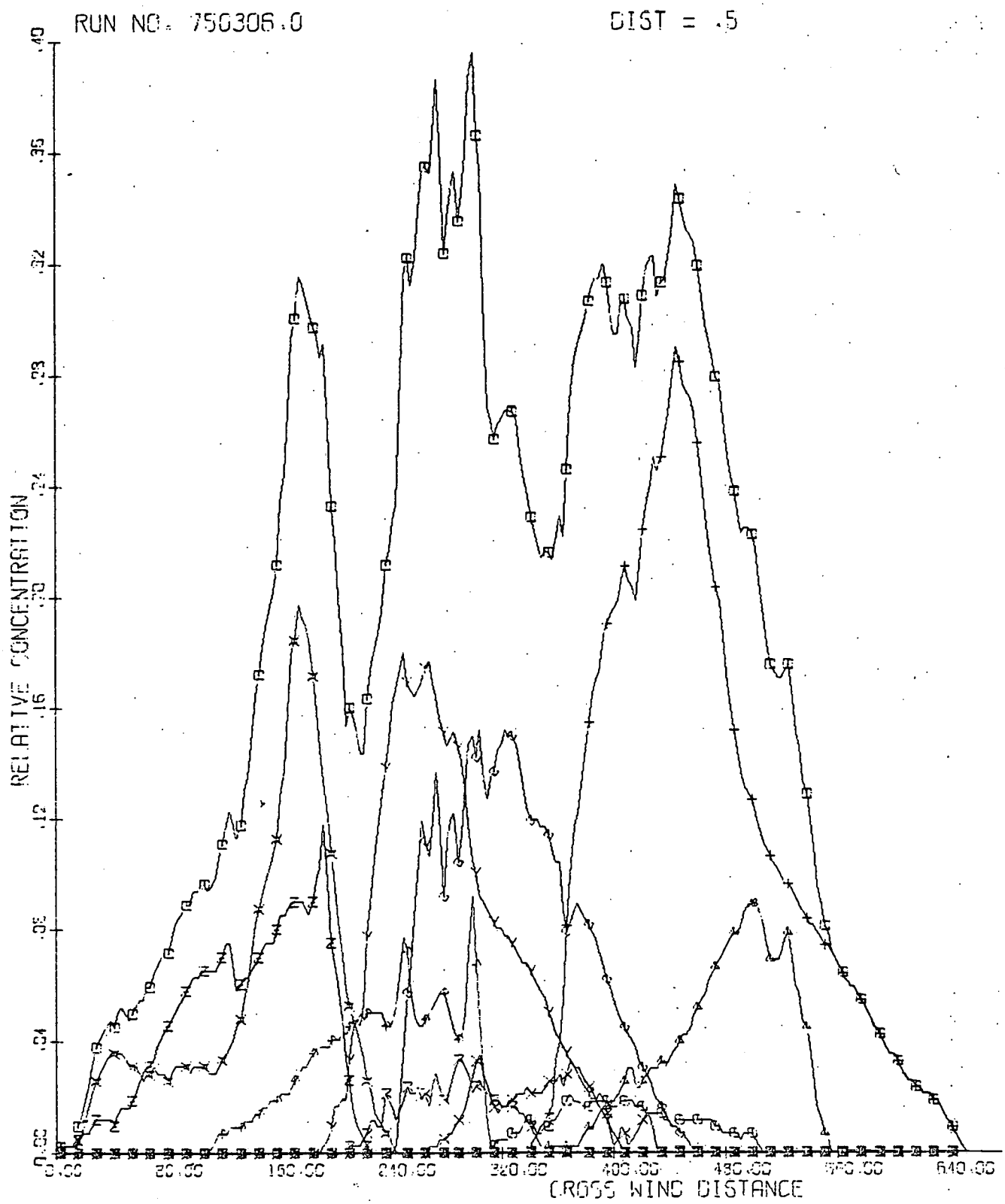


Figure 8 TURBULENCE Run 15 3-6-75




RUN NO. 750305.0
DIST = 2.0
ALT = 1.
RELATIVE CONCENTRATION(X10^{-1})
CROSS WIND DISTANCE
0.00
.10
.20
.30
.40
.50
.60
.70
.80
.90
1.00
0.00
40.00
80.00
120.00
160.00
200.00
240.00
280.00
320.00
360.00


RUN NO. 750306.0
DIST = .5
RELATIVE CONCENTRATION
CROSS WIND DISTANCE
.40
.36
.32
.28
.24
.20
.16
.12
.08
.04
0.00
0.00
80.00
160.00
240.00
320.00
400.00
480.00
640.00

ON SHORE DENSITOMETER RUN FROM VAN
TRAVERSES AT ONE DISTANCE

RUN =750306./ DATE = 30675 /DISTANCE FROM STACK (KM)= 2.05
DIRECTION(DEG) = 167./TIME FROM 1135 TO 1153 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGND)
1.0	.313E+01	251.0	53.8			4.10
2.0	.203E+01	137.0	39.3			3.10
3.0	.271E+01	278.4	43.2			3.51
4.0	.229E+01	111.8	35.7			3.17
5.0	.248E+01	241.8	37.5			2.90
6.0	.230E+01	243.7	38.0			2.52
GRAND TOTAL	.149E+02	216.5	42.5	74.3	60.9	

Corrected for plume angle 42.2 73.7 60.5

ON SHORE DENSITOMETER RUN FROM BOAT
TRAVERSES AT ONE DISTANCE

RUN =750306./ DATE = 30675 /DISTANCE FROM STACK (KM)= .48
DIRECTION(DEG) = 167./TIME FROM 1112 TO 1217 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGND)
1.0	.227E+01	406.7	45.8			1.29
2.0	.820E+01	480.7	40.7			5.25
3.0	.360E+02	461.5	61.1			13.71
4.0	.281E+01	347.7	37.9			1.72
5.0	.181E+02	328.0	45.9			9.17
6.0	.741E+01	234.9	47.2			3.30
7.0	.239E+01	283.6	31.8			1.53
8.0	.108E+02	138.9	46.3			4.09
9.0	.175E+02	282.1	42.9			6.90
10.0	.136E+02	151.7	49.8			4.81
GRAND TOTAL	.119E+03	330.1	50.4	131.6	121.6	

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Run No. 16
June 19, 1975

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: Oct. 30, 1975

TO: Files

FROM: G. S. Raynor

SUBJECT: Run 16

Offshore diffusion test no. 16 was held on June 19, 1975. Skies were clear at first with scattered cumulus later. Heavy haze was present. An east-west cold front extended through Massachusetts and central New York from a deep low over Newfoundland. A high was located over the southeastern states. The gradient wind was northwest to west. A sea breeze was expected but failed to develop until after the run was terminated. Winds were W to WSW during the test. Waves were small. Low tide occurred at 0844 and high tide at 1527. Thus, the tide was coming in during the run. Eastern standard time is used throughout this report.

Personnel left BNL at 0830, and reached the Coast Guard Station at 0930 and Tiana at 1020. The LCM left the Inlet at 1150. Cobolt was not available so no densitometer measurements could be made at sea. The Tiana tower was instrumented by 1220. The beach mast was not used because of the wind direction.

The beach was manned by Brown, McNeil, SethuRaman and Raynor plus Argonne personnel. Cup anemometers were mounted at heights of 3.4, 7.0, 10.7, 14.3, 18.0 and 23.5 m. The MRI bivane,aerovane and Thunder Scientific RH probe were mounted at the top level. The bivane and RH probe were recorded on the PI tape recorder. Temperatures from the Thermistor sensors recently installed at 3.4, 10.7, 18.0 and 23.5 m on the tower were recorded on the Lockheed tape recorder.

Wind speed from the aerovane varied from 4.0 to 6.5 mps and averaged about 5.0 mps. Mean direction was about 190° with moderate meander. Gustiness was D and wide D.

Anemometer data are tabulated in Table 1 and plotted in Figure 1.

Pibal soundings were taken at 1241 and 1333 (Figures 2 and 3). Direction veered strongly with height and speeds showed a low level maximum. The kytoon was not used.

The LCM was manned by Jahnig and Carlson. Since the wind direction did not permit densitometer measurements on the beach, the boat was stationed at successive distances offshore so that the appearance of the plume could be documented photographically as a function of distance from the shore. Smoke was produced at 1/8 mile from 1230-1243, at 1/4 mile from 1247-1252, at 1/2 mile from 1258-1304 and at 3/4 mile from 1307 to 1332.

Files
G. S. Raynor
Run 16 October 30, 1975

Six to eight pictures were taken from the beach at each location. At the 1/8 mile position, the plume ascended briefly at first and then became typical of neutral conditions. The ascending period was due to temporary flow off the land. At the other distances, the plume appeared stable although not as narrow as on some previous runs.

Water in the oil caused some delay in starting smoke. Since densitometer measurements were not taken, oil flow rate was not measured.

Four water temperatures were all 18.6 or 18.7 degrees.

The aircraft was manned by A. Tuthill. A variometer pass was made slightly offshore from Moriches Inlet to Shinnecock Inlet flying at 500 feet at 80 mph, from 1215-1223. Turbulence was light to moderate. No cross island passes or inland measurements were taken because of the wind direction.

Temperature spirals were made at three locations (Table 2 and Figure 4). The temperature over the water at the lowest flight altitude (152 m) was about 8°C warmer than the water indicating a strong low level inversion. The lapse rate over the land and at higher elevations over the water was near adiabatic.

Infrared temperature measurements were taken along a line just offshore at 1/2 mile out and in a pattern as far as 1.5 miles out off Tiana. Additional measurements were taken over Shinnecock Bay. These will be reported in more detail later but indicated ocean temperatures ranged from 18.1 to 20.3 with the colder temperatures east of the inlet. Bay temperatures varied from 18.6 to 23.4. All readings are believed from 1 to 3°C too high.

Photographs of the plumes were taken from the air at most of the four boat locations.

The run was terminated at 1335. Personnel reached BNL at 1500 and 1530.

In summary, ~~moderate,~~ strong low-level inversion over the water gave a stable plume when the wind was parallel to the shore and the boat 1/2 mile or more out. When closer to the shore, offshore components gave a plume typical of neutral lapse rates.

GSR/lk

TABLE 1

FIVE MINUTE MEAN WIND SPEEDS (M/SEC)

DATE=19JUN1975 RUN=R16 SITE=TIANA TOWR START TIME=1220

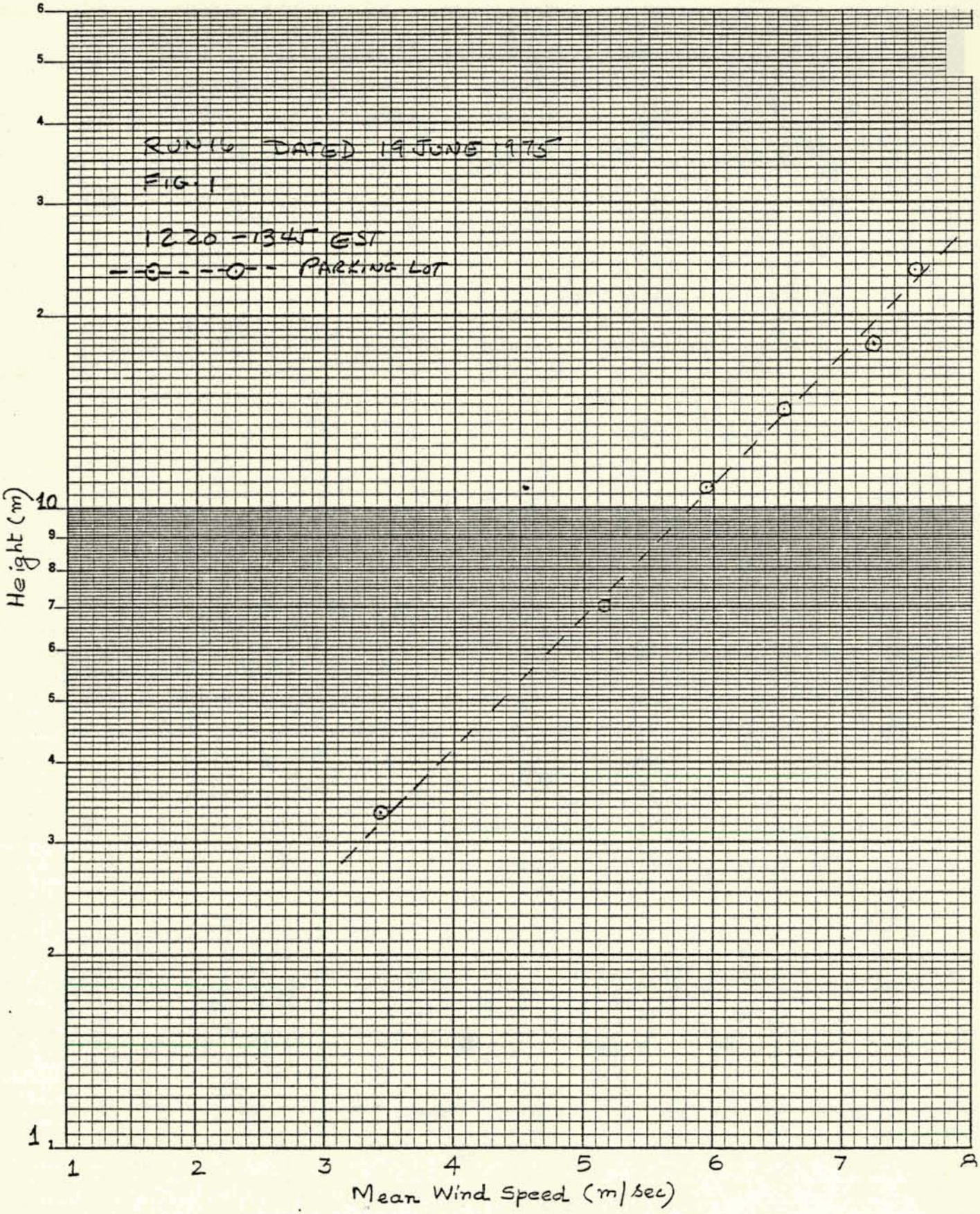
Height Z(m)

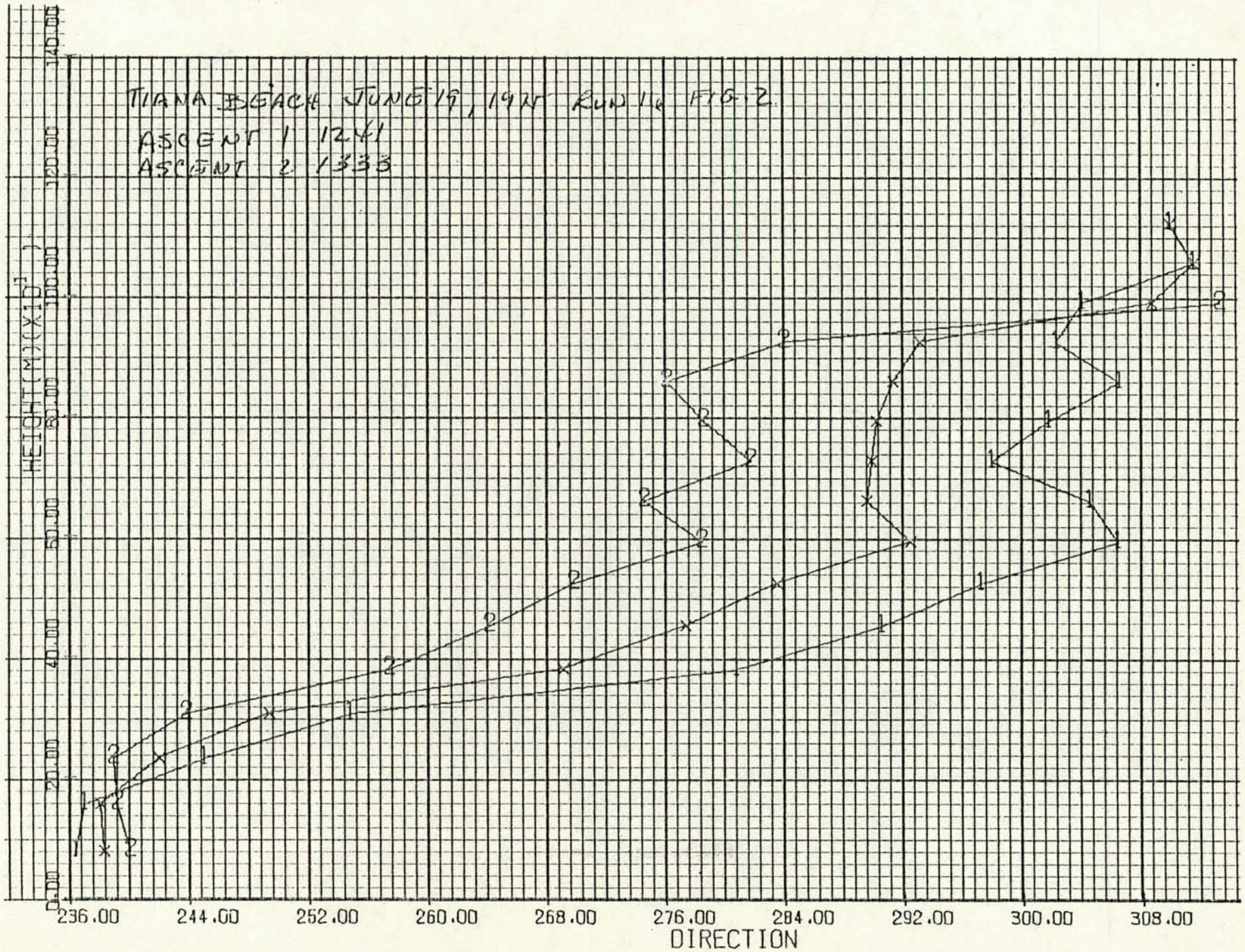
EST	3.35 m	7 m	10.7 m	14.3 m	16.2 m	23.5 m
1220	3.50	5.54	6.44	7.03	7.99	8.89
1225	3.38	4.73	5.33	5.87	6.61	7.61
1230	3.13	4.57	5.46	6.19	7.08	7.93
1235	3.74	5.63	6.34	6.66	7.28	7.93
1240	4.50	5.46	6.36	6.94	7.74	8.50
1245	3.19	5.14	6.14	6.91	7.70	8.50
1250	3.16	4.93	5.89	6.54	7.32	7.82
1255	3.43	5.20	6.19	6.66	7.20	7.72
1300	3.12	4.59	5.45	6.04	6.76	7.49
1305	2.97	4.54	5.28	5.71	6.25	6.75
1310	3.29	5.08	5.91	6.53	7.26	8.04
1315	4.04	4.53	5.21	5.89	6.35	7.05
1320	3.38	5.14	5.95	6.53	7.32	8.26
1325	3.34	5.27	6.00	6.55	7.23	8.12
1330	3.51	5.66	6.36	6.90	7.65	8.39
1335	3.83	5.68	6.39	6.88	7.54	8.27
1340	3.63	5.89	6.61	7.17	7.91	8.72
MEAN	3.42	5.15	5.96	6.53	7.24	7.54

1220 – 1345

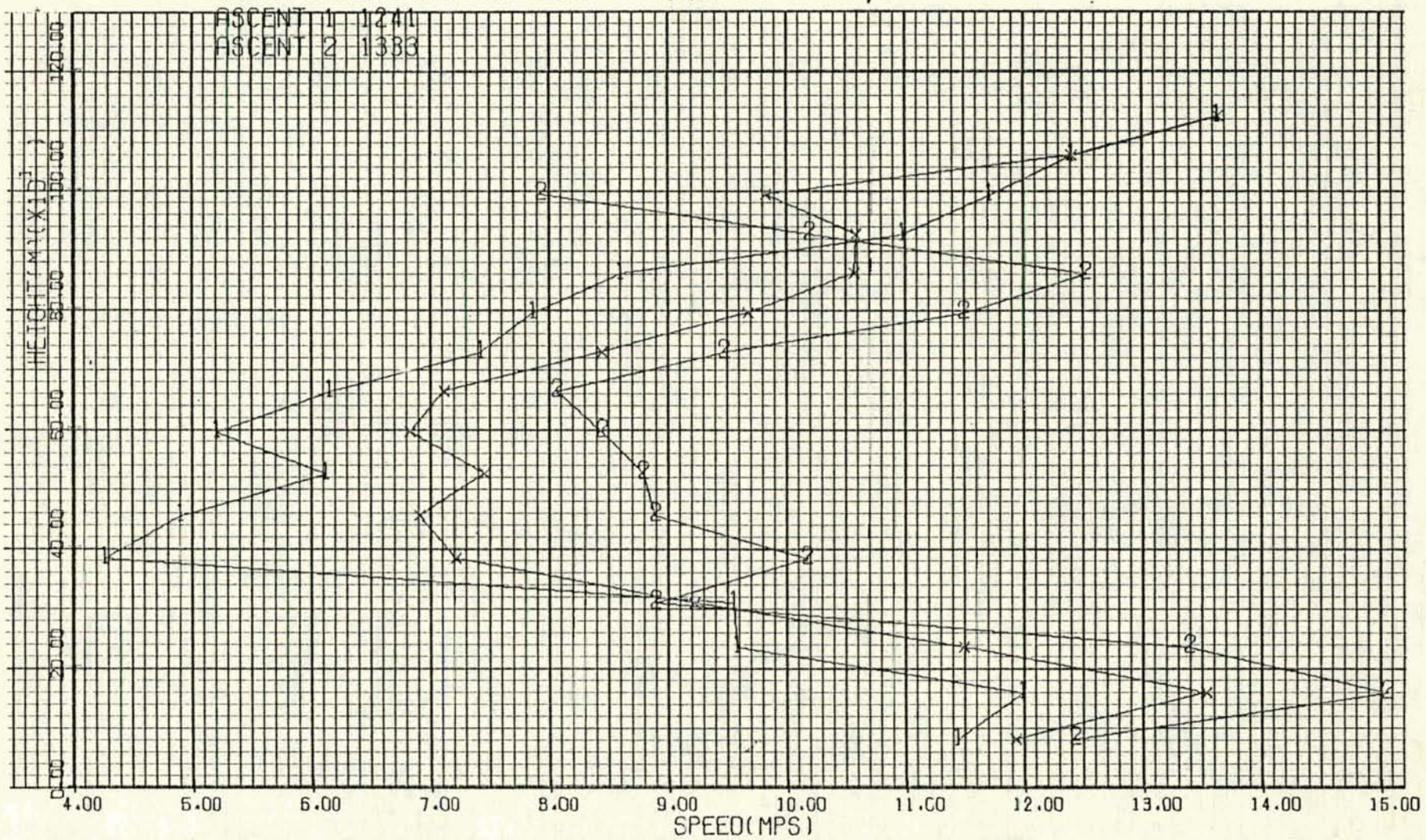
Table 2
Aircraft Temperatures (°C) Run 16 6-19-75

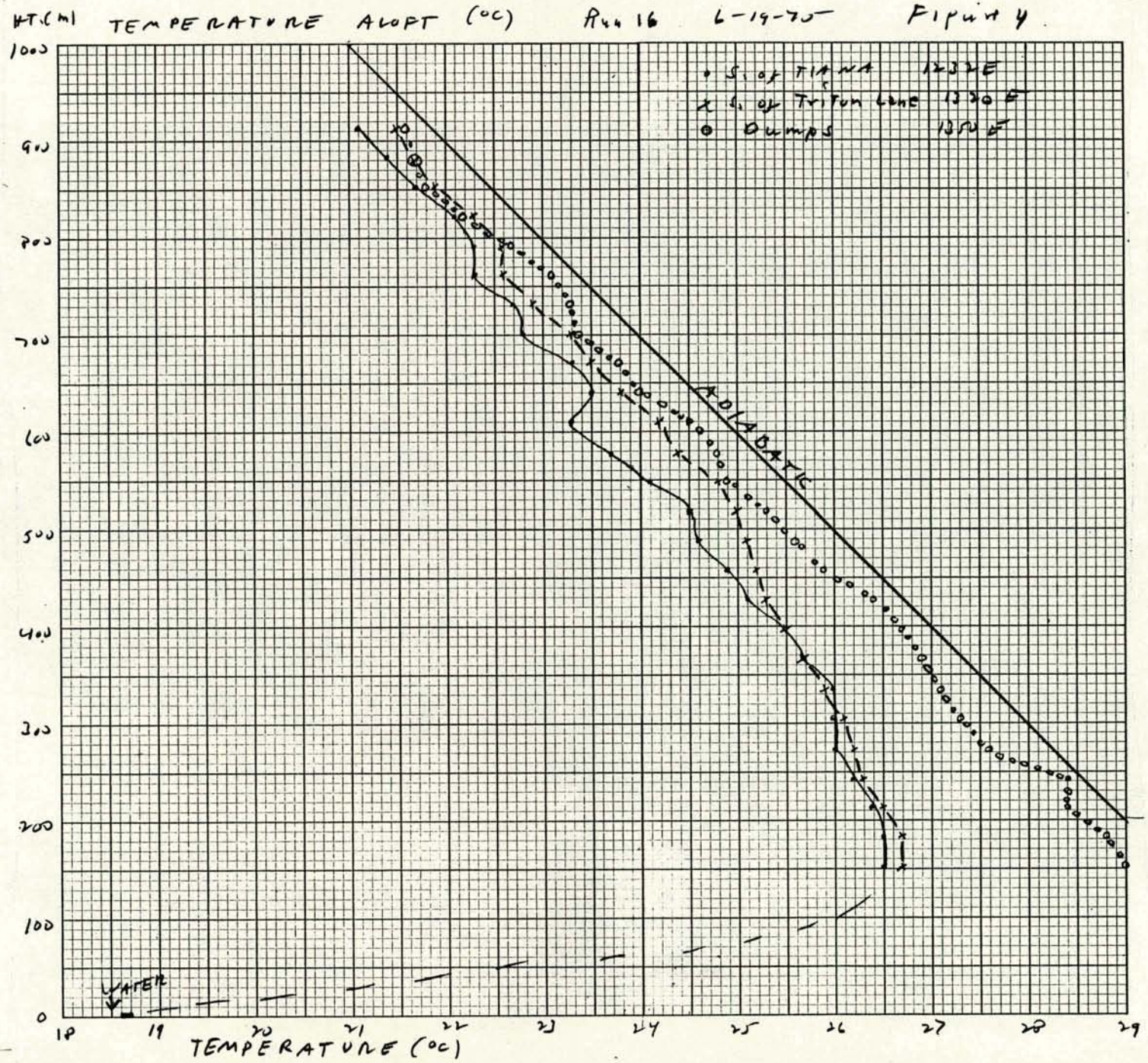
Ht. (m)	1232E Over Ocean S of Tiana	1330E Over Ocean S. of Triton La.	1350E Over Dumps
152	26.5	26.7	29.0
183	26.5	26.7	28.8
213	26.4	26.5	28.4
244	26.2	26.3	28.4
274	26.0	26.2	27.6
305	26.0	26.1	27.3
335	26.0	25.9	27.1
366	25.7	25.7	26.9
396	25.5	25.5	26.7
427	25.1	25.3	26.4
457	24.9	25.2	25.9
488	24.6	25.1	25.6
518	24.5	25.0	25.3
549	24.1	24.8	24.9
579	23.7	24.4	24.8
610	23.3	24.2	24.5
640	23.5	23.8	24.0
671	23.3	23.5	23.8
701	22.8	23.3	23.4
732	22.7	22.9	23.3
762	22.3	22.6	23.1
792	22.3	22.6	22.7
823	22.1	22.3	22.2
853	21.7	21.9	21.8
884	21.4	21.7	21.7
914	21.1	21.5	21.6


RUN 16 DATED 19 JUNE 1975
FIG. 1
1220 - 1345 EST
PARKING LOT
Height (m)
Mean Wind Speed (m/sec)
1
2
3
4
5
6
7
8
9
10


TIANA BEACH JUNE 19, 1971 RUN 16 FIG. 2
ASCENT 1 1241
ASCENT 2 1333
HEIGHT (MILES)
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
236.00
244.00
252.00
260.00
268.00
276.00
284.00
292.00
300.00
308.00
DIRECTION

TIANA BEACH JUNE 19, 1975 Run 1L Figure 3




HT. (m) TEMPERATURE ALOFT (°C) Run 16 6-19-70 Figure 4
• S. of Tiana 1232E
x S. of Triton Lane 1320 E
⊗ Dumps 1350 E
ADIABATIC
WATER
1000
900
800
700
600
500
400
300
200
100
0
18
19
20
21
22
23
24
25
26
27
28
29
TEMPERATURE (°C)

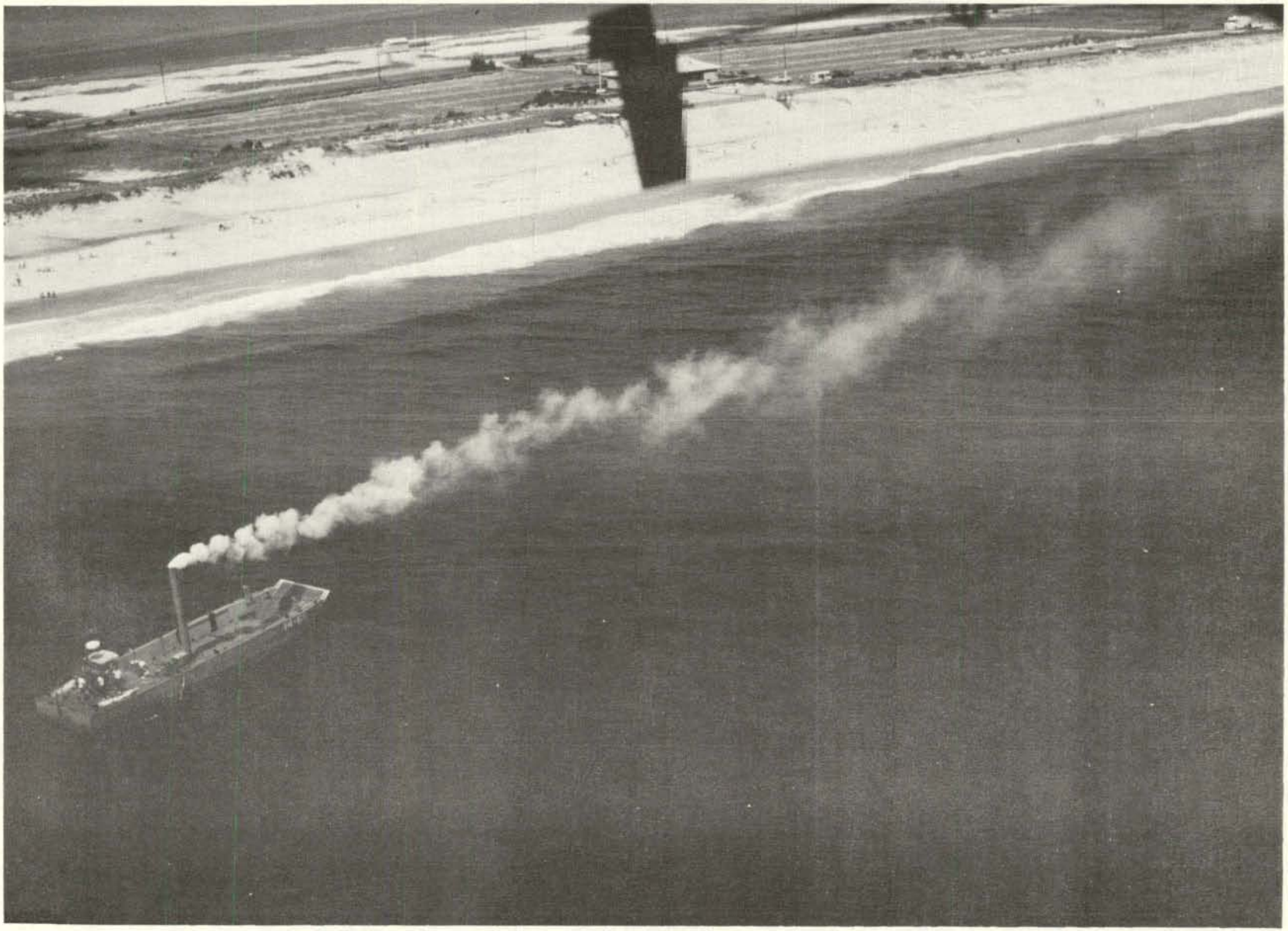


Figure 1. Aerial view of smoke plume,
Run 16, 6-19-75.

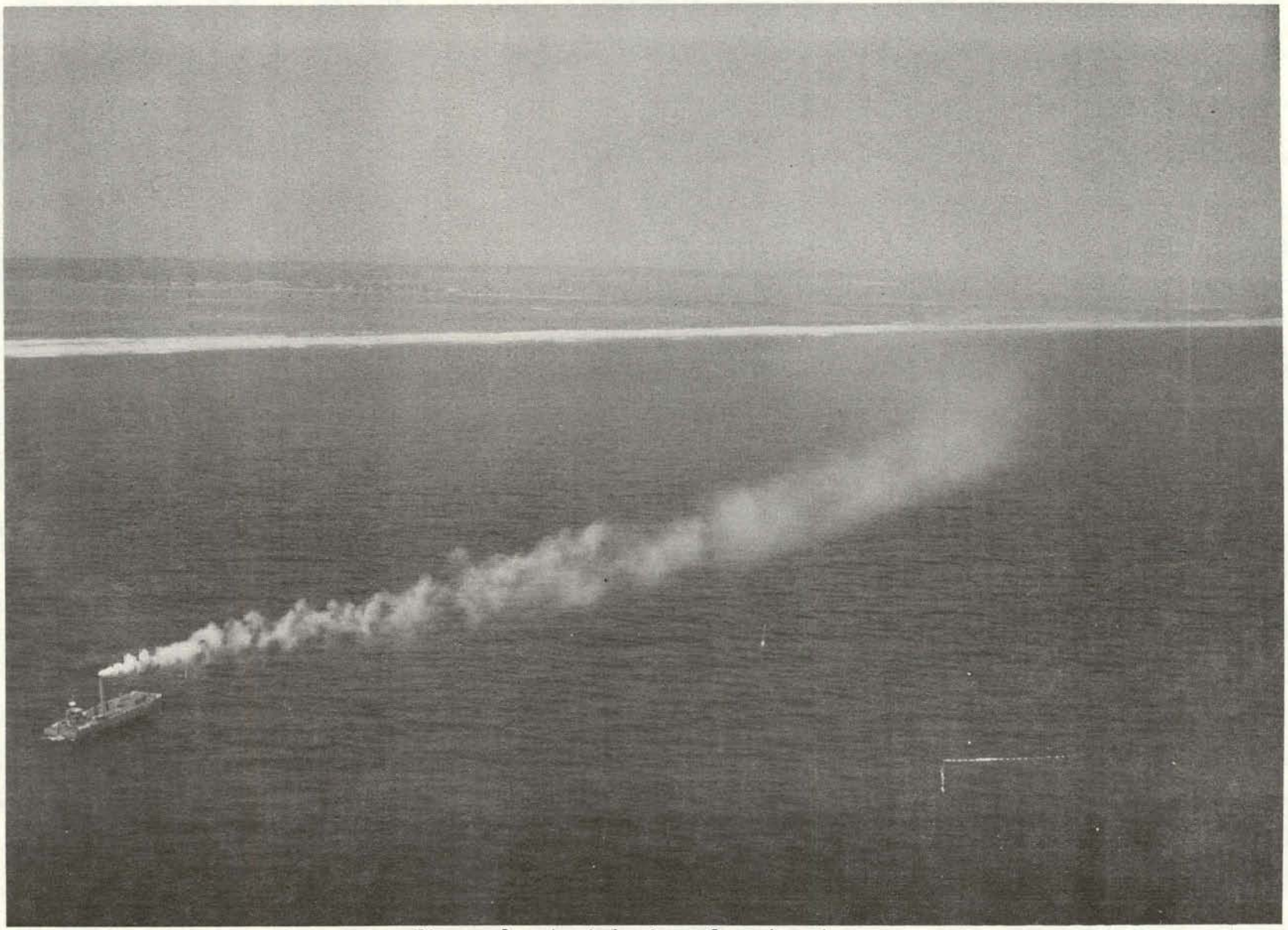


Figure 2. Aerial view of smoke plume,
Run 16, 6-19-75.

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Run No. 17
June 24, 1975

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: Nov. 13, 1975

TO: Files

FROM: G. S. Raynor

SUBJECT: Run 17

Offshore diffusion test no. 17 was held on June 24, 1975. Skies were mostly clear but scattered altocumulus was present from about 1140 to 1230. Heavy haze was present. A large E-W elongated high centered over the ocean extended inland through Virginia to the mid-west. A cold front was located from central Maine to central Lake Michigan. The gradient wind was from about 230°. Waves and swell were not recorded but waves were estimated to be from 2 to 3 feet. High tide occurred at 0709 and low tide at 1303. Thus, the tide was going out during the early part of the run but coming in during the period of densitometer traverses. Eastern standard time is used throughout this report.

Personnel left BNL at 0900 and reached Tiana at 0945. The LCM left the Inlet at 1020. The Tiana tower and beach mast were instrumented by 1030. Since only one densitometer was operative, it was used on COBOLT rather than the van because of the wind direction.

The beach was manned by Raynor, McNeil, SethuRaman and Carlson. Cup anemometers were mounted at heights of 3.4, 7.0, 10.7, 14.3, 18.0 and 23.5 m on the tower and at heights of 1, 2, 4, 8 and 10 m on the beach mast. The 6-m position was not instrumented due to a shortage of anemometers. The mast was located about 1.5 m above and 10 m from the water's edge. The MRI bivane and the Thunder Scientific RH sensor were mounted at 23.5 m. Temperatures were recorded from the sensors mounted permanently at 3.4, 10.7, 18.0 and 23.5 m. The Weathermeasure RH probe was used to measure the profile up the tower. The bivane and RH sensor outputs were recorded on the PI tape recorder and the temperatures on the Lockheed tape recorder. Speed runs were started at 1100, 1255 and 1340. Anemometer counters were operated from 1050-1500.

Wind direction from the Aerovane trace was from 220° to 230°. Speed ranged from 7.5 to 9.5 and averaged 8.5 mps. Gustiness was type D.

Pibal soundings were taken at 1045, 1310 and 1400. The kytoon was not used.

Anemometer data are tabulated in Tables 1 and 2 and plotted in Figure 1. The relative humidity profile is shown in Figure 2. The temperature data are not yet reduced and will be reported later. Winds aloft are plotted in Figures 3 and 4. Direction veered from southwest near the surface to west northwest or northwest at higher levels. Speeds were maximum at about 150 m.

Files
G. S. Raynor
Run 17 Nov. 13, 1975

The LCM was manned by W. Jahnig and S. Fink. Until 1230 it was used for release of constant-level balloons for the Argonne experiment. At 1230 it moved into the position shown in Figure 5. Test smoke was started at 1233 and continued until 1507 with a pause for refueling between 1400 and 1415. The plume was stable with smooth edges and close to the water. There was very little meander.

Densitometer traverses were made with COBOLT at three distances, 0.97, 1.85 and 3.48 km from the source. Location of marker buoys and densitometer tracks are shown in Figure 5. Smoke output was low and is shown in Figure 6. Tank pressures were lower than usual and one nozzle gave poor smoke for part of the run. COBOLT was manned by Bob Brown and John Mikutowicz.

The aircraft was manned by A. Tuthill. Temperature spirals were made from 100 to 2500 feet (30 - 762 m) over the ocean and from 500 to 2500 feet (152 - 762 m) inland (Table 3 and Figure 7). A very large inversion extended up to about 300 m. Temperatures at this level were about 15°C above the ocean temperature and about 13°C higher than air temperatures taken over the ocean from COBOLT. Water temperatures were unusually low. Two readings from COBOLT and three from the LCM gave 14.3 to 14.7°C. On June 19, 5 days earlier, they were 18.7 to 18.8°C. No unusual weather occurred in the meantime except several days of SW winds.

Infrared surface temperatures were measured from 1245-1313 travelling at 500 feet at 80 mph. One pass was made 1/4 mile offshore from Moriches Inlet to east of Shinnecock Inlet. Near Shinnecock Inlet, additional passes were made at 3/4, 1.5 and 3 miles out. Results have been reported by Mark Powell but indicated ocean temperatures varied from 16.0 to 18.9°C. Temperatures off Tiana were from 16.2 to 16.8°C. Warmest temperatures were off the Inlets since tide was flowing out. All temperatures are believed from 1 to 3 degrees high.

No variometer traverses were made due to the wind direction. Photographs were taken of the plume from the air including one or two timed runs.

In summary, this is the first run in which densitometer measurements were obtained at three distances. The strong low-level inversion gave a stable plume.

GSR/lk

Table 1

Five Minute Mean Wind Speeds (M/Sec)
Date=24 Jun 1975 Run=R17 Site=Tiana Towr Start Time=1050

	Height(M)					
EST	3.35	7.00	10.70	14.30	16.20	23.50
1050	3.52	5.65	6.51	7.15	7.66	8.43
1055	3.70	5.78	6.56	7.18	7.58	8.18
1100	3.69	5.30	5.91	6.57	7.02	7.80
1105	3.72	5.67	6.50	7.05	7.46	8.30
1110	4.04	5.83	6.55	7.21	7.69	8.48
1115	3.91	5.66	6.52	7.21	7.74	8.58
1120	3.83	6.15	7.08	7.80	8.26	9.04
1125	4.16	6.35	7.37	8.08	8.51	9.26
1130	4.15	6.63	7.49	8.08	8.36	8.92
1135	4.11	5.72	6.40	7.06	7.49	8.17
1140	3.98	5.85	6.61	7.28	7.70	8.38
1145	3.74	5.60	6.41	7.08	7.57	8.34
1150	3.53	5.26	6.07	6.75	7.24	8.13
1155	3.66	5.30	6.13	6.80	7.36	8.30
1200	3.95	5.79	6.77	7.58	8.11	8.95
1205	4.11	6.03	6.96	7.63	8.12	8.97
1210	3.66	5.57	6.44	7.19	7.68	8.48
1215	3.47	5.33	6.09	6.83	7.38	8.25
1220	3.28	5.14	6.10	6.76	7.32	8.28
1225	3.56	5.17	6.08	6.83	7.31	8.25
1230	4.04	5.49	5.97	6.74	7.29	8.06
1235	4.36	5.20	5.76	6.45	6.92	7.80
1240	4.36	5.14	5.66	6.33	6.83	7.67
1245	4.40	5.18	5.70	6.34	6.89	7.70
1250	4.45	5.47	5.98	6.69	7.21	7.99
1255	4.29	5.36	6.15	6.87	7.53	8.43
1300	4.08	5.70	6.58	7.37	7.94	8.74
1305	4.34	6.50	7.42	8.17	8.51	9.08
1310	4.08	6.33	7.08	7.67	7.83	8.34
1315	3.69	6.28	6.58	7.10	7.32	7.83
1320	3.80	6.19	6.65	7.31	7.57	8.11
1325	3.87	6.32	6.57	7.22	7.47	8.02
1330	3.62	6.44	6.23	6.90	7.10	7.59
1335	3.14	4.92	5.90	6.66	6.86	7.34
1340	3.09	4.85	5.79	6.59	6.84	7.32
1345	3.10	4.98	5.95	6.80	7.01	7.51
1350	2.94	4.83	5.64	6.49	6.95	7.53
1355	3.25	5.08	5.79	6.60	7.15	7.76
1400	3.69	5.91	6.23	6.99	7.50	8.14
1405	3.64	5.63	6.18	6.96	7.53	8.14
1410	4.17	5.49	6.08	6.78	7.34	8.01
1415	4.53	5.72	6.21	6.91	7.46	8.38
1420	5.03	6.15	6.47	7.14	7.65	8.49
1425	5.13	6.27	6.61	7.28	7.80	8.76
1430	5.04	6.42	6.59	7.27	7.79	8.67
1435	5.06	6.45	6.52	7.20	7.72	8.60
1440	4.47	5.86	6.57	7.35	7.90	8.64
1445	3.51	6.30	5.88	6.60	7.18	8.06
1450	3.36	6.17	5.81	6.53	7.08	7.88
1455	3.70	6.59	5.89	6.56	7.10	7.95
1500	3.75	6.56	6.08	6.88	7.52	8.35
Run Mean	3.92	5.76	6.34	7.04	7.50	8.24

Table 2

Five Minute Mean Wind Speeds (M/Sec)
Date=24 Jun 1975 Run=R17 Site=Beach Mast Start Time=1050

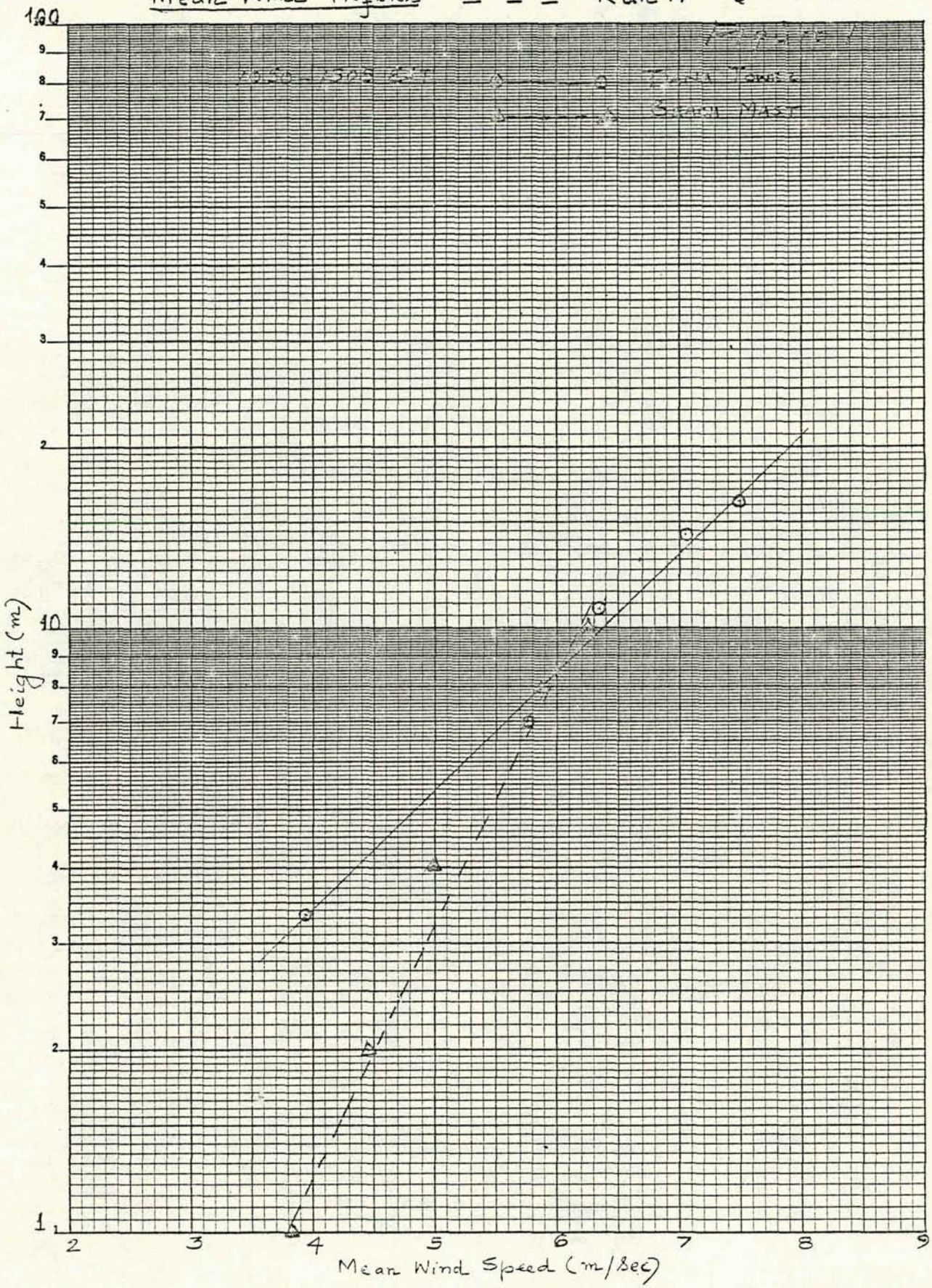
	Height(M)				
EST	1.00	2.00	4.00	8.00	10.00
1050	4.06	4.68	5.24	6.10	6.47
1055	4.11	4.72	5.24	6.10	6.47
1100	3.66	4.23	4.67	5.50	5.86
1105	4.00	4.60	5.11	5.91	6.27
1110	4.21	4.77	5.29	6.15	6.48
1115	4.11	4.75	5.31	6.15	6.55
1120	4.38	5.02	5.57	6.51	6.89
1125	4.48	5.07	5.76	6.79	7.16
1130	4.68	5.34	6.00	7.01	7.38
1135	3.99	4.58	5.12	5.96	6.30
1140	4.15	4.80	5.29	6.14	6.51
1145	4.02	4.67	5.19	6.07	6.37
1150	3.81	4.35	4.87	5.68	6.00
1155	3.67	4.20	4.68	5.54	5.92
1200	4.25	4.81	5.33	6.28	6.64
1205	4.11	4.79	5.34	6.25	6.54
1210	3.93	4.55	5.08	5.90	6.23
1215	3.67	4.28	4.76	5.58	5.89
1220	3.56	4.16	4.68	5.45	5.71
1225	3.47	4.03	4.55	5.43	5.72
1230	3.54	4.15	4.73	5.55	5.89
1235	3.52	4.07	4.53	5.37	5.73
1240	3.32	3.87	4.35	5.23	5.47
1245	3.32	3.89	4.35	5.18	5.51
1250	3.53	4.15	4.59	5.44	5.83
1255	3.70	4.27	4.76	5.59	5.97
1300	3.79	4.39	4.97	5.93	6.29
1305	4.36	5.05	5.70	6.69	7.14
1310	4.09	4.76	5.45	6.47	6.86
1315	3.77	4.38	4.95	5.93	6.35
1320	3.79	4.42	4.89	5.92	6.24
1325	3.73	4.38	4.98	5.89	6.33
1330	3.62	4.23	4.75	5.67	6.04
1335	3.35	4.02	4.53	5.47	-
1340	3.35	3.97	4.45	5.38	-
1345	3.49	4.09	4.60	5.56	-
1350	3.32	3.96	4.40	5.28	-
1355	3.36	4.03	4.51	5.40	-
1400	3.70	4.38	4.91	5.79	-
1405	3.60	4.32	4.84	5.74	-
1410	3.64	4.29	4.79	5.74	-
1415	3.77	4.47	5.00	5.93	-
1420	3.98	4.70	5.20	6.06	-
1425	4.10	4.82	5.34	6.28	-
1430	4.13	4.86	5.39	6.30	-
1435	4.08	4.74	5.29	6.21	-
1440	4.14	4.86	5.40	6.36	-
1445	3.64	4.42	4.94	5.78	-
1450	3.68	4.40	4.94	5.81	-
1455	3.75	4.46	4.94	5.79	-
1500	3.95	4.66	5.11	6.02	-
1050-1335	3.89	4.50	5.03	5.92	6.27
Run Mean	3.83	4.47	4.99	5.89	6.27

