TERMINAL FORECAST REFERENCE FILE

for McGuire AFB, New Jersey

20 October 71

prepared by:

Base Weather Branch, 15th Weather Squadron

PREFACE

Weather information for planning purposes generally falls into four categories: Climatic Data; Long-range Forecasts; Extended Outlooks; Short-range Forecasts. The information presented here is climatic data and should be applied in the same manner as other forms of statistical information.

If and when you have need for climatic assistance, it is particularly important that you exercise caution when interpreting the following statistics. In order to insure that all related factors are considered, it is strongly recommended that a meteorologist be consulted when applying these data. More detailed information for McGuire is on file in the weather station. These data together with our consultant services are available upon request.

Unless otherwise specified, the following statistical data is based on 20 years of record: August 1942 through March 1946, and August 1948 through December 1964.

BLANK PAGE

TERMINAL FORECAST REFERENCE FILE

TABLE OF CONTENTS

SECTION 1

LOCATION AND TOPOGRAPHY

A. GEOGRAPHICAL LOCATION

B. AIR POLLUTION

C. REPRESENTATIVE OBSERVATION SITE

D. MAPS

LOCATION AND TOPOGRAPHY

A. Geographic Location

McGuire Air Force Base is situated at 40° 00' N and 74° 36' W at an elevation of 133 feet above sea level. The station is 16 miles south-southeast of Trenton, New Jersey; 30 miles east-northeast of Philadelphia, Pa.; and 15 miles west of Lakehurst, New Jersey.

The ground coverage in the immediate area consists of approximately 40% open fields and 60% wooded country. The land areas are relatively flat within 25 miles of the station. Beyond 25 miles the terrain becomes rolling to the southwest through north with a marked upslope beyond 75 miles to the west through northwest approaching the Appalachian chain. There is a marked downslope effect at McGuire as the air masses move over the mountains from southwest through north.

The Atlantic Ocean lies 30 miles east of the station. The Delaware Bay, 60 miles to the south-southwest, and the Chesapeake Bay beyond are the only major water bodies affecting McGuire's local weather. Occassionally in the tropical air of summer, with a flat pressure gradient, a mild sea breeze will reach the station. Generally, this breeze will be from the southeast. It is probable that the ocean increases the velocity of cold northwest winds in winter.

B. Air Pollution

The major air pollution sources are the industrial areas of Trenton, Camden-Philadelphia, and Newark-New York City. Smoke pollution from these areas affect the visibilities at McGuire when the wind trajectory is from the NE or NNE for the Newark-New York City areas; WSW and WNW for the Camden-Philadelphia areas; and NNE for the Trenton area.

Visibility restrictions due to smoke pollution during periods of calm or light surface winds, originate primarily from the coal-fed base central heating plant and occur to the greatest extent during the plant's maximum utilization, i. e., the winter months.

There have been relatively few instances where smoke alone lowered visibilities at McGuire below one mile (overall average of 0. 5% of the total observations with smoke).

TABLE I

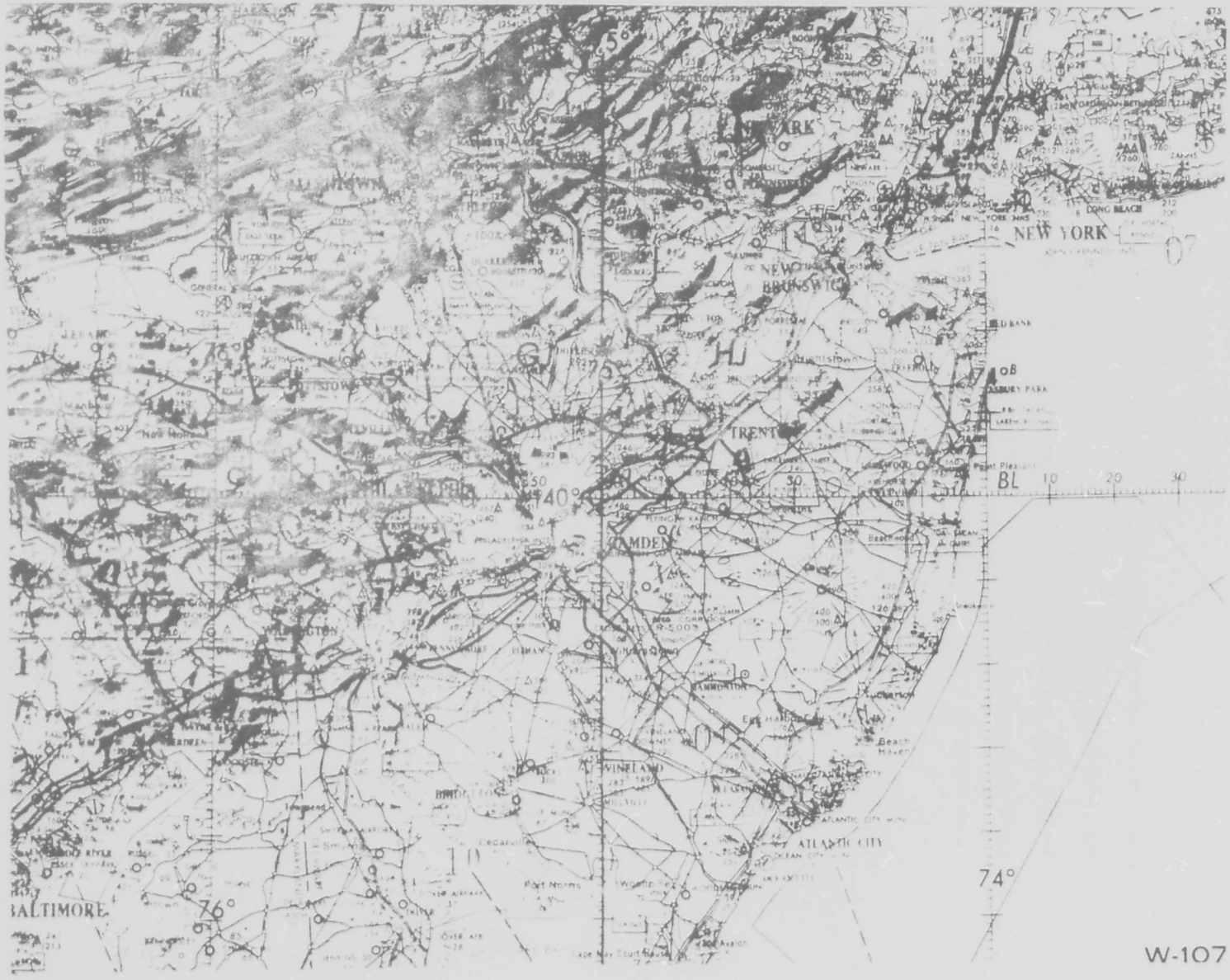
The relation of wind and visibility when smoke is the only restriction to visibility. Period of record: July 1942 - March 1946 and August 1948 - 1962.

SURFACE WIND DIRECTION	TOTAL OBS WITH SMOKE	% OF VSBY LESS THAN 1 MILE	% OF VSBY 1 - 2 1/2 MILES	% OF VSBY 3 - 6 MILES
Calm	2050	1. 4	16. 0	82. 7
N	645	0. 8	10. 5	88. 7
NNE	460	1. 1	15. 4	83. 5
NE	375	0. 5	16. 3	83. 2
ENE	356	0	9. 3	90. 7
E	327	0. 3	6. 4	93. 3
ESE	269	0. 4	7. 4	92. 2
SE	233	0. 1	9. 0	90. 6
SSE	245	0	5. 7	94. 3
S	441	0	6. 3	93. 7
SSW	711	0	4. 2	95. 8
SW	1298	0. 4	7. 9	91. 7
WSW	1359	0. 3	13. 3	86. 4
W	1103	0. 4	10. 0	89. 6
WNW	1129	0. 3	10. 0	89. 7
NW	683	0. 4	8. 6	90. 9
NNW	571	0. 2	8. 6	91. 2

C. Instrumentation:

McGuire AFB was the second base in the USAF to have complete dual weather instrumentation installed. The weather observations taken at McGuire are recorded in a Representative Observation Site (Bldg. 16-17) which is located 1 1/2 miles southwest of the Base Weather Station (Bldg. 17-31). The weather instrumentation at each end of runway 24-06 provides measurements of wind speed and direction, visibility, and the height of low clouds (below 3,800 feet). In addition a temperature-humidity device located northwest of runway 24-06 provides a continual measurement of free air temperature and dewpoint. This hygrothermometer has been modified so as to give accurate readings even during periods of heavy precipitation. A mercurial barometer, an aneroid barometer, and a microbarograph are also located in the ROS. Visibility readings are taken visually from the ROS using check points and reference markers. These check points, up to 3 miles from the ROS, provide excellent coverage except to the southwest where few reference points are available due to the proximity of a wooded area on the Fort Dix military reservation. The control tower personnel also take limited visual observations particularly in reference to visibility and special weather phenomena. When the visibility is below one mile, the transmissometer and runway visual range computer (measuring in feet) is used for the primary measurement of runway visibility.

All recorders and indicators are located in the ROS with the exception of the CPS-9 Weather Radar and the TPQ-11 Radar Cloud Detecting Set which are located in the Base Weather Station. Additional wind indicators are located in RAPCON and the control tower. The switch selector for the wind equipment is located in the control tower while the switch selectors



W-107

for the ceilometers and transmissometers are located in the ROS.

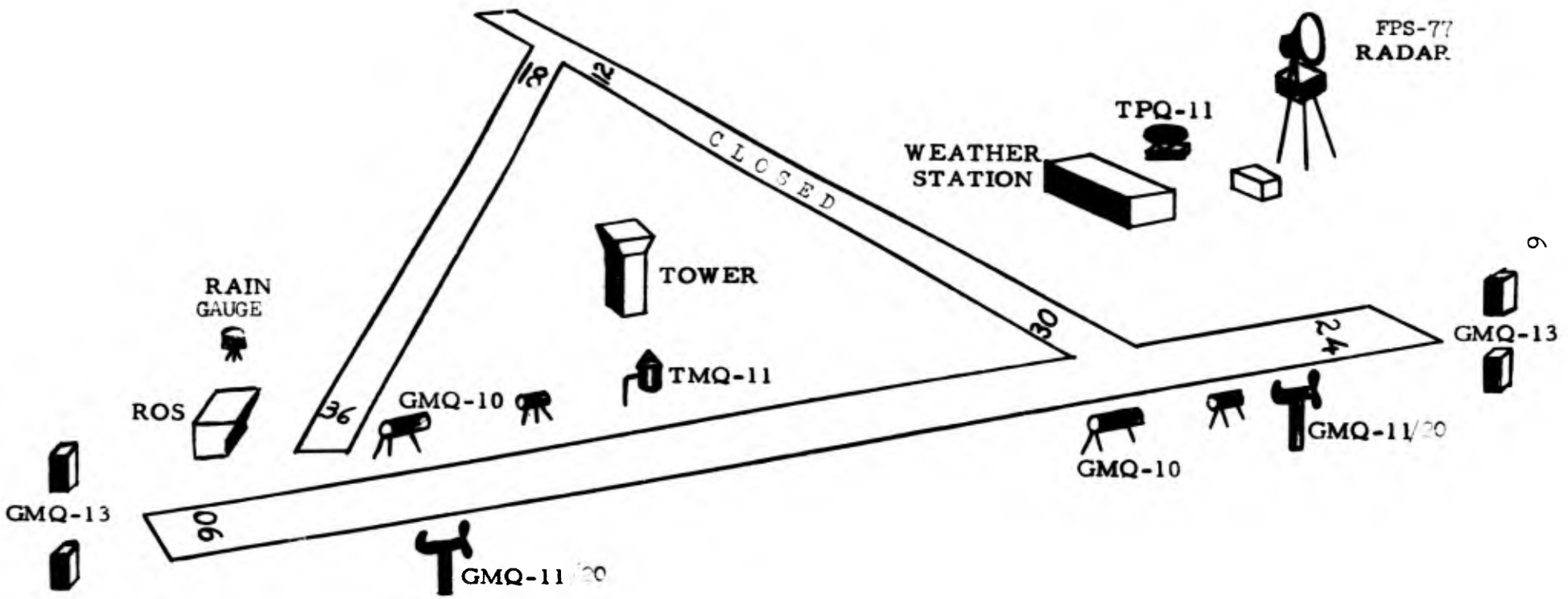
The location of the various instruments are listed below and shown by illustration in figure 1.

INSTRUMENT	SENSOR LOCATIONS
Rotating Beam Ceilometer (AN/GMQ-13A)	3
Detector (Runway 06)	3930 feet from end of runway 06 on centerline.
Projector (Runway 06)	400 feet NW of detector
Detector (Runway 24)	2500 feet from end of runway 24 on centerline.
Projector (Runway 24)	400 feet S of detector.
Transmissometer (AN/GMQ-10) and RVR Computer (FMN-1)	
Detector (Runway 06)	1000 feet from end of runway 06 and 500 feet from centerline
Projector (Runway 06)	500 feet NE of detector.
Detector (Runway 24)	1000 feet from end of runway 24 and 550 feet from centerline.
Projector (Runway 24)	500 feet NE of detector.
Wind Equipment (AN/GMQ-11/20	
Runway 06	500 feet SE of end of runway.
Runway 24	500 feet S of centerline and 1000 feet from approach end of 24.
Hygrothermometer (AN/TMQ-11)	2650 feet from end of runway 06 and 1200 feet NW of centerline.
Barometers	
Mercurial, Aneroid, Microbarograph	In ROS.
Radar Storm Detector (FPS-77)	
70 foot Tower	638 feet N of weather station.
Console	Base Weather Station
Rain Gauge (ML-17, 8" type)	51 feet N of ROS.
Radar Cloud Detecting Set (TPQ-11)	

INSTRUMENT	SENSOR LOCATION
Transmitter - Receiver	75 feet E of weather station
Readout	Base Weather Station

Figure 1

WEATHER INSTRUMENTATION



SECTION II

WEATHER CONTROLS

A. GENERAL CLIMATOLOGY

B. AIR MASSES

C. FRONTAL SYSTEMS

A. General Climatology

The winter weather at McGuire can be explained by the migratory cyclones and polar anticyclones that traverse the east coast. With the prevailing off shore flow the mean winter temperatures are quite low (compared with the extreme Western or Southeastern U. S.).

Throughout the summer, high temperatures predominate; however, there are periodic invasions of cool air, either from Hudson's Bay or the Atlantic Ocean.

There is no pronounced maximum or minimum precipitation. Winter precipitation can be attributed to cyclonic activity; the heaviest falls occur with low pressure systems that develop in the south and subsequently follow a northeasterly path. Eastward moving cyclones from the Alberta region contribute to McGuire's precipitation. In summer the rainfall is mainly a result of convective showers and thunderstorms although cyclonic activity still occurs. Occasional hurricanes affect the McGuire area in late summer and early fall.

In the most symplified analysis, there are but two major weather systems controlling the weather at McGuire: the continental polar high pressure from Canada which prevails during the winter in contrast to the maritime tropical high pressure centered near Bermuda which dominates in summer. The interaction, migration, or dominance of these two cells in the final analysis determines the daily weather conditions at McGuire. Typical synoptic types and the associated weather are illustrated in Section IV (Special Synoptic Studies).

E. Air Masses

Maritime tropical air is first found on the surface in March for one or two days. The frequency gradually increases to seven to nine days per month during mid-summer and early fall, and then gradually decreases to one day per month by December.

Maritime Polar air appears eight to twelve days per month throughout the year with a slight decrease in frequency from September to February.

Continental Polar air or some modified form of it appears over the station for the remainder of the time and is therefore the dominant air mass at McGuire.

Frontal systems approaching from the northwest with northwesterly winds aloft, give little bad weather. Field conditions will usually remain VFR except for brief periods during the frontal passage. But, systems approaching from the southwest with southwest winds aloft, give instrument to closed conditions. This is due not only to the relative dryness of the approaching air masses approaching from the west, but also to the protective mountain range extending northeast to southwest through Pennsylvania and northern New Jersey. Any air mass approaching this station from a direction between north-northwest and west-southwest will experience adiabatic heating by a descent of 2,000 to 3,000 feet, a feature that greatly influences the weather on the coastal plain. The lake effect, causing cloudiness and precipitation to the lee side of the Great Lakes southeastward into Pennsylvania is absent at this station.

McGuire has the typical Middle Atlantic Coastal Plain type climate, receiving the largest part of its bad weather in maritime air masses coming

from the Atlantic to the east or from the Gulf of Mexico. The maximum frequency of low ceiling below 1,000 feet occurs in January, 14.4% of the time. February and May follow with 14.0% and 12.4% respectively. The best ceilings are in June, July, August, October, and November when ceilings are 1,000 feet and above 90% of the time. January also has the highest percentage of low visibilities being below 3 miles 16.8% of the time. The best visibilities are in April, June, July, October, and November when visibilities are above 3 miles 87-89% of the time.

C. Frontal Systems

From Table I below it can be seen that cold fronts are the most common type of front passing this station in all seasons. It is also significant that the total number of frontal passages is greatly reduced in summer. For example, there are 17 passages in February and only 7 in August.

TABLE I

FREQUENCY OF FRONTAL PASSAGES BY MONTH

(Source: Historical Weather Maps, 5 year period.)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
COLD	4.0	5.7	5.4	3.7	5.8	5.2	5.7	4.8	3.6	5.2	5.9	5.5
WARM	2.4	4.3	5.0	2.0	2.8	2.3	2.5	1.8	3.0	1.8	4.7	2.8
OCCLUDED	2.7	2.0	1.3	1.7	0.2	0.8	0.2	2.3	1.3	2.3	2.1	1.8

Frontal systems move much faster in the winter than in summer; therefore, the air masses change more frequently in the winter than in summer. Although the frontal systems move more slowly in the summer, the periods

of bad weather associated with them are usually shorter than during other seasons.

The Allegheny Mountains to the west and northwest provide the only important topographical effect on climate and weather at this station. In the winter, spring, and fall this effect is most pronounced. Air masses moving across the mountains from the west to the east are considerably warmed in the lower levels. Precipitation from cold fronts or continental polar air masses west of the mountains seldom reach this station except as very light showers or squalls. Occasionally, a cold front moving slowly across the mountains will intensify on the lee side with a south to southwest gradient wind ahead of the front causing precipitation and low ceilings for an hour or two. Normally, the gradient wind east of the mountains ahead of a cold front will veer to the west or northwest before the front arrives. Because of the general low pressure area to the northeast during the greater part of the winter, the winds are largely from the west or northwest, more so than to the west of the mountains. With such winds, very little precipitation occurs and practically no low ceilings or visibilities except with an occasional squall associated with the passage of an active cold front. In summer, cold fronts act much like those of in the winter. One exception is the occasional line of thunderstorms which precede or accompany the frontal system, yielding heavy precipitation, usually in scattered areas. Tropical air masses with thunderstorms seldom extend this far east with a west-southwest to northwest gradient wind.

In all seasons, though more often in the colder months, cold fronts are usually preceded by more preceipitation than is in the front itself, unless there is a wave developing along the front to the west or southwest. The actual frontal passage will be dry with only scattered to broken clouds pre-

sent followed by clearing within 1 to 2 hours after the passage.

Cold fronts in winter, spring, and fall associated with a deep low south of Hudson Bay and north of the Mohawk Valley are invariably very dry with strong, gusty surface winds following the passage. The cold air behind these fronts is generally very unstable and turbulent because of the high winds blowing across the mountains from the Great Lakes. During the day, with the added influence of heating, a strato-cumulus layer develops which may give light showers or squalls. Wind shifts are very gradual with the passage of fast moving cold fronts.

SECTION III

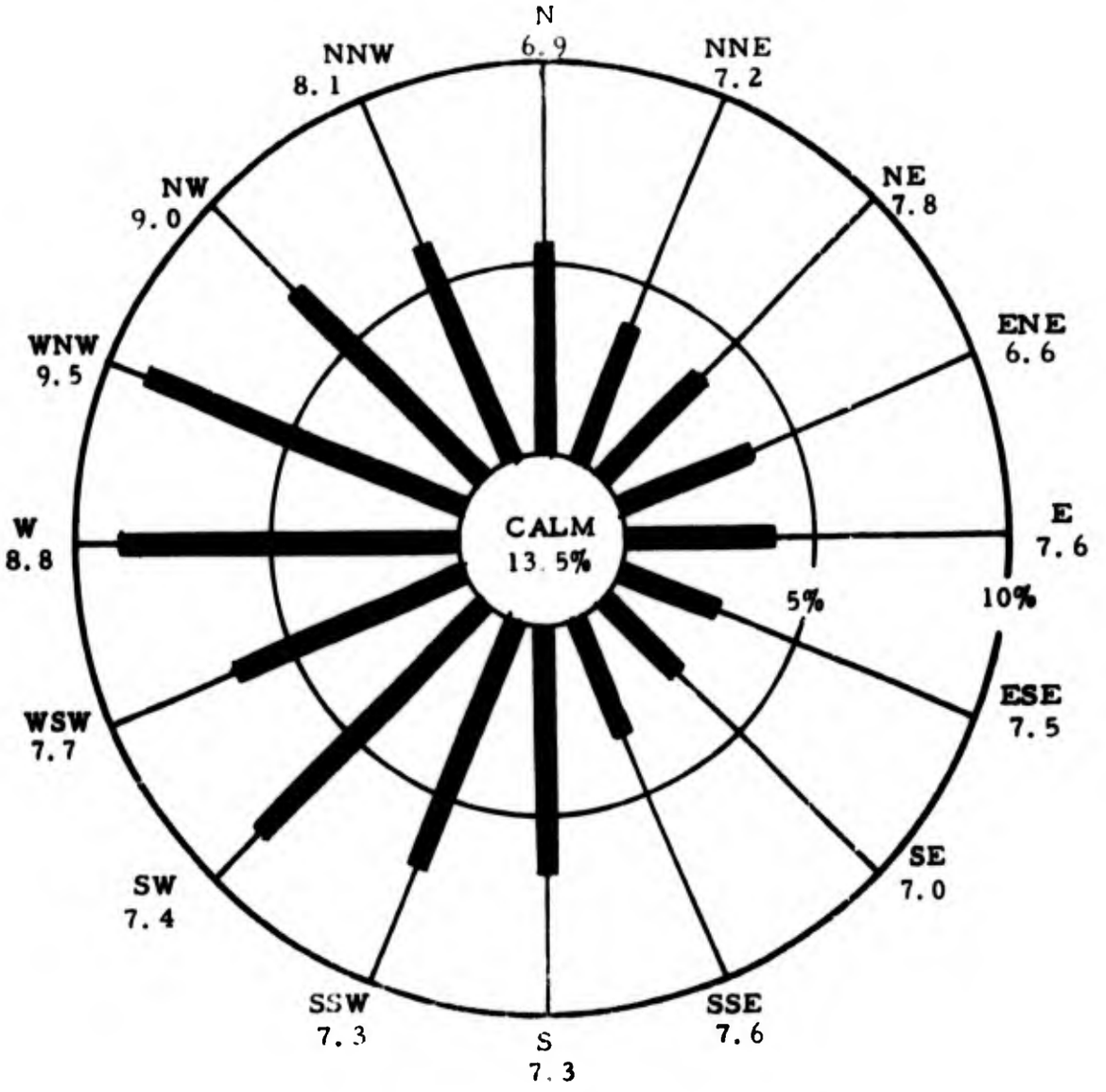
CLIMATIC AIDS

A. Climatological Summaries and Climatic Graphs

1. Annual
2. Winter
3. Spring
4. Summer
5. Fall

ANNUAL
WIND ROSE

(% Frequency of Occurrence)



Mean Hourly Speed: 6.9 knots

Prevailing Direction: W-WNW

NOTE: Average wind speed in knots for each direction is given next to each wind direction

CLIMATIC SUMMARY

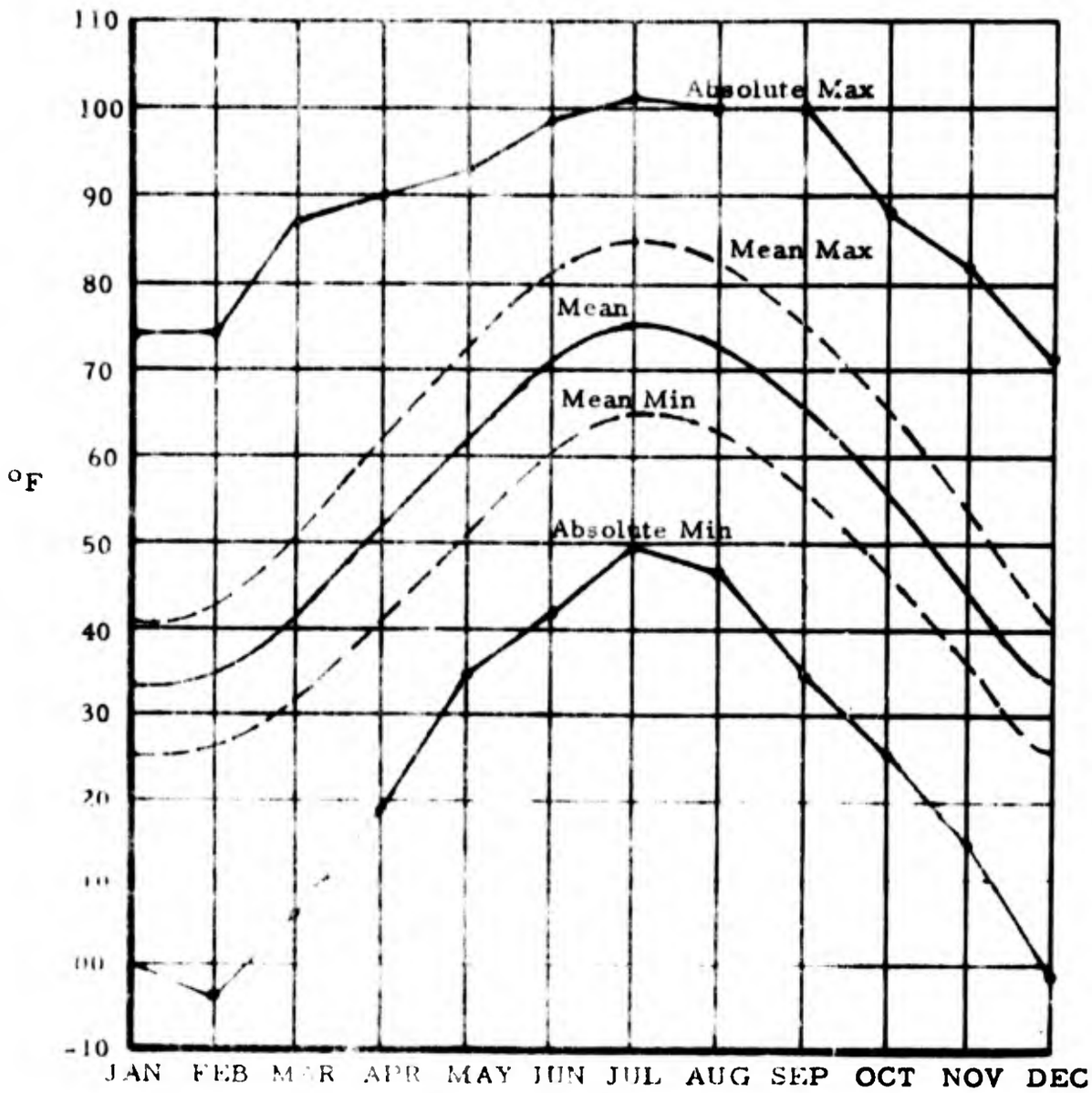
McGuire AFB, New Jersey Field Location: 40° - 00' N, 74° - 36' W Field Elevation: 133 Feet

ITEM	ANNUAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TEMPERATURE (°F)													
Mean Daily	53.2	32.6	34.1	40.8	51.1	61.2	70.5	74.8	72.7	66.0	55.9	45.4	34.0
Mean Daily Maximum	62.3	40.2	42.1	49.9	61.4	71.9	81.0	84.8	82.5	75.8	66.1	54.1	41.4
Mean Daily Minimum	43.9	24.9	26.1	32.1	41.4	50.7	60.3	65.4	63.7	56.7	46.7	36.5	26.1
Extreme Maximum	101	74	74	87	90	93	99	101	100	100	88	82	71
Extreme Minimum	-4	0	-4	6	19	35	42	50	47	35	26	15	-1
Mean Number of Days													
Maximum equal or greater 90°F	17.2	0	0	0	0.6	4.7	4.6	8.4	4.4	1.2	0	0	0
Maximum equal or greater 80°F	83.2	0	0	2.5	2.1	6.6	18.5	24.8	21.2	10.5	2.4	2.1	0
Minimum equal or less 32°F	95	23.2	20.2	14.1	3.1	0	0	0	0	0	8.1	8.9	21.7
Minimum equal or less 0°F	4.4	1.6	1.1	0.1	0	0	0	0	0	0	0	0	1.2
PRECIPITATION (Inches)													
Mean Monthly Rainfall	42.09	2.85	2.86	3.99	3.67	2.87	2.92	4.53	4.66	3.42	3.11	3.56	3.66
Maximum Monthly Rainfall		5.85	5.73	6.02	6.54	5.04	5.22	10.16	10.72	9.35	6.47	6.99	12.41
Maximum Rainfall in 24 hours		1.94	2.41	2.29	2.59	1.59	2.24	4.15	3.58	4.18	3.21	2.59	6.74
Mean Monthly Snowfall	20.30	5.5	4.5	5.1	0.20	T	0	0	0	0	0.10	0.80	4.2
Maximum Monthly Snowfall		18.4	18.6	26.8	2.4	T	0	0	0	0	1.0	6.7	13.1
Maximum Snowfall in 24 hours		8.9	9.7	20.1	1.2	T	0	0	0	0	1.0	6.7	6.7
Mean number of days with measureable:													
Rainfall	116	10.8	9.7	11.7	11.0	11.0	9.4	9.3	8.7	7.8	7.4	9.3	9.9
Snowfall	11.3	3.1	2.9	2.4	0.2	0	0	0	0	0	0.1	0.27	2.3
SURFACE WINDS (Knots)													
Mean Hourly Speed	6.9	7.9	8.2	8.6	8.4	6.6	6.1	5.4	5.2	5.8	6.4	7.0	7.4
Maximum Recorded Speed (Gusts)	87	49	48	54	50	42	71	43	87	56	42	73	51
Prevailing Direction	W-WNW	WNW	WNW	WNW	W	SW	SW	SW	SW	SW	SW	WNW	W
Hours/month with greater that 20 knot crosswind on runway 06-24		5.8	4.5	5.6	4.6	0.6	0.25	0	0.15	1.15	0.67	2.3	3.4
	ANNUAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

CLIMATIC SUMMARY (Con't)

ITEM	ANNUAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
WEATHER CONDITIONS - % Frequency of Occurrence													
Rain and/or Drizzle	9.7	9.3	10.3	12.2	14.1	10.5	7.7	7.0	7.4	8.4	8.9	10.7	10.1
Freezing Rain and/or Drizzle	0.1	0.7	0.5	0.2	0	0	0	0	0	0	0	0	0.2
Snow and/or Sleet	1.5	4.5	4.8	3.9	0.6	0	0	0	0	0	0.1	0.9	3.7
Mean # of days with Thunderstorms	0.5	0	0	0.1	0.4	0.8	1.3	1.5	1.2	0.4	0.2	0	0
FLYING CONDITIONS - % Frequency of Occurrence													
VISIBILITY (miles)													
0 - 1/4	1.5	2.4	1.9	1.1	1.1	1.4	1.1	1.1	1.4	1.3	1.7	1.6	1.8
1/4 - 1/2	0.7	0.9	1.0	0.9	0.4	0.7	0.7	0.5	0.6	0.5	0.6	0.5	1.1
1/2 - 1	2.0	3.0	2.8	4.6	1.2	1.9	1.5	1.5	2.5	1.9	1.5	1.8	2.8
1 - 2	4.0	5.0	5.3	4.1	3.9	3.3	3.1	3.4	3.7	4.0	3.6	3.8	4.7
2 - 3	5.1	5.5	5.3	4.7	4.4	3.8	5.1	5.1	6.5	5.3	5.3	4.7	5.4
3 - 5	11.0	10.7	9.1	9.0	9.0	8.3	11.1	12.8	15.0	12.3	11.2	10.3	11.8
Above 5	75.7	72.5	74.6	77.6	80.0	80.6	77.3	75.6	71.5	74.7	76.1	76.8	72.3
CEILING HEIGHT - (feet)													
0 - 100	1.0	1.8	1.3	0.8	0.8	0.9	0.6	0.9	0.9	1.0	1.1	1.0	1.2
100 - 200	0.8	1.2	0.9	0.8	0.6	1.3	1.0	0.5	0.6	0.5	0.4	0.5	1.1
200 - 500	3.7	5.1	5.8	5.0	4.3	4.7	2.8	3.1	2.6	3.7	2.4	2.7	4.8
500 - 1,000	5.4	6.3	6.0	6.7	6.8	5.5	4.6	4.4	4.7	5.4	5.0	4.7	5.2
1,000 - 3,000	8.8	9.4	8.1	8.2	8.2	7.9	7.8	8.5	9.0	9.9	9.1	9.8	8.6
Above 3,000	80.3	77.4	78.8	78.5	79.3	79.7	83.2	83.1	82.2	79.5	82.0	81.8	79.1
CEILING and VISIBILITY													
Cig less 3000 ft a/o Vis less 3 mi	24.0	26.7	25.0	23.8	22.9	22.7	21.8	22.1	24.3	25.3	23.9	23.7	25.5
Cig less 1000 ft a/o Vis less 2 mi	15.6	16.4	16.1	15.0	13.8	13.8	11.4	9.3	12.0	13.4	12.3	12.4	17.5
Cig less 500 ft a/o Vis less 1 mi	6.9	8.0	8.9	7.8	6.3	7.6	5.6	5.1	5.4	6.5	5.5	5.9	8.9
Cig less 100 ft a/o Vis less 1/4 mi	1.6	1.5	2.0	1.2	1.1	1.5	1.3	1.3	1.5	1.5	1.8	1.7	2.2
SKY CONDITION													
Clear	23.2	24.5	24.9	25.8	20.3	18.0	18.0	16.1	19.8	25.9	31.6	26.0	26.5
Scattered	21.4	16.9	17.4	18.2	19.8	21.8	27.1	27.2	26.6	23.2	21.1	20.2	18.0
Broken	19.7	14.7	14.9	16.1	19.7	22.3	24.6	26.8	25.3	21.0	17.7	18.6	15.6
Overcast	35.7	43.9	42.8	39.9	40.2	37.9	30.3	29.9	28.3	29.9	29.6	35.2	39.9
	ANNUAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

ANNUAL TEMPERATURES (°F)

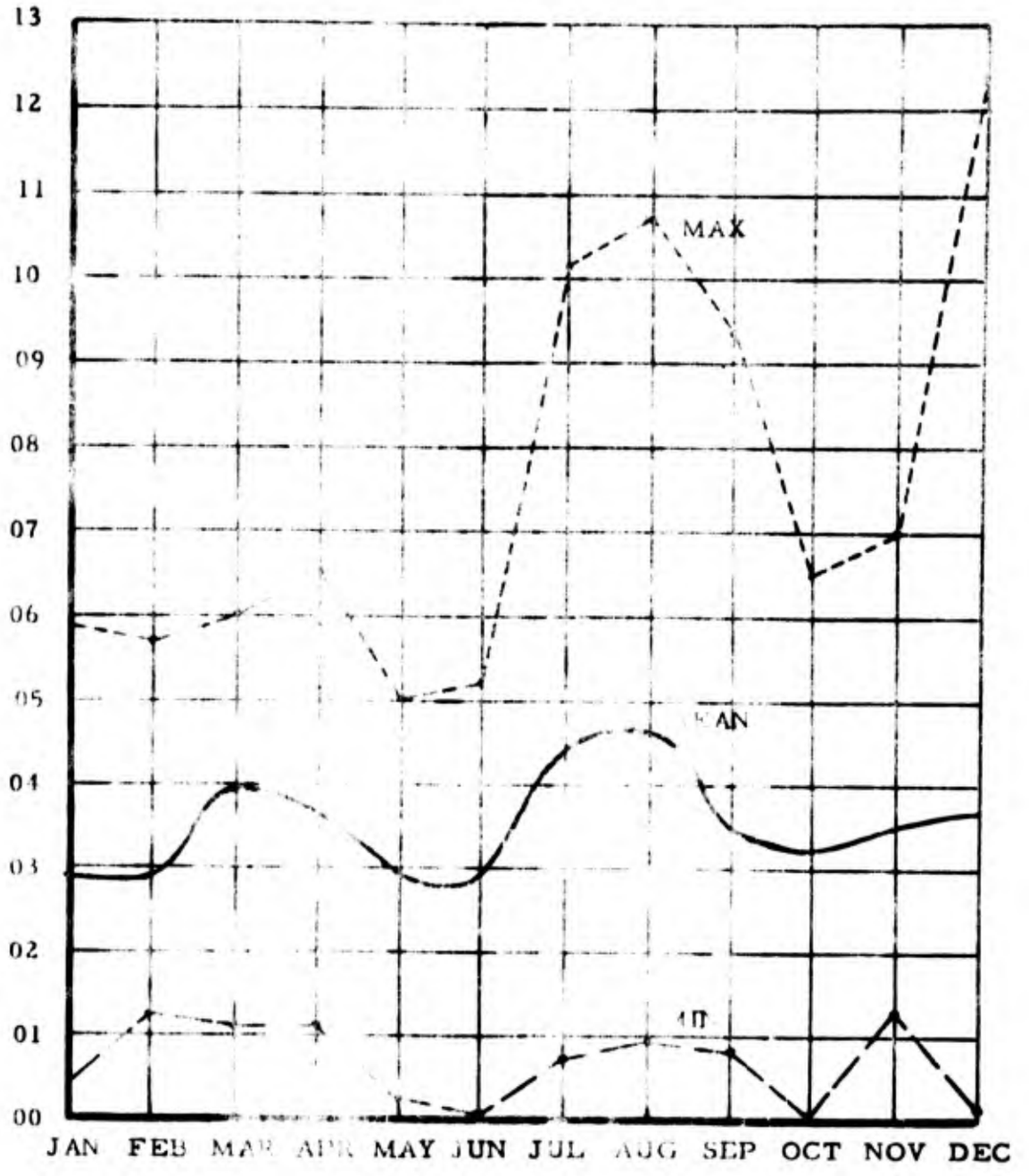


Mean Annual Temperature: 53.2°F

Extreme Maximum Temperature: 101°F (July 1966)

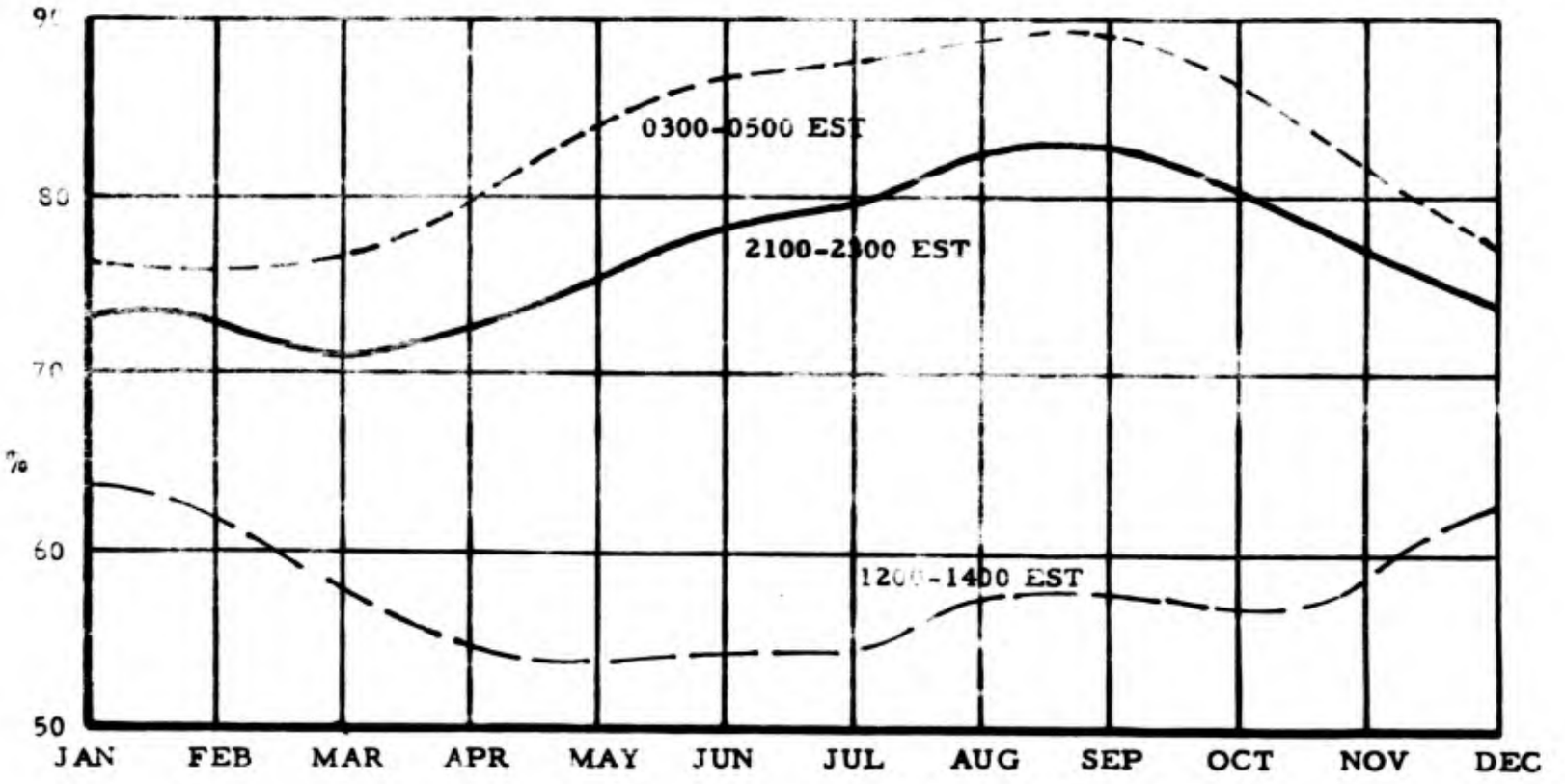
Extreme Minimum Temperature: -4°F (February 1961)

ANNUAL PRECIPITATION
(in Inches)



Mean Annual Precipitation: [illegible] Inches

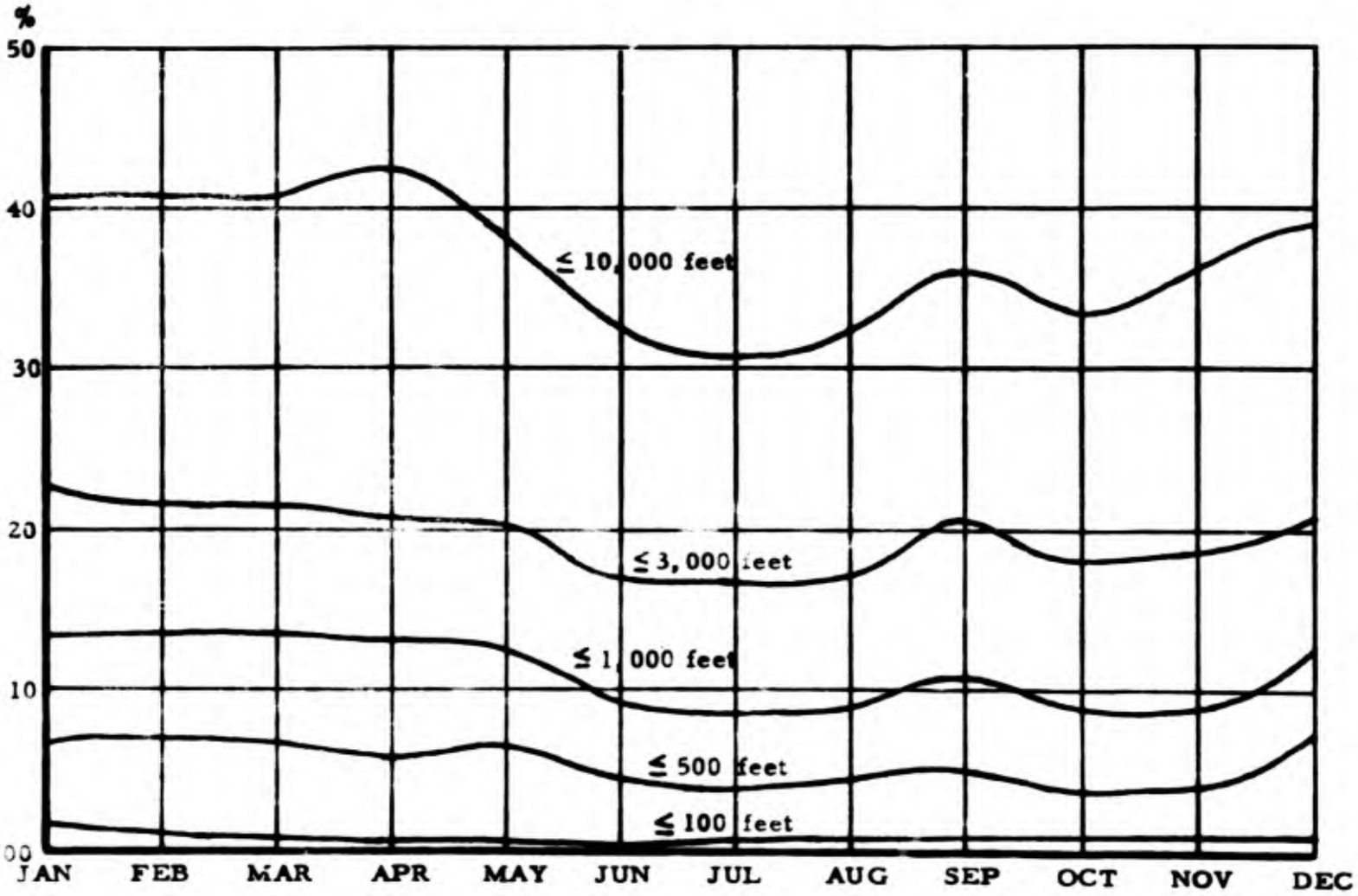
MEAN MONTHLY RELATIVE HUMIDITY (%)
(For Specified Hours, as Indicated)



