https://ntrs.nasa.gov/search.jsp?R=19700027625 2020-03-11T23:29:19+00:00Z

TECH LIBRARY KAFB, NM
0060750

NASA CONTRACTOR REPORT

NASA CR-1640

c. 1

LOAN COPY: RETURN TO
AFWL (WLOL)
KIRTLAND AFB, N MEX

NASA CR-1640

A FURTHER STUDY OF JIMSPHERE WIND PROFILES AS RELATED TO SPACE VEHICLE DESIGN AND OPERATIONS

by S. I. Adelfang, A. Court,
C. A. Melvin, and M. Pazirandeh

Prepared by
LOCKHEED-CALIFORNIA CO.
Burbank, Calif.
for George C. Marshall Space Flight Center

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION • WASHINGTON, D. C. • AUGUST 1970

TECH LIBRARY KAFB, NM

0060750

1. Report No. NASA CR-1640	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle A FURTHER STUDY OF JIMSPHERE WIND PROFILES AS RELATED TO SPACE VEHICLE DESIGN AND OPERATIONS		5. Report Date August 1970
		6. Performing Organization Code
7. Author(s) S. I. Adelfang, A. Court, C. A. Melvin, and M. Pazirandeh		8. Performing Organization Report No. LR-23535
9. Performing Organization Name and Address Lockheed-California Company Physical and Life Sciences Laboratory Burbank, California		10. Work Unit No.
		11. Contract or Grant No. NAS8-30165
12. Sponsoring Agency Name and Address NASA-Marshall Space Flight Center Aero-Astrodynamics Laboratory, Aerospace Environment Division Marshall Space Flight Center, Alabama 35812		13. Type of Report and Period Covered Final Contractor Report Feb. 1, 1969 to April 30, 1970
		14. Sponsoring Agency Code
15. Supplementary Notes Contract Monitor: George H. Fichtl, Aerospace Environment Division		

16. Abstract Statistical characteristics of steady state winds, gusts and wind shears observed over Cape Kennedy, Florida, and Point Mugu, California, with Jimsphere balloon sensors are described. Gusts in Jimsphere wind profiles as viewed in the time coordinates of a Saturn vehicle were isolated from the original profiles with a 33 weight digital high pass filter with negligible transmission of wind fluctuations at frequencies less than 0.15 cps. The distribution of gust variance computed for three 10-second intervals of Saturn flight time for Cape Kennedy profiles was found to be log-normal. Maximum absolute gusts increased witn altitude for altitudes from 4 to 15 km. The distribution of spectrum densities of gusts computed at frequencies from 0.3 to 3 cps for 900 Cape Kennedy profiles decreases with increasing frequency at a rate proportional to the -2.9 power of frequency for frequencies from 0.6 to 2.1 cps; at frequencies greater than 2.1 cps, a power law relation is not supported by the results. When spectrum densities were grouped with respect to deciles of wind speed and various wind shears, they showed a tendency to be larger at the high deciles. A preliminary study of a method for mathematical representation of observed gust functions suggests that the method can be applied to Jimsphere wind profiles that are closely spaced in time. Steady state winds for 794 Cape Kennedy profiles that were complete between 4 and 15 km, computed by subtraction of the gust component from the total wind, were in good agreement with the annual wind speeds of the Atlantic Missile Range Reference Atmosphere for the 50 percent cumulative frequency, but were significantly smaller for the 90, 95, 97.7 and 99 percent cumulative frequencies. A study of the climatological means and standard deviations of the magnitude of the vector shear at altitudes of 8 and 15 km indicates that they can be described by power law functions of layer thickness that are nearly alike for Cape Kennedy and Point Mugu, but are significantly different from those derived from a few summer profiles by other workers. A method for profile sampling is developed which provides profile sample sets that represent 5 critical characteristics of the parent population. A test of the method consisting of a comparison of the distributions of spectrum densities between 0.3 and 3.0 cps of 5 sample sets, each composed of 25 profiles, to the corresponding distributions of the entire population indicated that the spectrum distributions of any of the 5 sample sets offer a fair approximation to that of the whole 900 profile parent population.

17. Key Words (Suggested by Author(s))		18. Distribution Statement	
19. Security Classif. (of this report) UNCL	20. Security Classif. (of this page) UNCL	21. No. of Pages 85	22. Price* $3.00

*For sale by the Clearinghouse for Federal Scientific and Technical Information
Springfield, Virginia 22151

FOREWORD

This report was prepared by the Lockheed-California Company, Burbank, California for the National Aeronautics and Space Administration, George C. Marshall Space Flight Center, Huntsville, Alabama under Contract NAS 8-30165. The contract title is "Further Study of Jimsphere Wind Profiles Related to Space Vehicle Design and Operations".

Dr. George H. Fichtl of the George C. Marshall Space Flight Center, Aero-Astrodynamics Laboratory was the technical monitor on behalf of the Contracting Officer Mr. Phillip H. Taylor during the administration of the contract and Mr. Edward V. Ashburn was the Project Leader for the Lockheed-California Company.

The principal sections of this report were contributed by the following Lockheed-California Company (Calac) personnel and consultants: Dr. Stanley I. Adelfang (Calac), Sections 2 and 4; Dr. Arnold Court (Consultant) with Mr. Craig A. Melvin (Calac), Section 3; and Mr. Mohsen Pazirandeh (Consultant), Section 5.

ABSTRACT

Statistical characteristics of steady state winds, gusts and wind shears observed over Cape Kennedy, Florida and Point Mugu, California with Jimsphere balloon sensors are described. Gusts in Jimsphere wind profiles as viewed in the time coordinates of a Saturn vehicle were isolated from the original profiles with a 33 weight digital high pass filter with negligible transmission of wind fluctuations at frequencies less than 0.15 cps. The distribution of gust variance computed for three ten second intervals of Saturn flight time for Cape Kennedy profiles was found to be log-normal. Maximum absolute gusts increased with altitude for altitudes from 4 to 15 km. The distribution of spectrum densities of gusts computed at frequencies from 0.3 to 3 cps for 900 Cape Kennedy profiles decreases with increasing frequency at a rate proportional to the -2.9 power of frequency for frequencies from 0.6 to 2.1 cps; at frequencies greater than 2.1 cps a power law relation is not supported by the results. When spectrum densities were grouped with respect to deciles of wind speed and various wind shears they showed a tendency to be larger at the high deciles.

A preliminary study of a method for mathematical representation of observed gust functions suggests that the method can be applied to Jimsphere wind profiles that are closely spaced in time.

Steady state winds for 794 Cape Kennedy profiles that were complete between 4 and 15 km, computed by subtraction of the gust component from the total wind, were in good agreement with the annual wind speeds of the Atlantic Missile Range Reference Atmosphere for the 50 percent cumulative frequency but were significantly smaller for the 90, 95, 97.7 and 99 percent cumulative frequencies.

A study of the climatological means and standard deviations of the magnitude of the vector shear at altitudes between 8 and 15 km indicates that they can

be described by power law functions of layer thickness that are nearly alike for Cape Kennedy and Point Mugu but are significantly different from those derived from a few summer profiles by other workers.

A method for profile sampling is developed which provides profile sample sets that represent five critical characteristics of the parent population. A test of the method consisting of a comparison of the distributions of spectrum densities between 0.3 and 3.0 cps of five sample sets, each composed of 25 profiles, to the corresponding distributions of the entire population indicated that the spectrum distributions of any of the five sample sets offer a fair approximation to that of the whole 900 profile parent population.

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont.)

LIST OF FIGURES

LIST OF FIGURES (Cont.)

LIST OF TABLES

LIST OF TABLES (Cont.)

Section 1

INTRODUCTION

The characteristics of wind fluctuations that are important in space vehicle design and operation must be known with sufficient accuracy to assure a minimum risk of critical elastic and control mode responses. The development and use of roughened super-pressure (Jimsphere) balloons with minimal self induced notions that are tracked with advanced radar systems represents a significant advance towards increasing the accuracy of routine measurements of the horizontal vector wind as a fluctuation of altitude. The 1194 Jimsphere profiles taken over Cape Kennedy, Florida between Nov. 1964 and May 1967, were the subject of a detailed study by Adelfang, Ashburn, and Court (Ref. 1). Two aspects of that study which are further developed in this report are the analysis of gust profiles computed from Jimsphere wind profiles expressed as a function of Saturn vehicle time coordinates (Section 2) and the study of the magnitude of the vector wind shear over various layer thicknesses (Section 4); the later study includes a set of 83 Jimsphere profiles taken over Point Mugu, California. The principal aim of these studies has been to derive, from the entire set of available profiles, statistical characteristics that are useful for space vehicle design and operation. However, in addition, it is often desirable to have the capability of selecting a relatively small sample of profiles which represent the critical characteristics of the large parent sample; in Section 3, a set of critical and test characteristics are suggested and a methodology is described and tested for selecting profile sub-sets.

In Section 5 a preliminary study is presented of a method for representing gust functions observed in Jimsphere wind profiles. The theory and original application of the method by Dutton (Ref. 2) and its application to groups of Jimsphere profiles closely spaced in time are discussed.

Section 2

ANALYSIS OF GUSTS DERIVED FROM JIMSPHERE WIND PROFILES TRANSFORMED TO VEHICLE TIME COORDINATES

2.1 INTRODUCTION

Past analyses of Jimsphere profiles have resulted in the derivation of statistics which are valid for wind fluctuations described in altitude coordinates; for example Endlich et al, (Ref. 3) who studied three profile sequences, each composed of 4-6 profiles, found that there are no consistent or well-defined spectrum peaks that indicate natural separations between scales of motion and that the power spectrum density decreases with increasing frequency at a rate proportional to the -2.5 to -3 power. Although these and other similar results are interesting from a meteorological point of view they are not strictly applicable in describing the wind fluctuations that are seen by an accelerating space vehicle. For this study, 900 Cape Kennedy Jimsphere wind profiles were used as basic data for an analysis of wind fluctuations as viewed by a Saturn vehicle.

2.2 GUST PROFILE DEFINITION

The frequency response of space vehicles to wind fluctuations is a function of control and structural mode characteristics which are nearly uniform for a particular class of vehicles. These vehicle response characteristics are usually defined in terms of temporal frequency, f (cps), rather than spatial frequency, K (cycles per meter, cpm). As a vehicle ascends with vertical velocity, v (t), through the atmosphere, wind fluctuations at spatial frequency, K, are seen by the vehicle at frequency, f, given by

$$f = K\, v\,(t) \qquad (2.1)$$

Thus, for example, the fluctuations in the wind profile at $K = 2.74 \cdot 10^{-3}$ (cpm) as seen by a Saturn vehicle increase from f = 0.534 cps at 4 km (v = 195m/sec) to f = 1.00 cps at 12 km (v = 365m/sec). Since the first bending mode frequency of a Saturn 5 vehicle is approximately 1 cps the fluctuations at $K = 2.74 \cdot 10^{-3}$ (cpm) are more important at 12 km than at 4 km. It is obvious that innumerable spatial frequencies exist for a particular critical value of temporal vehicle response frequency. Therefore it is necessary to transform the spatial fluctuations of wind profiles to temporal fluctuations as seen by the vehicle.

The general procedure suggested by Adelfang, Ashburn, and Court (Ref. 1) for deriving gust profiles is used for this study of Jimsphere wind profiles. The principal steps in the derivation are the transformation of Jimsphere profiles to a vehicle time coordinate system, definition of the wind fluctuations of interest, and digital high pass filtering.

Jimsphere wind profiles were transformed to vehicle time coordinates by evaluating them at altitudes, Z, (km.) corresponding to the time, t (sec), from launch at intervals of time, Δt (sec), according to the least squares quadratic fit to the Saturn AS-504 trajectory given by Jacobs (Ref. 4).

$$Z = 2.98416 - 0.14889\, t + 0.00330\, t^2 \qquad (2.2)$$

Z calculated from Equation 2.1 deviates less than 1.7% from the AS-504 trajectory for the time interval from 50 to 95 seconds (Z = 3.855 to 18.530 km). The time interval Δt was chosen small enough to include all Jimsphere data up to 17.2 km. Assuming that a Jimsphere profile contains independent estimates of wind over 75m altitude intervals, the time interval, Δt (sec), between independent wind estimates as seen by a vehicle is $75/v(t)$; at 17.2 km, for Saturn AS-504, v(t) = 450 m/sec and thus $\Delta t = 1/6$ second.

The transformed wind profile is an approximation of the profile "seen" by the vehicle; the accuracy of the approximation for space vehicle studies is not yet known and may only be determined when the statistics of vehicle responses derived from simulated flights through Jimsphere wind profiles are compared to the same statistics derived from wind profile data obtained from sensors which traverse the atmosphere in space-time coordinates that are similar to those of space vehicles.

The fluctuations of interest which will be referred to as gusts are characterized by their influence on space vehicle control and structural excitation frequency modes. For a Saturn vehicle significant response to wind fluctuations occur at the control frequency (~0.2 cps) and at the first and second bending mode frequencies (~ 1,2 cps). Wind profiles which have fluctuations at frequencies $\geq$ 0.2 cps are defined as gust profiles. Gust profiles were calculated by application of a 33 weight digital high pass filter which has a transfer function of the form

$$H(f) = 1 - e^{-\left[f/f_s(.0255)\right]^2} \qquad (2.3)$$

where f = frequency (cps)

Since f_s, the data sampling frequency is 6 sec^{-1} Equation (2.3) reduces to

$$H(f) = 1 - e^{-(6.535\, f)^2} \qquad (2.4)$$

The 33 point weighting function (listed in Table 2.1) for the high pass filter was calculated by subtracting the weighting function of the low pass filter described by Alfriend (Ref. 5) from the weighting function of an all pass filter (an all pass filter has weights equal to zero except for the middle weight which is unity). The transfer function of the Alfriend low pass filter for f_s = 6 sec^{-1} is

$$H(f) = e^{-(6.535\, f)^2} \qquad (2.5)$$

The transfer functions of the high and low pass filters described by Equations 2.4 and 2.5 are illustrated in Figure 2.1.

TABLE 2.1

33 WEIGHT DIGITAL HIGH PASS FILTER
WITH TRANSFER FUNCTION GIVEN BY
EQUATION 2.4; $\Delta t = 1/6$ SEC.

TIME	NUMERICAL WEIGHTS
t	0.951844
$-\Delta t, + \Delta t$	-0.047848
$-Z\Delta t, + Z\Delta t$	-0.046936
•	-0.045453
•	-0.043457
•	-0.041013
•	-0.038222
•	-0.035162
•	-0.031935
•	-0.028634
•	-0.025346
•	-0.022151
$-n\Delta t, + n\Delta t$	-0.019110
•	-0.016288
•	-0.013689
•	-0.011364
$-16\Delta t, + 16\Delta t$	-0.009314

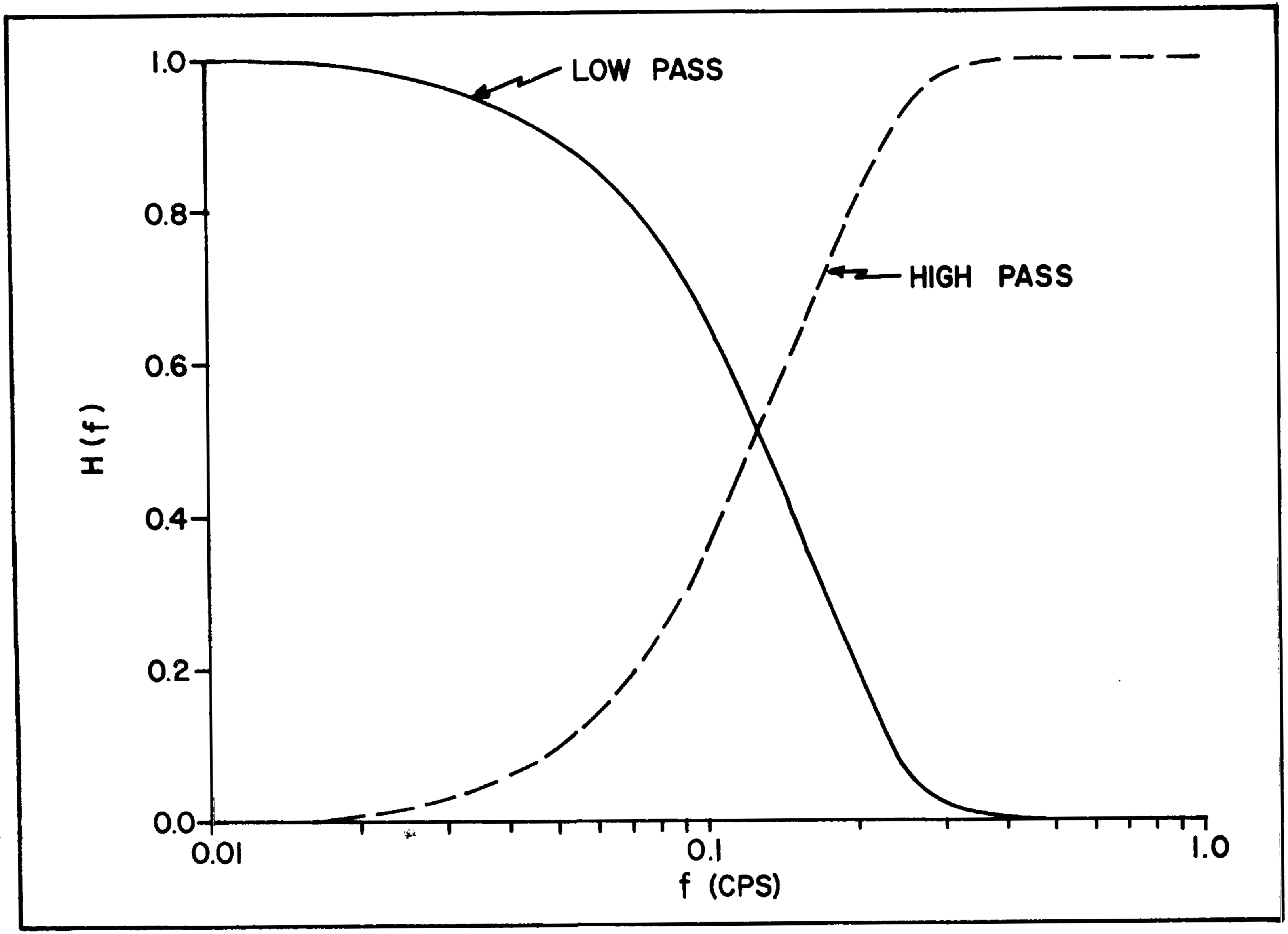

Figure 2.1 Transfer Function of Alfriend Exponential Low and High Pass Filters for a Sampling Frequency of 6/sec.

The relation between the low and high pass filtered profile and the total profile is illustrated in Figure 2.2 for Cape Kennedy Jimsphere profile # 477; the total profile transformed to Saturn AS-504 time coordinates is represented by the solid line; the low frequency or low pass filtered profile which has been termed the steady state wind profile with respect to the Saturn AS-504 in Reference 1 is illustrated by the dashed line; the gust or high pass filtered profile which is the total profile minus the low pass filtered profile is illustrated across the top of the figure.

2.3 STATISTICAL ANALYSIS

2.3.1 Introduction

The Cape Kennedy Jimsphere wind speed profiles, each decomposed into a low frequency steady state component and a high frequency gust component according to the method described in the previous section, were analyzed to determine the distribution of, gusts and steady state winds as a function of altitude, gust variance as a function of Saturn AS-504 flight time interval, and the power spectrum densities (PSD) of gusts. The distribution of PSD's of gusts were computed for 900 profiles that were complete between 1 and 14 km. The distribution of PSD's were also computed for sub-sets of 90 profiles associated with the deciles of maximum wind speed and maximum 100, 400, 1,000 and 3,000 m vector shears (for winds increasing with height) computed for each of the 900 profile parent population. Additional PSD calculations used to verify the technique for selecting representative profile sub-sets are presented in Section 3.

2.3.2 Distribution of Steady State Wind Speeds, Gusts, and Gust Variance

The percentile distributions of steady state wind speeds and gusts as a function of altitude are illustrated in Figures 2.3 and 2.4. The percentiles were computed for the 794 profiles which had steady state and gust data between 4 and 15 km. The percentiles are plotted at altitude intervals of

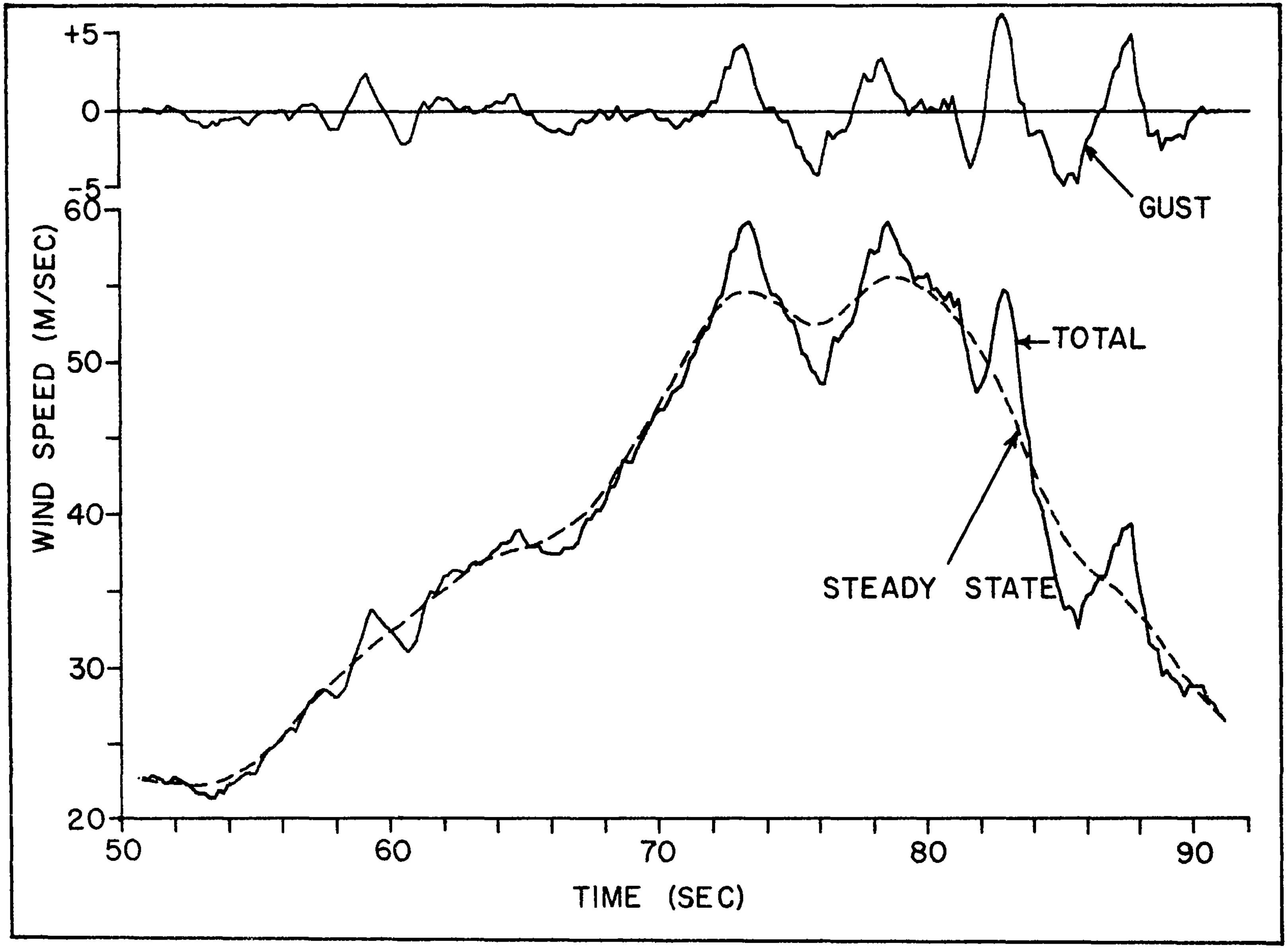

Figure 2.2 Jimsphere Wind Profile No. 477, Transformed to Saturn AS-504 Time Coordinates (Solid Line), Steady State (Dashed Line) and Gust as Labeled.

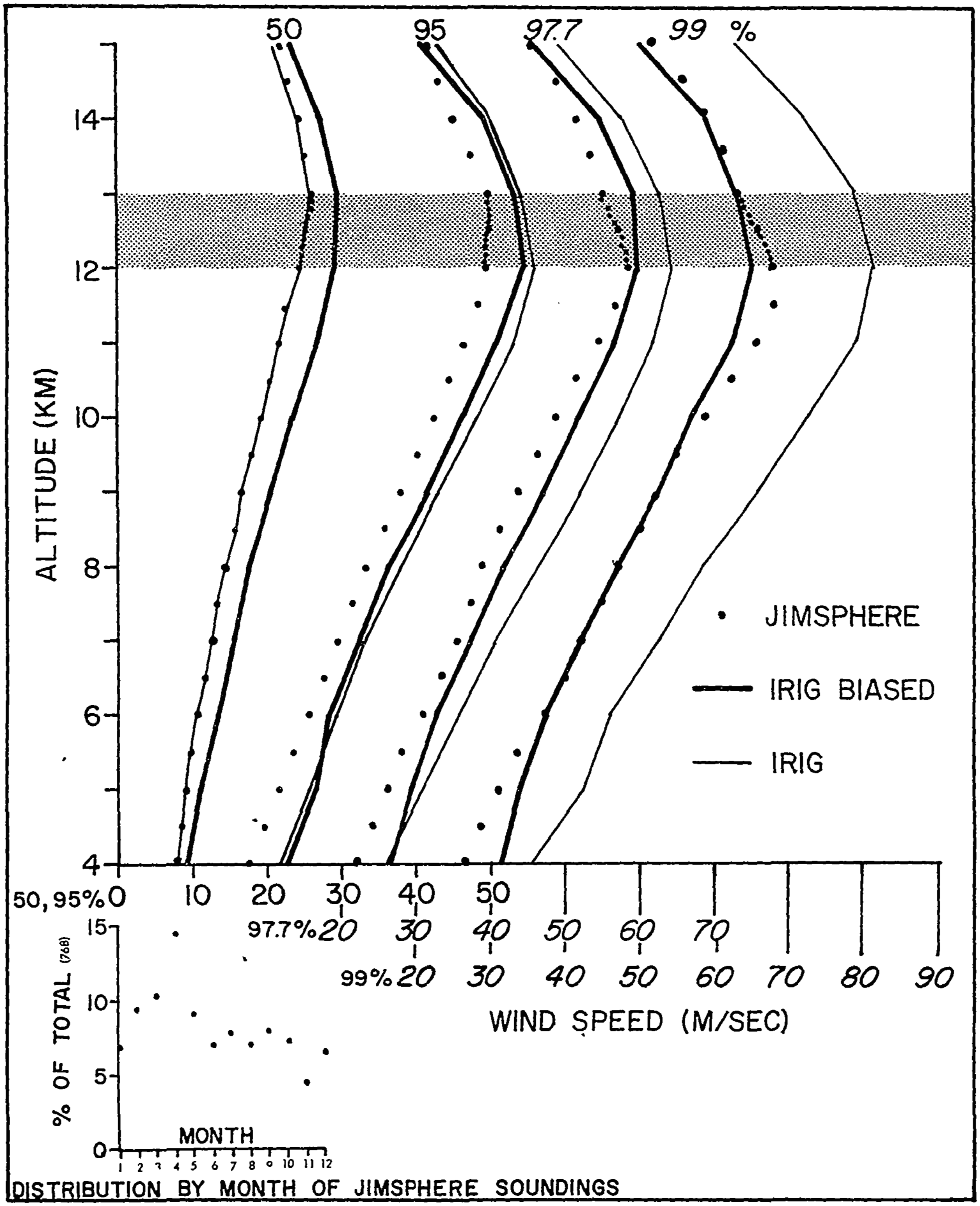

Figure 2.3 Distribution of Steady State Winds as a Function of Altitude Computed from 794 Cape Kennedy Jimsphere Profiles; at Lower Left Distribution by Month of the 794 Profiles Used; Also Illustrated are the Annual and Biased Annual IRIG Wind Speeds for Cape Kennedy (Ref. 5).

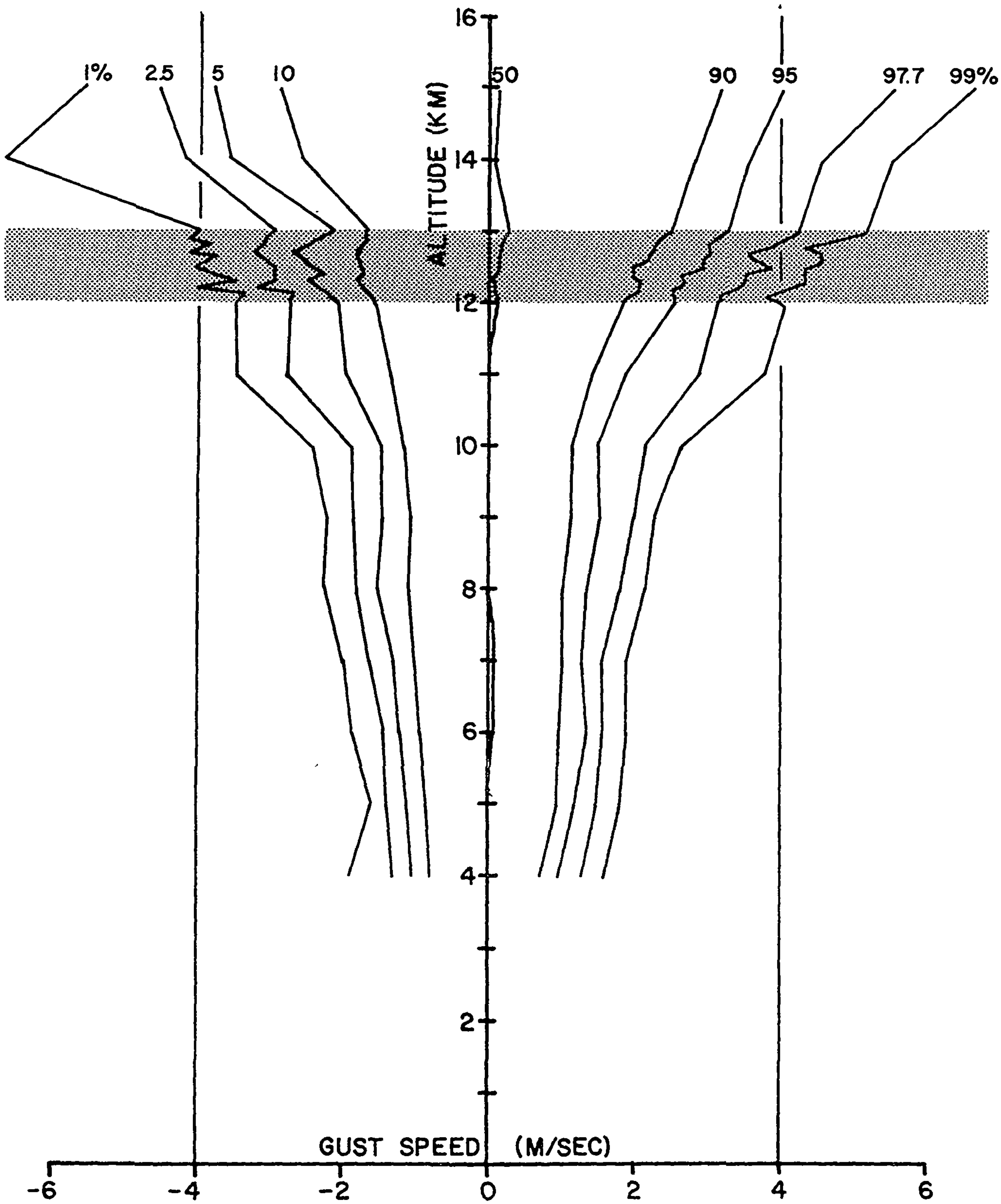

Figure 2.4 Distribution of Gusts as a Function of Altitude Computed from 794 Cape Kennedy Jimsphere Profiles; the Distribution by Month of the 794 Profiles is Illustrated in Figure 2.3

1 km between 4 and 15 km, and 100 m between 11 and 12 km. Also illustrated in Figure 2.3, for comparison, are the 50, 95, 99.7 and 99% annual scalar wind speeds of the IRIG reference atmosphere (Ref. 6) which were derived from 4,384 Rawinsonde profiles over Cape Kennedy. As illustrated the steady state winds derived from Jimsphere profiles increase with increasing altitude above 4 km attaining a maximum at an altitude of 12.9 km for 50%, 12.0 km for 95%, 12.1 km for 97.7% and $<$ 12 km for 99%. The 95, 97.7 and 99 percentile steady state winds computed from Jimsphere wind profiles are systematically smaller than the wind speeds of the IRIG standard atmosphere. As illustrated in Figure 2.3, the distribution of the 794 Jimsphere profiles by month is non-uniform with a large peak for April thus introducing a bias in the annual distribution. However, when biased annual IRIG wind speed percentiles, computed by taking an average of the monthly values weighted according to the number of Jimsphere soundings for a particular month, are compared to the Jimsphere distribution the same qualitative conclusions stated above for the comparison to the unbiased IRIG atmosphere are valid for the 95 and 97.7 percentiles; however at altitudes between 10 and 15 km the biased IRIG 99% wind speeds are as much as 5% less than the Jimsphere steady state winds. At the 50 percentile there is good agreement between Jimsphere and IRIG annual whereas the IRIG biased annual is substantially larger than the Jimsphere steady state winds. Thus by biasing the IRIG distribution the correspondance between IRIG and Jimsphere was generally improved at the extreme percentiles and degraded at the median.

As illustrated in Figure 2.4 the gust magnitudes at the extreme percentiles ($\geq$ 90%, $\leq$ 10%) generally increase with altitude; the variability of gust magnitudes for small scale variations of altitude is illustrated by the data given at 100 m intervals between 12 and 13 km. The maximum observed absolute gust speed (G_{max}, m/sec) as a function of altitude (km) is illustrated in Figure 2.5; the solid line in the figure is the least squares quadratic function fitted to the data

$$G_{max} = 2.90 - 0.30Z + 0.05Z^2 \qquad (2.6)$$

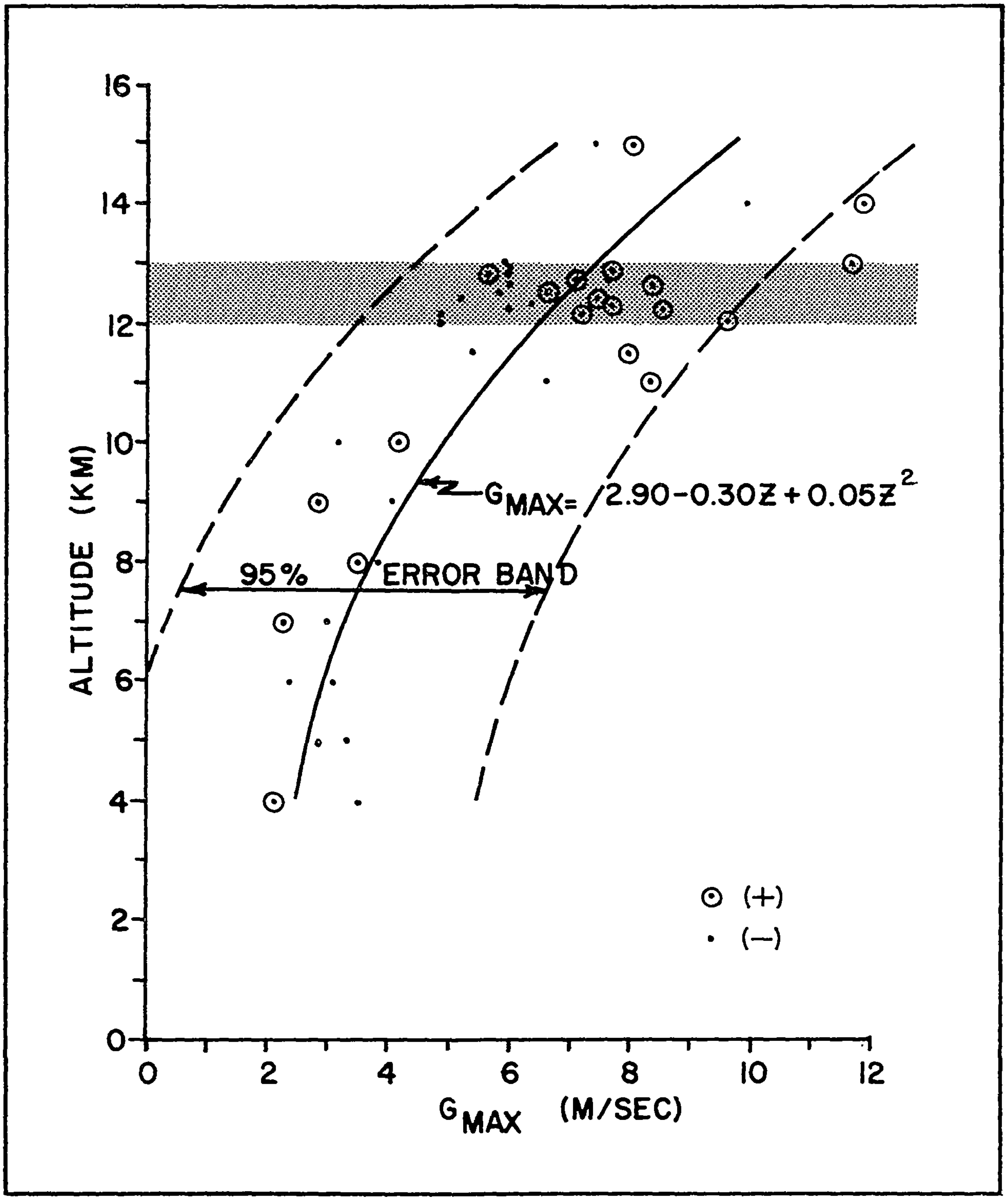

Figure 2.5 Maximum Observed Absolute Gust Speed as a Function of Altitude in 794 Cape Kennedy Jimsphere Profiles

Figure 2.6 illustrates the cumulative percentile distribution of gust variance (m^2/sec^2) for three Saturn vehicle flight time intervals of 60-70, 70-80 and 80-90 seconds; these time intervals correspond to Saturn altitude intervals of 5.93 to 8.73, 9.73 to 12.19, and 12.19 to 16.31 km respectively. The cumulative distribution is approximately log-normal as indicated by the straight lines fitted to the plotted points.

2.3.3 Power Spectrum Densities of Gusts

Power spectrum densities (PSD's) of 900 Jimsphere gust profiles defined in the time domain of a Saturn vehicle were computed according to the method described by Blackman and Tukey (Ref. 7). The 900 profiles were selected on the basis of completemess between 4 and 14 km. A Saturn vehicle in an AS-504 trajectory requires 36 seconds to traverse the 4 to 14 km altitude interval; thus a gust profile evaluated at 1/6 second intervals according to Equation 1 would contain 216 data points. PSD's, computed using 10 lags, are given at intervals of 0.3 cps from 0.3 to 3.0 cps. The cumulative percentile distribution of the PSD's $\left[(M/sec)^2/cycle/sec)\right]$ at each frequency is given in Table 2.2.

