



Bermuda Meteorological Office

Technical Note No. 7

The Surface Wind in Bermuda

By

W. A. MACKY

CONTENTS

	Page
1. Introduction.....	5
2. Site.....	5
3. Instrument.....	6
4. Mean Monthly Speed.....	6
5. Prevailing Direction.....	6
6. Speed from each Direction.....	8
7. Maximum Daily Mean Speed.....	9
8. Frequency of Days with given Mean Speeds.....	10
9. Maximum Hourly Speeds.....	12
10. Frequency of Days with Maximum Hourly in given limits....	13
11. Maximum wind (10 minute mean).....	16
12. Frequency of Days with maximum wind in given limits.....	17
13. Frequency of Days with Strong Winds.....	19
14. Frequency of Days with Gales.....	20
15. Frequency of Days with a Gale from the 8 Cardinal Directions	21
16. Total Duration of Gales Each Month.....	22
17. Maximum Gusts each Month.....	23
18. Frequency of Days with Maximum Gust in given limits.....	24
19. Continuous Strong and Gale Winds.....	26
20. Hurricanes.....	27
21. Calms.....	27
22. The Stormiest Month, January, 1955.....	28
23. Diurnal Variation of Speed.....	29
24. Relation between Speeds at Fort George and Hamilton.....	30

1. INTRODUCTION

A Dines Anemometer has been in operation at Fort George, Bermuda since 1st August, 1932, and in a previous paper (Technical Note No. 2) the gales recorded in the first 15 years were discussed.

Until the end of 1948 readings were scaled at only the three main observation hours, but since 1st January, 1949, mean hourly values have been scaled and included in the annual summary of observations. Summaries for 1932, 1933 and 1934 were not prepared until after 1949, and these also included the hourly values of wind. The hourly values for 1935-1948 have since been tabulated and general summaries for the whole period have been under preparation.

On the 23rd December, 1955, the Hamilton Meteorological office was completely destroyed by fire and all original Fort George records and summaries were lost. However, manuscript copies of certain parts which were being worked at the writer's home were preserved and are now the only data available for this period apart from that in the published annual summaries.

Averages can be computed up to April, 1954 in many cases and it is the purpose of this note to discuss the data available. All means and extremes refer to the period of 1st August, 1932 to 30th April, 1954, unless otherwise stated.

2. SITE

The anemometer is mounted on the Parapet of Fort George which is the highest point in St. George's being on a hill rising steeply from the harbour to a height of about 170 feet.

The fort is a three storey building 60 feet square sunk into the ground so that its top is only 9 feet above ground level. It is surrounded by a moat 22 feet wide and the full depth of the building. There is a 9-foot wide parapet rising 5 feet above the roof and the anemometer is erected in the centre of the western side with its head 40 feet above the parapet and 222 feet above Mean Sea Level. The signal lookout, a room about 12 feet square, is in the North-west corner of the fort with its roof 9 feet above the parapet.

The land falls very steeply to the south with St. George's harbour only 200 yards away. To the North-west the fall is steep at first and then more gradual to the ocean 450 yards away.

The greatest obstruction is to the North-east where Fort Victoria rises to 169 feet just over 1,000 yards away and a smaller hill reaches 150 feet 370 yards to the North. There are several small hills reaching 100 feet from 1,100 to 1,800 yards to West-south-west and an area around St. David's lighthouse, about 2 miles to the East-south-east, is above 100 feet with a small area over 150 feet.

Apart from these there are no appreciable obstructions until some points reach 150 feet 3 miles away to the South-west and South-south-west beyond the extensive area of Castle Harbour. The highest point of Bermuda, 269 feet, is over 5 miles to the South-west.

It is probable that none of these obstructions produces an appreciable reduction in the observed wind speed and possibly the chief effect of topography at Fort George is to increase the wind from directions between West and North-north-west.

3. INSTRUMENT

The anemometer is a standard Dines Anemometer recording speed and direction on the same drum.

Gusts are read as the highest point on the record. The mean speed for periods of 10 minutes or 60 minutes was determined, using a transparent scale. Daily means are the average of the 24 hourly means, and monthly means the average of the daily means.

Speeds are given in miles per hour.

4. MEAN MONTHLY SPEED

Table 1 gives the mean speed each month and shows that February, with a mean of close to 20 m.p.h., is the windiest month. It has almost

January.....17.5	May.....13.4	September.....12.1
February.....19.9	June.....11.9	October.....14.4
March.....18.3	July.....10.8	November.....15.9
April.....15.8	August.....10.3	December.....17.1

TABLE 1. Mean Wind Speed each Month.

twice the mean speed of August which has the lowest mean. July and August each have means of less than 11 m.p.h., while December, January, February and March each have 17 m.p.h. or more.

5. PREVAILING WIND DIRECTION

Table 2 gives the percentage of hours in each month with wind from each of the eight cardinal directions.

Over the year, Southerly is the most common wind, and North-easterly the least common.

Southerly is the most frequent wind direction from April to September and also in January. It is appreciably below the highest frequency only in December when each direction, South-west to North, is more frequent, and Westerly and North-westerly each blow for one-third again more hours than Southerly. Southerly blows for more than one-third of the time in July, more than one-fifth from April to August, and only in November and December does it average less than one-sixth of the time.

North-easterly is the least common direction in each month from January to July and in August it has a low frequency only slightly higher than the lowest, North-westerly. North-easterly has its highest frequency in the Autumn and September, October and November are the only months in which it blows for as much as one hour in ten. From February to August a North-easterly wind blows for less than one hour in 20, except for a slight increase in April and May.

Wind directions from South through West to North account for about three-quarters of the time in the five months December to April, while directions from South through East to North occur on three-quarters of the time in October and nearly as frequently in September and November.

Month	Calm	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Prevailing Direction
January	2.0	12.9	6.8	6.5	7.5	17.3	14.2	16.7	16.2	South
February	1.1	14.7	4.5	5.5	7.3	17.1	14.6	17.3	17.9	Northwest
March	1.0	13.5	4.2	5.5	7.5	17.3	14.8	18.2	18.1	West
April	1.0	12.1	7.3	9.2	9.2	20.2	12.9	15.2	12.9	South
May	1.0	7.6	5.6	10.5	13.4	23.2	13.6	17.1	8.0	South
June	2.2	5.8	4.0	7.2	9.3	27.2	19.3	19.3	5.6	South
July	1.7	3.3	3.0	6.6	13.0	35.7	19.3	12.8	4.5	South
August	3.3	5.3	4.8	11.9	14.3	24.7	16.1	15.2	4.4	South
September	3.4	9.4	11.2	16.5	15.9	16.5	10.8	10.7	5.7	South, East
October	1.9	13.2	15.6	17.7	11.1	16.9	7.9	9.1	6.5	East
November	2.1	16.7	11.9	16.0	9.4	15.0	7.1	9.5	12.5	North
December	1.3	15.2	8.7	7.1	6.9	12.8	13.7	17.2	16.9	West

TABLE 2. Percentage of Hours with Wind from each Direction.

Southerly and South-westerly occur more than half of the time in July and four hours out of ten in June and August.

North-easterly, Northerly and North-westerly are rare in summer and are recorded on only 3 to 6% of hours in June, July and August.

After the long period of mainly Southerly in the summer half year, there is a backing in late summer with South-easterly and Easterly becoming more common, and in October and November Northerly, North-easterly and Easterly are the most common directions. In December, Southerly has its lowest frequency and half of the time the wind direction is North, North-west or West. In January, February and March the weather is largely determined by the frontal passages from the West with mainly Southerly wind before them and Westerly or North-westerly behind so that these three are the most common directions.

Calms are most frequent in August and September where they occur about 24 hours a month, while in February, March, April and May there are only 7 calm hours per month.

6. WIND SPEED FROM EACH DIRECTION

Table 3 gives the mean speed from each direction.

The strongest winds in the winter months, October to April, are North-westerly, while Southerlies are the strongest in May, June and July, and only slightly less than the highest in August and September when Westerlies and South-easterlies, respectively, have the highest speed.

The lowest speeds are with North-easterly or Easterly winds from December to June, Northerlies in July and August and South-westerlies in September, October and November.

Over the year, the strongest winds are North-westerly in February with an average 25 m.p.h. Averages above 20 m.p.h. are reached by Southerly winds in February, Westerly in February and March, and North-westerly in December, January, February and March.

