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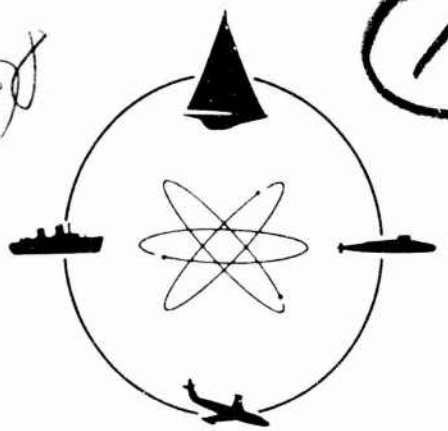

DAVIDSON LABORATORY

REPORT SIT-DL-76-1880
April 1976

HYDRODYNAMIC MODEL EVALUATION OF A SERIES OF PLANING LVA CONCEPTS

by

P. Ward Brown

Prepared for
Code 03221 of Naval Sea Systems Command
under
Office of Naval Research Contract
N00014-75-C-0746
Project No. NR 062-510
(Davidson Laboratory Project 4355/181)

STEVENS INSTITUTE OF TECHNOLOGY
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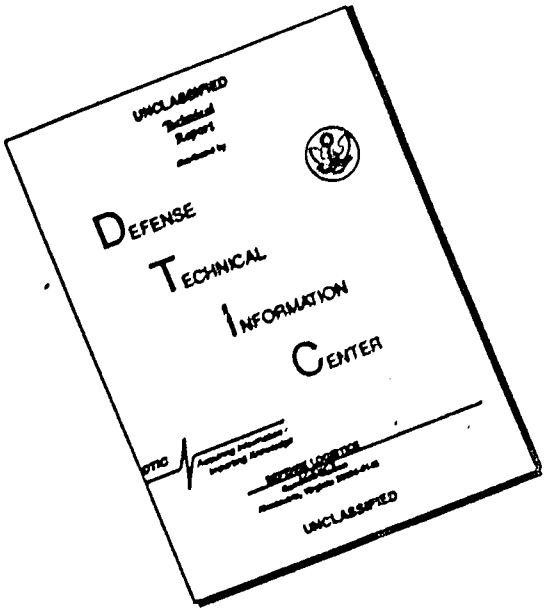

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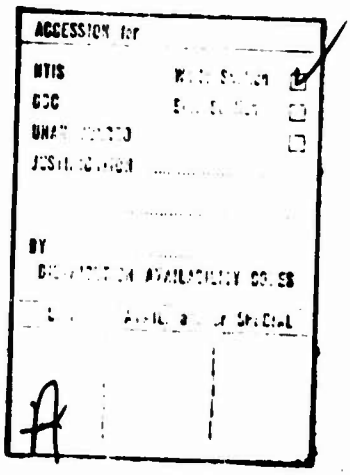

Approved

Daniel Savitsky
Deputy Director

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ABSTRACT

The results of hydrodynamic model tests of a series of four hulls suitable for an LVA planing-hull concept are presented and analyzed. The performance, seakeeping and habitability characteristics are discussed, together with the effects of fitting bow flaps, chine flaps and transom flaps. The transom flap is shown to be an efficient method of trim control. Satisfactory performance is obtained without the use of chine flaps and the impact accelerations are well below the habitability criterion.

KEYWORDS

Planing
Seakeeping
Habitability
Amphibious Craft

INTRODUCTION

One of the candidate design concepts for the LVA craft is a hard chine, low deadrise, planing hull. Due to the dimensional constraints on the craft and the loadings associated with its mission the craft is more heavily loaded than conventional planing hulls. Preliminary model tests of two LVA planing hulls demonstrated the potential for meeting the design objectives.[1] On the basis of these results it was appropriate to explore other design options with the objectives of further reducing the drag in waves and improving the rough water habitability.

Together with the two designs already tested a total of four hull designs were investigated. Variations in hull form included inverted vee-bottom, flat bottom, lowered bow profile and lowered bow profile with deadrise. These hull forms were tested with a variety of appendages including bow flaps, chine flaps and transom flaps. The overall hull dimensions and displacement were the same for all configurations.

A development type test program was used to select the most promising configurations which were then evaluated in some depth. The objective of the program was to identify those configurations having either improved rough water performance or improved rough water habitability and to determine their hydrodynamic characteristics. These characteristics include EHP requirements in calm water and waves and statistics of the loads and motions in waves, including 1/3-octave rms acceleration analysis. These results are intended to provide fundamental data on the hydrodynamic performance of highly loaded planing hulls in rough water which may be applied in the LVA design process to evaluate options and select the optimum configuration.

This study is in support of a development program initiated by Code 03221 of the Naval Sea Systems Command. Technical monitoring was provided by the LVA Office, David Taylor Naval Ship Research and Development Center (DTNSRDC).

MODELS

The four 1/12-scale models were constructed of polyurethane foam, reinforced with fiberglass sheet and covered with glass cloth and resin. All models were 28 ft overall length, 11.0 ft beam and 7 ft deep. (Throughout this report all quantities are expressed in terms of corresponding full-size values.) The following hull forms were investigated:

Model Designation	Description
P-1	An inverted vee-bottom hull configured by DTNSRDC.
S-1	A flat-bottom hull otherwise identical to P-1.
S-3	A flat-bottom hull similar to S-1 but with a lowered bow profile.
S-5	A flat-bottom hull having the same keel profile as S-3 but incorporating deadrise in the bow region for 25% of the overall length aft of the forward perpendicular: the maximum deadrise at the FP was 20 degrees decreasing to zero at a point 25% LOA aft of FP.

The hull profiles and sections are shown on Figure 1.

Various appendages were fitted to these models including:

Bow Flap — 4.7 ft chord by 11.5 ft span, 34 degree angle of attack, fitted to Model S-3 only, attached to keel at FP.

Chine Flaps — 19.6 ft chord by 3 ft span, trailing edge 2.4 ft forward of AP, fitted to Models P-1 and S-1.

- 15 ft chord by 3.5 ft span, trailing edge 6 ft forward of AP, fitted to Models S-3 and S-5.
- 45 degree deadrise flap fitted to Model S-5.
- 4 ft and 8 ft chord by 6 ft span, leading edge 23.4 ft forward of AP, fitted to Model S-5 only.

Transom Flaps
- 3 ft chord by 11.0 ft span fitted to Model S-1 only.
- 3 ft chord by 6.5 ft span fitted to all models.
- 6 ft and 9 ft chord by 6.5 ft span fitted to Model S-5 only. Leading edge of all flaps 2.4 ft forward of AP.

The appendages are shown on Figure 2.

The part-span transom flaps were adjustable in 2.5 degree increments from -2.5 degrees (upward deflection) to +15 degrees (downward deflection). In the case of the horizontal chine flaps fitted to Model S-3, the aft 3 ft of each flap was hinged and could be adjusted to a maximum downward angle of 15 degrees.

The bottoms of the models were scribed with a 1 inch grid for the purpose of estimating wetted lengths from underwater photographs.

The model was towed through a pitch pivot located at the nominal center of gravity: LCG 12.5 ft forward of transom (AP) and VCG 3.5 ft above baseline. Ballast weights were located in the model for adjusting the LCG and pitch radius of gyration which was set at 7.0 ft. Accelerometers were mounted in the model at bow, LCG and stern located 24 ft, 12.5 ft and 4 ft respectively forward of the transom.

Leading particulars of the models are summarized in Table 1.

APPARATUS AND INSTRUMENTATION

The model tests were carried out in Davidson Laboratory's Tank 3 test facility. The test set-up and model S-5 are shown in Figure 3. This setup allows the model freedom in pitch and heave, with restraint in yaw, roll and sway. Test instrumentation included a 50 lb capacity drag balance, heave and pitch transducers to measure the motions at and about the pitch axis, located at the model LCG, and bow, CG, and stern accelerometers. in rough water, a wave strut attached to the towing carriage was mounted to record the wave profile.

The signals from the transducers were relayed by overhead cables to the data station on shore where they were filtered (40 Hz low pass),

recorded on magnetic tape and processed by an on-line PDP-8e computer, which includes an analog-to-digital converter. The required model results were printed on a teletype and also stored on digital magnetic tape. All data channels were monitored on an oscillograph. A camera carriage, mounted ahead of the main carriage, included a black and white television camera which was used to observe the model tests on a shore based TV monitor. A video-tape recording was also made of each run. Underwater pictures were taken of most smooth water tests to determine the model wetted lengths and areas.

For the rough water tests the Tank 3 plunger type wave maker was used to make both regular and irregular waves. The irregular waves generated consist of a reproducible set of 100 waves having a variance density approximating the Pierson-Moskowitz spectrum. The spectrum used in these tests had a significant height of 2.2 ft and is compared with the Pierson-Moskowitz spectrum on Figure 4.

DATA PROCESSING

The instrumentation was calibrated by applying known displacements to the motion transducers and wave strut, known loads to the drag balance, and gravity multiples to the accelerometers. All calibrations were recorded on analog magnetic tape and processed by the on-line computer. All calibrations were linear and a "least-squares" technique was used to determine the calibration rates, which were spot-checked daily.

Test results were computed from the differences between the transducer outputs in the zero and running conditions. Drag zeros were taken with the model floating on the water in calm conditions, twice a day, and stored in the computer; the floating drag zero was monitored for stability between each run. All other zeros were taken with the model in the air at zero trim and known elevation above the water surface. After the model was up to speed data was collected over a 140 ft section of the tank. During data collection all channels of information were scanned at a rate of 250 Hz and the results stored in the computer for appropriate processing.

In the case of calm water tests mean values of drag, trim and draft were computed. The draft is defined as the immersion, relative to calm water, of the point formed by the intersection of the aft perpendicular (transom) with the base line. The velocity was computed from the time taken to travel through the 140 ft data-collection section.

For the tests in regular waves the mean drag was computed and a harmonic analysis was carried out for the heave, pitch and acceleration channels. The harmonic analysis performed on the regular wave time histories is a least squares fit of each data channel using the equation

$$y(t) = y_m + \sum_n r_n \cos[n\omega t - (\varphi_n - n\varphi_{\theta,1})], \qquad 0 < (\varphi_n - n\varphi_{\theta,1}) < 2\pi$$

where

$y(t)$ = fitted time history to data channel
y_m = mean value
n = 1/2, 1,2,3 frequency multiples
r_n = amplitude of each frequency component
ω = fundamental frequency of encounter
φ_n = phase angle relative to the time at which digitizing began
$\varphi_{\theta,1}$ = phase angle associated with the pitch fundamental frequency

The fundamental frequency of encounter was obtained in the PDP-8e computer by noting sequential up-or-down zero crossings of the moving wave strut. The frequency components at one-half, one, two and three times the fundamental were then computed and used in the fitting equation above. A time shift was then introduced so as to make the phase lag in the pitch fundamental equal to zero. Thus, the phase angles on all channels are relative to this particular frequency component.

For the irregular wave tests the velocity and mean drag were computed and a peak-trough analysis performed for the heave, pitch and acceleration channels. The peak-trough analysis computes for each signal the mean, rms, and statistics of the peaks and troughs (maxima and minima), i.e. the 1/3 and 1/10 highest. In the statistical analysis spurious oscillations are suppressed by means of "buffers." (Buffers are selected so as to prevent the detection of substantial maxima and minima in corresponding steady-state

calm water runs. A substantial maximum (minimum) is defined as any maximum (minimum) succeeded by a decrease (increase) in signal level at least equal to the magnitude of the stipulated buffer size.) Typical buffers employed in these tests were 1.0 degree pitch, 0.2 inch heave, 0.1 g acceleration, and 0.2 inch wave. In addition, for selected runs, spectral analyses of the vertical accelerations at the C.G. were performed and converted to 1/3-octave rms format for comparison with the habitability criteria.

The wetted areas of the models were measured from underwater photographs after the tests. Because of the small or zero deadrise of the models an average value of the wetted length across the beam of the model was determined. This average value defines the position of the leading edge of the wetted area. This position is reported relative to the transom and is referred to as the mean wetted length (MWL).

TEST PROGRAM AND TECHNIQUE

The test program was conducted in three phases and it is convenient to discuss each phase separately.

Phase 1 Tests

These tests were concerned with calm water tests of Models P-1 and S-1 both with and without chine flaps, and rough water tests of Model P-1 with and without chine flaps and S-1 with chine flaps. The results of these preliminary tests have been reported previously.[1]

The test technique employed in calm water provided for unloading the model to simulate the effect of the vertical component of the thrust due to trim, and for applying pitching moments to simulate the thrust moment. In the rough water tests thrust unloading was not simulated and all tests were made at a displacement of 55,000 lb. In this exploratory phase of rough water testing only one pass down the tank was made at each condition resulting in approximately 30 wave encounters out of the 100 available.

Phase 2 Tests

This test phase was concerned with comparative calm water and rough water tests of Model P-1 and S-1 without chine flaps, of Model S-3 with and without chine flaps and with bow flap extended and retracted.

In these tests, in order to properly identify the added resistance in waves, thrust unloading was not simulated and all models were tested at a displacement of 55,000 lb. Furthermore in the wave tests repeat runs were made at each condition, starting at a different point in the irregular wave train, to obtain a total of approximately 90 wave encounters.

Phase 3 Tests

In the third phase of testing Model S-5 was tested in calm water and waves with a variety of appendages to provide the basis for selecting the optimum configuration for the chine flap and transom flap.

The test program was set-up to identify the most promising configuration of Model S-5 in irregular waves, the primary criteria being the hump drag at 15 knots and the CG accelerations at 30 knots. The most suitable configuration would then be selected, with the advice of the LVA Office, DTNSRDC, for calm water evaluation.

With these objectives in mind the test procedure in waves provided for all testing at one displacement of 55,000 lb and one pass at each condition. Comparison of the Phase 1 and Phase 2 tests showed that increasing the number of wave encounters had negligible effect on both the added resistance in waves and on the rms accelerations. In the calm water tests, instead of simulated thrust unloading, displacements of 55,000 lb, 49,700 lb and 44,400 lb were tested. This technique is more time consuming than simulated thrust unloading but the data may then be used to account for the effect of arbitrary shaft angle, in addition a basis is provided for a limited extrapolation to greater design gross weights than 55,000 lb.

TEST PROCEDURE

All tests were made with the model free to trim and heave, and restrained in roll, yaw and sway. Calm water and rough water tests were made at constant speed. It has been shown[2] that constant speed rough water tests of planing hulls provide results identical to those obtained free-to-surge at constant thrust.

The bulk of the tests were run with the model ballasted to represent 55,000 lb, LCG 12.5 ft, VCG 3.5 ft and pitch radius of gyration equal to 7 ft. Test speeds of 10, 15, 20, 25, 30 and 35 knots were used, with the emphasis on the hump speed of 15 knots and the required speed of 30 knots in irregular head seas having significant height 2.2 ft.

For each configuration tested the chief parameter was the deflection of the transom flap. Repeat runs at the same condition with different flap settings, in both calm water and waves, resulted in curves of resistance and rms acceleration as functions of trim from which optima could be picked off. Additionally some runs were made at LCG's of 10.5 ft and 13.5 ft, in these cases the pitch pivot was moved to the new LCG and the model re-ballasted so as to properly simulate a CG shift in rough water. Calm water tests of Model S-5 were also made with various applied moments in order to define the variation of hydrodynamic pitch moment with trim.

For the tests in irregular waves a Pierson-Moskowitz spectrum having a significant height of 2.2 ft was used throughout the program. Regular wave tests were made with Model S-5 at speeds of 15, 20, 25 and 30 knots. Three regular wave trains were used: 1.8 ft high by 83 ft long, 1.8 ft high by 110 ft long and 3.6 ft high by 110 ft long.

Color motion pictures were taken of selected conditions in Phase 2. An edited movie sequence is presented in Table 2. Full-scale time is simulated when this movie is projected at 16 frames per second. Video tape records were made of all runs.

RESULTS

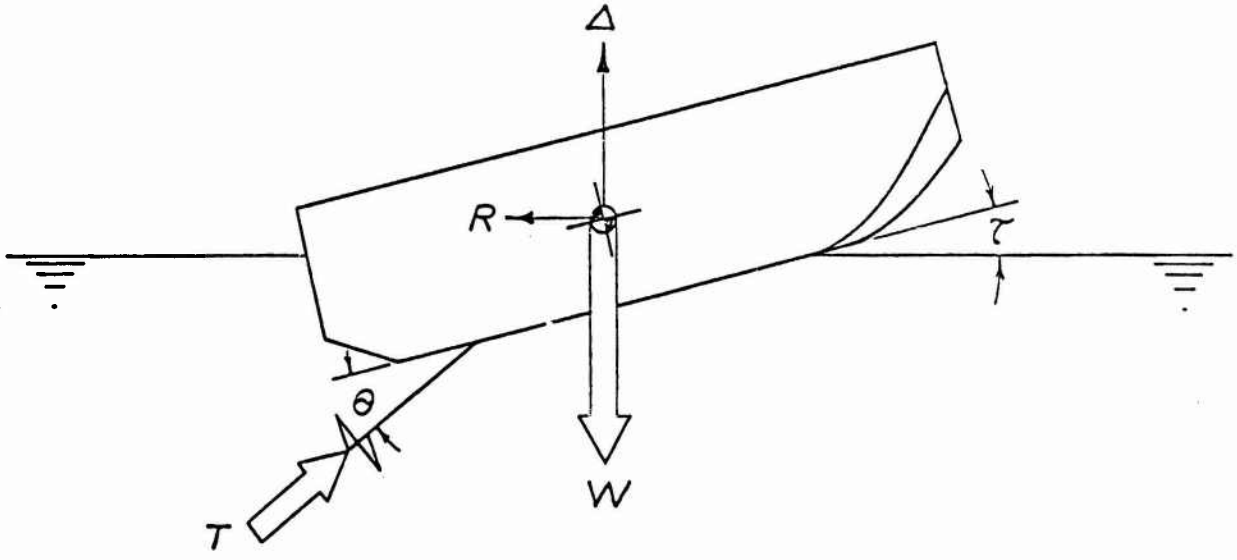
It is desirable that the results of this series of development tests of the LVA planing hull be presented in a comparative form so as to clearly identify the design options available. Toward the end of the third phase of testing it appeared that Model S-5, without chine flaps and with a part-span 6 ft transom flap, was the favored candidate design and was therefore more extensively tested than other configurations. Consequently S-5 is made the basis of comparison and the performance of other configurations is given relative to S-5, with the emphasis on performance in waves having a significant height of 2.2 ft.

Performance Results

The resistance of Model S-5, without chine flaps, for an LCG of 12.5 ft and trimmed by the transom flap, in both calm water and waves has been expanded to full-scale and is presented in Tables 3, 4, 5 and 6 for speeds of 15, 20, 25 and 30 knots. The method of expansion is described in Appendix A where the raw model data is also presented.

The full-scale bare-hull S-5 resistance data is tabulated in terms of the displacement (or load-on-water) and trim, in order to allow performance prediction at any shaft angle. The forces acting on the hull are illustrated in the following sketch:

Vector Diagram of Forces on Planing Hull



For vertical and horizontal equilibrium

$$\Delta = W - T \sin(\tau+\theta) \tag{1}$$

$$R = T \cos(\tau+\theta) \tag{2}$$

and eliminating the thrust from Equations (1) and (2):

$$\Delta = W - R \tan(\tau+\theta) \tag{3}$$

To find the resistance for a given speed (Tables 3 to 6), the constant-trim resistance contours are plotted as a function of load-on-water, Δ. For a given displacement, W, and shaft angle, θ, the constant-trim load contours given by Equation (3) are superimposed and the resistance read off at the equilibrium points of intersection. This process is illustrated on Figure 5, using the data in Table 6, to find the resistance of the S-5 configuration at 30 knots in 2.2 ft significant height-waves, for a displacement of 55,000 lb and with a shaft angle of 15 degrees. In the lower part of the figure the equilibrium resistance is plotted as a function of trim to show the minimum resistance and optimum trim angle.

Hence the EHP may be found from the product of the bare hull resistance and speed (in feet per second) divided by 550. Estimates of the shaft horsepower are dependent upon appendage drag, propeller characteristics and machinery which, with one exception, have not been considered in this study.

This procedure is applied in the Discussion Section of this report to illustrate the comparative performance of the different hull designs, for a given displacement and shaft angle, and to show the effect of displacement and shaft angle on a given design.

In the procedure described, the balance of moments is not taken into account. Considering operation at the optimum trim of 7 degrees shown on the lower part of Figure 5 it is probable that the thrust vector will apply a bow-up moment to the craft tending to drive the trim away from optimum. In order to restore the craft to optimum trim it will be necessary to increase the deflection of the transom flap, and indeed it is the moment equilibrium which determines the flap setting for optimum trim. This change in flap setting to restore the craft to optimum trim will not affect the performance of the craft. To demonstrate this point the relative effects on performance of flap deflection and applied moment, e.g. CG shift, must be considered. These effects are illustrated on Figure 17. At the top of the figure it can be seen that the optimum trim with flap deflection is 6 degrees. Suppose that the craft is operating at this point with zero applied moment. When the bow-up thrust moment is applied, the drag will move along the "Flap Deflection" curve in the direction of increasing trim. Increasing the flap deflection, to operate at optimum trim with thrust moment, will cause the drag to decrease along this curve to the same minimum drag. The flap-deflected drag is lower because of the reduced wetted area due to flap lift, and balancing the thrust moment by increased flap deflection will reinforce this effect. The equilibrium flap deflection may be found from the data in Table A4, for a specific shaft angle and location as illustrated later.

The increment in total rough water resistance, relative to S-5, for the various configurations is presented in Tables 7 and 8. The derivation of these results is discussed in the Appendix. It is appropriate

to tabulate the rough water increment since performance in rough water is one of the major criteria. Due to the exploratory nature of the tests it is in any event not generally possible to document the calm water increments: for example the calm water drag of Model S-5 with horizontal chine flaps has not been measured at this time.

To illustrate the use of Tables 7 and 8 suppose that the resistance of Model S-3 is required at 55,000 lb, a speed of 30 knots and at trim of 7 degrees. From Table 6 the resistance of S-5 at this condition is 11,010 lb and from Table 8 the increment for S-3, without chine flaps is 1190 lb. Thus the resistance of S-3, without chine flaps in 2.2 ft significant waves, at 55,000 lb load on water, 30 knots and 7 degrees trim is 12,200 lb.

Seakeeping Results

The results of the tests in irregular waves, in terms of full-scale values are given in Tables 9 to 13. For each configuration the results are ordered by velocity and flap deflection, and the number of wave encounters is noted. Statistics are given for the various data channels including: pitch, heave, bow acceleration, CG acceleration and stern acceleration. For each channel the statistics of the response are given in the following order: the signal mean and rms, the number of oscillations, the average of peaks and the troughs, (averages of maxima and minima), and the averages of the 1/3 highest peaks and troughs.

Values of the 1/10 highest peaks and troughs are not reported because the confidence bounds on these statistics are, in general, too broad due to the relatively small number of wave encounters.

The regular wave test results for Model S-5 are presented in Table 14, again in terms of full scale values. The speed; wave length, height and period; mean model drag, and number of wave encounters are noted. For the wave, pitch, heave, bow acceleration, CG acceleration and stern acceleration, the amplitude of the signal at one-half, one, two and three times the fundamental frequency is given together with the phase angles relative to the fundamental pitch response.

DISCUSSION

Performance and Seakeeping Characteristics of S-5 Configuration

Performance

The performance characteristics of the S-5 configuration without chine flaps, at 55,000 lb displacement with an LCG of 12.5 ft, are shown on Figure 6. The resistance in calm water and waves, 2.2 ft significant height, is shown together with the trim and transom draft. These results were obtained with the shaft-line assumed to be parallel to the keel and are tabulated below, the mean trims and drafts are the same in calm water and waves.

S-5 PERFORMANCE AT 55,000 lb.

SPEED	TRIM	RESISTANCE		TRANSOM DRAFT	LOAD ON WATER IN WAVES
		CALM	WAVES		
knots	degrees	lb.	lb.	ft.	lb.
0	0.8	-	-	3.5	55,000
10	2.5	7,000	7,000	4.7	54,700
15	15.0	18,300	18,300	5.9	50,100
20	13.0	13,550	14,480	3.9	51,700
25	10.0	10,760	12,110	2.5	52,900
30	7.0	8,700	10,790	1.8	53,700

The trims are the optima for this configuration with a 6 ft chord transom flap, (6.5 ft flap span). Increasing the chord of this flap from 3 ft to 6 ft reduced the drag but a further increase to 9 f. caused increased hump resistance due to the stern wave collapsing on the aft part of the flap.

To find the corresponding flap deflection at each trim it is necessary to balance the moments. Assuming the parallel shaft is 3.5 ft below the keel and with a VCG of 3.5 ft, at 15 knots there will be a bow-up moment of 132,600 ft-lb. From the model data presented in the Appendix, at 15 knots and 50,100 lb displacement (7.3 fps and 28 lb model scale) the pitch stiffness is 16,230 ft-lb/degree for zero flap deflection.

Hence the applied thrust moment would increase the trim 8.2 degrees. Correspondingly from the data taken at zero moment, the flap stiffness is -1.5 degrees/degree of trim, hence an increase in flap deflection of 12.3 degrees is required to offset the trim increase due to thrust moment. The data taken with zero moment shows that to run at 15 degrees trim a flap deflection of -5.6 degrees would be needed. Thus the equilibrium flap setting at 15 knots is 12.3 - 5.6 = 6.7 degrees for the assumed shaft angle and location.

Similarly at 30 knots a flap angle of 6.0 degrees is predicted. Evidently the flap setting, and other performance characteristics, depend on the assumed position of the propeller shaft. This is especially important in the case of highly loaded planing hulls which develop unusually large hump trim angles. It is desirable that the model data be collected over a sufficient parametric range in order to maintain flexibility in the design process.

Seakeeping

The seakeeping characteristics may be discussed in terms of the rms values of the motions and accelerations, for it can be shown from the data that the significant double amplitude (or significant height) is equal to 4 times the rms value within 5 percent. This suggests that the accelerations and motions are Rayleigh distributed. Moreover, at all speeds, the bow rms acceleration (11.5 ft forward of the LCG) is twice the CG rms acceleration and the stern rms acceleration (8.5 ft aft of the LCG) is 75 percent of the CG value.

For the S-5 configuration, without chine flaps, at 55,000 lb displacement in waves of 2.2 ft significant height, the rms values of the heave and pitch motions and the CG acceleration are shown on Figures 7, 8 and 9. It is evident that the motions and accelerations increase with speed and that the seakeeping characteristics deteriorate with increasing trim, especially at the higher speeds. It is generally possible to improve seakeeping at the expense of performance by running at less than optimum trim and this option may be considered as part of the design process.

The seakeeping characteristics as a function of speed are shown on Figure 10, for the optimum trim at each speed as given on Figure 6.

Habitability

The habitability characteristics of the S-5 configuration, without chine flaps, at 55,000 lb displacement in irregular waves having a significant height of 2.2 ft is shown on Figure 11 for speeds of 15, 20, 25 and 30 knots. The data is presented in the ISO format and includes the ISO "fatigue-decreased proficiency" (FDP) acceleration limit for a one hour exposure time.[3]

It is evident that the 30 knot habitability is most severe, although comfortably below the ISO one hour limit: the ISO boundary is not defined below 1 Hz. At 30 knots the peak rms occurs in the 1/3-octave having a center frequency of 0.8 Hz. The wave spectrum has its peak energy at a frequency of 0.25 Hz, Figure 4, and at 30 knots this corresponds to an encounter frequency of 0.87 Hz.

From the habitability data for the S-5 shown in Figure 11, and from the data for the other configurations, a simple relationship was found between the maximum 1/3-octave rms and the total rms CG acceleration. As shown on Figure 12, the peak value of the habitability curve is equal to half the value of the total rms acceleration.

Thus a table can be drawn up which relates the various statistical acceleration parameters to the rms CG acceleration by the factor shown:

Parameter	Factor
Maximum 1/3-octave rms	0.5
Significant double amplitude	4.0
1/10 highest double amplitude	5.0
Bow rms acceleration	2.0
Stern rms acceleration	0.75

It follows, for instance, that the peak of the habitability curve is equal to the significant double amplitude acceleration divided by 8. This peak occurs at an encounter frequency corresponding to the peak in the wave spectrum. These simple relations suggest that during the

development stage of a planing LVA it is sufficient to measure only the rms CG acceleration to characterize the habitability of the craft, however all parameters should be measured for the final design.

The relationships with the rms CG acceleration have only been demonstrated for the heavily loaded, zero deadrise type of craft considered in this study. They should not be taken to apply to other planing craft without further research.

Effect of Hull Form on Performance and Seakeeping

Performance

The comparative rough water performance of the P-1, S-1, S-3 and S-5 configurations is shown on Figure 13 in the form of EHP curves from 15 to 30 knots. In each case the displacement is 55,000 lb, the propeller shaft is assumed parallel to the keel and the significant wave height is 2.2 ft.

In chronological order of development, modifying the inverted-vee form of the P-1 to the flat-bottomed S-1, reduces the hump drag 18 percent at 15 knots with a small drag penalty at 30 knots. Lowering the bow profile of S-1 to get the S-3 configuration effectively rotates the force vector at the bow away from the horizontal and toward the vertical. This results in lowered drag at 30 knots and correspondingly some increase in vertical acceleration. The drag at the hump speed of 15 knots increases due to the more bluff bow entry presented by the lowered profile. Finally, adding deadrise to the S-3 over the forward 25 percent of the length yields the S-5 configuration. The eased entry into waves thereby obtained results in a hull form having the least drag of those tested to this point in development.

Seakeeping

The heave and pitch motions of the four hull designs, at a displacement of 55,000 lb, are compared on Figures 14 and 15. The inverted-vee hull, P-1, is the most lively of the designs studied, being significantly more responsive to waves above speeds of 20 knots. A general

improvement in seakeeping has been achieved in the course of development; both the heave and pitch motions have been reduced 40% at 30 knots in progressing from the P-1 to the S-5 configuration.

Habitability

Since the most severe accelerations are encountered at 30 knots it is appropriate to compare the C.G. accelerations for the four hulls at this maximum speed, in the ISO form of habitability charts. This comparison is presented on Figure 16.

The S-3 configuration has the largest peak 1/3-octave rms acceleration and the S-1 the smallest. The peak values are tabulated below:

Configuration	Peak 1/3-octave RMS Acceleration g units	Peak Acceleration Relative to S-5	Half-power Bandwidth Hz
P-1	.143	108	.46
S-1	.127	95	.65
S-3	.147	111	.61
S-5	.133	100	.55

This table shows that there is relatively little difference between the peak accelerations, all the data being within 16%. There is rather more variability in the width of the response. In particular Configuration P-1 exhibits more response at low frequency which could be a problem relative to motion sickness. At a frequency of 1 Hz all the designs are better than 40% below the ISO 1 hour FDP boundary.

Effects of Appendages

Transom Flaps

It can be shown[4] that it is generally better, in the sense of producing higher L/D ratios, to use as large a flap as possible and to minimize the deflection, within the constraint of leaving sufficient deflection range for control purposes. A brief series of experiments with the S-5 configuration at hump speed showed drag benefits resulted

from increasing the flap chord from 3 ft to 6 ft, however further increase to 9 ft caused a drag penalty due to the stern wave collapsing on the flap.