In Figure 2.7 the PSD's at the median and the 95 and 99 percentiles are compared with recent updated MSFC design criteria spectra (Ref. 8) derived in the altitude domain from a similar set of Cape Kennedy Jimsphere wind profiles. The direct comparison is valid only if the MSFC PSD's, Φ (K) $\left[(M/sec)^2/(cycle/4{,}000\ m)\right]$, originally expressed as a function of spatial frequency, K (cycles/4,000 m) can be transformed to PSD's in the time domain of vehicle flight, Φ (f) $\left[(M/sec)^2/(cycle/sec)\right]$ according to the simple relation, implied by Ryan et al, (Ref. 9),

$$\Phi(f) = \frac{4 \times 10^3\ \Phi(K)}{v} \qquad (2.7)$$

where v is a vehicle vertical velocity arbitrarily chosen at the altitude

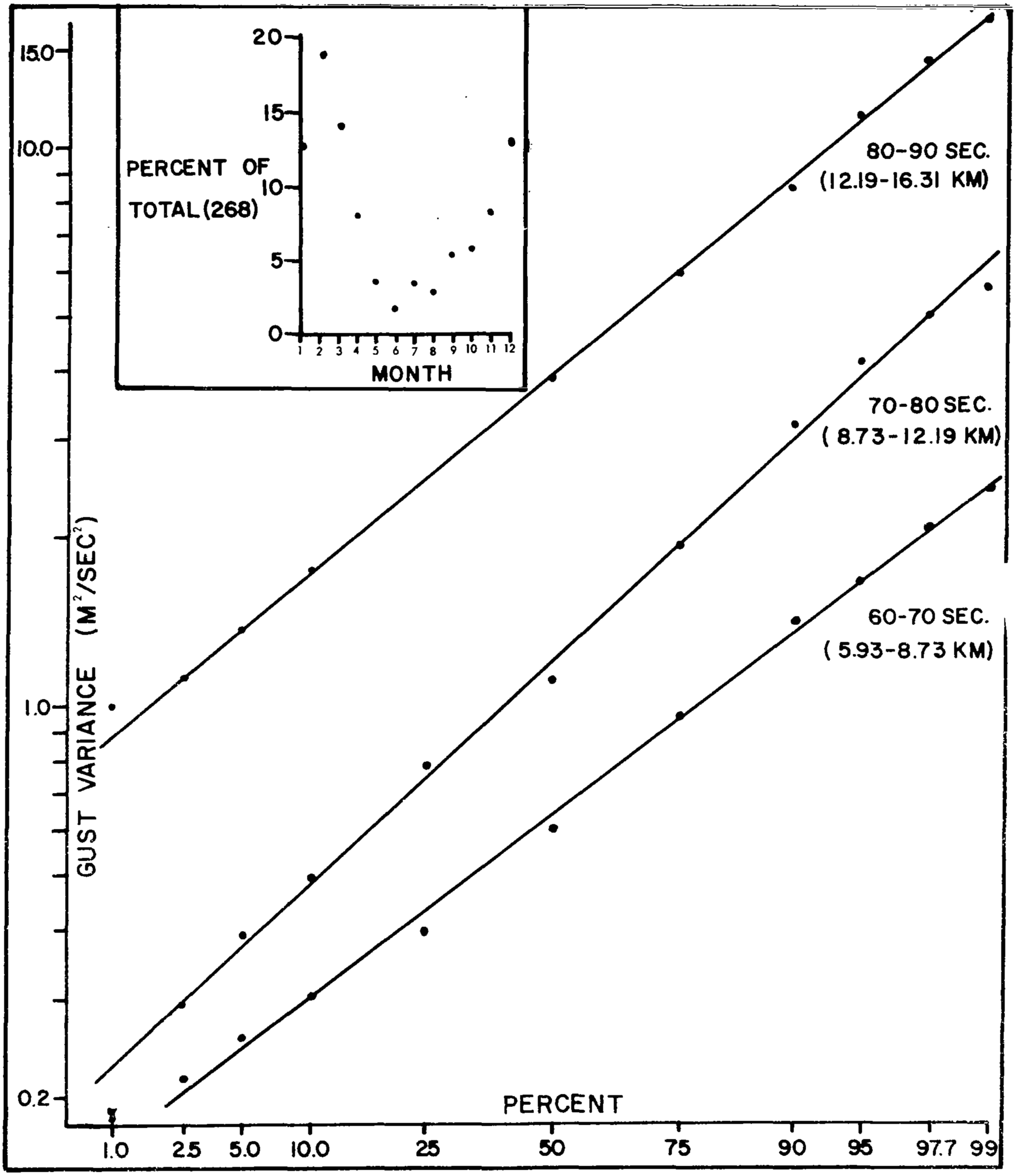

Figure 2.6 Cumulative Distribution of Gust Variance Computed for 268 Jimsphere Profiles for Three 10 Second Intervals of Saturn AS-504 Flight Time; at Upper Left is Distribution by Month of 268 Profiles Used

FREQUENCY (CPS)	PSD [(M/SEC)^2/(CYCLE/FT)] CUMULATIVE FREQUENCY (%) MIN.	1.0	2.3	5.0	10.0	25.0	50.0	75.0	90.0	95.0	97.7	99.0	MAX.
0.3	0.3728	0.5535	0.6612	0.7731	0.9057	1.3092	1.9327	2.6919	3.5582	4.4052	5.2680	5.7102	7.9160
0.6	0.1365	0.1583	0.1975	0.2317	0.2780	0.3672	0.5123	0.6993	0.8798	1.0055	1.1828	1.3697	1.7266
0.9	0.0490	0.0525	0.0692	0.0813	0.0941	0.1199	0.1613	0.2164	0.2650	0.2983	0.3358	0.3650	0.6652
1.2	0.0202	0.0243	0.0303	0.0351	0.0402	0.0526	0.0690	0.0896	0.1172	0.1345	0.1537	0.1760	0.3916
1.5	0.0107	0.0150	0.0166	0.0185	0.0212	0.0285	0.0374	0.0510	0.0681	0.0868	0.1022	0.1374	0.1941
1.8	0.0063	0.0079	0.0097	0.0103	0.0127	0.0175	0.0237	0.0332	0.0497	0.0658	0.0837	0.1066	0.1583
2.1	0.0037	0.0052	0.0059	0.0070	0.0085	0.0114	0.0161	0.0241	0.0381	0.0554	0.0718	0.1024	0.1453
2.4	0.0021	0.0037	0.0043	0.0052	0.0061	0.0082	0.0120	0.0185	0.0309	0.0453	0.0676	0.0959	0.1621
2.7	0.0014	0.0029	0.0035	0.0040	0.0048	0.0066	0.0098	0.0157	0.0269	0.0412	0.0619	0.0896	0.1703
3.0	0.0013	0.0023	0.0026	0.0032	0.0041	0.0062	0.0093	0.0144	0.0267	0.0384	0.0578	0.0904	0.1555

Table 2.2 Cumulative Distribution of Power Spectrum Densities of 900 Jimsphere Profiles

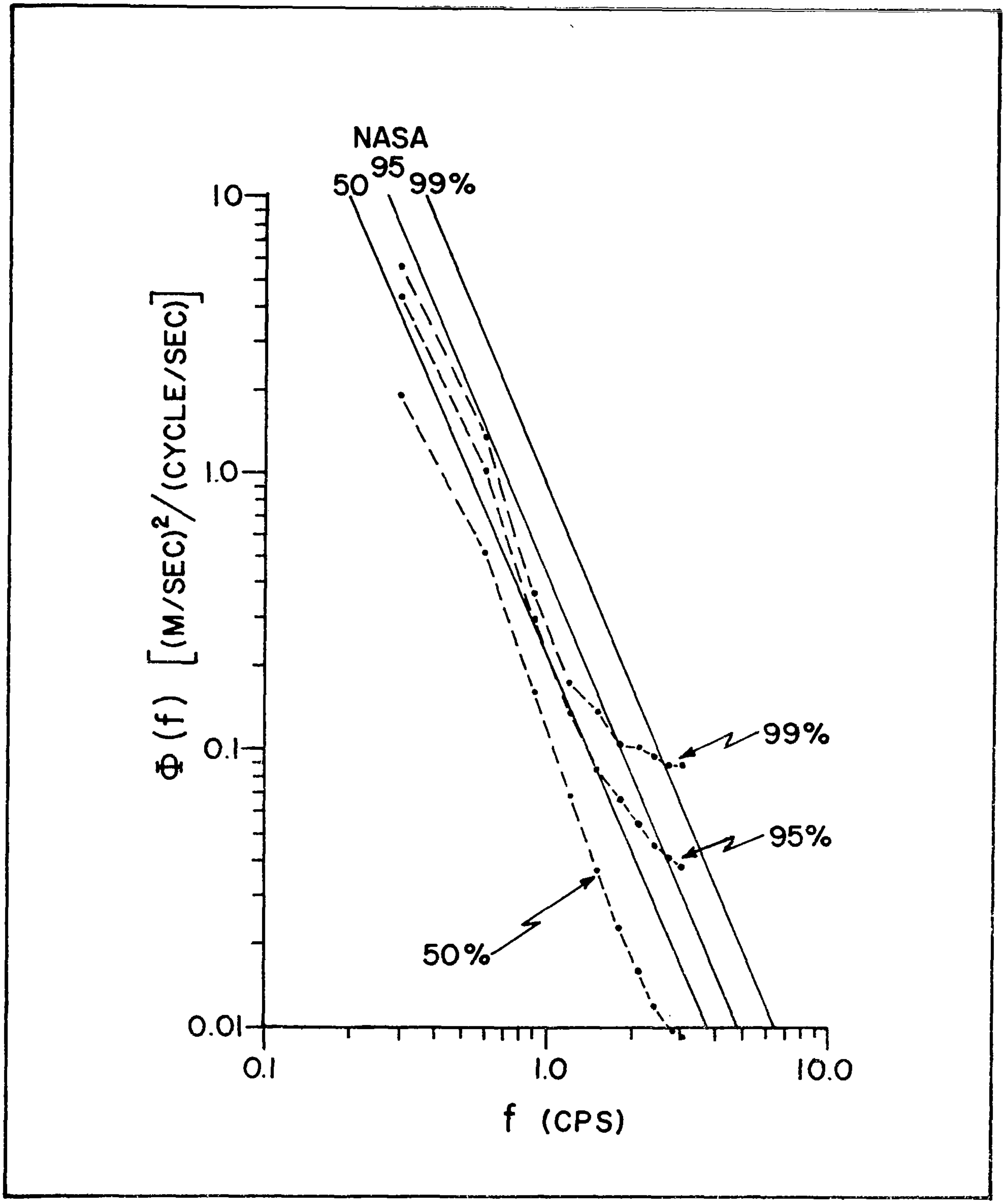

Figure 2.7 Median and 95 and 99% Upper Bounds of Power Spectrum Densities of 900 Jimsphere Wind Speed Gust Profiles from 4 to 14 km Over Cape Kennedy Computed in the Vehicle Time Domain (dots) and MSFC Design Spectra Bounds Computed in Altitude Domain and Transformed to Vehicle Time Domain (lines)

of maximum dynamic pressure, 12 km; for a Saturn vehicle v is 350 m/sec at 12 km and thus,

$$\Phi\ (f) = 11.4\ \Phi\ (K) \qquad (2.8)$$

similarly f (cps) is a function of K,

$$f = \frac{Kv}{4.10^3} = 0.0875\ K \qquad (2.9)$$

As illustrated in Figure 2.7 the PSD's at the 50 percent level for the MSFC design spectra are larger by a factor of 1.5 to 2 at all frequencies when compared to the PSD's computed from vehicle time domain profiles; similarly at the 95 and 99 percent level for $f \leq 1.5$ cps the MSFC design spectra are larger by factors of 1.4 to 1.7 and 2.2 to 2.7 respectively; for $f > 1.5$ cps the PSD's at the 95 and 99 percent level for the vehicle time domain profiles decrease at a slower rate with increasing f and thus each are larger than the MSFC PSD's for $f > 2.5$ cps. These comparisons illustrate an apparent difference between spectra of profiles expressed in vehicle time coordinates and spectra of profiles in altitude coordinates; however the transformation of the spectra from one coordinate system to the other implied by Equations 2.8 and 2.9 is strictly valid only when v is not a function of altitude; when v is a function of altitude comparison of the spectra is not possible because a simple transformation does not exist. Therefore the data given in Table 2.2 represent the best estimates, based on Jimsphere profiles, of the distribution of PSD at various frequencies as viewed by a Saturn vehicle; other estimates based on transformation of altitude domain spectra to the vehicle time domain [Equations 2.8 and 2.9] are not strictly comparable.

To study the relation of the distribution of PSD to the distribution of maximum wind speeds and maximum vector shears of 900 Jimsphere profiles, PSD's were computed from 50 sets of 90 profiles that are associated with the deciles (90 profiles per decile for a set 900 data values) of maximum wind speed and maximum 100, 400, 1,000, and 3,000 m. vector shear for wind speeds increasing with altitude (as indicated by (+) sign). The 50, 95, and 99% PSD at 0.3, 0.6, 1.2, and 2.4 cps, plotted as a function of decile for maximum wind speed and vector shears, are illustrated in the upper half of Figure 2.8. The tendency for the PSD to be larger at higher deciles of wind speed and shear is illustrated quantitatively in the lower half of Figure 8 in which the ratio of PSD at decile N (N = 1, 2 . . . 10) to PSD at decile 1 [PSD (N)/ PSD (1)] is plotted as a function of decile N.

The decile limits used in this analysis are given in Table 3.2 (Page 28)

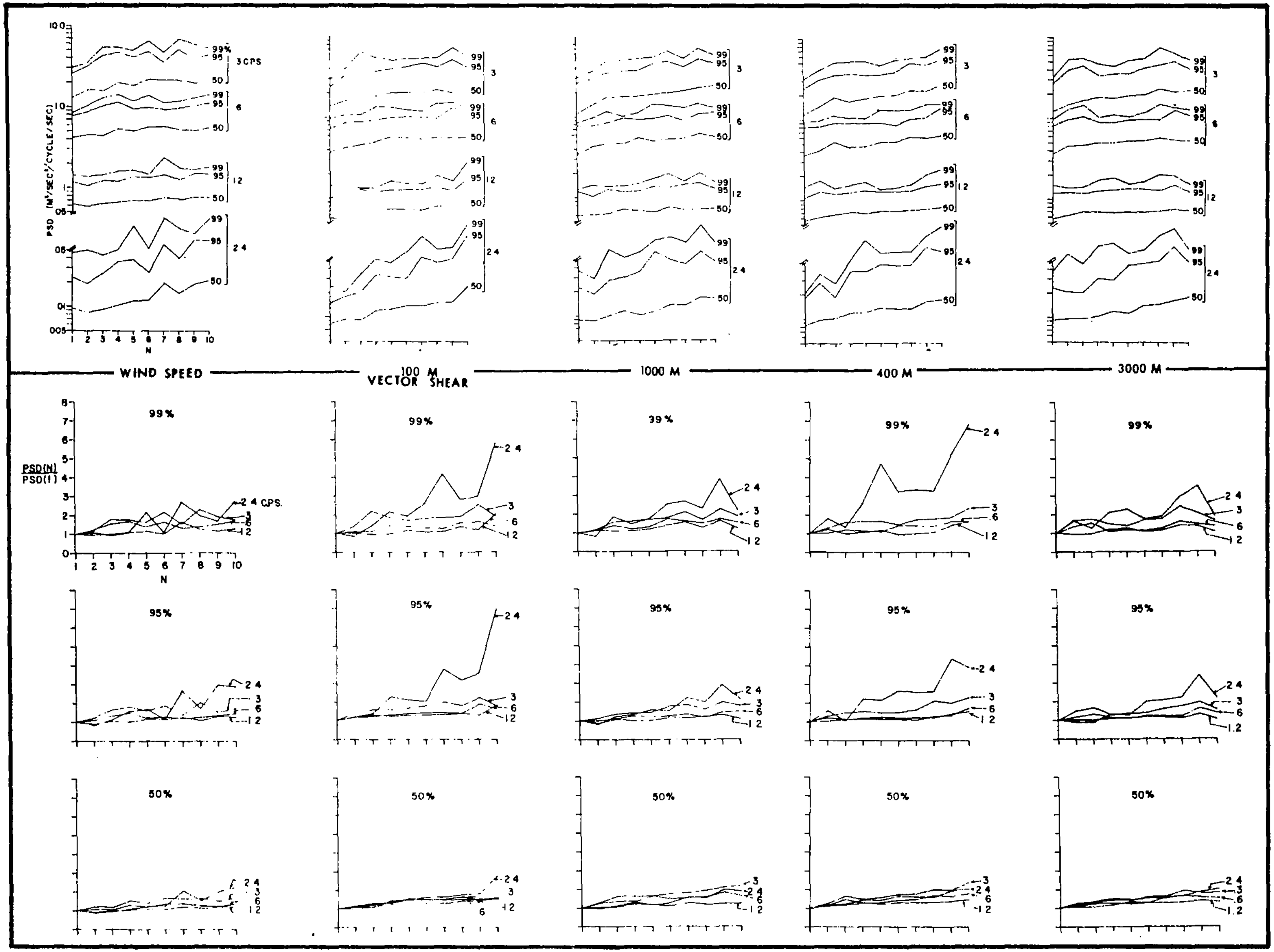

Figure 2.8 Upper Half: Median 95 and 99% Upper Bounds of PSD of Jimsphere Wind Speed Gust Profiles Associated with Deciles (90 Profiles per Decile) of Maximum Wind Speed and Maximum 100, 400, 1,000, and 3,000m Vector Shears; Lower Half: Ratio of Median, 95 and 99% Upper Bounds of PSD at Decile N (N = 1, 2 . . . 10) to PSD at Decile 1.

Section 3

WIND PROFILE SAMPLING

3.1 PROFILES

Wind profiles represent the variations with height of the horizontal motions of the atmosphere. In principle, a wind profile is a vector function of height, representing the variation of both the speed and the direction of the air movement, or wind. In practice, however, the variation of wind in the vertical usually is represented by two separate profiles, either for speed and direction or for the magnitudes of two orthogonal wind components. In this report, a method is offered for obtaining a representative sample of profiles from a collection of several hundred (or more) profiles, using order statistics.

Although profiles over a fixed point vary continuously in time, they are obtained routinely only every 6 or 12 hours at major weather stations; occasionally, research or operational requirements provide several consecutive wind observations, from which profiles can be obtained, at hourly intervals, or even more frequently. Horizontal air motion varies continuously with height, but instrumental and computational problems preclude obtaining wind information at intervals of less than 50 meters, usually much more. Routine upper wind information is available only at 1 km intervals, every 12 hours. Even so, in ten years more than 7,300 wind profiles accumulate for each station. For the entire United States during the 1960s, more than 1.5 million profiles were obtained, from the surface to heights of 30 km or more.

Wind profiles must be used in the formulation and testing of designs for vehicles intended to ascend or descend rapidly through the atmosphere, traversing layers in which the air motion may come from widely differing directions at highly variable speeds. But no engineer can hope to use all 1.5 million profiles in developing a new vehicle, or even the thousands available for the specific site from which the vehicle will be launched.

Some method of averaging or otherwise characterizing the profiles must be used.

Straight averages of wind speed and direction, level by level, are available, but are of little use to engineers. Their vehicles are most susceptible to the extremes, not the means, and in particular to the changes of wind with height. The difference between winds at two levels in the vertical shear of the horizontal wind. The difference between speeds of the wind at two levels, regardless of directions, is the scalar shear; the difference between the two wind vectors (involving both speed and direction) is the vector shear, which has both direction and magnitude.

Scalar shear may be positive (speed increasing with height) or negative, but the magnitude of vector shear is always positive. However, strong winds do not change much in direction with height, so very large vector shear magnitudes are virtually equivalent to the absolute values of the corresponding scalar shears. To distinguish between vector shears according to whether the wind speed increases or decreases with height, the vector shears, in this report, are given the sign of the corresponding scalar shears.

3.2 CRITERIA

Wind profiles, available in profusion, must be summarized in some way for the design and testing of aerospace vehicles. Such summaries may be either in the form of statistics representing the entire collection of available profiles, or may be in the form of a few profiles, either actual or synthetic, selected so as to be typical, in some way, or the entire collection.

Many statistical summaries, to varying degrees of sophistication, have been prepared of available wind data. Typically, they are based on winds represented, for each level, by two orthogonal components, the zonal (west-to-east) and meridional (south-to-north). The summaries offer the means and standard deviations of each component at each level, usually 1 km apart, and matrices of correlation coefficients, both within-component and cross-component.

Within-component correlations are between like components at different levels, so that for a set of n profiles, each offering data at k levels, two sets of correlations are computed, one for each component, for a total of $k^2 - k$ coefficients. Cross-component correlations are between the zonal component at one level and the meridional component at that level as well as each of the other levels, and vice-versa; including the correlations at each of the k levels gives a total of k^2 cross-component correlations. Thus a complete statistical summary (without considering possible serial correlation from one profile to the next) includes 2 k means, 2 k standard deviations, $k^2 - k$ within-component correlations, and k^2 cross-component correlations, or a total of $3k + 2k^2$ numbers. When winds are available from the surface up to 20 km, k = 21 and the complete statistical summary has 945 numbers.

A few wind profiles have been synthesized from statistical summaries, starting with an extreme wind speed at a level of maximum effect on a vehicle, and using correlations to determine the corresponding winds at other levels. The extreme wind usually is the mean wind speed plus two standard deviations, a value that would have been exceeded in less than 5% of the observations, if the wind speed were normally distributed. Even if such an assumption of normality were justified, the probability of the complete statistical profile cannot be established because of inter-dependence of the correlations.

The first profiles for design of missiles and space vehicles were less sophisticated. Essentially they were the observed profiles which included the strongest winds at the level of maximum effect. Variations on this approach included selection of not only the profiles containing the strongest winds but also those with the greatest wind shears above and below such winds.

Another approach was to calculate the actual effect induced upon a typical space vehicle by each of a great many profiles, and then selecting those profiles which produced the strongest effects. This sample was then presumed to be equally useful for other vehicles having responses to wind not greatly different from those of the typical vehicle.

The considerations inherent in these procedures have been used in the present study in a different way. From a large number of profiles, a sample is selected which has the same characteristics with respect to maximum wind speed and to wind shears over certain thicknesses.

3.3 PROFILE CODING

A wind profile represents wind speeds and directions (or strengths of two components) at many heights. From these values, wind shears for many thicknesses can be computed. While all of these quantities may be of some interest, only a few can be considered critical. After these critical characteristics are identified, from aerodynamic or other considerations, each profile can be classified according to them.

The critical characteristics, designated as c_1, c_2, . . ., c_j, may be, for example, the strongest wind at any level between 5 and 15 km, the greatest positive (speed increasing with height) vector wind shear over a 1 km layer within the same interval, the strongest negative 100 m shear, etc. Once these characteristics have been selected, values of each characteristic for the entire collection of profiles are assembled, and placed in rank order.

Thus, all the soundings are placed in sequence according to the magnitude of c_1, without regard to date or to any other characteristics. This ordering is then divided into equal numbers of soundings; for the present development, this number is taken as 10, but can be any other convenient number, such as 5 or 8 or 20. Then each profile is given an identifier according to the decile in which its value of c_1 falls. The 10 percent of all the profiles in which c_1 is smallest receive a code number of 1, the next 10 percent are coded 2, and so up to the 10 percent with the largest values of c_1, which are coded as 10.

The same process is repeated for each of the other characteristics, so that each profile eventually has a sequence of code numbers, one for each characteristic. The numbers indicate in which decile the profile falls with respect to each critical characteristic, and permit the profiles to be sorted and classified in various ways, including selection of representative samples.

From the large collection of profiles, a sample may be drawn so that each decile of each characteristic is represented by at least m profiles. This criterion can be shown simply by an array, or matrix, in which the rows represent the characteristics and the columns the deciles (Table 3.1).

TABLE 3.1

SCHEMATIC OF DECILE CODING SCHEME

	Deciles									
	1	2	3	4	5	6	7	8	9	10
c_1	.	.	.	1	.	.	.	.	.	.
c_2	.	.	.	.	1	.	.	.	.	.
--										
c_j	.	1	.	.	.	.	.	.	.	.

In Table 3.1, a single profile with code 4 5 . . . 2 is indicated. As soundings are added to the sample, the number of profiles falling into each cell is tallied, and profiles are accepted until all cells have at least m entries.

Alternatively, an upper limit may be placed on the number of entries per cell. Profiles are added to the sample, one at a time, unless such addition would cause some cell to have more than the desired number, m. Such a profile is rejected, and the next one examined, with the process continuing until all cells have m entries - - or the entire collection is exhausted, with some cells still having less than m entries.

3.4 APPLICATION

To test this procedure for obtaining representative samples of wind profiles, five critical characteristics were established and a collection of 900 Jimsphere wind profiles were classified and sorted. These profiles represent winds observed at 50-meter intervals from the surface to 14 km over Cape Kennedy, Fla.; they were selected from a set of 1194 profiles obtained from 28 Nov. 1964 through 11 May 1967 by discarding all profiles with any missing data at any level from 1 to 14 km. The complete 1194-profile set was examined in detail by Adelfang, Ashburn, and Court (Ref. 1). More intensive study showed that 16 listed profiles actually had no data, and 11 were exact duplicates of previous profiles.

The five critical characteristics, restricted to the range from 4 to 14 km, were:

c_1 : maximum wind speed at any level in the profile;

c_2 : maximum "positive" vector shear over any 100-meter interval;

c_3 : maximum "negative" vector shear over any 100-meter interval;

c_4 : maximum "positive" vector shear over any 1 km interval;

c_5 : maximum "negative" vector shear over any 1 km interval.

Thus, the lowest 100-meter shear considered was from 3900 to 4000 meters, while the lowest 1 km shear was from 3000 to 4000 meters. In several cases this definition caused the discarding of strong 100-meter shears below 4000 meters, while 1 km shears including this 100-meter shear were accepted.

Nevertheless these five characteristics were assumed to represent the major aspects of wind profiles of importance in space vehicle design. The sampling methodology would work equally well for other characteristics.

To test the representativeness of samples based on these five characteristics, four other vector shears were identified and coded by deciles for each profile; also only for shears for which the upper boundary was between 4 and 14 km:

c_6 : maximum "positive" vector shear over any 400-meter interval;

c_7 : maximum "negative" vector shear over any 400-meter interval;

c_8 : maximum "positive" vector shear over any 3 km interval;

c_9 : maximum "negative" vector shear over any 3 km interval.

These nine characteristics and their altitude of occurrence were identified in each of the 900 Jimsphere wind profiles, as shown in Appendix I. Each set of characteristics was then placed in rank order, and grouped into deciles. Limits of the deciles for each of the nine characteristics, for the 900 profiles, are given in Table 3.2 and graphed in Figure 3.1; various cumulative percentiles of the altitude of occurrence are also graphed in Figure 3.1. The only characteristic to have a lower limit of zero was the 3 km negative shear; actually, 41 profiles had no negative 3 km shears, indicating that these profiles, if smoothed by 3 km moving averages, would show winds continually increasing with height.

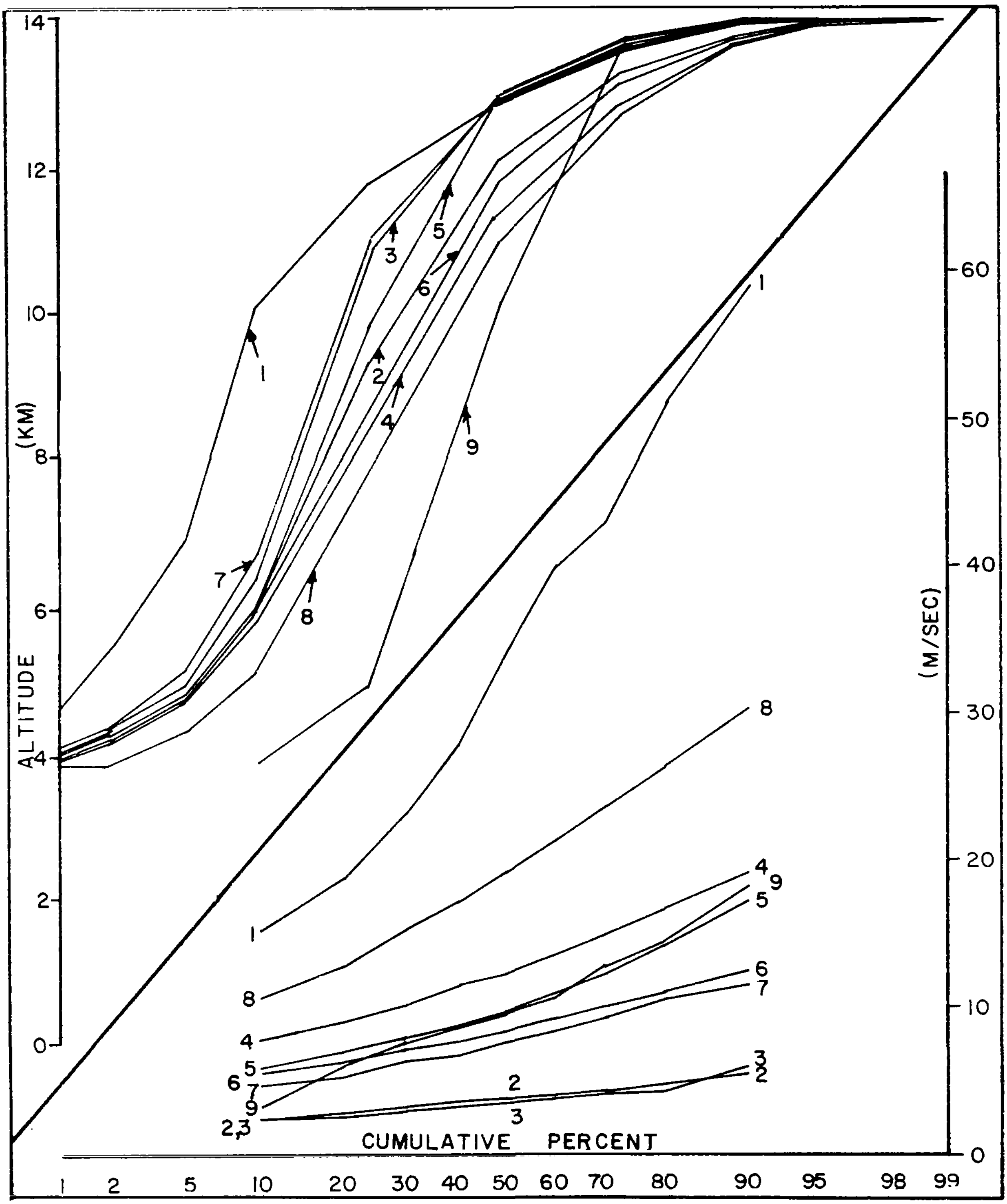

Figure 3.1 Cumulative Decile Limits and Percentiles of Corresponding Altitudes for 5 Selection Characteristics (1-5) and 4 Test Characteristics (6-9).

TABLE 3.2

LIMITS OF DECILES FOR EACH OF 9 CHARACTERISTICS OF 900 JIMSPHERE PROFILES. UNITS ARE METERS PER SECOND.

DECILE: 1 2 3 4 5 6 7 8 9 X

LIMITS:		MIN	10	20	30	40	50	60	70	80	90	MAX
MAX WIND SPEED		5.3	15.1	18.8	23.3	27.5	33.8	39.5	45.3	50.7	59.2	81.7
100m SHEAR	POS	1.7	2.6	3.0	3.3	3.6	3.9	4.1	4.5	4.9	5.6	14.2
	NEG	1.6	2.5	2.8	3.1	3.4	3.7	4.0	4.4	3.9	5.7	19.1
1 km SHEAR	POS	3.7	7.8	9.1	10.2	11.5	12.3	13.5	15.0	17.0	19.5	48.0
	NEG	2.3	6.0	7.1	8.0	8.9	9.9	11.0	12.3	14.2	17.4	33.5
400m SHEAR	POS	2.8	5.6	6.5	7.2	7.8	8.4	9.3	10.1	11.1	12.6	24.1
	NEG	3.1	4.8	5.5	6.4	6.9	7.7	8.5	9.5	10.7	12.7	20.0
3 km SHEAR	POS	2.7	10.6	12.8	15.4	17.2	19.1	21.2	23.6	26.4	30.3	97.0
	NEG	0.0	3.3	6.1	7.5	8.7	9.9	10.9	12.6	14.7	18.4	38.3

When all nine characteristics are used to typify a profile, 4 pairs of the 900 profiles were identical. Their codings (in codes, the tenth decile is indicated as X) were:

1 11 11 11 13 at 0100Z on 26 Jul 66 and at 1503Z on 9 Aug 66;
1 11 12 11 13 at 0432Z on 11 Aug 65 and at 0100Z on 20 Aug 65;
3 11 11 11 13 at 0906Z on 16 Sep 66 and at 0100Z on 21 Sep 66;
X 7X XX XX XX at 1300Z on 20 Jan 65 and at 0215Z on 24 Feb 66.

These four were among 34 sets of two or more profiles which were coded identically with respect to the five primary characteristics: 1 quintuplet, 3 quadruplets, 3 triplets, and 27 doublets (Table 3.3)

TABLE 3.3

REPEATED CODINGS AMONG 900 JIMSPHERE PROFILES, WITH TIME AND DATE OF SOUNDINGS. (IN CODE, X = 10)

*11111	1300Z	7Jul65	0100Z	6Aug65	0100Z	26Jul66	1503Z	9Aug66		
*11112	1300Z	14Jul65	0432Z	11Aug65	0100Z	20Aug65	0100Z	60ct66		
11113	0932Z	11Aug65	1300Z	20Sep65						
11121	1300Z	9Sep65	0159Z	13Jul65	1300Z	8Jul66				
11211	0101Z	18Aug65	1533Z	9Aug66						
11212	0102Z	28Aug65	0100Z	20Sep65						
12111	1300Z	3Aug65	1445Z	11Aug65						
12314	1300Z	16Jul65	1400Z	6Sep66						
21111	1901Z	2Jul65	0100Z	19Aug65	0806Z	16Sep66				
21112	1847Z	2Jul65	1746Z	15Sep66						
21124	0100Z	25Jun66	0100Z	1Dec66						
21213	0330Z	25Aug66	1004Z	12Sep66						
*31111	0906Z	16Sep66	0100Z	21Sep66						
31121	0100Z	29May65	0100Z	16Aug65						
33214	2030Z	14Sep65	0100Z	10Dec65						
37335	2135Z	18Apr67	2240Z	18Apr67						
45153	2300Z	190ct65	1445Z	15Mar67						
46448	1417Z	28Sep65	0125Z	24May66						
48472	2330Z	22May65	1300Z	21Apr67						
4XX68	0440Z	30May66	0500Z	4Jul66						
69874	1732Z	17Feb67	1732Z	17Feb67						
7XX77	1302Z	24Mar66	2101Z	3Feb67						
886XX	0100Z	3Mar66	1302Z	1Mar67						
9XX99	1228Z	5Apr66	1728Z	5Apr66						
9XXXX	0101Z	20Jan65	1300Z	6Jan66						
X6788	1607Z	5Apr66	0835Z	8Apr66						
X797X	2230Z	27Jan65	1715Z	25Feb66						
*X7XXX	1300Z	20Jan65	0215Z	24Feb66						
X8X99	1549Z	28Mar66	0100Z	10Feb67						
X8X9X	1300Z	19Jan66	1306Z	29Nov66						
X8XXX	1813Z	28Mar66	1800Z	7Apr66						
X99XX	0715Z	26Feb66	0945Z	26Feb66	1653Z	28Mar66	1134Z	29Mar66	1300Z	7Apr66
XXX9X	1001Z	10Mar65	0100Z	2Feb66						
XXXXX	0100Z	9Mar65	0151Z	10Mar65	1318Z	27Jan66				

*Identical for all nine characteristics on two of dates listed.

3.5 RELATIONS

Several interesting relations among the 900 profiles were revealed when they were coded by 9-digit numbers, according to the decile of each of 9 characteristics.

The four test characteristics, maximum 400-meter and 3 km positive and negative shears, had been originally selected because of presumed independence from the selection characteristics, maximum wind speed and maximum 100-meter and 1 km positive and negative shears. However, three of the four test characteristics were found to be strongly related to the selection characteristics. The fourth, the maximum 3 km negative shear, had very little relation to any of the other eight characteristics.

These relations were found from bivariate listings of all the 900 profiles by the deciles in which they fell according to pairs of characteristics. The 36 possible two-way comparison tables are given in Appendix II. For quick computation, each table was partitioned into four quarters, and the number of entries in one quarter was counted. Because each line and each column in a table represents a decile, it contains 90 entries, and the sum of two quarters, horizontally or vertically, is 450. Thus the total in each quarter differs from $900/4 = 225$ by the same amount, and only one quarter need be counted. These differences are given in the upper right part of Table 3.4.

The net difference between any quarter's total and 225 is an index of the correlation between the two characteristics of the table. Divided by 225, this number is analogous to a coefficient of medial correlation, because the division into quarters effectively classified the characteristics by their medians. The coefficient of medial correlation, q, from a sample of n independent pairs, has a sampling variance of approximately $(1 - q^2) / n$, so that for $n = 900$ any value of q greater than 0.06 differs from zero at the 95% confidence level.

TABLE 3.4

MEDIAL COMPARISONS BETWEEN PAIRS OF CHARACTERISTICS

MAXIMUM:		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
WIND SPEED	(1)	-	73	93	107	77	85	73	143	22
100m SHEAR POS	(2)	.35	-	89	88	53	114	66	73	29
100m SHEAR NEG	(3)	.41	.40	-	80	102	89	134	80	37
1 km SHEAR POS	(4)	.48	.39	.36	-	83	134	30	136	37
1 km SHEAR NEG	(5)	.34	.24	.45	.37	-	74	124	88	66
400m SHEAR POS	(6)	.38	.51	.40	.60	.33	-	38	97	41
400m SHEAR NEG	(7)	.32	.29	.60	.36	.55	.39	-	79	53
3 km SHEAR POS	(8)	.64	.32	.36	.60	.39	.43	.35	-	52
3 km SHEAR NEG	(9)	.10	.13	.16	.16	.29	.18	.24	.23	-

Values of the medial correlation are given in the lower left of Table 3.4. All correlations are positive and significantly greater than 0. Lines separate the first five selection characteristics from the last four test characteristics. The largest correlations appear between the two groups, especially between the positive 100m and 400m maximum shears, the 100m and 400m negative shears, and maximum wind speed and positive 3 km shear. The highest correlation within the selection group is .48, within the test group .43, but 6 of the 20 inter-group correlations are larger than .50. Least correlation is shown by the 3 km negative shear, for which the maximum correlation, .29, is with 1 km negative shear.

3.6 SAMPLING

The 900 profiles were sampled, to fill up the matrix of five characteristics vs. deciles (Table 3.1), in three different ways: in direct chronological order, in reverse chronological order, and after complete randomization; in the following discussion, these are termed Direct, Reverse, and Random. Five different randomizations were used, so that 7 samples were drawn. These sampling orders were used repeatedly, for lower and upper limits of 1, 2, 3, 4, and 5 entries per cell.

The number, n, of profiles in samples with at most m entries per cell, and in samples with at least m entries per cell, for m = 1, 2, 3, 4, 5, is given in Table 3.5, together with the ordinal (N) of the last profile used in the sample. These two numbers are presented as a fraction, n/N, which suggests the efficiency of the sampling procedure. For example, when the 900 profiles were examined in Direct (chronological) order to obtain at least m = 2 entries per cell, a total of 44 profiles were accepted. The 44th was the 151st profile examined, after which the examination stopped without considering the remaining 749 profiles. But when the same Direct sequence was examined to obtain at most m = 2 entries per cell, only 17 profiles were accepted, the 17th being the 571st examined. But since some cells still did not have 2 entries, the remaining 329 profiles were all examined, to no avail.

In general, seeking at least m entries per cell involved examining N = 2m to 3m or more profiles in Direct or Inverse order but less than 2m Random order profiles to meet the criterion. At most m entries, however, was never attained, even though all 900 profiles were examined. The values of n in Table 3.5 are shown in Figure 3.2, for all five random sampling arrangements. In Figure 3.2, the diagonal line represents the optimum number, if each cell had exactly m entries.

When an upper limit is placed on cell content, the actual number of profiles in the sample is about 90% of optimum, for each sampling sequence. But when a lower limit is imposed, many more profiles are used in the Direct and Reverse procedures than for Random. This effect is also seen in the actual matrices developed for each process: both Direct and Reverse ordering resulting in many cells having larger excesses above the minimum than for any of the 5 Random samples. Hence, further discussion will concentrate on the results of the Random sampling.

The actual numbers of entries per cell for each of the selection characteristics (c_1, c_2, c_3, c_4, c_5), and also the number of entries for the four test characteristics (c_6, c_7, c_8, c_9), are given in Appendix III for each of five Random sampling sequences, used to select at least and at most m entries per cell.

3.7 VALIDATION

To summarize the figures in the fifty 9 x 10 matrices in Appendix III, the deciles have been grouped into three classes, low (1-3), middle (4-7), and high (8-10). For each class, all the entries for the five selection characteristics were totaled, and similarly for the four test characteristics. Ideally, the low and high classes should each have 30 percent of the entries, and the middle class 40 percent.

The actual proportions, computed to tenths of a percent and expressed as

TABLE 3.5

NUMBER OF PROFILES USED (n) AND ORDINAL (N) OF LAST PROFILE USED, IN COMPLETING DECILE MATRIX WITH AT LEAST m PROFILES PER CELL AND IN ATTEMPTING TO COMPLETE WITH AT MOST m PROFILES PER CELL, FROM 2 ORDERED AND 5 RANDOM SEQUENCES OF 900 WIND PROFILES.

m:	1	2	3	4	5
At least m					
Direct	-	44/151	62/152	81/158	87/160
Inverse	-	44/158	62/220	80/222	96/229
Random 1	23/32	37/73	52/86	64/100	74/103
Random 2	21/39	40/53	51/100	63/108	75/109
Random 3	21/57	36/62	50/73	59/95	72/102
Random 4	19/63	35/78	50/79	64/86	75/103
Random 5	21/26	33/40	48/57	61/89	75/94
At most m					
Direct	-	17/571	26/571	35/639	46/247
Inverse	-	17/856	24/883	34/280	44/599
Random 1	8/531	17/397	26/567	34/448	46/374
Random 2	8/493	17/256	27/767	38/589	46/831
Random 3	8/842	19/807	26/292	35/842	44/886
Random 4	8/520	16/743	26/561	35/776	45/776
Random 5	8/373	16/821	27/847	36/847	45/720

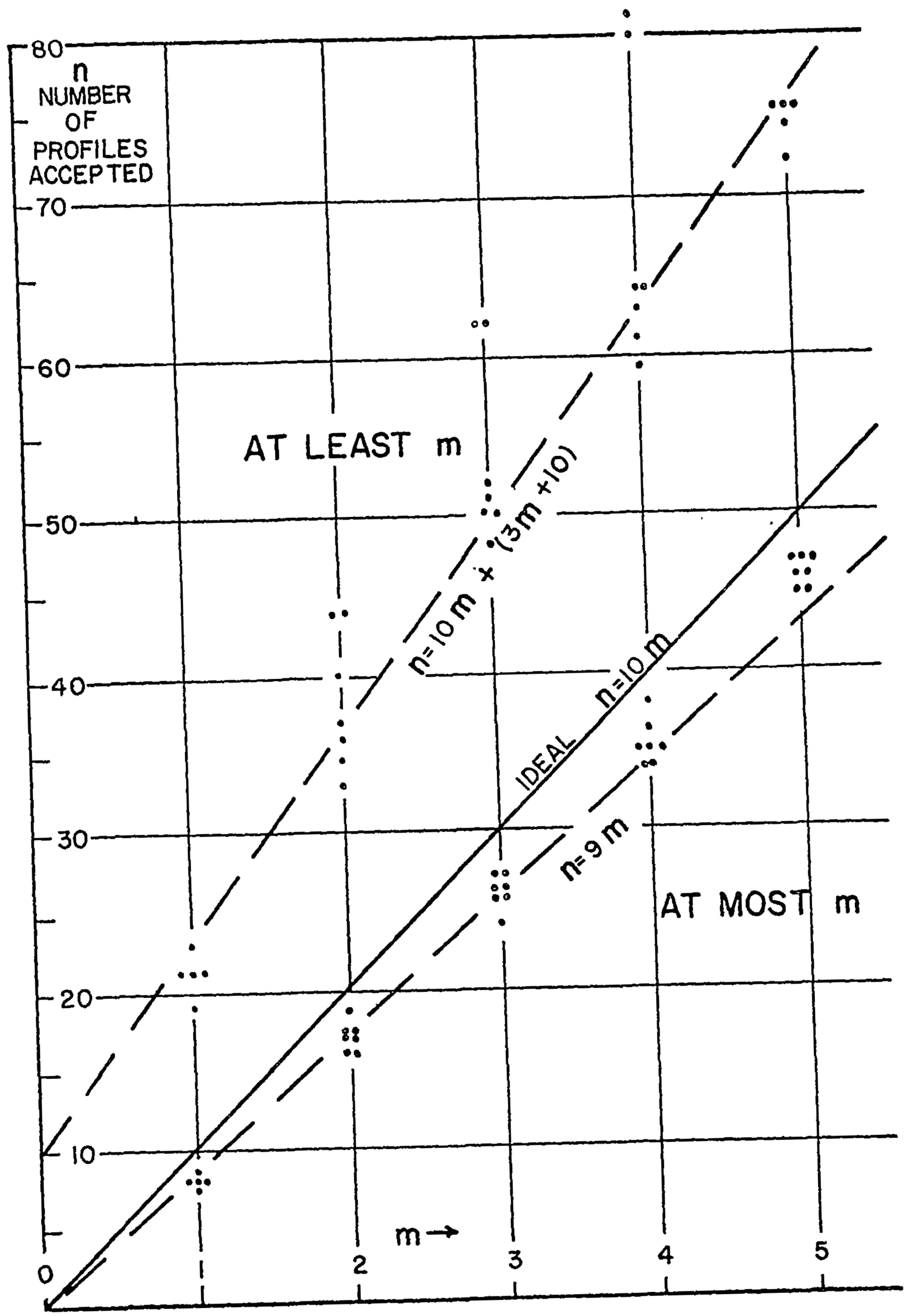

Figure 3.2 Number of Profiles Accepted (n) in Seeking at Least or at Most m Entries per Cell for Five Random Sampling Arrangements; Diagonal Line represents the Optimum Number, if Each Cell has Exactly m Entries.

parts per thousand for convenience (eliminating the decimal point), are given in Table 3.6 for each of the 5 Random sequence selections. These numbers, in turn, are shown by bars in Figure 3.3.

In each of the 50 samples, the number of entries in the three groups was gratifyingly close to the ideal figures. Since the upper extremes of wind speed and wind shear are of greatest practical interest, only the high group need be examined here. The actual percentages obtained in the sampling procedure varied from 26.7 (Random sequence 2 for at least 4) to 37.5 (Random sequence 4 for at most 1), for the selection characteristics, and from 19.0 (Random sequence 5 for at least 1) to 50.0 (Random sequence 1 for at most 1).

