NASA TECHNICAL MEMORANDUM

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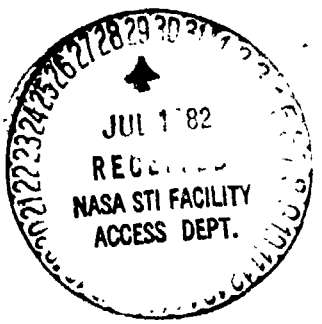
ATMOSPHERIC OBSERVATIONS FOR STS-3 LANDING

By Robert E. Turner, James E. Arnold, Gregory S. Wilson, and Wade Batts
Space Sciences Laboratory

June 1982



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Marshall Space Flight Center, Alabama

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16. ABSTRACT

A summary of synoptic weather conditions existing over the western United States is given for the time of Shuttle descent into White Sands Missile Range, New Mexico. The techniques and methods used to furnish synoptic atmospheric data at the surface and aloft for flight verification of the STS-3 Orbiter during its descent into White Sands Missile Range are specified. Examples of the upper-level data set are given.

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ATMOSPHERIC OBSERVATIONS FOR STS-3 LANDING

I. INTRODUCTION

The successful flight of STS-3 achieved another major step in the first phase of NASA's space vehicle/flight program [1,2]. This report presents a summary of synoptic conditions and the atmospheric observations taken in support of the flight verification of the STS-3 Orbiter.

The Space Shuttle STS-3 was launched from Complex 39A at the Kennedy Space Center, Florida, into a nominal 137/137 n.mi. altitude circular orbit on March 22, 1982.

The deorbit maneuver was initiated at approximately 190 hr, 59 min, ground elapsed time during the 129th orbit, with subsequent landing on Northrop Strip at White Sands Missile Range, New Mexico, on March 30, 1982, after 8 days and 5 min.

This document is written under the requirement Level II PRCB, dated May 5, 1980, Request S-13705A, to furnish atmospheric data at the surface and aloft for flight verification of STS-3 Orbiter during its descent into White Sands Missile Range, New Mexico.

II. GENERAL SYNOPTIC CONDITIONS AT LANDING TIME

Deorbit maneuvers for STS-3 were initiated at 1459 GMT March 30, 1982, while passing over the western portion of the North Pacific Ocean. The Shuttle Orbiter then descended into the atmosphere, passing rapidly through the stratosphere and then the troposphere over Southern California. It landed at 1605 GMT at Northrop Strip. This section describes the general synoptic conditions during this period. These conditions were derived using both satellite imagery (visible and infrared data from the GOES-W satellite) and conventional surface and upper-level rawinsonde measurements of temperature, winds, moisture, and pressure. Analysis of these data was performed by the Man Computer Interactive Data Access System (McIDAS) in the Space Sciences Laboratory of the Marshall Space Flight Center.

Synoptic conditions at the time of STS-3 landing were dominated by a large low pressure system over the north central U.S. One polar front extended through east Texas, east of the landing site, and a second polar front was in Arizona, to the west of the landing site, as shown in Figure 1. Strong, gusty winds the day before landing had reduced horizontal visibility in the landing area to less than 1 mile. On the day of the landing, the pressure gradient behind the polar front had weakened. At landing time surface winds averaged 10 to 15 knots from the southwest in the White Sands area.

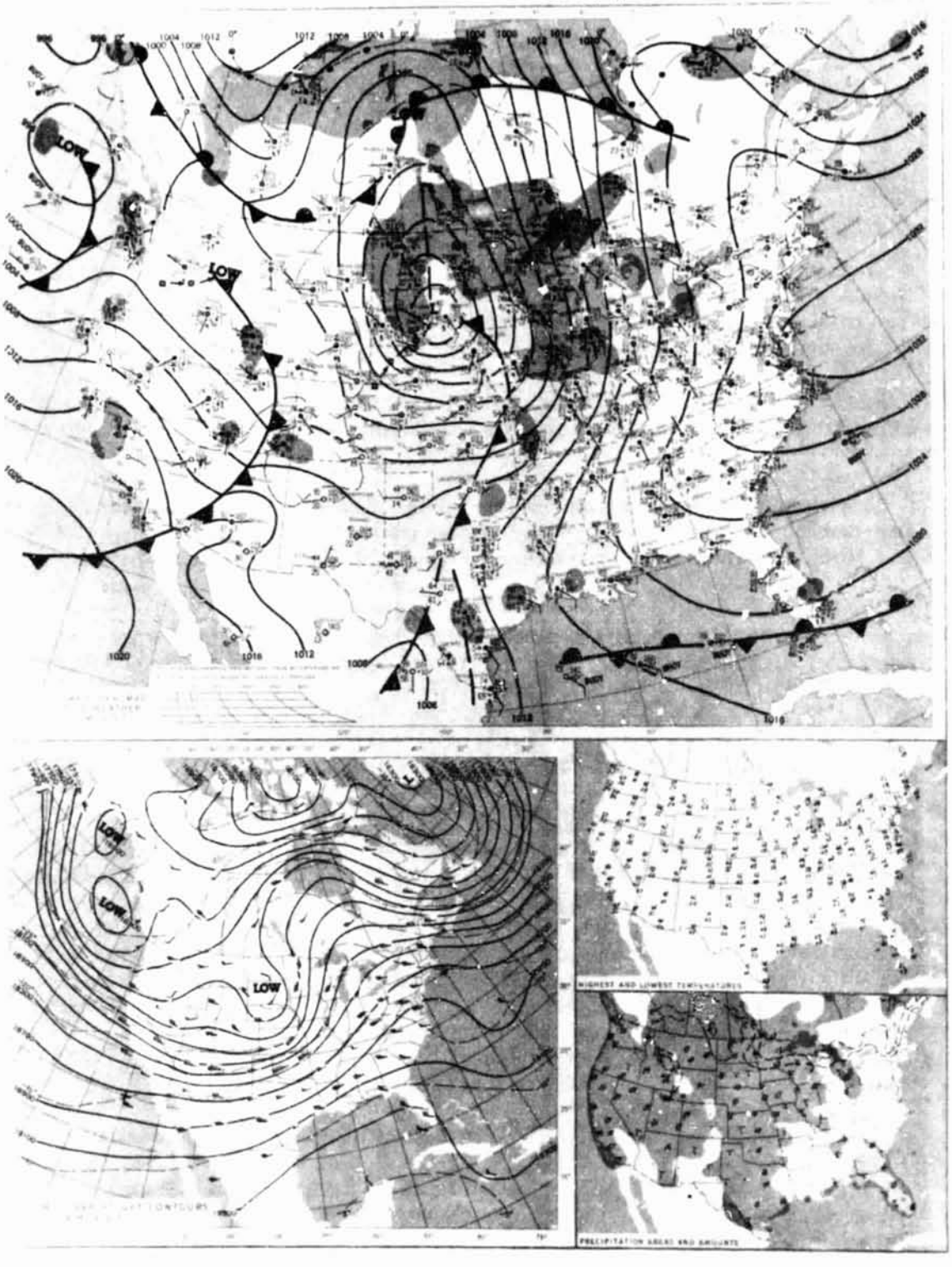

Figure 1. Large-scale analysis of weather conditions over North America and the U.S., including surface map, 500 mb (approximately 18,000 ft) height contours, high and low surface temperatures, and 24-hr precipitation map for 1200 GMT March 30, 1982.

Figures 2 through 4 show visible and infrared images over the western U.S. at 1600 GMT. State and geographical boundaries are superimposed, with the Northrop Strip area represented by a small white box in south central New Mexico. These figures show that skies were essentially clear at, but with high clouds to the south of, the White Sands-Northrop strip area. This is supported by the infrared image shown in Figure 3. The 500 mb (approximately 5,000 m/18,000 ft) wind barbs (m/sec) and a geopotential height analysis (decameters) superimposed in Figure 4 show westerly winds in the middle troposphere over southern New Mexico with speeds on the order of 60 m/sec.

This pattern of winds and the general shape of the geopotential height field extended throughout the troposphere. This is shown in Figures 5 through 8, which display the wind barb and geopotential height analysis for 700 mb (approximately 3,000 m/10,000 ft), 500 mb (approximately 5,000 m/18,000 ft), 300 mb (approximately 9,000 m/30,000 ft), and 200 mb (approximately 12,000 m/40,000 ft), respectively, over the southwest U.S. The thin streaks of upper-level clouds extending across the northern part of the Gulf of California into southern Arizona and New Mexico are associated with the high-speed core of wind at upper levels.

