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NAVORD REPORT

NOTS TP 2218

NAVORD REPORT 6527

THE WEATHER AT NOTS,
1946-1958

By

Donald L. Farnham, Paul H. Miller
and Isabelle C. Vercy

Atmospheric Studies Branch
Instrument Operations Division
Test Department

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U N C L A S S I F I E D

U. S. NAVAL ORDNANCE TEST STATION

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Technical Director

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China Lake, California
March 1959

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NOTS Technical Publication 2218
NAVORD Report 6527

Published by Test Department
Manuscript 30/MS 318
Supersedes NAVORD Report 3391
Collation Cover, 27 leaves, abstract cards
First printing 130 numbered copies
Security classification UNCLASSIFIED
 Abstract alone UNCLASSIFIED
 Title alone UNCLASSIFIED

FOREWORD

Weather measurements made at NOTS, China Lake, from 1946 through 1958 are summarized in this report, which supersedes NAVORD Report 3391, An Analysis of Atmospheric Data at the Naval Ordnance Test Station Inyokern, California, containing this same type of information for 1946 through 1953.

Work was done on this summary whenever operational duties would allow during January and February 1959, and was financed with overhead funds. This report is released at the working level and is intended for meteorologists and others interested in NOTS weather.

G. R. SCHRICKER, Head
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Released under the
authority of
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ABSTRACT

Surface and upper-air climatological conditions at the U. S. Naval Ordnance Test Station, China Lake, California, from 1946 through 1958, are summarized.

RECOMMENDED DESCRIPTORS FOR COORDINATE INDEX

Climatology
Weather

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INTRODUCTION

Why not say daily?

Complete weather records have been kept at NOTS, China Lake, for the past 12 years. These records show the Station to have a typical desert climate, with a moderate seasonal range of temperature and a large diurnal range, low humidity, light and variable precipitation, and little cloudiness or restriction to visibility. Winds are generally steady in direction when of significant speed, with speeds generally varying according to thermal conditions, the strongest gusts ordinarily being associated with frontal passages.

Details supporting this analysis are given on the following pages. The principal weather measurements made at NOTS and instruments for making them are described in Ref. 1, together with geographic and topographic considerations of NOTS weather origins, and the location and description of NOTS permanent weather-reporting stations.

SURFACE CLIMATOLOGY

A complete record of meteorological data for the Station has been maintained since January 1946, with observations being taken at Armitage Field by the Aerology Branch. These observations were begun in June 1945 but were not complete for a 24-hour daily period. Data prior to that is available, but the observations were taken at Harvey Field, about 10 miles west, and have been found to be unrepresentative of the Station, with particular reference to wind and precipitation. Table 1 summarizes the surface measurements for 1946 to 1958.

Pressure. As shown in Table 2, the yearly average Station barometric pressure is 935.4 millibars. The mean monthly trend is from a minimum of 931.5 mbs in June to a maximum of 940.2 mbs in December (Fig. 1). The mean extreme range is from 928.9 mbs in May 1946 to 943.6 mbs in November 1956. Recorded extremes of Station pressure are a minimum of 915.8 mbs on 1 March 1952, and a maximum of 957.8 mbs on 9 December 1956. A thermal low pressure area becomes established in or near the Station area during the summer months. Lower temperatures combined with the occasional occurrence of the nearby Great Basin high-pressure cell result in higher pressures during the winter. The summer minimums in May or June (rather than in July or August, the months of highest mean temperature) are caused by increasing temperatures together with the more frequent passage of frontal troughs or low pressure centers.

Temperature and Radiation. The location and topography of the Station combine to make its climate one of moderate seasonal temperature range, with large diurnal ranges. Mean and extreme monthly ranges are shown in Fig. 2 and Table 3.

The extreme maximum temperature of 114°F for the period of record was observed 22 June 1954. An extreme minimum of 3°F was recorded by hygrothermograph at G-1 range on 5 January 1949. Average monthly mean and extreme temperatures are shown in Fig. 3, with the mean ranging from 43°F in January to 87°F in July. Monthly and annual mean temperatures are shown in Table 4. The slight heat lag is to be expected in a desert locale.

TABLE 1. Summary of Surface Weather Measurements 1946-1958

MONTH	AVERAGE AIR DENSITY (SLUGS/FT ³)	STATION PRESSURE (MILLIBARS)	MEAN MAXIMUM TEMPERATURE (°F)	MEAN MINIMUM TEMPERATURE (°F)	MEAN TEMPERATURE (°F)	HIGHEST TEMPERATURE (°F)	DATE	LOWEST TEMPERATURE (°F)	DATE	AVERAGE DAILY TEMPERA- TURE RANGE (°F)	DAILY RANGE IN TEMPERA- TURE RANGE (°F)	TOTAL RANGE IN TEMPERA- TURE RANGE (°F)	DAYS WITH TEMPERATURE 32°F OR LESS	DAYS MAX. TEMPERATURE 100°F OR MORE	MEAN TEMPERATURE OF DEW POINT (°F)	MEAN RELATIVE HUMIDITY-% (IN.)	GREATEST PRECIPITATION IN 24 HRS (IN.)	DAYS WITH PRECIPITATION 0.01 INCHES OR MORE	DAYS WITH PRECIPITATION 0.01 INCHES OR MORE	TEMPERATURE UNRECORDED (IN.)	DAYS WITH SNOWFALL	PREVAILING WIND DIRECTION	AVERAGE WIND SPEED (MPH)	MAX. WIND VELOCITY PEAK GUST (MPH)	DIRECTION OF PEAK GUST	DATE	NO. OF DAYS CLEAR	NO. OF DAYS PARTLY CLOUDY	NO. OF DAYS CLOUDY	AVERAGE CLOUDINESS (%)	DAYS WITH RAIN	DAYS WITH BLOWING DUST	DAYS WITH FOG	DAYS WITH HAZE
Jan	0.00227	939.4	56.6	30.5	43.3	77	23/48	9 12/49	26.3	47 673	19.8	0	26 53	0.53	0.91	2.4	0.1	1.0	1.3	SW	7.2	77	SW	14/56	14.8	11.1	5.1	38	0	0.8	0.4	0.2		
Feb	0.00224	938.3	63.1	35.0	49.1	80	10/51 25/54	14 13/48	28.1	47 450	9.9	0	27 46	0.24	0.75	1.4	0	0	0.2	SW	8.1	69	W	22/48	13.9	10.5	3.8	35	0	1.9	0.2	0		
Mar	0.00221	935.2	67.2	40.1	53.8	86	24/56	22 5/48	27.0	45 351	4.5	0	29 41	0.26	0.89	1.3	0.2	0	0	SW	11.0	77	W	19/52	14.3	12.8	3.8	35	0	1.8	0.1	0		
Apr	0.00217	934.0	77.5	49.1	63.6	97	22,23/49	28 9/53	28.4	47 112	0.4	0	33 35	0.17	0.88	1.3	0.5	0	0	SW	11.2	66	N	2/57	15.9	11.1	3.0	31	0.2	1.4	0	0.2		
May	0.00213	932.2	85.4	56.6	71.2	107	26/51	38 29/53	28.8	43 32	0	1.1	37 30	0.03	0.16	0.6	0.5	0	0	SW	11.3	64	SW/WSW	1/50 31/55	20.2	8.6	2.2	27	0	1.1	0	0		
Jun	0.00210	931.5	94.5	64.1	79.6	114	22/54	42 10/54	30.4	43 0.7	0	7.7	40 25	0.01	0.07	0.2	0.2	0	0	SW	11.2	68	WSW	20/47	24.9	4.4	0.7	15	0.1	0.5	0	0		
Jul	0.00207	933.0	101.6	71.1	86.9	111	16/49 1, 2/50 10, 12/58	55 3/56	30.5	46 0	0	21.7	44 24	0.02	0.18	0.4	0.7	0	0	SW	10.4	57	NW	24/49	24.4	5.8	0.8	16	0	0	0	0		
Aug	0.00208	933.4	100.2	68.5	84.4	110	19/50 11, 12/58	53 3/53	31.6	45 0	0	18.0	43 25	T*	0.03	0.2	0.4	0	0	SW	10.2	51	ESE	11/53	26.7	3.7	0.6	13	0	0.7	0	0		
Sep	0.00210	933.4	94.8	62.4	78.7	110	1, 2/50 6/55	40 26, 27/48	32.3	46 1.8	0	9.1	39 26	0.12	0.68	0.8	0.2	0	0	SW	8.5	60	WSW W	16/46 24/48	25.9	3.6	0.5	12	0	0.4	0	0		
Oct	0.00216	935.8	81.3	50.2	65.8	99	2/52	32 30/46	31.2	45 72	0	0	34 33	0.08	0.40	0.6	0.1	0	0	SW	8.2	63	NW	23/56	22.3	7.6	1.1	20	0	0.6	0	0		
Nov	0.00223	939.3	67.6	37.5	52.2	85	2, 3, 4/49 2, 3/50	20 29/52 30/57	30.0	45 389	6.7	0	29 43	0.27	1.03	1.1	0	0	0	SW	6.7	64	SW	18/50	19.8	8.2	2.0	24	0	0.6	0.2	0		
Dec	0.00227	940.2	58.6	30.9	44.4	75	1, 2, 5/49 22/55 12/58	13 25/48	27.6	48 638	20.0	0	27 54	0.46	0.93	2.0	0	0	0	SW	6.5	68	SSW	4/53	15.2	11.5	4.2	35	0	0.4	0.7	0		
TOTAL										2720	61.3	57.6		2.19	12.3	2.9	1.0	1.5			SW	9.2												
AVG.	0.00217	935.4	79.0	49.6	64.4				29.4				34	36							SW	9.2					19.9	8.2	2.3	25				
EXTREME						114	22/54	9 12/49		48					1.03							77	SW/W	1/14/50 3/19/52										

* T = Trace.

TABLE 2. Average Monthly Surface Pressures (Millibars), 1946 to 1958

	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	High	Low	Av
Jan	940.4	939.4	941.0	939.1	938.0	938.9	939.7	942.3	937.9	940.0	937.0	938.4	940.1	942.3	937.0	939.4
Feb	937.4	936.7	937.3	938.3	939.4	937.6	938.9	939.7	940.6	940.7	937.6	936.9	936.0	940.7	936.0	938.2
Mar	933.6	934.3	935.7	935.2	936.4	935.4	934.1	935.7	934.8	937.2	937.7	934.9	932.1	937.7	932.1	935.2
Apr	934.5	934.3	935.3	935.9	933.6	932.5	934.4	932.0	934.4	934.1	933.7	933.5	934.3	935.9	932.0	934.0
May	928.9	930.6	932.4	933.0	932.4	932.5	933.6	933.2	930.8	932.9	933.3	931.6	933.3	933.6	928.9	932.2
Jun	931.9	929.7	932.5	931.9	931.9	931.0	931.5	931.7	930.6	932.1	932.0	931.0	931.4	932.5	929.7	931.5
Jul	933.0	932.9	932.2	933.6	932.8	932.3	934.7	933.3	933.1	931.1	934.4	933.0	932.2	934.7	932.2	933.0
Aug	932.3	932.2	933.9	934.1	934.2	932.9	933.6	933.5	933.4	933.2	933.9	933.7	933.8	934.2	932.2	933.4
Sep	931.9	934.3	933.6	933.0	933.5	932.9	934.8	934.7	932.4	932.7	934.3	933.8	932.7	934.8	931.9	933.4
Oct	934.0	934.9	936.1	935.9	935.1	936.0	937.5	936.7	936.0	936.2	935.8	934.5	937.0	937.5	934.0	938.8
Nov	937.4	937.8	940.6	940.9	938.9	938.7	937.8	939.1	940.1	937.5	943.6	939.4	938.6	943.6	937.4	939.3
Dec	938.0	940.0	939.0	939.0	939.2	938.3	939.6	943.1	942.1	938.5	942.6	941.3	942.4	943.1	938.0	940.2
High	940.4	940.0	941.0	939.1	939.4	938.9	939.7	943.1	942.1	940.7	943.6	941.3	942.4	943.6	-----	940.9
Low	928.9	929.7	932.2	931.9	931.9	931.0	931.5	931.7	930.6	931.1	932.0	931.0	931.4	-----	928.9	931.1
Av	934.4	934.8	935.8	935.8	935.4	934.9	935.8	936.2	935.5	935.5	936.6	935.2	935.3	-----	-----	935.4
Hi Mo.	Jan	Dec	Jan	Dec	Feb	Jan	Jan	Dec	Dec	Feb	Nov	Dec	Dec			
Lo Mo.	May	Jun	Jul	Jun	Jun	Jun	Jun	Jun	Jun	Jul	Jun	Jun	Jun			