Together, the 5 Random sequences slightly overemphasized the high deciles for the selection characteristics, giving them from 29.9 (at most 5) to 34.5 (at least 1) percent of the cell entries. But for the test characteristics the high deciles were underemphasized: 26.1 for at least 1, 31.8 for at most 1. In the grand average, for all sequences for all values of m, the high deciles obtained 31.3 of all entries for selection characteristics, 28.9 for test characteristics.

As another test of how well the decile coding and sorting provided samples representative of the entire population of 900 profiles, spectrum densities for each of the profiles in one sample were extracted. Chosen were the five groups of profiles obtained in seeking at most 3 entries per decile cell. As shown in Table 3.5 and Figure 3.2, three of these groups had 26 profiles each and two had 27 each. For ease in comparison, however, each group was reduced to 25 profiles, by eliminating the 26th and 27th to be selected.

Serial numbers of the 25 profiles making up each stratified sample are given in Table 3.7. Although only 900 profiles were available for sampling, the serial numbers run from 1 to 1186, because 286 profiles in the original tabulation were rejected for not being complete from 1 to 14 km, or being duplicates of other profiles. In each of the five stratified samples, the pro-

TABLE 3.6

RELATIVE NUMBERS (PER THOUSAND) OF ENTRIES IN 3 GROUPS OF DECILES (LOW, MIDDLE, HIGH) FOR ALL 5 SELECTION CHARACTERISTICS (LEFT NUMBERS) AND ALL 4 TEST CHARACTERISTICS (RIGHT NUMBERS) WHEN 5 RANDOM SEQUENCES ARE USED TO SELECT PROFILES TO FILL MATRICES WITH AT LEAST m AND AT MOST m ENTRIES PER CELL.

		AT LEAST m				AT MOST m		
Random Sequence	m	1-3	4-7	8-10	Deciles m	1-3	4-7	8-10
	1	235/228	426/424	339/348	1	300/281	350/219	350/500
	2	303/311	373/385	324/304	2	282/309	400/338	318/353
1	3	312/303	377/394	312/303	3	282/308	385/317	323/375
	4	309/281	369/414	322/315	4	300/294	388/360	312/346
	5	308/277	359/405	332/318	5	291/255	400/424	309/321
	Avg	293/280	381/404	326/316	Avg	291/289	385/332	322/379
	1	343/274	333/440	324/286	1	225/125	425/500	350/375
	2	320/244	400/513	280/244	2	294/250	388/441	318/309
2	3	310/260	419/500	271/240	3	289/250	400/440	311/306
	4	324/282	410/480	267/238	4	289/243	400/454	311/303
	5	304/273	408/460	288/267	5	313/293	396/440	291/266
	Avg	320/267	394/479	286/255	Avg	282/232	402/455	316/312
	1	222/286	472/429	306/286	1	300/281	350/438	350/281
	2	250/285	433/424	317/292	2	305/289	389/408	305/303
3	3	268/300	428/405	304/295	3	300/317	400/375	300/308
	4	275/305	420/381	305/314	4	280/329	446/386	274/286
	5	297/299	417/399	286/302	5	286/341	418/375	295/284
	Avg	262/295	434/408	304/298	Avg	294/311	401/396	305/292
	1	295/289	400/513	305/197	1	325/250	300/531	375/219
	2	274/271	394/471	331/257	2	288/266	375/453	338/281
4	3	272/275	392/480	336/245	3	300/269	408/471	292/260
	4	266/270	409/475	325/255	4	297/279	383/443	320/279
	5	293/297	403/460	304/243	5	307/295	382/454	311/251
	Avg	280/280	400/480	320/239	Avg	303/272	370/470	327/258
	1	343/357	381/452	276/190	1	275/313	425/469	300/219
	2	273/288	376/402	352/311	2	275/297	400/469	325/234
5	3	313/318	350/375	338/307	3	304/306	393/417	304/278
	4	331/290	361/423	308/286	4	317/299	378/417	306/285
	5	331/300	357/403	312/297	5	307/294	404/411	289/294
	Avg	318/311	365/411	317/278	Avg	276/302	400/437	305/262
Grand	Avg	295/298	395/436	311/277	Gr.Avg	294/281	391/418	315/301
Avg	1	287/287	402/451	310/261	1	285/250	370/431	345/318
	2	284/280	395/439	321/282	2	289/282	390/422	321/296
	3	295/291	393/431	312/278	3	295/290	397/404	306/305
	4	301/286	394/435	305/279	4	297/289	403/412	300/299
	5	307/289	389/425	304/286	5	301/296	400/421	299/283

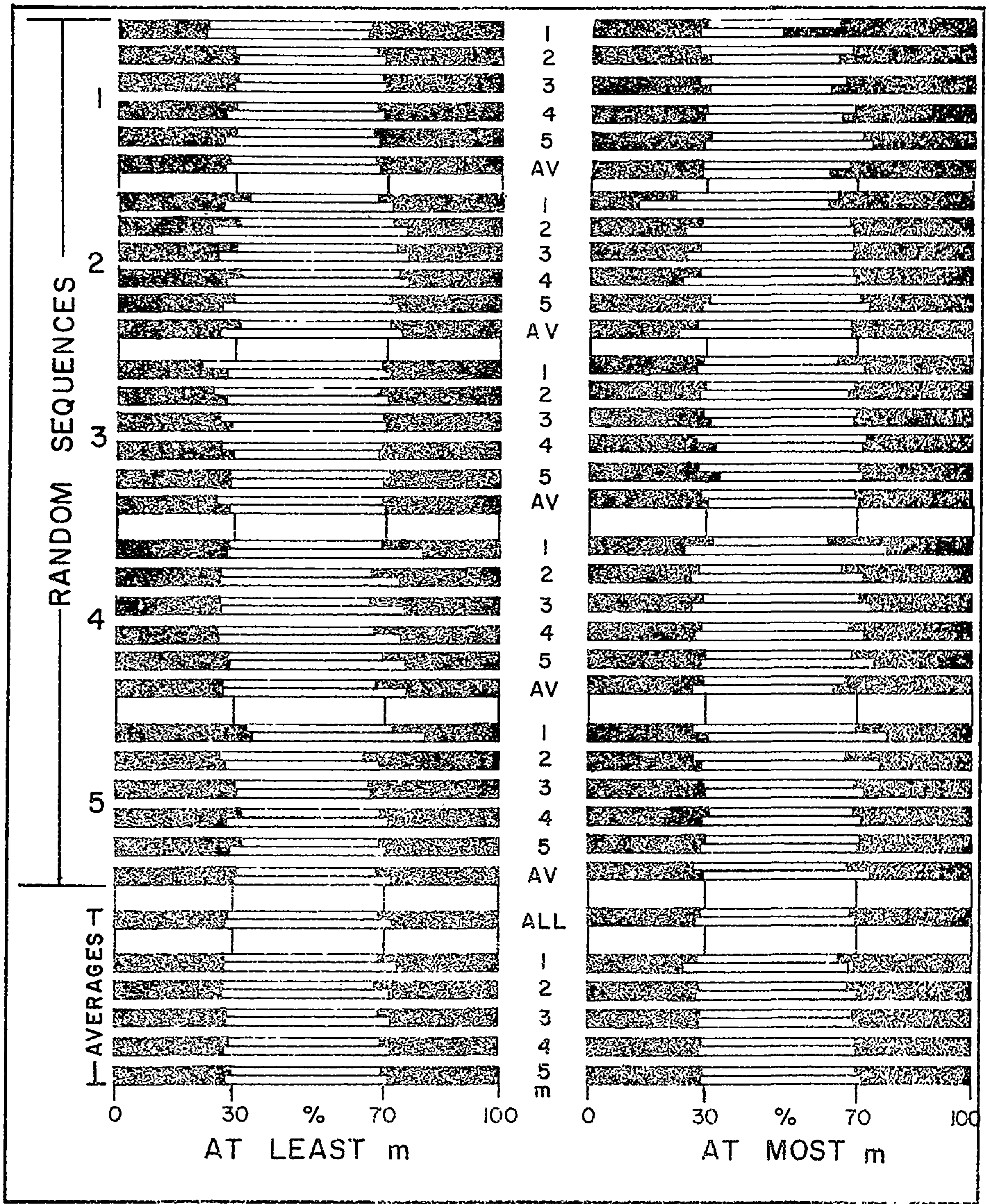

Figure 3.3 Percent of Entries in Low (1-3), Middle (4-7), and High [illegible] Deciles of Wind Characteristics in Samples Obtained from [illegible] Sequences of Wind Profiles.

TABLE 3.7

COMPOSITION OF 5 STRATIFIED RANDOM SAMPLES OF WIND PROFILES FROM TOTAL SAMPLE OF 900 PROFILES OVER CAPE KENNEDY, FLORIDA. NUMBERS ARE IDENTIFICATION NUMBERS OF PROFILES IN BASIC SAMPLE.

RS 1	RS 2	RS 3	RS 4	RS 5
1092	731	511	1042	696
251	323	1157	595	66
997	723	860	679	380
864	820	1034	1144	595
67	533	340	913	1041
197	168	344	1191	413
562	292	917	107	763
665	630	1063	674	492
88	827	715	649	426
802	487	358	1009	933
634	688	973	533	1175
637	1109	878	763	780
457	319	608	113	388
1008	995	4	370	718
878	677	54	13	44
623	348	160	1031	1135
1089	643	392	895	207
455	992	240	271	469
852	735	411	902	324
325	1173	822	653	208
340	85	432	844	56
314	1027	695	492	708
363	299	942	266	200
963	711	1113	707	459
713	791	545	180	470

files appear to have been drawn from the entire number with no bias.

For each group of 25 profiles, six spectrum densities at 10 frequencies are given in Table 3.8, and graphed in Figure 3.4. Values are in $(m/sec)^2/(cyc/sec)$. At each frequency from 0.3 to 3.0 cycles/second, the densities shown are the minimum, 5th, 10th, 15th, and 20th smallest, and the largest. For comparison, the corresponding percentile values of the densities in the entire population are also shown.

In Figure 3.4, the lines connect the densities for the entire 900 profile sample, and the vertical bars indicate the range of the values for the 5 stratified Ramdom samples. At each frequency, the maximum and minimum densities of the 5 samples do not attain the whole-sample values, but at the four intervening percentiles the range of the 5 sample values includes the whole-sample density.

On the whole, the spectrum of any one of the 5 stratified Random samples appears to offer a fair approximation to that of the whole sample. This investigation of 5 stratified samples, chosen arbitrarily from those available from the decile coding procedure, suggests that the method does indeed provide suitable samples of wind profiles.

Whether a stratified sample should be drawn by the "at most m" or "at least m" criterion depends on several factors. The former provides smaller samples, and is the only one available for samples of 25 or less, as long as decile coding is used. However, the selection characteristics could be coded in fewer (q) categories, such as quartiles ($q = 4$) or quintiles ($q = 5$). If quartiles are used, presumably samples of only 6 or 7 would be provided by a criterion of "at most 2" and of 12 to 15 by "at least 2".

The "at least m" criterion is more efficient, in that the selection process stops as soon as the minimum is reached in all cells, while the "at most m" criterion requires scanning of the entire set of available profiles in an

TABLE 3.8

SPECTRUM DENSITIES AT 10 FREQUENCIES OF 5 STRATIFIED RANDOM SAMPLES OF 25 WIND PROFILES EACH, AND OF ENTIRE SAMPLE OF 900 PROFILES OVER CAPE KENNEDY. GIVEN, IN $(m/sec)^2/(cyc/sec)$, ARE MINIMUM AND MAXIMUM VALUES AND 5TH, 10TH, 15TH, AND 20TH ORDERED VALUES IN EACH RANDOM SAMPLE AT EACH FREQUENCY, AND CORRESPONDING PERCENTILE VALUES OF TOTAL SAMPLE.

CYCLES PER SECOND

	0.3	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3.0
MAX										
RS 1	4.553	1.052	.2881	.1467	.0859	.0699	.0594	.0688	.0837	.0879
RS 2	4.923	0.985	.3205	.1467	.1577	.1504	.1296	.1274	.1284	.1233
RS 3	7.748	1.549	.3810	.1537	.1096	.0904	.0709	.0680	.0681	.0907
RS 4	5.275	1.209	.3300	.0528	.0902	.0746	.0718	.0769	.0725	.0667
RS 5	5.246	1.005	.2566	.1240	.0961	.0732	.0622	.0642	.0413	.0263
TOT	7.916	1.727	.6652	.3916	.1941	.1583	.1453	.1621	.1703	.1555
80 %										
RS 1	3.402	0.828	.2397	.0884	.0570	.0421	.0331	.0244	.0174	.0149
RS 2	3.052	0.702	.2240	.0861	.0485	.0363	.0232	.0223	.0208	.0190
RS 3	2.756	0.745	.2439	.0163	.0566	.0430	.0319	.0263	.0200	.0183
RS 4	2.789	0.742	.2072	.0820	.0601	.0384	.0270	.0294	.0215	.0219
RS 5	3.086	0.680	.2181	.0841	.0501	.0355	.0274	.0195	.0138	.0133
TOT	2.955	0.736	.2315	.0983	.0553	.0363	.0271	.0211	.0178	.0166
60 %										
RS 1	2.027	0.722	.1660	.0700	.0400	.0281	.0218	.0149	.0121	.0121
RS 2	2.060	0.540	.1663	.0692	.0398	.0266	.0201	.0179	.0130	.0114
RS 3	2.353	0.567	.1980	.0786	.0451	.0304	.0211	.0149	.0101	.0098
RS 4	2.567	0.552	.1655	.0682	.0430	.0275	.0193	.0133	.0136	.0142
RS 5	2.037	0.523	.1430	.0652	.0387	.0250	.0179	.0128	.0097	.0096
TOT	2.189	0.569	.1809	.0762	.0419	.0267	.0188	.0142	.0116	.0109
40 %										
RS 1	1.632	0.449	.1455	.0617	.0368	.0216	.0137	.0101	.0089	.0087
RS 2	1.558	0.413	.1249	.0575	.0300	.0194	.0133	.0124	.0092	.0082
RS 3	1.479	0.496	.1319	.0528	.0344	.0256	.0168	.0100	.0076	.0066
RS 4	1.741	0.450	.1276	.0584	.0317	.0219	.0148	.0101	.0098	.0109
RS 5	1.623	0.386	.1092	.0568	.0315	.0219	.0131	.0097	.0082	.0066
TOT	1.719	0.450	.1455	.0634	.0343	.0208	.0140	.0103	.0086	.0079
20 %										
RS 1	1.476	0.335	.1248	.0476	.0257	.0158	.0104	.0070	.0060	.0060
RS 2	1.097	0.275	.1068	.0439	.0197	.0113	.0086	.0072	.0065	.0046
RS 3	1.301	0.293	.0958	.0476	.0314	.0162	.0083	.0062	.0054	.0046
RS 4	1.455	0.421	.1100	.0533	.0300	.0162	.0097	.0083	.0080	.0073
RS 5	1.084	0.317	.1020	.0444	.0274	.0175	.0119	.0080	.0070	.0052
TOT	1.177	0.336	.1123	.0489	.0263	.0161	.0103	.0075	.0062	.0054
MIN										
RS 1	0.382	0.142	.0756	.0399	.0182	.0110	.0068	.0053	.0041	.0040
RS 2	0.776	0.263	.0661	.0232	.0133	.0092	.0066	.0036	.0026	.0018
RS 3	0.858	0.197	.0490	.0225	.0130	.0079	.0055	.0034	.0024	.0020
RS 4	0.932	0.281	.0848	.0329	.0145	.0077	.0066	.0041	.0026	.0026
RS 5	0.374	0.147	.0600	.0223	.0115	.0071	.0045	.0050	.0040	.0027
TOT	0.373	0/136	.0490	.0202	.0107	.0063	.0037	.0021	.0014	.0013

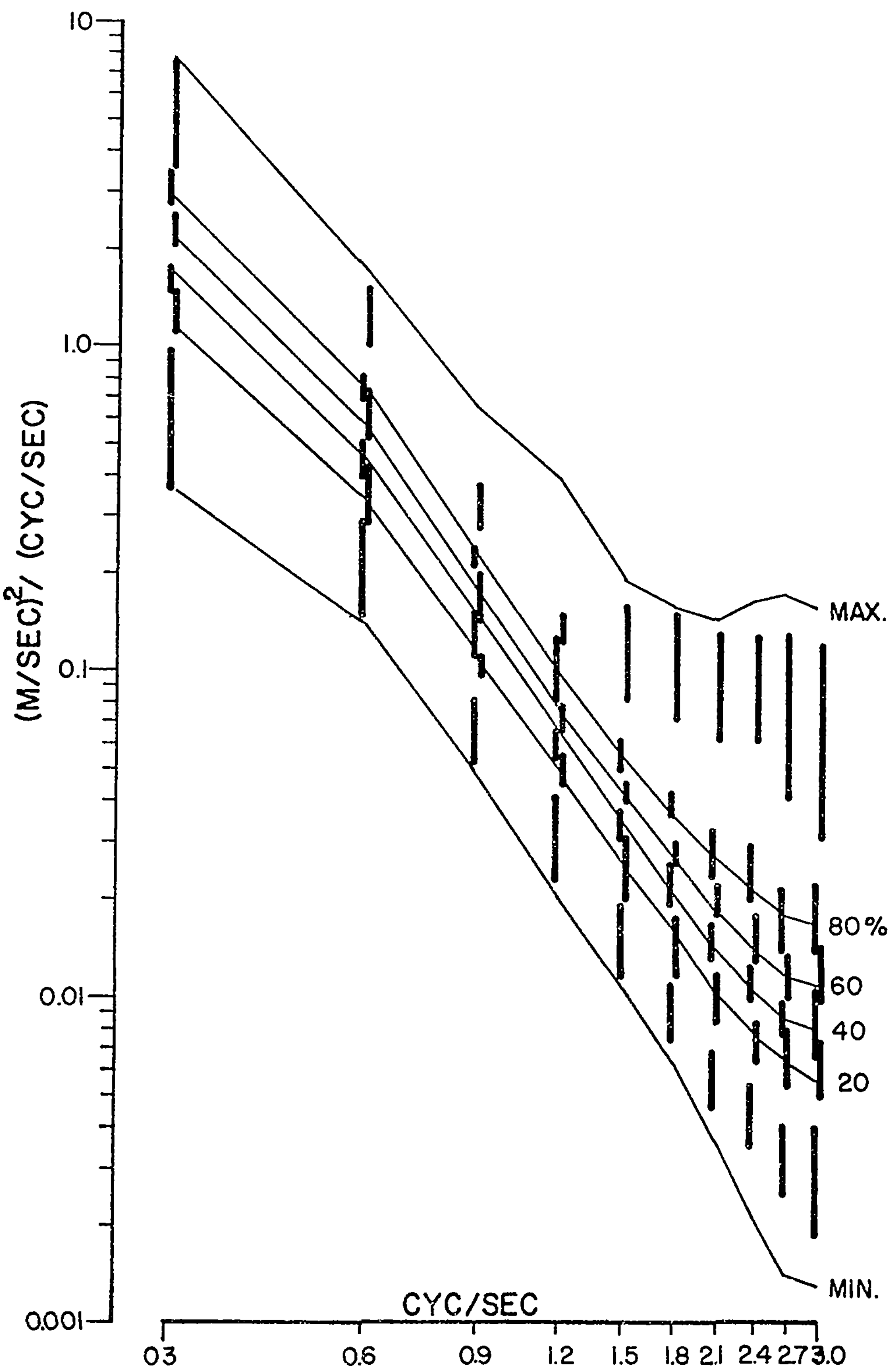

Figure 3.4 Range of Spectrum Densities at 10 Frequencies of 5 Stratified Random Samples, and Densities of Entire Sample of 900 Jimsphere Profiles.

effort to obtain a perfect sample of size m q. Decisions on which to use can be made realistically only after actual trials of the method.

Section 4

RELATIONS BETWEEN WIND SHEARS OVER VARIOUS ALTITUDE INTERVALS

4.1 INTRODUCTION

Various analyses of the magnitude of vector wind shears derived from balloon soundings have indicated that the mean and standard deviation of vector shear are functions of layer thickness of the form

$$\bar{w} = C \Delta Z^{n_1} \tag{1}$$

$$\sigma_w = E \Delta Z^{n_2} + D \tag{2}$$

where $\bar{w}$ and σ_w are the mean and standard deviation (m/sec) of vector shear and ΔZ is the layer thickness (m). Adelfang, Ashburn and Court (Ref. 1) showed that Equations 1 and 2 were generally valid for the climatological means and standard deviations computed at particular altitudes for 1194 Cape Kennedy Jimsphere profiles; based on computations at 8, 12, and 16 km for ΔZ from 50 to 5,000 m they found that the constants n_1 and n_2 are equal to 2/3, C and E are a function of altitude, and D = 0. Armendariz and Rider (Ref.10) also established the validity of Equations 1 and 2 for shear layer thicknesses between 61 and 914 m; their results, which were based upon a series of measurements during August and September 1964, were obtained by detailed tracking of 100 gm. spherical smooth balloons to an altitude of 3.05 km; they found that $n_2 = 0.74\, n_1$, $E = 1.1C^{0.74}$, and D = 0. Essenwanger (Ref. 11), who first proposed the form of Equations 1 and 2 based on an analysis of detailed wind measurements from rockets, finds that $n_1 = n_2$; Essenwanger and Reiter (Ref. 12) deduce from consideration of Tatarski's turbulence structure function (Ref. 13) that the constant n_1 (or n_2 since $n_1 = n_2$) has a lower bound of zero for an idealized wind profile composed of wind fluctuations with a "white noise" spectrum and an upper bound of unity for wind profiles composed of a linear trend without turbulence or mesostructure.

In the following discussion two sets of Jimsphere profiles are used to study the relation between mean and standard deviation of vector shear and layer thickness.

4.2 DATA

The two sets of Jimsphere profiles used for this study are composed of 1167 profiles measured over Cape Kennedy [ETR (Eastern Test Range)] during the period December 1964 through April 1967 and 83 profiles measured over Point Mugu (PMR) during the period January 1965 through March 1966. Monthly and tri-monthly distributions of the number of soundings for the two sets of data are given in Table 4.1. For an unbiased annual distribution 8.33 and 25 percent of the soundings should occur in any monthly or tri-monthly period respectively; as shown in Table 4.1 both data sets, have a relatively large percentage of the total soundings in the winter strong wind months (1-3), and a relatively small percentage in the fall months (10-12); the principal difference in the two distributions occurs in the spring months (4-6) for which the Point Mugu sample has only 8.43 percent of the soundings compared tc 28.91 percent for Cape Kennedy.

Vector shears were computed for all the soundings of the two data sets at 1 km intervals from 8 to 15 km for ΔZ equal to 50, 100, 400, 800, 1,000, 3,000, and 5,000 m. The vector shear at altitude Z is defined as the magnitude of the difference between two horizontal wind vectors, one at altitude Z and the other at $Z - \Delta Z$.

4.3 DISCUSSION

The means $(\overline{w})$ and standard deviations (σ_W) of vector shears of various layer thicknesses were computed for shear data given at intervals of 1 km between 8 and 15 km; the total number of observations of vector shear for each layer thickness was 8,708 for the Cape Kennedy data and 627 for the Point Mugu data. The means and standard deviations were also computed as a function of altitude

TABLE 4.1

MONTHLY AND TRI-MONTHLY DISTRIBUTIONS OF CAPE KENNEDY AND POINT MUGU JIMSPHERE PROFILES

M O N T H L Y

Month	1	2	3	4	5	6	7	8	9	10	11	12	Total
Cape Kennedy													
No. of Profiles	92	129	138	169	96	77	83	83	89	81	59	87	
% Total	7.78	10.90	11.67	14.29	8.10	6.51	7.02	7.02	7.52	6.85	4.99	7.35	1183
Point Mugu													
No. of Profiles	8	13	22	2	0	5	11	7	5	0	0	9	83
% Total	10.84	15.67	26.51	2.41	0	6.02	13.26	8.43	6.02	0	0	10.84	

T R I - M O N T H L Y

	1-3	4-6	7-9	8-12
Cape Kennedy	359	342	255	227
% Total	30.34	28.91	21.56	19.19
Point Mugu	44	7	23	9
% Total	53.01	8.44	27.71	10.84

at intervals of 1 km between 8 and 15 km. $\overline{w}$, σ_w and the constants C, E, n_1, and n_2 of Equations 4.1 and 4.2, calculated by taking logarithmic least squares, are listed in Table 4.2 for Cape Kennedy and Table 4.3 for Point Mugu. In Figure 4.1 $\overline{w}$ computed for the 8 to 15 km altitude band for various layer thicknesses is compared with the Armendariz-Rider and Essenwanger results obtained from late summer profiles (Ref.10); it is indicated that the mean vector shears computed for relatively large samples of wind profiles from all seasons at ETR and PMR are a function of layer thickness to a significantly larger power (n_1 equals 0.64 at PMR and 0.62 at ETR) than has been observed in a few late summer profiles by Armendariz and Rider at White Sands ($n_1 = 0.38$) and Essenwanger at Cape Kennedy ($n_1 = 0.44$).

For a similar comparison of standard deviations of vector shear, as illustrated in Figure 4.2, the constant power of ΔZ, n_2, is also significantly larger for the PMR ($n_2 = 0.68$) and ETR ($n_2 = 0.62$) profiles. In addition, the existence of the constant D in Equation 4.2, which implies a deviation from a power law relation between σ_w and ΔZ, that is large for ΔZ small, is not supported by either Aremdariz and Rider or the PMR and ETR Jimsphere data.

The significant variations noted above for the exponents n_1 and n_2 of the power law relations (Equations 1 and 2) which may possibly be partially related to season and method of observation is also noted when n_1 and n_2 are derived from data at 1 km altitude intervals. As illustrated in Figure 4.3, n_1 tends to be smaller at altitudes above 12 km and n_2 tends to decrease with altitude for the ETR profiles and is somewhat erratic for the PMR profiles. Similarly, as illustrated in Figure 4.4 the constants C and E generally increase with altitude again showing a relatively steady trend for the ETR sample.

4.4 CONCLUSION

For this study emphasis has been given to statistics of wind shear magnitude

TABLE 4.2

MEANS AND STANDARD DEVIATIONS OF VECTOR SHEARS FOR VARIOUS LAYER THICKNESSES AND CONSTANTS C, E, n_1, AND n_2 OF EQUATIONS 4.1 AND 4.2 FOR CAPE KENNEDY JIMSPHERE PROFILES

Z(km)		Δ Z(m) 50	100	400	800	1000	3000	5000	No. of Obs.	C	E	n_1	n_2
8	Mean(m/sec)	0.59	0.99	2.62	4.05	4.64	9.79	14.12	1154	0.042		0.68	
Std. Dev.(m/sec)		0.43	0.67	1.81	2.77	3.15	6.12	8.93			0.031		0.67
9	M.	0.60	0.99	2.75	4.24	4.93	10.16	14.95	1139	0.041		0.69	
	S.D.	0.43	0.66	1.80	2.89	3.31	6.38	9.17			0.028		0.70
10	M.	0.65	1.05	2.83	4.49	5.22	10.44	15.37	1132	0.046		0.68	
	S.D.	0.46	0.69	1.84	3.00	3.57	6.73	9.36			0.030		0.70
11	M.	0.73	1.15	3.13	4.82	5.47	10.87	15.76	1119	0.055		0.67	
	S.D.	0.61	0.87	2.27	3.42	3.81	7.26	9.73			0.050		0.63
12	M.	0.82	1.30	3.47	5.46	6.20	11.25	15.98	1101	0.069		0.64	
	S.D.	0.63	0.90	2.32	3.78	4.30	7.41	9.59			0.046		0.66
13	M.	0.99	1.56	4.07	5.88	6.51	10.71	14.81	1073	0110		0.58	
	S.D.	0.78	1.08	2.73	3.87	4.23	6.98	8.76			0.078		0.58
14	M.	1.17	1.88	5.02	7.11	7.60	10.05	12.02	1036	0.191		0.51	
	S.D.	0.82	1.14	3.10	4.52	4.87	6.61	7.48			0.071		0.62
15	M.	1.27	2.01	5.35	7.83	8.55	10.87	10.27	957	0.239		0.48	
	S.D.	0.97	1.25	3.06	4.55	4.92	6.33	5.98			0.099		0.57
8-15 km													
	M.	0.84	1.34	3.60	5.41	6.07	10.51	14.25	8708	0.082		0.62	
	S.D.	0.70	0.99	2.58	3.84	4.23	6.76	8.94			0.061		0.62

TABLE 4.3

MEANS AND STANDARD DEVIATIONS OF VECTOR SHEARS FOR VARIOUS LAYER THICKNESSES AND CONSTANTS C, E, n_1, AND n_2 OF EQUATIONS 4.1 AND 4.2 FOR POINT MUGU JIMSPHERE PROFILES

Z(km)		Δ Z(m) 50	100	400	800	1000	3000	5000	No. of Obs.	C	E	n_1	n_2
8	Mean(m/sec)	0.56	1.01	2.60	3.84	4.44	8.42	12.54	76	0.047		0.66	
Std. Dev.(m/sec)		0.44	0.70	1.84	2.57	2.93	5.21	6.39			0.037		0.64
9	M.	0.61	1.08	3.40	5.24	5.81	9.48	12.91	77	0.054		0.66	
	S.D.	0.47	0.79	.87	4.41	4.77	7.03	8.03			0.021		0.80
10	M.	1.00	1.74	4.90	7.75	8.88	14.37	17.69	77	0.098		0.63	
	S.D.	0.68	1.24	4.08	6.76	7.91	9.56	9.78			0.029		0.82
11	M.	0.98	1.46	3.94	5.93	7.33	18.32	21.71	80	0.061		0.70	
	S.D.	0.90	1.20	2.58	3.90	5.22	10.87	11.45			0.093		0.57
12	M.	0.85	1.41	3.55	6.00	7.23	17.07	21.77	80	0.051		0.72	
	S.D.	0.54	0.81	2.25	3.23	3.72	10.15	10.93			0.042		0.65
13	M.	0.97	1.71	4.28	6.18	6.87	12.52	19.40	81	0.091		0.63	
	S.D.	0.52	0.89	2.32	3.85	4.54	6.43	8.85			0.032		0.72
14	M.	1.10	1.90	5.13	6.79	7.48	12.79	15.86	80	0.135		0.58	
	S.D.	0.68	0.92	2.59	3.67	4.13	7.65	8.31			0.056		0.63
15	M.	1.17	1.85	5.30	6.29	6.91	12.66	13.56	76	0.160		0.54	
	S.D.	0.61	1.00	2.50	3.38	3.31	6.74	8.07			0.066		0.59
8-15 km													
	M.	0.91	1.52	4.14	6.01	6.88	13.21	16.99	627	0.081		0.64	
	S.D.	0.66	1.01	2.84	2.84	4.26	4.93	8.76	980		0.045		0.68

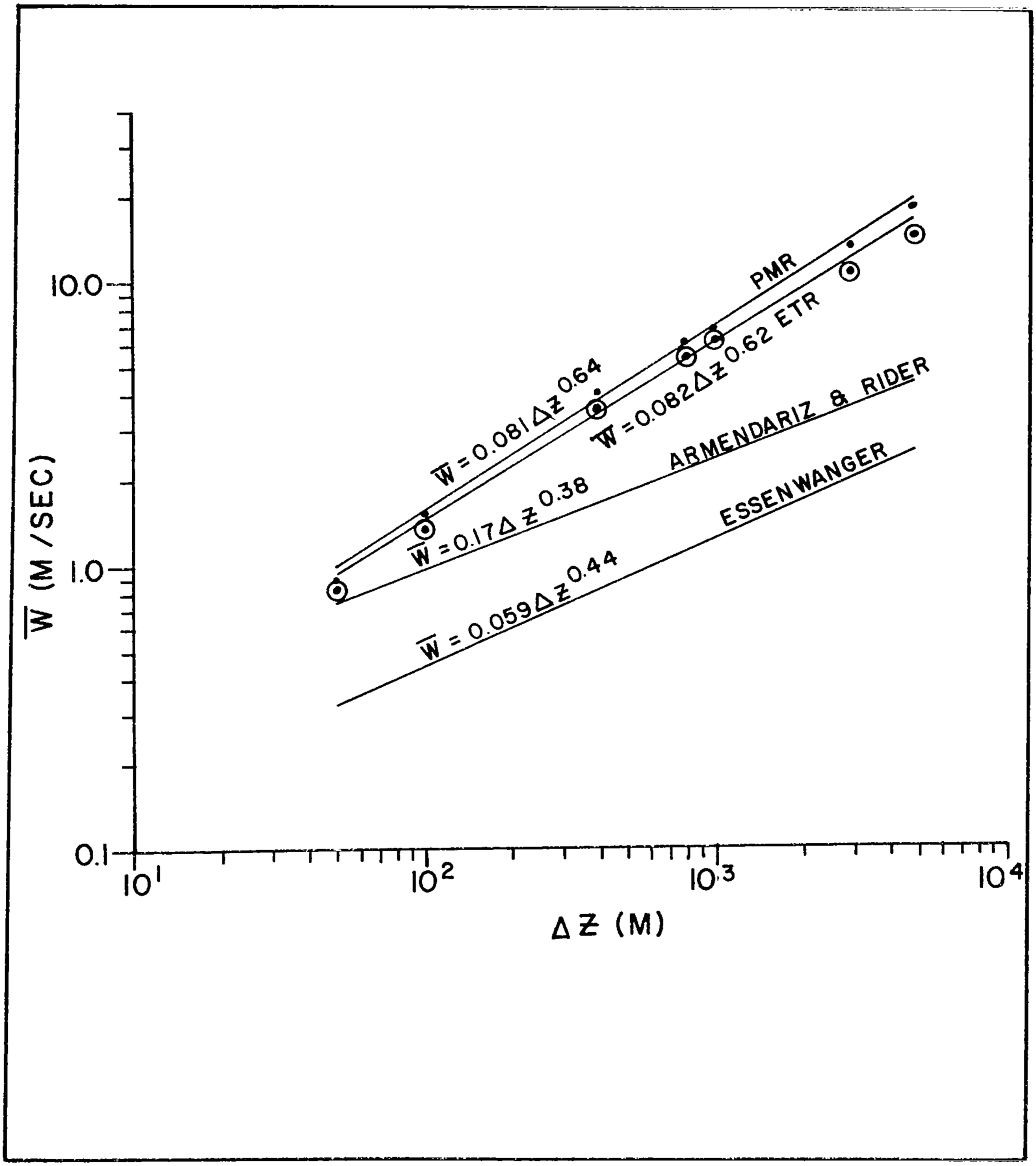

Figure 4.1 Mean Vector Shear as a Function of Layer Thickness

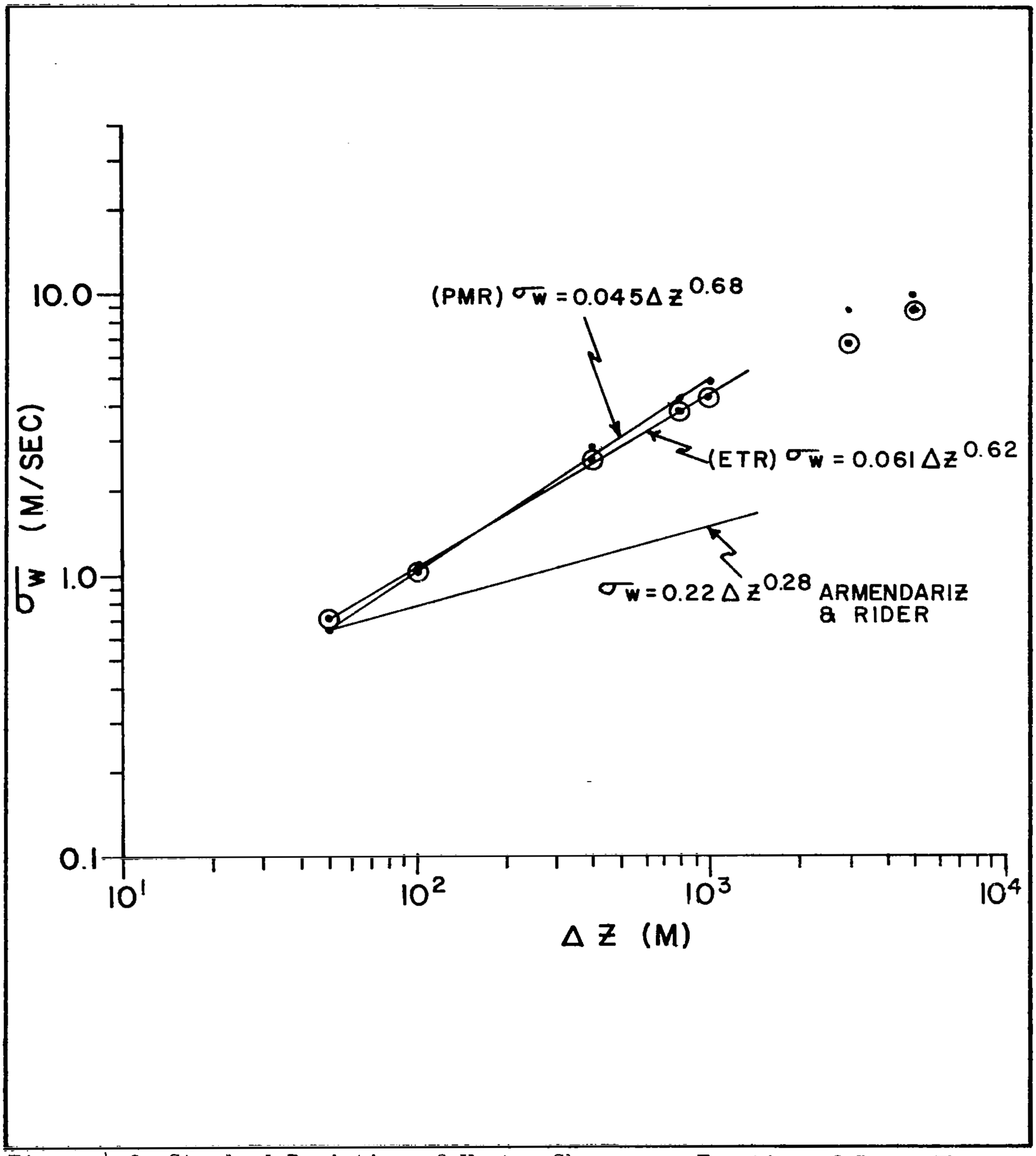

Figure 4.2 Standard Deviation of Vector Shear as a Function of Layer Thickness

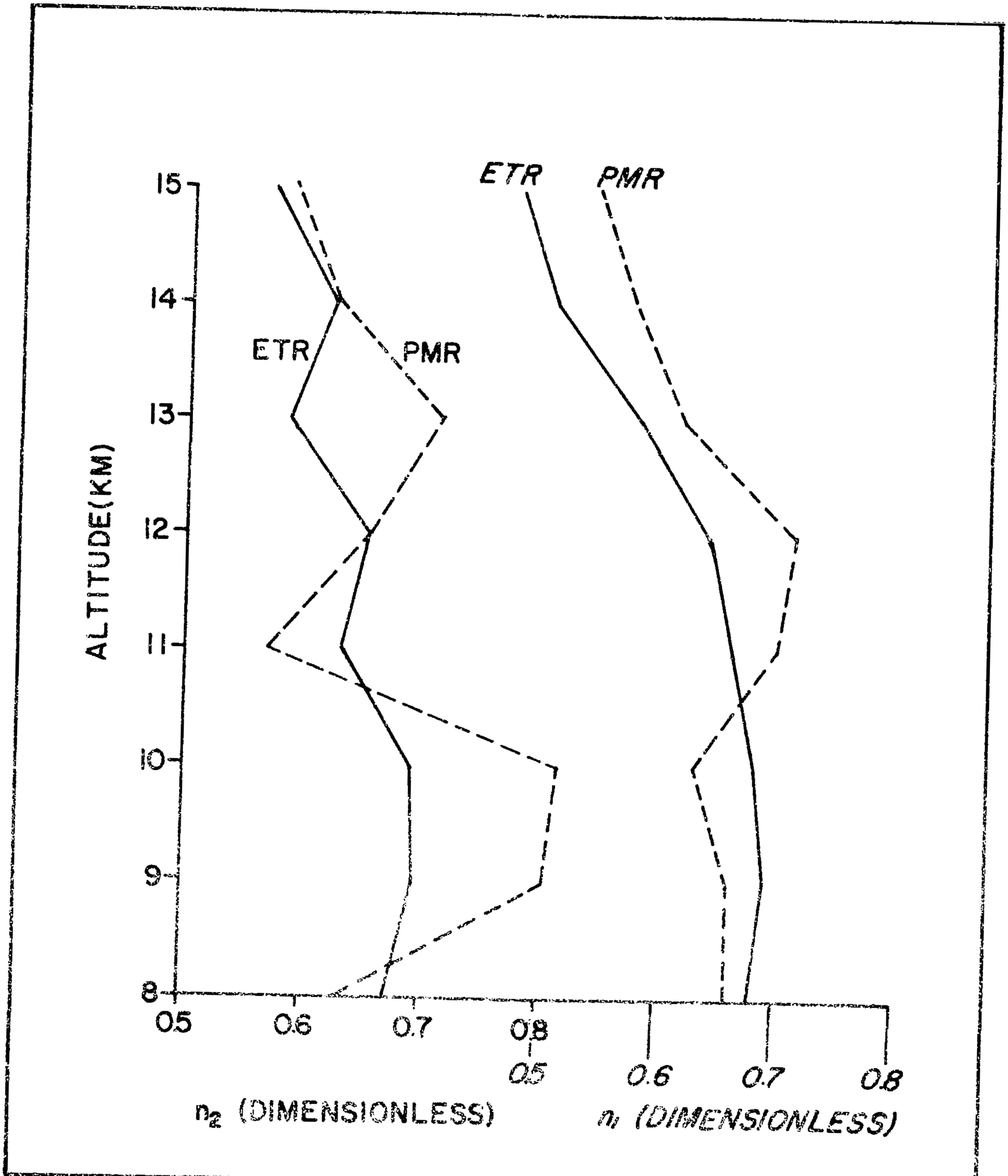

Figure 4.3 n_1, of Equation 4.1 and n_2 of Equation 4.2 as a Function of Altitude

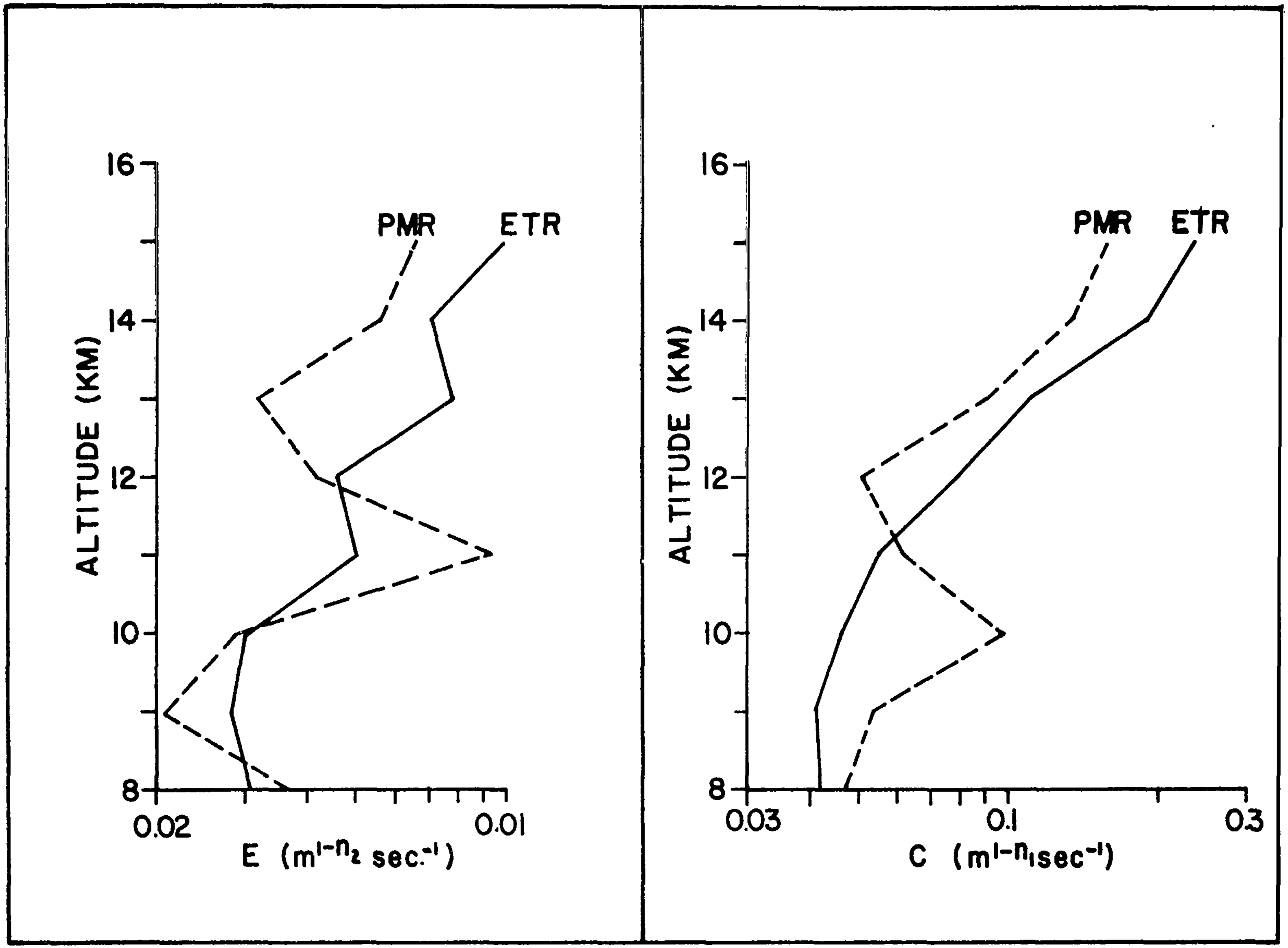

Figure 4.4 C of Equation 4.1 and E of Equation 4.2 as a Function of Altitude

computed from a relatively large sample of data obtained in all seasons. Therefore comparisons with other results derived from a few late summer soundings, which show poor agreement, further support the hypothesis that the constants of the proposed power law relations are a function of season; additional factors which may contribute to the poor agreement are systematic errors associated with the methods of observation (rockets, smooth balloons and Jimsphere) and differences in the altitude range of the observations which was 8 to 15 km for Jimsphere data and surface to 3.05 km for the White Sands data (Armendariz and Rider).

