

AD-A164 965

OPERATIONAL USE OF THE REEDM (ROCKET EXHAUST EFFLUENT  
DIFFUSION MODEL) (U) WEATHER SQUADRON (2D) PATRICK AFB  
FL DETACHMENT 11 B F BOYD 03 JUL 85 245/CP-85/005

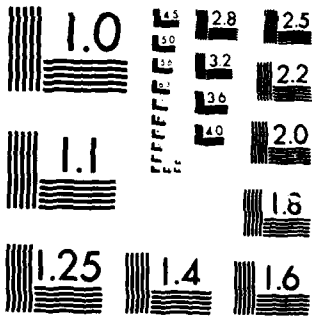
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MICROCOPY RESOLUTION TEST CHART  
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REPORT DOCUMENTATION PAGE

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- 3. Distribution/Availability of Report: Approved for public release; distribution is unlimited.
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- 18. Subject Terms: \*METEOROLOGY, \*WEATHER FORECASTING, \*SPACE SHUTTLE, ROCKET EXHAUST EFFLUENT DIFFUSION.
- 19. Abstract: *This abstract* Presents operational considerations in the use of the NASA (Marshall Space Flight Center) Rocket Exhaust Effluent Diffusion code and the resultant Rocket Exhaust Effluent Diffusion Model (REEDM). It concentrates on that area outside the REEDM Code: The meteorological data that goes into the code and its significance. *Keywords: weather forecasting; space shuttle; charts;*
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- 21. Abstract Security Classification: UNCLASSIFIED
- 22a. Name of Responsible Individual: Billie F. Boyd
- 22b. Telephone: 305 494-5915
- 22c. Office Symbol: ESMC/WER

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OPERATIONAL USE OF THE REEDM  
by  
Billie F. Boyd  
Office of the Staff Meteorologist  
Eastern Space and Missile Center  
Patrick AFB, Florida

In 1976, H.E. Cramer Company, Inc began development of the NASA (Marshall Space Flight Center) Rocket Exhaust Effluent Diffusion code which resulted in the REEDM (Rocket Exhaust Effluent Diffusion Model). REEDM has been used for Shuttle support at Kennedy Space Center (KSC) since the start of the Shuttle program; however, the model has undergone considerable changes during that time. Cramer has been under contract to the United States Air Force since 1983 for purposes of refining the model as used at KSC and to develop a specialized model for use at Vandenberg AFB for west coast Shuttle launches.

The model has been adequately described by Clint Bowman of H.E. Cramer Company (preceeding paper). The intent of this paper is to present the operational considerations in the use of the model and as such concentrates on that area outside the REEDM code: the meteorological data that goes into the code and its significance.

There are three sources for the meteorological data input to the model: rawinsonde data, instrumented ground tower data, and forecast data. The rawinsonde data files are built from rawinsonde releases at the Cape Canaveral Air Force Station (CCAFS) site approximately 10 miles southeast of the Shuttle launch area (pad 39A). Releases to support the Shuttle are normally made at 24, 11, 8½, 5, 2½, and 1 hour prior to launch. Data files are available 30 to 40 minutes after release. The KSC/CCAFS meteorological tower network currently consists of 16 permanent and 9 temporary towers which provide updated data every five minutes. The primary tower used for REEDM is tower 313, instrumented to 500 feet and located approximately 4 miles northwest of pad 39A.

The meteorological file from the rawinsonde is input to the REEDM which builds a file for display. The forecaster verifies the rawinsonde data, corrects if required, adds tower data if desired, determines homogenous layers in the lower 10,000 feet, and runs the model. If significant changes are expected prior to launch, actual data are changed to forecast values which are used to run the model. The following items are all significant as illustrated in the view graphs: wind direction, wind speed, directional variation ( $\sigma$  as a measure of turbulence), temperature and dew point. The importance of these parameters is illustrated in the series of view graphs for the two Shuttle launches in April 1985.

Measurements made for STS-51-D, launched 12 April 1985 indicate the model is currently performing quite well when the correct meteorological data are input.

#### Summary of View Graphs

1. Schematic diagram illustrating major components of the REEDM.
2. Diagram of KSC/CCAFS area indicating location of meteorological instrumented towers - the WINDS (Weather Information Network Display System).
3. Rawinsonde file input to the REEDM at L-5 on 12 April 1985 (Mission 51-D).
4. Rawinsonde file as modified (interpolated) by an earlier version of REEDM (51-D).
5. Rawinsonde file as interpolated by the latest REEDM. Note: 12 vs 4 additional levels, (51-D).
6. Display of met profiles and cloud segments without layering (51-D).
7. Met profiles and cloud segments after layering.
8. Isoleth values of HCL ground deposition (25,250,1000 mg/m<sup>2</sup>) based on the

