

REPORT DOCUMENTATION PAGE

1a REPORT SECURITY CLASSIFICATION UNCLASSIFIED			1b RESTRICTIVE MARKINGS		
2a SECURITY CLASSIFICATION AUTHORITY			3 DISTRIBUTION/AVAILABILITY OF REPORT APPROVED FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED		
2b DECLASSIFICATION/DOWNGRADING SCHEDULE			5 MONITORING ORGANIZATION REPORT NUMBER(S)		
4 PERFORMING ORGANIZATION REPORT NUMBER(S) DTNSRDC/SPD-0919-02			7a. NAME OF MONITORING ORGANIZATION		
6a NAME OF PERFORMING ORGANIZATION David W. Taylor Naval Ship Research & Development Center		6b OFFICE SYMBOL (If applicable) 1561	7b ADDRESS (City, State, and ZIP Code)		
6c ADDRESS (City, State, and ZIP Code) Bethesda, Maryland 20084-5000			9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER		
8a NAME OF FUNDING/SPONSORING ORGANIZATION Naval Sea Systems Command		8b OFFICE SYMBOL (If applicable) 63R-34	10 SOURCE OF FUNDING NUMBERS		
8c ADDRESS (City, State, and ZIP Code) Washington, D.C. 20362			PROGRAM ELEMENT NO. 62759N	PROJECT NO. SF59557695	TASK NO. 1500-384 & 1500-385
11 TITLE (Include Security Classification) STANDARDIZED WIND AND WAVE ENVIRONMENTS FOR NORTH PACIFIC OCEAN AREAS			WORK UNIT ACCESSION NO.		
12 PERSONAL AUTHOR(S) W. T. Lee, S. L. Bales and S. E. Sowby					
13a TYPE OF REPORT Final		13b TIME COVERED FROM _____ TO _____	14. DATE OF REPORT (Year, Month, Day) 1985 July		15 PAGE COUNT 650
16 SUPPLEMENTARY NOTATION					
17 COSATI CODES			18 SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP	Spectral Ocean Wave Model (SOWM) Extreme Value Idealized Wave Spectrum Spectral Moment		
19 ABSTRACT (Continue on reverse if necessary and identify by block number) This report is a source document for specifying wind and wave conditions for the North Pacific Ocean. The data are derived from the U.S. Navy's Spectral Ocean Wave Model (SOWM) hindcast wind and wave climatology. Some initial efforts by the Navy to synthesize the hindcasts into design tools are presented in this report. The report provides seasonal and geographic distributions of wind and wave parameters and specifies mathematical models by which wave spectra, required by any ship seakeeping performance methodology, can be developed. Long-term extreme wave predictions for fatigue analysis are also discussed.					
20 DISTRIBUTION/AVAILABILITY OF ABSTRACT <input type="checkbox"/> UNCLASSIFIED/UNLIMITED <input checked="" type="checkbox"/> SAME AS RPT <input type="checkbox"/> DTIC USERS			21 ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED		
22a NAME OF RESPONSIBLE INDIVIDUAL Wah T. Lee			22b TELEPHONE (Include Area Code) 202-227-1192		22c. OFFICE SYMBOL Code 1561

AN (1) AD-A159 393
FG (2) 040200
FG (2) 080300
CI (3) (U)
CA (5) DAVID W TAYLOR NAVAL SHIP RESEARCH AND DEVELOPMENT
CENTER BETHESDA MD SHIP PERFORMANCE DEPT
TI (6) Standardized Wind and Wave Environments for North
Pacific Ocean Areas.
DN (9) Final rept.,
AU (10) Lee, W. T.
AU (10) Bales, S. L.
AU (10) Sowby, S. E.
RD (11) Jul 1985
PG (12) 616p
RS (14) DTNSRDC/SPD-0919-02
PJ (16) F59557
TN (17) SF59557695
RC (20) Unclassified report
DE (23) *WIND, FATIGUE, NORTH PACIFIC OCEAN, METHODOLOGY,
CLIMATOLOGY, ENVIRONMENTS, SPECTRA, MATHEMATICAL
MODELS, DISTRIBUTION, WAVES, PARAMETERS, OCEAN WAVES,
OCEANOGRAPHIC DATA, METEOROLOGICAL DATA, GEOGRAPHICAL
DISTRIBUTION, FATIGUE(MECHANICS), STRUCTURAL ANALYSIS,
OCEAN ENVIRONMENTS, WAVES, SEASONAL VARIATIONS
DC (24) (U)
ID (25) PE62759N, WU1500384, WU1500385
IC (26) (U)
AB (27) This report is a source document for specifying wind
and wave conditions for the North Pacific Ocean. The
data are derived from the U.S. Navy's Spectral Ocean
Wave Model (SOWM) hindcast wind and wave climatology.
Some initial efforts by the Navy to synthesize the
hindcasts into design tools are presented in this
report. The report provides seasonal and geographic
distributions of wind and wave parameters and specifies
mathematical models by which wave spectra, required by
any ship seakeeping performance methodology, can be
developed. Long-term extreme wave predictions for
fatigue analysis are also discussed. (Author)
AC (28) (U)
DL (33) 01
SE (34) F
CC (35) 389694

DTNSRDC/SPD-0919-02

STANDARDIZED WIND AND WAVE ENVIRONMENTS FOR NORTH PACIFIC OCEAN AREAS

DAVID W. TAYLOR, NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER.

Bethesda, Maryland 20084



STANDARDIZED WIND AND WAVE ENVIRONMENTS
FOR NORTH PACIFIC OCEAN AREAS

by

W. T. Lee

S. L. Bales

and

S. E. Sowby

APPROVED FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED

SHIP PERFORMANCE DEPARTMENT

July 1985

DTNSRDC/SPD-0919-02

MAJOR DTNSRDC ORGANIZATIONAL COMPONENTS

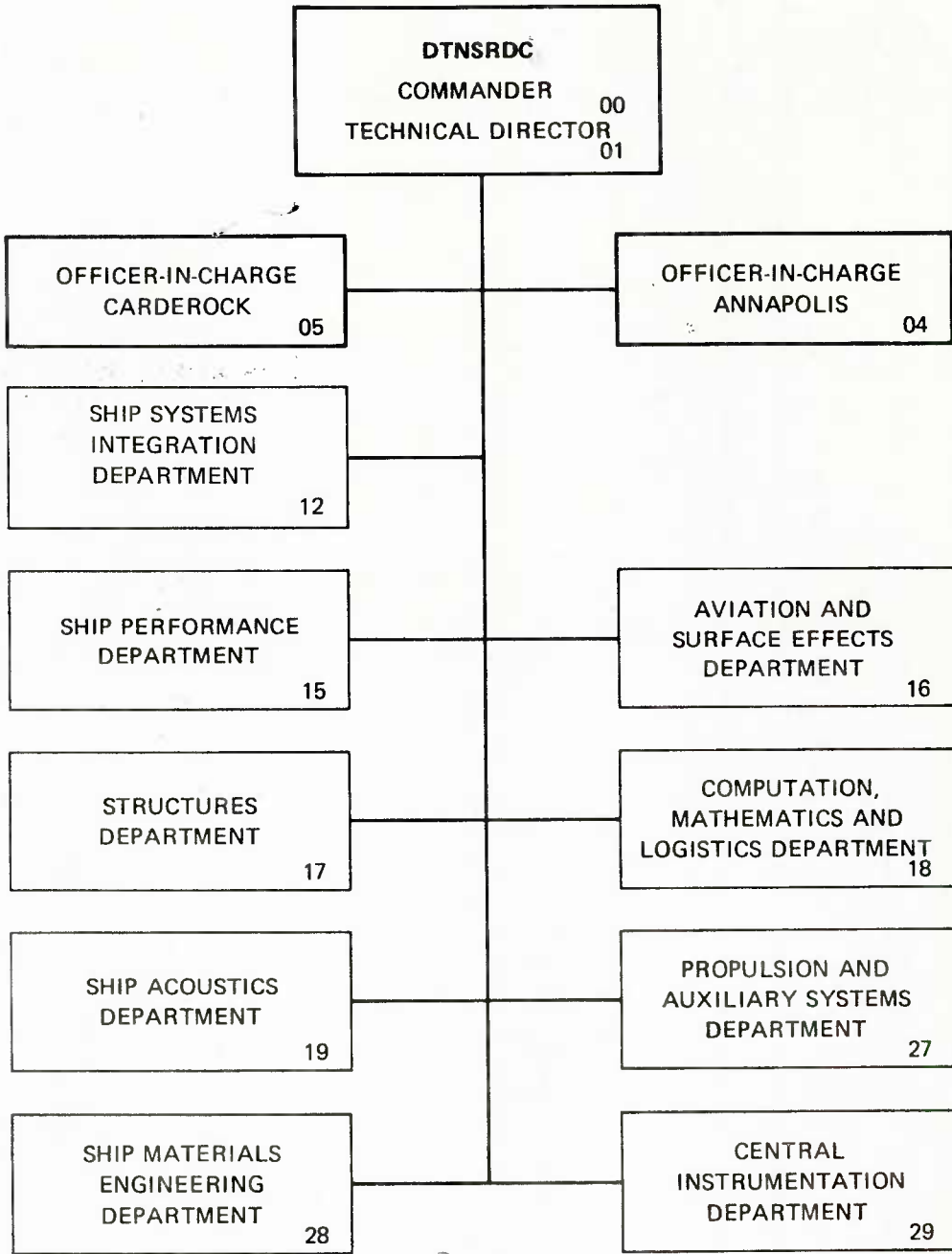


TABLE OF CONTENTS

	Page
LIST OF FIGURES	iv
LIST OF TABLES	iv
ABSTRACT	1
ADMINISTRATIVE INFORMATION	1
INTRODUCTION	1
OPEN OCEAN NORTH PACIFIC	2
WAVE SPECTRAL FAMILIES	3
BRETSCHEIDER	4
MODIFIED JONSWAP	4
SPECTRAL MOMENTS	5
COSINE-SQUARED SPREADING FUNCTION	6
SPECTRAL PARAMETERIZATION	7
LONG-TERM WAVE HEIGHT EXCEEDANCES	7
EXTREME VALUE	7
STRATIFIED SAMPLE	8
WIND AND WAVE MODEL	9
PRACTICAL APPLICATIONS	10
ACKNOWLEDGEMENTS	12
REFERENCES	13
APPENDIX A - SEASONAL CLIMATOLOGY OF THE NORTH PACIFIC OCEAN	A-1
APPENDIX B - DATA FORMAT DESCRIPTION	B-1

LIST OF FIGURES

1 - Definition of Representative Areas in the North Pacific Basin	15
2 - Comparison of Annual Wave Height Exceedances of Representative Areas	16

	Page
3 - Comparison of Winter Season Wave Height Exceedances of Representative Areas	17
4 - Comparisons of Annual and Winter Wave Height Exceedances for the North Pacific and the North Atlantic Oceans	18
5 - Significant Wave Height Exceedance Diagram	19

LIST OF TABLES

1 - Locations Defining North Pacific Ocean Areas	20
2 - Recommended Cosine-Squared Spreading Weights	21
3 - S^2/\bar{X}^2 Values as a Function of B	22
4 - Comparison of Calculated and Measured Extreme Wave Heights	23
5 - Coefficient to Calculate the B and θ Values for Open Ocean and Coastal Areas	24
6 - Recommended Values for Class Intervals X	25

ABSTRACT

This report is a source document for specifying wind and wave conditions for the North Pacific Ocean. The data are derived from the U.S. Navy's Spectral Ocean Wave Model (SOWM) hindcast wind and wave climatology. Some initial efforts by the Navy to synthesize the hindcasts into design tools are presented in this report.

The report provides seasonal and geographic distributions of wind and wave parameters and specifies mathematical models by which wave spectra, required by any ship seakeeping performance methodology, can be developed. Long-term extreme wave predictions for fatigue analysis are also discussed.

ADMINISTRATIVE INFORMATION

This report was prepared under the sponsorship of the Naval Sea Systems Command (NAVSEA), Code 63R-34 Surface Wave Spectra for Ship Design (SWSSD) Program under Program Element 62759N and Project Number SF 59 557 695. It is identified by Work Unit Numbers 1500-384 and 1500-385 at the David W. Taylor Naval Ship Research and Development Center (DTNSRDC).

INTRODUCTION

Until recently, the wind and wave environment has played a very minor role in the design and evaluation of ships and offshore platforms. The consideration of ship performance in the prevailing environment has focused primarily on optimization of calm water resistance and other factors related to the ship propulsion system. The effort to develop reliable open ocean wind and wave statistics was greatly advanced with the introduction of the Spectral Ocean Wave Model in 1975. Briefly, archived wind data are used by Fleet Numerical Oceanography Center (FNOC) to hindcast the resulting wave fields for approximately 1500 locations (grid points) throughout the Northern Hemisphere. The wind fields are updated at six hour intervals over a period of 17 years. Thus, the resulting wave directional spectra are really a hindcast time history of wave conditions throughout the Northern Hemisphere over a period of years. Some initial efforts by the Navy to synthesize the hindcasts into design tools are reported in References 1* to 6 and summarized in Reference 7. These reports generally develop techniques for parameterizing the spectra and developing joint frequencies of occurrence of

*A complete listing of references is given on page 13.

critical wave and wind parameters for a few particular locations. Additionally, the occurrence of extremes, the persistence of sea severity, and the characteristic spread and shape of spectral directionality are examined.

At present, design decisions may be biased by existing techniques which are essentially representative of only North Atlantic conditions. This report is intended to accelerate ongoing efforts to make the Navy North Pacific hindcast data available in a usable form to the entire naval engineering community.

OPEN OCEAN NORTH PACIFIC

The open ocean areas identified on Figure 1 span the North Pacific from the latitude of the Northeast Trade Winds (up to about 30° N) through those of the prevailing Westerlies (30-50° N) and into the Polar Easterlies (above 50° N). Additionally, the influence of land mass, currents, continental shelf, and local storm tracks each cause a different climatology variation with longitude. Table 1 identifies the location of the points currently included on Figure 1. The parameter sets that are developed are

- a. Significant wave height versus modal wave period
- b. Significant wave height versus wind speed at 19.5 meters
- c. Significant wave height versus primary wave direction
- d. Wind speed versus wind direction
- e. Significant wave height versus wind speed at 10 meters
- f. Significant wave height versus zero crossing period
- g. Significant wave height versus average mean period
- h. Modal wave period versus zero crossing period
- i. Modal wave period versus average mean period
- e. Persistence of wave height
- f. Persistence of wind speed at 19.5 meters

The data distributions are developed for the 17-year period from 1959 to 1975.

Appendix A provides the data base of open ocean wind and wave conditions derived from the 17-year hindcast wind and wave climatology. Wind and wave data tables are provided for areas identified in the North Pacific open ocean region. Both annual and seasonal distributions are provided. The seasons are defined by:

1. Winter - December to February
2. Spring - March to May

3. Summer - June to August

4. Fall - September to November

A few words are in order with regard to the quality of hindcast data. Since the SOWM hindcasts are based on the localized barometric pressures and resulting wind velocity fields, the wave observational biases of other wave models are excluded, see Reference 8. The SOWM is best used by statistically averaging wave conditions over a period of years for a specific location and season. The hindcasts generally provide greater occurrences of higher sea states and show less occurrences of lower sea states than visual observations. With regard to wave periods, the hindcasts generally indicate longer wave periods for given heights than for visual observations. This is not surprising as it is difficult to observe wave periods at sea and the codes used to record observed occurrences onboard ship are confusing to some observers. Very often the naval architect uses the most probable modal or peak wave period for several varying wave heights. In this work, the modal periods, being longer, will cause larger responses to be calculated for the longer ships. It is noted that the modal periods developed in this work are reflective of the peak of the entire (density) spectrum. Very often this coincides with the peak of the primary direction.

Figures 2 and 3 provide detailed comparisons of annual and winter season occurrences respectively for the locations defined in Table 1. These data are based on the occurrences provided in Appendix A. Generally, more severe conditions prevail between 50 and 60° N with the north-western region indicating slightly worse conditions. However, during the winter season the emphasis shifts slightly to the north-eastern longitudes. For the annual comparison of significant wave height occurrences for the grid points under consideration, the most consistently severe wave conditions occur in the north portion of the Pacific. Annual occurrence comparisons of modal wave periods and wind speeds for these same grid points also conform to the above specifications. Figure 4 provides comparisons of the annual and winter significant wave height exceedances for the North Pacific and the North Atlantic oceans. In general, annual data compares well for both oceans but winter data does not.

WAVE SPECTRAL FAMILIES

BRETSCHNEIDER

In keeping with the recommendations of the International Ship Structures Congress (ISSC) and the International Towing Tank Conference (ITTC), as well as current U.S. Navy design practice, the two-parameter Bretschneider spectral formulation is recommended for use for the open ocean areas. Bretschneider spectra represent the less common fully developed as well as the usual partially developed seas that persist most of the time throughout the world oceans. The spectral density can be written in the form

$$S(\omega) = A \omega^{-5} \exp\left[-\frac{B}{\omega^4}\right] \quad \text{m}^2 \cdot \text{sec} \quad (1)$$

$$\text{where } A = \frac{483.5 (\tilde{\zeta}_w)_{1/3}^2}{T_o^4} \quad \text{m}^2 \cdot \text{sec}^{-4} \quad (2)$$

$$\text{and } B = \frac{1944.5}{T_o^4} \quad \text{sec}^{-4} \quad (3)$$

where the two defining parameters of the spectrum are the significant wave height (average of one-third highest double amplitudes), $(\tilde{\zeta}_w)_{1/3}$, in meters and the modal wave period (peak of the wave spectrum), T_o , in seconds. The parameters can be taken from the data base provided in Appendix A, see Appendix B for data format description. As indicated in Appendix A, the frequency distribution, being fixed in SOWM, permits only certain modal period values in the parameterization of the spectra.

MODIFIED JONSWAP

When the ocean areas are relatively shallow, and at least partially surrounded by land, the Bretschneider spectral formulation is not recommended for use. Instead, the mean Modified JONSWAP spectrum is recommended. This formulation was developed by Hasselmann in order to model fetch-limited, shallow water wave conditions, see Reference 9.

The resulting function is a generalization of the Pierson-Moskowitz form by inclusion of fetch as an additional parameter to wind speed. As it is usually

written, the mean JONSWAP spectrum is dependent on the two parameters wind speed and fetch. However, for simplicity as well as consistency with the current state-of-the-art in seakeeping performance assessment, a JONSWAP expression which is dependent only on the two parameters, significant wave height and modal wave period, is desirable. Such an expression is derived in References 10 and 11 and written in the form

$$S(\omega) = Bg^2\omega^{-5} \exp\left[-1.25\left(\frac{\omega T_0}{2\pi}\right)^{-4}\right] \gamma \exp\left[-\frac{1}{2\sigma^2}\left(\frac{\omega T_0}{2\pi} - 1\right)^2\right] \quad \text{m}^2 \cdot \text{sec} \quad (4)$$

$$\text{where } \sigma = 0.07 \text{ for } \frac{\omega}{2\pi} < \frac{1}{T_0} \quad (5)$$

$$\sigma = 0.09 \text{ for } \frac{\omega}{2\pi} > \frac{1}{T_0}$$

$$B = \frac{319.43(\zeta_w)_{1/3}^2}{g^2 T_0^4} \quad (6)$$

$\gamma = 3.3$ for the mean JONSWAP spectra

If $\gamma = 1$ and $B = 0.0081$, the JONSWAP spectrum will reduce exactly to the Pierson-Moskowitz spectrum.

As with the usual JONSWAP formulation, the modified expression given in Equation (4) is for long-crested seas. While there is limited experimental verification, the cosine squared spreading function is recommended for use with the JONSWAP spectral formulation at this time.

SPECTRAL MOMENTS

Due to the randomness of ocean waves, two records measured at different times having the same height and period generally would not have the same spectrum. For the spectrum to remain the same, all moments must also remain the same. The various moments of the spectrum are defined as

$$m_n = \int_0^{\infty} S(\omega) \omega^n d\omega \quad (7)$$

The following are the most commonly used expressions using various combinations of the moments in describing wave spectra, see Reference 12.

$$\text{Significant Wave Height } (\tilde{z}_w)_{1/3} = 4\sqrt{m_0}$$

$$\text{Average Mean Period } T_1 = \frac{2\pi m_0}{m_1}$$

$$\text{Energy Average Period } T_{-1} = \frac{2\pi m_{-1}}{m_0}$$

$$\text{Average Zero Crossing Period } T_2 = 2\pi \left(\frac{m_0}{m_2}\right)^{1/2}$$

COSINE-SQUARED SPREADING FUNCTION

Since ocean waves are usually multi-directional, a cosine-squared spreading function is recommended to represent wave directionality. The function can be written as

$$S(\omega, \nu) = \frac{2}{\pi} \cos^2(\nu - \mu) S(\omega) \quad (8)$$

$$= W \cdot S(\omega) \quad (9)$$

where ν represents the secondary wave directions, μ is the predominant wave direction, and $S(\omega)$ is the point wave spectrum, see Reference 13. In applying Equation (8), it is assumed that energy is constant across direction bands equivalent to the increment across successive ν 's, and that it is constant for all wave frequencies. The spreading function is generally applied to ± 90 degrees and at 15-degree increments from the predominant wave direction for the wind-wave spectrum. Table 2 provides the weights, W , that can be applied to achieve spreading of the spectral components.

SPECTRAL PARAMETERIZATION

With regard to the estimation of the long-term wave data for design purposes, two factors which may seriously affect the magnitude of predicted values have to be taken into consideration. These include the sea severities and sample size. Calculations of extreme waves and ship response for long-term predictions and fatigue analysis are also discussed in this section.

LONG-TERM WAVE HEIGHT EXCEEDANCES

Long-term prediction provides valuable wave data to evaluate the extreme ship motion response expected to occur in the lifetime of a marine vehicle. It may also be used to evaluate the possible fatigue failure due to repeated loadings.

In connection with extreme load analysis, the 100 year return period of significant wave height is generally used. For fatigue analysis, a return period is normally 10 years. In general, the 1-year return period is taken as the basis for accidental loads or damage analysis, see Reference 14.

Figure 5 provides the combined annual significant wave height by return period for different ocean areas of the world. The maximum wave height corresponding to a specific return period may be obtained from this wave exceedance graph. This facilitates selecting a reasonable maximum design value and also helps in making fatigue calculations.

EXTREME VALUE

The most probable extreme value of a random process can be calculated by applying order statistics and the Weibull probability distribution to the wave data, see Reference 15. Then, the largest value in the ordered sample, k_n , with a return period factor R can be expressed as

$$k_n = \theta (\ln RN)^{1/B} \quad (10)$$

B is the Weibull slope known as the slope factor and θ is the scale parameter or characteristic value. B is dimensionless and θ has the same units as k_n . N is the sample size. The return period factor R , defined as the average waiting time between exceedances of the extreme value, is used as a safety factor to minimize the probability that the extreme value will exceed the predicted extreme value. For example, when R is equal to 100, the probability that the

predicted extreme value will be exceeded is 0.01, see Reference 15. If the samples are sufficiently large, derivation of the Weibull parameters based on the mean and the variance of the data set are simple to accomplish and can provide an objective estimate of the parameters. The procedure for this method is as follows. The mean value for the Weibull distribution can be defined as

$$\bar{X} = \theta \Gamma \left(1 + \frac{1}{B} \right) \quad (11)$$

where Γ is the gamma function and X is the mean value. The sample variance S^2 is given as

$$S^2 = \theta^2 \left[\Gamma \left(\frac{2}{B} + 1 \right) - \Gamma^2 \left(\frac{1}{B} + 1 \right) \right] \quad (12)$$

Dividing S^2 by \bar{X}^2 yields

$$\frac{S^2}{\bar{X}^2} = \frac{\Gamma \left(\frac{2}{B} + 1 \right)}{\Gamma^2 \left(1 + \frac{1}{B} \right)} - 1 \quad (13)$$

Table 3 lists S^2/\bar{X}^2 values as a function of B and can be used to obtain the value of B by interpolation.

Table 4 shows a comparison of actual and predicted extreme wave heights for various ocean areas over a 10 year period ($R = 1$). Also included in the table are the predicted extreme values for $R = 10, 25, 50$ and 100 . When the sample size is very large, i.e., North Pacific Ocean in Table 4, the agreement between the predicted and observed extreme values is within 2 percent. On the other hand, for a smaller sample size, such as Station India, the difference between the predicted and actual extreme value for $R = 1$ is about 9 percent.

STRATIFIED SAMPLE

Unpublished work by Cummins at DTNSRDC defines a family of "stratified" directional wave spectra for the period 1959-69 that has been developed for the North Atlantic. The primary stratification is with regard to significant wave height variations and the secondary is with regard to geographic location.

Seasonal variations are also included in the resulting approximately 2000 spectra. The wave height strata are 0 to 1, 1 to 2, 2 to 3, 3 to 5, 5 to 8, and greater than 8 meters. The Stratified Sample has no bias due to the fixed family shape of the commonly applied idealized spectra. It provides an unbiased sample of directional spectra representative of all sea severities and North Atlantic Ocean areas. An analogous data set is being constructed for the North Pacific.

WIND AND WAVE MODEL

As wind data are generally available for many open and coastal ocean areas, the following method is developed in Reference 16 for deriving the probability distributions of significant wave height or modal wave period from wind speed statistics. The procedure depends on the application of a two-parameter Weibull distribution. In brief, given a wind speed distribution from any data source, a corresponding significant wave height distribution or a modal wave period distribution can be developed. The procedure of this model is summarized by the following steps.

1. Using the appropriate a, b, c, and d values from Table 5 for Equations (14) and (15), determine B and θ values for various wind speed intervals.

$$B = a_B + b_B W + c_B W^2 + d_B W^3 \quad (14)$$

$$\theta = a_\theta + b_\theta W + c_\theta W^2 + d_\theta W^3 \quad (15)$$

where B is the Weibull slope known as the shape factor. θ is called the scale parameter or characteristic value. B is dimensionless and θ has the same units as X in Equation (16).

2. Substituting the appropriate sets of B and θ values into the following equation

$$f(X|B, \theta) = \frac{B}{\theta} \left(\frac{X}{\theta}\right)^{B-1} \exp\left[-\left(\frac{X}{\theta}\right)^B\right] \quad (16)$$

to derive the significant wave height frequency of occurrence distributions for different wind speeds. For best results the values for X as listed in Table 6 are recommended. These correspond to the interval mid-points of the data provided in Appendix A.

3. Then, using the existing wind speed percentage distributions and substituting into the equation as follows:

$$f(X_j) = \sum_i [f(X_j | B_i, \theta_i) \cdot f(W_i)] \quad (17)$$

$f(X_j | B_i, \theta_i)$ is a conditional probability density function of significant wave height or modal wave period for given wind speed. B_i and θ_i are functions of wind speed. Where $f(W_i)$ is the probability of wind speed derived from available wind speed occurrences, X_j is the significant wave height in meters or the modal wave period in seconds.

PRACTICAL APPLICATIONS

The recommended use of this wind and wave data is by utilizing a probabilistic approach to identifying the encountered environment of a maritime or naval mission. Many ocean activities can benefit through ascertaining and understanding the geographic and time (season, annual) specific environmental conditions which are to be expected. Conversely, one can use the data to select a time and area with the best likelihood of encountering a specified environmental condition. Ocean activities which may be enhanced or in which the safety of operation may be enhanced include: ship design, ship performance assessment, sea trials, naval warfare missions, offensive and defensive mining, amphibious operations, and salvage/rescue activities. Each activity would utilize the atlas in the same rudimentary fashion but with activity-specific algorithms to find the best forecast based on climatology.

I. Naval ship designers can follow four steps when applying wind and wave climatologies, as contained in this atlas toward improving the fleet.

a. Thoroughly define the mission of the ship and the limiting environmental factors, in which the mission must be performed, at specified levels of efficiency.

b. Identify the area(s) of operation.

c. Extract the percent of occurrence of the limiting environmental factors from the appropriate time and area specific table. This can be done either seasonally or annually.

d. To calculate ship response, derive the percent of time of successful, limited, and unsuccessful mission operation by using the percent frequencies of

occurrence of the environmental parameters. If the resultant percentages are not acceptable, the designer must fine tune the ship's hull configuration to meet the desired operating envelope.

II. Wind and wave data can be used to assess how the environment may have been a contributing factor in the failure or damage of a system, operation, or equipment. Failure in this context refers to losses which result from fatigue over a significant portion of the ship's lifespan and not to a specific single environmental episode.

a. Identify the area(s) and season of operation prior to the "failure" of interest.

b. Identify the environmental conditions which, if exceeded (modal wave period, significant wave height, wind speed), would probably cause the damage or failure.

c. Derive the percent of occurrence of conditions exceeding those conditions of step b above, for the operational areas and time.

III. Sea trial and naval warfare planning can be enhanced through the use of this atlas by following a procedure of identifying areas of the ocean most likely to provoke the desired seaway and resulting ship motions for a given time of year.

a. The first step is to define the seaway (upper and lower wave height limits) best suited for specific tasks of the sea trial or mission.

b. Identify the general geographic area of interest.

c. From the climatology, identify the time (season) which has acceptable probabilities of occurrence (e.g., 50 percent, 75 percent, 80 percent, etc.) of encountering the desired wave heights. Probabilities of occurrence can be extracted by area and time directly from Appendix A.

The basic underlying factor of each of the above uses is that one can obtain a good understanding of the general environmental conditions for a given time and location prior to the commencement of an activity or mission at sea. Armed with this knowledge one can have onboard contingency plans which will likely reduce mission reaction time in the event of encountering severe weather conditions as well as maximize mission effectiveness in all non-threatening environmental conditions.

ACKNOWLEDGMENTS

The authors gratefully acknowledge the continuing assistance of Ms. Dana M. Gentile and her staff, of ORI, Inc., in developing the climatology data presented herein. Additionally, the assistance of Mr. Gregory Neuschafer, formerly of DTNSRDC, and Mrs. Beverly Simon of DTNSRDC is appreciated.

REFERENCES

1. Cummins, W.E. and S.L. Bales, "Extreme Value and Rare Occurrence Statistics for Northern Hemispheric Shipping Lanes," Proceedings, 5th SNAME Ship Technology and Research (STAR) Symposium, Coronado, California (Jun 1980).
2. Cummins, W.E., S.L. Bales and D.M. Gentile, "Hindcasting Waves for Engineering Applications," Proceedings of the International Symposium on Hydrodynamics in Ocean Engineering, Trondheim (Aug 1981).
3. Bales, S.L., W.E. Cummins and E.N. Comstock, "Potential Impact of Twenty Year Hindcast Wind and Wave Climatology," Marine Technology, Vol. 19, No. 2 (Apr 1982).
4. Bales, S.L., W.E. Cummins and W.T. Lee, "Advances in Environment Specification for Seakeeping Analyses," 20th ATTC (Aug 1983).
5. Bales, S.L., W.T. Lee and J.M. Voelker, "Standardized Wave and Wind Environments for NATO Operational Areas," Report DTNSRDC/SPD-0919-01 (Jul 1981).
6. Bales, S.L., "Designing Ships to the Natural Environment," Naval Engineers Journal, Vol. 95, No. 2, (Mar 1983).
7. Bales, S.L., "Development and Application of a Deep Water Hindcast Wave and Wind Climatology," Royal Institute of Naval Architects Wave and Wind Climate World Wide Symposium, 1984.
8. Pierson, W.J., "The Spectral Ocean Wave Model (SOWM), A Northern Hemisphere Model for Specifying and Forecasting Ocean Wave Spectra," DTNSRDC Report 82/011 (Jul 1982).
9. Hasselmann, K. et al., "Measurements of Wind-Wave Growth and Swell Decay During the Joint North Sea Wave Project (JONSWAP)," Deutschen Hydrographischen Zeitschrift, A8, No. 12 (1973).
10. Lee, W.T. and S.L. Bales, "A Modified JONSWAP Spectrum Dependent Only on Wave Height and Period," DTNSRDC Report SPD-0918-01 (May 1980).
11. Miles, M.D., "A Note on the Use of Standard ITTC Wave Spectra at AVMRI," National Research Council Canada, Arctic Vessel and Marine Research Institute, MTB-147 (Jan 1984).
12. Bhattacharyya, R., "Dynamics of Marine Vehicles," John Wiley and Sons, Inc. (1978).
13. Bales, S.L., E.N. Comstock, R.T. Van Eseltine and E.W. Foley, "Ship Seakeeping Operator Guidance Simulation," Proceedings of the Summer Simulation Conference (July 1979).

14. Odland, J., "Response and Strength Analysis of Jack-Up Platforms,"
15. Lee, W.T. and S.L. Bales, "Environmental Data for Design of Marine Vehicles," Ship Structures Symposium (1984).
16. Lee, W.T., S.L. Bales and W. E. Cummins, "Joint Occurrence of Environment Disturbances," Ship Structure Committee Report SR-1287 (1985).

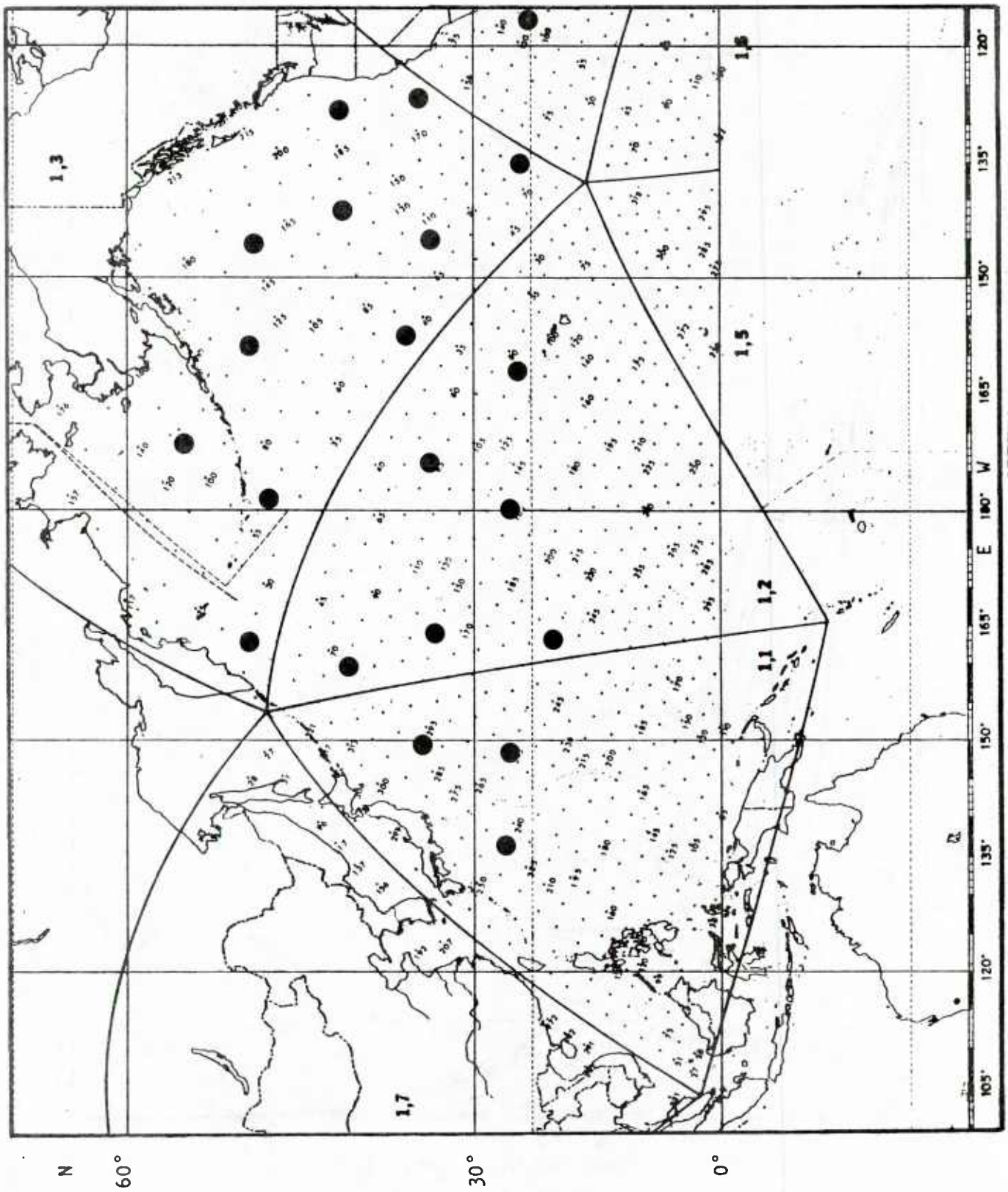


Figure 1 - Definition of Representative Areas in the North Pacific Basin

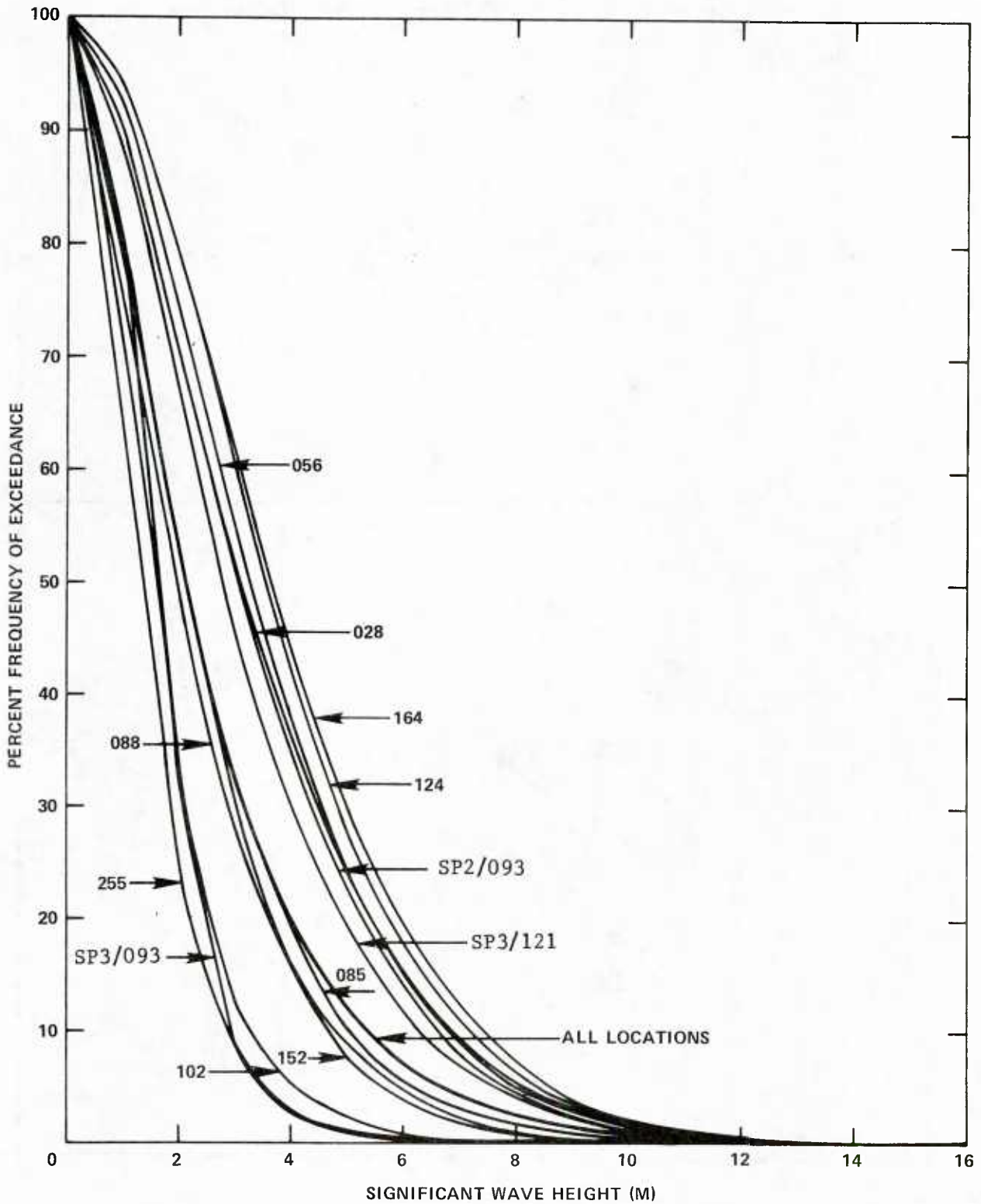


Figure 2 - Comparison of Annual Wave Height Exceedances of Representative Areas

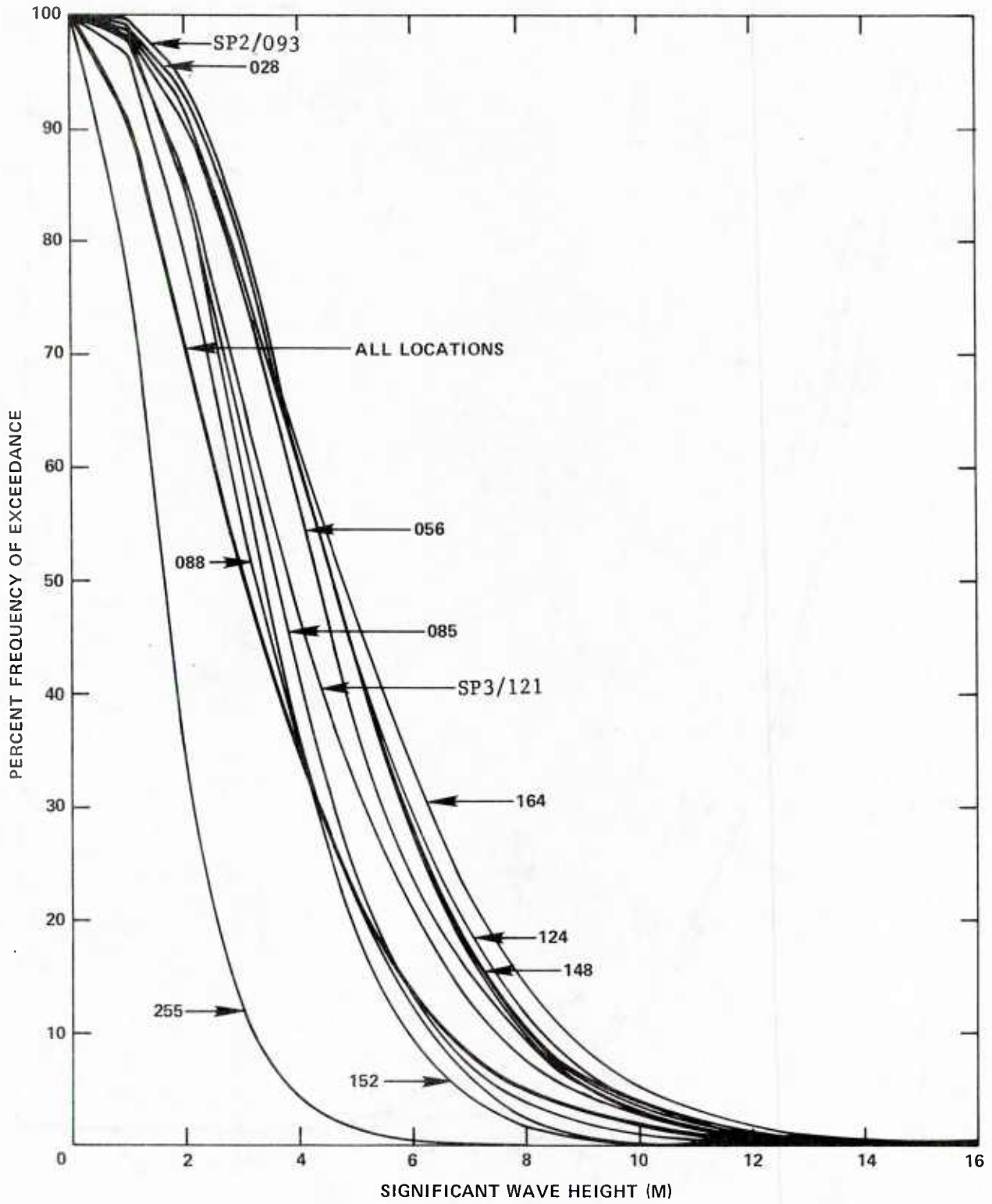


Figure 3 - Comparison of Winter Season Wave Height Exceedances of Representative Areas

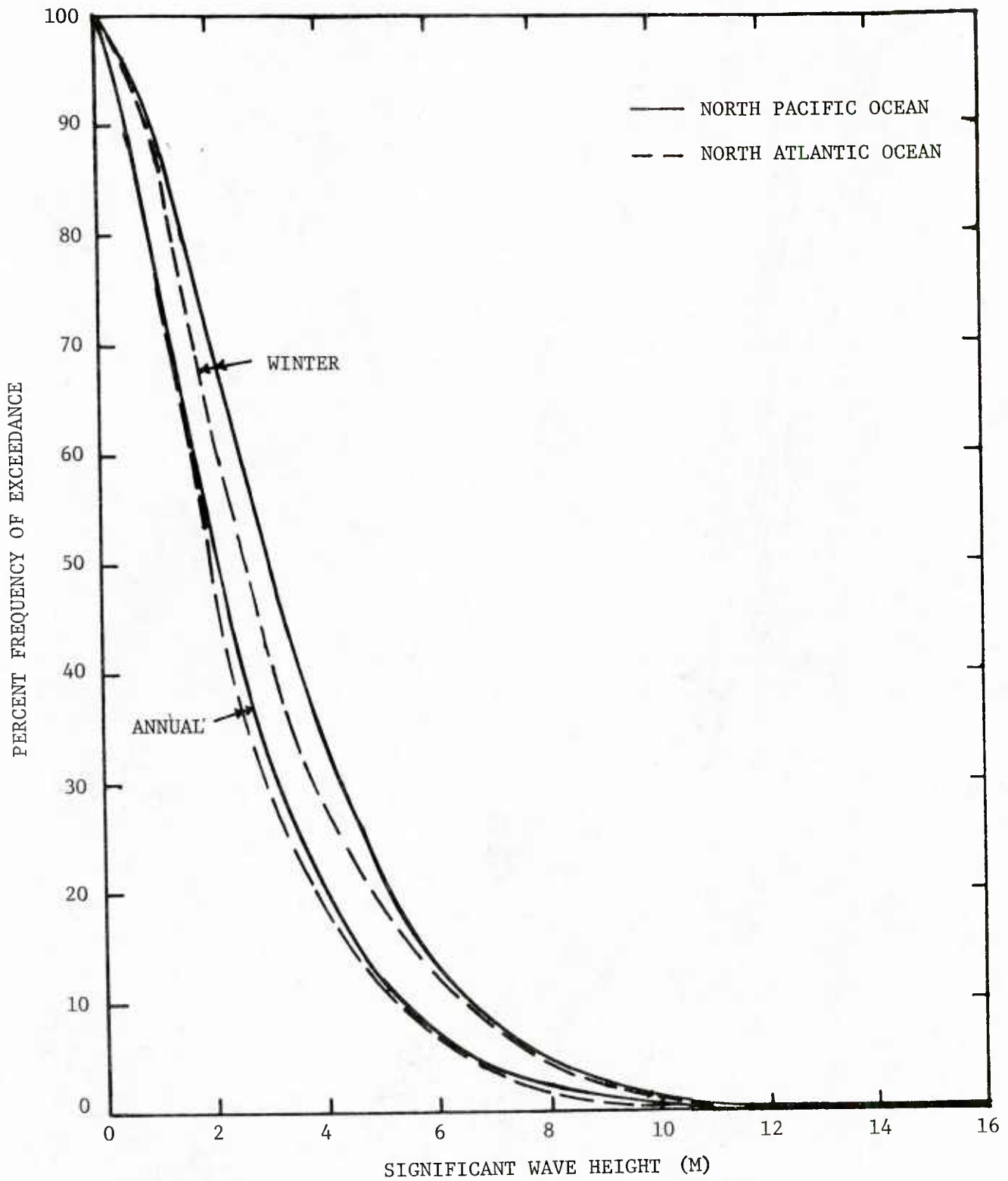


Figure 4 - Comparisons of Annual and Winter Wave Height Exceedances for the North Pacific and the North Atlantic Oceans

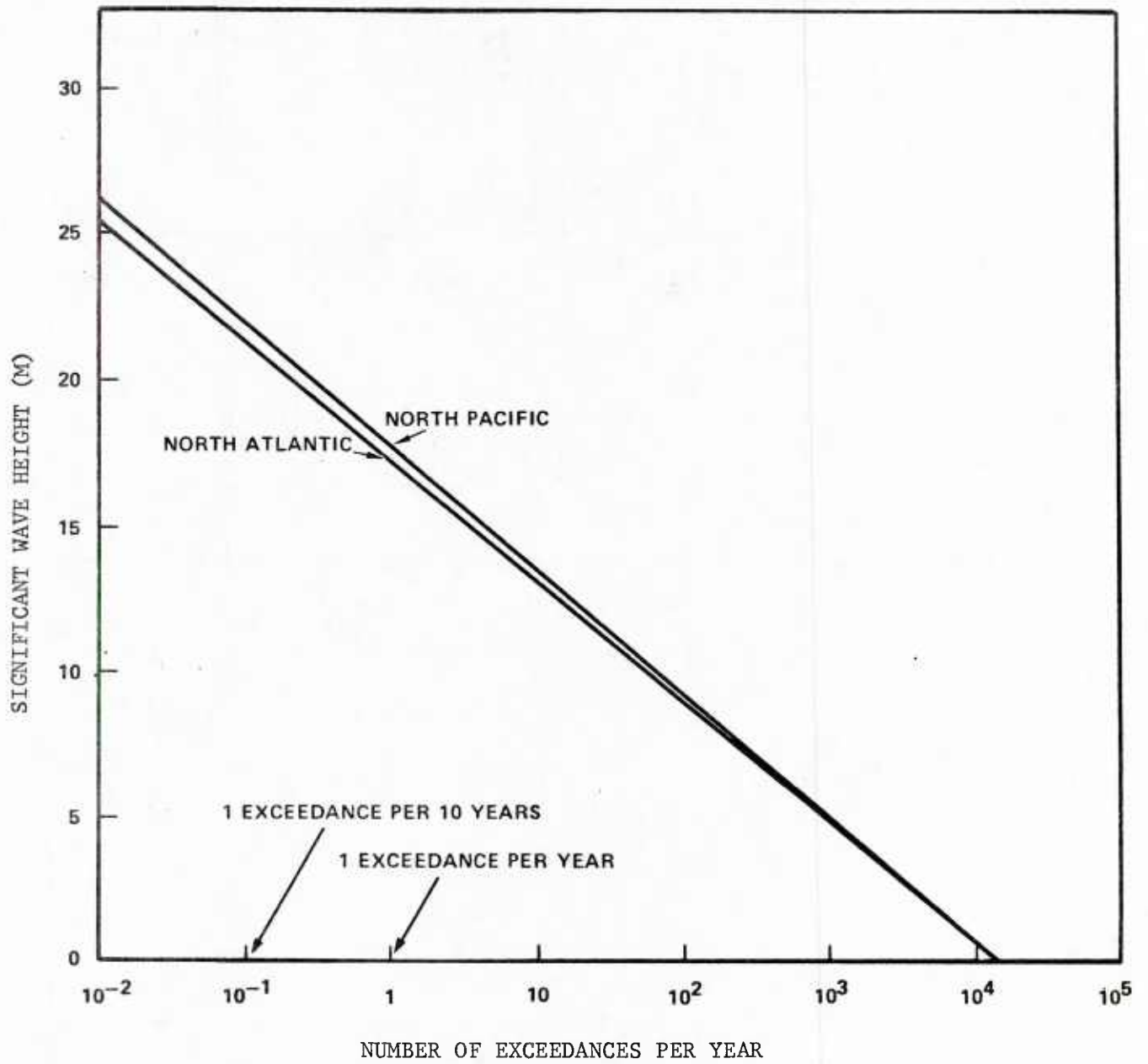


Figure 5 - Significant Wave Height Exceedance Diagram
(Figure 3 of Reference 16)

TABLE 1 - LOCATIONS DEFINING NORTH PACIFIC OCEAN AREAS

Subprojection	Grid Point	Latitude, N,	Longitude, W
1	255	26.0°	148.2°E
	239	26.5°	135.8°E
	294	36.3°	148.5°E
2	233	20.6°	163.1°E
	102	24.8°	162.5°
	165	25.2°	179.8°E
	152	34.2°	163.8°E
	85	34.5°	174.2°
	93	42.8°	159.0°E
3	93	24.6°	135.6°
	88	34.9°	145.6°
	188	36.2°	127.4°
	39	37.5°	158.0°
	148	43.2°	141.4°
	202	43.7°	128.7°
	56	50.0°	178.9°
	164	50.9°	145.6°
	124	51.3°	158.8°
	28	51.3°	162.5°E
121	56.4°	171.7°	
4	121	24.2°	116.3°

TABLE 2 - RECOMMENDED COSINE-SQUARED SPREADING WEIGHTS
(TABLE 2 OF REFERENCE 13)

W	ν^*	90°	75°	60°	45°	30°	15°	0°
Wave Angles, ν	-90°	0.000	--	--	--	--	--	--
	-75°	0.011	0.000	--	--	--	--	--
	-60°	0.042	0.019	0.000	--	--	--	--
	-45°	0.083	0.069	0.037	0.000	--	--	--
	-30°	0.125	0.131	0.125	0.083	0.000	--	--
	-15°	0.156	0.181	0.213	0.250	0.250	0.000	0.000
	0° (μ)	0.167	0.200	0.250	0.333	0.500	1.000	1.000
	15°	0.156	0.181	0.213	0.250	0.250	0.000	0.000
	30°	0.125	0.131	0.125	0.083	0.000	--	--
	45°	0.083	0.069	0.037	0.000	--	--	--
	60°	0.042	0.019	0.000	--	--	--	--
	75°	0.011	0.000	--	--	--	--	--
	90°	0.000	--	--	--	--	--	--

TABLE 3 - $\frac{S^2}{\bar{X}^2}$ VALUES AS A FUNCTION OF B

(TABLE V OF REFERENCE 15)

B	S^2/\bar{X}^2	B	S^2/\bar{X}^2	B	S^2/\bar{X}^2
0.5	5.0	1.9	0.300	3.3	0.111
0.55	3.861	1.95	0.286	3.35	0.108
0.6	3.091	2.0	0.275	3.4	0.106
0.65	2.543	2.05	0.261	3.45	0.103
0.7	2.139	2.1	0.25	3.5	0.1
0.75	1.83	2.15	0.24	3.55	0.098
0.8	1.589	2.2	0.23	3.6	0.095
0.85	1.396	2.25	0.221	3.65	0.093
0.9	1.239	2.3	0.213	3.7	0.091
0.95	1.109	2.35	0.205	3.75	0.088
1.00	1.00	2.4	0.197	3.8	0.086
1.05	0.908	2.45	0.19	3.85	0.084
1.1	0.828	2.5	0.183	3.9	0.082
1.15	0.760	2.55	0.177	3.95	0.081
1.2	0.700	2.6	0.171	4.0	0.079
1.25	0.648	2.65	0.165	4.05	0.077
1.3	0.602	2.7	0.16	4.1	0.075
1.35	0.561	2.75	0.154	4.15	0.074
1.4	0.524	2.8	0.149	4.2	0.072
1.45	0.491	2.85	0.145	4.25	0.071
1.5	0.461	2.9	0.14	4.3	0.069
1.55	0.434	2.95	0.136	4.35	0.068
1.6	0.409	3.0	0.132	4.4	0.066
1.65	0.387	3.05	0.128	4.45	0.065
1.70	0.367	3.1	0.125	4.5	0.064
1.75	0.348	3.15	0.121	5.0	0.053
1.80	0.330	3.2	0.118	5.5	0.044
1.85	0.314	3.25	0.114	6.0	0.041

TABLE 4 - COMPARISON OF CALCULATED AND MEASURED EXTREME WAVE HEIGHTS

(TABLE VII OF REFERENCE 15)

10 YEAR HINDCASTS	\bar{X} , M	S^2 , M ²	N	B	θ	ACTUAL EXTREME VALUE, M	PREDICTED EXTREME VALUE, k_n , M				
							R = 1	R = 10	R = 25	R = 50	R = 100
N. PACIFIC	2.9	4.65	175588	1.36	3.17	19.5	19.8	22.4	23.2	24.3	25.0
N. ATLANTIC	2.6	4.11	133088	1.29	2.81	19.5	19.0	21.8	22.9	23.7	24.5
STATION INDIA (58.9°N, 18.3°W)	3.25	4.90	13303	1.50	3.60	17.8	16.1	18.6	19.6	20.3	21.0
STATION PAPA (50.9°N, 145.6°W)	3.69	5.53	13575	1.60	4.12	18.1	16.8	19.2	20.2	20.8	21.5

TABLE 5 - COEFFICIENT TO CALCULATE THE B AND θ VALUES FOR OPEN OCEAN AND COASTAL AREAS
(TABLE D-1 OF REFERENCE 16)

OPEN OCEAN	SIGNIFICANT WAVE HEIGHT						MODAL WAVE PERIOD					
	ANNUAL			WINTER			ANNUAL			WINTER		
	B	θ		B	θ		B	θ		B	θ	
a	1.118	1.09	1.072	2.1355	3.581	11.934	3.995	13.44				
b	-0.0066	-0.0226	0.121	-0.0457	-0.0309	-0.1074	0.1015	-0.0225				
c	0.00276	0.00954	-0.008	0.0095	0.000715	0.00865	-0.00323	-0.0000265				
d	0.0000067	-0.00011	0.00022	-0.00011	0.000065	-0.000092	0.000057	0.000056				

COASTAL AREA	SIGNIFICANT WAVE HEIGHT						MODAL WAVE PERIOD					
	ANNUAL			WINTER			ANNUAL			WINTER		
	B	θ		B	θ		B	θ		B	θ	
a	0.6617	0.7472	0.7523	0.6889	3.11	12.132	4.666	13.68				
b	0.0779	-0.0183	0.08035	0.0456	-0.1056	-0.2313	-0.1897	-0.139				
c	0.000936	0.0071	0.000877	0.00355	0.0093	0.0096	0.010556	0.00178				
d	-0.0000215	-0.000078	-0.0000245	-0.0000228	-0.00011	-0.000072	-0.000121	0.0000426				

TABLE 6 - RECOMMENDED VALUES FOR CLASS INTERVALS X
 (TABLE D-2 OF REFERENCE 16)

SIGNIFICANT WAVE HEIGHT, M	MODAL WAVE PERIOD SEC
0.5	3.2
1.5	4.8
2.5	6.3
3.5	7.5
4.5	8.8
5.5	9.7
6.5	10.9
7.5	12.4
8.5	13.8
9.5	15.0
11.0	16.4
13.0	18.0
15.0	20.0
18.0	22.5
22.0	25.7
26.0	
30.0	

APPENDIX A

SEASONAL CLIMATOLOGY OF THE NORTH PACIFIC OCEAN

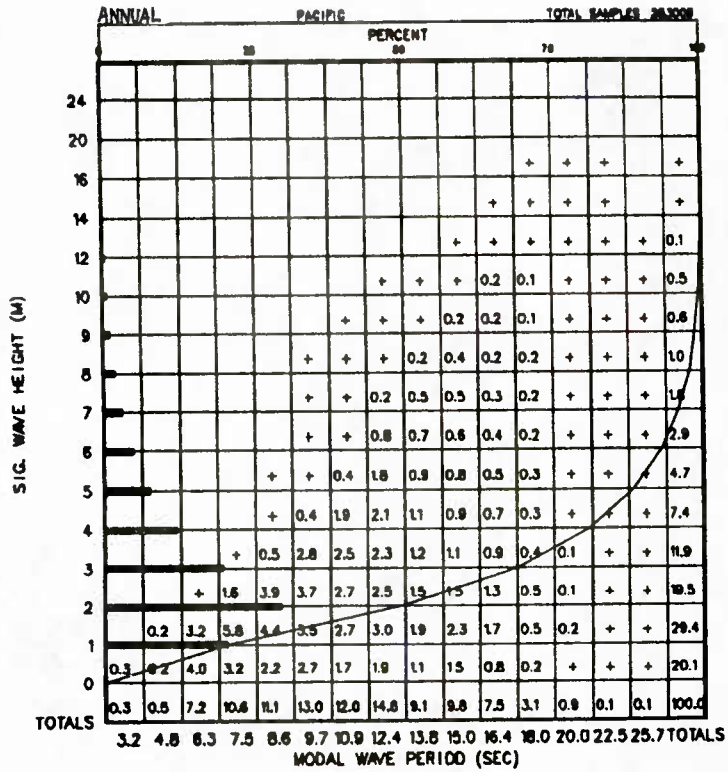


Figure A-Pac-1-1 Significant Wave Height vs. Modal Wave Period

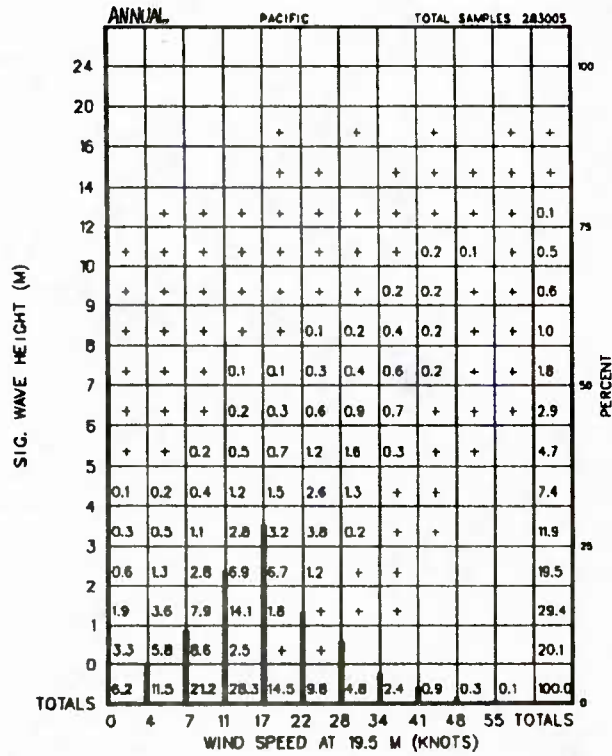


Figure A-Pac-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

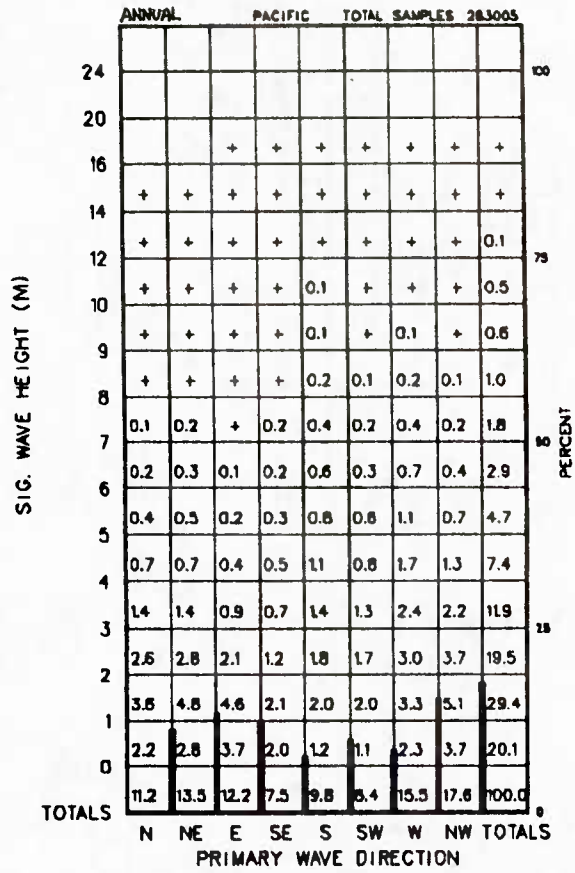


Figure A-Pac-1-3 Significant Wave Height vs. Primary Wave Direction

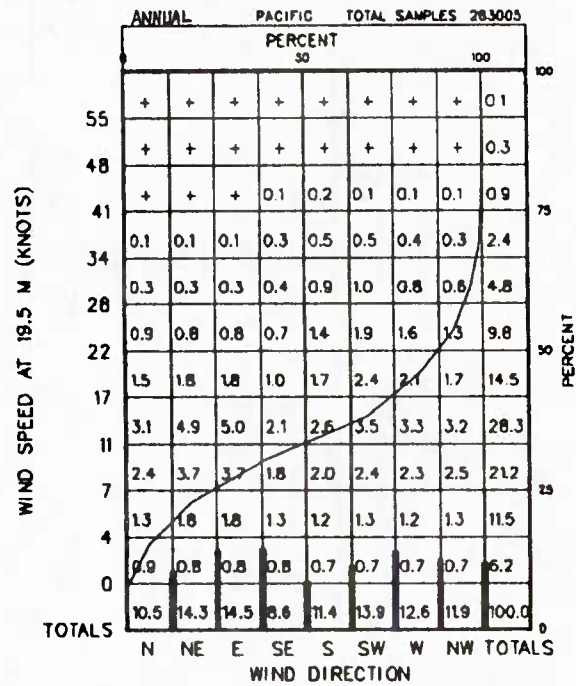


Figure A-Pac-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

SIG. WAVE HEIGHT (M)	ANNUAL			PACIFIC			TOTAL SAMPLES 283008			SEA STATE NO.
	+	+	+	+	+	+	+	+	+	
14.00										
9.00	+	+	+	+	+	0.8	0.1	+	+	1.1
6.00	+	0.1	0.4	0.6	1.1	3.3	+	+		5.8
4.00	0.4	0.7	1.9	2.5	4.4	2.2				12.1
2.50	1.3	2.4	6.1	7.2	3.5	0.1				20.5
1.25	4.2	7.3	16.5	4.2	+	+				32.4
.50	6.7	10.3	5.5	+	+					22.6
.10	3.2	2.2	+							5.4
0.00										
TOTALS	13.9	23.0	30.5	14.7	9.2	6.5	0.2	+	+	100.0
	0	6	10	16	21	27	47	55	63	TOTALS
	WIND SPEED AT 10 M (KNOTS)									

Figure A-Pac-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

SIG. WAVE HEIGHT (M)	ANNUAL			PACIFIC			TOTAL SAMPLES 283008			PERCENT
	+	+	+	+	+	+	+	+	+	
24										
20										
16							+	+		+
14							+	+	+	+
12							+	+	+	0.1
10							+	0.3	0.1	+
9							+	0.5	+	+
8							+	0.9	+	+
7							0.8	0.9	+	+
6							2.3	0.5	+	+
5							+	4.2	0.4	+
4							2.2	4.5	0.5	0.1
3							8.3	2.7	0.7	0.2
2	+	2.4	12.9	3.0	0.9	0.3	+	+	+	+
1		14.5	9.4	3.6	1.3	0.5	0.1	+	+	
0	1.9	6.7	6.6	3.3	1.1	0.3	+	+	+	
TOTALS	1.9	23.7	39.4	24.4	6.0	1.9	0.5	0.1	+	+
	0.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0
	ZERO CROSSING PERIOD (SEC)									

Figure A-Pac-1-6 Significant Wave Height vs. Zero Crossing Period

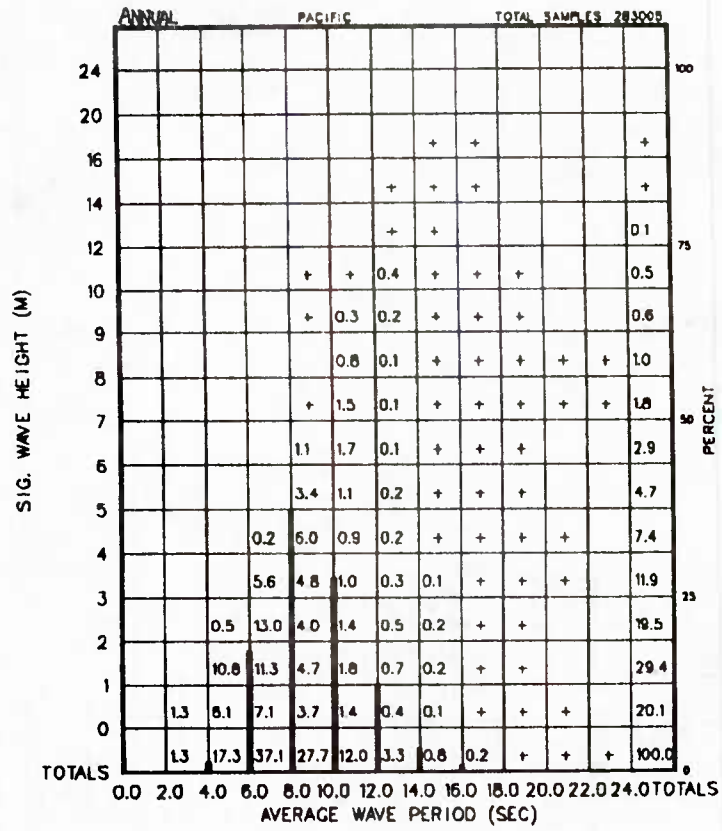


Figure A-Pac-1-7 Significant Wave Height vs. Average Wave Period

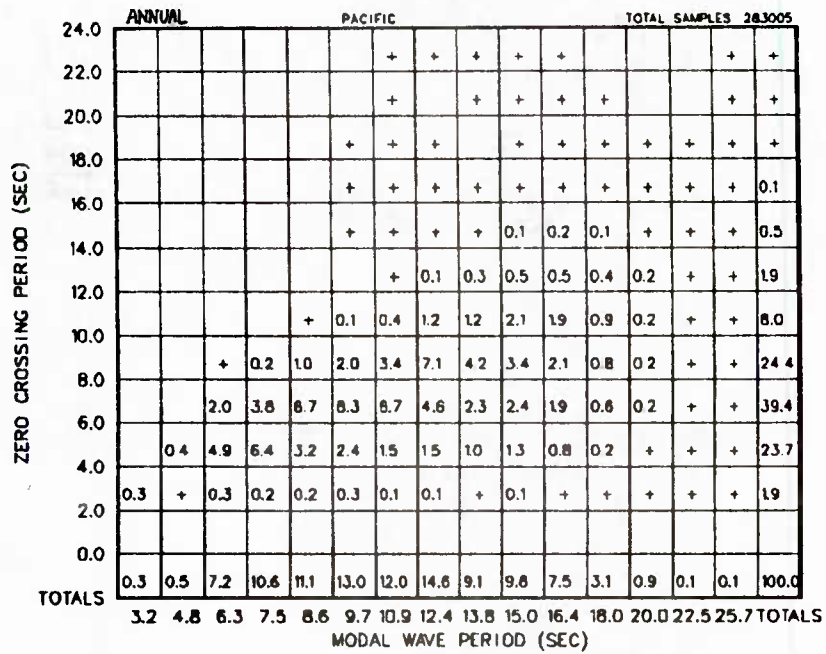


Figure A-Pac-1-8 Zero Crossing Period vs. Modal Wave Period

AVERAGE WAVE PERIOD (SEC)	ANNAL			PACIFIC									TOTAL SAMPLES 283005			
	3.2	4.8	6.3	7.5	8.6	9.7	10.9	12.4	13.8	15.0	16.4	18.0	20.0	22.5	25.7	TOTALS
24.0									+	+	+	+	+	+	+	+
22.0																
20.0									+	+	+	+	+			
18.0									+	+	+	+	+	+	+	+
16.0																0.2
14.0									+	+	+	0.1	0.3	0.2	0.1	+
12.0																0.8
10.0																3.3
8.0																12.0
6.0																27.7
4.0																37.1
2.0																17.3
0.0																1.3
TOTALS	0.3	0.5	7.2	10.6	11.1	13.0	12.0	14.6	9.1	9.8	7.5	3.1	0.9	0.1	0.1	100.0

Figure A-Pac-1-9 Average Wave Period vs. Modal Wave Period

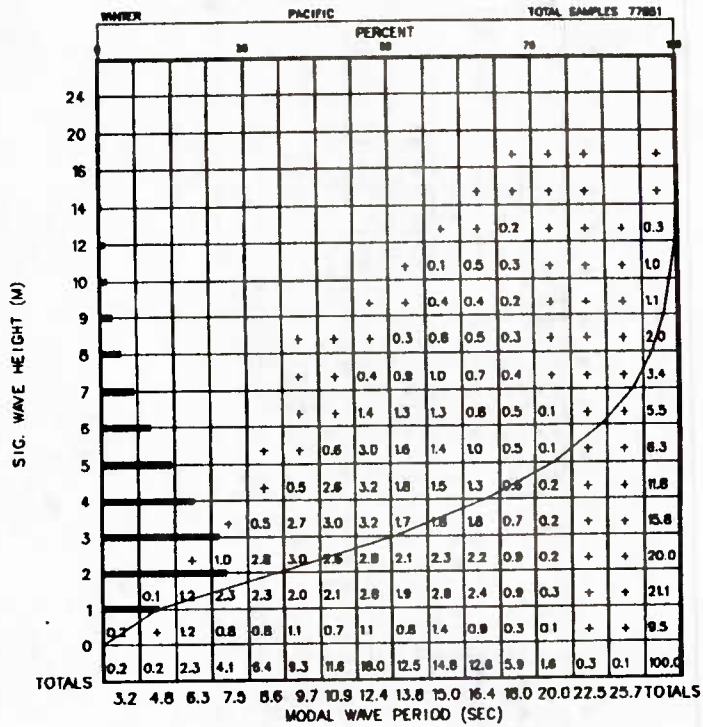


Figure A-Pac-2-1 Significant Wave Height vs. Modal Wave Period

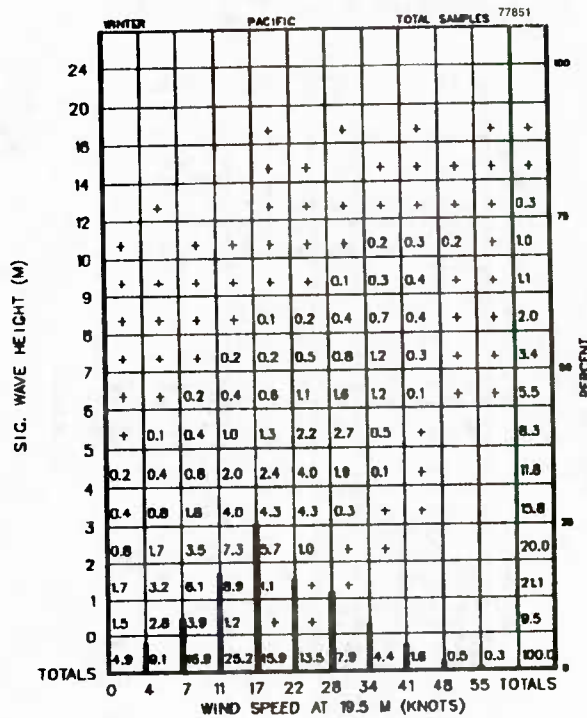


Figure A-Pac-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

		PACIFIC								TOTAL SAMPLES 77881	
		N	NE	E	SE	S	SW	W	NW	TOTALS	PERCENT
SIG. WAVE HEIGHT (M)	24										
	20										
	18				+	+	+	+	+	+	
	14	+	+	+	+	+	+	+	+	+	
	12	+	+	+	+	+	+	+	+	0.3	
	10	+	+	+	0.1	0.3	+	0.2	+	1.0	
	9	+	+	+	0.1	0.3	0.1	0.2	0.1	1.1	
	8	0.1	0.2	0.1	0.2	0.5	0.2	0.5	0.2	2.0	
	7	0.2	0.3	0.2	0.3	0.7	0.4	0.8	0.5	3.4	
	6	0.3	0.6	0.3	0.4	1.0	0.6	1.2	0.9	5.5	
	5	0.6	0.9	0.4	0.6	1.2	1.0	1.9	1.4	8.3	
	4	1.2	1.4	0.7	0.8	1.4	1.2	2.6	2.2	11.6	
	3	1.9	2.2	1.2	1.1	1.5	1.5	2.9	3.1	15.8	
2	3.1	3.3	2.0	1.4	1.5	1.4	2.7	4.1	20.0		
1	3.6	3.1	2.9	1.6	1.0	0.9	2.0	4.7	21.1		
0	1.5	1.3	1.6	0.6	0.3	0.3	0.9	2.1	9.5		
TOTALS	12.8	13.5	8.5	7.2	9.9	7.7	16.1	18.5	100.0		

Figure A-Pac-2-3 Significant Wave Height vs. Primary Wave Direction

		PACIFIC								TOTAL SAMPLES 77881	
		PERCENT									
		N	NE	E	SE	S	SW	W	NW	TOTALS	PERCENT
WIND SPEED AT 19.5 M (KNOTS)	55	+	+	+	+	+	+	+	+	0.3	
	48	+	+	+	+	0.1	+	+	+	0.5	
	41	+	0.1	0.1	0.2	0.4	0.3	0.2	0.2	1.6	
	34	0.2	0.3	0.3	0.5	0.9	0.9	0.7	0.6	4.4	
	28	0.5	0.5	0.6	0.7	1.4	1.7	1.4	1.1	7.9	
	22	1.0	1.2	1.2	1.1	1.9	2.7	2.3	2.0	13.5	
	17	1.5	2.1	1.9	1.2	1.8	2.8	2.5	2.1	15.8	
	11	3.1	4.3	3.8	1.9	2.3	3.1	3.3	3.0	25.2	
	7	2.4	3.1	2.3	1.3	1.5	1.7	2.0	2.1	16.9	
	4	1.2	1.5	1.2	0.9	0.8	1.0	1.1	1.1	9.1	
	0	0.8	0.8	0.8	0.5	0.5	0.5	0.5	0.8	4.9	
	TOTALS	12.8	13.7	12.0	8.4	11.7	14.5	14.1	12.8	100.0	

Figure A-Pac-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

SIG. WAVE HEIGHT (M)	WINTER			PACIFIC			TOTAL SAMPLES 77801			SEA STATE NO.
	0	6	10	16	21	27	47	55	63	
14.00				+	+	+	+	+	+	0.1
9.00	+	+	+	+	0.2	1.7	0.2	+	+	2.4
6.00	0.2	0.3	0.8	1.2	2.2	6.2	+	+		10.9
4.00	0.7	1.3	3.4	4.3	7.1	3.3				20.1
2.50	2.0	3.5	8.0	8.0	3.8	0.1				25.5
1.25	4.3	8.9	12.2	3.0	+	+				26.8
.50	4.2	5.4	2.8	+	+					12.4
.10	1.1	0.8	+							2.0
0.00										
TOTALS	12.5	18.3	27.4	18.7	13.3	11.5	0.3	+	+	100.0

Figure A-Pac-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

SIG. WAVE HEIGHT (M)	WINTER			PACIFIC			TOTAL SAMPLES 77801			PERCENT				
	0.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0		18.0	20.0	22.0	24.0
24														
20														
18								+	+					+
16							+	+	+					+
14														
12							+	0.2	+					0.3
10							0.7	0.2	+	+				1.0
9							+	1.1	+	+	+			1.1
8							+	1.8	+	+	+	+	+	2.0
7								1.5	1.7	+	+	+	+	3.4
6								4.2	1.1	0.1	+	+	+	5.5
5								+	7.3	0.8	0.2	+	+	8.3
4									3.0	7.5	1.0	0.2	+	11.8
3									9.9	4.3	1.1	0.3	+	15.8
2									1.4	12.5	4.1	1.3	0.5	20.0
1									7.7	7.2	3.7	1.6	0.7	21.1
0									0.9	2.9	2.5	1.9	0.9	8.5
TOTALS	0.9	12.0	36.1	34.6	13.2	3.1	0.8	0.2	+	+	+	+	+	100.0

Figure A-Pac-2-6 Significant Wave Height vs. Zero Crossing Period

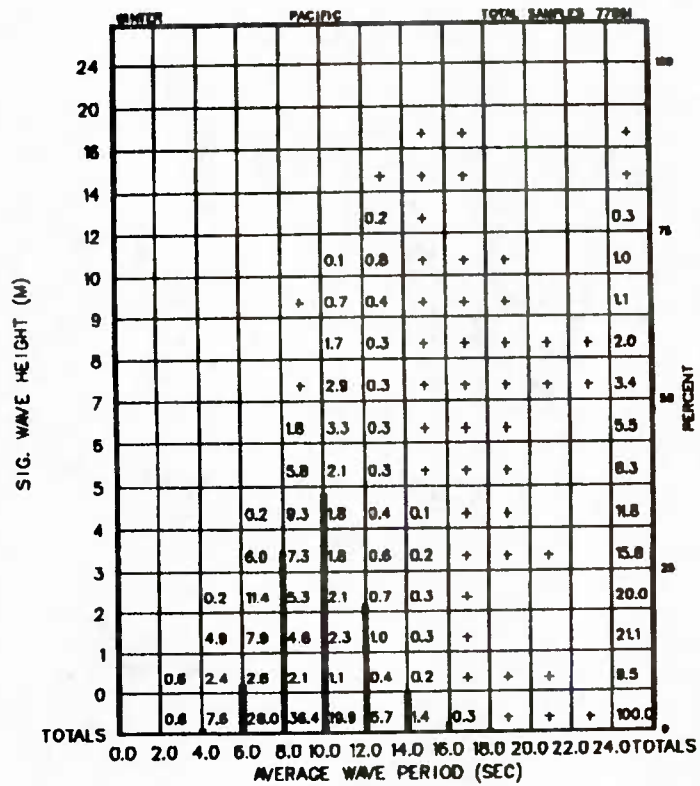


Figure A-Pac-2-7 Significant Wave Height vs. Average Wave Period

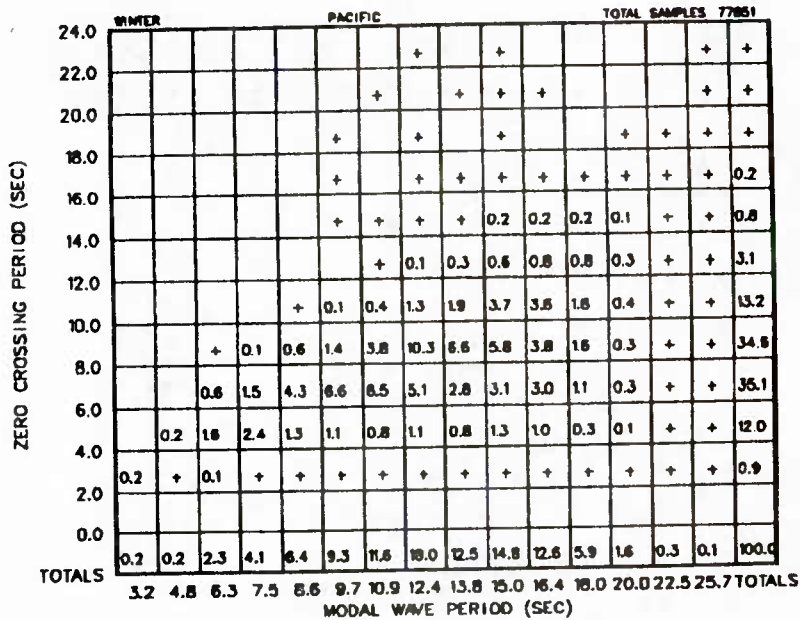


Figure A-Pac-2-8 Zero Crossing Period vs. Modal Wave Period

AVERAGE WAVE PERIOD (SEC)	WINTER		PACIFIC										TOTAL SAMPLES 77861			
	3.2	4.8	6.3	7.5	8.6	9.7	10.9	12.4	13.8	15.0	16.4	18.0	20.0	22.5	25.7	TOTALS
24.0																
22.0																
20.0																
18.0																
16.0																
14.0																
12.0																
10.0																
8.0																
6.0																
4.0																
2.0																
0.0																
TOTALS	0.2	0.2	2.3	4.1	6.4	9.3	11.6	18.0	12.5	14.8	12.6	5.9	1.6	0.3	0.1	100.0

Figure A-Pac-2-9 Average Wave Period vs. Modal Wave Period

TABLE A-239-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

Natural Environment	SEASON: ANNUAL; LOCATION: 26.51°, 135.84°E				
	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.25 6 -	1.25 9.5 -	3.5 17.5 -	1.5 11 -	0.5 8.6 E
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	2 0.5 -	9 1.25 -	20 2.5 -	10 1.5 -	9 1.25 NE-E
Visibility, nautical miles	7	18	25	-	-
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	0.5 0	6.5 1	8 7	- -	- -
Precipitation (Occurrence)	All precipitation - 13% of the time				
Relative Humidity, %	63	85	98	-	-
Air Temperature, °C	19	22	25	22	-
Sea Surface Temperature, °C	22.5	24	25.5	-	-
Sea Level Pressure, millibars	1006	1015	1025	-	-
Ice	None				
Refractivity Mean Surface Refractivity Sub-Refraction (1 km, Annual) Super-Refraction or Ducting (1 km, Annual)	- - -	- - -	- - -	312 - -	- 1% 3%

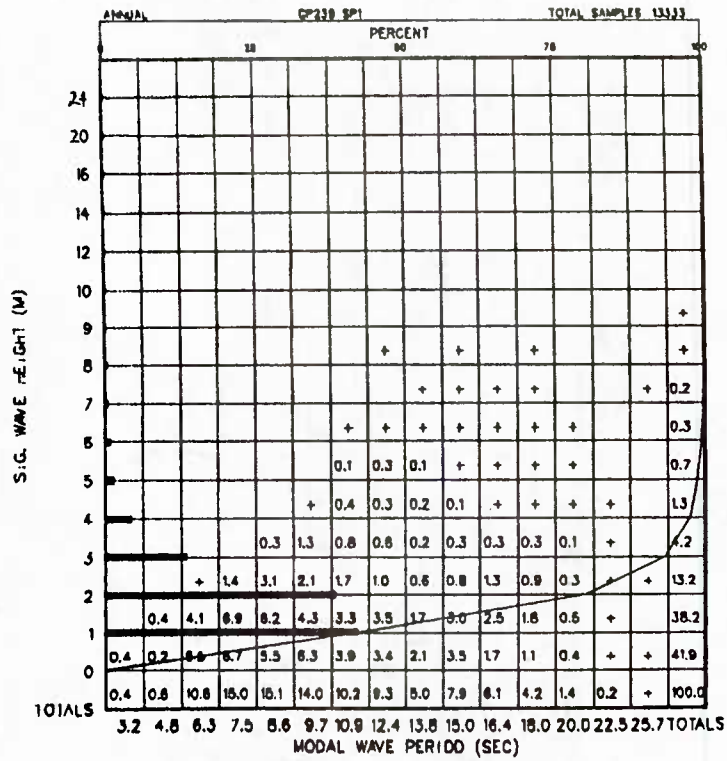


Figure A-239-1-1 Significant Wave Height vs. Modal Wave Period

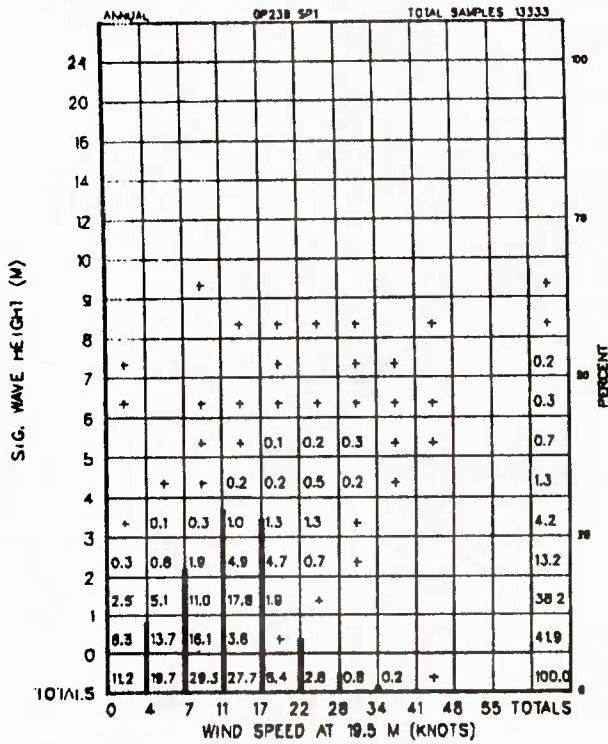


Figure A-239-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

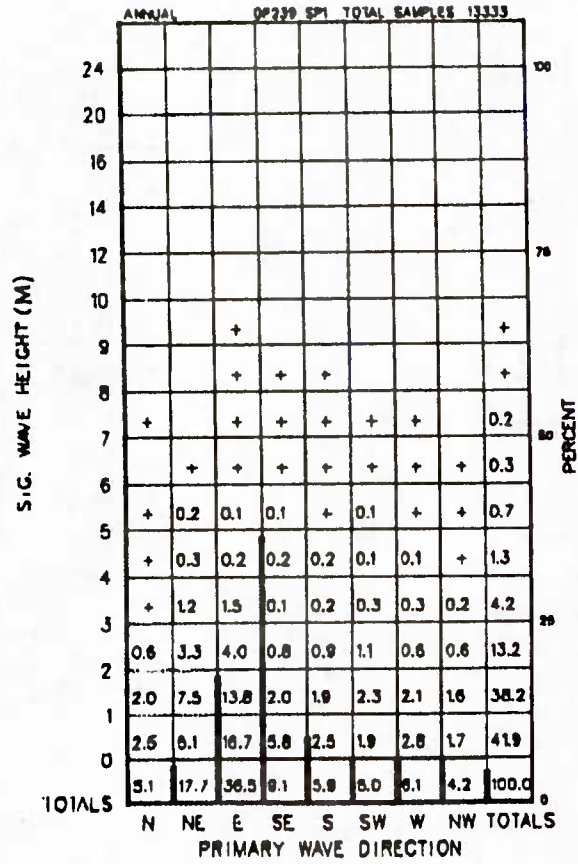


Figure A-239-1-3 Significant Wave Height vs. Primary Wave Direction

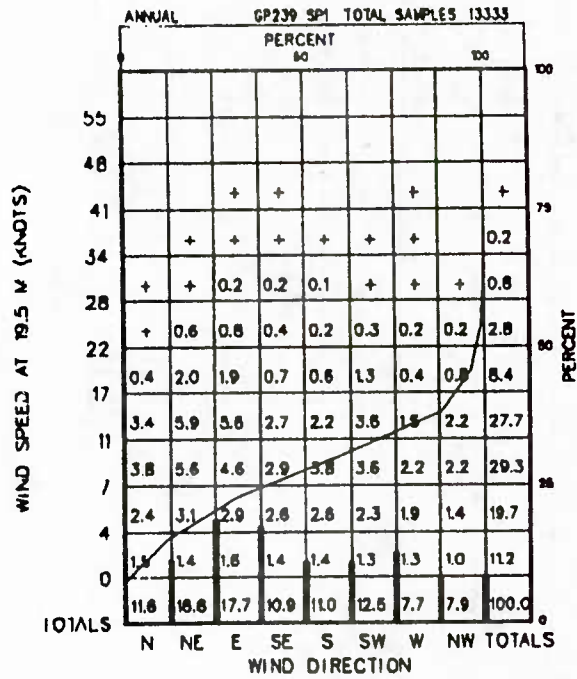


Figure A-239-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

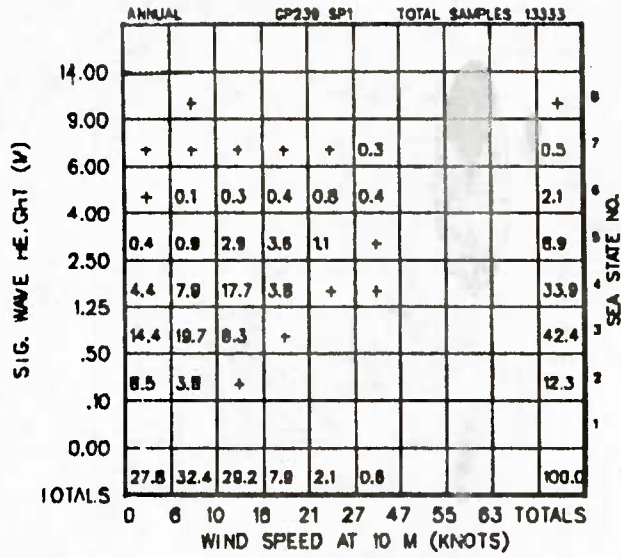


Figure A-239-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

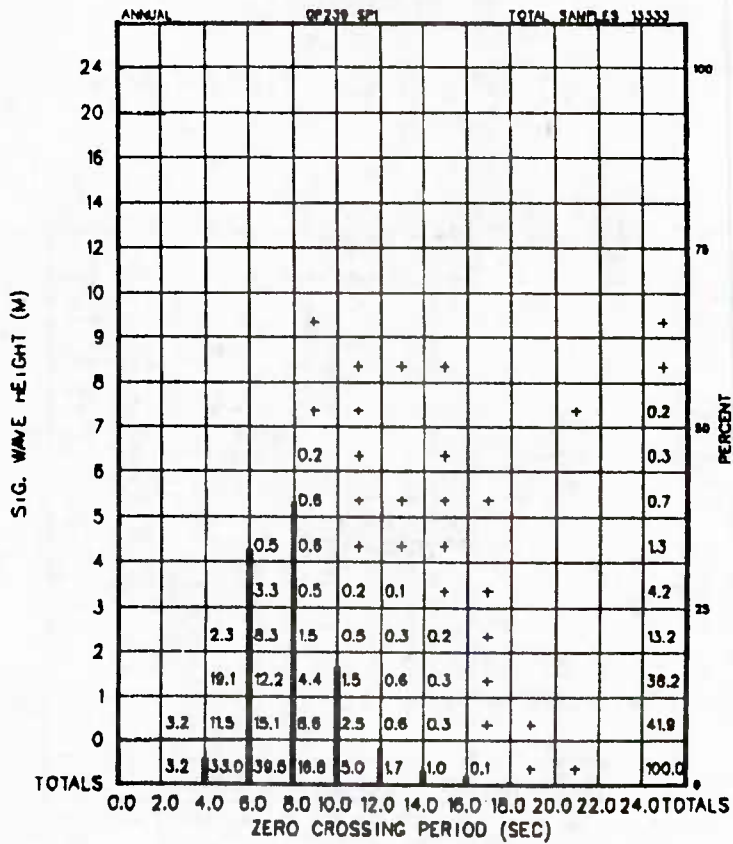


Figure A-239-1-6 Significant Wave Height vs. Zero Crossing Period

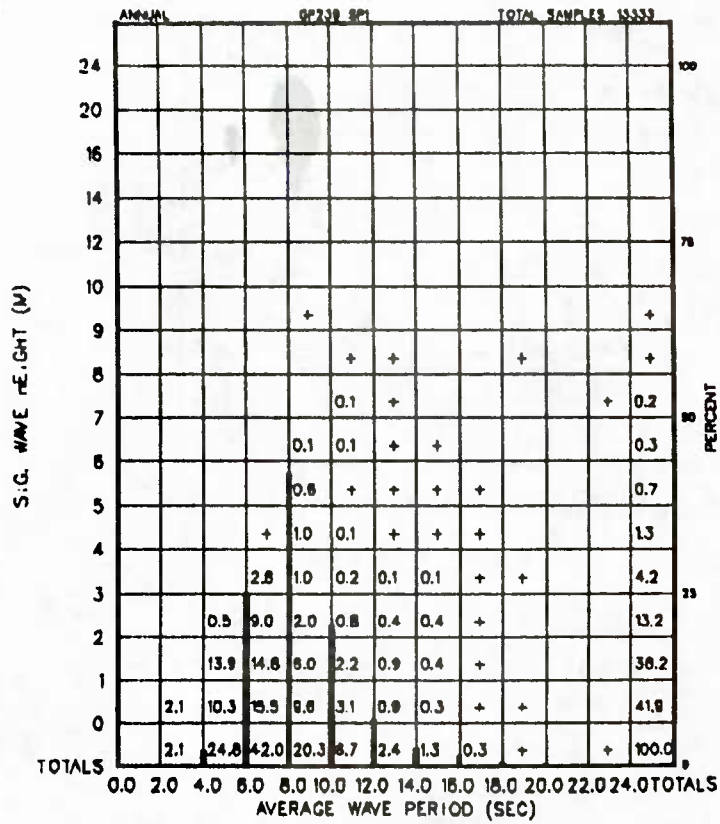


Figure A-239-1-7 Significant Wave Height vs. Average Wave Period

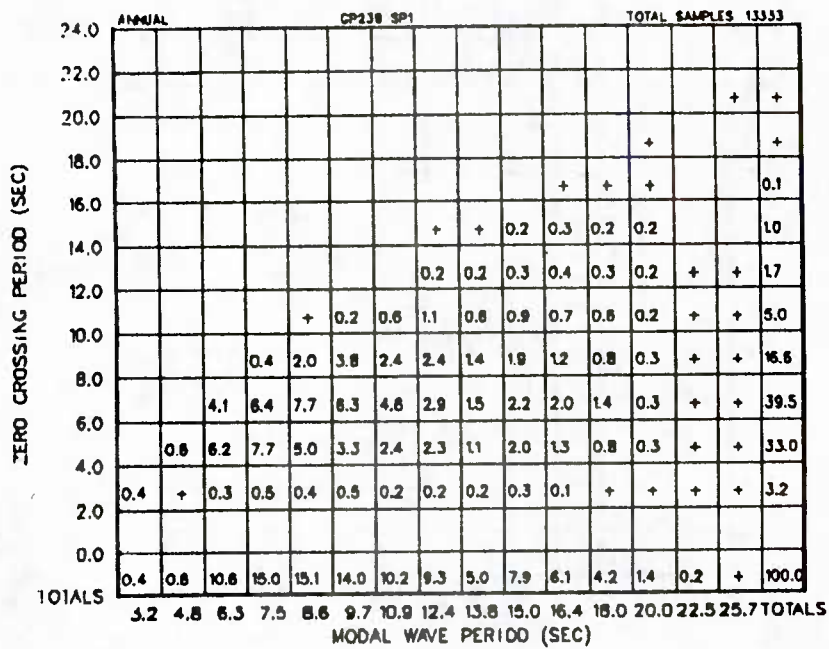


Figure A-239-1-8 Zero Crossing Period vs. Modal Wave Period

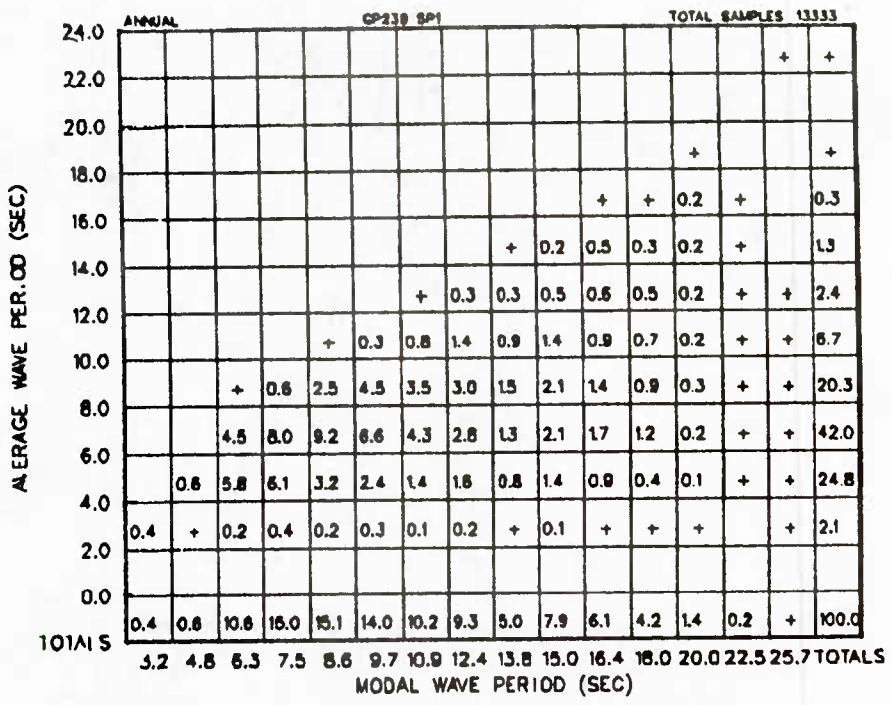


Figure A-239-1-9 Average Wave Period vs. Modal Wave Period

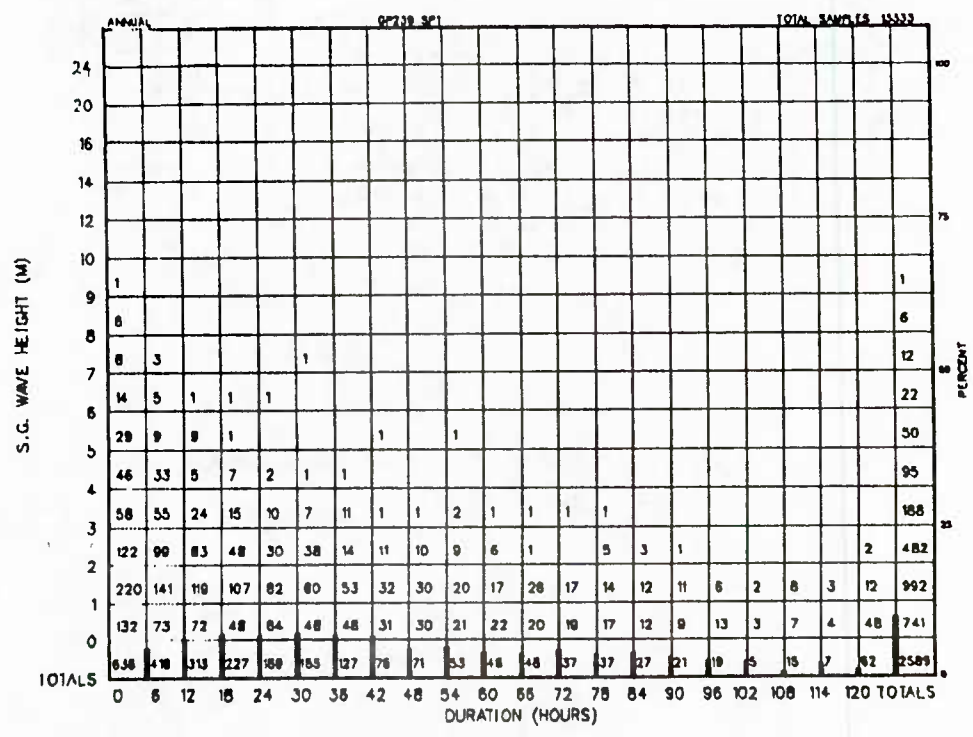


Figure A-239-1-10 Persistence of Wave Height

ANNUAL		CP138 SP1														TOTAL SAMPLES 13333						
55																						
48																						
41	4																			4		
34	12	3	1																	16		
28	35	14	4	3	1								1							58		
22	114	61	16	8	8	1			1				1							208		
17	297	165	58	24	13	8	6	6	1	1							1			577		
11	579	349	190	126	85	36	29	19	12	8	3	4	5	4	4				1	1432		
7	909	434	215	145	95	36	23	10	9	2	4						1		1	1844		
4	769	342	167	66	31	13	10	3	3	1	1	1								1427		
0	336	175	66	44	20	17	11	2	3	1	4	2							1	684		
TOTALS	3076	1543	719	418	191	104	79	41	26	13	12	7	6	5	4				2	1	8250	
	0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	TOTALS

Figure A-239-1-11 Persistence of Wind Speed at 19.5 M (Knots)

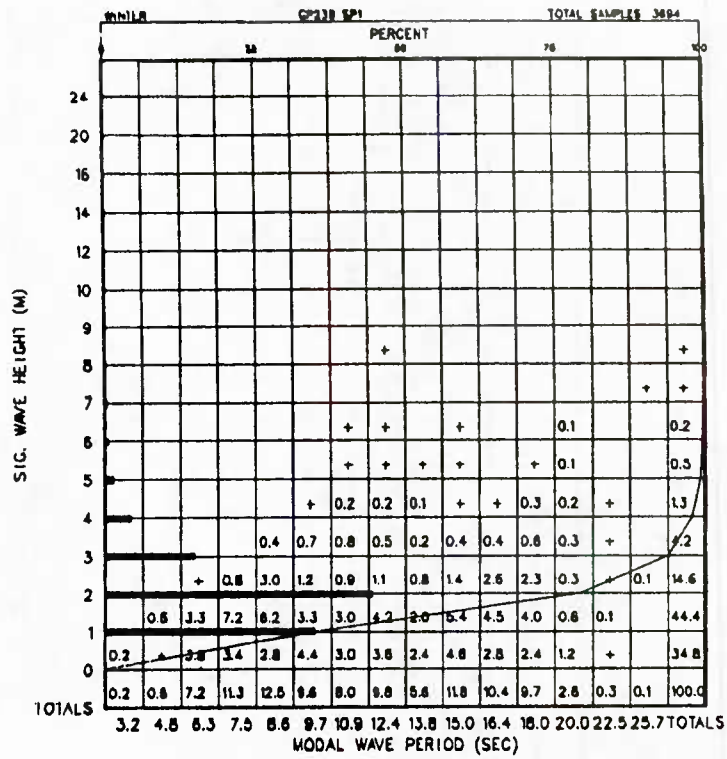


Figure A-239-2-1 Significant Wave Height vs. Modal Wave Period

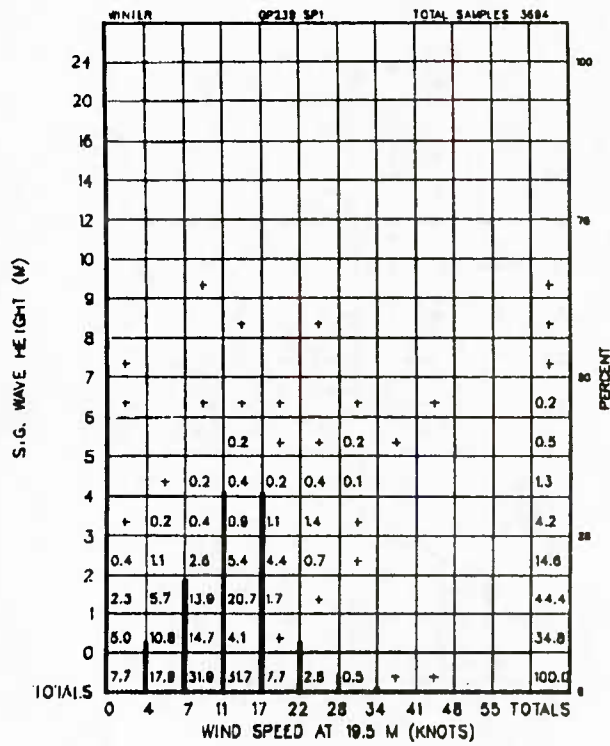


Figure A-239-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

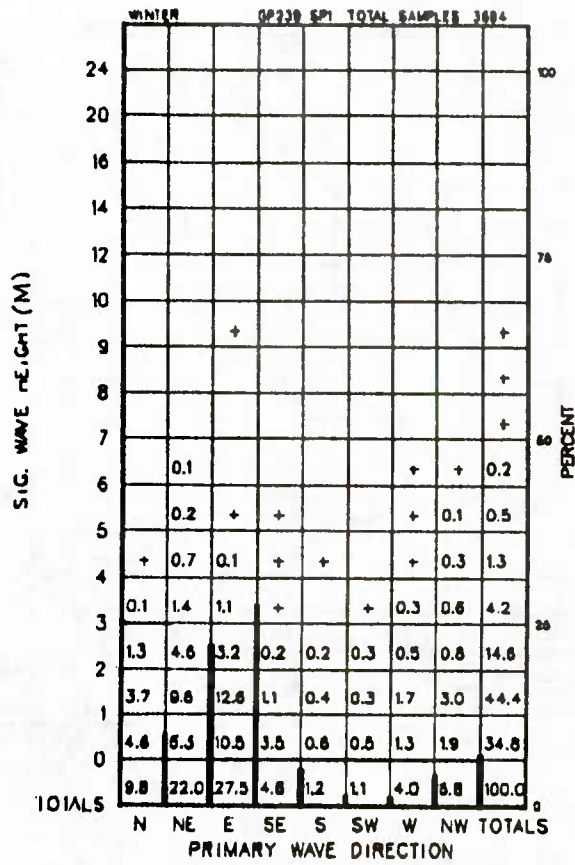


Figure A-239-2-3 Significant Wave Height vs. Primary Wave Direction

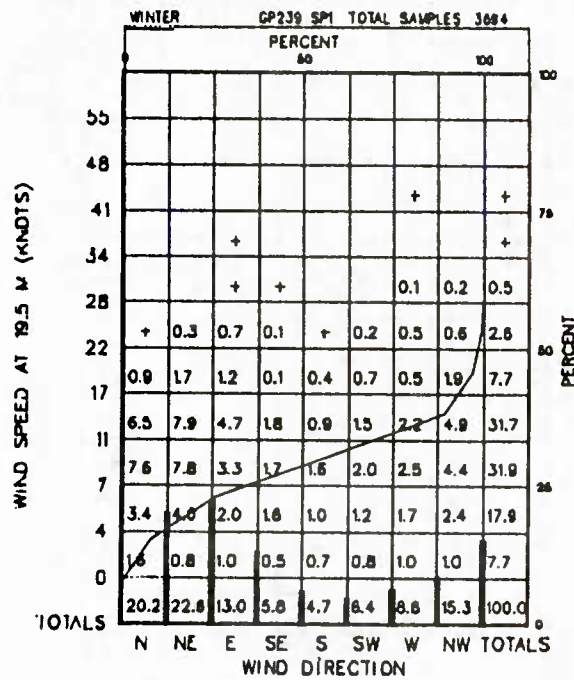


Figure A-239-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

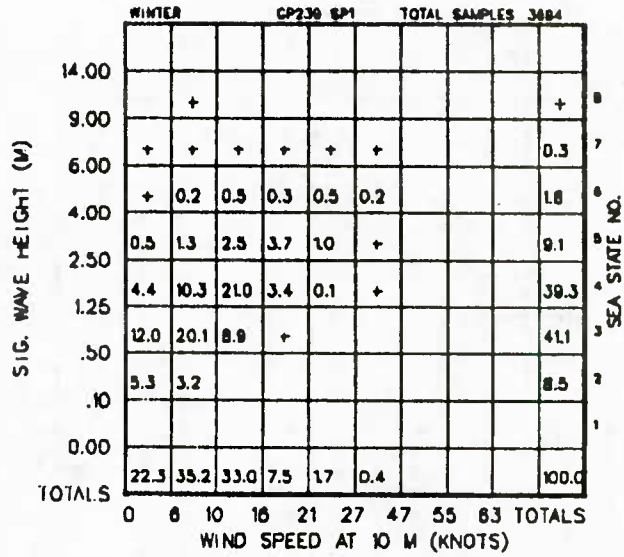


Figure A-239-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

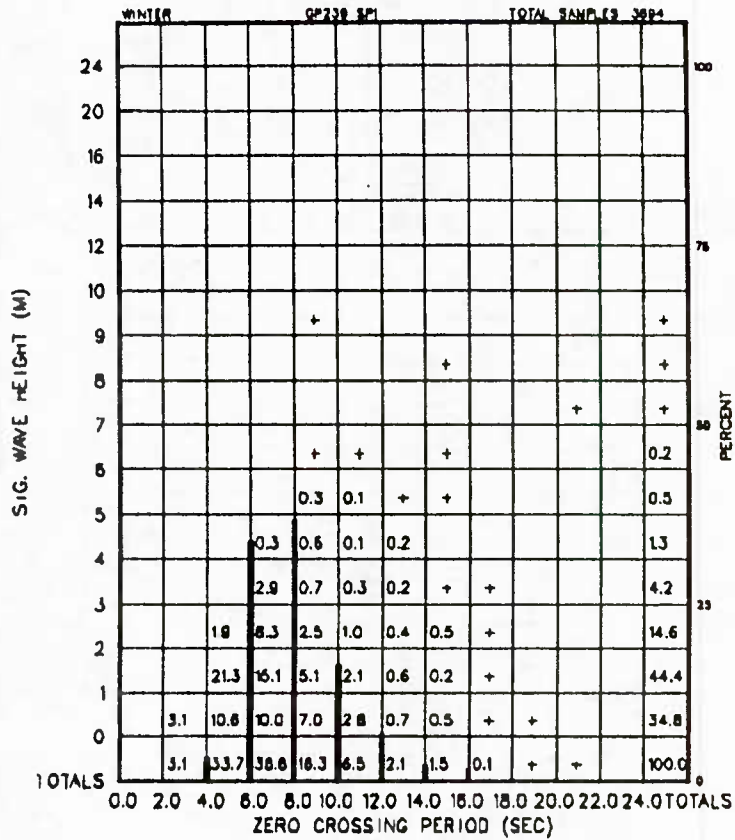


Figure A-239-2-6 Significant Wave Height vs. Zero Crossing Period

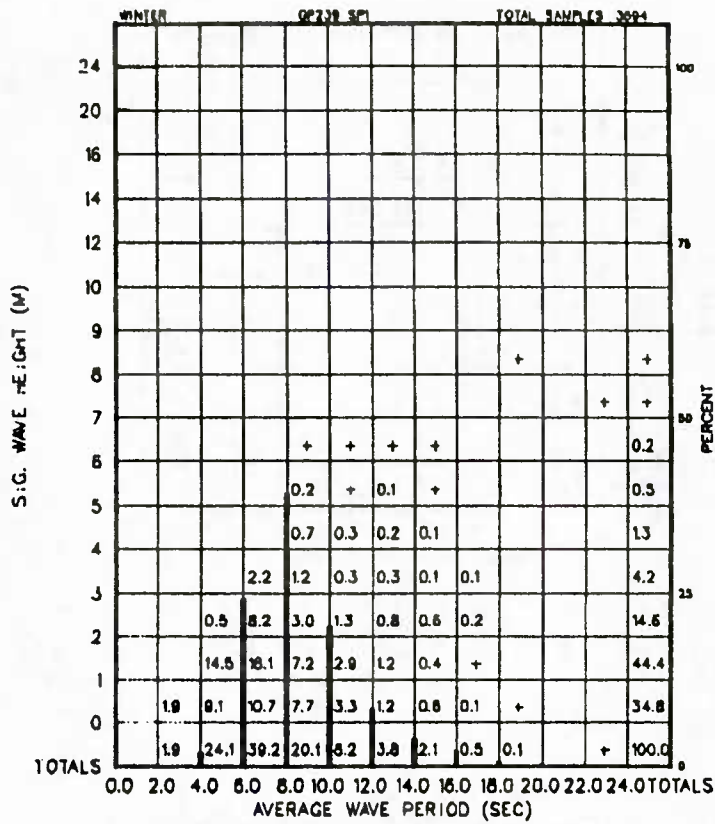


Figure A-239-2-7 Significant Wave Height vs. Average Wave Period

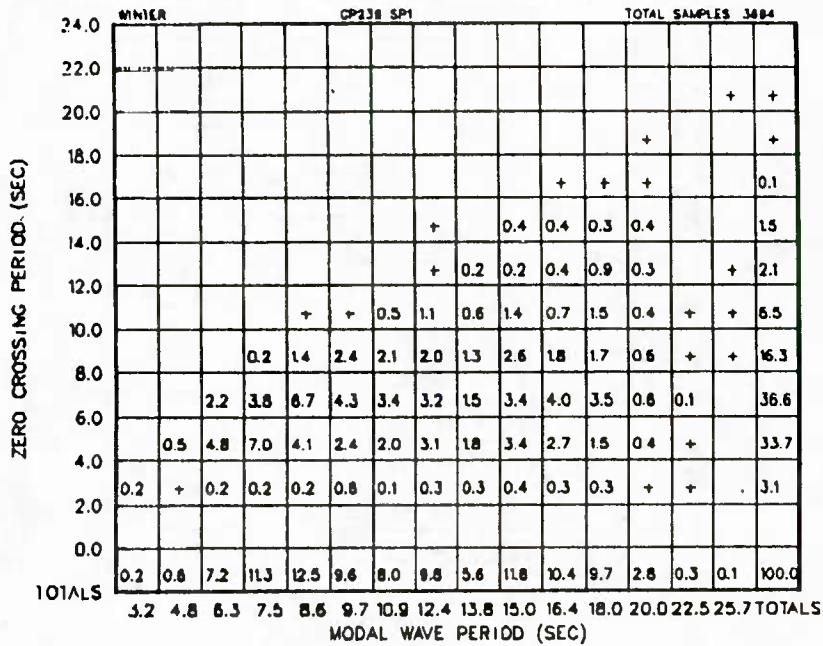


Figure A-239-2-8 Zero Crossing Period vs. Modal Wave Period

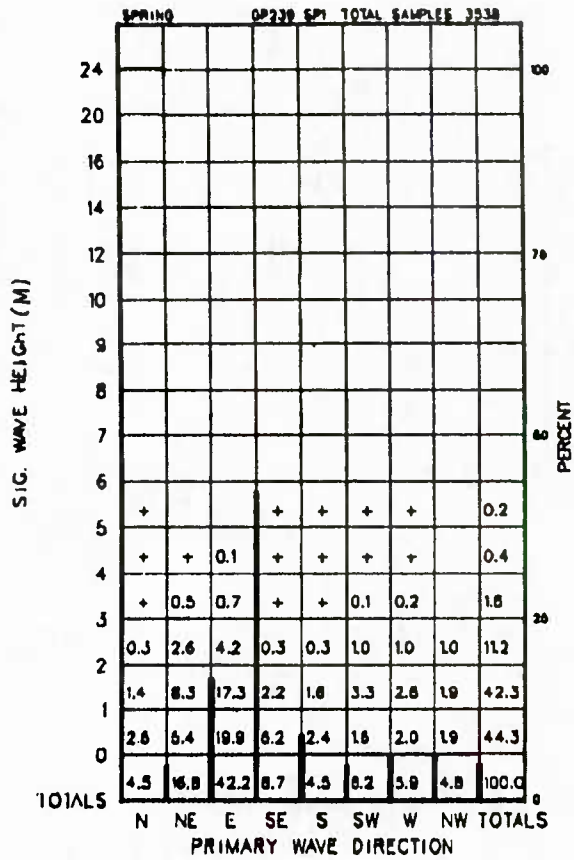


Figure A-239-3-3 Significant Wave Height vs. Primary Wave Direction

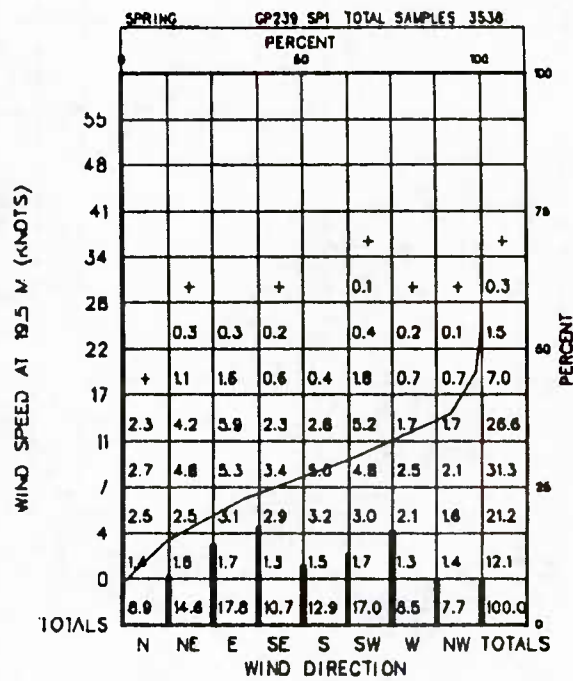


Figure A-239-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

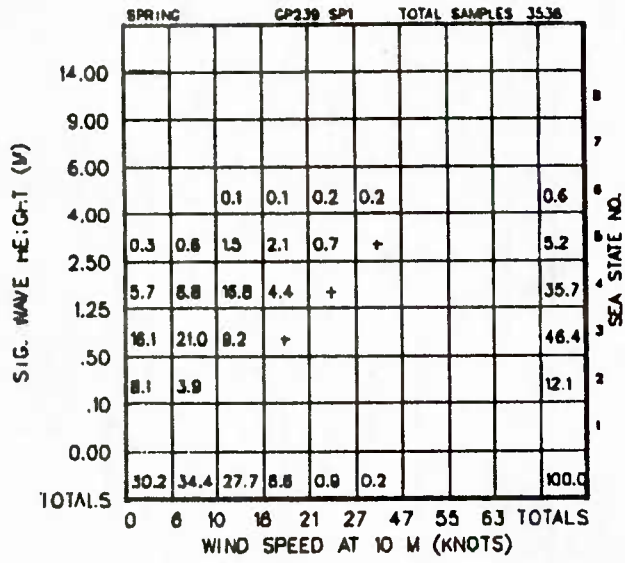


Figure A-239-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

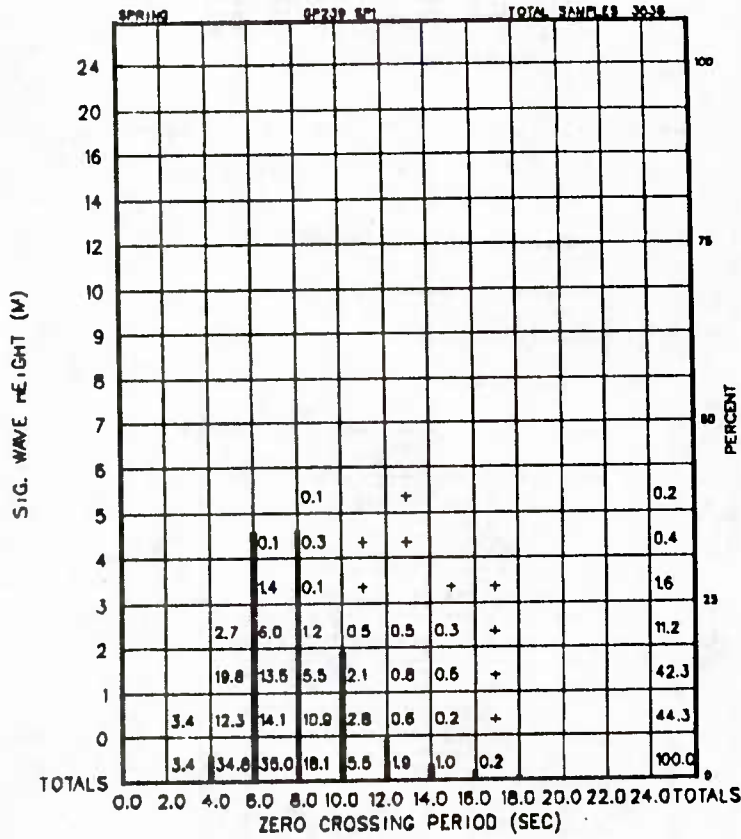


Figure A-239-3-6 Significant Wave Height vs. Zero Crossing Period

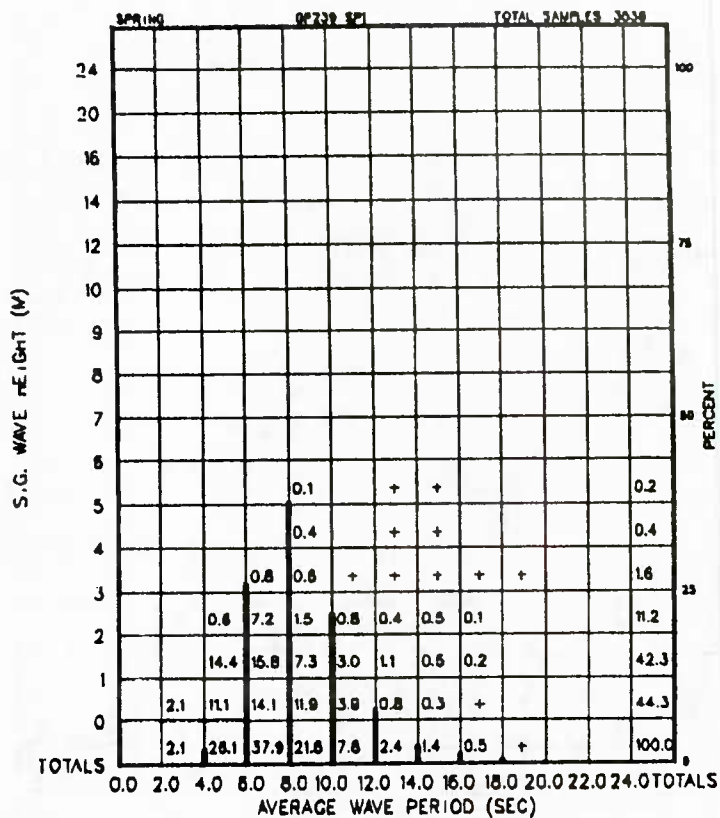


Figure A-239-3-7 Significant Wave Height vs. Average Wave Period

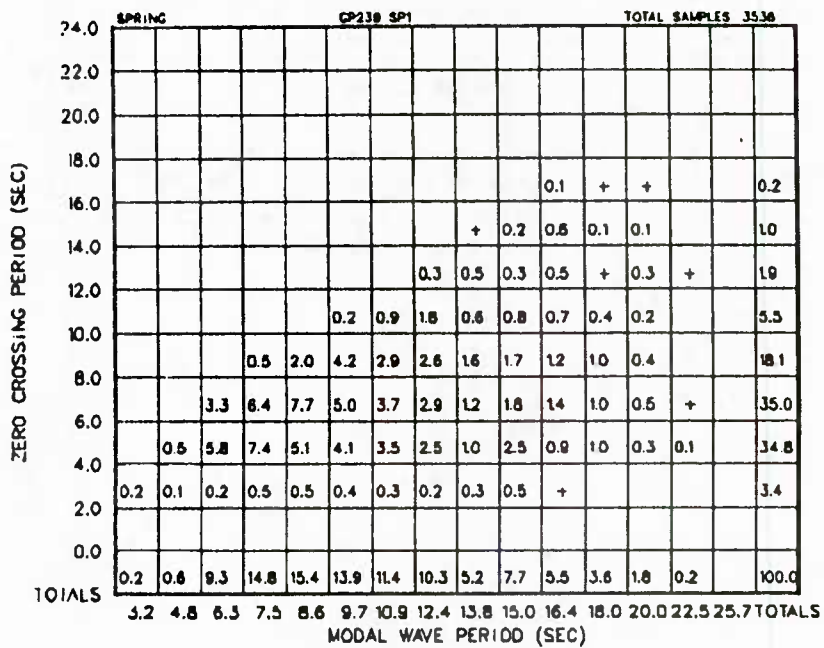


Figure A-239-3-8 Zero Crossing Period vs. Modal Wave Period

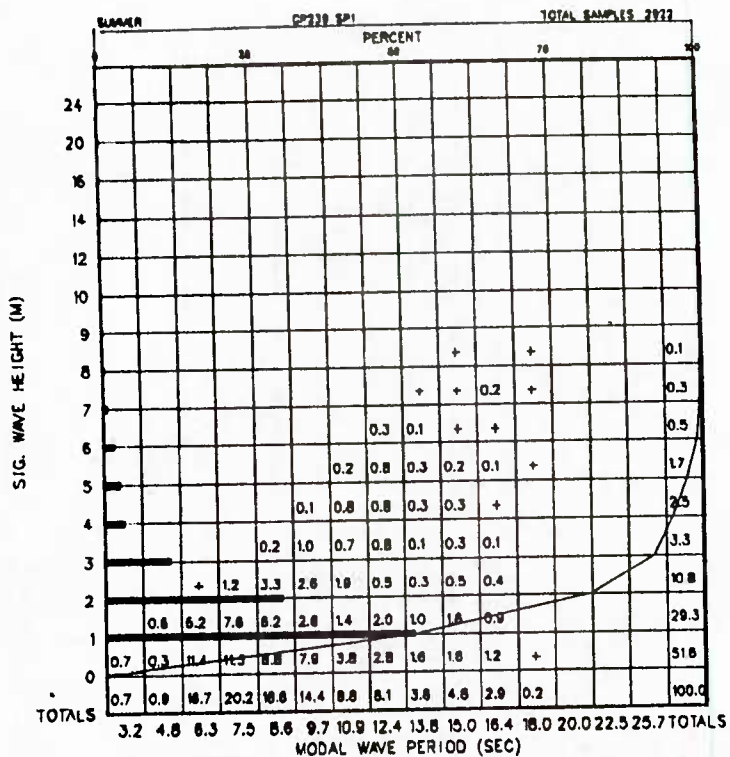


Figure A-239-4-1 Significant Wave Height vs. Modal Wave Period

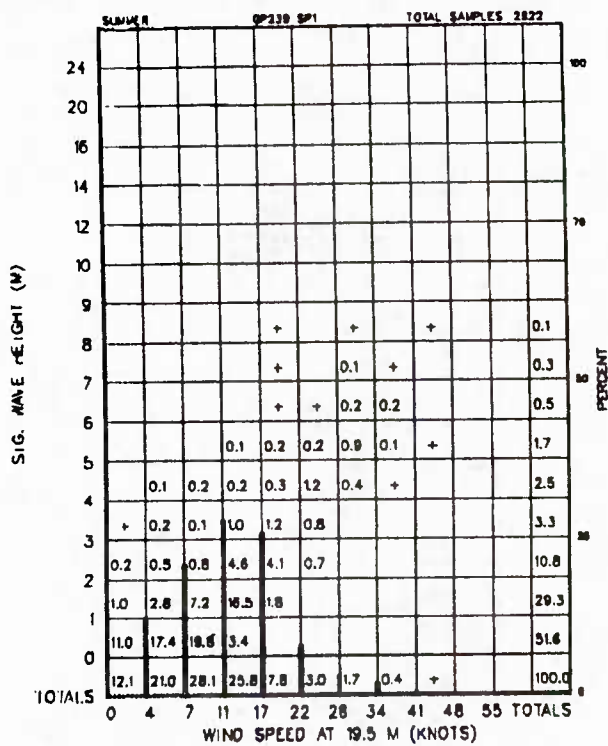


Figure A-239-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

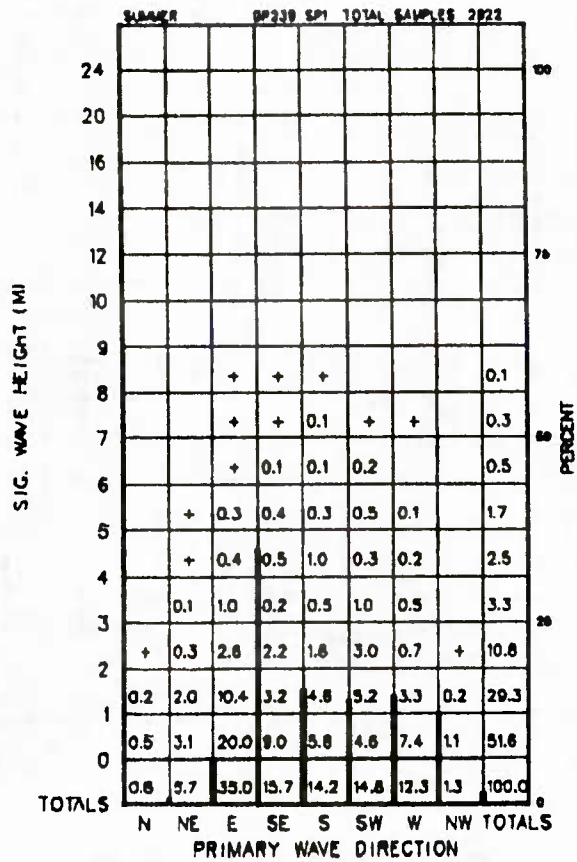


Figure A-239-4-3 Significant Wave Height vs. Primary Wave Direction

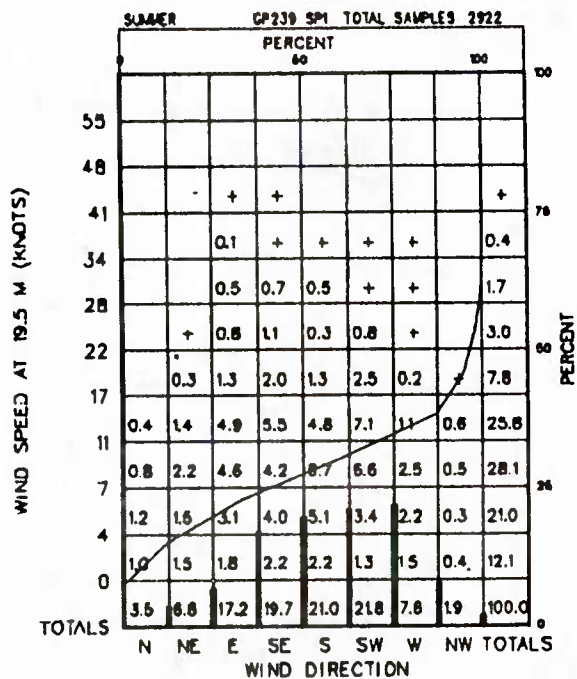


Figure A-239-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

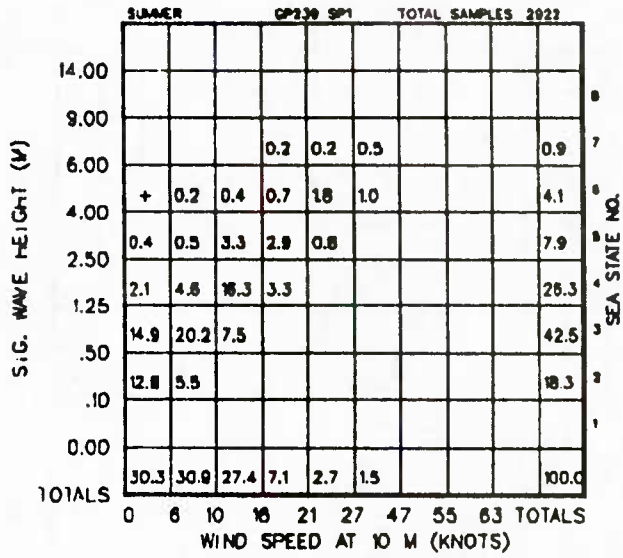


Figure A-239-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

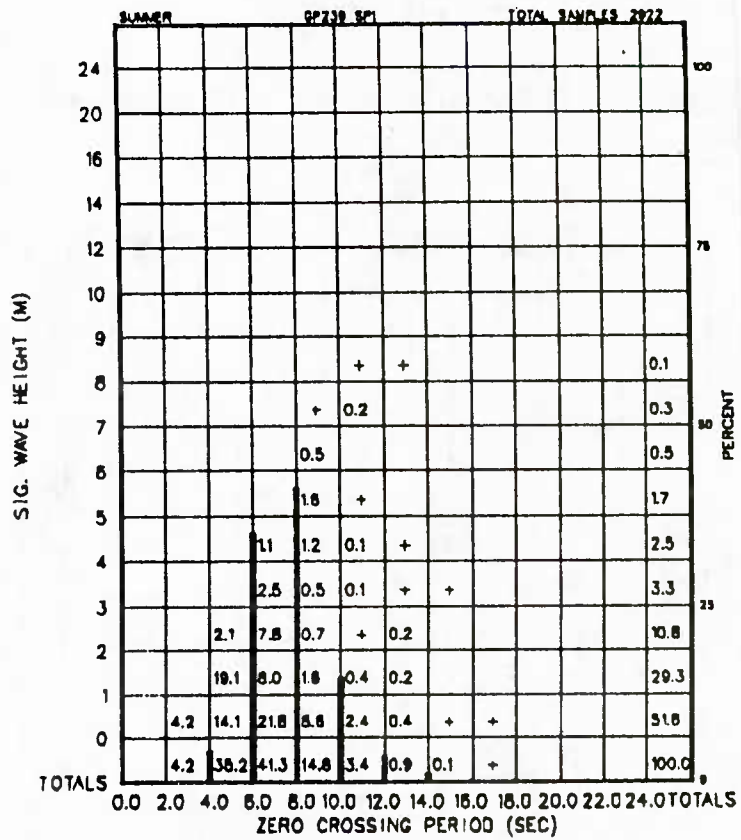


Figure A-239-4-6 Significant Wave Height vs. Zero Crossing Period

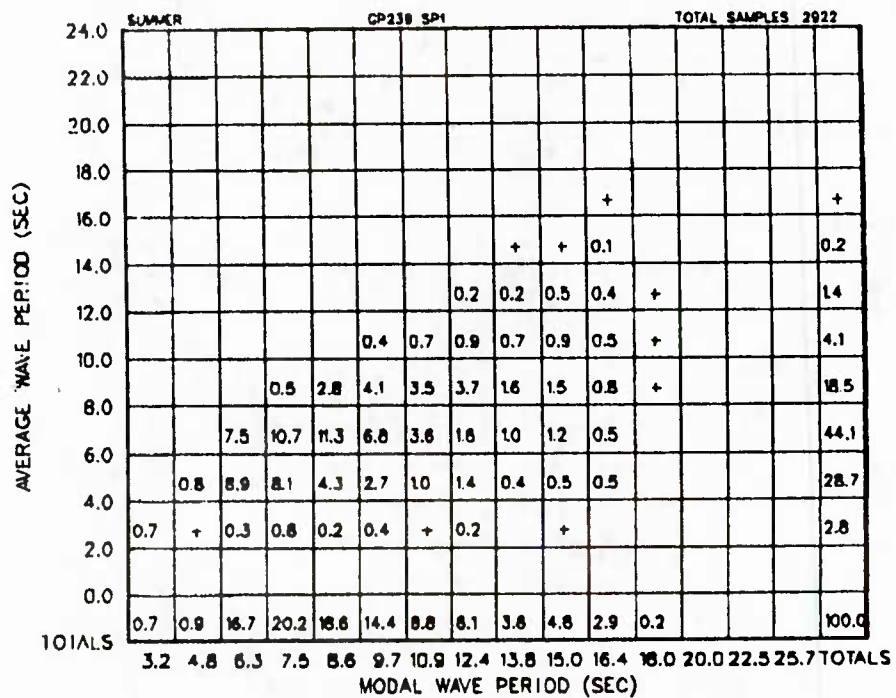


Figure A-239-4-9 Average Wave Period vs. Modal Wave Period

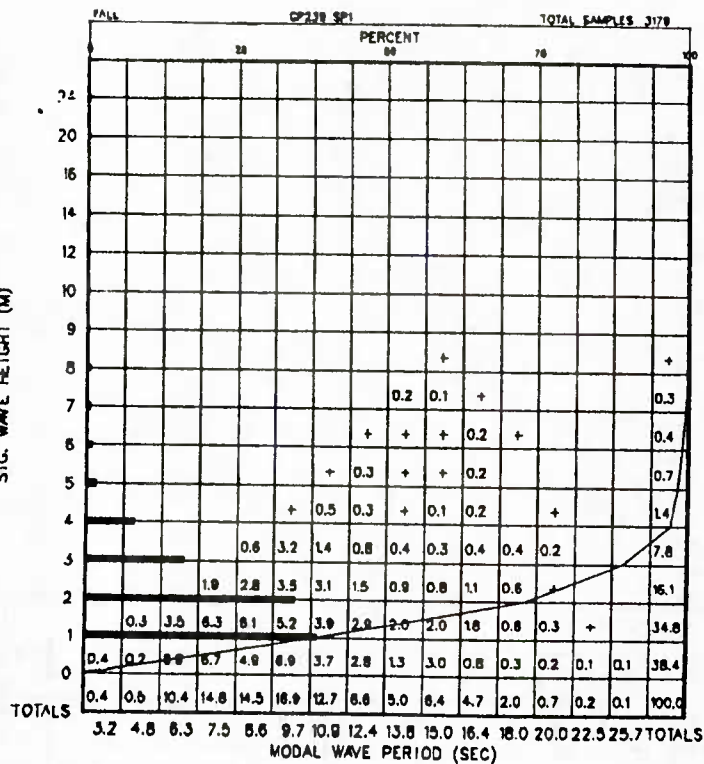


Figure A-239-5-1 Significant Wave Height vs. Modal Wave Period

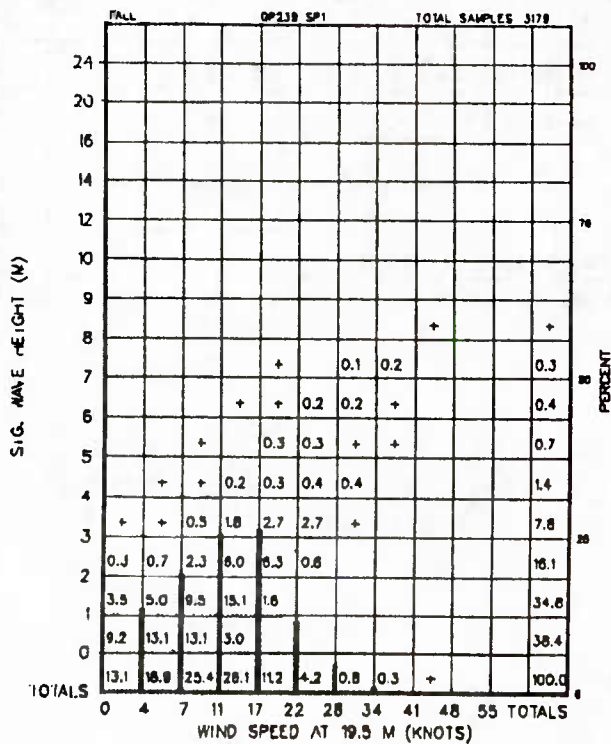


Figure A-239-5-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

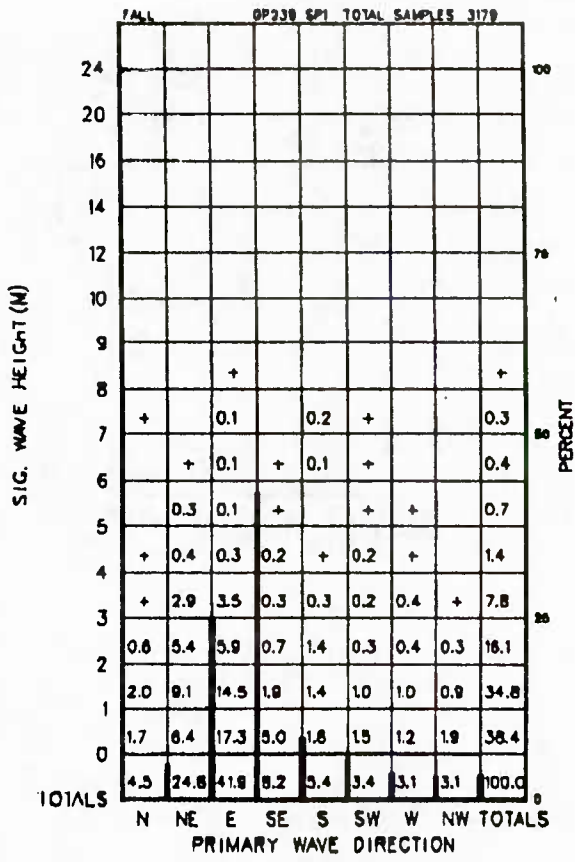


Figure A-239-5-3 Significant Wave Height vs. Primary Wave Direction

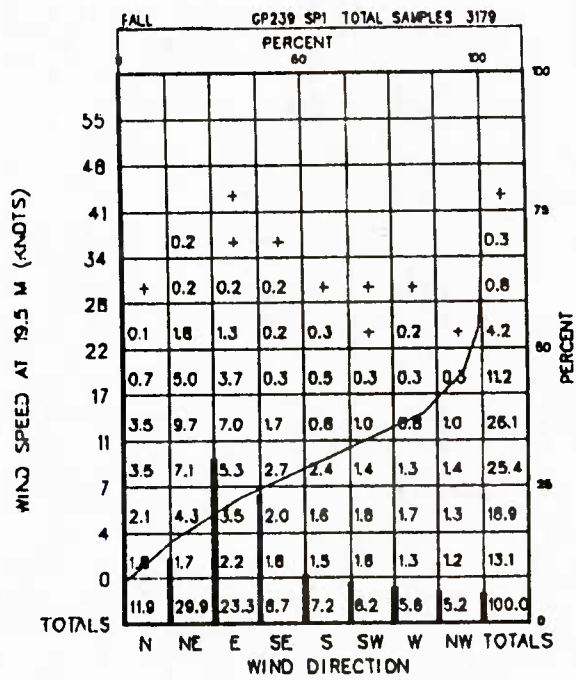


Figure A-239-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

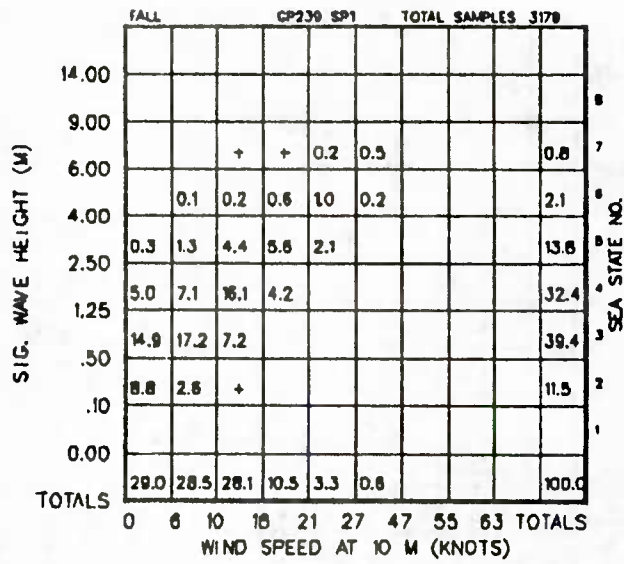


Figure A-239-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

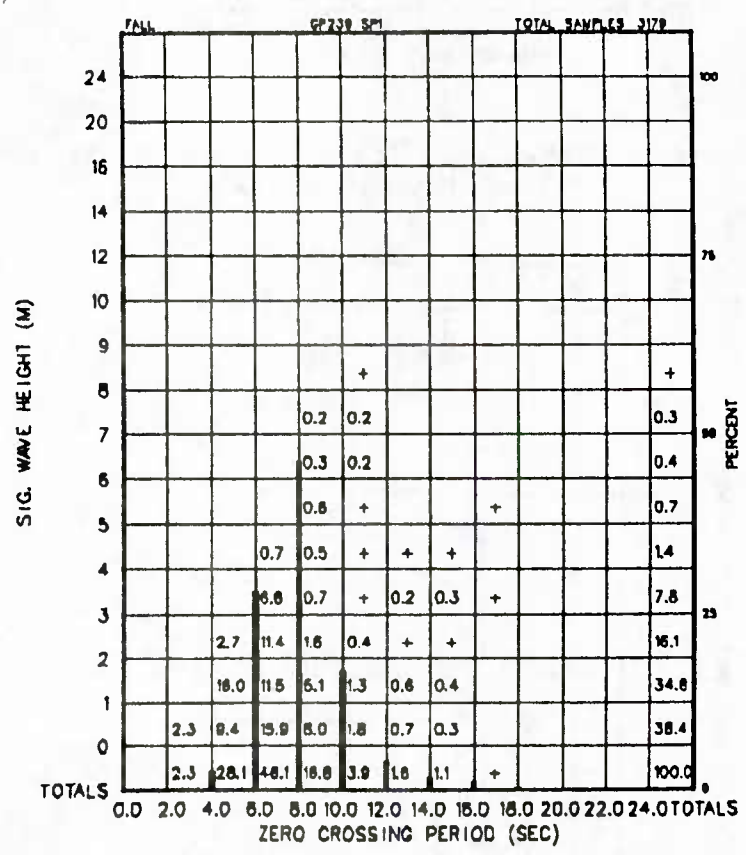


Figure A-239-5-6 Significant Wave Height vs. Zero Crossing Period

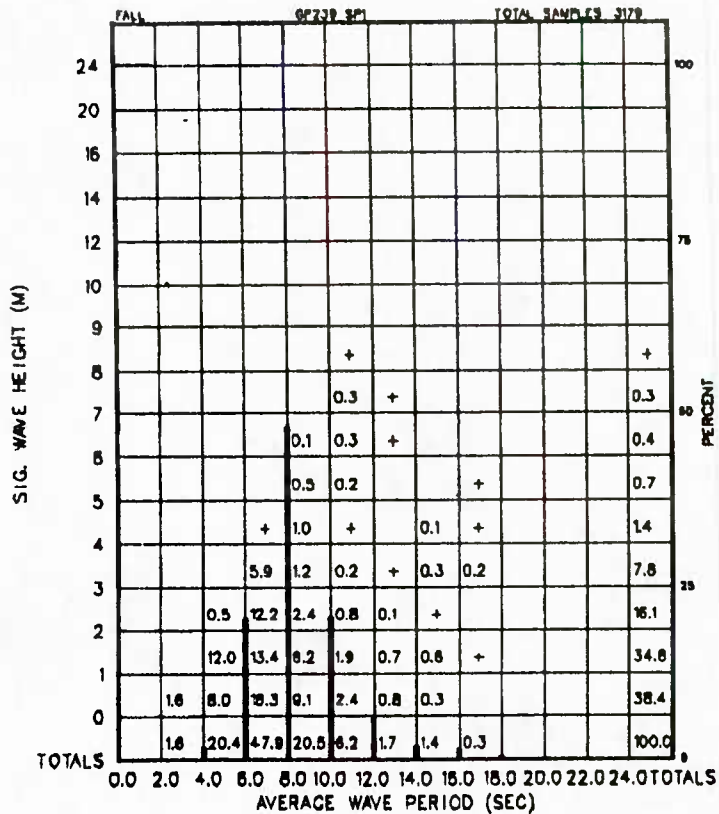


Figure A-239-5-7 Significant Wave Height vs. Average Wave Period

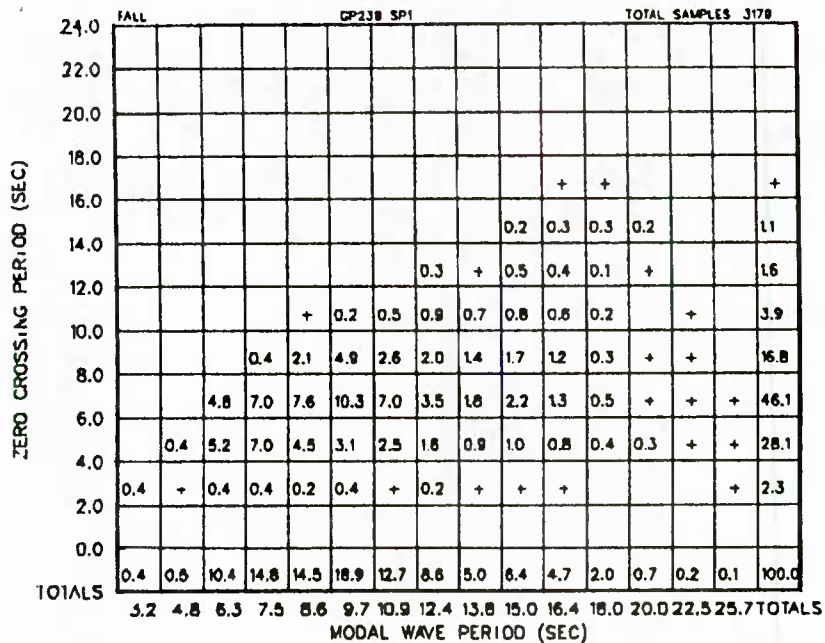


Figure A-239-5-8 Zero Crossing Period vs. Modal Wave Period

TABLE A-255-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 26.02°N, 148.2°E					
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.25 6 -	1.5 9.5 -	3.5 17.5 -	1.5 11 -	1.5 9.7 E
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	2 0.25 -	9 1.25 -	21 3.5 -	10 1.5 -	9 1.25 E
Visibility, nautical miles	3	12	25	-	-
Cloud Cover Total clouds, in eighths of sky obscured Low clouds, in eighths of sky obscured	1 0	6.5 5.5	8 8	- -	- -
Precipitation (Occurrence)	All precipitation - 16% of the time				
Relative Humidity, %	60	83	98	-	-
Air Temperature, °C	14	18	22	18	-
Sea Surface Temperature, °C	18	22	24.5	-	-
Sea Level Pressure, millibars	1000	1015	1026	-	-
Ice	None				
Refractivity Mean Surface Refractivity Sub-Refraction (1 km, Annual) Super-Refraction or Ducting (1 km, Annual)	- - -	- - -	- - -	372 - -	- 1% 3%

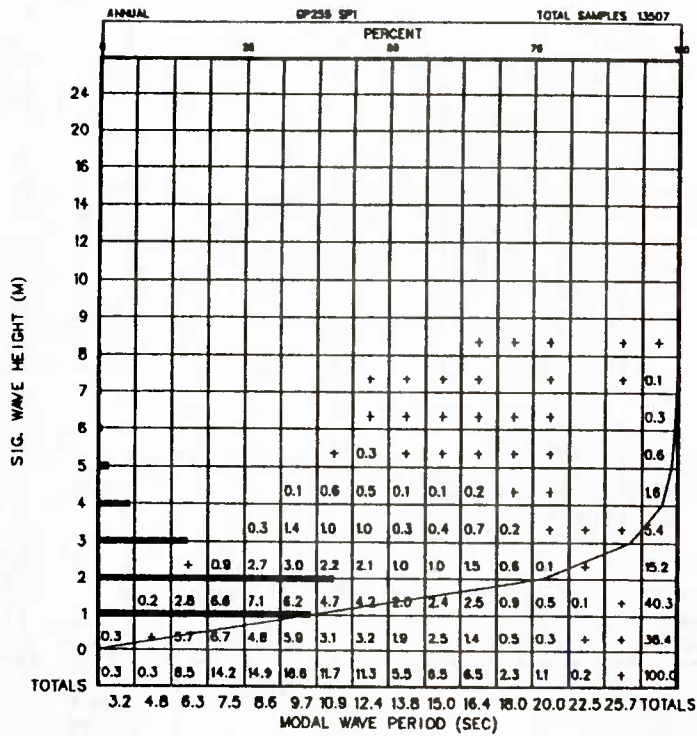


Figure A-255-1-1 Significant Wave Height vs. Modal Wave Period

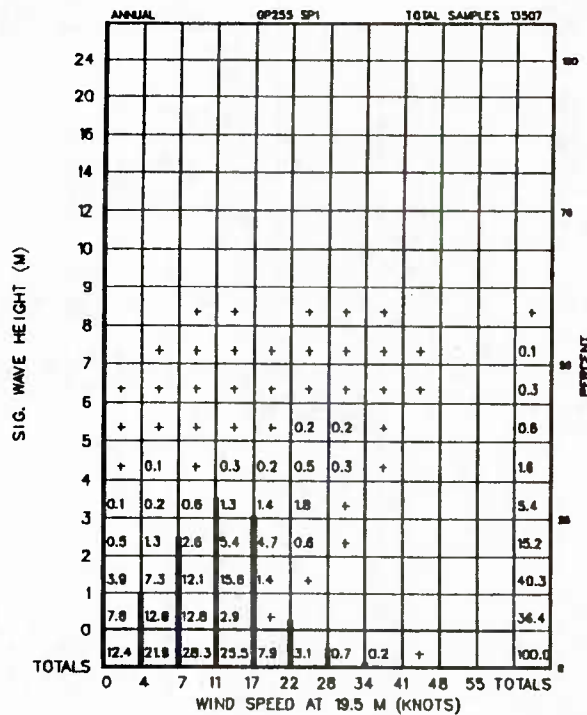


Figure A-255-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

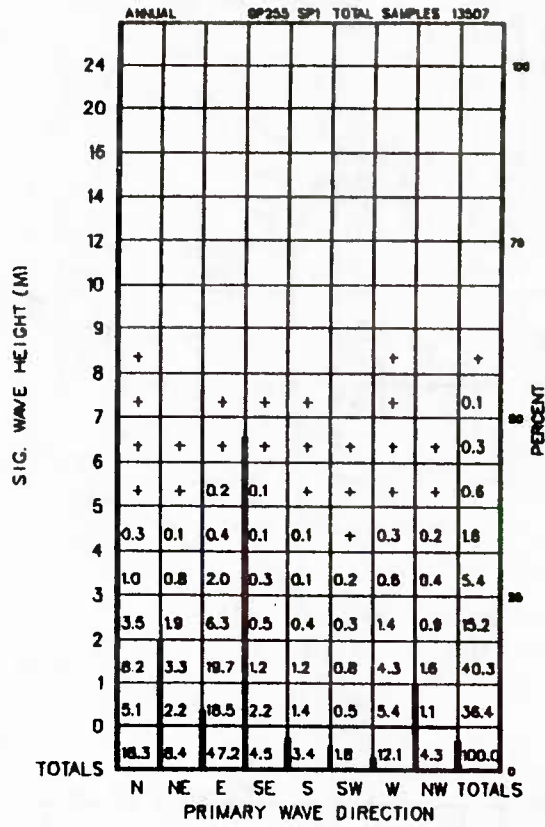


Figure A-255-1-3 Significant Wave Height vs. Primary Wave Direction

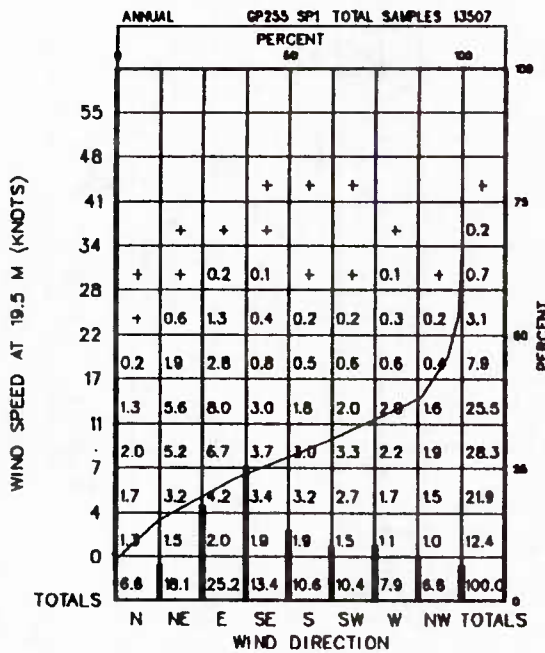


Figure A-255-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

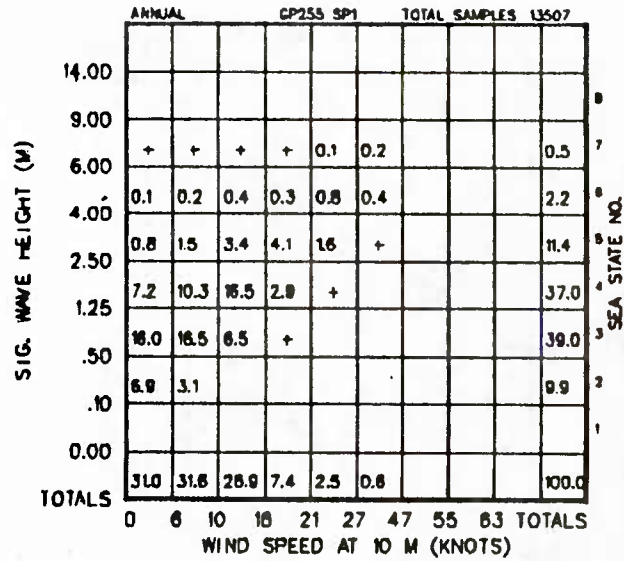


Figure A-255-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

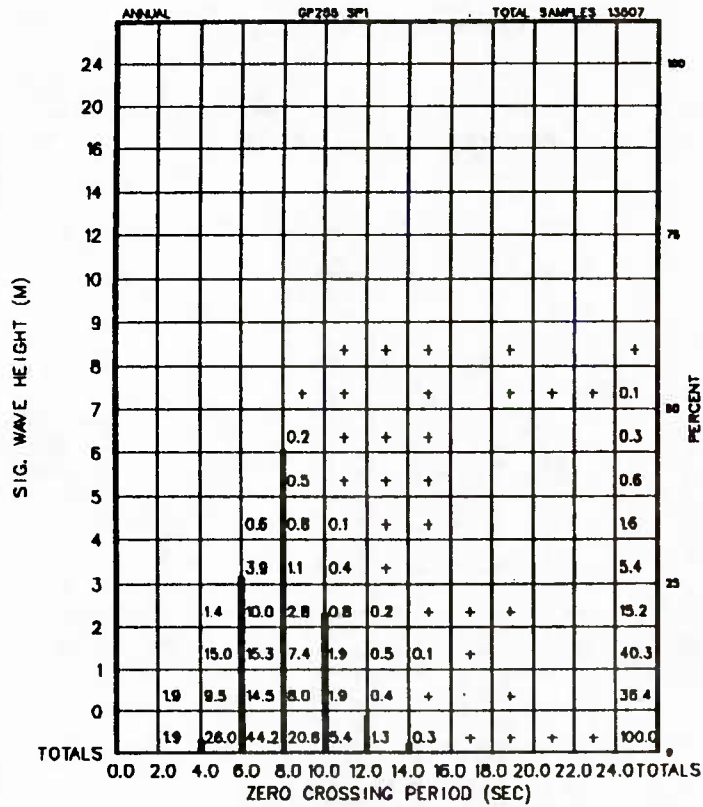


Figure A-255-1-6 Significant Wave Height vs. Zero Crossing Period

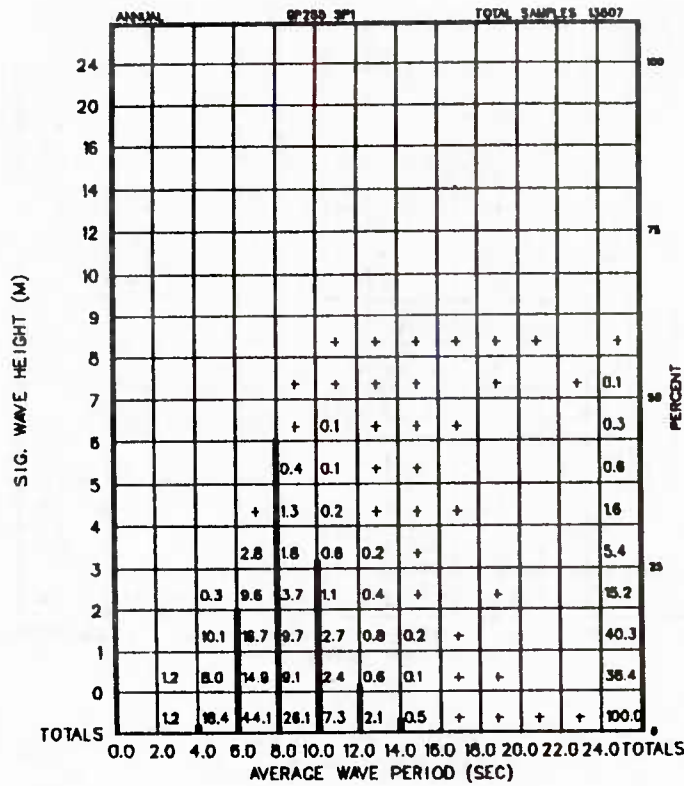


Figure A-255-1-7 Significant Wave Height vs. Average Wave Period

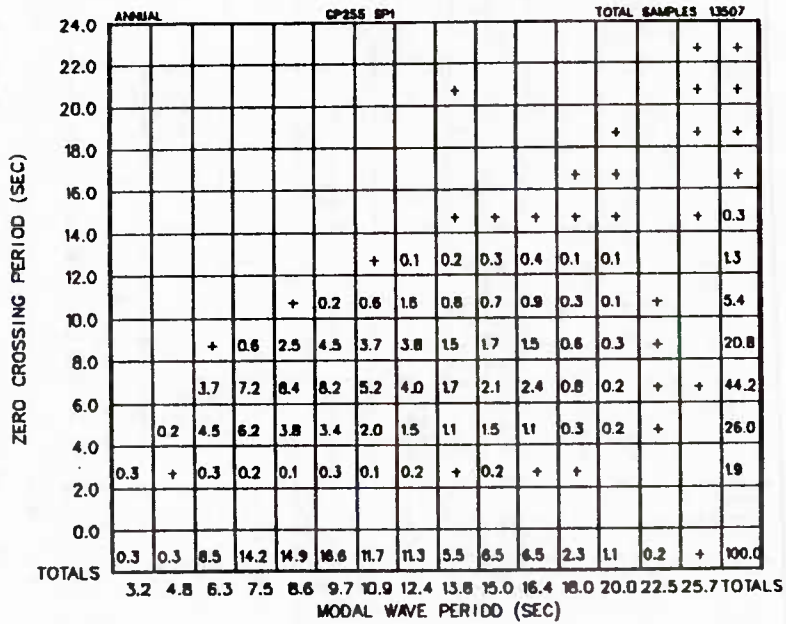


Figure A-255-1-8 Zero Crossing Period vs. Modal Wave Period

ANNUAL		DP255 SP1												TOTAL SAMPLES 13517								
55																						
48																						
41	2	1															3					
34	16	3															19					
28	45	15	3	3													66					
22	146	45	23	15	7	3	1										240					
17	335	150	58	25	13	8	2	2			1						594					
11	896	352	177	102	59	34	32	18	8	4	5	2		3		1	1491					
7	1031	444	223	108	52	28	25	11	8	2	1		1				1934					
4	885	360	182	86	39	22	10	4	3			1	1				1573					
0	431	178	103	50	23	8	11	8	3	2		1			2		818					
TOTALS	3567	1548	769	389	193	103	81	39	22	8	7	4	2	3	2	1		6738				
	0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	TOTALS

Figure A-255-1-11 Persistence of Wind Speed at 19.5 M (Knots)