The ETR and PMR vector shear magnitudes, derived from sets of soundings which differ more in size than in their distribution by season, show a distinct similarity in the variation of means and standard deviations as a function of layer thickness.

Section 5

MATHEMATICAL REPRESENTATION OF GUST FUNCTIONS

5.1 INTRODUCTION

In this section the aim is to develop a method of representing gust functions that are observed in detailed Jimsphere wind profiles. This will be achieved by utilizing a technique developed and used by Dutton (Ref. 2). The theory of the technique is discussed and a method of application is suggested.

5.2 THEORY

Dutton used data obtained at low altitudes in a turbulent wind field. Four sets of data were obtained at each of six levels at Cape Kennedy below 150 meters. At each level wind direction and speed were measured at intervals of 1/10 sec over a long period of time. From this a vector wind velocity $\vec{v}\ (t)$ was defined and an average vector $\vec{\bar{v}}$ was calculated according to

$$\vec{\bar{v}} = \frac{1}{T} \int_0^T \vec{v}\ (t)\ dt \qquad (5.1)$$

where T, the duration of some part of the experiment, is selected to include the portion of the wind record which has the largest gusts. Then the unit vector $\vec{i}$ is taken along this wind direction and $\vec{j}$ orthogonal to it. The longitudinal (u) and lateral (v) components of the turbulent wind are defined by:

$$\begin{aligned} u &= (\vec{u}\ (t) - \vec{\bar{u}}\ ) \cdot \vec{i} \\ v &= (\vec{v}\ (t) - \vec{\bar{v}}\ ) \cdot \vec{j} \end{aligned} \qquad (5.2)$$

Thus, at each level, not only the wind direction and speed, but also the u and v components are given as a function of time. For a particular run, at each level, ten largest gusts, for each component are chosen for every gust at each level. Assuming the validity of Taylor's hypothesis, a 3,000 ft. sample of data is extracted from the whole record in such a way that the gust falls in the center i.e. 1500 foot of data on each side of the gust. The aim is to find the general shape of these functions at all six levels. To this end a correlation matrix, $R(X_i, X_j)$, $[i, j = 1, \ldots, N]$ is defined as follows: u and v are chosen at random points $X_i \ldots, X_n$ on the 3,000 foot sample (in Dutton's case N is taken to be 50) for each of the 10 gust regions at each of the six levels. Let u_i and v_i be the u and v components of i^{th} gust. A correlation matrix is defined for the u component according to

$$R(X_i, X_j) = \frac{1}{10} \sum_{n=1}^{10} u_n(X_i)\, u_n(X_j) \qquad (5.3)$$

This correlation matrix is used for application to the theory which will be developed next. A similar correlation matrix is calculated for the v component. The aim is to represent these gust functions by some set of known functions.

The mathematical problem to be solved is to find an economical method of representing these gusts. There is no reason to believe that any of the classical orthonormal series will be very efficient. The object is to find a set of orthonormal functions, which in some sense, to be decided later, are more like the functions we are trying to represent. For this purpose a theorem in proper orthogonal decomposition given by Loeve (Ref. 14) is used. Given a set of functions $\{f\}$ defined on some finite domain, we would like to find a function ϕ which in some sense is more like most of the functions in the set. So, we first have to agree on a definition of "likeness". We may be tempted to say ϕ is more like f if the correlation between ϕ and f is as large as possible i.e. try to maximize $r = \int f(x)\, \phi(x)\, dx$. But, since sign and magnitude are immaterial, and we only need relative magnitude, we may use the normalized quantity

$$p^2 = \frac{\left[\int f(x) \; \phi(x) \, dx\right]^2}{\left[\int f^2(x) \, dx\right]\left[\int \phi^2(x) \, dx\right]} \qquad (5.4)$$

It can be shown that $p^2 \leq 1$. Another measure of likeness may be minimizing of

$$D = \int [f - \phi]^2 \, dx \qquad (5.5)$$

But ϕ could be more like f than it is more "unlike" - f; therefore we would like to redefine (5.5) so that ϕ is acceptable if it either is like f or - f. Thus we find it more convenient to use

$$D = \int (f - \phi)^2 \, dx \int (f + \phi)^2 \, dx \qquad (5.6)$$

In (5.6) we can use the normalized form of f and ϕ, denoted by f_n and ϕ_n and rewrite (5.6) as

$$D_n = \int (f_n - \phi_n)^2 \, dx \int (f_n + \phi_n)^2 \, dx \qquad (5.7)$$

A simple calculation shows that

$$D_n = 4 (1 - p^2) \qquad (5.8)$$

Thus a maximum of E (p^2) gives a minimum of E (D_n). Thus solving the problem, which involves finding a ϕ to satisfy (5.4) is the same as finding a ϕ to satisfy (5.7), and vice versa. Further any ϕ which resembles f or - f will be acceptable. And finally, if we are able to produce such a ϕ, it would be more "like" all the functions of the set simultaneously. Moreover, resemblence is in both senses of (5.4) and (5.7). It only remains to be seen whether there is such a ϕ. A standard method of calculus of variations is used, i.e. it is assumed that there is a maximizing function ϕ which induces a small variation $\epsilon \, \delta \, \phi$ in ϕ; $\phi = \epsilon \, \delta \, \phi$ is substituted into Equation (5.4) which is differentiated with respect to ϵ at $\epsilon = 0$. It follows that the equation

$$\int E [f (x) f (y)] \phi (x) dx = \vec{p}^{2} \phi (y) \qquad (5.9)$$

must be solved. This is a typical eigen value problem. Therefore, there is not only one, but a whole set of solutions to this integral equation. If we set $\lambda_1, \lambda_2, \ldots$ as possible eigen values with $\lambda_1 \geq \lambda_2 \geq \ldots$ we get corresponding eigen functions $\phi_1, \phi_2, \ldots$ upon setting

$$R (x,y) = E [f (x) f (y)] \qquad (5.10)$$

from (5.9) we get

$$\int R (x,y) \phi_n (x) dx = \lambda_n \phi_n (y) \qquad (5.11)$$

An easy calculation shows that the functions $\{ \phi_n \}$ form an orthogonal set under the inner product $<f,g> = \int f (x) g (x) dx$. Upon normalization they form an orthonormal set. Since $R (x,y)$ is defined on a finite domain, a possible choice for the eigen values is a countable set. In case an eigen value has multiplicity more than one, the associated eigen functions can be orthogonalized by the Gram-Schmidt method. Hence, the assumption that $[\phi_n]$ form an orthonormal set is correct. Therefore, any function f of the set has a unique representation

$$f (x) = \sum_{n=1}^{\infty} a_n \phi_n (x) \qquad (5.12)$$

where

$$a_n = \int f (x) \phi_n (x) dx \qquad (5.13)$$

a straight forward calculation shows that

$$E (a_n a_m) = \lambda_n \delta_{m,n} \qquad (5.14)$$

(where $\delta_{m,n} = 0$ if $m \neq n$ and $= 1$ if $m = n$). Thus the coefficients are uncorrelated across the set. The advantage of this analysis is that the tail end of the series is cut off in the formula (5.12) i.e. if we consider the first n terms in the power series expansion of f, we get close enough approximation of it. Of course the larger we choose n, the closer we get to the actual value of the function. But to get a fairly good estimation of the function, n does not have to be very large. For example, in the case of the data discussed in the earlier prargraph, if we take only the first eight eigen functions, they already explain at least 97 percent of the variance in each component. We can, in fact, calculate the error in the estimation of the function by the first n eigen functions; let $e_n (f)$ be the error. It can be shown that

$$e_n (f) = \int [f]^2 dx - \sum_{n=1}^{n} [a_n]^2 \qquad (5.15)$$

Some further argument would lead to $\lim_{n \to \infty} e_n (f) = 0$ i.e. (5.16)

the error can be made arbitrarily small.

This theory is used to analyze the data mentioned in the earlier paragraph. The correlation matrix (5.3) computed there is used in a summation form of Equation (5.11). A standard eigen value process is applied to the matrix and its eigen values and eigen functions are found. As mentioned earlier, by just using the first eight eigen functions, 97 percent of the variance in each component is explained.

5.3 APPLICATION

To apply the method outlined above it is suggested that a number of Jimsphere profiles closely separated in time be used. The time separation is analagous to the altitude separation of Dutton's data. Random points, x_i, are chosen to be at some fixed altitudes of the profiles. The number of x_i's used is a function of the degree of accuracy required. For N profiles for the period of interest the u and v components of the n^{th} profile at the altitude x_i are denoted by $u_n (x_i)$ and $v_n (x_i)$. A correlation matrix is formed for the u component, $R (x_i, x_j) = \frac{1}{N} \sum_{1}^{N} u_n (x_i) u_n (x_j)$, and similarly for the v component. The derivation of the functions which describe the u and v components of each profile from each correlation matrix was described in the previous section.

A variation of the approach suggested above could be attempted by using several groups of closely spaced Jimsphere profiles. Within each group the average value of u and v would be calculated and substituted for u_n and v_n in the above analysis. Another alternative would be to take the vector $\vec{i}$ u + $\vec{j}$ v at each point (altitude) x_i and find its vector sum within each group which again would be substituted for u_n and v_n to find the correlation matrix and carry out the calculation. If the largest gusts are of interest a few of the largest gusts could be chosen in each group and the method could be applied to them. In this case, however, more care is needed. If we only look at the u and v components and choose the largest gusts, depending on the angle of the wind vector with respect to the u and v axis we could get different values for u and v. In other words two different wind vectors with the same magnitude could give completely different u and v components because the angles they make with the axis are not the same. Since we only seek the largest gusts, this may lead us to ignore some gusts which have appreciable magnitudes, but not very large u and v components, because of being situated at a "bad angle". This can be remedied if we first take the magnitude of the wind vectors and choose those with biggest magnitudes, and then go ahead and apply the above method to the u and v component of these chosen vectors.

5.4 CONCLUSION

In applying Dutton's method for representing Jimsphere gust functions one should be careful in interpreting the results and have an understanding of the extent and limitation of their use. Most important is that this analysis does not reveal significant information about the vertical variation of wind vectors. In addition, in interpreting the results of this analysis as it relates to space vehicles it should be understood that the Jimsphere views the atmosphere in about an hour and a half as it rises from the ground to 18 km compared to the spacecraft which covers the same vertical distance in 94 seconds. What the spacecraft sees requires a further interpretation of the results.

Section 6

CONCLUDING REMARKS AND RECOMMENDATIONS

6.1 GUST STUDIES

Following the approach suggested in an earlier study of Jimsphere profiles (Ref. 1) a set of gust profiles have been derived in the time domain of a Saturn vehicle. An analysis of these gust profiles (Section 2) has revealed that their spectrum densities are generally smaller than spectrum densities of altitude profiles conventionally transformed to the time domain (Equation 2.7). It is suggested that the conventional transformation is invalid for time dependent vehicle velocities and that the spectrum densities of the time domain profiles derived in this study are the most accurate estimate of the spectrum of horizontal wind speeds seen by a Saturn vehicle. It is recommended that other aspects of these newly derived gust profiles be studied. Of particular interest is the variability of gust statistics; for example, the distribution functions and the distribution of spectrum densities of gusts computed for a number of vehicle flight time intervals should be stratified according to season and location (PMR, ETR, Wallops Island, White Sands) to partially explain their variability.

6.2 ANALYSIS OF WIND SHEARS

The mean and standard deviation of vector shear magnitudes at altitudes between 8 and 15 km can be described by similar power law functions of layer thickness (Equations 4.1, 4.2) for Cape Kennedy and Point Mugu Jimsphere profiles. The significant difference between these functions and others derived from a few summer profiles obtained with different measurement techniques is partially attributed to a seasonal variation of the constants in the power law functions. It is recommended that future studies of the magnitude of vector shear establish the constants in the power law functions for wind profiles grouped according to month or season; also recommended is a test of the hypothesis that the constants are correlated with the vector shear direction.

As suggested by Court (Ref. 1) the observed relations between means and extremes of shears to layer thickness is attributable to the decay of inter-level correlation of zonal and meridional wind speeds for increasing layer thickness; to test this hypothesis, it is suggested that Jimsphere profiles be used for a study of the decay of inter-level correlation beginning at 75 m layer thickness.

6.3 PROFILE SAMPLING

In Section 3, two validation tests of a method for selecting representative profile samples indicated that a) on the average the extremes were slightly over-estimated for the selection characteristics, and slightly under estimated for the test characteristics, and b) the spectra of any one of the five profile sub-sets selected from a random sequence of the parent population offer a fair approximation of that of the whole sample. It is recommended that further tests of the method be performed to establish how well profile samples obtained by using selection characteristics in fewer categories such as quartiles or quintiles, instead of deciles, represent the parent population.

Section 7

REFERENCES

1. Adelfang, S. I., Ashburn, E. V., and Court, A., "A Study of Jimsphere Wind Profiles as Related to Space Vehicle Design and Operations". NASA CR 1204 (Nov. 1968).

2. Dutton, J. A., "Investigations of the Turbulent Wind Field Below 150 m. Altitude at the Eastern Test Range" NASA CR 1410, (Aug. 1969).

3. Endlich, R. N., Singleton, R. C., and Kaufman, J. W., "Studies of Detailed Vertical Wind Speed Profiles", J. Atmos. Sci., 26, 1030-1041, (1969)

4. Jacobs, D. B., "Saturn V AS-504 Launch Vehicle Reference Trajectory" Document DS-15481-1 Vol. 2, Contract NAS 8-5608, The Boeing Company, (May 1967)

5. Alfriend, K. T., "Design of a Digital Filter for Application to Wind/ Turbulence Data", Lockheed Missiles and Space Company, LMSC/HREC A710908 (1965)

6. Anonymous, "Atlantic Missile Range Reference Atmosphere for Cape Kennedy, Florida (Part 1)", IRIG Document 104-63, Range Commanders Council, White Sands, New Mexico, (April 1963).

7. Blackman, R. B., and Tukey, J. W., "The Measurement of Power Spectra" Dover, New York (1958)

8. Fichtl, G. H.,"In-Flight Design Spectra of Atmospheric Turbulence" Marshall Space Flight Center Memorandum R-AERO-YE-182-69, (18 Feb.1969)

9. Ryan, R. S., Scoggins, J. R. and King, A., "Use of Wind Shears in the Design of Aerospace Vehicles", AIAA J. 1526-1532 (1967)

10. Armendariz, M., and Rider, L. J., "Wind Shear for Small Thichness Layers", J. Appl. Meteor., 5, 810-815 (1966)

11. Essenwanger, O., "On the Derivation of Frequency Distributions of Vector Wind Shear Values for Small Shear Intervals", Geofis. Pura.Appl., 56, 216-224 (1963).

12. Essenwanger, O., and Reiter, E. R., "Power Spectrum, Structure Function, Vertical Wind Shear, and Turbulence in Troposphere and Stratosphere", Arch. Met. Geoph. Biokl., SERA, 18, 17-24 (1969)

REFERENCES (Cont.)

13. Tatarski, V. I., "Wave Propagation in a Turbulent Medium", New York, McGraw-Hill (1961)

14. Loeve, A., "Probability Theory", Princeton, N. J., Van Nostrand (1963).

Section 8

ACKNOWLEDGEMENTS

The authors are indebted to Mr. Sam Dalmont for his computer programming efforts and Mrs. Lenore Barr for typing the manuscript.

APPENDIX I

MAXIMUM WIND SPEED AND MAGNITUDES OF VARIOUS VECTOR SHEARS, WITH CORRESPONDING ALTITUDES (TOP OF SHEAR LAYER), BETWEEN 4 AND 14 KM IN 900 JIMSPHERE WIND PROFILES OVER CAPE KENNEDY.

PROF NO	MAXIMUM WIND M/SEC	METER	+100M SHEAR M/SEC	METER	-100M SHEAR M/SEC	METER	+1000M SHEAR M/SEC	METER	-1000M SHEAR M/SEC	METER	+400M SHEAR M/SEC	METER	-400M SHEAR M/SEC	METER	+1000M SHEAR M/SEC	METER	-1000M SHEAR M/SEC	METER
1067	36.987	13350	3.129	12700	4.795	13500	14.113	13150	8.543	11900	11.066	13150	9.072	13625	15.725	4650	9.309	5375
1068	37.462	13300	5.006	12550	4.792	13425	14.297	13100	8.193	11900	10.549	13125	8.162	13600	15.862	4650	10.186	5225
1069	36.631	13500	4.225	13525	4.370	13875	11.577	6950	7.769	13975	7.389	13625	8.669	14000	17.967	8450	8.726	4950
1070	47.668	13500	5.331	13450	3.494	13750	17.114	13500	5.915	10875	10.765	12900	4.134	10525	22.601	5425	2.163	12550
1071	50.372	13775	4.914	13775	2.891	7825	14.169	13950	8.342	7925	9.856	13775	6.532	7875	21.843	9575	3.303	12550
1072	46.631	12975	4.898	13575	3.852	13500	12.025	6700	10.079	13900	8.427	13900	9.264	13675	21.711	7500	9.368	13500
1078	76.217	13325	5.101	13375	6.826	13275	17.154	10900	16.942	14000	9.604	10325	17.108	13775	26.609	7850	20.888	13950
1079	45.795	13750	3.282	13575	3.803	13575	9.482	7200	7.755	6300	10.087	13675	6.601	13200	19.636	9350	3.303	13950
1080	48.327	12975	5.267	12950	4.748	12925	11.451	12750	12.086	13975	8.550	13050	8.523	13125	19.256	9700	3.303	13950
1081	52.392	12525	4.988	12450	3.641	12900	10.373	7150	7.560	13350	7.596	6925	8.355	12700	21.611	6975	11.675	14000
1082	47.873	13900	4.872	12975	4.844	12775	12.134	13925	7.863	13425	11.926	13900	10.742	12830	16.288	4175	3.303	14000
1083	53.191	11375	4.316	13375	6.365	12950	11.629	7325	14.751	12950	9.739	7375	10.108	12950	20.915	7375	16.406	12950
1084	54.392	11950	3.619	11575	4.435	12275	13.612	5250	10.714	12525	7.401	5250	10.476	12575	22.852	6825	11.041	14000
1085	47.927	10725	4.523	9125	3.707	12050	23.934	10025	18.168	12525	13.272	9375	11.825	12350	31.671	10725	32.348	13550
1088	49.815	11975	4.072	12350	4.241	13875	15.700	5850	9.229	13925	11.220	13050	10.470	13750	22.344	7775	14.346	12950
1089	26.321	13925	4.624	10050	4.108	10175	15.096	11825	11.030	9875	7.321	11775	10.855	9850	16.591	12850	6.898	7525
1090	27.389	11300	3.456	13375	3.418	12275	12.199	13675	15.271	12450	9.035	13625	10.626	12450	14.454	11350	11.474	4300
1091	24.193	14300	3.737	4375	3.805	4100	12.319	4725	15.906	9275	9.484	4125	8.388	8975	18.133	6725	19.081	10475
1092	31.215	13550	4.584	13550	5.344	13775	12.471	13825	12.454	13850	10.244	13400	11.902	13325	13.828	11700	13.124	9650
1095	32.224	10400	3.586	4225	3.566	13575	8.843	9225	6.683	12550	7.430	9225	5.614	13525	16.692	5925	7.254	13550
1096	32.544	10800	2.530	4725	2.743	12100	8.695	6975	5.785	12950	5.620	6900	4.980	13525	16.230	9075	5.315	12225
1097	32.353	10500	2.693	13975	2.833	12725	12.569	6850	10.999	9900	6.536	6775	5.237	13450	19.502	8900	11.638	13375
1098	30.483	10925	3.688	12350	3.862	13575	9.315	13275	9.447	14000	10.282	12900	9.210	13600	16.323	6425	17.387	13300
1100	33.300	12925	3.522	4300	3.145	14000	15.713	4650	10.506	13375	10.248	4150	5.779	12825	24.457	6300	8.422	4200
1101	36.103	12875	4.415	11450	4.021	12200	14.167	5400	14.329	13775	7.354	4800	9.174	13700	24.843	6175	5.949	8575
1102	31.337	13300	4.560	11425	3.388	11375	10.156	11800	14.418	11050	11.109	11250	9.260	10050	34.501	13100	10.854	10975
1103	24.306	13975	4.164	12100	3.421	5125	12.888	12275	6.686	10275	9.183	12300	8.127	5250	22.824	13750	3.718	4375
1104	25.385	13125	3.763	12200	2.348	6023	11.829	12700	7.225	6925	7.899	12275	6.145	6325	16.534	13275	9.976	4425
1106	45.518	13375	4.510	13975	3.388	11775	9.877	11525	6.594	10450	9.196	13975	6.623	12050	20.600	4600	10.288	4350
1107	45.784	12575	5.668	10200	3.731	11400	26.312	12250	13.822	13275	12.356	11725	12.360	11575	23.910	12325	2.308	11425
1109	41.362	13300	5.118	12525	3.766	14000	16.082	12975	8.376	11925	11.134	12375	8.957	11900	21.164	12950	14.284	4300
1112	52.675	12350	4.143	11125	4.817	11100	13.801	12000	11.430	13450	9.121	12800	9.172	11275	23.738	9550	21.649	13575
1113	49.989	13475	4.041	12400	4.943	11623	19.511	10650	11.380	9350	9.931	12525	10.922	11825	29.862	12525	10.798	9575
1114	45.845	13450	3.801	12500	6.216	11650	22.979	12525	7.946	8200	10.105	12500	10.637	11950	34.093	13475	6.487	10200
1115	47.733	13500	4.019	12775	3.720	14000	17.399	12750	11.253	5575	9.487	12825	5.858	13200	28.272	12825	11.973	7350
1120	26.548	13425	3.569	14300	3.951	12900	9.778	11125	9.188	13900	6.913	12925	8.080	13825	21.004	12800	7.788	5300
1121	19.549	11450	3.791	12400	3.472	11625	8.896	4025	12.714	4575	7.621	13050	11.090	4000	10.212	6625	15.351	6575
1122	35.781	11175	4.066	12975	4.427	12200	11.414	7550	19.744	12225	8.868	13000	12.302	12200	19.139	8575	23.981	14300
1123	40.731	11950	4.510	13750	4.355	13725	15.141	12100	17.135	14000	11.316	14000	10.942	12650	23.863	11950	24.256	14000
1124	35.674	11325	3.409	9525	4.456	13175	19.762	13050	18.397	13025	10.469	13050	9.886	13500	21.263	10675	25.118	14300
1125	24.321	10900	4.901	12175	3.964	12725	12.942	12575	12.492	12475	9.644	13725	11.830	13000	19.145	11250	22.818	12550
1126	11.896	12525	4.797	12300	3.745	11800	9.675	13175	9.139	13825	13.583	12825	8.679	12025	11.775	12825	5.187	8925
1127	21.604	10900	4.206	12500	4.525	12800	13.741	12925	21.280	12725	11.056	12675	10.560	12250	20.838	12725	25.362	13700
1128	20.336	10725	5.197	13300	7.661	13025	17.442	13925	25.085	13750	13.373	13375	19.770	13225	14.367	10525	31.318	13775
1129	22.858	11550	4.198	13575	5.251	13025	20.511	13625	21.192	13725	13.450	13550	13.199	13425	14.085	10875	24.288	13725
1130	23.463	11550	5.347	13500	4.073	13300	20.512	13775	15.044	13500	16.643	13600	14.125	13500	16.899	11225	25.112	13975
1131	22.502	14300	5.479	13925	4.693	13425	18.593	14000	10.483	12875	16.689	13825	13.976	13725	19.365	14000	17.556	13700
1132	20.233	13750	7.913	13750	3.839	13900	13.350	13775	7.455	13300	13.151	13800	6.714	13000	12.946	13800	5.749	11400
1133	11.841	13775	2.930	12525	5.844	13975	7.689	7900	7.733	14000	7.198	12625	6.552	11975	10.821	9925	8.777	6950
1134	17.645	14300	5.155	13575	2.126	11575	12.400	14000	8.584	11900	8.201	14000	6.472	11825	11.364	10375	3.324	4375
1135	11.451	11175	5.321	13500	2.981	13750	8.063	7500	6.271	11825	6.832	6950	5.019	4775	8.375	9550	8.268	13675
1136	16.599	14300	4.728	13550	2.727	13550	10.144	14000	10.372	4225	7.634	12800	4.281	4000	16.150	14000	10.537	4125
1137	18.972	13700	5.390	12900	4.192	13250	19.003	13700	5.462	12450	11.578	13025	8.612	13550	22.321	13725	8.096	12550
1138	13.957	12725	4.776	11400	3.042	13075	9.787	12275	9.230	12900	8.524	11675	6.115	13125	13.837	12725	11.743	13300
1139	23.820	11400	5.784	12300	4.603	11525	14.353	12000	19.908	12425	13.394	12925	12.471	11800	17.182	11150	12.210	14000
1140	23.063	12950	5.779	12450	6.095	12950	11.050	13025	8.436	13575	9.549	12475	9.607	13025	15.462	4775	4.050	14300
1142	15.897	10950	4.004	12300	4.243	12450	8.722	12000	9.072	13775	9.329	12525	9.246	12550	12.265	5575	12.451	4850
1143	22.200	13450	4.166	12825	5.362	13925	18.280	13150	19.081	13100	15.543	13000	14.075	12950	14.739	13125	14.632	13300
1144	23.387	13450	5.987	12975	4.474	13850	9.975	13500	10.274	13975	11.611	13375	10.984	13900	14.445	13900	12.655	12950
1145	26.906	13825	4.888	12950	4.125	13725	14.526	13500	10.448	14000	13.262	13825	14.765	13950	11.123	13725	12.798	14000
1146	25.277	13175	3.483	13125	5.415	14002	12.144	13550	10.193	14000	9.578	13175	13.345	14000	11.288	10125	10.734	14000
1147	24.977	13025	4.958	13875	6.505	13100	9.049	13300	15.468	14000	11.481	14000	11.497	13825	11.368	12200	12.838	14300
1148	25.404	13850	3.828	13875	4.813	13600	11.311	13050	13.539	14000	8.276	14000	10.687	13750	13.563	7975	13.550	14300
1149	24.187	12500	3.713	12700	3.701	13675	10.838	12600	12.515	14000	9.291	13900	10.174	13850	15.428	12825	13.111	13900
1150	23.291	12525	3.367	4300	4.231	13750	9.621	12625	9.445	14000	7.809	12600	8.041	14000	14.263	12825	10.877	12375
1151	22.683	12700	3.405	12425	3.876	10075	8.363	13000	9.805	14000	8.111	12700	6.393	10375	13.382	12425	12.162	12325
1152	24.448	13950	3.993	12700	3.777	12900	8.167	11075	10.190	11000	7.106	13175	6.126	13100	13.193	13025	9.097	11000
1154	25.936	13925	3.473	12575	4.314	6100	12.689	13125	7.215	9450	8.985	6600	6.040	6200	17.197	13825	9.875	9750
1155	28.809	12150	12.232	12150	13.913	12250	23.752	12150	16.187	12200	14.177	12150	14.504	12550	23.498	12150	14.665	4150
1157	21.813	13700	4.445	11500	3.761	11575	12.894	11800	14.765	12100	7.947	10875	11.755	11800	14.217	13775	13.138	4375
1159	22.688	13900	4.370	12175	4.658	11300	9.563	13075	11.192	11900	7.255	12450	10.085	11575	16.565	13775	7.485	4525
1161	21.195	13725	3.468	10975	3.583	11200	10.142	12800	9.226	11425	7.999	12200	8.829	11400	16.316	13775	5.042	6150
1163	19.652	13500	3.931	11975	5.465	11025	10.529	12825	9.729	11250	9.602	12225	8.580	11075	15.247	13675	11.142	13950
1167	21.167	10350	4.364	13400	3.597	6050	9.414	10200	9.369	12900	8.021	12300	6.836	12425	12.411	10125	13.249	13450
1169	20.408	12300	4.142	5900	2.858	11000	9.159	12750	9.391	12775	6.977	12125	6.518	12175	12.206	9975	10.545	13575
1170	25.474	12875	4.447	12775	3.419	11950	12.282	12850	8.920	13775	10.146	12925	5.198	13425	12.055	12900	3.731	11850
1171	34.443	13625	4.300	12425	3.895	11200	14.027	12175	8.737	11675	10.073	12375	9.874	12350	15.763	12875	1.839	9950
1172	35.191	13850	4.030	12525	4.169	13575	23.360	12100	23.221	12075	11.922	6275	12.997	11500	26.162	13025	23.378	13500
1173	38.389	13750	3.751	13475	3.751	13900	11.120	11725	12.136	11775	9.146	13675	8.755	11300	23.938	13600	10.404	5250
1174	25.739	13700	4.609	12975	3.236	12150	14.483	13000	6.997	11775	10.012	13150	6.103	12375	15.456	8650	10.857	4550
1175	23.271	12275	2.652	11750	2.822	13025	14.503	12025	9.565	5225	7.816	12050	9.900	11950	14.875	12275	2.175	9950
1176	36.020	8900	3.366	6425	3.741	13025	9.012	8100	12.505	13250	6.522	5700	8.901	12600	18.991	8075	13.844	13575
1177	38.218	11450	3.284	12550	3.538	12500	12.028	8225	9.675	10125	8.518	7800	8.519	12675	19.904	8925	28.367	12100
1178	38.294	13975	5.217	13975	2.465	13800	8.991	12675	8.785	10650	13.563	13975	5.657	11275	19.588	5200	14.033	12650
1180	49.208	13200	4.843	13175	4.992	13625	11.625	12900	10.899	6575	8.361	12600	8.351	5975	16.080	5550	3.303	12650
1181	45.302	10825	3.172	12575	3.679	13100	12.885	12975	13.842	12775	7.545	13225	10.227	13375	22.918	4625	7.270	13900
1182	46.187	12550	5.835	9825	4.139	13575	16.183	11575	16.869	11475	9.164	9875	8.676	13400	19.314	7575	21.601	13475
1183	44.595	14300	3.421	13475	2.834	5525	14.463	13800	6.336	4625	9.513	13675	5.193	4825	24.082	10875	9.318	5500
1184	33.195	13100	3.230	13275	2.793	13925	13.448	13875	8.927	10775	7.924	12525	6.577	14000	22.962	13675	12.961	10575
1185	38.361	13450	4.618	12525	3.239	13900	11.525	11775	8.248	6550	6.566	4325	6.260	14000	17.885	11875	3.303	10575
1186	36.878	13200	3.242	10100	4.136	13850	12.107	11000	11.802	8950	7.586	10425	10.389	14000	19.312	13000	13.385	5500
1187	37.513	13525	4.283	13450	4.283	13900	13.259	13500	14.383	10200	9.468	13450	10.057	13925	21.570	12475	23.432	12175
1188	35.479	13475	5.459	12575	2.544	12625	14.060	9775	14.053	9850	7.998	12725	6.656	9775	20.023	11925	19.301	11875
1189	32.362	13500	3.619	8375	3.434	12650	11.899	12175	7.196	4800	8.394	8150	6.556	12900	20.041	12125	11.325	5750
1190	23.219	13325	3.734	13825	3.454	6475	9.338	8800	9.974	13875	6.735	13300	7.022	13750	11.118	8875	5.166	4850
1191	50.715	13850	4.516	13400	3.477	13950	9.794	7000	5.762	5850	8.346	4200	4.253	11325	17.734	8925	3.303	4552
1193	39.143	10750	3.687	12925	2.708	12552	9.172	11950	9.559	13800	6.193	13650	5.485	11750	16.891	11950	12.376	12725
1194	33.406	13350	4.182	13550	5.551	13925	6.885	4750	4.714	13925	7.873	13700	8.336	13800	8.251	9400	6.388	13825
1195	33.112	10750	5.186	7225	5.546	7325	11.520	7225	9.431	13650	8.124	7225	6.959	11250	16.403	4000	11.831	13650
1196	40.369	13373	3.788	11300	5.289	14000	22.290	11900	8.388	14000	11.183	11300	6.588	14000	30.689	13650	10.229	4250