Mean Annual Relative Humidity: 71.3%

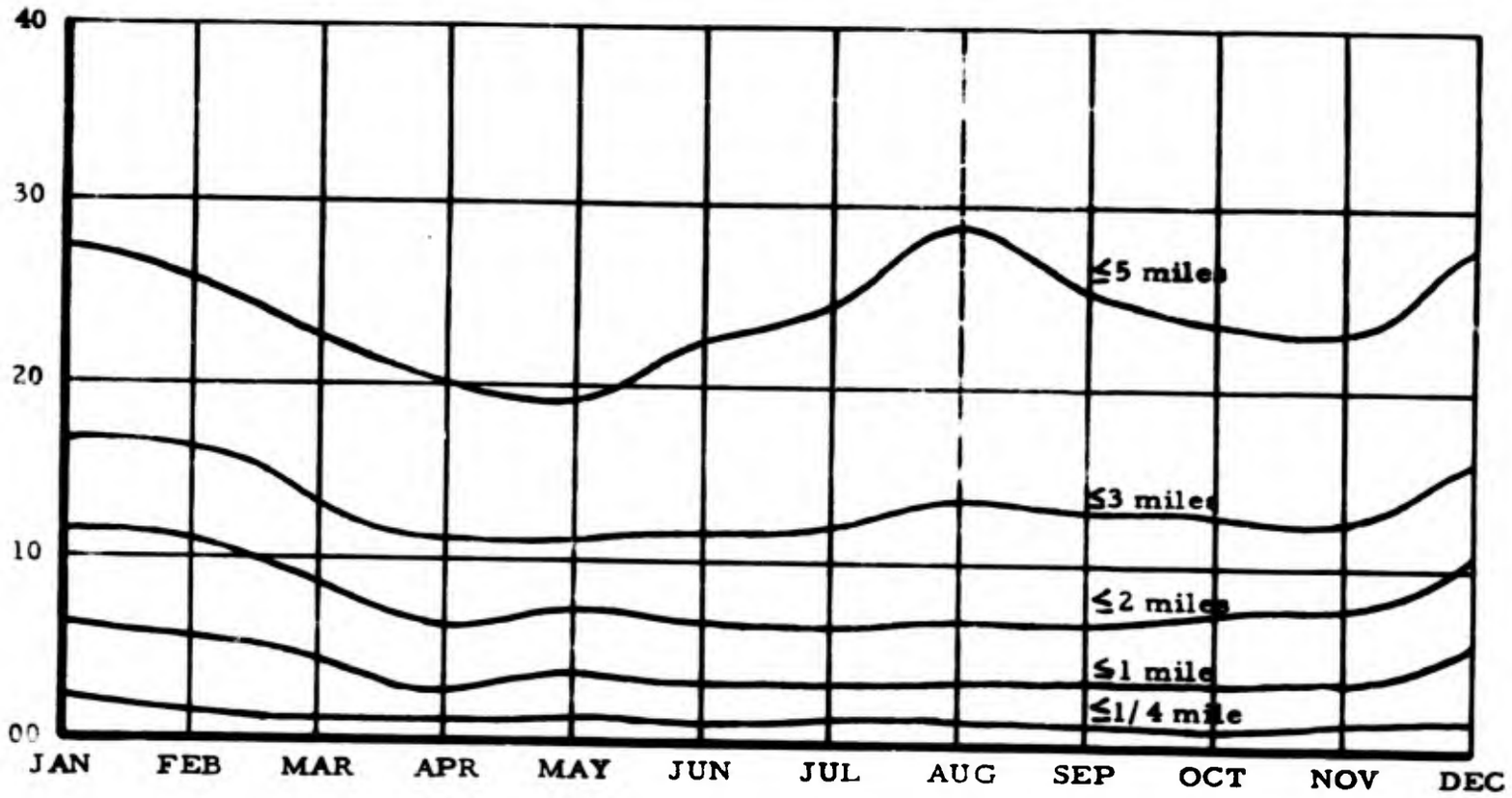
CEILINGS

(% Frequency of Occurrence, by Month, for Ceiling Height Indicated)

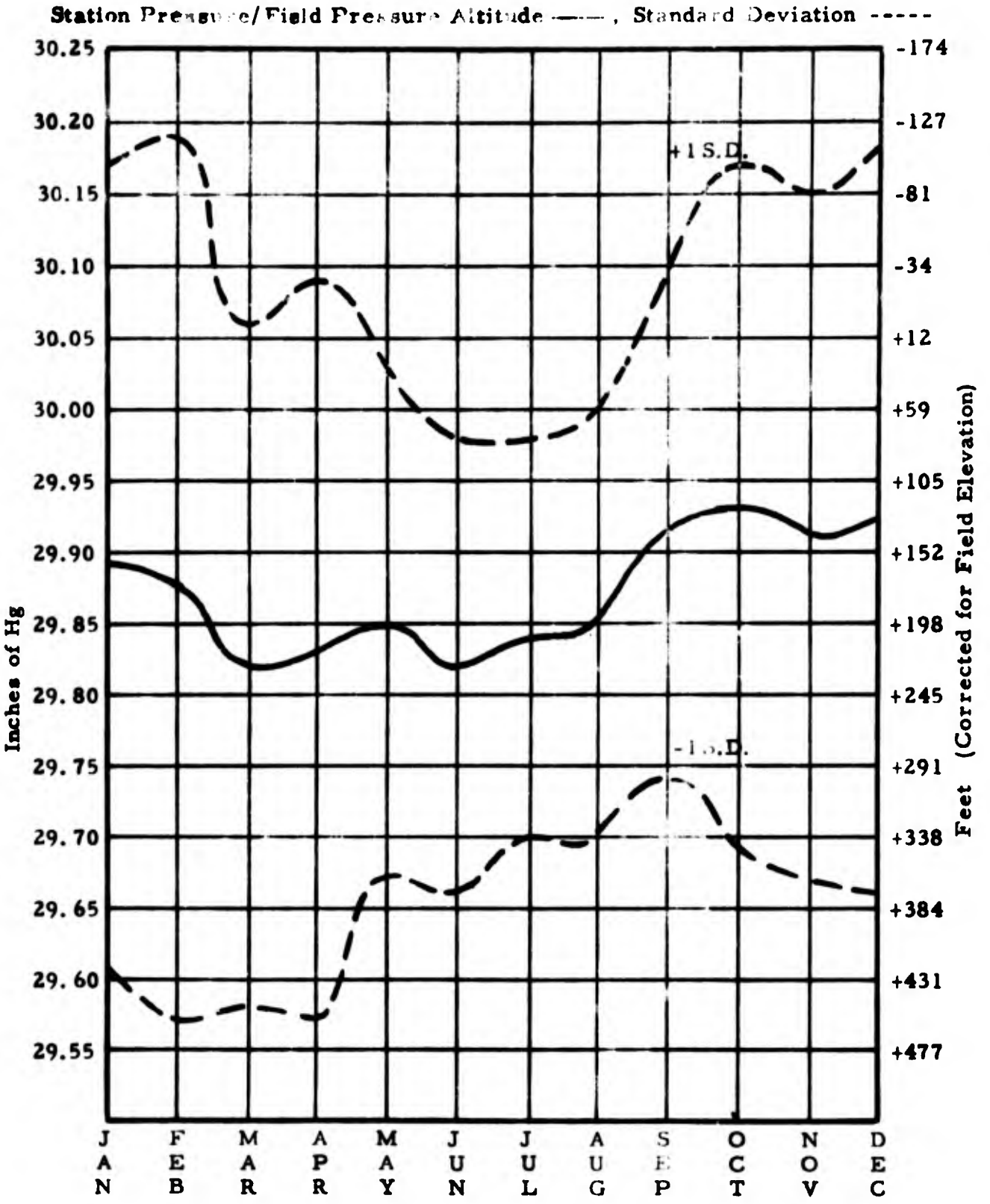


VISIBILITY

(% Frequency of Occurrence, by Month, for Visibility Catagory Indicated)



MEAN MONTHLY STATION PRESSURE (Inches of Hg) AND FIELD PRESSURE ALTITUDE (Feet) AND STANDARD DEVIATION



WINTER CLIMATE AND FLYING CONDITIONS

DECEMBER, JANUARY, FEBRUARY

GENERAL: In winter the McGuire area is no longer dominated by the mild Bermuda High Pressure System which persists during the summer and most of the fall. Now we find that the principal air masses are the continental and maritime polar which follow cold fronts passing the station every 5 or 6 days. Significantly, rain remains the principal precipitation type due, in part, to the proximity of the Atlantic Ocean and its modifying effects. Because of this, one of our major forecasting problems is the determination of snow versus rain. It is not unusual to have ten inches of snow fall on Philadelphia while only one or two inches of snow mixed with rain fall on McGuire from the same storm. Since we are nearly always on the snow-rain dividing line, freezing rain and/or sleet is a very real hazard throughout the winter months. Low ceilings and visibilities will result mainly from stratus and fog, especially near dawn, and fog burn off will be slow due to a lack of intense solar heating. Also, visibilities in falling snow will go below one mile on most occasions.

PRECIPITATION: Precipitation is rather evenly distributed during the winter months with a slight maximum occurring in December. Although snow is a definite hazard, rain is the principal precipitation type averaging 3.12 inches per month and occurring 9-12 days per month. Measureable snowfall occurs 8 days during the three month period for a seasonal total of 14.2 inches.

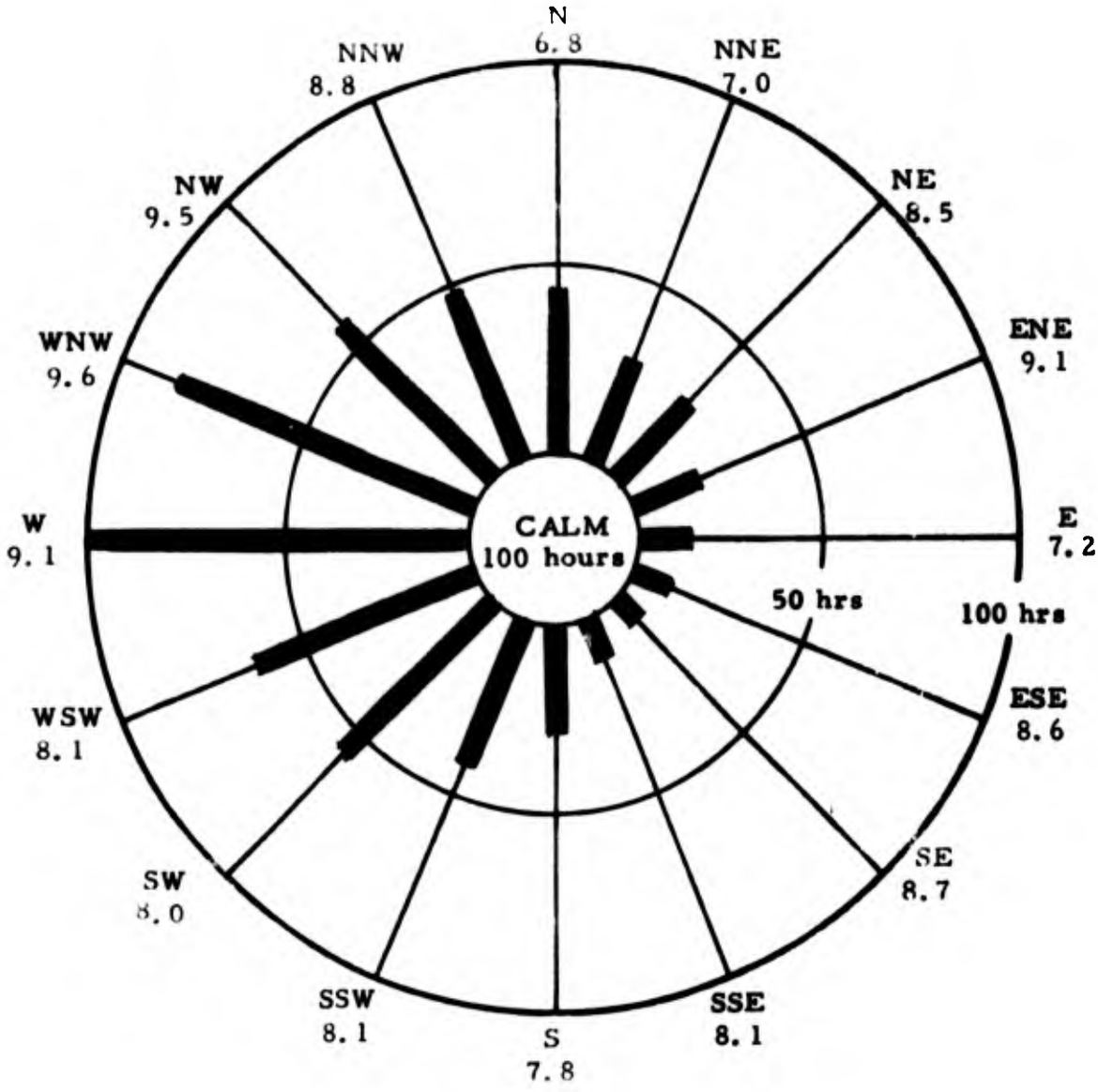
TEMPERATURES: On the average it can be expected that the minimum

temperature will drop to or below freezing two-thirds of the time. The lowest temperature on record was -4°F and this occurred in February of 1961.

FLYING CONDITIONS: Fog is by far the most prevalent and persistent cause of low visibilities at east coast bases. At McGuire, approximately 80% of the visibilities less than one mile are due to some form of fog. Advection fogs, borne by easterly or southeasterly winds, and radiation fog, forming at night under clear skies, yield the poorest visibilities near dawn and are the most common fogs at McGuire. Since surface heating is at a minimum during the winter months, below minimum conditions originating in the evening may not lift until mid-morning. The most hazardous weather conditions are generated by low pressure systems moving up the coast. These systems usually originate in the south-central or southeastern U. S. and intensify as they move northeastward along the coast. The heaviest snowfalls and lowest ceilings and visibilities are associated with these systems. Below field minimum conditions (100 feet and/or 1/4 mile) reach a maximum during the winter months averaging 16 hours per month. Surface winds, now predominately out of the west-northwest, are stronger during the winter months and velocities of 20 knots or greater can be expected approximately 25 hours per month.

Detailed statistics for the months noted above begin on the next page.

DECEMBER
WIND ROSE



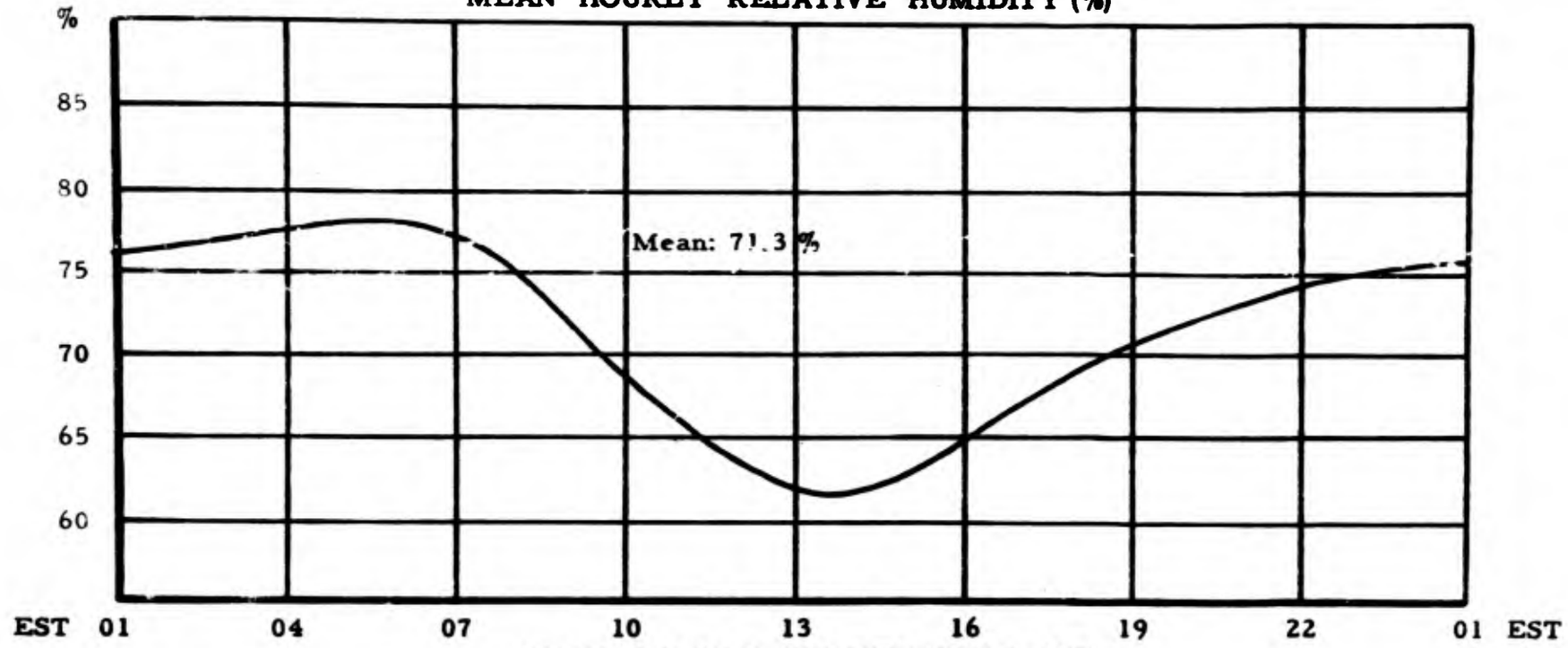
Mean Hourly Speed: 7.4 knots

Prevailing Direction: W

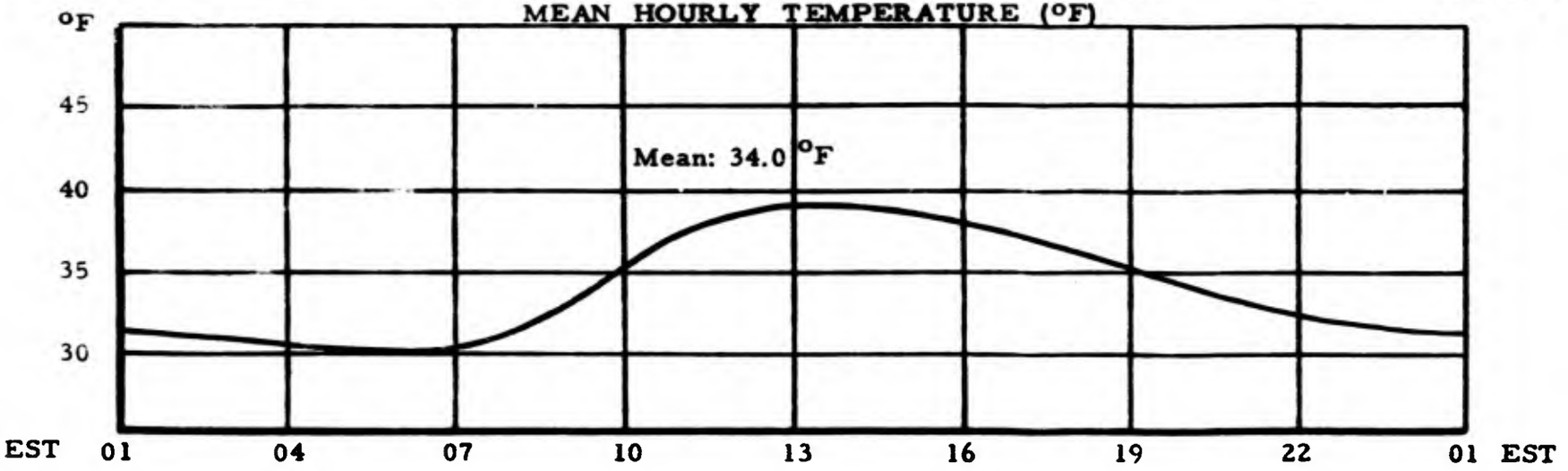
NOTE: Average wind speed in knots for each direction is given next to each wind direction

DECEMBER

MEAN HOURLY RELATIVE HUMIDITY (%)

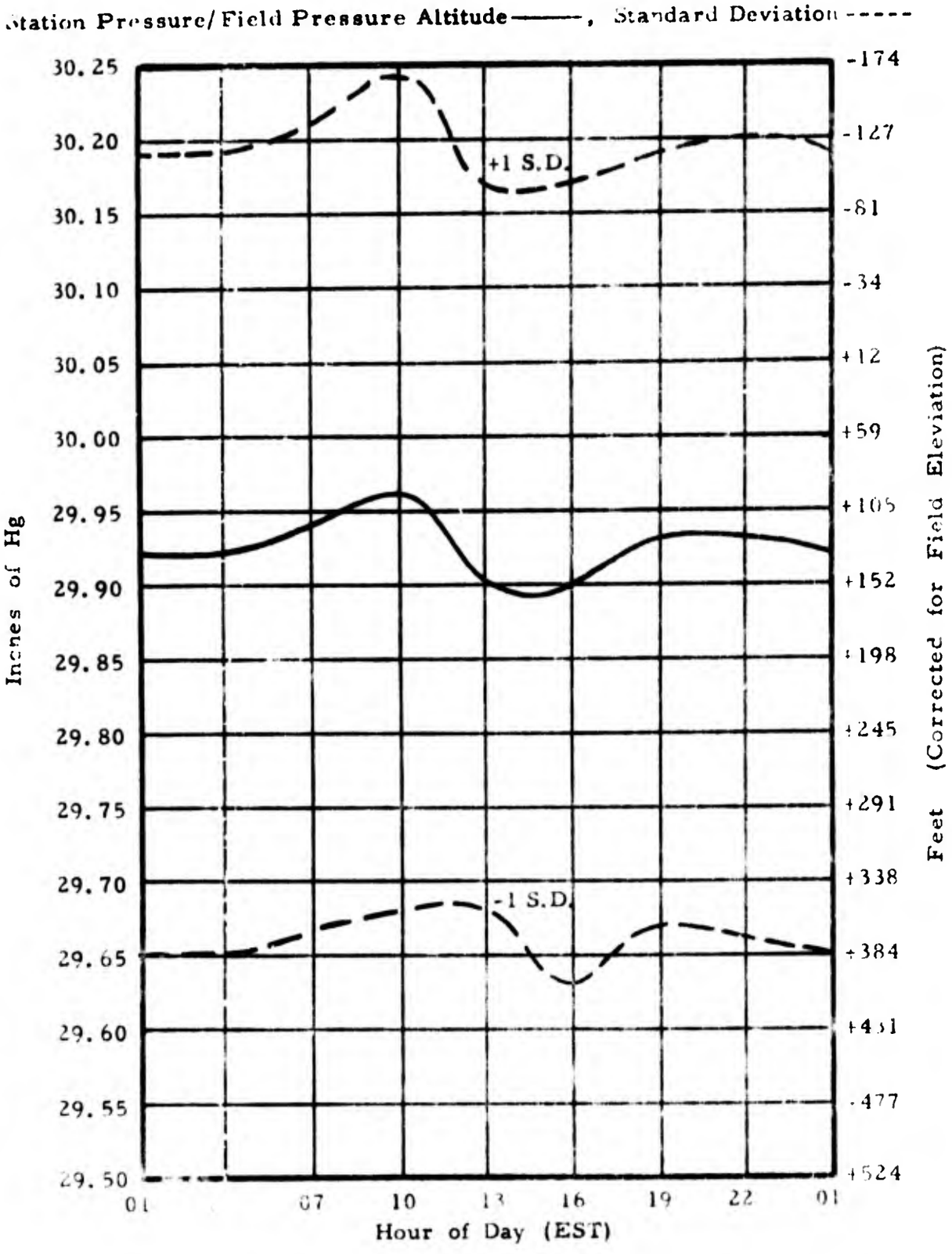


MEAN HOURLY TEMPERATURE (°F)

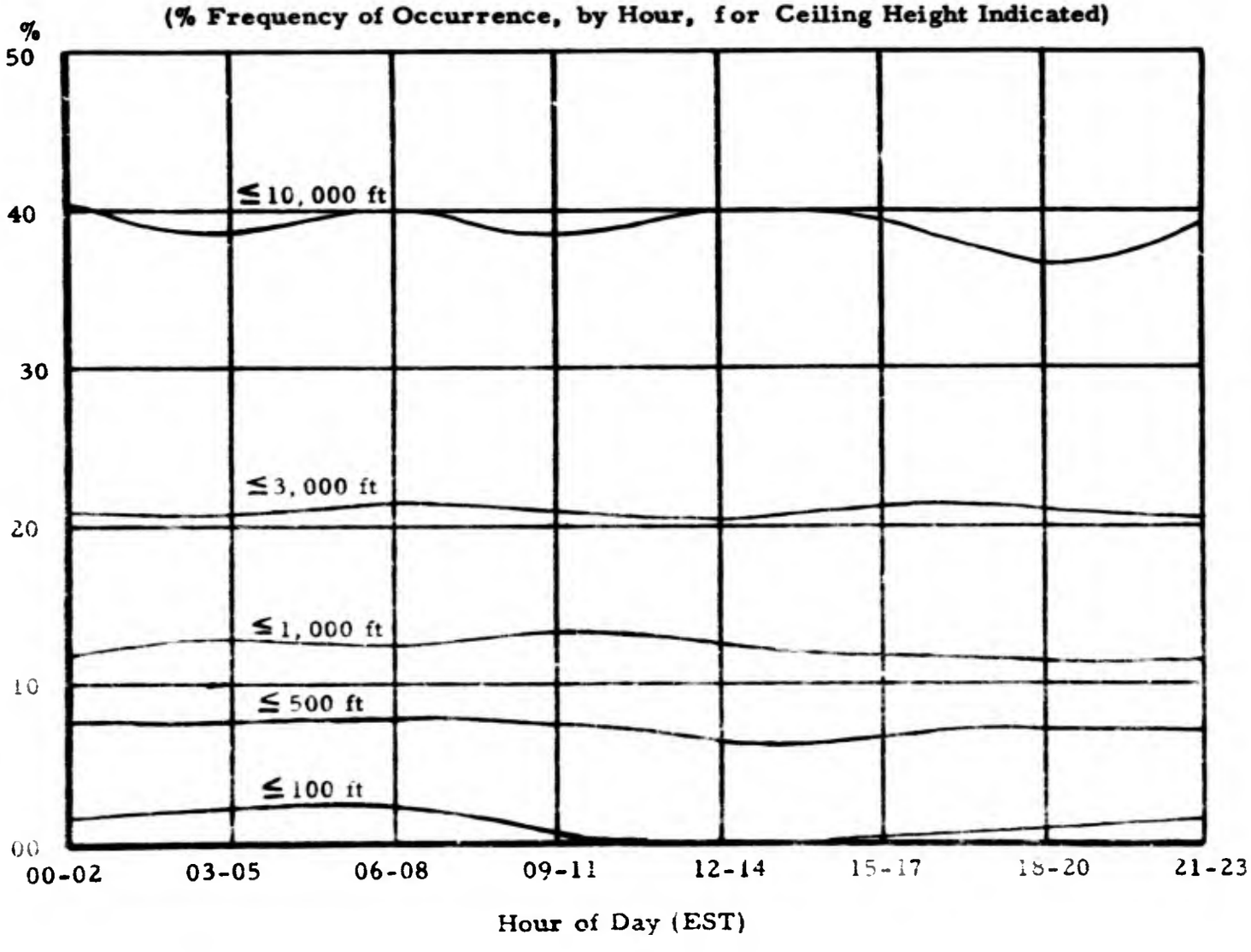


DECEMBER

MEAN HOURLY STATION PRESSURE (Inches of Hg) / FIELD PRESSURE ALTITUDE (Feet) AND STANDARD DEVIATION

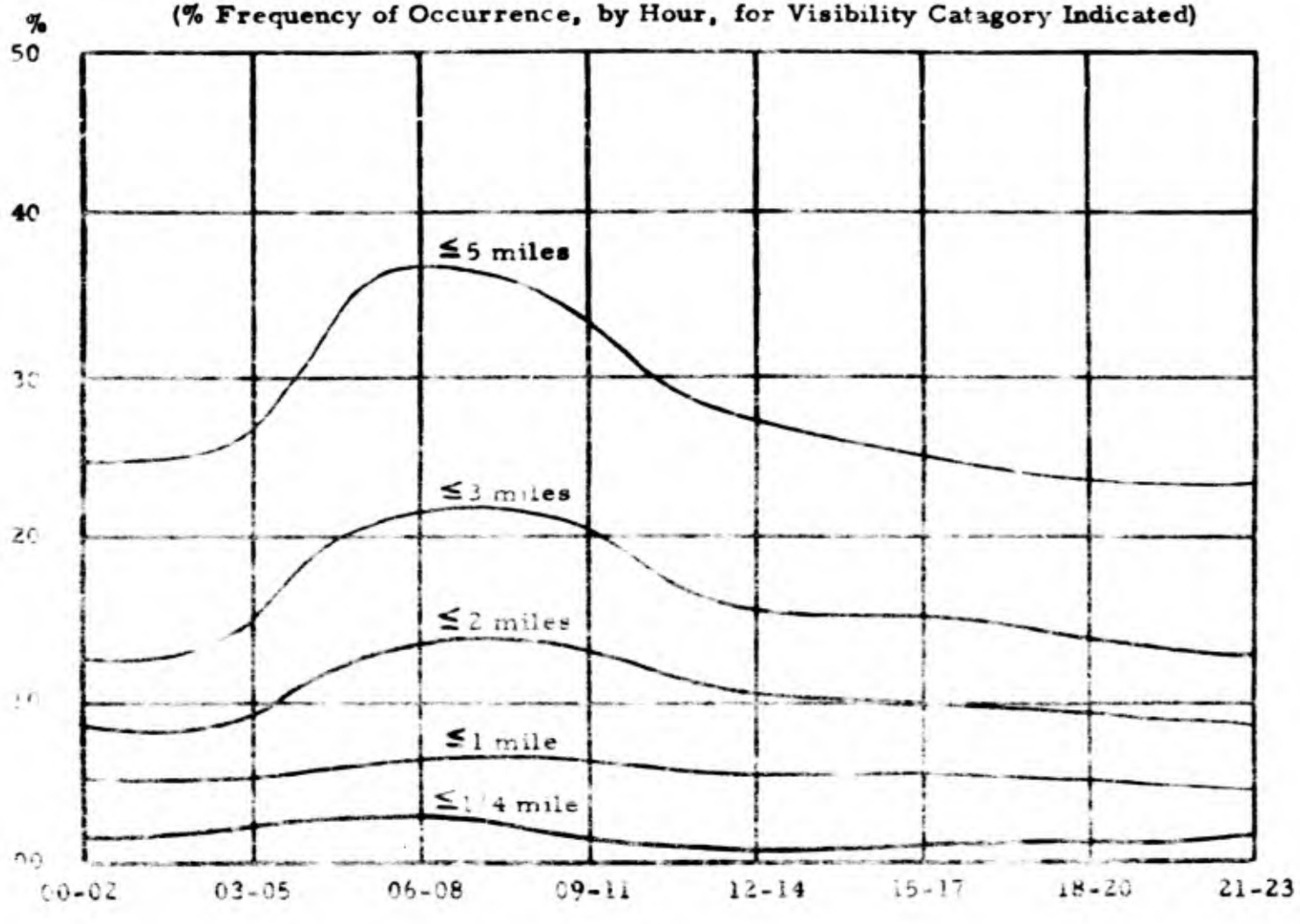


DECEMBER
CEILINGS

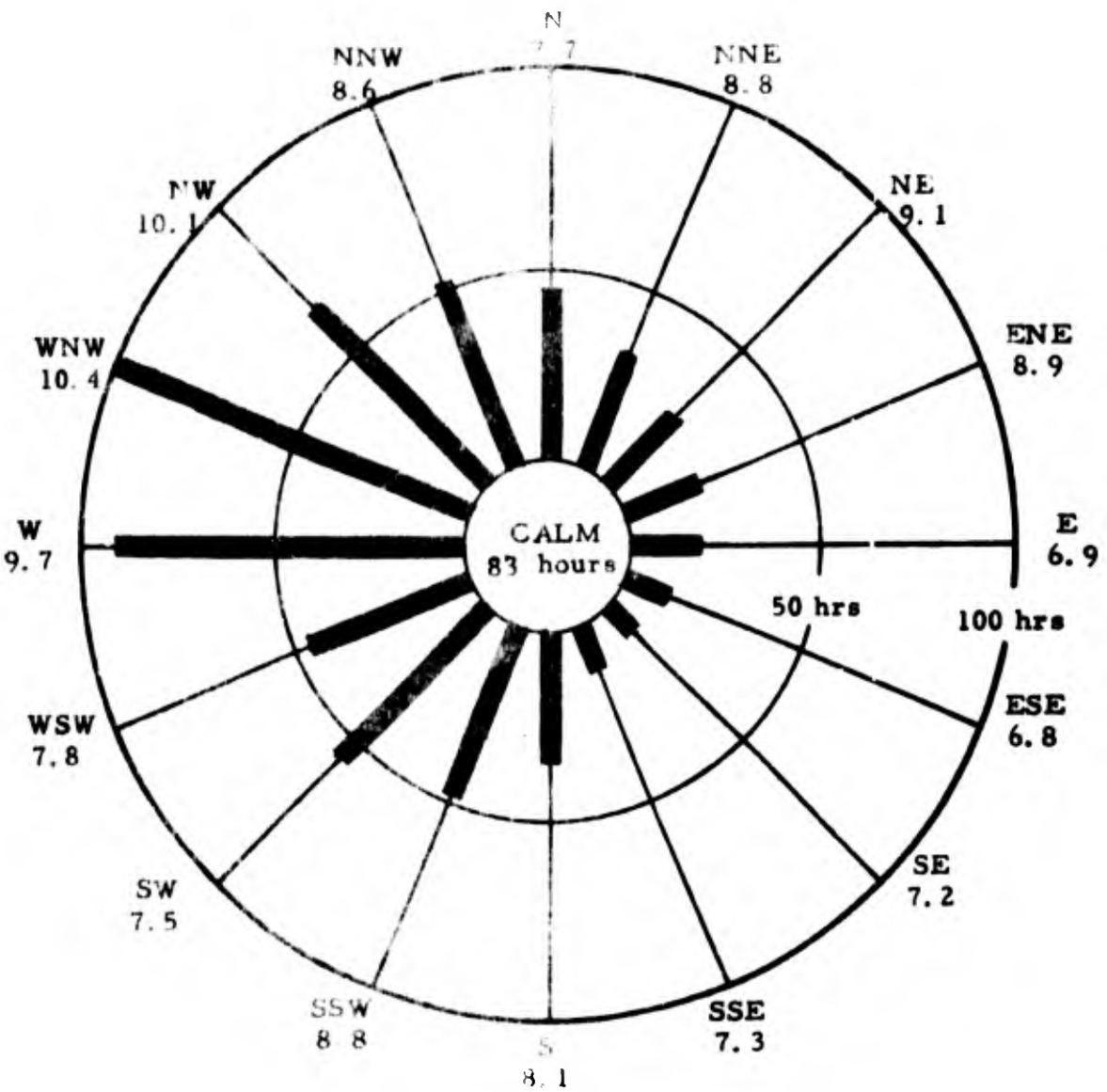


DECEMBER
VISIBILITY

(% Frequency of Occurrence, by Hour, for Visibility Catagory Indicated)



JANUARY
WIND ROSE



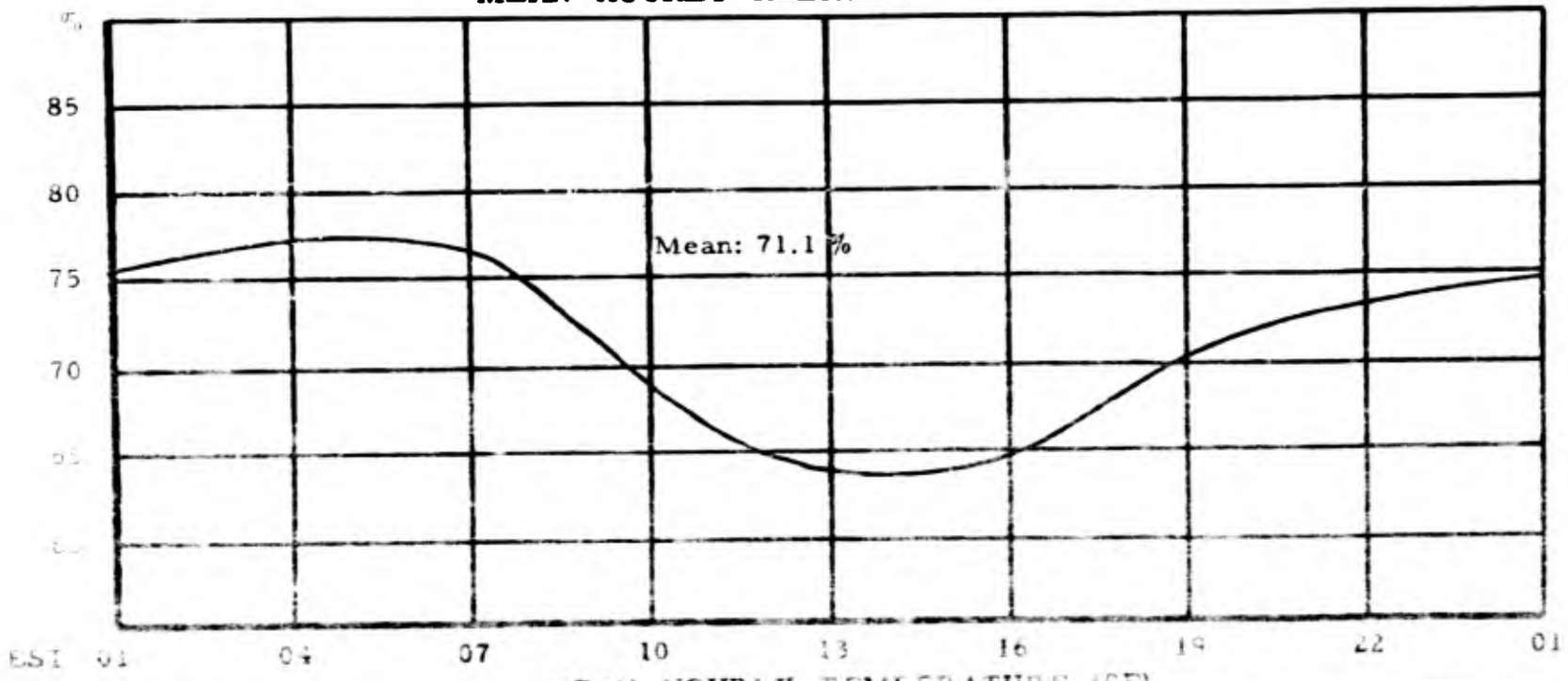
Mean Hourly Speed: 7.9 knots

Prevailing Direction: WNW

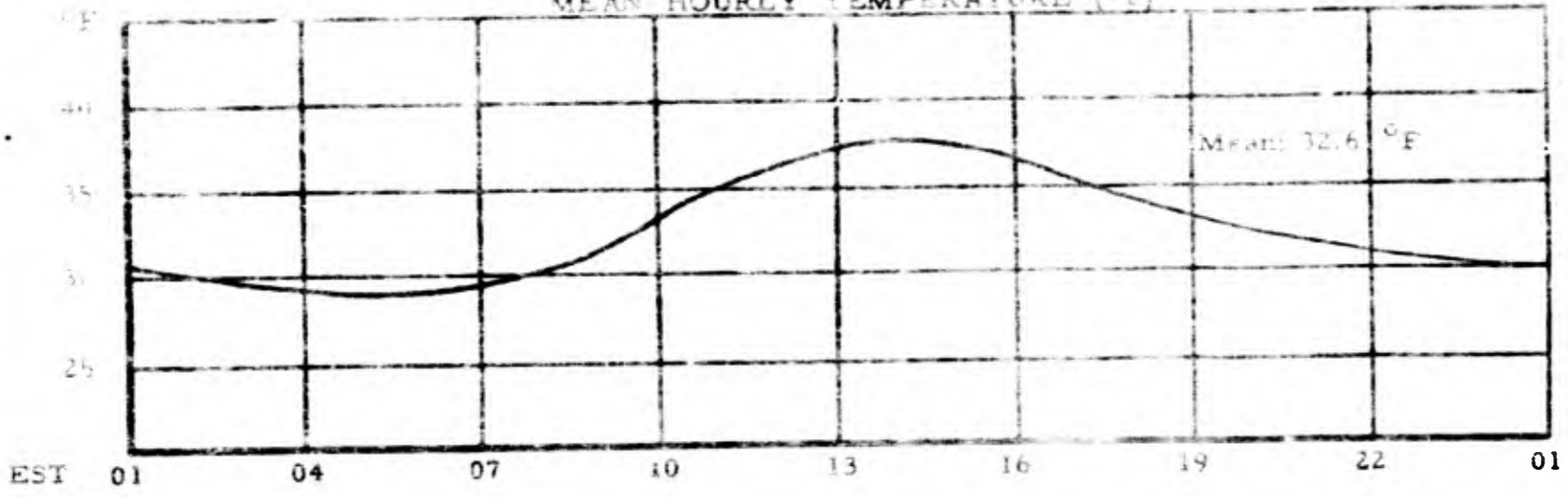
NOTE: Average wind speed in knots for each direction is given next to each wind direction

JANUARY

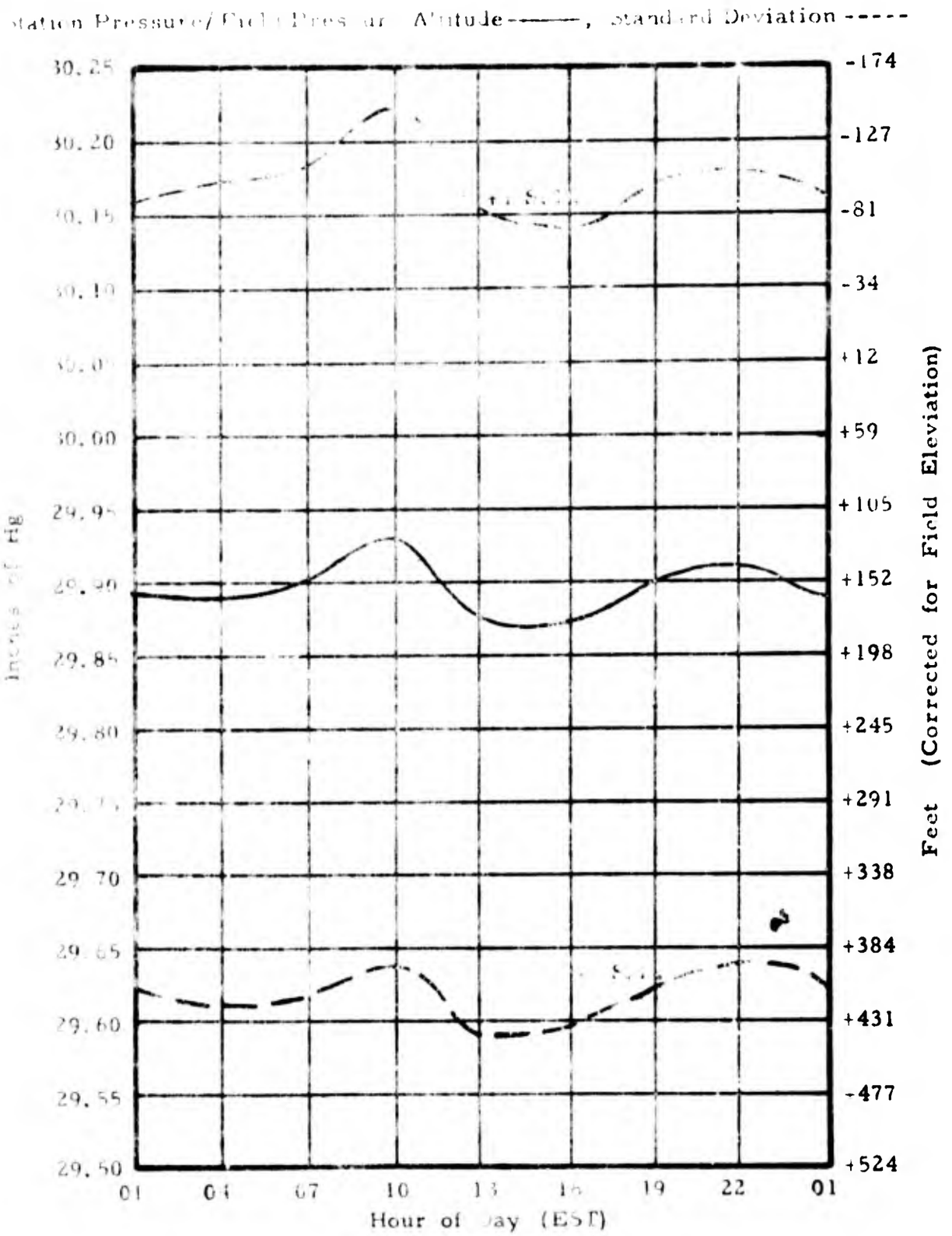
MEAN HOURLY RELATIVE HUMIDITY (%)



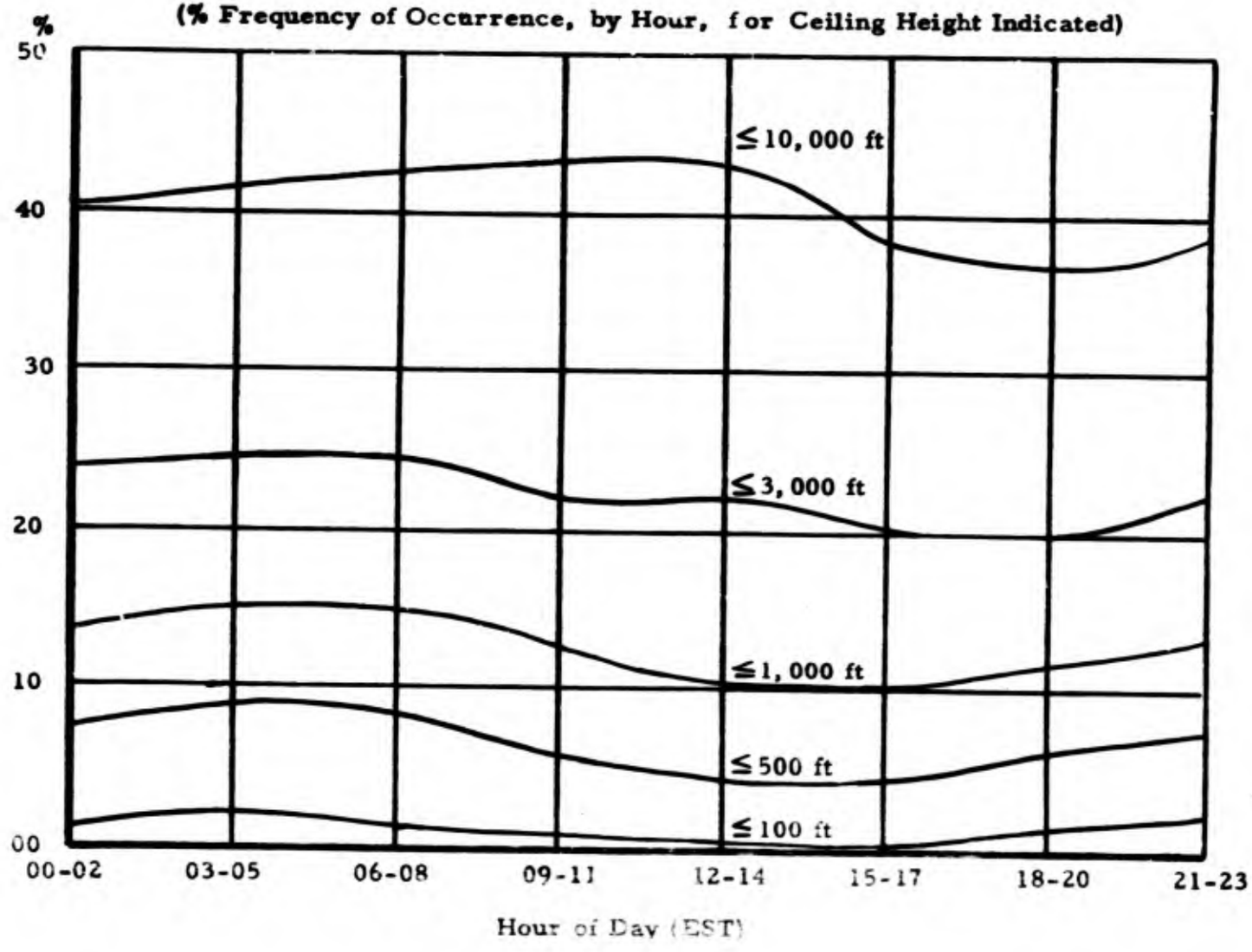
MEAN HOURLY TEMPERATURE (°F)