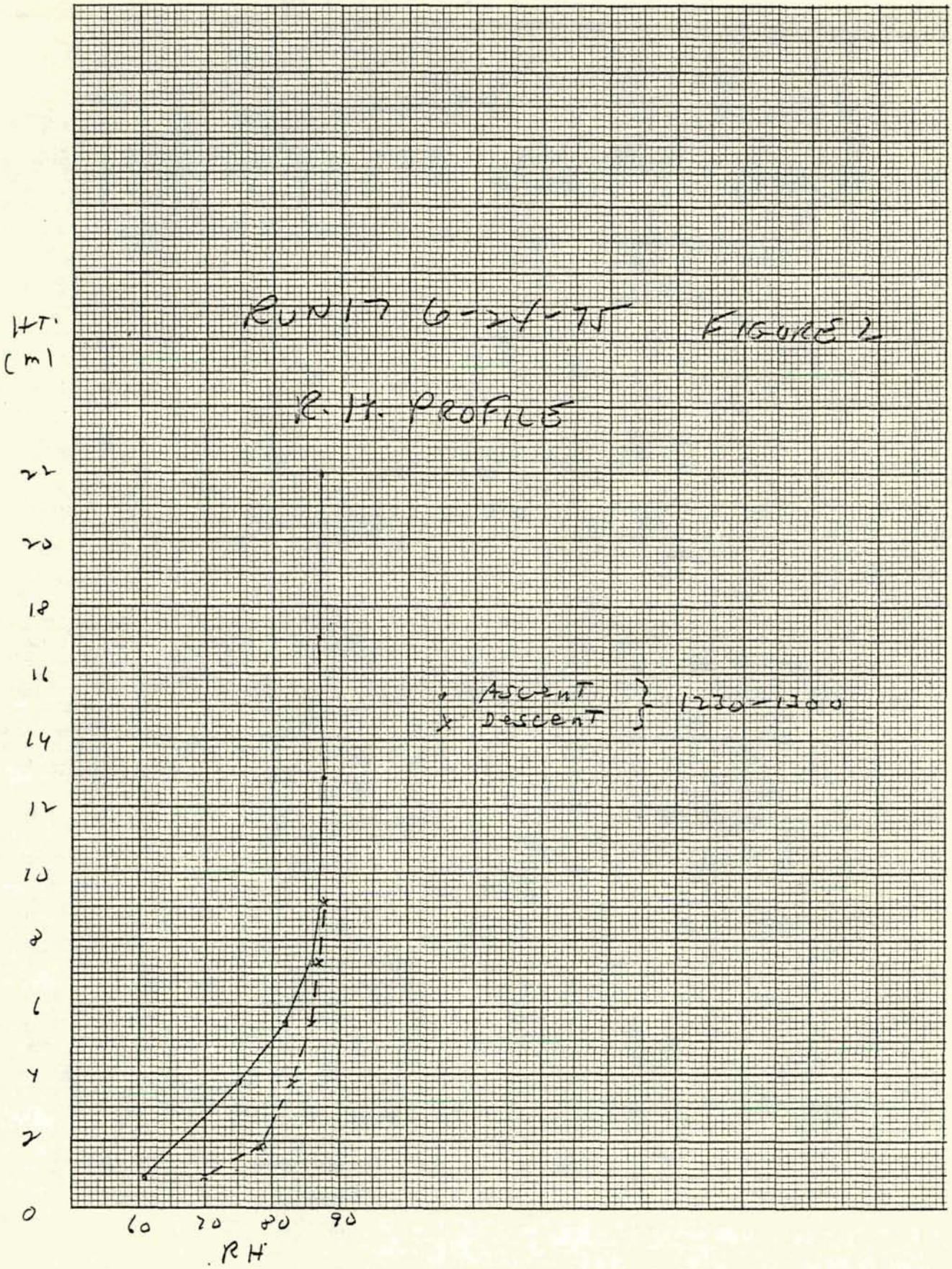
Table 3

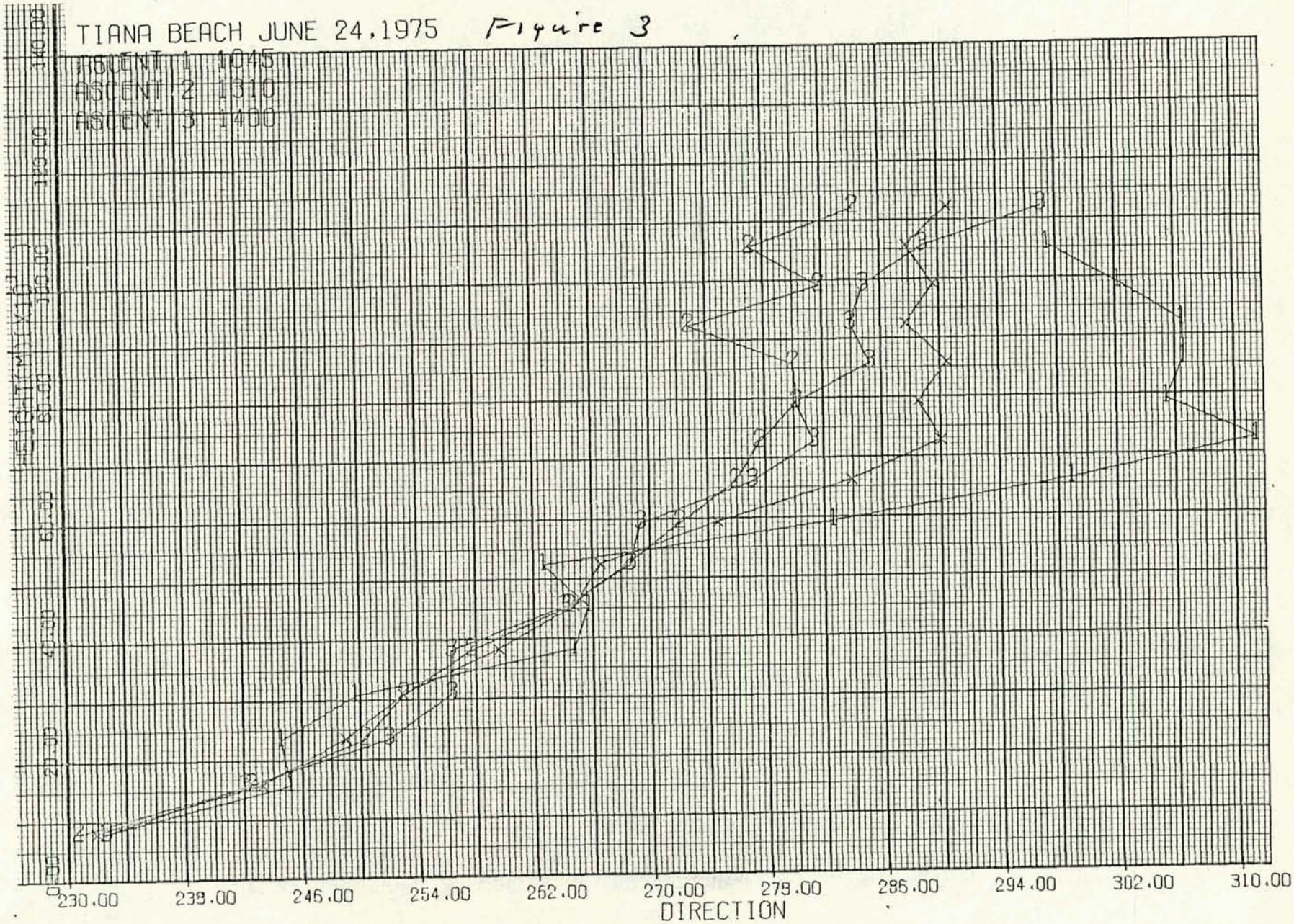
Aircraft Temperatures Run 17 6-24-75

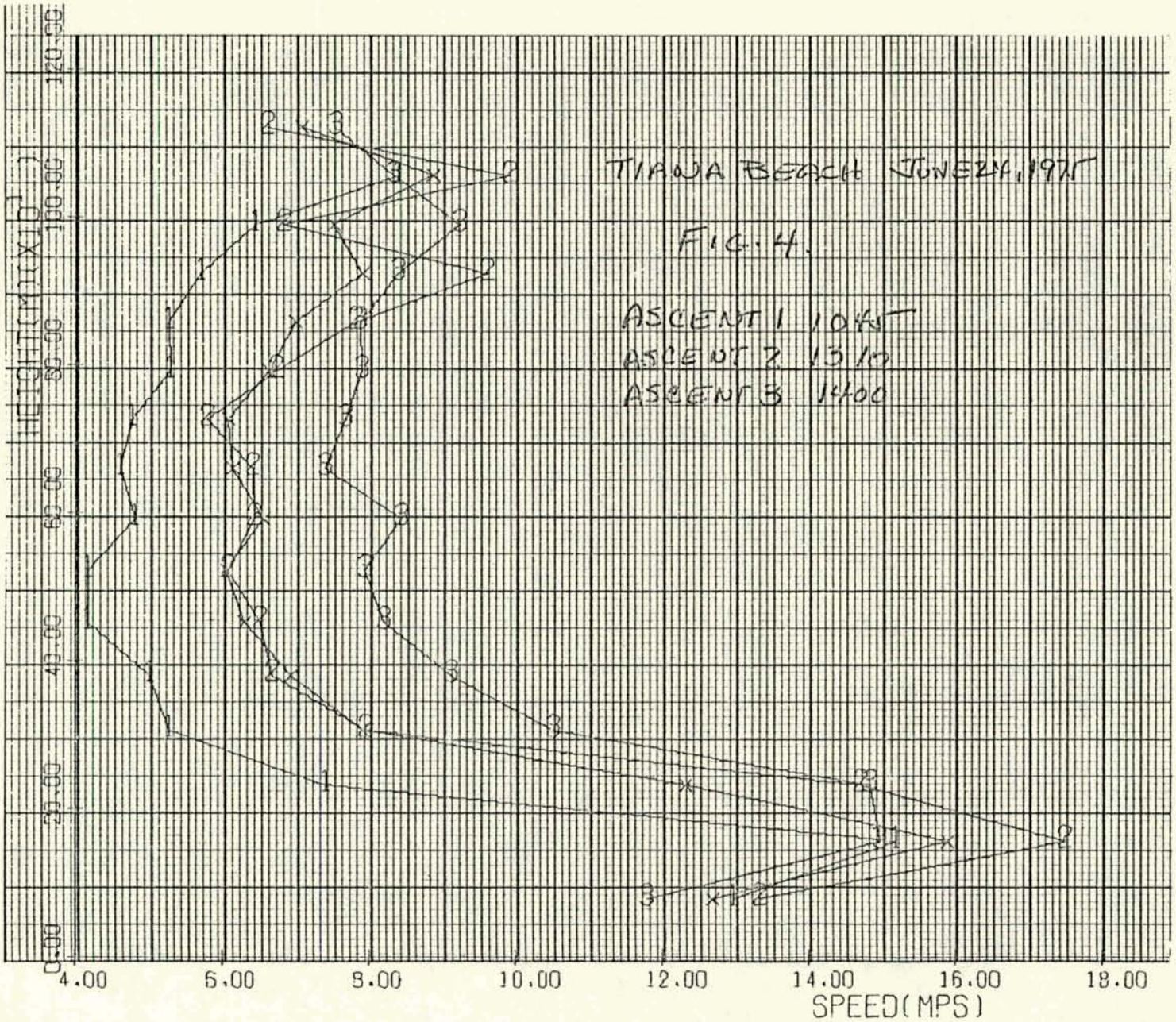
Ht (m)	1216E Over Ocean	1230E Over Dumps
40	19.9	--
61	20.6	--
91	22.0	--
122	23.7	--
152	24.7	26.4
183	25.7	26.8
213	26.3	26.7
244	26.6	27.1
274	27.6	28.7
305	27.7	28.5
335	27.6	28.3
366	27.5	27.9
396	27.2	27.7
427	27.0	27.3
457	26.9	27.1
488	26.6	26.7
518	26.1	26.4
549	25.9	26.2
579	25.8	25.8
610	25.7	25.6
640	25.3	25.6
671	25.1	25.1
701	25.0	25.2
732	24.9	25.0
762	24.8	24.7

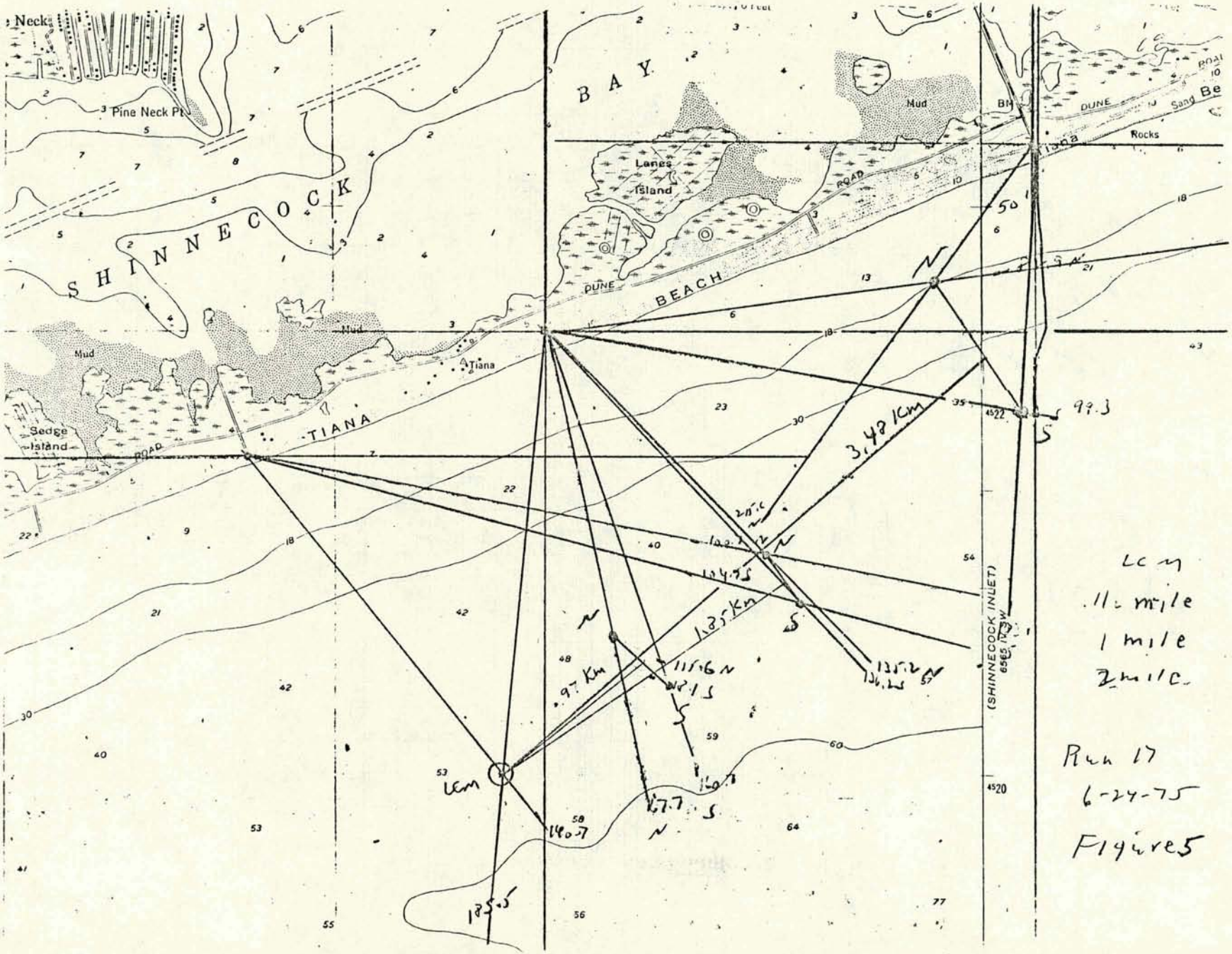
Mean Wind Profiles - - - Run 17 6-24-75

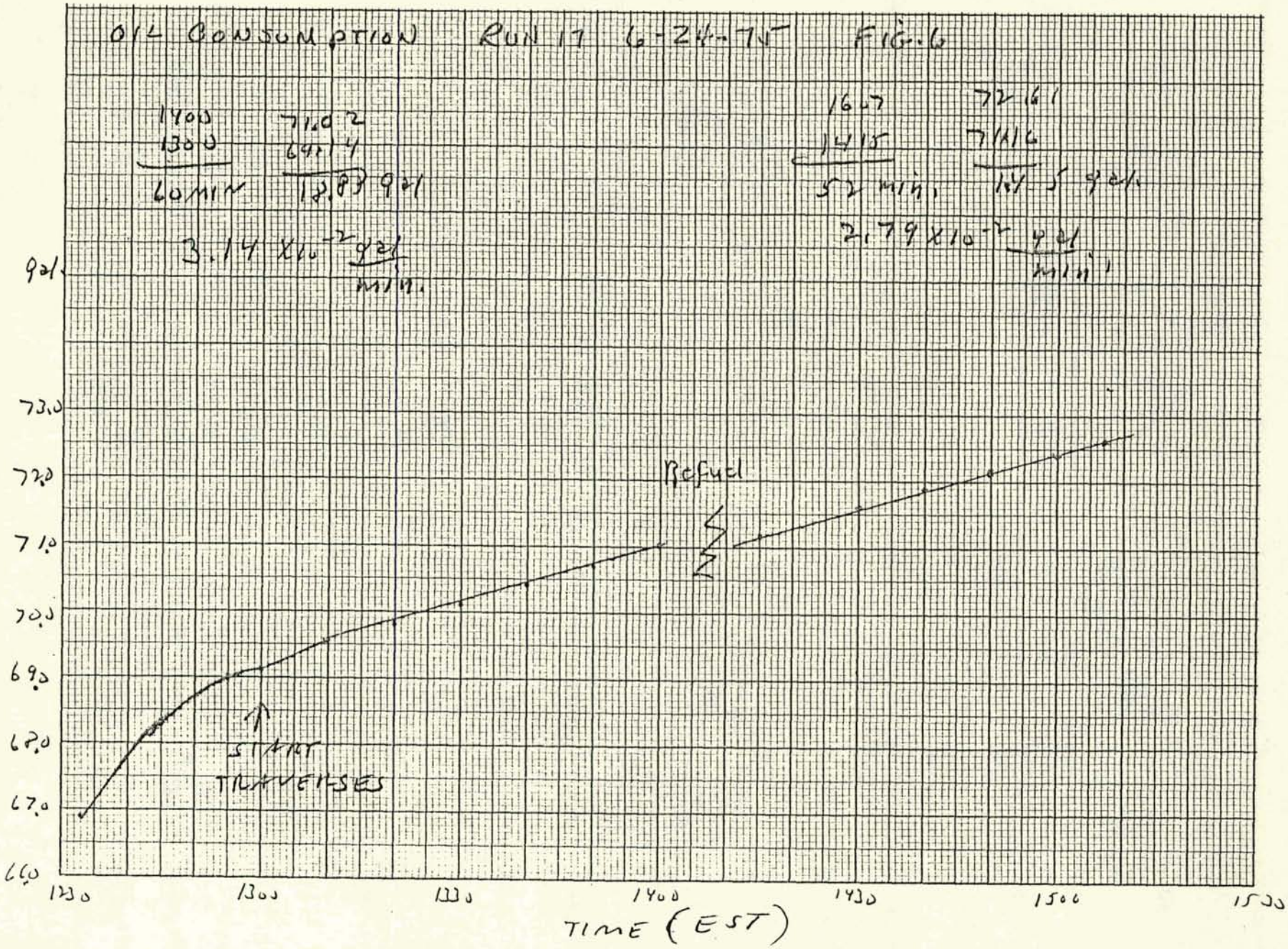



RUN 17 6-24-75
FIGURE 2
R.H. PROFILE
HT. (m)
22
20
18
16
14
12
10
8
6
4
2
0
60
70
80
90
RH
• ASCENT
x DESCENT
1230-1300


TIANA BEACH JUNE 24,1975
Figure 3
ASCENT 1 1045
ASCENT 2 1310
ASCENT 3 1400
HEIGHT (KILOMETERS)
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
230.00
238.00
246.00
254.00
262.00
270.00
278.00
286.00
294.00
302.00
310.00
DIRECTION


TIAWA BEACH JUNE 24, 1975
FIG. 4.
ASCENT 1 1040
ASCENT 2 1510
ASCENT 3 1400
HEIGHT (MIXING)
SPEED (MPS)
0.00
20.00
40.00
60.00
80.00
100.00
120.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00


Pine Neck Pt
SHINNECOCK
BAY
Mud
Lanes Island
DUNE
BEACH
ROAD
Tiana
TIANA
Sedge Island
Rocks
(SHINNECOCK INLET)
3.48 Km
1.35 Km
.97 Km
LCM
99.3
Run 17
6-24-75
Figure 5


OIL CONSUMPTION RUN 17 6-24-75 FIG. 6
1400
1300
60 MIN
71.02
64.14
12.88 gal
3.14 x10^-2 gal/min.
1607
1415
52 min.
72.61
71.16
1.45 gal.
2.79 x10^-2 gal/min.
Refuel
START TRAVERSES
73.0
72.0
71.0
70.0
69.0
68.0
67.0
66.0
1230
1300
1330
1400
1430
1500
1530
TIME (EST)

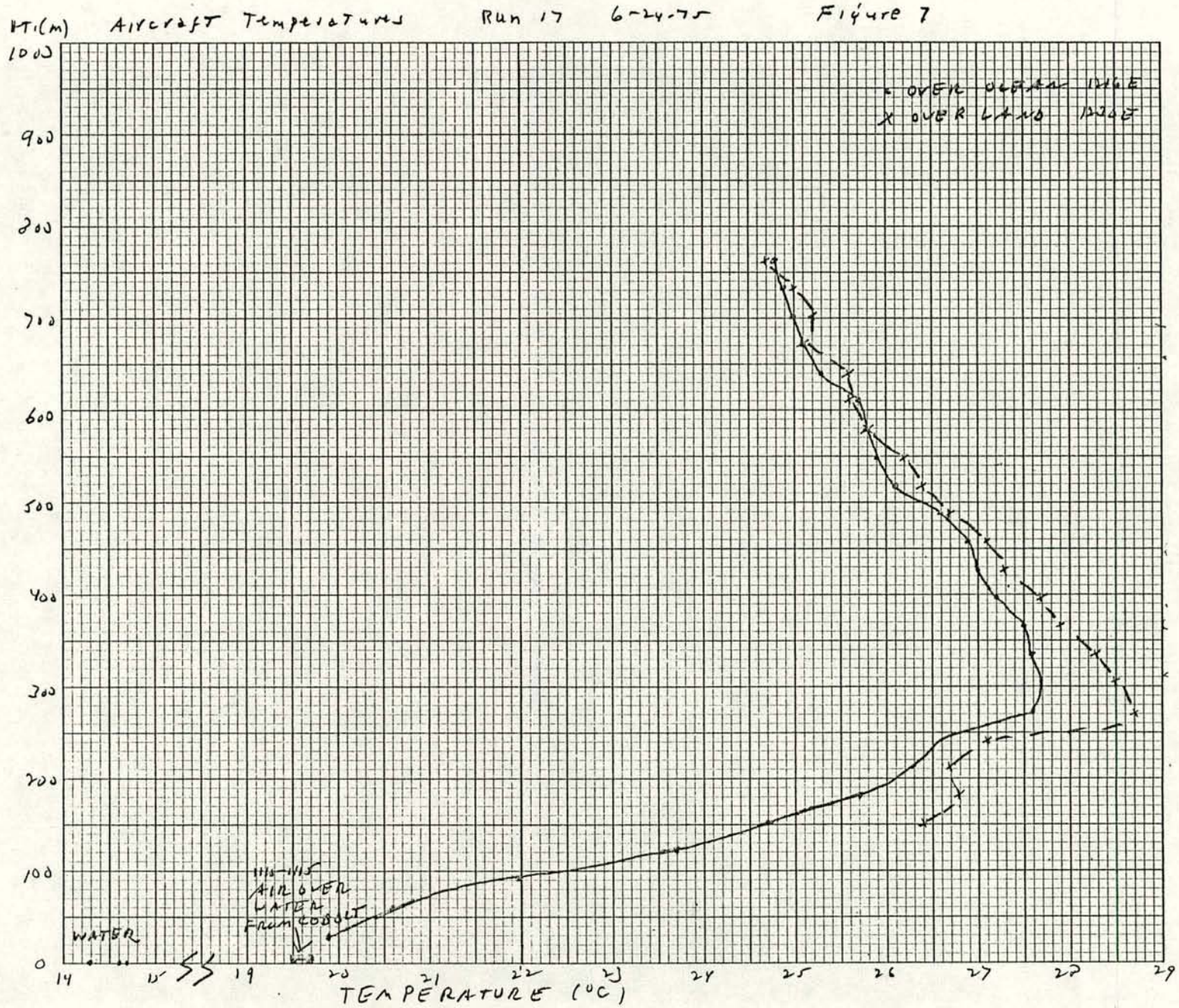
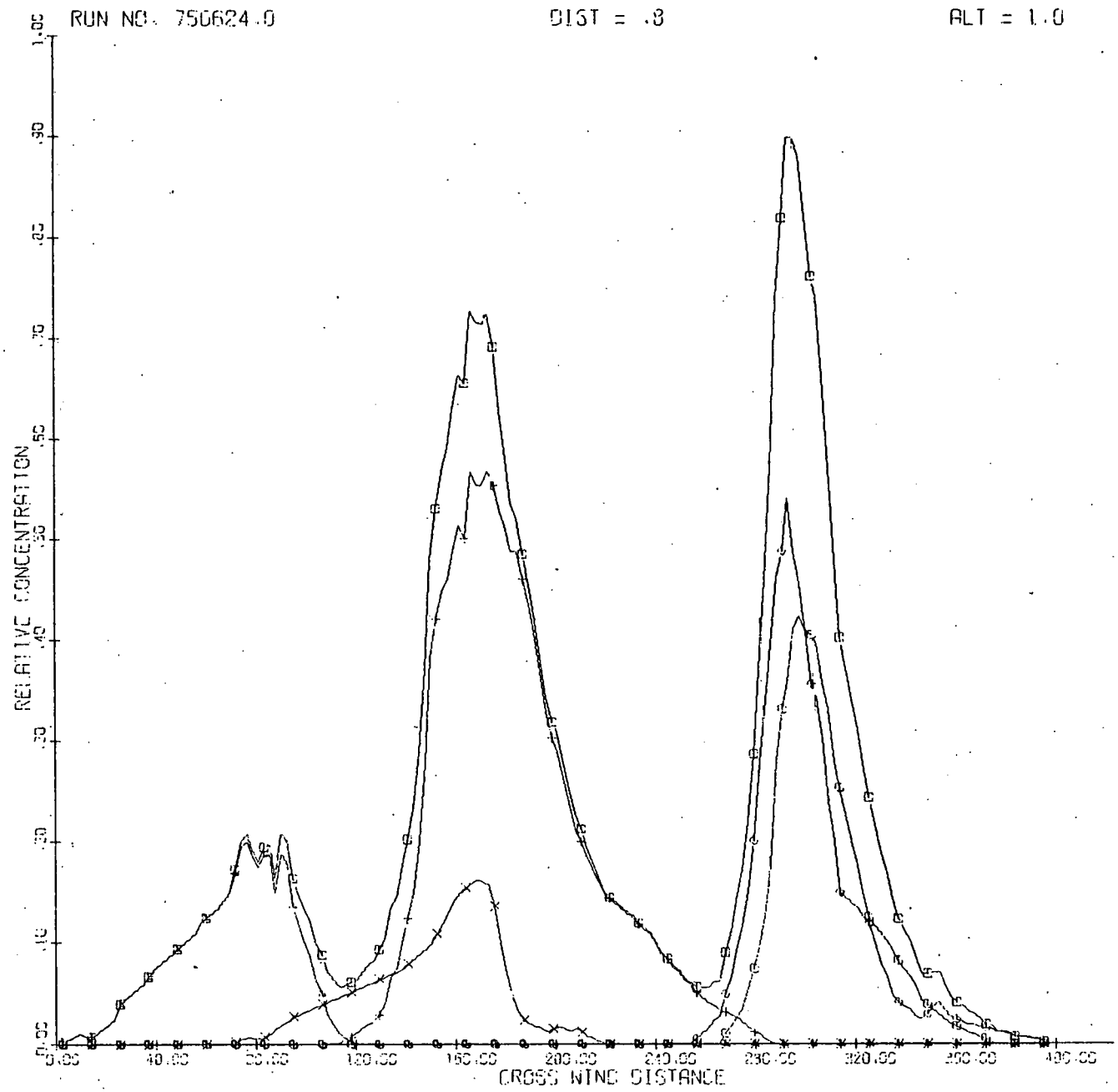

HT.(m) Aircraft Temperatures Run 17 6-24-75 Figure 7
• OVER OCEAN INLET
X OVER LAND INLET
1115-1115
AIR OVER
WATER
FROM COBOLT
WATER
1000
900
800
700
600
500
400
300
200
100
0
14
15
19
20
21
22
23
24
25
26
27
28
29
TEMPERATURE (°C)

Figure 1. Aerial view of smoke plume,
Run 17, 6-24-75.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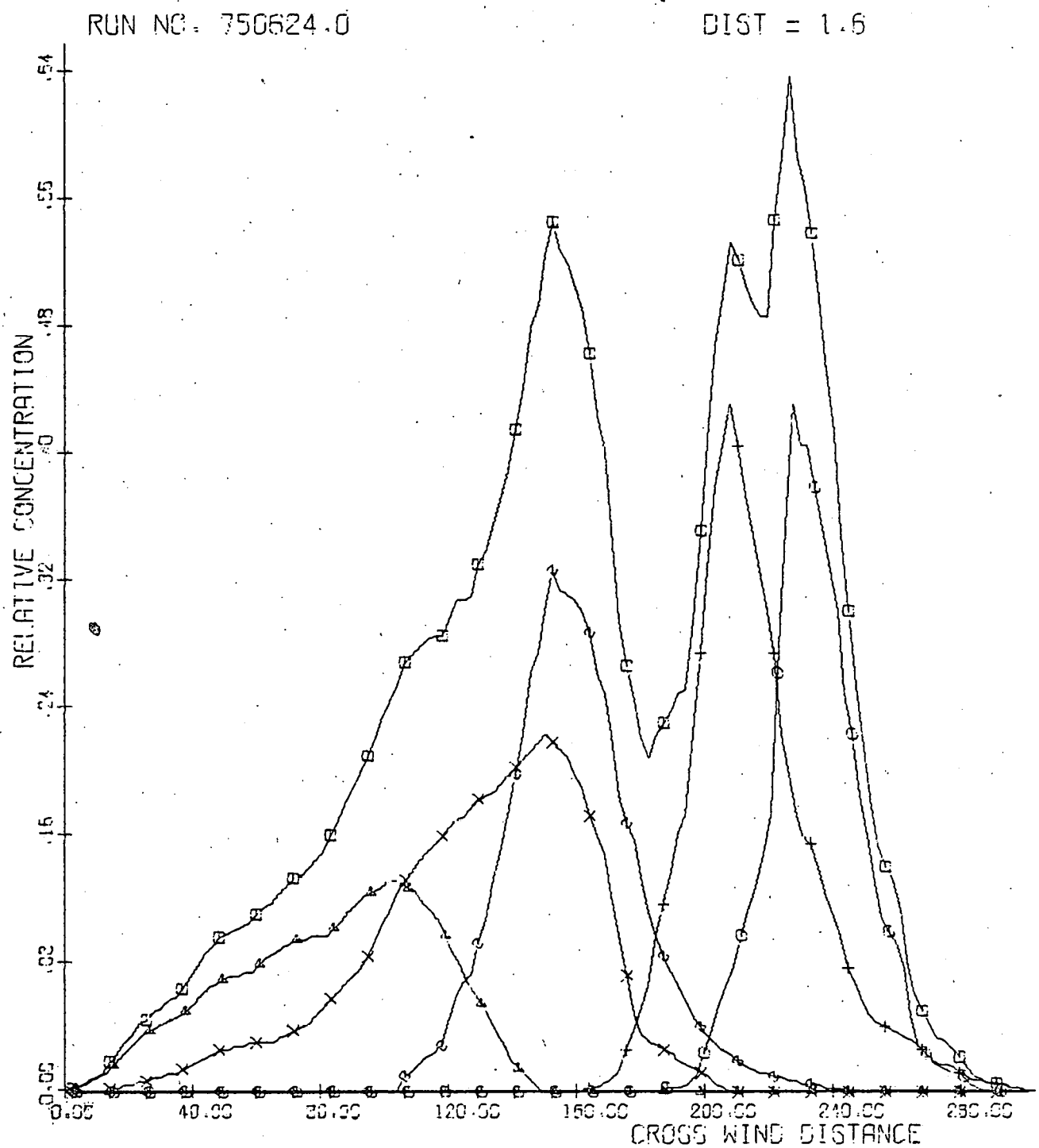
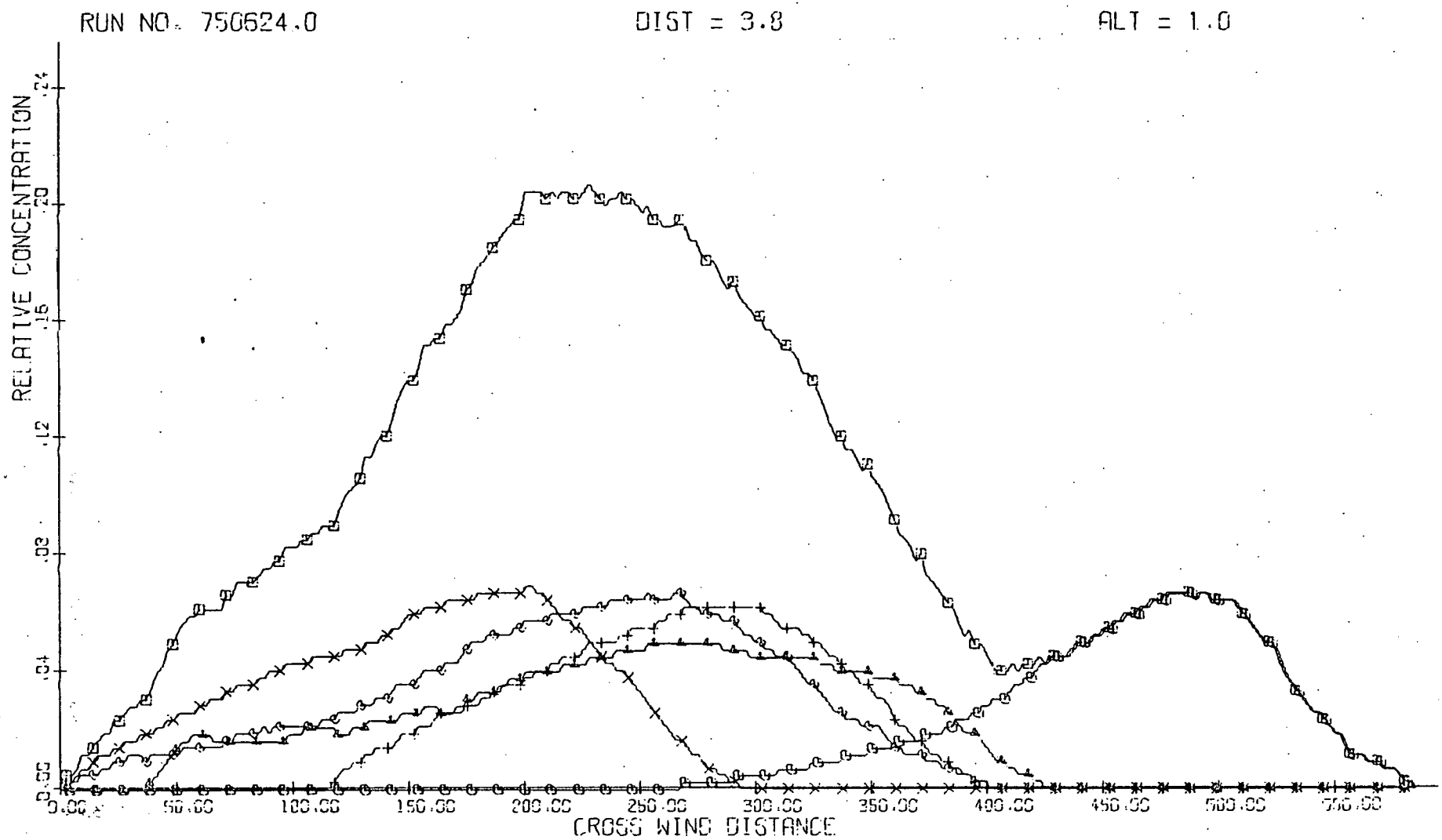
DIST = .8
ALT = 1.0
RELATIVE CONCENTRATION
CROSS WIND DISTANCE


RUN NO. 750624.0
DIST = 1.6
RELATIVE CONCENTRATION
CROSS WIND DISTANCE
0.00
40.00
80.00
120.00
160.00
200.00
240.00
280.00
.54
.55
.48
.40
.32
.24
.16
.08
0.00


RUN NO. 750624.0
DIST = 3.8
ALT = 1.0
RELATIVE CONCENTRATION
.24
.20
.16
.12
.08
.04
.00
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
450.00
500.00
550.00
CROSS WIND DISTANCE

ON SHORE DENSITOMETER RUN FROM BOAT TR
AVERSES AT ONE DISTANCE

RUN =750624./ DATE = 62475 /DISTANCE FROM STACK (KM)= .80
DIRECTION(DEG) = 225./TIME FROM 1306 TO 1324 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGND)
1.0	.155E+02	307.5	17.9			7.49
2.0	.101E+02	70.4	21.9			5.04
3.0	.353E+02	184.0	29.4			13.13
4.0	.822E+01	150.6	26.8			3.35
5.0	.177E+02	301.7	21.0			9.23
GRAND TOTAL	.868E+02	213.7	24.9	83.1	79.2	

ON SHORE DENSITOMETER RUN FROM BOAT TR
AVERSES AT ONE DISTANCE

RUN =750624./ DATE = 62475 /DISTANCE FROM STACK (KM)= 1.60
DIRECTION(DEG) = 225./TIME FROM 1343 TO 1357 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGND)
1.0	.131E+02	233.4	14.7			13.21
2.0	.101E+02	82.8	30.9			4.85
3.0	.161E+02	215.3	20.0			11.94
4.0	.167E+02	129.3	33.7			7.34
5.0	.146E+02	159.2	20.7			10.46
GRAND TOTAL	.707E+02	167.8	25.0	57.8	52.1	

ON SHORE DENSITOMETER RUN FROM BOAT TR
AVERSES AT ONE DISTANCE

RUN =750624./ DATE = 62475 /DISTANCE FROM STACK (KM)= 3.80
DIRECTION(DEG) = 225./TIME FROM 1438 TO 1501 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGND)
1.0	.924E+01	458.9	59.6			3.52
2.0	.120E+02	245.7	90.6			3.01
3.0	.103E+02	264.1	60.9			3.84
4.0	.112E+02	157.2	63.2			4.03
5.0	.132E+02	221.1	81.5			3.69
GRAND TOTAL	.560E+02	260.7	73.5	120.2	95.1	

Run No. 18
September 11, 1975

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: Dec. 4, 1975

TO: Files

FROM: G. S. Raynor

SUBJECT: Run SB 18

Smoke run SB18 was held on September 11, 1975. Cloud cover increased from scattered cirrus early to broken cirrus and altocumulus by 1100 and to overcast altocumulus by 1200. Clouds became overcast altostratus and altocumulus by 1300. A large high was centered well east of the area with a NE-SW cold front through the western Great Lakes. The wind was gradient southerly. Aerovane speeds increased from 4-5 mps at the beginning to 10 mps at the end. The sea was smooth at the start but built up to 4-5 foot waves from the SW at the end. High tide occurred at 1116 and low at 1720. Thus, the tide was going down during the run. All times are eastern standard.

Personnel left BNL at 0830. They reached the LCM at 0910 and Tiana at 0930. The LCM left the Inlet at 1010. The beach was manned by Brown and Raynor and the LCM by Jahnig and Carlson. The aircraft was not used due to shortage of personnel. This was the only four-man smoke run ever attempted.

At Tiana, cup anemometers were mounted at heights of 3.4, 7.0, 10.7, 14.3, 18.0, and 23.5 m. The aerovane, MRI bivane and Thermosystems RH probe were mounted at the top level. The beach mast was positioned about 2 m above and 14 m from the water with anemometers at heights of 1, 2, 4, 6, 8 and 10 m. However, the 1-and 10-m counters did not work properly.

The aerovane wind direction was about 185°. Speed was 10 mps at 1300 increasing to 11 mps. Gustiness was narrow B_1, almost as steady as a narrow C.

The tower anemometer counters were started at 1022 and the beach mast counters at 1057. All were turned off at 1507. The temperatures on the four tower levels (3.4, 10.7, 18.0 and 23.5 m) were recorded on the Lockheed tape recorder from 1020 to 1507. The bivane and RH probe outputs were recorded on the PI tape recorder from 1022 until the tape ran out.

The hot wire anemometer and the BNL bivane were mounted at 8.5 m on the MIT buoy and their output recorded on a TEAC tape recorder from 1205-1300. Because of the increasing seas, a second run was not attempted. Considerable time was spent installing a wooden platform on the buoy to replace one washed away earlier. The Climatronics unit was operating during the run. Water temperature was 18.7°C and air temperature over the ocean 19.4°C.

The LCM was then stationed near the second spar buoy and emitted smoke from 1350 to 1500. During this period, the LCM drifted about 1/2 mile northeast despite the use of two anchors (Figure 1). Only one unit of the

smoke generator was operative. Output rate is shown in Figure 2.

Seven densitometer traverses were made along Dune Road from 1425-1500. Results will be reported separately.

Anemometer counts are listed in Tables 1 and 2 and plotted in Fig. 3. Temperature data will be reported later. One pibal ascent was made at 1155. Data are plotted in Figures 4 and 5. Direction veered strongly with height (Figure 4) while speed peaked at 400 to 600 m.

A few pictures were taken from Tiana. The plume was somewhat unstable but quite coherent with little meander.

The run was terminated at 1507. Personnel left Tiana at 1545 and the LCM at 1615. They reached BNL by 1700.

In summary, good densitometer measurements were obtained but drift of the LCM will make interpretation difficult. Lack of aircraft data leaves inadequate meteorological information to which the densitometer results can be related.

GSR/lk
attachs.

TABLE 1

FIVE MINUTE MEAN WIND SPEEDS (M/SEC)

DATE=11SEP1975 RUN=R1A SITE=TIANA TOWR START TIME=1022

HEIGHT(M)

GMT	3.35	7.00	10.70	14.30	16.20	23.50
1022	4.47	4.54	4.87	5.02	5.10	5.06
1027	4.32	4.60	4.65	4.83	4.89	4.94
1032	4.59	4.78	4.86	4.99	5.02	5.06
1037	4.95	5.02	5.04	5.15	5.18	5.17
1042	4.31	4.94	4.92	5.00	5.03	5.02
1047	4.74	4.91	4.99	5.11	5.18	5.23
1052	4.95	5.10	5.71	5.24	5.29	5.28
1057	4.57	4.99	4.97	5.10	5.18	5.21
1102	4.77	4.96	4.99	5.08	5.15	5.15
1107	5.13	5.29	5.32	5.47	5.56	5.53
1112	5.00	5.11	5.15	5.30	5.34	5.35
1117	4.81	5.02	5.08	5.25	5.32	5.36
1122	5.01	5.19	5.21	5.36	5.46	5.53
1127	5.24	5.44	5.47	5.69	5.64	5.66
1132	5.36	5.65	5.58	5.78	5.74	5.77
1137	5.25	5.51	5.53	5.73	5.71	5.76
1142	5.30	5.49	5.57	5.83	5.85	5.88
1147	5.51	5.74	5.77	6.10	6.00	5.98
1152	5.24	5.45	5.52	5.80	5.74	5.79
1157	5.19	5.40	5.50	5.70	5.80	5.82
1202	5.51	5.71	5.76	6.06	6.02	6.12
1207	5.82	6.09	6.19	6.72	6.44	6.42
1212	5.83	6.06	6.09	6.52	6.35	6.39
1217	6.11	6.31	6.34	6.97	6.68	6.72
1222	6.25	6.47	6.32	7.36	6.80	6.87
1227	6.43	6.59	6.67	7.55	7.00	7.06
1232	6.78	7.06	7.10	7.63	7.42	7.46
1237	6.97	7.17	7.19	7.76	7.49	7.49
1242	7.24	7.47	7.53	8.21	7.82	7.87
1247	7.97	8.31	8.42	9.02	8.73	8.70
1252	8.25	8.50	8.55	9.31	8.89	8.97
1257	8.21	8.51	8.53	9.10	8.87	8.93
1302	8.40	8.66	8.79	9.31	9.18	9.32
1307	8.57	8.65	9.10	9.58	9.42	9.41
1312	8.61	8.83	8.96	9.36	9.19	9.23
1317	8.75	9.12	9.28	9.79	9.63	9.61
1322	8.47	8.97	9.03	9.53	9.31	9.38
1327	8.75	8.14	9.25	9.77	9.52	9.55
1332	8.57	8.94	9.08	9.76	9.39	9.42
1337	9.05	9.42	9.57	9.95	9.81	9.80
1342	8.40	8.80	8.95	9.63	9.33	9.50
1347	8.50	8.72	8.91	9.50	9.16	9.20
1352	7.98	8.39	8.48	9.19	8.85	8.97
1357	8.51	9.11	9.20	9.93	9.62	9.69
1402	9.16	9.59	9.70	9.48	9.97	9.90
1407	8.83	9.11	9.23	9.76	9.65	9.73
1412	8.85	9.25	9.32	9.79	9.70	9.69
1417	9.25	9.53	9.70	10.06	9.99	10.06
1422	9.37	9.76	9.79	10.15	10.12	10.16
1427	9.44	9.82	9.88	10.31	10.29	10.30
1432	9.35	9.60	9.59	10.03	9.94	10.00
1437	9.54	9.98	10.04	10.29	10.29	10.33
1442	10.01	10.39	10.45	10.76	10.79	10.81
1447	9.72	10.24	10.50	10.83	10.99	11.10
1452	9.55	10.24	10.41	10.62	10.74	10.75
1457	9.84	10.32	10.50	10.74	10.82	10.90
1502	10.07	10.26	10.56	10.74	10.77	10.82
1022-1407	6.55	6.81	6.90	7.27	7.14	7.18
RUN AVG (1022-1502)	7.14	7.43	7.51	7.87	7.77	7.81

TABLE 2

TIME MINUTE MEAN WIND SPEEDS (M/SEC)

DATE=11SEP1975 RUN=P1W SITE=HEACH MAST START TIME=1000

HEIGHT(M)

EST	1.00	2.00	3.00	5.00	8.00
1000	4.11	4.11	4.34	4.50	4.55
1005	4.09	4.17	4.37	4.55	4.58
1010	4.32	4.54	4.76	4.91	4.96
1015	4.34	4.39	4.63	4.77	4.82
1020	4.30	4.31	4.53	4.69	4.71
1025	4.37	4.47	4.74	4.86	4.89
1030	4.53	4.69	4.89	5.02	5.04
1035	4.47	4.71	4.97	5.14	5.17
1040	4.51	4.70	4.95	5.09	5.13
1045	4.49	4.67	4.90	5.09	5.14
1050	4.55	4.74	4.98	5.19	5.27
1055	4.47	4.72	4.95	5.11	5.17
1100	4.43	4.64	4.99	5.08	5.16
1105	4.64	4.89	5.12	5.30	5.36
1110	-	5.23	5.47	5.63	5.73
1115	4.79	5.13	5.36	5.52	5.61
1120	5.14	5.43	5.71	5.87	5.97
1125	5.32	5.62	5.90	6.10	6.21
1130	5.50	5.76	6.04	6.22	6.30
1135	5.70	5.99	6.27	6.50	6.57
1140	5.93	6.05	6.38	6.57	6.66
1145	5.91	6.19	6.59	6.85	6.95
1150	6.98	-	7.60	7.87	8.00
1155	7.06	7.38	7.80	8.06	8.15
1200	6.91	7.23	7.59	7.79	7.95
1205	7.10	7.51	7.92	8.17	8.29
1210	7.29	7.68	8.14	8.42	8.52
1215	7.06	7.44	7.90	8.14	8.29
1220	7.17	7.62	8.08	8.38	8.50
1225	7.15	7.55	8.01	8.29	8.44
1230	7.17	7.57	8.06	8.34	8.42
1235	7.19	7.56	8.01	8.25	8.34
1240	7.56	8.06	8.55	8.82	8.88
1245	7.44	7.76	8.19	8.40	8.48
1250	7.10	7.48	7.91	8.11	8.20
1255	6.90	7.35	7.66	7.93	8.06
1300	7.40	7.70	8.12	8.40	8.51
1305	7.58	7.94	8.38	8.66	8.81
1310	7.57	7.57	8.35	8.59	8.69
1315	7.75	8.12	8.62	8.83	8.96
1320	7.93	8.13	8.49	8.73	8.93
1325	7.72	8.08	8.54	8.94	9.01
1330	7.93	8.85	8.79	9.16	9.31
1335	7.77	8.14	8.55	8.85	8.85
1340	8.05	8.44	8.87	9.22	9.37
1345	8.36	8.79	9.24	9.53	9.74
1350	8.65	8.91	9.33	9.67	9.82
1355	8.34	8.73	9.16	9.50	9.81
1400	8.51	8.94	9.43	9.78	9.90
1405	8.38	8.82	9.31	9.65	9.76
RUN MEAN	6.36	6.62	6.99	7.22	7.32

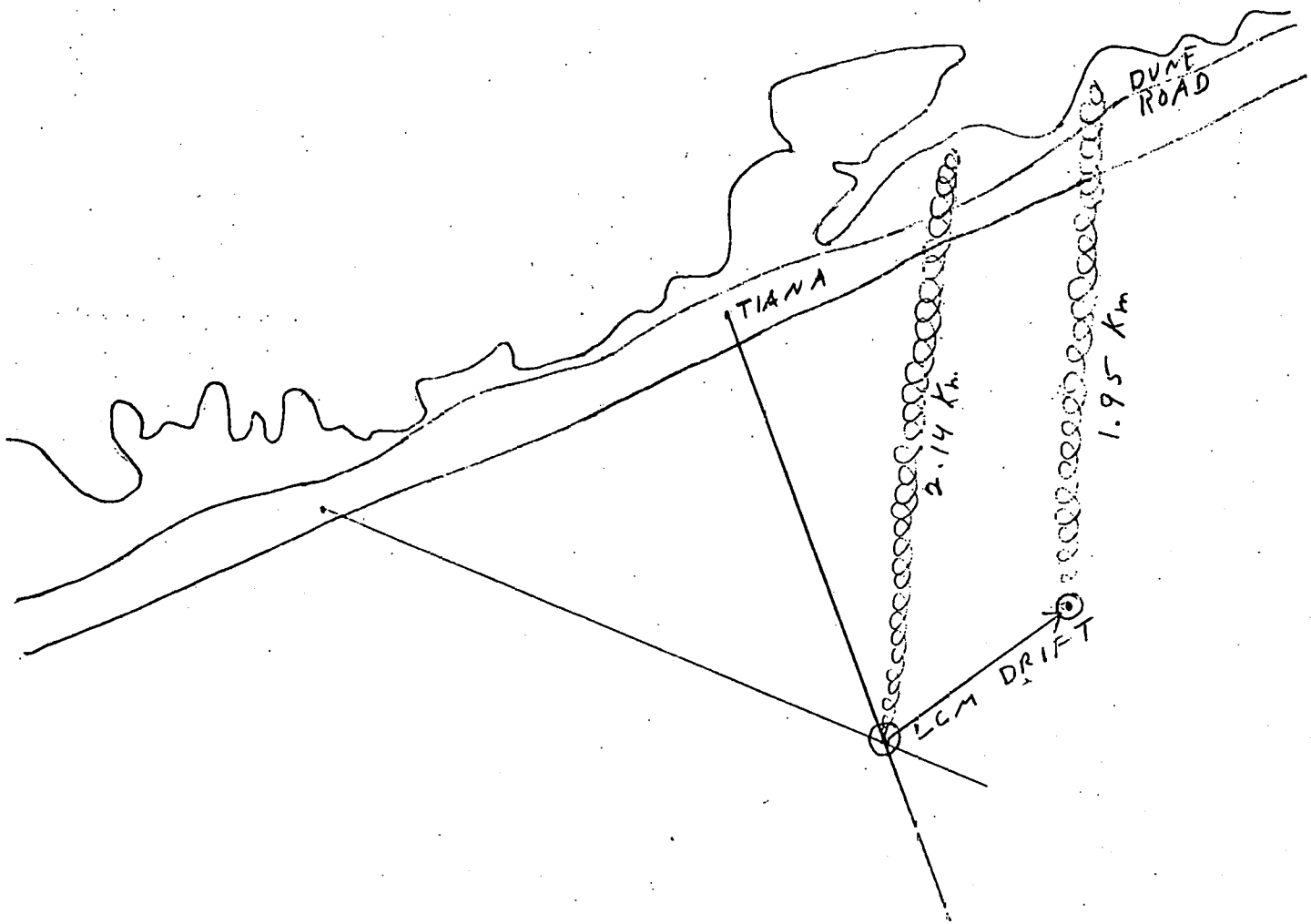
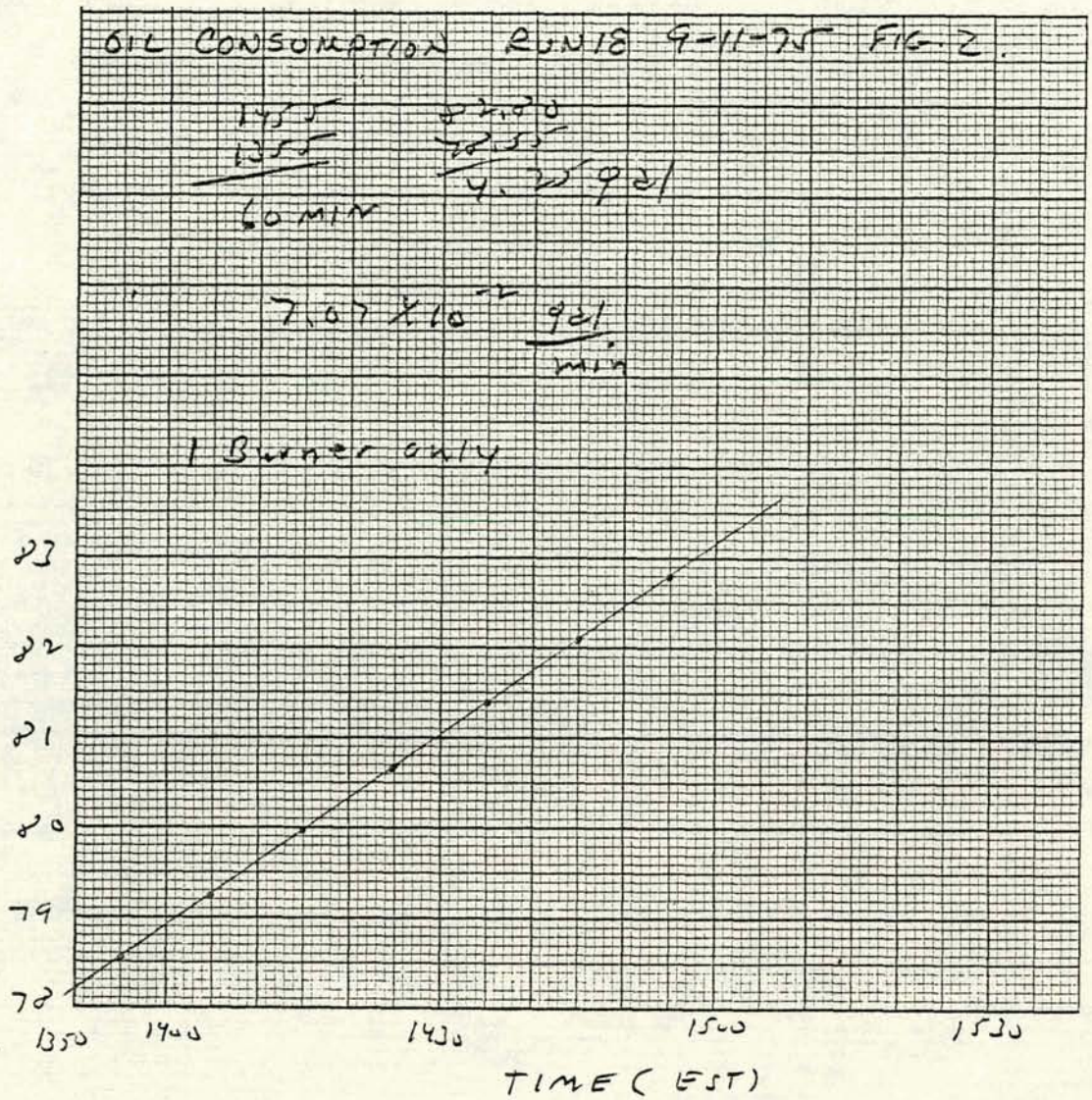
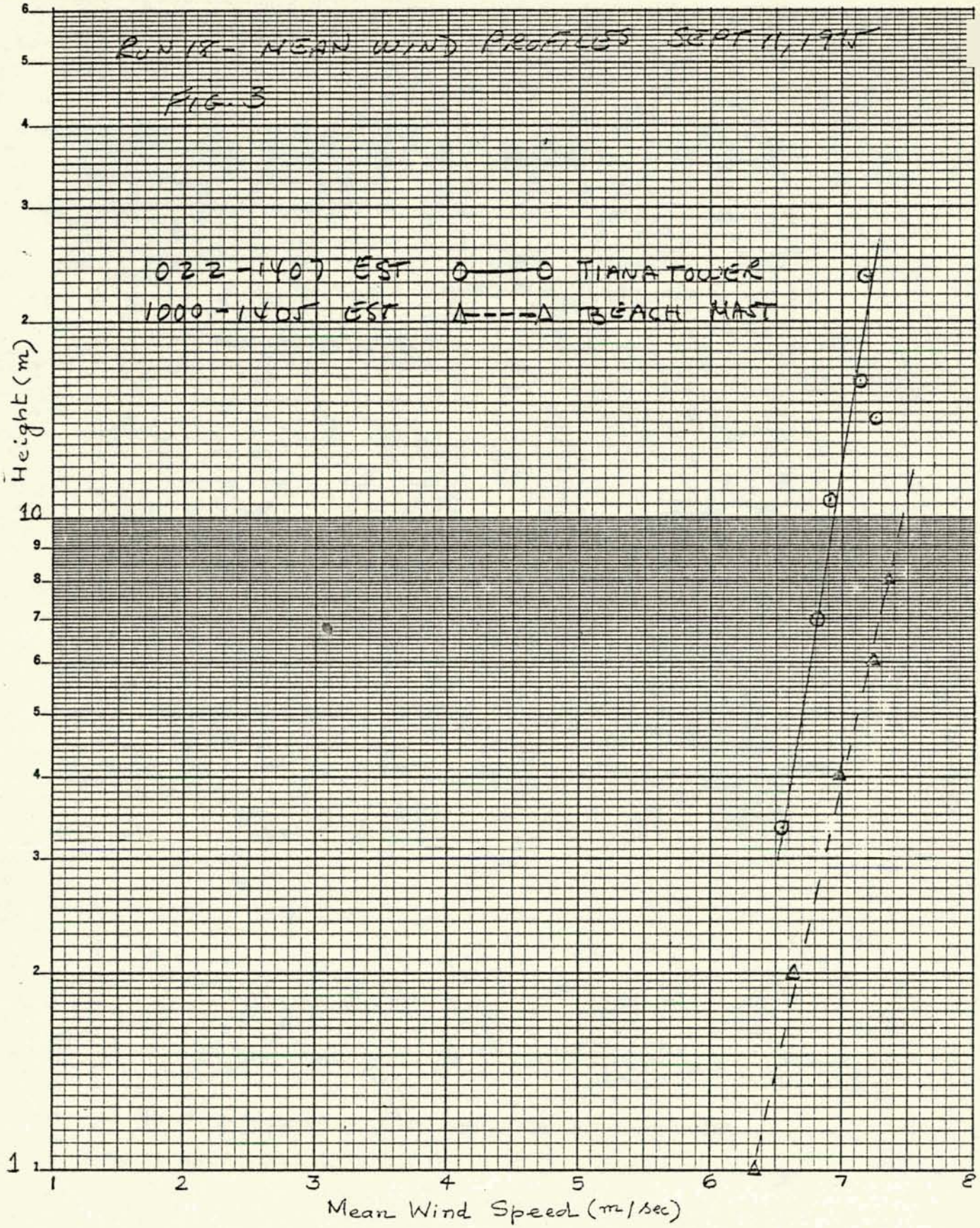
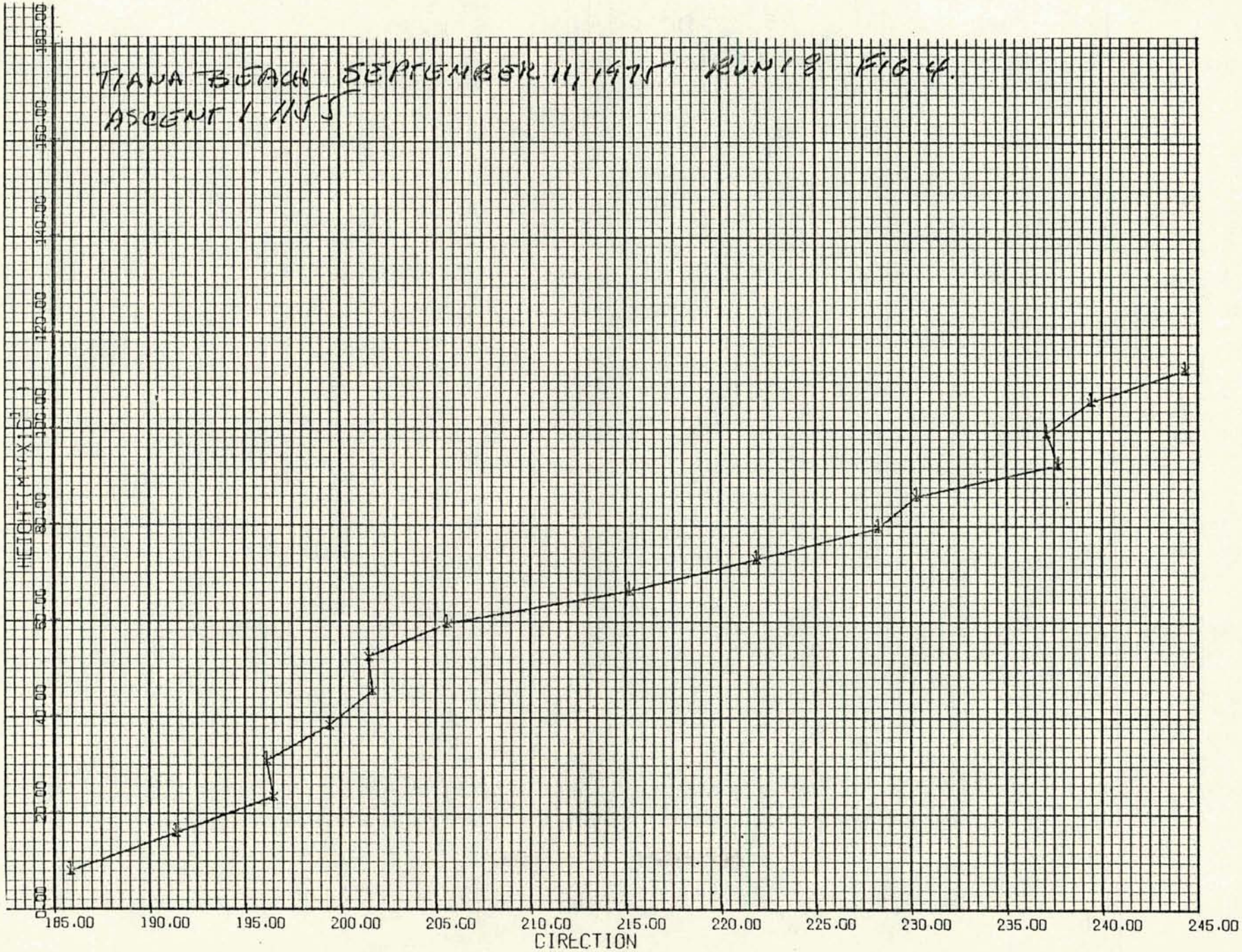
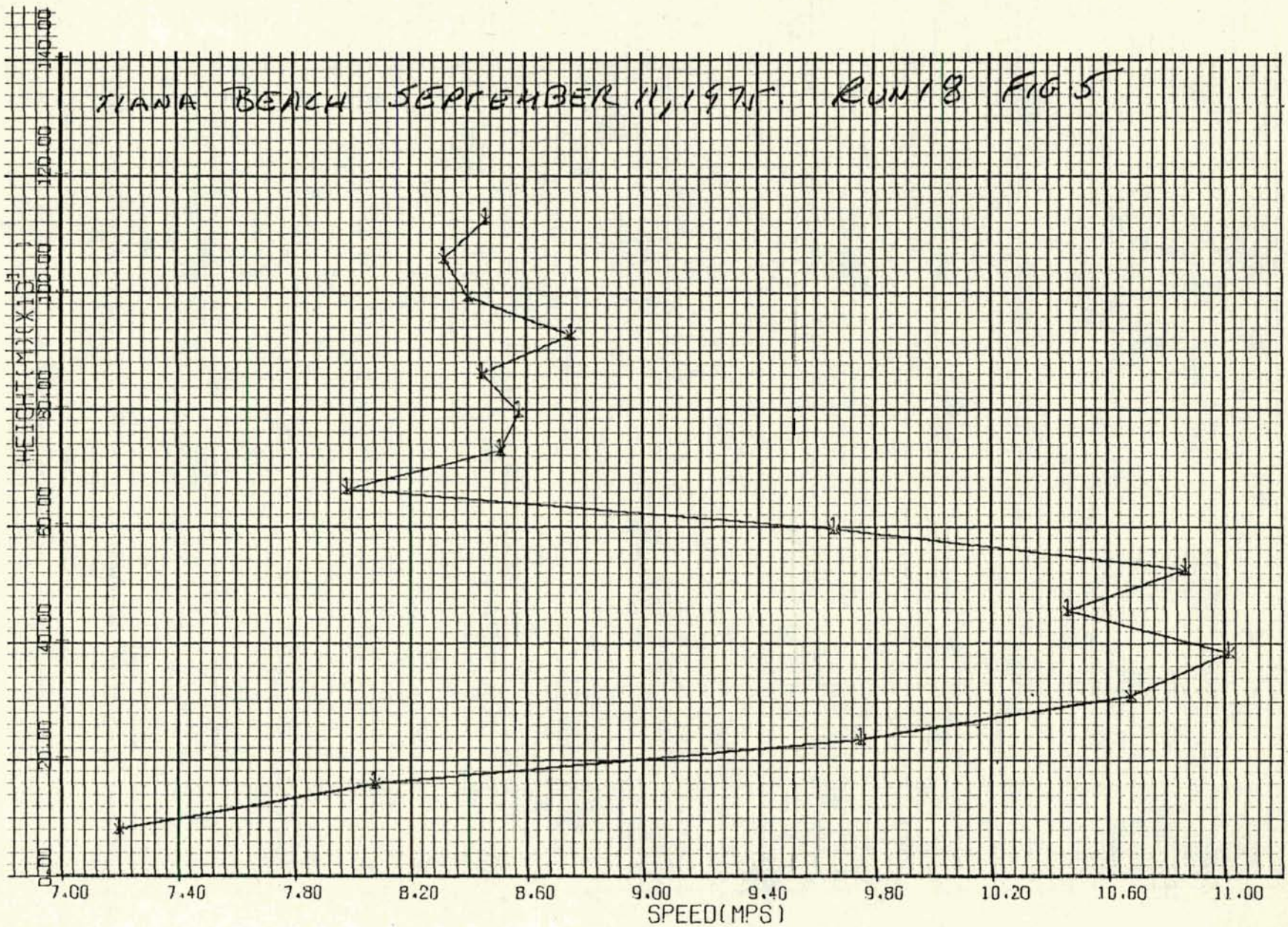