Month	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.
January.....	16.8	12.6	13.7	15.6	18.5	15.3	19.5	23.3
February.....	18.4	12.0	12.9	16.7	20.8	17.9	23.5	25.1
March.....	17.2	11.8	14.3	18.4	19.4	15.9	20.3	21.5
April.....	15.2	14.5	12.8	14.3	17.3	16.3	16.4	18.1
May.....	13.4	11.9	13.3	14.0	14.2	12.6	13.5	13.3
June.....	9.5	7.9	10.0	11.7	13.7	12.9	12.6	11.3
July.....	6.7	8.9	9.4	10.3	12.0	11.2	11.7	8.1
August.....	8.3	8.5	9.9	10.8	11.6	10.5	11.8	8.6
September.....	13.0	12.9	13.0	13.5	13.2	10.4	11.7	10.6
October.....	15.2	14.6	15.0	15.4	14.6	12.0	14.3	16.3
November.....	16.3	14.7	16.2	15.8	16.9	12.5	16.2	19.5
December.....	16.1	14.3	13.6	16.9	18.5	15.0	18.8	21.1

TABLE 3. Average Speed of Wind from each Direction.

The lowest winds in the year are Northerly in July with an average speed of less than 7 m.p.h. In July and August North-westerly, Northerly, North-easterly and Easterly each average less than 10 m.p.h. as do Northerly and North-easterly in June.

The five directions from South through West to North each has its highest speeds in February. South-easterly has its highest in March, and North-easterly and Easterly in November.

July gives the lowest speeds of Northerly, North-westerly and Westerly and also of Easterly and South-easterly, August the lowest North-easterly and Southerly and September the lowest South-westerly.

7. MAXIMUM DAILY MEAN SPEED

Table 4 gives data on the windiest day each month as shown by the greatest mean speed over 24 hours.

It is seen that in every month of the year there is normally one day with a mean speed reaching 20 m.p.h., while each of the seven months, October to April, has a day with more than 30 m.p.h., with over 35 m.p.h. in January, February and March, and a maximum of nearly 39 m.p.h. in February.

July, in which the windiest day on record averaged 29 m.p.h., is the only month where there has not been a daily mean of 30 m.p.h., and May, June and July are the only months in which there has not been a day with

Month	Average Monthly Maximum	Absolute Maximum	Date	Lowest Monthly Maximum	Year
January.....	37.2	54.0	14/55	24.1	47
February.....	38.6	51.5	15/40	27.6	35
March.....	35.3	44.5	1/44	26.3	46
April.....	30.2	39.6	1/37	20.3	47
May.....	24.8	31.7	26/48	16.5	39
June.....	24.4	34.9	7/41	16.4	43
July.....	20.0	29.4	18/44	13.0	51
August.....	24.1	48.6	21/33	14.8	37
September.....	29.4	54.1	13/48	12.6	34
October.....	32.0	54.0	20/47	21.1	37
November.....	30.5	39.8	22/44	19.8	53
December.....	34.7	43.3	22/38	23.7	40
Year.....		54.1	13/9/48		

TABLE 4. Highest Mean Daily Speed (from midnight to midnight).

a mean speed close to 40 m.p.h. The two winter months, January and February, and the hurricane months, September and October, have each had days with an average of over 50 m.p.h. The highest of 54 m.p.h. occurred with tropical hurricanes in September, 1948 and October, 1947, and with the storms of January, 1955.

There has not been a February without one day whose average wind exceeded 27 m.p.h., nor a March without a day above 26, and each of the seven months, October to April, always has one day with average speed near or above 20 m.p.h. July, August and September have each passed without the mean speed reaching 15 m.p.h. on any day and during September, 1934, there was not a single day with an average speed as high as 13 m.p.h.

8. FREQUENCY OF DAYS WITH GIVEN MEAN SPEEDS

Table 5 gives, for each month, the percentage of days with daily mean speed in successive 5 m.p.h. ranges.

Calm days with speeds up to 5 m.p.h. are rare in February and March where they occur about once in two years; but in July, August and September calm days are 6 to 7 times as frequent as in winter, and in August they occur 5 or 6 times each month.

Days with mean speeds above 20 m.p.h. occur once per month in July and August and twice per month in June, but in all other months there are

Speed Limits	0-5.0	5.1-10.0	10.1-15.0	15.1-20.0	20.1-25.0	25.1-30.0	30.1-35.0	35.1-40.0	40.1-45.0	45.1-50.0	50.1-55.0
January.....	5.3	13.2	26.0	21.7	16.9	7.9	5.4	2.3	0.6	0.6	0.1
February.....	1.9	8.7	20.3	23.5	21.6	12.2	6.3	3.4	1.6	0.3	0.2
March.....	1.8	12.6	25.1	22.1	18.6	12.0	5.7	1.6	0.4		
April.....	4.1	18.2	25.5	25.9	17.6	6.1	1.5	1.2			
May.....	4.3	27.2	32.6	22.7	10.7	1.8	0.6				
June.....	8.9	30.3	33.0	21.1	5.1	1.3	0.3				
July.....	11.1	33.6	38.1	14.7	2.0	0.5					
August.....	15.6	37.0	32.9	11.0	1.9	0.9	0.1	0.1	0.3	0.1	
September.....	13.5	30.8	28.8	13.8	7.6	3.0	1.7	0.5	0.3		0.1
October.....	5.7	22.7	30.1	23.9	9.8	5.6	1.3	0.4	0.1		0.3
November.....	4.4	17.9	25.1	28.5	13.9	5.8	2.7	1.7			
December.....	2.8	16.3	25.2	22.9	17.7	8.8	4.3	1.5	0.6		

TABLE 5. Percentage of Days with Mean Daily Speed in limits stated.