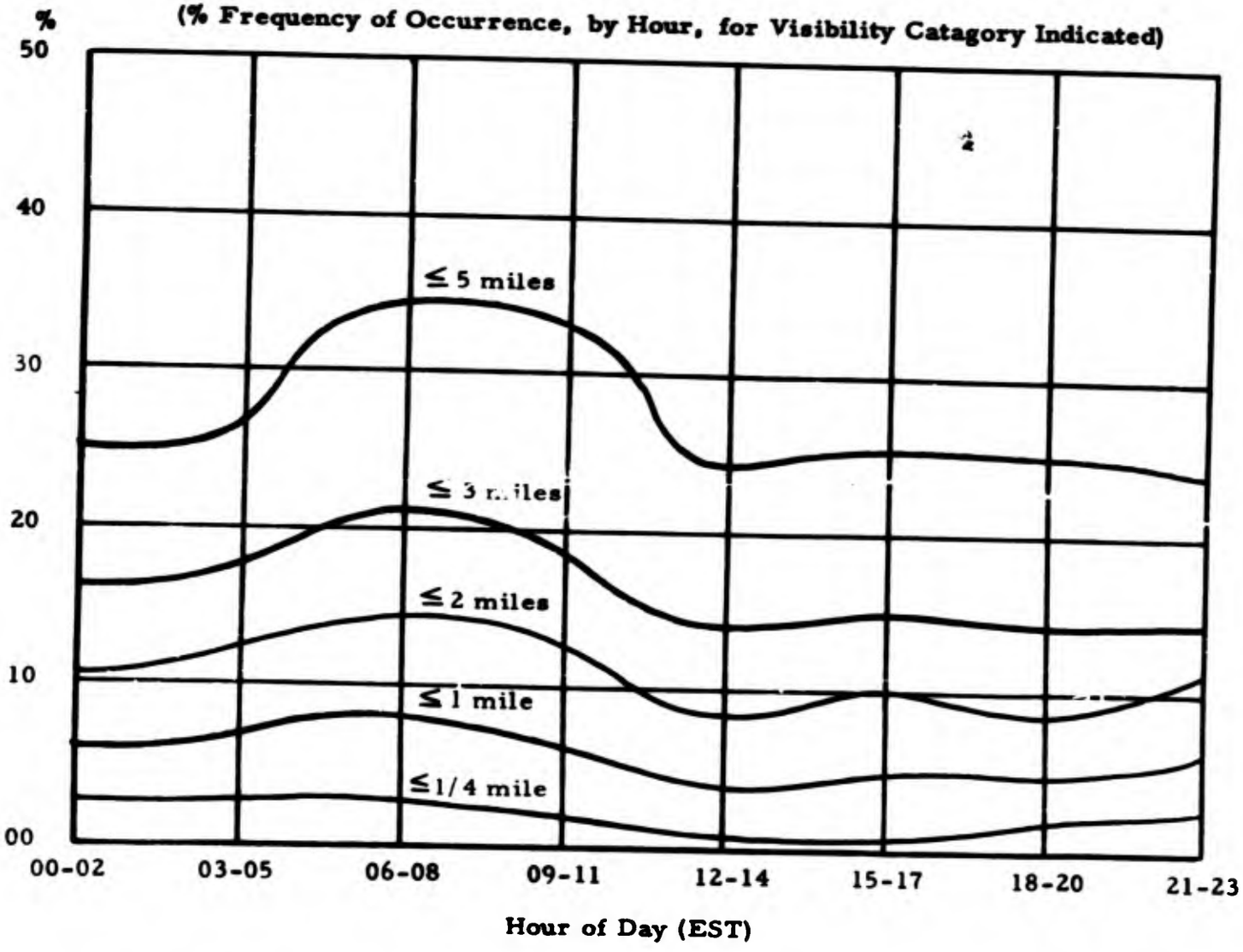
MEAN HOURLY STATION PRESSURE (Inches of Hg) / FIELD PRESSURE ALTITUDE (Feet) AND STANDARD DEVIATION



JANUARY
CEILINGS

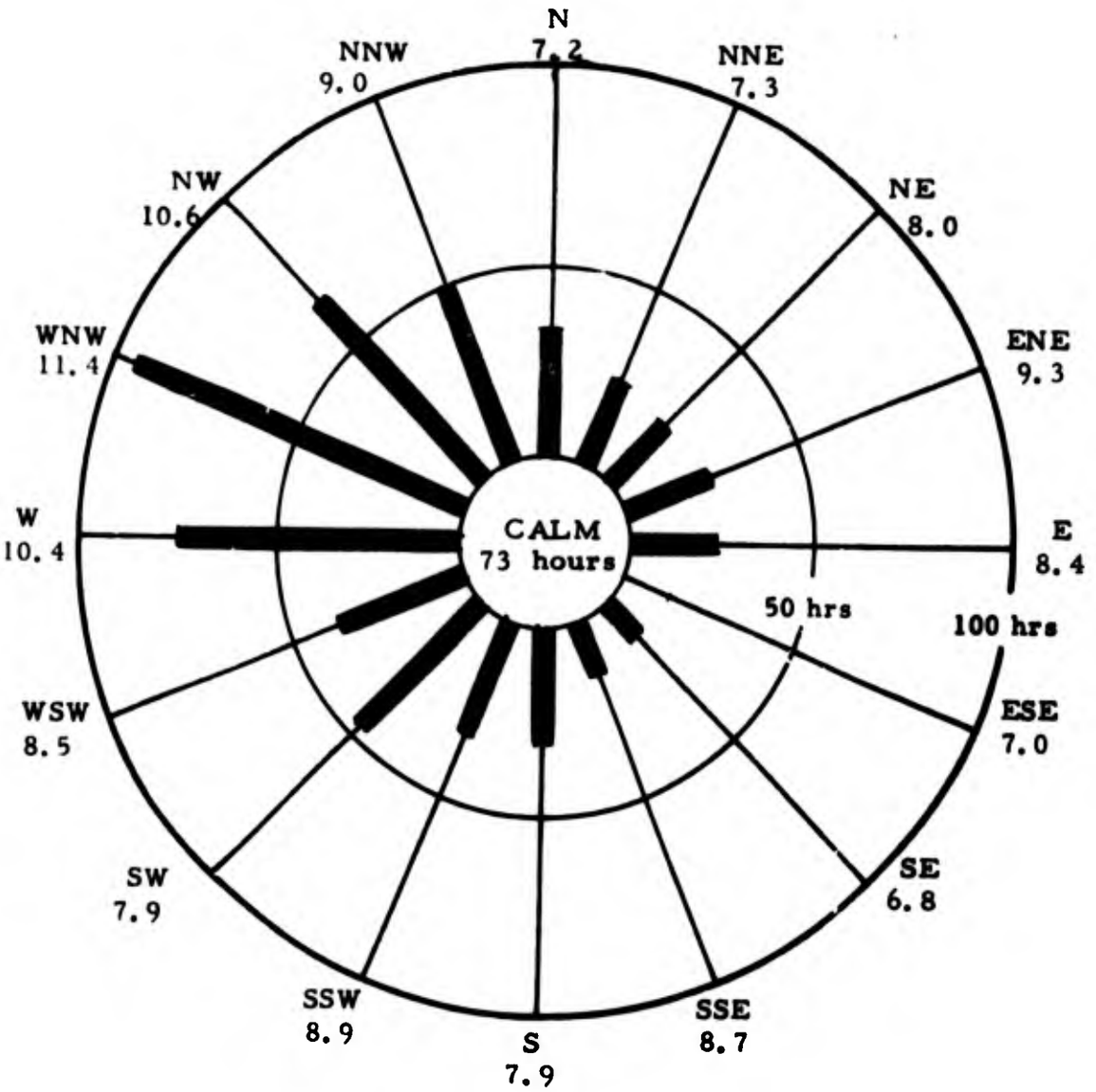


JANUARY
VISIBILITY



FEBRUARY

WIND ROSE



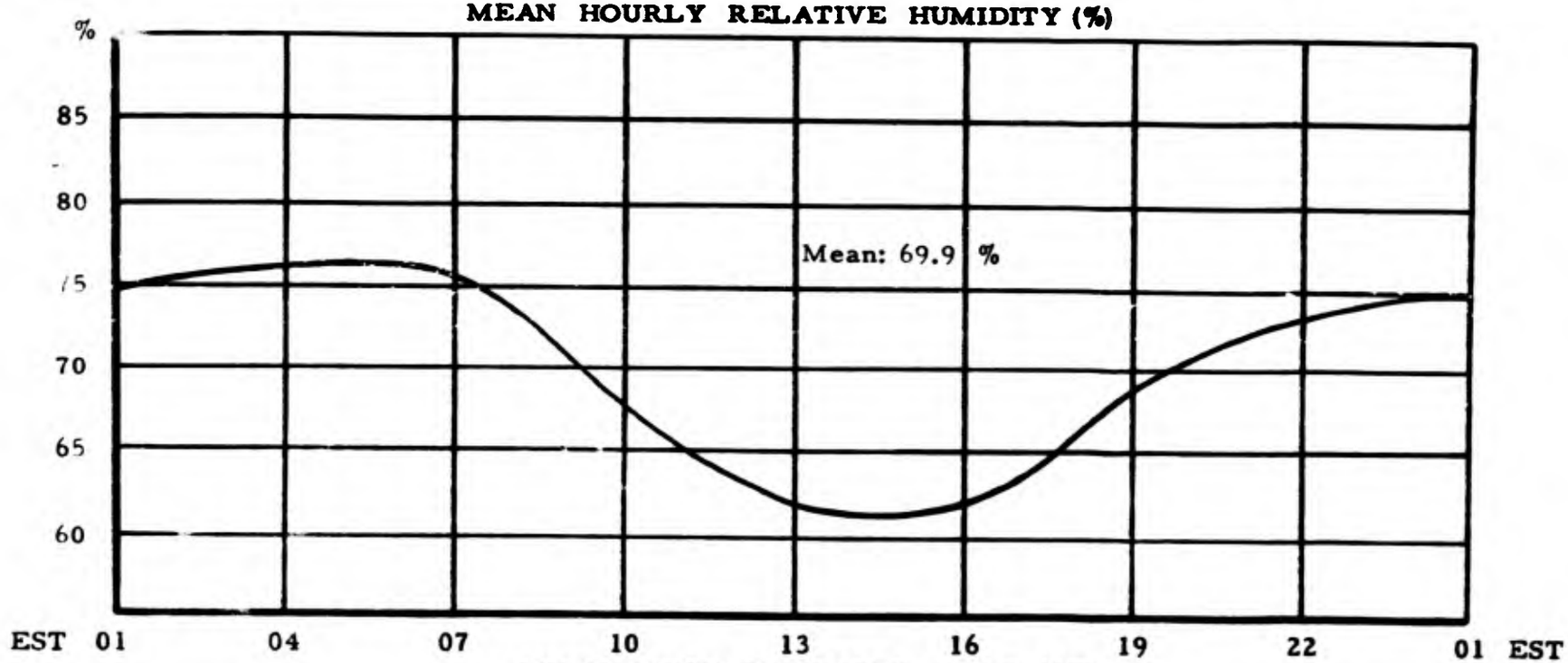
Mean Hourly Speed: 8.2 knots

Prevailing Direction: WNW

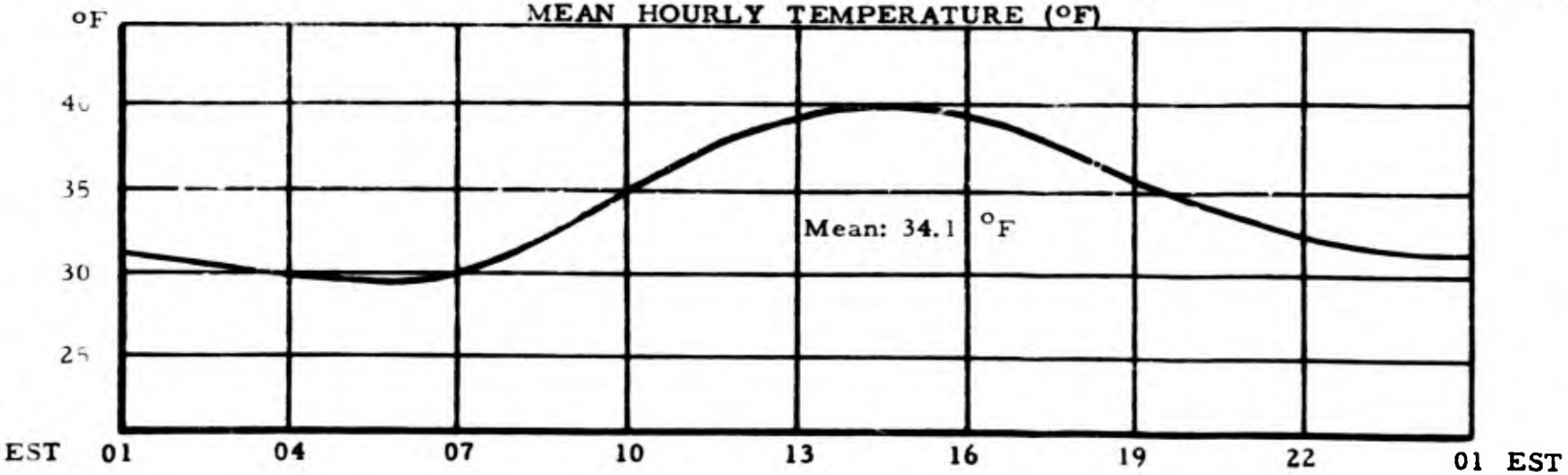
NOTE: **Average wind speed in knots for each direction is given next to each wind direction**

FEBRUARY

MEAN HOURLY RELATIVE HUMIDITY (%)

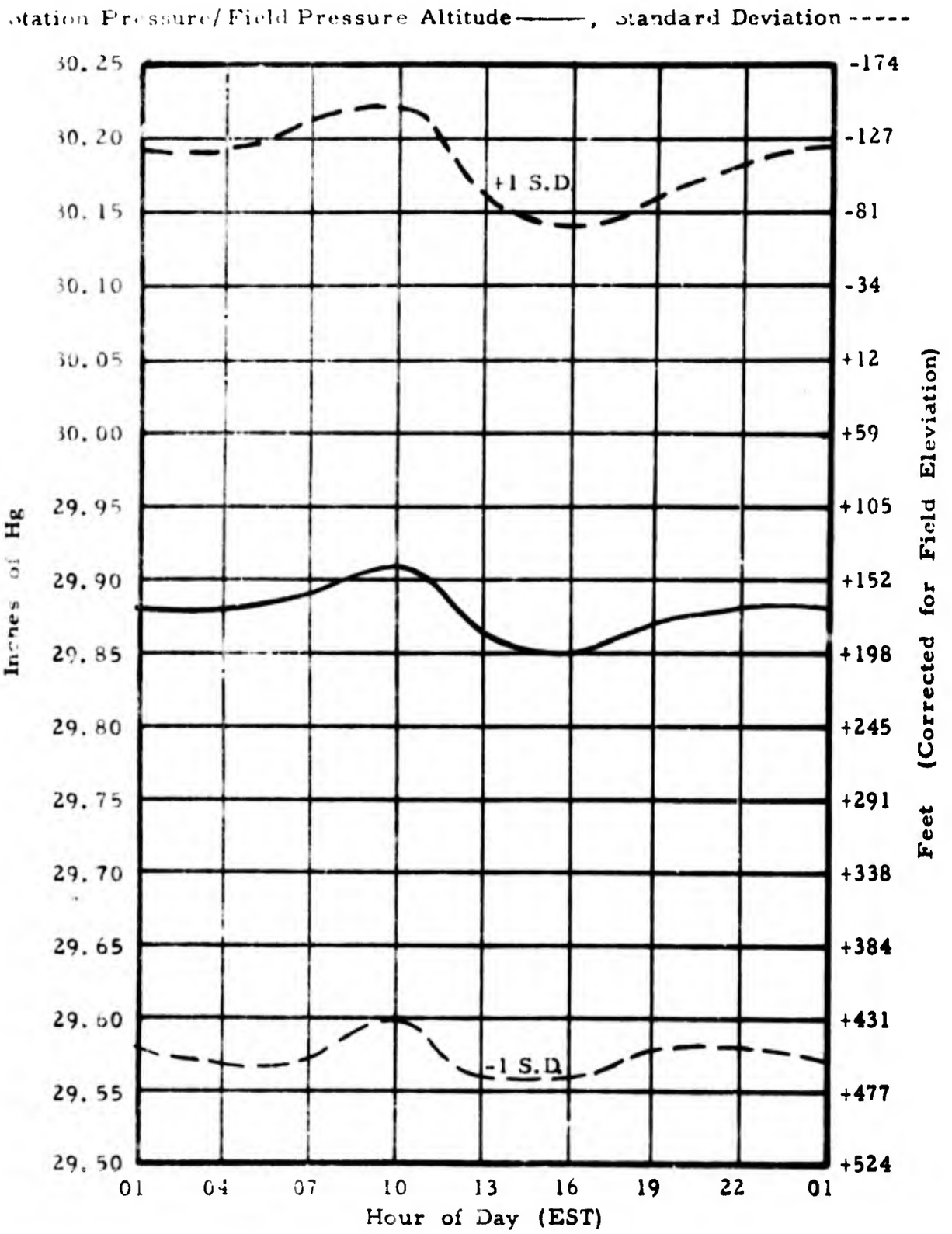


MEAN HOURLY TEMPERATURE (°F)



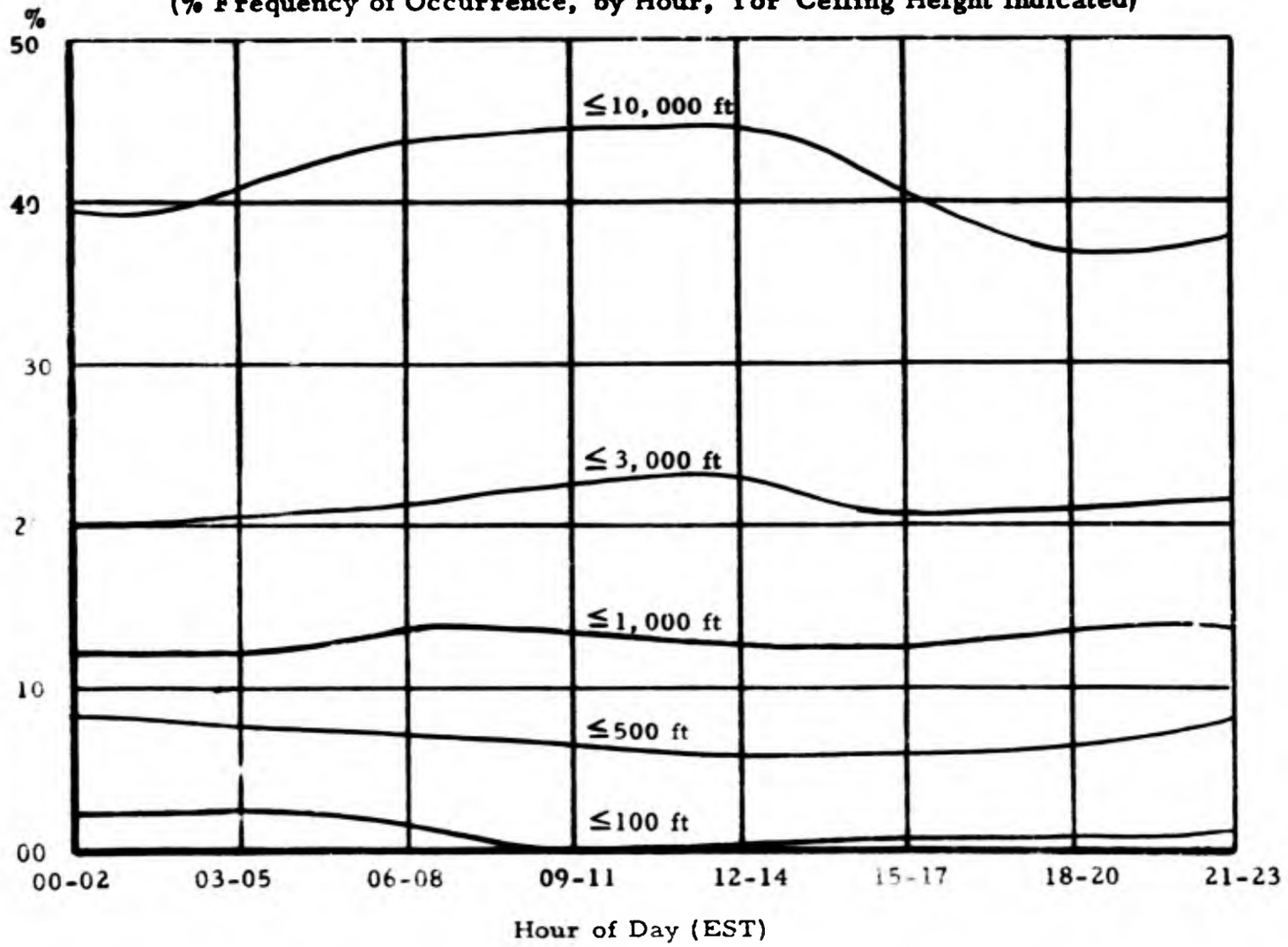
FEBRUARY

MEAN HOURLY STATION PRESSURE (Inches of Hg) / FIELD PRESSURE ALTITUDE (Feet) AND STANDARD DEVIATION

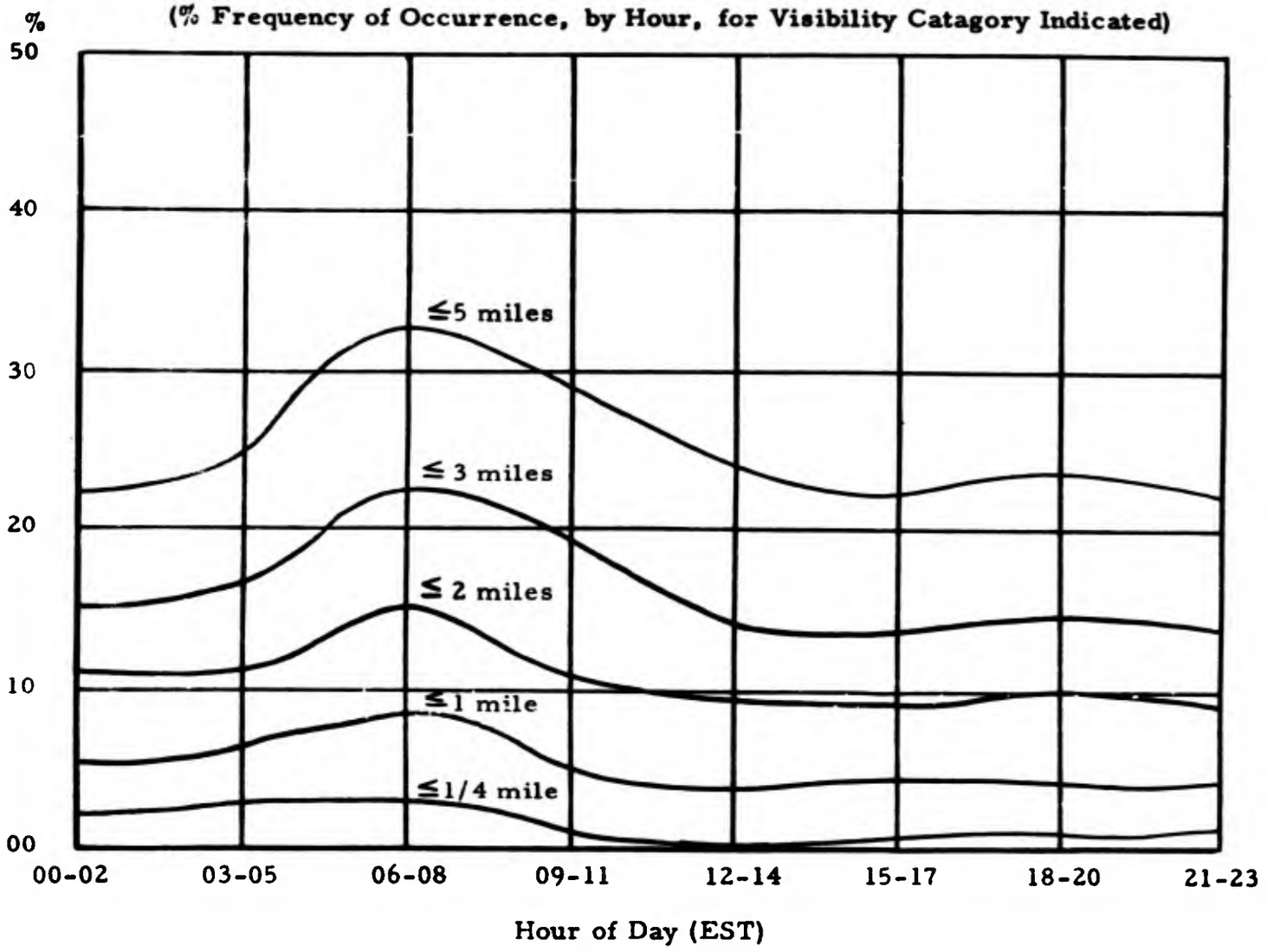


FEBRUARY
CEILINGS

(% Frequency of Occurrence, by Hour, for Ceiling Height Indicated)



FEBRUARY
VISIBILITY



SPRING CLIMATE AND FLYING CONDITIONS

MARCH, APRIL, MAY

GENERAL: Spring is the season of rising temperatures and decreasing cyclonic activity. Early March, however, is more typical of the winter months with intense cyclonic storminess. In fact, the maximum monthly snowfall and the greatest amount of snow recorded in 24 hours occurred in March with 26.8 inches and 20.1 inches respectively. By late March the increased solar heating becomes evident and temperatures start their upward trend at the rate of 10 degrees per month until July. Early spring is still a period of strong surface winds with February and March averaging more days with surface winds of 25 knots or greater. An appreciable decrease in wind speeds is not evident until May. Thunder - storms are rare in March but the probability of occurrence increases steadily with the approach of summer.

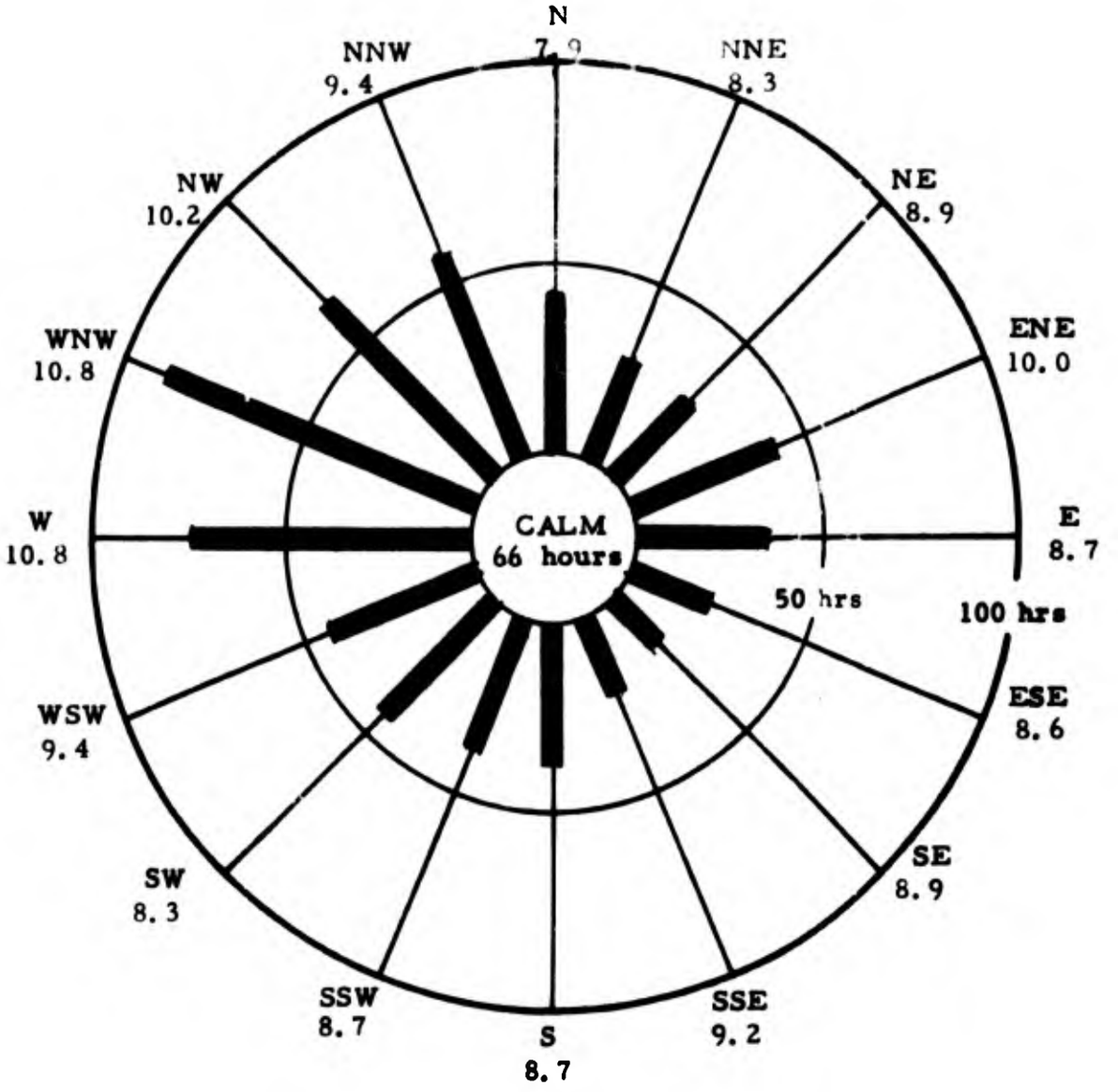
PRECIPITATION: Precipitation is moderate with the greatest amount falling in March (3.99 inches) and least in May (2.87 inches). Measureable precipitation can be expected on the average of 11.2 days per month for the three month period. Characteristically, spring weather situations tend to oscillate between those of winter and summer. That is, we may have a period of persistent rain and/or snow followed, in a few days, by wind squalls and intermittent shower activity. As in February, there is a chance that one unusually heavy snowstorm will strike McGuire with a total snow depth in excess of 5 inches.

TEMPERATURES: Temperatures are on the increase with the mean daily temperature rising about 10 degrees per month. Minimum temperatures drop to or below freezing approximately 14 days in March and 3 days in April.

FLYING CONDITIONS: In most respects, the visibility characteristics during March are nearly identical with those of February with the possible exception that, due to increased daily warming, fog burn off will occur progressively earlier as the month passes. A significant decrease in low visibilities and ceilings is seen in the April statistics; however, part of this improvement takes place during the latter days of March. Throughout the spring season brief shower acitivity (rain or snow) will lower the ceiling and visibility abruptly for periods of less than one hour. Sudden changes of this nature are not generally reflected in our statistics. Below field minimum conditions (100 feet and/or 1/4 mile) occur approximately 9.3 hours per month as compared to 16 hours per month during the winter. Surface winds in March are more characteristic of the winter months. No significant decrease in surface winds takes place until May.

Detailed statistics for the months noted above begin on the next page.

MARCH
WIND ROSE

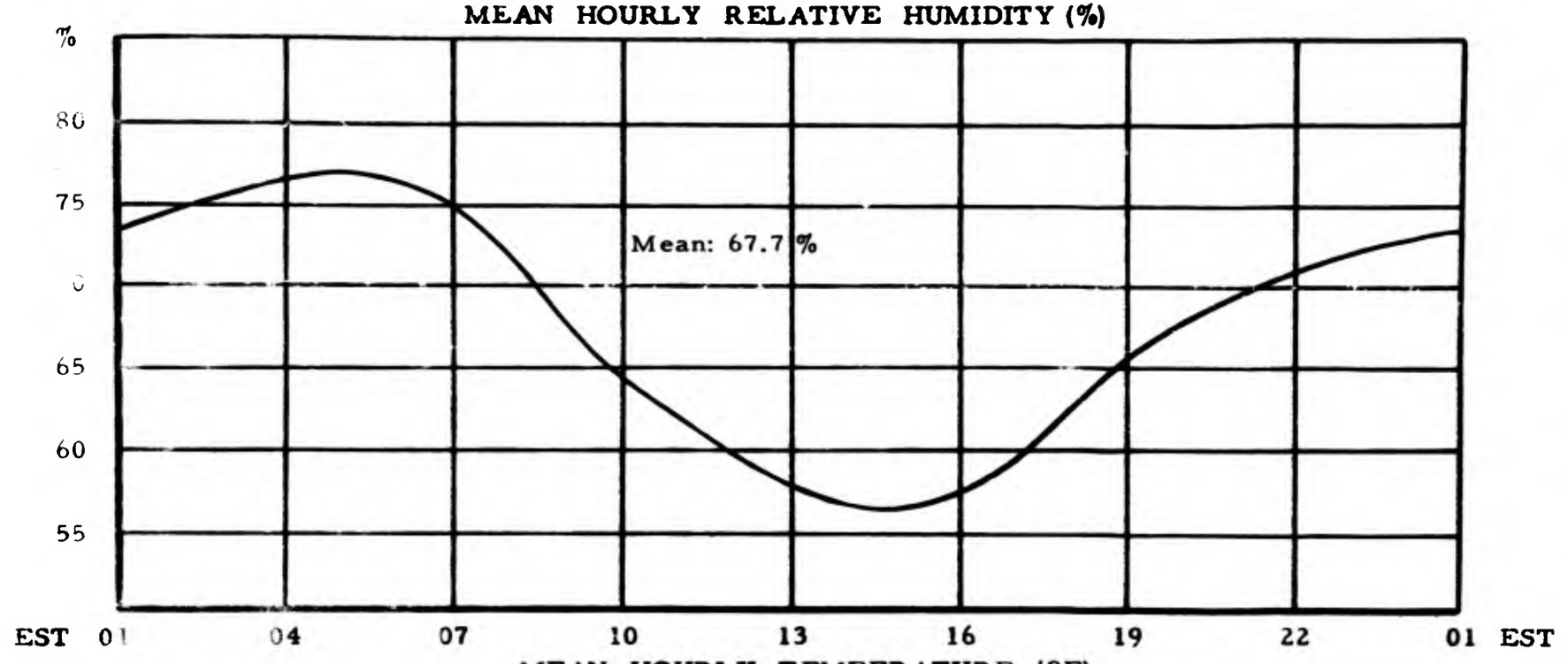


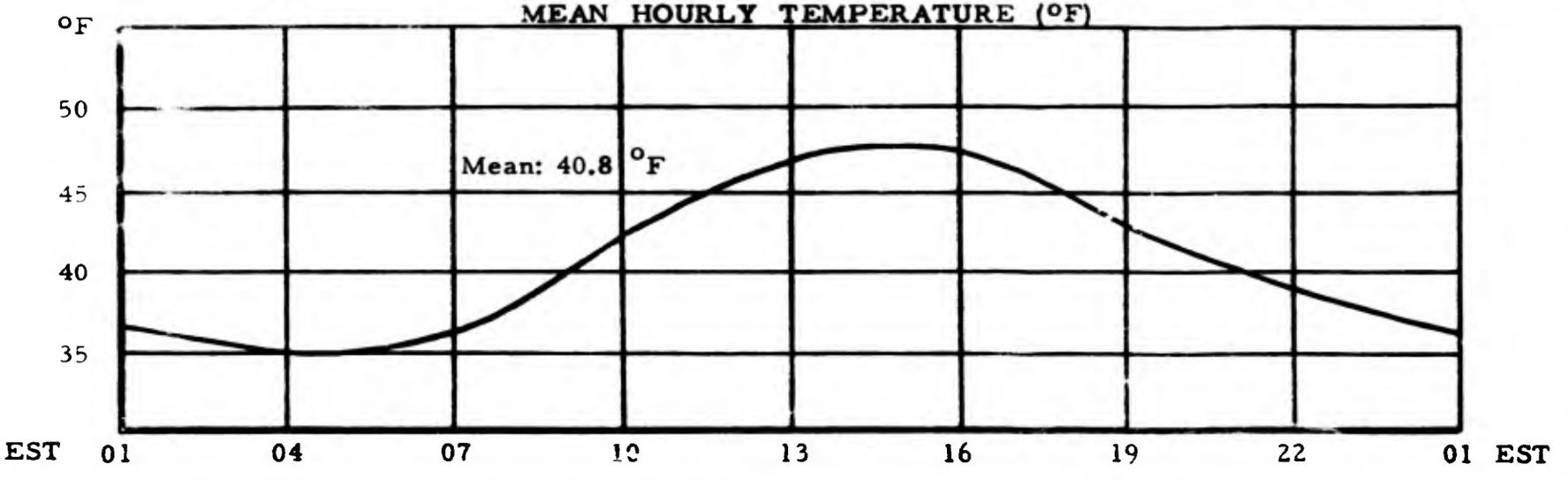
Mean Hourly Speed: 8.6 knots

Prevailing Direction: WNW

NOTE: Average wind speed in knots for each direction is given next to each wind direction

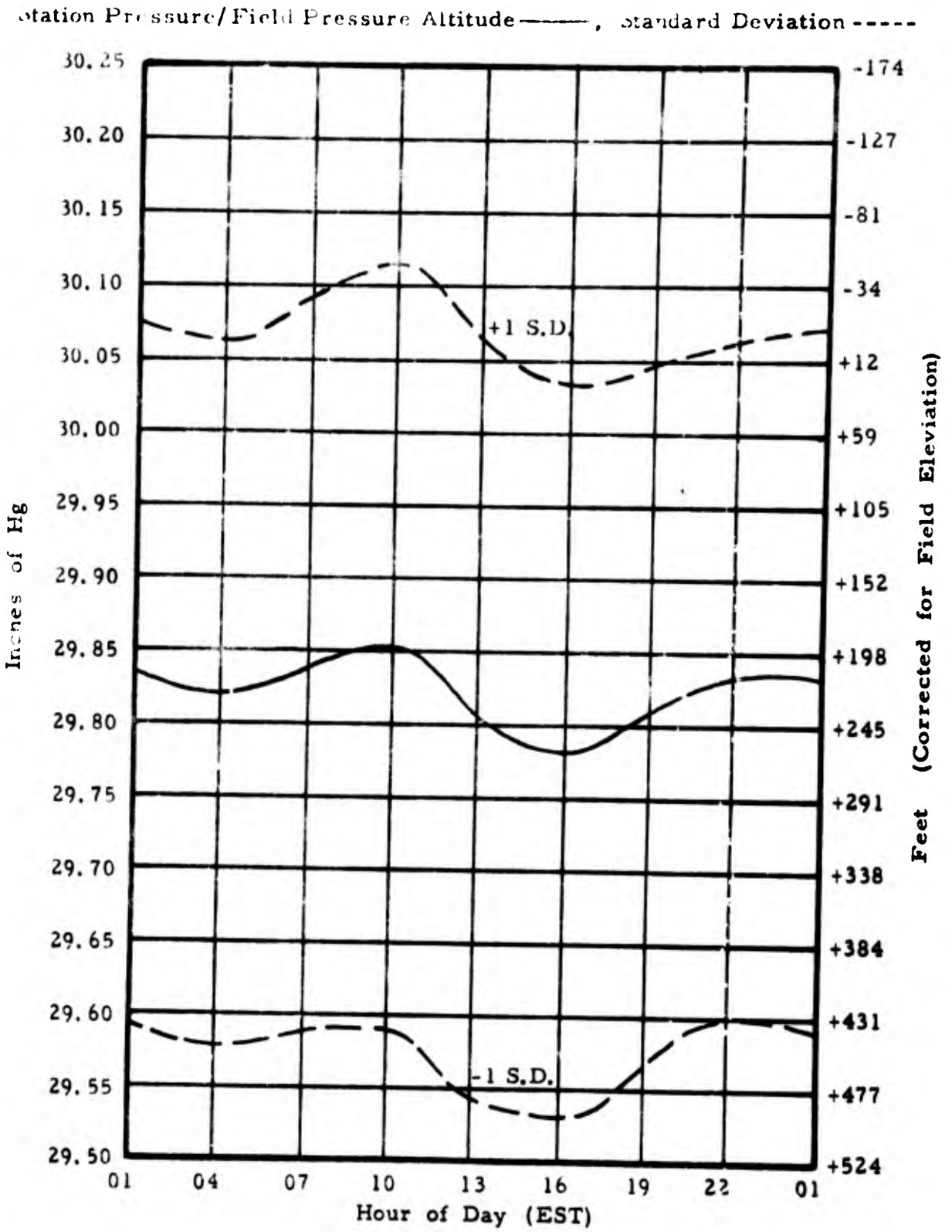
MARCH


MEAN HOURLY RELATIVE HUMIDITY (%)
%
80
75
65
60
55
Mean: 67.7 %
EST 01 04 07 10 13 16 19 22 01 EST

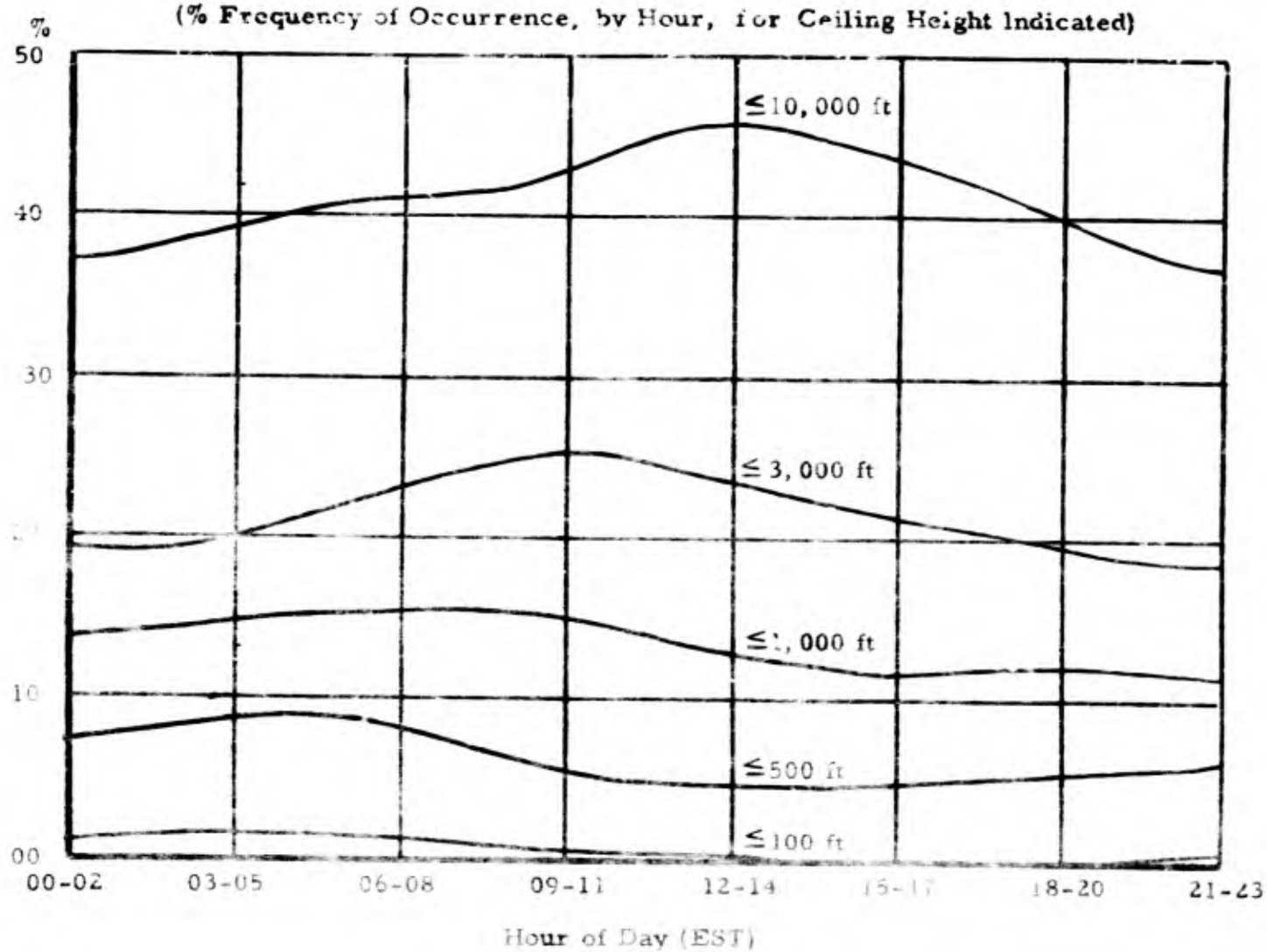

MEAN HOURLY TEMPERATURE (°F)
°F
50
45
40
35
Mean: 40.8 °F
EST 01 04 07 10 13 16 19 22 01 EST

MARCH

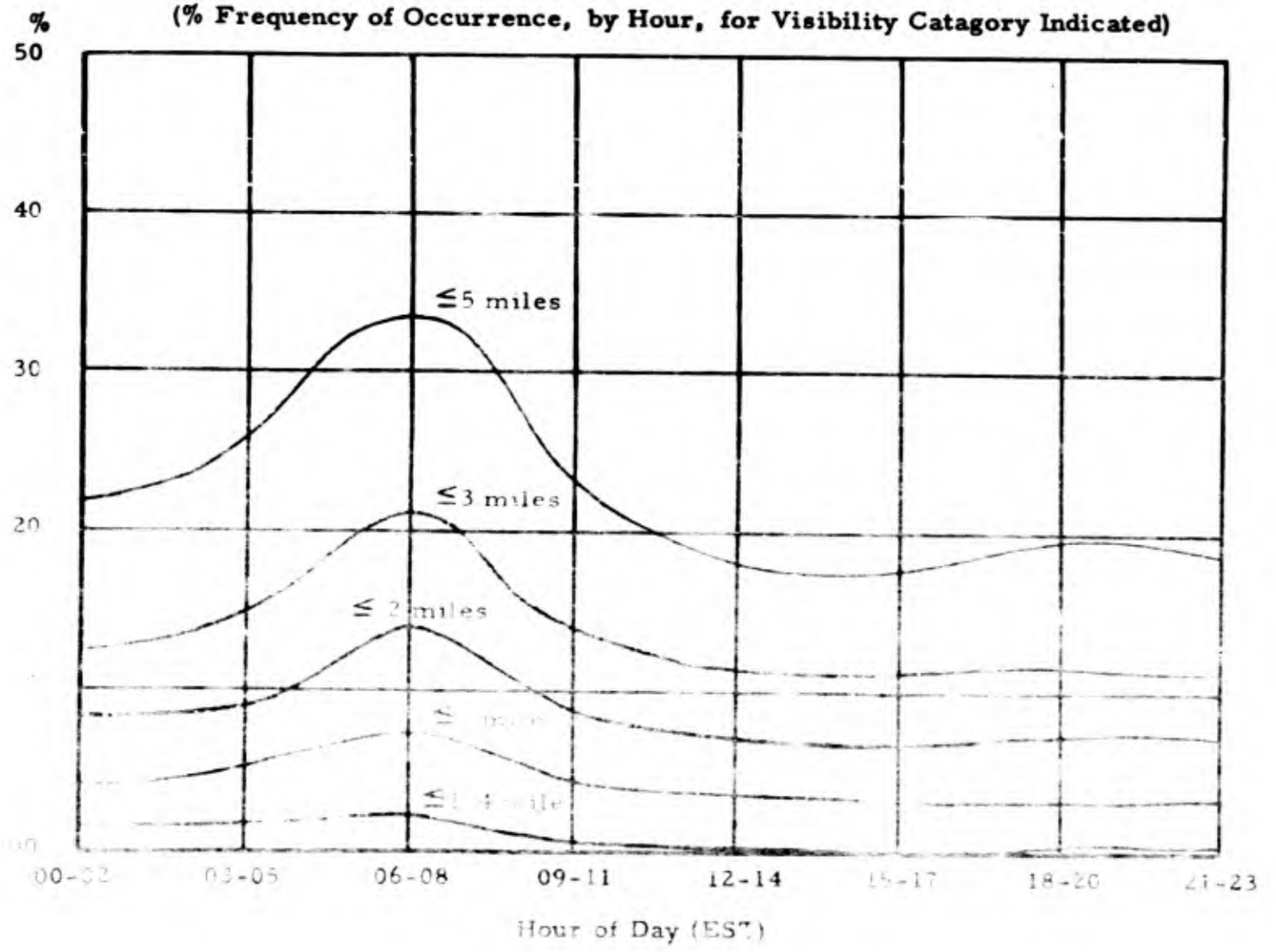
MEAN HOURLY STATION PRESSURE (Inches of Hg) / FIELD PRESSURE ALTITUDE (Feet) AND STANDARD DEVIATION