PROF NO	MAXIMUM WIND M/SEC	METER	+100M SHEAR M/SEC	METER	-100M SHEAR M/SEC	METER	+1000M SHEAR M/SEC	METER	-1000M SHEAR M/SEC	METER	+400M SHEAR M/SEC	METER	-400M SHEAR M/SEC	METER	+1000M SHEAR M/SEC	METER	-1000M SHEAR M/SEC	METER
929	50.402	13250	3,721	8550	3.853	13675	17.338	8750	10.515	13725	8.541	8675	11.317	13750	27.831	10725	17.401	5300
931	47,912	13475	5,727	7500	4.985	13700	12.195	8600	10.539	13150	7.050	7800	8.138	12650	26.047	10400	16.162	4500
932	47,923	11500	4,450	13525	3.790	13850	11.015	10050	9,962	12950	7.141	10000	9.349	13975	24.451	10475	10.986	4275
933	50.644	12575	2,632	11425	3.785	13500	11.868	11750	18.354	13675	7.227	11725	9.823	13075	23.207	9525	3.000	4275
934	49,725	13325	3,656	8375	4.380	12300	15.702	9700	9.535	12750	10.270	8525	10.397	12575	29.760	9700	13.317	13350
937	41,621	12350	3,837	4325	3.290	13500	15.322	4350	10.500	13950	11.331	4800	6.432	13650	21.843	5325	3.000	13350
938	38,305	13775	4,824	4425	1.815	9650	9.864	10775	4.383	5425	5.845	10200	3.335	9800	19.517	9150	13.250	4300
940	22,529	8300	3,873	5300	3.224	8475	11.706	4850	12,457	4600	6.357	5650	9.532	8550	18.001	5825	6.220	10925
942	27,453	14300	2,677	13925	2.251	13600	9.230	10325	5.972	11825	6.834	7775	5.741	11825	18.704	10350	6.078	13750
944	24,940	11275	3,882	10325	3.023	13600	11.415	7250	5.524	4700	7.799	7225	5.268	10325	22.831	7225	13.324	5725
946	21,420	12700	3,861	12425	3.962	13025	10.936	10650	7.555	13750	7.143	12675	7.601	13325	14.557	10750	12.620	8700
948	25,314	11325	4,631	12750	4.934	12925	19.333	12300	17.306	12650	12.072	12825	8.723	13225	22.095	12800	28.841	14300
949	13,948	13400	2,616	13300	2.369	13500	9.447	13250	5.596	12700	6.018	12875	4.318	10825	11.023	13200	9.586	13450
951	41,262	12375	4,666	11500	3.837	13675	15.893	12575	15.362	14000	12.250	12000	12.317	13800	22.374	12325	13.992	11325
952	37,937	12425	3,789	4350	5.211	10800	16.177	4000	20.673	11550	12.995	11100	13.949	11025	24.684	4200	10.287	13400
953	36,689	12375	5,991	4225	4.310	12250	20.477	4525	13.102	12925	12.568	4350	10.912	12575	24.355	4925	14.034	4125
954	35,496	11750	3,301	13325	3.949	11900	14.123	8425	11.907	4675	8.980	11750	7.756	4825	25.593	8550	14.691	6100
955	31,419	9425	2,231	11375	3.575	10925	17.518	13325	12,555	11625	10.371	12950	9.184	13675	26.112	13300	25.071	13425
956	34,682	12975	2,974	6200	8.060	13100	14.884	12700	21.713	13975	7.646	6275	13.500	13400	20.995	13000	13.755	13850
958	61,168	11500	4,645	10375	6.753	13700	17.717	13500	26,135	14000	10.119	12950	19.395	14000	22.824	5650	31.763	14300
960	43,544	11975	3,939	5775	3.918	12650	9.633	13900	9,756	13200	8.161	13525	6.235	12900	16.122	12200	3.504	13425
961	43,802	13350	3,526	6150	3.354	13200	12.684	6775	6.187	6825	10.514	6425	5.596	13350	21.050	7175	3.000	13425
962	52,822	13350	5,876	6350	3.534	13450	16.378	6950	6.950	14000	9.835	6325	5.094	13050	20.431	6950	3.000	13425
963	48,981	13375	3,199	12925	3.810	13625	13.555	11275	10.647	4725	6.941	13225	7.562	13625	20.253	13300	8.826	6300
964	47,210	12500	5,142	12775	2.732	13425	16.205	12625	5.869	4675	12.361	12475	6.539	13525	25.765	12825	7,212	5100
965	47,605	13250	3,744	12350	2.489	8100	16.714	12700	8.814	13975	13.172	12125	4.595	8375	30.915	13400	4.531	5950
967	51,213	12575	3,971	11200	2.469	10550	10.677	11250	6,056	14000	12.226	11250	5.446	9850	37,664	12525	16.350	5325
971	29,465	14200	3,997	11550	2.743	4125	12.743	4250	4.913	4850	8.697	13375	5.908	4225	21.367	4000	4.622	6675
972	23,227	13675	5,107	13925	4.326	13900	15.044	12875	13.274	12800	10.111	12900	8.336	13950	17.974	13600	15.939	5725
973	17,745	13950	4,859	12150	2.950	12675	7.202	13725	6,957	8575	5.654	13200	6.102	8050	10.312	10200	12.753	4875
974	15,422	11200	2,684	14975	3.561	12525	11.426	7350	13.759	14000	7.124	13650	7.844	12775	11.316	11225	13.145	14300
975	9,322	6500	2,872	6425	3.038	8425	8.241	6975	8.222	9975	6.182	6550	6.558	8700	13.878	7350	8.465	4000
976	15.350	7250	3,145	9275	2.456	7475	12.117	9850	12.189	8375	9.020	9550	6.669	7750	13.801	13250	10.117	12875
977	23.470	12750	4,633	12175	3.774	13450	16.248	12750	11.787	6500	11.163	12375	9.215	13575	20.265	12750	15.895	10050
978	31.554	12150	3,119	7350	2.771	12300	9.386	14200	5.741	12925	6.519	10075	5.853	7850	17.791	10125	4.986	4100
980	40.570	10300	3.521	10325	3.729	12650	10.180	7200	11.425	11525	8.545	10450	8.562	10950	18.339	4025	14.966	12025
981	46.309	9900	3.455	13125	5.417	13275	12.617	12200	15.008	13600	8.047	9500	10.116	11600	23.187	11950	23.279	11875
982	57.834	11300	5.732	10925	5.149	13825	20.484	11375	11.056	12400	14.150	12625	9.172	11250	27.183	5675	14.003	13975
983	57.978	12500	4.780	11375	4.391	12975	20.323	11850	13.337	13575	11.573	11175	11.054	13050	28.807	12600	3.200	13975
984	59.374	12250	7.497	11575	5.126	12600	19.143	12200	10.000	13425	14.142	11725	9.841	12725	30.998	12175	15.867	4700
992	45.398	12975	13.292	12525	7.146	13475	14.043	11575	15.574	13525	16.976	12925	9.966	13475	21.223	5850	12.860	12300
995	39.661	13575	3,450	5575	3.021	5125	12.029	6350	9.505	4800	9.508	5800	9.427	5375	18.330	13600	12.296	5825
996	36.116	12950	2,601	13575	3.195	13600	12.071	12625	6.689	13975	6.411	12025	6.631	13900	17.150	12750	8,916	11500
997	36.443	13500	3,180	13825	3.248	13975	10.168	8775	8.500	10925	7.484	13100	6.025	4450	15.438	8550	3.000	11500
1000	46,660	12300	3,541	8475	4.191	13400	18.548	8800	19.531	13550	9.325	8750	10.673	13375	25,852	10525	14.106	12850
1002	39,356	13950	3,858	5150	3.019	14000	14.518	13675	14.586	13475	7.326	13350	5.756	5175	17.249	6800	3.002	12950
1003	36,824	14300	2,864	4925	2.913	12500	12.372	4425	7.374	13100	9.872	4325	7.608	12800	20.653	6775	1.298	13725
1004	49,185	12500	3,417	13925	3.795	13875	10.970	8575	17.457	13975	6.437	4675	10.703	14000	24.464	4800	10.199	13975
1007	38,263	14300	3,717	10750	3.497	12950	18.400	8525	5.579	6000	10.441	10750	5.817	13275	24.929	8625	8.339	5325
1008	53,444	11900	4,913	14000	4.569	13150	18.184	11875	19.404	13000	11.210	11875	14.587	13225	30.520	11875	11.647	5825
1009	58,873	12975	4,389	8275	6.191	13850	16.352	13100	20.573	13975	17.332	13100	13.132	13975	28.540	8925	10.180	13950
1010	50,205	13375	4,258	13375	6.679	13625	18.138	8900	19,666	14000	10.319	13150	19.300	13775	32.497	8900	8.809	13775
1012	44,488	13225	3,811	13800	3.021	12675	11.938	13225	6,443	5575	8.896	12500	9.230	13575	19.543	8500	11.791	5575
1013	44,960	12925	4,747	12500	2.755	13875	13.000	6325	4.995	10800	8.338	12900	4.874	12300	17.664	8300	16.473	4800
1014	43,869	12850	3,420	12300	4.269	12150	10.393	12700	9.686	13025	8.432	12075	7.396	12400	19.257	12825	9,501	14300
1015	38,491	11875	4,736	12700	4.459	12675	11.433	6575	7.093	13575	9.110	11100	6.672	12250	21.553	8275	11.792	4800
1016	23,437	13375	4,338	13525	3.664	13550	8.841	10650	9.007	14000	9.757	13950	11.194	13850	15.661	10650	14.447	4300
1017	17,838	12950	3,372	11325	4.142	13250	9.663	8050	9.547	10250	9.717	11300	12.459	13425	13.729	11525	10.412	11200
1018	16,691	12975	4,432	10700	5.104	13250	11.507	11900	12.579	11975	12.286	10975	10.537	13300	19.055	12700	13.383	10100
1019	23,255	12100	4,302	8725	3.417	12525	15.983	8000	16.083	7975	9.927	7975	10.338	12950	28.256	10025	17.424	13050
1020	30.405	11575	4,187	6475	4,695	12525	14.906	6600	10.902	13225	9.995	6350	9,558	12825	19.259	11625	5.989	14300
1022	39,402	13350	2,995	13475	4.661	4500	13.988	9750	11.354	4625	7.242	9150	9.589	4625	23.734	11750	11.154	6625
1023	43,339	13725	3,263	13300	5.826	13650	12.731	10400	8.119	14000	7.331	13825	11.129	13700	20.544	10625	7.280	14300
1024	56,885	12100	3,662	8550	5.352	13700	13.772	11975	11.655	13950	7.860	6650	10.255	13975	22.461	11475	7.535	13975
1025	58.718	13375	5,762	13575	5.255	13803	16.728	11250	14.181	13800	9.416	11050	11.530	13575	24.430	12750	6.194	14300
1026	41,639	13150	3.705	12500	7.433	13600	9.101	4020	11.192	10775	5.926	4850	6.644	10250	19.868	6675	17.489	10575
1027	45,972	12750	4,859	12750	4.849	13700	12.429	11200	12.479	11250	7.819	12850	7.799	13700	26.770	7925	9.804	11700
1028	39,728	11950	3,372	12150	6.221	12275	9.299	4175	9.189	10175	7.236	4525	8.640	4575	16.177	9750	8.208	11900
1029	33,739	11750	3,781	12800	4.876	12200	8.914	12900	5.085	12275	7.341	4900	6,571	12475	15.512	10975	6.489	4675
1030	32.710	13575	3,284	13525	3.467	11175	9.368	4100	3.867	12400	6.379	11525	4.967	12050	17.460	4600	3.000	4675
1031	41,804	11850	11,169	12300	13.142	12700	17.762	11900	22.027	12850	10.814	12600	15.221	12275	20.195	11875	11,831	13300
1032	44,267	11975	4,128	13525	5.608	12000	14.542	14200	14.253	13075	9,482	13275	12.441	12275	17.109	11875	5.957	13200
1033	43,491	11700	4,543	11725	5.724	11800	17.917	4650	12.236	12275	11.542	13775	11.421	12375	21.133	6675	3.000	13200
1034	40,913	13500	4,740	13750	4.573	13675	15.134	4800	14.513	12125	8.436	4000	8.787	11550	17.317	9875	13.441	14300
1035	40,115	13450	3,660	13850	2.801	13225	8.384	4725	6.815	10675	9.415	11075	4.884	13825	16.745	13700	6.281	4275
1036	40,598	13525	4,736	14625	3.501	12975	11.725	13675	7.938	13475	8.216	10675	7.134	11075	16.475	6750	4.375	4125
1037	44.276	12325	3.803	6350	4.349	11100	11.451	6575	6.729	13475	7.562	6550	5.760	11700	18.792	9150	3.483	13725
1038	46,154	11200	4,345	13725	3.767	11525	12.349	6350	11.215	12200	7.249	6350	6.733	11825	17.726	8325	6.739	14200
1039	44,363	11225	9,132	13525	5.242	13525	11.911	11300	11.300	12300	9.609	11300	7.879	12100	17.363	9550	4.370	13525
1040	45,212	13325	7,466	9300	5.869	9200	13.786	10200	12.204	12550	10.195	9600	7.139	11950	15.377	9625	3.000	13525
1041	46,707	13375	4,776	13500	4.496	11225	11.813	11125	14.610	12125	8.579	13950	7.983	11000	15.697	11450	3.000	13525
1042	47.956	12575	3,741	12775	4.967	13925	13.486	11025	14.670	12250	9.615	14000	7.417	11750	17.128	11275	3.000	13525
1043	40,470	13575	3,502	13300	3.781	14000	14.814	12575	16,638	12475	8.332	12475	8.637	14000	21.411	10250	11,442	13250
1045	53,365	12500	3,975	12150	4.481	13925	16.327	12225	13.202	13925	8.609	11650	6.052	13000	18.471	10700	1.309	13575
1047	54,841	12700	1,927	11925	4.189	12250	14.762	12500	8.242	13875	9.975	12000	6.044	13300	18.611	9250	3.000	13575
1048	56,594	12900	5,270	11875	4.551	10550	14.307	12375	10.133	13950	10.793	12850	7.690	13350	20.956	8575	2,370	11400
1049	59,537	13100	5,371	11775	5.968	13200	15.228	12500	10.821	13625	12.231	12050	7,713	12850	17.264	13100	3.000	11400
1050	58,075	12375	5,656	12575	5.859	12750	15.954	8775	13.720	13025	10.549	8775	11.732	12750	27.191	10825	12.547	13725
1051	55,439	13925	5,916	13325	6.077	11300	22.294	7375	7.098	325	13.780	7000	14.305	13400	27.506	9100	4.219	10450
1052	47,303	14000	3,910	13725	5,629	9700	12.653	10250	12.151	10525	7.757	7425	10.581	9925	19.047	12250	19.974	12500
1053	47,581	9250	3,926	12925	6.124	13650	12.467	6975	11.634	11100	6.819	8650	6.391	13850	21.760	13375	20.210	13400
1054	56,853	11950	4,627	12550	5.916	12300	15.839	8325	13.465	13500	10.487	13225	12,570	12900	25.621	11475	6,370	14200
1055	55,287	11525	4,759	6825	4.930	12950	13.618	6600	5.674	9625	9.286	6025	5.910	8425	20.352	7325	4.296	14000
1057	62.345	11250	4,738	6575	8.328	12900	18.541	12500	14.574	13325	9.216	11250	12.417	12900	26.318	12900	23.013	13700
1058	69.512	11525	4,143	12750	4.813	12975	13.995	10500	14.759	13500	7.639	10275	8.650	13275	27.295	11000	19.799	13975
1059	55,700	10525	5,853	12525	4.565	14000	15.265	4807	20.638	14200	10.351	4000	10.489	14000	29.853	10325	21.870	13425
1061	37,404	13150	3,458	11375	5.317	10650	17.483	8375	11.780	7775	10.439	7775	10.844	9775	26.768	10100	1.633	6350
1063	32,004	13275	4,737	11300	4.350	11125	13.597	13275	11.779	12125	7.165	13150	9.492	11525	22.344	6700	10.181	4750
1064	36,122	12175	5,360	12875	4.217	12550	12.425	14000	23.566	13200	12.957	12175	11.987	12750	27.867	13975	20.247	14000
1065	33,005	13900	3,700	12275	3.859	12875	16.878	13575	10.126	12175	6.696	12520	11.857	12675	10.810	11650	9.320	4525

PROF NO	MAXIMUM WIND M/SEC	MAXIMUM WIND METER	+100M SHEAR M/SEC	+100M SHEAR METER	-100M SHEAR M/SEC	-100M SHEAR METER	+1000M SHEAR M/SEC	+1000M SHEAR METER	-1000M SHEAR M/SEC	-1000M SHEAR METER	+400M SHEAR M/SEC	+400M SHEAR METER	-400M SHEAR M/SEC	-400M SHEAR METER	+1000M SHEAR M/SEC	+1000M SHEAR METER	-1000M SHEAR M/SEC	-1000M SHEAR METER
798	10.990	14300	2,512	5575	2.665	6950	5.912	13050	5.703	4250	4.596	11800	4.191	4025	8.858	14800	6.516	9500
799	11.249	11850	3,090	11500	3.744	7300	8.779	11850	6.928	12975	6.666	11025	5.383	12475	9.991	11825	8.194	6550
800	13.309	13975	3,761	13525	2.827	13400	12.019	13950	12.202	13625	9.417	13675	8.210	13575	12.705	13950	8.510	8350
801	14,486	12350	4,522	14000	2.430	10250	10.533	12325	10.536	13700	7.799	11875	5.307	10475	11.004	8300	8.990	7800
802	12.396	11950	2,753	14000	2.439	13725	8.178	13900	8.095	13850	6.230	11850	4.093	13725	8.510	8825	8,691	7975
804	12.938	11725	2,585	13575	3.900	12950	6.030	11650	10.005	13850	5.540	11575	8.102	13925	11.558	11850	9.031	7700
805	15,860	12350	3,493	13525	3.950	13875	7.502	10000	7,838	13525	5.421	9925	5.630	13625	12.469	9975	9.211	8900
809	15,609	5325	2,896	12450	2.988	12325	11.030	13575	13,410	13025	7,996	13025	7.680	12625	14.402	13575	9,549	8275
815	16.038	8425	2,771	10275	3.163	12975	9.505	10275	11.966	9575	7.021	8325	8.310	13225	13.050	8500	16.696	11350
816	10.295	4550	2,155	12375	2.504	9175	8.137	9600	7.562	13850	5.793	9475	4.957	13325	9.923	12600	11.749	9575
817	15,380	7575	2,235	9175	2.645	8150	5.148	11350	7.001	8650	4.985	13750	6.009	8175	6.921	8075	13.350	12500
820	17.492	4500	2,410	12375	2.461	10675	6.564	13050	10.970	10725	5.558	12475	5.710	10350	7.741	13750	12.600	12100
822	22,346	12550	3,220	7375	3.096	13800	8.161	8275	9.624	13800	5.740	10000	6.654	9950	12.796	10225	5.979	5525
823	17.174	13500	3,367	12325	2.625	4675	8.833	13850	8.805	13900	6.100	10675	4.697	7100	17.437	12850	7.172	5200
825	17.810	12225	2,500	8500	2.340	10075	12.614	10950	6.399	5800	7.367	10350	7.383	10325	10.477	11750	8.371	6875
826	20.466	11100	2,604	10350	2.491	6225	10.219	10525	7.979	6775	6.147	10125	6.606	6225	19.118	10700	11.084	8700
827	23.305	10375	3,104	9550	2.830	6200	12.980	10375	8.607	5125	8.470	10175	6.526	13475	17.526	10350	13.079	7350
828	23.003	10525	2,613	9775	2.636	13600	13.478	10675	9.685	8225	7.103	10075	7.348	13600	17.640	11400	15.481	13175
829	22,059	10525	4,027	9350	2.313	13700	13.046	10025	5.237	7250	10.505	10075	5.005	9575	15.011	10450	9.492	13875
830	18,506	9550	2,685	8175	2.495	13150	7.384	9525	7.304	13725	5.234	8425	7.006	13150	13.000	9575	10.922	12725
831	9.110	11400	2,568	13725	2.948	13875	10.279	12950	11.219	12825	6.792	13675	6.840	13450	12.323	13025	12.441	13350
832	8.046	5700	2.901	11925	2.893	4725	6.000	10400	8.002	6700	4.663	11650	6.145	8975	13.027	10900	12.557	10975
833	8.472	5550	2,776	13775	2.684	13925	8.964	9800	9.395	12900	8.743	11800	6.373	11600	11.421	10700	12.346	10500
834	11,526	6975	3,558	13350	5.171	13175	7.148	4000	13.437	8325	7.831	13575	11.691	13450	9.583	4000	13.764	9875
835	12,720	9125	2,120	8500	4.220	13900	9.425	9125	9.120	10100	6.444	13900	6.831	13950	11.006	13825	12.987	12225
836	14.750	12775	3,024	13150	3.176	13125	9.902	13975	9.782	13950	5.627	13350	5.617	13275	8.934	11325	8.440	4950
839	13.120	11550	2.246	13700	2.609	11725	7.590	11350	7.919	12525	5.180	13975	6.178	11975	12.440	11350	6.427	7275
841	17,584	13525	2,130	11275	2,571	12700	6.623	10500	7.309	4225	5.192	12325	4.661	12625	13.100	12425	11,169	4200
844	16,185	13350	3,231	8325	3.564	13675	10.937	8725	5,122	5650	6.521	8325	8,348	7725	10.550	7050	8,059	4300
845	15,397	12350	2,724	6300	1.954	14000	7.788	11675	6,924	14000	4,742	6175	4,680	9825	8.641	8400	6,272	4300
846	19,191	13400	3,624	4300	2.527	5250	11,603	4050	8,204	8250	6.468	4050	7,005	8250	16,201	6125	5,741	10250
847	28,742	11375	2,820	4350	2,813	4325	6.595	8225	3.352	5775	5.926	4500	3,783	13825	11,618	10350	2,119	14300
848	15,545	7225	2,363	13725	2,462	6225	7.395	13925	6,324	7875	5,598	8275	4,391	9575	8.147	6050	5,681	9625
849	16,813	11575	2,502	13725	2,508	13250	10.706	13725	9,460	13775	5.668	13950	5,837	13500	9.822	6050	4,739	9200
850	18,302	11525	1,925	9325	3,241	13275	6,457	13425	6,656	13375	4,856	13400	4,950	13350	11,996	11725	7,547	11250
851	29.510	12500	4,215	5575	4.887	12750	15.386	12600	17,228	12775	8.519	12550	10.993	13000	23.725	13825	24.824	13450
852	19,605	8525	1,979	4125	2.590	11750	10.612	4150	7,963	12050	5,543	4150	5,006	11900	17,267	6350	4,830	12850
855	10,317	13200	2,164	11500	2,129	11350	4.535	13500	5,349	12175	3.439	13350	5.504	11600	8.670	4425	4.807	11800
856	20,300	7450	1,864	13550	2,419	8350	6.750	4525	5,575	12350	4.167	13950	3,970	8600	9,453	5925	6,898	13550
858	27,291	14300	2,631	13250	2.969	12600	14.015	13575	16.690	13450	7.932	14000	8.271	12775	13.129	12050	9.815	13400
859	17,182	13975	4,528	13975	4.220	13900	11.766	14000	7,223	9575	7.050	14000	3.735	11025	13.109	14000	8.277	11225
860	20.588	13550	2,389	11500	2.257	8825	6.699	11525	4.835	9375	3.575	4525	4.366	8925	8.977	4600	6.375	9700
861	28,545	13300	2,927	11525	2,509	7000	7.298	9925	5,637	6675	6,355	13425	6.164	13475	10.999	5150	1,842	13775
862	28,586	6775	9,529	6775	8,979	6875	9.286	6775	5,993	7775	9.524	6775	6.153	7175	12.161	4050	4.805	9775
863	31.714	10275	5,397	13450	5.366	13400	7.005	12700	11.251	13850	8.703	13700	11.218	13625	12.398	7200	9.159	13350
864	36,829	13175	2,599	7500	1.842	11575	7.266	10700	4.902	12675	5.190	10700	4.737	9275	11.384	12200	8.300	13850
865	39,214	13275	3,663	9300	3.906	13625	13.620	9350	14,276	14000	7.006	9325	10.964	13850	22.737	10525	10.973	13500
866	39,572	13475	3,884	10150	5.122	14000	20.208	10250	14,587	14000	12.693	10250	13.548	14000	27.146	10975	15.147	14000
867	43.754	13700	5,346	13700	11.657	13800	10.786	13700	7.982	9775	11.134	13425	8.843	13800	26.118	13700	4.398	4800
868	39,524	12575	2,855	4375	2.237	13775	9.569	6475	8,194	13550	6.737	6500	4.448	4100	20.317	8725	7.555	4800
870	23,543	9500	2,246	13400	2.386	7125	6.831	13575	7.447	7850	3.948	13525	5.499	7325	10.078	4025	7.129	12125
871	31,525	13700	3,527	11475	2.048	13800	7.836	11500	7,999	12050	5.964	11550	4.752	11700	12.694	12275	8.590	6700
872	32,417	13300	2,746	12375	2.775	7625	10.137	10000	5,123	6450	7.128	12550	4.111	5825	16.297	10500	5.911	6850
873	15.190	12200	2,764	10275	3.354	4350	12.429	10675	9,232	5100	8.227	10525	8.389	4400	15.104	12200	10.489	9950
874	15,661	13625	2,410	13500	2.420	9275	8.490	11550	8,565	10400	6.549	12575	5,775	12525	11.172	9350	9.710	12475
875	27,581	7450	5,157	7450	5.586	7550	8.029	7450	10.025	8450	7.601	4375	7.835	7850	19.377	6500	14.081	10450
876	24,300	9300	2,421	8775	3.215	9850	9.894	4700	10.402	11600	5.931	10375	7.389	9925	16.154	6025	10.399	11975
877	26.604	9500	4,747	9500	3.984	9700	11.581	7950	13.563	12975	7.161	7950	7.387	12975	19.858	9875	25.664	13225
878	13,521	8900	2,973	8850	3.296	4975	12.087	5000	12.372	4975	6.345	7675	6.489	11700	11.364	9125	17.434	5800
879	13,970	14000	4,331	13700	2,960	6625	17.280	14000	9.171	9150	12.141	13725	8.069	13525	14.547	14000	12.700	11225
880	7.754	13325	2,282	8375	1.931	6600	5.923	7750	6.733	7500	4.331	7550	3.705	6900	9.195	8375	8.393	9525
881	10,935	14000	2,661	13525	3.639	9825	8.923	9675	5.694	6775	6.723	13825	4.641	10075	13.337	11675	6.137	6500
882	26,153	14300	3,250	8750	3.537	4675	9.125	9325	8.450	8900	6.177	8825	6.114	9725	13.853	4000	12.852	4275
883	22,343	13625	2,622	4625	2.266	6775	8.945	5075	4.852	9525	5.952	4600	5.069	4550	11.794	7200	5.363	6175
884	25,363	13575	2,478	7575	4.752	9975	9.514	7275	11.509	10850	6.278	8125	7.089	10225	19.046	9300	15.237	12850
885	35,264	14300	2,692	10400	3.224	13325	9.864	7250	6.518	6075	5.862	6625	6,353	13600	20.110	12550	10.035	6850
886	45,879	12275	3,752	5700	2.454	7175	12.650	12250	7.909	13425	6.884	11900	6.083	13150	22.103	12100	3.896	4375
888	33,967	13575	2,881	8900	2.123	13725	11.572	9375	5.157	5025	6.312	7625	3.982	4675	17.893	12325	8.615	5675
889	38,316	12450	2,763	12325	3.133	7725	12.928	12225	10.261	13825	8.875	12075	7.869	7850	24.778	12375	8.524	5950
890	38.141	12350	3,475	11150	4.558	6275	12.933	11675	14,180	6950	10.947	11250	10.702	6550	20.033	11675	17.860	4900
892	14.976	13625	2,825	13325	2.566	4150	9.928	9300	5.581	4200	8.205	13100	5.481	14000	16.149	11175	7.183	8375
893	15,559	13725	2,528	12425	2.903	5675	7.819	12950	6.354	6575	5,385	12750	4.221	8725	10.619	13750	10.381	7750
894	14.412	13975	3.049	11575	2.548	7275	11.493	13775	6.669	8725	5.863	5800	4.861	8600	12.343	5925	11.245	8775
895	16.673	6225	3,247	13525	2.726	6550	6.607	8050	9.485	11550	7.304	13875	6.738	6700	9.346	13875	10.709	12900
896	32.839	9975	2,727	8575	3.304	10375	8.180	9475	12.778	10975	5.125	6050	9.963	10475	16.541	9975	15.117	12950
897	32,897	11350	5,190	13275	3.805	12725	15.902	13475	10,786	13325	9,462	13250	10,420	13325	23,787	8975	18,005	13500
898	34,631	12850	2,765	9825	3.927	10450	11.112	8875	11,754	13100	6.411	8875	7.993	13675	23.027	9825	10.613	13100
899	27.156	11550	2,792	9525	3.632	12025	9.780	9525	8.664	12750	5.577	6500	6.827	12200	17.093	11425	7.842	14000
900	29.803	12275	2,035	4575	3.246	13950	7.300	6200	9,030	12975	4.394	9450	5.757	14000	14.853	11950	8.752	14000
901	32.308	12275	2,936	13575	3.518	12625	9.472	7175	9.766	13300	5.229	6600	9.371	12750	15.013	12275	6.359	14000
902	33.543	12200	2,235	9750	2.789	12325	8.659	10650	9.567	14000	4.915	10650	7.734	14000	16.563	12700	10.623	14200
905	36.345	12850	3.338	8525	3.041	13925	10.637	9175	7.845	13525	7.529	11325	6.821	13975	20.852	11425	5.476	14300
907	37.348	13350	2.694	8300	3.081	13850	11.735	10975	9.372	14000	6.938	10975	6.927	14000	22.766	11025	8.231	14000
908	43,892	12525	3,652	6725	3.116	12900	12.057	6900	12,171	13975	7.442	6925	7,909	13975	19.864	11300	8.253	13575
909	45,704	12525	3,301	6250	2.838	13900	11.391	10475	9.365	13750	6.287	9975	5.088	13600	18.048	12625	10.163	13925
910	48.110	12150	3.216	6850	2.386	13275	15.418	12625	11.836	13850	8.764	11625	6.906	13475	20.399	12025	8.008	13825
911	46,406	12375	4,571	13975	3.385	13925	9.473	10725	12,049	14000	7.380	8600	7,237	8100	17.469	12850	16,810	14000
912	47.629	12900	5,867	13700	4.284	13475	11.018	13000	15.411	13875	9.705	12925	8,890	13925	19.107	13700	16.759	13000
913	46.026	12700	3,866	13525	4.425	14000	14.027	12850	14,031	13975	7.874	9650	7.213	14000	16.994	5550	18.059	13525
915	44,842	12150	4,128	11350	3.917	13300	13,516	12150	11,020	13650	8.289	9000	8.602	13800	20,820	5800	17.164	13550
917	58.906	11575	3,666	8375	5.380	12275	12.366	4875	16.160	13700	9.858	4450	9.286	13330	21.106	4475	20.472	13775
919	39.995	11250	3,399	9825	2.960	12775	14.758	9725	11.373	14000	8.554	9250	6.523	13225	23.618	11225	15.527	14000
920	46.617	11350	3,868	11325	4.013	13525	19.379	8350	10.902	14000	10.282	10625	8.472	10725	34.429	10425	14.599	13550
921	40.929	13975	3,883	13375	2.730	13225	10.162	11225	7.808	13675	7.151	14000	6.816	13625	18.334	5350	3.808	13850
922	54.591	12150	3,714	6525	3.158	13425	15.438	9800	10.951	13750	8.893	6750	7.746	7475	32.716	9825	8.910	13525
923	64.776	12200	4,458	11575	5.490	12850	13.675	8175	14.179	13350	9.404	11675	8.681	13000	28.928	10450	8.009	13525
924	64.183	13200	3,661	11425	4.014	13325	11.785	9675	11.782	7325	7.636	11425	6.069	6825	30.892	10275	8.080	13525
926	58.618	12725	3,356	10925	3.999	13350	17.232	11325	16.577	13000	7.989	10975	10.531	13500	31.553	11700	6.291	14300
927	39.872	12350	3,528	9975	2.808	10850	10.888	11325	4.503	13925	8.361	11175	6.172	10950	18.651	8750	20.777	4700
928	31.287	12975	3,232	7250	2.398	13875	8.208	4575	7.459	13875	5.556	4475	5.218	13875	15.169	10150	20.985	4675

APPENDIX I (Cont.)

PROF NO	MAXIMUM WIND M/SEC	METER	+100M SHEAR M/SEC	METER	-100M SHEAR M/SEC	METER	+1000M SHEAR M/SEC	METER	-1000M SHEAR M/SEC	METER	+400M SHEAR M/SEC	METER	-400M SHEAR M/SEC	METER	+1000M SHEAR M/SEC	METER	-1000M SHEAR M/SEC	METER
674	29,387	11725	2,395	12925	3.073	13875	7.919	5050	10.444	13900	4.395	9775	6.931	13950	14.297	11700	8.142	14000
675	27,937	13425	4,442	13425	5.642	13725	12.326	12375	13.715	13975	8.743	13475	16.255	13625	16.982	13450	10.438	13675
676	29,964	12425	3,042	13000	5.153	12775	14.238	10150	14.829	10325	8.772	10150	11.712	12950	22.303	13100	3.845	4400
677	22,412	13300	3,555	13900	3.688	13450	8.783	12325	6.977	13975	6.702	6825	7.405	13700	15.376	13300	12.556	4825
679	25,390	13550	4,737	13550	3.135	13700	13.999	12450	7.649	8675	8.168	12375	6.659	13825	15.672	13675	12.219	10375
680	21,567	13475	4,809	13425	2.413	7950	12.050	13850	7.182	8100	11.399	13450	5.506	12750	12.464	11050	10.729	11500
681	24,111	13975	3,783	13850	3.384	14000	8.437	10400	7.010	9450	8.831	13950	5.273	5275	10.858	7375	11.772	4900
682	20,830	11975	2,897	6375	4.157	5975	10.470	10275	12.502	6775	7.606	9700	10.634	6150	20.495	8600	12.338	13500
683	30,417	12950	3,217	12950	6.112	13500	18.592	12675	19.457	13950	9.855	12225	14.699	13750	25.361	12950	9.506	6350
684	24,357	13600	2,911	6875	2.470	14200	9.237	9725	6.689	10725	6.016	6300	5.671	10750	17.272	13725	10.282	12675
685	20,574	9575	3,174	13775	3.193	13225	13.876	13875	14.201	14000	8.095	13300	7.753	13450	17.063	13850	18.357	14000
686	26,370	11300	3,989	13350	3.327	12725	10.216	9050	12.445	12900	8.260	12625	9.421	12750	19.536	9000	24.508	14200
687	19,278	13475	3,999	12250	3.239	12525	10.256	12425	6.410	10425	7.657	12800	6.869	13525	11.922	13475	6.704	6700
688	22,248	12200	2,909	13725	3.432	12325	4.789	7850	7.777	13125	4.870	7275	6.799	12550	8.410	9875	10.793	13500
689	20,567	12475	4,553	12775	4.781	12725	9.895	12925	13.706	13300	6.272	12375	11.979	12850	12.370	6425	10.456	10800
690	30,407	10775	3,768	13450	4.589	11875	12.891	13750	20.878	12300	9.756	13475	13.507	12000	21.035	10200	35.627	13775
691	24,574	13225	3,699	12775	3.879	13475	7.687	13350	8.222	14000	7.004	12775	7.504	13600	11.256	7625	5.194	11000
692	25,382	11350	5,169	11350	4.482	13250	9.585	12675	6.965	13750	8.413	13050	9.471	12600	13.562	7050	7.426	13300
693	23,776	13975	3,682	13475	3.094	13325	9.944	5750	8.569	12725	11.253	13650	9.344	13575	17.047	6050	7.895	9325
694	26,579	13975	5,762	13300	5.892	5100	12.715	13975	13.323	4300	11.952	14200	7.573	5300	17.569	13975	9.117	13750
695	40,169	13100	5,424	12900	6.395	13225	24.932	13000	23.823	14000	15.753	13025	19.966	13500	24.640	13000	10.712	14000
696	39,249	13275	4,123	13250	5.474	13850	17.664	13275	15.731	14000	10.474	13275	15.147	13950	22.066	13275	6.651	14000
697	37,874	13475	4,282	13425	5.521	13975	19.626	13450	13.208	14000	9.560	13475	15.668	13975	24.709	13450	8.134	8550
699	56,997	12775	4,386	11425	4.364	13975	18.861	11325	18.238	14000	9.773	11025	10.284	14000	34.513	11150	13.598	14000
703	47,225	12775	4,098	13500	6.650	13750	21.330	12350	16.154	10725	10.348	11950	12.606	13900	45.252	12800	13.014	4000
704	54,245	13550	3,667	11425	4.788	13900	24.504	11925	10.316	14000	10.346	11325	11.177	14000	41.576	11950	16.749	4250
705	37,867	13525	2,713	12375	2.606	7475	12.658	12675	6.752	9450	5.941	12675	4.285	14000	19.782	13525	13.290	4950
707	36,621	13700	3,529	13550	4.252	14000	13.419	13700	7.765	6475	10.693	13700	4.517	11350	17.988	13700	9.635	4300
708	39,890	12925	5,513	11325	3.869	11625	15.912	12375	5.793	11275	8.086	11800	4.987	4925	24.458	10300	14.732	4250
711	53,422	13275	5,544	10775	4.297	13925	22.251	10625	20.608	13975	14.401	10775	13.359	13975	40.063	11300	18.907	13975
712	52,246	13350	4,847	9225	3.308	13825	18.545	9725	15.399	14000	9.265	9500	9.257	14000	39.044	11375	14.812	5925
713	49,923	12775	4,232	10700	3.596	13975	18.060	10750	16.788	14000	11.377	10750	10.001	13975	35.705	10725	21.731	13975
715	38,907	13950	4,443	9100	4.038	4175	16.595	9900	9.252	4825	10.839	9375	7.737	4300	32.139	10275	14.222	7400
717	28,715	6525	2,505	5425	3.309	9825	7.496	13525	7.249	11900	5.592	13275	6.599	13975	8.527	4175	8.804	13875
718	16,702	4000	3,153	12975	3.465	11125	6.740	12450	10.155	10725	6.164	11825	5.300	10125	10.097	13975	16.111	10975
719	20,807	13250	2,692	11200	2.733	13900	12.006	11375	7.804	14000	7.035	11225	6.361	14000	15.633	13250	8.389	7375
720	31,815	13125	2,626	4475	5.410	13750	10.750	13100	18.057	14000	5.822	13100	15.140	14000	22.091	13125	6.945	13500
721	20,901	12525	3,166	9400	2.355	9600	11.559	9725	6.333	4425	6.646	9375	4.668	7625	16.926	10200	7.764	6500
722	17,762	13525	4,593	13525	3.962	14200	10.045	13825	6.570	6325	12.816	13825	7.619	13925	11.638	11250	8.721	8350
723	17,856	10400	2,160	4275	4.781	13750	9.685	13650	9.164	4000	5.675	13625	8.622	14000	17.786	10400	13.596	14300
724	15,167	11500	3,879	13950	3.279	13975	7.637	8000	12.587	14000	6.266	13925	8.225	14000	13.658	11525	17.249	14000
725	23,585	13725	3,484	12700	4.628	13925	12.793	13375	7.476	9375	7.491	13175	7.447	14000	19.873	13775	5.344	8975
726	11,774	12925	3,460	4800	3,368	13900	11.835	4500	11,619	13800	8.921	4000	7.629	13775	13.271	12925	14.066	5750
727	18,812	12525	2,926	4725	3.905	13800	6.297	9875	9.190	13950	6.875	4225	9.624	13825	13.290	9650	9.941	8225
728	10,183	13975	3,469	13475	3.389	12550	6.606	13975	4.953	8625	5.750	13950	4.935	6950	10.060	14000	9.408	4450
729	15,260	13350	2,389	13100	2.184	13475	8.144	13175	8,628	12225	4.593	11850	5.530	13775	9.522	9450	9.761	8150
730	31,752	12475	2,767	10325	2.558	13900	13.503	10525	11.072	13975	7.738	10500	5,887	13550	25.439	10950	13.951	8550
731	28,367	11700	3,066	11575	3.359	13575	15.436	11625	10,847	13575	7.577	11000	7.617	13775	25.175	11925	8.071	4825
733	39,284	13400	3,357	13200	4.128	13975	13.962	13500	13.129	13925	9.163	13350	14.051	13925	27.990	13425	15.577	13950
734	39,670	13975	3,762	13975	1.922	7600	16.080	9775	4.846	6600	8.018	9175	3.464	6350	25.707	10975	14.272	5100
735	30,652	13625	2,894	7575	1.932	8450	9.357	7875	9.041	11700	6.151	7875	4.775	11275	14.769	7875	10.836	4925
736	24,597	12250	3,204	8300	2.306	6900	11.972	9850	6.730	7650	10.601	9000	5.381	7050	16.521	10075	11.444	7100
737	25,882	12700	2,508	8100	2.445	13575	8.214	9900	9.786	13500	5.570	9500	5.445	13600	13.103	9850	8.708	7500
738	25,594	13450	2,399	11275	3.012	13775	7.333	10025	7.602	14000	5.426	9850	8.507	14000	11.137	11750	6.305	6325
739	24,944	6125	12,899	6125	12.064	6225	12.726	6125	13.480	7125	12.371	6125	13.089	6525	16.705	6125	10.451	9125
740	24,371	13450	3,014	4175	2.619	7700	6.720	12275	5.006	4650	4.564	4300	4.278	7750	14.969	13425	7.196	7850
741	24,954	12275	1,988	13550	2.616	5975	8.128	5500	6.618	13600	4.753	4900	4.350	12950	11.012	5300	5.861	10150
743	27,171	13525	3,217	13375	3.583	13925	7.376	13525	6.778	10175	8.256	13425	9.040	14000	11.878	13425	5.001	10200
744	20,878	7000	2,464	13975	3.002	13275	6.913	12125	4.218	13975	5.536	11975	7.465	13975	10.936	4825	6.193	9275
745	18,878	7325	3,339	13675	4.108	14000	8.051	13575	[illegible]	12400	9.815	13975	4.504	7725	11.361	4425	11.045	13550
746	19,151	6350	3,974	13350	3.284	13300	14.180	13750	6.999	11375	11.691	13550	5.167	13975	12.806	4725	10.951	11475
747	19,669	6275	3,715	13950	2.665	13725	9.871	13950	8.329	13900	6.523	11225	7.438	13925	4.991	4625	11.420	9575
748	19,537	14000	3,836	5150	2.911	5250	13.995	13875	5.522	6925	7.441	13775	6.320	12575	11.379	5150	10.043	9975
750	18,536	13125	3,820	8325	3.585	14000	7.830	12175	[illegible]	11525	4.965	12525	6.651	13650	9.640	13225	6.269	11125
751	16,412	4750	2,432	13325	3.735	13125	14.282	14000	12.094	12750	8.461	13350	10.660	12625	10.072	4750	9.249	8050
752	16,235	4500	3,088	13925	2.992	13475	9.096	13950	11.043	13425	7.559	13925	6.728	13675	9.391	4700	12.835	13275
753	17,891	13950	3,369	13525	2.225	5250	10.115	14000	[illegible]	10175	6.498	13925	4.385	9575	13.217	14000	6.550	12175
755	11,293	11950	3,471	14000	2.126	12125	4.583	10650	2.535	13900	5.364	14000	5.023	6275	7.132	11900	6.297	4150
756	9,315	11900	2,321	10325	2.410	13975	8.052	10925	[illegible]	12875	5.251	10925	4.966	14000	9.060	12775	8.491	12850
757	7,679	11575	1,998	8225	2.370	10125	7.972	11000	7.444	9700	3.726	9650	5.281	10400	10.327	4025	10.806	4300
759	45,356	13175	3,697	13150	4.528	13925	19.000	13175	6.925	14000	9.591	13100	10.756	14000	27.148	13200	5.453	9375
763	30,420	13900	5,524	6950	2.405	8575	14.441	7250	6.916	12750	9.320	7250	5.593	12775	19.448	7250	10.972	4550
764	19,920	12325	4,035	13850	4.679	13875	10.266	7700	7.005	4375	6.670	13775	5.247	13675	14.042	13700	8.042	11300
765	13.208	8775	3,241	6425	2.913	8950	9.339	9775	7.478	8375	5.754	8750	7.579	9200	13.573	8800	12.454	11775
767	13,377	8925	4,159	13775	3.767	10950	8.029	5925	17.459	11225	7.415	11225	7.630	11000	9.695	9075	15.701	11925
769	14,745	9575	5,251	6750	3.050	11400	12.416	12150	13.635	12475	9.279	7550	7.231	7125	10.780	10125	21.800	12575
770	25,516	13425	4,029	13375	3.294	4000	7.465	10575	7.511	4150	7.555	4925	6.522	4250	13.720	12550	7.019	4250
771	34,106	13275	3,125	11575	3.501	13900	17.378	12250	9.310	14000	10.957	11625	8.494	14000	24.002	12425	8.183	4650
772	18.219	13700	2,406	4325	3.679	12750	8.905	9325	10.375	10925	5.796	10850	6.090	10525	12.050	9325	6.155	5975
773	17,677	14000	2,547	13100	2.105	7925	10.817	11475	10.422	8575	5.826	13350	5.425	8175	15.643	11725	11.453	9350
774	26,526	13975	2,532	12150	2.475	9425	7.930	12600	5.699	9500	5.368	13975	4.481	6225	17.604	13975	9.989	7025
776	20.908	12750	3.775	6850	3.118	4250	9.434	13175	11.376	13825	7.896	13950	8.572	13450	13.395	12250	5.101	4700
777	28,868	13650	5,250	11000	4.361	10950	19.881	11600	21.498	12725	13.195	11875	12.724	11025	21.878	14000	17.355	11025
778	9,849	5500	1,726	4450	1.636	4700	4.030	11000	5.322	7475	2.623	10825	3.414	6250	5.564	12725	6.426	8275
779	10,092	5375	2,499	12375	3.124	5750	8.028	13675	6.313	6375	5.919	13075	4.413	9300	8.142	14000	7.951	8575
780	12,508	14000	5,666	13900	2.031	13125	16.741	13950	10.663	13800	9.387	13950	6.726	13400	11.557	13975	9.035	13375
781	16.912	13925	3,476	13100	2.603	11675	11.064	13875	6.053	12800	8.933	13250	4.991	11875	11.575	13900	8.711	12350
782	18.027	13950	2,716	12325	1.965	12950	8.780	13700	5.367	7225	6.516	13450	4.143	9500	12.417	13725	5.170	12100
783	25.926	13125	4.164	12775	3.017	13925	10.447	13100	4.727	4525	10.669	12850	4.794	14000	19.162	12850	6.713	7225
784	23,455	12975	5,504	10725	2.303	13875	10.673	11625	4.501	7275	2.910	11000	3.664	14000	10.440	12925	8.890	8225
786	11,465	10575	2,587	13475	4.045	13400	6.433	9100	10.935	13850	6.617	9150	10.520	13475	6.897	4100	14.316	13500
788	15,277	5100	2,013	13500	2.513	13275	6.731	4550	11.323	13775	6.238	13575	7.780	13400	10.824	14000	12.102	13575
789	17,329	6225	3,184	12550	3.034	11125	9.672	12650	9.237	13250	7.256	12650	5.755	12725	10.563	5925	8.390	10450
790	15,440	13525	2,821	13225	2.990	7200	7.987	13525	7.569	8975	7.121	13300	6.655	14000	15.920	13425	13.735	9925
791	16,422	12400	4,010	11950	3.484	12675	13.176	12400	16.390	13425	7.587	12000	10.005	12900	10.836	12400	10.099	13575
792	10,287	4725	2,113	10975	3.555	5650	9.530	14000	6.474	13775	5.970	13750	8.146	5150	9.124	11300	9.283	14000
793	11,069	11575	2,769	7400	2.172	13975	4.030	7550	7.440	13875	4.560	7275	7.364	13850	5.318	11900	9.651	14700
794	11,884	12925	4,424	13350	4.210	13525	5.616	5375	11.469	13050	7.739	13700	7.274	13625	9.418	11325	11.850	14000
796	6,524	5525	2,120	12200	2.900	5875	7.471	12925	4.800	8300	5.321	12325	3.737	8375	6.075	13125	7.781	9550
797	9,985	13450	2,487	8425	2.320	13975	6.661	12550	4.092	4250	4.411	8450	3.793	5325	7.325	13700	6.922	7975