Figure 9 shows a full-resolution (1 km) visible picture over the White Sands-Northrop area (white box) at 1600 GMT on March 30, 1982. Cirroform clouds are present near the Texas-New Mexico border. The white cloud-like patch to the west of the Northrop location is the White Sands area. Surface winds were from the southwest with mean speed on the order of 13 knots. Surface visibilities were 20 miles along the New Mexico portion of the final groundtrack.

Figure 10 is a plot of the vertical distribution of winds (m/sec), temperature (solid line in °C), and dew-point temperature (dashed line in °C) at 1200 GMT, March 30, taken at White Sands Missile Range. The profiles extend from the surface to 100 mb (approximately 17,000/55,000 ft). Wind speeds reached 70 m/sec in the mid-troposphere, with considerable speed shear between reported wind levels.

III. DISCUSSION OF BASIC DATA

A. Collection of the Data and the Data Acquisition System

Past experience gained on Apollo and Skylab programs has shown that it is necessary to have atmospheric data to verify the analytical techniques used for engineering analysis. For this reason, atmospheric data at the surface and aloft were obtained by using the Rawinsonde System. The set was positioned along the STS-3 reentry track. The requirements to collect atmospheric data at approximately 1 hr 30 min before, as well as 20 min after landing from this location have been met.

The Rawinsonde System is a transportable radio direction finder designed to track a balloon-borne radiosonde automatically. A radiosonde signal containing information about the atmosphere in the form of an amplitude or frequency modulation data signal is received, amplified, and detected by this system. The detected signal is passed to separate equipment in the system where it is recorded. By reference to calibration data for the radiosonde, this recorded information is converted to values of temperature, humidity, and pressure. Recordings of time versus progressive changes of the elevation and azimuth positions of the ascending balloon package, as determined by tracking of the signal from the radiosonde, or made so they can later be converted to wind speed and direction.

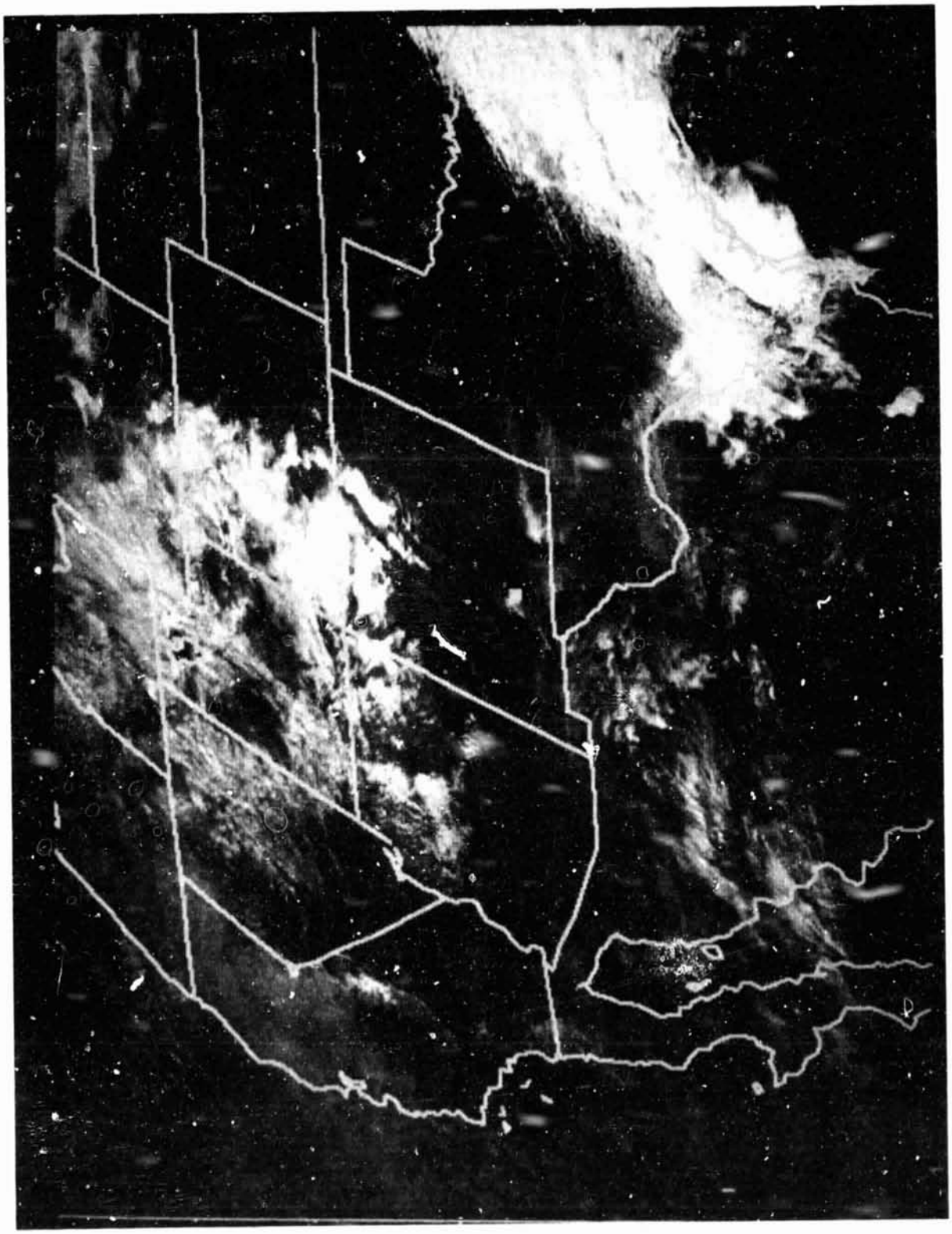

Figure 2. GOES-W visible satellite image at 1600 GMT March 30, 1982.