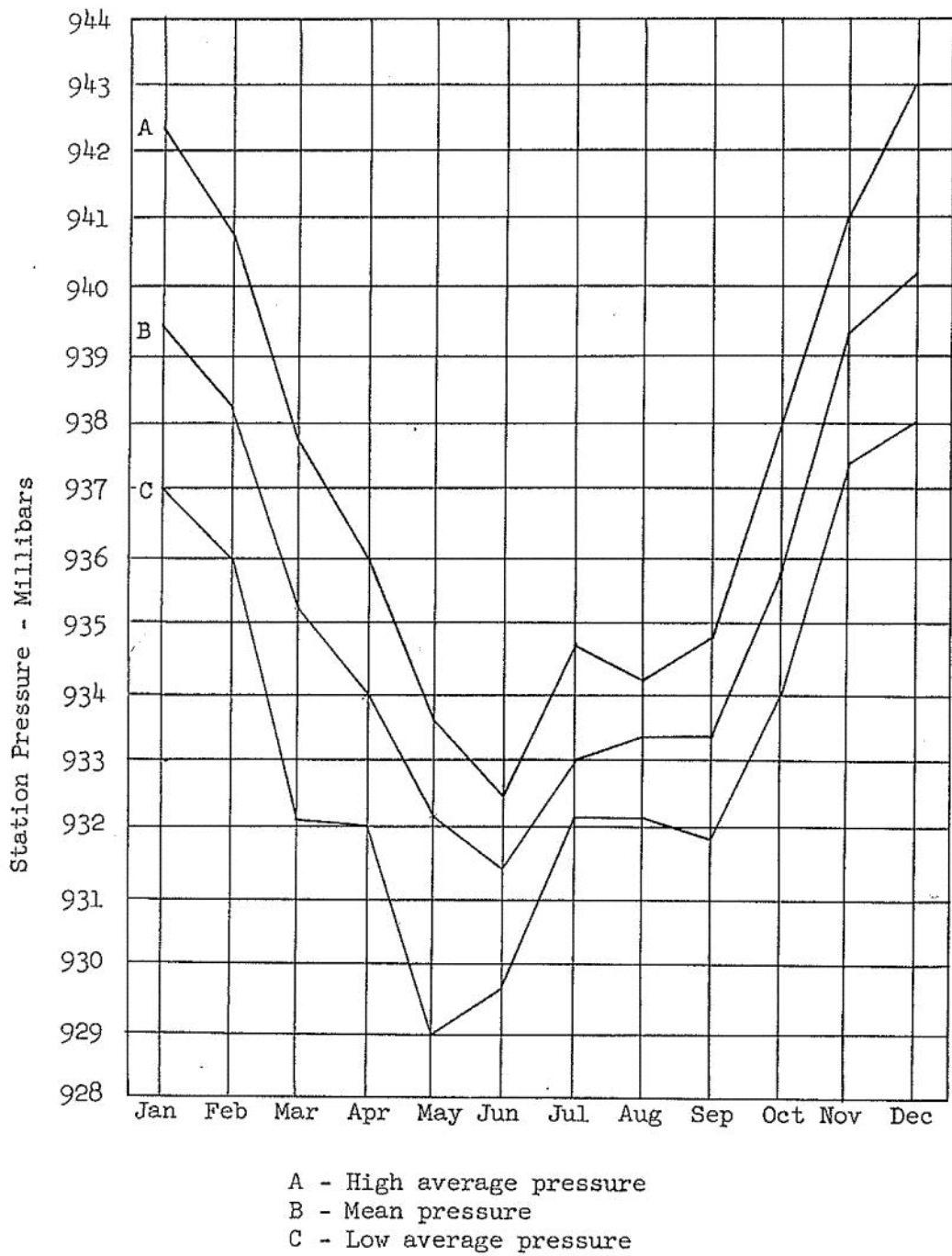


FIG. 1. Average Monthly Surface Pressures (1946-1958 Inclusive).

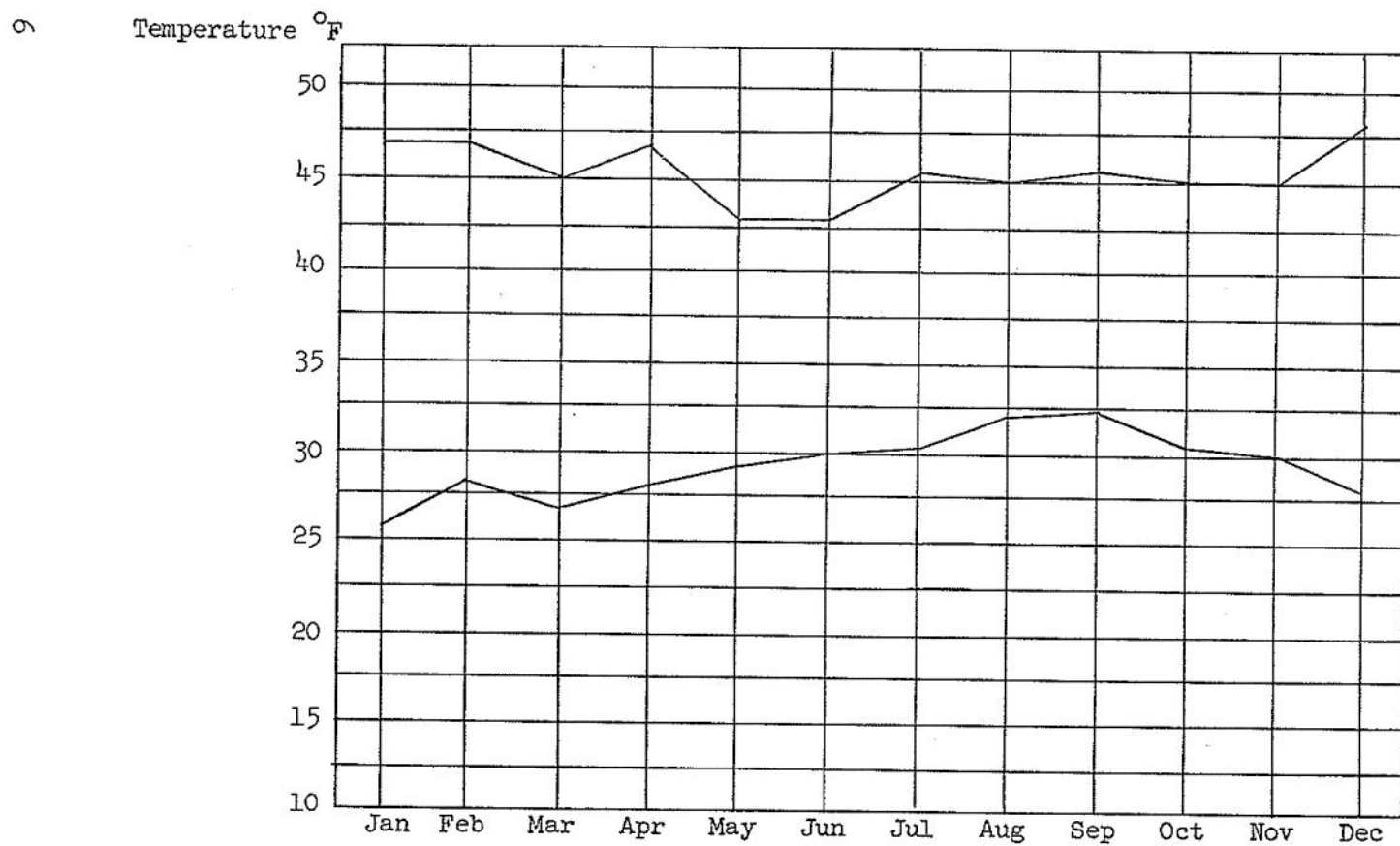
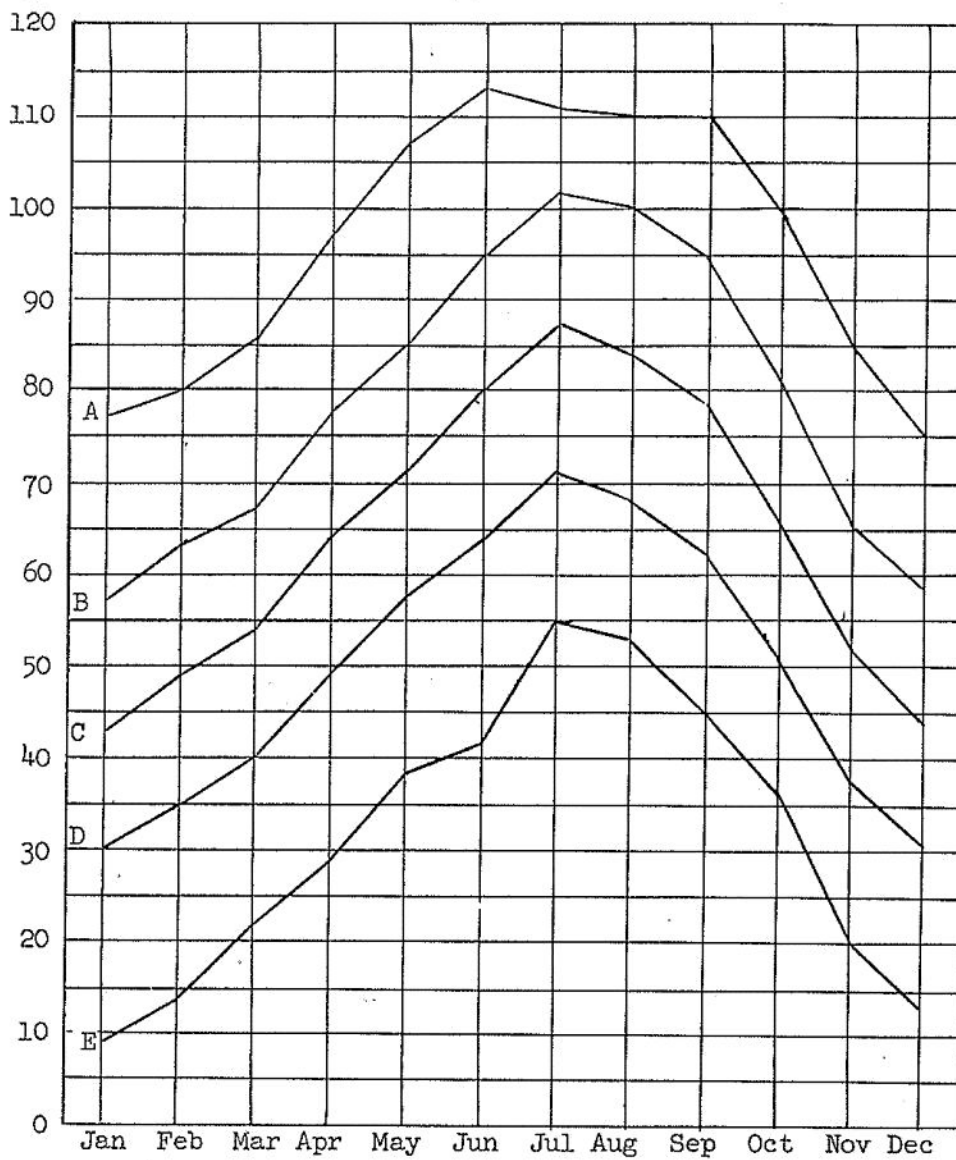


FIG. 2. Greatest Daily Temperature Range and Average Daily Temperature Range (1946-1958 Inclusive).

TABLE 3. Greatest and Average Daily Temperature Ranges ($^{\circ}$ F)

	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	High	Av
Jan	40-29	41-29	42-30	42-20	46-26	42-28	35-23	44-31	47-26	35-23	38-25	39-23	38-29	47	26
Feb	42-26	40-28	42-30	40-27	43-32	40-28	38-27	45-32	41-32	41-28	42-27	36-25	37-23	45	28
Mar	39-22	41-18	41-30	38-25	40-32	42-26	41-23	43-32	37-25	43-30	45-32	36-25	33-21	45	26
Apr	41-29	42-27	47-29	42-29	44-32	40-29	42-29	41-29	37-30	39-27	41-26	37-27	40-27	47	29
May	36-28	35-27	43-32	38-27	37-29	38-29	42-32	40-28	40-31	38-28	40-27	37-27	41-32	43	29
Jun	38-31	35-24	43-32	38-30	41-32	43-31	40-30	42-32	43-29	39-31	40-32	37-30	42-31	43	30
Jul	38-27	37-29	43-35	38-29	37-29	46-31	42-31	45-32	38-29	41-31	38-29	40-32	41-33	46	31
Aug	37-30	39-27	41-35	43-34	38-33	41-32	38-32	45-32	41-30	43-29	40-34	37-31	41-32	45	32
Sep	41-27	43-31	43-34	46-37	39-28	45-36	46-31	44-35	45-32	40-31	43-32	43-33	40-32	46	32
Oct	41-27	39-25	42-31	44-34	43-31	42-32	45-37	43-32	43-34	41-33	41-30	39-27	41-32	45	31
Nov	42-24	37-26	40-30	45-38	41-30	41-31	36-29	42-29	39-29	41-30	45-36	38-27	41-31	45	30
Dec	36-25	36-23	36-26	43-28	30-30	36-25	39-24	41-32	37-25	38-26	48-33	44-28	40-34	48	28
Max	42	43	47	46	46	46	46	45	47	43	48	44	42	48	--
Mean.														45	29

Temperature °F



A - Maximum temperatures
 B - Average maximum temperatures
 C - Mean temperatures
 D - Average minimum temperatures
 E - Minimum temperatures

FIG. 3. Average and Extreme Temperatures Observed at Armitage Field (1946-1958 Inclusive).