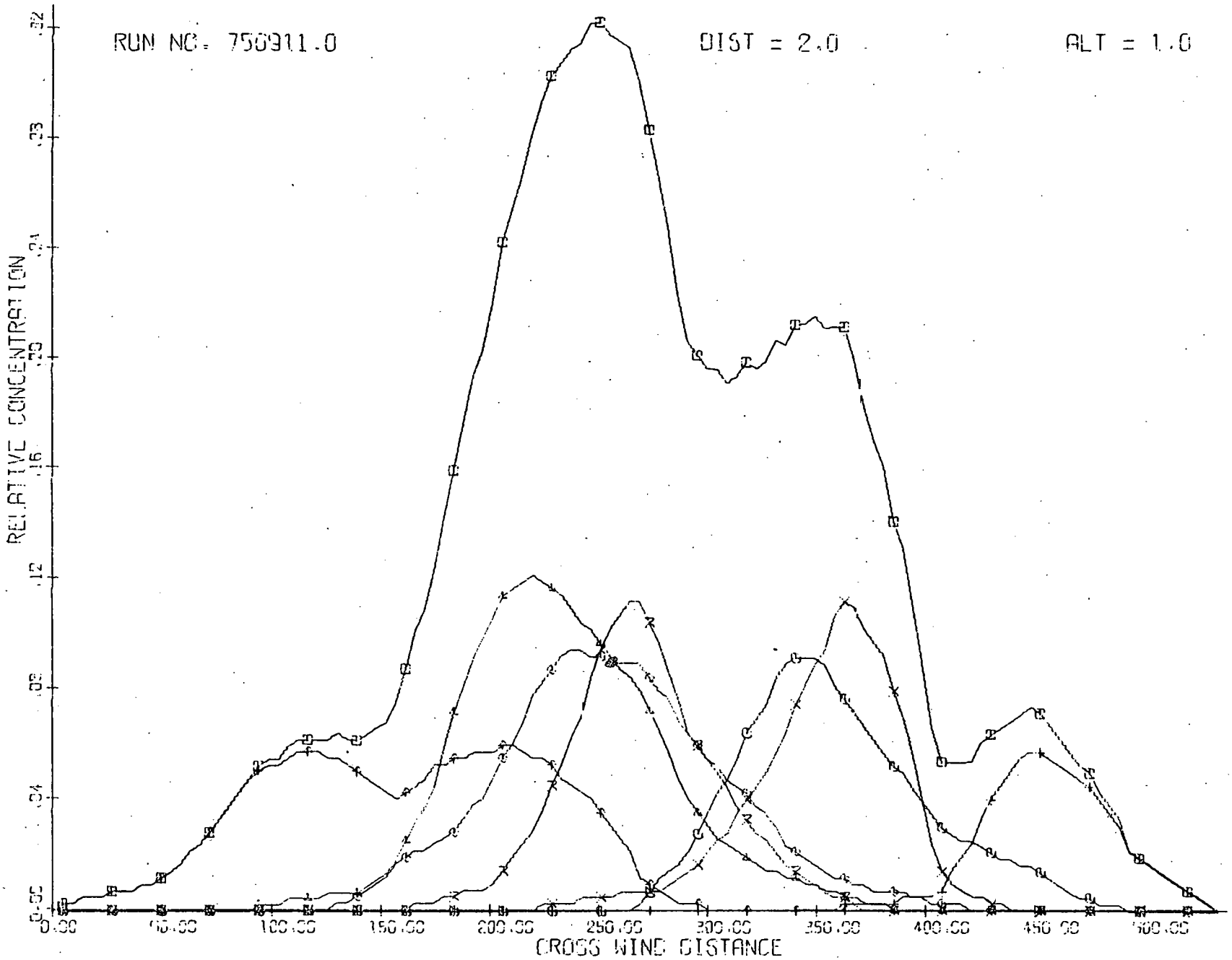
Figure 1
Run 18
9-11-75


OIL CONSUMPTION RUN 18 9-11-75 FIG. 2.
60 MIN
7.07 X 10^-2 gal/min
1 Burner only
83
82
81
80
79
78
1350
1400
1450
1500
1550
TIME (EST)


RUN 18 - MEAN WIND PROFILES SEPT. 11, 1975
FIG. 3
1022-1407 EST O——O TIANA TOWER
1000-1405 EST Δ----Δ BEACH MAST
Height (m)
Mean Wind Speed (m/sec)


TIANA BEACH SEPTEMBER 11, 1975 RUN 18 FIG 4.
ASCENT 1 MTS
HEIGHT(MMXID)
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
185.00
190.00
195.00
200.00
205.00
210.00
215.00
220.00
225.00
230.00
235.00
240.00
245.00
DIRECTION


TIANA BEACH SEPTEMBER 11, 1971. RUN 18 FIG 5
HEIGHT(MCXIC)
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
7.00
7.40
7.80
8.20
8.60
9.00
9.40
9.80
10.20
10.60
11.00
SPEED(MPS)


RUN NO. 750911.0
DIST = 2.0
ALT = 1.0
RELATIVE CONCENTRATION
CROSS WIND DISTANCE
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
450.00
500.00
0.00
.04
.08
.12
.16
.20
.24
.28
.32

ON SHORE DENSITOMETER RUN FROM VAN
TRAVERSES AT ONE DISTANCE

RUN =750911./ DATE = 91175 /DISTANCE FROM STACK (KM)= 2.00
DIRECTION(DEG) = 190./TIME FROM 1422 TO 1459 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGND)
1.0	.872E+01	359.0	42.0			4.83
2.0	.129E+02	233.1	45.4			6.62
3.0	.400E+01	456.5	28.8			3.23
4.0	.784E+01	353.5	33.8			5.40
5.0	.114E+02	257.6	50.5			5.27
6.0	.102E+02	160.8	60.0			3.92
7.0	.832E+01	269.6	33.8			5.72
GRAND TOTAL	.635E+02	276.9	45.4	91.5	79.5	
Corrected for plume angle			39.5	79.5	69.2	

Run No. 19
September 18, 1975

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: Dec. 8, 1975

TO: Files

FROM: G. S. Raynor

SUBJECT: Run No. 19

Smoke run no. 19 was held on September 18, 1975 in conjunction with a balloon test by personnel from Argonne National Laboratory.

Clouds changed from broken altocumulus, cumulus and stratocumulus at 1115 to overcast cumulus, stratocumulus and cirrostratus at 1320. A large high was centered over Maine and extended into this region. A weak front extended from a low in Ohio to the south and east passing the coast near Cape Hatteras. Light haze was present, visibility was 5 to 6 miles. Waves were moderate but increasing during the run. High tides occurred at 0521 and 1737 and low tide at 1113. Thus, the tide was rising during the run. Eastern standard time is used throughout this report.

Personnel left BNL at 0830 and reached Tiana at 0920. The LCM left the Inlet about 1120. The delay was caused by waiting for Argonne personnel who were wiring their trailer at Tiana. The LCM was manned by Jahnig and Carlson, COBOLT by Brown, Fink and Mikutowicz, Tiana by Raynor, McNeil and SethuRaman and the aircraft by Tuthill and Cederwall.

At Tiana, cup anemometers were mounted at heights of 3.4, 7.0, 10.7, 14.3, 18.0 and 23.5 m on the tower. The aerovane, MRI bivane and Thermosystems RH probe were mounted at 23.5 m. The bivane and RH probe were recorded on the PI tape recorder. Temperatures from sensors at 3.4, 10.7, 18.0 and 23.5 m were recorded on the Lockheed tape recorder. The beach mast was located 2 m above and 25 m from the water just north of a 1-m high step in the beach. Anemometers were mounted at 1, 2, 4, 6, 8 and 10 m. Anemometer counters were operated from 1116 to 1402. The tape recorders ran for the same time period.

The aerovane wind direction was 65-70 degrees at the beginning of the run. It shifted to 90 degrees at 1230 and to 105 degrees at 1312 but soon shifted back to about 90 degrees. Speeds decreased from 9 - 10 mps to 8 mps during the run. Gustiness was type narrow B_1.

The LCM was stationed about 1 mile SE of Tiana (Figure 1). This distance was chosen to enable Argonne personnel to operate their balloon tracking system. Smoke was released from 1152-1400. The plume was moderately unstable with both horizontal and vertical diffusion and small vertical loops. It reached the water close to the source and was fairly smooth-edged but was usually broken into thick and thin segments.

Files
G. S. Raynor
Run No. 19 December 8, 1975

Densitometer traverses were taken at two distances, about 0.35 and 1.0 miles downwind from 1225-1300 and from 1315-1353. Positions of marker buoys were determined by triangulation from Ponquogue, Tiana and Triton Lane. Positions and tracks followed are shown in Figure 1. Results will be reported separately.

Anemometer counts are tabulated in Tables 1 and 2. Beach data are plotted in Figure 2. Tower data indicated instrumental problems and was not plotted. Temperature data from the tower will be reported later. Temperatures taken from the LCM are shown in Table 3.

Pibal ascents were made at 1247 and 1330. Directions veered with height (Figure 3). Speeds peaked at about 400 m and at the maximum height reached (Figure 4). Some data are missing from ascent 1. The curves marked by x are means of the two ascents.

Aircraft temperature spirals were made over the dumps from 500 to 2500 feet (152 - 762 m) at 1155 and over the LCM from 100 to 2500 ft (30 - 712 m) at 1205. Measurements are tabulated in Table 4 and plotted in Figure 5 with water and low-level air temperatures for comparison. The lapse rate below 100 m was strongly superadiabatic but near adiabatic to slightly stable above.

Variometer traverses were made at heights of 61, 152 and 305 m about 1/4 mile off shore parallel to the beach from Shinnecock to Moriches Inlet between 1227 and 1300, (Table 5). Turbulence was moderate and similar at all levels indicating good vertical mixing.

Infrared temperature measurements were taken from 500 feet along a similar track from Smith's Point to opposite the east end of Shinnecock Bay, then out to the sea buoy and the MIT buoy, over the Inlet and across Shinnecock Bay. Unfortunately, the temperature selected as the baseline on the chart was not recorded or remembered so some doubt exists concerning interpretation of the record. Setting the value measured near Tiana to the average temperature of 18.0^{o} measured from the LCM gives a baseline of 17°C. This is used for presenting the data in Table 6. Temperature range over the ocean was rather small but somewhat warmer in the bay.

Oil consumption was quite uniform and is shown in Figure 6.

Photographs of the plume were taken from the aircraft about 1208. Several were taken periodically from the beach and some from COBOLT both before and after the densitometer traverses.

The run was terminated at 1405. Personnel from Tiana and COBOLT reached BNL about 1540 but the LCM remained on station longer to enable Barvenik to complete his measurements.

In summary, air cooler than the water caused a very unstable lapse rate near the surface and a moderately unstable plume.

GSR/lk
attach.

Table 1

Five Minute Mean Wind Speeds (M/Sec)
Date=18 Sep 1975 Run=19 Site=Tiana Towr Start=1116

	Height (M)				
EST	3.35	10.70	14.30	16.20	23.50
1116	7.95	10.63	9.25	9.46	9.41
1121	6.36	9.78	8.61	8.79	8.84
1126	7.38	10.55	8.80	8.99	9.03
1131	7.13	9.03	7.94	8.07	8.08
1136	7.19	8.97	8.19	8.40	8.42
1141	7.99	9.82	8.84	8.98	8.9
1146	7.91	10.74	8.68	8.89	8.89
1151	7.63	10.37	8.69	8.87	8.91
1156	7.38	9.71	8.28	8.44	8.47
1201	7.18	9.53	8.11	8.23	8.28
1206	7.29	9.57	8.08	8.27	8.33
1211	7.44	9.66	8.29	8.53	8.56
1216	7.60	10.13	8.55	8.72	8.70
1221	7.29	9.51	8.23	8.35	8.34
1226	7.52	9.44	8.21	8.31	8.29
1231	7.27	9.79	8.23	8.40	8.42
1236	7.25	2.16	7.85	8.02	8.02
1241	7.35	9.67	8.10	8.27	8.27
1246	7.16	9.12	7.85	8.02	8.03
1251	7.01	9.28	7.89	8.03	8.10
1256	6.80	9.66	7.70	7.85	7.85
1301	6.98	9.03	7.62	7.77	7.80
1306	7.06	9.05	7.66	7.80	7.78
1311	6.83	8.79	7.27	7.57	7.55
1316	7.04	9.40	7.71	7.88	7.85
1321	7.12	9.66	7.83	8.00	8.00
1326	6.97	8.78	7.51	7.72	7.75
1331	7.24	10.16	7.99	8.18	8.18
1336	7.28	9.89	7.94	8.14	8.12
1341	7.40	10.20	8.28	8.44	8.41
1346	7.54	10.18	8.36	8.53	8.55
1351	7.68	10.28	8.45	8.66	8.74
1356	7.49	10.27	8.07	8.21	8.17
Run Mean	7.29	9.48	8.15	8.33	8.34

Table 2

Five Minute Mean Wind Speeds (M/Sec)
Date=18 Sep 1975 Run=R19 Site=Beach Mast Start Time=1116

	Height(M)					
EST	1.00	2.00	4.00	6.00	8.00	10.00
1116	6.92	7.84	8.30	8.97	8.74	8.34
1121	6.55	7.55	7.75	8.02	7.97	7.81
1126	6.78	7.78	7.93	8.40	8.28	8.05
1131	5.83	6.89	7.16	7.36	7.40	7.39
1136	5.90	6.91	7.15	7.36	7.45	7.49
1141	6.27	7.36	7.70	7.90	8.12	7.94
1146	6.21	7.17	7.42	7.59	7.77	7.69
1151	5.95	7.01	7.39	7.59	7.78	7.69
1156	5.99	7.02	7.30	7.49	7.62	7.55
1201	6.56	6.83	7.10	7.27	7.32	7.36
1206	5.92	7.00	7.51	7.44	7.49	7.45
1211	6.36	7.36	7.88	7.85	7.93	7.78
1216	6.14	7.16	7.54	7.66	7.76	7.66
1221	5.74	6.85	7.31	7.39	7.47	7.44
1226	5.92	6.85	7.21	7.39	7.56	7.46
1231	5.95	6.89	7.34	7.48	7.68	7.51
1236	5.93	6.95	7.40	7.47	7.63	7.49
1241	5.93	6.87	7.15	7.30	7.34	7.27
1246	5.71	6.72	6.99	7.19	7.29	7.17
1251	5.68	6.61	6.81	6.99	7.02	7.02
1256	5.57	6.55	6.82	7.01	7.18	7.09
1301	5.57	6.47	6.75	6.87	7.15	6.72
1306	5.55	6.46	6.89	6.85	7.08	6.95
1311	5.74	6.51	6.82	6.74	6.85	6.75
1316	5.61	6.42	6.91	6.66	6.79	6.63
1321	5.87	6.76	7.25	7.02	7.22	5.69
1326	6.01	6.87	7.36	7.17	7.32	7.17
1331	6.02	6.90	7.44	7.27	7.40	7.30
1336	5.93	6.87	7.53	7.34	7.49	7.06
1341	5.94	6.90	7.58	7.49	7.73	7.46
1346	6.19	7.11	7.51	7.34	7.55	6.95
1351	6.18	7.16	7.77	7.72	7.91	7.73
1356	6.32	7.34	7.96	7.66	7.78	7.66
Run Mean	6.02	6.97	7.36	7.43	7.55	7.36

Table 3

Water and low-level air temperatures (^{o}C) Run 19 9-18-75

Time (EST)	Water	Dry Bulb	Wet Bulb
1205	17.8		
1250		17.2	16.2
1310	18.1		
1325		16.8	15.6

Table 4

Temperatures Aloft Run 19 9-18-75

Ht. (m)	1155E Over Dumps	1205E Over Water
30	-	16.2
61	-	14.8
91	-	14.4
122	-	14.0
152	15.5	13.9
183	15.2	13.7
213	15.1	13.3
244	14.9	13.4
274	14.6	13.1
305	14.2	12.7
335	13.9	12.8
366	13.7	12.3
396	13.3	12.1*
427	13.1	11.9
457	12.8	11.4
488	12.7	11.1
518	12.7	11.2
549	12.6*	11.0
579	12.0	11.0
610	11.6	10.7
640	11.3	10.5
671	11.3	10.3
701	10.9	9.8
732	10.9	9.7
762	11.0	9.9

* Cloud base

Table 5

Variometer Passes Run 19 9-18-75

Pass No.	Heading	Ht. Ft.	Ht. m	Time Began	Time End	Len. of Record (min)	Turbulence
1	W	500	152	1227	1235	8.5*	moderate
2	E	1000	305	1236	1249	13.5	moderate
3	W	200	61	1250	1300	10.2	moderate

* First 2.3 minutes of pass 1 on chart but not on magnetic tape.

Table 6

Infrared thermometer readings Run 19 9-18-75

(Degrees C above baseline assumed to be 17.0)

Location	Temperature Range
Smith's Point to Pattersquash	18.2-18.3
Pattersquash to Great Gun Beach	18.1-18.8
Great Gun Beach to Moriches Inlet	18.2-18.5
Moriches Inlet to Cupsoque Beach	18.0-18.3
Cupsoque to West Groin	17.9-18.1
West Groin to W. Bridge	17.8-18.1
West Bridge to E. Bridge	17.8-18.1
E. Bridge to Quogue Bridge	17.8-18.0
Quogue Bridge to Round Dune	17.9-18.0
Round Dune to Tiana	17.9-18.0
Tiana to Shinnecock Inlet	17.8-18.5
Shinnecock to E. End Bay	17.9-18.4
E. End Bay to Sea Buoy and MIT Buoy	17.8-18.1
Shinnecock Inlet	18.2-18.6
Flats in Bay	18.5-18.7
Middle of Bay	18.5-18.9
N. Side Bay	18.8-19.0

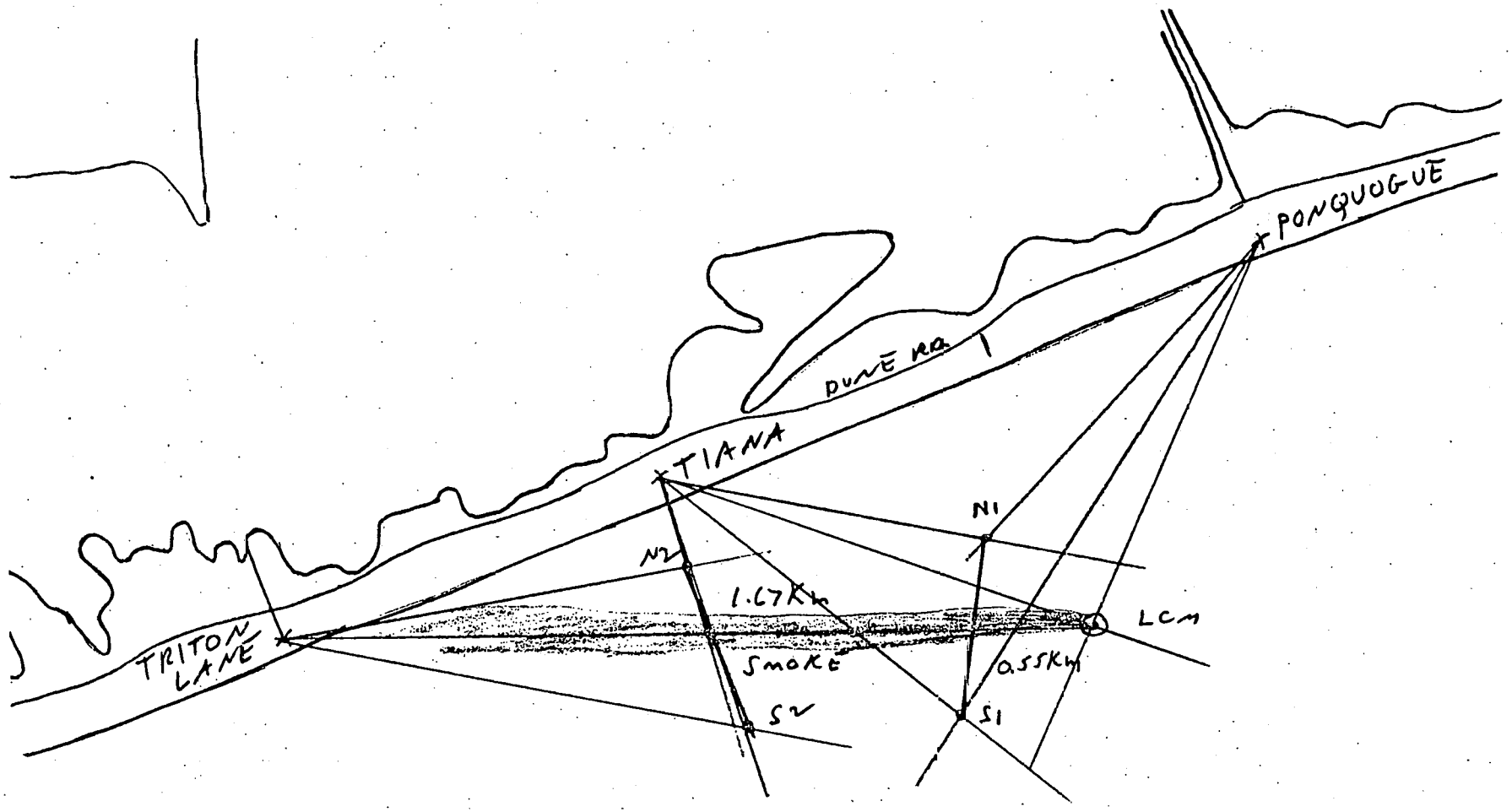


Figure 1
Run 19
9-18-75

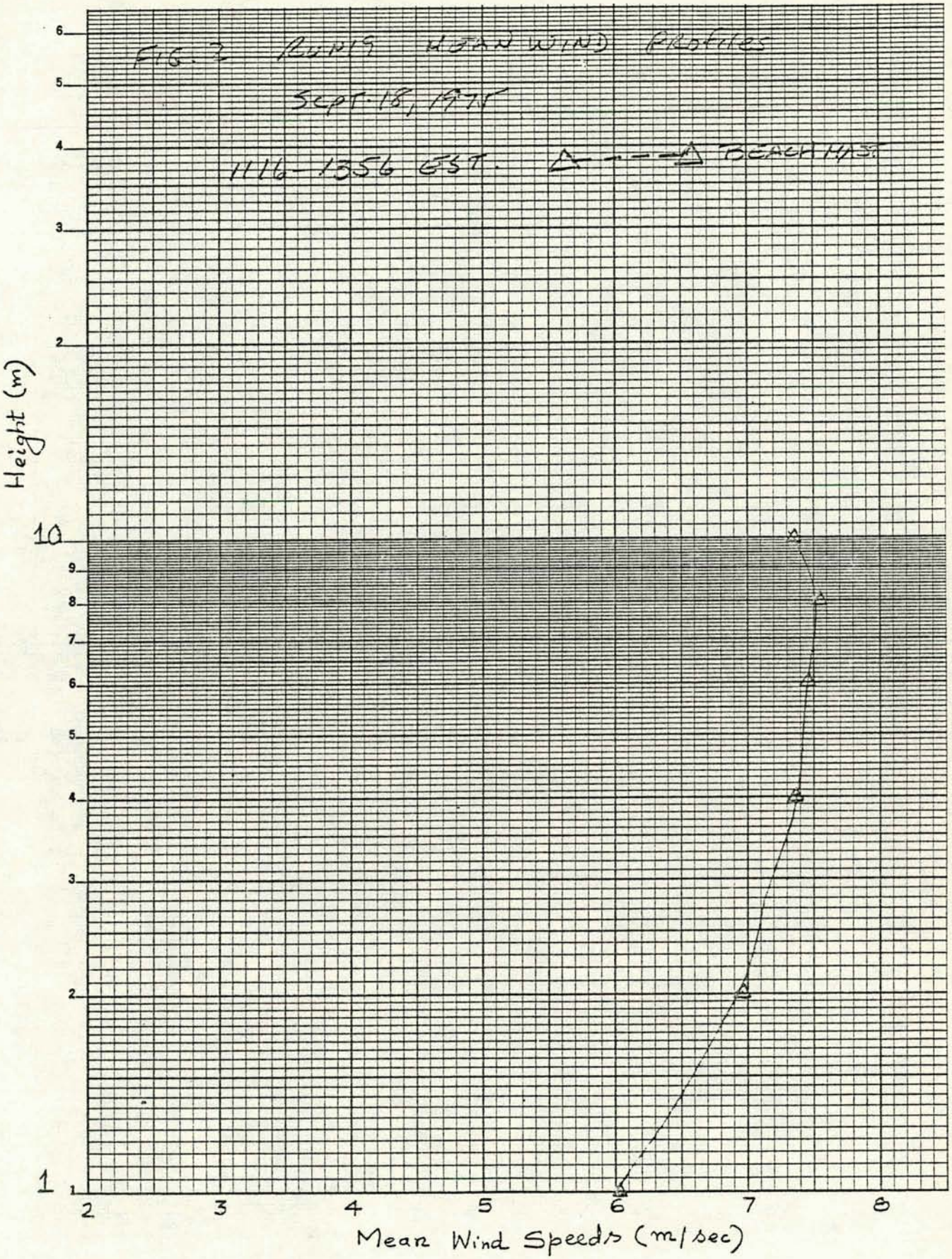
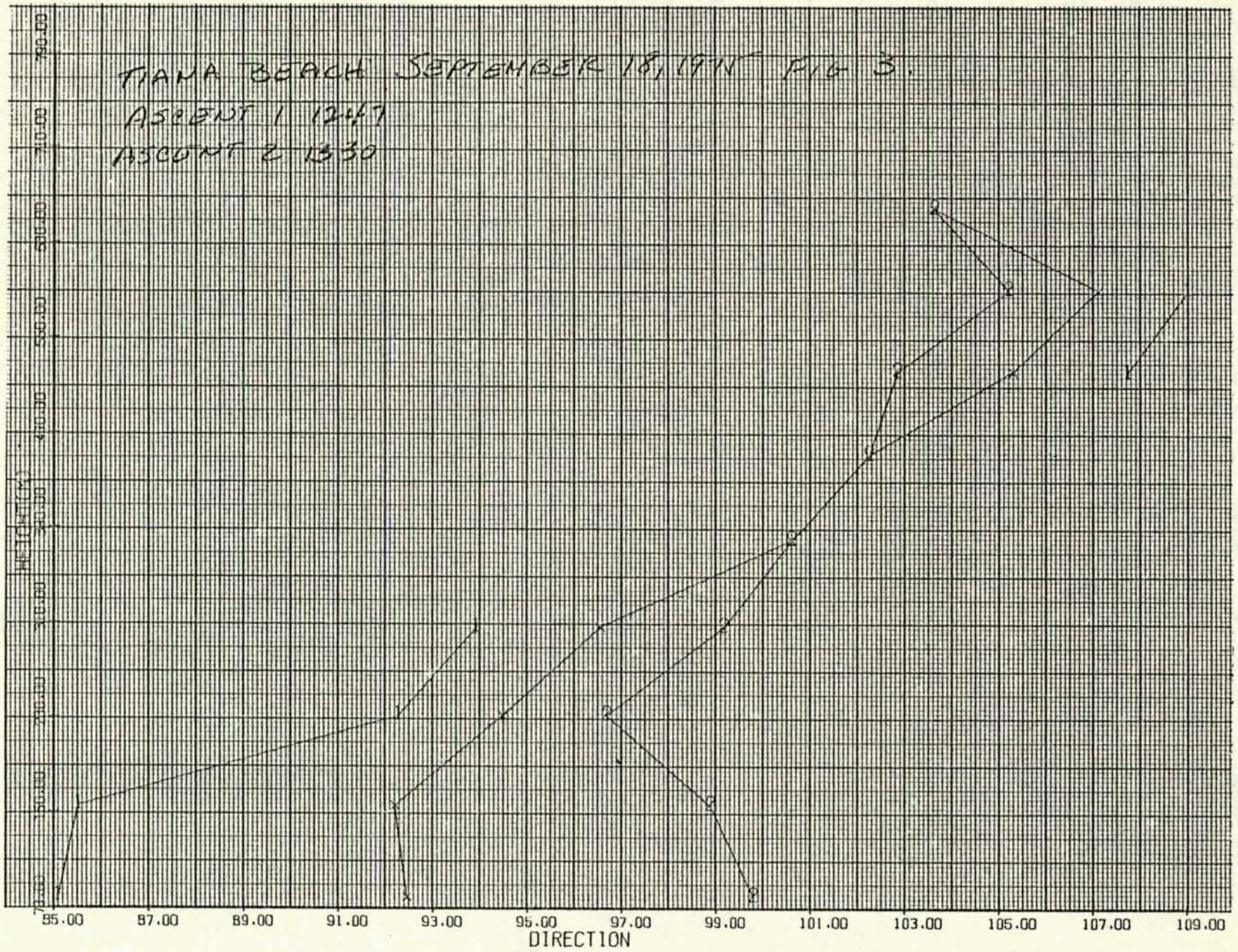
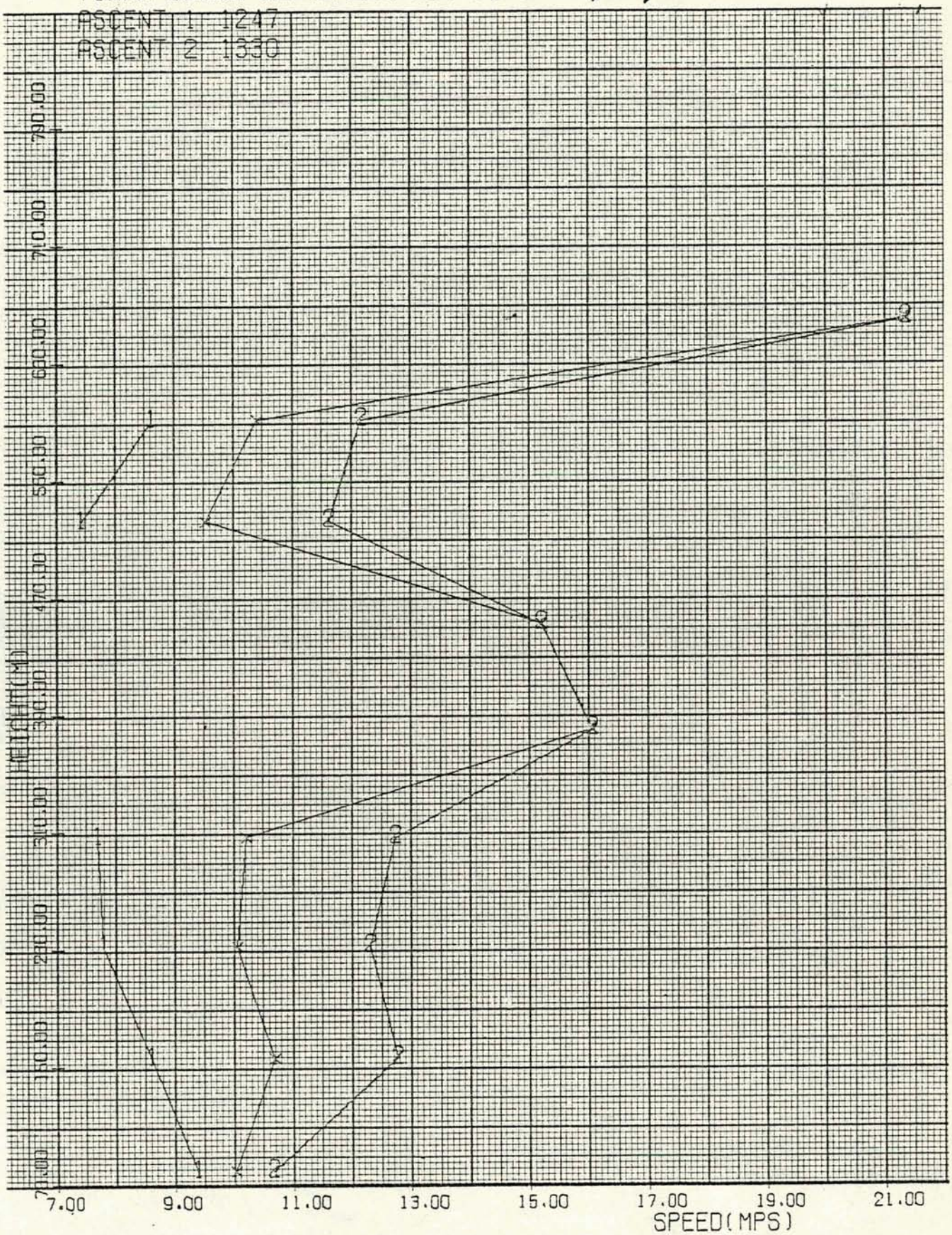


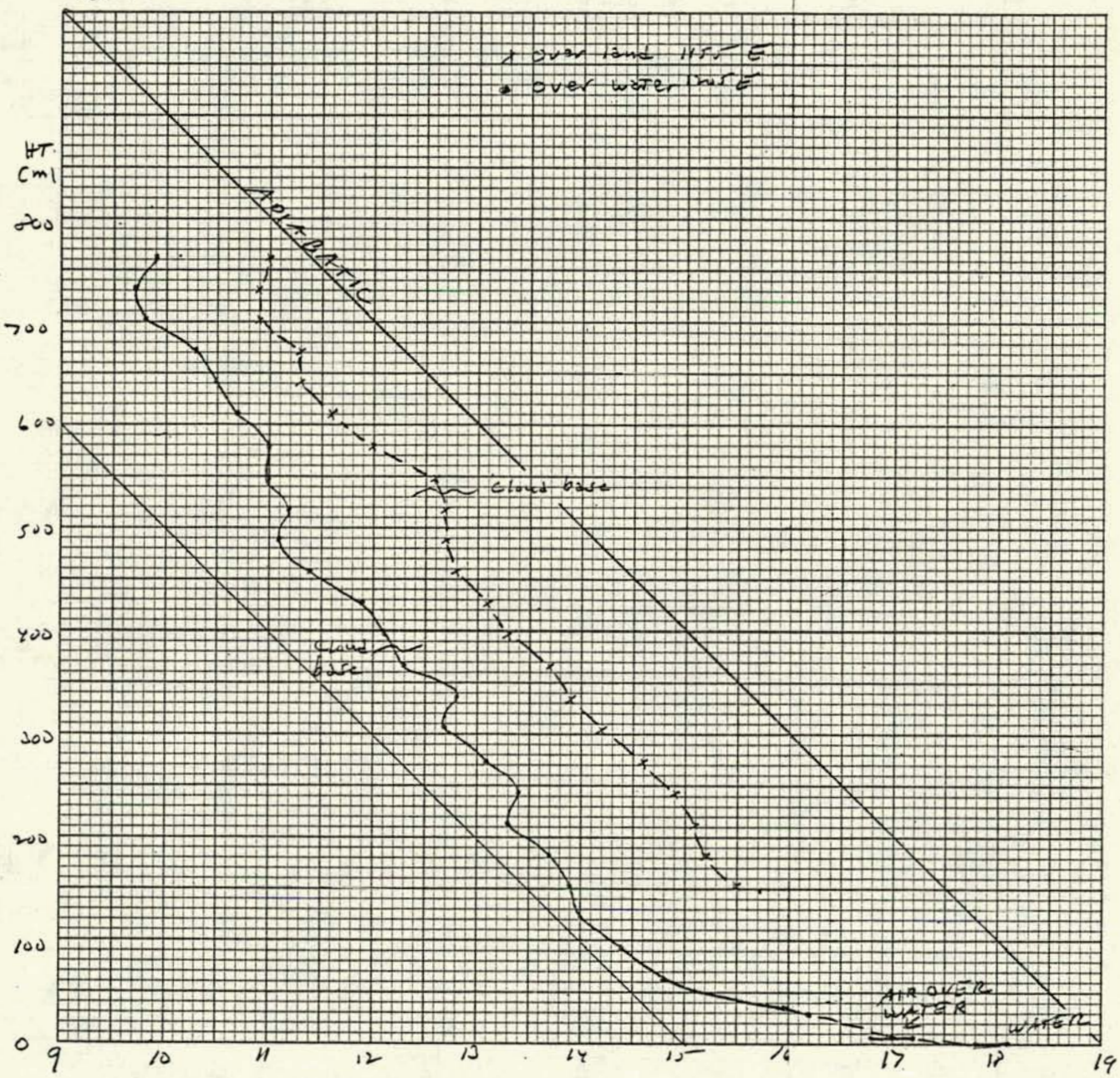
FIG. 2 RUN 19 MEAN WIND PROFILES
SEPT. 18, 1975
1116-1356 EST. △ - - - △ BEACH HAS.
Height (m)
Mean Wind Speeds (m/sec)
10
1
2
3
4
5
6
7
8
9


TIAMA BEACH SEPTEMBER 18, 1977 FIG 3.
ASCENT 1 1247
ASCENT 2 1330
HEIGHT (METERS)
DIRECTION
85.00
87.00
89.00
91.00
93.00
95.00
97.00
99.00
101.00
103.00
105.00
107.00
109.00

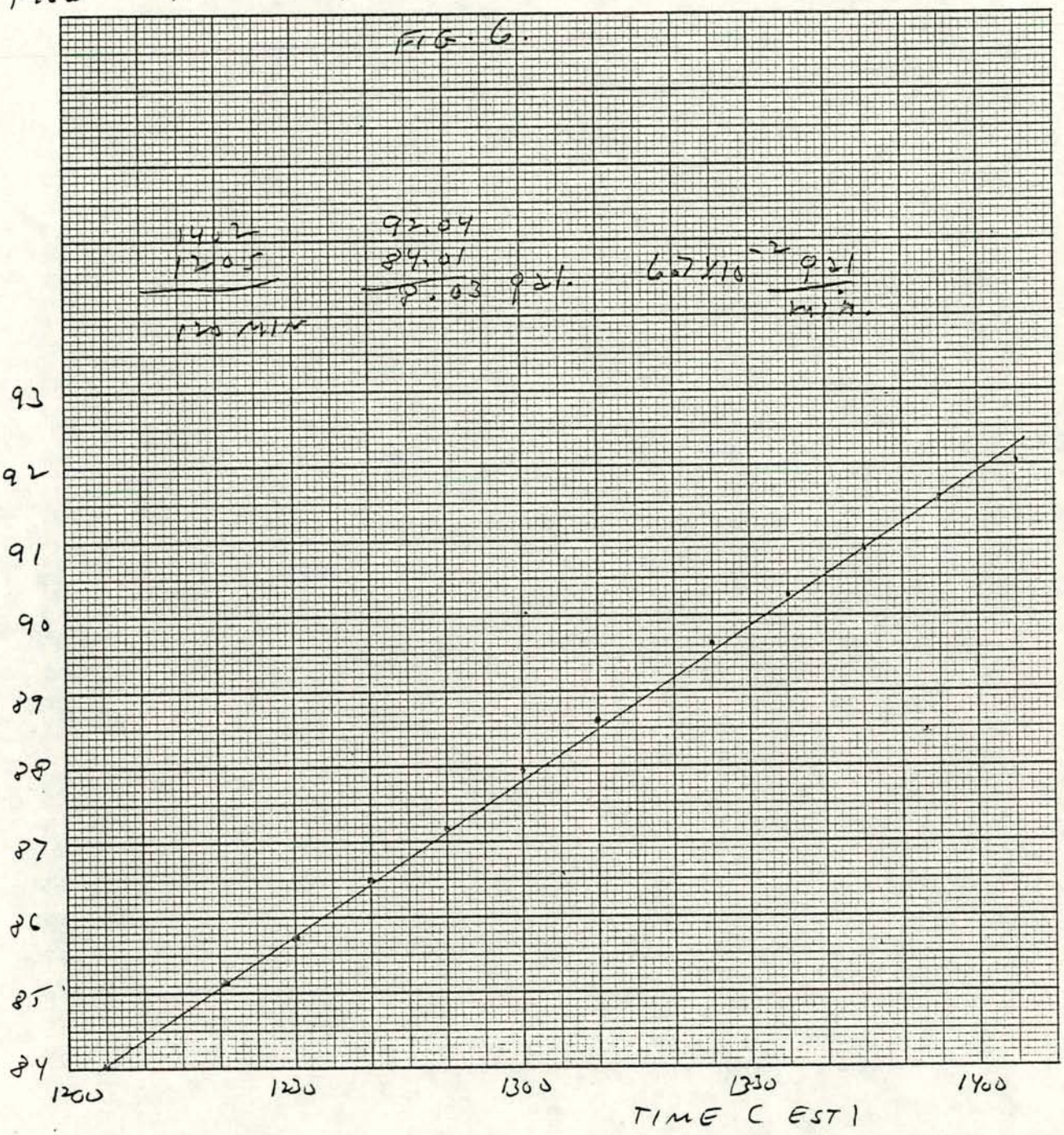
TIANA BEACH SEPTEMBER 18, 1975 Figure 4



TEMPERATURE PROFILES Run 19 9-10-75 Figure 5



Flow Oil Consumption Run 19 9-18-75



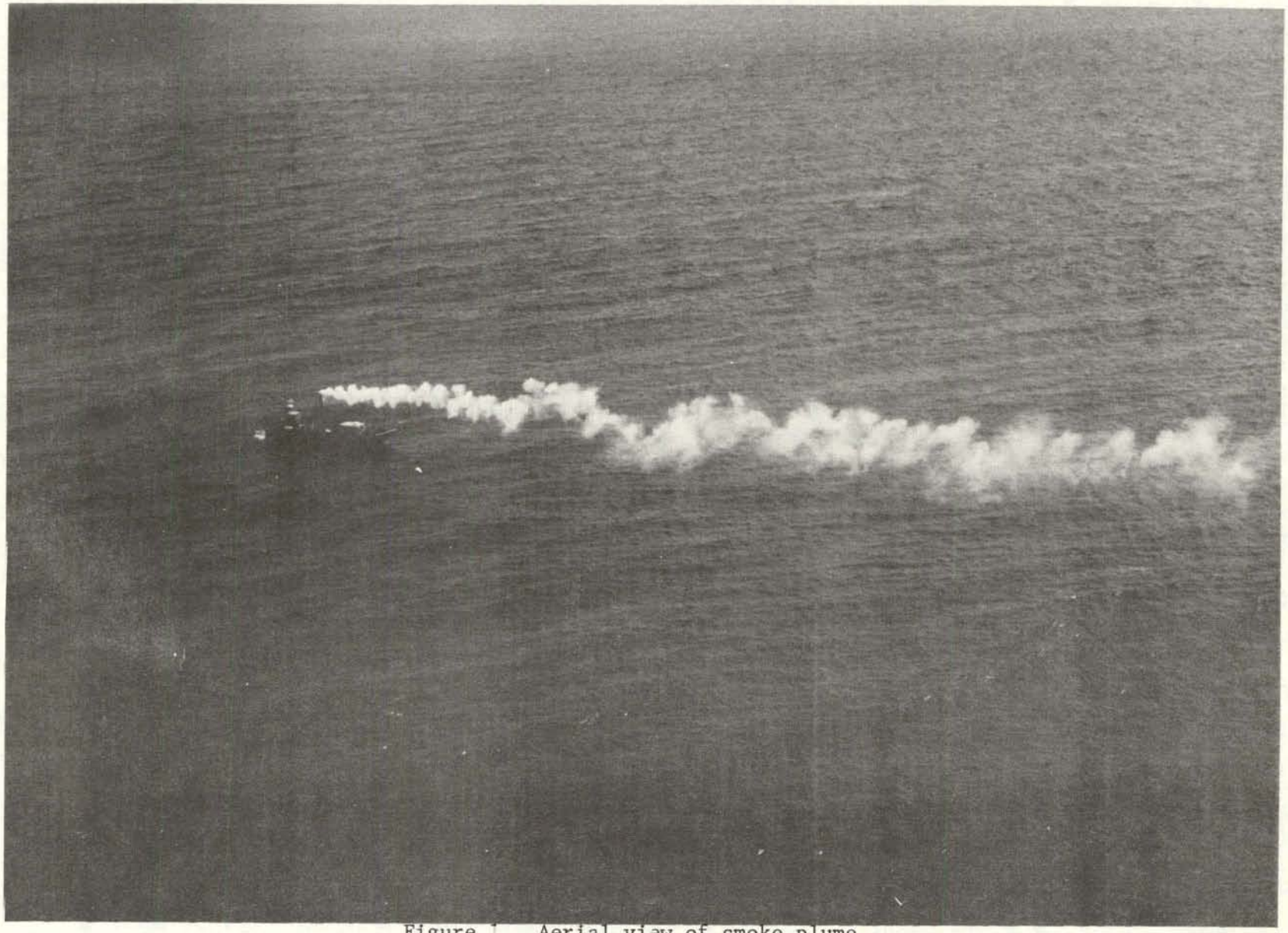
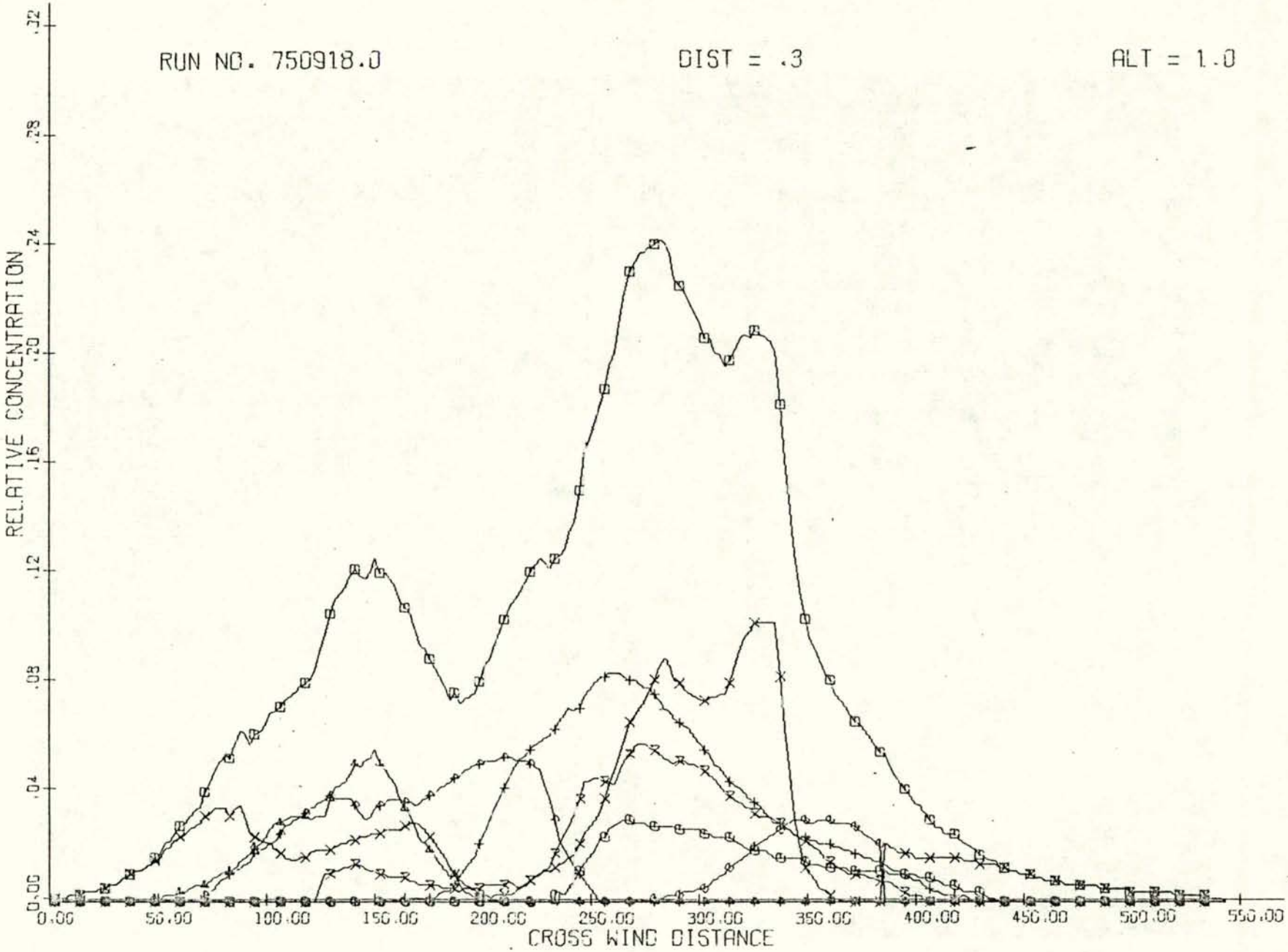


Figure 1. Aerial view of smoke plume,
Run 19, 9-18-75.