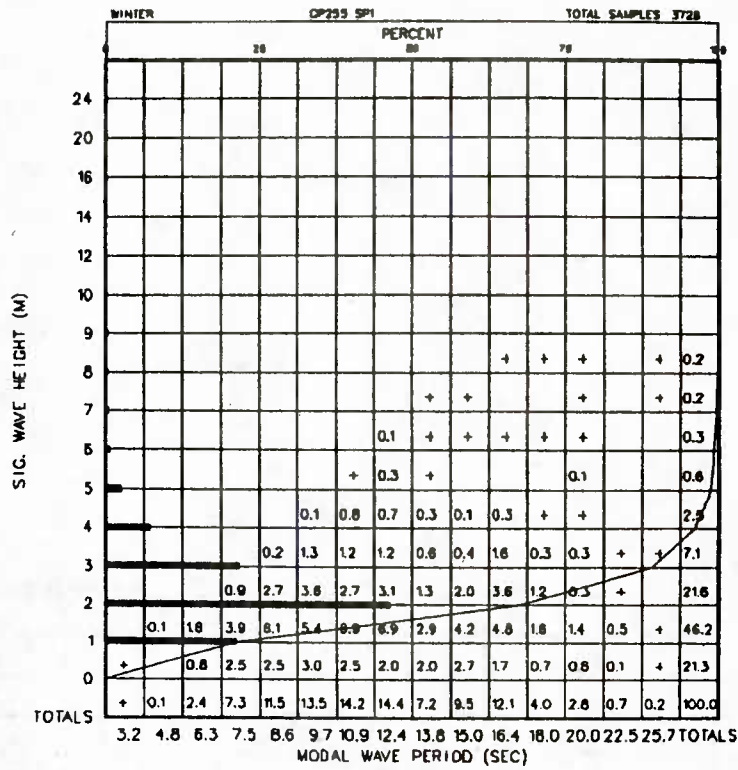


Figure A-255-2-1 Significant Wave Height vs. Modal Wave Period

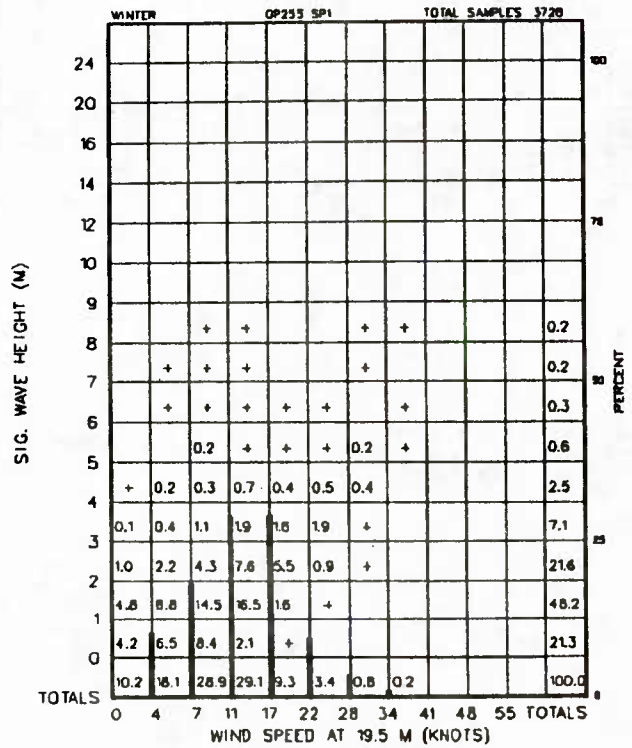


Figure A-255-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

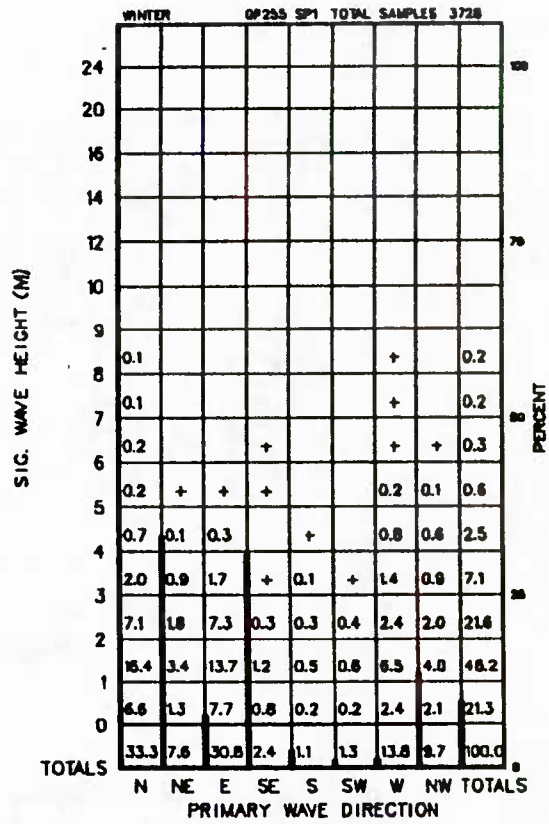


Figure A-255-2-3 Significant Wave Height vs. Primary Wave Direction

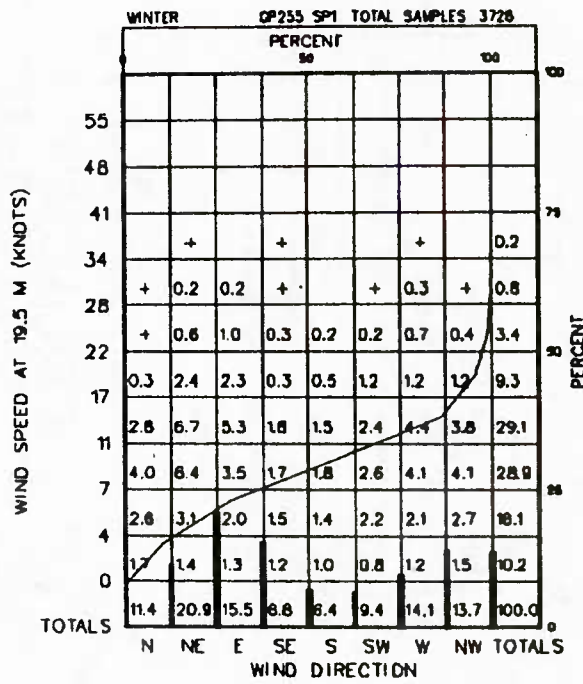


Figure A-255-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

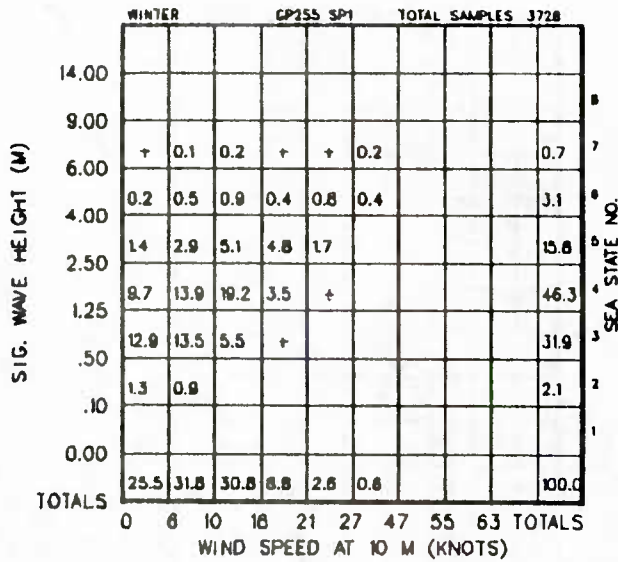


Figure A-255-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

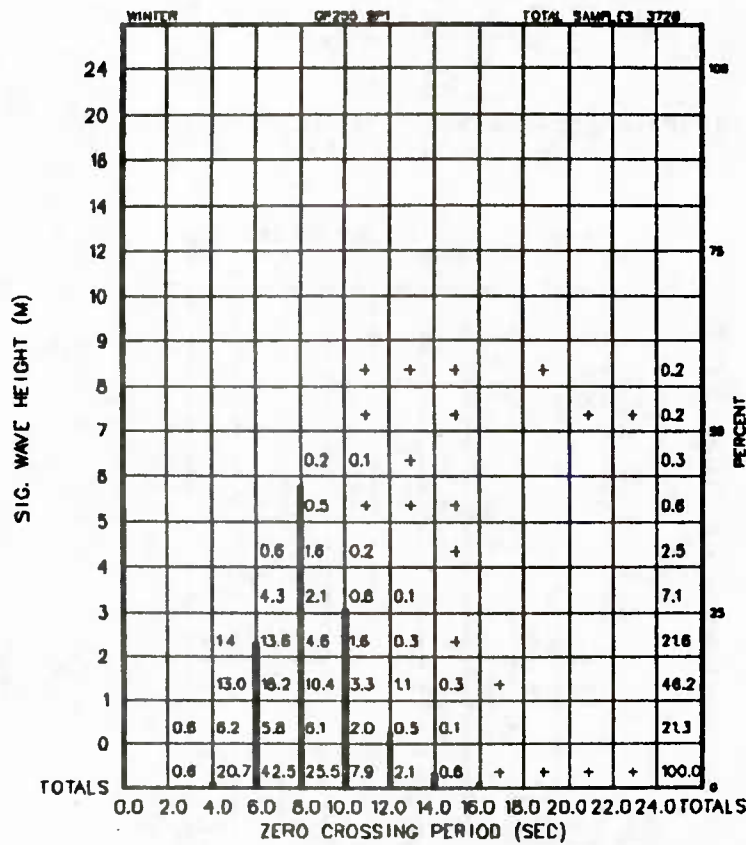


Figure A-255-2-6 Significant Wave Height vs. Zero Crossing Period

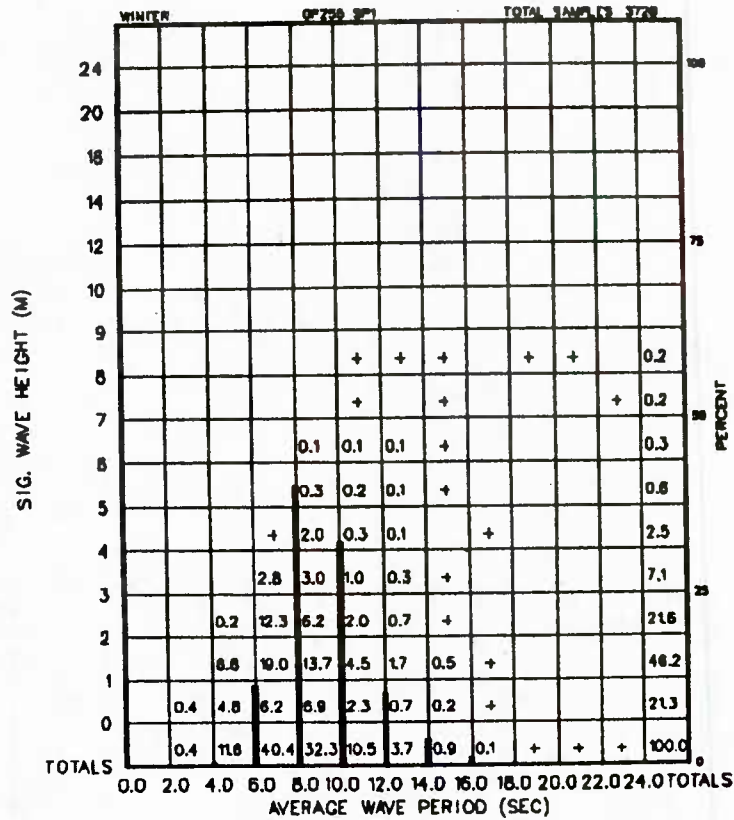


Figure A-255-2-7 Significant Wave Height vs. Average Wave Period

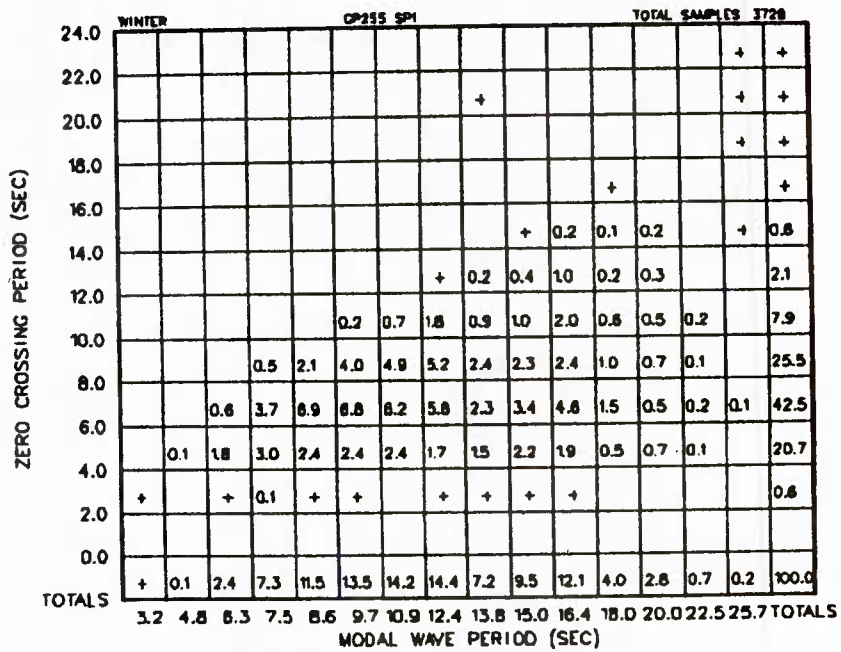


Figure A-255-2-8 Zero Crossing Period vs. Modal Wave Period

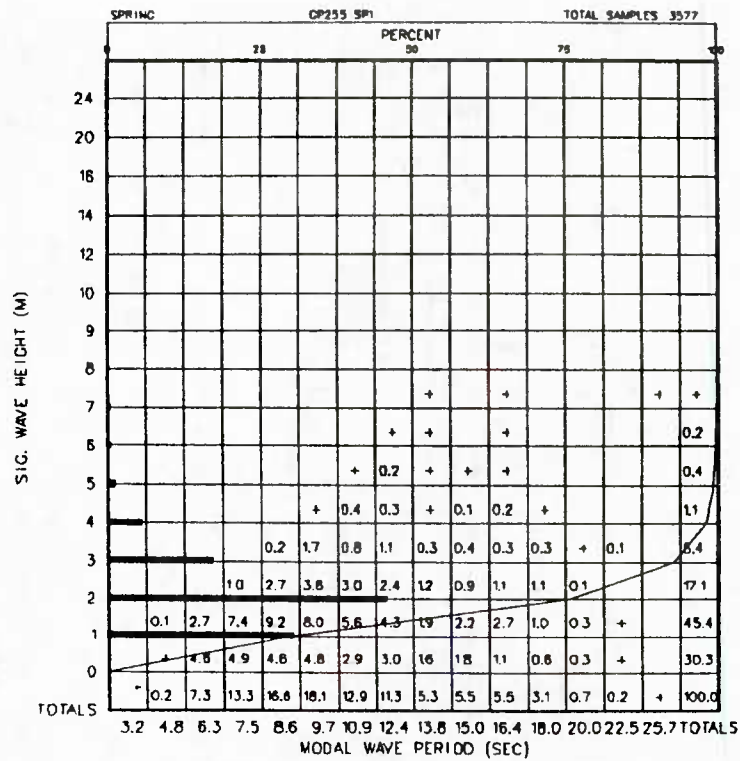


Figure A-255-3-1 Significant Wave Height vs. Modal Wave Period

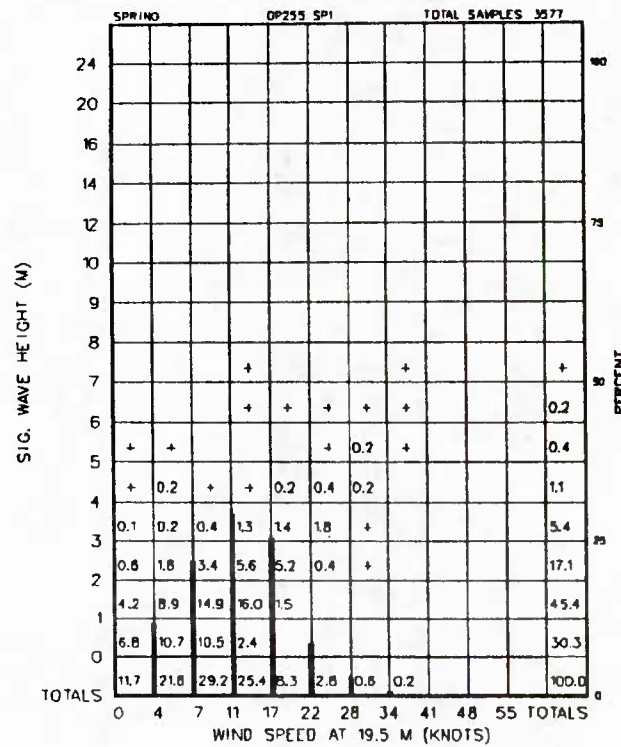


Figure A-255-3-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

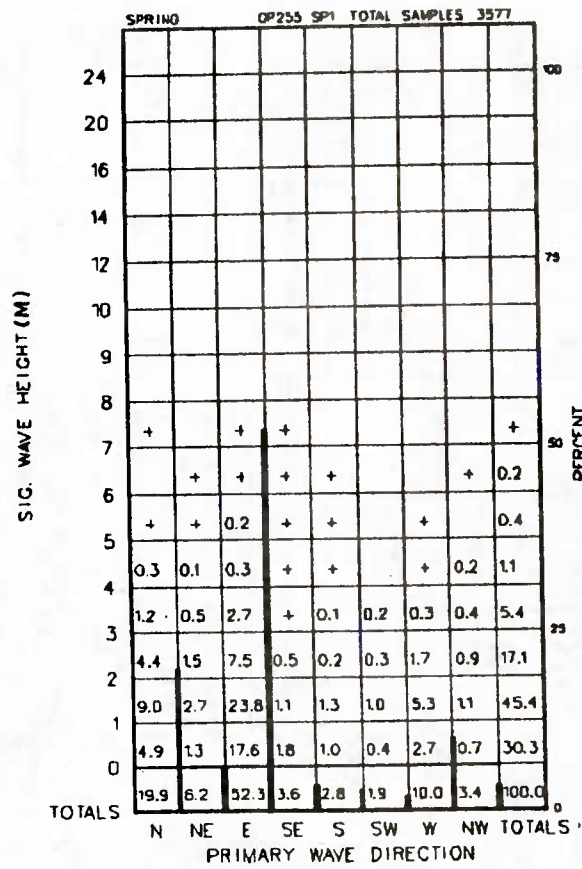


Figure A-255-3-3 Significant Wave Height vs. Primary Wave Direction

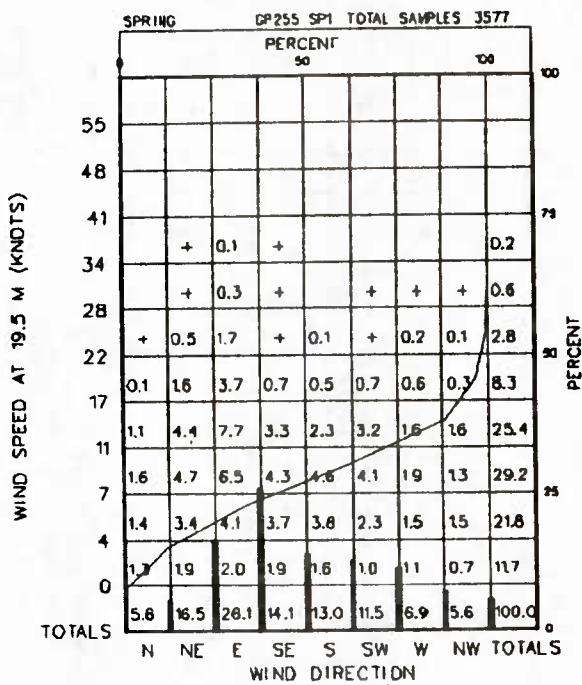


Figure A-255-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

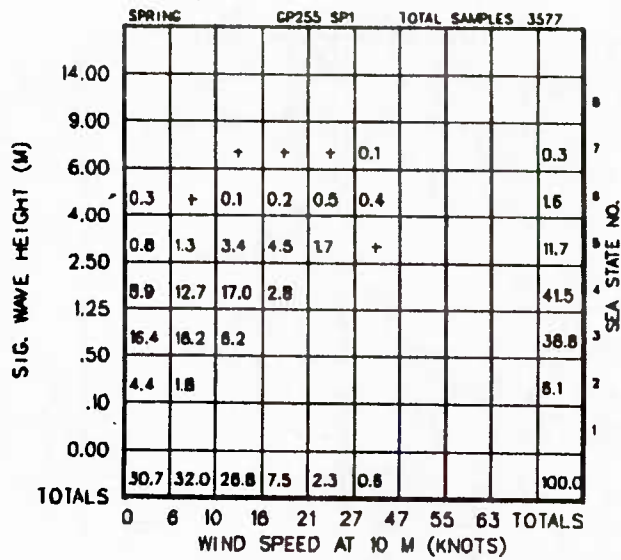


Figure A-255-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

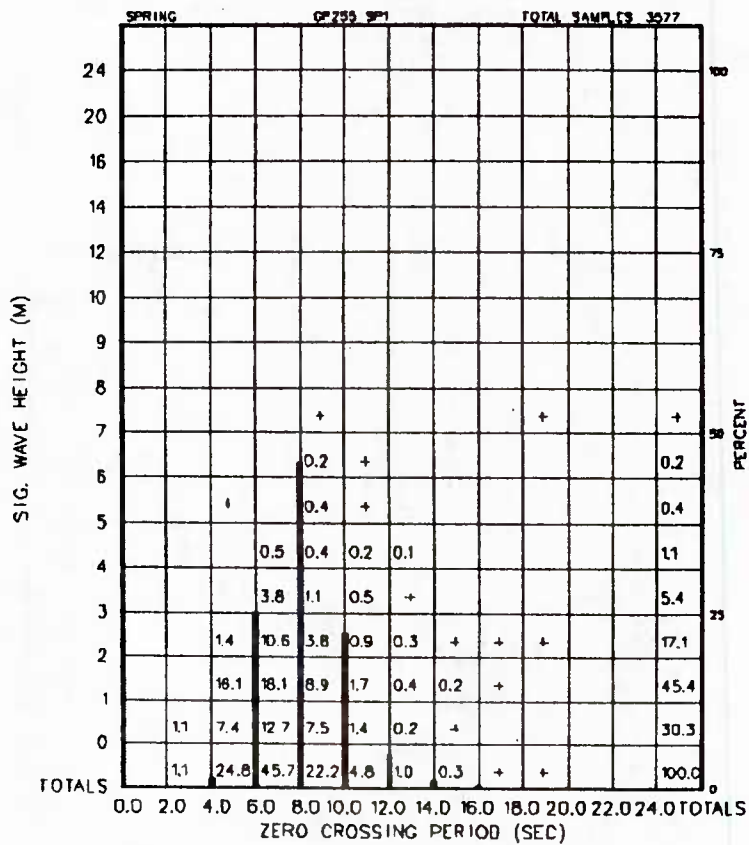


Figure A-255-3-6 Significant Wave Height vs. Zero Crossing Period

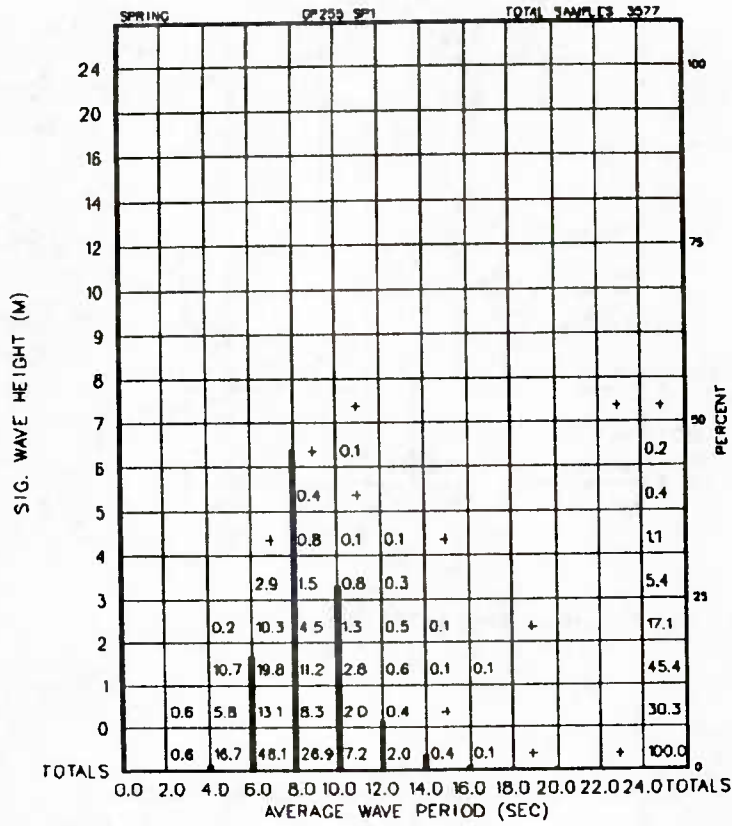


Figure A-255-3-7 Significant Wave Height vs. Average Wave Period

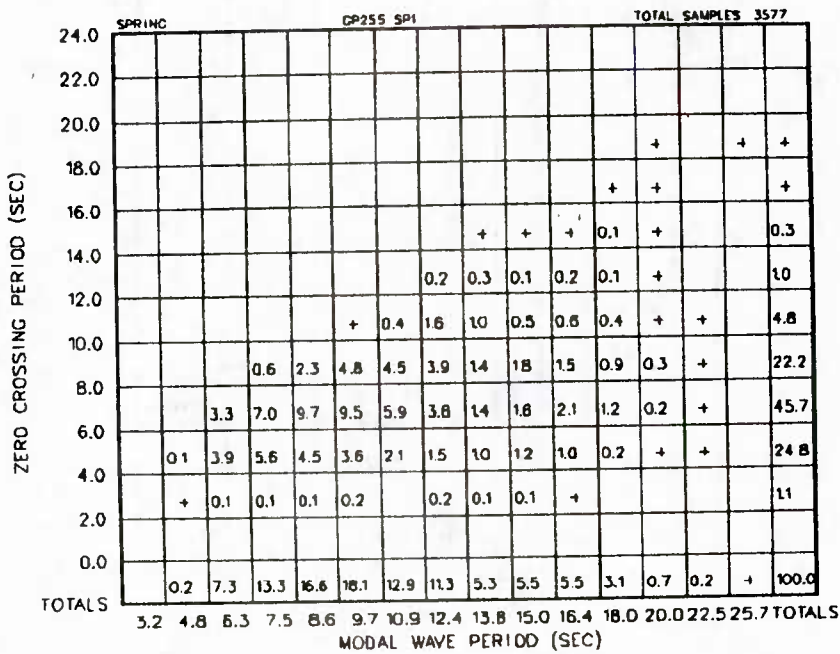


Figure A-255-3-8 Zero Crossing Period vs. Modal Wave Period

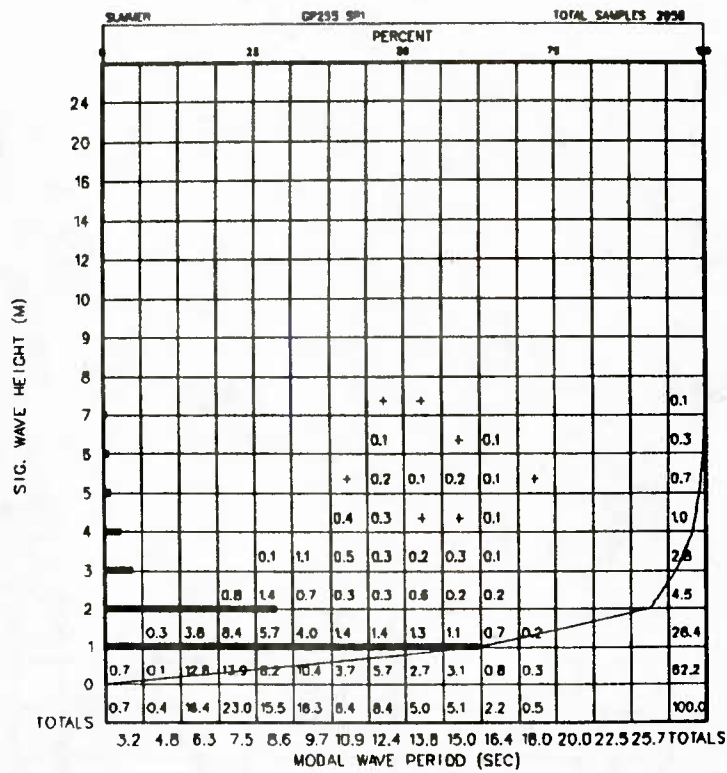


Figure A-255-4-1 Significant Wave Height vs. Modal Wave Period

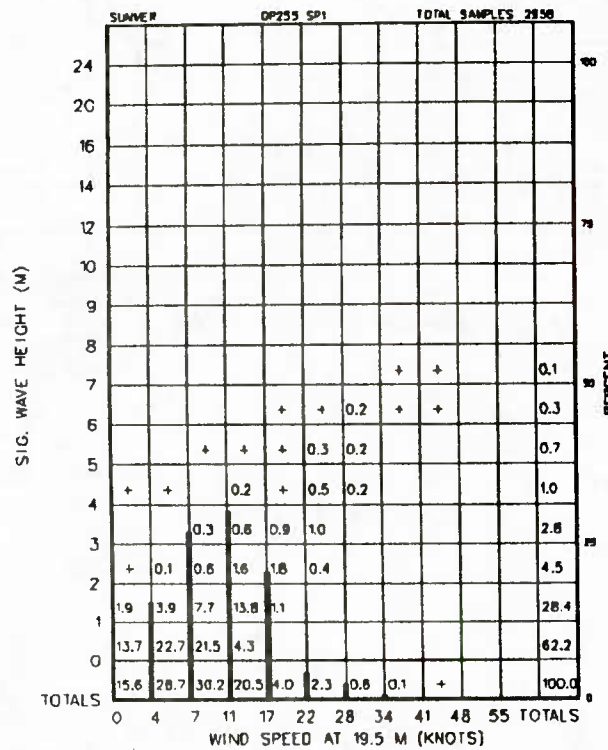


Figure A-255-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

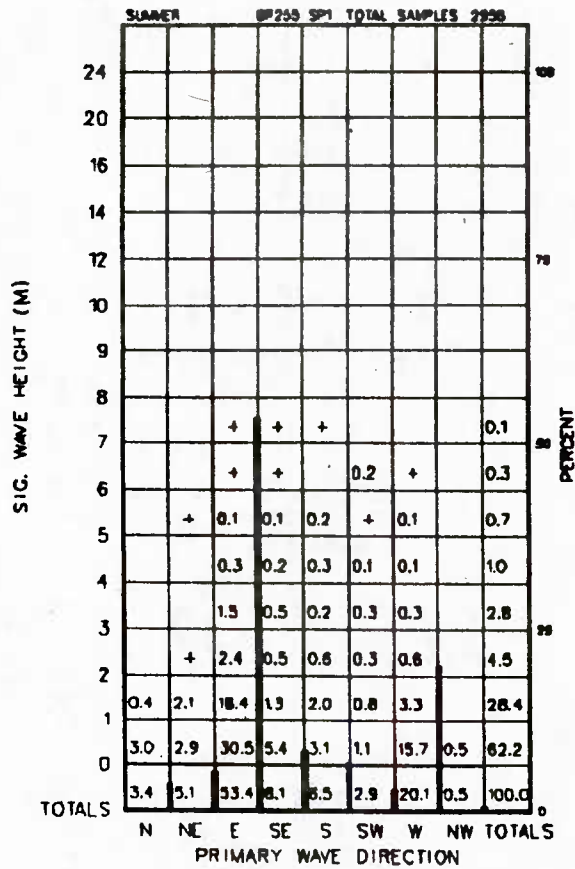


Figure A-255-4-3 Significant Wave Height vs. Primary Wave Direction

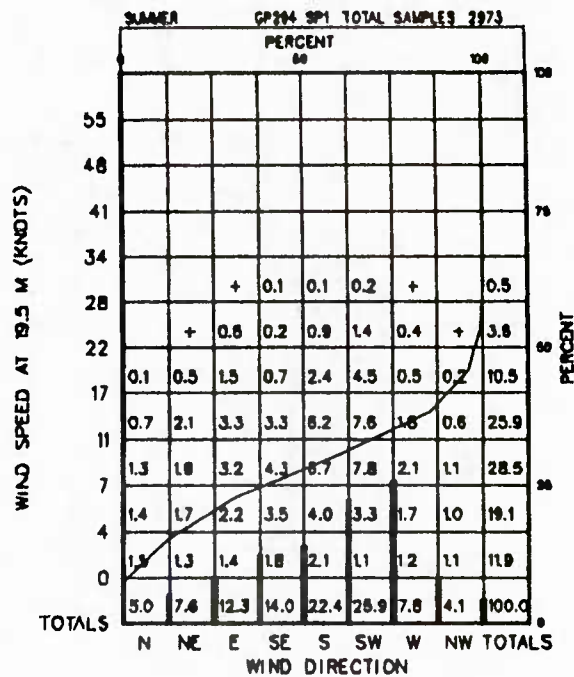


Figure A-255-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

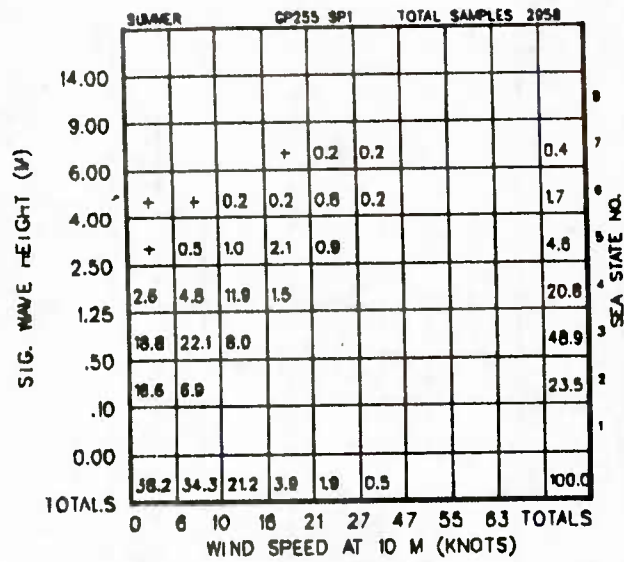


Figure A-255-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

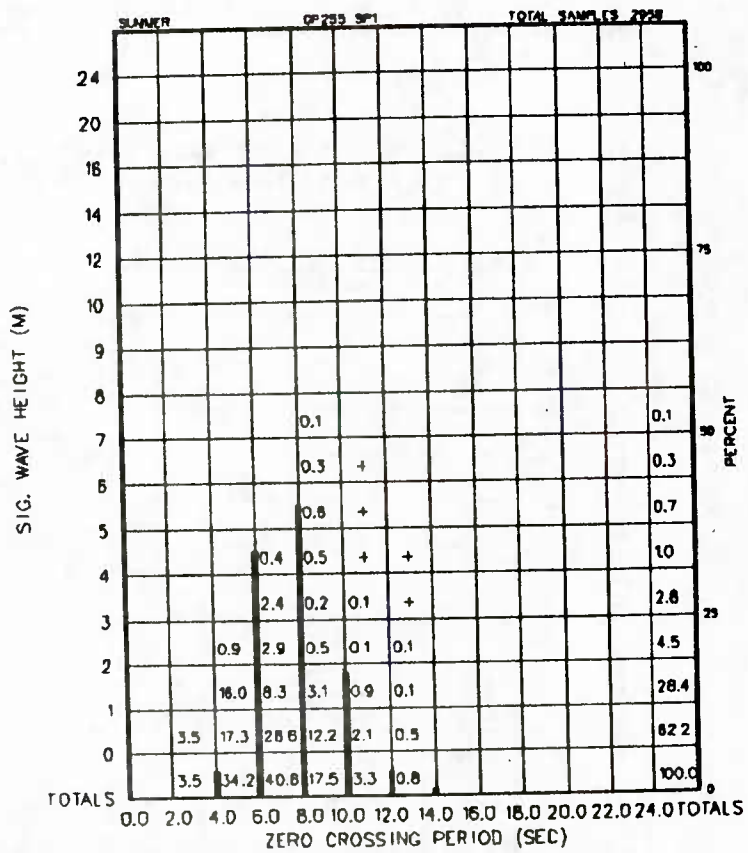


Figure A-255-4-6 Significant Wave Height vs. Zero Crossing Period

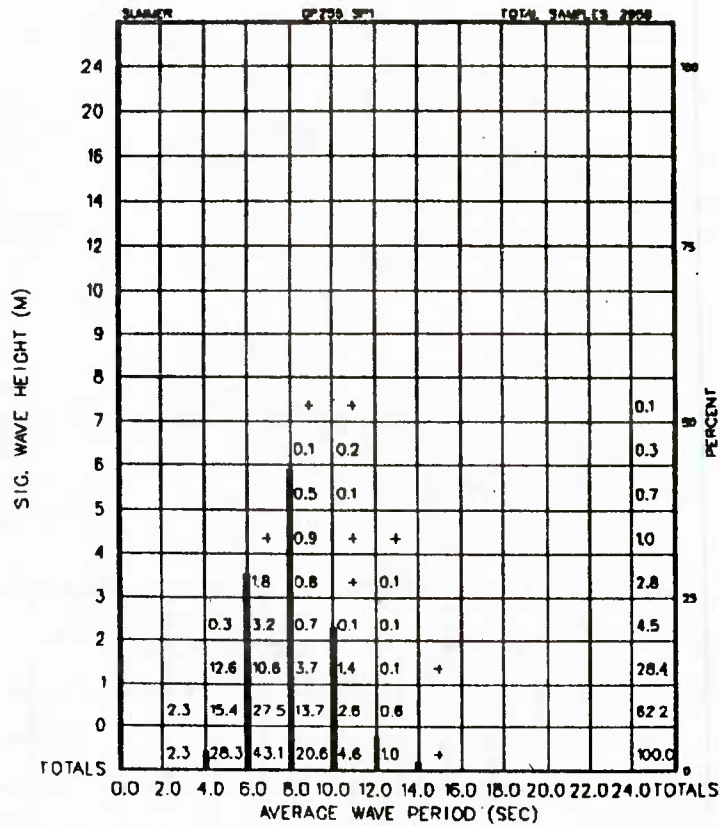


Figure A-255-4-7 Significant Wave Height vs. Average Wave Period

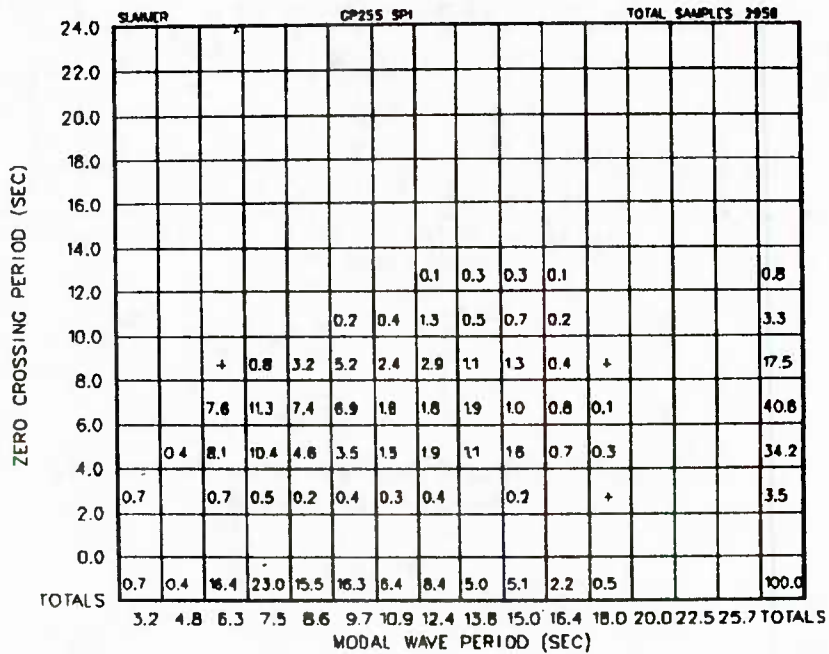


Figure A-255-4-8 Zero Crossing Period vs. Modal Wave Period

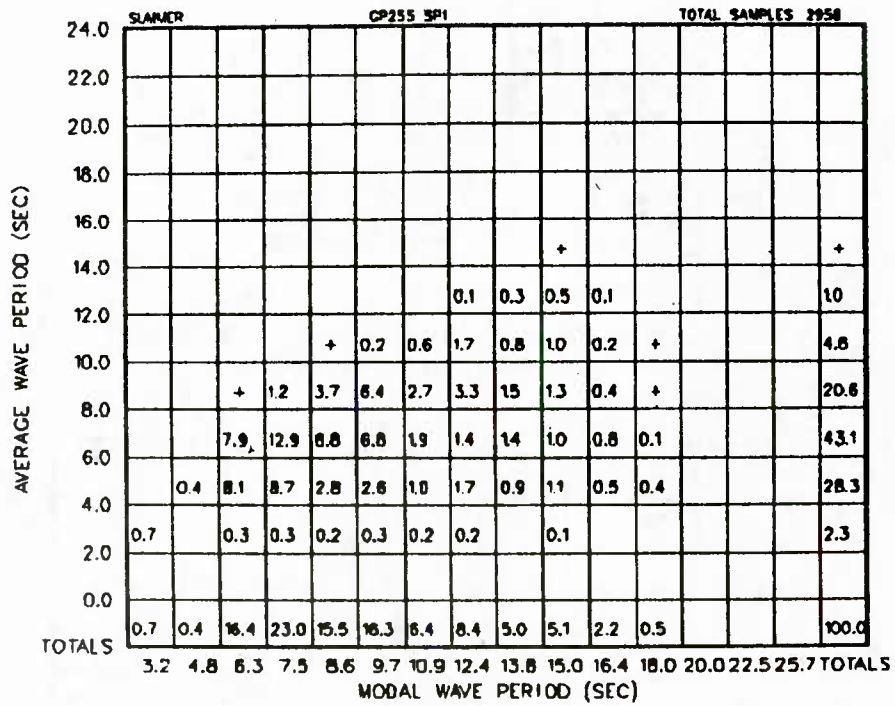


Figure A-255-4-9 Average Wave Period vs. Modal Wave Period

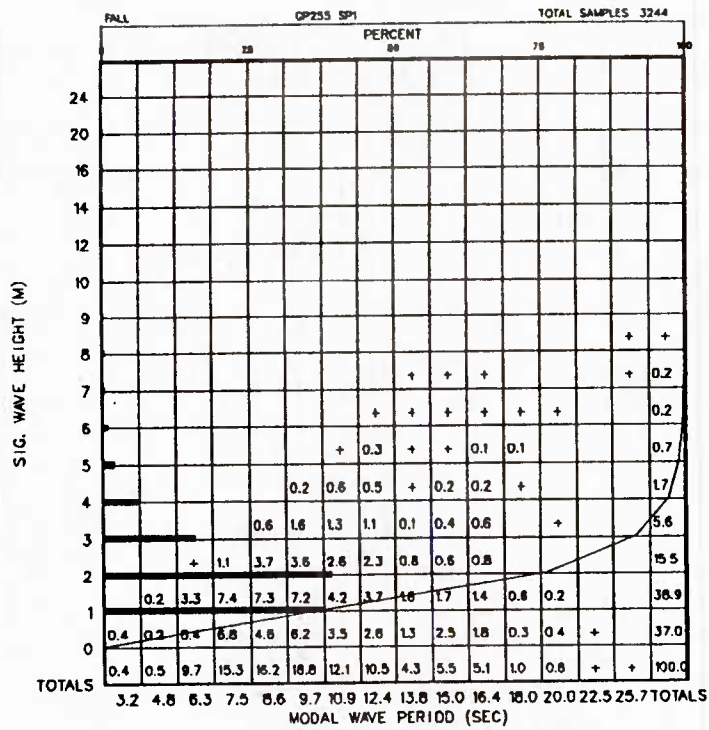


Figure A-255-5-1 Significant Wave Height vs. Modal Wave Period

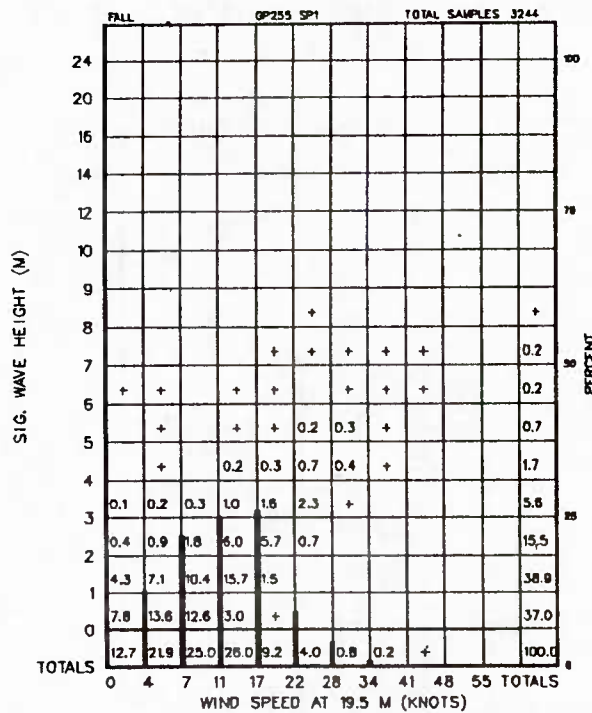


Figure A-255-5-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

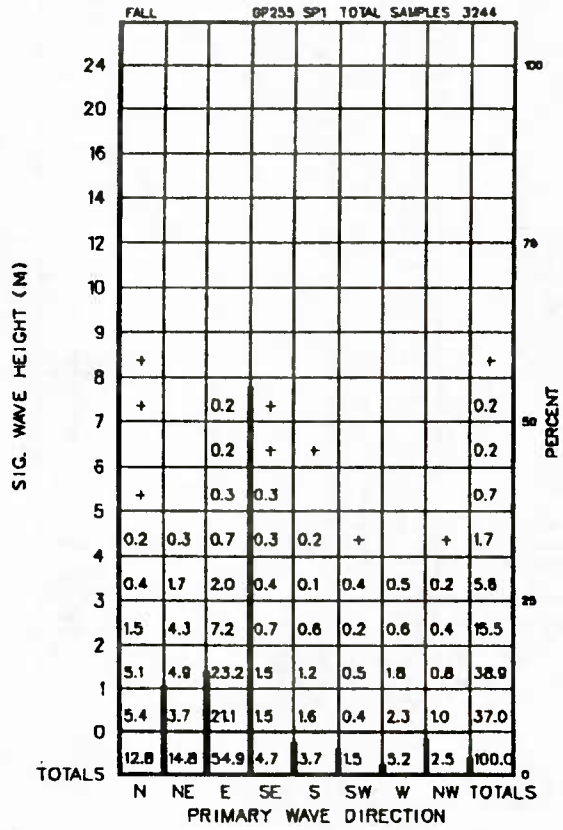


Figure A-255-5-3 Significant Wave Height vs. Primary Wave Direction

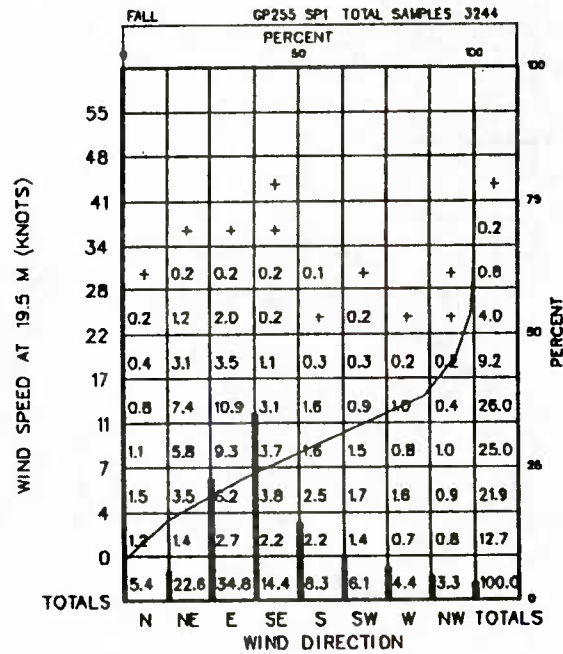


Figure A-255-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

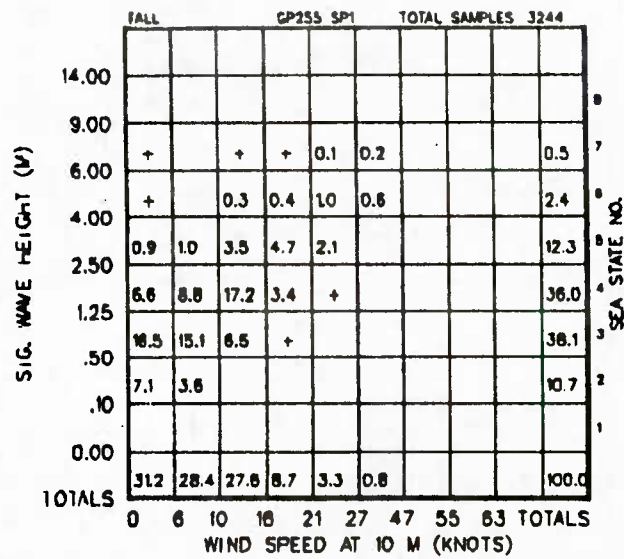


Figure A-255-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

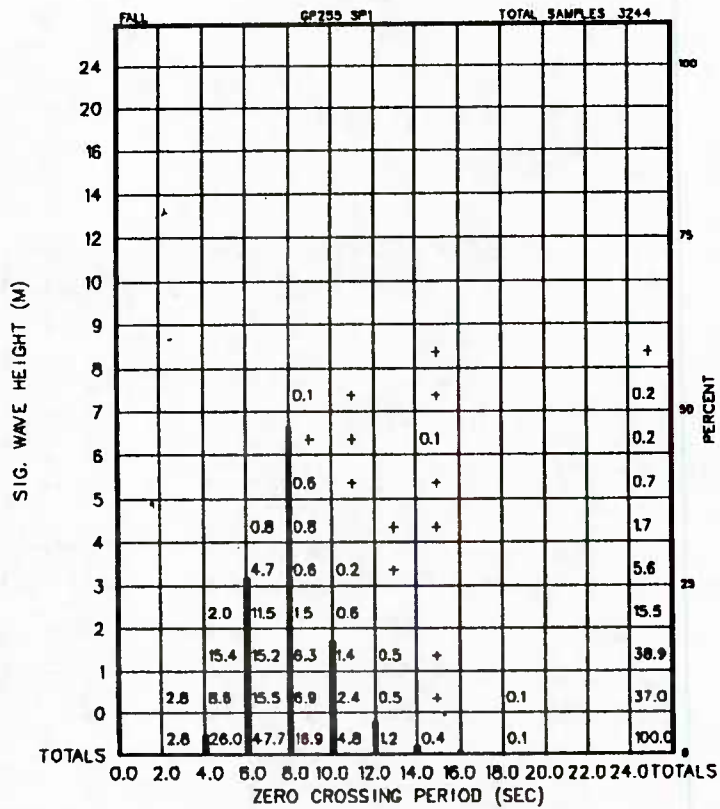


Figure A-255-5-6 Significant Wave Height vs. Zero Crossing Period

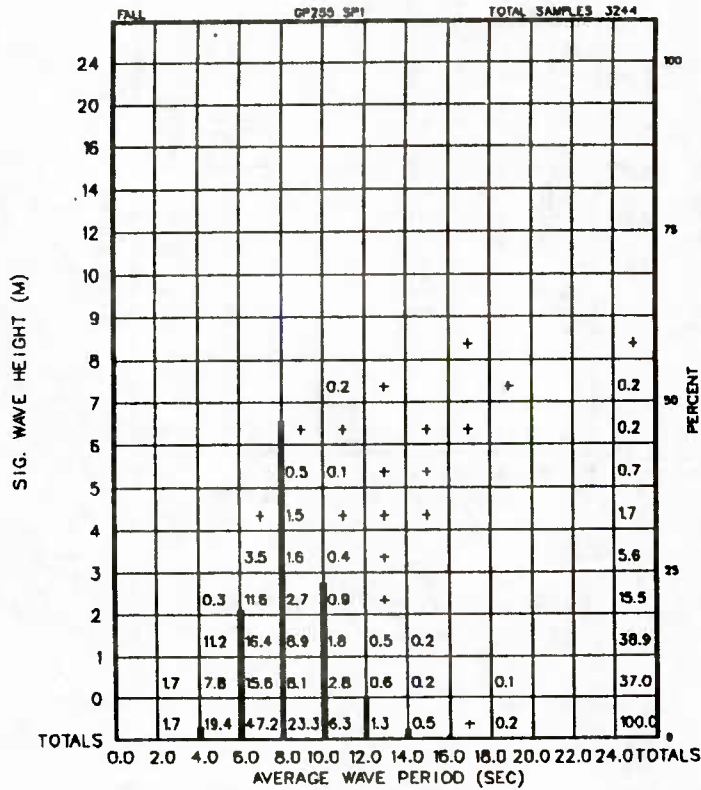


Figure A-255-5-7 Significant Wave Height vs. Average Wave Period

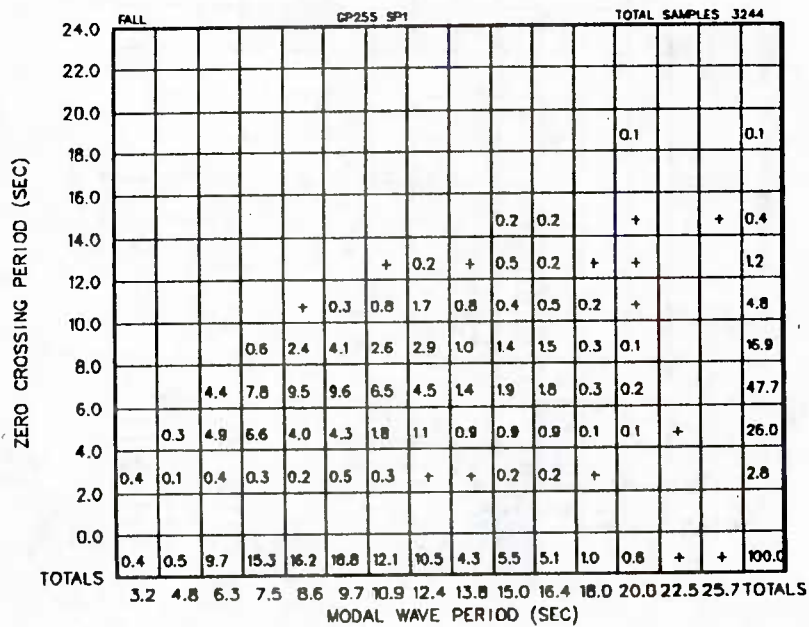


Figure A-255-5-8 Zero Crossing Period vs. Modal Wave Period

TABLE A-294-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

Natural Environment	SEASON: ANNUAL; LOCATION: 36.32°N, 148.51°E				
	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.25 6 -	1.5 9.5 -	5.0 17.5 -	2.0 11 -	1.5 8.6 S
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	3 0.5 -	12 1.75 -	28 3.5 -	14 2 -	14 2 S-SW-NW
Visibility, nautical miles	3	15	25	-	-
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	0.5 0	7 3	8 7.5	- -	- -
Precipitation (Occurrence)	All precipitation - 19% of the time Snow - 5% of the time (Dec-Mar)				
Relative Humidity, %	63	85	98	-	-
Air Temperature, °C	8.5	13	17	13	-
Sea Surface Temperature, °C	14.5	17	19.5	-	-
Sea Level Pressure, millibars	995	1015	1026	-	-
Ice	None				
Refractivity Mean Surface Refractivity Sub-Refraction (1 km, Annual) Super-Refraction or Ducting (1 km, Annual)	- - -	- - -	- - -	322 - -	- 14 24

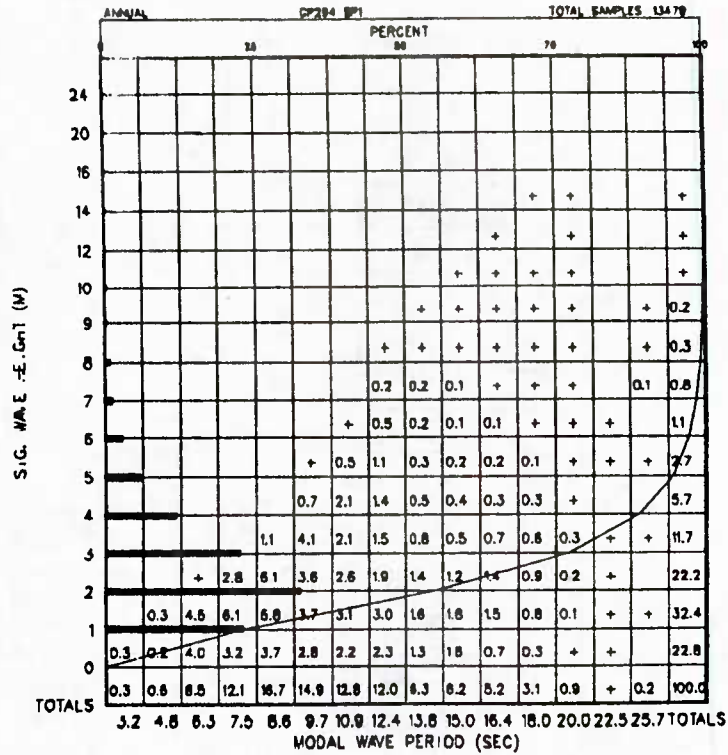


Figure A-294-1-1 Significant Wave Height vs. Modal Wave Period

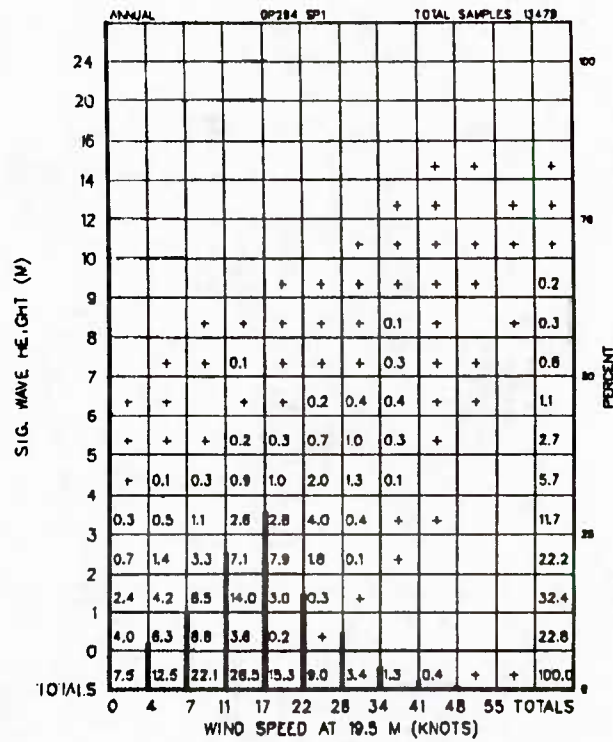


Figure A-294-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

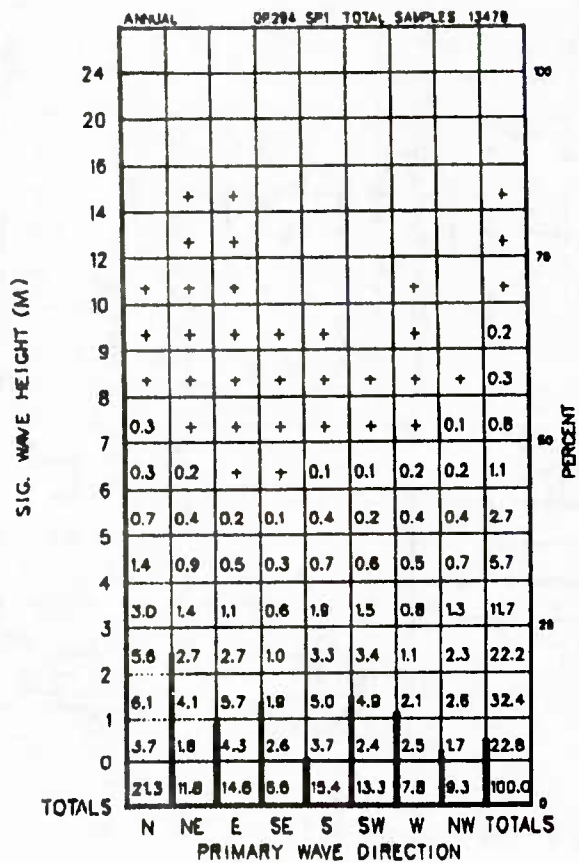


Figure A-294-1-3 Significant Wave Height vs. Primary Wave Direction

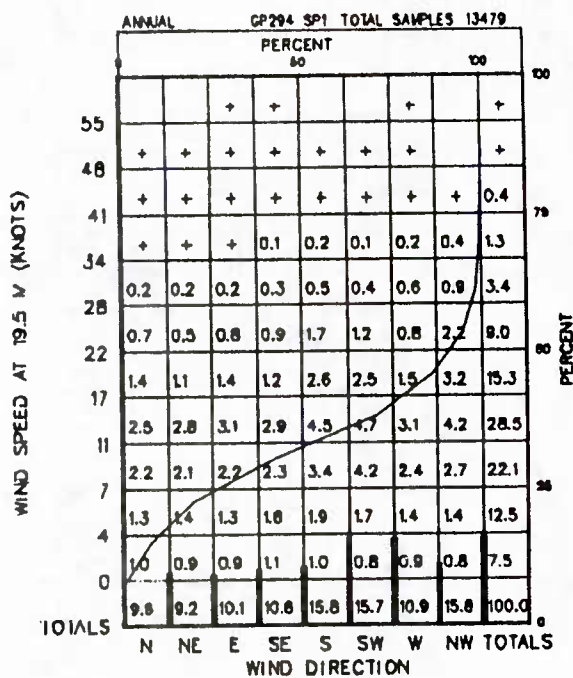


Figure A-294-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

	ANNUAL		CP284 SPI				TOTAL SAMPLES 13479			
14.00						+	+		+	
9.00			+	+	+	0.3	+		0.3	
6.00	+	+	0.2	0.2	0.4	1.3	+		2.2	
4.00	0.2	0.4	1.2	1.5	3.3	1.8			8.4	
2.50	1.3	2.5	5.6	7.3	4.1	0.3			21.4	
1.25	5.0	8.4	16.3	6.1	0.3	+			36.2	
.50	7.5	10.1	7.0	0.2	+				24.8	
.10	4.0	2.6	+						6.6	
0.00										
TOTALS	16.0	24.1	30.6	15.4	8.2	3.7	+	+	100.0	
	0	6	10	16	21	27	47	55	63	TOTALS

Figure A-294-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

	ANNUAL		CP284 SPI				TOTAL SAMPLES 13479							
24										100				
20														
16														
14						+				+				
12						+	+			+				
10						+	+			+				
9					0.2	+	+			0.2				
8				+	0.2	+	+			0.3				
7				0.4	0.2	+		+	+	0.6				
6				1.0	+	+				1.1				
5			+	2.5	0.1	+	+			2.7				
4			2.5	3.0	0.2	+	+	+		5.7				
3			6.7	2.3	0.5	0.1	+	+	+	11.7				
2	+	3.5	14.3	3.4	0.7	0.2	+			22.2				
1		15.9	10.9	4.1	1.1	0.3	+	+		32.4				
0	2.7	7.2	7.5	3.8	1.0	0.3	0.1			22.8				
TOTALS	2.7	26.6	43.9	20.5	4.4	1.2	0.4	0.1	+	+	+	100.0		
	0.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	TOTALS

Figure A-294-1-6 Significant Wave Height vs. Zero Crossing Period

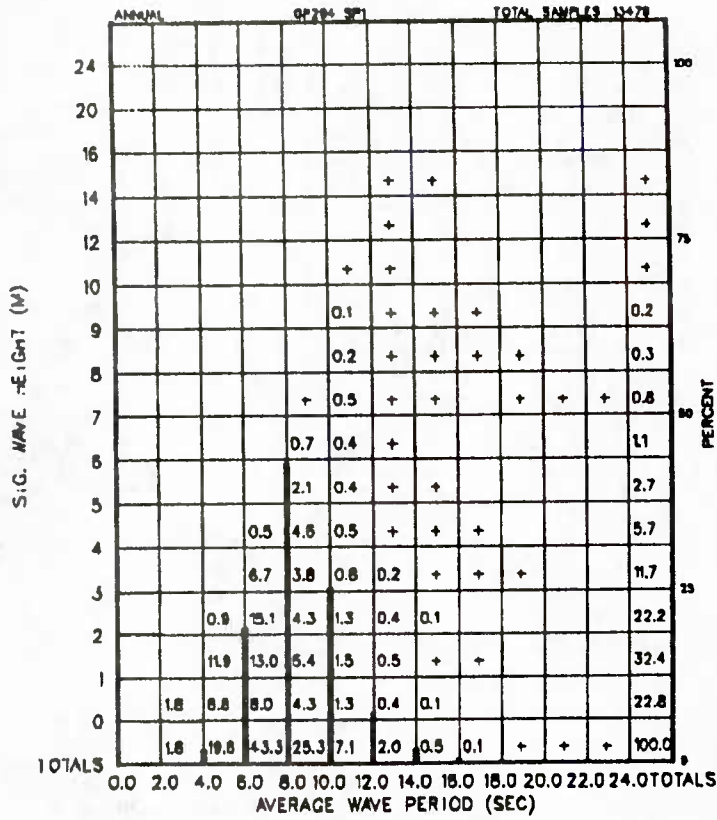


Figure A-294-1-7 Significant Wave Height vs. Average Wave Period

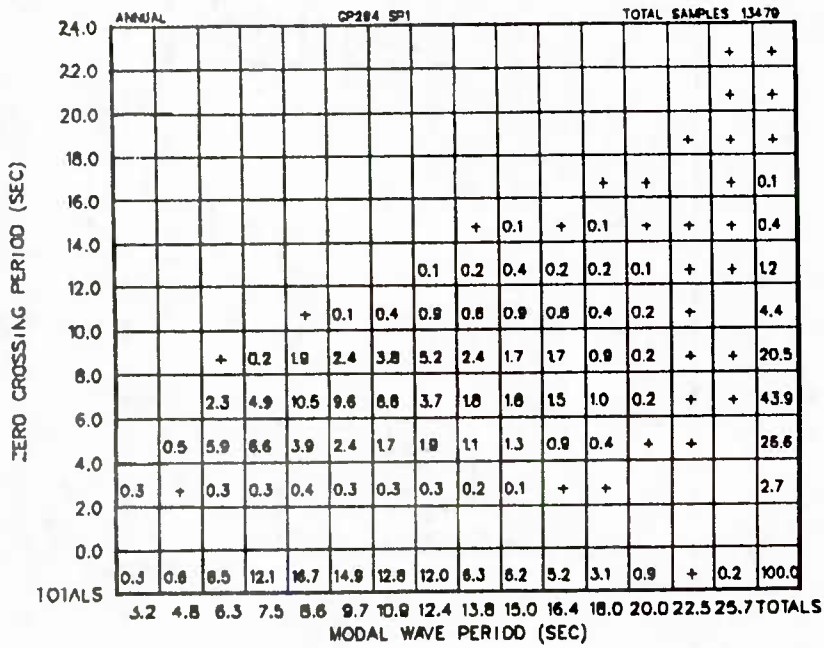


Figure A-294-1-8 Zero Crossing Period vs. Modal Wave Period

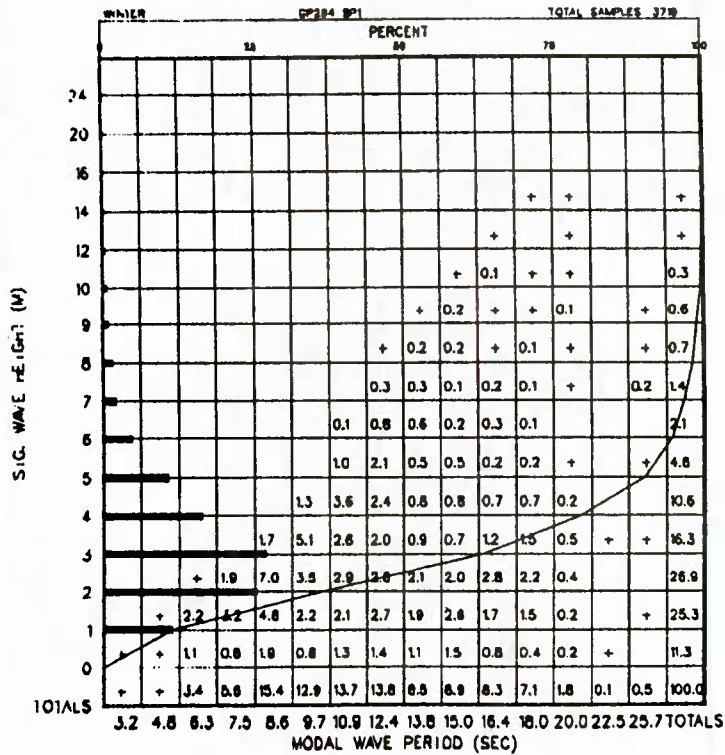


Figure A-294-2-1 Significant Wave Height vs. Modal Wave Period

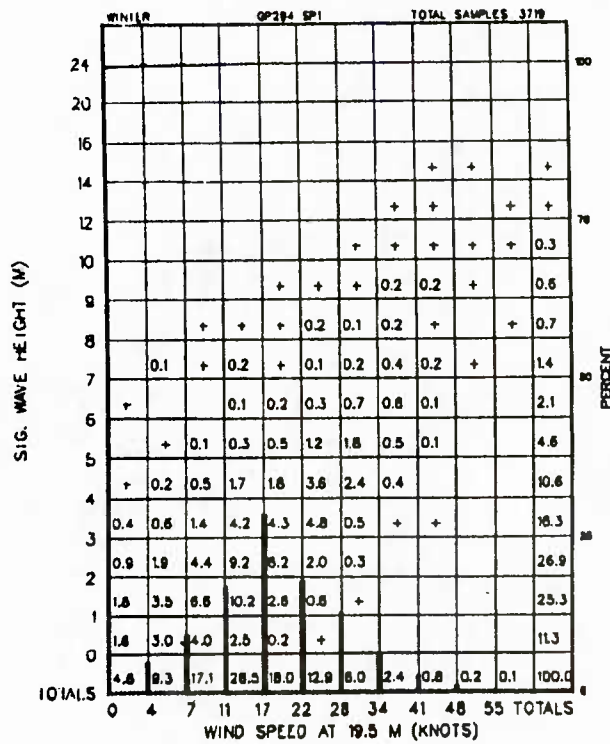


Figure A-294-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

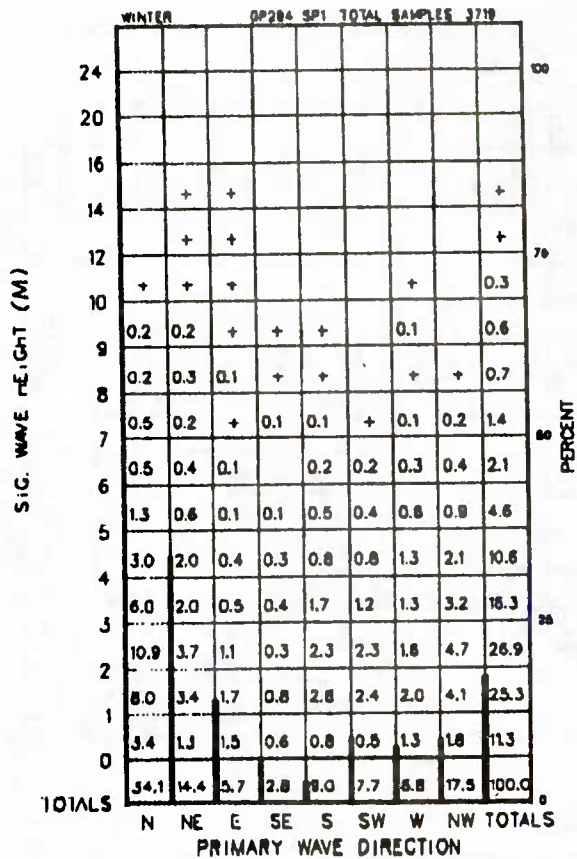


Figure A-294-2-3 Significant Wave Height vs. Primary Wave Direction

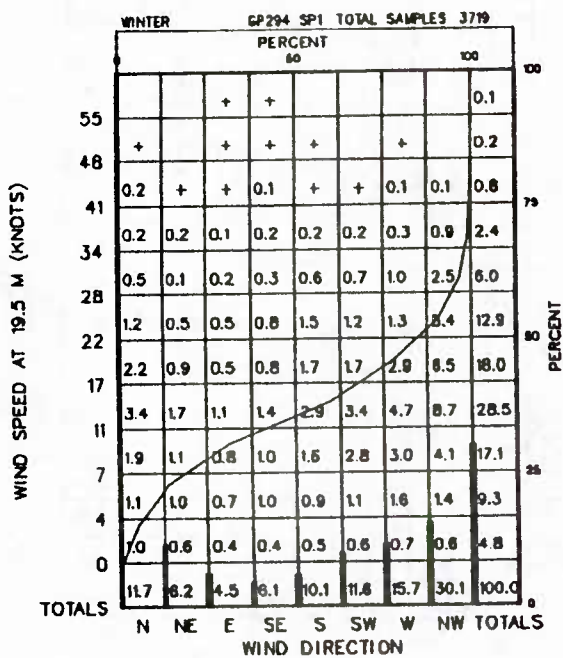


Figure A-294-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

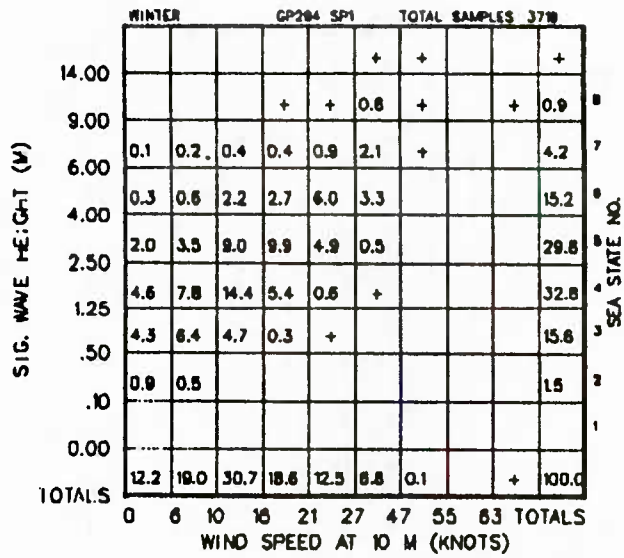


Figure A-294-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

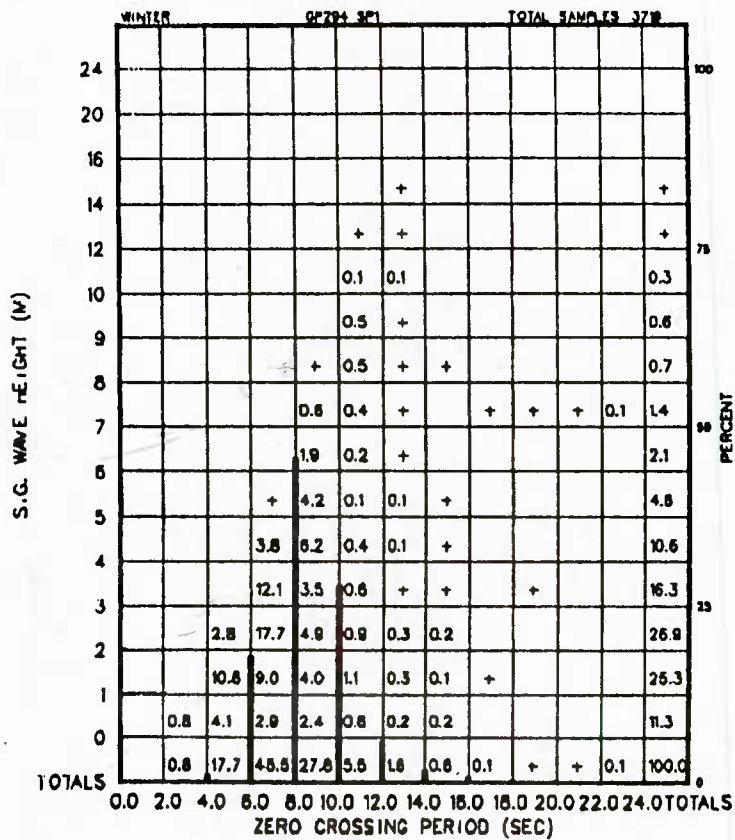


Figure A-294-2-6 Significant Wave Height vs. Zero Crossing Period

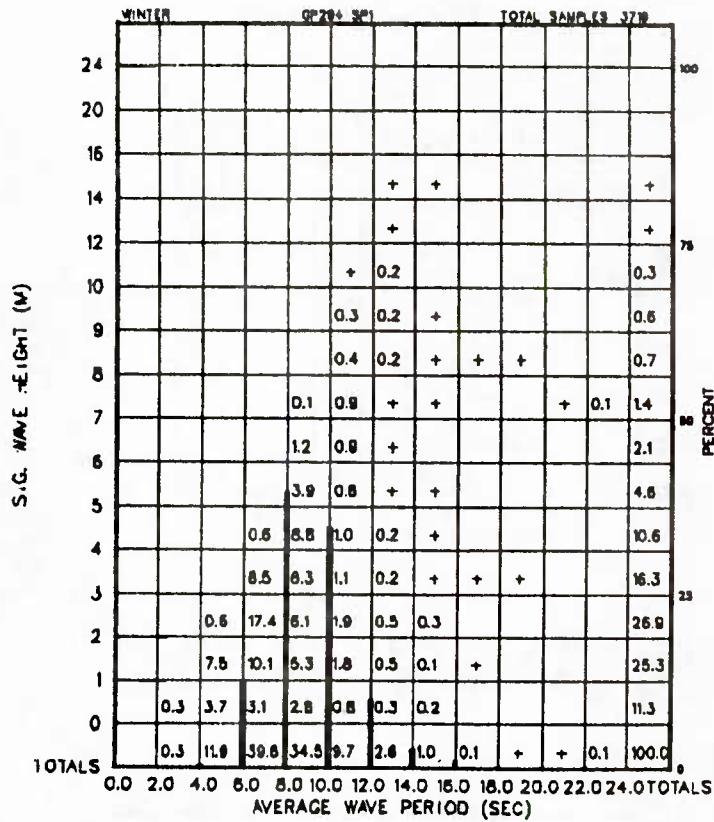


Figure A-294-2-7 Significant Wave Height vs. Average Wave Period

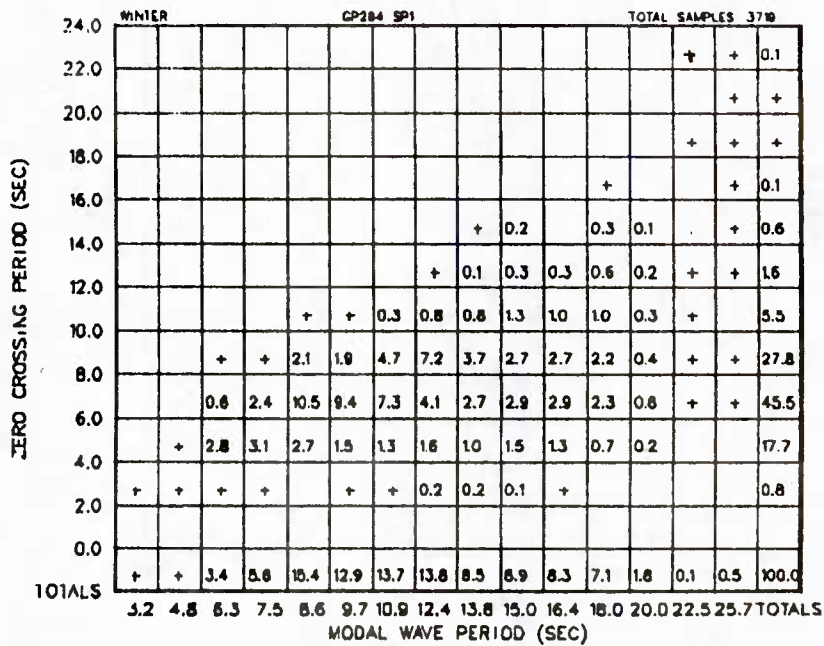


Figure A-294-2-8 Zero Crossing Period vs. Modal Wave Period

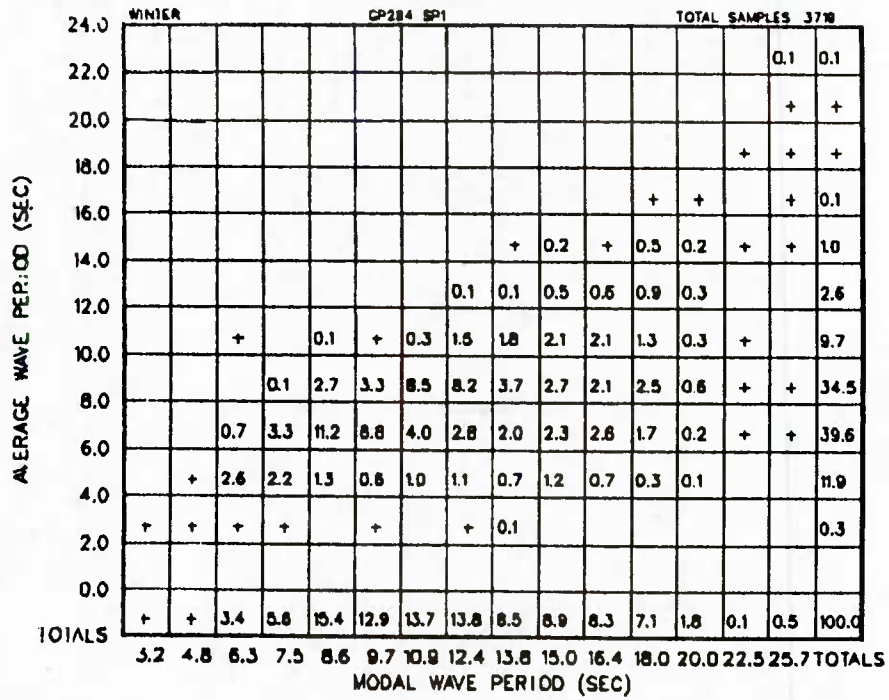


Figure A-294-2-9 Average Wave Period vs. Modal Wave Period

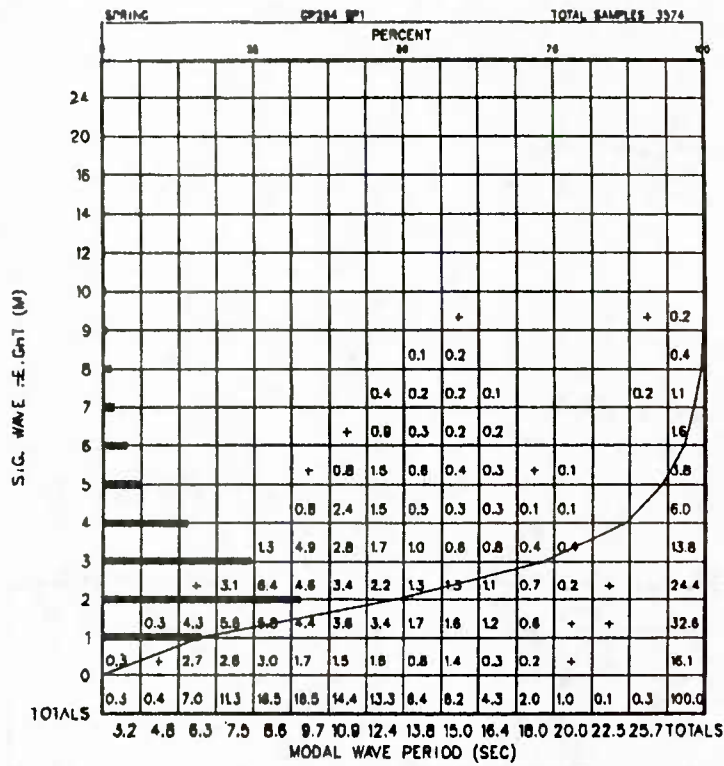


Figure A-294-3-1 Significant Wave Height vs. Modal Wave Period

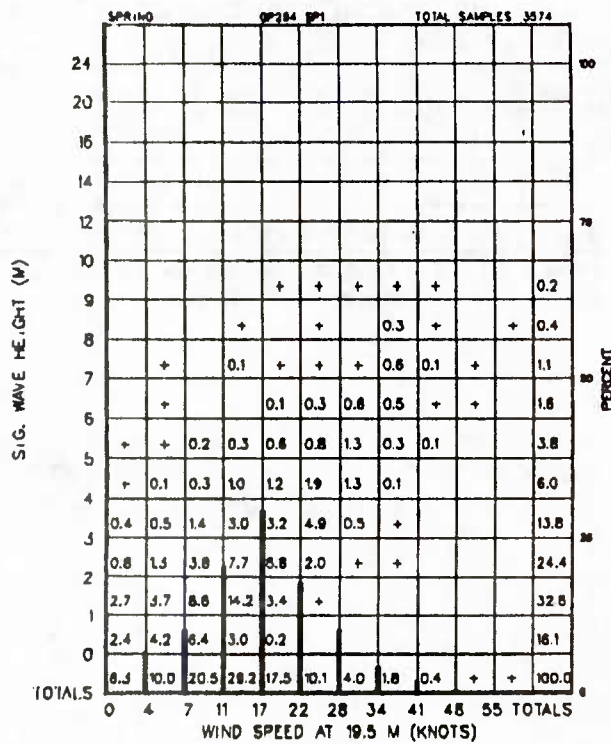


Figure A-294-3-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

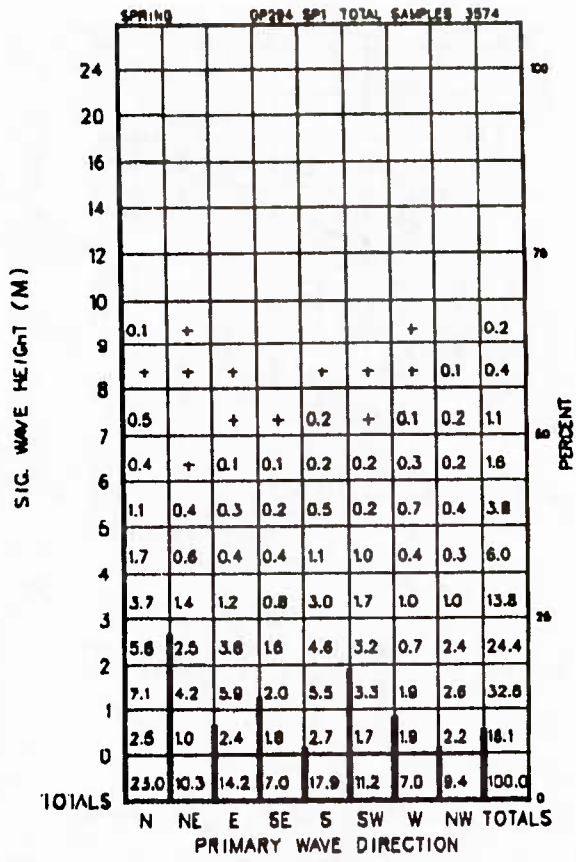


Figure A-294-3-3 Significant Wave Height vs. Primary Wave Direction

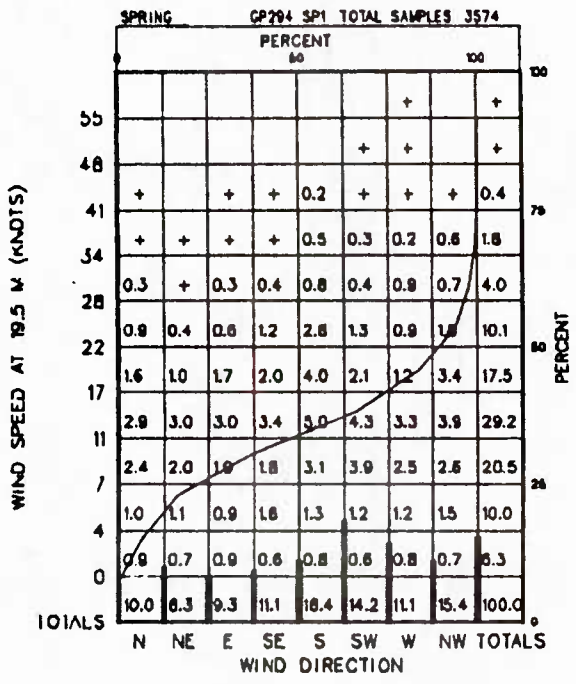


Figure A-294-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

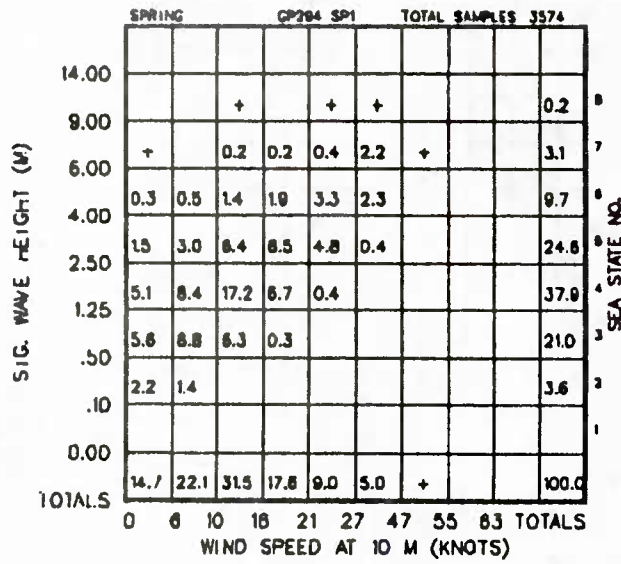


Figure A-294-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

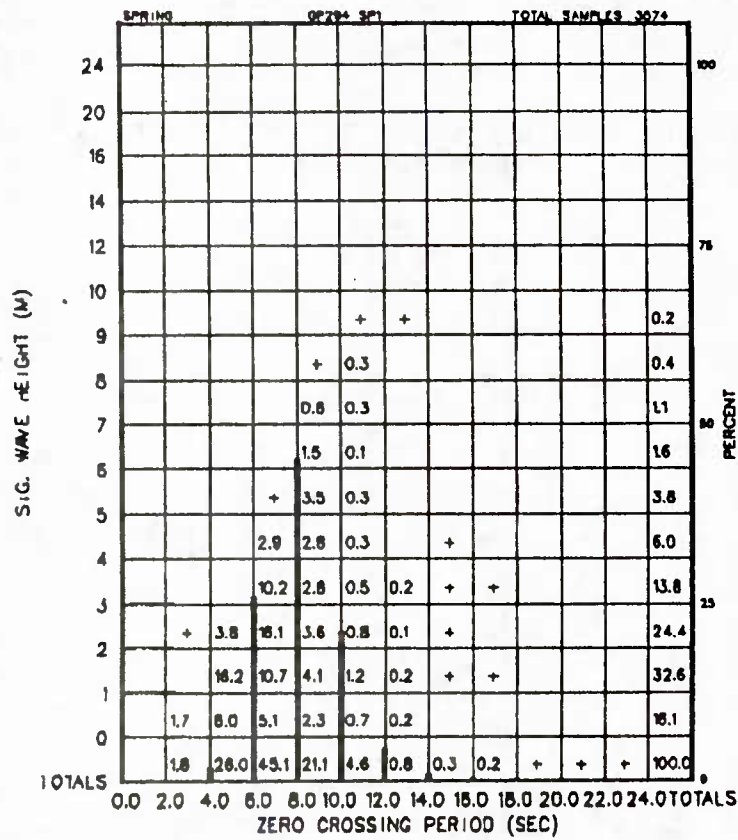


Figure A-294-3-6 Significant Wave Height vs. Zero Crossing Period

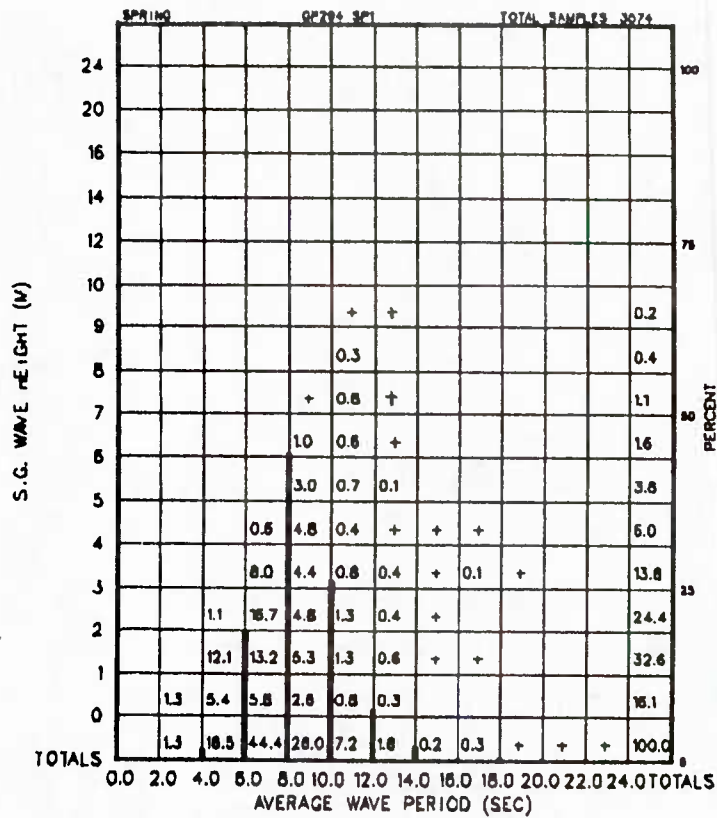


Figure A-294-3-7 Significant Wave Height vs. Average Wave Period

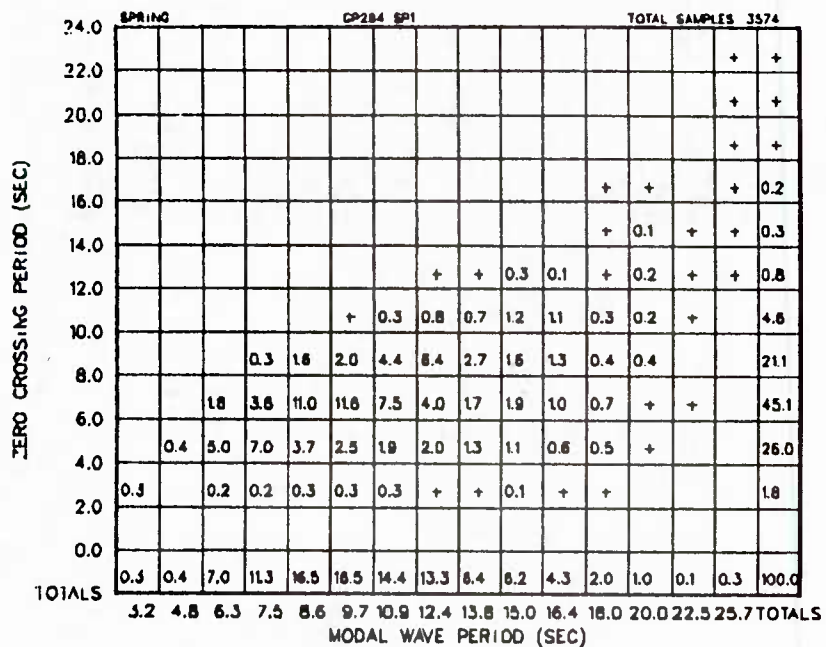


Figure A-294-3-8 Zero Crossing Period vs. Modal Wave Period

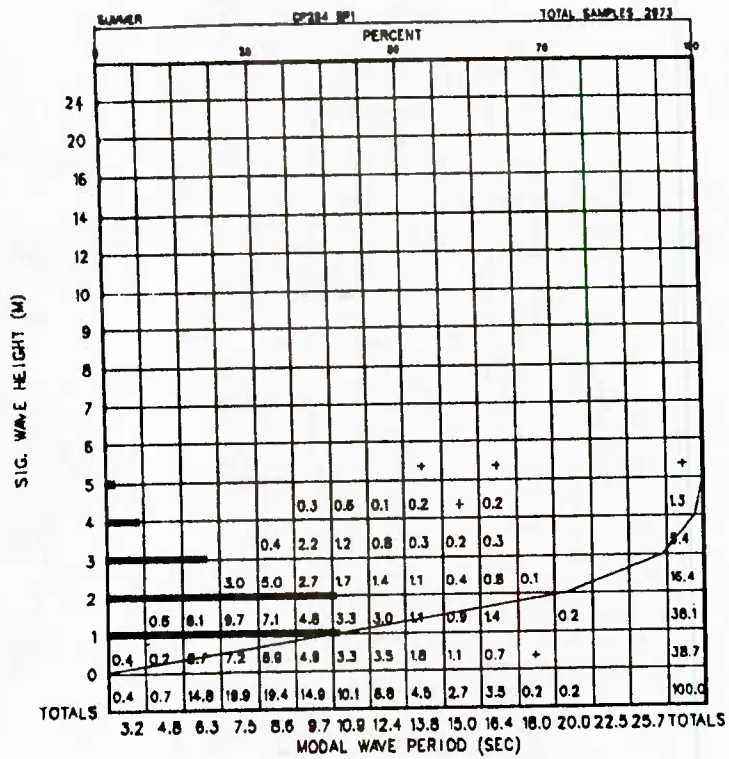


Figure A-294-4-1 Significant Wave Height vs. Modal Wave Period

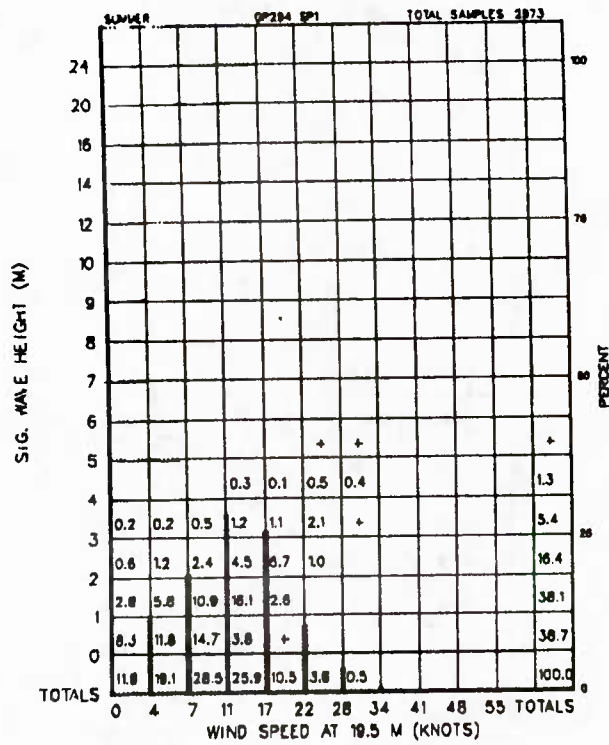


Figure A-294-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

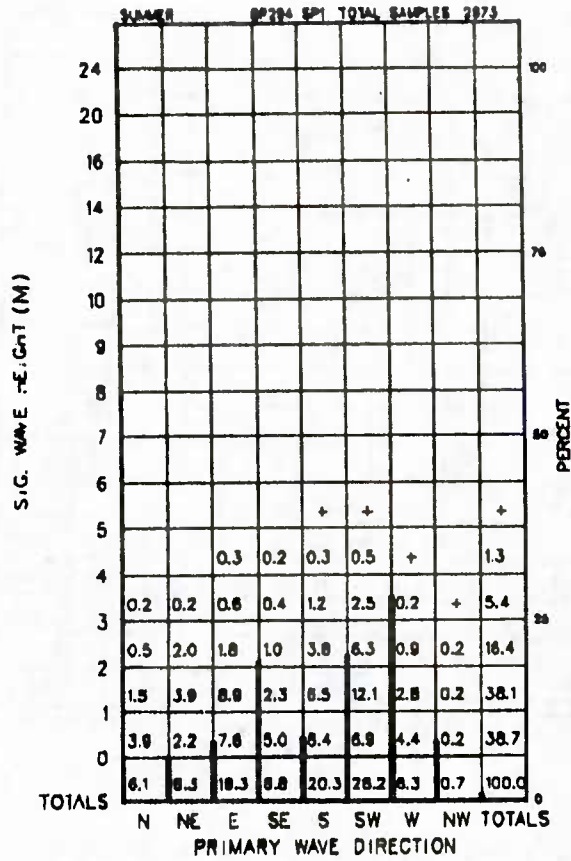


Figure A-294-4-3 Significant Wave Height vs. Primary Wave Direction

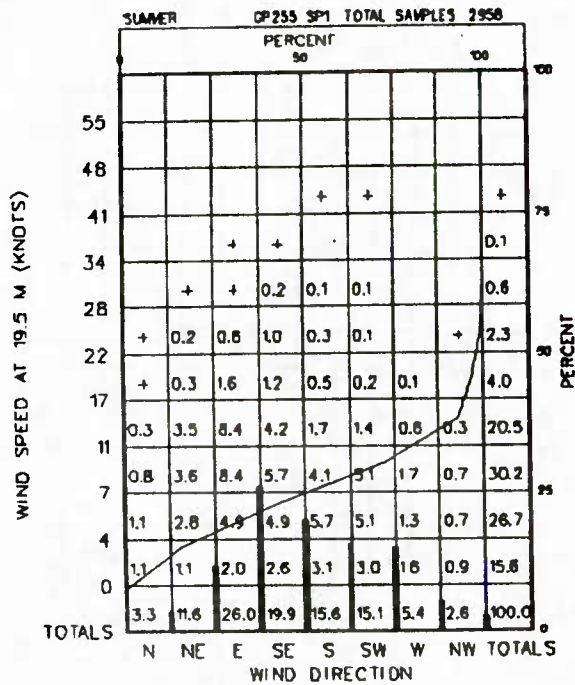


Figure A-294-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

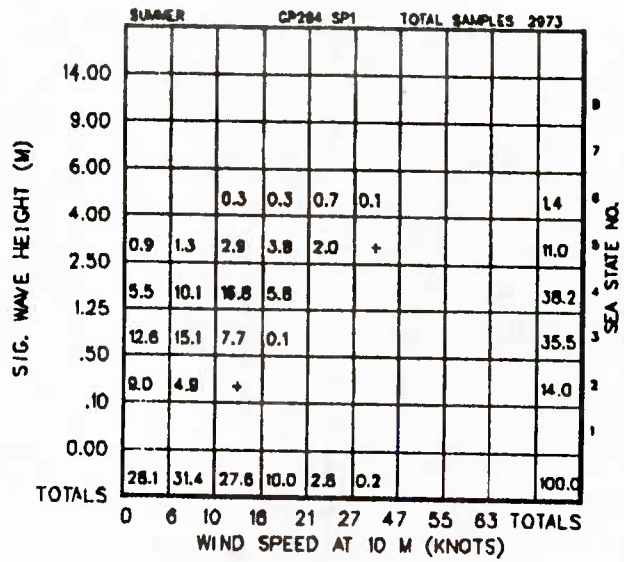


Figure A-294-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

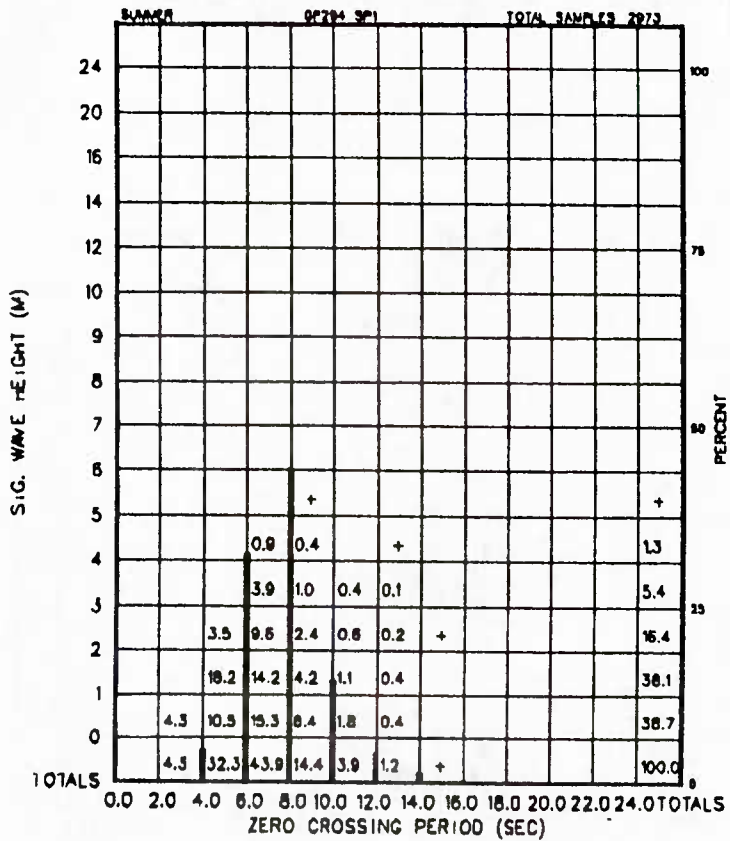


Figure A-294-4-6 Significant Wave Height vs. Zero Crossing Period

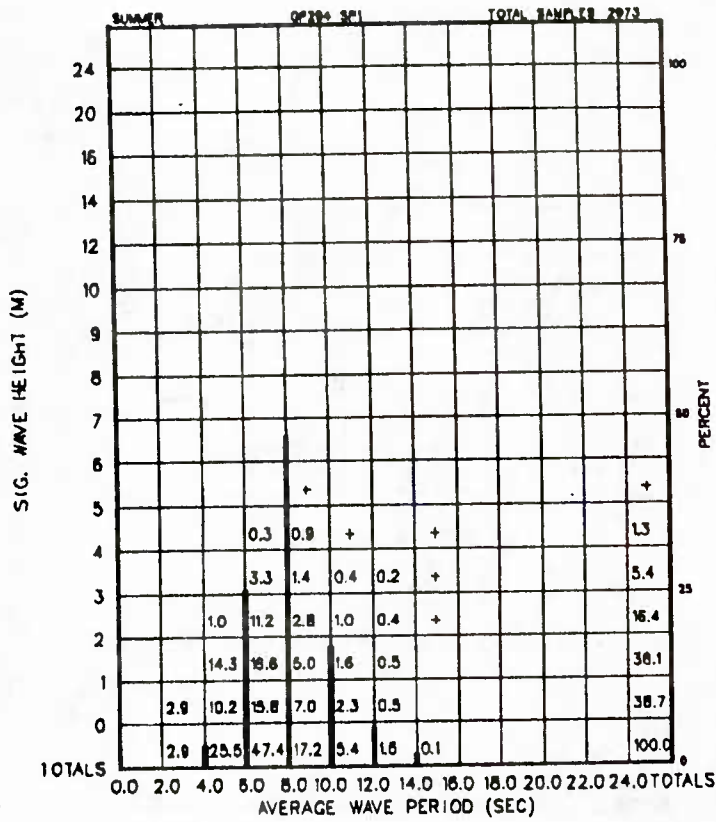


Figure A-294-4-7 Significant Wave Height vs. Average Wave Period

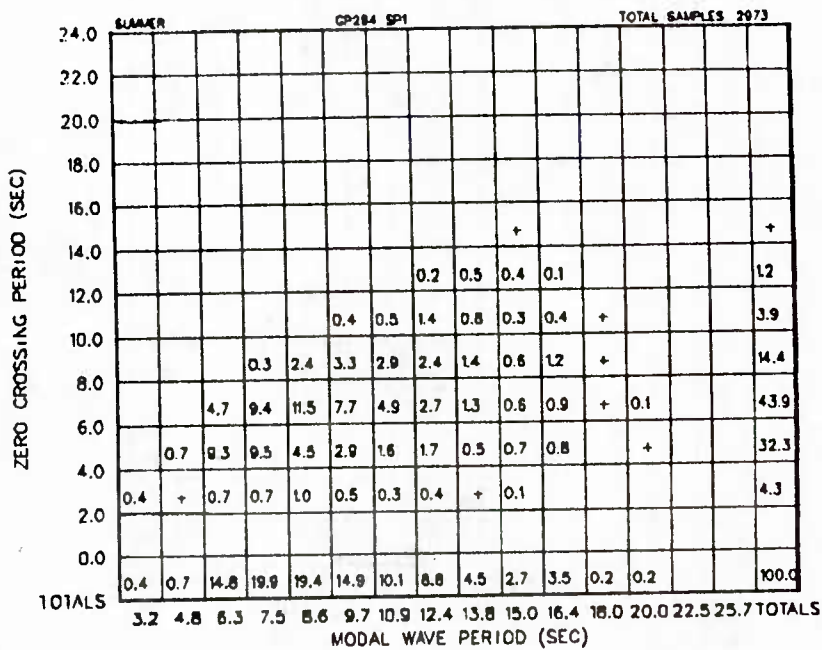


Figure A-294-4-8 Zero Crossing Period vs. Modal Wave Period

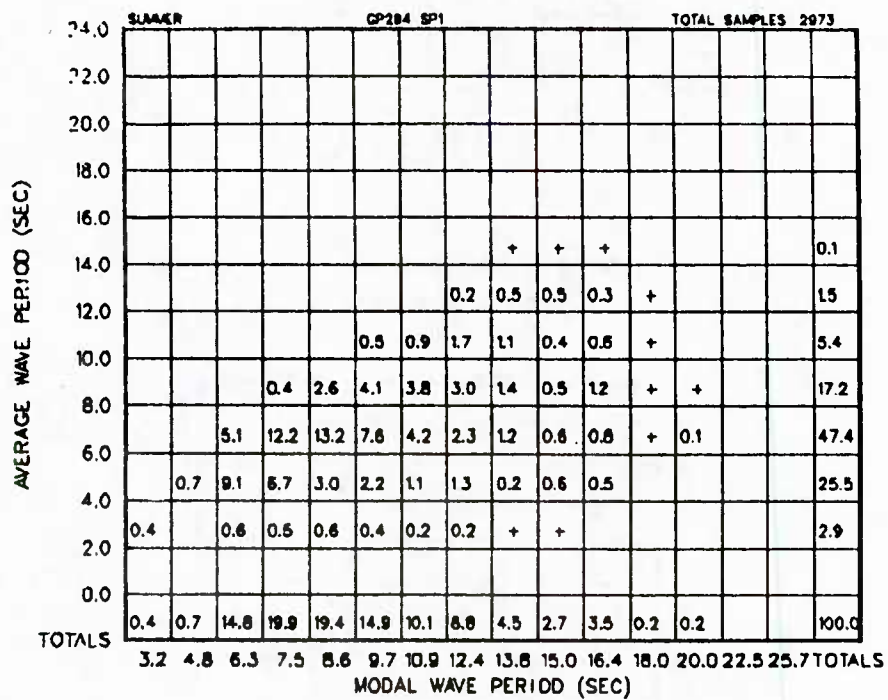


Figure A-294-4-9 Average Wave Period vs. Modal Wave Period

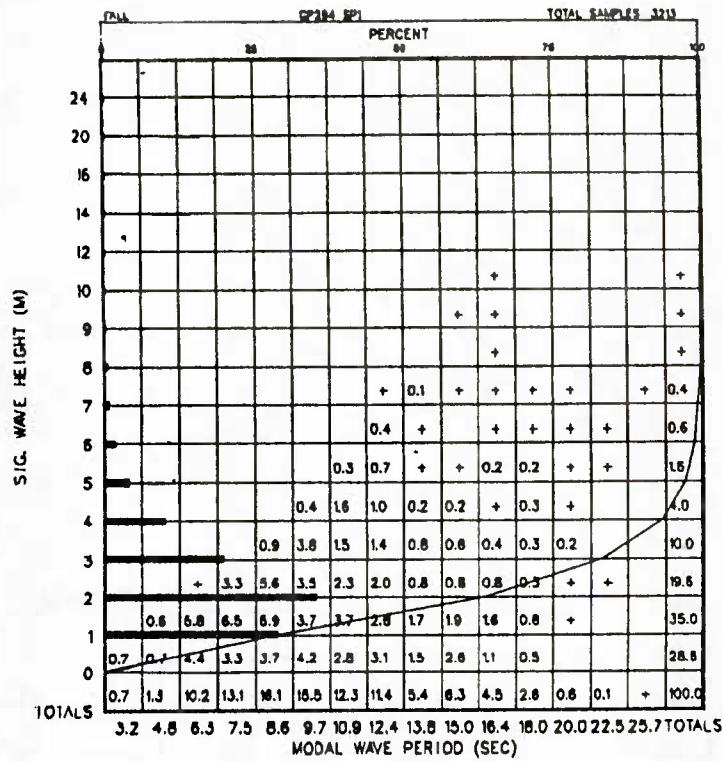


Figure A-294-5-1 Significant Wave Height vs. Modal Wave Period

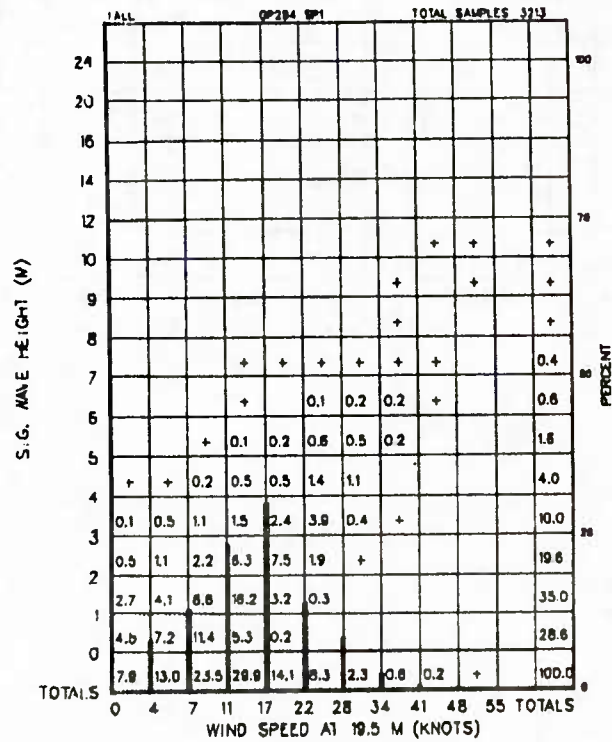


Figure A-294-5-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

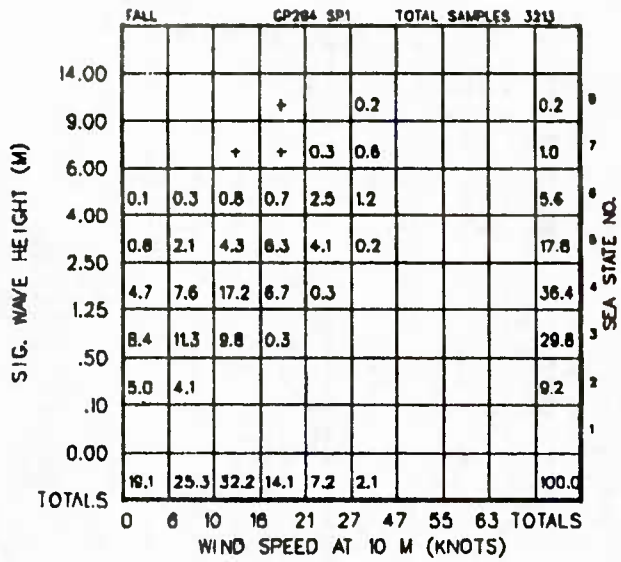


Figure A-294-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

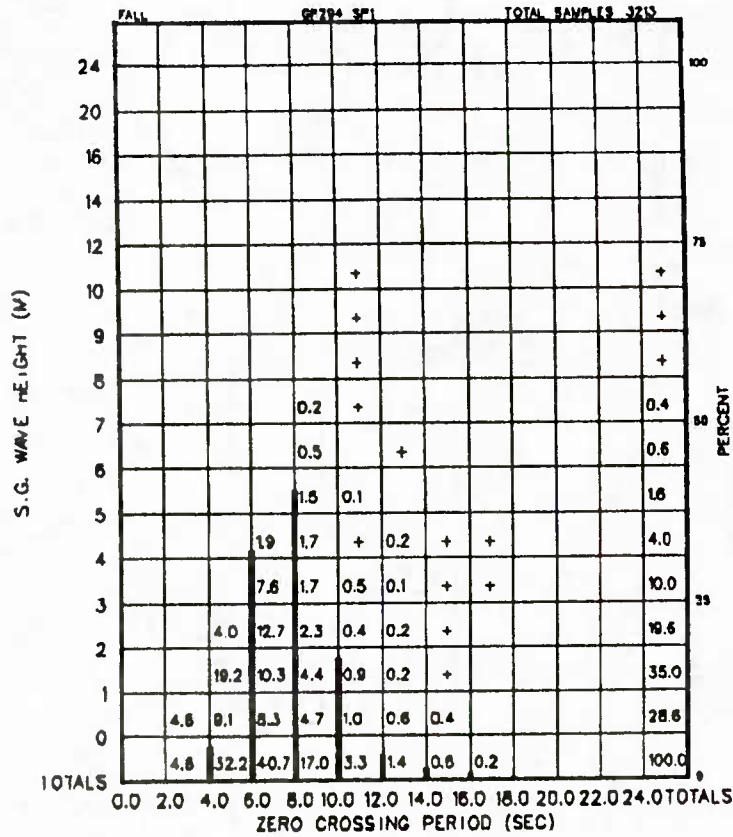


Figure A-294-5-6 Significant Wave Height vs. Zero Crossing Period

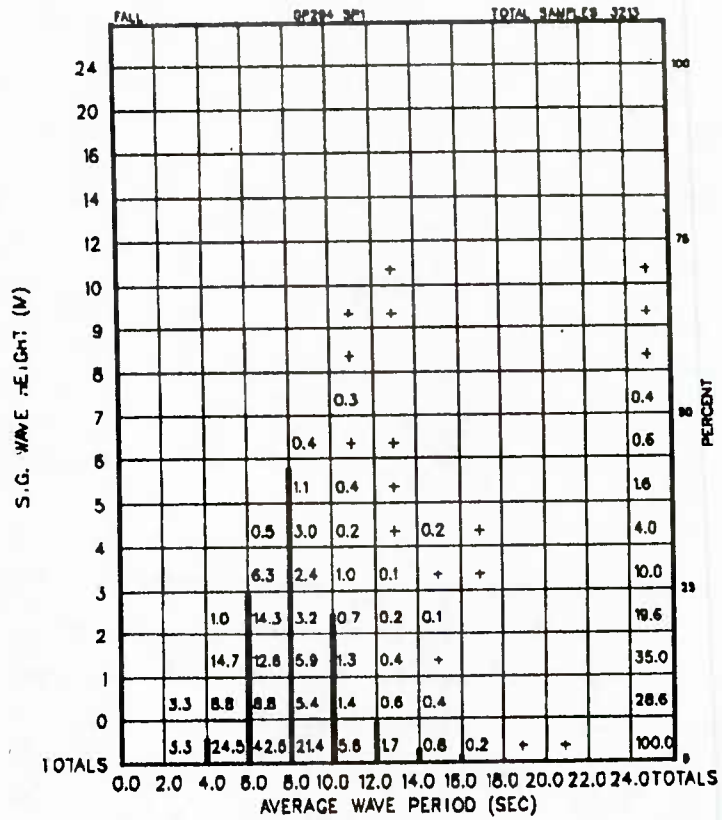


Figure A-294-5-7 Significant Wave Height vs. Average Wave Period

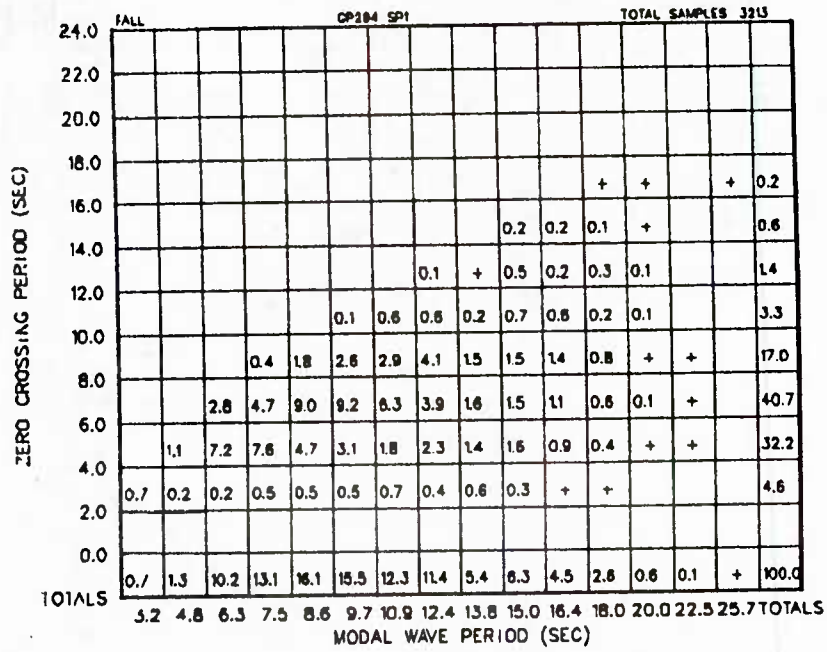


Figure A-294-5-8 Zero Crossing Period vs. Modal Wave Period

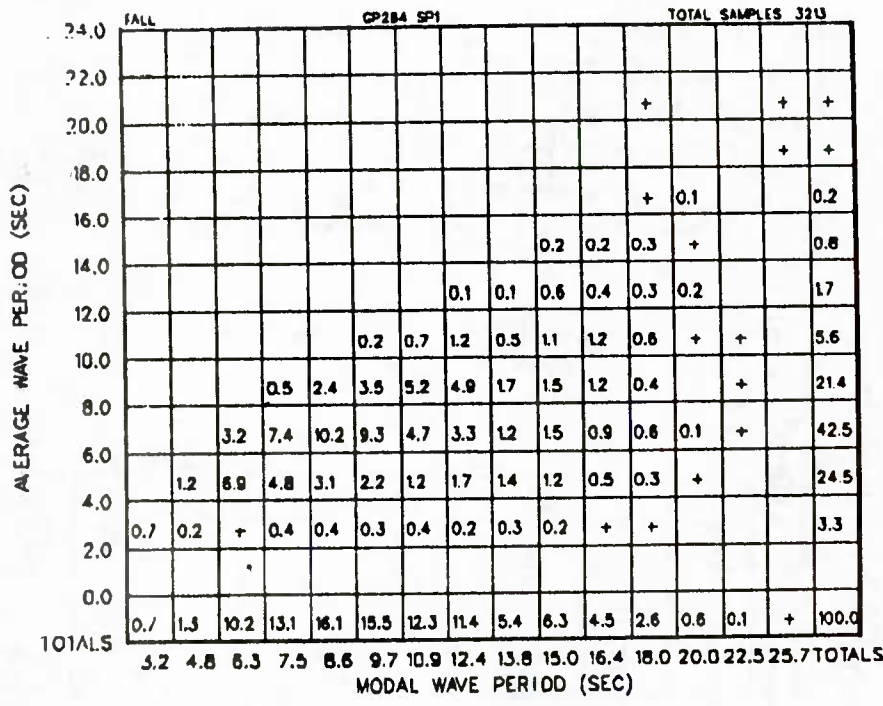


Figure A-294-5-9 Average Wave Period vs. Modal Wave Period

TABLE A-085-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 34.48°N, 174.21°W					
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.25 6 -	2 11.5 -	6 18.5 -	2.5 12 -	1.5 12.4 NW
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	3 0.5 -	12.5 1.75 -	31 5 -	14 2 -	14 2 SW
Visibility, nautical miles	2	12	25	-	-
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	1 0.5	6.5 5.5	8 8	- -	- -
Precipitation (Occurrence)	All precipitation - 12% of the time				
Relative Humidity, %	58	80	98	-	-
Air Temperature, °C	12.5	16	19.5	16	-
Sea Surface Temperature, °C	14.5	18.5	21.5	-	-
Sea Level Pressure, millibars	1002	1020	1032	-	-
Ice	None				
Refractivity Mean Surface Refractivity Sub-Refraction (1 km, Annual) Super-Refraction or Ducting (1 km, Annual)	- - -	- - -	- - -	248 - -	- 1% 1%

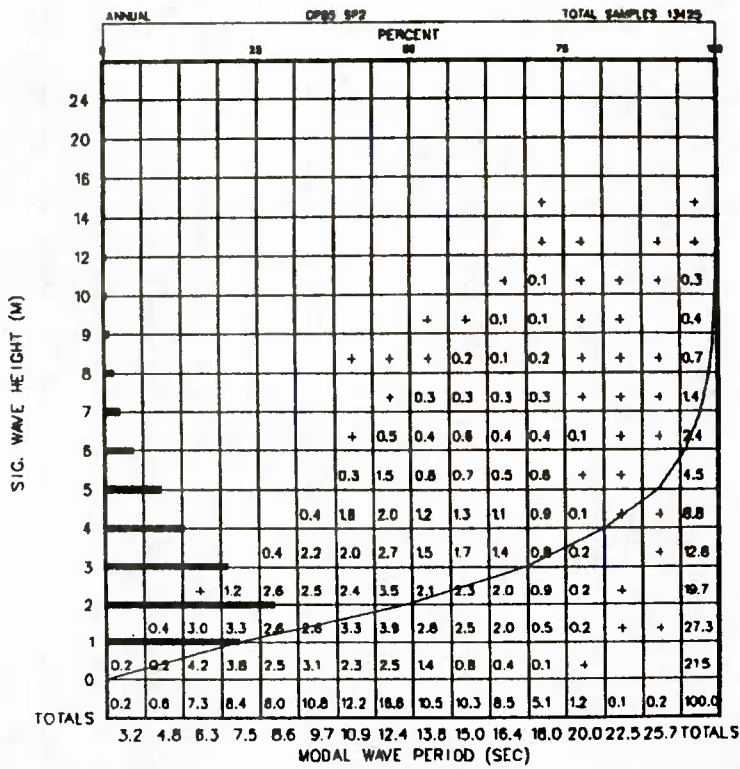


Figure A-085-1-1 Significant Wave Height vs. Modal Wave Period

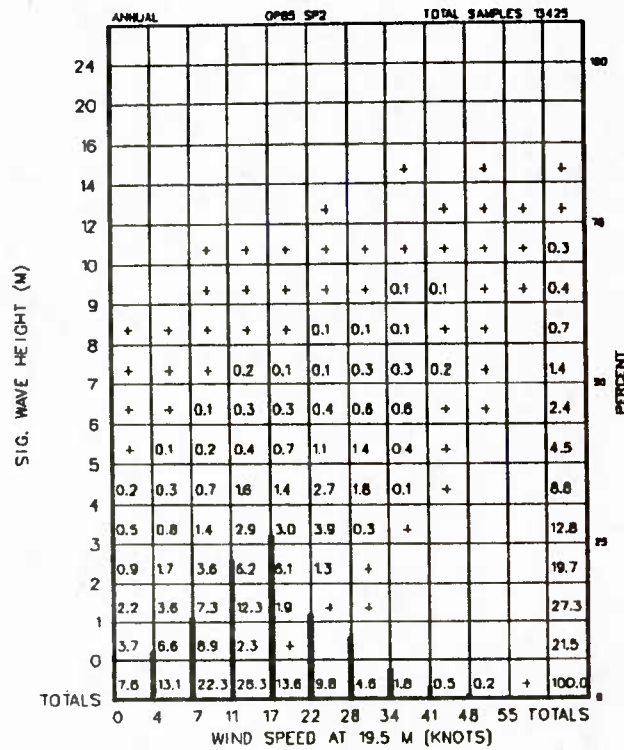


Figure A-085-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

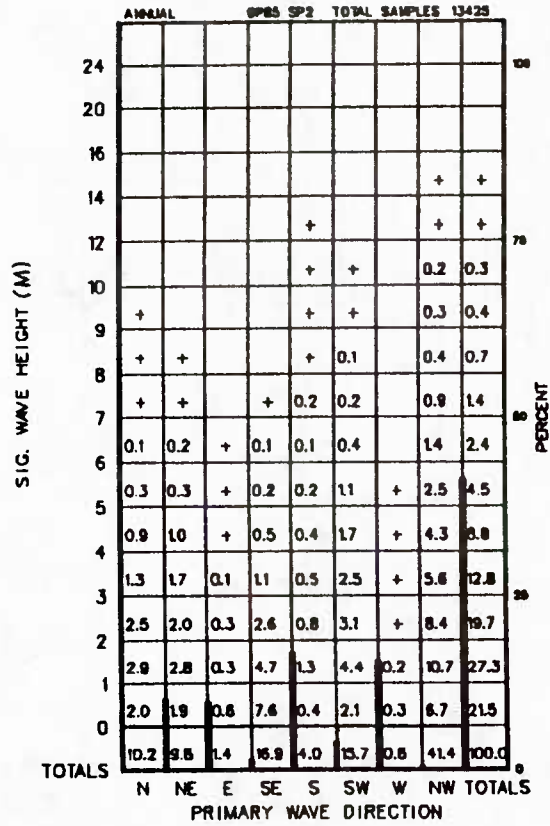


Figure A-085-1-3 Significant Wave Height vs. Primary Wave Direction

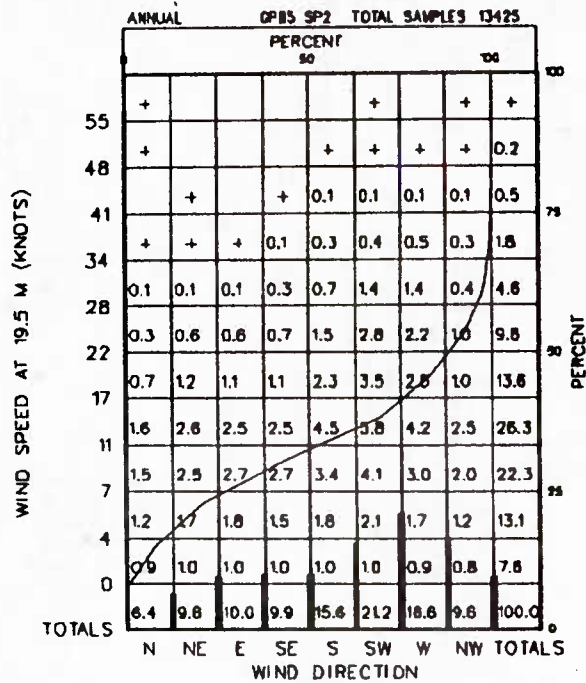


Figure A-085-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

SIG. WAVE HEIGHT (M)	ANNUAL					GPS SP2					TOTAL SAMPLES 13425									
	0	6	10	16	21	27	47	55	63	TOTALS	0	6	10	16	21	27	47	55	63	TOTALS
14.00										+										+
9.00			+	+	+	+	0.5	+	+											0.8
6.00	0.1	0.2	0.6	0.6	0.8	2.1	+													4.5
4.00	0.7	0.9	2.3	2.5	4.5	2.5														13.4
2.50	2.0	3.2	6.0	6.3	4.0	0.1														21.8
1.25	5.3	7.1	14.2	4.3	0.1	+														31.0
.50	6.3	10.5	5.3	+	+															22.1
.10	4.4	2.2	+																	6.7
0.00																				
TOTALS	18.9	24.1	28.4	13.7	9.6	5.2	0.1	+												100.0

Figure A-085-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

SIG. WAVE HEIGHT (M)	ANNUAL					GPS SP2					TOTAL SAMPLES 13425				
	0.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	TOTALS	
24															
20															
18															
14										+				+	
12										+				+	
10										0.2	+	+		0.3	
9										0.3	0.1		+	0.4	
8										+	0.4	0.2	+	0.7	
7										0.3	0.5	0.1	+	1.4	
6										1.4	0.7	0.2	+	2.4	
5										+	3.7	0.8	0.2	4.5	
4										19	5.3	1.1	0.3	8.8	
3										7.2	3.7	1.2	0.5	12.8	
2										18	11.4	4.0	1.7	19.7	
1										12.3	7.9	4.0	2.0	27.3	
0										2.0	6.9	7.1	3.9	21.5	
TOTALS	2.0	21.1	35.4	26.3	10.5	3.6	0.9	0.1	+	+	+	+	+	100.0	

Figure A-085-1-6 Significant Wave Height vs. Zero Crossing Period

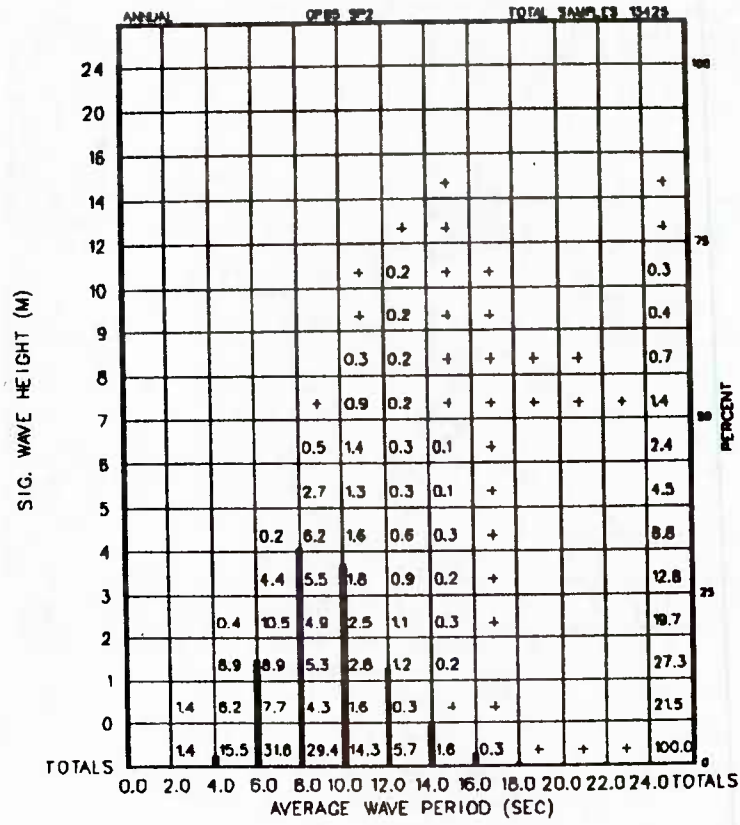


Figure A-085-1-7 Significant Wave Height vs. Average Wave Period

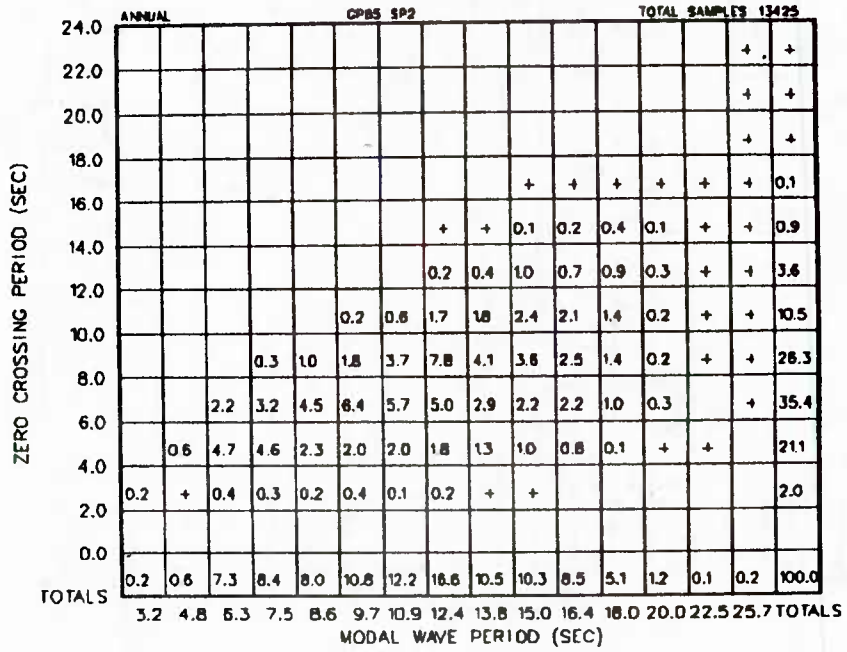


Figure A-085-1-8 Zero Crossing Period vs. Modal Wave Period

AVERAGE WAVE PERIOD (SEC)	ANNUAL GPS SP2 TOTAL SAMPLES 13425																	TOTALS	
	3.2	4.8	6.3	7.5	8.6	9.7	10.9	12.4	13.8	15.0	16.4	18.0	20.0	22.5	25.7	TOTALS			
24.0																	+	+	
22.0																		+	+
20.0																		+	+
18.0																	+	+	+
16.0																	+	+	0.1
14.0																	+	+	1.6
12.0																	+	+	5.7
10.0																	+	+	14.3
8.0																	+	+	29.4
6.0																	+	+	31.6
4.0																	+	+	15.5
2.0																	+	+	1.4
0.0																	+	+	
TOTALS	0.2	0.6	7.3	8.4	8.0	10.8	12.2	16.6	10.5	10.3	8.5	5.1	1.2	0.1	0.2	100.0			

Figure A-085-1-9 Average Wave Period vs. Modal Wave Period

SIG. WAVE HEIGHT (M)	ANNUAL GPS SP2 TOTAL SAMPLES 13425																	TOTALS					
	0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96		102	108	114	120	TOTALS
24																							1
20																							6
16																							20
14		1																					36
12	3	1	2																				69
10	10	5	3	2																			127
9	25	13		1																			185
8	53	9	5	2																			312
7	92	20	10	2	2	1																	542
6	118	30	21	9	4	1				1	1												730
5	169	67	40	19	8	3	1	3	1	1												889	
4	280	133	70	32	18	13	3	4	2	1	3	1			1			1				1280	
3	327	158	109	52	36	21	11	9	6		2	1										1889	
2	307	199	130	85	51	33	28	17	12	11	4	4	3	1	2	1	1					2689	
1	210	148	130	115	73	81	42	26	16	20	14	5	2	4	4	1	1	2			5	8	3889
0	87	62	58	38	31	24	20	15	13	14	10	9	4	5	7	7	1	3	4	1	28	451	
TOTALS	1661	844	578	357	221	157	116	77	52	48	34	20	9	11	13	10	3	5	4	8	36	1280	

Figure A-085-1-10 Persistence of Wave Height

WIND SPEED AT 19.5 M (KNOTS)	ANNUAL																	CP85 SP2																	TOTAL SAMPLES 13425																	PERCENT
	0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	TOTALS																														
55	3	2																						5																												
48	19	4	1																					24																												
41	41	11	3																					55																												
34	118	27	13	4	1	1																		184																												
28	225	97	30	15	7		2																	378																												
22	399	189	90	29	18	8	4	1	1	1														720																												
17	609	239	115	41	19	10	5	2	2	1														1043																												
11	745	371	188	118	56	47	17	13	10	8	2	2	1		2	1	1							1580																												
7	809	349	185	85	44	25	19	8	1	2		1	2									1		1511																												
4	647	232	98	40	20	8	1		1	2	1													1050																												
0	375	131	46	24	9	15	7		2	2	1			1										548																												
TOTALS	1930	832	727	358	174	114	50	24	17	15	5	3	4		2	1	1					1		7058																												

Figure A-085-1-11 Persistence of Wind Speed at 19.5 M (Knots)

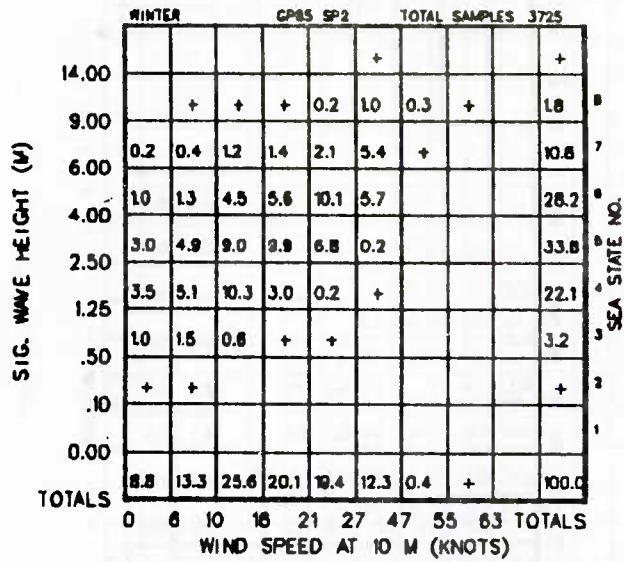


Figure A-085-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

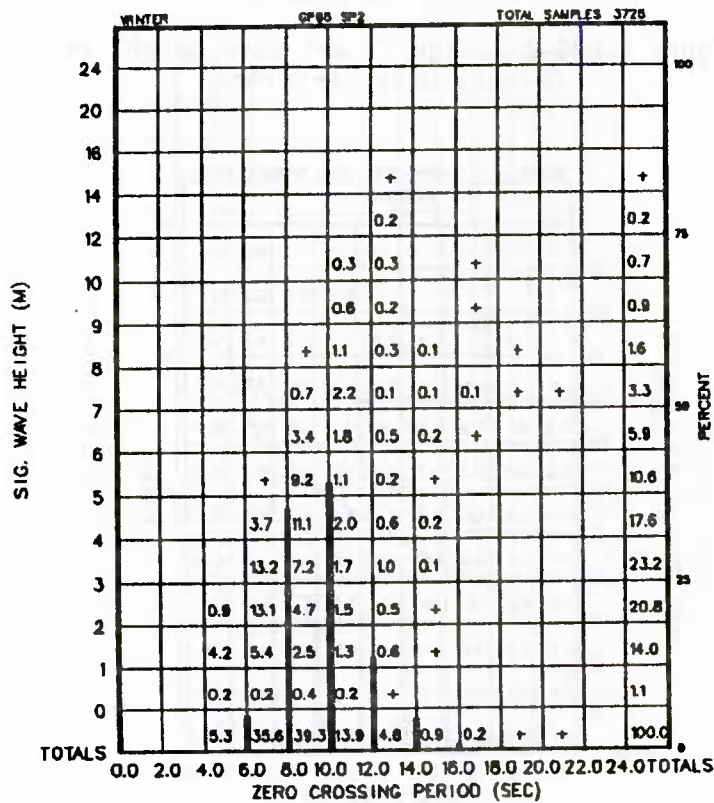


Figure A-085-2-6 Significant Wave Height vs. Zero Crossing Period

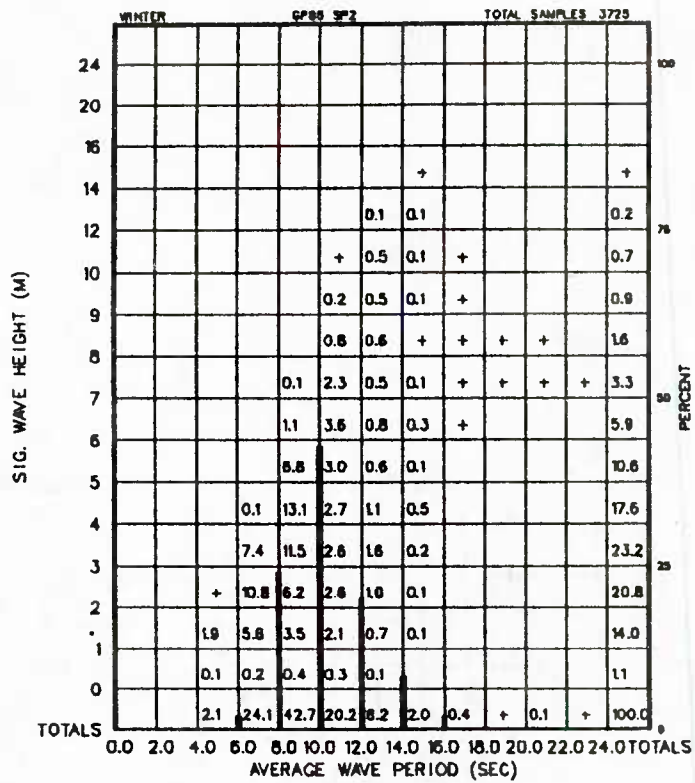


Figure A-085-2-7 Significant Wave Height vs. Average Wave Period

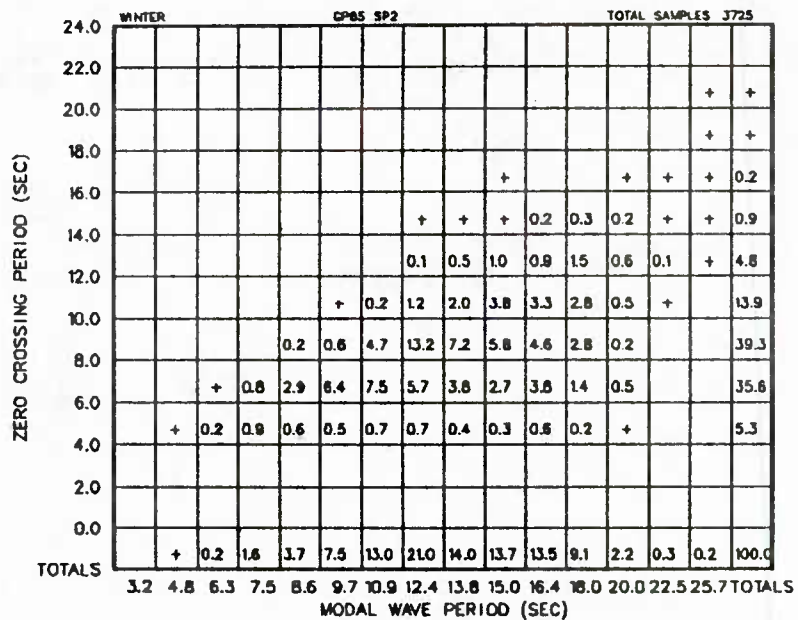


Figure A-085-2-8 Zero Crossing Period vs. Modal Wave Period

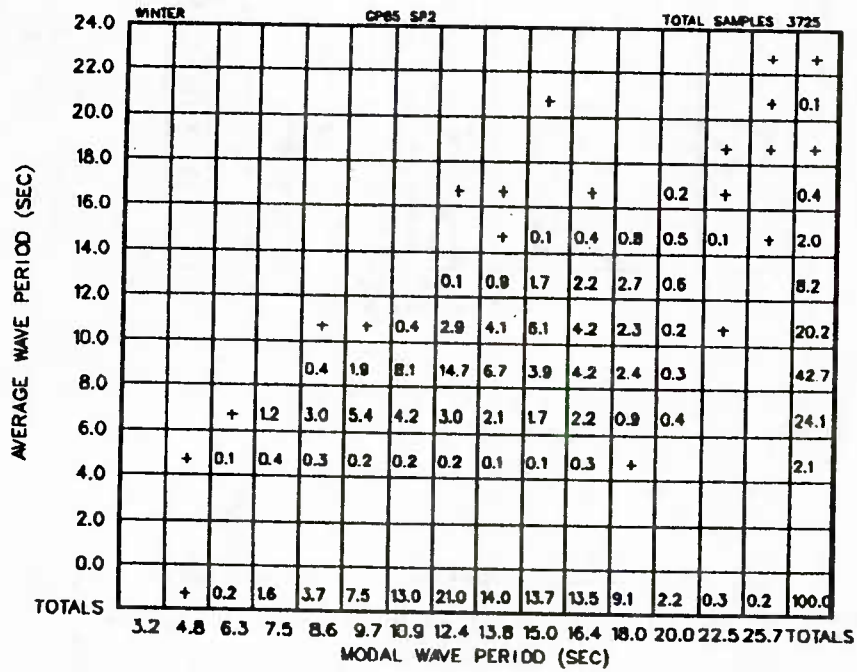


Figure A-085-2-9 Average Wave Period vs. Modal Wave Period

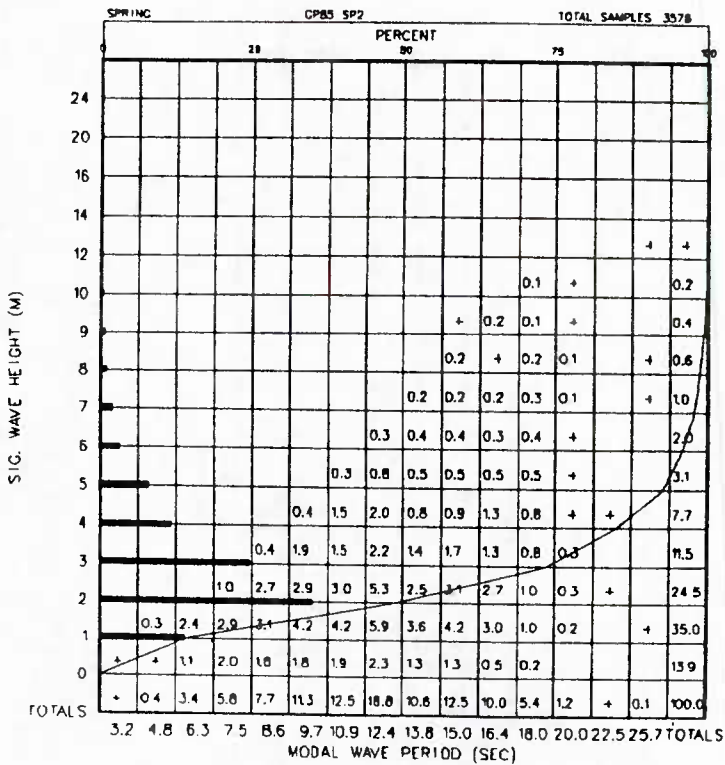


Figure A-085-3-1 Significant Wave Height vs. Modal Wave Period

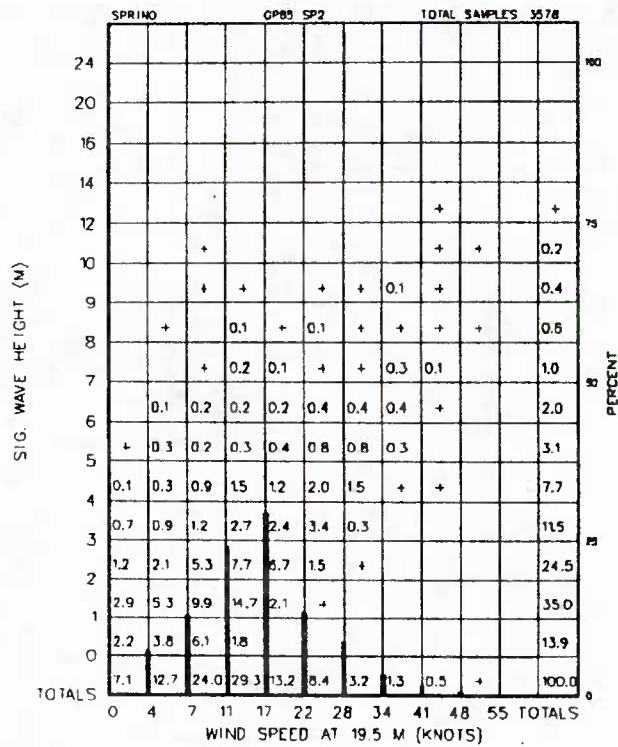


Figure A-085-3-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

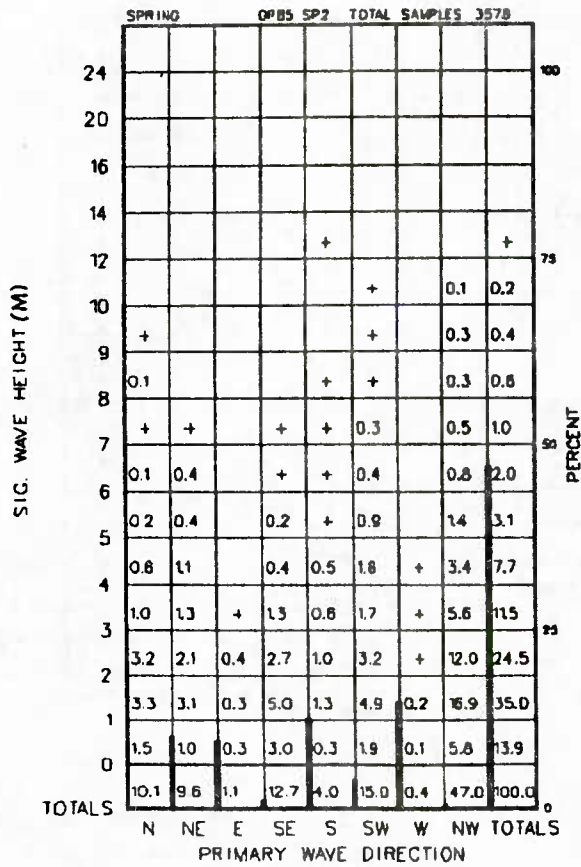


Figure A-085-3-3 Significant Wave Height vs. Primary Wave Direction

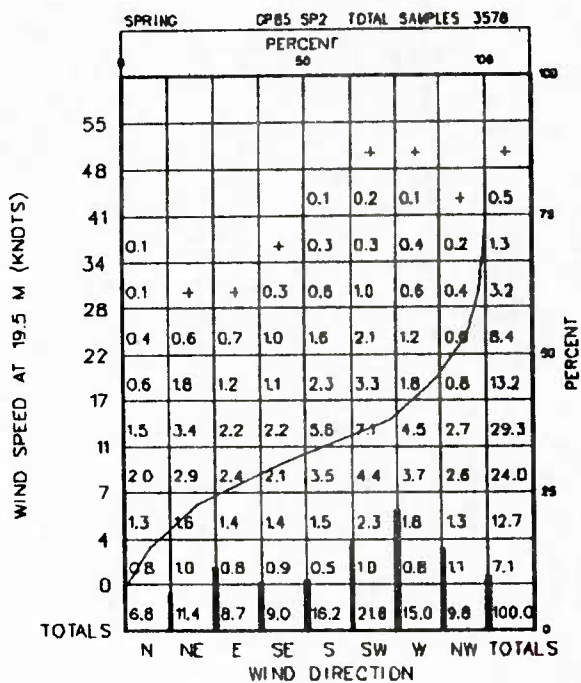


Figure A-085-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

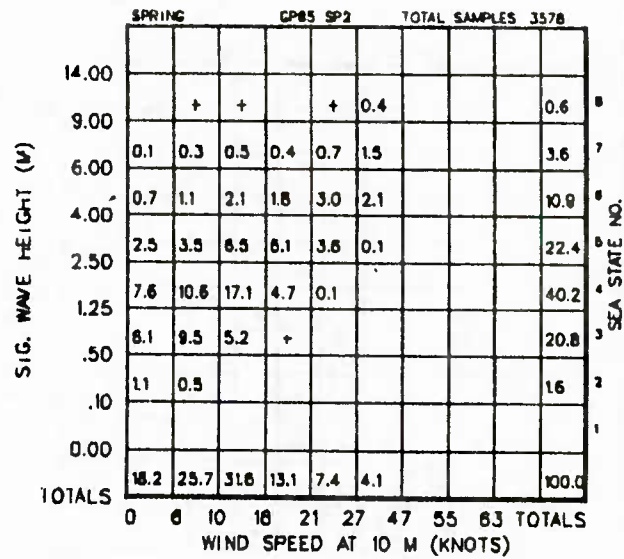


Figure A-085-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

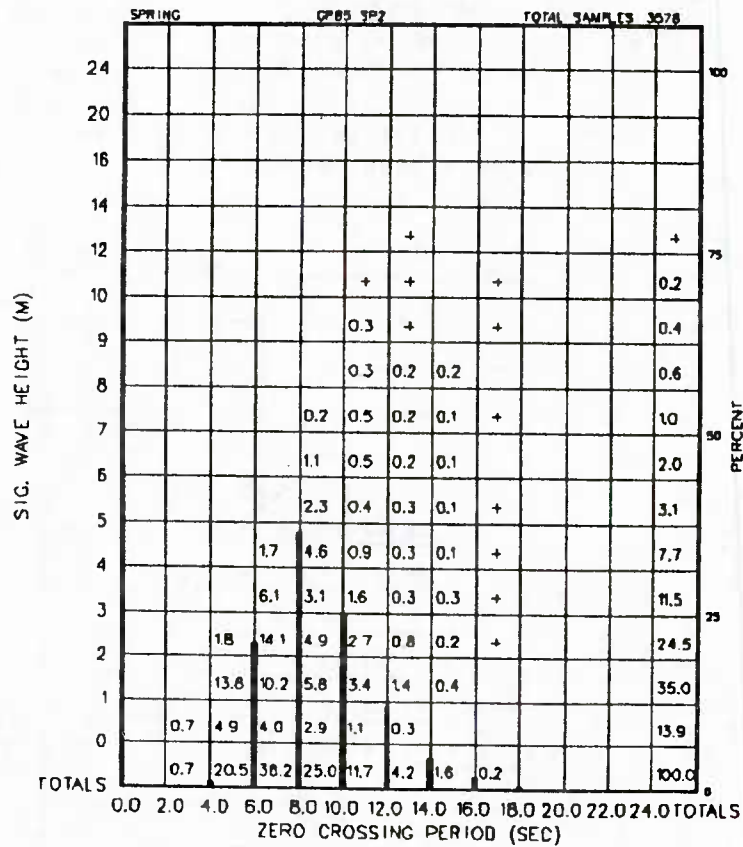


Figure A-085-3-6 Significant Wave Height vs. Zero Crossing Period

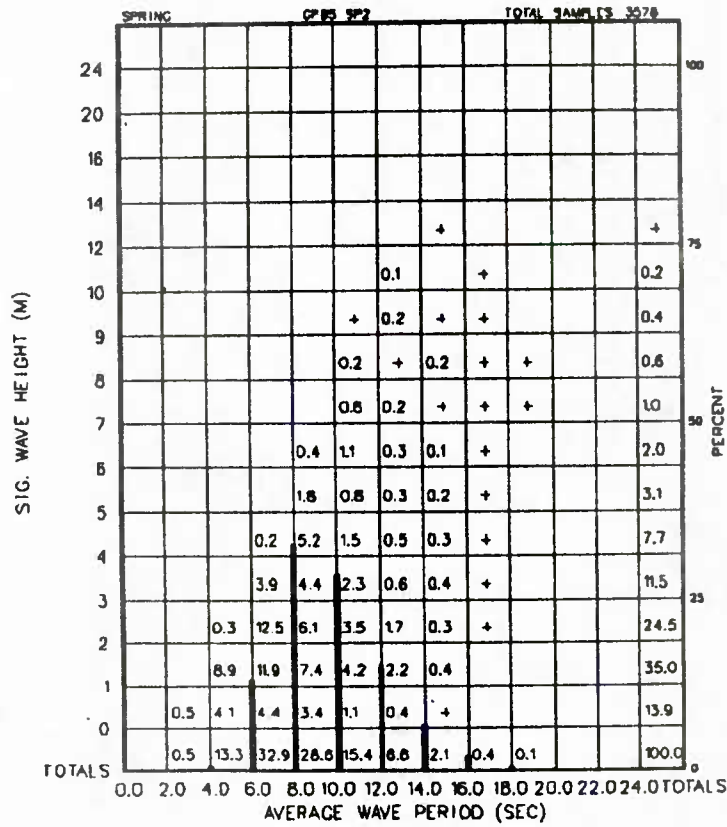


Figure A-085-3-7 Significant Wave Height vs. Average Wave Period

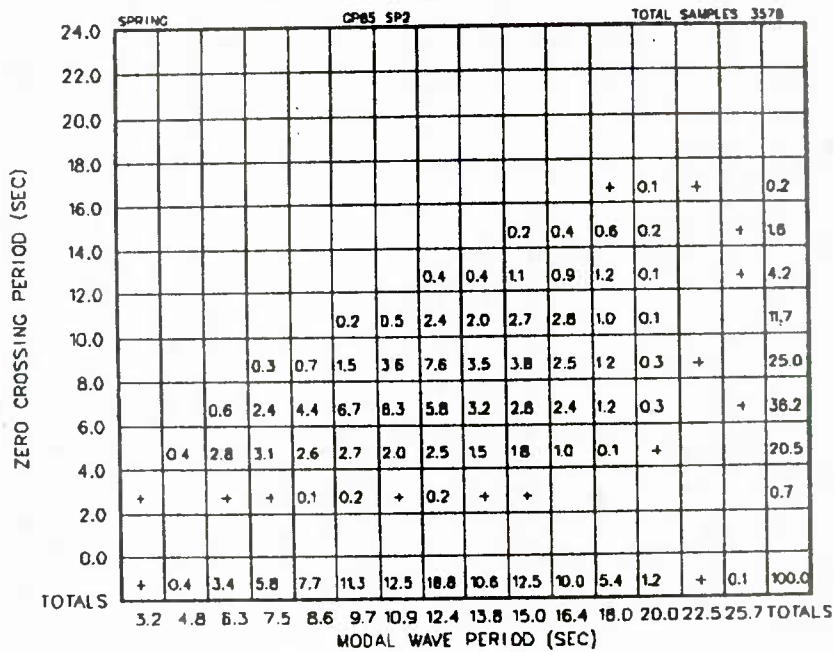


Figure A-085-3-8 Zero Crossing Period vs. Modal Wave Period

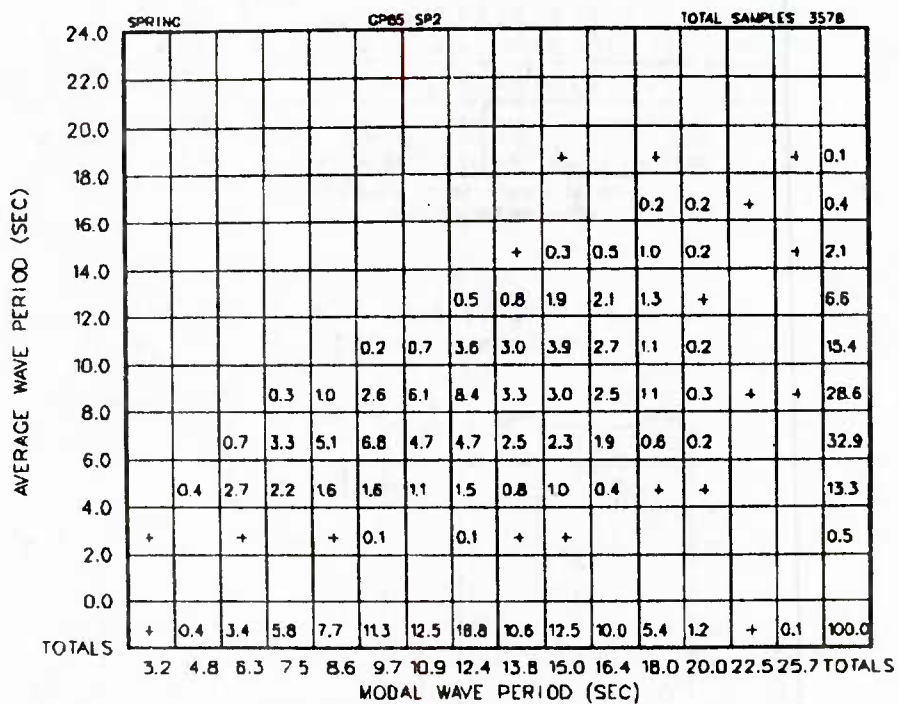


Figure A-085-3-9 Average Wave Period vs. Modal Wave Period

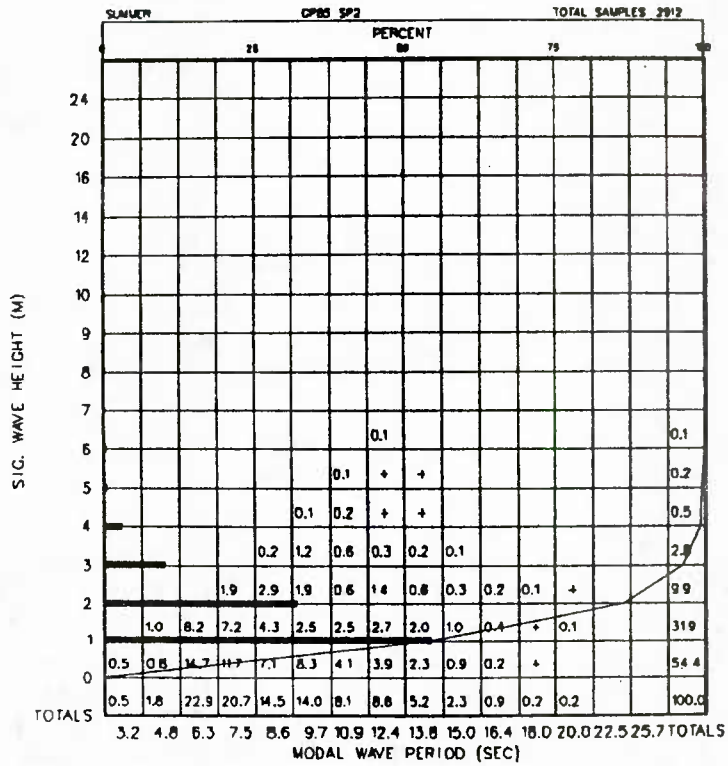


Figure A-085-4-1 Significant Wave Height vs. Modal Wave Period

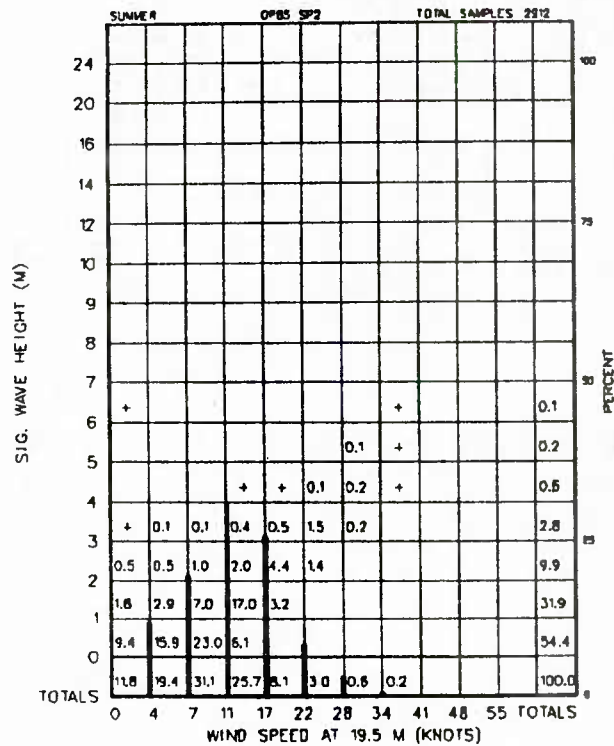


Figure A-085-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

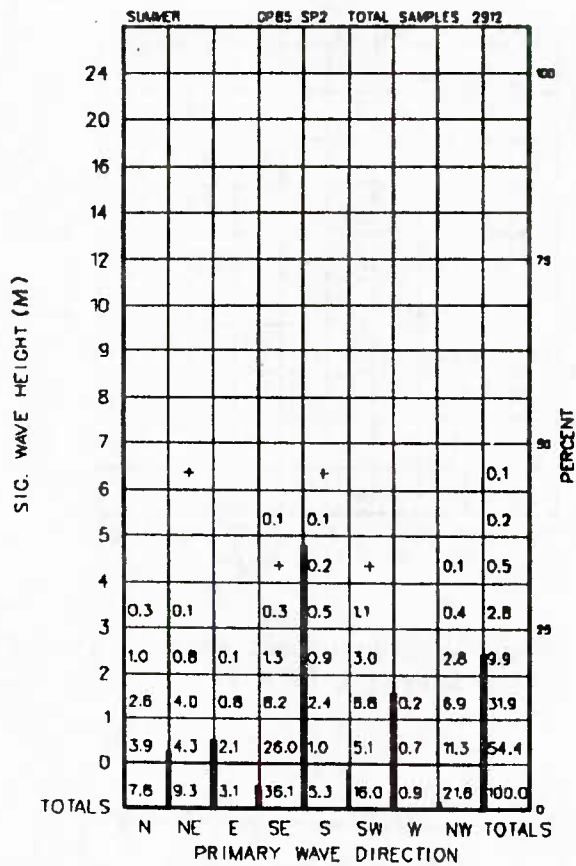


Figure A-085-4-3 Significant Wave Height vs. Primary Wave Direction

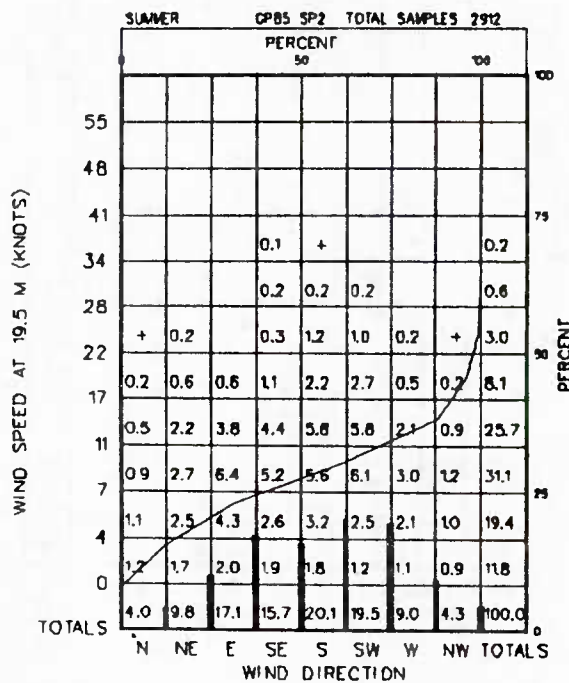


Figure A-085-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

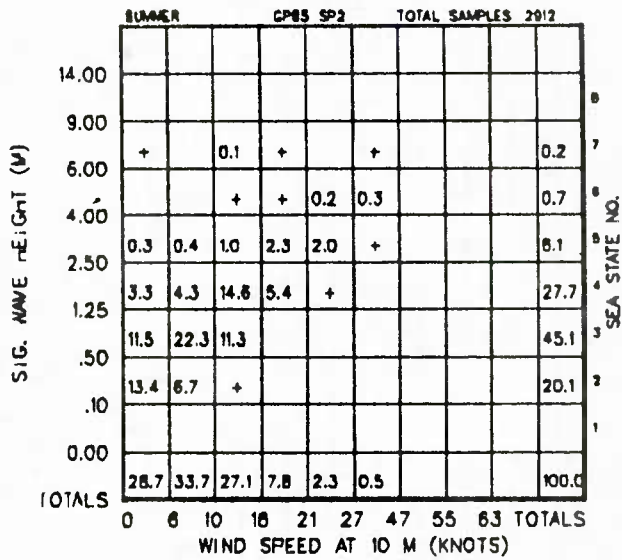


Figure A-085-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

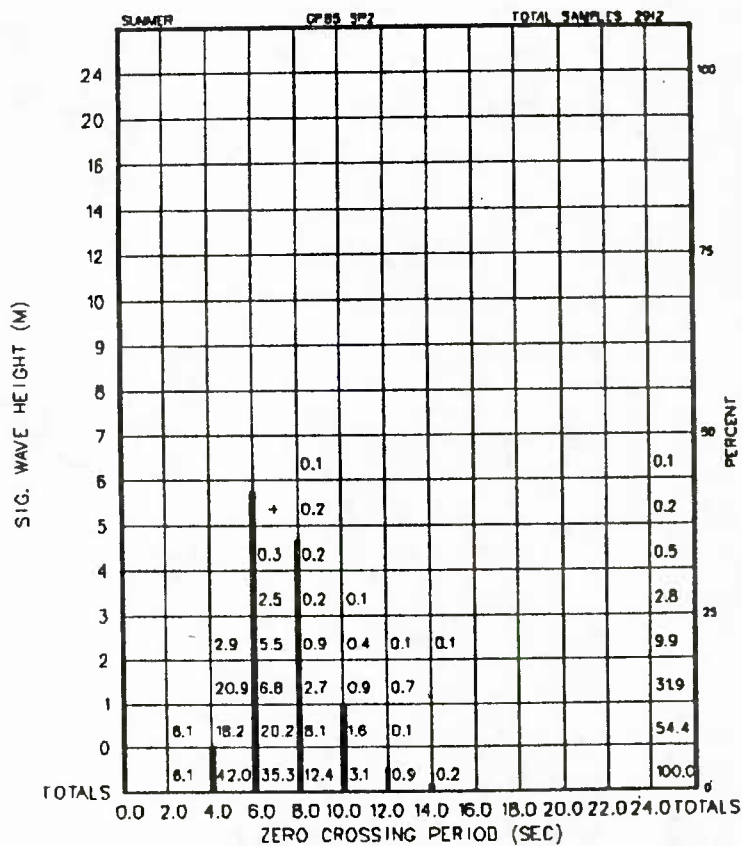


Figure A-085-4-6 Significant Wave Height vs. Zero Crossing Period

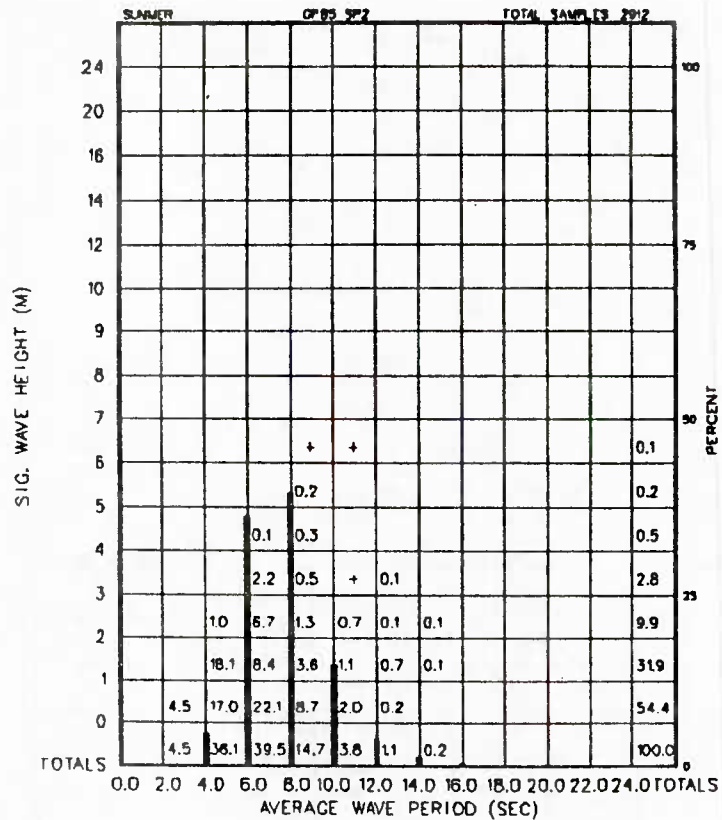


Figure A-085-4-7 Significant Wave Height vs. Average Wave Period

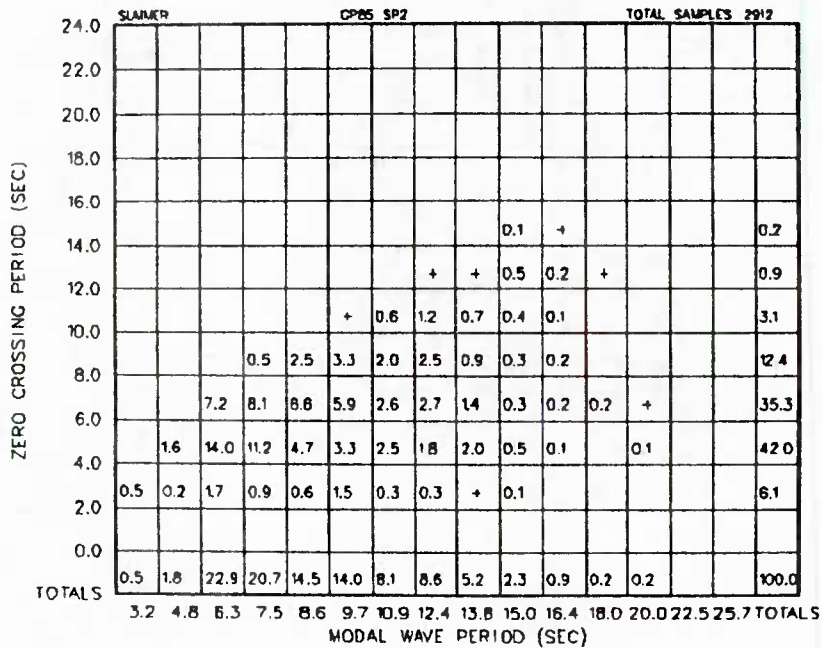


Figure A-085-4-8 Zero Crossing Period vs. Modal Wave Period

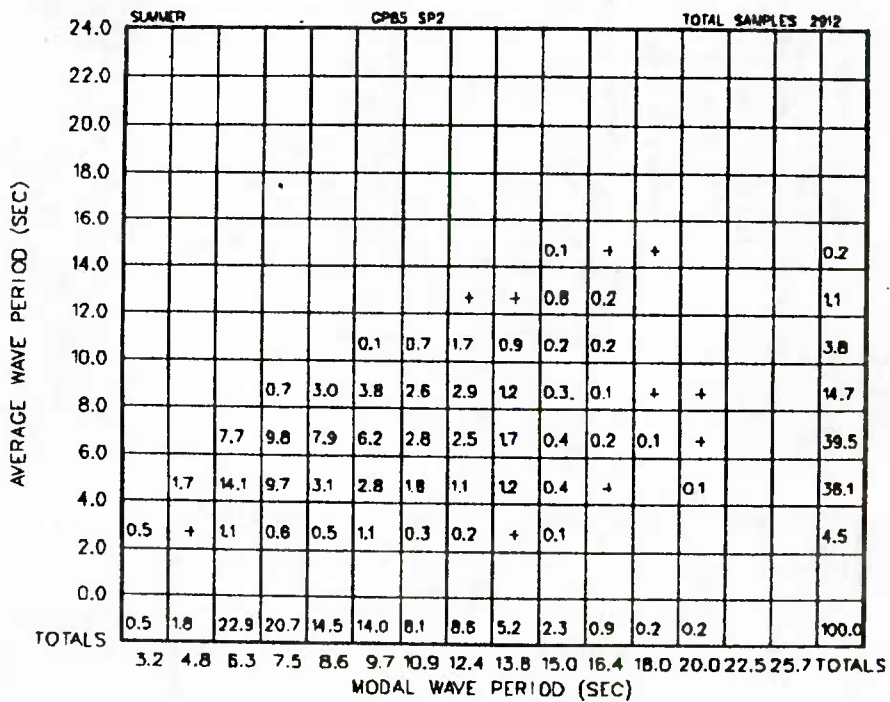


Figure A-085-4-9 Average Wave Period vs. Modal Wave Period

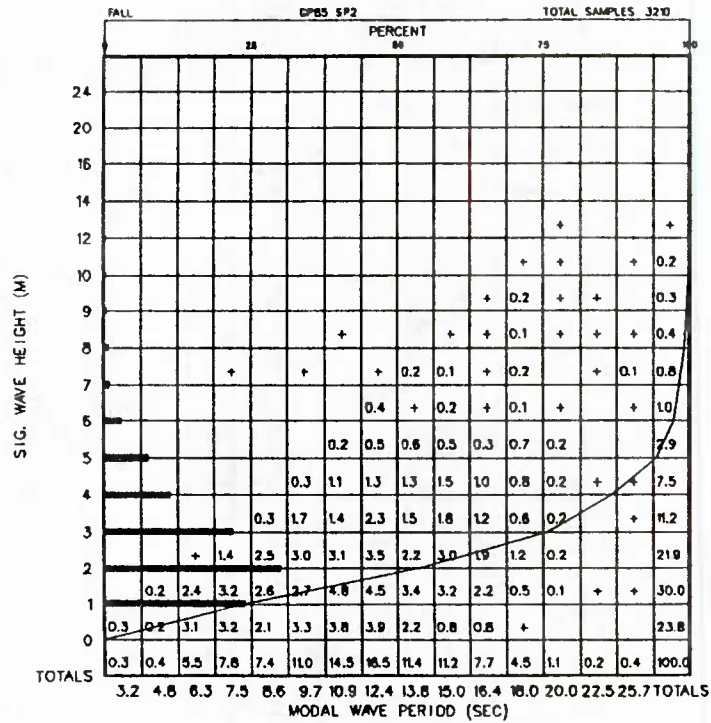


Figure A-085-5-1 Significant Wave Height vs. Modal Wave Period

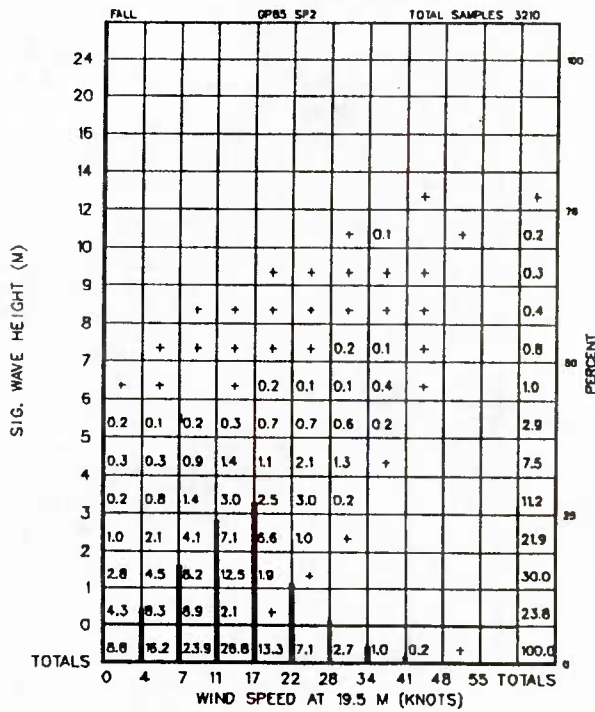


Figure A-085-5-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

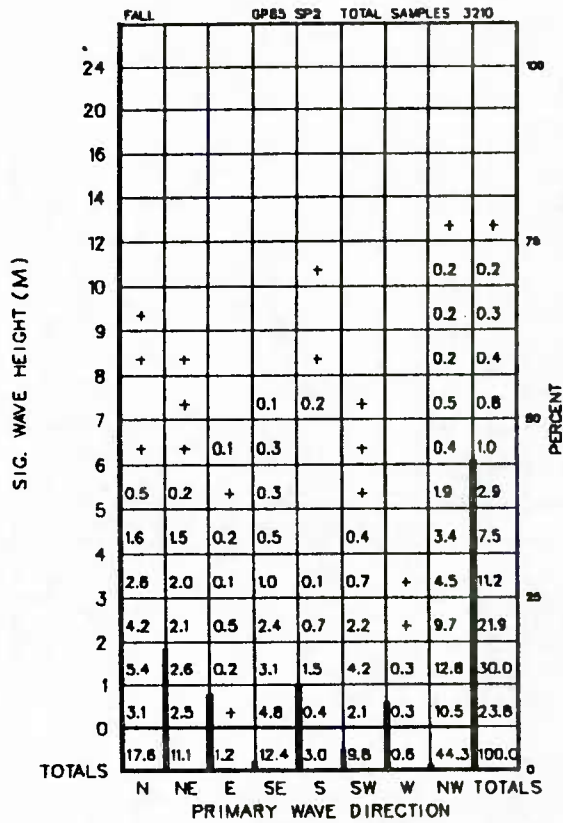


Figure A-085-5-3 Significant Wave Height vs. Primary Wave Direction

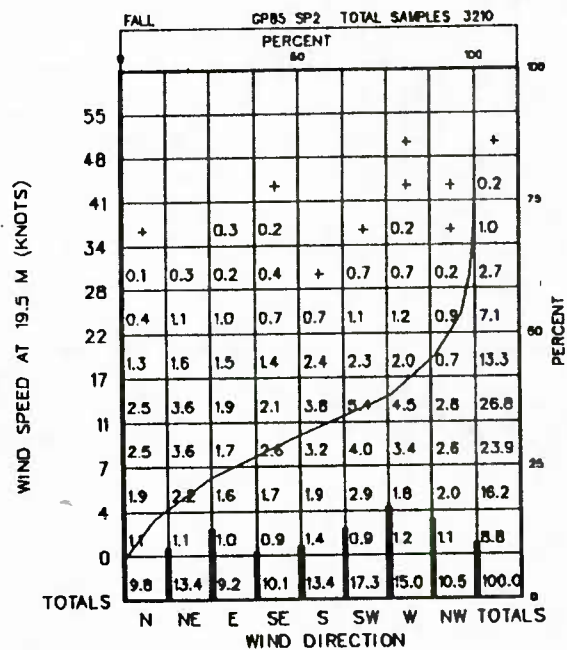


Figure A-085-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

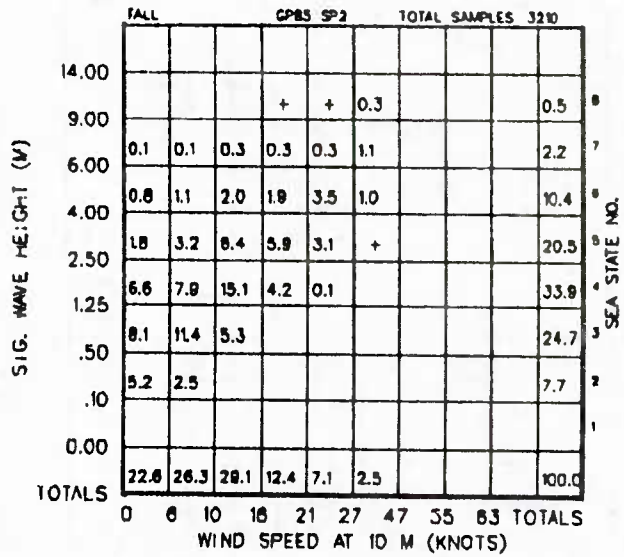


Figure A-085-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

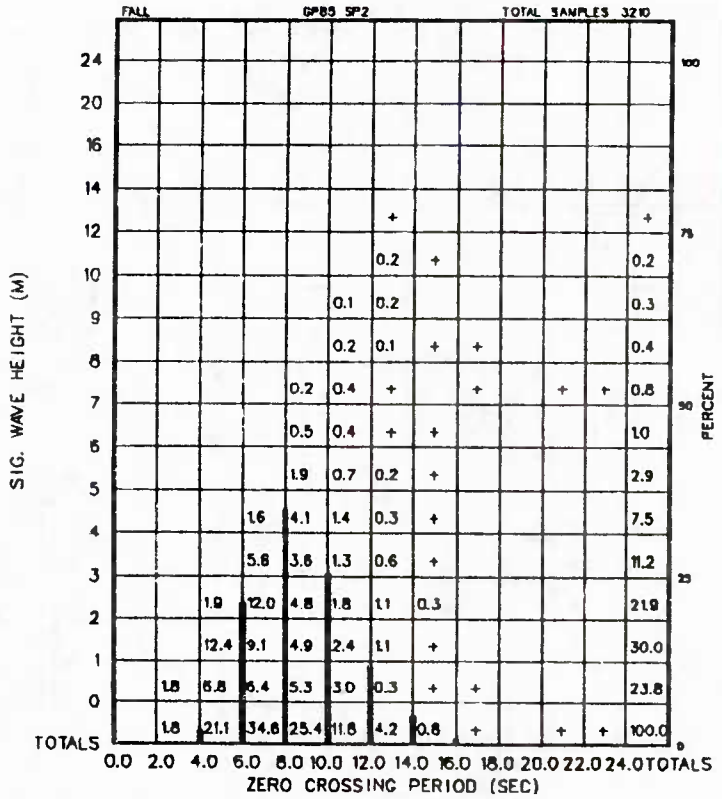


Figure A-085-5-6 Significant Wave Height vs. Zero Crossing Period

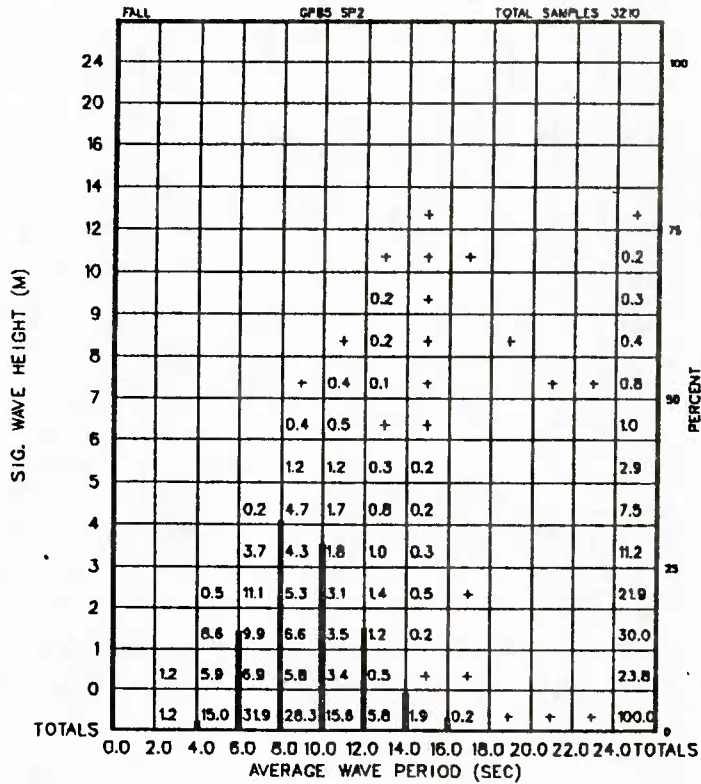


Figure A-085-5-7 Significant Wave Height vs. Average Wave Period

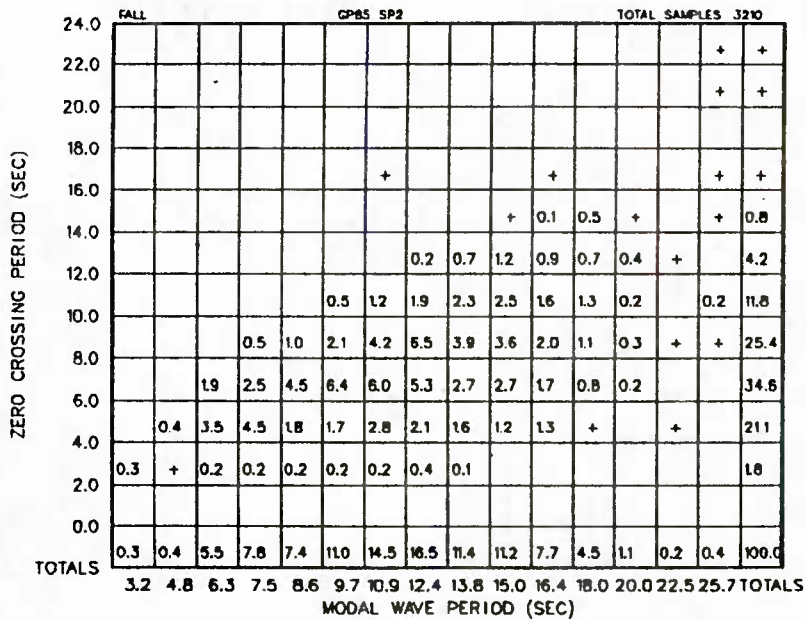


Figure A-085-5-8 Zero Crossing Period vs. Modal Wave Period

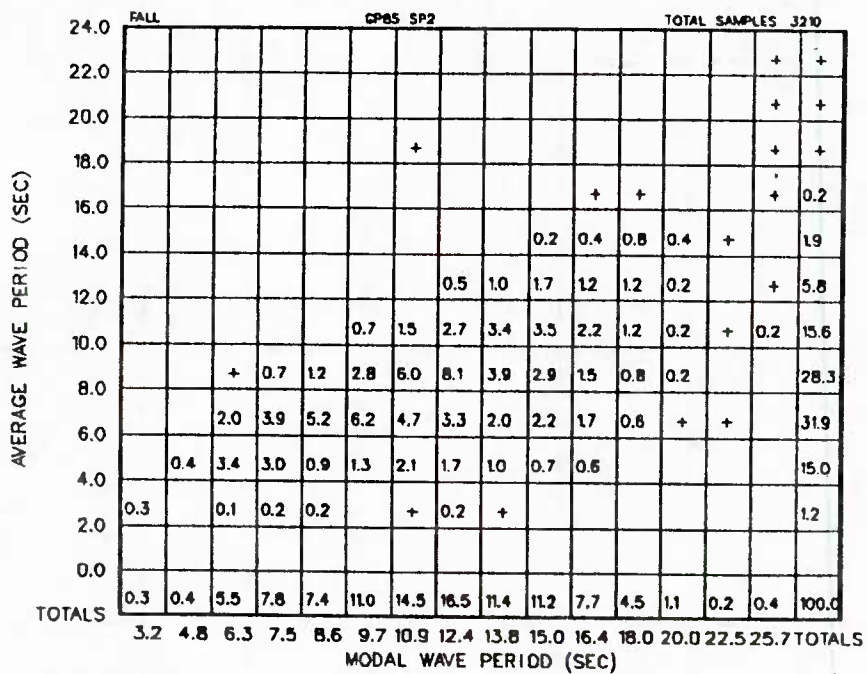


Figure A-085-5-9 Average Wave Period vs. Modal Wave Period

TABLE A-2/093-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

Natural Environment		SEASON: ANNUAL; LOCATION: 42-81°N, 159-01°E				Mean	Most Probable
		Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)			
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction		0.5	3	8	3.5	1.5	
		6.5	11.5	16.5	11.5	12.4	
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction		5	16.5	40	18.5	14	
		0.75	2.5	7	3	2	W-NW
Visibility, nautical miles		0.5	7	25	-	-	
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured		0	7.5	8	-	-	
		0	7	8	-	-	
Precipitation (Occurrence)		All precipitation - 23% of the time		Snow - 22% of the time (Dec-Mar)			
Relative Humidity, %		72	90	98	-	-	
Air Temperature, °C		1	3	6	3.5	-	
Sea Surface Temperature, °C		3.5	6	12	-	-	
Sea Level Pressure, millibars		982	1008	1025	-	-	
Ice		Moderate* superstructure icing - 1% of the time (Dec-Mar)					
Refractivity Mean Surface Refractivity Sub-Refracton (1 km, Annual) Super-Refracton or Ducting (1 km, Annual)		-	-	-	352	-	
		-	-	-	-	1%	
		-	-	-	-	2%	

*Buildup of less than 1/10 in. per hour (derived from observations with temperature < -2.2°C and wind speed > 13 knots).