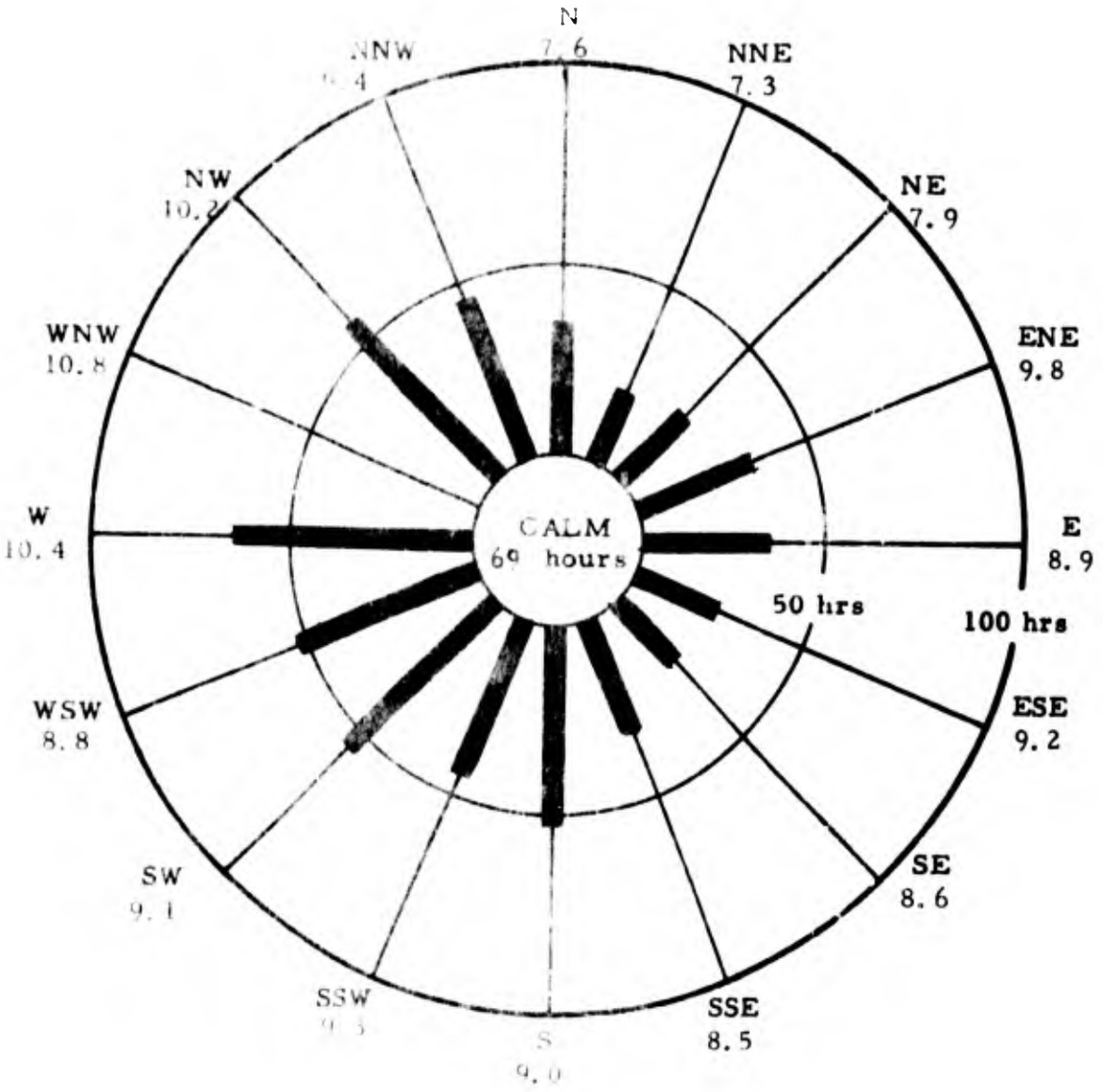
MARCH
CEILINGS



MARCH
VISIBILITY



APRIL
WIND ROSE



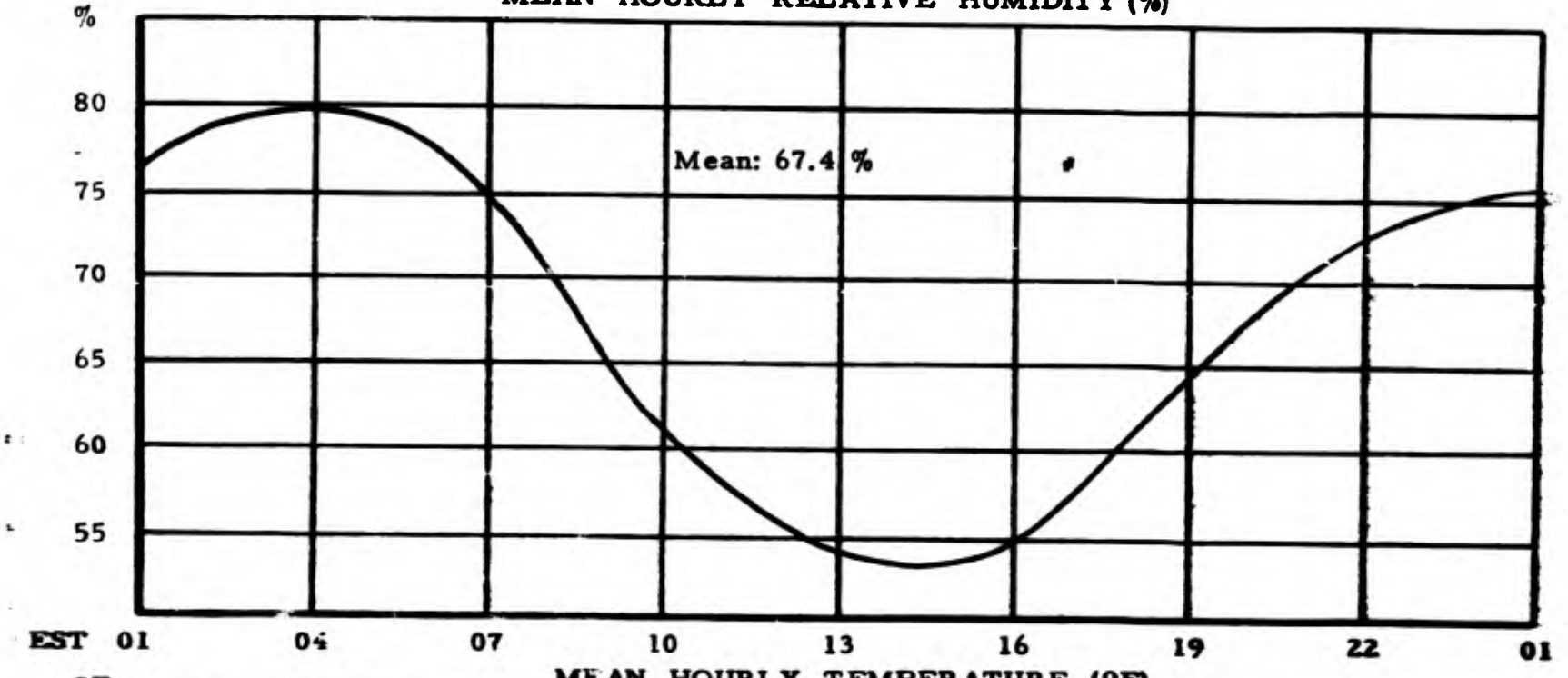
Mean Hourly Speed: 8.4 knots

Prevailing Direction: W-WNW

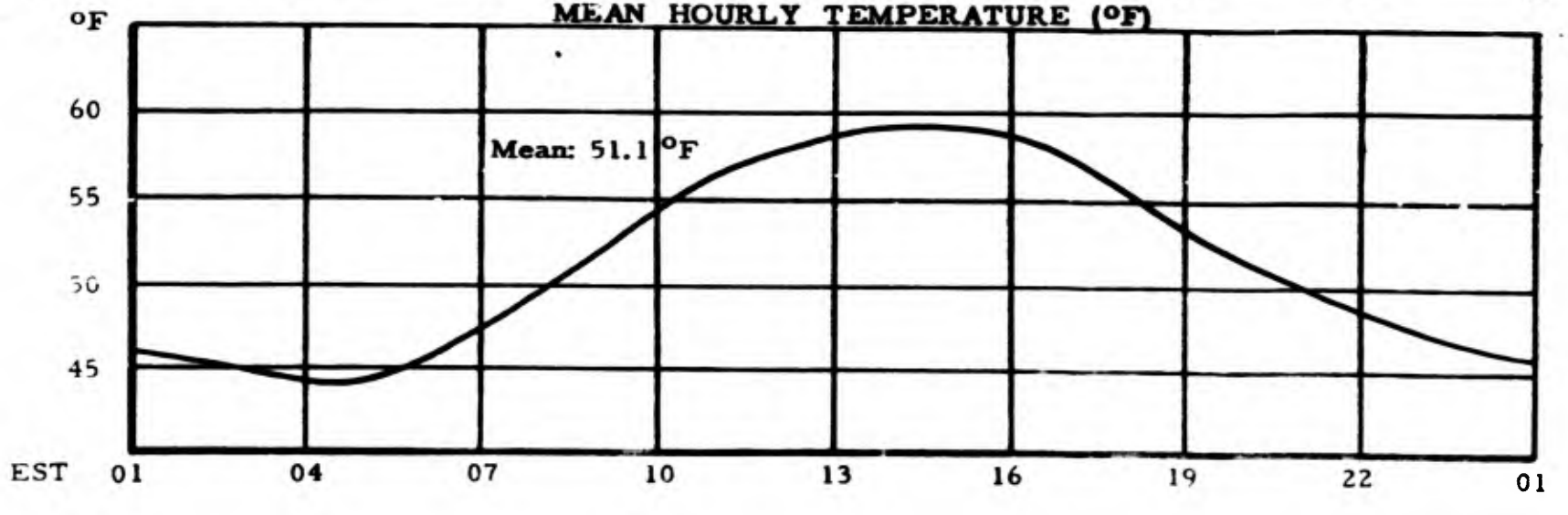
NOTE: Average wind speed in knots for each direction is given next to each wind direction

APRIL

MEAN HOURLY RELATIVE HUMIDITY (%)

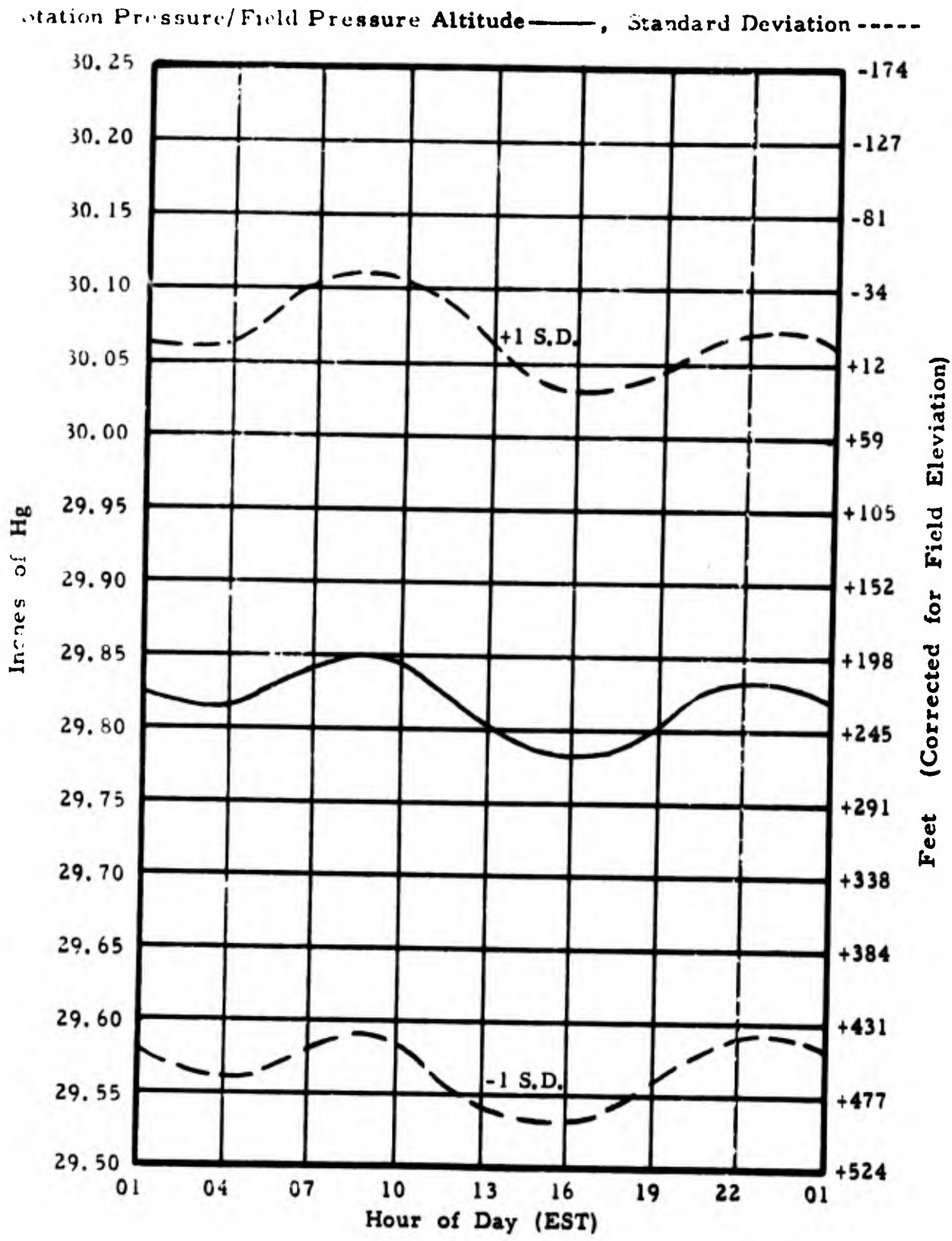


MEAN HOURLY TEMPERATURE (°F)

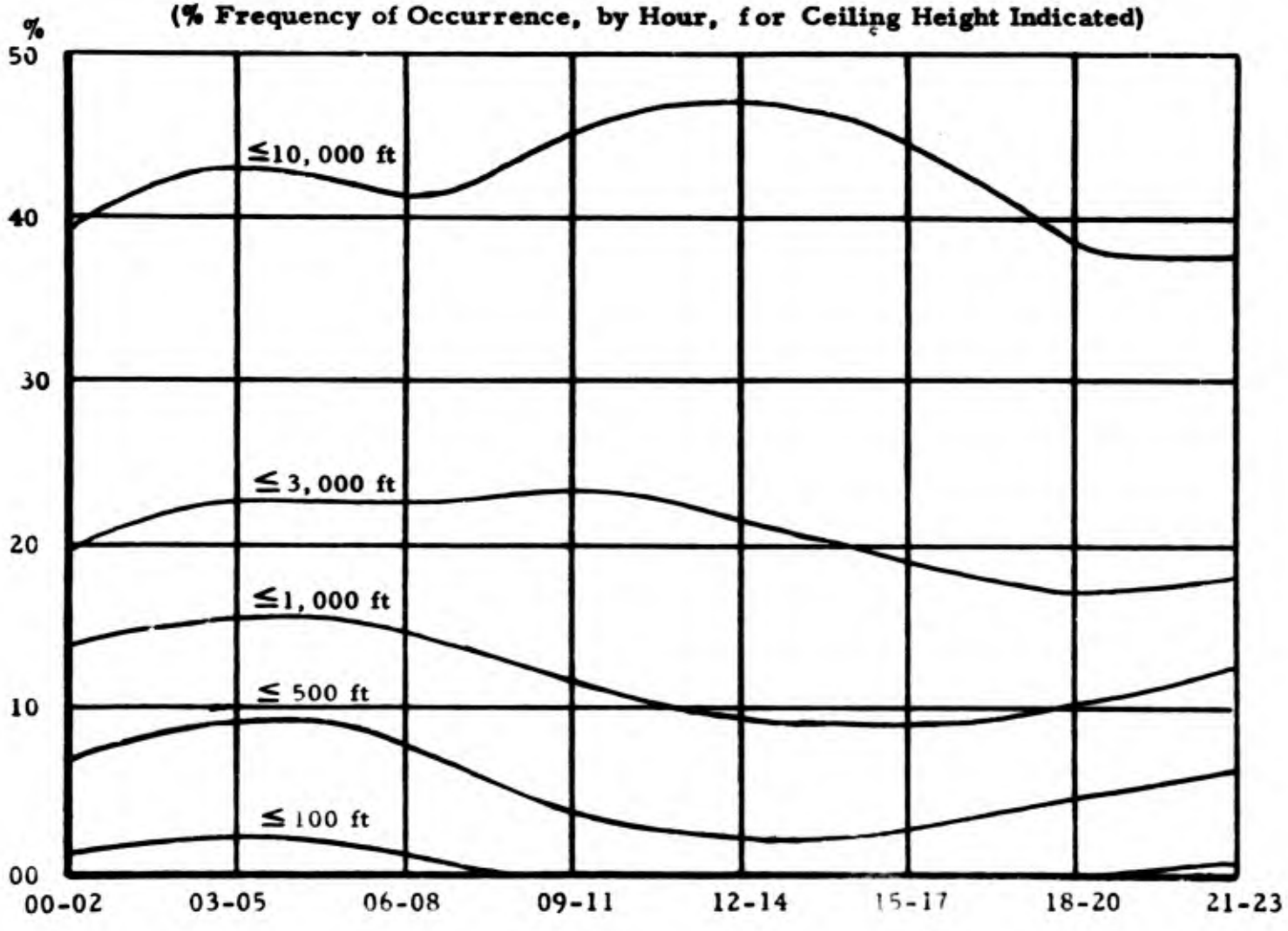


APRIL

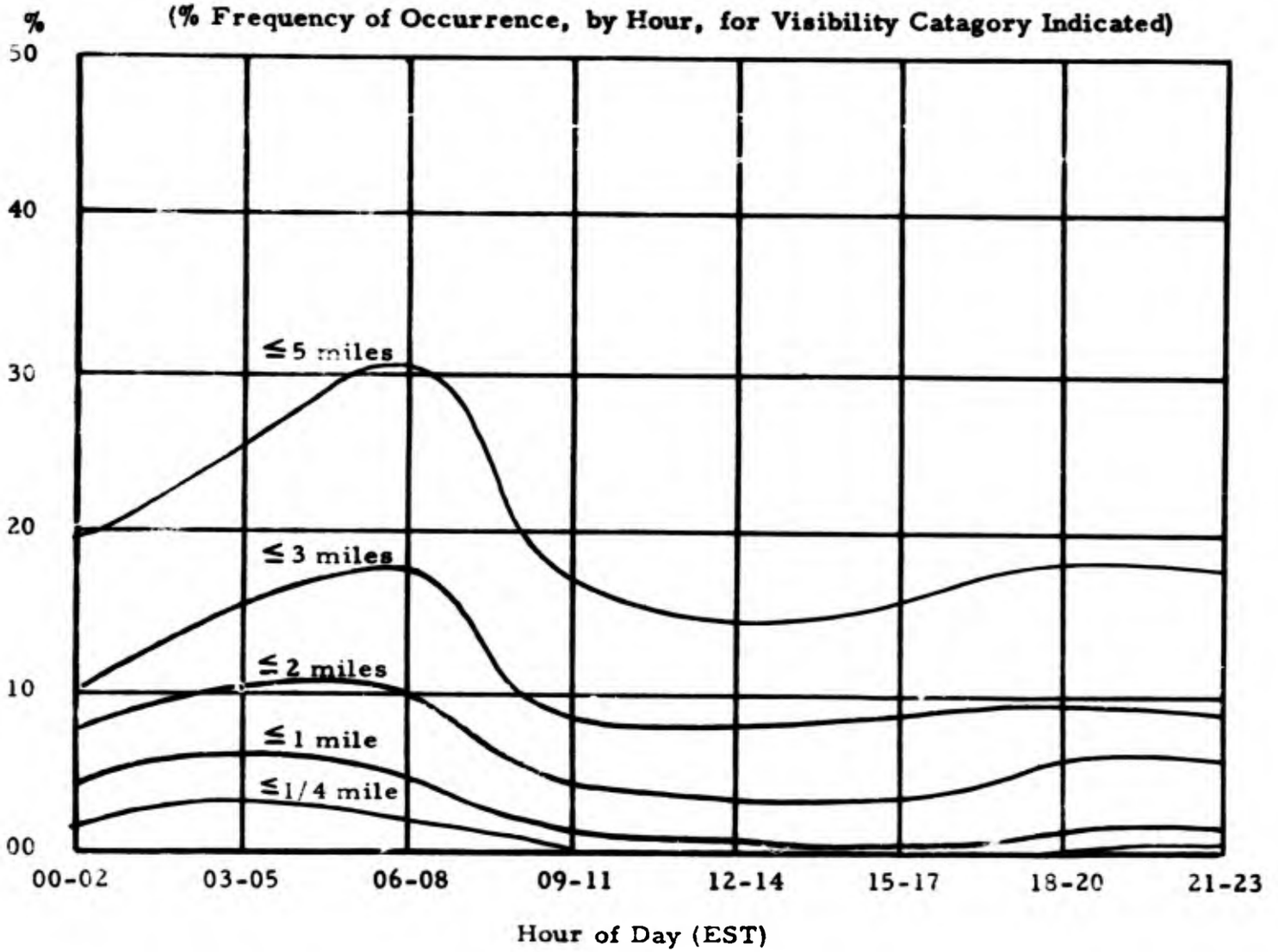
MEAN HOURLY STATION PRESSURE (Inches of Hg) / FIELD PRESSURE ALTITUDE (Feet) AND STANDARD DEVIATION



APRIL
CEILINGS

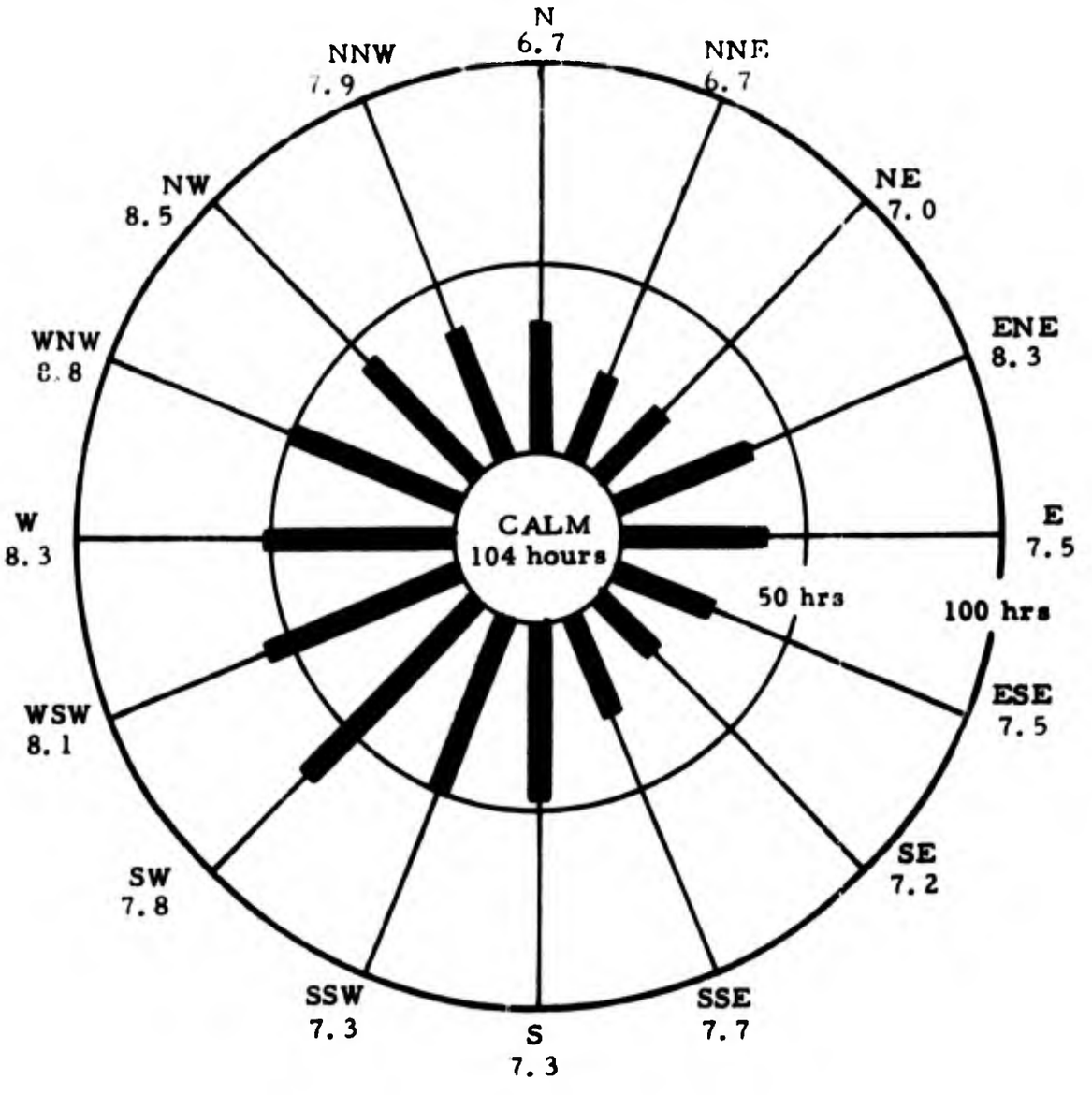


APRIL
VISIBILITY



MAY

WIND ROSE



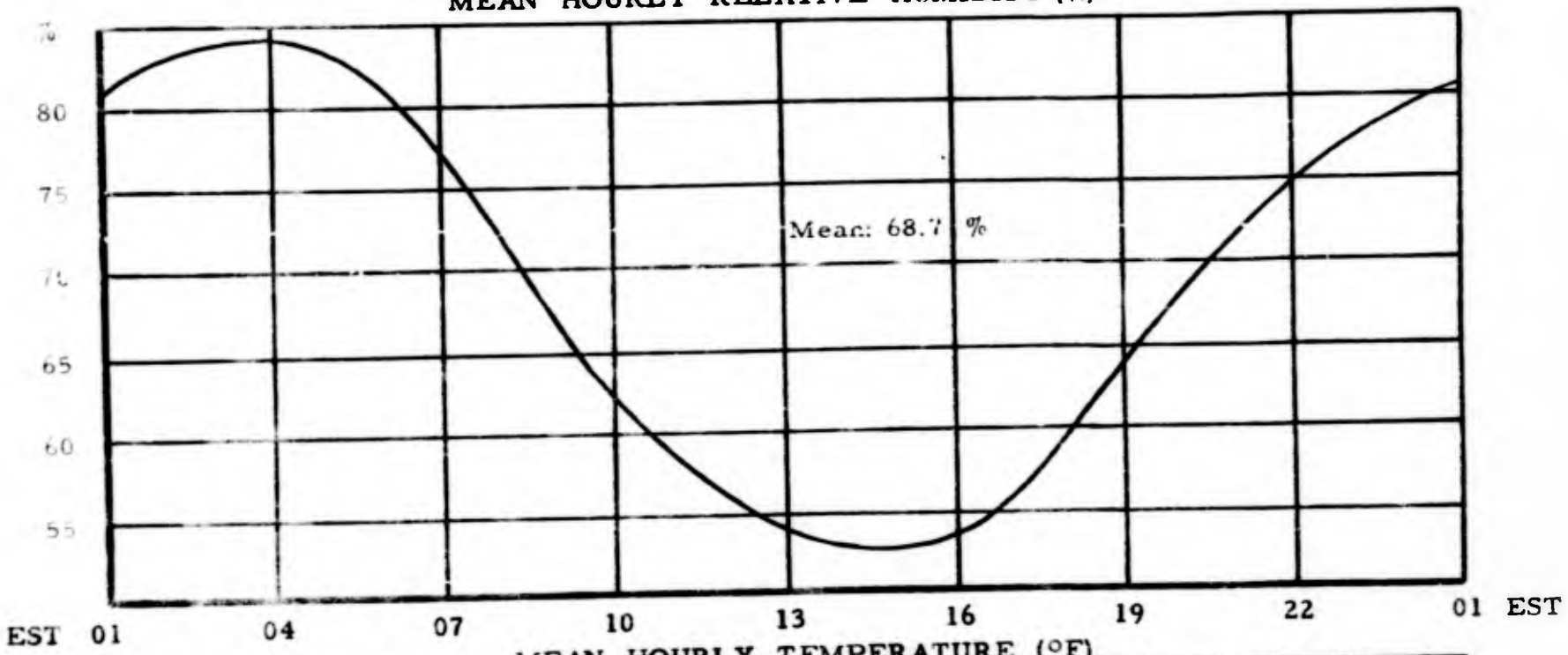
Mean Hourly Speed: 6.6 knots

Prevailing Direction: SW

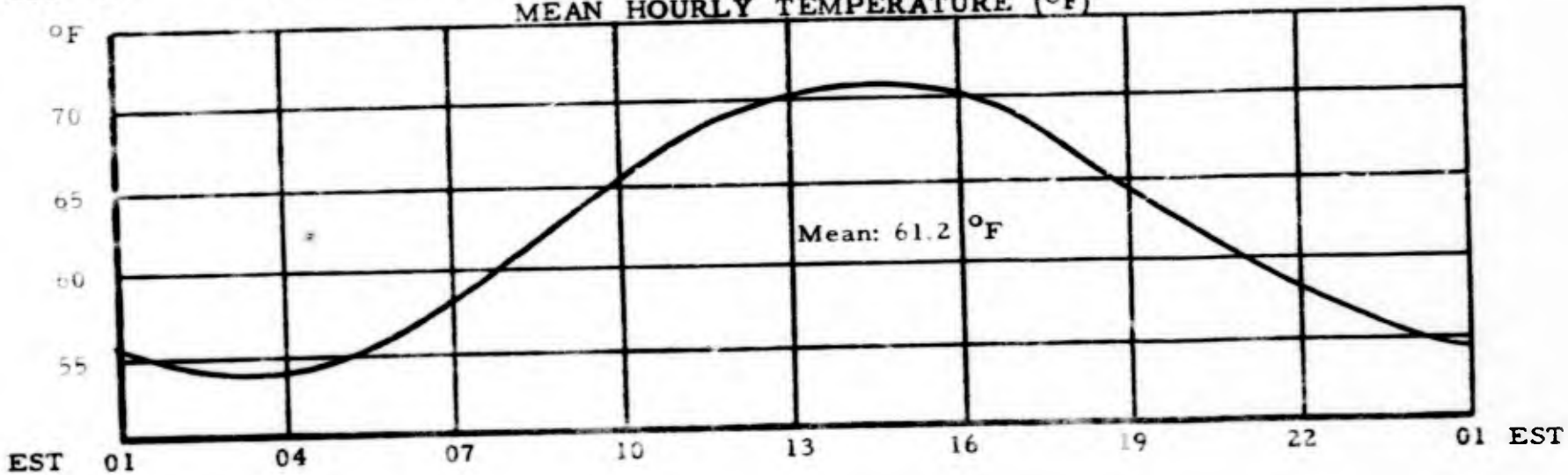
NOTE: Average wind speed in knots for each direction is given next to each wind direction

MAY

MEAN HOURLY RELATIVE HUMIDITY (%)

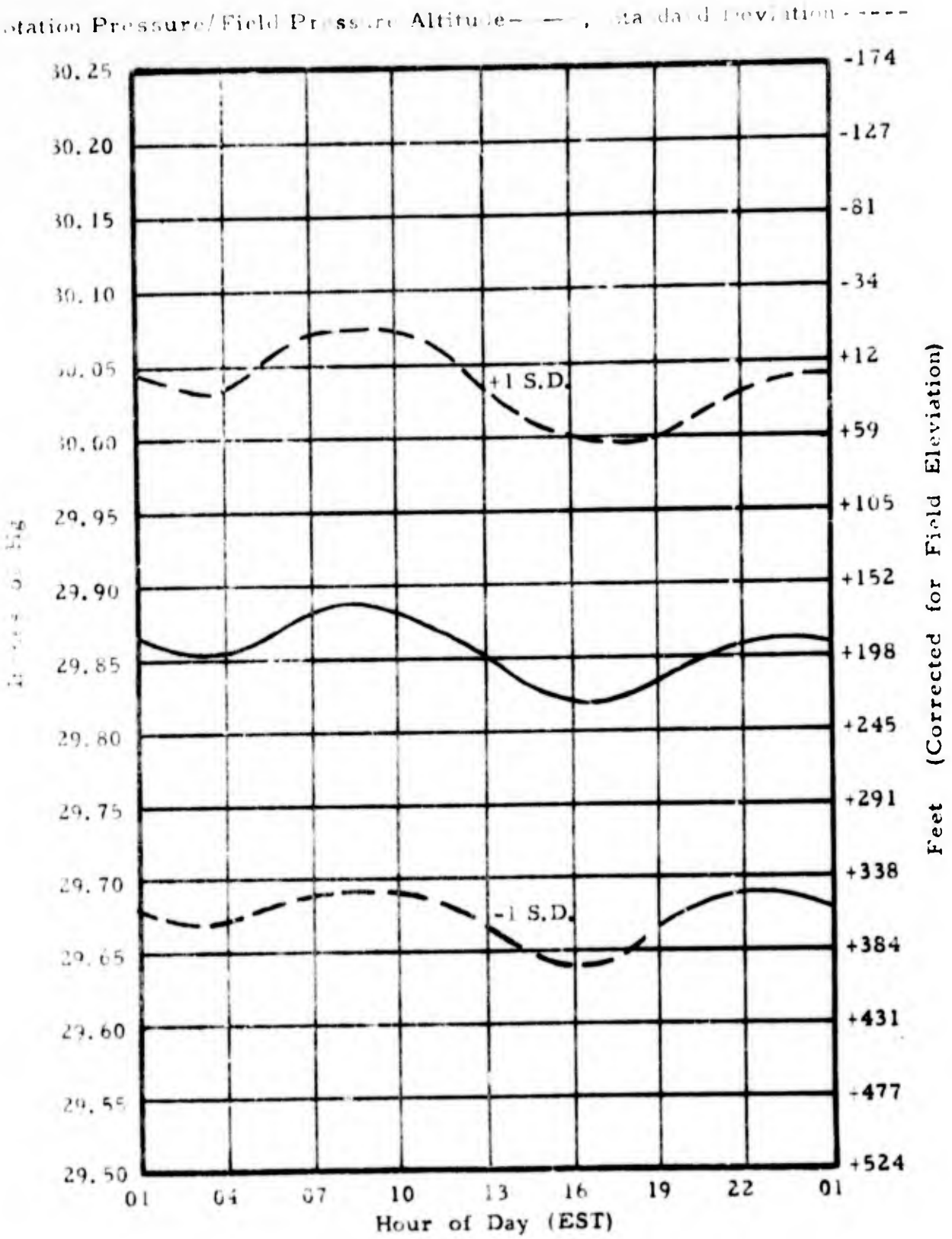


MEAN HOURLY TEMPERATURE (°F)



MAY

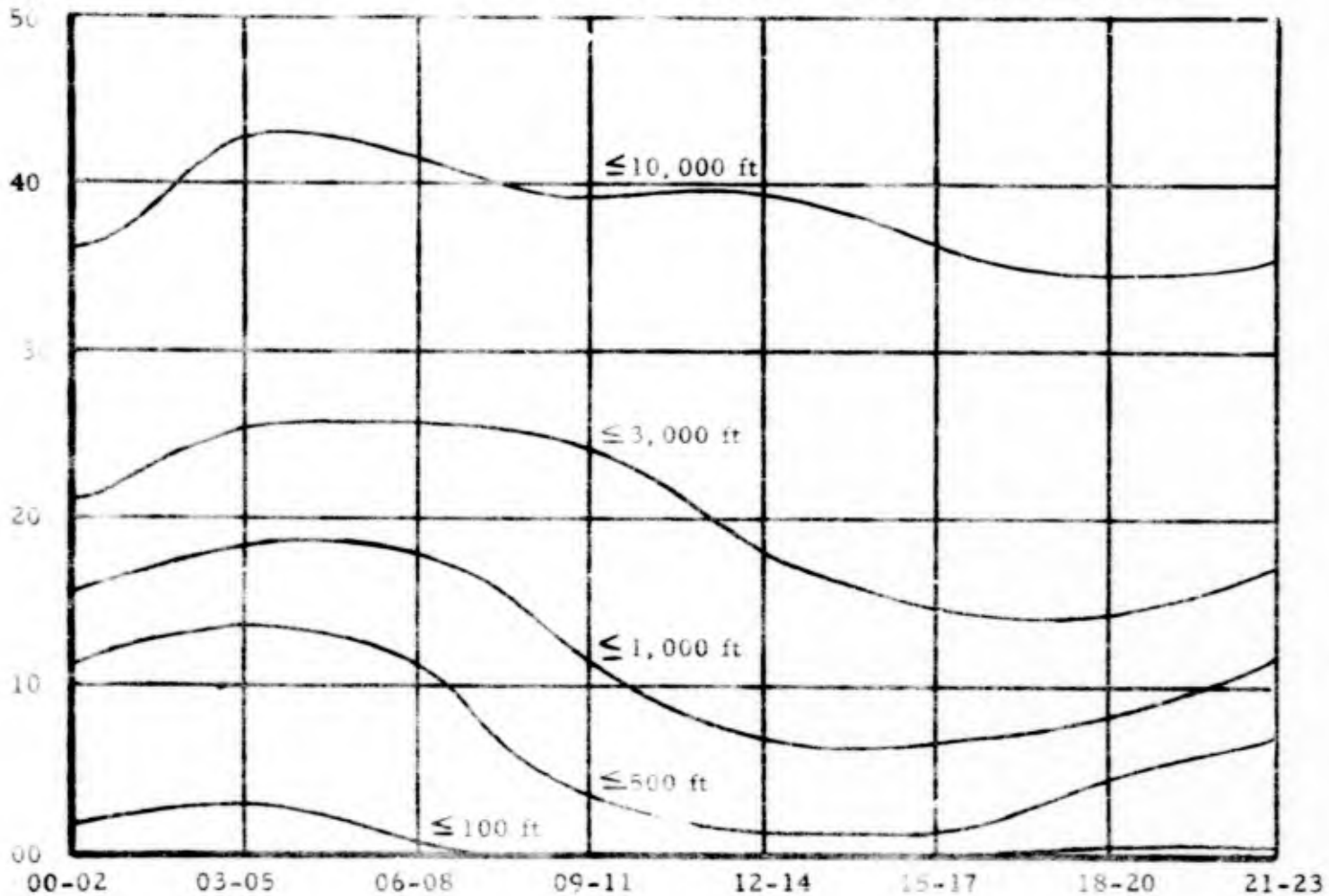
MEAN HOURLY STATION PRESSURE (Inches of Hg) / FIELD PRESSURE ALTITUDE (Feet) AND STANDARD DEVIATION



MAY

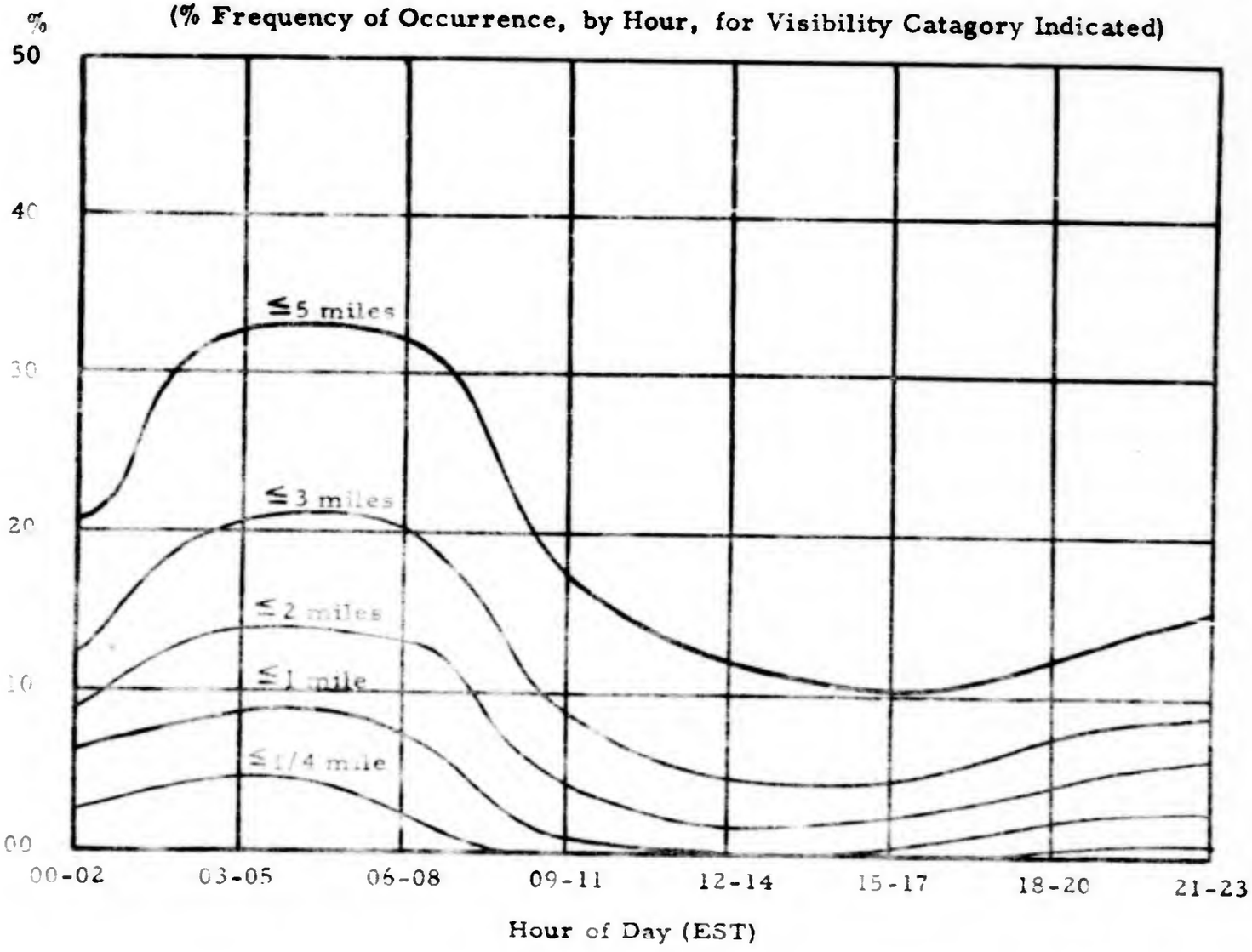
CEILINGS

(% Frequency of Occurrence, by Hour, for Ceiling Height Indicated)



MAY

VISIBILITY



SUMMER CLIMATE AND FLYING CONDITIONS

JUNE, JULY, AUGUST

GENERAL: The Bermuda High is the predominating weather influence at McGuire during the summer months. The prevailing southwesterly winds advect maritime tropical air over the middle Atlantic states which is characterized by haze conditions both at the surface and aloft. In the afternoons surface visibilities generally improve to 5-6 miles while visibilities aloft decrease to 3-4 miles as the shallow morning haze layers lift to altitudes of 10,000 feet or more with afternoon heating. Thunderstorm activity reaches a maximum in July and during all summer months thunderstorms present the most significant weather hazard. Although the amount of precipitation reaches a maximum in summer, the rainfall is usually showery in nature and therefore of short duration. Surface winds are significantly lighter than during the winter and spring months. Wind gusts over 25 knots are rare except when associated with thunderstorms or tropical storms.

PRECIPITATION: As stated, precipitation reaches a maximum during the summer months. Precipitation is fairly light in June but increases significantly during July and August. Continuous rain and/or drizzle is at a minimum during the summer and showery type precipitation accounts for the majority of rainfall. As with most areas, thunderstorm activity reaches a maximum during the summer months. These thunderstorms are evenly distributed over the three month period with a slight maximum occuring in July.

TEMPERATURE: July is the hottest month of the year. Temperatures of 90°F or more can be expected on the average of 8.4 days and temperatures of 100°F or more at least one day. The mean daily temperature increases from 70.8°F in June to 75.3°F in July and falls slightly to 73.2°F in August. The highest recorded temperature occurred in July, 1966--101°F.

FLYING CONDITIONS: One of the trickiest weather phenomena to forecast during the summer is the daily fluctuations in visibility. Visibilities between two and five miles are more prevalent than any other time of the year averaging approximately 136 hours per month. In contrast, ceilings are generally better during this period, being above 3,000 feet 83% of the time. The variation of visibility with altitude should be a consideration if you are planning a VFR flight. During a summer morning with a typical shallow ground fog, surface visibility may be reduced below one mile, but visibilities aloft above 1,000 feet will be excellent. By 1000L surface visibilities will improve to 3-4 miles and this haze condition will extend to 5-6,000 feet. By 1400L the surface visibilities will be 5-6 miles and aloft up to 10-12,000 feet may be 1-3 miles.