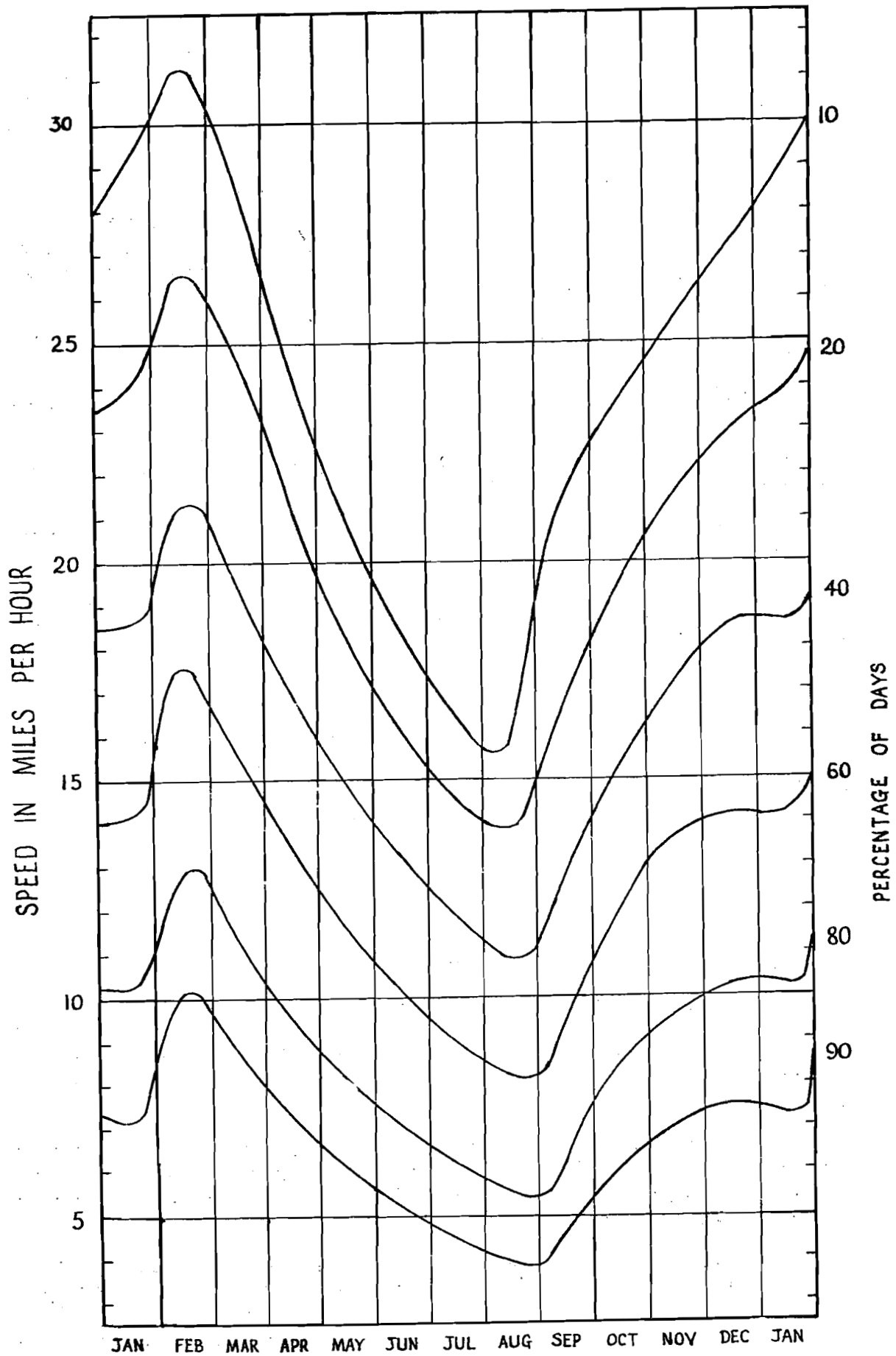


FIG. 1. Mean Daily Speed reached on 10, 20, 40, 60, 80 and 90% Days.

4 or more such days with a maximum of nearly half the days in February having mean winds above 20 m.p.h.

A daily mean speed above 30 m.p.h. has not been recorded in July and only once in 5 years in May, June and August while the remaining months have one to two such days each year, with a maximum of more than three in February.

Daily mean speeds in excess of 40 m.p.h. have not been recorded from April to July or in November. They are most frequent in February where they occur about once in 2 years and in January once in 3 years, so that with the occasional occurrences in the other months there are one or two days each year with mean speeds of 40 m.p.h.

Figure 1, which is derived from Table 5, gives the daily mean speed reached on 10, 20, 40, 60, 80 and 90% of days.

The highest point on each curve is reached in February and the lowest in August.

In February the windiest 10% of days have mean speeds at least 31 m.p.h. and the calmest 10% have speeds below 10 m.p.h.

In August the windiest 10% are above 16 m.p.h., and the calmest 10% below 4 m.p.h.

The curve for the highest 10% shows a steady fall in speed from February to July, a small further fall to the minimum in August and then a rapid rise to September, followed by a smaller but steady rise to the February maximum.

As a larger percentage of days is included, the rise from August to September becomes much smaller and the January figure shows a smaller rise from December so that the limits for 40, 60 and 80% are close in January and December, while the calmest 10% has a slightly lower value in January than in December.

9. MAXIMUM HOURLY SPEEDS

Table 6 gives the highest 60-minute mean speed in each month.

In both January and February there is normally at least one hour with a mean speed over 50 m.p.h., while in each month from September to April there is an hour over 40 m.p.h. July with a normal maximum of 28 m.p.h. has the lowest values and the other three summer months each have an average maximum of at least 34 m.p.h.

In all months except May, June and July there has been an hour with mean speed over 60 m.p.h., and September and October have each had an hour with a mean speed over 90 m.p.h. July has never had an hour with a mean speed above 40 m.p.h.

There has not been a year without at least one hour averaging 37 m.p.h. in each of the four winter months, December, January, February and March. There have, however, been years when the mean hourly speed in the summer months of July, August and September did not exceed 22 m.p.h. with an extreme case in September, 1934, when no hour exceeded 20 m.p.h.

	Average Monthly Maximum	Absolute Maximum	Date	Lowest Maximum	Year
January.....	50.9	64	28/33 24/40	38	47
February.....	51.0	65	15/40	40	53
March.....	48.7	75	15/41	37	46
April.....	43.9	62	26/33	27	47
May.....	35.5	48	29/36	29	39
June.....	34.2	51	16/36	26	43
July.....	28.2	40	18/44	22	47
August.....	34.0	62	24/43	22	37
September.....	44.1	90	17/53	20	34
October.....	48.9	93	16/39	27	49
November.....	44.0	69	12/32	29	48
December.....	47.9	61	1/51	38	46

TABLE 6. Highest Hourly Speed (60 minute Mean) each Month.

10. FREQUENCY OF DAYS WITH MAXIMUM HOURLY WIND (60 MINUTE MEAN) IN LIMITS STATED

Table 7 gives the percentage of days each month on which the highest 60-minute mean was in each 5 m.p.h. range, while Figure 2, which is derived from Table 7, gives the speed of the maximum 60-minute wind reached on 10, 20, 40, 60, 80 and 90% of days.

The table shows that the most frequent range is 26-30 m.p.h. in February and 11-15 m.p.h. in July, August and September. In the summer the peak of frequency is much sharper than in winter, and almost one-third of the days in July and August have maximum hourly wind from 11-15 m.p.h.

In February only one day in three years does not have an hourly wind above 10 m.p.h., whereas in August, 6 days each month do not exceed this speed.

Hourly speeds above 30 m.p.h. are reached on nearly half the days in February, and on one-third the days in January and March, but on less than one-tenth the days from May to September.

Speeds above 40 m.p.h. occur on one-sixth of the days in February, but on only one day in six years in May and June, and have never been observed in July.

Over 50 m.p.h. winds occur one day each month in January and February, and about once in three years in each of the other months, September to April. In the whole 21 years over 50 m.p.h. was recorded once in June and not at all in May or July.

	January	February	March	April	May	June	July	August	Sept.	October	Nov.	Dec.	Year
0- 5	0.3	0.3	0.1	0.2	0.1	1.3	0.6	1.0	3.3	0.4	0.5	0.1	.69
6-10	5.3	1.0	1.9	5.0	7.7	12.2	16.2	19.0	12.9	6.9	4.4	3.2	8.0
11-15	10.0	7.4	8.5	14.3	24.0	27.1	32.5	31.2	27.1	18.3	14.2	9.1	18.6
16-20	16.1	9.3	16.3	19.5	25.3	29.7	30.9	27.2	22.4	26.1	18.2	19.1	21.7
21-25	18.8	17.9	21.3	23.4	23.8	17.9	14.8	13.5	17.7	21.4	23.3	20.7	19.6
26-30	16.3	18.2	16.7	16.9	12.1	7.8	4.0	5.0	7.4	13.5	17.7	17.2	12.8
31-35	12.2	15.6	15.2	11.4	4.9	2.5	0.9	1.3	4.1	6.6	9.4	11.6	8.0
36-40	9.8	12.6	11.1	4.9	1.4	1.0	0.2	0.3	2.1	3.2	7.0	10.1	5.3
41-45	5.9	8.2	4.5	2.1	0.5	0.3	—	0.4	1.1	1.5	3.2	5.0	2.7
46-50	2.5	5.5	3.1	1.5	0.1	—	—	0.4	0.9	0.9	1.5	2.8	1.6
51-55	1.6	2.3	0.9	0.5	—	0.2	—	0.1	0.5	0.1	0.2	1.0	.60
56-60	0.6	1.3	0.1	0.3	—	—	—	0.1	0.2	0.6	—	—	.26
61-65	0.7	0.5	—	0.2	—	—	—	0.1	—	—	0.2	0.1	.15
66-70	—	—	—	—	—	—	—	—	—	—	0.3	—	.03
71-75	—	—	0.1	—	—	—	—	—	—	—	—	—	.01
76-80	—	—	—	—	—	—	—	—	0.2	—	—	—	.01
81-85	—	—	—	—	—	—	—	—	—	0.3	—	—	.03
86-90	—	—	—	—	—	—	—	—	0.2	—	—	—	.01
91-95	—	—	—	—	—	—	—	—	—	0.1	—	—	.01

TABLE 7. Percentage of Days with Highest 60 Minute Mean in limits stated.

