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DR-408
March 1969

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METEOROLOGICAL DATA REPORT

AEROBEE NASA 4.135 DS
(NRL NE 3.175)
(12 February 1969)

BY

MARJORIE McLARDIE HOIDALE

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WHITE SANDS MISSILE RANGE, NEW MEXICO

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DA Task 1T665702D127-02

ATMOSPHERIC SCIENCES OFFICE
WHITE SANDS MISSILE RANGE, NEW MEXICO

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ABSTRACT

Meteorological data gathered for the launching of Aerobee NASA 4.135 DS (NRL NE 3.175) are presented for the NASA Goddard Space Flight Center, Greenbelt, Maryland, the Naval Research Laboratory, Washington, D. C., and for ballistic studies. The data appear, along with calculated ballistic data, in tabular form.

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INTRODUCTION

Aerobee NASA 4.135 DS (NRL NE 3.175) was launched by Naval Ordnance Missile Test Facility personnel, White Sands Missile Range (WSMR), New Mexico, at 1320 hours MST, 12 February 1969.

Meteorological data used in conjunction with theoretical calculations to predict rocket impact were collected by the Meteorological Support Technical Area, Atmospheric Sciences Research Office, WSMR, New Mexico. The Ballistic Meteorologists for this firing were

DISCUSSION

Wind data for the first 4,000 feet above the surface were obtained from an automatic pilot-balloon wind measuring system (1,2) utilizing a T-9 radar tracker. Pilot-balloons released at the launch site were equipped with lightweight corner reflectors to improve the reflected signal and permit radar tracking. Acquisition of the target was accomplished by means of a boresight television camera. An analog computer converted azimuth and elevation angles and the slant range data into horizontal components of position with respect to the radar as reference. Changes of these components per unit time were converted into East-West and North-South wind components values which were then displayed on two plotters with a specially designed wind velocity ballistic chart. It is possible to read directly from the chart both the mean wind component values and the mean ballistic wind components in the various ballistic layers.

Temperature, pressure, and humidity data, along with upper wind data from 4,000 to approximately 100,000 feet above the surface, were obtained from standard rawinsonde operations.

Mean wind components values in each ballistic zone were determined from vertical cross sections by equal-area method.

Data appearing in Tables XIII, XIV, and XV, are based on the Mary Ann Seagraves (3) Theory. The "Predicted Impact" includes, when applicable, an adjustment of impact based on the experience of the Ballistic Meteorologists and the forecast of firing time wind conditions.

REFERENCES

1. Engineering Division, "Pilot-Balloon Radar Tracker at White Sands Missile Range", Atmospheric Sciences Laboratory, U. S. Army Electronics Command, White Sands Missile Range, New Mexico.

2. Kubinski, S. F., April 1967: "A Comparative Evaluation of the Automatic Tracking Pilot-Balloon Wind Measuring System". Meteorological Support Division, Atmospheric Sciences Laboratory, U. S. Army Electronics Command, White Sands Missile Range, New Mexico, ECOM-5121.

3. Seagraves, M. A., B. Butler, September 1968: "Performance Characteristics and Wind Effects for the Aerobee 150 with Vam Booster". Meteorological Support Technical Area, Atmospheric Sciences Research Office, U. S. Army Electronics Command, White Sands Missile Range, New Mexico, ECOM-5209.

PAYLOAD	Excludes Nosecone Weight	276.5	Pounds
UNIT WIND EFFECT	Cross	3.54	Miles/MPH
	Range	3.47	Miles/MPH
TOWER TILT EFFECT		17.07	Miles/Degree
BURNOUT	Velocity	5,561	Feet/Second
	Altitude	124,700	Feet MSL
	Time	51.8	Seconds
PEAK	Altitude	115.4	Miles MSL
	Time	215.0	Seconds
TOTAL FLIGHT TIME		436.0	Seconds
CORIOLIS EFFECT	West	5.14	Miles

TABLE I. THEORETICAL ROCKET PERFORMANCE VALUES
AEROBEE NASA 4.135 DS (VAM-20 BOOSTER)

LAYERS IN FEET ABOVE GROUND	BALLISTIC FACTORS
143- 250	.126
250- 400	.171
400- 600	.137
600- 800	.076
800-1200	.085
1200-1600	.053
1600-2000	.003
2000-2500	.017
2500-3000	.016

LAYERS IN FEET ABOVE GROUND	BALLISTIC FACTORS
3000- 3500	.014
3500- 4000	.013
4000- 5000	.023
5000-10000	.076
10000-15000	.044
15000-20000	.031
20000-25000	.023
25000-30000	.015
30000-35000	.014

LAYERS IN FEET ABOVE GROUND	BALLISTIC FACTORS
35000- 40000	.011
40000- 45000	.009
45000- 50000	.008
50000- 60000	.012
60000- 70000	.008
70000- 80000	.007
80000- 90000	.004
90000-100000	.004

TABLE II. BALLISTIC FACTORS
AEROBEE NASA 4.135 DS

TIME IN MINUTES	ANEMOMETER-MEASURED WIND	
	SPEED (Knots)	DIRECTION (Degrees)
T - 15	3.0	231
T - 10	3.5	211
T - 5	7.0	210
T - Time	6.0	190
T + 5	4.5	210
T + 10	3.0	172
T + 15	3.5	164

TABLE III. ANEMOMETER-MEASURED WIND SPEED AND DIRECTION
AEROBEE NASA 4.135 DS

NOTE: Wind speeds and directions are 5-minute averages centered at indicated times.

LAYERS IN FEET ABOVE GROUND	MEAN WIND COMPONENTS IN MILES PER HOUR													
	1 1000 MST		2 1030 MST		3 1100 MST		4 1120 MST		5 1140 MST		6 1200 MST		7 1215 MST	
	N-S	E-W	N-S	E-W	N-S	E-W	N-S	E-W	N-S	E-W	N-S	E-W	N-S	E-W
143- 250	8.0N	2.5E	7.5N	2.5E	2.5N	1.5E	1.5N	1.5E	0.0	0.0	2.0S	1.0W	1.0S	4.0W
250- 400	8.0	1.5	8.0	2.0	2.0	1.0	1.0	1.0	0.0	0.0	2.5	0.5	1.5	2.5
400- 600	6.5	0.5	8.0	1.0	2.0	0.5	0.5	0.5	1.0S	0.0	2.5	1.0	2.0	1.0
600- 800	2.0	2.0	3.0	2.0	0.0	0.5W	3.0S	3.0	0.5	1.0W	6.5	1.0E	5.0	0.0
800-1200	2.0S	3.0	2.0S	3.5	5.5S	2.0E	5.0	0.0	2.0	0.5	2.0	2.5W	4.5	0.0
1200-1600	6.5	3.0	6.0	1.5	6.0	0.5W	6.0	0.0	5.0	2.0	3.0	1.0E	6.0	3.0W
1600-2000	8.0	4.0	8.0	3.0	6.5	1.5E	7.0	2.0E	6.0	3.0E	7.0	3.0	8.5	2.0E
2000-2500	9.5	4.0	9.5	1.5	8.0	1.0	9.0	5.0	10.0	7.5	10.0	6.0	10.5	5.0
2500-3000	13.5	1.0	15.0	3.0	11.5	3.0	11.5	8.5	14.0	9.0	15.0	7.5	15.0	6.0
3000-3500	14.5	2.5	15.5	2.0	20.0	4.0	20.0	6.5	17.0	7.5	17.0	7.0	16.5	8.0
3500-4000	13.0	3.5	16.0	3.5	20.0	2.5	21.5	4.0	22.0	7.0	20.5	8.5	19.0	9.5

TABLE IV. PILOT-BALLOON-MEASURED WIND DATA
AEROBEE NASA 4.135 DS

LAYERS IN FEET ABOVE GROUND	MEAN WIND COMPONENTS IN MILES PER HOUR													
	8 1228 MST		9 1240 MST		10 1250 MST		11 1300 MST		12 1306 MST		13 1314 MST		14 1320 MST	
	N-S	E-W	N-S	E-W	N-S	E-W	N-S	E-W	N-S	E-W	N-S	E-W	N-S	E-W
143- 250	3.0S	1.0W	2.5S	2.0W	5.0S	1.5W	4.0S	1.5E	1.0S	1.5W	7.0S	3.0W	7.5S	1.5W
250- 400	2.5	1.0	3.0	2.5	5.0	1.5	6.0	2.5	3.0	1.0	7.0	1.5	7.0	2.0
400- 600	3.0	1.5	3.5	3.0	5.5	1.0	8.0	4.0	4.5	1.0E	7.0	1.5E	7.0	2.5
600- 800	4.5	2.0	7.5	2.0E	7.0	2.0	9.0	2.5	4.5	1.0	6.0	2.5	4.5	1.0
800-1200	4.0	5.0	6.0	1.5	10.0	0.0	9.0	1.0W	8.5	3.5	5.0	0.5W	5.5	2.0E
1200-1600	7.0	3.0	6.0	2.0W	9.0	0.5E	9.0	1.0E	5.5	0.0	6.0	1.5	6.0	0.0
1600-2000	8.0	1.0	7.0	0.5	11.0	1.0W	11.5	1.0	6.5	0.0	5.0	1.0	7.5	1.0E
2000-2500	8.0	1.0E	9.0	0.5	13.0	2.5E	10.5	3.0	8.5	3.0E	7.0	0.0	9.0	1.5
2500-3000	13.0	5.0	13.0	0.0	16.0	5.0	13.0	4.0	10.0	6.0	11.5	2.5E	10.0	1.5
3000-3500	15.0	8.0	17.5	5.0E	15.0	7.0	13.5	6.0	20.0	5.5	15.0	5.0	12.0	1.5
3500-4000	19.5	9.0	19.0	9.5	21.0	7.0	20.0	8.0	21.0	6.5	18.0	4.0	16.0	3.0