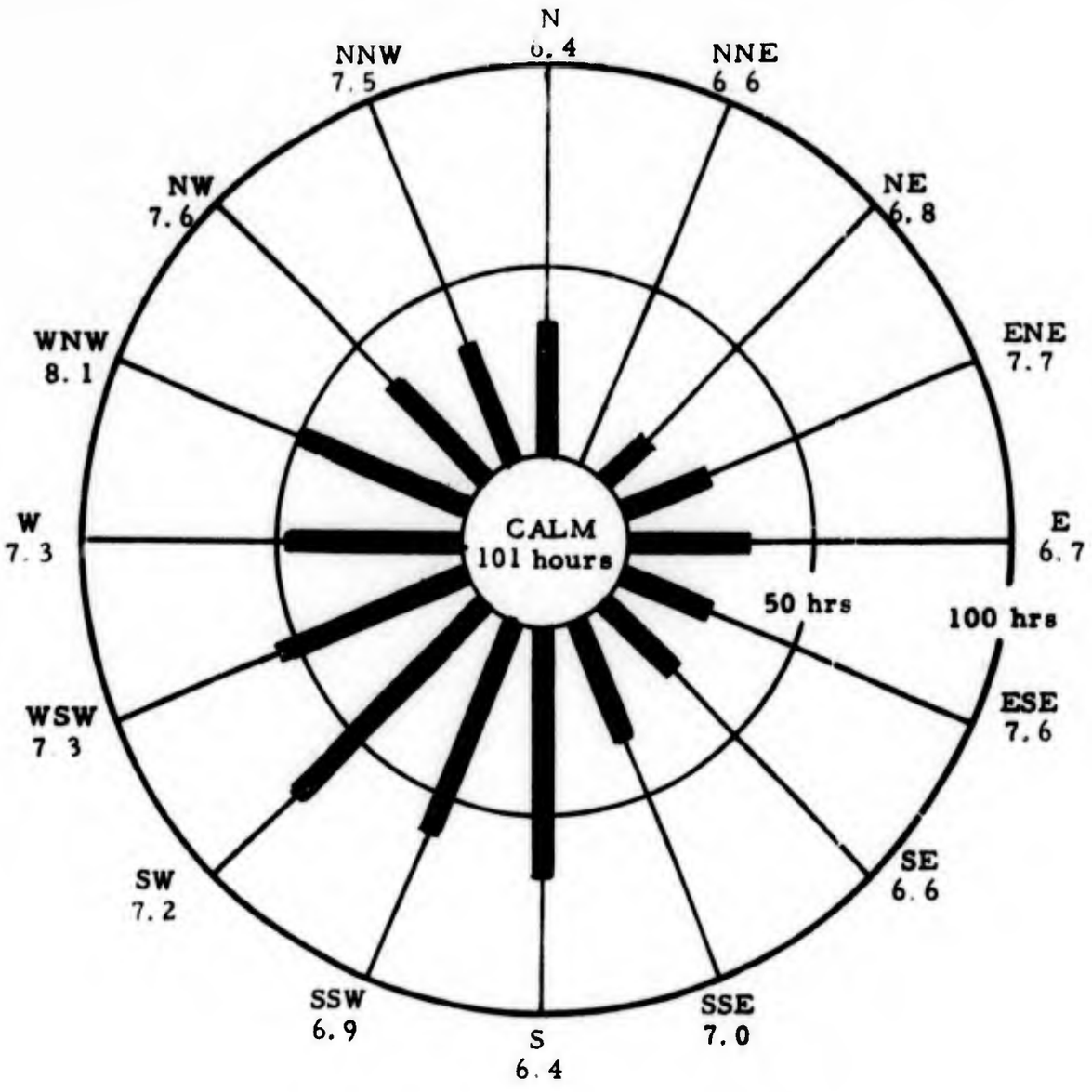
THUNDERSTORMS: Thunderstorms can be expected approximately 18 days per year at McGuire with the maximum activity taking place during the summer months. Thunderstorms have occurred every month of the year and at every hour of the day; however, a distinct maximum is found during the hours from 1200L to 0200L. In general, thunderstorms in this area are not nearly so severe as those found in the mid-west. The majority of occurrences are associated with prefrontal squall lines forming east of the Allegheny Mountains. These squall lines are associated with active

cold fronts which are regularly moving. The occurence of hail with thunderstorms is rare at McGuire. Gusty surface winds, above 35 knots, have occurred, but infrequently. Air mass thunderstorms are usually associated wi: weak southwesterly flow from the Bermuda High which has persisted for 2 days. Turbulence is found at every level in a thunderstorm, but the most severe turbulence usually occurs above 10,000 feet. Severe turbulence may also occur "in the clear" when flying over the top of a developing thunderstorm. Heavy icing conditions are most prevalent in the layer 1,000 feet above the freezing level. During the summer months the freezing level varies from 12-15,000 feet at McGuire.

Detailed statistics for the months noted above begin on the next page.

JUNE

WIND ROSE



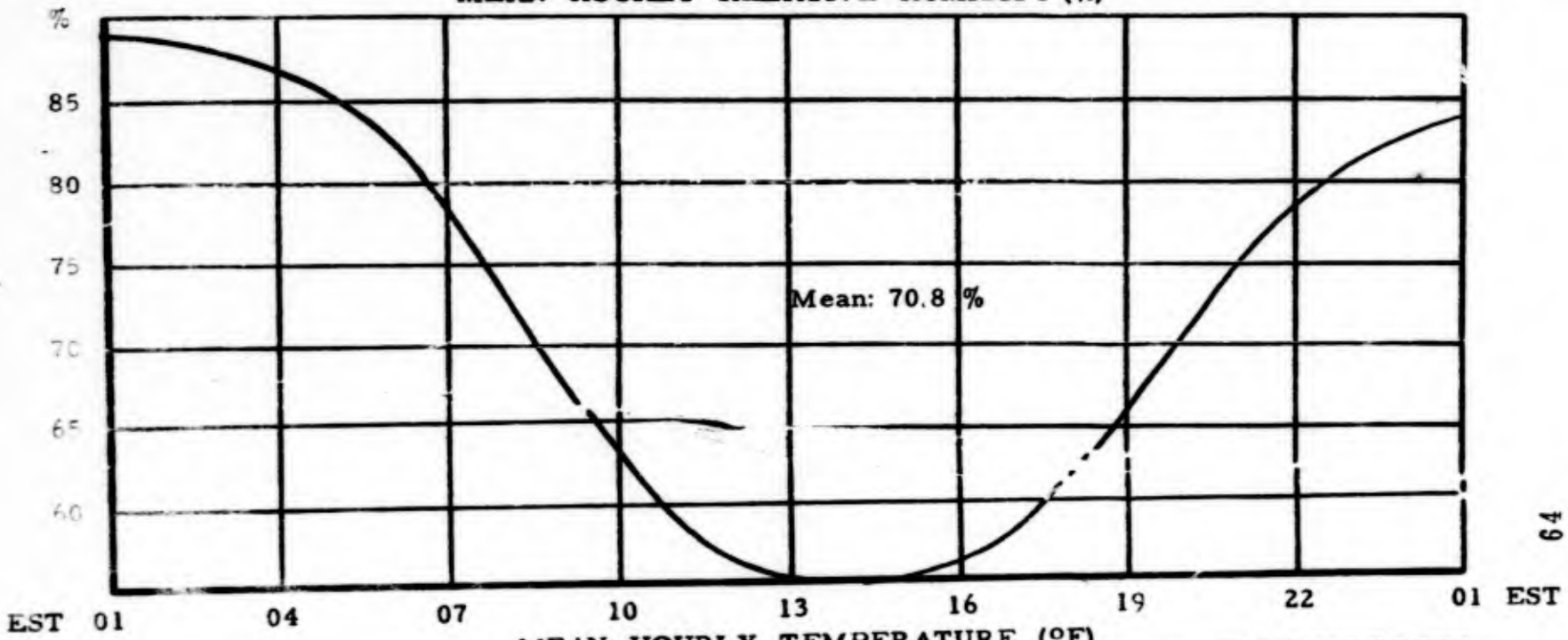
Mean Hourly Speed: 6.1 knots

Prevailing Direction: SW

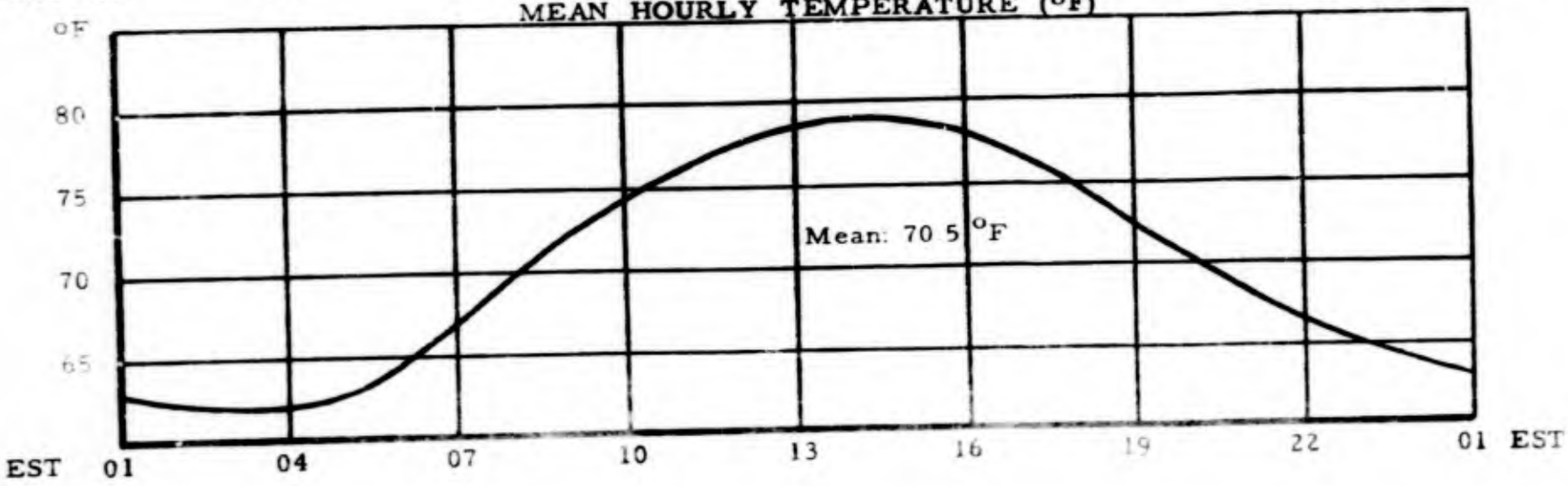
NOTE: Average wind speed in knots for each direction is given next to each wind direction

JUNE

MEAN HOURLY RELATIVE HUMIDITY (%)



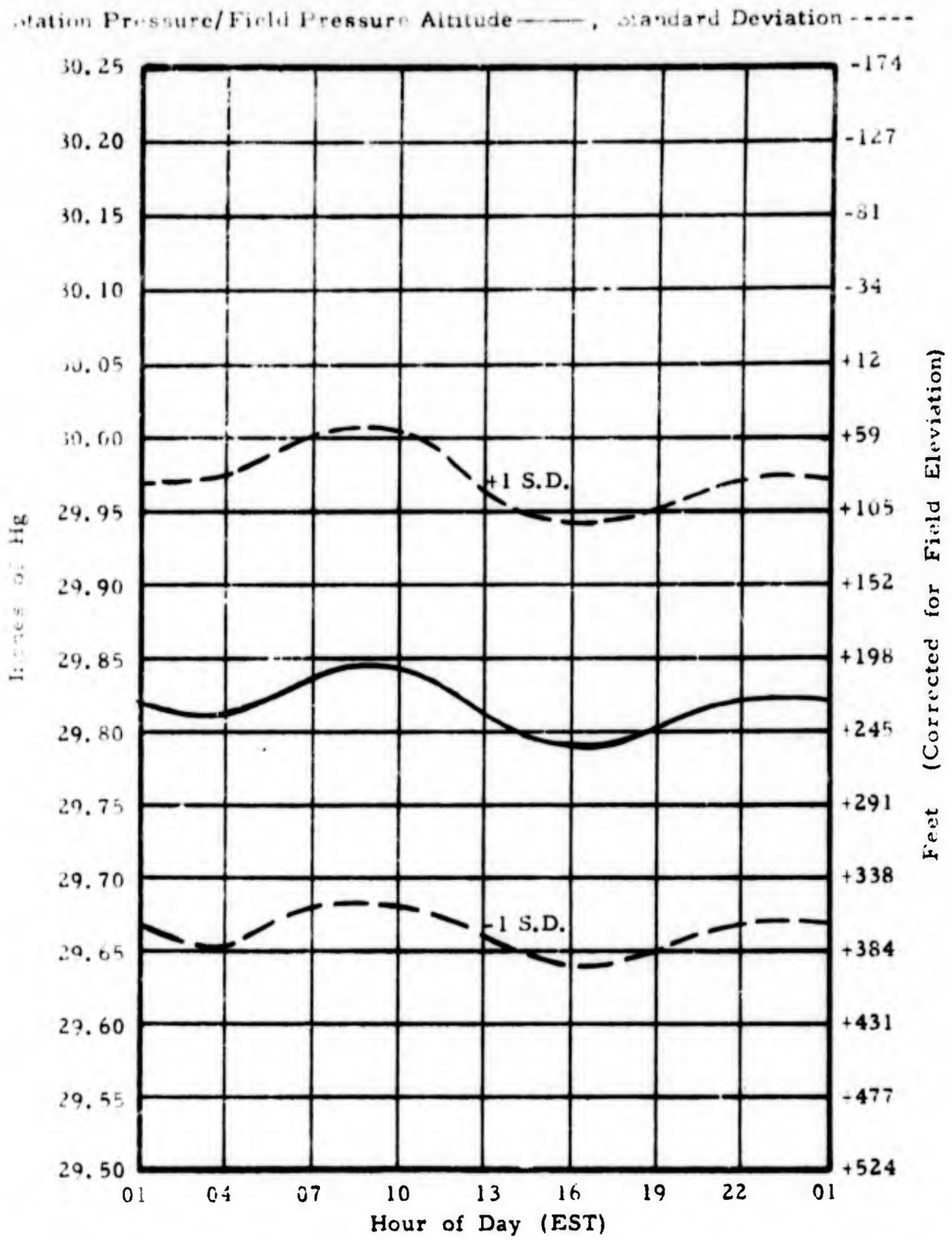
MEAN HOURLY TEMPERATURE (°F)



64

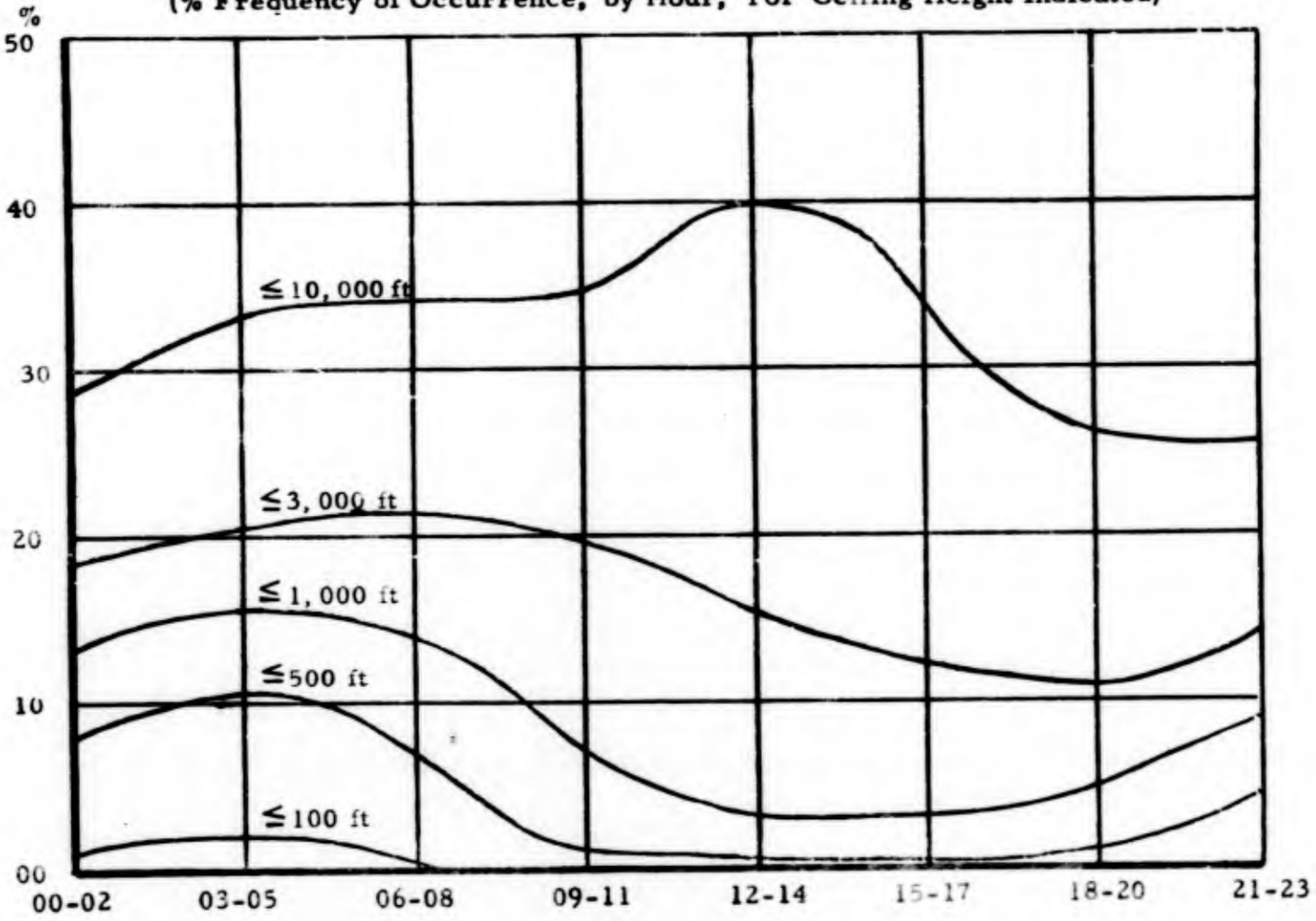
JUNE

MEAN HOURLY STATION PRESSURE (Inches of Hg) / FIELD PRESSURE ALTITUDE (Feet) AND STANDARD DEVIATION



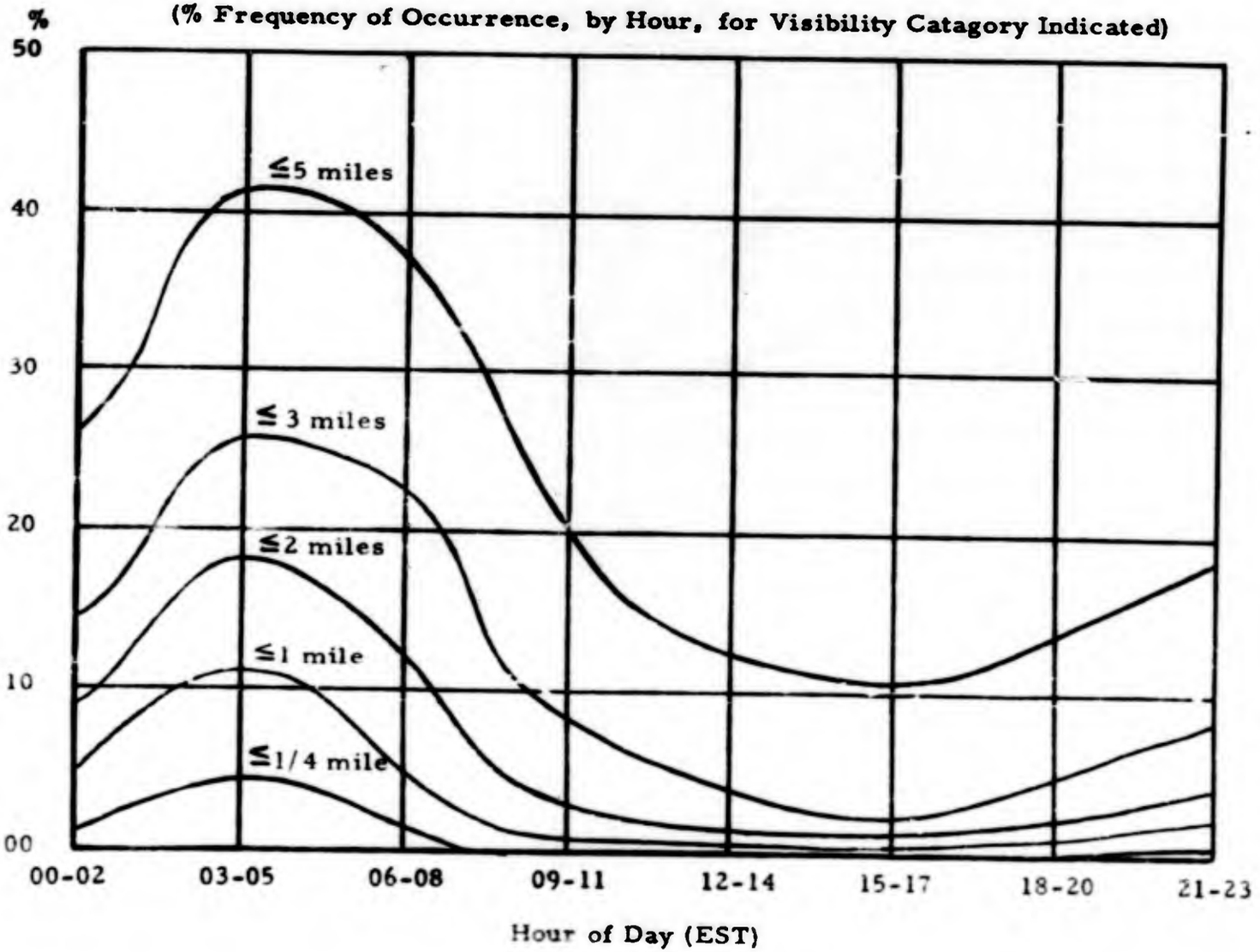
JUNE
CEILINGS

(% Frequency of Occurrence, by Hour, for Ceiling Height Indicated)



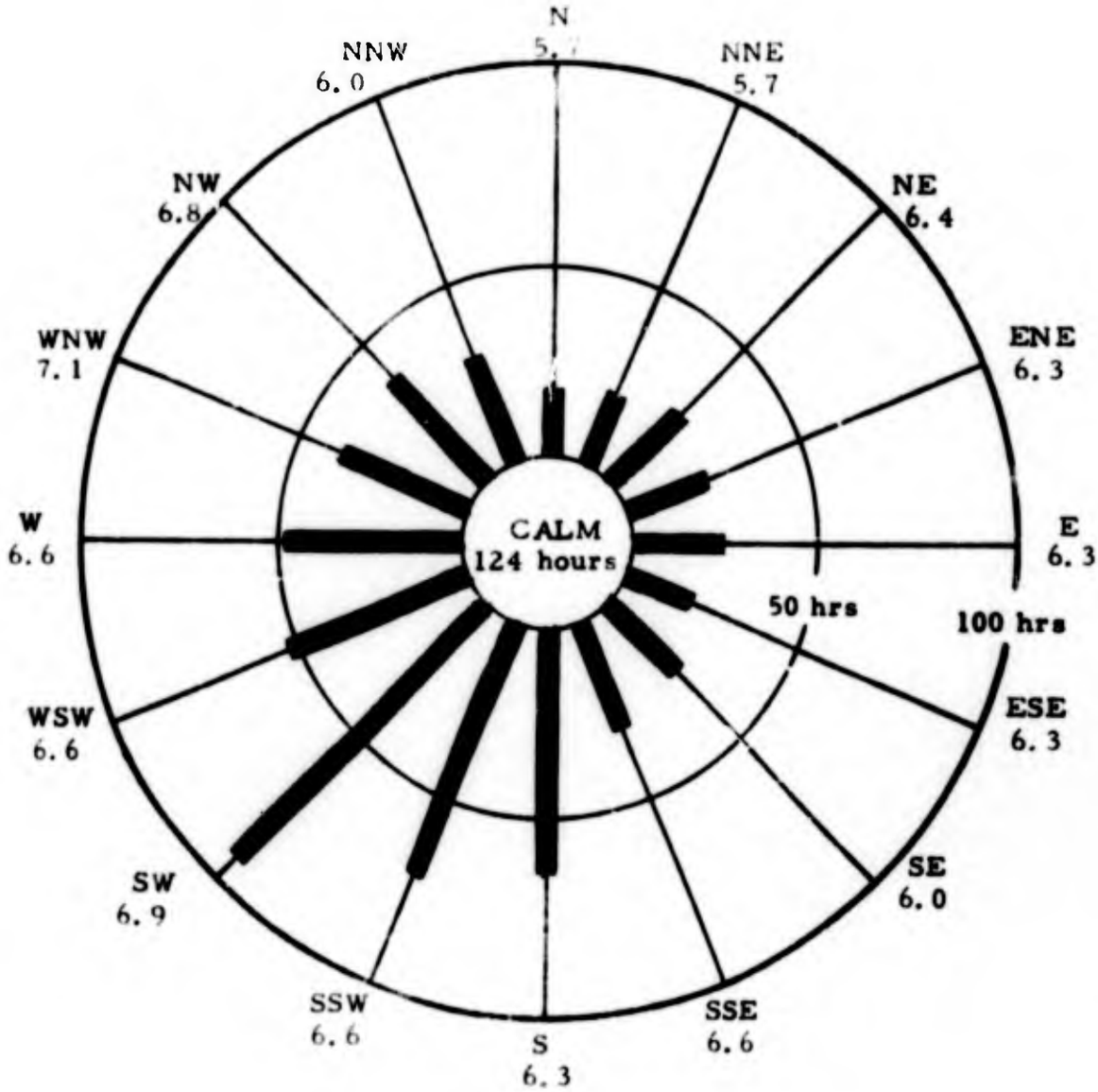
JUNE

VISIBILITY



JULY

WIND ROSE



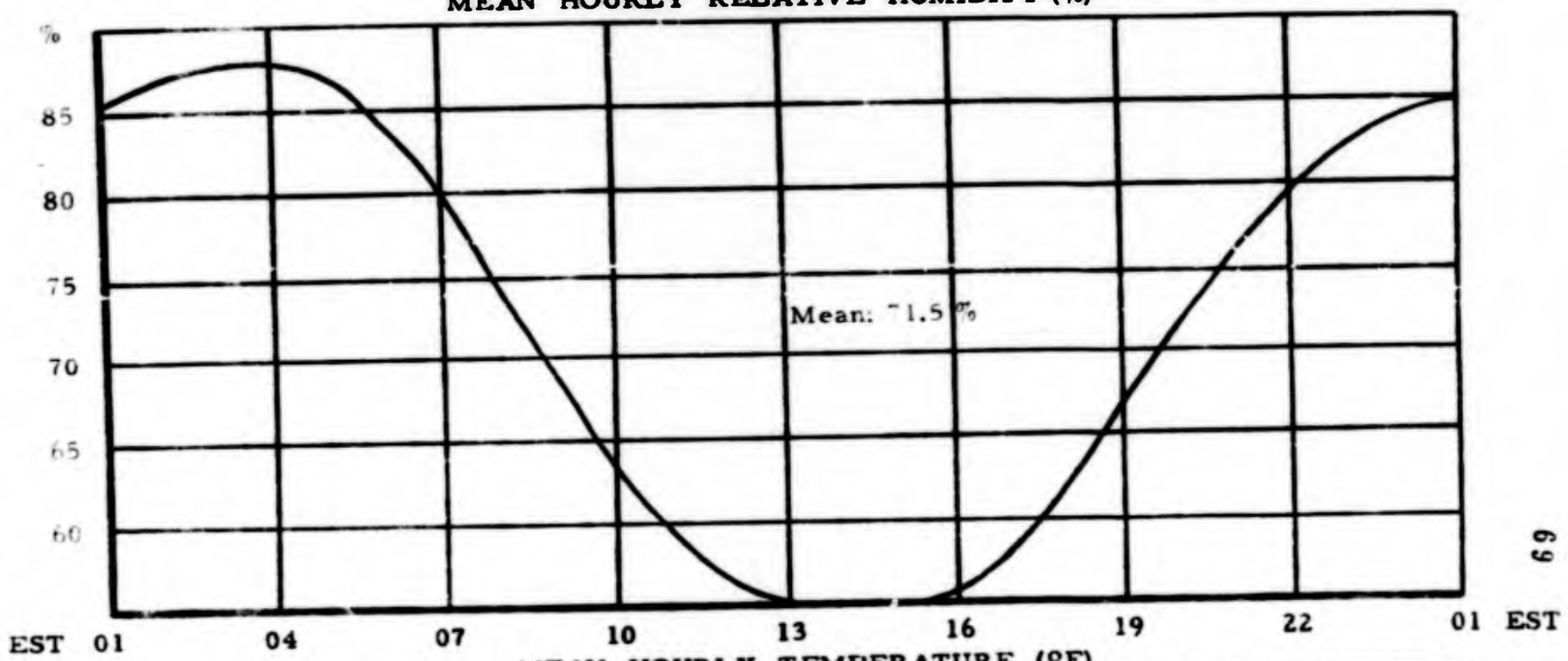
Mean Hourly Speed: 5.4 knots

Prevailing Direction: SW

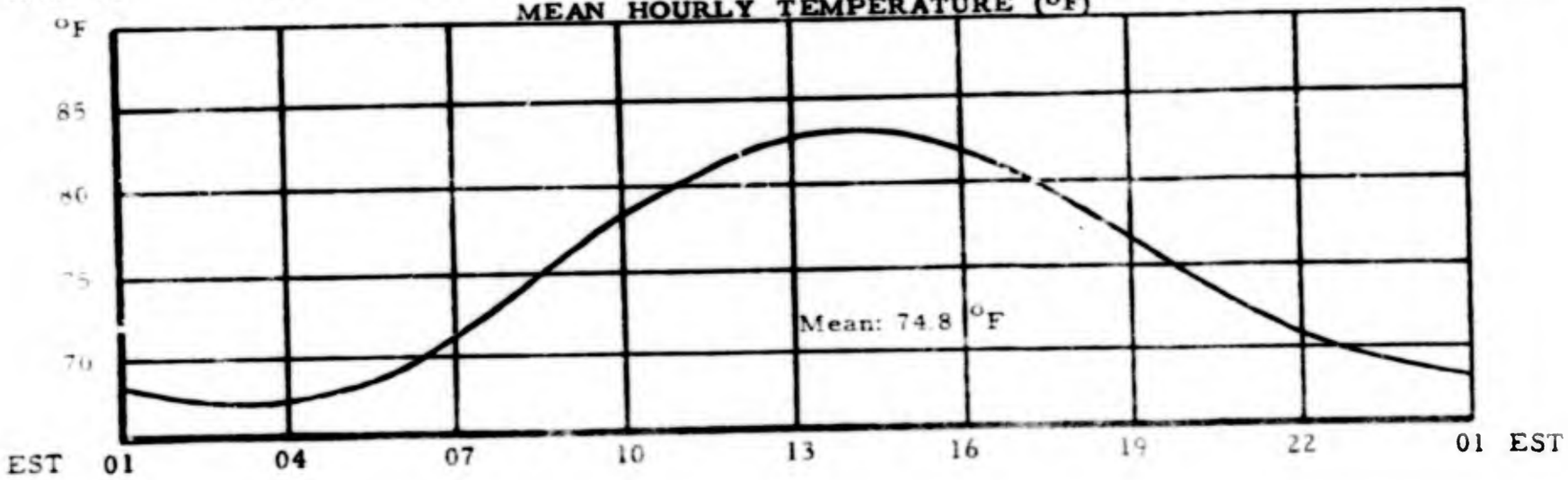
NOTE: Average wind speed in knots for each direction is given next to each wind direction

JULY

MEAN HOURLY RELATIVE HUMIDITY (%)

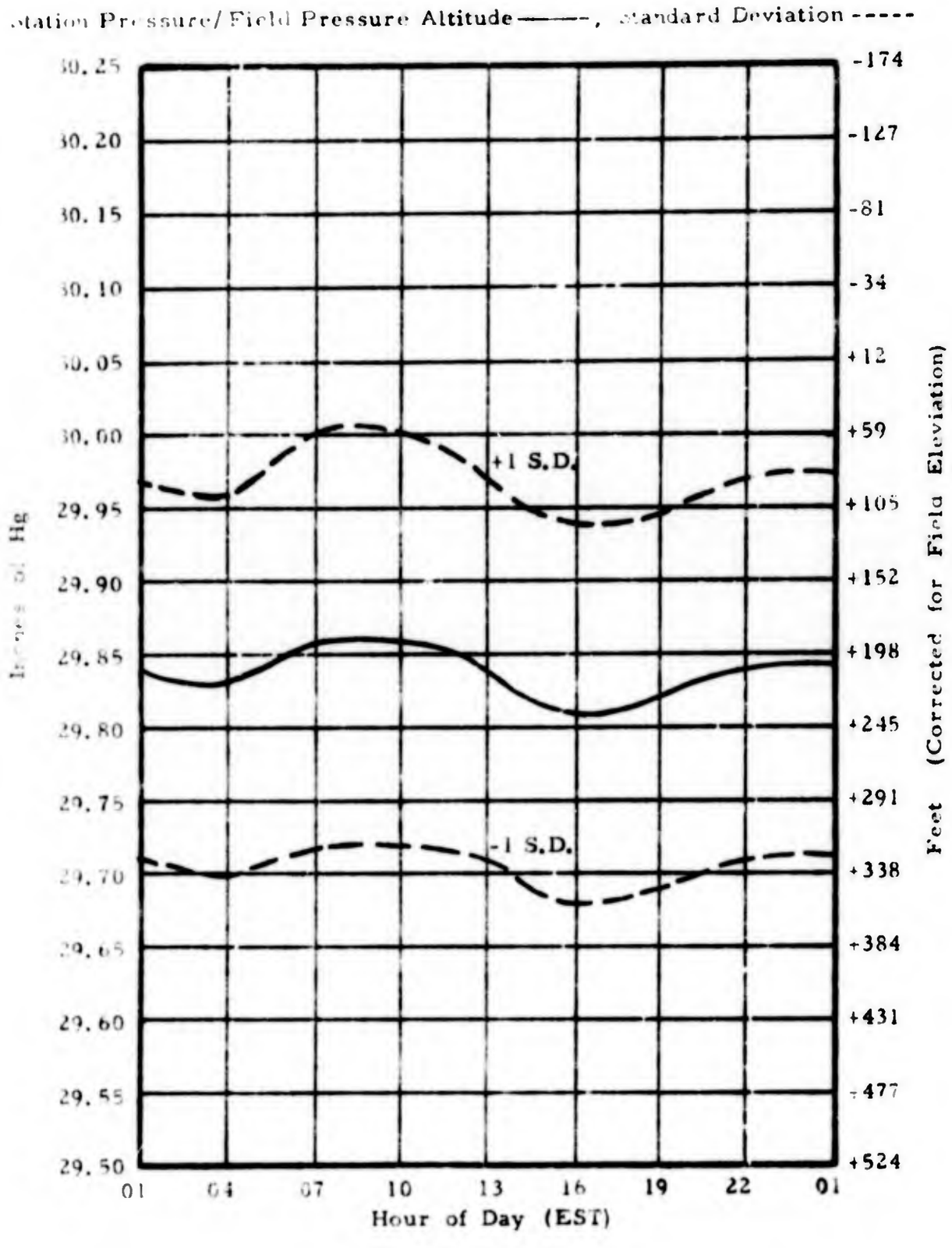


MEAN HOURLY TEMPERATURE (°F)



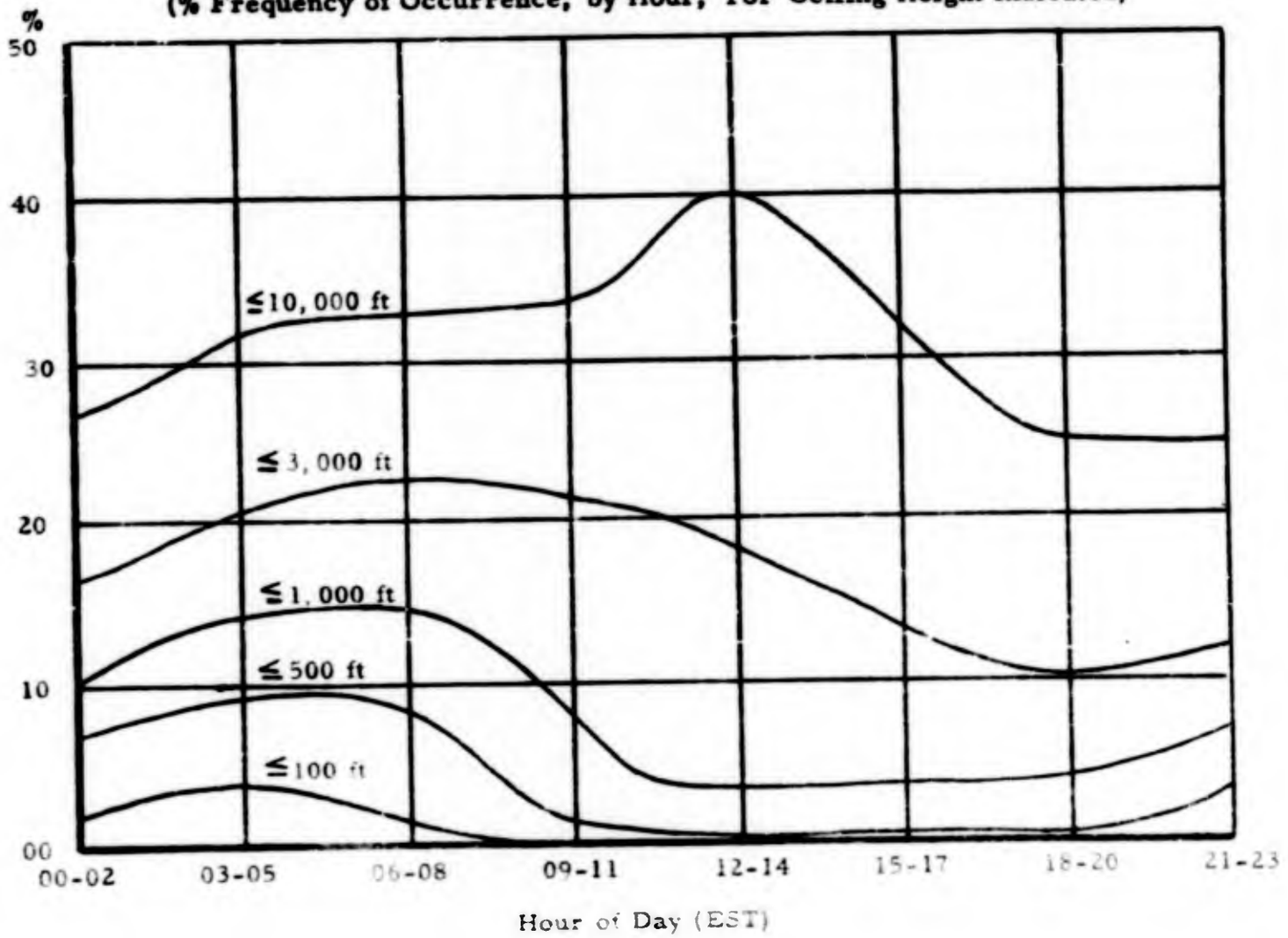
JULY

MEAN HOURLY STATION PRESSURE (Inches of Hg) / FIELD PRESSURE ALTITUDE (Feet) AND STANDARD DEVIATION



JULY
CEILINGS

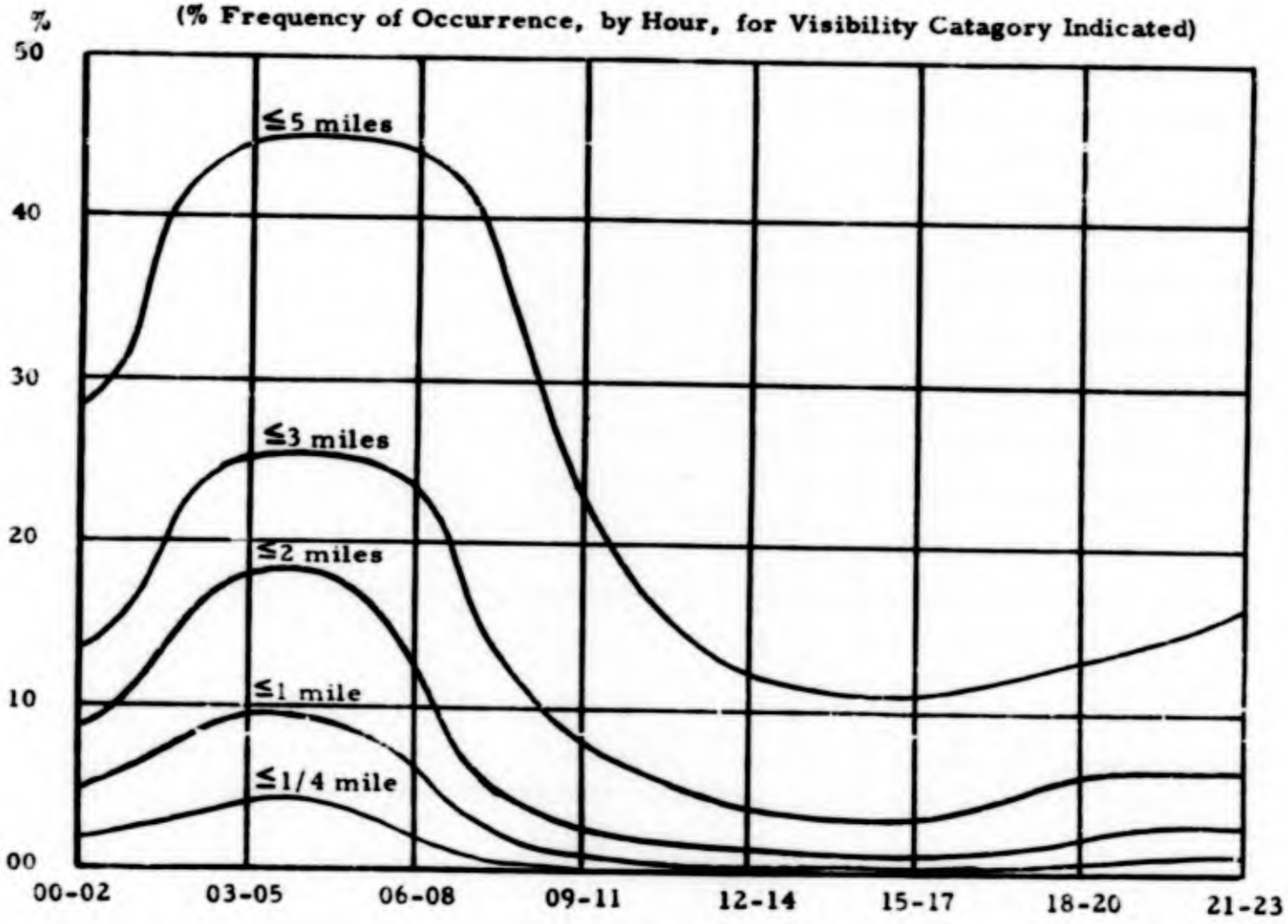
(% Frequency of Occurrence, by Hour, for Ceiling Height Indicated)



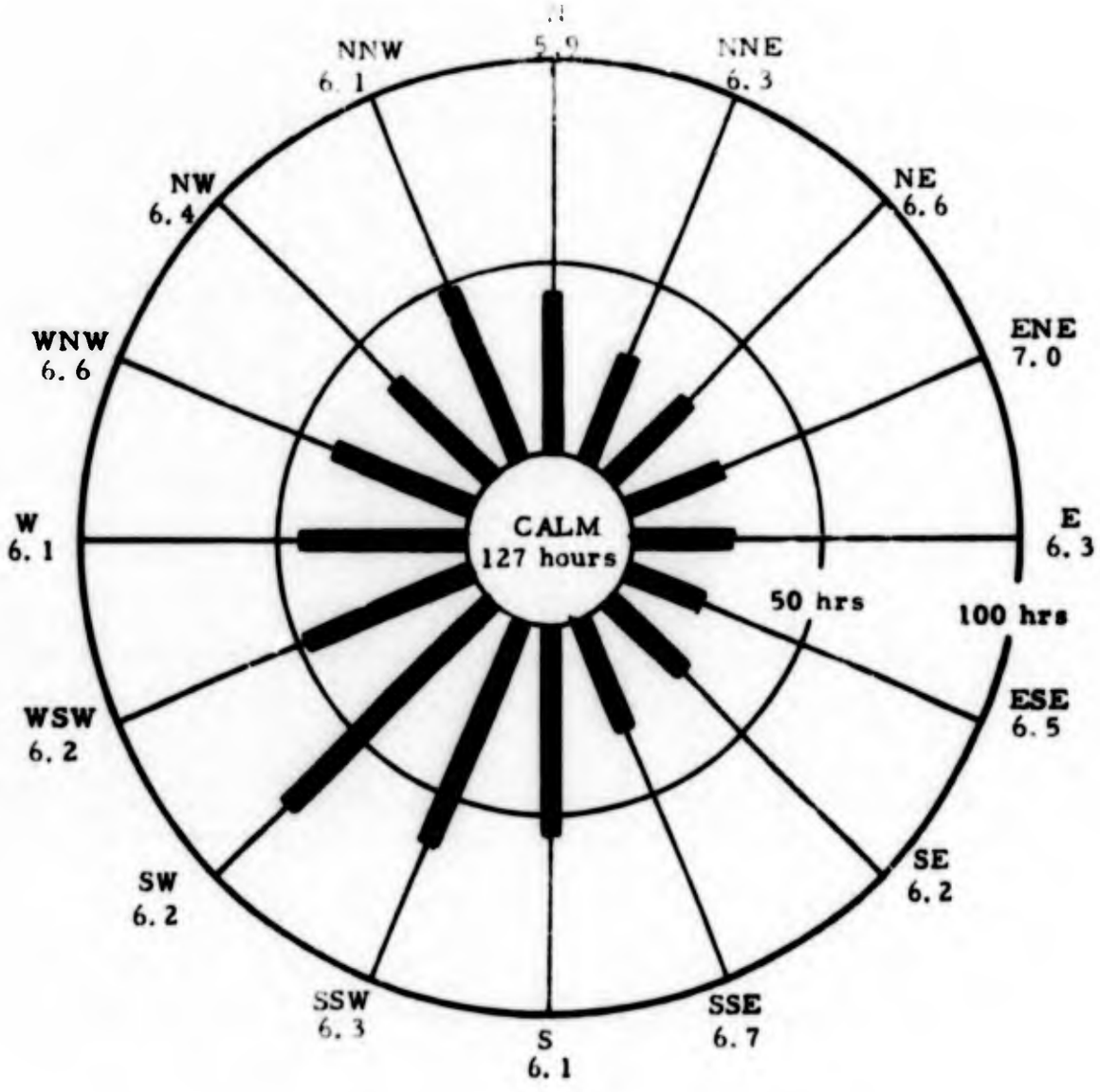
JULY

VISIBILITY

(% Frequency of Occurrence, by Hour, for Visibility Catagory Indicated)