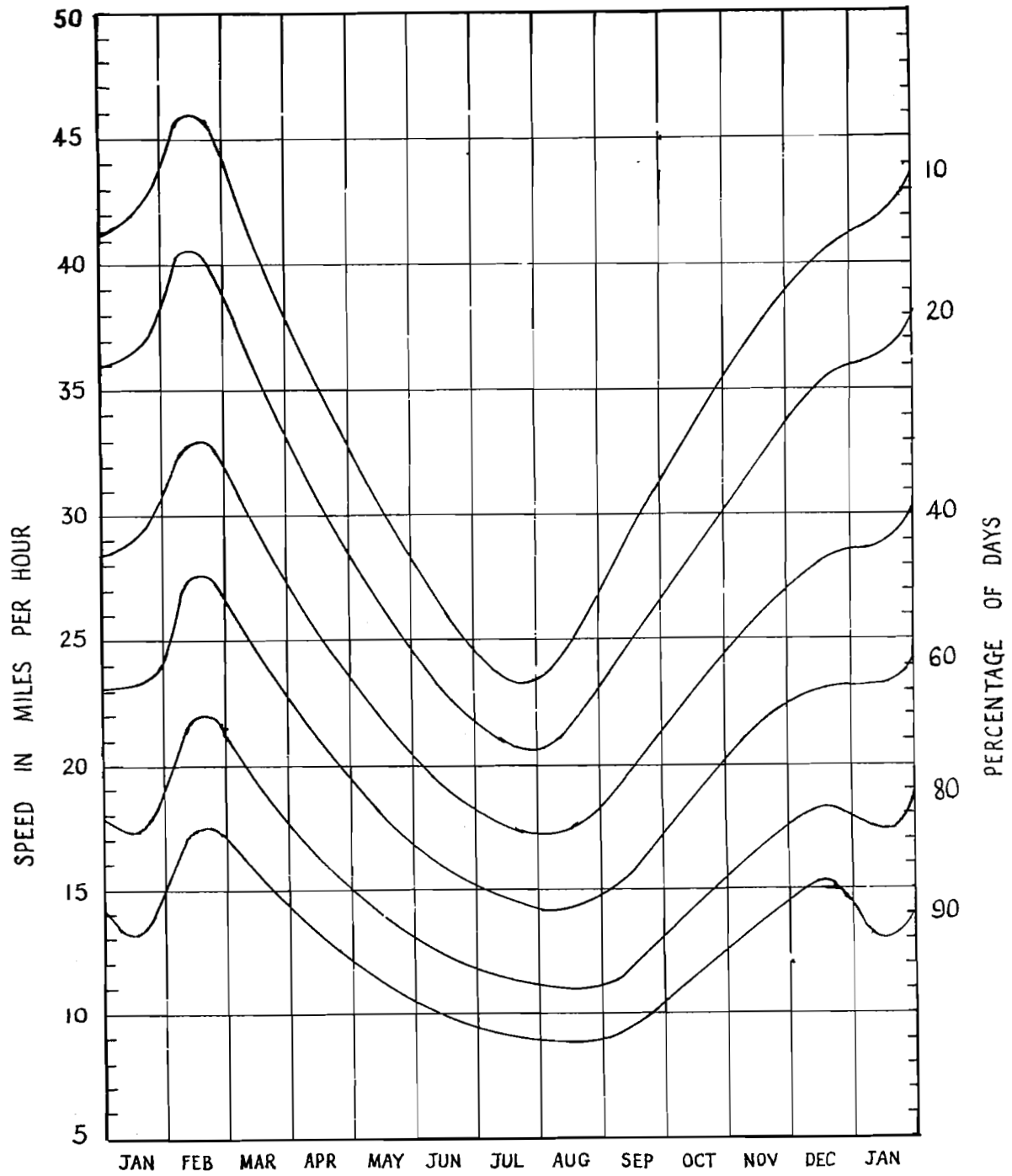


FIG. 2 Maximum Hourly Wind reached on 10, 20, 40, 60, 80 and 90% of Days.

Each of the curves of Figure 2 has its maximum in February and its minimum in July and August. The highest 10 and 20% of days have lowest values in July and then as a larger percentage of days is included the lowest point changes to August.

January shows a slightly lower value for the highest 10% than a steady rise from July to February would indicate and this variation in January becomes more marked as a larger percentage of days is included, so that for 80% and more of days the speed in January is lower than in December.

11. MAXIMUM WIND (10 MINUTE MEAN) EACH MONTH

The average determined over 10 minutes on the Dines record is usually considered as the wind speed and Table 8 gives the normal highest wind speed each month and the extreme values observed.

In each of the eight months from September to April the normal highest wind is 47 m.p.h. or more, while in January and February it is over 55 m.p.h. From May to August the speed does not usually reach 40 m.p.h. and July has the lowest values with an average maximum of 32 m.p.h.

The highest values observed are 99 and 100 in September and October, which speeds were recorded during hurricanes in September, 1948, and October, 1947. Speeds above 40 have occurred in all months and above 60 in all months except May, June and July.

There has not been a single individual month in which the wind did not reach 26 m.p.h. and December, January and February have never

	Average Months Maximum	Absolute Maximum			Lowest Months Maximum
		Speed	Direction	Date	
January.....	55	71	N.W.	14/55	44
February.....	56	69	S	5/37	44
March.....	52	80	N	15/41	38
April.....	48	74	N.W.	26/33	35
May.....	38	49	S	29/36	31
June.....	37	56	S	16/36	27
July.....	32	41	S	18/44	26
August.....	39	64	S.S.E.	24/43	26
September.....	47	99	S.S.E.	17/53	26
October.....	52	100	N.W.	16/39	29
November.....	47	73	N	12/32	27
December.....	52	63	W.N.W.	1/51	44

TABLE 8. Highest Wind (10 minute Mean) each Month.

passed in any year without the wind reaching at least 44 m.p.h. in each of them.

12. FREQUENCY OF DAYS WITH MAXIMUM WIND (10 MINUTE MEAN) REACHING SPECIFIC SPEEDS

Table 9 gives the percentage of days in the 1932-1947 period on which the maximum wind reached each 10 m.p.h. range and Figure 3 which is derived from Table 9 gives the maximum speed reached on 10, 20, 40, 60, 80 and 90% of days.

Month	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100-9	Average Daily Max.
January.....	2.4	22.8	37.6	24.7	8.8	3.0	0.6					27
February....	0.5	13.5	28.8	32.4	17.0	6.6	1.2					32
March.....	1.1	23.0	40.6	23.9	9.9	1.1	0.2	0.2				27
April.....	2.2	28.6	46.4	15.4	5.8	1.3	—	—	—	0.2		24
May.....	4.7	48.2	37.2	9.0	0.9							20
June.....	8.7	53.1	31.6	5.6	0.7	0.4						18
July.....	6.2	59.1	30.5	3.9	0.2							18
August.....	9.1	54.5	29.1	5.4	1.3	0.4	0.2					18
September..	10.9	46.4	30.7	10.0	1.6	0.4						19
October.....	3.0	36.6	39.8	13.3	4.9	2.2	—	—	—	—	0.2	23
November..	2.9	24.2	39.6	24.0	7.8	1.3	0.2					26
December..	1.1	23.0	32.0	24.9	15.9	2.6	0.4					29

TABLE 9. Percentage of Days with Maximum wind (10 minute mean) in limits stated.

Both the table and figure show the general effect of high speeds in winter with highest values in February and low speeds in summer with lowest in July to September.

In February speeds reach 20 m.p.h. on 6 days out of 7, 30 m.p.h. on more than half the days, 40 m.p.h. on 1 day in 4, and 50 m.p.h. on 1 day in 13.

In July, at the other extreme, 20 m.p.h. is reached on only 1 day in 3, and 30 m.p.h. on 1 day in 25.