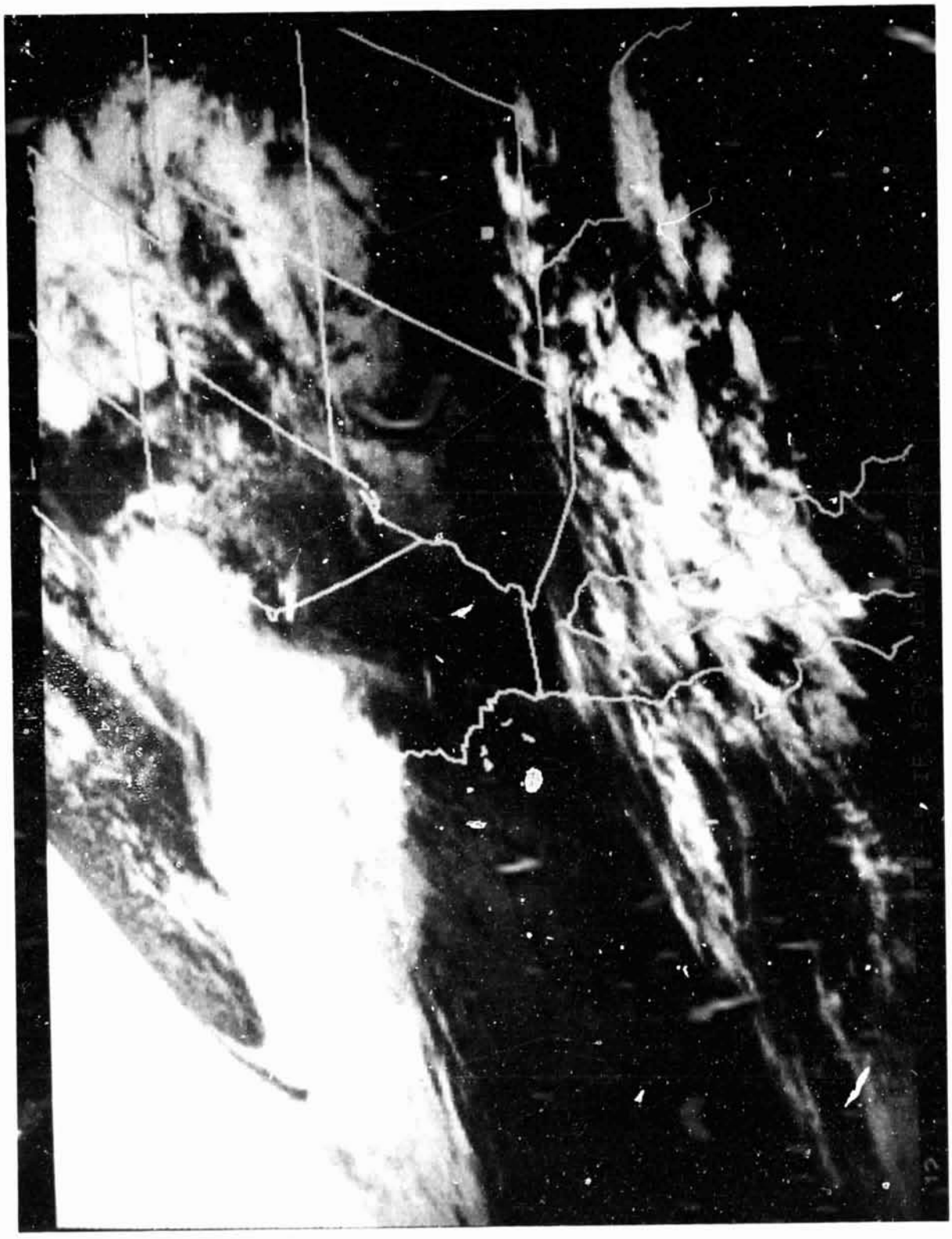

Figure 3. GOES-W infrared satellite image at 1600 GMT March 30, 1982.

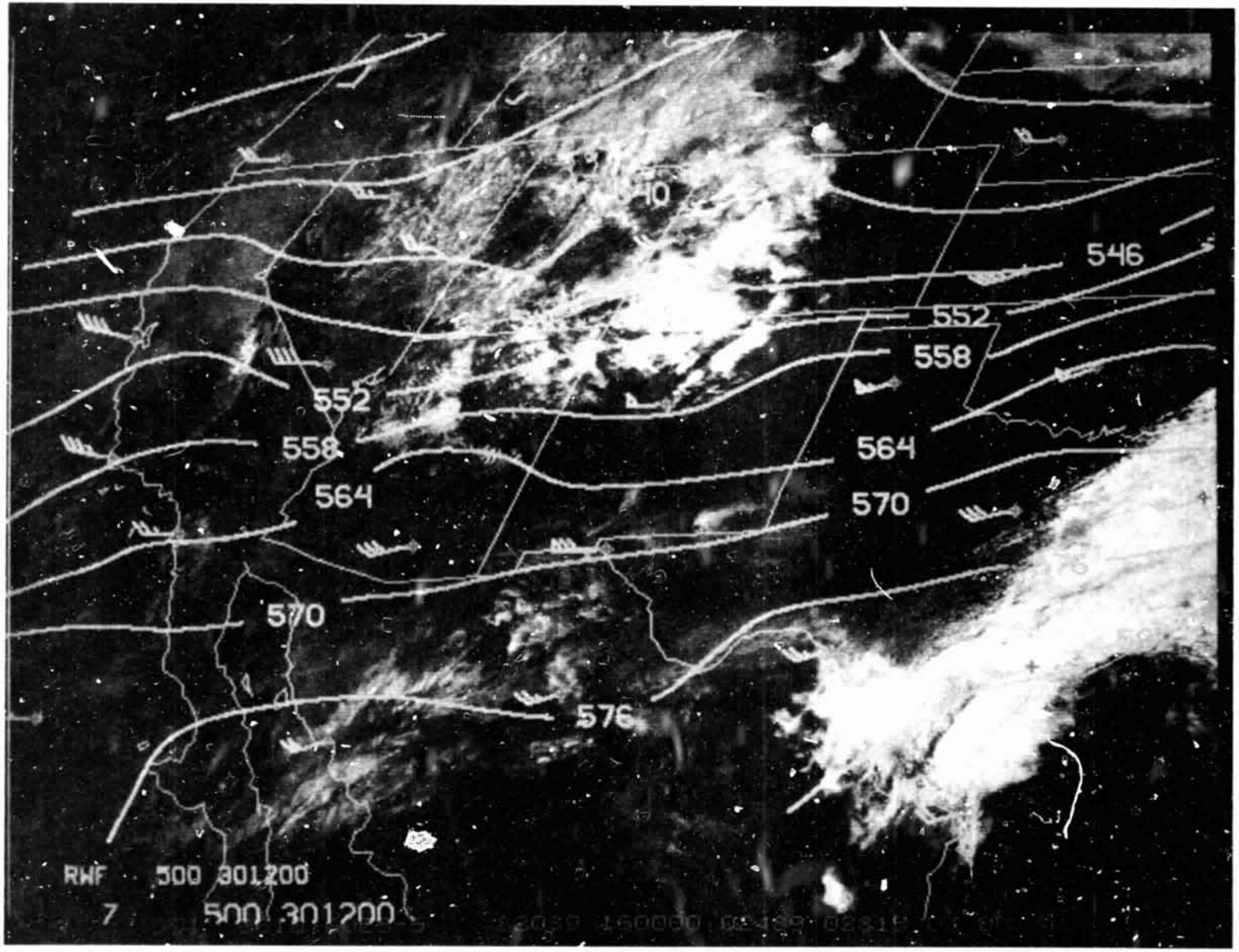

Figure 4. GOES-W visible satellite image at 1600 GMT March 30, 1982. Superimposed wind barbs (m/sec) and a geopotential height analysis (m) for 500 mb (approximately 18.000 ft) from data at 1200 GMT March 30, 1982.