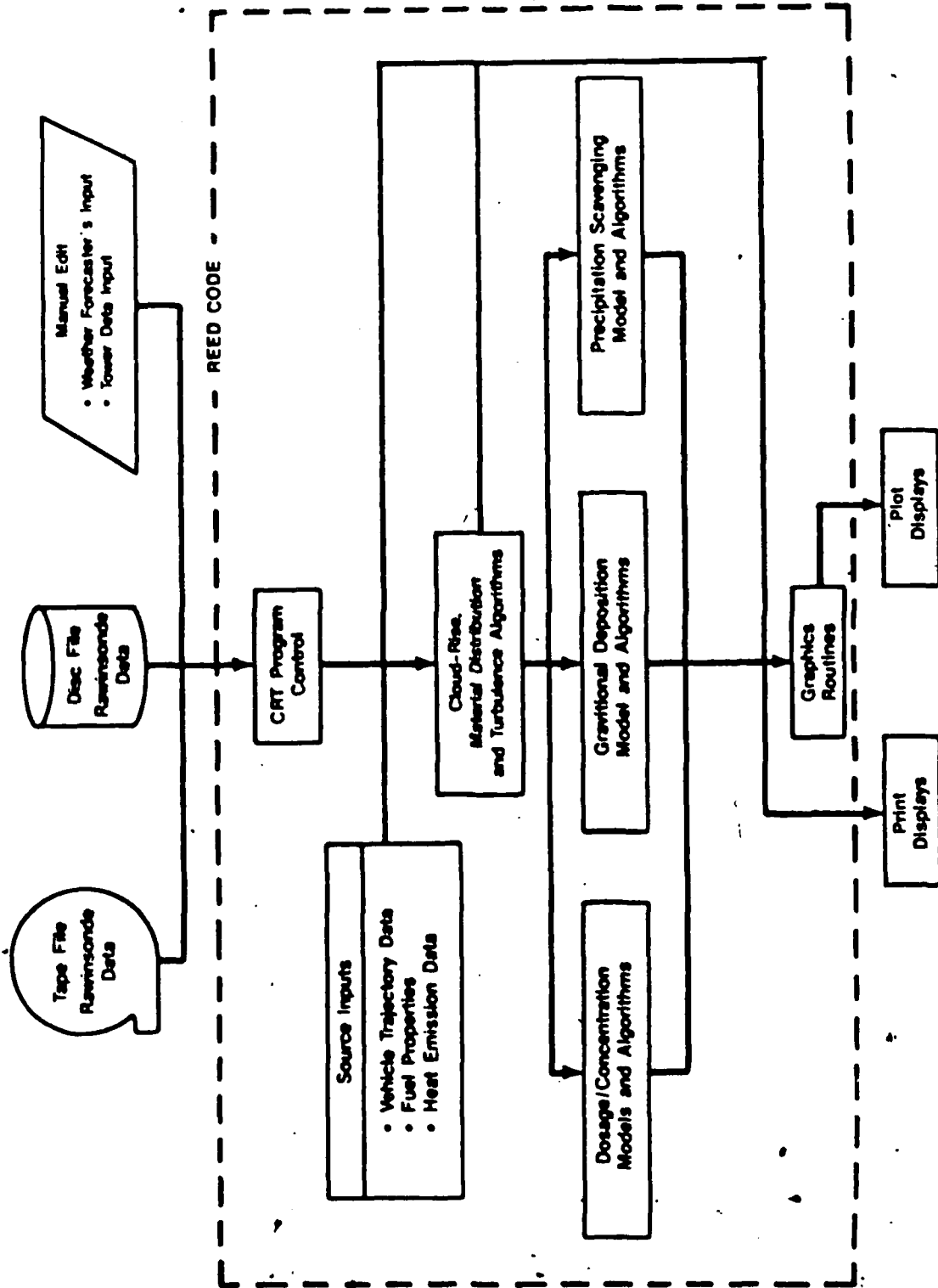
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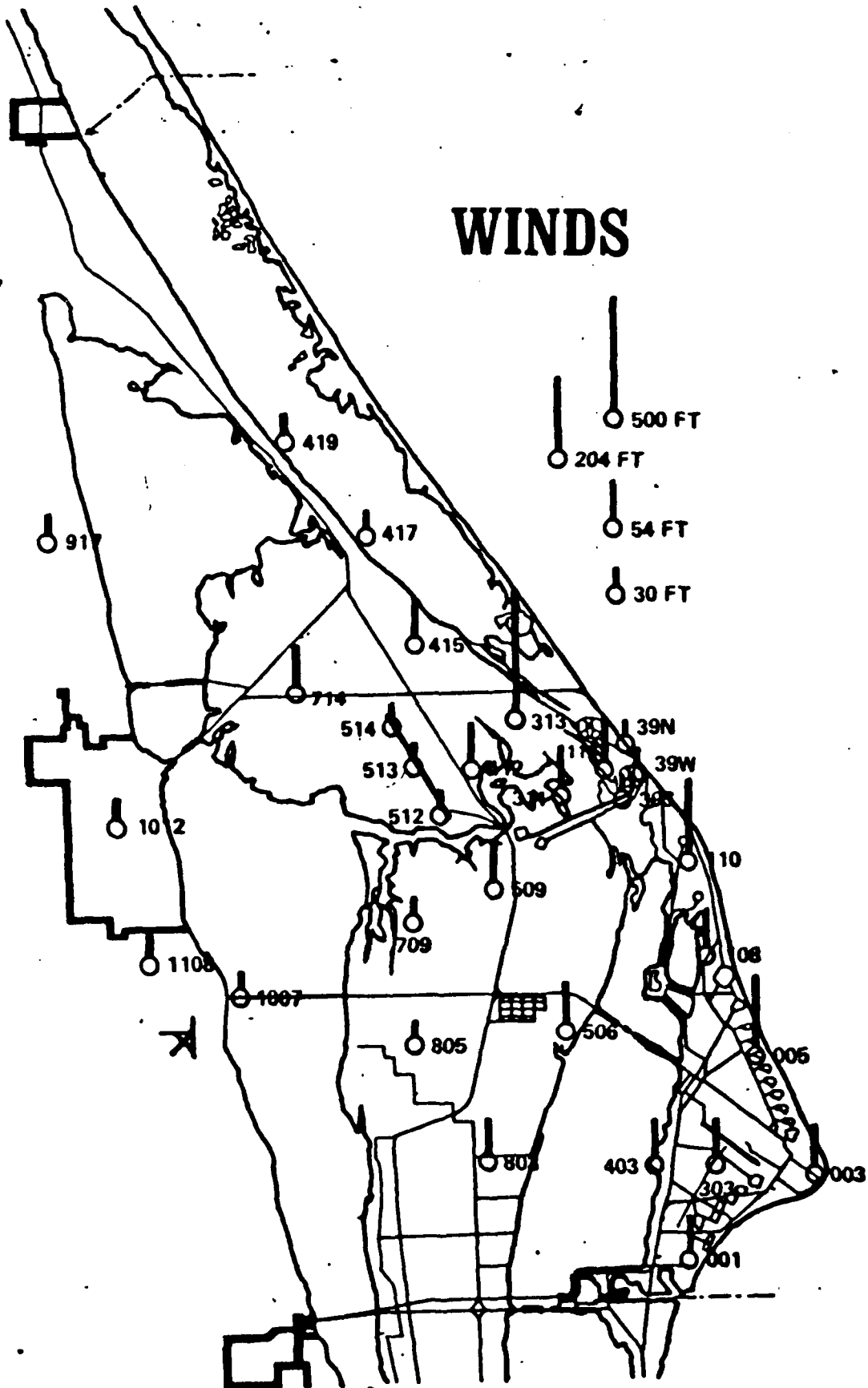
- L-5 data (51-D).
9. Gravitational deposition along the centerline by range/bearing/amount (51-D).
  10. REEDM interpolated meteorological file at L-5 for mission 51-B, 29 April 1985.
  11. Meteorological data profiles and cloud segment depiction based on L-5 data for mission 51B.
  12. Isopleth values of HCL ground deposition based on the L-5 data (51-B).
  13. Range/bearing/amount for the 51-B based on L-5 data.
  14. REEDM interpolated meteorological file using launch time data. Note the wind shift (51-B).
  15. Launch time met data and cloud depiction for the mission 51-B.
  16. Isopleth values based on the launch time rawinsonde release. Note shift from L-5 (51-B).
  17. Range/bearing/amount for 51-B based on the launch time rawinsonde data.

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# REED MODEL MAJOR COMPONENTS



# WINDS



RAWINSONDE  
0801 Z 12 APRIL 1985

ALT (ft)	DIR (deg)	SPD (kts)	TEMP (deg C)	D/PT (deg C)	PRESS (mbar)	RH (pct)	g/m <sup>3</sup>	DENSITY (g/m <sup>3</sup> )	ALT (m)
000016	080	010	19.6	12.4	1023.70	063		1211.80	00005.
000675	096	018	17.8	10.8	1000.00	063			00206
001000	100	022	17.0	10.0	988.60	064			00305
001022	100	022	16.9	10.0	987.82	064			00312
002000	104	021	14.2	10.1	953.80	076			00610
002108	105	021	13.9	10.1	950.00	078			00643
003000	108	020	11.3	9.4	919.90	088			00914
003594	108	019	9.8	8.8	900.00	094			01095
004000	109	019	8.8	8.4	886.90	098			01219
004231	109	019	8.2	8.2	879.48	100			01290
004786	108	017	7.0	7.0	861.67	100			01459
004771	107	016	7.9	-7	855.82	055			01515
005000	107	016	8.5	-8.5	854.90	048			01524
005148	109	012	11.5	-18.8	850.00	010			01569
005159	110	012	11.5	-18.9	849.94	011			01572
006000	112	010	11.3	-9.3	824.30	023			01829
006483	112	009	10.7	-7.5	809.91	028			01976
006806	114	009	9.9	-7.4	800.00	029			02074
007000	114	009	9.5	-7.3	794.70	030			02134
007500	117	008	8.4	-7.4	780.35	032			02286
008000	120	007	7.2	-7.5	766.00	034			02438
008553	124	006	6.2	-8.1	750.00	035			02607
009000	129	005	5.3	-8.3	738.10	037			02743
009500	141	004	4.3	-8.1	724.55	041			02896
010000	153	003	3.2	-7.8	711.00	044			03048