Transom flaps are the most efficient means for trimming a planing hull. Since increasing the flap deflection causes the craft to trim down, and because the seakeeping characteristics improve as the trim decreases (Figures 7, 8 and 9), it follows that the seakeeping characteristics may be significantly improved by transom flap deflection as previously reported.[1] A similar decrease in trim, however, could be achieved by a forward shift of the CG, assuming that the designer has sufficient disposable load, which is not always the case. Disregarding this consideration, it is not immediately obvious that trimming the craft with transom flaps is more efficient than shifting the CG.

The reason for the efficiency of the transom flap as a means of trim control, relative to CG shift, lies in the superior performance obtained with the flap and is illustrated in Figure 17, prepared from data taken with the S-5 configuration. The upper part of this figure shows that higher L/D ratio (lower R/W) can be obtained with flap deflection than with CG shift. The reason for this improved L/D ratio is shown in the middle chart where, for trims less than 8 degrees, less wetted area is required for the hull with deflected flap at given trim. This is due to the lift generated by flap deflection. The power of this flap can be deduced from the lower chart, which shows that each degree of flap deflection is equivalent to a 1 ft forward shift of the LCG.

At trims greater than 8 degrees the same L/D ratio is obtained either with flap or CG shift; in this region the drag is due to induced drag and friction. As the trim is reduced below optimum the drag increases due to the form drag associated with bow immersion. The upper chart on Figure 17 makes it clear that while flap deflection is beneficial, to both performance and seakeeping, it can be over done. For the case shown increasing the flap deflection from 0 to 5 degrees increases the L/D ratio 18 percent, for the same LCG position, however a further increase to 7.5 degrees deflection causes a decrease in L/D ratio of 79 percent.

Chine Flaps

Fitting chine flaps to the hull improves performance and degrades habitability. This situation is summarized on Figure 18 for the S-5 configuration with and without the 15 ft x 3.5 ft chine flaps, (Figure 2). The chine flaps reduced the drag 24 percent at 15 knots and 9 percent at 30 knots. At 30 knots the peak 1/3-octave rms acceleration was increased 80 percent by chine flaps and the response broadened. The increased response at low frequency may have implications relative to motion sickness, however ISO criteria have not been developed below 1 Hz since these criteria are primarily concerned with vibration.

Adding chine flaps effectively reduces the beam loading of the hull with predictable results in rough water: the drag is decreased and the CG acceleration increased.[2] In this specific case, however, the degradation in habitability does not seem worth the improvement in performance. It was therefore decided, with the advice of the LVA Office, to concentrate on obtaining satisfactory performance without chine flaps.

Prior to this decision some variations on the chine flap concept were investigated and these are shown on Figure 2. The use of an adjustable trailing edge flap indicated that the rms acceleration could be reduced, but only by 10% relative to the S-5 with chine flap, and therefore was not pursued.

The effect of using high aspect ratio chine flaps or "chine wings" was briefly investigated. The intention here was to locate the wings sufficiently far forward so that they would be wet at 15 knots, and thus reduce hump drag, but dry at 30 knots so as to avoid increasing the acceleration. This ideal was only approached with the small, 4 ft chord, wing. Relative to the S-5 without chine flaps the hump drag was reduced 11 percent. At 30 knots there was no effect on drag but the CG rms acceleration was still increased 33 percent.

The 45 degree chine flap was an attempt at a compromise and succeeded about as well as could be expected. Relative to the S-5 without chine flap the hump drag was decreased 16 percent. At 30 knots the drag increased 14 percent and the rms acceleration increased 11 percent.

This compromise appeared promising enough to start calm water testing over the speed range. The effect of pitch moment was determined but this calm water series was abandoned before the effect of flap deflection had been determined due to the decision to proceed without chine flaps.

A brief investigation of the response in regular waves was also made with the S-5 fitted with 45 degree chine flaps. Data of this type is needed to characterize the seakeeping in swell conditions. The results obtained with the longest wave, having a period of 4.6 seconds and a length of 110 ft are shown on Figure 19. As would be expected, the response is non-linear above a speed of 15 knots. On the basis of these results it is estimated that the natural frequency in pitch is 0.7 Hz and in heave 0.5 Hz.

Effect of Inclined Thrust Axis on Performance

The results discussed so far have all been concerned with the performance predicted for the various configurations with the propeller shaft parallel to the keel, or more generally to allow for water-jet propulsion, with the thrust axis parallel to the keel. For conventional planing hulls the hump trim rarely exceeds 7 degrees and the inclination of the shaft might also be 7 degrees. Thus the total angle of the shaft at hump speed is less than 15 degrees. The load on water at the hump speed, allowing for the vertical component of the thrust, is usually therefore of the order of 96 percent of the displacement. Although the effect of thrust unloading is always simulated in model tests, it is not a very significant effect and would usually not be worth discussing.

The situation for the heavily loaded hulls considered in this study is quite different. The hump trim is 15 degrees and, in at least one application, a shaft line inclination to the keel of 15 degrees is being considered. This results in a total thrust angle of 30 degrees at the hump and a load on water equal to only 90 percent of the displacement, and this is significant.

The effect of shaft angle on the S-5 configuration, without chine flaps, is shown on Figure 20. The inclined shaft accounts for a reduction

in drag of 13 percent at 15 knots and 5 percent at 30 knots. While there may be a penalty to pay in propeller efficiency, it is remarkable that the drag of these heavily loaded hulls can be reduced so much by this simple change in the machinery installation.

CONCLUSIONS

Model tests of a series of planing hulls were conducted in order to provide a data base to identify the design options available for a planing LVA concept. Due to the dimensional constraints on this hull concept, with a design gross weight of 55,000 lb, the hulls are heavily loaded and there is little margin for refinement of design. Nonetheless, the series developed exhibits progressively reduced drag in waves while maintaining the same acceptable g level, or habitability. The following conclusions apply to operation in head seas of 2.2 ft significant height at a displacement of 55,000 lb and an LCG 12.5 ft forward of the transom, with a transom flap fitted for trim control.

A flat bottom hull is better than inverted-vee hull, having lower drag, lower CG acceleration and reduced motion response to waves. A lowered bow profile reduces the high speed resistance, with a small penalty in hump drag and vertical acceleration. The addition of positive deadrise in the bow region overcomes these penalties and results in the lowest drag over the speed range of 15 to 30 knots.

The transom flap is a most efficient method of trim control. The flap permits operation at a lower trim and lower drag than would otherwise be possible. As a consequence of the reduced trim the seakeeping and habitability characteristics are improved.

A margin of 40% below the ISO habitability criteria (one hour fatigue decreased proficiency boundary) was achieved by all hulls.

Horizontal chine flaps, which decrease the beam loading, are an effective means of improving performance but exact a heavy penalty in habitability increasing the g load 80% at 30 knots. Chine flaps with 45 degree deadrise reduce the hump drag at 15 knots and increase the 30 knot drag, the g loads however are only increased 11%.

The bow accelerations are twice those at the CG while the stern accelera. : are 75% of those at the CG. The significant double amplitudes of the motions and accelerations are four times the corresponding rms values. The 1/3-octave rms acceleration is equal to half the value of the total rms acceleration.

This study is of an exploratory nature and some aspects have not been considered; for example the behavior in following seas. It is therefore recommended that designs based on this data be subject to in-depth evaluation.

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TABLE 1

LEADING PARTICULARS OF PLANING LVA CONCEPT

Displacement, lb	55,000
Length overall, ft	28
Beam, ft	11
Depth, ft	7
Center of gravity	
Forward of transom, LCG, ft	12.5
Above baseline, VCG, ft	3.5
Pitch radius of gyration, ft	7
Static trim, degrees	0.84
Static transom draft, ft	3.5

TABLE 2

MOVIE SEQUENCE OF TESTS IN CALM WATER AND
WAVES 2.2 FT SIGNIFICANT HEIGHT, DISPLACEMENT 55,000 LB

Speed knots		Transom Flap Deflection, degrees							
		-2.5	0	2.5	5	7.5	10	12.5	15
	CONFIGURATION P-1, 12.5 Ft LCG								
20	Calm Water				4	6	8		
	Waves	1	2	3	5	7	9	10	
30	Calm Water			13	15	17			
	Waves	11	12	14	16	18	9	20	
	CONFIGURATION P-1, 10.5 Ft LCG								
20	Calm Water						26	28	30
	Waves	22	22	23	24	25	27	29	31
30	Calm Water				32	34	36		
	Waves				33	35	37		
	CONFIGURATION S-1, 12.5 Ft LCG								
20	Calm Water				38	40	42		
	Waves				39	41	43		
30	Calm Water			44	46	48			
	Waves			45	47	49			

TABLE 2.2

CONFIGURATION S-3, 12.5 FT LCG, BOW FLAP RETRACTED AND EXTENDED

Speed knots		Transom Flap Deflection, degrees				
		0	2.5	5	7.5	10
15	Calm Water	50		53		56
	Waves	51		54		57
	Waves and Bow Flap	52		55		58
20	Calm Water and Bow Flap			59	61	63
	Waves and Bow Flap			60	62	64
30	Calm Water and Bow Flap			67	70	
	Waves		65	68		
	Waves and Bow Flap		66	69	71	
35	Calm Water			72		
	Waves			73		

TABLE 2.3

CONFIGURATION S-3 WITH CHINE FLAPS (a.k.a. S-4)
12.5 FT LCG, TRANSOM FLAP DEFLECTION 7.5 DEGREES
WITH BOW FLAP EXTENDED

Speed knots		T.E. Chine Flap Deflection, degrees				
		-5	0	5	10	15
15	Calm Water		74	76	78	82
	Waves		75	77	79	83
	Transom Flap 10 degrees					
	Calm Water				80	
	Waves				81	
20	Calm Water		84	86	88	
	Waves		85	87	89	
30	Calm Water	90	92	94	96	
	Waves	91	93	95		

TABLE 3

RESISTANCE OF CONFIGURATION S-5

No Chine Flaps LCG 12.5 Ft

Speed: 15 Knots

Displacement lb	Trim degrees	Resistance, lb Calm Water	Resistance, lb Significant Height 2.2 ft
60,000	12	24,180	24,180
	14	24,150	24,150
	16	24,180	24,180
	18	24,290	24,290
55,000	12	21,450	21,450
	14	21,260	21,260
	16	21,060	21,060
	18	21,330	21,330
50,000	12	18,720	18,720
	14	18,320	18,320
	16	18,210	18,210
	18	18,640	18,640
45,000	12	15,990	15,990
	14	15,530	15,530
	16	15,620	15,620
	18	16,220	16,220

TABLE 4

RESISTANCE OF CONFIGURATION S-5

Nc Chine Flaps LCG 12.5 Ft

Speed: 20 Knots

Displacement lb	Trim degrees	Resistance, lb Calm Water	Resistance, lb Significant Height 2.2 ft
60,000	12	18,220	19,550
	13	17,340	18,320
	14	17,250	17,910
	15	17,960	18,280
55,000	12	15,070	16,400
	13	14,850	15,830
	14	15,130	15,790
	15	15,880	16,200
50,000	12	12,600	13,930
	13	12,870	13,850
	14	13,560	14,220
	15	14,460	14,780
45,000	12	10,800	12,130
	13	11,440	12,420
	14	12,290	12,950
	15	13,150	13,470

TABLE 5

RESISTANCE OF CONFIGURATION S-5

No Chine Flaps LCG 12.5 Ft

Speed: 25 Knots

Displacement lb	Trim degrees	Resistance, lb Calm Water	Resistance, lb Significant Height 2.2 ft
60,000	8	13,530	16,320
	9	13,100	15,190
	10	12,870	14,290
	11	13,120	13,850
55,000	8	11,710	14,500
	9	11,210	13,300
	10	11,210	12,630
	11	11,990	12,720
50,000	8	9,800	12,590
	9	9,480	11,570
	10	10,120	11,540
	11	11,040	11,770
45,000	8	7,970	10,760
	9	8,440	10,530
	10	9,260	10,680
	11	10,090	10,820

TABLE 6

RESISTANCE OF CONFIGURATION S-5

No Chine Flaps LCG 12.5 Ft

Speed: 30 Knots

Displacement lb	Trim degrees	Resistance, lb Calm Water	Significant Height 2.2 ft
60,000	6	11,390	14,160
	7	9,760	11,890
	8	10,580	12,050
	9	11,540	12,370
55,000	6	9,140	11,910
	7	8,880	11,010
	8	9,660	11,130
	9	10,510	11,340
50,000	6	7,680	10,450
	7	8,030	10,160
	8	8,750	10,220
	9	9,520	10,350
45,000	6	6,690	9,460
	7	7,170	9,300
	8	7,800	9,270
	9	8,520	9,350

TABLE 7

DRAG INCREMENT, LB.,
RELATIVE TO S-5 WITHOUT CHINE FLAPS

Significant Wave Height 2.2 Ft
S-5 CONFIGURATIONS
6 FT. TRANSOM FLAP

Speed knots	Trim degrees	Horizontal Chine Flaps	45 degree Chine Flaps	9 ft Transom Flap	4 ft Chine Wings
15	12	-5060	-2480	440	-2640
	14	-4990	-2700	280	-2680
	16	-4280	-2880	200	-2630
	18	-2730	-3050	140	-2500
20	12	-3370			
	13	-1780			
	14	- 710			
	15	- 180			
30	6	-1650	1800		320
	7	-1030	1460		250
	8	- 710	1100		200
	9	- 530	760		120

TABLE 8

DRAG INCREMENT, LB.,
RELATIVE TO S-5 WITHOUT CHINE FLAPS

Significant Wave Height 2.2 Ft

		P-1 CONFIGURATION 3 FT TRANSOM FLAP		S-1 CONFIGURATION 3 FT TRANSOM FLAP		S-3 CONFIGURATION 3 FT TRANSOM FLAP	
Speed knots	Trim degrees	No Chine Flaps	With Chine Flaps	No Chine Flaps	With Chine Flaps	No Chine Flaps	With Chine Flaps
15	12	3320	-1780		-1780	1970	-3620
	14	3370	-1600		-1600	1690	-2750
	16	3660	-1470		-1470	1540	-1920
	18	4100	-		-	1650	-1460
20	12	2340	-2100	1720	-2720	1060	-3370
	13	2790	-1240	1670	-1600	1150	-1780
	14	2700	- 780	1260	- 910	980	- 710
	15	2240	- 410	1310	- 410	530	- 180
25	8	1210	-3180		-3180		
	9	1580	-1970		-1970		
	10	1900	-1120		-1120		
	11	1990	- 730		- 730		
30	6	2500		5130		1330	-1650
	7	2630		3960		1190	-1030
	8	2380		3270		550	- 710
	9	2060		2860		180	- 530

TABLE 9

MEAN AND RMS MODEL DATA FROM SEAKEEPING STATISTICS
SIGNIFICANT HEIGHT = 2.2 IN. DISPLACEMENT = 31 LB

CONFIGURATION P-1 WITHOUT CHINE FLAPS
LCG = 12.5 IN.

RUN	SPEED FPS	TRANSOM FLAP ANGLE DEG	MEAN PITCH DEG	MEAN DRAG LB	RMS BOW ACCEL G	RMS CG ACCEL G	RMS STERN ACCEL G
200	7.30	0.0	16.17	14.15	0.17	0.09	0.05
174	7.30	15.0	9.53	16.31	0.13	0.07	0.04
320	9.75	-2.5	18.13	12.32	0.36	0.17	0.11
202	9.75	0.0	16.69	11.80	0.34	0.16	0.07
321	9.75	0.0	17.02	11.55	0.37	0.18	0.11
314	9.75	2.5	16.08	10.98	0.36	0.17	0.12
313	9.75	5.0	14.90	10.63	0.36	0.17	0.12
316	9.75	7.5	14.00	10.67	0.35	0.17	0.12
317	9.75	10.0	13.14	10.80	0.33	0.16	0.12
318	9.75	12.5	11.16	10.92	0.27	0.14	0.11
163	9.75	15.0	8.86	14.77	0.21	0.10	0.14
173	9.75	15.0	9.65	13.38	0.23	0.11	0.06
204	12.19	0.0	12.69	9.19	0.52	0.25	0.13
167	12.19	10.0	8.60	8.52	0.41	0.20	0.11
165	12.19	12.5	7.62	9.68	0.38	0.19	0.11
310	14.62	-2.5	10.34	9.81	0.94	0.51	0.48
305	14.62	0.0	10.09	8.70	0.75	0.40	0.33
304	14.62	2.5	8.59	8.04	0.68	0.34	0.29
303	14.62	5.0	7.95	8.10	0.64	0.32	0.26
302	14.62	7.5	6.78	8.20	0.59	0.29	0.22
169	14.62	7.5	6.61	8.05	0.58	0.60	0.16
168	14.62	10.0	5.76	8.92	0.52	0.26	0.13
329	14.62	10.0	4.46	9.19	0.58	0.28	0.23
330	14.62	12.5	4.72	10.91	0.47	0.23	0.20
170	14.62	12.5	4.84	10.65	0.44	0.59	0.12
210	17.06	5.0	6.14	8.49	0.74	0.39	0.22
172	17.06	7.5	5.46	8.41	0.67	0.34	0.19
171	17.06	12.5	3.10	14.33	0.45	0.22	0.13

TABLE 9.2

CONFIGURATION P-1 WITHOUT CHINE FLAPS

LCG = 10.5 IN.

RUN	SPEED FPS	TRANSØM FLAP ANGLE DEG	MEAN PITCH DEG	MEAN DRAG LB	RMS BØW ACCEL G	RMS CG ACCEL G	RMS STERN ACCEL G
343	9.75	-2.5	20.69	13.88	0.43	0.16	0.09
342	9.75	0.0	20.12	13.49	0.42	0.16	0.09
341	9.75	2.5	19.12	12.88	0.42	0.16	0.10
339	9.75	5.0	18.28	12.61	0.43	0.17	0.10
340	9.75	7.5	17.11	11.52	0.44	0.17	0.11
344	9.75	10.0	16.12	11.03	0.48	0.18	0.12
345	9.75	12.5	15.23	10.91	0.48	0.19	0.13
346	9.75	15.0	14.00	10.39	0.48	0.18	0.13
369	14.62	5.0	10.32	8.99	0.97	0.49	0.47
364	14.62	7.5	8.17	7.62	0.91	0.68	0.37
363	14.62	10.0	6.95	7.70	0.74	0.32	0.27

CONFIGURATION P-1 WITHOUT CHINE FLAPS

LCG = 12.5 IN.

197	7.30	0.0	15.98	11.18	0.31	0.16	0.07
161	7.30	15.0	8.39	11.20	0.16	0.09	0.06
193	9.75	0.0	11.98	8.36	0.56	0.27	0.11
158	9.75	15.0	7.31	6.80	0.38	0.19	0.10
191	12.19	0.0	8.19	6.93	0.70	0.35	0.17
156	12.19	10.0	5.46	5.77	0.54	0.27	0.12
157	12.19	12.5	4.71	6.18	0.46	0.24	0.12
189	12.19	12.5	4.65	7.41	0.49	0.25	0.12
152	14.67	5.0	4.56	7.39	0.71	0.37	0.17
183	14.62	5.0	4.67	7.00	0.67	0.37	0.18
154	14.64	7.5	3.95	7.35	0.63	0.34	0.16
185	14.62	7.5	3.99	7.78	0.63	0.34	0.17
155	14.61	10.0	3.30	8.52	0.54	0.34	0.14
187	14.62	12.5	2.60	11.65	0.39	0.21	0.13
159	17.06	5.0	3.70	7.88	0.74	0.41	0.21
182	17.06	5.0	3.61	8.01	0.72	0.41	0.21
177	17.06	7.5	2.89	10.95	0.64	0.36	0.19

TABLE 9.3

CONFIGURATION S-1 WITHOUT CHINE FLAPS

LCG = 12.5 IN.

RUN	SPEED FPS	TRANSØM FLAP ANGLE DEG	MEAN PITCH DEG	MEAN DRAG LB	RMS BØW ACCEL G	RMS CG ACCEL G	RMS STERN ACCEL G
404	9.75	5.0	14.71	10.00	0.36	0.17	0.13
401	9.75	7.5	13.47	9.95	0.34	0.16	0.12
407	9.75	10.0	11.97	10.50	0.28	0.14	0.12
392	14.62	2.5	8.51	8.53	0.64	0.31	0.24
395	14.62	5.0	7.64	8.67	0.59	0.29	0.22
398	14.62	7.5	6.45	9.43	0.53	0.25	0.20

CONFIGURATION S-1 WITH CHINE FLAPS

LCG = 12.5 IN.

232	7.30	0.0	15.61	10.90	0.30	0.15	0.07
230	7.30	15.0	7.42	12.29	0.15	0.08	0.05
234	9.75	0.0	11.12	7.80	0.55	0.27	0.12
228	9.75	15.0	6.24	8.43	0.32	0.17	0.10
226	12.19	0.0	7.54	6.62	0.70	0.35	0.16
224	12.19	12.5	5.33	6.84	0.57	0.29	0.14
218	14.62	2.5	4.66	7.00	0.73	0.39	0.20
220	14.62	5.0	4.04	7.13	0.68	0.36	0.19
222	14.62	7.5	3.35	8.21	0.57	0.31	0.20
216	17.06	2.5	3.45	7.91	0.77	0.44	0.24
212	17.06	5.0	2.88	8.63	0.68	0.39	0.20
214	17.06	7.5	1.98	10.74	0.58	0.32	0.18

TABLE 9.4

CONFIGURATION S-3 WITHOUT CHINE FLAPS

BOW RAMP EXTENDED LCG = 12.5 IN.

RUN	SPEED FPS	TRANSOM FLAP ANGLE DEG	MEAN PITCH DEG	MEAN DRAG LB	RMS BOW ACCEL G	RMS CG ACCEL G	RMS STERN ACCEL G
453	7.31	0.0	17.91	12.91	0.23	0.11	0.08
451	7.31	5.0	15.19	12.19	0.22	0.10	0.09
455	7.31	10.0	12.27	12.03	0.21	0.10	0.10
425	9.75	5.0	14.72	9.62	0.40	0.19	0.13
428	9.75	7.5	13.53	9.31	0.38	0.18	0.13
431	9.75	10.0	12.33	9.26	0.36	0.17	0.14
416	14.63	2.5	8.58	6.96	0.69	0.35	0.28
419	14.63	5.0	7.70	7.08	0.65	0.32	0.25
422	14.63	7.5	6.58	7.50	0.62	0.30	0.24

CONFIGURATION S-3 WITHOUT CHINE FLAPS

BOW RAMP RETRACTED LCG = 12.5 IN.

438	7.31	0.0	18.54	13.12	0.23	0.11	0.08
439	7.31	5.0	15.35	12.40	0.21	0.10	0.09
440	7.31	10.0	12.48	12.36	0.18	0.09	0.08
434	14.63	2.5	8.63	7.06	0.70	0.35	0.27
437	14.63	5.0	7.75	7.02	0.65	0.34	0.26
444	17.06	5.0	5.94	7.52	0.74	0.38	0.32

TABLE 9.5

CONFIGURATION S-3 WITH CHINE FLAPS

BOW RAMP EXTENDED LCG = 12.5 IN.

RUN	SPEED FPS	TRANSØM FLAP ANGLE DEG	CHINE FLAP ANGLE DEG	MEAN PITCH DEG	MEAN DRAG LB	RMS BØW ACCEL G	RMS CG ACCEL G	RMS STERN ACCEL G
470	7.31	7.5	0.0	16.37	10.52	0.34	0.17	0.11
471	7.31	7.5	5.0	15.50	10.15	0.33	0.16	0.11
472	7.31	7.5	10.0	14.93	10.02	0.34	0.17	0.12
501	7.31	10.0	10.0	14.30	9.75	0.33	0.16	0.12
498	7.31	7.5	15.0	14.46	10.00	0.34	0.17	0.12
483	9.75	7.5	0.0	10.68	7.09	0.56	0.28	0.17
480	9.75	7.5	5.0	9.60	6.73	0.56	0.27	0.17
477	9.75	7.5	10.0	8.49	6.62	0.55	0.27	0.18
494	14.62	7.5	-5.0	5.14	6.74	0.74	0.39	0.30
486	14.62	7.5	0.0	4.45	6.79	0.68	0.36	0.28
488	14.62	7.5	5.0	3.37	7.25	0.64	0.34	0.28

TABLE 9.6

CONFIGURATION S-5 WITHOUT CHINE FLAPS

LCG = 12.5 IN.

RUN	SPEED FPS	TRANSOM FLAP ANGLE DEG	MEAN PITCH DEG	MEAN DRAG LB	RMS BOW ACCEL G	RMS CG ACCEL G	RMS STERN ACCEL G
62	4.68	0.0	0.51	4.45	0.25	0.07	0.09
63	4.83	0.0	1.47	4.92	0.25	0.08	0.09
26	7.33	-6.0	16.48	12.50	0.20	0.10	0.07
17	7.25	0.0	11.96	11.26	0.19	0.09	0.07
22	7.26	0.0	11.22	12.07	0.18	0.09	0.08
34	7.34	0.0	12.00	11.74	0.19	0.09	0.08
18	7.32	2.5	10.94	11.46	0.17	0.08	0.07
23	7.36	2.5	9.30	12.11	0.18	0.09	0.07
24	7.35	5.0	6.87	12.64	0.15	0.07	0.07
61	9.75	0.0	15.35	9.53	0.36	0.18	0.12
60	9.75	2.5	13.72	9.31	0.34	0.17	0.12
59	9.66	5.0	12.33	9.78	0.30	0.15	0.12
56	12.18	0.0	12.09	7.58	0.47	0.23	0.15
57	12.19	2.5	10.51	7.47	0.47	0.24	0.16
58	12.18	5.0	9.35	7.67	0.46	0.23	0.17
35	14.72	0.0		6.79	0.66	0.33	0.24
38	14.61	0.0	9.22	5.54	0.66	0.33	0.23
36	14.65	2.5	7.81	6.72	0.57	0.29	0.21
37	14.62	5.0	6.65	6.86	0.53	0.27	0.20

TABLE 9.7

CONFIGURATION S-5 WITH HORIZONTAL CHINE FLAPS

LCG = 12.5 IN.

RUN	SPEED FPS	TRANSØM FLAP ANGLE DEG	CHINE FLAP ANGLE DEG	MEAN PITCH DEG	MEAN DRAG LB	RMS BØW ACCEL G	RMS CG ACCEL G	RMS STERN ACCEL G
27	7.34	0.0	0.0	16.11	9.94	0.28	0.14	0.10
28	7.33	2.5	0.0	13.24	9.22	0.26	0.13	0.10
29	7.35	5.0	0.0	10.63	9.40	0.24	0.12	0.10
30	7.34	0.0	10.0	14.71	9.77	0.28	0.14	0.10
31	7.34	2.5	10.0	11.76	9.17	0.24	0.13	0.10
67	9.77	0.0	0.0	15.68	7.68	0.77	0.45	0.29
68	9.76	2.5	0.0	11.34	7.10	0.51	0.26	0.15
69	9.77	5.0	0.0	10.35	6.91	0.50	0.25	0.15
50	14.65	-6.0	0.0	9.29	7.11	1.03	0.61	0.50
39	14.62	0.0	0.0	6.56	6.13	0.84	0.44	0.33
49	14.64	0.0	0.0	7.31	6.22	0.84	0.47	0.34
40	14.62	2.5	0.0	5.78	6.67	0.73	0.41	0.28
41	14.61	5.0	0.0	4.80	7.01	0.63	0.34	0.23

TABLE 9.8

CONFIGURATION S-5 WITHOUT CHINE FLAPS

LCG = 13.5 IN.

RUN	SPEED FPS	TRANSØM FLAP ANGLE DEG	MEAN PITCH DEG	MEAN DRAG LB	RMS BØW ACCEL G	RMS CG ACCEL G	RMS STERN ACCEL G
54	14.65	0.0	9.03	7.16	0.54	0.27	0.19

CONFIGURATION S-5 WITH HORIZONTAL CHINE FLAPS

LCG = 13.5 IN.

52	14.64	0.0	6.50	6.68	0.68	0.37	0.28
53	14.65	0.0	6.48	6.41	0.68	0.37	0.25

CONFIGURATION S-5 WITH 9 IN. TRANSOM FLAP

LCG = 12.5 IN.

65	7.33	-6.0	11.52	12.37	0.17	0.08	0.07
66	7.33	-3.0	8.94	12.64	0.14	0.07	0.06
64	7.32	0.0	7.64	13.19	0.12	0.06	0.05

CONFIGURATION S-5 WITH 8 IN. CHINE WINGS

LCG = 12.5 IN.

70	7.33	0.0	19.81	11.92	0.36	0.18	0.10
71	7.31	2.5	18.58	11.38	0.36	0.18	0.10
72	7.31	5.0	17.43	10.92	0.34	0.17	0.10
74	7.32	10.0	14.41	10.06	0.29	0.14	0.10

TABLE 9.9

CONFIGURATION S-5 WITH 4 IN. CHINE WINGS

LCG = 12.5 IN.

RUN	SPEED FPS	TRANSØM FLAP ANGLE DEG	MEAN PITCH DEG	MEAN DRAG LB	RMS BØW ACCEL G	RMS CG ACCEL G	RMS STERN ACCEL G
75	7.32	0.0	18.31	11.68	0.32	0.16	0.10
76	7.32	5.0	15.34	10.84	0.25	0.12	0.09
77	7.32	10.0	10.58	10.69	0.19	0.09	0.08
78	14.64	0.0	9.63	6.96	0.84	0.41	0.30
79	14.69	5.0	6.85	6.90	0.70	0.36	0.25

CONFIGURATION S-5 WITH 45 DEGREE CHINE FLAPS

LCG = 12.5 IN.