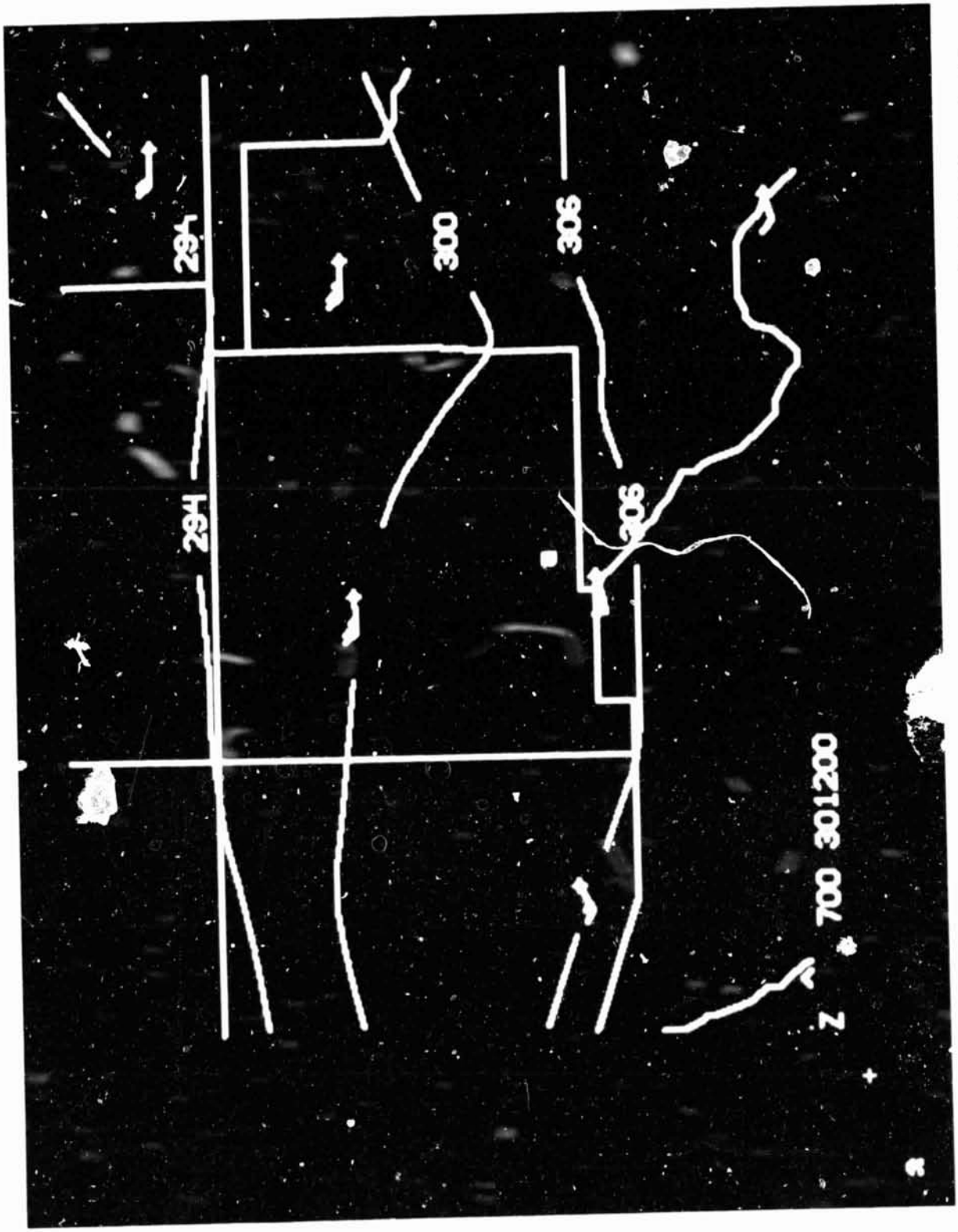

Figure 5. 700 mb (approximately 10,0[illegible] winds (m/sec) and geopotential height analysis (decameters) from data at 1200 GMT March 30, 1982.

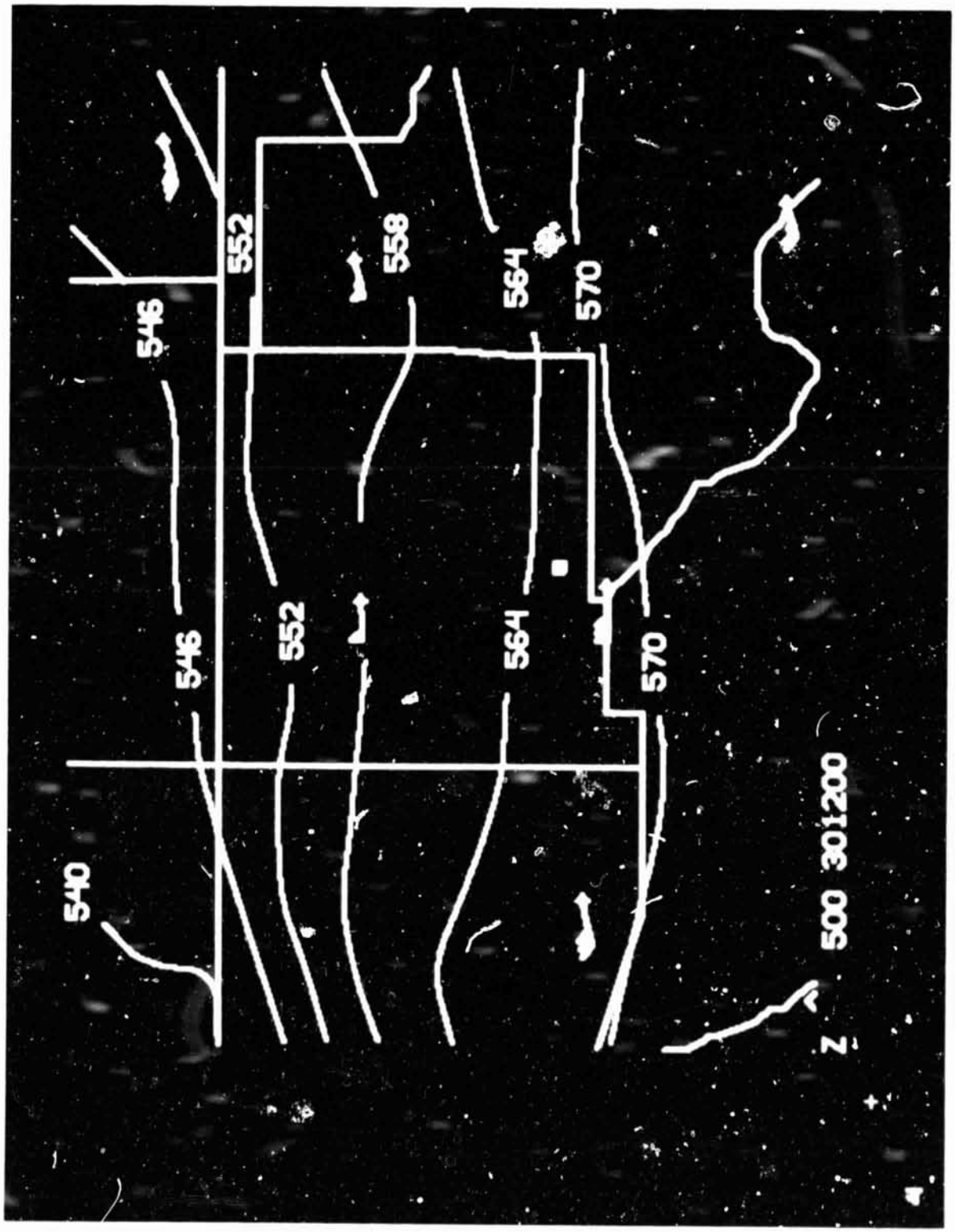

Figure 6. 500 mb (approximately 18,000 ft) winds (m/sec) and geopotential height analysis (decameters) from data at 1200 GMT March 30, 1982.

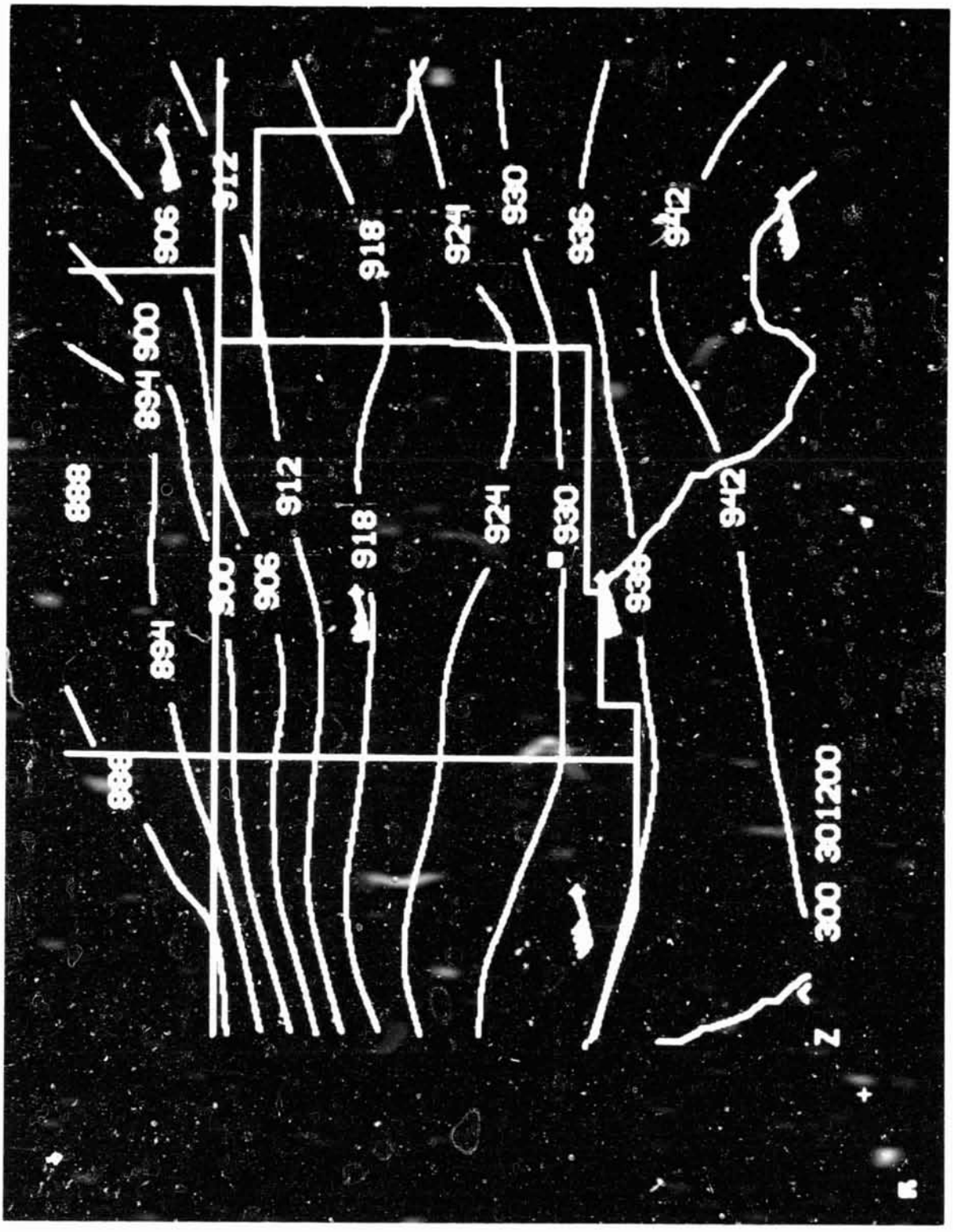

Figure 7. 300 mb (approximately 30,000 ft) winds (m/sec) and geopotential height analysis (decameters) from data at 1200 GMT March 30, 1982.