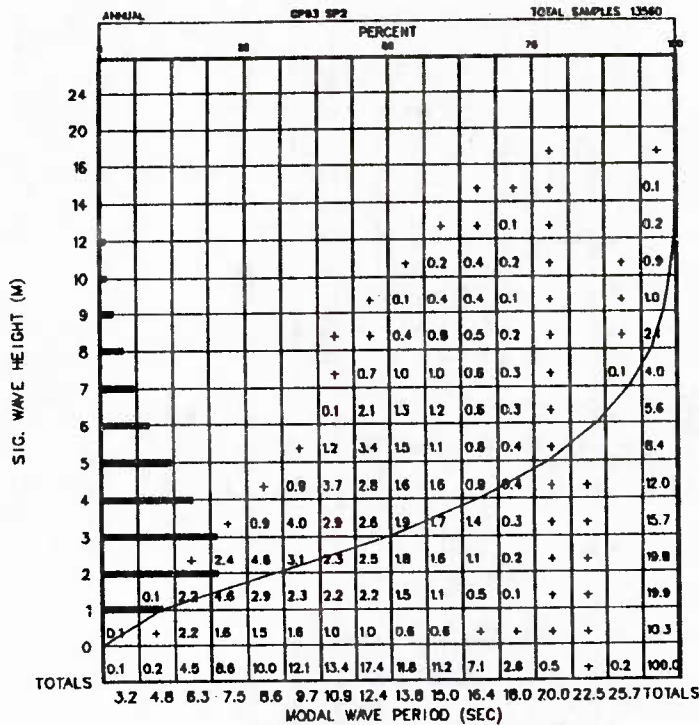


Figure A-2/093-1-1 Significant Wave Height vs. Modal Wave Period

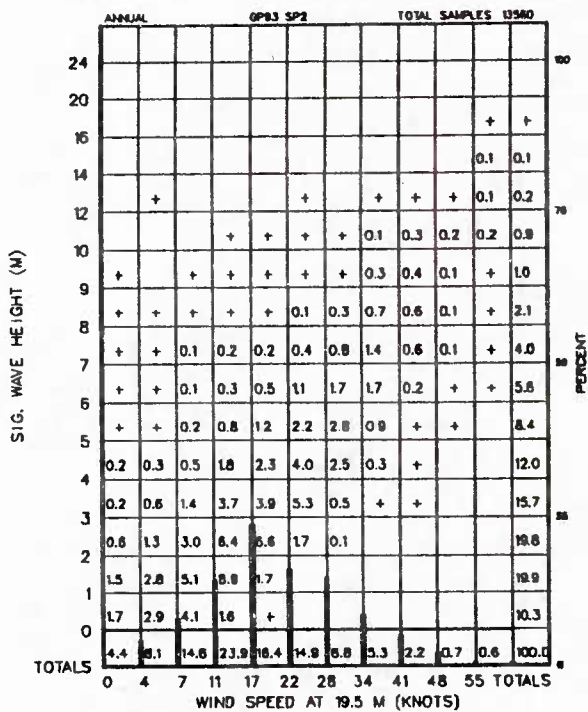


Figure A-2/093-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

SIG. WAVE HEIGHT (M)	ANNUAL		GP93 SP2		TOTAL SAMPLES		13560		PERCENT
	N	NE	E	SE	S	SW	W	NW	
24									
20									
16								+	+
14		+	+					+	+
12		+	+	+	+		+	+	0.2
10		+	+	0.1	+	0.1	+	0.2	0.2
9		+	+	+	+	0.1	+	0.3	0.2
8		+	0.2	0.2	+	0.3	+	0.5	0.4
7	0.1	0.5	0.3	+	0.8	0.2	0.9	0.5	4.0
6	0.2	0.8	0.6	0.2	0.9	0.4	1.2	0.7	5.8
5	0.2	1.1	0.7	0.4	1.2	0.8	1.5	1.1	8.4
4	0.4	1.6	0.9	0.6	1.9	0.9	2.1	1.5	12.0
3	0.5	1.8	1.6	0.7	2.2	1.8	2.7	1.9	15.7
2	0.8	2.2	2.4	1.0	2.8	2.5	3.3	2.0	19.8
1	1.0	1.9	2.1	1.5	3.4	3.2	2.7	1.5	18.9
0	0.8	0.8	1.5	1.1	1.7	1.4	1.1	0.8	10.3
TOTALS	4.1	11.2	10.4	5.7	15.5	11.3	18.8	10.8	100.0
	PRIMARY WAVE DIRECTION								

Figure A-2/093-1-3 Significant Wave Height vs. Primary Wave Direction

WIND SPEED AT 19.5 M (KNOTS)	ANNUAL		GP93 SP2		TOTAL SAMPLES		13560		PERCENT
	N	NE	E	SE	S	SW	W	NW	
55								+	0.3
48								+	0.1
41								+	0.3
34								+	0.7
28								+	2.2
22	0.2	0.1	0.2	0.5	0.8	0.5	1.4	1.5	5.3
17	0.4	0.2	0.4	1.1	1.1	0.8	2.2	2.4	8.8
11	0.9	0.5	0.7	1.5	1.7	2.1	3.8	3.7	14.9
7	1.1	0.8	0.8	1.7	2.1	2.9	3.4	3.3	16.4
4	1.9	1.5	1.9	2.4	3.1	3.7	4.8	4.0	23.9
0	1.2	1.2	1.3	1.6	1.9	2.4	2.5	2.1	14.6
	0.7	0.8	0.8	0.9	1.1	1.2	1.2	1.1	8.1
	0.6	0.5	0.5	0.5	0.6	0.6	0.6	0.5	4.4
TOTALS	6.9	5.8	7.0	10.7	13.1	14.3	20.2	19.8	100.0
	WIND DIRECTION								

Figure A-2/093-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

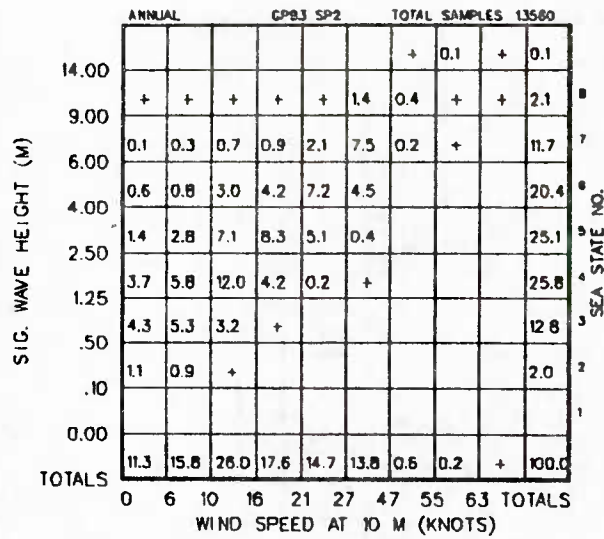


Figure A-2/093-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

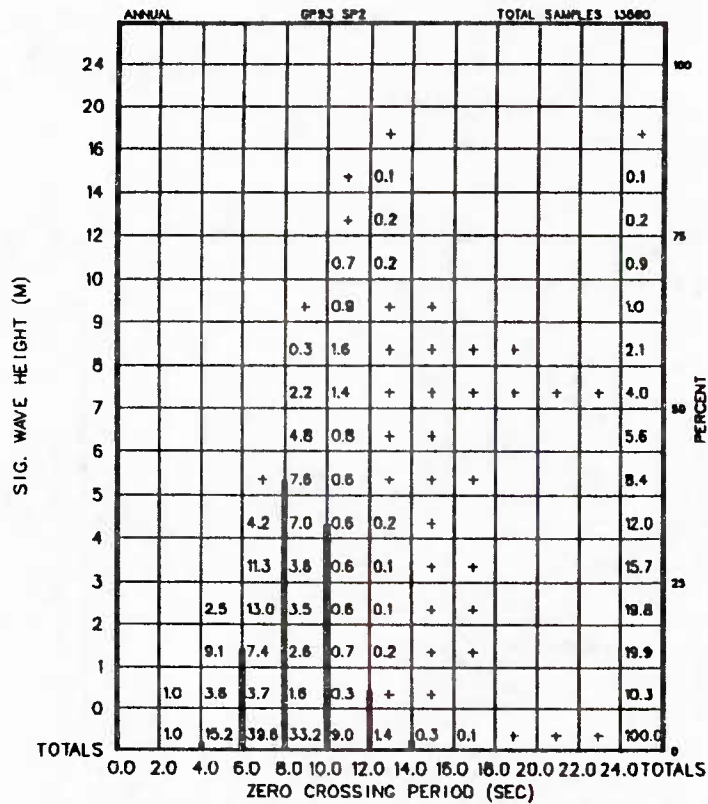


Figure A-2/093-1-6 Significant Wave Height vs. Zero Crossing Period

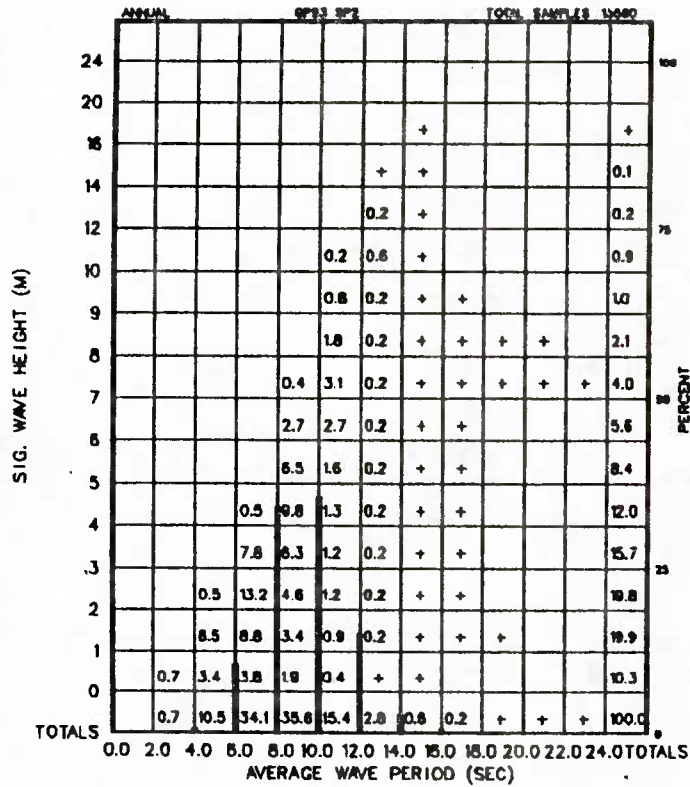


Figure A-2/093-1-7 Significant Wave Height vs. Average Wave Period

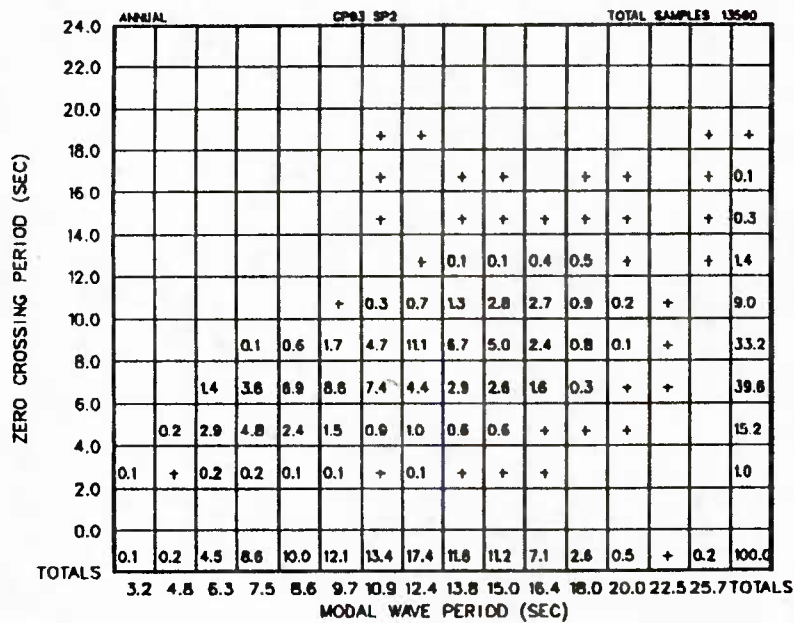


Figure A-2/093-1-8 Zero Crossing Period vs. Modal Wave Period

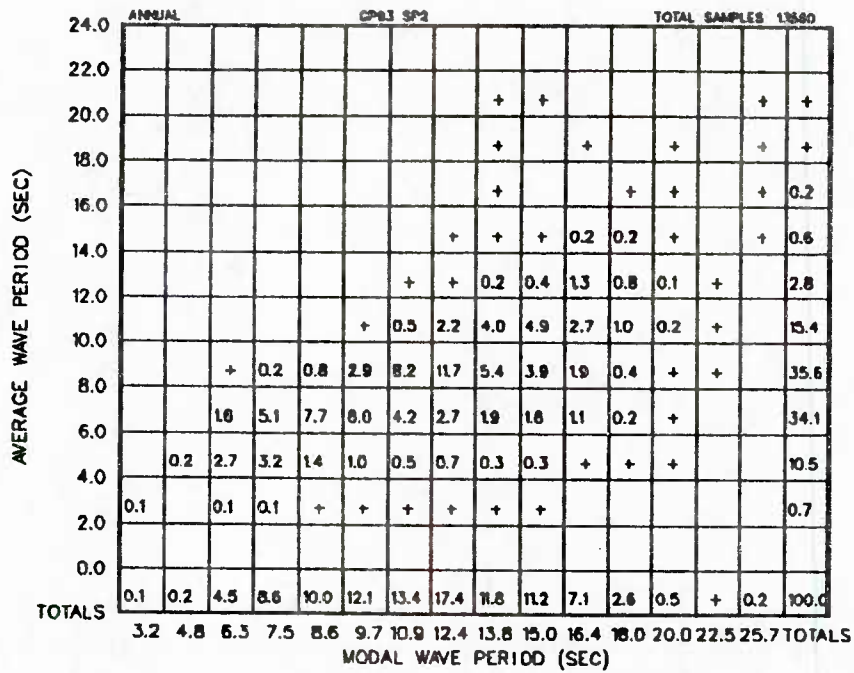


Figure A-2/093-1-9 Average Wave Period vs. Modal Wave Period

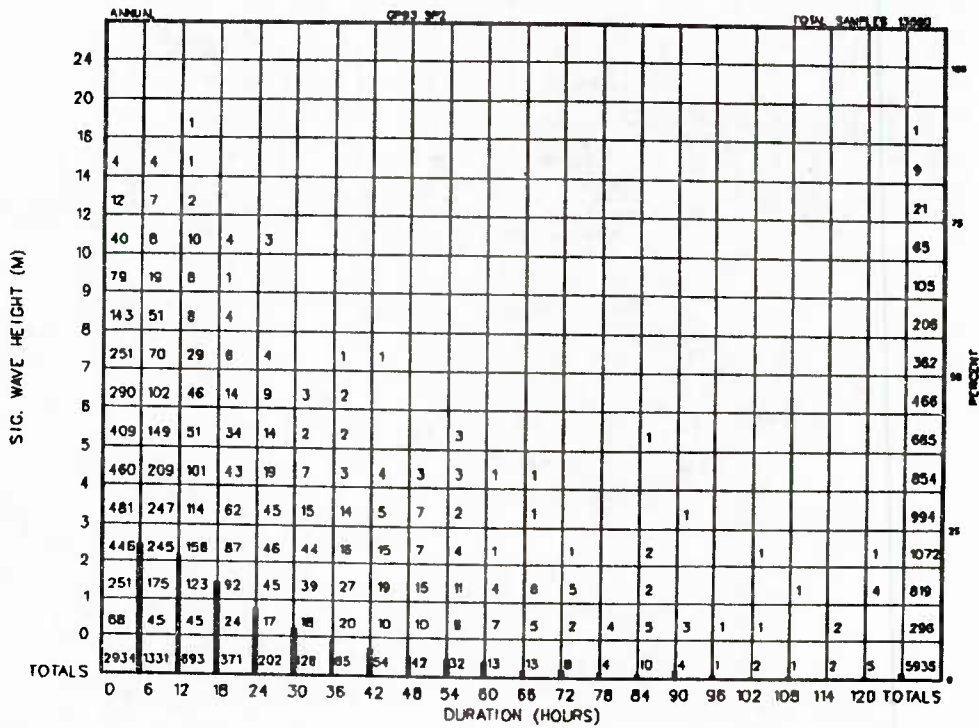


Figure A-2/093-1-10 Persistence of Wave Height

ANNUAL		093 SP2												TOTAL SAMPLES (3269)											
		0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	TOTALS	PERCENT	
55	24	4	8	2	1																		40		
48	66	16	1																					83	
41	126	63	9	2	3																			205	
34	297	121	39	13	2				1															473	
28	550	163	53	23	3	5	1			1														799	
22	810	282	85	42	19	8	2	1	1	1	1	1												1261	
17	1005	280	103	45	17	8	4	1	1	1														1483	
11	1036	400	171	87	36	28	9	8	1	1	1	2												1782	
7	845	243	91	37	21	8	4	1	1	2	1													1254	
4	510	150	45	12	11	1	1	1	1															735	
0	263	73	27	10	3	3	3	2																384	
TOTALS	5534	1795	642	273	121	57	28	14	8	4	3	3		1										8470	

Figure A-2/093-1-11 Persistence of Wind Speed at 19.5 M (Knots)

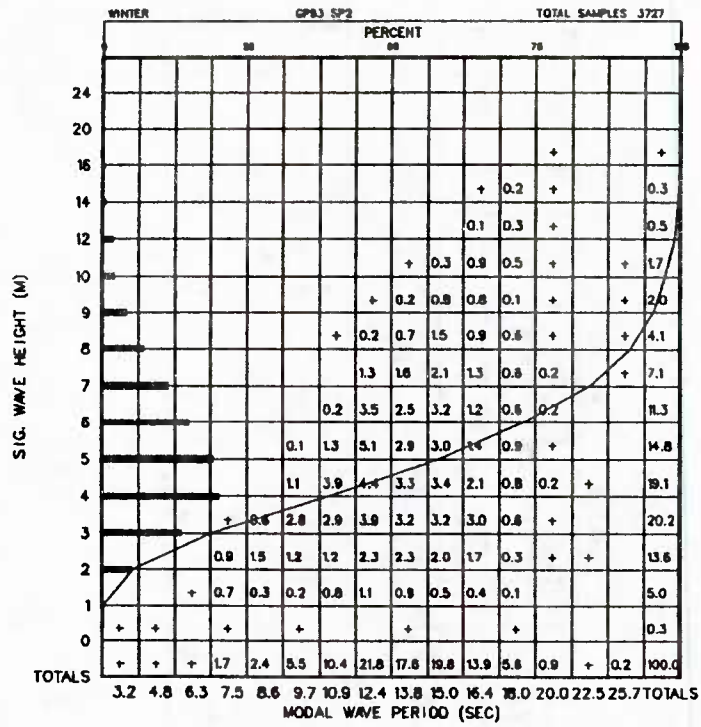


Figure A-2/093-2-1 Significant Wave Height vs. Modal Wave Period

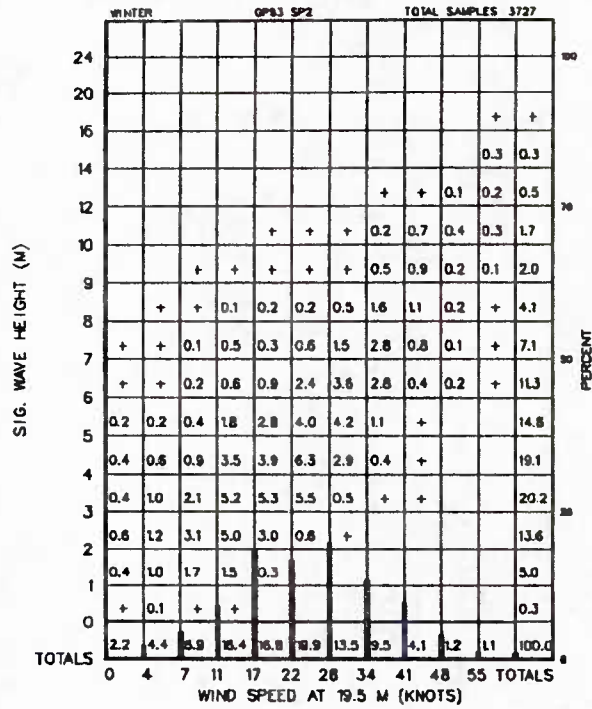


Figure A-2/093-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

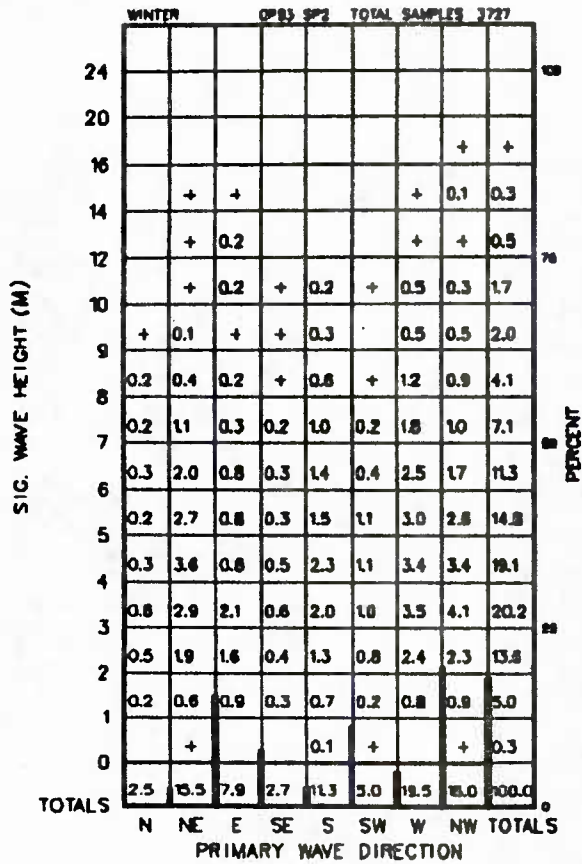


Figure A-2/093-2-3 Significant Wave Height vs. Primary Wave Direction

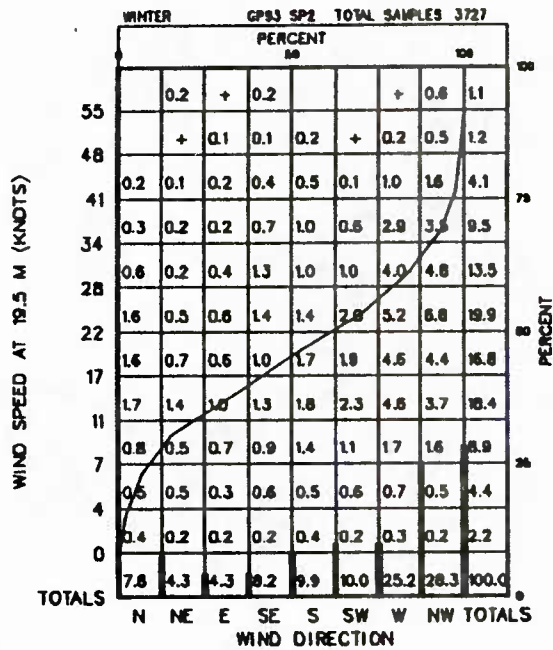


Figure A-2/093-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

		WINTER					CP83 SP2					TOTAL SAMPLES 3727															
14.00																											
	+	+	+	+	0.1	2.9	0.7	0.1	+	4.2																	
9.00		0.2	0.5	1.4	1.5	4.3	14.3	0.3	+	22.5																	
6.00		1.4	1.4	6.0	7.9	11.4	5.7			33.9																	
4.00		1.9	4.2	8.8	7.8	4.9	0.4			26.0																	
2.50		1.9	3.3	4.0	1.0	+				10.4																	
1.25		0.3	0.2	0.2						0.7																	
.50																											
.10																											
0.00																											
TOTALS		9.8	9.7	20.8	18.3	20.7	23.3	1.0	0.4	0.1	100.0																
		0	6	10	16	21	27	47	55	63	TOTALS																
		WIND SPEED AT 10 M (KNOTS)																									

Figure A-2/093-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

		WINTER					CP83 SP2					TOTAL SAMPLES 3727															
24																											
20																											
16																											
14																											
12																											
10																											
9																											
8																											
7																											
6																											
5																											
4																											
3																											
2																											
1																											
0																											
TOTALS		+	+	+	0.2																						
		+	1.0	27.9	51.8	18.3	2.8	0.4	+	+	100.0																
		0.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	TOTALS												
		ZERO CROSSING PERIOD (SEC)																									

Figure A-2/093-2-6 Significant Wave Height vs. Zero Crossing Period

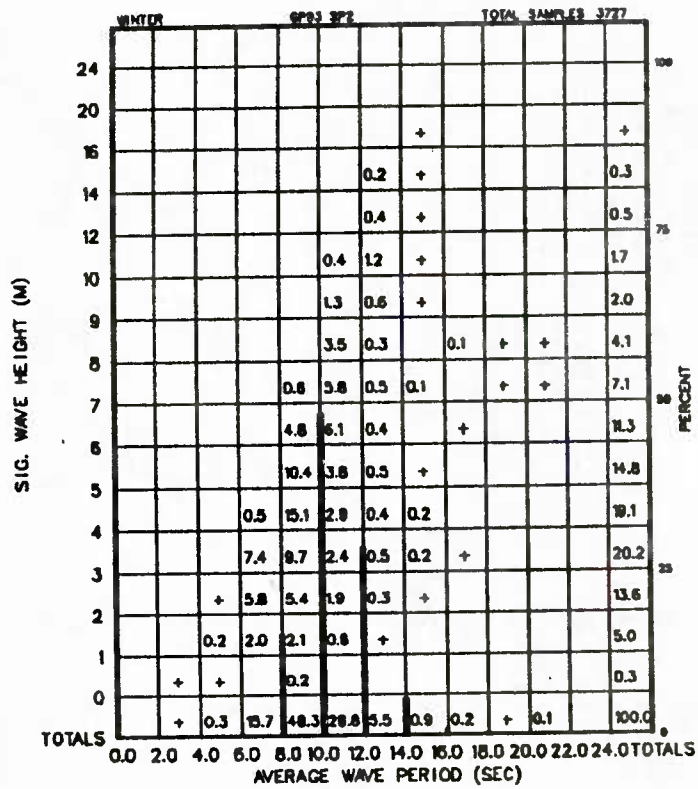


Figure A-2/093-2-7 Significant Wave Height vs. Average Wave Period

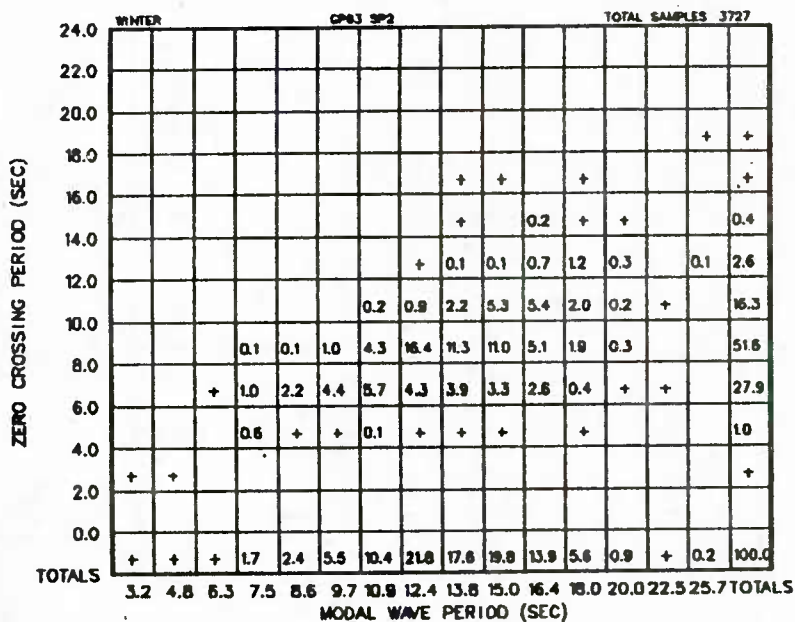


Figure A-2/093-2-8 Zero Crossing Period vs. Modal Wave Period

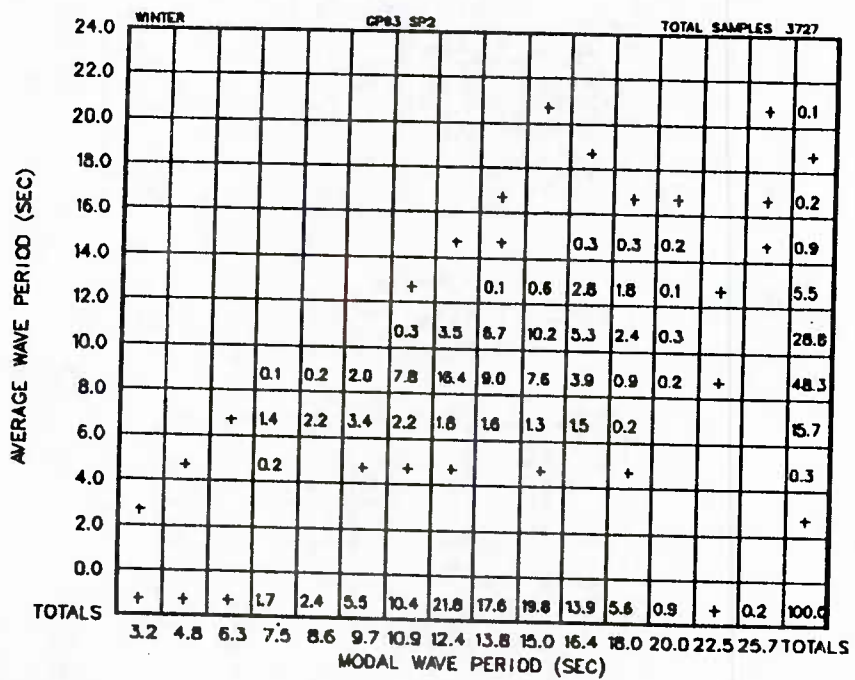


Figure A-2/093-2-9 Average Wave Period vs. Modal Wave Period

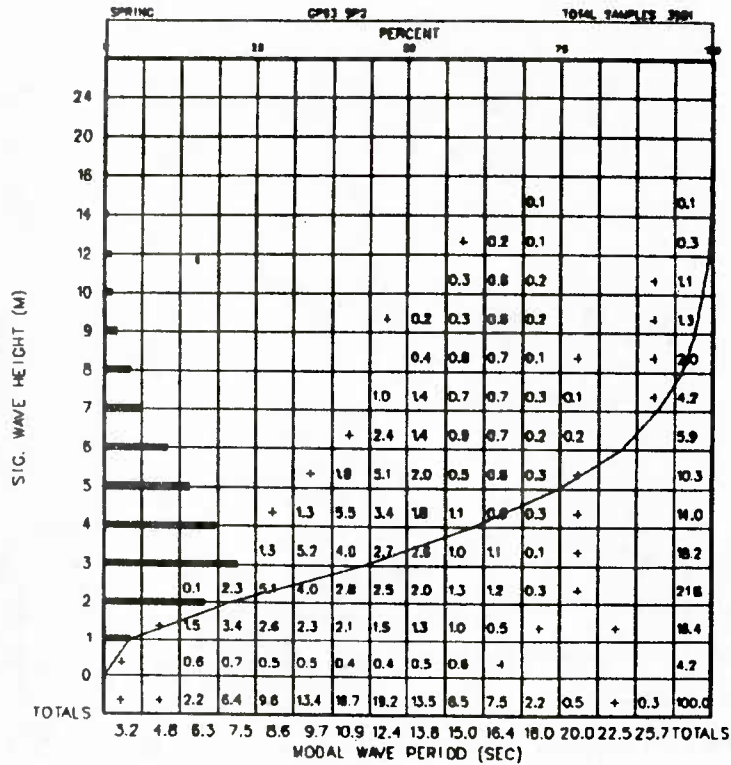


Figure A-2/093-3-1 Significant Wave Height vs. Modal Wave Period

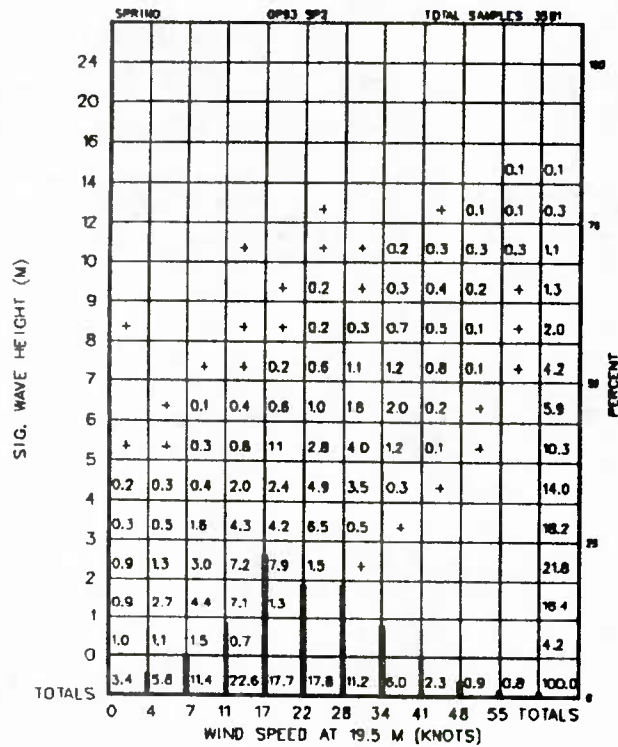


Figure A-2/093-3-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

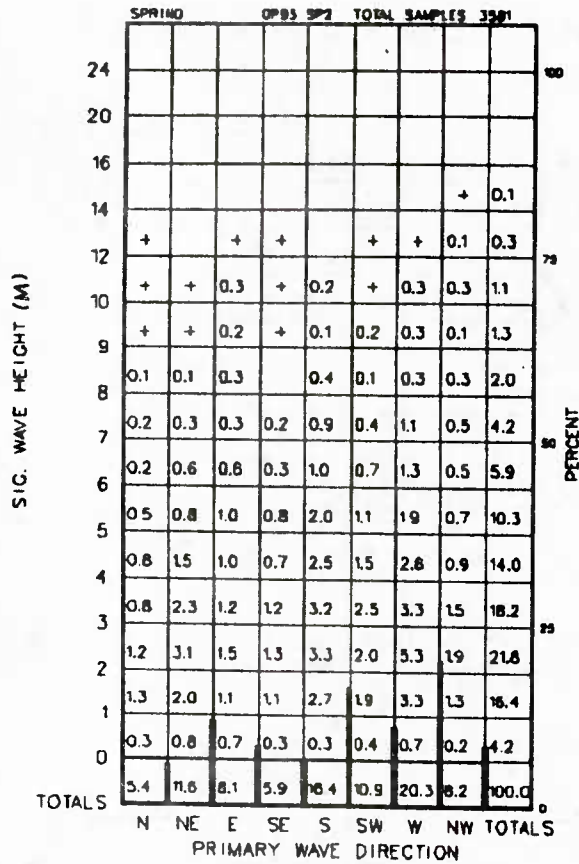


Figure A-2/093-3-3 Significant Wave Height vs. Primary Wave Direction

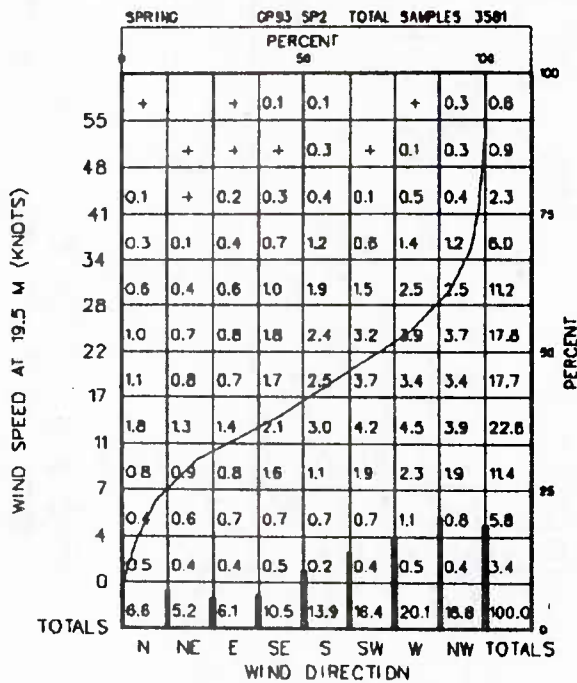


Figure A-2/093-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

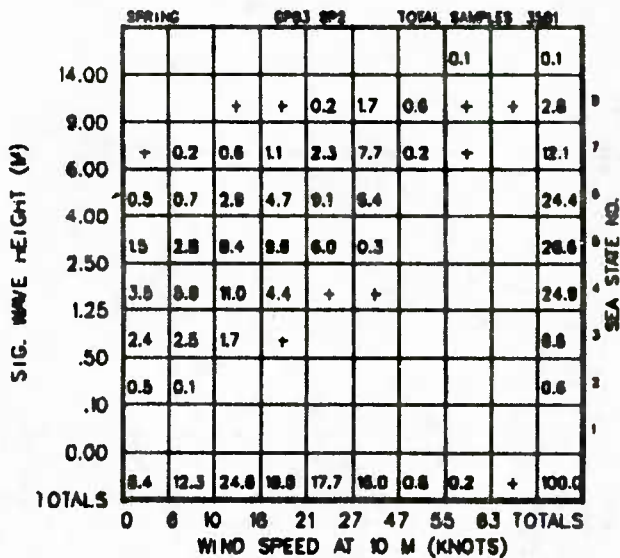


Figure A-2/093-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

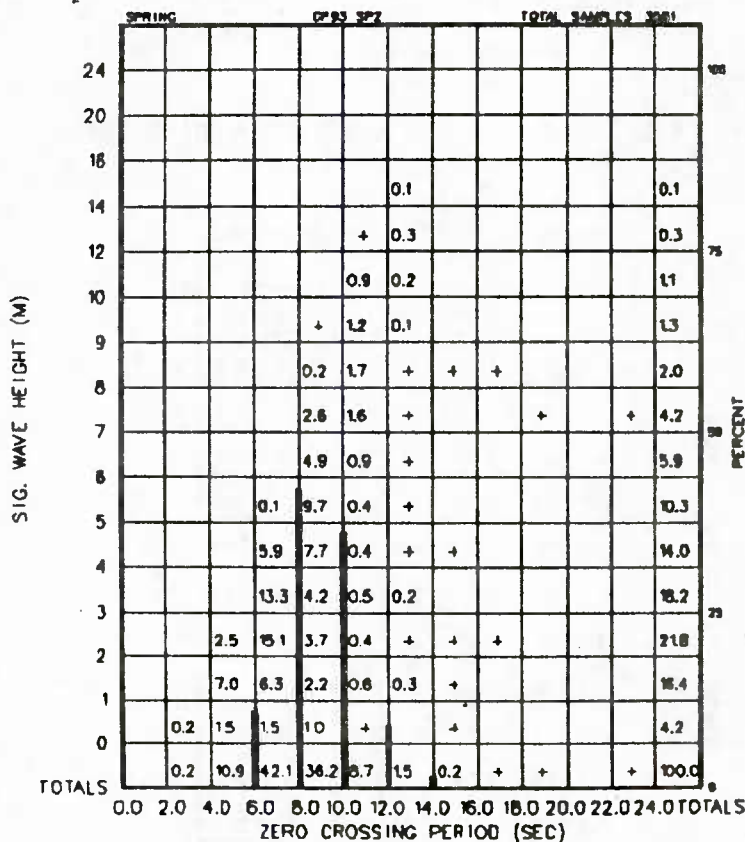


Figure A-2/093-3-6 Significant Wave Height vs. Zero Crossing Period

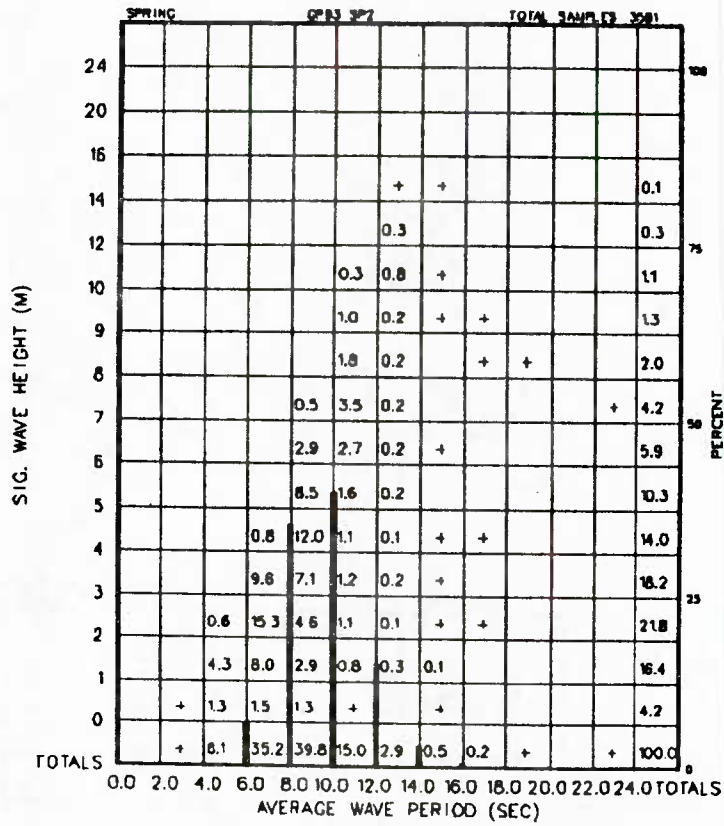


Figure A-2/093-3-7 Significant Wave Height vs. Average Wave Period

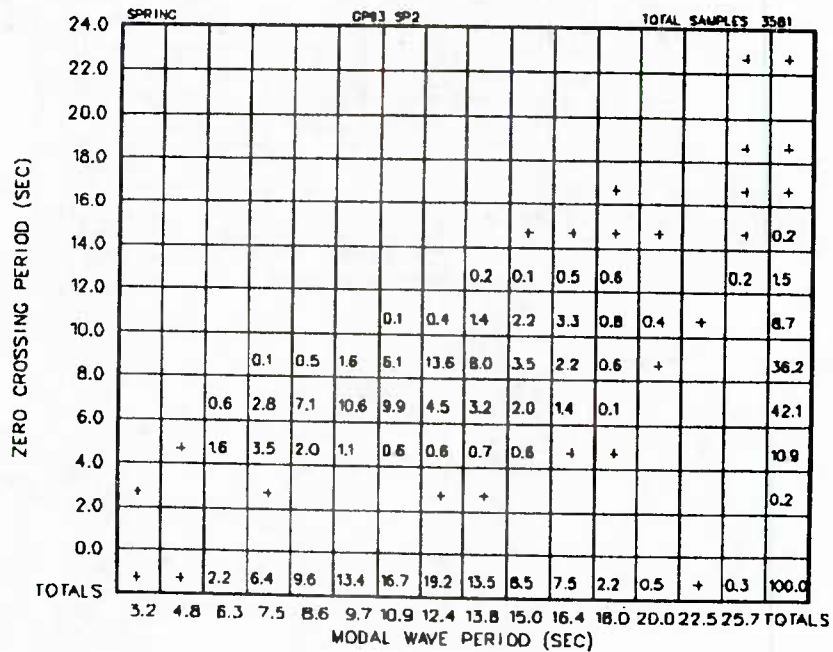


Figure A-2/093-3-8 Zero Crossing Period vs. Modal Wave Period

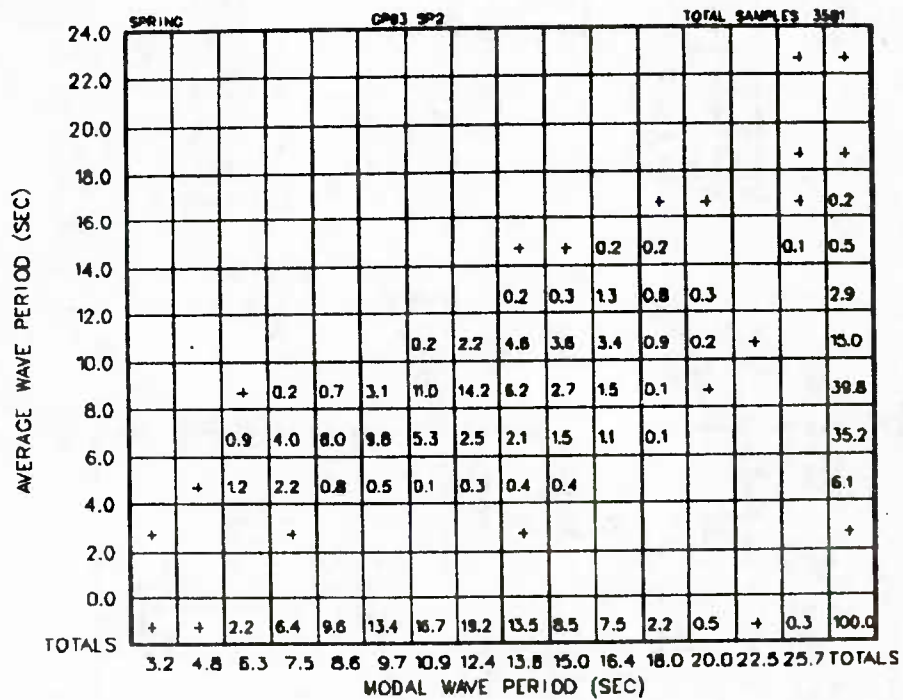


Figure A-2/093-3-9 Average Wave Period vs. Modal Wave Period

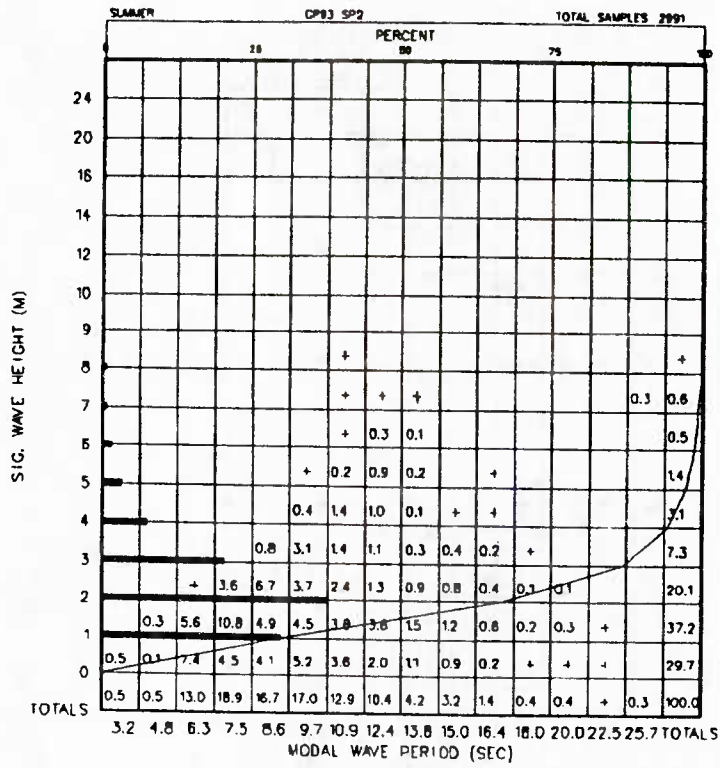


Figure A-2/093-4-1 Significant Wave Height vs. Modal Wave Period

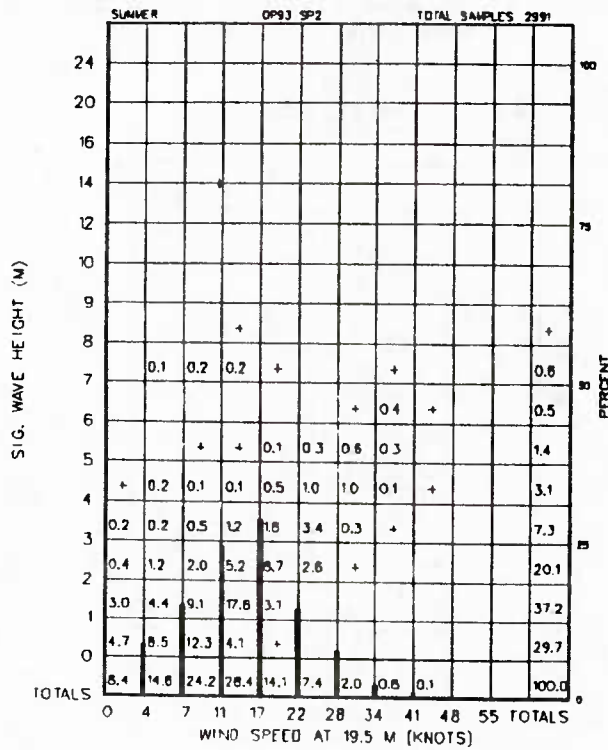


Figure A-2/093-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

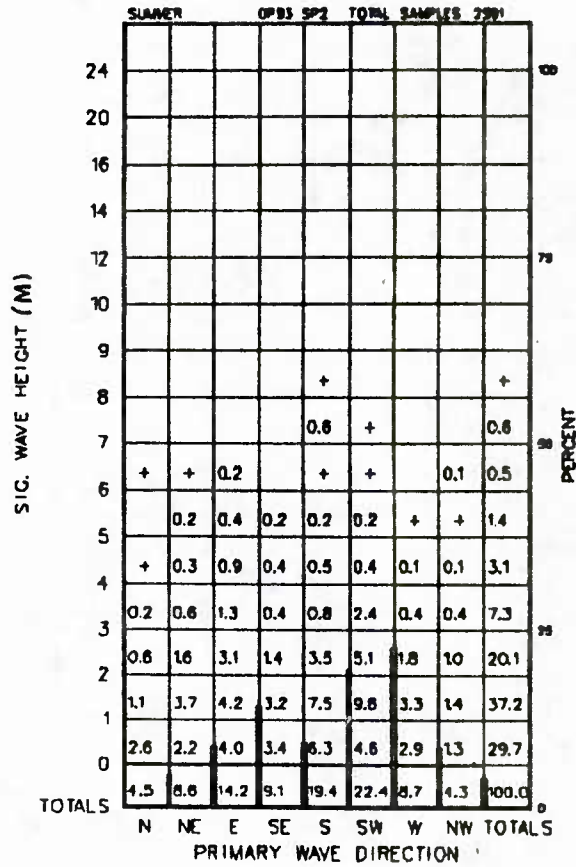


Figure A-2/093-4-3 Significant Wave Height vs. Primary Wave Direction

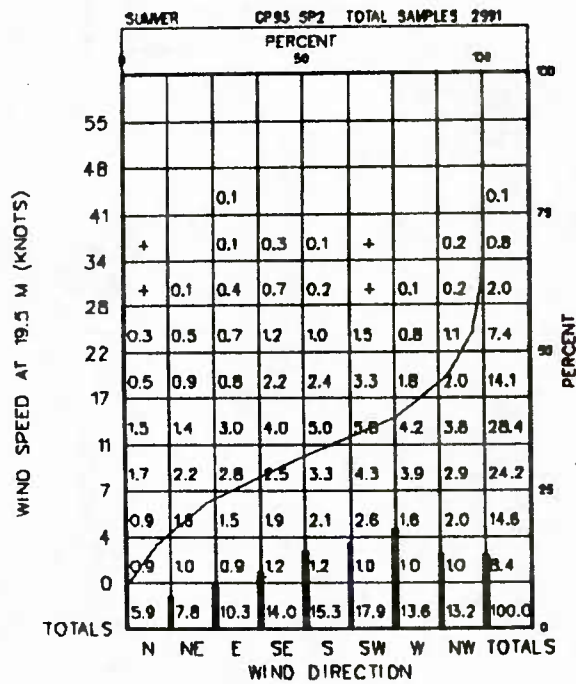


Figure A-2/093-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

		SUMMER				GPS SP2				TOTAL SAMPLES 2001				
SIG. WAVE HEIGHT (M)	14.00													8
	9.00													7
	6.00	0.1	0.2	0.2	+		0.5					1.2	6	
	4.00	0.2	0.2	0.1	0.9	1.7	1.5					4.5	5	
	2.50	0.8	1.2	3.0	6.7	3.8	0.2					13.8	4	
	1.25	5.2	7.8	16.7	7.1	0.2						38.8	3	
	.50	10.8	14.2	8.2	+							33.2	2	
	.10	3.8	3.0	+								6.7	1	
0.00														
TOTALS	20.8	26.4	30.2	14.8	9.7	2.2						100.0		
		0	6	10	16	21	27	47	55	63	TOTALS			
		WIND SPEED AT 10 M (KNOTS)												

Figure A-2/093-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

		SUMMER				GPS SP2				TOTAL SAMPLES 2001					
SIG. WAVE HEIGHT (M)	24													80	
	20													75	
	16													70	
	14													65	
	12													60	
	10													55	
	9													50	
	8													45	
	7													40	
	6													35	
5													30		
4													25		
3													20		
2													15		
1													10		
0													5		
TOTALS		3.3	9.9	11.2	4.0	1.3	+						29.7	0	
		3.3	33.8	44.6	13.8	3.1	0.5	0.2	0.2	0.2	0.1	+	100.0		
		0.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	TOTALS
		ZERO CROSSING PERIOD (SEC)													

Figure A-2/093-4-6 Significant Wave Height vs. Zero Crossing Period

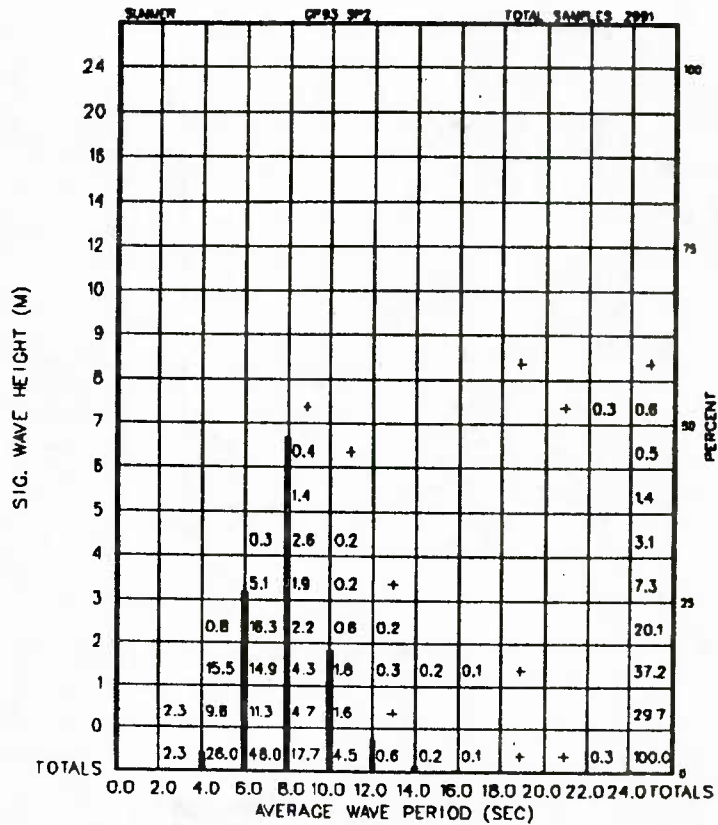


Figure A-2/093-4-7 Significant Wave Height vs. Average Wave Period

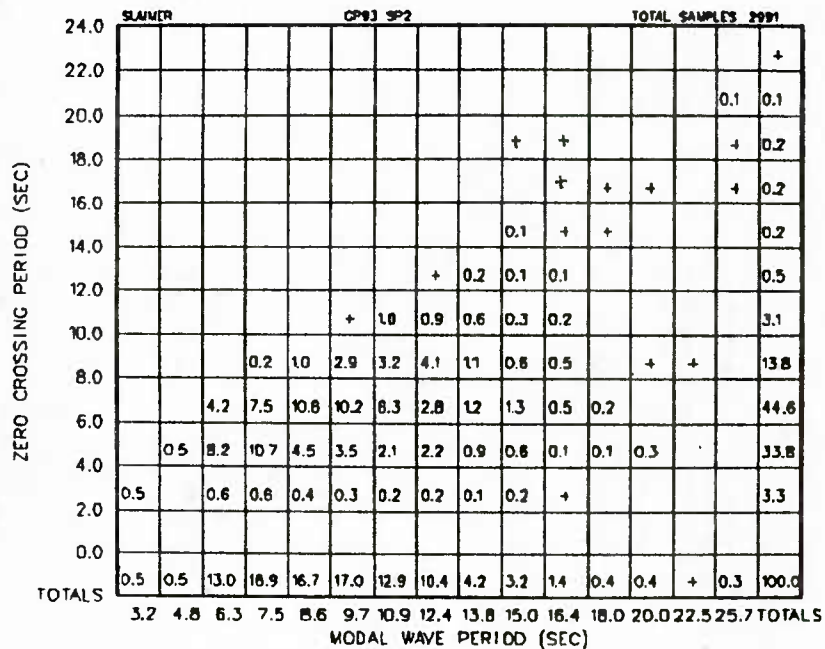


Figure A-2/093-4-8 Zero Crossing Period vs. Modal Wave Period

AVERAGE WAVE PERIOD (SEC)	SLAMER											CP93 SP2			TOTAL SAMPLES 2991		
	0.5	0.5	13.0	18.9	16.7	17.0	12.9	10.4	4.2	3.2	14	0.4	0.4	+	0.3	100.0	
24.0															0.1	0.	
22.0															+	+	
20.0																	
18.0														+		+	
16.0													+	+		0.1	
14.0										0.1	+					0.2	
12.0								0.1	0.2	0.1	0.1					0.6	
10.0						+	1.2	1.4	0.9	0.6	0.2			+	+	4.5	
8.0				0.3	1.4	3.8	5.0	4.6	1.2	0.6	0.6	+		+		17.7	
6.0			4.7	10.6	11.6	10.5	5.0	2.5	1.1	1.3	0.2	0.2	0.2			48.0	
4.0		0.5	7.8	7.7	3.2	2.4	1.4	1.6	0.7	0.4	0.1	+	0.2			28.0	
2.0	0.5		0.5	0.4	0.3	0.3	0.1	+	+	+						2.3	
0.0																	
TOTALS	0.5	0.5	13.0	18.9	16.7	17.0	12.9	10.4	4.2	3.2	14	0.4	0.4	+	0.3	100.0	

Figure A-2/093-4-9 Average Wave Period vs. Modal Wave Period

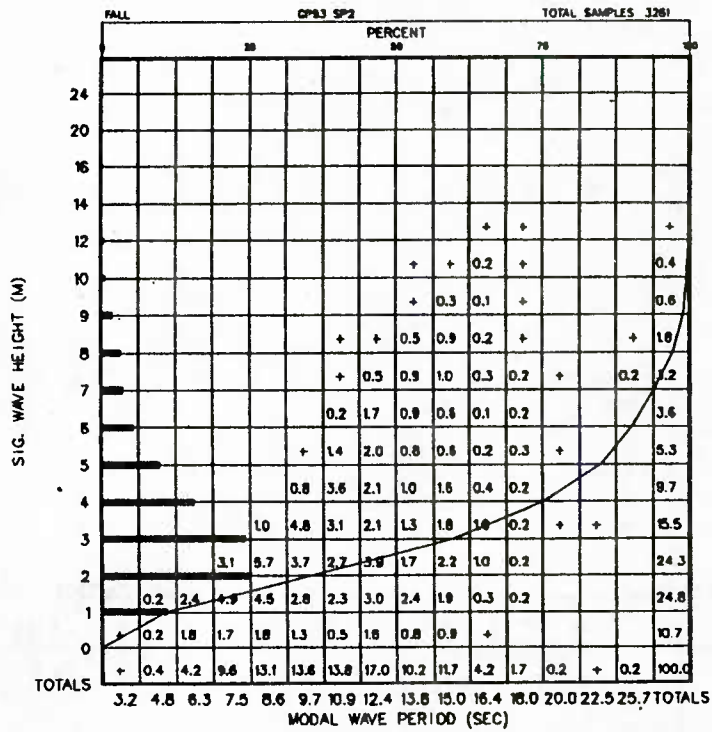


Figure A-2/093-5-1 Significant Wave Height vs. Modal Wave Period

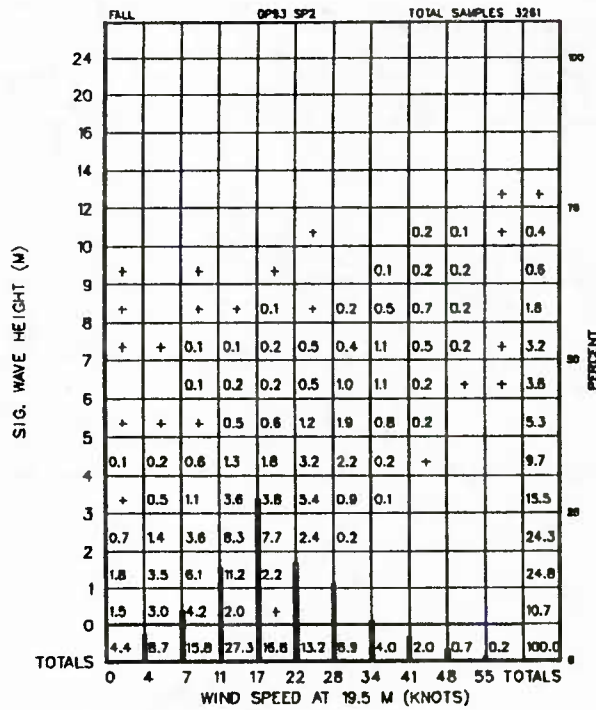


Figure A-2/093-5-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

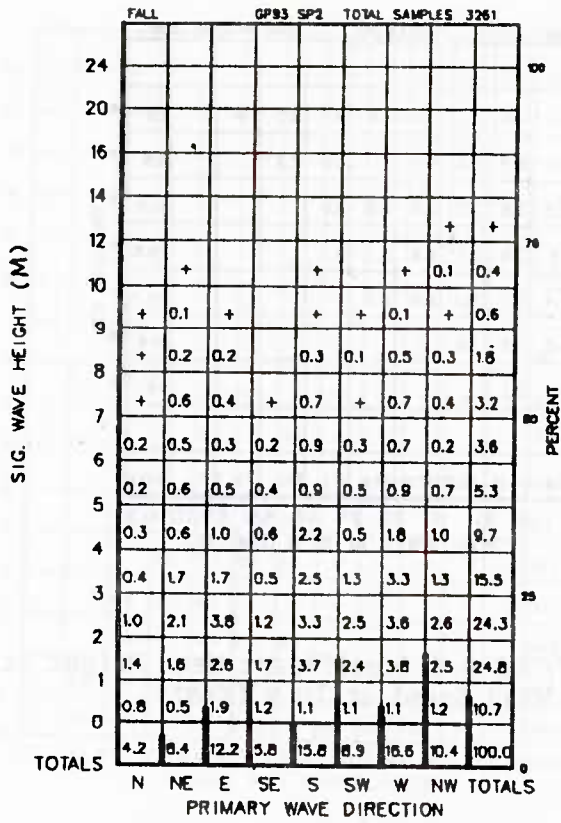


Figure A-2/093-5-3 Significant Wave Height vs. Primary Wave Direction

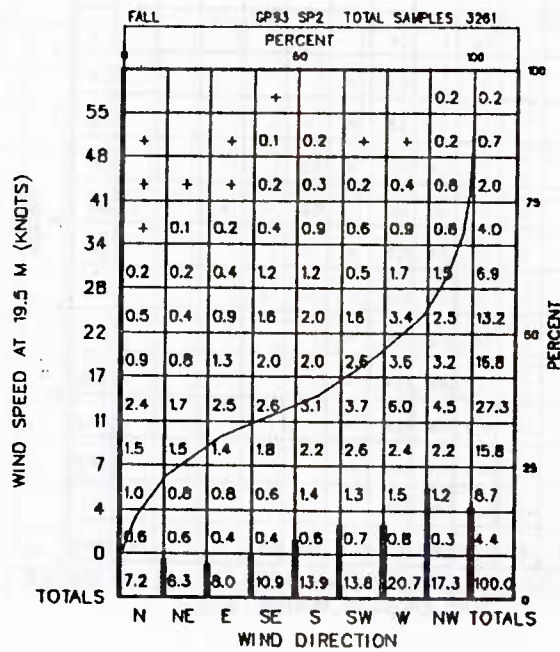


Figure A-2/093-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

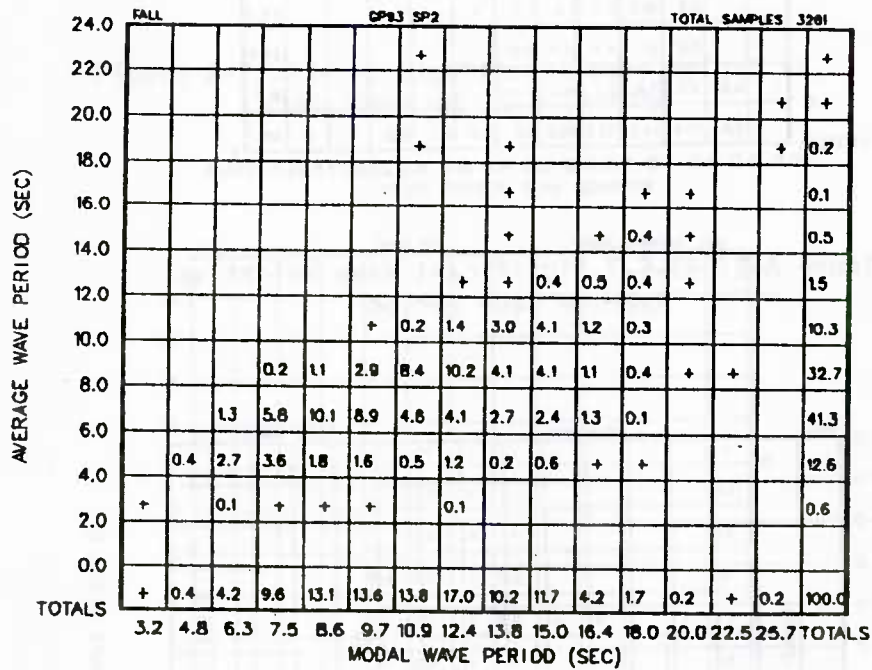


Figure A-2/093-5-9 Average Wave Period vs. Modal Wave Period

TABLE A-102-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

Natural Environment	SEASON: ANNUAL; LOCATION: 24.78°N, 162.46°W					Mean	Most Probable
	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Maximum	Mean		
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.25 5 -	1.5 10 -	4 18 -	1.5 11 -	1.5 6.3 NE		
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	3 0.25 -	11.5 1.5 -	22.5 3.5 -	12.5 1.5 -	14 1.5 E		
Visibility, nautical miles	7	20	25	-	-		
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	0.5 0.5	4 3	7.5 7	-	-		
Precipitation (Occurrence)	All precipitation - 8% of the time						
Relative Humidity, %	62	78	95	-	-		
Air Temperature, °C	22.5	24.5	28	24.5	-		
Sea Surface Temperature, °C	24	26.5	28.5	-	-		
Sea Level Pressure, millibars	1010	1017	1021	-	-		
Ice	None						
Refractivity Mean Surface Refractivity Sub-Refraction (1 km, Annual) Super-Refraction or Ducting (1 km, Annual)	- - -	- - -	- - -	357 - -	- 3% 3%		

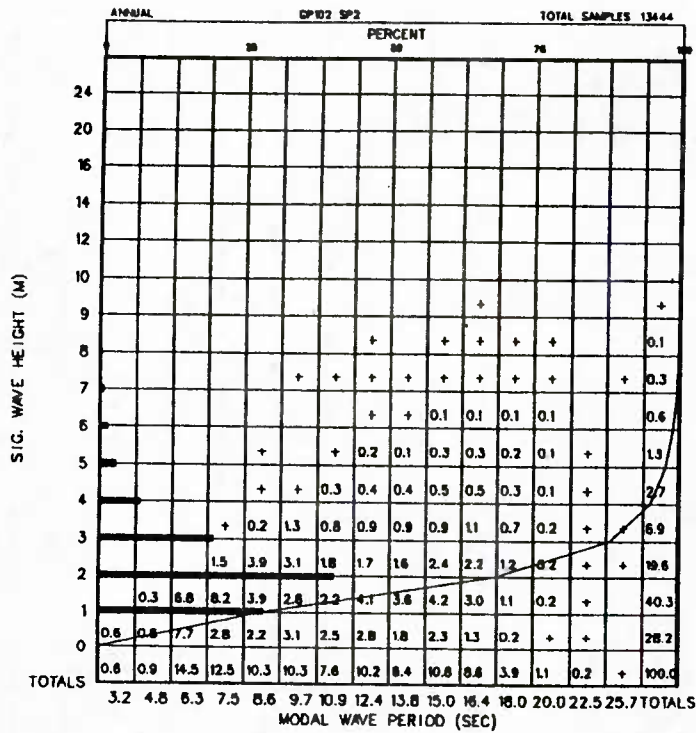


Figure A-102-1-1 Significant Wave Height vs. Modal Wave Period

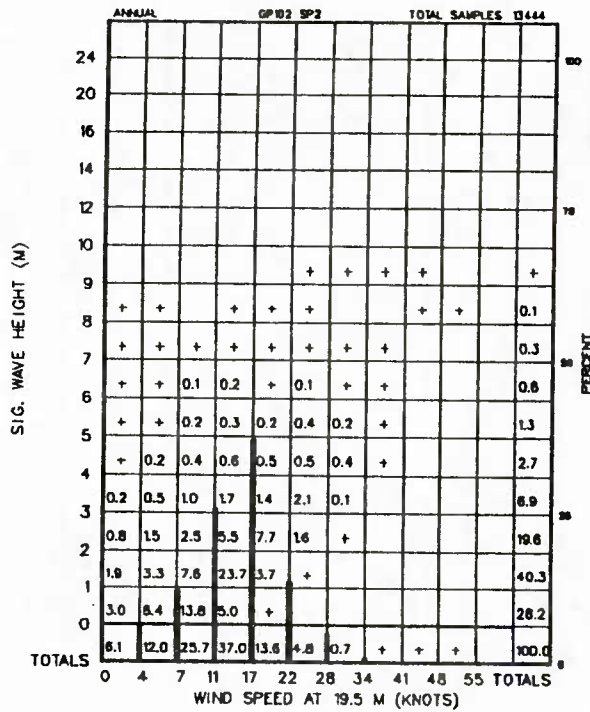


Figure A-102-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

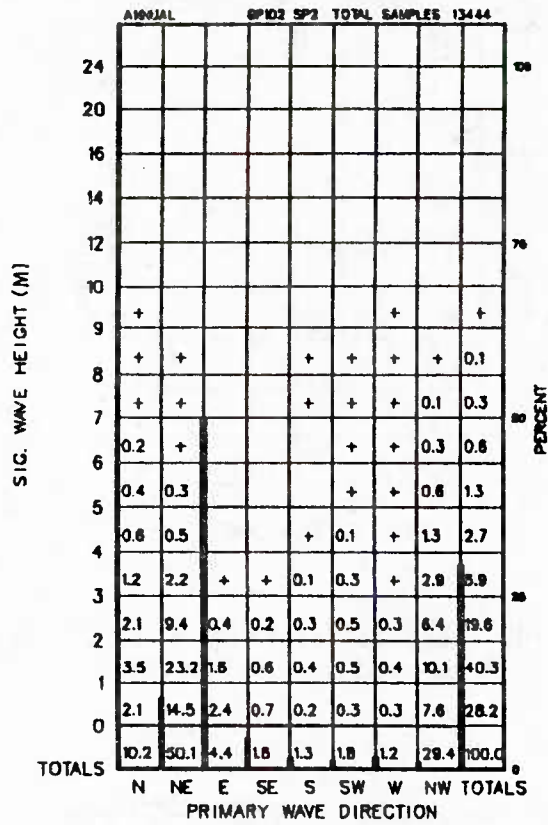


Figure A-102-1-3 Significant Wave Height vs. Primary Wave Direction

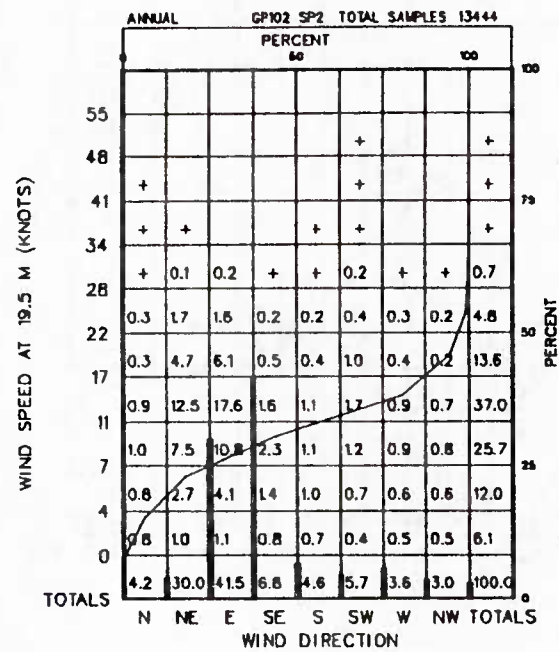


Figure A-102-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

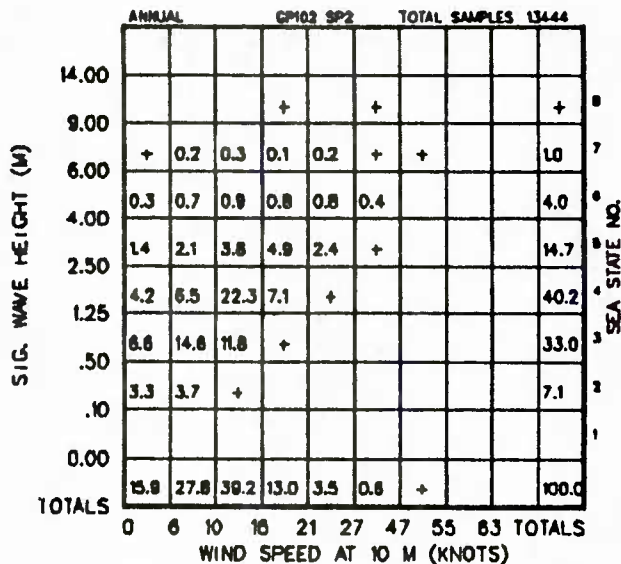


Figure A-102-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

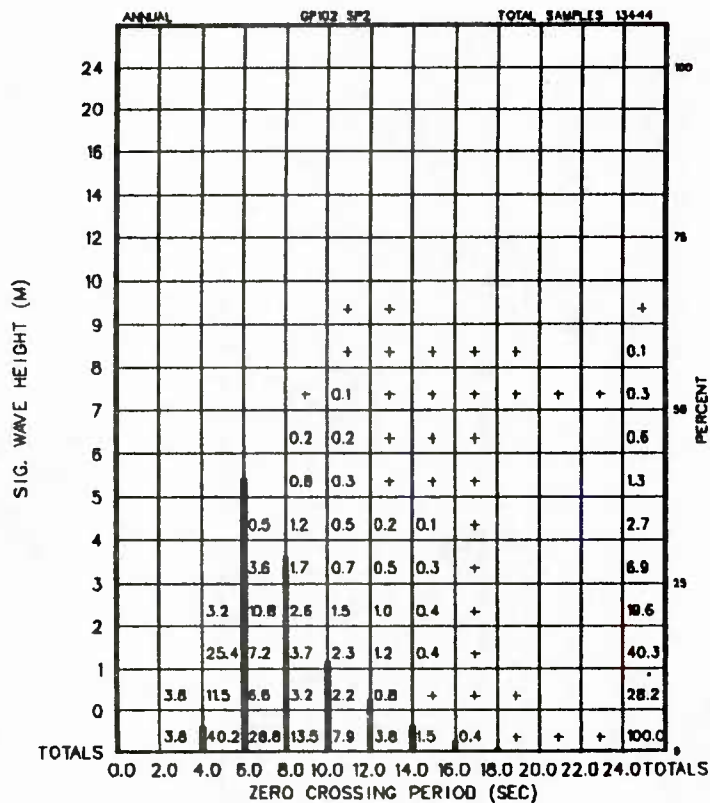


Figure A-102-1-6 Significant Wave Height vs. Zero Crossing Period

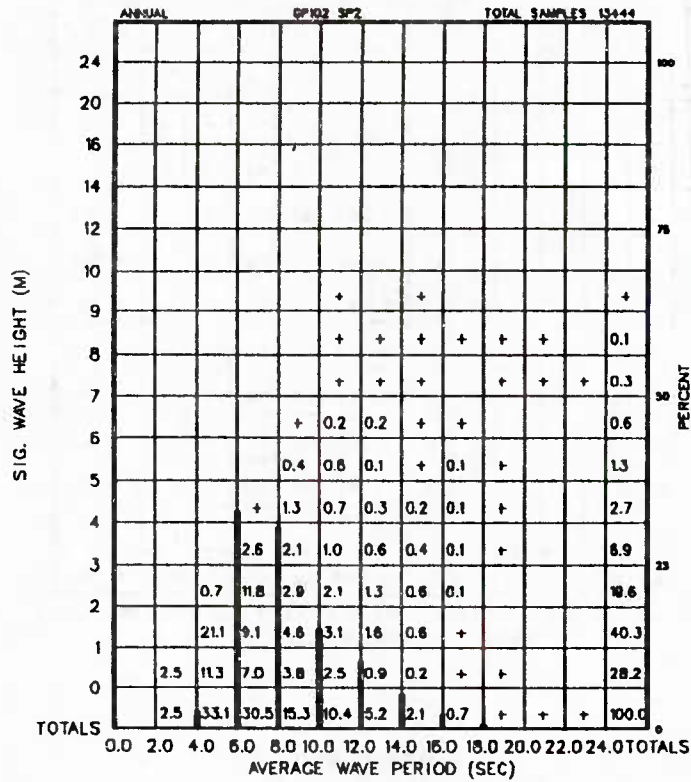


Figure A-102-1-7 Significant Wave Height vs. Average Wave Period

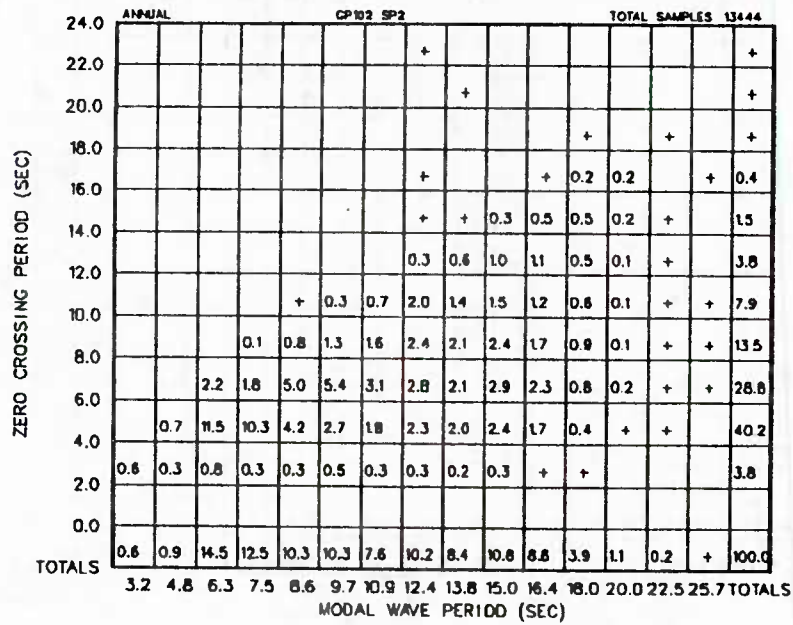


Figure A-102-1-8 Zero Crossing Period vs. Modal Wave Period

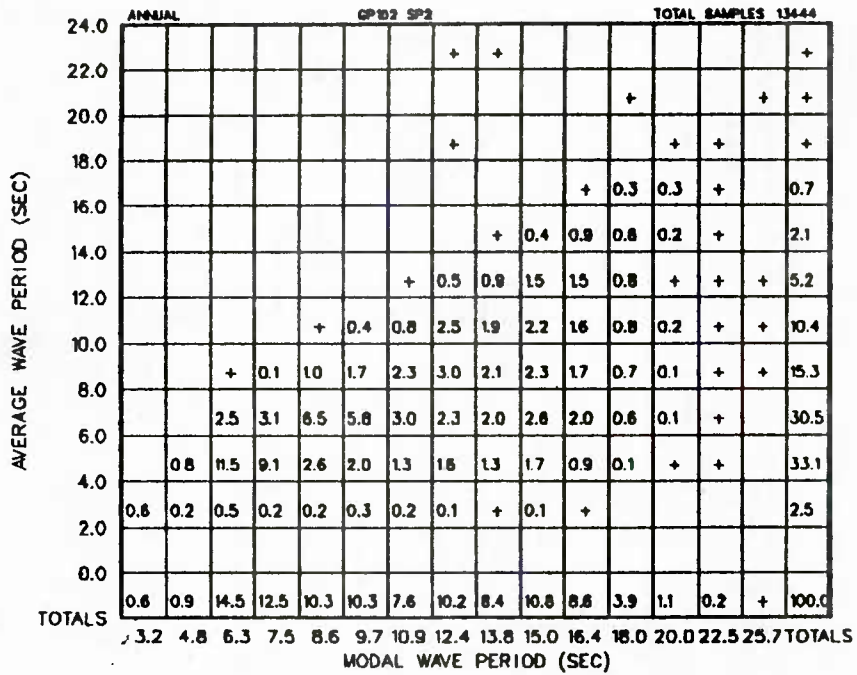


Figure A-102-1-9 Average Wave Period vs. Modal Wave Period

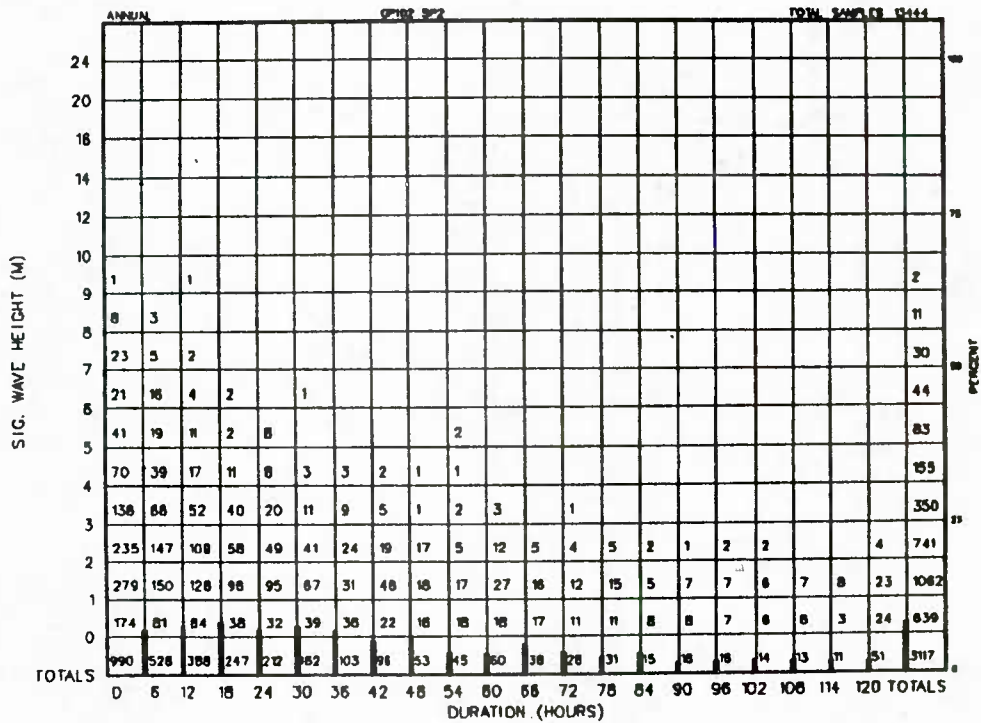


Figure A-102-1-10 Persistence of Wave Height

WIND SPEED AT 19.5 M (KNOTS)	ANNUAL												OP102 SP2												TOTAL SAMPLES 13444		PERCENT
	0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	TOTALS					
**																											
55																											
48																						1					
41																						2					
34																						8					
28																						52					
22																						297					
17																						785					
11																						1495					
7																						1500					
4																						875					
0																						407					
TOTALS	2582	1097	840	583	231	155	94	61	46	25	22	13	8	6	7	9	5	3	1	4	10	3402					

Figure A-102-1-11 Persistence of Wind Speed at 19.5 M (Knots)

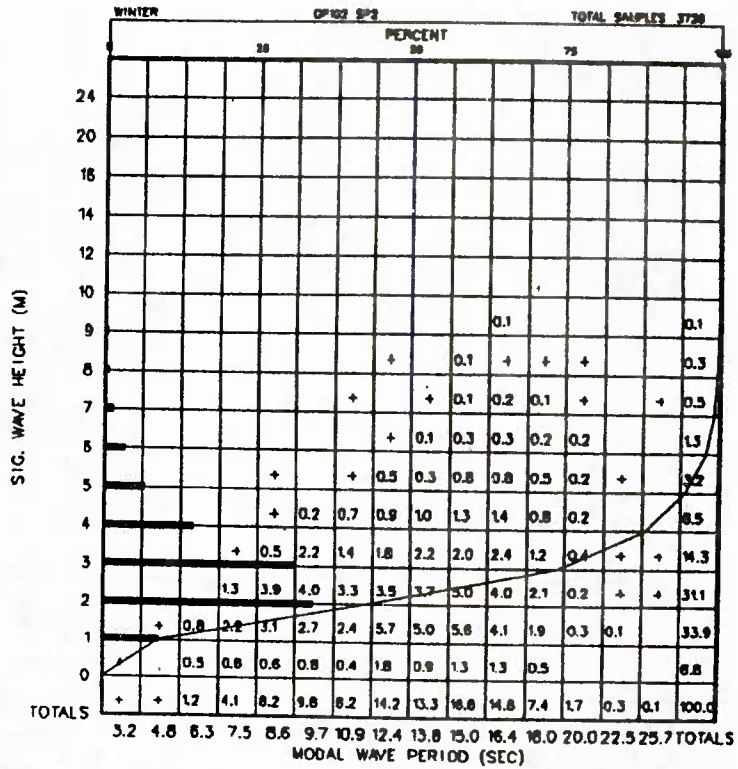


Figure A-102-2-1 Significant Wave Height vs. Modal Wave Period

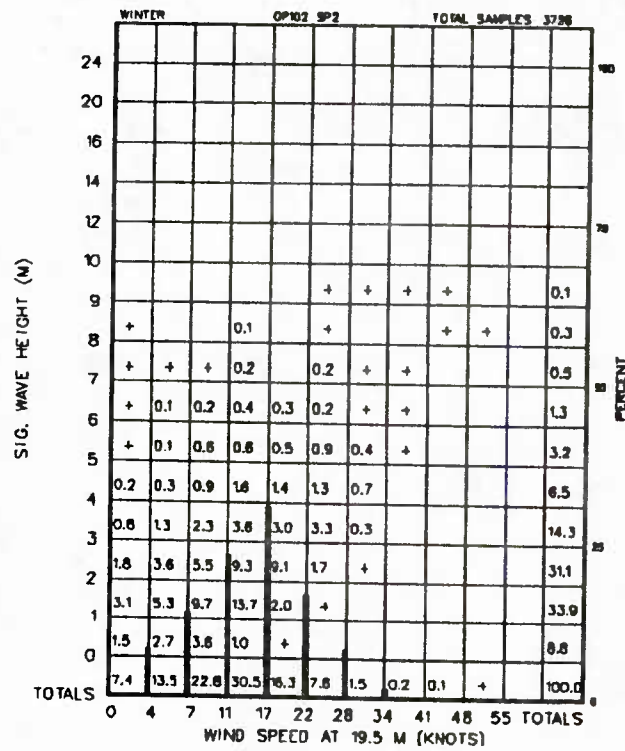


Figure A-102-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

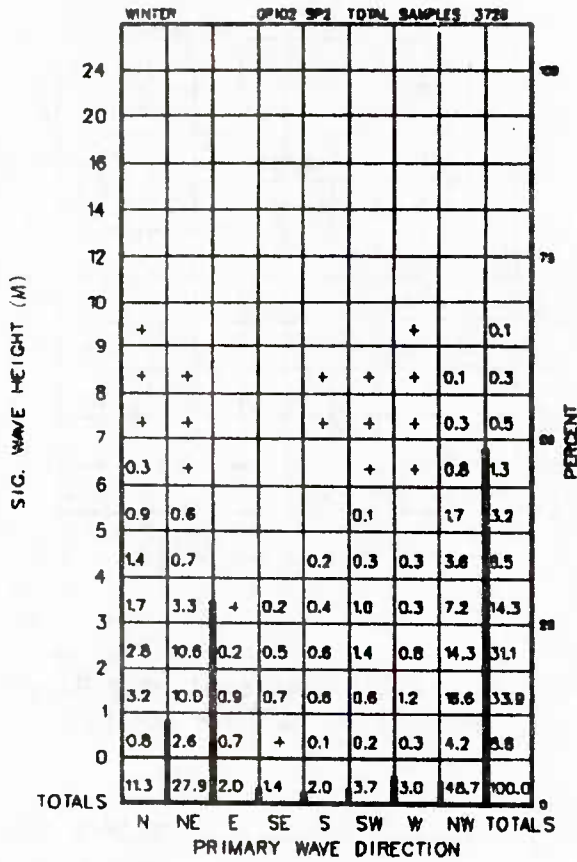


Figure A-102-2-3 Significant Wave Height vs. Primary Wave Direction

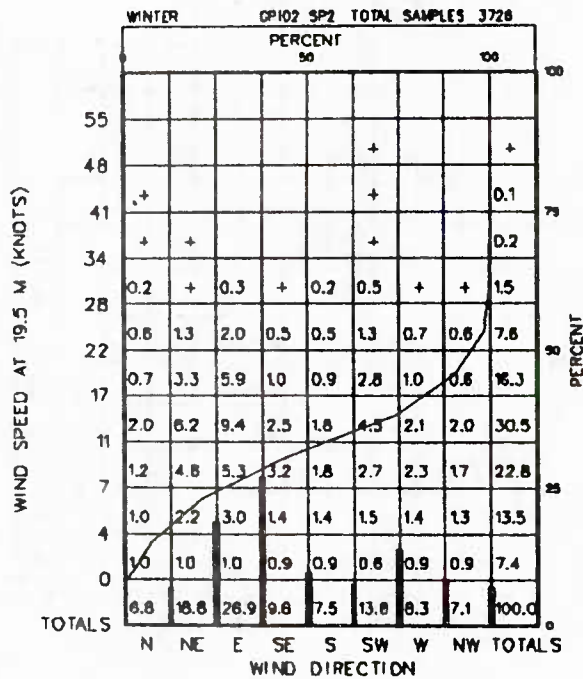


Figure A-102-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

		WINTER			CP102 SP2			TOTAL SAMPLES 3728				
SIG. WAVE HEIGHT (M)	14.00											
	9.00				+		+					0.1
	6.00	0.2	0.2	0.7	0.3	0.4	0.2	+				2.1
	4.00	0.7	1.6	2.5	2.3	2.0	0.7					9.7
	2.50	3.5	5.1	8.1	7.8	3.3	0.1					27.9
	1.25	8.1	11.4	18.5	6.1	+						44.2
	.50	5.7	6.5	3.0	+							15.2
	.10	0.6	0.2									0.8
	0.00											
	TOTALS	18.8	24.9	32.8	16.6	5.8	1.1	+				100.0
		0	6	10	16	21	27	47	55	63	TOTALS	
		WIND SPEED AT 10 M (KNOTS)										

Figure A-102-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

		WINTER			CP102 SP2			TOTAL SAMPLES 3728								
SIG. WAVE HEIGHT (M)	24															
	20															
	18															
	14															
	12															
	10															
	9							+	+			0.1				
	8							0.2	+	+	+	0.3				
	7							+	0.3	0.1	+	+	0.5			
	6							0.3	0.6	0.2	0.1	+	1.3			
5							2.1	0.7	0.1	0.2	0.2	3.2				
4							1.1	3.3	1.1	0.5	0.3	6.5				
3							6.8	3.8	1.6	1.3	0.7	14.3				
2							2.6	15.9	5.9	3.7	2.1	31.1				
1							10.9	9.9	6.7	3.8	2.0	33.9				
0							0.1	2.5	2.1	1.6	1.8	8.8				
TOTALS							0.1	18.0	35.7	23.8	13.5	7.1	3.1	0.6	+	100.0
		0.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	TOTALS	
		ZERO CROSSING PERIOD (SEC)														

Figure A-102-2-6 Significant Wave Height vs. Zero Crossing Period

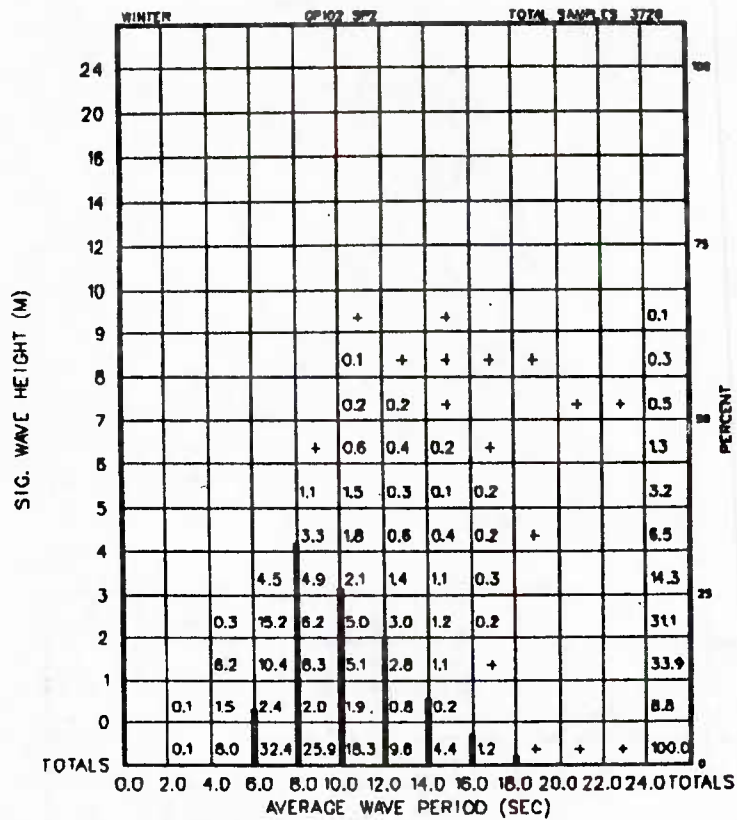


Figure A-102-2-7 Significant Wave Height vs. Average Wave Period

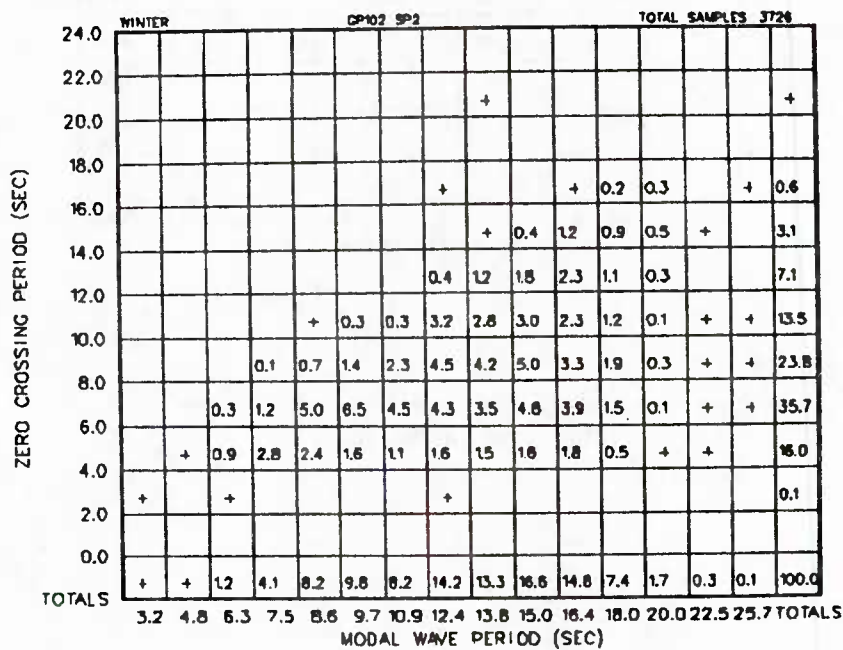


Figure A-102-2-8 Zero Crossing Period vs. Modal Wave Period

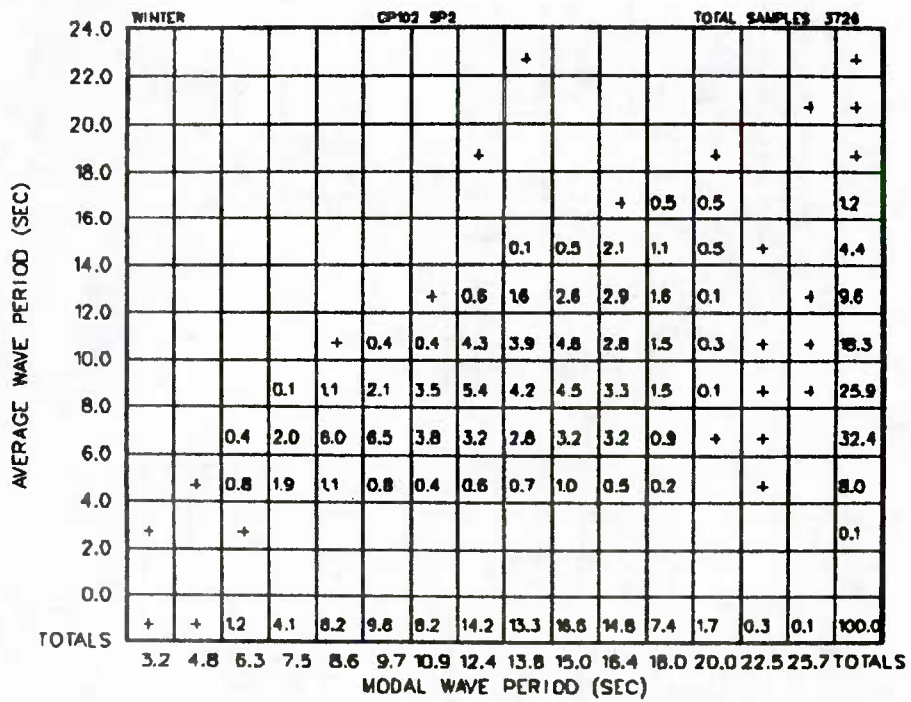


Figure A-102-2-9 Average Wave Period vs. Modal Wave Period

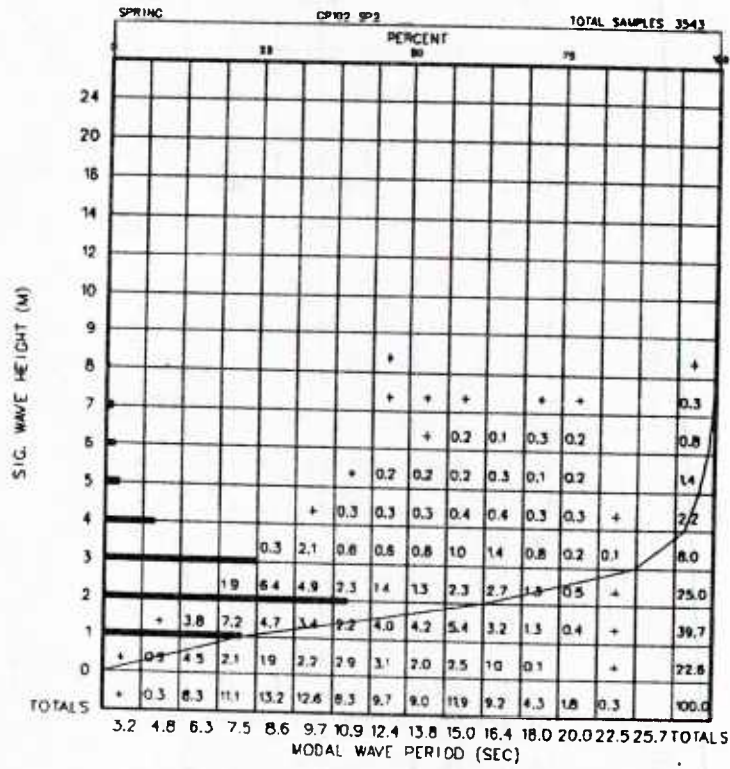


Figure A-102-3-1 Significant Wave Height vs. Modal Wave Period

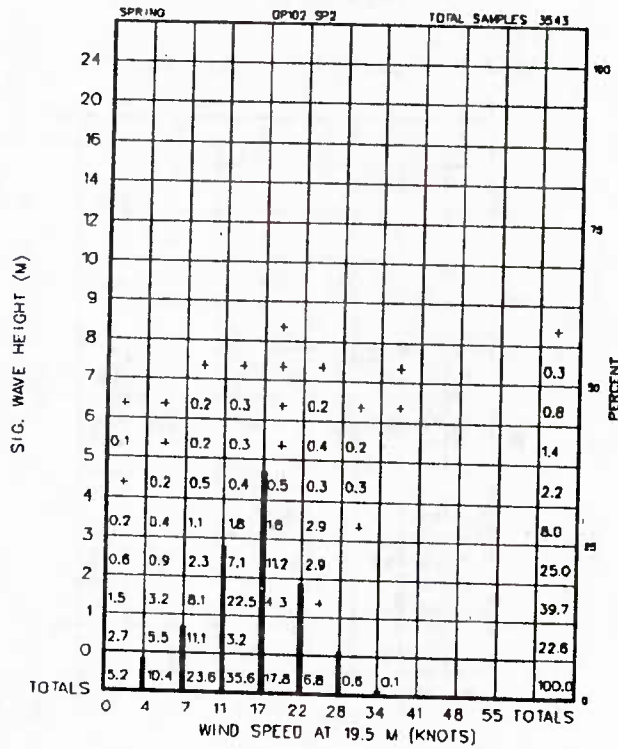


Figure A-102-3-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

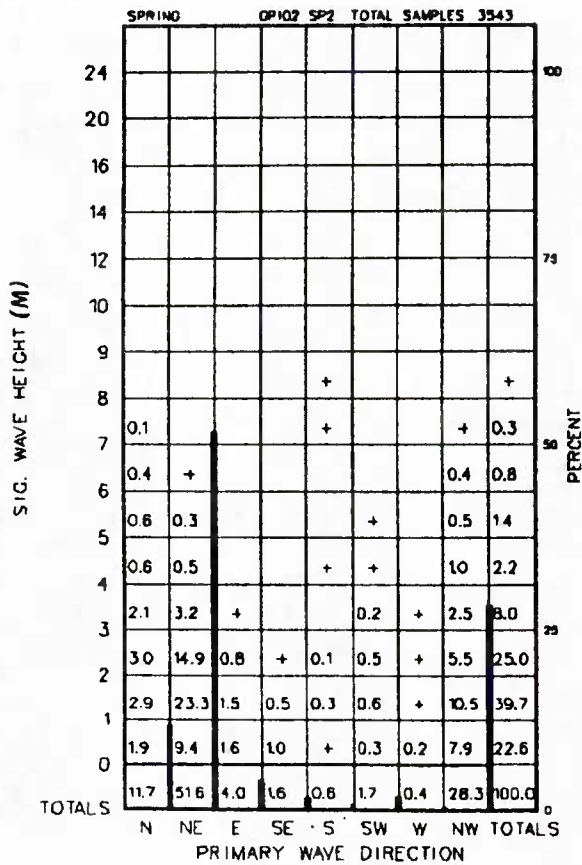


Figure A-102-3-3 Significant Wave Height vs. Primary Wave Direction

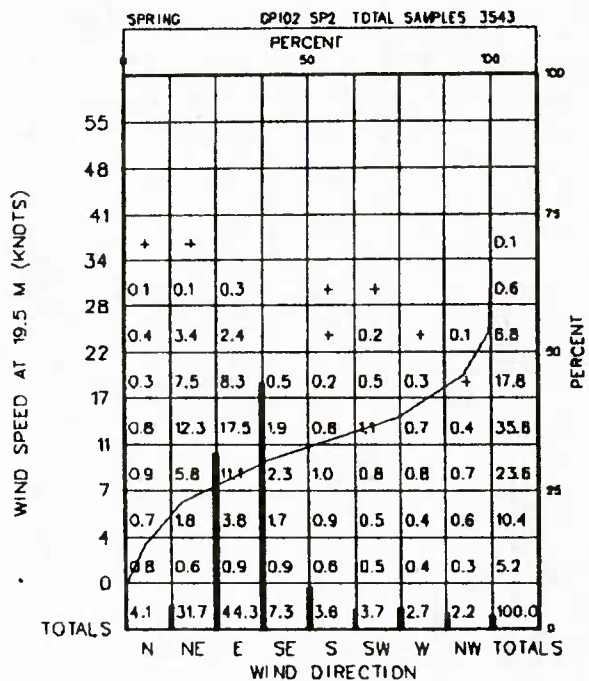


Figure A-102-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

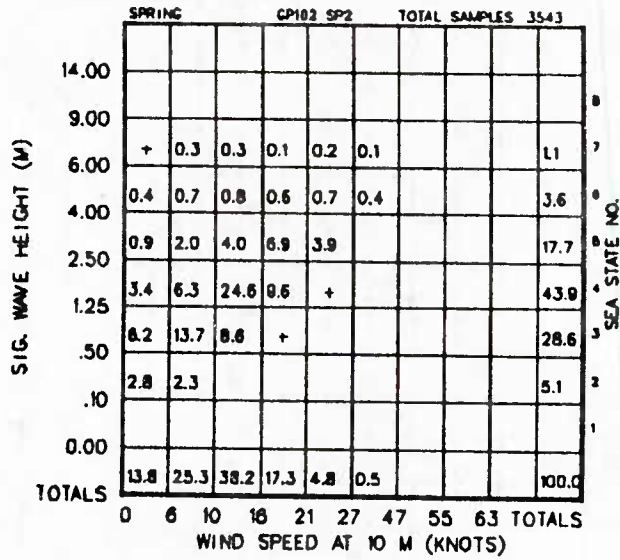


Figure A-102-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

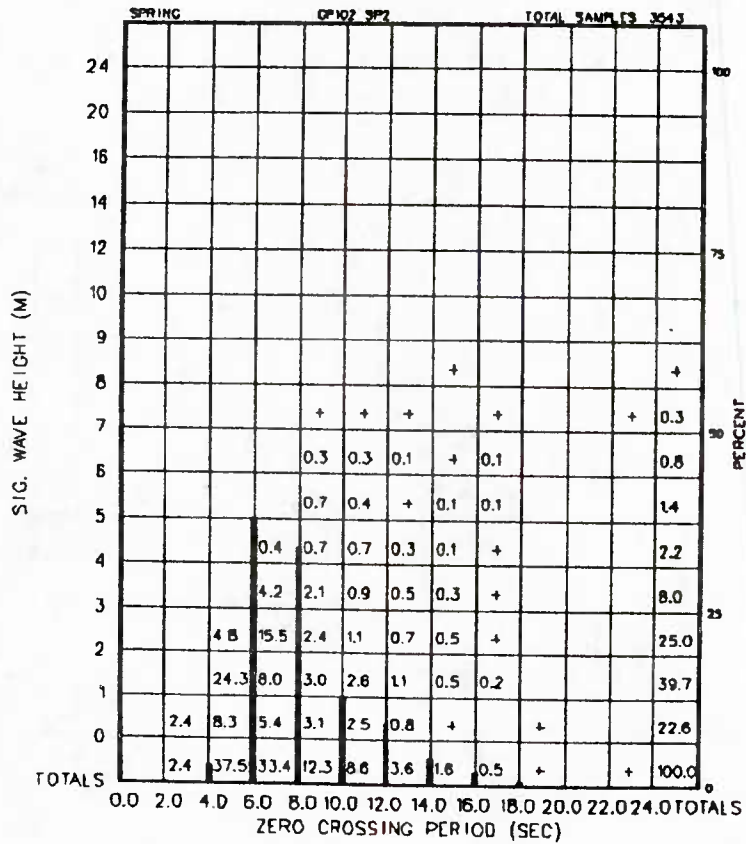


Figure A-102-3-6 Significant Wave Height vs. Zero Crossing Period

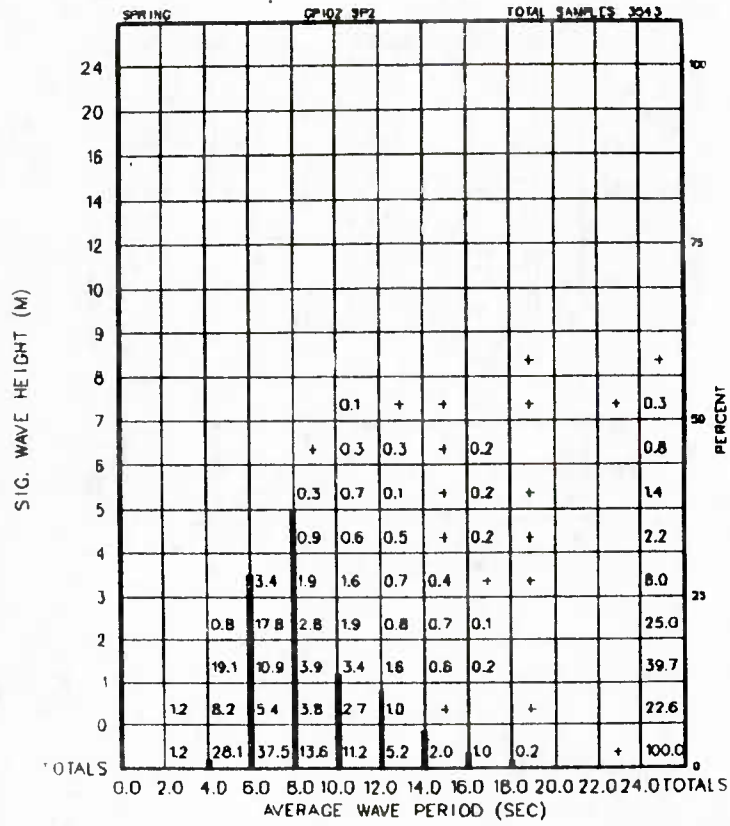


Figure A-102-3-7 Significant Wave Height vs. Average Wave Period

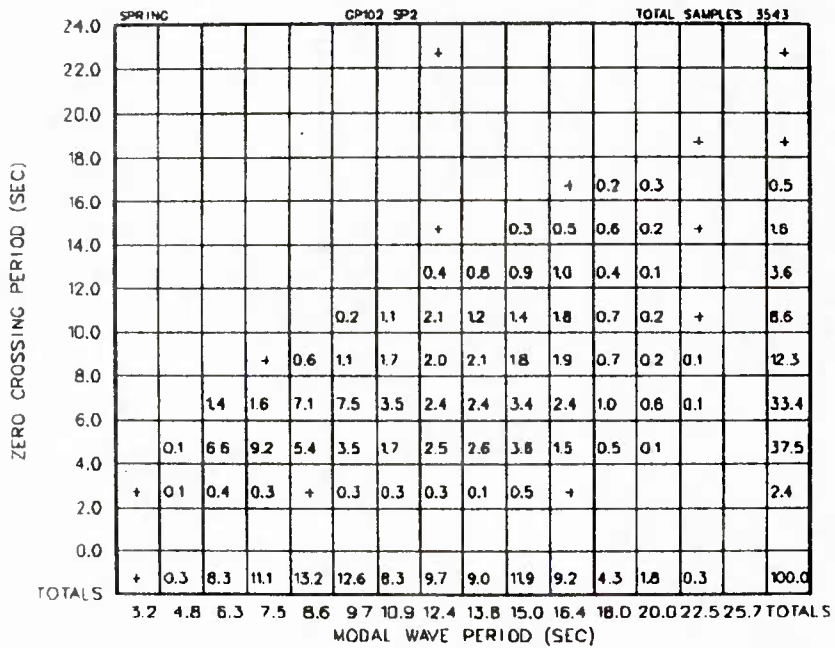


Figure A-102-3-8 Zero Crossing Period vs. Modal Wave Period

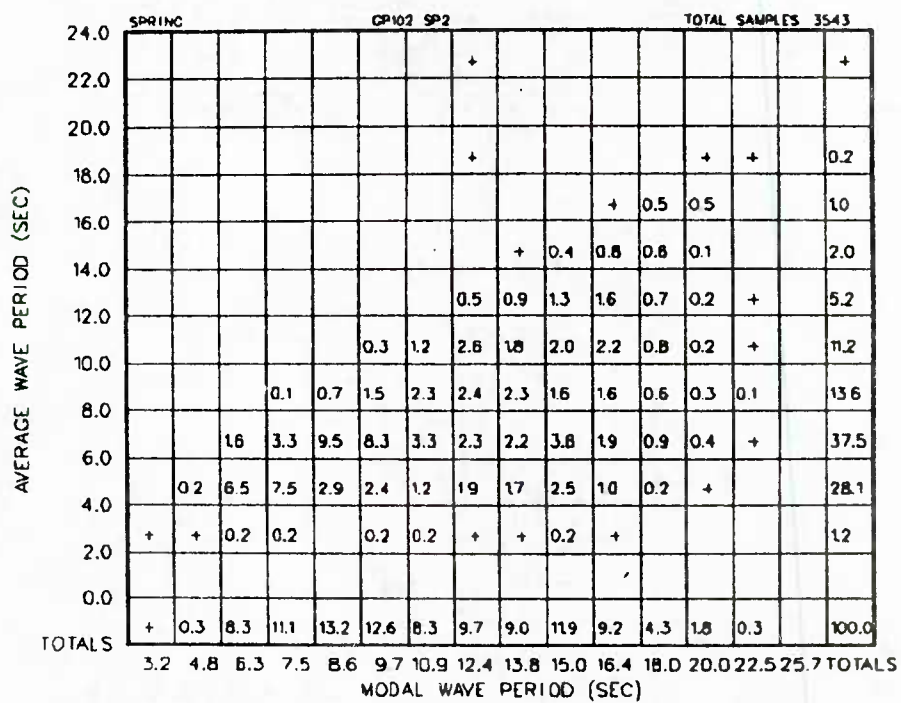


Figure A-102-3-9 Average Wave Period vs. Modal Wave Period

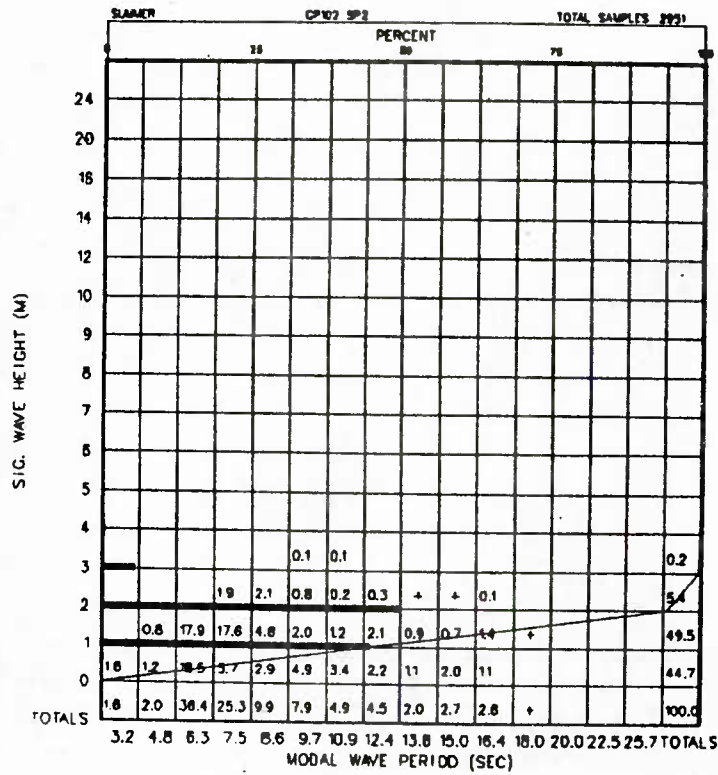


Figure A-102-4-1 Significant Wave Height vs. Modal Wave Period

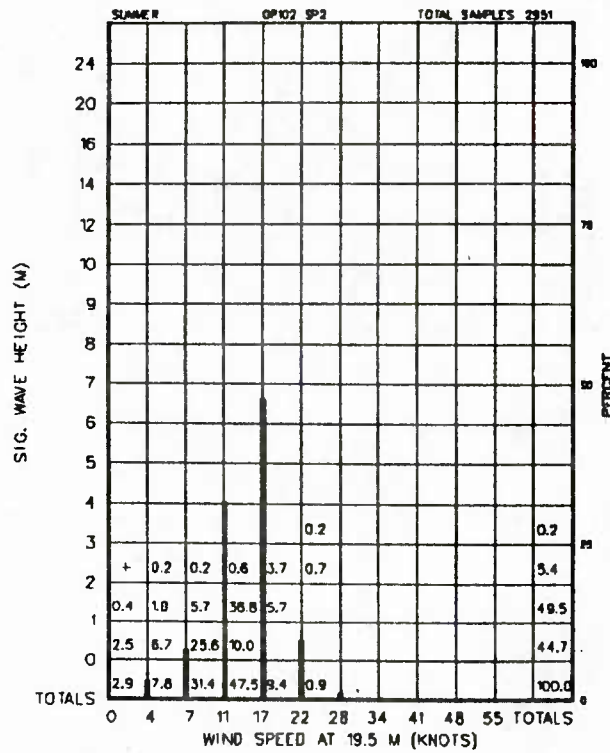


Figure A-102-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

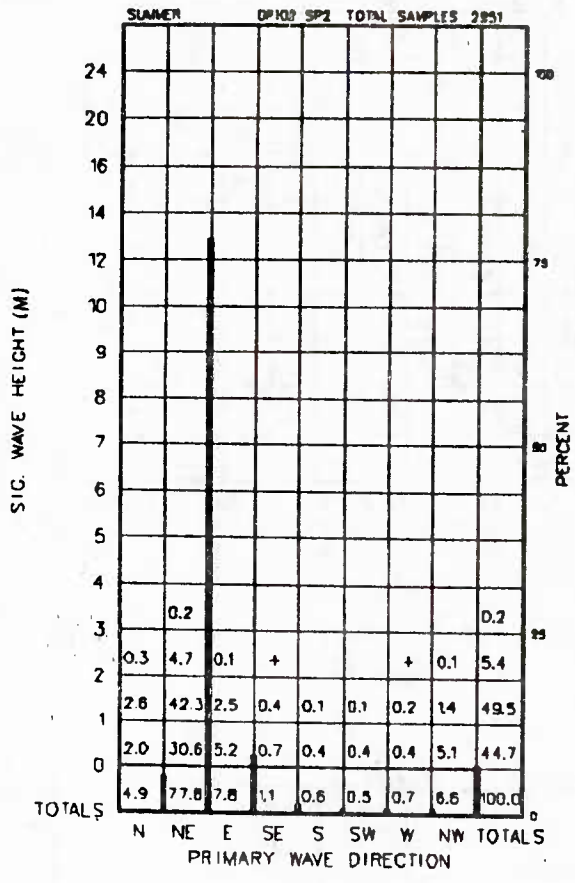


Figure A-102-4-3 Significant Wave Height vs. Primary Wave Direction

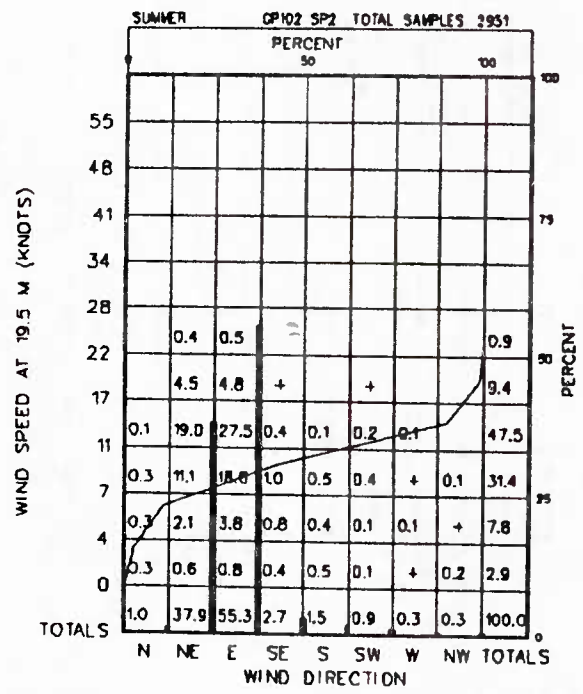


Figure A-102-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

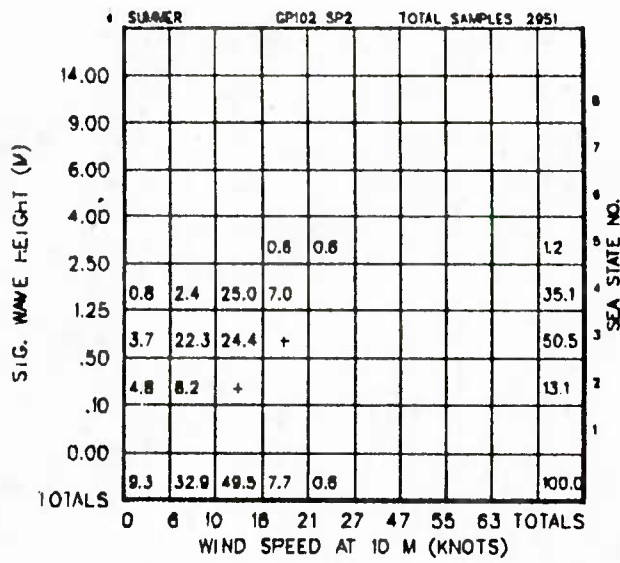


Figure A-102-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

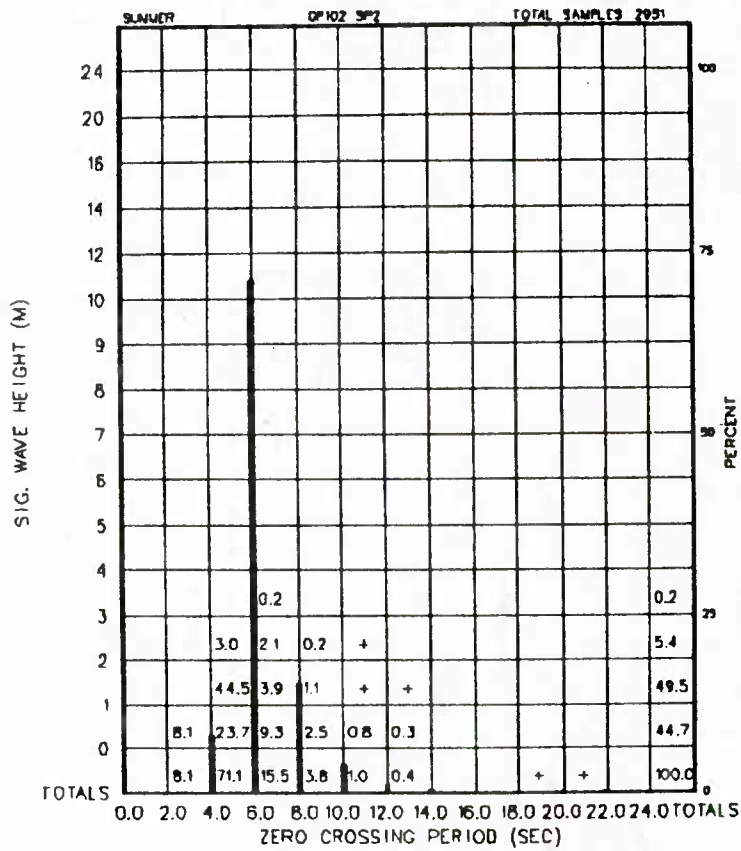


Figure A-102-4-6 Significant Wave Height vs. Zero Crossing Period

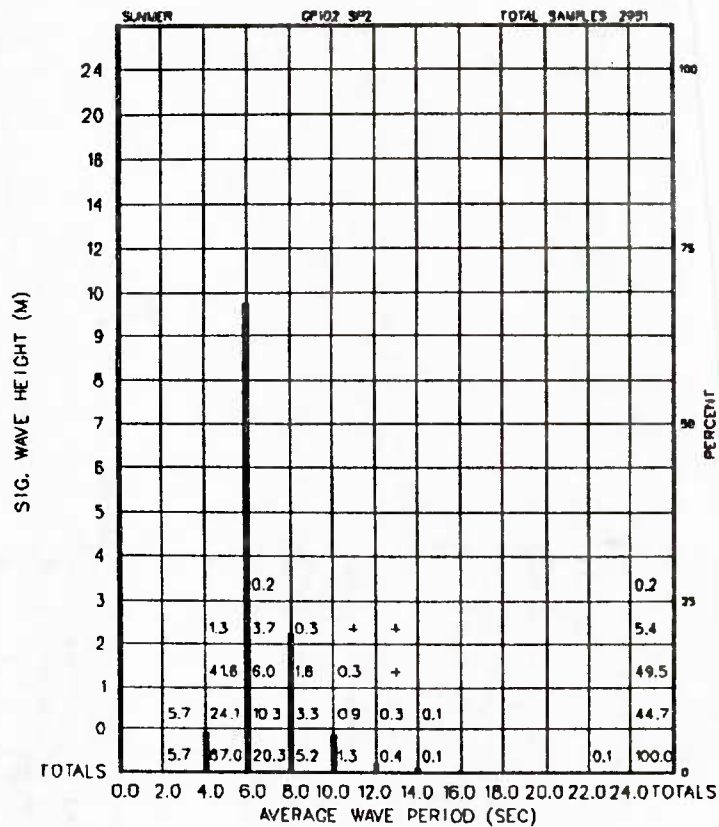


Figure A-102-4-7 Significant Wave Height vs. Average Wave Period

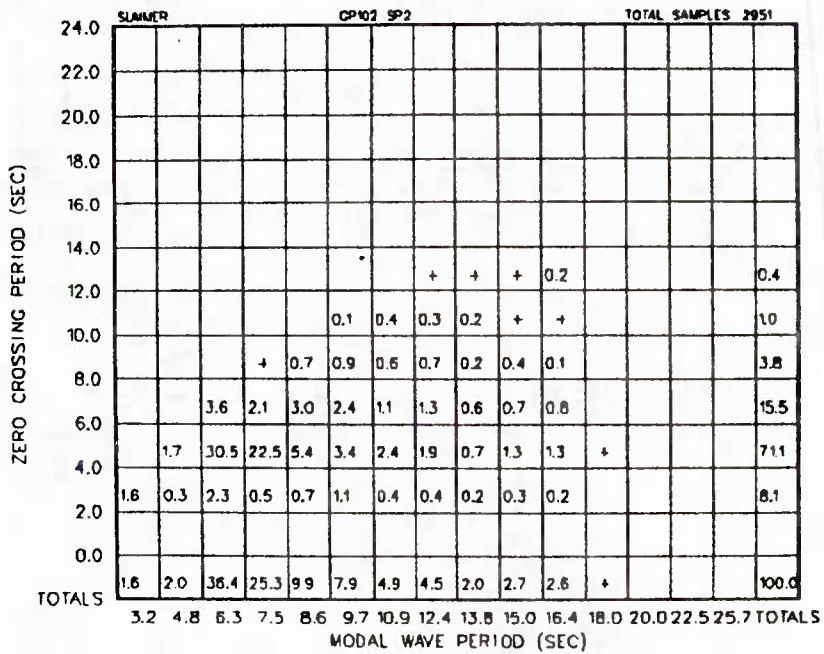


Figure A-102-4-8 Zero Crossing Period vs. Modal Wave Period

SWMMER GP102 SP2 TOTAL SAMPLES 2951

	3.2	4.8	6.3	7.5	8.6	9.7	10.9	12.4	13.8	15.0	16.4	18.0	20.0	22.5	25.7	TOTALS
24.0																
22.0																
20.0																
18.0																
16.0																
14.0											0.1					0.1
12.0								+ 0.1		+ 0.1						0.4
10.0						0.1	0.4	0.4	0.2	0.1		+				1.3
8.0				+ 0.9	1.2	0.8	1.0	0.3	0.6	0.3						5.2
6.0			4.3	3.8	4.4	2.8	1.4	1.1	0.9	0.7	1.1					20.3
4.0		1.9	30.7	2.1	4.0	3.1	2.1	1.8	0.3	1.1	0.8	+				67.0
2.0	1.6	0.1	1.5	0.4	0.5	0.7	0.1	0.2	0.2	+	0.1					5.7
0.0																
TOTALS	1.6	2.0	38.4	25.3	9.9	7.9	4.9	4.5	2.0	2.7	2.6	+				100.0

AVERAGE WAVE PERIOD (SEC)

MODAL WAVE PERIOD (SEC)

Figure A-102-4-9 Average Wave Period vs. Modal Wave Period

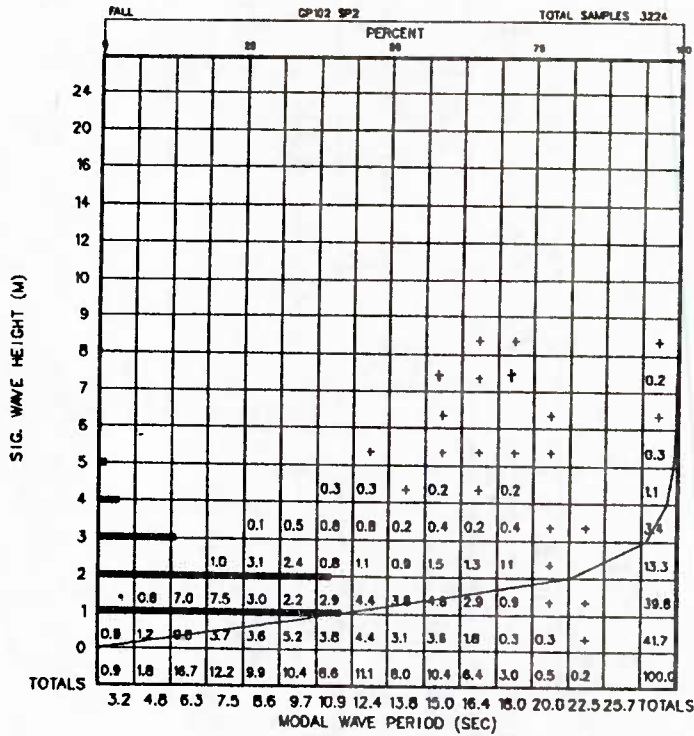


Figure A-102-5-1 Significant Wave Height vs. Modal Wave Period

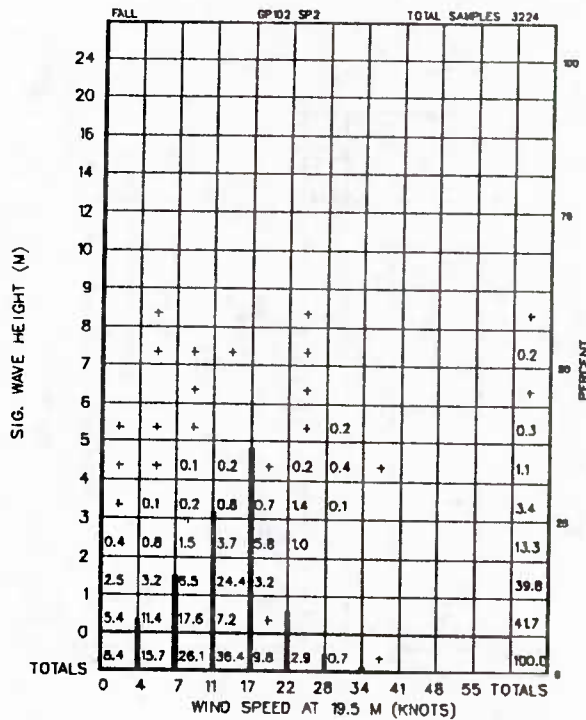


Figure A-102-5-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

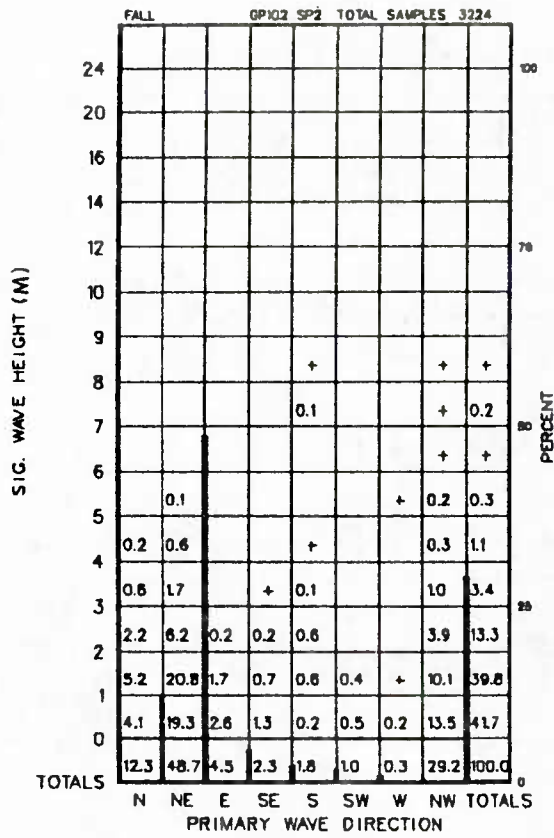


Figure A-102-5-3 Significant Wave Height vs. Primary Wave Direction

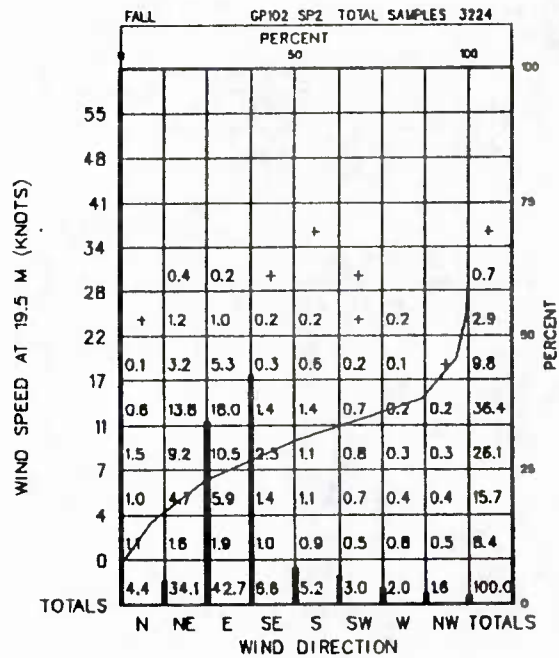


Figure A-102-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

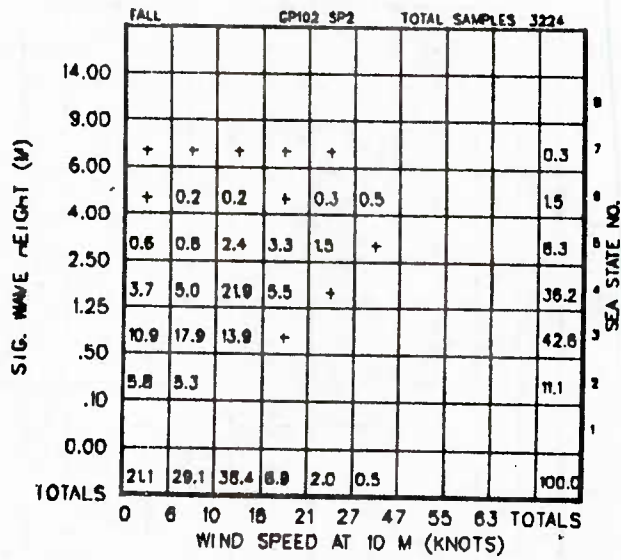


Figure A-102-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

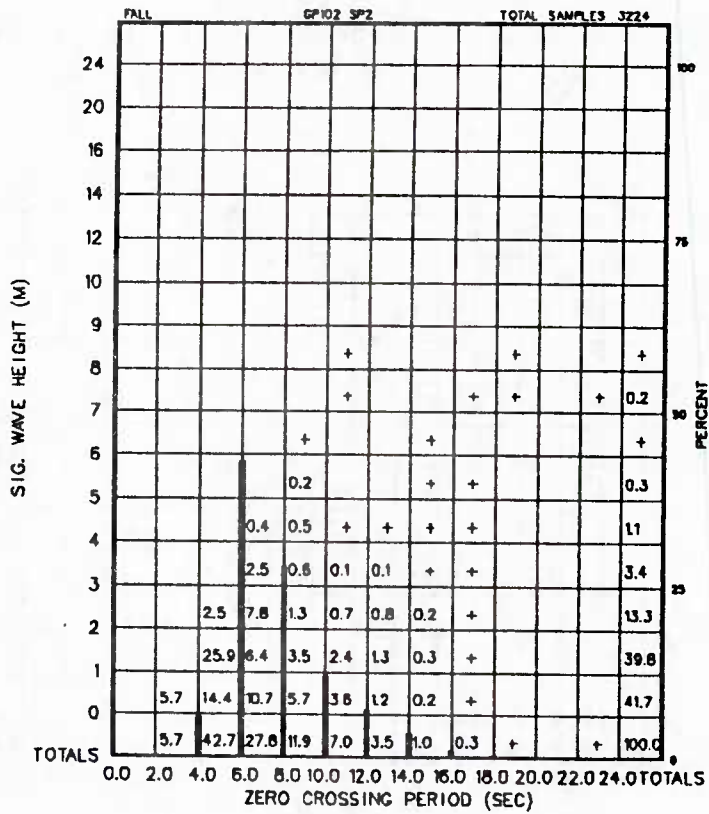


Figure A-102-5-6 Significant Wave Height vs. Zero Crossing Period

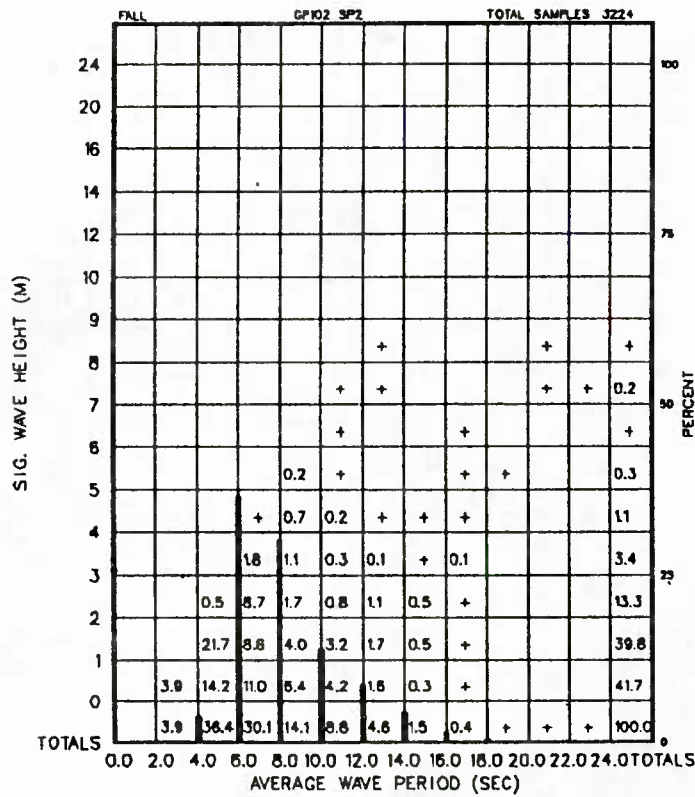


Figure A-102-5-7 Significant Wave Height vs. Average Wave Period

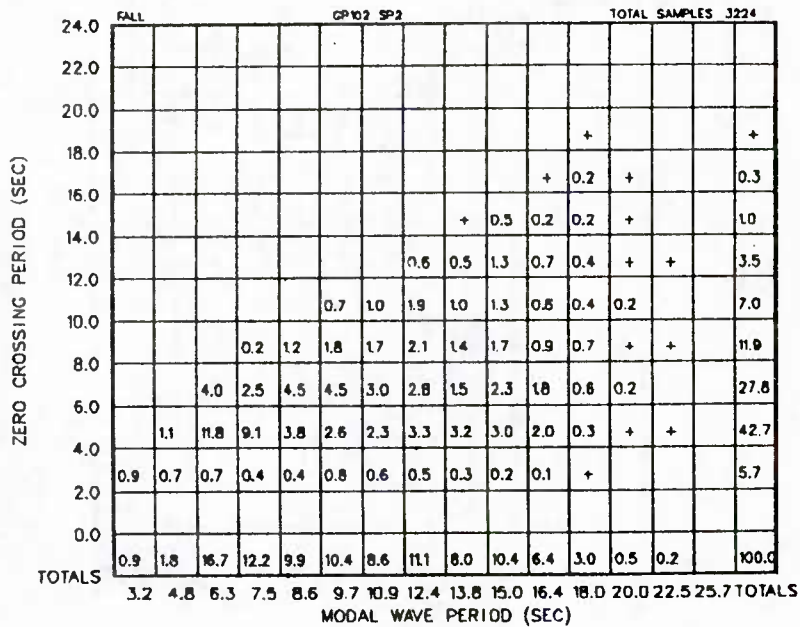


Figure A-102-5-8 Zero Crossing Period vs. Modal Wave Period

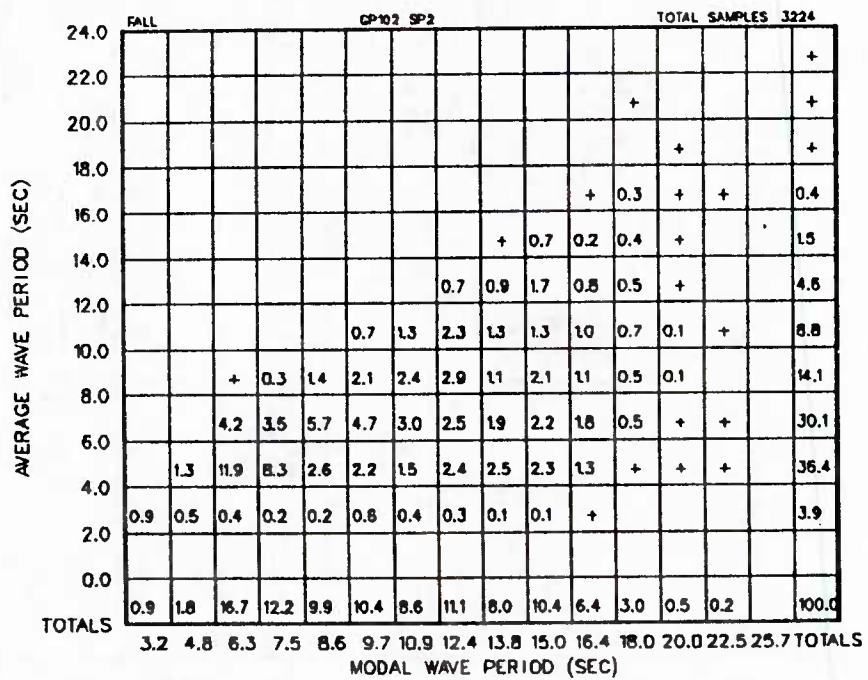


Figure A-102-5-9 Average Wave Period vs. Modal Wave Period

TABLE A-152-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 34.16°N, 163.78°E					
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.25. 6 -	2 10.5 -	5.5 17.5 -	2.5 11 -	1.5 9.7 W-N
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	3 0.5 -	13 2 -	31.5 5 -	14.5 2 -	14 2 SW
Visibility, nautical miles	5	18	25	-	-
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	1 0.5	7 6	8 7.5	- -	- -
Precipitation (Occurrence)	All precipitation - 17% of the time				
Relative Humidity, %	62	84	98	-	-
Air Temperature, °C	14	18	21	17.5	-
Sea Surface Temperature, °C	19	22	24	-	-
Sea Level Pressure, millibars	1002	1016	1028	-	-
Ice	None				
Refractivity Mean Surface Refractivity Sub-Refraction (1 km, Annual) Super-Refraction or Ducting (1 km, Annual)	- - -	- - -	- - -	352 - -	- 1% 2%

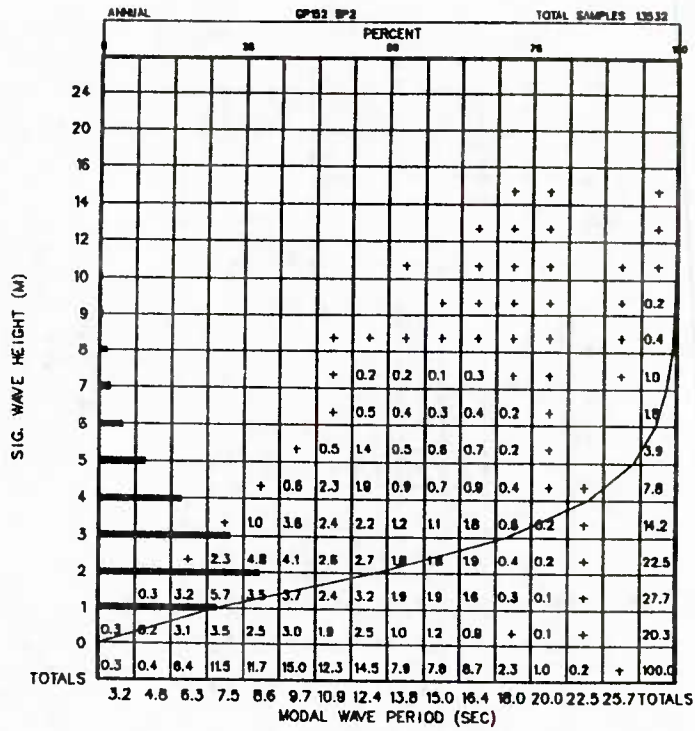


Figure A-152-1-1 Significant Wave Height vs. Modal Wave Period

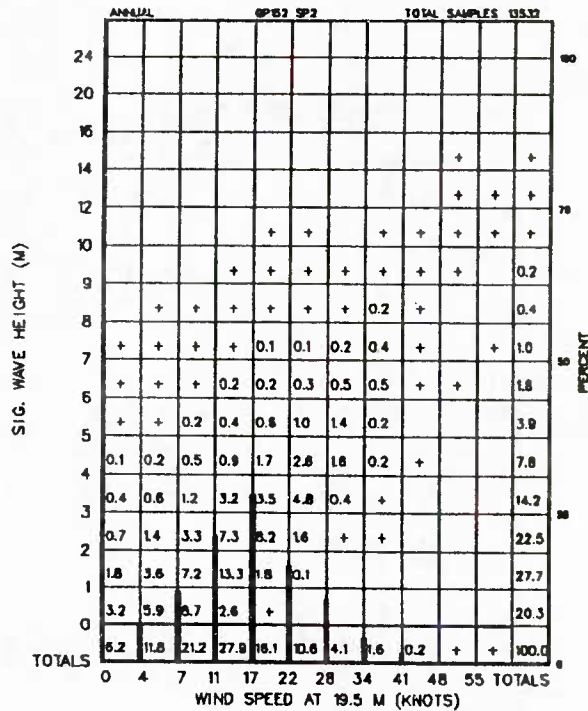


Figure A-152-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

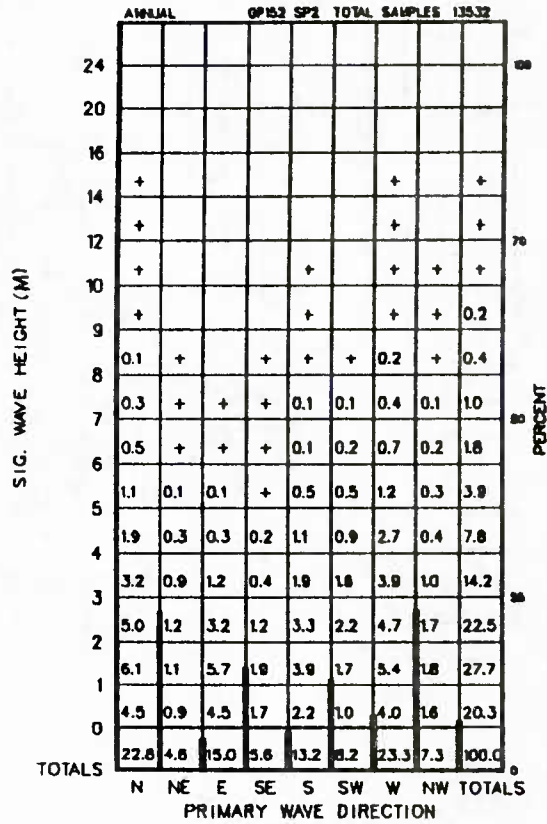


Figure A-152-1-3 Significant Wave Height vs. Primary Wave Direction

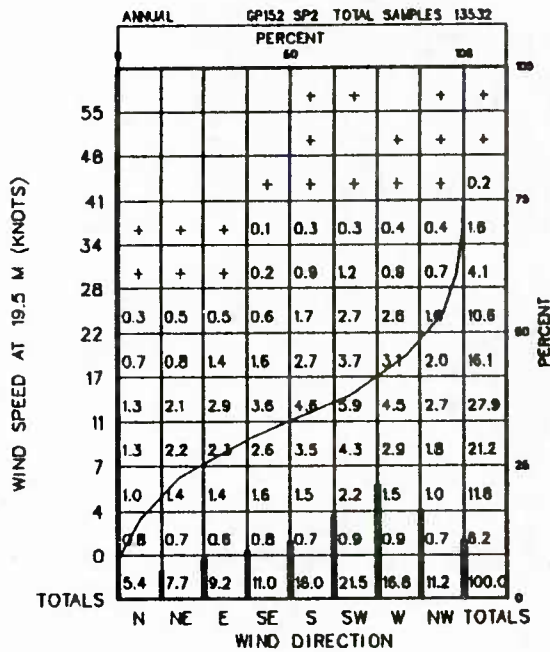


Figure A-152-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

SIG. WAVE HEIGHT (M)	ANNUAL		GP152 SP2			TOTAL SAMPLES 13532			SEA STATE NO.	
	0	6	10	16	21	27	47	55		63
14.00							+	+		+
9.00			+	+	+	0.2	+	+		0.3
6.00	+	0.1	0.3	0.4	0.8	1.8	+			3.2
4.00	0.4	0.7	1.6	2.5	4.2	2.2				11.7
2.50	1.8	2.7	6.9	6.6	4.6	0.3				24.7
1.25	4.3	7.3	15.9	4.8	0.2	+				32.4
.50	6.6	9.9	5.5	+						22.1
.10	3.3	2.3	+							5.6
0.00										
TOTALS	18.3	23.0	30.2	18.4	9.6	4.5	+	+		100.0

Figure A-152-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

SIG. WAVE HEIGHT (M)	ANNUAL		GP152 SP2			TOTAL SAMPLES 13532			PERCENT					
	0.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0		16.0	20.0	22.0	24.0	TOTALS
24														
20														
16														
14								+					+	
12								+					+	
10								+	+				+	
9						0.1	+						0.2	
8					+	0.3	+	+				+	0.4	
7						0.5	0.4	+	+	+	+	+	1.0	
6						1.3	0.4	+	+				1.8	
5					+	3.4	0.4	+	+				3.9	
4						3.1	4.1	0.5	+	+	+		7.8	
3						10.2	3.1	0.7	0.2	+	+		14.2	
2						3.0	14.9	3.4	0.9	0.2	+		22.5	
1						13.6	9.3	3.3	1.1	0.3	+	+	27.7	
0						2.1	6.7	6.6	3.6	1.1	0.2	+	+	20.3
TOTALS	2.1	23.4	44.1	22.7	3.9	1.4	0.3	+	+	+	+	+	100.0	

Figure A-152-1-6 Significant Wave Height vs. Zero Crossing Period

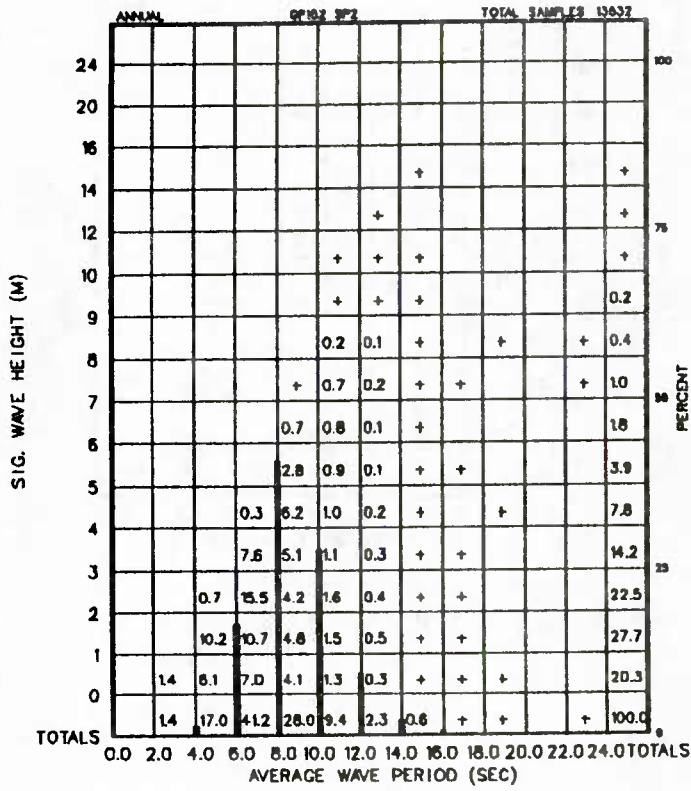


Figure A-152-1-7 Significant Wave Height vs. Average Wave Period

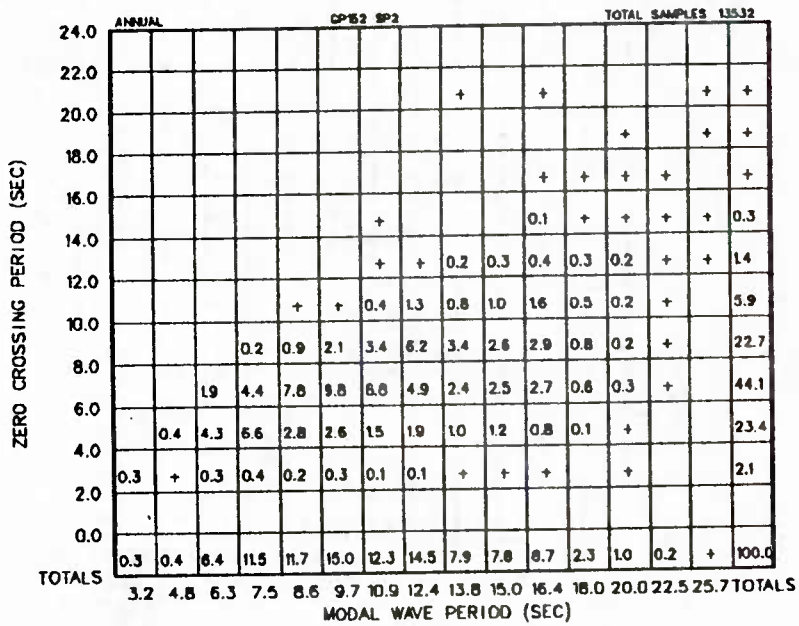


Figure A-152-1-8 Zero Crossing Period vs. Modal Wave Period

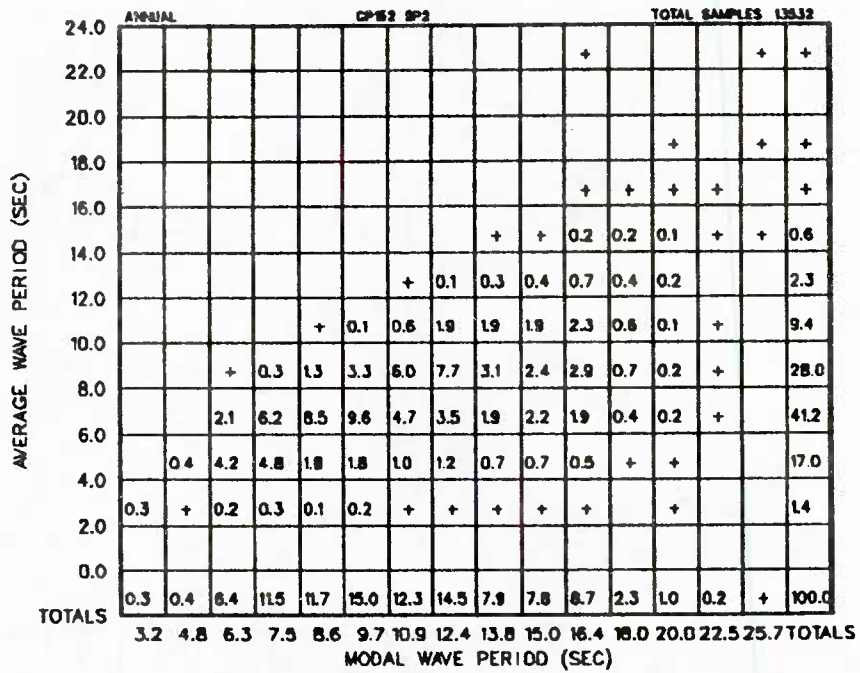


Figure A-152-1-9 Average Wave Period vs. Modal Wave Period

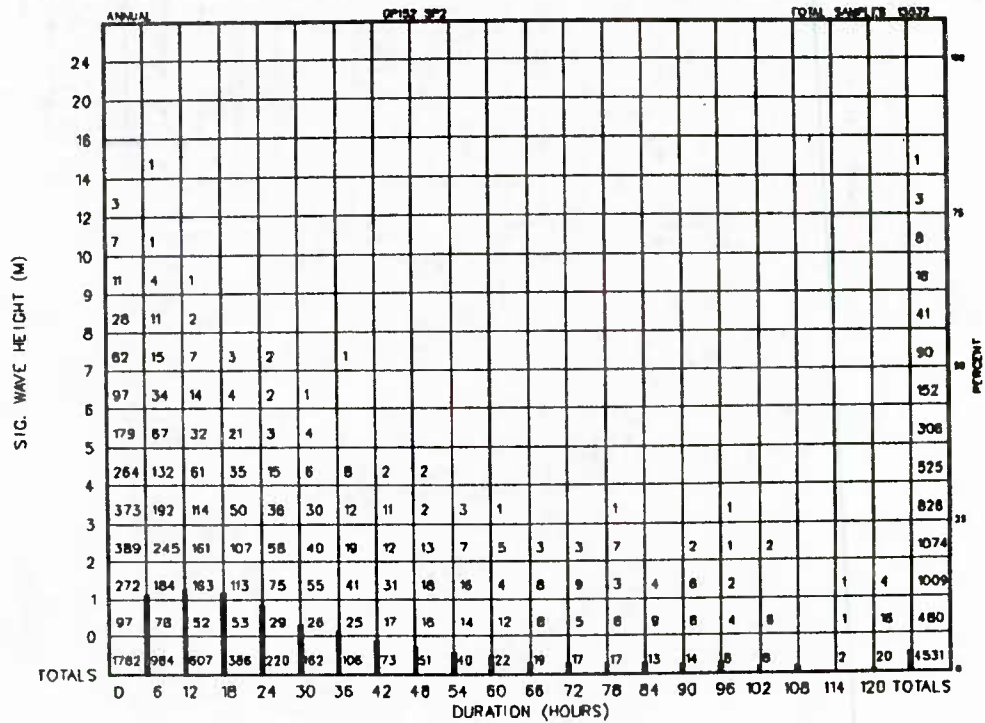


Figure A-152-1-10 Persistence of Wave Height

		ANNUAL												OPIS2 SP2												TOTAL SAMPLES 13122	
		0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	TOTALS				
55	4																						4	%			
48	5			1																			6				
41	22	1	2																				25				
34	92	30	8	8	1			1															136				
28	249	73	31	9	6	1																	369				
22	483	195	79	35	15	10			3	2	1												823				
17	780	297	117	56	22	13	2	3	1														1291	%			
11	887	417	205	128	54	36	22	11	8	8	4	1									1		1780				
7	919	340	141	79	39	18	13	5	1	2	3		1					1	1				1561				
4	637	202	88	29	24	5	3	2															968				
0	317	99	50	19	5	4	8					1											501				
TOTALS	4375	1554	718	363	166	85	47	24	12	9	7	2	1					1	1		1		7408				

Figure A-152-1-11 Persistence of Wind Speed at 19.5 M (Knots)

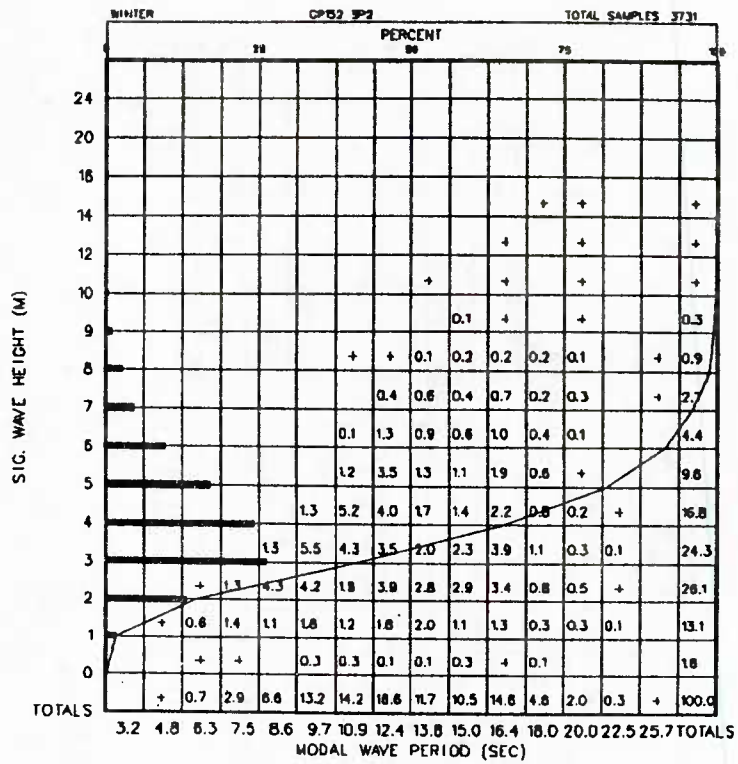


Figure A-152-2-1 Significant Wave Height vs. Modal Wave Period

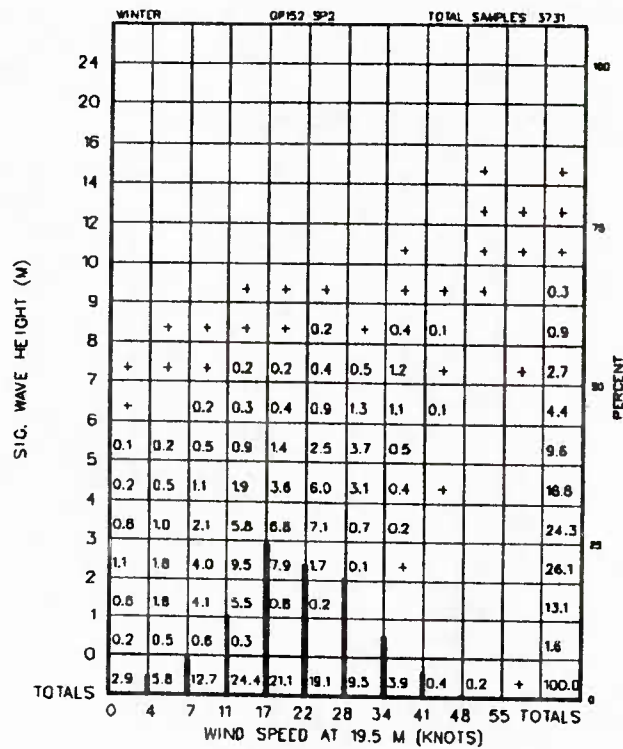


Figure A-152-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

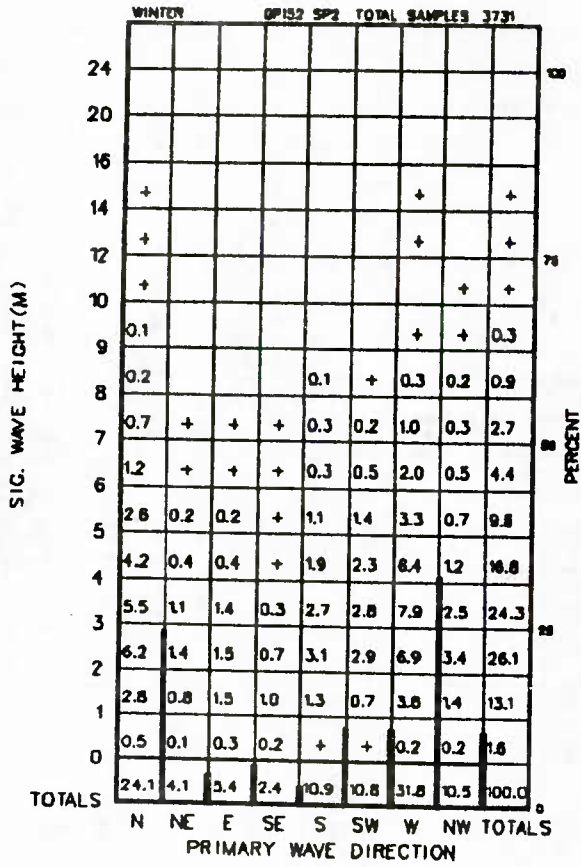


Figure A-152-2-3 Significant Wave Height vs. Primary Wave Direction

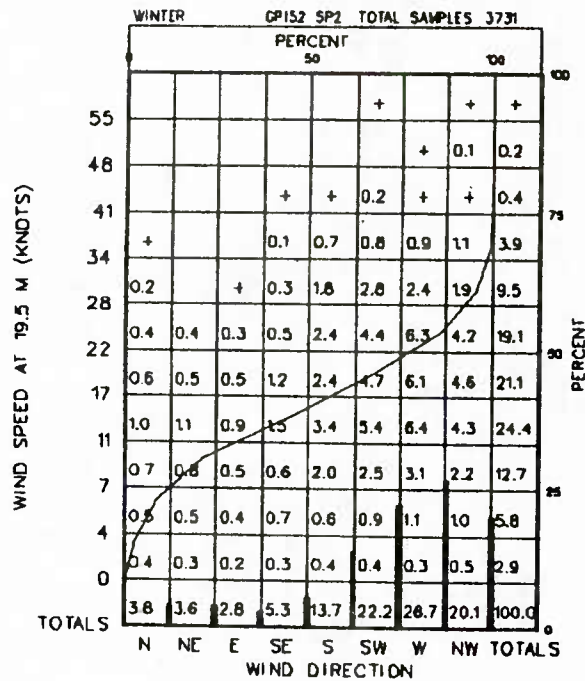


Figure A-152-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

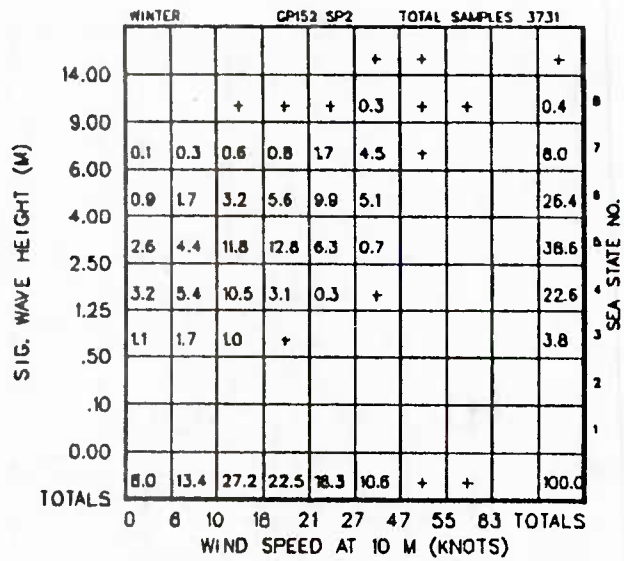


Figure A-152-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

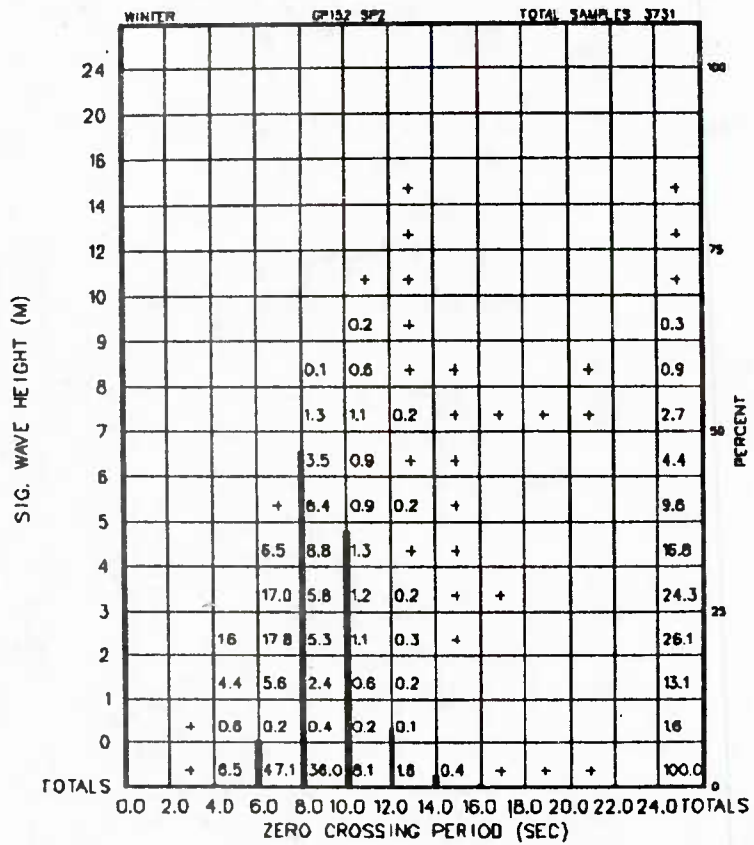


Figure A-152-2-6 Significant Wave Height vs. Zero Crossing Period

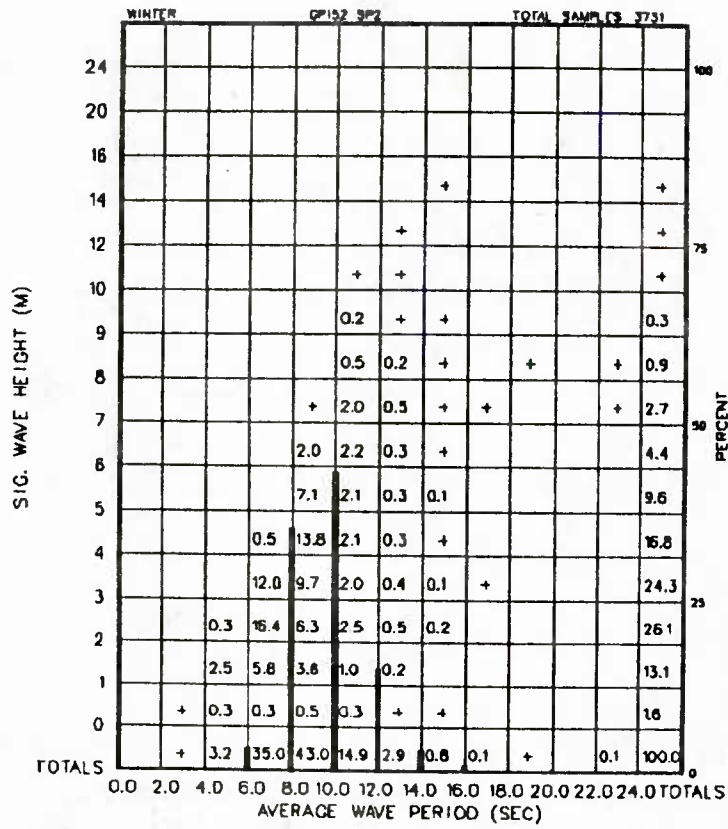


Figure A-152-2-7 Significant Wave Height vs. Average Wave Period

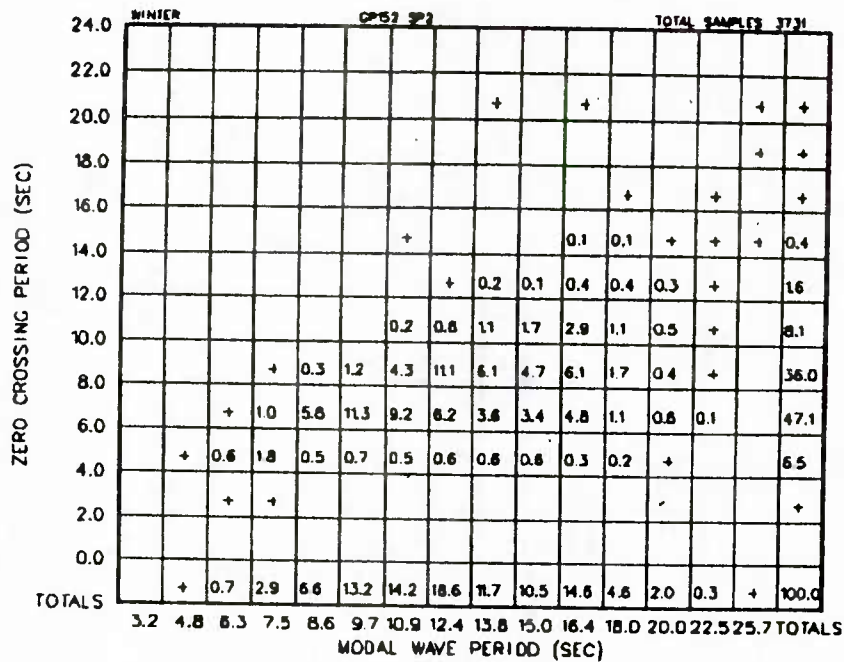


Figure A-152-2-8 Zero Crossing Period vs. Modal Wave Period

		WINTER				CP152 SP2				TOTAL SAMPLES 3731								
24.0													+	+	0.1			
22.0																		
20.0																		
18.0														+	+			
16.0														+	0.1			
14.0											0.2	0.3	0.3	+	0.8			
12.0							0.1	0.3	0.3	10	0.8	0.5			2.9			
10.0							0.3	1.8	3.0	3.3	4.5	1.5	0.3	+	14.9			
8.0				+	0.4	2.9	9.3	13.0	5.3	4.2	5.9	1.3	0.5	+	43.0			
6.0					0.1	2.0	6.0	10.1	4.3	3.5	2.8	2.3	2.9	0.6	0.3	0.1	35.0	
4.0		+			0.6	0.8	0.3	0.2	0.2	0.2	0.2	0.4	0.1	0.1			3.2	
2.0																	+	
0.0																		
TOTALS		+	0.7	2.9	6.6	13.2	14.2	18.6	11.7	10.5	14.6	4.6	2.0	0.3	+	100.0		
			3.2	4.8	6.3	7.5	8.6	9.7	10.9	12.4	13.8	15.0	16.4	18.0	20.0	22.5	25.7	TOTALS
																		MODAL WAVE PERIOD (SEC)

Figure A-152-2-9 Average Wave Period vs. Modal Wave Period

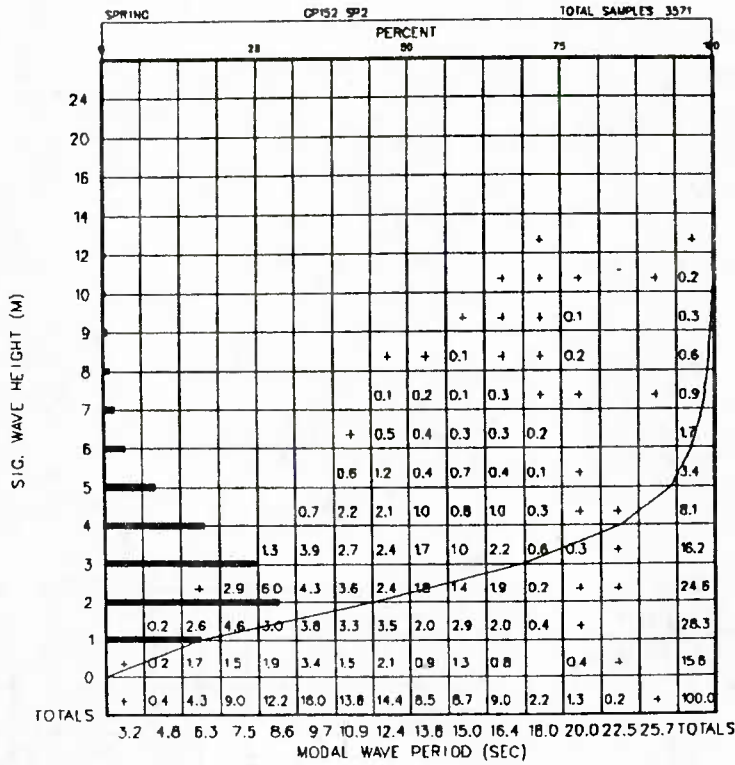


Figure A-152-3-1 Significant Wave Height vs. Modal Wave Period

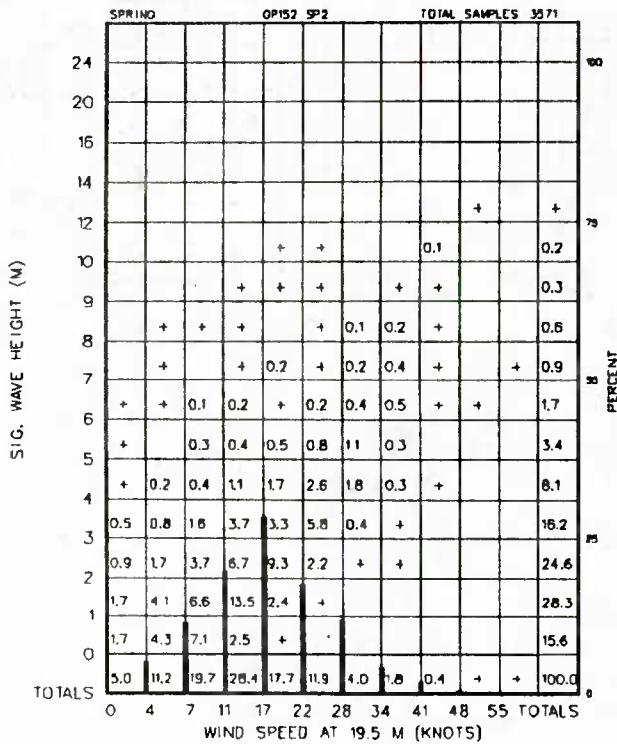


Figure A-152-3-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

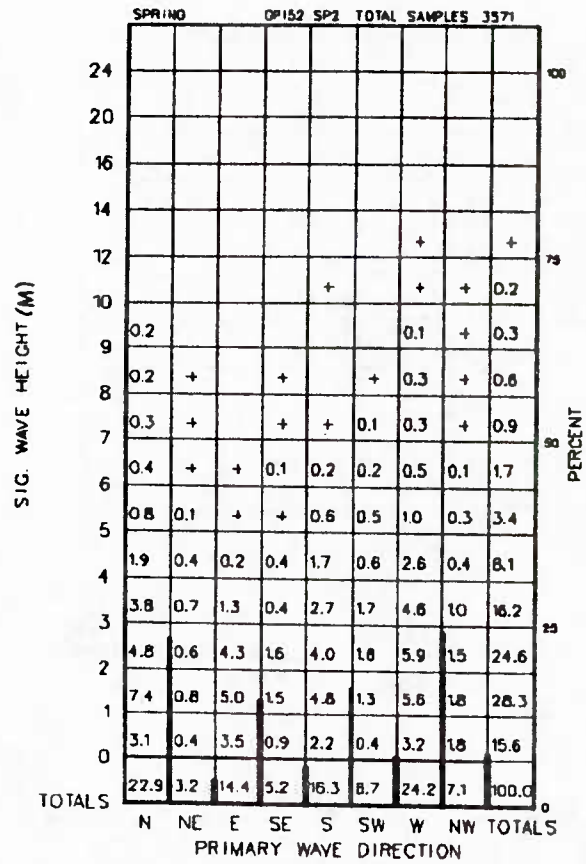


Figure A-152-3-3 Significant Wave Height vs. Primary Wave Direction

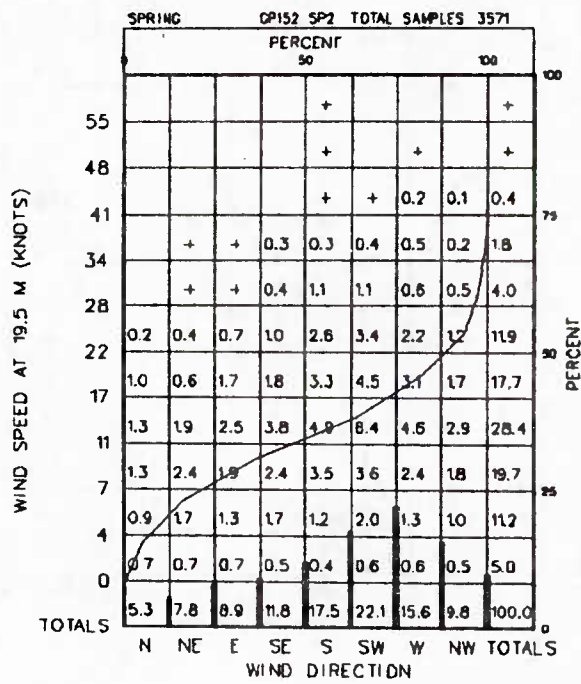


Figure A-152-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

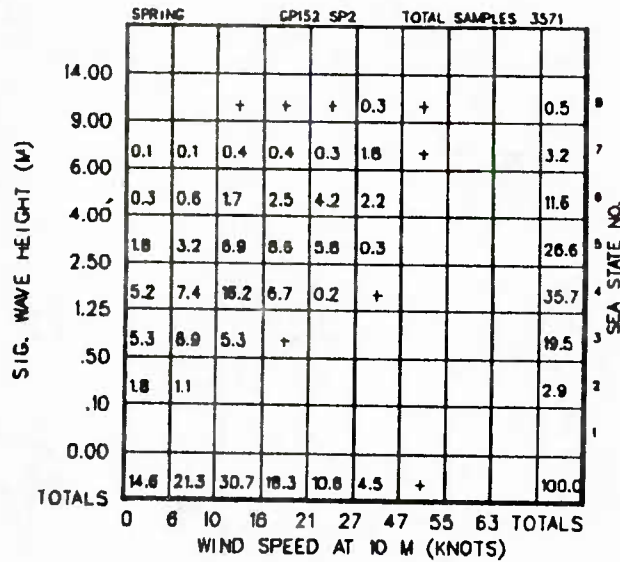


Figure A-152-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

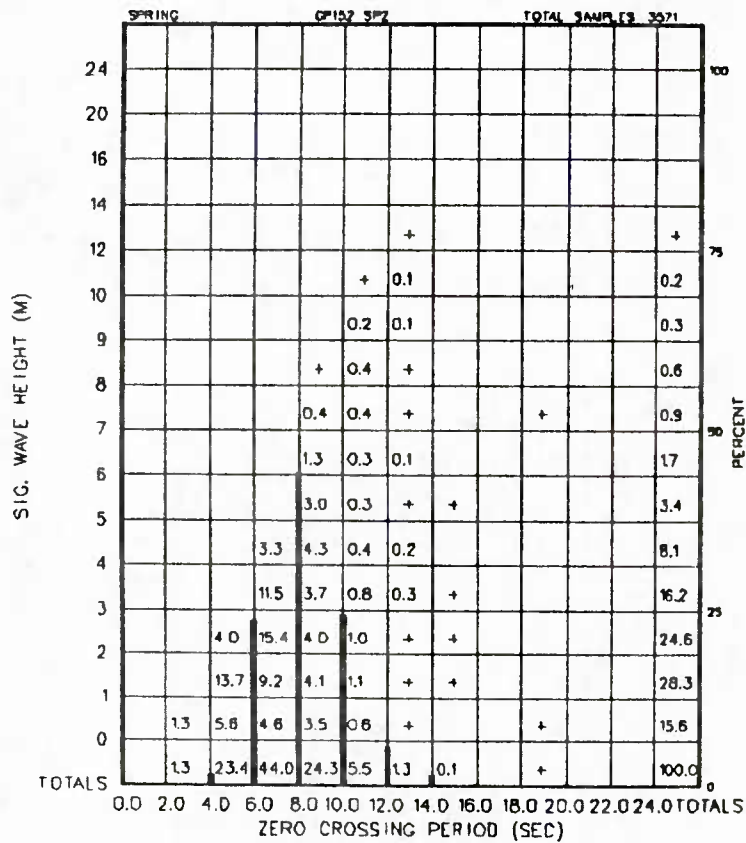


Figure A-152-3-6 Significant Wave Height vs. Zero Crossing Period

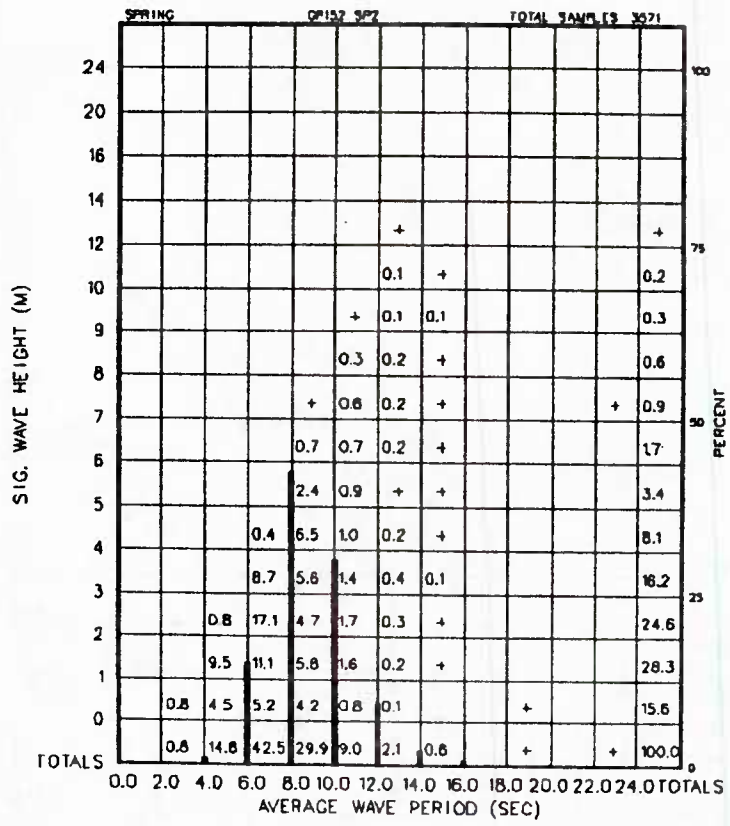


Figure A-152-3-7 Significant Wave Height vs. Average Wave Period

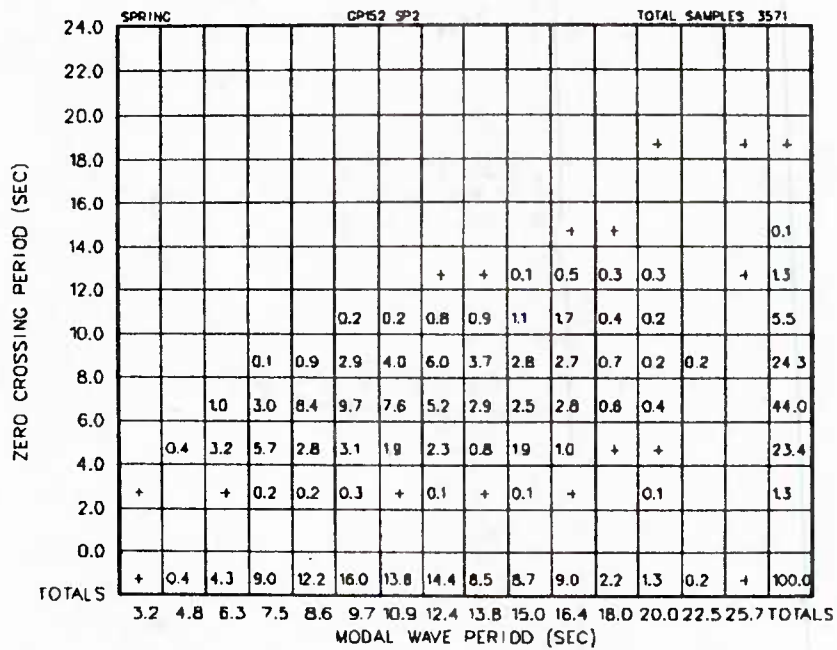


Figure A-152-3-8 Zero Crossing Period vs. Modal Wave Period

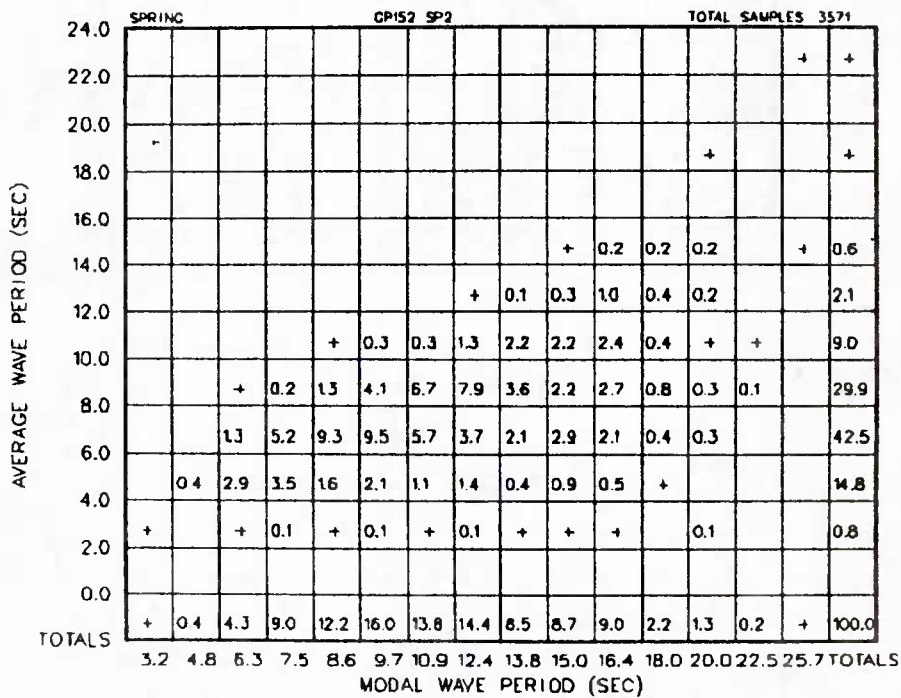


Figure A-152-3-9 Average Wave Period vs. Modal Wave Period

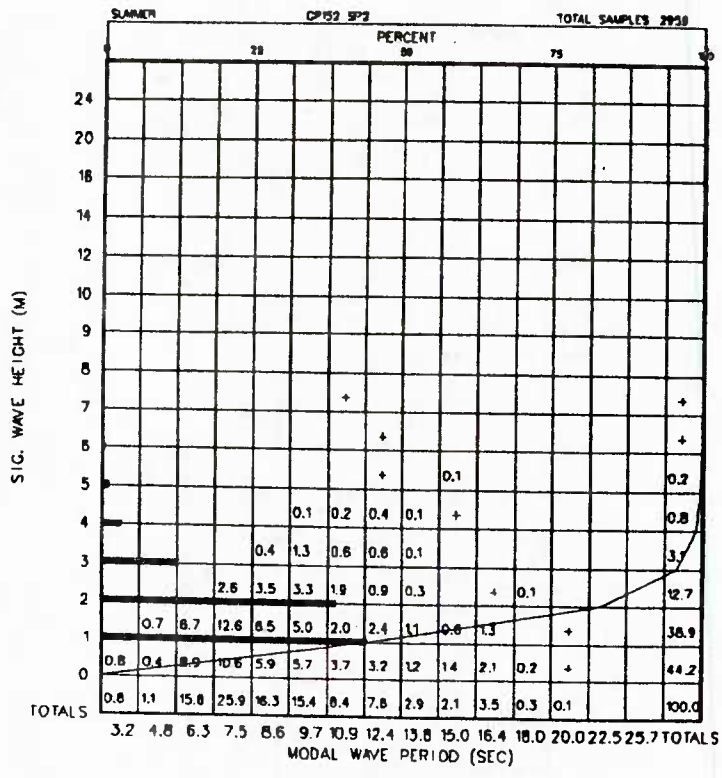


Figure A-152-4-1 Significant Wave Height vs. Modal Wave Period

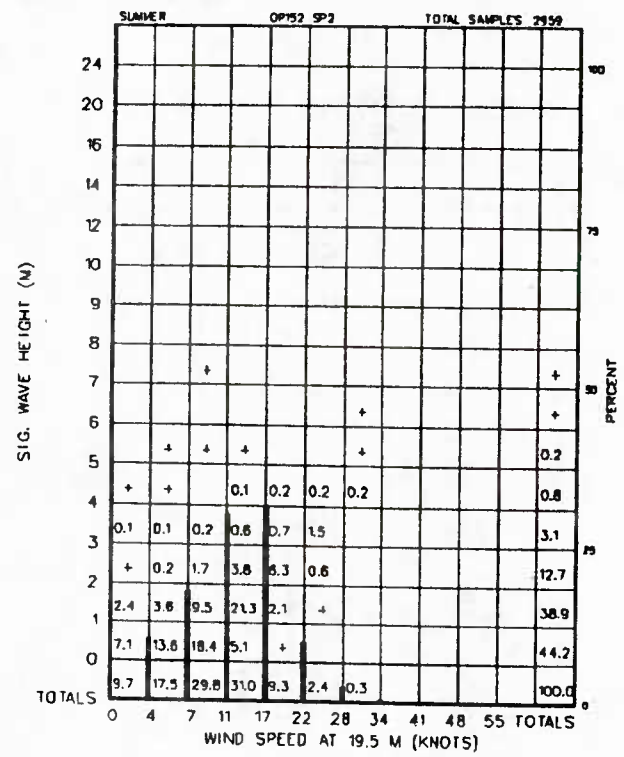


Figure A-152-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

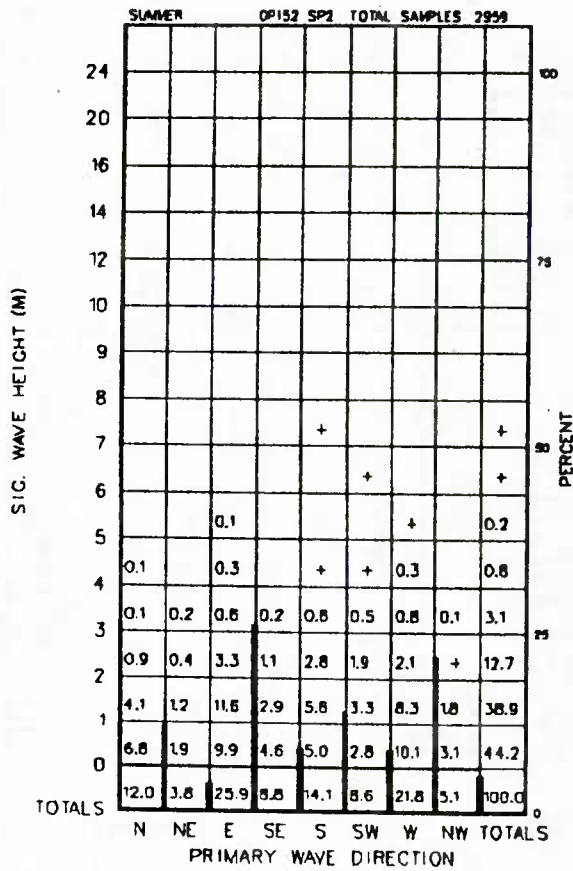


Figure A-152-4-3 Significant Wave Height vs. Primary Wave Direction

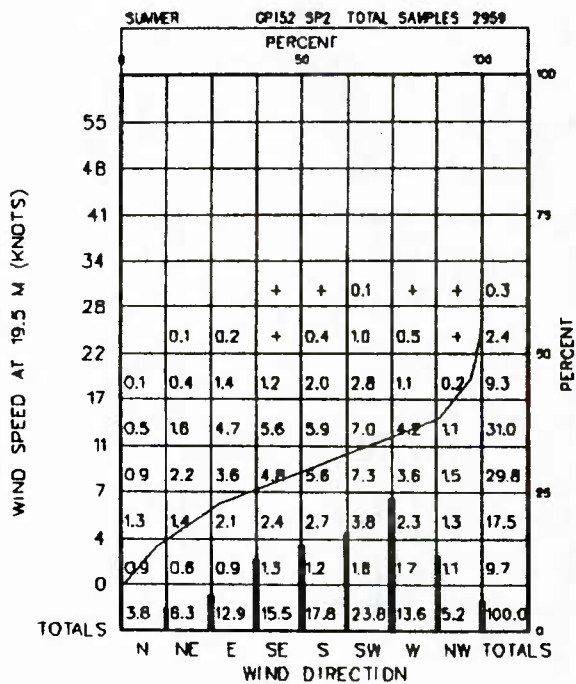


Figure A-152-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

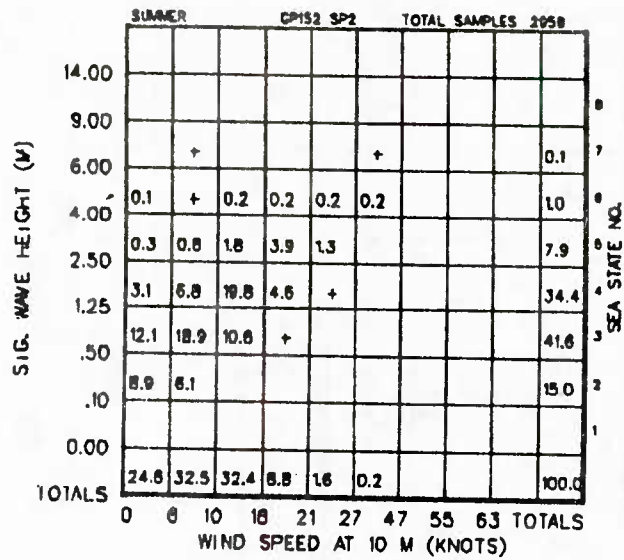


Figure A-152-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

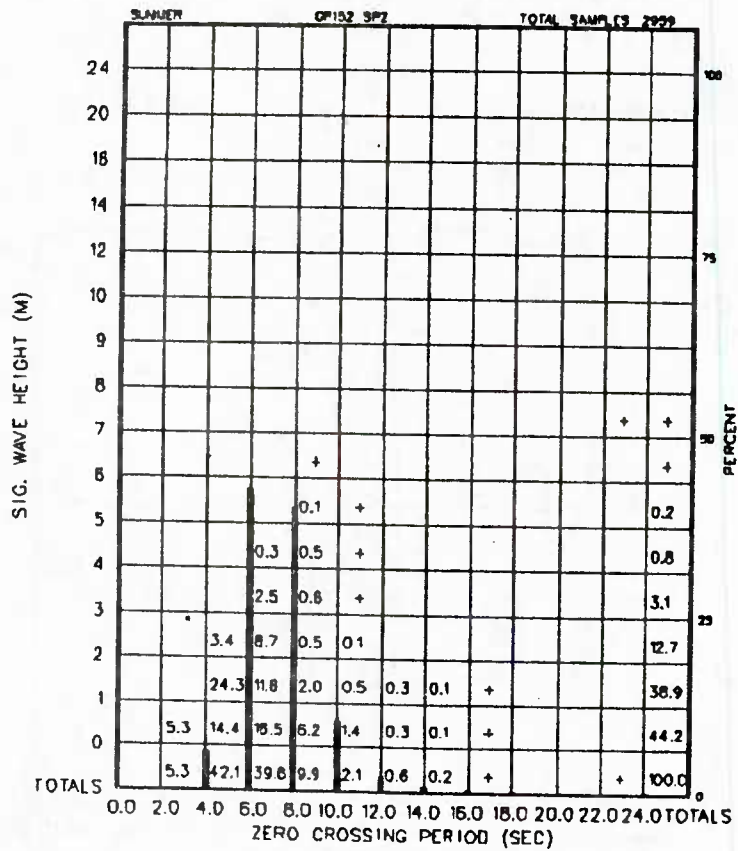


Figure A-152-4-6 Significant Wave Height vs. Zero Crossing Period

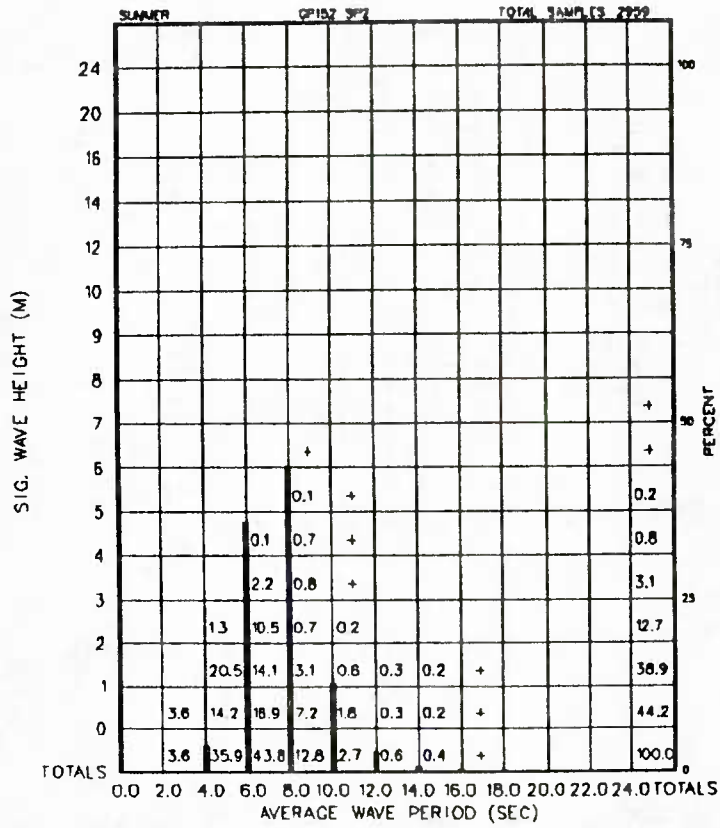


Figure A-152-4-7 Significant Wave Height vs. Average Wave Period

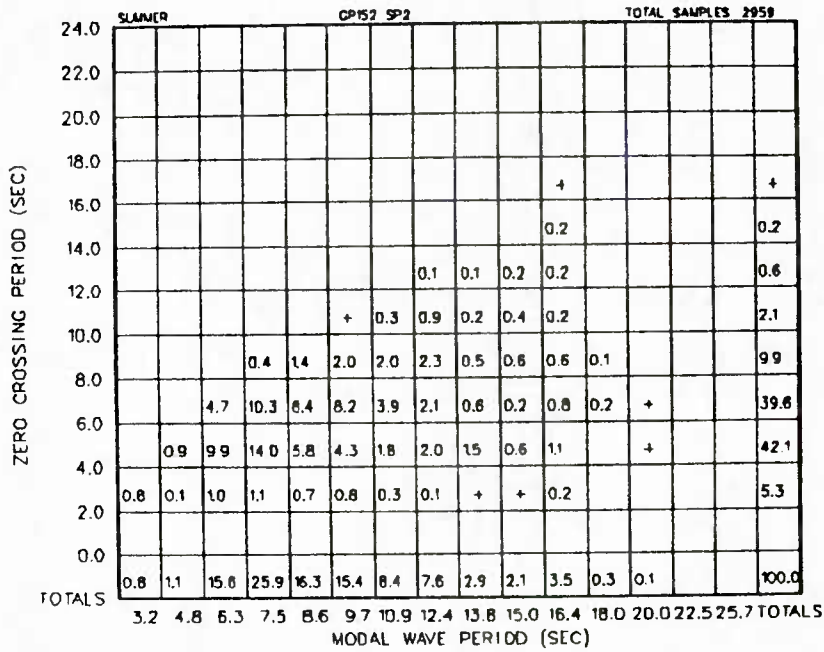


Figure A-152-4-8 Zero Crossing Period vs. Modal Wave Period

AVERAGE WAVE PERIOD (SEC)	SUMMER CP152 SP2														TOTAL SAMPLES 2039	
	3.2	4.8	6.3	7.5	8.6	9.7	10.9	12.4	13.8	15.0	16.4	18.0	20.0	22.5	25.7	TOTALS
24.0																
22.0																
20.0																
18.0																
16.0																
14.0																
12.0																
10.0																
8.0																
6.0																
4.0																
2.0																
0.0																
TOTALS	0.8	1.1	15.8	25.9	16.3	15.4	8.4	7.6	2.9	2.1	3.5	0.3	0.1			100.0