Figure 2. Aerial view of smoke plume,
Run 19, 9-18-75.


RUN NO. 750918.0
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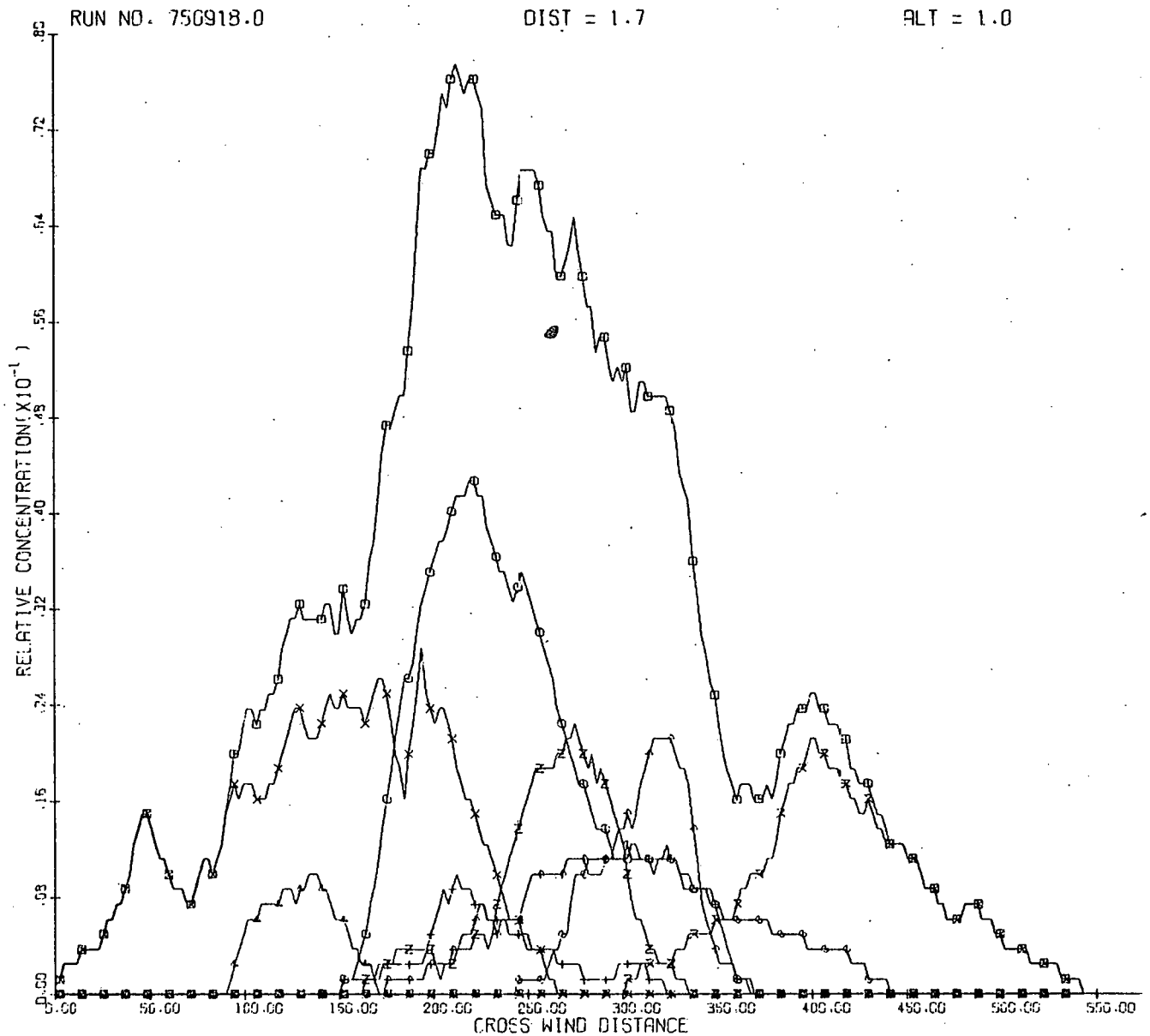
ALT = 1.0
RELATIVE CONCENTRATION
.00
.04
.08
.12
.16
.20
.24
.28
.32
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
450.00
500.00
550.00
CROSS WIND DISTANCE


RUN NO. 750918.0
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.08
.16
.24
.32
.40
.48
.56
.64
.72
.80
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
450.00
500.00
550.00
CROSS WIND DISTANCE

ON SHORE DENSITOMETER RUN FROM BOAT
TRAVERSES AT ONE DISTANCE

RUN =750918./ DATE = 91875 /DISTANCE FROM STACK (KM)= .33
DIRECTION(DEG) = 90./TIME FROM 1229 TO 1300 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGND)
1.0	.324E+01	314.7	47.7			2.83
2.0	.350E+01	134.2	29.3			4.98
3.0	.956E+01	277.8	48.6			8.19
4.0	.127E+02	260.7	109.7			4.82
5.0	.192E+01	347.5	22.6			3.55
6.0	.588E+01	171.7	42.9			5.71
7.0	.622E+01	279.0	56.7			4.58
GRAND TOTAL	.430E+02	252.6	71.1	89.7	54.7	

ON SHORE DENSITOMETER RUN FROM BOAT
TRAVERSES AT ONE DISTANCE

RUN =750918./ DATE = 91875 /DISTANCE FROM STACK (KM)= 1.67
DIRECTION(DEG) = 105./TIME FROM 1310 TO 1348 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGND)
1.0	.429E+01	241.2	45.3			3.94
2.0	.493E+00	129.0	18.3			1.12
3.0	.615E+00	230.6	37.2			.69
4.0	.382E+01	144.1	58.2			2.74
5.0	.127E+01	330.2	43.7			1.21
6.0	.164E+01	289.8	40.4			1.70
7.0	.205E+01	416.9	47.5			1.80
8.0	.151E+01	262.8	32.9			1.91
GRAND TOTAL	.157E+02	250.9	46.6	98.7	87.0	

5

Run No. 20
February 10, 1976

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: March 26, 1976

TO: Files

FROM: G. S. Raynor

SUBJECT: Run 20.

Smoke run No. 20 was held on February 10, 1976. Clouds were scattered altocumulus to broken cirrus and altocumulus. Light haze was present. A large high was centered over Florida with a ridge up the Atlantic Coast. A deep low was located in eastern Canada and a smaller low in the midwest. NE-SW cold fronts connected the lows and extended to the SW. The gradient flow was from the SW.

Waves were 5-6 feet high one mile out but somewhat smaller closer to the beach. No noticeable swell was present. Low tide occurred at 0822 and high tide at 1416. Thus, the tide was rising during most of the run. Eastern standard time is used throughout this report.

Personnel left BNL at 0925. They reached the Coast Guard Station at 1000 and Tiana at 1030. The LCM left the Inlet at 1140.

At Tiana cup anemometers were mounted at heights of 3.4, 7.0, 10.7, 14.3, 18.0 and 23.5 m on the tower. The aerovane, the Weathermaster RH probe and the Thermosystems temperature sensor were mounted at 23.5 m. The bivane tail broke in the strong wind while taking it up the tower so the bivane was not used. The 10-m mast was frozen in a mound of frozen sand and snow drifted over it in the recent storm and could not be used.

Anemometer counters were started at 1130 and stopped at 1400. The RH and temperature probe and the aerovane speed were recorded on the PI tape recorder. Temperatures from the permanent sensors at 10.7, 18.0 and 23.5 m were recorded on the Lockheed tape recorder. The aerovane chart was put on fast speed for part of the run. At least one and possibly two anemometer counters appeared to be over-counting.

The aerovane wind direction was about 240° for much of the run, shifting later to about 230°. Speed averaged about 12 mps, decreasing to about 10 mps late in the run. Gustiness was narrow B_1.

Since the wind failed to switch to the expected southerly direction until after the run was terminated, no densitometer measurements could be taken. However, the LCM was stationed off Tiana so that pictures could be taken from the beach and from the air to document the behavior of the plume. Pictures were taken from the beach from 1245-1305 and from the air from 1315-1323. Difficulty was experienced with the smoke generator due to orifice icing, water in the oil and the viscosity of the oil due to the cold temperatures. Smoke output was very low.

Files
G. S. Raynor
Run 20.

March 26, 1976

The beach was manned by Raynor, Brown, SethuRaman and McNeil, the LCM by Jahnig, Fink and Carlson and the aircraft by Tuthill.

At 1230, air temperature from the LCM was 1.9°C and water temperature 1.5°C at one mile out.

The smoke plume was somewhat unstable with some small vertical looping but rather smooth edged with little meander.

Anemometer counts are tabulated in Table 1 and plotted in Figure 1. The wind direction was almost parallel to the beach during this run. Acceleration of wind at lower levels (Fig. 1) is due to the effect of the dune. Increase in wind speed at 24 m relative to the lower levels is probably due to the strong inversion over water.

A pibal ascent was made at 1335. Data are shown in Figures 2 and 3. Direction was between SW and WSW near the surface but WSW aloft. Speeds increased sharply to about 180 m and more gradually higher up.

Aircraft temperature spirals were made over the ocean at 1327 and inland at 1338 from 152 m to 762 m (500-2500 feet). Data are tabulated in Table 2 and plotted with low-level temperatures in Figure 4. The data suggest a very low-level inversion close to the water, a neutral lapse rate to about 400 m, a large inversion from 450 - 620 m and an adiabatic lapse rate above 650 m.

No variometer data were taken since the instrument mounting was not available.

Infrared surface temperatures were taken from 1000 feet at 145 mph along the following tracks: from 1300-1315, from the Airport to 1/2 mile off Mastic, then parallel to the shore to the east end of Shinnecock Bay, then to one mile out and west to opposite Triton Lane; from 1350-1415, from the ocean off Southampton, across the beach to the east end of Shinnecock Bay, then west over the bays to Bellport Bay, then north from Mastic to Wading River, over L. I. Sound and back to the Airport. The regular scale was used over land and an expanded scale having 2°C across the chart and set at 0°C on the left margin was used over the ocean. Results are given in Table 3 and plotted in Figures 5 and 6.

Oil consumption is shown in Figure 7.

The run was terminated at 1400. Personnel left Tiana at 1425 and the Coast Guard Station about 1500. They reached BNL about 1600.

In summary, air only slightly warmer than the water resulted in a slightly unstable plume.

GSR/lk
attach.

Table 1

FIVE MINUTE MEAN WIND SPEEDS (M/SEC)

DATE=10FEB1976 RUN=020 SITE=TIARA TUNE START TIME 13

HEIGHT(M)

EST	3.35	7.00	14.30	18.00	23.50
1130	7.74	9.42	10.04	10.19	11.64
1135	7.54	9.35	9.82	9.67	11.11
1140	7.55	9.61	10.11	10.28	11.52
1145	7.63	10.07	10.54	10.29	12.33
1150	7.16	9.42	9.92	10.12	11.61
1155	7.40	9.58	10.06	10.21	10.87
1200	7.30	9.20	9.50	9.74	11.19
1205	7.45	9.46	9.84	10.04	11.62
1210	7.99	10.35	10.94	11.01	12.44
1215	7.70	10.06	10.46	10.50	12.06
1220	7.27	9.31	9.74	9.56	11.71
1225	7.93	9.27	9.53	9.65	11.25
1230	7.95	9.69	10.27	10.44	11.84
1235	7.12	9.17	9.64	9.91	11.43
1240	6.94	8.71	9.03	9.13	10.63
1245	7.79	9.69	10.19	10.27	11.77
1250	7.39	9.23	9.47	9.80	11.34
1255	7.72	9.95	10.36	10.56	12.35
1300	7.23	9.23	9.53	9.73	11.31
1305	7.91	9.55	9.90	10.10	11.74
1310	7.79	9.50	9.91	10.07	11.69
1315	7.49	9.19	9.55	9.70	11.08
1320	8.34	9.42	10.23	10.39	11.97
1325	8.25	9.67	10.13	10.16	11.38
1330	8.09	9.39	9.77	9.93	11.49
1335	8.34	9.72	9.95	9.99	11.50
1340	8.03	9.07	9.21	9.29	10.75
1345	8.19	9.14	9.38	9.41	10.55
1350	7.70	9.14	9.39	9.45	11.07
1355	7.64	8.74	9.01	9.06	9.79
1400	7.26	8.52	8.72	8.90	10.48
1405	7.29	8.30	8.53	8.78	10.19
1410	7.29	8.72	9.03	9.12	10.48
1415	7.28	8.08	8.34	8.47	10.05
1420	7.32	8.36	8.54	8.79	10.43
RUN MEAN	7.62	9.31	9.68	9.80	11.29

Table 2

Temperatures Aloft - Run 20 2-10-76

Ht. (m)	1327E Over Ocean	1338E Over Dumps
152	+0.6	+1.4
183	+0.5	+1.1
213	-0.3	+1.0
244	-0.2	+0.5
274	-0.2	+0.3
305	-0.4	+0.4
335	-0.4	0.0
366	-0.4	-0.2
396	-0.1	-0.4
427	+0.1	-0.2
457	0.0	-0.7
488	-0.1	-0.4
518	+0.1	0.0
549	+0.3	+0.8
579	+1.2	+1.2
610	+4.3	+3.2
640	+4.2	+4.4
671	+4.0	+4.2
701	+3.7	+4.0
732	+3.5	+3.7
762	+3.2	+3.4

Table 3

IR Temperatures (^{o}C) - Run 20 2-10-76

Location	Temperature
Airport to shore of Bay	-0.1^{o} to 2.5^{o}, average 1.5^{o} except all roads warmer, to 8.2^{o}
Narrow Bay, water and ice	-2.3 to -1.5
Beach	0.5 to 5.5
Ocean off Mastic	0.5 to 0.7
Ocean 1/2 mile out, Smith's Point to west of Moriches Inlet	1.75
Just west of Moriches Inlet	1.65
Moriches Inlet to Ponquogue	1.75
Ponquogue to Shinnecock Inlet	1.6
Inlet to east end of bay	1.7 to 1.65
Ocean, 1 mile out, opposite east end	1.65 to 1.7
Opposite Inlet and Ponquogue	1.6
Opposite Tiana and Triton Lane	1.7
Beach near Southampton	3.0
East end of Shinnecock Bay	0.0 to 0.6
Islands and sand bars	1.6 to 6.0
Bay east of Ponquogue Bridge	0.5
Bay west of Bridge	0.0 to 0.5
Ice in bay	-2.0 to -2.2
Land at Quogue	1.0 to 4.5
Quantuck Bay ice	-1.8
Land at Westhampton	0.0 to 4.0
Moneybogue Bay ice	-2.0
Moriches Bay ice	-2.2 to -2.3
Moriches Bay water	0.2 to 1.0
C. G. Station to Moriches Inlet	0.8 to 3.1
Ice in W. end of Bay	-2.0 to -1.6
Water and Ice, Narrow Bay	-2.0 to -1.2
Pattersquash Island	1.7
Bellport Bay	-2.0 to -0.5
Land, Mastic to Sunrise Hwy.	-0.5 to 5.5, average 2.0
Sunrise Hwy to BNL	-0.5 to 4.5, average 2.0
BNL to Wading River	0.0 to 4.0, average 2.5
L.I. Sound	-1.0
Wading River to Airport, return	-0.5 to 5.0, average 2.5

Figure 1 Run 20 Feb 10, 1976

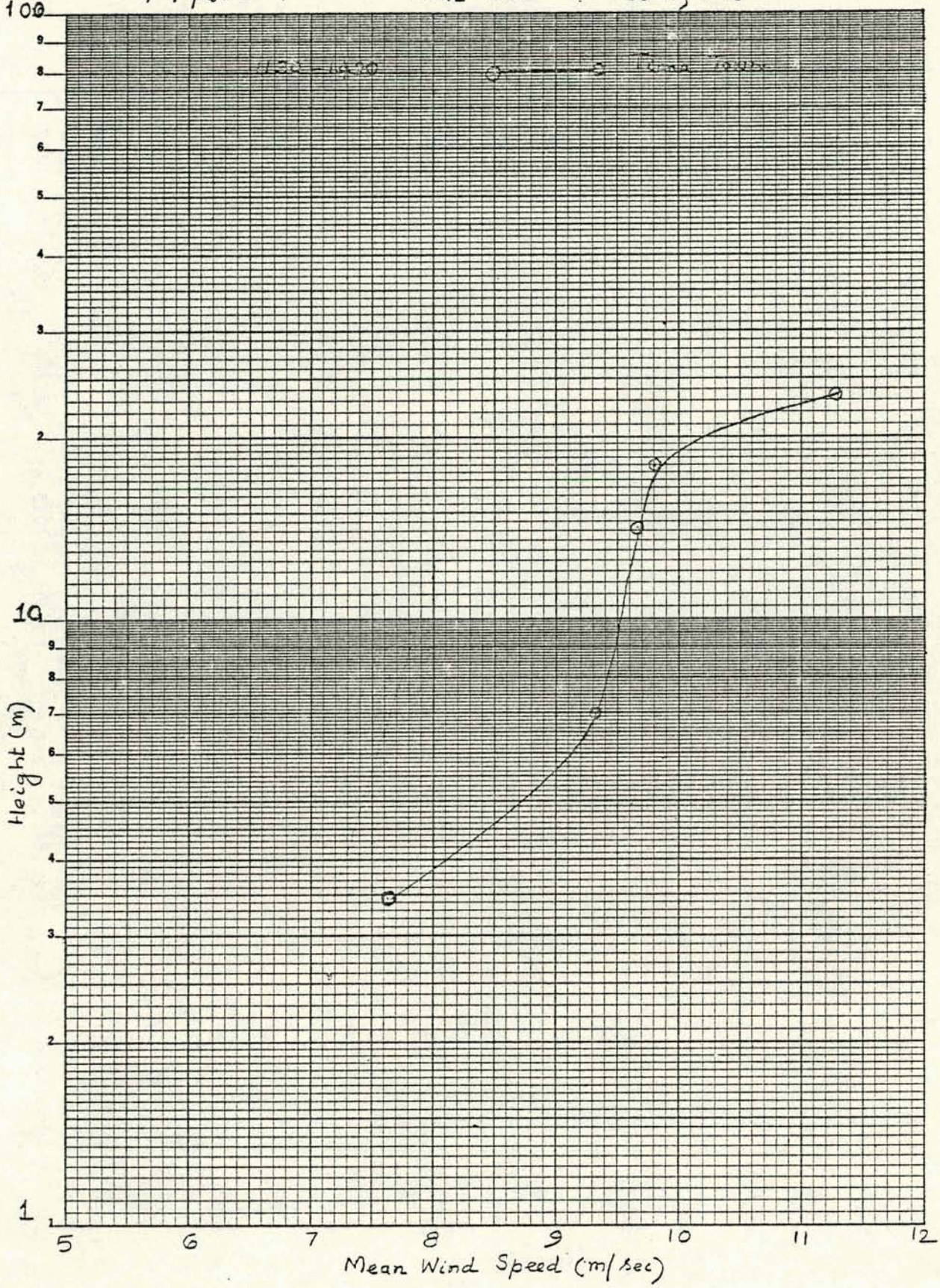


FIG. 2

TIANA BEACH

YEAR 50 MONTH 21 DAY 1 RELEASE TIME 3350 EST ASCENT NO.01 SITE 1 STATION HEIGHT 10.M

ORIGINAL NO OF PTS= 13

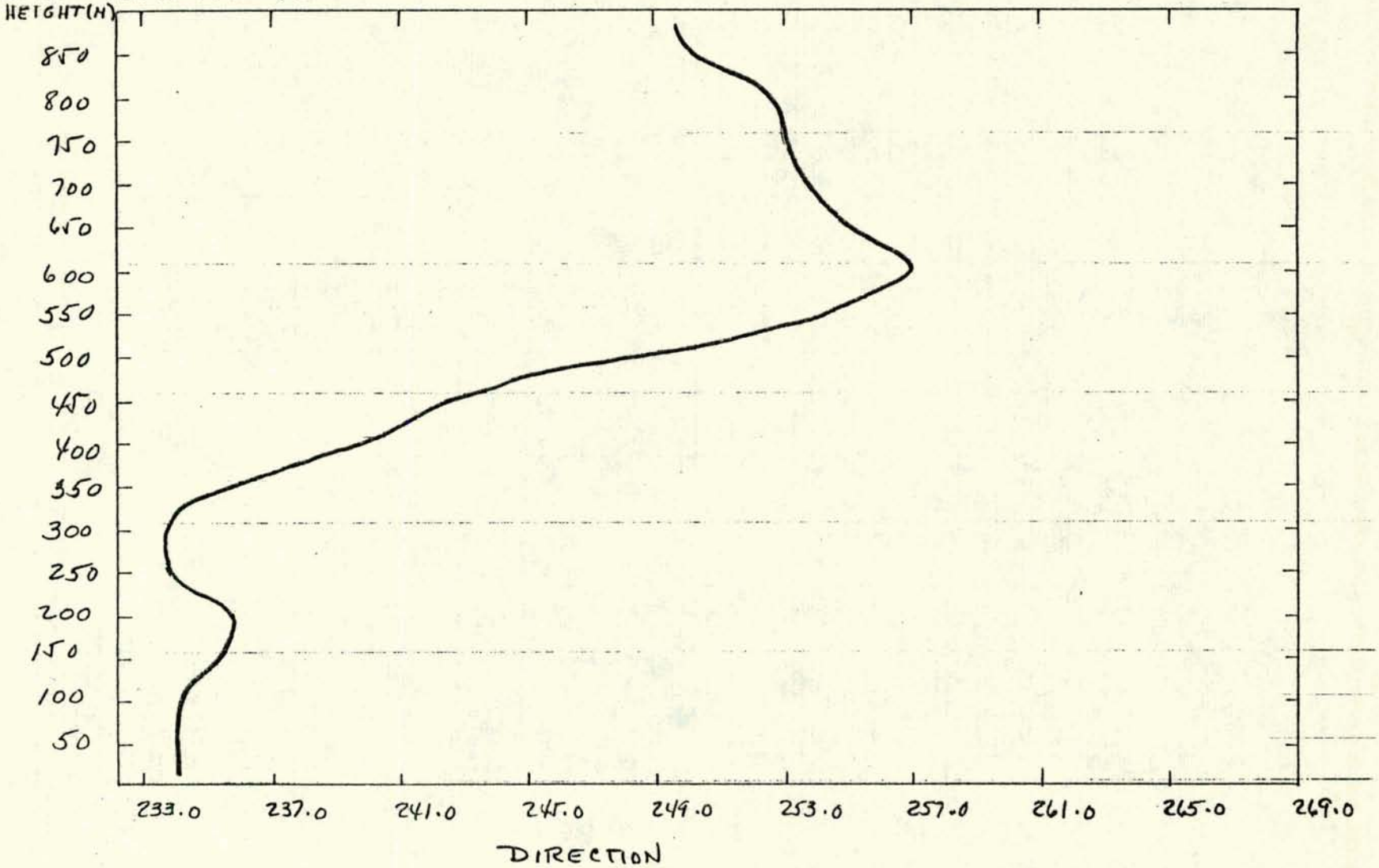
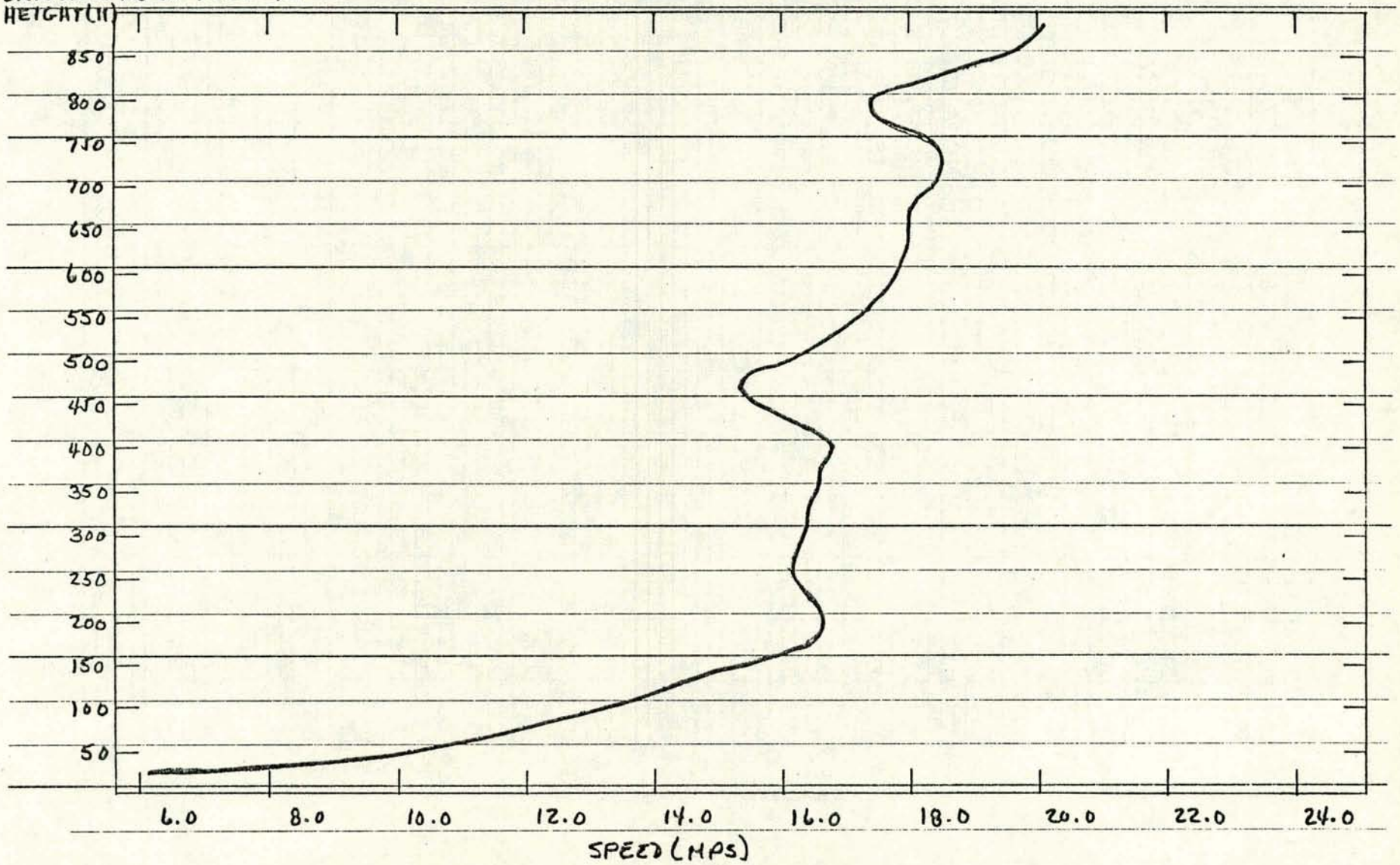


FIG. 3

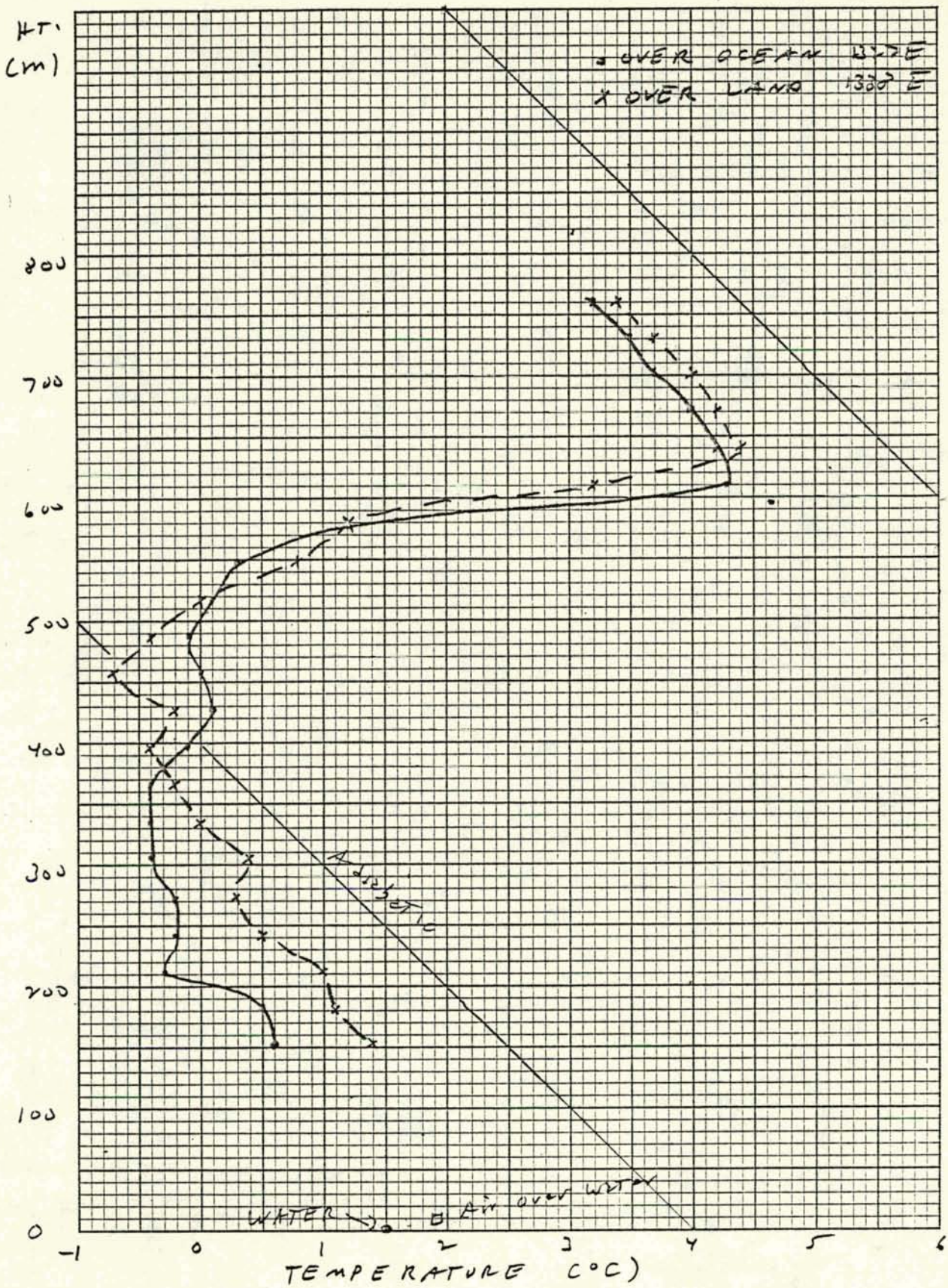
TIANA BEACH

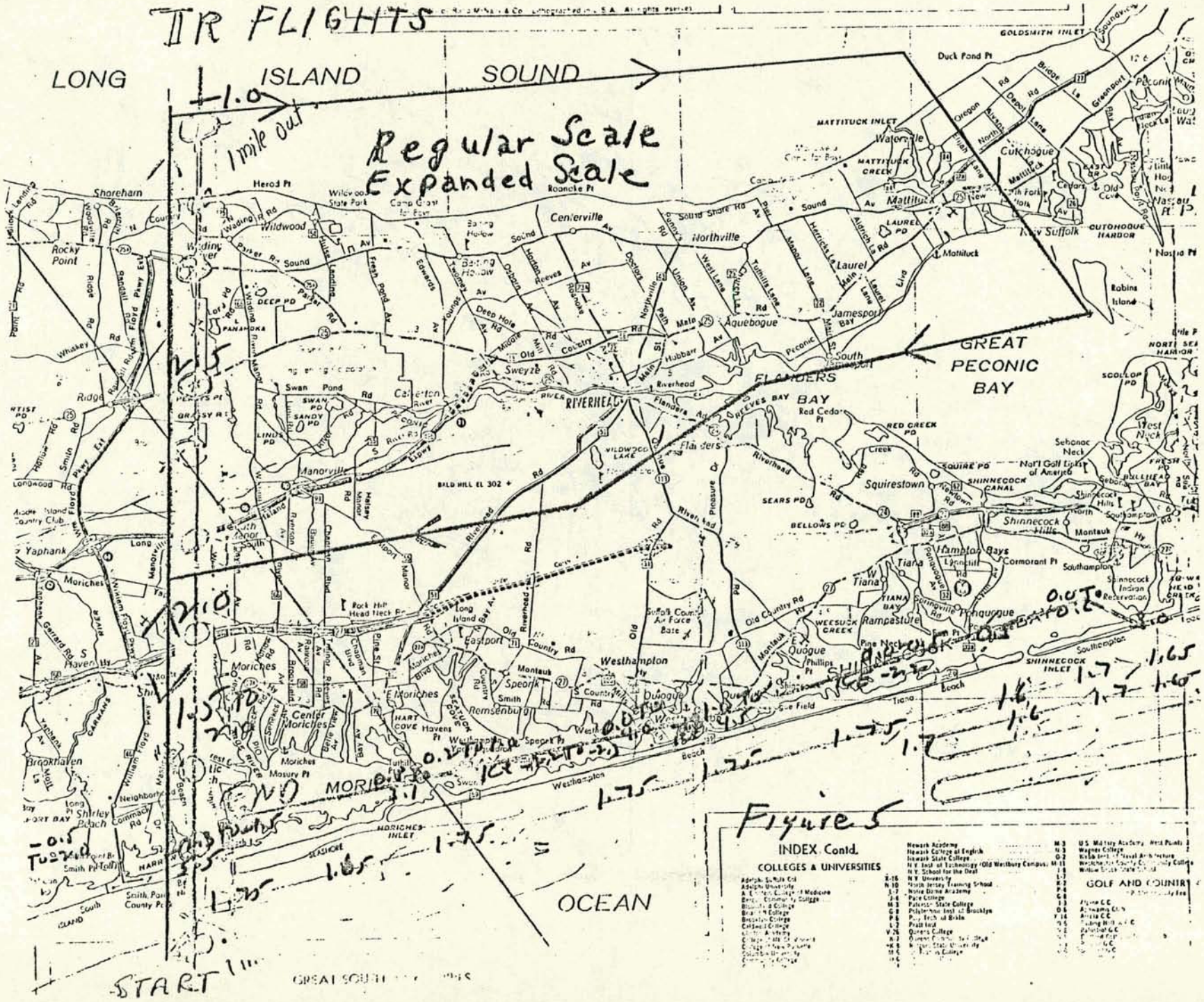
YEAR 50 MONTH 21 DAY 1 RELEASE TIME 3350 EST ASCENT NO. 01 SITE 1 STATION HEIGHT 10.M

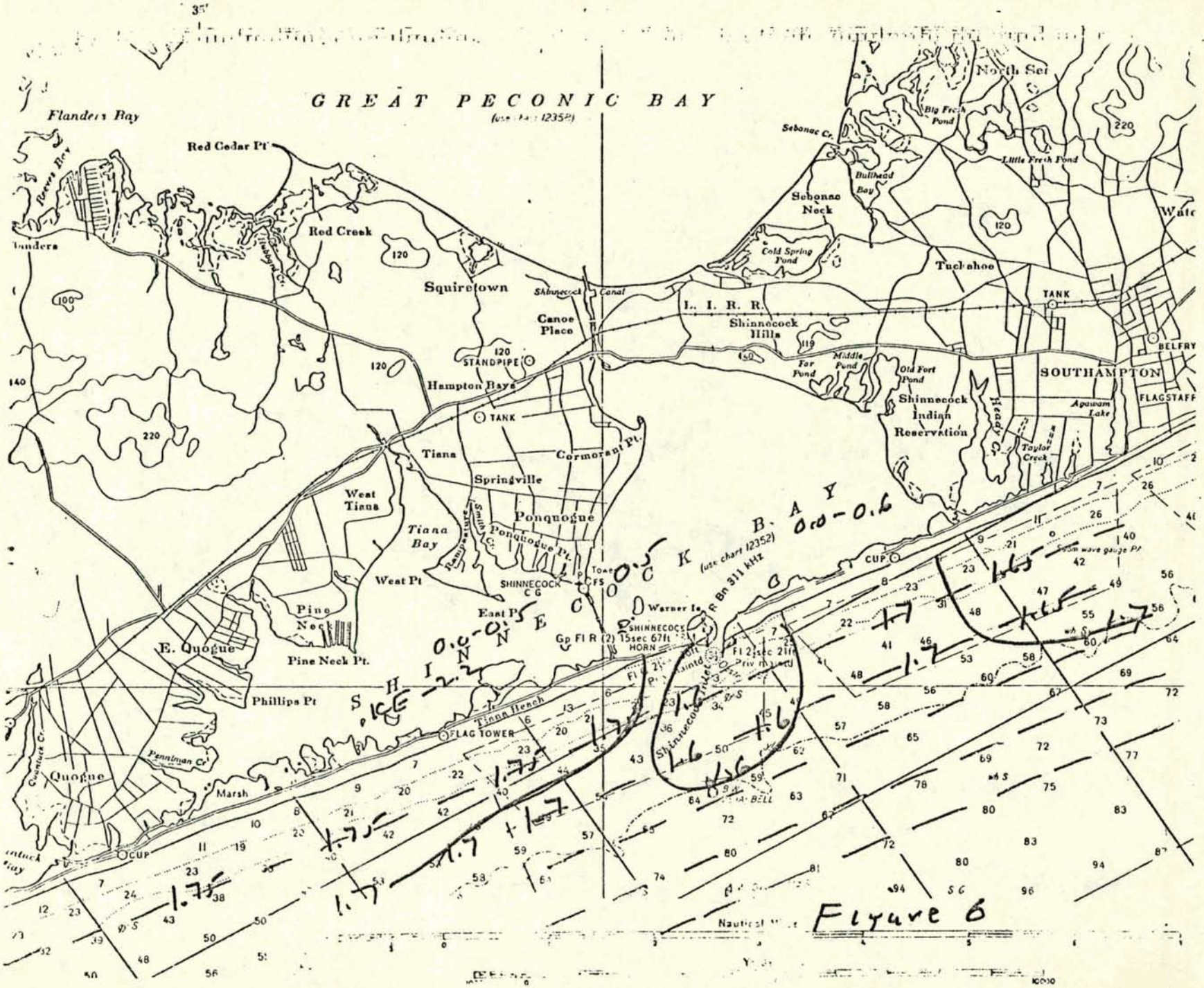
ORIGINAL NO OF PTS= 13



TEMPERATURE PROFILES RUN 20 2-10-76 Fig. 4




IR FLIGHTS
LONG ISLAND SOUND
1.0
1 mile out
Regular Scale
Expanded Scale
GREAT PECONIC BAY
FLANDERS BAY
RIVERHEAD
Shoreham
Wildwood
Centerville
Northville
Aquebogue
Jamesport
Mattituck
Cutchogue
Southampton
Shinnecock Hills
Hampton Bays
Westhampton
Moriches
Eastport
Speonk
Remsenburg
Quogue
Rampasture
Tiana
Squirestown
Manorville
Yaphank
Brookhaven
Shirley
Rocky Point
Riverhead
Flanders
Southampton
OCEAN
START
Figures
INDEX Contd.
COLLEGES & UNIVERSITIES
GOLF AND COUNTRY


GREAT PECONIC BAY
(use chart 12352)
Flanders Bay
Red Cedar Pt
Flanders
Red Creek
Squiretown
Canoe Place
Shinnecock Canal
STANDPIPE
Hampton Bays
TANK
Tiana
Springville
Cormorant Pt.
West Tiana
Tiana Bay
Ponquogue
Ponquogue Pt.
Weat Pt
East Pt
SHINNECOCK CG
Pine Neck
Pine Neck Pt.
E. Quogue
Phillips Pt
Quogue
Marsh
FLAG TOWER
CUP
Tiana Beach
Warner Is.
SHINNECOCK
Gp Fl R (2) 15sec 67ft
HORN
Fl 2 sec 21ft
Shinnecock Inlet
SHINNECOCK BAY
(use chart 12352)
Sebonac Neck
Sebonac Cr.
Bullhead Bay
Cold Spring Pond
Big Fresh Pond
Little Fresh Pond
North Sea
Tuckahoe
L. I. R. R.
Shinnecock Hills
Far Pond
Middle Pond
Old Fort Pond
Shinnecock Indian Reservation
Heady Cr.
Taylor Creek
Agawam Lake
SOUTHAMPTON
FLAGSTAFF
BELFRY
TANK
Nautical Mile
Figure 6

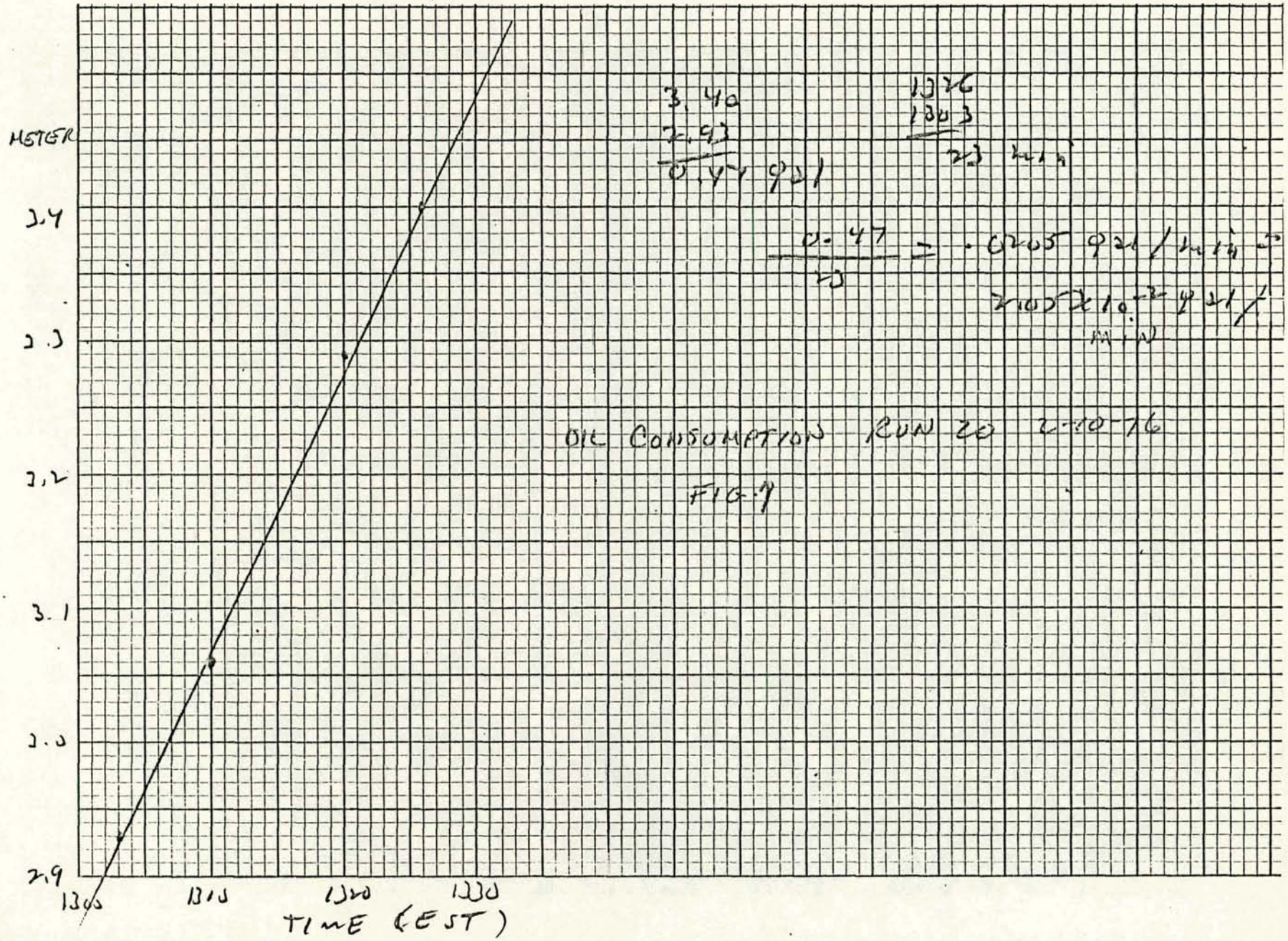

METER
3.4
3.3
3.2
3.1
3.0
2.9
1305
1310
1320
1330
TIME (EST)
3.40
2.93
0.47 gal
1326
1303
23 min
0.47 / 23 = .0205 gal/min =
2.05 x 10^-2 gal/min
OIL CONSUMPTION RUN 20 2-10-76
FIG. 7

Figure 1. Aerial view of smoke plume,
Run 20, 2-1C-76.

Figure 2. Aerial view of smoke plume,
Run 20, 2-10-76.

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Run No. 21
February 26, 1976

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: April 12, 1976

TO: Files

FROM: G. S. Raynor

SUBJECT: Run 21

Smoke run No. 21 was held on February 26, 1976. Clouds varied from overcast altostratus at 1100 to overcast cirrostatus, altostratus and altocumulus by 1245 to overcast altostratus again by 1400. Thick haze limited visibility to about 2 miles. The area was in a warm sector formed by a warm front through upper New York State and Massachusetts, and a cold front from a low in lower Michigan through western Pennsylvania, West Virginia and southward. A high was centered well off the mid-Atlantic coast. The gradient wind was SW.

Waves were about 3 feet high. Low tide occurred at 0925 and high tide at 1553, thus, tide was rising during the run. Eastern standard time is used throughout this report.

Personnel left BNL from 0910 to 0930. They reached Tiana at 0950 and the Coast Guard station at 1010. The LCM left the inlet about 1115.

At Tiana, cup anemometers were mounted at heights of 3.4, 7.0, 10.7, 14.3, 18.0 and 23.5 M on the tower and heights of 1, 2, 4, 6, 8 and 10 M on the 10-M mast. The mast was located about 1.5 M above and 22 M from the water at the beginning of the run, but about 1.0 M above and 10 M from the water at the end. Waves were reaching the base of the mast at the end. The tower anemometer counters were started at 1035 and the beach anemometer counters at 1110. The 7.0 M counter appeared to be double counting.

The aerovane, MRI bivane, Weathermeasure RH probe, and Thermosystems temperature sensor were mounted at 23.5 M. All except the aerovane were recorded on the P.I. tape recorder. Temperatures from the 3 operating tower levels (10.7, 18.0 and 23.5 M) were recorded on the Lockheed tape recorder starting at 1210.

The aerovane direction was 230° and speed 6.0 mps at 1045. At 1105, the readings were 225° and 6.5 mps. By 1210, they had shifted to 218° and 8.0 mps. At 1242, they shifted to 210° and 8.0 mps. Direction remained at 207 to 210° until 1356 when a constant shift to the west occurred, reaching 240° at 1435. Speeds decreased during that period to 6.5 mps. Gustiness was slightly wide D. Several step-like wind direction shifts of about 10° occurred apparently due to an instrument problem.

Pibals were taken at 1134 and 1320.

The LCM was stationed about 1 mile off Triton Lane at 1133 (Figure 1) and started smoke at 1134. Densitometer traverses along Dune Road were not started

until 1240 when the wind reached a favorable direction. Nine successful passes were made from 1240 - 1340.

The smoke was ended at 1340 and the LCM moved to 1/2 miles off the beach. Smoke was started from there at 1359 and densitometer traverses started. However, the wind shift made further traverses useless so the run was terminated at 1435.

The smoke plume was quite stable, low on the water and smooth edged. No pictures were taken from the beach because of the haze and the cloud background.

The following water temperatures were taken from the LCM: 1155, 1 mile out, 4.3°C; 1428, 0.5 miles out, 4.3°C; 1520, 1.5 miles out, 4.3°C.

The beach was manned by Raynor, Brown, SethuRaman and McNeil, the LCM by Jahnig, Fink and Carlson, and the aircraft by Tuthill.

Anemometer counts are tabulated in Tables 1 and 2 and plotted in Figure 2. The profile on the beach is nearly logarithmic. The wind profile observed at Tiana Tower shows some interesting characteristics. The lower levels up to about 10 M show the effect of the dune. The upper levels ($z > 10$m) are not affected by the dune and are also above the internal boundary layer as indicated by mean temperature measurements at the tower. The well-defined change in slope of the wind profiles reflects the change in roughness. An estimation of roughness lengths could be obtained by extrapolation of these profiles as below:

$$z_o \text{ (beach)} = 17 \text{ cm}$$

$$z_o \text{ (ocean)} = 1 \text{ mm}$$

A change in roughness of about 20 orders of magnitude was experienced for this run. For some of the previous runs the change in profile slope was not very well defined. This was probably due to additional effects of significant change in surface temperature. During February and March, the average surface temperatures of sea and land tend to be approximately the same.

Pibal data are shown in Figures 3 and 4. Both direction and speed showed several reversals with height.

Aircraft temperature spirals were made twice over the ocean and inland. Results are tabulated in Table 3 and plotted in Figure 5. The data shows a strong inversion to about 400 to 500 M and nearly isothermal lapse rates above Air temperatures at all levels were well above water temperature.

No variometer data were taken since the instrument mounting was not available. Photographs of the plume was taken from the air but no timed runs were made over the plume since access to the hole in the bottom of the fuselage is very difficult in this new aircraft.

Infrared surface temperatures were taken on the expanded scale at 0.5 miles out from Mastic to the east end of Shinnecock Bay and at 1.5 miles out back to

Memorandum to Files April 12, 1976

Subject: Run 21

Tiana. Trouble with the recorder prevented taking further data. Data were taken from 1135 - 1155 at 1000 feet and 110 mph, and are shown in Table 4. The aircraft left early due to low clouds moving in over the airport.

Oil consumption is shown in Figure 6. The oil drum was kept in the small, heated trailer on the LCM prior to and during the run so output rate was somewhat higher than during Run 20, but still low.

The run was terminated at 1433. Personnel left Tiana at 1525 and the LCM somewhat later since oceanographic measurements were taken after completion of the smoke run. Personnel reached BNL at 1610 and 1640.

In summary, this was one of the few successful winter runs. The warm air over cold water resulted in a stable plume.