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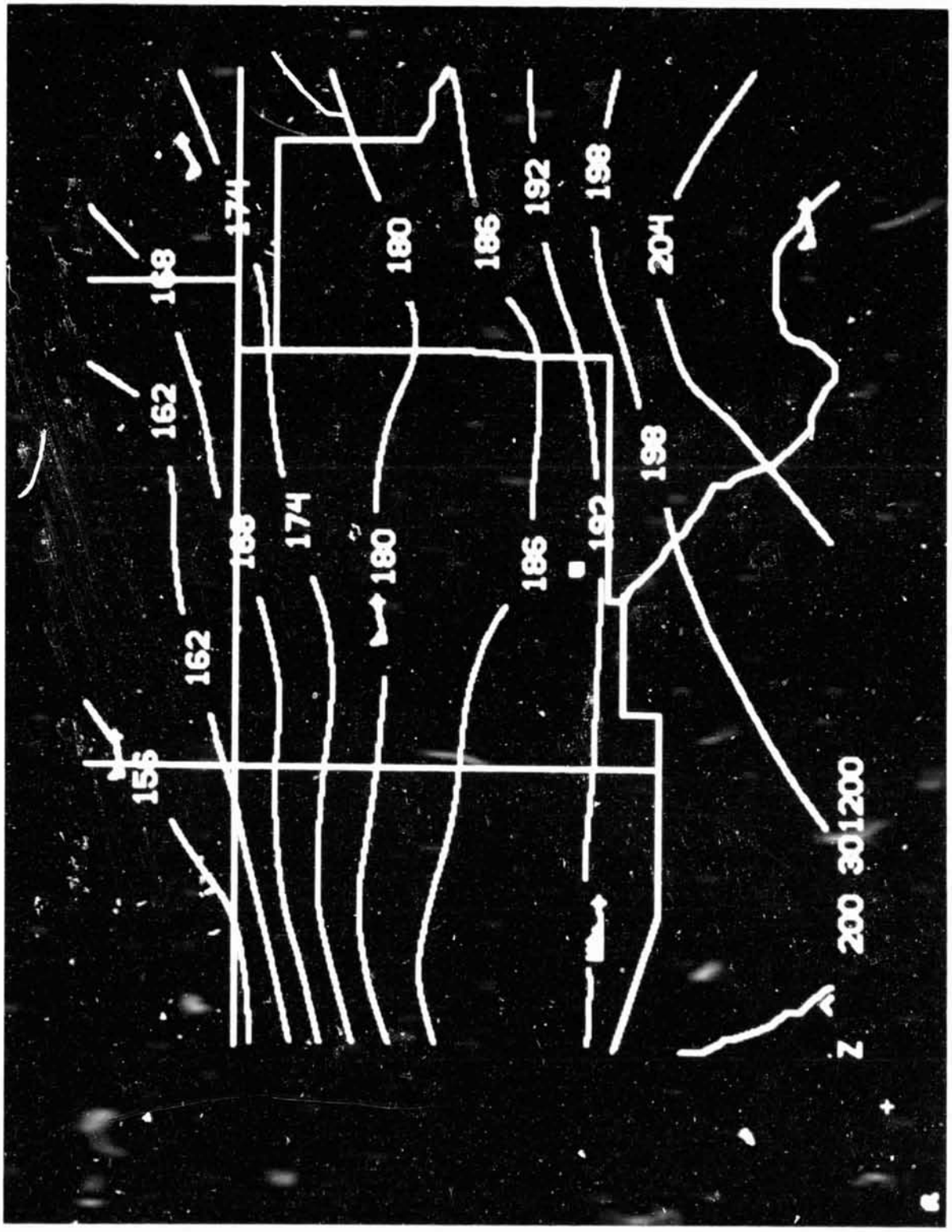

Figure 8. 200 mb (approximately 55,000 ft) winds (m/sec) and geopotential height analysis (decameters) from data at 1200 GMT March 30, 1982.

Figure 9. Visible GOES-W satellite image at 1600 GMT March 30, 1982 over southern New Mexico.

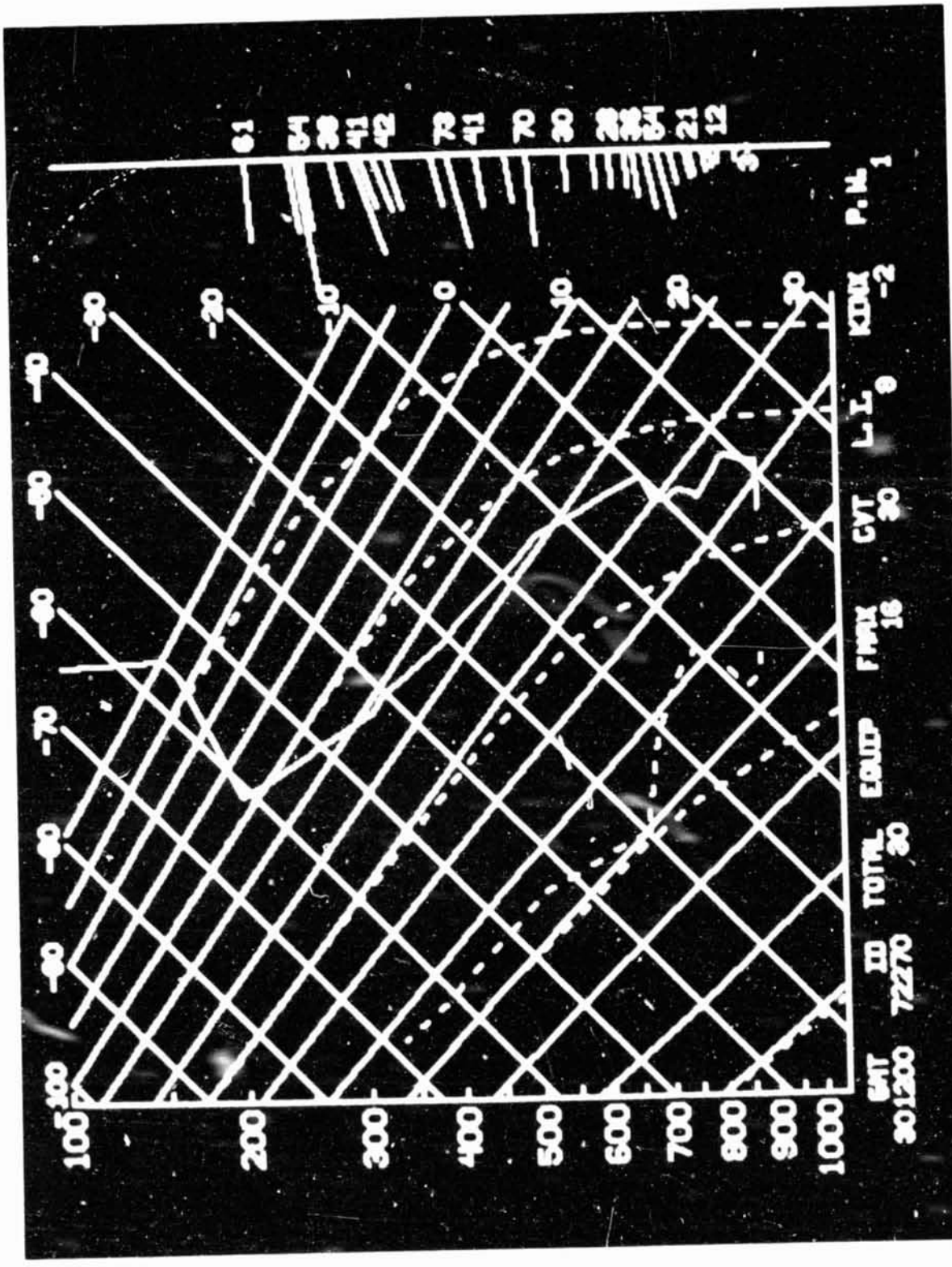

Figure 10. Vertical profiles of wind barbs (m/sec), temperature (solid line in °C), and dew-point temperature (dashed line in °C) from the surface to 100 mb (approximately 55,000 ft) at 1200 GMT March 30, 1982 for White Sands Missile Range.