Figure A-152-4-9 Average Wave Period vs. Modal Wave Period

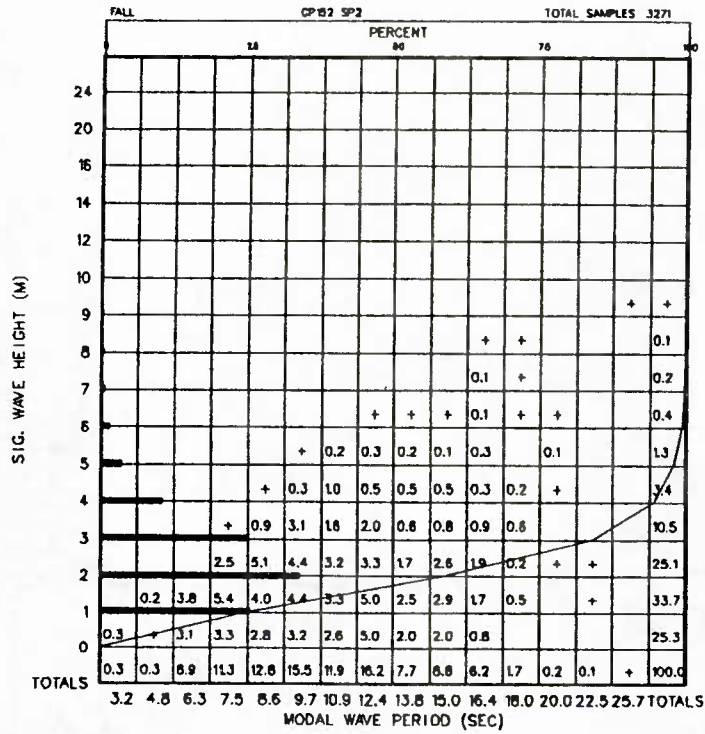


Figure A-152-5-1 Significant Wave Height vs. Modal Wave Period

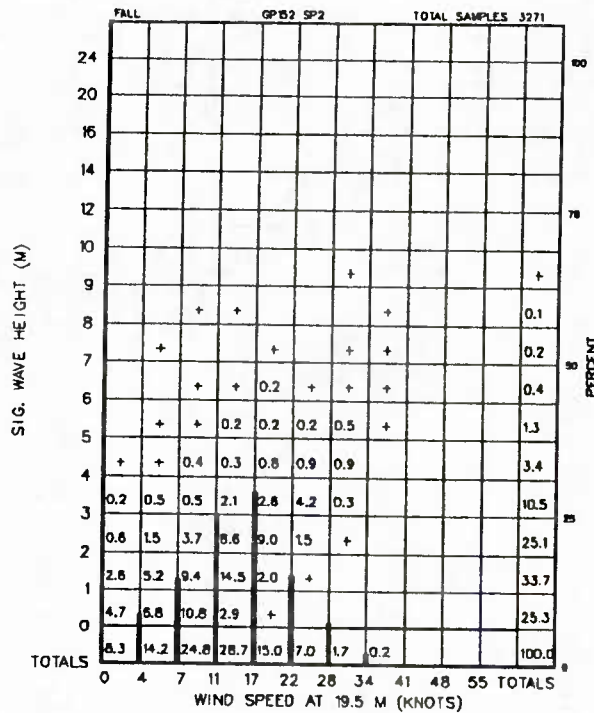


Figure A-152-5-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

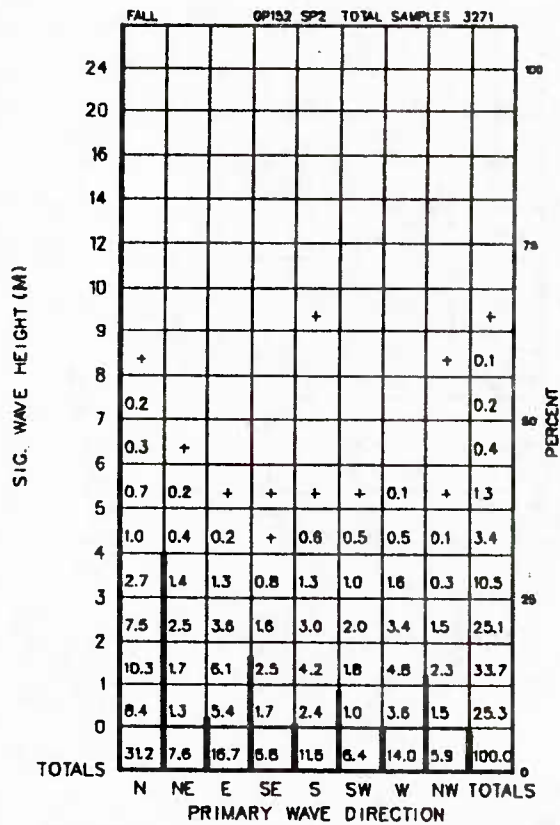


Figure A-152-5-3 Significant Wave Height vs. Primary Wave Direction

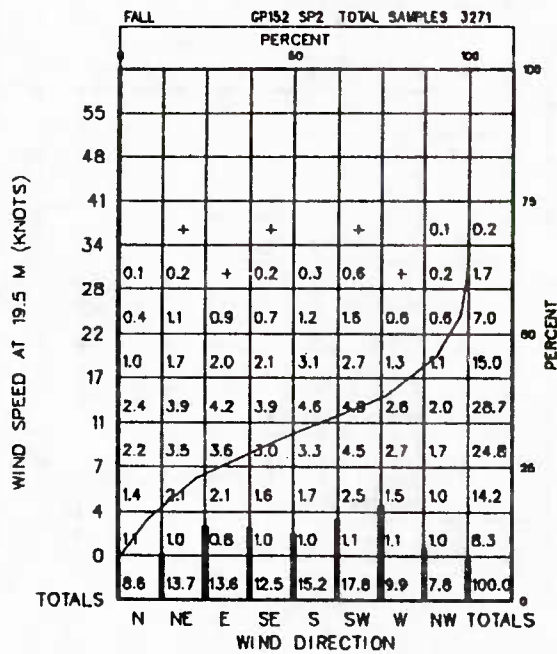


Figure A-152-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

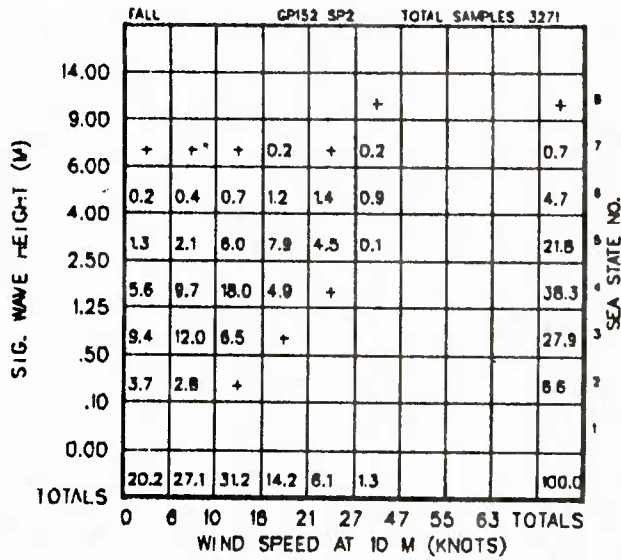


Figure A-152-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

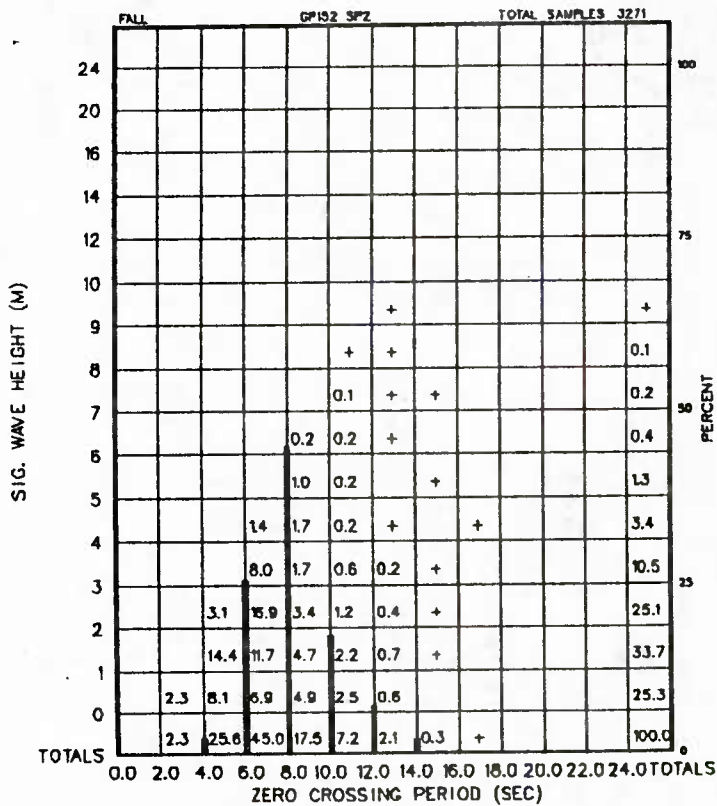


Figure A-152-5-6 Significant Wave Height vs. Zero Crossing Period

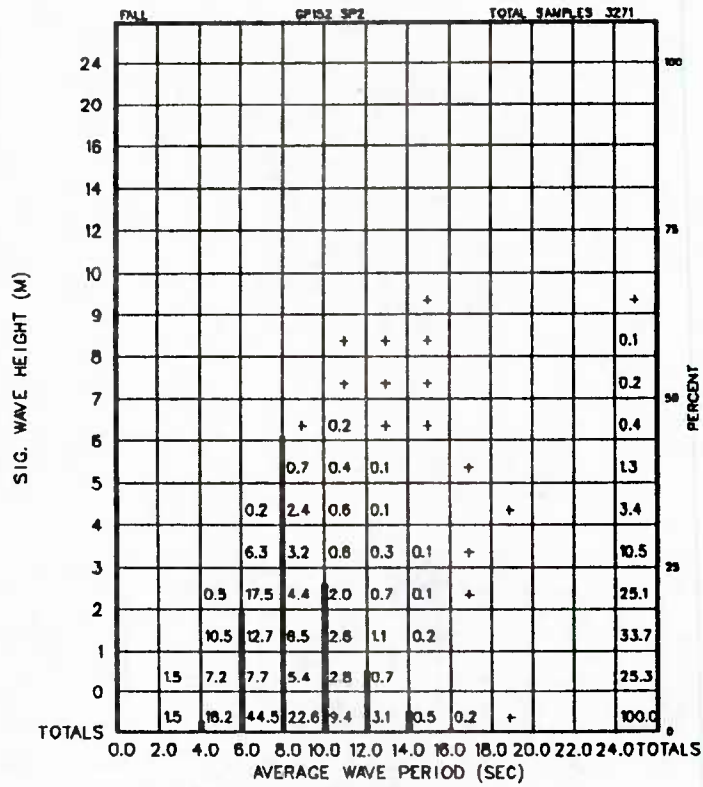


Figure A-152-5-7 Significant Wave Height vs. Average Wave Period

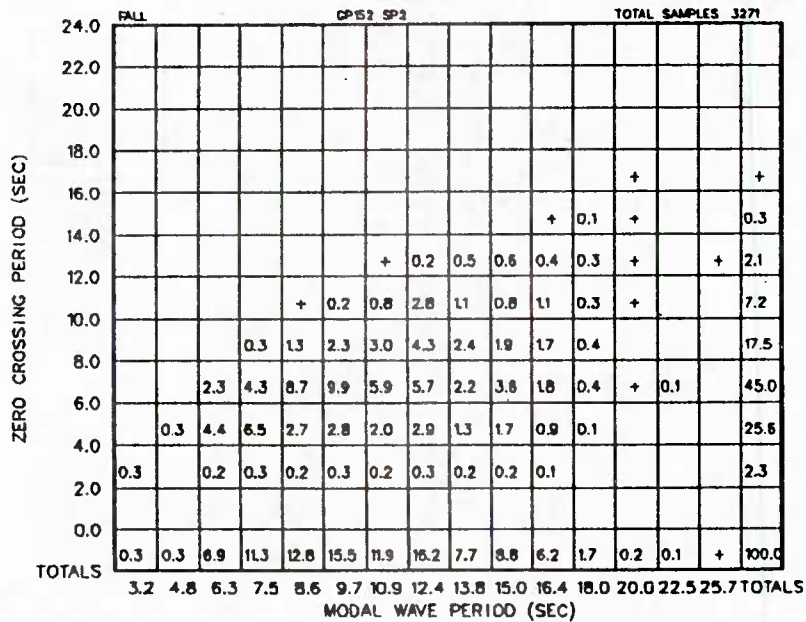


Figure A-152-5-8 Zero Crossing Period vs. Modal Wave Period

AVERAGE WAVE PERIOD (SEC)	FALL GPE2 SP2													TOTAL SAMPLES 3271		
	3.2	4.8	6.3	7.5	8.6	9.7	10.9	12.4	13.8	15.0	16.4	18.0	20.0	22.5	25.7	TOTALS
24.0																
22.0																
20.0																
18.0															+	+
16.0															+	+
14.0															+	+
12.0																
10.0																
8.0																
6.0																
4.0																
2.0																
0.0																
TOTALS	0.3	0.3	6.9	11.3	12.8	15.5	11.9	16.2	7.7	8.8	6.2	1.7	0.2	0.1	+	100.0

Figure A-152-5-9 Average Wave Period vs. Modal Wave Period

TABLE A-165-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

Natural Environment	SEASON: ANNUAL; LOCATION: 25.19°N, 179.77°E					Mean	Most Probable
	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)				
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.25 6 -	1.5 9.5 -	3.5 17 -			1.5 11 -	1.5 7.5 E
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	2 0.5 -	8.5 1.25 -	21 2.5 -			11 1.5 -	14 1.75 E
Visibility, nautical miles	7	20	25			-	-
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	0.5 0	5.5 3.5	8 8			- -	- -
Precipitation (Occurrence)	All precipitation - 8% of the time						
Relative Humidity, %	60	80	97			-	-
Air Temperature, °C	17	21	26			21	-
Sea Surface Temperature, °C	20	23	26			-	-
Sea Level Pressure, millibars	1008	1020	1028			-	-
Ice	None						
Refractivity Mean Surface Refractivity Sub-Refraction (1 km, Annual) Super-Refraction or Ducting (1 km, Annual)	- - -	- - -	- - -			352 - -	- 24 24

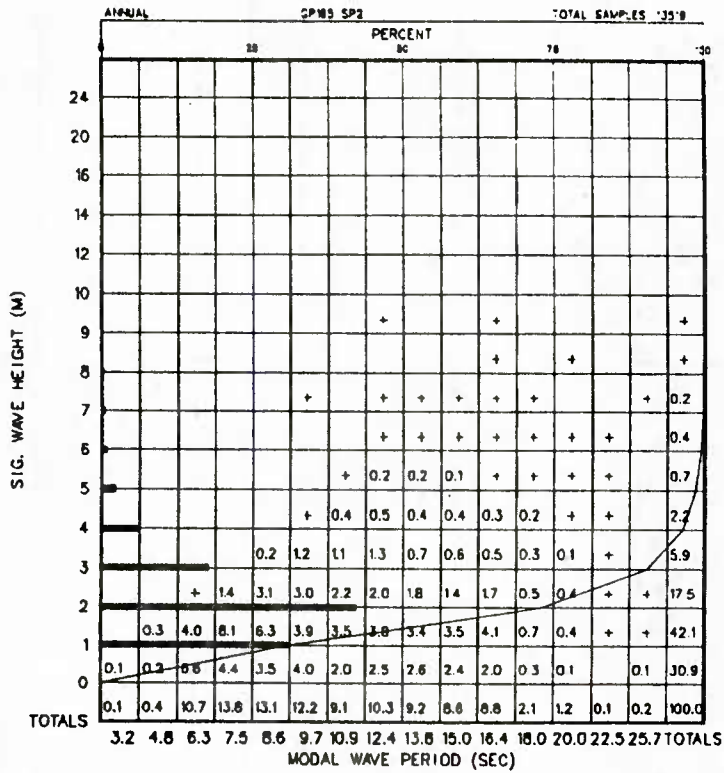


Figure A-165-1-1 Significant Wave Height vs. Modal Wave Period

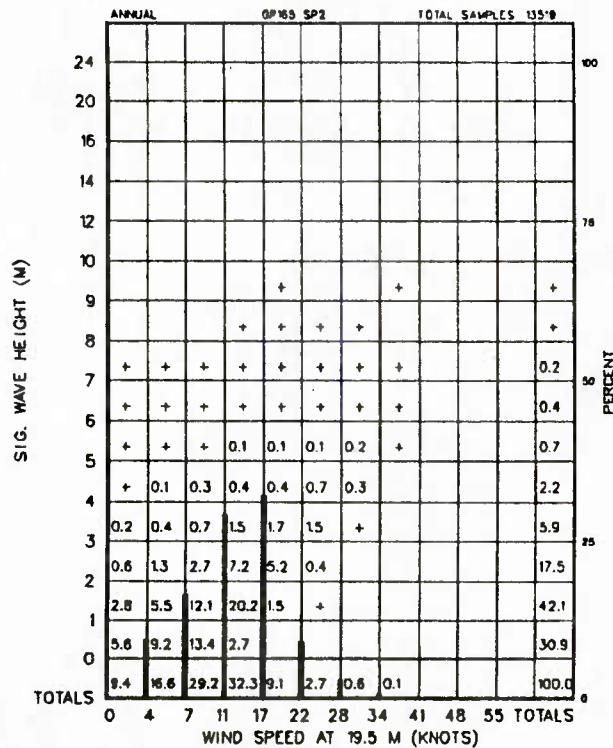


Figure A-165-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

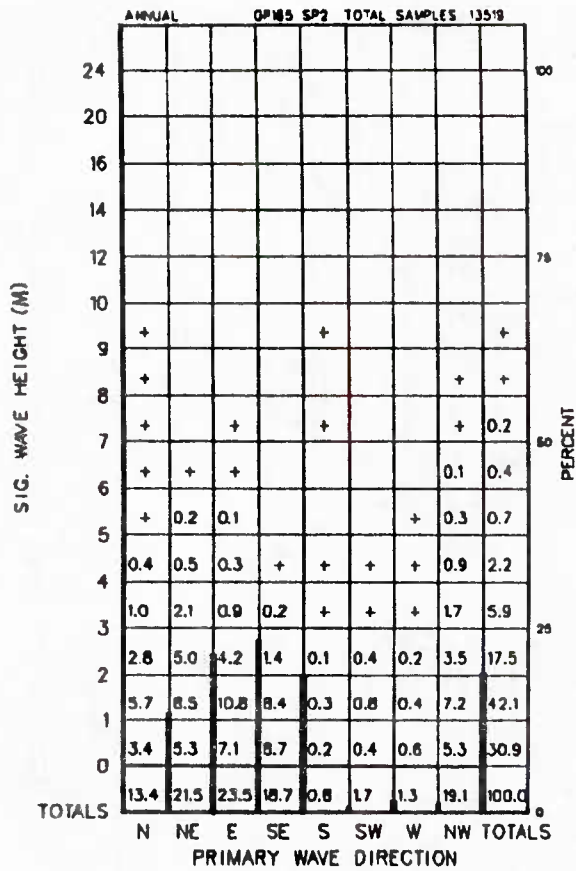


Figure A-165-1-3 Significant Wave Height vs. Primary Wave Direction

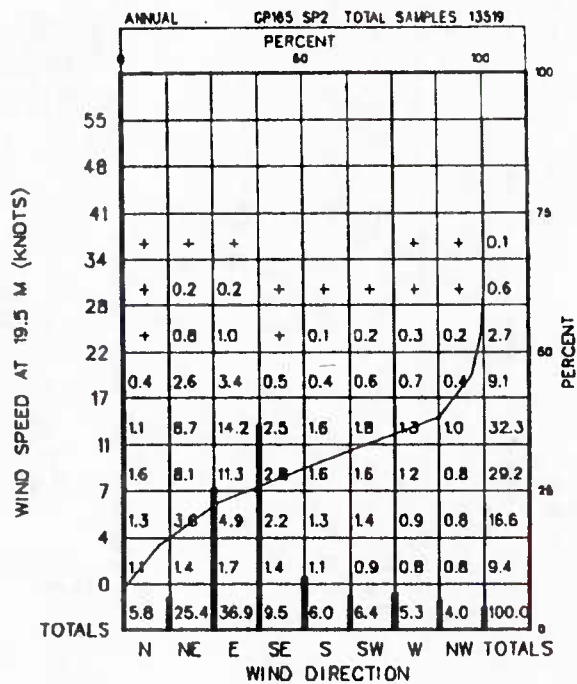


Figure A-165-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

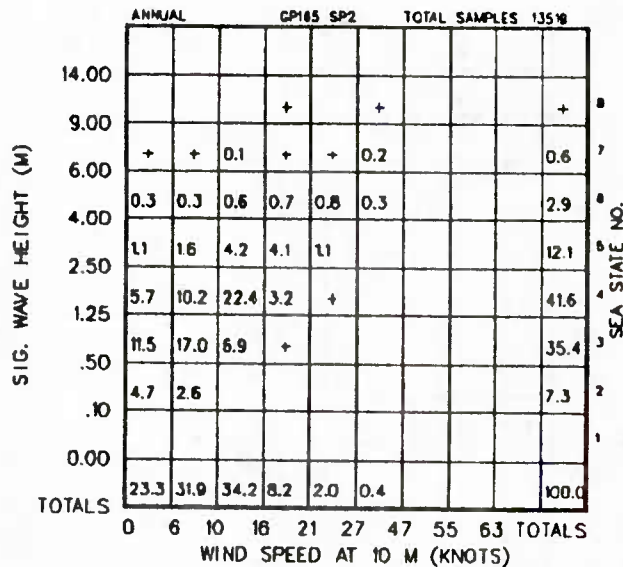


Figure A-165-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

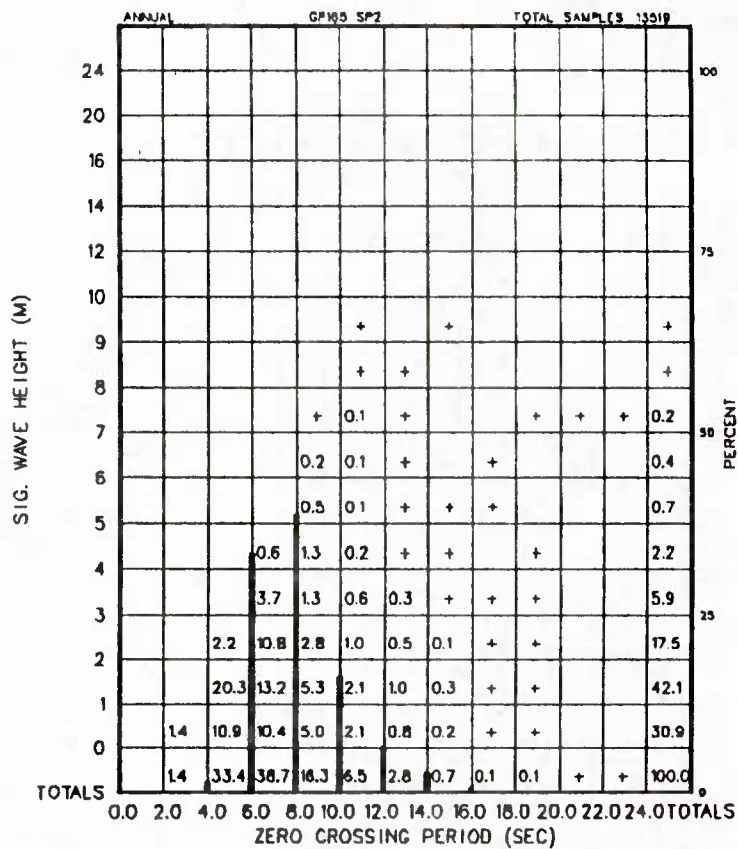


Figure A-165-1-6 Significant Wave Height vs. Zero Crossing Period

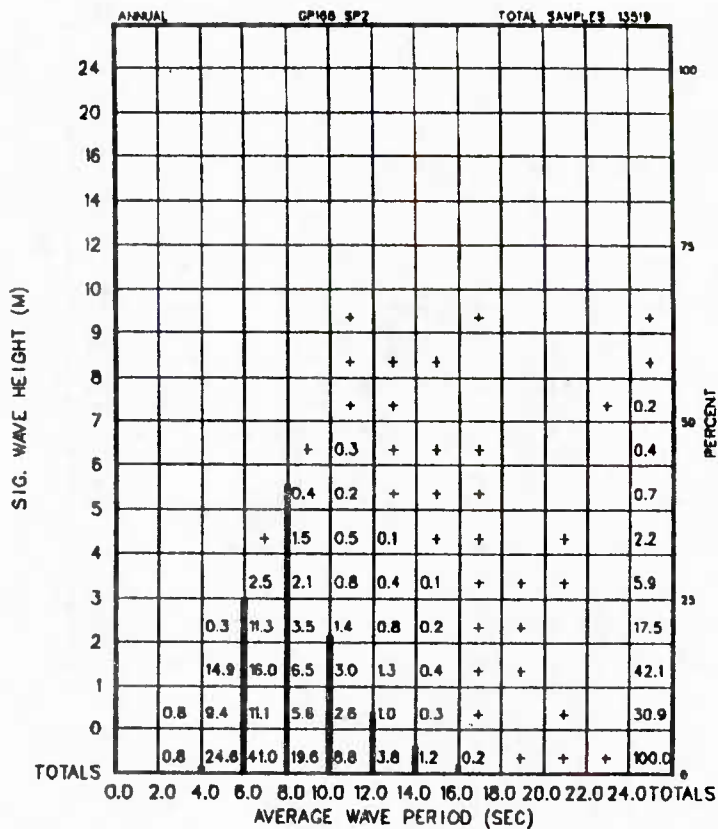


Figure A-165-1-7 Significant Wave Height vs. Average Wave Period

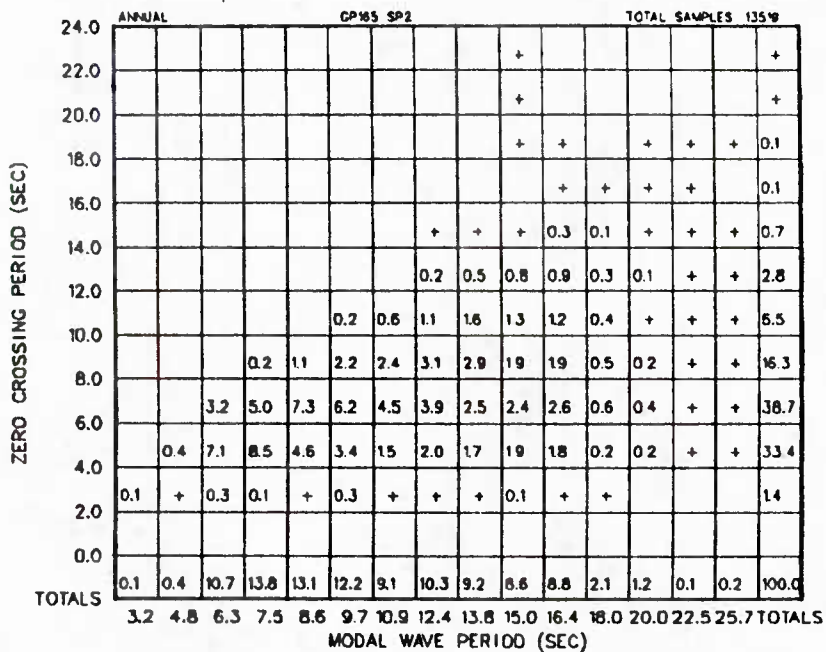


Figure A-165-1-8 Zero Crossing Period vs. Modal Wave Period

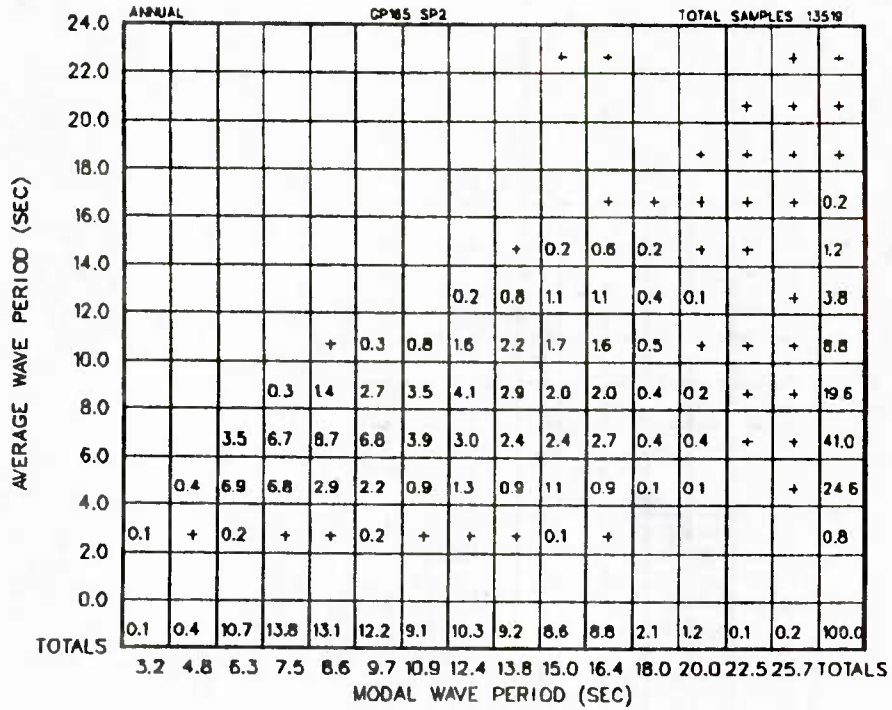


Figure A-165-1-9 Average Wave Period vs. Modal Wave Period

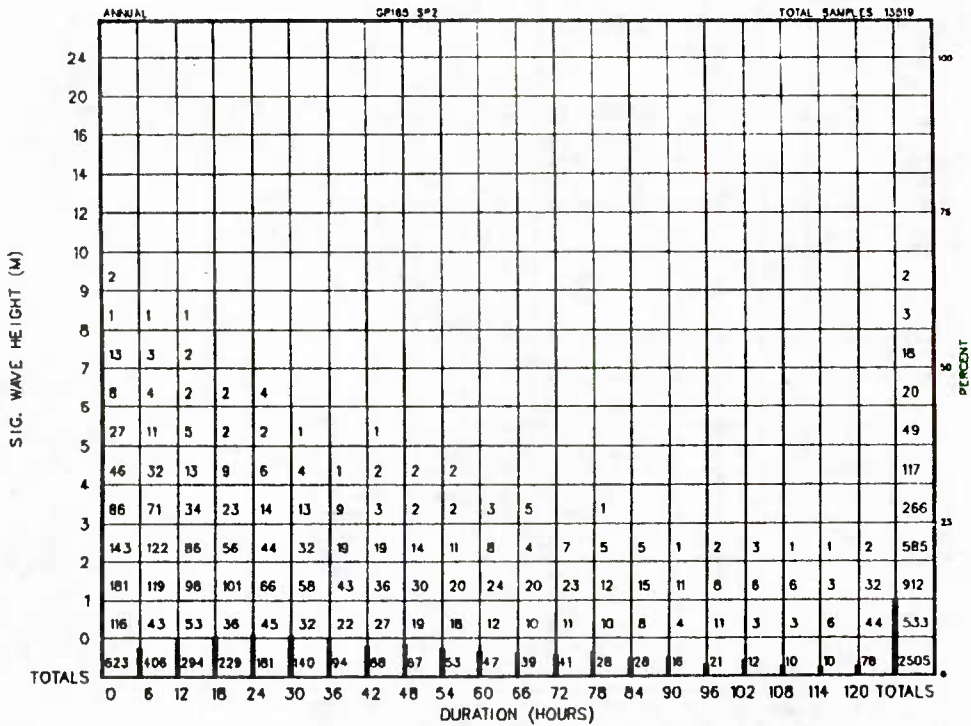


Figure A-165-1-10 Persistence of Wave Height

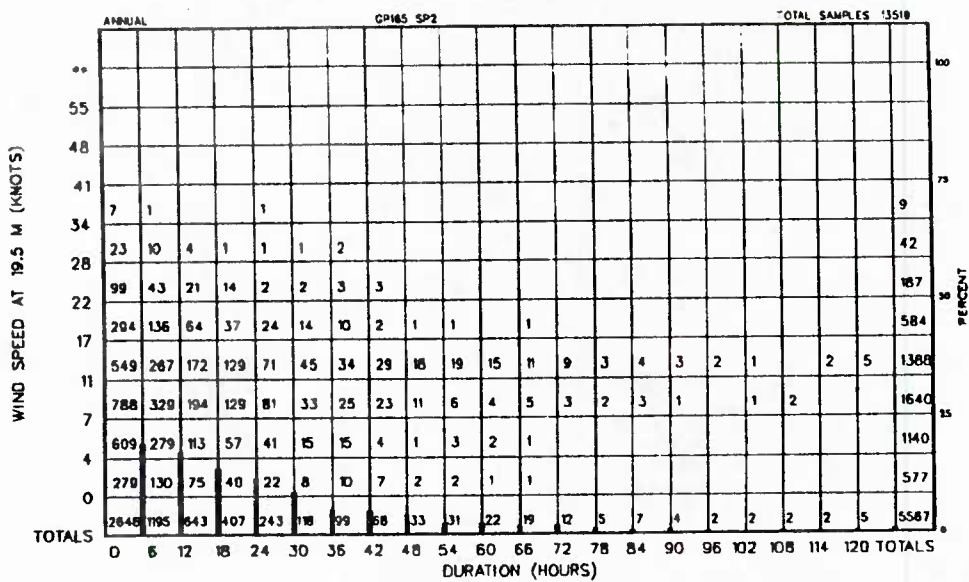


Figure A-165-1-11 Persistence of Wind Speed at 19.5 M (Knots)

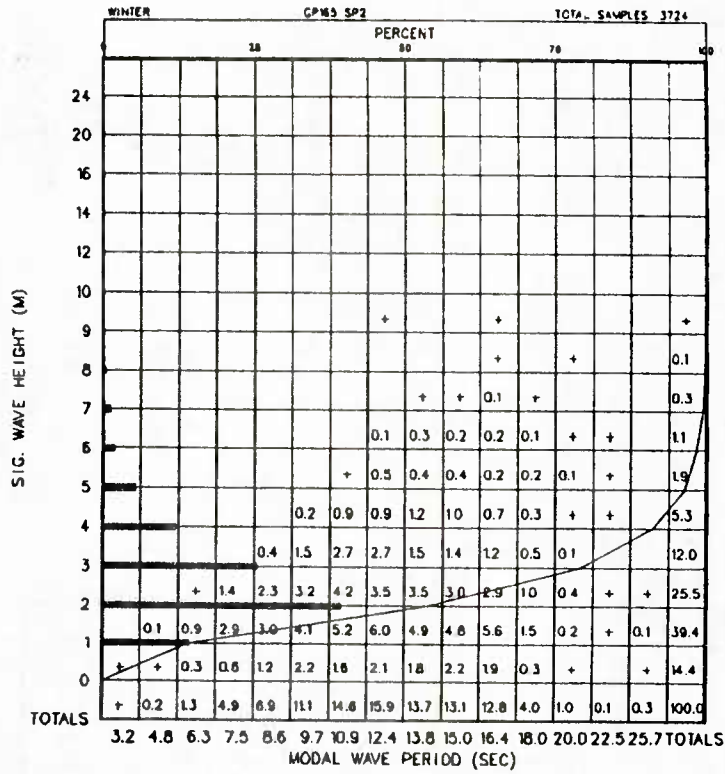


Figure A-165-2-1 Significant Wave Height vs. Modal Wave Period

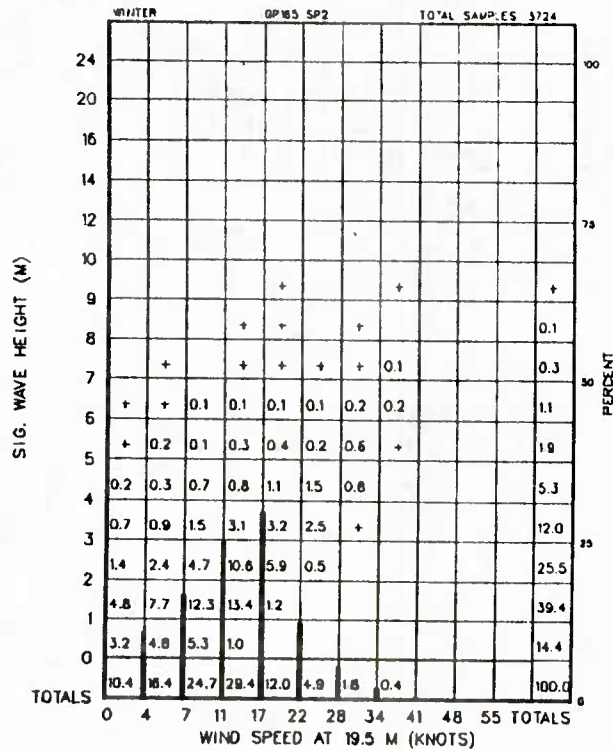


Figure A-165-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

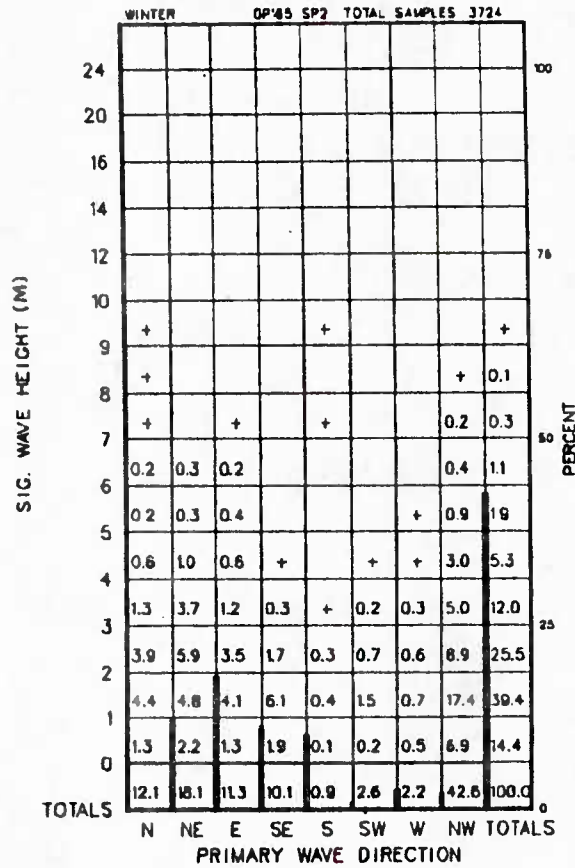


Figure A-165-2-3 Significant Wave Height vs. Primary Wave Direction

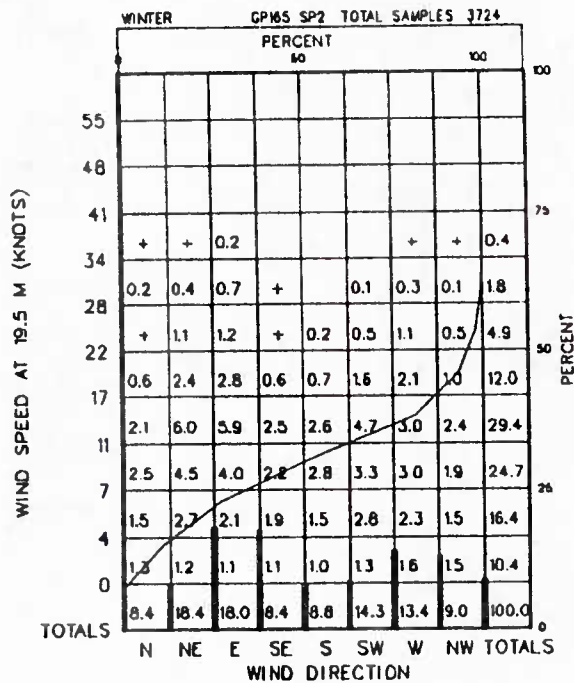


Figure A-165-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

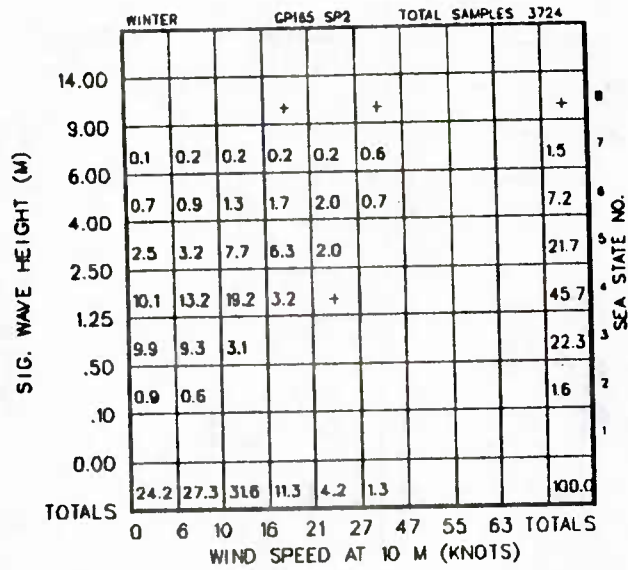


Figure A-165-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

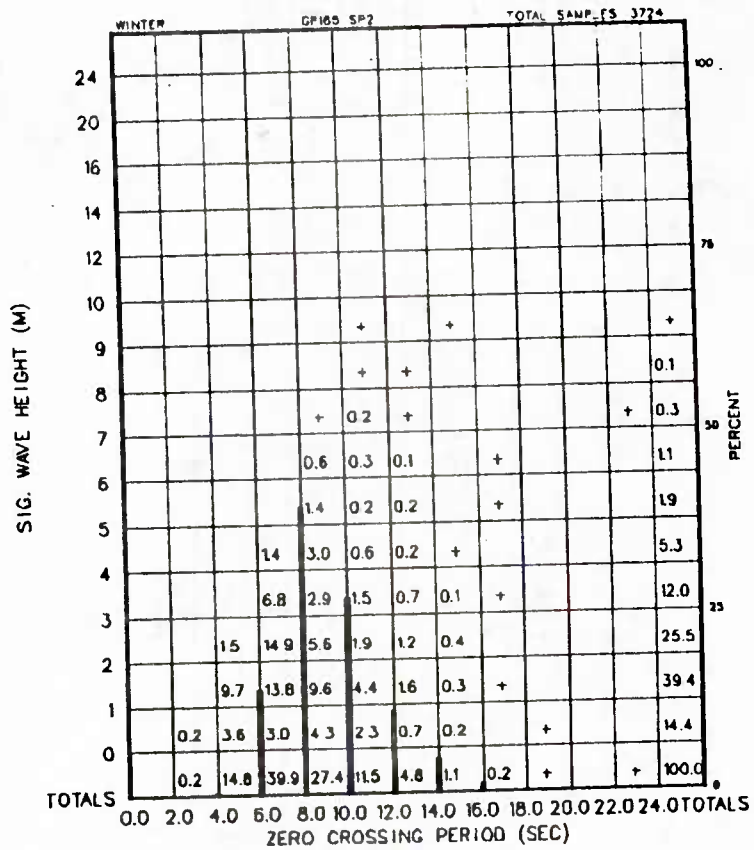


Figure A-165-2-6 Significant Wave Height vs. Zero Crossing Period

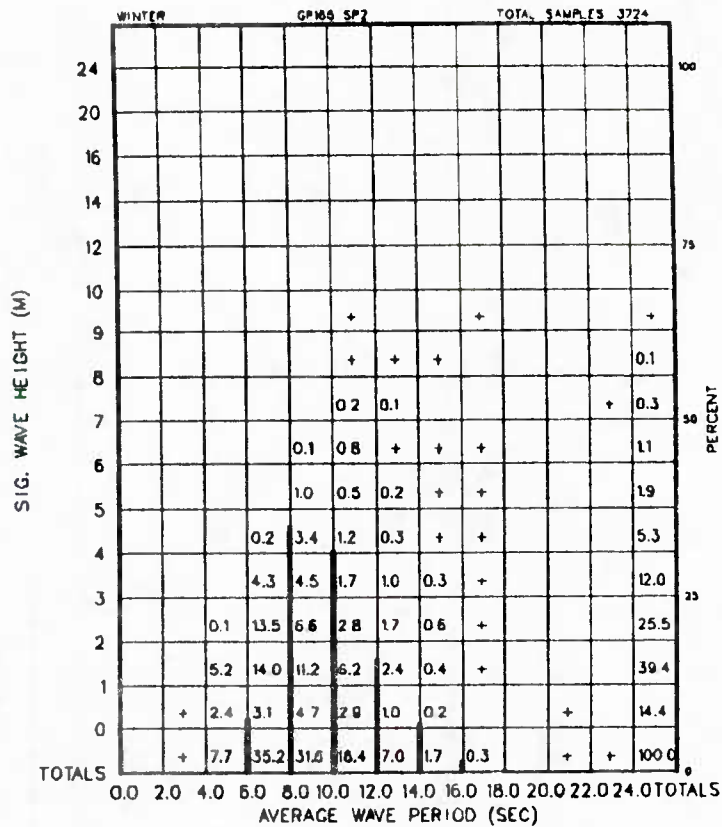


Figure A-165-2-7 Significant Wave Height vs. Average Wave Period

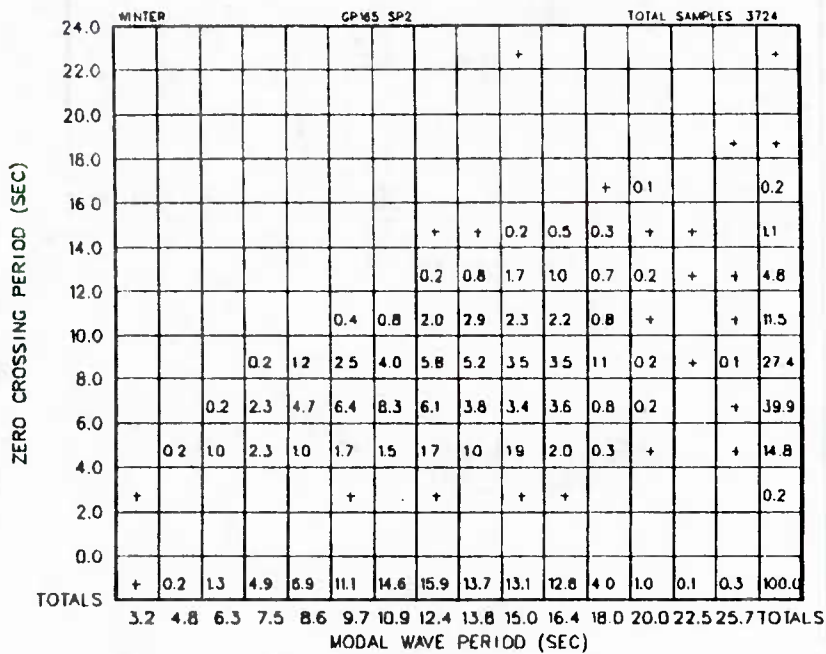


Figure A-165-2-8 Zero Crossing Period vs. Modal Wave Period

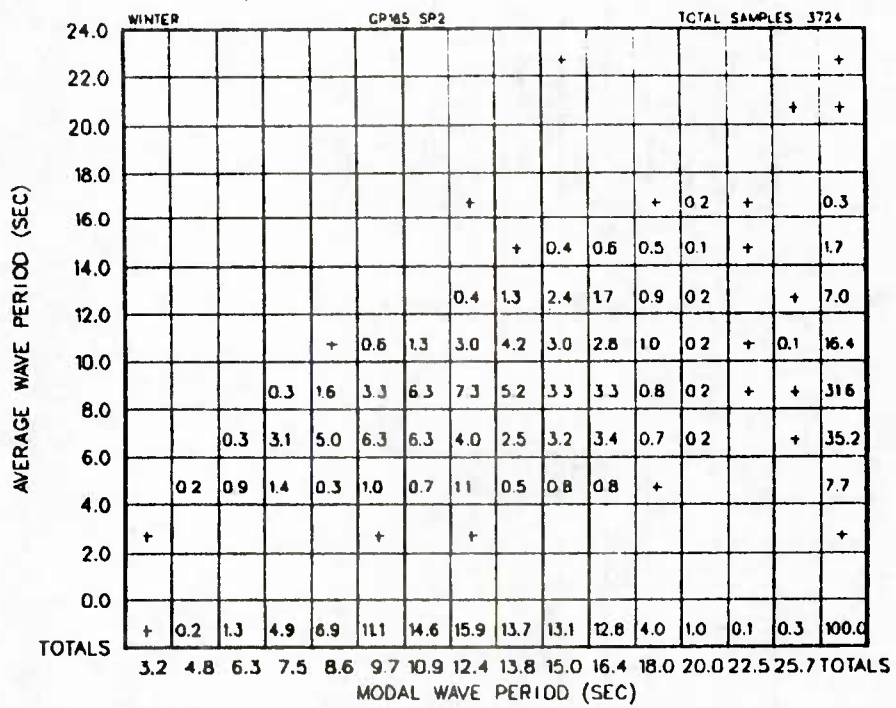


Figure A-165-2-9 Average Wave Period vs. Modal Wave Period

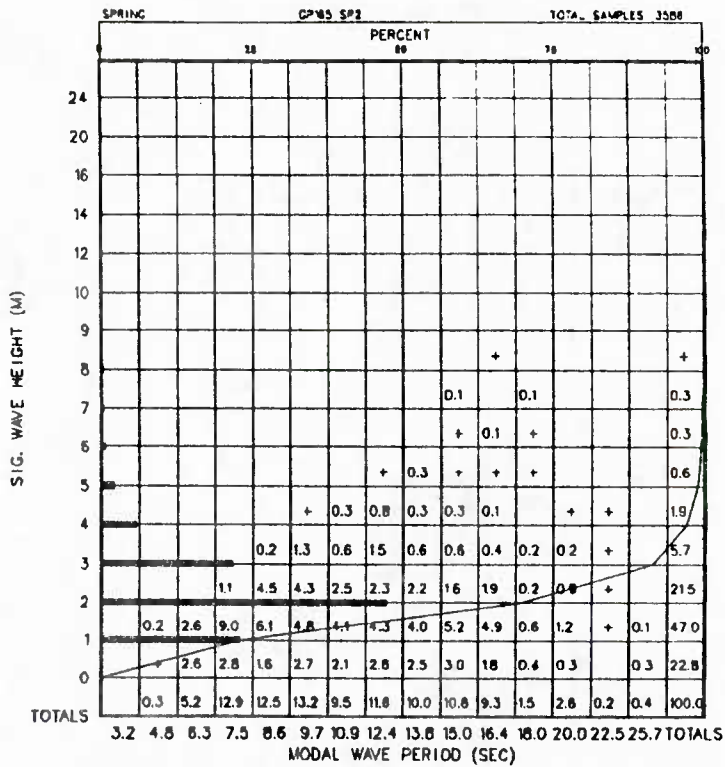


Figure A-165-3-1 Significant Wave Height vs. Modal Wave Period

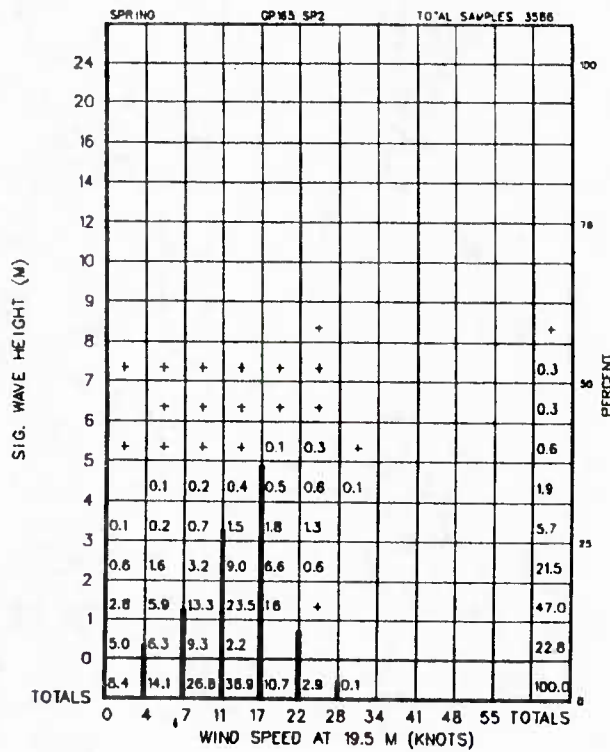


Figure A-165-3-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

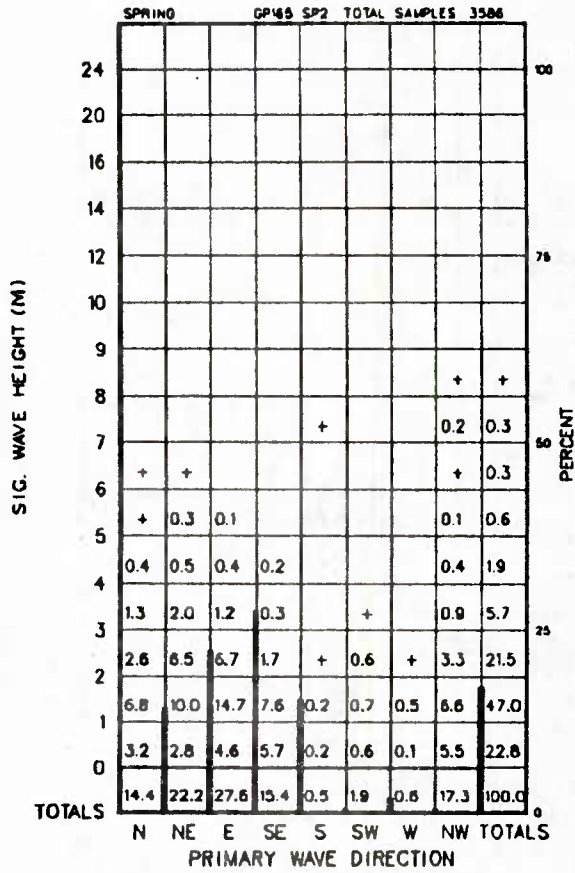


Figure A-165-3-3 Significant Wave Height vs. Primary Wave Direction

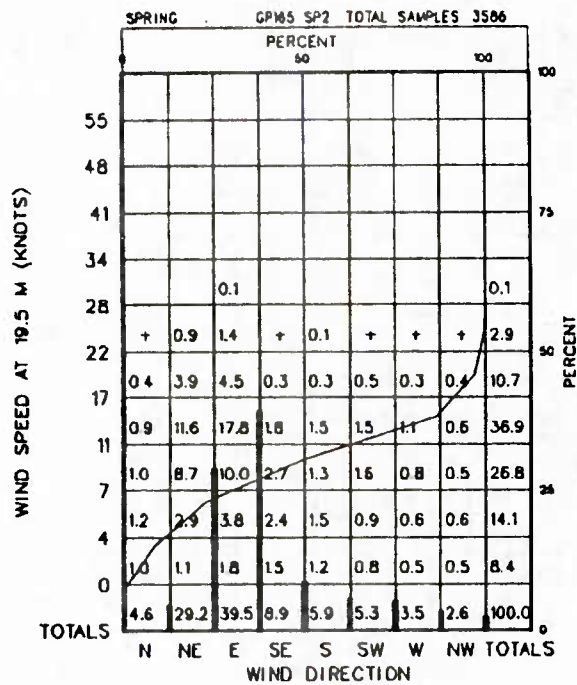


Figure A-165-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

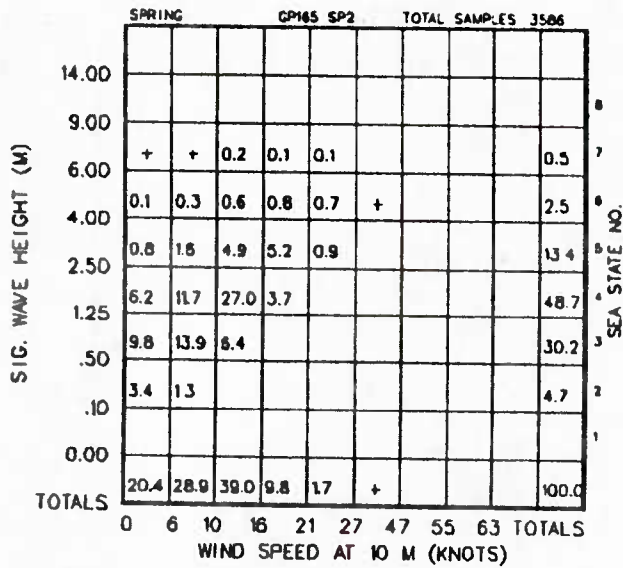


Figure A-165-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

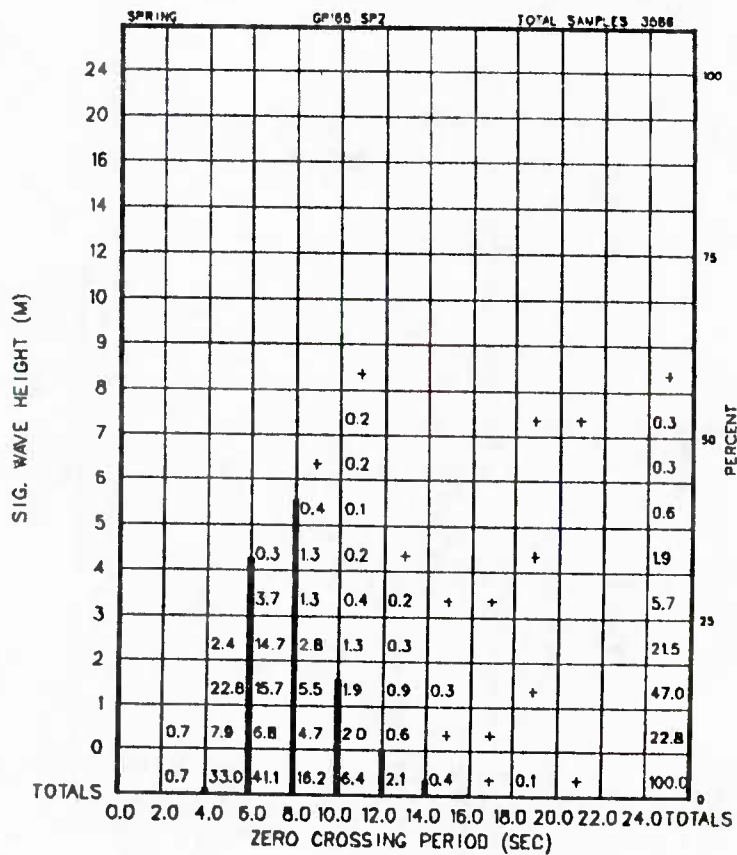


Figure A-165-3-6 Significant Wave Height vs. Zero Crossing Period

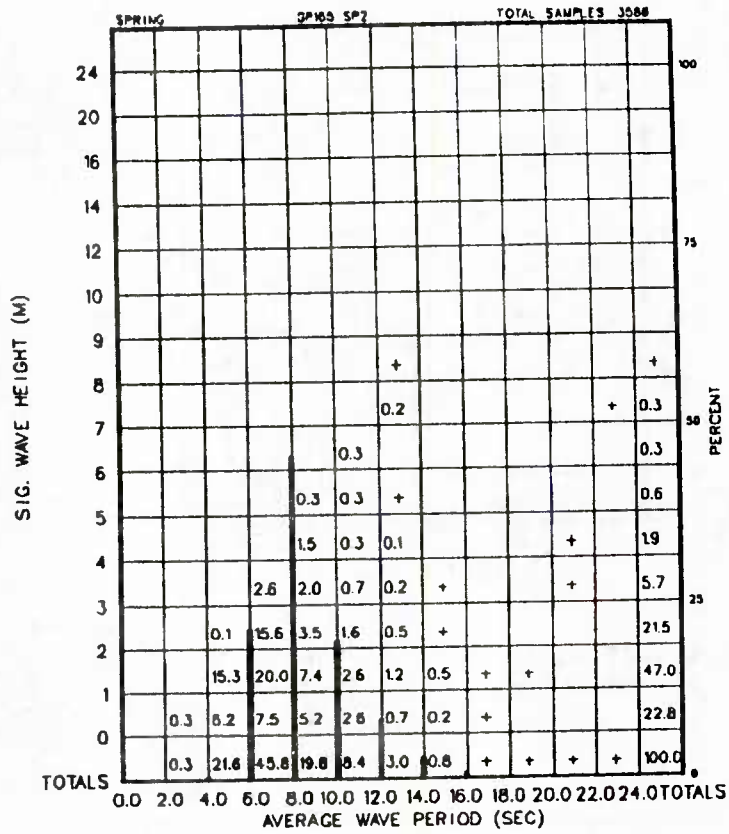


Figure A-165-3-7 Significant Wave Height vs. Average Wave Period

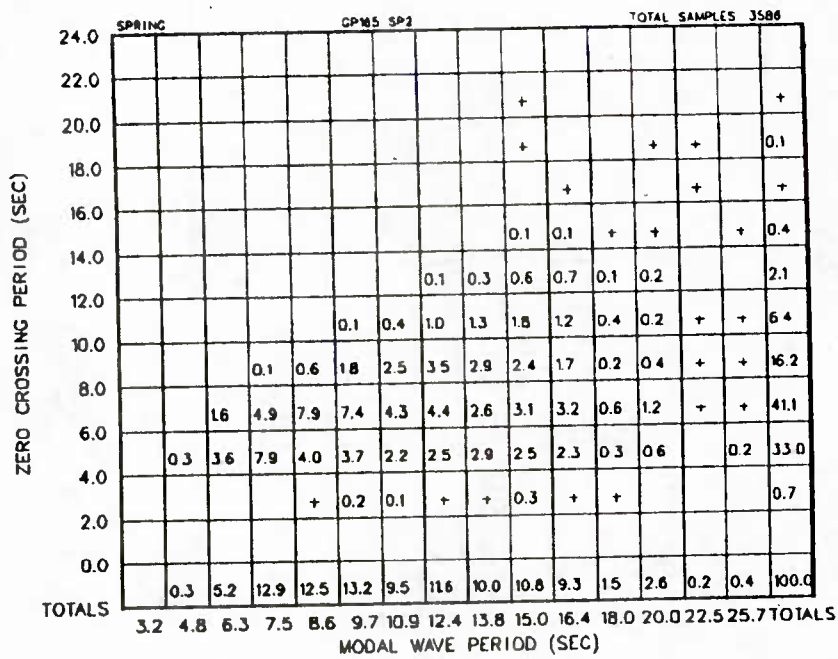


Figure A-165-3-8 Zero Crossing Period vs. Modal Wave Period

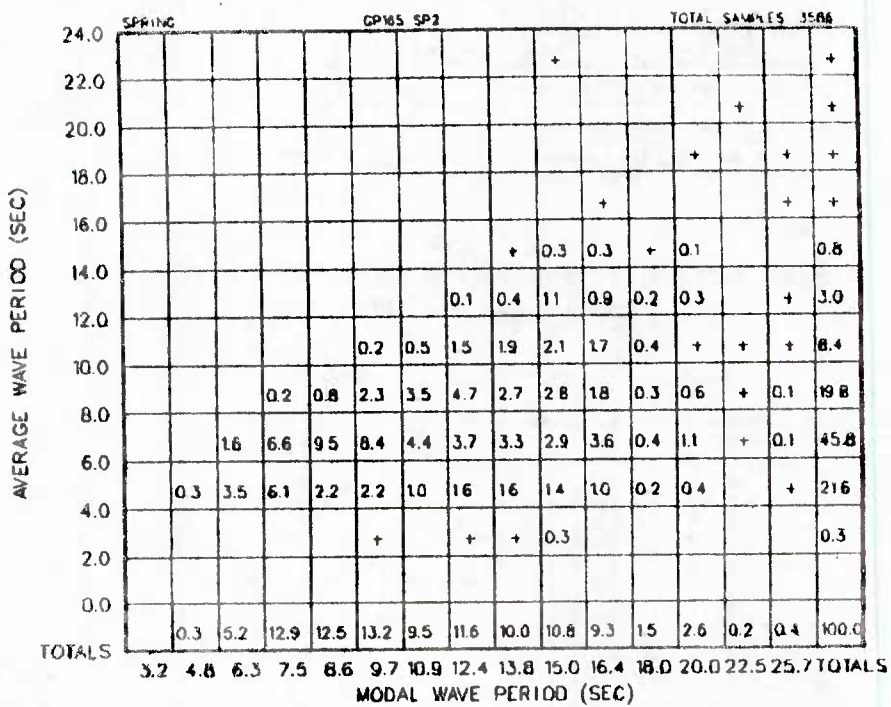


Figure A-165-3-9 Average Wave Period vs. Modal Wave Period

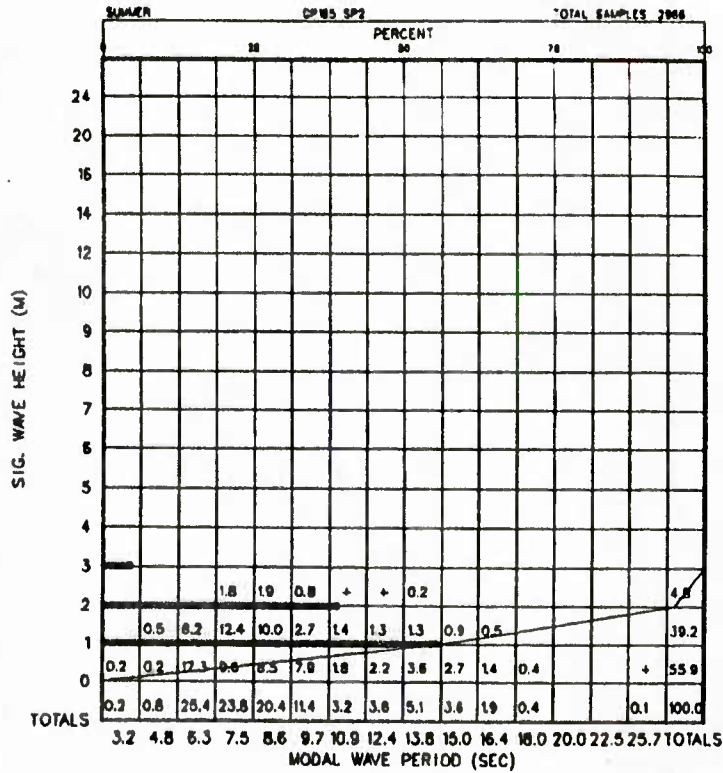


Figure A-165-4-1 Significant Wave Height vs. Modal Wave Period

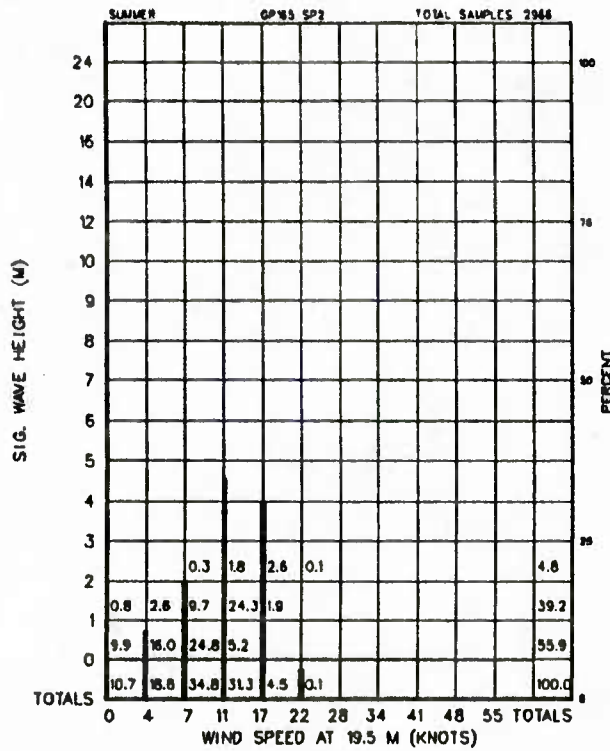


Figure A-165-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

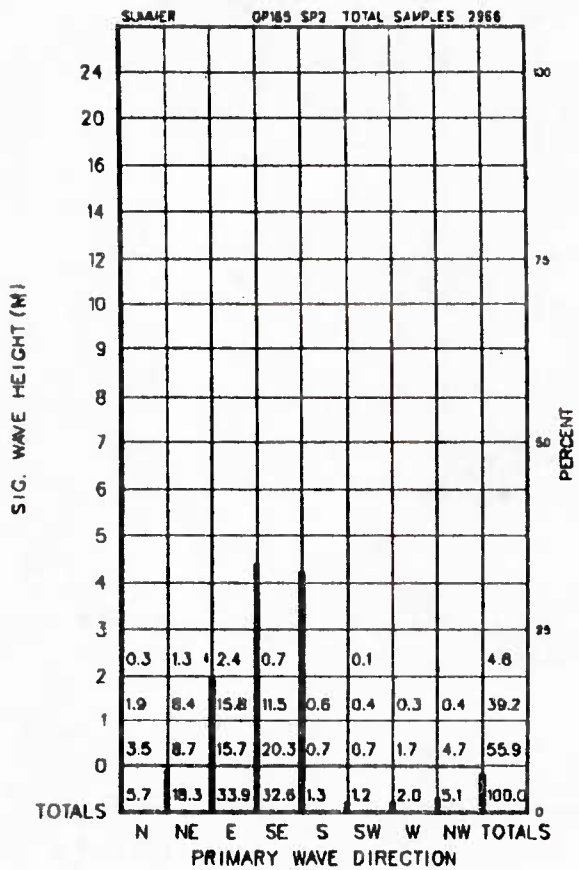


Figure A-165-4-3 Significant Wave Height vs. Primary Wave Direction

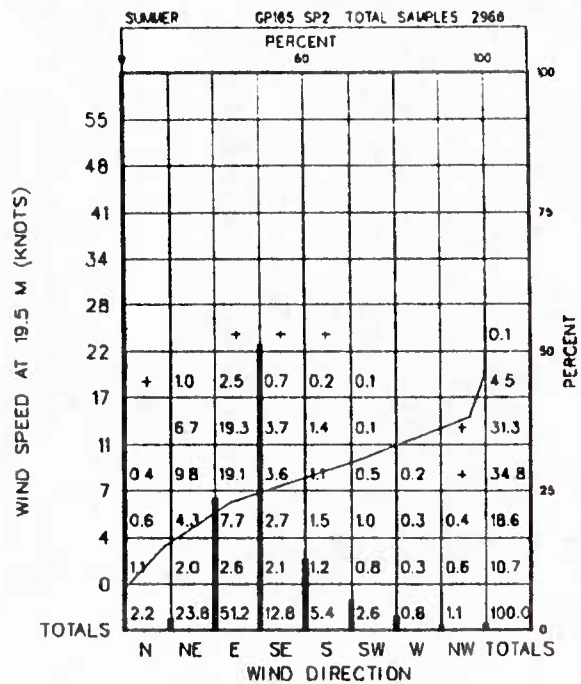


Figure A-165-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

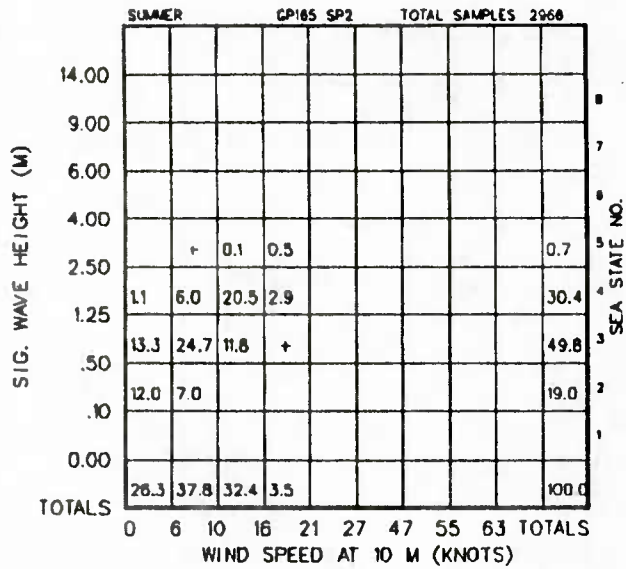


Figure A-165-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

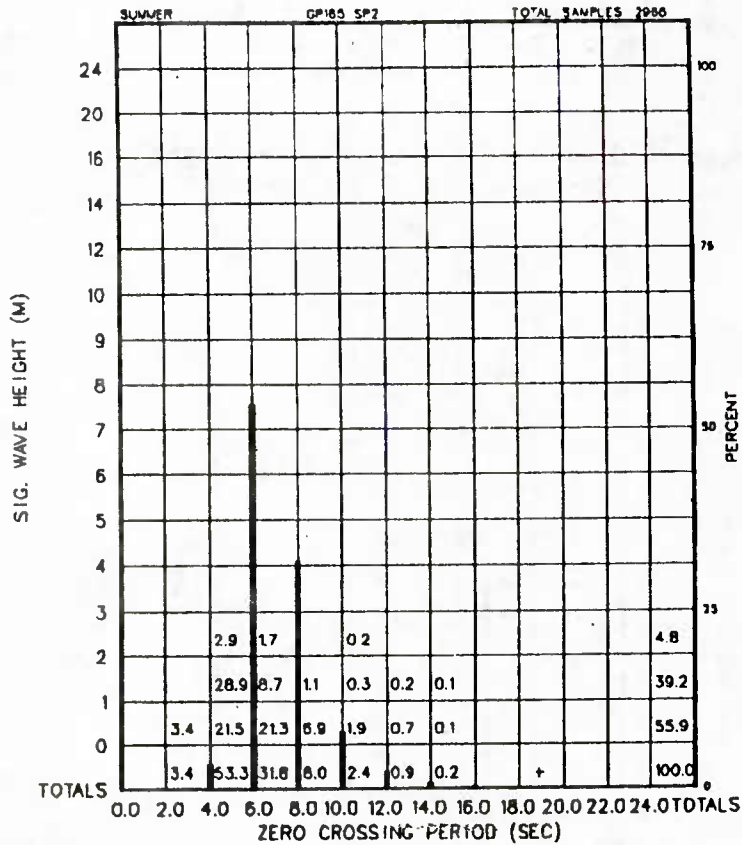


Figure A-165-4-6 Significant Wave Height vs. Zero Crossing Period

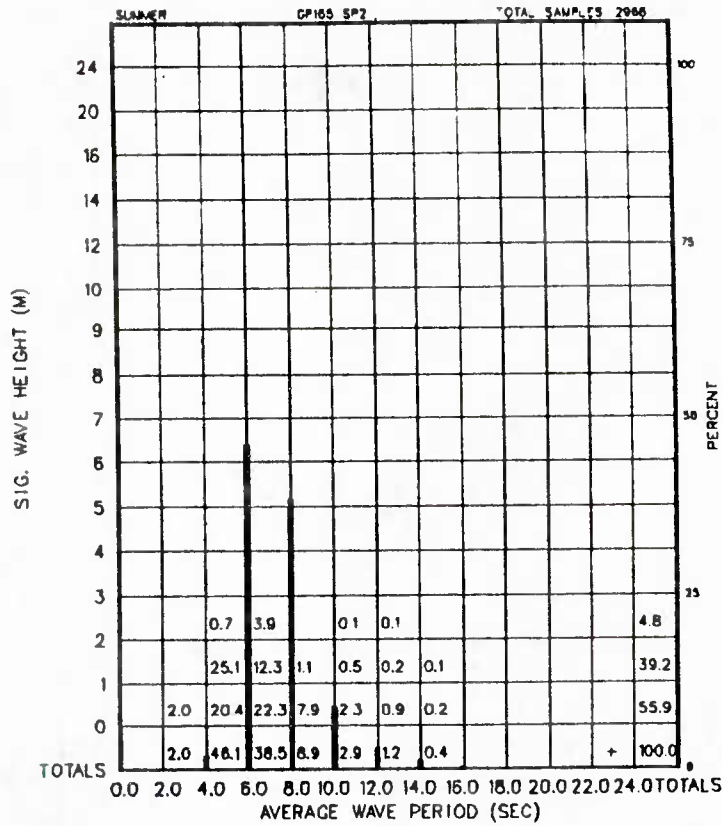


Figure A-165-4-7 Significant Wave Height vs. Average Wave Period

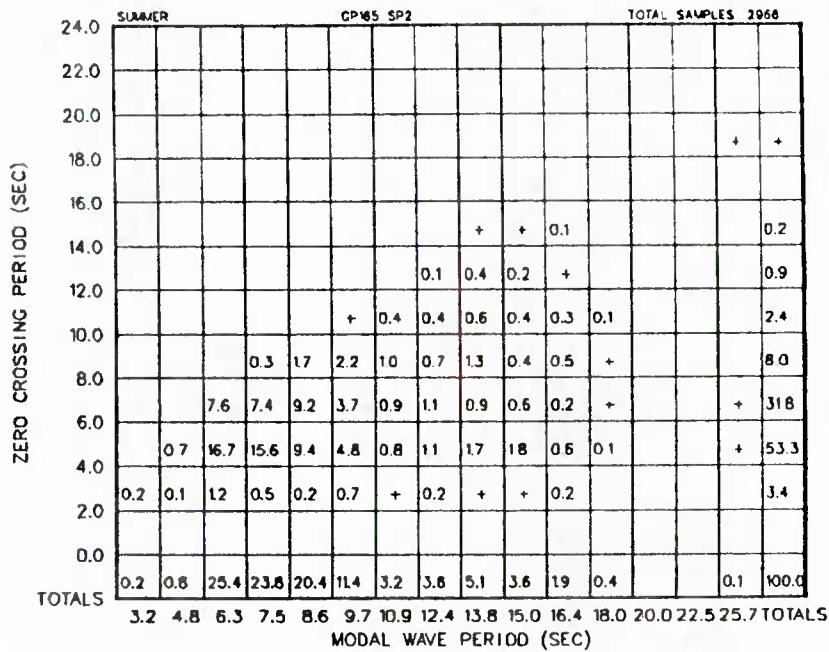


Figure A-165-4-8 Zero Crossing Period vs. Modal Wave Period

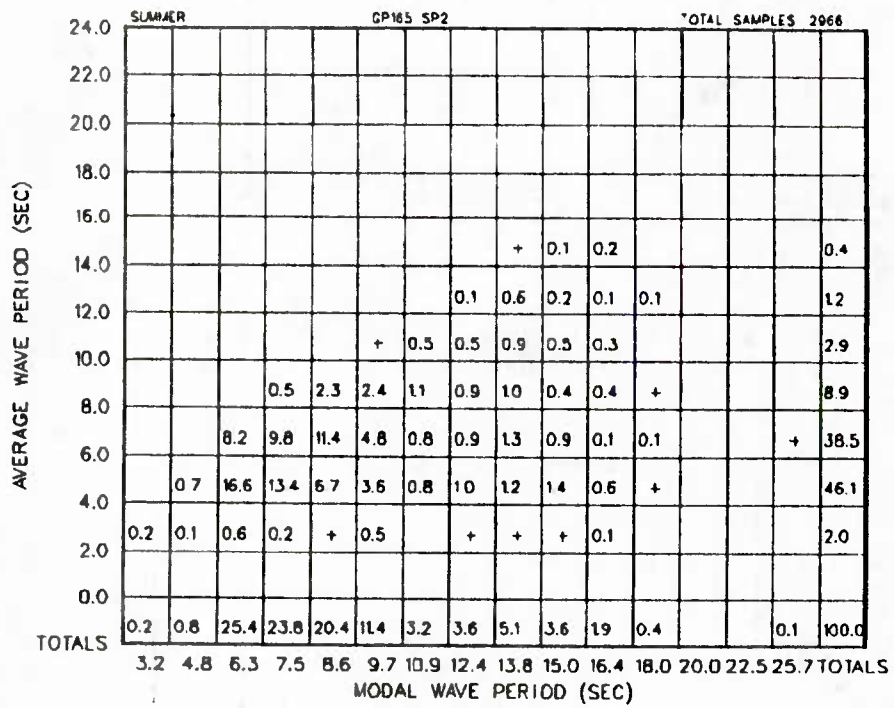


Figure A-165-4-9 Average Wave Period vs. Modal Wave Period

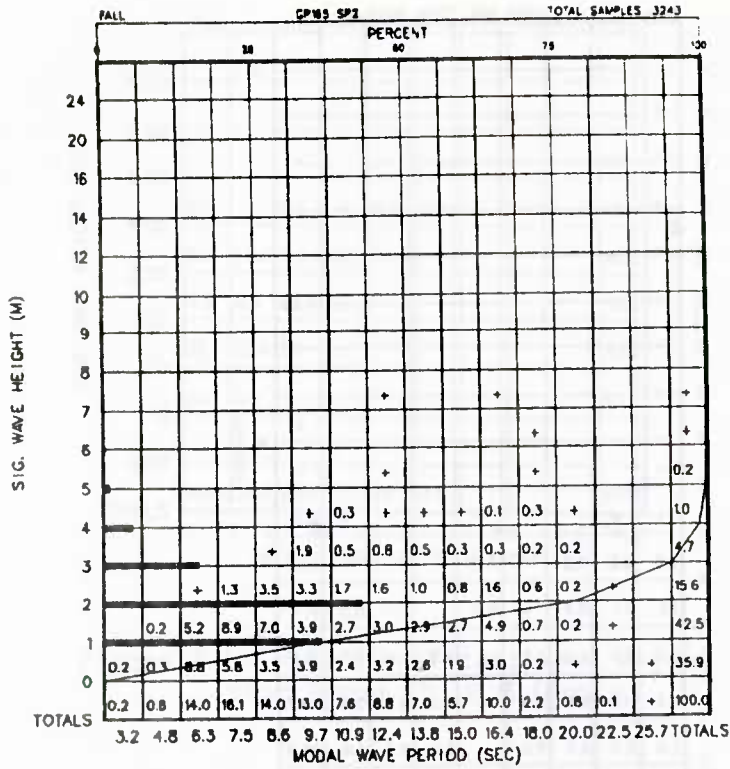


Figure A-165-5-1 Significant Wave Height vs. Modal Wave Period

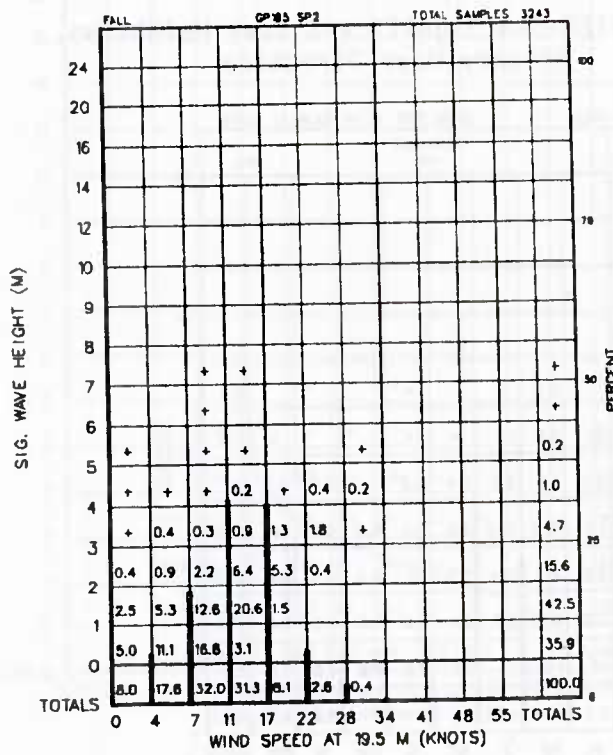


Figure A-165-5-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

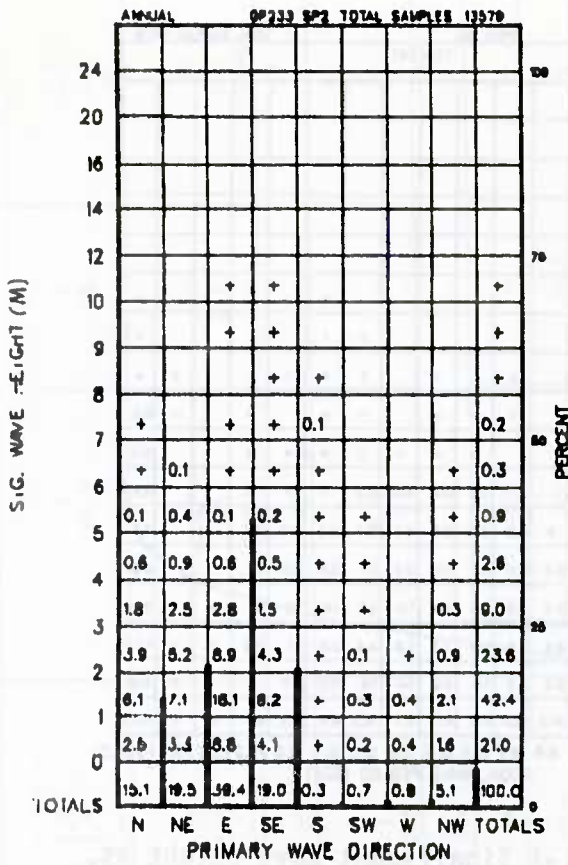


Figure A-233-1-3 Significant Wave Height vs. Primary Wave Direction

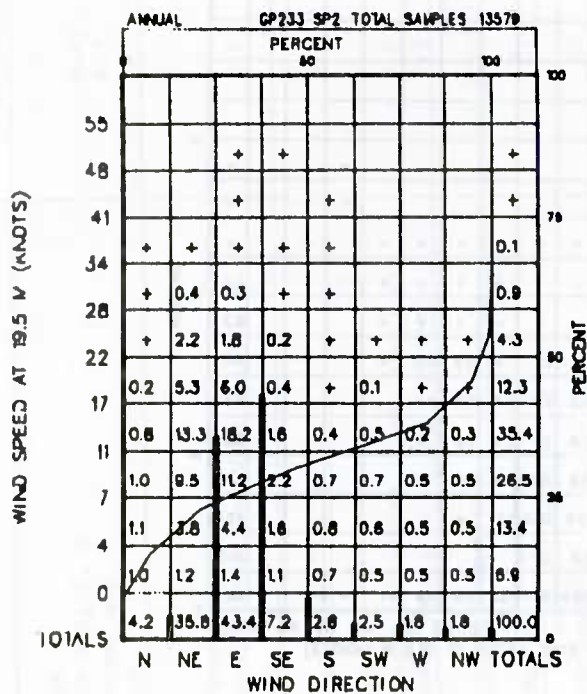


Figure A-233-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

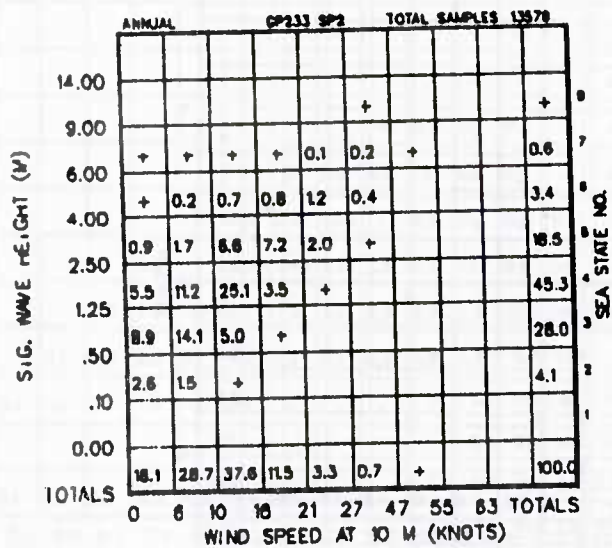


Figure A-233-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

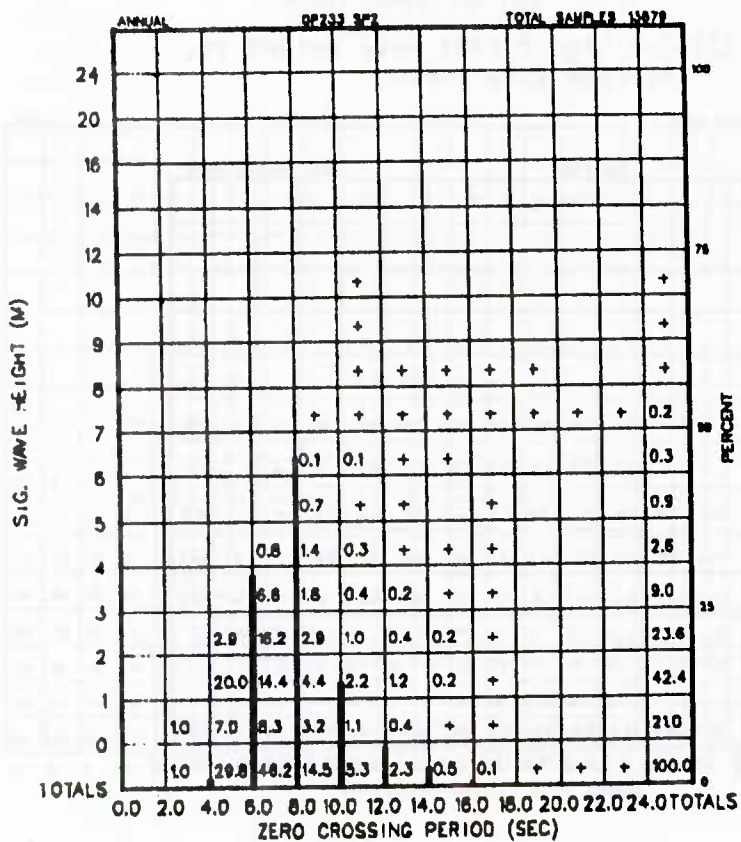


Figure A-233-1-6 Significant Wave Height vs. Zero Crossing Period

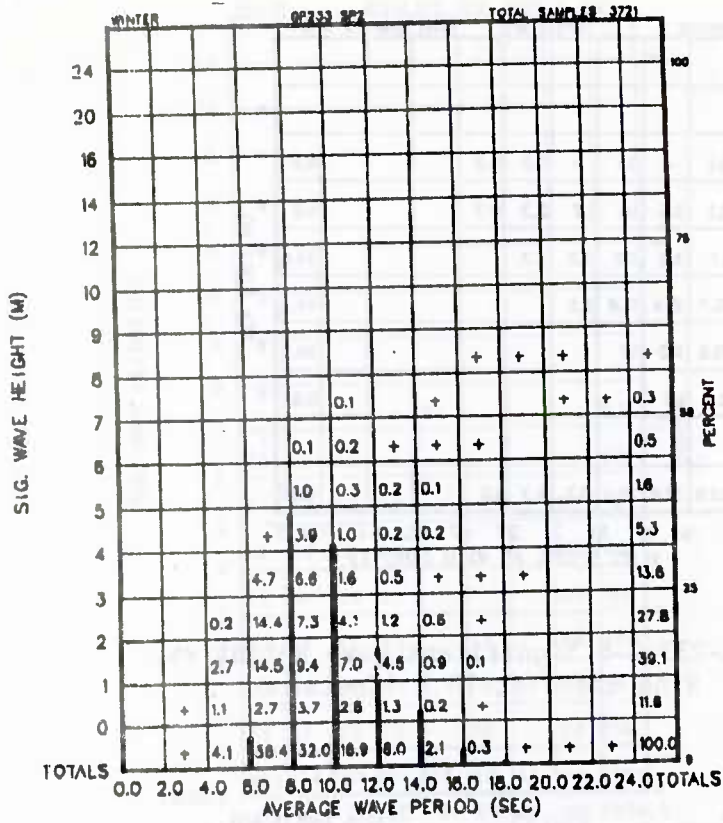


Figure A-233-2-7 Significant Wave Height vs. Average Wave Period

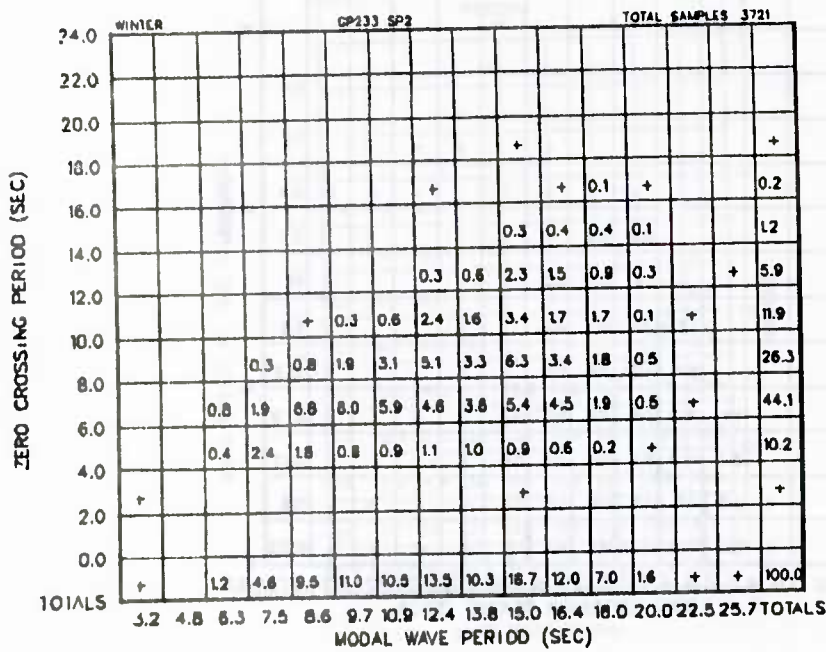


Figure A-233-2-8 Zero Crossing Period vs. Modal Wave Period

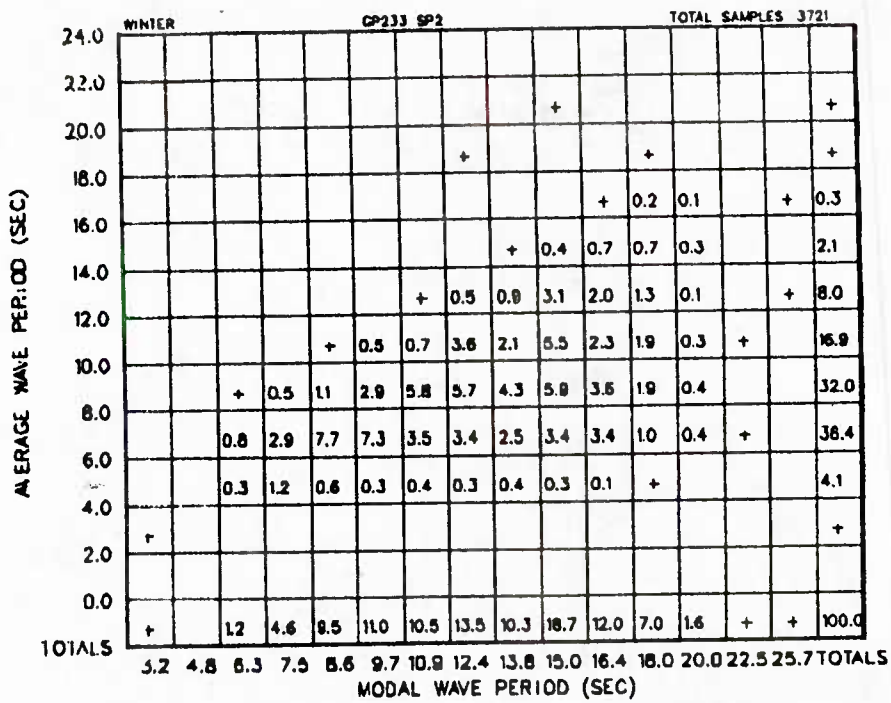


Figure A-233-2-9 Average Wave Period vs. Modal Wave Period

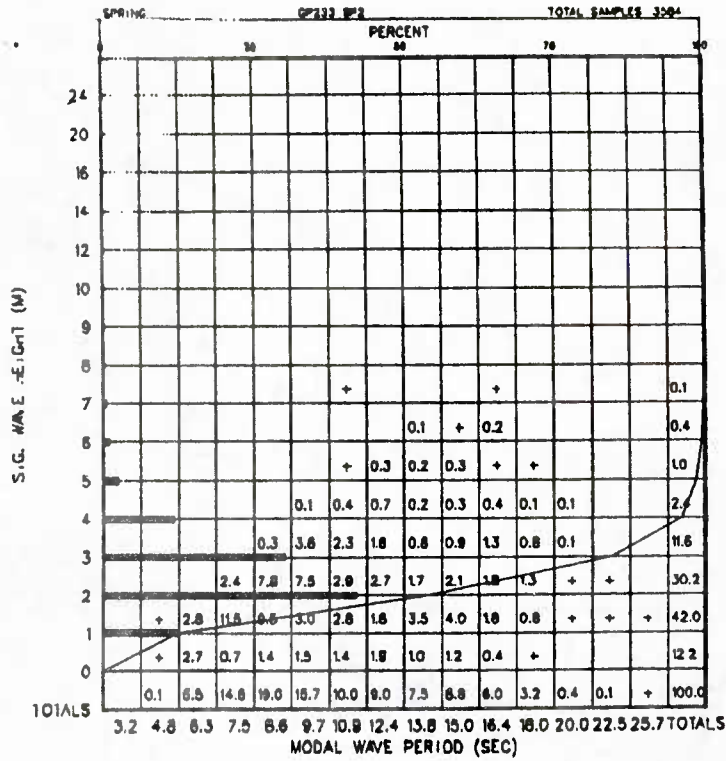


Figure A-233-3-1 Significant Wave Height vs. Modal Wave Period

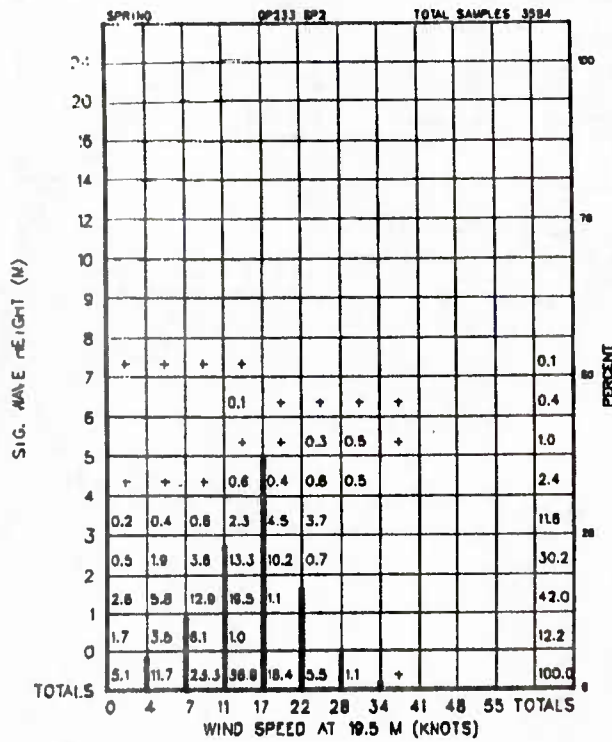


Figure A-233-3-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

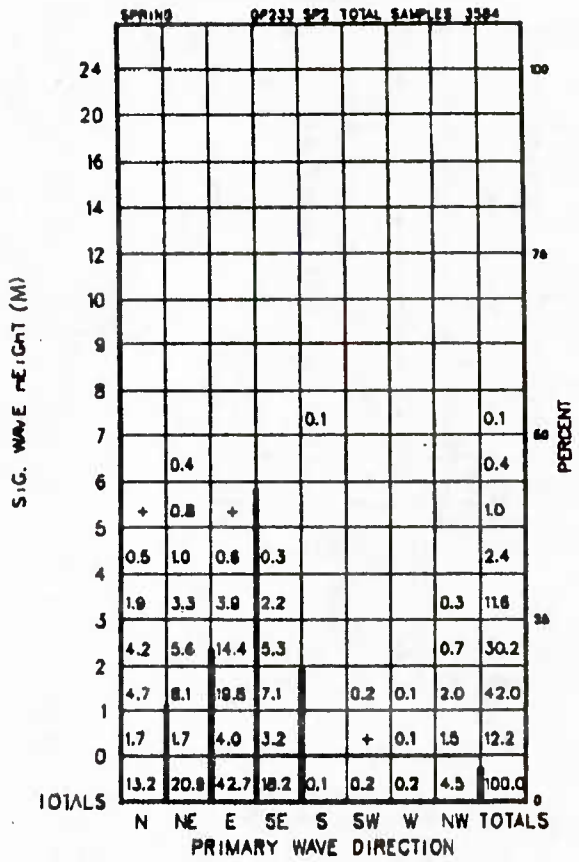


Figure A-233-3-3 Significant Wave Height vs. Primary Wave Direction

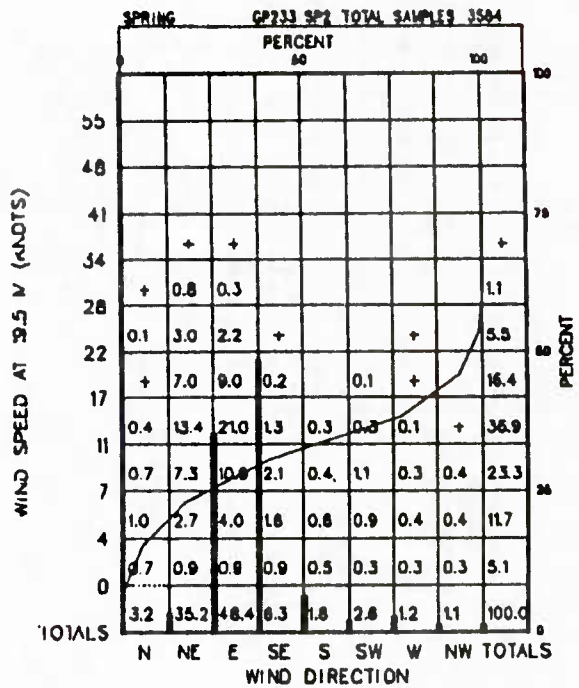


Figure A-233-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

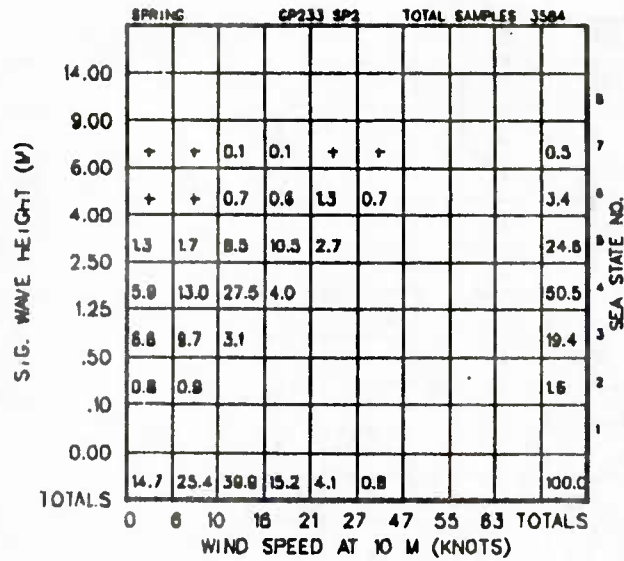


Figure A-233-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

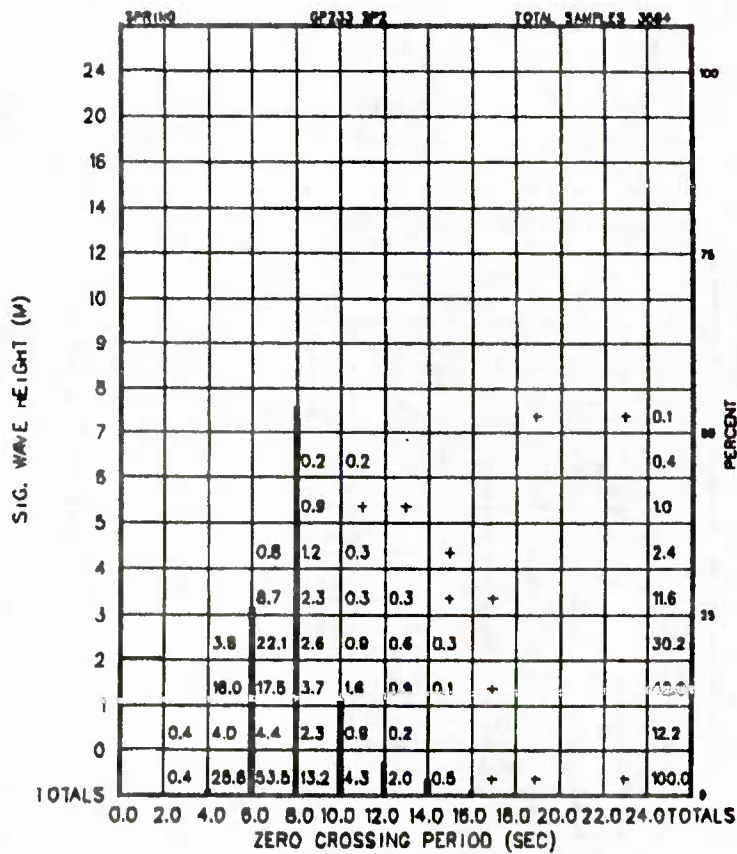


Figure A-233-3-6 Significant Wave Height vs. Zero Crossing Period

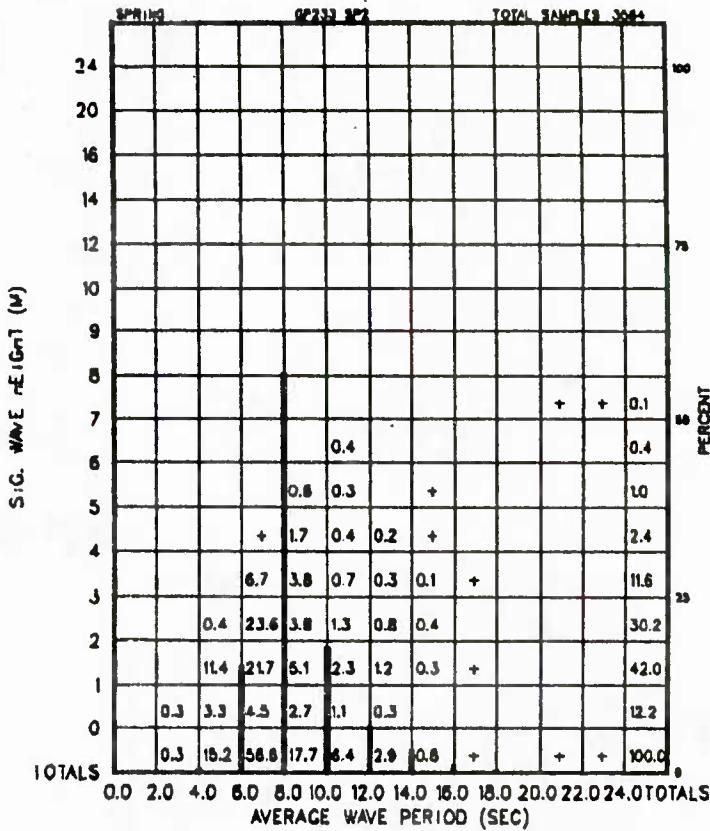


Figure A-233-3-7 Significant Wave Height vs. Average Wave Period

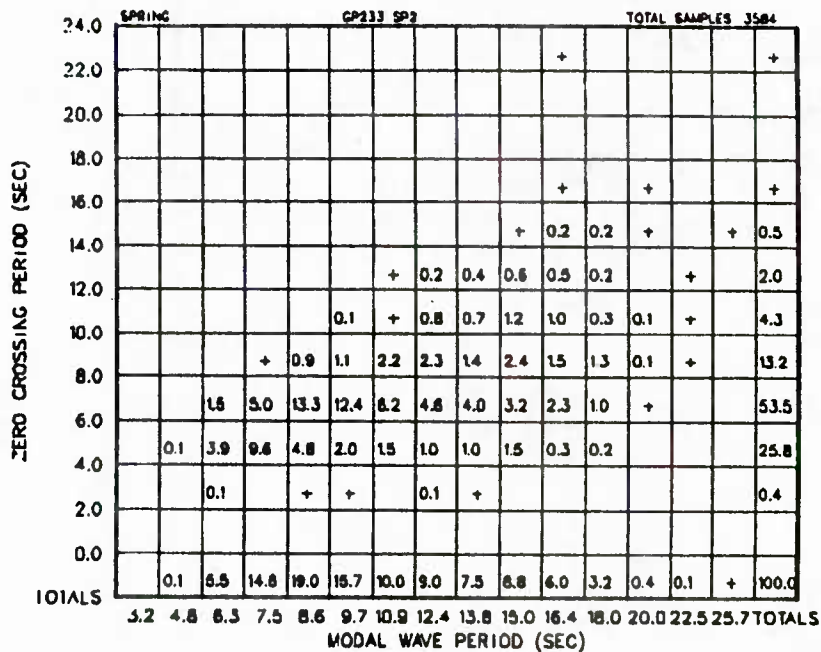


Figure A-233-3-8 Zero Crossing Period vs. Modal Wave Period

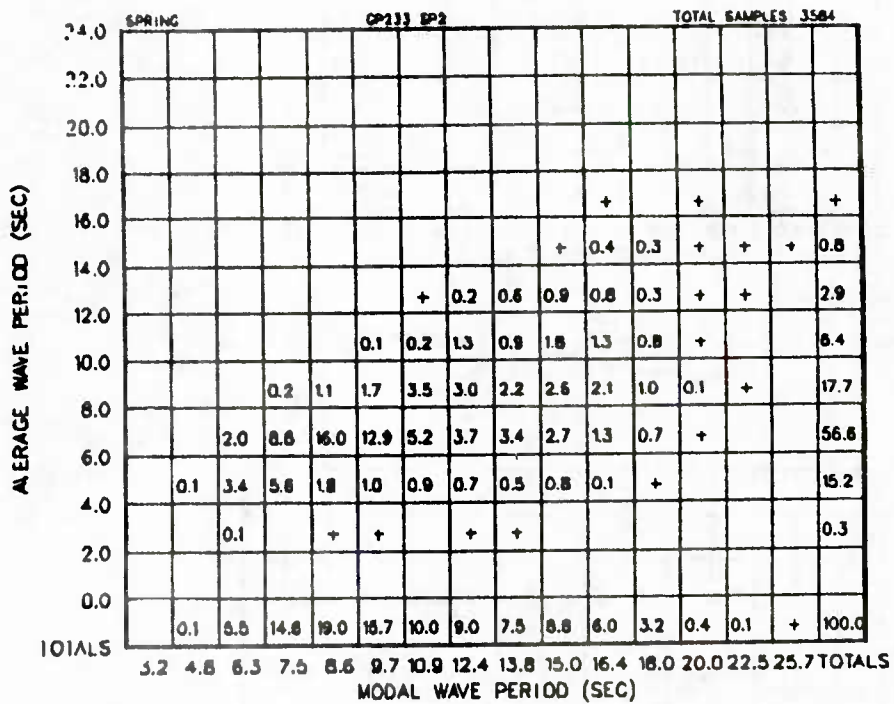


Figure A-233-3-9 Average Wave Period vs. Modal Wave Period

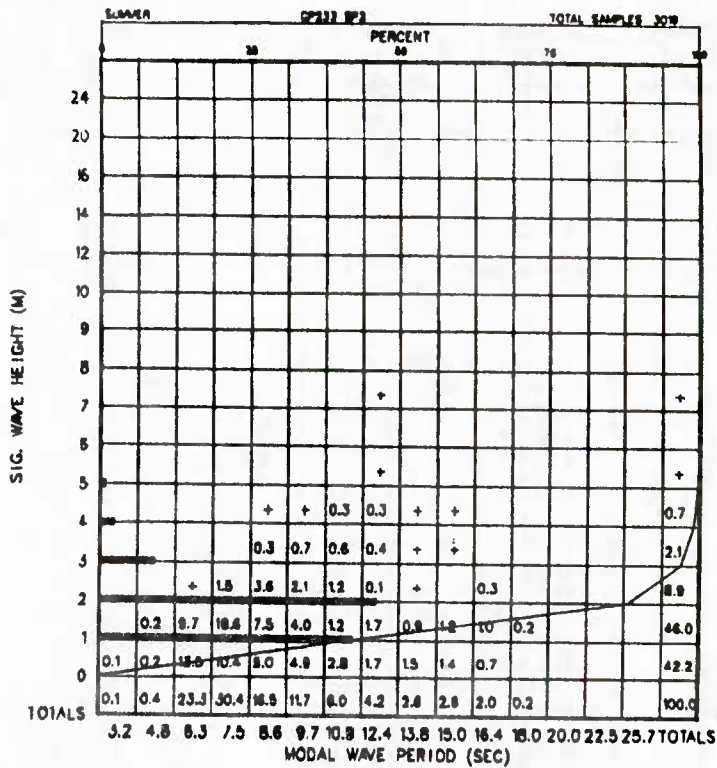


Figure A-233-4-1 Significant Wave Height vs. Modal Wave Period

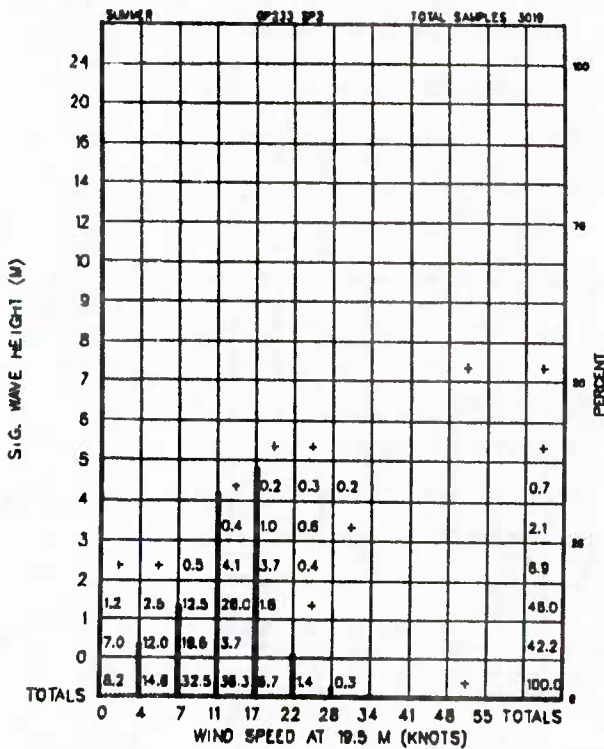


Figure A-233-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

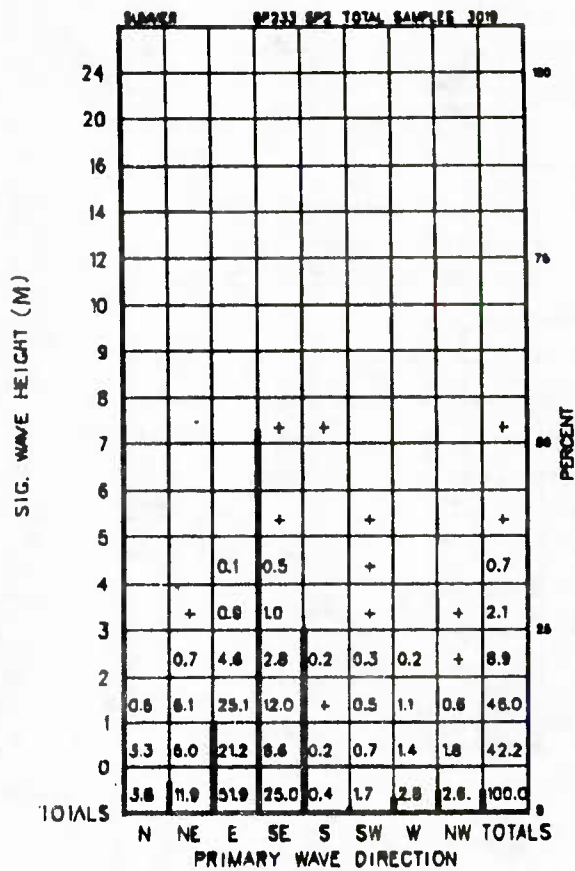


Figure A-233-4-3 Significant Wave Height vs. Primary Wave Direction

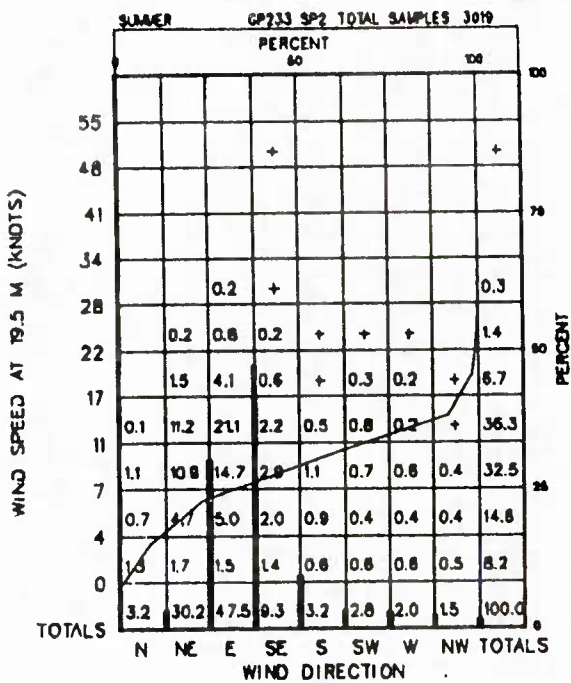


Figure A-233-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

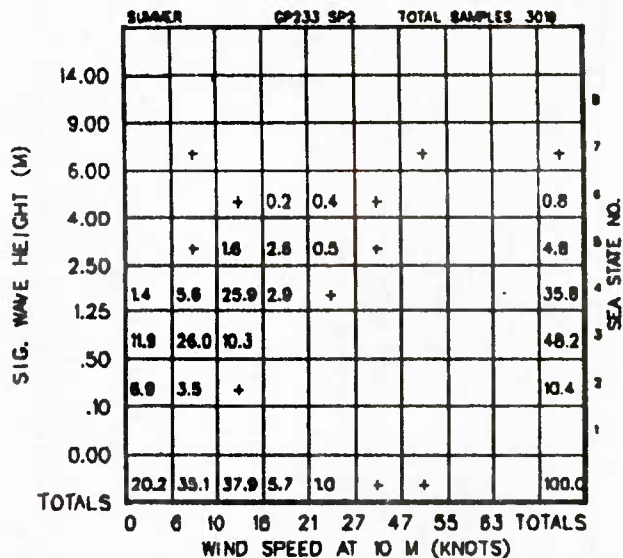


Figure A-233-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

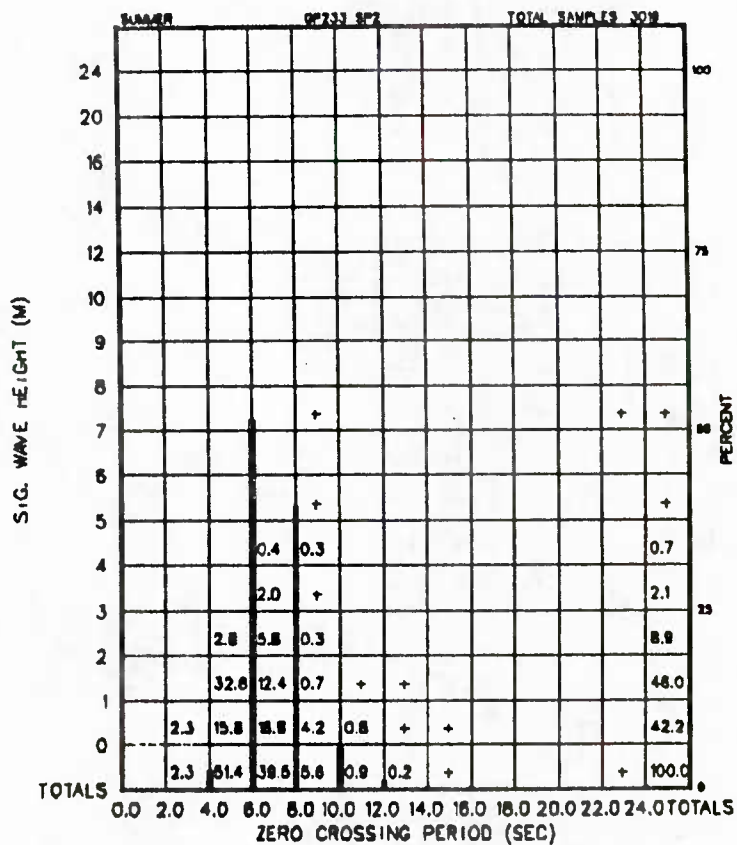


Figure A-233-4-6 Significant Wave Height vs. Zero Crossing Period

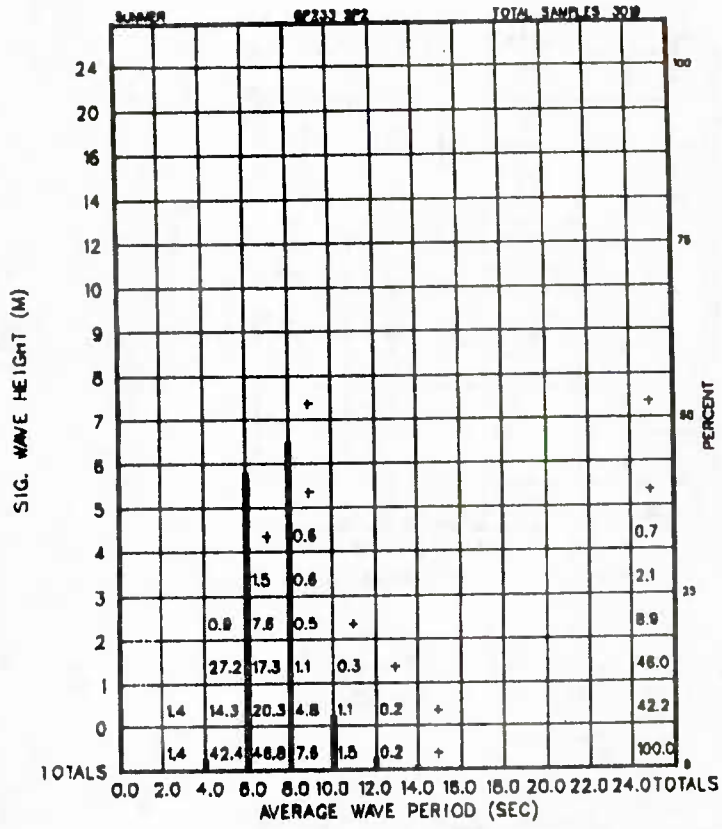


Figure A-233-4-7 Significant Wave Height vs. Average Wave Period

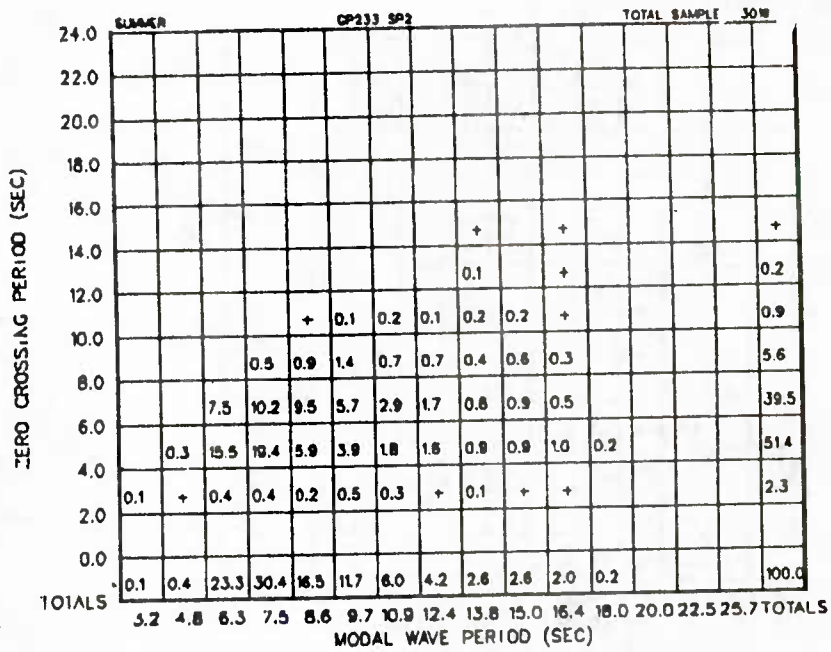


Figure A-233-4-8 Zero Crossing Period vs. Modal Wave Period

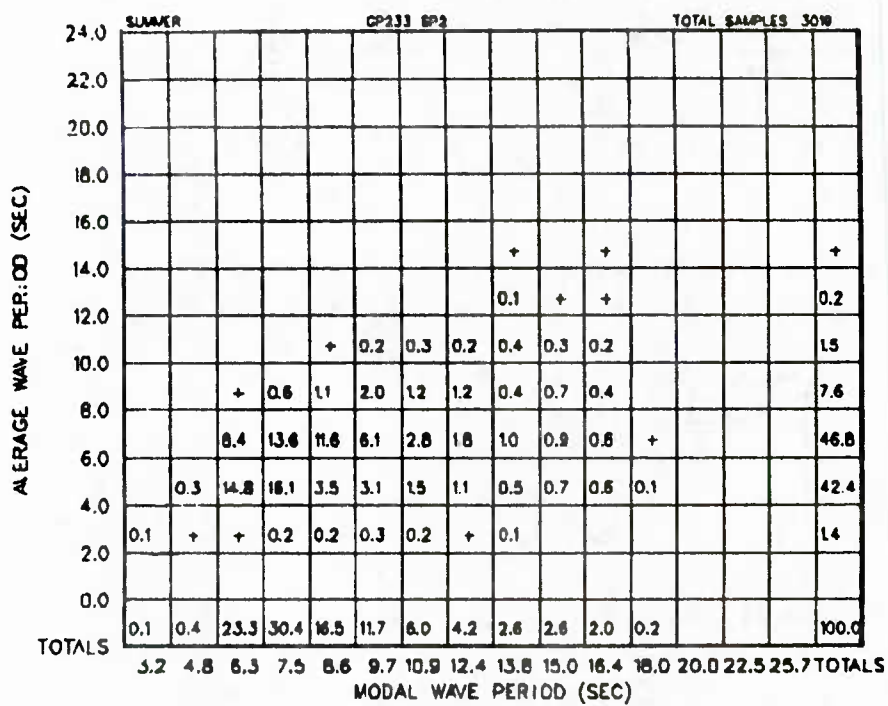


Figure A-233-4-9 Average Wave Period vs. Modal Wave Period

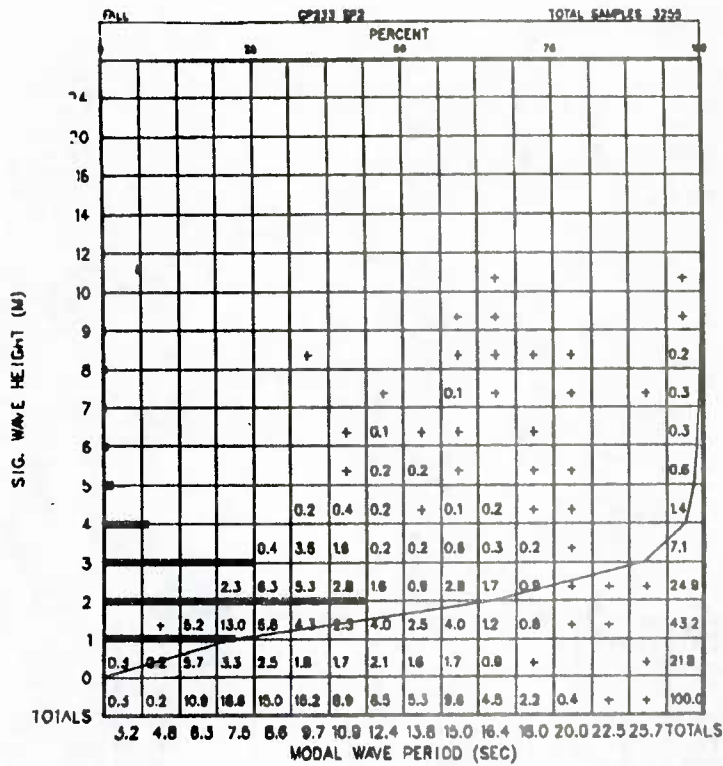


Figure A-233-5-1 Significant Wave Height vs. Modal Wave Period

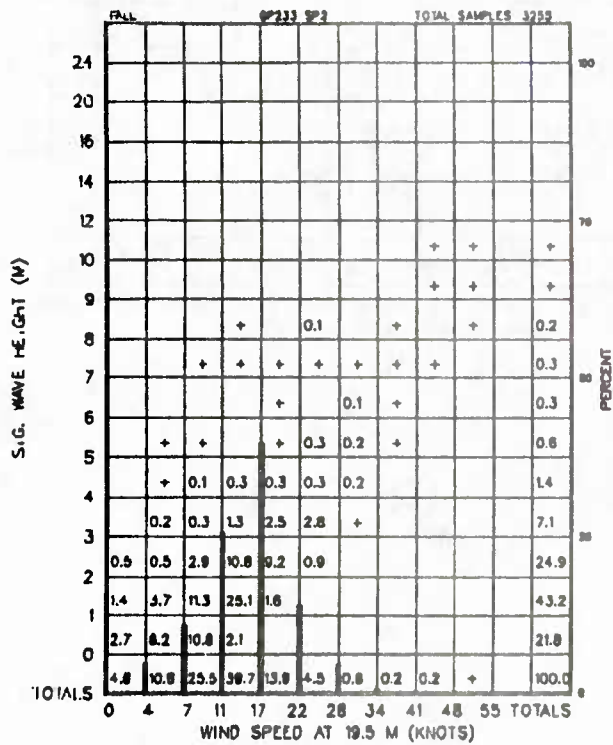


Figure A-233-5-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

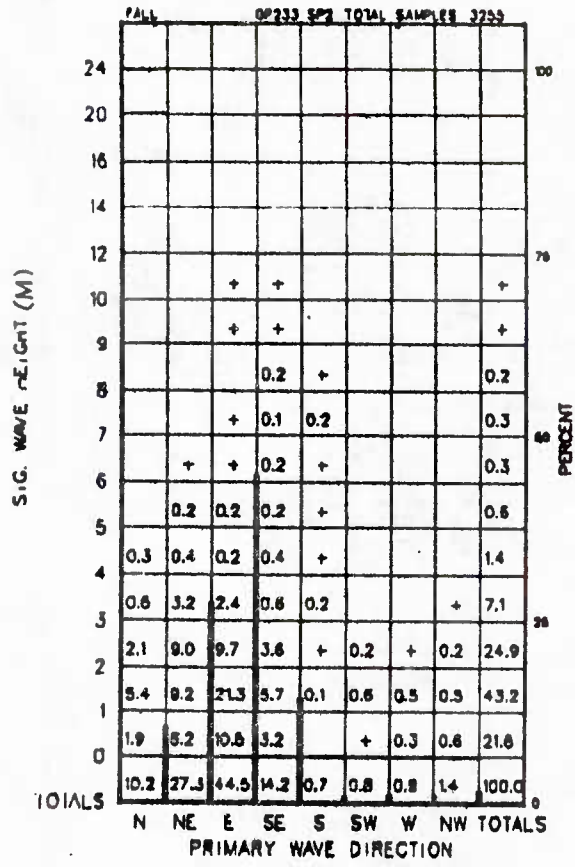


Figure A-233-5-3 Significant Wave Height vs. Primary Wave Direction

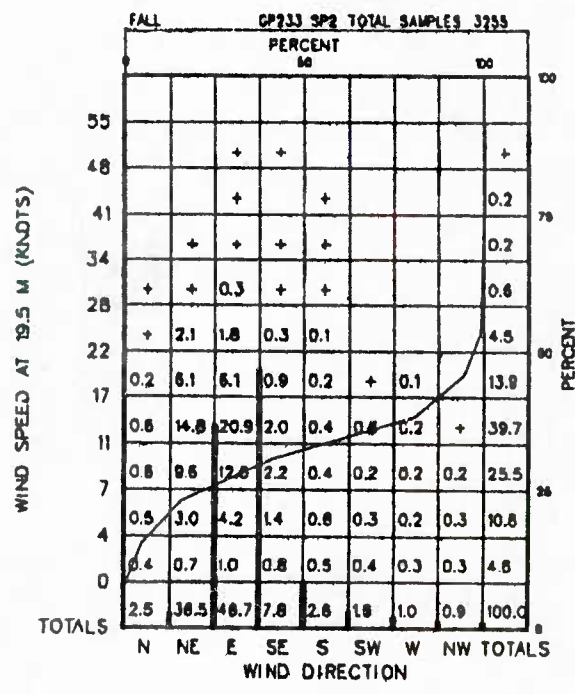


Figure A-233-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

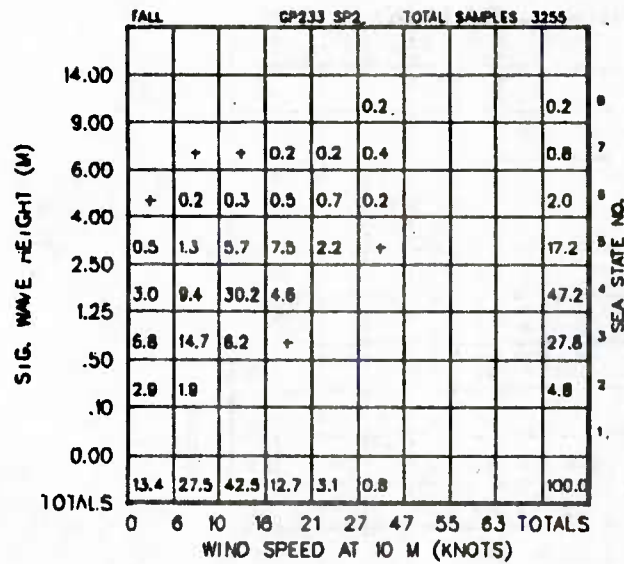


Figure A-233-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

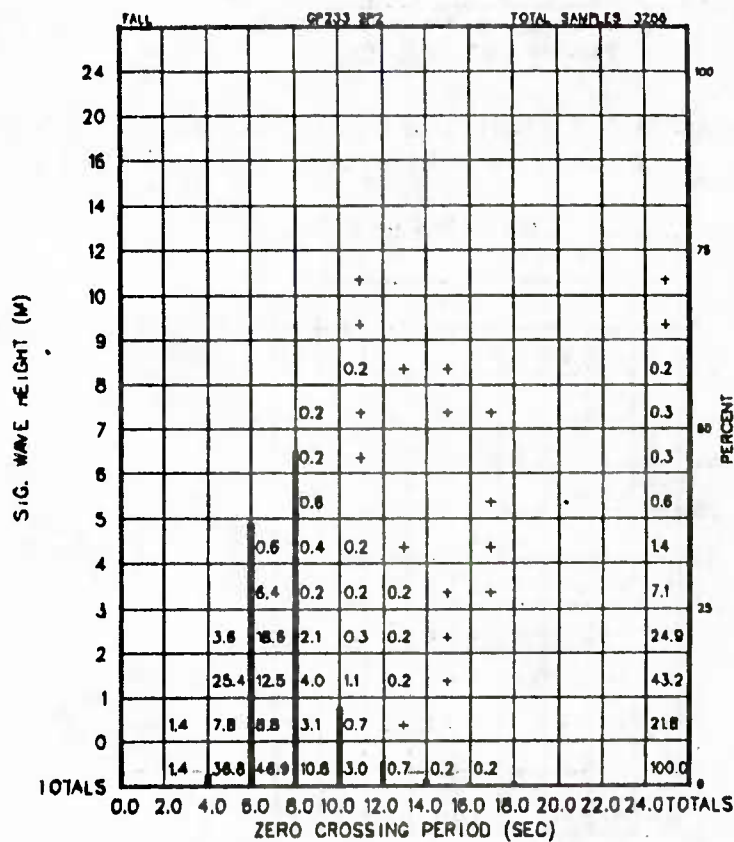


Figure A-233-5-6 Significant Wave Height vs. Zero Crossing Period

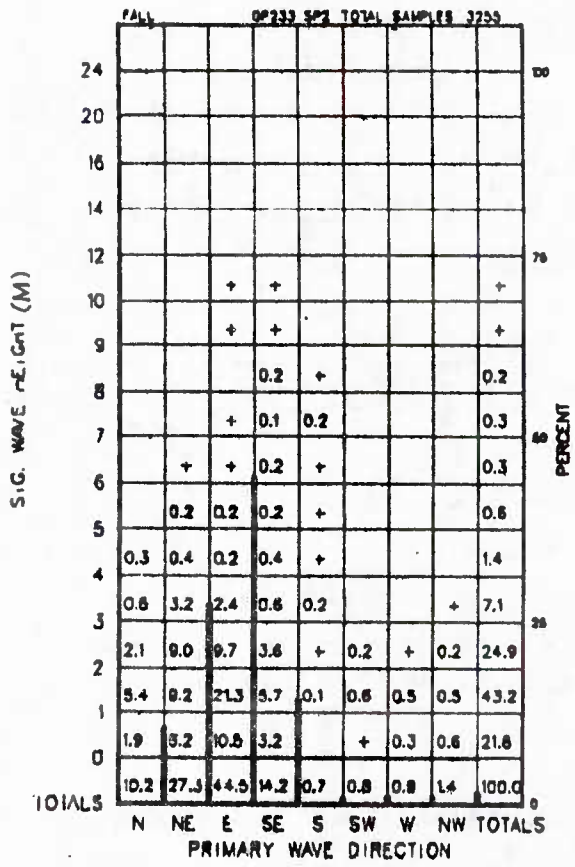


Figure A-233-5-3 Significant Wave Height vs. Primary Wave Direction

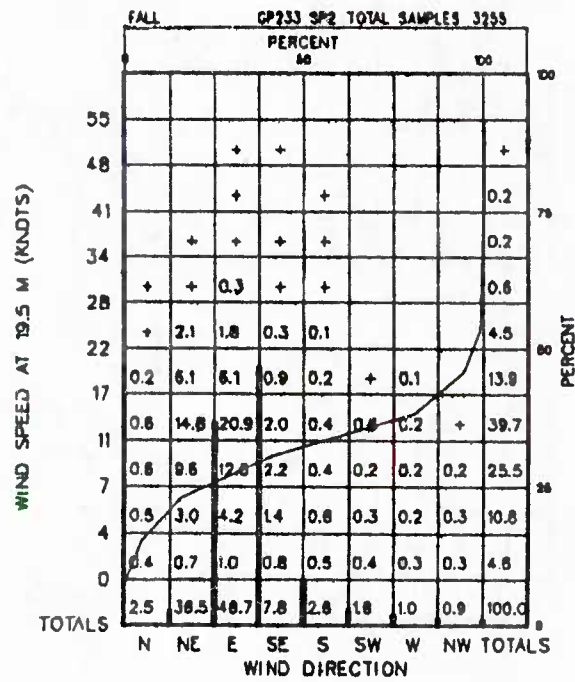


Figure A-233-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

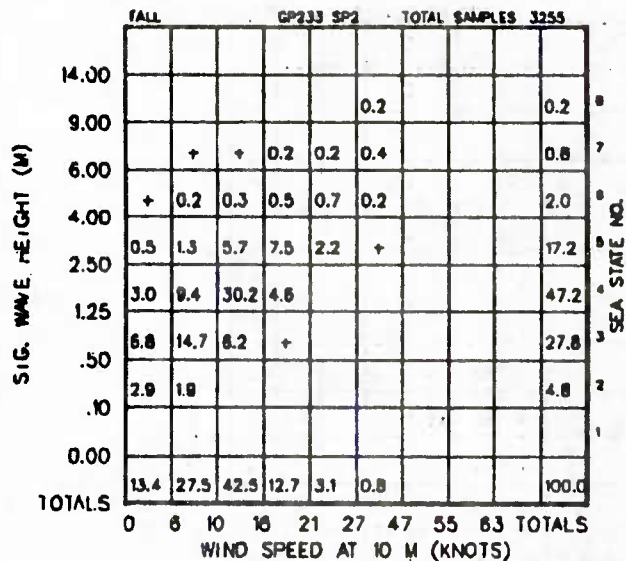


Figure A-233-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

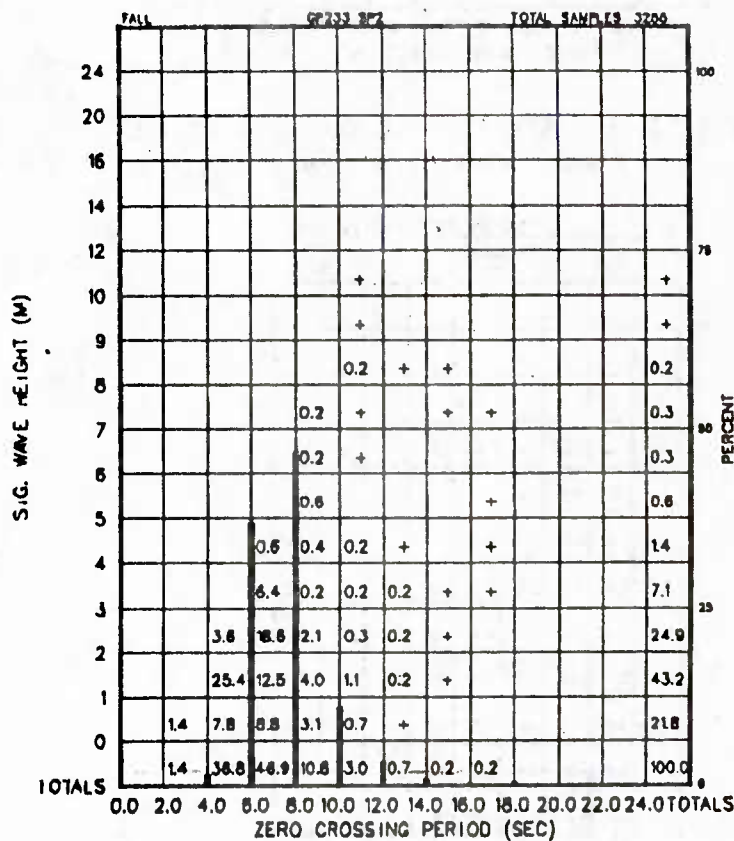


Figure A-233-5-6 Significant Wave Height vs. Zero Crossing Period

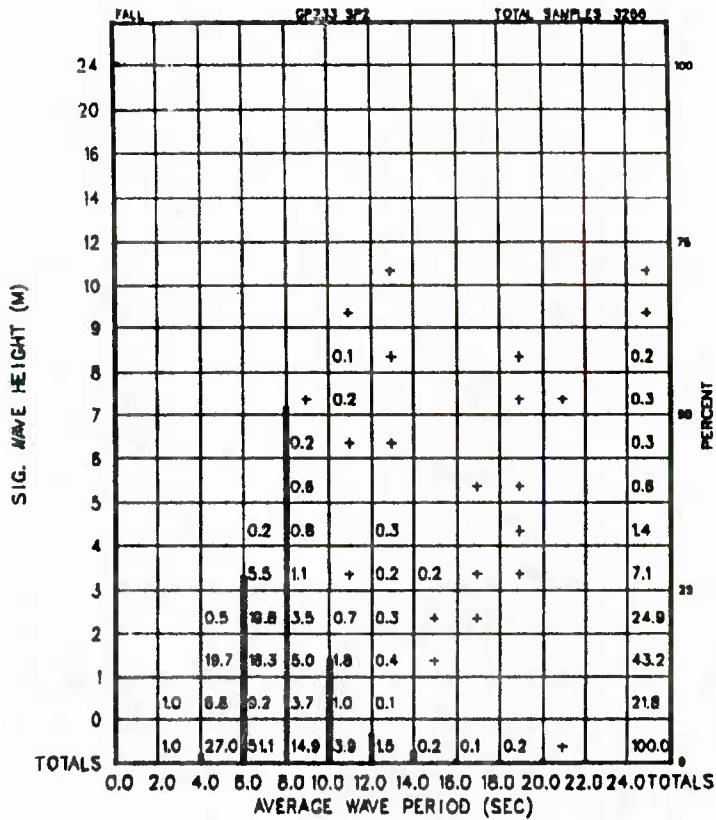


Figure A-233-5-7 Significant Wave Height vs. Average Wave Period

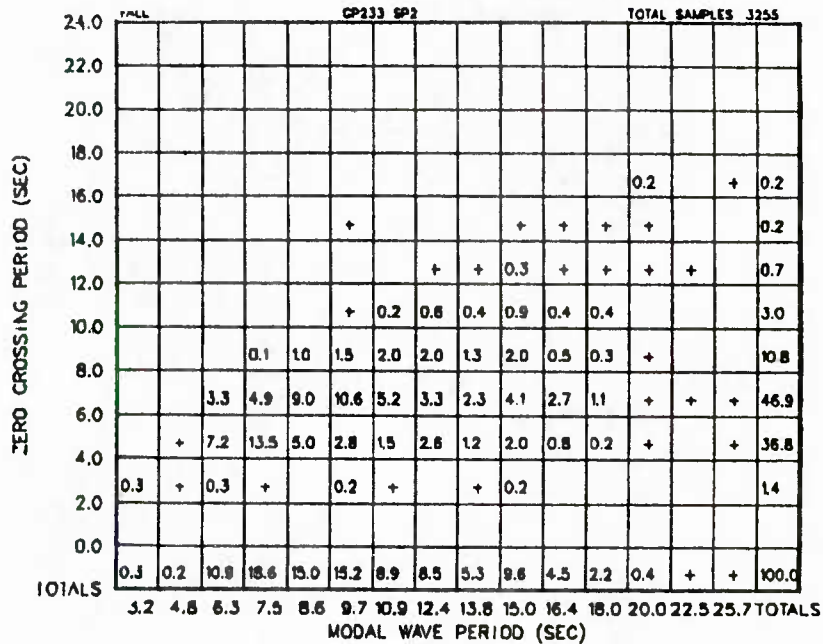


Figure A-233-5-8 Zero Crossing Period vs. Modal Wave Period

TABLE A-028-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

Natural Environment	SEASON: ANNUAL; LOCATION: 51.35°N, 162.52°E					Mean	Most Probable
	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Maximum	Mean		
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.5 6 -	3 11 -	8 17 -	3.5 12.5 -	1.5 12.4 NE		
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	4 1 -	16 2.75 -	39 7 -	18 3.5 -	14 2.5 W-NW		
Visibility, nautical miles	6.25	12	25	-	-		
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	0 0	6 4.5	8 7.5	-	-		
Precipitation (Occurrence)	All precipitation - 16% of the time					Snow - 15% of the time (Dec-Mar)	
Relative Humidity, %	70	90	99	-	-		
Air Temperature, °C	0	3	9	4	-		
Sea Surface Temperature, °C	1	4	7	-	-		
Sea Level Pressure, millibars	986	1005	1020	-	-		
Ice	Moderate superstructure icing - 2% of the time (Dec-Mar)						
Refractivity Mean Surface Refractivity Sub-Refracton (1 km, Annual) Super-Refracton or Ducting (1 km, Annual)	- - -	- - -	- - -	330 - -	- - -	2% 2%	

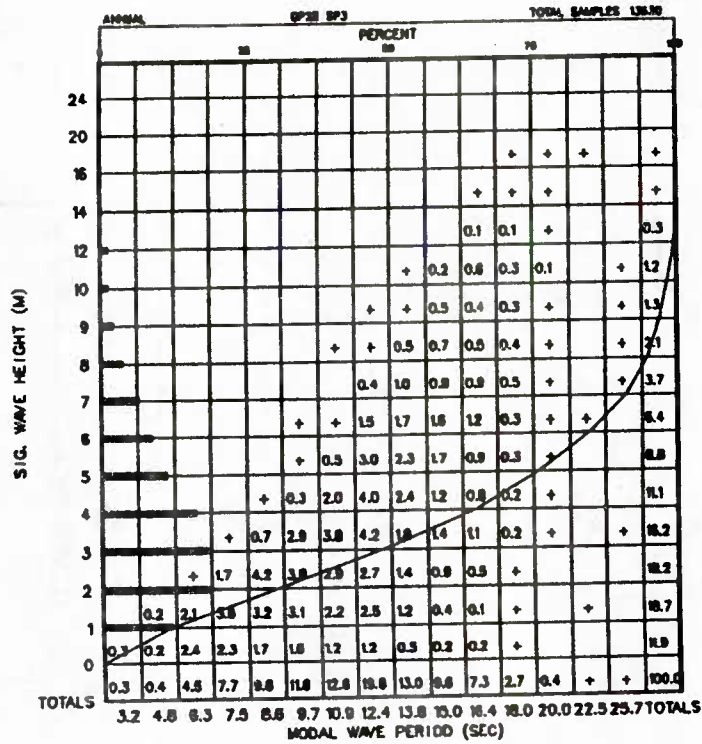


Figure A-028-1-1 Significant Wave Height vs. Modal Wave Period

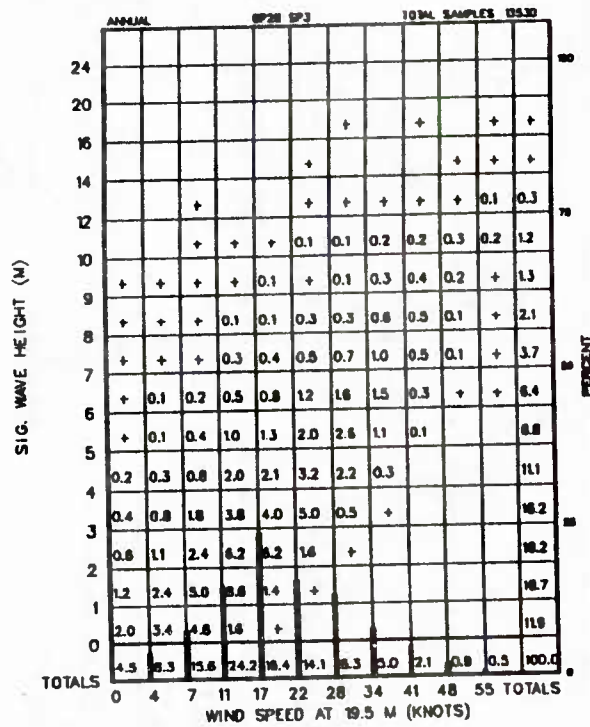


Figure A-028-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

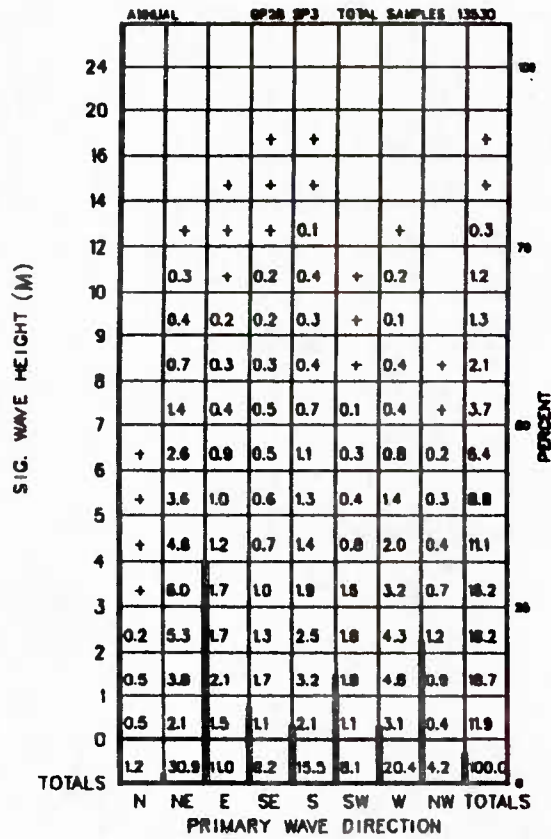


Figure A-028-1-3 Significant Wave Height vs. Primary Wave Direction

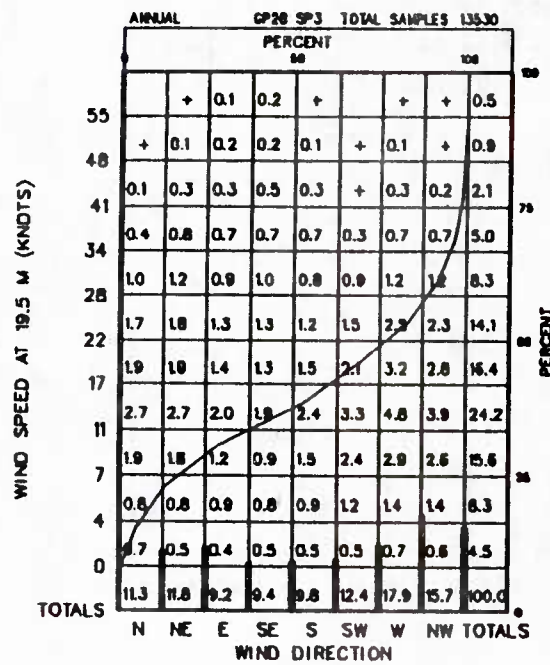


Figure A-028-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

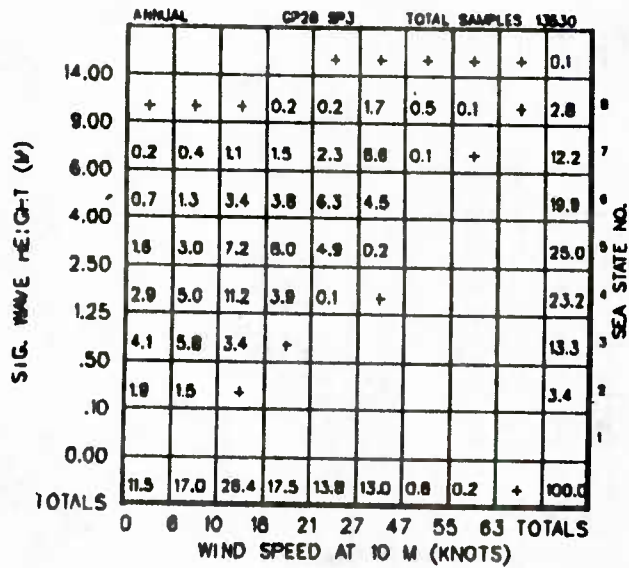


Figure A-028-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

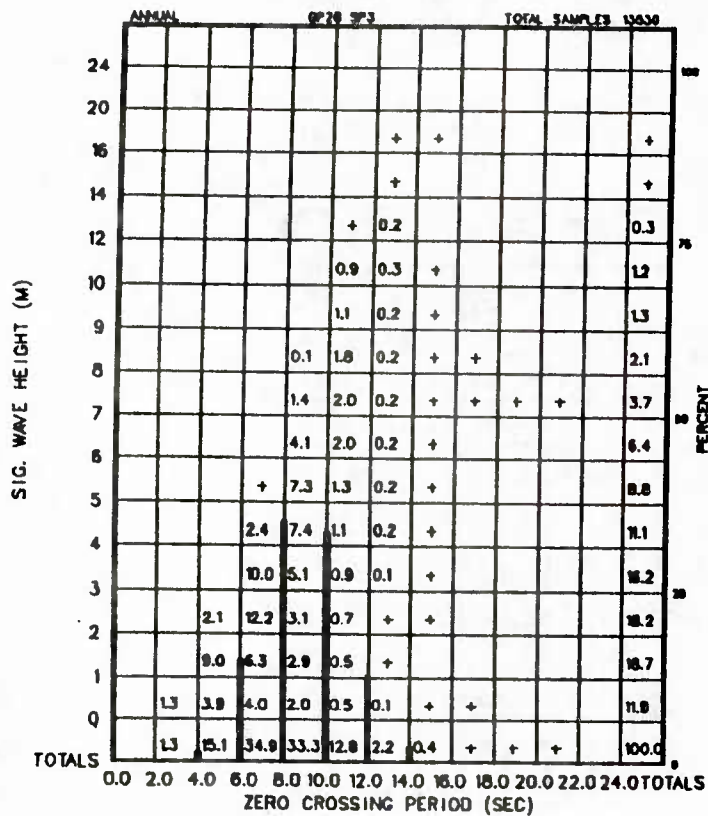


Figure A-028-1-6 Significant Wave Height vs. Zero Crossing Period

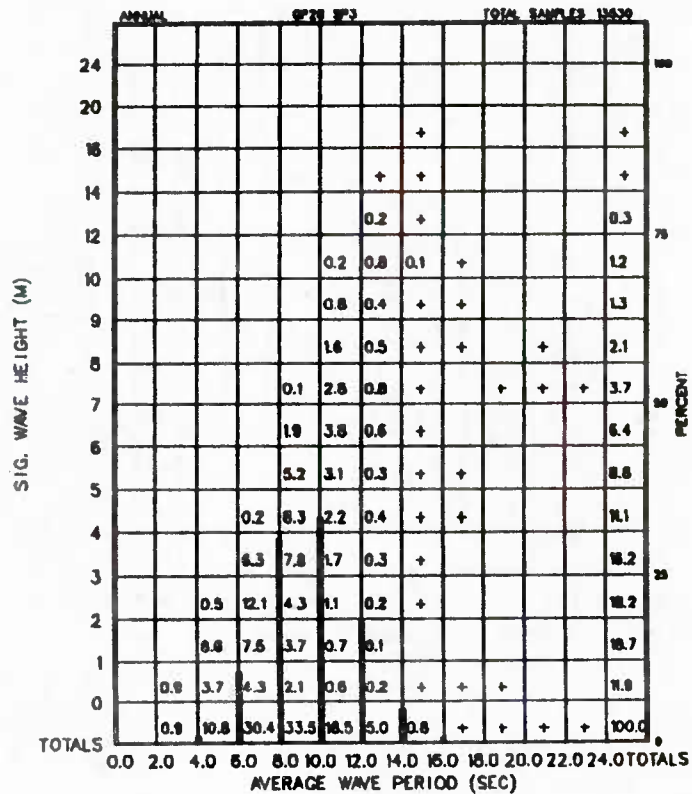


Figure A-028-1-7 Significant Wave Height vs. Average Wave Period

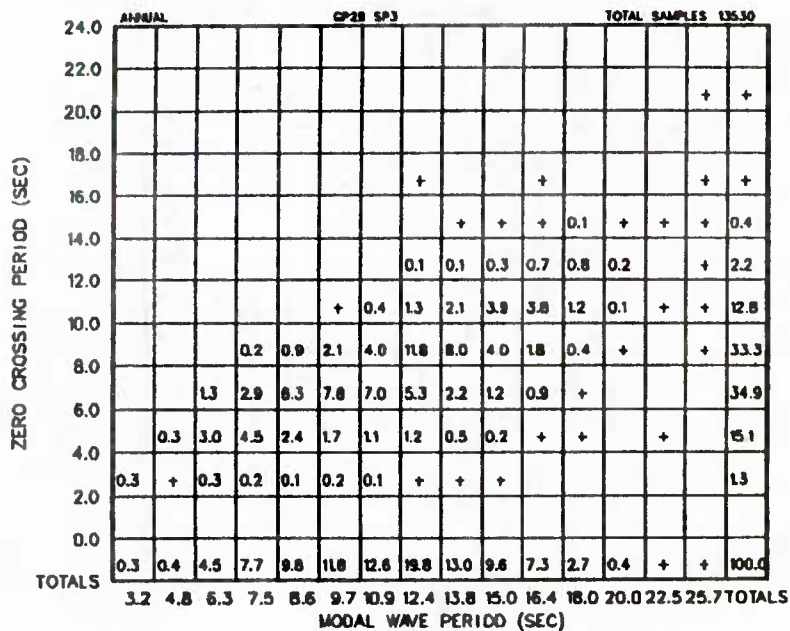


Figure A-028-1-8 Zero Crossing Period vs. Modal Wave Period

		GP28 SP3												TOTAL SAMPLES 15530												
WIND SPEED AT 19.5 M (KNOTS)		0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	TOTALS	PERCENT		
55	18	15	5	1																				39		
48	57	13	7	2		1																			80	
41	123	41	12	6	2																				186	
34	278	80	32	15	10	4	2																		421	
28	423	156	56	23	12	5	2		1				1												679	
22	620	231	97	46	26	14	6	2	4	1			1				1								1050	
17	808	289	112	57	20	15	8	2				1													1312	
11	846	362	161	69	48	31	12	14	10		2	1	1	1											1608	
7	667	294	80	43	24	21	9	6	2		1														1187	
4	462	141	67	19	10	7		2																	708	
0	251	53	37	9	11	3	3	1	1																389	
TOTALS	4583	1575	708	311	165	101	42	27	18	1	4	3	1	1	1										7630	

Figure A-028-1-11 Persistence of Wind Speed at 19.5 M (Knots)

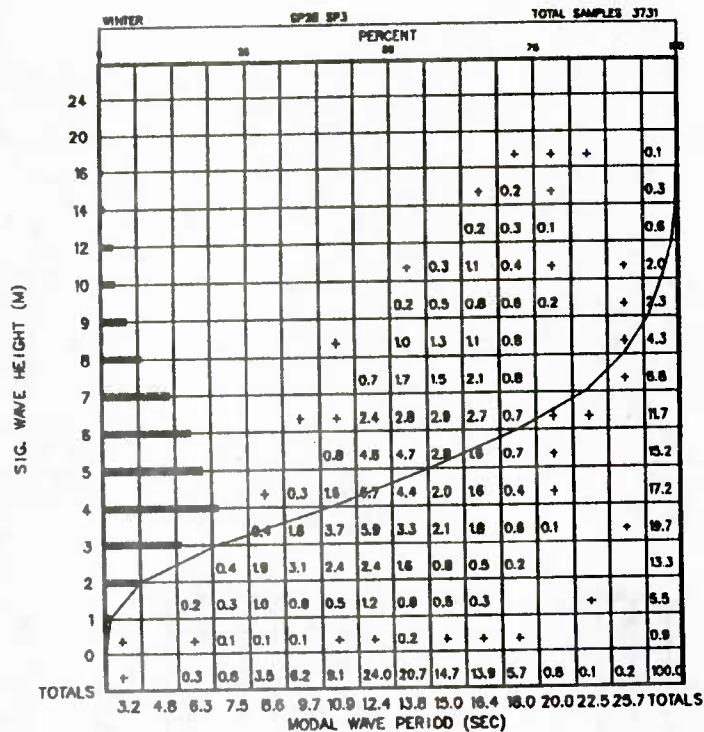


Figure A-028-2-1 Significant Wave Height vs. Modal Wave Period

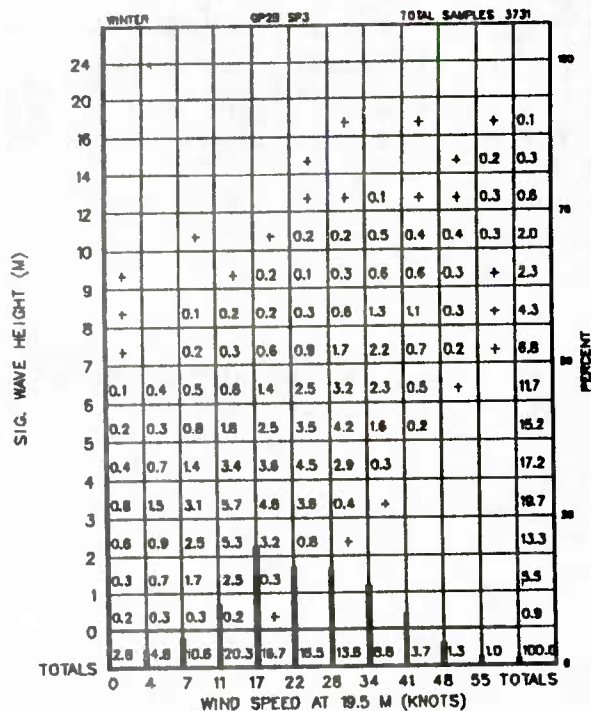


Figure A-028-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

WINTER GP20 SP3 TOTAL SAMPLES 3731

SIG. WAVE HEIGHT (M)	PERCENT								TOTALS	
	N	NE	E	SE	S	SW	W	NW		
24										
20										
16				+	+					0.1
14			0.1	+	+					0.3
12	0.1	0.1	0.2	0.2			+			0.6
10	0.4	0.2	0.5	0.7			0.2			2.0
9	0.9	0.3	0.3	0.6		+	0.2			2.3
8	1.4	0.5	0.6	0.8	0.1	0.6	+			4.3
7	2.9	0.8	0.8	1.2	0.2	0.8	0.2			6.8
6	+	5.7	1.6	0.7	1.6	0.3	1.5	0.3		11.7
5	+	7.0	2.1	0.9	1.4	0.6	2.6	0.7		15.2
4	+	9.1	2.1	0.6	1.0	0.7	3.1	0.5		17.2
3	+	12.1	3.0	0.5	1.1	0.7	3.5	0.8		19.7
2	0.2	6.5	1.5	0.2	0.7	0.6	2.8	1.1		13.3
1	0.3	1.7	1.0	0.2	0.3	0.2	1.0	0.7		5.5
0	+	0.5	0.1	+	+		0.1	+		0.9
TOTALS	0.8	46.3	13.4	3.6	9.7	3.5	16.2	4.4		100.0

PRIMARY WAVE DIRECTION

Figure A-028-2-3 Significant Wave Height vs. Primary Wave Direction

WINTER GP20 SP3 TOTAL SAMPLES 3731

WIND SPEED AT 19.5 M (KNOTS)	PERCENT								TOTALS	
	N	NE	E	SE	S	SW	W	NW		
55		0.1	0.3	0.5	+		+			1.0
48	+	0.2	0.4	0.3	0.1	+	0.1	0.1		1.3
41	0.2	0.7	0.5	0.8	0.4	0.1	0.5	0.4		3.7
34	0.8	1.7	1.1	1.2	1.0	0.4	1.1	1.2		8.8
28	1.9	2.4	1.6	1.2	0.6	1.3	1.9	2.0		13.6
22	2.5	2.9	2.0	1.5	1.0	1.0	2.4	2.9		16.5
17	2.5	3.1	1.6	1.3	0.9	1.3	2.8	2.9		16.7
11	3.2	3.5	2.0	1.5	1.4	1.9	3.0	3.1		20.3
7	1.9	1.9	1.2	0.5	0.8	0.8	1.4	1.4		10.6
4	0.6	0.8	0.6	0.5	0.2	0.4	0.7	0.6		4.8
0	0.5	0.3	0.3	0.3	0.2	0.2	0.5	0.4		2.8
TOTALS	14.2	17.7	11.7	9.5	6.8	7.5	14.4	15.1		100.0

WIND DIRECTION

Figure A-028-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

SIG. WAVE HEIGHT (M)	WINTER			CP28 SP3			TOTAL SAMPLES 3731			SEA STATE NO.
	+	+	0.2	0.3	0.3	3.0	0.9	0.2	+	
14.00										
9.00	+	+	0.2	0.3	0.3	3.0	0.9	0.2	+	5.0
6.00	0.5	0.8	1.6	2.8	4.3	12.8	0.1	+		22.8
4.00	1.6	2.4	6.0	6.4	9.6	6.5				32.4
2.50	2.6	4.8	9.7	7.1	3.2	0.2				27.5
1.25	1.6	2.9	4.6	1.1	0.1					10.3
.50	0.5	0.6	0.4	+						1.5
.10	+	+								0.2
0.00										
TOTALS	6.9	11.3	22.5	17.8	17.6	22.3	1.0	0.4	0.1	100.0
	0	6	10	16	21	27	47	55	63	TOTALS
	WIND SPEED AT 10 M (KNOTS)									

Figure A-028-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

SIG. WAVE HEIGHT (M)	WINTER			CP28 SP3			TOTAL SAMPLES 3731			PERCENT			
	+	+	0.2	0.3	0.3	3.0	0.9	0.2	+		0.4		
24													
20													
18										0.1			
16										0.3			
14										0.6			
12					0.2	0.5				2.0			
10					1.6	0.4	+			2.3			
9					2.0	0.3				4.3			
8				0.2	3.8	0.2	+			6.8			
7				2.7	3.9	0.2				11.7			
6				7.0	4.0	0.6	+			15.2			
5				12.1	2.8	0.5	+			17.2			
4			2.1	12.5	2.1	0.4	+			19.7			
3			8.9	8.5	1.9	0.3	+			13.3			
2		0.5	8.8	3.2	0.7	+	+			5.5			
1		1.8	2.4	1.1	0.3	+				0.9			
0	+	0.3	0.4	0.1	+	+				100.0			
TOTALS	+	2.4	22.6	47.5	23.2	3.8	0.4						
	0.0	2.0	4.0	6.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	TOTALS
	ZERO CROSSING PERIOD (SEC)												

Figure A-028-2-6 Significant Wave Height vs. Zero Crossing Period

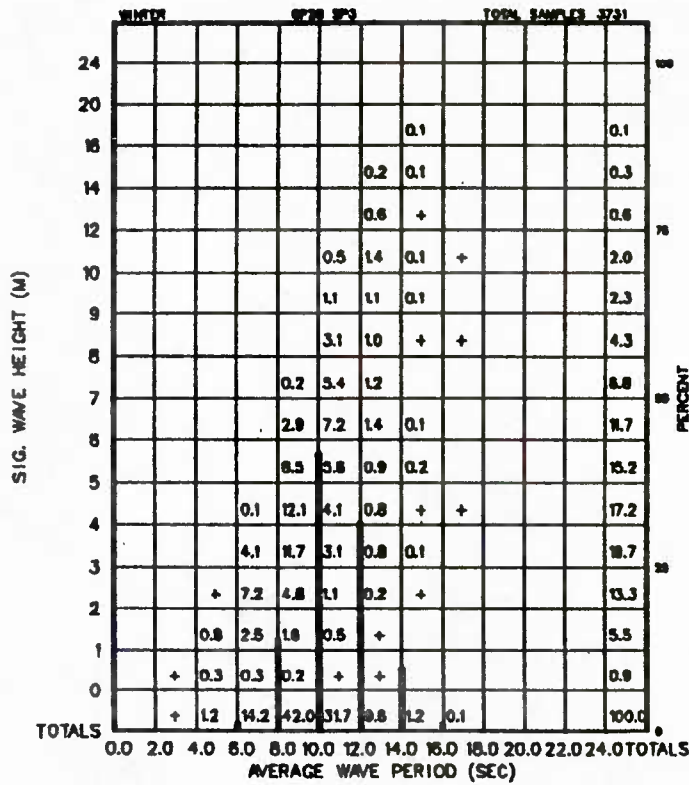


Figure A-028-2-7 Significant Wave Height vs. Average Wave Period

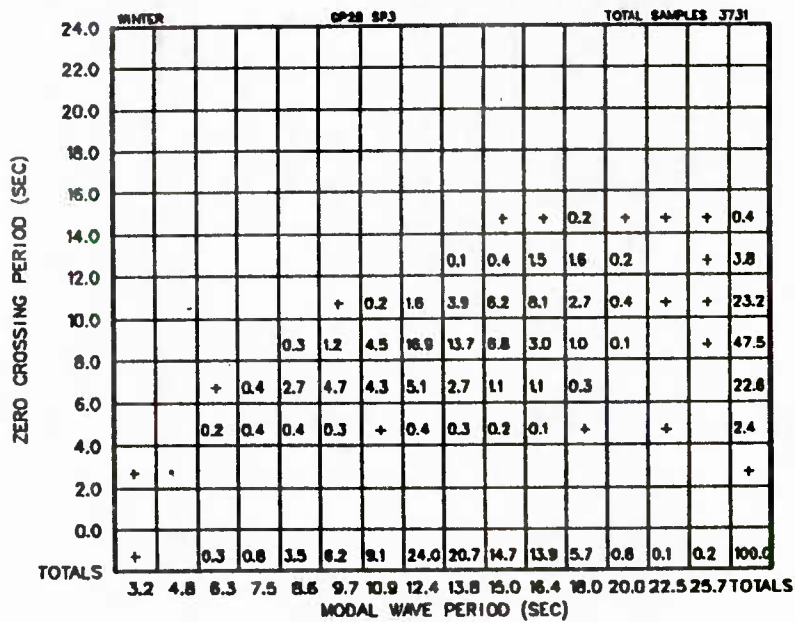


Figure A-028-2-8 Zero Crossing Period vs. Modal Wave Period

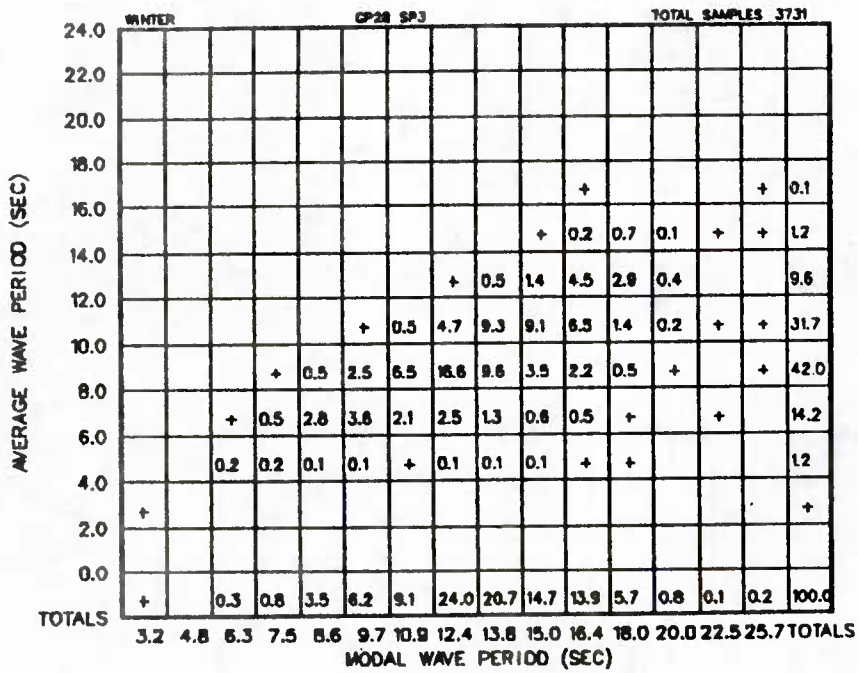


Figure A-028-2-9 Average Wave Period vs. Modal Wave Period

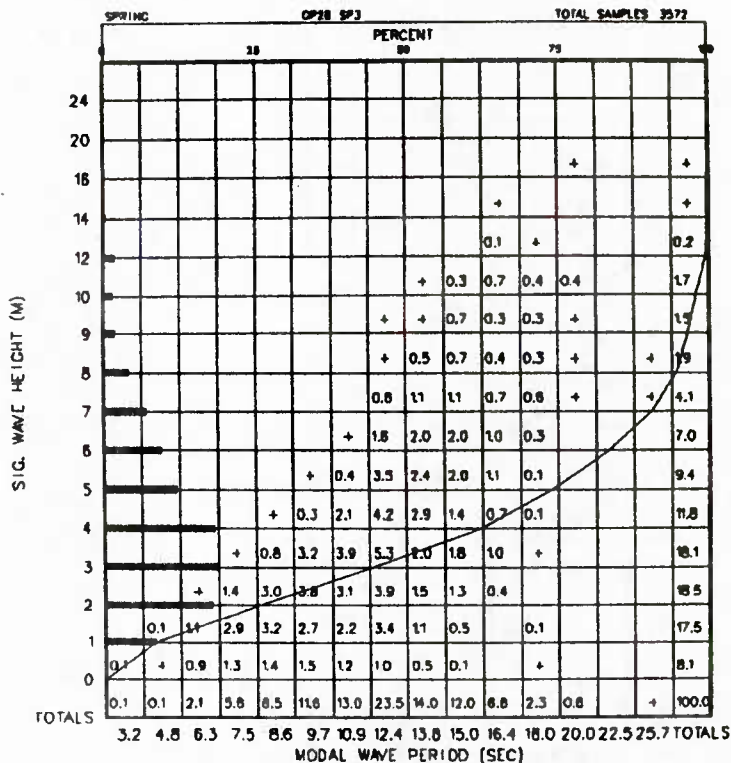


Figure A-028-3-1 Significant Wave Height vs. Modal Wave Period

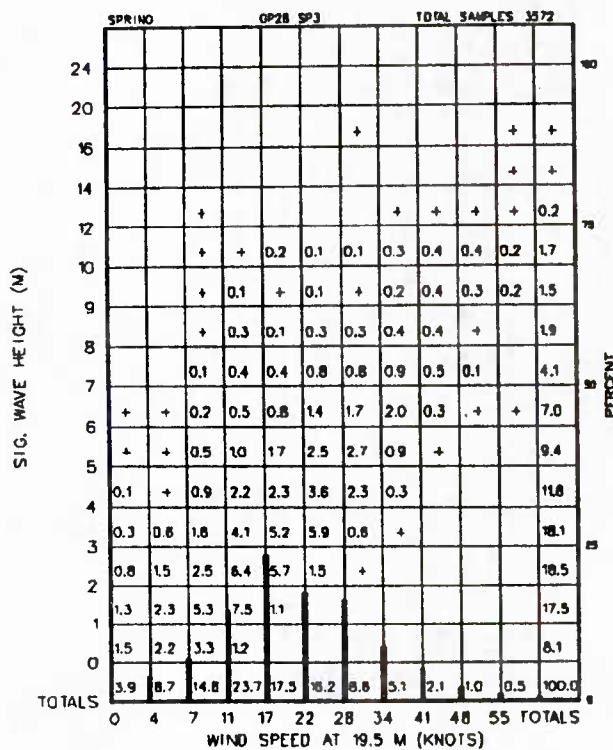


Figure A-028-3-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

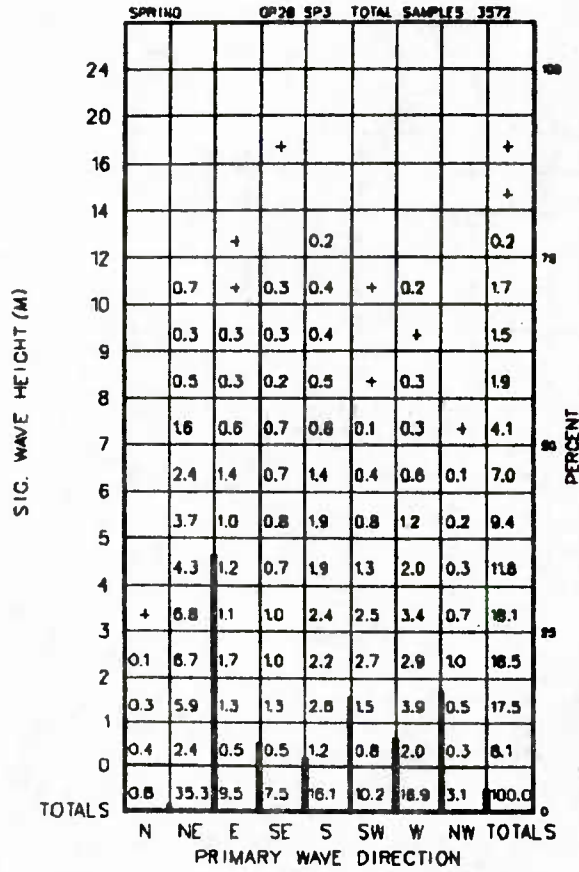


Figure A-028-3-3 Significant Wave Height vs. Primary Wave Direction

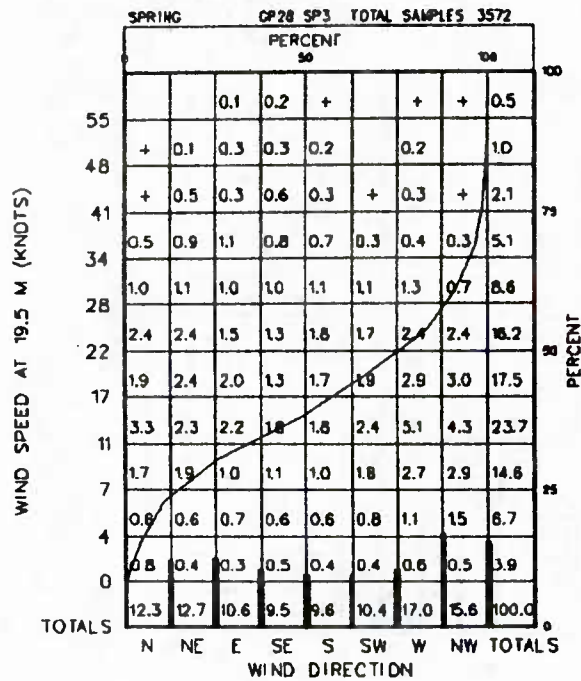


Figure A-028-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

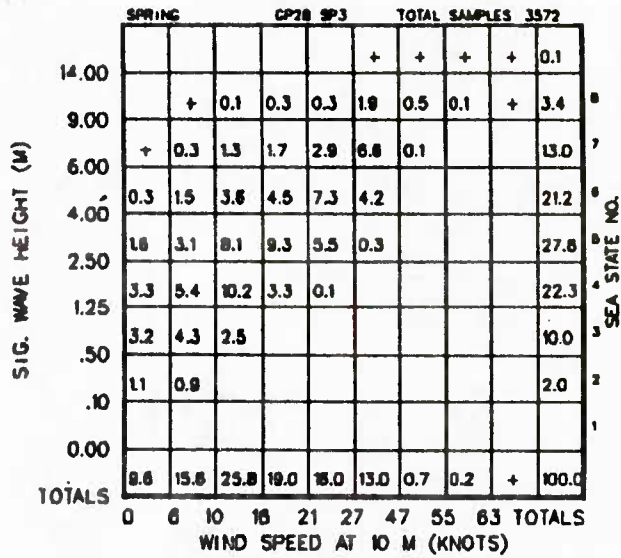


Figure A-028-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

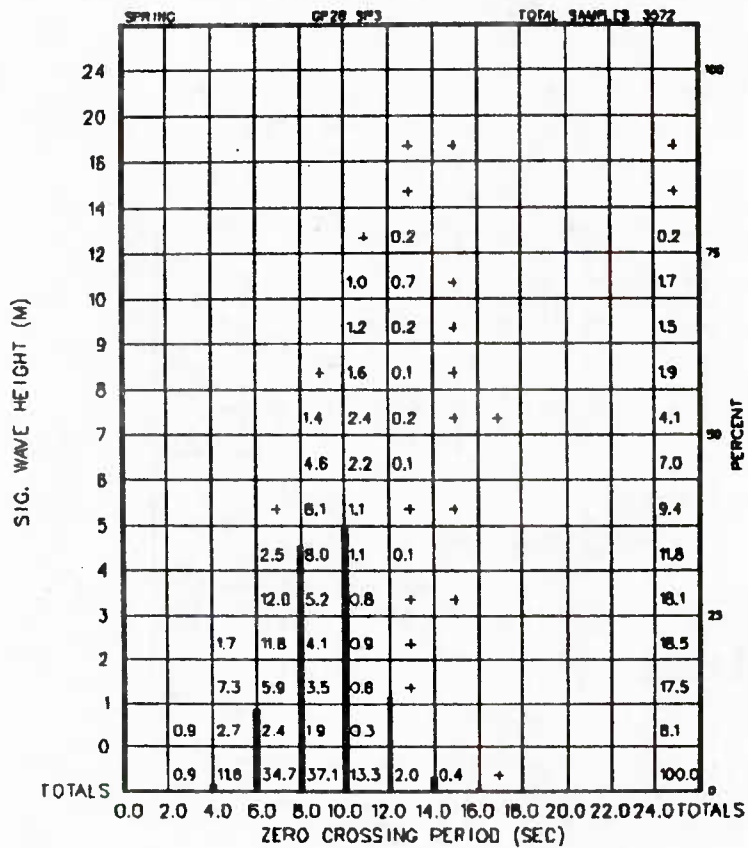


Figure A-028-3-6 Significant Wave Height vs. Zero Crossing Period

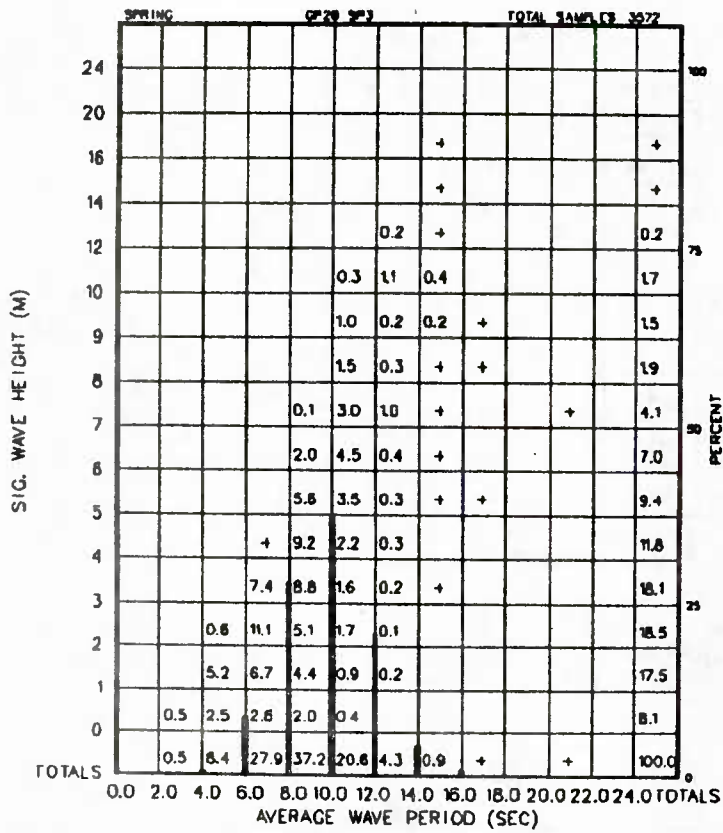


Figure A-028-3-7 Significant Wave Height vs. Average Wave Period

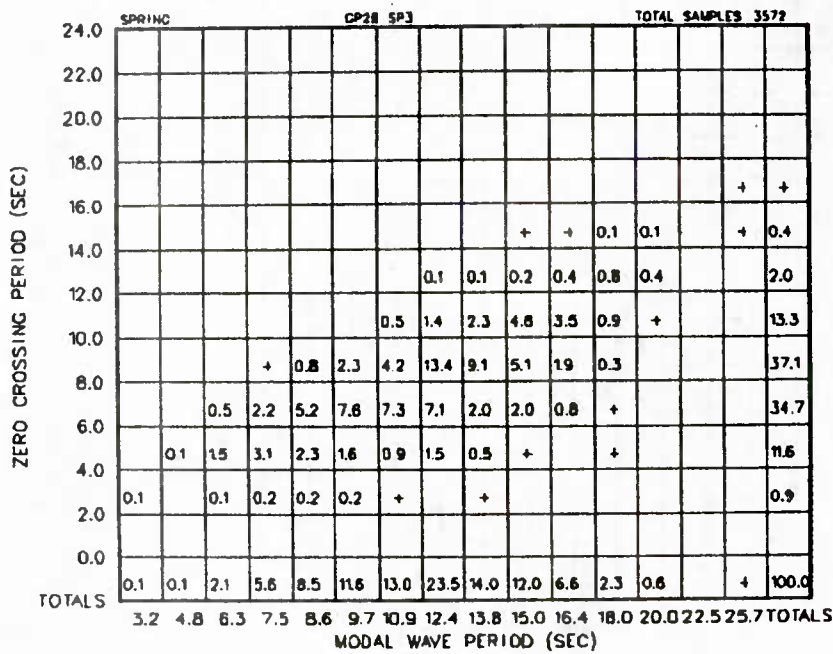


Figure A-028-3-8 Zero Crossing Period vs. Modal Wave Period

		SPRING GP28 SP3													TOTAL SAMPLES 3572		
		3.2	4.8	6.3	7.5	8.6	9.7	10.9	12.4	13.8	15.0	16.4	18.0	20.0	22.5	25.7	TOTALS
AVERAGE WAVE PERIOD (SEC)	24.0																
	22.0																
	20.0																+
	18.0																
	16.0																
	14.0																
	12.0																
	10.0																
	8.0																
	6.0																
	4.0																
	2.0																
	0.0																
TOTALS	0.1	0.1	2.1	5.6	8.5	11.6	13.0	23.5	14.0	12.0	6.6	2.3	0.6			+	100.0