TABLE 4. Annual Mean Temperature ($^{\circ}\text{F}$) by Months
From observations taken at Armitage Field 1946-1958

Month	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	Average
Jan	45	44	46	35	41	45	41	49	45	40	47	41	46	43
Feb	48	52	47	44	52	49	50	49	53	43	46	55	52	49
Mar	52	58	49	53	56	56	50	56	51	54	56	58	51	54
Apr	66	64	62	67	66	63	63	63	69	59	61	63	62	64
May	71	74	68	70	72	72	74	65	77	69	71	68	75	71
Jun	79	79	79	82	78	81	76	77	80	79	83	84	80	80
Jul	85	84	85	88	87	88	87	90	89	85	85	91	87	87
Aug	85	81	83	82	85	84	87	83	83	88	83	84	89	84
Sep	76	80	78	78	76	80	79	81	78	80	81	78	80	79
Oct	61	67	66	63	70	65	71	65	67	68	63	62	70	66
Nov	50	49	51	59	59	51	50	54	55	52	49	49	52	52
Dec	46	44	41	43	51	45	44	43	41	47	43	44	45	44
Av	64	65	63	64	66	65	64	65	66	64	64	65	66	64

The prevailing scant cloudiness and low humidity allow a large amount of solar and sky radiation, as shown in Table 5. A steady increase from December to June obtains, in direct proportion to the increase in angular elevation of the sun. In contrast, the data for Riverside, California, taken from the Monthly Weather Review and available for but one year, shows a decline from April to May, probably due to increased cloudiness.

The same factors which permit high insolation result in rapid cooling by radiation at night, giving low minimum temperatures and large diurnal ranges. There is also some mountain-valley drainage of cool air. The greatest daily range of 48°F occurred in December 1956, with the average extreme range by months being 45°F . The mean daily range by months varies from 26° to 32°F .

The seasonal extremes of hot and cold weather are shown in Fig. 4, which gives the number of degree days for each month, the number of days per month on which the maximum temperature was 100°F or above, and the number of days per month on which the minimum temperature was 32°F or less. A "degree day" has the usual meaning, occurring when the mean daily temperature is less than 65°F and the amount for a given day equals the difference between the mean temperature and 65°F . The monthly totals indicate the amount of artificial heating required.

Precipitation. Precipitation in the Station area is seasonal, with negligible amounts from April through October. There is the winter maximum to be expected in a location near a region having a Mediterranean-type climate. The large variation typical of a desert is shown by a maximum annual total of 5.88 inches in 1952 and the minimum of 0.14 inches in 1953. The annual and monthly precipitation is shown in Table 6. The yearly average over the period is 2.19 inches.

Precipitation over the valley area of the Station is usually in the form of rain, with snow at the higher levels during the winter. One or two days of snow flurries normally occur each winter, but during the period of 11-14 January 1949, snow fell over the entire area, reaching depths of 12 to 14 inches over the southern portion of the Station (Ref. 2).

Rain during the winter months usually results from closed low-pressure centers aloft or strong frontal wave systems, especially from the southwest, either case resulting in rain for periods of one to three days. Precipitation during the other months is usually in the form of rain showers, with an occasional thunder-shower. Light hail may occur with the thundershower. On 8 June 1948, hail one-fourth to one-half inch in diameter fell in sufficient quantities to cover the ground (Ref. 2).

TABLE 5. Solar and Sky Radiation

Monthly averages of the total daily solar radiation (direct and diffuse), in gram-calories per square centimeter, received on a horizontal surface, measured at NOTS with a 50-junction Eppley pyrliometer placed on the roof of the instrumentation laboratory at G-1 range*.

Month	1949**	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	Av
Jan	227	313	--	286	269	305	333	314	311	312	337	300
Feb	295	406	--	433	373	411	458	454	492	407	--	414
Mar	416	522	--	554	516	557	587	620	625	608	516	552
Apr	523	616	--	640	624	663	750	742	720	768	754	680
May	493	700	--	756	735	766	797	806	808	784	824	783
Jun	593	729	--	810	768	828	842	844	857	849	882	824
Jul	584	744	--	767	728	754	776	779	775	837	829	763
Aug	531	673	--	742	715	727	745	725	756	763	709	706
Sep	469	587	--	636	--	615	674	646	648	660	651	604
Oct	356	487	--	469	--	500	474	502	505	449	485	440
Nov	279	375	342	312	--	346	346	367	386	367	358	348
Dec	223	293	278	243	243	311	292	275	329	299	319	282
Av	416	537	--	554	--	565	590	590	601	592	606	558

*Instrument moved to this location in February 1958. Former location was on the roof of the third story of Michelson Laboratory.

**Riverside, California data listed for comparison.

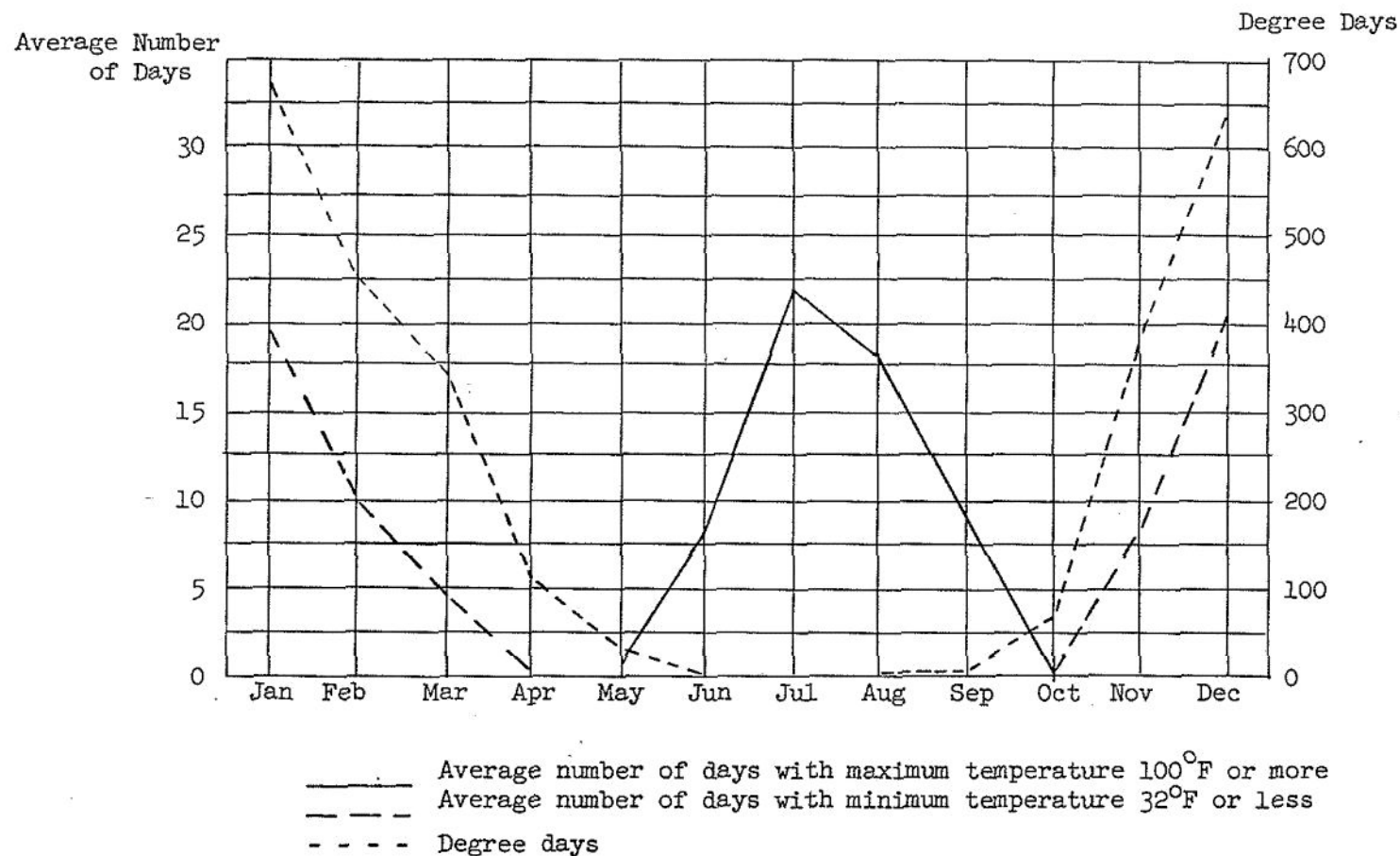


FIG. 4. Degree Days and Days With Temperatures 100°F or More or 32°F or Less.

TABLE 6. Annual Precipitation in Inches by Months
From observations taken at Armitage Field 1946-1958

Month	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	Average
Jan	T*	T	T	0.55	0.09	0.08	2.13	T	1.41	0.48	0.71	1.00	0.38	0.53
Feb	0.07	0.04	0.19	0.14	0.16	0.01	0.15	0.00	0.40	T	T	0.41	1.53	0.24
Mar	0.24	0.08	0.02	0.14	0.05	T	1.76	T	0.45	0.00	0.00	0.02	0.65	0.26
Apr	T	0.44	0.06	0.05	T	0.01	0.05	0.06	0.00	0.01	0.94	0.01	0.58	0.17
May	0.00	T	0.16	0.03	0.00	0.13	0.00	T	0.02	T	0.01	0.06	T	0.03
Jun	0.00	0.00	0.10	T	T	0.00	T	0.00	0.00	0.00	0.00	0.03	0.00	0.01
Jul	0.03	0.00	0.00	T	0.18	T	0.02	0.02	0.05	0.00	T	T	T	0.02
Aug	T	T	0.00	0.03	T	T	T	T	T	0.00	0.00	0.00	0.01	T
Sep	0.02	0.00	0.00	T	0.78	0.00	0.12	T	0.41	0.00	0.00	0.05	0.15	0.12
Oct	0.17	0.42	T	T	T	T	0.00	T	0.00	0.00	0.07	0.03	0.40	0.08
Nov	1.87	T	0.00	0.04	0.02	0.05	0.55	0.06	0.76	0.05	0.00	0.16	T	0.27
Dec	1.09	1.05	0.34	0.32	T	0.56	1.10	0.00	0.57	0.02	0.00	0.91	0.00	0.46
Total	3.49	2.03	0.87	1.30	1.28	0.84	5.88	0.14	4.07	0.56	1.73	2.68	3.70	2.19

*T = trace.