PROF NO	MAXIMUM WIND M/SEC	METER	+100M SHEAR M/SEC	METER	-100M SHEAR M/SEC	METER	+1000M SHEAR M/SEC	METER	-1000M SHEAR M/SEC	METER	+400M SHEAR M/SEC	METER	-400M SHEAR M/SEC	METER	+1000M SHEAR M/SEC	METER	-1000M SHEAR M/SEC	METER
539	55.804	11125	3.657	12300	4.153	7425	15.439	9375	17.774	14000	9.381	9300	8.342	13625	26.085	11400	21.109	14000
540	58.279	11225	4.672	9525	4.807	13250	20.041	10000	18.685	13575	10.228	9575	11.626	13400	27.265	11275	23.921	13825
542	42.353	9500	3.424	7525	3.176	13950	12.901	6475	18.471	13300	8.606	7625	6.673	10500	27.872	8500	14.579	13350
543	49.897	11250	4.698	10575	3.707	12225	27.406	11025	13.899	12250	15.720	11000	9.844	12300	21.869	11025	17.916	14000
545	53.423	13700	5.447	8575	6.259	12675	26.425	11825	26.175	11000	10.917	11600	13.089	11275	33.853	13675	15.124	12675
547	57.368	12325	4.666	11550	6.228	11450	18.359	11250	11.402	12975	8.516	11900	9.966	11550	26.495	11275	15.909	4300
549	57.679	12950	3.729	11525	3.569	13650	15.703	11375	11.995	13975	10.610	11300	7.573	14000	22.317	11375	13.601	4725
550	56.428	13150	5.299	11575	4.000	13000	21.040	11000	17.614	14000	14.326	11700	10.670	13000	27.900	8475	15.953	6175
551	57.149	13725	4.855	12900	3.623	14000	16.256	11775	12.823	14000	9.374	13025	9.189	14000	34.964	13225	19.588	5700
552	58.556	13425	3.656	11525	4.699	13600	16.560	12000	13.462	14000	8.944	13425	10.490	13950	33.774	13375	12.317	4500
553	56.743	11100	3.437	10850	4.582	13900	23.551	10425	12.408	12625	11.118	10050	9.418	14000	34.742	11100	17.747	14000
554	62.595	11250	3.510	12225	5.544	12550	13.632	11275	14.798	13225	8.797	8575	9.874	11650	26.716	11175	21.503	14000
556	62.267	11350	3.622	13750	4.339	13975	13.865	10000	16.713	13400	7.623	10000	11.331	12625	25.769	10025	24.045	14000
558	38.927	8200	3.992	5700	3.382	12725	10.984	11175	14.175	13825	6.939	10575	8.701	13750	17.116	4375	15.045	11925
559	46.761	10175	3.251	11100	4.204	12325	11.006	5600	11.655	11000	8.701	10175	9.031	13950	21.850	5625	19.929	12725
560	33.832	11975	2.697	12900	2.518	13625	10.725	7425	8.486	8400	7.781	10025	7.278	7800	17.007	10400	13.192	13575
561	65.118	11225	5.412	10750	4.705	12625	19.320	11150	14.439	13400	12.686	10900	12.503	12825	32.962	11050	26.212	14000
562	63.971	11475	3.066	9450	4.081	13475	21.849	10000	13.495	13850	12.306	9600	10.839	13775	36.957	11375	16.364	14000
563	63.369	11525	4.385	9325	5.381	12500	22.432	9700	15.860	13950	13.999	9275	10.917	12550	36.216	10975	24.430	14000
564	51.808	11125	5.025	9200	3.171	11175	18.204	10100	10.209	13825	12.613	9450	7.558	11550	35.662	11125	13.094	4275
565	45.349	13575	4.151	11225	3.037	14000	13.523	5875	5.270	4125	7.645	11350	4.456	4100	22.280	10325	13.341	4325
566	32.674	13950	3.693	12750	3.569	13600	23.237	13200	8.120	5525	13.651	13000	7.355	12625	20.618	13225	8.212	11425
567	25.178	12320	2.677	13725	4.676	12475	8.919	12850	8.857	13175	6.961	12825	8.478	12700	12.973	9550	12.860	5550
568	34.233	12325	5.076	12475	2.695	12550	10.542	12750	4.287	13800	8.984	12925	6.024	13325	13.652	9975	4.891	4500
569	28.366	14000	5.324	12500	3.039	12100	12.787	12825	5.755	12450	8.409	12525	8.665	12375	12.835	9525	11.451	4450
570	32.964	13550	4.586	12775	3.825	13250	15.383	13150	7.206	14000	11.150	13150	7.945	13525	15.378	13500	2.120	11450
571	42.984	13775	9.778	13775	12.419	13875	13.635	12450	11.722	12350	12.657	13775	7.034	11925	17.808	14000	3.300	11450
572	37.637	13175	4.508	13725	4.259	13400	13.172	13250	10.278	14000	7.898	12750	10.286	13575	15.426	9650	7.981	13425
573	71.464	11925	4.469	11900	5.798	13700	28.475	11900	25.009	13700	12.639	11875	13.182	13750	46.502	11975	21.156	14000
574	68.128	12100	5.327	13550	5.613	13775	15.168	11525	26.465	13850	13.300	14000	14.198	13150	31.822	12300	22.915	14000
575	61.749	12375	4.119	12225	5.318	12600	15.518	12350	23.197	13450	9.506	12225	15.960	12875	27.631	12450	15.363	14000
576	61.714	13125	4.299	9925	3.460	12150	16.339	9950	13.301	13825	10.503	9950	6.463	13300	31.831	10800	8.473	13325
577	70.966	11900	4.822	13500	7.234	13050	10.528	13950	14.324	12950	11.810	13350	9.278	12700	23.894	4025	11.033	13500
581	74.432	11200	4.857	13250	7.164	12525	16.992	10425	16.882	12950	10.412	4850	10.550	12900	32.863	10925	17.111	13500
582	81.864	11450	4.947	11400	5.323	11675	21.856	11425	22.872	12500	13.265	11425	13.960	11875	33.628	11450	15.695	14000
583	82.924	11925	4.519	11300	8.534	12975	22.783	11600	20.137	12925	11.175	11275	17.335	12325	33.419	11625	21.022	14000
584	65.778	13025	5.213	12400	5.737	14000	12.643	5225	12.310	13900	11.698	12925	11.996	13350	22.975	5825	0.000	14000
585	59.703	11775	3.902	12575	3.375	8675	14.723	11450	9.580	12675	9.614	11425	7.085	12025	27.112	11900	0.000	14000
586	63.645	12525	5.768	11725	3.859	13300	14.025	12000	20.266	6850	11.461	11925	9.158	6250	27.553	12550	0.000	14000
587	62.333	13575	5.044	11450	5.300	13775	21.476	4825	21.132	5925	14.367	11625	11.588	5200	29.029	4800	21.022	7900
588	62.475	13575	4.883	5550	3.095	12075	20.497	11150	7.035	12825	11.508	5625	7.473	13950	27.512	11150	0.000	7500
591	72.674	12250	7.855	13550	6.338	13425	19.060	8025	13.770	13775	13.697	7400	15.573	13650	32.154	9150	13.667	13650
593	74.783	10975	5.940	13325	4.445	12300	27.844	8975	15.168	13725	13.384	8425	10.293	13200	37.855	10700	15.055	13475
594	66.484	12975	4.129	6775	5.148	11325	16.396	6775	16.973	13975	10.968	6775	11.819	13425	32.286	8900	10.524	13325
595	67.248	12500	4.110	6300	7.308	13475	19.816	6650	21.033	13875	12.676	6550	12.688	13500	30.497	12825	7.709	14000
599	72.754	11175	5.729	11825	5.935	12400	17.952	7825	7.942	12400	13.398	7700	6.091	12400	28.247	11175	4.342	13700
600	70.300	12825	4.300	10725	4.084	12750	22.365	11175	10.613	13650	11.684	10900	7.269	13375	36.458	11950	3.000	13700
602	55.210	13175	4.118	6925	3.968	14000	14.113	12975	8.835	8525	8.571	5300	7.356	14000	26.372	13175	16.267	9175
603	53.914	12950	3.986	12750	3.429	9275	17.917	12950	11.835	9525	11.285	12875	7.914	13975	22.637	13350	21.198	9350
604	55.230	13100	5.931	13100	5.273	13200	17.664	13100	12.274	7600	14.095	13100	10.447	13500	26.009	13100	10.622	8925
605	57.819	13350	5.444	13325	8.273	13900	17.521	13700	21.111	13975	11.440	13550	17.713	14000	26.900	13375	13.098	8900
607	54.940	11425	3.914	13500	4.968	13575	19.184	4725	14.071	13500	9.148	4500	11.151	13575	31.107	6575	16.061	9550
608	55.469	12925	5.662	6575	3.410	12725	18.244	5100	13.262	13625	11.272	6925	8.516	13150	29.722	5225	11.800	13950
609	55.550	12850	5.294	6500	7.004	13100	17.265	13100	17.380	14000	12.301	6650	13.081	13100	26.035	6175	22.231	14000
610	56.446	13200	4.462	5450	3.637	13700	18.261	5825	16.526	14000	10.097	5775	9.721	13925	30.964	5875	10.970	13925
611	58.723	12900	7.206	12900	6.038	12950	17.894	13525	19.563	13950	11.644	12900	12.618	13350	27.338	6075	21.384	14000
612	55.432	12925	7.071	5525	7.299	5625	19.208	5525	16.458	13950	15.172	5525	11.327	13925	28.625	5525	15.189	14000
613	59.192	11975	4.249	5575	6.787	13675	15.181	6225	9.673	14000	9.620	6125	9.375	13975	23.853	8825	10.097	13950
622	67.895	12025	5.422	13125	5.324	13775	32.661	13425	33.528	13325	15.106	13150	15.538	12675	36.716	12150	20.418	12700
623	59.951	12575	4.600	13950	5.808	13225	22.886	13825	25.470	13625	11.390	13450	15.433	13225	25.687	4675	8.706	12900
624	61.266	11975	4.810	12175	6.810	13075	15.192	13875	22.300	13575	10.979	13475	14.479	13250	23.105	7500	10.604	12975
625	61.860	12575	4.657	13275	5.372	12850	15.384	13950	23.438	13575	10.761	13575	16.315	13350	26.438	5025	9.539	13325
626	63.372	11725	4.464	10475	5.668	12500	10.574	11200	11.029	13275	8.538	7950	11.154	12700	23.566	8925	10.130	13925
627	63.277	12100	4.241	12550	3.874	13350	10.085	9325	10.894	13650	10.537	9000	7.911	13375	27.217	9250	8.290	13175
628	63.306	12125	4.097	8350	4.129	12775	15.136	9575	9.931	13075	10.675	8950	7.541	13475	27.171	7075	6.992	14000
629	63.023	11475	5.304	6900	4.306	13950	15.306	9475	8.867	13675	11.636	8925	9.030	13325	27.668	5675	8.777	14000
630	69.170	11625	11.296	11525	8.539	11725	10.522	9025	11.990	12625	12.603	8625	9.574	12025	29.114	5900	7.704	14000
631	63.015	11500	4.822	11550	3.013	12175	17.097	9200	8.734	12850	10.409	8900	6.762	12450	29.000	11550	6.338	13725
632	62.347	11450	3.934	11300	4.106	13625	15.175	9550	10.703	12900	11.241	9025	8.012	13050	30.432	11450	9.690	13950
633	64.696	11975	4.960	13425	4.536	12750	17.312	9650	13.516	13050	11.576	8975	11.249	13800	30.440	11375	10.047	13975
634	66.412	11550	5.207	11125	7.945	13650	23.164	11525	9.924	12950	14.223	11250	16.676	13900	33.531	11500	11.751	14000
635	63.629	11225	5.036	11100	4.011	13800	20.975	11125	11.054	12750	15.152	11125	9.601	13525	36.451	11225	9.504	14000
636	41.974	13050	5.230	13750	7.017	13150	14.976	12600	7.705	13100	10.122	12475	9.858	12525	23.125	13050	12.265	4125
637	40.577	13200	5.368	10900	4.677	13350	15.032	10900	19.475	13950	13.693	10900	13.491	13350	25.405	11825	16.377	13900
638	37.745	12725	4.900	11150	4.319	11725	14.595	11250	10.717	13925	9.983	11225	9.290	13600	24.246	11350	10.224	4375
639	39.049	12900	3.627	12200	3.432	11875	10.266	9900	11.369	13800	6.548	12375	9.473	13475	10.257	11300	12.439	13950
640	41.207	13450	3.655	11400	3.479	11625	13.326	12625	11.696	13750	9.453	12750	8.079	13750	10.566	13425	0.000	13950
641	39.874	12925	3.057	4700	3.857	13275	10.934	5475	9.471	4350	9.255	4925	12.711	13325	19.078	12625	0.000	13950
642	45.045	13900	4.951	5500	4.781	7050	12.978	9200	11.172	13175	7.348	5700	8.704	6200	19.846	4425	5.752	8100
643	58.700	12400	4.291	13150	5.396	13400	16.974	12250	17.683	13425	9.001	11725	10.409	12950	29.541	12200	5.480	14000
646	35.139	13925	3.614	12500	4.420	12925	21.000	12725	8.037	9925	10.346	12750	6.925	14000	27.577	12000	13.530	4125
649	19.756	13175	3.769	12450	3.257	13675	12.302	12025	10.003	6400	9.895	12775	9.537	12800	22.309	13175	11.920	6625
652	31.740	13025	3.782	6950	3.101	13850	11.921	7425	7.117	14000	9.372	7075	6.848	13950	16.726	12650	9.016	4700
653	24.507	13725	5.068	13475	3.076	6125	11.645	13975	7.517	12975	12.462	13375	5.308	12950	11.374	7750	3.962	4550
654	27.476	12700	3.667	9900	2.581	13150	9.531	12425	8.489	11100	8.326	10075	5.386	13425	15.441	10000	10.350	4550
655	31.227	12150	3.625	13125	3.110	13075	12.215	11275	11.365	13125	7.133	11275	6.905	13150	23.628	12125	7.953	4900
656	26.178	13975	3.558	6025	3.739	6575	17.028	7450	13.743	12025	8.637	6850	7.724	11950	21.345	9450	17.280	13190
657	24.949	13950	4.297	12775	2.922	6100	13.479	14000	9.772	10925	12.083	12300	7.706	12050	19.824	13950	10.880	11675
660	20.294	13720	3.603	12775	4.013	13850	13.074	13675	5.562	11225	9.117	12775	6.565	14000	16.325	9475	8.644	4300
661	12.034	4950	5.263	13025	3.593	13275	10.215	4250	9.761	10150	8.457	13050	9.309	12300	15.053	4775	12.322	12300
662	16.276	13975	4.959	13550	4.126	13300	19.561	13975	12.966	13475	15.894	13625	10.740	13450	19.520	13875	11.369	8325
663	24.990	13550	4.742	13525	6.574	13800	11.607	13575	15.219	13325	13.233	13650	11.202	13025	17.197	5250	15.369	5450
664	23.083	13475	2.334	8175	3.652	13575	8.791	10700	6.142	4150	5.191	4200	6.874	13050	16.661	12575	7.760	5325
665	31.528	13525	2.509	6975	5.775	13800	10.584	9450	9.372	4050	7.787	9200	10.155	14000	15.441	9350	9.942	4525
666	40.726	13725	2.849	13525	3.089	13850	11.520	13550	6.425	4400	7.158	12950	9.845	14000	22.860	13525	12.053	4925
668	30.039	14000	3.417	14000	3.005	5800	10.092	11525	10.139	4125	6.941	14000	5.847	6100	21.317	14000	12.623	4100
669	39.303	13925	3.971	5525	3.566	5550	13.478	6000	9.485	6450	8.327	13700	4.260	6675	20.153	7100	6.960	4300
670	30.072	13900	5.457	4275	2.652	5200	16.497	13900	10.310	5450	14.375	4450	6.373	13500	23.556	5325	7.361	7300
671	34.631	13100	2.086	9750	3.334	13400	11.722	12700	14.122	13925	6.815	12775	7.895	13650	19.966	12650	10.120	4700
673	39.412	13575	3.875	7450	3.694	14000	10.792	13225	8.420	4975	7.876	5925	7.247	4500	17.597	13625	7.213	5475

APPENDIX I (Cont.)

PROF NO	MAXIMUM WIND M/SEC	MAXIMUM WIND METER	+100M SHEAR M/SEC	+100M SHEAR METER	-100M SHEAR M/SEC	-100M SHEAR METER	+1000M SHEAR M/SEC	+1000M SHEAR METER	-1000M SHEAR M/SEC	-1000M SHEAR METER	+400M SHEAR M/SEC	+400M SHEAR METER	-400M SHEAR M/SEC	-400M SHEAR METER	+1200M SHEAR M/SEC	+1200M SHEAR METER	-1200M SHEAR M/SEC	-1200M SHEAR METER
395	38.221	13950	4.408	13725	4.854	14000	11.907	11375	12.411	12450	10.344	13825	7.909	11775	19.713	6525	15.260	5575
396	41.617	12200	2.696	11525	3.349	13700	15.741	11650	10.622	4900	6.996	11725	8.131	13725	24.142	11650	13.603	4300
397	41.997	13450	2.789	4300	4.912	13900	10.465	9775	9.236	14000	5.259	5900	9.003	14000	22.609	11825	14.973	5450
398	45.707	13825	4.651	13300	5.150	13525	12.844	10750	14.016	14000	8.117	13225	10.433	13800	23.389	12600	15.029	4325
400	36.345	13925	4.030	12675	3.476	4650	18.433	12100	8.597	10625	11.226	12725	7.290	13875	33.315	13925	5.266	10525
401	39.053	12300	3.626	12250	2.986	11200	12.846	5725	6.579	7150	6.318	5700	7.086	12650	18.420	13175	3.803	10525
402	41.255	12325	3.989	9725	2.935	12750	10.978	12325	6.675	13900	6.494	11125	6.426	14000	25.928	12325	2.875	9350
404	43.952	13175	3.408	11775	6.084	13550	14.938	12225	18.687	13950	10.484	12050	14.254	13825	22.811	12225	5.160	13975
405	27.132	13475	3.567	12475	3.906	5500	11.418	12375	8.986	13775	5.848	12100	7.261	13875	17.886	13475	7.440	6500
410	31.496	12275	2.864	11775	3.369	12900	10.375	6825	8.358	13475	8.383	12225	6.943	12675	14.735	6550	0.000	6500
411	42.947	11300	3.917	13775	5.075	13250	10.607	5575	7.393	13875	7.295	4975	9.962	13400	19.993	4200	5.679	13725
412	52.332	13975	4.525	4375	3.595	13925	11.442	5300	6.993	8050	7.995	4675	5.391	12650	23.992	6175	3.420	8950
413	60.652	13900	3.817	5125	3.202	14000	11.136	5450	4.302	11800	7.395	5150	7.321	13025	21.827	4000	3.300	8950
414	61.543	10925	3.847	13525	4.940	13400	19.041	5150	13.597	13225	7.705	4925	14.262	13625	30.333	5175	13.467	14000
415	53.944	13000	3.575	5775	5.202	13200	9.637	5975	19.410	13925	7.400	6050	12.092	13475	22.454	6000	15.965	4475
416	41.561	11500	3.267	9125	3.323	13750	12.127	9975	14.351	12200	7.731	9300	9.875	12000	22.342	11300	15.728	14000
417	42.811	12525	3.227	8125	3.199	13675	17.162	9050	10.068	13400	9.830	8475	8.078	13650	30.423	9375	15.897	4450
421	53.362	13500	4.754	13475	5.997	13775	18.421	13925	21.181	14000	11.518	13700	18.523	14000	24.039	7450	0.000	4750
422	53.915	13500	4.881	13575	5.681	13875	17.255	13675	17.713	14000	13.654	13575	12.350	14000	25.386	7775	0.000	4050
423	25.323	13325	4.900	13550	5.718	13425	19.843	13325	16.227	13075	12.537	13850	15.916	13725	16.897	13325	7.982	13550
424	44.760	10775	3.325	13450	3.278	13925	15.447	[illegible]	14.251	13425	8.505	8800	7.475	13300	25.135	10225	17.937	13575
425	45.565	13475	3.306	13775	4.663	6500	9.625	8350	7.988	6650	6.584	7850	6.961	13875	33.950	4000	5.727	13375
426	38.488	12675	3.130	13400	3.673	4975	12.665	9100	7.484	8700	5.140	5500	6.874	11375	24.340	4650	5.775	13925
427	32.213	11925	3.935	11775	3.611	11600	8.101	11820	8.585	12450	7.465	11800	6.733	11700	14.720	8525	10.709	13950
428	23.698	12725	3.035	9475	3.493	13975	12.757	10050	7.261	13925	7.913	9725	4.763	13325	19.467	10825	4.712	13900
429	20.243	12900	3.317	12425	2.617	13500	7.235	12125	8.417	7475	4.364	11775	5.590	7050	14.101	9450	5.702	4500
430	20.829	13100	3.051	10125	4.077	12150	8.141	13500	7.040	5375	5.082	13300	5.224	13900	12.230	13300	9.233	4225
432	49.431	13050	3.137	5400	4.912	13175	11.172	9950	21.524	14000	6.149	9975	14.381	13475	26.498	5900	13.745	14300
433	47.463	12500	3.306	5700	4.496	13725	13.163	5850	19.222	13525	9.963	5950	11.866	13625	21.793	5800	13.978	13950
434	46.787	12450	3.189	11925	4.083	13800	12.222	5450	13.721	14000	6.965	7825	12.933	14000	19.729	7650	9.150	4525
435	58.239	10975	3.317	12450	4.413	11250	15.287	7475	13.513	13700	8.523	7350	8.297	11375	29.510	7575	22.415	13925
436	46.794	12300	3.391	13575	4.870	12975	15.211	12000	21.997	13875	8.345	11550	13.502	13250	28.107	12775	15.060	13250
437	47.470	12500	4.511	13575	5.797	12750	16.603	12600	23.702	13675	9.495	12325	13.198	13350	21.502	12600	7.979	13275
438	47.032	12725	3.581	4500	5.596	13325	14.565	12750	23.926	13925	10.367	13850	16.434	13525	21.765	12725	7.615	13400
440	44.105	13725	7.374	13725	5.937	13400	11.774	11950	7.903	13875	8.802	13725	11.203	13675	16.981	13275	0.000	13400
441	45.389	13500	3.602	12225	4.787	13975	9.970	12600	6.381	5200	7.876	13600	14.161	14000	18.253	4425	5.782	13975
442	41.424	9375	4.026	12475	3.733	11925	10.432	4225	10.113	12825	573	13950	7.806	12225	17.572	4825	9.170	11325
443	53.035	12900	3.462	12975	5.792	13750	17.058	12600	13.314	13975	9.748	12625	11.862	13950	26.513	12900	10.247	10900
444	53.372	13400	3.170	6250	7.435	13850	12.353	13350	11.670	14000	8.375	6325	14.842	13900	23.979	6300	10.385	13950
446	58.355	13575	4.726	13575	4.150	14200	17.291	9175	15.821	12800	12.100	13675	12.183	14000	24.233	11125	5.436	12975
453	42.670	13375	3.513	11975	2.955	12975	12.363	12875	7.052	7075	7.298	12925	5.173	7000	18.473	13375	20.087	4925
454	46.178	12700	3.903	11225	3.254	13325	20.969	12100	5.056	7050	11.200	12000	7.248	13850	29.584	12725	12.489	4700
455	24.667	14000	3.785	11400	3.496	11650	11.310	12275	7.025	11150	8.053	11950	7.913	11925	16.348	12450	13.189	4100
456	29.924	13525	4.771	12575	2.886	13900	10.448	12725	7.553	13875	7.390	12650	7.545	13875	17.476	12800	13.800	7050
457	37.471	14000	5.569	13550	4.573	13150	16.902	13775	7.458	4575	9.875	13725	3.362	6425	17.543	14000	14.242	4350
459	43.008	13975	3.420	13425	3.130	5250	13.995	13775	11.127	5425	9.328	5525	7.464	5400	21.567	7475	17.492	6400
460	39.130	12900	3.859	12775	3.156	13425	13.638	12800	11.383	13625	10.487	12775	7.625	13225	19.778	6775	7.421	10375
461	53.345	13125	5.102	12775	7.200	13500	19.799	13100	24.441	14000	12.376	13200	19.291	13700	27.769	13100	7.990	13575
463	61.577	12950	4.398	13500	3.220	6400	15.945	6875	9.301	13875	8.137	13900	7.529	6600	25.184	7875	0.000	13575
465	54.630	12525	3.346	8325	5.175	8000	21.229	12050	10.000	13425	15.074	11700	10.176	8125	35.699	8275	11.144	5150
466	57.474	10775	5.470	6525	3.299	5852	24.609	6975	14.104	12975	16.165	6700	7.072	7075	38.056	7800	23.452	13500
467	40.472	11575	4.295	7925	3.202	12250	24.684	8050	8.078	13450	11.179	8100	6.630	8625	34.577	9075	14.347	4525
468	45.032	12500	4.796	13950	4.263	12800	13.439	9550	24.336	13550	11.252	13950	12.706	13075	24.385	9575	15.428	4025
469	59.101	12925	4.398	7525	5.675	13900	17.444	8875	22.912	13975	15.702	7500	13.521	13500	31.000	9975	13.722	4875
470	57.001	13375	4.372	6475	4.300	14000	15.354	7200	13.406	13975	12.817	6775	11.256	13875	24.516	6875	8.439	14300
471	54.945	12250	5.187	13900	3.274	14300	11.796	6550	7.760	13800	7.512	7175	4.994	12550	23.417	4825	9.879	13900
474	66.103	9550	5.087	10175	4.913	12450	18.625	9650	20.494	13700	12.720	6575	15.063	12225	31.067	9175	19.761	12700
475	67.335	8975	4.776	4100	6.124	12840	15.351	11200	20.112	11725	15.223	11250	15.801	11150	30.944	7600	20.214	11950
476	58.421	10975	3.701	4375	4.363	11025	21.797	4425	16.413	11900	9.844	9000	11.823	11325	30.659	12900	23.792	13925
477	59.422	11550	4.207	10750	5.577	13675	11.014	11775	19.726	11150	12.797	12825	13.343	13700	26.115	4050	23.007	12725
478	73.197	11550	4.338	11525	5.947	12775	24.144	8275	25.532	13450	13.179	7675	12.994	13050	42.989	8725	28.539	13950
479	65.397	10350	5.311	13500	4.973	13725	15.350	7150	27.968	13900	11.965	13150	11.486	12450	30.986	7450	18.950	13900
481	63.144	13775	4.121	13150	4.175	13975	13.049	5600	7.619	10125	9.401	6675	4.910	9525	31.793	6925	0.000	13900
482	53.642	13375	4.201	12575	5.307	13675	11.115	4100	11.025	13825	7.422	6700	12.506	13775	30.829	4100	13.082	13925
483	51.405	13925	3.957	5925	5.898	14000	15.322	6925	10.143	9550	9.296	6350	5.955	9675	21.159	6425	13.972	11275
486	77.706	11125	3.611	6400	5.845	13925	24.328	6725	24.200	12175	16.324	6800	12.635	11525	51.417	8375	24.513	13975
487	60.875	9975	4.866	8300	5.282	10125	18.554	8800	18.409	10825	9.663	9700	12.438	12475	43.012	8975	24.764	12975
488	64.051	11375	7.392	13525	5.106	10275	17.270	7325	12.051	13750	8.152	7325	5.427	13750	27.681	9300	9.990	13775
489	62.761	12375	4.268	5250	3.172	13050	14.765	5050	9.537	13625	10.221	5250	5.990	13525	29.202	7100	12.961	13575
490	56.981	13275	3.765	11500	3.552	12025	17.781	11875	7.380	12100	9.242	12550	5.575	14000	23.699	10350	0.000	13575
491	66.567	12475	5.922	13225	5.637	12675	16.423	9175	27.190	13475	10.733	13525	18.779	13200	33.371	8800	15.999	12875
492	63.349	12475	4.834	13575	4.372	13200	27.542	6650	11.596	13475	11.513	6900	7.792	13350	30.621	8525	8.974	13925
493	72.934	13550	4.329	6225	3.951	11975	22.101	6975	7.745	12750	12.225	6525	9.017	13925	24.906	6600	14.430	5375
498	70.646	11150	5.954	8425	4.124	13375	32.747	9575	17.090	13925	13.764	9525	11.514	13650	54.243	10850	16.673	14000
499	71.005	10750	4.831	9225	5.129	13625	27.124	10625	13.066	13925	14.495	9500	10.425	13700	34.995	10750	16.448	13925
500	69.742	11950	4.439	9375	3.227	14200	25.007	9800	8.147	13800	14.195	9525	5.180	14000	47.914	11600	14.585	14000
505	36.104	14000	5.339	12100	2.983	11650	11.946	12150	5.136	6175	5.777	12125	5.416	5200	16.814	14000	0.000	14000
506	58.412	13375	3.959	13350	2.835	13550	13.643	10525	8.325	5500	7.731	13350	6.212	13750	27.632	11900	14.424	4900
507	49.918	12325	4.781	14000	3.952	5525	13.239	5875	15.609	13125	7.503	12770	9.694	5800	29.900	8375	5.786	4150
508	47.561	13225	2.470	4100	3.484	7500	11.845	5775	8.181	7225	6.494	5175	4.430	7650	22.020	5600	0.000	4150
509	40.137	13400	4.290	7100	3.768	13575	15.073	7225	13.028	13825	9.022	7325	8.077	13550	18.632	7400	6.410	13525
510	34.379	10425	3.601	9925	2.849	5950	12.475	5350	6.700	12000	7.875	10200	5.421	12700	16.615	7350	11.007	13300
511	34.114	13200	4.201	9950	3.358	13400	12.440	12225	7.242	13925	9.215	10200	4.774	7275	22.510	5650	10.944	13900
513	38.444	11550	2.533	11550	2.755	13825	14.795	9325	9.500	11950	7.277	8325	6.210	7550	16.908	12100	10.097	13950
514	57.059	12950	3.641	12350	4.329	13375	17.441	8200	24.460	14000	6.879	8175	14.727	13375	27.370	8200	10.110	4375
516	52.794	14000	4.803	13700	5.899	14500	15.572	5525	12.109	5175	11.825	14000	10.400	4975	22.503	13375	3.279	8575
517	63.050	11550	5.243	10925	4.255	13350	24.310	11050	12.996	13975	12.628	10700	8.650	11950	33.398	11600	19.401	4525
519	80.692	12325	4.608	9900	5.503	13475	20.051	9675	16.331	13475	10.070	9500	9.499	13625	42.586	11825	1.164	14000
524	55.124	13750	5.392	11375	4.519	13725	17.702	11725	11.442	13900	16.193	11675	9.296	13725	36.597	4525	38.261	4425
525	56.099	13200	4.028	11175	4.093	13450	14.127	6250	15.162	13925	9.810	8150	10.136	13900	23.825	11600	3.021	13950
526	70.411	12925	4.243	11275	5.485	13975	19.418	12275	21.170	13875	11.419	12225	16.208	13375	32.730	12050	0.000	13950
528	70.369	11250	5.549	11175	5.491	12925	32.766	11250	15.547	14000	15.437	11175	13.381	13925	31.074	11175	9.030	14000
529	71.032	13475	3.168	11875	5.254	13725	32.629	11325	20.287	13650	15.949	11325	15.337	13950	36.970	12850	14.017	13950
530	71.689	13775	5.431	13725	5.357	13875	37.651	11225	21.214	14000	14.255	11275	12.946	13500	36.691	11300	0.000	13950
532	69.063	13775	4.740	11500	3.742	13850	24.527	11850	7.523	7100	12.797	11575	7.018	12700	35.319	13775	0.000	13950
533	68.102	11550	5.018	11150	5.235	13975	21.365	11250	12.275	12400	15.304	11325	9.637	13925	29.572	11650	7.935	9250
535	57.023	13225	3.708	11300	2.948	13700	13.111	12100	7.465	7300	9.253	11050	5.377	12525	22.522	5300	20.216	4875
536	55.969	12500	4.740	13475	4.753	12775	11.087	12600	9.522	11575	6.979	12000	7.639	13425	20.992	12625	0.000	4375
537	61.928	12000	5.340	13850	5.365	12425	17.668	13050	13.347	13200	6.786	12750	6.160	12900	24.770	11850	0.000	4275
538	62.243	11775	4.387	11775	4.203	13750	19.722	10725	11.201	14000	12.199	10625	6.649	13875	30.952	11775	10.674	14000

PROF NO	MAXIMUM WIND M/SEC	METER	+100M SHEAR M/SEC	METER	-100M SHEAR M/SEC	METER	+1000M SHEAR M/SEC	METER	-1000M SHEAR M/SEC	METER	+400M SHEAR M/SEC	METER	-400M SHEAR M/SEC	METER	+1000M SHEAR M/SEC	METER	-1000M SHEAR M/SEC	METER
271	11.442	6175	3,848	6175	3.082	6275	7.660—	6175	6.082	11475	5.770	8475	4.981	11500	7.316	6175	5.124	13975
272	11.443	5500	2,644	4550	2.306	13575	5.194	5350	5.950	6925	4.584	10925	4.489	13425	8.510	4850	7.294	13475
273	11.676	4575	5,360	5575	3.705	5675	8.249	12100	7.314	11825	4.802	5575	5.506	8575	13.651	12650	14.713	12125
275	8.778	6025	2,795	13950	2.542	7000	6.274	4700	6.063	7025	5.065	13900	4.037	6425	7.759	6050	5.868	13350
276	5.461	10475	1,869	8375	2.331	13350	6.507	8575	4.153	6000	3.881	10400	4.427	13500	6.610	10550	5.666	7775
277	12.240	12250	3,203	13400	2.336	12400	8.908	13650	11.224	13450	5.946	13700	6.233	12700	10.845	13775	5.972	4300
278	22.400	13025	7,336	13500	12.861	13450	9.131	12800	12.731	13800	8.096	12020	15.402	13425	13.596	11875	7.054	7925
279	11.247	13950	2,082	5150	2.005	7775	6.520	13050	6.578	13025	4.221	6500	3.843	6475	10.321	14000	5.667	4325
280	14.854	13400	2,096	7425	5.435	14000	8.209	13525	9.221	14000	4.847	13150	8.578	14000	12.190	10850	7.172	14000
281	5.305	5150	1,843	9975	1.878	9850	6.287	7425	7.350	6350	4.183	14000	3.980	6275	6.072	14000	5.542	6550
282	6.984	4273	5,251	9500	9.761	9700	6.392	9375	8.749	10600	8.796	9600	8.523	10020	7.816	9600	5.508	12500
283	6.818	4550	2,957	5925	1.565	5525	3.692	14000	5.025	5025	3.564	14000	3.954	7450	4.753	4000	5.000	9875
284	12.187	4700	3,966	12750	3.578	12650	5.956	13275	5.540	9025	5.507	13075	4.121	13975	9.941	13150	5.652	10350
287	20.973	13425	2,204	10700	1.710	5475	8.569	11025	4.017	4675	6.013	11175	3.806	4600	17.292	13725	4.723	7575
288	19.987	10375	2,763	13175	2.488	12900	9.246	13550	13.018	13225	6.454	12150	8.034	13200	12.905 -	9250	9.474	13275
289	14.941	6375	4,075	13100	2.714	12700	12.521	13575	12.094	12575	7.634	12525	7.532	12500	10.761	11475	10.431	8925
291	12.967	11900	2,891	13525	2.573	6875	8.208	13875	6.521	13400	6.351	13850	4.821	7150	11.562	10725	7.484	6550
292	9.971	13725	2,406	13350	2.727	12625	6.398	13725	5.396	9800	5.125	13725	3.843	7875	6.989	5600	9.598	4475
293	17.945	13150	2,771	12300	2.905	13575	10.412	12850	9.597	13975	5.723	12600	6.754	13650	11.859	13300	7.262	7525
294	16.269	14000	2,187	11525	1.871	9350	5.361	12300	4.594	12875	4.437	11550	3.131	12250	10.876	12375	3.767	4325
295	15.230	13175	4,441	13175	4.435	13275	12.438	11250	10.600	10000	9.366	13175	7.404	10750	20.855	13175	13.923	12550
296	16.670	14000	2,875	13575	2.558	13800	7.135	10525	3.975	11400	4.177	14000	5.276	7550	10.978	12500	5.128	5500
297	16.924	13475	2,080	6150	1.834	13625	5.365	13225	4.496	5350	5.223	12825	5.430	12800	11.205	13075	5.298	5925
298	11.737	10725	1,907	12325	2.105	12750	7.012	9700	6.160	13400	4.789	9725	4.741	12925	9.174	10175	7.213	6175
299	14.645	13725	2,799	13125	4.064	13850	8.019	12200	5.726	4200	5.106	11750	6.399	14000	13.302	13725	7.612	6350
300	19.338	13500	2,460	12850	2.583	13750	6.618	12875	4.449	6025	4.822	12875	3.269	4475	11.887	13575	4.043	6450
301	16.991	13500	5,746	8025	3.298	4550	7.873	6050	6.214	4750	5.285	9225	4.676	4825	9.812	11825	5.528	5300
303	19.182	13950	2,860	5475	2.367	5450	5.079	6275	6.282	5475	4.991	5650	4.700	5600	8.488	7825	5.132	7425
304	21.609	12400	2,629	12175	3.411	13675	6.442	8900	9.537	13975	5.101	12400	7.818	13750	10.544	10925	5.702	13775
305	18.705	13225	2,479	12575	3.109	13350	8.623	12725	4.690	10550	5.811	12750	4.021	12175	10.185	11750	5.016	7125
306	11.816	12400	1,736	13925	2.609	13850	4.454	9100	6.543	14000	3.880	4750	5.644	13950	7.260	11650	5.972	6125
307	18.114	9975	2,565	6300	2.820	10825	7.576	6575	11.396	10900	5.562	11825	6.157	10900	12.433	7400	9.439	11225
308	19.441	8525	3,963	8275	4.711	13225	11.961	8525	13.808	13650	8.053	8350	10.750	13500	11.468	12500	13.237	12175
310	17.990	11950	3,029	10350	3.127	12400	14.774	10450	10.501	13750	7.112	10350	6.976	12550	19.513	11725	12.507	13700
311	12.687	11900	2,303	9100	4.709	12800	7.666	5225	8.975	12475	6.543	13900	7.723	13850	14.148	11475	7.197	10125
313	16.756	13100	2,480	9975	2.614	8725	9.051	13075	6.565	14000	5.206	10100	4.935	14000	14.842	11175	9.522	6925
314	17.228	13575	5,817	12375	2.723	11725	14.182	12575	10.286	11750	11.333	12475	7.154	11175	26.474	13750	6.713	7700
315	34.542	6250	4,841	5525	4.966	9200	13.425	10650	15.336	10050	11.803	5825	9.112	9200	17.950	6875	31.347	10550
318	23.877	12525	2,644	4975	3.879	7625	11.616	12625	8.147	13625	7.074	10525	6.524	5000	15.727	12750	5.082	4125
319	23.550	13575	3,942	5450	4.779	5425	11.655	11675	7.347	7825	9.294	5700	5.938	7700	20.086	13650	12.462	9902
321	20.470	13700	4,438	10475	2.421	11650	8.435	11175	7.726	9500	9.378	10625	4.651	9425	11.239	4025	6.308	10575
322	20.981	14000	4,161	10552	2.318	9450	9.051	11250	6.536	10250	7.962	10825	6.030	13350	10.429	4000	5.506	11100
323	21.424	13975	3,478	4575	3.371	10400	10.823	11275	7.535	12175	7.941	13950	5.237	13425	12.637	4425	5.704	11575
324	21.220	10950	3,963	13375	2.782	13025	5.910	5725	6.040	12050	5.953	13225	5.693	13525	11.678	4250	4.412	13350
325	22.653	10025	3,100	10750	2.669	10525	4.981	12900	8.146	11800	5.239	13300	5.032	11175	10.439	4275	4.917	13350
326	23.206	10775	3,409	13700	3.160	13675	7.327	10775	9.064	11975	6.107	13025	5.533	12700	10.357	4275	4.560	13525
327	24.688	10950	3,711	13725	3.366	13700	6.562	10850	9.666	12175	4.884	13775	8.673	11600	10.859	8000	5.267	13325
328	15.693	7625	3,335	10100	2.670	9400	9.598	10775	9.278	9500	7.121	10225	5.348	9575	10.564	12625	9.387	9800
329	25.579	11275	2,286	10350	2.715	12050	8.921	11300	11.466	12275	5.229	10800	6.951	11675	11.015	7850	8.348	13050
330	77.674	14000	5,646	13775	4.223	10000	48.039	14000	4.097	4325	24.119	14000	11.295	10200	96.979	14000	5.490	4550
331	22.227	13250	4,548	12300	2.823	4275	15.868	12350	8.251	11200	9.128	12175	7.995	12500	29.787	13250	8.243	11500
332	17.755	13550	5,871	12150	4.387	11800	21.385	12225	20.219	12125	14.416	12125	12.821	12075	28.129	13550	22.280	12200
333	16.793	13525	3,538	10325	3.865	10575	15.924	11450	10.891	10775	11.797	10875	5.560	9925	19.957	13475	10.127	7225
334	9.970	13325	2,333	13252	2.638	13625	6.428	13325	6.087	12100	5.300	13275	4.467	11000	9.705	13975	7.011	11325
335	10.841	6300	2,182	13575	2.175	13725	4.626	13275	7.658	11525	4.285	13825	3.664	11025	5.319	9950	8.739	9750
336	15.357	13225	4,432	4300	4.684	4050	7.005	6775	6.319	4325	5.222	4725	6.106	4400	10.399	7325	8.174	4325
337	20.991	9350	3,195	13925	3.246	12850	9.542	5700	10.972	13650	5.419	5100	7.028	13550	13.577	7700	14.262	13700
340	16.788	6925	3,732	6250	3.893	13000	8.251	6250	12.168	7825	7.951	13300	8.455	7300	15.795	6725	14.444	9725
341	33.381	12375	4,985	12275	4.520	12550	18.701	12375	8.370	13375	13.779	12275	10.484	12725	20.107	12375	7.129	5350
342	18.717	13225	3,680	7350	3.344	13600	12.955	11800	8.598	9250	6.749	11200	9.662	13625	15.685	13200	9.423	7500
343	27.787	13625	2,613	9825	8.899	13975	11.843	9700	11.997	8950	7.823	9300	9.875	14000	14.831	11700	11.075	8700
344	24.424	14000	3,938	13700	3.290	8275	10.186	9725	13.318	8750	9.200	14000	9.754	8375	14.743	10725	10.698	8325
345	32.274	13525	4,695	8975	5.184	8875	10.510	12925	8.543	8675	7.004	13625	6.849	13975	22.288	13625	10.883	10500
347	31.040	13550	2,229	12725	3.658	7750	12.545	8450	13.086	8500	5.998	13725	9.076	7900	22.323	13875	11.183	7950
348	28.265	13450	4,307	4500	3.323	6275	11.323	13450	6.091	12000	7.235	13350	5.804	12025	21.175	13425	14.274	4300
349	26.619	13250	3,208	12525	2.480	4125	10.211	10825	9.919	14000	6.188	12700	6.181	13675	21.511	4000	9.410	9275
351	27.284	12500	2,616	14000	2.721	12925	11.618	13650	13.081	13500	6.584	12975	7.210	12900	19.374	14000	12.081	8175
353	20.832	12225	2,434	13725	3.632	12500	8.081	12700	11.152	13300	5.376	10125	8.331	12725	17.145	11425	9.322	13150
354	14.360	12550	2,237	5325	2.700	12850	8.481	12550	9.559	13550	6.020	11450	6.854	13125	15.467	12550	11.384	4500
355	11.141	12350	2,609	5725	2.449	10700	9.215	11600	8.244	11275	4.059	5925	4.798	10800	12.937	12350	9.912	8050
357	27.901	13550	2,262	10300	1.706	8950	8.196	12600	4.931	10900	5.063	7125	3.183	9050	15.171	4600	3.003	8050
358	20.340	12950	2,649	11450	2.498	9025	8.480	6775	8.683	14000	5.314	6575	5.124	13950	15.787	4000	11.416	14000
360	22.358	11875	3,287	5750	3.571	8950	11.023	13950	8.616	12125	7.309	13725	6.420	9225	11.270	4075	5.023	12775
361	27.195	13500	3,918	13300	2.716	13700	7.320	13850	7.520	13975	6.380	4950	6.586	13975	10.534	13975	9.113	12325
362	29.334	10500	3,330	7250	2.534	5500	14.042	7775	8.673	4800	11.106	7475	5.023	6150	18.252	9475	12.355	13325
363	24.054	13875	5,674	10550	3.254	11600	7.154	5675	5.683	13925	6.787	5125	5.872	11875	11.588	5100	3.704	13375
364	23.403	12550	2,900	11300	2.580	14000	11.633	11725	5.387	4850	7.563	11150	3.969	4750	15.616	11850	6.220	4750
365	33.982	13525	2,951	9450	3.116	14000	9.857	10325	3.568	13175	5.050	11375	4.340	6075	14.142	12100	3.603	4750
366	45.519	13275	2,825	10125	3.344	13300	15.150	10975	10.281	14000	8.958	10400	7.208	13600	29.404	11500	3.800	4750
370	20.248	14000	4,093	13550	5.338	12275	15.057	12875	15.499	12850	10.471	13850	11.083	12425	28.413	14000	14.843	12550
371	21.294	14000	3,275	13550	4.745	12125	15.947	12850	17.118	12675	10.128	12425	13.896	12225	25.022	14000	9.944	6350
372	20.834	13700	2,952	12325	3.399	12250	14.500	12825	7.674	4925	10.918	12450	10.664	12425	19.840	13750	9.464	6575
373	49.251	12300	3,669	11300	4.671	12700	22.847	12300	14.984	13575	11.050	12000	11.358	12950	33.561	12400	9.548	9500
374	23.205	13250	3,331	12425	2.483	4250	12.820	13825	7.951	5025	8.606	12625	5.017	4350	18.351	13700	9.218	8875
375	44.320	13250	4,554	11350	3.622	12325	17.609	12150	10.846	9675	10.584	12000	6.847	14000	27.052	13000	4.507	10425
376	45.868	13200	4,310	11950	4.548	13850	19.469	12200	13.819	14000	10.570	12125	12.219	13950	21.222	12125	3.203	10425
377	24.232	13625	3,671	12250	2.365	5525	11.631	12450	7.200	13950	9.032	12450	4.627	13950	16.437	13450	9.202	7775
380	34.703	12950	2,514	8325	2.318	13725	11.373	9425	9.765	13975	6.880	9100	6.484	13800	18.831	9925	4.949	13550
381	36.954	13250	3,236	14000	4.470	13375	9.793	9175	8.757	14000	7.488	13250	7.622	13650	18.293	10850	1.993	14000
382	35.505	12875	3,339	13725	2.103	13000	12.798	8750	6.774	13125	7.706	8375	4.577	13475	22.205	10300	9.192	4125
383	40.671	12725	3,695	6950	3.198	13525	12.123	6875	5.886	9900	11.326	6850	5.335	7275	18.106	11875	3.403	4125
384	49.893	12550	2,701	9525	3.838	13700	9.393	10625	10.274	13900	7.852	5150	9.097	13925	20.819	11625	4.917	14000
385	40.792	11425	3,970	7375	3.063	13975	13.229	4725	8.645	7275	7.812	7350	7.371	6850	25.748	5150	7.150	13550
386	51.668	9950	4,014	9350	3.146	7200	19.253	9625	9.067	13025	10.665	9050	6.008	10275	29.360	10225	9.300	12975
387	53.285	13550	3,409	8450	3.900	12600	16.135	7525	16.091	13275	8.869	12900	9.776	12725	36.405	9550	8.845	13275
388	47.723	13225	3,351	6400	4.606	13875	12.735	6650	11.001	11525	7.812	6675	6.967	13900	25.422	7275	18.724	4300
389	46.860	13175	3,326	7275	4.612	13425	11.327	4400	13.260	14000	7.248	7450	10.800	13525	24.560	8825	21.708	4275
391	46.498	11200	9,974	9325	4.077	11925	16.614	10250	9.902	13850	11.623	9675	7.005	13750	28.721	10975	17.419	13975
392	47.536	12300	3,624	8825	4.552	12625	15.114	8300	8.356	12625	9.973	8150	7.916	13925	25.935	8525	10.790	4750
393	43.099	12950	13,966	11375	7.968	11975	17.500	11875	15.104	13050	15.606	11875	8.075	13775	23.723	8525	15.962	4975

APPENDIX I (Cont.)