81	7.34	2.5	11.50	10.74	0.21	0.11	0.09
82	7.34	5.0	9.60	10.89	0.20	0.10	0.09
83	14.64	0.0	8.80	7.35	0.68	0.35	0.26
84	14.64	2.5	7.52	7.37	0.62	0.33	0.24
85	14.64	5.0	6.42	7.96	0.57	0.30	0.22

TABLE 10

SEAKEEPING STATISTICS FOR CONFIGURATION P-1
SIGNIFICANT HEIGHT = 2.2 FT DISPLACEMENT = 55,000 LB
WITHOUT CHINE FLAPS LCG = 12.5 FT

RUN NO 200 VELOCITY 15.0 KNOTS FLAP DEFLECTION 0.0 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	16.17	1.29	37	17.49	14.81	18.64	13.67
HEAVE,	FT	0.05	0.33	24	0.49	-0.36	0.76	-0.70
BOW ACCEL,	G	-0.02	0.17	55	0.19	-0.22	0.33	-0.37
CG ACCEL,	G	-0.01	0.09	43	0.10	-0.14	0.16	-0.21
STERN ACCEL,	G	-0.07	0.05	29	0.01	-0.15	0.06	-0.18

RUN NO 174 VELOCITY 15.0 KNOTS FLAP DEFLECTION 15.0 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	9.53	1.54	35	10.86	8.20	12.34	6.91
HEAVE,	FT	-0.61	0.29	24	-0.28	-0.96	0.00	-1.20
BOW ACCEL,	G	0.08	0.13	51	0.26	-0.08	0.36	-0.18
CG ACCEL,	G	0.01	0.07	38	0.11	-0.10	0.16	-0.15
STERN ACCEL,	G	-0.02	0.04	24	0.06	-0.10	0.08	-0.13

RUN NO 320 VELOCITY 20.0 KNOTS FLAP DEFLECTION -2.5 DEG

NUMBER OF WAVE ENCOUNTERS 43

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	18.13	2.15	29	20.62	15.43	21.98	13.64
HEAVE,	FT	2.35	0.45	25	2.91	1.82	3.27	1.49
BOW ACCEL,	G	-0.06	0.36	33	0.55	-0.47	0.89	-0.66
CG ACCEL,	G	-0.07	0.17	28	0.23	-0.33	0.35	-0.42
STERN ACCEL,	G	-0.07	0.11	11	0.21	-0.25	0.30	-0.31

RUN NO 202 VELOCITY 20.0 KNOTS FLAP DEFLECTION 0.0 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	16.69	2.02	29	18.92	14.26	20.47	12.75
HEAVE,	FT	2.30	0.45	26	2.76	1.84	3.15	1.50
BOW ACCEL,	G	0.00	0.34	49	0.42	-0.33	0.71	-0.56
CG ACCEL,	G	0.02	0.16	43	0.23	-0.15	0.34	-0.29
STERN ACCEL,	G	-0.07	0.07	30	0.05	-0.17	0.11	-0.20

TABLE 10.2

WITHOUT CHINE FLAPS LCG = 12.5 FT

RUN NO 321 VELOCITY 20.0 KNOTS FLAP DEFLECTION 0.0 DEG

NUMBER OF WAVE ENCOUNTERS 45

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	17.02	2.04	33	19.13	14.59	20.60	12.88
HEAVE,	FT	2.23	0.43	25	2.76	1.72	3.12	1.44
BOW ACCEL,	G	-0.06	0.37	39	0.56	-0.47	0.92	-0.66
CG ACCEL,	G	-0.05	0.18	29	0.24	-0.31	0.36	-0.41
STERN ACCEL,	G	-0.06	0.11	14	0.19	-0.22	0.26	-0.28

RUN NO 314 VELOCITY 20.0 KNOTS FLAP DEFLECTION 2.5 DEG

NUMBER OF WAVE ENCOUNTERS 42

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	16.08	2.04	31	18.50	13.63	19.88	12.08
HEAVE,	FT	2.23	0.41	25	2.77	1.71	3.07	1.40
BOW ACCEL,	G	-0.05	0.36	41	0.52	-0.47	0.79	-0.66
CG ACCEL,	G	-0.03	0.17	31	0.25	-0.30	0.35	-0.38
STERN ACCEL,	G	-0.04	0.12	15	0.22	-0.22	0.32	-0.26

RUN NO 313 VELOCITY 20.0 KNOTS FLAP DEFLECTION 5.0 DEG

NUMBER OF WAVE ENCOUNTERS 132

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	14.90	2.10	97	17.22	12.34	18.72	10.63
HEAVE,	FT	2.08	0.42	78	2.62	1.57	2.97	1.29
BOW ACCEL,	G	-0.04	0.36	124	0.53	-0.47	0.82	-0.69
CG ACCEL,	G	-0.01	0.17	92	0.27	-0.29	0.36	-0.39
STERN ACCEL,	G	-0.04	0.12	52	0.20	-0.25	0.28	-0.30

RUN NO 316 VELOCITY 20.0 KNOTS FLAP DEFLECTION 7.5 DEG

NUMBER OF WAVE ENCOUNTERS 133

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	14.00	1.96	97	16.27	11.50	17.51	9.95
HEAVE,	FT	1.99	0.40	79	2.50	1.49	2.80	1.20
BOW ACCEL,	G	-0.03	0.35	129	0.51	-0.44	0.81	-0.63
CG ACCEL,	G	-0.03	0.17	89	0.23	-0.31	0.32	-0.41
STERN ACCEL,	G	-0.04	0.12	58	0.20	-0.24	0.27	-0.30

TABLE 10.3

WITHOUT CHINE FLAPS LCG = 12.5 FT

RUN NO 317 VELOCITY 20.0 KNOTS FLAP DEFLECTION 10.0 DEG

NUMBER OF WAVE ENCOUNTERS 126

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	13.14	1.86	98	15.29	10.73	16.46	9.29
HEAVE,	FT	1.97	0.38	78	2.47	1.49	2.77	1.25
BOW ACCEL,	G	-0.03	0.33	128	0.48	-0.43	0.76	-0.63
CG ACCEL,	G	-0.03	0.16	86	0.23	-0.30	0.31	-0.39
STERN ACCEL,	G	-0.03	0.12	59	0.20	-0.24	0.27	-0.30

RUN NO 318 VELOCITY 20.0 KNOTS FLAP DEFLECTION 12.5 DEG

NUMBER OF WAVE ENCOUNTERS 85

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	11.16	1.54	70	12.85	9.40	14.05	8.17
HEAVE,	FT	1.59	0.34	45	2.04	1.19	2.29	0.92
BOW ACCEL,	G	-0.03	0.27	86	0.36	-0.37	0.56	-0.53
CG ACCEL,	G	0.05	0.14	49	0.27	-0.19	0.34	-0.27
STERN ACCEL,	G	-0.04	0.11	33	0.19	-0.25	0.27	-0.30

RUN NO 163 VELOCITY 20.0 KNOTS FLAP DEFLECTION 15.0 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	8.66	1.21	35	9.94	7.72	10.95	6.82
HEAVE,	FT	0.92	0.26	22	1.21	0.60	1.38	0.33
BOW ACCEL,	G	0.06	0.21	55	0.31	-0.18	0.50	-0.33
CG ACCEL,	G	-0.05	0.10	41	0.10	-0.19	0.18	-0.26
STERN ACCEL,	G	-0.44	0.14	41	-0.33	-0.57	-0.29	-0.70

RUN NO 173 VELOCITY 20.0 KNOTS FLAP DEFLECTION 15.0 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	9.65	1.32	34	10.96	8.37	12.22	7.63
HEAVE,	FT	1.27	0.30	24	1.61	0.98	1.86	0.77
BOW ACCEL,	G	0.07	0.23	51	0.36	-0.19	0.58	-0.36
CG ACCEL,	G	0.03	0.11	40	0.18	-0.13	0.25	-0.22
STERN ACCEL,	G	-0.02	0.06	33	0.06	-0.13	0.13	-0.18

TABLE 10.4

WITHOUT CHINE FLAPS LCG = 12.5 FT

RUN NO 204 VELOCITY 25.0 KNOTS FLAP DEFLECTION 0.0 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	12.69	3.15	25	16.38	8.90	18.13	6.89
HEAVE,	FT	3.33	0.60	21	4.09	2.61	4.46	2.23
BOW ACCEL,	G	0.03	0.52	41	0.84	-0.39	1.24	-0.78
CG ACCEL,	G	0.05	0.25	41	0.35	-0.22	0.52	-0.42
STERN ACCEL,	G	-0.03	0.13	34	0.11	-0.21	0.24	-0.30

RUN NO 167 VELOCITY 25.0 KNOTS FLAP DEFLECTION 10.0 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	8.60	1.94	31	10.64	6.65	12.06	5.32
HEAVE,	FT	2.72	0.40	23	3.21	2.26	3.43	1.99
BOW ACCEL,	G	0.06	0.41	52	0.58	-0.31	0.93	-0.59
CG ACCEL,	G	0.06	0.20	43	0.31	-0.19	0.44	-0.33
STERN ACCEL,	G	0.01	0.11	34	0.16	-0.15	0.24	-0.22

RUN NO 165 VELOCITY 25.0 KNOTS FLAP DEFLECTION 12.5 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	7.62	1.72	30	9.50	5.90	10.67	4.43
HEAVE,	FT	2.54	0.39	23	2.96	2.15	3.24	1.85
BOW ACCEL,	G							
CG ACCEL,	G	0.07	0.19	44	0.30	-0.14	0.42	0.30
STERN ACCEL,	G	-0.20	0.11	33	-0.07	-0.35	0.01	-0.42

RUN NO 310 VELOCITY 30.0 KNOTS FLAP DEFLECTION -2.5 DEG

NUMBER OF WAVE ENCOUNTERS 34

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	10.34	6.31	19	18.23	0.53	20.52	-1.15
HEAVE,	FT	3.67	1.30	19	5.49	1.96	6.31	1.59
BOW ACCEL,	G	-0.02	0.94	25	1.57	-1.15	2.65	-1.92
CG ACCEL,	G	0.01	0.51	23	0.75	-0.77	0.98	-1.37
STERN ACCEL,	G	-0.02	0.48	32	0.47	-0.85	0.83	-1.11

TABLE 10.5

WITHOUT CHINE FLAPS LCG = 12.5 FT

RUN NO 305 VELOCITY 30.0 KNOTS FLAP DEFLECTION 0.0 DEG

NUMBER OF WAVE ENCOUNTERS 110

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	10.09	4.42	65	15.06	4.10	17.79	1.60
HEAVE,	FT	3.63	0.90	57	4.78	2.60	5.56	2.10
BOW ACCEL,	G	-0.04	0.75	96	1.19	-0.74	2.03	-1.23
CG ACCEL,	G	-0.01	0.40	90	0.54	-0.47	0.68	-0.83
STERN ACCEL,	G	0.00	0.33	89	0.40	-0.53	0.67	-0.79

RUN NO 304 VELOCITY 30.0 KNOTS FLAP DEFLECTION 2.5 DEG

NUMBER OF WAVE ENCOUNTERS 108

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	8.59	3.59	67	12.55	3.81	14.93	1.06
HEAVE,	FT	3.34	0.74	59	4.25	2.52	4.94	2.10
BOW ACCEL,	G	-0.02	0.68	113	1.12	-0.58	1.67	-1.03
CG ACCEL,	G	0.02	0.34	88	0.55	-0.40	0.81	-0.65
STERN ACCEL,	G	-0.01	0.29	79	0.37	-0.47	0.62	-0.70

RUN NO 303 VELOCITY 30.0 KNOTS FLAP DEFLECTION 5.0 DEG

NUMBER OF WAVE ENCOUNTERS 109

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	7.95	3.12	72	11.29	4.06	13.60	1.47
HEAVE,	FT	3.18	0.65	57	3.98	2.45	4.57	2.00
BOW ACCEL,	G	-0.02	0.64	122	1.02	-0.57	1.72	-0.98
CG ACCEL,	G	0.03	0.32	96	0.51	-0.36	0.77	-0.60
STERN ACCEL,	G	0.00	0.26	75	0.35	-0.42	0.55	-0.64

RUN NO 302 VELOCITY 30.0 KNOTS FLAP DEFLECTION 7.5 DEG

NUMBER OF WAVE ENCOUNTERS 105

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	6.78	2.43	82	9.16	4.01	11.14	1.79
HEAVE,	FT	2.97	0.51	55	3.64	2.35	4.10	2.01
BOW ACCEL,	G	-0.01	0.59	125	0.95	-0.56	1.54	-0.90
CG ACCEL,	G	0.00	0.29	100	0.42	-0.35	0.63	-0.59
STERN ACCEL,	G	-0.01	0.22	72	0.30	-0.37	0.47	-0.54

TABLE 10.6

WITHOUT CHINE FLAPS LCG = 12.5 FT

RUN NO 169 VELOCITY 30.0 KNOTS FLAP DEFLECTION 7.5 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	6.61	2.43	26	9.19	3.75	10.66	1.63
HEAVE,	FT	3.07	0.52	21	3.72	2.50	4.10	2.10
BOW ACCEL,	G	0.28	0.58	50	1.06	-0.11	1.61	-0.58
CG ACCEL,	G							
STERN ACCEL,	G	-0.06	0.16	36	0.09	-0.26	0.23	-0.40

RUN NO 168 VELOCITY 30.0 KNOTS FLAP DEFLECTION 10.0 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	5.78	1.97	28	7.77	3.89	9.03	2.24
HEAVE,	FT	2.86	0.44	20	3.41	2.36	3.76	1.98
BOW ACCEL,	G	0.11	0.52	53	0.78	-0.27	1.28	-0.65
CG ACCEL,	G	0.05	0.26	44	0.34	-0.22	0.48	-0.46
STERN ACCEL,	G	0.00	0.13	35	0.16	-0.18	0.26	-0.27

RUN NO 329 VELOCITY 30.0 KNOTS FLAP DEFLECTION 10.0 DEG

NUMBER OF WAVE ENCOUNTERS 34

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	4.46	2.40	26	7.05	1.27	8.60	-0.97
HEAVE,	FT	3.02	0.52	21	3.68	2.49	4.22	2.11
BOW ACCEL,	G	-0.01	0.58	41	0.95	-0.53	1.56	-0.92
CG ACCEL,	G	0.02	0.28	30	0.41	-0.35	0.61	-0.59
STERN ACCEL,	G	0.00	0.23	25	0.30	-0.37	0.45	-0.52

RUN NO 330 VELOCITY 30.0 KNOTS FLAP DEFLECTION 12.5 DEG

NUMBER OF WAVE ENCOUNTERS 33

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	4.72	1.72	30	6.54	2.64	7.72	0.95
HEAVE,	FT	2.52	0.38	20	3.02	2.12	3.33	1.79
BOW ACCEL,	G	-0.01	0.47	33	0.68	-0.53	1.17	-0.80
CG ACCEL,	G	0.13	0.23	27	0.44	-0.22	0.58	-0.39
STERN ACCEL,	G	0.00	0.20	26	0.27	-0.32	0.42	-0.45

TABLE 10.7

WITHOUT CHINE FLAPS LCG = 12.5 FT

RUN NØ 170 VELØCITY 30.0 KNØTS FLAP DEFLECTION 12.5 DEG

NUMBER ØF WAVE ENCØUNTERS 30

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	4.84	1.59	30	6.48	3.36	7.50	1.72
HEAVE,	FT	2.64	0.37	17	3.11	2.20	3.39	1.92
BØW ACCEL,	G							
CG ACCEL,	G							
STERN ACCEL,	G	-0.03	0.12	36	0.10	-0.21	0.20	-0.30

RUN NØ 210 VELOCITY 35.0 KNØTS FLAP DEFLECTION 5.0 DEG

NUMBER ØF WAVE ENCØUNTERS 30

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	6.14	3.00	21	9.45	2.25	11.85	-0.06
HEAVE,	FT	3.38	0.70	18	4.25	2.62	4.87	2.07
BØW ACCEL,	G	0.05	0.74	45	1.09	-0.42	1.63	-1.06
CG ACCEL,	G	0.05	0.39	49	0.42	-0.26	0.75	-0.71
STERN ACCEL,	G	-0.01	0.22	40	0.13	-0.29	0.35	-0.51

RUN NØ 172 VELOCITY 35.0 KNØTS FLAP DEFLECTION 7.5 DEG

NUMBER ØF WAVE ENCØUNTERS 30

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	5.46	2.56	23	7.35	2.36	10.02	0.19
HEAVE,	FT	3.22	0.57	20	3.83	2.67	4.33	2.15
BØW ACCEL,	G							
CG ACCEL,	G	0.09	0.34	50	0.46	-0.17	0.73	-0.50
STERN ACCEL,	G	-0.01	0.19	31	0.16	-0.25	0.33	-0.45

RUN NØ 171 VELOCITY 35.0 KNØTS FLAP DEFLECTION 12.5 DEG

NUMBER ØF WAVE ENCØUNTERS 30

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	3.10	1.37	31	4.32	1.74	5.59	0.57
HEAVE,	FT	2.60	0.32	17	3.01	2.36	3.26	2.01
BØW ACCEL,	G							
CG ACCEL,	G	0.15	0.22	40	0.40	-0.13	0.59	-0.31
STERN ACCEL,	G	-0.01	0.13	34	0.15	-0.18	0.36	-0.29

TABLE 10.8

WITHOUT CHINE FLAPS LCG = 10.5 FT

RUN NO 343 VELOCITY 20.0 KNOTS FLAP DEFLECTION -2.5 DEG

NUMBER OF WAVE ENCOUNTERS 42

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	20.69	2.43	27	23.33	17.35	24.32	15.16
HEAVE,	FT	2.71	0.50	25	3.31	2.14	3.78	1.88
BOW ACCEL,	G	-0.07	0.43	35	0.65	-0.54	1.06	-0.76
CG ACCEL,	G	-0.07	0.16	25	0.21	-0.32	0.30	-0.41
STERN ACCEL,	G	-0.07	0.09	11	0.15	-0.27	0.22	-0.32

RUN NO 342 VELOCITY 20.0 KNOTS FLAP DEFLECTION 0.0 DEG

NUMBER OF WAVE ENCOUNTERS 44

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	20.12	2.42	29	22.67	17.07	24.45	14.73
HEAVE,	FT	2.86	0.48	25	3.44	2.29	3.95	1.99
BOW ACCEL,	G	-0.07	0.42	36	0.61	-0.54	1.06	-0.78
CG ACCEL,	G	-0.09	0.16	27	0.18	-0.34	0.29	-0.44
STERN ACCEL,	G	-0.06	0.09	8	0.17	-0.26	0.24	-0.31

RUN NO 341 VELOCITY 20.0 KNOTS FLAP DEFLECTION 2.5 DEG

NUMBER OF WAVE ENCOUNTERS 41

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	19.12	2.49	29	21.73	15.94	23.34	13.59
HEAVE,	FT	2.82	0.49	24	3.45	2.22	3.95	1.91
BOW ACCEL,	G	-0.06	0.42	33	0.64	-0.52	1.05	-0.75
CG ACCEL,	G	-0.08	0.16	27	0.19	-0.34	0.30	-0.44
STERN ACCEL,	G	-0.05	0.10	10	0.18	-0.24	0.26	-0.30

RUN NO 339 VELOCITY 20.0 KNOTS FLAP DEFLECTION 5.0 DEG

NUMBER OF WAVE ENCOUNTERS 40

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	18.28	2.61	29	21.06	14.78	22.70	12.71
HEAVE,	FT	2.67	0.48	25	3.29	2.09	3.69	1.81
BOW ACCEL,	G	-0.05	0.43	35	0.71	-0.54	1.16	-0.78
CG ACCEL,	G	-0.04	0.17	26	0.24	-0.31	0.35	-0.40
STERN ACCEL,	G	-0.05	0.10	11	0.15	-0.25	0.26	-0.31

TABLE 10.9

WITHOUT CHINE FLAPS LCG = 10.5 FT

RUN NO 340 VELOCITY 20.0 KNOTS FLAP DEFLECTION 7.5 DEG

NUMBER OF WAVE ENCOUNTERS 45

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	17.11	2.63	30	19.95	13.63	21.66	11.16
HEAVE,	FT	2.68	0.47	27	3.25	2.15	3.72	1.81
BOW ACCEL,	G	-0.04	0.44	40	0.70	-0.50	1.13	-0.75
CG ACCEL,	G	-0.06	0.17	28	0.23	-0.32	0.32	-0.41
STERN ACCEL,	G	-0.05	0.11	12	0.20	-0.26	0.26	-0.32

RUN NO 344 VELOCITY 20.0 KNOTS FLAP DEFLECTION 10.0 DEG

NUMBER OF WAVE ENCOUNTERS 126

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	16.12	2.63	95	19.00	12.71	20.36	10.67
HEAVE,	FT	2.63	0.45	81	3.21	2.09	3.59	1.83
BOW ACCEL,	G	-0.04	0.48	123	0.77	-0.56	1.26	-0.79
CG ACCEL,	G	-0.04	0.18	92	0.25	-0.32	0.35	-0.42
STERN ACCEL,	G	-0.04	0.12	50	0.21	-0.24	0.27	-0.30

RUN NO 345 VELOCITY 20.0 KNOTS FLAP DEFLECTION 12.5 DEG

NUMBER OF WAVE ENCOUNTERS 129

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	15.23	2.75	91	18.37	11.59	20.10	9.50
HEAVE,	FT	2.65	0.46	78	3.25	2.08	3.66	1.82
BOW ACCEL,	G	-0.03	0.48	121	0.79	-0.55	1.28	-0.76
CG ACCEL,	G	-0.02	0.19	92	0.28	-0.30	0.40	-0.41
STERN ACCEL,	G	-0.04	0.13	50	0.22	-0.25	0.30	-0.31

RUN NO 346 VELOCITY 20.0 KNOTS FLAP DEFLECTION 15.0 DEG

NUMBER OF WAVE ENCOUNTERS 125

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	14.00	2.64	98	16.94	10.73	18.73	8.65
HEAVE,	FT	2.57	0.44	81	3.13	2.03	3.51	1.77
BOW ACCEL,	G	-0.02	0.48	126	0.79	-0.55	1.28	-0.80
CG ACCEL,	G	-0.02	0.18	94	0.27	-0.31	0.37	-0.42
STERN ACCEL,	G	-0.03	0.13	52	0.23	-0.24	0.31	-0.31

TABLE 10.10

WITHOUT CHINE FLAPS LCG = 10.5 FT

RUN NØ 369 VELØCITY 30.0 KNØTS FLAP DEFLECTION 5.0 DEG

NUMBER ØF WAVE ENCØUNTERS 110

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	10.32	6.31	58	17.78	0.78	20.75	-1.31
HEAVE,	FT	4.00	1.32	57	5.68	2.34	6.75	1.89
BØW ACCEL,	G	-0.02	0.97	87	1.74	-0.76	2.79	-1.31
CG ACCEL,	G	0.05	0.49	85	0.70	-0.46	1.00	-0.81
STERN ACCEL,	G	-0.01	0.47	86	0.51	-0.63	0.87	-0.90

RUN NØ 364 VELOCITY 30.0 KNOTS FLAP DEFLECTION 7.5 DEG

NUMBER ØF WAVE ENCØUNTERS 111

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	8.17	4.72	67	12.93	1.86	16.19	-1.20
HEAVE,	FT	3.69	0.98	61	4.47	2.52	5.60	1.69
BØW ACCEL,	G	0.03	0.91	105	1.59	-0.54	2.55	-1.08
CG ACCEL,	G	0.09	0.68	85	0.56	-0.42	0.85	-0.72
STERN ACCEL,	G	0.00	0.37	83	0.42	-0.47	0.75	-0.75

RUN NO 363 VELOCITY 30.0 KNOTS FLAP DEFLECTION 10.0 DEG

NUMBER ØF WAVE ENCØUNTERS 114

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	6.95	3.39	74	10.68	2.59	13.15	0.22
HEAVE,	FT	3.43	0.65	57	4.33	2.70	4.92	2.41
BØW ACCEL,	G	0.00	0.74	115	1.32	-0.63	2.22	-1.05
CG ACCEL,	G	0.06	0.32	97	0.50	-0.34	0.73	-0.59
STERN ACCEL,	G	-0.01	0.27	79	0.34	-0.44	0.52	-0.65

TABLE 10.11

WITH CHINE FLAPS LCG = 12.5

RUN NO 197 VELOCITY 15.0 KNOTS FLAP DEFLECTION 0.0 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	15.98	1.77	40	17.73	13.33	19.13	12.37
HEAVE,	FT	1.92	0.46	33	2.45	1.43	2.90	1.09
BOW ACCEL,	G	0.00	0.31	64	0.40	-0.31	0.75	-0.55
CG ACCEL,	G	0.02	0.16	54	0.21	-0.18	0.33	-0.31
STERN ACCEL,	G	-0.08	0.07	41	0.03	-0.19	0.06	-0.24

RUN NO 161 VELOCITY 15.0 KNOTS FLAP DEFLECTION 15.0 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	8.39	1.15	37	9.64	7.20	10.76	6.23
HEAVE,	FT	0.76	0.32	26	1.13	0.41	1.45	0.15
BOW ACCEL,	G	-0.04	0.16	59	0.17	-0.23	0.31	-0.36
CG ACCEL,	G	-0.10	0.09	44	0.03	-0.23	0.10	-0.30
STERN ACCEL,	G	-0.07	0.06	39	0.02	-0.16	0.07	-0.20

RUN NO 193 VELOCITY 20.0 KNOTS FLAP DEFLECTION 0.0 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	11.93	2.77	34	14.97	9.47	16.76	6.27
HEAVE,	FT	3.31	0.57	32	3.95	2.67	4.35	2.25
BOW ACCEL,	G	0.02	0.56	49	0.87	-0.49	1.51	-0.54
CG ACCEL,	G	0.04	0.27	51	0.37	-0.25	0.61	-0.48
STERN ACCEL,	G	-0.02	0.11	47	0.10	-0.17	0.21	-0.24

RUN NO 158 VELOCITY 20.0 KNOTS FLAP DEFLECTION 15.0 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	7.31	1.62	34	9.05	5.33	9.96	4.18
HEAVE,	FT	2.69	0.39	30	3.12	2.29	3.41	1.93
BOW ACCEL,	G	0.00	0.38	61	0.51	-0.35	0.35	-0.65
CG ACCEL,	G	0.17	0.19	51	0.40	-0.07	0.53	-0.23
STERN ACCEL,	G	0.03	0.10	39	0.13	-0.13	0.25	-0.19

TABLE 10.12

WITH CHINE FLAPS LCG = 12.5 FT

RUN NO 191 VELOCITY 25.0 KNOTS FLAP DEFLECTION 0.0 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	8.19	3.43	25	12.28	3.47	14.10	1.15
HEAVE,	FT	3.60	0.70	23	4.47	2.77	4.96	2.33
BOW ACCEL,	G	0.03	0.70	48	1.10	-0.47	2.07	-0.93
CG ACCEL,	G	0.05	0.35	55	0.44	-0.23	0.78	-0.53
STERN ACCEL,	G	-0.06	0.17	46	0.12	-0.29	0.27	-0.43

RUN NO 156 VELOCITY 25.0 KNOTS FLAP DEFLECTION 10.0 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	5.46	1.82	33	7.33	3.23	8.46	1.43
HEAVE,	FT	3.30	0.41	25	3.81	2.81	4.10	2.48
BOW ACCEL,	G	-0.02	0.54	56	0.81	-0.49	1.46	-0.64
CG ACCEL,	G	0.11	0.27	55	0.42	-0.19	0.64	-0.42
STERN ACCEL,	G	0.06	0.12	42	0.21	-0.12	0.32	-0.20

RUN NO 157 VELOCITY 25.0 KNOTS FLAP DEFLECTION 12.5 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	4.71	1.48	34	6.40	2.38	7.09	1.48
HEAVE,	FT	3.16	0.35	26	3.53	2.75	3.75	2.47
BOW ACCEL,	G	0.00	0.46	56	0.64	-0.43	1.17	-0.76
CG ACCEL,	G	0.11	0.24	47	0.39	-0.20	0.58	-0.38
STERN ACCEL,	G	0.05	0.12	41	0.19	-0.12	0.28	-0.19

RUN NO 189 VELOCITY 25.0 KNOTS FLAP DEFLECTION 12.5 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	4.65	1.66	32	6.38	2.64	7.38	1.00
HEAVE,	FT	3.03	0.42	25	3.49	2.57	3.66	2.26
BOW ACCEL,	G	-0.01	0.49	54	0.70	-0.44	1.21	-0.84
CG ACCEL,	G	0.03	0.25	46	0.35	-0.25	0.49	-0.51
STERN ACCEL,	G	-0.04	0.12	39	0.12	-0.22	0.19	-0.31

TABLE 10.13

WITH CHINE FLAPS LCG = 12.5 FT

RUN NO 152 VELOCITY 30.1 KNOTS FLAP DEFLECTION 5.0 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	4.56	2.43	25	7.17	1.43	8.66	-0.39
HEAVE,	FT	3.40	0.60	21	4.15	2.75	4.62	2.21
BOW ACCEL,	G	0.02	0.71	47	1.07	-0.44	1.92	-0.99
CG ACCEL,	G	0.06	0.37	46	0.52	-0.22	0.64	-0.61
STERN ACCEL,	G	-0.04	0.17	41	0.15	-0.25	0.32	-0.38

RUN NO 183 VELOCITY 30.0 KNOTS FLAP DEFLECTION 5.0 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	4.57	2.41	25	7.10	1.69	8.38	-0.23
HEAVE,	FT	3.44	0.63	21	4.19	2.79	4.70	2.33
BOW ACCEL,	G	0.09	0.67	47	1.21	-0.39	1.99	-0.89
CG ACCEL,	G	0.04	0.37	46	0.50	-0.29	0.82	-0.64
STERN ACCEL,	G	0.02	0.18	45	0.18	-0.18	0.34	-0.33

RUN NO 154 VELOCITY 30.1 KNOTS FLAP DEFLECTION 7.5 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	3.95	1.99	27	6.19	1.39	7.42	-0.36
HEAVE,	FT	3.28	0.51	20	3.96	2.75	4.34	2.33
BOW ACCEL,	G	0.08	0.63	49	1.05	-0.33	1.63	-0.88
CG ACCEL,	G	0.11	0.34	50	0.53	-0.19	0.77	-0.54
STERN ACCEL,	G	0.00	0.16	39	0.19	-0.20	0.30	-0.32

RUN NO 185 VELOCITY 30.0 KNOTS FLAP DEFLECTION 7.5 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	3.99	2.09	29	5.75	1.56	7.33	-0.33
HEAVE,	FT	3.25	0.60	20	3.93	2.68	4.39	2.26
BOW ACCEL,	G	0.07	0.63	47	1.06	-0.46	1.76	-0.88
CG ACCEL,	G	0.05	0.34	43	0.48	-0.31	0.70	-0.61
STERN ACCEL,	G	-0.02	0.17	41	0.15	-0.23	0.27	-0.39

TABLE 10.14

WITH CHINE FLAPS LCG = 12.5 FT

RUN NO 155 VELOCITY 30.0 KNOTS FLAP DEFLECTION 10.0 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	3.30	1.62	32	4.85	1.52	6.06	-0.14
HEAVE,	FT	3.11	0.44	20	3.70	2.64	4.01	2.34
BØW ACCEL,	G	0.10	0.34	52	0.68	-0.30	1.43	-0.77
CG ACCEL,	G	0.14	0.34	44	0.51	-0.16	0.74	-0.49
STERN ACCEL,	G	0.03	0.14	36	0.20	-0.17	0.30	-0.29

RUN NO 187 VELOCITY 30.0 KNOTS FLAP DEFLECTION 12.5 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	2.60	1.26	30	3.94	1.17	4.91	-0.02
HEAVE,	FT	2.74	0.42	23	3.03	2.42	3.53	2.13
BØW ACCEL,	G	0.06	0.39	59	0.43	-0.29	0.66	-0.63
CG ACCEL,	G	0.03	0.21	43	0.27	-0.22	0.41	-0.44
STERN ACCEL,	G	-0.03	0.13	36	0.15	-0.22	0.23	-0.33

RUN NO 159 VELOCITY 35.0 KNOTS FLAP DEFLECTION 5.0 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	3.70	2.33	25	6.00	0.94	7.77	-0.50
HEAVE,	FT	3.39	0.60	18	4.17	2.76	4.79	2.45
BØW ACCEL,	G	0.03	0.74	50	1.10	-0.39	1.71	-1.03
CG ACCEL,	G	0.19	0.41	47	0.65	-0.14	0.95	-0.53
STERN ACCEL,	G	0.04	0.21	44	0.23	-0.20	0.43	-0.36