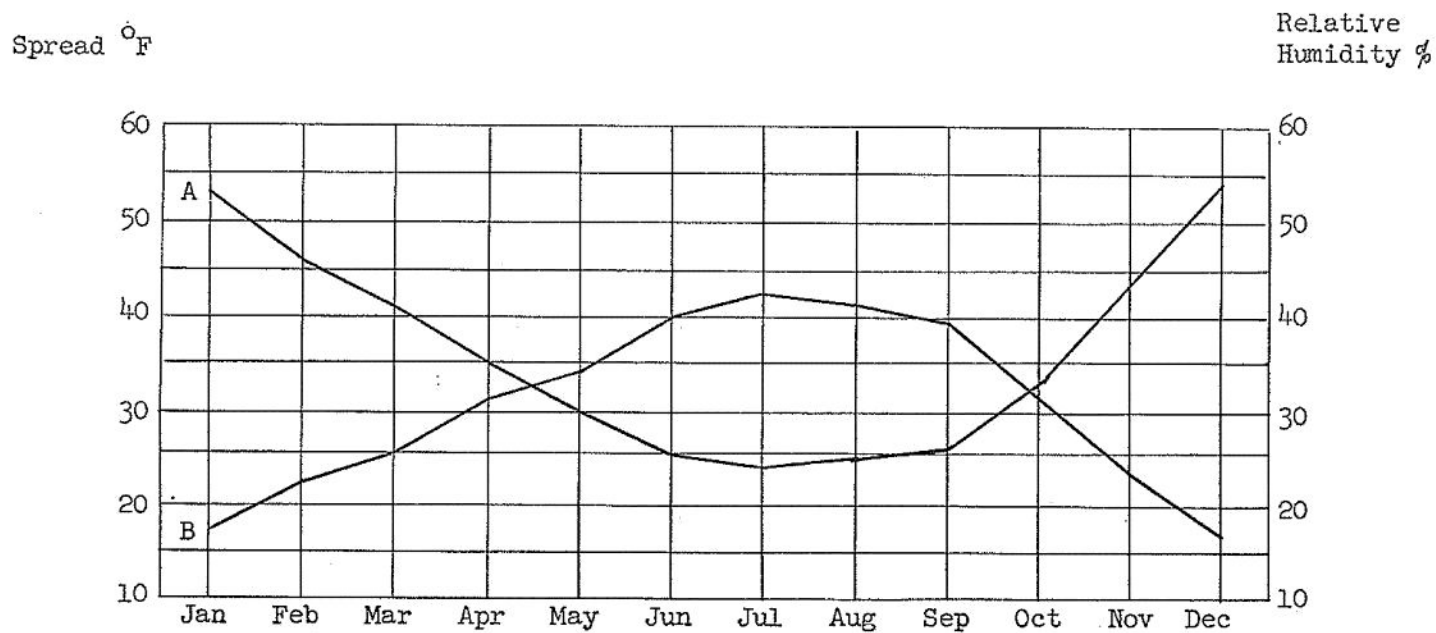
Relative Humidity. The relative humidity is consistently low except during periods of precipitation, the monthly mean ranging from 24% in July to 54% in December. During the hours of maximum summer heating, the humidity may drop to 10% or less. The low summer humidity, of course, plays a large part in alleviating the sensible temperature. The trend of monthly humidity through the year is shown in Fig. 5.

Wind. As shown in Table 1, the prevailing wind direction remains southwest throughout the year, with average wind speed by months varying from a minimum of 6 mph in December to 11 mph from March through June. Peak gusts of 77 mph from the southwest on 14 January 1950 and from the west on 19 March 1952 have been observed.

An analysis of the Summary of Monthly Aerological Records for Armitage Field (Ref. 3), compiled by the Navy Unit of the National Weather Records Center, and covering the period April 1945 through December 1952, shows the hourly frequency of wind direction by months and discloses that the prevailing direction is south to southeast, beginning at 0900 PST. The southwest flow becomes dominant between 1400 and 1500 in the afternoon, from March through July, and between 1600 and 1700 for the balance of the year. These effects appear to be the result of a combination of steering by the mountain passes plus mountain-valley thermal variations. The generally higher terrain to the west and the passes southwest of the Station result in a predominantly southwest flow. The strong heating in the valley during spring and summer months is likely the cause of the earlier change to southwest winds during that period. Relatively stronger heating during morning hours on the mountain slopes west of the Station would cause a thermal low in that area and a temporary southeast flow.

Highest peak velocities occur in the winter months of December through March because of the more frequent frontal passages and stronger winds aloft. The increase in average monthly velocities after January results from a combination of frontal activity with increased heating. Through the day, velocities tend to increase with the heating, and lessen after sundown. Pronounced drainage of cooling air down from the mountains, however, may give relatively high velocities throughout the night. Particularly strong convection during the summer may cause gusts of 40 mph or more.

Visibility. The main restriction to visibility is blowing sand or dust, occurring on an average of 10 days per year, mostly in the winter and spring months when average and peak wind velocities are highest. Since standards for meteorological observations call for the reporting of restrictions to visibility only when



A - Average relative humidity--1946-1958 inclusive
 B - Spread = difference between mean temperature and mean dew point--
 1946-1958 inclusive

FIG. 5. Relative Humidity and Spread (Temperature and Dew Point).

visibility is less than 7 miles throughout one-half or more of the horizon, local conditions of visibility may be worse than those reported. Usually velocities of 35-40 mph cause blowing dust, although a somewhat lesser velocity is sufficient if the direction is north or north-northwest. In the latter case, apparently, alkali dust from around Owens Lake is carried through Little Lake Gap and causes especially low visibility in the northern and northwestern area of the Station ranges. The frequency of blowing dust appears to be on the decline, possibly due to the decrease in construction on the Station and to the hard surfacing on the most traveled roads. Reference 1, covering 1945-48, reports blowing dust on an average of 20 days per year.

Haze is common throughout the year because of the large amount of dust and salt nuclei, especially in the eastern part of the valley, but visibility is seldom reduced to less than 7 miles, except occasionally locally and when humidity may be temporarily high. Smoke from the vicinity of the housing area and the local asphalt plant may limit visibility in the southeast and southwest quadrants, particularly during winter morning hours while the inversion is in effect. This inversion also may cause thicker haze.

Fog is a very minor factor in limiting visibility, occurring as it does on an average of only two days per year, from November through March.

UPPER-AIR DATA

Radiosonde Summary. Table 7 is a summary of radiosonde data compiled from ascents at Tower 8 (G-1 range) and B-1 range. Records for months in which fewer than five ascents were made were not used in computing averages. Humidity averages for altitudes above 30,000 ft are not shown since data was often missing, indeterminate, or outside the limits of the recording elements.

The pressure trend at 3,000 ft above m.s.l. is similar to that at the surface, showing a winter maximum and a summer minimum in correlation with thermal conditions. The 5,000-ft level is relatively indeterminate, with no definite indications. At 10,000 ft and above, the effect of winter storms becomes evident, with pressure minima in January and March resulting from the more frequent passage of low-pressure troughs and closed systems.

Temperature and humidity averages have the normal seasonal variations.

Tropopause Height. The average monthly height of the tropopauses for the years 1955 through 1957 is shown in Fig. 6. Figure 7 indicates the average range of the potential temperature of each tropopause over NOTS. The usual winter minimum and summer maximum appear.

More detailed information on the tropopauses and related phenomena is given in Refs. 4 and 5.

Summary of Upper Winds. Prevailing wind directions aloft for the period are shown by months in Table 8. Wind flow at 3,000 and 5,000 ft above m.s.l. has a generally north-south orientation throughout the year, determined by the mountain-valley topography. From 10,000 through 55,000 ft the directions are west to southwest during the summer and west to northwest in the winter. The northerly winter component results from the passage of troughs and low-pressure centers. Noticeable at 60,000 ft and above is the pronounced shift to an easterly direction during the summer. These levels are above the main tropopauses.

TABLE 7. Summary of Radiosonde Data, 1949 Through 1958

Monthly averages of pressure P (millibars), temperature T ($^{\circ}\text{C}$), and relative humidity H (per cent), at various altitudes above mean sea level.

Height		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
Surf.	P	941	941	937	936	934	933	935	935	935	938	941	942	937
	T	7.4	11.0	15.0	18.5	22.6	25.9	28.9	27.6	24.1	19.1	13.7	9.5	19.5
	H	50	37	32	32	29	24	26	26	28	31	35	42	32
5,000	P	847	848	846	846	845	845	848	848	847	848	849	850	847
	T	4.6	6.8	8.2	11.7	15.8	19.6	23.5	23.1	21.1	15.8	10.7	8.2	14.8
	H	43	39	34	33	31	26	28	26	27	29	34	38	32
10,000	P	701	703	700	702	704	705	709	709	708	706	706	705	705
	T	-2.1	-1.2	-1.7	0.5	4.5	9.0	12.5	11.9	9.9	5.9	2.8	1.3	-5.0
	H	39	41	39	41	38	31	38	35	35	35	36	34	37
15,000	P	577	578	576	578	581	584	589	589	587	584	582	581	583
	T	-10.4	-10.9	-11.0	-8.8	-5.6	-1.0	1.8	1.0	-0.3	-3.1	-5.9	-7.8	-4.7
	H	44	44	43	40	38	35	50	41	42	35	35	41	41
20,000	P	472	472	471	473	477	481	486	485	483	480	478	477	478
	T	-21.3	-21.7	-21.7	-19.5	-16.0	-11.3	-8.1	-9.4	-10.5	-13.9	-16.6	-18.4	-15.2
	H	43	45	42	39	33	33	45	37	43	38	40	44	40
25,000	P	382	382	381	383	388	392	397	397	395	390	387	386	389
	T	-32.4	-33.1	-33.1	-30.8	-27.4	-22.9	-19.1	-20.0	-21.8	-25.1	-28.0	-29.9	-26.4
	H	46	53	47	43	39	32	41	30	38	42	40	44	41
30,000	P	305	306	304	307	311	317	322	321	319	315	312	310	313
	T	-42.3	-44.4	-44.2	-42.6	-39.6	-34.4	-30.2	-31.5	-33.0	-37.1	-39.8	-41.8	-37.9
	H	51	61	42	49	46	25	38	32	35	40	34	47	37
35,000	P	242	242	241	243	248	253	258	257	255	251	248	246	249
	T	-53.5	-53.4	-53.9	-52.7	-50.2	-45.1	-40.8	-41.9	-43.1	-47.5	-49.9	-51.7	-48.3
40,000	P	191	191	190	191	196	202	206	205	203	199	196	194	198
	T	-57.2	-57.1	-58.8	-58.5	-56.7	-53.8	-50.5	-51.0	-51.6	-55.4	-57.4	-57.6	-55.2

45,000	P	149	149	149	150	153	157	162	161	159	156	153	152	154
	T	-58.1	-57.3	-57.6	-57.5	-58.5	-59.2	-58.6	-58.0	-58.6	-59.6	-61.2	-59.7	-58.6
50,000	P	117	117	116	117	120	123	126	126	125	122	119	119	121
	T	-61.2	-59.9	-58.7	-58.6	-59.5	-62.5	-64.1	-63.3	-63.6	-63.1	-63.6	-62.6	-61.8
55,000	P	91.7	91.9	91.6	92.4	93.5	96.3	98.4	98.3	97.3	95.0	93.3	93.2	94.5
	T	-61.4	-62.2	-60.3	-59.3	-61.0	-63.3	-65.5	-64.5	-64.5	-63.9	-64.3	-65.0	-63.0
60,000	P	72.0	72.7	71.7	72.7	73.4	75.3	76.7	76.6	75.9	74.4	73.1	72.6	74.0
	T	-61.2	-62.0	-60.3	-58.6	-60.2	-61.4	-61.5	-60.6	-61.8	-62.3	-63.5	-64.4	-61.5
65,000	P	56.1	56.1	55.9	56.7	57.4	58.6	60.2	59.9	59.2	57.9	56.7	56.4	57.6
	T	-59.9	-61.2	-59.0	-57.3	-57.5	-57.9	-57.7	-56.6	-58.2	-59.8	-61.4	-61.6	-59.0
70,000	P	44.1	43.9	43.8	44.8	45.0	46.0	47.1	47.1	46.7	45.9	44.4	44.2	45.3
	T	-58.7	-60.3	-57.1	-55.8	-55.5	-55.2	-54.7	-54.1	-54.9	-57.2	-59.2	-60.0	-56.8
75,000	P	34.6	34.4	34.5	35.1	35.5	36.3	36.9	37.2	36.9	36.1	34.8	34.6	35.6
	T	-56.8	-59.7	-54.8	-54.4	-52.6	-52.5	-52.0	-51.3	-52.5	-54.1	-56.5	-57.5	-54.4
80,000	P	26.9	27.0	27.1	27.3	28.1	28.7	29.5	29.5	29.1	28.3	27.5	27.2	28.2
	T	-55.3	-56.4	-53.0	-51.3	-49.3	-50.4	-49.3	-48.8	-49.8	-51.5	-54.3	-56.8	-51.8
85,000	P	21.5	21.1	22.1	22.2	22.3	22.6	23.4	23.4	23.0	22.3	22.0	21.2	22.4
	T	-54.6	-53.5	-46.8	-48.6	-48.1	-48.5	-47.8	-46.5	-48.1	-49.1	-52.0	-54.3	-49.5
90,000	P	16.9	16.8	17.5	17.9	17.4	17.8	18.4	18.3	18.7	17.6	17.2	16.6	17.7
	T	-53.0	-50.8	-44.9	-43.9	-46.1	-45.5	-45.2	-45.1	-44.5	-47.0	-49.9	-52.6	-47.1
95,000	P	13.4	14.0	13.7	14.2	14.1	13.9	14.8	14.6	14.7	14.1	13.5	13.4	14.1
	T	-48.6	-45.0	-41.7	-40.5	-42.1	-43.2	-43.8	-42.5	-41.9	-46.5	-48.6	-49.5	-44.8
100,000	P	10.5	----	12.0	11.6	11.3	11.4	11.8	11.5	11.9	11.3	10.9	10.6	11.4
	T	-47.5	----	-35.4	-37.4	-39.0	-40.9	-42.0	-40.9	-40.2	-44.0	-45.9	-45.6	-42.2