TABLE IV. PILOT-BALLOON-MEASURED WIND DATA (CONT)
AEROBEE NASA 4.135 DS

LAYERS IN FEET ABOVE GROUND	MEAN WIND COMPONENTS IN KNOTS	
	1 1210 MST	
	N-S	E-W
4000- 5000	18.0S	6.5E
5000-10000	22.0	0.0
10000-15000	23.5	13.5W
15000-20000	23.5	20.0

TABLE V. UPPER AIR DATA (4,000-20,000 FT) AEROBEE NASA 4.135 DS

LAYERS IN FEET ABOVE GROUND	MEAN WIND COMPONENTS IN KNOTS					
	1 0715 MST		2* 1000 MST		3 1320 MST	
	N-S	E-W	N-S	E-W	N-S	E-W
4000- 5000	7.0S	0.0	12.0S	4.5E	19.5S	3.5E
5000- 10000	11.5	4.0W	16.0	0.0	24.5	4.5W
10000- 15000	10.5	12.0	15.5	13.0W	23.5	13.5
15000- 20000	7.0	19.5	16.5	20.0	23.5	20.0
20000- 25000	4.0	23.5	18.5	22.0	25.0	30.0
25000- 30000	6.0	35.5	23.5	40.5	28.0	48.5
30000- 35000	0.0	65.0	12.0	69.0	25.5	70.5
35000- 40000	0.0	65.0	12.0	71.0	24.0	68.0
40000- 45000	8.0N	45.5	8.0	45.5	19.0	52.5
45000- 50000	7.0	39.5	6.5	37.5	15.5	42.5
50000- 60000	0.0	32.0	4.0	23.5	5.0	27.5
60000- 70000	9.5N	11.5	7.0N	6.0	4.5N	12.0
70000- 80000	10.0	1.5E	3.0	2.5	TERMINATED	
80000- 90000	0.0	12.0W	2.0S	12.0		
90000-100000	5.0N	27.5	0.0	21.0		

TABLE VI. UPPER AIR DATA (4,000-100,000 FT) AEROBEE NASA 4.135 DS

* Rawin, Telecompute data not available.

STATION ALTITUDE 3989.0 FEET MSL
12 FEB. 69 0715 HRS MST
ASCENSION NO. 149

SIGNIFICANT LEVEL DATA
0736003901
WHITE SANDS SITE

WSTM SITE COORDINATES
E 488,580 FEET
N 185,045 FEET

TABLE VII

PRESSURE MILLIBARS	GEOMETRIC ALTITUDE MSL FEET	TEMPERATURE AIR DEGREES	TEMPERATURE DEWPOINT CENTIGRADE	REL.HUM. PERCENT
874.5	3989.0	-2.3	-12.1	47.0
864.0	4309.5	7.1	-5.3	41.0
858.0	4498.5	9.4	-4.9	36.0
827.0	5504.8	12.1	-9.6	21.0
747.0	8273.6	6.9	-17.2	16.0
695.0	10201.9	1.8	-11.4	37.0
666.0	11323.3	-1.9	-15.7	34.0
635.0	12560.9	-5.4	-13.8	52.0
618.0	13259.3	-6.9	-9.5	82.0
584.0	14700.0	-11.3	-11.5	99.0
572.0	15221.7	-13.6	-18.3	68.0
562.0	15663.8	-12.4	-23.9	38.0
540.0	16663.7	-14.0	-25.3	38.0
531.0	17084.3	-12.8	-24.8	36.0
457.0	20791.8	-20.6	-32.2	35.0
432.0	22149.3	-24.8	-36.0	35.0
400.0	23976.8	-28.6	-39.4	35.0
376.0	25426.1	-31.6	-41.9	36.0
335.0	28071.6	-39.2	-45.3	53.0
314.0	29522.8	-42.0	-49.4	45.0
299.0	30607.9	-44.4	0.	-0. **
286.0	31591.3	-43.0	0.	-0. **
256.0	34037.5	-45.4	0.	-0. **
231.0	36283.7	-47.6	0.	-0. **
205.0	38882.8	-47.4	0.	-0. **
171.0	42781.3	-53.3	0.	-0. **
145.0	46230.2	-59.7	0.	-0. **
126.0	49092.3	-64.5	0.	-0. **
110.0	51825.7	-65.0	0.	-0. **
100.0	53724.3	-68.9	0.	-0. **

** RELATIVE HUMIDITY NOT SUPPLIED. ZERO VALUE ASSUMED FOR COMPUTATIONS.

STATION ALTITUDE 3989.0 FEET MSL
12 FEB. 69 0715 HRS MST
ASCENSION NO. 149

SIGNIFICANT LEVEL DATA
0736003901
WHITE SANDS SITE

WSTM SITE COORDINATES
E 488,580 FEET
N 185,045 FEET

TABLE VII (Cont)

PRESSURE MILLIBARS	GEOMETRIC ALTITUDE MSL FEET	TEMPERATURE AIR DEGREES CENTIGRADE	TEMPERATURE DEWPOINT DEGREES CENTIGRADE	REL.HUM. PERCENT
81.0	57849.4	-72.2	0.	-0. **
60.0	63799.1	-63.9	0.	-0. **
40.0	71961.7	-66.1	0.	-0. **
21.0	85162.0	-56.9	0.	-0. **
14.0	93695.0	-55.1	0.	-0. **

** RELATIVE HUMIDITY NOT SUPPLIED. ZERO VALUE ASSUMED FOR COMPUTATIONS.

STATION ALTITUDE 3989.0 FEET MSL
12 FEB. 69 0715 HRS MST
ASCENSION NO. 149

UPPER AIR DATA
0736003901
WHITE SANDS SITE

WSTM SITE COORDINATES
E 488,580 FEET
N 185,045 FEET

TABLE VIII

GEOMETRIC ALTITUDE MSL FEET	PRESSURE MILLIBARS	TEMPERATURE AIR DEGREES	TEMPERATURE DEWPOINT CENTIGRADE	REL.HUM. PERCENT	DENSITY GM/CUBIC METER	SPEED OF SOUND KNOTS	WIND DATA DIRECTION DEGREES(TN)	WIND DATA SPEED KNOTS	INDEX OF REFRACTION
3989.0	874.5	-2.3	-12.1	47.0	1123.8	641.2	60.0	4.1	1.000263
4000.0	874.1	-2.0	-11.9	46.8	1121.9	641.5	60.5	4.1	1.000263
4500.0	858.0	9.4	-4.9	36.0	1056.0	655.1	84.7	4.3	1.000255
5000.0	842.4	10.7	-6.8	28.5	1032.2	656.6	109.0	4.5	1.000247
5500.0	827.1	12.1	-9.6	21.1	1009.0	658.1	133.2	4.6	1.000239
6000.0	812.1	11.2	-10.9	20.1	993.9	657.0	157.4	4.8	1.000234
6500.0	797.3	10.2	-12.3	19.2	979.2	655.8	176.0	5.2	1.000229
7000.0	782.8	9.3	-13.7	18.3	964.6	654.7	183.8	6.1	1.000225
7500.0	768.5	8.4	-15.1	17.4	950.3	653.6	186.6	6.5	1.000221
8000.0	754.5	7.4	-16.5	16.5	936.2	652.5	183.9	6.5	1.000217
8500.0	740.7	6.3	-16.0	18.5	922.7	651.2	185.0	7.1	1.000214
9000.0	727.0	5.0	-14.0	23.9	909.7	649.7	188.3	8.0	1.000213
9500.0	713.5	3.7	-12.6	29.4	897.0	648.2	190.4	8.6	1.000211
10000.0	700.3	2.3	-11.7	34.8	884.5	646.7	191.9	9.2	1.000210
10500.0	687.2	0.8	-12.5	36.2	872.8	644.9	192.0	9.9	1.000206
11000.0	674.2	-0.8	-14.5	34.9	861.7	642.9	191.6	10.8	1.000202
11500.0	661.5	-2.4	-15.3	36.6	850.3	641.0	194.0	12.2	1.000199
12000.0	648.9	-3.3	-14.4	43.8	838.4	639.4	196.9	13.7	1.000197
12500.0	636.5	-5.2	-13.8	51.1	826.7	637.7	200.3	15.3	1.000195
13000.0	624.3	-6.3	-10.8	70.9	813.9	636.5	203.6	16.9	1.000196
13500.0	612.2	-7.6	-9.8	84.8	801.9	635.0	206.6	17.6	1.000194
14000.0	600.3	-9.2	-10.5	90.7	790.9	633.2	209.5	18.3	1.000191
14500.0	588.6	-10.7	-11.2	96.6	780.1	631.3	211.8	18.1	1.000188
15000.0	577.1	-12.6	-15.3	81.2	770.8	628.9	213.9	17.6	1.000182
15500.0	565.7	-12.8	-21.4	49.1	756.6	628.5	217.1	16.3	1.000175
16000.0	554.5	-12.9	-24.4	38.0	742.0	628.3	220.8	14.6	1.000170
16500.0	543.5	-13.7	-25.1	38.0	729.6	627.3	224.0	13.1	1.000167
17000.0	532.8	-13.0	-24.9	36.4	713.3	628.2	227.1	11.5	1.000163
17500.0	522.1	-13.7	-25.7	35.9	700.7	627.4	234.3	10.9	1.000160
18000.0	511.7	-14.7	-26.7	35.8	689.5	626.1	242.6	10.6	1.000158