RUN NO 162 VELOCITY 35.0 KNOTS FLAP DEFLECTION 5.0 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	3.61	2.15	23	5.76	0.38	7.76	-0.82
HEAVE,	FT	3.37	0.61	19	4.10	2.76	4.60	2.29
BØW ACCEL,	G	0.08	0.72	52	1.10	-0.27	1.37	-0.90
CG ACCEL,	G	0.05	0.41	53	0.51	-0.20	0.75	-0.63
STERN ACCEL,	G	-0.04	0.21	43	0.17	-0.28	0.36	-0.49

TABLE 10.15

WITH CHINE FLAPS LCG = 12.5 FT

RUN NO 177 VELOCITY 35.0 KNOTS FLAP DEFLECTION 7.5 DEG

NUMBER OF WAVE ENCOUNTERS 30

	MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH, DEG	2.89	1.98	26	4.75	0.74	6.20	-1.02
HEAVE, FT	3.07	0.59	16	3.92	2.50	4.25	2.15
BOW ACCEL, G	0.18	0.64	49	1.05	-0.31	1.66	-0.80
CG ACCEL, G	0.06	0.36	47	0.41	-0.27	0.66	-0.65
STERN ACCEL, G	-0.02	0.19	39	0.17	-0.25	0.34	-0.44

TABLE 11

SEAKEEPING STATISTICS FOR CONFIGURATION S-1
SIGNIFICANT HEIGHT = 2.2 FT DISPLACEMENT = 55,000 LB
WITHOUT CHINE FLAPS LCG = 12.5 FT

RUN NO 404 VELOCITY 20.0 KNOTS FLAP DEFLECTION 5.0 DEG

NUMBER OF WAVE ENCOUNTERS 137

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	14.71	1.58	98	16.94	12.19	18.02	10.64
HEAVE,	FT	2.06	0.40	78	2.58	1.56	2.87	1.26
BOW ACCEL,	G	-0.04	0.36	135	0.54	-0.46	0.87	-0.65
CG ACCEL,	G	-0.01	0.17	91	0.27	-0.28	0.36	-0.38
STERN ACCEL,	G	-0.04	0.13	82	0.19	-0.26	0.23	-0.32

RUN NO 401 VELOCITY 20.0 KNOTS FLAP DEFLECTION 7.5 DEG

NUMBER OF WAVE ENCOUNTERS 140

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	13.47	1.73	100	15.46	11.25	16.47	9.67
HEAVE,	FT	1.96	0.38	77	2.45	1.51	2.74	1.21
BOW ACCEL,	G	-0.04	0.34	134	0.50	-0.44	0.79	-0.66
CG ACCEL,	G	0.00	0.16	92	0.25	-0.28	0.34	-0.39
STERN ACCEL,	G	-0.04	0.12	67	0.17	-0.28	0.25	-0.35

RUN NO 407 VELOCITY 20.0 KNOTS FLAP DEFLECTION 10.0 DEG

NUMBER OF WAVE ENCOUNTERS 133

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	11.97	1.50	105	13.64	10.12	14.74	8.74
HEAVE,	FT	1.68	0.33	70	2.12	1.27	2.36	0.99
BOW ACCEL,	G	-0.03	0.28	127	0.41	-0.39	0.64	-0.57
CG ACCEL,	G	-0.01	0.14	74	0.23	-0.26	0.30	-0.34
STERN ACCEL,	G	-0.03	0.12	62	0.18	-0.25	0.26	-0.32

RUN NO 392 VELOCITY 30.0 KNOTS FLAP DEFLECTION 2.5 DEG

NUMBER OF WAVE ENCOUNTERS 109

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	8.51	2.88	76	11.63	5.06	13.67	2.41
HEAVE,	FT	3.17	0.63	56	3.99	2.46	4.54	1.98
BOW ACCEL,	G	0.00	0.64	123	1.12	-0.56	1.67	-0.95
CG ACCEL,	G	0.01	0.31	105	0.47	-0.39	0.72	-0.61
STERN ACCEL,	G	-0.01	0.24	81	0.36	-0.41	0.45	-0.61

TABLE 11.2

WITHOUT CHINE FLAPS LCG = 12.5 FT

RUN NØ 395 VELØCITY 30.0 KNØTS FLAP DEFLECTIØN 5.0 DEG

NUMBER OF WAVE ENCØUNTERS 107

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	7.64	2.38	82	10.08	4.87	11.73	2.72
HEAVE,	FT	3.02	0.52	56	3.70	2.41	4.10	2.01
BØW ACCEL,	G	0.00	0.59	127	0.99	-0.56	1.61	-0.95
CG ACCEL,	G	0.01	0.29	105	0.43	-0.37	0.62	-0.60
STERN ACCEL,	G	-0.01	0.22	81	0.29	-0.36	0.45	-0.54

RUN NØ 396 VELØCITY 30.0 KNØTS FLAP DEFLECTIØN 7.5 DEG

NUMBER OF WAVE ENCØUNTERS 118

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	6.45	1.91	88	8.42	4.22	9.69	2.38
HEAVE,	FT	2.76	0.44	54	3.36	2.25	3.70	1.86
BØW ACCEL,	G	-0.01	0.53	133	0.86	-0.54	1.42	-0.88
CG ACCEL,	G	0.05	0.25	103	0.41	-0.32	0.56	-0.54
STERN ACCEL,	G	-0.01	0.20	81	0.26	-0.36	0.39	-0.51

TABLE 11.3

WITH CHINE FLAPS LCG = 12.5 FT

RUN NØ 232 VELØCITY 15.0 KNØTS FLAP DEFLECTION 0.0 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	15.61	1.72	40	17.51	13.59	18.71	12.21
HEAVE,	FT	2.11	0.43	31	2.65	1.58	2.97	1.22
BØW ACCEL,	G	-0.01	0.30	60	0.39	-0.31	0.69	-0.56
CG ACCEL,	G	0.01	0.15	46	0.22	-0.20	0.33	-0.32
STERN ACCEL,	G	-0.06	0.07	41	0.06	-0.17	0.11	-0.21

RUN NØ 230 VELØCITY 15.0 KNØTS FLAP DEFLECTION 15.0 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	7.42	1.12	39	8.54	6.24	9.47	5.33
HEAVE,	FT	0.62	0.31	29	0.95	0.28	1.19	0.00
BØW ACCEL,	G	0.00	0.15	49	0.21	-0.21	0.34	-0.33
CG ACCEL,	G	0.02	0.08	40	0.14	-0.12	0.19	-0.18
STERN ACCEL,	G	-0.06	0.05	38	0.03	-0.15	0.07	-0.19

RUN NØ 234 VELØCITY 20.0 KNØTS FLAP DEFLECTION 0.0 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	11.12	2.08	34	13.94	7.85	15.97	5.82
HEAVE,	FT	3.21	0.55	28	3.86	2.60	4.27	2.27
BØW ACCEL,	G	0.02	0.55	47	0.94	-0.52	1.56	-0.90
CG ACCEL,	G	0.04	0.27	49	0.37	-0.26	0.61	-0.50
STERN ACCEL,	G	-0.05	0.12	47	0.03	-0.21	0.20	-0.30

RUN NØ 228 VELØCITY 20.0 KNØTS FLAP DEFLECTION 15.0 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	6.24	1.45	33	7.68	4.63	8.76	3.36
HEAVE,	FT	2.51	0.35	26	2.90	2.13	3.16	1.81
BØW ACCEL,	G	0.02	0.32	57	0.42	-0.31	0.79	-0.55
CG ACCEL,	G	0.04	0.17	43	0.24	-0.17	0.35	-0.32
STERN ACCEL,	G	0.03	0.10	45	0.17	-0.11	0.25	-0.19

TABLE 11.4

WITH CHINE FLAPS LCG = 12.5 FT

RUN NO 226 VELOCITY 25.0 KNOTS FLAP DEFLECTION 0.0 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	7.54	3.22	27	11.10	3.31	13.22	0.88
HEAVE,	FT	3.82	0.68	22	4.70	3.04	5.19	2.69
BOW ACCEL,	G	0.02	0.70	48	1.16	-0.48	2.20	-0.95
CG ACCEL,	G	0.06	0.35	54	0.50	-0.22	0.88	-0.55
STERN ACCEL,	G	-0.03	0.16	46	0.14	-0.25	0.30	-0.39

RUN NO 224 VELOCITY 25.0 KNOTS FLAP DEFLECTION 12.5 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	5.33	2.11	30	7.59	2.65	9.13	0.93
HEAVE,	FT	3.32	0.49	27	3.90	2.84	4.33	2.47
BOW ACCEL,	G	0.01	0.57	49	0.94	-0.49	1.61	-0.88
CG ACCEL,	G	0.04	0.29	49	0.41	-0.26	0.65	-0.54
STERN ACCEL,	G	-0.03	0.14	41	0.12	-0.24	0.25	-0.32

RUN NO 218 VELOCITY 30.0 KNOTS FLAP DEFLECTION 2.5 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	4.66	2.61	24	7.47	1.26	8.85	-0.76
HEAVE,	FT	3.50	0.67	20	4.37	2.76	4.64	2.42
BOW ACCEL,	G	0.04	0.73	48	1.20	-0.34	2.11	-1.01
CG ACCEL,	G	0.05	0.39	47	0.55	-0.25	0.82	-0.66
STERN ACCEL,	G	-0.05	0.20	40	0.14	-0.32	0.33	-0.46

RUN NO 220 VELOCITY 30.0 KNOTS FLAP DEFLECTION 5.0 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	4.04	2.21	27	6.31	1.29	7.79	-0.43
HEAVE,	FT	3.45	0.56	22	4.13	2.87	4.59	2.56
BOW ACCEL,	G	0.03	0.68	49	1.07	-0.36	1.72	-0.94
CG ACCEL,	G	0.05	0.36	50	0.48	-0.25	0.70	-0.63
STERN ACCEL,	G	-0.04	0.19	42	0.16	-0.28	0.31	-0.41

TABLE 11.5

WITH CHINE FLAPS LCG = 12.5 FT

RUN NO 222 VELOCITY 30.0 KNOTS FLAP DEFLECTION 7.5 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	3.35	1.76	30	4.97	1.41	6.25	-0.12
HEAVE,	FT	3.24	0.49	21	3.81	2.75	4.14	2.41
BOW ACCEL,	G	0.02	0.57	55	0.80	-0.36	1.41	-0.87
CG ACCEL,	G	0.05	0.31	49	0.41	-0.23	0.61	-0.58
STERN ACCEL,	G	0.31	0.20	43	0.53	0.08	0.68	-0.09

RUN NO 216 VELOCITY 35.0 KNOTS FLAP DEFLECTION 2.5 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	3.45	2.19	23	5.69	0.65	7.52	-1.00
HEAVE,	FT	3.55	0.61	19	4.30	2.89	4.88	2.61
BOW ACCEL,	G	0.03	0.77	54	1.17	-0.33	1.94	-1.02
CG ACCEL,	G	0.05	0.44	48	0.61	-0.27	0.89	-0.74
STERN ACCEL,	G	-0.04	0.24	40	0.17	-0.32	0.39	-0.56

RUN NO 212 VELOCITY 35.0 KNOTS FLAP DEFLECTION 5.0 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	2.88	1.86	23	4.75	0.44	5.82	-1.16
HEAVE,	FT	3.29	0.49	19	3.97	2.67	4.30	2.40
BOW ACCEL,	G	0.03	0.68	46	1.08	-0.42	1.70	-0.97
CG ACCEL,	G	0.05	0.39	41	0.56	-0.34	0.81	-0.69
STERN ACCEL,	G	-0.04	0.20	39	0.17	-0.27	0.36	-0.46

RUN NO 214 VELOCITY 35.0 KNOTS FLAP DEFLECTION 7.5 DEG

NUMBER OF WAVE ENCOUNTERS 30

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	1.98	1.49	29	3.41	0.35	4.38	-1.14
HEAVE,	FT	3.14	0.38	21	3.59	2.72	3.89	2.37
BOW ACCEL,	G	0.01	0.58	47	0.80	-0.48	1.25	-0.92
CG ACCEL,	G	0.04	0.32	46	0.36	-0.30	0.59	-0.59
STERN ACCEL,	G	-0.02	0.18	36	0.18	-0.24	0.34	-0.36

TABLE 12

SEAKEEPING STATISTICS FOR CONFIGURATION S-3
SIGNIFICANT HEIGHT = 2.2 FT DISPLACEMENT = 55,000 LB
WITHOUT CHINE FLAPS BOW RAMP EXTENDED LCG = 12.5 FT

RUN NO 453 VELOCITY 15.0 KNOTS FLAP DEFLECTION 0.0 DEG

NUMBER OF WAVE ENCOUNTERS 133

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	17.91	1.64	74	19.70	15.87	21.06	14.47
HEAVE,	FT	0.38	0.35	56	0.83	-0.09	1.12	-0.32
BOW ACCEL,	G	-0.06	0.23	83	0.32	-0.36	0.53	-0.49
CG ACCEL,	G	-0.06	0.11	41	0.16	-0.27	0.22	-0.34
STERN ACCEL,	G	-0.04	0.08	16	0.18	-0.21	0.21	-0.26

RUN NO 451 VELOCITY 15.0 KNOTS FLAP DEFLECTION 5.0 DEG

NUMBER OF WAVE ENCOUNTERS 102

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	15.19	1.59	77	16.97	13.22	18.13	12.01
HEAVE,	FT	0.26	0.33	59	0.69	-0.17	0.96	-0.41
BOW ACCEL,	G	-0.05	0.22	82	0.30	-0.35	0.46	-0.49
CG ACCEL,	G	-0.06	0.10	34	0.13	-0.28	0.17	-0.35
STERN ACCEL,	G	-0.03	0.09	22	0.17	-0.22	0.20	-0.27

RUN NO 455 VELOCITY 15.0 KNOTS FLAP DEFLECTION 10.0 DEG

NUMBER OF WAVE ENCOUNTERS 95

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	12.27	1.71	73	14.40	10.07	15.68	9.01
HEAVE,	FT	0.13	0.33	58	0.56	-0.32	0.81	-0.53
BOW ACCEL,	G	-0.04	0.21	80	0.32	-0.34	0.50	-0.46
CG ACCEL,	G	-0.04	0.10	40	0.17	-0.23	0.22	-0.29
STERN ACCEL,	G	-0.01	0.10	28	0.20	-0.19	0.25	-0.25

RUN NO 425 VELOCITY 20.0 KNOTS FLAP DEFLECTION 5.0 DEG

NUMBER OF WAVE ENCOUNTERS 132

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	14.72	2.02	101	16.99	12.12	18.42	10.61
HEAVE,	FT	2.10	0.42	34	2.64	1.60	3.30	1.33
BOW ACCEL,	G	-0.04	0.40	136	0.59	-0.48	1.01	-0.69
CG ACCEL,	G	-0.04	0.19	95	0.26	-0.34	0.39	-0.45
STERN ACCEL,	G	-0.04	0.13	63	0.21	-0.25	0.32	-0.32

TABLE 12.2

WITHOUT CHINE FLAPS BOW RAMP EXTENDED LCG = 12.5 FT

RUN NO 428 VELOCITY 20.0 KNOTS FLAP DEFLECTION 7.5 DEG

NUMBER OF WAVE ENCOUNTERS 133

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	13.53	1.95	99	15.85	10.99	17.13	9.67
HEAVE,	FT	2.02	0.40	81	2.56	1.52	2.85	1.28
BOW ACCEL,	G	-0.04	0.38	135	0.57	-0.47	0.91	-0.69
CG ACCEL,	G	-0.03	0.18	100	0.25	-0.32	0.35	-0.43
STERN ACCEL,	G	-0.03	0.13	70	0.22	-0.24	0.30	-0.30

RUN NO 431 VELOCITY 20.0 KNOTS FLAP DEFLECTION 10.0 DEG

NUMBER OF WAVE ENCOUNTERS 138

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	12.33	1.84	103	14.48	10.04	15.72	8.54
HEAVE,	FT	1.88	0.38	81	2.38	1.41	2.65	1.09
BOW ACCEL,	G	-0.04	0.36	134	0.52	-0.45	0.85	-0.65
CG ACCEL,	G	-0.02	0.17	91	0.25	-0.30	0.36	-0.40
STERN ACCEL,	G	-0.03	0.14	68	0.23	-0.26	0.34	-0.32

RUN NO 416 VELOCITY 30.0 KNOTS FLAP DEFLECTION 2.5 DEG

NUMBER OF WAVE ENCOUNTERS 112

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	8.58	3.23	72	12.13	4.47	14.55	1.80
HEAVE,	FT	3.17	0.70	61	4.02	2.44	4.71	2.00
BOW ACCEL,	G	-0.01	0.69	120	1.13	-0.61	2.02	-1.01
CG ACCEL,	G	-0.01	0.35	100	0.52	-0.42	0.82	-0.69
STERN ACCEL,	G	-0.02	0.28	81	0.36	-0.44	0.58	-0.67

RUN NO 419 VELOCITY 30.0 KNOTS FLAP DEFLECTION 5.0 DEG

NUMBER OF WAVE ENCOUNTERS 164

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	7.70	2.59	73	10.46	4.40	12.42	2.35
HEAVE,	FT	3.03	0.55	59	3.74	2.39	4.27	2.07
BOW ACCEL,	G	-0.01	0.65	123	1.08	-0.57	1.64	-0.94
CG ACCEL,	G	0.00	0.32	100	0.52	-0.41	0.77	-0.64
STERN ACCEL,	G	-0.02	0.25	86	0.34	-0.37	0.54	-0.57

TABLE 12.3

WITHOUT CHINE FLAPS BOW RAMP EXTENDED LCG = 12.5 FT

RUN NØ 422 VELØCITY 30.0 KNØTS FLAP DEFLECTION 7.5 DEG

NUMBER ØF WAVE ENCØUNTERS 146

		MEAN	RMS ØSC		AVERAGE		1/3 HIGHEST	
PITCH,	DEG	6.58	2.22	88	8.82	3.95	10.54	2.08
HEAVE,	FT	2.86	0.47	62	3.46	2.32	3.92	2.02
BØW ACCEL,	G	-0.01	0.62	131	1.02	-0.56	1.74	-0.92
CG ACCEL,	G	-0.01	0.30	102	0.43	-0.41	0.65	-0.63
STERN ACCEL,	G	-0.01	0.24	80	0.35	-0.36	0.53	-0.53

TABLE 12.4

WITHOUT CHINE FLAPS BOW RAMP RETRACTED LCG = 12.5 FT

RUN NO 438 VELOCITY 15.0 KNOTS FLAP DEFLECTION 0.0 DEG

NUMBER OF WAVE ENCOUNTERS 95

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	13.54	1.53	71	20.35	16.56	21.37	15.26
HEAVE,	FT	0.31	0.35	57	0.76	-0.15	1.03	-0.42
BOW ACCEL,	G	-0.07	0.23	84	0.31	-0.38	0.51	-0.50
CG ACCEL,	G	-0.05	0.11	39	0.17	-0.26	0.25	-0.33
STERN ACCEL,	G	-0.06	0.08	14	0.17	-0.24	0.22	-0.29

RUN NO 439 VELOCITY 15.0 KNOTS FLAP DEFLECTION 5.0 DEG

NUMBER OF WAVE ENCOUNTERS 96

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	15.35	1.64	72	17.37	13.26	18.54	12.07
HEAVE,	FT	0.16	0.34	56	0.61	-0.31	0.56	-0.54
BOW ACCEL,	G	-0.05	0.21	81	0.30	-0.34	0.46	-0.45
CG ACCEL,	G	-0.03	0.10	32	0.18	-0.24	0.24	-0.30
STERN ACCEL,	G	-0.04	0.09	20	0.18	-0.23	0.24	-0.28

RUN NO 440 VELOCITY 15.0 KNOTS FLAP DEFLECTION 10.0 DEG

NUMBER OF WAVE ENCOUNTERS 94

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	12.48	1.55	72	14.36	10.59	15.45	9.35
HEAVE,	FT	-0.01	0.31	53	0.41	-0.44	0.64	-0.68
BOW ACCEL,	G	-0.04	0.18	78	0.27	-0.31	0.39	-0.43
CG ACCEL,	G	0.01	0.09	20	0.19	-0.20	0.23	-0.27
STERN ACCEL,	G	-0.03	0.08	14	0.16	-0.23	0.19	-0.30

RUN NO 434 VELOCITY 30.0 KNOTS FLAP DEFLECTION 2.5 DEG

NUMBER OF WAVE ENCOUNTERS 110

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	8.63	3.11	76	11.85	4.75	14.14	2.24
HEAVE,	FT	3.15	0.66	61	3.97	2.42	4.65	2.04
BOW ACCEL,	G	-0.03	0.70	116	1.22	-0.64	2.14	-1.06
CG ACCEL,	G	0.00	0.35	102	0.54	-0.41	0.85	-0.68
STERN ACCEL,	G	0.00	0.27	86	0.36	-0.43	0.59	-0.66

TABLE 12.5

WITHOUT CHINE FLAPS BOW RAMP RETRACTED LCG = 12.5 FT

RUN NO 437 VELOCITY 30.0 KNOTS FLAP DEFLECTION 5.0 DEG

NUMBER OF WAVE ENCOUNTERS 33

		MEAN	RMS	OSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	7.75	2.69	24	10.81	4.23	12.66	2.29
HEAVE,	FT	3.03	0.61	19	3.88	2.39	4.45	2.21
BOW ACCEL,	G	-0.01	0.65	40	1.14	-0.55	1.89	-0.97
CG ACCEL,	G	-0.01	0.34	32	0.50	-0.44	0.78	-0.71
STERN ACCEL,	G	0.00	0.26	27	0.37	-0.39	0.61	-0.62

RUN NO 444 VELOCITY 35.0 KNOTS FLAP DEFLECTION 5.0 DEG

NUMBER OF WAVE ENCOUNTERS 110

		MEAN	RMS	OSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	5.94	2.54	71	8.52	2.68	10.52	1.16
HEAVE,	FT	3.07	0.59	55	3.83	2.40	4.38	2.13
BOW ACCEL,	G	-0.01	0.74	127	1.28	-0.55	2.06	-1.03
CG ACCEL,	G	0.01	0.38	104	0.56	-0.42	0.84	-0.73
STERN ACCEL,	G	-0.01	0.32	82	0.40	-0.47	0.63	-0.74

TABLE 12.6

WITH CHINE FLAPS BOW RAMP EXTENDED LCG = 12.5 FT

RUN NO 470 VELOCITY 15.0 KNOTS FLAP DEFLECTION 7.5 DEG

CHINE FLAP DEFLECTION 0.0 DEG NUMBER OF WAVE ENCOUNTERS 96

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	16.37	2.10	77	18.81	13.59	20.04	11.97
HEAVE,	FT	2.11	0.47	68	2.70	1.52	3.06	1.23
BOW ACCEL,	G	-0.06	0.34	97	0.48	-0.48	0.80	-0.67
CG ACCEL,	G	-0.06	0.17	74	0.19	-0.33	0.28	-0.43
STERN ACCEL,	G	-0.04	0.11	36	0.19	-0.23	0.26	-0.29

RUN NO 471 VELOCITY 15.0 KNOTS FLAP DEFLECTION 7.5 DEG

CHINE FLAP DEFLECTION 5.0 DEG NUMBER OF WAVE ENCOUNTERS 92

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	15.50	2.11	80	17.94	12.89	19.23	11.14
HEAVE,	FT	2.08	0.46	67	2.68	1.50	3.03	1.18
BOW ACCEL,	G	-0.05	0.33	95	0.50	-0.47	0.80	-0.67
CG ACCEL,	G	-0.05	0.16	73	0.20	-0.32	0.30	-0.41
STERN ACCEL,	G	-0.03	0.11	47	0.18	-0.22	0.25	-0.27

RUN NO 472 VELOCITY 15.0 KNOTS FLAP DEFLECTION 7.5 DEG

CHINE FLAP DEFLECTION 10.0 DEG NUMBER OF WAVE ENCOUNTERS 91

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	14.93	2.12	79	17.51	12.28	18.80	10.64
HEAVE,	FT	2.20	0.46	66	2.80	1.61	3.14	1.31
BOW ACCEL,	G	-0.05	0.34	97	0.48	-0.47	0.79	-0.66
CG ACCEL,	G	-0.05	0.17	71	0.20	-0.33	0.30	-0.44
STERN ACCEL,	G	-0.03	0.12	44	0.20	-0.22	0.27	-0.27

RUN NO 501 VELOCITY 15.0 KNOTS FLAP DEFLECTION 10.0 DEG

CHINE FLAP DEFLECTION 10.0 DEG NUMBER OF WAVE ENCOUNTERS 96

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	14.30	2.01	82	16.57	11.71	17.77	9.97
HEAVE,	FT	2.11	0.43	69	2.66	1.56	3.01	1.24
BOW ACCEL,	G	-0.05	0.33	93	0.48	-0.44	0.83	-0.62
CG ACCEL,	G	-0.05	0.16	73	0.20	-0.30	0.30	-0.40
STERN ACCEL,	G	-0.04	0.12	44	0.19	-0.23	0.27	-0.30

TABLE 12.7

WITH CHINE FLAPS BOW RAMP EXTENDED LCG = 12.5 FT

RUN NO 493 VELOCITY 15.0 KNOTS FLAP DEFLECTION 7.5 DEG

CHINE FLAP DEFLECTION 15.0 DEG NUMBER OF WAVE ENCOUNTERS 93

		MEAN	RMS	OSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	14.46	2.12	85	16.81	11.90	18.15	10.03
HEAVE,	FT	2.17	0.45	67	2.75	1.59	3.10	1.29
BOW ACCEL,	G	-0.05	0.34	99	0.50	-0.46	0.83	-0.64
CG ACCEL,	G	-0.05	0.17	74	0.21	-0.32	0.31	-0.41
STERN ACCEL,	G	-0.05	0.12	45	0.19	-0.24	0.27	-0.30

RUN NO 483 VELOCITY 20.0 KNOTS FLAP DEFLECTION 7.5 DEG

CHINE FLAP DEFLECTION 0.0 DEG NUMBER OF WAVE ENCOUNTERS 136

		MEAN	RMS	OSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	10.68	2.85	101	13.86	7.08	15.75	5.04
HEAVE,	FT	3.13	0.56	91	3.84	2.49	4.33	2.12
BOW ACCEL,	G	-0.03	0.56	143	0.99	-0.55	1.69	-0.86
CG ACCEL,	G	-0.03	0.28	121	0.43	-0.39	0.66	-0.57
STERN ACCEL,	G	-0.03	0.17	86	0.26	-0.30	0.42	-0.40

RUN NO 480 VELOCITY 20.0 KNOTS FLAP DEFLECTION 7.5 DEG

CHINE FLAP DEFLECTION 5.0 DEG NUMBER OF WAVE ENCOUNTERS 139

		MEAN	RMS	OSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	9.60	2.73	103	12.64	6.07	14.60	4.11
HEAVE,	FT	3.10	0.54	91	3.77	2.43	4.25	2.14
BOW ACCEL,	G	-0.02	0.56	147	1.00	-0.55	1.70	-0.85
CG ACCEL,	G	-0.03	0.27	126	0.41	-0.38	0.69	-0.57
STERN ACCEL,	G	-0.02	0.17	93	0.27	-0.29	0.40	-0.40

RUN NO 477 VELOCITY 20.0 KNOTS FLAP DEFLECTION 7.5 DEG

CHINE FLAP DEFLECTION 10.0 DEG NUMBER OF WAVE ENCOUNTERS 132

		MEAN	RMS	OSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	8.49	2.70	104	11.45	5.11	13.32	2.80
HEAVE,	FT	3.03	0.54	84	3.73	2.40	4.20	2.02
BOW ACCEL,	G	-0.03	0.55	140	0.99	-0.56	1.71	-0.85
CG ACCEL,	G	-0.02	0.27	116	0.41	-0.37	0.66	-0.56
STERN ACCEL,	G	-0.01	0.18	88	0.28	-0.29	0.41	-0.39

TABLE 12.8

WITH CHINE FLAPS BOW RAMP EXTENDED LCG = 12.5 FT

RUN NO 494 VELOCITY 30.0 KNOTS FLAP DEFLECTION 7.5 DEG

CHINE FLAP DEFLECTION -5.0 DEG NUMBER OF WAVE ENCOUNTERS 114

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	5.14	2.63	79	8.07	1.65	9.33	-0.16
HEAVE,	FT	3.31	0.61	65	4.08	2.63	4.67	2.26
BOW ACCEL,	G	-0.01	0.74	129	1.33	-0.62	2.10	-1.03
CG ACCEL,	G	0.00	0.39	120	0.58	-0.43	0.83	-0.73
STERN ACCEL,	G	-0.01	0.30	96	0.42	-0.43	0.69	-0.68

RUN NO 496 VELOCITY 30.0 KNOTS FLAP DEFLECTION 7.5 DEG

CHINE FLAP DEFLECTION 0.0 DEG NUMBER OF WAVE ENCOUNTERS 112

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	4.45	2.20	83	6.73	1.51	8.24	-0.07
HEAVE,	FT	3.21	0.54	68	3.87	2.62	4.35	2.25
BOW ACCEL,	G	-0.02	0.68	130	1.20	-0.63	1.90	-0.99
CG ACCEL,	G	0.00	0.36	115	0.55	-0.44	0.83	-0.71
STERN ACCEL,	G	-0.01	0.28	100	0.37	-0.39	0.62	-0.61

RUN NO 498 VELOCITY 30.0 KNOTS FLAP DEFLECTION 7.5 DEG

CHINE FLAP DEFLECTION 5.0 DEG NUMBER OF WAVE ENCOUNTERS 112

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	3.37	2.03	85	5.48	0.80	6.73	-0.79
HEAVE,	FT	3.11	0.51	63	3.77	2.53	4.23	2.18
BOW ACCEL,	G	-0.02	0.64	136	1.04	-0.60	1.69	-0.97
CG ACCEL,	G	-0.01	0.34	114	0.47	-0.44	0.72	-0.71
STERN ACCEL,	G	-0.01	0.28	96	0.38	-0.40	0.62	-0.66

TABLE 13

SEAKEEPING STATISTICS FOR CONFIGURATION S-5
SIGNIFICANT HEIGHT = 2.2 FT DISPLACEMENT = 55,000 LB
WITHOUT CHINE FLAPS LCG = 12.5 FT

RUN NØ 62 VELØCITY 9.6 KNØTS FLAP DEFLECTIØN 0.0 DEG

NUMBER ØF WAVE ENCØUNTERS 72

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	0.51	1.87	42	2.83	-1.88	4.28	-3.07
HEAVE,	FT	-4.10	0.34	41	-3.66	-4.55	-3.40	-4.77
BØW ACCEL,	G	-0.04	0.25	49	0.16	-0.33	0.23	-0.71
CG ACCEL,	G	0.00	0.07	42	0.11	-0.11	0.16	-0.16
STERN ACCEL,	G	0.01	0.09	42	0.15	-0.13	0.20	-0.18