# MET DATA FILE

0301 EST 12 APR 85

SURFACE DENSITY (GM/M<sup>3</sup>): 1211.80

LEVEL NO.	ALTITUDE (ft)	ALTITUDE (m)	DIR (deg)	(m/s)	SPEED (kt)	TEMP	PTEMP (deg C)	DPTMP	PRESS (mbar)	RH (%)
1	16	4.9	80.0	5.15	10.00	19.6	19.19	12.4	1023.7	63.0
2	675	205.7	95.0	9.27	18.00	17.8	19.22	10.8	1000.0	63.0
3	1000	304.8	99.0	11.33	22.00	17.0	19.35	10.0	986.6	64.0
4	1500	457.2	101.5	11.07	21.50	15.6	19.46	10.1	971.2	70.0**
5	2000	609.6	104.0	10.82	21.00	14.2	19.57	10.1	953.8	76.0
6	2108	642.5	104.0	10.82	21.00	13.9	19.62	10.1	950.0	78.0
7	3000	914.4	107.0	10.30	20.00	11.3	19.65	9.4	919.9	88.0
8	3594	1095.5	108.0	9.79	19.00	9.8	19.92	8.8	900.0	94.0
9	4000	1219.2	109.0	9.79	19.00	8.8	20.11	8.4	886.9	98.0
10	4231	1289.6	109.0	9.79	19.00	8.2	20.16	8.2	879.5	100.0
11	4786	1458.8	108.0	8.76	17.00	7.0	20.57	7.0	861.7	100.0
12	4971	1515.2	107.0	8.24	16.00	7.9	21.56	-7	855.8	55.0
13	5000	1524.0	107.0	8.24	16.00	8.5	22.21	-3.5	854.9	48.0
14	5148	1569.1	109.0	6.18	12.00	11.5	25.32	-18.8	850.0	10.0
15	5159	1572.5	110.0	6.18	12.00	11.5	25.34	-18.9	849.9	10.5
16	6000	1828.8	112.0	5.15	10.00	11.3	26.00	-9.3	824.3	23.0
17	6483	1976.0	112.0	4.64	9.00	10.7	26.98	-7.5	809.9	27.8
18	6806	2074.5	114.0	4.64	9.00	9.9	29.20	-7.4	800.0	29.0
19	7000	2133.6	114.0	4.64	9.00	9.5	29.35	-7.3	794.7	30.0
20	7500	2286.0	117.0	4.12	8.00	8.4	29.71	-7.4	780.4	32.0**
21	8000	2438.4	120.0	3.61	7.00	7.2	30.09	-7.5	766.0	34.0
22	8553	2607.0	124.0	3.09	6.00	6.2	30.84	-8.1	750.0	35.0
23	9000	2743.2	129.0	2.58	5.00	5.3	31.27	-8.3	738.1	37.0
24	9500	2895.6	141.0	2.06	4.00	4.3	31.76	-8.1	724.6	40.5**
25	10000	3048.0	153.0	1.55	3.00	3.2	32.28	-7.8	711.0	44.0

L-5 SPACE SHUTTLE NORMAL LAUNCH  
 LAUNCH TIME: 805 EST DATE: 12 APR 1985  
 TIME OF EXECUTION: 343 EST DATE: 12 APR 1985  
 METEOROLOGICAL DATA FILE

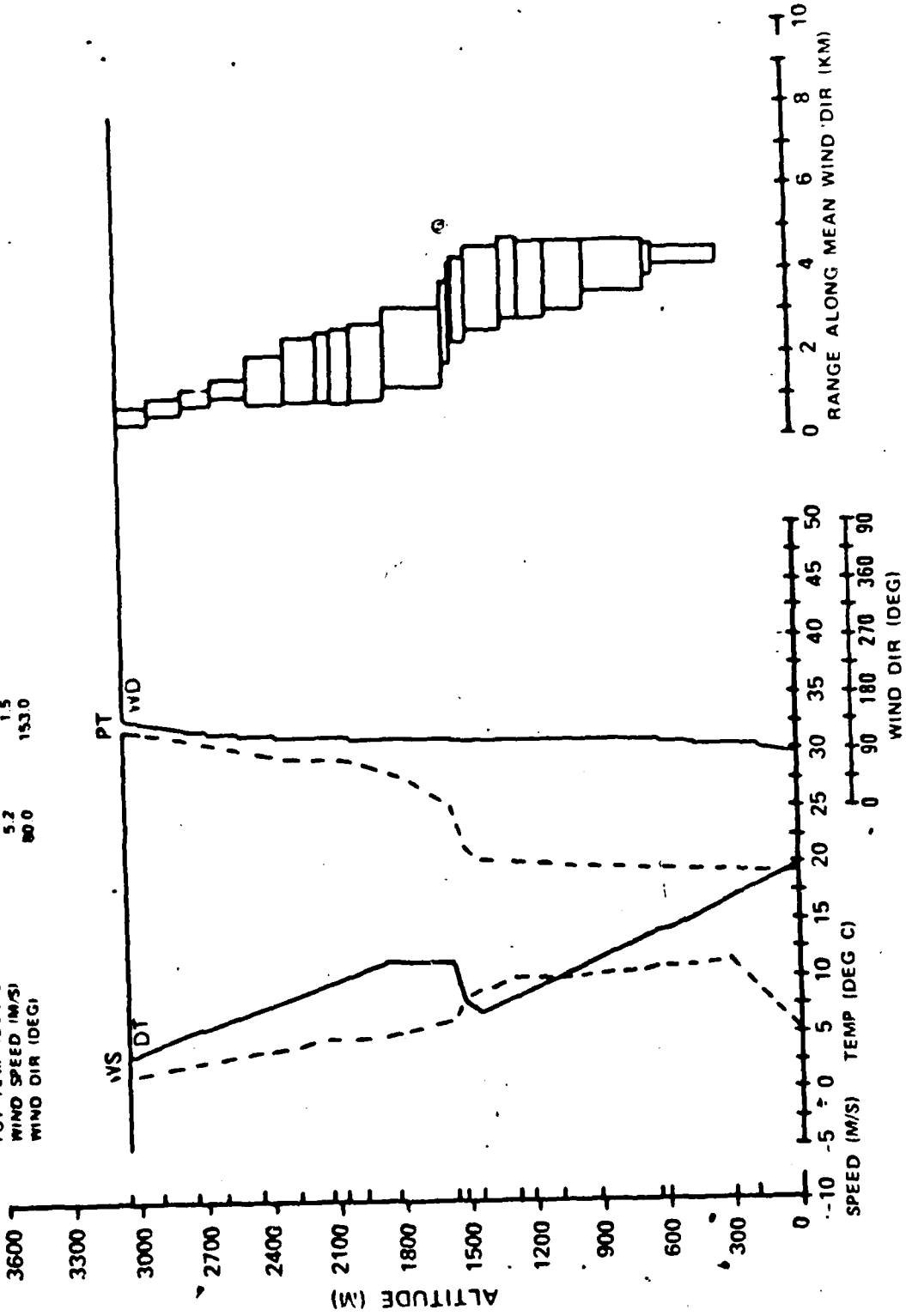
SURFACE DENSITY (GM/M<sup>3</sup>): 1211.80

LEVEL NO.	ALTITUDE (ft)	ALTITUDE (m)	DIR (deg)	SPEED (m/s)	SPEED (kt)	TEMP	PTEMP (deg C)	DPTMP	PRESS (mbar)	RH (%)
1	16	4.9	80.0	5.14	10.00	19.6	19.19	12.4	1023.7	63.0
2	110	33.6	82.3	5.73	11.14	19.3	19.19	12.2	1020.3	63.1**
3	204	62.3	84.6	6.32	12.29	19.1	19.20	11.9	1016.9	63.2**
4	298	91.0	86.9	6.91	13.43	18.8	19.21	11.7	1013.5	63.3**
5	393	119.7	89.1	7.50	14.57	18.6	19.21	11.5	1010.1	63.4**
6	487	148.4	91.4	8.08	15.71	18.3	19.22	11.3	1006.8	63.4**
7	581	177.0	93.7	8.67	16.86	18.1	19.23	11.0	1003.4	63.5**
8	675	205.7	96.0	9.26	18.00	17.8	19.22	10.8	1000.0	63.0
9	838	255.3	98.0	10.29	20.00	17.4	19.29	10.4	994.2	63.5**
10	1000	304.8	100.0	11.32	22.00	17.0	19.35	10.0	988.6	64.0
11	1348	410.9	101.3	11.15	21.67	16.0	19.40	10.0	976.4	67.8**
12	1674	510.2	102.7	10.97	21.33	15.1	19.49	10.1	965.0	72.0**
13	2000	609.6	104.0	10.80	21.00	14.2	19.57	10.1	953.0	76.0
14	2108	642.5	105.0	10.80	21.00	13.9	19.62	10.1	950.0	78.0
15	2554	778.5	106.5	10.55	20.50	12.6	19.64	9.8	934.8	82.9**
16	3000	914.4	108.0	10.29	20.00	11.3	19.64	9.4	919.9	88.0
17	3594	1095.5	108.0	9.77	19.00	9.8	19.92	8.8	900.0	94.0
18	4000	1219.2	109.0	9.77	19.00	8.8	20.11	8.4	886.9	98.0
19	4971	1515.2	107.0	8.23	16.00	7.9	21.55	-7	855.8	55.0
20	5148	1569.1	109.0	6.17	12.00	11.5	25.32	-18.8	850.0	10.0
21	6000	1828.8	112.0	5.14	10.00	11.3	28.00	-9.3	824.3	23.0
22	6483	1976.0	112.0	4.63	9.00	10.7	28.97	-7.5	809.9	27.8
23	6806	2074.5	114.0	4.63	9.00	9.9	29.19	-7.4	800.0	29.0
24	7000	2133.6	114.0	4.63	9.00	9.5	29.35	-7.3	794.7	30.0
25	7500	2286.0	117.0	4.12	8.00	8.3	29.74	-7.4	780.2	32.8**
26	8000	2438.4	120.0	3.60	7.00	7.2	30.09	-7.5	766.0	34.0
27	8553	2607.0	124.0	3.09	6.00	6.2	30.84	-8.1	750.0	35.0
28	9000	2743.2	129.0	2.57	5.00	5.3	31.26	-8.3	738.1	37.0
29	9500	2895.6	141.0	2.06	4.00	4.3	31.79	-8.0	724.4	41.4**
30	10000	3048.0	153.0	1.54	3.00	3.2	32.27	-7.8	711.0	44.0