GSR:mlk

Table 1

FIVE MINUTE MEAN WIND SPEEDS (M/SEC)

DATE=26FEB1976 RUN=421 SITE=TIANA TOWR START TIME=1035

HEIGHT(M)

EST	3.35	10.70	14.30	18.00	23.50
1035	2.51	2.09	4.49	4.87	5.17
1040	3.00	4.16	4.83	5.23	5.45
1045	3.11	4.16	4.73	5.08	5.39
1050	2.96	4.10	4.68	5.04	5.31
1055	3.21	4.22	4.70	5.06	5.28
1100	3.43	4.24	4.72	5.09	5.37
1105	4.17	4.53	4.94	5.28	5.60
1110	4.43	4.78	5.15	5.58	5.92
1115	3.96	4.40	4.87	5.32	5.65
1120	4.22	4.57	5.13	5.56	5.93
1125	4.19	4.57	5.15	5.61	5.94
1130	4.67	5.02	5.46	5.86	6.14
1135	4.45	4.72	5.17	5.60	5.91
1140	4.43	4.84	5.30	5.74	6.08
1145	4.76	5.25	5.75	6.19	6.53
1150	5.07	5.34	5.82	6.30	6.59
1155	5.32	5.53	6.07	6.53	6.58
1200	5.72	5.84	6.36	6.86	7.20
1205	5.71	5.91	6.56	6.92	7.21
1210	5.75	5.96	6.40	6.80	7.01
1215	5.58	5.81	6.16	6.57	6.84
1220	5.79	5.79	6.25	6.67	6.95
1225	5.93	5.98	6.34	6.80	7.01
1230	5.70	5.77	6.17	5.99	6.86
1235	5.64	5.93	6.37	6.87	7.10
1240	5.35	5.74	6.21	6.61	6.95
1245	5.70	5.89	6.34	6.80	7.09
1250	5.69	6.11	6.64	7.10	7.40
1255	5.75	6.00	6.37	6.88	7.19
1300	6.03	6.15	6.55	7.05	7.32
1305	6.02	6.23	6.59	7.08	7.30
1310	6.49	6.59	6.94	7.49	7.91
1315	6.51	6.70	7.06	7.55	7.81
1320	6.66	6.67	7.01	7.53	7.78
1325	6.59	6.88	7.25	7.73	8.00
1330	6.88	7.21	7.63	8.16	8.42
1335	6.50	6.91	7.25	7.72	7.93
1340	6.37	6.55	6.97	7.42	7.70
1345	6.63	6.72	7.04	7.54	7.74
1350	6.48	6.58	6.93	7.34	7.58
1355	5.90	6.23	6.56	7.00	7.22
1400	5.55	5.62	6.00	6.40	6.68
1405	4.93	5.36	5.69	6.05	6.27
1410	3.97	5.11	5.55	5.91	6.10
1415	4.04	5.30	5.74	6.13	6.38
1420	3.94	5.03	5.48	5.86	6.12
1425	4.00	4.80	5.26	5.62	5.87
1430	3.64	4.66	5.21	5.59	5.79
1150-1435	5.63	5.97	6.37	6.81	7.09
RUN MEAN	5.07	5.47	5.95	6.37	6.66

Table 2

FIVE MINUTE MEAN WIND SPEEDS (M/SEC)

DATE=26FEB1976 RUN=921 SITE=BEACH MAST START TIME=1110

HEIGHT(M)

EST	1.00	2.00	4.00	6.00	8.00	10.00
1110	3.52	5.19	4.21	4.45	4.63	4.91
1115	3.18	4.77	3.83	4.06	4.24	4.49
1120	3.39	4.94	4.02	4.30	4.50	4.75
1125	3.47	4.61	4.10	4.38	4.57	4.81
1130	3.65	4.55	4.34	4.62	4.83	5.08
1135	3.44	4.38	4.04	4.36	4.55	4.79
1140	3.61	4.49	4.26	4.53	4.72	4.96
1145	3.75	4.44	4.47	4.81	5.04	5.25
1150	3.91	4.62	4.66	4.93	5.15	5.41
1155	4.11	4.81	4.89	5.23	5.48	5.72
1200	4.43	4.95	5.31	5.60	5.83	6.04
1205	4.38	4.91	5.23	5.59	5.82	6.10
1210	4.34	4.86	5.10	5.46	5.81	5.93
1215	4.31	4.79	5.06	5.40	5.59	5.88
1220	4.32	4.77	5.17	5.53	5.70	5.98
1225	4.31	4.77	5.15	5.47	5.68	5.95
1230	4.30	4.72	5.11	5.40	5.59	5.89
1235	4.45	4.94	5.25	5.55	5.76	6.08
1240	4.26	4.70	5.03	5.39	5.61	5.94
1245	4.37	4.77	5.17	5.50	5.71	5.83
1250	4.47	4.94	5.34	5.63	5.87	6.10
1255	4.40	4.83	5.23	5.52	5.88	6.06
1300	4.51	4.96	5.40	5.71	5.93	6.22
1305	4.53	4.94	5.34	5.69	5.91	6.01
1310	4.81	5.19	5.57	5.95	6.18	6.49
1315	4.98	5.41	5.80	6.11	6.40	6.66
1320	4.81	5.23	5.66	5.96	6.16	6.41
1325	4.91	5.34	5.80	6.21	6.51	6.64
1330	5.31	5.79	6.38	6.76	7.00	7.16
1335	5.04	5.49	6.02	6.36	6.64	6.98
1340	4.74	5.17	5.68	6.06	6.30	6.59
1345	5.07	5.51	5.96	6.28	6.52	6.78
1350	4.77	5.23	5.68	5.98	6.23	6.53
1355	4.56	4.93	5.39	5.68	5.94	6.21
1400	4.05	4.43	4.85	5.15	5.37	5.64
1405	4.02	4.43	4.80	5.10	5.27	5.54
1410	3.87	4.27	4.68	4.96	5.12	5.37
1415	3.92	4.32	4.79	5.10	5.32	5.54
1420	3.81	4.23	4.60	4.91	5.08	5.32
1425	3.52	4.02	4.43	4.76	4.95	5.17
1430	3.51	4.02	4.39	4.74	4.94	5.11
RUN MEAN	4.23	4.82	5.03	5.35	5.57	5.81
1150-1435	4.41	4.86	5.24	5.57	5.80	6.[illegible]

Table 3

Temperatures Aloft Run 21, 2-26-76

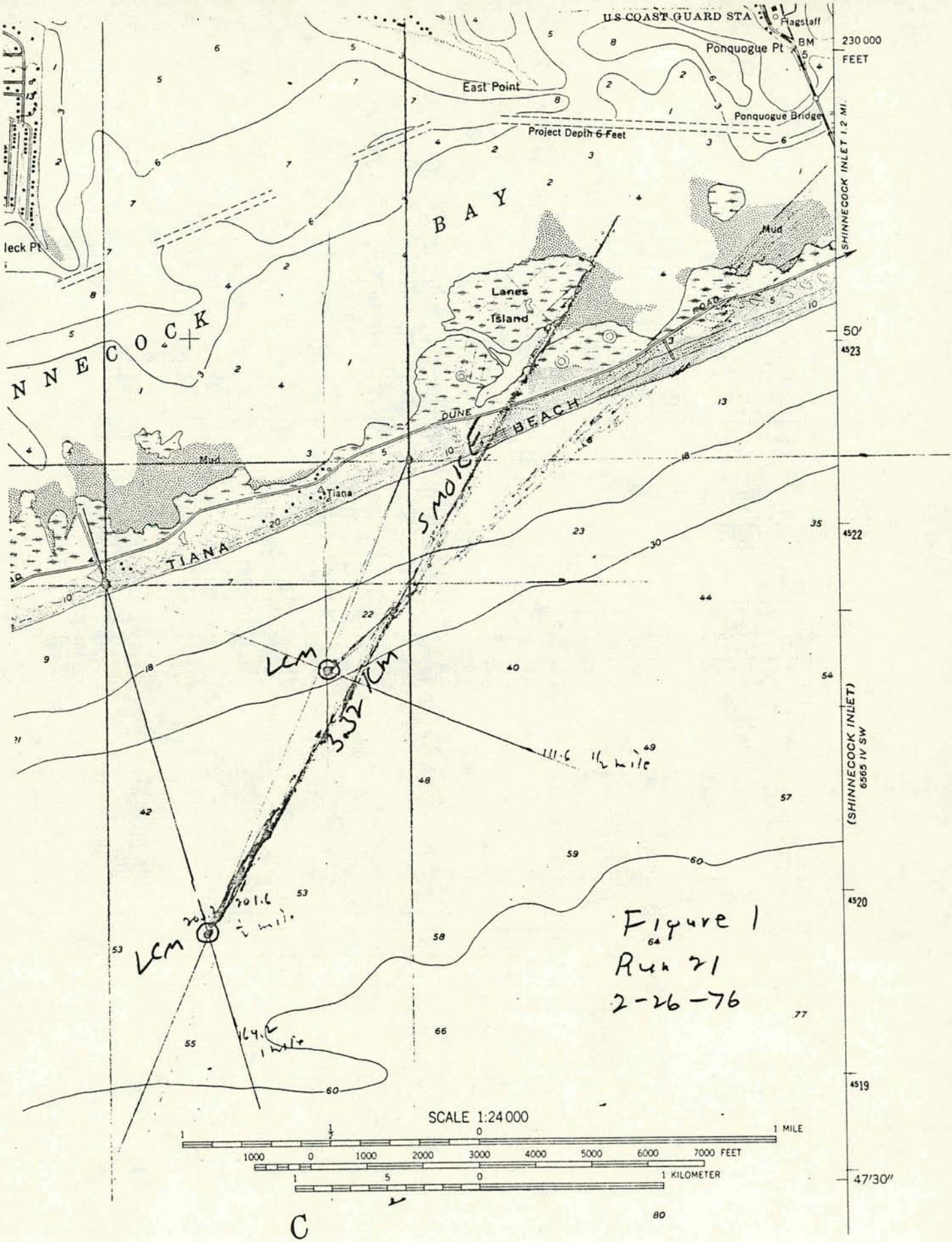
HT.(m)	1202E Over Ocean	1212E Over Land	1314E Over Ocean	1320E Over Land
152	9.8	7.4	7.0	7.1
183	10.1	7.5	7.9	7.0
213	10.1	7.7	9.3	6.8
244	10.0	8.3	9.6	6.9
274	9.9	8.8	10.0	7.4
305	10.0	10.3	10.1	8.3
335	10.5	10.8	10.4	10.0
366	10.7	11.4	10.8	10.4
396	10.6	11.7	11.0	11.1
427	10.8	12.0	11.2	11.6
457	11.3	11.9	11.3	11.8
488	11.4	12.4	11.2	11.8
518	11.4	12.8	11.1	11.6
549	11.7	12.8	11.0	11.5
579	11.8	12.8	10.9	11.4
610	12.0	12.8	10.7	11.4
640	12.0	12.8	10.8	11.5
671	12.0	12.5	10.9	12.2
701	11.9	12.5	10.8	12.1
732	12.0	12.4	11.0	12.1
762	11.9	12.4	11.5	12.2

Table 4

IR Temperature Measurements

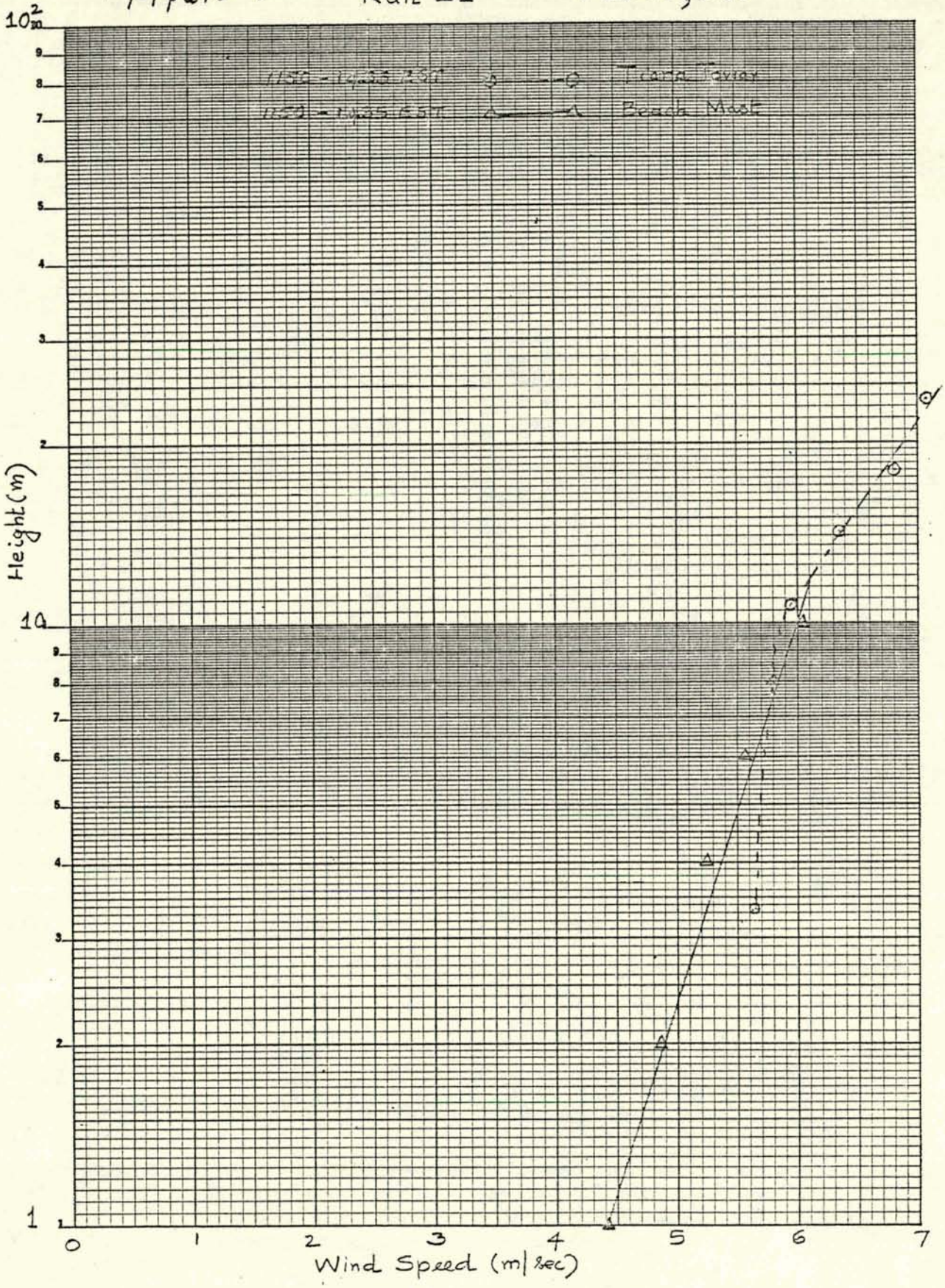
Run 21, 2-26-76

Location	Temperature (°C)
0.5 miles out	
Mastic to Moriches Inlet	4.7
Moriches Inlet	4.8-4.9
E. of Inlet	4.8
W. Jetty	4.8
W. Bridge - Quogue Bridge	4.7
Round Dune - Tiana	4.6
Ponquogue	4.7
Shinnecock Inlet	4.9
E. of Inlet	4.7
E. end of Bay	4.6
1.5 miles out	
E. end of Bay	4.6
E. of Inlet	4.7
Inlet	4.8
W. of Inlet to Tiana	4.5
Visual Meter Readings	
Inland, dumps area	13.0
Land, Quogue area	15.0
Quantuck Bay	5.0-6.0
Moriches Bay	5.0-6.0


U.S. COAST GUARD STA
Flagstaff
BM
Ponquogue Pt
230 000
FEET
East Point
Ponquogue Bridge
Project Depth 6 Feet
SHINNECOCK INLET 1.2 MI.
BAY
Mud
Lanes
Island
ROAD
50'
4523
NNECOCK
DUNE
BEACH
SMOICE
Mud
Tiana
TIANA
4522
LCM
332
LCM
111.6
½ mile
(SHINNECOCK INLET)
6565 IV SW
4520
Figure 1
Run 21
2-26-76
LCM
301.6
½ mile
164.6
1 mile
4519
SCALE 1:24 000
1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
47'30"

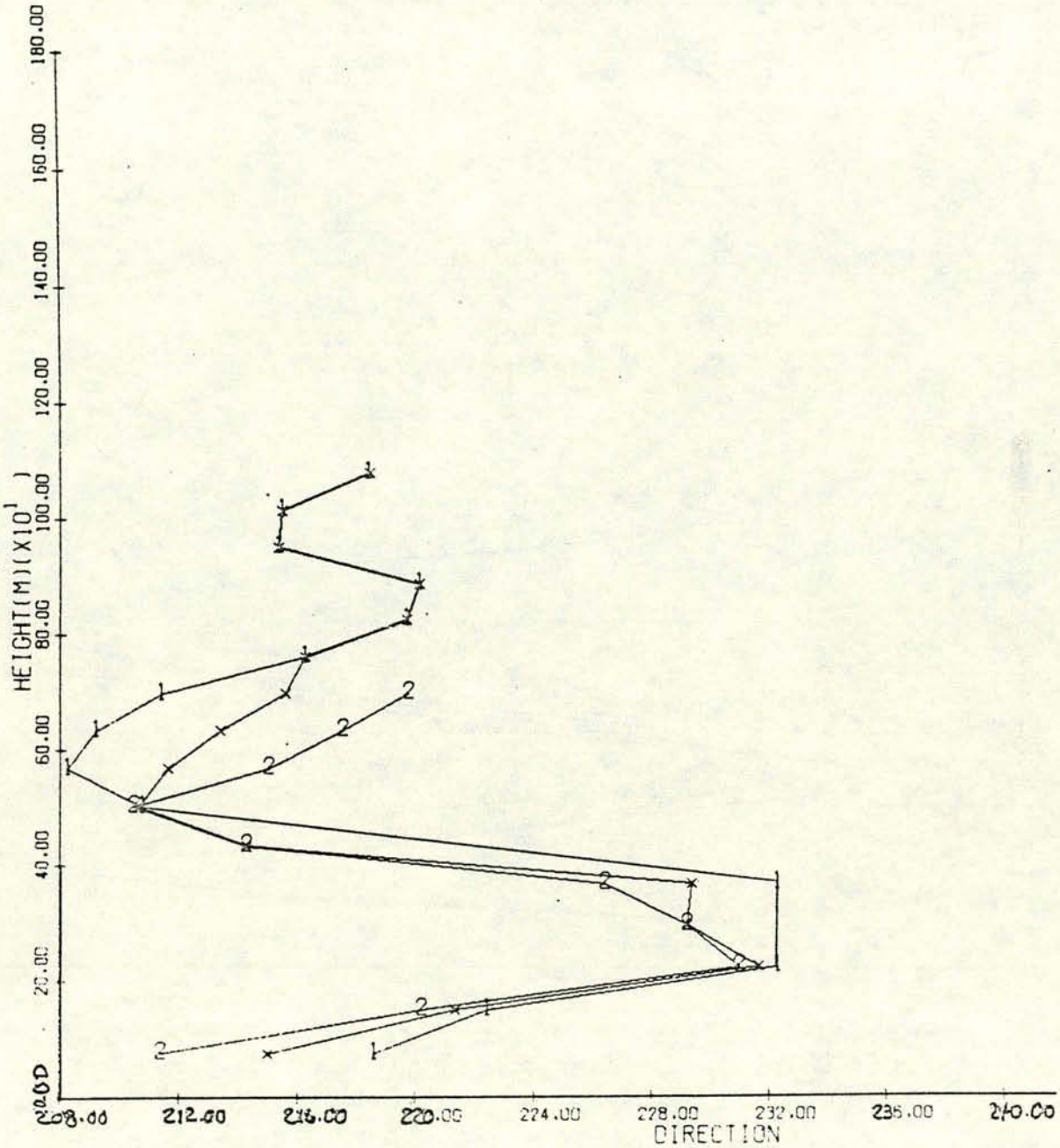
C

Figure 2 Run 21 Feb 26, 1976



OFF SHORE RUN 21 FEB. 2.1976 TIANA BEACH
ASCENT 1 1134
ASCENT 2 1328

Figure 3

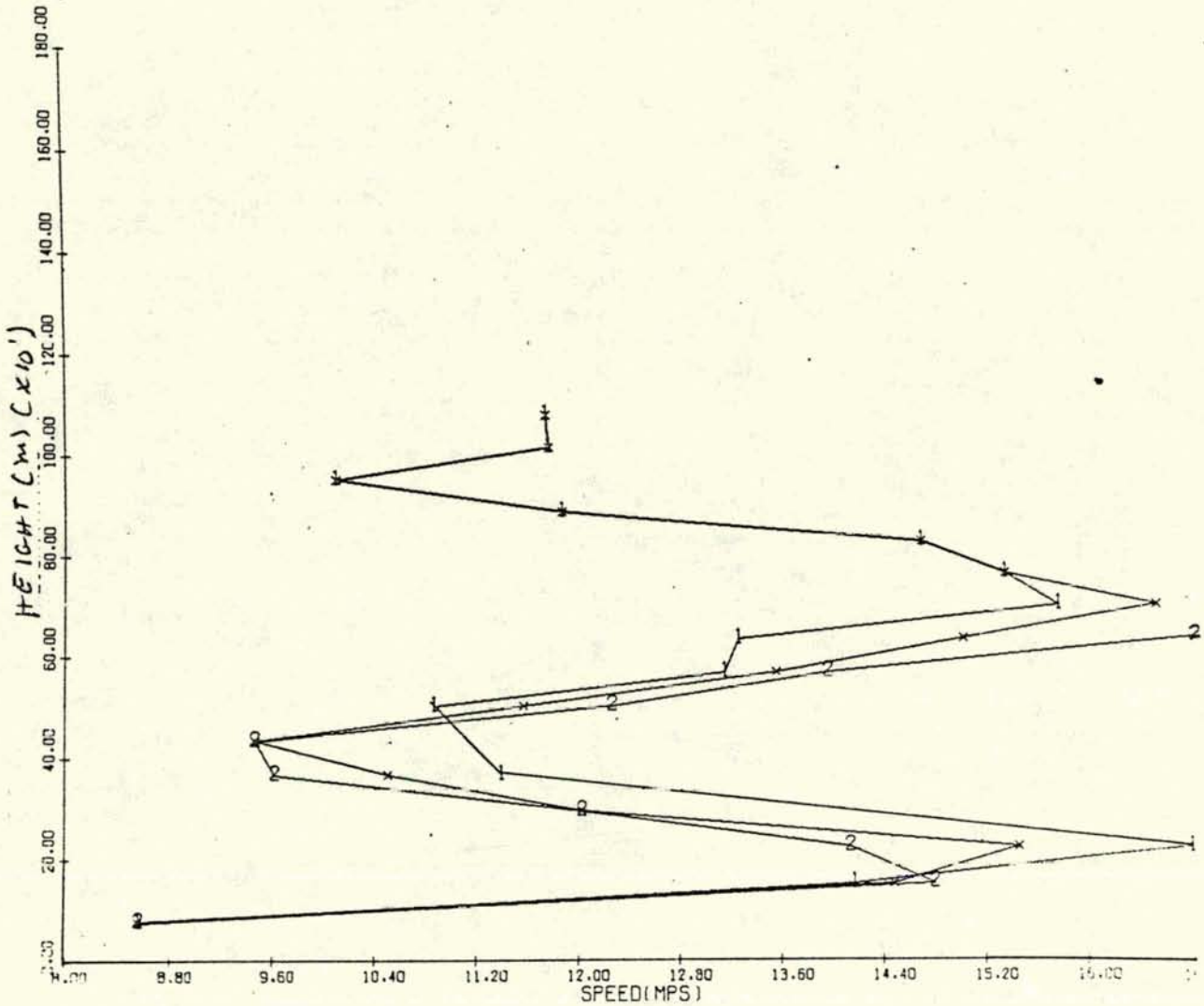


OFF SHORE RUN 21 FEB. 2.1976 TIANA BEACH

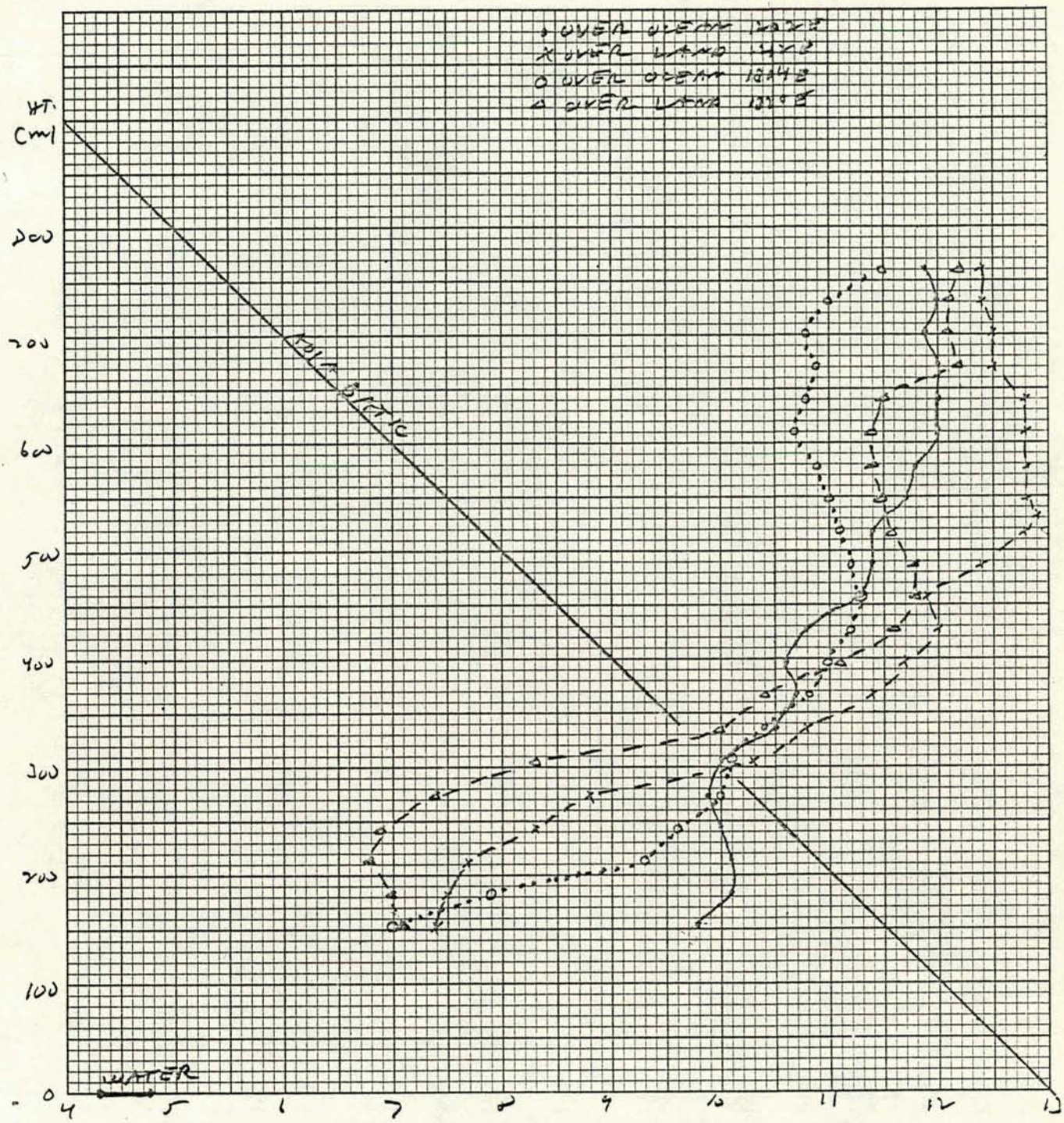
ASCENT 1 1134

ASCENT 2 1328

Figure 4



TEMPERATURES ALOFT RUN 21 6-26-76 Figure 5



Smoke output Run 21 2-26-76 Figure 6

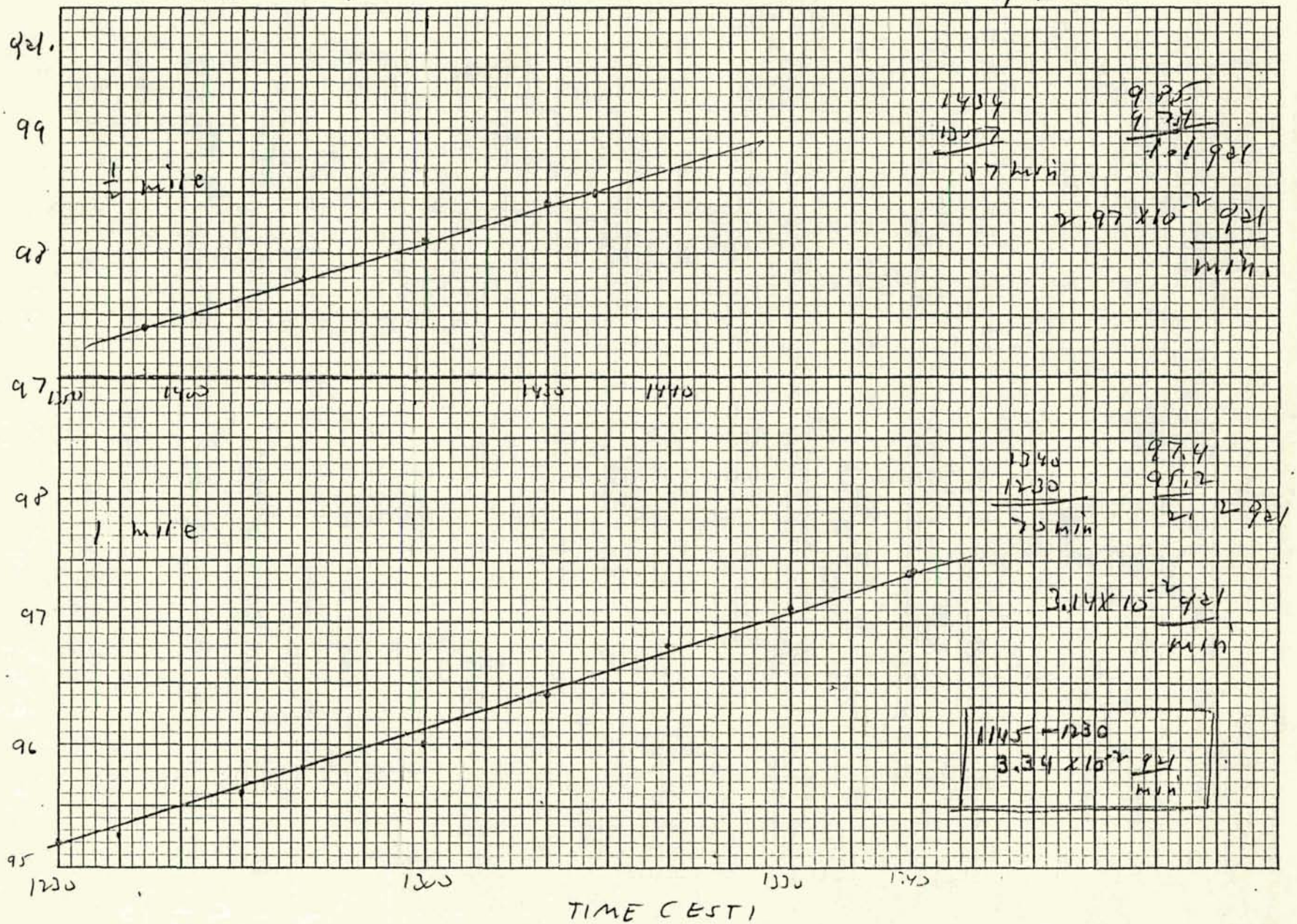


Figure 1. Aerial view of smoke plume,
Run 21, 2-26-75.

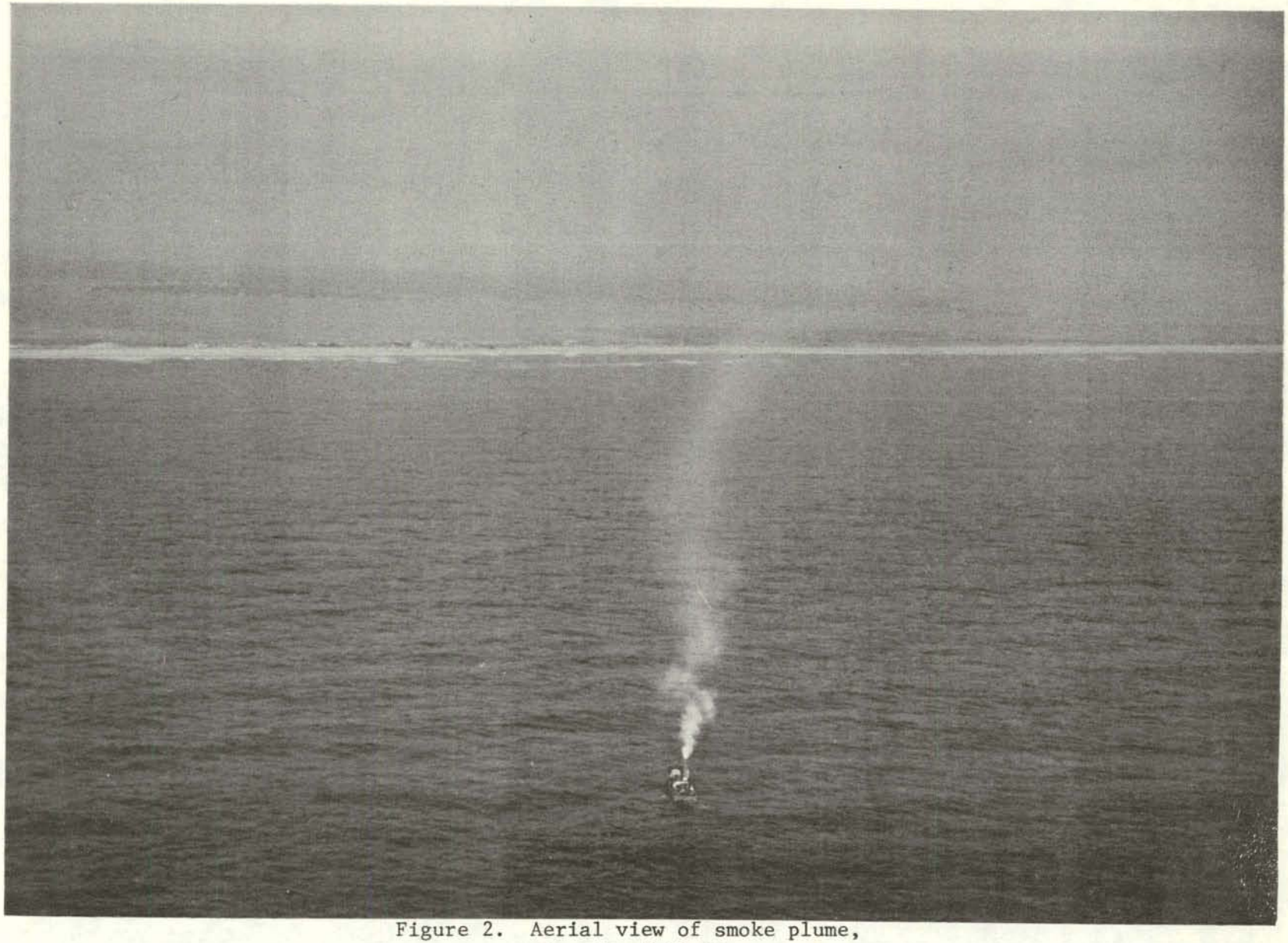
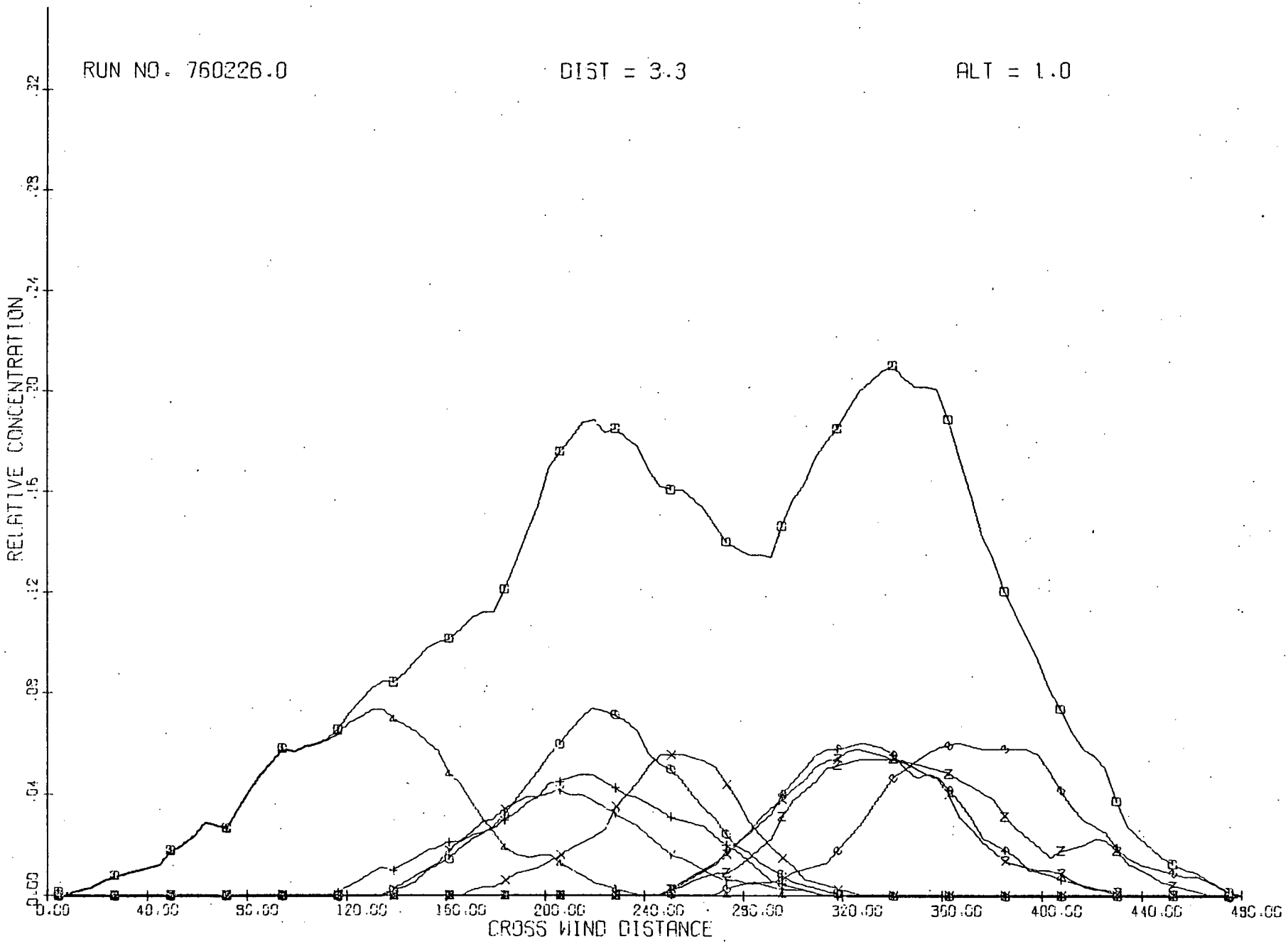


Figure 2. Aerial view of smoke plume,
Run 21, 2-26-76.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ALT = 1.0
RELATIVE CONCENTRATION
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.04
.08
.12
.16
.20
.24
.28
.32
0.00
40.00
80.00
120.00
160.00
200.00
240.00
280.00
320.00
360.00
400.00
440.00
480.00
CROSS WIND DISTANCE

ON SHORE DENSITOMETER RUN FROM VAN
TRAVERSES AT ONE DISTANCE

RUN =760226./ DATE = 22676 /DISTANCE FROM STACK (KM)= 3.32
DIRECTION(DEG) = 210./TIME FROM 1245 TO 1335 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*[illegible])
1.0	.601E+01	224.3	33.5			7.49
2.0	.742E+01	122.5	41.5			7.46
3.0	.470E+01	214.3	39.6			4.95
4.0	.385E+01	249.8	28.3			5.67
5.0	.586E+01	374.7	37.1			6.37
6.0	.529E+01	330.5	33.5			6.5[illegible]
7.0	.511E+01	331.1	34.2			6.[illegible]3
8.0	.593E+01	348.8	42.3			5.8[illegible]
9.0	.346E+01	209.9	33.0			4.37
GRAND TOTAL	.476E+02	265.7	35.7	92.3	84.6	
Corrected for plume angle			23.6	59.3	54.4	

Run No. 22
May 11, 1976

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: September 14, 1976

TO: Files

FROM: G.S. Raynor

SUBJECT: Run 22

Smoke run no. 22 was held on May 11, 1976. Clouds increased from scattered cirrus to broken cirrus by 1030 to overcast cirrus and cirrostratus by 1100 to overcast cirrostratus and altostratus by 1230. Haze limited visibility to 3 or 4 miles. A high was centered well off shore while a cold front with waves extended along the Saint Lawrence Valley, through Ohio and Southwest. A low was centered in South Carolina with a warm front eastward and a cold front southwestward. The gradient wind was southerly.

At Shinnecock Inlet, high tides occurred at 0425 and 1657 and low tide at 1019. Thus, the tide was rising during the run. Waves were 4-5 feet. Eastern standard time is used in this report.

Personnel left BNL at 0640, arrived at the Coast Guard Station at 0720 and at Tiana at 0725. The LCM left the Inlet about 0830. It had been planned to use the densitometer on Cobolt but the wind was too strong and the ocean too rough so it was used in the van.

Tiana was manned by Raynor, Brown, SethuRaman and McNeil. Cup anemometers were mounted at heights of 3.4, 7.0, 10.7, 14.3, 18.0 and 23.5 m on the tower and heights of 1, 2, 4, 6, 8 and 10 m on the 10-m mast. The mast was located about 25 m from and 1.5 m above the water at the beginning of the run but the waves were nearly to the base at the end. Considerable trouble and delay was caused by bolts on the 10-m tower and a connector corroded by salt. Tower anemometers were started at 0821 and the beach anemometers at 0921. The 10.7-m anemometer failed to work properly and was changed at 0930. The 23.5-m and 7.0-m anemometer gave questionable data. The 4-m beach anemometer appeared to be double counting and the data from 8.0-m and 10.0-m were not used.

The Aerovane, MRI bivane, Weathermeasure RH probe and Thermosystems temperature sensor were mounted at 23.5 m. All except the aerovane speed were recorded on the P.I. tape recorder. Visual temperature readings at 1330 E were: 10.7m, 11.90°C; 18 m, 11.81°C;23.5 m, 11.85°C.

Wind speed and direction as recorded by the aerovane were rather steady and gave the following mean readings during the three traverse periods:

1010-1050	175°	12.0 mps
1125-1200	177°	11.0 mps
1245-1330	170°	12.0 mps

Gustiness was wide D or narrow C. Anemometer wind speeds are tabulated in Tables 1 and 2 and plotted in Figure 1.

Pibals were taken at 1035, 1155 and 1309 (Figures 2 and 3). All ascents gave similar data, a speed maximum near 200 m and direction veering with height.

The LCM was manned by Jahnig, Carlson and Fink. After making test smoke, it was stationed about 1.5 miles off Triton Lane (Figure 4) and started smoke at 0929. The plume crossed the beach somewhat west of Tiana and densitometer traverses were made from 1010-1050. Distance from the boat to the road was 2.95 km.

The LCM was then stationed about a mile out and a little farther east. Smoke crossed near the west end of Tiana parking lot. Distance was 2.15 km. Traverses were made from 1125-1200.

The LCM was then moved to about 2.5 miles out and further east. Distance was 3.85 km. Smoke crossed the beach nearly a mile east of Tiana. Traverses were made from 1245-1330.

The smoke plume was low on the water and smooth edged but somewhat uneven on top, typical of near neutral conditions. No photos were taken from the beach because of the haze and cloud background.

Water temperature was 10.3° at 1.5 miles out. Air temperature from the LCM was 12.9°.

The Cessna 172 was manned by A. Tuthill and arrived at Tiana about 1115. IR measurements were made at 1.5 m out from Mastic to the east end of Shinnecock Bay and at 0.5 m intervals out to 2.5 miles opposite the Inlet from 1100-1145. Altitude was 300 feet and flight speed 80 mph. A flight was made along the bays on the return flight at 600 feet at 120 mph from 1330 to 1345. Results are tabulated in Table 3 and plotted in Figure 5. Temperature maxima were located opposite both inlets.

Temperature spirals were taken over the ocean from 91-762 m (300 to 2500 feet) at 1155 and 1315 and over the land from 152-762 m (500 to 2500 feet) at 1210. Results are tabulated in Table 4 and plotted in Figure 7 with the water and low-level air temperature. A moderate inversion was located at 150 m over the water with slightly stable lapse rates above.

Photographs were taken of the plume from at least two of the three boat positions.

The variometer and the epsilon meter were flown for turbulence measurements but the string used for a variometer tail was apparently too long. The instrument failed to fly level and the data are useless. Results from the epsilon meter will be reported separately after the magnetic tape is analyzed.

Oil consumption was steady during each traverse period and is plotted in Figure 8.

The run was terminated at 1331. Personnel left Tiana at 1415.

In summary, water appreciably cooler than the air and a moderate low-level inversion over the water resulted in a rather stable plume despite the high wind speeds.

GR:js

TABLE 1

EST	7.35	7.40	14.30	15.40
610	8.41	8.17	11.14	11.34
615	8.63	8.25	11.21	11.37
620	8.87	8.14	11.19	11.42
625	8.03	8.13	11.02	11.23
630	8.49	7.83	10.91	11.06
635	7.66	7.93	10.79	10.89
640	7.97	8.13	11.07	11.17
645	8.62	8.25	11.23	11.43
650	7.94	8.10	11.08	11.29
655	7.95	8.00	10.97	11.08
600	7.95	8.06	11.04	11.25
605	8.16	7.93	10.76	10.92
610	8.04	7.76	10.56	10.72
615	7.73	7.90	9.73	10.82
620	7.38	7.58	10.33	10.53
625	7.96	7.13	10.35	10.60
630	8.22	7.53	10.53	10.71
635	8.63	7.65	10.68	10.87
640	8.46	7.70	10.81	11.00
645	8.29	7.65	10.53	10.79
650	8.31	7.65	10.53	10.76
655	8.30	7.62	10.64	10.80
1000	8.24	7.65	10.47	10.88
1005	8.07	7.35	10.21	10.42
1010	7.92	7.22	9.99	10.18
1015	7.69	7.08	9.86	10.14
1020	8.00	7.07	9.87	10.07
1025	7.60	7.07	9.92	10.14
1030	7.86	7.43	10.29	10.40
1035	7.82	7.28	10.24	10.43
1040	7.69	7.28	10.08	10.27
1045	7.75	7.02	9.79	9.98
1050	7.56	6.90	9.59	9.71
1055	7.53	6.80	9.56	9.76
1100	7.44	6.84	9.43	9.59
1105	7.42	6.74	9.33	9.49
1110	7.35	6.63	9.22	9.41
1115	7.41	6.82	9.44	9.62
1120	7.53	6.88	9.58	9.76
1125	7.72	6.97	9.69	9.94
1130	7.59	6.97	9.68	9.87
1135	7.73	6.99	9.76	9.94
1140	7.50	6.87	9.49	9.69
1145	7.54	6.74	9.37	9.60
1150	7.19	6.65	9.25	9.47
1155	7.15	6.56	9.09	9.32
1200	7.19	6.69	9.31	9.50
1205	7.23	6.74	9.34	9.55
1210	7.45	6.83	9.45	9.62
1215	7.43	6.80	9.36	9.57
1220	7.34	7.02	9.73	9.91
1225	7.30	6.99	9.70	9.95
1230	7.33	6.91	9.58	9.76
1235	7.57	7.05	9.81	10.00
1240	7.68	7.40	10.25	10.47
1245	7.81	7.58	10.43	10.64
1250	7.12	7.87	10.64	10.83
1255	8.13	7.54	10.50	10.75
1300	7.80	7.56	10.65	10.58
1305	7.85	7.47	10.33	10.58
1310	7.[illegible]	7.[illegible]	10.59	10.60
1315	7.94	7.[illegible]	10.53	10.81
1320	7.77	7.47	10.35	10.64
1325	7.55	7.21	10.02	10.24
[illegible]	7.[illegible]	7.[illegible]	10.17	10.[illegible]

TABLE 2

FIVE MINUTE MEAN WIND SPEEDS (M/SEC)

DATE=760511 RUN=922 SITE=BEACH MAST START TIME= 920

HEIGHT(M)

EST	1.00	2.00	4.00	6.00
920	5.23	6.13	5.95	6.75
925	5.14	5.70	6.01	6.71
930	5.31	5.67	6.24	6.86
935	5.37	5.72	6.37	6.96
940	5.38	5.72	6.34	6.91
945	5.22	5.59	6.31	6.76
950	5.24	5.59	6.39	6.85
955	5.47	5.81	6.53	6.97
1000	5.34	5.71	6.49	6.89
1005	5.03	5.48	6.28	6.54
1010	4.95	5.40	6.24	6.42
1015	4.89	5.36	6.04	6.29
1020	4.94	5.43	6.17	6.38
1025	4.77	5.30	6.06	6.24
1030	5.15	5.69	6.51	6.70
1035	5.03	5.48	6.25	6.51
1040	5.04	5.51	6.29	6.50
1045	4.86	5.21	6.17	6.19
1050	4.83	5.15	6.03	6.10
1055	4.66	5.09	6.10	6.11
1100	4.63	5.04	6.05	6.08
1105	4.62	5.03	5.92	5.99
1110	4.54	4.91	5.88	5.92
1115	4.68	5.14	5.93	6.07
1120	4.69	5.12	6.02	6.08
1125	4.75	5.19	6.13	6.20
1130	4.67	5.08	6.05	6.15
1135	4.72	5.14	6.07	6.17
1140	4.59	5.11	5.84	6.01
1145	4.51	5.03	5.83	5.93
1150	4.46	4.89	5.86	5.87
1155	4.41	4.92	5.63	5.72
1200	4.51	5.00	5.97	5.87
1205	4.48	5.03	5.84	5.92
1210	4.57	4.98	5.84	6.03
1215	4.62	4.98	6.06	6.00
1220	4.78	5.24	6.27	6.24
1225	4.68	5.23	6.02	6.19
1230	4.69	5.23	6.06	6.11
1235	4.71	5.19	6.02	6.13
1240	5.01	5.46	6.46	6.61
1245	5.07	5.43	6.43	6.62
1250	5.09	5.46	6.55	6.70
1255	5.12	5.54	6.67	6.80
1300	5.10	5.36	6.41	6.59
1305	5.05	5.48	6.62	6.61
1310	5.01	5.37	6.56	6.58
1315	5.15	5.47	6.64	6.67
1320	4.92	5.36	6.54	6.59
1325	4.85	5.23	6.35	6.34
RUN MEAN	4.99	5.33	6.19	6.37

Table 3

IR Temperature Measurements - Run 22 - 5-11-76

Location	Temperature (°C) Range	Mean
Beach	14.0-20.5	
0.5 miles out		
Off Mastic	9.5-10.2	9.8
Mastic to W. of Moriches Inlet	9.5-10.8	10.2
Just W. of and opposite Inlet	12.6-13.3	13.0
E. of Inlet to Cupsoque	10.5-12.2	11.8
Cupsoque to W. groin	9.8-10.0	10.0
W. groin to W. bay bridge	10.0-10.6	10.3
W. bay bridge to E. bay bridge	10.1-12.0	11.0
E. bay bridge to Quoque bridge	10.0-10.8	10.6
Quoque bridge to Round Dune	10.5-11.0	10.7
Round Dune to Tiane	10.6-11.0	10.8
Tiana to W. of Shinnecock Inlet	10.8-12.0	11.0
Opposite Inlet	11.5-12.7	12.1
Inlet to E. end bay	10.0-11.0	10.4
1 mile out		
E. end bay to Inlet	10.0-10.2	10.0
Opposite Inlet	10.0-12.7	12.0
W. of Inlet to Tiana	10.3-11.3	10.5
Tiana to Triton Lane	10.4-10.6	10.5
1.5 miles out		
Tiana to Inlet	10.4-11.0	10.5
Opposite Inlet	11.0-12.0	11.8
E. of Inlet to E. end	9.8-10.4	10.0
2 miles out		
E. end to Inlet	9.8-10.0	9.9
Opposite Inlet	10.6-11.0	10.8
Inlet to Tiana	9.8-10.0	10.0
2.5 miles out		
Tiana to Inlet	10.2-10.4	10.3
Opposite Inlet	10.0-10.2	10.1
Inlet to E. end	10.0-10.3	10.2
Shinnecock by near Inlet		10.3
Sand bars	24.8-27.0	
Bay	10.8-11.5	
Shoals	13.3-17.0	
Bay E. of Ponquoque bridge		13.5
Bay W. of bridge		13.8
Sand bars	11.8-12.5	
Tiana Bay	14.0-15.1	
Bay from Tiana to Round Dune	14.6-17.5	16.0
Shallows	17.8-21.0	
West end bay		17.4
Land and water at Quoque	17.5-32.0	

Table 3 (continued)

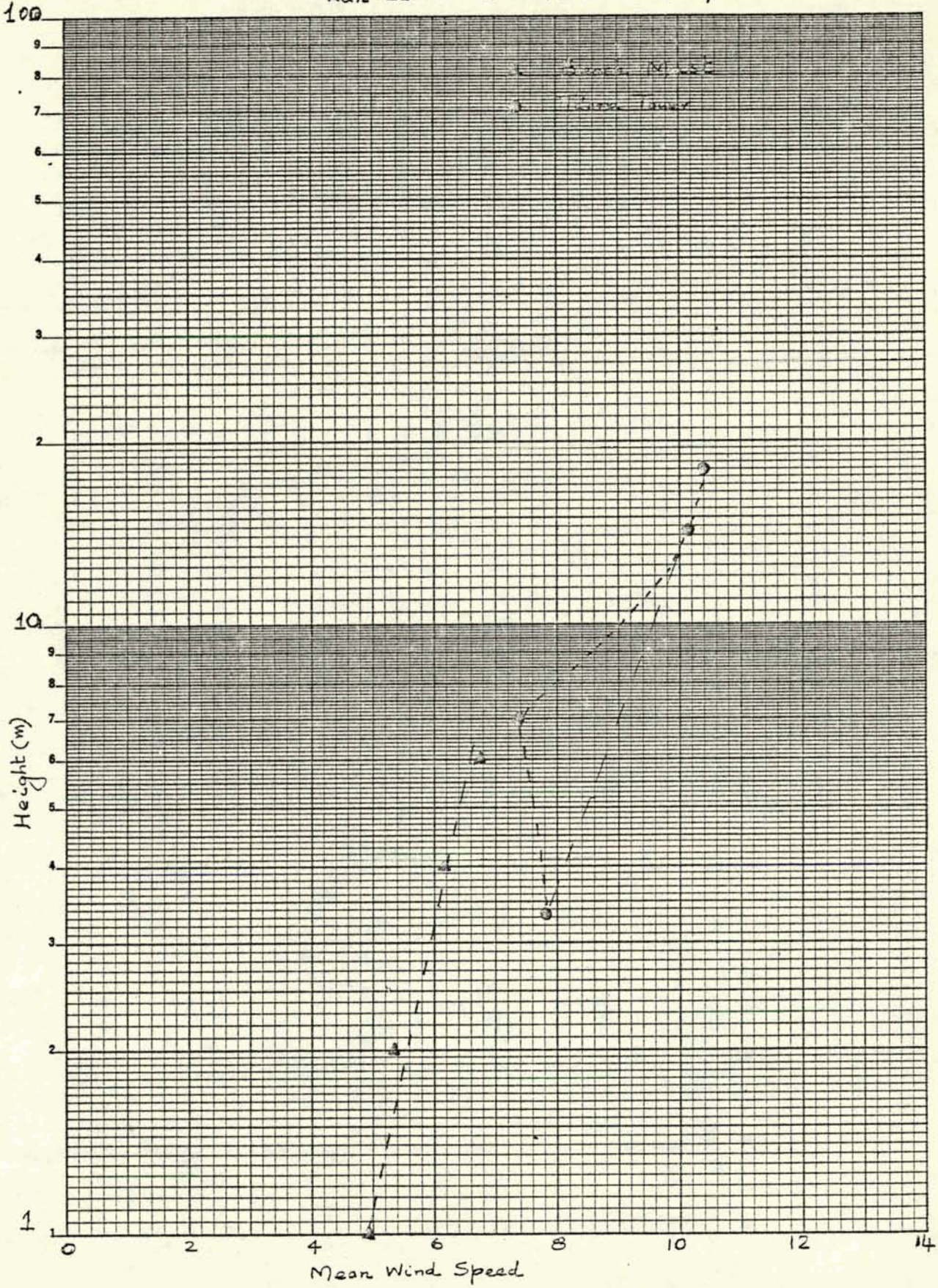
Location	Temperature (°C) Range	Mean
Quantuck Bay	17.6-18.0	17.8
Land, Westhampton	23.5-30.8	
Moneyboque Bay	17.0-17.5	
E. end Moriches Bay	16.6-17.5	17.0
Moriches Bay E. of Inlet	15.4-18.0	
Inlet to C.G. Station	14.0-14.4	
Inlet to W. end bay	16.0-16.6	16.4
Narrow Bay	16.5-17.0	16.7

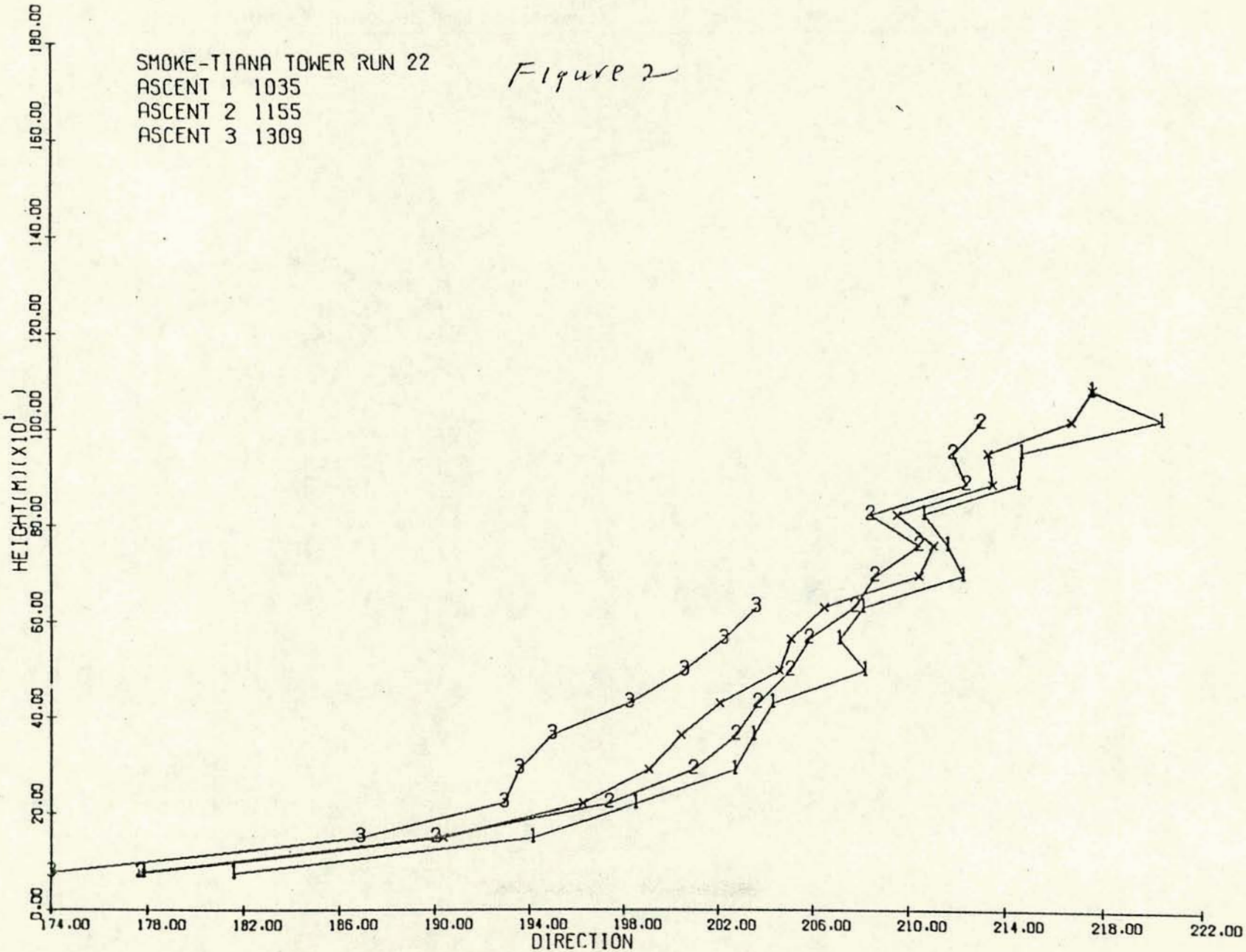
Table 4

Temperatures Aloft - Run 22 - 5-11-76

Ht. (m)	1155 Over Ocean	1210 Over Dumps	1315 Over Ocean
91	12.8		13.1
122	13.2		14.1
152	14.9	13.0	15.1
183	15.2	12.4	15.1
213	15.2	13.1	15.1
244	15.1	12.8	14.9
274	14.9	13.2	14.6
305	14.6	13.9	14.4
335	14.5	13.8	14.2
366	14.4	13.5	14.0
396	14.2	13.4	13.7
427	13.9	13.1	13.5
457	13.8	12.9	13.2
488	13.6	12.7	13.0
518	13.2	12.4	12.9
549	13.0	12.2	12.8
579	12.8	12.0	12.5
610	12.5	11.8	12.3
640	12.2	11.6	11.9
671	12.1	11.4	11.9
701	11.8	11.3	11.7
732	11.7	11.1	11.6
762	11.5	11.0	11.7