B. Methods of Processing

The procedure used to compute the soundings is described by Fuelberg [3] and Turner [4]. All raw data keypunched were checked for errors by calculating centered differences on the input data. Additional checks include centered differences on computed winds and checks on lapse rates of computed temperatures and dew points. Suspected errors were checked with the original recorder chart information and the appropriate corrections made.

The following procedures were employed in the processing of these data which differ from those described by Fuelberg [3]:

1) Humidity values, including dew-point temperature, were computed only at temperatures above -40°C; at temperatures below -40°C, humidity values are missing and are indicated by a field of nines.

2) Wind direction and speed were determined by WSMR technique.

In processing the data, corrections were made for any errors made in recording the observational data.

IV. DISCUSSION OF UPPER AIR DATA

A. Accuracy Estimates

Estimates of the RMS errors in the wind and thermodynamic quantities of the STS-3 descent rawinsonde soundings are the same as those given by Fuelberg [3]. The error estimates for thermodynamic variables are presented in Table 1.

The RMS errors for wind speed and direction are difficult to describe since they are a function of tracking geometry and other factors. Maximum RMS errors for winds (speed and direction) computed (based on the worst geometric tracking configuration) for 10 and 40 degree elevation angles are presented in Table 2.

B. Tabulated Data

An example of the data is given in Table 3, with the explanation of column headings in Table 4. The data are extended above the rawinsonde sounding by a tie in to the Global Reference Atmosphere for the latitude and longitude, solar conditions, day, and month at the landing site.

The data are presented in Appendix A.

TABLE 1. ESTIMATES OF THE RMS ERRORS IN THERMODYNAMIC QUANTITIES

Parameter	Approximate RMS Error
Temperature	0.5°C
Pressure	1.3 mb from surface to 400 mb 1.1 mb between 400 and 100 mb 0.7 mb between 100 and 10 mb
Humidity	10 percent
Pressure Altitude	10 gpm at 500 mb 20 gpm at 300 mb 50 gpm at 50 mb

TABLE 2. ESTIMATES OF RMS ERRORS IN WIND DATA

	RMS Errors ($msec^{-1}$) in Speed		RMS Errors (degree) in Direction	
Pressure mb	10-degree elevation	40-degree elevation	10-degree elevation	40-degree elevation
700	2.5	0.5	9.5	1.3
500	4.5	0.8	13.4	1.8
300	7.8	1.0	18.0	2.5

TABLE 3. EXAMPLE OF DATA

STATION NO. 72269
WHITE SANDS MISSILE RANGE
30 MARCH 1982
1437 GMT

HEIGHT GPM	PRES MB	TEMP DG C	DEW PT DG C	DIR DG	SPEED M/SEC
1192.4	880.0	11.0	-2.8	140.0	2.1
1219.2	877.3	11.1	-2.9	144.0	2.1
1524.0	845.7	9.1	-4.0	167.0	4.0
1828.8	814.8	5.9	-5.2	210.0	4.3
2133.6	784.9	2.7	-6.6	241.0	7.6
2438.4	756.1	3.6	-10.7	255.0	25.3
2743.2	728.5	6.5	-16.9	262.0	23.8
3048.0	701.8	4.7	-18.1	263.0	24.1
3352.8	675.9	2.5	-18.7	265.0	23.5
3657.6	650.8	.3	-19.5	270.0	23.8
3962.4	626.4	-2.2	-20.7	271.0	25.6
4267.2	602.8	-4.9	-22.2	272.0	27.7
4572.0	579.9	-7.5	-23.8	270.0	29.6
4876.8	557.6	-9.8	-25.3	265.0	31.7
5181.6	535.9	-12.3	-28.4	261.0	33.5
5486.4	514.9	-14.7	-31.1	259.0	32.6
5791.2	494.6	-17.9	-32.1	261.0	32.9
6096.0	474.9	-19.0	-31.7	264.0	34.7
6400.8	455.8	-21.2	-34.9	263.0	37.2
6705.6	437.3	-23.1	-37.2	264.0	39.3
7010.4	419.4	-25.6	-39.4	265.0	41.5
7315.2	402.2	-28.4	-41.6	265.0	43.0
7620.0	385.3	-30.9	-43.8	263.0	44.5
7924.8	369.1	-33.4	-46.0	262.0	46.0
6229.6	353.5	-35.8	-48.0	261.0	47.9
8534.4	338.2	-38.0	-50.9	257.0	50.3
8839.2	323.5	-40.1	9999.0	254.0	52.4
9144.0	309.4	-42.2	9999.0	252.0	50.9
9448.8	295.8	-44.2	9999.0	253.0	53.6
9753.6	282.6	-46.2	9999.0	257.0	63.4
10058.4	270.0	-47.4	9999.0	260.0	51.8
10363.2	257.8	-49.0	9999.0	262.0	49.1
10668.0	246.1	-51.2	9999.0	260.0	64.7
10972.8	234.6	-53.6	9999.0	259.0	101.8
11277.6	223.7	-56.1	9999.0	260.0	87.5
11582.4	213.3	-58.5	9999.0	260.0	73.5
11887.2	203.3	-61.0	9999.0	259.0	61.9
12192.0	193.8	-56.8	9999.0	258.0	50.0
12496.8	184.7	-57.0	9999.0	255.0	43.3
12801.6	176.1	-56.5	9999.0	250.0	38.7
13106.4	167.9	-58.1	9999.0	245.0	35.1
13411.2	159.9	-59.0	9999.0	250.0	42.1
13716.0	152.4	-59.5	9999.0	253.0	49.4
14020.8	145.2	-59.8	9999.0	256.0	43.9

TABLE 4. EXPLANATION OF COLUMN HEADINGS OF TABULATED SOUNDING DATA FOR THE STS-3 ORBITER DURING ITS DESCENT AND LANDING

HEIGHT (GPM)	Height of corresponding pressure surface in geopotential meters.
PRES (MB)	Pressure in millibars.
TEMP (DG C)	Ambient temperature in degrees Celsius.
DEW PT (DG C)	Dew-point temperature in degrees Celsius.
DIR (DG)	Wind direction measured clockwise from true north and is the direction from which the wind is blowing.
SPEED (M/SEC)	Scalar wind speed in meters per second.