STATION ALTITUDE 3989.0 FEET MSL
12 FEB. 69 0715 HRS MST
ASCENSION NO. 149

UPPER AIR DATA
0736003901
WHITE SANDS SITE

WSTM SITE COORDINATES
E 488,580 FEET
N 185,045 FEET

TABLE VIII (Cont)

GEOMETRIC ALTITUDE MSL FEET	PRESSURE MILLIBARS	TEMPERATURE AIR DEGREES	TEMPERATURE DEWPOINT CENTIGRADE	REL.HUM. PERCENT	DENSITY GM/CUBIC METER	SPEED OF SOUND KNOTS	WIND DATA DIRECTION DEGREES(TN)	WIND DATA SPEED KNOTS	INDEX OF REFRACTION
18500.0	501.4	-15.8	-27.6	35.6	678.5	624.8	248.1	11.5	1.000155
19000.0	491.4	-16.8	-28.6	35.5	667.6	623.5	252.6	12.9	1.000152
19500.0	481.5	-17.9	-29.6	35.3	657.0	622.2	255.2	14.9	1.000149
20000.0	471.9	-18.9	-30.6	35.2	646.5	620.9	256.8	17.2	1.000147
20500.0	462.4	-20.0	-31.6	35.1	636.2	619.7	255.6	19.0	1.000144
21000.0	453.1	-21.2	-32.8	35.0	626.5	618.1	253.1	20.7	1.000142
21500.0	443.8	-22.8	-34.2	35.0	617.4	616.2	251.6	21.5	1.000140
22000.0	434.7	-24.3	-35.6	35.0	608.5	614.3	250.4	22.2	1.000137
22500.0	425.7	-25.5	-36.6	35.0	598.8	612.8	250.2	22.8	1.000135
23000.0	416.8	-26.6	-37.6	35.0	588.8	611.5	250.3	23.4	1.000133
23500.0	408.1	-27.6	-38.5	35.0	579.0	610.2	252.0	24.5	1.000130
24000.0	399.6	-28.6	-39.5	35.0	569.3	608.9	254.1	25.7	1.000128
24500.0	391.2	-29.7	-40.3	35.4	559.7	607.6	254.9	26.6	1.000126
25000.0	382.9	-30.7	-41.1	35.7	550.2	606.3	255.6	27.5	1.000124
25500.0	374.8	-31.8	-41.9	36.5	541.0	604.9	255.0	27.5	1.000121
26000.0	366.7	-33.2	-42.5	39.7	532.5	603.1	254.3	27.4	1.000120
26500.0	358.8	-34.7	-43.1	42.9	524.1	601.3	252.7	26.3	1.000118
27000.0	351.0	-36.1	-43.7	46.1	515.9	599.5	251.3	25.1	1.000116
27500.0	343.5	-37.6	-44.5	49.3	507.9	597.7	251.2	24.2	1.000114
28000.0	336.0	-39.0	-45.2	52.5	500.0	595.9	251.2	23.3	1.000112
28500.0	328.7	-40.0	-46.5	50.6	491.1	594.5	251.4	22.7	1.000110
29000.0	321.4	-41.0	-47.9	47.9	482.3	593.3	251.5	22.5	1.000108
29500.0	314.3	-42.0	-49.4	45.1	473.6	592.1	250.8	24.0	1.000106
30000.0	307.3	-43.1	-55.2	25.2**	465.3	590.7	249.8	26.1	1.000104
30500.0	300.5	-44.2	-69.2	4.5**	457.2	589.2	248.1	29.5	1.000102
31000.0	293.7	-43.8	0.	-0. **	446.3	589.6	247.5	32.8	1.000099
31500.0	287.2	-43.1	0.	-0. **	435.0	590.5	248.8	36.1	1.000097
32000.0	280.8	-43.4	0.	-0. **	425.8	590.2	251.4	38.9	1.000095
32500.0	274.5	-43.9	0.	-0. **	417.1	589.6	255.6	41.4	1.000093
33000.0	268.3	-44.4	0.	-0. **	408.7	588.9	260.0	44.3	1.000091

** AT LEAST ONE ASSUMED RELATIVE HUMIDITY VALUE WAS USED IN THE INTERPOLATION.

STATION ALTITUDE 3989.0 FEET MSL
12 FEB. 69 0715 HRS MST
ASCENSION NO. 149

UPPER AIR DATA
0736003901
WHITE SANDS SITE

WSTM SITE COORDINATES
E 488,580 FEET
N 185,045 FEET

TABLE VIII (Cont)

GEOMETRIC ALTITUDE MSL FEET	PRESSURE MILLIBARS	TEMPERATURE AIR DEGREES	TEMPERATURE DEWPOINT CENTIGRADE	REL.HUM. PERCENT	DENSITY GM/CUBIC METER	SPEED OF SOUND KNOTS	WIND DATA DIRECTION DEGREES(TN)	WIND DATA SPEED KNOTS	INDEX OF REFRACTION
33500.0	262.3	-44.9	0.	-0. **	400.4	588.3	264.6	47.6	1.000089
34000.0	256.4	-45.4	0.	-0. **	392.2	587.7	267.6	50.7	1.000087
34500.0	250.6	-45.9	0.	-0. **	384.2	587.0	269.5	53.6	1.000086
35000.0	245.0	-46.3	0.	-0. **	376.3	586.4	270.1	56.6	1.000084
35500.0	239.4	-46.8	0.	-0. **	368.6	585.8	269.9	59.5	1.000082
36000.0	234.0	-47.3	0.	-0. **	361.1	585.1	269.1	61.5	1.000080
36500.0	228.7	-47.6	0.	-0. **	353.3	584.8	268.1	63.2	1.000079
37000.0	223.5	-47.5	0.	-0. **	345.2	584.9	267.7	65.9	1.000077
37500.0	218.4	-47.5	0.	-0. **	337.3	584.9	267.7	69.4	1.000075
38000.0	213.5	-47.5	0.	-0. **	329.6	585.0	267.7	71.2	1.000073
38500.0	208.6	-47.4	0.	-0. **	322.0	585.0	267.6	71.5	1.000072
39000.0	203.9	-47.6	0.	-0. **	314.9	584.8	267.4	71.4	1.000070
39500.0	199.2	-48.3	0.	-0. **	308.7	583.8	266.9	70.7	1.000069
40000.0	194.6	-49.1	0.	-0. **	302.6	582.8	266.2	69.7	1.000067
40500.0	190.1	-49.8	0.	-0. **	296.7	581.9	265.2	67.9	1.000066
41000.0	185.8	-50.6	0.	-0. **	290.8	580.9	264.4	66.3	1.000065
41500.0	181.5	-51.4	0.	-0. **	285.1	579.9	264.5	66.3	1.000063
42000.0	177.3	-52.1	0.	-0. **	279.5	578.9	264.6	66.3	1.000062
42500.0	173.3	-52.9	0.	-0. **	274.0	577.9	266.6	65.7	1.000061
43000.0	169.2	-53.7	0.	-0. **	268.7	576.8	268.7	65.1	1.000060
43500.0	165.2	-54.6	0.	-0. **	263.4	575.6	271.4	62.9	1.000059
44000.0	161.3	-55.6	0.	-0. **	258.3	574.4	274.3	60.3	1.000058
44500.0	157.5	-56.5	0.	-0. **	253.3	573.1	276.3	57.2	1.000056
45000.0	153.8	-57.4	0.	-0. **	248.4	571.9	277.8	53.7	1.000055
45500.0	150.2	-58.3	0.	-0. **	243.5	570.7	278.6	50.0	1.000054
46000.0	146.6	-59.3	0.	-0. **	238.8	569.4	278.2	46.1	1.000053
46500.0	143.1	-60.2	0.	-0. **	234.1	568.3	277.4	42.6	1.000052
47000.0	139.6	-61.0	0.	-0. **	229.3	567.2	274.0	41.1	1.000051
47500.0	136.2	-61.8	0.	-0. **	224.6	566.0	270.7	39.9	1.000050
48000.0	132.9	-62.7	0.	-0. **	220.1	564.9	267.6	42.2	1.000049