AUGUST
WIND ROSE



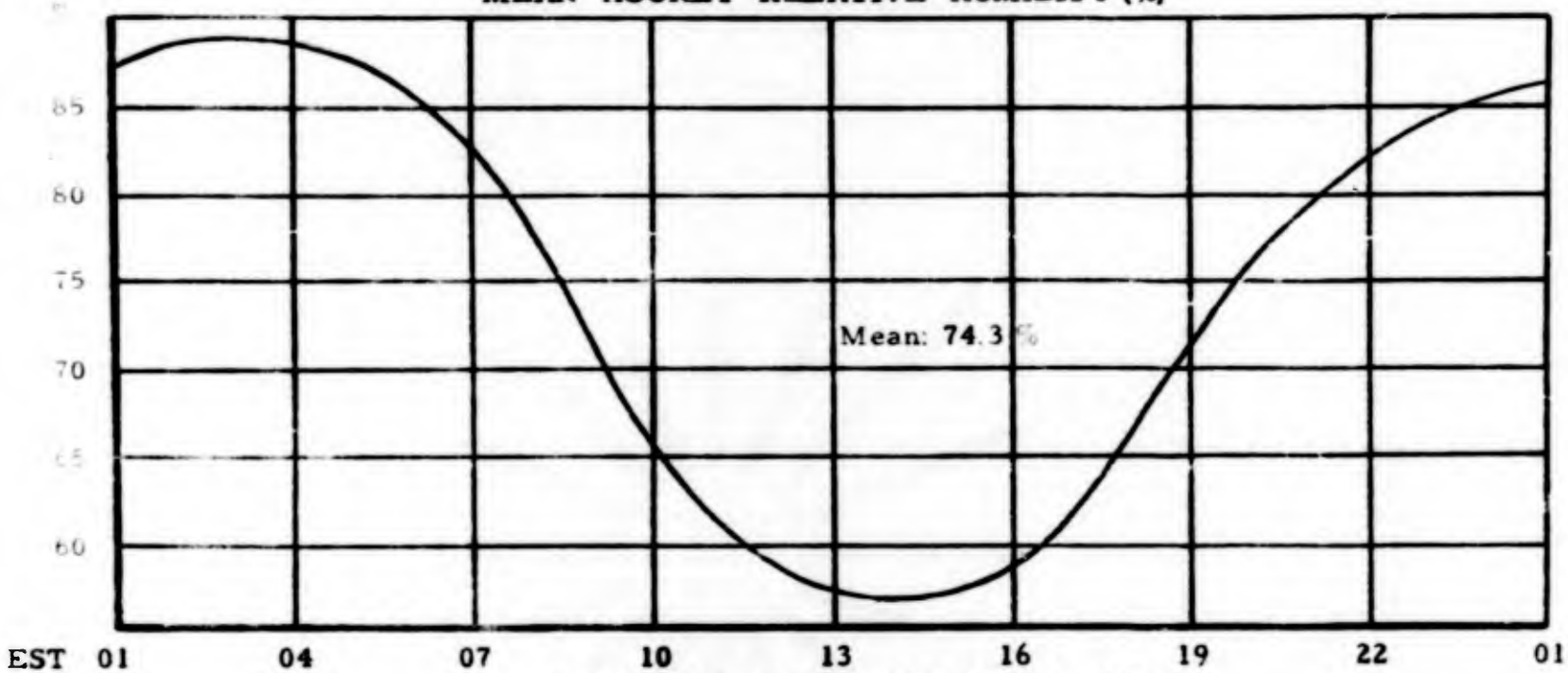
Mean Hourly Speed: 5.2 knots

Prevailing Direction: SW

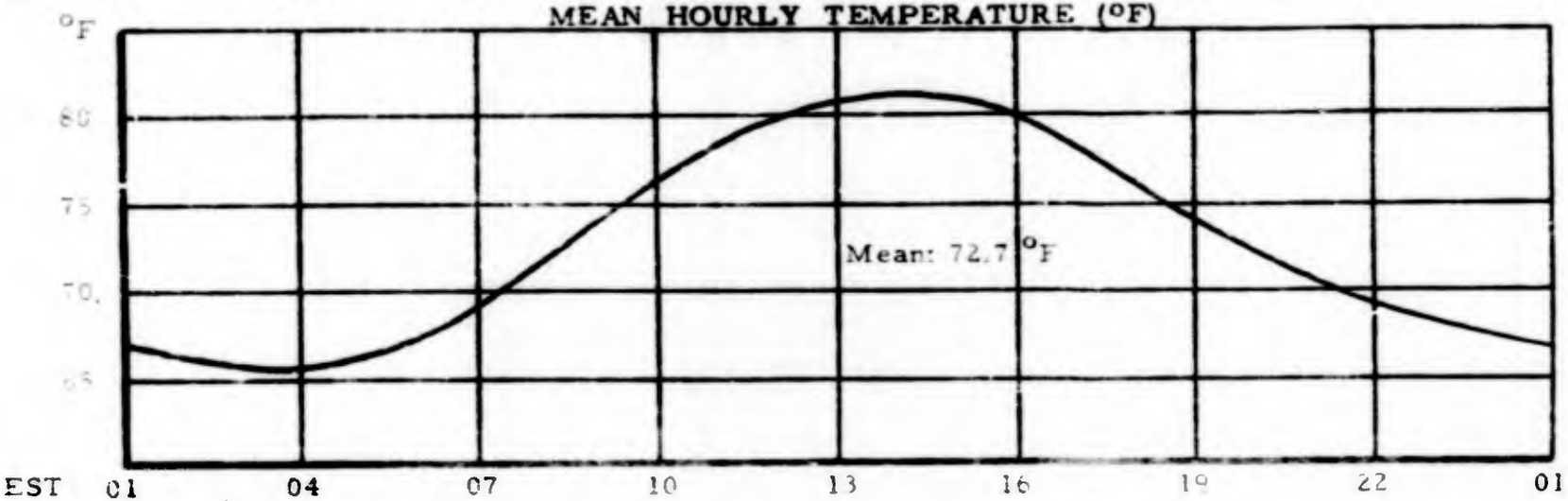
NOTE: Average wind speed in knots for each direction is given next to each wind direction

AUGUST

MEAN HOURLY RELATIVE HUMIDITY (%)

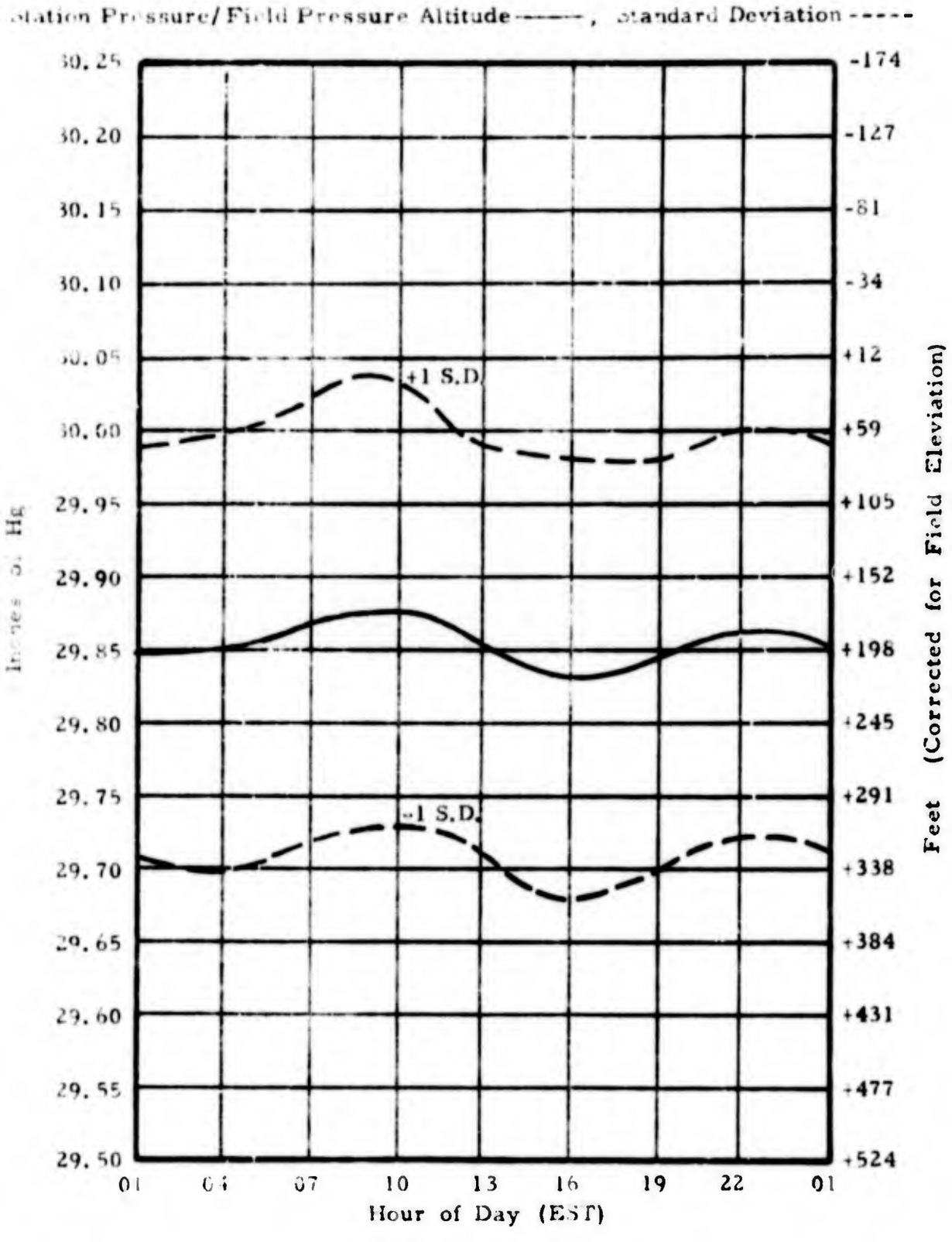


MEAN HOURLY TEMPERATURE (°F)



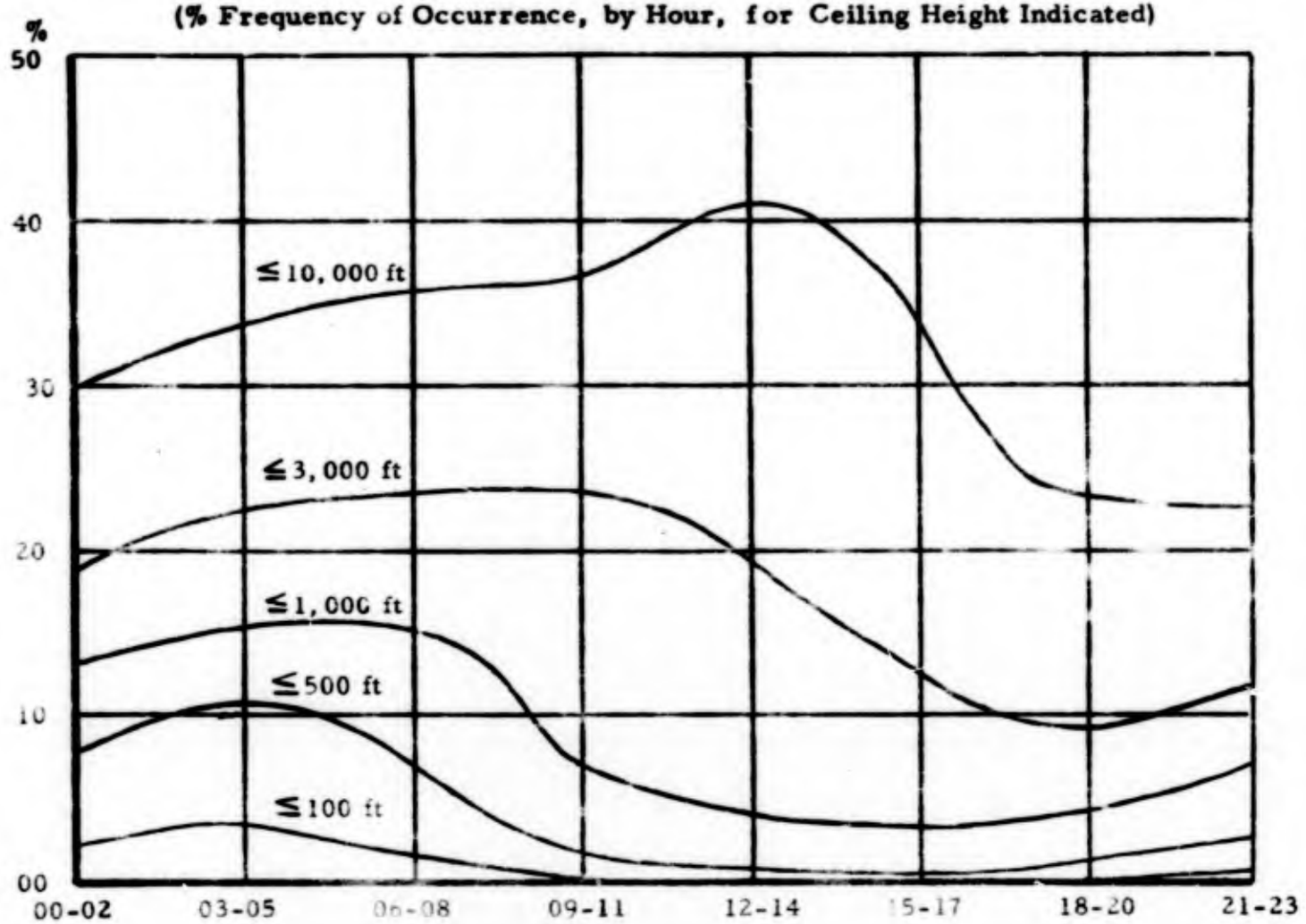
AUGUST

MEAN HOURLY STATION PRESSURE (Inches of Hg) / FIELD PRESSURE ALTITUDE (Feet) AND STANDARD DEVIATION

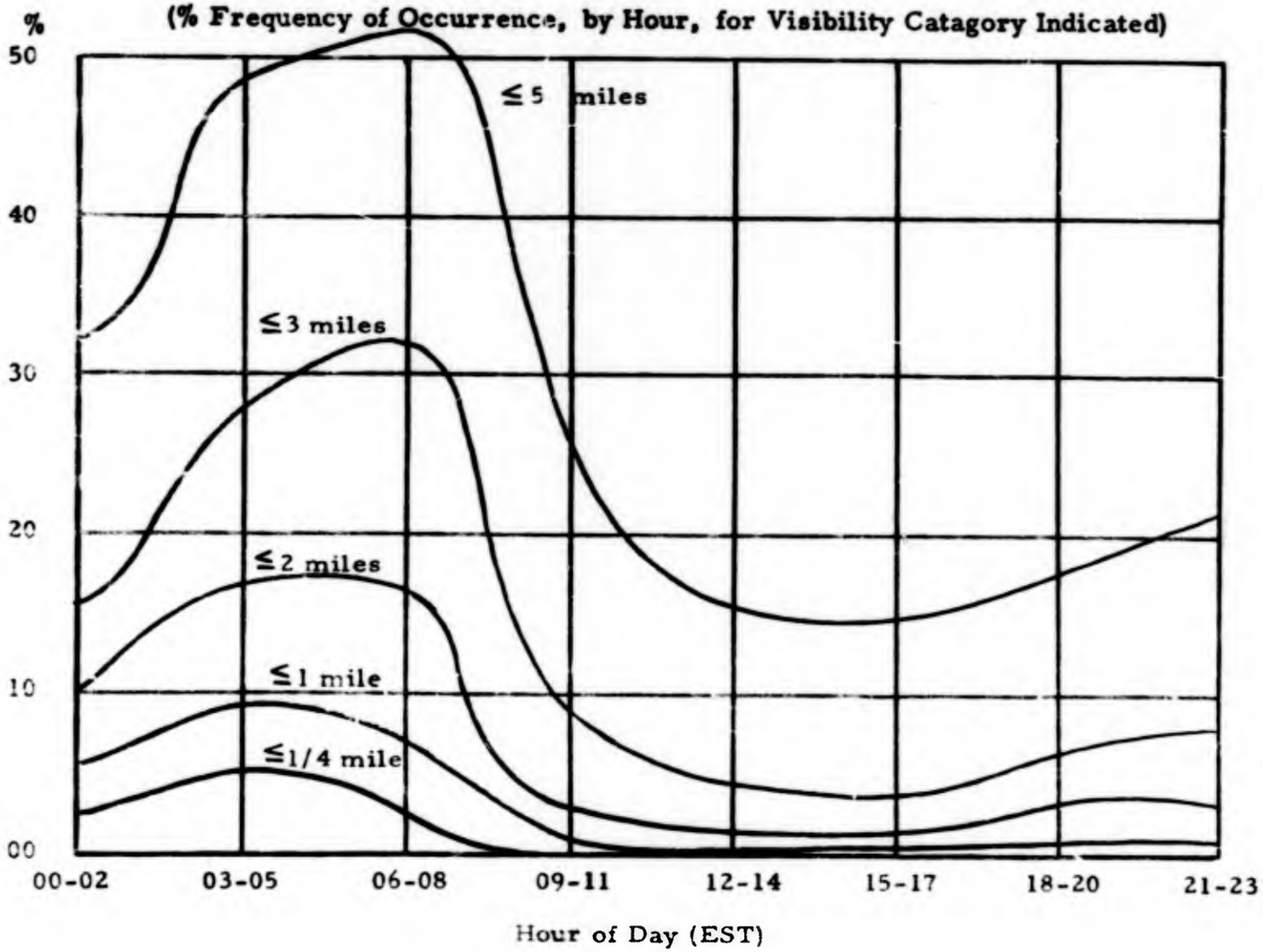


AUGUST
CEILINGS

(% Frequency of Occurrence, by Hour, for Ceiling Height Indicated)



AUGUST
VISIBILITY



FALL CLIMATE AND FLYING CONDITIONS

SEPTEMBER, OCTOBER, NOVEMBER

GENERAL: During the fall the warm Bermuda High gives way to the building continental polar high. Typical winter cyclonic activity increases as evidenced by the averaged number of frontal passages which increases from 8 in July to over 12 in November. But during this transition period, shower activity has noticeably decreased and storminess associated with winter cyclones and fronts is not yet well developed. Accordingly, fall has the reputation of being one of the periods of genrally good weather. The average cloud cover is less during fall than any other season. The chance of thunderstorms in September is only one third that of August. The mean number of days with measureable precipitation is at a minimum in October. Winter really begins in November and snowfalls of two inches or more have been recorded.

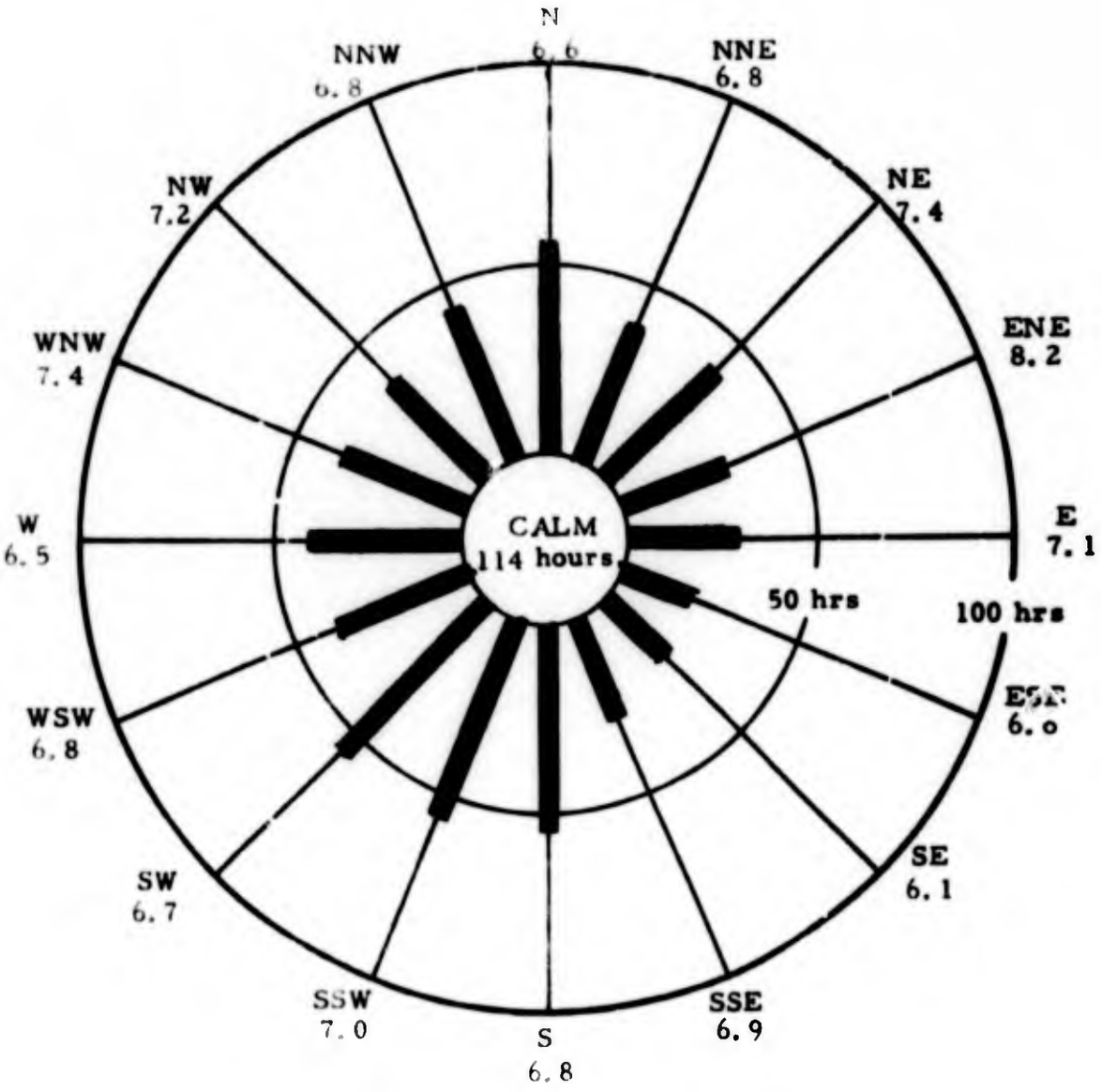
PRECIPITATION: September shows a marked decrease in precipitation amount over August; however, occurrences of continuous rain and/or drizzle are on the increase. Thunderstorm activity decreases in September and approaches a near zero probability in November. Rainfall is evenly distributed over the three month period and averages 3.36 inches per month.

TEMPERATURE: The mean daily temperature drops from 73.2°F in August to 66.4°F in September and continues to drop on the average of 10°F per month. The mean number of days with temperatures below 32°F averages 8.1 days in October and 8.9 days in November.

FLYING CONDITIONS: September is in most respects similar to the summer months. Radiation fog is the primary cause of reduced visibility which occurs with a high frequency in the early morning hours and improves rapidly by mid-morning. There is a gradual increase in fog and low stratus ceilings due in part to tropical storms and hurricanes which have their highest frequency of occurrence in September. Below field minimum conditions (100 feet and/or 1/4 mile) can be expected on the average of 12.1 hours per month for the three month period. Surface winds which have a prevailing direction from the southwest in September and October change to a west-northwesterly direction in November. The average wind speed increases from 5.8 knots in September to 7.0 knots in November.

Detailed statistics for the months noted above begin on the next page.

SEPTEMBER
WIND ROSE



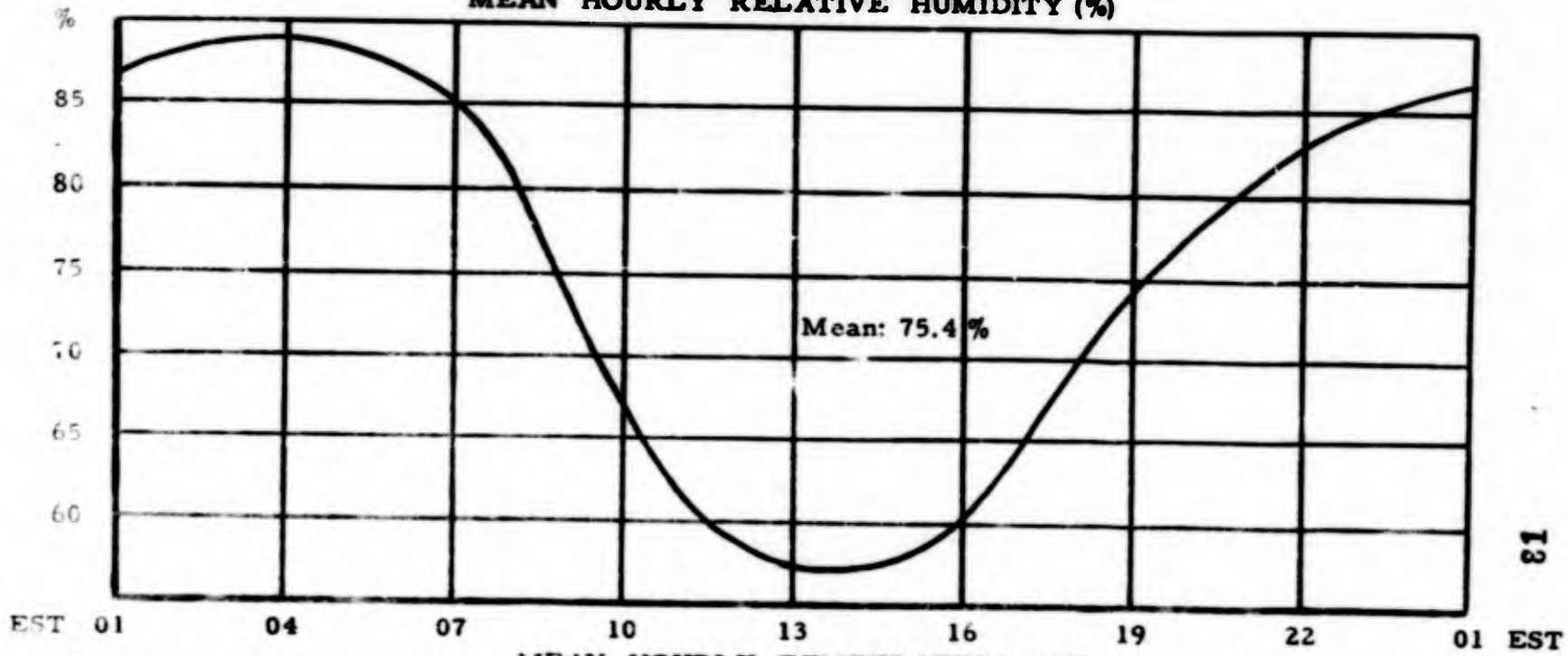
Mean Hourly Speed: 5.8 knots

Prevailing Direction: SW

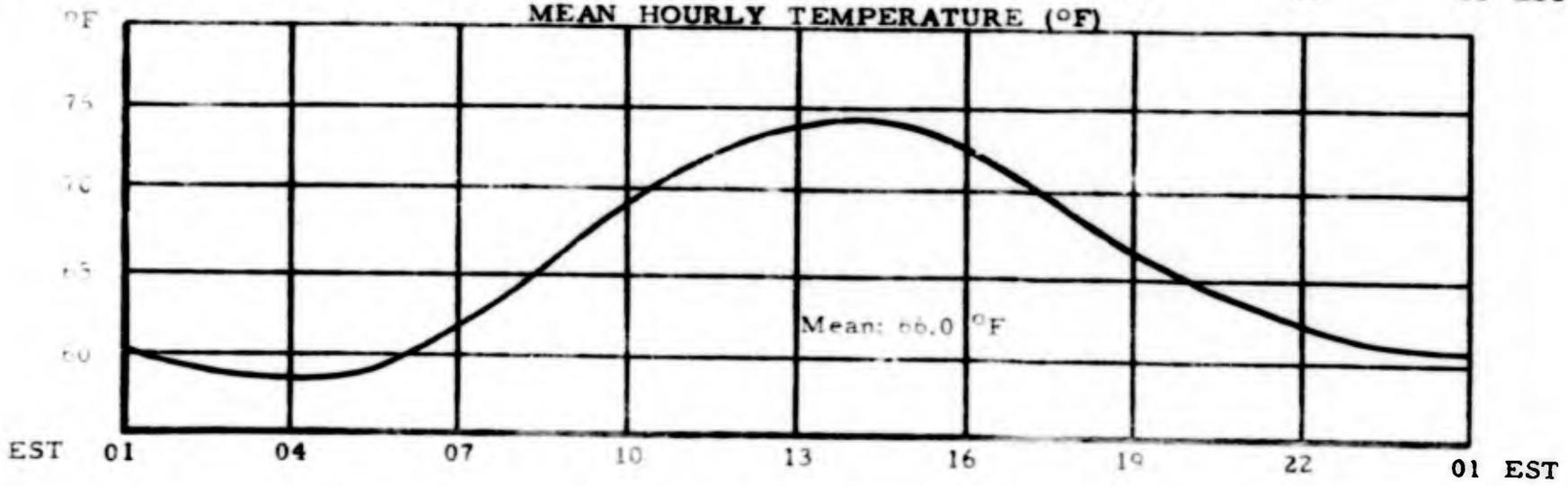
NOTE: Average wind speed in knots for each direction is given next tc each wind direction

SEPTEMBER

MEAN HOURLY RELATIVE HUMIDITY (%)

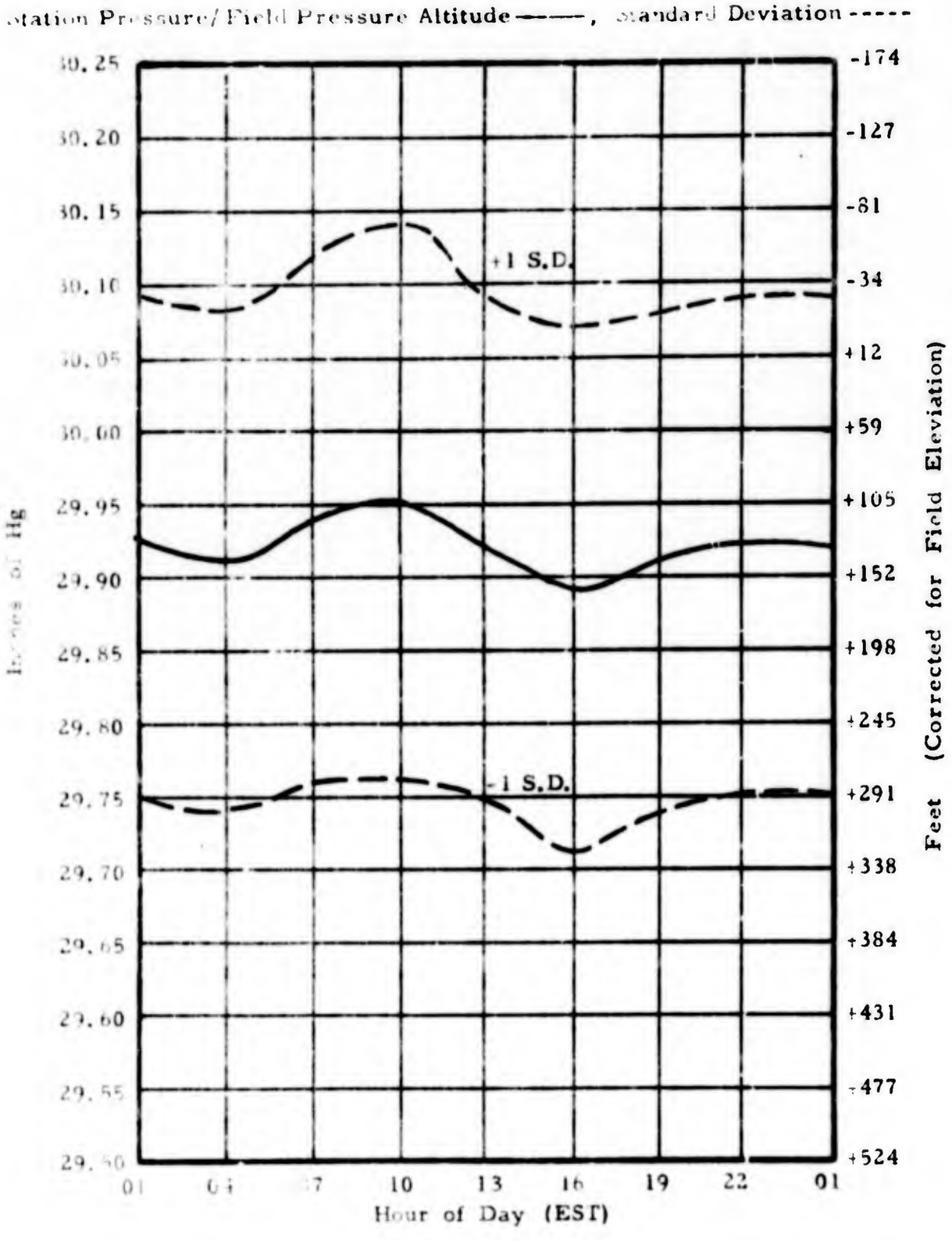


MEAN HOURLY TEMPERATURE (°F)

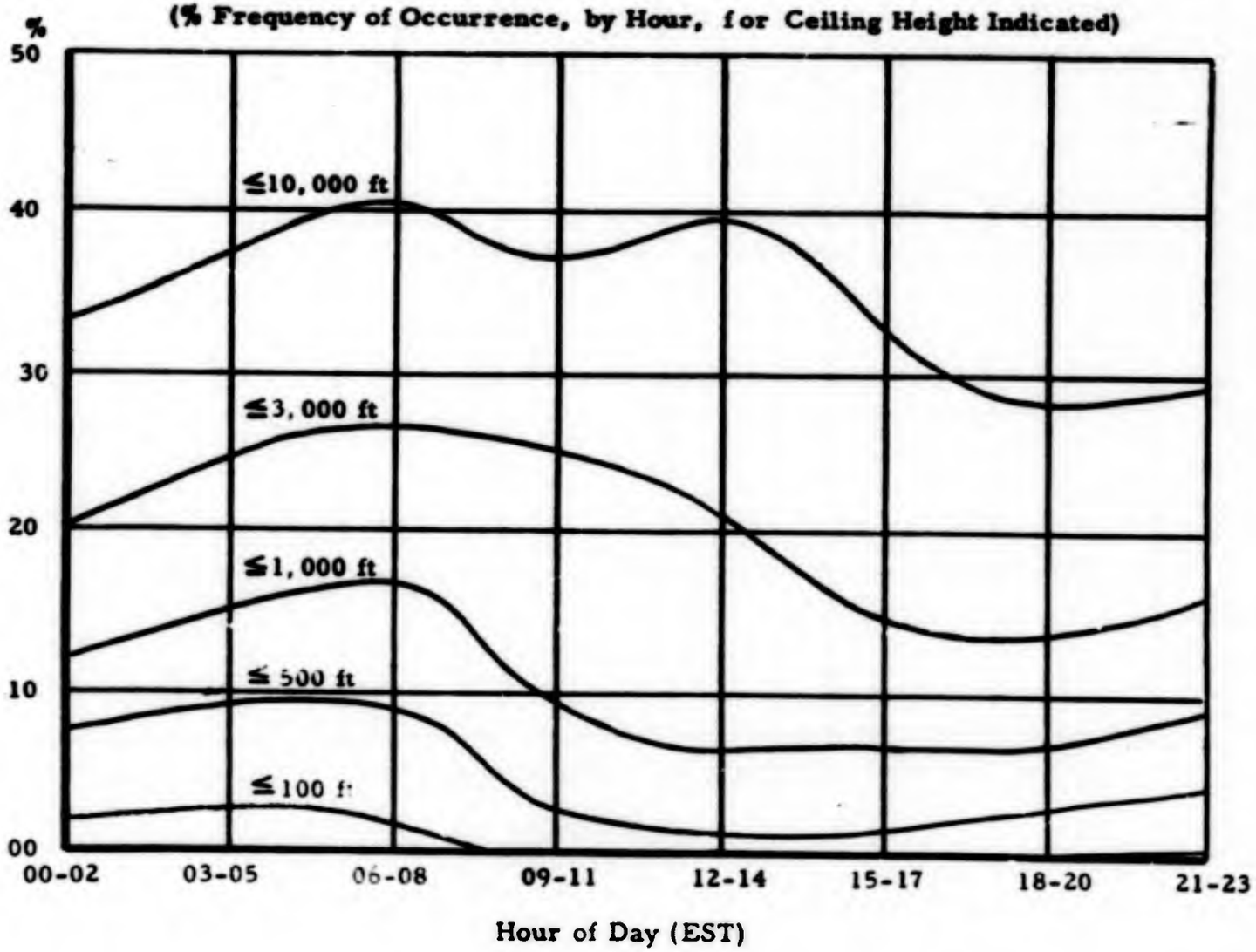


SEPTEMBER

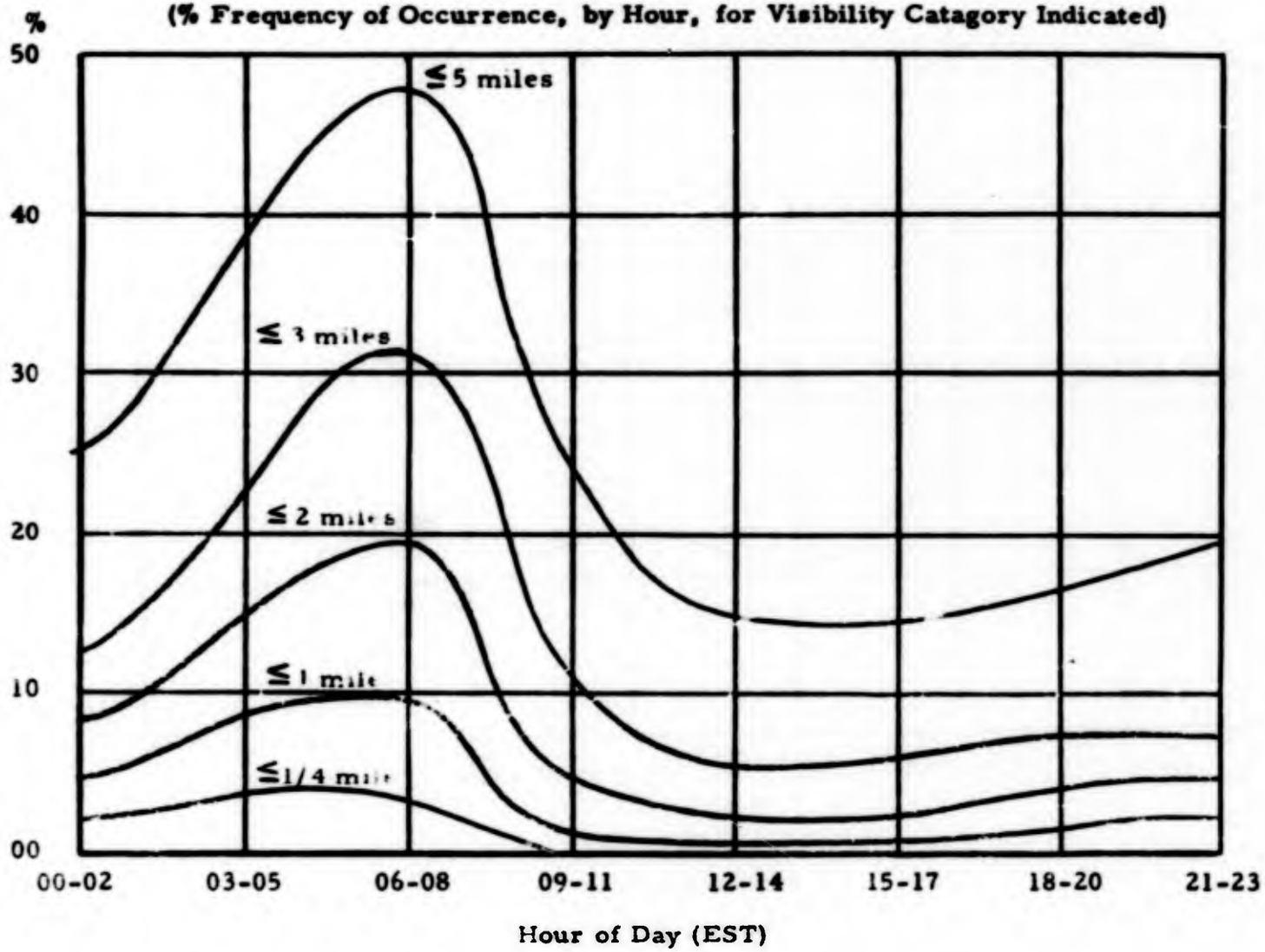
MEAN HOURLY STATION PRESSURE (Inches of Hg) / FIELD PRESSURE ALTITUDE (Feet) AND STANDARD DEVIATION



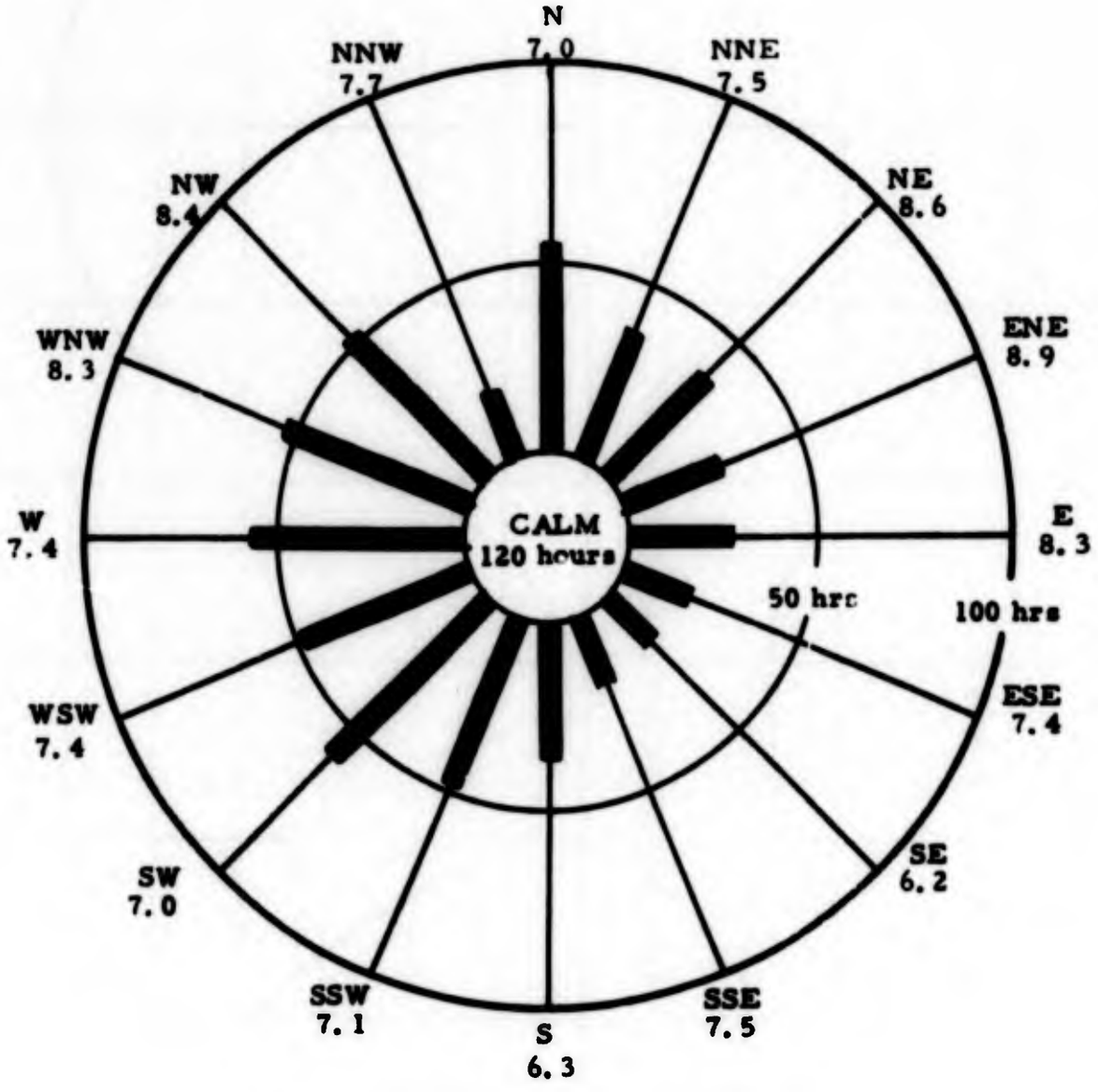
SEPTEMBER
CEILINGS



SEPTEMBER
VISIBILITY



OCTOBER
WIND ROSE

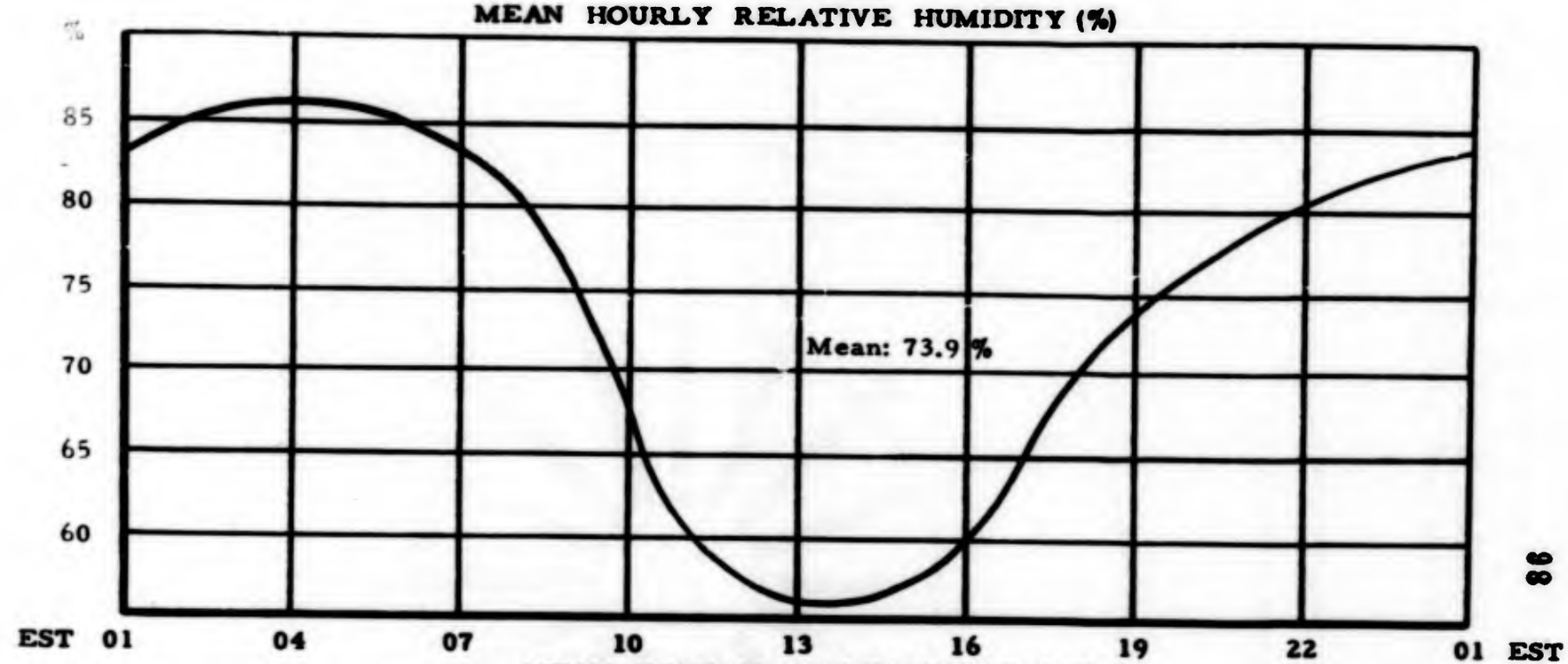


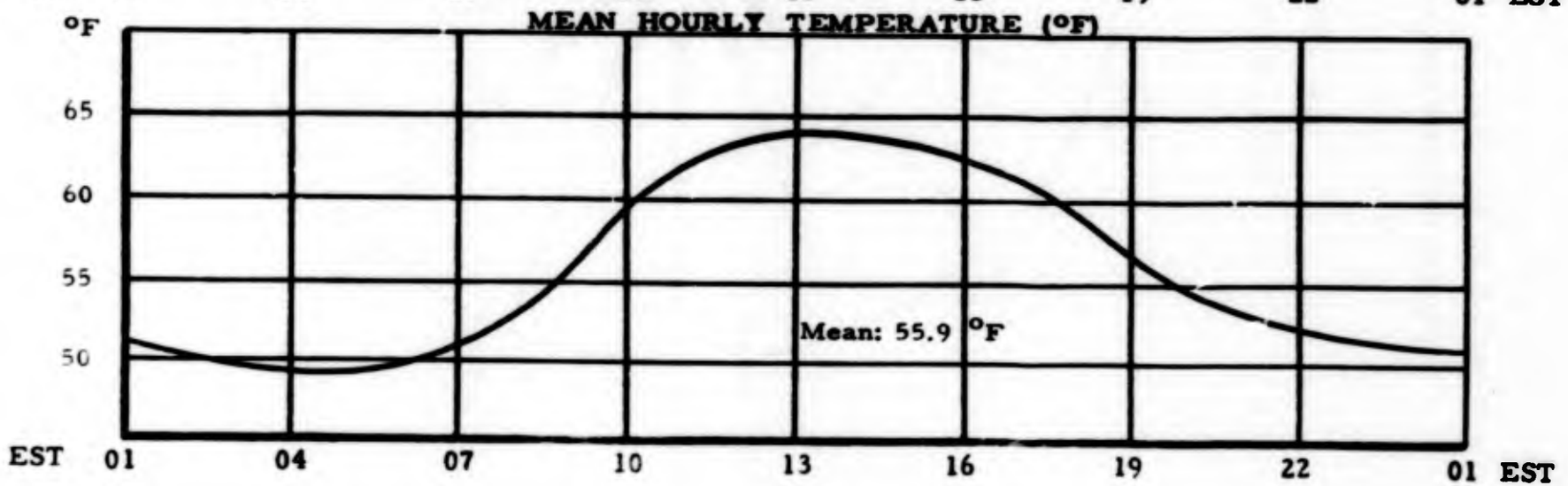
Mean Hourly Speed: 6.4 knots

Prevailing Direction: SW

NOTE: Average wind speed in knots for each direction is given next to each wind direction