APPENDIX A

DATA

STATION NO.72269
WHITE SANDS MISSILE RANGE
30 MARCH 1982
1437 GMT

HEIGHT GPM	PRES MB	TEMP DG C	DEW PT DG C	DIR DG	SPEED M/SEC
1192.4	860.0	11.0	-2.8	140.0	2.1
1219.2	857.3	11.1	-2.9	144.0	2.1
1524.0	845.7	9.1	-4.0	167.0	4.0
1828.8	814.8	5.9	-5.2	210.0	4.3
2133.6	784.9	2.7	-6.6	241.0	7.6
2438.4	756.1	3.6	-10.7	255.0	25.3
2743.2	728.5	6.5	-16.9	262.0	23.8
3048.0	701.8	4.7	-18.1	263.0	24.1
3352.8	675.9	2.5	-18.7	265.0	23.5
3657.6	650.8	.3	-19.5	270.0	23.8
3962.4	626.4	-2.2	-20.7	271.0	25.6
4267.2	602.8	-4.9	-22.2	272.0	27.7
4572.0	579.9	-7.5	-23.8	270.0	29.6
4876.8	557.6	-9.8	-25.3	265.0	31.7
5181.6	535.9	-12.3	-28.4	261.0	33.5
5486.4	514.9	-14.7	-31.1	259.0	32.6
5791.2	494.6	-16.9	-32.1	261.0	32.9
6096.0	474.9	-19.0	-31.7	264.0	34.7
6400.8	455.8	-21.2	-34.9	263.0	37.2
6705.6	437.3	-23.1	-37.2	264.0	39.3
7010.4	419.4	-25.6	-39.4	265.0	41.5
7315.2	402.2	-28.4	-41.6	265.0	43.0
7620.0	385.3	-30.9	-43.8	263.0	44.5
7924.8	369.1	-33.4	-46.0	262.0	46.0
8229.6	353.5	-35.8	-48.0	261.0	47.9
8534.4	338.2	-38.0	-50.9	257.0	50.3
8839.2	323.5	-40.1	9999.0	254.0	52.4
9144.0	309.4	-42.2	9999.0	252.0	50.9
9448.8	295.8	-44.2	9999.0	253.0	53.6
9753.6	282.6	-46.2	9999.0	257.0	63.4
10058.4	270.0	-47.4	9999.0	260.0	51.8
10363.2	257.8	-49.0	9999.0	262.0	49.1
10668.0	246.1	-51.2	9999.0	260.0	64.7
10972.8	234.6	-53.6	9999.0	259.0	101.8
11277.6	223.7	-56.1	9999.0	260.0	87.5
11582.4	213.3	-58.5	9999.0	260.0	73.5
11887.2	203.3	-61.0	9999.0	259.0	61.9
12192.0	193.8	-56.8	9999.0	258.0	50.0
12496.8	184.7	-57.0	9999.0	255.0	43.3
12801.6	176.1	-56.5	9999.0	250.0	38.7
13106.4	167.9	-58.1	9999.0	245.0	35.1
13411.2	159.9	-59.0	9999.0	250.0	42.1
13716.0	152.4	-59.5	9999.0	253.0	49.4
14020.8	145.2	-59.8	9999.0	256.0	43.9

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STATION NO.72269
WHITE SANDS MISSILE RANGE
30 MARCH 1982
1437 GMT

HEIGHT GPM	PRES MB	TEMP DG C	DEW PT DG C	DIR DG	SPEED M/SEC
19500.0	58.7	-61.5	99.9	272.0	12.9
21300.0	43.7	-59.5	99.9	290.7	5.0
23200.0	32.7	-56.6	99.9	345.0	1.7
25000.0	24.5	-53.4	99.9	54.0	3.7
26800.0	18.4	-50.1	99.9	35.5	2.7
28700.0	13.8	-46.8	99.9	3.6	2.2
30500.0	10.5	-43.5	99.9	324.8	2.8
32300.0	8.0	-40.2	99.9	300.2	5.1
34100.0	6.2	-36.8	99.9	291.5	7.7
36000.0	4.8	-32.8	99.9	284.9	10.3
37800.0	3.7	-28.2	99.9	279.5	12.9
39600.0	2.9	-23.5	99.9	276.0	15.6
41500.0	2.3	-18.8	99.9	272.2	18.0
43300.0	1.8	-14.1	99.9	267.0	20.5
45100.0	1.4	-10.1	99.9	263.7	23.0
46900.0	1.1	-8.5	99.9	262.2	24.8
48800.0	.9	-6.9	99.9	260.9	26.6
50600.0	.7	-6.6	99.9	259.5	28.2
52400.0	.6	-9.0	99.9	257.9	29.5
54300.0	.5	-11.4	99.9	256.4	30.8
56100.0	.4	-15.7	99.9	255.7	32.2
57900.0	.3	-21.1	99.9	255.5	33.6
59700.0	.2	-26.5	99.9	255.3	35.1
61600.0	.2	-31.7	99.9	259.7	36.0
63400.0	.1	-36.9	99.9	264.6	37.1
65200.0	.1	-42.0	99.9	269.0	37.6
67100.0	.1	-46.0	99.9	271.9	32.0
68900.0	.1	-50.4	99.9	276.1	26.5
70700.0	.0	-54.7	99.9	277.8	20.5
72500.0	.0	-58.6	99.9	269.3	13.5
74400.0	.0	-62.6	99.9	245.0	7.3
76200.0	.0	-66.2	99.9	219.5	5.9
78000.0	.0	-69.1	99.9	208.9	5.9
79900.0	.0	-72.0	99.9	196.9	6.2
81700.0	.0	-74.4	99.9	186.8	9.6
83500.0	.0	-76.7	99.9	181.3	13.6
85300.0	.0	-78.9	99.9	182.0	16.1
87200.0	.0	-80.6	99.9	205.0	13.2
89000.0	.0	-82.3	99.9	233.3	13.2
90800.0	.0	-82.8	99.9	247.9	12.6
92700.0	.0	-81.1	99.9	251.9	8.6
94500.0	.0	-79.3	99.9	262.0	4.4
96300.0	.0	-76.3	99.9	268.7	3.1
98100.0	.0	-72.8	99.9	265.4	2.5
100000.0	.0	-69.3	99.9	246.5	1.0

STATION NO.72269
WHITE SANDS MISSILE RANGE
30 MARCH 1982
1437 GMT

HEIGHT GPM	PRES MB	TEMP DG C	DEW PT DG C	DIR DG	SPEED M/SEC
101800.0	.0	-62.2	99.9	254.7	1.9
103600.0	.0	-55.1	99.9	253.4	3.5
105500.0	.0	-46.3	99.9	259.6	5.2
107300.0	.0	-32.4	99.9	249.6	5.3
109100.0	.0	-18.5	99.9	230.5	5.2
110900.0	.0	-1.7	99.9	226.4	4.1
112800.0	.0	17.8	99.9	207.3	5.6
114600.0	.0	37.4	99.9	190.7	8.2
116400.0	.0	59.2	99.9	190.2	5.2
118300.0	.0	82.9	99.9	185.1	6.3
120100.0	.0	107.6	99.9	181.3	7.6
121900.0	.0	133.5	99.9	176.4	9.0

STATION NO.72269
WHITE SANDS MISSLE RANGE
30 MARCH 1982
1627 GMT

HEIGHT gpM	PRES MB	TEMP DG C	DEW PT DG C	DIR DG	SPEED M/SEC
1192.4	881.2	15.0	-3.2	.0	.0
1219.2	878.5	14.3	-3.3	222.0	.3
1524.0	847.2	11.6	-4.4	224.0	4.0
1828.8	816.6	8.9	-5.4	236.0	6.4
2133.6	787.1	6.2	-6.6	243.0	7.9
2438.4	758.1	3.3	-8.0	246	7.9
2743.2	730.2	.3	-9.6	254	8.8
3048.0	703.1	5.7	-16.1	284.	15.8
3352.8	677.2	3.7	-16.8	277.	21.9
3657.6	652.3	1.7	-17.2	276.0	22.6
3962.4	628.0	-.7	-18.6	277.0	22.9
4267.2	604.5	-3.1	-20.1	274.0	24.1
4572.0	581.4	-5.7	-22.6	271.0	25.6
4876.8	559.2	-8.4	-25.1	269.0	27.4
5181.6	537.6	-11.1	-27.1	267.0	29.0
5486.4	516.6	-13.7	-28.5	266.0	30.2
5791.2	496.4	-16.4	-29.9	265.0	31.1
6096.0	476.6	-19.1	-30.9	265.0	32.3
6400.8	457.5	-21.6	-31.5	261.0	33.5
6705.6	438.9	-22.8	-33.8	258.0	35.1
7010.4	421.1	-24.0	-37.8	258.0	35.7
7315.2	403.8	-26.4	-40.7	259.0	37.5
7620.0	387.0	-29.3	-43.3	259.0	39.3
7924.8	370.7	-32.1	-45.7	259.0	43.3
8229.6	355.2	-35.0	-48.2	259.0	46.9
8534.4	340.0	-37.5	-50.3	258.0	50.6
8839.2	325.2	-39.3	-54.5	257.0	54.6
9144.0	311.1	-40.4	9999.0	256.0	57.0
9448.8	297.5	-41.4	9999.0	256.0	59.1
9753.6	284.5	-42.1	9999.0	257.0	60.0
10058.4	271.9	-44.6	9999.0	256.0	61.3
10363.2	259.8	-47.0	9999.0	256.0	62.8
10668.0	248.1	-49.1	9999.0	253.0	64.9
10972.8	236.9	-51.5	9999.0	251.0	67.4
11277.6	225.9	-54.2	9999.0	251.0	69.5
11582.4	215.3	-56.9	9999.0	251.0	69.2
11887.2	205.2	-59.7	9999.0	251.0	63.4
12192.0	195.6	-61.5	9999.0	251.0	57.9
12496.8	186.4	-54.9	9999.0	251.0	52.7
12801.6	177.7	-54.2	9999.0	251.0	47.9
13106.4	169.5	-54.1	9999.0	251.0	43.9
13411.2	161.7	-54.5	9999.0	252.0	40.8
13716.0	154.2	-55.2	9999.0	253.0	37.8
14020.8	147.0	-57.4	9999.0	253.0	35.7