In Figure 3 the highest point of each percentage curve is well marked in February in each case. The low point of the curve is also definite in July

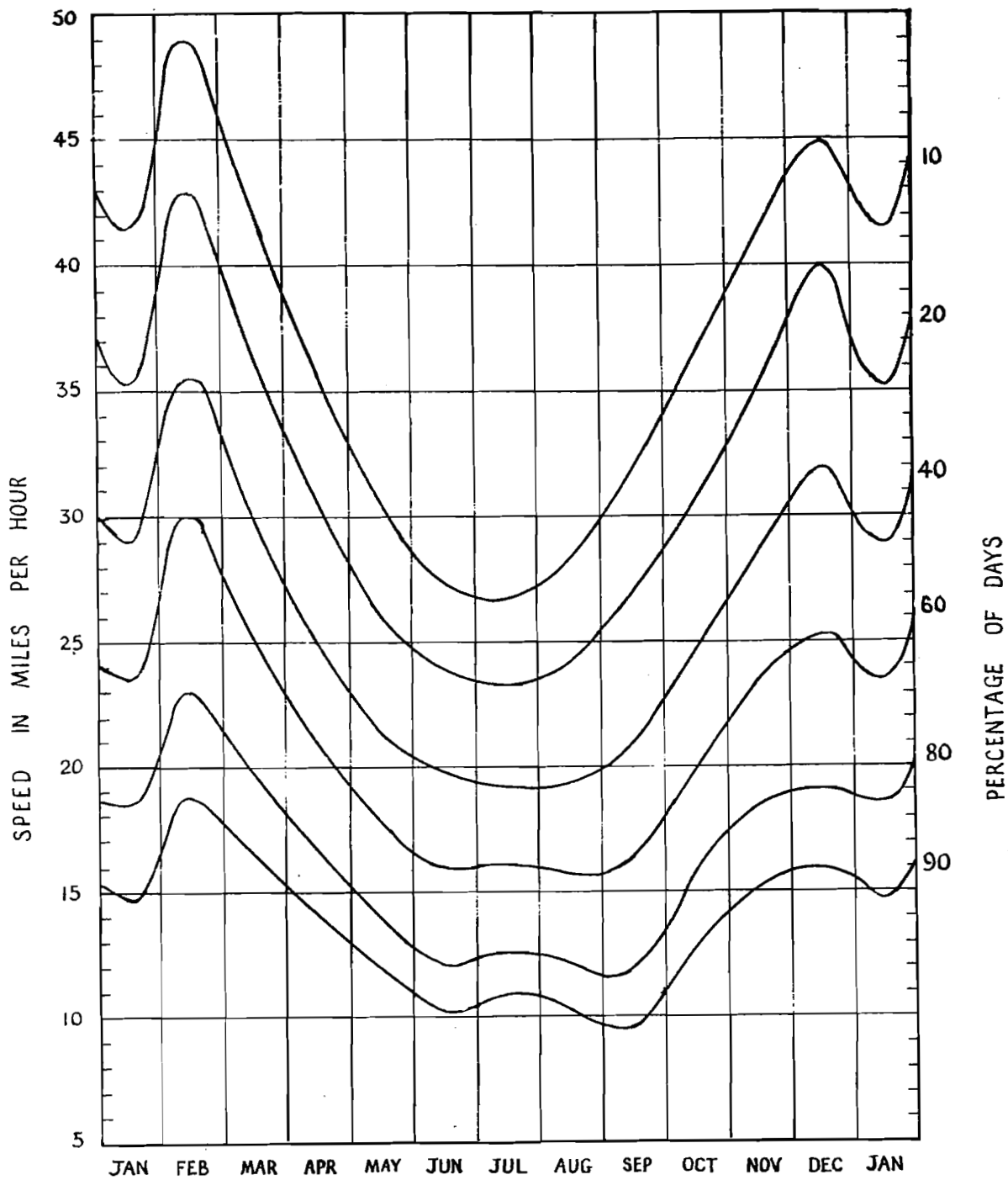


FIG. 3 Maximum Wind Speed (10 minute mean) reached on 10, 20, 40, 60 80 and 90% of Days.

with the windiest 10% of days, but as larger percentages of days are included the summer minimum becomes broader so that the lower limit of speeds which are reached on 60, 80 and 90% of days are much the same in each of the four months of July to September.

Each curve shows a regular annual variation in speed except that in each case January has lower values than December and February thus giving a subsidiary minimum in the curve.

13. FREQUENCY OF DAYS WITH STRONG WINDS

A day is listed as having a strong wind when the ten minute mean has reached 25 m.p.h. during the day, and Table 10 gives a summary covering 1937-1953.

Strong winds occur on at least half the days in the six months, November to April, with the highest frequency of 3 days out of four in February, while in the summer months they average only one day in five.

	Average Number Days	Percentage all Days	Maximum Number Days	Minimum Number Days
January.....	19	61	27	8
February.....	21	75	26	14
March.....	21	66	29	12
April.....	15	50	20	5
May.....	10	31	16	4
June.....	6	22	12	1
July.....	5	15	10	1
August.....	6	18	10	3
September.....	9	31	19	2
October.....	12	39	20	7
November.....	16	53	27	10
December.....	19	61	29	13
Year.....	159	43	193	138

Table 10. Frequency of Days with Strong Winds. (Mean 10 minute wind reaching 25 m.p.h.) Period 1937-1953.

Each month, November to March has on occasion had strong winds on all except 3 or 4 days in the month, while neither July nor August has ever had more than ten days with strong winds.

February has always had strong winds on at least half the days.

14. FREQUENCY OF DAYS WITH A GALE

A day is recorded as having a gale when the 10-minute mean at some time reaches 39 m.p.h. and Table 11 gives the frequency of days with gales.

July, which had only one gale throughout the whole period, has the lowest frequency but the 4 months, May to August, each average less than one gale a year. The 4 winter months, December to March, each average more than 5 days with gale per month with a maximum of nearly 8 in February, which has gales on 27% of all days.

	Average		Max. No.	Year	Min. No.	Year	Percentage of years with gales in month
	Number Days	Percent all days					
January.....	6.4	20.7	20	1955	1	37, 50	100
February....	7.7	27.2	16	1947	2	1935	100
March.....	6.0	19.4	14	1949	0	1946	95
April.....	2.7	8.9	7	1943	0	7 yrs.	67
May.....	0.5	1.7	3	1948	0	13 yrs.	38
June.....	0.3	1.1	1	Sev.	0	14 yrs.	33
July.....	0.05	0.15	1	1944	0	20 yrs.	5
August.....	0.7	2.2	3	33, 48	0	14 yrs.	36
September.	1.5	4.8	6	1953	0	8 yrs.	64
October.....	1.6	5.1	6	1944	0	6 yrs.	73
November.	3.4	11.2	10	1944	0	4 yrs.	82
December..	5.3	17.2	12	1935	1	1932	100
Year....	36.1	9.9	50	1944	20	1946	

TABLE 11. Frequency of Days with Gale (Mean 10 minute wind reaching 39 m.p.h.)

June and July have not had more than one gale each in any year, May and August not more than 3 and April, September and October not more than 7 each. The other 5 months have each had 10 or more with the greatest number of 20 in January, 1955.

December, January and February have never passed without at least 2 gales in February and one in each of the other two. Each of the other 9 months of the year has on occasion passed without a gale.

There are an average of 36 days with gale a year ranging from a low of 20 in 1946 to a high of 50 in 1944.

In 1946 there was not a gale for $6\frac{1}{2}$ months from 28 April to 18 November and none in March. In 1944 there was a gale in every month except May and September.

15. FREQUENCY OF DAYS WITH GALES FROM THE EIGHT CARDINAL DIRECTIONS

Table 12 gives the average number of days in each month with gales from each direction over the period 1932 to 1947.

Over the year North-westerly is the most common direction for gales, and North-easterly and Easterly the least common, there being an average of 16 gales from the North-west and only one from the North-east.

From November to April, North-westerly gales are the most common, with Westerlies rather more than half and Southerlies about one-third as frequent as North-westerlies, but still more frequent than the remaining directions.

From May to September, Southerly gales are the most frequent, but the total number of gales is small and they are largely due to tropical storms moving North between Bermuda and the United States coast.

Month	N	N.E.	E	S.E.	S	S.W.	W	N.W.
January.....	0.7	0.1	0.1	0.4	1.4	0.9	2.0	3.8
February.....	0.5	0.0	0.1	0.4	1.6	1.0	3.5	4.4
March.....	0.9	0.1	0.1	0.3	0.9	0.7	2.0	2.0
April.....	0.5	0.2	0.1	0.3	0.3	0.4	0.7	1.4
May.....	0.1	0.0	0.1	0.0	0.2	0.0	0.1	0.1
June.....	0.0	0.0	0.0	0.1	0.3	0.0	0.0	0.1
July.....	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
August.....	0.1	0.0	0.1	0.4	0.3	0.1	0.0	0.1
September.....	0.2	0.1	0.3	0.0	0.3	0.1	0.1	0.0
October.....	0.5	0.2	0.1	0.4	0.3	0.1	0.3	0.5
November.....	0.6	0.3	0.5	0.3	0.7	0.1	0.7	1.1
December.....	0.7	0.1	0.0	0.3	0.8	0.5	1.9	2.7
Year....	4.7	1.0	1.3	2.8	7.1	3.8	11.2	16.1

TABLE 12. Average Number of Days per Month with Gales from each Cardinal Direction. Period 1932-1947.