RUN NØ 63 VELØCITY 9.9 KNØTS FLAP DEFLECTIØN 0.0 DEG

NUMBER ØF WAVE ENCØUNTERS 70

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	1.47	1.76	41	3.75	-0.91	4.89	-2.04
HEAVE,	FT	-4.12	0.34	39	-3.67	-4.56	-3.43	-4.83
BØW ACCEL,	G	-0.06	0.25	49	0.15	-0.35	0.23	-0.74
CG ACCEL,	G	0.00	0.08	41	0.12	-0.12	0.18	-0.16
STERN ACCEL,	G	0.00	0.09	43	0.14	-0.14	0.20	-0.19

RUN NØ 26 VELØCITY 15.0 KNØTS FLAP DEFLECTIØN -6.0 DEG

NUMBER ØF WAVE ENCØUNTERS 59

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	16.48	1.37	34	18.31	14.76	19.24	13.79
HEAVE,	FT	-2.97	0.29	29	-2.59	-3.35	-2.38	-3.59
BØW ACCEL,	G	-0.05	0.20	53	0.21	-0.29	0.36	-0.44
CG ACCEL,	G	-0.06	0.10	43	0.07	-0.21	0.14	-0.27
STERN ACCEL,	G	-0.06	0.07	37	0.05	-0.17	0.11	-0.22

RUN NØ 17 VELØCITY 14.9 KNØTS FLAP DEFLECTIØN 0.0 DEG

NUMBER ØF WAVE ENCØUNTERS 58

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	11.96	1.40	36	13.76	10.29	14.85	9.24
HEAVE,	FT	-3.39	0.28	29	-3.01	-3.74	-2.80	-4.00
BØW ACCEL,	G	-0.03	0.19	53	0.22	-0.25	0.34	-0.39
CG ACCEL,	G	-0.02	0.09	41	0.10	-0.16	0.16	-0.22
STERN ACCEL,	G	-0.01	0.07	37	0.10	-0.12	0.15	-0.18

TABLE 13.2

WITHOUT CHINE FLAPS LCG = 12.5 FT

RUN NØ 22 VELØCITY 14.9 KNØTS FLAP DEFLECTIØN 0.0 DEG

NUMBER ØF WAVE ENCØUNTERS 55

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	11.22	1.32	34	12.90	9.49	13.78	8.62
HEAVE,	FT	-3.31	0.27	31	-2.97	-3.64	-2.80	-3.90
BØW ACCEL,	G	-0.03	0.18	52	0.22	-0.26	0.34	-0.39
CG ACCEL,	G	-0.02	0.09	41	0.10	-0.16	0.16	-0.21
STERN ACCEL,	G	-0.03	0.08	39	0.07	-0.15	0.12	-0.20

RUN NØ 34 VELØCITY 15.1 KNØTS FLAP DEFLECTIØN 0.0 DEG

NUMBER ØF WAVE ENCØUNTERS 55

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	12.00	1.38	32	13.87	10.12	14.86	9.16
HEAVE,	FT	-3.15	0.28	31	-2.80	-3.51	-2.57	-3.73
BØW ACCEL,	G	0.01	0.19	55	0.25	-0.23	0.38	-0.37
CG ACCEL,	G	-0.03	0.09	41	0.10	-0.17	0.16	-0.23
STERN ACCEL,	G	-0.05	0.08	39	0.07	-0.16	0.12	-0.22

RUN NØ 18 VELØCITY 15.0 KNØTS FLAP DEFLECTIØN 2.5 DEG

NUMBER ØF WAVE ENCØUNTERS 59

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	10.94	1.38	34	12.69	9.24	13.65	8.22
HEAVE,	FT	-3.49	0.29	27	-3.10	-3.85	-2.87	-4.12
BØW ACCEL,	G	-0.03	0.17	52	0.20	-0.25	0.33	-0.36
CG ACCEL,	G	-0.02	0.08	41	0.10	-0.15	0.16	-0.21
STERN ACCEL,	G	0.00	0.07	37	0.11	-0.11	0.15	-0.16

RUN NØ 23 VELØCITY 15.1 KNØTS FLAP DEFLECTIØN 2.5 DEG

NUMBER ØF WAVE ENCØUNTERS 55

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	9.30	1.35	34	10.98	7.58	11.89	6.72
HEAVE,	FT	-3.36	0.28	30	-2.99	-3.70	-2.81	-3.95
BØW ACCEL,	G	-0.02	0.18	50	0.20	-0.25	0.31	-0.39
CG ACCEL,	G	-0.02	0.09	39	0.10	-0.16	0.15	-0.23
STERN ACCEL,	G	-0.03	0.07	37	0.08	-0.14	0.12	-0.20

TABLE 13.3

WITHOUT CHINE FLAPS LCG = 12.5 FT

RUN NØ 24 VELØCITY 15.1 KNØTS FLAP DEFLECTIØN 5.0 DEG

NUMBER ØF WAVE ENCØUNTERS 58

		MEAN	RMS	ØSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	6.87	1.28	29	8.56	5.15	9.41	4.07
HEAVE,	FT	-3.62	0.27	26	-3.27	-3.99	-3.08	-4.20
BØW ACCEL,	G	-0.01	0.15	47	0.19	-0.21	0.29	-0.31
CG ACCEL,	G	-0.02	0.07	38	0.09	-0.13	0.14	-0.19
STERN ACCEL,	G	-0.01	0.07	32	0.09	-0.12	0.13	-0.18

RUN NØ 61 VELØCITY 20.0 KNØTS FLAP DEFLECTIØN 0.0 DEG

NUMBER ØF WAVE ENCØUNTERS 49

		MEAN	RMS	ØSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	15.35	1.66	30	17.31	12.98	18.35	11.73
HEAVE,	FT	-1.08	0.37	28	-0.63	-1.55	-0.35	-1.78
BØW ACCEL,	G	-0.03	0.36	56	0.43	-0.34	0.83	-0.57
CG ACCEL,	G	-0.02	0.18	45	0.20	-0.23	0.35	-0.35
STERN ACCEL,	G	-0.03	0.12	35	0.13	-0.17	0.21	-0.23

RUN NØ 60 VELØCITY 20.0 KNØTS FLAP DEFLECTIØN 2.5 DEG

NUMBER ØF WAVE ENCØUNTERS 53

		MEAN	RMS	ØSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	13.72	1.59	30	15.64	11.44	16.55	10.16
HEAVE,	FT	-1.21	0.35	29	-0.79	-1.64	-0.54	-1.89
BØW ACCEL,	G	0.00	0.34	55	0.44	-0.33	0.81	-0.55
CG ACCEL,	G	-0.03	0.17	45	0.19	-0.24	0.32	-0.37
STERN ACCEL,	G	-0.02	0.12	37	0.14	-0.17	0.22	-0.24

RUN NØ 59 VELØCITY 19.8 KNØTS FLAP DEFLECTIØN 5.0 DEG

NUMBER ØF WAVE ENCØUNTERS 50

		MEAN	RMS	ØSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	12.33	1.37	31	14.02	10.38	14.84	9.39
HEAVE,	FT	-1.48	0.30	29	-1.11	-1.85	-0.93	-2.09
BØW ACCEL,	G	-0.03	0.30	52	0.38	-0.32	0.69	-0.52
CG ACCEL,	G	-0.02	0.15	44	0.18	-0.21	0.29	-0.33
STERN ACCEL,	G	-0.03	0.12	36	0.13	-0.18	0.20	-0.25

TABLE 13.4

WITHOUT CHINE FLAPS LCG = 12.5 FT

RUN NO 56 VELOCITY 25.0 KNOTS FLAP DEFLECTION 0.0 DEG

NUMBER OF WAVE ENCOUNTERS 50

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	12.09	2.12	25	14.55	8.98	15.82	7.61
HEAVE,	FT	-0.14	0.43	24	0.43	-0.64	0.78	-0.95
BOW ACCEL,	G	-0.02	0.47	49	0.62	-0.42	1.17	-0.72
CG ACCEL,	G	-0.01	0.23	45	0.27	-0.25	0.47	-0.46
STERN ACCEL,	G	-0.02	0.15	35	0.16	-0.23	0.30	-0.34

RUN NO 57 VELOCITY 25.0 KNOTS FLAP DEFLECTION 2.5 DEG

NUMBER OF WAVE ENCOUNTERS 53

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	10.51	1.95	28	12.71	7.80	13.82	6.25
HEAVE,	FT	-0.32	0.40	26	0.16	-0.75	0.49	-1.04
BOW ACCEL,	G	-0.03	0.47	43	0.69	-0.49	1.16	-0.74
CG ACCEL,	G	-0.01	0.24	42	0.29	-0.29	0.47	-0.46
STERN ACCEL,	G	-0.02	0.16	38	0.17	-0.21	0.33	-0.32

RUN NO 58 VELOCITY 25.0 KNOTS FLAP DEFLECTION 5.0 DEG

NUMBER OF WAVE ENCOUNTERS 51

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	9.35	1.85	27	11.43	6.75	12.72	5.47
HEAVE,	FT	-0.52	0.39	26	-0.03	-0.98	0.28	-1.28
BOW ACCEL,	G	-0.01	0.46	52	0.64	-0.38	1.16	-0.71
CG ACCEL,	G	-0.01	0.23	43	0.28	-0.28	0.47	-0.46
STERN ACCEL,	G	-0.01	0.17	33	0.20	-0.24	0.36	-0.36

RUN NO 35 VELOCITY 30.2 KNOTS FLAP DEFLECTION 0.0 DEG

NUMBER OF WAVE ENCOUNTERS 45

		MEAN	RMS	OSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG							
HEAVE,	FT	-0.04	0.49	21	0.61	-0.63	0.86	-0.90
BOW ACCEL,	G	0.01	0.66	42	0.93	-0.58	1.74	-1.13
CG ACCEL,	G	-0.01	0.33	40	0.39	-0.34	0.71	-0.60
STERN ACCEL,	G	-0.03	0.24	44	0.16	-0.31	0.38	-0.48

TABLE 13.5

WITHOUT CHINE FLAPS LCG = 12.5 FT

RUN NØ 38 VELØCITY 30.0 KNØTS FLAP DEFLECTIØN 0.0 DEG

NUMBER ØF WAVE ENCØUNTERS 45

		MEAN	RMS	ØSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	9.22	2.54	25	12.34	5.87	14.23	4.23
HEAVE,	FT	-0.02	0.48	23	0.60	-0.57	0.83	-0.97
BØW ACCEL,	G	-0.01	0.66	45	0.86	-0.58	1.53	-1.30
CG ACCEL,	G	-0.02	0.33	43	0.39	-0.29	0.64	-0.63
STERN ACCEL,	G	-0.03	0.23	44	0.14	-0.31	0.38	-0.47

RUN NØ 36 VELØCITY 30.1 KNØTS FLAP DEFLECTIØN 2.5 DEG

NUMBER ØF WAVE ENCØUNTERS 46

		MEAN	RMS	ØSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	7.81	2.25	23	10.50	4.71	11.85	3.00
HEAVE,	FT	-0.20	0.45	21	0.41	-0.77	0.76	-1.10
BØW ACCEL,	G	0.00	0.57	46	0.82	-0.38	1.39	-0.83
CG ACCEL,	G	-0.01	0.29	42	0.36	-0.27	0.61	-0.55
STERN ACCEL,	G	-0.02	0.21	35	0.19	-0.30	0.39	-0.43

RUN NØ 37 VELØCITY 30.0 KNØTS FLAP DEFLECTIØN 5.0 DEG

NUMBER ØF WAVE ENCØUNTERS 50

		MEAN	RMS	ØSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	6.65	1.88	24	8.83	4.06	10.09	2.47
HEAVE,	FT	-0.41	0.40	21	0.13	-0.91	0.47	-1.22
BØW ACCEL,	G	-0.01	0.53	51	0.69	-0.40	1.28	-0.81
CG ACCEL,	G	-0.01	0.27	44	0.34	-0.26	0.55	-0.54
STERN ACCEL,	G	-0.02	0.20	37	0.17	-0.28	0.37	-0.41

TABLE 13.6

WITH HORIZONTAL CHINE FLAPS LCG = 12.5 F

RUN NØ 27 VELØCITY 15.1 KNØTS FLAP DEFLECTIØN 0.0 DEG

CHINE FLAP DEFLECTIØN 0.0 DEG NUMBER ØF WAVE ENCØUNTERS 57

		MEAN	RMS	ØSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	16.11	1.65	36	18.25	14.00	19.26	12.66
HEAVE,	FT	-1.15	0.38	34	-0.68	-1.62	-0.45	-1.95
BØW ACCEL,	G	-0.05	0.28	59	0.32	-0.35	0.57	-0.59
CG ACCEL,	G	-0.04	0.14	46	0.15	-0.25	0.24	-0.35
STERN ACCEL,	G	-0.05	0.10	40	0.09	-0.18	0.17	-0.24

RUN NØ 28 VELØCITY 15.0 KNØTS FLAP DEFLECTIØN 2.5 DEG

CHINE FLAP DEFLECTIØN 0.0 DEG NUMBER ØF WAVE ENCØUNTERS 58

		MEAN	RMS	ØSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	13.24	1.60	34	15.31	11.10	16.36	9.96
HEAVE,	FT	-1.46	0.38	32	-0.99	-1.93	-0.68	-2.26
BØW ACCEL,	G	-0.03	0.26	58	0.32	-0.31	0.54	-0.50
CG ACCEL,	G	-0.04	0.13	49	0.13	-0.22	0.22	-0.32
STERN ACCEL,	G	-0.03	0.10	38	0.12	-0.18	0.19	-0.23

RUN NØ 29 VELØCITY 15.1 KNØTS FLAP DEFLECTIØN 5.0 DEG

CHINE FLAP DEFLECTIØN 0.0 DEG NUMBER ØF WAVE ENCØUNTERS 52

		MEAN	RMS	ØSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	10.63	1.50	36	12.54	8.68	13.65	7.79
HEAVE,	FT	-1.85	0.34	36	-1.44	-2.24	-1.13	-2.50
BØW ACCEL,	G	-0.02	0.24	54	0.28	-0.30	0.46	-0.48
CG ACCEL,	G	-0.03	0.12	46	0.13	-0.20	0.20	-0.30
STERN ACCEL,	G	-0.03	0.10	42	0.10	-0.18	0.18	-0.25

RUN NØ 30 VELØCITY 15.1 KNØTS FLAP DEFLECTIØN 0.0 DEG

CHINE FLAP DEFLECTIØN 10.0 DEG NUMBER ØF WAVE ENCØUNTERS 58

		MEAN	RMS	ØSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	14.71	1.64	37	16.81	12.59	17.85	11.36
HEAVE,	FT	-1.13	0.37	34	-0.66	-1.58	-0.42	-1.89
BØW ACCEL,	G	-0.04	0.28	59	0.34	-0.33	0.57	-0.55
CG ACCEL,	G	-0.06	0.14	47	0.14	-0.26	0.23	-0.36
STERN ACCEL,	G	-0.05	0.10	44	0.09	-0.17	0.17	-0.23

TABLE 13.7

WITH HORIZONTAL CHINE FLAPS LCG = 12.5 FT

RUN NØ 31 VELØCITY 15.1 KNØTS FLAP DEFLECTIØN 2.5 DEG

CHINE FLAP DEFLECTIØN 10.0 DEG NUMBER ØF WAVE ENCØUNTERS 56

		MEAN	RMS	ØSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	11.76	1.61	36	13.83	9.77	15.09	8.67
HEAVE,	FT	-1.46	0.35	33	-1.02	-1.88	-0.72	-2.16
BØW ACCEL,	G	-0.02	0.24	55	0.28	-0.30	0.49	-0.48
CG ACCEL,	G	-0.02	0.13	46	0.14	-0.21	0.23	-0.29
STERN ACCEL,	G	-0.03	0.10	41	0.11	-0.17	0.19	-0.23

RUN NØ 67 VELØCITY 20.1 KNØTS FLAP DEFLECTIØN 0.0 DEG

CHINE FLAP DEFLECTIØN 0.0 DEG NUMBER ØF WAVE ENCØUNTERS 51

		MEAN	RMS	ØSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	15.68	3.26	32	19.26	11.34	21.59	8.73
HEAVE,	FT	-0.90	0.71	30	-0.05	-1.71	0.67	-2.14
BØW ACCEL,	G	-0.01	0.77	54	1.05	-0.63	1.98	-1.16
CG ACCEL,	G	0.00	0.45	54	0.52	-0.43	0.94	-0.82
STERN ACCEL,	G	-0.05	0.29	53	0.26	-0.39	0.61	-0.62

RUN NØ 68 VELØCITY 20.0 KNØTS FLAP DEFLECTIØN 2.5 DEG

CHINE FLAP DEFLECTIØN 0.0 DEG NUMBER ØF WAVE ENCØUNTERS 51

		MEAN	RMS	ØSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	11.34	2.39	31	14.20	8.00	15.72	6.25
HEAVE,	FT	0.03	0.48	30	0.62	-0.51	0.98	-0.85
BØW ACCEL,	G	-0.01	0.51	49	0.82	-0.47	1.39	-0.76
CG ACCEL,	G	-0.01	0.26	50	0.36	-0.29	0.62	-0.48
STERN ACCEL,	G	-0.02	0.15	44	0.16	-0.21	0.30	-0.31

RUN NØ 69 VELØCITY 20.1 KNØTS FLAP DEFLECTIØN 5.0 DEG

CHINE FLAP DEFLECTIØN 0.0 DEG NUMBER ØF WAVE ENCØUNTERS 51

		MEAN	RMS	ØSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	10.35	2.20	31	13.03	7.38	14.22	5.80
HEAVE,	FT	-0.08	0.45	31	0.46	-0.59	0.81	-0.90
BØW ACCEL,	G	0.01	0.50	56	0.76	-0.40	1.40	-0.71
CG ACCEL,	G	-0.02	0.25	51	0.33	-0.28	0.56	-0.48
STERN ACCEL,	G	-0.02	0.15	43	0.17	-0.21	0.30	-0.30

TABLE 13.8

WITH HORIZONTAL CHINE FLAPS LCG = 12.5 FT

RUN NØ 50 VELØCITY 30.1 KNØTS FLAP DEFLECTIØN -6.0 DEG

CHINE FLAP DEFLECTIØN 0.0 DEG NUMBER ØF WAVE ENCØUNTERS 51

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	9.29	5.40	20	15.39	1.87	18.92	-0.78
HEAVE,	FT	0.97	1.20	20	2.50	-0.41	3.6	-0.98
BØW ACCEL,	G	-0.01	1.03	39	1.65	-0.61	2.85	-1.58
CG ACCEL,	G	0.00	0.61	44	0.77	-0.43	1.41	-1.15
STERN ACCEL,	G	-0.02	0.50	52	0.40	-0.61	0.97	-1.06

RUN NØ 39 VELØCITY 30.0 KNØTS FLAP DEFLECTIØN 0.0 DEG

CHINE FLAP DEFLECTIØN 0.0 DEG NUMBER ØF WAVE ENCØUNTERS 51

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	6.56	2.95	25	9.93	2.77	12.15	0.58
HEAVE,	FT	0.28	0.59	24	1.06	-0.37	1.44	-0.90
BØW ACCEL,	G	0.02	0.84	42	1.34	-0.75	2.24	-1.64
CG ACCEL,	G	-0.01	0.44	50	0.57	-0.30	0.95	-0.79
STERN ACCEL,	G	-0.01	0.33	53	0.27	-0.35	0.57	-0.67

RUN NØ 49 VELØCITY 30.1 KNØTS FLAP DEFLECTIØN 0.0 DEG

CHINE FLAP DEFLECTIØN 0.0 DEG NUMBER ØF WAVE ENCØUNTERS 47

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	7.31	3.50	22	11.42	2.54	13.57	1.06
HEAVE,	FT	0.53	0.81	20	1.63	-0.44	2.34	-0.74
BØW ACCEL,	G	0.01	0.84	40	1.56	-0.55	2.57	-1.12
CG ACCEL,	G	0.00	0.47	47	0.69	-0.32	1.22	-0.75
STERN ACCEL,	G	-0.02	0.34	50	0.35	-0.38	0.64	-0.65

RUN NØ 40 VELØCITY 30.0 KNØTS FLAP DEFLECTIØN 2.5 DEG

CHINE FLAP DEFLECTIØN 0.0 DEG NUMBER ØF WAVE ENCØUNTERS 47

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	5.78	2.66	21	9.30	1.78	10.57	0.59
HEAVE,	FT	0.14	0.61	20	1.04	-0.63	1.42	-0.96
BØW ACCEL,	G	0.00	0.73	46	1.22	-0.49	2.04	-1.10
CG ACCEL,	G	-0.02	0.41	53	0.55	-0.24	0.90	-0.71
STERN ACCEL,	G	-0.01	0.28	45	0.28	-0.35	0.51	-0.60

TABLE 13.9

WITH HORIZONTAL CHINE FLAPS LCG = 12.5 FT

RUN NØ 41 VELØCITY 30.0 KNØTS FLAP DEFLECTIØN 5.0 DEG

CHINE FLAP DEFLECTIØN 0.0 DEG NUMBER ØF WAVE ENCØUNTERS 48

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	4.80	2.03	23	7.28	1.99	8.40	0.40
HEAVE,	FT	0.01	0.49	21	0.65	-0.58	1.06	-0.92
BØW ACCEL,	G	0.02	0.63	54	1.00	-0.33	1.67	-0.89
CG ACCEL,	G	-0.02	0.34	53	0.45	-0.26	0.74	-0.63
STERN ACCEL,	G	-0.01	0.23	48	0.22	-0.29	0.46	-0.47

TABLE 13.10

WITHOUT CHINE FLAPS LCG = 13.5 FT

RUN NØ 54 VELØCITY 30.1 KNØTS FLAP DEFLECTIØN 0.0 DEG

NUMBER ØF WAVE ENCØUNTERS 45

		MEAN	RMS	ØSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	9.03	2.04	22	11.48	6.04	12.64	4.46
HEAVE,	FT	-0.01	0.44	21	0.56	-0.56	0.93	-0.89
BØW ACCEL,	G	0.00	0.54	47	0.74	-0.41	1.35	-0.77
CG ACCEL,	G	-0.01	0.27	43	0.33	-0.27	0.56	-0.50
STERN ACCEL,	G	-0.02	0.19	42	0.16	-0.27	0.36	-0.41

WITH HORIZONTAL CHINE FLAPS LCG = 13.5 FT

RUN NØ 52 VELØCITY 30.1 KNØTS FLAP DEFLECTIØN C.C DEG

NUMBER ØF WAVE ENCØUNTERS 47

		MEAN	RMS	ØSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	6.50	2.64	20	9.82	2.46	11.28	1.31
HEAVE,	FT	0.40	0.64	21	1.24	-0.32	1.66	-0.66
BØW ACCEL,	G	-0.01	0.68	47	1.04	-0.39	1.85	-0.97
CG ACCEL,	G	0.00	0.37	47	0.52	-0.28	0.90	-0.67
STERN ACCEL,	G	0.00	0.28	50	0.31	-0.32	0.61	-0.58

RUN NØ 53 VELØCITY 30.1 KNØTS FLAP DEFLECTIØN 0.0 DEG

NUMBER ØF WAVE ENCØUNTERS 47

		MEAN	RMS	ØSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	6.48	2.34	22	9.28	3.08	10.76	1.66
HEAVE,	FT	0.39	0.55	22	1.11	-0.23	1.58	-0.63
BØW ACCEL,	G	0.00	0.68	51	1.08	-0.41	1.93	-0.96
CG ACCEL,	G	0.01	0.37	54	0.54	-0.23	0.94	-0.60
STERN ACCEL,	G	-0.01	0.25	52	0.32	-0.30	0.56	-0.51

TABLE 13.11

WITH 9 FT TRANSOM FLAP LCG = 12.5 FT

RUN NØ 65 VELØCITY 15.0 KNØTS FLAP DEFLECTIØN -6.0 DEG

NUMBER ØF WAVE ENCØUNTERS 56

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	11.52	1.30	34	13.22	9.94	14.14	8.94
HEAVE,	FT	-3.46	0.27	28	-3.10	-3.80	-2.91	-4.03
BØW ACCEL,	G	-0.01	0.17	55	0.22	-0.20	0.34	-0.34
CG ACCEL,	G	-0.02	0.08	43	0.10	-0.14	0.16	-0.20
STERN ACCEL,	G	-0.02	0.07	37	0.08	-0.13	0.12	-0.18

RUN NØ 66 VELØCITY 15.0 KNØTS FLAP DEFLECTIØN -3.0 DEG

NUMBER ØF WAVE ENCØUNTERS 56

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	8.94	1.25	30	10.52	7.41	11.34	6.24
HEAVE,	FT	-3.67	0.28	26	-3.32	-3.99	-3.14	-4.27
BØW ACCEL,	G	0.01	0.14	52	0.19	-0.17	0.29	-0.27
CG ACCEL,	G	-0.01	0.07	39	0.10	-0.12	0.15	-0.17
STERN ACCEL,	G	-0.01	0.06	34	0.08	-0.10	0.11	-0.15

RUN NØ 64 VELØCITY 15.0 KNØTS FLAP DEFLECTIØN 0.0 DEG

NUMBER ØF WAVE ENCØUNTERS 56

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	7.64	1.21	29	9.10	6.25	10.12	5.25
HEAVE,	FT	-3.89	0.27	24	-3.57	-4.18	-3.30	-4.45
BØW ACCEL,	G	0.00	0.12	51	0.17	-0.16	0.25	-0.24
CG ACCEL,	G	-0.02	0.06	39	0.08	-0.11	0.12	-0.15
STERN ACCEL,	G	-0.01	0.05	30	0.07	-0.09	0.11	-0.12

TABLE 13.12

WITH 8 FT CHINE WINGS LCG = 12.5 FT

RUN NØ 70 VELØCITY 15.0 KNØTS FLAP DEFLECTIØN 0.0 DEG

NUMBER ØF WAVE ENCØUNTERS 57

		MEAN	RMS	ØSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	19.81	2.05	37	22.31	17.18	23.62	15.59
HEAVE,	FT	-1.10	0.47	35	-0.51	-1.66	-0.13	-2.00
BØW ACCEL,	G	-0.04	0.36	57	0.49	-0.38	0.78	-0.67
CG ACCEL,	G	-0.06	0.18	50	0.18	-0.27	0.29	-0.42
STERN ACCEL,	G	-0.06	0.10	41	0.09	-0.19	0.16	-0.26

RUN NØ 71 VELØCITY 15.0 KNØTS FLAP DEFLECTIØN 2.5 DEG

NUMBER ØF WAVE ENCØUNTERS 62

		MEAN	RMS	ØSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	18.58	2.06	37	21.18	15.91	22.40	14.28
HEAVE,	FT	-1.09	0.46	36	-0.53	-1.59	-0.16	-1.97
BØW ACCEL,	G	-0.03	0.36	58	0.48	-0.41	0.80	-0.67
CG ACCEL,	G	-0.05	0.18	50	0.19	-0.27	0.30	-0.41
STERN ACCEL,	G	-0.06	0.10	41	0.09	-0.20	0.16	-0.27

RUN NØ 72 VELØCITY 15.0 KNØTS FLAP DEFLECTIØN 5.0 DEG

NUMBER ØF WAVE ENCØUNTERS 55

		MEAN	RMS	ØSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	17.43	1.98	37	19.87	14.80	21.07	13.49
HEAVE,	FT	-1.14	0.42	35	-0.57	-1.62	-0.29	-1.95
BØW ACCEL,	G	-0.03	0.34	56	0.44	-0.44	0.72	-0.65
CG ACCEL,	G	-0.04	0.17	50	0.18	-0.26	0.28	-0.38
STERN ACCEL,	G	-0.05	0.10	41	0.10	-0.19	0.15	-0.25

RUN NØ 74 VELØCITY 15.0 KNØTS FLAP DEFLECTIØN 10.0 DEG

NUMBER ØF WAVE ENCØUNTERS 59

		MEAN	RMS	ØSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	14.41	1.79	37	16.62	12.06	17.63	10.62
HEAVE,	FT	-1.17	0.37	35	-0.72	-1.59	-0.45	-1.91
BØW ACCEL,	G	-0.02	0.29	60	0.37	-0.34	0.65	-0.57
CG ACCEL,	G	-0.03	0.14	49	0.16	-0.23	0.25	-0.35
STERN ACCEL,	G	-0.05	0.10	44	0.08	-0.19	0.16	-0.25

TABLE 13.13

WITH 4 FT CHINE WINGS LCG = 12.5 FT

RUN NØ 75 VELØCITY 15.0 KNØTS FLAP DEFLECTIØN 0.0 DEG

NUMBER ØF WAVE ENCØUNTERS 59

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	18.31	1.92	37	20.57	15.77	21.66	14.27
HEAVE,	FT	-1.79	0.43	34	-1.24	-2.28	-0.93	-2.59
BØW ACCEL,	G	-0.04	0.32	54	0.38	-0.42	0.68	-0.66
CG ACCEL,	G	-0.04	0.16	45	0.16	-0.27	0.26	-0.40
STERN ACCEL,	G	-0.06	0.10	40	0.07	-0.21	0.13	-0.28

RUN NØ 76 VELØCITY 15.0 KNØTS FLAP DEFLECTIØN 5.0 DEG

NUMBER ØF WAVE ENCØUNTERS 54

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	15.34	1.58	34	17.41	13.24	18.36	12.16
HEAVE,	FT	-1.88	0.33	31	-1.43	-2.29	-1.17	-2.56
BØW ACCEL,	G	-0.03	0.25	61	0.27	-0.31	0.47	-0.52
CG ACCEL,	G	-0.04	0.12	46	0.12	-0.22	0.20	-0.33
STERN ACCEL,	G	-0.05	0.09	38	0.08	-0.18	0.14	-0.25

RUN NØ 77 VELØCITY 15.0 KNØTS FLAP DEFLECTIØN 10.0 DEG

NUMBER ØF WAVE ENCØUNTERS 56

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	10.58	1.32	35	12.31	8.96	13.25	8.02
HEAVE,	FT	-2.23	0.28	32	-1.88	-2.54	-1.68	-2.79
BØW ACCEL,	G	-0.01	0.19	58	0.23	-0.24	0.37	-0.38
CG ACCEL,	G	-0.02	0.09	43	0.10	-0.16	0.16	-0.24
STERN ACCEL,	G	-0.03	0.08	37	0.09	-0.15	0.14	-0.20

TABLE 13.14

WITH 4 FT CHINE WINGS LCG = 12.5 FT

RUN NØ 78 VELØCITY 30.1 KNØTS FLAP DEFLECTIØN 0.0 DEG

NUMBER ØF WAVE ENCØUNTERS 45

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	9.63	3.61	23	13.79	4.33	15.62	2.50
HEAVE,	FT	0.38	0.69	22	1.24	-0.44	1.82	-0.76
BØW ACCEL,	G	0.02	0.84	34	1.54	-0.62	2.52	-1.02
CG ACCEL,	G	-0.01	0.41	45	0.49	-0.32	0.90	-0.67
STERN ACCEL,	G	-0.03	0.30	50	0.22	-0.40	0.55	-0.62