** AT LEAST ONE ASSUMED RELATIVE HUMIDITY VALUE WAS USED IN THE INTERPOLATION.

STATION ALTITUDE 3989.0 FEET MSL
12 FEB. 69 0715 HRS MST
ASCENSION NO. 149

UPPER AIR DATA
0736003901
WHITE SANDS SITE

WSTM SITE COORDINATES
E 488,580 FEET
N 185,045 FEET

TABLE VIII (Cont)

GEOMETRIC ALTITUDE MSL FEET	PRESSURE MILLIBARS	TEMPERATURE AIR DEGREES	TEMPERATURE DEWPOINT CENTIGRADE	REL.HUM. PERCENT	DENSITY GM/CUBIC METER	SPEED OF SOUND KNOTS	WIND DATA DIRECTION DEGREES(TN)	WIND DATA SPEED KNOTS	INDEX OF REFRACTION
48500.0	129.7	-63.5	0.	-0. **	215.6	563.8	264.6	44.4	1.000048
49000.0	126.6	-64.3	0.	-0. **	211.2	562.7	265.6	45.2	1.000047
49500.0	123.5	-64.6	0.	-0. **	206.3	562.3	266.6	46.0	1.000046
50000.0	120.4	-64.7	0.	-0. **	201.3	562.2	268.0	46.0	1.000045
50500.0	117.5	-64.8	0.	-0. **	196.4	562.1	269.6	45.8	1.000044
51000.0	114.6	-64.8	0.	-0. **	191.7	562.0	271.1	44.7	1.000043
51500.0	111.8	-64.9	0.	-0. **	187.1	561.9	272.7	42.0	1.000042
52000.0	109.0	-65.4	0.	-0. **	182.8	561.3	274.2	39.2	1.000041
52500.0	106.3	-66.4	0.	-0. **	179.2	559.9	272.6	37.7	1.000040
53000.0	103.7	-67.4	0.	-0. **	175.6	558.5	270.5	36.4	1.000039
53500.0	101.1	-68.4	0.	-0. **	172.1	557.1	268.4	35.3	1.000038
54000.0	98.6	-69.1	0.	-0. **	168.4	556.2	266.2	34.5	1.000037
54500.0	96.1	-69.5	0.	-0. **	164.5	555.6	264.4	33.8	1.000037
55000.0	93.7	-69.9	0.	-0. **	160.6	555.1	263.9	33.7	1.000036
55500.0	91.3	-70.3	0.	-0. **	156.9	554.5	263.3	33.6	1.000035
56000.0	89.0	-70.7	0.	-0. **	153.2	554.0	264.6	33.6	1.000034
56500.0	86.8	-71.1	0.	-0. **	149.7	553.5	266.0	33.7	1.000033
57000.0	84.6	-71.5	0.	-0. **	146.2	552.9	266.6	33.8	1.000033
57500.0	82.5	-71.9	0.	-0. **	142.8	552.4	266.7	33.8	1.000032
58000.0	80.4	-72.0	0.	-0. **	139.2	552.3	267.0	33.9	1.000031
58500.0	78.4	-71.3	0.	-0. **	135.3	553.2	267.8	34.0	1.000030
59000.0	76.4	-70.6	0.	-0. **	131.5	554.2	268.6	34.2	1.000029
59500.0	74.5	-69.9	0.	-0. **	127.8	555.1	268.7	34.3	1.000028
60000.0	72.7	-69.2	0.	-0. **	124.1	556.1	268.8	34.4	1.000028
60500.0	70.9	-68.5	0.	-0. **	120.6	557.0	270.1	31.2	1.000027
61000.0	69.1	-67.8	0.	-0. **	117.2	558.0	271.6	26.8	1.000026
61500.0	67.4	-67.1	0.	-0. **	113.9	558.9	272.4	23.8	1.000025
62000.0	65.7	-66.4	0.	-0. **	110.7	559.9	271.9	23.1	1.000025
62500.0	64.1	-65.7	0.	-0. **	107.6	560.8	271.4	22.3	1.000024
63000.0	62.5	-65.0	0.	-0. **	104.6	561.8	269.9	20.4	1.000023

** AT LEAST ONE ASSUMED RELATIVE HUMIDITY VALUE WAS USED IN THE INTERPOLATION.

STATION ALTITUDE 3989.0 FEET MSL
12 FEB. 69 0715 HRS MST
ASCENSION NO. 149

UPPER AIR DATA
0736003901
WHITE SANDS SITE

WSTM SITE COORDINATES
E 488,580 FEET
N 185,045 FEET

TABLE VIII (Cont)

GEOMETRIC ALTITUDE MSL FEET	PRESSURE MILLIBARS	TEMPERATURE AIR DEGREES CENTIGRADE	TEMPERATURE DEWPOINT DEGREES CENTIGRADE	REL.HUM. PERCENT	DENSITY GM/CUBIC METER	SPEED OF SOUND KNOTS	WIND DATA DIRECTION DEGREES(TN)	WIND DATA SPEED KNOTS	INDEX OF REFRACTION
63500.0	60.9	-64.3	0.	-0. **	101.6	562.7	268.4	18.4	1.000023
64000.0	59.4	-64.0	0.	-0. **	98.9	563.2	267.5	18.5	1.000022
64500.0	57.9	-64.1	0.	-0. **	96.6	563.0	267.1	20.1	1.000022
65000.0	56.5	-64.2	0.	-0. **	94.3	562.8	267.6	21.1	1.000021
65500.0	55.1	-64.4	0.	-0. **	92.0	562.6	275.1	17.6	1.000020
66000.0	53.8	-64.5	0.	-0. **	89.8	562.5	282.5	14.0	1.000020
66500.0	52.5	-64.6	0.	-0. **	87.7	562.3	288.9	12.3	1.000020
67000.0	51.2	-64.8	0.	-0. **	85.6	562.1	294.5	12.0	1.000019
67500.0	49.9	-64.9	0.	-0. **	83.5	561.9	300.1	11.6	1.000019
68000.0	48.7	-65.0	0.	-0. **	81.5	561.7	307.3	11.0	1.000018
68500.0	47.5	-65.2	0.	-0. **	79.6	561.5	314.7	10.3	1.000018
69000.0	46.3	-65.3	0.	-0. **	77.7	561.4	319.6	9.9	1.000017
69500.0	45.2	-65.4	0.	-0. **	75.8	561.2	313.2	10.4	1.000017
70000.0	44.1	-65.6	0.	-0. **	74.0	561.0	306.8	10.9	1.000016
70500.0	43.0	-65.7	0.	-0. **	72.2	560.8	307.2	11.2	1.000016
71000.0	42.0	-65.8	0.	-0. **	70.5	560.6	315.5	11.5	1.000016
71500.0	40.9	-66.0	0.	-0. **	68.8	560.5	323.7	11.7	1.000015
72000.0	39.9	-66.1	0.	-0. **	67.2	560.3	330.0	12.9	1.000015
72500.0	39.0	-65.7	0.	-0. **	65.4	560.8	335.4	14.5	1.000015
73000.0	38.0	-65.4	0.	-0. **	63.8	561.3	340.9	16.1	1.000014
73500.0	37.1	-65.0	0.	-0. **	62.1	561.7	340.3	16.2	1.000014
74000.0	36.2	-64.7	0.	-0. **	60.5	562.2	339.4	16.3	1.000013
74500.0	35.3	-64.3	0.	-0. **	59.0	562.7	338.4	16.4	1.000013
75000.0	34.5	-64.0	0.	-0. **	57.4	563.1	337.4	16.0	1.000013
75500.0	33.7	-63.6	0.	-0. **	56.0	563.6	336.3	15.5	1.000012
76000.0	32.8	-63.3	0.	-0. **	54.5	564.1	335.2	14.9	1.000012
76500.0	32.1	-62.9	0.	-0. **	53.1	564.6	335.4	14.0	1.000012
77000.0	31.3	-62.6	0.	-0. **	51.8	565.0	337.5	12.6	1.000012
77500.0	30.5	-62.2	0.	-0. **	50.4	565.5	339.6	11.2	1.000011
78000.0	29.8	-61.9	0.	-0. **	49.1	566.0	341.7	9.8	1.000011

** AT LEAST ONE ASSUMED RELATIVE HUMIDITY VALUE WAS USED IN THE INTERPOLATION.

STATION ALTITUDE 3989.0 FEET MSL
12 FEB. 69 0715 HRS MST
ASCENSION NO. 149

UPPER AIR DATA
0736003901
WHITE SANDS SITE

WSTM SITE COORDINATES
E 488,580 FEET
N 185,045 FEET

TABLE VIII (Cont)