Figure A-028-3-9 Average Wave Period vs. Modal Wave Period

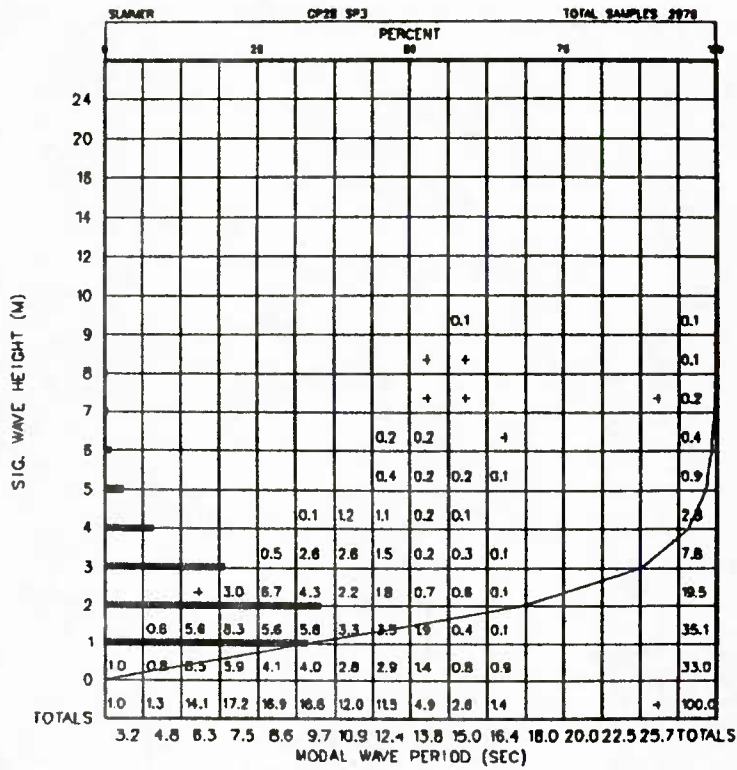


Figure A-028-4-1 Significant Wave Height vs. Modal Wave Period

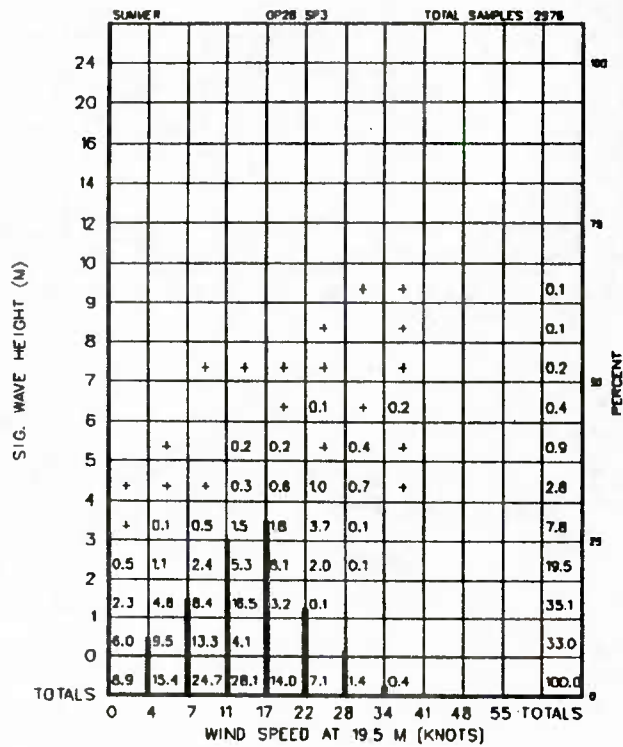


Figure A-028-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

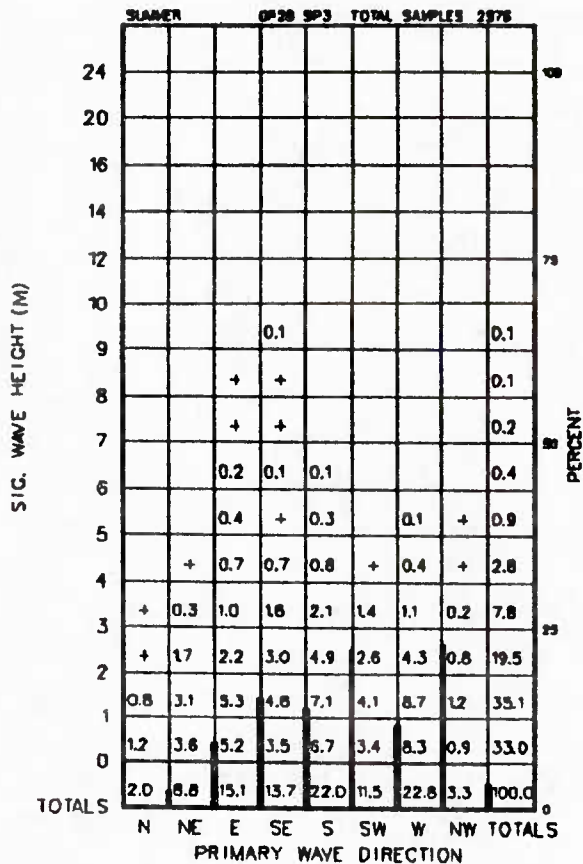


Figure A-028-4-3 Significant Wave Height vs. Primary Wave Direction

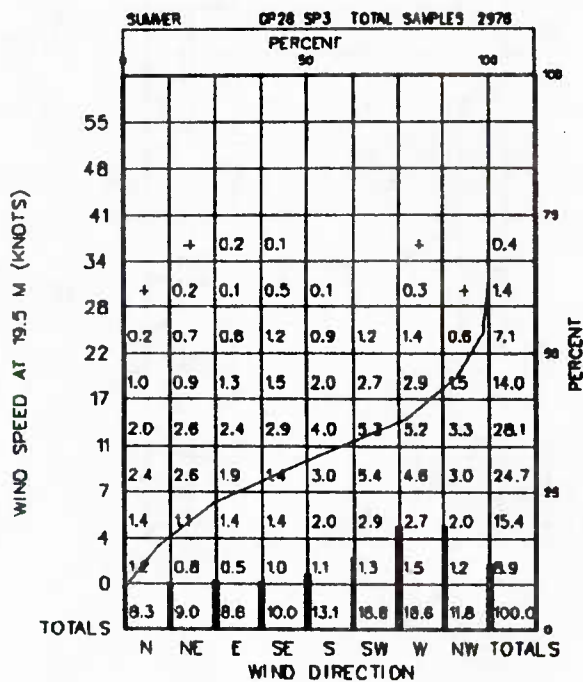


Figure A-028-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

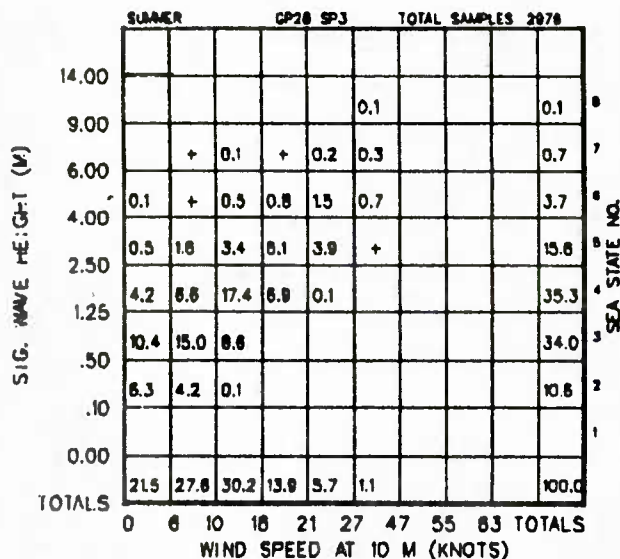


Figure A-028-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

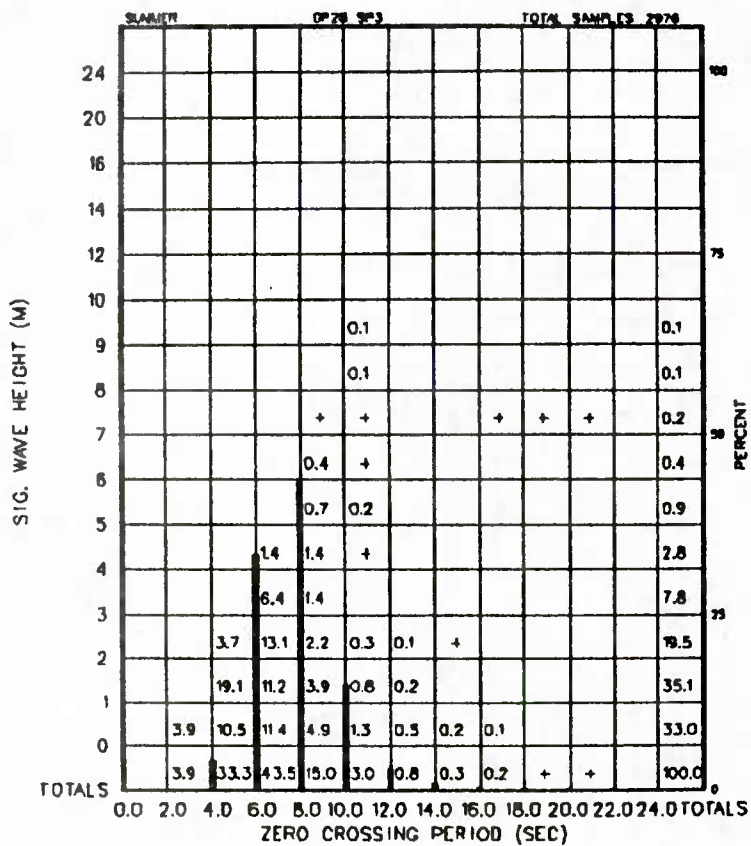


Figure A-028-4-6 Significant Wave Height vs. Zero Crossing Period

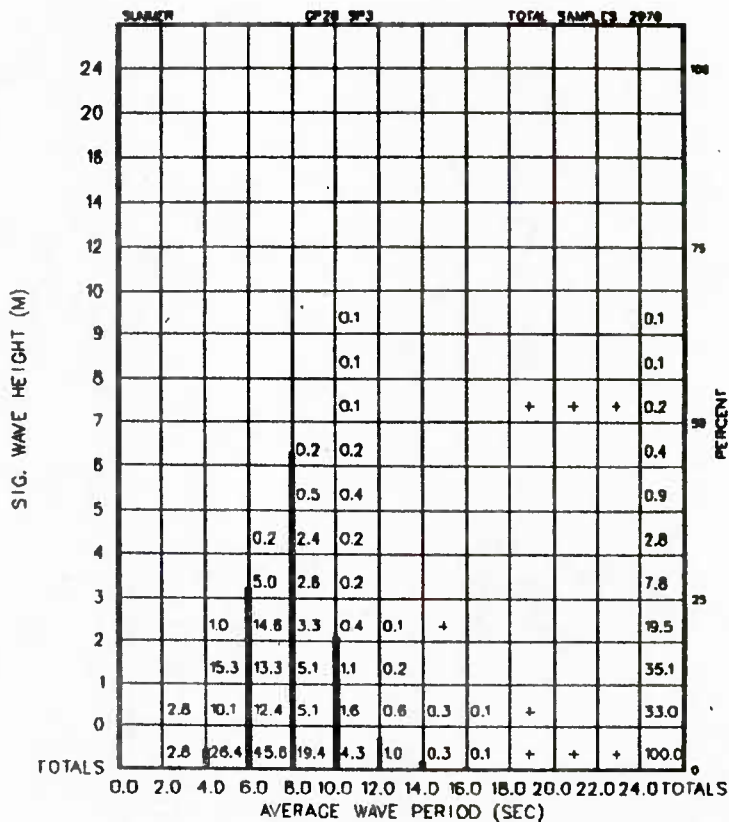


Figure A-028-4-7 Significant Wave Height vs. Average Wave Period

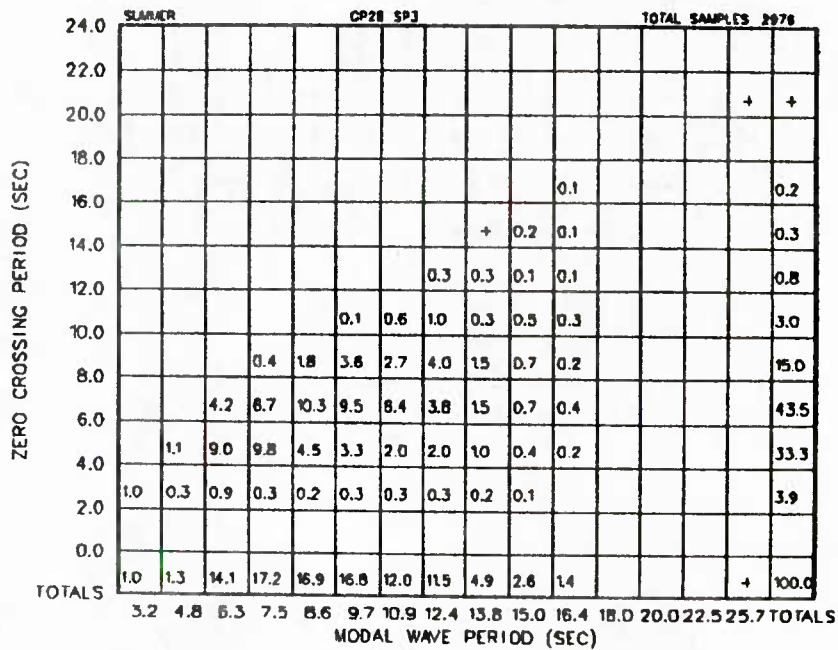


Figure A-028-4-8 Zero Crossing Period vs. Modal Wave Period

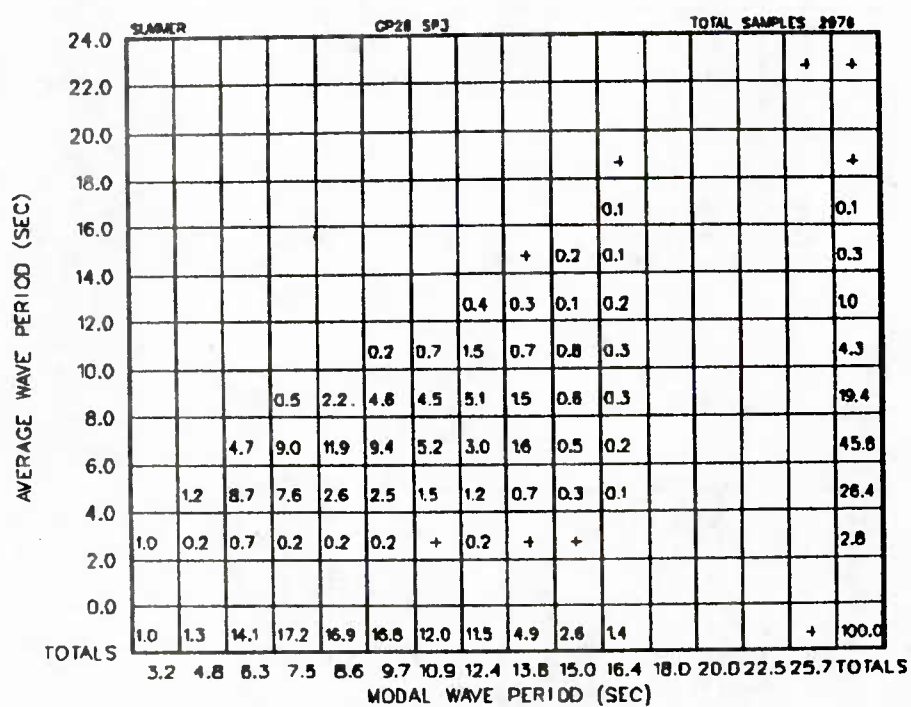


Figure A-028-4-9 Average Wave Period vs. Modal Wave Period

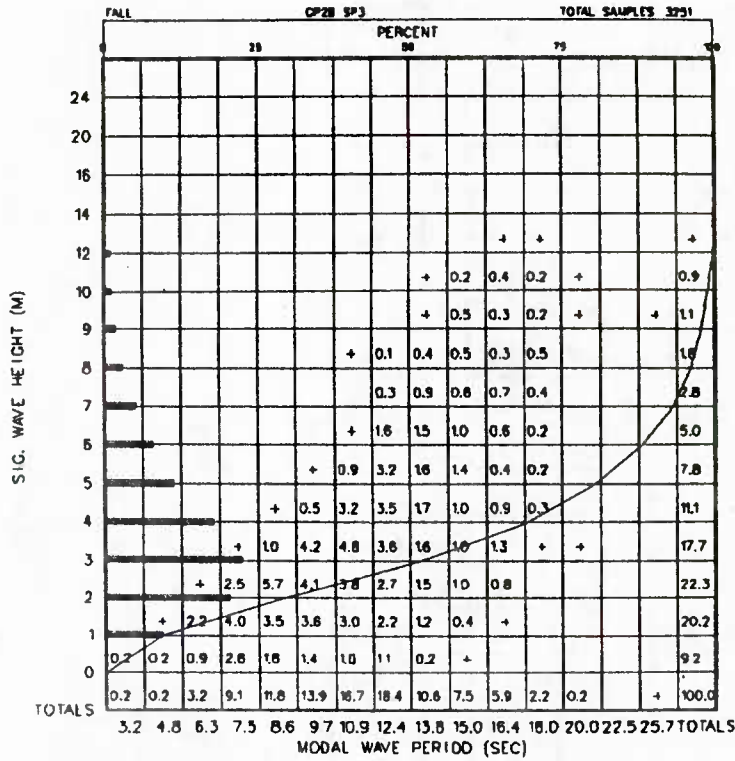


Figure A-028-5-1 Significant Wave Height vs. Modal Wave Period

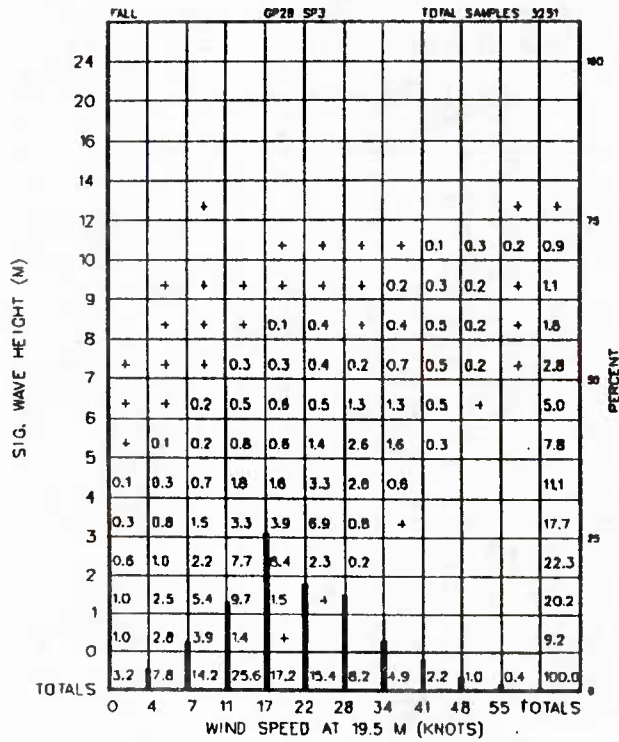


Figure A-028-5-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

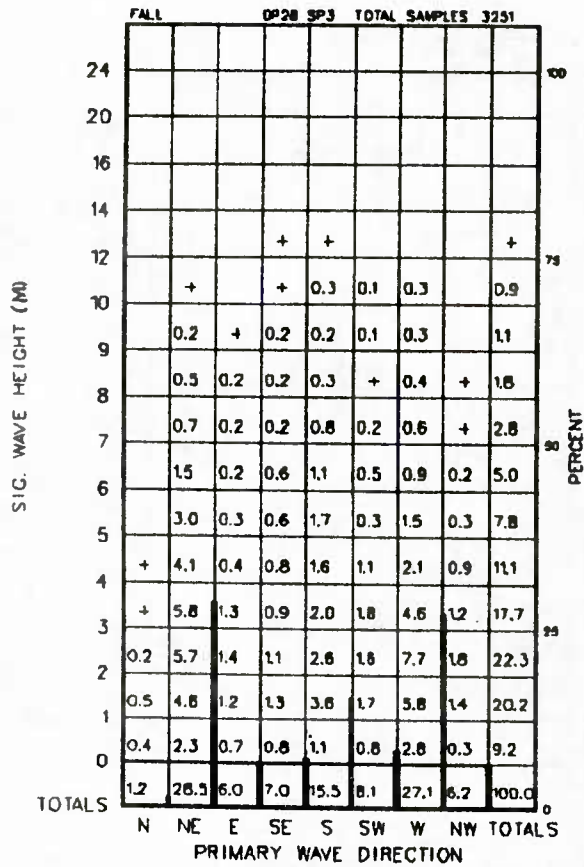


Figure A-028-5-3 Significant Wave Height vs. Primary Wave Direction

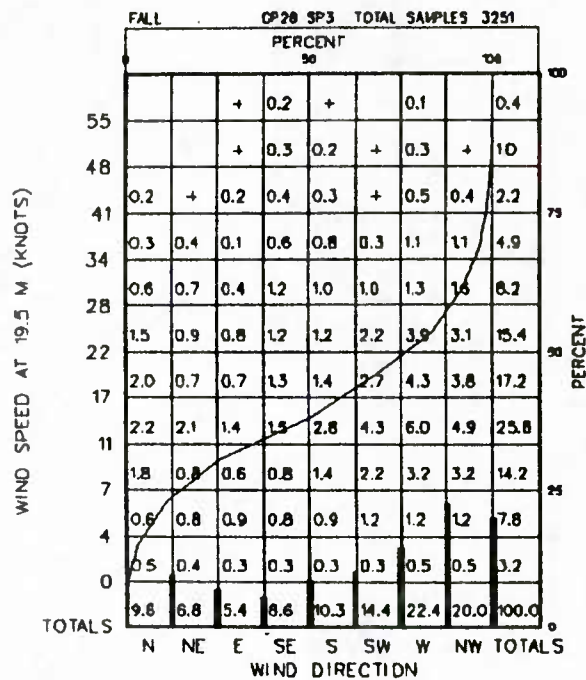


Figure A-028-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

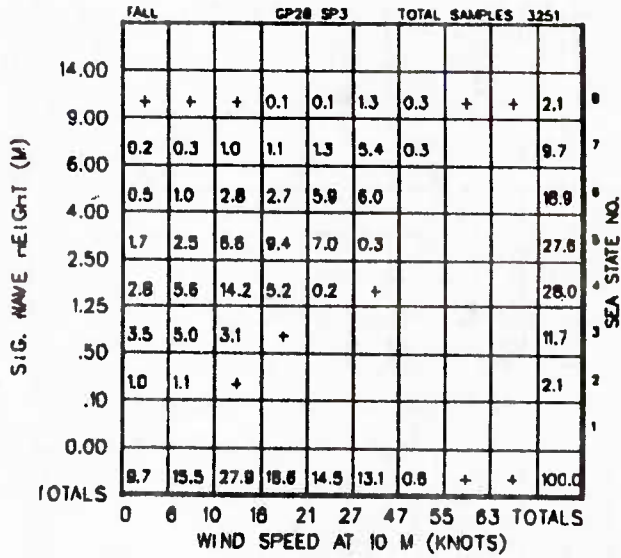


Figure A-028-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

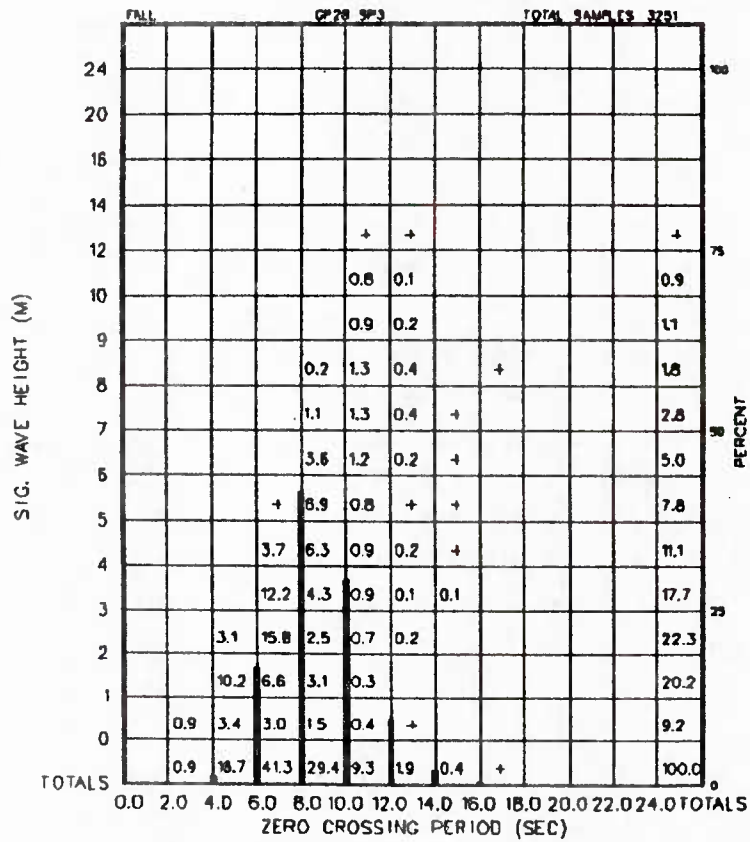


Figure A-028-5-6 Significant Wave Height vs. Zero Crossing Period

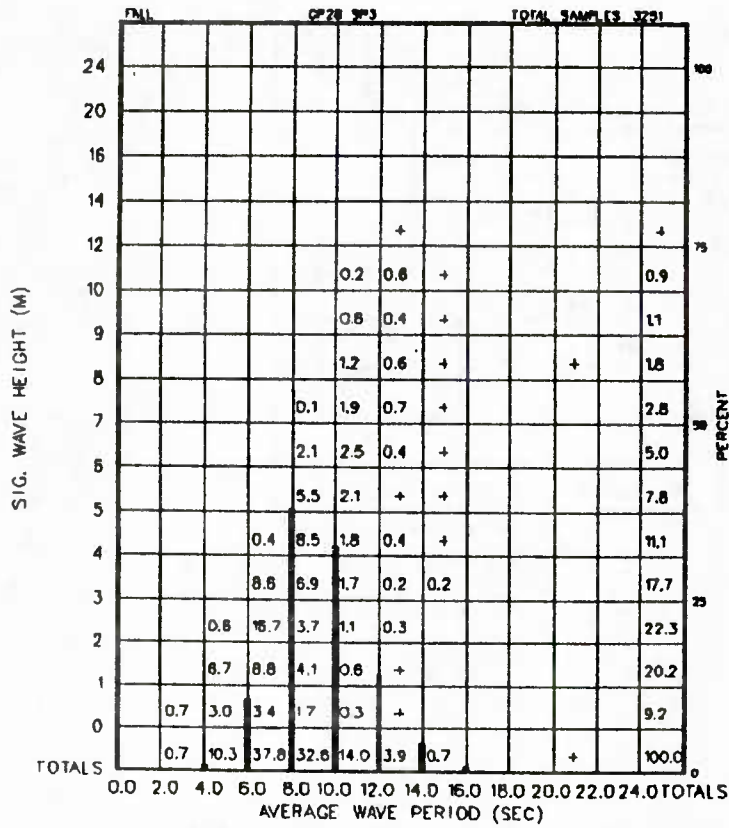


Figure A-028-5-7 Significant Wave Height vs. Average Wave Period

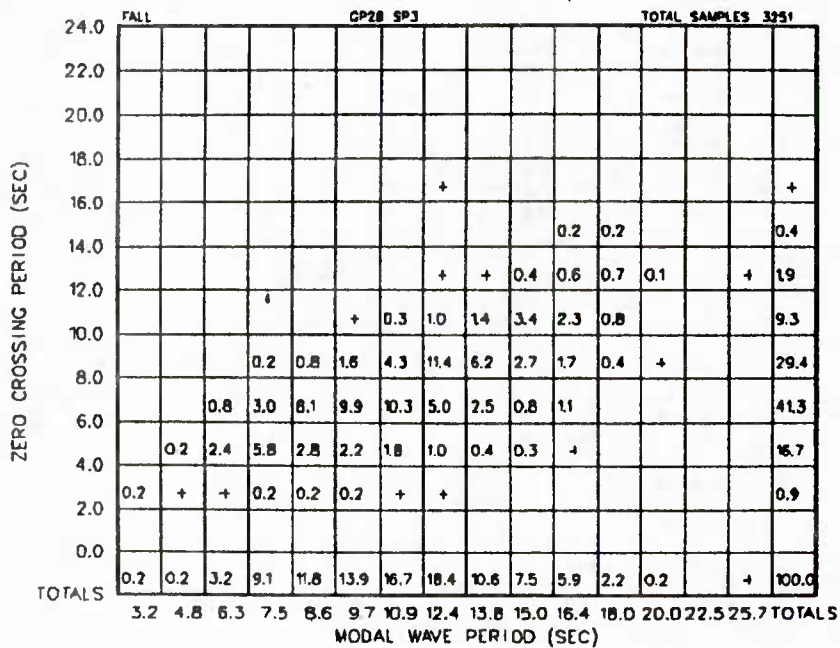


Figure A-028-5-8 Zero Crossing Period vs. Modal Wave Period

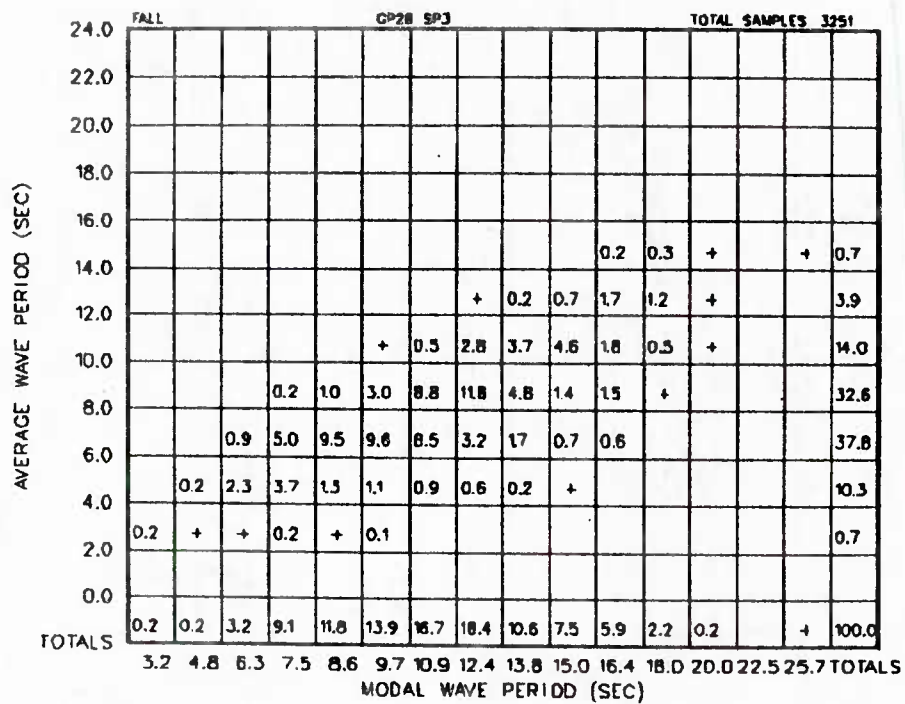


Figure A-028-5-9 Average Wave Period vs. Modal Wave Period

TABLE A-056-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

		SEASON: ANNUAL; LOCATION: 50.04°N, 178.91°W			
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.75 7 -	3.5 11 -	8.5 17 -	3.5 11.75 -	2.5 12.4 S-SW
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	5 1 -	17.5 3.25 -	40 7 -	19.5 3.5 -	14 2.5 W
Visibility, nautical miles	0.5	8	25	-	-
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	1 0.5	7 6.5	8 8	- -	- -
Precipitation (Occurrence)	All precipitation - 21% of the time Snow - 12% of the time (Dec-Mar)				
Relative Humidity, %	63	86	98	-	-
Air Temperature, °C	2.5	5	9	5	-
Sea Surface Temperature, °C	3.5	6	8	-	-
Sea Level Pressure, millibars	980	1008	1030	-	-
Ice	Moderate superstructure icing - 1% of the time (Dec-Mar)				
Refractivity Mean Surface Refractivity Sub-Refraction (1 km, Annual) Super-Refraction or Ducting (1 km, Annual)	- - -	- - -	- - -	327 - -	- 3% 2%

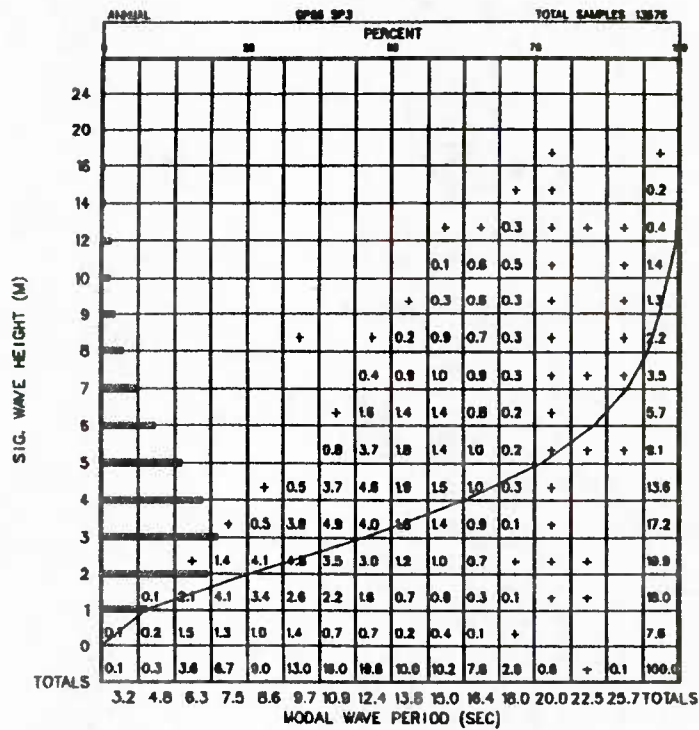


Figure A-056-1-1 Significant Wave Height vs. Modal Wave Period

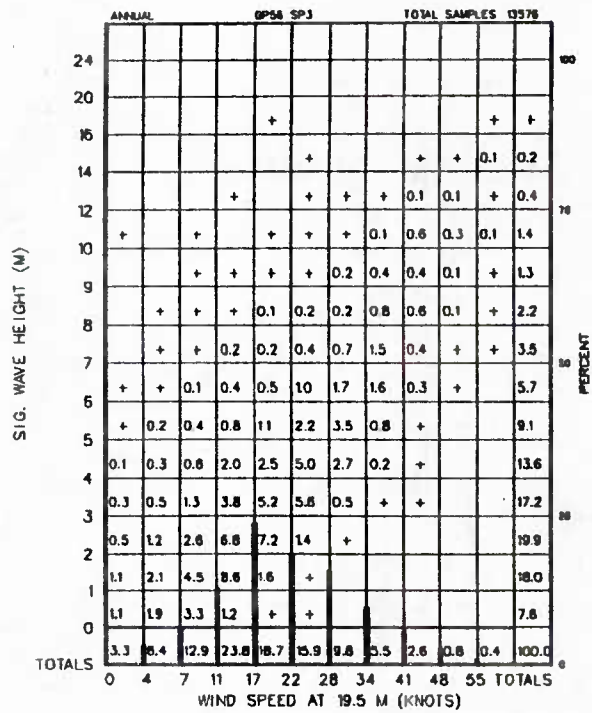


Figure A-056-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

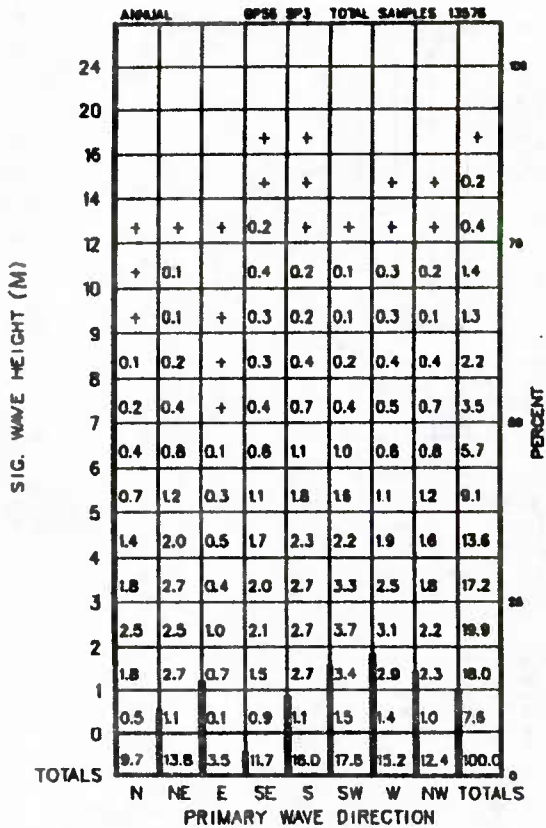


Figure A-056-1-3 Significant Wave Height vs. Primary Wave Direction

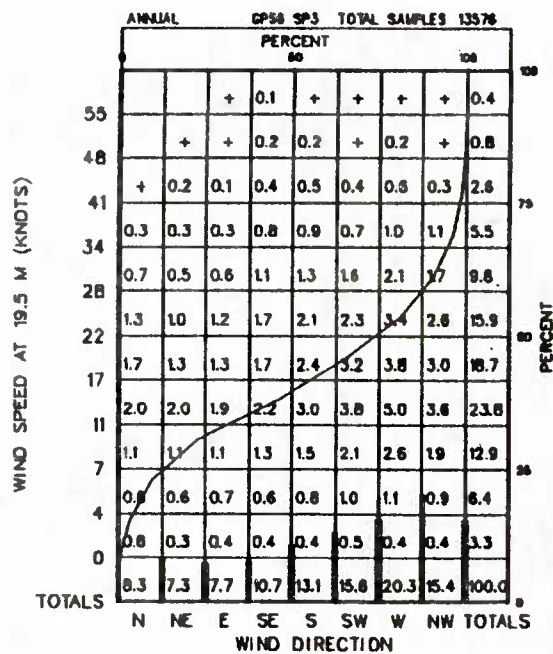


Figure A-056-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

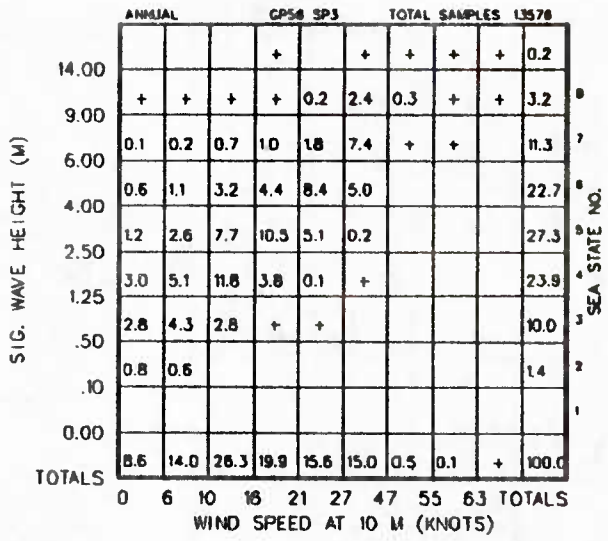


Figure A-056-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

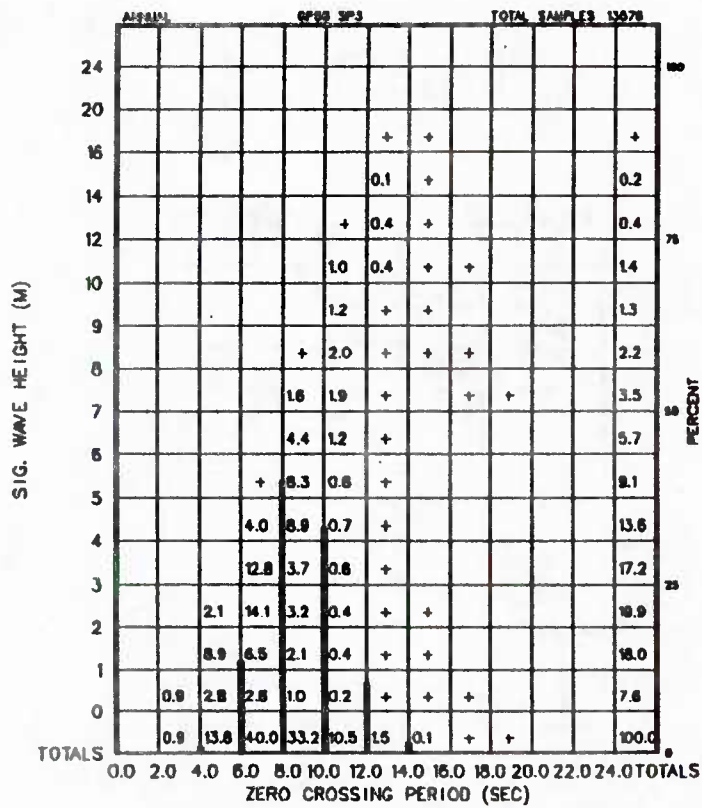


Figure A-056-1-6 Significant Wave Height vs. Zero Crossing Period

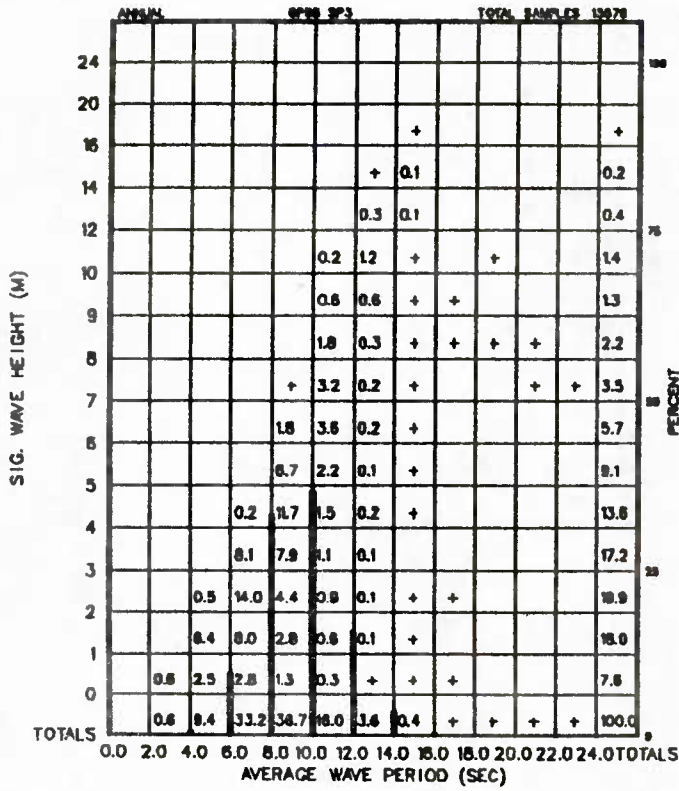


Figure A-056-1-7 Significant Wave Height vs. Average Wave Period

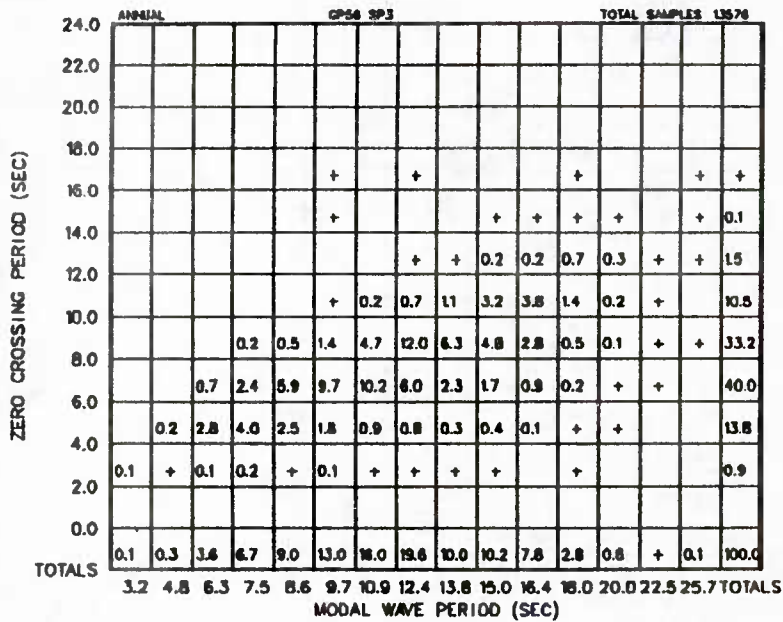


Figure A-056-1-8 Zero Crossing Period vs. Modal Wave Period

ANNUAL		OPS 50 SP1												TOTAL SAMPLES 13578												
WIND SPEED AT 19.5 M (KNOTS)	TOTALS	DURATION (HOURS)												TOTALS	PERCENT											
		0	6	12	18	24	30	36	42	48	54	60	66			72	78	84	90	96	102	108	114	120		
55	15	13	3																					31		
48	54	20	4	1																					79	
41	145	38	21	7	4	2	1																		219	
34	286	110	38	12	8	2	1		1	1															459	
28	490	182	79	27	17	8	1																		807	
22	737	287	115	51	22	14	8	3		1	1														1238	
17	937	314	123	58	20	24	9	3	2		1	1													1482	
11	653	375	178	82	52	28	15	12	4	3	3					1	1	1							1606	
7	692	228	88	31	17	10	7	1	2																1076	
4	404	115	42	19	2	2	1																		585	
0	202	53	21	5	2	2	3		1																289	
TOTALS	4815	1738	712	293	144	88	48	19	10	5	5	1				1	1	1							7877	

Figure A-056-1-11 Persistence of Wind Speed at 19.5 M (Knots)

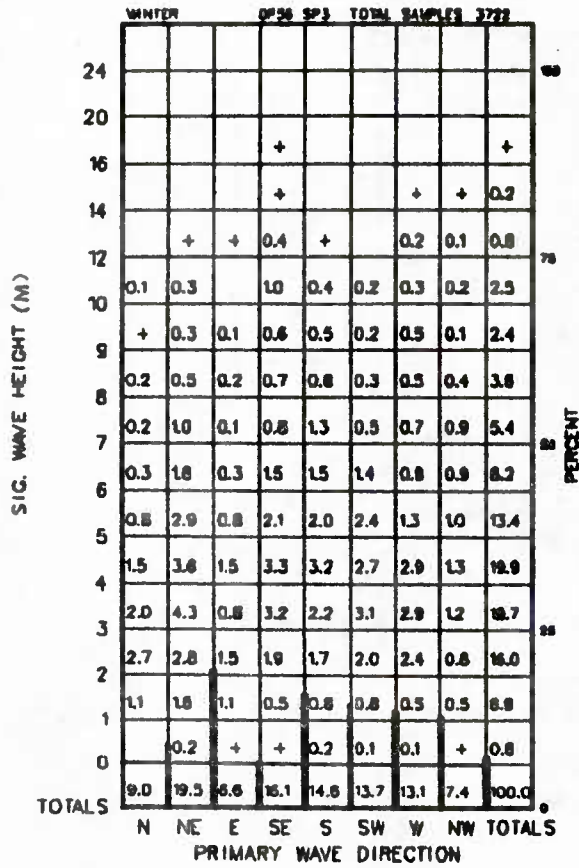


Figure A-056-2-3 Significant Wave Height vs. Primary Wave Direction

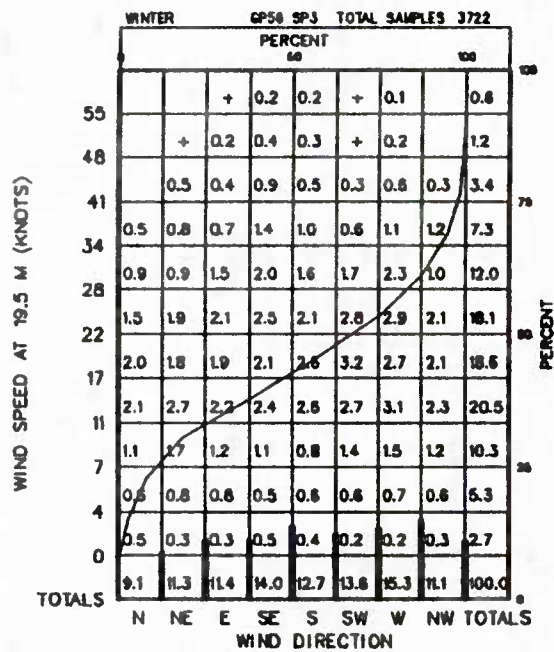


Figure A-056-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

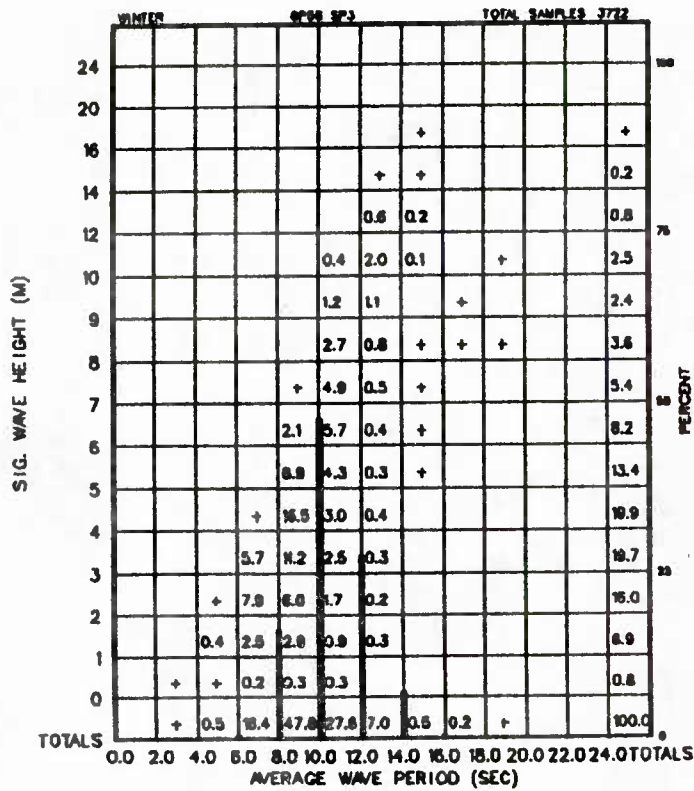


Figure A-056-2-7 Significant Wave Height vs. Average Wave Period

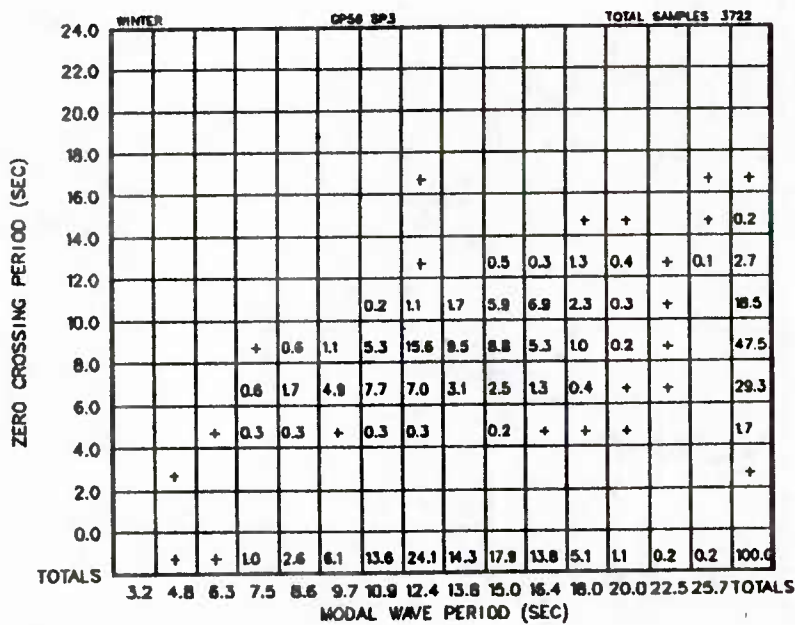


Figure A-056-2-8 Zero Crossing Period vs. Modal Wave Period

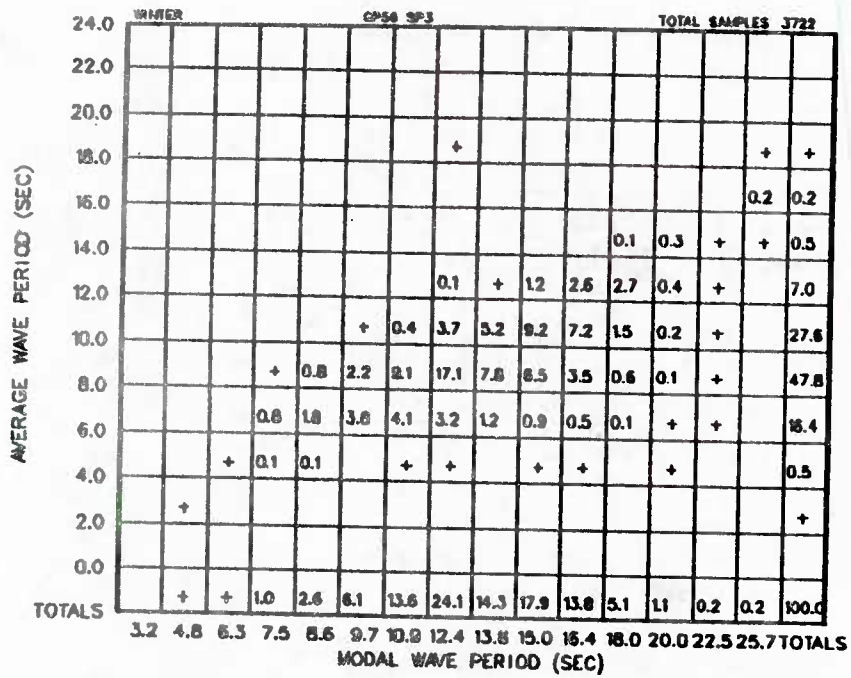


Figure A-056-2-9 Average Wave Period vs. Modal Wave Period

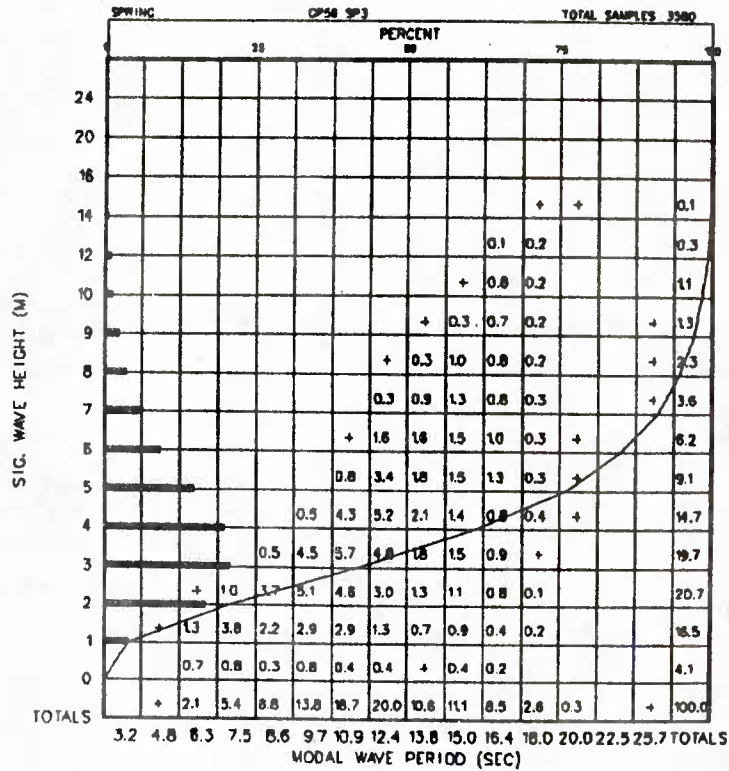


Figure A-056-3-1 Significant Wave Height vs. Modal Wave Period

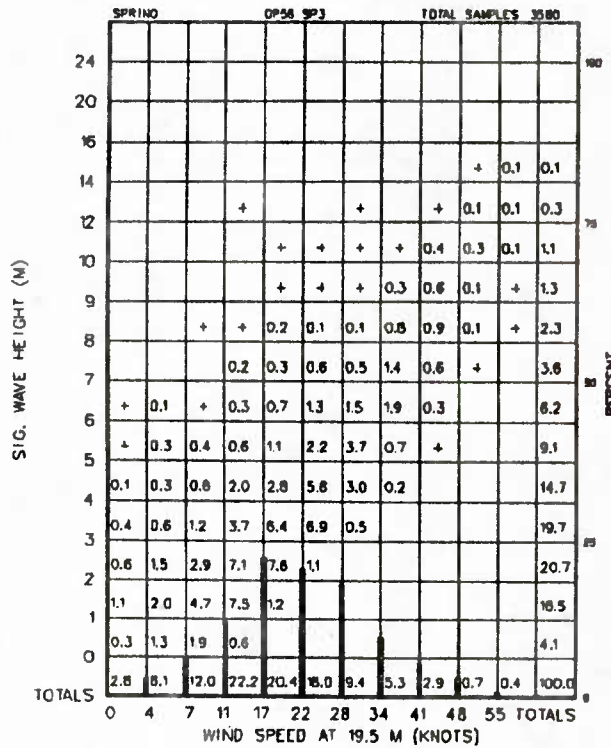


Figure A-056-3-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

SPRING		0756 SP3		TOTAL SAMPLES		3580			
24									
20									
16									
14			+		+		0.1		
12			0.1	+	+	+	0.3		
10			0.4	0.3	0.1	0.1	0.2	1.1	
9	0.2		0.3	0.2	+	0.3	0.3	1.3	
8	0.1	+	+	0.4	0.5	0.3	0.3	0.6	2.3
7	0.2	0.4	0.2	0.6	0.8	0.6	0.4	0.5	3.6
6	0.5	0.7	+	0.9	1.3	1.3	0.7	0.7	6.2
5	0.8	0.9	0.1	0.8	2.1	1.9	1.2	1.2	9.1
4	1.6	2.3	+	1.3	2.3	2.9	2.2	2.0	14.7
3	1.8	3.9	0.4	1.3	3.0	4.1	3.0	2.2	19.7
2	2.4	3.0	0.9	2.2	2.5	5.3	2.5	2.0	20.7
1	2.6	3.5	0.6	0.7	1.5	3.2	2.8	1.6	16.5
0	0.4	1.4		0.3	0.2	0.7	0.9	0.3	4.1
TOTALS	10.7	16.3	2.4	9.4	14.6	20.6	14.4	11.6	100.0
	N	NE	E	SE	S	SW	W	NW	TOTALS
	PRIMARY WAVE DIRECTION								

Figure A-056-3-3 Significant Wave Height vs. Primary Wave Direction

SPRING		0756 SP3		TOTAL SAMPLES		3580			
PERCENT		50		08					
55				0.2	+		+	0.1	0.4
48				0.3	+	+	0.2	0.2	0.7
41	0.2		+	0.6	0.4	0.4	0.6	0.4	2.9
34	0.3	0.2	0.3	0.9	0.7	0.9	1.1	0.8	5.3
28	1.1	0.5	0.3	0.8	1.1	1.9	2.1	1.6	9.4
22	1.9	1.1	1.1	1.5	2.4	2.4	4.0	3.4	18.0
17	2.0	1.7	1.6	1.5	2.5	3.3	3.9	3.4	20.4
11	2.3	2.4	2.3	1.7	2.6	3.2	3.9	3.3	22.2
7	1.6	1.1	0.9	1.2	1.1	1.7	2.3	1.9	12.0
4	0.7	0.6	0.6	0.6	0.6	0.6	1.0	0.8	6.1
0	0.5	0.3	0.5	0.4	0.3	0.3	0.2	0.1	2.6
TOTALS	10.6	7.8	7.9	9.8	11.9	14.7	19.5	16.0	100.0
	N	NE	E	SE	S	SW	W	NW	TOTALS
	WIND DIRECTION								

Figure A-056-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

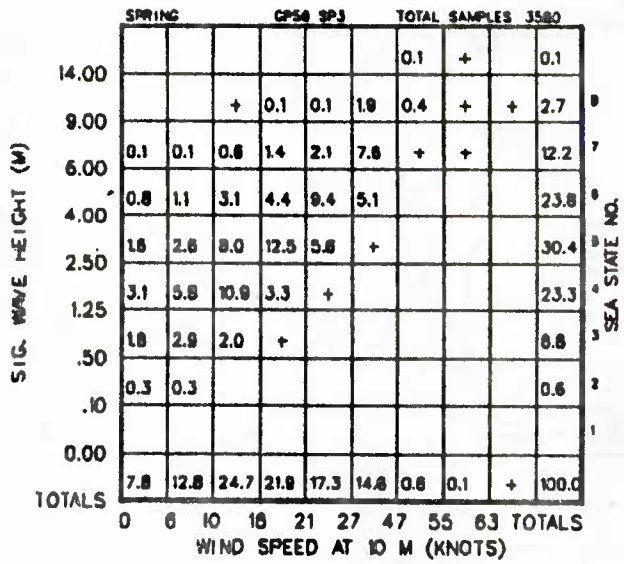


Figure A-056-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

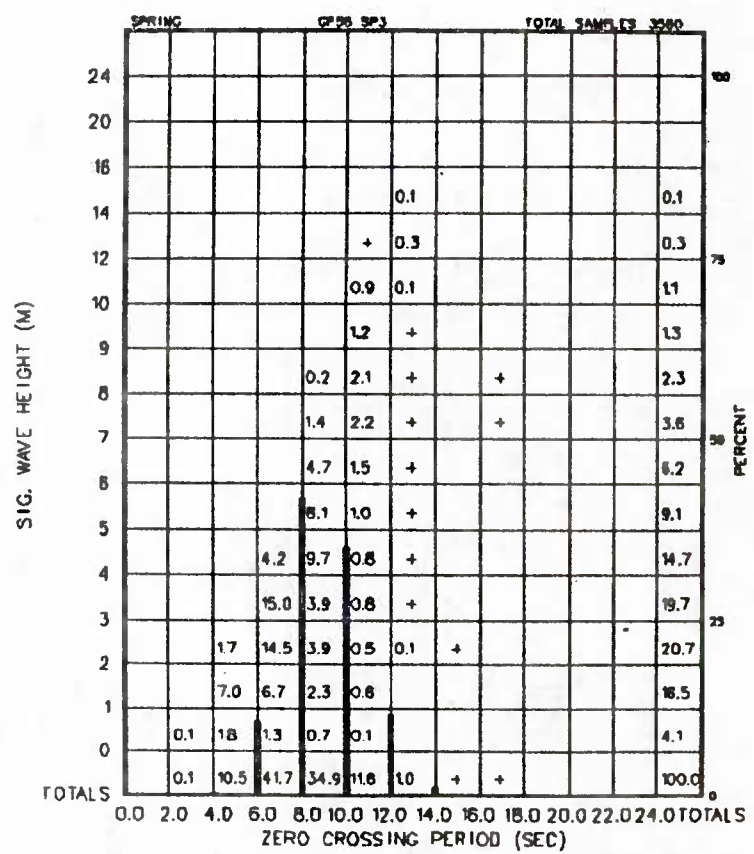


Figure A-056-3-6 Significant Wave Height vs. Zero Crossing Period

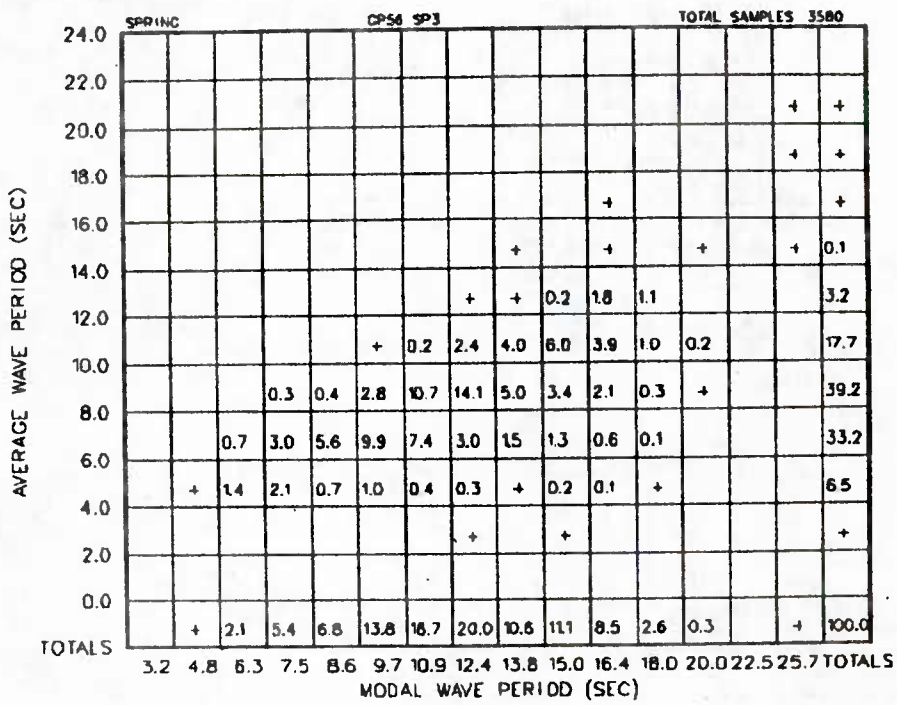


Figure A-056-3-9 Average Wave Period vs. Modal Wave Period

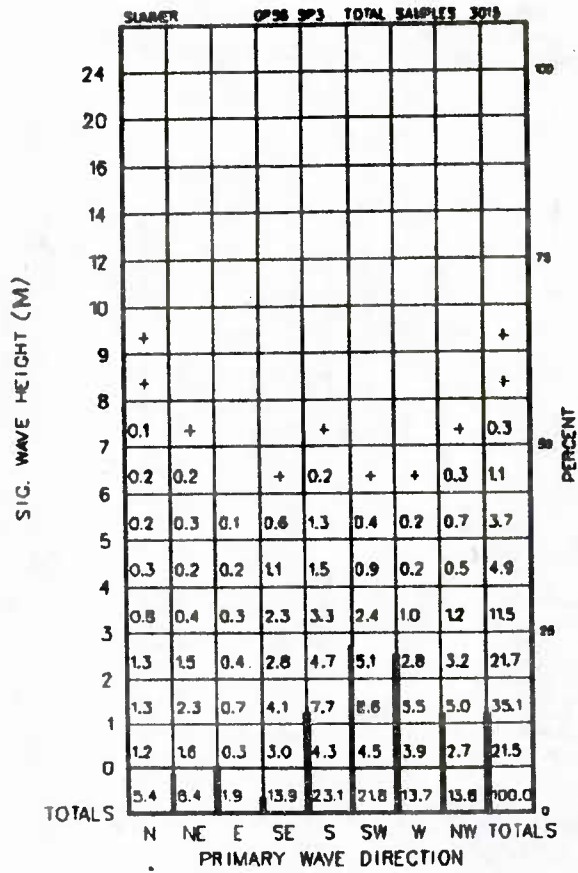


Figure A-056-4-3 Significant Wave Height vs. Primary Wave Direction

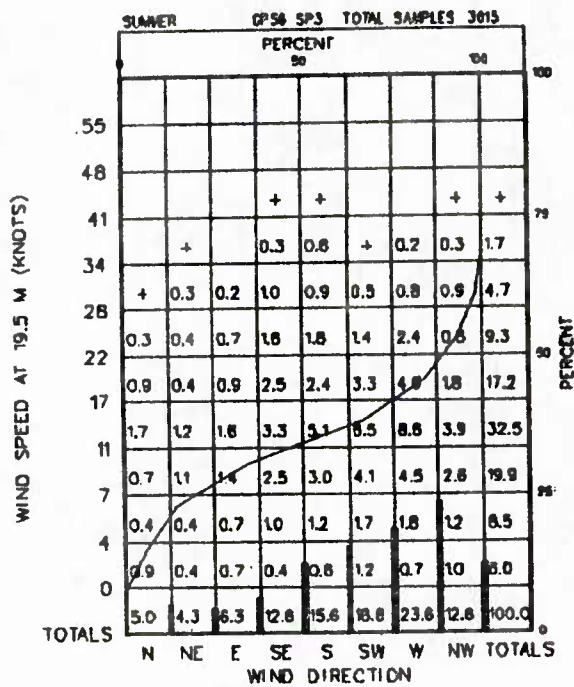


Figure A-056-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

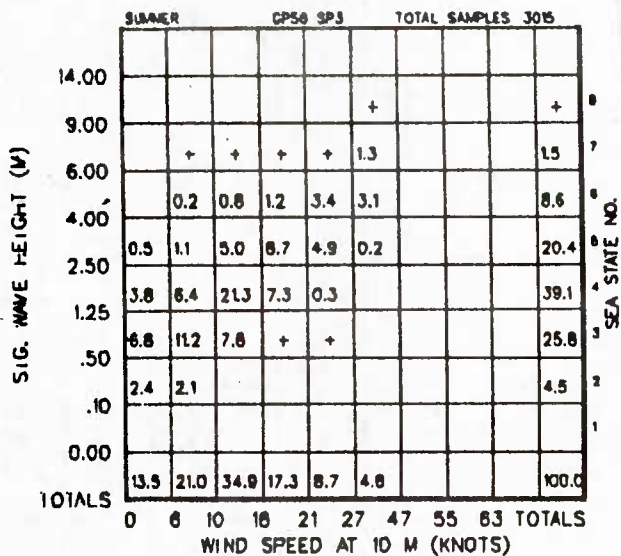


Figure A-056-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

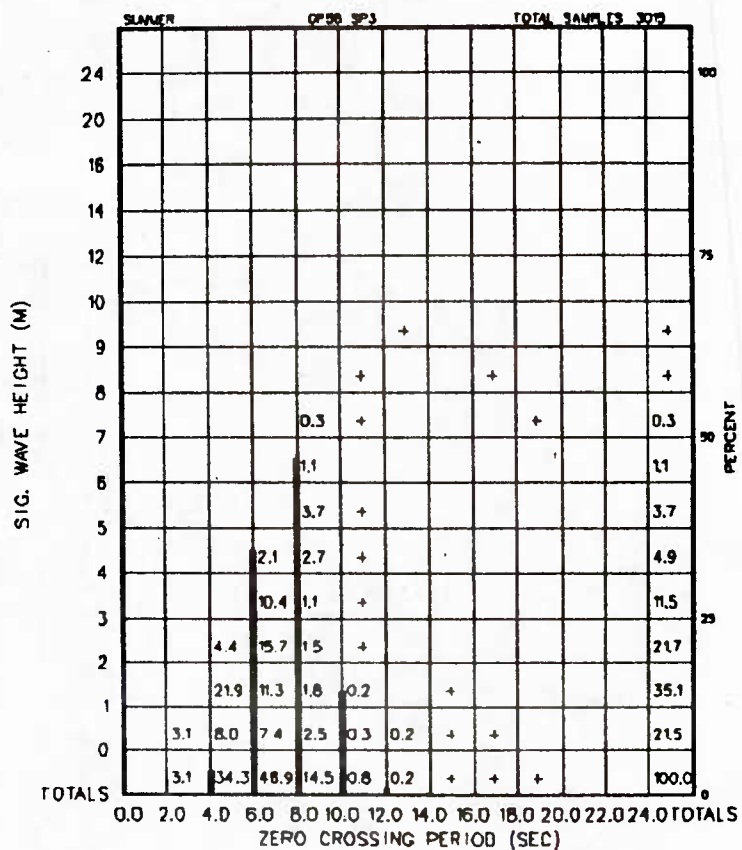


Figure A-056-4-6 Significant Wave Height vs. Zero Crossing Period

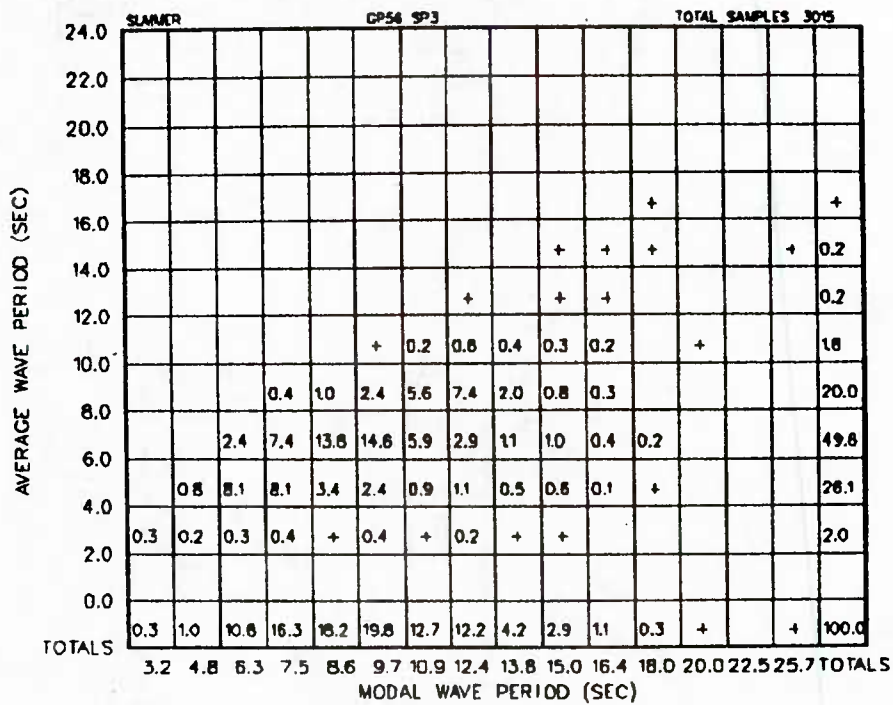


Figure A-056-4-9 Average Wave Period vs. Modal Wave Period

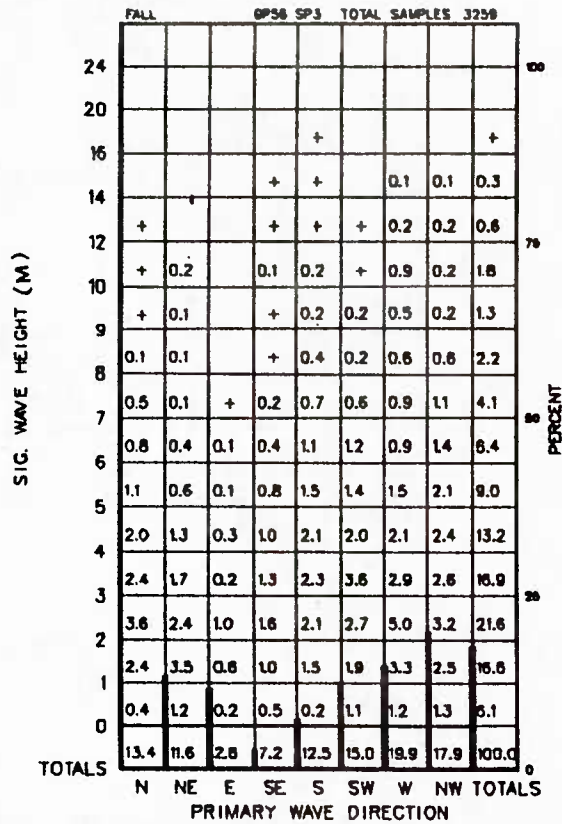


Figure A-056-5-3 Significant Wave Height vs. Primary Wave Direction

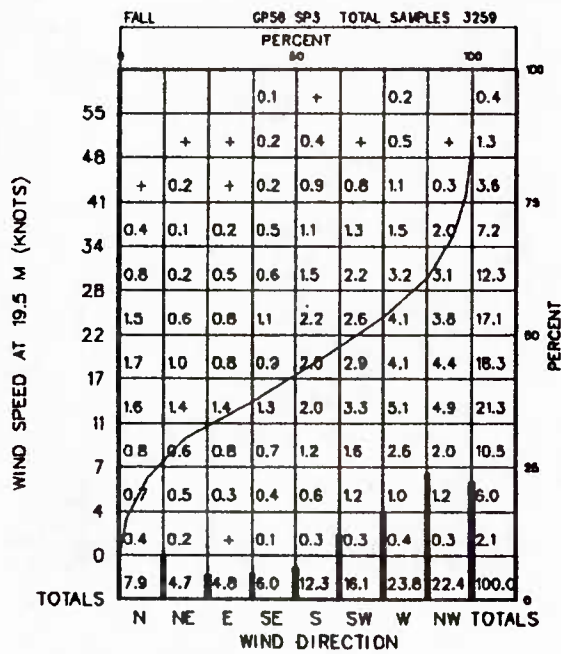


Figure A-056-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

		FALL					GPS0 SP3					TOTAL SAMPLES 3250					
SIG. WAVE HEIGHT (M)	14.00										0.1	0.1	+	+	0.4	SEA STATE NO.	
	9.00	+					0.2	3.1	0.2	0.1					3.7		
	6.00	+	+	0.4	0.5	2.0	9.6	+							12.6		
	4.00	0.3	0.6	2.4	4.0	6.4	6.5								22.2		
	2.50	0.8	1.9	7.6	11.1	6.8	0.5								26.7		
	1.25	2.6	5.1	11.4	3.7	0.1	+								23.0		
	.50	2.5	3.7	2.1	0.2										6.4		
	.10	0.7	0.4												1.1		
	0.00																
	TOTALS	8.9	11.7	23.9	16.8	17.4	19.9	0.4	0.2	+					100.0		
		0	6	10	16	21	27	47	55	63	TOTALS						
		WIND SPEED AT 10 M (KNOTS)															

Figure A-056-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

		FALL					GPS0 SP3					TOTAL SAMPLES 3250								
SIG. WAVE HEIGHT (M)	24															PERCENT				
	20																			
	16									+					+					
	14									0.3	+				0.3					
	12									+	0.5				0.6					
	10									1.1	0.7	+			1.8					
	9									1.2	+				1.3					
	8									2.1		+			2.2					
	7									2.1	2.1				4.1					
	6									5.5	0.8	+			6.4					
5									+	6.5	0.5			9.0						
4									4.9	7.8	0.3	+		13.2						
3									13.8	2.8	0.3			16.9						
2									2.1	16.6	2.7	0.2		21.6						
1									8.1	6.2	2.1	0.3		16.6						
0									0.6	2.0	2.4	1.0	0.2	+	6.1					
TOTALS									0.6	12.2	43.9	32.4	9.0	1.6	0.1	100.0				
		0.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	TOTALS					
		ZERO CROSSING PERIOD (SEC)																		

Figure A-056-5-6 Significant Wave Height vs. Zero Crossing Period

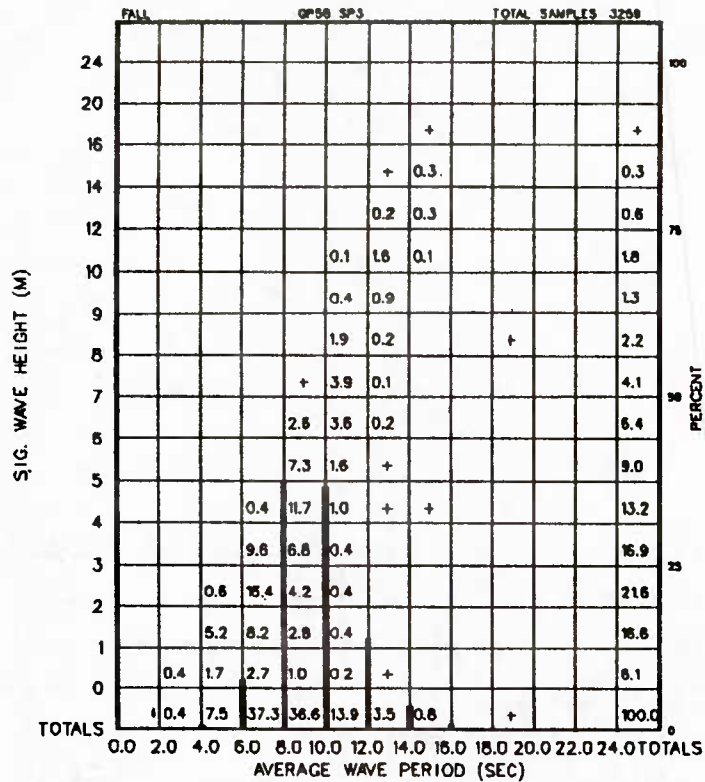


Figure A-056-5-7 Significant Wave Height vs. Average Wave Period

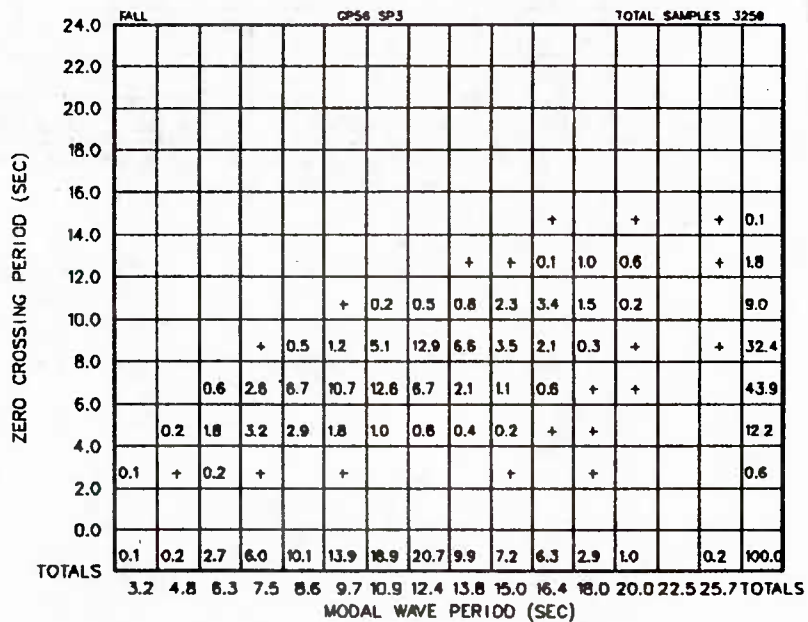


Figure A-056-5-8 Zero Crossing Period vs. Modal Wave Period

TABLE A-039-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 37.52°N, 158.01°W					
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.5 6 -	2.5 11.5 -	7.5 18.5 -	3 12 -	2.5 12.4 NW
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	4 1 -	14 2.5 -	34.5 7 -	16 3 -	14 2.5 SW
Visibility, nautical miles	3	15	25		
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	1 0.5	6.5 5	8 8	- -	- -
Precipitation (Occurrence)					
Relative Humidity, %	60	82	98	-	-
Air Temperature, °C	12	16	20	16	-
Sea Surface Temperature, °C	16	19	22	-	-
Sea Level Pressure, millibars	1003	1022	1032	-	-
Ice	None				
Refractivity Mean Surface Refractivity Sub-Refraction (1 km, Annual) Super-Refraction or Ducting (1 km, Annual)	- - -	- - -	- - -	325 - -	- 2% 2%

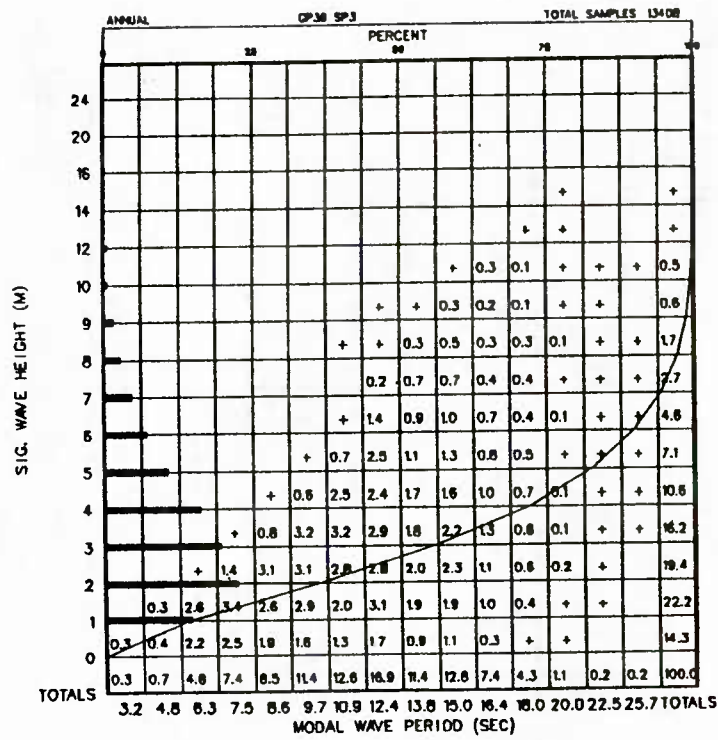


Figure A-039-1-1 Significant Wave Height vs. Modal Wave Period

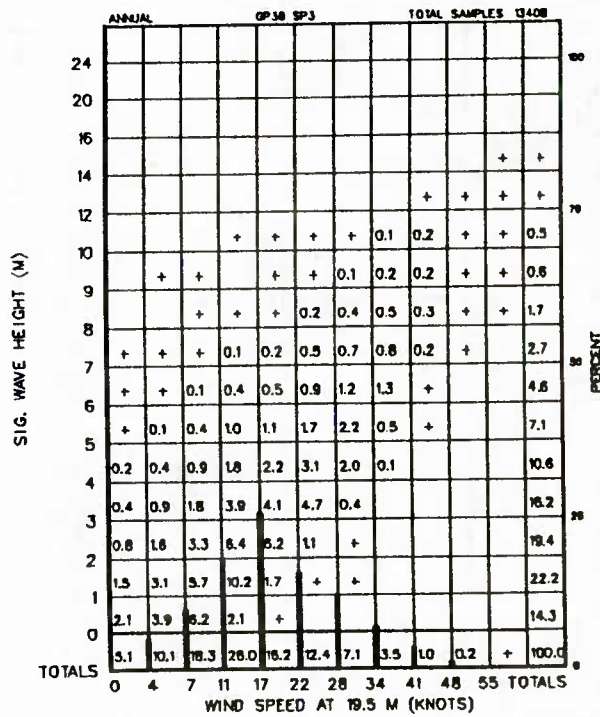


Figure A-039-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

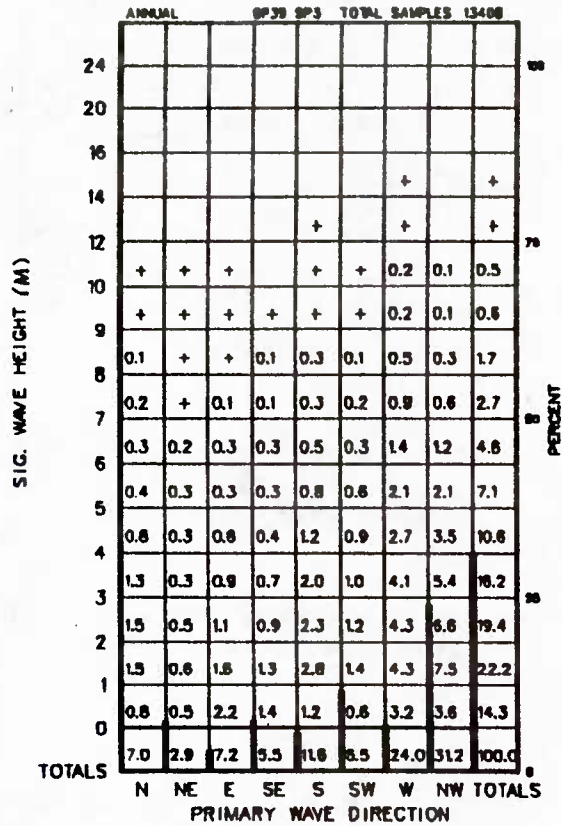


Figure A-039-1-3 Significant Wave Height vs. Primary Wave Direction

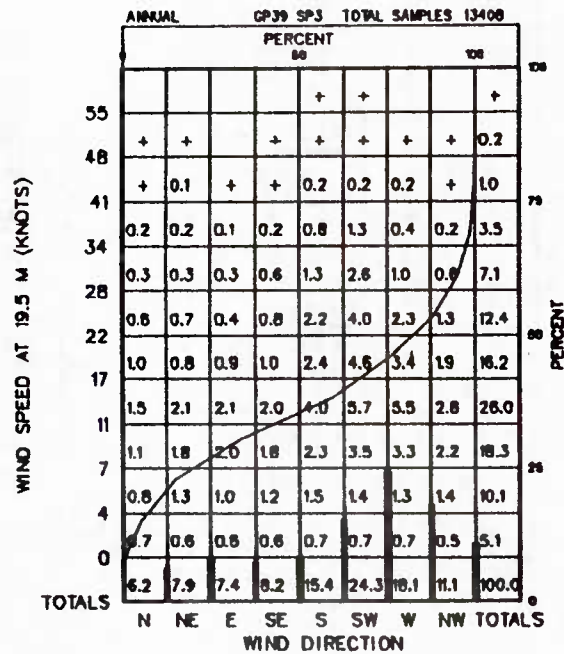


Figure A-039-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

SIG. WAVE HEIGHT (M)	ANNUAL					CP38 SP3					TOTAL SAMPLES 13408		SEA STATE NO.	
	0	6	10	16	21	27	47	55	63	TOTALS	0	63		TOTALS
14.00													+	+
9.00	+	+	+	+	+	1.0	+	+						1.2
6.00	+	0.1	0.8	1.0	2.1	4.9	+							8.9
4.00	0.8	1.3	3.2	3.7	5.5	3.2								17.7
2.50	1.8	3.4	7.3	8.1	4.4	+								25.4
1.25	4.4	8.5	12.6	3.8	0.1									27.4
.50	3.7	6.4	4.3	+	+									14.5
.10	2.7	2.0	+											4.8
0.00														
TOTALS	13.7	18.6	28.3	16.8	12.2	9.2	0.1	+						100.0

Figure A-039-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

SIG. WAVE HEIGHT (M)	ANNUAL					CP38 SP3					TOTAL SAMPLES 13408		PERCENT	
	0.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0		24.0
24														
20														
16														
14														+
12														+
10						0.4	0.1	+						0.5
9						0.6	+							0.8
8						+	1.5	+	+	+				1.7
7						1.2	1.4	+	+	+	+	+	+	2.7
6						3.7	0.7	0.1	+	+				4.8
5						+	6.1	0.8	0.2	+	+			7.1
4						3.3	6.1	0.9	0.3	+	+			10.6
3						10.3	4.2	1.2	0.4	+	+			16.2
2						1.7	12.5	3.6	1.2	0.5	+	+		18.4
1						10.2	6.8	3.4	1.3	0.4	+			22.2
0						2.0	4.8	4.0	2.4	1.0	0.3	+		14.3
TOTALS	2.0	16.5	36.9	30.7	10.9	2.6	0.3	+	+	+	+	+	+	100.0

Figure A-039-1-6 Significant Wave Height vs. Zero Crossing Period

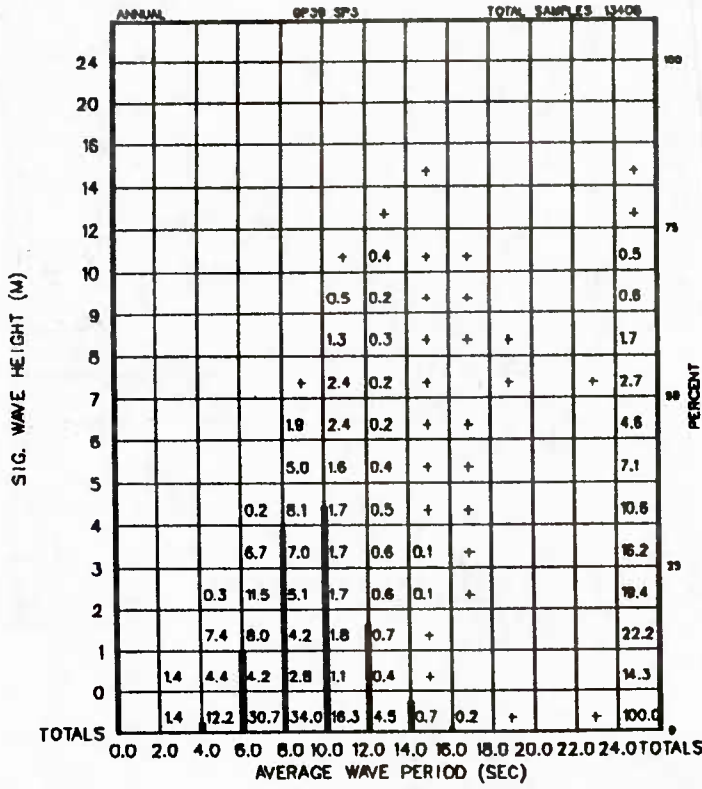


Figure A-039-1-7 Significant Wave Height vs. Average Wave Period

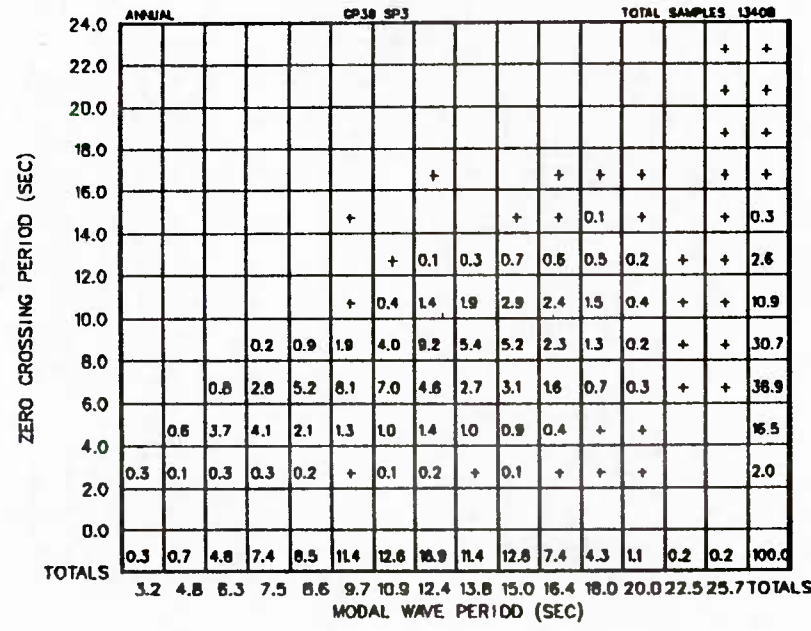


Figure A-039-1-8 Zero Crossing Period vs. Modal Wave Period

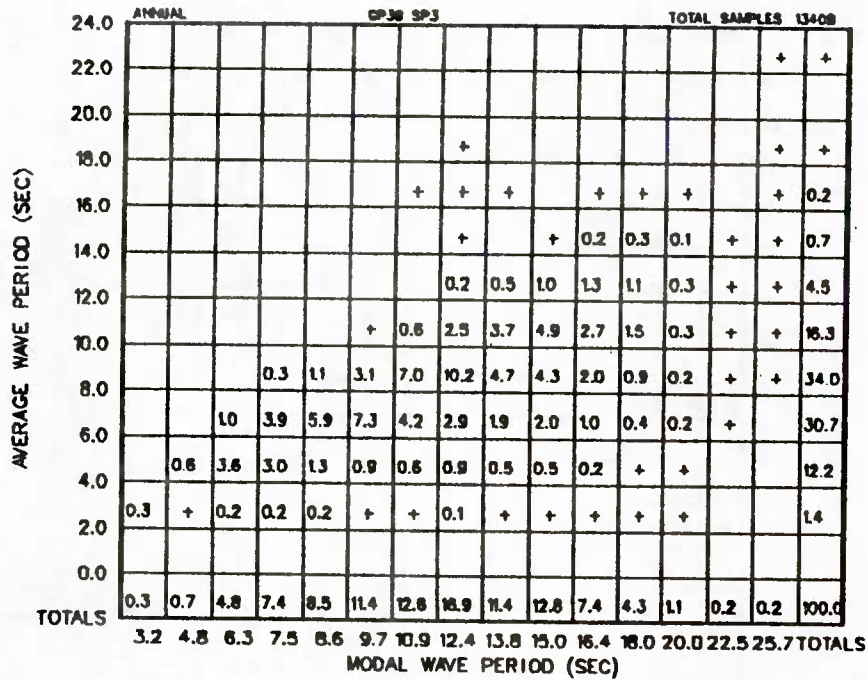


Figure A-039-1-9 Average Wave Period vs. Modal Wave Period

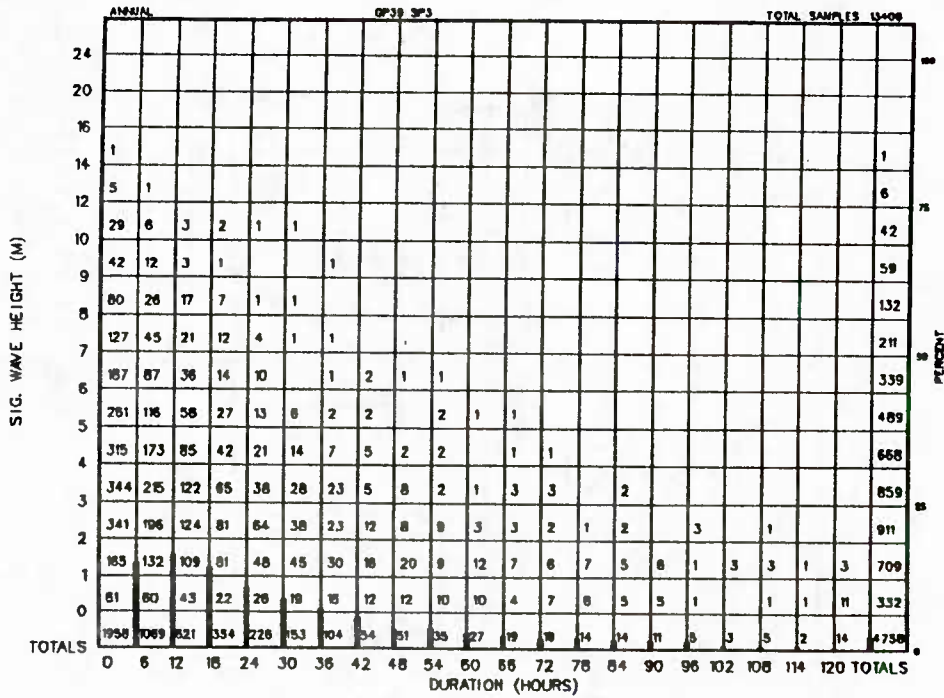


Figure A-039-1-10 Persistence of Wave Height

ANNUAL		CP30 SP3												TOTAL SAMPLES 13408											
WIND SPEED AT 19.5 M (KNOTS)		0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	TOTALS	PERCENT	
**																								6	100
55	3	2	1																					29	
48	26	3																						94	70
41	67	20	3	3	1																			298	
34	190	62	31	12	1	2																		588	
28	373	130	52	19	5	8								1										972	
22	578	219	107	35	22	4	6	1																1263	30
17	767	281	124	41	20	15	9	4	1	1														1648	35
11	842	366	194	109	61	28	13	12	9	6	5			1	1	1								1318	35
7	752	301	124	62	36	22	10	6	3			2												797	35
4	482	192	85	29	16	5	4	1	1	1	1													389	
0	239	83	39	11	3	7	2	2	2															7402	
TOTALS	4318	1659	749	321	165	81	44	26	15	9	9			1	1	2									

Figure A-039-1-11 Persistence of Wind Speed at 19.5 M (Knots)

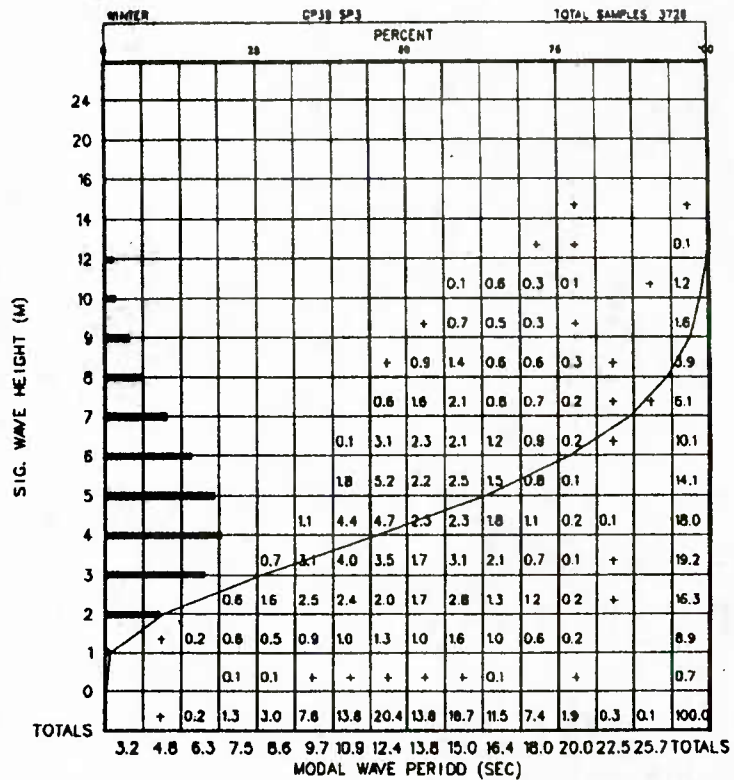


Figure A-039-2-1 Significant Wave Height vs. Modal Wave Period

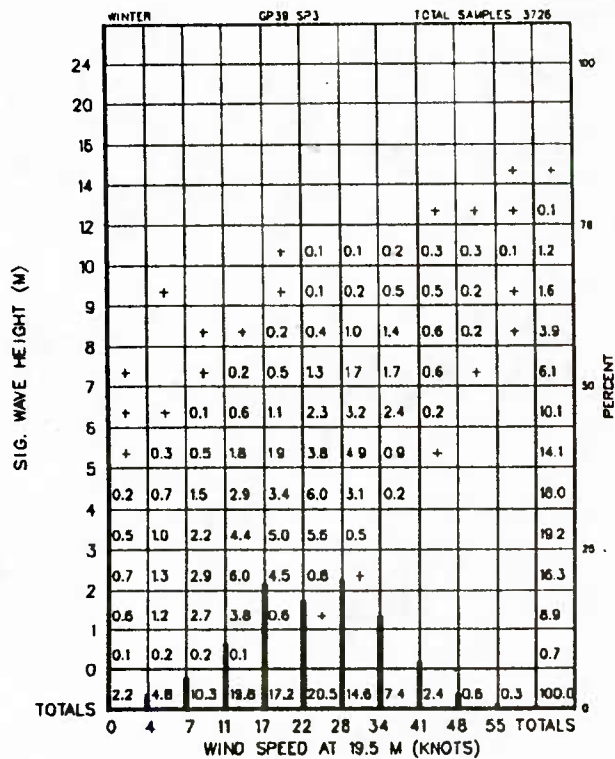


Figure A-039-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

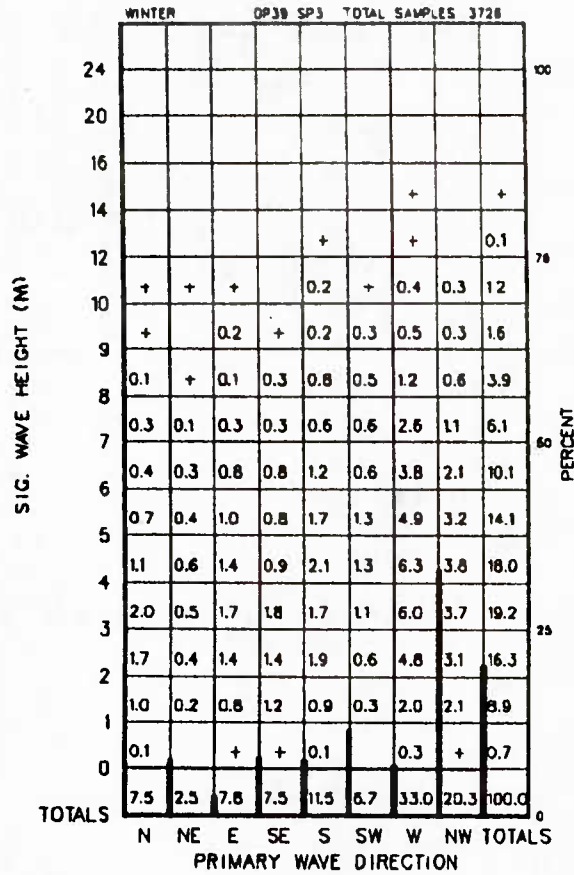


Figure A-039-2-3 Significant Wave Height vs. Primary Wave Direction

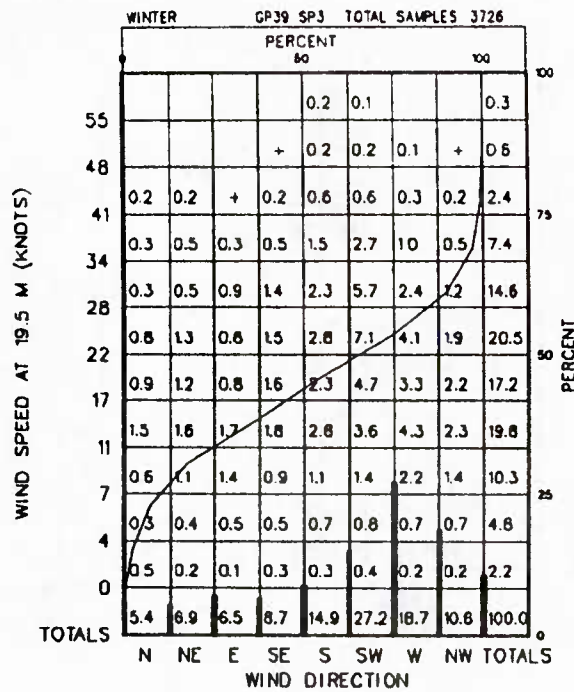


Figure A-039-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

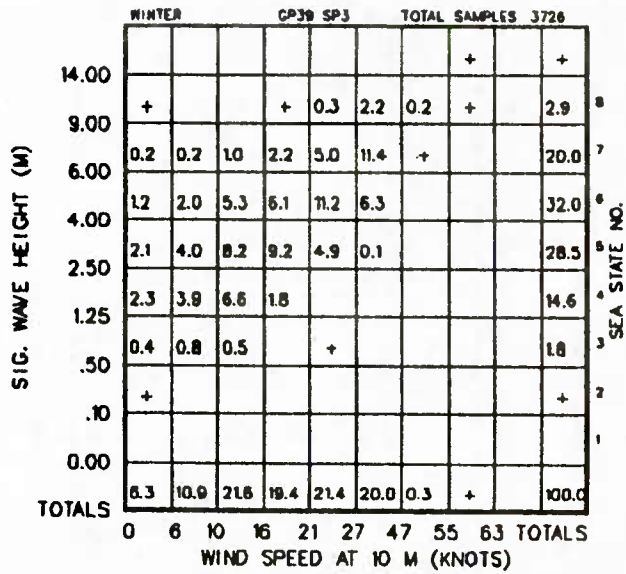


Figure A-039-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

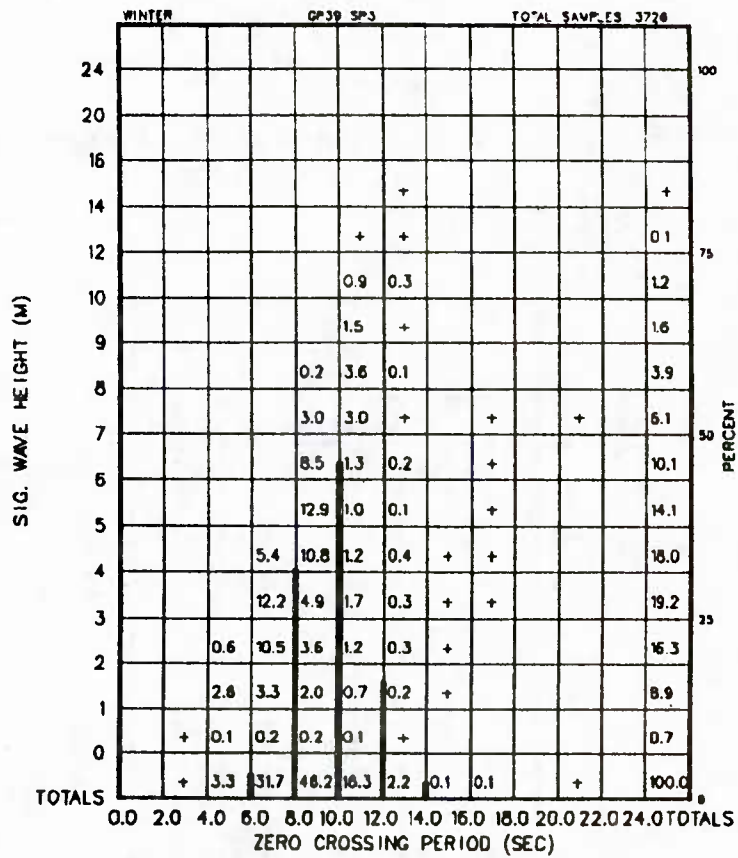


Figure A-039-2-6 Significant Wave Height vs. Zero Crossing Period

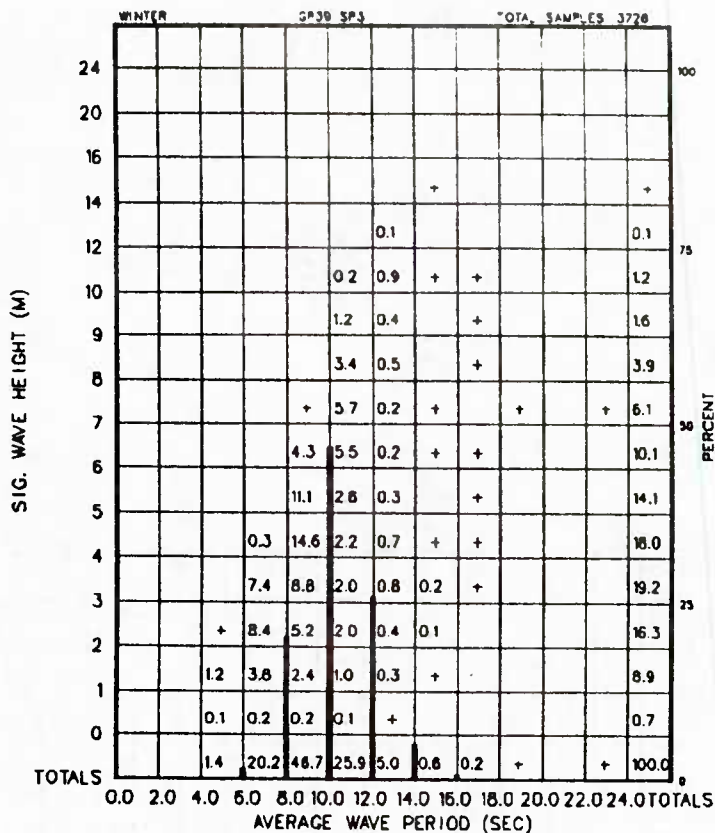


Figure A-039-2-7 Significant Wave Height vs. Average Wave Period

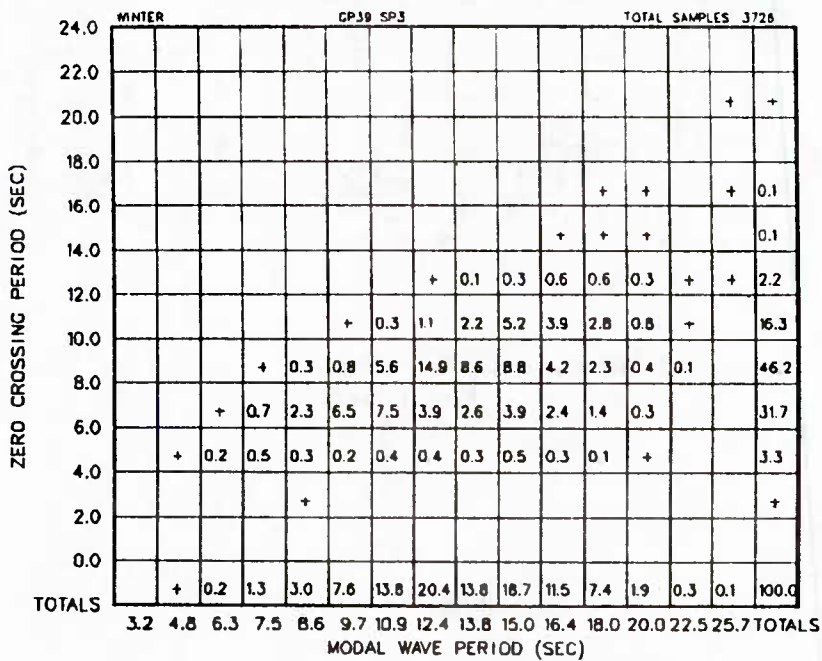


Figure A-039-2-8 Zero Crossing Period vs. Modal Wave Period

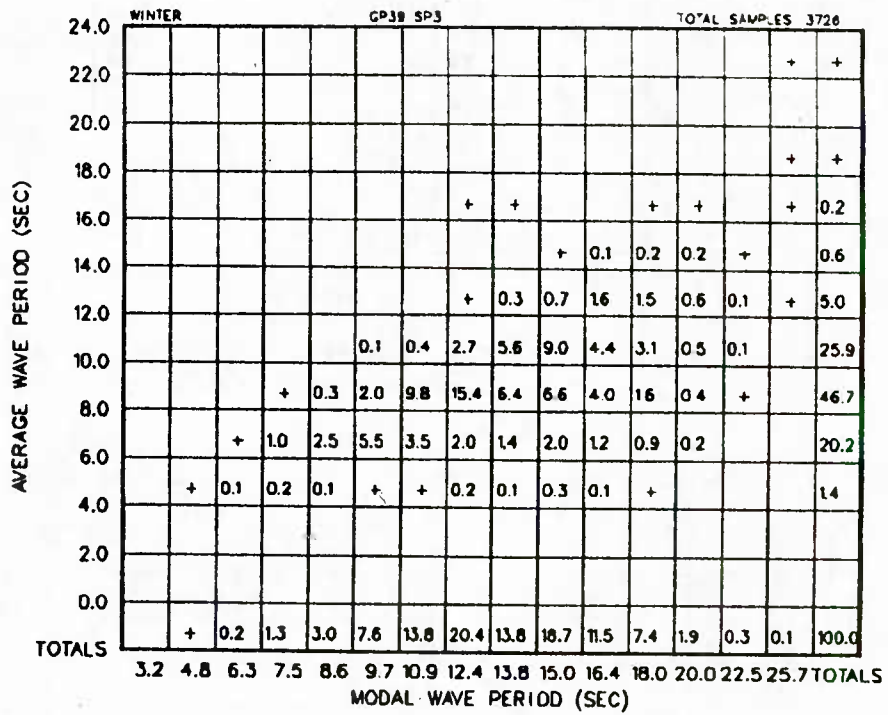


Figure A-039-2-9 Average Wave Period vs. Modal Wave Period

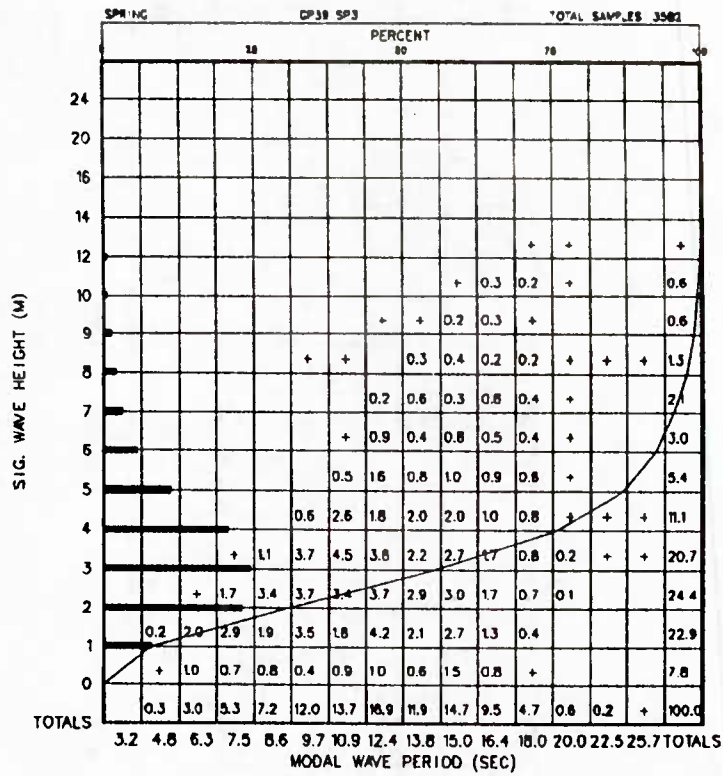


Figure A-039-3-1 Significant Wave Height vs. Modal Wave Period

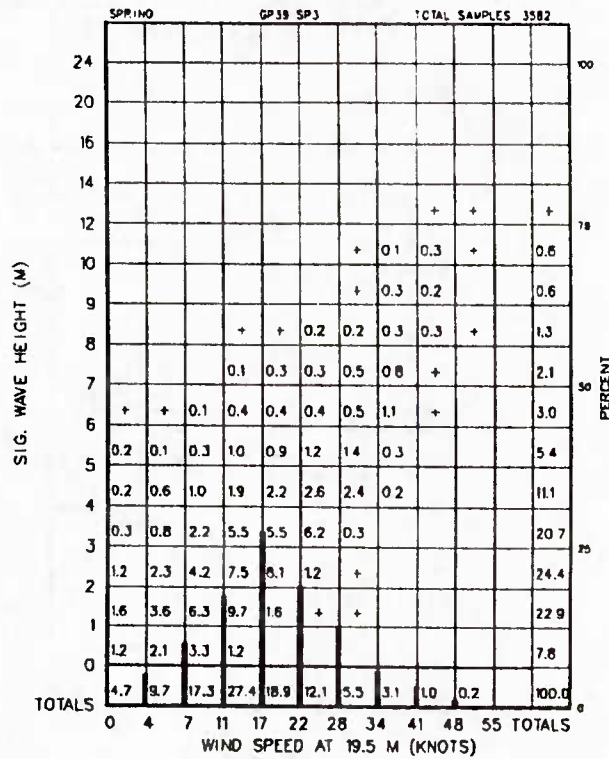


Figure A-039-3-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

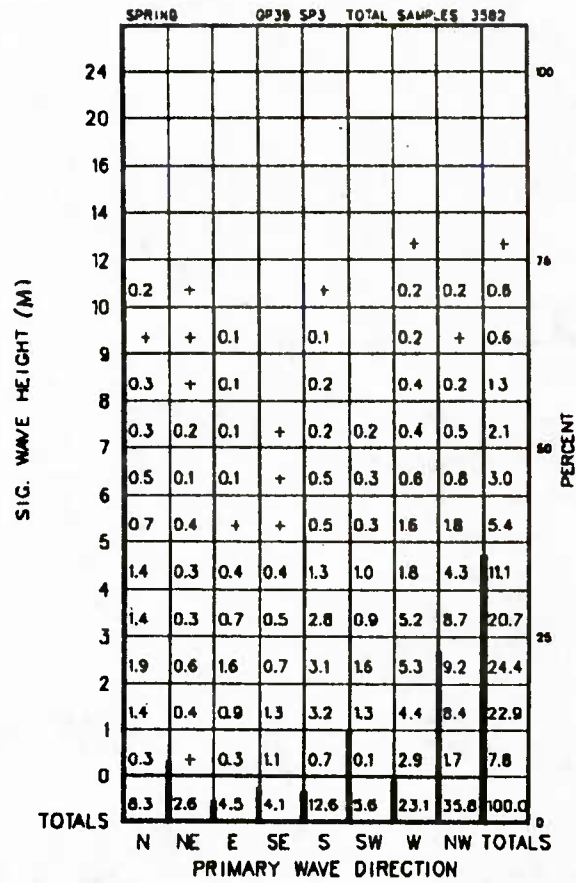


Figure A-039-3-3 Significant Wave Height vs. Primary Wave Direction

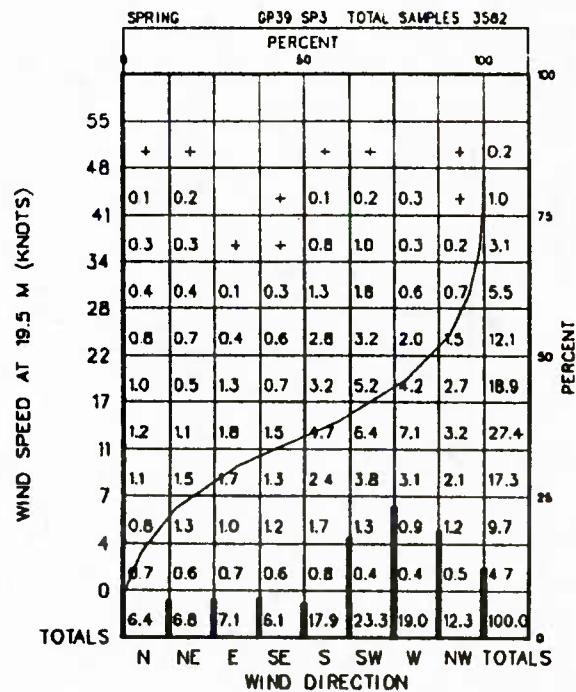


Figure A-039-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

		SPRING		GP39 SP3			TOTAL SAMPLES 3582				
SIG. WAVE HEIGHT (M)	14.00						1.2	+		1.3	
	9.00										
	6.00	0.1	0.1	0.8	0.8	1.1	3.5			6.4	
	4.00	1.1	1.3	3.3	3.4	4.7	2.6			16.5	
	2.50	2.3	4.2	9.8	10.5	5.4	0.1			32.3	
	1.25	5.6	7.9	13.4	4.5	+				31.5	
	.50	3.3	4.9	2.8	+					11.1	
	.10	0.6	0.4							1.0	
	0.00										
	TOTALS	12.9	18.9	30.2	19.2	11.3	7.5	+			100.0
		0	6	10	18	21	27	47	55	63	TOTALS
		WIND SPEED AT 10 M (KNOTS)									

Figure A-039-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

		SPRING		GP39 SP3			TOTAL SAMPLES 3582								
SIG. WAVE HEIGHT (M)	24														
	20														
	16														
	14														
	12							+		+					
	10						0.5	+		0.6					
	9						0.6	+		0.6					
	8					+	1.0	0.1	+	1.3					
	7						0.9	1.0	0.1	+	2.1				
	6						2.1	0.7	0.2	+	3.0				
5						4.2	0.8	0.3	+	5.4					
4						3.2	5.9	1.3	0.5	+	11.1				
3						13.4	5.7	1.2	0.4		20.7				
2						1.9	15.8	4.0	1.6	1.0	+	24.4			
1						8.9	7.6	4.0	1.8	0.6		22.9			
0						0.3	2.7	1.8	1.5	1.0	0.4	+	7.8		
TOTALS						0.3	13.6	41.8	28.4	11.5	3.9	0.5		100.0	
		0.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	TOTALS
		ZERO CROSSING PERIOD (SEC)													

Figure A-039-3-6 Significant Wave Height vs. Zero Crossing Period

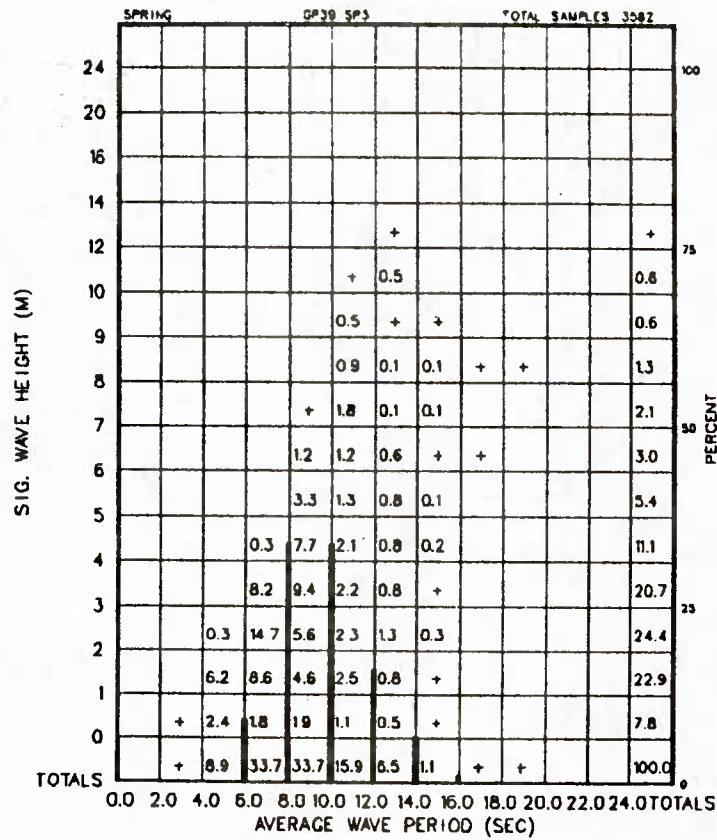


Figure A-039-3-7 Significant Wave Height vs. Average Wave Period

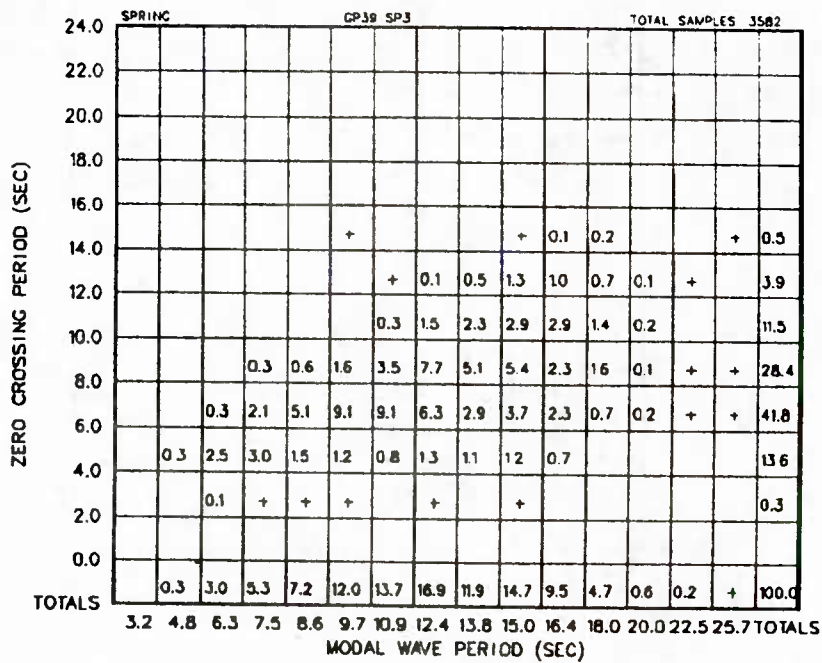


Figure A-039-3-8 Zero Crossing Period vs. Modal Wave Period

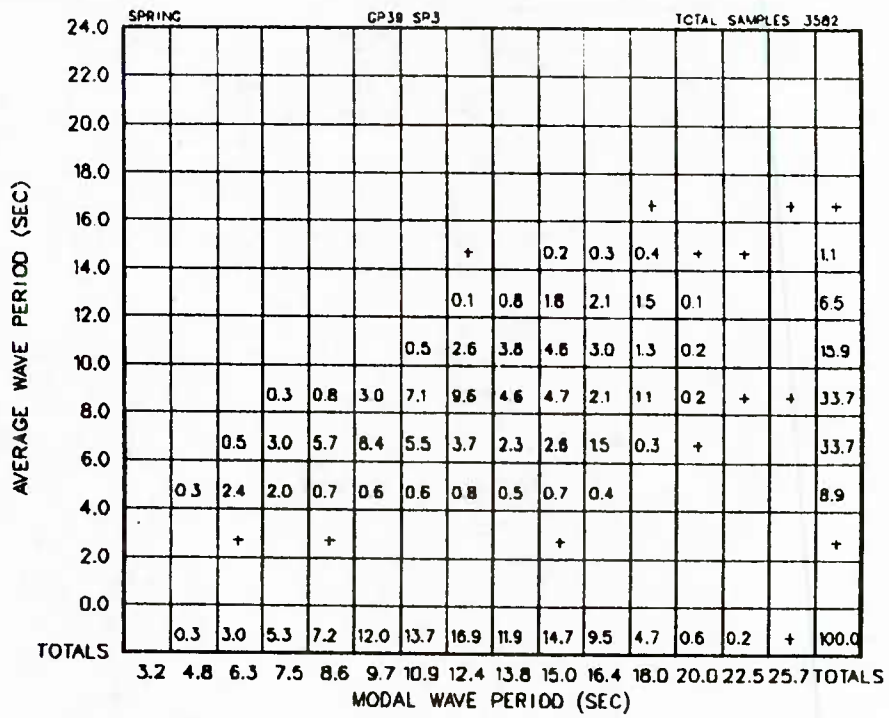


Figure A-039-3-9 Average Wave Period vs. Modal Wave Period

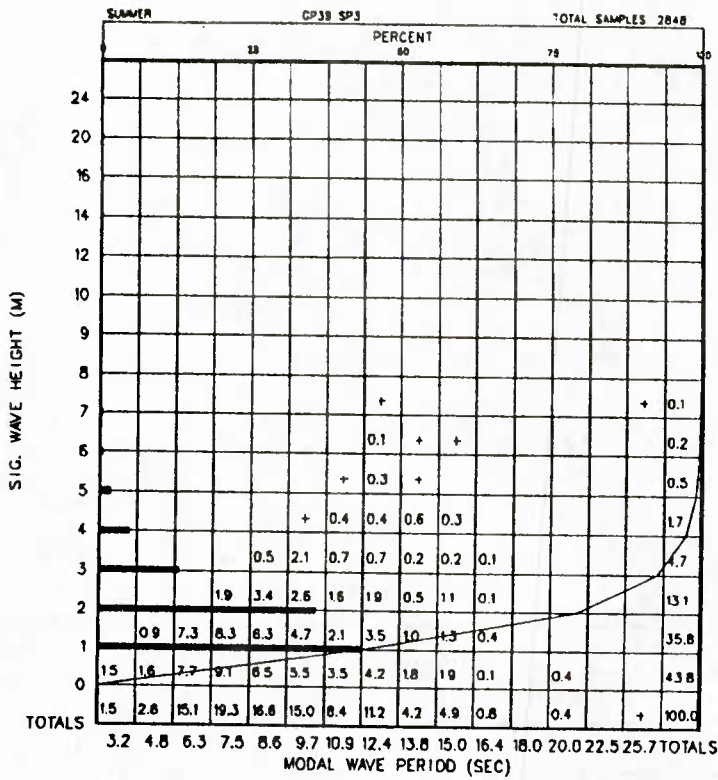


Figure A-039-4-1 Significant Wave Height vs. Modal Wave Period

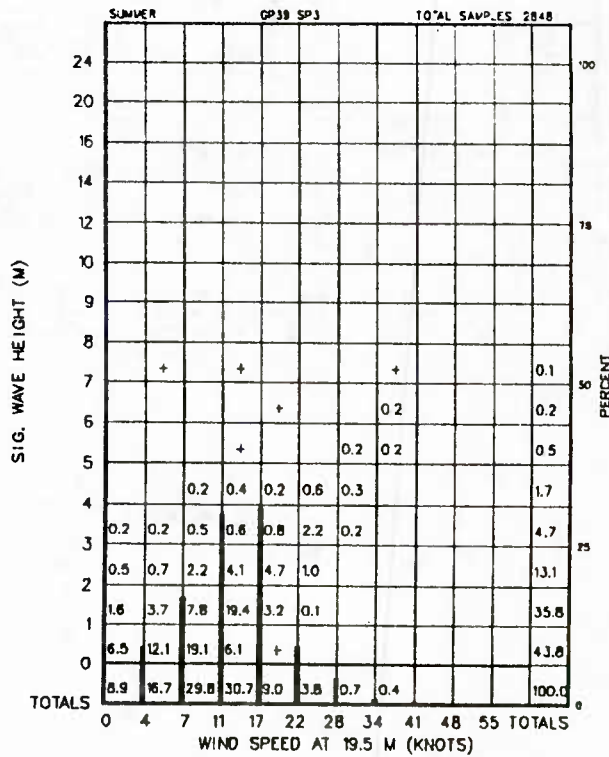


Figure A-039-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

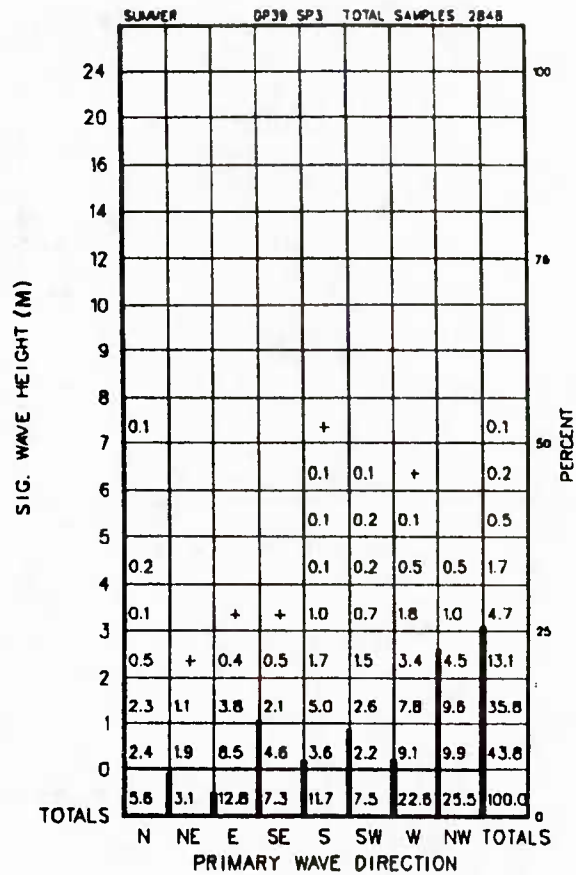


Figure A-039-4-3 Significant Wave Height vs. Primary Wave Direction

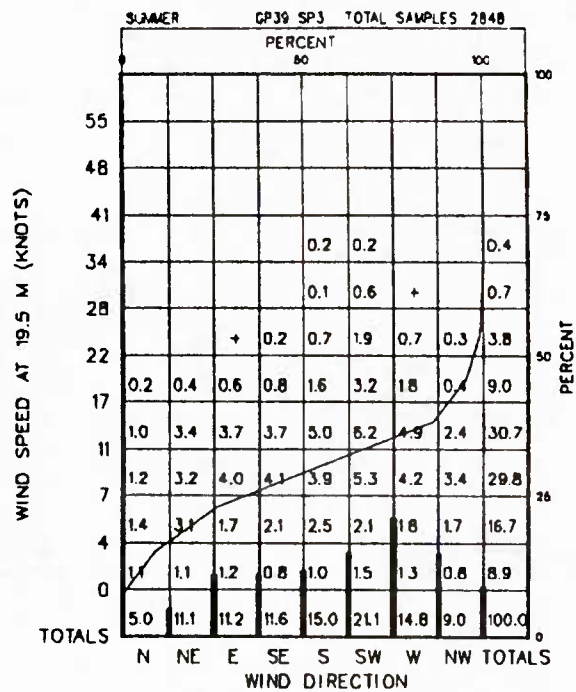


Figure A-039-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

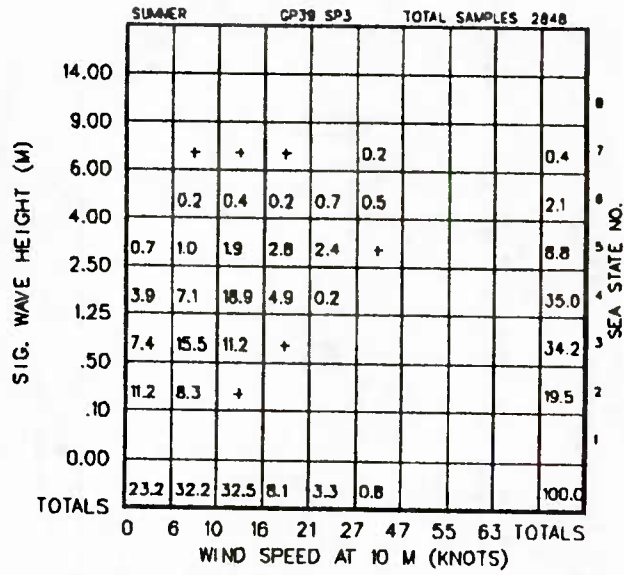


Figure A-039-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

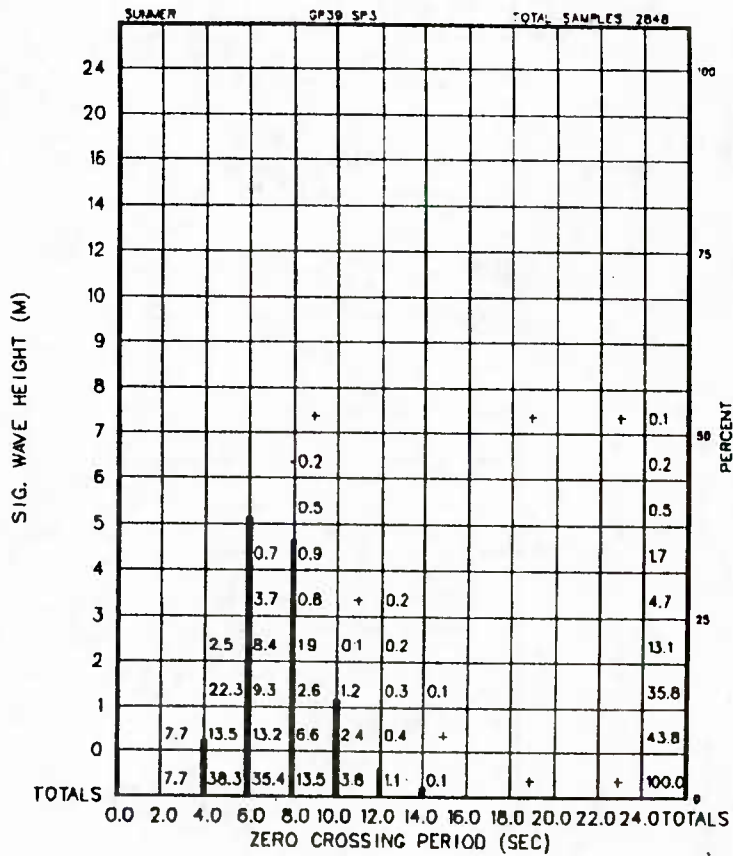


Figure A-039-4-6 Significant Wave Height vs. Zero Crossing Period

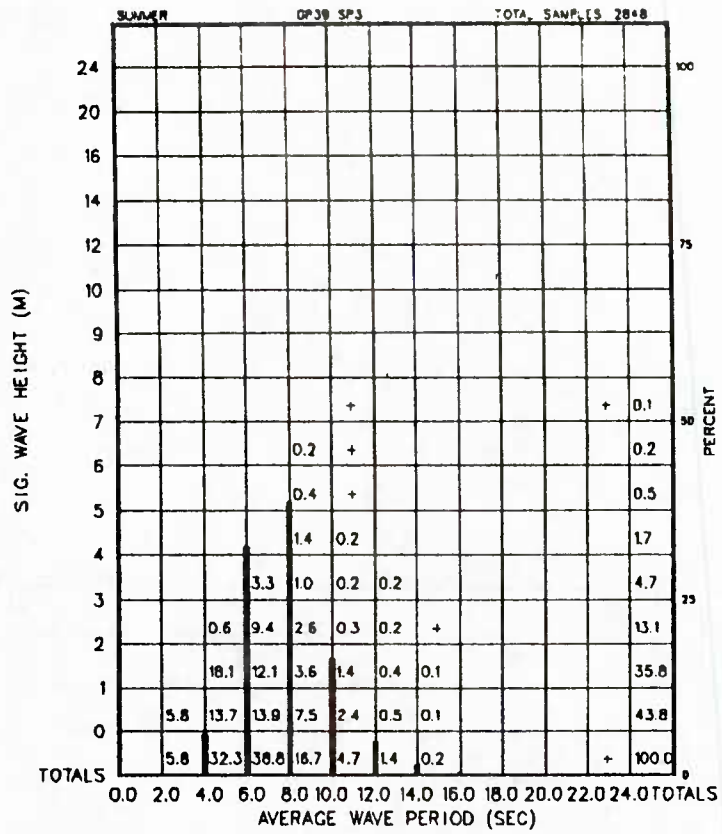


Figure A-039-4-7 Significant Wave Height vs. Average Wave Period

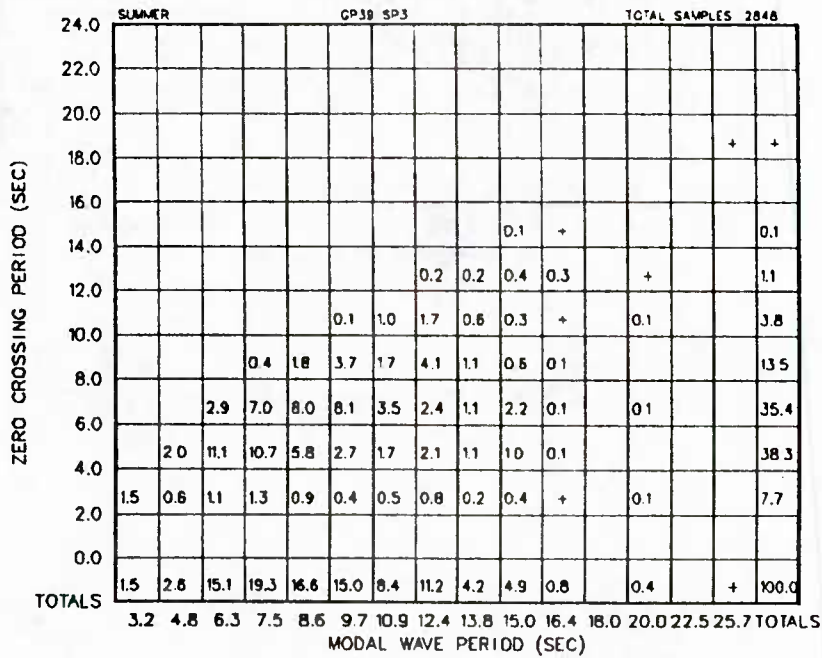


Figure A-039-4-8 Zero Crossing Period vs. Modal Wave Period

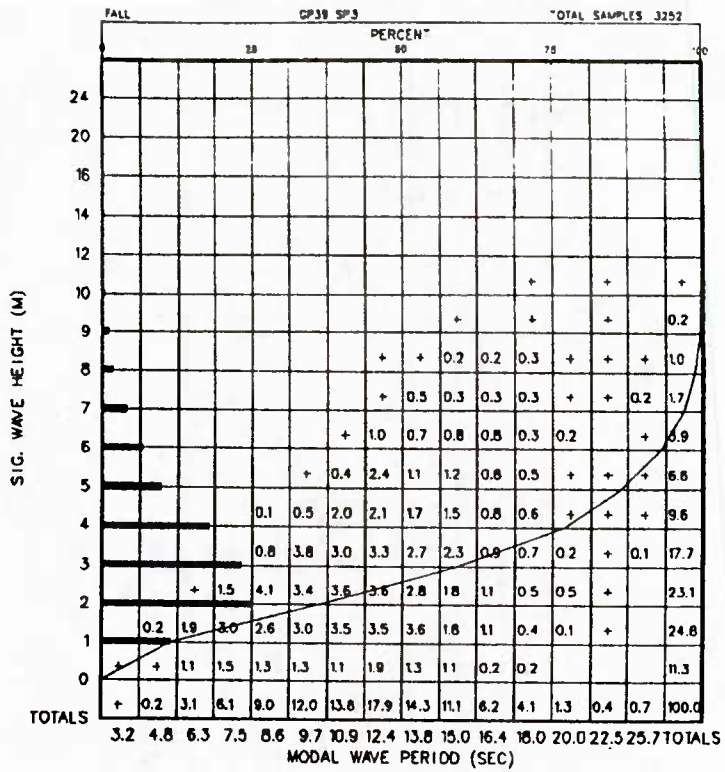


Figure A-039-5-1 Significant Wave Height vs. Modal Wave Period

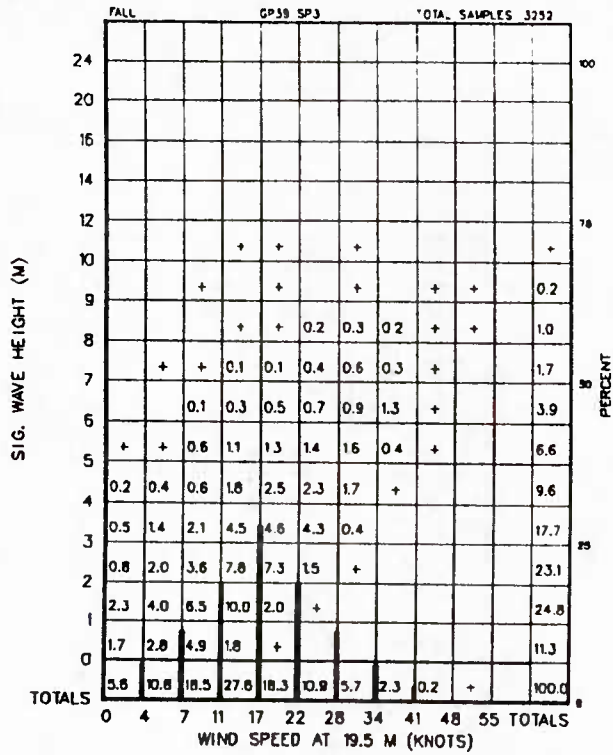


Figure A-039-5-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

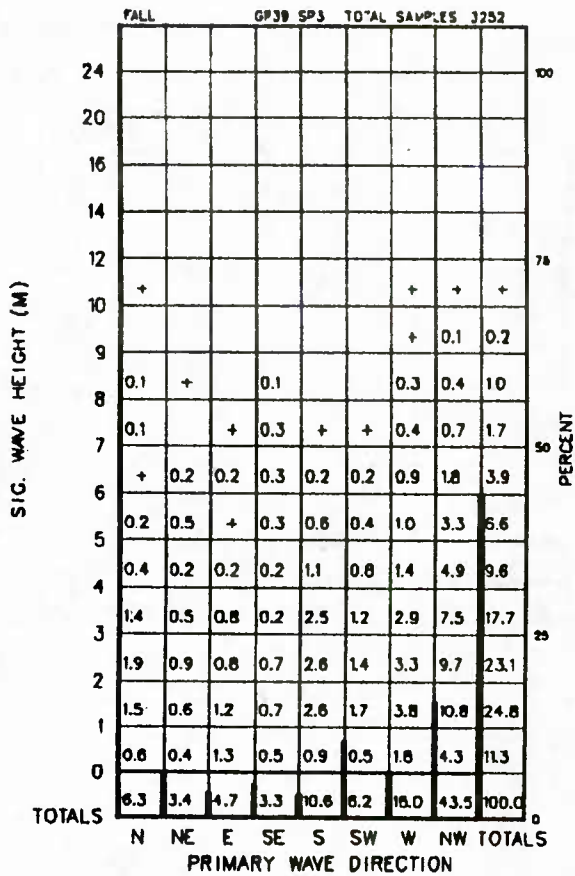


Figure A-039-5-3 Significant Wave Height vs. Primary Wave Direction

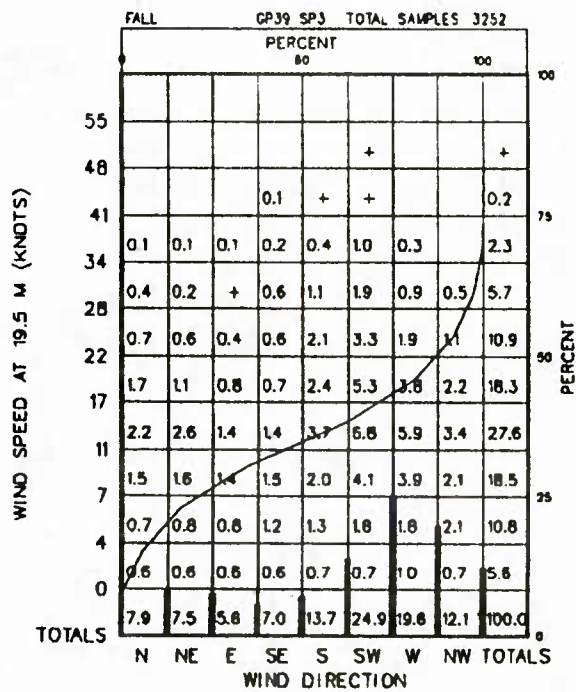


Figure A-039-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

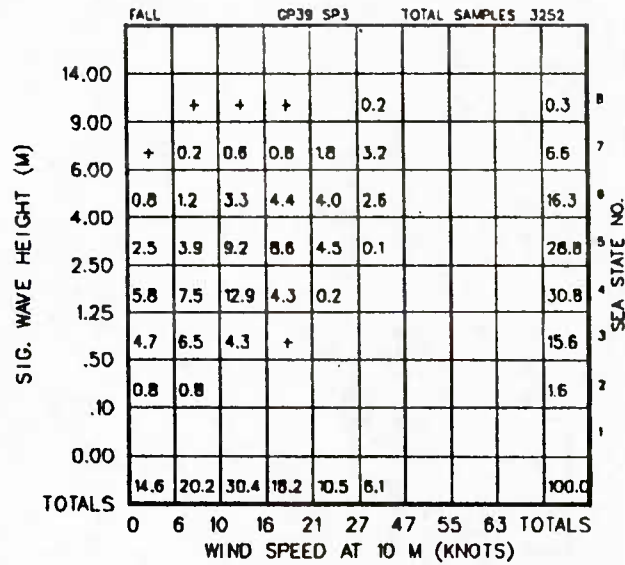


Figure A-039-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

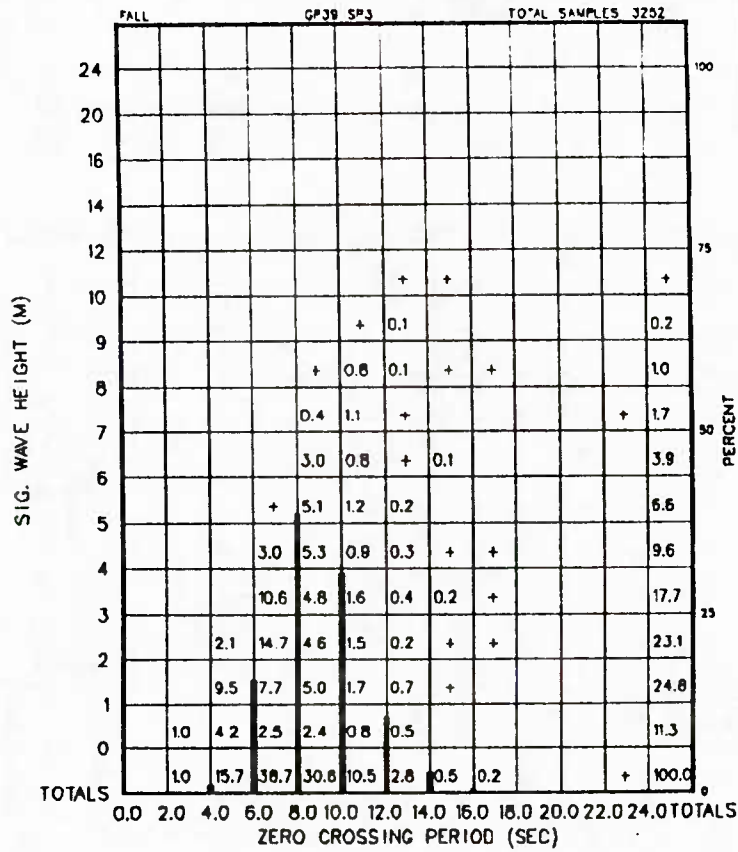


Figure A-039-5-6 Significant Wave Height vs. Zero Crossing Period

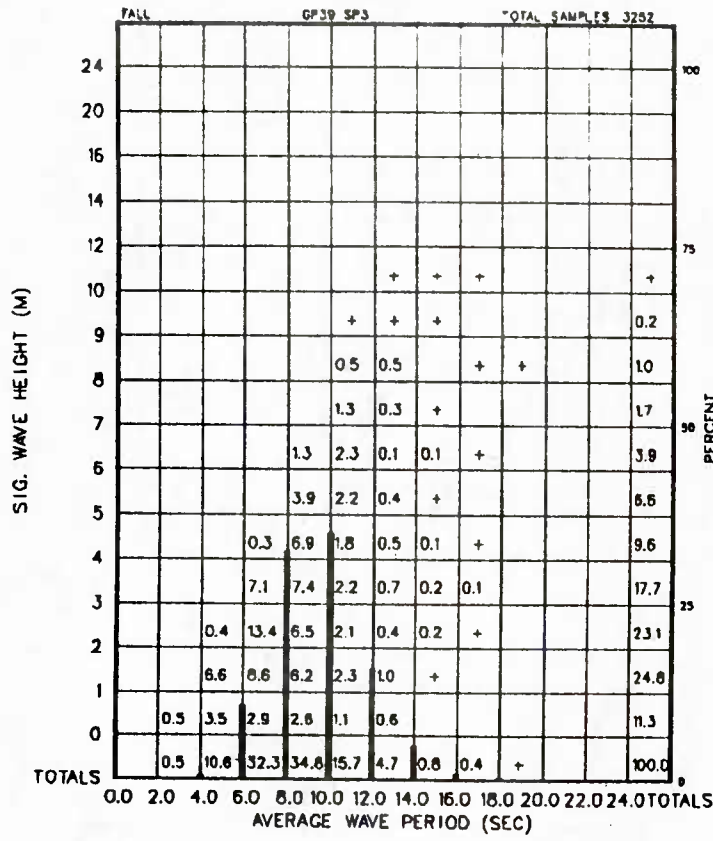


Figure A-039-5-7 Significant Wave Height vs. Average Wave Period

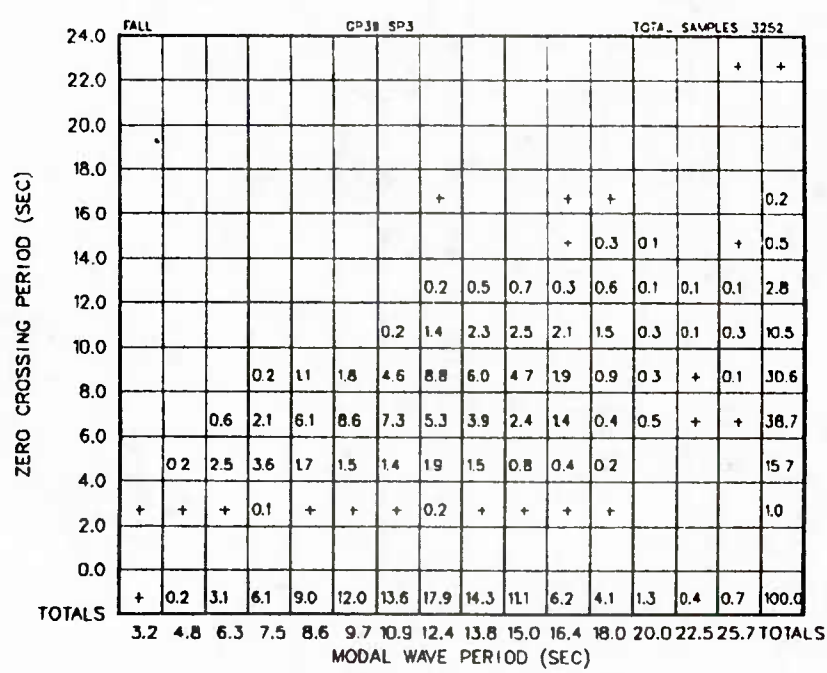


Figure A-039-5-8 Zero Crossing Period vs. Modal Wave Period

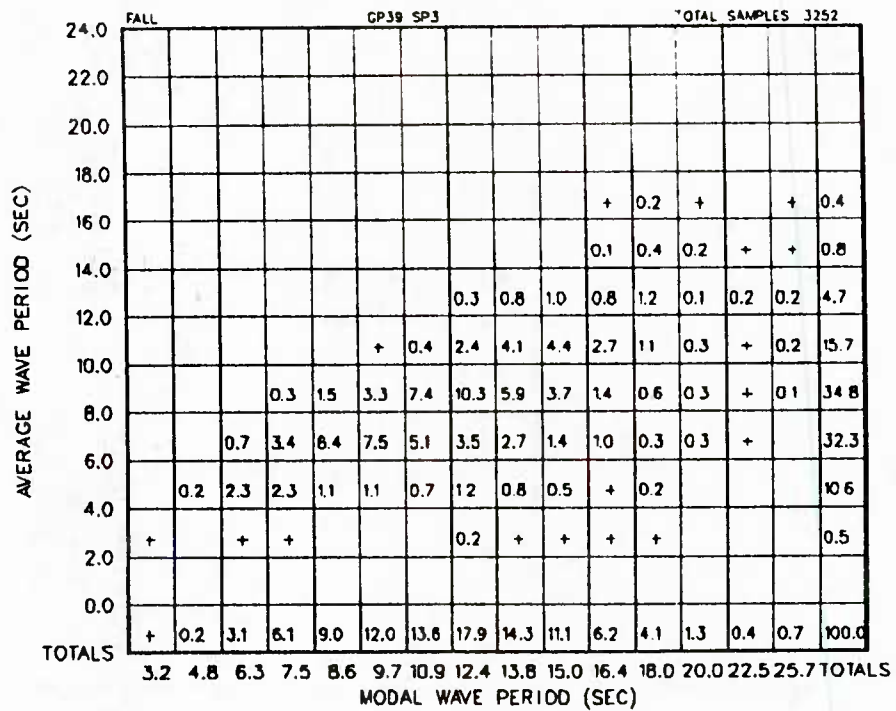


Figure A-039-5-9 Average Wave Period vs. Modal Wave Period

TABLE A-088-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 34.9°N, 145.58°W						
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable	
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.25 6 -	1.5 11 -	6 17.5 -	2.25 11.75 -	1.5 12.4 NW	
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	3 0.5 -	12 2 -	32.5 5.25 -	13.5 2.25 -	14 2.5 S	
Visibility, nautical miles	5	18	25	-	-	
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	1 0.5	6.5 6	8 8	- -	- -	
Precipitation (Occurrence)	All precipitation - 10% of the time					
Relative Humidity, %	58	78	96	-	-	
Air Temperature, °C	12.5	16	19.5	16	-	
Sea Surface Temperature, °C	16.5	19	21.5	-	-	
Sea Level Pressure, millibars	1005	1023	1034	-	-	
Ice	None					
Refractivity Mean Surface Refractivity Sub-Refraction (1 km, Annual) Super-Refraction or Ducting (1 km, Annual)	- - -	- - -	- - -	343 - -	- 27 24	

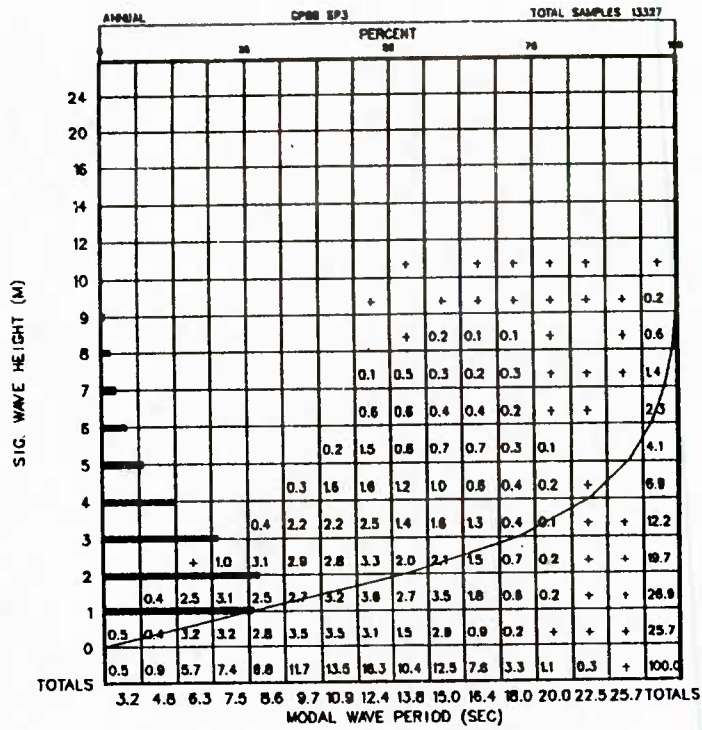


Figure A-088-1-1 Significant Wave Height vs. Modal Wave Period

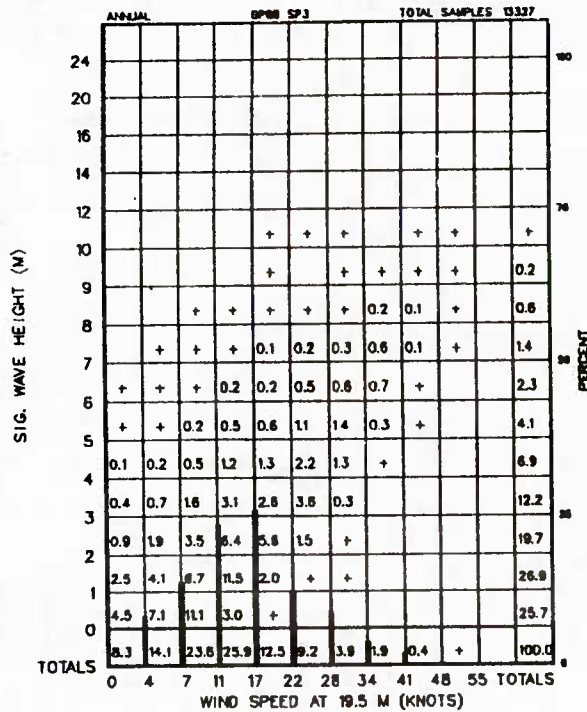


Figure A-088-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

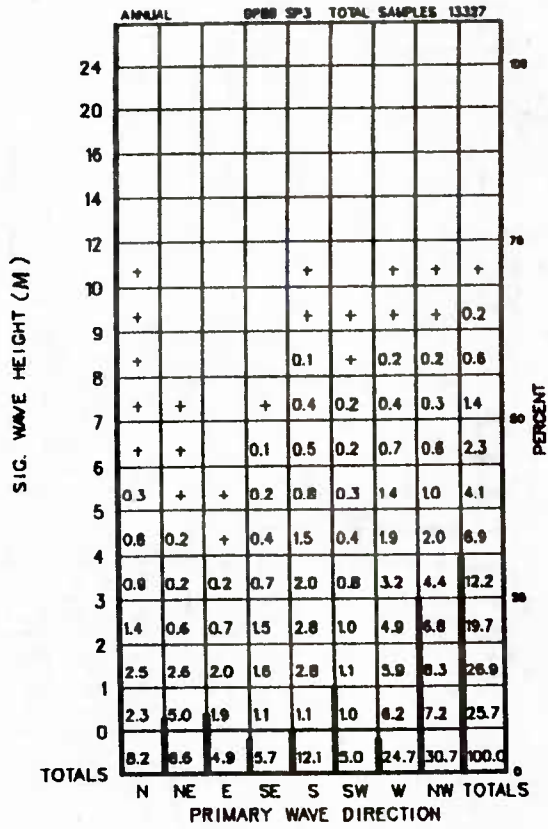


Figure A-088-1-3 Significant Wave Height vs. Primary Wave Direction

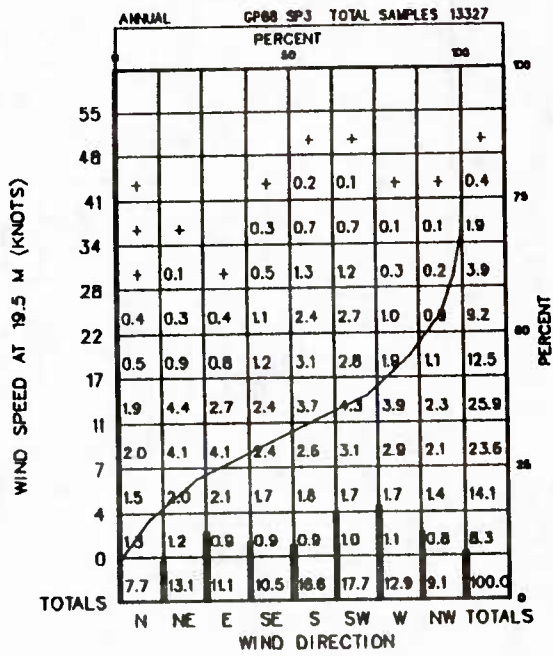


Figure A-088-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

		ANNUAL		GP88 SP3				TOTAL SAMPLES 13327			
SIG. WAVE HEIGHT (M)	14.00										0.2
	9.00				+	+	0.2				4.3
	6.00	+	+	0.3	0.5	0.8	2.6	+			11.0
	4.00	0.4	0.7	1.9	2.1	3.7	2.2				21.2
	2.50	1.9	3.1	6.4	5.8	3.8	0.1				30.0
	1.25	5.5	7.0	13.4	4.0	+					24.4
	.50	7.8	10.7	6.0	+						8.8
	.10	4.9	3.9	+							
	0.00										
	TOTALS	20.6	25.5	27.9	12.5	8.5	5.0	+			
		0	6	10	16	21	27	47	55	63	TOTALS
		WIND SPEED AT 10 M (KNOTS)									

Figure A-088-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

		ANNUAL		GP88 SP3				TOTAL SAMPLES 13327							
SIG. WAVE HEIGHT (M)	24										100				
	20														
	16														
	14														
	12														
	10					+	+				+				
	9					0.1	+	+	+		0.2				
	8				+	0.4	+	+	+		0.6				
	7				0.7	0.5	0.1		+	+	14				
	6				1.8	0.4	+		+		2.3				
5				3.5	0.8	+	+	+		4.1					
4				2.0	4.0	0.7	+	+	+	6.9					
3				7.5	3.2	1.0	0.4	0.1	+	+	12.2				
2				1.8	11.7	3.8	1.7	0.5	0.2	+	+	18.7			
1				11.5	7.1	4.8	2.2	0.9	0.3	+	+	26.8			
0				3.2	7.7	6.2	5.2	2.7	0.6	0.1	+	25.7			
TOTALS				3.2	21.1	34.5	26.9	10.3	2.8	0.6	0.2	+	+	+	100.0
		0.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	TOTALS
		ZERO CROSSING PERIOD (SEC)													

Figure A-088-1-6 Significant Wave Height vs. Zero Crossing Period

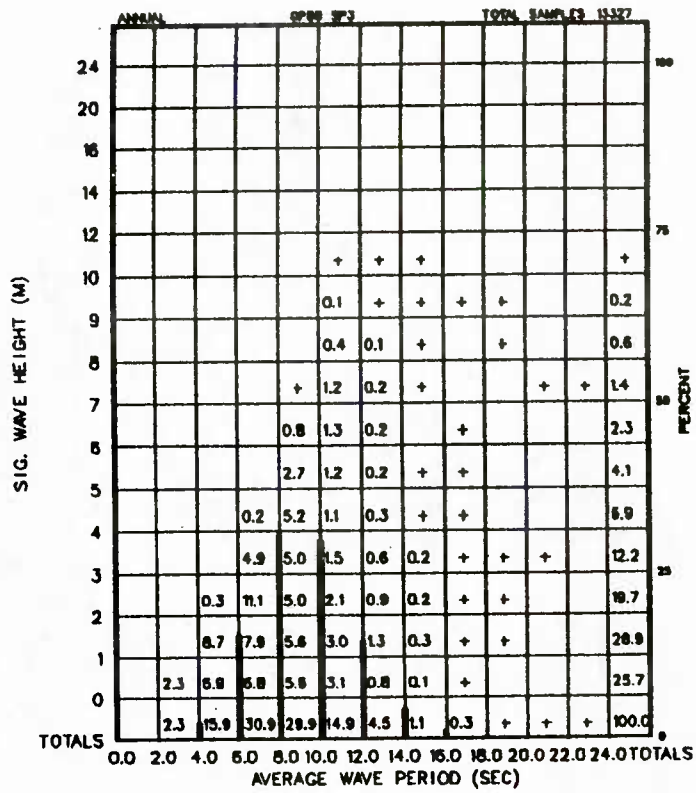


Figure A-088-1-7 Significant Wave Height vs. Average Wave Period

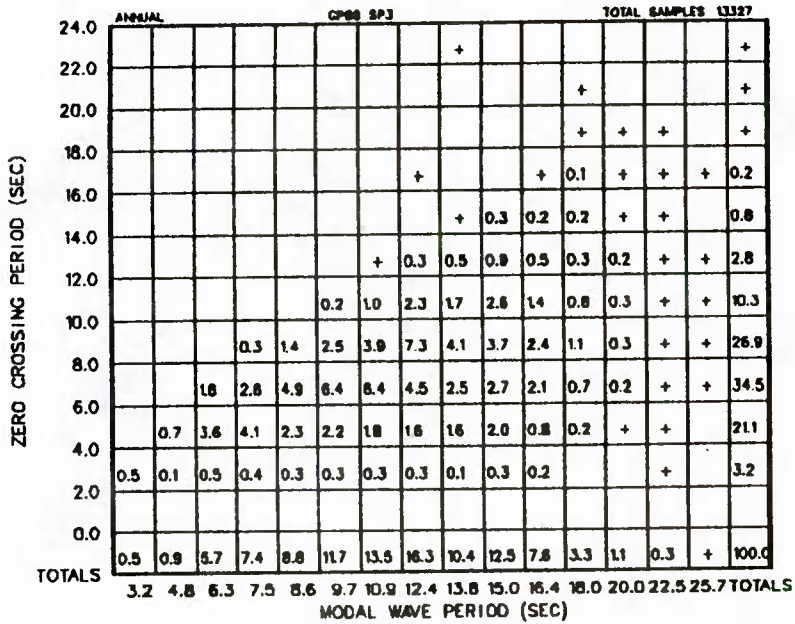


Figure A-088-1-8 Zero Crossing Period vs. Modal Wave Period

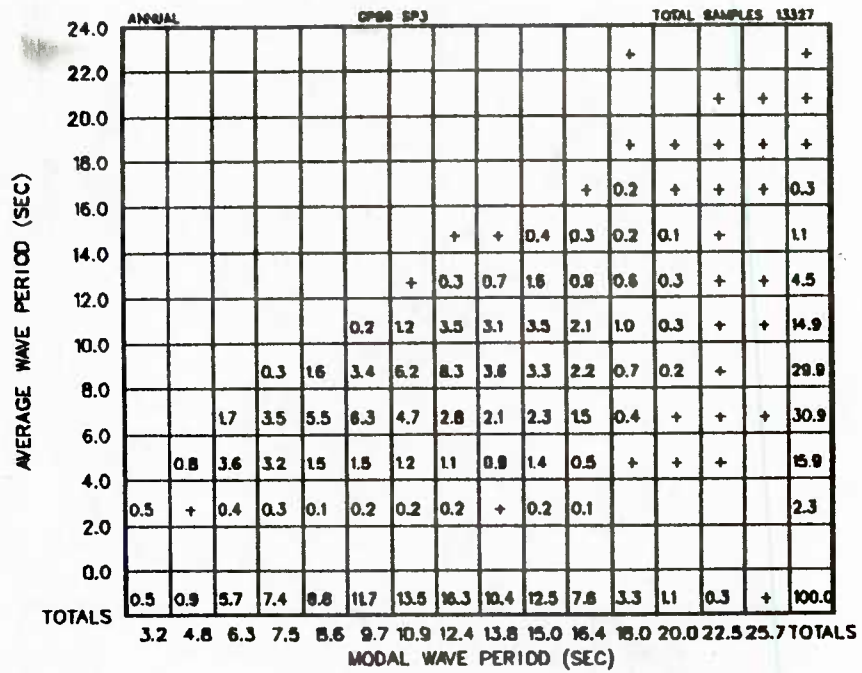


Figure A-088-1-9 Average Wave Period vs. Modal Wave Period

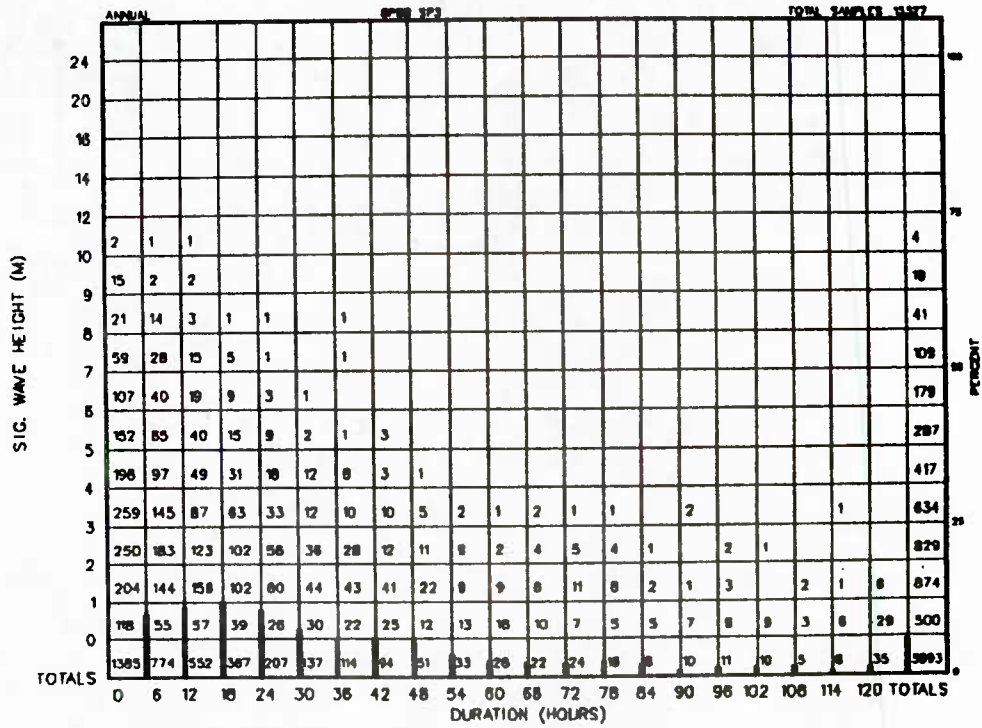


Figure A-088-1-10 Persistence of Wave Height

		ANNUAL												OPER SP3												TOTAL SAMPLES 1327	
		0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	TOTALS	PERCENT			
55																											
48	4	1																					5				
41	23	12	1	1																			37				
34	77	38	15	5	6				1														142				
28	196	76	28	10	8	1	1																320				
22	373	185	87	35	16	6	5	2	2														671				
17	540	217	88	50	21	9	4	2	1	1													933				
11	636	305	161	96	61	31	23	16	7	11	9	9	3	7	2								1379				
7	698	319	155	95	51	26	26	18	5	3	4	4		2	1							1	1408				
4	563	250	99	48	25	13	4	3	6	2													1013				
0	238	97	61	48	16	14	7	4	2	3				1									481				
TOTALS	3346	1480	675	366	204	100	70	48	23	20	13	14	3	9	3							1	6399				

Figure A-088-1-11 Persistence of Wind Speed at 19.5 M (Knots)

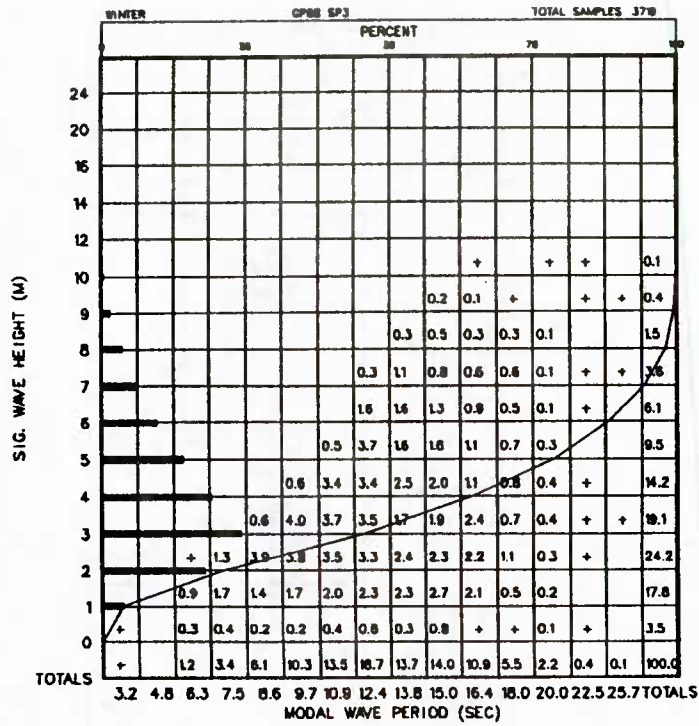


Figure A-088-2-1 Significant Wave Height vs. Modal Wave Period

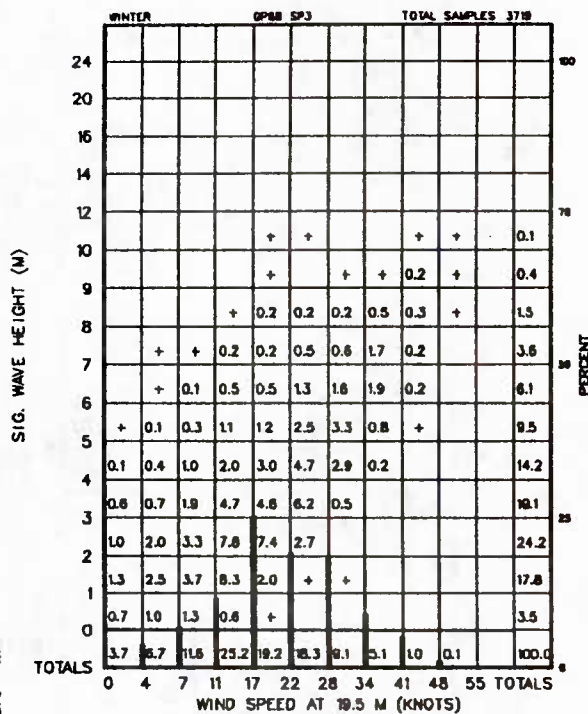


Figure A-088-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

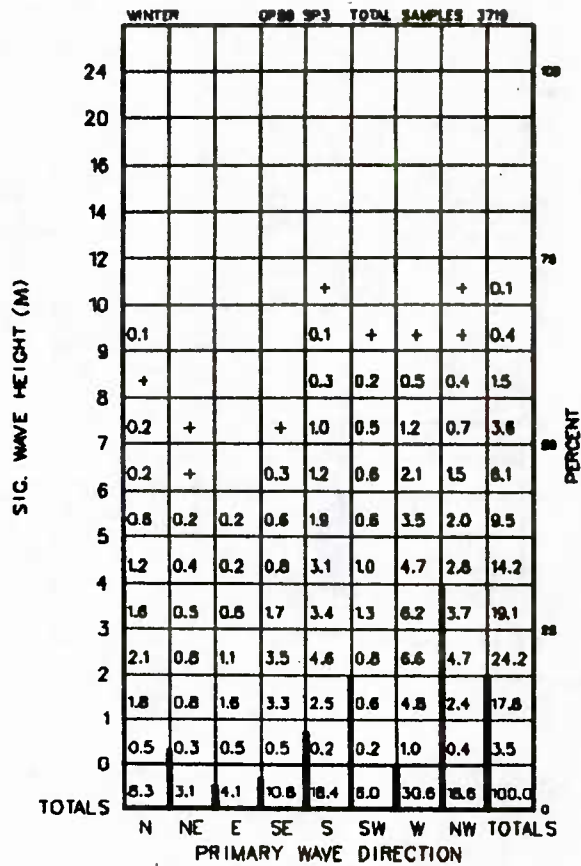


Figure A-088-2-3 Significant Wave Height vs. Primary Wave Direction

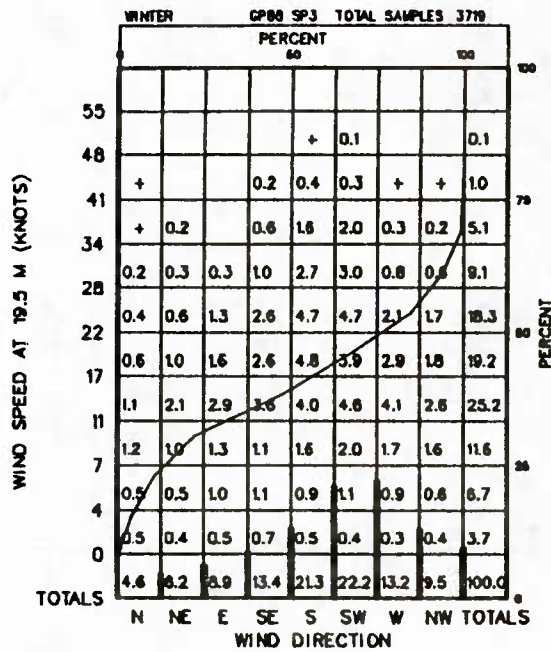


Figure A-088-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

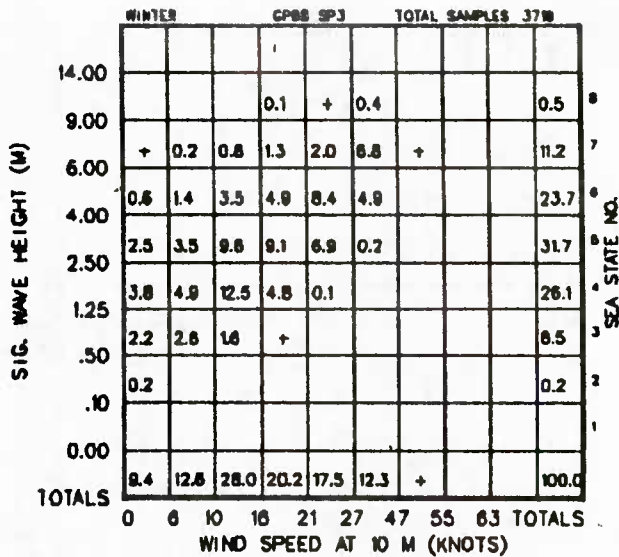


Figure A-088-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

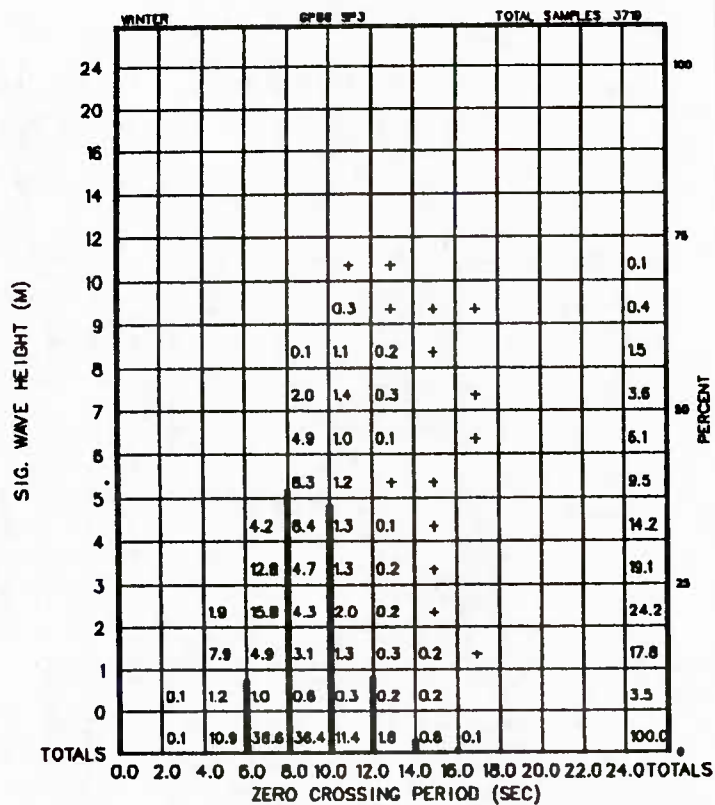


Figure A-088-2-6 Significant Wave Height vs. Zero Crossing Period

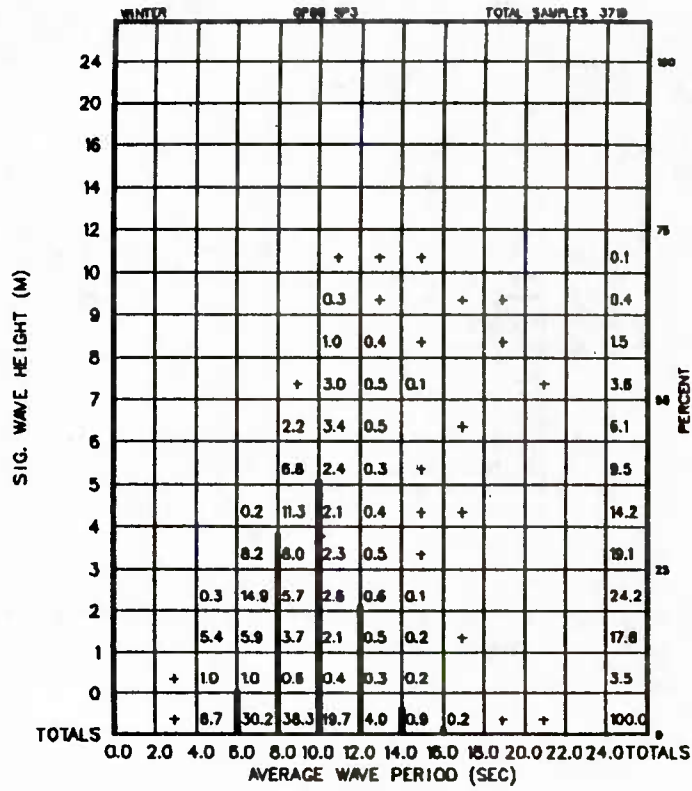


Figure A-088-2-7 Significant Wave Height vs. Average Wave Period

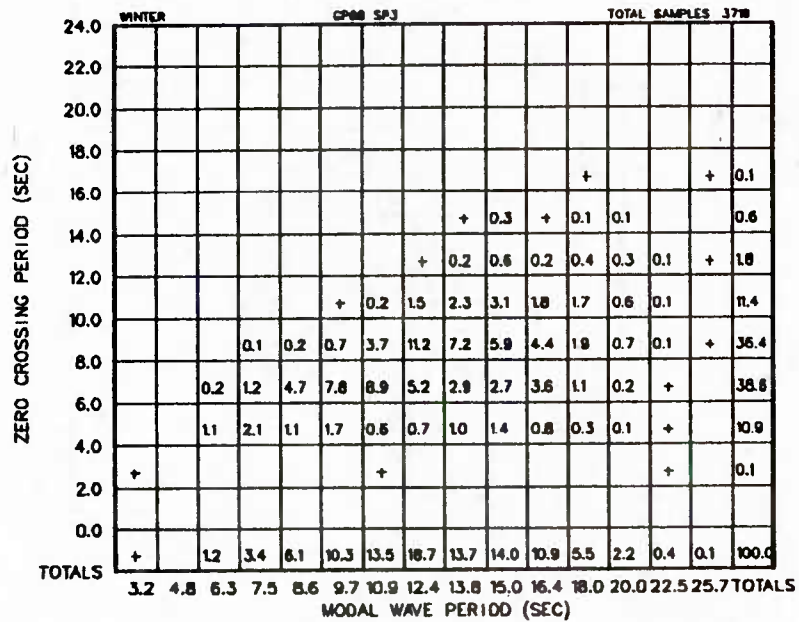


Figure A-088-2-8 Zero Crossing Period vs. Modal Wave Period

		WINTER														TOTAL SAMPLES 3710												
		CP88 SP3																										
AVERAGE WAVE PERIOD (SEC)	24.0																											
	22.0																											
	20.0																											
	18.0																											
	16.0																											
	14.0																											
	12.0																											
	10.0																											
	8.0																											
	6.0																											
	4.0																											
	2.0																											
	0.0																											
TOTALS																												
		3.2	4.8	6.3	7.5	8.6	9.7	10.9	12.4	13.8	15.0	16.4	18.0	20.0	22.5	25.7	TOTALS											
		MODAL WAVE PERIOD (SEC)																										

Figure A-088-2-9 Average Wave Period vs. Modal Wave Period

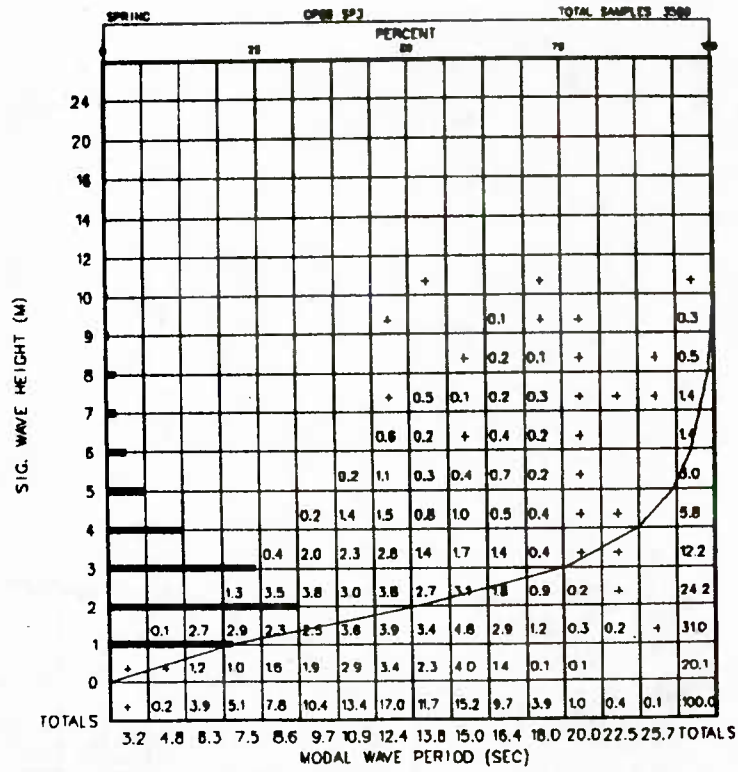


Figure A-088-3-1 Significant Wave Height vs. Modal Wave Period

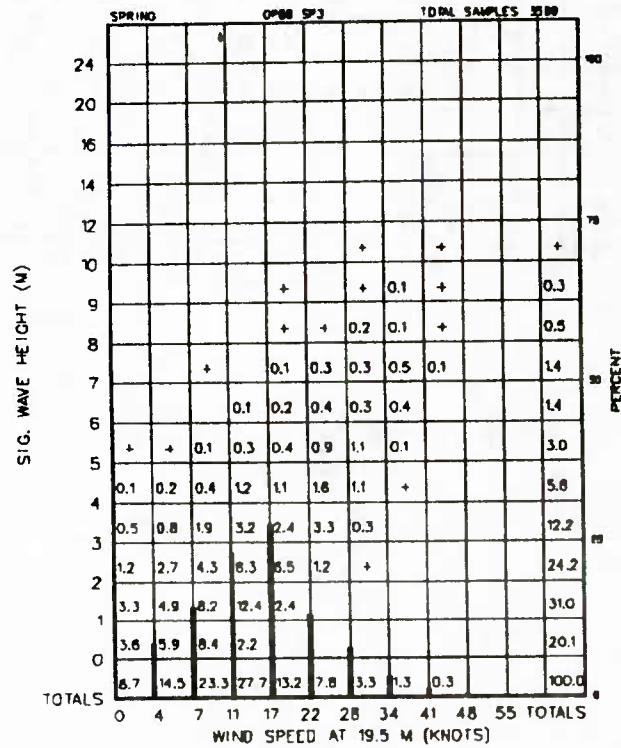


Figure A-088-3-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

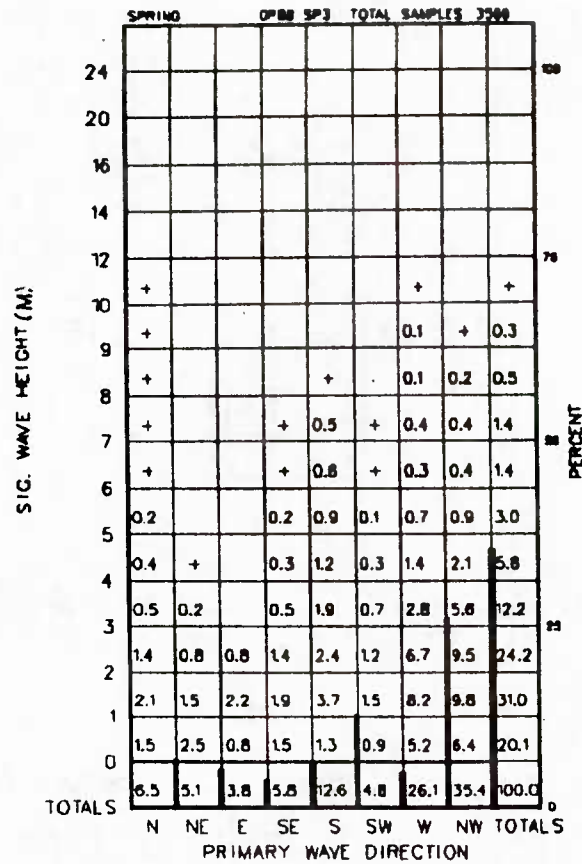


Figure A-088-3-3 Significant Wave Height vs. Primary Wave Direction

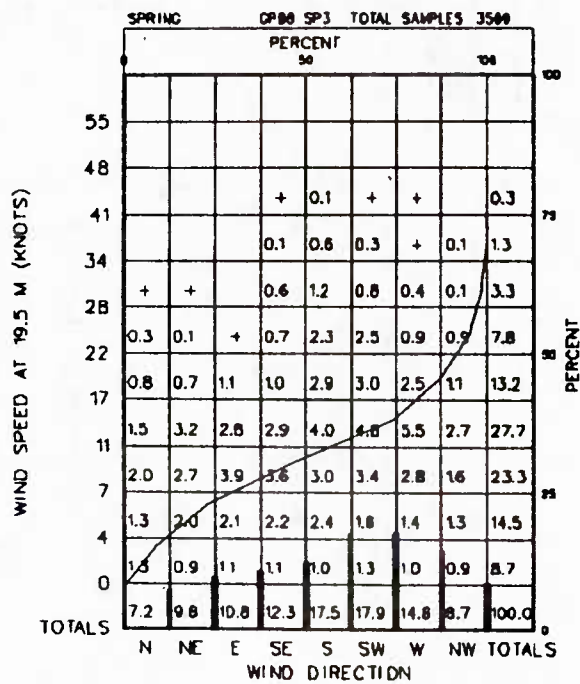


Figure A-088-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

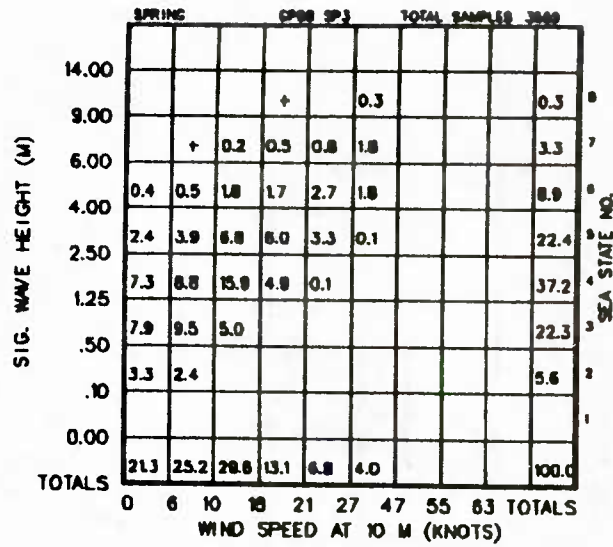


Figure A-088-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

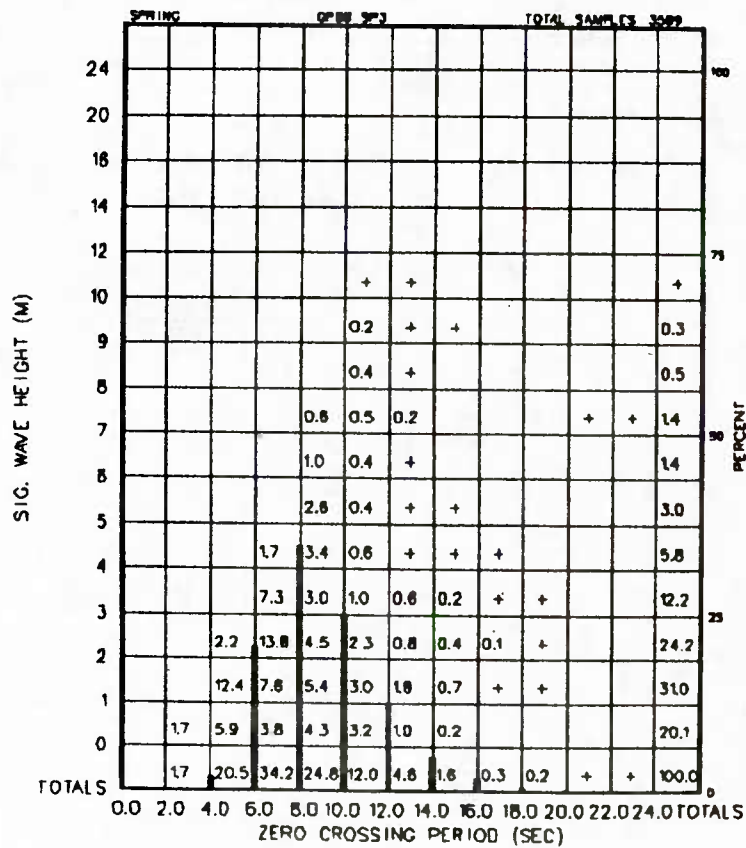


Figure A-088-3-6 Significant Wave Height vs. Zero Crossing Period

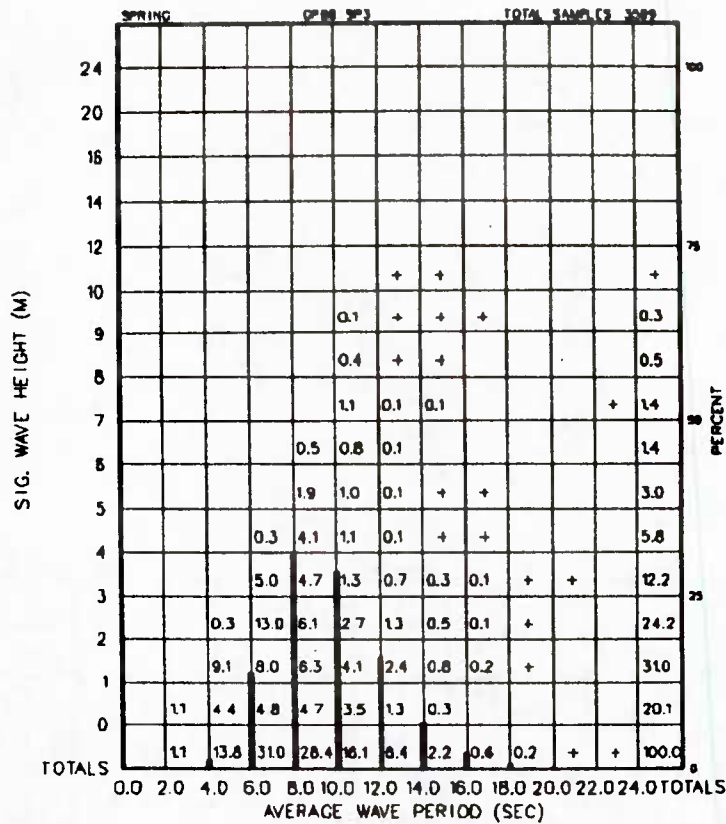


Figure A-088-3-7 Significant Wave Height vs. Average Wave Period

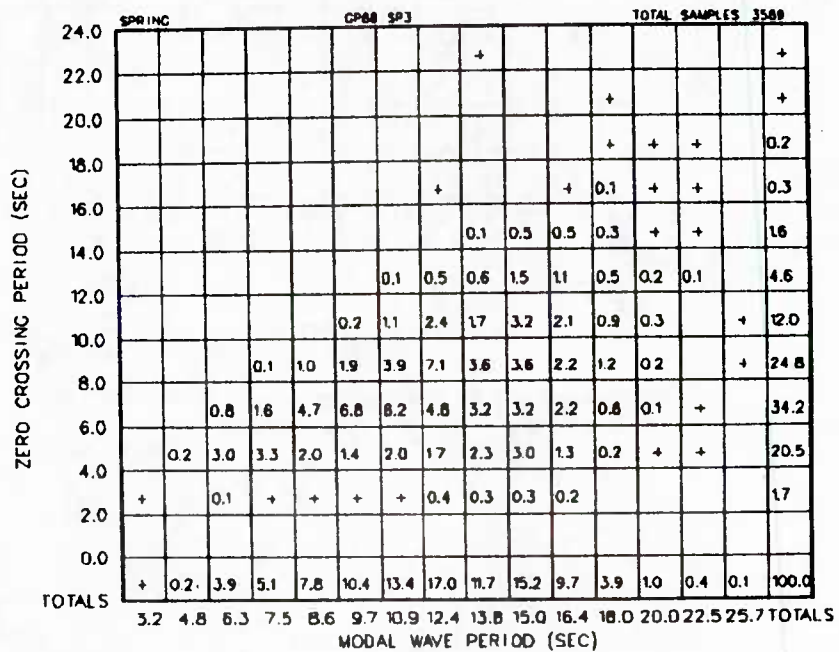


Figure A-088-3-8 Zero Crossing Period vs. Modal Wave Period

AVERAGE WAVE PERIOD (SEC)	SPRING										CP08 SP3					TOTAL SAMPLES 3500			
	3.2	4.8	6.3	7.5	8.6	9.7	10.9	12.4	13.8	15.0	16.4	18.0	20.0	22.5	25.7	TOTALS			
24.0																			
22.0																			
20.0																			
18.0																			
16.0																			
14.0																			
12.0																			
10.0																			
8.0																			
6.0																			
4.0																			
2.0																			
0.0																			
TOTALS	0.2	3.9	5.1	7.8	10.4	13.4	17.0	11.7	15.2	9.7	3.9	1.0	0.4	0.1	100.0				