RUN NØ 79 VELØCITY 30.2 KNØTS FLAP DEFLECTIØN 5.0 DEG

NUMBER ØF WAVE ENCØUNTERS 44

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	6.85	2.37	25	9.61	3.53	11.17	1.82
HEAVE,	FT	0.01	0.48	23	0.64	-0.57	1.03	-0.86
BØW ACCEL,	G	0.00	0.70	46	1.05	-0.54	1.94	-0.95
CG ACCEL,	G	-0.02	0.36	50	0.44	-0.28	0.78	-0.64
STERN ACCEL,	G	-0.02	0.25	42	0.19	-0.33	0.45	-0.52

TABLE 13.15

WITH 45 DEGREE CHINE FLAPS LCG = 12.5 FT

RUN NØ 81 VELØCITY 15.1 KNØTS FLAP DEFLECTIØN 2.5 DEG

NUMBER ØF WAVE ENCØUNTERS 53

		MEAN	RMS	ØSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	11.50	1.45	35	13.43	9.66	14.44	8.64
HEAVE,	FT	-2.47	0.32	31	-2.06	-2.87	-1.83	-3.14
BØW ACCEL,	G	0.00	0.21	56	0.27	-0.24	0.44	-0.39
CG ACCEL,	G	-0.02	0.11	43	0.13	-0.18	0.20	-0.24
STERN ACCEL,	G	-0.03	0.09	39	0.10	-0.17	0.17	-0.23

RUN NØ 82 VELØCITY 15.1 KNØTS FLAP DEFLECTIØN 5.0 DEG

NUMBER ØF WAVE ENCØUNTERS 57

		MEAN	RMS	ØSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	9.60	1.46	35	11.46	7.80	12.53	6.81
HEAVE,	FT	-2.62	0.31	30	-2.20	-3.02	-1.97	-3.30
BØW ACCEL,	G	0.00	0.20	50	0.27	-0.27	0.41	-0.40
CG ACCEL,	G	0.00	0.10	42	0.14	-0.16	0.21	-0.24
STERN ACCEL,	G	-0.01	0.09	42	0.11	-0.14	0.18	-0.21

RUN NØ 83 VELØCITY 30.1 KNØTS FLAP DEFLECTIØN 0.0 DEG

NUMBER ØF WAVE ENCØUNTERS 47

		MEAN	RMS	ØSC	AVERAGE		1/3	HIGHEST
PITCH,	DEG	8.80	2.93	21	12.28	4.48	14.06	2.94
HEAVE,	FT	0.18	0.62	21	0.95	-0.56	1.52	-0.92
BØW ACCEL,	G	0.01	0.68	41	1.06	-0.46	1.86	-0.94
CG ACCEL,	G	-0.02	0.35	45	0.37	-0.29	0.68	-0.61
STERN ACCEL,	G	-0.01	0.26	43	0.26	-0.34	0.53	-0.53

TABLE 13.16

WITH 45 DEGREE CHINE FLAPS I.CG = 12.5 FT

RUN NØ 84 VELØCITY 30.1 KNØTS FLAP DEFLECTIØN 2.5 DEG

NUMBER ØF WAVE ENCØUNTERS 48

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	7.52	2.35	22	10.47	4.21	11.67	2.70
HEAVE,	FT	0.00	0.51	21	0.68	-0.61	1.05	-0.91
BØW ACCEL,	G	0.01	0.62	48	0.86	-0.41	1.55	-0.91
CG ACCEL,	G	0.00	0.33	50	0.37	-0.26	0.66	-0.59
STERN ACCEL,	G	-0.01	0.24	44	0.23	-0.28	0.44	-0.45

RUN NØ 85 VELØCITY 30.1 KNØTS FLAP DEFLECTIØN 5.0 DEG

NUMBER ØF WAVE ENCØUNTERS 44

		MEAN	RMS	ØSC	AVERAGE		1/3 HIGHEST	
PITCH,	DEG	6.42	1.90	23	8.85	3.74	9.88	2.47
HEAVE,	FT	-0.17	0.42	22	0.39	-0.64	0.69	-0.89
BØW ACCEL,	G	0.01	0.57	49	0.85	-0.40	1.48	-0.85
CG ACCEL,	G	0.00	0.30	50	0.38	-0.24	0.63	-0.57
STERN ACCEL,	G	-0.01	0.22	37	0.21	-0.28	0.39	-0.43

TABLE 14

REGULAR WAVES

MODEL S-5 WITH 45° DEADRISE CHINE FLAPS
TRANSOM FLAP DEFLECTION = 0 LCG = 12.5 FT

RUN 89 , SPEED = 15 KNOTS WAVE LENGTH = 83 FT
MODEL DRAG = 10.8 LB WAVE HEIGHT = 1.9 FT
FREQUENCY OF ENCOUNTER = 0.561 HZ

FREQ. MULTIPLE:			0.5		1.0		2.0		3.0	
		MEAN	AMP	PHASE	AMP	PHASE	AMP	PHASE	AMP	PHASE
WAVE	FT	0.10	0.01	53.	0.93	1.	0.03	352.	0.01	133.
PITCH	DEG	13.67	0.07	26.	3.28	0.	0.08	138.	0.02	221.
HEAVE	FT	-2.32	0.02	92.	0.62	62.	0.00	123.	0.00	195.
BOW ACC	G	-0.02	0.00	261.	0.43	211.	0.03	308.	0.01	76.
CG ACC	G	-0.03	0.00	260.	0.24	238.	0.01	299.	0.00	70.
STERN ACC	G	-0.03	0.00	269.	0.20	284.	0.00	241.	0.00	261.

RUN 90 , SPEED = 20 KNOTS WAVE LENGTH = 83 FT
MODEL DRAG = 9.7 LB WAVE HEIGHT = 1.9 FT
FREQUENCY OF ENCOUNTER = 0.665 HZ

FREQ. MULTIPLE:			0.5		1.0		2.0		3.0	
		MEAN	AMP	PHASE	AMP	PHASE	AMP	PHASE	AMP	PHASE
WAVE	FT	0.01	0.01	255.	0.94	329.	0.05	295.	0.00	285.
PITCH	DEG	14.35	0.03	281.	3.82	0.	0.39	165.	0.10	311.
HEAVE	FT	-0.74	0.01	344.	0.77	49.	0.03	179.	0.01	319.
BOW ACC	G	-0.03	0.00	268.	0.76	206.	0.22	353.	0.10	137.
CG ACC	G	-0.03	0.00	142.	0.42	227.	0.07	351.	0.04	127.
STERN ACC	G	-0.04	0.00	132.	0.28	270.	0.04	173.	0.02	345.

RUN 91 , SPEED = 25 KNOTS WAVE LENGTH = 83 FT
MODEL DRAG = 8.3 LB WAVE HEIGHT = 1.9 FT
FREQUENCY OF ENCOUNTER = 0.768 HZ

FREQ. MULTIPLE:			0.5		1.0		2.0		3.0	
		MEAN	AMP	PHASE	AMP	PHASE	AMP	PHASE	AMP	PHASE
WAVE	FT	-0.01	0.02	119.	0.94	299.	0.04	255.	0.01	214.
PITCH	DEG	11.27	0.02	348.	3.63	0.	0.49	163.	0.19	327.
HEAVE	FT	0.12	0.01	2.	0.68	41.	0.04	167.	0.01	299.
BOW ACC	G	-0.01	0.00	252.	0.95	202.	0.38	350.	0.24	139.
CG ACC	G	-0.01	0.00	227.	0.50	219.	0.12	344.	0.09	129.
STERN ACC	G	-0.03	0.00	298.	0.29	266.	0.08	183.	0.04	350.

TABLE 14.2

REGULAR WAVES

RUN 92 , SPEED = 30 KNOTS WAVE LENGTH = 83 FT
MODEL DRAG = 8.0 LB WAVE HEIGHT = 1.8 FT
FREQUENCY OF ENCOUNTER = 0.874 HZ

FREQ. MULTIPLE:			0.5		1.0		2.0		3.0	
		MEAN	AMP	PHASE	AMP	PHASE	AMP	PHASE	AMP	PHASE
WAVE	FT	-0.09	0.01	76.	0.91	284.	0.04	230.	0.00	245.
PITCH	DEG	8.85	0.83	314.	3.01	0.	0.42	155.	0.15	320.
HEAVE	FT	0.20	0.25	13.	0.55	37.	0.04	162.	0.01	302.
BOW ACC	G	-0.00	0.09	176.	1.02	200.	0.46	346.	0.30	133.
CG ACC	G	-0.01	0.06	195.	0.52	216.	0.15	334.	0.11	117.
STERN ACC	G	-0.02	0.05	220.	0.27	264.	0.09	196.	0.05	5.

RUN 95 , SPEED = 15 KNOTS WAVE LENGTH = 110 FT
MODEL DRAG = 10.7 LB WAVE HEIGHT = 1.8 FT
FREQUENCY OF ENCOUNTER = 0.447 HZ

FREQ. MULTIPLE:			0.5		1.0		2.0		3.0	
		MEAN	AMP	PHASE	AMP	PHASE	AMP	PHASE	AMP	PHASE
WAVE	FT	-0.08	0.01	315.	0.89	259.	0.01	128.	0.01	95.
PITCH	DEG	13.10	0.02	262.	4.06	0.	0.04	124.	0.02	146.
HEAVE	FT	-2.36	0.01	25.	0.97	313.	0.00	189.	0.00	145.
BOW ACC	G	-0.02	0.00	221.	0.36	100.	0.01	61.	0.01	359.
CG ACC	G	-0.03	0.00	190.	0.24	128.	0.00	60.	0.01	16.
STERN ACC	G	-0.04	0.00	262.	0.22	162.	0.00	74.	0.00	89.

RUN 96 , SPEED = 20 KNOTS WAVE LENGTH = 110 FT
MODEL DRAG = 9.7 LB WAVE HEIGHT = 1.8 FT
FREQUENCY OF ENCOUNTER = 0.526 HZ

FREQ. MULTIPLE:			0.5		1.0		2.0		3.0	
		MEAN	AMP	PHASE	AMP	PHASE	AMP	PHASE	AMP	PHASE
WAVE	FT	-0.10	0.02	344.	0.58	356.	0.03	346.	0.00	99.
PITCH	DEG	14.08	0.08	148.	5.35	0.	0.53	164.	0.11	311.
HEAVE	FT	-0.78	0.02	182.	1.25	59.	0.04	166.	0.01	344.
BOW ACC	G	-0.02	0.01	7.	0.69	212.	0.18	350.	0.06	137.
CG ACC	G	-0.02	0.00	28.	0.42	236.	0.06	356.	0.02	131.
STERN ACC	G	-0.04	0.00	74.	0.33	272.	0.04	150.	0.02	324.

TABLE 14.3

REGULAR WAVES

RUN 97 , SPEED = 25 KNOTS WAVE LENGTH = 110 FT
MODEL DRAG = 8.9 LB WAVE HEIGHT = 1.8 FT
FREQUENCY OF ENCOUNTER = 0.604 HZ

FREQ. MULTIPLE:			0.5		1.0		2.0		3.0	
		MEAN	AMP	PHASE	AMP	PHASE	AMP	PHASE	AMP	PHASE
WAVE	FT	-0.02	0.02	32.	0.89	320.	0.03	258.	0.01	29.
PITCH	DEG	11.22	0.04	79.	5.96	0.	0.87	167.	0.25	312.
HEAVE	FT	0.09	0.01	85.	1.26	53.	0.06	177.	0.02	315.
BOW ACC	G	-0.02	0.01	268.	0.98	209.	0.40	354.	0.25	141.
CG ACC	G	-0.02	0.00	286.	0.58	231.	0.12	356.	0.08	126.
STERN ACC	G	-0.02	0.00	13.	0.42	270.	0.09	167.	0.06	346.

RUN 98 , SPEED = 30 KNOTS WAVE LENGTH = 110 FT
MODEL DRAG = 9.2 LB WAVE HEIGHT = 1.7 FT
FREQUENCY OF ENCOUNTER = 0.680 HZ

FREQ. MULTIPLE:			0.5		1.0		2.0		3.0	
		MEAN	AMP	PHASE	AMP	PHASE	AMP	PHASE	AMP	PHASE
WAVE	FT	-0.21	0.01	175.	0.86	297.	0.02	219.	0.00	332.
PITCH	DEG	8.99	0.05	134.	5.19	0.	0.82	167.	0.31	311.
HEAVE	FT	0.19	0.02	200.	1.07	51.	0.07	176.	0.02	304.
BOW ACC	G	0.01	0.00	349.	1.09	208.	0.51	357.	0.33	142.
CG ACC	G	-0.01	0.00	13.	0.63	230.	0.15	359.	0.13	123.
STERN ACC	G	-0.01	0.00	18.	0.45	271.	0.11	172.	0.08	23.

RUN 99 , SPEED = 15 KNOTS WAVE LENGTH = 110 FT
MODEL DRAG = 11.7 LB WAVE HEIGHT = 3.6 FT
FREQUENCY OF ENCOUNTER = 0.448 HZ

FREQ. MULTIPLE:			0.5		1.0		2.0		3.0	
		MEAN	AMP	PHASE	AMP	PHASE	AMP	PHASE	AMP	PHASE
WAVE	FT	-0.06	0.01	160.	1.80	21.	0.12	42.	0.01	257.
PITCH	DEG	13.58	0.03	353.	8.32	0.	0.60	157.	0.12	266.
HEAVE	FT	-2.33	0.00	93.	2.09	72.	0.06	163.	0.01	302.
BOW ACC	G	-0.02	0.00	263.	0.77	220.	0.14	338.	0.07	110.
CG ACC	G	-0.04	0.00	298.	0.52	248.	0.06	348.	0.02	107.
STERN ACC	G	-0.04	0.00	332.	0.46	281.	0.02	91.	0.01	289.

TABLE 14.4
REGULAR WAVES

RUN101 , SPEED = 25 KNOTS WAVE LENGTH = 110 FT
MODEL DRAG = 11.1 LB WAVE HEIGHT = 3.6 FT
FREQUENCY OF ENCOUNTER = 0.601 HZ

FREQ. MULTIPLE:			0.5		1.0		2.0		3.0	
		MEAN	AMP	PHASE	AMP	PHASE	AMP	PHASE	AMP	PHASE
WAVE	FT	-0.01	0.01	298.	1.80	311.	0.10	272.	0.01	190.
PITCH	DEG	13.00	0.21	34.	7.04	0.	1.35	188.	0.35	347.
HEAVE	FT	0.49	0.07	47.	1.93	48.	0.14	192.	0.04	341.
BOW ACC	G	-0.01	0.01	208.	1.37	209.	0.70	17.	0.45	174.
CG ACC	G	-0.02	0.01	207.	0.87	226.	0.25	16.	0.18	151.
STERN ACC	G	-0.03	0.01	210.	0.61	254.	0.08	196.	0.12	58.

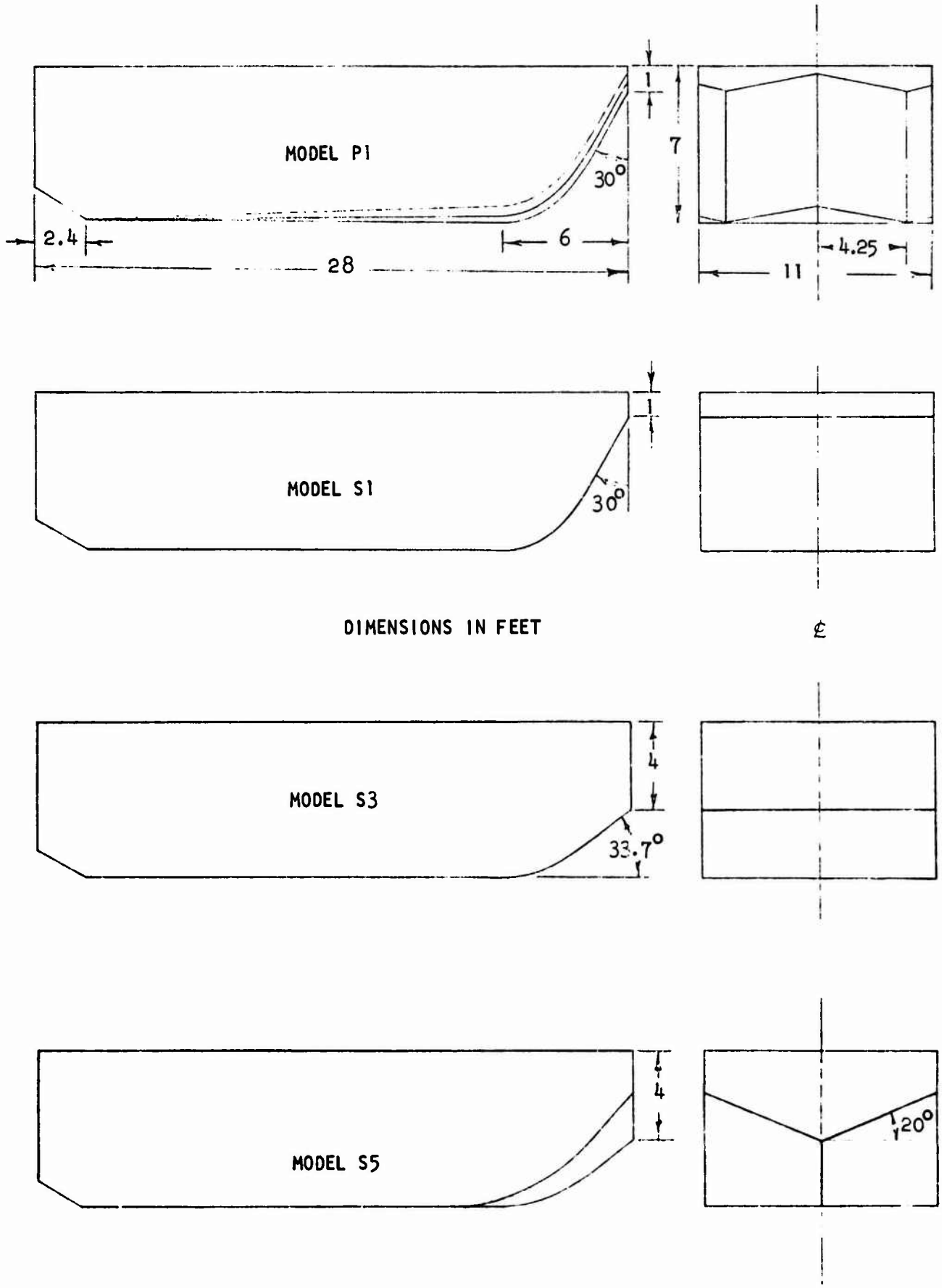


FIGURE 1. LVA CONFIGURATIONS

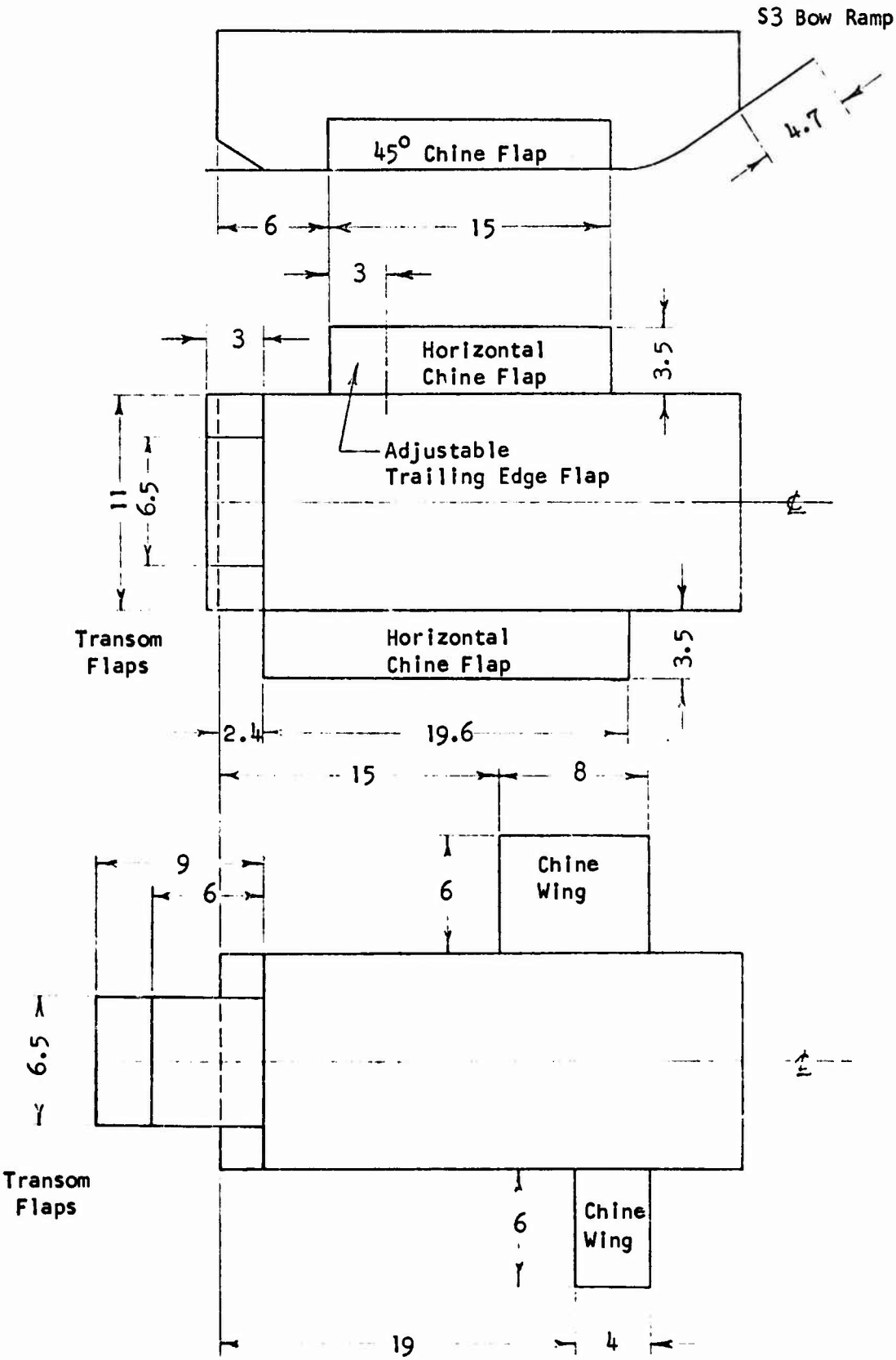


FIGURE 2. APPENDAGES
(Dimensions in Ft)

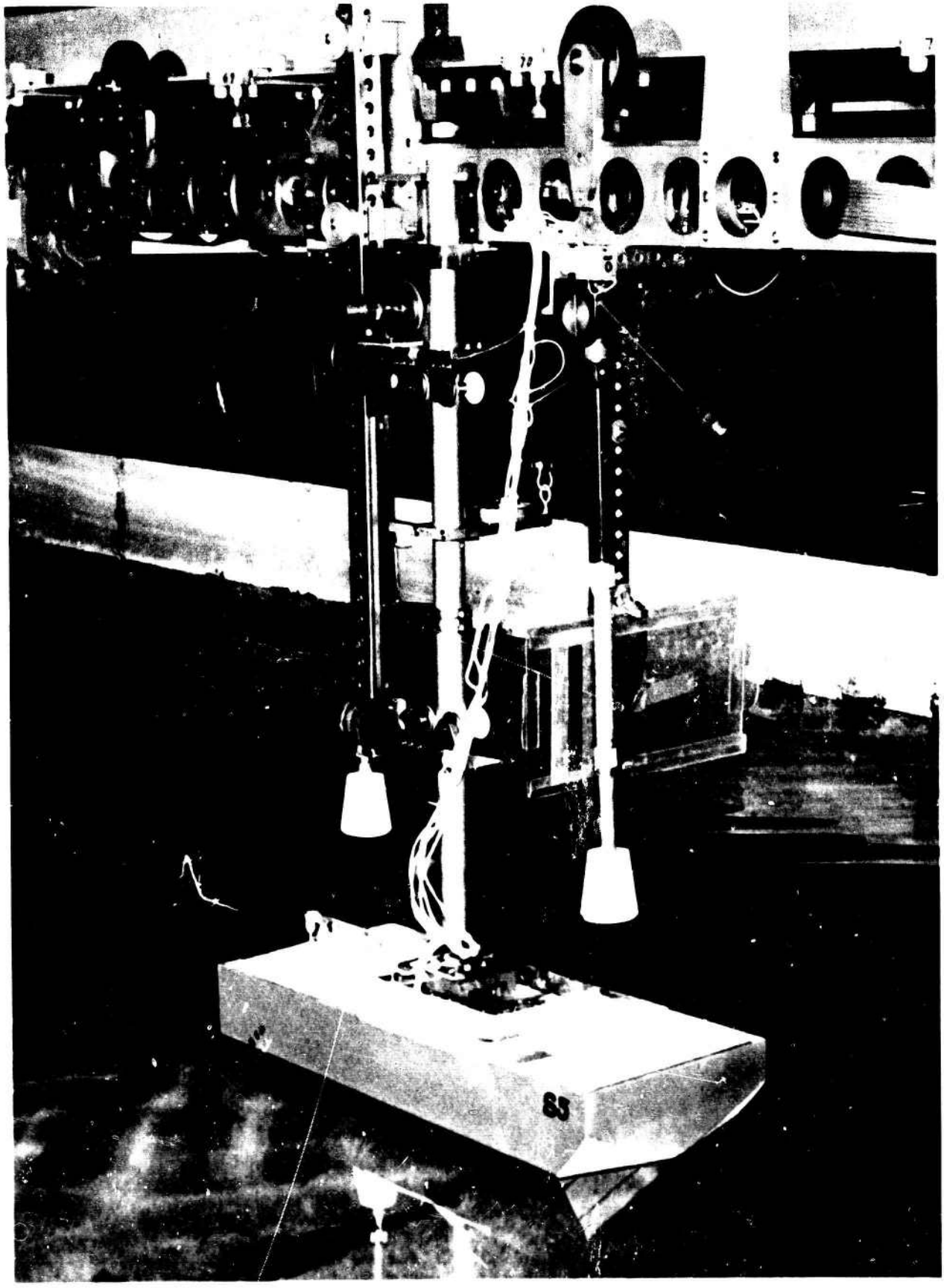


FIGURE 3

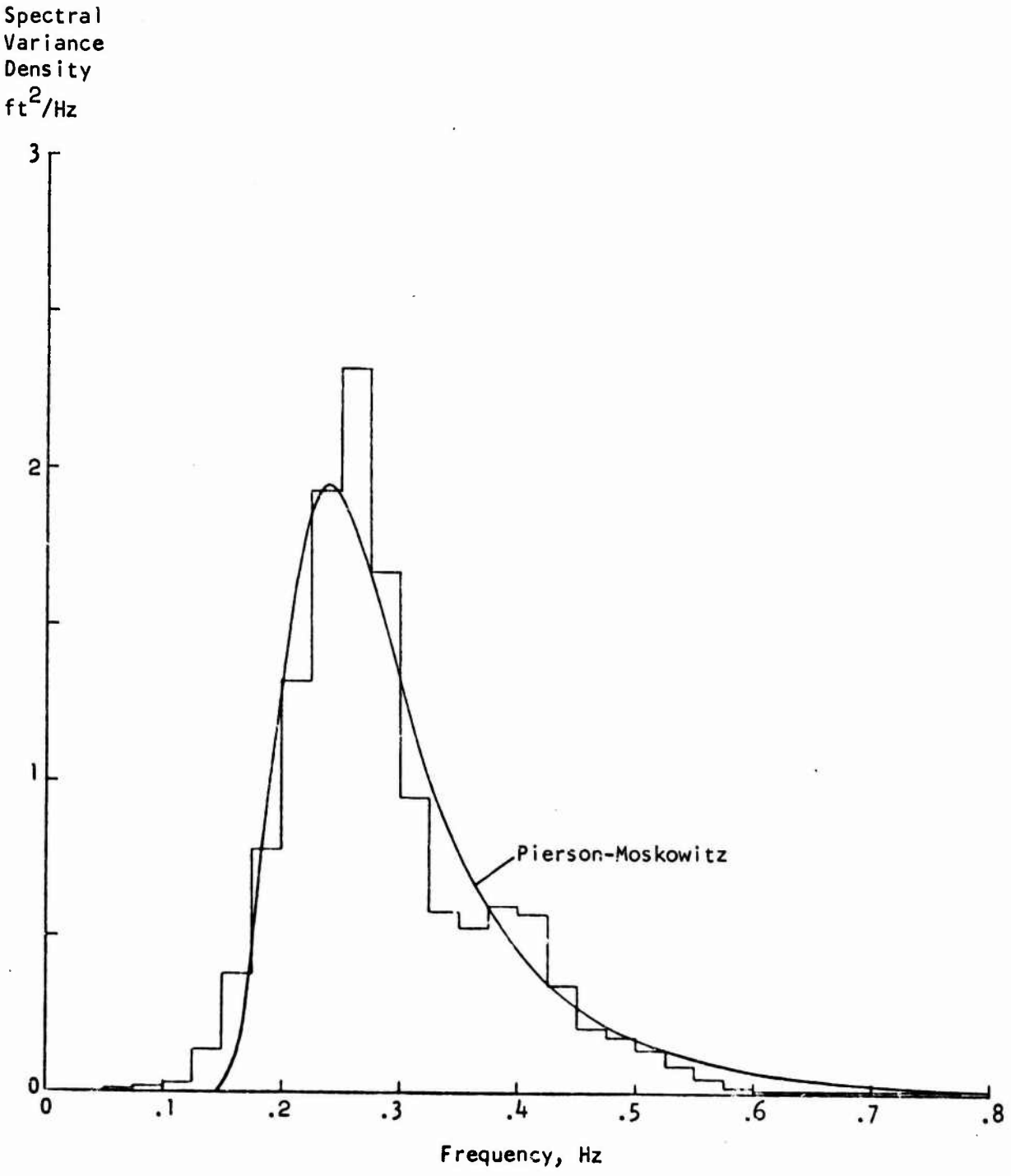
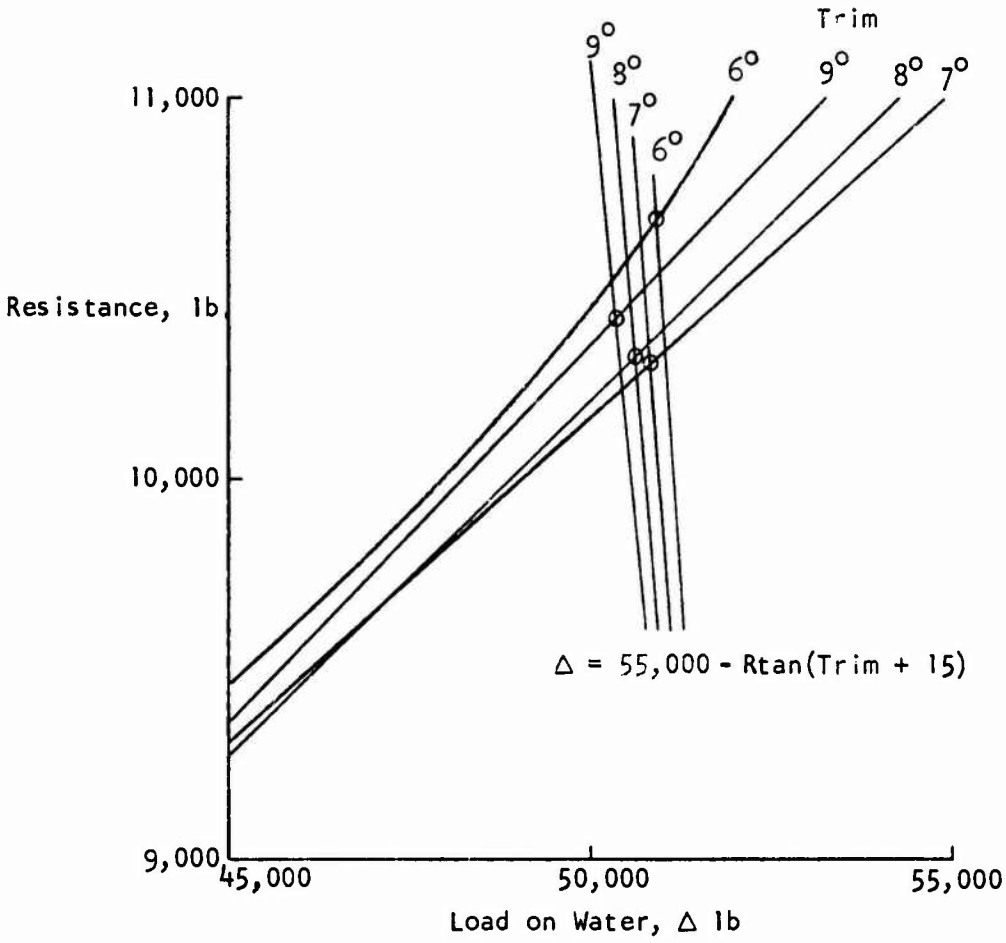