GEOMETRIC ALTITUDE MSL FEET	PRESSURE MILLIBARS	TEMPERATURE AIR DEGREES CENTIGRADE	TEMPERATURE DEWPOINT DEGREES CENTIGRADE	REL.HUM. PERCENT	DENSITY GM/CUBIC METER	SPEED OF SOUND KNOTS	WIND DATA DIRECTION DEGREES(TN)	WIND DATA SPEED KNOTS	INDEX OF REFRACTION
78500.0	29.1	-61.5	0.	-0. **	47.9	566.4	338.9	9.9	1.000011
79000.0	28.4	-61.2	0.	-0. **	46.6	566.9	336.0	10.1	1.000010
79500.0	27.7	-60.8	0.	-0. **	45.4	567.4	333.0	10.3	1.000010
80000.0	27.0	-60.5	0.	-0. **	44.3	567.8	332.9	9.8	1.000010
80500.0	26.4	-60.1	0.	-0. **	43.1	568.3	334.8	8.7	1.000010
81000.0	25.7	-59.8	0.	-0. **	42.0	568.7	336.8	7.6	1.000009
81500.0	25.1	-59.5	0.	-0. **	40.9	569.2	335.9	7.0	1.000009
82000.0	24.5	-59.1	0.	-0. **	39.9	569.7	318.4	9.0	1.000009
82500.0	23.9	-58.8	0.	-0. **	38.9	570.1	300.9	11.0	1.000009
83000.0	23.3	-58.4	0.	-0. **	37.9	570.6	283.3	13.0	1.000008
83500.0	22.8	-58.1	0.	-0. **	36.9	571.1	275.6	13.0	1.000008
84000.0	22.2	-57.7	0.	-0. **	35.9	571.5	271.6	12.2	1.000008
84500.0	21.7	-57.4	0.	-0. **	35.0	572.0	267.6	11.4	1.000008
85000.0	21.2	-57.0	0.	-0. **	34.1	572.4	265.3	10.9	1.000008
85500.0	20.7	-56.8	0.	-0. **	33.3	572.7	267.0	10.8	1.000007
86000.0	20.2	-56.7	0.	-0. **	32.5	572.8	268.6	10.8	1.000007
86500.0	19.7	-56.6	0.	-0. **	31.7	573.0	270.3	10.7	1.000007
87000.0	19.2	-56.5	0.	-0. **	30.9	573.1	274.4	10.2	1.000007
87500.0	18.8	-56.4	0.	-0. **	30.2	573.3	279.1	9.5	1.000007
88000.0	18.4	-56.3	0.	-0. **	29.5	573.4	283.8	8.9	1.000007
88500.0	17.9	-56.2	0.	-0. **	28.8	573.5	288.3	8.3	1.000006
89000.0	17.5	-56.1	0.	-0. **	28.1	573.7	290.0	9.0	1.000006
89500.0	17.1	-56.0	0.	-0. **	27.4	573.8	291.7	9.7	1.000006
90000.0	16.7	-55.9	0.	-0. **	26.8	573.9	293.4	10.4	1.000006
90500.0	16.3	-55.8	0.	-0. **	26.1	574.1			1.000006
91000.0	15.9	-55.7	0.	-0. **	25.5	574.2			1.000006
91500.0	15.5	-55.6	0.	-0. **	24.9	574.4			1.000006
92000.0	15.2	-55.5	0.	-0. **	24.3	574.5			1.000005
92500.0	14.8	-55.4	0.	-0. **	23.7	574.6			1.000005
93000.0	14.5	-55.2	0.	-0. **	23.1	574.8			1.000005
93500.0	14.1	-55.1	0.	-0. **	22.6	574.9			1.000005

** AT LEAST ONE ASSUMED RELATIVE HUMIDITY VALUE WAS USED IN THE INTERPOLATION.

STATION ALTITUDE 3989.0 FEET MSL
12 FEB. 69 0715 HRS MST
ASCENSION NO. 149

MANDATORY LEVELS
0736003901
WHITE SANDS SITE

WSTM SITE COORDINATES
E 488,580 FEET
N 185,045 FEET

TABLE IX

PRESSURE MILLIBARS	GEOPOTENTIAL FEET	TEMPERATURE AIR DEGREES	TEMPERATURE DEWPOINT CENTIGRADE	REL.HUM. PERCENT	WIND DATA DIRECTION DEGREES(TN)	WIND DATA SPEED KNOTS
850.0	4752.	10.1	-5.8	32.	97.0	4.4
800.0	6411.	10.4	-12.0	19.	174.6	5.1
750.0	8161.	7.1	-16.9	16.	183.1	6.5
700.0	10006.	2.3	-11.7	35.	191.9	9.2
650.0	11948.	-3.7	-14.4	43.	196.7	13.5
600.0	14003.	-9.2	-10.5	91.	209.6	18.3
550.0	16190.	-13.3	-24.7	38.	222.1	14.0
500.0	18564.	-15.9	-27.8	36.	248.8	11.8
450.0	21141.	-21.8	-33.2	35.	252.4	21.1
400.0	23945.	-28.6	-39.4	35.	254.0	25.6
350.0	27038.	-36.3	-43.8	47.	251.3	25.0
300.0	30484.	-44.2	-71.8	3.**	248.0	29.7
250.0	34494.	-45.9	0.	-0.**	269.7	53.9
200.0	39338.	-48.2	0.	-0.**	267.0	70.8
175.0	42197.	-52.5	0.	-0.**	265.8	66.0
150.0	45422.	-58.4	0.	-0.**	278.6	49.8
125.0	49128.	-64.5	0.	-0.**	266.1	45.6
100.0	53577.	-68.9	0.	-0.**	267.5	34.9
80.0	57920.	-71.9	0.	-0.**	267.2	33.9
70.0	60526.	-68.2	0.	-0.**	270.7	29.4
60.0	63594.	-63.9	0.	-0.**	267.7	17.8
50.0	67252.	-64.9	0.	-0.**	299.8	11.6
40.0	71705.	-66.1	0.	-0.**	329.4	12.8
30.0	77486.	-62.0	0.	-0.**	340.7	10.4
25.0	81208.	-59.4	0.	-0.**	335.0	7.1
20.0	85825.	-56.7	0.	-0.**	269.2	10.7
15.0	91827.	-55.4	0.	-0.**		

** AT LEAST ONE ASSUMED RELATIVE HUMIDITY VALUE WAS USED IN THE INTERPOLATION.

STATION ALTITUDE 3989.0 FEET MSL
12 FEB. 69 1320 HRS MST
ASCENSION NO. 152

SIGNIFICANT LEVEL DATA
0736003902
WHITE SANDS SITE

WSTM SITE COORDINATES
E 488,580 FEET
N 185,045 FEET

TABLE X

PRESSURE MILLIBARS	GEOMETRIC ALTITUDE MSL FEET	TEMPERATURE AIR DEGREES	TEMPERATURE DEWPOINT CENTIGRADE	REL.HUM. PERCENT
870.7	3989.0	1[illegible].6	-6.1	17.0
860.0	4336.2	1[illegible]	-6.7	19.0
769.0	7417.5	8.7	-9.8	26.0
676.0	10867.5	0.5	-6.8	58.0
571.0	15229.5	-10.5	-20.5	44.0
553.0	16038.5	-11.4	-32.3	16.0
534.0	16918.1	-12.4	-30.8	20.0
421.0	22727.5	-26.5	-39.0	30.0
397.0	24117.5	-28.3	-35.2	52.0
343.0	27508.1	-36.7	-49.7	25.0
313.0	29571.1	-41.9	0.	-0. **
252.0	34387.9	-43.4	0.	-0. **
230.0	36398.0	-46.6	0.	-0. **
190.0	40559.5	-48.1	0.	-0. **
171.0	42822.2	-53.1	0.	-0. **
118.0	50495.9	-64.6	0.	-0. **
94.0	55021.7	-69.6	0.	-0. **
69.0	61127.4	-68.0	0.	-0. **
65.0	62320.7	-65.0	0.	-0. **
43.0	70651.6	-64.3	0.	-0. **
36.0	74269.6	-61.2	0.	-0. **
27.0	80190.9	-59.9	0.	-0. **