PROF	MAXIMUM WIND		+100M SHEAR		-100M SHEAR		+1000M SHEAR		-1000M SHEAR		+400M SHEAR		-400M SHEAR		+1800M SHEAR		-1000M SHEAR	
NO	M/SEC	METER	M/SEC	METER	M/SEC	METER	M/SEC	METER	M/SEC	METER	M/SEC	METER	M/SEC	METER	M/SEC	METER	M/SEC	METER
140	26.396	13900	4.197	12550	3.789	12700	8.691	10825	7.288	13150	8.794	13900	9.338	13300	18.789	12625	10.415	7100
141	46.115	14000	3.903	13975	3.773	13225	16.989	13775	17.564	13700	12.256	13525	12.626	13450	24.753	13800	5.509	4300
142	43.530	10425	3.727	10125	2.610	13925	12.453	10150	6.546	11150	7.630	10150	4.065	12850	26.230	10150	9.295	13125
143	45.435	13325	3.203	6700	2.937	9025	13.240	10550	6.948	12250	7.733	9950	6.891	9250	21.791	8575	5.131	13925
144	48.365	13325	3.376	7425	3.705	13450	13.007	10675	8.478	14000	6.942	8250	8.361	13750	23.348	10800	4.645	13900
146	49.571	13900	5.147	13375	3.195	6700	21.480	13725	8.282	7175	12.494	13550	6.155	6900	28.238	13975	14.386	8575
147	46.371	13925	3.960	5900	4.385	6925	13.784	13225	12.429	7475	8.072	13150	9.566	7000	25.752	14000	9.335	4900
148	45.295	13125	3.347	4100	4.822	4350	12.526	7500	9.083	5125	7.961	11350	8.601	4600	21.817	8225	5.672	10500
149	54.421	13900	4.063	6700	2.357	9325	14.182	12750	5.215	10125	10.565	6850	4.166	8350	19.157	13425	3.000	10500
150	55.765	13400	4.818	13575	7.202	13525	9.339	7250	9.457	8400	7.499	7300	10.045	13850	25.686	4000	3.000	10300
151	38.575	13150	7.947	9375	3.255	13400	14.223	9825	13.615	14000	12.193	9375	8.305	13700	21.791	12125	12.147	6275
152	40.728	13900	3.321	13775	2.419	9450	9.513	8475	8.545	4175	6.166	10050	3.995	9650	23.454	9400	9.555	6150
153	24.137	13250	3.986	12900	4.924	12425	10.273	13325	11.158	14000	10.779	12825	12.138	13950	12.793	9625	9.238	6300
154	23.373	13925	3.531	13375	2.530	13725	10.177	11125	5.328	12925	6.090	13625	4.610	14000	14.960	11175	5.273	4575
155	23.013	12725	3.283	12775	3.521	12825	12.828	12475	13.821	13500	6.999	9175	9.852	13000	16.113	12725	12.413	7425
156	27.407	13375	5.180	13700	6.745	13600	12.761	13400	6.466	9425	9.700	13250	15.233	13700	16.706	6625	9.658	13900
157	24.321	12150	2.851	13325	3.673	12575	10.068	6300	10.754	13150	6.754	6225	6.710	12800	11.030	8225	5.283	14000
158	18.802	9875	2.758	13550	2.949	6525	9.157	5950	9.067	11875	6.381	5325	5.842	13475	13.861	6100	10.640	13550
159	37.389	12575	2.522	11450	5.194	13325	11.058	9700	12.802	13625	6.615	12500	8.880	13425	18.373	11575	5.405	14000
160	30.607	13550	3.433	6552	2.619	12800	11.551	13400	8.403	12325	5.142	12425	7.850	12800	12.865	5525	9.962	4000
162	34.361	13975	2.981	13550	3.129	9200	15.651	8675	5.429	13325	7.957	13825	5.169	13400	23.703	9725	11.889	4400
165	30.269	13575	4.365	8300	3.257	9250	15.848	8750	9.270	9725	10.999	8375	8.936	13975	18.083	9850	13.695	4375
166	27.796	13925	5.496	13925	3.183	4550	12.069	8450	7.196	10275	7.583	8425	6.224	13250	16.929	9425	13.733	4350
167	25.107	14000	4.242	13975	3.583	11500	17.251	7600	7.568	13425	9.379	13950	7.198	13650	15.885	8550	14.484	4350
168	26.860	12875	3.926	9500	2.839	5850	11.542	12875	7.394	8900	7.238	9300	5.171	8875	21.531	12925	7.493	6475
169	21.988	14000	5.755	7100	2.922	7700	11.810	13750	9.950	13825	7.320	13750	6.634	13700	14.560	7850	9.359	4950
171	10.898	11225	3.229	13700	2.994	4750	7.463	5100	7.547	5350	6.923	4975	5.675	4750	8.172	8625	7.129	13775
173	15.612	12425	3.399	11125	1.969	5575	10.967	11825	7.082	5125	6.916	11425	5.773	5725	10.189	8725	7.730	7850
174	15.556	14000	2.380	8325	3.019	8375	9.192	12325	8.051	9800	6.592	12000	5.132	7050	13.177	14000	11.239	8875
175	26.197	13975	4.607	13925	3.294	11850	13.689	13850	6.763	4150	8.393	13975	4.442	11225	21.443	13975	12.752	6175
178	10.486	14000	3.550	13925	2.700	4550	9.147	11875	6.756	4575	8.730	14000	5.187	4525	13.203	12700	9.897	4450
179	22.778	13975	3.711	11850	3.599	11875	12.078	11950	6.387	4675	6.355	9650	6.598	11400	19.146	13950	11.351	4575
180	21.777	13375	2.766	10275	3.252	13925	9.874	13150	5.500	4775	6.531	10400	6.671	14000	16.819	13050	7.306	9950
184	16.494	11575	2.626	13575	2.493	4100	8.859	11325	9.197	12750	4.924	10675	5.669	12225	16.174	10925	13.249	14000
187	23.145	14000	4.060	14000	2.090	7625	9.474	10275	9.753	8400	6.455	9675	5.174	7925	13.027	7175	7.767	9275
188	24.960	13250	3.340	13150	4.515	13975	14.237	13175	10.413	12175	8.816	13150	8.465	14000	17.912	5200	7.895	10250
189	25.117	12225	3.148	11975	3.239	12775	12.563	12225	11.925	13325	7.997	12225	8.659	12850	13.239	8000	8.263	10900
190	14.399	7575	3.229	13400	2.891	4575	8.186	4400	11.474	4375	5.920	4650	6.035	4700	15.622	6350	14.723	6300
191	22.510	12375	2.605	7575	1.847	8025	8.228	4900	5.674	13550	6.317	4825	3.566	12975	12.399	12575	8.863	4875
193	29.359	12200	3.341	13875	3.813	14000	11.589	7525	9.451	12925	9.608	6925	10.119	12825	14.831	6175	5.487	13350
195	36.022	12275	3.985	11425	3.130	11275	9.935	12100	10.126	13075	7.971	13625	8.548	12925	20.574	11100	10.315	4550
196	31.624	12550	3.895	8175	4.560	14000	14.834	8275	11.011	13425	5.597	8225	7.927	13050	20.299	8300	5.845	5550
197	31.607	13700	4.454	13575	5.013	13875	14.751	12500	9.287	13350	10.767	13425	11.699	14000	17.781	8100	9.499	5575
198	29.740	14000	3.368	4350	2.707	13075	9.388	11625	14.792	4350	9.503	6350	7.824	4025	18.561	6500	20.611	5575
199	22.902	13575	4.017	13275	2.922	13950	11.041	10300	4.774	8500	10.226	13500	7.086	13900	13.239	13675	8.481	5275
200	26.071	13525	3.178	13150	3.747	13800	9.820	8775	7.813	12925	11.442	13375	8.257	12925	18.029	11025	5.351	13350
201	31.768	12400	4.710	5300	3.991	5775	14.909	12400	12.195	13450	12.849	9200	10.016	13350	18.920	8225	9.340	5525
202	12.164	13950	4.943	13125	2.538	9100	14.095	13300	8.697	9675	8.472	13275	5.252	9325	16.055	13975	12.418	10550
204	20.030	13775	2.595	6400	2.921	7675	11.465	12700	6.061	9425	5.545	12525	4.067	6625	24.644	13725	13.956	11700
205	14.078	8950	3.014	8550	2.632	9450	9.877	9525	6.985	10050	6.622	8925	5.280	9575	10.556	9750	9.801	11525
207	16.199	14000	2.266	9450	3.310	5900	6.918	13225	7.613	9175	4.806	13950	6.504	8550	13.440	14000	10.343	10175
208	16.203	4775	2.437	4425	2.469	4000	7.799	4900	6.196	2625	4.752	4300	4.317	5325	5.874	6650	5.489	9650
209	18.474	12150	2.959	13125	3.352	13975	9.339	10050	9.927	9675	5.945	13375	7.811	14000	10.236	12450	9.378	9375
210	17.137	13425	2.511	4575	3.315	7325	7.968	13850	7.739	9500	7.352	13375	5.077	10125	10.628	13425	9.236	13900
213	22.230	12950	4.603	9200	3.976	9100	11.452	12275	10.103	13950	7.772	12150	6.509	13300	23.190	12950	8.353	6975
216	17.111	13575	4.582	4475	4.348	9550	11.300	4900	11.354	5100	9.611	4625	9.402	4500	13.363	12300	12.694	9100
217	20.747	13325	2.612	13500	4.941	13600	12.484	13325	7.863	14000	7.739	13325	12.930	13725	17.973	13725	9.853	5425
219	14.147	5500	3.804	13775	3.478	14000	6.595	8125	13.000	13775	5.565	13775	5.752	13275	7.818	12000	8.215	8550
221	18.520	13975	2.511	4950	3.653	4875	14.428	13750	7.348	11125	7.307	13750	7.506	5175	15.292	14000	14.242	7450
222	22.928	12375	3.557	13525	3.112	4000	7.727	6500	10.897	13600	7.725	13600	6.797	12775	13.159	8400	10.057	5875
223	13.896	13725	3.161	13500	3.130	12475	11.748	13875	6.822	12750	8.207	13600	5.098	8150	7.998	12875	9.430	5900
224	12.330	12700	2.698	11575	2.933	13675	8.611	11575	6.540	6325	4.526	10925	5.426	13950	10.552	12700	9.537	7525
225	14.442	14000	4.016	13175	4.352	13350	14.623	14000	7.140	12825	10.091	13575	6.067	12825	14.034	14000	9.183	4925
227	17.294	11100	5.221	13350	2.963	13950	6.573	7750	7.191	13325	8.933	13725	6.611	13200	11.392	9850	9.242	13225
228	19.365	13275	2.488	13275	3.406	13650	7.953	11875	6.900	13650	5.828	13275	7.798	13650	11.543	13275	5.639	6725
229	20.745	13700	3.189	4250	2.544	13850	13.451	13700	5.187	13275	9.810	13625	4.638	10075	17.832	13725	8.982	4175
230	14.214	13700	3.719	11575	3.437	13275	12.115	13775	5.673	13100	6.767	13725	4.988	12650	12.023	13700	7.353	4450
231	9.508	13975	3.408	12575	2.883	12075	11.598	13100	12.292	12975	6.396	13000	5.637	12350	14.637	13850	10.712	13525
232	16.395	13525	5.863	13475	5.972	12250	9.247	12900	10.191	13050	6.457	13525	8.310	12450	10.004	12050	7.404	5750
233	31.876	12975	14.224	12975	19.391	13075	18.456	12975	20.967	13975	17.828	12975	17.248	13375	25.498	12975	5.027	10700
235	23.149	13500	3.852	13300	3.601	13850	12.128	13500	11.477	13950	10.383	13300	9.855	14000	16.742	9600	5.951	4300
236	19.204	14000	3.227	6225	3.267	6200	8.878	5925	7.579	13250	6.799	6425	5.485	6350	10.572	5675	8.000	4300
237	17.235	13300	3.463	13150	2.297	4750	9.636	13325	8.120	13525	6.814	13300	5.261	12175	9.768	8025	5.360	5275
238	10.629	13950	2.548	6550	2.391	5025	9.456	6775	6.725	9725	5.947	5525	5.522	5025	11.181	8775	7.360	4975
239	10.540	14000	3.457	4300	3.435	4450	8.102	13875	6.574	5350	5.987	4125	6.382	12500	11.137	8325	7.557	4700
240	16.310	11900	2.327	6300	2.147	4875	7.704	6350	6.799	7375	5.694	6375	4.802	12450	11.504	8175	7.956	5550
241	17.228	11900	2.365	9525	2.310	8650	7.017	6450	5.575	12925	3.870	8700	3.784	4975	11.373	8450	5.888	5575
242	8.567	12825	2.587	11325	2.343	6650	5.192	13175	5.329	13100	5.852	12925	5.869	12950	8.625	11850	7.855	10300
245	15.077	12375	2.120	9375	2.090	12800	9.068	9750	4.215	13725	5.291	9450	5.366	13750	11.716	11900	5.942	8025
246	14.518	14000	4.207	13950	2.035	13300	8.082	13975	4.898	6800	6.089	14000	4.548	13550	11.728	6525	1.638	11500
247	10.537	11525	3.108	13350	1.989	12800	10.167	13975	10.783	13450	6.235	13475	6.209	13075	14.595	10750	10.835	13725
248	11.574	5500	2.000	12350	2.006	6400	8.401	5450	5.302	6600	4.568	5375	3.573	6575	10.100	5575	8.621	8500
249	9.677	4550	2.435	13375	1.853	13325	7.392	12875	7.014	13325	4.864	14000	3.811	13650	10.198	12225	7.509	11950
250	9.750	13100	2.977	13700	2.977	13725	7.306	12375	8.266	13925	3.203	12550	8.477	13825	11.537	13800	12.139	13900
251	9.994	9525	2.474	13750	2.417	6900	12.160	11700	9.428	11475	6.300	14000	6.555	11100	11.325	13375	17.077	12500
252	17.405	14000	4.961	13925	3.365	13100	20.468	14000	8.717	13325	13.419	13950	7.139	13300	23.279	14000	10.884	13500
254	17.312	13900	3.765	12950	4.927	12325	23.892	13125	21.503	12900	10.983	12925	11.688	12600	26.550	13800	17.611	12975
255	21.666	13925	3.647	13550	2.275	6925	16.546	13650	5.346	6775	9.482	13775	3.688	6625	24.760	13900	3.239	5225
256	18.426	13950	5.181	13425	2.683	12875	20.992	13725	7.578	13100	13.667	13550	7.931	13075	21.995	13950	9.434	10800
257	27.540	12775	2.985	10350	2.069	13200	9.117	11975	8.654	13800	8.024	10650	4.903	13400	17.849	12475	4.209	10225
259	25.629	13225	2.623	14000	3.335	13600	15.773	11750	8.727	9000	7.796	11150	6.849	13725	27.784	12950	11.655	10350
260	22.847	13775	5.719	7550	5.631	7450	13.335	10900	8.871	7475	7.447	13375	7.067	7450	19.996	12425	12.577	8975
261	15.030	13925	3.020	10125	3.701	6750	8.789	10550	9.062	7575	6.965	8825	7.009	8775	16.434	10000	14.775	9550
263	15.835	4325	2.732	7375	3.250	13500	10.229	9400	10.750	13850	5.743	8825	9.713	13725	13.661	13350	12.250	7625
264	17.912	6225	3.127	6150	3.222	13275	7.154	13350	11.852	7375	5.614	4925	7.954	13750	10.115	13350	13.763	8525
265	17.405	6500	3.260	13450	3.184	13100	5.430	4100	7.978	7575	4.345	10650	5.685	13325	7.494	10975	13.593	9500
266	14.975	7575	3.501	13500	4.306	7725	7.633	14000	8.777	8550	6.152	13650	7.991	7950	5.876	7550	10.233	10500
267	14.283	6525	4.725	6525	3.928	6625	8.414	13625	7.731	13650	5.931	13250	6.116	14000	4.856	13625	9.350	4950
268	10.779	4975	4.844	13700	2.105	7100	3.765	6575	5.114	13775	6.003	14000	4.417	13700	2.713	11875	9.635	4400
270	27.870	11950	3.224	13550	4.263	13875	11.116	10225	13.484	14000	7.692	13775	10.543	14000	17.139	4975	14.203	13375

APPENDIX I (Cont.)

PROF NO	MAXIMUM WIND M/SEC	METER	+100M SHEAR M/SEC	METER	-100M SHEAR M/SEC	METER	+1000M SHEAR M/SEC	METER	-1000M SHEAR M/SEC	METER	+400M SHEAR M/SEC	METER	-400M SHEAR M/SEC	METER	+1000M SHEAR M/SEC	METER	-100M SHEAR M/SEC	METER
2	30.822	13350	3.956	13825	3.876	10600	13.733	11325	6.801	12650	10.758	13075	9.940	10775	26.733	13275	5.565	9200
3	24.741	11975	3.863	11975	3.349	12150	15.355	11975	14.309	11850	8.635	11975	6.831	11225	16.732	13500	19.593	13525
4	14.497	4825	5.073	12550	3.470	12350	11.851	13350	9.324	12425	10.634	12775	7.077	12375	11.749	4725	11.711	12375
5	32.872	12950	3.969	14000	6.153	13075	17.037	12950	23.113	13975	10.338	13550	16.319	13375	21.592	8100	15.993	11100
7	16.279	12575	3.373	11950	2.700	12725	11.699	5450	8.930	13575	9.345	12475	5.660	13950	16.618	5100	13.132	10850
9	13.633	14000	3.260	13225	2.767	12975	11.382	5375	6.311	12875	7.931	13275	7.559	12875	14.379	5225	8.914	10475
10	16.612	14000	4.134	13300	4.201	12975	11.917	5275	8.672	13725	10.965	13250	9.606	13150	14.640	5175	9.936	10325
11	15.240	14000	3.873	12950	2.822	4225	11.361	5600	8.047	8625	9.192	13075	6.260	4225	13.008	5150	9.216	12625
13	17.436	14000	3.318	13325	2.549	4100	8.353	13900	6.903	12650	5.505	5100	5.242	11600	11.034	9250	10.697	4150
15	24.544	13725	3.100	11425	2.510	13950	13.533	13750	6.932	6350	7.354	4800	6.022	13550	17.491	13275	11.235	8350
16	29.378	13650	3.465	11150	3.491	4750	8.982	11200	9.452	5325	6.699	11325	8.000	4775	20.206	12250	11.175	7325
18	37.546	8750	3.312	13500	2.986	13450	13.518	5525	11.753	12650	7.764	13725	6.655	12050	23.845	5350	12.058	13925
19	24.653	12925	4.894	9875	3.876	13375	10.954	12925	15.459	13950	7.704	12575	12.227	13550	22.085	5900	19.845	4725
20	41.659	12575	5.564	11050	4.157	13625	20.530	11750	12.314	14000	15.735	11275	9.327	13900	25.323	12575	5.105	8825
29	55.287	11950	5.038	11650	5.805	12050	22.320	11950	21.594	13250	14.281	11650	11.235	13300	31.159	11950	9.970	13550
30	59.971	11950	4.950	13775	6.179	12150	13.274	11850	23.672	12925	10.989	13900	13.139	12300	29.036	11125	10.698	13500
35	57.847	10150	4.745	10200	6.411	10275	16.412	13475	19.946	13775	9.636	4650	13.667	13750	21.951	7150	15.087	13925
36	60.612	10250	4.051	13500	4.432	10450	11.601	6150	26.324	13925	9.808	6075	12.815	13600	26.515	4175	24.038	13925
37	61.100	10150	4.283	6425	5.395	10275	14.125	6450	24.583	13875	10.838	6425	14.362	13650	27.750	4325	27.732	13875
38	57.040	12575	4.537	8975	3.336	8875	15.397	12625	12.454	14000	9.805	11925	8.953	14000	23.146	12000	4.510	14000
39	63.807	11925	4.970	13125	6.326	12825	17.522	13350	16.653	13325	12.761	13075	14.413	12875	27.468	4975	12.264	14000
40	56.825	12500	4.055	13150	5.379	13200	15.169	11325	14.231	13825	9.259	7975	9.798	13950	28.410	11375	15.570	4300
41	44.963	12925	4.432	12500	4.121	13825	13.505	12500	11.629	12700	10.114	12550	9.534	12400	27.970	12925	0.000	4300
42	35.606	12975	5.336	12525	4.471	13325	14.226	12975	17.413	14000	9.398	12625	9.691	13950	18.969	13000	8.455	6750
43	36.954	13700	4.864	11525	3.843	13800	22.661	12425	6.983	4000	11.524	12150	5.247	14000	28.073	13700	15.424	5425
44	33.697	12750	4.574	11775	3.414	11875	22.183	11975	8.611	11275	13.306	11775	4.515	10825	27.072	12975	11.482	4300
46	33.243	12850	3.879	11525	2.955	4975	19.539	11925	7.524	5325	11.354	11675	6.287	10275	27.533	12475	10.668	4225
47	33.483	12025	4.350	11550	2.920	10000	22.214	11650	6.549	5425	13.381	11650	6.113	10200	27.043	11650	10.565	4275
48	33.523	12850	4.465	10400	2.352	10525	19.354	11750	7.898	5350	10.479	11575	6.277	10825	27.222	11050	9.883	4375
49	34.981	11975	4.232	10225	2.276	10725	19.731	11850	7.937	5500	12.443	11325	5.366	10675	27.967	11925	10.525	4300
52	38.068	13900	5.242	11125	4.215	14000	20.264	11475	9.349	5500	15.607	11250	5.278	5150	27.435	11475	3.872	5350
53	36.057	13075	5.614	11025	2.320	13175	23.246	11600	7.927	13200	15.396	11225	5.263	5600	24.385	13575	1.625	5350
54	35.841	11000	7.031	10575	4.195	10375	21.361	11000	10.875	11575	15.822	10725	5.986	6500	25.464	11000	12.231	9100
55	41.233	11025	5.542	10900	3.530	4900	15.169	10900	11.412	12100	9.071	10850	9.100	5375	21.241	11025	17.562	13950
56	42.138	10925	5.669	10900	3.090	5025	13.390	10925	10.328	11925	10.784	10950	8.651	5625	23.683	10925	16.283	13925
57	43.659	12475	5.161	11125	4.606	11100	17.727	11375	10.440	13925	14.430	11150	15.253	11200	22.737	10700	13.097	13500
59	37.898	11325	4.034	9925	3.807	4150	18.282	10175	14.936	12450	12.953	10000	9.647	12475	26.575	12150	13.534	13325
60	43.035	11775	3.926	11700	5.488	12950	18.999	12125	12.230	13325	9.945	11500	8.641	12175	20.987	12200	16.163	7300
61	36.272	14000	3.446	11325	4.447	11975	21.229	12250	16.264	13250	10.482	12175	11.742	12250	21.815	11850	6.416	10100
63	54.479	13500	3.698	12575	3.702	13850	13.611	8725	8.779	14000	8.727	5300	9.251	14000	20.879	9600	7.537	11625
64	53.218	14000	5.971	11925	5.444	11925	14.196	7750	9.196	12825	10.625	13400	8.695	13325	17.612	9725	0.000	11625
66	56.506	12950	5.284	12300	4.908	14000	11.119	6200	13.726	14000	7.945	5600	8.486	13875	19.215	9800	12.100	13875
67	57.518	13125	3.888	12700	4.360	13575	13.170	6125	11.792	14000	8.297	5725	8.756	13775	20.936	8275	7.221	13850
68	54.330	12725	3.971	12450	2.939	13600	10.065	5575	8.289	14000	7.642	12725	5.244	13825	15.718	9350	0.000	13850
69	55.524	12475	4.473	12450	4.551	13800	12.183	12475	9.978	5575	8.434	12475	4.817	5550	17.424	9675	6.206	11850
70	56.215	12725	4.243	12300	3.328	13975	12.069	4700	7.005	11075	9.865	12420	4.587	13700	17.182	6350	0.000	11850
72	79.023	12125	5.789	13775	8.163	13475	24.141	11775	26.134	13700	13.109	11875	15.619	13750	30.281	10375	28.877	13800
73	74.181	12500	4.274	11125	8.595	12625	19.515	4550	25.292	13275	12.172	12650	15.434	12625	31.245	5850	15.855	13825
75	66.843	12175	5.308	12875	3.299	12425	16.509	12125	17.847	12000	11.615	7275	9.571	11500	31.294	4050	13.017	13925
76	61.094	14000	7.400	13550	6.561	11925	22.096	13350	23.952	12875	14.771	13825	11.586	12725	30.122	5675	22.477	13425
77	69.770	11725	5.048	13700	6.868	12750	19.412	13525	30.484	12750	11.655	6500	15.351	12200	36.230	11725	22.077	14000
80	61.913	13900	9.207	13975	4.285	12825	21.222	13550	24.687	13425	15.629	13925	12.748	12825	27.851	5125	21.172	13425
81	61.290	11450	7.539	13925	3.511	12675	13.794	5100	15.164	13075	13.195	14000	7.908	13175	28.039	5475	3.807	9775
82	60.013	13375	3.701	4325	3.752	13650	16.691	5075	14.727	13600	10.446	5275	8.374	13075	30.573	5275	12.442	13500
84	57.511	12775	4.298	11975	5.215	13975	17.055	4000	9.729	7000	9.899	12300	7.824	13775	32.833	5350	10.872	8950
85	54.222	12025	4.269	12075	4.678	12100	14.702	4600	15.708	13175	10.118	4300	9.448	12525	26.560	4350	15.374	13550
86	50.430	11350	4.382	10550	4.979	13400	10.137	4275	16.274	12325	7.465	10950	11.324	13700	26.082	4000	21.390	12050
87	49.851	10950	4.655	13325	5.810	12925	12.192	10850	9.239	12475	6.917	10800	6.716	12925	20.865	4650	15.870	12925
88	52.295	12775	5.627	12550	5.234	12450	13.435	5000	15.943	14000	13.040	13900	14.874	13850	33.015	4975	8.839	13450
89	51.191	11775	3.233	11500	3.568	12525	16.393	6125	10.154	13075	9.887	5800	6.409	12675	21.933	4000	9.809	14000
90	48.935	12450	3.127	5900	4.542	13525	13.496	13725	12.525	13650	7.725	13100	8.740	13725	22.026	8150	14.502	4300
91	45.607	13500	4.506	12925	6.270	12750	22.987	6675	14.835	13075	13.005	6875	16.328	12900	31.545	6750	11.538	11275
92	50.664	13425	3.646	12950	3.597	12800	10.158	5975	6.122	10975	9.239	13225	4.998	13750	16.702	8050	4.136	11925
93	51.747	13375	4.536	12350	3.534	12925	15.762	12575	14.577	13675	10.354	12600	9.126	13225	20.109	12525	0.000	11925
94	46.958	12850	3.500	12125	4.866	12100	12.643	13000	7.792	10000	7.777	10825	8.085	12400	35.066	4025	6.138	14000
95	47.576	12975	3.602	5325	2.969	13600	12.000	9975	10.425	12200	7.134	5725	6.874	13675	37.497	4100	6.478	13950
97	59.606	13175	3.739	8175	4.085	13375	15.167	8200	12.255	14000	9.943	8150	8.490	13950	24.895	8900	6.720	14000
98	57.494	12950	3.890	6700	5.687	13825	11.779	7600	11.336	14000	6.863	6750	9.041	14000	29.133	4025	0.000	14000
101	44.328	14000	3.405	14000	4.436	13600	14.031	8700	7.975	12750	8.154	9325	8.293	13800	25.949	9700	3.951	12700
102	39.392	12500	3.588	12475	3.357	4575	10.634	9600	12.231	5350	6.346	11125	8.074	4750	17.968	11250	0.000	12700
103	39.556	13200	3.142	12150	2.410	4700	11.168	8225	9.375	5500	7.126	13225	5.779	5000	24.256	7800	12.981	14000
104	39.159	12950	4.624	4500	4.283	13125	16.554	4925	13.764	13975	12.041	4900	11.973	13400	24.569	4975	0.000	14000
106	43.924	13175	4.056	12725	5.817	13650	10.698	11075	14.566	13900	8.200	11275	13.901	13600	19.592	11075	7.409	13775
107	42.864	12750	5.512	12575	4.804	13775	16.000	12000	11.199	13750	13.020	12625	11.771	13775	19.087	12750	0.000	13775
108	44.911	12575	4.455	12475	4.862	12700	15.342	12575	13.990	13575	11.021	12575	9.924	12975	19.549	12575	10.214	4250
110	44.253	12500	3.387	11175	3.379	12700	11.848	12450	9.699	14000	7.196	11850	8.713	14000	16.449	7725	4.731	13525
111	41.382	13950	5.076	11900	5.374	11875	17.889	12750	13.801	12375	11.937	12175	9.122	12100	22.321	13175	0.000	13825
112	36.225	13475	3.510	12475	5.296	13600	10.183	12475	11.273	14000	7.652	12775	9.967	13925	15.604	12825	6.656	4000
113	40.958	12125	4.320	13300	3.645	13650	10.791	13250	13.943	13125	9.592	13100	7.382	12825	18.550	8400	15.363	13700
114	37.804	13550	4.726	13525	3.254	13875	19.372	13650	10.471	12800	16.204	13625	9.369	12750	15.064	13650	6.113	12775
115	33.549	12750	3.777	13550	3.907	13675	10.028	9300	13.263	14000	9.882	13725	6.374	13500	17.007	6250	9.255	9150
116	33.481	14000	7.523	5150	5.992	13525	12.587	14000	16.000	13400	11.085	14000	9.139	13250	20.527	6250	12.123	13375
117	39.611	13500	5.142	13300	4.398	13975	20.866	13725	8.426	10200	13.526	13600	6.827	13925	18.993	13800	11.263	4300
119	44.310	12375	4.820	7975	4.678	13000	9.092	9950	12.513	13425	8.686	13525	10.018	13150	14.733	7275	7.047	13550
121	45.737	12300	5.082	13975	4.162	13500	8.721	4600	11.530	13725	8.451	13625	10.023	13800	16.835	6200	7.220	13800
124	47.467	12250	3.828	13475	4.344	13525	10.384	9375	10.671	13275	7.143	7175	6.610	13300	20.942	9850	10.215	13300
125	47.700	12225	3.530	10950	3.567	14000	9.597	9250	10.521	13725	7.461	10950	6.596	14000	18.827	5600	14.621	14000
126	45.573	11500	3.006	12550	3.122	12825	12.007	5850	10.856	13650	7.308	5825	6.305	13025	20.137	5600	9.929	13950
127	45.884	11475	3.766	13475	5.081	13525	10.898	4825	13.398	13775	7.266	4875	7.055	13150	20.859	5850	11.901	13975
128	49.594	11500	4.729	13425	4.120	12625	11.848	10875	11.797	13300	9.703	13650	11.004	13750	20.692	11550	12.495	14000
129	41.692	13600	3.837	12925	4.751	12850	11.095	13275	11.559	13350	11.057	13275	11.075	13000	19.721	12350	0.000	14000
130	37.313	12525	5.048	12475	4.785	10825	14.009	7600	12.970	13950	9.437	12650	9.853	12675	14.122	13700	0.965	10425
131	40.903	12000	4.112	11550	2.738	10325	14.538	12000	8.946	13875	11.793	11775	5.885	13775	23.166	12050	0.000	10425
132	41.281	12500	3.639	11475	3.661	13175	15.004	11725	16.184	13575	8.547	13550	10.443	13350	20.642	12725	6.327	4825
133	40.909	13325	3.101	12050	4.171	12850	17.400	12125	6.359	11425	9.944	11875	7.769	11725	19.791	13200	10.310	8375
134	43.718	13525	4.104	12525	3.020	5850	10.207	11725	9.649	10150	9.433	12725	5.933	6075	29.099	13525	0.105	4300
135	41.257	13400	4.532	12775	2.519	13675	14.998	13375	5.845	9925	9.397	12850	4.877	7925	26.245	13575	4.394	7925
136	43.172	13575	4.947	13300	3.644	13150	20.728	13425	6.048	7425	11.308	13575	5.345	12425	28.002	13600	8.213	4300
137	35.924	13950	4.075	13550	4.111	13250	11.349	13600	6.440	5525	7.371	13875	3.935	6725	21.757	13625	10.317	7500
139	20.850	12575	4.022	13550	3.102	12850	11.089	11325	7.709	12125	7.867	12550	6.777	12825	16.373	11350	0.171	4300

APPENDIX II

COMPARISON OF CHARACTERISTICS OF 900 WIND PROFILES

Each 10 X 10 table in this Appendix gives the number of profiles which fell into the indicated deciles with respect to two critical (selection) or test (verification) characteristics. Thus, the upper left entry in the first table shows that in 32 of the 900 profiles both the maximum wind speed and the largest 100-meter positive shear were in the lowest deciles. The upper right figure indicates that 3 profiles in which the maximum wind speed was in the highest decile had no appreciable 100-meter positive shears, because the maximum such shears were in the lowest decile.

MAX.WIND

+100M S DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
1	32	16	13	6	4	3	4	5	4	3
2	28	14	10	11	4	5	4	5	3	6
3	9	14	16	9	9	9	10	5	3	6
4	9	12	10	9	11	8	7	8	10	6
5	8	16	9	10	9	7	10	7	6	8
6	4	11	9	13	9	11	10	7	12	4
7	0	5	8	15	13	13	6	9	11	12
8	0	4	12	10	14	12	7	16	9	6
9	0	0	3	6	11	13	14	13	14	16
10	0	0	0	1	6	9	16	15	18	23

MAX.WIND

-100M S DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
1	28	16	16	5	7	7	7	0	2	2
2	19	19	14	13	8	4	7	3	2	1
3	13	12	9	11	16	7	6	8	6	2
4	7	13	9	12	12	14	4	10	3	6
5	7	16	12	9	11	7	4	6	9	9
6	8	5	9	13	8	10	16	13	7	1
7	6	7	8	11	8	11	8	11	7	13
8	8	2	7	4	8	17	15	10	11	8
9	2	0	3	8	9	6	9	14	18	21
10	0	0	3	4	3	7	14	7	25	27

MAX.WIND

+1000M S DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
1	18	23	10	4	6	3	2	1	1	0
2	23	26	16	11	4	6	4	1	0	5
3	13	15	16	10	11	9	6	5	4	1
4	9	12	11	12	16	12	9	5	2	2
5	6	14	10	9	11	12	9	8	7	6
6	1	2	9	15	9	13	16	5	7	11
7	0	3	5	11	12	13	15	15	10	6
8	0	1	10	10	12	15	5	13	13	11
9	0	0	3	7	6	7	13	21	24	13
10	0	0	0	3	3	2	9	16	22	35

MAX.WIND

-1000M S DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
1	19	16	12	9	13	5	6	6	2	0
2	8	19	12	11	11	15	7	4	1	2
3	17	10	12	11	11	7	4	9	5	4
4	9	12	16	10	6	7	6	10	10	2
5	13	5	10	13	13	9	6	7	7	7
6	7	9	9	11	9	7	11	12	9	6
7	8	5	7	6	12	6	17	7	11	5
8	4	4	4	10	4	14	13	12	13	12
9	2	3	5	6	6	10	10	14	15	19
10	3	1	3	3	3	8	8	9	19	33

MAX.WIND

+4000M S DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
1	34	26	9	5	4	6	2	2	1	1
2	24	19	14	7	5	7	4	3	3	4
3	12	13	17	9	14	3	6	8	3	5
4	9	6	11	10	12	11	12	5	9	5
5	9	11	7	10	11	7	11	11	5	8
6	2	7	11	14	9	11	6	13	9	8
7	0	3	6	11	12	13	13	9	13	10
8	0	3	13	13	13	12	10	12	11	3
9	0	0	2	7	8	16	17	12	14	14
10	0	0	0	4	2	4	11	15	22	32

MAX.WIND

-4000M S DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
1	23	19	13	11	11	8	3	1	1	0
2	15	16	17	10	9	10	3	6	3	1
3	12	14	6	15	9	9	4	9	5	7
4	10	7	11	10	12	10	9	6	9	6
5	8	8	15	10	7	8	9	10	7	8
6	11	8	9	7	8	12	12	10	7	6
7	4	8	8	9	8	9	18	9	10	7
8	4	2	3	14	11	9	8	14	17	8
9	3	6	5	1	6	8	15	16	16	14
10	0	2	3	3	9	7	9	9	15	33

MAX.WIND

+3000M S DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
1	46	25	15	4	0	0	0	0	0	0
2	28	22	20	7	3	5	2	0	3	0
3	12	20	23	13	9	5	3	2	3	0
4	2	10	13	23	17	12	8	0	1	0
5	2	6	13	18	11	12	12	10	5	1
6	0	1	4	11	17	16	13	18	8	2
7	0	0	2	6	19	16	18	19	6	2
8	0	0	0	7	9	13	18	14	16	13
9	0	0	0	1	4	11	11	17	21	25
10	0	0	0	0	1	0	5	10	27	47

MAX.WIND

-3000M S DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
1	1	6	14	21	17	5	14	5	6	1
2	0	10	11	9	17	15	7	16	4	1
3	1	15	14	14	9	9	11	8	6	3
4	1	13	11	11	10	10	9	11	6	8
5	6	9	6	10	11	14	12	10	7	5
6	15	7	8	8	5	13	9	10	6	9
7	17	15	7	5	4	4	8	7	20	3
8	16	7	11	2	6	7	7	10	10	14
9	17	5	5	4	5	9	8	7	14	16
10	16	3	3	6	6	4	5	6	11	30

-100M S	DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5 (+100M S)	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
	1	36	21	10	7	7	2	3	2	2	0
	2	15	23	12	14	9	7	2	2	1	5
	3	8	13	14	17	14	5	8	8	1	2
	4	7	11	10	9	7	16	8	11	8	3
	5	6	6	14	9	15	11	8	12	8	1
	6	3	6	10	11	7	12	13	9	14	5
	7	5	6	7	7	10	10	12	13	18	0
	8	5	3	4	7	10	15	11	7	10	18
	9	2	4	7	7	5	8	16	16	14	11
	10	3	3	2	2	6	4	9	10	14	37

+1000M S	DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5 (+100M S)	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
	1	40	29	8	5	3	2	3	0	0	0
	2	17	16	17	14	12	7	4	3	0	0
	3	8	11	16	11	11	14	6	8	5	0
	4	7	9	14	11	9	15	12	5	5	3
	5	5	6	9	8	17	11	8	15	5	6
	6	5	4	5	10	5	7	15	10	14	7
	7	3	6	4	6	9	9	14	12	12	15
	8	2	2	10	7	11	8	6	17	15	12
	9	2	5	2	9	4	8	12	9	16	23
	10	1	2	5	1	9	9	10	11	18	24

-1000M S	DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5 (+100M S)	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
	1	24	20	14	6	11	7	6	2	0	0
	2	17	9	9	15	15	9	5	7	1	3
	3	6	13	8	12	11	11	11	9	6	3
	4	3	13	10	9	15	8	8	0	9	7
	5	10	9	7	11	5	11	14	2	10	6
	6	7	6	9	9	10	9	12	11	11	6
	7	4	6	8	4	13	9	7	10	14	15
	8	8	8	8	5	5	5	10	13	16	12
	9	8	3	9	13	2	7	7	13	9	19
	10	3	3	8	6	3	14	10	10	14	19

+400M S	DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5 (+100M S)	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
	1	56	23	7	3	0	1	0	0	0	0
	2	19	25	22	10	9	4	0	1	0	0
	3	8	15	15	17	15	10	6	4	0	0
	4	2	11	13	12	14	10	8	9	3	0
	5	1	5	15	10	12	14	16	11	5	1
	6	1	4	8	10	14	11	14	14	11	3
	7	1	1	3	10	6	9	16	21	13	10
	8	0	5	5	8	9	10	12	12	20	9
	9	1	0	1	6	5	10	11	7	19	30
	10	1	1	1	4	6	3	7	11	19	37