In October Northerly and North-westerly are the most common directions for gales.

The least frequent gale direction is North-easterly or Easterly in every month except November when South-westerly is the least frequent.

There is no year without at least one North-west gale in both January and February, but with this exception all months have on occasion passed without a gale from any specified direction.

Over the year Westerlies and North-westerlies account for gales on 27 days, while North-easterlies and Easterlies give less than three a year. There is a subsidiary maximum with Southerlies giving 7 gales per year.

There has not been a year without at least one North, three South, five West, and twelve North-west gales.

16. TOTAL DURATION OF GALES IN EACH MONTH

Table 13 gives the average total duration each month, of gales from each of the eight cardinal directions, and the extreme totals per year independent of direction, over the period 1932 to 1947.

February with an average of 63 hours has the highest monthly duration, followed by January with 41 hours. From this maximum the monthly

Month	N	N.E.	E	S.E.	S	S.W.	W	N.W.	Total all Directions		
									Ave.	Max.	Min.
January...	1.8	0.04	0.2	0.6	3.8	1.7	9.8	22.8	40.7	155.0	3.5
February..	1.5	0.0	0.0	1.2	4.7	3.2	20.7	31.8	63.1	128.3	5.2
March.....	3.8	0.1	0.6	1.5	3.3	0.6	8.3	7.3	25.5	56.0	0.0
April.....	0.9	0.9	0.8	0.4	0.7	0.6	3.2	4.1	11.5	42.8	0.0
May.....	0.3	0.0	0.05	0.0	0.2	0.0	0.01	0.02	0.6	4.3	0.0
June.....	0.0	0.0	0.0	0.02	0.7	0.0	0.0	0.8	1.5	11.5	0.0
July.....	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.5	8.0	0.0
August.....	0.4	0.0	1.1	2.9	1.5	0.3	0.0	0.01	6.2	41.7	0.0
September	1.7	0.03	2.0	0.0	1.1	0.1	0.01	0.0	5.0	25.1	0.0
October....	1.4	1.2	0.15	1.5	0.7	0.08	1.7	1.4	8.2	25.5	0.0
November	1.5	0.9	2.4	0.7	2.2	0.05	2.0	4.4	14.1	62.1	0.0
December	1.9	0.04	0.0	1.0	1.5	0.9	7.8	13.6	26.8	74.7	2.0
Year..	15.2	3.2	7.3	9.8	20.9	7.5	53.5	86.2	209.9	345.1	80.1

TABLE 13. Average Total Duration, in hours per month, of Gales from each Direction, and Average and Extreme Durations of Gales from any Direction. Period 1932 - 1947.

duration falls away in March and December to less than one-half the February total, and in April and November to less than one-fourth of that total. July has the lowest average duration during the entire period, as the one gale gives an average of one-half hour per month, but May has little more, and June only an hour and a half. August and September have from 5 to 6 hours due almost entirely to tropical depressions.

The total yearly duration, independent of direction averages 210 hours ranging from a low of 80 hours in 1946 to a high of 345 hours in 1933.

North-westerly gales with an average of 86 hours per year are much the longest duration and together with Westerly gales which average 53 hours. account for two-thirds of the total yearly duration of gales. North-easterly gales have the shortest duration, averaging 3 hours per year.

In the period 1932-1947 to which the averages in Table 13 refer, the longest duration of gales in January was 113 hours and February, 1947, with a total of 128 hours was the windiest month on record. However, as is stated in Section 22, January, 1955, was exceptionally windy, the first 21 days having a total of 155 hours of gale or nearly $7\frac{1}{2}$ hours per day, and a mean of 5 hours per day for the month, which makes it by far the windiest month since 1932.

17. MAXIMUM GUSTS EACH MONTH

Table 14 gives the maximum gust in each month.

In each of the eight months, September to April there is normally a gust exceeding 60 m.p.h. with over 70 m.p.h. in October, December, January and February. In July the normal maximum is 47 m.p.h., but each of the other summer months has normally at least one gust over 50 m.p.h.

	Average Monthly Maximum	Absolute Maximum	Lowest Monthly Maximum
January.....	73.2	96	55
February.....	74.9	94	54
March.....	69.5	99	48
April.....	64.5	132	43
May.....	54.5	73	41
June.....	52.2	75	36
July.....	47.2	64	37
August.....	54.4	89	38
September.....	64.6	126	43
October.....	71.2	131	47
November.....	62.6	93	46
December.....	70.8	86	55

TABLE 14. Monthly Highest Gusts.

The highest gust which has been recorded in July is 64 m.p.h., but May and June have each had over 70 m.p.h., while each of the other months has had 86 m.p.h. or more, with over 125 m.p.h. in April, September and October.

Even in the summer there has not been a month without at least one gust to 36 m.p.h., and December, January and February have each always had gusts to 54 m.p.h.

18. FREQUENCY OF DAYS WITH MAXIMUM GUST IN GIVEN LIMITS

Table 15 gives the percentage of days with maximum gusts in each 10 m.p.h. range and Figure 4 the maximum gust reached on 10, 20, 40, 60, 80 and 90% of days.

The daily highest gust averages 39 m.p.h. or more in December, January, February and March with the highest average of 45 m.p.h. in February. In June, July and August the average daily maximum gust is 26 m.p.h.

The most frequent value in February is 40-49 m.p.h. which occurs on about one-fourth of the days, while in the other months November to

Month	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	130-9	Average Daily Max.
January.....	—	6.0	20.9	25.2	22.6	14.2	7.5	1.3	1.9	0.4	—	40
February...	—	3.8	14.0	19.1	26.2	19.1	11.8	3.3	2.4	0.2	—	45
March.....	0.2	4.5	22.4	30.8	20.9	12.7	6.7	1.3	0.4	0.2	—	39
April.....	0.2	10.7	26.3	29.2	19.6	8.9	3.1	1.1	0.4	—	0.2	35
May.....	0.6	21.5	35.3	28.6	10.3	2.6	0.9	0.2	—	—	—	28
June.....	1.3	25.6	40.7	22.0	7.3	2.0	0.7	0.4	—	—	—	26
July.....	0.4	23.7	46.0	20.0	8.0	1.5	0.4	—	—	—	—	26
August.....	0.6	29.7	37.7	20.9	7.1	2.6	0.4	0.4	0.4	—	—	26
September	1.6	25.3	33.1	22.4	11.3	4.4	1.3	0.4	—	—	—	28
October.....	1.3	14.8	33.1	27.5	15.3	3.9	2.2	1.7	—	—	0.2	32
November..	1.1	8.9	26.0	30.4	18.9	9.3	4.4	0.7	—	0.2	—	35
December..	0.4	6.7	22.2	24.1	11.8	15.5	6.0	1.7	0.6	—	—	40

TABLE 15. Percentage of Days with Maximum Gust in limits stated. 1932-1947.

April 30-39 is most frequent. In May to October 20-29 m.p.h. is the most common maximum, occurring on one-third of the days in all months and almost one-half of the days in July.