** RELATIVE HUMIDITY NOT SUPPLIED. ZERO VALUE ASSUMED FOR COMPUTATIONS.

STATION ALTITUDE 3989.0 FEET MSL
12 FEB. 69 1320 HRS MST
ASCENSION NO. 152

UPPER AIR DATA
0736003902
WHITE SANDS SITE

WSTM SITE COORDINATES
E 488,580 FEET
N 185,045 FEET

TABLE XI

GEOMETRIC ALTITUDE MSL FEET	PRESSURE MILLIBARS	TEMPERATURE AIR DEGREES	TEMPERATURE DEWPOINT CENTIGRADE	REL.HUM. PERCENT	DENSITY GM/CUBIC METER	SPEED OF SOUND KNOTS	WIND DATA DIRECTION DEGREES(TN)	WIND DATA SPEED KNOTS	INDEX OF REFRACTION
3989.0	870.7	19.6	-6.1	17.0	1034.5	666.8	210.0	8.0	1.000248
4000.0	870.4	19.5	-6.1	17.1	1034.4	666.7	209.8	8.0	1.000248
4500.0	854.9	16.7	-6.8	19.4	1026.1	663.4	199.4	8.7	1.000245
5000.0	839.5	15.3	-7.2	20.5	1012.5	661.8	189.1	9.4	1.000242
5500.0	824.4	13.9	-7.7	21.6	999.0	660.3	178.7	10.1	1.000238
6000.0	809.6	12.6	-8.2	22.8	985.7	658.7	168.4	10.8	1.000235
6500.0	795.0	11.2	-8.7	23.9	972.7	657.1	161.2	11.8	1.000232
7000.0	780.7	9.8	-9.3	25.1	959.8	655.5	160.1	13.3	1.000228
7500.0	766.6	8.5	-9.6	26.8	947.0	654.0	162.4	15.0	1.000225
8000.0	752.4	7.3	-8.6	31.4	933.2	652.6	166.6	17.0	1.000223
8500.0	738.5	6.1	-7.8	36.0	919.8	651.3	170.4	18.6	1.000221
9000.0	724.9	4.9	-7.3	40.7	906.5	649.9	174.4	20.0	1.000219
9500.0	711.4	3.8	-7.0	45.3	893.5	648.6	178.8	20.9	1.000217
10000.0	698.3	2.6	-6.8	50.0	880.7	647.2	182.4	22.1	1.000214
10500.0	685.3	1.4	-6.8	54.6	868.1	645.8	184.1	24.0	1.000212
11000.0	672.5	0.2	-7.2	57.6	855.6	644.4	185.9	25.5	1.000209
11500.0	659.7	-1.1	-8.8	56.0	843.3	642.8	187.7	26.4	1.000204
12000.0	647.0	-2.4	-10.4	54.4	831.1	641.3	188.9	27.4	1.000200
12500.0	634.6	-3.6	-11.9	52.8	819.1	639.7	189.0	28.6	1.000195
13000.0	622.5	-4.9	-13.5	51.2	807.3	638.2	189.4	29.2	1.000191
13500.0	610.5	-6.1	-15.0	49.6	795.7	636.6	190.1	29.0	1.000187
14000.0	598.8	-7.4	-16.6	47.9	784.3	635.1	191.7	28.6	1.000184
14500.0	587.3	-8.7	-18.2	46.3	773.0	633.5	194.2	28.1	1.000180
15000.0	576.1	-9.9	-19.8	44.7	761.9	632.0	198.0	27.4	1.000177
15500.0	564.9	-10.8	-23.5	34.6	749.8	630.9	202.7	26.7	1.000172
16000.0	553.8	-11.4	-31.4	17.3	736.9	630.1	207.7	26.1	1.000167
16500.0	542.9	-11.9	-31.5	18.1	723.9	629.4	212.7	25.6	1.000164
17000.0	532.2	-12.6	-30.9	20.1	711.5	628.6	215.8	25.9	1.000161
17500.0	521.4	-13.8	-31.5	21.0	700.3	627.2	218.4	26.3	1.000158
18000.0	510.9	-15.0	-32.1	21.9	689.4	625.7	217.6	27.2	1.000156

STATION ALTITUDE 3989.0 FEET MSL
12 FEB. 69 1320 HRS MST
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UPPER AIR DATA
0736003902
WHITE SANDS SITE

WSTM SITE COORDINATES
E 488,580 FEET
N 185,045 FEET

TABLE XI (Cont)

GEOMETRIC ALTITUDE MSL FEET	PRESSURE MILLIBARS	TEMPERATURE AIR DEGREES	TEMPERATURE DEWPOINT CENTIGRADE	REL.HUM. PERCENT	DENSITY GM/CUBIC METER	SPEED OF SOUND KNOTS	WIND DATA DIRECTION DEGREES(TN)	WIND DATA SPEED KNOTS	INDEX OF REFRACTION
18500.0	500.5	-16.2	-32.8	22.7	678.6	624.2	217.7	28.2	1.000153
19000.0	490.4	-17.5	-33.5	23.6	668.0	622.7	219.8	29.4	1.000151
19500.0	480.5	-18.7	-34.1	24.4	657.6	621.2	221.1	30.2	1.000148
20000.0	470.7	-19.9	-34.9	25.3	647.4	619.8	221.3	30.7	1.000146
20500.0	461.2	-21.1	-35.6	26.2	637.3	618.3	221.6	30.8	1.000144
21000.0	451.8	-22.3	-36.3	27.0	627.5	616.8	222.0	30.5	1.000141
21500.0	442.7	-23.5	-37.1	27.9	617.7	615.3	221.5	30.1	1.000139
22000.0	433.7	-24.7	-37.9	28.7	608.2	613.8	220.3	29.5	1.000137
22500.0	424.9	-25.9	-38.6	29.6	598.8	612.3	220.8	29.9	1.000135
23000.0	416.2	-26.9	-38.0	34.3	588.6	611.1	222.3	30.8	1.000133
23500.0	407.5	-27.5	-36.6	42.2	577.8	610.4	224.1	32.6	1.000130
24000.0	399.0	-28.1	-35.5	50.1	567.2	609.6	226.0	34.7	1.000128
24500.0	390.5	-29.2	-36.7	49.0	557.7	608.2	227.1	36.4	1.000126
25000.0	382.2	-30.5	-38.7	45.0	548.6	606.6	228.0	38.1	1.000124
25500.0	374.0	-31.7	-40.8	41.0	539.7	605.1	228.2	38.5	1.000121
26000.0	366.0	-33.0	-42.8	37.0	530.9	603.5	228.2	38.6	1.000119
26500.0	358.2	-34.2	-45.0	33.0	522.3	601.9	230.0	38.9	1.000117
27000.0	350.6	-35.4	-47.3	29.0	513.8	600.4	232.1	39.2	1.000115
27500.0	343.1	-36.7	-49.7	25.1	505.5	598.8	233.4	40.0	1.000113
28000.0	335.6	-37.9	-53.1	19.0**	497.1	597.2	234.5	40.7	1.000111
28500.0	328.2	-39.2	-57.3	13.0**	488.8	595.6	234.6	42.8	1.000109
29000.0	321.0	-40.5	-63.1	6.9**	480.7	594.0	234.5	45.0	1.000107
29500.0	314.0	-41.7	-78.2	0.9**	472.7	592.4	234.3	46.0	1.000105
30000.0	307.0	-42.0	0.	-0. **	462.8	592.0	234.7	47.3	1.000103
30500.0	300.2	-42.2	0.	-0. **	452.8	591.8	237.7	49.9	1.000101
31000.0	293.5	-42.3	0.	-0. **	443.1	591.6	241.7	52.9	1.000099
31500.0	287.0	-42.5	0.	-0. **	433.5	591.4	248.3	57.3	1.000097
32000.0	280.6	-42.7	0.	-0. **	424.1	591.2	253.7	61.4	1.000094
32500.0	274.3	-42.8	0.	-0. **	415.0	591.0	253.5	64.8	1.000092
33000.0	268.2	-43.0	0.	-0. **	406.0	590.8	253.3	68.0	1.000090

** AT LEAST ONE ASSUMED RELATIVE HUMIDITY VALUE WAS USED IN THE INTERPOLATION.

STATION ALTITUDE 3989.0 FEET MSL
12 FEB. 69 1320 HRS MST
ASCENSION NO. 152

UPPER AIR DATA
0736003902
WHITE SANDS SITE

WSTM SITE COORDINATES
E 488,580 FEET
N 185,045 FEET

TABLE XI (Cont)

GEOMETRIC ALTITUDE MSL FEET	PRESSURE MILLIBARS	TEMPERATURE AIR DEGREES	TEMPERATURE DEWPOINT CENTIGRADE	REL.HUM. PERCENT	DENSITY GM/CUBIC METER	SPEED OF SOUND KNOTS	WIND DATA DIRECTION DEGREES(TN)	WIND DATA SPEED KNOTS	INDEX OF REFRACTION
33500.0	262.3	-43.1	0.	-0. **	397.3	590.6	253.4	69.8	1.000088
34000.0	256.4	-43.3	0.	-0. **	388.7	590.4	253.4	71.6	1.000087
34500.0	250.7	-43.6	0.	-0. **	380.5	590.0	249.8	71.7	1.000085
35000.0	245.1	-44.4	0.	-0. **	373.3	588.9	246.1	71.8	1.000083
35500.0	239.6	-45.2	0.	-0. **	366.1	587.9	245.8	73.8	1.000082
36000.0	234.2	-46.0	0.	-0. **	359.2	586.9	245.8	76.1	1.000080
36500.0	228.9	-46.6	0.	-0. **	352.1	586.0	245.5	78.7	1.000078
37000.0	223.7	-46.8	0.	-0. **	344.4	585.8	245.2	81.3	1.000077
37500.0	218.7	-47.0	0.	-0. **	336.9	585.6	245.6	81.6	1.000075
38000.0	213.7	-47.2	0.	-0. **	329.5	585.3	246.2	81.5	1.000073
38500.0	208.8	-47.4	0.	-0. **	322.3	585.1	247.3	82.2	1.000072
39000.0	204.1	-47.5	0.	-0. **	315.2	584.9	248.7	83.4	1.000070
39500.0	199.5	-47.7	0.	-0. **	308.3	584.6	249.6	83.7	1.000069
40000.0	194.9	-47.9	0.	-0. **	301.5	584.4	249.9	83.2	1.000067
40500.0	190.5	-48.1	0.	-0. **	294.9	584.2	250.4	82.3	1.000066
41000.0	186.1	-49.1	0.	-0. **	289.4	582.9	251.9	79.4	1.000064
41500.0	181.9	-50.2	0.	-0. **	284.2	581.4	253.5	76.3	1.000063
42000.0	177.7	-51.3	0.	-0. **	279.0	580.0	254.7	70.7	1.000062
42500.0	173.6	-52.4	0.	-0. **	274.0	578.5	256.0	65.5	1.000061
43000.0	169.5	-53.4	0.	-0. **	268.8	577.3	257.9	63.8	1.000060
43500.0	165.5	-54.1	0.	-0. **	263.2	576.3	259.4	62.3	1.000059
44000.0	161.5	-54.9	0.	-0. **	257.8	575.3	257.6	61.9	1.000057
44500.0	157.7	-55.6	0.	-0. **	252.5	574.3	255.9	61.6	1.000056
45000.0	153.9	-56.4	0.	-0. **	247.4	573.3	254.3	61.5	1.000055
45500.0	150.2	-57.1	0.	-0. **	242.3	572.3	252.7	61.4	1.000054
46000.0	146.6	-57.9	0.	-0. **	237.3	571.3	251.6	58.2	1.000053
46500.0	143.1	-58.6	0.	-0. **	232.5	570.3	250.4	55.0	1.000052
47000.0	139.7	-59.4	0.	-0. **	227.7	569.3	250.6	55.0	1.000051
47500.0	136.4	-60.1	0.	-0. **	223.1	568.3	251.2	56.0	1.000050
48000.0	133.1	-60.9	0.	-0. **	218.5	567.3	252.1	56.6	1.000049