\*\* INDICATES THAT DATA IS LINEARLY INTERPOLATED FROM INPUT METEOROLOGY

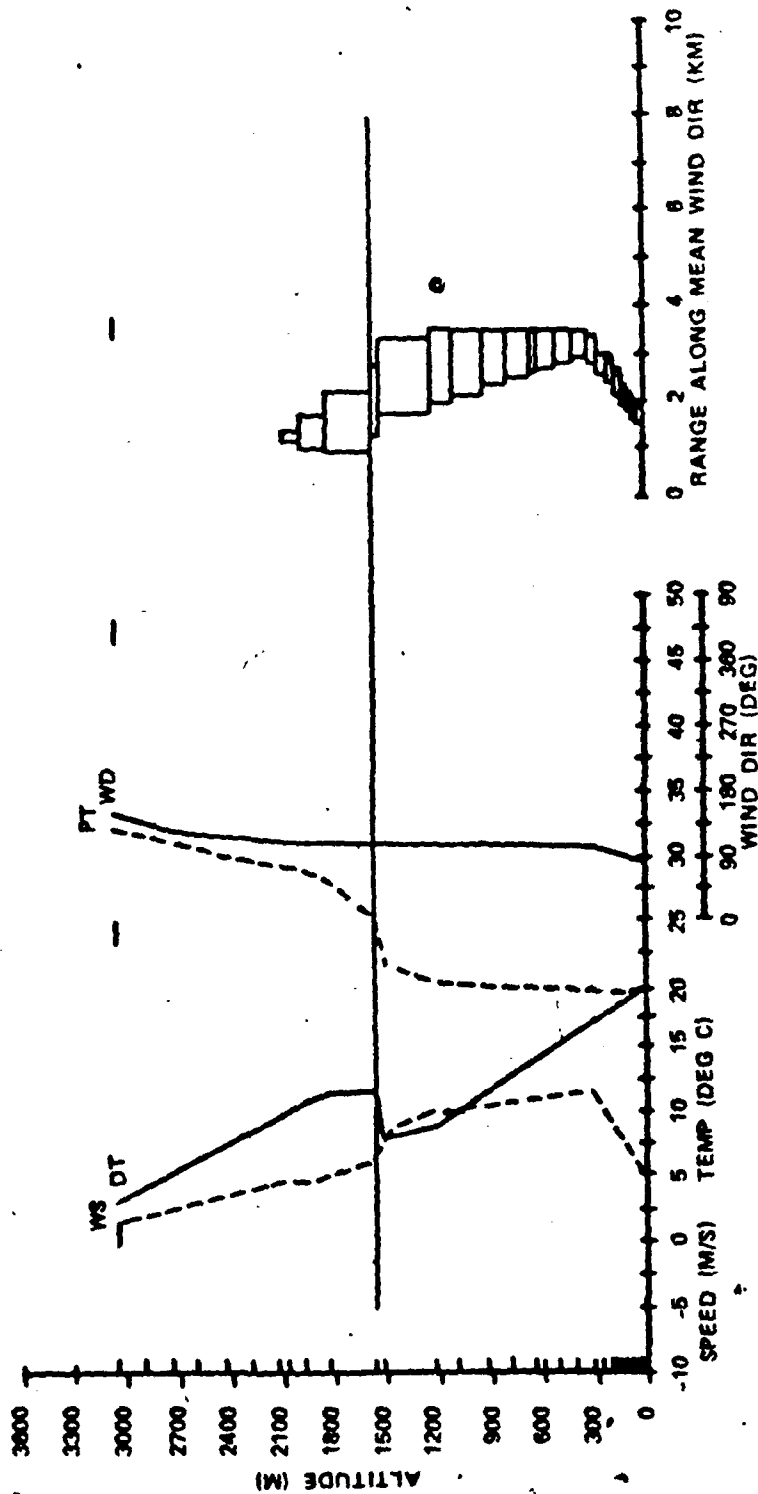
DATE: 12 APR 1965 TIME 0301 EST  
 SURFACE PRESSURE 1023.7 MB DENSITY 1211.8 GM<sup>3</sup> e - STAB HT: 1549.1 M