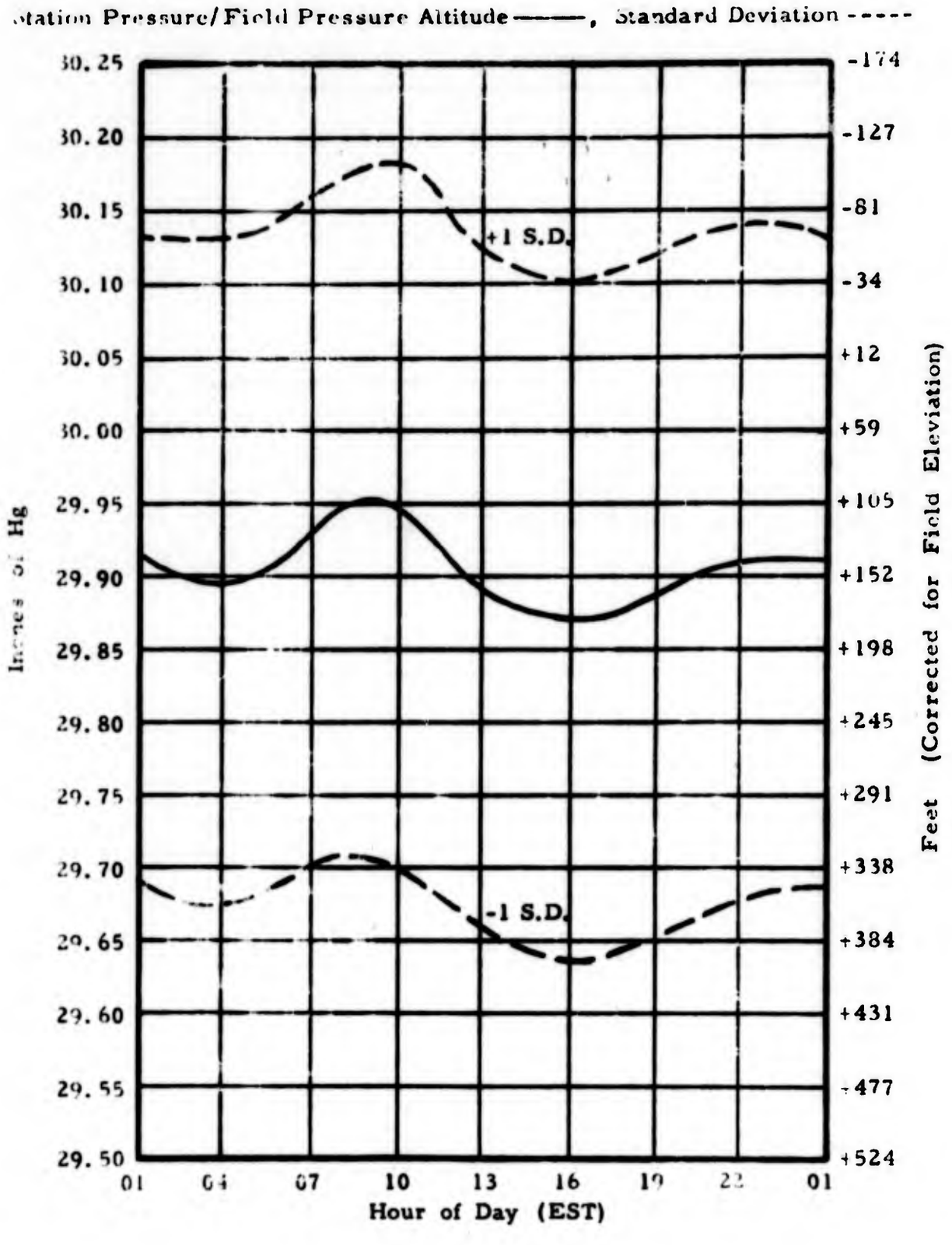
OCTOBER


MEAN HOURLY RELATIVE HUMIDITY (%)
%
85
80
75
70
65
60
Mean: 73.9 %
EST 01
04
07
10
13
16
19
22
01 EST

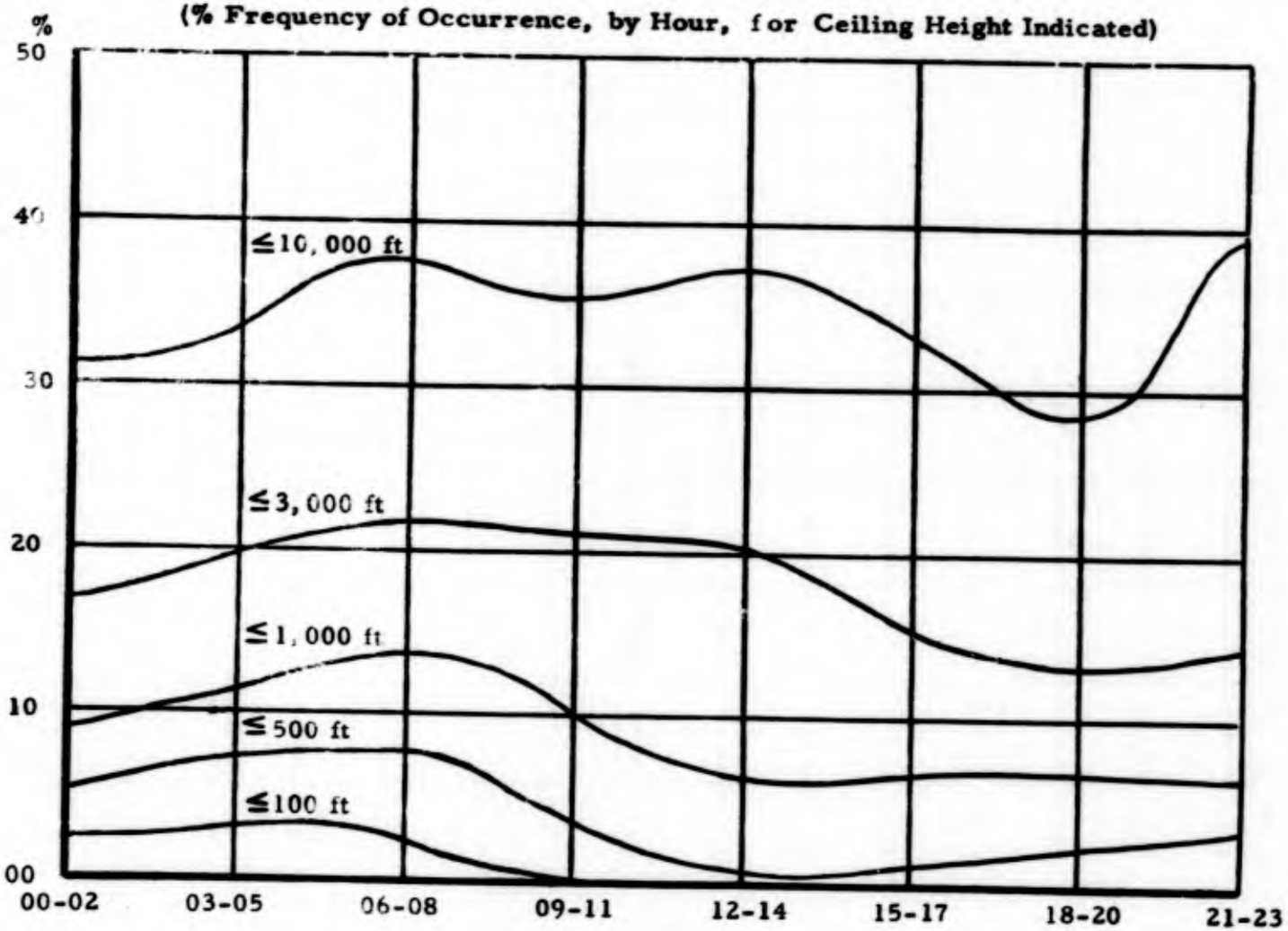

MEAN HOURLY TEMPERATURE (°F)
°F
65
60
55
50
Mean: 55.9 °F
EST 01
04
07
10
13
16
19
22
01 EST

OCTOBER

MEAN HOURLY STATION PRESSURE (Inches of Hg) / FIELD PRESSURE ALTITUDE (Feet) AND STANDARD DEVIATION

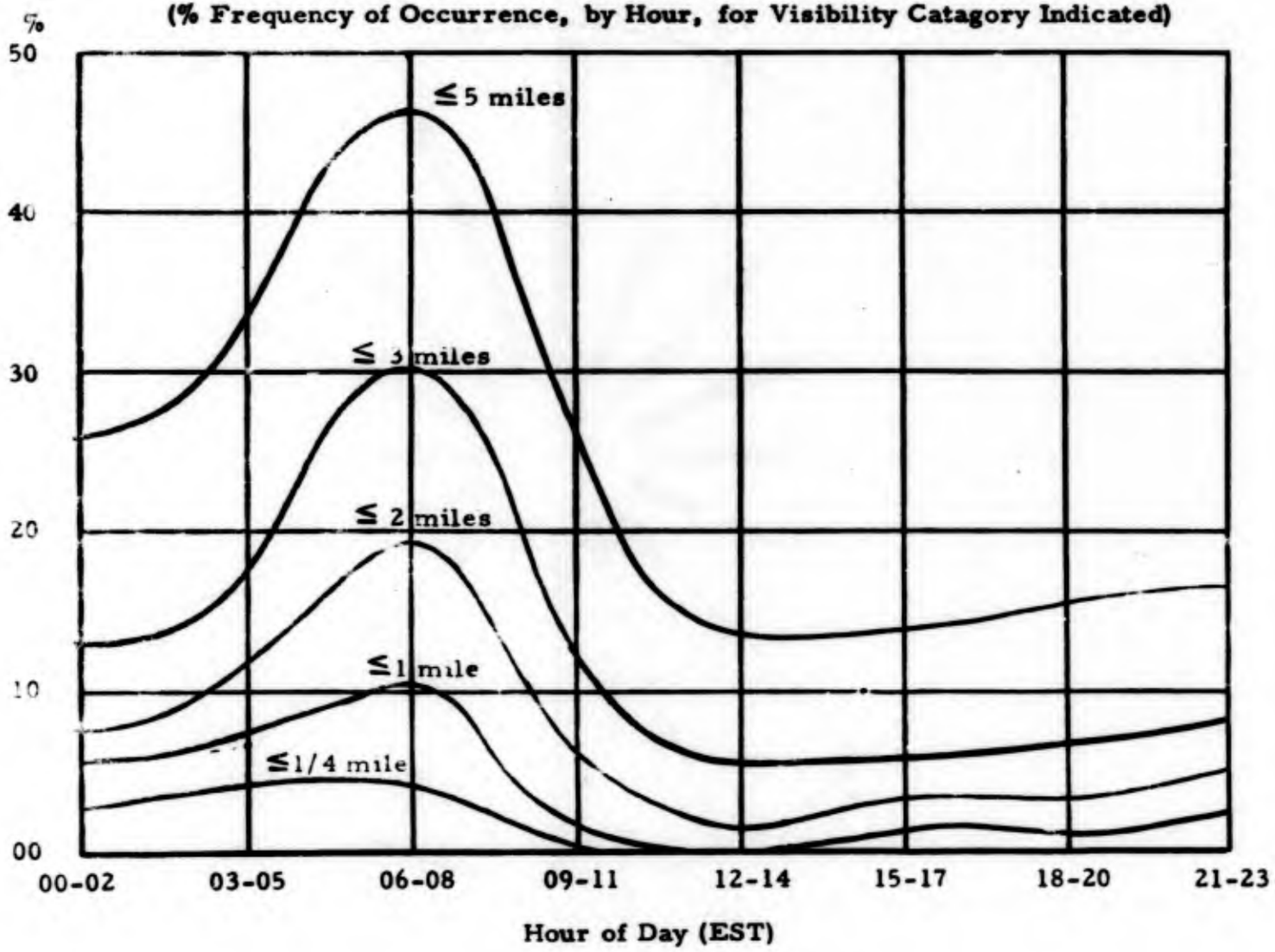


OCTOBER
CEILINGS

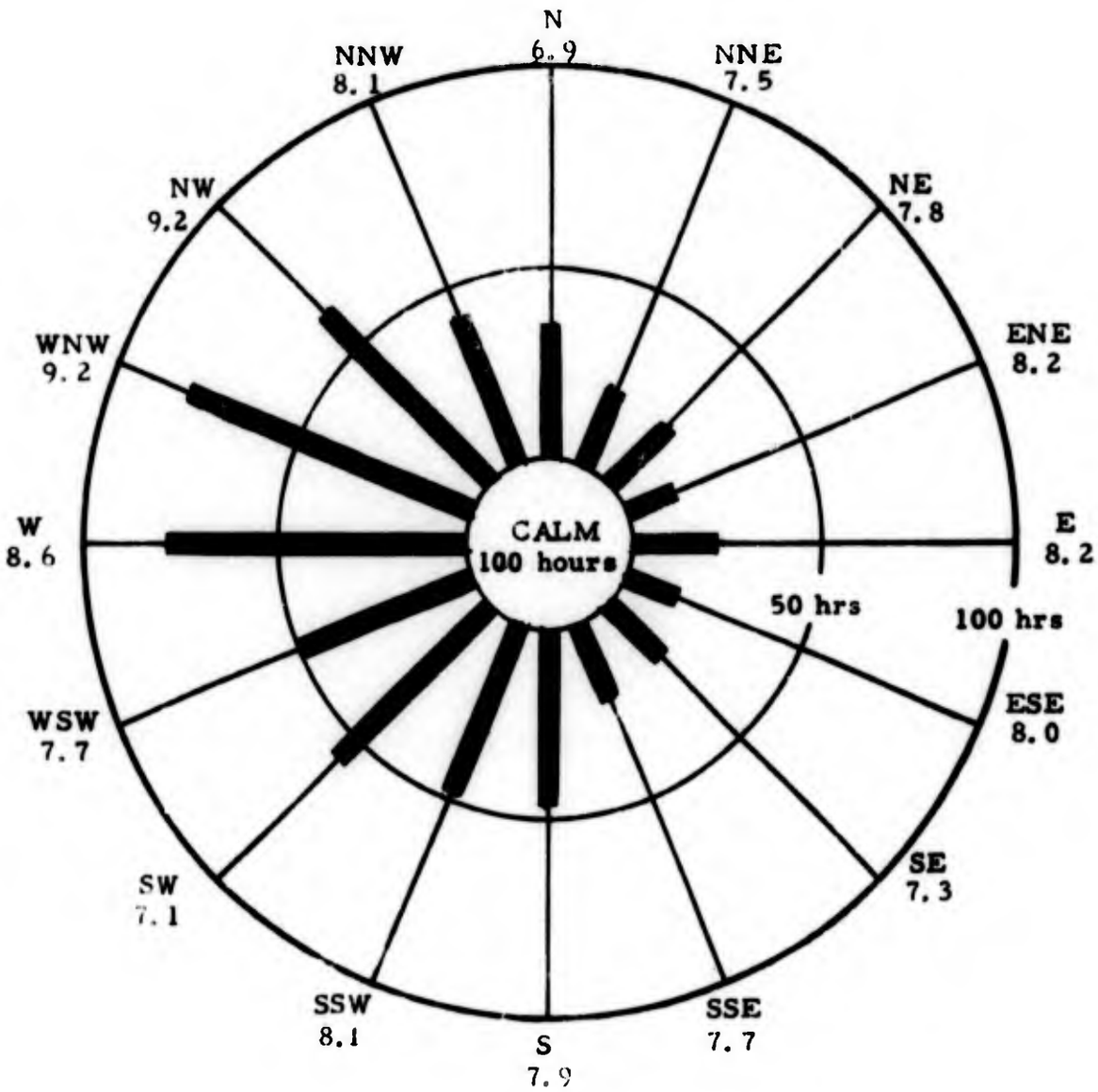


OCTOBER
VISIBILITY

(% Frequency of Occurrence, by Hour, for Visibility Catagory Indicated)



NOVEMBER
WIND ROSE

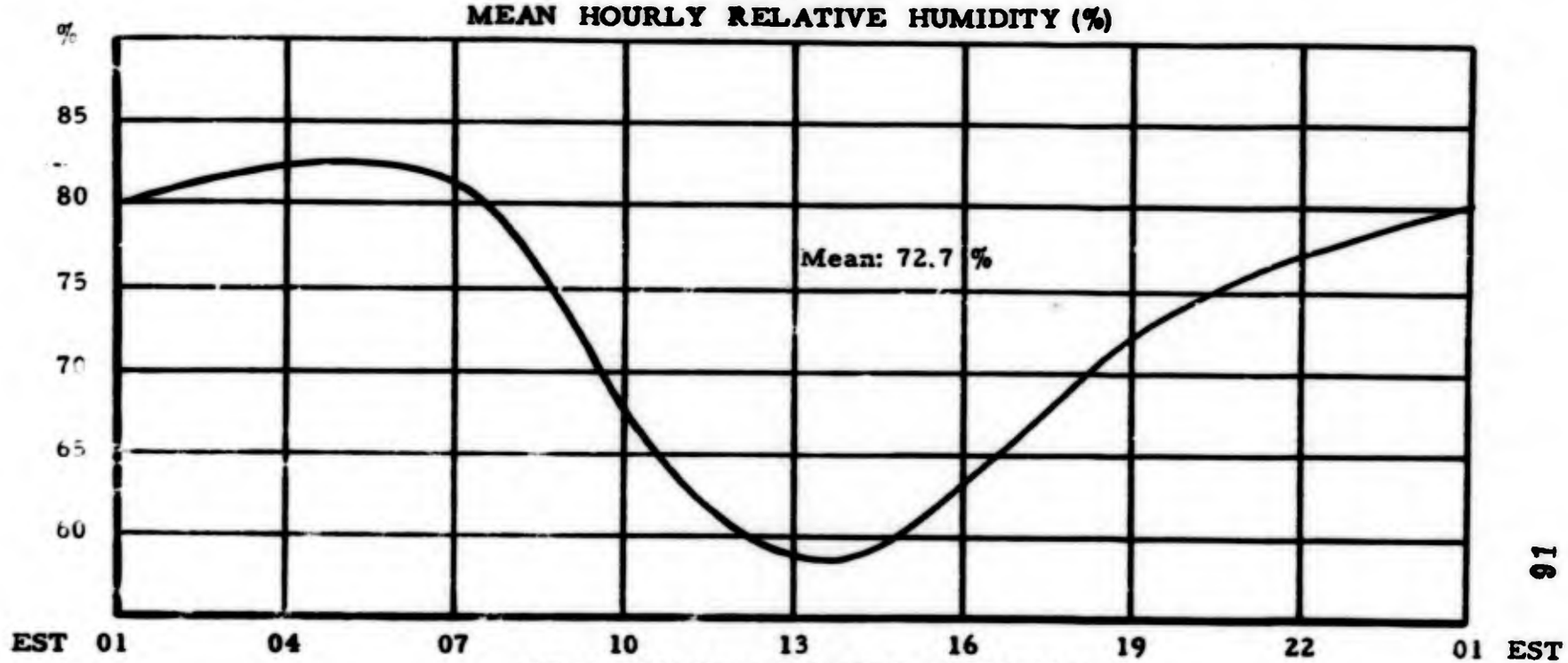


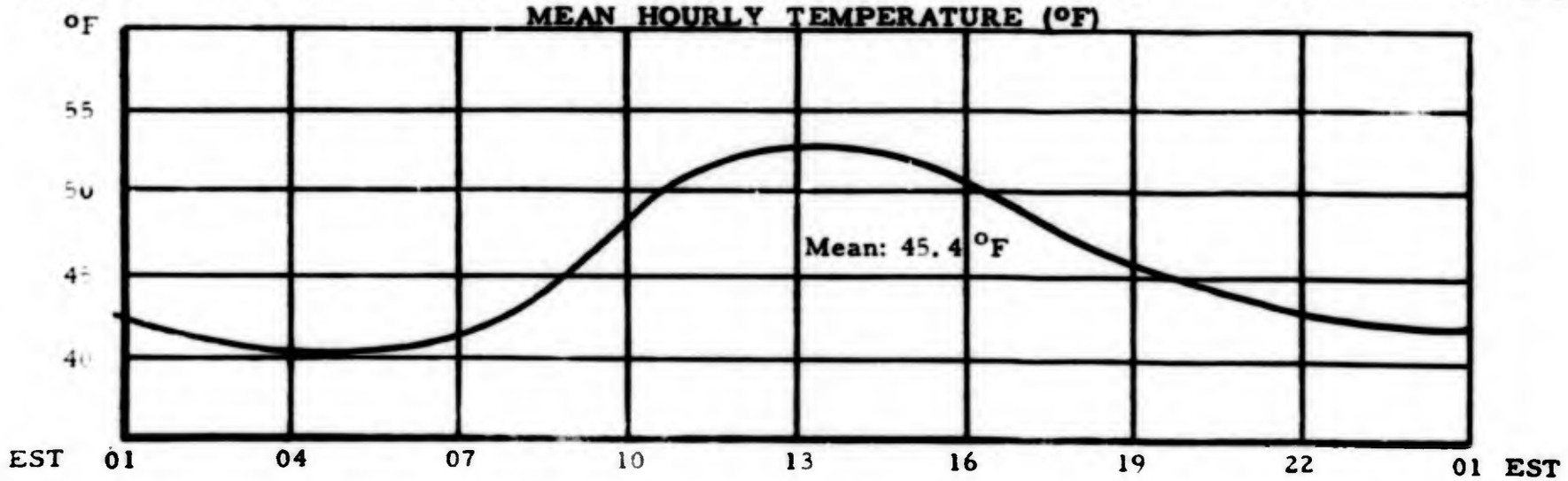
Mean Hourly Speed: 7.0 knots

Prevailing Direction: W-WNW

NOTE: Average wind speed in knots for each direction is given next to each wind direction

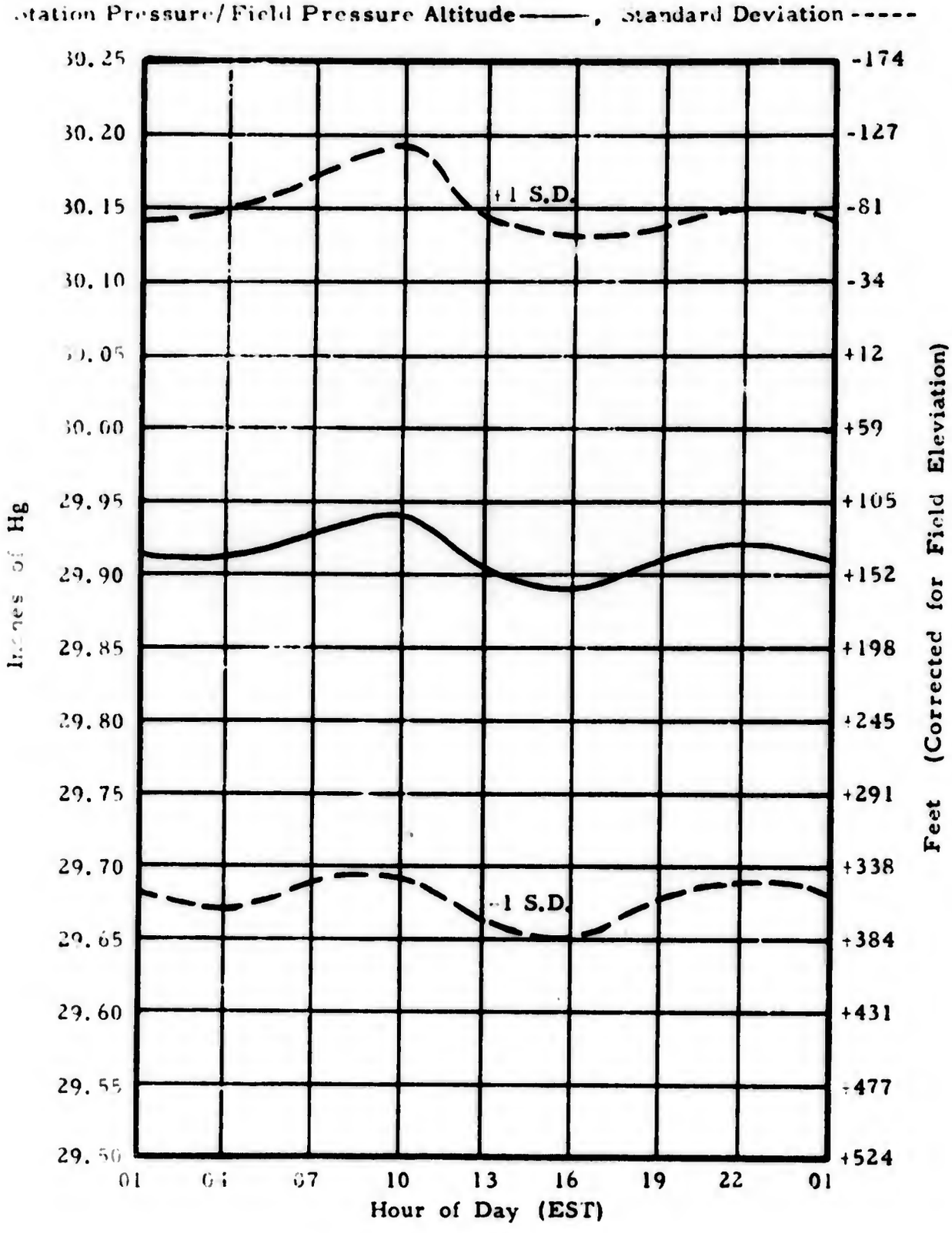
NOVEMBER


MEAN HOURLY RELATIVE HUMIDITY (%)
%
85
80
75
70
65
60
Mean: 72.7 %
EST 01 04 07 10 13 16 19 22 01 EST

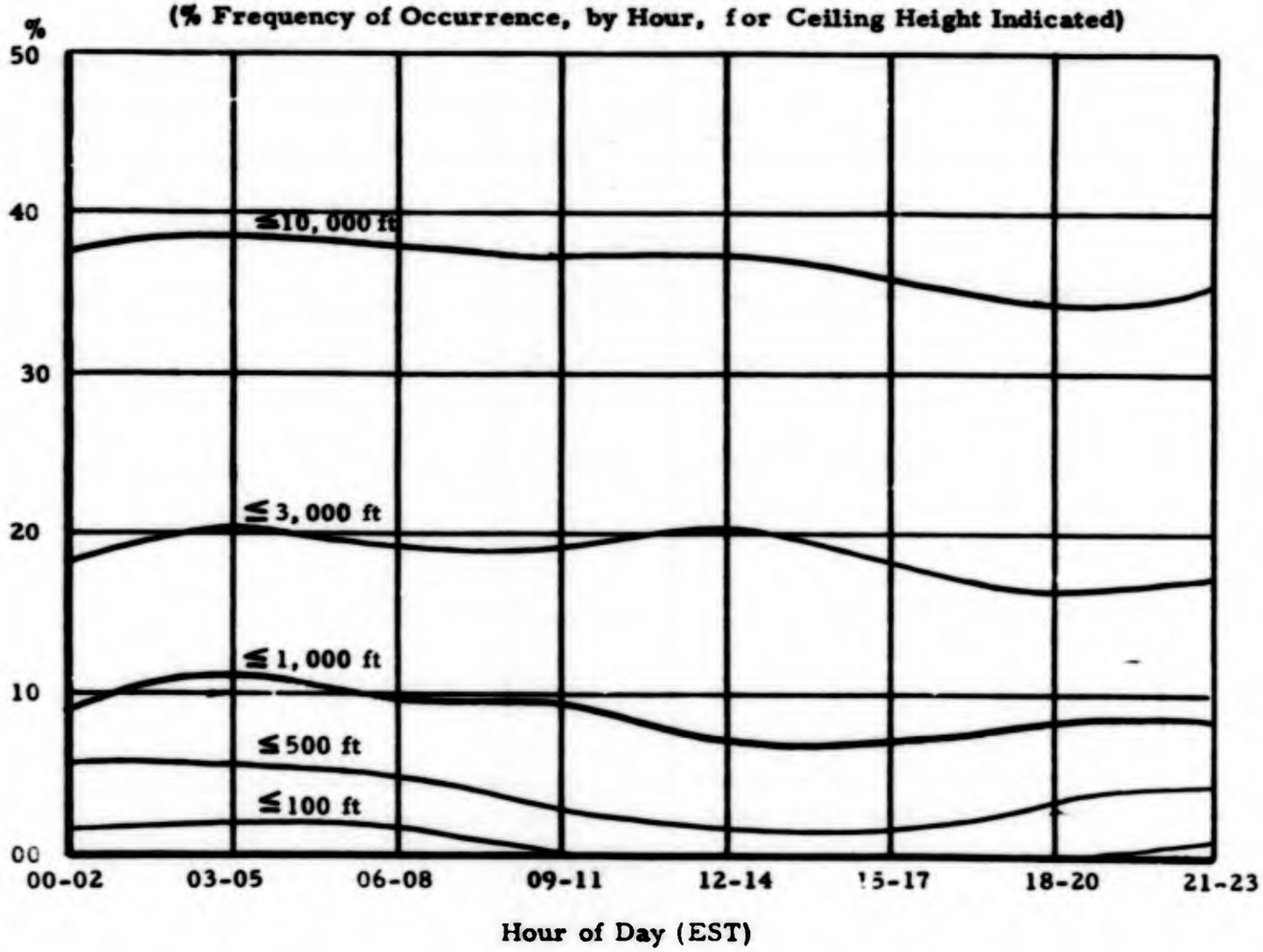

MEAN HOURLY TEMPERATURE (°F)
°F
55
50
45
40
Mean: 45.4 °F
EST 01 04 07 10 13 16 19 22 01 EST

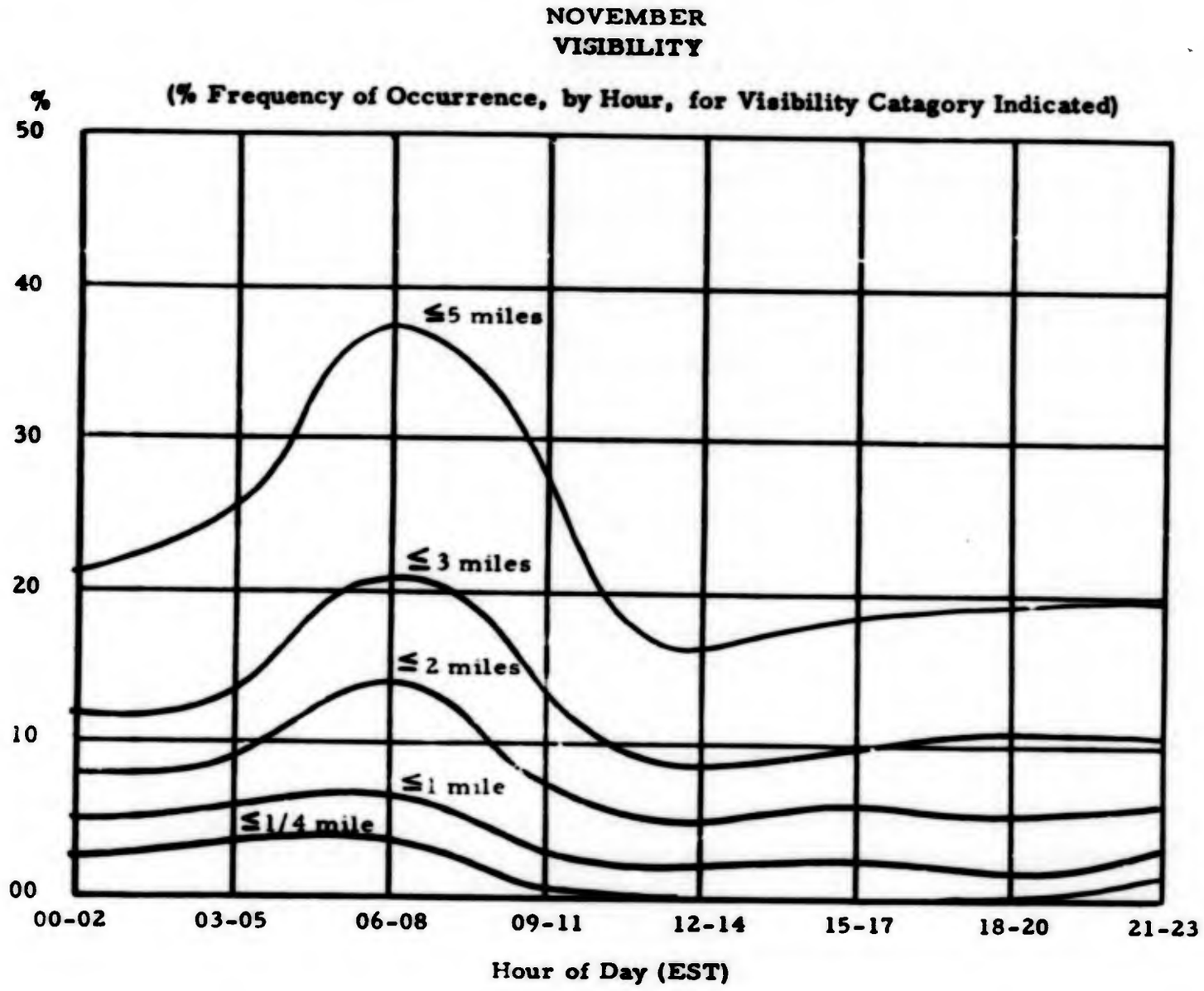
NOVEMBER

MEAN HOURLY STATION PRESSURE (Inches of Hg) / FIELD PRESSURE ALTITUDE (Feet) AND STANDARD DEVIATION



NOVEMBER
CEILINGS




NOVEMBER
VISIBILITY
(% Frequency of Occurrence, by Hour, for Visibility Catagory Indicated)
%
50
40
30
20
10
00
≤5 miles
≤3 miles
≤2 miles
≤1 mile
≤1/4 mile
00-02
03-05
06-08
09-11
12-14
15-17
18-20
21-23
Hour of Day (EST)

SECTION IV

Local Forecast Studies

A. Objective Forecast Studies

1. Objective Forecast Study for Air Mass Thunderstorms.

B. Rules of Thumb

C. General Synoptic Reminders

1. Temperature
2. Visibility
3. Ceiling
4. Precipitation
5. Surface Wind

D. Special Synoptic Types

1. "Northeaster"
2. Winter Cold Front
3. Stationary Front with Waves
4. Spring Warm Front
5. Summer Cold Front
6. Bermuda High

A. OBJECTIVE FORECAST STUDIES

1. OBJECTIVE FORECAST STUDY

AIR MASS THUNDERSTORMS

Mr. James H. Drennen

McGuire Air Force Base, New Jersey

1. Background: Thunderstorm activity at McGuire AFB has a direct impact on operational activities. This objective method is designed to increase the capability of the duty forecaster in predicting the occurrence of thunderstorm activity at McGuire AFB (5 nautical mile radius) and in the local flying area (100 nautical mile radius of McGuire). This study is designed to predict air-mass thunderstorms.

2. The Forecast Problem: Using data available from 1200Z observations (RAOB and 850 mb chart) to determine if air-mass thunderstorms will occur at McGuire AFB or in the local flying area during the afternoon and evening (1700 - 2400Z) in the months of June through September.

3. Predictor Parameters Used:

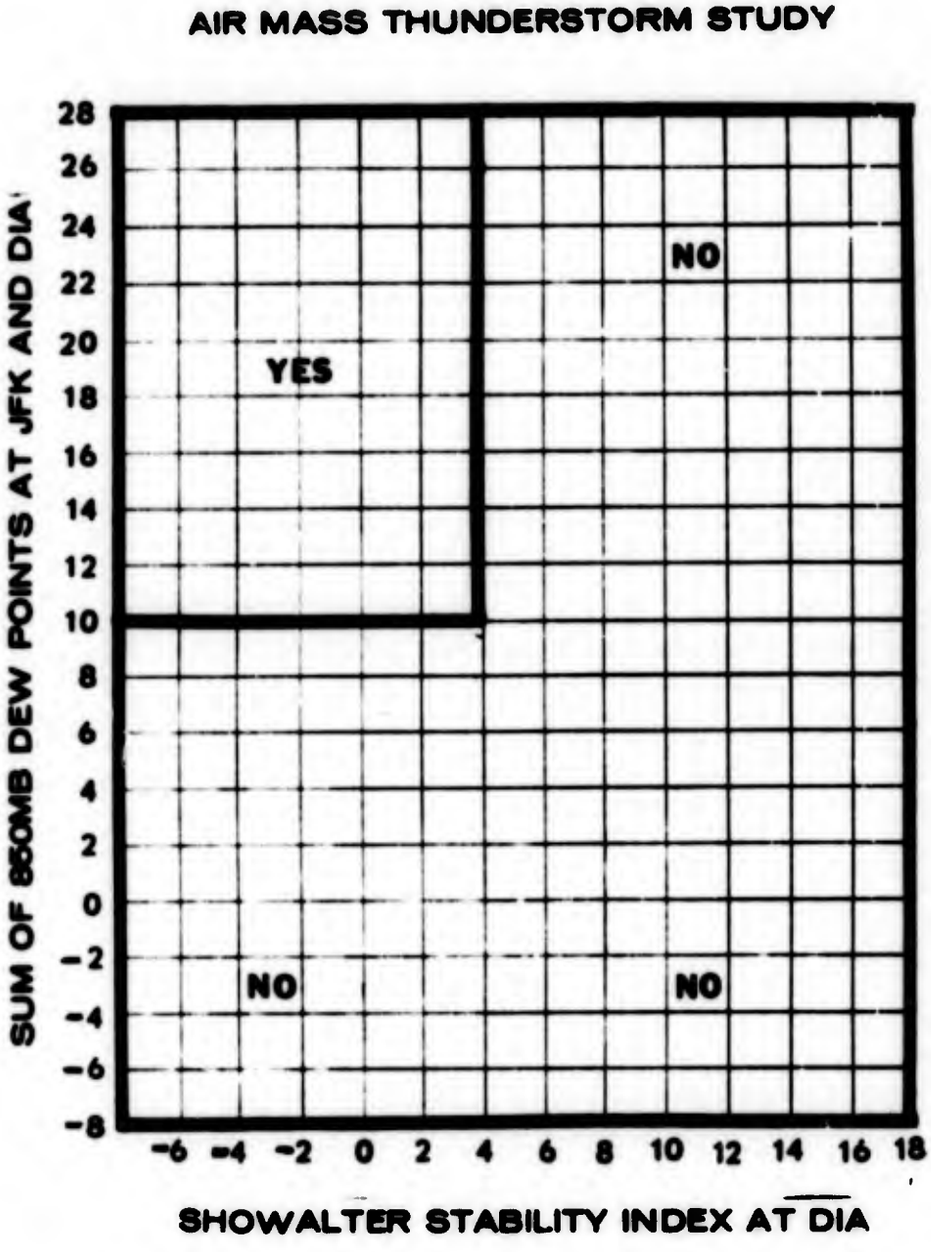
a. Sum of 850 mb dew points derived from 1200Z soundings at J. F. Kennedy International Airport, NY (KJFK) and Dulles International Airport, Washington, DC (KIAD).

b. Showalter Stability Index at KIAD at 1200Z.

4. Explanation of the Chart Used: This study uses one nomogram. The Dulles Showalter Stability Index is the abscissa and the sum of the JFK and Dulles 850 mb dew points is the ordinate. The nomogram yields either a "YES" or "NO" decision on thunderstorm activity.

5. Limitations: This study only predicts air-mass thunderstorms. Convective activity generated by fronts and/or squall lines will not always be forecast by this method.

6. Evaluation and Verification: Dependent data was used from the period 1 June 1968 through 30 September 1968, and 1 June 1969 through 30 September 1969. Independent data to test the study was taken from 1 June through 30 September 1970.


AIR MASS THUNDERSTORM STUDY
SUM OF 850MB DEW POINTS AT JFK AND DIA
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
YES
NO
NO
NO
-6
-4
-2
0
2
4
6
8
10
12
14
16
18
SHOWALTER STABILITY INDEX AT DIA

VERIFICATION STATISTICS

Dependent Data

1 June - 30 September 1968 and 1969

Flying Area

OBSERVED \ FORECAST	YES	NO	TOTAL
YES	73	2	75
NO	8	136	144
TOTAL	81	138	219

% Correct 95%
% YES Correct 90%
% NO Correct 99%
Heidke Skill Score + 0.90

Terminal Area

OBSERVED \ FORECAST	YES	NO	TOTAL
YES	47	5	52
NO	29	138	167
TOTAL	76	143	219

% Correct 84%
% YES Correct 62%
% NO Correct 97%
Heidke Skill Score +0.63

Independent Data

1 June - 30 September 1970

Flying Area

OBSERVED \ FORECAST	YES	NO	TOTAL
YES	28	6	34
NO	10	72	82
TOTAL	38	78	116

% Correct 86%
% YES Correct 74%
% NO Correct 92%
Heidke Skill Score +0.68

Terminal Area

OBSERVED \ FORECAST	YES	NO	TOTAL
YES	26	12	38
NO	12	66	78
TOTAL	38	78	116

% Correct 79%
% YES Correct 69%
% NO Correct 85%
Heidke Skill Score +0.53

THUNDERSTORM STUDY STEP BY STEP PROCEDURES

1.	KJFK 12Z 850 mb dew point	_____ C
2.	KIAD 12Z 850 mb dew point	_____ C
3.	Sum of steps 1 and 2	_____ C
4.	Lifting condensation level (LCL) - KIAD (12Z)	_____ mb
5.	KIAD 12Z 500 mb temperature (T)	_____ C
6.	T' (temperature derived by following saturated adiabat from LCL to 500 mb)	_____ C
7.	Step 5 minus step 6 (T-T')	_____ C
8.	Enter graph with data from steps 3 and 7 above. Forecast is (YES or NO)	_____

1. Relationship of McGuire AFB dew point and sea temperature (in degrees Fahrenheit). During the spring and summer (April thru September), the following relationships can be used to predict fog/stratus at McGuire:

a. If dew point at maximum heating time is above water temperature (use unwind reporting station: Ship Ambrose or Five Fathoms): FOG by sunrise.

b. If dew point is 1-2 degrees below water temperature: STRATUS at 500 feet by sunrise.

c. If dew point is 3 or more degrees below water temperature: NO FOG or STRATUS.

2. The following parameters can be used in predicting rain versus snow:

	RAIN	RAIN/SNOW	SNOW
a. Surface temperature at onset of precip (°F)	39-40	36-38	34-35
b. Height of freezing level (ft)	>2700	800-2700	<800
c. 850 MB temperature (°C)	>-2	-2 to -4	<-4
d. 1000-700 MB thickness (meters)	>3060		≤3060

3. Peak surface wind gusts during the day will equal the prevailing wind velocity at 2000 ft. in the 200 mile western semicircle (as observed on the 0600Z winds aloft chart).

4. Surface wind gusts based on pressure gradient between stations which form a line perpendicular to the surface wind flow results in the following table:

STATION	DISTANCE	PRESSURE GRADIENT	WINDS
MAR-ALB	203 NMI	4.5 MB	15 K
		6.0 MB	20 K
		9.0 MB	30 K
		12.0 MB	40 K
MAR-ACK	312 NMI	6.9 MB	15 K
		9.2 MB	20 K
		13.9 MB	30 K
		18.5 MB	40 K
MAR-SBY	108 NMI	2.4 MB	15 K
		3.2 MB	20 K
		4.8 MB	30 K
		6.4 MB	40 K

STATION	DISTANCE	PRESSURE GRADIENT	WINDS
[illegible]	305 NMI	7.7 MB	15 K
		9.0 MB	20 K
		13.6 MB	30 K
		18.1 MB	40 K
[illegible]	275 NMI	6.0 MB	15 K
		8.0 MB	20 K
		12.1 MB	30 K
		16.1 MB	40 K

2. SPECIAL SYNOPTIC REMINDERS

1. Temperature

a. Many types of operations at McGuire are sensitive to temperature: take-off performance, outside maintenance, Fort Dix troop training, etc. Extreme temperatures recorded at McGuire are 101°F (observed in July, August, and September) and -4°F (observed in February).

(1) Extreme high temperatures result from a persistent mT air mass that has obtained extensive additional heating by a long over-land trajectory with the "coup-de-grace" added by the downslope adiabatic heating as the air approaches McGuire from the west or west-northwest.

(2) Extreme low temperatures result when strong advection of cP air lasts for two or more days and the wind drops off in the evening allowing additional radiational cooling to further reduce the surface temperatures.

b. One of the most complete references on maximum and minimum temperature forecasting is the USWB Forecasting Guide, "Maximum and Minimum Temperature Forecasting", which summarizes numerous methods of forecasting these elements.

2. Visibility

a. Low visibilities are closely correlated with low ceilings at McGuire. (77% of the time when the ceiling is below 200 ft., the visibility is below $\frac{1}{2}$ mile.)

b. If an air mass stagnates over McGuire, visibilities will become progressively lower each day.

3. Ceilings

a. All types of cloud cover as well as numerous ceiling limits are important to various flight operations at McGuire. The general statements concerning seasonal and diurnal visibility variations at McGuire are also true for ceilings.

b. Reminders for forecasting cloud cover:

(1) After a cold front passage: partly cloudy skies during the day, clear at night regardless of shower activity over the Appalachians. If there is a closed low at 850 MB or 700 MB, there will be post frontal shower activity.

(2) If the winds are in an easterly quadrant, the cloud cover will increase and the ceiling will lower (or remain constant) until the wind shifts to a westerly quadrant.

4. Precipitation

a. The specific forecasting problems concerning precipitation are as follows:

(1) Beginning or ending times.

(2) Type of precipitation (i.e., Rain vs Snow, or Freezing Rain.)

b. Results of special investigations made of three heavy snowstorms that occurred during February and March of 1958. (Heavy snowstorm means a fall of 4 inches or more of snow in 12 hours, or a fall of 6 inches or more in 24 hours):

(1) Two of the storms moved NE from the Gulf area; the other storm, less severe (but resulted in six inches of snow), moved eastward from the Ohio Valley.

(2) Based on precipitation onset times of these storms, precipitation started at McGuire when the storm center passed the line: Willmington, N.C. - Pulaski, Va., - Akron, Ohio.