Figure A-088-3-9 Average Wave Period vs. Modal Wave Period

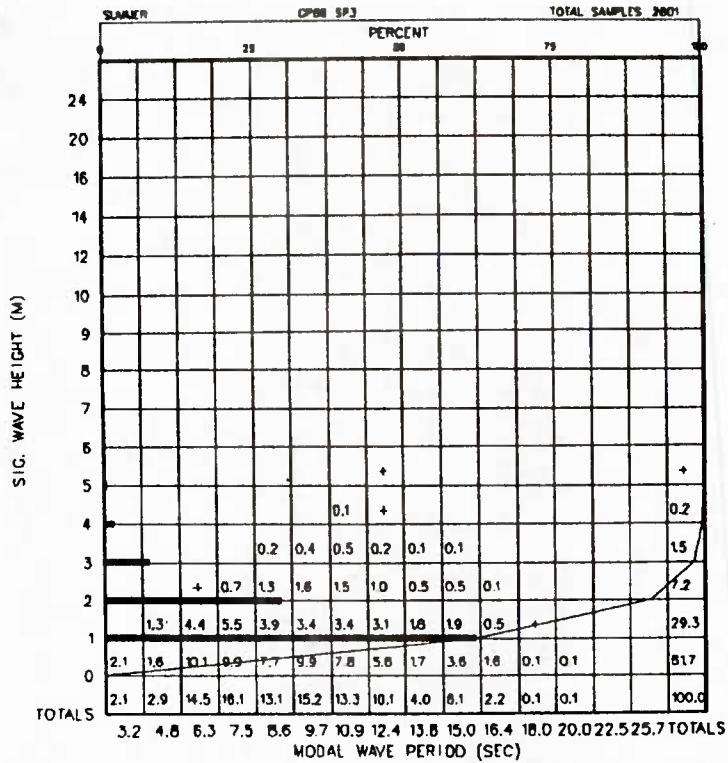


Figure A-088-4-1 Significant Wave Height vs. Modal Wave Period

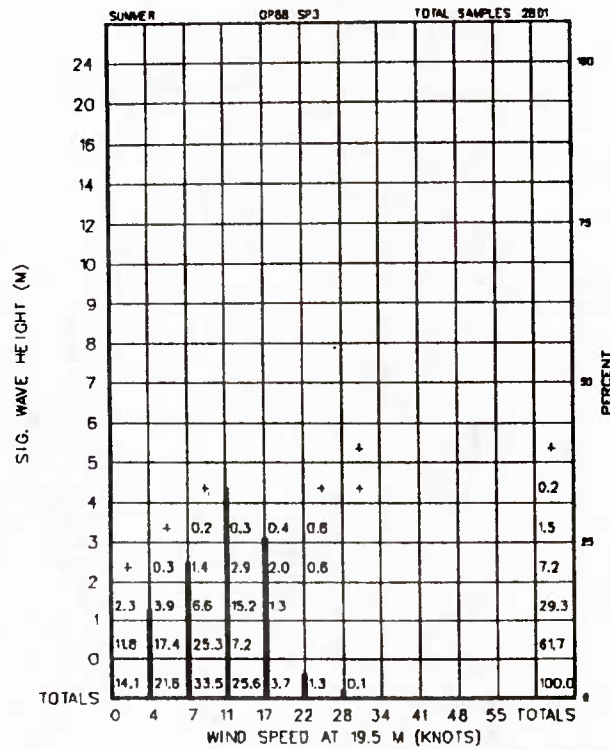


Figure A-088-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

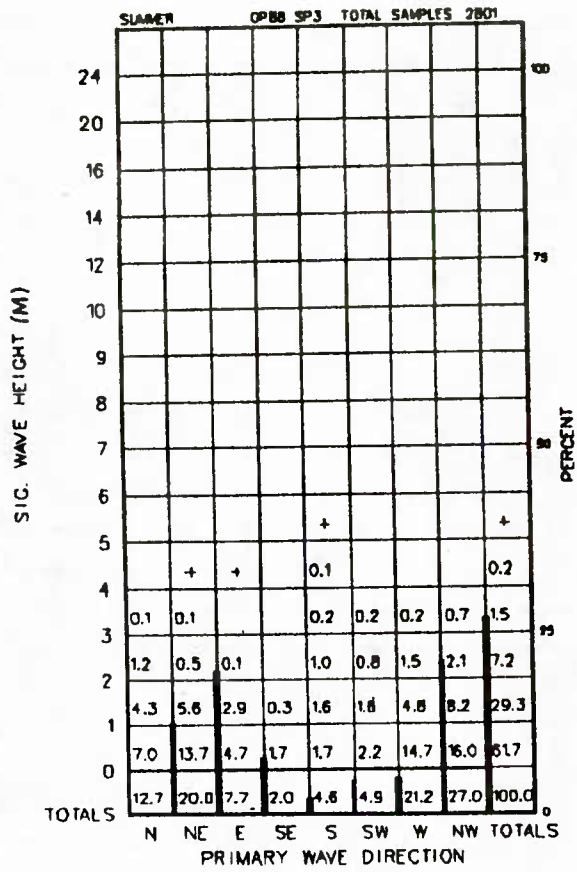


Figure A-088-4-3 Significant Wave Height vs. Primary Wave Direction

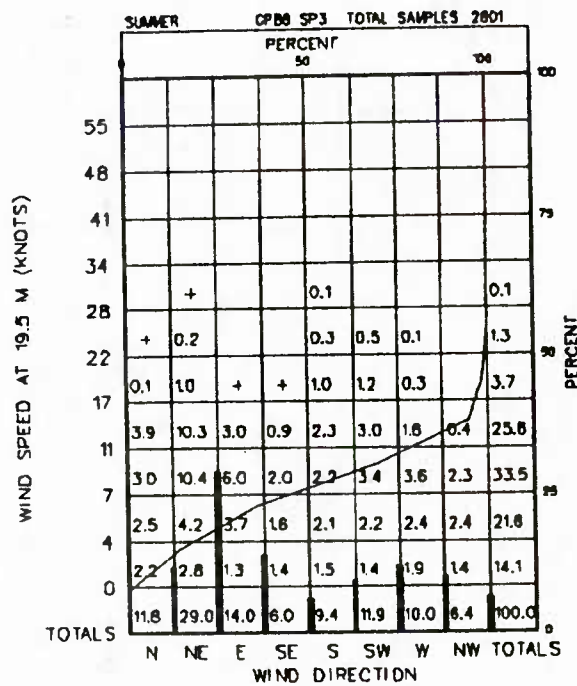


Figure A-088-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

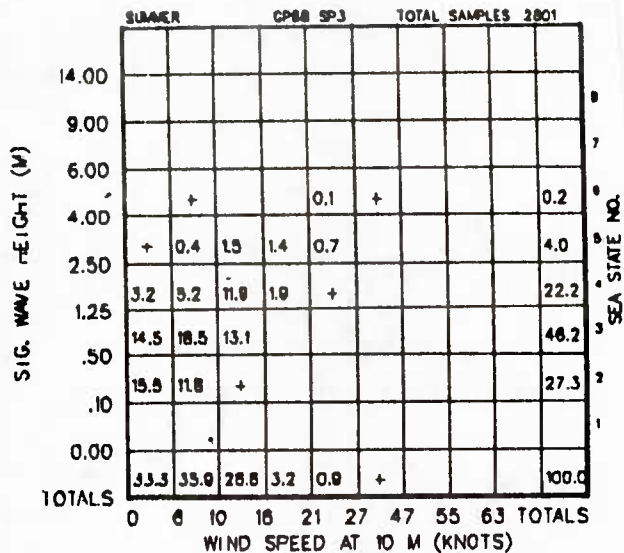


Figure A-088-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

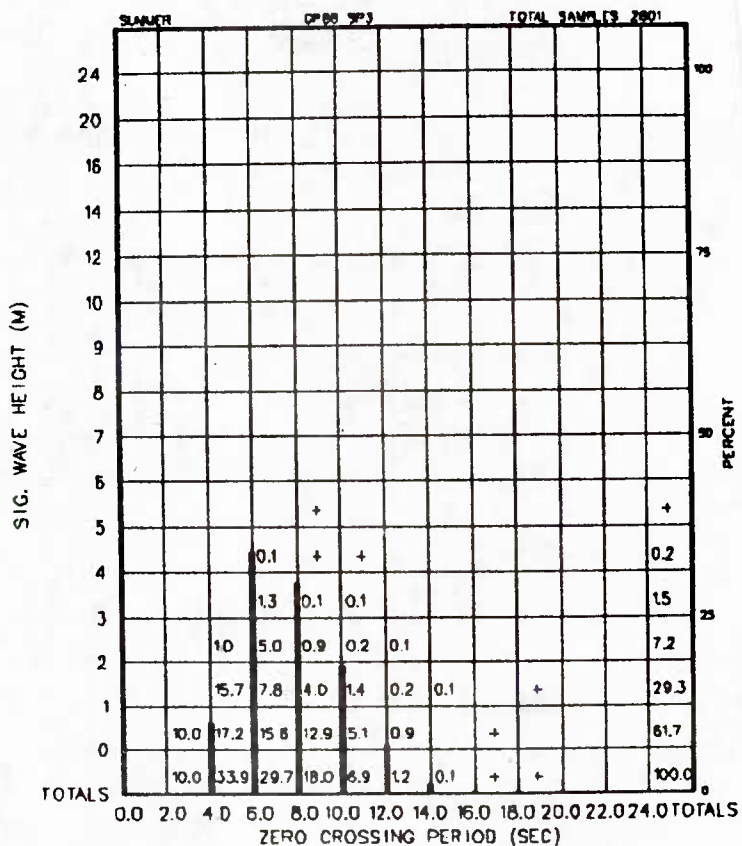


Figure A-088-4-6 Significant Wave Height vs. Zero Crossing Period

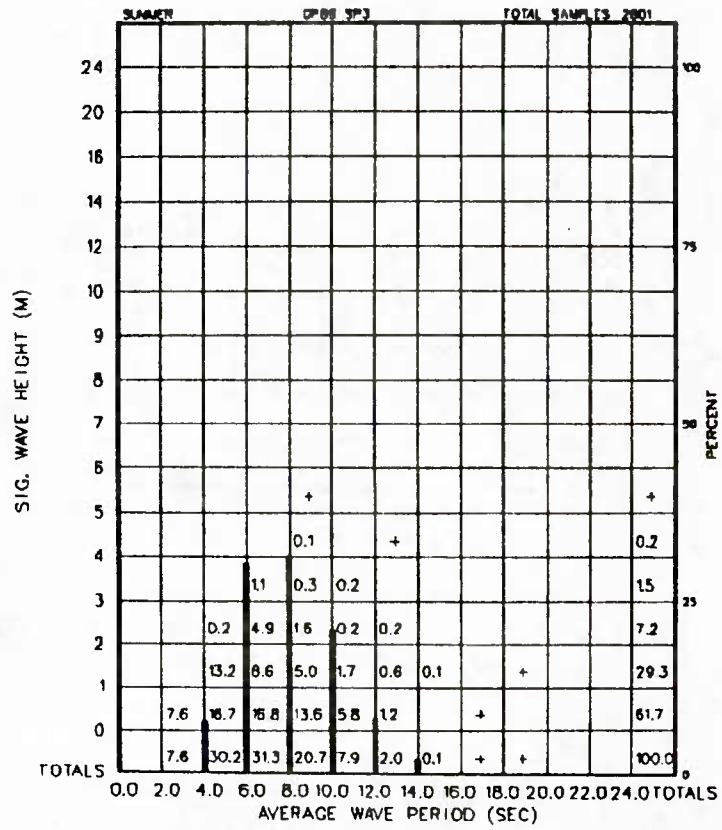


Figure A-088-4-7 Significant Wave Height vs. Average Wave Period

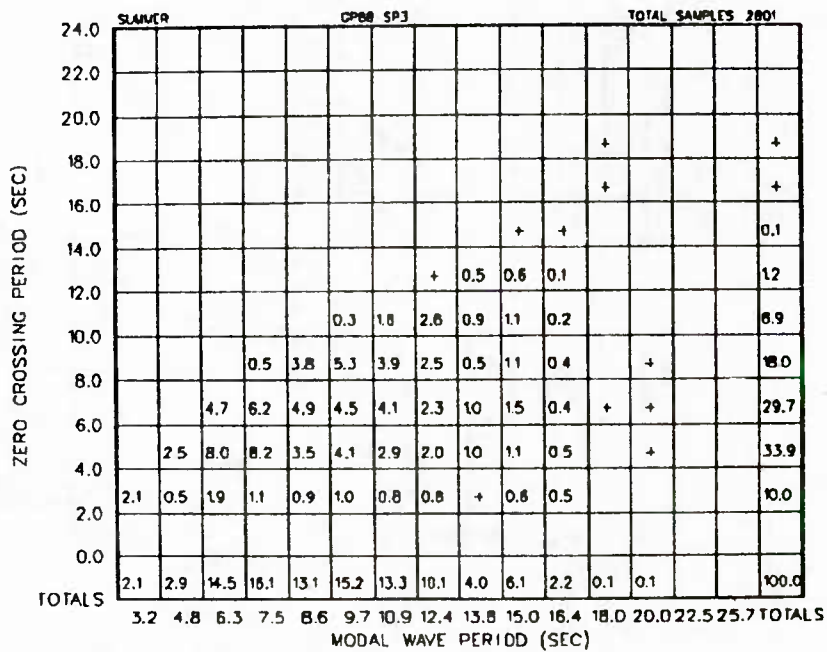


Figure A-088-4-8 Zero Crossing Period vs. Modal Wave Period

	SLAMMER		CPDB SP3										TOTAL SAMPLES 2801							
24.0																				
22.0																				
20.0																				
18.0																			+	+
16.0																			+	+
14.0																			+	+
12.0																				
10.0																				
8.0																				
6.0																				
4.0																				
2.0																				
0.0																				
TOTALS	2.1	2.9	14.5	16.1	13.1	15.2	13.3	10.1	4.0	6.1	2.2	0.1	0.1							100.0
	3.2	4.8	6.3	7.5	8.6	9.7	10.9	12.4	13.8	15.0	16.4	18.0	20.0	22.5	25.7	TOTALS				
	MODAL WAVE PERIOD (SEC)																			

Figure A-088-4-9 Average Wave Period vs. Modal Wave Period

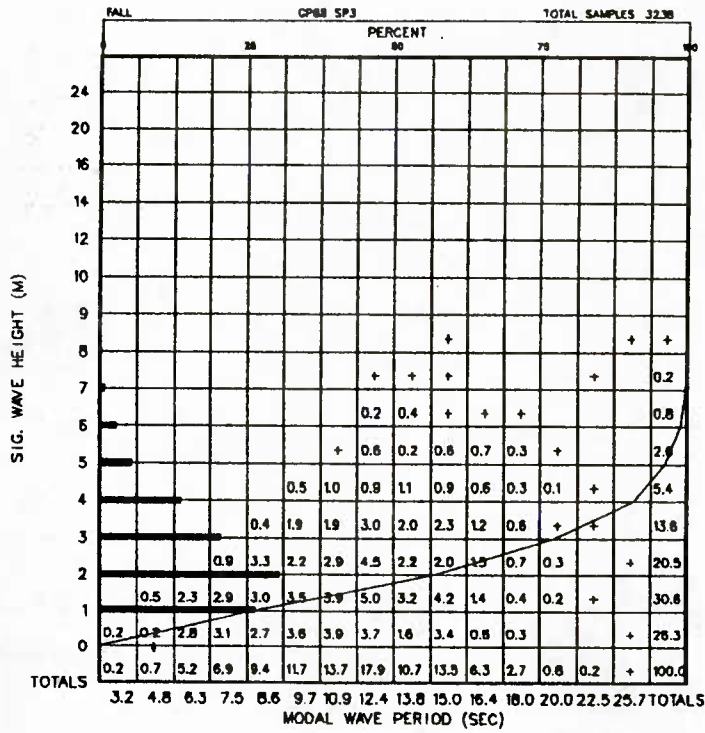


Figure A-088-5-1 Significant Wave Height vs. Modal Wave Period

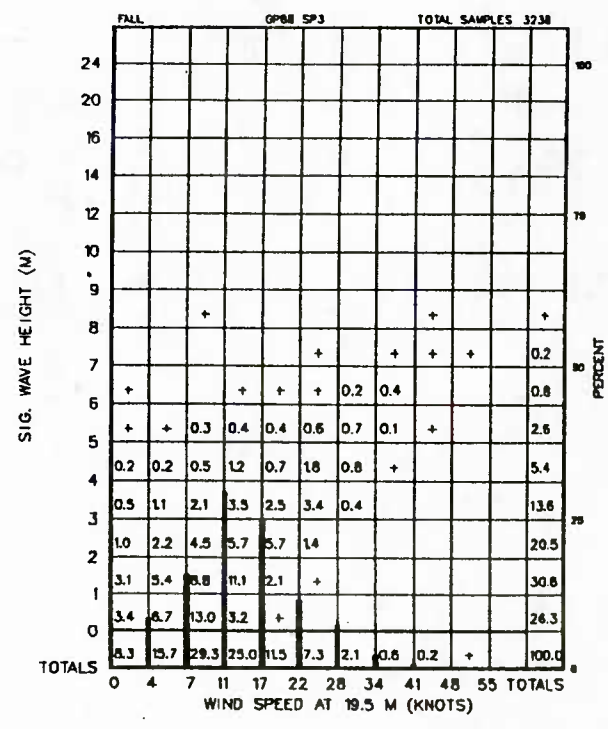


Figure A-088-5-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

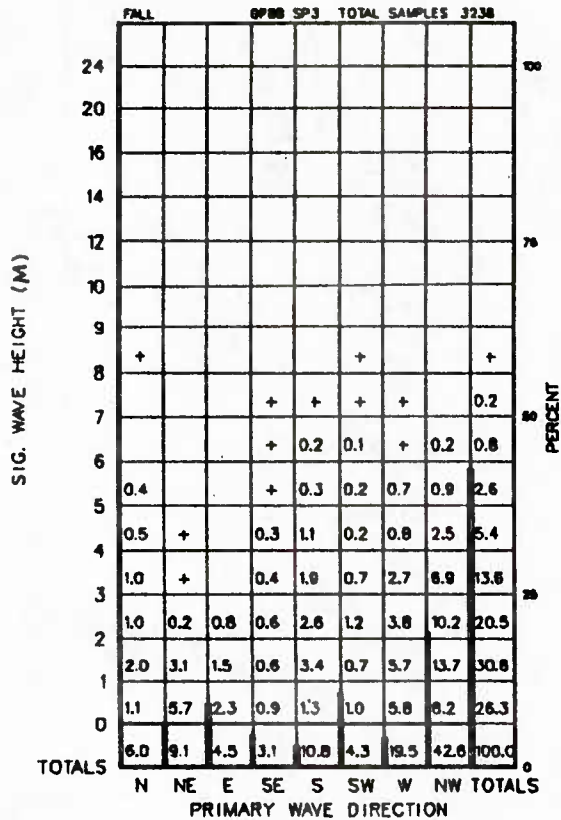


Figure A-088-5-3 Significant Wave Height vs. Primary Wave Direction

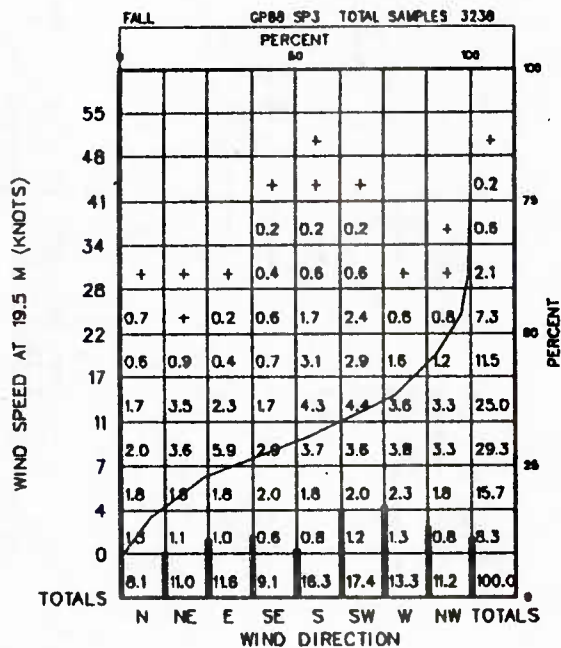


Figure A-088-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

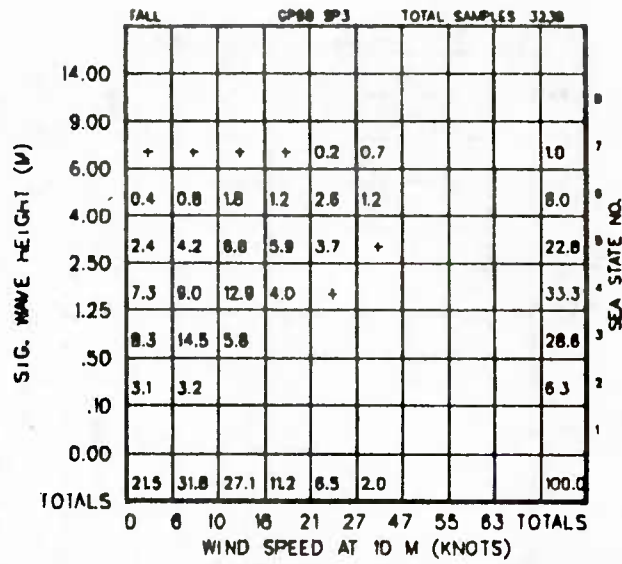


Figure A-088-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

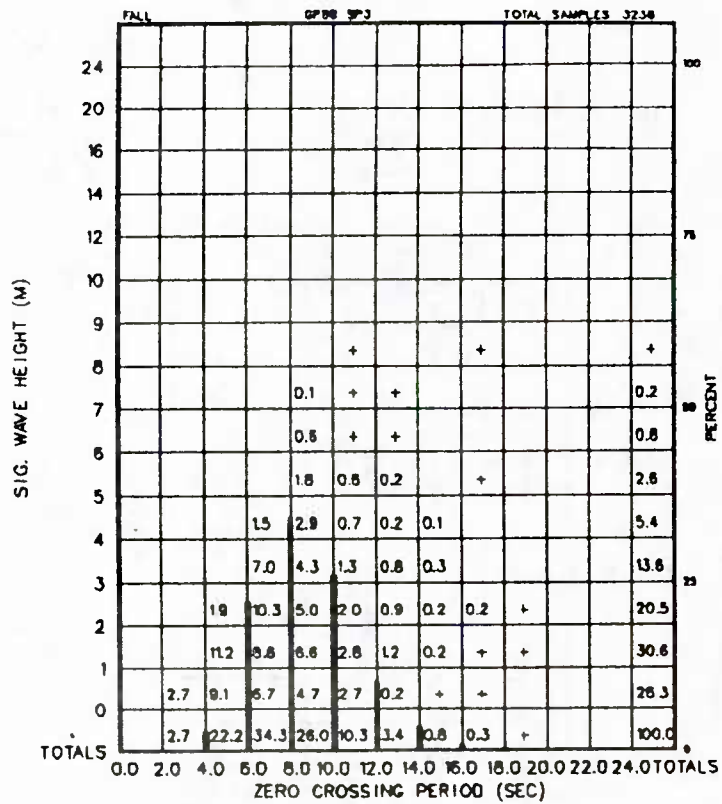


Figure A-088-5-6 Significant Wave Height vs. Zero Crossing Period

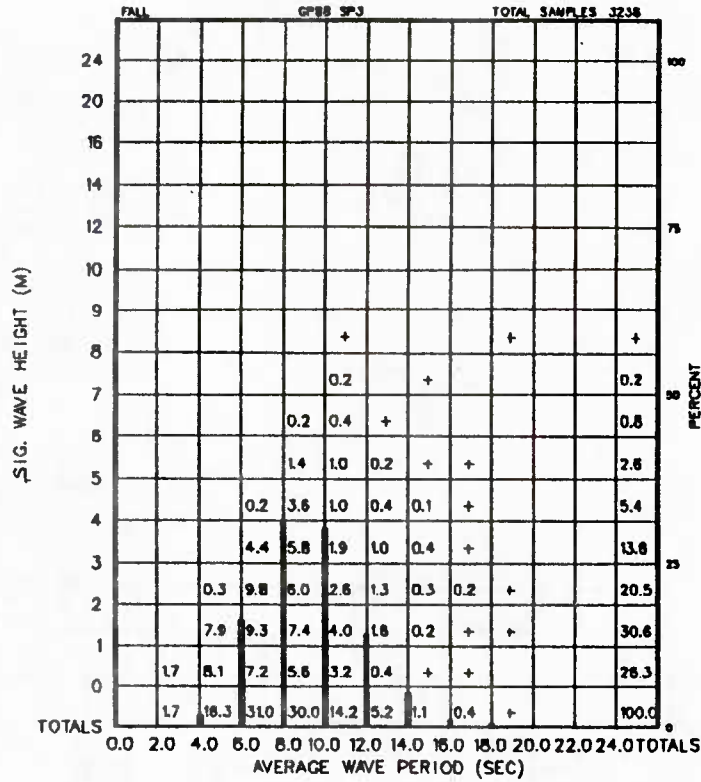


Figure A-088-5-7 Significant Wave Height vs. Average Wave Period

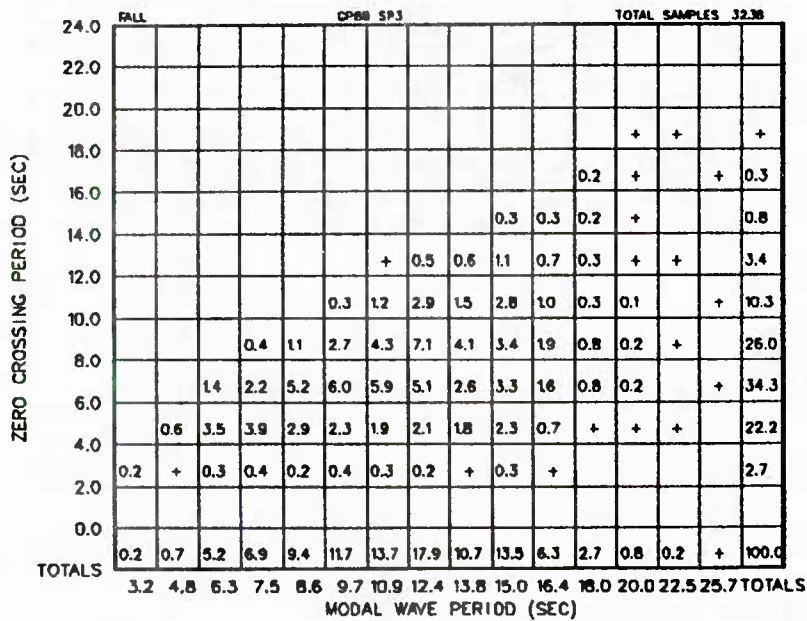


Figure A-088-5-8 Zero Crossing Period vs. Modal Wave Period

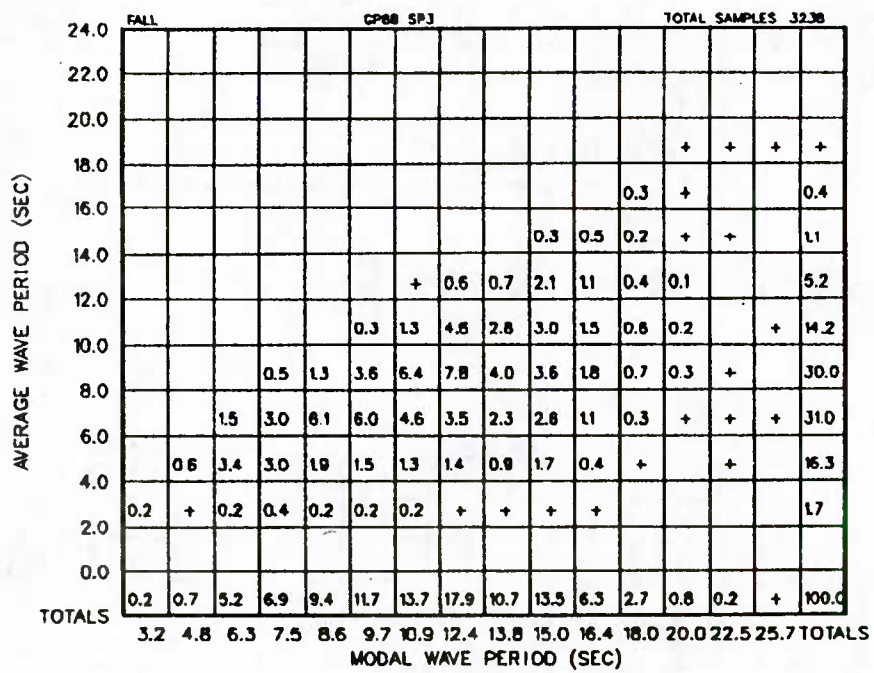


Figure A-088-5-9 Average Wave Period vs. Modal Wave Period

TABLE A-3/093-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

Natural Environment	SEASON: ANNUAL; LOCATION: 24.58°N, 135.65°W					Mean	Most Probable
	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable		
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.25 6 -	1.5 10 -	3.5 19 -	1.75 11 -	1.5 9.7 NE		
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	4 0.5 -	12 1.5 -	21 2.5 -	12 1.5 -	14 1.75 NE		
Visibility, nautical miles	7	20	25	-	-		
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	1.5 0.5	6.5 5.5	8 7.5	-	-		
Precipitation (Occurrence)	All precipitation - 3% of the time						
Relative Humidity, %	60	75	92	-	-		
Air Temperature, °C	19	21	24	21.5	-		
Sea Surface Temperature, °C	22	24	26	-	-		
Sea Level Pressure, millibars	1014	1017	1021	-	-		
Ice	None						
Refractivity Mean Surface Refractivity Sub-Refraction (1 km, Annual) Super-Refraction or Ducting (1 km, Annual)	- - -	- - -	- - -	343 - -	- 2% 3%		

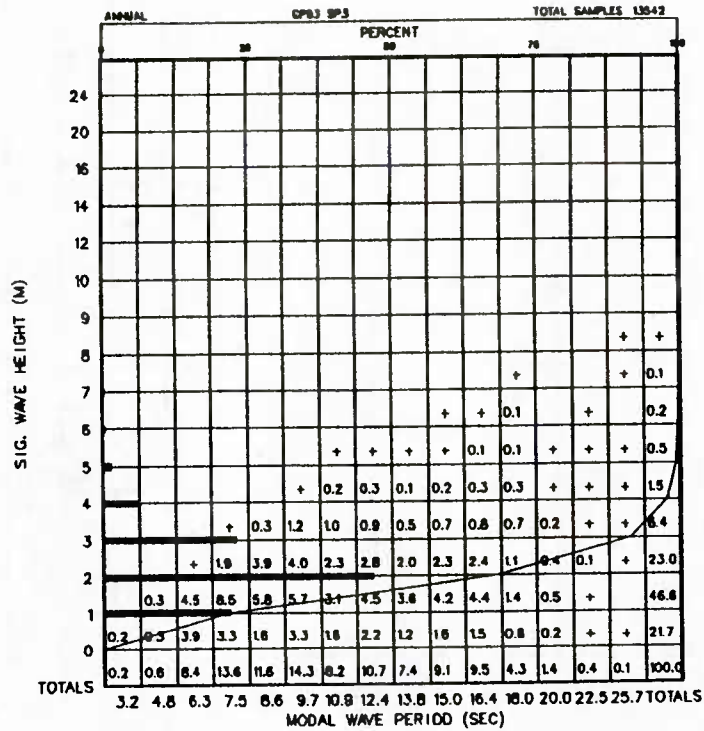


Figure A-3/093-1-1 Significant Wave Height vs. Modal Wave Period

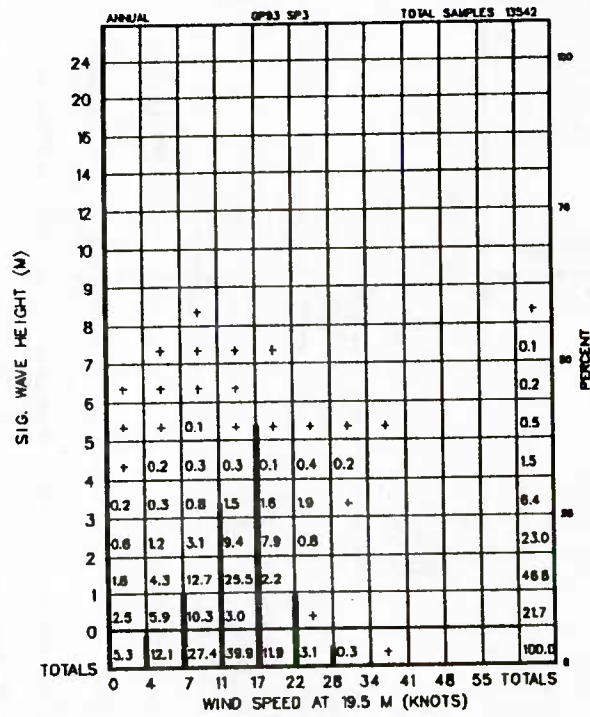


Figure A-3/093-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

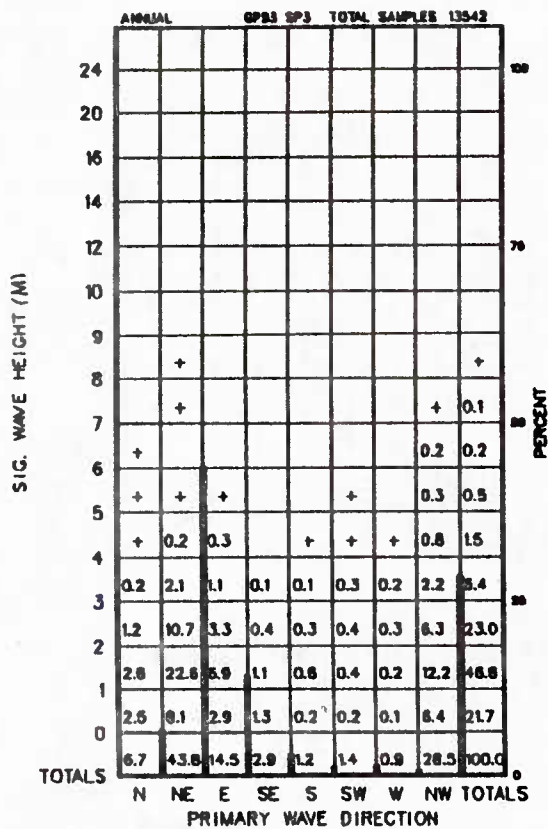


Figure A-3/093-1-3 Significant Wave Height vs. Primary Wave Direction

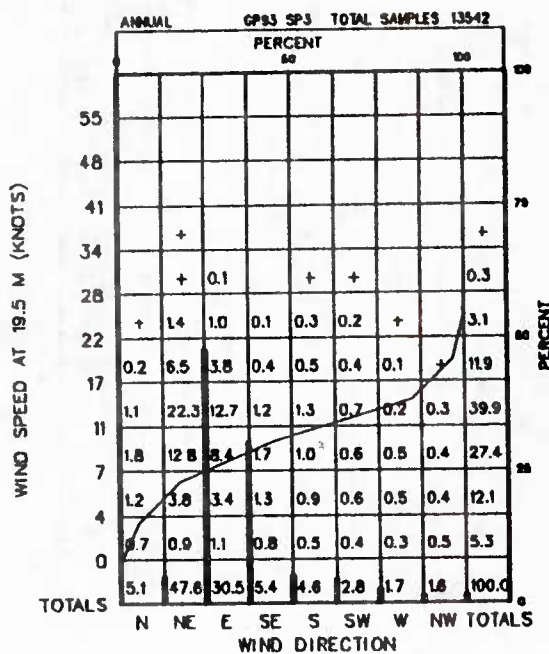


Figure A-3/093-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

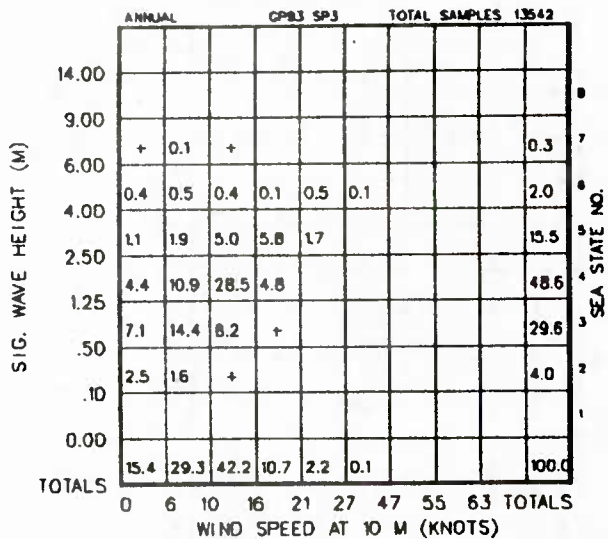


Figure A-3/093-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

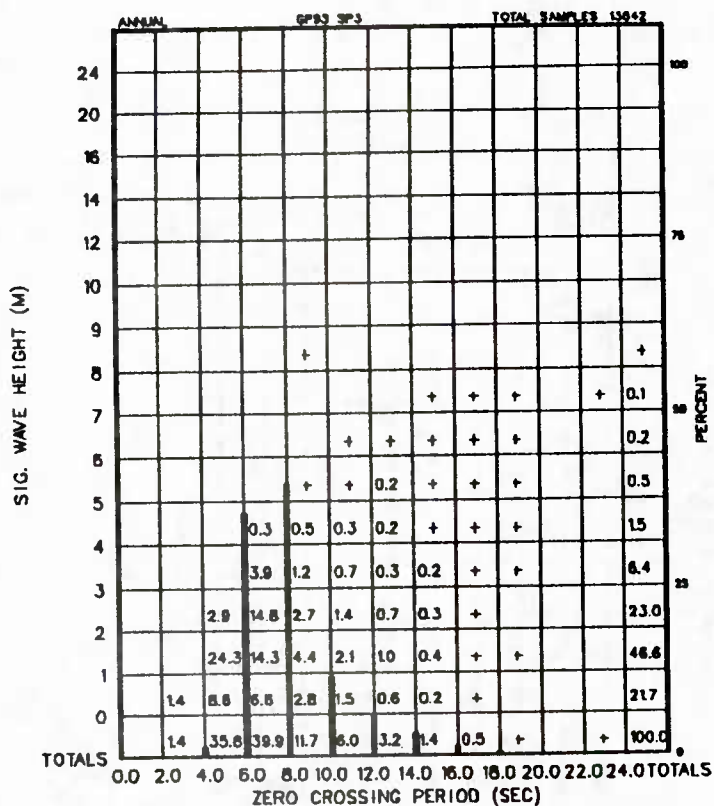


Figure A-3/093-1-6 Significant Wave Height vs. Zero Crossing Period

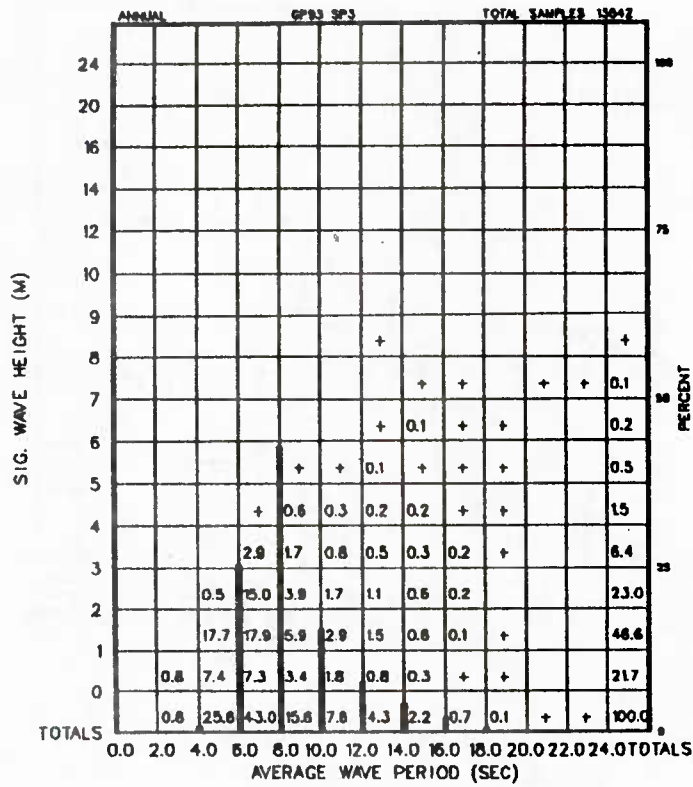


Figure A-3/093-1-7 Significant Wave Height vs. Average Wave Period

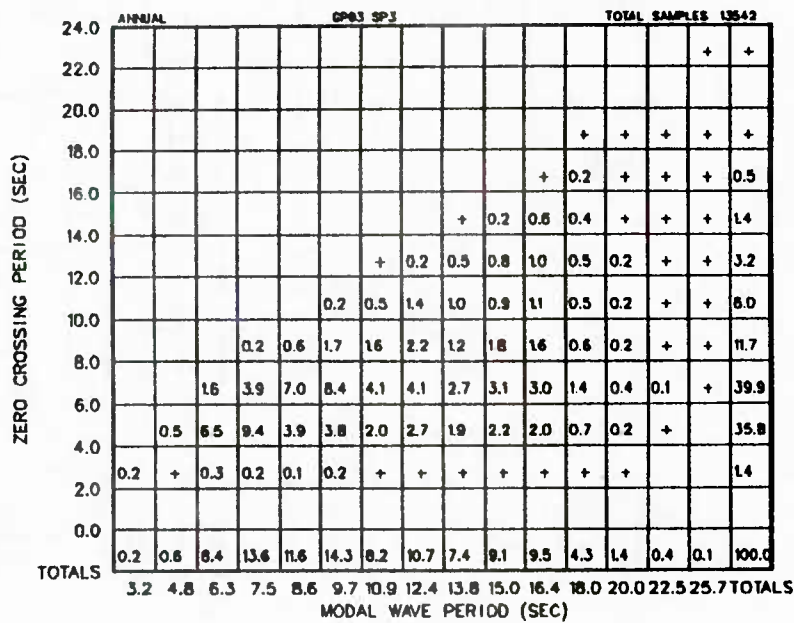


Figure A-3/093-1-8 Zero Crossing Period vs. Modal Wave Period

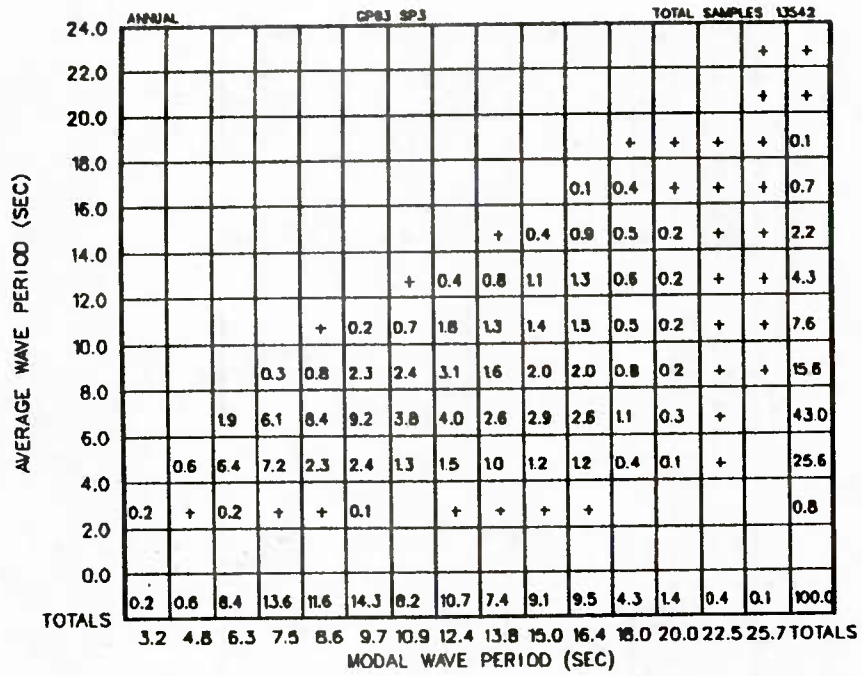


Figure A-3/093-1-9 Average Wave Period vs. Modal Wave Period

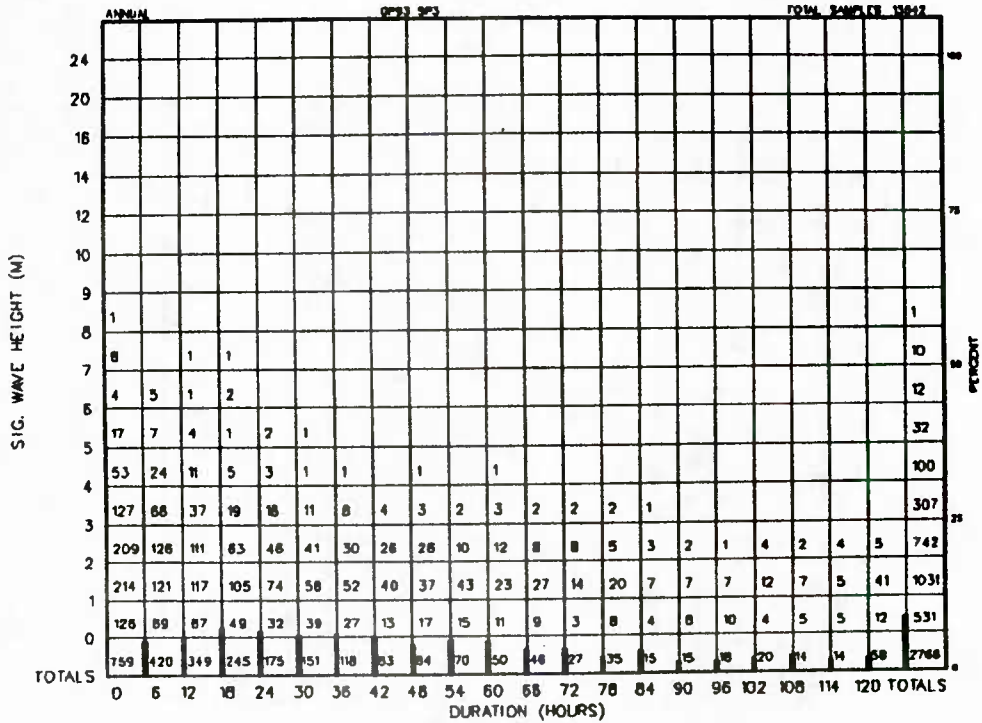


Figure A-3/093-1-10 Persistence of Wave Height

WIND SPEED AT 19.5 M (KNOTS)	DURATION (HOURS)												TOTALS	PERCENT								
	0	6	12	18	24	30	36	42	48	54	60	66			72	78	84	90	96	102	108	114
60																						
55																						
48																						
41																						
34	1																					1
28	17	7			1																	25
22	125	27	17	8	10	4	8	3	2													202
17	358	143	93	47	38	10	12	8	2	3	2	1	1			1						717
11	639	288	197	138	105	53	49	48	26	23	18	10	10	8	3	8		4	4	1	4	1838
7	827	348	197	120	58	43	24	18	11	7	5	3	1									1880
4	534	195	93	48	21	12	4	5		1												911
0	198	68	44	18	10	5	8	1	1	2												355
TOTALS	2897	1078	641	377	243	127	103	81	42	38	25	14	12	8	3	8		4	4	1	4	5507

Figure A-3/093-1-11 Persistence of Wind Speed at 19.5 M (Knots)

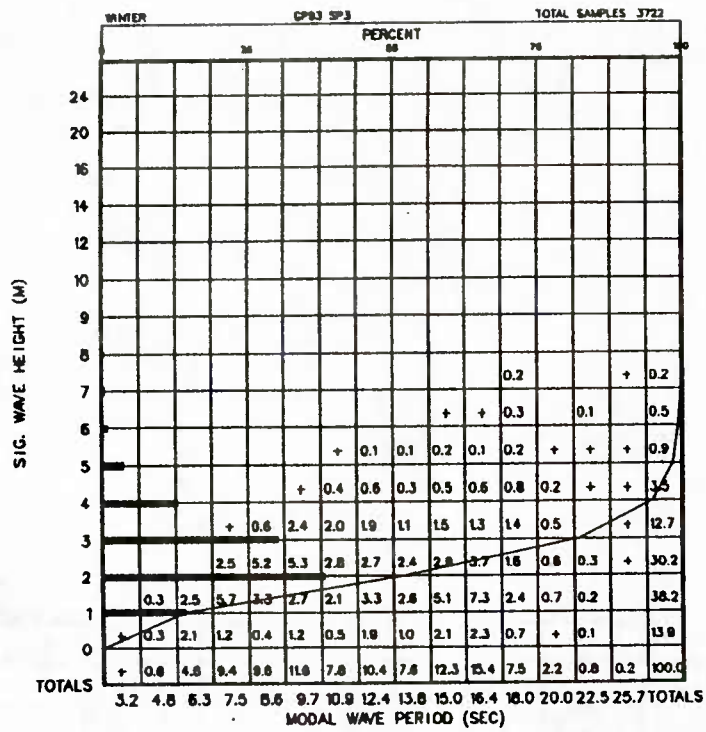


Figure A-3/093-2-1 Significant Wave Height vs. Modal Wave Period

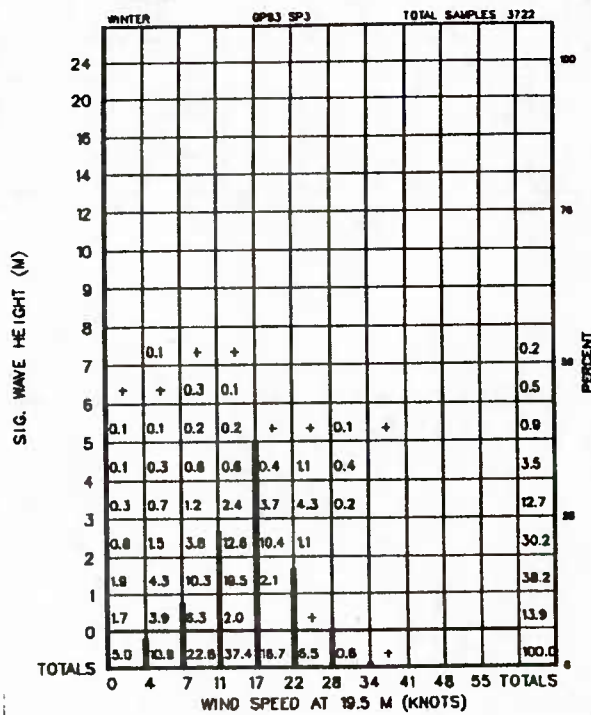


Figure A-3/093-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

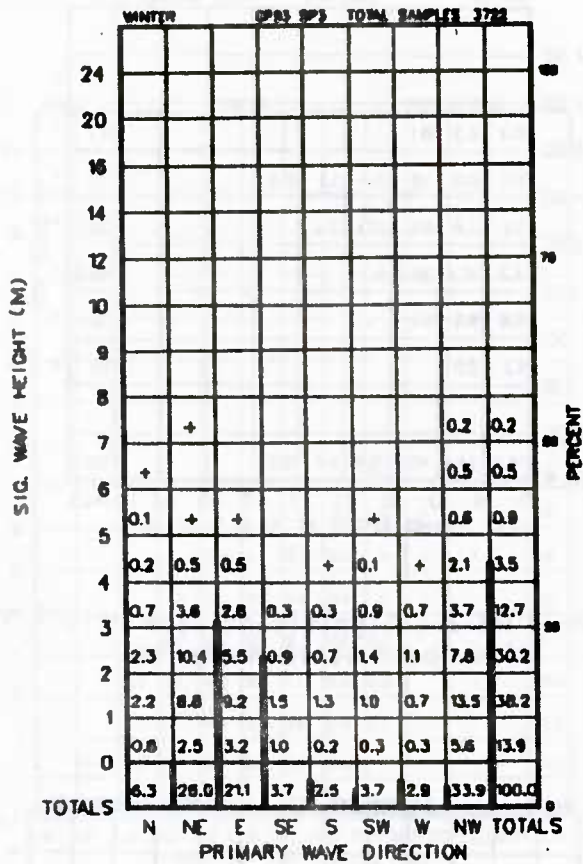


Figure A-3/093-2-3 Significant Wave Height vs. Primary Wave Direction

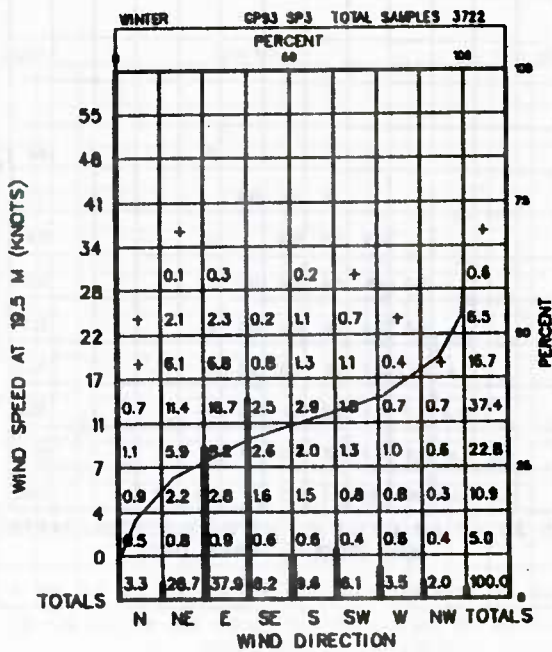


Figure A-3/093-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

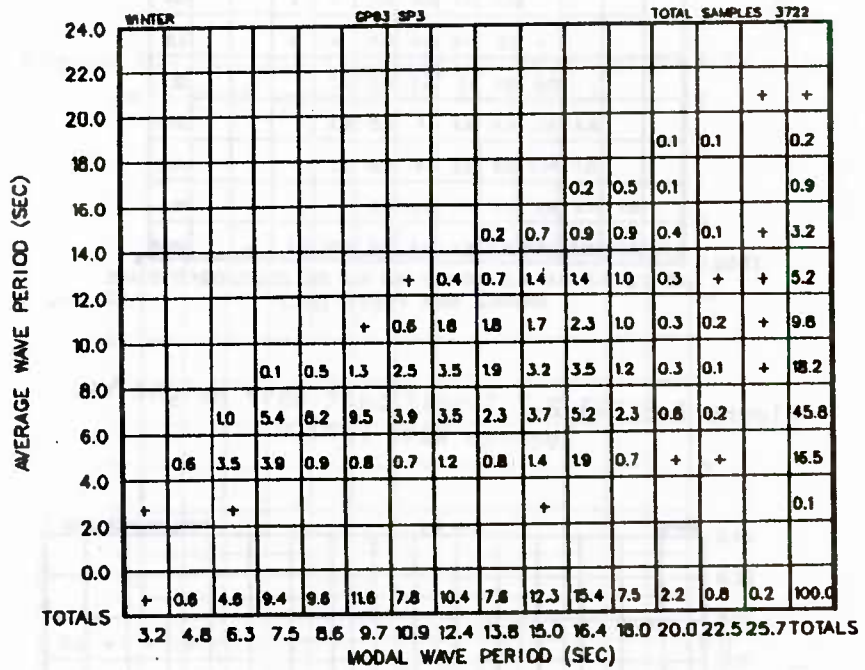


Figure A-3/093-2-9 Average Wave Period vs. Modal Wave Period

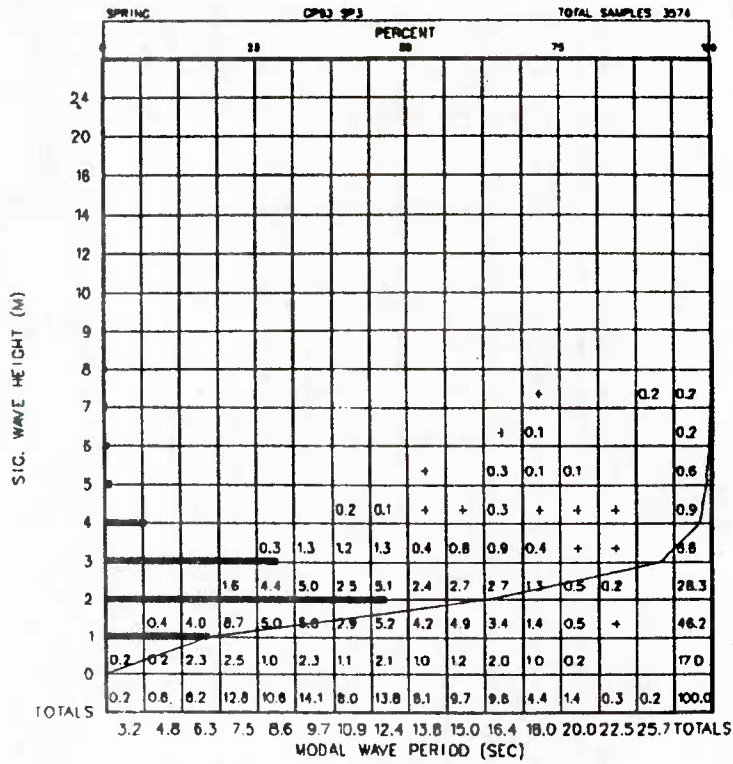


Figure A-3/093-3-1 Significant Wave Height vs. Modal Wave Period

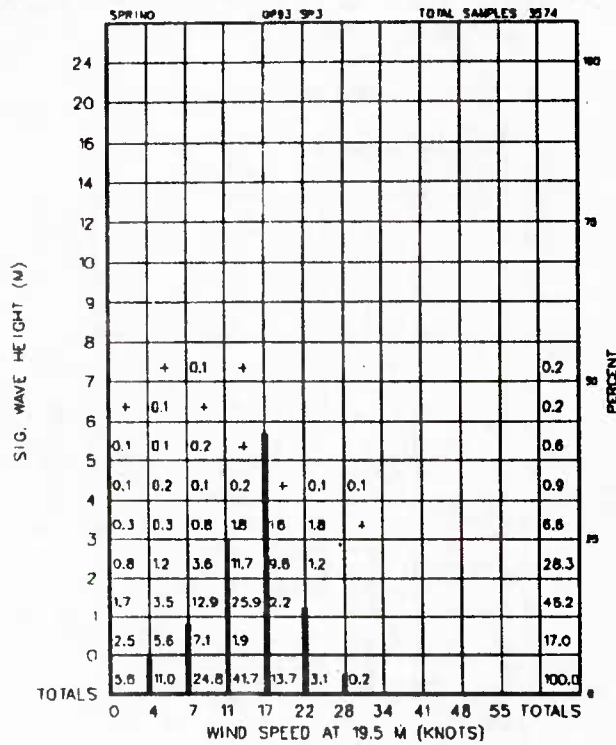


Figure A-3/093-3-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

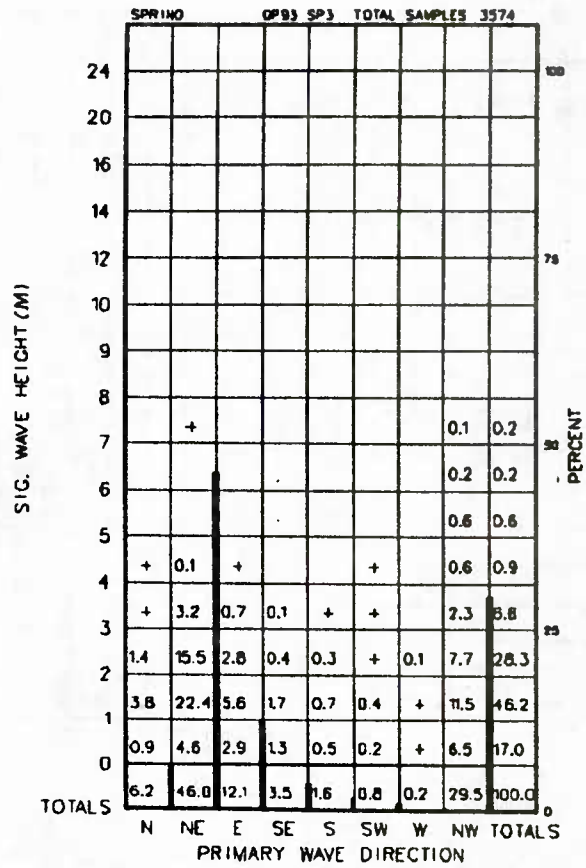


Figure A-3/093-3-3 Significant Wave Height vs. Primary Wave Direction

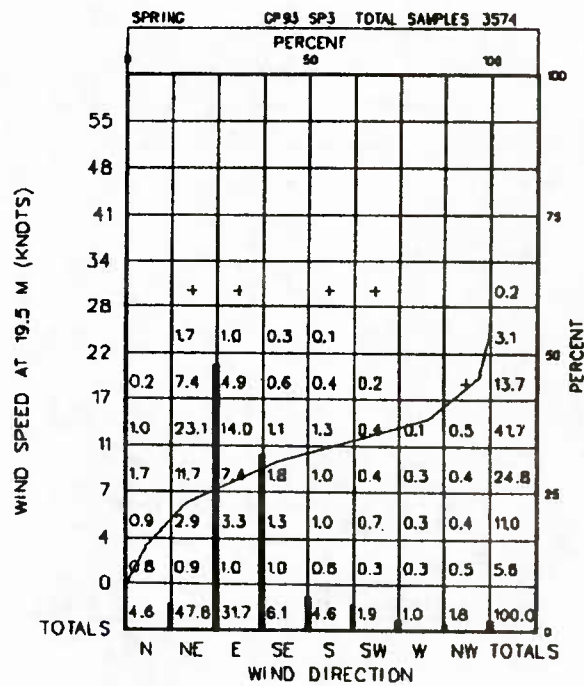


Figure A-3/093-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

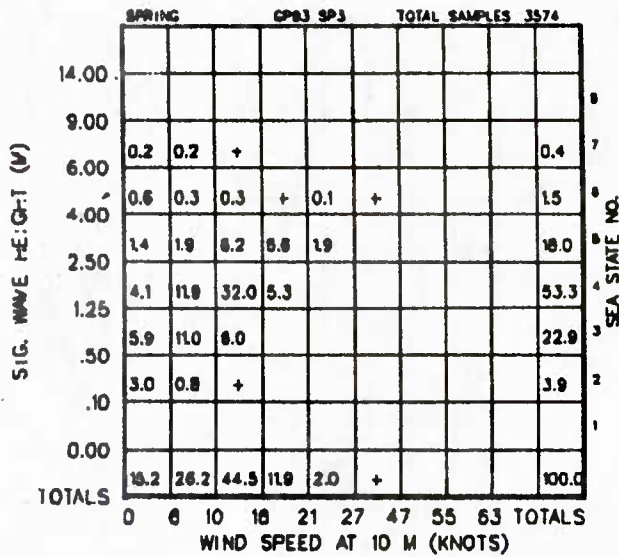


Figure A-3/093-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

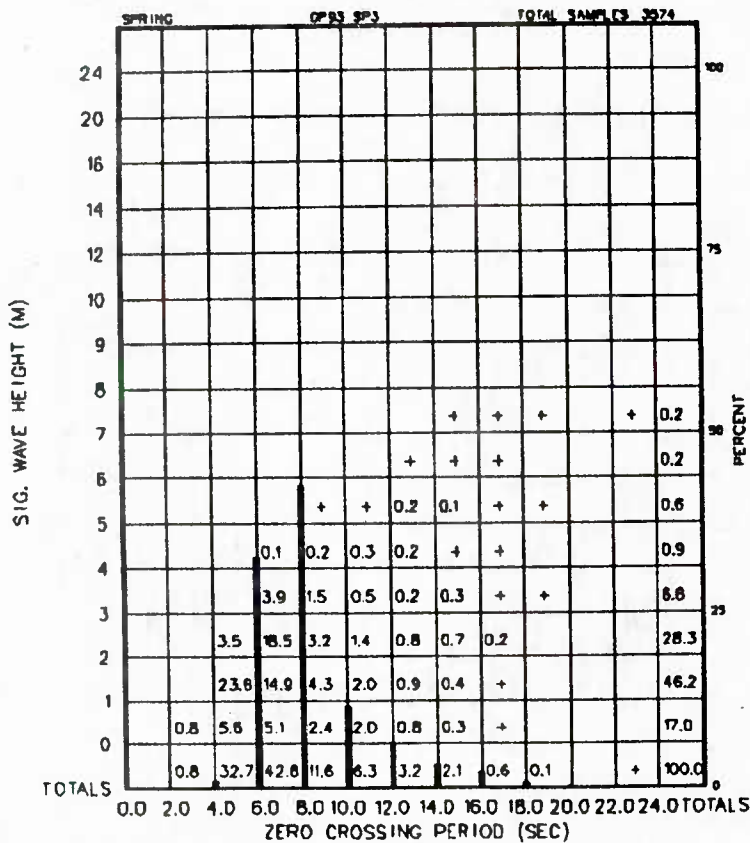


Figure A-3/093-3-6 Significant Wave Height vs. Zero Crossing Period

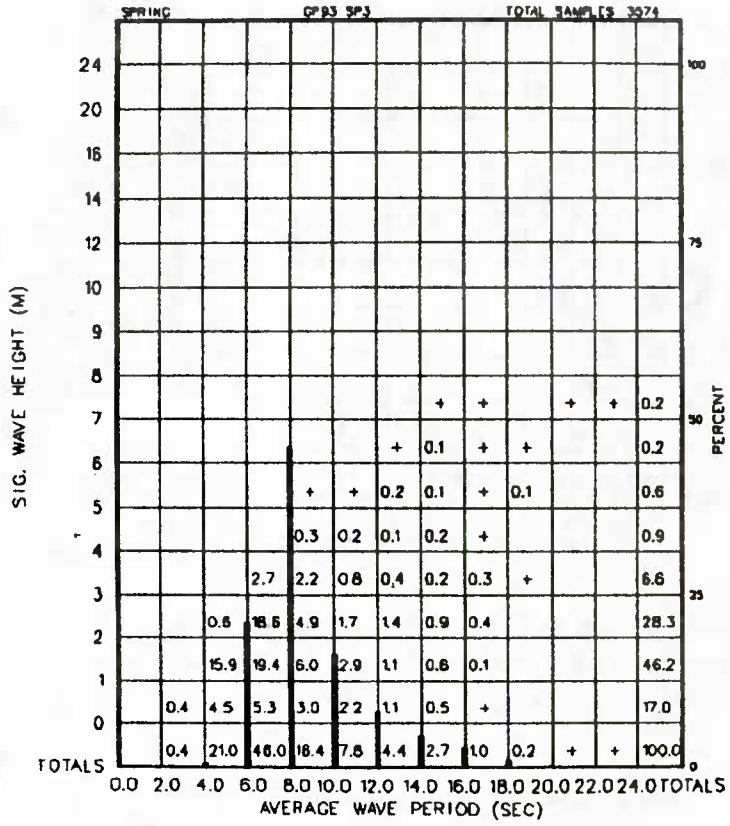


Figure A-3/093-3-7 Significant Wave Height vs. Average Wave Period

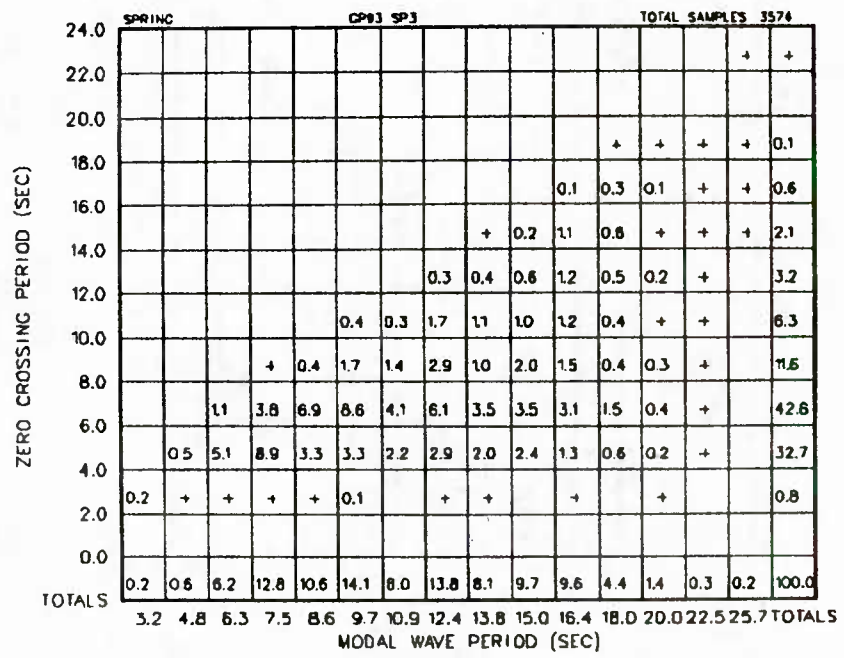


Figure A-3/093-3-8 Zero Crossing Period vs. Modal Wave Period

		SPRING CP93 SP3													TOTAL SAMPLES 3574					
24.0																			+	+
22.0																			+	+
20.0																				
18.0																		+	+	+
16.0																		0.2	0.6	0.1
14.0																		0.2	0.6	0.1
12.0																		0.1	0.3	1.4
10.0																		0.4	0.6	0.9
8.0																		0.4	0.4	1.9
6.0																		+	0.4	0.4
4.0																		0.3	0.5	2.2
2.0																		0.3	0.5	2.2
0.0																		0.3	0.5	2.2
TOTALS	0.2	0.6	6.2	12.8	10.6	14.1	8.0	13.8	8.1	9.7	9.6	4.4	1.4	0.3	0.2			0.3	0.2	100.0
	3.2	4.8	6.3	7.5	8.6	9.7	10.9	12.4	13.8	15.0	16.4	18.0	20.0	22.5	25.7	TOTALS				
	MODAL WAVE PERIOD (SEC)																			

Figure A-3/093-3-9 Average Wave Period vs. Modal Wave Period

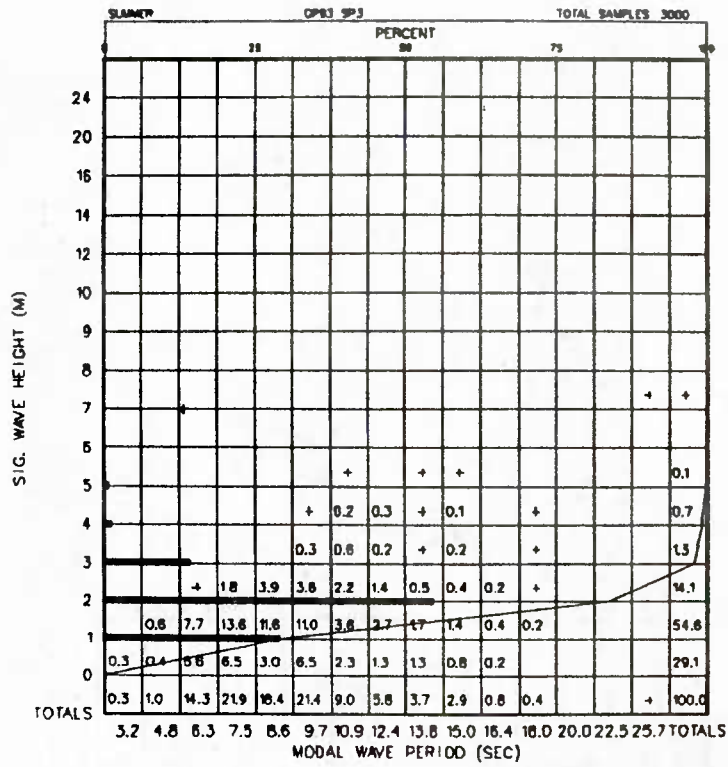


Figure A-3/093-4-1 Significant Wave Height vs. Modal Wave Period

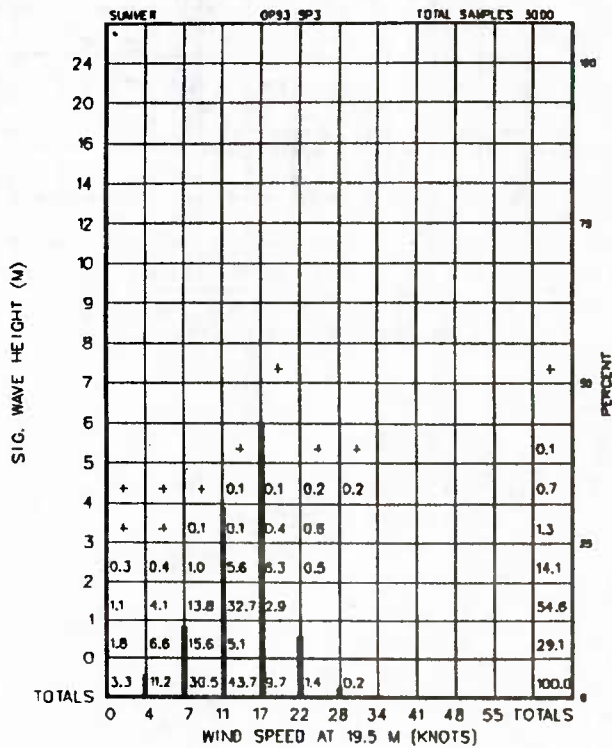


Figure A-3/093-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

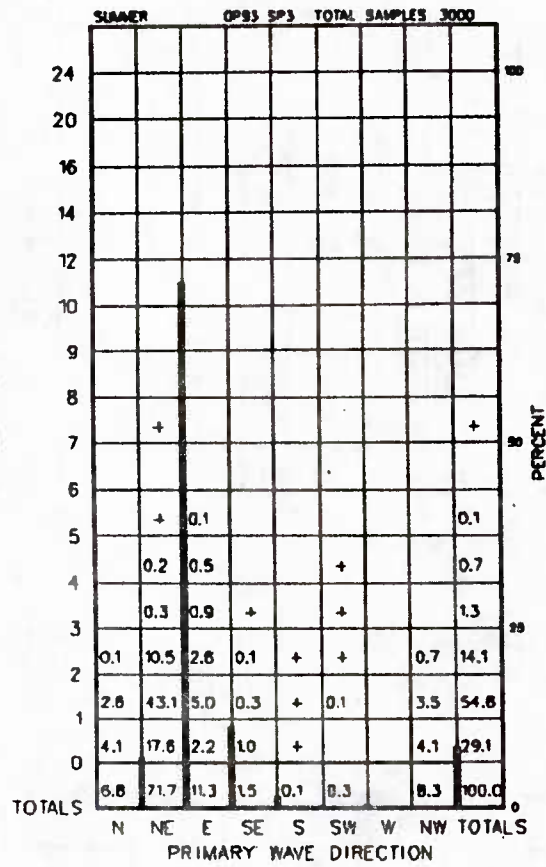


Figure A-3/093-4-3 Significant Wave Height vs. Primary Wave Direction

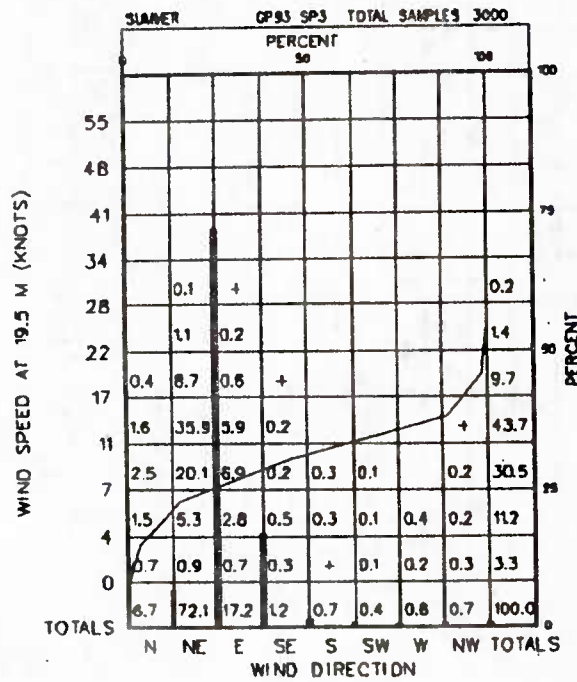


Figure A-3/093-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

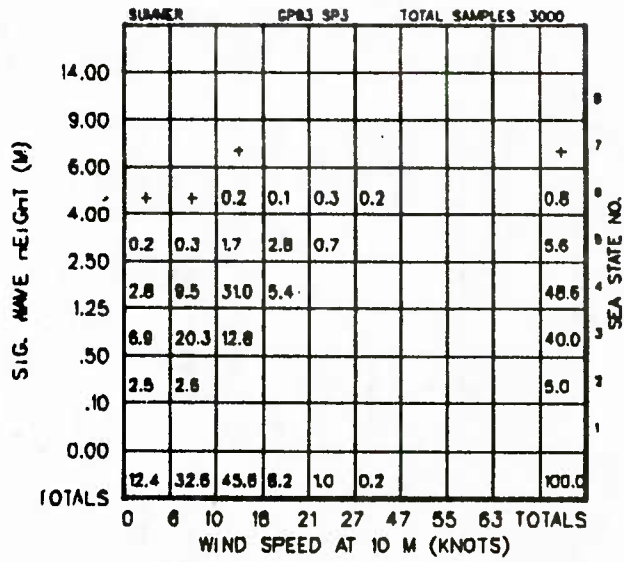


Figure A-3/093-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

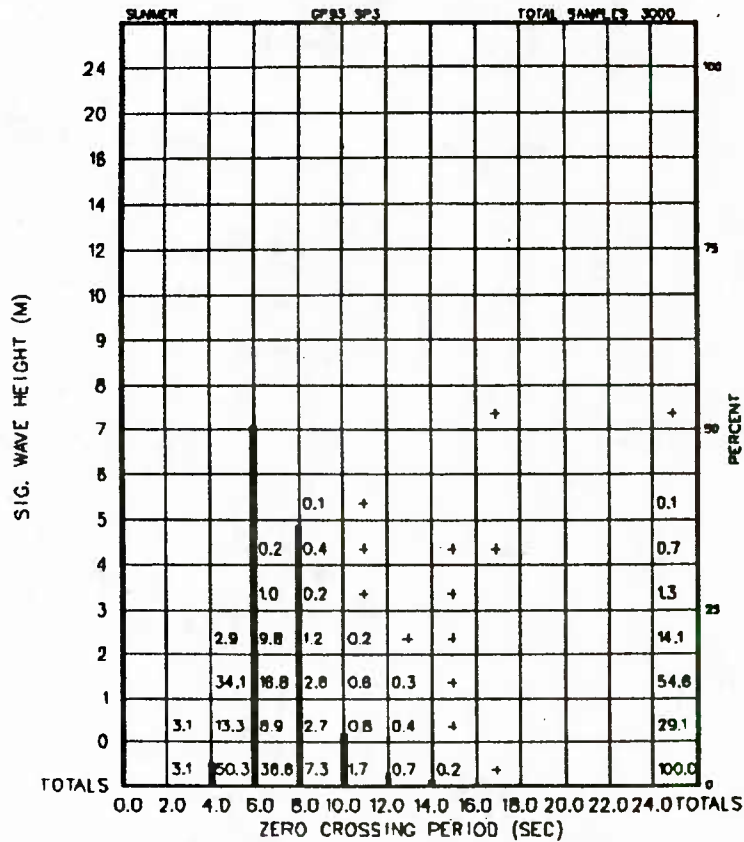


Figure A-3/093-4-6 Significant Wave Height vs. Zero Crossing Period

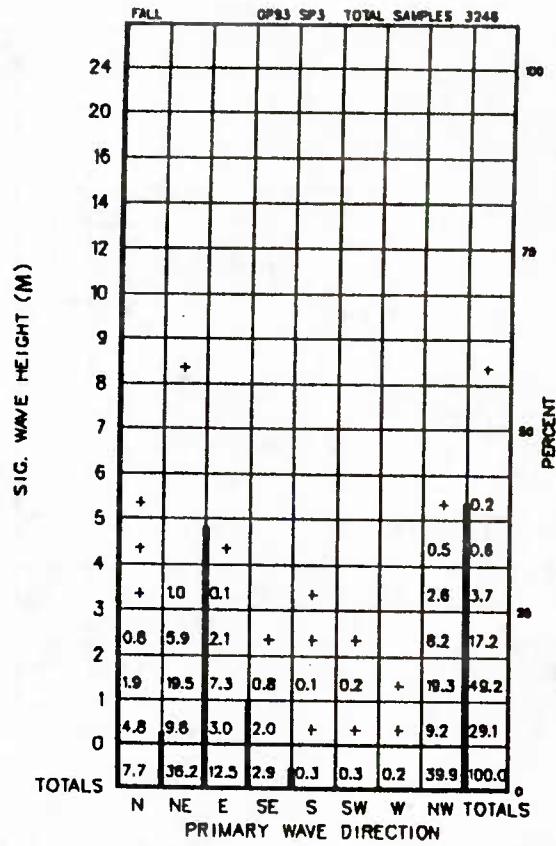


Figure A-3/093-5-3 Significant Wave Height vs. Primary Wave Direction

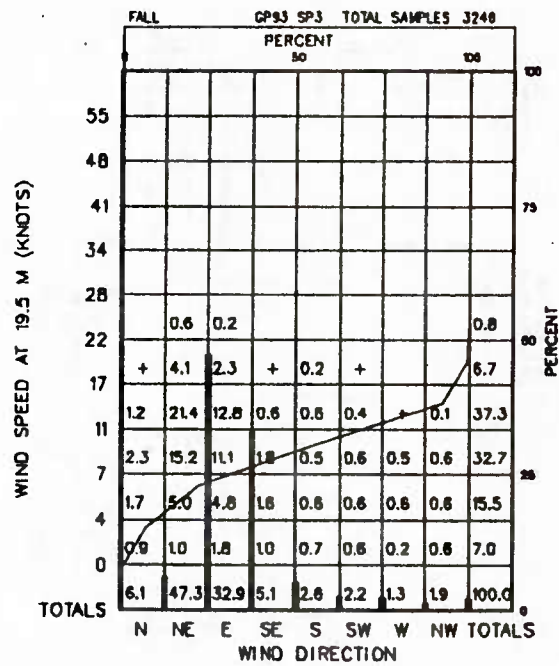


Figure A-3/093-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

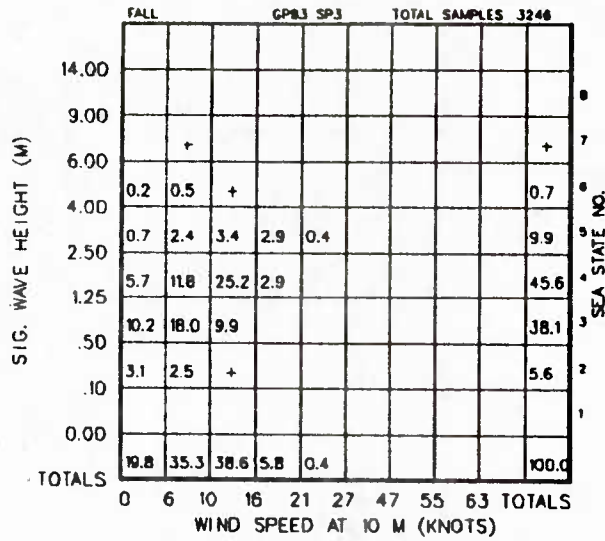


Figure A-3/093-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

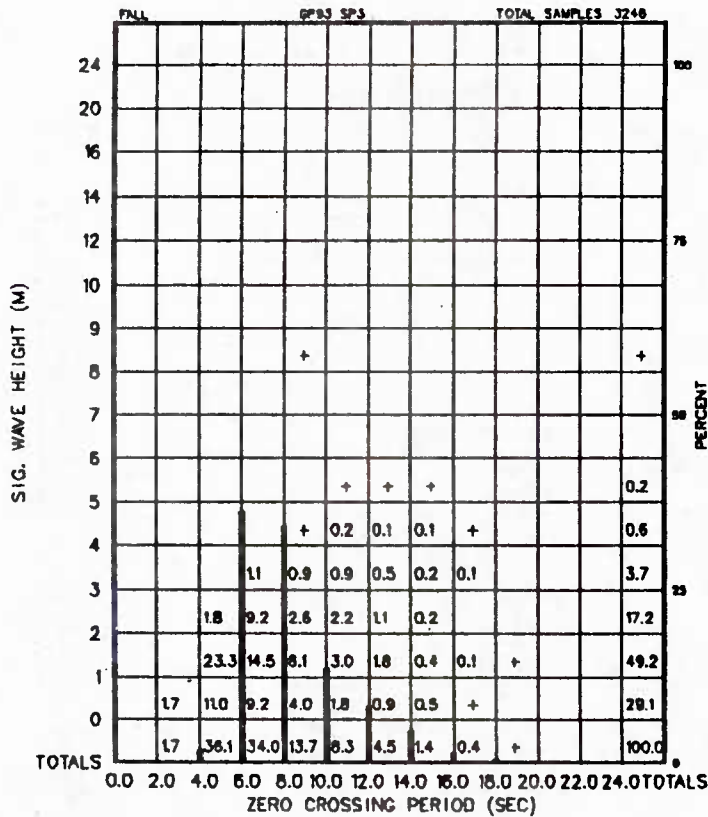


Figure A-3/093-5-6 Significant Wave Height vs. Zero Crossing Period

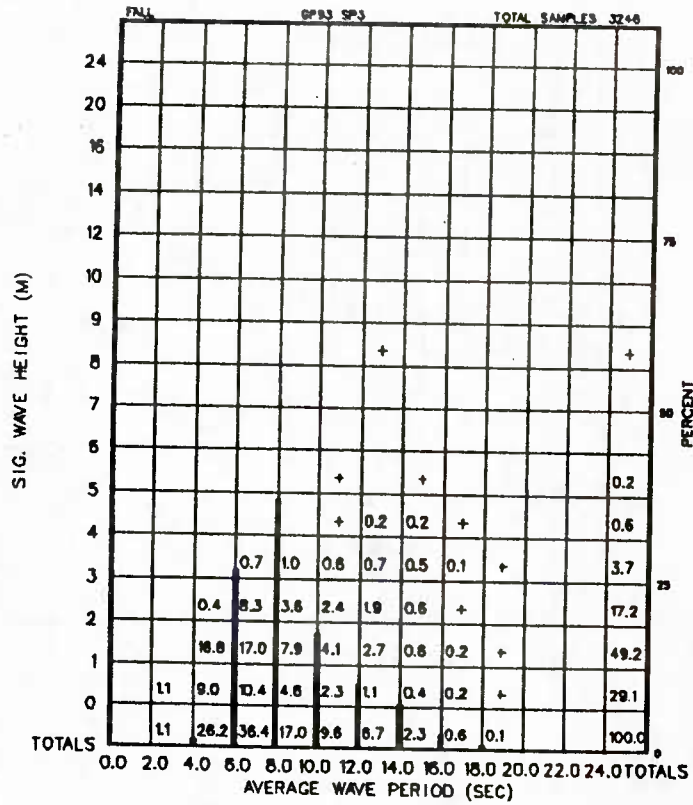


Figure A-3/093-5-7 Significant Wave Height vs. Average Wave Period

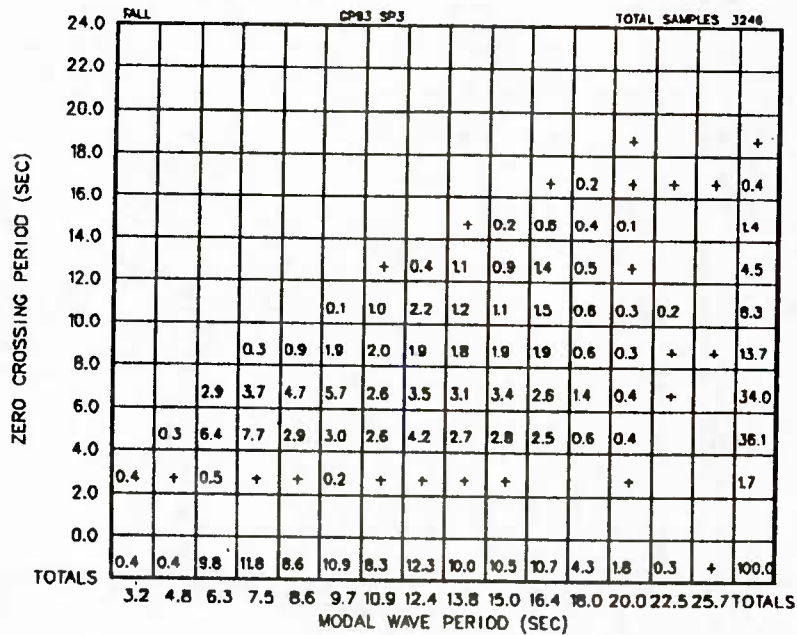


Figure A-3/093-5-8 Zero Crossing Period vs. Modal Wave Period

TABLE A-3/121-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 56.38°N, 171.71°W					
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.25 6.5 -	2.5 11 -	7.5 17.5 -	3 11.5 -	1.5 12.4 SW
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	4.5 0.75 -	15 2 -	37 6.75 -	17 2.5 -	14 2 E-NE
Visibility, nautical miles	0.5	7	22	-	-
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	1 0.5	7.5 7	8 8	- -	- -
Precipitation (Occurrence)	All precipitation - 38% of the time		Snow - 20% of the time (Dec-Mar)		
Relative Humidity, %	70	89	99	-	-
Air Temperature, °C	-3	1.5	5	1.5	-
Sea Surface Temperature, °C	2.5	4	5.5	-	-
Sea Level Pressure, millibars	990	1010	1030	-	-
Ice	Moderate superstructure icing -1% of the time (Dec-Mar)				
Refractivity Mean Surface Refractivity Sub-Refraction (1 km, Annual) Super-Refraction or Ducting (1 km, Annual)	- - -	- - -	- - -	316 - -	- 2% 1%

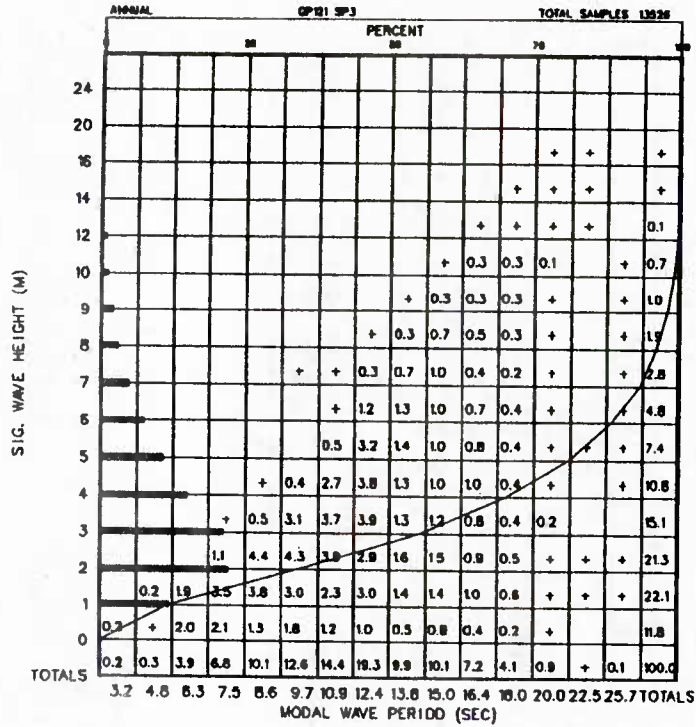


Figure A-3/121-1-1 Significant Wave Height vs. Modal Wave Period

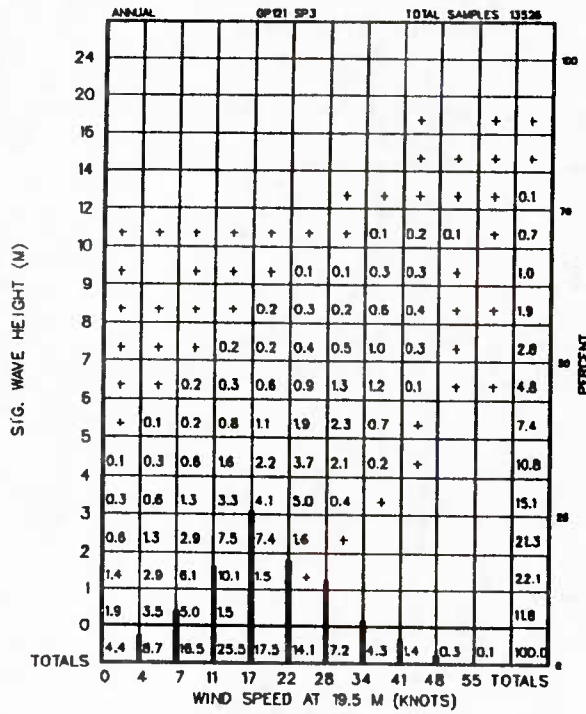


Figure A-3/121-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

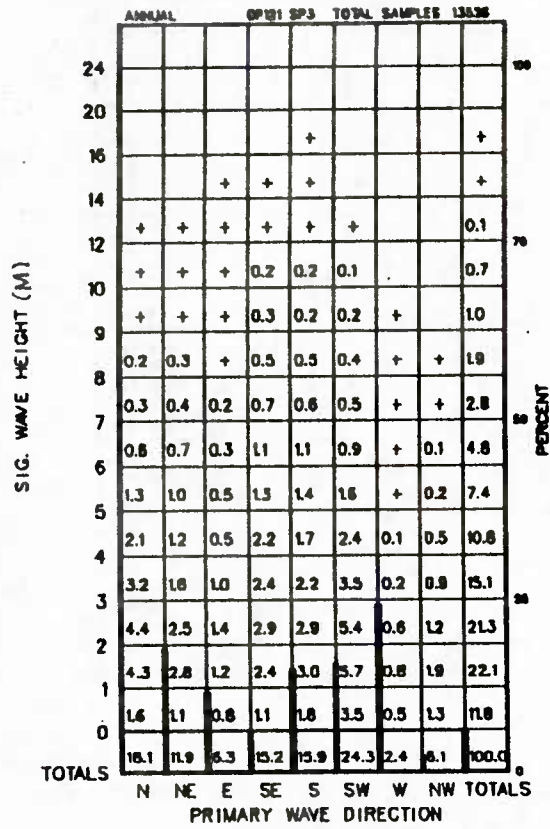


Figure A-3/121-1-3 Significant Wave Height vs. Primary Wave Direction

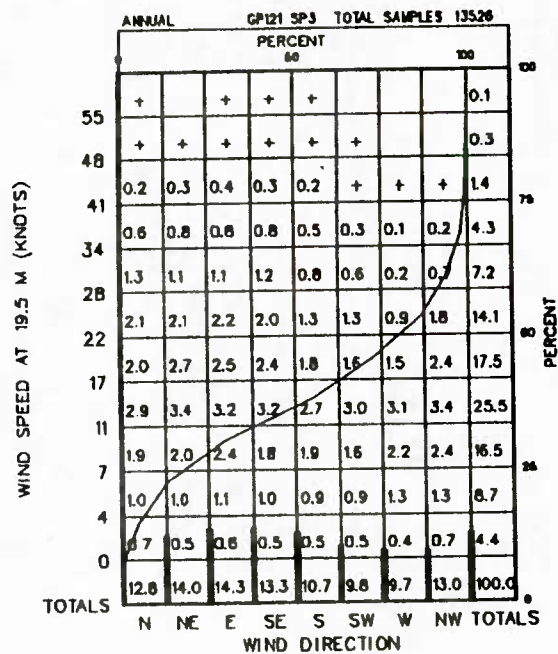


Figure A-3/121-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

		ANNUAL				GP121 SP3				TOTAL SAMPLES 13628						
SIG. WAVE HEIGHT (M)	14.00									+	+	+	+	0.1	SEA STATE NO.	
	9.00	+	+	+	0.1	0.3	1.3	+					+	1.8		
	6.00	0.1	0.3	0.7	1.2	1.9	5.3	+						8.6		
	4.00	0.5	0.9	2.7	3.8	6.4	3.8							18.2		
	2.50	1.4	2.6	8.9	8.9	4.8	0.2							24.9		
	1.25	3.5	6.4	13.9	4.3	0.1								28.3		
	.50	4.1	6.4	3.4	+									13.9		
	.10	1.8	1.2													3.1
	0.00															
	TOTALS		11.7	17.9	27.8	18.4	13.5	10.8	0.1	+	+					100.0
		0	6	10	18	21	27	47	55	63	TOTALS					
		WIND SPEED AT 10 M (KNOTS)														

Figure A-3/121-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

		ANNUAL				GP121 SP3				TOTAL SAMPLES 13628						
SIG. WAVE HEIGHT (M)	24														PERCENT	
	20															
	16								+	+						
	14								+	+						
	12								+	0.1						
	10								+	0.5	0.2	+				
	9									0.9	+	+				
	8									+	1.8	+	+	+		
	7									1.0	1.6	+	+	+		+
	6									3.6	1.1	+	+			
5									+	6.8	0.5	+				
4									2.7	7.2	0.8	0.1	+			
3									10.9	3.3	0.8	0.1				
2									2.4	14.9	3.3	0.6	0.1			
1									10.3	7.7	3.2	0.7	0.2			
0									1.0	4.1	3.8	2.0	0.7			
TOTALS		1.0	16.8	40.0	30.4	10.0	1.5	0.2	+	+	+	+	+			
		0.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0		
		ZERO CROSSING PERIOD (SEC)														

Figure A-3/121-1-6 Significant Wave Height vs. Zero Crossing Period

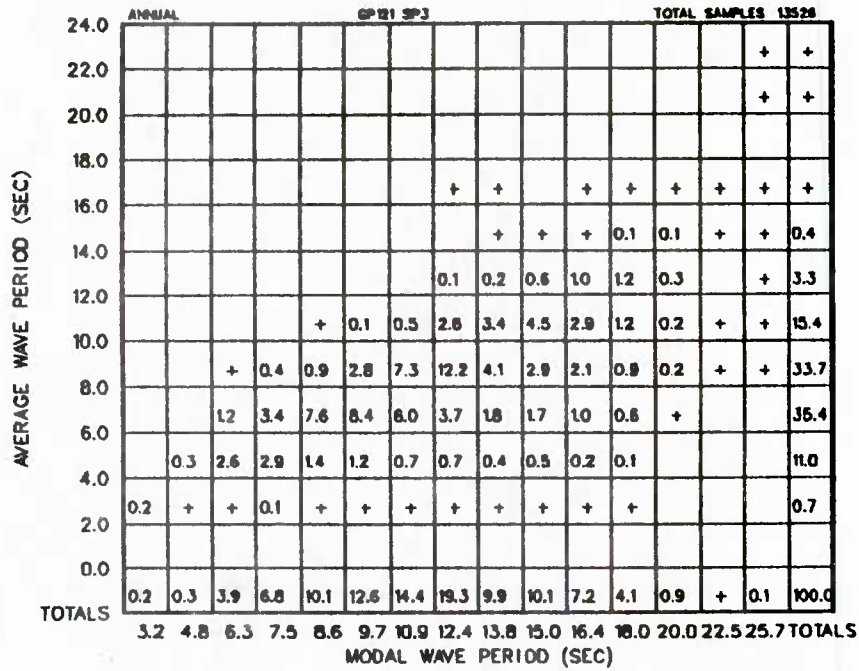


Figure A-3/121-1-9 Average Wave Period vs. Modal Wave Period

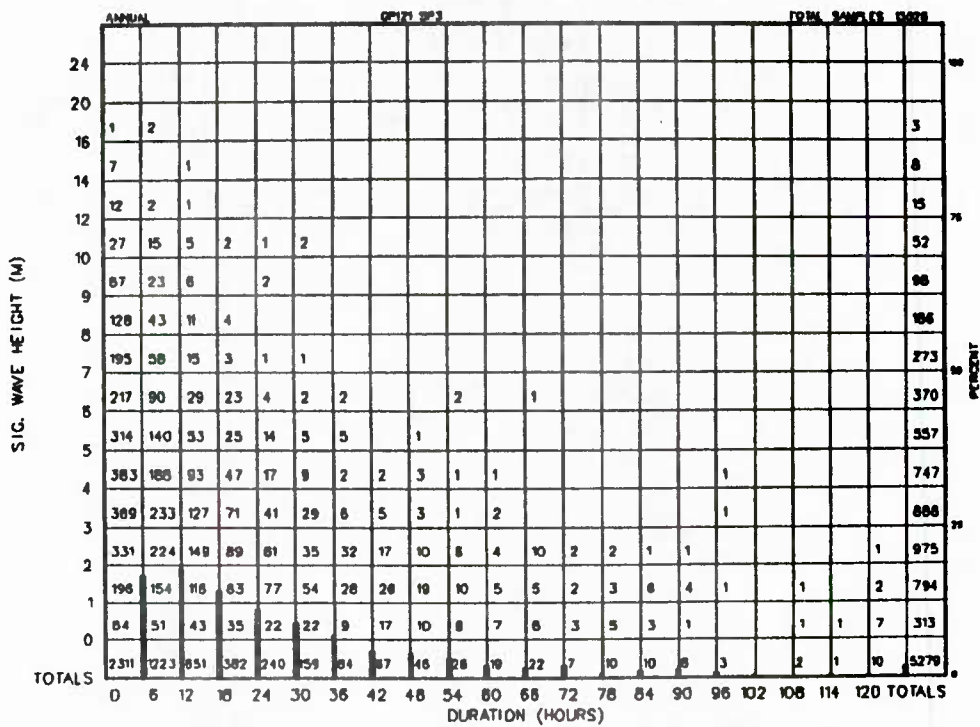


Figure A-3/121-1-10 Persistence of Wave Height

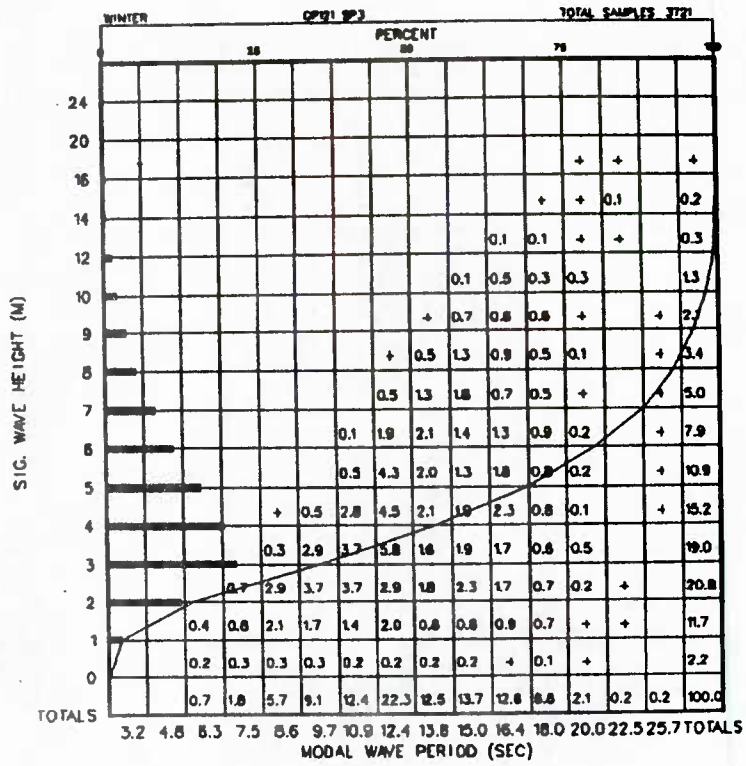


Figure A-3/121-2-1 Significant Wave Height vs. Modal Wave Period

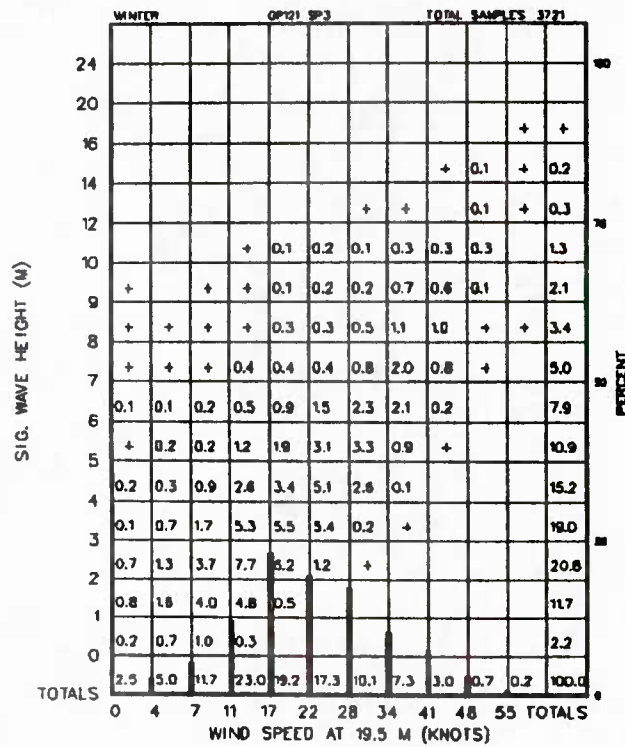


Figure A-3/121-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

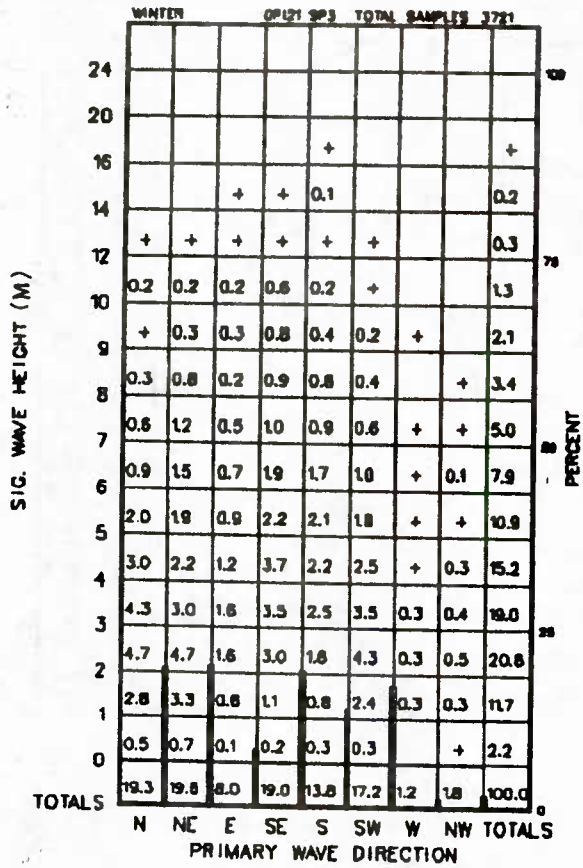


Figure A-3/121-2-3 Significant Wave Height vs. Primary Wave Direction

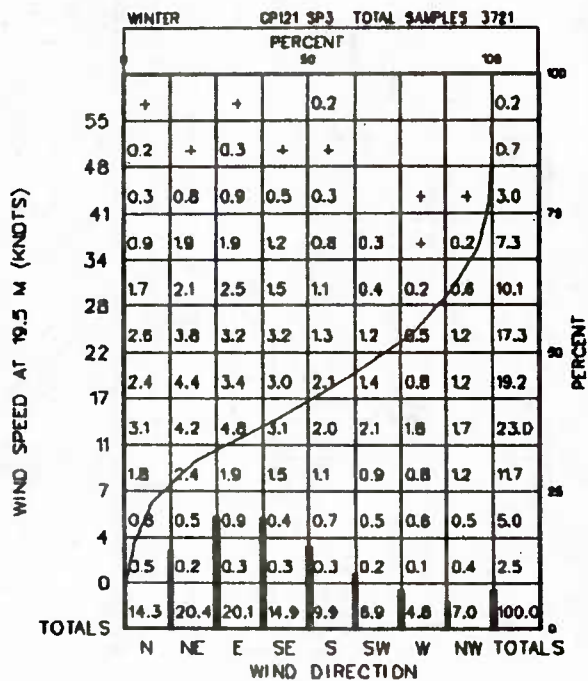


Figure A-3/121-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

		WINTER					CP121 SP3					TOTAL SAMPLES 3721									
		0	6	10	16	21	27	47	55	63	TOTALS	0	6	10	16	21	27	47	55	63	TOTALS
SIG. WAVE HEIGHT (M)	14.00						0.1	+	+	+	0.3										
	9.00	+	+	0.2	0.3	0.4	2.6	0.2			3.7										
	6.00	0.4	0.3	1.0	1.9	2.7	9.9	+			16.3										
	4.00	0.8	1.1	4.4	6.1	9.0	4.7				26.1										
	2.50	1.6	3.3	9.9	9.9	4.6	0.1				29.4										
	1.25	2.7	5.6	8.7	2.8	+					19.8										
	.50	1.2	2.1	0.9	+						4.2										
	.10	+	+								0.1										
	0.00																				
	TOTALS	6.7	12.5	25.1	21.1	16.8	17.4	0.2	+	+	100.0										

Figure A-3/121-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

		WINTER					CP121 SP3					TOTAL SAMPLES 3721						
		0.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	TOTALS			
SIG. WAVE HEIGHT (M)	24																	
	20																	
	18								+	+					+			
	14								0.1	+					0.2			
	12								+	0.3					0.3			
	10								0.8	0.5	+				1.3			
	9								1.9	0.2					2.1			
	8								+	3.2					3.4			
	7								1.9	2.9	0.2	+		+	5.0			
	6								5.8	2.0	0.2	+			7.9			
5								10.0	0.7	0.1				10.9				
4								2.8	10.8	1.4	0.2	+		15.2				
3								12.9	4.8	1.2	0.2			19.0				
2								12	14.8	3.8	0.5	0.4	+	20.8				
1								3.7	5.1	2.3	0.4	+	+	11.7				
0								+	10	0.7	0.4	+		2.2				
TOTALS								+	6.0	36.3	39.8	15.0	2.4	0.3	+	+	+	100.0

Figure A-3/121-2-6 Significant Wave Height vs. Zero Crossing Period

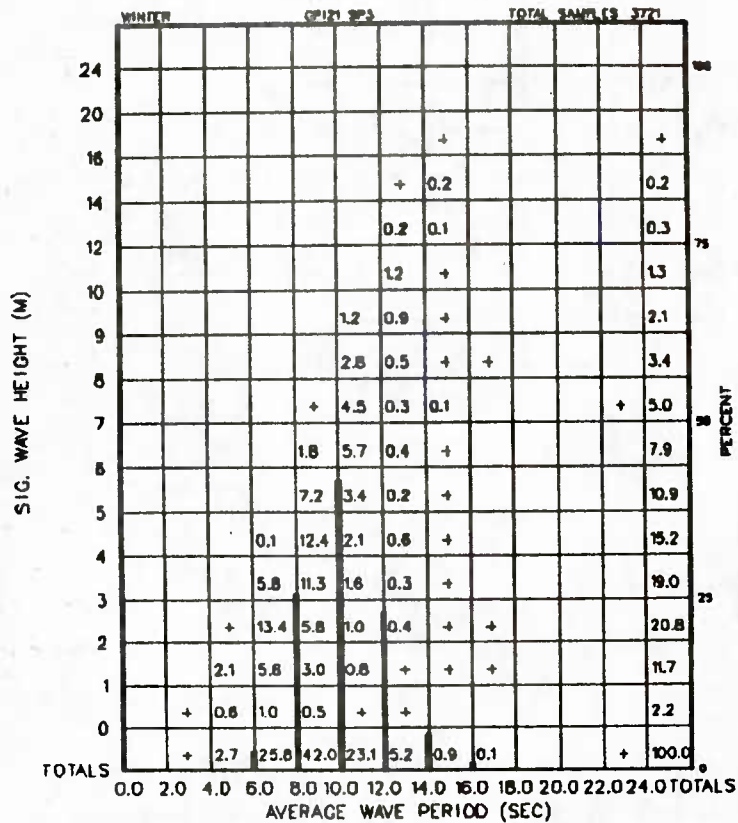


Figure A-3/121-2-7 Significant Wave Height vs. Average Wave Period

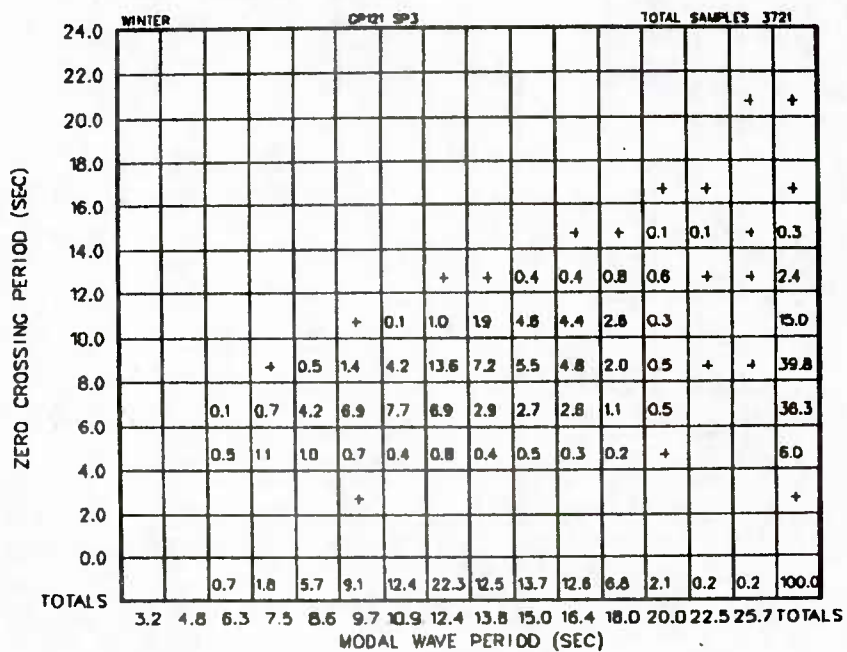


Figure A-3/121-2-8 Zero Crossing Period vs. Modal Wave Period

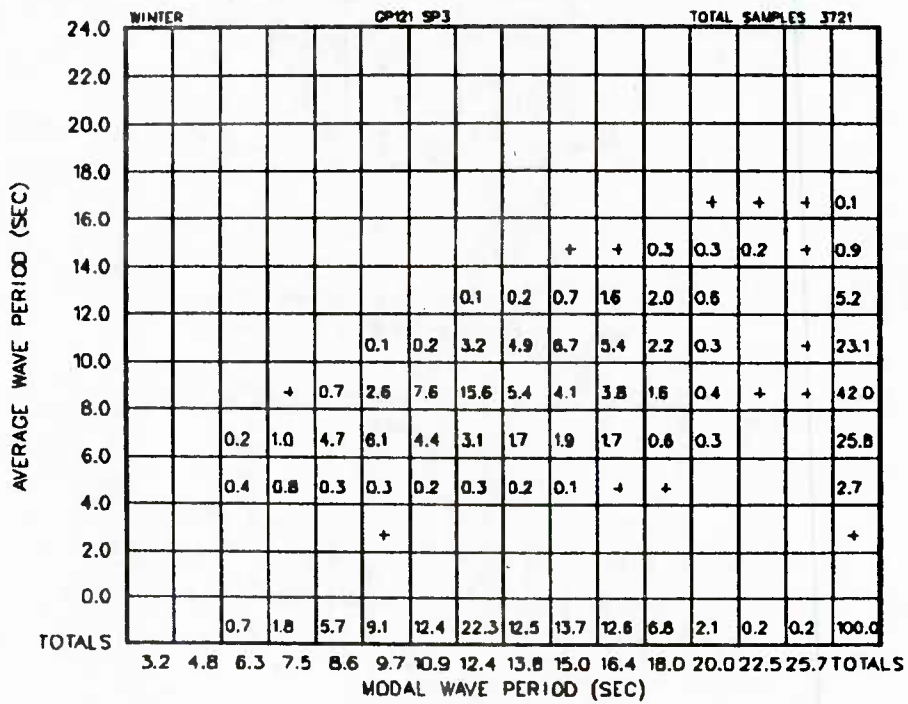


Figure A-3/121-2-9 Average Wave Period vs. Modal Wave Period

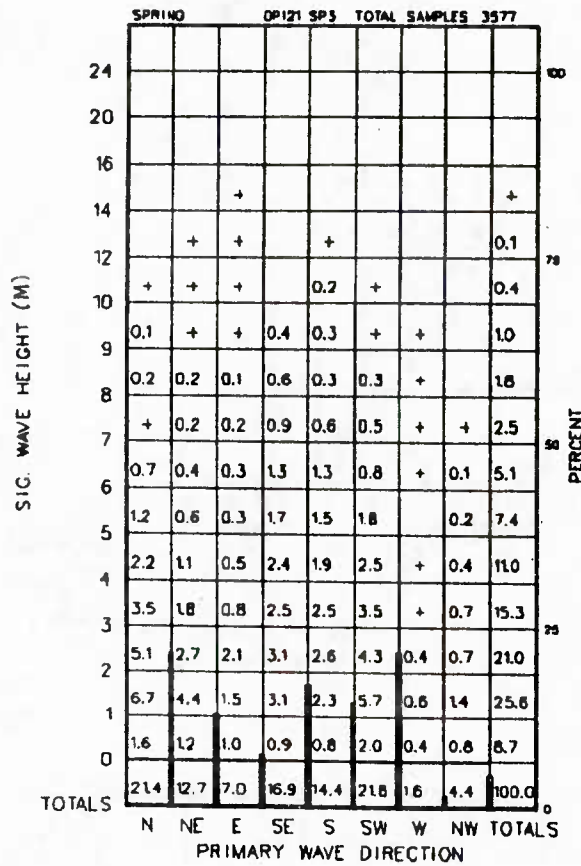


Figure A-3/121-3-3 Significant Wave Height vs. Primary Wave Direction

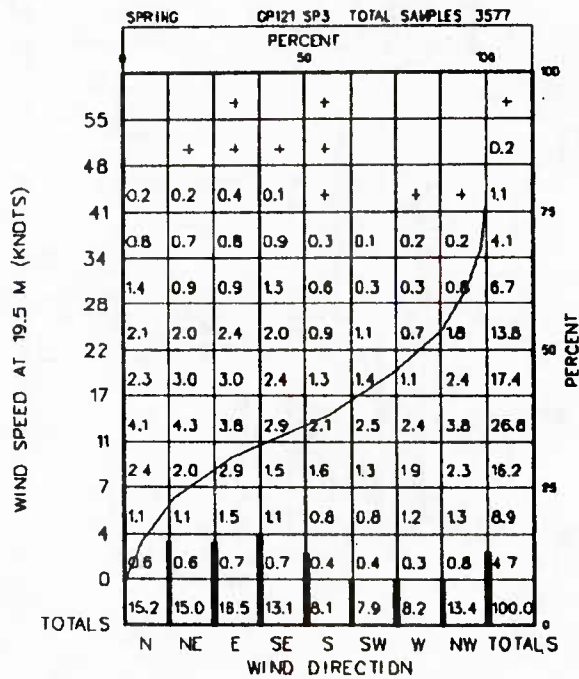


Figure A-3/121-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

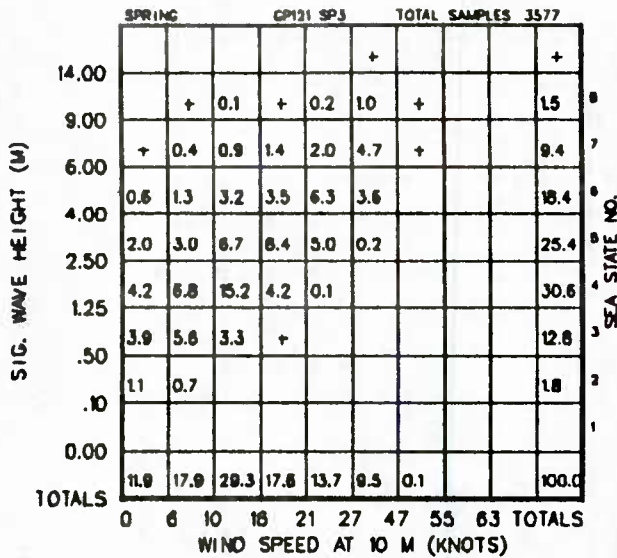


Figure A-3/121-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

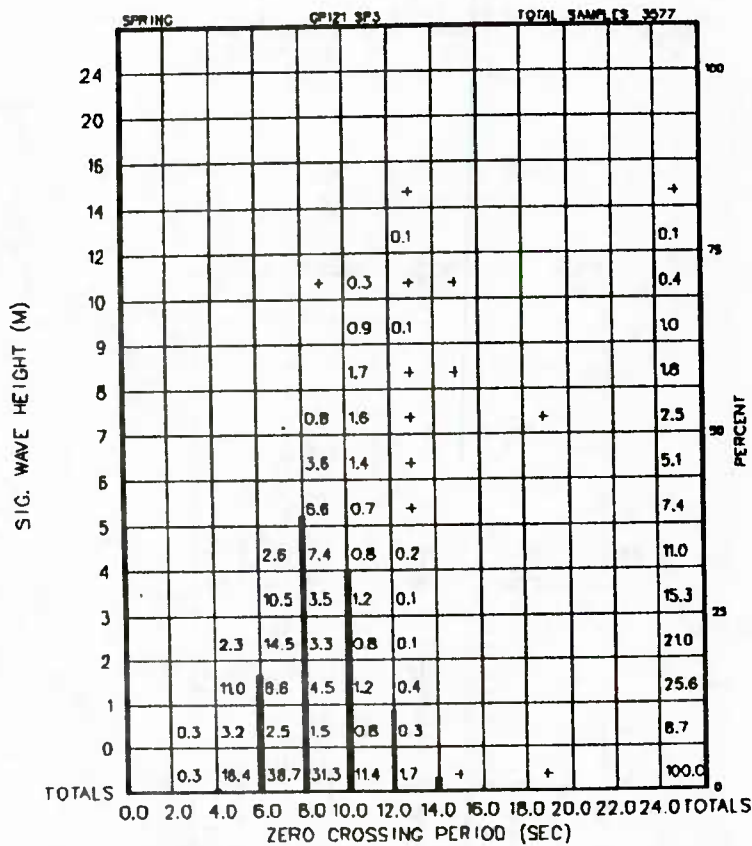


Figure A-3/121-3-6 Significant Wave Height vs. Zero Crossing Period

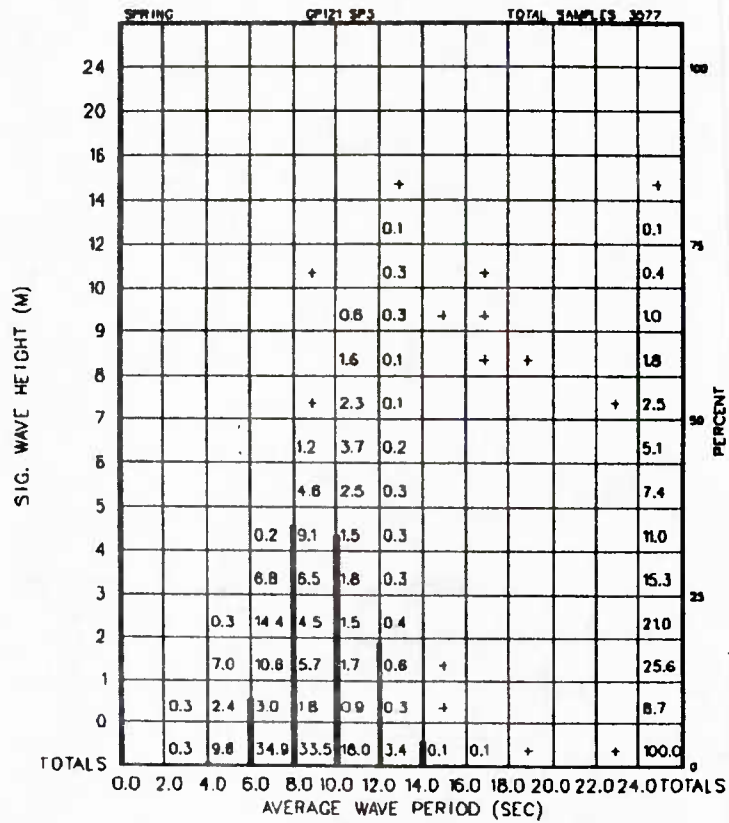


Figure A-3/121-3-7 Significant Wave Height vs. Average Wave Period

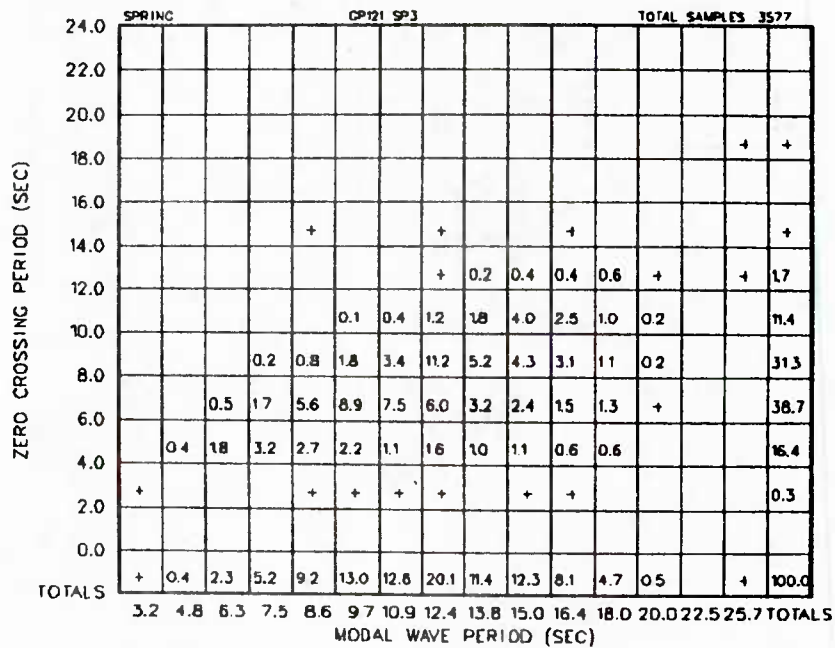


Figure A-3/121-3-8 Zero Crossing Period vs. Modal Wave Period

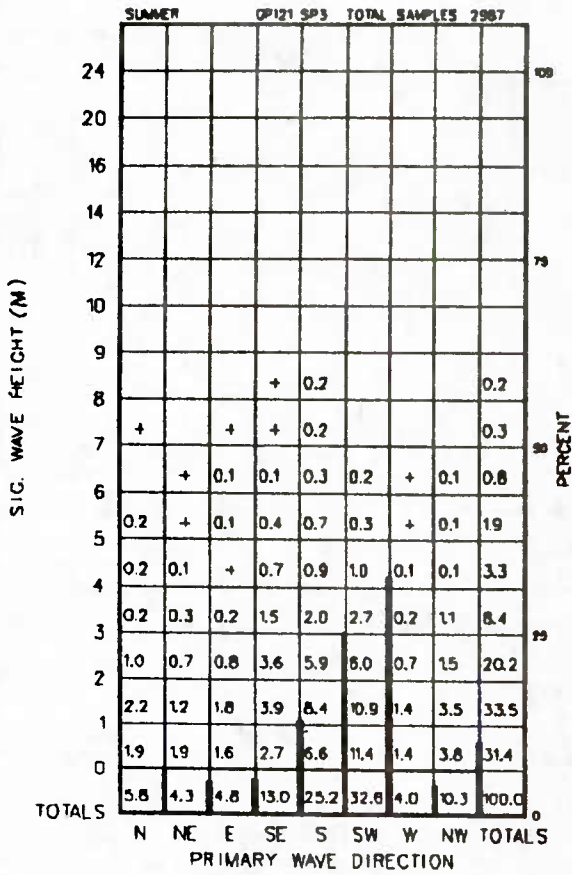


Figure A-3/121-4-3 Significant Wave Height vs. Primary Wave Direction

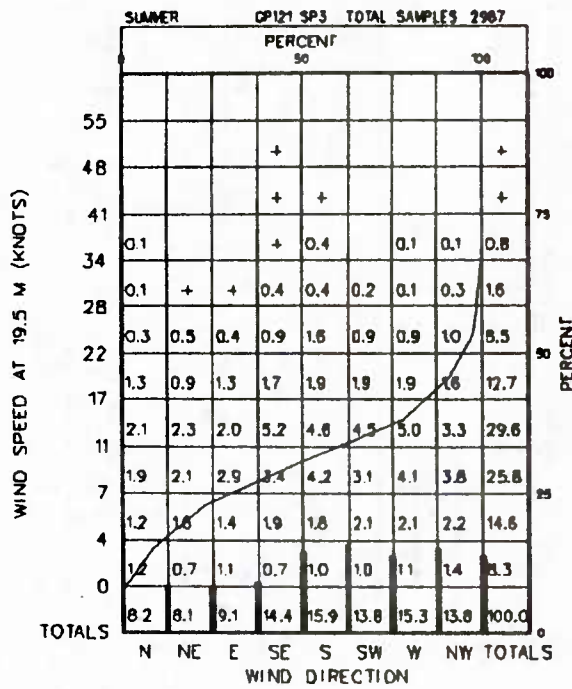


Figure A-3/121-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

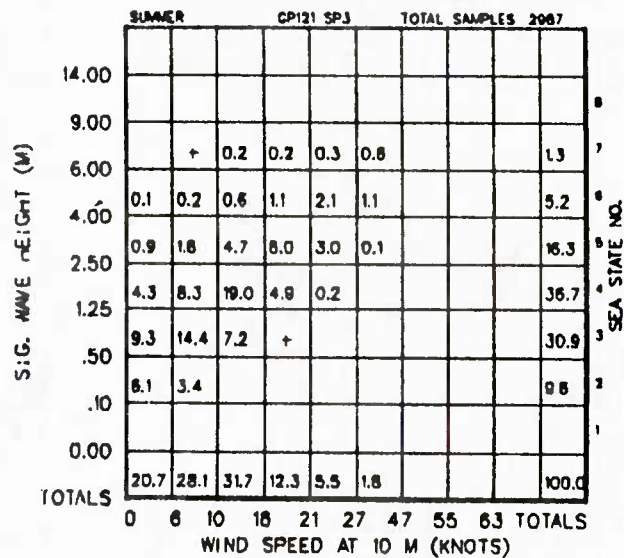


Figure A-3/121-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

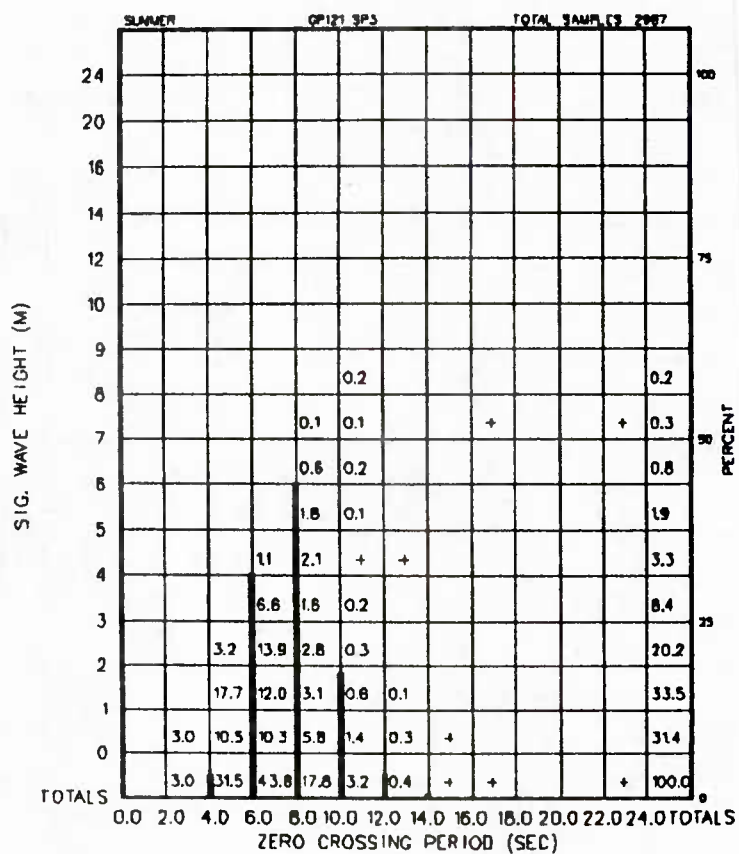


Figure A-3/121-4-6 Significant Wave Height vs. Zero Crossing Period

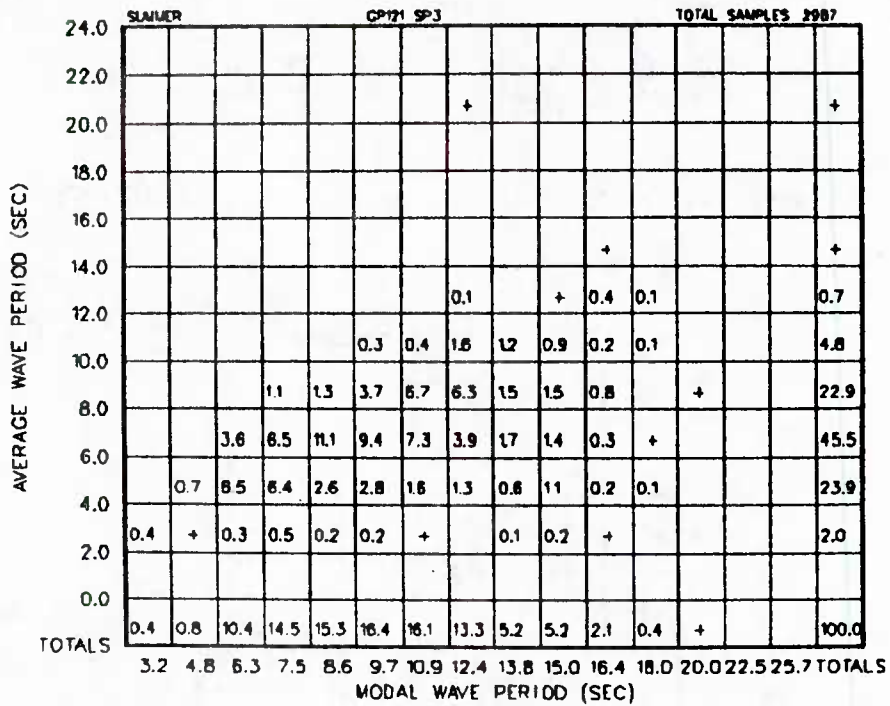


Figure A-3/121-4-9 Average Wave Period vs. Modal Wave Period

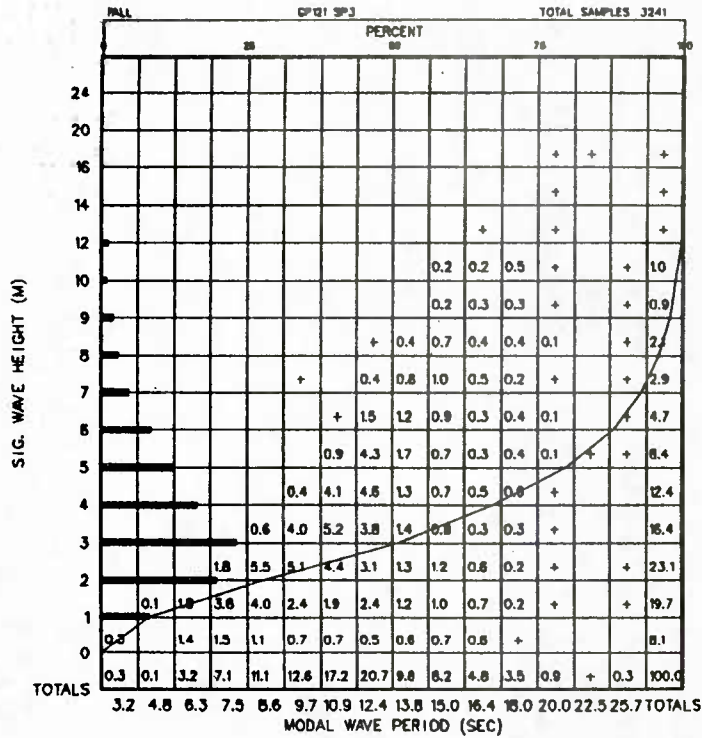


Figure A-3/121-5-1 Significant Wave Height vs. Modal Wave Period

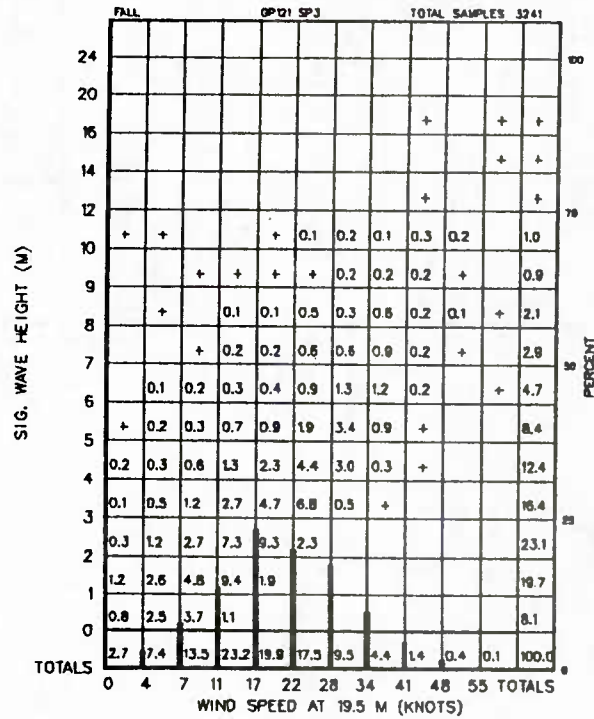


Figure A-3/121-5-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

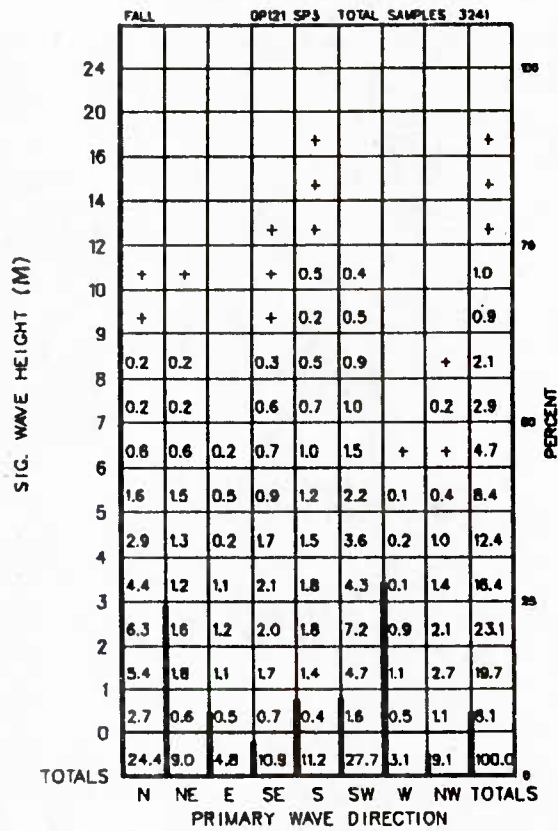


Figure A-3/121-5-3 Significant Wave Height vs. Primary Wave Direction

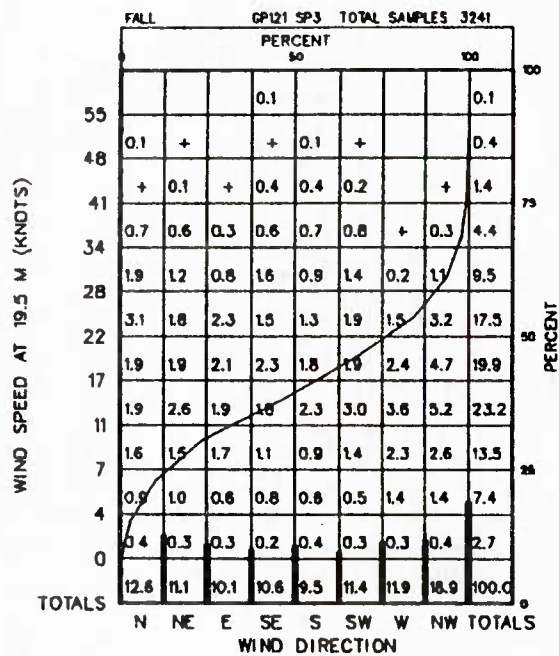


Figure A-3/121-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

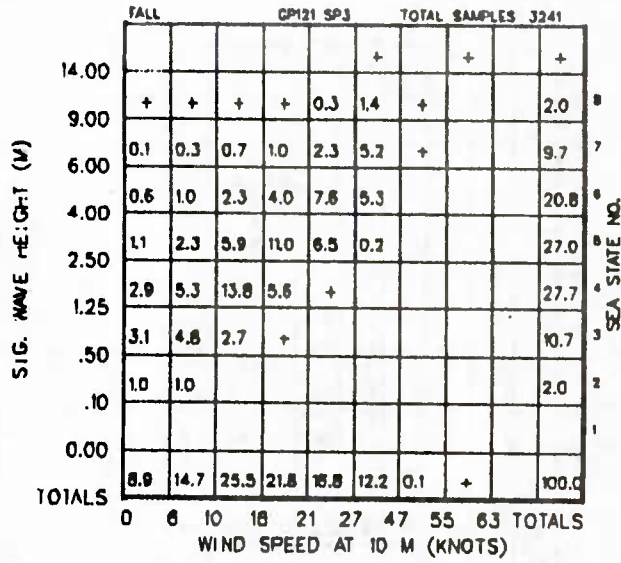


Figure A-3/121-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

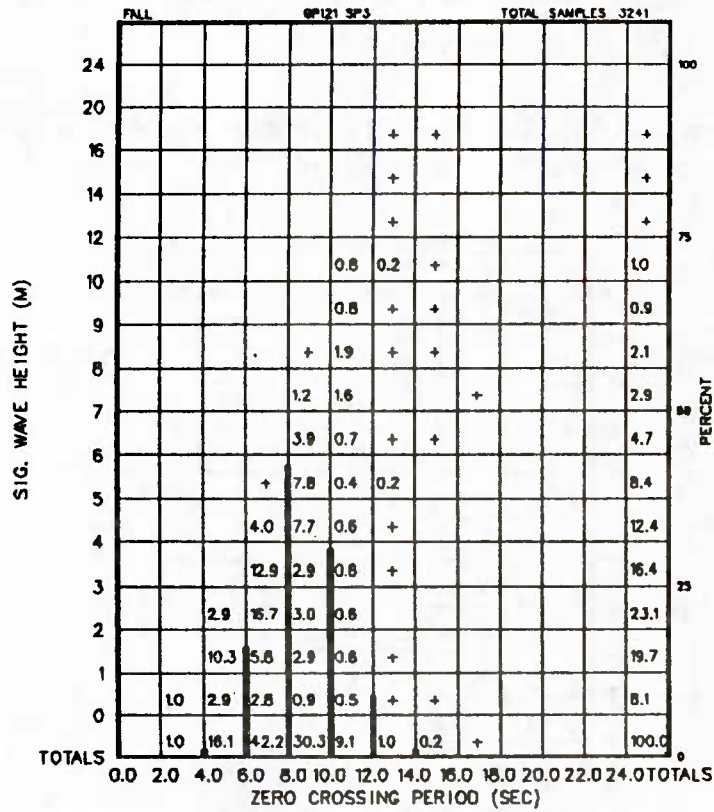


Figure A-3/121-5-6 Significant Wave Height vs. Zero Crossing Period

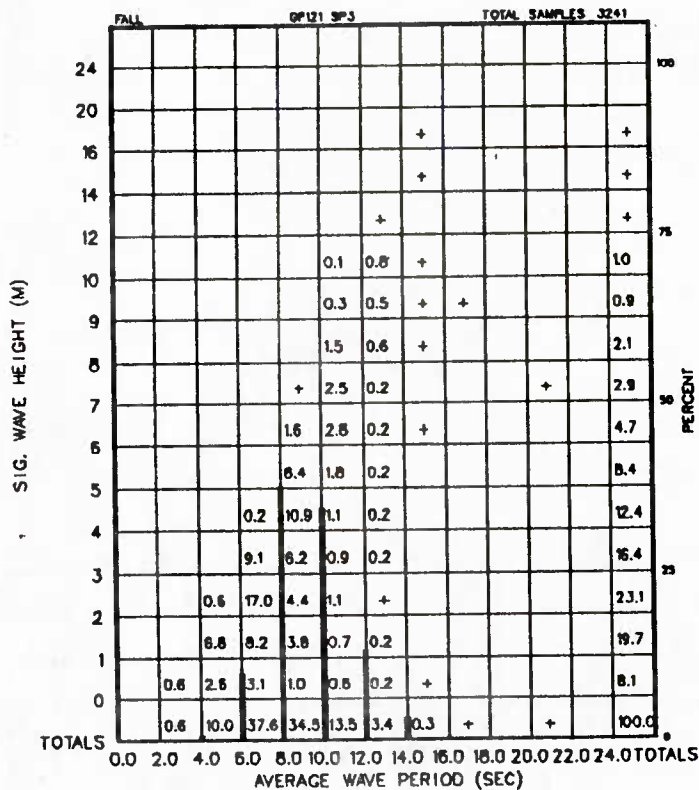


Figure A-3/121-5-7 Significant Wave Height vs. Average Wave Period

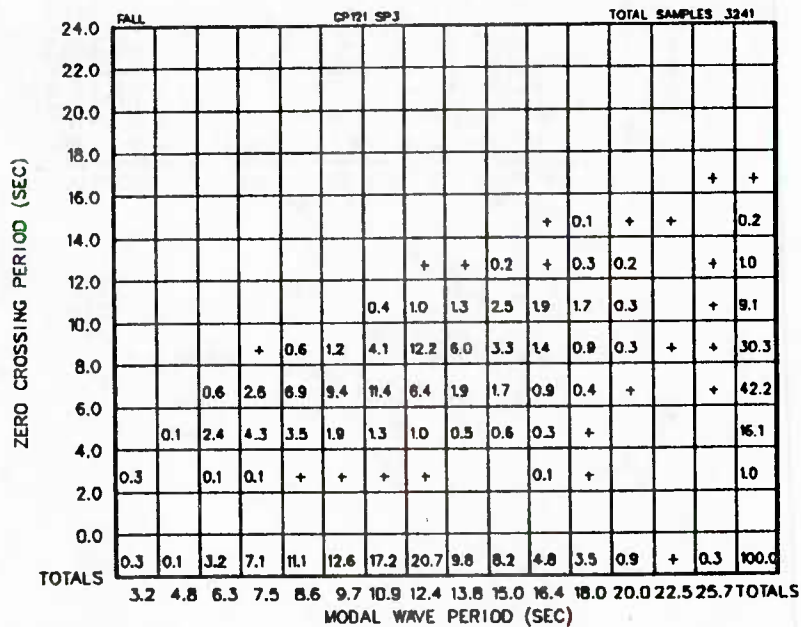


Figure A-3/121-5-8 Zero Crossing Period vs. Modal Wave Period

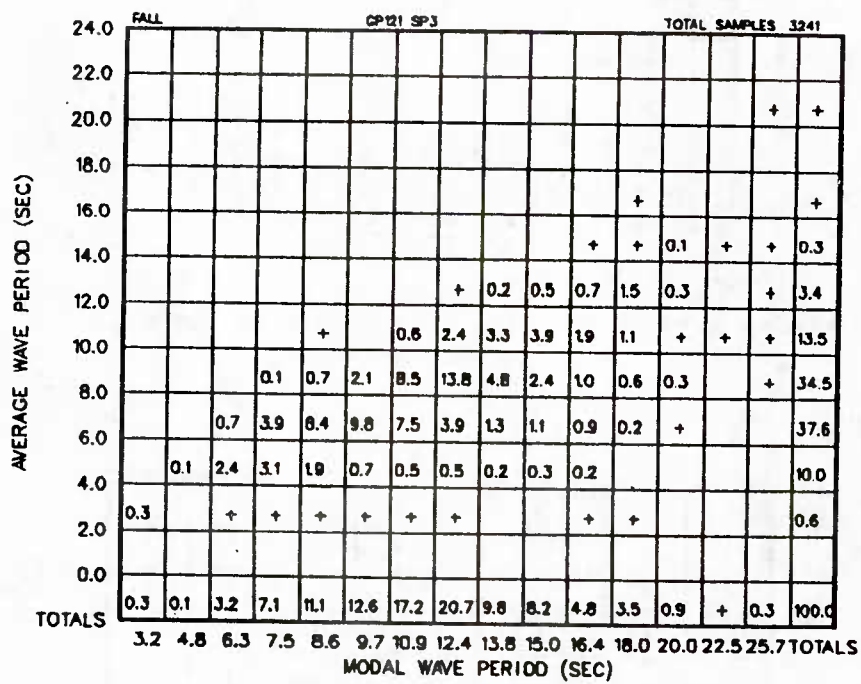


Figure A-3/121-5-9 Average Wave Period vs. Modal Wave Period

TABLE A-124-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 51.31°N, 158.82°N					
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	1 7.5 -	3.5 12 -	8.5 18 -	4 12 -	2.5 12.4 W
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	5 1.25 -	18 3 -	39 7.5 -	19.5 3.5 -	14 2.5 W-SW
Visibility, nautical miles	0.5	8	25	-	-
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	1.5 1	7 6.5	8 8	- -	- -
Precipitation (Occurrence)	All precipitation - 23% of the time Snow - 7% of the time (Dec-Mar)				
Relative Humidity, %	64	85	98	-	-
Air Temperature, °C	3	5	10	5.5	-
Sea Surface Temperature, °C	4	6.5	9	-	-
Sea Level Pressure, millibars	985	1010	1030	-	-
Ice	Moderate superstructure icing - 1% of the time (Dec-Mar)				
Refractivity Mean Surface Refractivity Sub-Refraction (1 km, Annual) Super-Refraction or Ducting (1 km, Annual)	- - -	- - -	- - -	324 - -	- 3% 1%

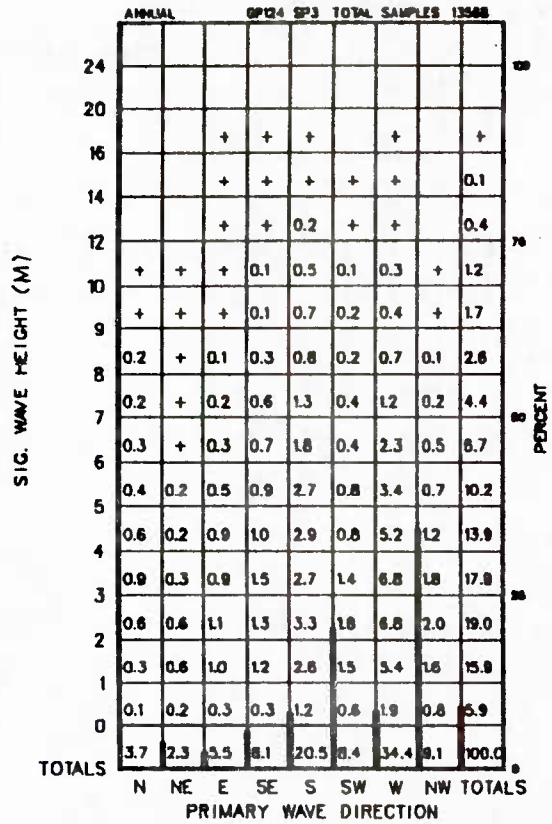


Figure A-124-1-3 Significant Wave Height vs. Primary Wave Direction

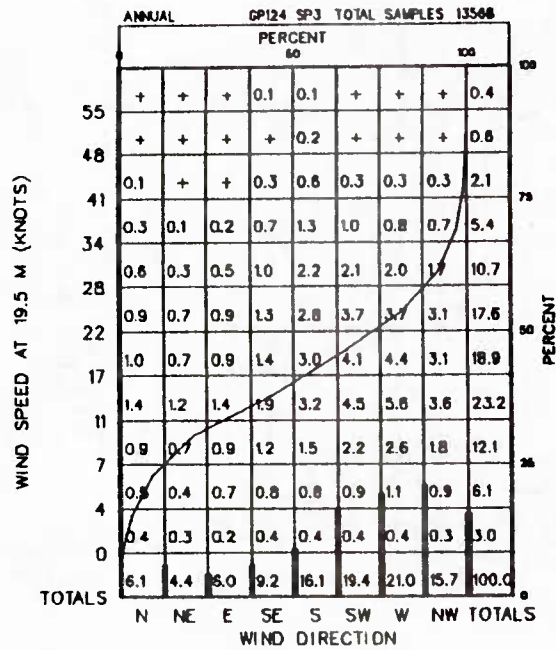


Figure A-124-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

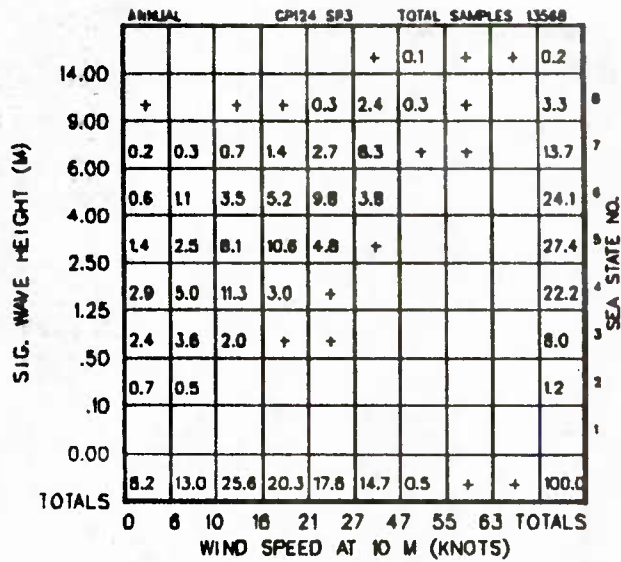


Figure A-124-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

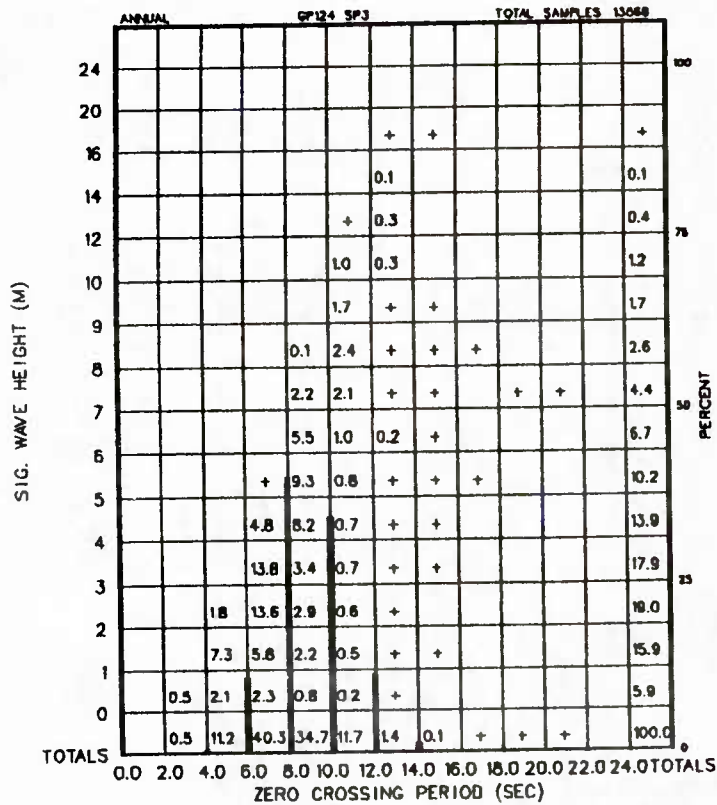


Figure A-124-1-6 Significant Wave Height vs. Zero Crossing Period

ANNUAL		OP124 SP3												TOTAL SAMPLES 13509								
55	13	11	2	1		1												28				
48	50	8			1	1												60				
41	126	39	19	6														190				
34	303	123	28	18	4	1												477				
28	566	179	86	38	9	3	4	2	1									888				
22	809	292	137	64	31	14	5	8										1356				
17	928	367	116	50	25	16	9	2	1	3						1		1518				
11	839	354	173	93	40	24	17	7	4	4	4	4		1	1			1585				
7	646	209	82	33	13	8	7		4	1								1001				
4	403	103	30	15	7	1	1	1	1									542				
0	221	51	15	6	2			1										296				
TOTALS	490	1738	688	324	132	87	43	19	11	8	4	4		1	1	1		7943				
	0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	TOTALS

Figure A-124-1-11 Persistence of Wind Speed at 19.5 M (Knots)

WINTER CP124 SP3 TOTAL SAMPLES 3722

SIC. WAVE HEIGHT (M)	PERCENT								TOTALS	
	N	NE	E	SE	S	SW	W	NW		
24										
20										
16				0.1	+					0.1
14				0.2	+					0.2
12				0.2	0.4	+	+			0.7
10	0.1	+	+	0.5	0.8	0.2	0.7	+		2.5
9	+	+	0.2	0.3	1.0	0.3	0.8	0.2		3.0
8	0.2	0.1	0.4	0.6	1.4	0.3	1.3	0.2		4.9
7	0.2	0.1	0.6	1.3	2.2	0.5	1.6	0.4		7.6
6	0.4	0.1	0.8	1.7	2.7	0.5	2.4	0.5		9.8
5	0.8	0.4	1.1	1.8	3.8	1.2	3.9	0.7		14.9
4	1.0	0.5	2.0	1.6	3.8	0.6	4.7	0.7		18.4
3	1.5	0.8	1.1	2.3	2.4	1.2	3.1	0.8		17.0
2	0.9	1.0	1.1	1.4	2.9	0.9	3.6	0.2		13.5
1	0.3	1.0	0.5	1.1	2.1	0.3	2.1	0.2		8.4
0		0.3	+	+	0.3	+	+			1.1
TOTALS	5.8	4.4	8.0	13.2	23.7	8.1	26.4	3.8		100.0

PRIMARY WAVE DIRECTION

Figure A-124-2-3 Significant Wave Height vs. Primary Wave Direction

WINTER CP124 SP3 TOTAL SAMPLES 3722

WIND SPEED AT 19.5 M (KNOTS)	PERCENT								TOTALS	
	N	NE	E	SE	S	SW	W	NW		
55	+	+	+	0.3	0.1	+		+		0.7
48	+	+	0.1	0.2	0.3		+	+		0.8
41	0.2	0.1	0.2	0.6	0.6	0.5	0.5	0.6		3.5
34	0.6	0.3	0.7	1.6	1.7	1.3	0.8	1.1		8.4
28	1.0	0.5	1.2	1.9	2.9	2.3	2.3	1.9		14.5
22	1.4	1.5	1.7	2.1	3.3	3.5	2.8	3.5		20.4
17	1.7	1.0	1.7	1.4	2.6	2.9	3.0	2.2		18.7
11	1.9	1.3	1.9	2.4	2.6	2.6	3.0	1.7		17.7
7	0.9	1.0	1.1	1.1	1.6	1.6	1.3	1.2		10.0
4	0.5	0.5	0.8	0.6	0.5	0.7	0.6	0.6		4.8
0	0.6	0.3	0.2	0.4	0.3	0.5	+	0.2		2.8
TOTALS	8.6	8.8	9.3	12.7	16.6	15.9	14.4	13.1		100.0

WIND DIRECTION

Figure A-124-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

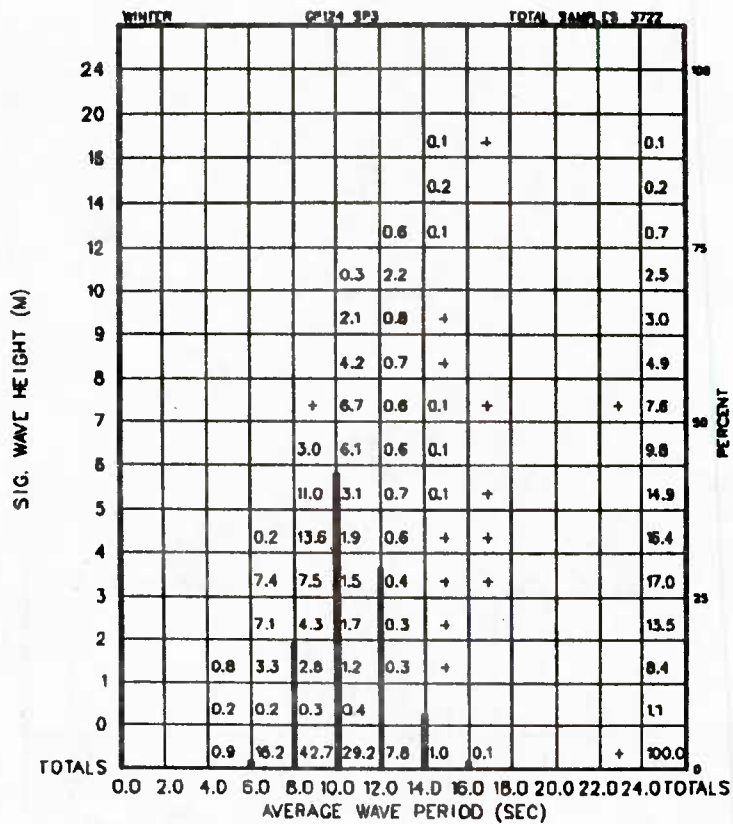


Figure A-124-2-7 Significant Wave Height vs. Average Wave Period

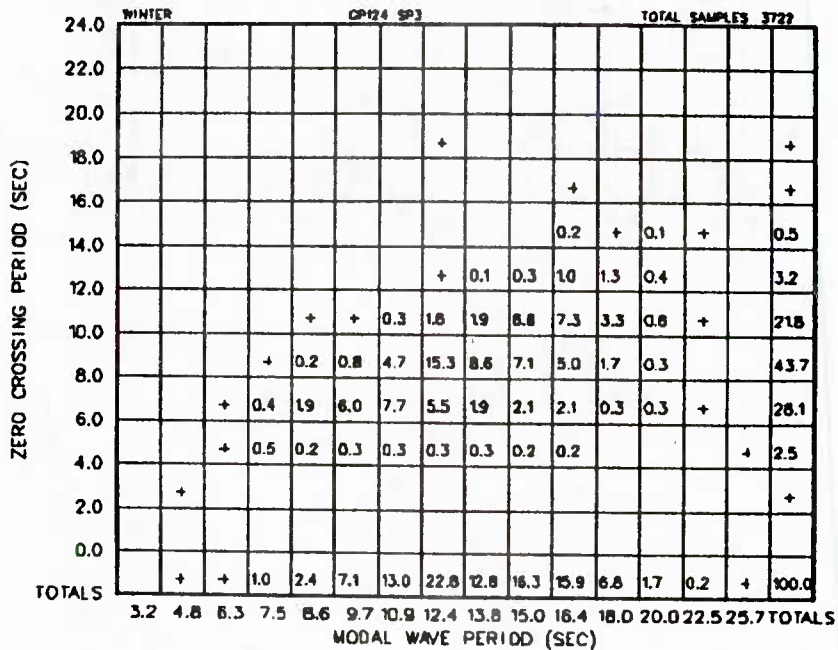


Figure A-124-2-8 Zero Crossing Period vs. Modal Wave Period

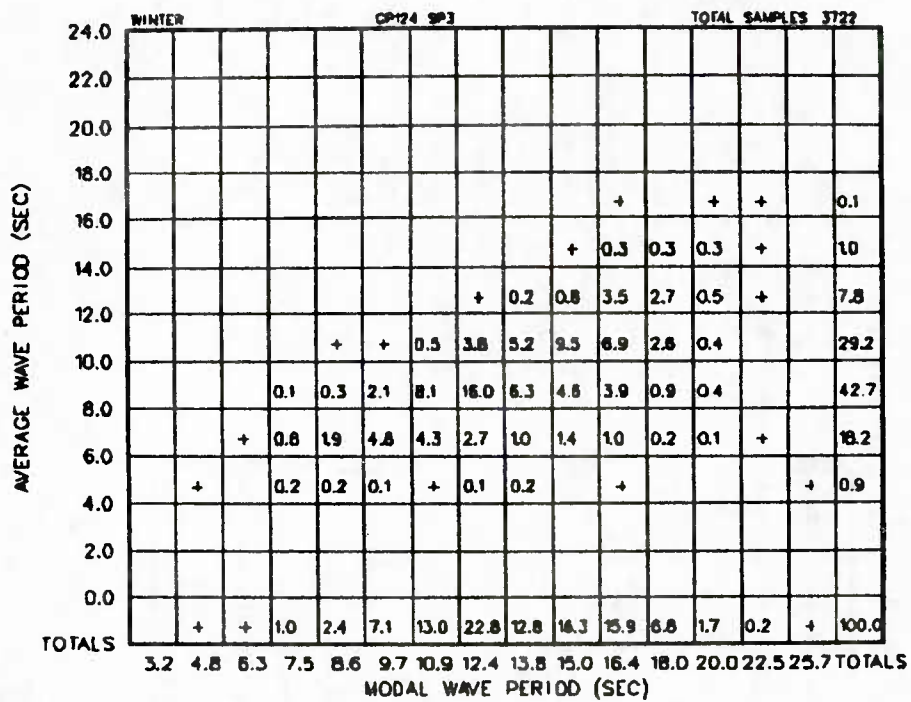


Figure A-124-2-9 Average Wave Period vs. Modal Wave Period

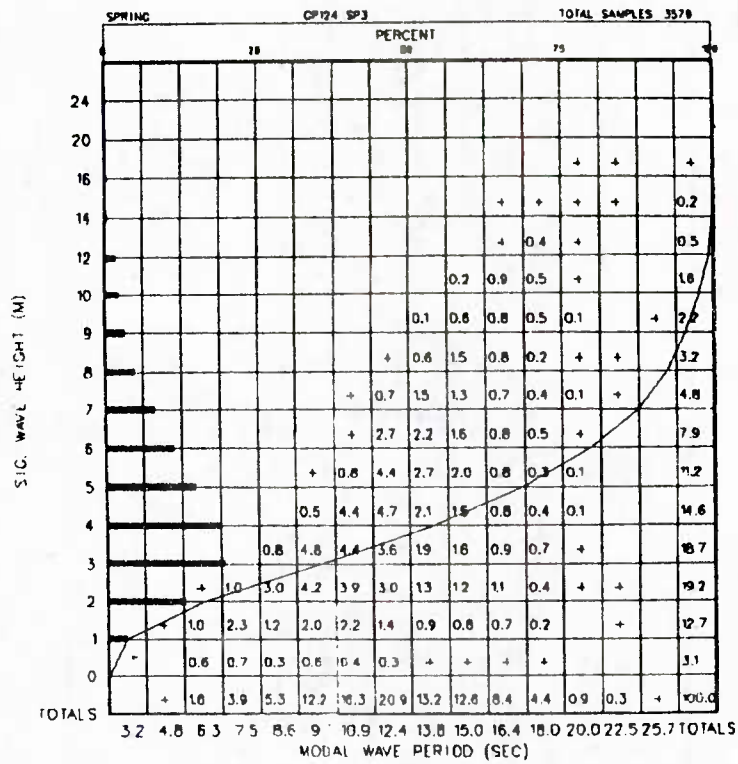


Figure A-124-3-1 Significant Wave Height vs. Modal Wave Period

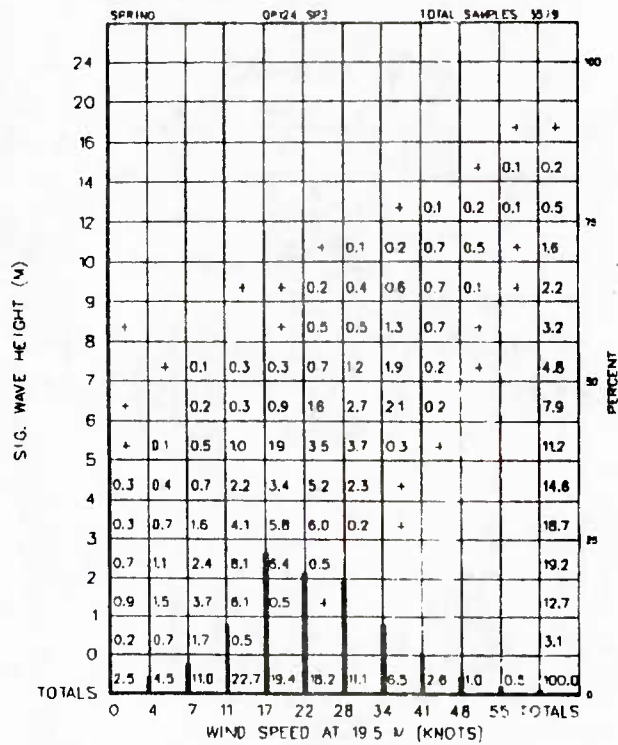


Figure A-124-3-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

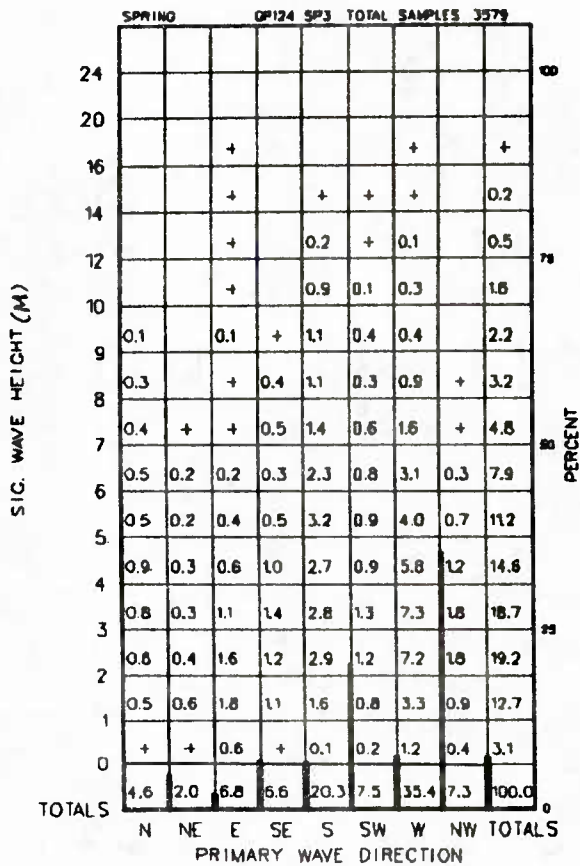


Figure A-124-3-3 Significant Wave Height vs. Primary Wave Direction

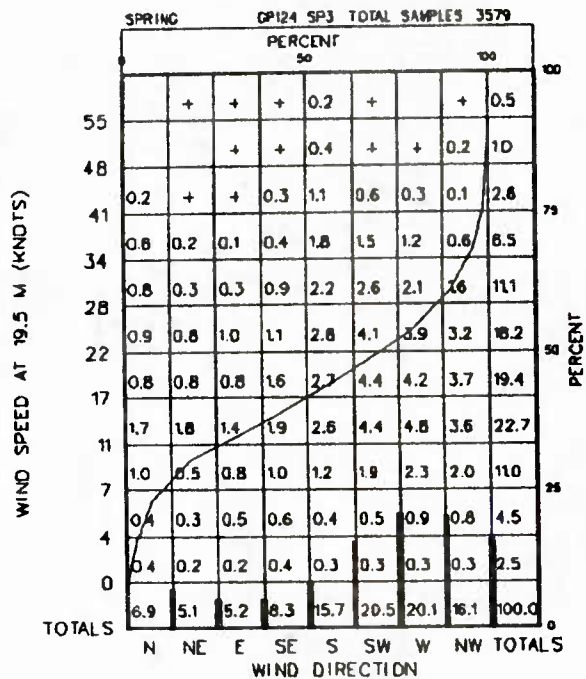


Figure A-124-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

		SPRING					GP124 SP3					TOTAL SAMPLES 3579			
												0.2	+		0.3
14.00				+	+	0.3	3.3	0.5	+						4.3
9.00		0.1	0.3	0.7	1.6	3.3	9.8	+							15.9
6.00		0.7	1.4	3.8	6.1	10.1	3.6								25.7
4.00		1.4	2.7	9.3	10.9	4.4	0.1								28.9
2.50		2.8	4.7	9.9	2.2	+									19.6
1.25		0.9	2.3	1.4											4.7
.50		0.1	0.5												0.7
.10															
0.00															
TOTALS		8.1	12.0	25.2	20.9	18.2	16.8	0.7	0.1						100.0
		0	6	10	16	21	27	47	55	63	TOTALS				
		WIND SPEED AT 10 M (KNOTS)													

Figure A-124-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

		SPRING					GP124 SP3					TOTAL SAMPLES 3579			
24															
20															
16									+	+					+
14									0.2						0.2
12									+	0.4					0.5
10									1.4	0.2					1.6
9									2.2	+					2.2
8									0.2	2.9				+	3.2
7									2.5	2.2	+			+	4.8
6									7.0	0.9	+				7.9
5									10.5	0.7	+				11.2
4									4.9	8.9	0.7	+			14.6
3									13.5	4.4	0.7	0.1			18.7
2									1.4	14.1	3.1	0.6	+		19.2
1									4.8	4.8	2.5	0.6	+		12.7
0									0.4	1.2	1.1	0.3	+		3.1
TOTALS		0.4	7.5	38.5	39.4	12.9	1.3	+	+	+	+	+	+	+	100.0
		0.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	TOTALS
		ZERO CROSSING PERIOD (SEC)													

Figure A-124-3-6 Significant Wave Height vs. Zero Crossing Period

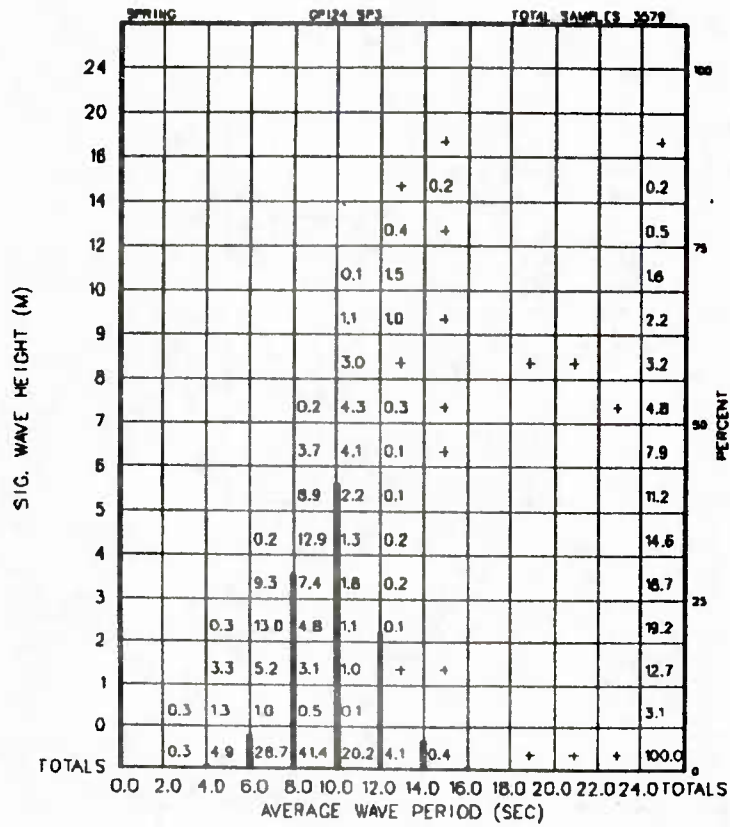


Figure A-124-3-7 Significant Wave Height vs. Average Wave Period

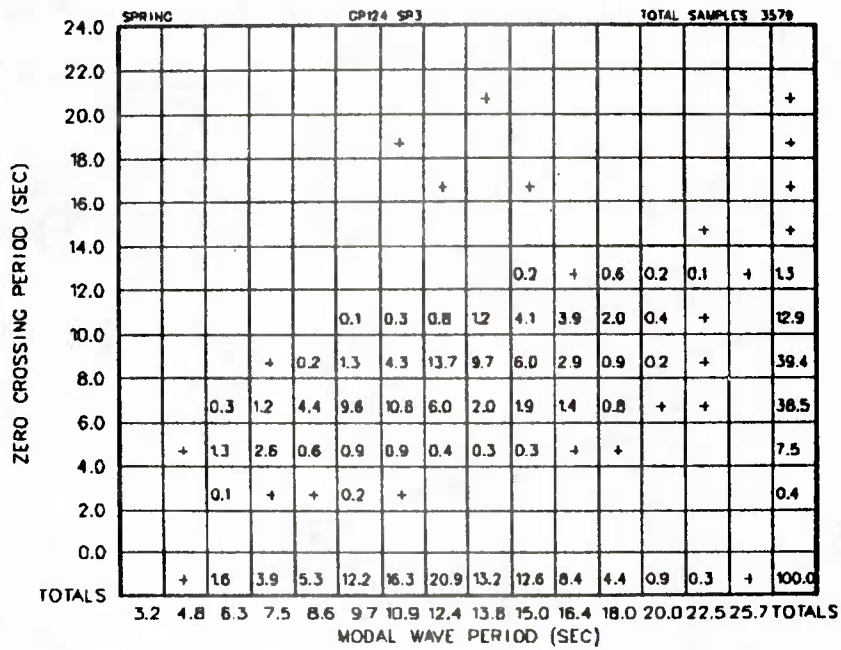


Figure A-124-3-8 Zero Crossing Period vs. Modal Wave Period

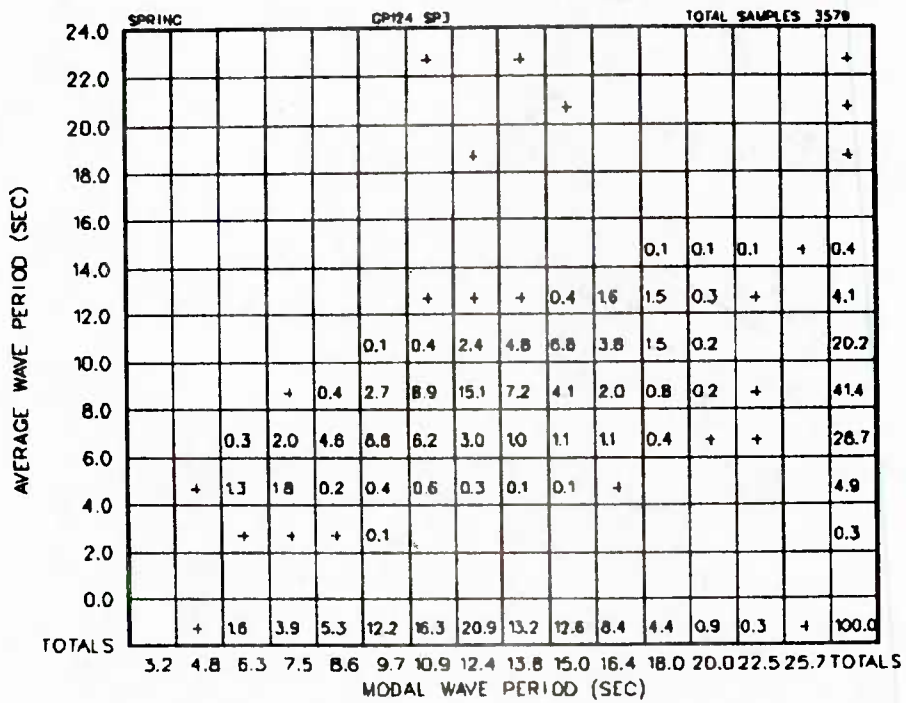


Figure A-124-3-9 Average Wave Period vs. Modal Wave Period

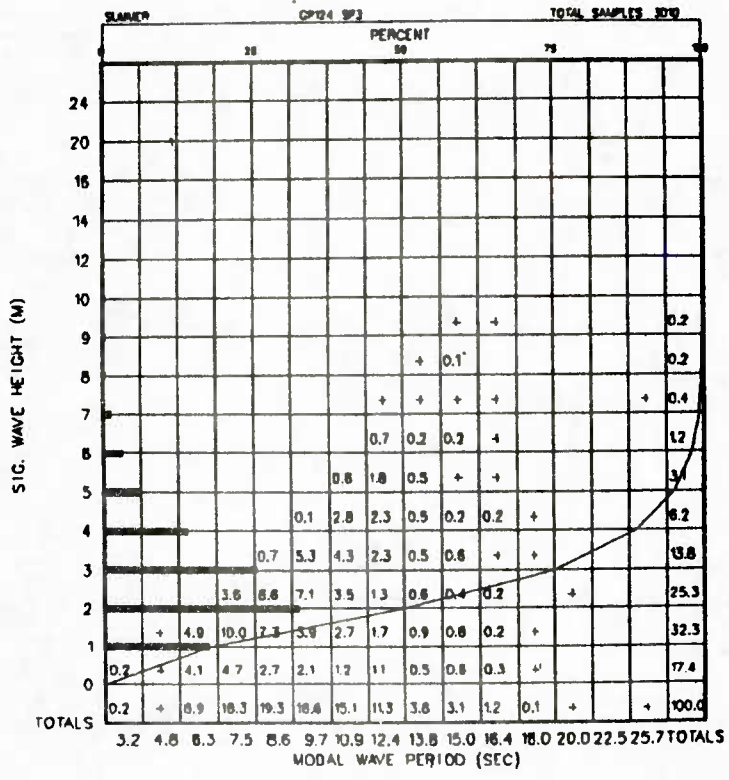


Figure A-124-4-1 Significant Wave Height vs. Modal Wave Period

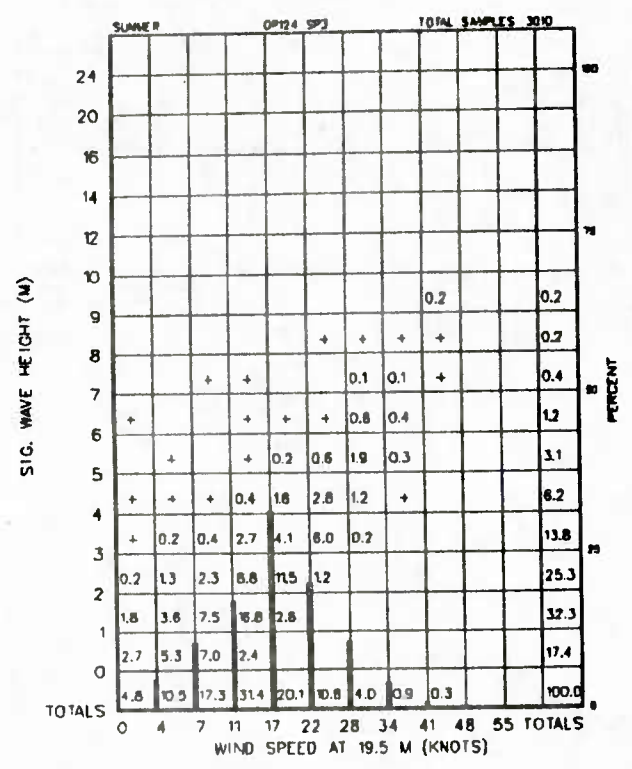


Figure A-124-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

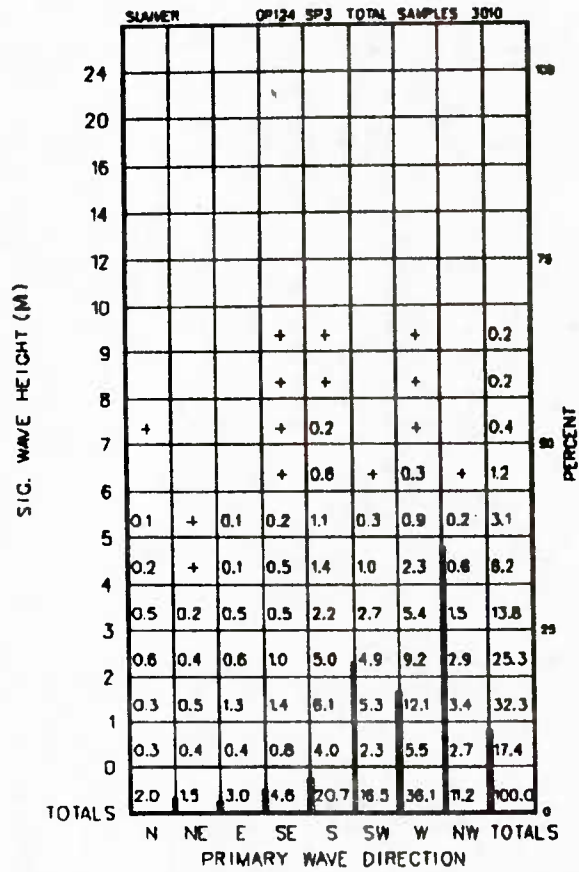


Figure A-124-4-3 Significant Wave Height vs. Primary Wave Direction

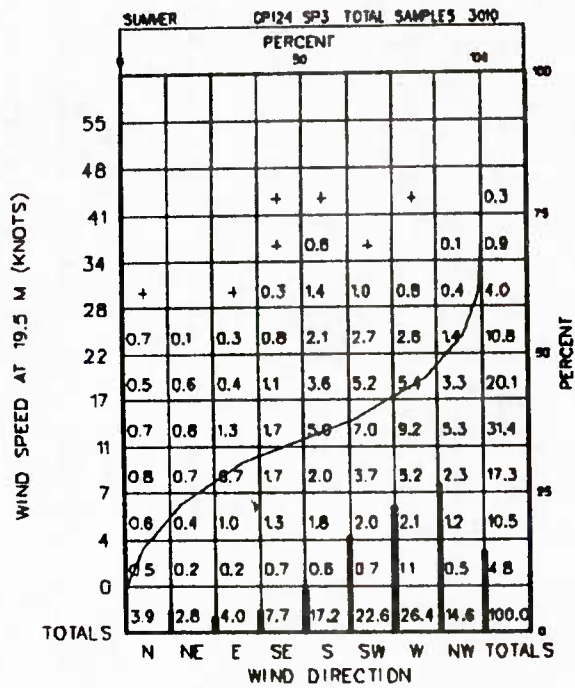


Figure A-124-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

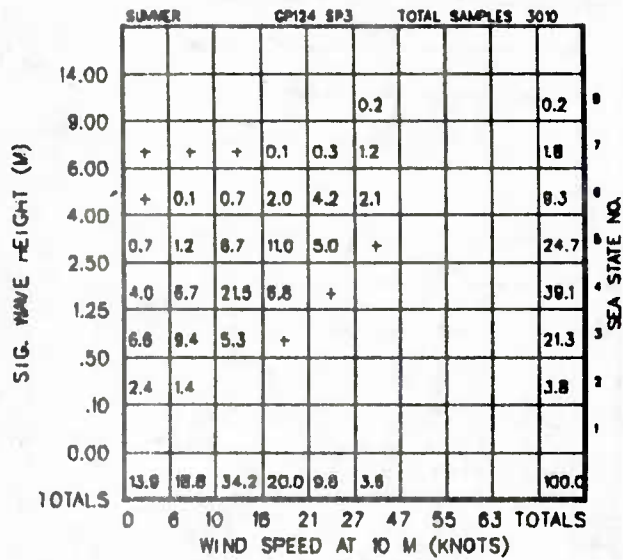


Figure A-124-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

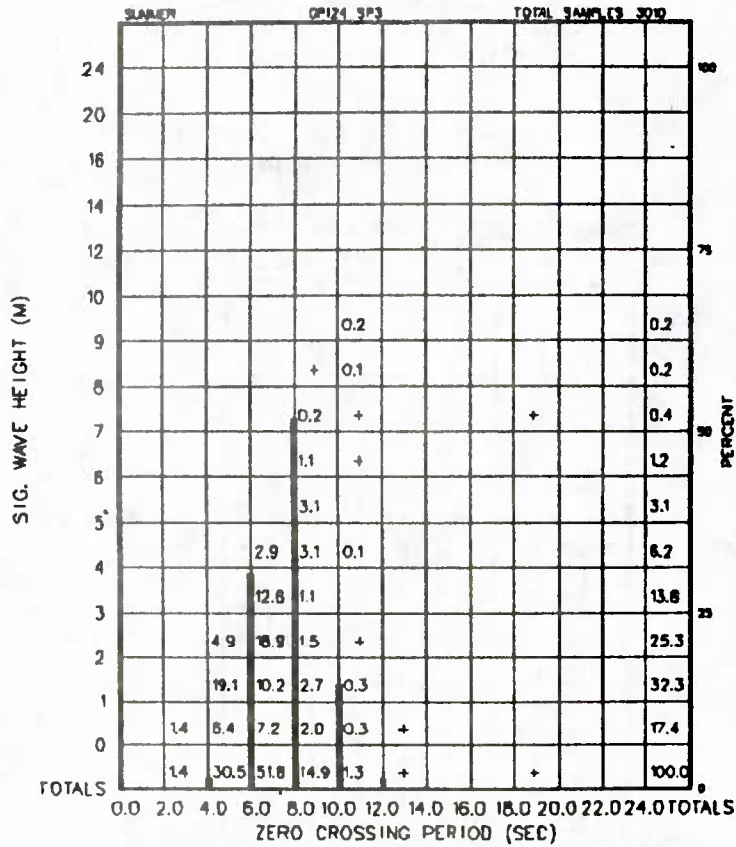


Figure A-124-4-6 Significant Wave Height vs. Zero Crossing Period

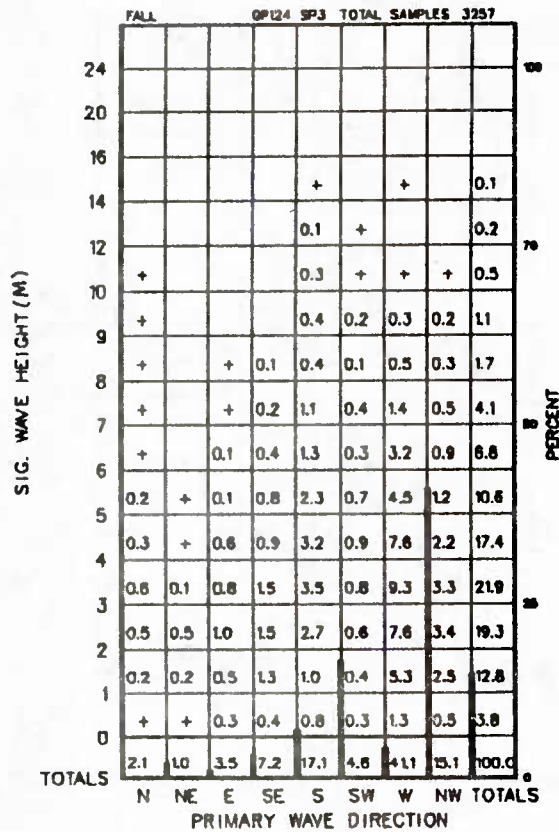


Figure A-124-5-3 Significant Wave Height vs. Primary Wave Direction

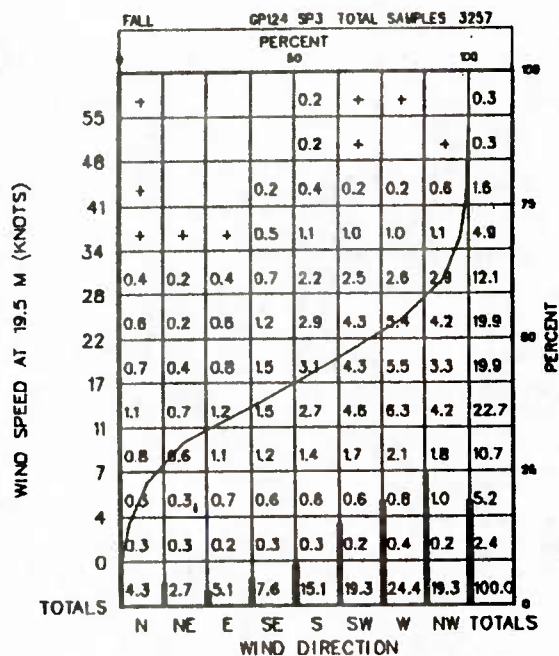


Figure A-124-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

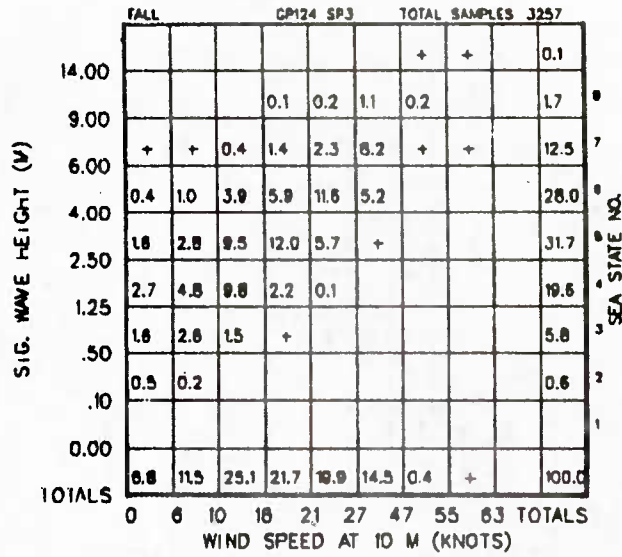


Figure A-124-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

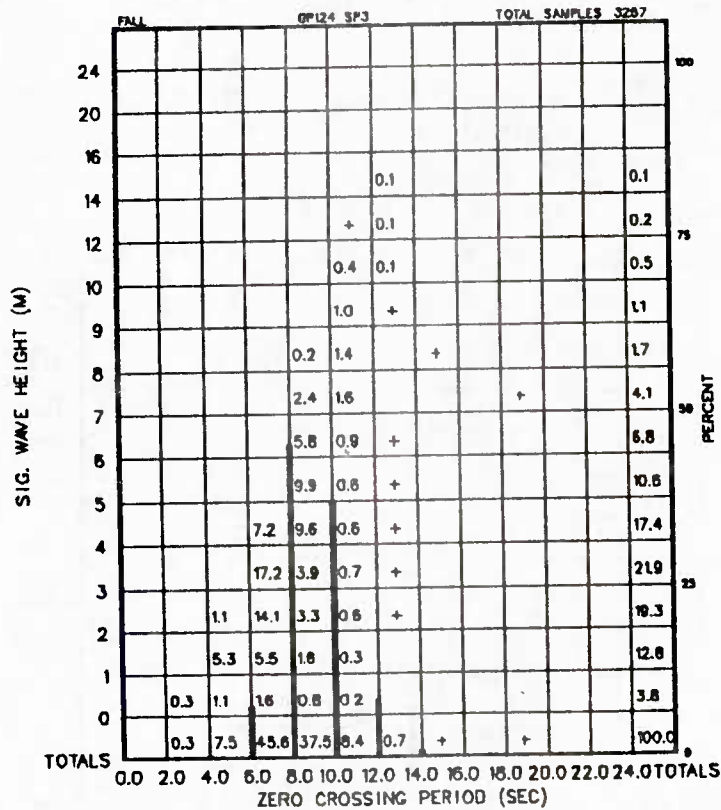


Figure A-124-5-6 Significant Wave Height vs. Zero Crossing Period

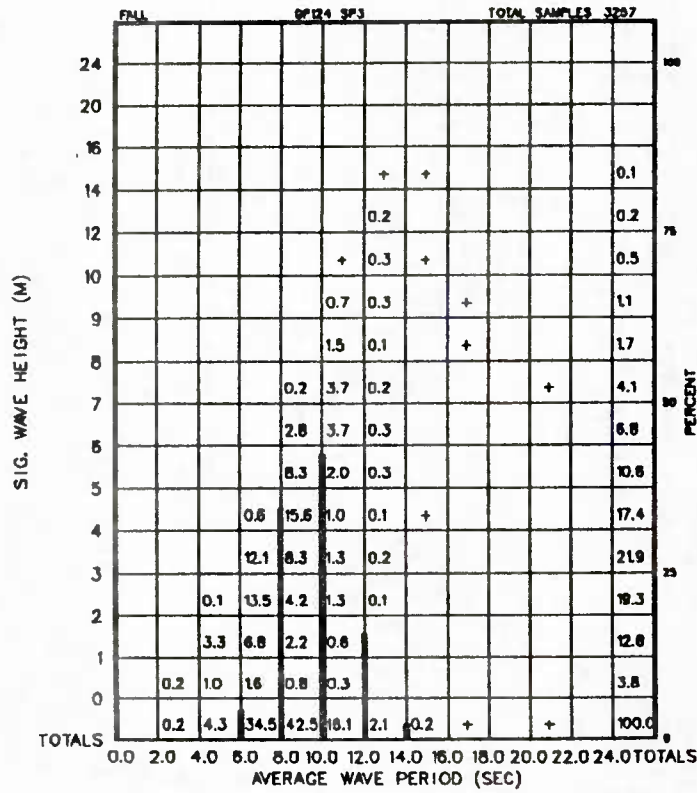


Figure A-124-5-7 Significant Wave Height vs. Average Wave Period

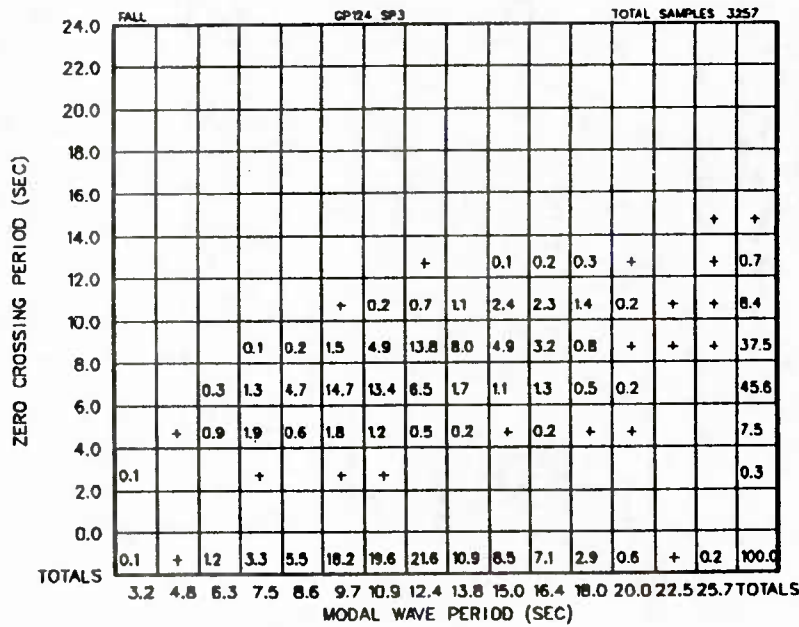


Figure A-124-5-8 Zero Crossing Period vs. Modal Wave Period

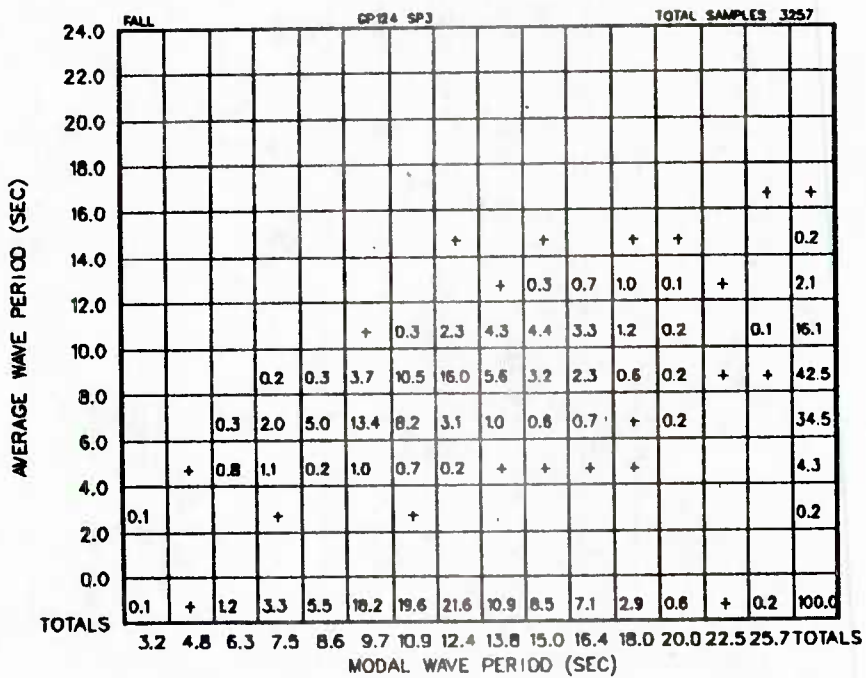


Figure A-124-5-9 Average Wave Period vs. Modal Wave Period

TABLE A-148-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

Natural Environment	SEASON: ANNUAL; LOCATION: 43.17°N, 141.43°W				
	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.5 6.5 -	3 11.5 -	7.5 16 -	3.25 11.75 -	1.5 12.4 W
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	4.5 0.75 -	16.5 2.75 -	37 7.5 -	17.25 3 -	14 2.5 SW-W
Visibility, nautical miles	1	10	25	-	-
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	1 0.5	7 6.5	8 8	- -	- -
Precipitation (Occurrence)	All precipitation - 16% of the time Snow - 2% of the time (Dec-Mar)				
Relative Humidity, %	62	83	98	-	-
Air Temperature, °C	7	9.5	13.5	10	-
Sea Surface Temperature, °C	9	12	15	-	-
Sea Level Pressure, millibars	995	1018	1035	-	-
Ice	None				
Refractivity Mean Surface Refractivity Sub-Refraction (1 km, Annual) Super-Refraction or Ducting (1 km, Annual)	- - -	- - -	- - -	324 - -	- 2% 2%