LAYER	
SURFACE	TOP
0.0	3048.0
19.6	3.2
19.2	32.3
5.2	1.5
80.0	153.0

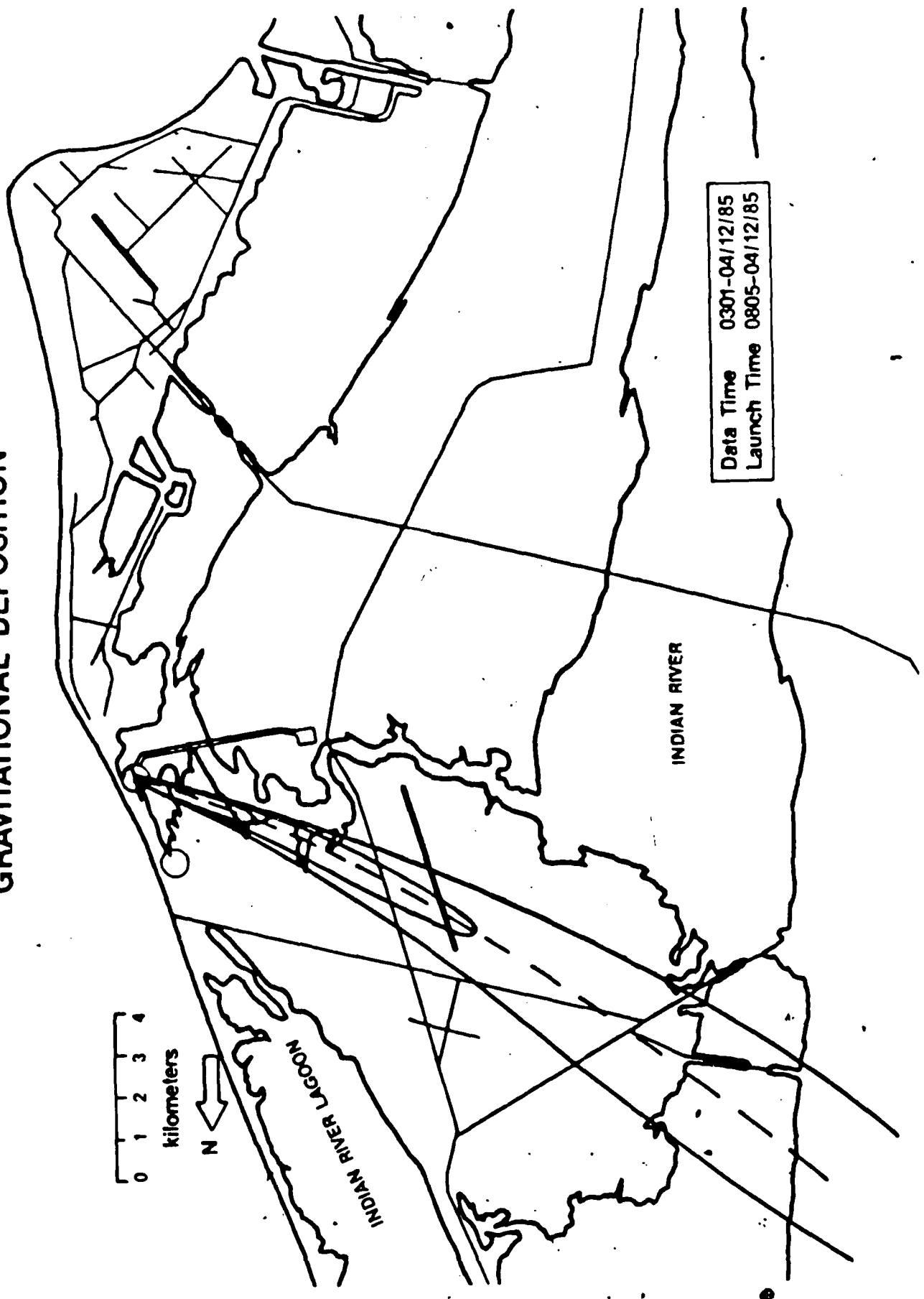


DATE: 12 APR 1965 TIME: 0301 EST  
 SURFACE PRESSURE: 1023.7 MB DENSITY: 1211.8 G/M<sup>3</sup> STAB HT: 1178.8 M

LAYER#1	
SURFACE	TOP
ALTITUDE (M)	1000.1
DRY TEMP (DEG C)	11.5
POT TEMP (DEG C)	25.3
WIND SPEED (M/S)	8.2
WIND DIR (DEG)	108.0



# HCL GRAVITATIONAL DEPOSITION



0 1 2 3 4

kilometers



INDIAN RIVER LAGOON

INDIAN RIVER

Data Time 0301-04/12/85  
Launch Time 0805-04/12/85

# MAXIMUM CENTERLINE CALCULATIONS

FOR HCL AT GROUND LEVEL  
 DOWNWIND FROM A SPACE SHUTTLE NORMAL LAUNCH  
 CALCULATIONS APPLY TO THE LAYER BETWEEN THE SURFACE AND 3048.00 METERS  
 THE METEOROLOGICAL DATA IS FROM 301 EST 12 APR 1985  
 LAUNCH TIME: 805 EST 12 APR 1985  
 TIME OF EXECUTION: 348 EST 12 APR 1985

-- GRAVITATIONAL DEPOSITION --

RANGE (meters)	BEARING (degrees)	(MILLIGRAMS/ sq. meter)
400.586	293.849	9150.326
1495.080	282.393	1551.671
2405.306	280.472	1071.034
3400.762	280.724	1019.896
4400.461	281.679	873.324
5400.117	281.780	637.486
6400.328	282.410	503.830
7400.005	282.780	447.642
8400.006	282.902	391.397
9400.004	283.007	338.152
10400.000	283.048	281.655
11400.051	283.239	247.170
12400.004	283.299	207.803
13400.020	283.424	176.687
14400.006	283.536	152.543
15400.008	283.646	132.863
16400.008	283.752	116.692
17400.008	283.844	102.639
18400.004	283.918	89.727
19400.000	283.977	77.926
20400.004	284.023	67.276
21400.000	284.059	57.831
22400.000	284.086	49.614
23400.000	284.107	42.575
24400.000	284.123	36.593
25400.000	284.135	31.518
26400.000	284.143	27.202
27400.004	284.146	23.519
28400.004	284.145	20.369
29400.000	284.141	17.670

9150.326 IS THE PEAK GRAVITATIONAL DEPOSITION      RANGE      BEARING  
 400.586      293.849

L-5  
 SPACE SHUTTLE NORMAL LAUNCH  
 LAUNCH TIME: 1204 EDT DATE: 29 APR 1985  
 TIME OF EXECUTION: 652 EDT DATE: 29 APR 1985  
 METEOROLOGICAL DATA FILE

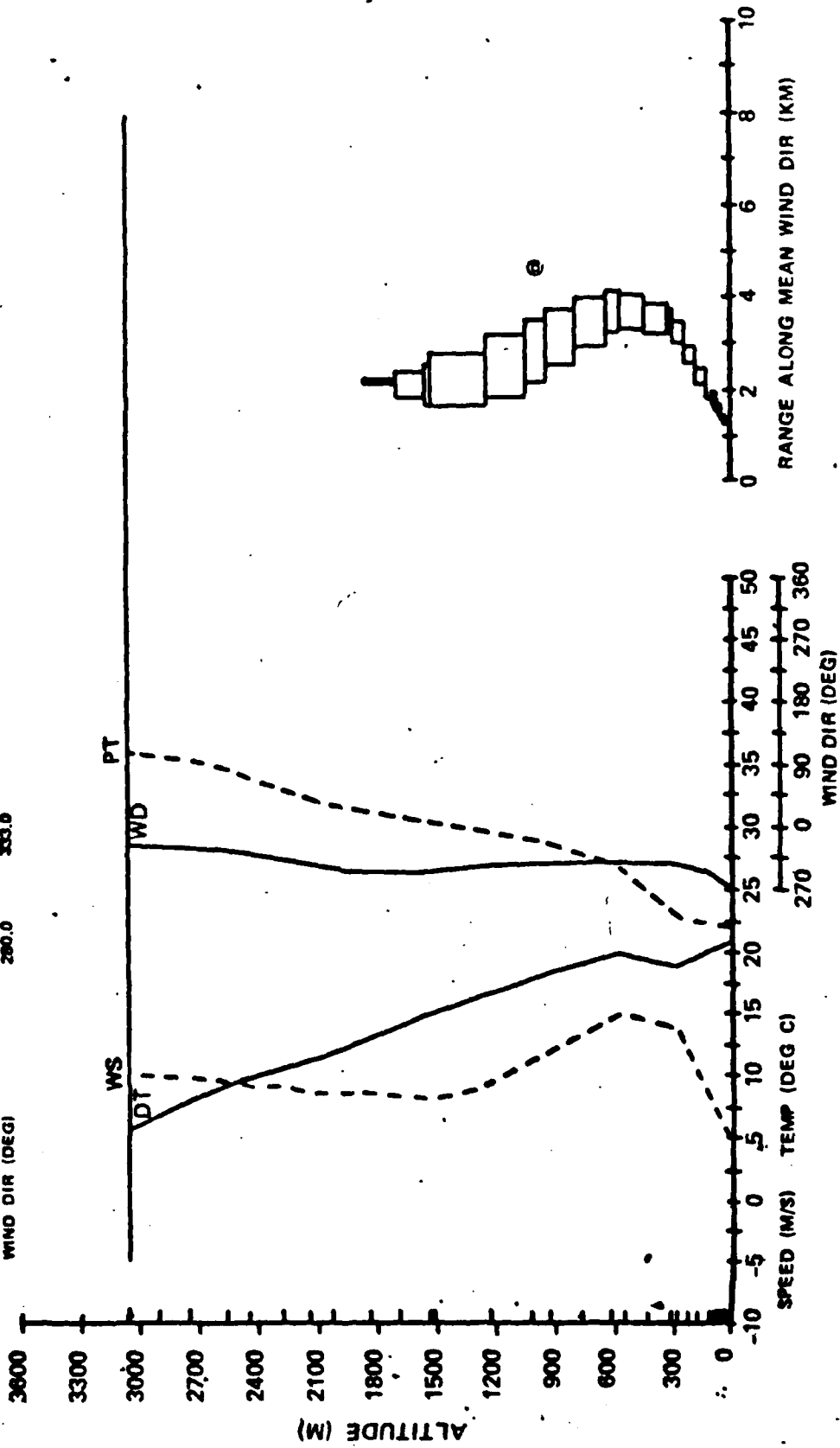
SURFACE DENSITY (GM/M<sup>3</sup>): 1189.90