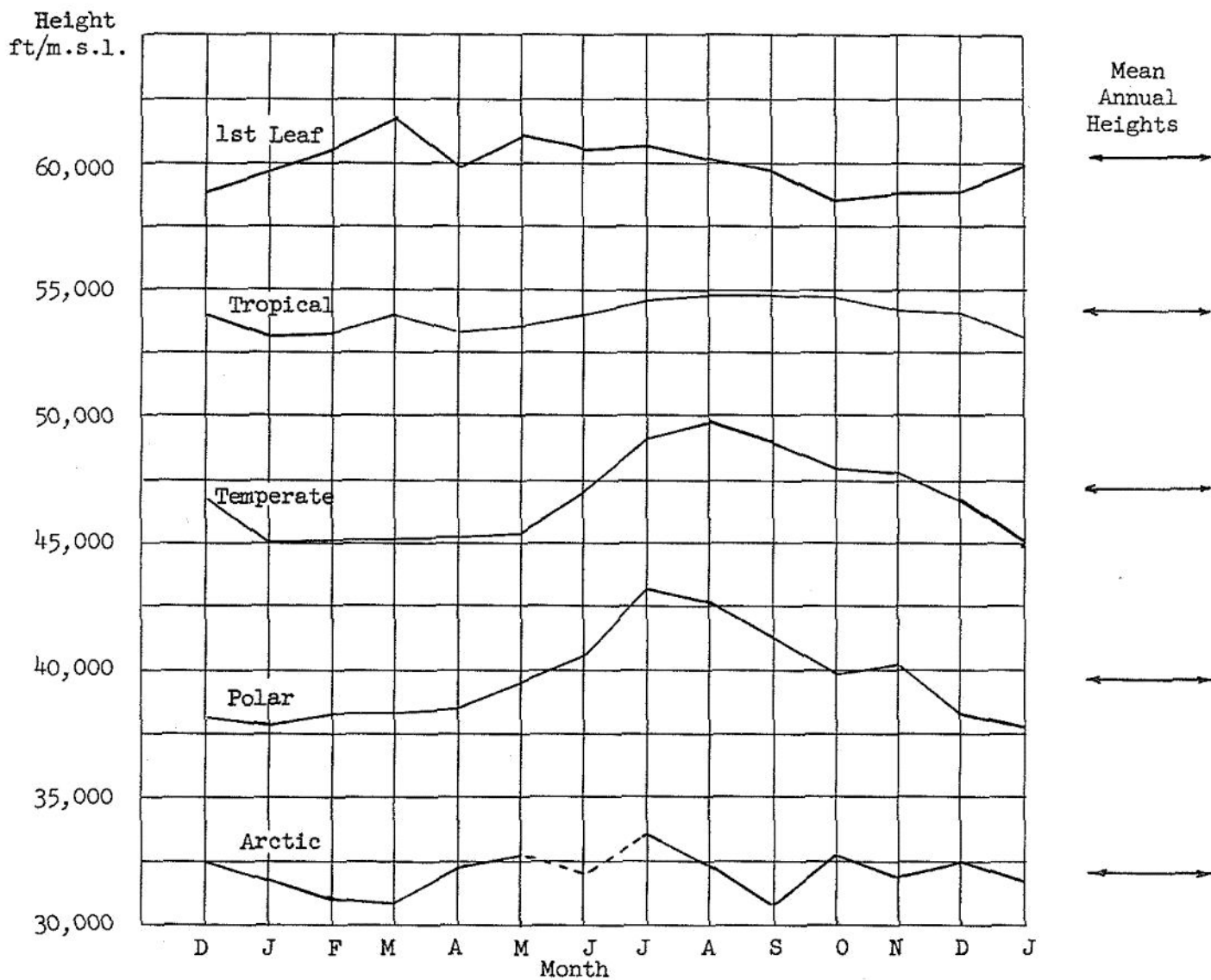


FIG. 6. Monthly Average Tropopause Heights Over NOTS (1955-1957).

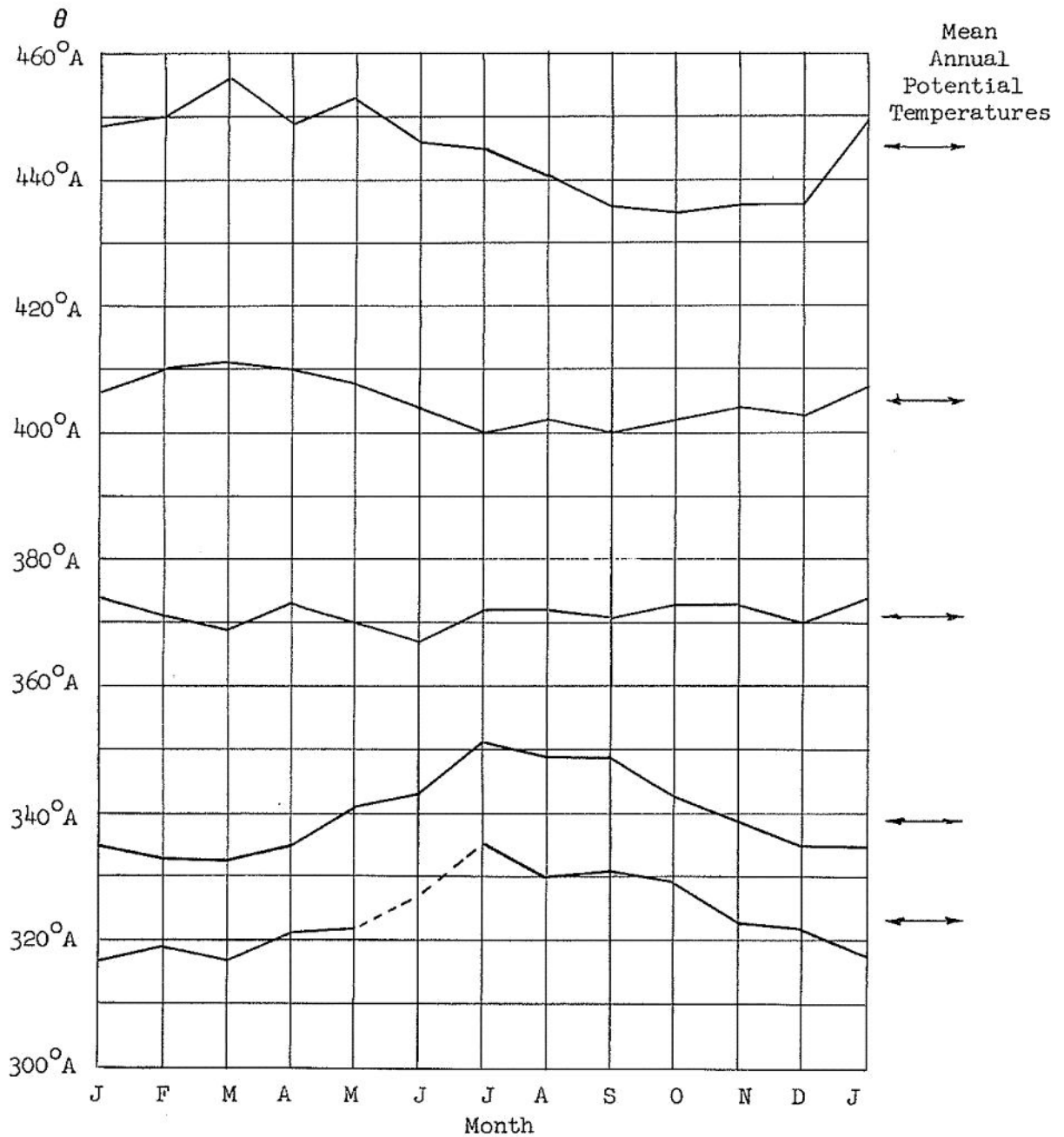


FIG. 7. Monthly Average Potential Temperatures of the Tropopauses Over NOTS (1955-1957).

TABLE 8. Prevailing Wind Directions, 1946 Through 1958

Altitude above mean sea level

Month	3,000	5,000	10,000	15,000	20,000	25,000	30,000	35,000	40,000
Jan	N,SSE	N	WNW	W,WNW	W	W	NW	WSW	W
Feb	SSE	N	NW,N	NNW	NNW	WSW	WSW	WSW	WSW
Mar	SSE	N	W	NW	W,WNW	W	W	W	W
Apr	S,SSW SW	N	W,WNW	W	W	W	W	W	W
May	SE	N	S,SW,W WNW,N	SW,WNW	WSW,WNW	WNW	W	W	WNW
Jun	SE	N	WSW	WSW	WSW,W	SW	SW	WSW	WSW
Jul	SSE	S	S	SSW	SW	SW	SW	SW	SW
Aug	S	SSW	SW	SW	SW	SW	SW	SW	SW
Sep	SSE,S	SSW,SW	SW	SW	SW	SW	WSW	SW	SW
Oct	SSE	N	SSW	WSW,W SSW	SW	SW	W	NW	W
Nov	SE,SSE	N	N	NW	NW	WNW	NW	NNW	NW
Dec	SE	N	W	WNW	WNW	W	W	W,WNW	W,WNW

TABLE 8. Prevailing Wind Directions, 1946 Through 1958--Continued

Altitude above mean sea level

Month	45,000	50,000	55,000	60,000	65,000	70,000	75,000	80,000	85,000
Jan	W	W	WNW	W	WNW	WNW	NE	ENE,E	**
Feb	WSW	WSW	W	W	W	N	**	**	**
Mar	W	W	W	W	W	WSW	W	**	**
Apr	W	W	W	W	WSW	SW,WSW W,NW	W	**	**
May	WNW	WSW	W	NNW	E	ENE	ENE,E	E	ESE
Jun	WSW	SW	SW	SSW	E	E	E	E	E
Jul	SW	SW	S	E	ESE	E	E	E	E
Aug	SW	WSW	SSE,S SW	ESE	E	E	E	E	E
Sep	SW,W	WSW	W	ENE	E	E	E	E	E
Oct	WSW,W	W	W	WSW	WSW,W	WSW	W	W	W
Nov	NW	WNW	NW	WNW	N	NNE,WSW	E,W	W	WSW,W
Dec	WSW,NW	W	WNW	WSW,NW NNW	E	NE	ENE	NE	**

**Insufficient data.

Summaries by months showing frequencies of direction and average speeds at 5,000-ft intervals are shown in Table 9. Frequencies are given in per cent and speeds in knots. Frequencies below five are considered insignificant and are indicated by a single line. Data from less than ten observations in one month was considered insufficient and is indicated by a double line. Results from less than 25 observations in a given month are probably more indicative than representative.

Highest average speeds occur during the winter months at the 35,000- and 40,000-ft levels, when fronts and upper-level troughs are most frequent. The levels are near the polar tropopause, where air-mass temperature contrasts are sharpest. There is a steep decline in average speed of nearly 50 per cent in the summer, when frontal action is at a minimum. The only exceptions to this are at altitudes well above the tropopauses, where the summer easterlies take effect. Data at these levels, however, is not sufficient for the results to be entirely representative.

TABLE 9. Frequencies of Direction (%) and Average Speeds in Knots (K) of Prevailing Winds, 1946 Through 1958, at 5,000-ft Intervals

3,000 Feet m.s.l.

	Jan		Feb		Mar		Apr		May		Jun	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	7		8		9		5		-		-	
N	10	10	8	12	6	10	6	9	8	10	6	7
NNE	6	7	6	5	-		-		-		-	
NE	-		-		-		-		-		-	
ENE	-		-		-		-		-		-	
E	5	3	5	3	-		-		5	4	5	4
ESE	8	3	7	3	6	4	7	4	8	5	9	4
SE	7	3	10	4	8	4	9	5	10	5	12	5
SSE	10	4	12	4	11	5	7	6	8	5	11	5
S	8	6	10	5	7	6	8	8	8	7	7	6
SSW	6	8	6	10	6	8	8	11	5	7	6	9
SW	-		-		6	11	8	12	6	11	6	10
WSW	5	7	-		8	16	7	16	8	12	-	
W	6	8	5	12	8	14	7	12	5	15	6	10
WNW	-		-		-		-		-		-	
NW	-		-		-		-		-		-	
NNW	-		-		6	11	-		-		5	8
No. of Observ.	771		571		629		626		684		758	
Average Speed		5K		6K		8K		8K		7K		6K

	Jul		Aug		Sep		Oct		Nov		Dec	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	-		-		-		5		7		7	
N	-		-		7	7	6	7	10	7	9	10
NNE	-		-		-		-		5	7	-	
NE	-		6	4	-		-		-		5	3
ENE	5	4	6	4	-		-		-		-	
E	6	4	8	4	6	4	6	3	5	3	5	2
ESE	8	4	8	4	6	4	8	3	7	3	8	3
SE	9	5	9	5	8	5	10	4	11	4	10	3
SSE	14	6	11	6	11	5	11	5	11	4	7	4
S	12	6	12	7	11	6	9	7	8	5	8	4
SSW	6	7	7	7	7	7	7	10	5	5	-	
SW	7	7	9	8	8	8	6	10	-		5	10
WSW	6	7	-		6	10	6	11	-		6	13
W	7	7	-		5	5	-		-		7	16
WNW	-		-		-		-		-		-	
NW	-		-		-		-		-		-	
NNW	-		-		-		-		-		-	
No. of Observ.	758		698		735		815		698		645	
Average Speed		5K		5K		5K		6K		5K		6K

TABLE 9. Frequencies of Direction (%) and Average Speeds in Knots (K) of Prevailing Winds, 1946 Through 1958, at 5,000-ft Intervals--Continued

5,000 Feet m.s.l.