Run 22 5-11-76 Figure 1




SMOKE-TIANA TOWER RUN 22
ASCENT 1 1035
ASCENT 2 1155
ASCENT 3 1309
Figure 2
HEIGHT(M)(X10¹)
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
174.00
178.00
182.00
186.00
190.00
194.00
198.00
202.00
206.00
210.00
214.00
218.00
222.00
DIRECTION

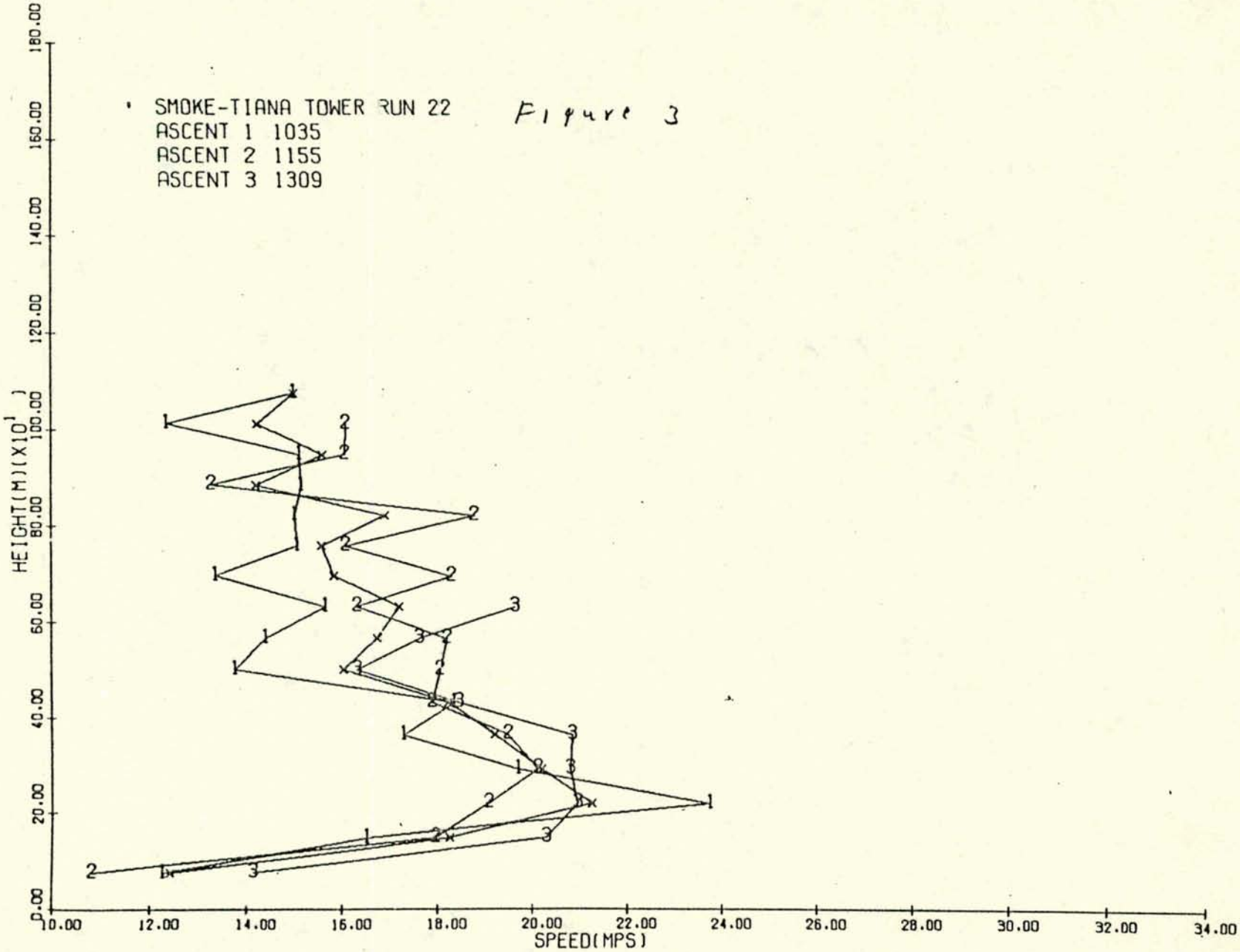

SMOKE-TIANA TOWER RUN 22
ASCENT 1 1035
ASCENT 2 1155
ASCENT 3 1309
HEIGHT(M)(X10¹)
SPEED(MPS)
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
10.00
12.00
14.00
16.00
18.00
20.00
22.00
24.00
26.00
28.00
30.00
32.00
34.00

Figure 3

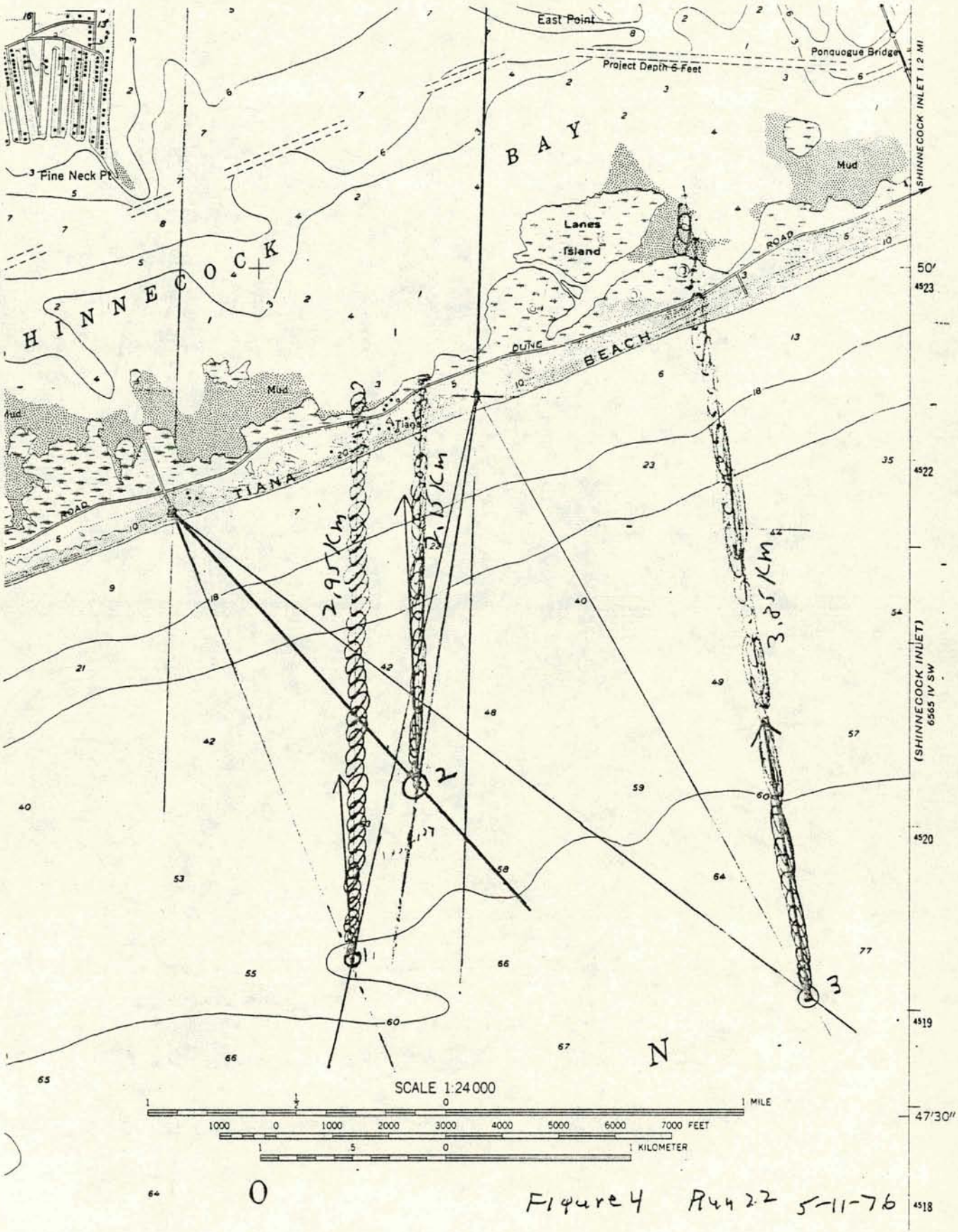
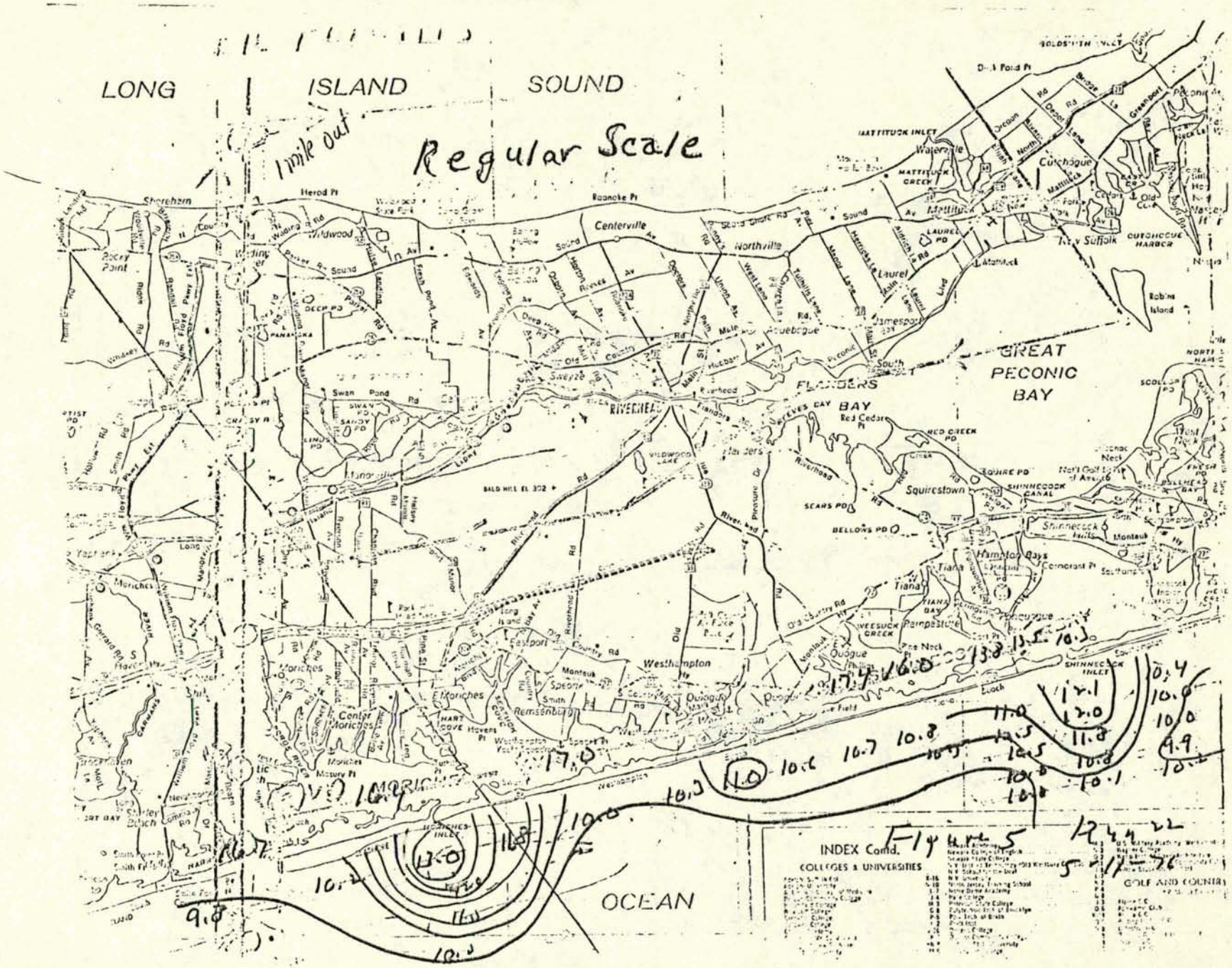
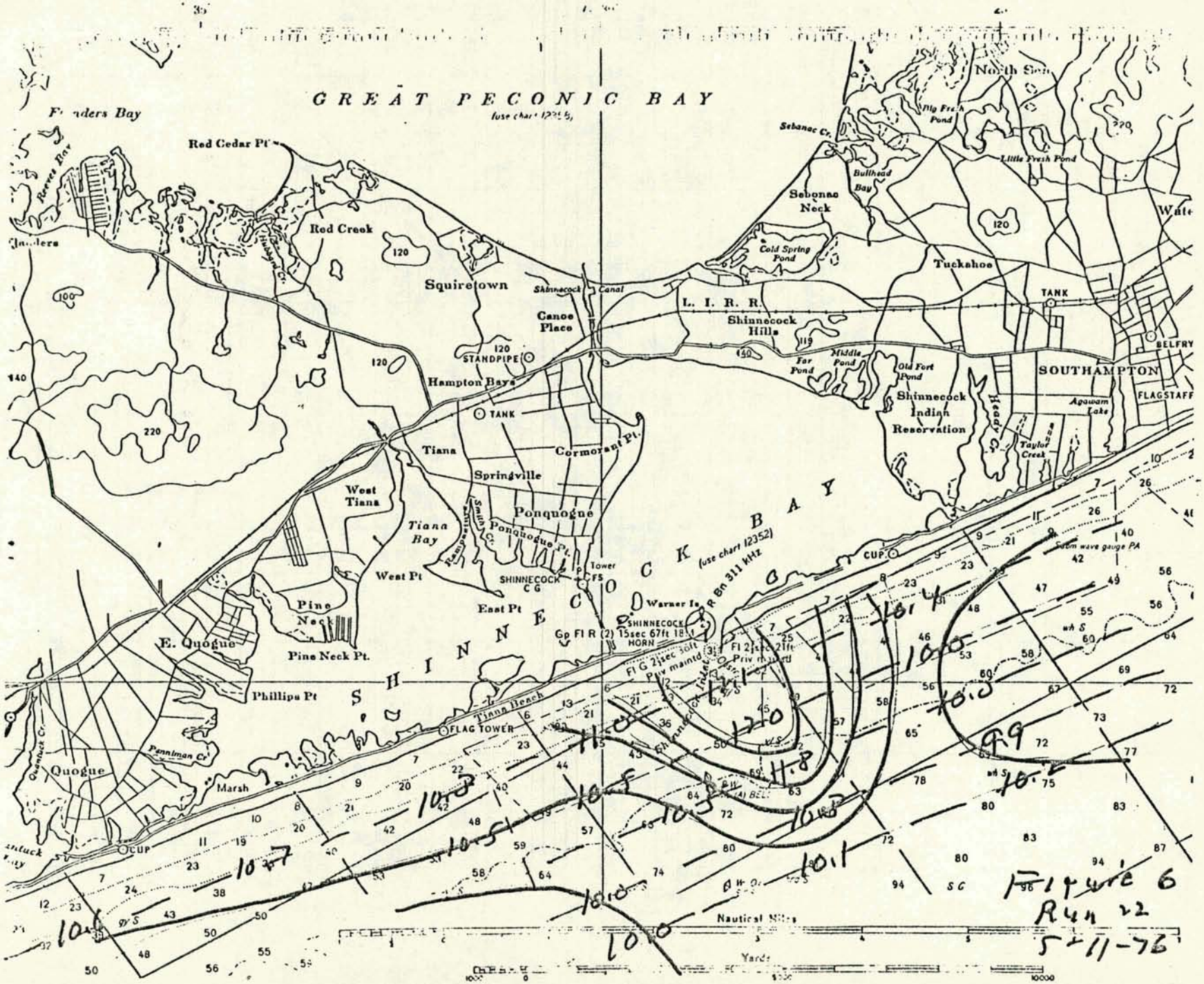
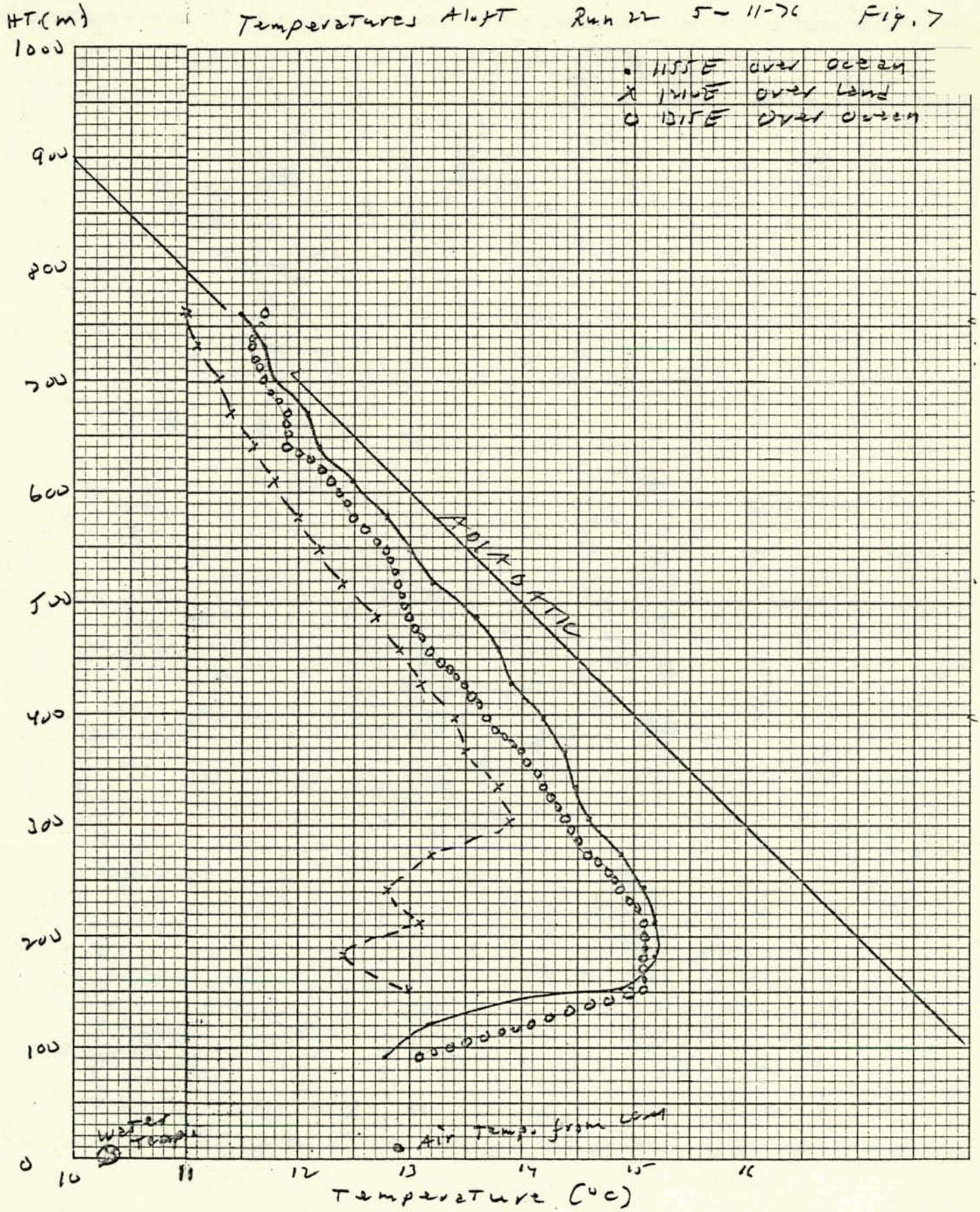


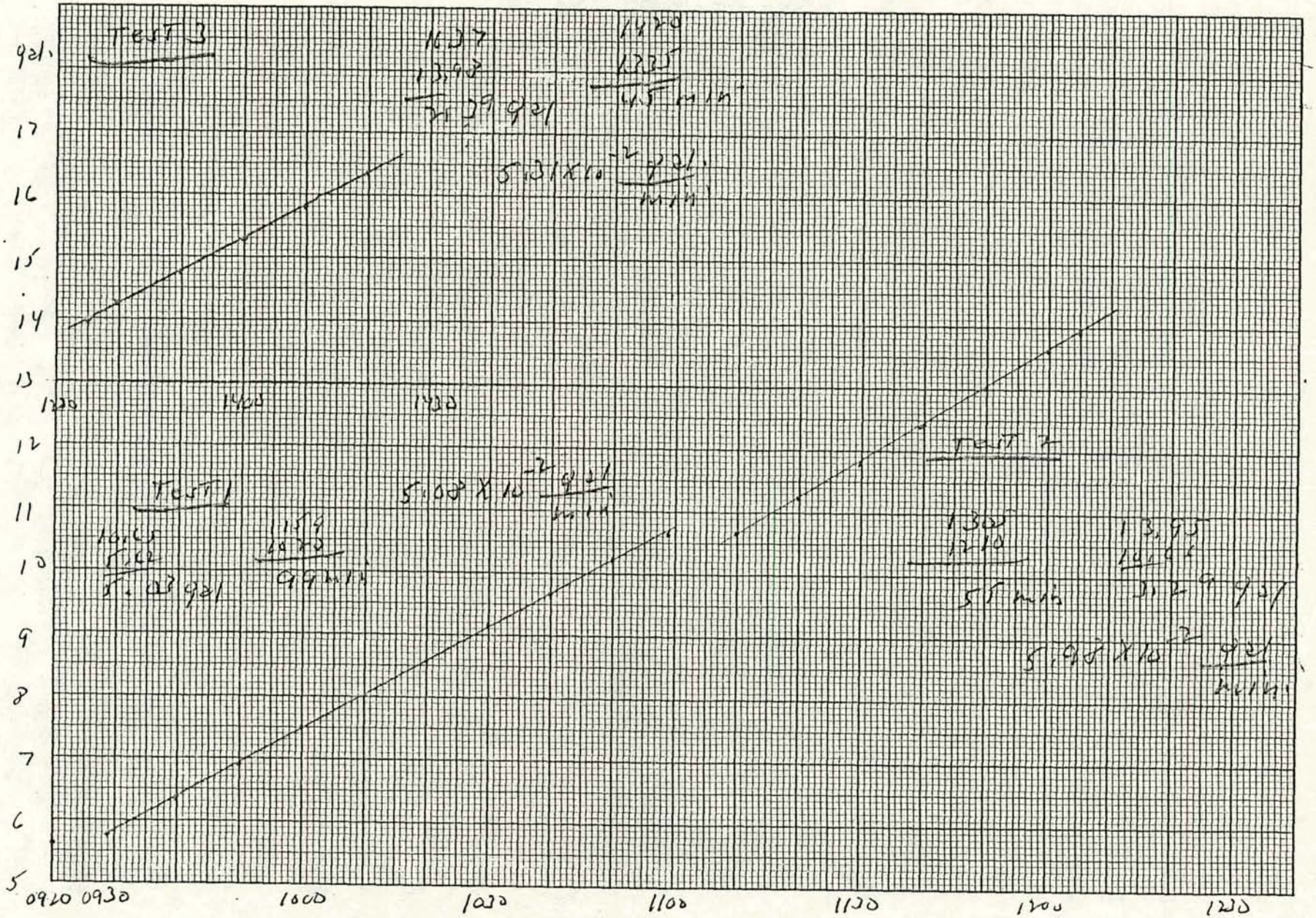
Figure 4 Run 22 5-11-76


LONG ISLAND SOUND
1 mile out
Regular Scale
GREAT PECONIC BAY
FLANDERS BAY
OCEAN
Shoreham
Wildwood
Centerville
Northville
Riverhead
Mattituck
Cutchogue
Southold
Greenport
Southampton
Westhampton
Quogue
Hampton Bays
Shinnecock Hills
Montauk
Moriches
Center Moriches
East Moriches
Remsenburg
Speonk
Eastport
Tiana
Squirestown
Robins Island
Figure 5
INDEX Cont'd.
COLLEGES & UNIVERSITIES
GOLF AND COUNTRY


GREAT PECONIC BAY
(use chart 12358)
Flanders Bay
Reeves Bay
Red Cedar Pt
Red Creek
Squiretown
Shinnecock Canal
Canoe Place
STANDPIPE
Hampton Bays
TANK
Tiana
Cormorant Pt.
Springville
Ponquogue
Ponquogue Pt.
Tiana Bay
West Tiana
West Pt
East Pt
SHINNECOCK CG
Tower
FS
Pine Neck
Pine Neck Pt.
E. Quogue
Phillips Pt
Quogue
Pennimen Cr.
Marsh
Tiana Beach
FLAG TOWER
CUP
SHINNECOCK BAY
(use chart 12352)
Warner Is.
R Bn 311 kHz
SHINNECOCK HORN
Gp Fl R (2) 15sec 67ft 18
Fl G 2sec 30ft Priv maintd
Fl 2sec 21ft Priv maintd
Sebonac Cr.
Sebonac Neck
Bullhead Bay
Cold Spring Pond
L. I. R. R.
Shinnecock Hills
Far Pond
Middle Pond
Old Fort Pond
Shinnecock Indian Reservation
Tuckahoe
TANK
North Sea
Big Fresh Pond
Little Fresh Pond
SOUTHAMPTON
BELFRY
FLAGSTAFF
Agawam Lake
Taylor Creek
Neck Cr.
Swim wave gauge PA
Nautical Miles
Yards
Figure 6
Run 22
5-11-76


HT (m)
Temperatures Aloft Run 22 5-11-76 Fig. 7
• 1155E over Ocean
X 1140E over Land
O 1315E over Ocean
ADIABATIC
Water Temps
Air Temps from LCM
1000
900
800
700
600
500
400
300
200
100
0
10
11
12
13
14
15
16
Temperature (°C)

Oil Consumption Run 22 5-11-76 Figure 8



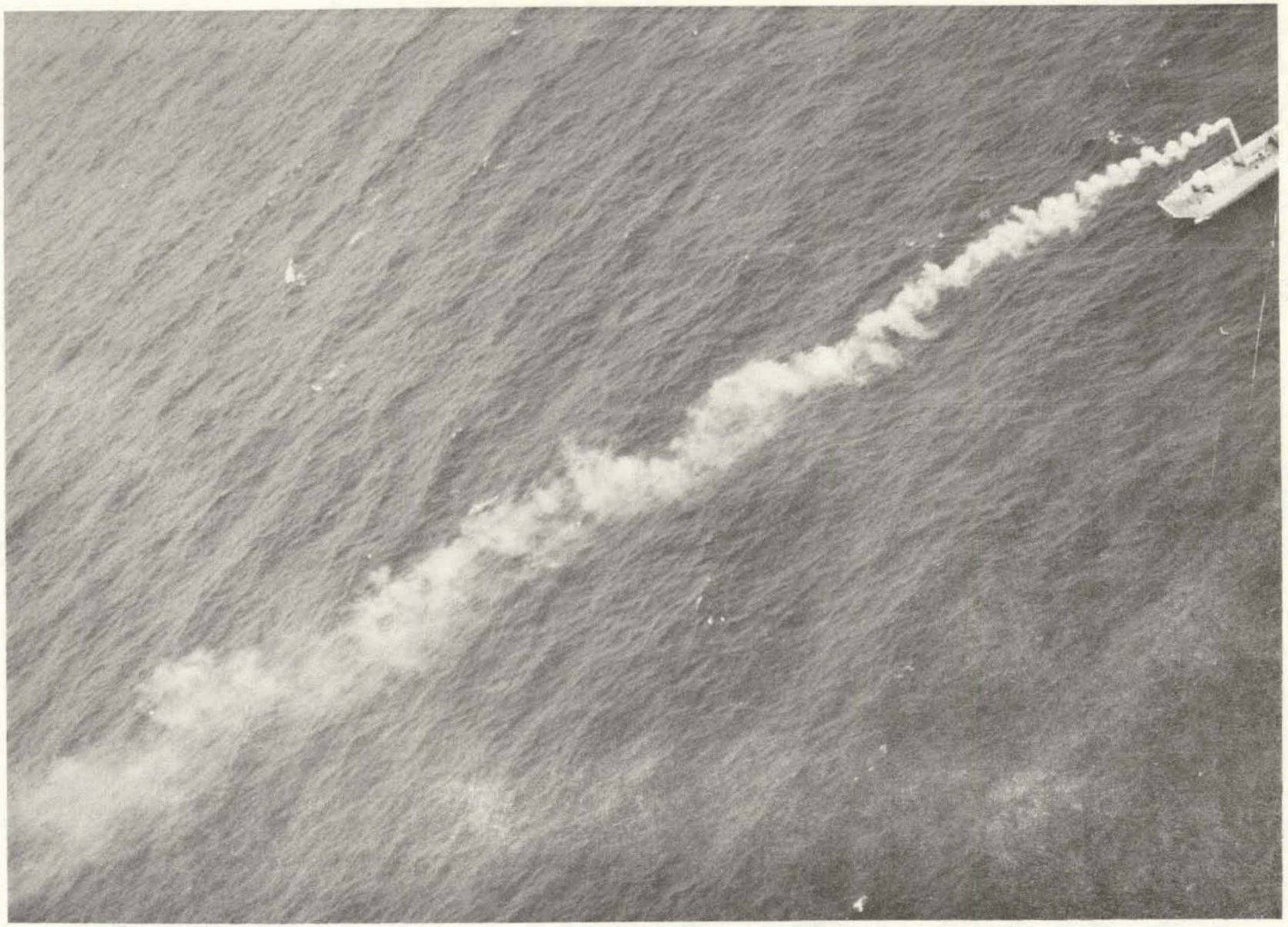
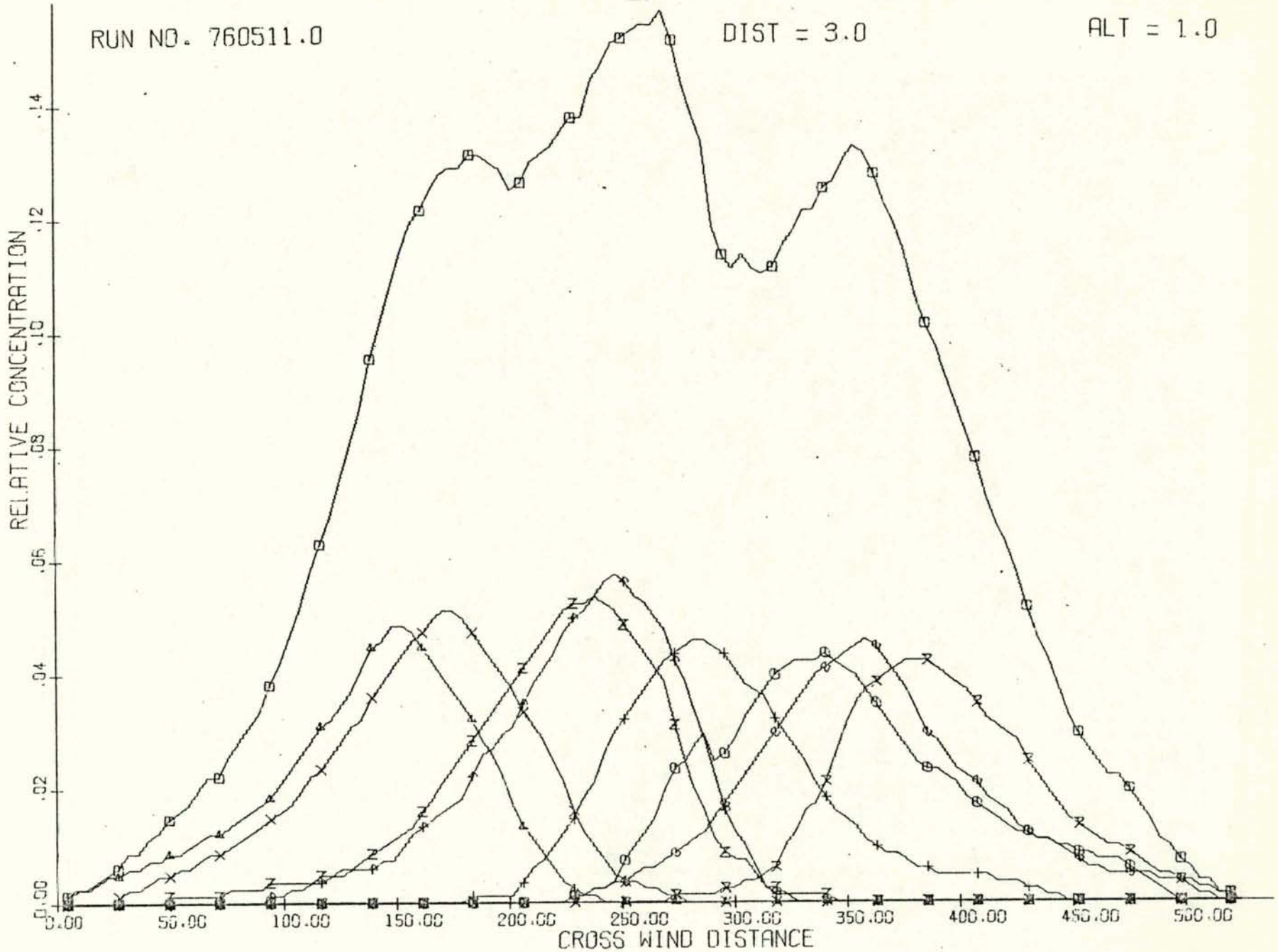
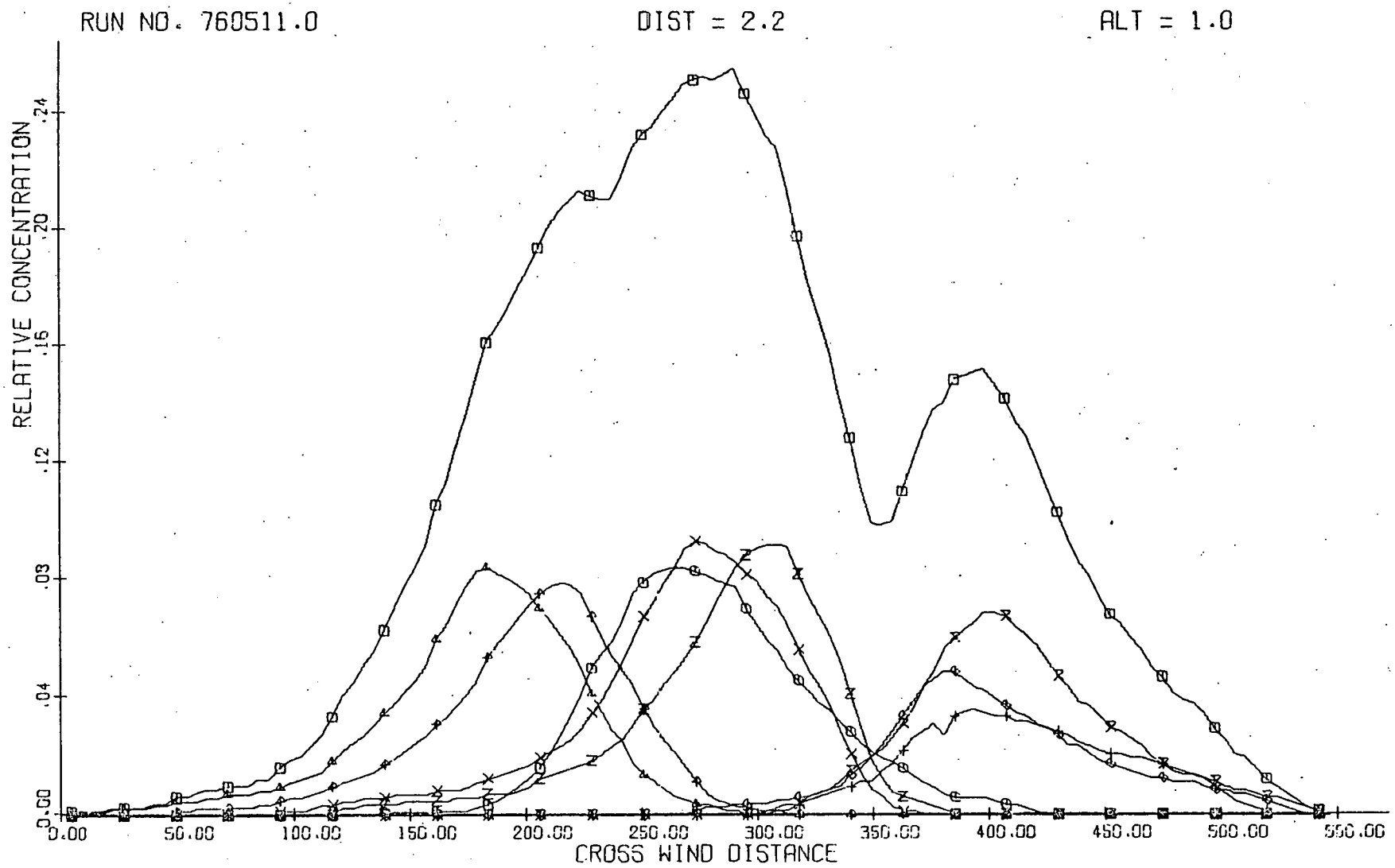
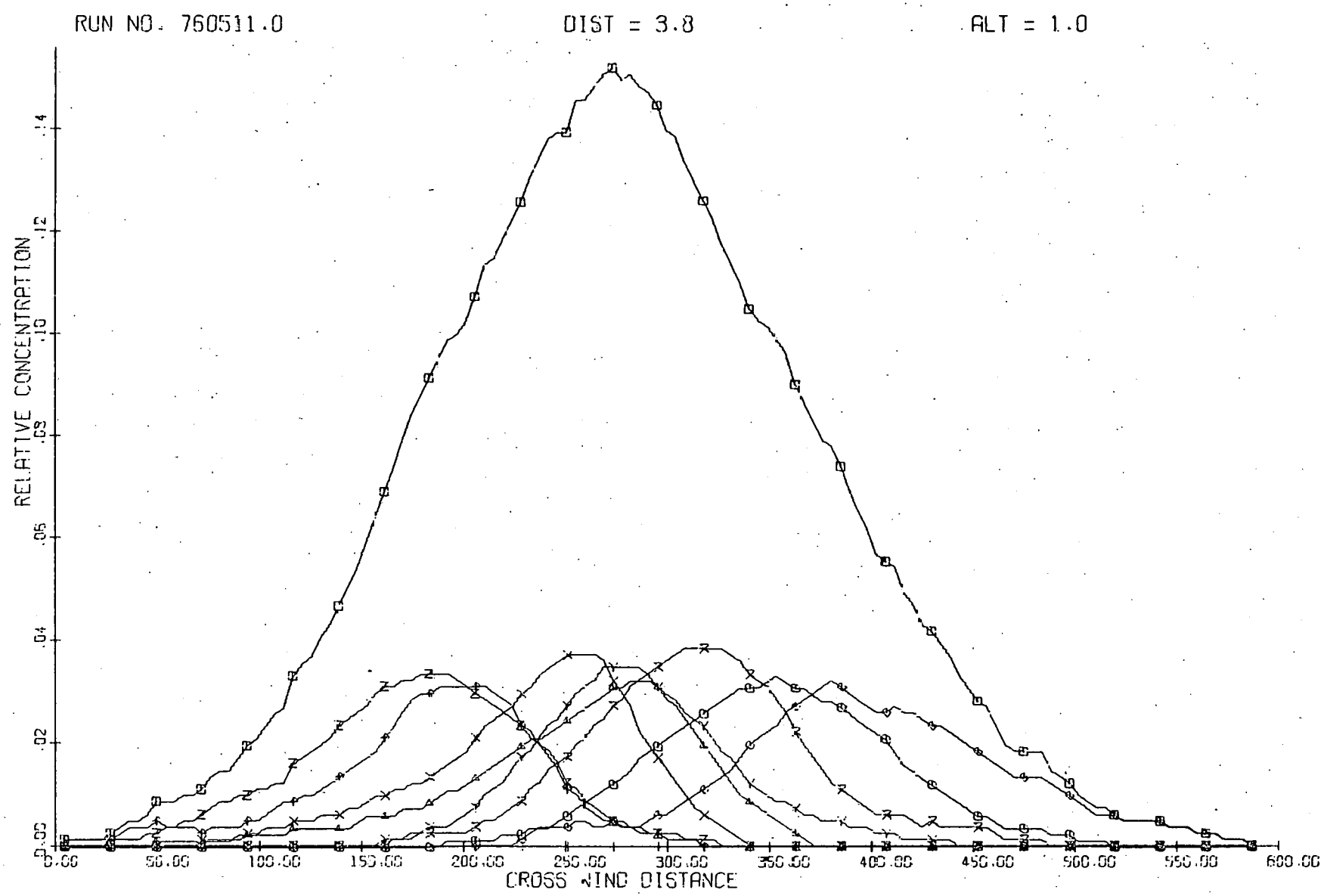


Figure 1. Aerial view of smoke plume,
Run 22, 5-11-76.

Figure 2. Aerial view of smoke plume,
Run 22, 5-11-76.


RUN NO. 760511.0
DIST = 3.0
ALT = 1.0
RELATIVE CONCENTRATION
.00
.02
.04
.06
.08
.10
.12
.14
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
450.00
500.00
CROSS WIND DISTANCE


RUN NO. 760511.0
DIST = 2.2
ALT = 1.0
RELATIVE CONCENTRATION
.24
.20
.16
.12
.03
.04
0.00
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
450.00
500.00
550.00
CROSS WIND DISTANCE


RUN NO. 760511.0
DIST = 3.8
ALT = 1.0
RELATIVE CONCENTRATION
.14
.12
.10
.08
.06
.04
.02
0.00
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
450.00
500.00
550.00
600.00
CROSS WIND DISTANCE

ON SHORE DENSITOMETER RUN FROM VAN
TRAVERSES AT ONE DISTANCE

RUN =760511./ DATE = 51176 /DISTANCE FROM STACK (KM)= 2.95
DIRECTION(DEG) = 175./TIME FROM 1010 TO 1050 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGND)
1.0	.545E+01	347.2	53.6			8.65
2.0	.480E+01	137.8	44.8			9.10
3.0	.477E+01	294.9	45.7			8.87
4.0	.539E+01	160.4	45.4			10.09
5.0	.503E+01	360.0	50.8			8.43
6.0	.556E+01	231.3	42.0			11.25
7.0	.445E+01	392.8	42.9			8.83
8.0	.557E+01	220.7	46.3			10.23
GRAND TOTAL	.410E+02	265.7	46.7	99.0	87.4	

Corrected for plume angle 45.1 95.6 84.4

ON SHORE DENSITOMETER RUN FROM VAN
TRAVERSES AT ONE DISTANCE

RUN =760511./ DATE = 51176 /DISTANCE FROM STACK (KM)= 2.15
DIRECTION(DEG) = 177./TIME FROM 1130 TO 1200 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGND)
1.0	.904E+01	280.2	44.2			17.39
2.0	.784E+01	178.1	45.0			14.83
3.0	.401E+01	413.4	44.5			7.66
4.0	.908E+01	268.3	46.4			16.63
5.0	.475E+01	403.2	48.1			8.40
6.0	.696E+01	201.4	41.5			14.28
7.0	.650E+01	412.9	42.8			12.93
8.0	.805E+01	286.2	44.3			15.43
GRAND TOTAL	.562E+02	290.4	44.6	93.4	82.0	

Corrected for plume angle 42.6 89.3 78.4

ON SHORE DENSITOMETER RUN FROM VAN
TRAVERSES AT ONE DISTANCE

RUN =760511./ DATE = 51176 /DISTANCE FROM STACK (KM)= 3.85
DIRECTION(DEG) = 170./TIME FROM 1253 TO 1325 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BK*WD)
1.0	.454E+01	353.4	56.7			6.82
2.0	.393E+01	254.6	59.0			5.66
3.0	0.	-0.0	-0.0			-0.00
4.0	.406E+01	233.1	50.3			6.86
5.0	.465E+01	401.1	66.8			5.92
6.0	.363E+01	182.8	54.4			5.67
7.0	.485E+01	315.4	53.7			7.67
8.0	.439E+01	177.0	53.1			7.04
9.0	.385E+01	285.1	47.7			6.87
GRAND TOTAL	.339E+02	279.8	55.7	93.5	75.1	
Corrected for plume angle			54.9	92.1	74.0	

Run No. 23
June 4, 1976

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: 8-27-76

TO: Files

FROM: G. S. Raynor

SUBJECT: Run 23

Smoke run no. 23 was held on June 4, 1976. Skies were clear at first with scattered altocumulus appearing at 1110. A large high was centered north of New England and extended over the whole northeast. At Shinnecock Inlet, tide was low at 0504 and 1727 and high at 1141. Thus, it changed from incoming to outgoing during the run. Waves were small, from 1-2 feet, but increased somewhat during the afternoon.

The Aerovane wind direction was 120-130° until 1435 when it changed to 135°. Speeds were 5-6 mps. Gustiness was on the boundary between wide D and narrow B_1.

Eastern standard time is used in this report.

Personnel left BNL at 0810 and 0835. They arrived at Tiana at 0910. The LCM left the Inlet about 1010. Argonne personnel were conducting balloom dispersion experiments at Tiana.

Tiana was manned by Brown, Raynor, SethuRaman, Dieterle and McNeil. Cup anemometers were mounted at heights of 3.4, 7.0, 10.7, 14.3, 18.0 and 23.5 m on the tower and heights of 1, 4, 4, 6, 8 and 10 m on the 10-m mast which was located about 12 m from and 1 m above the water on a small step-like rise. The 23.5 m anemometer failed to work because of a bad wire. The 10.7 m anemometer also failed to give usable data. Anemometer data were started at 1020.

The Aerovane, MRI bivane and Weathermeasure RH probe were mounted at 23.5 m. The bivane and RH probe were recorded on the Lockheed tape recorder from 1120 - 1415. Tower temperatures were not recorded but were observed at 1100 and 1130. A pibal was taken at 1417.

The LCM was manned by Jahnig and Carlson. Test smoke was started at 1316. It was not started earlier because of the shallow angle between the wind and the beach. The LCM anchored at 1320 and made smoke until 1443. A set of traverses was made along Dune Road from 1408 to 1435 with the LCM in the position shown in Figure 1. Pictures of the plume were taken from the beach and from the air. The plume was smooth edged, low to the water and somewhat uneven on top. After the smoke run was finished, the LCM was used for balloon releases for the Argonne experiments.

Files
G. S. Raynor
Run 23 8-27-76

The Cessna 172 was manned by S. Fink. Infrared thermometer measurements were taken from the airport to the ocean and parallel to the coast at 0.5 miles out from Mastic to Southampton. Traverses were then made opposite Shinnecock Inlet every half mile from 0.5 to 2.5 miles out. On the return trip, a pass was made over the bays.

Temperature spirals were taken from 30 - 762 m over the ocean and from 152 - 762 m inland. Later, they were taken at 4 locations along a line from Sag Harbor to south of Bridgehampton.

No variometer data were obtained since the string tail failed to keep the instrument level.

Water temperature was 13.2°C at 2 miles out and 14.4 and 14.5 at 0.75 miles out. Temperatures on the tower at 1100 and 1130 respectively were: 10.7 m, 14.70 and 14.49°C; 18.0 m, 14.83 and 14.41°C; 23.5 m, 14.96 and 14.61°C.

Anemometer data are tabulated in tables 1 and 2 and plotted in Figure 2. The tower profile is believed due to the beach and dunes upwind of the tower.

Pibal data are shown in Figures 3 and 4. Direction became more easterly with height while speed showed a maximum below 150 m.

Lowe-level and water temperatures are plotted in Figure 5. However, they are all nearly instantaneous values and not necessarily representative of longer periods.

Temperatures aloft are tabulated in table 3 and plotted as profiles in Figure 6. A small inversion was present over the ocean with slightly stable lapse rates above about 200 m. The temperature cross section across the south fork is shown in Figure 7. The small inversion disappears inland while heating over the land is evident.

The IR water temperature data are tabulated in table 4 and plotted, for the Inlet area, in Figure 8. Coldest temperatures were centered south of the Inlet with warm water both east and west.

Oil consumption was about normal although only one generator was operative. Data are plotted in Figure 9.

The run was ended at 1455. Personnel left Tiana at 1558.

In summary, the small low level inversion was enough to give a stable plume. This is one of the few runs with a SE wind although the angle to the beach was too shallow for best densitometer data.

GSR/lk
attach.