LEVEL NO.	ALTITUDE (ft)	ALTITUDE (m)	DIR (deg)	SPEED (m/s)	SPEED (kt)	TEMP	PTEMP (deg C)	DPTMP	PRESS (mbar)	RH (%)
1	16	4.9	280.0	5.14	10.00	20.6	22.12	19.5	1011.9	94.0
2	64	19.5	282.3	5.59	10.86	20.5	22.16	19.4	1010.2	93.5**
3	112	34.1	284.6	6.03	11.71	20.4	22.21	19.4	1008.5	93.6**
4	160	48.8	286.9	6.47	12.57	20.3	22.26	19.3	1006.8	93.7**
5	208	63.4	289.1	6.91	13.43	20.3	22.31	19.2	1005.1	93.7**
6	256	78.0	291.4	7.35	14.29	20.2	22.36	19.1	1003.4	93.8**
7	304	92.7	293.7	7.79	15.14	20.1	22.41	19.1	1001.7	93.9**
8	352	107.3	296.0	8.23	16.00	20.0	22.46	19.0	1000.0	94.0
9	540	164.7	299.3	10.12	19.67	19.7	22.66	18.7	993.4	94.0**
10	729	222.1	302.7	12.00	23.33	19.3	22.85	18.3	986.8	94.0**
11	917	279.5	306.0	13.89	27.00	19.0	23.04	18.0	980.3	93.9
12	1000	304.8	306.0	13.89	27.00	19.1	23.39	17.9	977.5	93.0
13	1393	424.4	307.0	14.40	28.00	19.5	24.93	17.4	964.0	87.7**
14	1785	544.1	308.0	14.92	29.00	19.9	26.49	16.9	950.8	82.9
15	2000	609.6	308.0	14.40	28.00	19.7	26.96	16.9	943.6	84.0
16	2500	762.0	308.0	13.12	25.50	19.0	27.78	16.4	927.1	84.5**
17	3000	914.4	308.0	11.83	23.00	18.4	28.60	15.8	910.9	85.0
18	3335	1016.5	307.0	10.80	21.00	17.8	28.92	14.9	900.0	83.0
19	4000	1219.2	303.0	9.26	18.00	16.5	29.41	13.0	879.1	80.0
20	4935	1504.2	294.0	8.23	16.00	15.0	30.42	9.4	850.0	70.0
21	5000	1524.0	293.0	8.23	16.00	14.9	30.46	9.1	848.3	69.0
22	5500	1676.4	293.0	8.49	16.50	13.9	30.82	7.3	833.2	64.9**
23	6000	1828.8	293.0	8.75	17.00	12.9	31.16	5.5	818.3	60.0
24	6612	2015.3	299.0	8.75	17.00	11.6	31.64	3.6	800.0	58.0
25	7000	2133.6	305.0	8.75	17.00	11.1	32.25	2.6	789.1	56.0
26	7446	2269.5	312.0	9.26	18.00	10.4	32.86	1.3	776.4	54.0
27	8000	2438.4	320.0	9.26	18.00	9.7	33.94	1.8	760.8	58.0
28	8377	2553.3	326.0	9.77	19.00	9.3	34.81	2.2	750.0	61.0
29	9000	2743.2	330.0	9.77	19.00	-8.1	35.40	.7	733.4	60.0**
30	9500	2895.6	331.5	10.03	19.50	6.9	35.71	.0	720.0	62.6**
31	10000	3048.0	333.0	10.29	20.00	5.7	35.98	-.6	706.8	64.0

\*\* INDICATES THAT DATA IS LINEARLY INTERPOLATED FROM INPUT METEOROLOGY

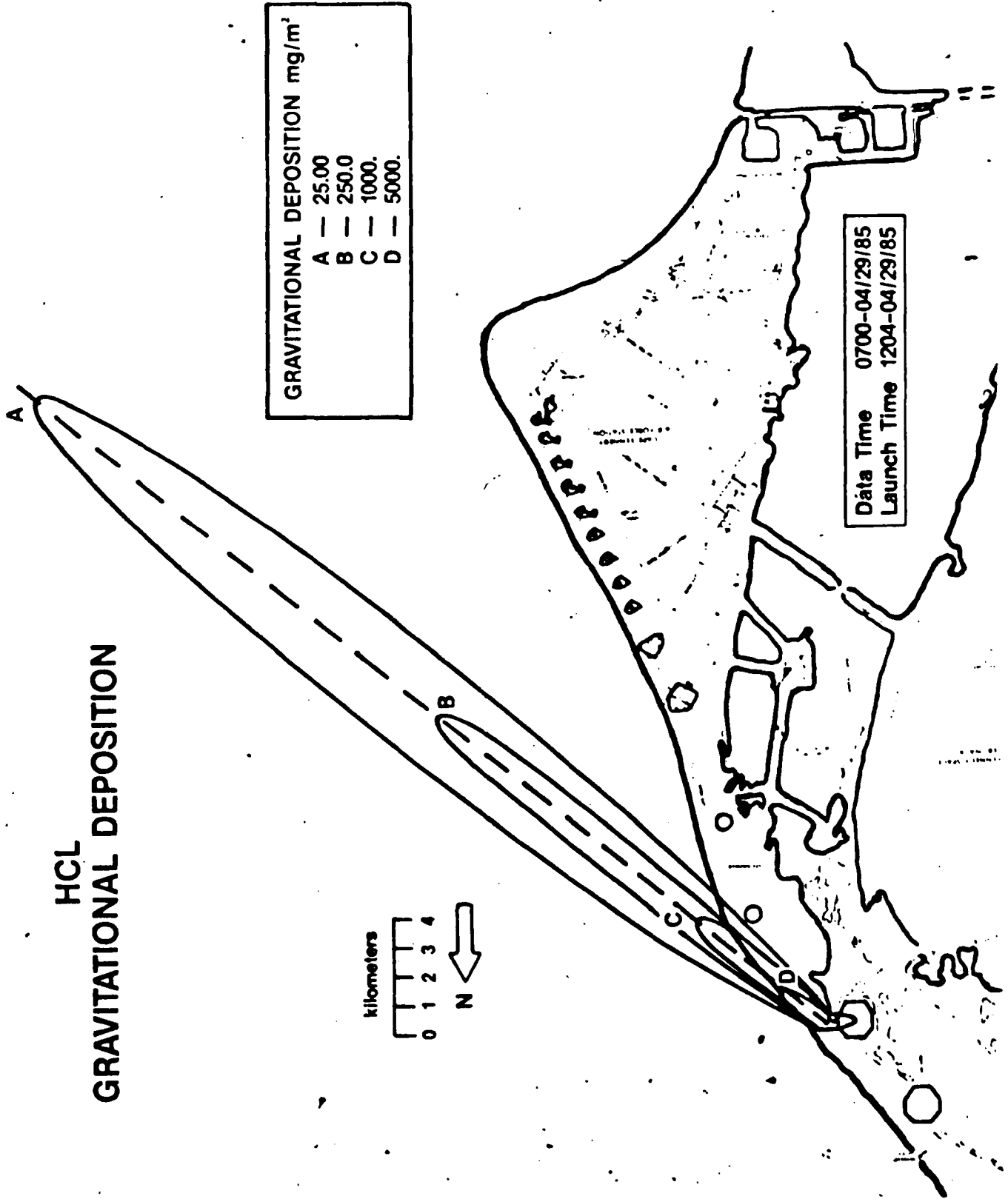
DATE: 29 APR 1985 TIME: 0700 EDT  
 SURFACE PRESSURE: 1011.9 MB DENSITY: 1189.9 G/M<sup>3</sup> ● - STAB HT: 985.1 M

LAYER		SURFACE	TOP
ALTITUDE (M)		0.0	3048.0
DRY TEMP (DEG C)		20.6	5.7
POT TEMP (DEG C)		22.1	38.0
WIND SPEED (M/S)		6.1	10.3
WIND DIR (DEG)		280.0	333.0