	Jan		Feb		Mar		Apr		May		Jun	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	-		-		-		-		-		-	
N	14	11	15	11	14	12	13	11	12	11	11	9
NNE	12	15	11	12	8	10	8	10	10	10	6	8
NE	-		6	6	-		-		-		-	
ENE	-		-		-		-		-		-	
E	-		-		-		-		-		-	
ESE	-		-		-		-		-		-	
SE	-		-		-		-		7	6	-	
SSE	-		-		-		5	7	6	7	-	
S	-		-		5	9	7	8	9	8	9	8
SSW	7	10	7	9	7	11	8	11	9	9	9	10
SW	8	10	7	11	8	9	9	11	7	10	8	9
WSW	9	13	6	11	8	12	8	13	7	10	7	10
W	8	14	6	10	9	13	6	13	-		-	
WNW	6	14	7	14	8	13	7	12	6	11	6	11
NW	6	9	7	9	6	10	-		-		7	9
NNW	9	8	8	8	7	10	6	10	6	9	10	8
No. of Observ.	765		566		630		628		684		699	
Average Speed		10K		9K		10K		10K		9K		8K

	Jul		Aug		Sep		Oct		Nov		Dec	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	-		-		-		-		-		-	
N	8	6	8	7	9	8	12	8	17	11	16	14
NNE	-		-		6	7	9	9	15	11	11	13
NE	-		-		-		6	6	6	5	-	
ENE	-		-		-		-		-		-	
E	-		-		-		-		-		-	
ESE	5	6	5	6	5	7	6	5	-		-	
SE	5	5	6	6	-		-		-		-	
SSE	8	7	6	7	-		-		-		5	6
S	13	8	11	8	8	8	7	8	8	7	6	6
SSW	12	9	15	10	13	10	10	11	8	9	7	9
SW	12	9	14	10	13	11	10	12	-		6	9
WSW	8	10	9	8	8	12	7	11	-		8	13
W	7	9	5	6	6	9	6	12	-		10	13
WNW	-		-		-		-		-		5	17
NW	-		-		-		-		-		-	
NNW	-		-		-		-		7	8	6	9
No. of Observ.	758		690		736		819		693		641	
Average Speed		8K		8K		8K		9K		9K		11K

TABLE 9. Frequencies of Direction (%) and Average Speeds in Knots (K) of Prevailing Winds, 1946 Through 1958, at 5,000-ft Intervals--Continued

10,000 Feet m.s.l.

	Jan		Feb		Mar		Apr		May		Jun	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	0		-		0		0		-		-	
N	9	28	13	23	11	20	11	19	9	14	-	
NNE	10	20	7	19	-		-		6	16	-	
NE	5	18	-		-		-		-		-	
ENE	-		-		-		-		-		-	
E	-		-		-		-		-		-	
ESE	-		-		-		-		-		-	
SE	-		-		-		-		5	13	-	
SSE	-		-		-		-		-		-	
S	-		-		-		-		9	15	11	16
SSW	-		-		-		-		7	15	7	16
SW	8	27	6	22	8	22	8	20	9	20	10	18
WSW	9	25	11	23	10	21	11	24	8	15	13	17
W	13	24	10	16	15	24	12	22	9	20	10	13
WNW	15	27	12	18	11	22	12	21	9	20	9	14
NW	13	25	13	20	13	24	9	20	7	15	6	14
NNW	10	18	9	19	10	21	9	16	-		-	
No. of Observ.	674		523		588		582		641		671	
Average Speed		23K		19K		20K		18K		15K		14K

	Jul		Aug		Sep		Oct		Nov		Dec	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	0		-		-		-		-		0	
N	-		-		-		7	14	12	22	12	21
NNE	-		-		-		6	16	10	22	10	22
NE	-		-		-		6	12	6	18	5	18
ENE	-		-		-		-		6	12	-	
E	-		-		-		-		-		-	
ESE	-		-		7	12	-		-		-	
SE	7	9	6	11	6	11	-		-		-	
SSE	10	9	9	12	6	12	-		-		-	
S	16	13	14	16	8	15	8	13	-		-	
SSW	14	14	17	17	12	17	11	18	-		-	
SW	14	15	19	17	16	20	7	18	-		6	25
WSW	12	14	13	15	14	22	8	20	7	17	7	26
W	5	11	-		11	14	9	19	10	24	15	28
WNW	-		-		-		9	18	11	22	13	28
NW	-		-		-		6	17	11	23	13	26
NNW	-		-		-		-		9	17	8	17
No. of Observ.	736		682		724		701		601		603	
Average Speed		12K		14K		15K		16K		19K		23K

TABLE 9. Frequencies of Direction (%) and Average Speeds in Knots (K) of Prevailing Winds, 1946 Through 1958, at 5,000-ft Intervals--Continued

15,000 Feet m.s.l.

	Jan		Feb		Mar		Apr		May		Jun	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	0		0		-		0		0		0	
N	8	38	7	30	-		6	26	6	23	-	
NNE	-		5	29	-		-		-		-	
NE	-		-		-		-		-		-	
ENE	-		-		-		-		-		-	
E	-		-		-		-		-		-	
ESE	-		-		-		-		-		-	
SE	0		-		-		-		-		-	
SSE	-		-		-		-		-		-	
S	-		-		-		-		8	18	7	25
SSW	-		-		-		-		8	22	10	25
SW	10	39	5	34	9	25	8	29	12	22	14	26
WSW	10	34	14	29	14	26	16	31	11	31	16	25
W	18	31	10	26	14	29	17	30	10	24	13	20
WNW	18	29	13	30	15	33	12	32	12	24	11	24
NW	13	32	12	26	20	31	10	25	11	25	6	26
NNW	9	31	15	28	13	30	11	24	9	25	6	24
No. of Observ.	416		351		445		465		452		510	
Average Speed		31K		26K		28K		27K		23K		23K

	Jul		Aug		Sep		Oct		Nov		Dec	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	-		0		0		-		0		-	
N	-		-		-		6	21	10	24	7	28
NNE	-		0		-		-		6	25	-	
NE	-		-		-		-		5	16	-	
ENE	-		-		-		-		-		-	
E	-		-		-		-		-		-	
ESE	6	14	-		-		-		-		-	
SE	8	13	6	12	-		-		-		-	
SSE	12	13	5	12	5	16	-		-		0	
S	13	14	16	14	8	17	7	17	-		-	
SSW	16	18	18	19	13	21	11	24	-		-	
SW	14	18	22	20	16	24	10	21	6	32	8	39
WSW	8	17	11	19	13	23	11	25	12	31	10	36
W	6	16	5	15	10	19	11	27	9	30	14	29
WNW	-		-		10	16	8	25	10	32	16	41
NW	-		-		6	12	8	25	17	35	15	31
NNW	-		-		-		7	21	10	27	13	29
No. of Observ.	450		438		504		515		412		385	
Average Speed		15K		16K		19K		21K		27K		32K

TABLE 9. Frequencies of Direction (%) and Average Speeds in Knots (K) of Prevailing Winds, 1946 Through 1958, at 5,000-ft Intervals--Continued

20,000 Feet m.s.l.

	Jan		Feb		Mar		Apr		May		Jun	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	0		0		0		-		0		0	
N	8	38	6	31	-		6	28	5	33	-	
NNE	-		-		-		-		-		-	
NE	-		-		-		-		-		-	
ENE	-		-		-		-		-		-	
E	-		-		0		-		0		-	
ESE	-		-		0		-		-		-	
SE	0		-		-		-		-		-	
SSE	-		-		-		-		-		-	
S	-		-		-		-		-		-	
SSW	-		-		-		-		6	38	10	35
SW	7	51	7	31	7	34	8	47	10	33	17	37
WSW	15	46	12	29	13	29	14	42	16	33	18	31
W	19	41	15	35	20	36	23	43	11	34	18	30
WNW	18	35	14	26	20	35	14	37	16	30	9	34
NW	9	31	15	34	13	40	10	32	14	29	7	36
NNW	12	40	17	35	12	41	13	34	7	40	-	
No. of Observ.	345		272		331		370		390		438	
Average Speed		40K		32K		35K		37K		32K		31K

	Jul		Aug		Sep		Oct		Nov		Dec	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	0		-		0		0		0		0	
N	-		-		-		-		12	29	7	31
NNE	-		-		-		-		6	26	-	
NE	-		-		-		-		-		-	
ENE	-		0		0		-		-		-	
E	-		-		-		-		-		-	
ESE	-		-		-		-		-		-	
SE	8	12	-		-		-		-		0	
SSE	7	13	5	12	-		-		-		-	
S	11	15	8	15	-		-		-		-	
SSW	14	20	16	23	12	24	11	30	-		-	
SW	20	21	23	25	19	29	14	28	-		6	41
WSW	11	21	20	25	13	28	12	33	11	37	13	39
W	9	22	8	22	15	25	12	28	13	35	16	38
WNW	6	20	5	13	9	24	8	31	14	32	17	44
NW	-		-		6	15	9	24	18	41	14	44
NNW	-		-		6	20	8	26	9	27	13	42
No. of Observ.	392		318		413		440		321		289	
Average Speed		20K		20K		23K		26K		32K		39K

TABLE 9. Frequencies of Direction (%) and Average Speeds in Knots (K) of Prevailing Winds, 1946 Through 1958, at 5,000-ft Intervals--Continued

25,000 Feet m.s.l.

	Jan		Feb		Mar		Apr		May		Jun	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	0		0		0		0		0		0	
N	8	38	8	38	-		9	39	-		-	
NNE	-		-		-		-		-		-	
NE	-		-		-		-		-		-	
ENE	-		-		-		-		-		-	
E	0		-		0		-		-		-	
ESE	-		-		0		-		-		-	
SE	0		-		0		-		-		-	
SSE	0		-		-		-		-		-	
S	-		-		-		-		-		-	
SSW	-		-		-		-		6	51	8	34
SW	7	43	8	31	7	43	7	35	11	33	21	41
WSW	14	50	19	44	13	46	12	48	14	42	19	39
W	21	47	11	49	21	44	22	45	15	35	20	36
WNW	19	46	17	46	20	46	15	39	18	43	9	44
NW	9	44	18	44	17	44	11	35	12	34	-	
NNW	14	56	8	51	9	49	11	36	9	38	-	
No. of Observ.	160		179		254		256		327		335	
Average Speed		46K		42K		44K		39K		38K		36K

	Jul		Aug		Sep		Oct		Nov		Dec	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	0		0		0		0		0		0	
N	-		-		-		-		11	35	10	46
NNE	-		-		-		-		5	28	-	
NE	-		-		-		-		-		-	
ENE	-		-		-		5		-		-	
E	-		-		-		-		-		-	
ESE	-		-		-		-		-		-	
SE	-		-		-		-		-		-	
SSE	5	15	-		-		-		-		-	
S	8	13	7	22	-		-		-		-	
SSW	15	27	11	24	9	31	6	30	-		0	
SW	23	27	24	29	20	32	13	30	5	32	-	
WSW	16	25	21	31	19	39	10	31	10	50	10	38
W	11	26	15	24	17	29	12	34	14	40	22	42
WNW	7	22	6	20	7	26	11	33	15	33	18	52
NW	-		-		6	23	12	32	14	52	8	60
NNW	-		-		-		9	27	14	38	13	47
No. of Observ.	323		260		254		297		241		183	
Average Speed		22K		25K		30K		30K		38K		44K

TABLE 9. Frequencies of Direction (%) and Average Speeds in Knots (K) of Prevailing Winds, 1946 Through 1958, at 5,000-ft Intervals--Continued

30,000 Feet m.s.l.