TABLE I

FIVE MINUTE MEAN WIND SPEEDS (M/SEC)

DATE=760604 JDA=923 SITE=[illegible] START TIME=1020

HEIGHT(M)

EST	3.75	7.00	14.30	18.00
1020	5.02	5.84	6.03	6.17
1025	4.94	5.71	5.80	6.00
1030	4.99	6.09	6.23	6.46
1035	5.14	5.99	6.16	6.39
1040	5.05	5.80	6.04	6.31
1045	5.09	6.02	6.25	6.23
1050	5.26	6.00	6.22	6.40
1055	4.97	5.56	5.30	6.00
1100	4.91	5.73	5.07	6.27
1105	4.80	5.35	5.68	6.04
1110	4.51	5.09	5.47	5.69
1115	4.85	5.46	5.73	5.95
1120	4.65	5.20	5.63	5.84
1125	4.29	4.91	5.11	5.34
1130	4.03	4.49	4.87	5.09
1135	4.31	4.96	5.20	5.48
1140	4.27	4.97	5.18	5.42
1145	4.36	4.88	5.13	5.37
1150	4.14	4.66	4.85	5.05
1155	4.49	5.03	5.25	5.41
1200	4.54	5.14	5.36	5.55
1205	4.14	4.60	4.73	4.93
1210	4.12	4.46	5.07	4.77
1215	4.17	4.79	4.84	5.01
1220	4.10	4.24	4.94	5.12
1225	4.28	5.16	5.14	5.37
1230	4.32	5.06	5.21	5.48
1235	4.28	4.76	4.83	5.13
1240	4.44	5.09	5.27	5.56
1245	4.24	4.71	4.88	5.14
1250	4.07	4.65	4.74	5.14
1255	4.09	4.94	4.97	5.33
1300	3.67	4.53	4.52	4.91
1305	3.52	4.84	4.71	5.22
1310	3.92	5.02	4.93	5.44
1315	4.11	5.07	5.02	5.51
1320	4.17	5.06	4.98	5.49
1325	4.07	5.15	5.12	5.74
1330	4.00	5.30	5.30	5.57
1335	4.33	5.31	5.25	5.79
1340	4.54	5.20	5.30	5.63
1345	4.36	4.95	5.19	5.34
1350	4.39	4.52	4.86	4.58
1355	4.49	4.76	4.95	5.04
1400	4.21	4.43	5.09	4.52
1405	4.19	4.54	4.80	4.86
1410	4.44	5.01	5.45	5.51
1415	4.16	4.71	5.04	5.06
1420	3.42	3.72	4.02	4.04
1425	3.38	3.64	4.09	4.23
1430	4.33	4.74	4.93	5.03
1435	4.51	4.93	5.13	5.39
1440	4.04	4.63	5.00	5.21
1445	3.65	4.35	4.77	4.90
RUN MEAN	4.25	5.01	5.20	5.43

cont'd

TABLE 2

FIVE MINUTE MEAN WIND SPEEDS (M/SEC)

DATE=760604 RUN=023 SITE=BEACH MAST START TIME=1020

	HEIGHT(M)			
EST	1.00	2.00	4.00	6.00
1020	3.05	4.69	4.93	4.97
1025	3.01	4.72	4.83	4.89
1030	3.15	5.01	5.07	5.13
1035	3.19	5.05	5.07	5.13
1040	3.06	4.71	4.94	4.97
1045	3.14	4.80	4.99	5.16
1050	3.22	4.95	5.07	5.20
1055	3.03	4.56	4.90	4.90
1100	3.19	4.62	4.98	5.11
1105	3.15	4.36	4.95	5.00
1110	2.92	4.08	4.61	4.73
1115	3.00	4.09	4.77	4.92
1120	3.06	3.94	4.71	4.81
1125	2.82	3.40	4.30	4.37
1130	2.81	3.10	4.30	4.39
1135	2.91	3.43	4.40	4.51
1140	2.95	3.58	4.42	4.48
1145	2.86	3.85	4.43	4.44
1150	2.73	3.47	4.19	4.20
1155	2.89	4.02	4.45	4.53
1200	2.88	4.18	4.53	4.55
1205	2.53	3.66	4.07	4.11
1210	2.71	3.89	4.14	4.12
1215	2.64	3.87	4.14	4.15
1220	2.84	4.19	4.50	4.47
1225	2.85	4.14	4.39	4.42
1230	2.89	4.20	4.45	4.39
1235	2.69	3.98	4.26	4.27
1240	2.89	4.24	4.52	4.58
1245	2.83	4.04	4.30	4.27
1250	2.56	3.70	3.93	3.94
1255	2.62	3.87	4.10	4.20
1300	2.50	3.66	3.87	3.96
1305	2.64	3.85	3.98	4.16
1310	2.70	3.96	4.15	4.18
1315	2.81	4.17	4.42	4.51
1320	2.75	4.05	4.29	4.39
1325	2.81	4.18	4.42	4.52
1330	2.93	4.31	4.60	4.67
1335	2.89	4.25	4.49	4.52
1340	2.94	4.29	4.47	4.56
1345	2.69	3.89	4.04	4.13
1350	2.51	3.56	3.71	3.83
1355	2.78	3.94	3.98	4.00
1400	2.45	3.46	3.57	3.63
1405	2.55	3.54	3.75	3.81
1410	2.72	3.91	4.16	4.20
1415	2.65	3.76	4.03	4.04
1420	2.21	3.09	3.17	3.20
1425	2.18	3.01	3.15	3.25
1430	2.67	3.69	3.89	3.94
1435	2.74	3.93	4.06	4.05
1440	2.52	3.47	3.65	3.75
1445	2.39	3.44	3.52	3.62
1450	2.06	2.96	3.02	3.14
RUN MEAN	2.74	3.99	4.24	4.35

60604 023 TIME TOTS 620 1320 4.54

Table 3

Temperatures Aloft - Run 23 - 6-4-76

Ht. (m)	1124E Over Ocean	1132E Over Dumps	1245E Sag Harbor	1251E Long Pond	1256E Bridge-hampton	1304E Over Ocean
30	13,6					
61	14.6					
91	14.8					
122	14.8					
152	14.7	14.9	16.2	16.8	15.8	15.4
183	14.7	14.6	16.1	16.7	15.6	15.6
213	14.7	14.5	15.7	16.7	15.6	15.4
244	14.6	14.4	15.5	15.7	15.3	15.2
274	14.4	14.0	15.3	15.5	15.3	14.8
305	14.2	14.0	15.0	15.5	14.8	14.5
335	13.9	13.6	14.7	15.3	14.6	14.2
366	13.7	13.1	14.4	14.9	14.4	14.0
396	13.6	12.9	14.4	14.5	14.3	13.9
427	13.2	12.7	14.2	14.3	14.2	13.8
457	13.0	12.6	13.8	14.0	13.8	13.6
488	12.7	12.3	13.4	13.7	13.6	13.4
518	12.5	12.3	13.2	13.2	13.3	13.0
549	12.3	11.8	12.9	13.1	13.1	12.8
579	12.1	11.8	12.6	12.8	12.8	12.5
610	11.9	11.3	12.4	12.6	12.5	12.3
640	11.5	11.1	12.0	12.3	12.3	12.1
671	11.3	10.8	11.9	12.2	12.0	11.9
701	11.1	10.6	11.5	11.8	11.8	11.7
732	10.9	10.3	11.2	11.5	11.5	11.5
762	10.7	10.3	11.0	11.2	11.3	11.2

Table 4
IR Measurements - Run 23 - 6-4-76

Location	Range(°C)	Mean(°C)
Sunrise Hwy to Bay	20.6-39.8	29.0
Narrow Bay	18.4-18.8	18.6
Beach	24.2-33.4	
Ocean S. of Mastic	13.5-14.2	13.8
0.5 miles out		
Mastic - Moriches Inlet	14.0-15.6	15.0
Moriches Inlet - W. groin	14.0-14.4	14.2
W. groin - W. bridge	14.3-14.6	14.4
W. bridge - Quogue bridge	14.5-15.0	14.8
Quogue bridge - Tiana	14.5-15.0	14.7
Tiana - Ponquogue	13.5-15.4	14.8
Ponquogue - Shinnecock Inlet	13.4-13.6	13.5
Inlet - E. end bay	13.5-14.0	13.8
1 mile out		
E. end bay - Inlet	13.4-14.0	13.5
Inlet-Tiana	13.0-14.0	13.5
1.5 miles out		
Tiana - Inlet	12.7-14.6	13.0
coldest to east, warming just east of Tiana		
Inlet - E. end	12.8-13.2	12.0
2 miles out		
E.end - Inlet	12.5-13.2	13.0
	coldest at Inlet	
Inlet-Tiana	12.6-13.4	13.0
	warmest at Tiana	
2.5 miles out		
Tiana - Inlet	12.7-13.6	12.9
	warmest at Tiana	
Inlet - E. end	12.7-13.0	12.9
	coldest at Inlet	
Beach		38.5
E. end Shinnecock Bay	15.0-16.0	15.5
Bay opposite inlet	13.6-14.0	13.8
E. of Ponquogue bridge	15.5-16.0	15.8
W. of " "	13.5-16.4	14.0
Center of bay	16.4-18.5	17.5
W. end bay	18.0-19.0	18.5
land at Quogue	21.0-38.0	30.0
Quantuck Bay	18.4-18.8	18.6
Moneybogue Bay		18.7
E. end Moriches Bay	17.5-21.0	18.5
E. of and opposite C. G. Station	15.0-18.5	17.0
E. of Inlet		13.6
Just W. of Inlet		19.0
W. end bay	16.5-18.0	17.5
Narrow Bay		18.0
Land to Airport	19.5-35.5	26.0

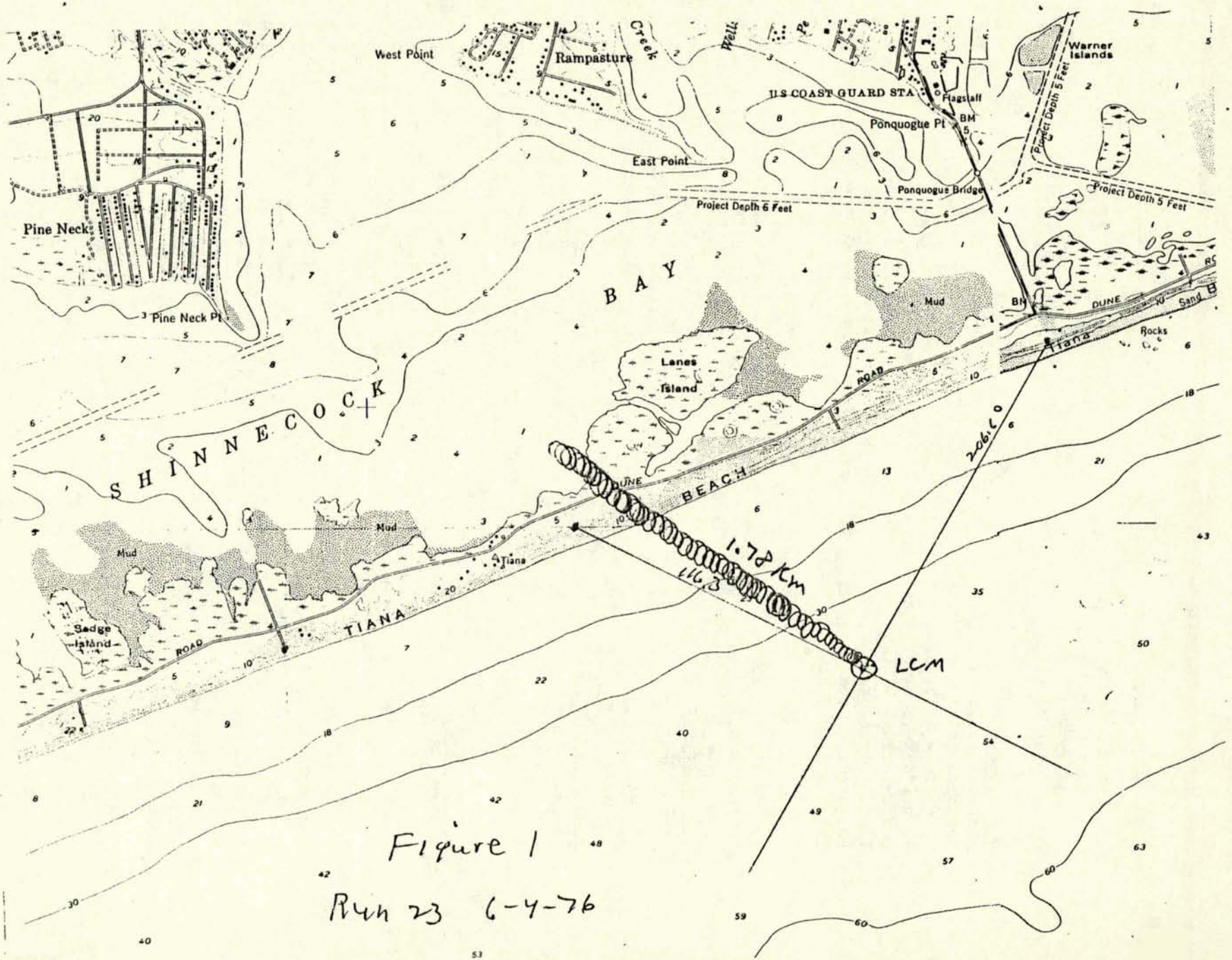


Figure 1

Run 23 6-4-76

Run 23 June 4, 1976 Figure 2

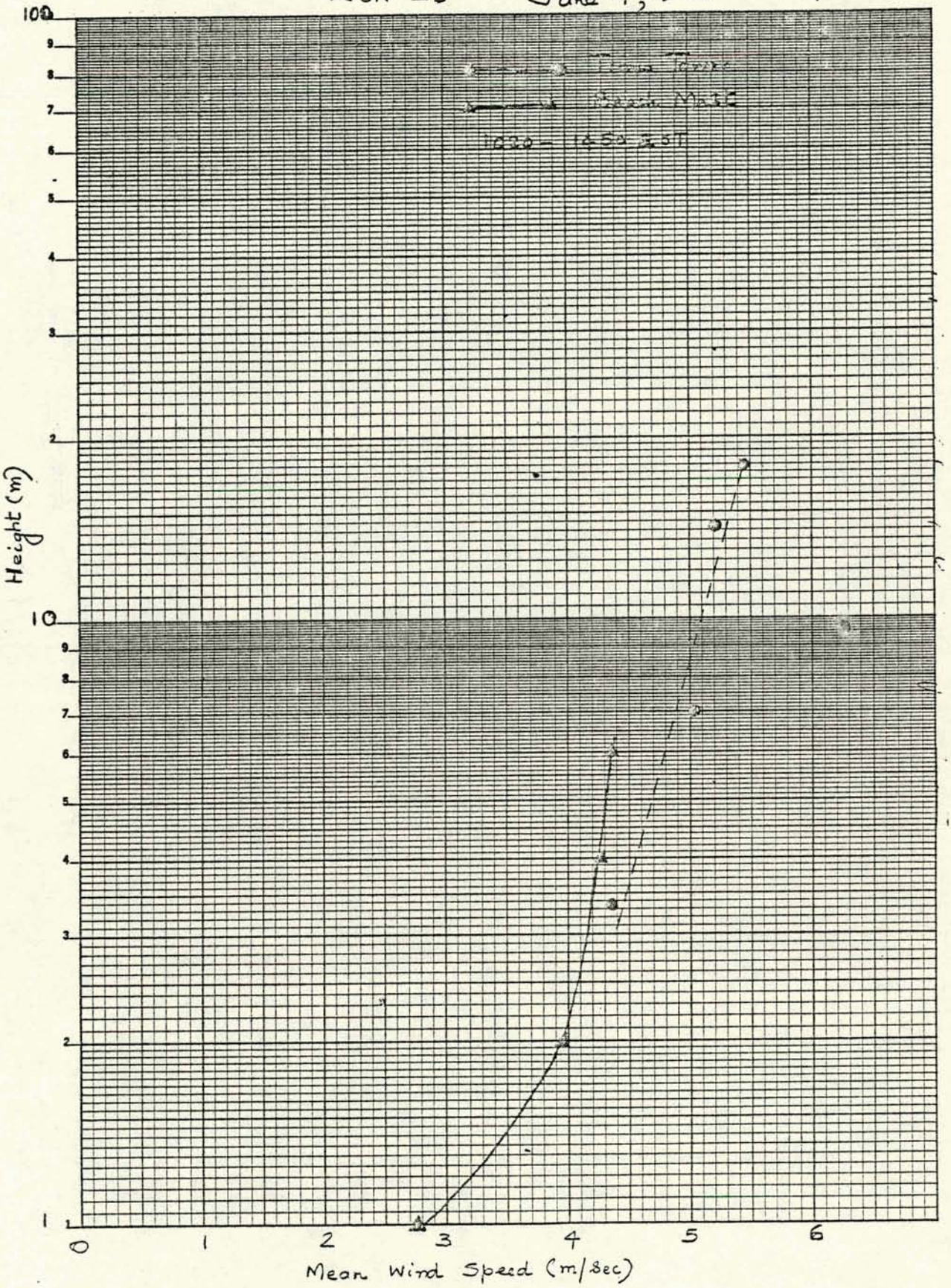


FIGURE 3

SMOKE-TIANA BEACH RUN 23

YEAR 76 MONTH 6 DAY 4 RELEASE TIME 1417 EST ASCENT NO.01

SITE 1 STATION HEIGHT 10.M

ORIGINAL NO OF PTS= 16

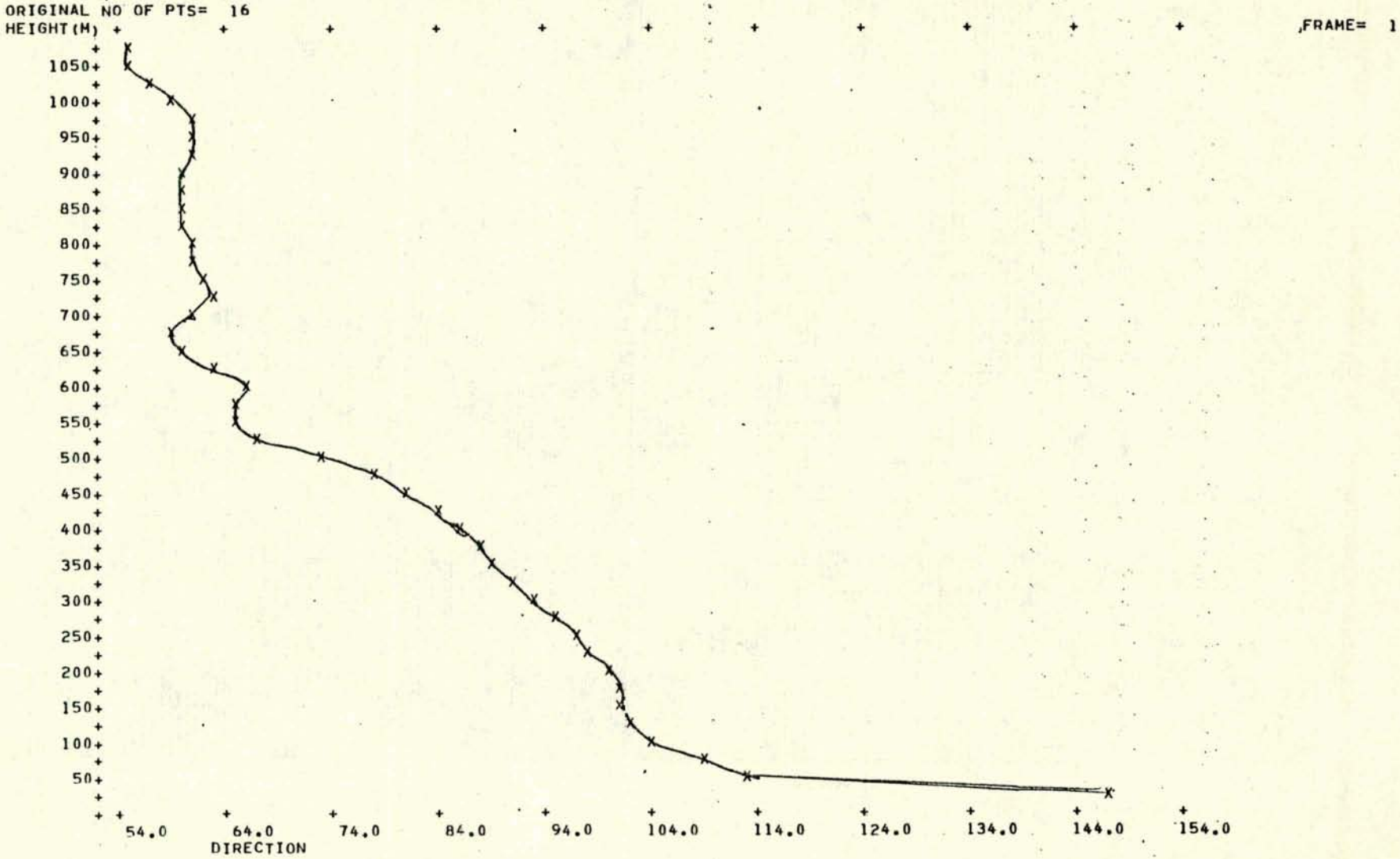


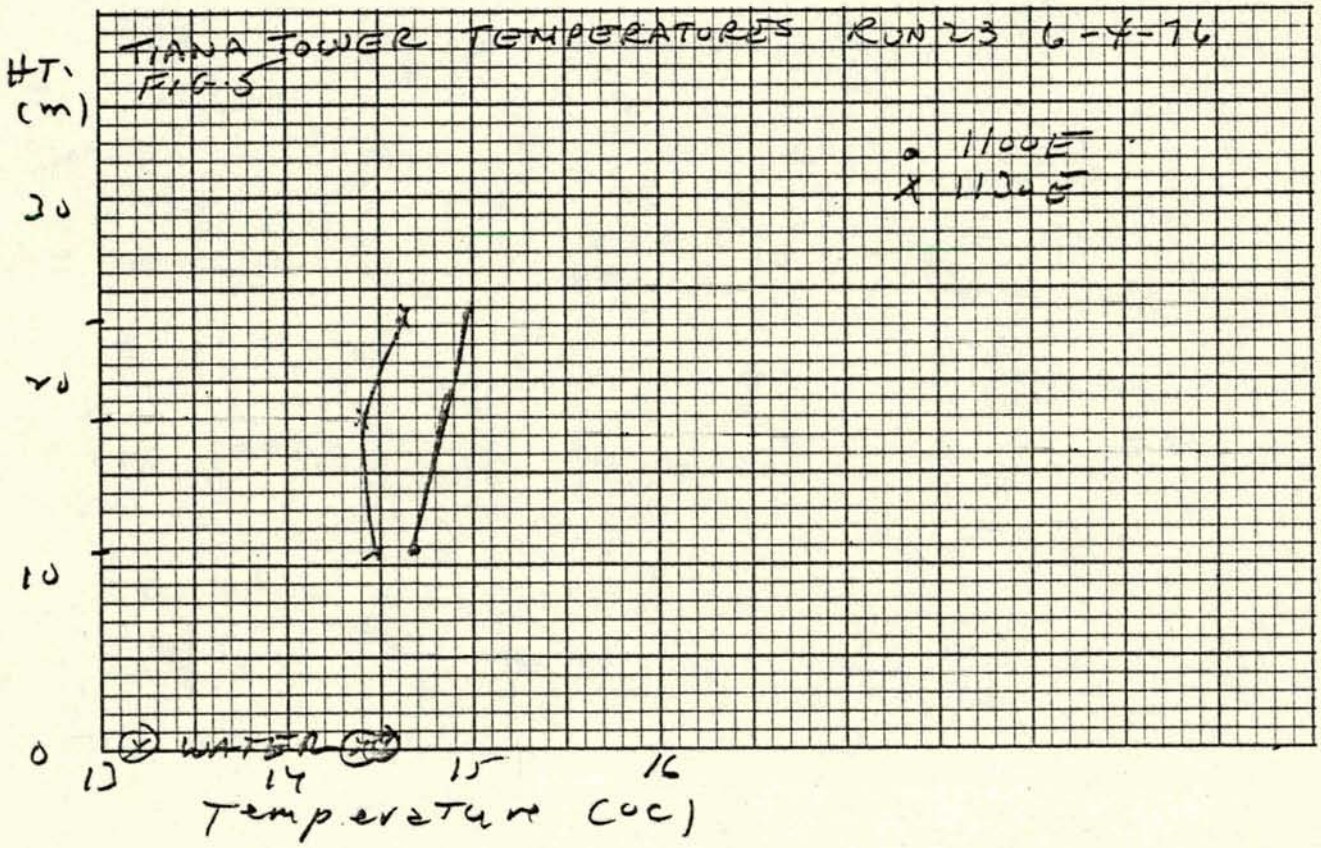
FIGURE 4

SMOKE-TIANA BEACH RUN 23

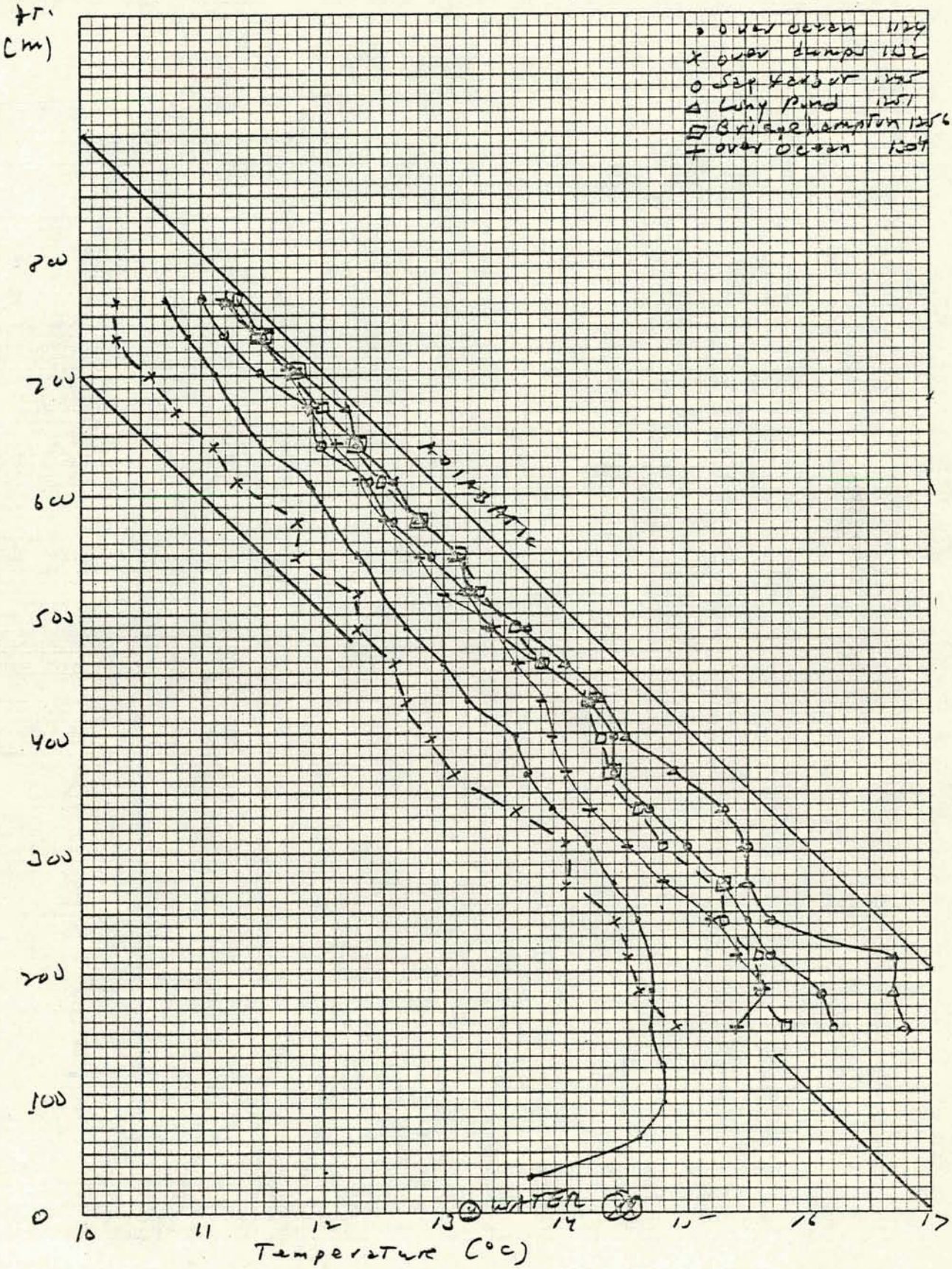
YEAR 76 MONTH 6 DAY 4 RELEASE TIME 1417 EST ASCENT NO.01 SITE 1 STATION HEIGHT 10.M

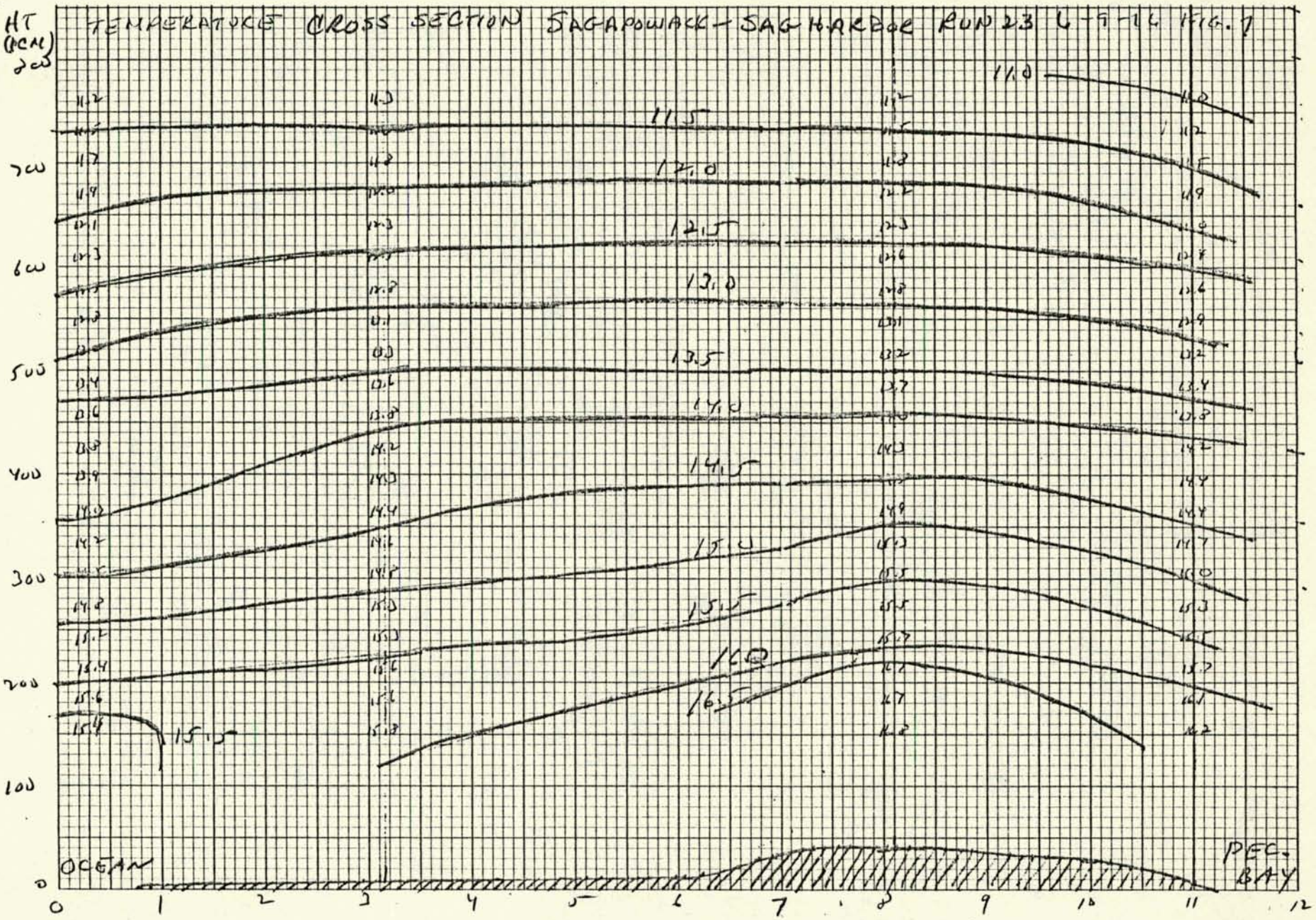
ORIGINAL NO OF PTS= 16

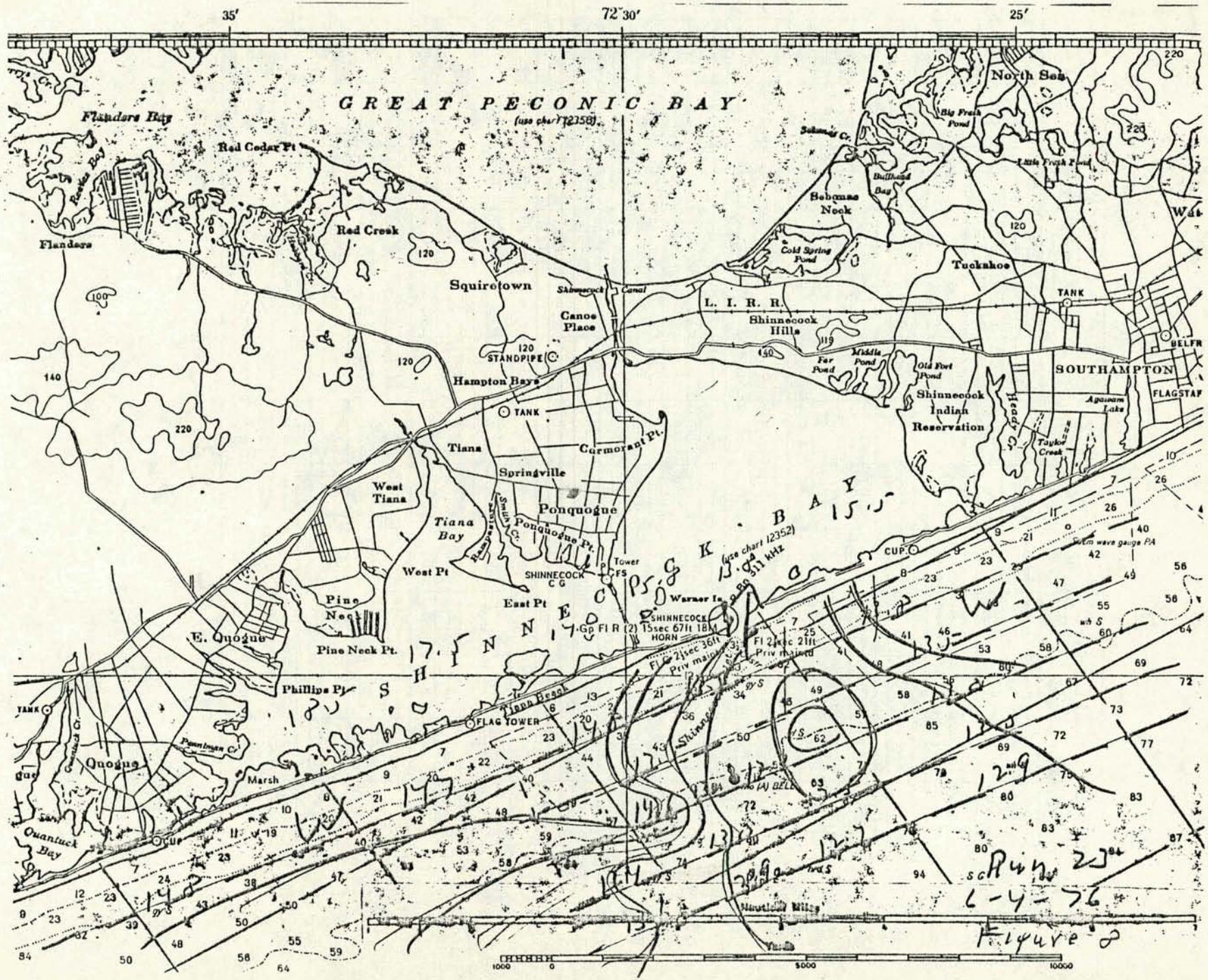
FRAME= 1


TIANA TOWER TEMPERATURES RUN 23 6-4-76
FIG. 5
HT. (m)
30
20
10
0
1100E
1130E
WATER
13
14
15
16
Temperature (°C)

Temperatures Aloft Run 23 6-4-x Figure 6




TEMPERATURE CROSS SECTION SAGAPONACK - SAG HARBOR RUN 23 6-9-66 FIG. 7
HT (CM)
200
100
0
OCEAN
PEC. BAY
11.0
11.5
12.0
12.5
13.0
13.5
14.0
14.5
15.0
15.5
16.0
16.5
0
1
2
3
4
5
6
7
8
9
10
11
12


35′
72°30′
25′
GREAT PECONIC BAY
(use chart 12358)
Flanders Bay
Red Cedar Pt
Flanders
Red Creek
Squiretown
Canoe Place
Shinnecock Canal
STANDPIPE
Hampton Bays
TANK
Tiana
Cormorant Pt.
Springville
West Tiana
Tiana Bay
Ponquogue
Ponquogue Pt.
West Pt
East Pt
SHINNECOCK CG
Tower
FS
Pine Neck
Pine Neck Pt.
E. Quogue
Phillips Pt
Quogue
Marsh
Quantuck Bay
CUP
FLAG TOWER
Tiana Beach
Warner Is.
SHINNECOCK
HORN
Fl R (2) 15sec 67ft 18M
Fl 2sec 36ft
Priv maintd
Fl 2sec 21ft
Priv maintd
(use chart 12352)
511 kHz
Shinnecock Inlet
Nautical Miles
1000
0
5000
10000
North Sea
Big Fresh Pond
Little Fresh Pond
Sebonac Neck
Bullhead Bay
Cold Spring Pond
Tuckahoe
L. I. R. R.
Shinnecock Hills
Far Pond
Middle Pond
Old Fort Pond
Shinnecock Indian Reservation
Agawam Lake
Taylor Creek
SOUTHAMPTON
FLAGSTAF
BELFR
TANK
Run 23
6-4-76
Figure 8

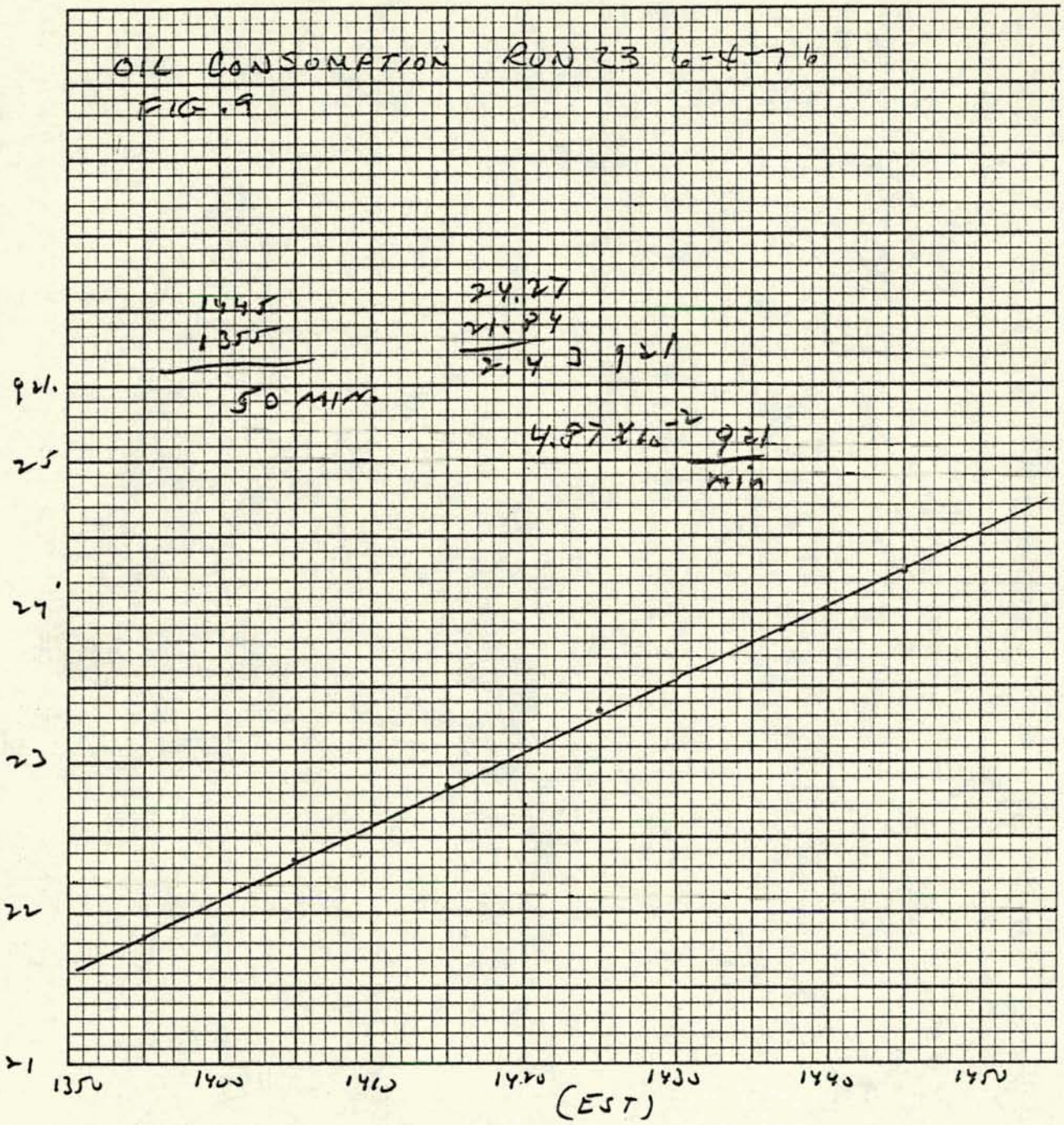
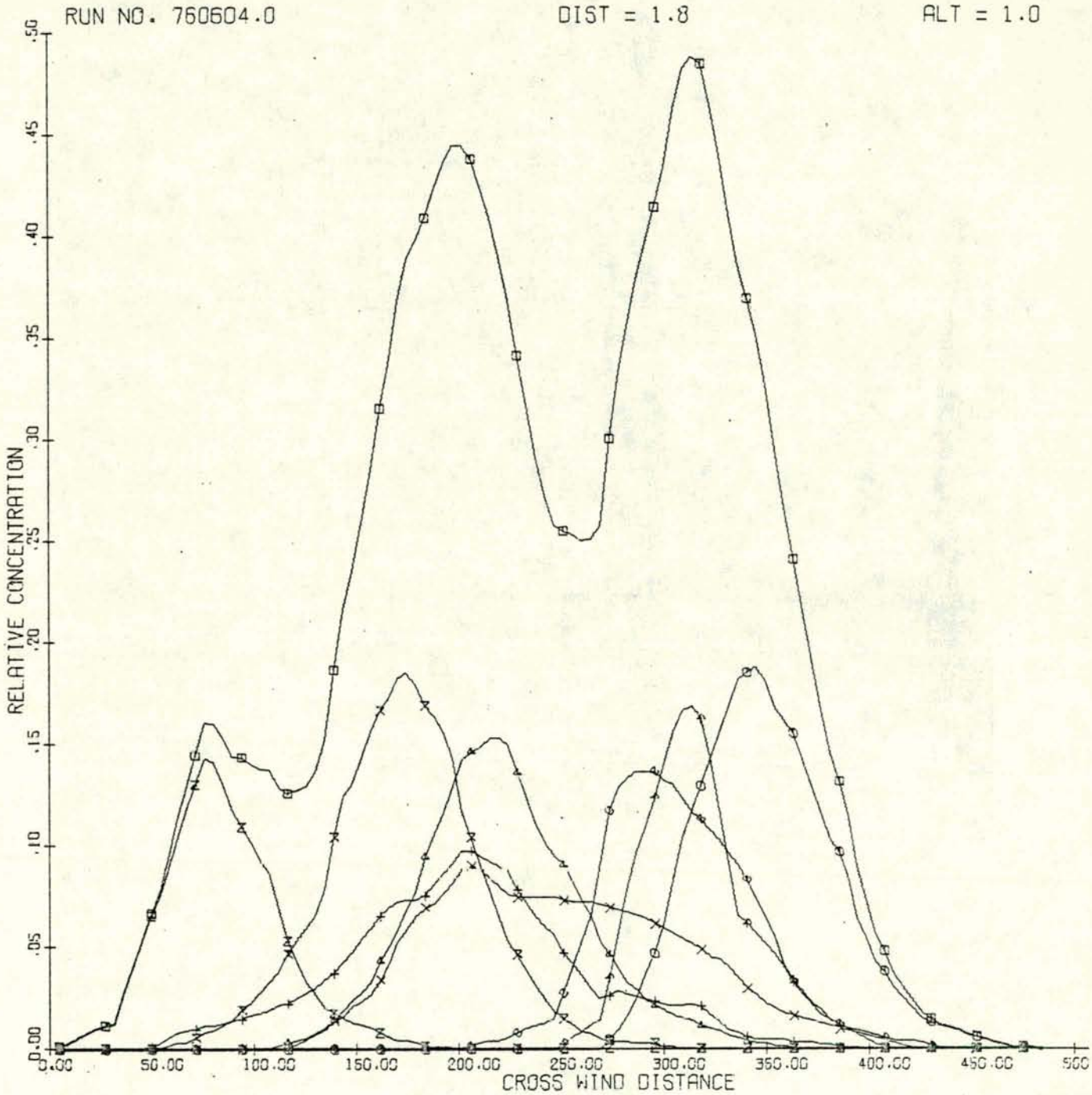

OIL CONSUMPTION RUN 23 6-4-76
FIG. 9
1445
1355
50 MIN
24.27
21.84
2.43 gal
4.87 x 10^-2 gal/min
gal.
25
24
23
22
21
1350
1400
1410
1420
1430
1440
1450
(EST)

Figure 1. View of smoke plume from
Tiana Tower, Run 23, 6-4-76.

Figure 2. Aerial view of smoke plume,
Run 23, 6-4-76.

Figure 3. Aerial view of smoke plume,
Run 23, 6-4-76.


RUN NO. 760604.0
DIST = 1.8
ALT = 1.0
RELATIVE CONCENTRATION
.50
.45
.40
.35
.30
.25
.20
.15
.10
.05
0.00
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
450.00
500
CROSS WIND DISTANCE

ON SHORE DENSITOMETER RUN FROM VAN
TRAVERSES AT ONE DISTANCE

RUN =760604./ DATE = 60476 /DISTANCE FROM STACK (KM)= 1.78
DIRECTION(DEG) = 124./TIME FROM 1408 TO 1435 HRS

PASS NO	CWI	Y BAR	STGMA Y SIMPLE	TOTAL	MEANDER	CWI/(SIG*BKGND)
1.0	.151E+02	350.6	33.5			48.09
2.0	.136E+02	220.0	39.6			36.66
3.0	.119E+02	205.1	59.2			21.45
4.0	.132E+02	249.0	59.1			23.95
5.0	.117E+02	306.4	33.2			37.69
6.0	.975E+01	317.2	28.3			36.79
7.0	.152E+02	173.0	35.9			45.19
8.0	.891E+01	84.0	23.4			33.53
GRAND TOTAL	.993E+02	242.2	41.8	88.3	77.7	

Corrected for plume angle	33.8	71.4	62.9

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Run No. 24
June 8, 1976

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: Sept. 13, 1976

TO: Files

FROM: G. S. Raynor

SUBJECT: Smoke Run 24

Smoke run no. 24 was held on June 8, 1976 in conjunction with Argonne balloon experiments. Weather was clear early with a thin cirrostratus overcast later. Heavy haze was present. A large high was centered over Missouri and Arkansas with a ridge extending northeast into this area. A small low was located near Cape Hatteras with a warm front NE about 200 miles south of Long Island. Another low was located in eastern Canada with a cold front along the St. Lawrence Valley. The gradient wind was southwest.

At Shinnecock Inlet, low tide occurred at 0901 and high tide at 1541. Thus, the tide was rising during the run. Waves were 1-2 feet. Eastern standard time is used in this report.

Personnel left BNL at 0840 and reached the Coast Guard Station at 0920 and Tiana somewhat later. The LCM left the Inlet at 1015.

Tiana was manned by Brown, Raynor, SethuRaman and McNeil. Cup anemometers were mounted at heights of 3.4, 7.0, 10.7, 14.3, 18.0 and 23.5 m on the tower and heights of 1, 2, 4, 6, 8 and 10 m on the beach mast which was located about 25 m from and 1 m above the water. The beach was smooth and the mast was located on a small rise. Tower anemometer counters were started at 1001 and the beach anemometers at 1027.

The Aerovane, MRI bivane and Weathermeasure RH probe were mounted at 23.5 m. The permanent temperature sensors at 10.7, 18 and 23.5 m were still operative. Data were taken on the Lockheed tape recorder as follows:

1048-1250 - Bivane and RH
1252-1330 - Bivane speed and elevation, 10.7 m and 23.5 m temperature
1331-1425 - Bivane and 23.5 m temperature.

Aerovane wind directions ranged from 215 - 224° and speed from 5-8 mps.

Anemometer wind speeds are tabulated in Tables 1 and 2 and plotted in Figure 1. Data from 10.7 m on the tower and 8 m on the mast were not used. Data are tabulated for two time periods because the 10 m anemometer also failed about 1300.

Temperatures read visually from the tower sensors are listed in Table 3 and plotted in Figure 2 with air and water temperatures taken from the LCM. Also shown are temperature and humidity data from analysis of the magnetic tape record. The visual data show an inversion over the tower height interval.

Pibals were taken at 1135, 1205 and 1409. Data are plotted in Figures 3 and 4. All ascents show a speed maximum at low levels. Both speed and direction data show a change in conditions between ascents 2 and 3.

The LCM was manned by Jahnig and Carlson. It was used for Argonne balloon releases until about 1245. It was then stationed about 0.3 miles off Tiana in the position shown in Figure 5. Smoke was produced from 1325 to 1422. Only one burner was operative but output rate was near normal as shown in Figure 6. Nine traverses were made along Dune Road from 1340 - 1417. Distance from the source to the plume was 0.93 km. Several pictures of the plume were taken from the beach and some from the aircraft. The plume was stable, smooth edged and reached the water about 3 boat lengths downwind.

The aircraft was manned by S. Fink. Infrared thermometer measurements were made from the airport to the ocean and parallel to the beach at 0.5 miles out from Mastic to Southampton. Passes were also made opposite Shinnecock Inlet from 1.0 to 2.5 miles out, across the beach and over Shinnecock Bay. Data are tabulated in Table 4 and plotted in Figure 7. Temperatures were warm opposite the Inlet and colder both east and west.

Temperature spirals were made from 30 m - 762 m over the ocean at 1213 and 1306 and from 152 m - 762 m over the land at 1222. Data are tabulated in Table 5 and plotted in Figure 8. A large low-level inversion is indicated by the data with stable lapse rates above. The cause of the pattern in the 1306 sounding is not known but may be related to the change in conditions suggested by the pibal data.

No turbulence data were obtained since a short in the power supply unit with subsequent smoke and danger of fire caused an early return to the airfield.

The run was terminated at 1426. Personnel left Tiana at 1500 and reached BNL at 1545.

In summary, a large low-level inversion over the water resulted in a stable plume.

GSR/lk

TABLE 1

FIVE MINUTE MEAN WIND SPEEDS (M/SEC)

DATE=760608 RUN=P24 SITE=TIANA TOWR START TIME=1005

HEIGHT(M)

EST	3.35	7.00	14.30	18.00	23.50
1005	4.10	5.58	6.07	6.30	6.35
1010	3.71	5.26	5.81	6.03	6.34
1015	3.81	5.31	5.84	6.03	6.28
1020	3.72	5.17	5.70	5.87	6.10
1025	3.92	5.53	5.98	6.10	6.37
1030	3.97	5.43	5.94	6.11	6.38
1035	3.71	5.31	5.88	6.05	6.31
1040	3.89	5.45	6.07	6.24	6.55
1045	3.71	5.26	5.96	6.27	6.57
1050	3.41	5.20	5.92	6.22	6.62
1055	3.85	5.35	6.03	6.33	6.67
1100	4.09	5.72	6.28	6.64	6.91
1105	4.17	5.65	6.35	6.62	6.93
1110	3.92	5.42	6.08	6.43	6.79
1115	4.12	5.85	6.27	6.68	6.83
1120	4.13	5.58	6.17	6.40	6.77
1125	3.78	5.31	5.91	6.19	6.59
1130	3.65	5.13	5.80	6.09	6.48
1135	3.63	5.16	5.82	6.14	6.59
1140	3.90	5.38	6.03	6.29	6.70
1145	3.73	5.44	6.18	6.62	7.20
1150	3.34	5.28	6.17	6.66	7.26
1155	3.28	5.17	5.93	6.59	7.10
1200	3.10	5.13	5.88	6.56	6.89
1205	3.13	5.10	5.94	6.56	6.66
1210	3.26	5.12	6.04	6.63	6.37
1215	3.02	5.22	6.07	6.31	5.77
1220	2.91	5.27	6.35	6.52	4.89
1225	3.40	5.38	6.31	6.15	5.53
1230	3.41	5.15	5.97	6.34	6.53
1235	3.50	4.75	5.41	5.73	6.14
1240	3.26	4.51	5.11	5.53	6.03
1245	3.03	4.30	4.85	5.21	5.68
1250	2.91	4.38	4.94	5.21	5.54
1255	2.97	4.24	4.79	5.12	5.55
1300	2.94	4.18	4.76	5.10	5.56
RUN MEAN:	3.57	5.18	5.85	6.13	6.39

FIVE MINUTE MEAN WIND SPEEDS (M/SEC)

DATE=760608 RUN=P24 SITE=TIANA TOWR START TIME=1310

HEIGHT(M)

EST	3.35	7.00	14.30	18.00	23.50
1310	2.81	4.45	4.71	4.93	5.36
1315	2.93	4.01	4.51	5.05	5.59
1320	2.91	4.16	4.83	5.35	6.07
1325	2.98	4.31	4.93	5.36	5.96
1330	3.16	4.33	4.90	5.44	6.10
1335	3.14	4.62	5.36	5.88	6.09
1340	3.17	4.53	5.34	5.83	5.48
RUN MEAN:	3.00	4.28	4.97	5.41	5.76

TABLE 2

FIVE MINUTE MEAN WIND SPEEDS (M/SEC)

DATE=760608 RUN=024 SITE=BEACH MAST START TIME=1020

	HEIGHT(M)				
EST	1.00	2.00	4.00	6.00	10.00
1020	2.63	3.64	4.50	4.54	7.03
1025	2.61	3.79	4.61	4.60	6.95
1030	2.51	3.68	4.40	4.43	6.76
1035	2.59	3.73	4.43	4.51	6.93
1040	2.52	3.64	4.32	4.44	6.78
1045	2.52	3.78	4.30	4.35	6.75
1050	2.58	4.06	4.50	4.54	6.94
1055	2.82	4.05	4.93	4.86	7.38
1100	2.77	3.83	4.71	4.79	7.26
1105	2.67	3.98	4.56	4.54	6.98
1110	2.73	4.02	4.74	4.75	7.24
1115	2.76	3.66	4.80	4.92	7.27
1120	2.52	3.73	4.40	4.42	6.75
1125	2.55	3.75	4.39	4.39	6.74
1130	2.63	3.99	4.39	4.46	6.80
1135	2.66	3.97	4.53	4.81	7.05
1140	2.74	3.88	4.61	4.67	7.15
1145	2.66	3.72	4.49	4.56	6.99
1150	2.52	3.64	4.37	4.41	6.79
1155	2.50	3.73	4.29	4.38	6.82
1200	2.53	3.74	4.30	4.31	6.65
1205	2.57	3.77	4.35	4.40	6.74
1210	2.57	3.65	4.41	4.41	6.68
1215	2.49	3.91	4.32	4.37	6.57
1220	2.66	3.82	4.59	4.66	7.05
1225	2.62	3.52	4.45	4.49	6.92
1230	2.43	3.39	4.13	4.09	6.27
1235	2.31	3.13	3.91	3.91	5.99
1240	2.14	3.00	3.61	3.66	5.54
1245	2.13	2.92	3.50	3.59	5.45
1250	2.01	2.92	3.41	3.44	5.29
1255	2.04	2.94	3.44	3.44	5.22
RUN MEAN	2.53	3.66	4.33	4.37	6.87

FIVE MINUTE MEAN WIND SPEEDS (M/SEC)

DATE=760608 RUN=024 SITE=BEACH MAST START TIME=1310

	HEIGHT(M)			
EST	1.00	2.00	4.00	6.00
1310	1.[illegible]	2.44	3.29	3.25
1315	1.95	2.35	3.39	3.33
1320	1.99	2.47	3.47	3.47
1325	2.13	3.15	3.63	3.59
1330	2.15	3.12	3.52	3.46
1335	2.20	3.13	3.65	3.54
1340	2.23	3.26	3.63	3.59
RUN MEAN	2.09	3.05	3.54	3.54

Table 3

Low-Level Air and Water Temperature and Humidity

Temperatures from Tower (visual readings)

Time	Height (m) 10.7	18.0	23.5
1030	15.15	15.66	15.85
1130	15.23	16.05	16.30
1430	15.13	15.34	15.72

Temperature from 23.5 m (1245 - 1320)

Mean	S.D.	Max.	Min.
18.4	0.88	19.8	17.2

Specific Humidity (gm/kg) from 23.5 m

Time	Mean	S.D.	Max.	Min.
1045-1125	8.85	0.06	8.95	8.68
1125-1205	8.48	0.46	8.93	7.67
1205-1245	7.42	0.55	8.41	6.45

Temperatures from Boat

Time	Dry	Wet	Water
1115	15.3	14.1	12.2
1215	17.4	14.8	12.8
1315	17.1	15.3	13.2
1415	16.8	15.2	13.9
1510	16.0	14.9	13.6

Table 4

IR Measurements - Run 24 - 6-8-76

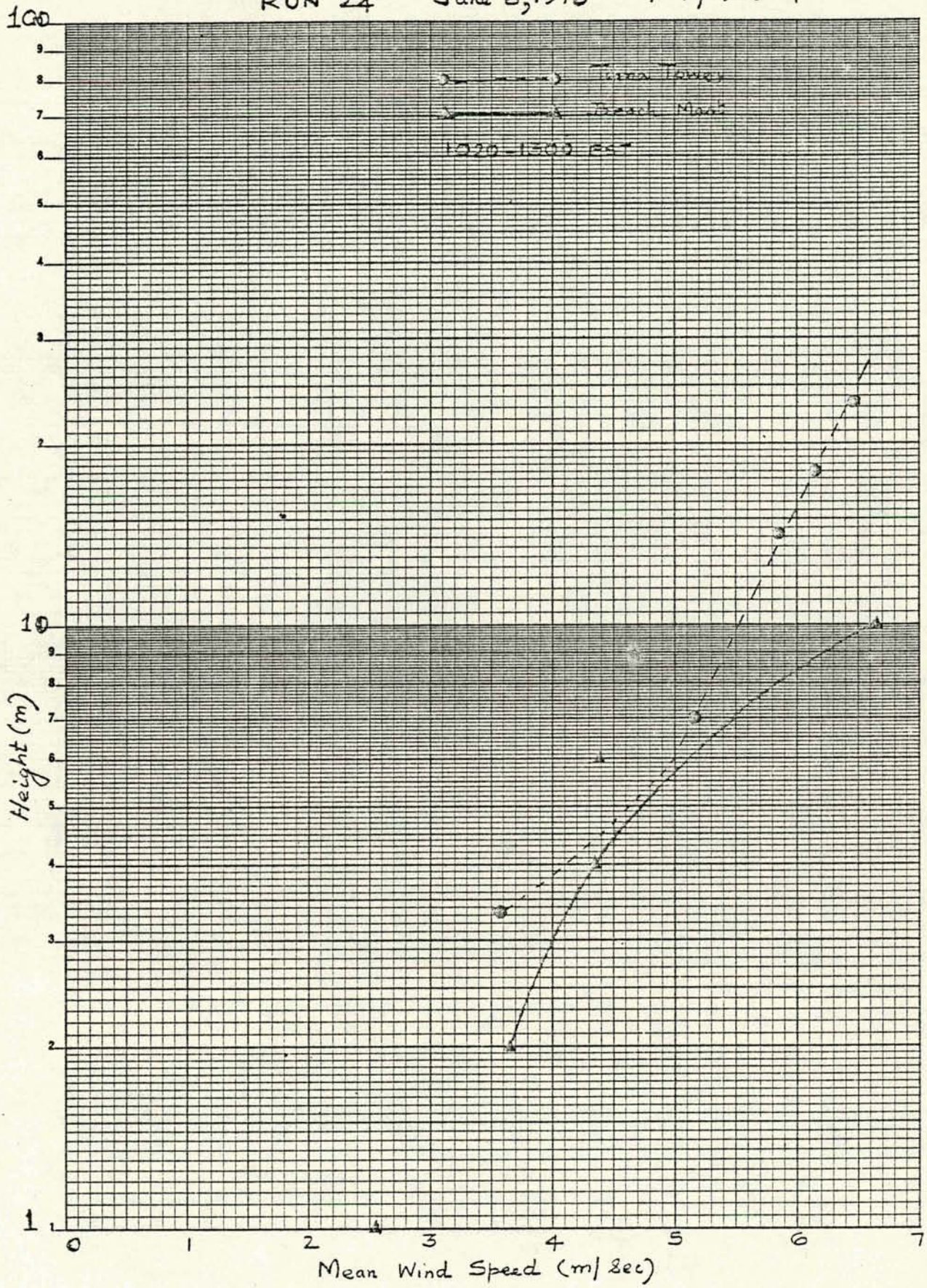
Location	Range	Mean (°C)
Airport - Bay	25.4-40.0+	35.0
Narrow Bay	19.6-20.5	20.2
Beach	24.6-34.0	
Ocean off Mastic	14.0-14.7	14.5
0.5 Miles Out		
Mastic-Moriches Inlet	13.5-17.5	17.0
	Warmest west of Inlet	
Moriches Inlet-W. Groin	13.0-14.4	13.5
	Coldest E. of Inlet	
W. Groin - W. Bridge	13.0-13.5	13.1
W. Bridge - Quogue Bridge	13.2-13.7	13.4
Quogue Bridge - Tiana	11.8-13.2	12.5
	Coldest just W. of Tiana	
Tiana - Shinnecock Inlet	13.4-15.7	14.5
	Warmest just W. of Inlet	
Inlet - E. end	12.0-13.8	12.5
	Coldest at E. end & warmest E. of Inlet	
1 Mile Out		
E. end - Inlet	12.0-13.0	12.5
Inlet - Ponquogue	14.0-15.5	15.0
	Warmest west of Inlet	
	12.6-13.0	12.0
1.5 Miles Out		
Tiana - Inlet	13.0-14.0	13.7
Inlet - E. end	13.4-15.5	14.5
	Warmest E. of Inlet	
2 Miles Out		
E. end - Inlet	13.6-14.3	14.0
Inlet - Tiana	14.0-14.2	14.1
2.5 Miles Out		
Tiana - Inlet	14.0-14.2	14.1
Inlet - E. end	13.5-14.2	13.7
Beach	31.8-36.2	
Bay	12.6-13.0	12.8