** AT LEAST ONE ASSUMED RELATIVE HUMIDITY VALUE WAS USED IN THE INTERPOLATION.

STATION ALTITUDE 3989.0 FEET MSL
12 FEB. 69 1320 HRS MST
ASCENSION NO. 152

UPPER AIR DATA
0736003902
WHITE SANDS SITE

WSTM SITE COORDINATES
E 488,580 FEET
N 185,045 FEET

TABLE XI (Cont)

GEOMETRIC ALTITUDE MSL FEET	PRESSURE MILLIBARS	TEMPERATURE AIR DEGREES CENTIGRADE	TEMPERATURE DEWPOINT DEGREES CENTIGRADE	REL.HUM. PERCENT	DENSITY GM/CUBIC METER	SPEED OF SOUND KNOTS	WIND DATA DIRECTION DEGREES(TN)	WIND DATA SPEED KNOTS	INDEX OF REFRACTION
48500.0	130.0	-61.6	0.	-0. **	214.0	566.3	253.5	56.4	1.000048
49000.0	126.8	-62.4	0.	-0. **	209.7	565.3	254.9	56.1	1.000047
49500.0	123.8	-63.1	0.	-0. **	205.4	564.3	255.5	55.8	1.000046
50000.0	120.9	-63.9	0.	-0. **	201.2	563.3	256.0	55.6	1.000045
50500.0	118.0	-64.6	0.	-0. **	197.1	562.3	256.5	54.2	1.000044
51000.0	115.0	-65.2	0.	-0. **	192.7	561.6	257.0	51.4	1.000043
51500.0	112.2	-65.7	0.	-0. **	188.4	560.8	257.5	48.6	1.000042
52000.0	109.4	-66.3	0.	-0. **	184.3	560.1	256.3	46.3	1.000041
52500.0	106.7	-66.8	0.	-0. **	180.2	559.3	255.1	44.1	1.000040
53000.0	104.0	-67.4	0.	-0. **	176.2	558.6	254.8	41.3	1.000039
53500.0	101.5	-67.9	0.	-0. **	172.3	557.8	255.0	38.1	1.000038
54000.0	99.0	-68.5	0.	-0. **	168.4	557.1	255.1	35.0	1.000038
54500.0	96.5	-69.0	0.	-0. **	164.7	556.3	254.9	32.3	1.000037
55000.0	94.1	-69.6	0.	-0. **	161.1	555.6	254.8	29.6	1.000036
55500.0	91.8	-69.5	0.	-0. **	157.0	555.7	254.6	28.[illegible]	1.000035
56000.0	89.5	-69.3	0.	-0. **	152.9	555.9	254.4	27.0	1.000034
56500.0	87.2	-69.2	0.	-0. **	149.0	556.1	253.4	27.5	1.000033
57000.0	85.0	-69.1	0.	-0. **	145.2	556.2	251.7	29.2	1.000032
57500.0	82.9	-69.0	0.	-0. **	141.5	556.4	250.5	31.0	1.000032
58000.0	80.8	-68.8	0.	-0. **	137.8	556.6	251.5	33.3	1.000031
58500.0	78.8	-68.7	0.	-0. **	134.3	556.8	252.6	35.6	1.000030
59000.0	76.8	-68.6	0.	-0. **	130.9	557.0	253.6	37.6	1.000029
59500.0	74.9	-68.4	0.	-0. **	127.5	557.1	254.7	39.3	1.000028
60000.0	73.1	-68.3	0.	-0. **	124.2	557.3	255.8	39.7	1.000028
60500.0	71.2	-68.2	0.	-0. **	121.1	557.5	257.4	35.4	1.000027
61000.0	69.4	-68.0	0.	-0. **	118.0	557.7	258.9	31.0	1.000026
61500.0	67.7	-67.1	0.	-0. **	114.5	559.0	257.7	27.4	1.000025
62000.0	66.1	-65.8	0.	-0. **	111.0	560.7	255.4	24.0	1.000025
62500.0	64.4	-65.0	0.	-0. **	107.8	561.8	254.1	20.9	1.000024
63000.0	62.8	-64.9	0.	-0. **	105.2	561.9	256.4	18.6	1.000023

** AT LEAST ONE ASSUMED RELATIVE HUMIDITY VALUE WAS USED IN THE INTERPOLATION.

STATION ALTITUDE 3989.0 FEET MSL
12 FEB. 69 1320 HRS MST
ASCENSION NO. 152

UPPER AIR DATA
0736003902
WHITE SANDS SITE

WSTM SITE COORDINATES
E 488,580 FEET
N 185,045 FEET

TABLE XI (Cont)

GEOMETRIC ALTITUDE MSL FEET	PRESSURE MILLIBARS	TEMPERATURE AIR DEGREES	TEMPERATURE DEWPOINT CENTIGRADE	REL.HUM. PERCENT	DENSITY GM/CUBIC METER	SPEED OF SOUND KNOTS	WIND DATA DIRECTION DEGREES(TN)	WIND DATA SPEED KNOTS	INDEX OF REFRACTION
63500.0	61.3	-64.9	0.	-0. **	102.6	561.9	258.7	16.3	1.000023
64000.0	59.8	-64.9	0.	-0. **	100.0	562.0	261.1	17.3	1.000022
64500.0	58.3	-64.8	0.	-0. **	97.6	562.0	263.4	19.6	1.000022
65000.0	56.9	-64.8	0.	-0. **	95.2	562.1	266.0	21.5	1.000021
65500.0	55.5	-64.7	0.	-0. **	92.8	562.1	269.4	21.5	1.000021
66000.0	54.2	-64.7	0.	-0. **	90.5	562.2	272.8	21.4	1.000020
66500.0	52.8	-64.6	0.	-0. **	88.3	562.2	275.1	20.4	1.000020
67000.0	51.5	-64.6	0.	-0. **	86.1	562.3	276.8	18.9	1.000019
67500.0	50.3	-64.6	0.	-0. **	84.0	562.4	278.6	17.3	1.000019
68000.0	49.0	-64.5	0.	-0. **	81.9	562.4	278.7	15.9	1.000018
68500.0	47.8	-64.5	0.	-0. **	79.9	562.5	278.6	14.4	1.000018
69000.0	46.7	-64.4	0.	-0. **	77.9	562.5	278.9	13.1	1.000017
69500.0	45.5	-64.4	0.	-0. **	76.0	562.6	283.0	12.8	1.000017
70000.0	44.4	-64.4	0.	-0. **	74.1	562.6	287.1	12.6	1.000016
70500.0	43.3	-64.3	0.	-0. **	72.3	562.7	291.1	12.4	1.000016
71000.0	42.3	-64.0	0.	-0. **	70.4	563.1	294.7	12.5	1.000016
71500.0	41.2	-63.6	0.	-0. **	68.6	563.7	298.3	12.5	1.000015
72000.0	40.2	-63.1	0.	-0. **	66.8	564.3	303.5	12.1	1.000015
72500.0	39.3	-62.7	0.	-0. **	65.0	564.8	311.5	11.1	1.000014
73000.0	38.3	-62.3	0.	-0. **	63.3	565.4	319.6	10.0	1.000014
73500.0	37.4	-61.9	0.	-0. **	61.6	566.0	326.3	8.8	1.000014
74000.0	36.5	-61.4	0.	-0. **	60.0	566.6	331.8	7.4	1.000013
74500.0	35.6	-61.1	0.	-0. **	58.5	566.9	337.2	6.0	1.000013
75000.0	34.7	-61.0	0.	-0. **	57.1	567.1	336.8	4.6	1.000013
75500.0	33.9	-60.9	0.	-0. **	55.7	567.2	332.7	3.1	1.000012
76000.0	33.1	-60.8	0.	-0. **	54.3	567.4	328.6	1.7	1.000012
76500.0	32.3	-60.7	0.	-0. **	53.0	567.5	311.9	1.8	1.000012
77000.0	31.5	-60.6	0.	-0. **	51.7	567.7	291.5	2.3	1.000012
77500.0	30.8	-60.5	0.	-0. **	50.4	567.8	271.1	2.8	1.000011
78000.0	30.0	-60.4	0.	-0. **	49.2	568.0			1.000011