	Jan		Feb		Mar		Apr		May		Jun	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	0		0		0		0		-		0	
N	6	41	6	37	-		7	52	-		-	
NNE	-		-		-		-		-		-	
NE	-		-		-		-		-		0	
ENE	0		-		0		0		-		-	
E	0		-		0		-		-		-	
ESE	0		-		0		0		0		-	
SE	-		0		0		-		-		-	
SSE	0		-		0		-		-		-	
S	0		0		-		-		-		-	
SSW	-		-		-		-		-		-	
SW	11	51	6	43	14	47	7	48	10	42	25	50
WSW	16	61	23	46	15	46	13	48	10	51	19	40
W	15	55	14	58	21	51	24	56	21	49	18	47
WNW	11	60	17	46	14	50	12	44	20	38	10	45
NW	18	49	11	43	16	46	17	39	10	54	-	
NNW	14	56	10	57	7	50	8	41	11	39	-	
No. of Observ.	105		126		138		158		187		208	
Average Speed		52K		45K		46K		46K		43K		41K

	Jul		Aug		Sep		Oct		Nov		Dec	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	-		0		0		0		0		0	
N	-		-		-		-		13	36	9	36
NNE	-		-		-		-		5	38	-	
NE	-		-		-		-		-		-	
ENE	-		0		0		6	39	0		-	
E	-		-		-		-		-		-	
ESE	-		-		-		0		-		-	
SE	-		-		-		-		0		-	
SSE	-		-		0		-		0		-	
S	6	18	5	18	-		-		-		5	10
SSW	15	33	14	34	-		7	42	-		-	
SW	27	34	28	31	21	46	10	41	-		-	
WSW	17	32	20	34	23	41	9	38	10	47	14	50
W	13	29	12	32	21	39	17	31	10	40	23	48
WNW	7	21	5	25	8	35	10	36	13	40	12	61
NW	-		-		-		12	32	19	44	11	50
NNW	-		-		5	37	8	32	13	52	7	51
No. of Observ.	214		129		132		170		135		101	
Average Speed		28K		29K		39K		35K		42K		44K

TABLE 9. Frequencies of Direction (%) and Average Speeds in Knots (K) of Prevailing Winds, 1946 Through 1958, at 5,000-ft Intervals--Continued

35,000 Feet m.s.l.

	Jan		Feb		Mar		Apr		May		Jun	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	0		0		0		0		0		-	
N	-		8	59	-		-		-		-	
NNE	-		0		-		-		0		-	
NE	0		-		-		0		-		0	
ENE	0		-		0		-		0		-	
E	-		-		0		0		-		-	
ESE	0		-		0		-		0		-	
SE	-		-		0		-		0		-	
SSE	0		0		0		-		-		-	
S	0		0		0		-		-		-	
SSW	-		-		-		-		-		-	
SW	8	98*	10	47	-		6	58	12	44	22	63
WSW	22	60	21	61	20	46	18	56	15	55	26	48
W	19	49	14	61	26	55	24	64	22	50	20	52
WNW	11	39	17	53	20	67	14	47	17	49	8	42
NW	17	53	14	54	12	57	13	41	10	45	-	
NNW	9	64	5	31	6	63	6	56	9	56	-	
No. of Observ.	64		78		99		107		105		148	
Average Speed		58K		53K		54K		52K		49K		49K

	Jul		Aug		Sep		Oct		Nov		Dec	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	-		0		0		0		0		0	
N	0		-		-		-		10	54	8	43
NNE	-		-		-		-		-		-	
NE	-		-		-		-		-		-	
ENE	-		0		0		-		0		-	
E	-		-		-		-		-		-	
ESE	-		-		-		-		0		-	
SE	-		-		-		-		0		-	
SSE	-		-		-		-		0		-	
S	-		6	32	-		-		0		-	
SSW	18	37	19	34	6	56	10	43	-		-	
SW	27	44	29	37	26	47	7	45	-		0	
WSW	21	38	19	34	22	51	11	44	11	46	16	54
W	14	31	10	40	20	36	14	36	15	55	18	45
WNW	-		-		-		9	35	10	44	18	51
NW	-		-		-		18	33	17	55	8	44
NNW	0		-		-		11	42	20	50	6	50
No. of Observ.	164		103		81		103		95		67	
Average Speed		35K		33K		41K		38K		49K		42K

* Unrepresentative, based on 5 observations.

TABLE 9. Frequencies of Direction (%) and Average Speeds in Knots (K) of Prevailing Winds, 1946 Through 1958, at 5,000-ft Intervals--Continued

40,000 Feet m.s.l.

	Jan		Feb		Mar		Apr		May		Jun	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	0		0		0		0		0		0	
N	0		-		-		5	66	-		-	
NNE	0		-		-		-		0		-	
NE	0		-		0		0		-		0	
ENE	0		-		0		0		-		-	
E	0		0		0		-		-		-	
ESE	0		-		0		-		0		-	
SE	0		0		0		0		0		-	
SSE	0		0		0		0		0		-	
S	0		0		0		-		-		0	
SSW	-		0		0		-		-		7	49
SW	-		11	53	-		-		11	64	23	74
WSW	25	65	27	64	28	54	7	60	19	63	26	56
W	35	48	18	72	30	52	31	63	19	45	16	50
WNW	14	49	18	53	21	67	21	58	24	55	11	45
NW	10	46	9	51	8	63	19	43	9	49	-	
NNW	10	70	6	55	6	42	7	42	6	36	-	
No. of Observ.	49		55		78		75		81		108	
Average Speed		54K		57K		56K		52K		51K		53K

	Jul		Aug		Sep		Oct		Nov		Dec	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	0		0		0		0		0		0	
N	0		-		-		-		9	40	6	38
NNE	-		0		0		0		5	42	6	20
NE	0		-		0		-		-		-	
ENE	-		0		0		-		-		-	
E	-		0		-		-		0		0	
ESE	0		0		-		-		-		0	
SE	-		-		0		0		0		0	
SSE	-		-		0		0		0		-	
S	5	25	8	36	0		-		0		-	
SSW	15	39	19	42	9	44	7	47	0		0	
SW	31	42	30	34	26	59	10	53	-		-	
WSW	25	41	23	41	23	54	12	42	21	46	15	53
W	14	36	8	51	23	46	27	34	14	62	21	52
WNW	-		0		-		8	38	12	72	21	44
NW	0		-		6	32	11	47	22	64	13	53
NNW	-		-		-		11	49	10	41	9	52
No. of Observ.	118		73		66		74		58		53	
Average Speed		37K		38K		47K		41K		53K		46K

TABLE 9. Frequencies of Direction (%) and Average Speeds in Knots (K) of Prevailing Winds, 1946 Through 1958, at 5,000-ft Intervals--Continued

45,000 Feet m.s.l.

	Jan		Feb		Mar		Apr		May		Jun	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	0		0		0		0		0		0	
N	0		0		0		0		0		-	
NNE	0		0		0		0		0		0	
NE	0		0		0		0		0		0	
ENE	0		0		0		0		0		0	
E	0		0		0		0		0		-	
ESE	0		0		0		0		0		0	
SE	0		0		0		0		0		-	
SSE	0		0		0		0		0		0	
S	0		0		-		0		0		0	
SSW	0		0		0		0		5	71	-	
SW	8	55	0		0		-		21	46	22	68
WSW	20	62	42	60	17	51	16	40	26	45	37	52
W	36	47	23	63	48	55	40	54	18	50	20	44
WNW	13	40	16	62	15	53	27	53	28	38	6	38
NW	10	55	10	39	17	45	9	36	0		-	
NNW	13	56	9	50	-		7	55	-		-	
No. of Observ.	39		31		48		45		39		54	
Average Speed		52K		58K		51K		50K		45K		50K

	Jul		Aug		Sep		Oct		Nov		Dec	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	0		0		0		0		0		0	
N	0		-		0		0		7	35	9	42
NNE	0		0		0		0		-		0	
NE	0		-		-		-		-		-	
ENE	0		0		-		-		0		0	
E	0		0		0		-		0		0	
ESE	0		0		0		-		0		-	
SE	0		-		0		0		0		0	
SSE	0		-		0		-		0		0	
S	-		8	25	-		-		0		0	
SSW	8	44	16	35	0		-		0		0	
SW	36	44	36	34	31	48	7	35	0		-	
WSW	32	37	18	38	21	63	20	50	20	40	21	52
W	22	37	12	42	31	41	20	34	13	37	18	39
WNW	0		0		-		18	43	18	59	18	53
NW	0		0		-		15	38	27	58	21	36
NNW	0		0		-		7	58	11	41	-	
No. of Observ.	50		50		48		55		45		44	
Average Speed		40K		34K		45K		40K		47K		42K

TABLE 9. Frequencies of Direction (%) and Average Speeds in Knots (K) of Prevailing Winds, 1946 Through 1958, at 5,000-ft Intervals--Continued

50,000 Feet m.s.l.

	Jan		Feb		Mar		Apr		May		Jun	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	0		0		0		0		0		0	
N	-		0		0		0		0		-	
NNE	0		0		0		0		0		0	
NE	0		0		0		0		0		0	
ENE	0		0		0		0		0		-	
E	0		0		0		0		0		0	
ESE	0		0		0		0		0		-	
SE	0		0		0		0		0		0	
SSE	0		0		0		0		0		0	
S	0		0		0		0		0		0	
SSW	0		0		0		0		10	24	-	
SW	9	47	-		-		-		20	35	30	36
WSW	21	55	33	55	20	48	18	34	37	23	28	45
W	44	40	30	52	49	41	41	44	20	33	16	38
WNW	12	35	17	44	11	42	31	39	13	51	12	28
NW	6	40	7	37	18	33	0		0		-	
NNW	6	64	10	63	0		8	52	0		-	
No. of Observ.	34		30		45		39		30		50	
Average Speed		46K		50K		42K		41K		31K		37K

	Jul		Aug		Sep		Oct		Nov		Dec	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	-		0		0		0		0		0	
N	0		0		0		-		-		-	
NNE	0		6	14	0		0		-		0	
NE	0		-		0		0		-		-	
ENE	0		-		0		-		0		-	
E	0		0		-		-		0		0	
ESE	0		6	17	-		-		0		0	
SE	-		-		0		0		0		0	
SSE	-		-		0		0		0		-	
S	7	14	-		0		-		0		0	
SSW	7	19	10	16	-		0		-		0	
SW	38	27	21	26	16	49	9	25	-		7	21
WSW	22	32	27	22	32	43	22	45	16	38	24	48
W	16	30	-		27	31	26	37	11	40	26	32
WNW	-		8	15	11	24	15	30	27	44	5	41
NW	0		0		-		11	31	18	51	12	43
NNW	0		0		0		-		16	29	17	25
No. of Observ.	45		48		44		54		45		42	
Average Speed		26K		19K		36K		34K		38K		34K

TABLE 9. Frequencies of Direction (%) and Average Speeds in Knots (K) of Prevailing Winds, 1946 Through 1958, at 5,000-ft Intervals--Continued

55,000 Feet m.s.l.

	Jan		Feb		Mar		Apr		May		Jun	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	0		0		0		0		0		0	
N	-		0		0		0		0		-	
NNE	0		0		0		0		0		5	10
NE	0		0		0		0		0		0	
ENE	0		0		0		0		0		-	
E	0		0		0		0		0		0	
ESE	0		0		0		0		0		0	
SE	0		0		0		0		0		-	
SSE	0		0		0		0		0		0	
S	0		0		0		0		0		-	
SSW	0		0		0		0		7	12	19	29
SW	-		-		-		0		22	32	24	24
WSW	19	36	25	49	11	32	17	32	22	27	19	21
W	19	31	42	39	43	35	43	35	30	16	16	16
WNW	27	28	17	32	31	28	31	31	15	21	-	
NW	19	27	8	26	11	31	6	35	-		-	
NNW	8	48	-		0		-		0		0	
No. of Observ.	26		24		35		35		27		37	
Average Speed		32K		39K		32K		34K		23K		22K

	Jul		Aug		Sep		Oct		Nov		Dec	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	0		0		0		0		0		0	
N	0		0		-		-		7	29	5	23
NNE	-		0		-		0		0		0	
NE	0		-		0		-		0		-	
ENE	5	7	0		-		-		-		0	
E	0		9	10	0		0		0		0	
ESE	-		7	13	0		0		-		0	
SE	0		11	11	0		-		0		0	
SSE	10	9	13	7	-		0		0		0	
S	23	14	13	12	-		-		0		0	
SSW	8	17	9	13	10	11	6	15	0		0	
SW	15	14	13	12	12	14	9	18	0		-	
WSW	10	24	9	13	17	23	19	29	12	24	13	28
W	13	16	0		24	20	23	30	19	30	23	35
WNW	0		-		10	14	15	24	17	28	26	30
NW	5	14	7	4	15	13	17	22	29	33	10	31
NNW	5	11	-		0		0		12	16	18	17
No. of Observ.	39		45		41		47		42		39	
Average Speed		14K		11K		17K		24K		27K		28K

TABLE 9. Frequencies of Direction (%) and Average Speeds in Knots (K) of Prevailing Winds, 1946 Through 1958, at 5,000-ft Intervals--Continued

60,000 Feet m.s.l.