Gusts reach 60 m.p.h. on at least one day per month from October to April, with 5 days in February, 3-4 days in January, and 2-3 days in De-

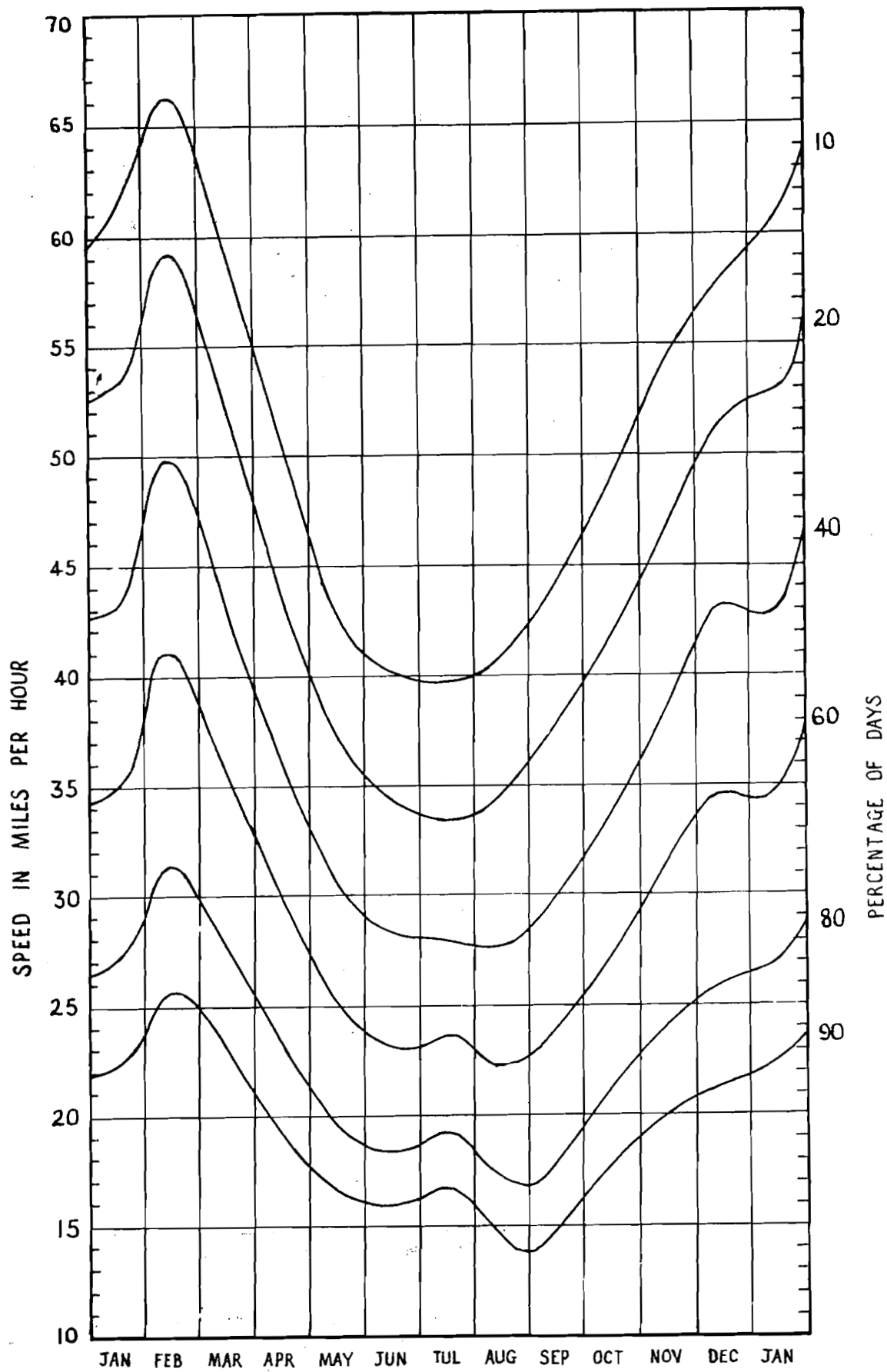


FIG. 4. Maximum Gust reached on 10, 20, 40, 60, 80 and 90% of Days.

ember and March. Gusts of 70 m.p.h. and above are observed, on an average, nearly 2 days in February, one day in January, and once in 2 years in March, April, October and December, and less frequently in each of the remaining months except July where they have not been recorded.

19. CONTINUOUS STRONG AND GALE WINDS

Table 16 gives data as to the longest period each month with continuous strong, gale and hurricane winds as shown by the hourly mean speeds.

From September to April there is normally at least one 24-hour period each month with continuous strong winds, with over 36 hours from December to March and a period of 52 hours in February. The longest period of strong winds is not usually more than four hours in July or six hours in August.

In each of the two summer months, July and August, there has been an occasion with 33 continuous hours of strong wind, while February has had 92 hours, and in September, 1943, there were 122 hours or over five days of continuous strong wind.

Speed	Average Longest		Longest 1935-1953				
	25	39	25	39	55	64	75
January.....	39.0	12.9	62-1941	35-1941	3-1939	—	—
February.....	51.8	14.4	92-1945	36-1940	8-1940	—	—
March.....	43.2	9.4	89-1940	40-1944	5-1941	4-1941	—
April.....	23.8	4.2	46-1953	11-37,49 53	2-1940	—	—
May.....	18.4	0.2	84-1948	2-1947	—	—	—
June.....	12.6	0.6	38-1941	5-1941	—	—	—
July.....	3.8	0.1	33-1944	2-1944	—	—	—
August.....	6.3	1.3	34-1943	17-1943	6-1943	—	—
September.....	31.8	5.6	122-1943	25-1943	10-1948	9-1948	6-1948
October.....	26.0	3.9	48-1953	22-1947	11-1947	7-1947	4-1939
November.....	27.1	4.4	70-1947	22-1947	3-1951	—	—
December.....	36.2	7.2	56-1939	29-1938	2-1951	—	—

TABLE 16. Longest Continuous Periods with Strong, Gale and Hurricane Force Winds.

January and February each have normally at least one period of 13 hours with continuous gales, while March has 9 hours, and December, 7. The length of gales decreases towards summer and in May, June and July the longest gales last less than an hour. Each of the seven months, September to March, has had a period of 22 hours or more with continuous

gale, with a maximum of 40 hours in March, 1944. At the other extreme, there have not been more than 5 hours continuous gale in June or more than 2 hours in May or July.

Mean hourly winds of 55 m.p.h. have not been observed in May, June and July, while the other months have had at least 2 hours with maxima of 8 hours in February, 10 hours in September and 11 hours in October.

Hourly means of 64 m.p.h. occurred only in March, September and October, the longest duration being 9 hours in September, 1948.

Hourly means of hurricane force were recorded only in September and October where they have lasted for 6 and 4 hours respectively.

20. HURRICANES

Table 17 lists the occasions when hurricane force winds were recorded. Of the eight occasions in the 24 years, 1932-55, only one in March, 1941, was caused by a severe storm of frontal origin. This covered a wide area and was only slightly more intense than many which occur in winter.

Date	Max. 60 Minute	Max. 10 Minute	Max. Gust	Direction Degrees
12th Nov., 1932	69	73	91	010
26th April, 1933	62	74	132	325
16th October, 1939	93	100	131	320
15th March, 1941	75	80	99	355
20th October, 1947	81	82	126	235
13th Sept., 1948	78	80	112	145
7th October, 1948	82	85	110	315
17th Sept., 1953	90	99	126	165

TABLE 17. Occasions with Wind (10 minute Mean) of Hurricane Force.

The storm in April, 1933, was observed only in the Bermuda area and was of very small extent. It was considered to be either a wave on a front which was near Bermuda or possibly a small circular depression. It gave the highest gust which has been recorded.

The other six cases were due to Tropical Hurricanes of considerable intensity and extent which passed at various distances from Bermuda.

21. CALMS

Short periods of calm occur at all times of the year but no data is available on such calms, and Table 18 refers to calms lasting 60 minutes between exact hours as tabulated in the annual summaries.

Over the year there is an average of 43 days with calm hours and a total of 154 hours of calm.

BERMUDA METRO OFFICE
TECHNICAL NOTE
#7

	Days with at least One Calm Hour			Total Calm Hours			Longest Continuous Calm
	Average Number	Max. No.	Min. No.	Average Number	Max. No.	Min. No.	
January.....	4.6	9	0	22	63	0	16
February.....	3.8	9	1	13	39	2	13
March.	1.4	4	0	3	11	0	4
April.....	2.4	3	2	7	10	4	5
May.....	1.0	3	0	2	6	0	4
June.....	2.8	5	1	11	25	2	12
July.	4.8	8	1	19	40	3	9
August.....	7.2	10	2	30	58	6	13
September.....	5.8	11	3	21	50	8	12
October.	3.0	6	1	10	22	5	6
November.....	4.0	6	2	10	23	3	12
December.	2.2	3	2	3	5	2	3
Year.....	43	55	27	154	212	74	16

TABLE 18. Calms lasting at least an hour (between exact hours) 1949-1953.

There are most calms in summer and fewest in spring; August averages 7 days with a total of 30 hours of calm while May has only one day with 2 calm hours.

Besides its strong winds, February has more than an average amount of calm, but the means in both January and February are possibly over-affected by the exceptional amount of calm in 1950 when each had 9 days with a calm hour and there were 63 hours of calm in January.

The longest continuous period of calm is 16 hours which was in January, and 5 other months have had 12 hours or more.