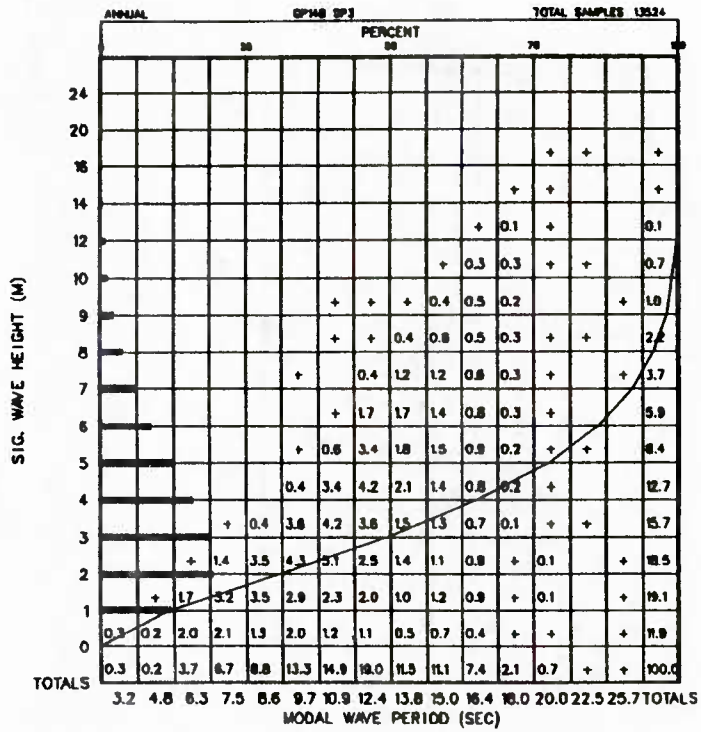


Figure A-148-1-1 Significant Wave Height vs. Modal Wave Period

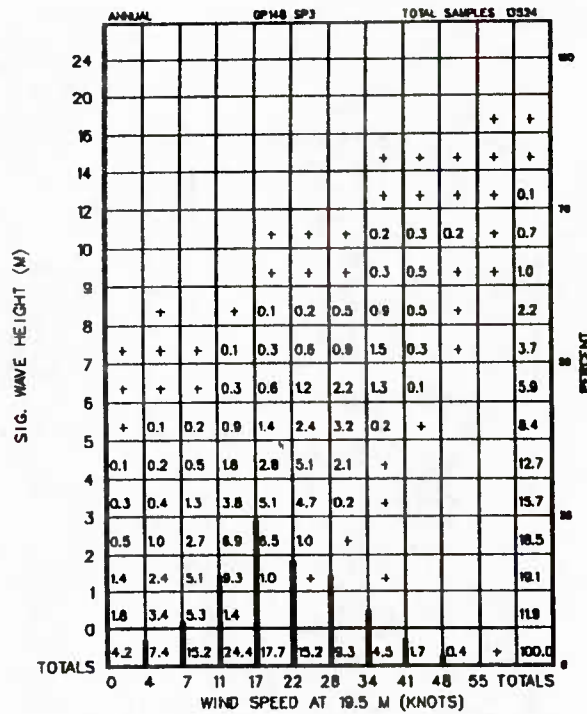


Figure A-148-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

ANNUAL GPM8 SP3 TOTAL SAMPLES 13524

SIG. WAVE HEIGHT (M)	PERCENT								TOTALS
	N	NE	E	SE	S	SW	W	NW	
24									
20									
16				+	+		+		+
14				+	+	+	+	+	+
12				+	+	+	+	+	0.1
10	+		+	+	0.3	+	0.3	+	0.7
9	+			+	0.4	0.2	0.3	+	1.0
8	0.1		+	+	0.7	0.2	0.8	0.2	2.2
7	0.2	+	+	0.1	1.0	0.3	1.4	0.8	3.7
6	0.3	+	0.2	0.2	1.7	0.5	2.1	0.9	5.9
5	0.4	+	0.2	0.2	2.0	0.7	3.8	1.2	8.4
4	0.7	+	0.3	0.3	2.4	0.9	8.2	1.9	12.7
3	1.0	0.2	0.5	0.5	3.1	1.1	8.9	2.3	15.7
2	1.2	0.3	0.8	0.7	2.8	1.5	8.6	2.8	18.5
1	1.5	0.5	0.8	0.6	2.5	1.8	8.7	2.9	18.1
0	1.4	0.7	0.8	0.2	1.0	0.9	5.1	2.0	11.9
TOTALS	5.9	1.8	3.3	3.0	18.0	8.1	44.2	14.8	100.0

PRIMARY WAVE DIRECTION

Figure A-148-1-3 Significant Wave Height vs. Primary Wave Direction

ANNUAL GPM8 SP3 TOTAL SAMPLES 13524

WIND SPEED AT 19.5 M (KNOTS)	PERCENT								TOTALS
	N	NE	E	SE	S	SW	W	NW	
55				+	+	+			+
48				+	0.2	0.1	+	+	0.4
41	+	+	+	0.1	0.7	0.5	0.2	+	1.7
34	0.2	+	0.1	0.2	1.1	1.8	0.8	0.4	4.5
28	0.2	+	0.3	0.4	2.4	3.0	1.8	1.0	9.3
22	0.4	0.3	0.5	0.7	2.8	4.9	3.8	1.8	15.2
17	0.7	0.5	0.8	0.9	2.7	5.3	4.8	1.9	17.7
11	1.4	1.0	1.3	1.7	3.2	6.1	6.1	3.2	24.4
7	1.2	1.0	1.0	1.1	1.7	3.0	3.6	2.2	15.2
4	0.5	0.6	0.7	0.7	0.9	1.3	1.3	1.3	7.4
0	0.8	0.4	0.4	0.4	0.5	0.8	0.7	0.8	4.2
TOTALS	5.3	3.9	5.1	6.2	16.2	26.7	22.7	12.8	100.0

WIND DIRECTION

Figure A-148-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

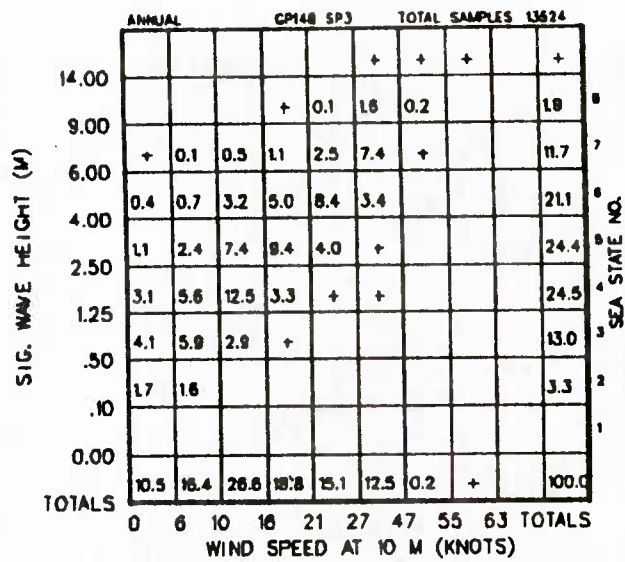


Figure A-148-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

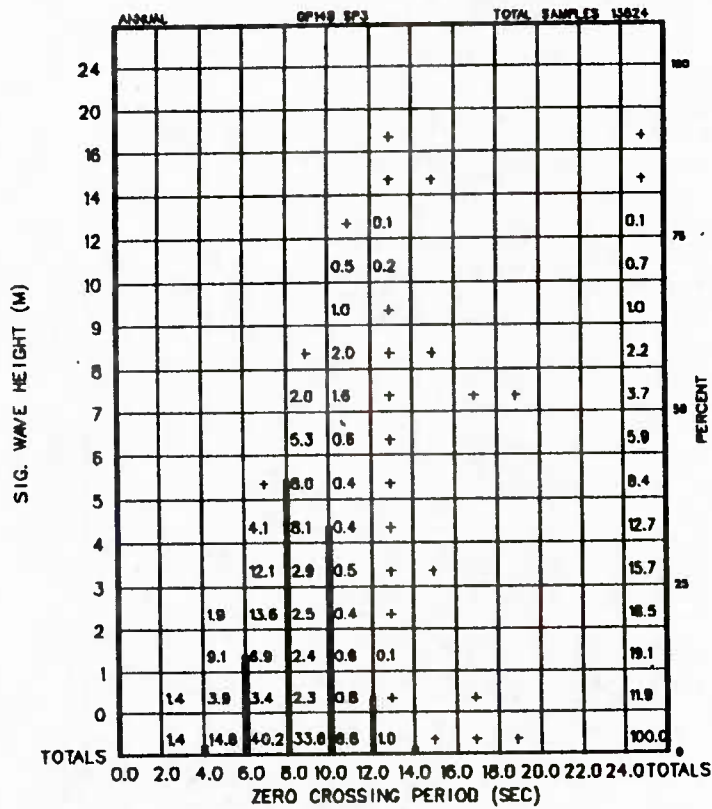


Figure A-148-1-6 Significant Wave Height vs. Zero Crossing Period

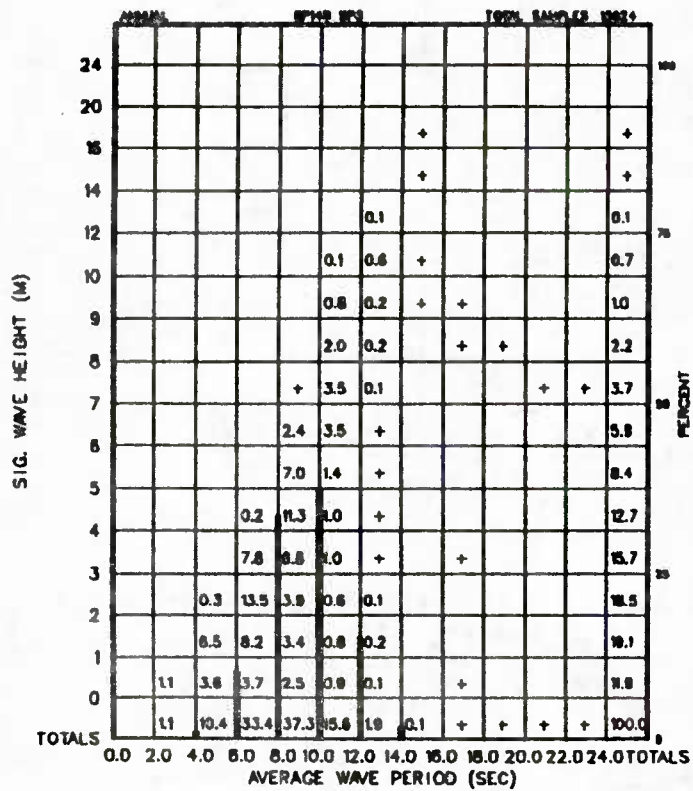


Figure A-148-1-7 Significant Wave Height vs. Average Wave Period

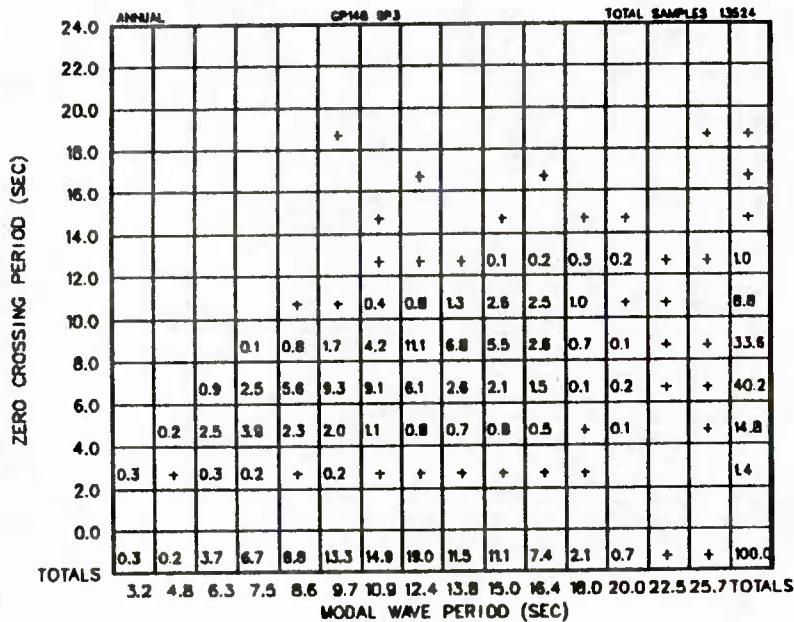


Figure A-148-1-8 Zero Crossing Period vs. Modal Wave Period

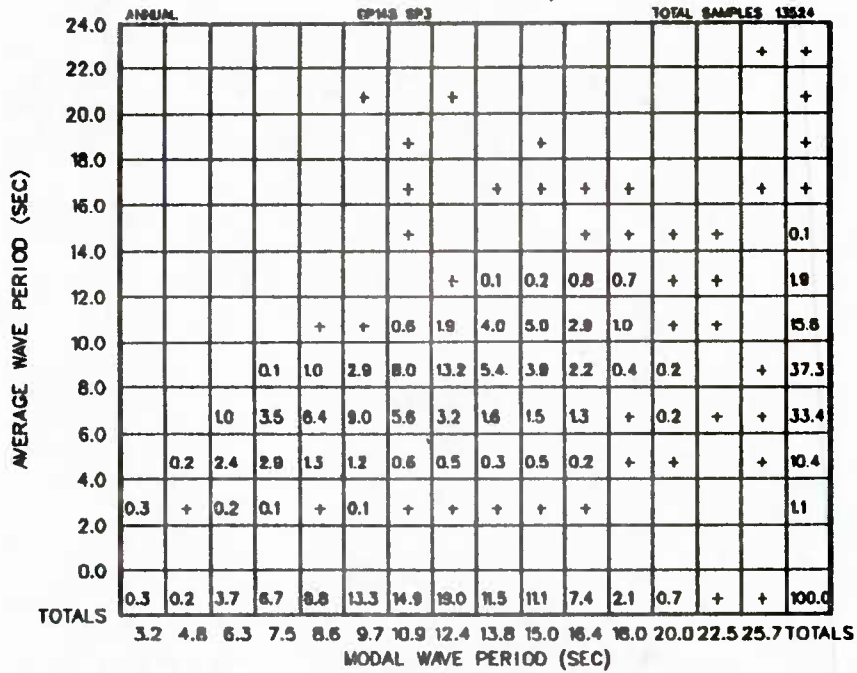


Figure A-148-1-9 Average Wave Period vs. Modal Wave Period

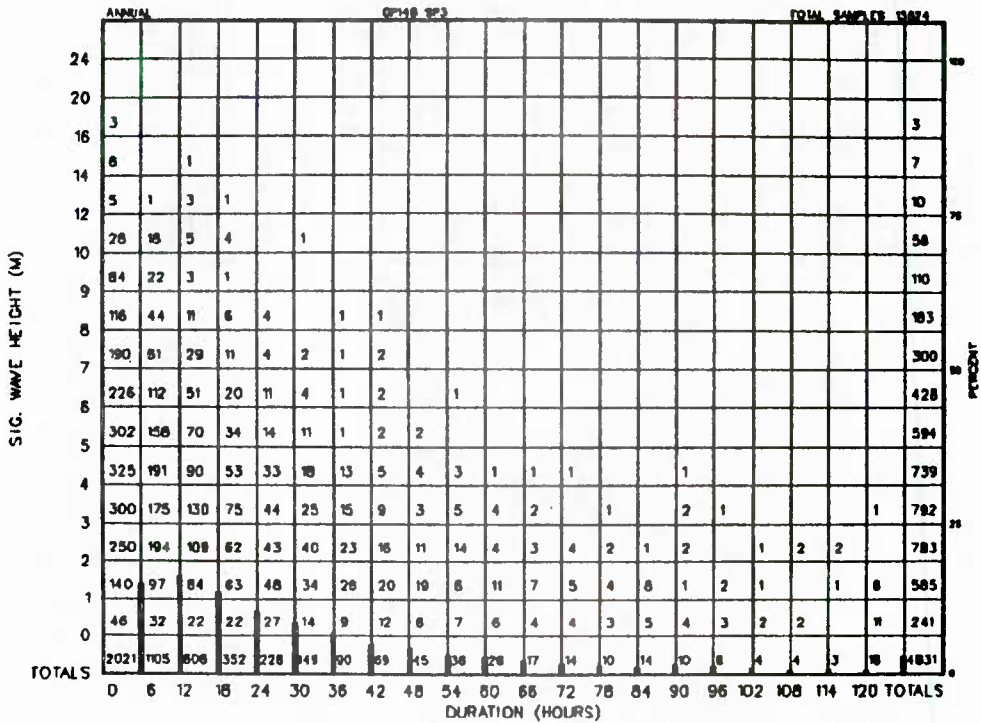


Figure A-148-1-10 Persistence of Wave Height

ANNUAL		SP148 SP2												TOTAL SAMPLES 13974									
55	10	1																	11				
48	33	9	2																44				
41	94	29	16	4	2														145				
34	210	58	42	16	6	5	1		1			1							340				
28	423	173	81	34	13	4	2												730				
22	827	276	106	66	29	11	9		1	1									1028				
17	785	291	131	66	26	17	10	6	2	2									1316				
11	669	367	159	94	61	40	17	16	4	7	3	2	5				1		1445				
7	563	230	115	59	28	16	9	4	6	2	1		1	1					1037				
4	394	136	43	22	9	5	1				1	1	1						615				
0	197	59	31	15	6	5	2	1	2										318				
TOTALS	3985	1631	726	376	190	105	51	27	16	12	5	4	6	2			1		7127				
		0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	TOTALS

Figure A-148-1-11 Persistence of Wind Speed at 19.5 M (Knots)

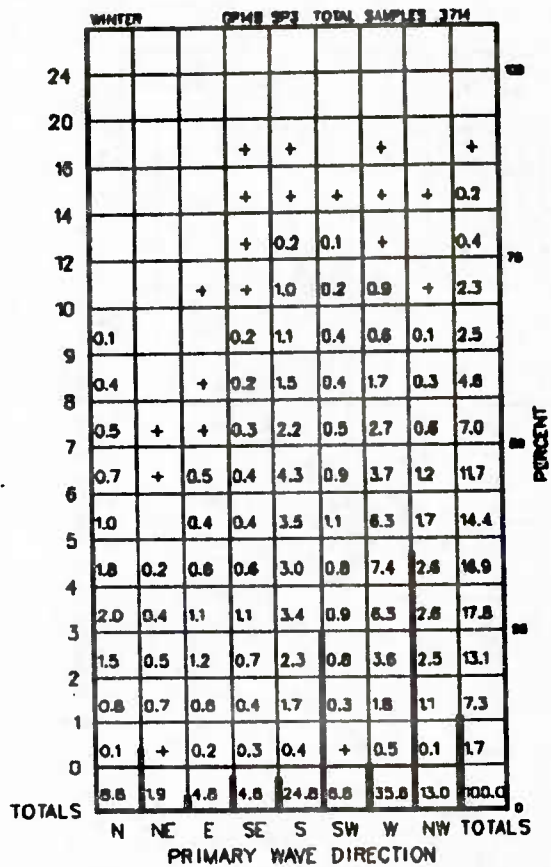


Figure A-148-2-3 Significant Wave Height vs. Primary Wave Direction

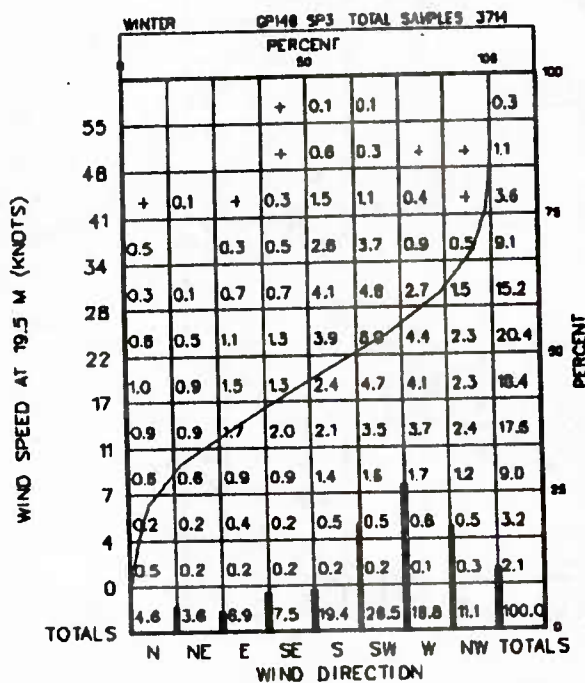


Figure A-148-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

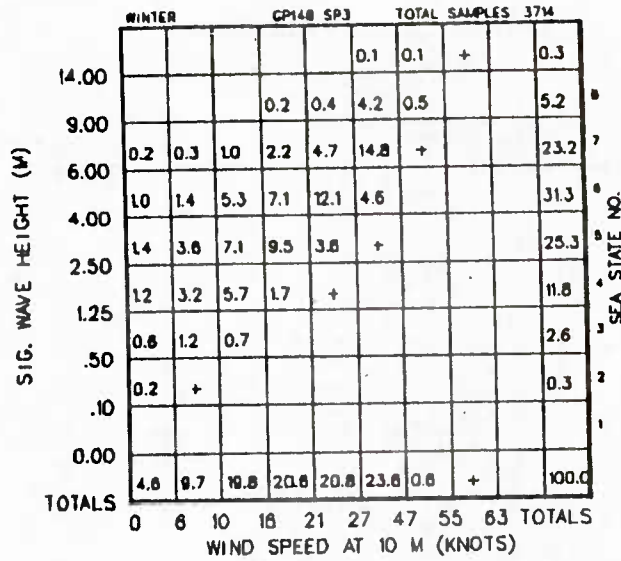


Figure A-148-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

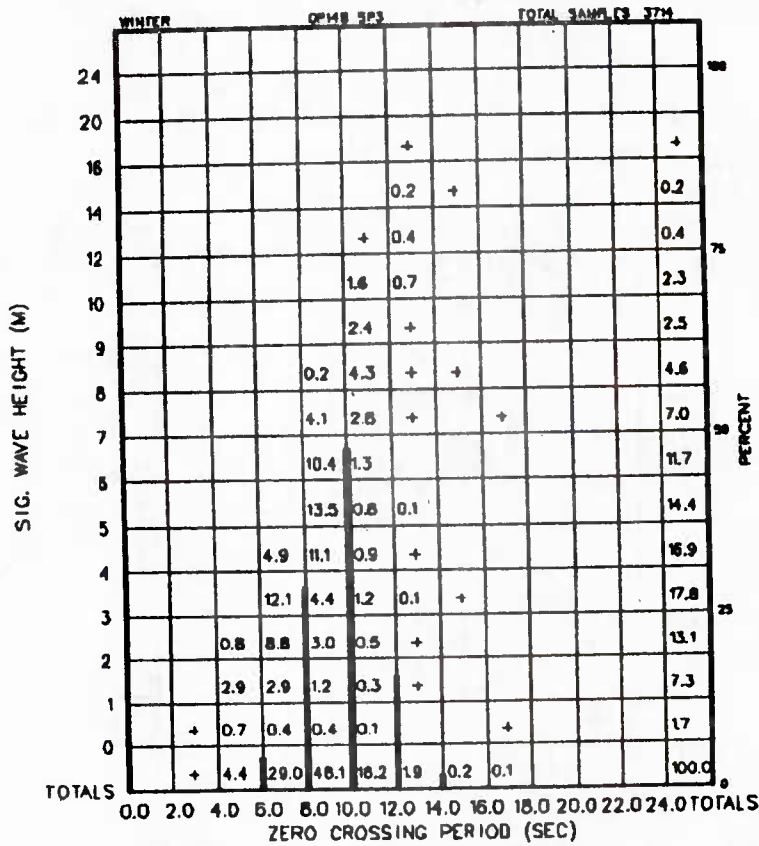


Figure A-148-2-6 Significant Wave Height vs. Zero Crossing Period

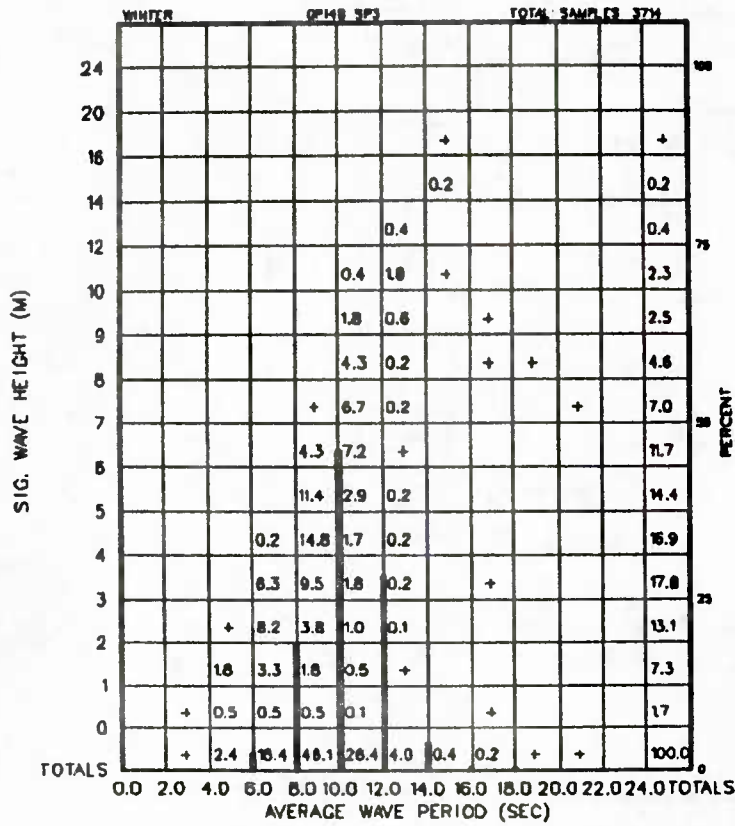


Figure A-148-2-7 Significant Wave Height vs. Average Wave Period

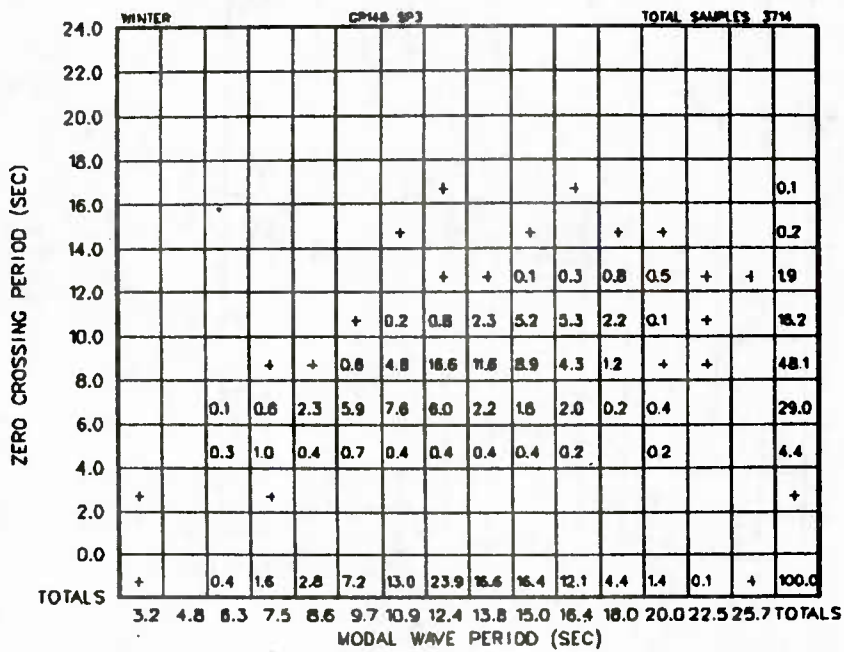


Figure A-148-2-8 Zero Crossing Period vs. Modal Wave Period

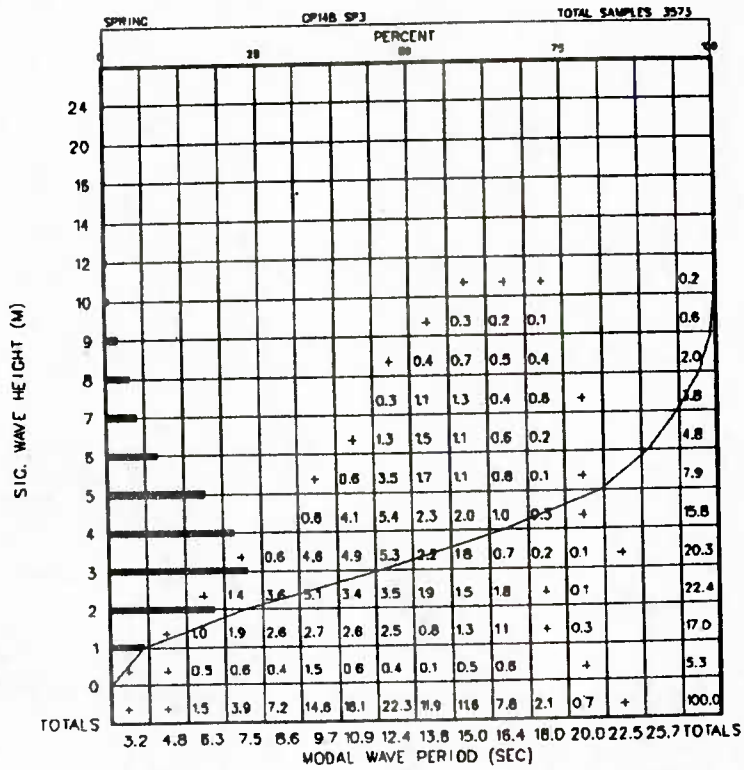


Figure A-148-3-1 Significant Wave Height vs. Modal Wave Period

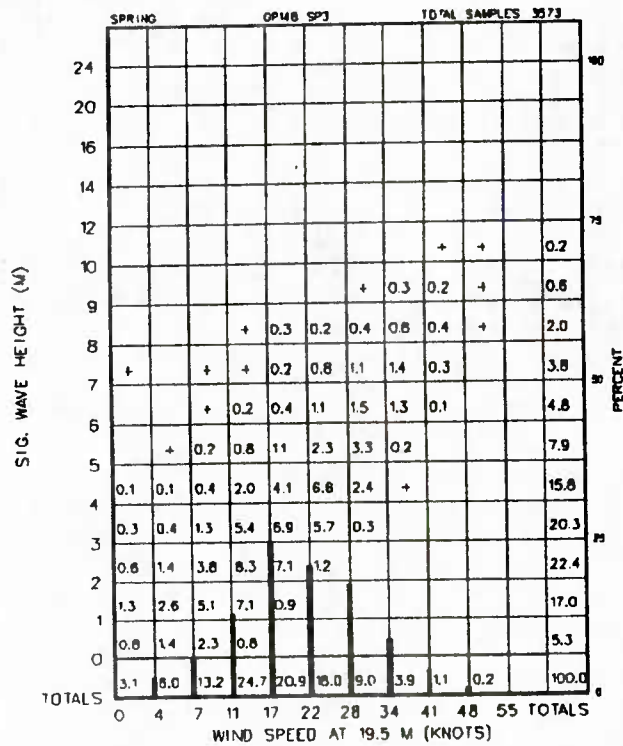


Figure A-148-3-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

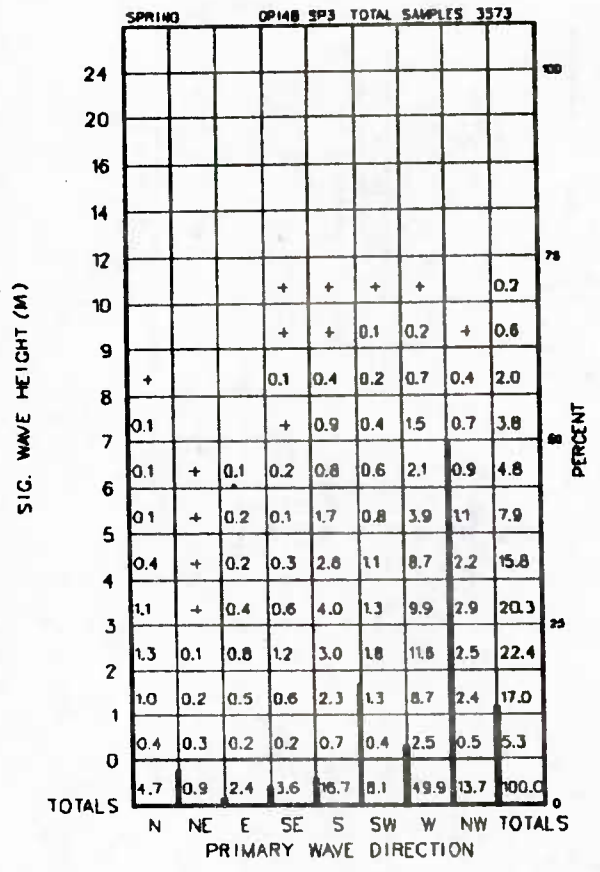


Figure A-148-3-3 Significant Wave Height vs. Primary Wave Direction

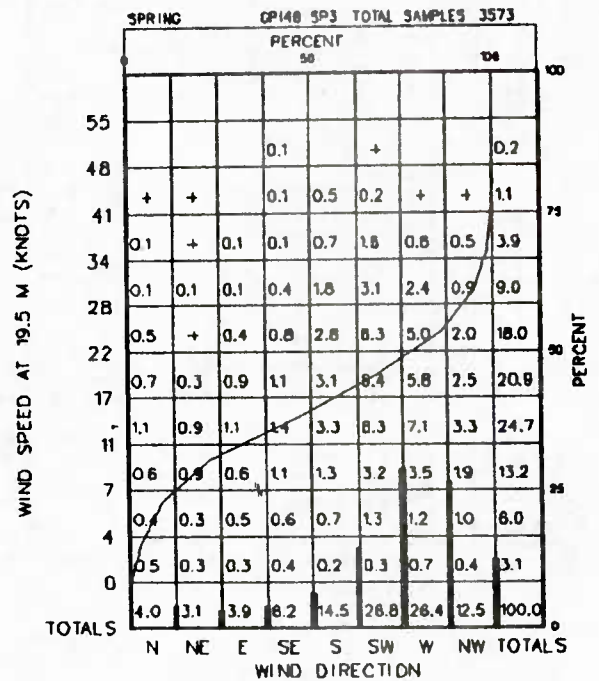


Figure A-148-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

		SPRING		GPI48 SP3		TOTAL SAMPLES 3573			
SIG. WAVE HEIGHT (M)	14.00					0.7	+		0.7
	9.00	+	+	0.4	1.0	2.7	6.4		10.8
	6.00	0.3	0.7	3.3	6.2	9.7	3.8		23.7
	4.00	1.3	2.9	10.5	12.1	4.8	0.1		31.7
	2.50	3.7	6.5	11.3	3.1	0.1			24.6
	1.25	2.2	3.5	1.8					7.6
	.50	0.6	0.6						1.1
	.10								
	0.00								
	TOTALS	8.1	14.2	27.3	22.4	17.2	10.9	+	
		0 6 10 16 21 27 47 55 63		TOTALS					
		WIND SPEED AT 10 M (KNOTS)							

Figure A-148-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

		SPRING		GPI48 SP3		TOTAL SAMPLES 3573			
SIG. WAVE HEIGHT (M)	24								
	20								
	16								
	14								
	12								
	10					0.2			0.2
	9					0.6			0.6
	8				+	1.8	+		2.0
	7				1.8	2.0	+		3.8
	6				4.3	0.4			4.8
5			+	7.8	0.3			7.9	
4			4.8	10.5	0.4	+		15.8	
3			16.2	3.6	0.4			20.3	
2		17	17.2	3.2	0.3			22.4	
1		6.2	7.1	3.0	0.7	+		17.0	
0	0.5	19	1.3	1.0	0.3	0.2		5.3	
TOTALS	0.5	9.7	46.7	35.2	7.4	0.4		100.0	
		0.0 2.0 4.0 6.0 8.0 10.0 12.0 14.0 16.0 18.0 20.0 22.0 24.0		TOTALS					
		ZERO CROSSING PERIOD (SEC)							

Figure A-148-3-6 Significant Wave Height vs. Zero Crossing Period

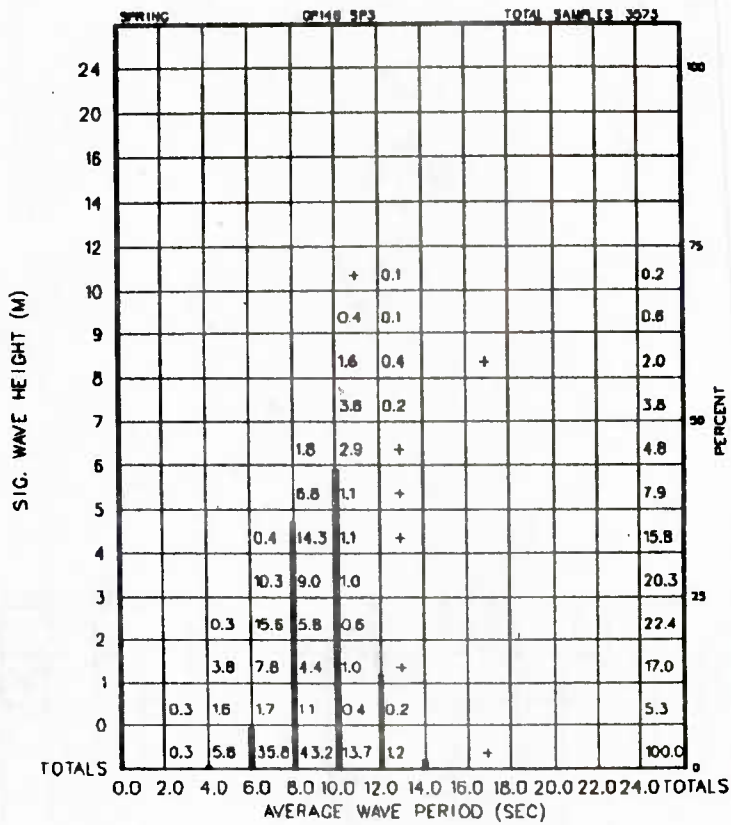


Figure A-148-3-7 Significant Wave Height vs. Average Wave Period

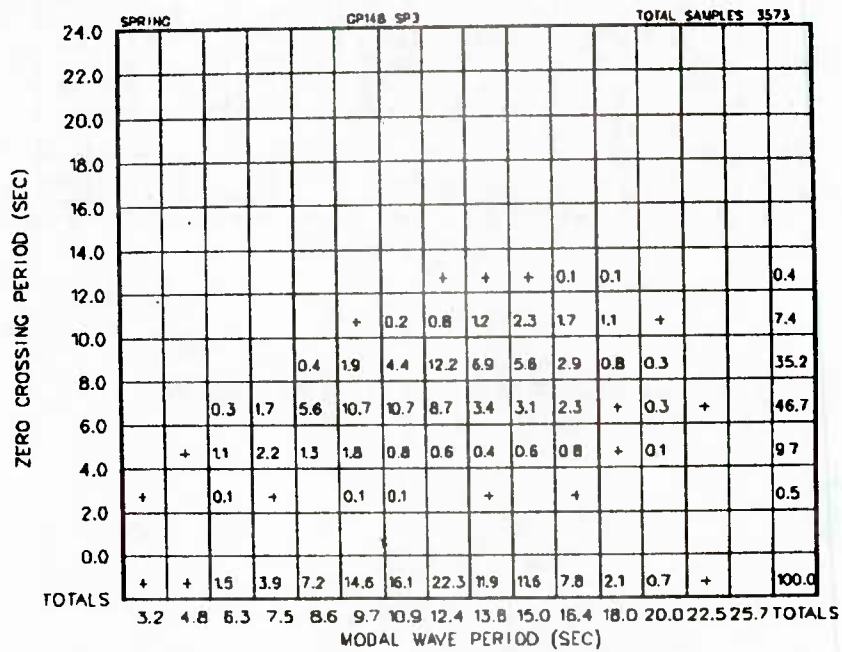


Figure A-148-3-8 Zero Crossing Period vs. Modal Wave Period

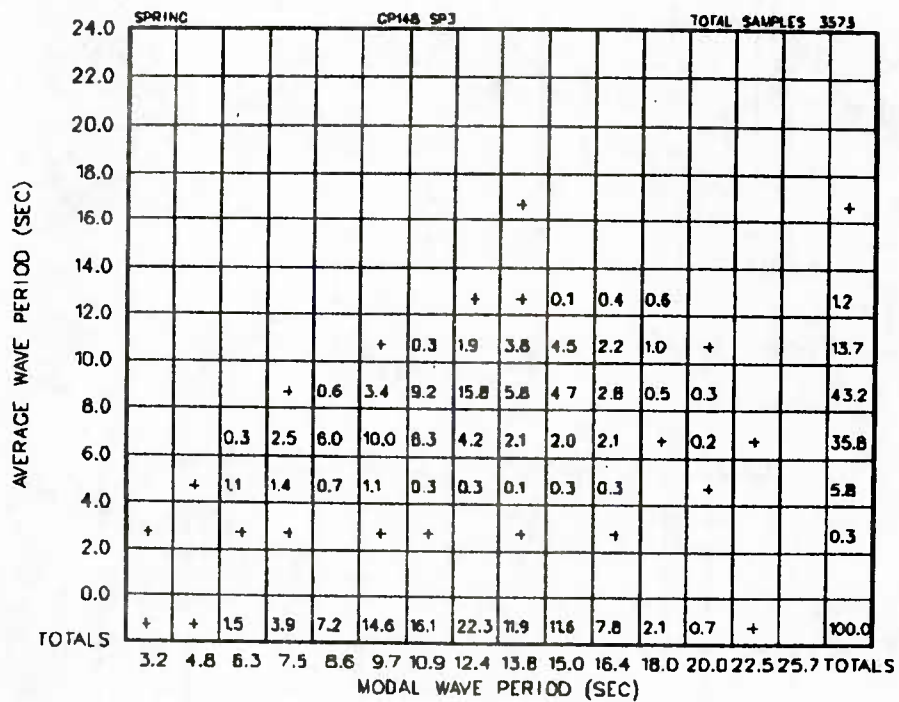


Figure A-148-3-9 Average Wave Period vs. Modal Wave Period

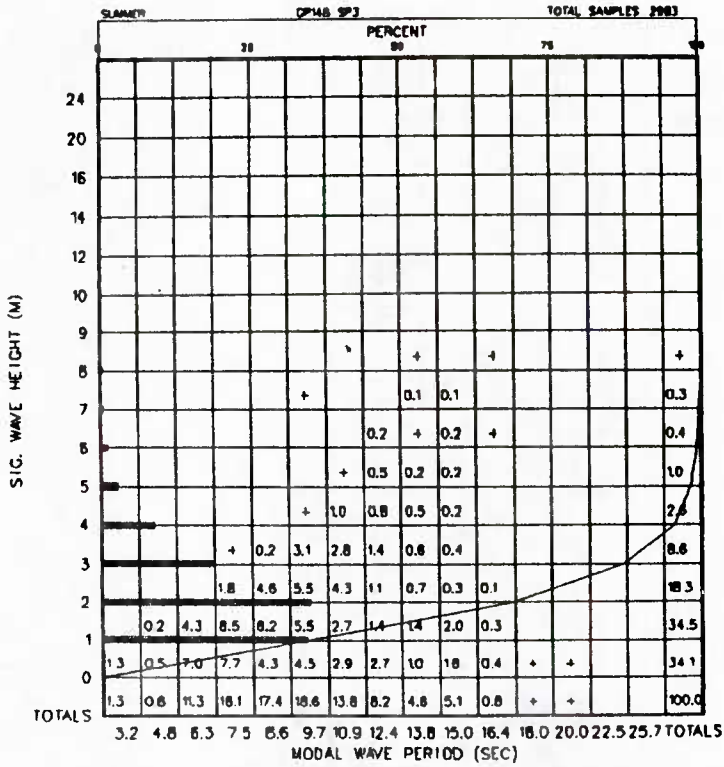


Figure A-148-4-1 Significant Wave Height vs. Modal Wave Period

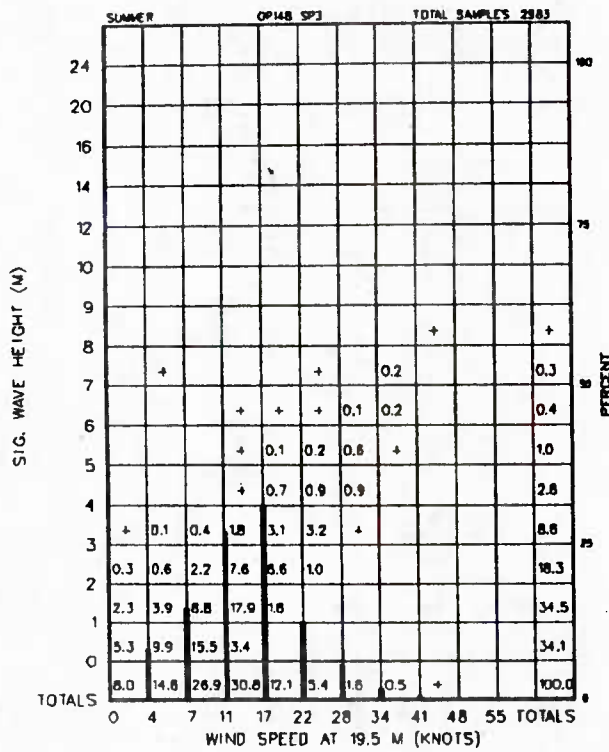


Figure A-148-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

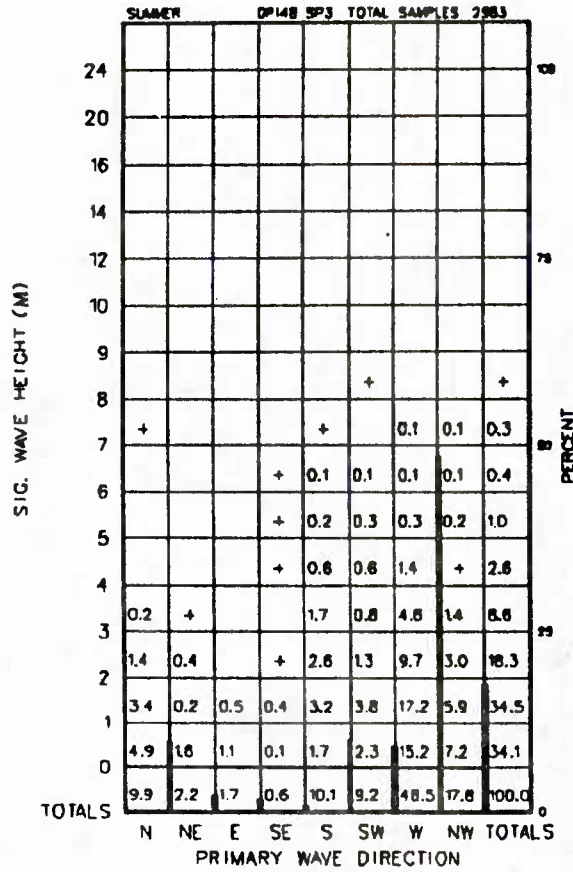


Figure A-148-4-3 Significant Wave Height vs. Primary Wave Direction

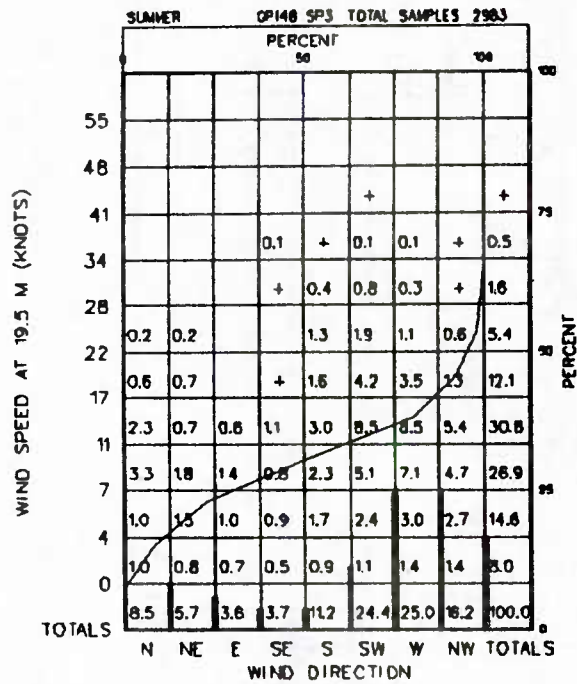


Figure A-148-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

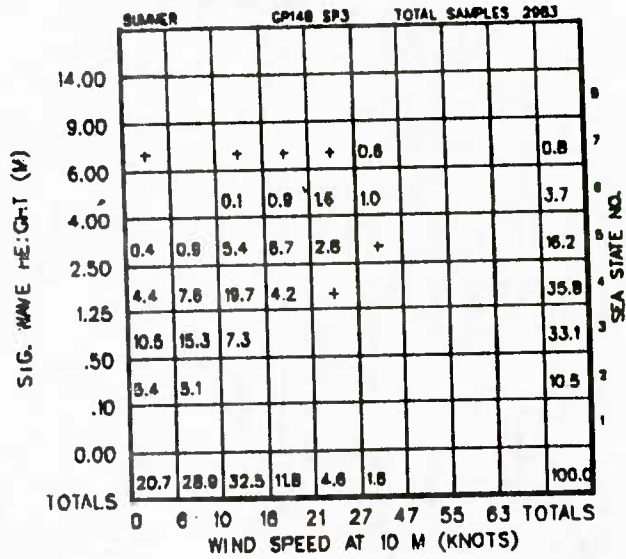


Figure A-148-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

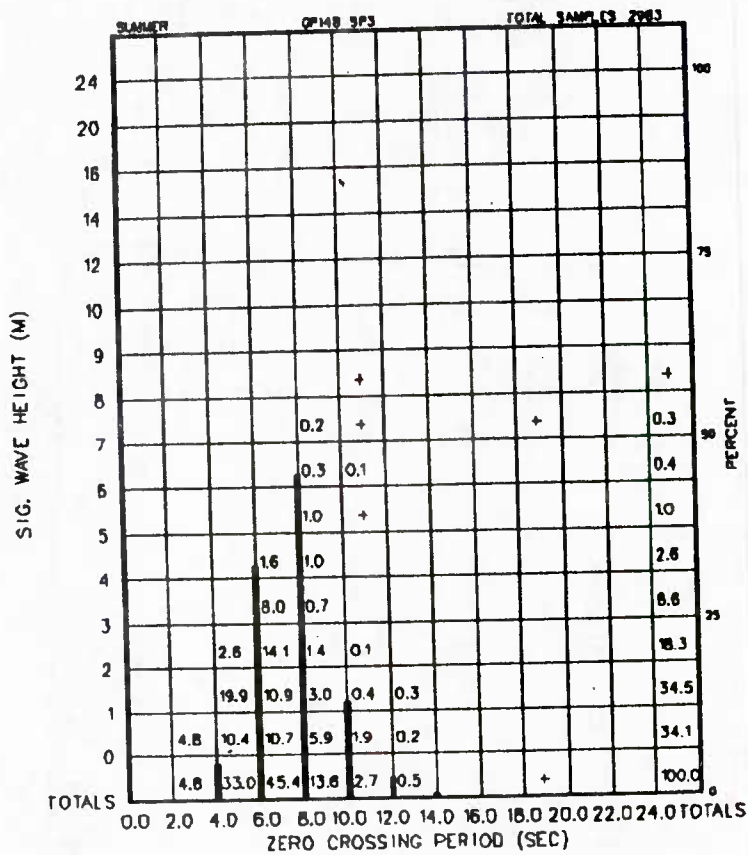


Figure A-148-4-6 Significant Wave Height vs. Zero Crossing Period

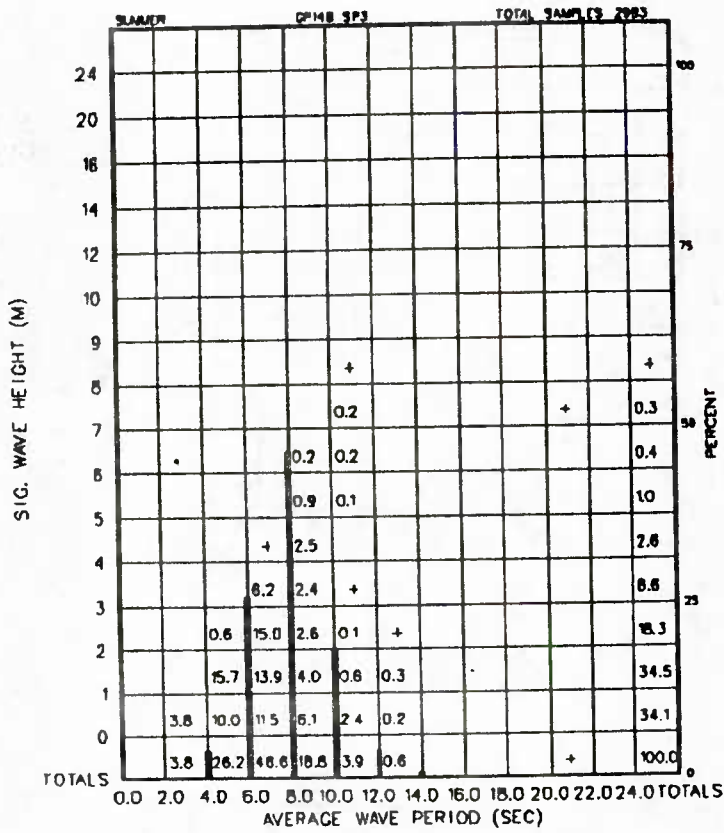


Figure A-148-4-7 Significant Wave Height vs. Average Wave Period

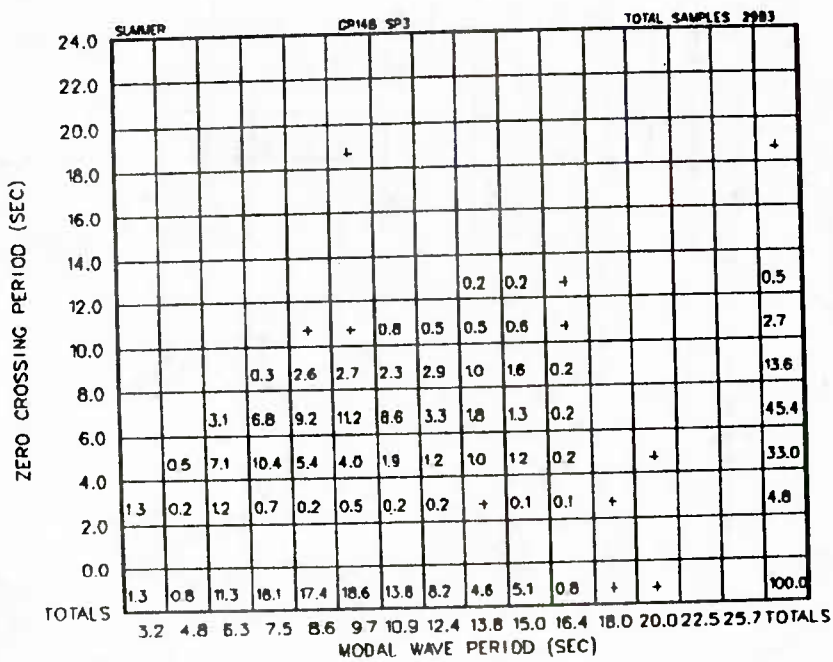


Figure A-148-4-8 Zero Crossing Period vs. Modal Wave Period

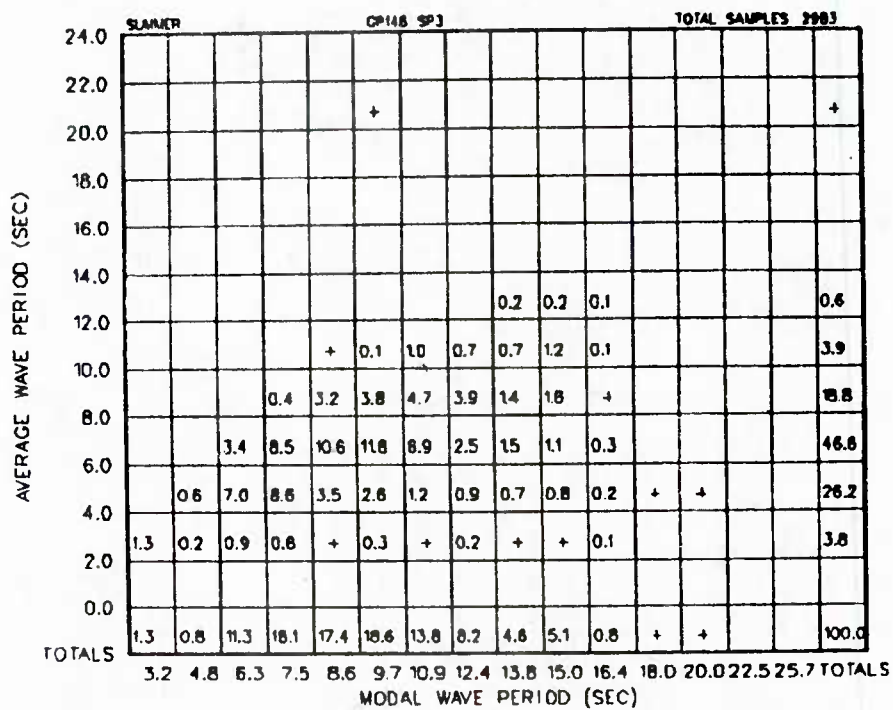


Figure A-148-4-9 Average Wave Period vs.
Modal Wave Period

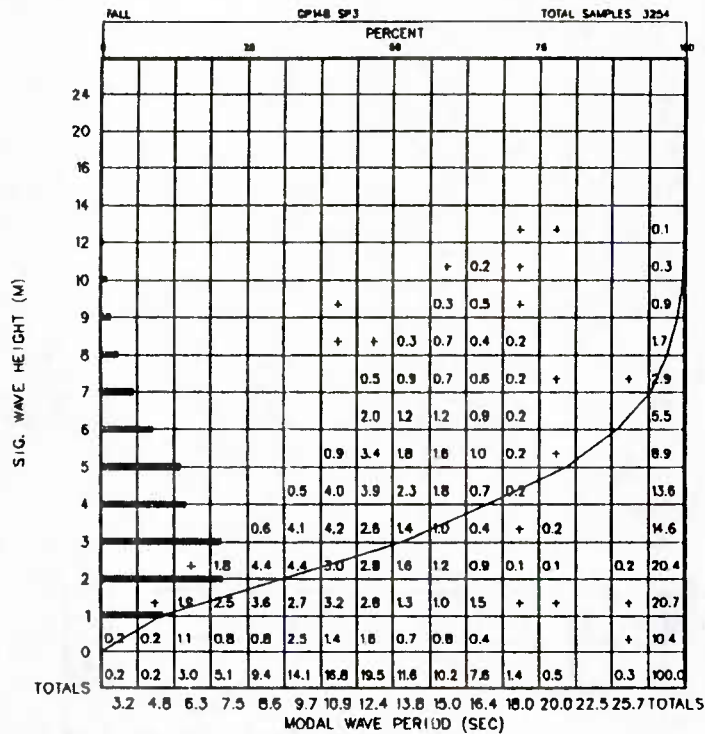


Figure A-148-5-1 Significant Wave Height vs. Modal Wave Period

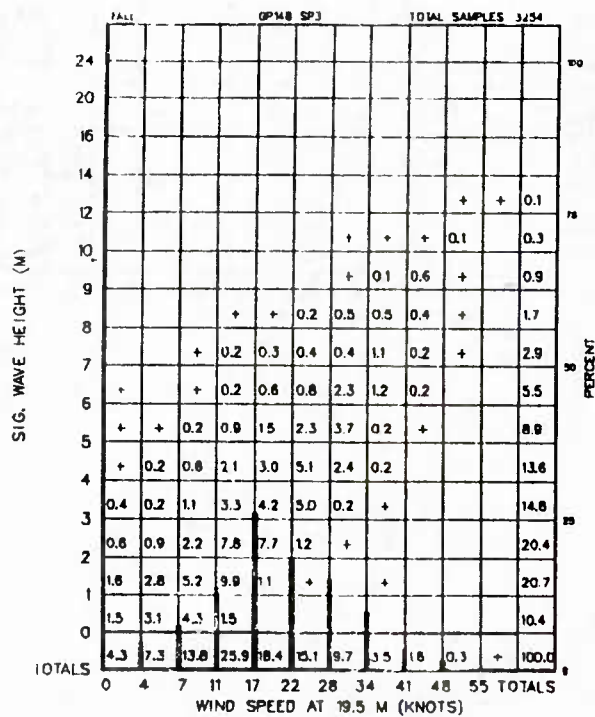


Figure A-148-5-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

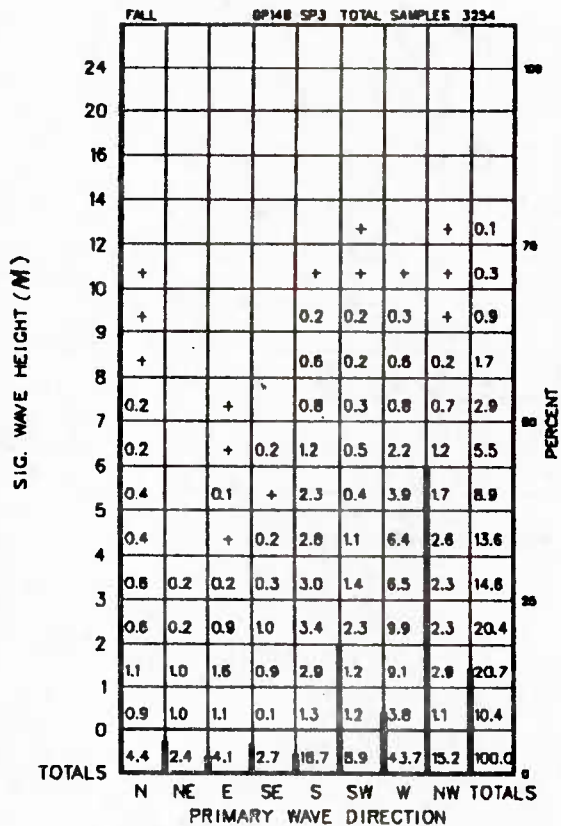


Figure A-148-5-3 Significant Wave Height vs. Primary Wave Direction

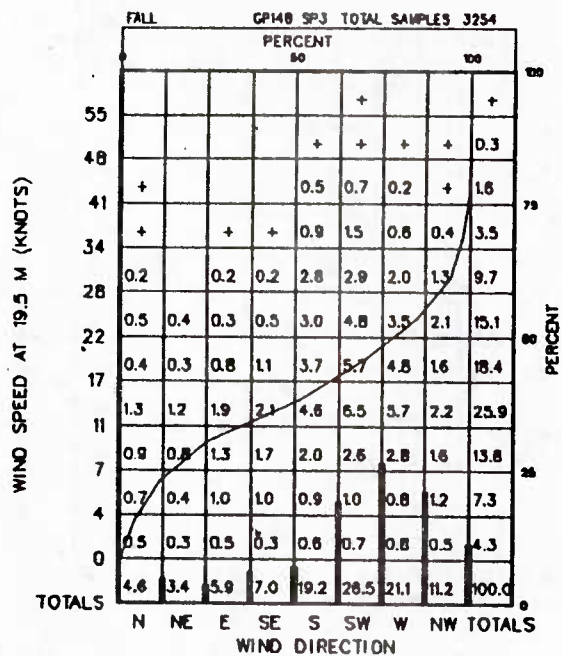


Figure A-148-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

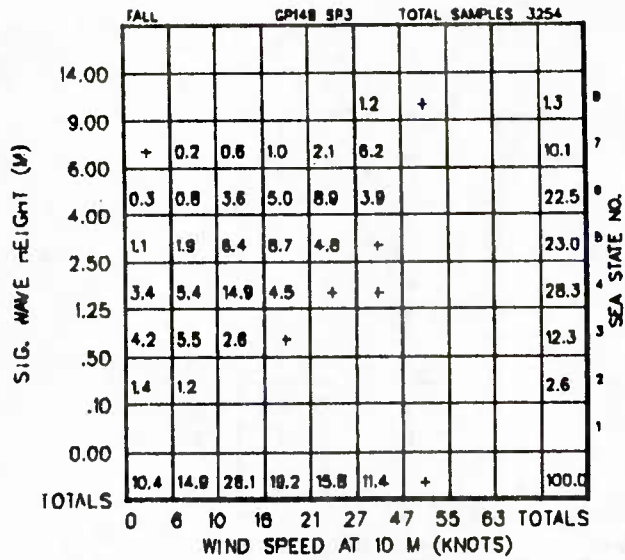


Figure A-148-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

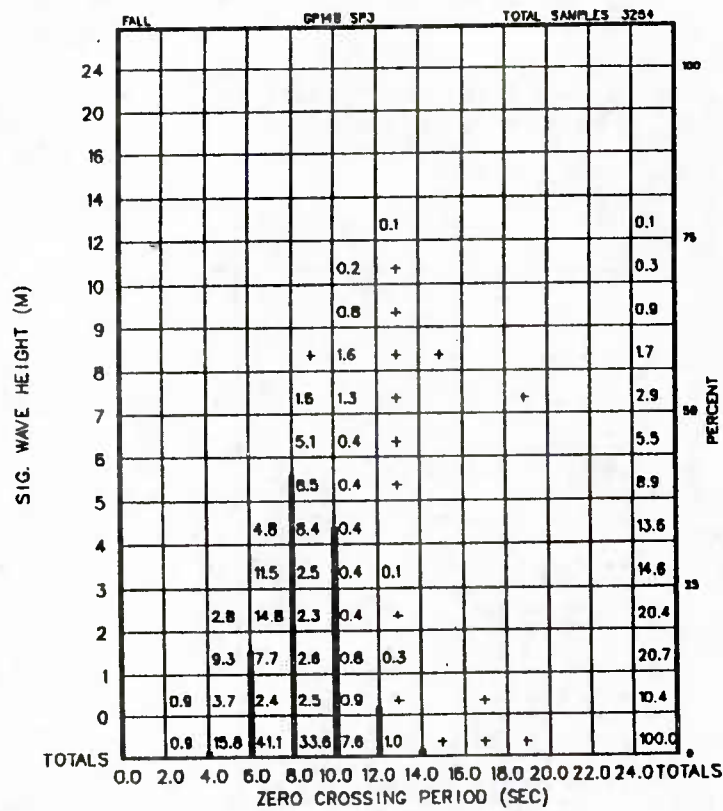


Figure A-148-5-6 Significant Wave Height vs. Zero Crossing Period

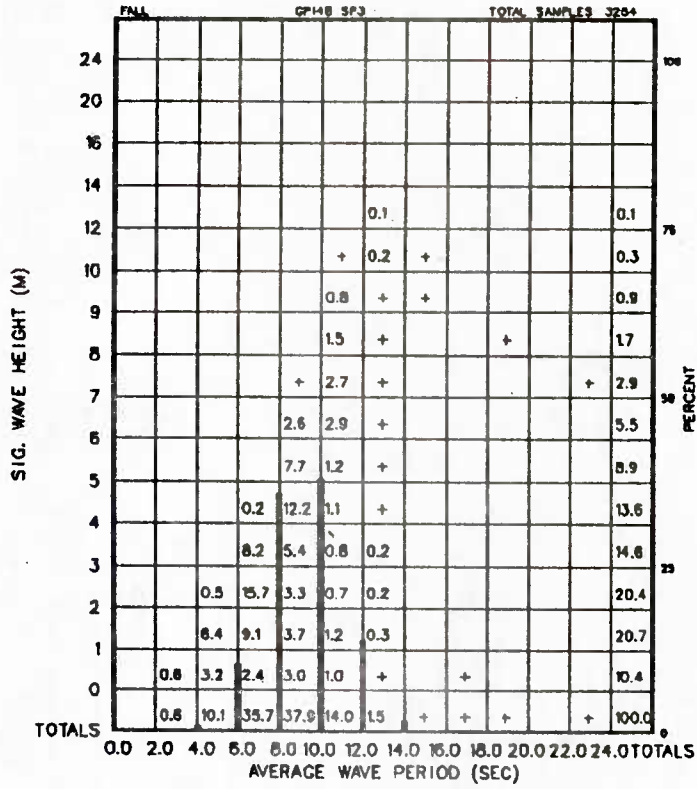


Figure A-148-5-7 Significant Wave Height vs. Average Wave Period

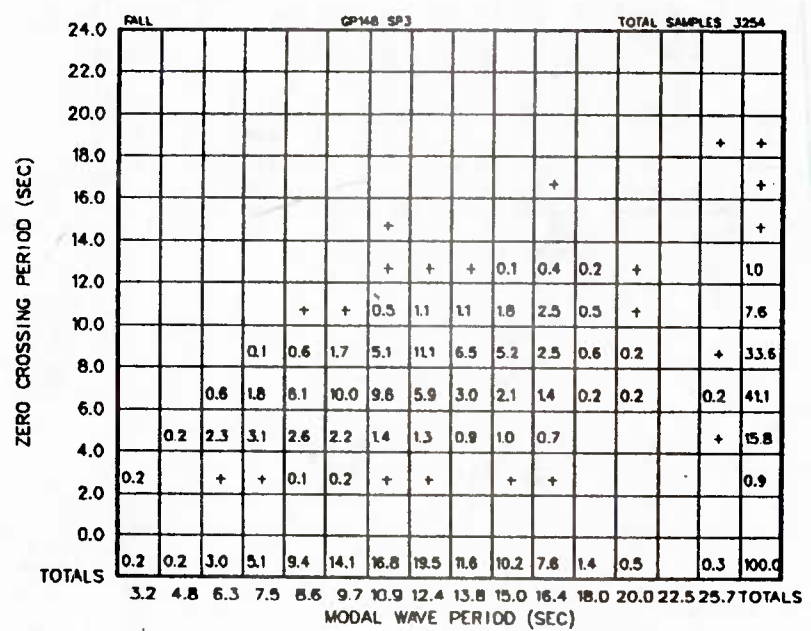


Figure A-148-5-8 Zero Crossing Period vs. Modal Wave Period

TABLE A-164-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 50.89°N, 145.65°W					
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	1 7 -	3.5 12.4 -	8.5 18 -	4 12.25 -	2.5 12.4 W
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	5 1.25 -	19 3 -	38 7.5 -	19.75 3.25 -	14 2.75 SW-W
Visibility, nautical miles	0.5	8	20	-	-
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	0.5 0.5	7 6	8 8	- -	- -
Precipitation (Occurrence)	All precipitation - 21% of the time		Snow - 5% of the time (Dec-Mar)		
Relative Humidity, %	70	88	98	-	-
Air Temperature, °C	4.5	6.5	9	6.5	-
Sea Surface Temperature, °C	6.5	8.5	11	-	-
Sea Level Pressure, millibars	990	1012	1032	-	-
Ice	None				
Refractivity Mean Surface Refractivity Sub-Refraction (1 km, Annual) Super-Refraction or Ducting (1 km, Annual)	- - -	- - -	- - -	324 - -	- 3% 2%

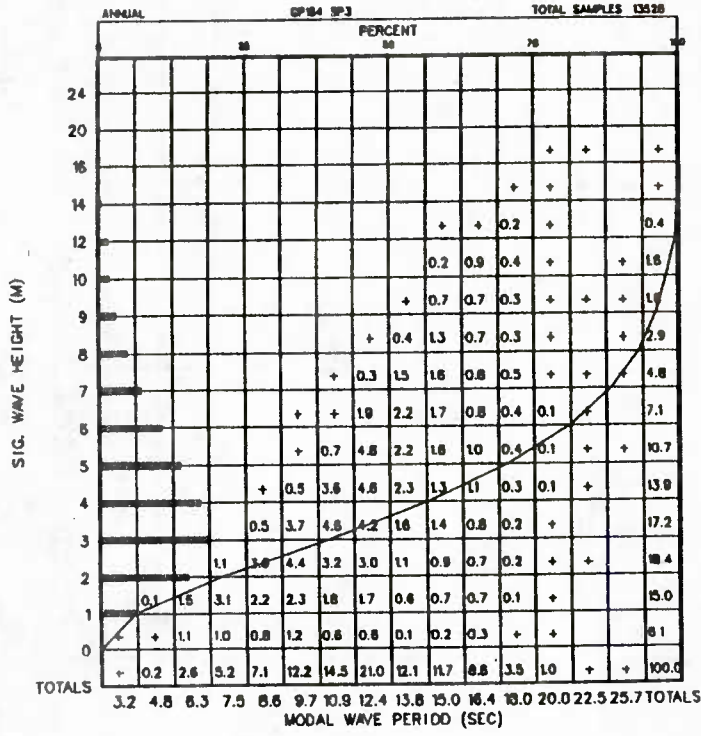


Figure A-164-1-1 Significant Wave Height vs. Modal Wave Period

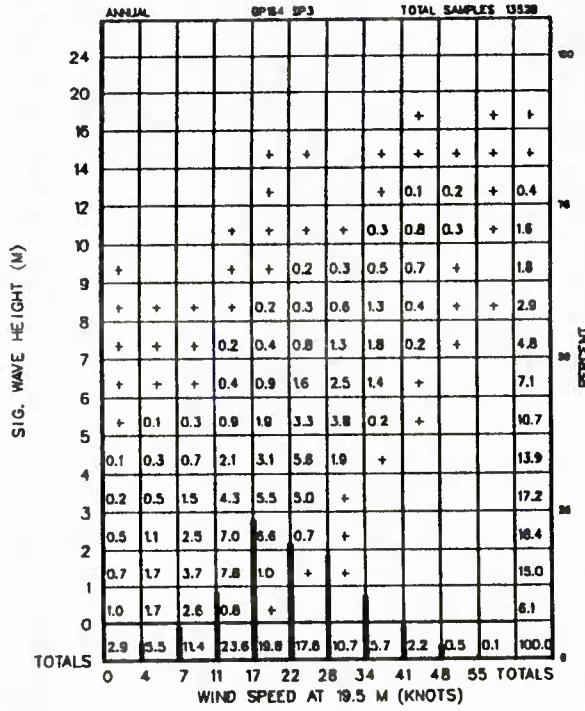


Figure A-164-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

ANNUAL		GP164 SP3 TOTAL SAMPLES 13520							
		PERCENT							
		50 100							
24									
20									
16				+		+		+	
14	+			+	+	+	+	+	
12	+			+	0.2	+	+	+	0.4
10	+			0.1	0.8	+	0.3	0.1	1.6
9	+		+	0.1	0.7	0.2	0.6	0.2	1.6
8	+		+	0.1	1.2	0.3	0.9	0.2	2.9
7	0.2	+	+	0.3	1.6	0.5	1.7	0.4	4.8
6	0.1	+	0.1	0.5	2.2	0.8	2.8	0.6	7.1
5	0.2	0.1	0.2	0.7	3.1	1.1	4.4	0.8	10.7
4	0.4	0.1	0.4	0.8	3.5	1.6	6.0	1.1	13.9
3	0.7	0.2	0.5	1.0	3.7	1.9	7.7	1.4	17.2
2	0.8	0.5	0.9	1.1	3.7	2.0	8.1	1.3	18.4
1	0.8	0.5	0.9	0.8	2.7	1.6	6.7	0.8	15.0
0	0.2	0.2	0.3	0.2	1.2	0.8	2.7	0.4	6.1
TOTALS	3.5	1.8	3.6	5.8	24.7	11.0	42.1	7.5	100.0
	N	NE	E	SE	S	SW	W	NW	TOTALS
	PRIMARY WAVE DIRECTION								

Figure A-164-1-3 Significant Wave Height vs. Primary Wave Direction

ANNUAL		GP164 SP3 TOTAL SAMPLES 13520							
		PERCENT							
		50 100							
55	+				+	+	+	+	0.1
48	+				+	0.1	+	0.1	0.5
41	+	+	+	0.2	0.7	0.4	0.5	0.3	2.2
34	0.1	+	+	0.5	1.4	1.2	1.3	0.8	5.7
28	0.3	0.1	0.2	0.9	2.5	2.8	2.5	1.6	10.7
22	0.5	0.3	0.5	1.3	3.3	4.9	4.2	2.2	17.6
17	0.6	0.5	0.7	2.2	3.4	5.3	4.8	2.2	19.8
11	1.0	1.1	1.4	2.3	3.6	5.3	5.6	3.1	23.6
7	0.8	0.6	0.8	1.2	1.6	2.1	2.5	1.6	11.4
4	0.5	0.5	0.4	0.8	0.7	1.1	1.0	0.7	5.5
0	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	2.8
TOTALS	3.9	3.4	4.3	9.8	17.9	23.6	23.0	12.8	100.0
	N	NE	E	SE	S	SW	W	NW	TOTALS
	WIND DIRECTION								

Figure A-164-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

SIG. WAVE HEIGHT (M)	ANNUAL		GP164 SP3			TOTAL SAMPLES 13528			SEA STATE NO.	
			+	+	+	+	+			
14.00									0.1	
9.00	+		+	+	0.2	3.1	0.3	+	3.8	
6.00	0.1	0.2	0.9	1.6	3.4	6.5	+		14.8	
4.00	0.6	1.1	3.5	6.0	9.9	3.5			24.6	
2.50	1.2	2.8	8.7	10.0	4.1	+			26.8	
1.25	2.4	4.3	11.0	2.9	+	+			20.6	
.50	2.2	3.3	2.2	+					7.7	
.10	1.0	0.7							1.7	
0.00										
TOTALS	7.4	12.3	26.2	20.6	17.7	15.2	0.3	+	100.0	
	0	6	10	16	21	27	47	55	63	TOTALS

Figure A-164-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

SIG. WAVE HEIGHT (M)	ANNUAL		GP164 SP3			TOTAL SAMPLES 13528			PERCENT					
24									100					
20						+	+		+					
18						+	+		+					
14						+	0.3	+	0.4					
12					1.4	0.2			1.6					
10					1.8	+		+	1.8					
9					+	2.6	+	+	2.9					
8					2.2	2.5	+	+	4.8					
7					6.3	0.8	+		7.1					
6					10.0	0.6	+	+	10.7					
5					3.9	9.3	0.5	0.2	13.9					
4					12.9	3.5	0.8	+	17.2					
3					1.8	13.3	2.6	0.6	18.4					
2					7.7	5.0	1.8	0.4	15.0					
1					0.7	2.0	1.8	1.3	6.1					
0					0.7	11.4	37.0	37.1	12.5					
TOTALS	0.7	11.4	37.0	37.1	12.5	1.2	0.1	+	100.0					
	0.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	TOTALS

Figure A-164-1-6 Significant Wave Height vs. Zero Crossing Period

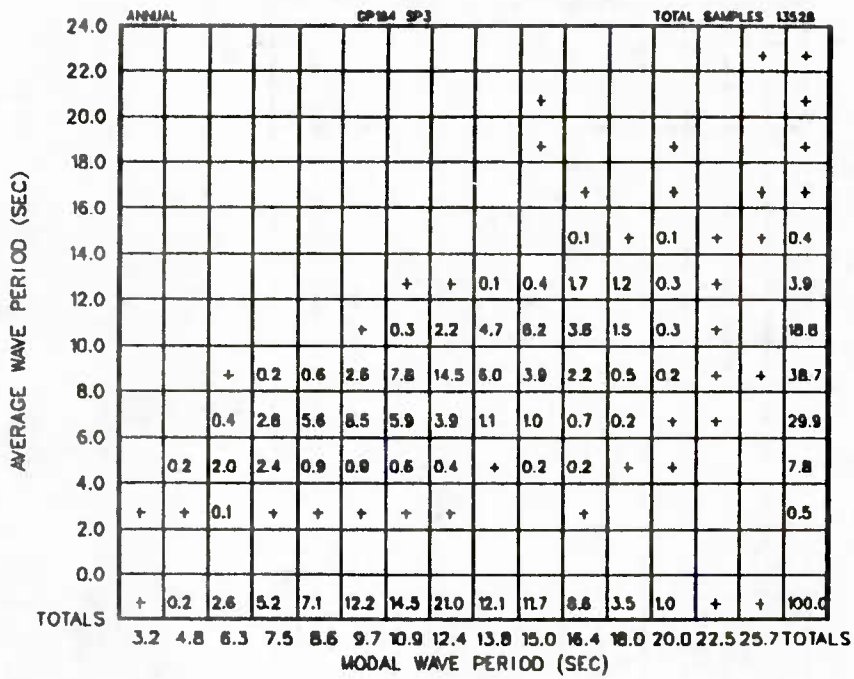


Figure A-164-1-9 Average Wave Period vs. Modal Wave Period

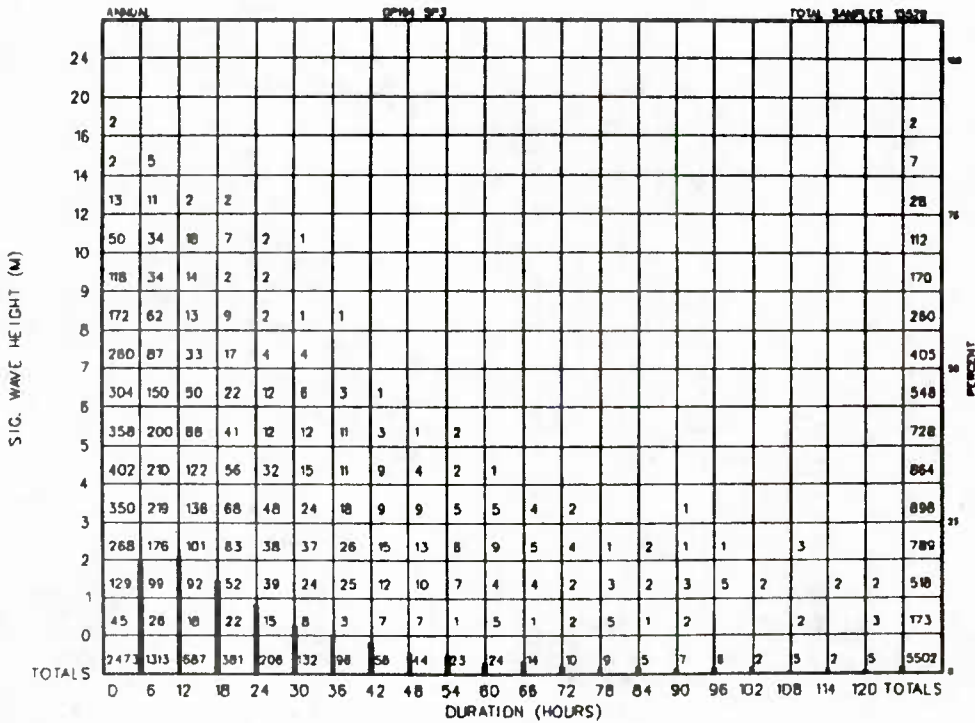


Figure A-164-1-10 Persistence of Wave Height

		ANNUAL												CP164 SP3												TOTAL SAMPLES 13528													
		0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	TOTALS																
WIND SPEED AT 19.5 M (KNOTS)	55	10	2	2																			14																
	48	38	9	4	1																		52																
	41	119	49	20	3	1				1													163																
	34	274	112	52	13	5	2	2	1														481																
	28	490	198	89	37	15	10	1	1														839																
	22	737	283	149	68	32	10	10	3	2	1	1											1290																
	17	854	322	165	83	37	18	6	8	1	1		1		1								1475	PERCENT															
	11	728	337	168	82	54	29	12	15	8	4	5	3	2	1	2							1483																
	7	524	202	97	33	15	8	4	1	2		1											887																
	4	334	109	32	10	7	4																498																
	0	154	54	19	10	3	2																242																
	TOTALS	4282	1670	815	320	169	81	38	29	13	8	7	4	2	2	2							7418																
			0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	TOTALS															

Figure A-164-1-11 Persistence of Wind Speed at 19.5 M (Knots)

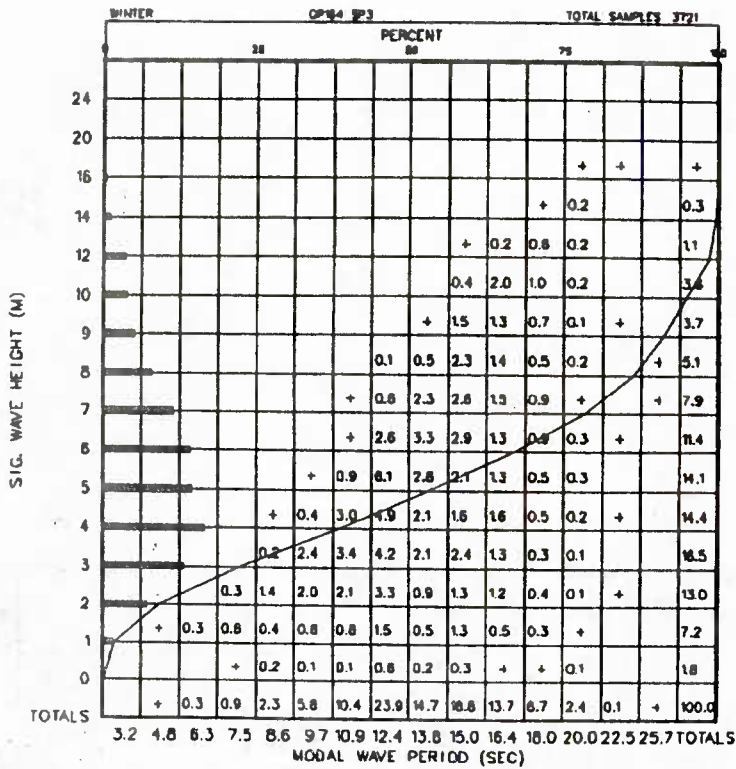


Figure A-164-2-1 Significant Wave Height vs. Modal Wave Period

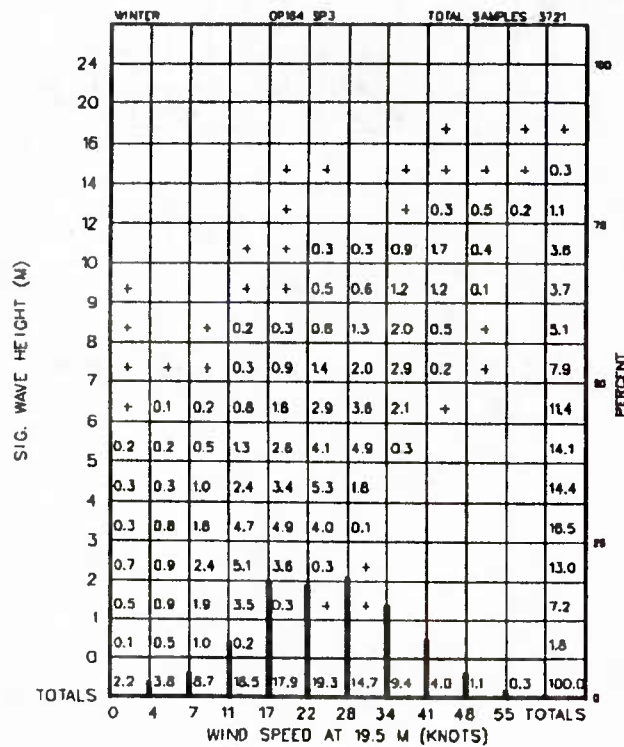


Figure A-164-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

WINTER GPM4 SP3 TOTAL SAMPLES 3721

SIC. WAVE HEIGHT (M)	PERCENT								TOTALS	
	N	NE	E	SE	S	SW	W	NW		
24										
20										
16				+		+		+		
14	+			+	+	+		+		0.3
12	+			+	0.8	+	0.1	+		1.1
10	0.2			0.3	2.1	0.2	0.8	0.1		3.8
9	+		0.1	0.1	1.9	0.3	1.0	0.1		3.7
8	0.1		0.3	0.2	2.5	0.4	1.3	0.3		5.1
7	0.4	+	0.2	0.4	2.8	0.7	2.6	0.8		7.9
6	0.3	+	0.3	0.9	3.7	1.2	3.8	1.1		11.4
5	0.5	0.4	0.5	1.0	4.5	1.3	4.7	1.4		14.1
4	1.0	0.4	0.8	0.9	3.8	1.4	4.8	1.7		14.4
3	1.3	0.5	0.8	1.8	3.8	1.1	5.2	2.2		18.5
2	1.0	0.9	1.0	1.0	3.3	0.8	4.1	1.2		13.0
1	1.0	0.8	0.7	0.3	1.9	0.3	1.7	0.3		7.2
0	+	0.3	+	+	0.3	0.1	0.9	+		1.8
TOTALS	6.0	3.5	4.3	6.9	31.3	7.8	31.0	9.2		100.0

PRIMARY WAVE DIRECTION

Figure A-164-2-3 Significant Wave Height vs. Primary Wave Direction

WINTER GPM4 SP3 TOTAL SAMPLES 3721

WIND SPEED AT 19.5 M (KNOTS)	PERCENT								TOTALS	
	N	NE	E	SE	S	SW	W	NW		
55	+				0.2	+	+	+		0.3
48	+				0.2	0.3	0.3	0.2	0.1	1.1
41	+	+	+	0.3	1.6	0.7	0.7	0.5		4.0
34	0.3	+	0.3	1.1	2.4	1.8	2.0	1.2		9.4
28	0.5	0.3	0.4	1.6	3.0	3.3	3.4	2.1		14.7
22	0.9	0.3	0.5	1.8	3.4	4.8	4.5	2.6		19.3
17	0.8	0.7	1.1	2.6	2.3	4.0	4.0	2.3		17.9
11	1.2	1.5	2.1	2.5	2.8	2.8	3.4	2.3		18.5
7	0.8	0.6	1.1	1.1	1.4	0.8	1.3	1.4		8.7
4	0.3	0.3	0.2	0.8	0.3	0.5	0.6	0.6		3.8
0	0.3	0.2	0.3	0.3	0.2	0.3	0.3	0.2		2.2
TOTALS	5.3	4.1	6.1	12.3	17.7	19.2	20.4	13.2		100.0

WIND DIRECTION

Figure A-164-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

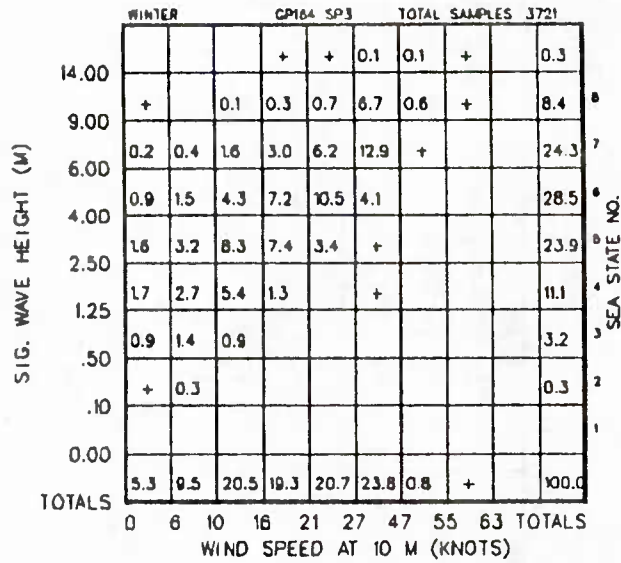


Figure A-164-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

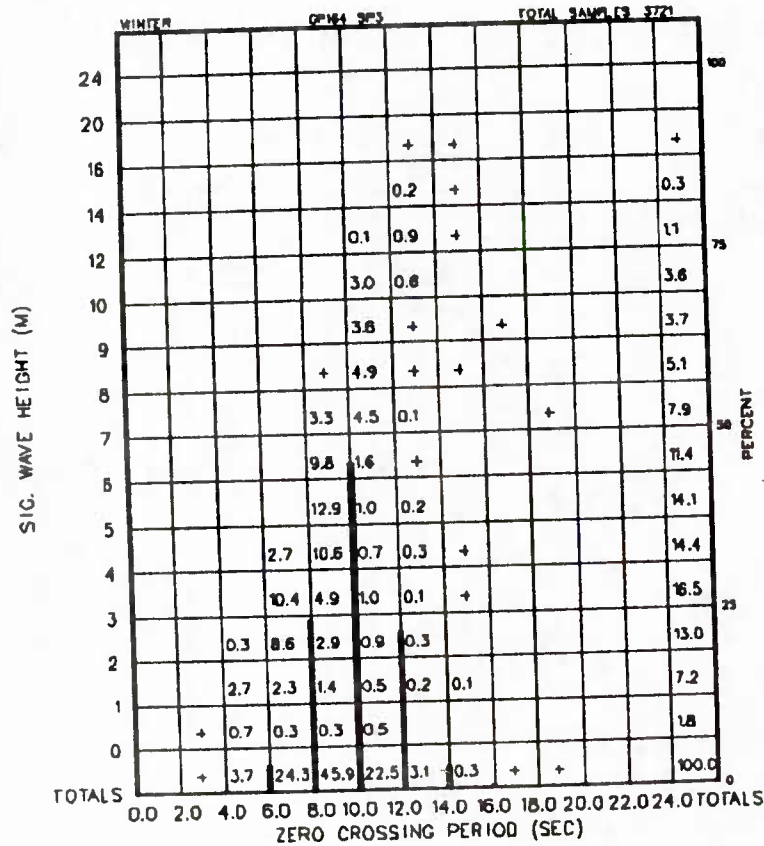


Figure A-164-2-6 Significant Wave Height vs. Zero Crossing Period

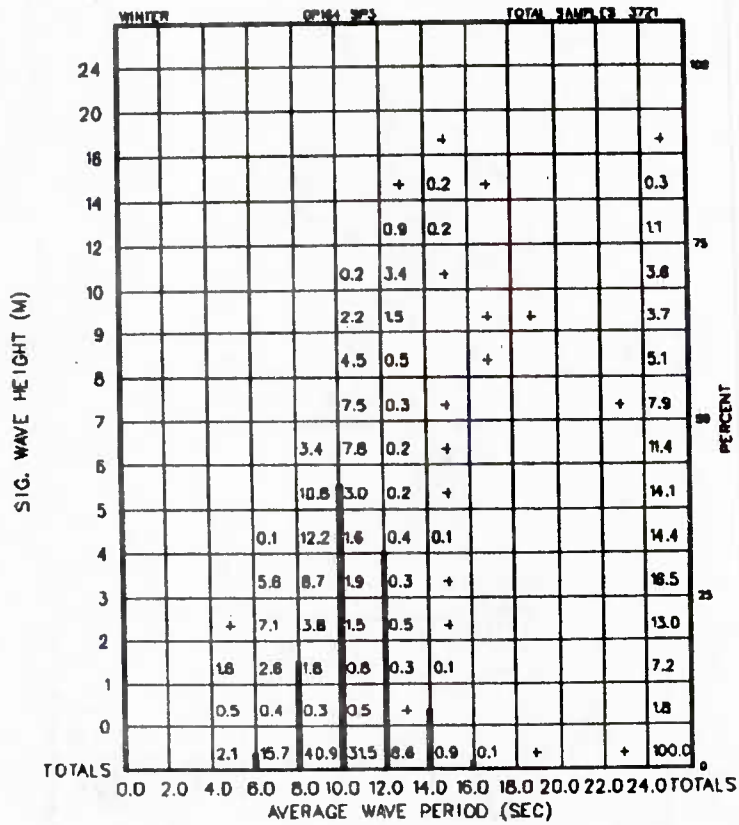


Figure A-164-2-7 Significant Wave Height vs. Average Wave Period

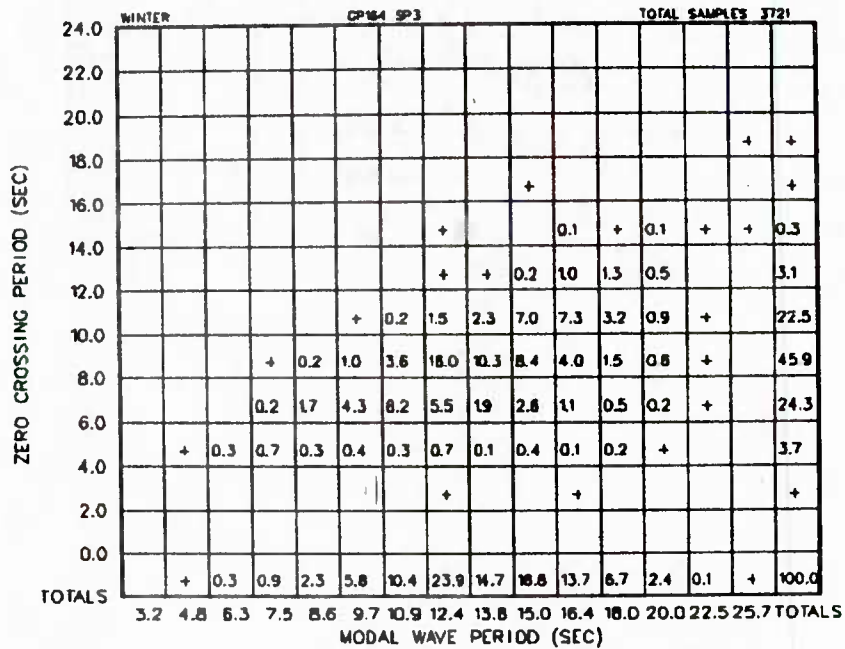


Figure A-164-2-8 Zero Crossing Period vs. Modal Wave Period

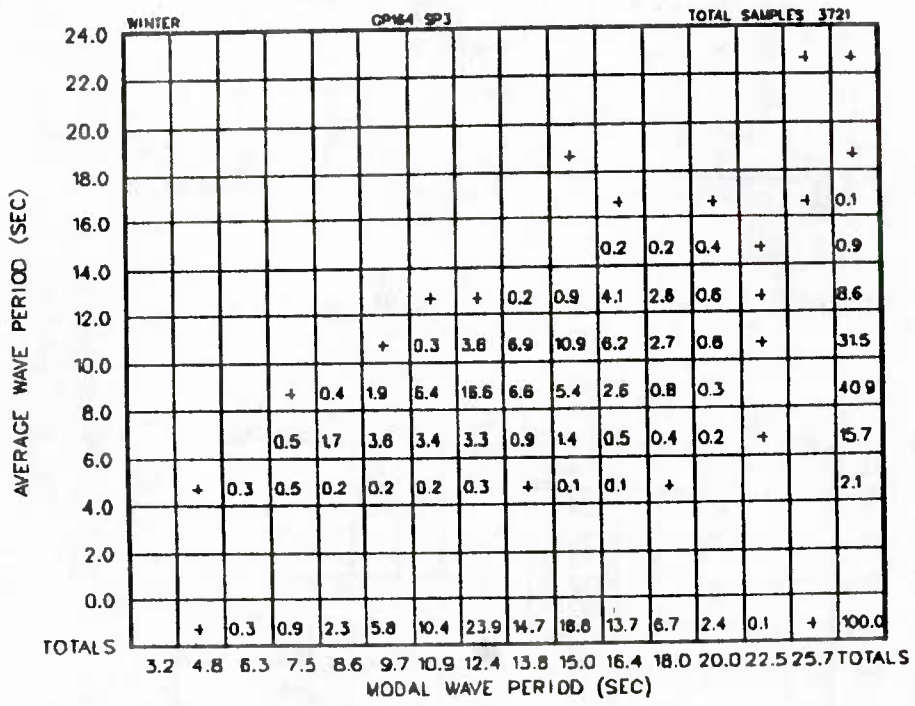


Figure A-164-2-9 Average Wave Period vs. Modal Wave Period

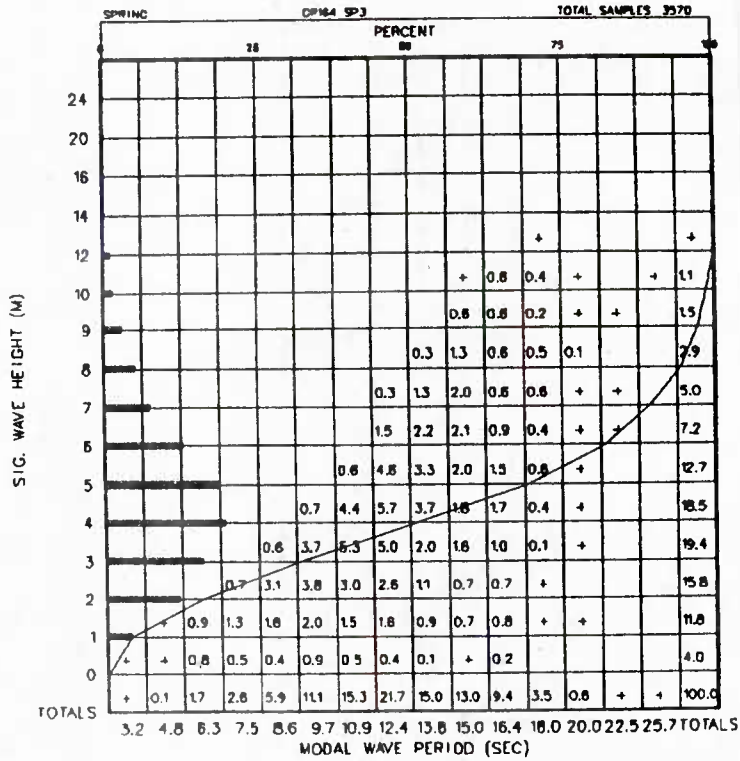
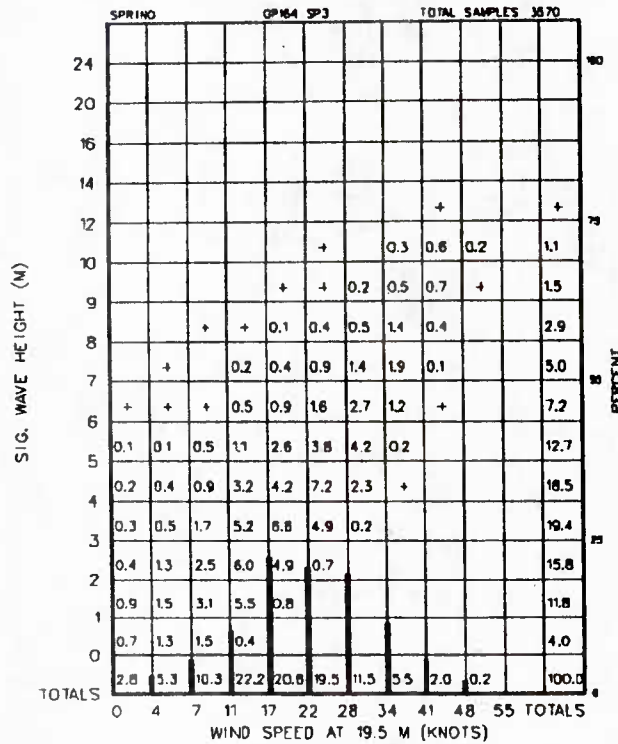


Figure A-164-3-1 Significant Wave Height vs. Modal Wave Period



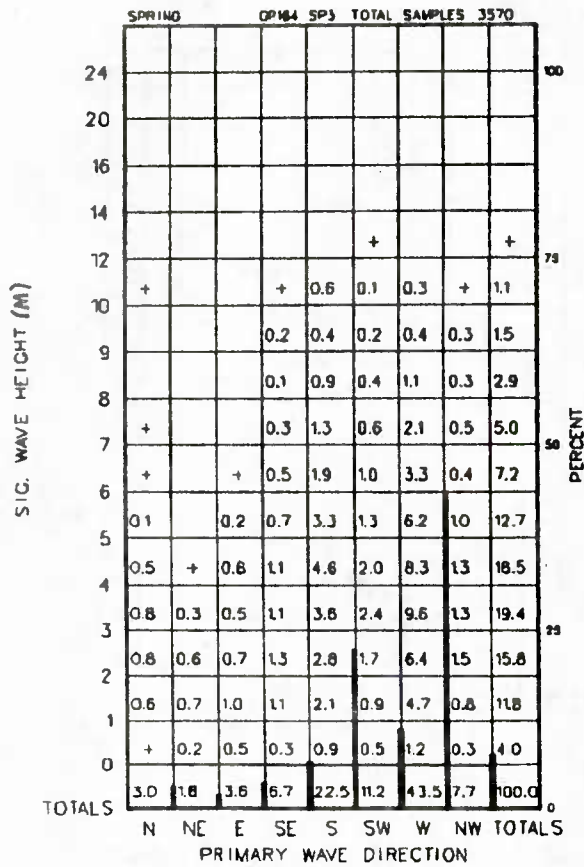


Figure A-164-3-3 Significant Wave Height vs. Primary Wave Direction

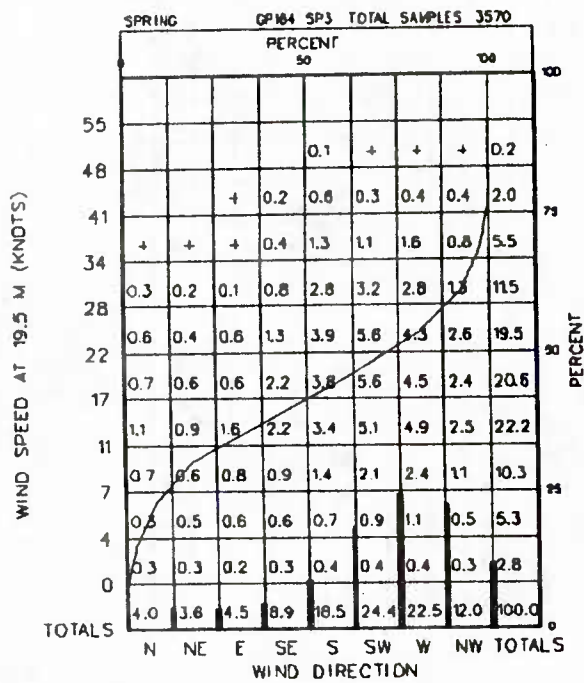


Figure A-164-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

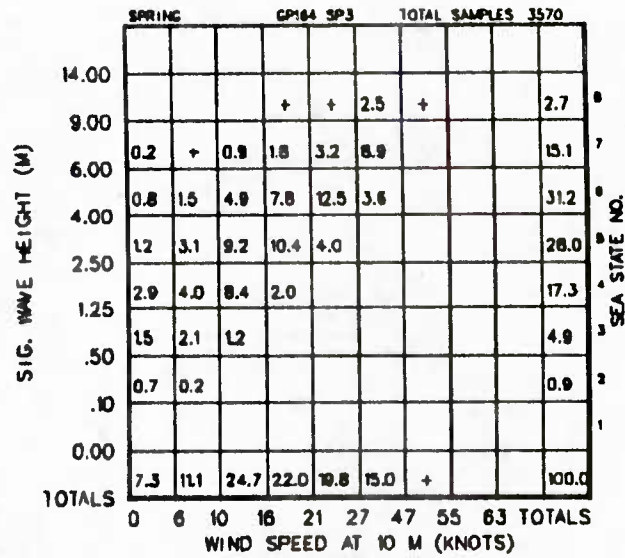


Figure A-164-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

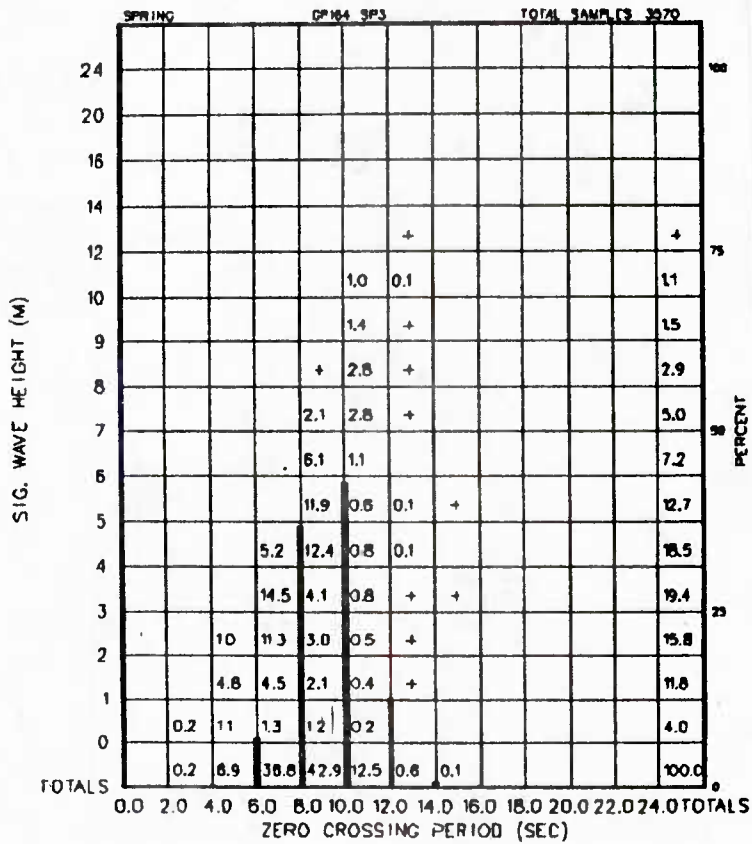


Figure A-164-3-6 Significant Wave Height vs. Zero Crossing Period

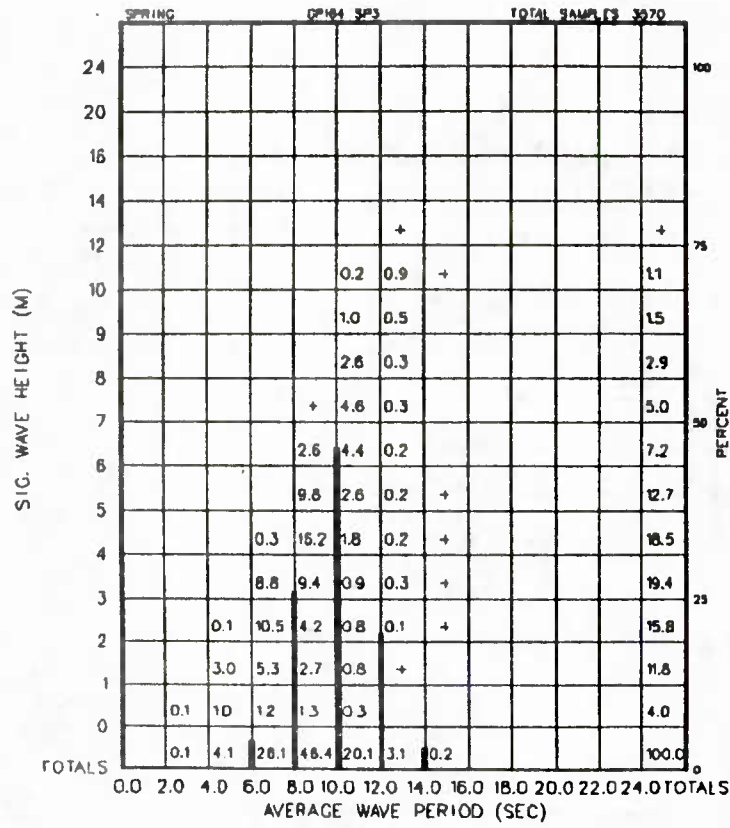


Figure A-164-3-7 Significant Wave Height vs. Average Wave Period

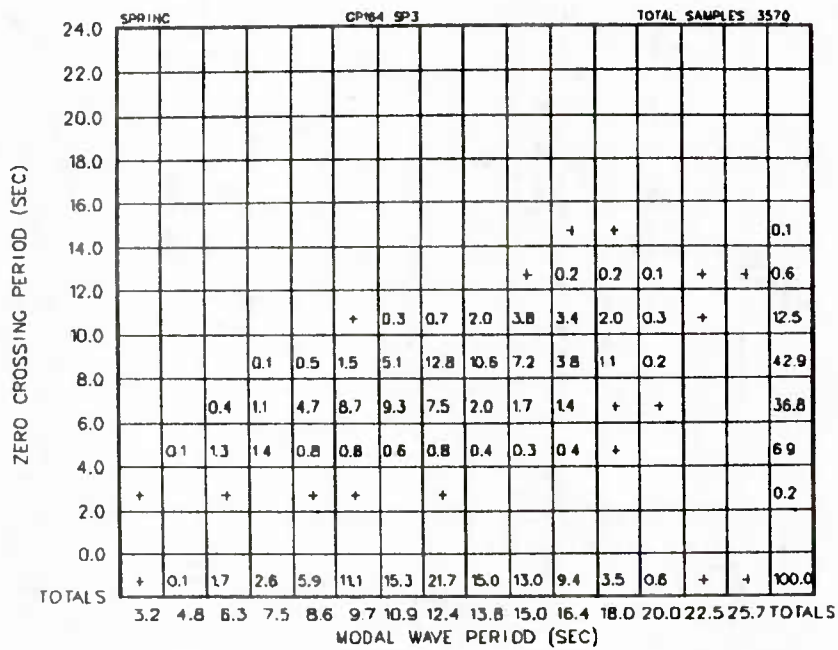


Figure A-164-3-8 Zero Crossing Period vs. Modal Wave Period

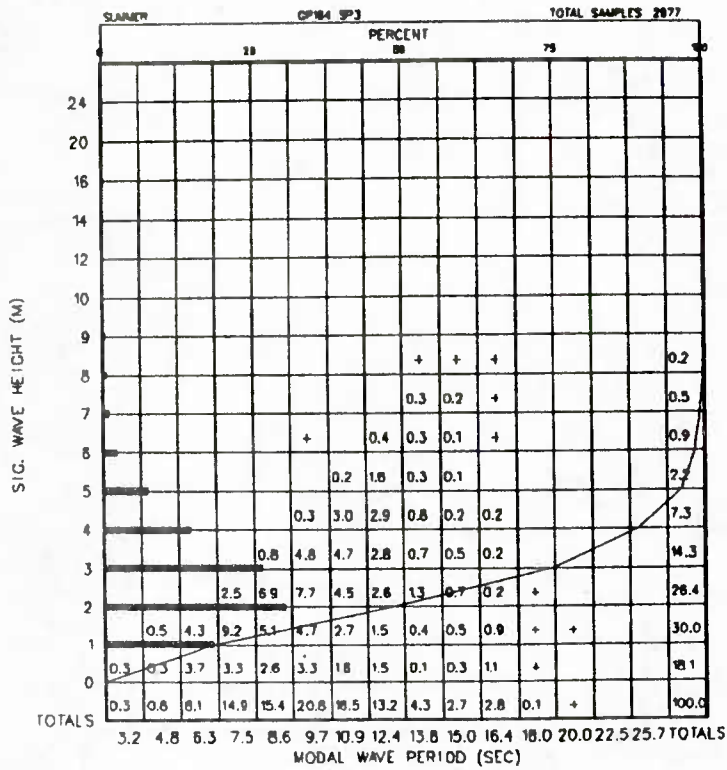


Figure A-164-4-1 Significant Wave Height vs. Modal Wave Period

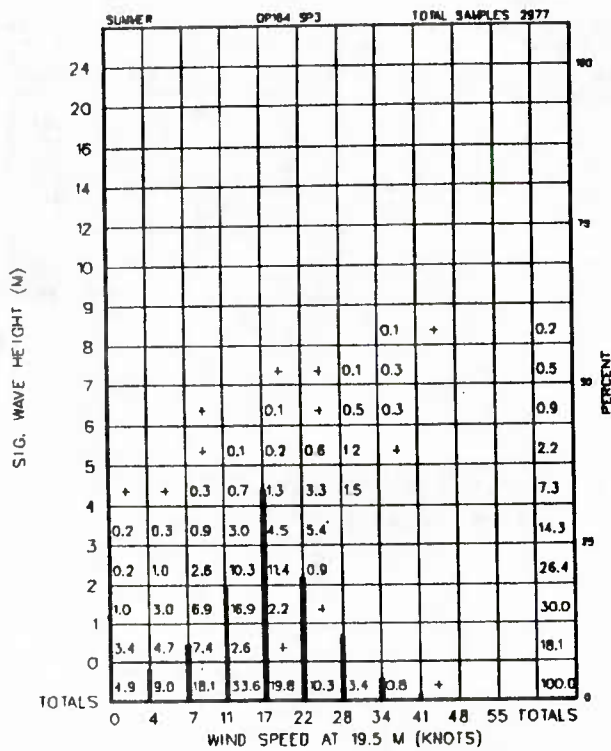


Figure A-164-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

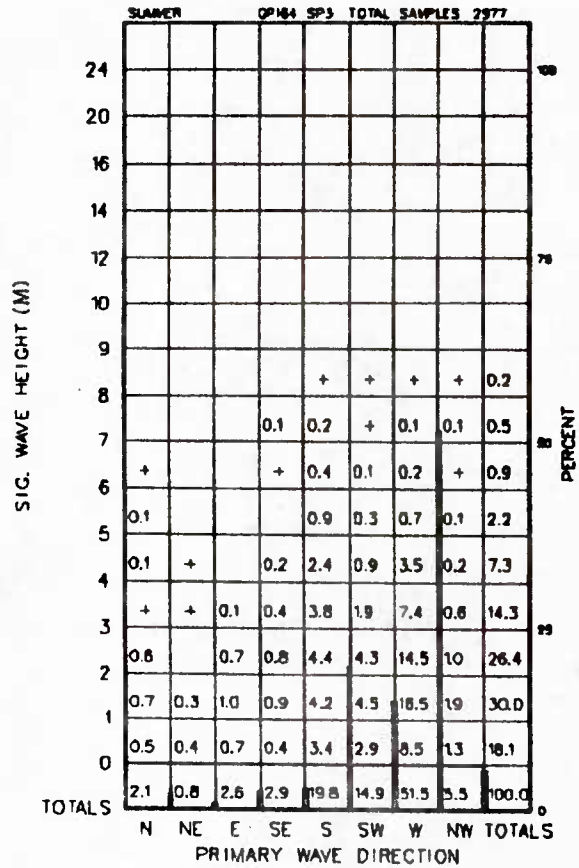


Figure A-164-4-3 Significant Wave Height vs. Primary Wave Direction

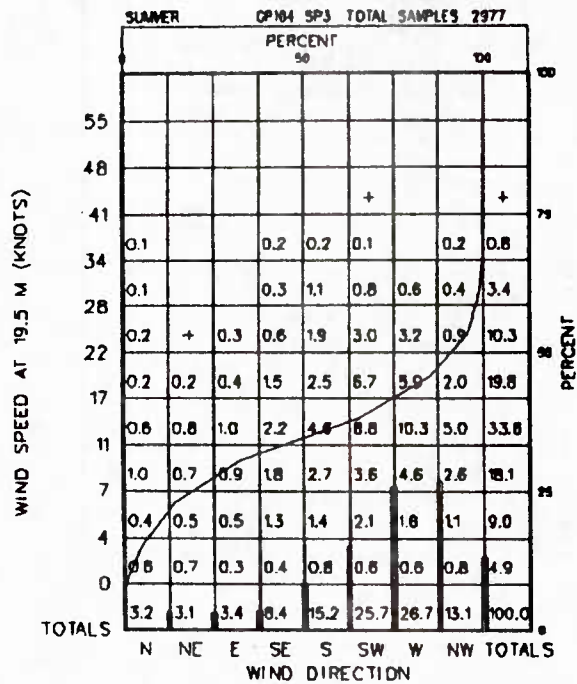


Figure A-164-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

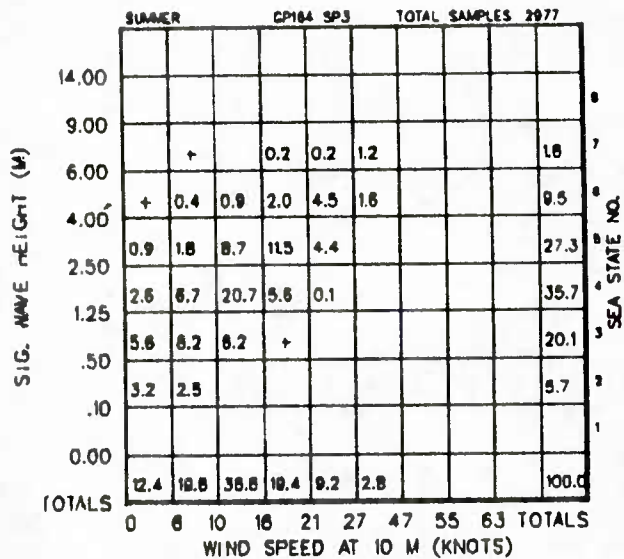


Figure A-164-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

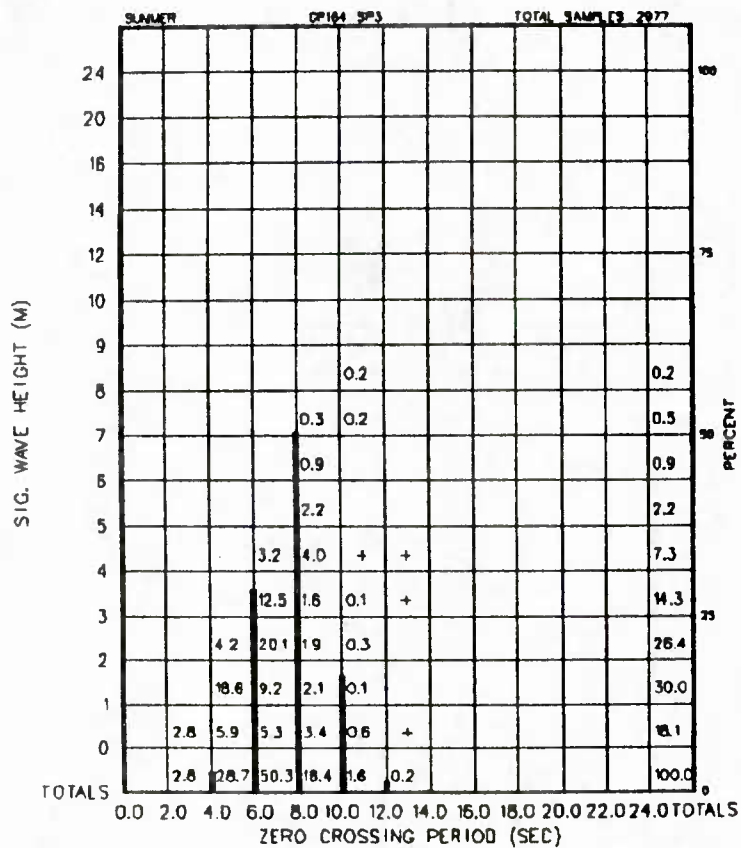


Figure A-164-4-5 Significant Wave Height vs. Zero Crossing Period

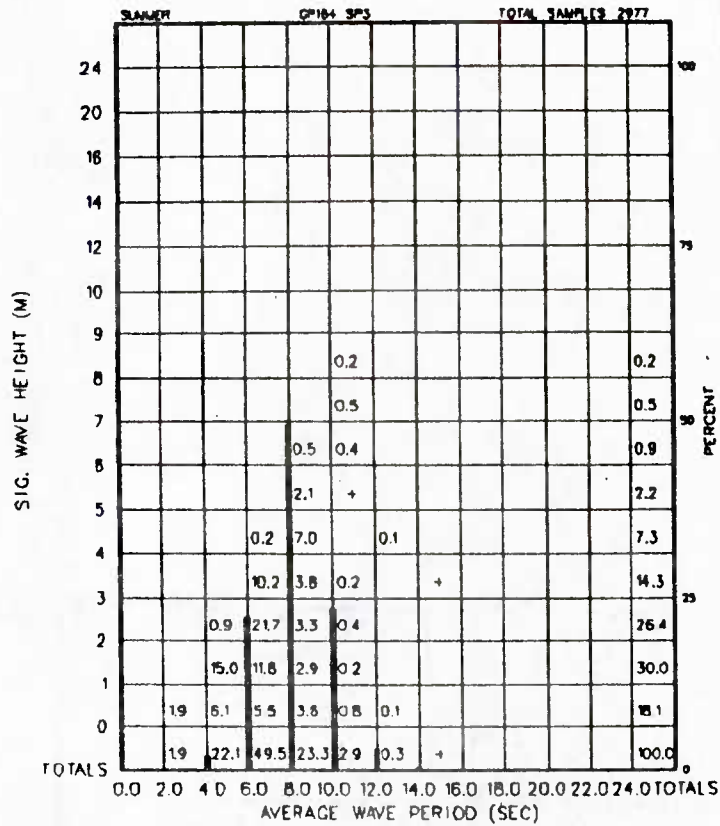


Figure A-164-4-7 Significant Wave Height vs. Average Wave Period

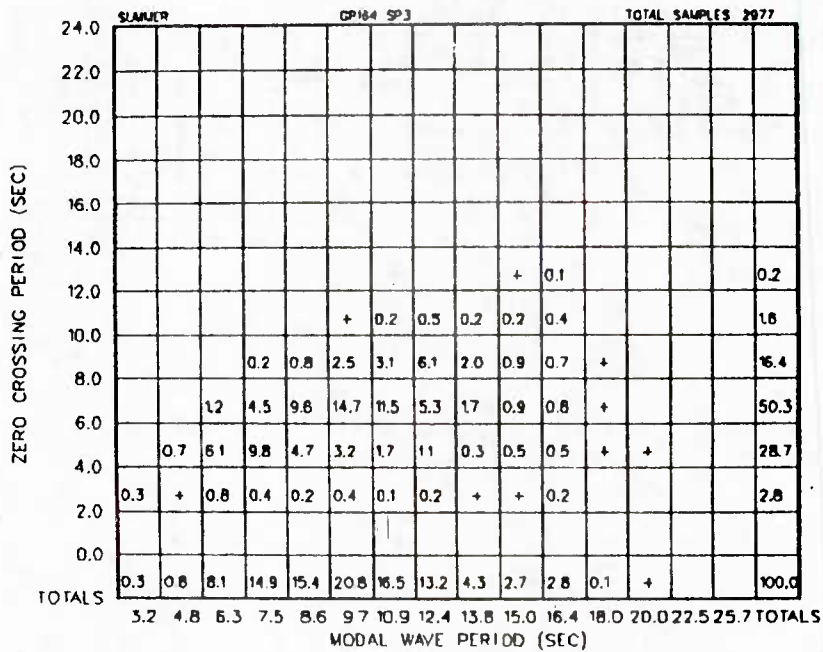


Figure A-164-4-8 Zero Crossing Period vs. Modal Wave Period

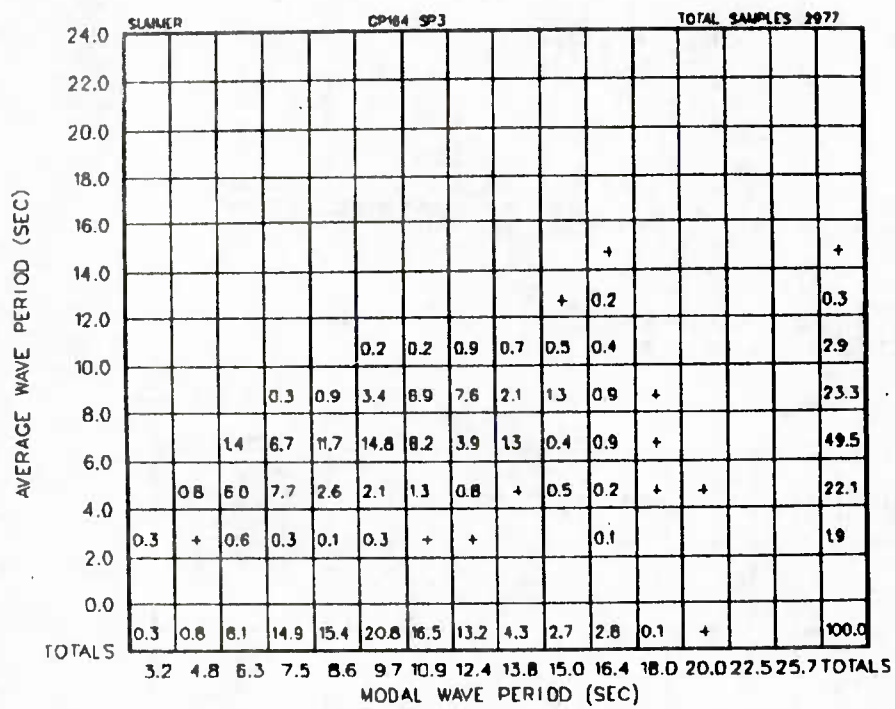


Figure A-164-4-9 Average Wave Period vs. Modal Wave Period

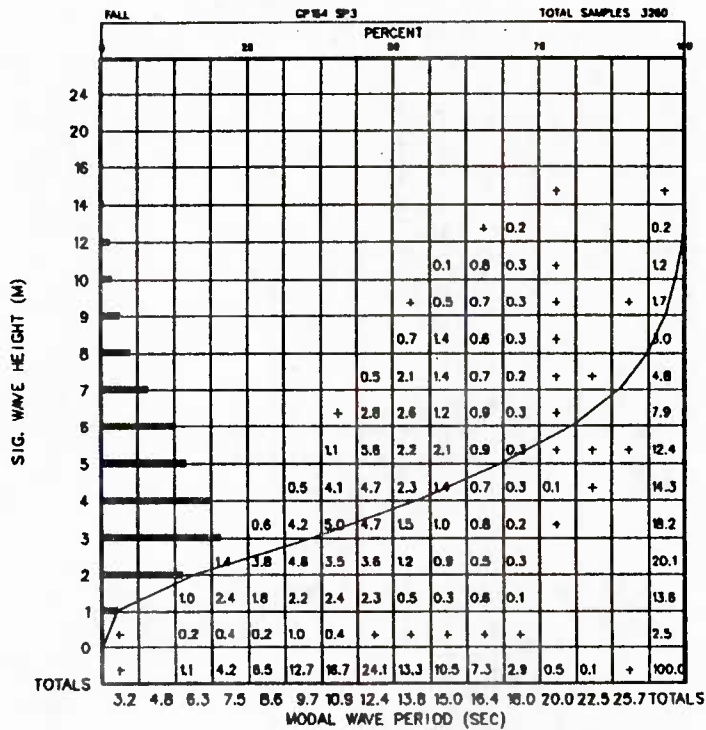


Figure A-164-5-1 Significant Wave Height vs. Modal Wave Period

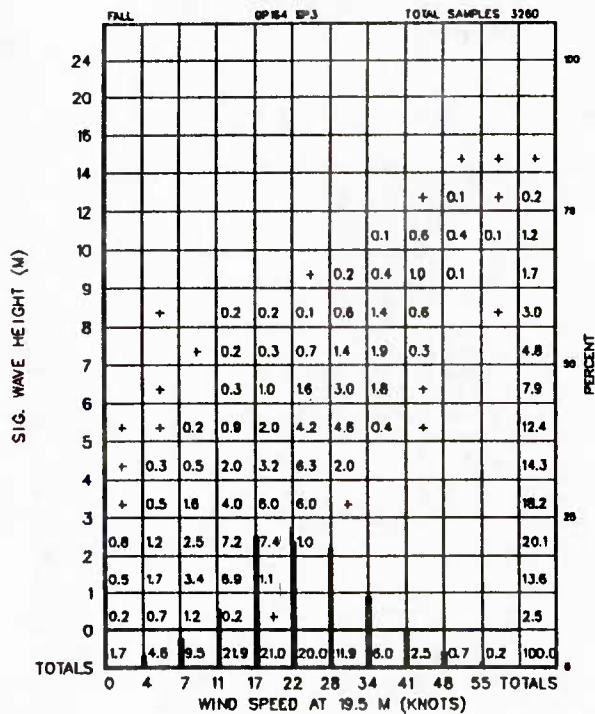


Figure A-164-5-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

FALL		GP164 SP3		TOTAL SAMPLES		3260				
24								8		
20										
16										
14						+	+			
12						+	+	0.2		
10	0.1				0.4	+	0.4	0.2	1.2	
9	+				+	0.2	0.2	0.9	0.2	1.7
8	0.1			0.1	1.0	0.4	1.2	0.2	3.0	
7	+		+	0.5	1.9	0.5	1.5	0.4	4.8	
6	+		+	0.6	2.4	0.8	3.6	0.5	7.9	
5	0.2		0.2	0.9	3.3	1.5	5.6	0.7	12.4	
4	+	+	0.4	0.8	3.2	1.9	7.0	0.9	14.3	
3	0.5	+	0.8	0.9	3.6	2.1	8.7	1.5	16.2	
2	0.6	0.3	1.3	1.4	4.3	2.0	8.7	1.5	20.1	
1	0.7	0.2	0.7	0.9	3.1	1.3	5.8	0.8	13.6	
0	0.1	+	+	+	0.7	0.2	1.3	+	2.5	
TOTALS	2.8	0.7	3.7	6.1	24.2	10.9	44.8	7.1	100.0	
	N	NE	E	SE	S	SW	W	NW	TOTALS	

PRIMARY WAVE DIRECTION

Figure A-164-5-3 Significant Wave Height vs. Primary Wave Direction

FALL		GP164 SP3		TOTAL SAMPLES		3260				
		PERCENT		90		100				
55						+	+	+	+	0.2
48					+	0.2	+	0.2	0.2	0.7
41	+			0.2	0.5	0.4	0.9	0.4	2.5	
34				0.4	1.6	1.6	1.5	0.9	6.0	
28	0.2		+	0.8	2.9	3.6	2.9	1.4	11.9	
22	0.3	0.4	0.4	1.5	3.8	6.1	4.7	2.3	20.0	
17	0.5	0.3	0.6	2.3	4.8	5.2	5.0	2.2	21.0	
11	0.8	0.9	0.7	2.2	4.2	5.3	4.6	3.0	21.9	
7	0.7	0.5	0.5	1.0	1.0	2.0	2.1	1.5	9.5	
4	0.3	0.6	0.3	0.5	0.5	1.0	0.7	0.6	4.6	
0	0.2	+	0.2	0.2	0.2	0.3	0.3	0.1	1.7	
TOTALS	3.1	2.8	2.7	9.1	19.8	25.6	22.9	12.9	100.0	
	N	NE	E	SE	S	SW	W	NW	TOTALS	

WIND DIRECTION

Figure A-164-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

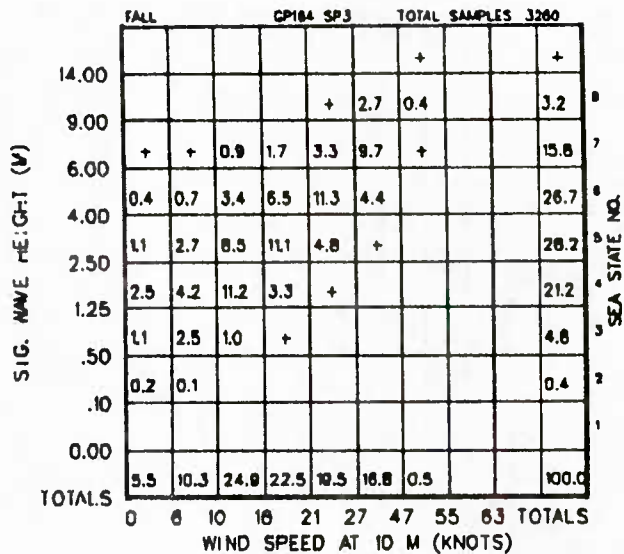


Figure A-164-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

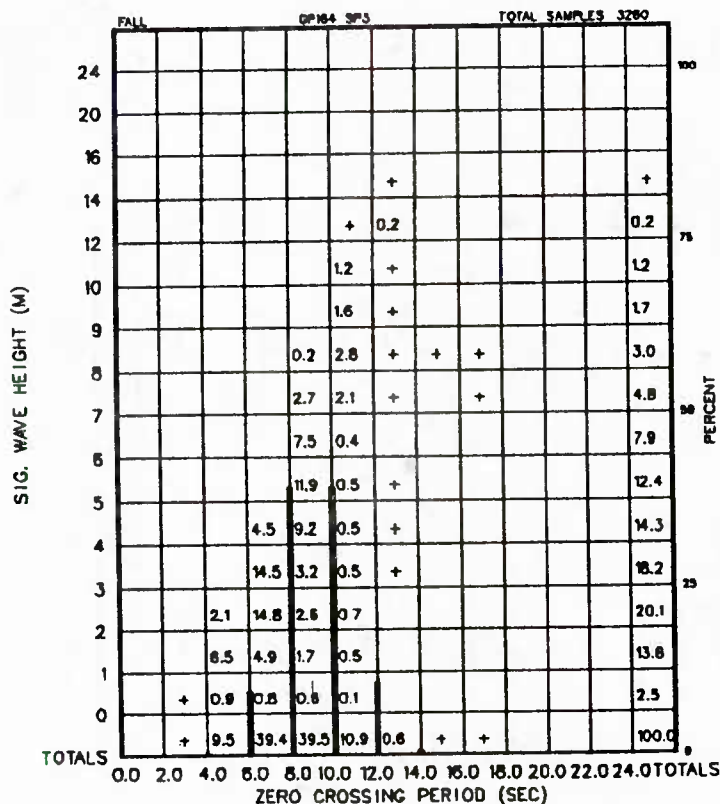


Figure A-164-5-6 Significant Wave Height vs. Zero Crossing Period

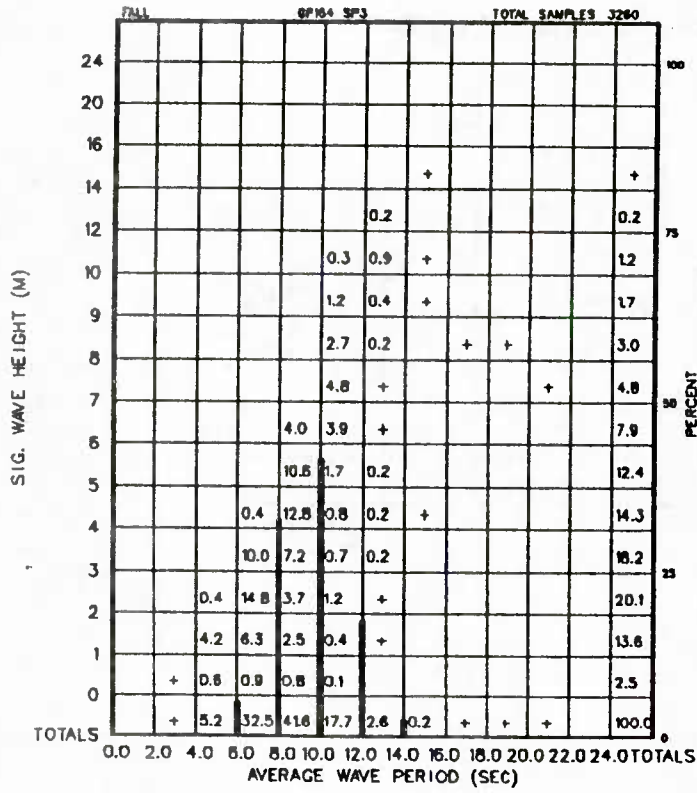


Figure A-164-5-7 Significant Wave Height vs. Average Wave Period

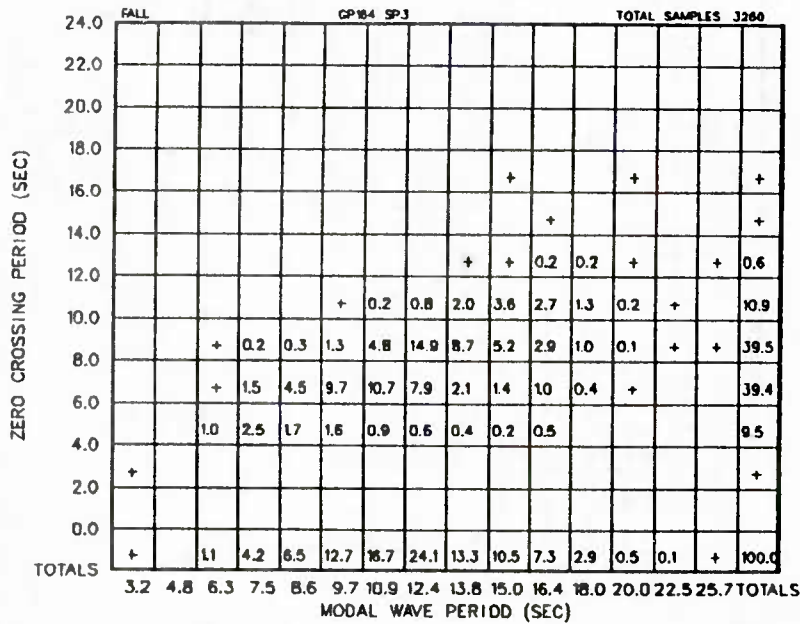


Figure A-164-5-8 Zero Crossing Period vs. Modal Wave Period

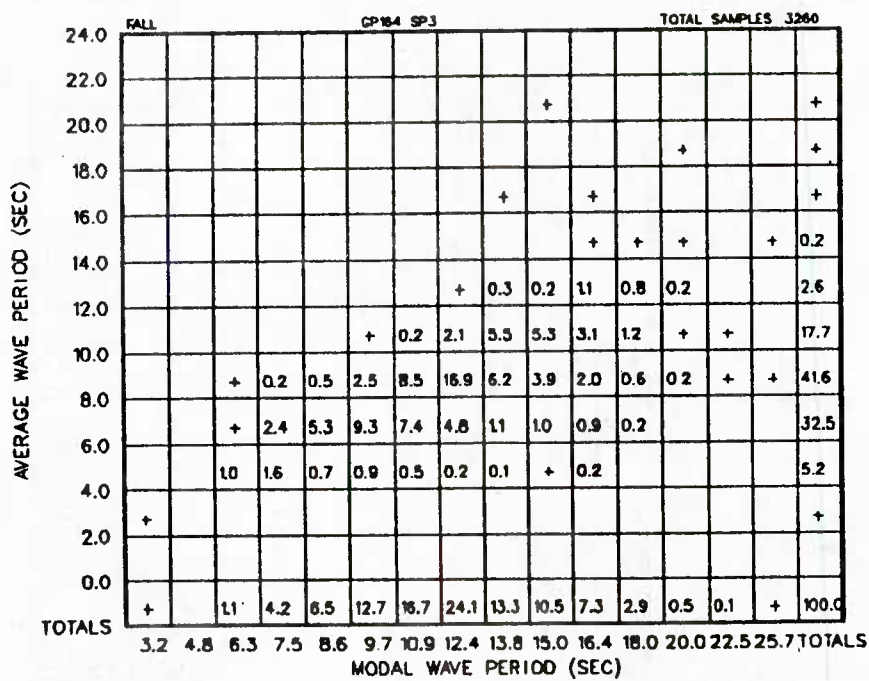


Figure A-164-5-9 Average Wave Period vs. Modal Wave Period

TABLE A-188-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 36.16°N, 127.36°W					
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.5 6.5 -	2.25 10 -	5 17 -	2.25 11.25 -	1.5 9.7 NW
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	3 0.75 -	14 2 -	33 5 -	14 2 -	14 2 N-NW
Visibility, nautical miles	5	20	25	-	-
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	0.5 0	5.5 5	8 8	- -	- -
Precipitation (Occurrence)	All precipitation - 6% of the time				
Relative Humidity, %	62	80	95	-	-
Air Temperature, °C	11.5	14	18	14	-
Sea Surface Temperature, °C	14	17	19.5	-	-
Sea Level Pressure, millibars	1008	1022	1030	-	-
Ice	None				
Refractivity Mean Surface Refractivity Sub-Refraction (1 km, Annual) Super-Refraction or Ducting (1 km, Annual)	- - -	- - -	- - -	343 - -	- 27 6%

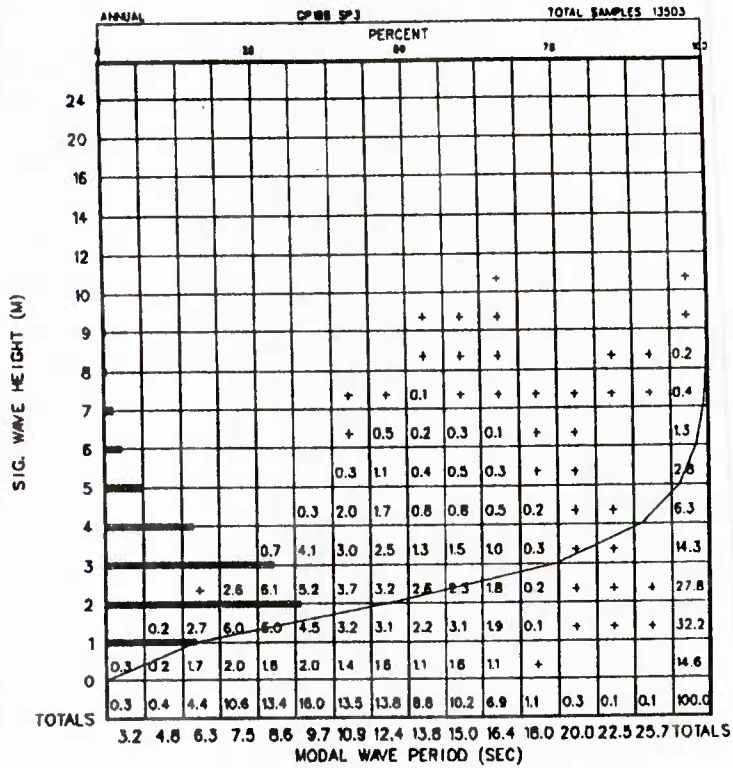


Figure A-188-1-1 Significant Wave Height vs. Modal Wave Period

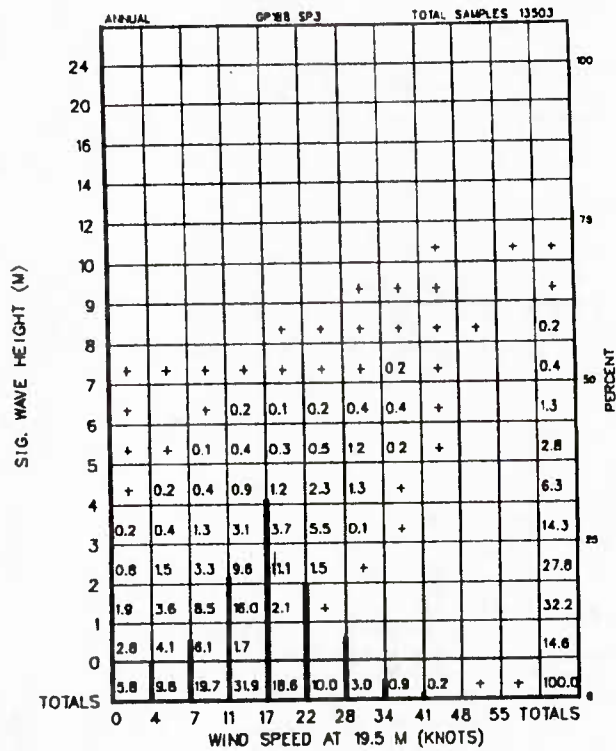


Figure A-188-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

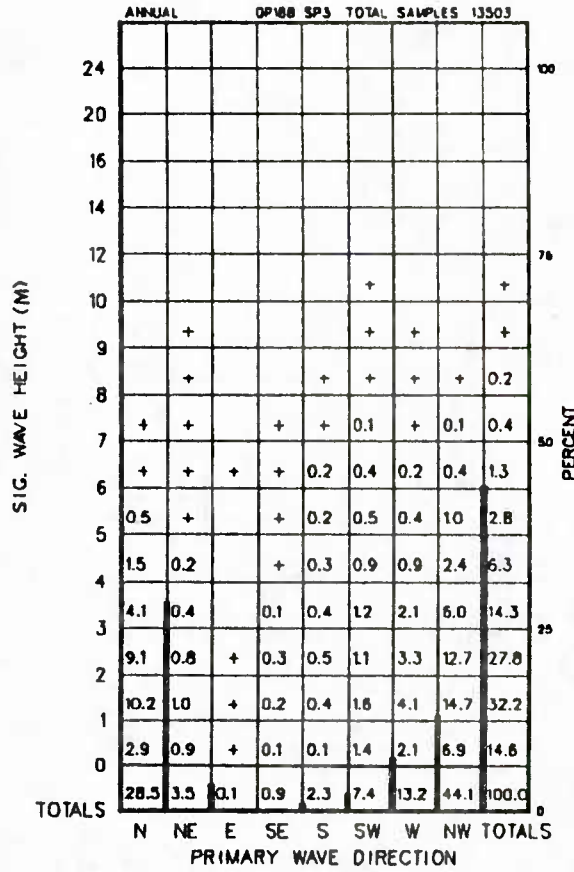


Figure A-188-1-3 Significant Wave Height vs. Primary Wave Direction

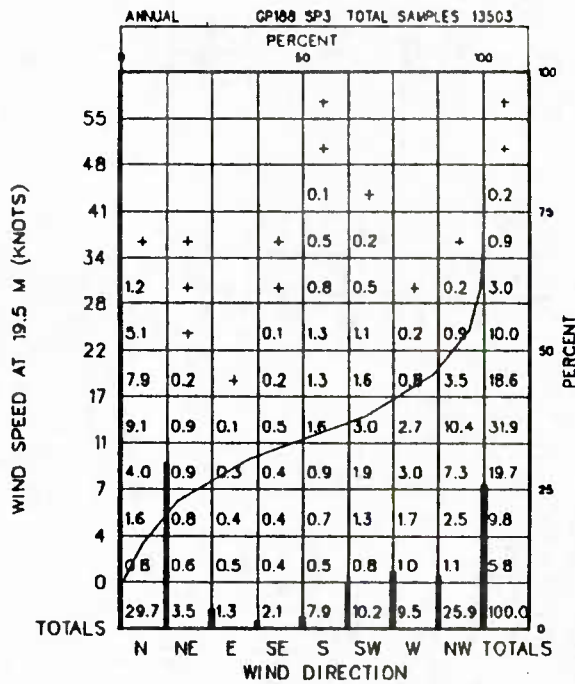


Figure A-188-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

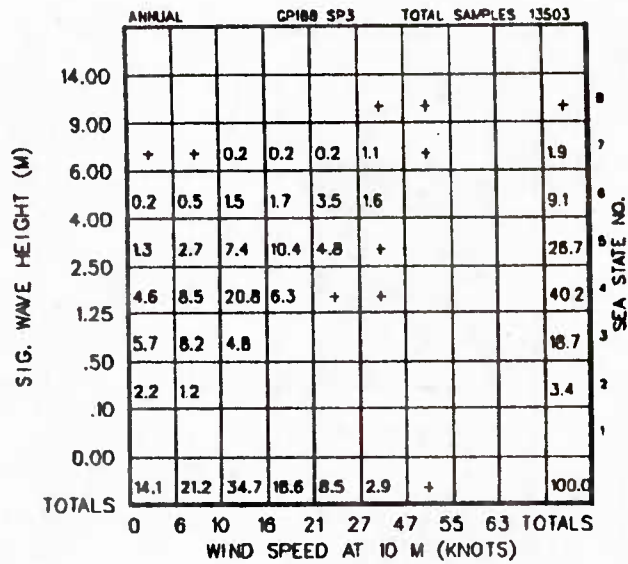


Figure A-188-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

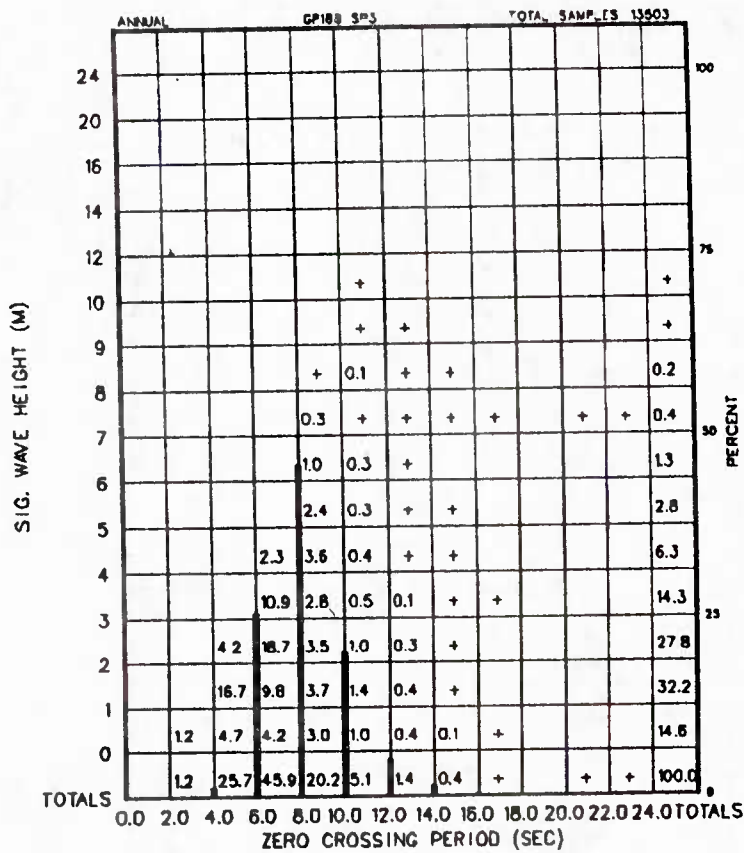


Figure A-188-1-6 Significant Wave Height vs. Zero Crossing Period

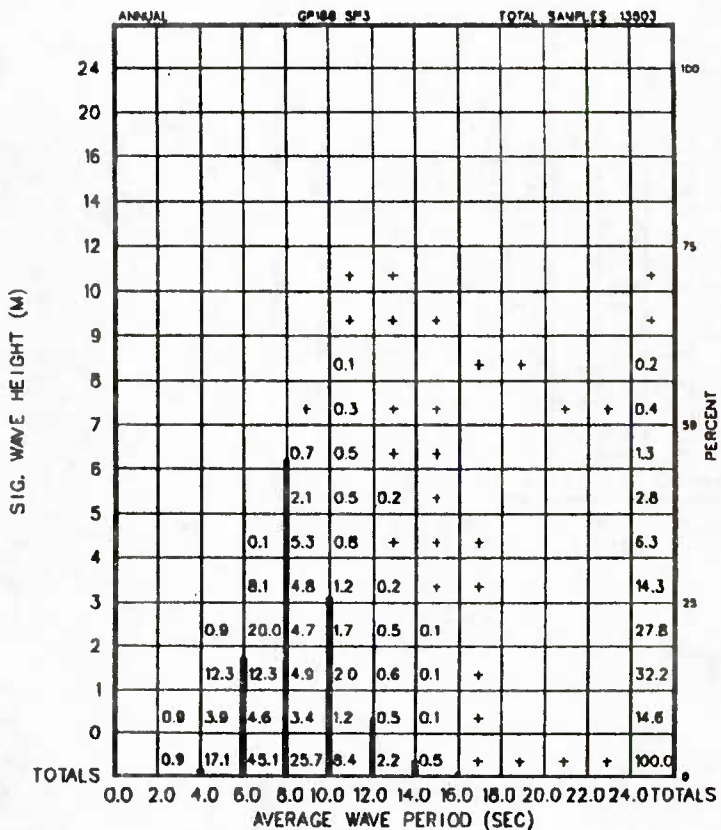


Figure A-188-1-7 Significant Wave Height vs. Average Wave Period

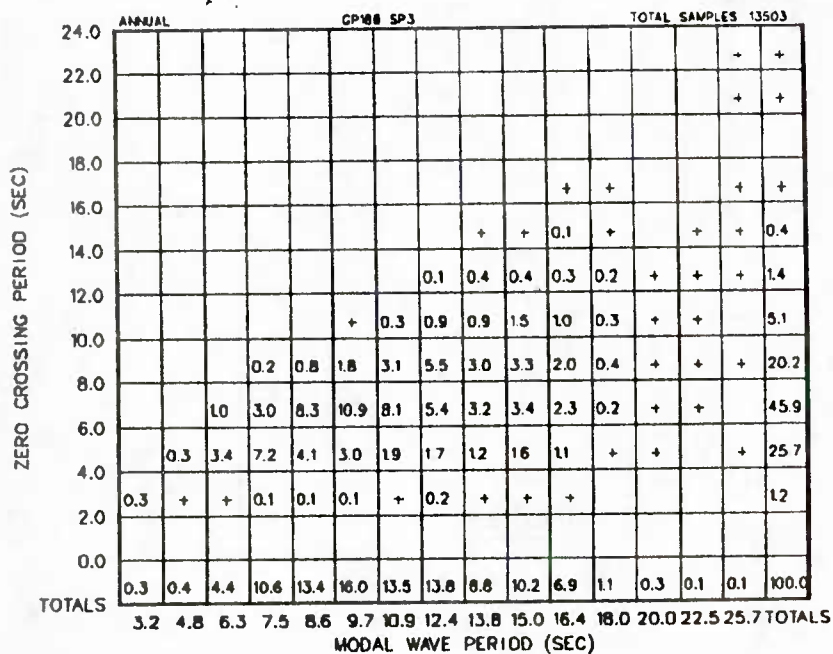


Figure A-188-1-8 Zero Crossing Period vs. Modal Wave Period

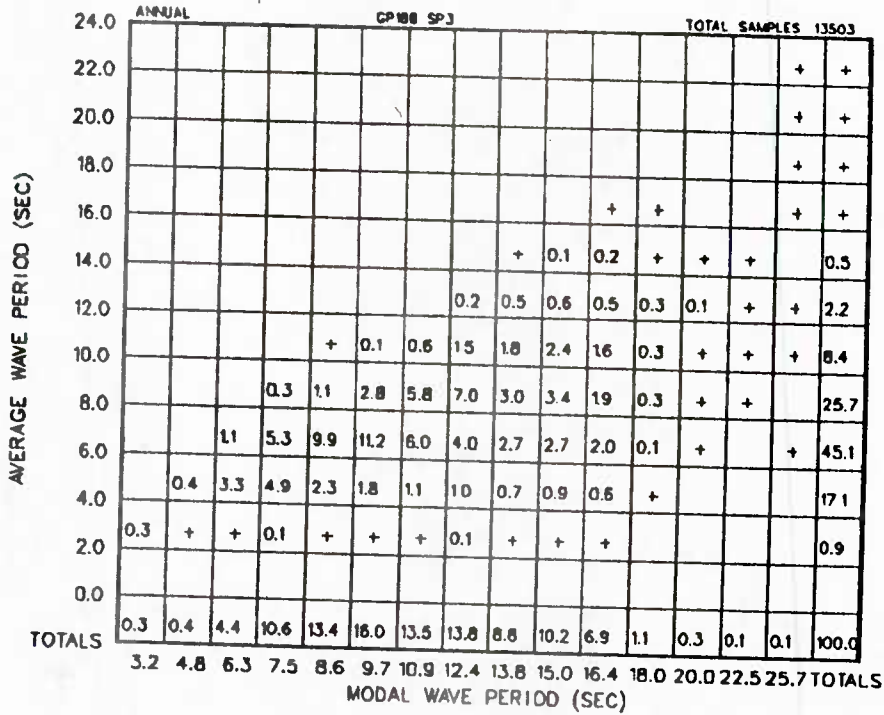


Figure A-188-1-9 Average Wave Period vs. Modal Wave Period

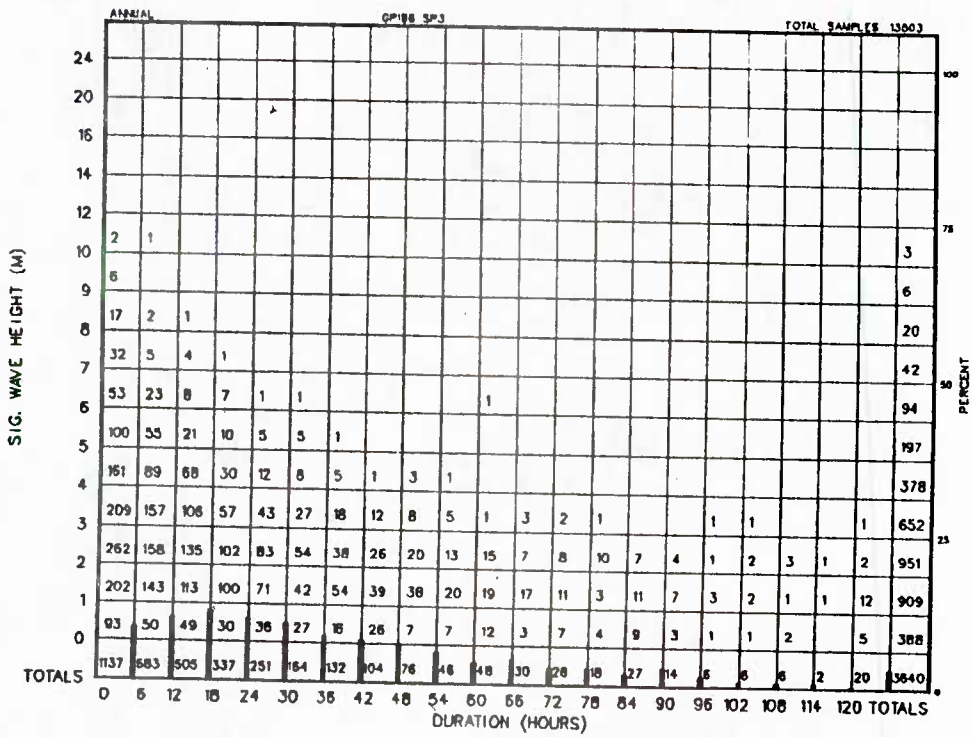


Figure A-188-1-10 Persistence of Wave Height

ANNUAL		GP188 SP3														TOTAL SAMPLES 13503							
44																			100				
55	1																		1				
48	2																		2				
41	8	4	1	1															14				
34	37	21	4	2	1	1	1												67				
28	125	53	23	10	1	3	2	2	2										221				
22	309	134	61	48	24	12	8	5	4	4			1					1	611				
17	496	275	124	87	35	28	16	10	9	4	4		1			1	1		1001				
11	583	340	212	133	73	56	39	27	20	13	6	5	6	3	3	2		1	1	1524			
7	593	291	167	83	48	18	21	7	6	4	1									1239			
4	431	191	73	33	15	8	3						1							755			
0	179	86	32	26	18	4	9	2	3										1	360			
TOTALS	2784	1395	697	423	215	130	99	53	44	25	11	6	9	3	3	3	1	1	1	2	5885		
		0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	TOTALS
		DURATION (HOURS)																					
																						PERCENT	

Figure A-188-1-11 Persistence of Wind Speed at 19.5 M (Knots)