	Jan		Feb		Mar		Apr		May		Jun	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	0		0		0		0		0		0	
N	-		0		0		-		0		-	
NNE	0		0		0		0		11	7	0	
NE	0		0		0		0		0		11	13
ENE	0		0		0		0		0		11	7
E	0		0		0		0		6	6	11	13
ESE	0		0		0		0		0		-	
SE	-		0		0		0		0		7	6
SSE	0		0		0		0		5	4	11	10
S	0		0		0		0		11	10	11	13
SSW	0		0		0		0		6	14	25	10
SW	0		0		0		13	23	11	13	13	-
WSW	-		23	43	-		23	22	5	18	0	
W	32	25	32	33	55	25	39	23	11	11	-	
WNW	23	25	23	22	36	25	7	22	6	5	0	
NW	23	19	18	19	7	26	10	21	11	18	0	
NNW	9	17	-		0		7	14	17	5	0	
No. of Observ.	22		22		31		31		18		28	
Average Speed		24K		29K		25K		22K		10K		11K

	Jul		Aug		Sep		Oct		Nov		Dec	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	0		0		0		0		0		0	
N	-		-		-		-		11	20	14	17
NNE	0		0		-		-		-		-	
NE	-		5	13	7	7	-		-		5	7
ENE	12	11	18	10	19	9	-		0		0	
E	21	11	18	12	0		0		0		-	
ESE	15	16	28	13	0		0		0		0	
SE	18	16	5	11	0		0		0		0	
SSE	6	7	10	10	-		-		0		0	
S	-		8	14	10	11	-		0		0	
SSW	-		0		7	12	-		-		0	
SW	12	9	-		16	6	7	25	8	23	8	5
WSW	0		-		10	13	26	21	8	8	16	23
W	-		0		7	10	12	18	19	21	8	29
WNW	0		0		-		14	22	22	15	11	28
NW	0		-		13	11	12	15	16	27	16	18
NNW	0		0		0		9	13	8	19	16	11
No. of Observ.	33		40		31		43		37		37	
Average Speed		12K		12K		10K		17K		20K		17K

TABLE 9. Frequencies of Direction (%) and Average Speeds in Knots (K) of Prevailing Winds, 1946 Through 1958, at 5,000-ft Intervals--Continued

65,000 Feet m.s.l.

	Jan		Feb		Mar		Apr		May		Jun	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	0		0		0		0		-		0	
N	11	18	6	10	-		-		0		-	
NNE	11	12	5	12	0		-		-		0	
NE	0		0		-		0		9	7	-	
ENE	5	28	0		0		0		-		18	12
E	0		0		0		0		14	12	27	12
ESE	0		0		0		0		9	6	15	13
SE	0		0		0		-		-		18	11
SSE	5	14	0		0		0		9	13	9	11
S	0		0		0		0		-		0	
SSW	0		0		0		0		0		0	
SW	0		0		9	25	8	13	9	4	-	
WSW	5	4	11	46	22	20	35	14	9	6	0	
W	11	18	33	44	30	16	23	19	9	4	0	
WNW	26	26	28	18	22	20	12	15	0		0	
NW	5	24	11	11	9	22	-		-		0	
NNW	21	18	6	10	0		8	21	-		-	
No. of Observ.	19		18		23		26		22		33	
Average Speed		19K		28K		19K		15K		7K		12K

	Jul		Aug		Sep		Oct		Nov		Dec	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	0		0		-		0		-		0	
N	0		0		-		-		23	13	-	
NNE	0		0		6	6	12	5	13	12	-	
NE	-		-		0		6	13	7	12	-	
ENE	11	16	6	11	9	11	-		0		9	11
E	31	18	58	15	18	10	0		0		22	11
ESE	36	15	12	8	15	7	0		0		6	13
SE	6	10	9	15	6	17	-		0		9	8
SSE	6	9	0		0		-		0		0	
S	-		0		9	9	-		0		-	
SSW	-		-		9	6	-		0		0	
SW	0		-		6	4	0		0		-	
WSW	0		0		6	5	21	22	13	14	13	28
W	0		-		-		21	13	13	24	9	5
WNW	-		-		-		9	17	13	21	0	
NW	0		0		0		12	5	7	16	9	22
NNW	0		0		6	8	-		10	16	6	17
No. of Observ.	36		33		34		34		31		32	
Average Speed		15K		13K		8K		12K		16K		14K

TABLE 9. Frequencies of Direction (%) and Average Speeds in Knots (K) of Prevailing Winds, 1946 Through 1958, at 5,000-ft Intervals--Continued

70,000 Feet m.s.l.

	Jan		Feb		Mar		Apr		May		Jun	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	0		0		0		5		6		0	
N	14	14	33	9	0		10	7	0		0	
NNE	7	22	0		8	4	5	6	5	12	0	
NE	15	21	0		0		0		6	2	5	14
ENE	7	12	0		0		0		28	8	11	14
E	0		0		0		0		5	6	47	21
ESE	7	4	0		0		0		6	12	21	18
SE	0		0		0		0		5	10	0	
SSE	7	50	0		0		0		17	5	5	12
S	0		0		0		5	4	0		5	12
SSW	7	4	0		0		10	13	0		6	14
SW	0		0		15	8	15	8	0		0	
WSW	0		25	55	31	20	15	16	11	6	0	
W	7	22	17	46	23	25	15	5	0		0	
WNW	22	25	17	23	15	19	5	10	6	12	0	
NW	7	38	8	14	8	14	15	14	5	6	0	
NNW	0		0		0		0		0		0	
No. of Observ.	14		12		13		20		18		19	
Average Speed		21K		30K		17K		9K		7K		18K

	Jul		Aug		Sep		Oct		Nov		Dec	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	0		0		-		0		0		0	
N	0		0		0		0		7	7	10	13
NNE	0		0		-		12	8	13	16	-	
NE	-		-		10	11	8	11	7	12	16	18
ENE	-		16	17	10	6	8	19	10	9	13	13
E	56	22	61	14	23	11	0		7	21	10	7
ESE	31	17	16	18	17	12	0		-		0	
SE	6	17	0		0		0		0		0	
SSE	0		0		10	4	-		0		0	
S	0		0		10	8	8	6	0		-	
SSW	0		0		0		0		0		0	
SW	0		0		0		12	7	10	12	0	
WSW	0		0		0		23	14	13	14	13	11
W	0		-		7	12	8	8	10	19	7	38
WNW	0		0		-		0		7	16	10	28
NW	0		0		-		12	12	10	9	7	12
NNW	0		0		0		8	6	-		10	17
No. of Observ.	32		31		30		26		30		31	
Average Speed		20K		15K		9K		11K		13K		16K

TABLE 9. Frequencies of Direction (%) and Average Speeds in Knots (K) of Prevailing Winds, 1946 Through 1958, at 5,000-ft Intervals--Continued

75,000 Feet m.s.l.

	Jan		Feb		Mar		Apr		May		Jun	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	0		--	--	0		0		6		0	
N	9	6			0		9	8	0		0	
NNE	9	20			9	6	0		0		0	
NE	37	14			0		0		0		-	
ENE	18	19			0		0		19	12	18	17
E	0				0		0		19	14	32	14
ESE	0				18	18	0		6	4	23	20
SE	0				0		9	4	6	10	23	14
SSE	0				0		0		6	6	0	
S	0				9	8	0		0		0	
SSW	0				9	18	18	10	0		0	
SW	0				9	18	18	12	6	4	0	
WSW	0				0		0		0		0	
W	0				28	15	27	9	13	6	0	
WNW	9	36			18	10	19	8	13	6	0	
NW	18	38			0		0		0		0	
NNW	0				0		0		6	4	0	
No. of Observ.	11				11		11		16		22	
Average Speed		21K				14K		9K		8K		16K

	Jul		Aug		Sep		Oct		Nov		Dec	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	0		0		7		0		0		-	
N	0		0		-		8	14	-		8	12
NNE	0		0		0		0		8	10	8	19
NE	0		0		7	10	-		8	13	-	
ENE	14	20	13	19	17	9	-		8	14	16	15
E	66	25	58	21	28	12	8	8	16	6	-	
ESE	17	17	25	18	17	11	-		0		12	17
SE	-		0		0		8	11	0		0	
SSE	0		0		0		0		0		0	
S	0		0		-		8	11	0		0	
SSW	0		0		7	6	-		-		0	
SW	0		0		0		8	4	-		0	
WSW	0		0		0		8	4	12	22	-	
W	0		0		0		21	14	16	14	12	14
WNW	0		-		0		-		12	22	8	10
NW	0		0		7	8	-		8	10	8	19
NNW	0		0		-		-		0		12	15
No. of Observ.	29		24		29		24		25		25	
Average Speed		23K		20K		9K		9K		14K		15K

TABLE 9. Frequencies of Direction (%) and Average Speeds in Knots (K) of Prevailing Winds, 1946 Through 1958, at 5,000-ft Intervals--Continued

80,000 Feet m.s.l.

	Jan		Feb		Mar		Apr		May		Jun	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	0		--	--	--	--	--	--	6		0	
N	0								0		0	
NNE	10	10							0		0	
NE	10	20							7	13	6	22
ENE	20	24							13	14	23	21
E	20	26							27	14	59	19
ESE	10	46							6	10	6	22
SE	0								7	10	6	2
SSE	0								0		0	
S	10	4							0		0	
SSW	0								0		0	
SW	0								0		0	
WSW	0								0		0	
W	10	38							7	14	0	
WNW	10	48							7	10	0	
NW	0								7	6	0	
NNW	0								13	9	0	
No. of Observ.	10								15		17	
Average Speed		27K								11K		19K

	Jul		Aug		Sep		Oct		Nov		Dec	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	0		0		0		0		0		0	
N	0		0		0		11	10	6	4	17	13
NNE	0		0		0		0		0		11	8
NE	0		0		0		0		12	15	33	13
ENE	8	26	13	22	28	15	5	6	12	12	6	12
E	76	25	75	23	39	13	11	17	12	9	5	10
ESE	12	21	6	22	17	14	0		0		0	
SE	-		0		0		0		6	2	0	
SSE	0		0		0		0		0		0	
S	0		0		5	12	0		0		0	
SSW	0		0		0		11	5	0		0	
SW	0		0		0		5	4	0		6	10
WSW	0		0		0		16	21	12	44	0	
W	0		0	26	11	10	26	18	23	20	5	14
WNW	0		0		0		10	6	6	5	11	14
NW	0		0		0		5	4	0		6	20
NNW	0		0		0		0		11	9	0	
No. of Observ.	25		16		18		19		17		18	
Average Speed		25K		23K		13K		13K		16K		13K

TABLE 9. Frequencies of Direction (%) and Average Speeds in Knots (K) of Prevailing Winds, 1946 Through 1958, at 5,000-ft Intervals--Continued

85,000 Feet m.s.l.

	Jan		Feb		Mar		Apr		May		Jun	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	--	--	--	--	--	--	--	--	0		0	
N									9	6	0	
NNE									0		0	
NE									0		10	12
ENE									0		0	
E									9	6	60	26
ESE									46	7	10	20
SE									0		10	20
SSE									0		0	
S									0		0	
SSW									0		0	
SW									9	6	0	
WSW									9	18	0	
W									0		0	
WNW									0		0	
NW									9	18	0	
NNW									9	4	10	10
No. of Observ.									11		10	
Average Speed										9K		22K

	Jul		Aug		Sep		Oct		Nov		Dec	
	%	K	%	K	%	K	%	K	%	K	%	K
Calm	0		0		0		7		0		--	--
N	0		0		0		7	16	17	7		
NNE	0		0		0		0		8	2		
NE	0		0		13	5	14	11	0			
ENE	7	34	10	30	13	15	7	6	8	2		
E	80	26	50	25	40	18	0		9	34		
ESE	13	27	30	22	7	14	0		0			
SE	0		0		7	12	21	6	0			
SSE	0		0		0		0		0			
S	0		0		0		0		0			
SSW	0		0		0		7	4	0			
SW	0		0		7	12	0		0			
WSW	0		0		7	20	7	30	25	44		
W	0		10	28	6	10	22	24	25	31		
WNW	0		0		0		0		0			
NW	0		0		0		0		8	8		
NNW	0		0		0		8	4	0			
No. of Observ.	15		10		15		14		12			
Average Speed		27K		25K		14K		12K		24K		

MISCELLANEOUS PHENOMENA

Detailed descriptions and analyses of miscellaneous atmospheric phenomena occurring in the Station area are given in Refs. 6-25.

REFERENCES

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U. S. Naval Ordnance Test Station

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