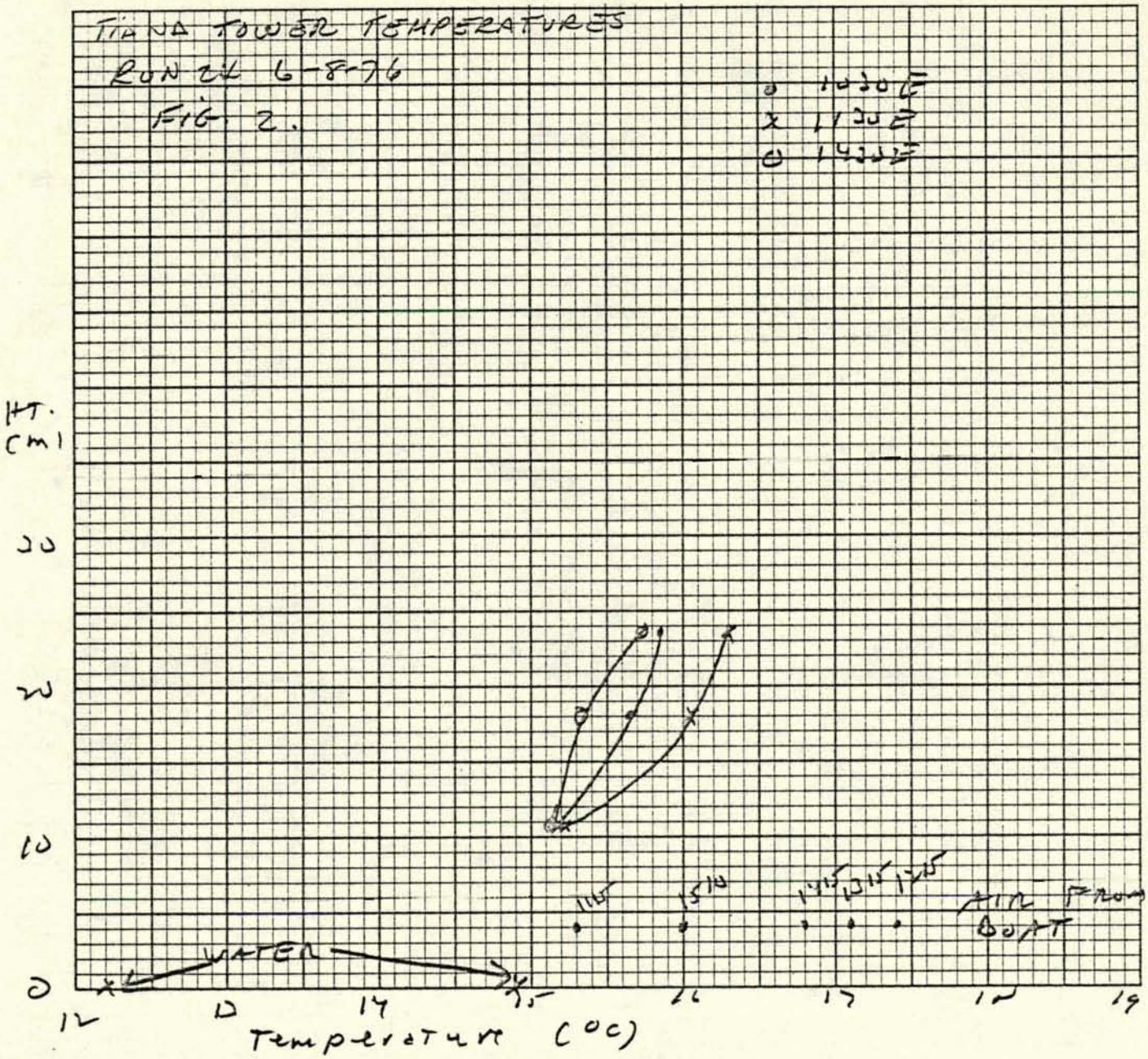
Table 5

Temperatures Aloft - Run 24 - 6-8-76

Ht. (m)	1213E Over Ocean	1222E Over Demps	1306E Over Ocean
30	20.2		18.5
61	21.1		19.9
91	21.6		20.9
122	21.7		22.8
152	22.6	23.3	20.6
183	22.7	22.9	21.0
213	22.8	22.7	21.5
244	22.6	22.8	22.4
274	22.5	22.2	22.5
305	22.5	21.7	22.4
335	22.7	21.9	22.3
366	22.7	22.1	22.1
396	22.7	22.3	22.0
427	22.6	22.5	21.9
457	22.8	22.3	21.9
488	22.5	22.2	21.9
518	22.5	22.1	21.7
549	22.1	21.9	21.5
579	21.8	21.7	21.3
610	21.7	20.5	21.2
640	21.6	21.2	20.9
671	21.2	21.0	20.7
701	21.5	20.8	20.6
732	20.8	20.5	20.5
762	20.6	20.2	20.3

RUN 24 June 8, 1976 Figure 1




TIANA TOWER TEMPERATURES
RUN 21 6-8-76
FIG 2.
1030 EST
1130 EST
1430 EST
HT. (m)
30
20
10
0
WATER
1115
1510
1115 1315 1515
AIR FROM BOAT
12
13
14
15
16
17
18
19
Temperature (°C)

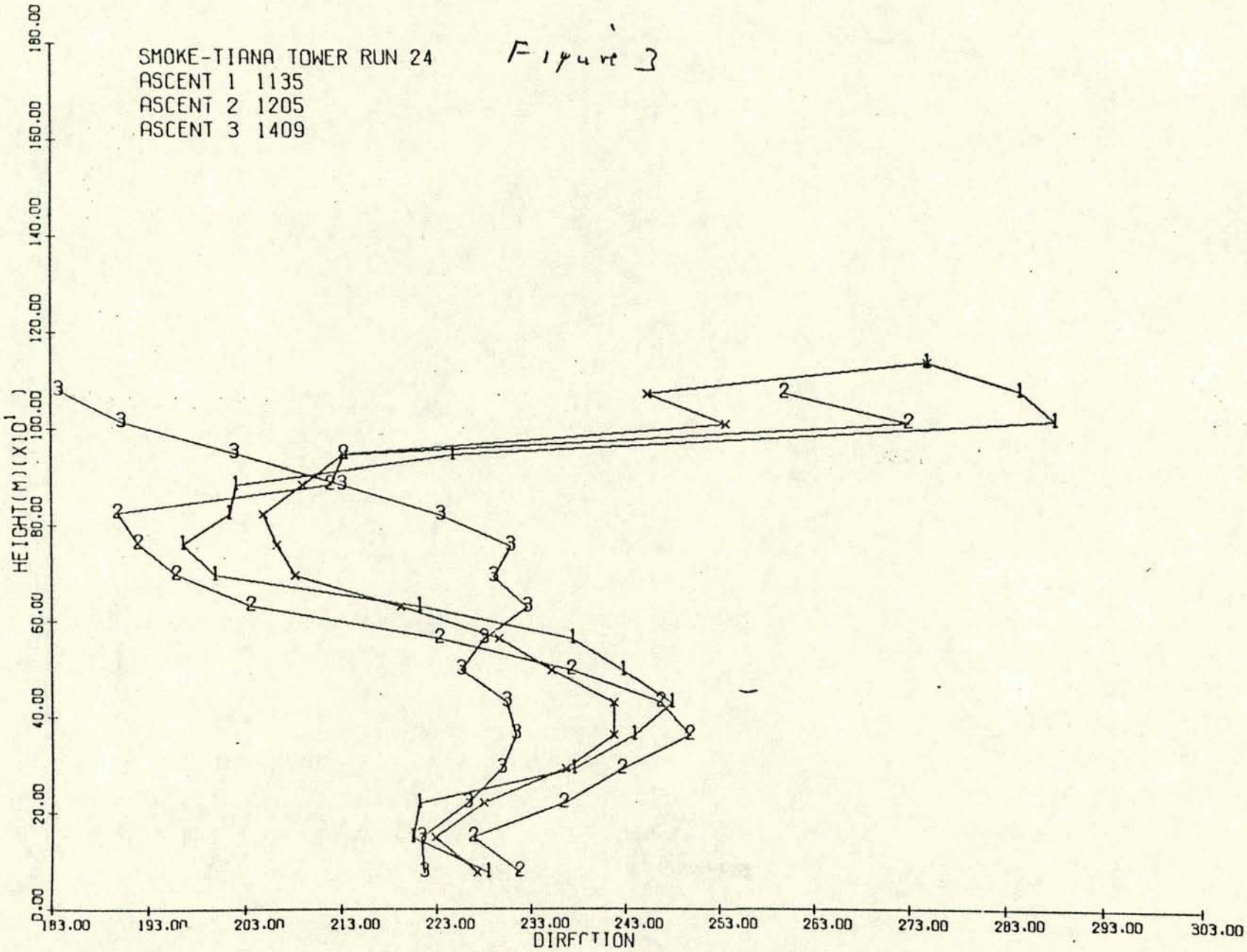

SMOKE-TIANA TOWER RUN 24
ASCENT 1 1135
ASCENT 2 1205
ASCENT 3 1409
HEIGHT(M)(X10¹)
DIRECTION
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
183.00
193.00
203.00
213.00
223.00
233.00
243.00
253.00
263.00
273.00
283.00
293.00
303.00

Figure 3

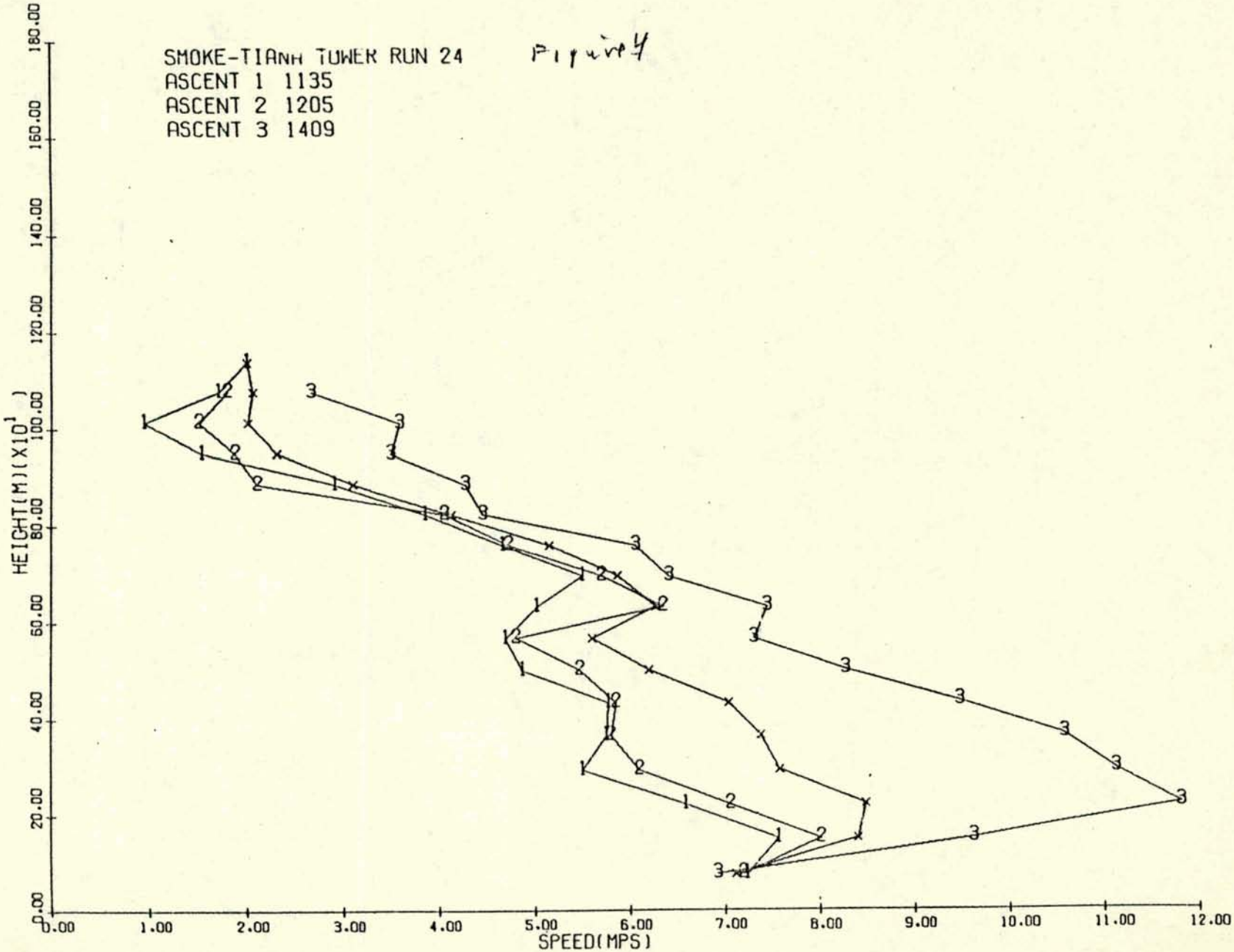
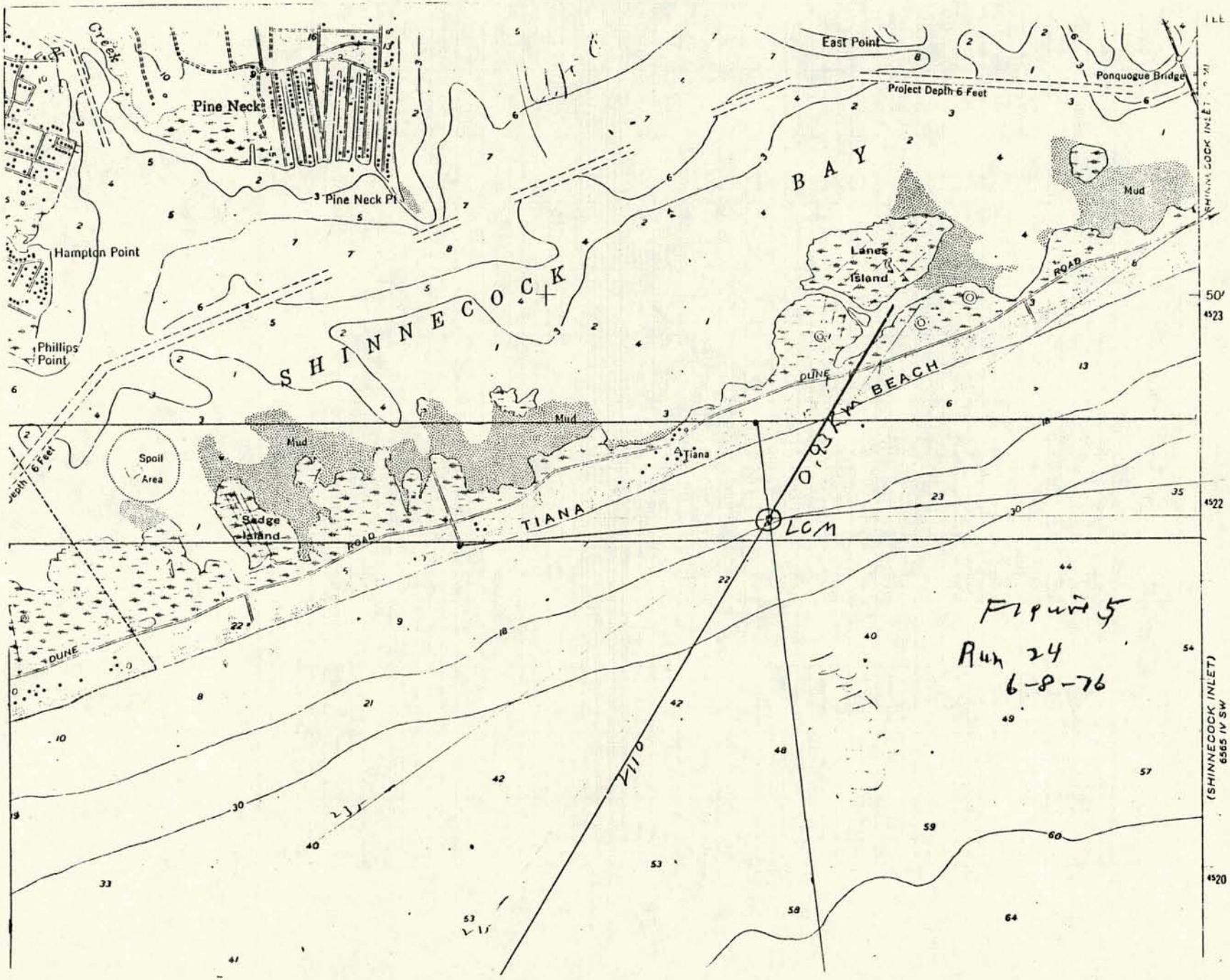
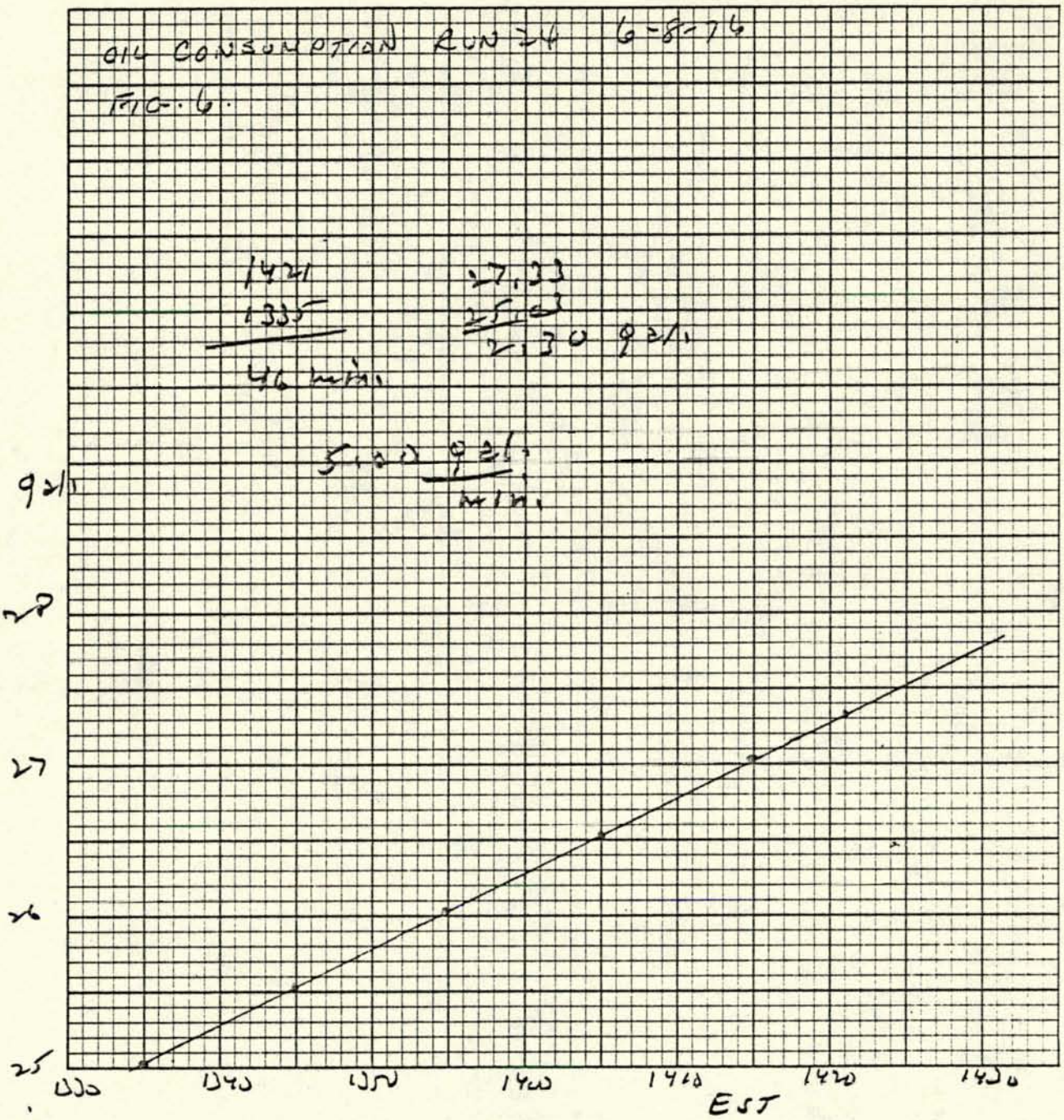
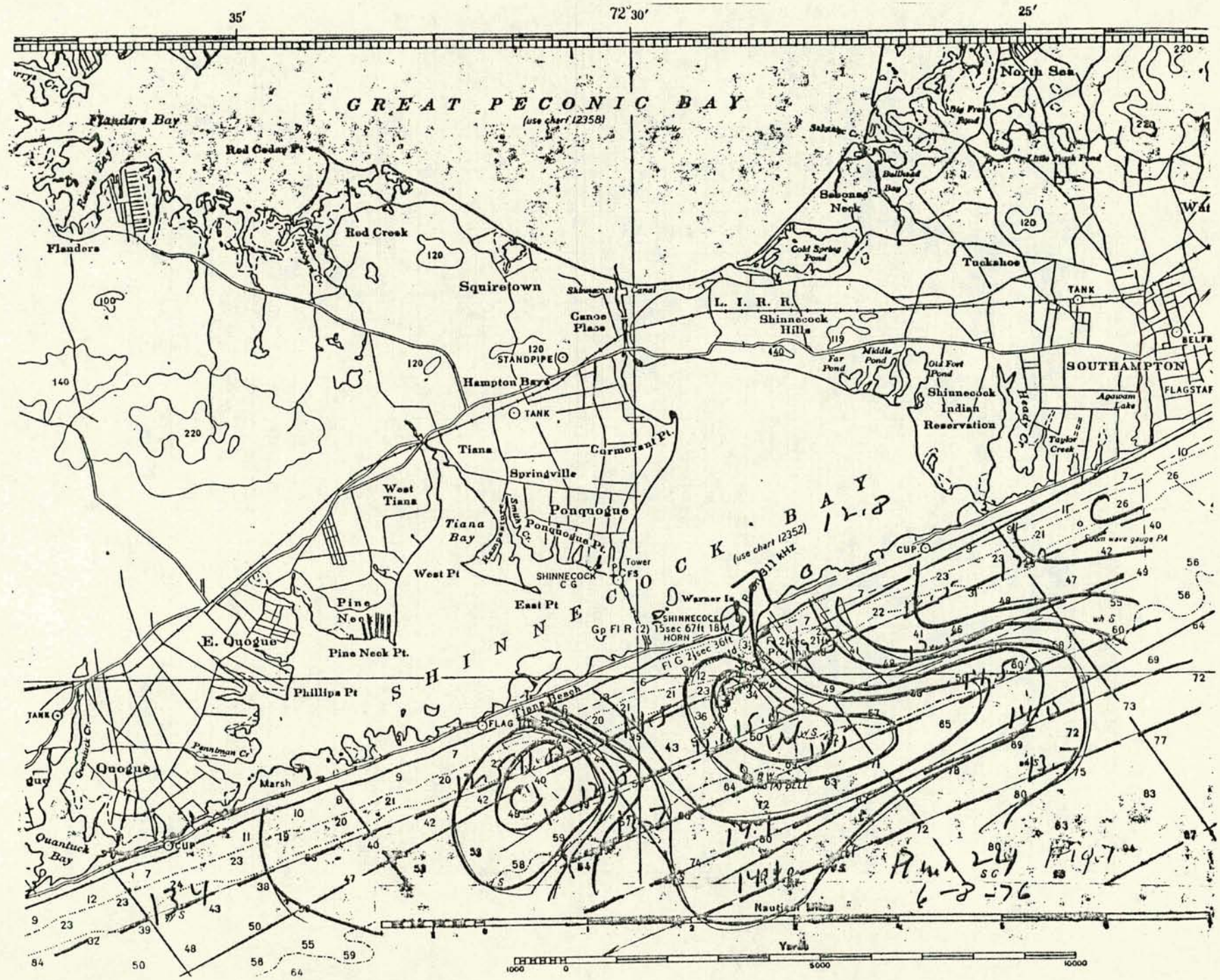

SMOKE-TIANH TOWER RUN 24
ASCENT 1 1135
ASCENT 2 1205
ASCENT 3 1409
HEIGHT(M)(X10¹)
SPEED(MPS)
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
11.00
12.00

Figure 4


East Point
Ponquogue Bridge
Project Depth 6 Feet
Pine Neck
Pine Neck Pt
Hampton Point
Phillips Point
SHINNECOCK
BAY
Mud
Lanes Island
ROAD
DUNE
TIANA BEACH
Tiana
Spoil Area
Sedge Island
TIANA ROAD
LCM
Figure 5
Run 24
6-8-76
(SHINNECOCK INLET)
6565 IV SW


OIL CONSUMPTION RUN 24 6-8-76
FIG. 6.
1421
1335
46 min.
27.33
25.03
2.30 gal.
5.00 gal/min.
gal
28
27
26
25
1330
1340
1350
1400
1410
1420
1430
EST


35′
72°30′
25′
GREAT PECONIC BAY
(use chart 12358)
Flanders Bay
Red Cedar Pt
Flanders
Red Creek
Squiretown
Canoe Place
STANDPIPE
Hampton Bays
TANK
Tiana
Cormorant Pt.
Springville
Ponquogue
Ponquogue Pt.
Tiana Bay
West Tiana
West Pt
East Pt
SHINNECOCK CG
Tower
Pine Neck
Pine Neck Pt.
E. Quogue
Phillips Pt
Quogue
Quantuck Bay
Marsh
Pannbman Cr
Tiana Beach
FLAG
CUP
Warner Is
SHINNECOCK
Gp Fl R (2) 15sec 67ft 18M
HORN
Fl G 2sec 36ft
Nautical Miles
Yards
1000
0
5000
10000
L. I. R. R.
Shinnecock Hills
Far Pond
Middle Pond
Old Fort Pond
Shinnecock Indian Reservation
Cold Spring Pond
Sebonac Neck
Bullhead Bay
Tuckahoe
North Sea
Big Fresh Pond
Little Fresh Pond
SOUTHAMPTON
FLAGSTAF
Agawam Lake
Taylor Creek
Heady Cr
Shinnecock Canal
Swan wave gauge PA
(use chart 12352)
311 kHz
12.8
14.4
17.4
Fig 7
6-8-76

Temperatures Aloft Run 24 6-8-76 Figure 8

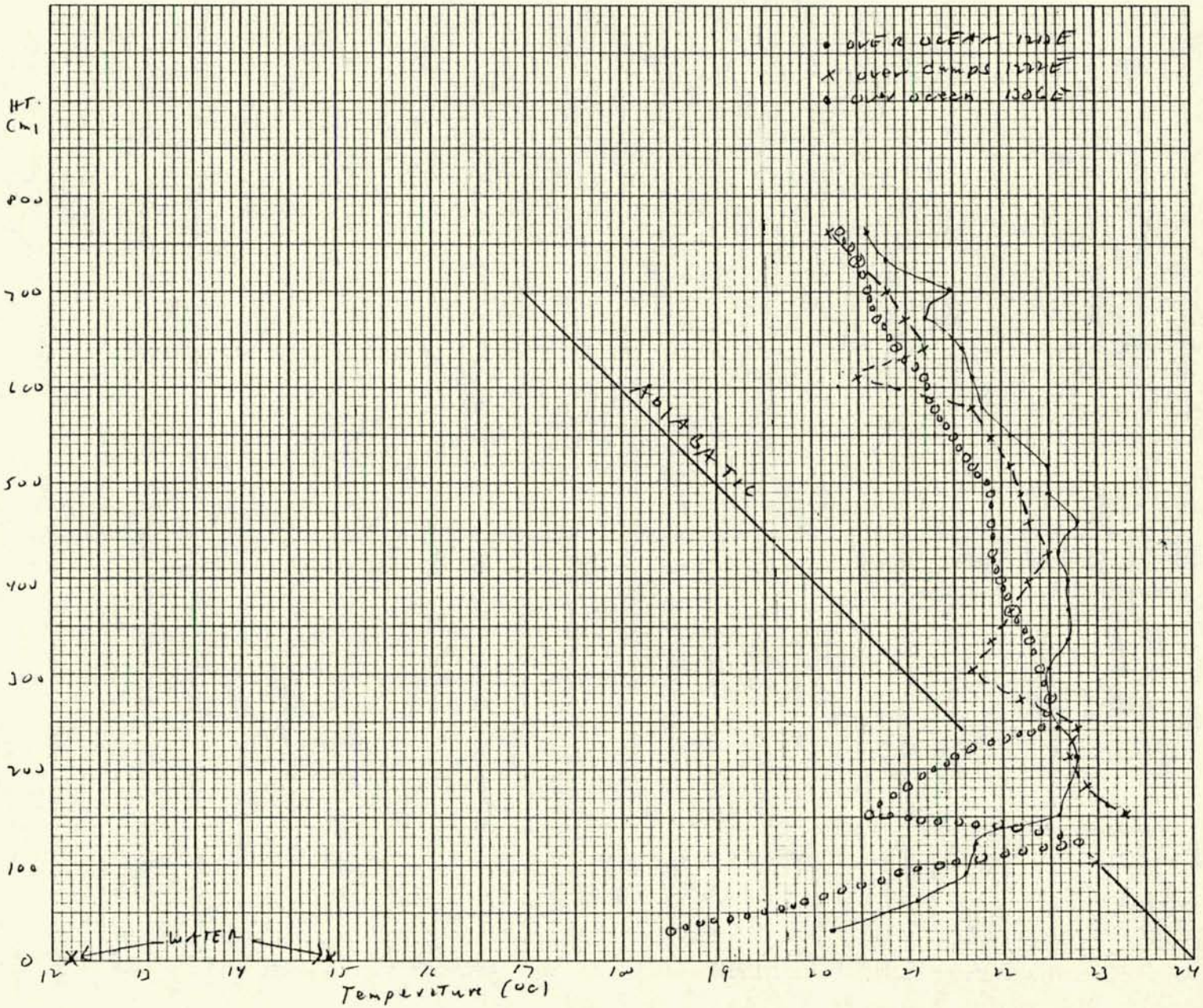
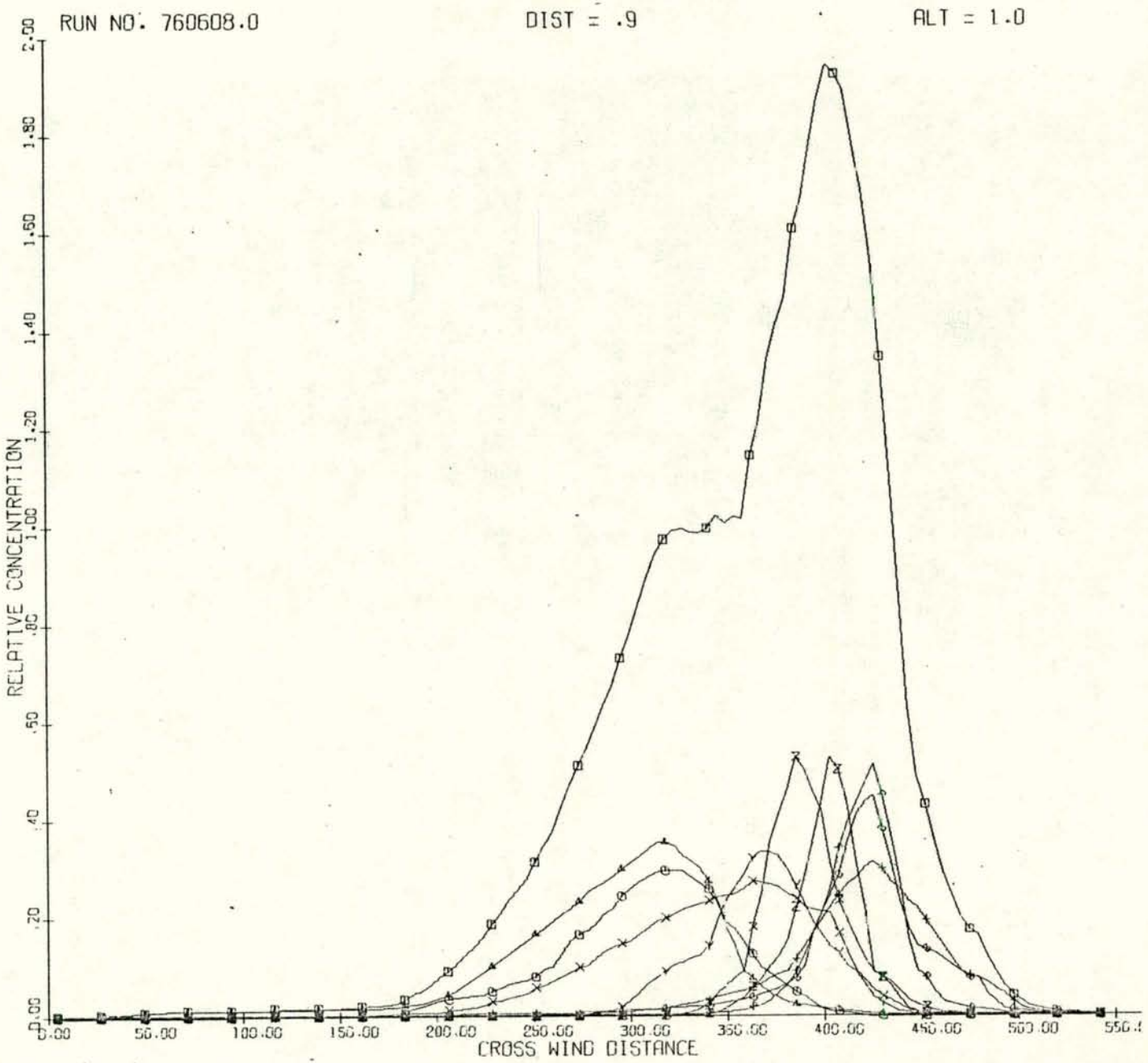


Figure 1. View of smoke plume from
Tiana Tower, Run 24, 6-8-76.


RUN NO. 760608.0
DIST = .9
ALT = 1.0
RELATIVE CONCENTRATION
CROSS WIND DISTANCE
0.00
.20
.40
.60
.80
1.00
1.20
1.40
1.60
1.80
2.00
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
450.00
500.00

ON SHORE DENSITOMETER RUN FROM VAN
TRAVERSES AT ONE DISTANCE

RUN =760608./ DATE = 60876 /DISTANCE FROM STACK (KM)= .93
DIRECTION(DEG) = 211./TIME FROM 1340 TO 1417 HRS

PASS NO	CWI	Y BAR	SIGMA Y SIMPLE	SIGMA Y TOTAL	SIGMA Y MEANDER	CWI/(SIG*BKGND)
1.0	.298E+02	308.3	43.6			18.76
2.0	.375E+02	287.8	58.9			17.51
3.0	.246E+02	417.8	43.9			15.40
4.0	.334E+02	342.2	49.6			18.47
5.0	.239E+02	420.4	33.2			19.77
6.0	.216E+02	417.8	22.8			26.02
7.0	.236E+02	390.4	21.3			30.44
8.0	.187E+02	400.8	17.3			29.74
9.0	.224E+02	367.4	29.1			21.17
GRAND TOTAL	.236E+03	363.9	40.6	64.1	49.5	
Corrected for plume angle			32.8	51.9	40.0	

BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: March 6, 1974

TO: Files

FROM: R. M. Brown

SUBJECT: Densitometer determined standard deviations

The following data pertain to the densitometer measurements for the on-shore runs taken to date:

Run No. 2 August 17, 1972 - Cloudy day

1st set of data taken while boat was located 1.15 statute miles off the beach. The plume made an angle of 73° to the beach, so actual plume length was 1.18 mi (1.9 Km).

Uncorrected -	Simple σ_y	Overall Σ	Meander
	85.8	137.5	99.2
	98.6		
	66.0	Data made from 1020 - 1043 EST.	
	92.8		
	103.6		
Ave.	95.2		

Corrected standard deviations for plume angle to the beach:

Simple	Overall	Meander
91.0	131.5	94.8

2nd set of data taken while boat was located 3.45 statute miles off the beach. Plume straight on to the beach, so actual plume length was 3.45 mi (5.5 Km).

	Simple σ_y	Overall Σ	Meander
	74.2	83.5	51.0
	67.9		
	58.4	Data made from 1225-1300 EST.	
	62.9		
Ave.	66.2		

Corrected standard deviations for plume angle to the beach:

Simple	Overall	Meander
63.3	79.8	48.8

Files
Densitometer determined standard deviations March 6, 1974

Run No. 3 August 31, 1972 - Clear day.

1st set of data taken while the boat was 1.15 statute miles off the beach. The plume made an angle of 50° to the beach so actual plume distance to the beach was 1.7 mi (2.7 Km).

Uncorrected -	Simple σ_y	Overall Σ	Meander
	56.3	210.3	201.9
	73.4		
	42.7	Data made from 1153 - 1224 EST.	
	56.0		
	56.5		
Ave.	58.7		

Corrected standard deviations for plume angle to the beach:

Simple	Overall	Meander
44.9	161.1	154.7

2nd set of data taken with smoke boat 3.45 statute miles off the beach. The plume made an angle of 59° to the beach so actual plume distance to the beach was 4.2 mi (6.7 Km)

Uncorrected -	Simple σ_y	Overall Σ	Meander
	37.8	79.7	63.1
	48.2		
	54.6		
	49.8	Data made from 1450 - 1508 EST.	
	55.6		
Ave.	48.7		

Corrected standard deviations for plume angle to the beach:

Simple	Overall	Meander
41.7	68.3	54.1

Files March 6, 1974
Densitometer determined standard deviations

Run No. 4 - October 3, 1972 - High cirrus

1st set of data taken while smoke boat was 1.15 statute miles off the beach. The plume made an angle of 55° with the beach so actual plume distance was 1.45 mi (2.3 Km).

Uncorrected -	Simple σ_y	Overall Σ	Meander
	211.2	148.7	107.6
	69.5		
	87.8		
	82.1		
	61.8		
	83.0	Data taken from 1156-1323 EST.	
	146.4		
	78.7		
	67.9		
	120.0		
Ave.	102.7		

Corrected for plume angle to the beach:

Simple	Overall	Meander
84.1	121.8	

2nd set of data taken while boat was 1.15 miles off the beach. Plume continued to make an angle of 46° with the beach so actual plume distance was 1.45 mi (2.3 Km).

Uncorrected -	Simple σ_y	Overall Σ	Meander
	125.7	211.2	185.4
	102.5		
	60.9	Data taken from 1455 - 1515 EST.	
Ave.	101.2		

Corrected for plume angle to the beach:

Simple	Overall	Meander
72.8	151.9	133.3

Files March 6, 1974

Densitometer determined standard deviations

Run No. 5 November 7, 1972

No significant smoke concentration data taken.

Run No. 6 May 23, 1973 - Overcast - rainy day

Densitometer smoke measurements were made at the beach and on the ocean with another boat.

1st set of data taken at the beach with the smoke boat 1.15 statute mi. off the beach. The plume made an angle of 40° to the beach so the actual plume distance to the beach was 1.65 mi (2.6 Km).

Uncorrected -	Simple σ_y	Overall Σ	Meander
	102.3	135.2	105.0
	62.0		
	70.0		
	94.5		
	80.5		
	78.4		
	97.4	Data taken from 1047 - 1137 EST.	
	71.2		
Ave.	85.2		

Corrected for plume angle to the beach:

Simple	Overall	Meander
54.8	86.9	67.5

2nd set of data taken at the beach while boat was 1.15 mi off the beach. Actual plume distance to beach was 1.65 mi (2.6 Km).

Uncorrected -	Simple σ_y	Overall	Meander
	62.7	139.8	126.6
	46.3		
	69.1		
	53.0	Data taken from 1242 - 1318 EST.	
	59.2		
	59.7		
Ave.	59.4		

Files March 6, 1974
Densitometer determined standard deviations

Run No. 6 continued:

Corrected standard deviations for plume angle:

Simple	Overall	Meander
38.2	89.9	81.4

The boat densitometer measurements are as follows:

1st set of data was taken .46 Km downwind of smoke boat.

	Simple σ_y	Overall Σ	Meander
	23.9	35.5	27.3
	24.3		
	19.4		
Ave.	22.8	Data taken from 1037 - 1056 EST.	

2nd set of data taken .93 Km downwind of smoke boat.

	Simple σ_y	Overall Σ	Meander
	23.9	62.9	54.0
	45.6		
	27.6		
Ave.	32.3	Data taken from 1145 - 1153 EST.	

3rd set of data taken 1.84 Km downwind of smoke boat.

	Simple σ_y	Overall Σ	Meander
	43.1	75.1	65.3
	33.5		
	26.7		
Ave.	37.1	Data taken from 1225 - 1244 EST.	

Files March 6, 1974
Densitometer determined standard deviations

Run No. 7 June 1, 1973 - Scattered cirrus - some cumulus

Seven traverses were made at the beach with the smoke boat located 1.23 statute miles off the beach. The plume made an angle of 29.0° to the beach so the actual plume length was 2.68 mi (4.3 Km).

Uncorrected -	Simple σ_y	Overall Σ	Meander
	52.8	117.3	97.9
	51.4		
	52.4		
	56.2		
	55.0		
	74.7		
	79.4	Data taken from 1228 - 1258 EST.	
Ave.	64.6		

Corrected for plume angle to the beach.

Simple	Overall	Meander
31.3	56.9	47.5

Files March 6, 1974
Densitometer determined standard deviations

Run No. 8 June 15, 1973 - Broken cirrus and altocumulus

Densitometer traverses were made on the ocean as the wind direction was from the land to the water (330°).

1st set of data taken 1.38 Km downwind of smoke boat.

	Simple σ_y	Overall Σ	Meander
	55.2	227.2	191.8
	27.9		
	42.9		
	34.3	Data taken from 1210 - 1320 EST	
	203.7		
	25.2		
Ave.	121.9	No corrections needed because data made at right angles to the plume.	

2nd set of data taken 0.46 Km downwind.

	Simple σ_y	Overall Σ	Meander
	37.0	120.0	112.2
	42.5		
	36.2		
	43.7	Data taken from 1347 - 1416 EST.	
	28.1		
	51.1		
Ave.	42.5	No corrections needed because data taken at right angles to plume.	

Files March 6, 1974

Densitometer determined standard deviations

Run No. 9 July 13, 1973 - Scattered cirrus and stratocumulus.

Five densitometer traverses were made during this run. The smoke boat was located 1.15 statute miles off the beach. The plume made an angle of 20° to the beach, so the actual plume length was 3.09 mi (4.9 Km).

Uncorrected -	Simple σ_y	Overall Σ	Meander
	123.5	231.3	190.1
	129.3		
	170.0		
	113.7	Data taken from 1303 - 1335 EST.	
	100.4		
Ave.	131.9		

Corrected for plume angle to the beach:

Simple	Overall	Meander
45.1	79.1	65.0

Files March 6, 1974
Densitometer determined standard deviations

Run No. 10 September 20, 1973 Broken to scattered cirrus, broken to scattered altocumulus and scattered cumulus.

Five densitometer traverses were made on Dune Road while the smoke boat was located 1.16 Km from the beach. The plume made an angle of 20° with the beach so the actual plume length to the beach was 3.4 Km.

Uncorrected -	Simple σ_y	Overall Σ	Meander
	122.9	410.3	295.3
	200.9		
	376.7		
	269.7	Data taken from 1336 - 1419 EST.	
	371.8		
Ave.	284.9		

Corrected for plume angle of 20° to the beach:

Simple	Overall	Meander
97.4	140.3	101.0

Files June 16, 1976
Densitometer determined standard deviations

Run No. 11 April 11, 1974 High cirrus.

Two sets of traverses made using Liberty on the ocean. 1st set of four traverses made 0.86 Km downwind from LCM.

	Simple σ	Overall Σ	Meander
	38.4	82.6	70.3
	24.5		
	28.1		
	64.3	Data taken from 1345 to 1411 EST.	
Ave.	43.3		

The 2nd set of five traverses were made at a distance of 1.85 Km downwind of the LCM.

	Simple σ	Overall Σ	Meander
	66.1	82.5	68.9
	31.1		
	26.0		
	40.4	Data taken from 1445 to 1511 EST.	
	42.8		
Ave.	45.2		

No corrections needed for this run.

Files June 16, 1976
Densitometer determined standard deviations

Run No. 12 May 14, 1974 High cirrus early then clear.

Two sets of traverses made on the beach with the van. Measurements were also made using Liberty on the ocean but that data was not usable. The plume made an angle of 50° to the beach. The first set of 10 traverses was made at a distance downwind of the LCM of 5.6 Km.

Uncorrected -	Simple σ	Overall Σ	Meander
	69.8	595.8	589.1
	72.4		
	65.1		
	67.1		
	50.2		
	114.5		
	63.1		
	129.7		
	75.5	Data taken from 1100 to 1146 EST.	
	87.2		
Ave.	88.2		

Corrected standard deviations for plume angle to the beach:

Simple	Overall	Meander
67.6	456.2	451.3

The second set of 10 traverses was made at a distance downwind of the LCM of 2.7 Km.

Uncorrected -	Simple σ	Overall Σ	Meander
	30.3	48.7	29.0
	34.7		
	38.1		
	41.1		
	36.4		
	39.4		
	42.3		
	35.2		
	43.8		
	39.6		
Ave.	39.0		

Corrected standard deviations for plume angle to the beach:

Simple	Overall	Meander
29.9	37.3	22.2

Files June 16, 1976
Densitometer determined standard deviations

Run No. 14 July 18, 1974 Overcast day

Two sets of data taken from the van on Dune Road and two sets of data taken using the boat.

The plume made an angle of 48° to the beach. The first set from the van was made while the LCM was located 3.5 Km unwind of the traverse line. Six traverses were made from 1210 to 1242 EST.

Uncorrected -	Simple σ	Overall Σ	Meander
	59.9	199.4	190.8
	56.1		
	58.5		
	53.4		
	68.4		
	45.2		
Ave.	57.9		

Corrected standard deviations for plume angle to the beach:

Simple	Overall	Meander
43.9	148.2	141.8

The second set from the van was made while the LCM was located 3.5 Km upwind of the traverse line (same distance as first set). Eight traverses were made from 1257 to 1332 EST.

Uncorrected -	Simple σ	Overall Σ	Meander
	69.8	189.7	176.5
	54.0		
	45.5		
	56.7		
	49.3		
	83.8		
	66.7		
	88.0		
Ave.	69.6		

Corrected standard deviations for plume angle to the beach:

Simple	Overall	Meander
51.7	140.9	131.1

Files June 16, 1976
Densitometer determined standard deviations

Run No. 13 June 14, 1974 Scattered cirrus.

Two sets of traverses were made along Dune Road but only one set was usable because one set was barely above background level.

Seven traverses were made with the LCM located 4.8 Km upwind of the traverse line.

Uncorrected -	Simple σ	Overall Σ	Meander
	175.9	373.9	345.7
	191.1		
	87.0		
	90.9		
	121.8		
	98.6		
	91.7		
Ave.	142.5		

Corrected standard deviations for plume angle to the beach:

Simple	Overall	Meander
133.9	351.5	324.9

Files June 16, 1976
Densitometer determined standard deviations

Run No. 14 continued

The first set taken from the boat was made at a distance of 0.85 Km downwind of the LCM. Five traverses were made from 1137 to 1208 EST.

Sim	Simple σ	Overall Σ	Meander
	39.4	70.4	56.1
	57.4		
	26.6		
	35.1		
	28.1		
Ave.	42.5		

No corrections needed.

The second set taken from the boat was made at a distance downwind of 1.77 Km downwind of the LCM. Seven traverses were made from 1231 to 1318 EST.

	Simple σ	Overall Σ	Meander
	51.0	93.4	79.9
	33.5		
	61.2		
	36.1		
	50.7		
	45.2		
	50.3		
Ave.	48.4		

No corrections needed.

Files June 16, 1976
Densitometer determined standard deviations

Run No. 15 March 6, 1975 Mostly overcast.

Two sets of data was taken during this run. One set was made using the van on Dune Road while the other was made using the boat.

The plume made an angle of 83° to the beach. The set made using the van included six traverses taken 2.05 Km downwind of the LCM from 1135 to 1153 EST.

Uncorrected -	Simple σ	Overall Σ	Meander
	53.8	74.3	60.9
	39.3		
	43.2		
	35.7		
	37.5		
	38.0		
Ave.	42.5		

Corrected standard deviations for plume angle to the beach:

Simple	Overall	Meander
42.2	73.7	60.5

The set made from the boat consisted of ten traverses made at a distance of 0.48 Km from the LCM. They were made from 1112 to 1217 EST.

Simple σ	Overall Σ	Meander
45.8	131.6	121.6
40.7		
61.1		
37.9		
45.9		
47.2		
31.8		
46.3		
42.9		
49.8		
Ave. 50.4		

No corrections required.

Files June 16, 1976
Densitometer determined standard deviations

Run No. 17 June 24, 1975 Hazy but mostly clear.

Three sets of data were taken using the boat.

The first set of five traverses was made at a distance downwind of 0.80 Km from 1306 to 1324 EST.

	Simple σ	Overall Σ	Meander
	17.9	83.1	79.2
	21.9		
	29.4		
	26.8		
	21.0		
Ave.	24.9		

The second set of five traverses was made at a distance downwind of 1.60 Km from 1343 to 1357 EST.

	Simple σ	Overall Σ	Meander
	14.7	57.8	52.1
	30.9		
	20.0		
	33.7		
	20.7		
Ave.	25.0		

The third set of five traverses was made at a distance downwind of 3.80 Km from 1438 to 1501 EST.

	Simple σ	Overall Σ	Meander
	59.6	120.2	95.1
	90.6		
	60.9		
	63.2		
	81.5		
Ave.	73.5		

No corrections needed.

Files June 16, 1976

Densitometer determined standard deviations

Run No. 18 September 11, 1975 Mostly overcast.

One set of data was taken with the van along Dune Road. Seven traverses were made at a distance downwind of 2.00 Km from the LCM. The data were taken from 1422 to 1459 EST.

Uncorrected -	Simple σ	Overall Σ	Meander
	42.0	91.5	79.5
	45.4		
	28.8		
	33.8		
	50.5		
	60.8		
	33.8		
Ave.	45.4		

Corrected standard deviations for plume angle to the beach:

Simple	Overall	Meander
39.5	79.5	69.2

Files June 16, 1976
Densitometer determined standard deviations

Run No. 19 September 18, 1975 Mostly overcast

The lobster boat was used to make traverses of the smoke plume.

Two sets of traverses were made during the afternoon.

The first set was made from 1229 to 1300 EST at a distance downwind of the LCM of 0.33 Km.

	Simple σ	Overall Σ	Meander
	47.7	89.7	54.7
	29.3		
	48.6		
	109.6		
	22.6		
	42.9		
	56.7		
Ave.	71.1		

The second set was made from 1310 to 1348 at a distance downwind of the LCM of 1.67 Km.

	Simple σ	Overall Σ	Meander
	45.3	98.7	87.0
	18.3		
	37.2		
	58.2		
	43.7		
	40.4		
	47.5		
	32.9		
Ave.	46.6		

No corrections needed.

Files June 16, 1976

Densitometer determined standard deviations

Run No. 21 February 2, 1976 Mostly overcast.

The van was used to make nine traverses along Dune Road from 1247 to 1335 EST while the LCM was 3.32 Km upwind of the traverse line. The plume made an angle of 40° to the beach.

Uncorrected -	Simple σ	Overall Σ	Meander
	33.5	92.3	84.6
	41.5		
	39.6		
	28.3		
	37.1		
	33.5		
	34.2		
	42.3		
	33.0		
Ave.	36.7		

Corrected standard deviations for plume angle to the beach:

Simple	Overall	Meander
23.6	59.3	54.4

Files
Densitometer determined standard deviations

June 16, 1976

Run No. 22 May 11, 1976

The van was used to make three sets of traverses along Dune Road during this smoke run.

The first set was made from 1010 to 1050 EST while the smoke boat was located 2.95 Km upwind from the traverse line. The plume made an angle of 75° with the beach.

Uncorrected -	Simple σ	Overall Σ	Meander
	53.6	99.0	87.4
	44.8		
	45.7		
	45.4		
	50.8		
	42.9		
	46.3		
Ave.	46.7		

Corrected standard deviations for plume angle to the beach:

Simple	Overall	Meander
45.1	95.6	84.4

The second set was made from 1130 to 1200 EST while the smoke boat was located 2.15 Km from the traverse line. The plume made an angle of 73° with the beach.

Uncorrected -	Simple σ	Overall Σ	Meander
	44.2	93.4	82.0
	45.0		
	44.5		
	46.4		
	48.1		
	41.5		
	42.8		
	44.3		
Ave.	44.6		

Corrected standard deviations for plume angle to the beach:

Simple	Overall	Meander
42.6	89.3	78.4

June 16, 1976

Run No. 22 continued

The third set was made from 1253 to 1325 EST while the LCM was 3.85 Km away from the traverse line. The plume made an angle of 80° with the beach.

Uncorrected -	Simple σ	Overall Σ	Meander
	56.7	93.5	75.1
	59.0		
	50.3		
	66.8		
	54.4		
	53.7		
	53.1		
	47.7		
Ave.	55.7		

Corrected standard deviation for plume angle to the beach:

Simple	Overall	Meander
54.9	92.1	74.0

Files June 17, 1976

Densitometer determined standard deviations

Run No. 23 June 4, 1976

The van was used to make eight traverses along Dune Road during the time period 1408 to 1435 EST.

The traverse line was 1.78 Km downwind of the smoke boat and the plume made an angle of 54° to the beach.

Uncorrected -	Simple σ	Overall Σ	Meander
	33.5	88.3	77.7
	39.6		
	59.2		
	59.1		
	33.2		
	28.3		
	35.9		
	28.4		
Ave.	41.8		

Corrected standard deviation for plume angle to the beach:

Simple	Overall	Meander
33.8	7.14	62.9

Files
Densitometer determined standard deviations

June 17, 1976

Run No. 24 June 8, 1976

The van was used to make nine traverses along Dune Road during the time period 1340 to 1417 EST.

The traverse line was 0.93 Km downwind of the smoke boat and the plume made an angle of 39° with the beach.

Uncorrected -	Simple σ	Overall Σ	Meander
	43.6	64.1	49.5
	58.9		
	43.9		
	49.6		
	33.2		
	22.8		
	21.3		
	17.3		
	29.1		
Ave.	40.6		

Corrected standard deviations for plume angle to the beach.

Simple	Overall	Meander
32.8	51.9	40.0