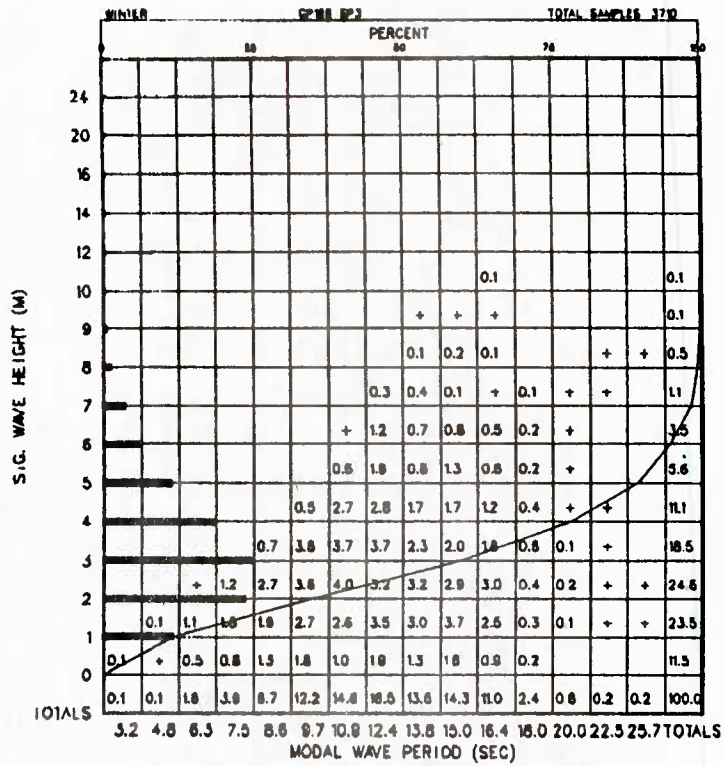


Figure A-188-2-1 Significant Wave Height vs. Modal Wave Period

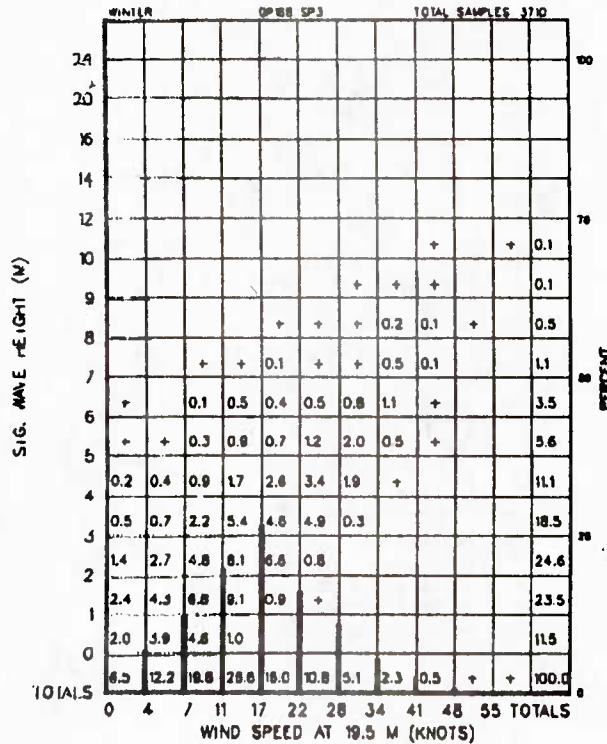


Figure A-188-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

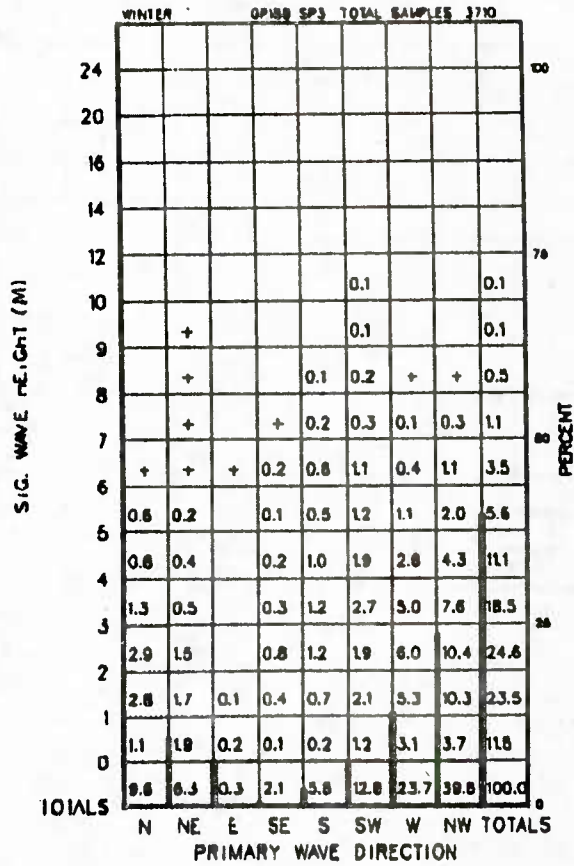


Figure A-188-2-3 Significant Wave Height vs. Primary Wave Direction

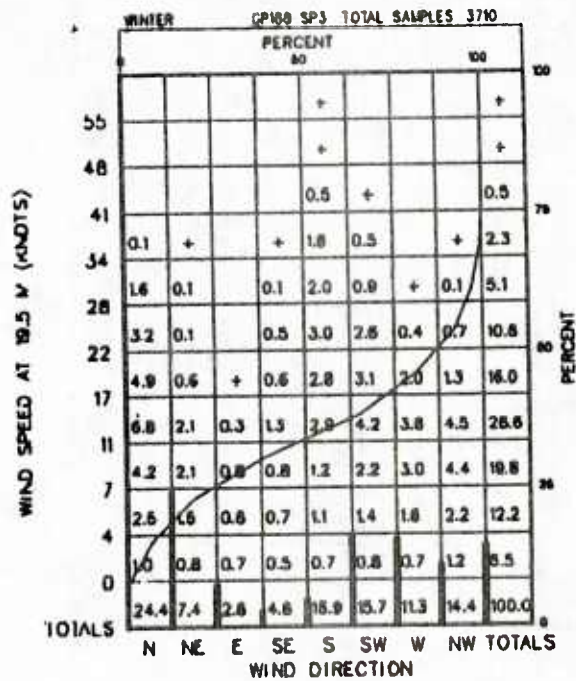


Figure A-188-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

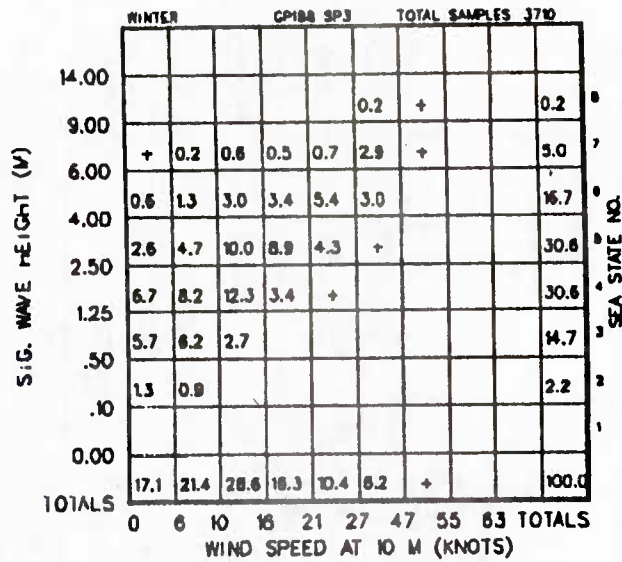


Figure A-188-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

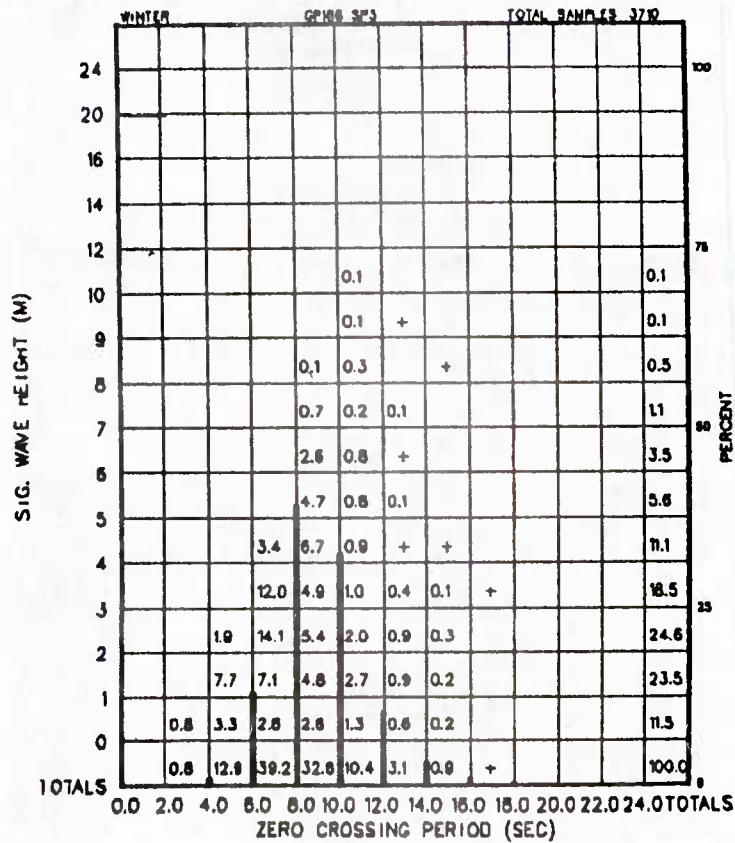


Figure A-188-2-6 Significant Wave Height vs. Zero Crossing Period

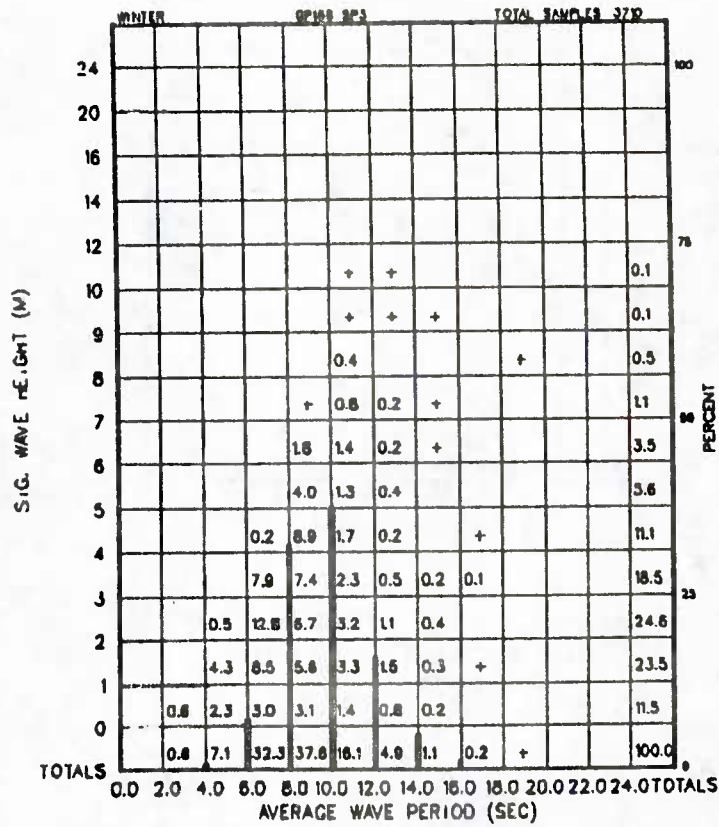


Figure A-188-2-7 Significant Wave Height vs. Average Wave Period

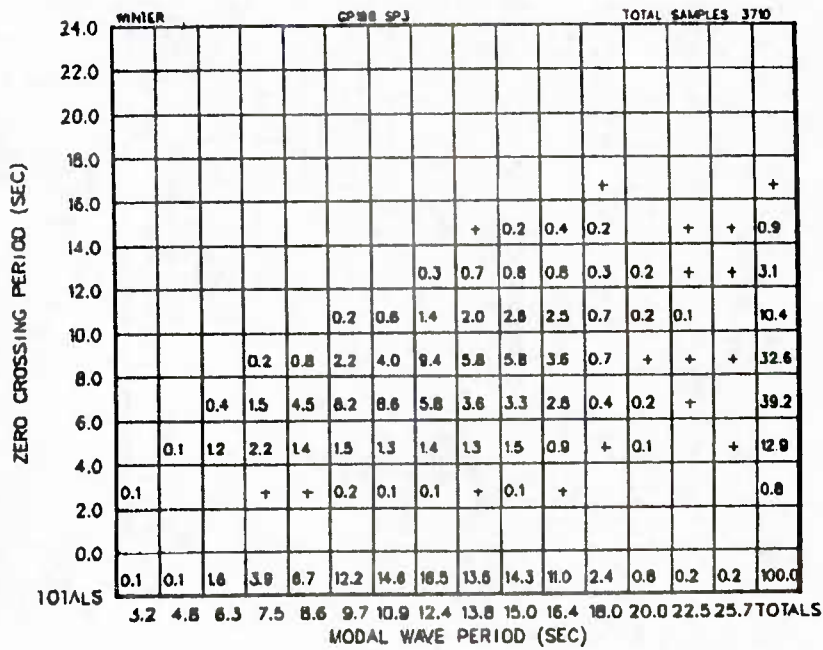


Figure A-188-2-8 Zero Crossing Period vs. Modal Wave Period

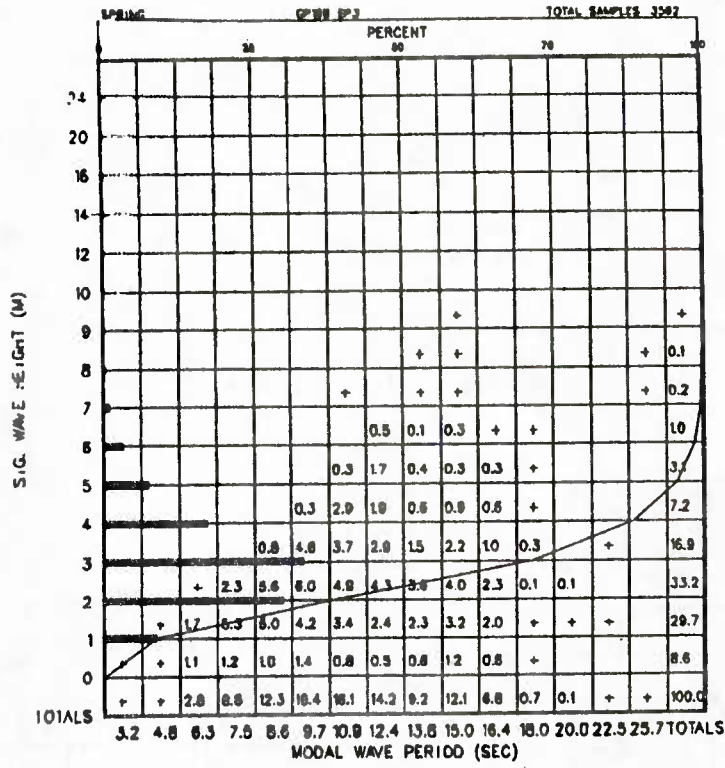


Figure A-188-3-1 Significant Wave Height vs. Modal Wave Period

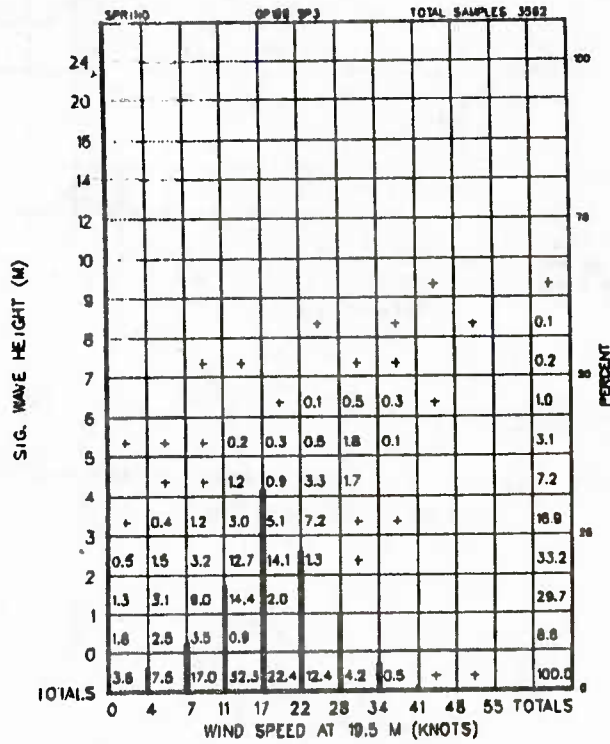


Figure A-188-3-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

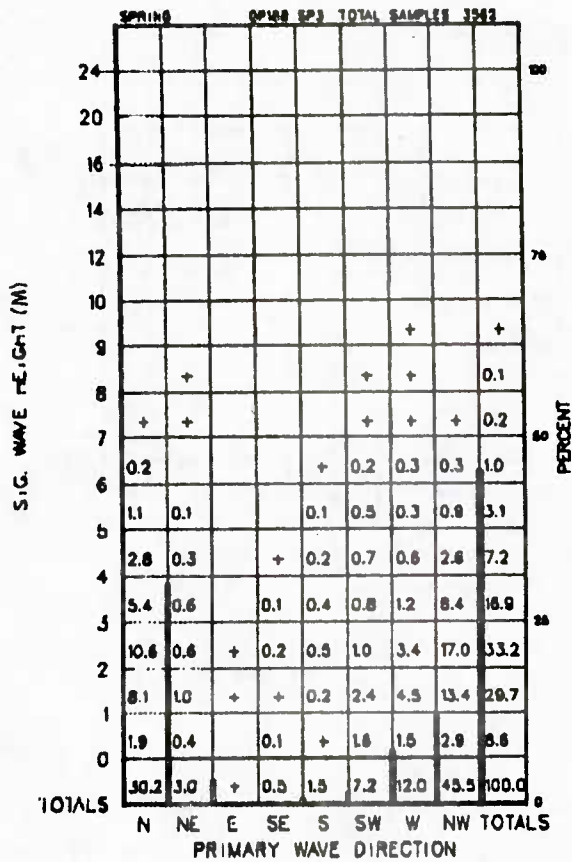


Figure A-188-3-3 Significant Wave Height vs. Primary Wave Direction

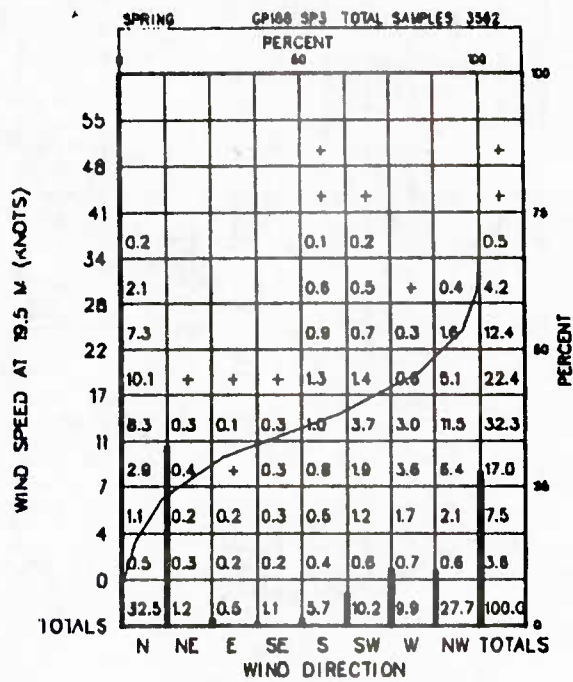


Figure A-188-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

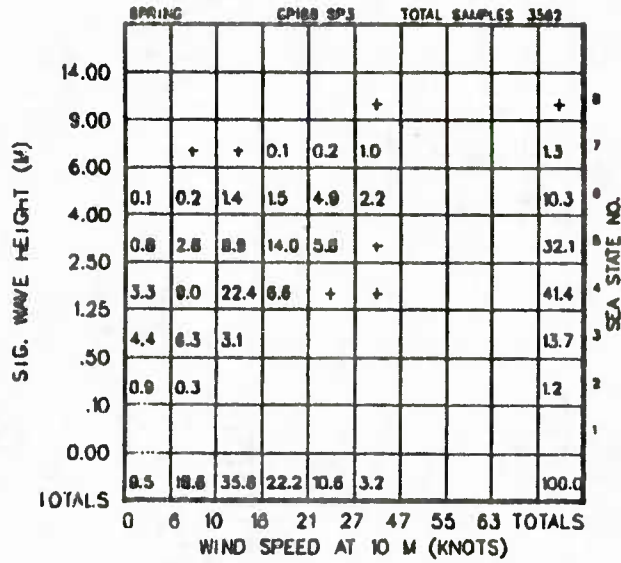


Figure A-188-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

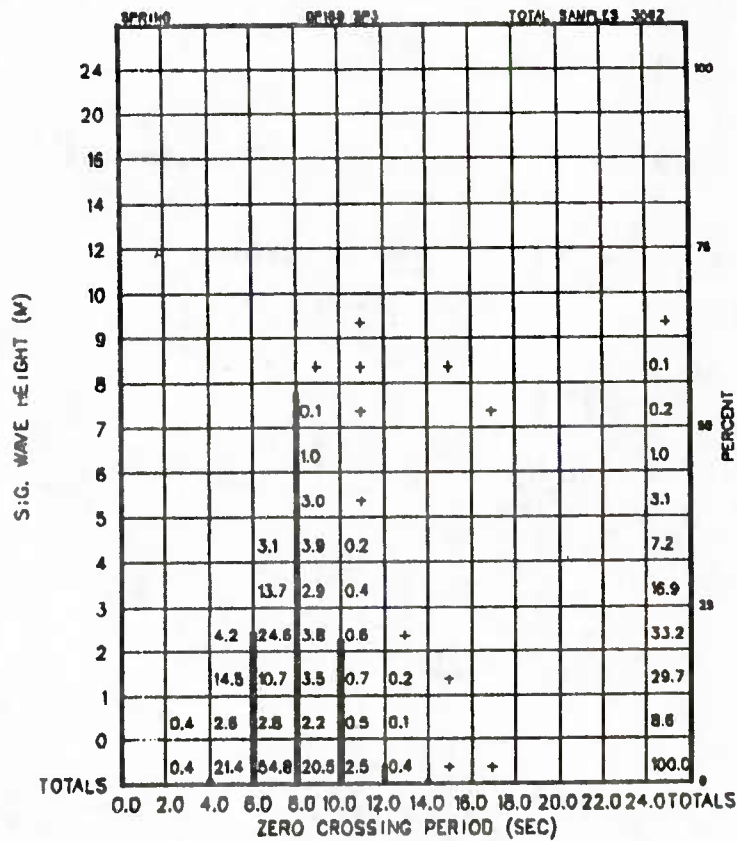


Figure A-188-3-6 Significant Wave Height vs. Zero Crossing Period

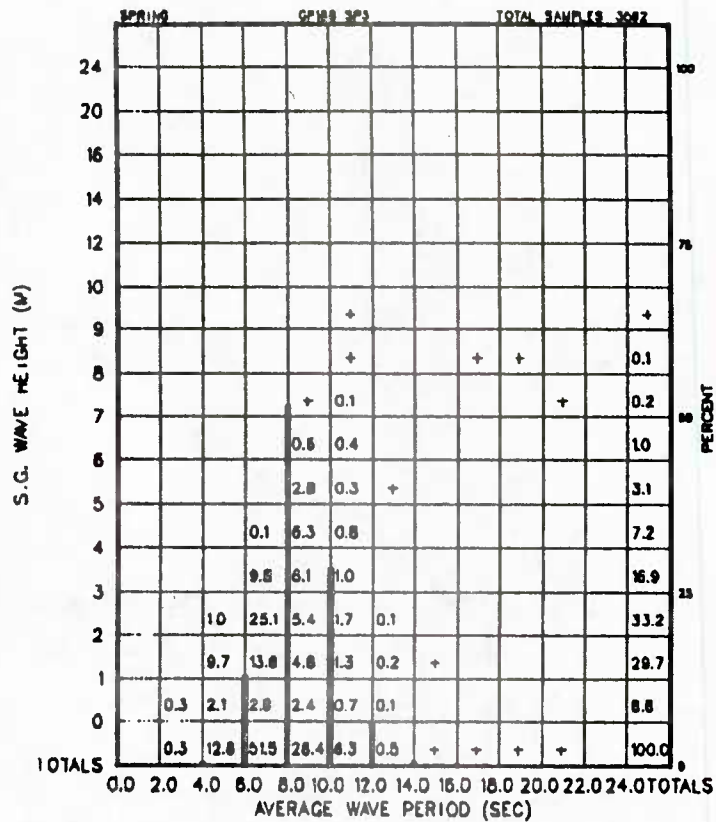


Figure A-188-3-7 Significant Wave Height vs. Average Wave Period

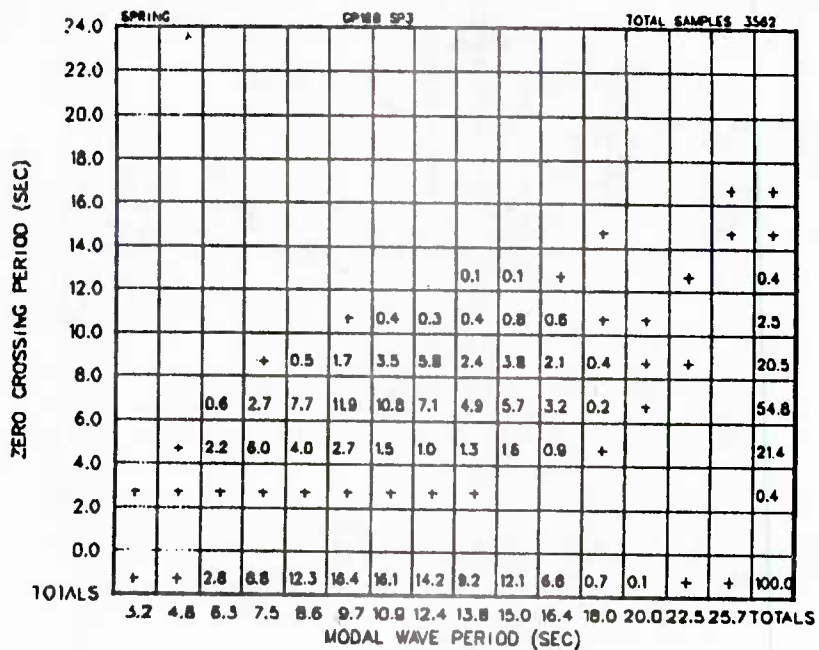


Figure A-188-3-8 Zero Crossing Period vs. Modal Wave Period

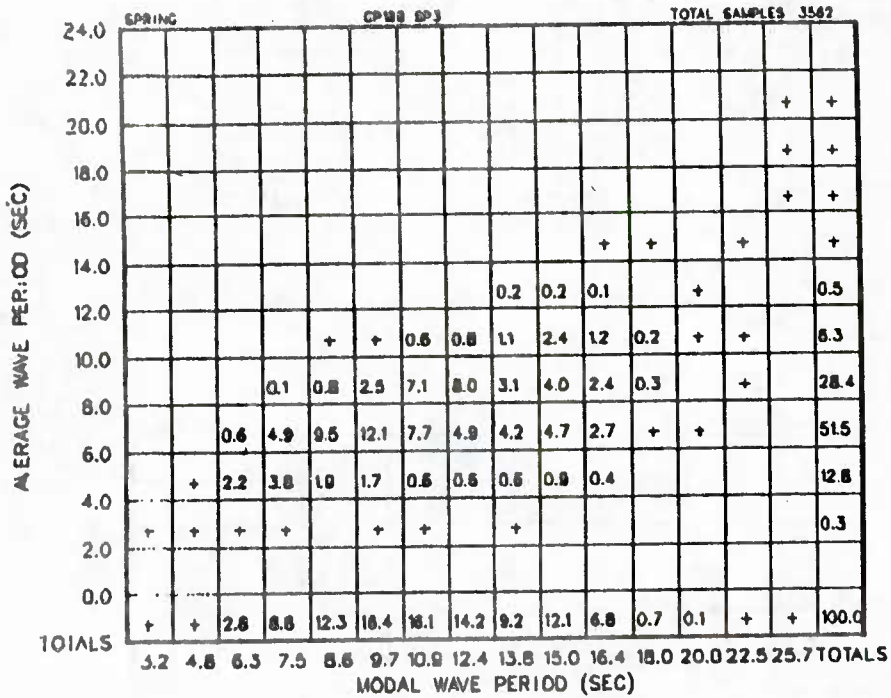


Figure A-188-3-9 Average Wave Period vs. Modal Wave Period

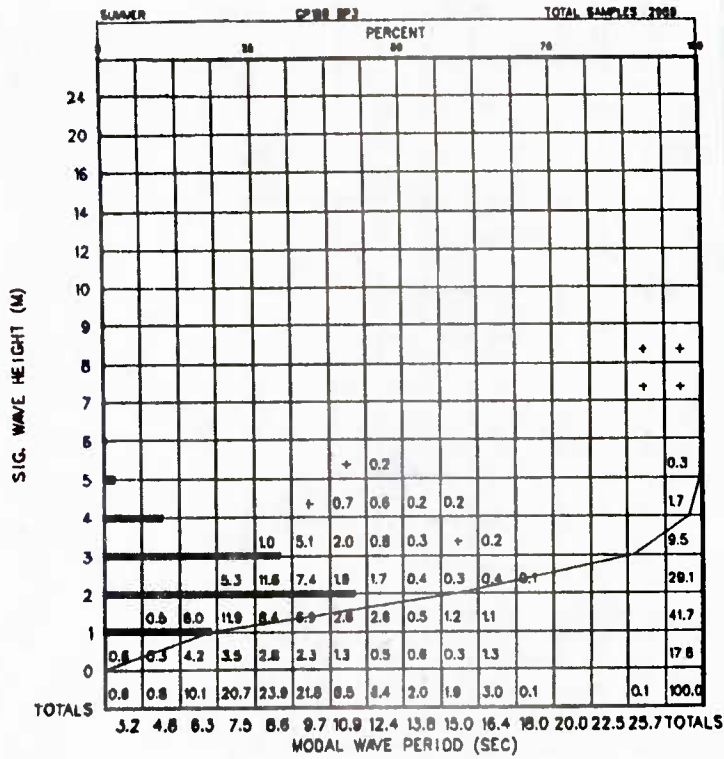


Figure A-188-4-1 Significant Wave Height vs. Modal Wave Period

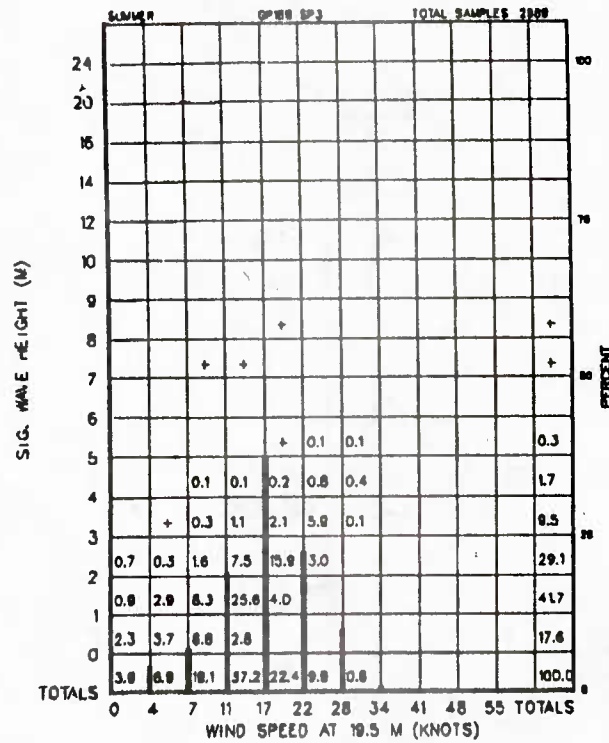


Figure A-188-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

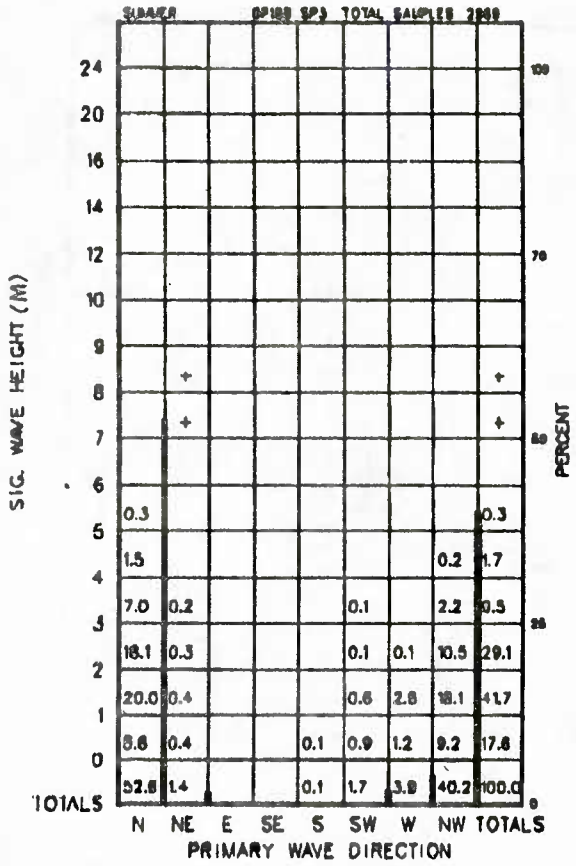


Figure A-188-4-3 Significant Wave Height vs. Primary Wave Direction

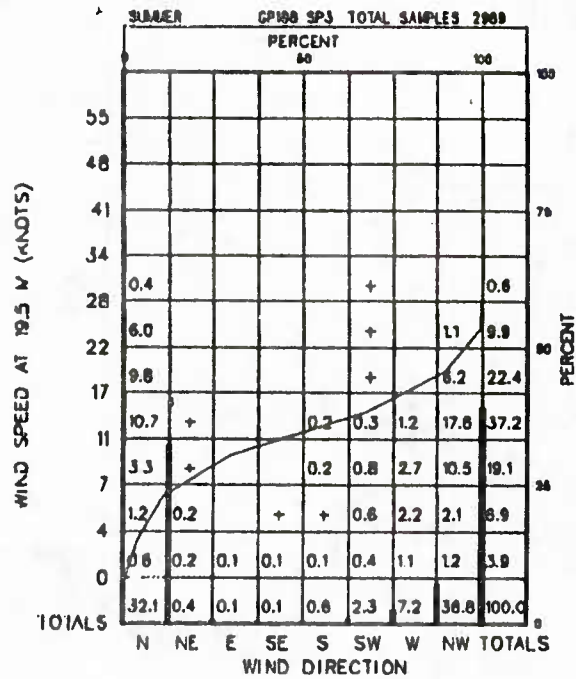


Figure A-188-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

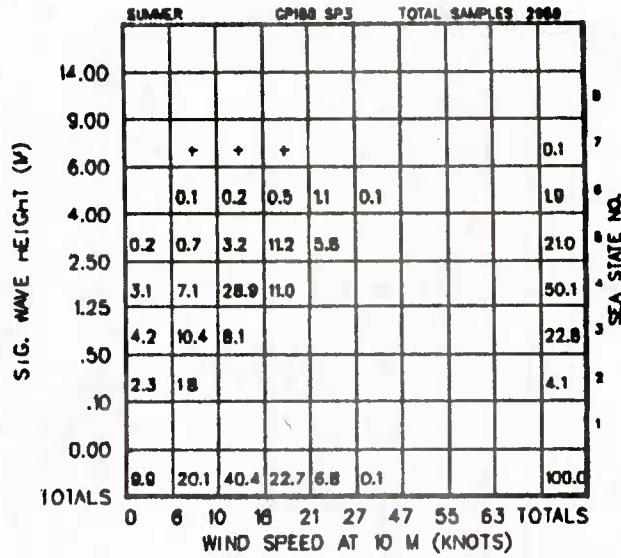


Figure A-188-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

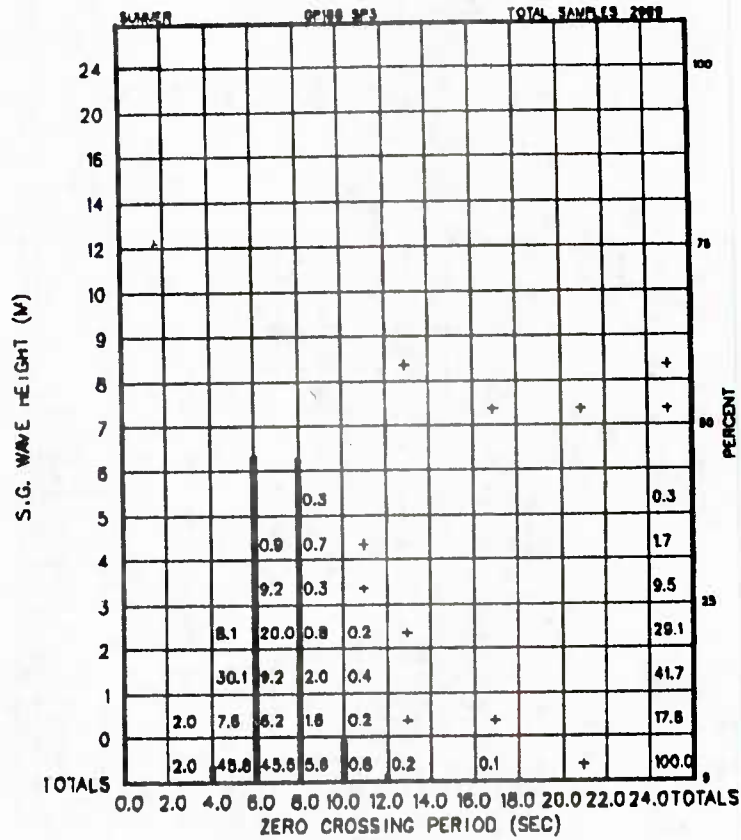


Figure A-188-4-6 Significant Wave Height vs. Zero Crossing Period

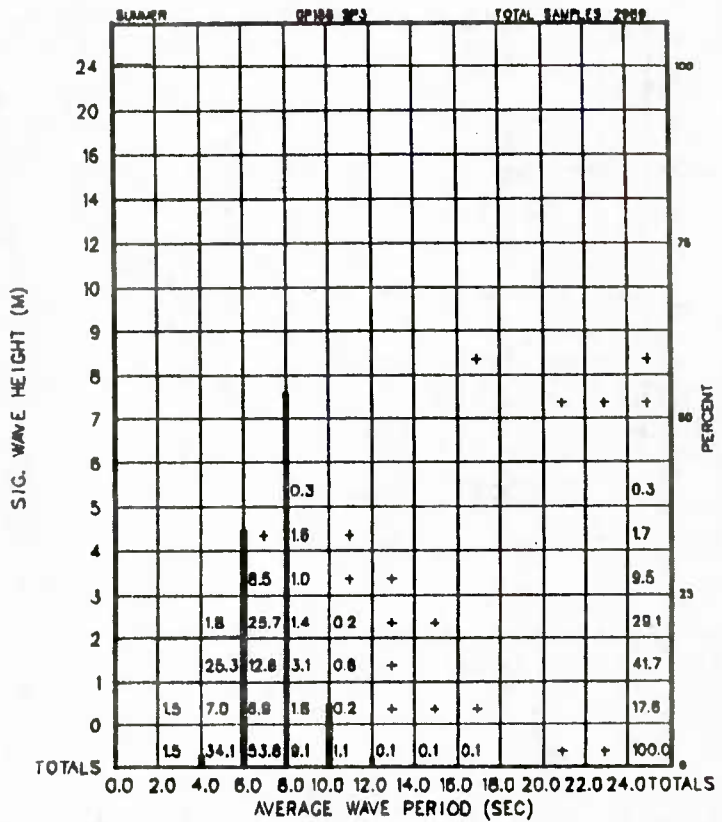


Figure A-188-4-7 Significant Wave Height vs. Average Wave Period

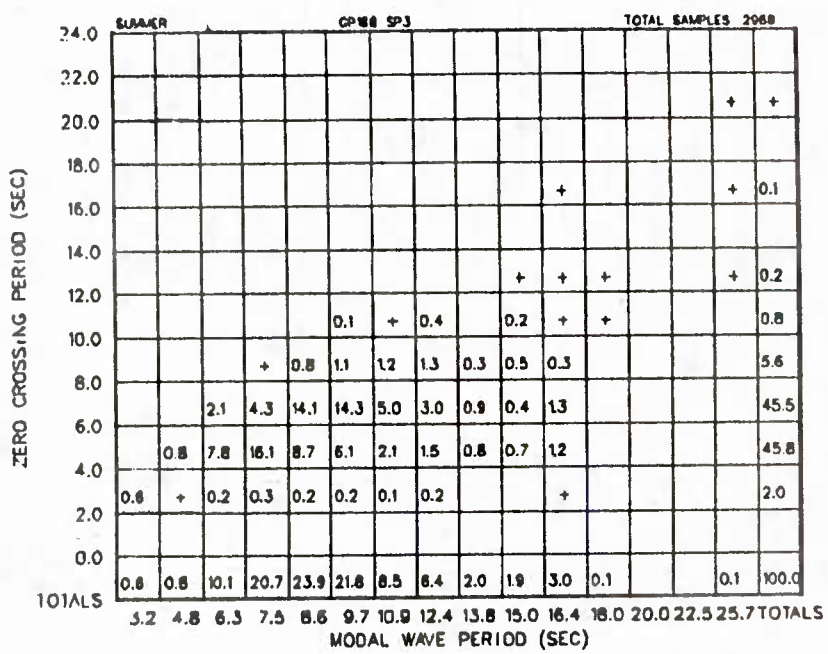


Figure A-188-4-8 Zero Crossing Period vs. Modal Wave Period

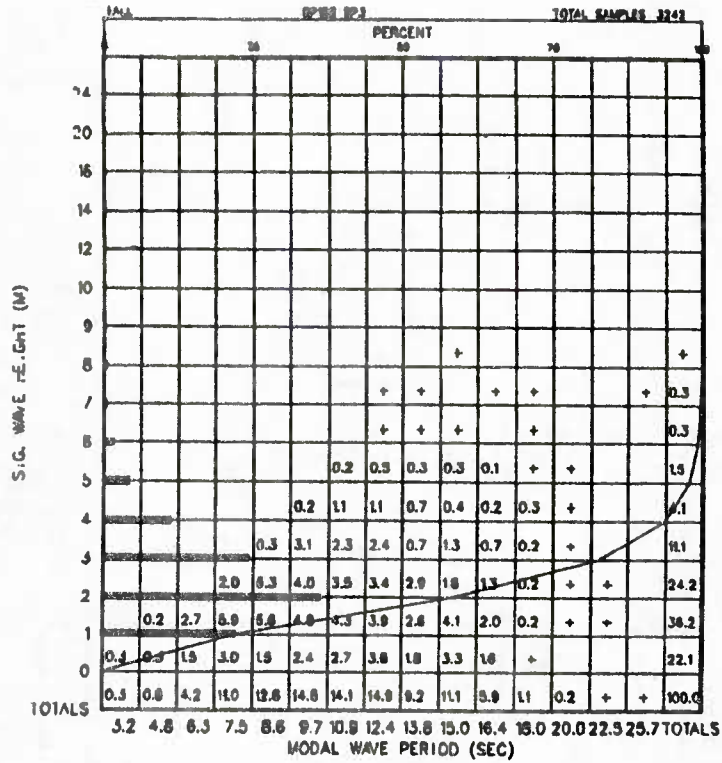


Figure A-188-5-1 Significant Wave Height vs. Modal Wave Period

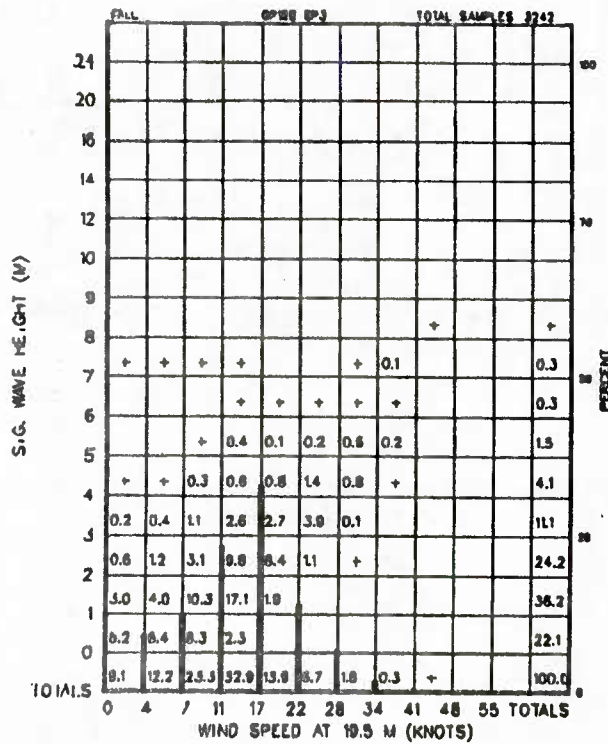


Figure A-188-5-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

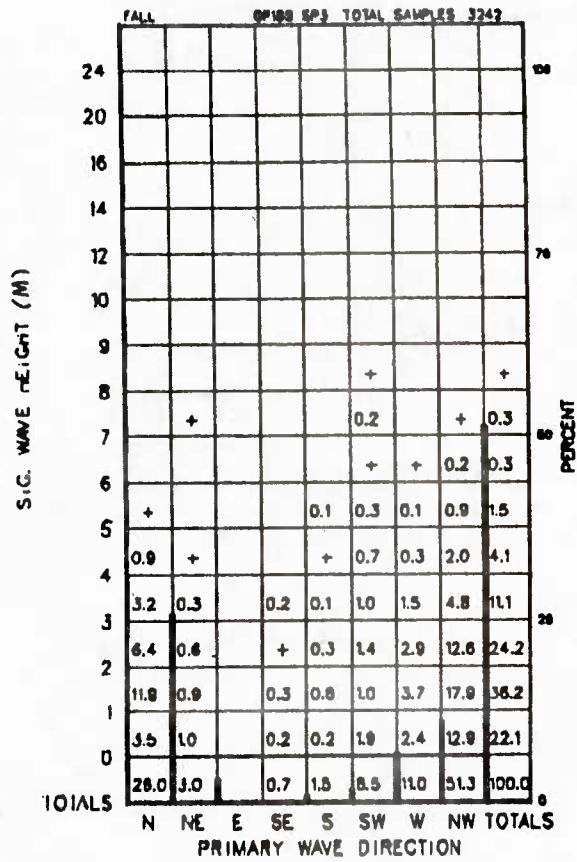


Figure A-188-5-3 Significant Wave Height vs. Primary Wave Direction

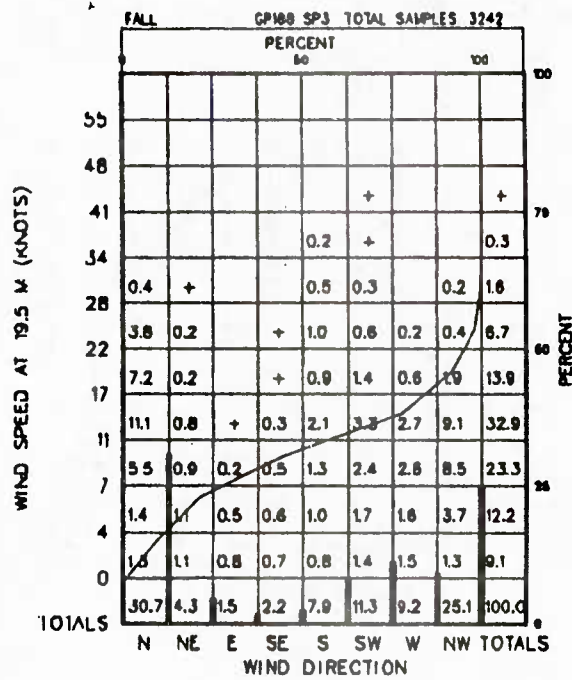


Figure A-188-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

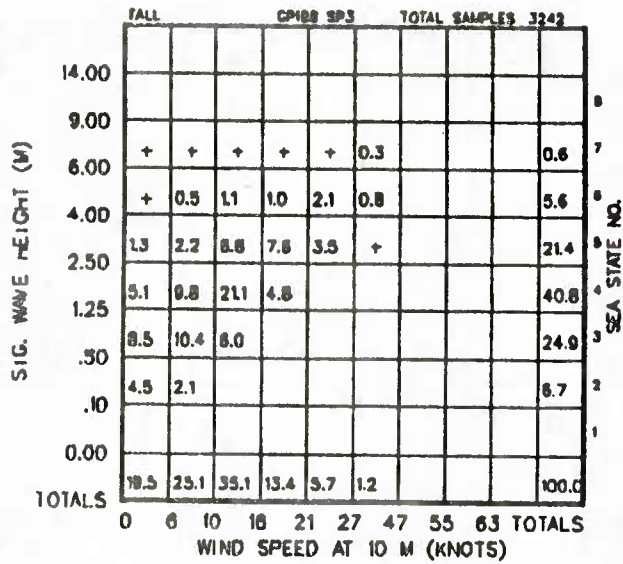


Figure A-188-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

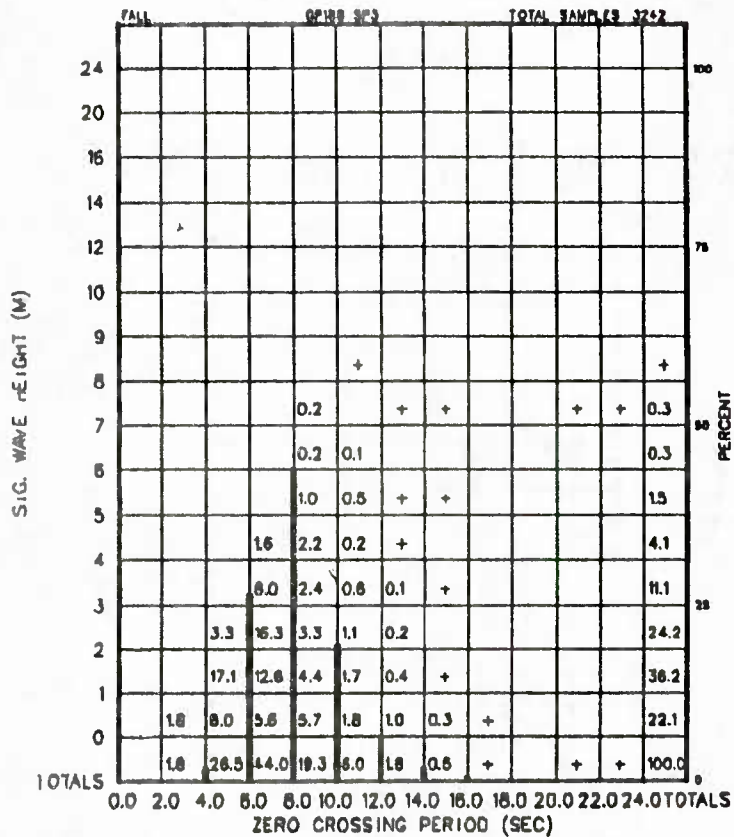


Figure A-188-5-6 Significant Wave Height vs. Zero Crossing Period

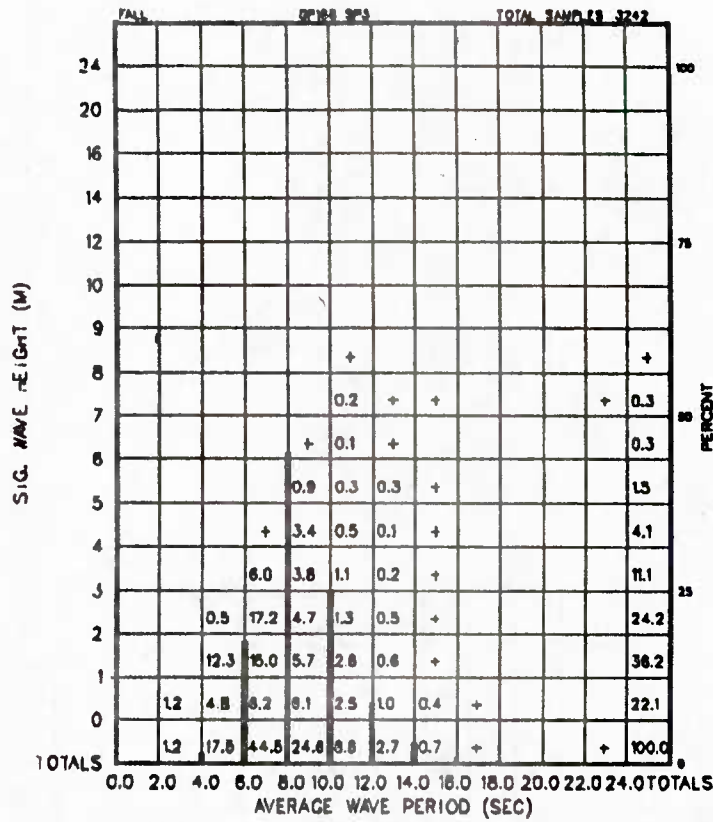


Figure A-188-5-7 Significant Wave Height vs. Average Wave Period

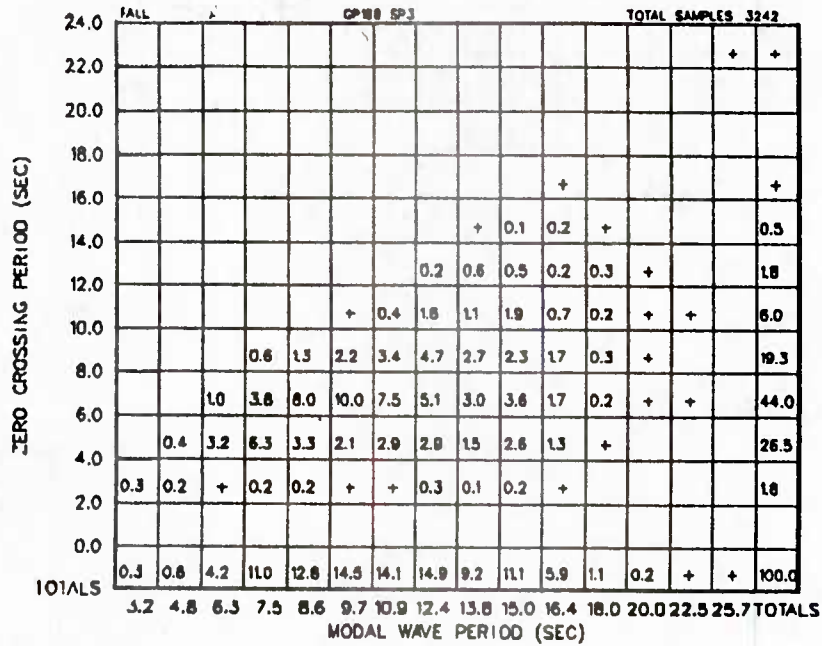


Figure A-188-5-8 Zero Crossing Period vs. Modal Wave Period

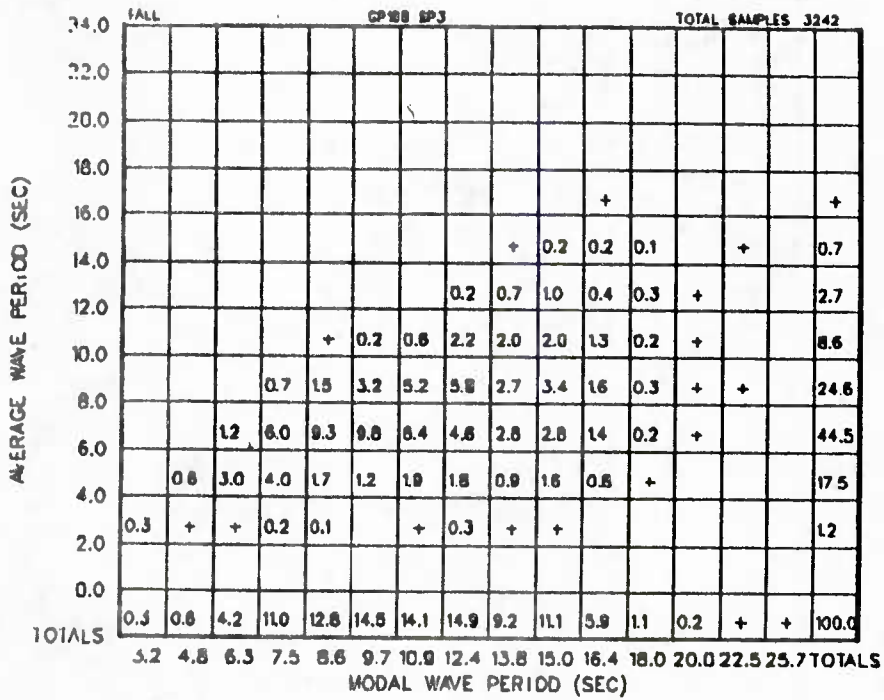


Figure A-188-5-9 Average Wave Period vs. Modal Wave Period

TABLE A-202-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

Natural Environment	SEASON: ANNUAL; LOCATION: 43.73°N, 128.73°W				
	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.5 6.5 -	2.5 11 -	7 17.5 -	3 11.75 -	1.5 12.4 W-NW
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	3 0.75 -	14 2.25 -	35 6.5 -	15.75 3 -	14 2.25 W-SW
Visibility, nautical miles	2	15	25	-	-
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	1 0.5	6.5 6	8 8	- -	- -
Precipitation (Occurrence)	All precipitation - 15% of the time Snow - 0.5% of the time (Dec-Mar)				
Relative Humidity, %	60	80	97	-	-
Air Temperature, °C	8.5	11	14	11.5	-
Sea Surface Temperature, °C	11.5	13.5	16	-	-
Sea Level Pressure, millibars	1000	1018	1032	-	-
Ice	None				
Refractivity Mean Surface Refractivity Sub-Refraction (1 km, Annual) Super-Refraction or Ducting (1 km, Annual)	- - -	- - -	- - -	324 - -	- 2% 3%

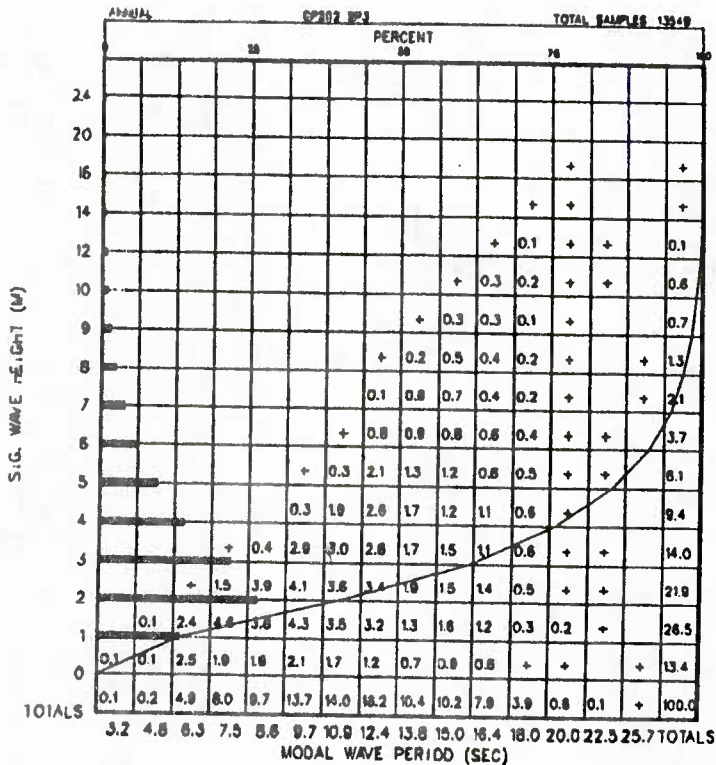


Figure A-202-1-1 Significant Wave Height vs. Modal Wave Period

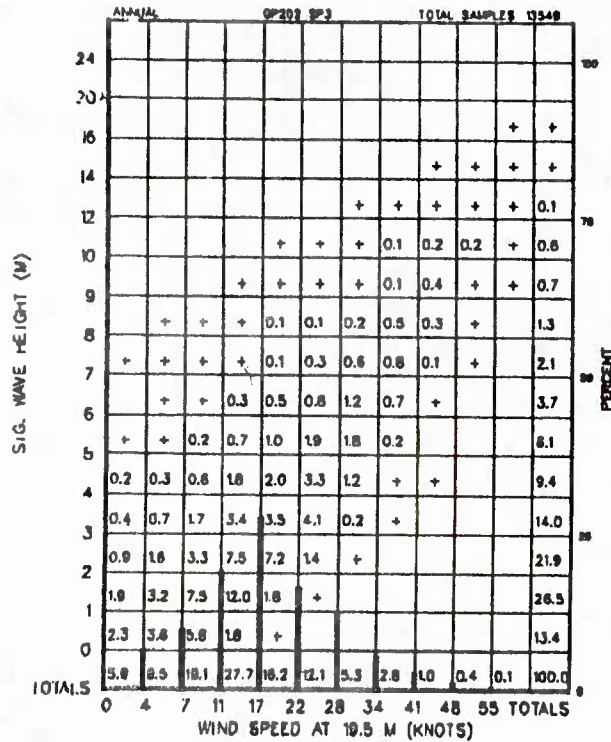


Figure A-202-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

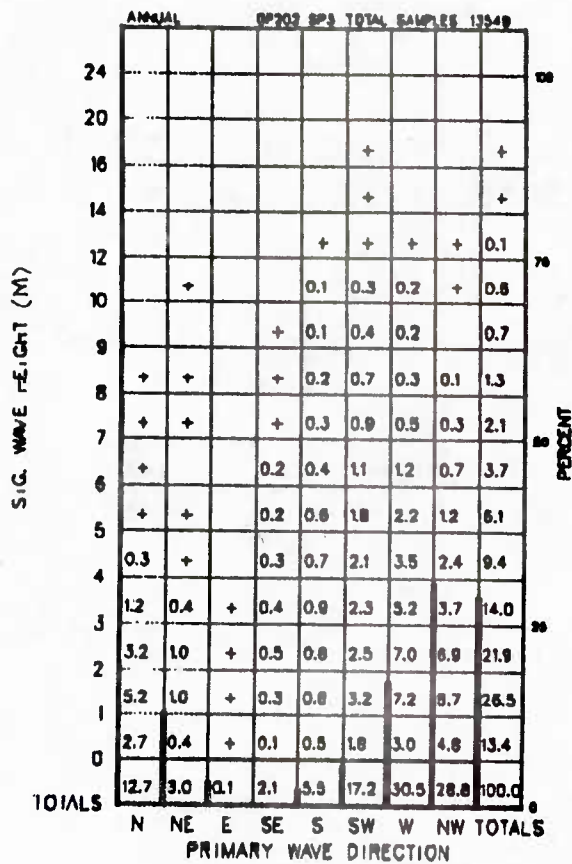


Figure A-202-1-3 Significant Wave Height vs. Primary Wave Direction

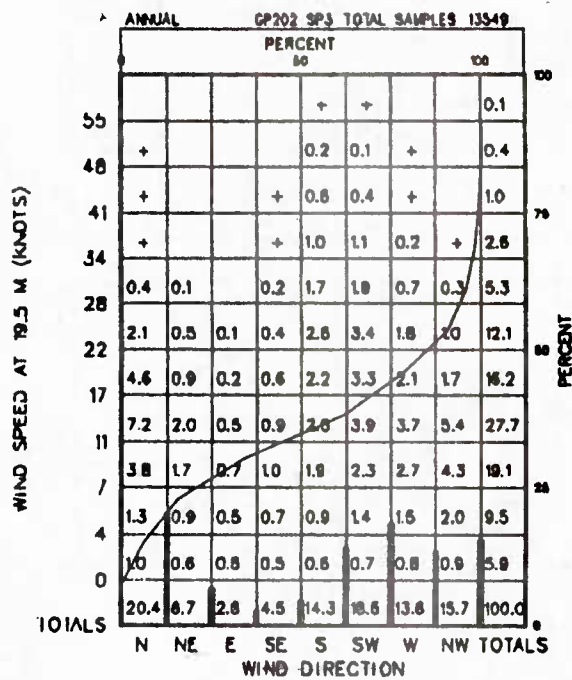


Figure A-202-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

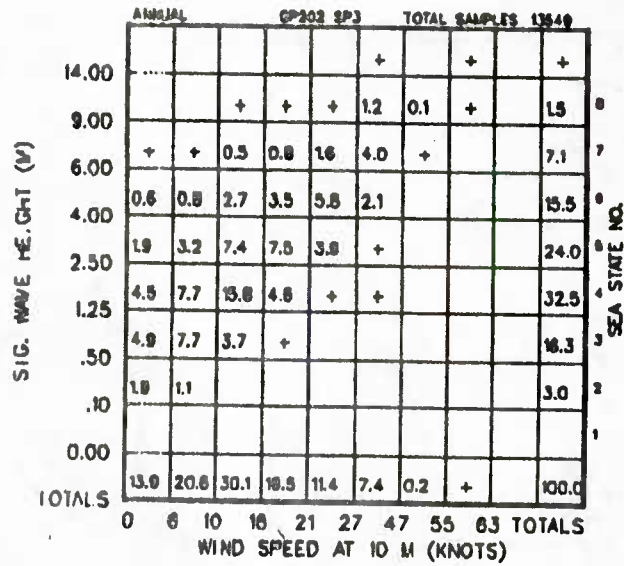


Figure A-202-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

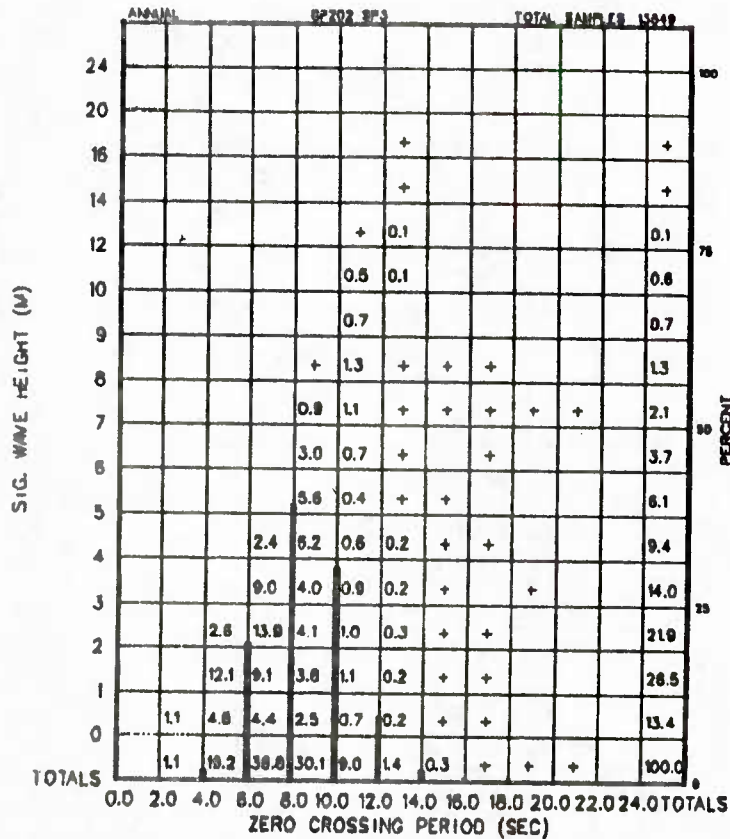


Figure A-202-1-6 Significant Wave Height vs. Zero Crossing Period

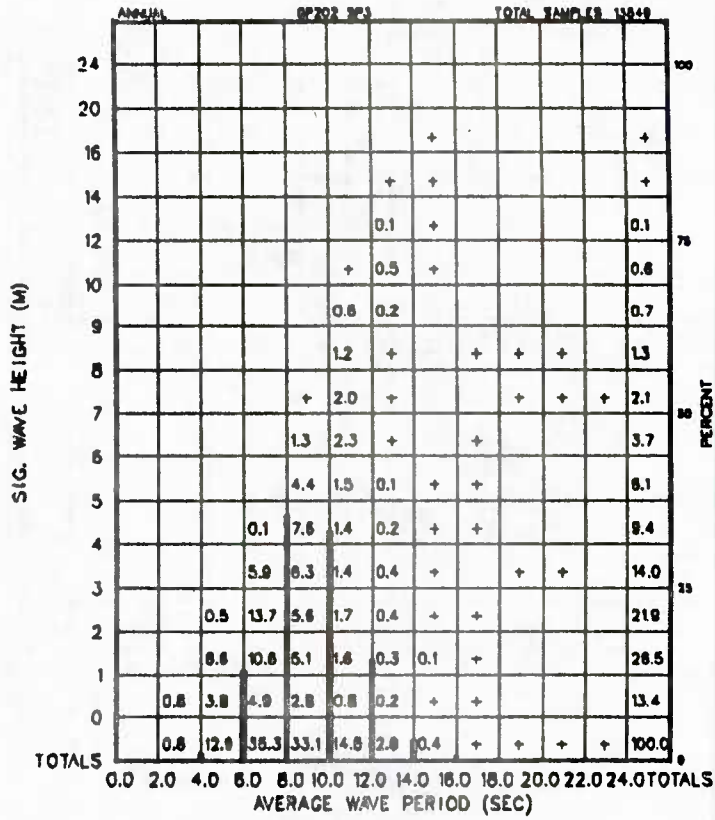


Figure A-202-1-7 Significant Wave Height vs. Average Wave Period

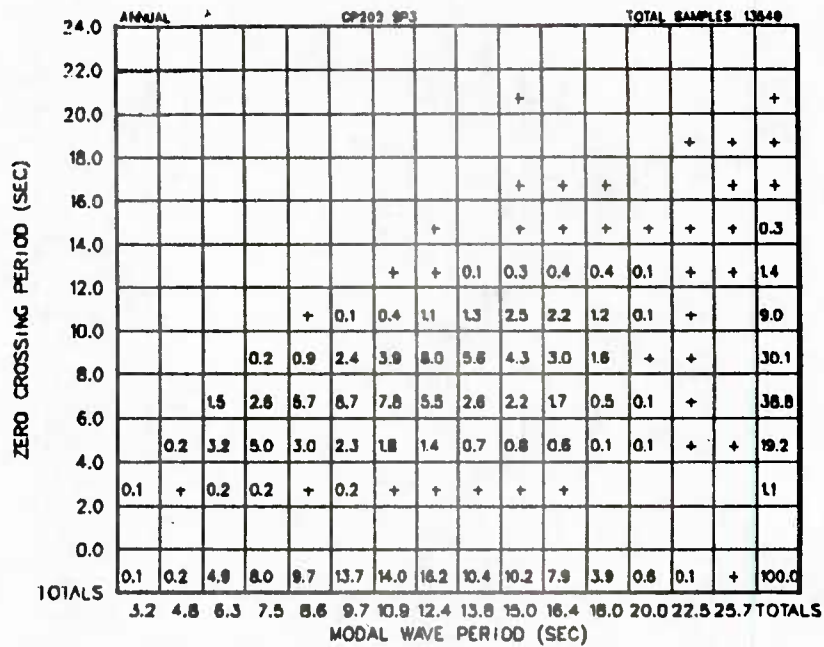


Figure A-202-1-8 Zero Crossing Period vs. Modal Wave Period

ANNUAL		CP209 SP3												TOTAL SAMPLES 13549								
55	7	4																11				
48	26	9	4															39				
41	78	19	5	1			1											104				
34	171	51	18	4	1	1												248				
28	276	108	42	12	5	4		1										448				
22	432	204	89	48	21	15	5	1	4	3								850				
17	683	274	138	42	28	15	8	1	1	3	3			1				1188				
11	737	383	204	108	84	41	29	13	6	8	3		1	5	1	2	2	1607				
7	698	324	154	75	31	13	15	6	6	3		2	1	1		1		1310				
4	475	192	88	29	12	6	2											784				
0	239	81	42	17	11	7	2	3	2	1	2		1					408				
TOTALS	3842	1849	768	334	173	102	52	25	18	18	8	2	3	7	1	3	2	7005				
	0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	TOTALS

Figure A-202-1-11 Persistence of Wind Speed at 19.5 M (Knots)

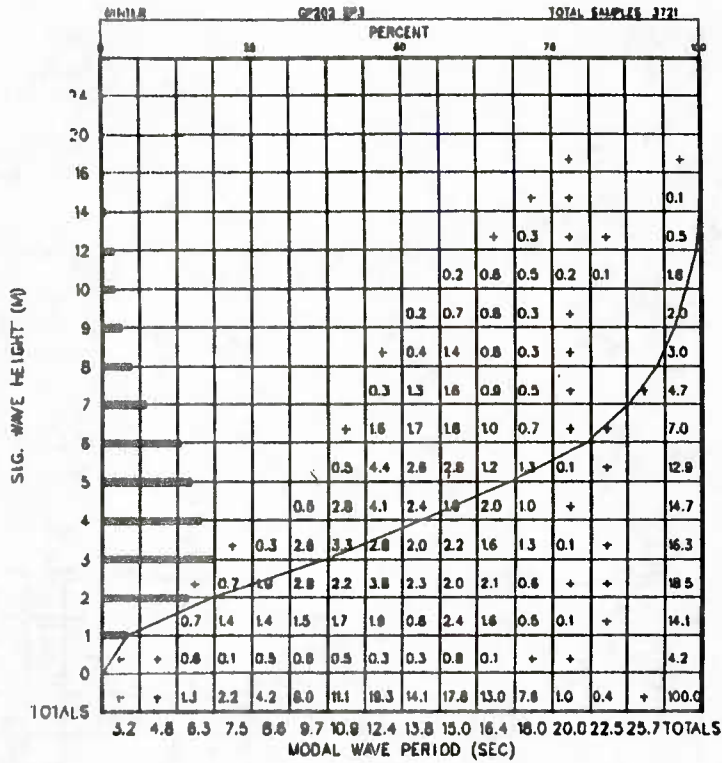


Figure A-202-2-1 Significant Wave Height vs. Modal Wave Period

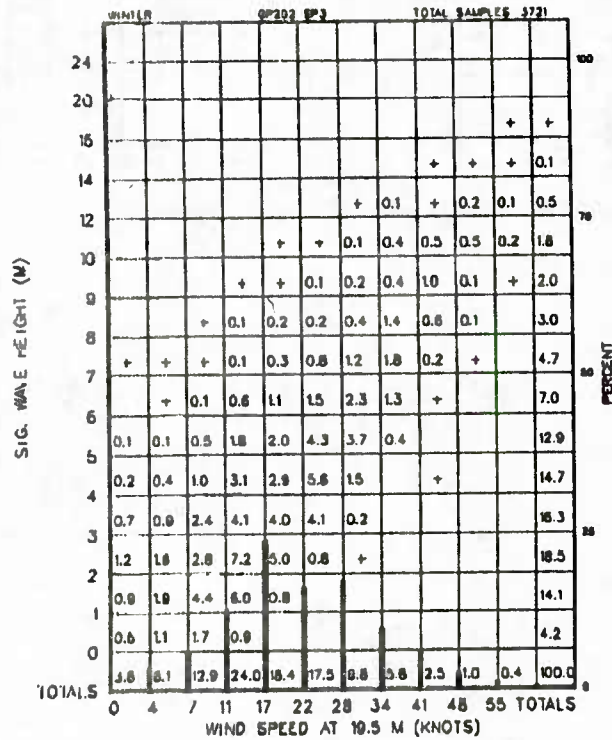


Figure A-202-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

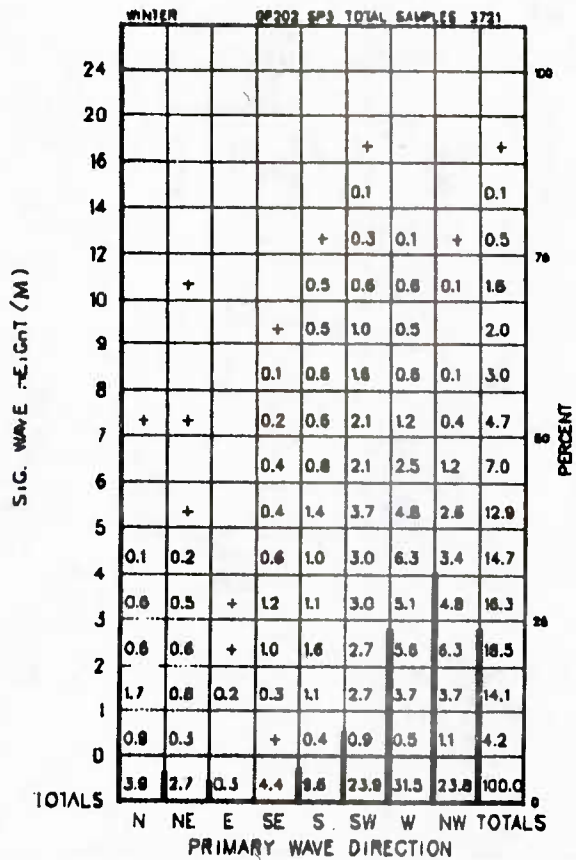


Figure A-202-2-3 Significant Wave Height vs. Primary Wave Direction

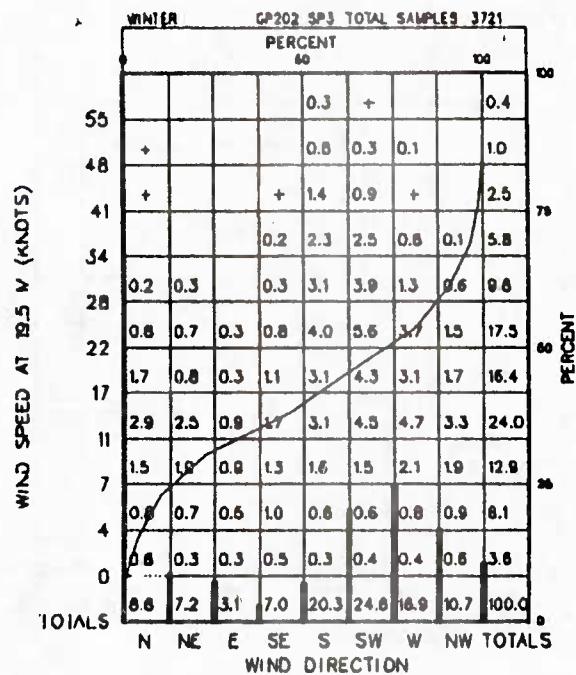


Figure A-202-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

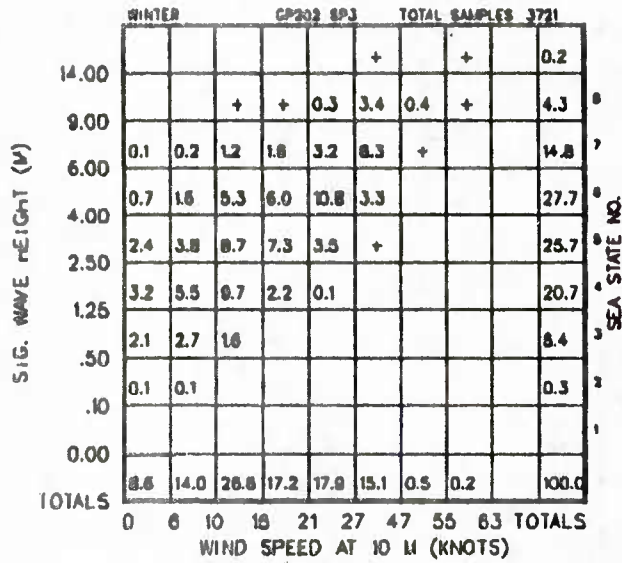


Figure A-202-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

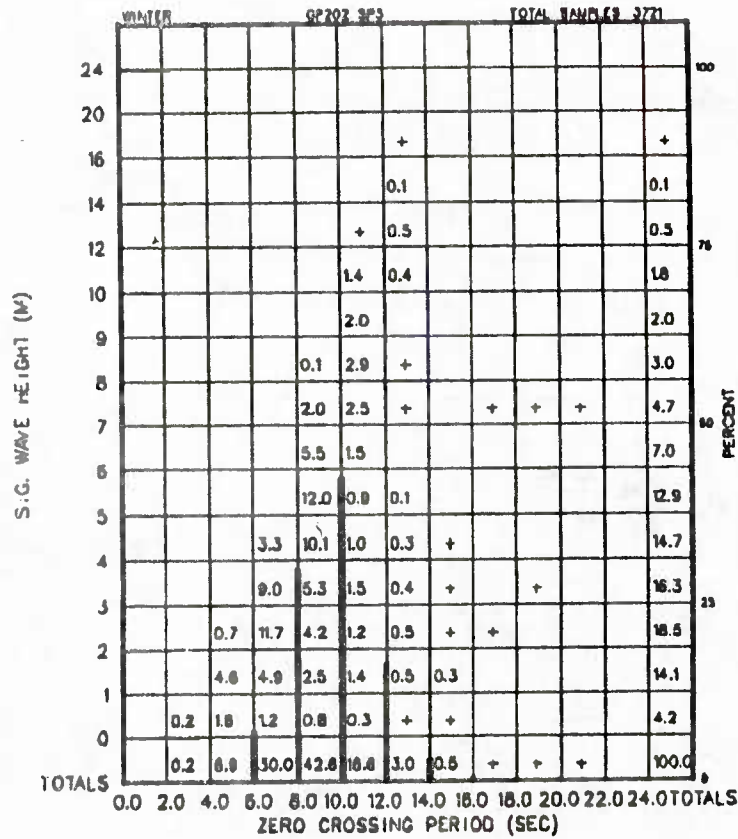


Figure A-202-2-6 Significant Wave Height vs. Zero Crossing Period

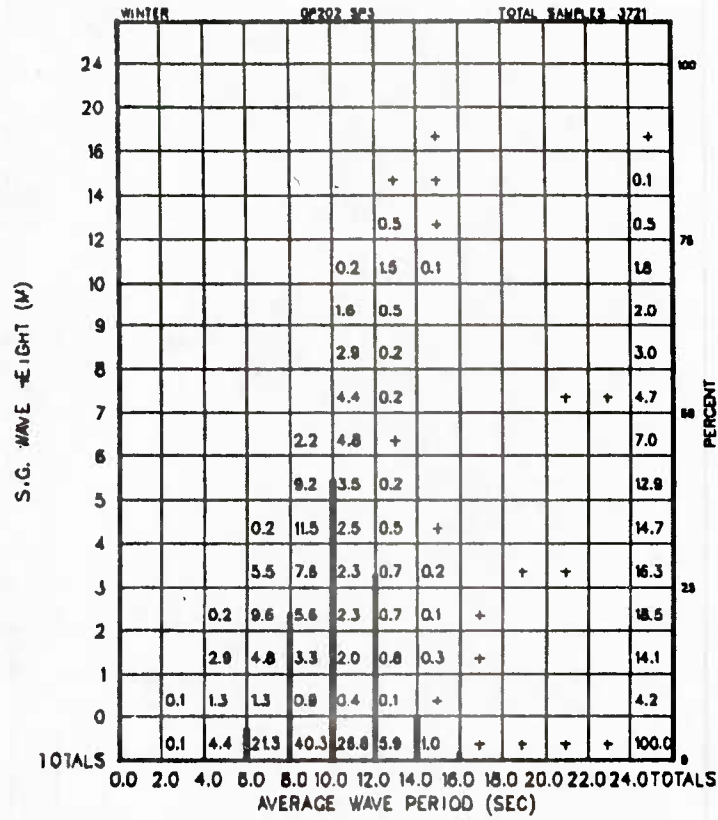


Figure A-202-2-7 Significant Wave Height vs. Average Wave Period

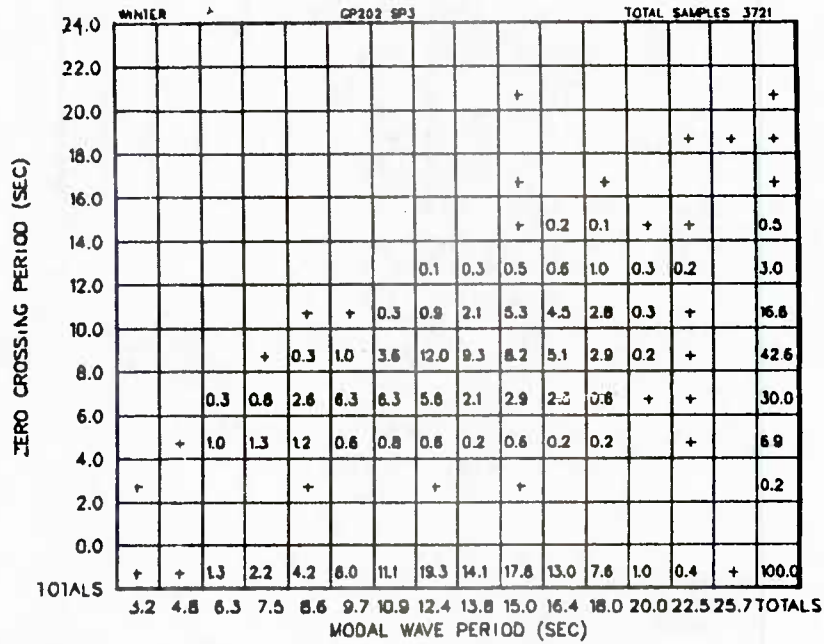


Figure A-202-2-8 Zero Crossing Period vs. Modal Wave Period

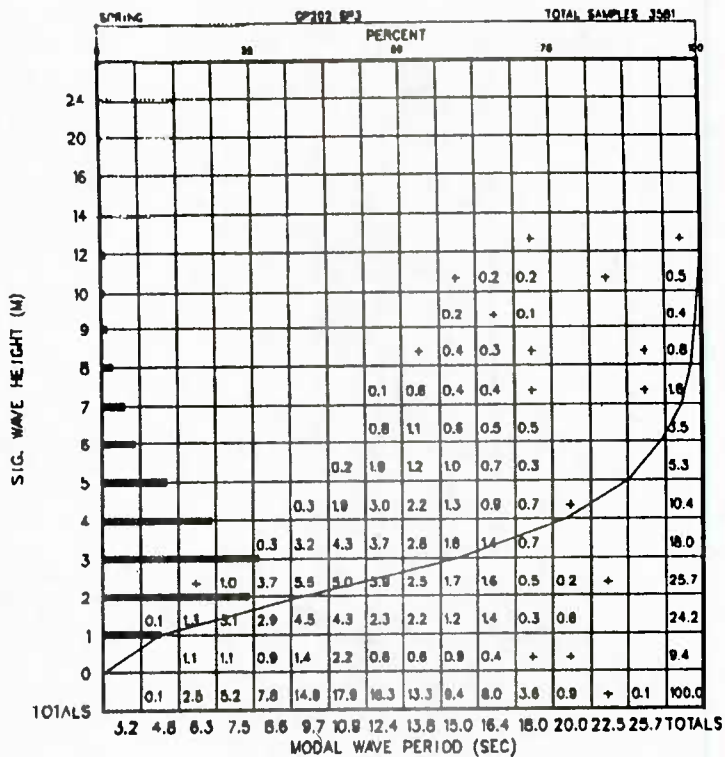


Figure A-202-3-1 Significant Wave Height vs. Modal Wave Period

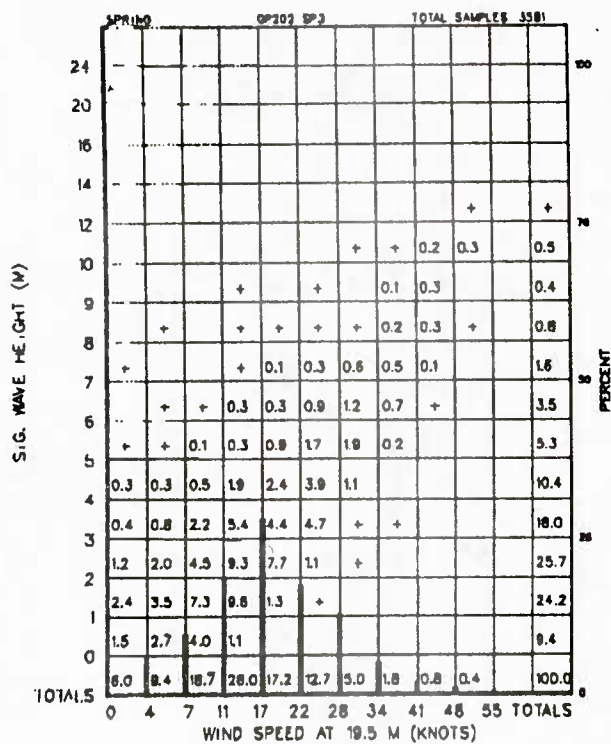


Figure A-202-3-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

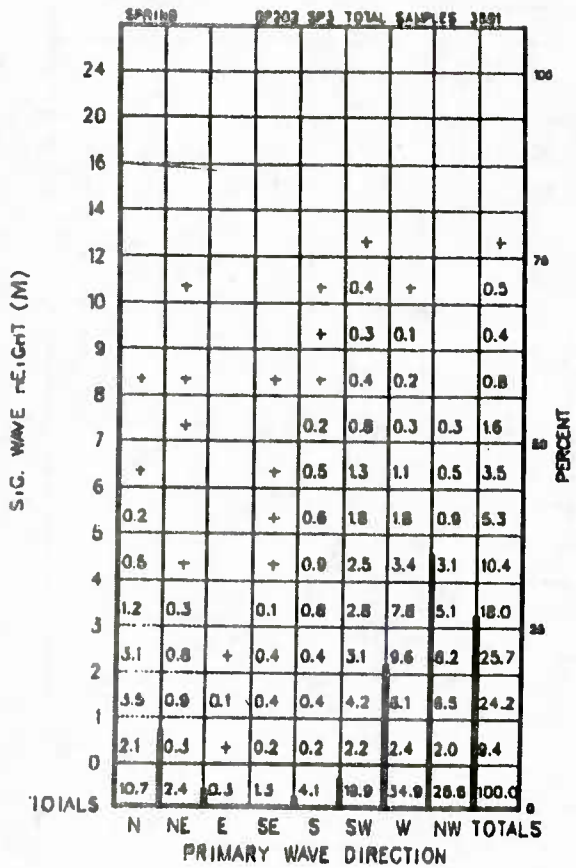


Figure A-202-3-3 Significant Wave Height vs. Primary Wave Direction

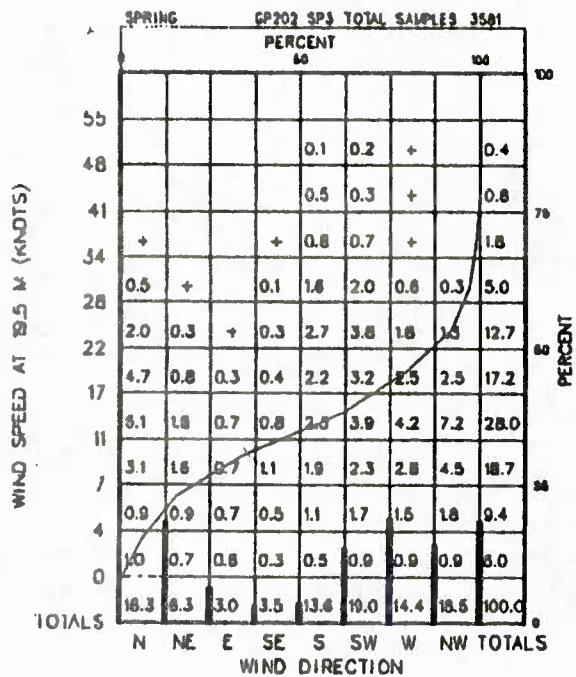


Figure A-202-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

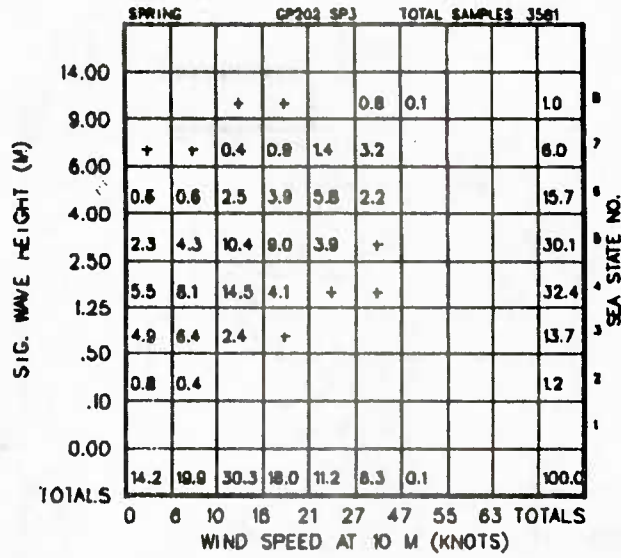


Figure A-202-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

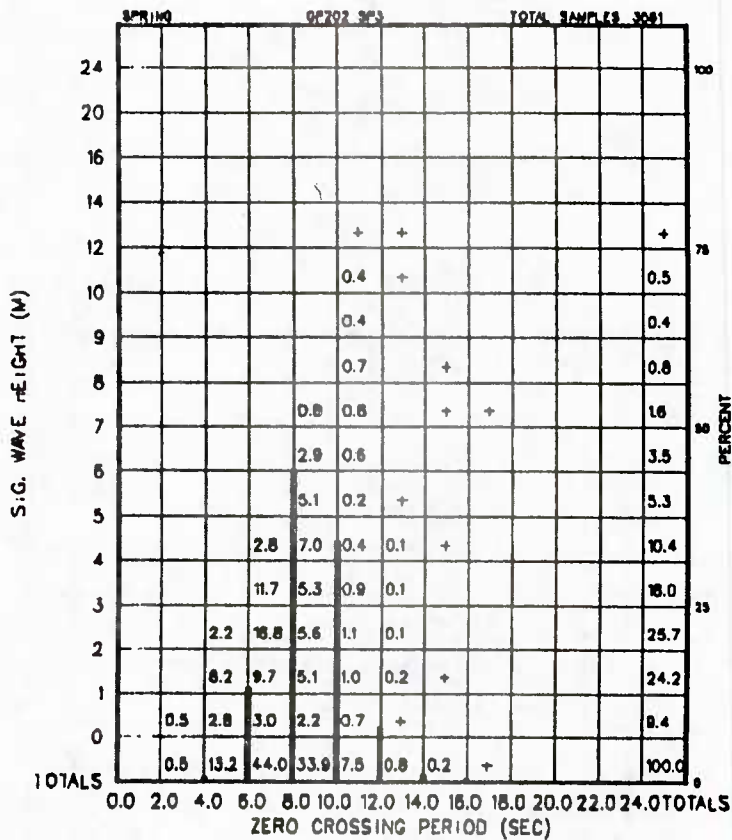


Figure A-202-3-6 Significant Wave Height vs. Zero Crossing Period

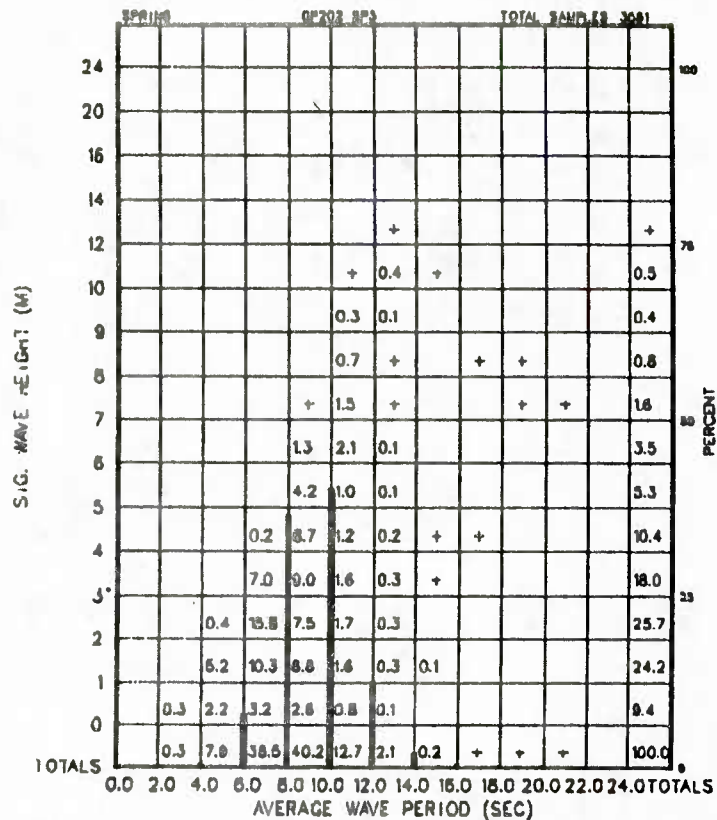


Figure A-202-3-7 Significant Wave Height vs. Average Wave Period

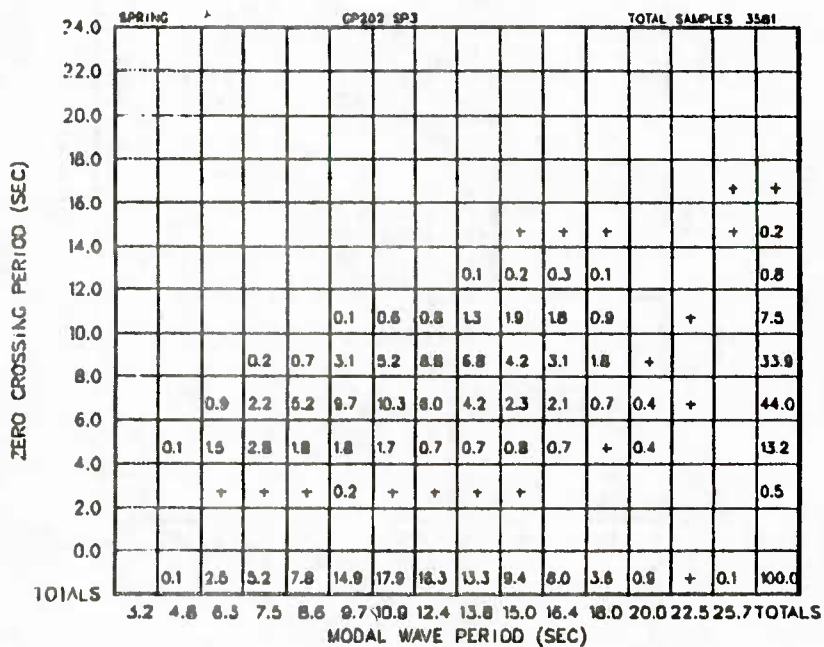


Figure A-202-3-8 Zero Crossing Period vs. Modal Wave Period

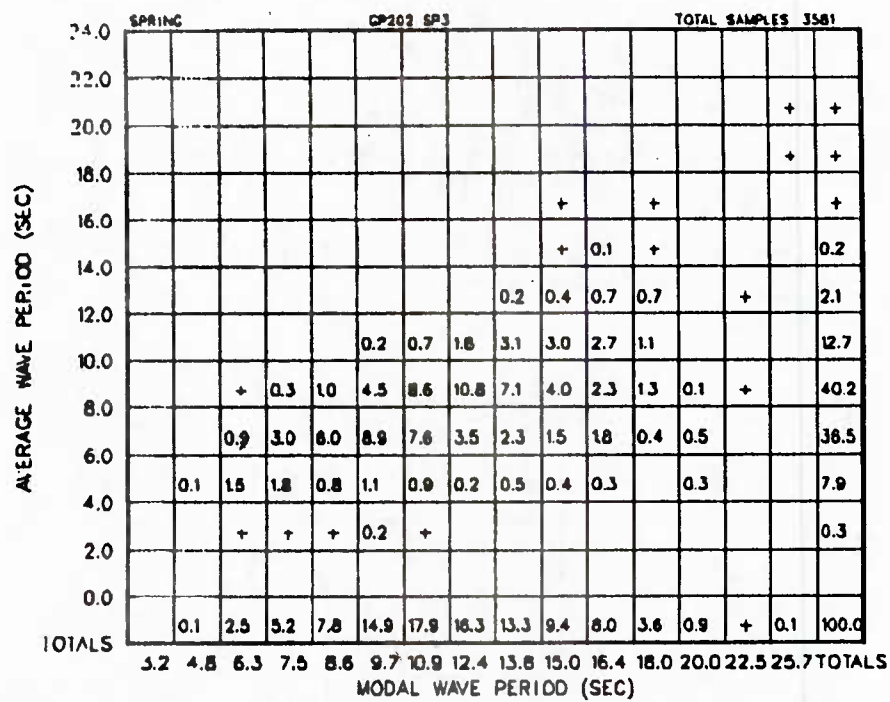


Figure A-202-3-9 Average Wave Period vs. Modal Wave Period

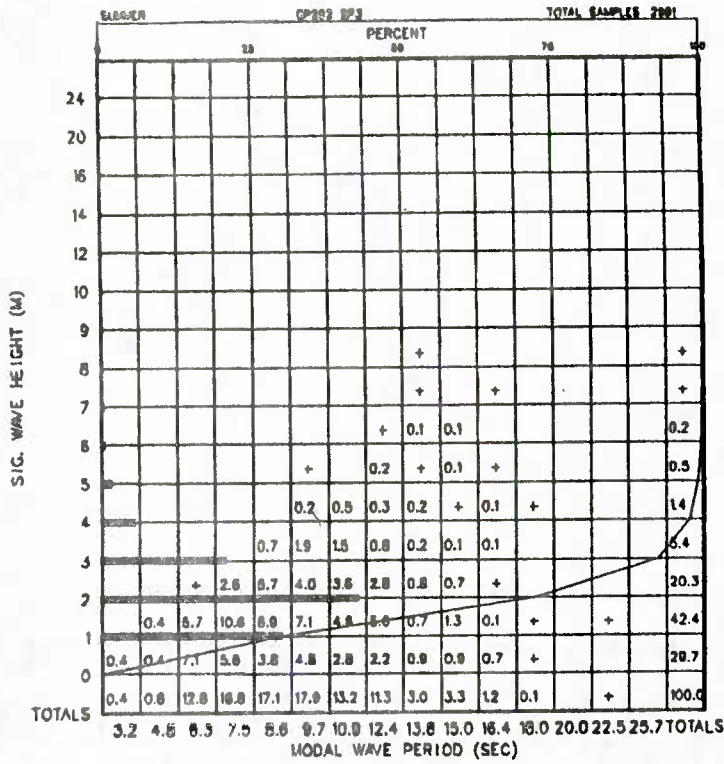


Figure A-202-4-1 Significant Wave Height vs. Modal Wave Period

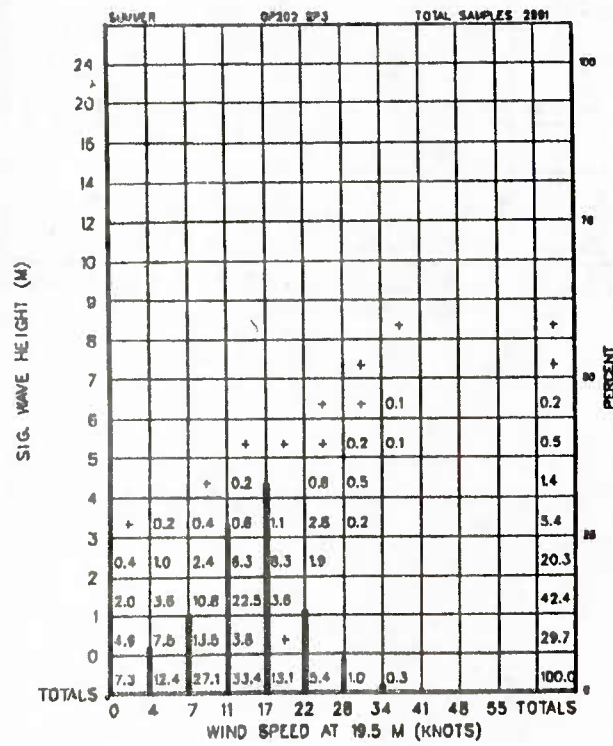


Figure A-202-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

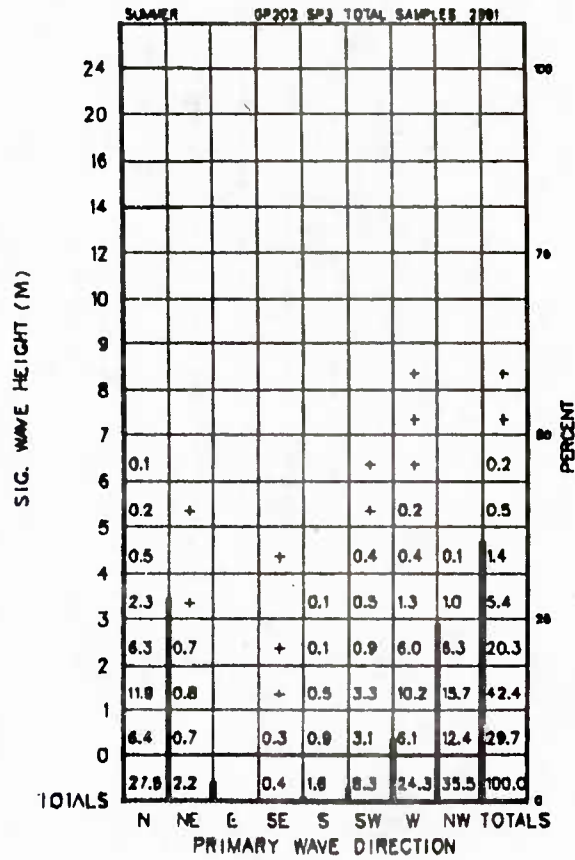


Figure A-202-4-3 Significant Wave Height vs. Primary Wave Direction

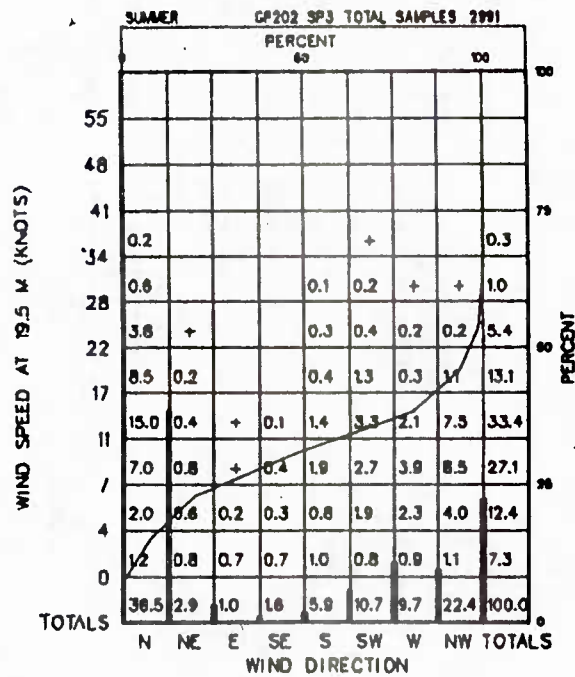


Figure A-202-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

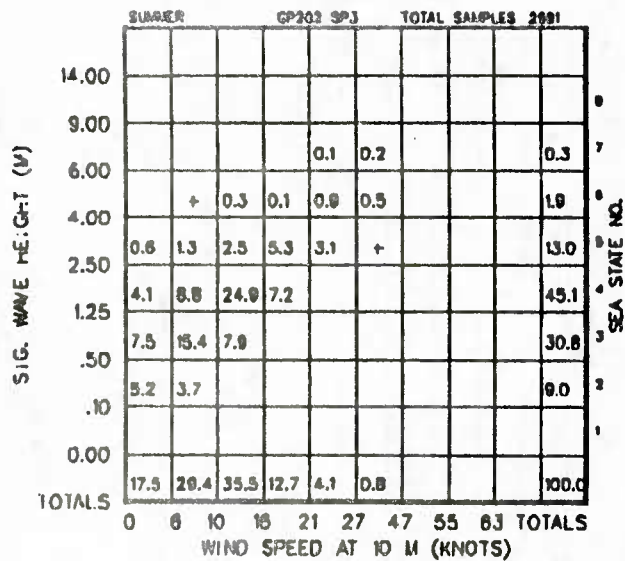


Figure A-202-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

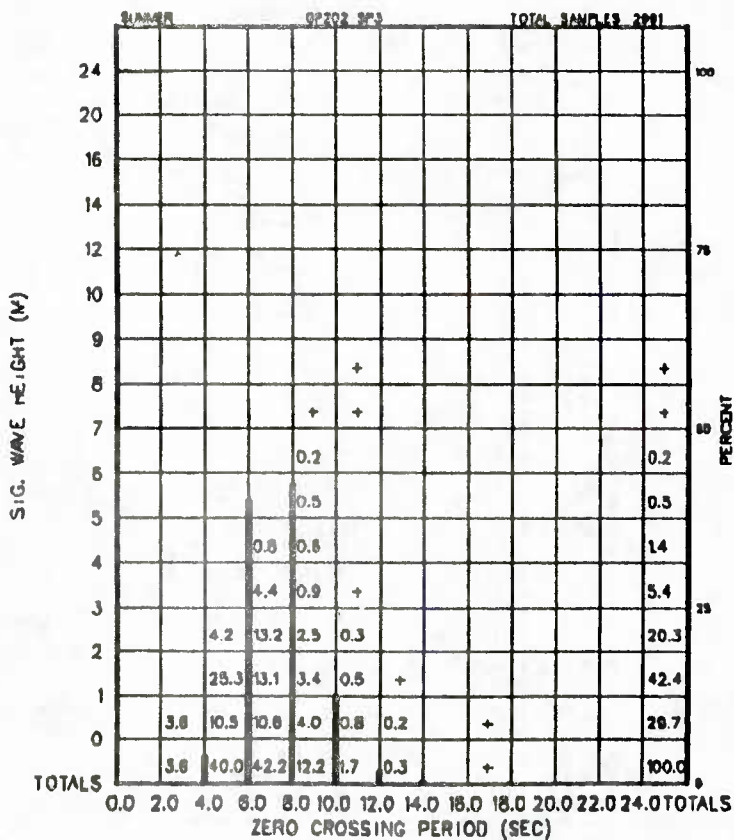


Figure A-202-4-6 Significant Wave Height vs. Zero Crossing Period

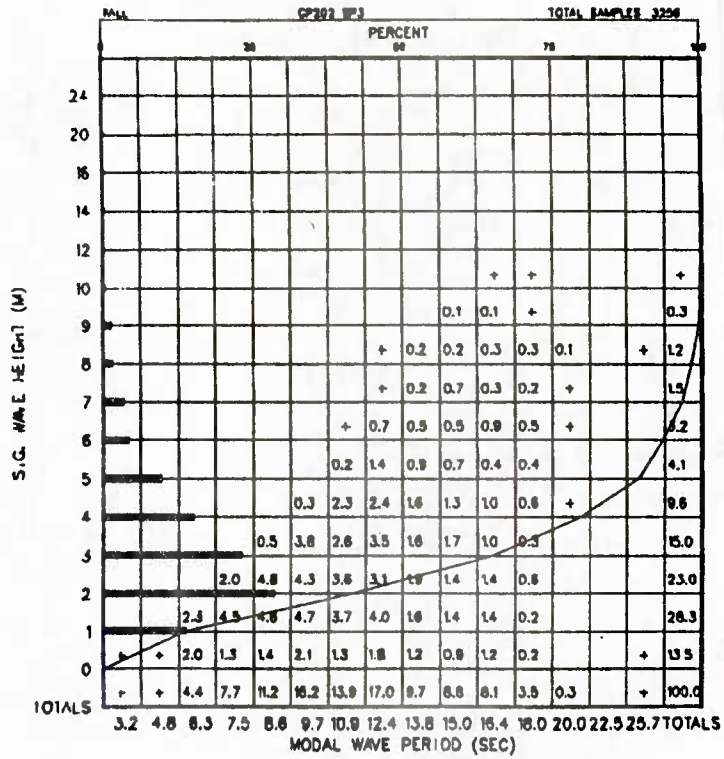


Figure A-202-5-1 Significant Wave Height vs. Modal Wave Period

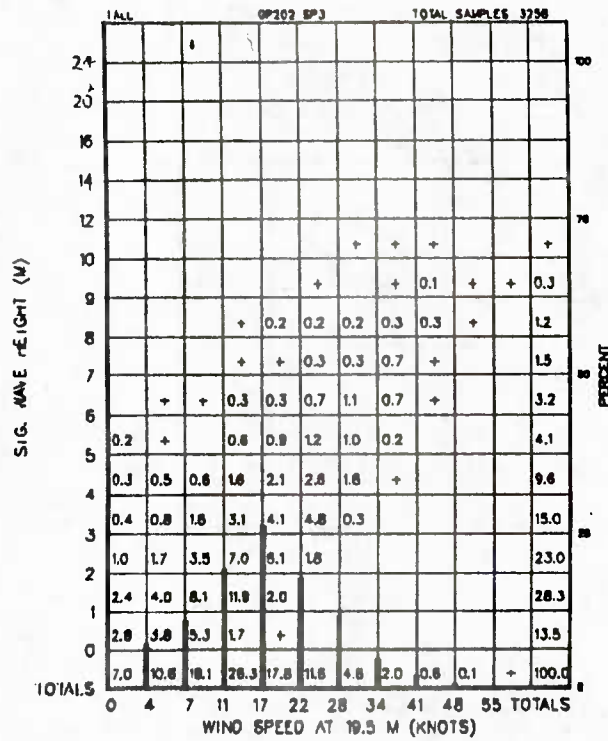


Figure A-202-5-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

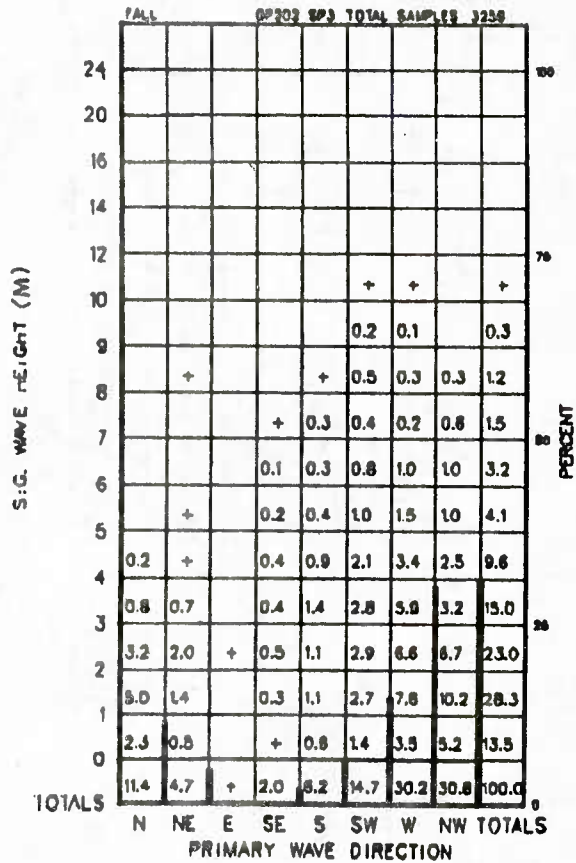


Figure A-202-5-3 Significant Wave Height vs. Primary Wave Direction

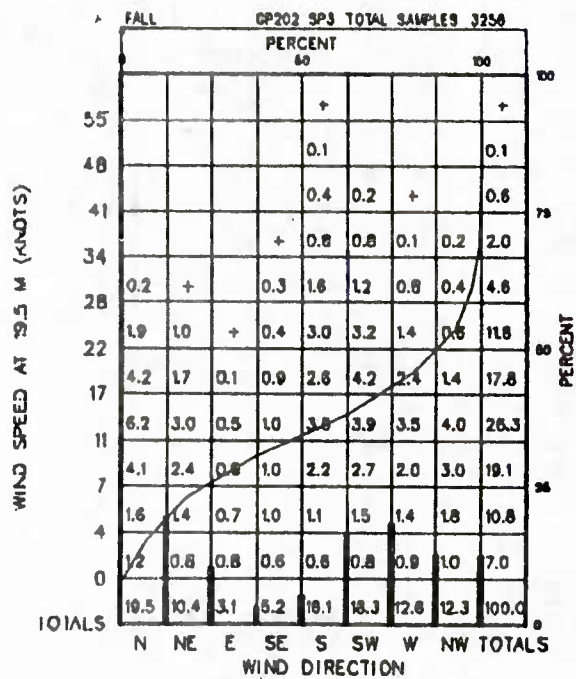


Figure A-202-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

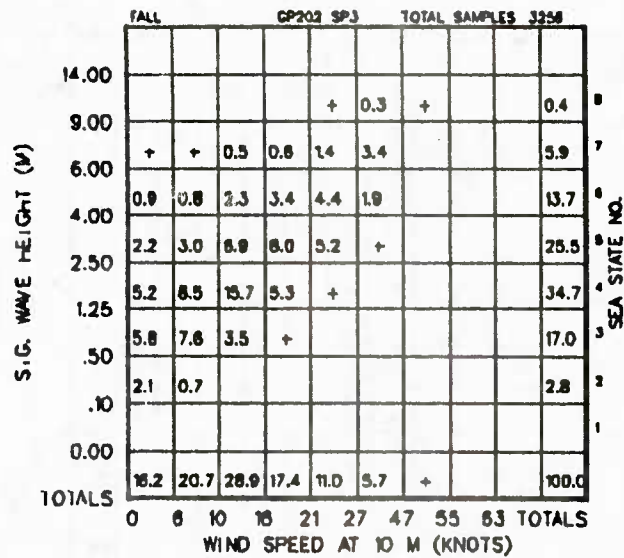


Figure A-202-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

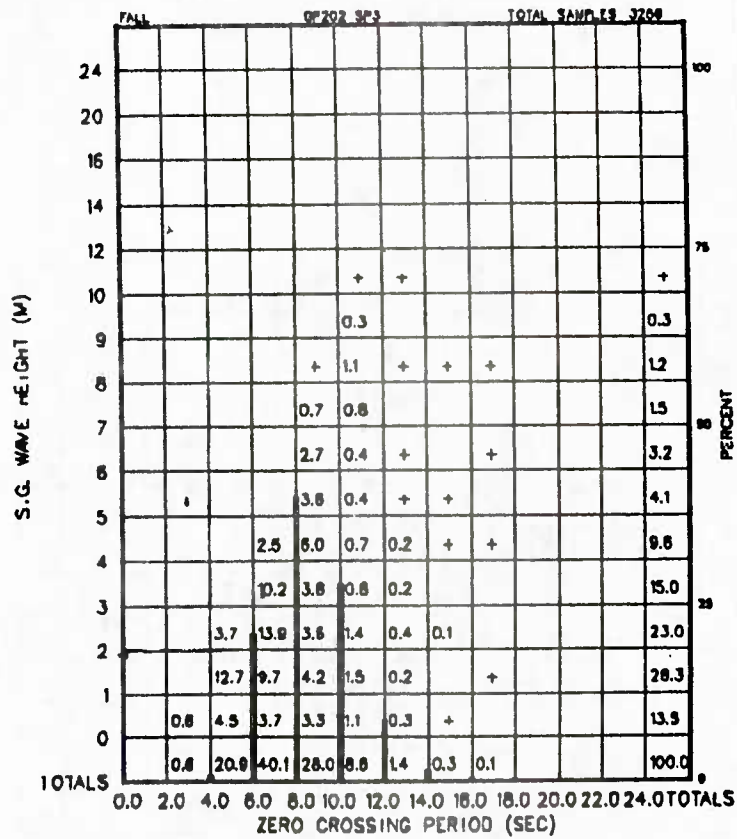


Figure A-202-5-6 Significant Wave Height vs. Zero Crossing Period

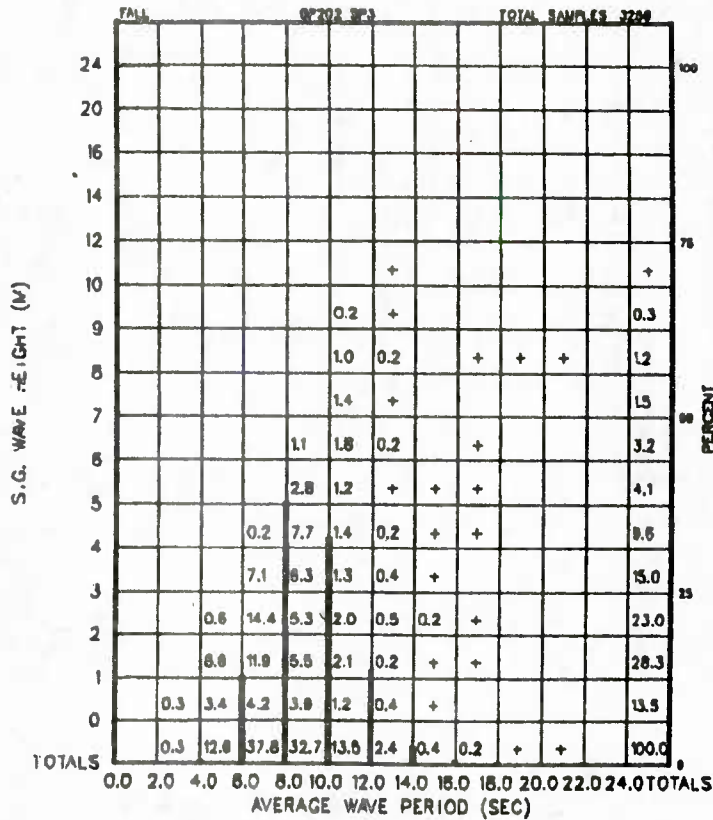


Figure A-202-5-7 Significant Wave Height vs. Average Wave Period

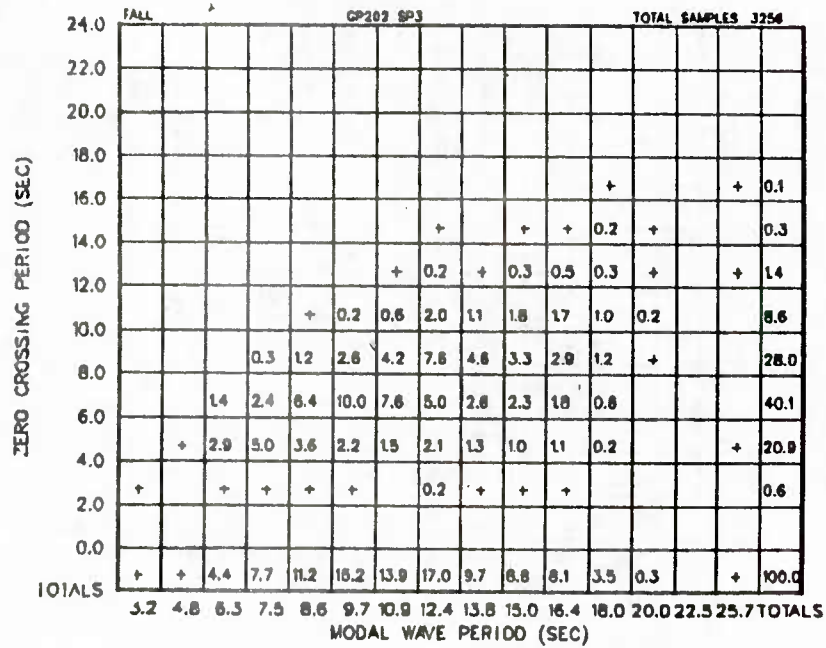


Figure A-202-5-8 Zero Crossing Period vs. Modal Wave Period

TABLE A-4/121-1-1 - SURFACE NATURAL ENVIRONMENT SUMMARY

SEASON: ANNUAL; LOCATION: 24.25°N, 116.34°W						
Natural Environment	Minimum (5 Percentile)	Median (50 Percentile)	Maximum (95 Percentile)	Mean	Most Probable	
Sea Surface Sig. Wave Height, m. Wave Period, sec Direction	0.25 5 -	1.25 8 -	2.5 16 -	1.25 9 -	0.5 7.5 NW	
Winds Speed, knots Corresponding Mean Sig. Wave Height, m. Direction	3 0.75 -	10 1 -	19 2 -	10.75 1 -	14 1.5 N	
Visibility, nautical miles	10	22	25	-	-	
Cloud Cover Total clouds, in eights of sky obscured Low clouds, in eights of sky obscured	0 0	3 2	7.5 7	- -	- -	
Precipitation (Occurrence)	All precipitation - 1% of the time					
Relative Humidity, %	62	77	92	-	-	
Air Temperature, °C	23	25.5	29	26	-	
Sea Surface Temperature, °C	26	28	29.5	-	-	
Sea Level Pressure, millibars	1010	1014	1017	-	-	
Ice	None					
Refractivity Mean Surface Refractivity Sub-Refraction (1 km, Annual) Super-Refraction or Ducting (1 km, Annual)	- - -	- - -	- - -	328 - -	- 2% 1%	

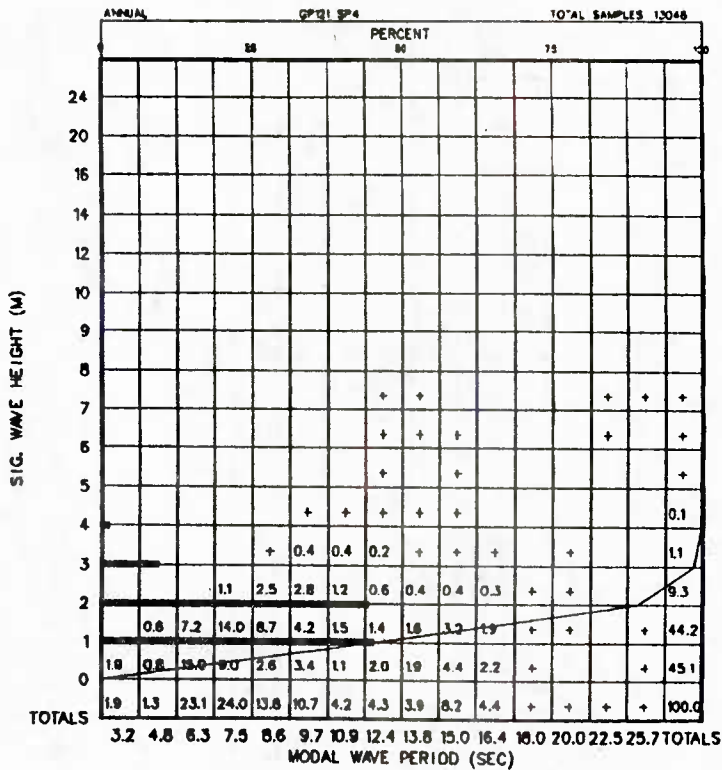


Figure A-4/121-1-1 Significant Wave Height vs. Modal Wave Period

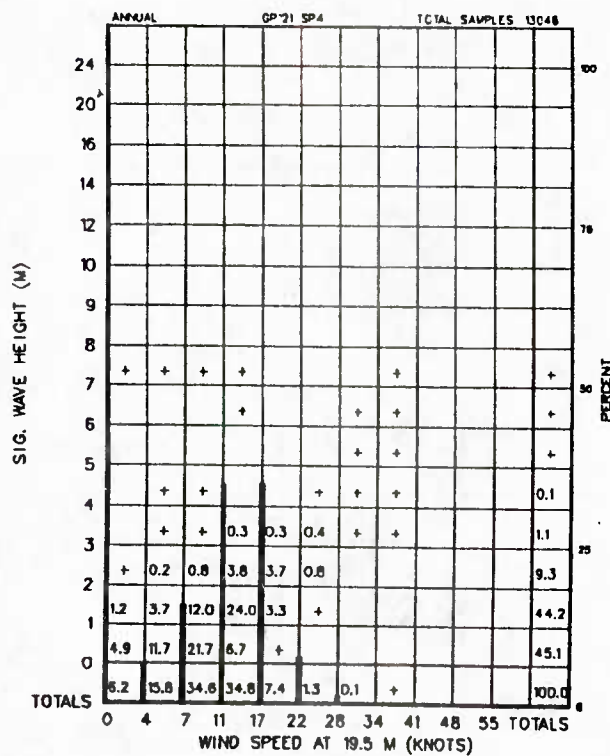


Figure A-4/121-1-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

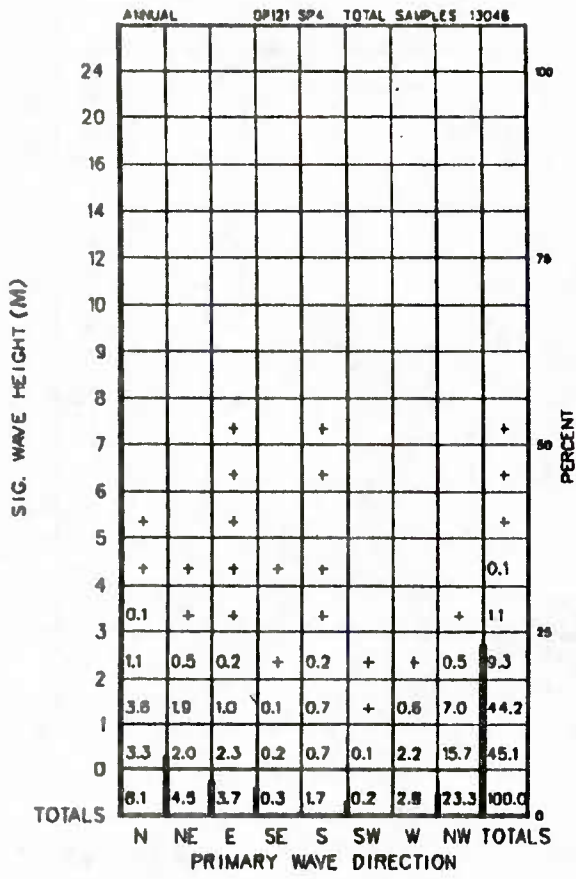


Figure A-4/121-1-3 Significant Wave Height vs. Primary Wave Direction

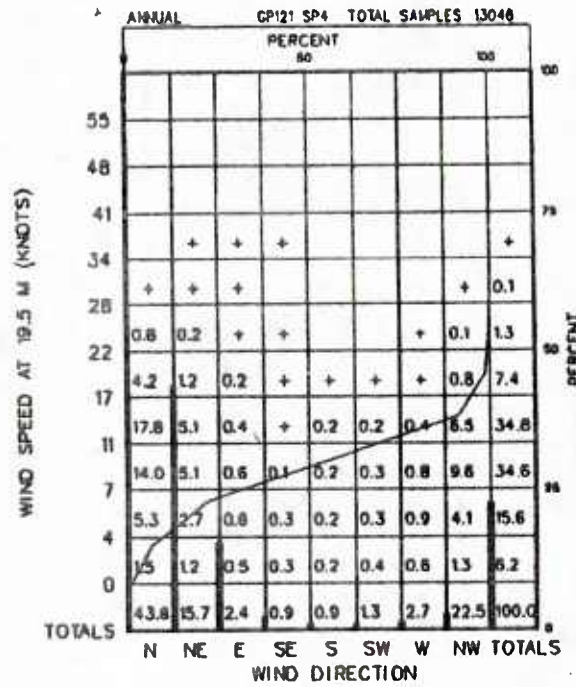


Figure A-4/121-1-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

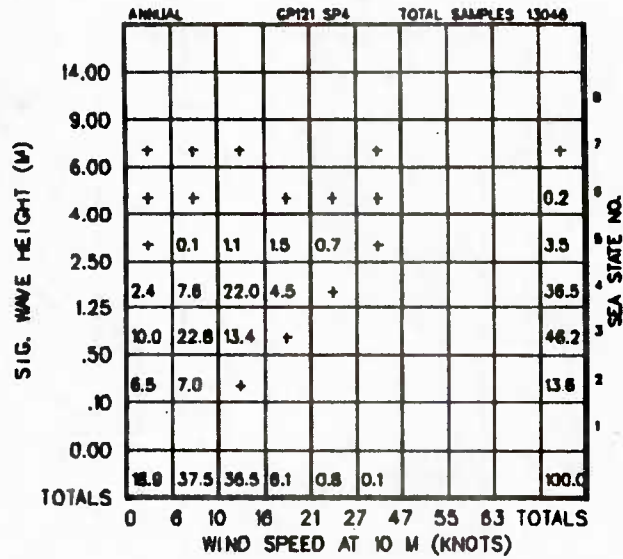


Figure A-4/121-1-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

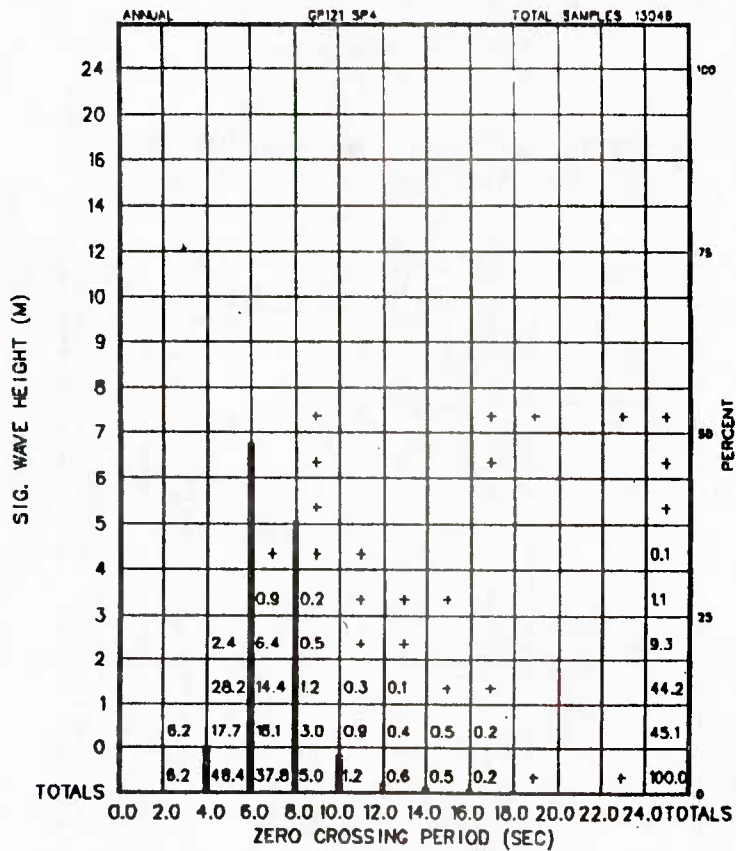


Figure A-4/121-1-6 Significant Wave Height vs. Zero Crossing Period

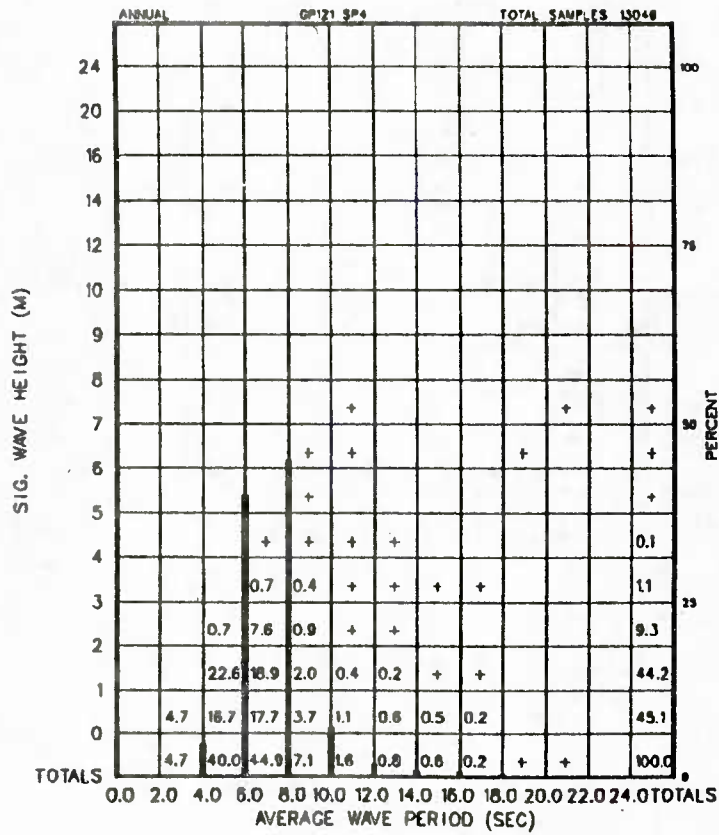


Figure A-4/121-1-7 Significant Wave Height vs. Average Wave Period

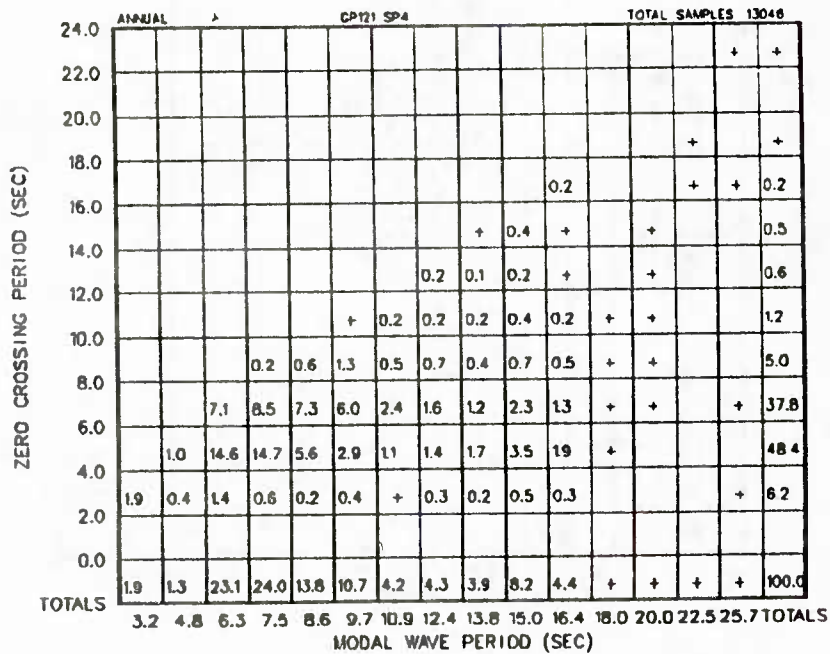


Figure A-4/121-1-8 Zero Crossing Period vs. Modal Wave Period

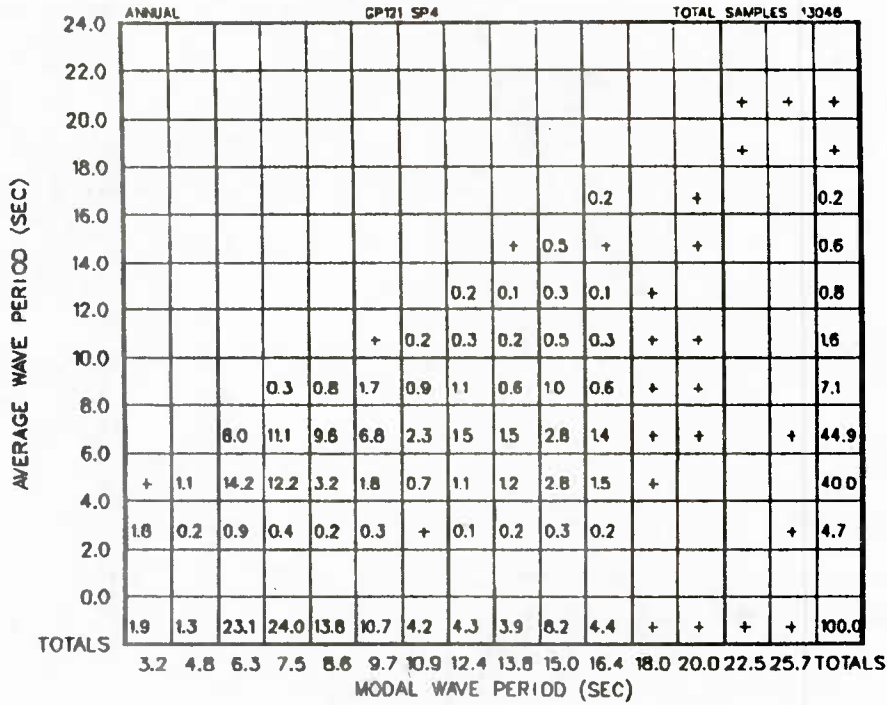


Figure A-4/121-1-9 Average Wave Period vs. Modal Wave Period

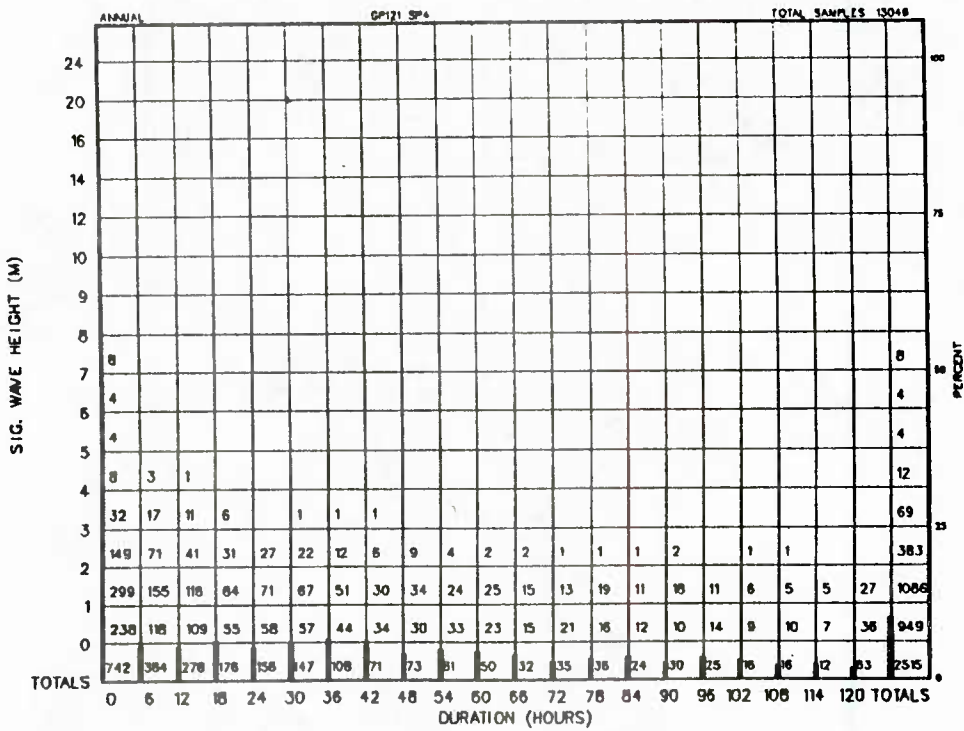


Figure A-4/121-1-10 Persistence of Wave Height

CP121 SP4

TOTAL SAMPLES 13048

WIND SPEED AT 19.5 M (KNOTS)	0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	TOTALS	PERCENT	
48																								
41																								
34		1	1			1																	3	
28		9	2	2																			13	
22		81	14	10		4	1																110	
17		387	114	44	28	9	6		1				1										590	
11		806	401	221	146	90	47	37	28	16	8	10	1	2	1		1	2				1	1818	
7		1045	464	271	128	76	46	14	22	11	10	5				2							209	
4		754	270	123	44	15	9	5	3	1													1224	
0		285	91	29	22	15	8	3	2			1											456	
TOTALS		3368	1357	700	388	210	117	59	54	28	18	17	3	2	1	2	1	2				1	6308	

Figure A-4/121-1-11 Persistence of Wind Speed at 19.5 M (Knots)

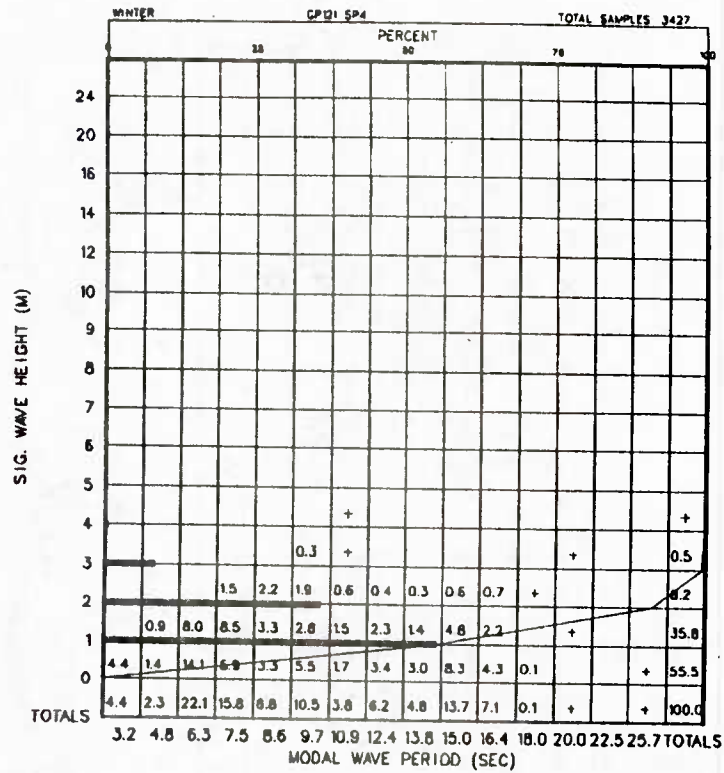


Figure A-4/121-2-1 Significant Wave Height vs. Modal Wave Period

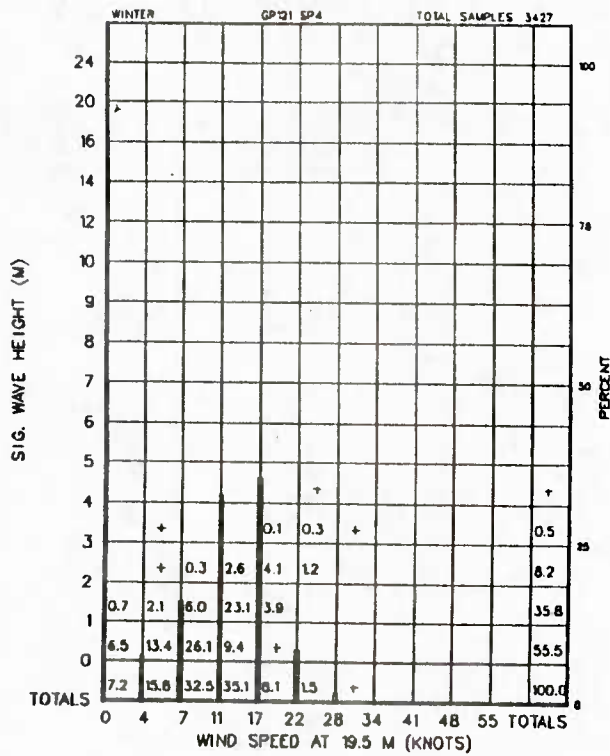


Figure A-4/121-2-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

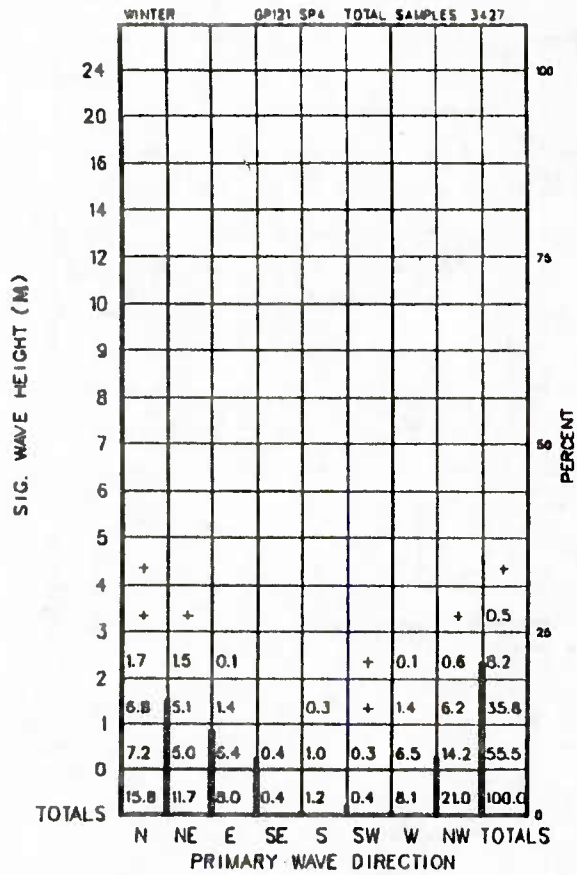


Figure A-4/121-2-3 Significant Wave Height vs. Primary Wave Direction

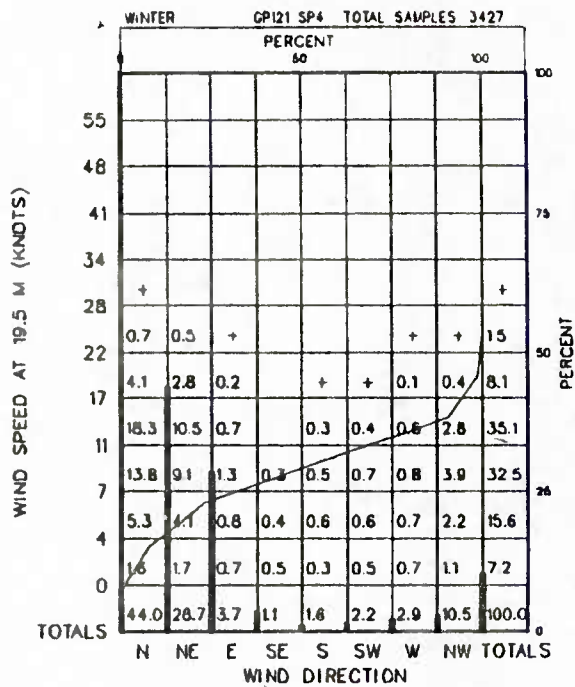


Figure A-4/121-2-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

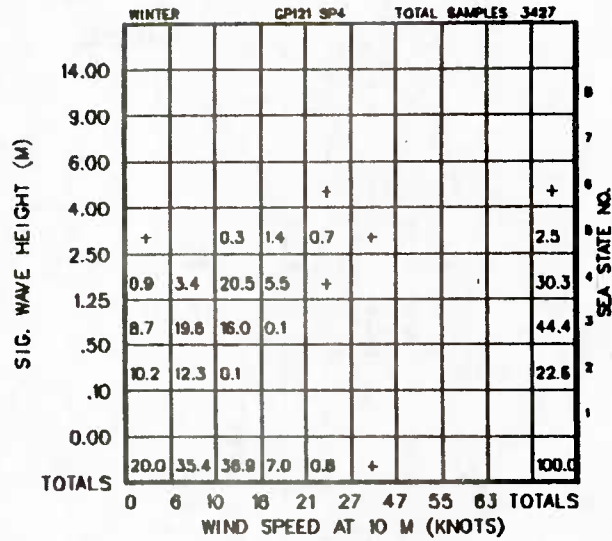


Figure A-4/121-2-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

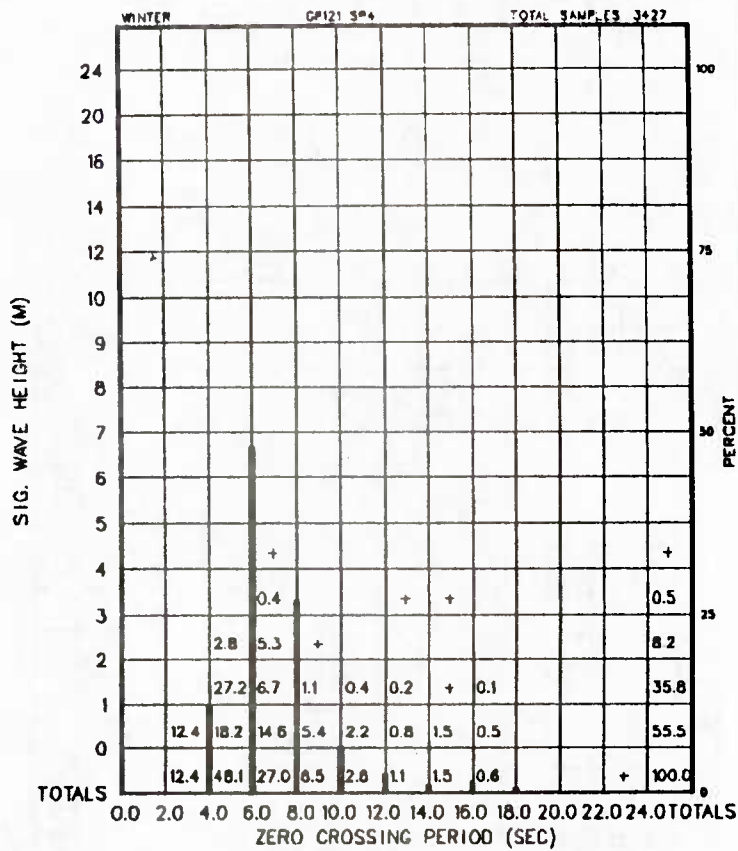


Figure A-4/121-2-6 Significant Wave Height vs. Zero Crossing Period

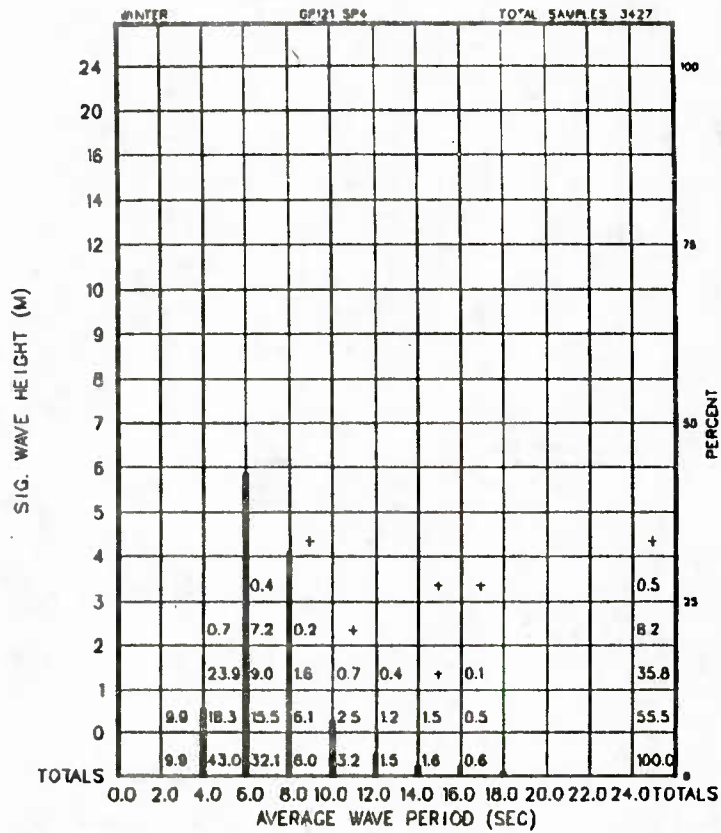


Figure A-4/121-2-7 Significant Wave Height vs. Average Wave Period

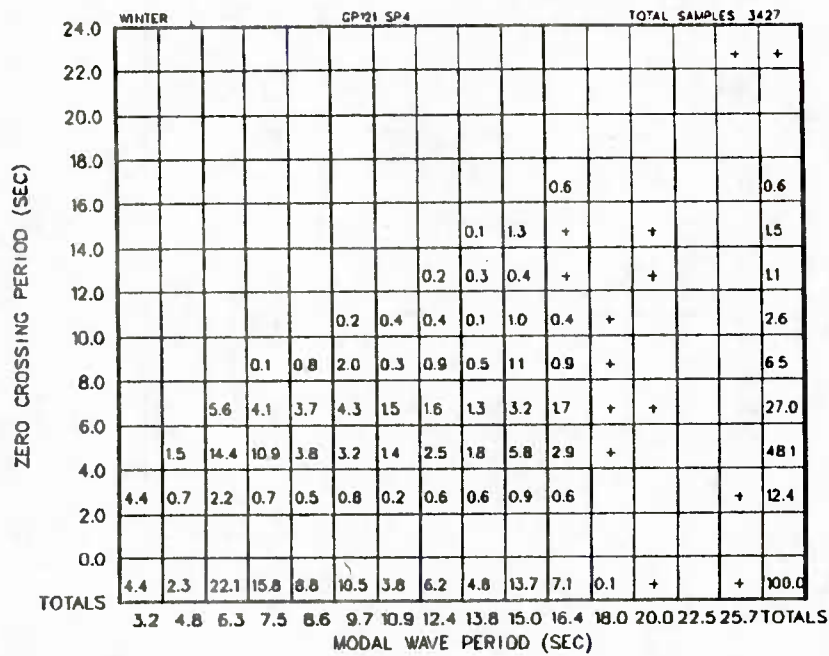


Figure A-4/121-2-8 Zero Crossing Period vs. Modal Wave Period

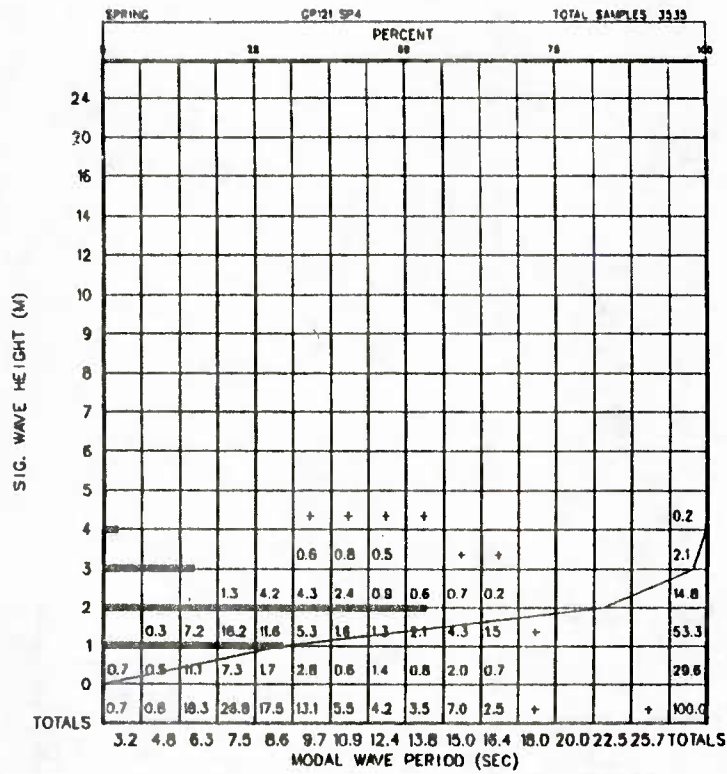


Figure A-4/121-3-1 Significant Wave Height vs. Modal Wave Period

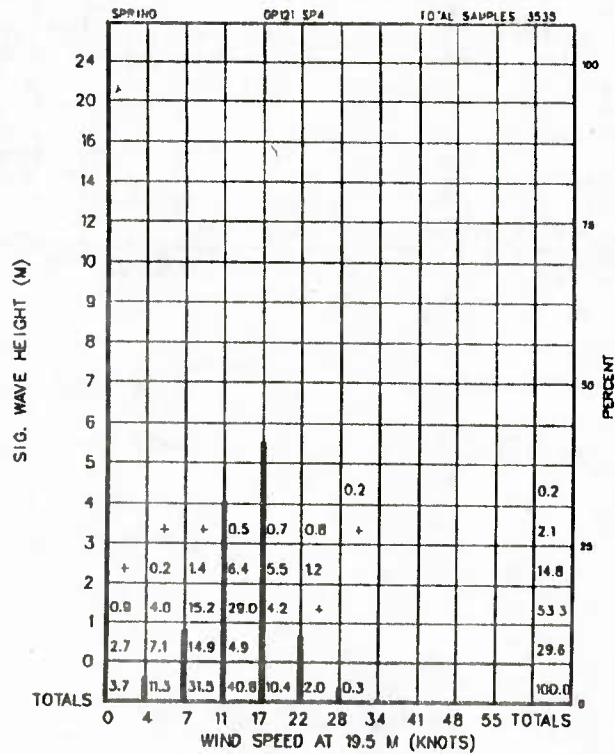


Figure A-4/121-3-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

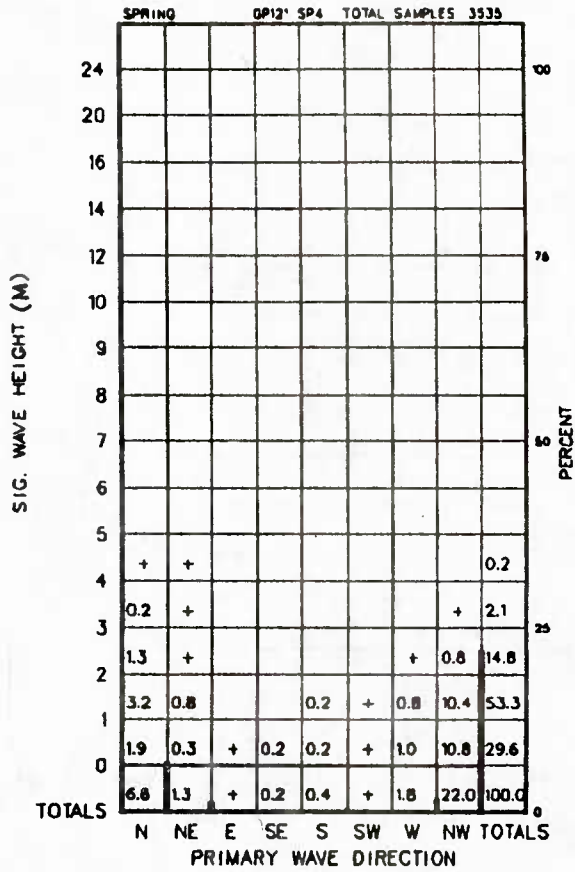


Figure A-4/121-3-3 Significant Wave Height vs. Primary Wave Direction

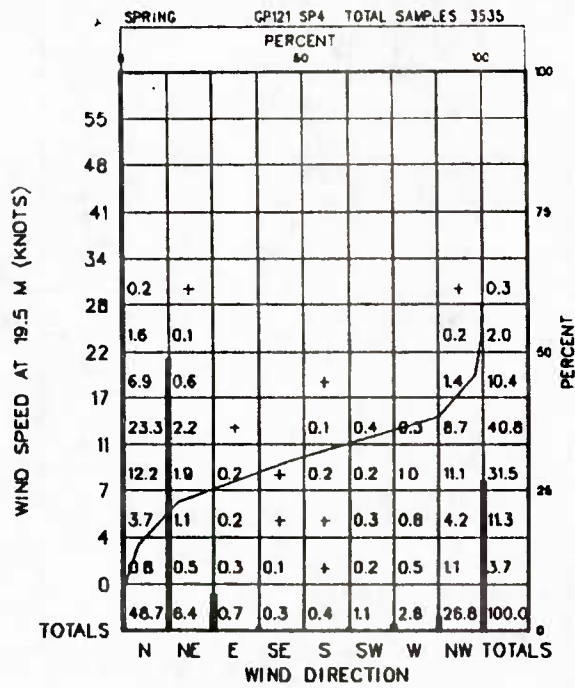


Figure A-4/121-3-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

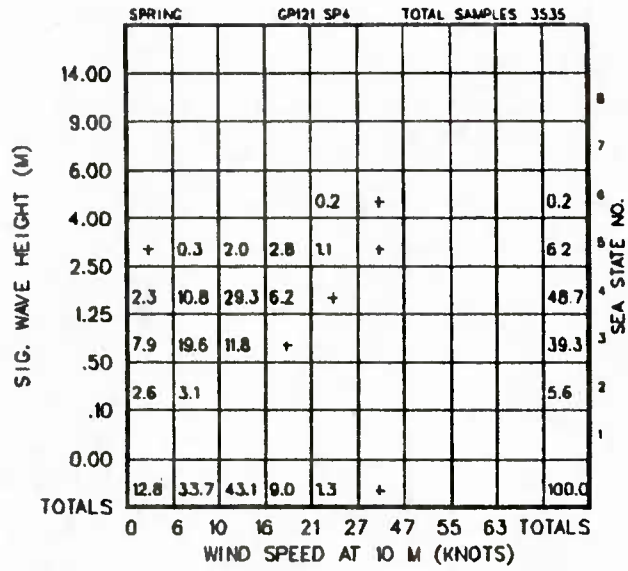


Figure A-4/121-3-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

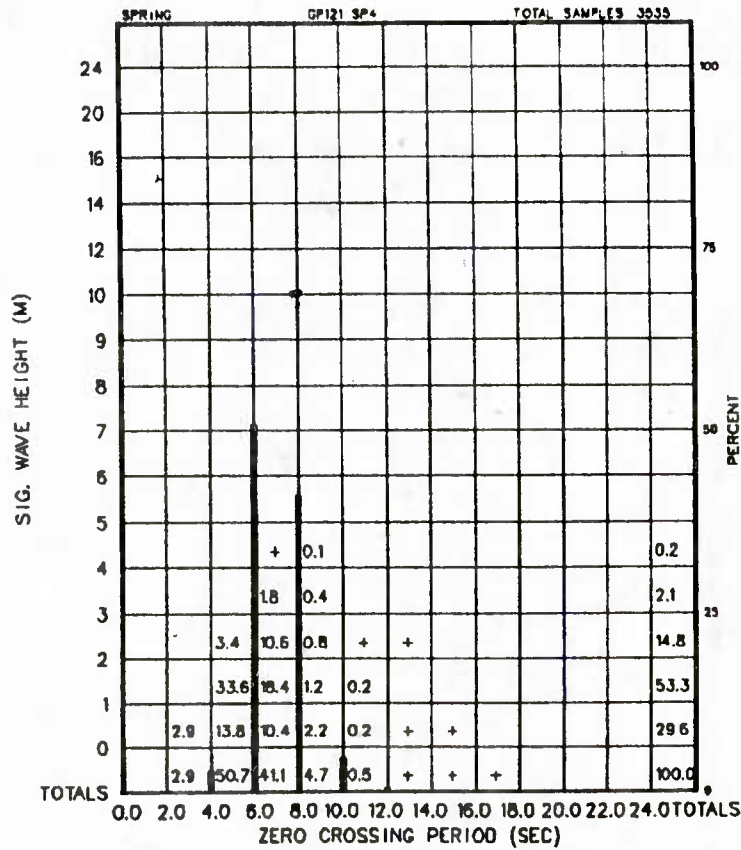


Figure A-4/121-3-6 Significant Wave Height vs. Zero Crossing Period

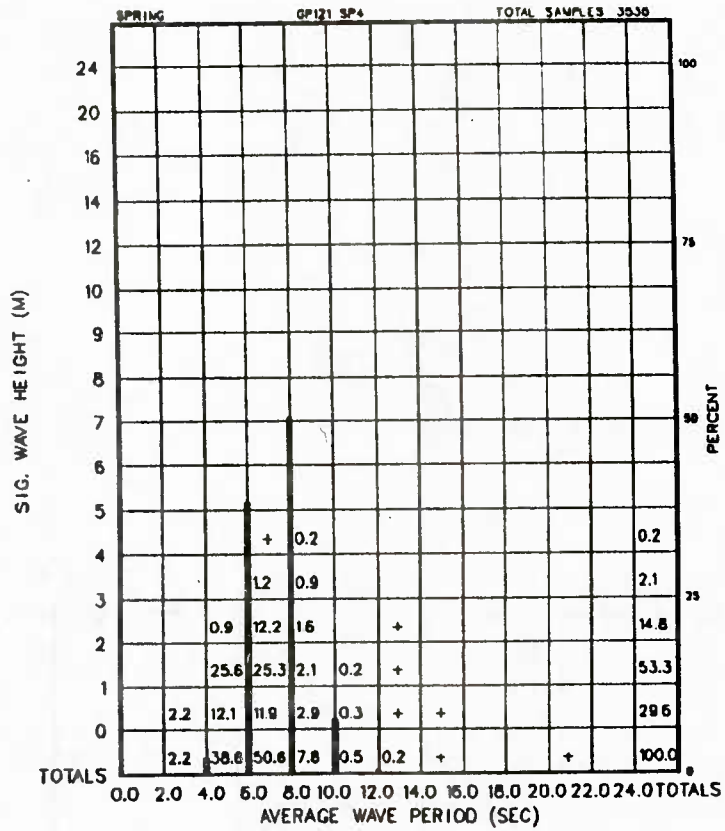


Figure A-4/121-3-7 Significant Wave Height vs. Average Wave Period

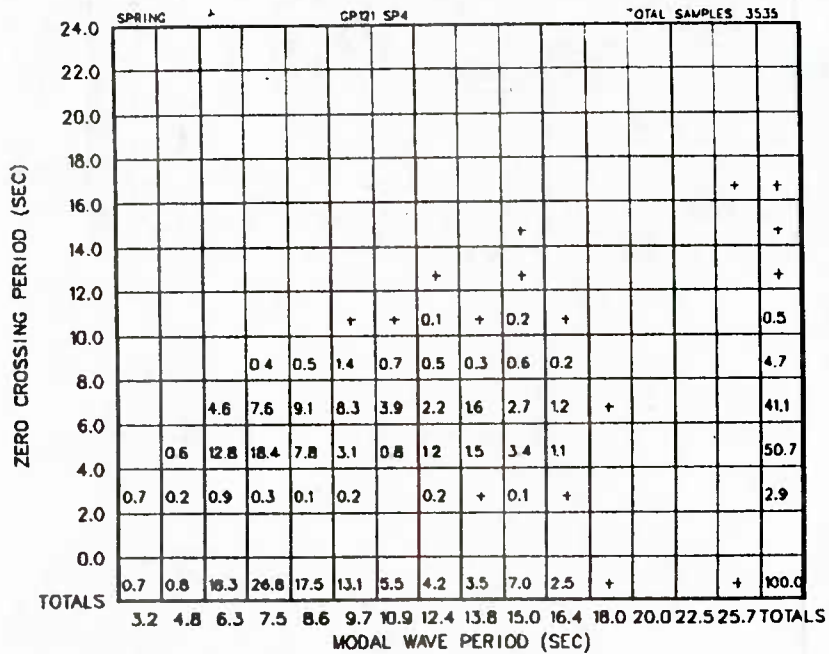


Figure A-4/121-3-8 Zero Crossing Period vs. Modal Wave Period

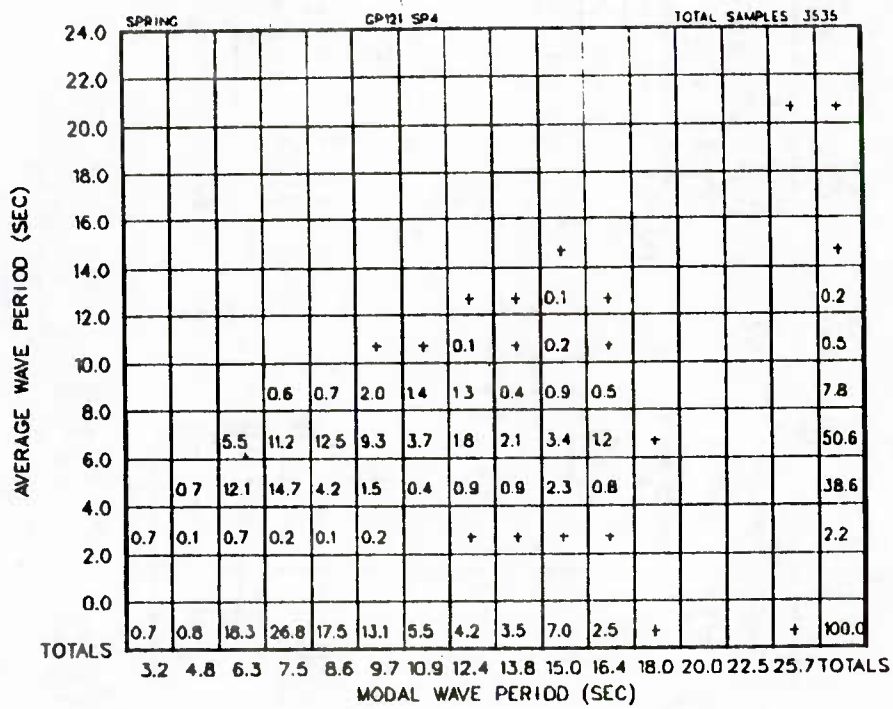


Figure A-4/121-3-9 Average Wave Period vs. Modal Wave Period

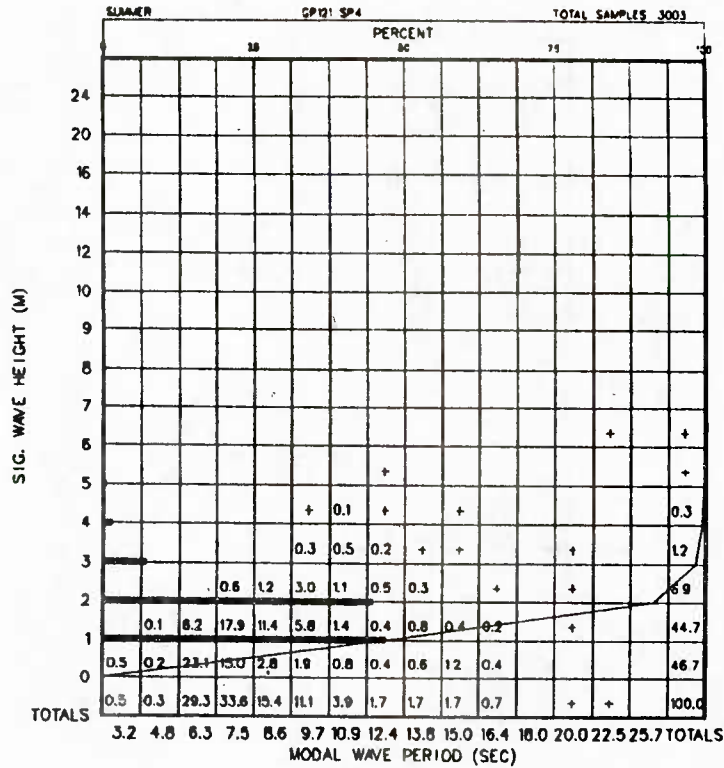


Figure A-4/121-4-1 Significant Wave Height vs. Modal Wave Period

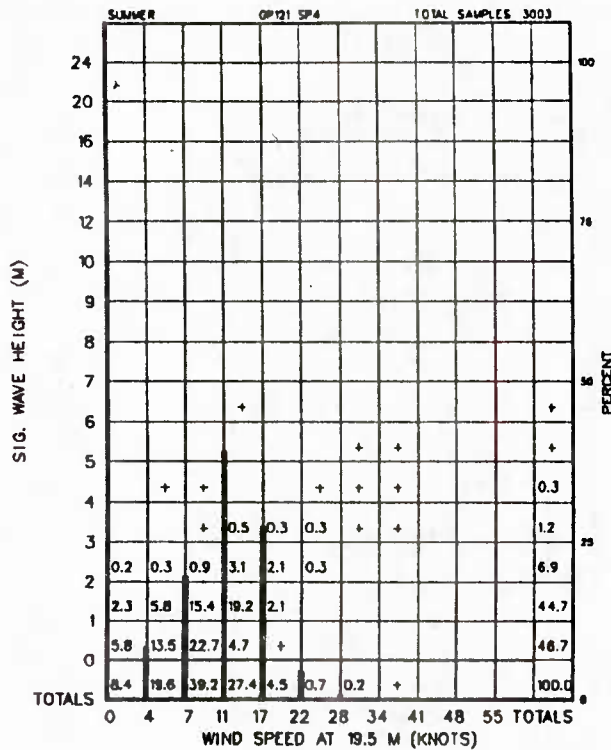


Figure A-4/121-4-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

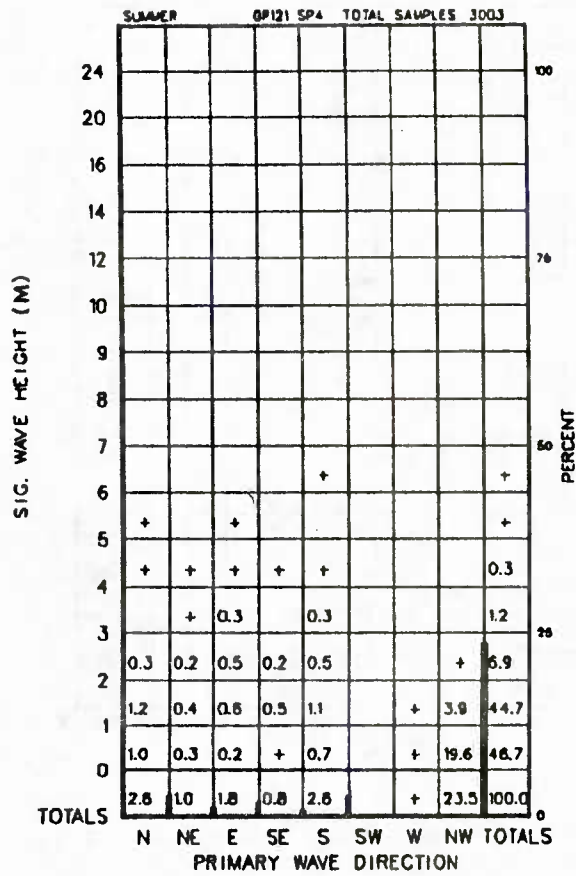


Figure A-4/121-4-3 Significant Wave Height vs. Primary Wave Direction

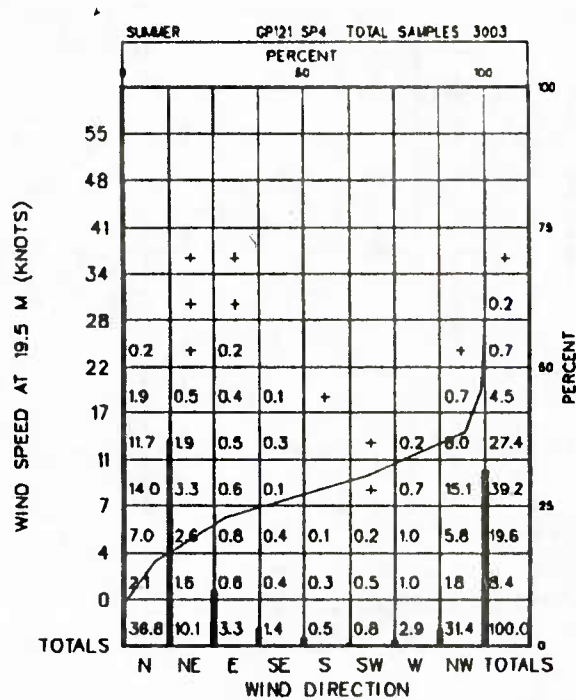


Figure A-4/121-4-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

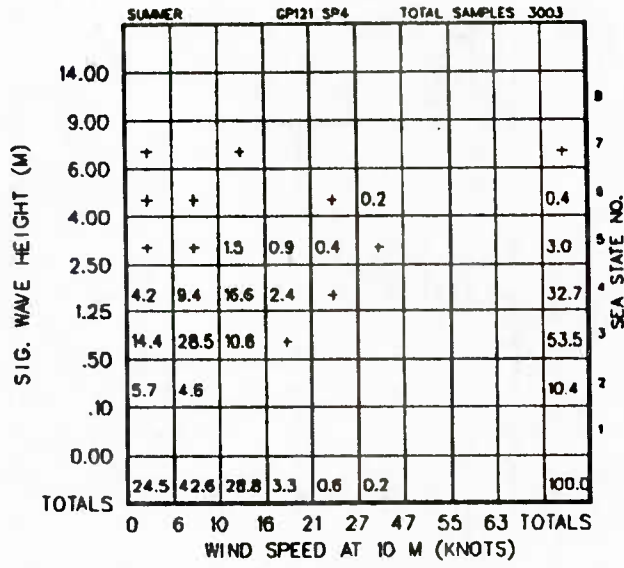


Figure A-4/121-4-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

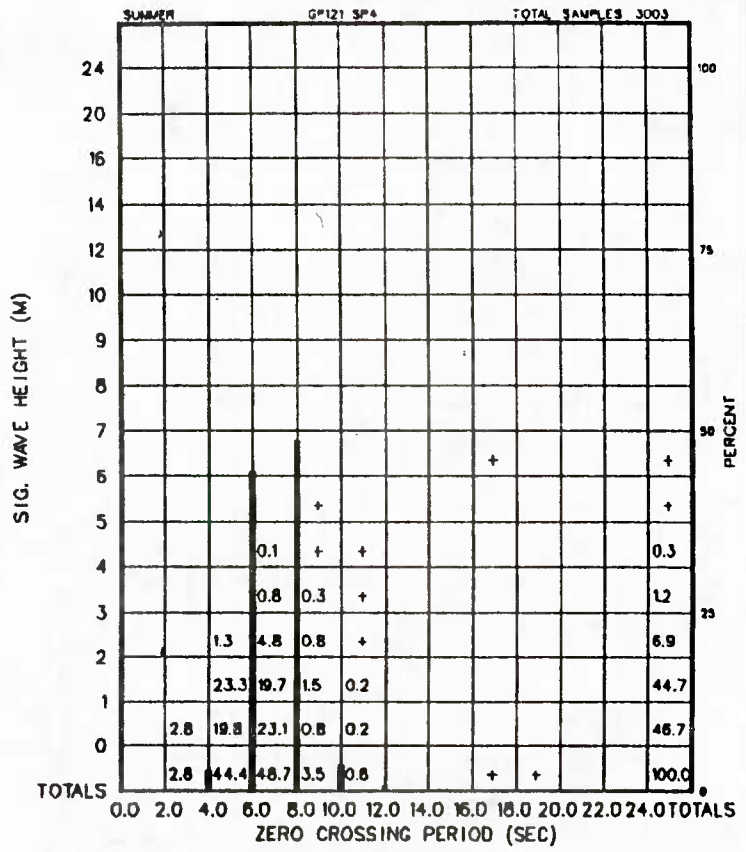


Figure A-4/121-4-6 Significant Wave Height vs. Zero Crossing Period

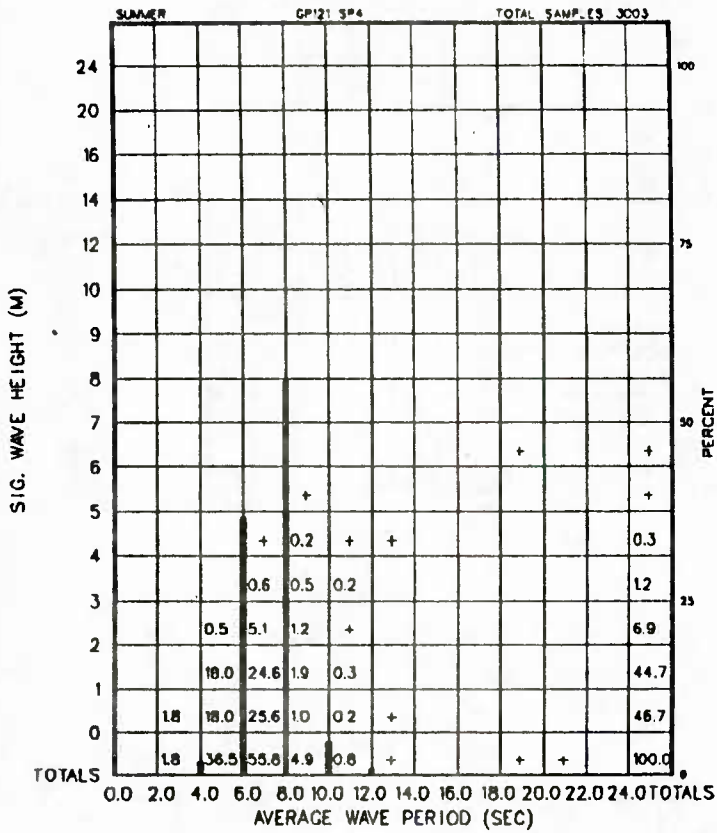


Figure A-4/121-4-7 Significant Wave Height vs. Average Wave Period

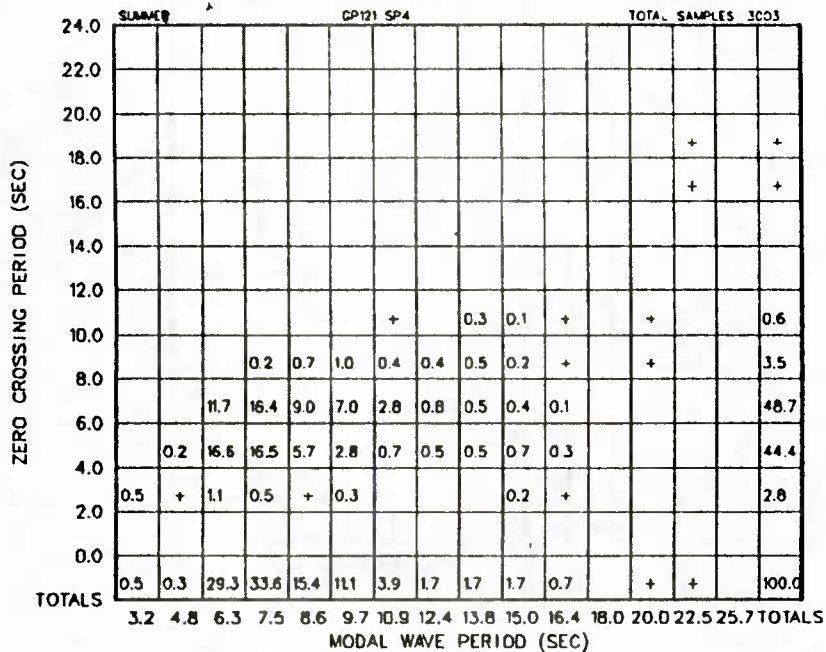


Figure A-4/121-4-8 Zero Crossing Period vs. Modal Wave Period

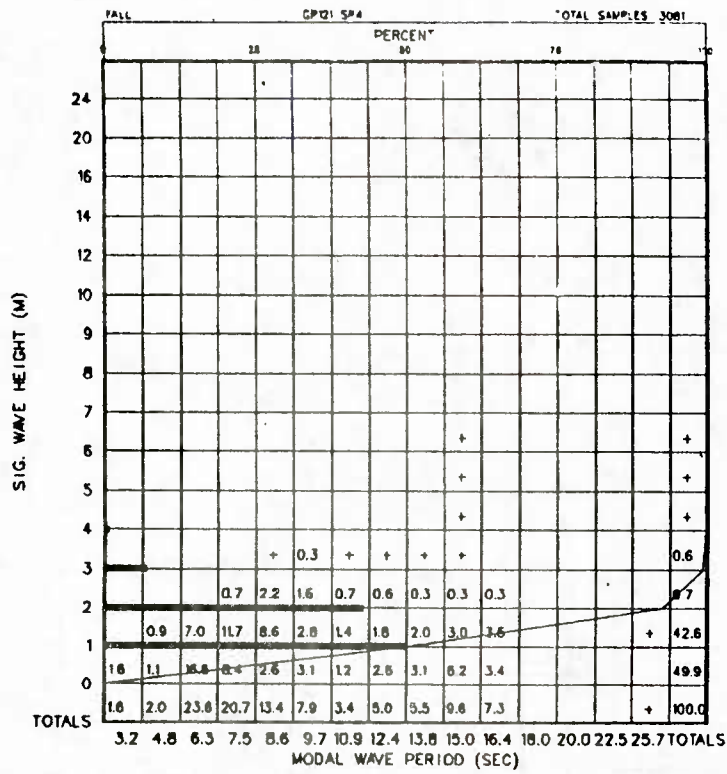


Figure A-4/121-5-1 Significant Wave Height vs. Modal Wave Period

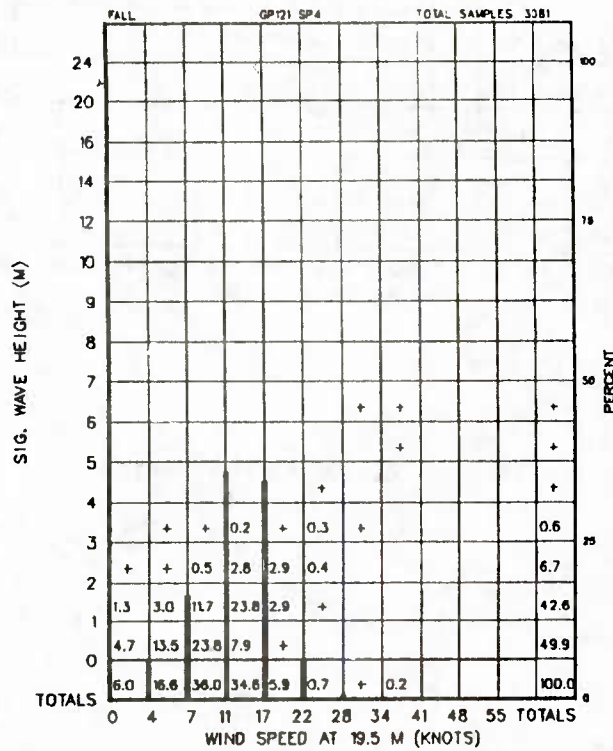


Figure A-4/121-5-2 Significant Wave Height vs. Wind Speed at 19.5 M (Knots)

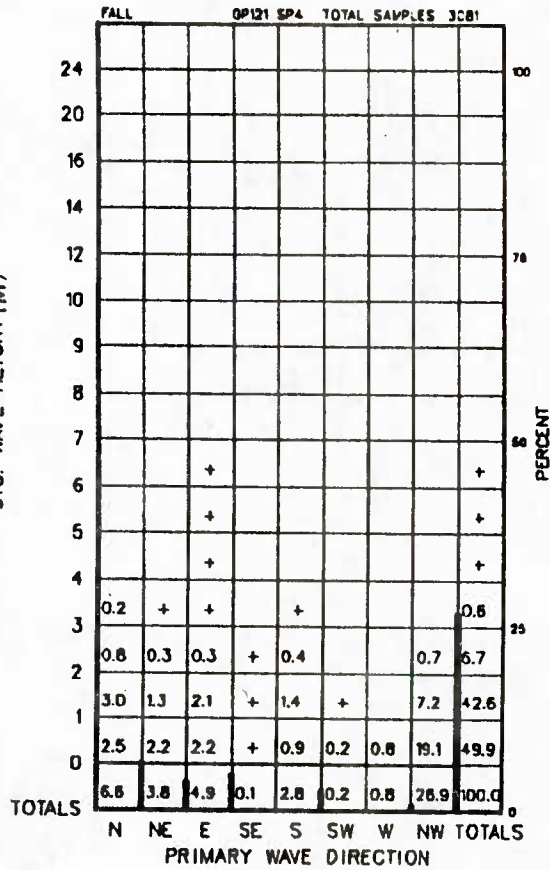


Figure A-4/121-5-3 Significant Wave Height vs. Primary Wave Direction

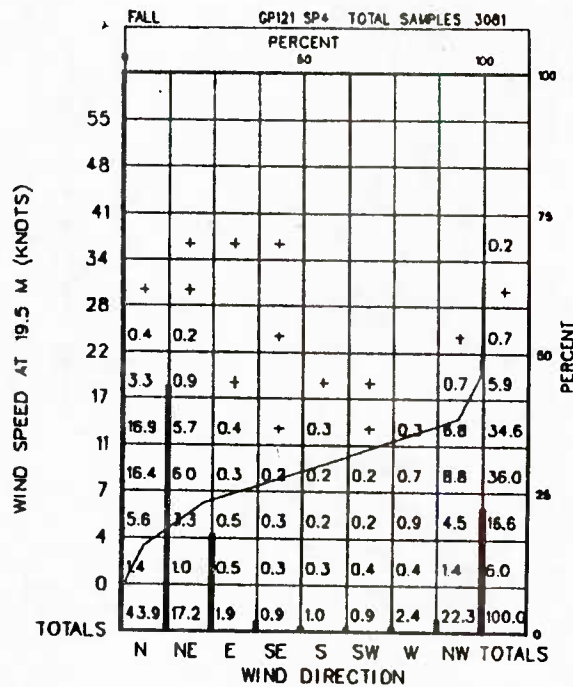


Figure A-4/121-5-4 Wind Speed at 19.5 M (Knots) vs. Wind Direction

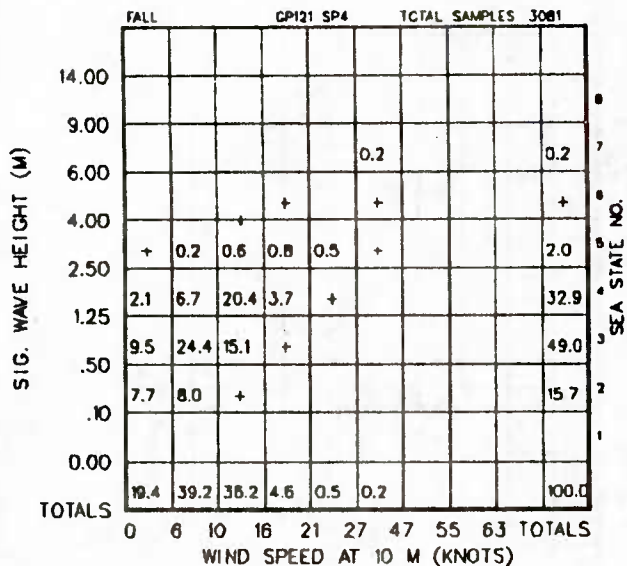


Figure A-4/121-5-5 Significant Wave Height vs. Wind Speed at 10 M (Knots)

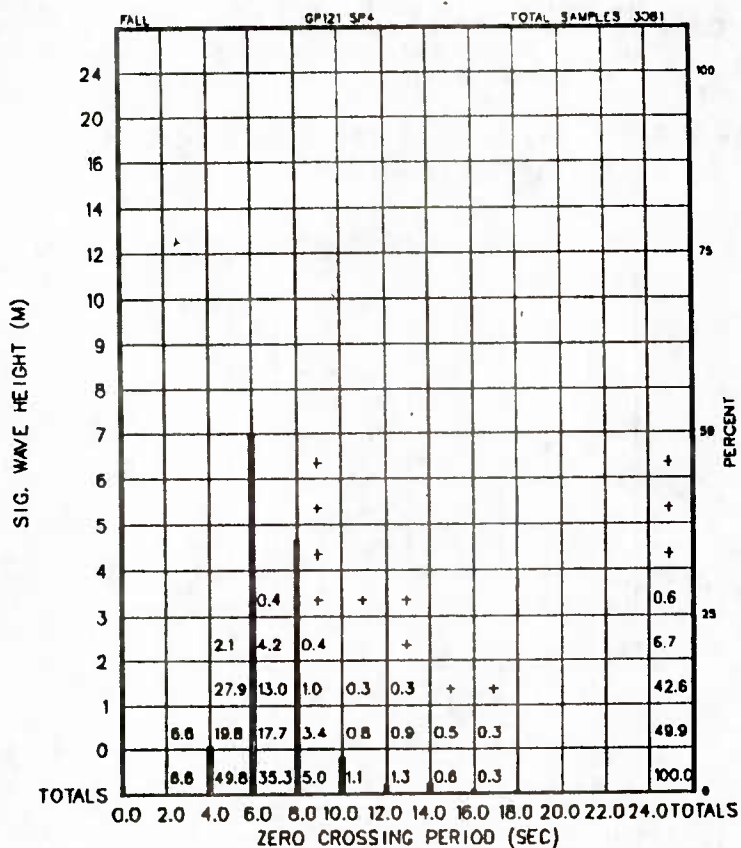


Figure A-4/121-5-6 Significant Wave Height vs. Zero Crossing Period

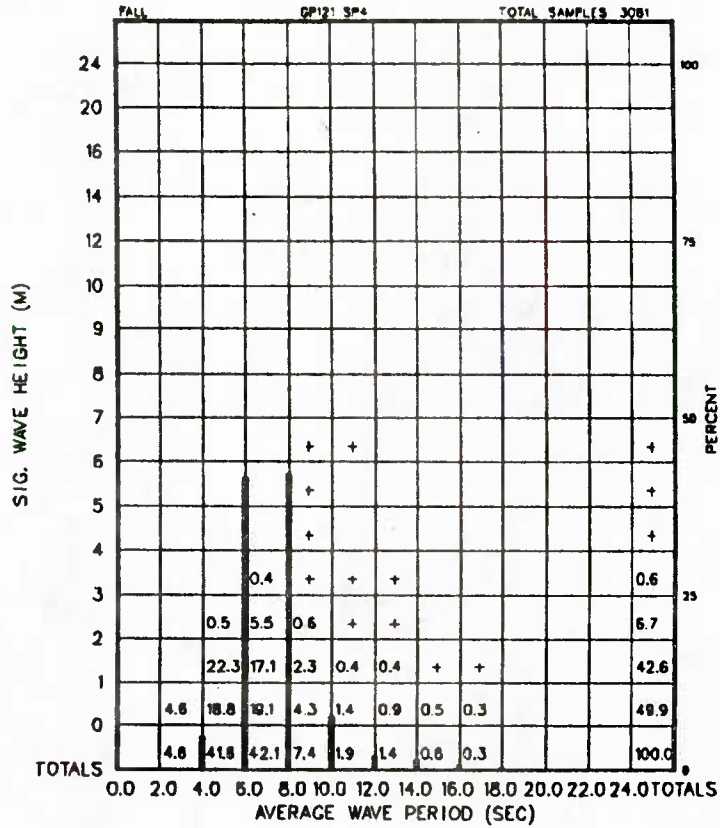


Figure A-4/121-5-7 Significant Wave Height vs. Average Wave Period

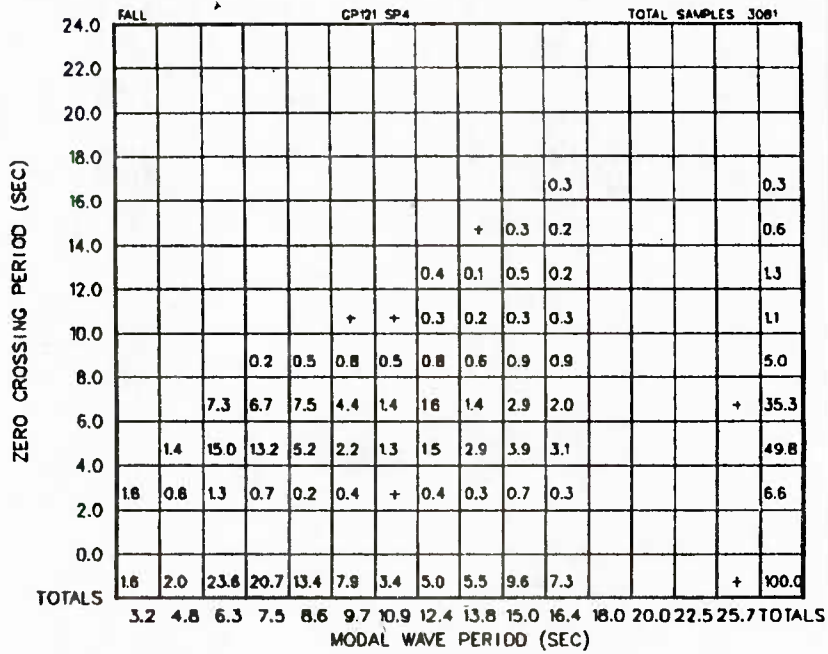


Figure A-4/121-5-8 Zero Crossing Period vs. Modal Wave Period

APPENDIX B

DATA FORMAT DESCRIPTION

APPENDIX B
DATA FORMAT DESCRIPTION

Appendix A contains some of the following natural environment data distributions for each respective geographic location:

- I. Surface Natural Environment Summary
- II. Waves and Wind
 - a. Significant wave height versus modal wave period
 - b. Significant wave height versus wind speed at 19.5 meters
 - c. Significant wave height versus primary wave direction
 - d. Wind speed versus wind direction
 - e. Significant wave height versus wind speed at 10 meters
 - f. Significant wave height versus zero crossing period
 - g. Significant wave height versus average mean period
 - h. Modal wave period versus zero crossing period
 - i. Modal wave period versus average mean period
- III. Persistence
 - j. Persistence of wave height
 - k. Persistence of wind speed

Surface Natural Environment Summary and persistence data are presented for annual season only. Data sets a through k above correspond to data sets 1 through 11, as presented in Figure B-1, respectively.

Each figure in Appendix A is identified by a code as detailed in Figure B-1.

A "standard" format has been adhered to for each environmental parameter at each ocean location. They are described in the following paragraphs and these descriptions should be referred to in interpreting the data presented in Appendix A.

I. SURFACE NATURAL ENVIRONMENT SUMMARY

This table, given for individual ocean or sea areas, summarizes the total natural environment by listing mean, median, most probable, minimum, and maximum values for the various environmental parameters. Ninety-five percent of all natural environment values exceed minimum values, while 5 percent of all natural environment values exceed maximum values. Thus, 90 percent of all values fall within the minimum to maximum value range. The median is the value where above or below lie an equal number of all parameter values. The mean is the average of all values, while the most probable is the one which occurs most often. Together,

these parameters provide an idea of the "shape" of the distribution of occurrences. For example, if the most probable value is less than the mean, the distribution of occurrences is skewed to the lower values. If the most probable value is greater than the mean, the distribution of all occurrences is skewed to the higher values. If the most probable and mean values coincide, the distribution of occurrences may be of the normal type.

II. WAVES AND WIND

Data sets a through i present the percentage frequency of occurrences for various combinations of atmospheric and oceanographic parameters. The number in each square is the percentage frequency of occurrences for that particular combination of parameters indicated at that intersection of the ordinate and abscissa. The right column and bottom row of each graph present the cumulative totals for each respective row and column. As an example, in Figure A-Pac-1-1, the following information can be obtained: (1) 5.8 percent of the data had a combination of 7.5 second modal wave period and 1 to 2 meter significant wave height, (2) 10.6 percent of significant wave heights had modal wave period of 7.5 second, (3) 29.4 percent of all significant wave heights were between 1 and 2 meters, and (4) these events were out of a total of 283,005 samples.

III. PERSISTENCE

Data sets j and k present the persistence or duration of wave height (data set j) and wind speeds (data set k) in terms of occurrences within a range of hours (in 6 hour increments). Again, totals are given in the right column and bottom row. As an example, in Figure A-028-1-10, the following information can be obtained: (1) a significant wave height of 5 to 6 meters persisted for a period greater than 12 hours in 131 cases, (2) a significant wave height of 5 to 6 meters occurred for a total of 634 events, and (3) these events were out of a total of 5561 events.

SAMPLE FIGURE NUMBER

FIGURE

A

-

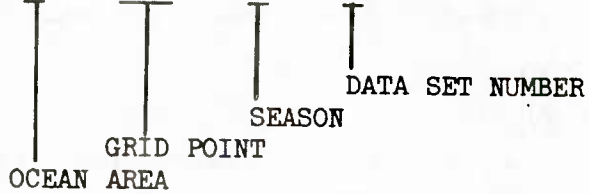
255

-

1

-

1



Ocean	Grid Point	Season	Data Set Number
A-North Pacific	PAC (COMBINED)	1-Combined Annual	1. Height versus Modal Period
		2-Winter	2. Height versus Wind Speed at 19.5 m
	1/239	3-Spring	3. Height versus Wave Direction
	1/255	4-Summer	4. Wind Speed versus Wind Direction
	1/294	5-Fall	5. Height versus Wind Speed at 10 m
	2/85		6. Height versus Zero Crossing Period
	2/93		7. Height versus Mean Period
	2/102		8. Modal Periods versus Zero Crossing period
	2/152		9. Modal Period versus Mean Period
	2/165		10. Persistence of Wave Height
	2/233		11. Persistence of Wind Speed
	3/28		
	3/56		
	3/39		
	3/88		
	3/93		
	3/121		
	3/124		
	3/148		
	3/164		
3/188			
3/202			
4/121			

Figure B-1 - Figure Number Coding System

DTNSRDC ISSUES THREE TYPES OF REPORTS

- 1. DTNSRDC REPORTS, A FORMAL SERIES, CONTAIN INFORMATION OF PERMANENT TECHNICAL VALUE. THEY CARRY A CONSECUTIVE NUMERICAL IDENTIFICATION REGARDLESS OF THEIR CLASSIFICATION OR THE ORIGINATING DEPARTMENT.**
- 2. DEPARTMENTAL REPORTS, A SEMIFORMAL SERIES, CONTAIN INFORMATION OF A PRELIMINARY, TEMPORARY, OR PROPRIETARY NATURE OR OF LIMITED INTEREST OR SIGNIFICANCE. THEY CARRY A DEPARTMENTAL ALPHANUMERICAL IDENTIFICATION.**
- 3. TECHNICAL MEMORANDA, AN INFORMAL SERIES, CONTAIN TECHNICAL DOCUMENTATION OF LIMITED USE AND INTEREST. THEY ARE PRIMARILY WORKING PAPERS INTENDED FOR INTERNAL USE. THEY CARRY AN IDENTIFYING NUMBER WHICH INDICATES THEIR TYPE AND THE NUMERICAL CODE OF THE ORIGINATING DEPARTMENT. ANY DISTRIBUTION OUTSIDE DTNSRDC MUST BE APPROVED BY THE HEAD OF THE ORIGINATING DEPARTMENT ON A CASE-BY-CASE BASIS.**

DUDLEY KNOX LIBRARY - RESEARCH REPORTS



5 6853 01002142 1

U219481