# HCL GRAVITATIONAL DEPOSITION



# MAXIMUM CENTERLINE CALCULATIONS

FOR HCL AT GROUND LEVEL  
 DOWNWIND FROM A SPACE SHUTTLE NORMAL LAUNCH  
 CALCULATIONS APPLY TO THE LAYER BETWEEN THE SURFACE AND 3048.00 METERS  
 THE METEOROLOGICAL DATA IS FROM 700 EDT 29 APR 1985  
 LAUNCH TIME: 1204 EDT 29 APR 1985  
 TIME OF EXECUTION: 652 EDT 29 APR 1985

- GRAVITATIONAL DEPOSITION -

RANGE (meters)	BEARING (degrees)	(MILLIGRAMS/ sq. meter)
401.798	77.187	10213.463
1499.444	108.577	1805.511
2419.491	117.438	2484.513
3400.646	120.751	1397.588
4400.076	122.089	1078.615
5400.047	122.988	838.479
6400.072	123.890	682.417
7400.005	124.117	580.023
8400.000	124.327	486.404
9400.004	124.489	439.832
10400.004	124.509	378.346
11400.002	124.549	302.732
12400.000	124.585	248.964
13400.002	124.629	209.451
14400.000	124.663	178.701
15400.000	124.683	153.093
16400.000	124.690	130.932
17400.000	124.688	111.508
18400.000	124.681	94.532
19399.996	124.672	79.867
20400.000	124.662	67.363
21400.000	124.652	56.817
22400.000	124.643	47.989
23400.000	124.635	40.634
24400.000	124.628	34.516
25399.996	124.622	29.429
26400.004	124.617	25.193
27399.996	124.612	21.658
28400.000	124.609	18.698
29399.996	124.605	16.212
10213.463 IS THE PEAK GRAVITATIONAL DEPOSITION	RANGE	BEARING
	401.798	77.187

**To**  
**SPACE SHUTTLE**      **NORMAL LAUNCH**  
**LAUNCH TIME: 1204 EDT DATE: 29 APR 1985**  
**TIME OF EXECUTION: 1330 EDT DATE: 29 APR 1985**  
**METEOROLOGICAL DATA FILE**

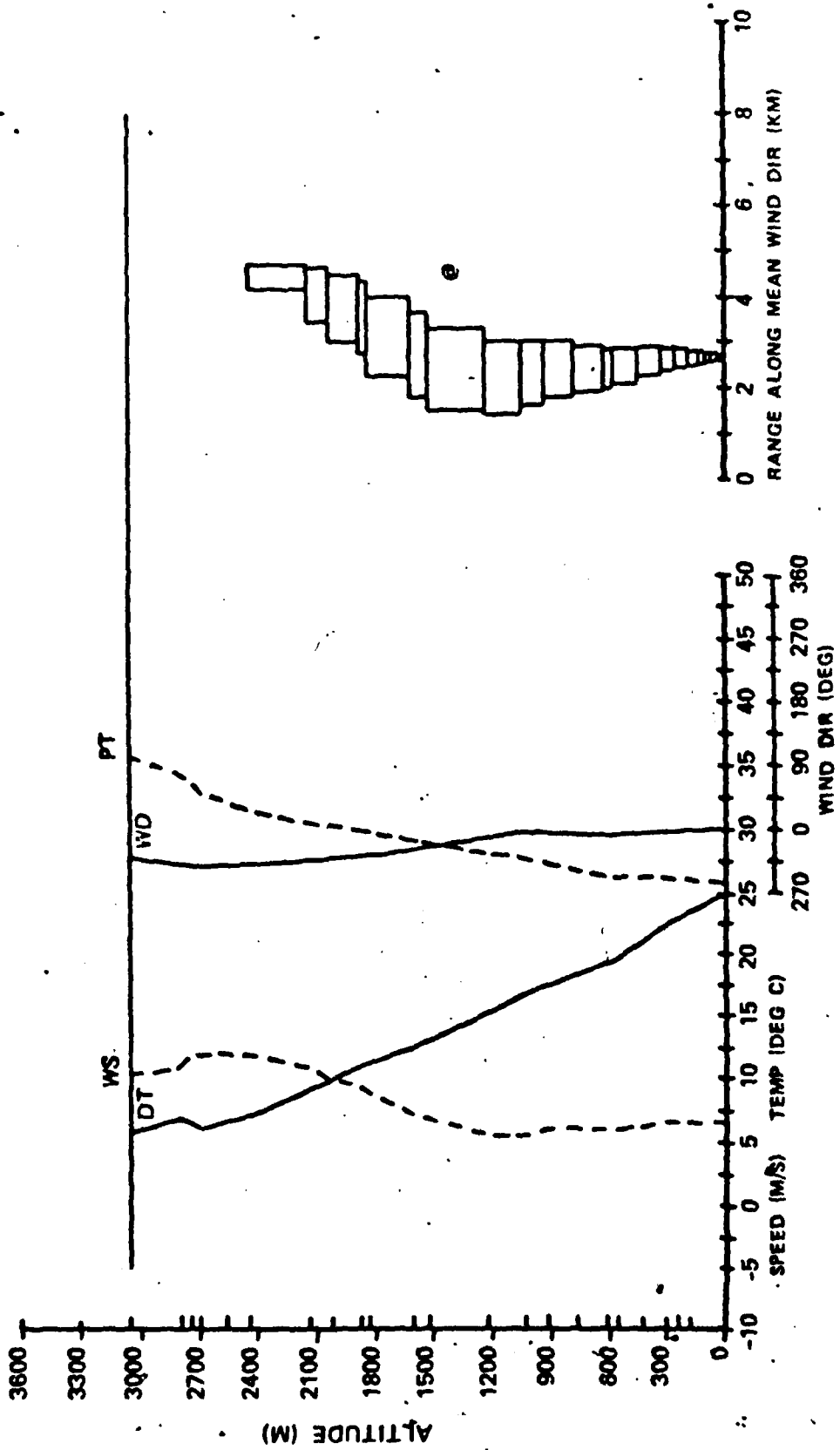
LEVEL NO.	SURFACE DENSITY (GM/M <sup>3</sup> )	ALTITUDE (m)	DIR (deg)	SPEED (m/s)	SPEED (kt)	TEMP	PTEMP (deg C)	DPTMP	PRESS (mbar)	RH (%)
1	16	4.9	360.0	6.69	13.00	24.9	25.85	16.1	1012.9	58.0
2	69	20.9	359.9	6.69	13.00	24.8	25.86	16.0	1011.1	58.4**
3	121	36.9	359.7	6.69	13.00	24.6	25.87	16.0	1009.2	58.7**
4	174	52.9	359.6	6.69	13.00	24.5	25.88	15.9	1007.4	59.0**
5	226	69.0	359.4	6.69	13.00	24.3	25.89	15.9	1005.5	59.2**
6	279	85.0	359.3	6.69	13.00	24.2	25.90	15.8	1003.7	59.5**
7	331	101.0	359.1	6.69	13.00	24.0	25.91	15.8	1001.9	59.8**
8	384	117.0	359.0	6.69	13.00	23.9	25.92	15.7	1000.0	60.0
9	569	179.6	358.3	6.69	13.00	23.4	25.99	15.5	992.9	61.2**
10	795	242.2	357.7	6.69	13.00	22.8	26.05	15.2	985.8	62.3**
11	1000	304.8	357.0	6.69	13.00	22.3	26.09	15.0	978.8	63.0
12	1410	429.8	354.0	6.43	12.50	21.0	26.14	16.0	964.8	73.4
13	1820	554.7	351.0	6.17	12.00	19.6	26.17	17.0	951.1	85.0
14	1849	563.6	351.0	6.17	12.00	19.5	26.16	16.9	950.0	85.0
15	2000	609.6	351.0	6.17	12.00	19.2	26.25	16.4	945.0	84.0
16	2500	762.0	352.5	6.17	12.00	18.3	26.75	15.4	928.4	83.3**
17	3000	914.4	354.0	6.17	12.00	17.4	27.25	14.4	912.2	83.0
18	3373	1028.1	355.0	5.66	11.00	16.7	27.68	14.1	900.0	85.0
19	4000	1219.2	348.0	5.66	11.00	15.3	28.11	13.6	880.2	89.0
20	4965	1513.3	333.0	6.69	13.00	13.1	28.74	12.4	850.0	95.0
21	5253	1601.1	329.0	7.20	14.00	12.5	28.97	12.0	841.5	96.8
22	6000	1828.8	319.0	8.75	17.00	11.3	29.77	9.1	819.0	87.0
23	6133	1869.3	318.0	9.26	18.00	11.1	29.92	8.6	815.1	84.6
24	6633	2021.7	314.0	9.77	19.00	9.9	30.21	7.9	800.0	87.0
25	7000	2133.6	312.0	10.80	21.00	9.1	30.46	7.4	789.7	89.0
26	7954	2424.4	308.0	11.83	23.00	7.2	31.39	6.0	762.5	92.3
27	8000	2438.4	308.0	11.83	23.00	7.1	31.40	5.8	761.2	91.0
28	8386	2556.1	307.0	11.83	23.00	6.7	32.15	4.2	750.0	84.0
29	8846	2696.3	307.0	11.83	23.00	6.2	32.92	2.4	737.8	77.2
30	9000	2743.2	309.0	11.32	22.00	6.5	33.61	.5	733.6	66.0
31	9154	2790.1	311.0	10.80	21.00	6.8	34.33	-1.3	729.4	57.2
32	10000	3048.0	320.0	10.29	20.00	5.8	35.89	-7.9	706.9	38.0