22. JANUARY, 1955. THE STORMIEST MONTH

January, 1955, was the stormiest month since these observations began in 1932. Although all the instrument charts and the summaries prepared for official records were lost in the fire, a general account of the month's weather is available in the newspapers and some of the chief figures are well remembered.

The bad weather was mainly in the first three weeks during which a series of deep depressions between Bermuda and the United States and Canadian coasts followed one another so closely and covered such wide

areas that there was almost a permanent low centre 500 to 700 miles to the North-west to North-east of Bermuda.

In the 19 days, 3rd to 21st, there were gales on 18 days and the month's total of 20 days with gale is the highest recorded in any month of any year. This total is 3 times the average for January, almost twice the previous January maximum of 11 gale days in 1940, and equals the entire number in the year 1946.

There were 155 hours of gale which is much more than the previous January maximum of 113 hours and the longest of 128 hours in February, 1947.

On the 14th the wind averaged 54 m.p.h. for the 24 hours which is 4 m.p.h. more than the previous January maximum in 1933. Daily means of 54 m.p.h. have been recorded on only 2 other days, namely 13th September, 1948 and 20th October, 1947, on each occasion owing to a Tropical Hurricane.

On the 14th there was a maximum 10-minute wind of 71 m.p.h., the previous highest in January being 68 m.p.h. in 1939. This speed of 71 m.p.h. has been exceeded on only 8 occasions.

These January, 1955, extremes have been entered in the appropriate place as extremes in Tables 4, 8, 11 and 13 but they have not been used in the calculation of means.

23. DIURNAL VARIATION OF WIND SPEED

Table 19 gives the average diurnal variation in speed.

The times given are in Bermuda Standard Time which is that of 60 degrees West. As Fort George is at longitude 64° 41' West, these times are 19 minutes ahead of Local Mean Time.

The daily range is greatest in July where it is 3.6 m.p.h., and least in December and February where it is 1.1 and 1.2 m.p.h. As percentage of mean the range is least in February being only 6% whereas the range in July is 34% of mean.

In all months there is an increase during the forenoon to the day's maximum which is about 11 a.m. from September to December, and between 12 and 1.30 p.m. in other months. There is a steady decrease from the maximum during the afternoon with a minimum in the early part of the night. The variation is somewhat erratic during the night and the day's minimum is not so sharply marked as the day's maximum. In general there is an evening minimum and then a slight rise before a fall to a subsidiary minimum about daybreak.

The day's maximum occurs latest in January when it comes about 1.30 p.m. It is earlier in February and then in March and April progressively earlier, being about 11.45 a.m. in April. It occurs later again in May and is about 1.15 p.m. in June, only slightly earlier than in January. The time of the maximum then becomes earlier through the summer and autumn until it occurs about 10.45 a.m. in November. It becomes later during December, giving an average of about 11 a.m. for the month, and then 1.30 p.m. in January.

Hour	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
0- 1	-40	-24	-27	-57	-69	-85	-94	-88	-72	-51	-23	-21
1- 2	-27	0	-24	-41	-66	-78	-90	-80	-81	-46	-21	-17
2- 3	-20	11	-13	-15	-71	-72	-100	-80	-79	-56	-33	-16
3- 4	-18	10	-1	- 3	-62	-70	-99	-80	-79	-56	-50	1
4- 5	-10	14	-6	- 8	-62	-72	-96	-85	-70	-46	-40	19
5- 6	- 8	10	-12	-18	-63	-75	-100	-76	-58	-33	-16	17
6- 7	0	1	- 9	-32	-54	-49	-80	-59	-47	-18	- 3	22
7- 8	- 7	-18	-17	-15	-27	-18	- 9	- 3	- 4	5	20	7
8- 9	-12	-19	14	22	22	17	54	61	64	55	44	12
9-10	31	13	54	53	78	85	109	117	106	90	64	43
10-11	65	43	69	95	113	116	175	157	131	113	89	53
11-12	73	53	78	98	129	143	208	171	135	110	76	53
12-13	80	49	87	97	131	157	217	171	123	90	58	50
13-14	84	55	81	86	122	159	211	165	109	74	46	43
14-15	72	44	60	78	105	141	181	138	93	50	29	28
15-16	54	21	52	63	91	114	130	113	52	42	12	3
16-17	19	3	29	35	57	72	76	67	14	13	-14	-35
17-18	-10	-28	-8	2	15	20	16	8	-24	-18	-47	-59
18-19	-39	-49	-50	-43	-30	-35	-60	- 55	-44	-45	-43	-42
19-20	-53	-61	-72	-72	-58	-79	-118	-107	-46	-55	-41	-23
20-21	-55	-53	-82	-86	-77	-100	-147	-123	-57	-56	-42	-37
21-22	-60	-34	-74	-86	-79	-102	-138	-125	-55	-50	-26	-36
22-23	-64	-23	-69	-77	-73	-97	-127	-114	-58	-51	-30	-32
23-24	-53	-13	-61	-69	-70	-98	-114	-102	-57	-56	- 7	-18
Range m.p.h.....	1.5	1.2	1.7	1.8	2.1	2.6	3.6	3.0	1.9	1.7	1.4	1.1
Range % Mean	8	6	9	12	16	24	34	29	18	12	11	9

TABLE 19. Diurnal Variation of Wind Speed. Table gives departure in 0.01 m.p.h. from daily mean.

The minimum occurs earliest in December where it is about 5.30 p.m. and latest in September where it does not come until 2 a.m. November has minima at 5.30 p.m. and 3.30 a.m., while October shows little variation from 7.30 p.m. to 3.30 a.m. During the seven months, February to August, lowest winds occur between 8 and 9 p.m.

The highest average hourly speed over the year is 20.5 m.p.h. between 1 and 2 p.m. in February and the lowest, 9.0 m.p.h., between 9 and 10 p.m. in August.

24. RELATION BETWEEN SPEED AT FORT GEORGE AND AT HAMILTON HOTEL

As the map shows Fort George is one of the most exposed places in Bermuda and the surface wind speed is likely to be greater than at most other parts of the Islands.

A comparison is possible with records from a Dines anemometer which was maintained at Hamilton Hotel with its head 40 feet above the roof of the building and 170 feet above Mean Sea Level. This site would also be likely to have higher winds than the average over the whole of Bermuda but the speeds recorded were appreciably less than at Fort George.

Comparison was made between mean hourly speeds as given in 1952 and 1953 summaries, using only hours where the directions were within 10 degrees at the two sites. There were sufficient cases to give a reasonable comparison of these two sites up to 40 m.p.h. and it was found that for each direction and between 10 and 40 m.p.h. at Fort George, the Hamilton wind speed bore a definite ratio to that at Fort George.

N	75	E	63	S	85	W	68
NNE	73	ESE	70	SSW	84	WNW	65
NE	67	SE	75	SW	85	NW	73
ENE	65	SSE	78	WSW	79	NNW	75

TABLE 20. Percentage of Fort George speed shown by Hamilton wind for each main direction.

The ratio is given in Table 20 which shows that according to direction the wind speed at Hamilton was from 63% to 85% of that at Fort George. The ratio has its highest value with wind from South to South-west and lowest with Easterly, East-north-easterly and West-north-westerly.

As Fort George is an open exposure, the ratio of speeds is mainly determined by the obstructions affecting wind at Hamilton. Between East and East-north-east of Hamilton there are a succession of ridges for 4 to 5 miles leading to the highest point in Bermuda in Smith's Parish, so wind at Hamilton suffers its maximum reduction. To West and West-north-west there are other hills in west Pembroke, within 1 to 2 miles.

The Hamilton site was most open between West and South-west where, except for Bermudiana Hotel and smaller buildings, the wind was relatively unobstructed right across the water for about 4 miles. Consequently the wind is least reduced from these directions and the ratio has its highest value being perhaps mainly determined by the difference in altitude of the two anemometers.

The records show that Hamilton had only 60% as many days with strong winds as had Fort George and only one-quarter as many days with gales. Hamilton had 50% more days with a calm hour and 80% more hours of calm.

I am indebted to Mr. S. G. Hirst for completing the large task of scaling the anemometer records from 1932 to 1948 and extracting the monthly means and extremes. Although all these original records and monthly tabulations were lost in the fire, copies of the means and extremes for each month were made and provided the basis for much of this note.

Meteorological Office,
Hamilton,
June, 1956.