FIGURE 4. EXPERIMENTAL WAVE SPECTRUM
SIGNIFICANT HEIGHT 2.2 FT



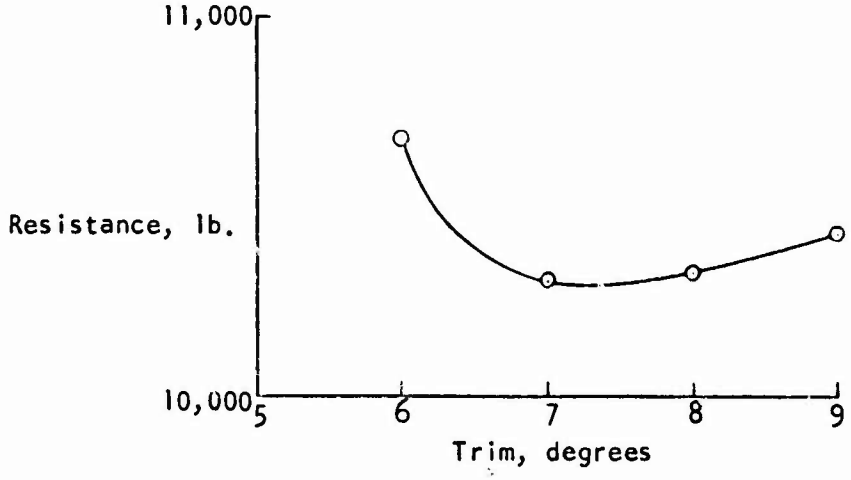


FIGURE 5. DETERMINATION OF EQUILIBRIUM TRIM AT 30 KNOTS 55,000 LB. DISPLACEMENT, SHAFT ANGLE 15 DEGREES FOR CONFIGURATION S-5