\*\*INDICATES THAT DATA IS LINEARLY INTERPOLATED FROM INPUT METEOROLOGY

DATE: 29 APR 1985 TIME: 1228 EDT  
 SURFACE PRESSURE: 1012.9 MB DENSITY: 1175.9 G/M<sup>3</sup> e - STAB HT: 1362.3 M

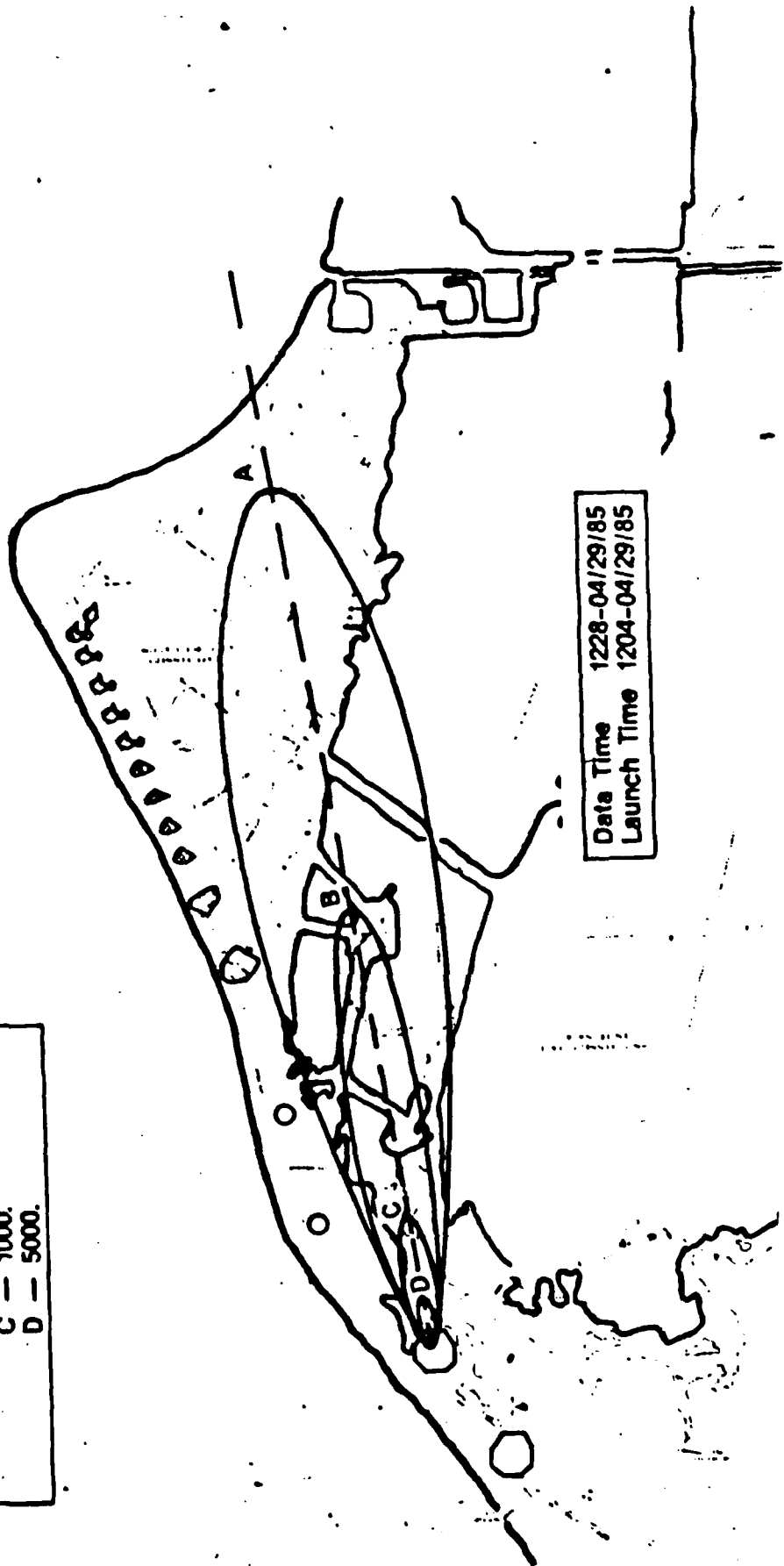
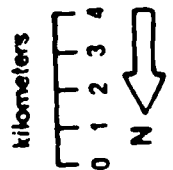
LAYER1

ALTIITUDE (M)	SURFACE	TOP
	0.0	3048.0
DRY TEMP (DEG C)	24.9	5.8
POT TEMP (DEG C)	25.8	36.7
WIND SPEED (M/S)	6.7	10.3
WIND DIR (DEG)	360.0	320.0



# HCL GRAVITATIONAL DEPOSITION

GRAVITATIONAL DEPOSITION mg/m <sup>3</sup>	
A	— 25.00
B	— 250.0
C	— 1000.
D	— 5000.



# MAXIMUM CENTERLINE CALCULATIONS

FOR HCL AT GROUND LEVEL  
 DOWNWIND FROM A SPACE SHUTTLE NORMAL LAUNCH  
 CALCULATIONS APPLY TO THE LAYER BETWEEN THE SURFACE AND 3048.00 METERS  
 THE METEOROLOGICAL DATA IS FROM 1228 EDT 29 APR 1985  
 LAUNCH TIME: 1204 EDT 29 APR 1985  
 TIME OF EXECUTION: 1330 EDT 29 APR 1985

-- GRAVITATIONAL DEPOSITION --

RANGE (meters)	BEARING (degrees)	(MILLIGRAMS/ sq. meter)
400.037	179.114	6722.393
1401.718	175.888	2095.000
2400.479	175.418	1224.871
3400.199	174.563	695.508
4400.538	173.240	743.435
5400.102	172.225	647.327
6400.013	171.604	503.389
7400.051	171.080	390.736
8400.000	170.790	289.751
9400.137	170.335	220.112
10400.014	170.015	165.906
11400.006	169.795	122.589
12400.205	169.358	95.177
13400.029	169.025	73.294
14400.039	168.728	55.448
15400.164	168.316	42.969
16400.207	167.823	33.727
17400.172	167.324	26.603
18400.121	166.869	21.058
19400.082	166.475	16.716
20400.059	166.141	13.303
21400.043	165.858	10.621
22400.031	165.620	8.515
23400.027	165.417	6.866
24400.023	165.240	5.575
25400.023	165.082	4.564
26400.020	164.936	3.768
27400.020	164.799	3.138
28400.016	164.670	2.636
29400.020	164.548	2.231

6722.393 IS THE PEAK GRAVITATIONAL DEPOSITION

RANGE  
400.037

BEARING  
179.114

**END**

**FILMED**

4-86

**DTIC**