STATION NO.72269
WHITE SANDS MISSLE RANGE
30 MARCH 1982
1627 GMT

HEIGHT GPM	PRES MB	TEMP DG C	DEW PT DG C	DIR DG	SPEED M/SEC
14325.6	140.0	-59.6	9999.0	254.0	34.1
14630.4	133.3	-61.8	9999.0	254.0	32.3
14935.2	127.0	-64.0	9999.0	255.0	32.0
15240.0	120.9	-65.1	9999.0	256.0	33.2
15544.8	115.0	-66.1	9999.0	257.0	34.4
15849.6	109.4	-66.3	9999.0	257.0	36.3
16154.4	104.1	-65.2	9999.0	256.0	39.3
16459.2	99.0	-63.1	9999.0	255.0	42.4
16764.0	94.3	-62.1	9999.0	255.0	38.4
17068.8	89.8	-61.0	9999.0	254.0	32.6
17373.6	85.5	-58.5	9999.0	253.0	27.1
17678.4	81.6	-52.6	9999.0	246.0	24.1
17983.2	77.9	-53.0	9999.0	236.0	21.0
18288.0	74.2	-55.0	9999.0	230.0	16.5
16592.8	70.8	-57.0	9999.0	218.0	8.8
18897.6	67.5	-58.7	9999.0	157.0	3.7
19202.4	64.3	-60.2	9999.0	169.0	2.4
19507.2	61.2	-61.7	9999.0	239.0	3.7
19812.0	58.4	-59.7	9999.0	257.0	6.1
20116.8	55.6	-56.4	9999.0	264.0	5.8
20421.6	53.0	-55.7	9999.0	270.0	6.1
20726.4	50.6	-55.6	9999.0	264.0	5.2
21031.2	48.2	-54.7	9999.0	239.0	4.0
21336.0	46.0	-53.7	9999.0	206.0	4.0
21640.8	43.9	-55.3	9999.0	207.0	4.6
21945.6	41.8	-56.2	9999.0	215.0	5.2
22250.4	39.9	-55.1	9999.0	221.0	5.8
22555.2	38.1	-54.1	9999.0	245.0	4.6
22860.0	36.3	-53.7	9999.0	275.0	4.6
23164.8	34.6	-53.7	9999.0	295.0	5.2
23469.6	33.0	-53.6	9999.0	290.0	4.9
23774.4	31.5	-53.6	9999.0	285.0	4.6
24079.2	30.1	-53.5	9999.0	283.0	3.4
24384.0	28.7	-52.7	9999.0	346.0	.9
24688.8	27.4	-51.8	9999.0	70.0	3.0
24993.6	26.2	-51.0	9999.0	79.0	4.3
25298.4	25.0	-50.1	9999.0	91.0	3.4
25603.2	23.8	-49.8	9999.0	112.0	2.4
25908.0	22.8	-50.0	9999.0	123.0	1.8
26212.8	21.7	-50.3	9999.0	116.0	1.2
26517.6	20.7	-50.5	9999.0	100.0	.6
26822.4	19.8	-50.7	9999.0	76.0	.9
27127.2	18.9	-50.7	9999.0	76.0	1.8
27432.0	18.1	-50.6	9999.0	76.0	2.4
27700.0	16.0	-48.5	99.9	21.0	2.4

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STATION NO.72269
WHITE SANDS MISSLE RANGE
30 MARCH 1982
1627 GMT

HEIGHT GPM	PRES MB	TEMP DG C	DEW PT DG C	DIR DG	SPEED M/SEC
29600.0	12.0	-45.2	99.9	345.7	2.3
31400.0	9.2	-41.8	99.9	308.9	3.9
33200.0	7.1	-38.5	99.9	294.9	6.4
351[illegible]0.0	5.4	-35.1	99.9	288.8	9.0
36900.0	4.2	-30.5	99.9	282.0	11.6
38700.0	3.3	-25.8	99.9	277.6	14.3
40500.0	2.6	-21.2	99.9	273.7	16.9
42400.0	2.0	-16.5	99.9	268.9	19.3
44200.0	1.6	-12.3	99.9	265.2	21.8
46000.0	1.3	-9.3	99.9	262.9	23.9
47900.0	1.0	-7.7	99.9	261.5	25.7
49700.0	.8	-6.1	99.9	260.3	27.5
51500.0	.6	-7.7	99.9	258.7	28.9
53300.0	.5	-10.2	99.9	257.2	30.1
55200.0	.4	-13.0	99.9	255.8	31.4
57000.0	.3	-18.4	99.9	255.6	32.9
58800.0	.2	-23.8	99.9	255.4	34.4
60700.0	.2	-29.1	99.9	257.1	35.6
62500.0	.1	-34.3	99.9	262.2	36.5
64300.0	.1	-39.5	99.9	267.0	37.8
66100.0	.1	-44.0	99.9	270.3	34.8
68000.0	.1	-48.1	99.9	273.8	29.2
69800.0	.1	-52.7	99.9	278.9	23.9
71600.0	.0	-56.7	99.9	274.4	16.9
73500.0	.0	-60.6	99.9	260.8	10.2
75300.0	.0	-64.5	99.9	224.7	5.9
77100.0	.0	-67.7	99.9	214.2	5.9
78900.0	.0	-70.6	99.9	203.8	6.0
80600.0	.0	-73.2	99.9	191.7	7.8
82600.0	.0	-75.6	99.9	183.6	11.6
84400.0	.0	-77.9	99.9	179.6	15.6
86300.0	.0	-79.7	99.9	192.4	14.4
88100.0	.0	-81.5	99.9	219.2	12.8
89900.0	.0	-83.2	99.9	245.9	14.4
91700.0	.0	-81.9	99.9	249.5	10.6
93600.0	.0	-80.2	99.9	255.5	6.5
95400.0	.0	-78.1	99.9	269.3	3.2
97200.0	.0	-74.5	99.9	267.2	2.9
99100.0	.0	-70.9	99.9	260.2	1.9
100900.0	.0	-65.6	99.9	254.5	1.4
102700.0	.0	-58.3	99.9	252.8	2.7
104500.0	.0	-51.1	99.9	251.8	4.9
106400.0	.0	-38.5	99.9	254.3	5.6
108200.0	.0	-24.3	99.9	241.0	5.7
110000.0	.0	-9.9	99.9	236.4	4.4

STATION NO.72269
WHITE SANDS MISSILE RANGE
30 MARCH 1982
1627 GMT

HEIGHT GPM	PRES MB	TEMP DG C	DEW PT DG C	DIR DG	SPEED M/SEC
111900.0	.0	10.1	99.9	220.3	5.6
113700.0	.0	30.1	99.9	204.2	7.7
115500.0	.0	50.6	99.9	204.9	5.8
117300.0	.0	74.3	99.9	200.3	6.9
119200.0	.0	99.2	99.9	196.7	8.2
121000.0	.0	125.0	99.9	194.0	9.7

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APPROVAL

ATMOSPHERIC OBSERVATIONS FOR STS-3 LANDING

By Robert E. Turner, James E. Arnold, Gregory S. Wilson, and Wade Batts

The information in this report has been reviewed for technical content. Review of any information concerning Department of Defense or nuclear energy activities or programs has been made by the MSFC Security Classification Officer. This report, in its entirety, has been determined to be unclassified.

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