** AT LEAST ONE ASSUMED RELATIVE HUMIDITY VALUE WAS USED IN THE INTERPOLATION.

STATION ALTITUDE 3989.0 FEET MSL
12 FEB. 69 1320 HRS MST
ASCENSION NO. 152

UPPER AIR DATA
0736003902
WHITE SANDS SITE

WSTM SITE COORDINATES
E 488,580 FEET
N 185,045 FEET

TABLE XI (Cont)

GEOMETRIC ALTITUDE MSL FEET	PRESSURE MILLIBARS	TEMPERATURE AIR DEGREES CENTIGRADE	TEMPERATURE DEWPOINT DEGREES CENTIGRADE	REL.HUM. PERCENT	DENSITY GM/CUBIC METER	SPEED OF SOUND KNOTS	WIND DATA DIRECTION DEGREES(TN)	WIND DATA SPEED KNOTS	INDEX OF REFRACTION
78500.0	29.3	-60.3	0.	-0. **	48.0	568.1			1.000011
79000.0	28.6	-60.2	0.	-0. **	46.8	568.3			1.000010
79500.0	27.9	-60.1	0.	-0. **	45.7	568.4			1.000010
80000.0	27.3	-59.9	0.	-0. **	44.5	568.6			1.000010

** AT LEAST ONE ASSUMED RELATIVE HUMIDITY VALUE WAS USED IN THE INTERPOLATION.

STATION ALTITUDE 3989.0 FEET MSL
12 FEB. 65 1320 HRS MST
ASCENSION NO. 152

MANDATORY LEVELS
0736003902
WHITE SANDS SITE

WSTM SITE COORDINATES
E 488,580 FEET
N 185,045 FEET

TABLE XII

PRESSURE MILLIBARS	GEOPOTENTIAL FEET	TEMPERATURE AIR DEGREES CENTIGRADE	TEMPERATURE DEWPOINT DEGREES CENTIGRADE	REL.HUM. PERCENT	WIND DATA DIRECTION DEGREES(TN)	WIND DATA SPEED KNOTS
850.0	4661.	16.2	-7.0	20.	196.1	8.9
800.0	6337.	11.7	-8.5	24.	161.6	11.4
750.0	8091.	7.1	-8.4	32.	167.3	17.3
700.0	9938.	2.7	-6.9	49.	182.2	21.9
650.0	11889.	-2.1	-10.0	55.	188.9	27.1
600.0	13957.	-7.3	-16.4	48.	191.5	28.6
550.0	16161.	-11.6	-32.0	17.	209.4	25.9
500.0	18539.	-16.3	-32.8	23.	217.9	28.3
450.0	21109.	-22.5	-36.5	27.	222.1	30.4
400.0	23910.	-28.1	-35.6	49.	225.8	34.4
350.0	27009.	-35.5	-47.5	29.	232.2	39.3
300.0	30468.	-42.2	0.	-0.**	237.8	50.0
250.0	34503.	-43.7	0.	-0.**	249.4	71.7
200.0	39366.	-47.7	0.	-0.**	249.5	83.8
175.0	42239.	-52.0	0.	-0.**	255.5	67.0
150.0	45475.	-57.2	0.	-0.**	252.6	60.9
125.0	49210.	-62.8	0.	-0.**	255.3	55.9
100.0	53658.	-68.2	0.	-0.**	255.1	36.2
80.0	58033.	-68.8	0.	-0.**	252.0	34.2
70.0	60660.	-68.1	0.	-0.**	258.4	32.4
60.0	63731.	-64.9	0.	-0.**	260.7	16.9
50.0	67384.	-64.6	0.	-0.**	278.7	17.0
40.0	71865.	-63.0	0.	-0.**	305.3	11.9
30.0	77722.	-60.4	0.	-0.**		

** AT LEAST ONE ASSUMED RELATIVE HUMIDITY VALUE WAS USED IN THE INTERPOLATION.

RELEASE TIME (MST)			IMPACT DISPLACEMENT DUE TO WIND IN MILES								THEORETICAL IMPACT IN MILES FROM LAUNCHER	
			143-4000 FT		4000-20000 FT		20000-100000 FT		TOTAL			
RAWINSONDE		PIBAL	N-S	E-W	N-S	E-W	N-S	E-W	N-S	E-W	N-S	E-W
R_1 0715	R 0715	P 1000	6.4N	5.2E	6.9S	6.1W	0.3N	16.1W	0.2S	17.0W	91.0N	0.6E
R_2 1000	R 0715	P 1030	6.7N	5.2E	10.9S	4.6W	0.3N	16.1W	3.9S	15.5W	87.3N	2.1E
R_2 1000	R 0715	P 1100	3.1S	2.7E	10.9S	4.6W	0.3N	16.1W	13.7S	18.0W	77.5N	0.4W
R_2 1000	R 0715	P 1120	4.9S	3.9E	10.9S	4.6W	0.3N	16.1W	15.5S	16.8W	75.7N	0.8E
R_2 1000	R_3 1000	P 1140	5.7S	1.3E	10.9S	4.6W	4.9S	16.2W	21.5S	19.5W	69.7N	1.9W
R_2 1000	R_3 1000	P 1200	8.6S	0.8W	10.9S	4.6W	4.9S	16.2W	24.4S	21.6W	66.8N	4.0W
R_2 1000	R_3 1000	P 1215	9.8S	2.2W	10.9S	4.6W	4.9S	16.2W	25.6S	23.0W	65.6N	5.4W
R_2 1000	R_3 1000	P 1228	11.4S	2.7W	10.9S	4.6W	4.9S	16.2W	27.2S	23.5W	64.0N	5.9W
R_2 1210	R_3 1000	P 1240	12.8S	2.8W	15.4S	6.6W	4.9S	16.2W	33.1S	25.6W	58.1N	8.0W
R_2 1210	R_3 1000	P 1250	18.4S	1.0W	15.4S	6.6W	4.9S	16.2W	38.7S	23.8W	52.5N	6.2W
R_2 1210	R_3 1000	P 1300	19.2S	6.1E	15.4S	6.6W	4.9S	16.2W	39.5S	16.7W	51.7N	0.9E
R_2 1210	R_3 1000	P 1306	12.4S	1.5E	15.4S	6.6W	4.9S	16.2W	32.7S	21.3W	58.5N	3.7W
R_2 1210	R_3 1000	P 1314	17.9S	0.9W	15.4S	6.6W	4.9S	16.2W	38.2S	23.7W	53.0N	6.1W
*R_1 1320	*R 1320	P 1320	17.6S	2.1W	16.6S	6.2W	7.8S	18.2W	42.0S	26.5W	49.2N	8.9W

TABLE XIII. IMPACT PREDICTION DATA TIME: 1320 MST
AEROBEE NASA 4.135 DS DATE: 12 FEBRUARY 1969

* = Post-Shoot Data
P = Double Theodolite Winds (143-4,000 FT)
R = Rawinsonde Winds (Above 20,000 FT)
R_1 = Rawinsonde Winds (4,000-20,000 FT)
R_2 = Rawin Winds (4,000-20,000 FT)
R_3 = Rawin Winds (Above 20,000 FT)

JACK SETTINGS FOR LAUNCHER 21-A	West leg	55	inches
	East leg	43	inches
LAUNCHER SETTING	Tilt	5.50	degrees
	Azimuth	013.9	degrees
TILT COMPONENTS	North	5.34	degrees
	East	1.33	degrees
NO WIND IMPACT FROM LAUNCHER	North	91.2	miles
	East	17.6	miles

PREDICTED IMPACT FROM LAUNCHER	North	52.0	miles
	West	3.0	miles
PREDICTED BOOSTER IMPACT FROM LAUNCHER	Azimuth	015	degrees
	Distance	2,930	feet

RECOMMENDATION - Fire with 87 per cent confidence of impacting on range, based upon:
wind correction of 44 miles
1-hr wind variability of 16 miles

12 February 1969/1314 MST

TABLE XIV. ACTUAL AND PREDICTED LAUNCH DATA
AEROBEE NASA 4.135 DS

*SOTIM IMPACT FROM LAUNCHER	North	51.3	miles
	West	11.2	miles
ACTUAL BOOSTER IMPACT FROM LAUNCHER	Azimuth	N/A	degrees
	Distance	N/A	feet

TABLE XV. IMPACT DATA
AEROBEE NASA 4.135 DS

*Sonic Observation of the Trajectory and Impact of Missiles.

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13. ABSTRACT

Meteorological data gathered for the launching of Aerobee NASA 4.135 S (NRL NE 3.175) are presented for the NASA Goddard Space Flight Center, Greenbelt, Maryland, the Naval Research Laboratory, Washington, D. C., and for ballistic studies. The data appear, along with calculated ballistic data, in tabular form.

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