(3) Ceiling dropped abruptly from 6-8000' to 500' with onset of precipitation.

5. Surface winds

a. Strong surface winds at McGuire are critical to certain ground functions as well as aircraft operations. There are three categories of synoptic situations which result in strong winds:

(1) Tight westerly gradient - most common during the winter months reaching a maximum during March.

(2) East Coast Storms (includes Hatteras type lows and tropical storms).

(3) Gustiness associated with thunderstorms (although these create a significant hazard, the frequency is very low).

b. Tight gradient type gusts:

(1) Due to terrain effects, easterly winds are not as gusty as westerly winds (note that due to less friction, easterly winds are more likely to approach gradient velocities than are the westerlies).

c. Remainder for forecasting wind speed, gusts, and direction: From the prog (this will generally be the NMC 12-hour 1000-500 MB thickness PROG), steady wind equal 2/3 of the geostrophic, gust equal full value of the geostrophic, direction 5-30° across isobars and toward low pressure.

d. Thunderstorm gustiness: Maximum gusts during thunderstorms are usually equal to prevailing wind speed at 5000 feet. Use Winds Aloft Chart to determine prevailing 5000 ft. winds in McGuire area.

e. With a deep stagnant low near Newfoundland and a large high over the central U.S., winds of 25-35 knots may last for a period of several days.

D. SPECIAL SYNOPTIC TYPES

1. "NORTHEASTER"

3-4 February 1961

SYNOPTIC SITUATION: On 3 February a ridge of Arctic air was oriented NE-SW from New England to western North Carolina. A low pressure system was located over Ohio and a weak depression over the southeastern U. S. At 500MB a cut-off low was located in Illinois with a N-S ridge along the coast. By 4 February the 500MB low had deepened and moved eastward to south central Pennsylvania while the surface low intensified and moved north-northeastward to a position just off the N. J. coast.

SIGNIFICANT WEATHER: Altostratus clouds appeared over McGuire at 03/0140E. By 1000E snow began to fall and ceilings lowered to 1300 feet. Ceilings generally fluctuated between 100 feet and 1100 feet from 03/1400E to 04/1600E. Gusty surface winds (above 25 knots) persisted from 03/2200E t 04/1800E. The maximum gust reported was 36 knots. Total snow accumulation for the 48 hour period was 7.3 inches. The following data depicts the beginning and ending times of precipitation.

SNOW: Began 03/1000E Ended 03/1900E Began 04/0900E Ended 04/1900E
SNOW & RAIN MXD: Began 03/1900E Ended 04/0000E
RAIN: Began 04/0000E Ended 04/0900E

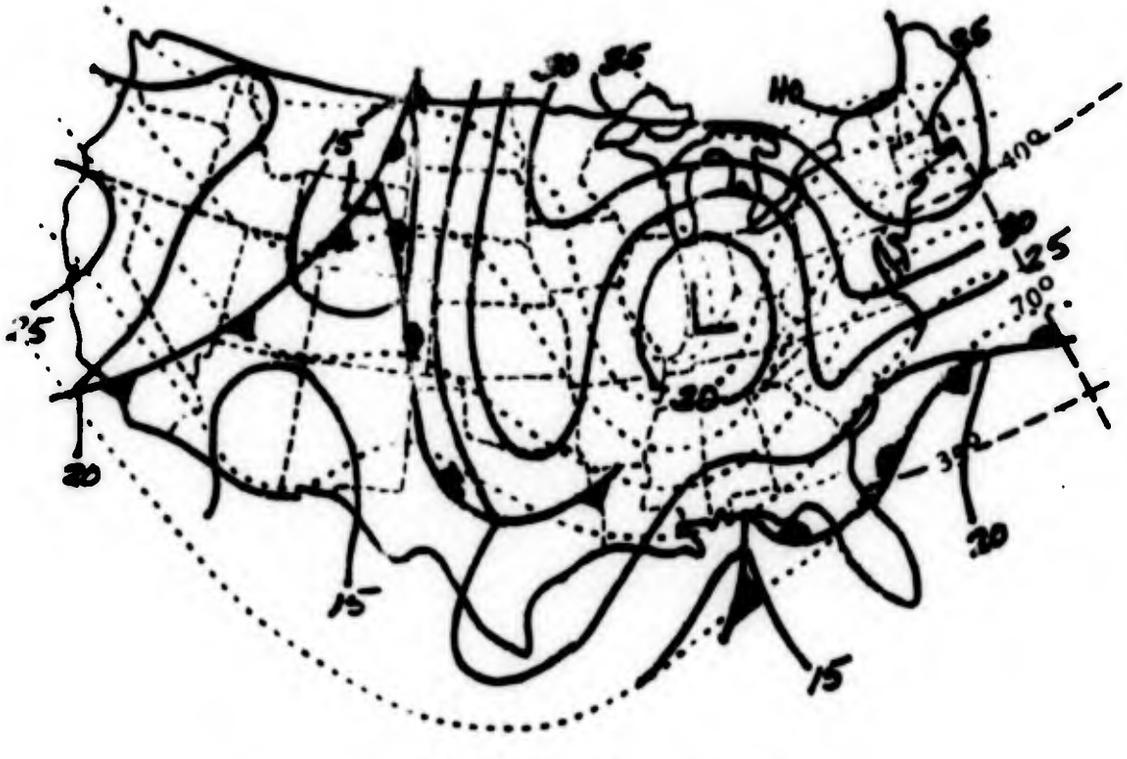
OTHER COMMENTS: This storm was rather typical of Northeasters. Cyclogenesis took place in the southeastern U. S. to the east of the Appalachian Mountains and intensified very rapidly as it moved north-northeastward along the coast. The cold ridge of high pressure aided the storm's

development and was responsible for the precipitation falling primarily as snow. As the 500MB low began its eastward movement the flow which was southwesterly along the coast backed to a southerly to southeasterly flow. This is a typical feature when the surface low intensifies and moves up the coast.

Source: DAILY SERIES SYNOPTIC WEATHER MAPS, ESSA, February, 1961. McGuire Observations from WBAN.

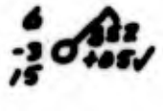
500 MB CONTOURS & SURFACE WEATHER CHART

DATE/TIME 3 Feb 61/1200Z

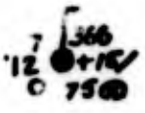


McGuire Observations

01E



04E



07E

10E

13E

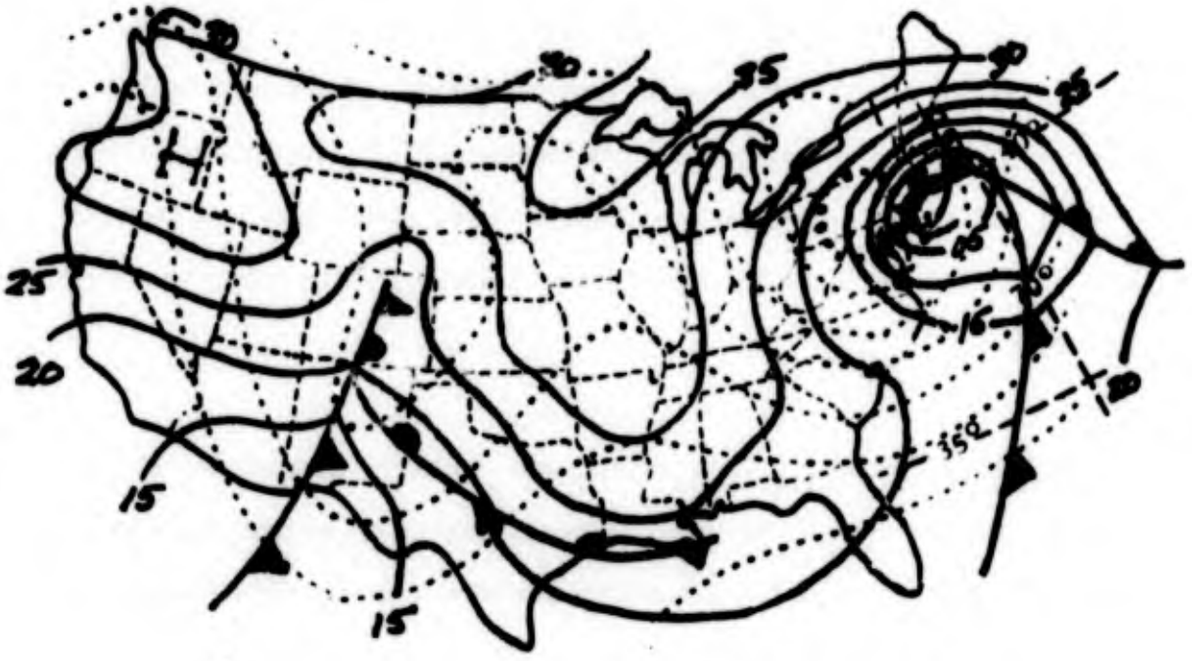
16E

19E

22E

500 MB CONTOURS & SURFACE WEATHER CHART

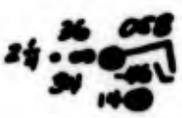
DATE/TIME 4 Feb 61/1200Z



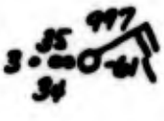
McGuire Observations

01E

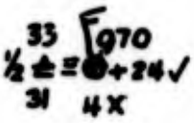
04E



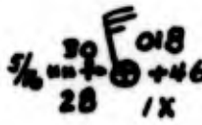
07E



10E

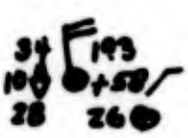


13E



16E

19E



22E

2. WINTER COLD FRONT

19 - 20 February 1961

SYNOPTIC SITUATION: On 19 February a low pressure system was located just north of Lake Erie and a cold front extended from eastern Pennsylvania through northern Georgia. This rapidly moving cold front had moved off the coast the following day and a strong high pressure system dominated the northeastern U. S. As with most cold fronts which move from west to east with the associated low north of the Great Lakes, very little if any precipitation will accompany the front.

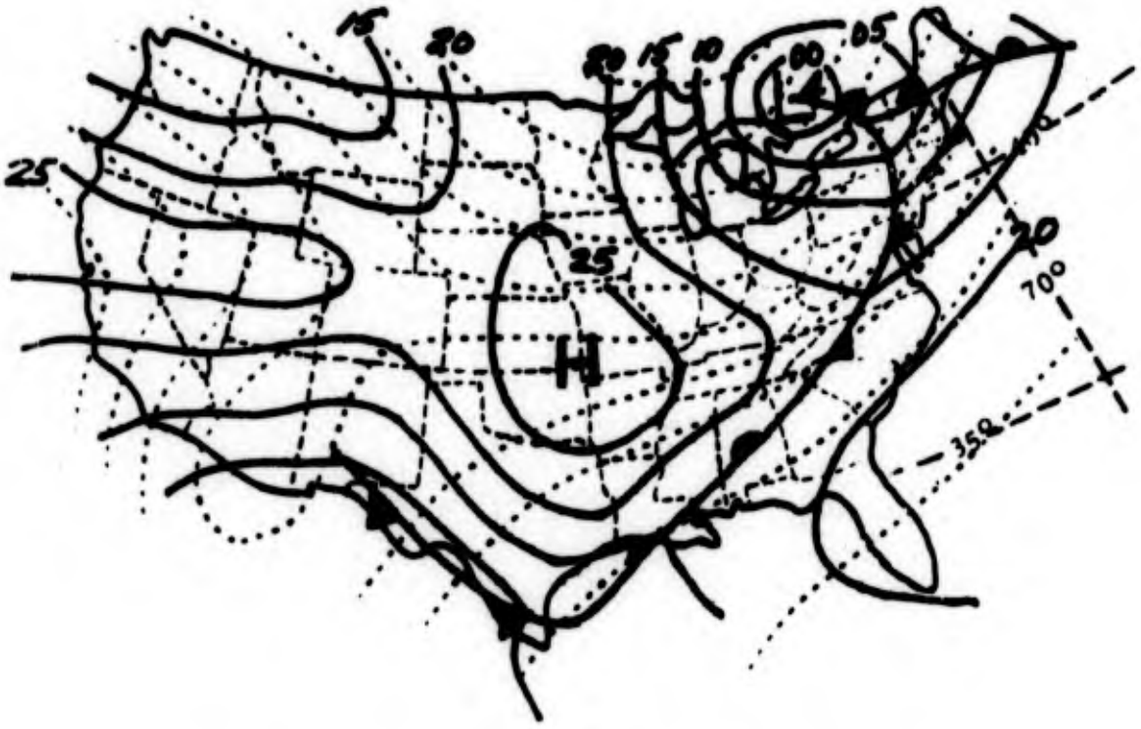
SIGNIFICANT WEATHER: Ceilings and visibilities remained above 5,000 feet and 5 miles prior to, during, and after frontal passage. The wind gradually shifted from the southwest to the west-northwest.

OTHER COMMENTS: The cold front passed McGuire at 19/1900E.

Source: DAILY SERIES SYNOPTIC WEATHER MAPS, ESSA, February, 1961. McGuire Observation from WBAN.

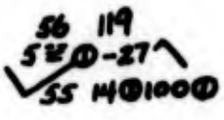
500 MB CONTOURS & SURFACE WEATHER CHART

DATE/TIME 19 Feb 61/1200Z



McGuire Observations

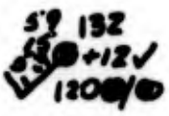
01E



04E

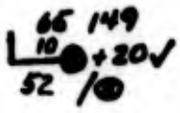
07E

10E

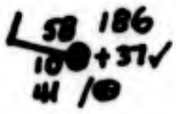


13E

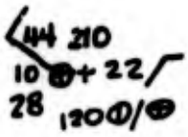
16E



19E

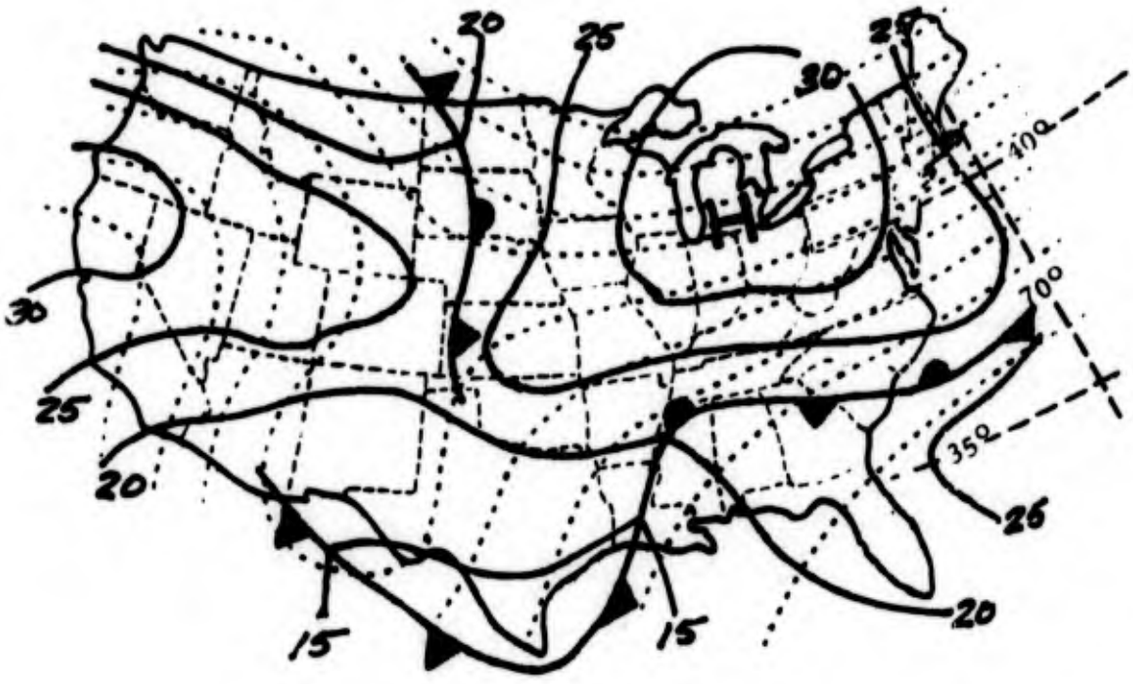


22E



500 MB CONTOURS & SURFACE WEATHER CHART

DATE/TIME **20 Feb 61/1200Z**



McGuire Observations

01E	04E	07E	10E
39 237 10 28	261 +25 25	291 +29 25	312 +20 23

13E	16E	19E	22E
40 312 15 00- 22 120	40 308 15 -03 23	36 308 15 00- 24	36 318 10 +12 25 100

3. STATIONARY FRONT WITH WAVES

8 - 10 March 1964

SYNOPTIC SITUATION: On 8 March a stationary front with waves extended from southern Virginia to eastern Texas and at 500MB a trough with a closed low in Arizona was oriented NNE-SSW through the western U. S. Southwesterly flow prevailed over the eastern two-thirds of the U. S. By 9 March the 500MB trough moved eastward to the central U. S. and was oriented N-S from South Dakota to western Texas. At the surface an elongated trough extended from the northeastern U. S. to eastern Texas with low centers in southern Arkansas and northern N. Y. The low in Arkansas deepened considerably and moved rapidly northeastward and by the morning of the 10th an intense low pressure system was situated along the New Jersey coast.

SIGNIFICANT WEATHER: Easterly flow prevailed on the 8th with the stationary front south of McGuire. Below minimum conditions (100 feet &/or 1/4 mile) prevailed from 8/2300E to 9/1000E. The shallow wave on the stationary front passed McGuire and conditions improved with the southwesterly flow. With the advance of the low in Arkansas, surface winds again shifted to an easterly direction and ceiling remained between 600-1200 feet from 10/0630 - 1200E. A thunderstorm was reported with the cold frontal passage at 1300E and the wind gusted to 42 knots. Ceilings lifted to above 3,000 feet by 2200E.

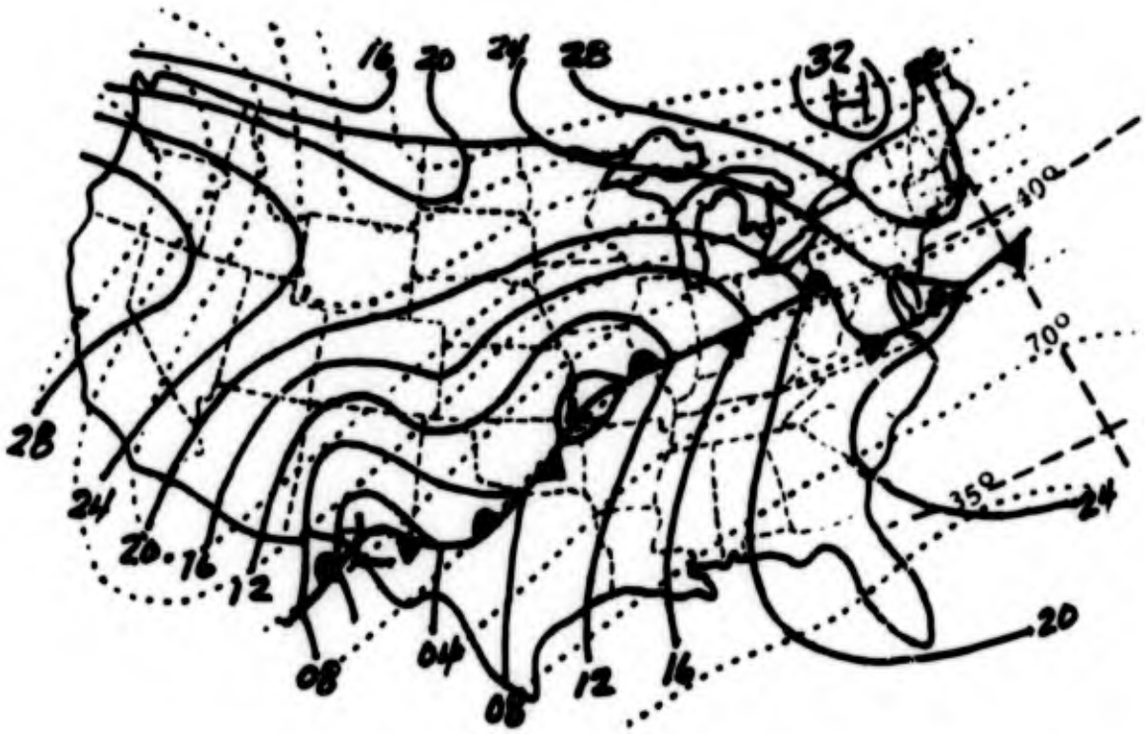
OTHER COMMENTS: Easterly flow during the late winter and early spring is especially conducive to fog and stratus formation since water

temperatures are at a minimum and the cooling effect on an easterly airstream tends to saturate the air very quickly.

Source: ETAC MICROFILM LIBRARY, March 1964. McGuire Observations from WBAN.

500 MB CONTOURS & SURFACE WEATHER CHART

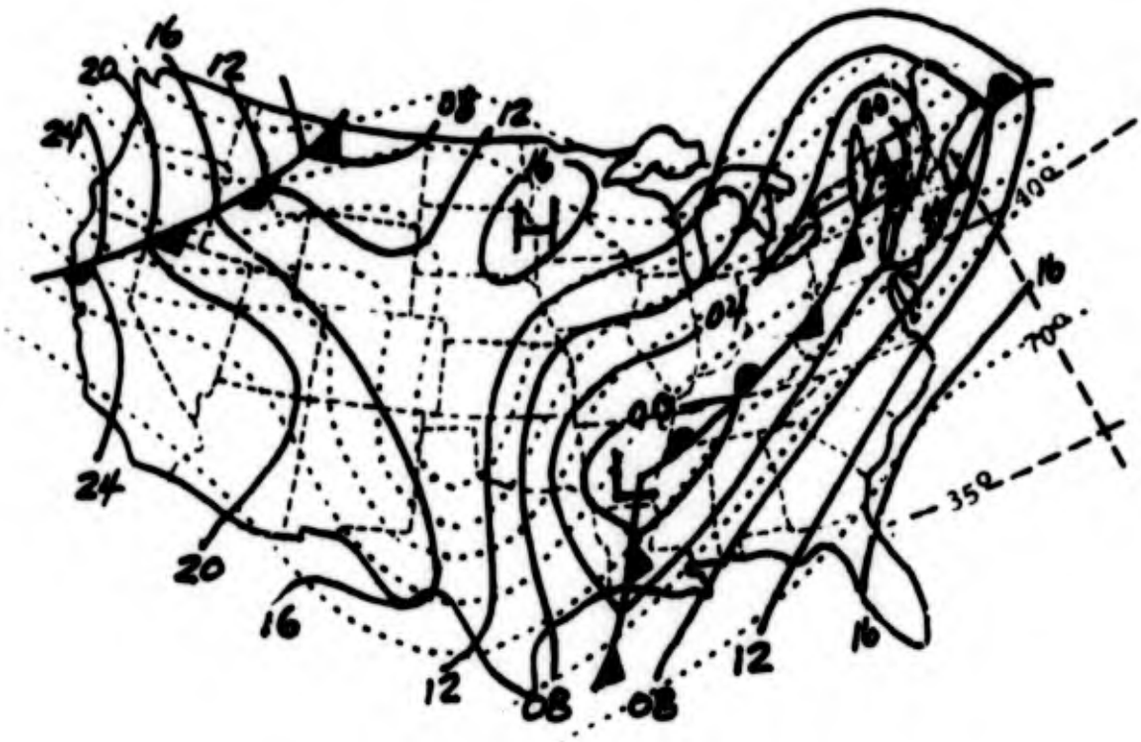
DATE/TIME 8 Mar 64/1200Z



McGuire Observations

500 MB CONTOURS & SURFACE WEATHER CHART

DATE/TIME 9 Mar 64/1200Z



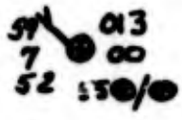
McGuire Observations

500 MB CONTOURS & SURFACE WEATHER CHART

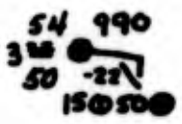
DATE/TIME 10 Mar 64/1200Z

McGuire Observations

01E

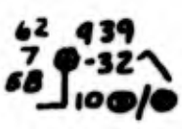


04E

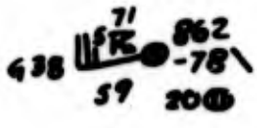


07E

10E

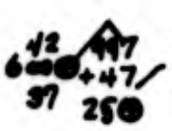


13E

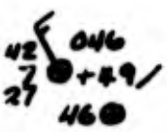


16E

19E



22E



4. SPRING WARM FRONT

13 - 14 March 1961

SYNOPTIC SITUATION: On 13 March a warm front extended from southern Virginia to a low pressure system in Missouri and a ridge of high pressure was oriented NNW-SSE from the southern tip of Hudson Bay to Long Island. A cut-off low at 500MB was stacked vertically with the surface low and the 500MB ridge extended from northern Wisconsin to the North Carolina coast. By 14 March the surface low had moved northeastward to Lake Huron and a ridge of high pressure was now situated from the Gulf of St. Lawrence to southeastern Pennsylvania. The ridge is a typical feature which retards the northward progression of warm fronts, and at times tends to push warm fronts in a southward direction. This feature causes the winds in advance of the warm front to persist for long periods in a northeasterly to southeasterly direction resulting in low ceilings and visibilities.

SIGNIFICANT WEATHER: Altostratus clouds appeared at 13/0400E and ceilings lowered rapidly to 1200 feet by 0800E. Rain, sleet, and snow were reported from 0600E to 0900E. Ceiling picked up to 4000 feet by 0900E and remained good until 2300E. By 14/0000E rain was again reported and from 14/0300E to 14/2300E ceilings fluctuated between 200 feet and 900 feet. A thunderstorm was reported at 0642E.

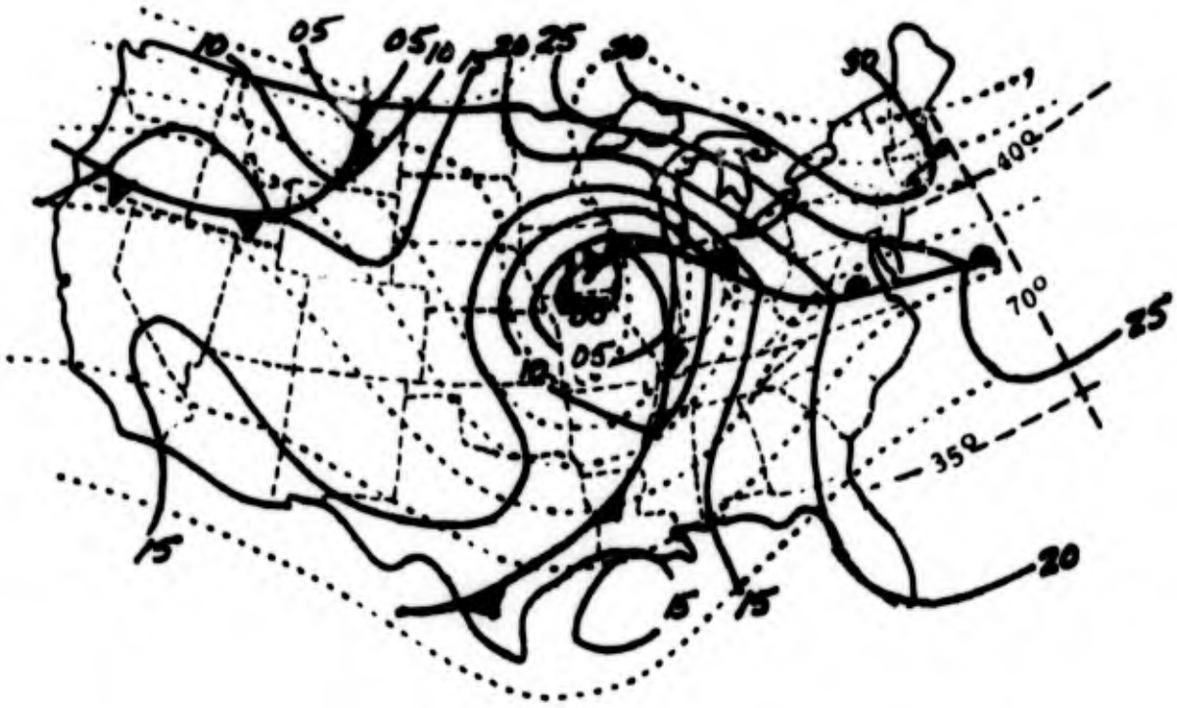
OTHER COMMENTS: The cold front passed McGuire at 14/1930E, however, ceilings remained in the 400-600 foot range till 2300E. Warm fronts of this type are the most prevalent cause of extended periods of poor weather

and can occur throughout the year; however, they occur more frequently during the late winter, early spring and fall. In most cases a warm frontal passage will occur almost simultaneously with the passage of the cold front. It is more likely that the front will pass as an occlusion.

Source: DAILY SERIES SYNOPTIC WEATHER MAPS, ESSA, March 1961. McGuire Observations from WBAN.

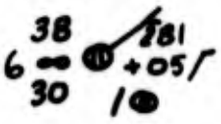
500 MB CONTOURS & SURFACE WEATHER CHART

DATE/TIME 13 Mar 61/ 1200Z



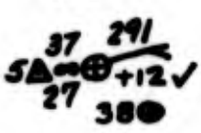
McGuire Observations

01E

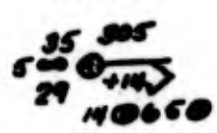


04E

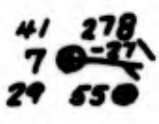
07E



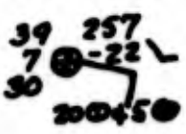
10E



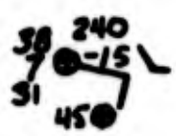
13E



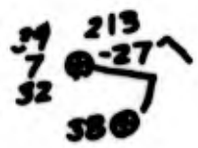
16E



19E

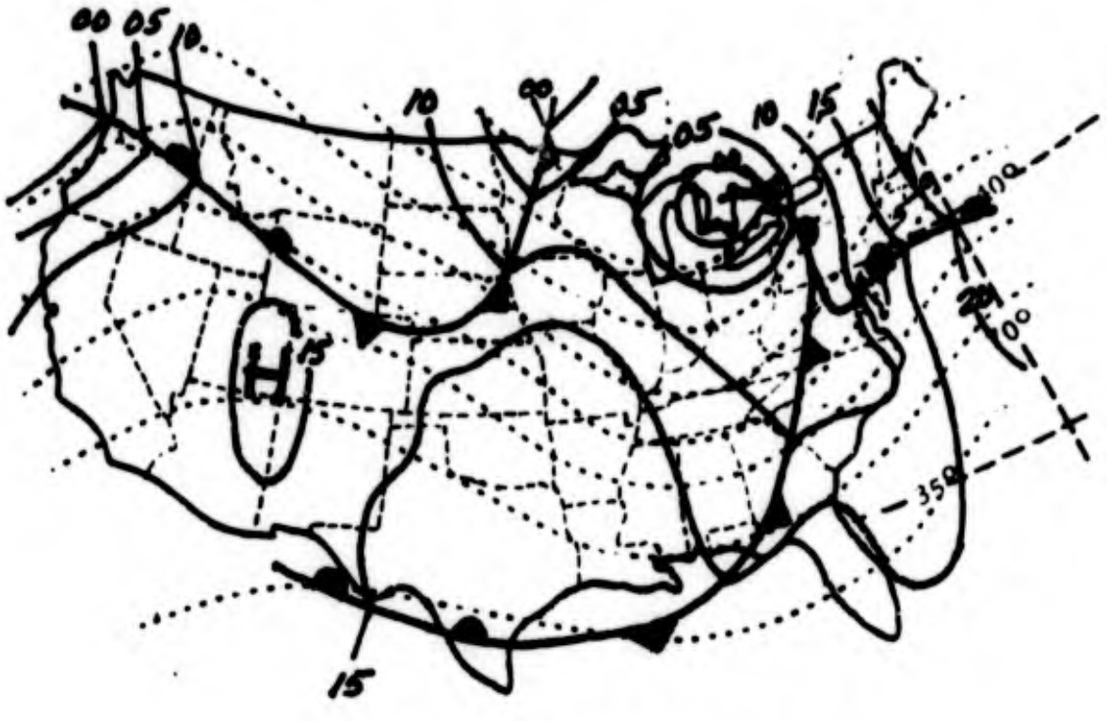


22E



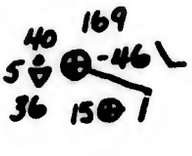
500 MB CONTOURS & SURFACE WEATHER CHART

DATE/TIME 14 Mar 61/1200Z

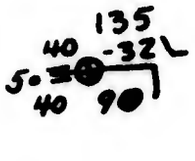


McGuire Observations

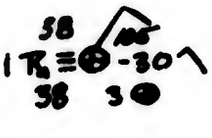
01E



04E

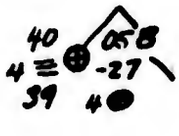


07E

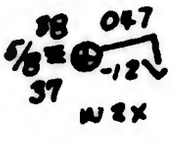


10E

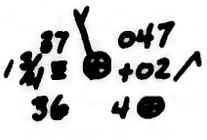
13E



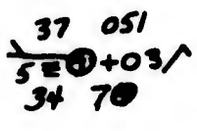
16E



19E



22E



5. SUMMER COLD FRONT

29-30 July 1963

SYNOPTIC SITUATION: On 29 July a cold front extended from Central Ohio to southern Illinois and the associated 500MB trough extended from Lake Michigan through central Illinois. Warm, moist air from the Bermuda High prevailed along the eastern seaboard. During the evening, a squall line preceding the cold front passed McGuire.

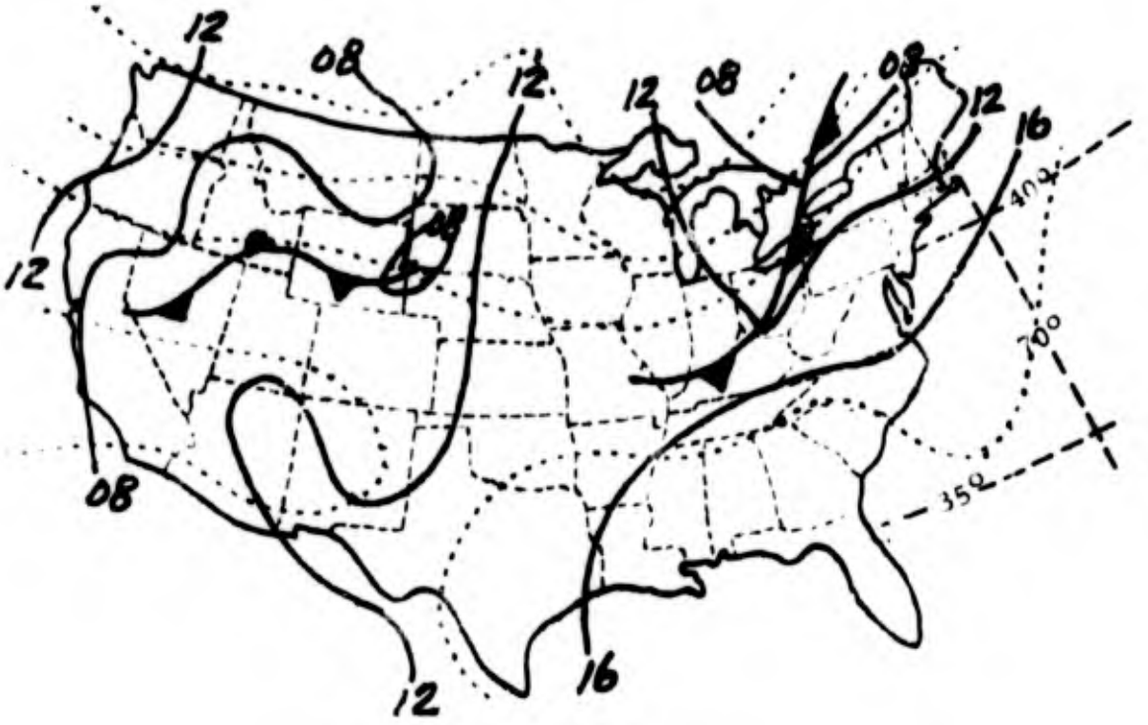
SIGNIFICANT WEATHER: Thunderstorms were reported at McGuire from 29/1000E to 1100E. The squall line passed the station at 29/2100E and RW- were reported. Frequent distant lightning was carried in remarks from 2000E - 2130E. The lowest ceilings were reported with the passage of the squall line - 3200 feet.

OTHER COMMENTS: As with most cold frontal passages during the summer months, more weather precedes the front than is in the front itself. Thunderstorm activity is much greater in and to the west of the Allegheny chain because of orographic effects. The moisture in the front is usually spent as the air descends on the lee side of the mountains.

Source: ETAC Microfilm Library, July 1963. McGuire Observations from WBAN.

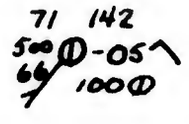
500 MB CONTOURS & SURFACE WEATHER CHART

DATE/TIME 29 Jul 63/1200Z

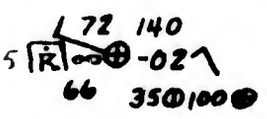


McGuire Observations

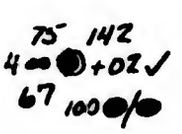
01E



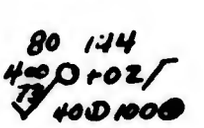
04E



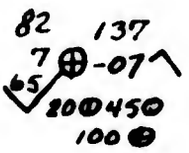
07E



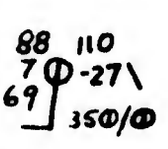
10E



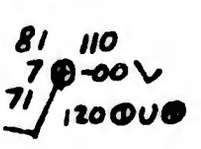
13E



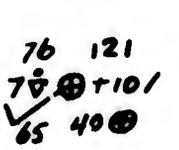
16E



19E

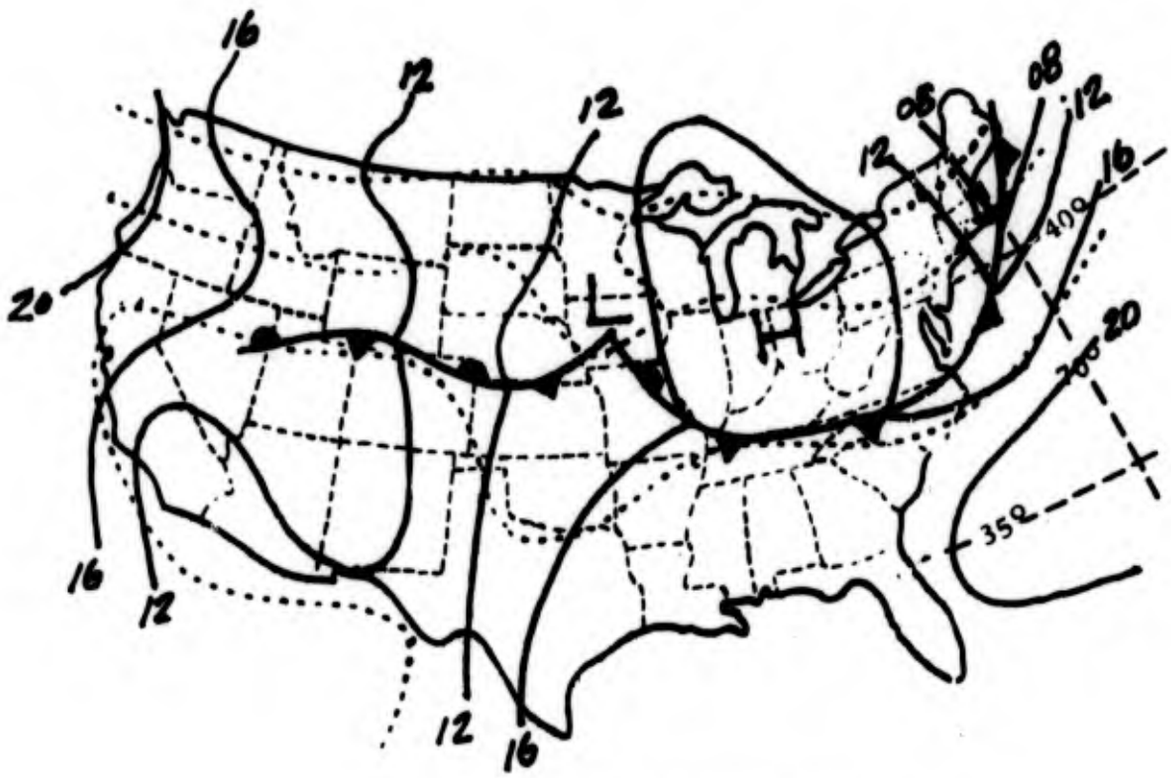


22E

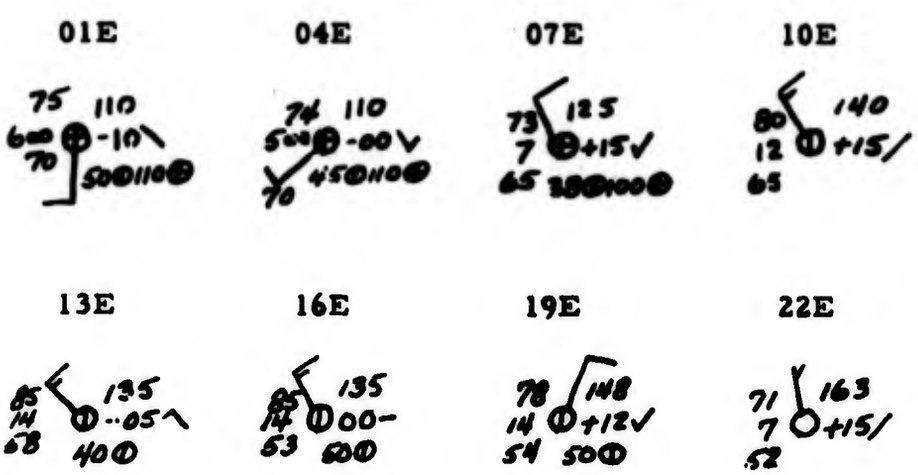


500 MB CONTOURS & SURFACE WEATHER CHART

DATE/TIME 30 Jul 63/1200Z



McGuire Observations



6. BERMUDA HIGH

27 July 1963

SYNOPTIC SITUATION: The Bermuda High is the predominant air mass affecting the eastern seaboard during the summer months. This warm moist air mass is responsible for the generally good flying weather which prevails during this period. Because it persists for long periods, the stagnated air mass tends to cause visibility restrictions during the early morning hours at the surface and with daytime heating the haze layer is lifted, and visibilities may be restricted at heights of 10,000 feet or more. Air mass thunderstorm activity, although somewhat infrequent at this station, is associated with the Bermuda High and usually occurs when this air mass has persisted for several days. The system illustrated is typical both at the surface and 500MB.

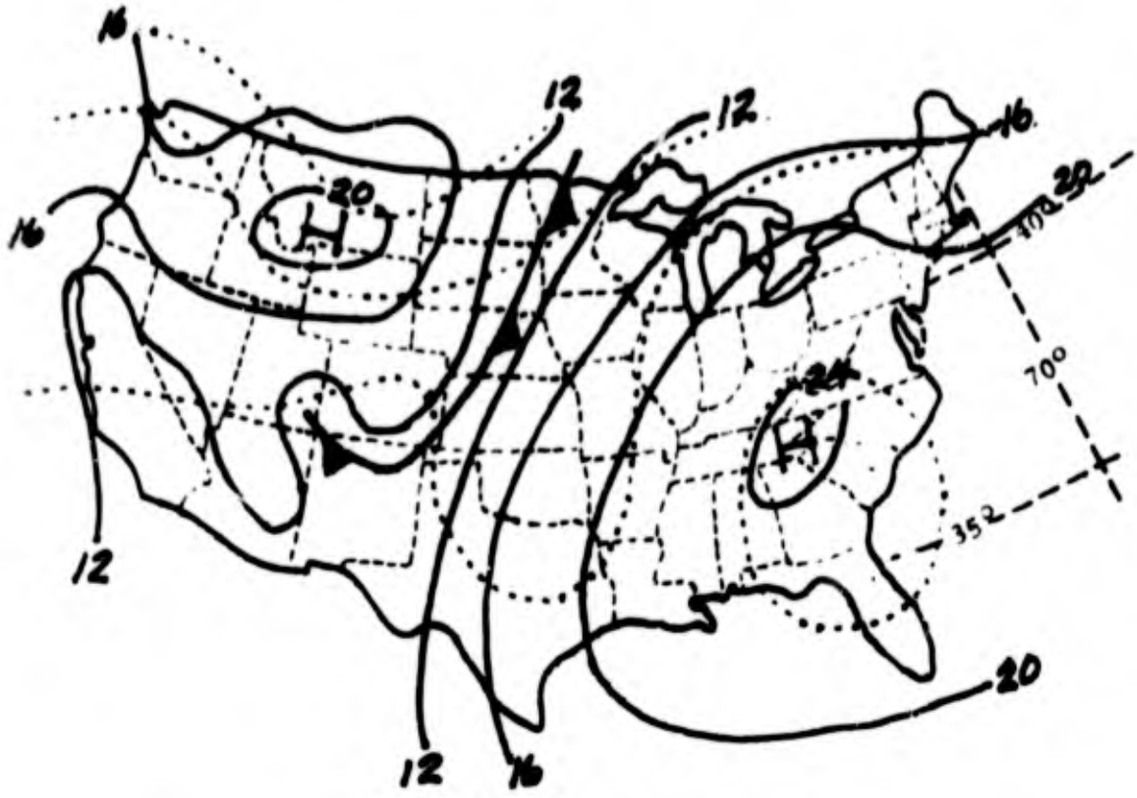
SIGNIFICANT WEATHER: At 0400E the visibility dropped below 5 miles and the lowest visibility recorded was 2 1/2 H at 0600E. The visibility increased to 5 miles at 1000E.

OTHER COMMENTS: The following afternoon, thunderstorms were reported at McGuire.

Source: ETAC MICROFILM LIBRARY, July, 1963 McGuire Observations from WBAN.

500 MB CONTOURS & SURFACE WEATHER CHART

DATE/TIME 27 Jul 63/1200Z



McGuire Observations

UNCLASSIFIED
Security Classification

DOCUMENT CONTROL DATA - R & D
(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author)
Base Weather Station, 15th Weather Squadron
McGuire AFB, NJ 08641

2a. REPORT SECURITY CLASSIFICATION
N/A

2b. GROUP
N/A

3. REPORT TITLE
TERMINAL FORECAST REFERENCE FILE, McGUIRE AFB, NJ

4. DESCRIPTIVE NOTES (Type of report and inclusive dates)
FINAL

5. AUTHOR(S) (First name, middle initial, last name)
N/A

6. REPORT DATE
20 October 1971

7a. TOTAL NO. OF PAGES
130

7b. NO. OF REFS
6

8a. CONTRACT OR GRANT NO
N/A

8b. PROJECT NO
N/A

8c.
N/A

8d.
N/A

9a. ORIGINATOR'S REPORT NUMBER(S)
N/A

9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)
N/A

10. DISTRIBUTION STATEMENT
Approved for public release; distribution unlimited.

11. SUPPLEMENTARY NOTES
N/A

12. SPONSORING MILITARY ACTIVITY
Hq 7th Weather Wing
Scott AFB, IL 62225

13. ABSTRACT
This reference file discusses factors affecting the weather at McGuire AFB, NJ. Included are location and topragraphy, weather controls, climatic aids, and local forecast studies.

DD FORM 1 NOV 1473

UNCLASSIFIED
Security Classification

14 KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Meteorology						
Climatic Data						
McGuire AFB, NJ						
Local Forecast Study						