-400M S	DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5 (+100M S)	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
	1	34	17	11	8	8	6	4	2	0	0
	2	17	9	10	14	12	12	3	10	8	5
	3	5	15	14	14	13	8	6	6	4	5
	4	7	13	13	7	6	13	9	9	8	5
	5	5	9	7	13	10	11	10	9	12	4
	6	4	7	13	10	11	10	8	9	11	7
	7	7	2	7	5	7	8	13	16	11	14
	8	7	7	6	8	7	5	15	8	17	10
	9	3	8	5	6	5	8	12	9	14	20
	10	1	3	4	5	11	9	10	12	13	22

+3400M S	DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5 (+100M S)	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
	1	17	24	11	9	7	0	1	1	0	0
	2	11	15	20	13	8	11	7	3	2	0
	3	16	8	11	9	9	7	12	13	3	2
	4	8	6	11	7	15	9	13	9	6	4
	5	3	8	2	17	11	11	10	12	6	10
	6	3	8	11	7	6	13	9	6	17	10
	7	5	5	5	6	9	11	4	14	12	19
	8	3	5	7	8	8	9	15	11	12	12
	9	1	5	6	8	11	11	13	7	11	17
	10	3	4	6	6	6	0	6	14	21	16

-3000M S	DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5 (+100M S)	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
	1	3	15	19	17	13	6	7	7	3	0
	2	9	11	10	11	11	13	13	7	5	0
	3	6	9	8	9	11	10	9	13	8	7
	4	5	12	9	9	10	10	10	8	10	7
	5	9	11	7	13	7	9	11	9	7	7
	6	10	8	12	7	9	9	7	8	14	6
	7	9	2	8	6	6	13	3	17	9	17
	8	16	6	5	6	6	10	8	3	14	14
	9	14	5	5	7	7	7	11	11	7	16
	10	9	9	7	5	10	3	11	7	13	16

+1000M S DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5 (-100M S)	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
1	27	22	13	6	7	5	3	3	2	2
2	22	16	14	9	7	9	9	3	0	1
3	10	13	12	12	11	14	9	3	2	4
4	11	4	10	9	14	7	11	14	5	5
5	6	14	14	11	11	8	3	9	11	3
6	4	10	8	12	9	8	11	12	8	8
7	4	6	3	8	8	8	12	15	7	19
8	1	2	9	10	8	12	17	11	11	9
9	3	2	2	8	9	10	8	11	19	18
10	2	1	5	5	6	9	7	9	25	21

-1000M S DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5 (-100M S)	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
1	32	18	14	11	7	6	2	0	0	0
2	22	18	11	12	14	4	5	3	1	0
3	10	13	14	18	11	9	10	3	2	0
4	5	13	9	9	11	19	8	10	5	1
5	10	13	11	9	12	8	8	10	9	0
6	3	6	11	9	9	12	11	11	11	7
7	4	3	6	6	11	10	13	16	10	11
8	1	5	6	9	4	11	12	16	12	14
9	2	0	2	3	5	8	13	13	21	23
10	1	1	6	4	6	3	8	8	19	34

+400M S DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5 (-100M S)	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
1	33	22	11	3	5	2	5	4	3	2
2	25	20	9	9	6	8	4	1	4	2
3	10	12	16	16	9	10	5	5	5	2
4	8	13	8	11	16	8	9	5	9	3
5	7	9	13	8	13	10	8	13	6	3
6	3	3	16	8	10	15	8	9	12	6
7	2	4	5	10	7	8	14	9	15	16
8	1	5	5	10	10	13	11	16	8	11
9	1	0	5	9	8	10	16	11	8	22
10	0	2	2	6	4	6	10	17	20	23

-400M S DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5 (-100M S)	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
1	43	25	14	6	2	0	0	0	0	0
2	20	23	24	7	10	5	0	1	0	0
3	8	15	15	22	16	8	6	0	0	0
4	5	9	16	13	16	14	10	7	0	0
5	9	9	5	10	10	16	13	9	2	7
6	0	5	6	9	11	13	17	16	13	0
7	4	3	5	5	6	12	14	15	16	9
8	2	1	2	3	10	12	12	17	20	11
9	0	0	1	3	5	7	11	14	22	27
10	0	0	2	3	4	3	7	11	17	43

+3000M S DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5 (-100M S)	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
1	32	19	9	6	7	6	3	5	2	1
2	15	17	10	17	16	3	6	4	1	1
3	10	15	17	9	9	7	7	7	7	2
4	10	7	14	12	6	9	10	7	8	7
5	10	14	7	13	8	12	9	5	6	6
6	4	5	10	6	13	10	15	11	10	6
7	4	4	8	5	8	10	7	17	13	13
8	1	3	7	8	12	15	10	9	9	13
9	2	3	4	7	6	6	10	11	18	21
10	2	3	4	6	5	7	13	14	16	20

-3000M S DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5 (-100M S)	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
1	5	17	15	16	17	9	3	4	3	1
2	5	17	13	6	12	14	12	6	2	3
3	11	4	10	15	9	13	12	9	4	3
4	13	7	6	8	7	11	9	14	11	4
5	8	12	9	15	5	3	15	9	7	7
6	9	10	7	6	13	7	6	8	14	8
7	7	4	9	6	11	9	8	13	8	15
8	10	6	9	5	6	6	6	12	15	13
9	11	7	5	5	6	8	5	10	14	19
10	11	6	7	8	4	10	10	5	12	17

+3000M S DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5 (+300M S)	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
1	1	17	10	24	17	[illegible]	3	7	3	[illegible]
2	4	20	14	8	15	9	12	7	2	[illegible]
3	6	6	8	[illegible]	13	10	14	12	3	3
4	10	10	10	12	6	12	10	12	8	2
5	19	5	10	6	11	5	7	6	9	9
6	13	[illegible]	8	5	4	11	14	11	9	8
7	12	7	6	6	8	6	12	9	11	13
8	11	9	7	11	3	6	5	6	14	14
9	9	9	3	7	4	9	9	9	15	16
10	7	2	6	2	9	7	6	11	16	24

+1000M S

+1000M S DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
1	26	18	18	9	7	4	5	3	0	0
2	16	19	12	12	12	5	0	5	1	0
3	13	10	4	15	21	15	5	4	2	1
4	6	12	10	9	11	10	12	12	4	4
5	5	10	14	7	12	10	11	12	6	3
6	6	10	14	7	7	6	12	12	11	5
7	5	6	6	10	8	9	15	7	17	7
8	6	1	2	6	6	16	8	12	18	15
9	3	1	3	6	5	10	10	10	17	25
10	4	3	7	9	1	5	4	13	14	30

+1000M S

+400M S DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
1	56	17	8	4	2	3	0	0	0	0
2	28	25	15	5	6	5	4	0	1	1
3	4	25	19	12	14	6	3	4	2	1
4	1	14	16	20	14	15	6	2	2	0
5	1	8	19	13	13	10	13	7	5	1
6	0	1	8	19	23	12	10	7	7	3
7	0	0	4	14	11	12	18	19	7	5
8	0	0	1	3	6	19	18	20	17	6
9	0	0	0	0	1	7	16	21	25	28
10	0	0	0	0	0	1	2	10	24	53

+1000M S

-400M S DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
1	32	9	16	11	7	9	2	2	2	0
2	17	26	12	13	4	8	4	3	3	0
3	12	13	15	11	10	10	10	1	6	2
4	3	10	7	12	14	10	13	9	9	[illegible]
5	9	9	11	13	9	9	7	13	5	5
6	7	7	6	16	16	8	10	10	9	7
7	3	5	11	5	11	11	15	10	6	5
8	5	3	3	9	9	12	11	13	13	12
9	1	2	5	3	2	11	11	12	17	26
10	1	6	4	3	8	2	7	9	20	30

+1000M S

+3000M S DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
1	55	24	11	0	0	0	0	0	0	0
2	21	26	15	16	8	4	0	0	0	0
3	9	11	24	18	14	8	3	2	0	1
4	3	9	13	11	17	13	13	9	1	1
5	1	11	9	21	14	17	9	3	3	2
6	0	5	6	9	17	16	20	10	5	2
7	1	3	6	11	11	13	15	14	16	8
8	0	1	1	2	8	11	13	26	16	12
9	0	0	4	0	0	6	10	15	24	31
10	0	0	1	2	1	2	7	11	25	41

+1000M S

-3000M S DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
1	3	16	21	17	13	7	5	7	1	[illegible]
2	3	11	14	16	9	9	9	10	8	1
3	10	14	12	7	10	15	4	5	6	4
4	8	8	8	6	10	13	14	11	5	7
5	13	8	7	9	7	10	16	6	8	4
6	8	9	8	9	12	6	7	10	6	15
7	15	10	3	4	12	7	16	5	11	7
8	13	4	9	[illegible]	9	8	6	11	15	[illegible]
9	9	6	6	7	3	8	5	12	15	21
10	8	4	2	8	5	7	6	12	15	23

-400M S

+3000M S DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
1	20	15	9	5	11	7	8	4	1	1
2	12	18	8	12	11	2	4	6	4	3
3	14	12	12	11	9	6	6	6	10	2
4	8	16	10	14	9	9	9	6	6	3
5	3	9	14	9	14	14	5	7	9	6
6	10	7	10	8	8	14	8	10	6	9
7	8	5	8	7	16	13	13	12	7	9
8	2	1	11	13	3	11	16	7	13	13
9	2	5	4	6	7	7	8	19	15	17
10	0	2	4	5	2	5	13	13	19	27

-400M S

-3000M S DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
1	10	16	20	17	11	[illegible]	3	5	0	1
2	9	13	11	11	13	10	13	1	6	3
3	9	16	4	10	12	14	8	15	1	1
4	7	7	11	13	11	12	12	8	5	4
5	17	5	9	8	7	7	10	11	12	3
6	7	6	7	11	11	13	8	10	11	6
7	12	12	7	5	[illegible]	5	10	8	15	15
8	4	7	10	5	10	5	14	12	12	11
9	14	5	6	2	5	7	7	11	14	19
10	3	2	5	8	7	10	5	9	14	[illegible]

APPENDIX II (Cont.)

-1200M S

+400M S DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
1	26	18	9	5	12	[illegible]	5	6	5	2
2	21	15	11	10	11	7	7	4	3	1
3	17	5	10	13	8	11	6	7	6	[illegible]
4	9	11	16	12	6	7	5	7	10	7
5	8	15	14	6	13	5	13	10	4	2
6	5	9	15	9	7	10	2	4	9	8
7	3	6	5	16	11	15	12	8	8	4
8	1	6	9	9	11	11	9	9	14	9
9	0	0	1	9	7	17	14	13	11	18
10	0	3	0	3	2	3	11	18	14	32

-1000M S

+400M S DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
1	43	28	13	5	4	2	2	0	1	0
2	24	27	13	9	6	4	3	2	0	2
3	10	18	16	18	10	7	3	4	2	2
4	9	14	12	15	17	10	5	[illegible]	2	0
5	2	7	17	13	11	12	17	6	5	2
6	2	4	3	12	18	17	7	[illegible]	[illegible]	4
7	0	0	5	11	[illegible]	16	17	16	9	[illegible]
8	0	2	1	6	7	12	15	18	21	[illegible]
9	1	0	0	1	2	[illegible]	16	21	26	1[illegible]
10	0	0	0	0	0	1	1	10	18	60

-1200M S

+300M S DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
1	21	19	8	5	11	[illegible]	6	7	3	2
2	25	15	7	12	9	3	7	5	4	0
3	14	11	13	12	11	[illegible]	7	5	5	3
4	9	[illegible]	11	15	11	8	7	4	9	7
5	8	13	8	15	12	9	5	5	6	[illegible]
6	6	[illegible]	10	5	[illegible]	14	10	10	[illegible]	12
7	5	0	7	5	[illegible]	14	[illegible]	12	9	[illegible]
8	4	4	10	9	[illegible]	14	[illegible]	10	[illegible]	[illegible]
9	0	[illegible]	3	7	8	[illegible]	13	15	[illegible]	[illegible]
10	[illegible]	[illegible]	3	1	[illegible]	1	14	17	23	2[illegible]

-1800M S

+300M S DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
1	14	25	17	15	7	[illegible]	3	1	2	1
2	6	9	15	28	11	[illegible]	10	6	1	2
3	2	12	12	4	[illegible]	12	9	8	1	[illegible]
4	2	12	11	11	14	[illegible]	13	12	2	[illegible]
5	9	1[illegible]	5	12	[illegible]	10	12	14	5	[illegible]
6	6	6	6	[illegible]	14	11	[illegible]	10	11	1
7	14	[illegible]	4	8		6	11	7	16	6
8	[illegible]	[illegible]	[illegible]	5	7	10	11	11	17	13
9	7	5	8	2	7	3	11	5	10	27
10	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	5	10	16	15

-4200M S

+400M S DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
1	17	1[illegible]	12	5	[illegible]	[illegible]	3	2	4	0
2	11	15	10	14	4	[illegible]	[illegible]	[illegible]	2	[illegible]
3	5	11	13	15	12	[illegible]	7	4	1	[illegible]
4	6	5	2	11	14	[illegible]	[illegible]	15	9	[illegible]
5	7	11	3	13	12	[illegible]	15	9	5	[illegible]
6	3	[illegible]	7	11	6	13	12	13	13	[illegible]
7	5	5	[illegible]	6	0	11	13	13	9	1[illegible]
8	[illegible]	[illegible]	7	4	2	9	[illegible]	1[illegible]	16	15
9	[illegible]	[illegible]	4	6	12	8	15	[illegible]	19	14
10	1	3	5	2	5	5	[illegible]	11	17	36

[illegible]M S

+300M S DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
1	46	12	11	6	[illegible]	2	0	1	0	0
2	23	22	12	9	11	4	[illegible]	1	1	0
3	12	12	13	13	9	12	[illegible]	6	2	[illegible]
4	6	[illegible]	3	15	12	12	16	11	4	[illegible]
5	3	7	12	14	11	11	16	11	3	[illegible]
6	2	7	11	9	14	9	[illegible]	14	11	4
7	0	0	4	11	13	[illegible]	12	13	12	[illegible]
8	0	4	5	7	6	14	11	7	28	16
9	0	4	3	3	6	6	11	16	15	[illegible]
10	2	2	5	[illegible]	4	5	0	11	19	3[illegible]

+4200M S

+300M S DEC.	DEC.1	DEC.2	DEC.3	DEC.4	DEC.5	DEC.6	DEC.7	DEC.8	DEC.9	DEC.10
1	[illegible]	14	21	10	11	[illegible]	4	7	2	
2	5	[illegible]	9	13	12	14	10	[illegible]	9	0
3		10	10	13	8	6	11	9	6	7
4	9	5	13	7	5	15	12	11	5	8
5	8	12	13	6	12	7	11	12	7	[illegible]
6	11	6	5	7	11	8	10	3	14	15
7	10	11	4	6	9	6	9	10	11	12
8	13	5	9	5	12	[illegible]	6	0	13	9
9	18	3	5	5	5	[illegible]	9	12	8	14
10	6	6	1	5	6	4	10	11	15	23

APPENDIX III

NUMBER OF ENTRIES PER DECILE CELL FROM 5 RANDOM SEQUENCES

RAND SEQ	DECILE:		At least m = 1: 1	2	3	4	5	6	7	8	9	10	At most: m = 1: 1	2	3	4	5	6	7	8	9	10
1	MAX WIND SPEED		3	1	1	2	4	4	1	1	4	2	1	1	1	0	1	1	1	0	1	1
	100m SHEAR	POS	3	5	1	2	1	2	2	1	4	2	1	0	1	0	1	1	1	1	1	1
		NEG	3	1	1	1	2	1	2	5	3	4	1	1	1	1	1	0	0	1	1	1
	1 km SHEAR	POS	3	1	1	2	1	4	4	3	2	2	1	1	1	0	1	1	0	1	1	1
		NEG	1	1	1	4	5	3	2	3	1	2	1	0	0	1	1	1	1	1	1	1
	400m SHEAR	POS	3	2	1	3	1	2	3	3	2	3	0	2	0	1	1	0	0	2	0	2
		NEG	2	1	2	1	0	5	1	2	4	5	0	0	2	1	0	1	0	1	1	2
	3 km SHEAR	POS	2	4	1	4	4	1	0	2	1	4	0	2	1	2	0	0	0	1	0	2
		NEG	2	0	1	4	3	4	3	3	3	0	1	1	0	0	0	0	1	2	2	1
2	MAX WIND SPEED		3	3	2	3	1	1	1	1	1	5	0	1	1	0	1	1	1	1	1	1
	100m SHEAR	POS	4	2	5	1	1	1	2	1	3	1	1	1	1	0	1	1	1	0	1	1
		NEG	1	2	3	3	1	2	1	2	5	1	0	0	1	1	1	1	1	1	1	1
	1 km SHEAR	POS	3	1	2	2	3	1	1	4	2	2	1	0	1	1	0	1	1	1	1	1
		NEG	1	1	3	4	3	2	1	2	1	3	0	0	1	1	1	1	1	1	1	1
	400m SHEAR	POS	4	1	1	2	2	2	4	1	3	1	1	1	0	1	1	1	1	0	0	2
		NEG	1	2	2	3	2	2	3	3	1	2	0	0	0	1	2	0	2	3	0	0
	3 km SHEAR	POS	3	2	2	0	2	3	2	3	2	2	1	0	0	0	1	0	1	3	1	1
		NEG	1	1	3	4	1	3	2	4	0	2	0	0	1	2	0	2	1	2	0	0
3	MAX WIND SPEED		1	2	2	2	4	3	1	1	3	2	0	1	1	0	1	1	1	1	1	1
	100m SHEAR	POS	1	2	1	2	2	1	4	3	1	4	1	1	0	1	1	0	1	1	1	1
		NEG	2	2	2	4	3	1	3	1	1	2	1	1	1	1	1	1	0	1	1	0
	1 km SHEAR	POS	1	2	1	2	3	4	2	3	1	2	1	1	1	0	1	1	0	1	1	1
		NEG	1	2	2	2	2	1	2	3	5	1	1	0	1	1	0	1	1	1	1	1
	400m SHEAR	POS	2	2	1	2	2	3	2	3	1	3	1	1	1	0	1	2	0	0	1	1
		NEG	3	2	2	2	0	5	3	1	1	2	2	0	0	0	0	3	2	0	1	0
	3 km SHEAR	POS	1	3	3	2	1	1	6	1	2	1	1	1	0	1	1	1	1	0	2	0
		NEG	0	2	3	0	0	4	3	4	3	2	0	1	1	0	0	1	1	1	1	2
4	MAX WIND SPEED		1	3	1	2	3	1	1	5	1	1	1	1	0	1	1	0	1	1	1	1
	100m SHEAR	POS	1	1	3	1	4	2	1	2	3	1	1	1	1	0	1	1	0	1	1	1
		NEG	1	2	3	2	1	1	1	5	1	2	1	1	1	1	1	0	0	1	1	1
	1 km SHEAR	POS	2	2	4	1	2	1	3	2	1	1	1	1	1	0	0	1	1	1	1	1
		NEG	1	2	1	2	3	5	1	1	1	2	1	0	1	0	1	1	1	1	1	1
	400m SHEAR	POS	2	2	2	2	3	0	3	0	2	3	1	1	0	1	1	0	1	0	1	2
		NEG	1	2	2	3	4	0	1	2	3	1	1	0	0	2	2	1	0	0	2	2
	3 km SHEAR	POS	2	1	3	3	3	3	2	0	1	1	1	1	1	2	1	0	2	0	1	1
		NEG	4	0	1	3	1	5	3	1	1	0	2	0	0	2	1	1	2	0	0	2
5	MAX WIND SPEED		3	1	2	1	2	4	1	2	1	4	0	1	1	0	1	1	1	1	1	1
	100m SHEAR	POS	1	6	2	1	1	3	1	2	2	2	1	1	1	1	1	1	0	1	1	0
		NEG	4	3	2	1	3	2	1	2	2	1	1	1	1	0	1	1	1	1	1	0
	1 km SHEAR	POS	2	2	2	4	2	2	2	2	1	2	1	1	0	1	1	1	1	0	1	1
		NEG	3	1	2	1	5	2	1	1	2	3	0	1	0	1	1	1	1	1	1	1
	400m SHEAR	POS	2	2	3	2	4	2	2	1	1	2	1	1	0	2	1	0	1	1	1	0
		NEG	3	2	2	4	1	4	0	2	1	2	1	1	1	0	1	2	0	1	0	1
	3 km SHEAR	POS	4	1	1	3	2	2	4	1	0	3	1	1	0	0	0	2	2	1	0	1
		NEG	4	4	2	3	2	0	3	0	1	2	1	0	2	1	1	0	2	0	1	0

APPENDIX III (Cont.)

RAND SEQ			At least m = 2										At most: m = 2									
	DECILE:		1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
1	MAX WIND SPEED		6	2	2	2	4	6	3	4	6	2	2	2	1	Ø	2	2	2	2	2	2
	100m SHEAR	POS	6	6	2	4	2	4	2	4	5	2	2	2	2	2	Ø	2	1	2	2	2
		NEG	7	3	2	3	3	3	2	6	4	4	2	1	1	2	2	2	2	2	2	1
	1 km SHEAR	POS	5	2	3	3	2	6	4	7	2	3	2	1	2	2	1	2	2	2	1	2
		NEG	5	3	2	5	5	3	2	6	2	3	2	1	1	2	2	2	2	2	1	2
	400m SHEAR	POS	5	6	1	5	2	3	4	4	3	4	3	1	1	2	4	Ø	Ø	2	2	2
		NEG	7	2	2	4	Ø	5	3	4	5	5	1	3	1	1	1	2	2	Ø	3	3
	3 km SHEAR	POS	4	7	1	4	4	3	3	3	2	6	Ø	6	1	1	2	1	1	2	Ø	3
		NEG	2	4	5	5	4	5	3	3	5	1	2	Ø	2	Ø	1	1	4	2	5	Ø
2	MAX WIND SPEED		5	4	6	4	5	2	3	4	2	5	2	2	2	1	2	1	2	1	2	2
	100m SHEAR	POS	6	4	6	3	4	2	3	2	5	5	2	2	2	2	1	Ø	2	2	2	2
		NEG	3	2	7	5	3	7	2	4	5	2	2	Ø	2	2	2	2	2	2	1	2
	1 km SHEAR	POS	5	3	2	5	6	3	4	6	3	3	2	2	1	2	2	1	1	2	2	2
		NEG	3	3	5	6	5	4	4	4	3	3	2	Ø	2	2	2	2	2	2	2	1
	400m SHEAR	POS	6	3	1	5	3	5	7	2	4	4	3	2	Ø	2	2	1	1	1	3	2
		NEG	1	2	5	6	4	5	7	7	1	2	1	2	1	2	1	1	6	2	1	Ø
	3 km SHEAR	POS	4	5	4	2	6	5	4	4	3	3	2	2	1	Ø	2	1	1	2	4	2
		NEG	2	2	4	8	3	5	7	5	1	3	1	Ø	2	4	Ø	5	1	3	1	Ø
3	MAX WIND SPEED		2	5	4	3	5	3	2	4	5	3	2	2	2	2	2	2	2	2	2	1
	100m SHEAR	POS	2	2	3	3	5	2	5	6	2	6	2	2	1	2	2	2	2	2	2	2
		NEG	5	2	3	5	4	4	4	5	2	2	2	2	2	2	2	1	2	2	2	2
	1 km SHEAR	POS	3	2	3	4	5	5	4	5	3	2	2	2	2	2	2	2	1	2	2	2
		NEG	2	4	5	4	5	3	2	4	6	2	2	2	2	2	1	2	2	2	2	2
	400m SHEAR	POS	2	5	2	4	3	4	5	4	2	4	3	1	1	1	2	3	4	2	1	1
		NEG	4	4	3	3	2	8	3	5	1	3	4	2	Ø	Ø	1	3	2	3	1	3
	3 km SHEAR	POS	2	6	5	3	1	2	7	3	5	2	2	3	3	2	1	1	2	2	1	2
		NEG	1	3	4	1	Ø	9	5	7	4	2	1	1	1	1	1	3	4	3	3	1
4	MAX WIND SPEED		3	4	2	4	5	2	3	7	3	2	1	2	2	2	2	1	1	2	1	2
	100m SHEAR	POS	3	2	3	4	5	3	4	5	4	2	1	1	2	1	2	2	1	2	2	2
		NEG	3	3	4	3	2	2	4	7	5	2	Ø	2	2	2	1	2	1	2	2	2
	1 km SHEAR	POS	5	3	5	2	2	4	4	5	3	2	2	2	2	1	2	1	2	2	Ø	2
		NEG	3	2	3	3	4	7	2	6	3	2	Ø	2	2	Ø	2	2	2	2	2	2
	400m SHEAR	POS	5	3	2	4	4	Ø	6	3	2	6	2	2	2	2	1	Ø	1	1	3	2
		NEG	2	2	3	4	7	2	3	4	7	1	Ø	2	1	2	3	2	Ø	2	3	1
	3 km SHEAR	POS	4	2	4	6	4	5	3	2	4	1	2	1	3	5	Ø	Ø	2	Ø	2	1
		NEG	5	4	2	5	3	7	3	1	4	1	1	Ø	1	4	Ø	5	2	2	1	Ø
5	MAX WIND SPEED		3	2	2	2	3	6	2	4	4	5	1	2	1	Ø	2	2	2	2	2	2
	100m SHEAR	POS	2	6	3	3	2	3	2	5	3	4	1	2	2	2	1	2	Ø	2	2	2
		NEG	4	3	2	2	5	3	2	4	5	2	2	2	2	2	2	1	1	2	1	1
	1 km SHEAR	POS	3	2	3	6	2	4	2	4	4	3	2	2	1	2	2	1	2	Ø	2	2
		NEG	3	2	5	2	5	2	3	2	3	6	Ø	1	1	2	2	2	2	2	2	2
	400m SHEAR	POS	3	2	3	4	6	2	2	3	3	5	2	1	2	1	2	1	2	2	2	1
		NEG	4	3	2	6	3	5	Ø	3	2	5	Ø	4	1	2	1	4	1	1	1	1
	3 km SHEAR	POS	4	1	2	4	2	4	4	5	2	5	3	Ø	1	2	1	2	3	1	1	2
		NEG	6	5	3	3	2	1	5	1	4	3	2	2	1	2	1	2	3	Ø	3	Ø

APPENDIX III (Cont.)

RAND SEQ	DECILE:		At least m = 3: 1	2	3	4	5	6	7	8	9	10	At most m = 3: 1	2	3	4	5	6	7	8	9	10
1	MAX WIND SPEED		8	3	4	4	5	8	4	5	9	3	3	3	2	3	3	3	1	2	3	3
	100m SHEAR	POS	8	8	4	5	4	4	5	5	5	4	3	3	3	1	3	2	2	3	3	3
		NEG	8	4	3	3	6	5	5	8	5	5	3	3	2	3	3	0	3	3	3	3
	1 km SHEAR	POS	5	4	8	5	3	6	4	10	3	4	3	3	1	3	2	3	3	3	2	3
		NEG	6	4	4	8	8	3	3	8	3	5	2	2	2	3	3	3	3	3	2	3
	400m SHEAR	POS	5	9	3	8	5	3	6	5	4	4	3	4	2	3	3	0	1	2	5	3
		NEG	9	3	2	5	3	7	5	5	6	7	2	3	2	3	2	2	1	2	4	5
	3 km SHEAR	POS	4	9	3	7	7	3	4	6	2	7	2	5	1	5	3	1	2	2	2	5
		NEG	4	4	8	5	4	6	4	7	6	4	2	3	3	3	3	1	2	4	4	1
2	MAX WIND SPEED		6	4	8	5	7	3	5	5	3	5	2	3	3	3	3	1	3	3	3	3
	100m SHEAR	POS	6	5	8	6	4	3	4	4	5	6	3	3	3	3	2	2	3	3	3	2
		NEG	3	3	9	6	5	8	3	6	5	3	2	1	3	3	3	3	3	3	3	3
	1 km SHEAR	POS	5	5	3	6	8	5	5	7	4	3	3	2	3	3	3	3	2	3	3	2
		NEG	3	6	6	7	5	5	5	5	6	3	2	3	3	3	3	2	3	2	3	3
	400m SHEAR	POS	6	5	4	5	5	7	7	3	5	4	4	2	1	4	2	5	3	1	2	3
		NEG	1	4	6	7	6	7	9	7	2	2	2	3	3	3	2	1	5	6	0	2
	3 km SHEAR	POS	4	7	6	5	6	5	4	5	5	4	3	2	3	1	3	3	2	3	5	2
		NEG	3	3	4	9	3	8	9	5	4	3	0	2	2	5	0	4	5	5	2	2
3	MAX WIND SPEED		4	5	6	4	6	5	5	7	5	3	2	3	3	3	3	3	3	3	3	3
	100m SHEAR	POS	5	3	4	4	5	4	6	8	5	6	2	3	2	2	3	3	3	3	2	3
		NEG	7	3	3	6	5	6	7	6	4	3	3	3	3	3	2	1	3	3	3	2
	1 km SHEAR	POS	6	3	4	6	5	5	5	8	4	4	3	3	2	3	3	3	1	3	2	3
		NEG	4	5	5	4	9	3	7	4	6	3	3	2	2	3	3	1	3	3	3	3
	400m SHEAR	POS	4	5	3	7	4	6	6	5	4	6	2	8	0	1	2	3	4	3	1	2
		NEG	6	4	4	4	3	9	4	8	4	4	4	1	3	2	1	5	3	2	2	3
	3 km SHEAR	POS	4	7	7	6	2	3	8	4	7	2	2	5	3	2	2	2	2	3	3	2
		NEG	4	5	7	1	0	12	6	8	4	3	0	4	1	1	0	4	5	5	4	2
4	MAX WIND SPEED		4	6	3	5	6	3	5	9	5	4	2	3	3	3	3	2	3	3	1	3
	100m SHEAR	POS	4	3	5	4	5	5	5	6	8	5	2	2	3	3	3	3	2	3	3	2
		NEG	3	4	6	4	4	3	6	9	7	4	1	3	3	3	3	1	3	3	3	3
	1 km SHEAR	POS	6	4	6	7	4	4	6	5	4	4	3	3	3	3	3	2	3	3	0	3
		NEG	4	5	5	5	5	9	3	7	4	3	3	2	3	1	3	3	3	3	2	3
	400m SHEAR	POS	6	5	4	6	4	1	8	5	4	7	3	3	3	1	2	0	4	3	4	3
		NEG	4	3	5	6	7	6	5	5	7	2	2	3	1	3	4	5	0	2	4	2
	3 km SHEAR	POS	6	3	5	7	4	7	7	2	6	3	4	2	2	5	4	2	2	0	3	2
		NEG	8	4	2	8	5	9	6	2	5	1	3	1	1	5	2	6	4	1	3	2
5	MAX WIND SPEED		3	4	5	4	3	6	4	9	5	5	3	3	1	2	3	3	3	3	3	3
	100m SHEAR	POS	4	7	5	4	3	6	3	6	4	6	3	3	3	2	1	3	3	3	3	3
		NEG	7	5	4	4	6	4	3	6	6	3	3	3	3	3	3	3	2	3	3	1
	1 km SHEAR	POS	6	3	5	6	4	5	3	6	4	6	3	3	1	3	3	3	3	3	2	3
		NEG	8	3	6	3	6	4	3	4	4	7	3	3	3	1	3	3	3	3	2	3
	400m SHEAR	POS	5	5	4	7	7	2	3	4	4	7	2	3	2	2	5	2	3	2	2	4
		NEG	7	3	5	8	6	5	1	3	3	7	3	3	2	4	3	4	1	2	2	3
	3 km SHEAR	POS	6	3	2	5	4	6	4	8	5	5	4	2	2	2	2	2	4	5	1	3
		NEG	6	11	4	3	2	2	7	1	7	5	4	3	3	4	2	2	3	1	5	0

APPENDIX III (Cont.)

RAND SEQ	DECILE:		At least m = 4: 1	2	3	4	5	6	7	8	9	10	At most: m = 4: 1	2	3	4	5	6	7	8	9	10
1	MAX WIND SPEED		9	4	6	4	6	8	4	6	10	7	4	4	3	3	4	4	1	3	4	4
	100m SHEAR	POS	9	9	4	6	6	5	7	6	8	4	4	4	4	0	4	4	3	4	4	3
		NEG	8	6	5	5	6	6	7	9	6	6	4	4	1	4	4	2	3	4	4	4
	1 km SHEAR	POS	6	5	11	6	4	6	5	11	4	6	4	4	2	4	2	4	4	4	2	4
		NEG	7	5	5	8	9	5	5	9	4	7	4	3	2	4	4	4	4	4	1	4
	400m SHEAR	POS	6	9	4	10	6	3	9	5	8	4	4	4	3	4	3	0	4	4	5	3
		NEG	10	3	4	6	5	9	6	6	7	8	4	3	3	2	3	5	2	2	3	7
	3 km SHEAR	POS	5	9	3	11	8	6	5	7	4	9	3	7	2	6	4	1	1	4	1	5
		NEG	5	4	10	7	6	7	5	8	7	5	2	3	2	4	4	4	2	7	5	1
2	MAX WIND SPEED		6	7	9	6	8	5	6	5	5	6	4	3	4	4	4	3	4	4	4	4
	100m SHEAR	POS	8	6	10	6	6	5	5	4	7	6	4	4	4	4	4	3	4	3	4	4
		NEG	5	4	10	9	6	8	4	6	7	4	3	3	4	4	4	4	4	4	4	4
	1 km SHEAR	POS	7	5	5	8	9	6	6	8	4	5	4	4	2	4	4	4	4	4	4	4
		NEG	5	8	7	8	7	6	5	5	8	4	4	4	4	4	4	4	2	4	4	4
	400m SHEAR	POS	8	6	5	7	5	9	9	3	6	5	4	2	3	4	3	8	4	1	5	4
		NEG	4	7	7	8	7	8	9	8	3	2	2	4	5	4	4	3	5	8	0	3
	3 km SHEAR	POS	6	7	8	7	6	7	6	5	7	4	4	3	3	2	5	5	3	5	5	3
		NEG	4	4	5	10	3	10	10	6	5	6	1	4	2	8	2	3	6	7	2	3
3	MAX WIND SPEED		4	6	8	4	7	6	5	7	6	6	3	4	4	4	4	4	4	4	4	0
	100m SHEAR	POS	6	4	5	6	5	5	7	9	5	7	2	3	2	4	4	4	4	4	4	4
		NEG	7	4	5	8	5	7	8	6	4	5	4	2	4	4	4	4	4	4	3	2
	1 km SHEAR	POS	6	4	5	7	7	5	5	9	5	6	4	2	4	4	4	4	3	4	3	3
		NEG	4	7	6	4	11	4	8	4	7	4	3	4	4	4	4	6	4	4	4	1
	400m SHEAR	POS	5	7	3	7	5	6	7	6	7	6	3	4	4	3	2	4	4	4	2	5
		NEG	7	5	6	5	4	9	5	8	4	6	6	3	3	2	3	5	4	4	3	2
	3 km SHEAR	POS	4	9	7	7	2	4	8	7	8	3	3	5	5	3	2	4	5	4	3	1
		NEG	4	6	9	2	0	13	6	10	4	5	2	4	4	2	1	6	4	6	4	2
4	MAX WIND SPEED		6	6	4	11	6	4	7	9	5	6	3	4	2	4	4	2	4	4	4	4
	100m SHEAR	POS	6	4	6	7	6	6	5	6	10	8	4	1	4	3	4	4	4	4	4	3
		NEG	4	5	8	5	6	4	6	9	10	7	3	3	4	4	3	2	4	4	4	4
	1 km SHEAR	POS	7	5	7	10	7	4	8	6	6	4	4	4	4	4	4	1	4	4	2	4
		NEG	4	6	7	6	7	11	5	7	7	4	4	4	4	2	4	4	2	4	4	3
	400m SHEAR	POS	8	6	5	7	5	2	13	5	5	8	6	1	4	4	3	0	6	2	5	4
		NEG	5	4	5	7	8	9	6	8	7	5	4	3	3	4	6	4	0	3	5	3
	3 km SHEAR	POS	7	6	7	9	5	8	8	2	8	4	5	3	2	5	4	4	2	1	5	4
		NEG	8	6	3	10	7	10	9	2	7	2	4	3	1	7	2	7	4	3	3	1
5	MAX WIND SPEED		4	7	5	7	4	6	5	11	6	6	3	4	4	2	4	4	3	4	4	4
	100m SHEAR	POS	4	8	9	5	4	8	4	7	5	7	4	4	4	3	4	4	1	4	4	4
		NEG	10	6	7	7	6	4	4	6	6	5	4	4	4	3	4	4	3	4	4	2
	1 km SHEAR	POS	7	4	6	9	5	7	5	7	4	7	4	4	2	4	4	3	4	4	3	4
		NEG	9	7	8	4	7	4	5	5	4	8	4	4	4	2	4	4	4	3	3	4
	400m SHEAR	POS	6	6	4	8	12	4	5	4	5	7	4	4	4	4	5	2	2	2	4	5
		NEG	10	4	5	11	7	7	2	4	3	8	3	3	3	6	5	5	1	3	2	5
	3 km SHEAR	POS	8	3	4	7	6	6	5	12	5	5	4	3	3	3	3	4	5	5	3	3
		NEG	6	12	5	5	7	3	7	3	8	5	5	5	2	4	2	2	7	3	3	3

RAND SEQ	DECILE:		At least m = 5: 1	2	3	4	5	6	7	8	9	10	At most m = 5: 1	2	3	4	5	6	7	8	9	10
1	MAX WIND SPEED		9	5	7	5	7	10	5	8	11	7	5	3	5	3	5	5	5	5	5	5
	100m SHEAR	POS	11	10	5	6	6	6	7	8	9	6	5	5	5	4	5	5	4	5	5	3
		NEG	9	7	6	6	7	6	8	10	8	7	5	4	4	5	5	4	4	5	5	5
	1 km SHEAR	POS	8	6	12	6	5	7	5	12	6	7	5	5	3	4	5	5	5	5	4	5
		NEG	7	6	6	9	9	7	6	11	5	8	5	5	3	5	5	5	4	5	4	5
	400m SHEAR	POS	9	9	5	12	6	3	10	6	9	5	5	7	2	5	6	3	4	4	5	5
		NEG	10	4	4	6	7	11	6	7	8	11	6	3	2	5	1	8	5	3	6	7
	3 km SHEAR	POS	6	10	3	12	10	3	8	9	4	9	5	7	3	6	4	4	3	6	1	7
		NEG	5	5	12	8	6	7	5	10	11	5	3	2	2	7	5	6	6	7	6	2
2	MAX WIND SPEED		7	8	10	7	9	7	6	6	6	9	5	4	5	5	5	4	5	4	4	5
	100m SHEAR	POS	8	9	11	6	6	6	8	6	9	6	5	5	5	5	2	4	5	5	5	5
		NEG	5	5	12	9	7	8	7	8	9	5	4	4	5	5	5	5	5	5	5	3
	1 km SHEAR	POS	7	7	5	9	10	7	8	9	5	8	5	5	5	5	4	5	5	5	2	5
		NEG	5	8	7	11	8	7	7	5	9	8	5	5	5	5	5	5	2	5	5	4
	400m SHEAR	POS	8	6	7	8	5	11	11	4	6	9	6	4	5	4	3	5	5	3	6	5
		NEG	5	8	8	9	7	10	10	9	3	6	4	5	4	6	5	6	6	7	0	3
	3 km SHEAR	POS	6	8	11	7	6	8	9	6	7	7	5	5	5	2	5	7	5	3	6	3
		NEG	5	5	5	10	3	11	13	9	6	8	2	4	5	8	3	5	6	5	2	6
3	MAX WIND SPEED		7	7	11	6	8	8	6	7	6	6	4	5	5	5	5	5	4	4	5	2
	100m SHEAR	POS	7	8	6	7	6	6	8	10	6	8	4	5	2	5	5	3	5	5	5	5
		NEG	9	5	6	11	5	7	9	8	6	6	5	2	5	5	4	5	5	5	4	4
	1 km SHEAR	POS	8	5	6	8	8	7	7	11	6	6	5	3	5	5	5	5	2	5	4	5
		NEG	5	8	9	6	11	5	11	5	7	5	3	5	5	5	5	4	5	4	5	3
	400m SHEAR	POS	5	9	5	10	6	7	7	8	8	7	4	4	5	5	4	4	5	4	2	7
		NEG	8	5	7	9	6	10	5	8	6	8	6	6	4	4	1	7	4	5	5	2
	3 km SHEAR	POS	5	13	8	10	3	4	8	10	8	3	3	9	7	3	2	2	7	4	4	3
		NEG	5	6	10	4	4	15	7	11	5	5	3	3	6	2	2	8	6	6	4	4
4	MAX WIND SPEED		7	7	7	13	6	5	7	10	6	7	5	5	4	5	5	2	5	5	4	5
	100m SHEAR	POS	11	5	8	7	6	6	7	6	11	8	5	2	5	3	5	5	5	5	5	5
		NEG	5	6	11	6	6	6	6	10	12	7	4	4	5	4	4	4	5	5	5	5
	1 km SHEAR	POS	8	7	8	12	8	5	9	6	7	5	5	5	5	5	5	2	5	5	4	4
		NEG	6	6	8	8	9	12	7	7	7	5	5	5	5	4	4	5	4	5	5	3
	400m SHEAR	POS	9	9	7	8	6	2	14	6	5	9	7	1	5	4	4	1	10	2	5	6
		NEG	7	6	5	8	10	10	6	10	7	6	6	4	3	6	7	3	2	5	6	3
	3 km SHEAR	POS	8	8	8	11	6	8	9	3	8	6	6	4	5	7	4	4	3	1	7	4
		NEG	10	8	4	10	8	12	10	2	9	2	5	4	4	7	7	7	4	3	3	1
5	MAX WIND SPEED		6	7	7	8	6	7	7	12	8	7	3	5	5	3	5	5	4	5	5	5
	100m SHEAR	POS	5	10	9	7	5	10	5	9	7	8	5	5	5	4	5	5	1	5	5	5
		NEG	10	7	11	7	6	7	5	7	7	8	5	4	5	5	5	5	5	5	3	3
	1 km SHEAR	POS	9	5	7	10	6	7	6	10	5	10	5	5	3	5	4	5	5	5	3	5
		NEG	10	9	12	5	9	5	6	5	6	8	5	4	5	5	5	5	5	2	4	5
	400m SHEAR	POS	8	6	5	9	12	5	6	7	7	10	6	4	4	3	7	4	3	4	4	6
		NEG	11	6	6	12	8	9	4	6	5	8	6	3	2	8	6	6	2	4	3	5
	3 km SHEAR	POS	8	5	6	8	9	7	5	13	7	7	6	4	3	3	4	4	6	8	3	4
		NEG	8	15	6	5	8	3	11	4	10	5	7	6	2	5	3	2	8	4	5	3

MSFC—RSA, Ala

NASA-Langley, 1970 —— 20