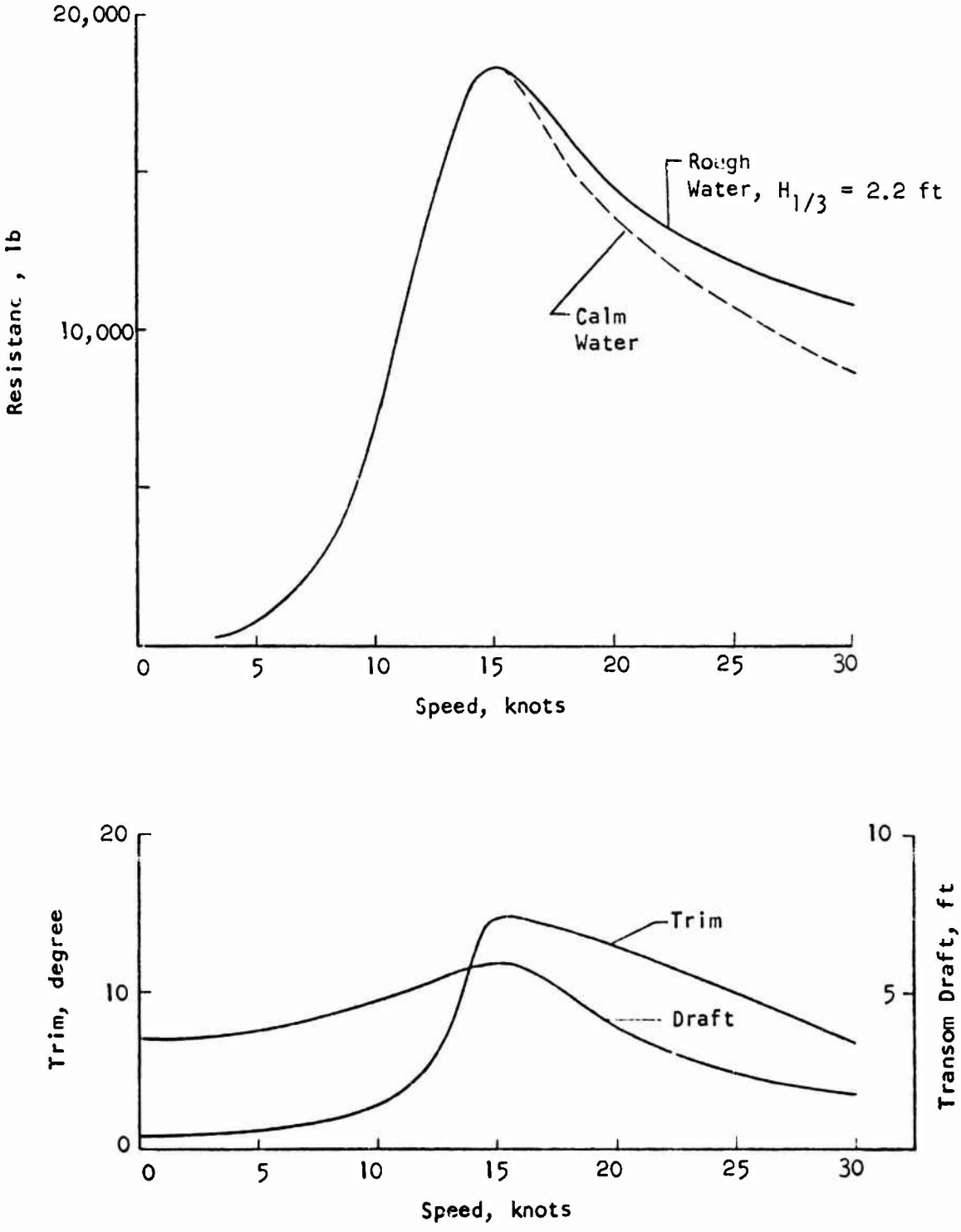


FIGURE 6. PERFORMANCE OF S-5 AT 55,000 LB, 12.5 FT LCG, NO CHINE FLAPS, SHAFT LINE PARALLEL TO KEEL

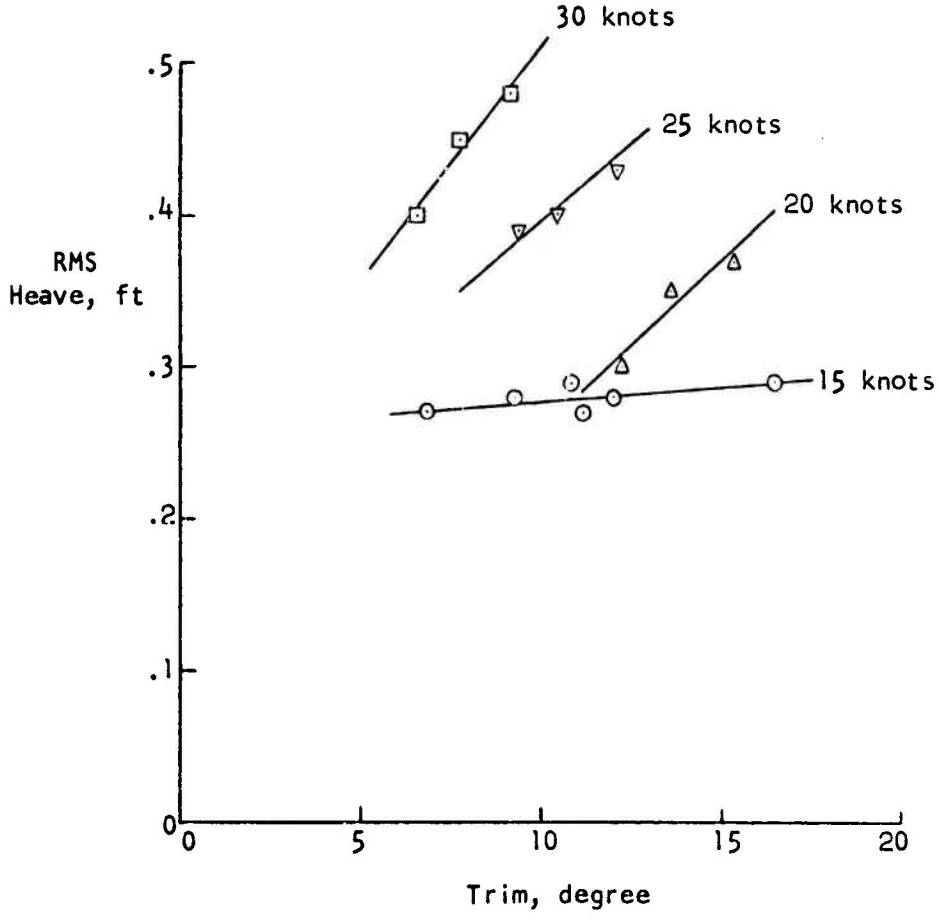


FIGURE 7. S-5 HEAVE MOTION IN SEA STATE 2.2 FT SIGNIFICANT HEIGHT

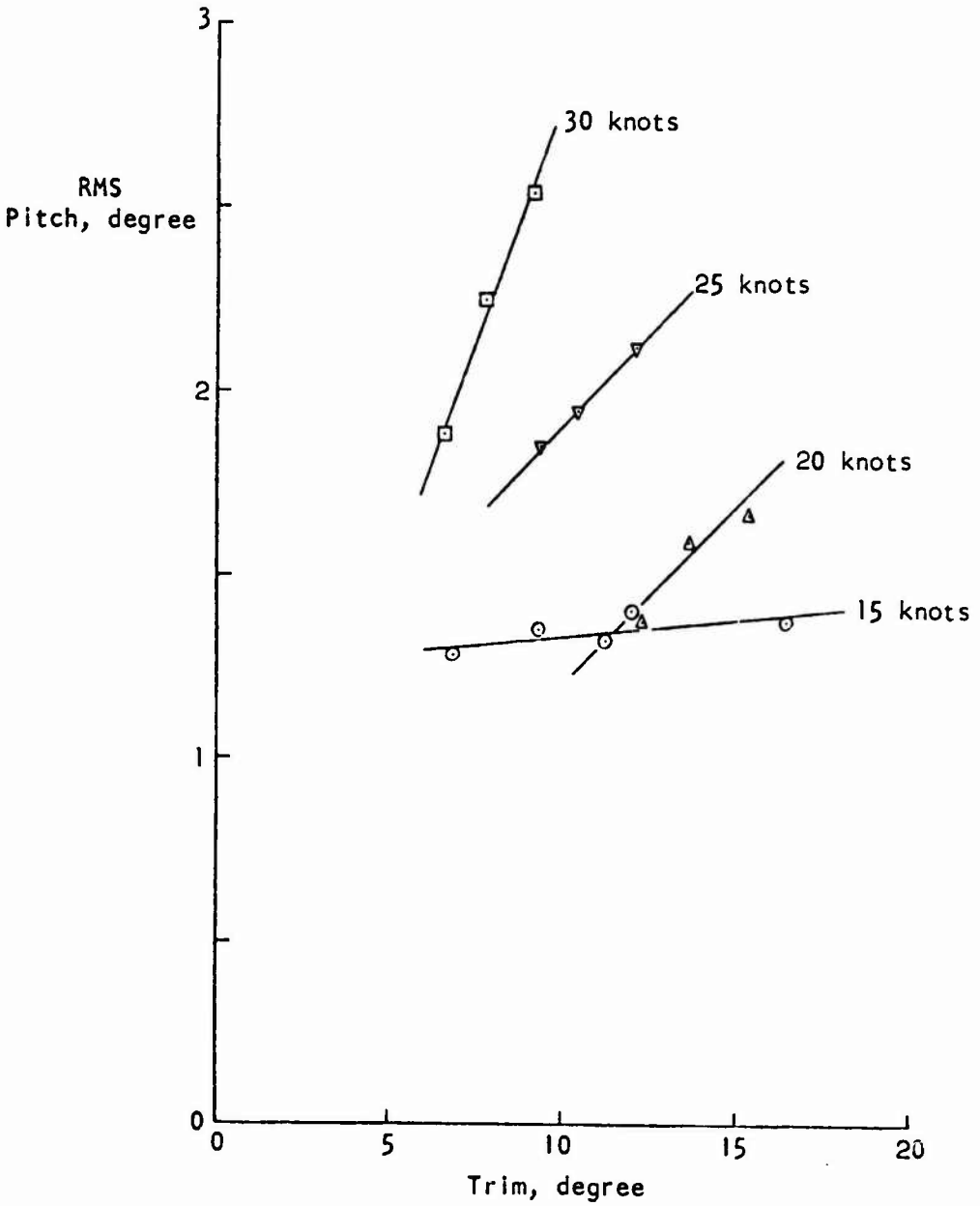


FIGURE 8. S-5 PITCH MOTIONS IN SEA STATE 2.2 FT SIGNIFICANT HEIGHT

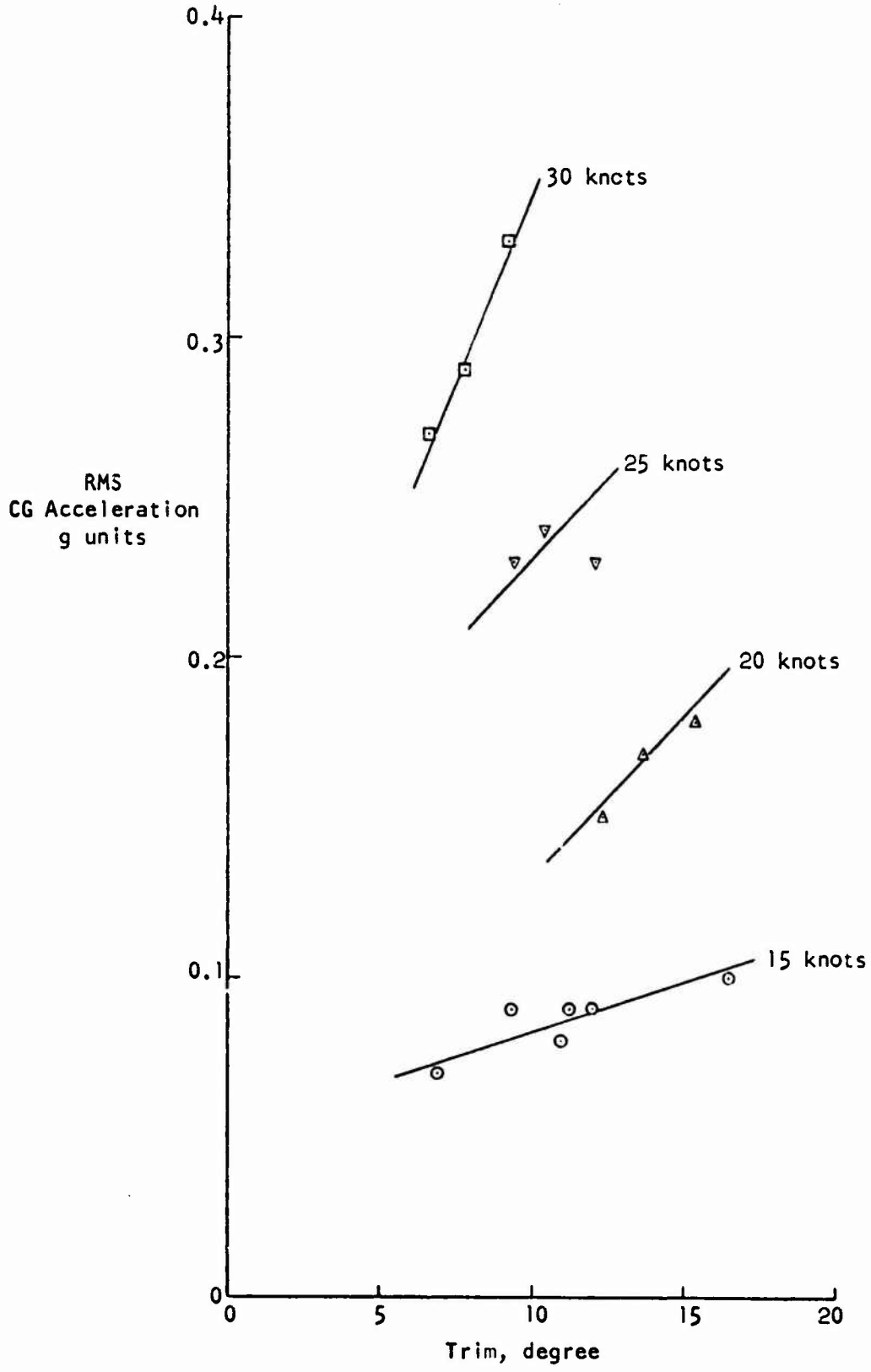


FIGURE 9. S-5 C.G. ACCELERATION IN SEA STATE 2.2 FT SIGNIFICANT HEIGHT

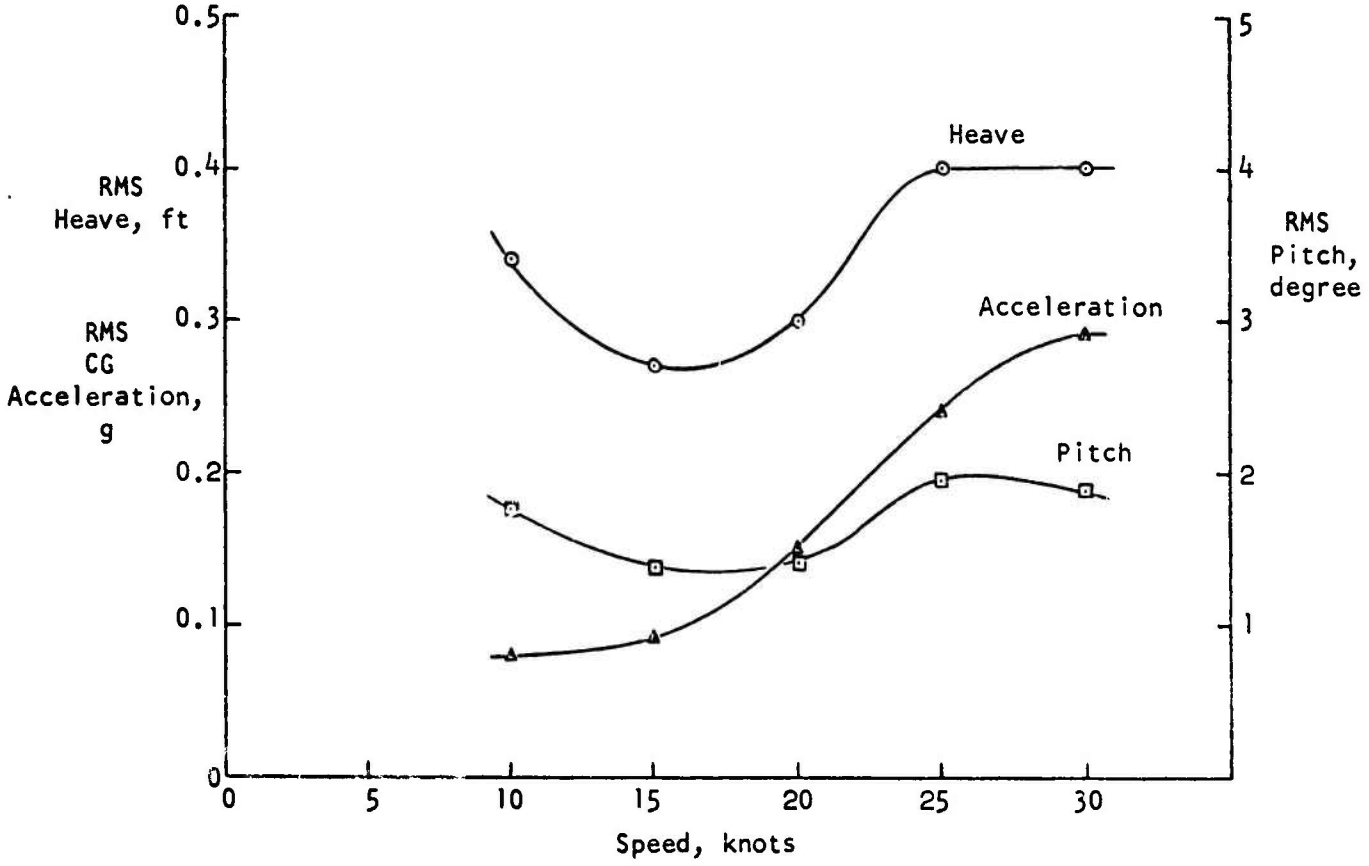


FIGURE 10. S-5 SEAKEEPING CHARACTERISTICS IN SEA STATE 2.2 FT SIGNIFICANT HEIGHT

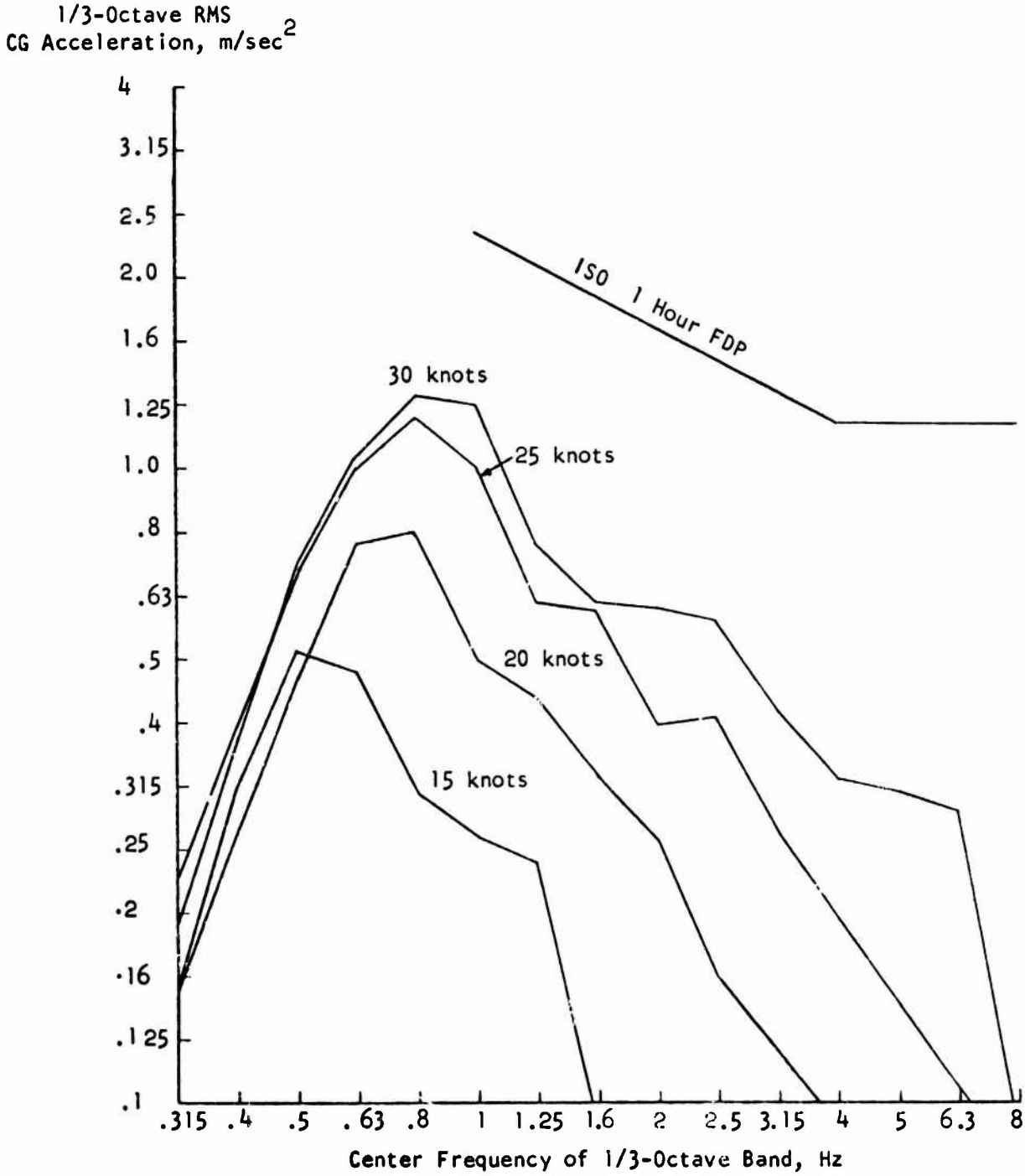


FIGURE 11. S-5 HABITABILITY CHARACTERISTICS, 55,000 LB, 2.2 FT SIGNIFICANT HEIGHT WAVES

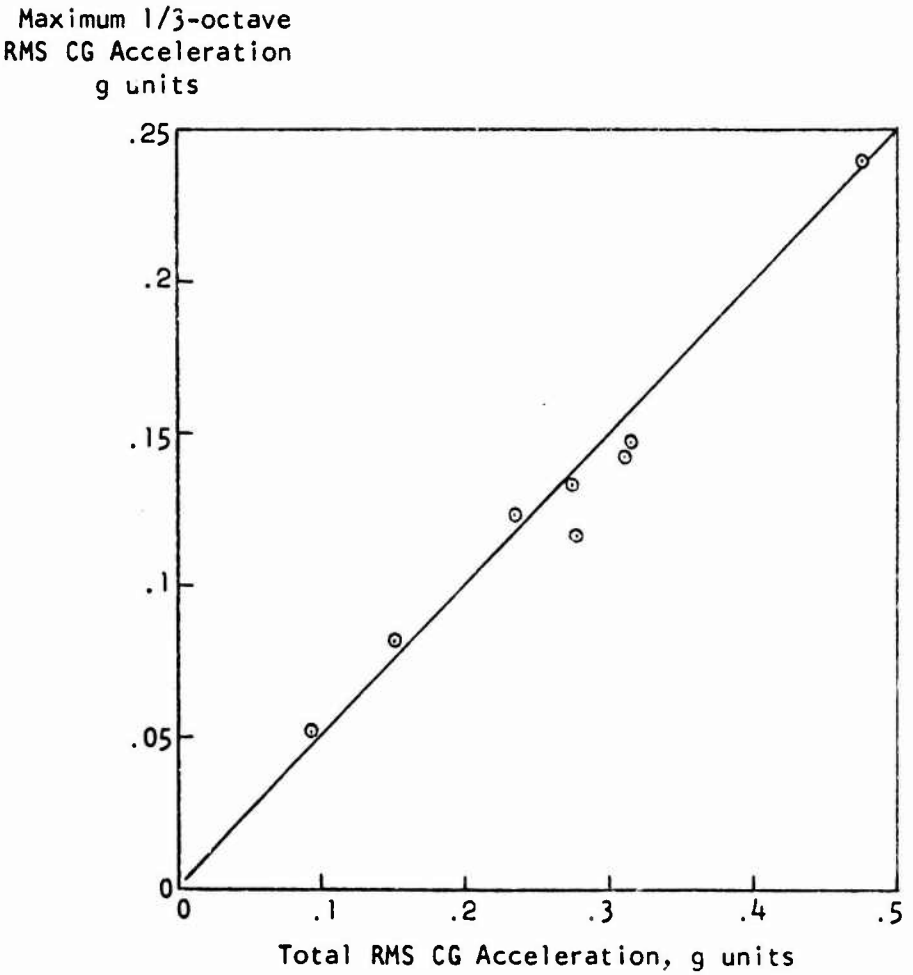


FIGURE 12. RELATION BETWEEN MAXIMUM 1/3-OCTAVE AND TOTAL RMS ACCELERATION

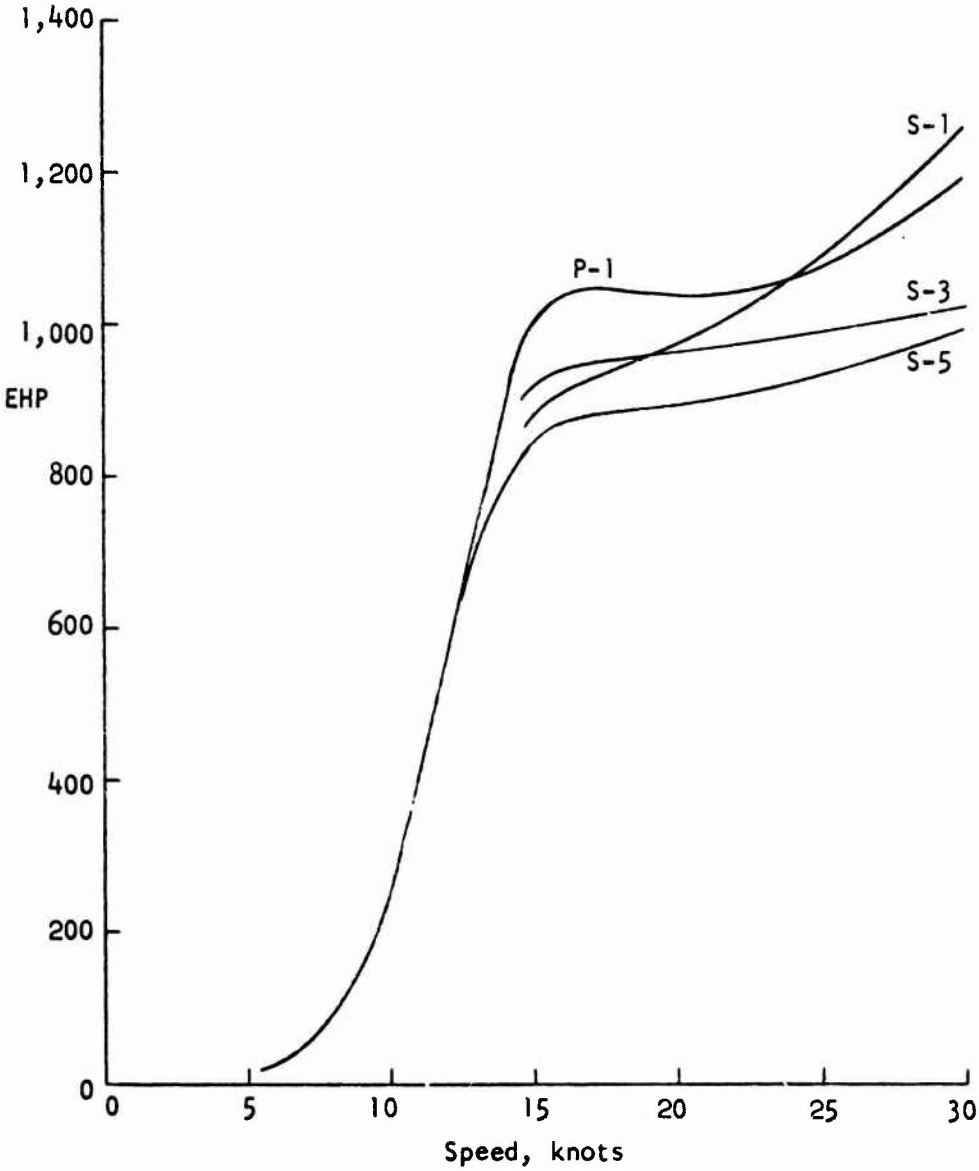


FIGURE 13. COMPARATIVE ROUGH WATER PERFORMANCE, 55,000 LB DISPLACEMENT, 2.2 FT SIGNIFICANT HEIGHT WAVES

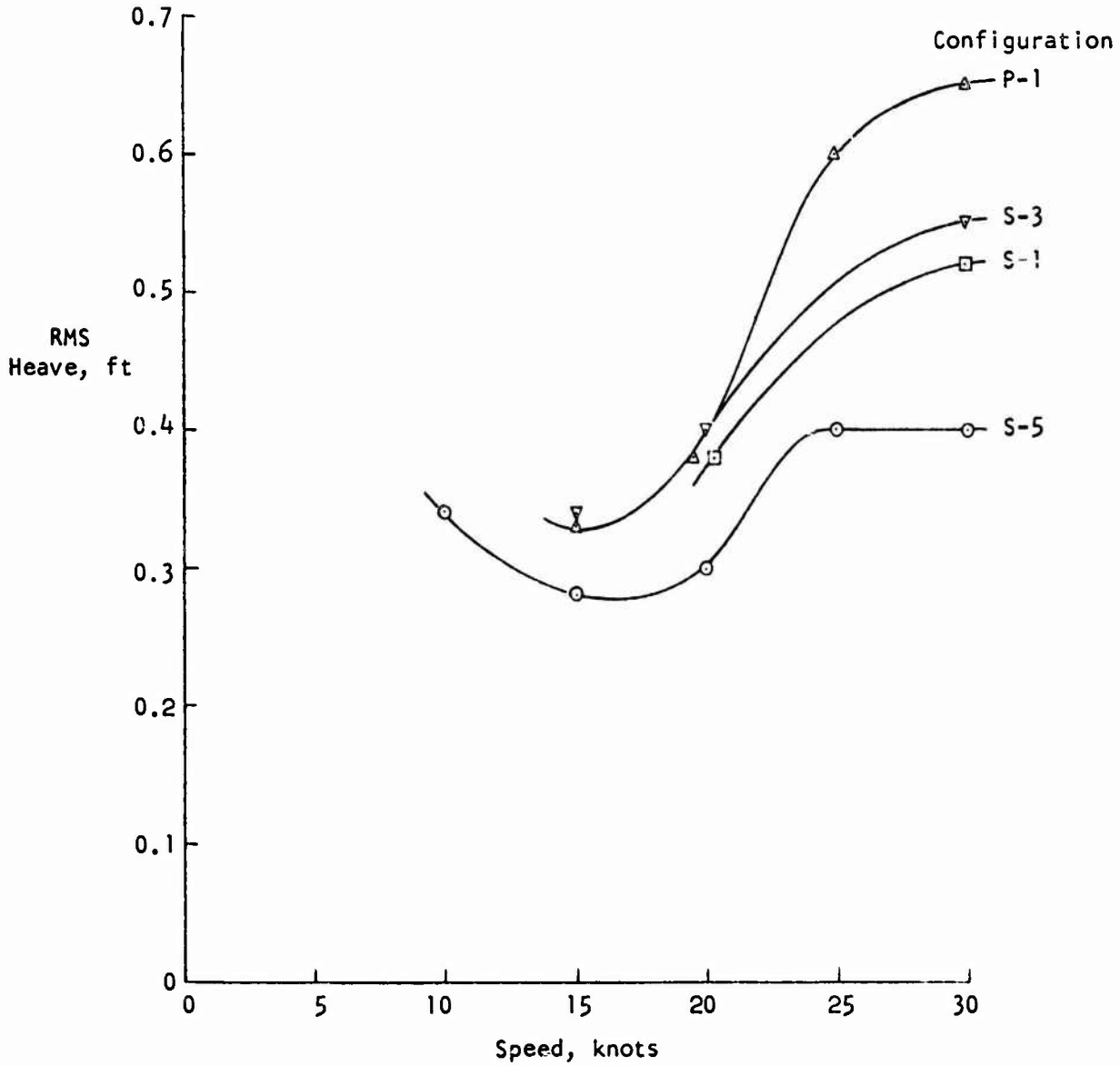


FIGURE 14. HEAVE MOTION IN SEA STATE
SIGNIFICANT HEIGHT 2.2 FT

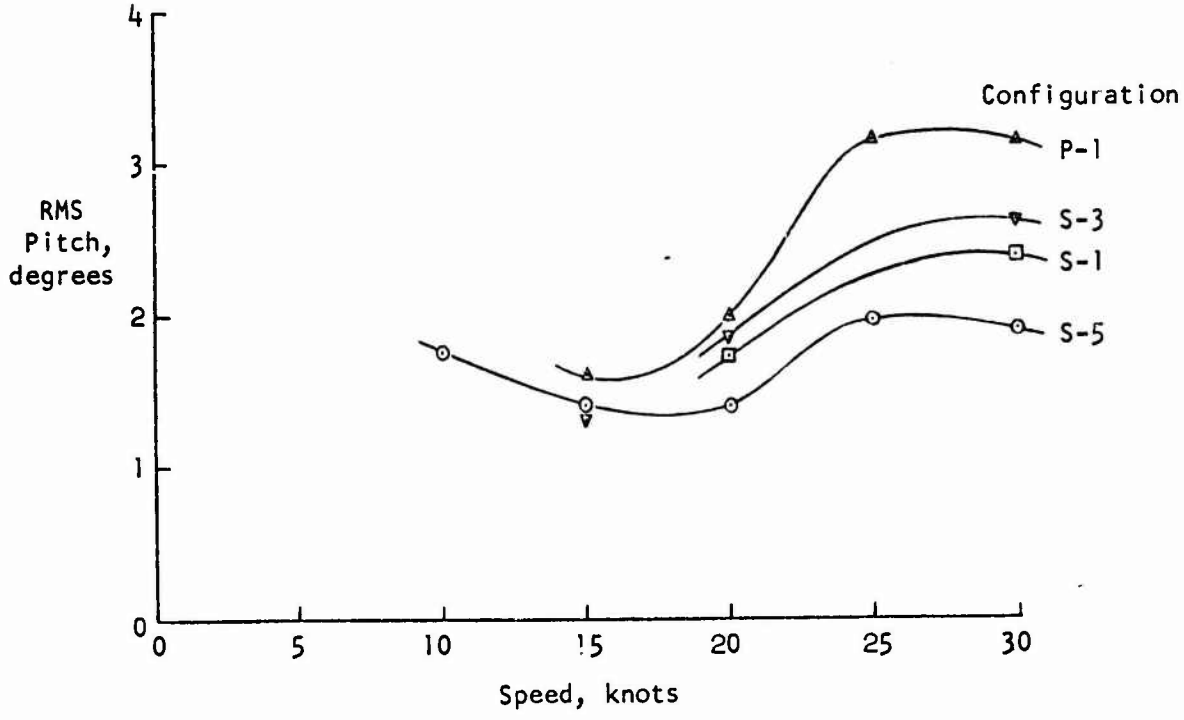


FIGURE 15. PITCH MOTION IN SEA STATE
SIGNIFICANT HEIGHT 2.2 FT

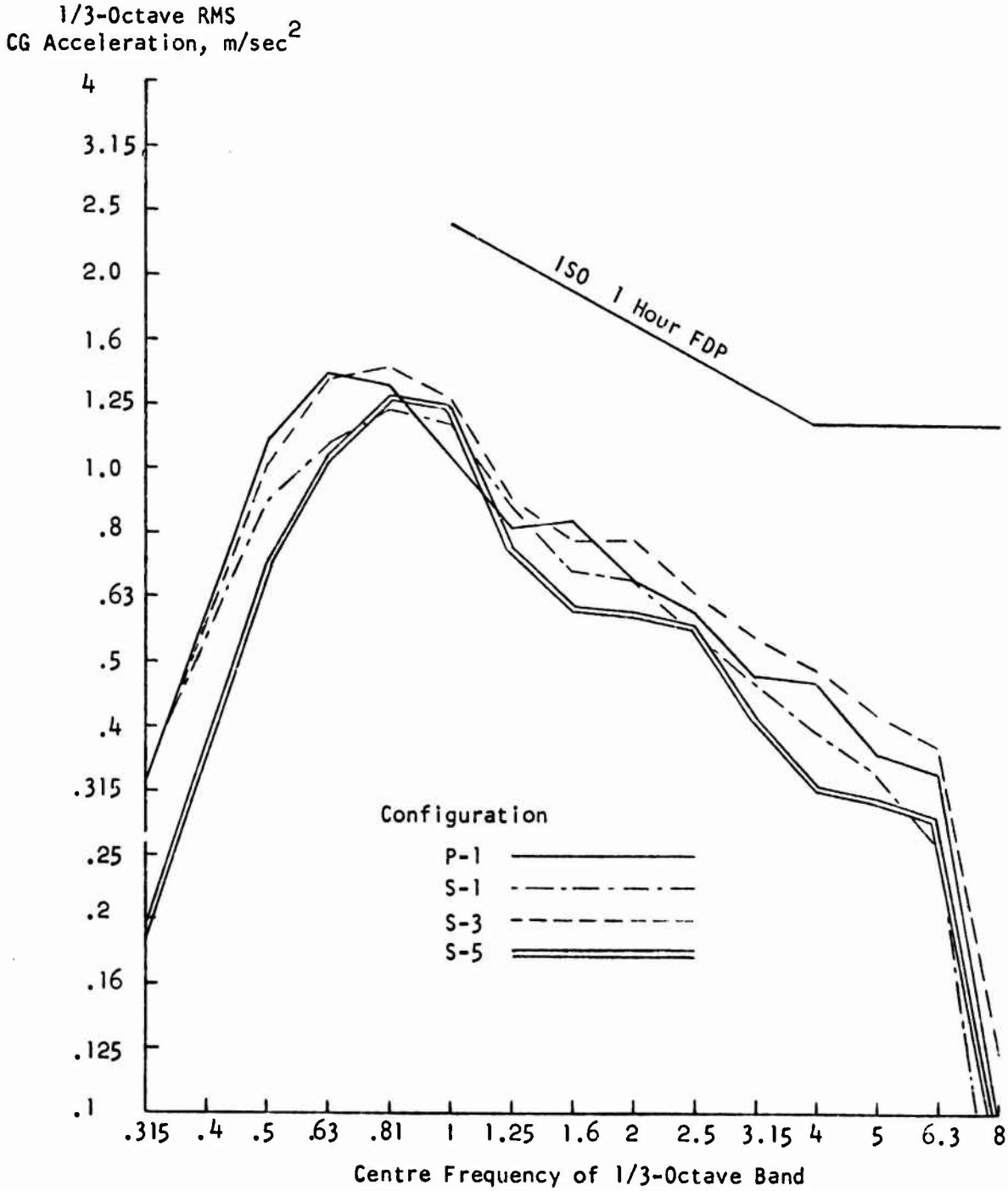
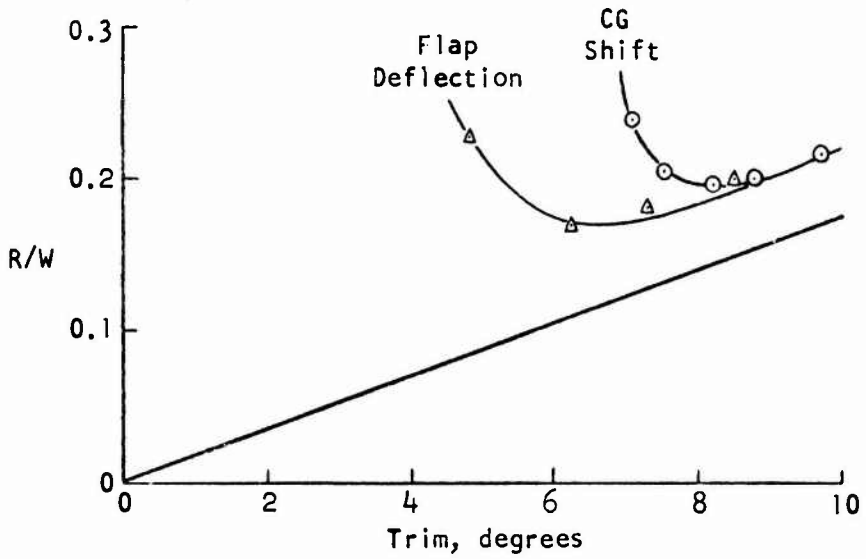
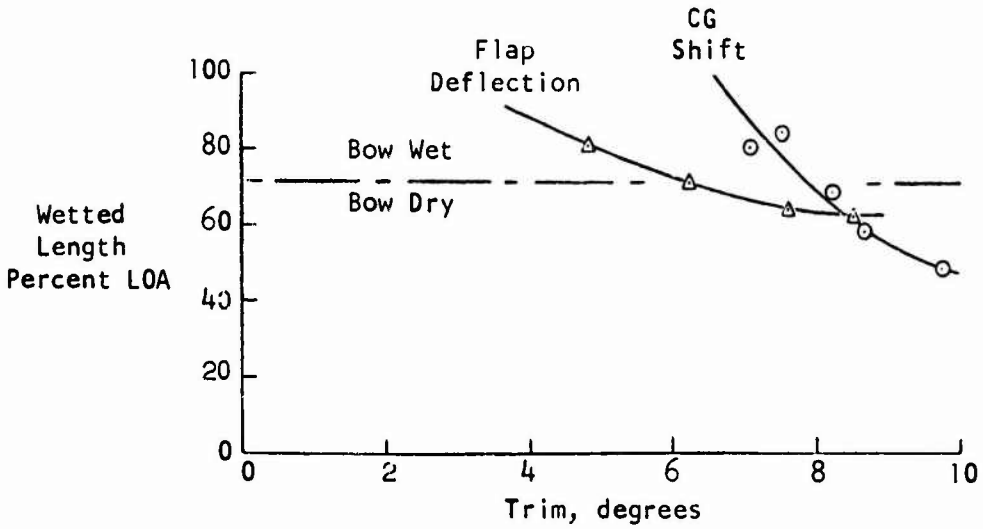


FIGURE 16. COMPARATIVE HABITABILITY CHARACTERISTICS AT 30 KNOTS, 55,000 LB, 2.2 FT SIGNIFICANT HEIGHT WAVES





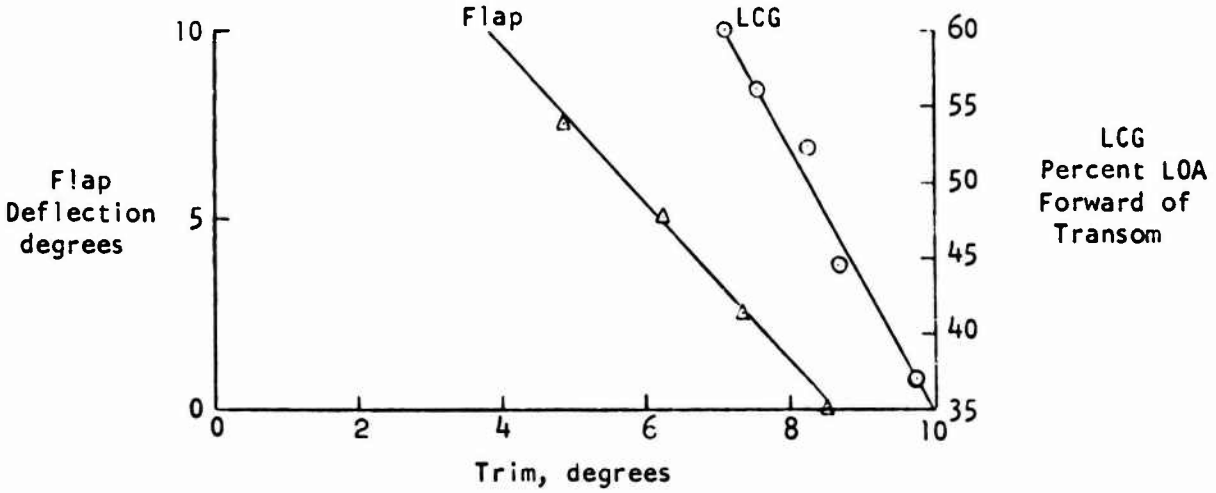
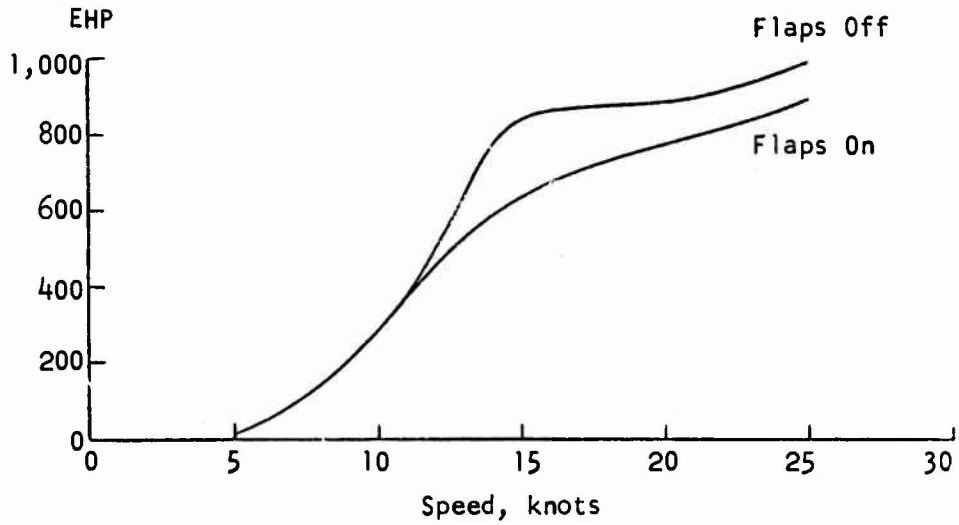


FIGURE 17. EFFECT OF FLAP DEFLECTION ON CALM WATER PERFORMANCE AT 30 KNOTS, 50,000 LB DISPLACEMENT



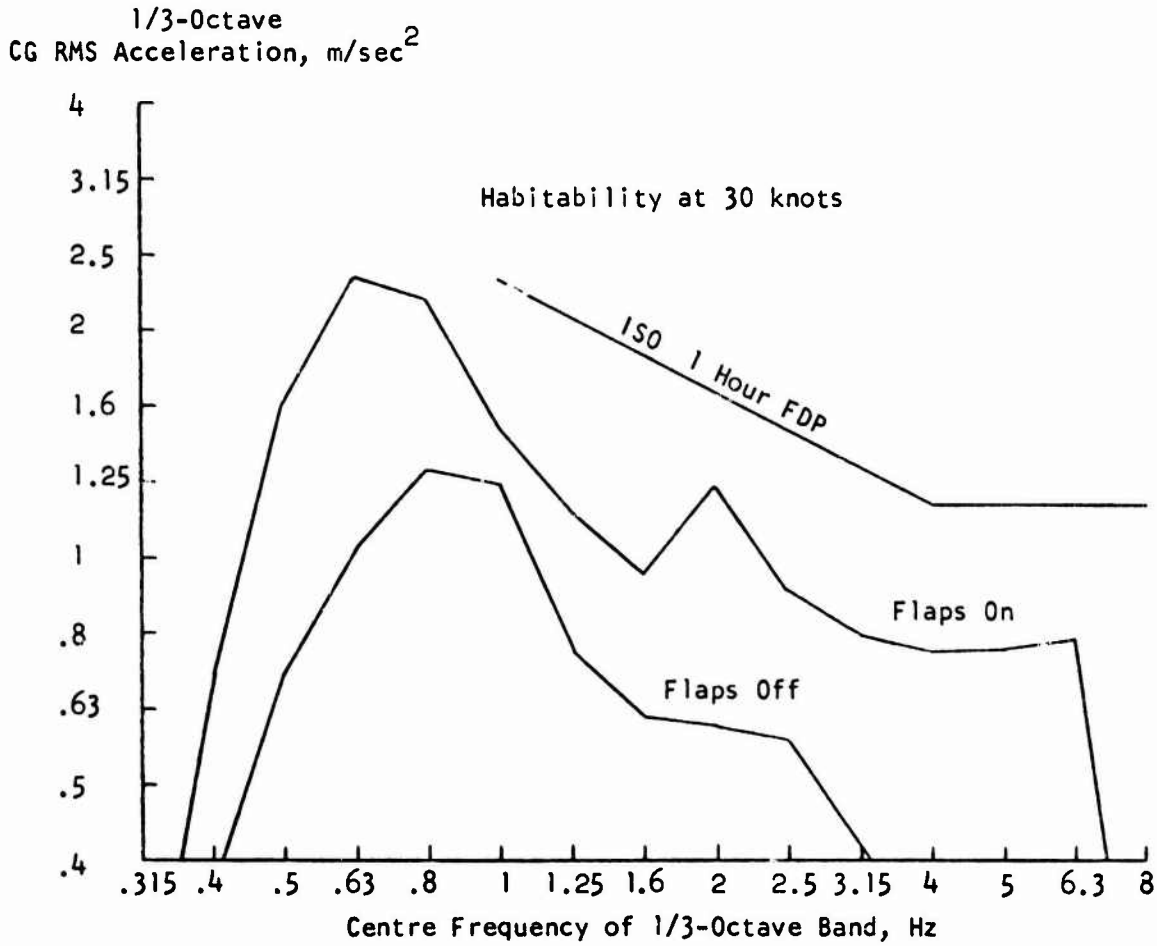
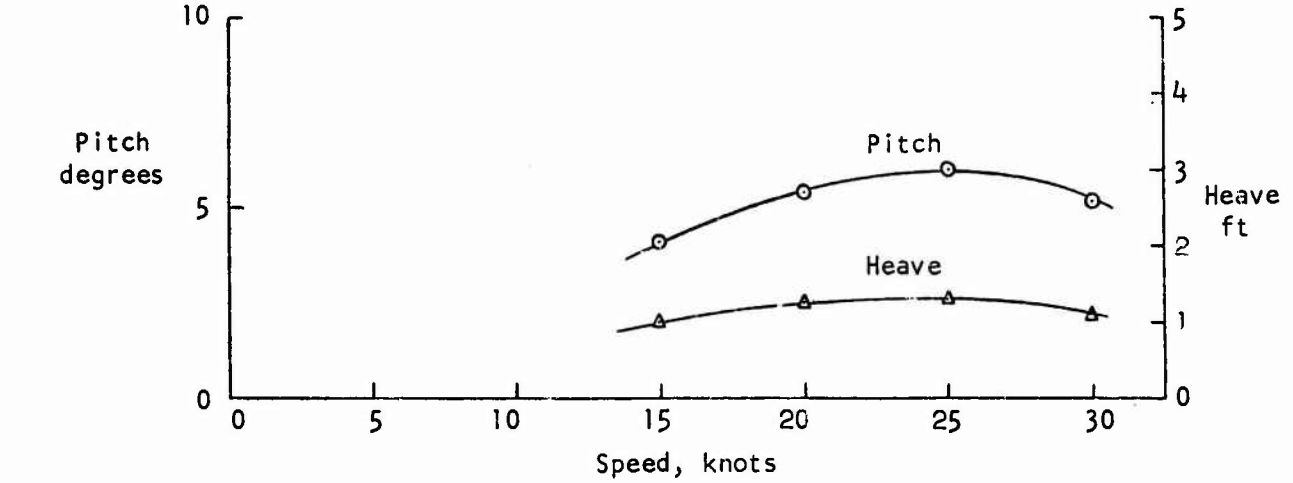


FIGURE 18. EFFECT OF CHINE FLAPS ON S-5 AT 55,000 LB IN 2.2 FT SIGNIFICANT HEIGHT WAVES



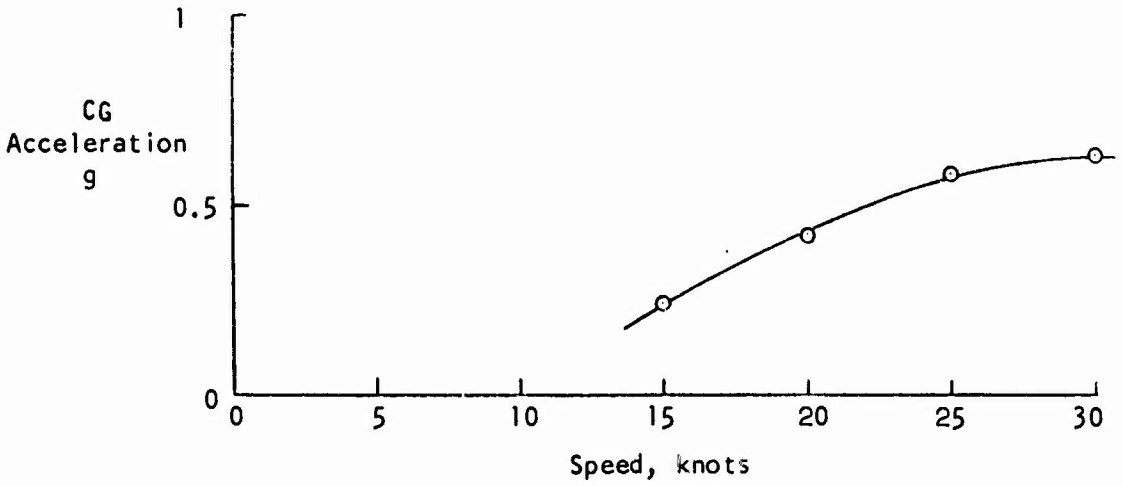


FIGURE 19. MOTION AND ACCELERATION AMPLITUDES IN REGULAR WAVES 1.8 FT HIGH BY 110 FT LONG. CONFIGURATION S-5 WITH 45 DEGREE CHINE FLAPS

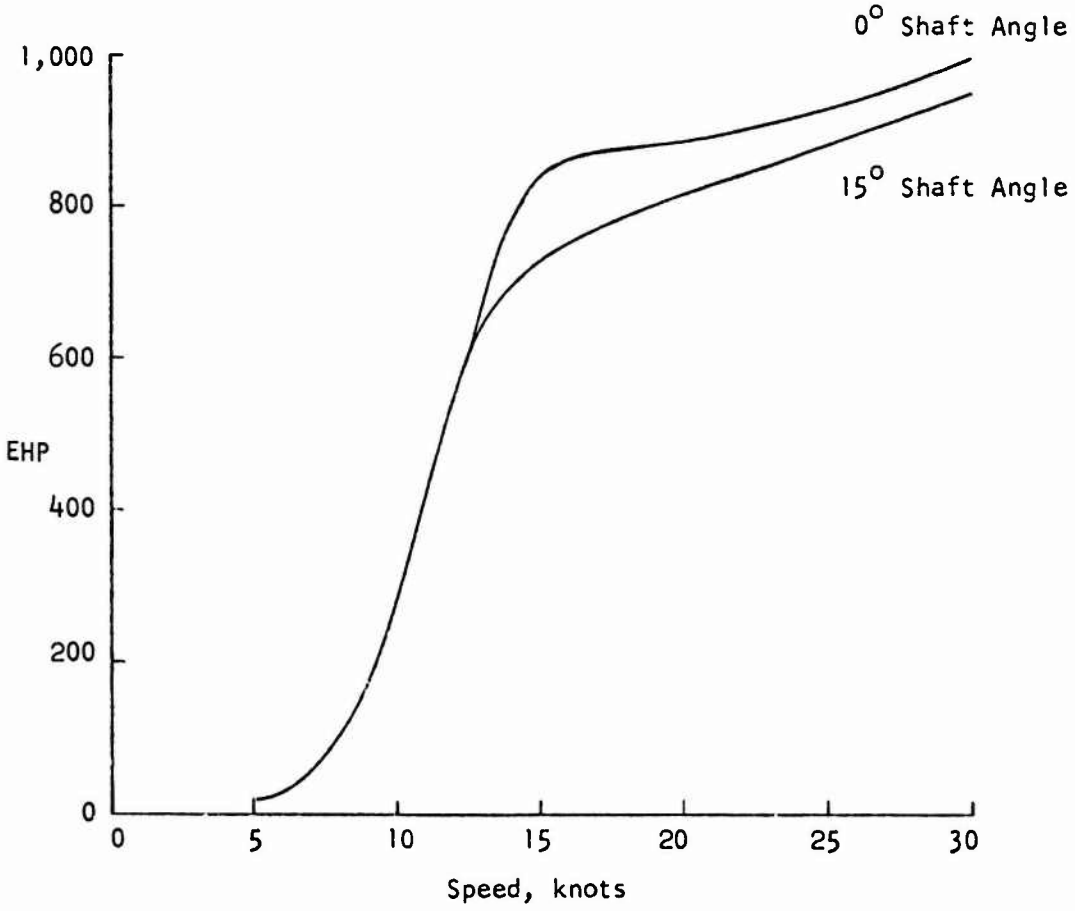


FIGURE 20. EFFECT OF THRUST AXIS INCLINATION TO KEEL, S-5, 55,000 LB, 2.2 FT SIGNIFICANT HEIGHT WAVES

APPENDIX A

EXPANSION OF MODEL RESISTANCE DATA TO FULL-SCALE

INTRODUCTION

The methods used to expand the model data are described in this appendix. Due to the exploratory nature of the test series and the different techniques used in the various phases, it was desirable to apply uniform expansion procedures and to provide for interpolation. The procedures used to expand the basic resistance data obtained with Configuration S-5, without chine flaps, with an LCG of 12.5 inches, are described, followed by the method of determining the drag increments of other configurations, (Tables 7 and 8).

The calm water model data is presented in Tables A1 to A4. The rough water resistance data is included in Table 9.

EXPANSION OF S-5 MODEL DATA

The total drag is made up of induced drag, friction drag, form or profile drag, and added resistance in waves:

$$R_T = R_i + R_f + R_p + R_{aw} \qquad (A1)$$

where

$R_i = \Delta \tan\tau$

$R_f = C_f \frac{1}{2} \rho V^2 S$

S = wetted area

Δ = load on water

τ = trim

It is assumed that the profile drag is a function of the load and trim. The added resistance in waves is assumed to be independent of load over the range investigated, and to be a function of trim. Thus the functional dependence of resistance at any one speed is assumed to be:

$$R_T = R_i(\Delta,\tau) + R_f(\Delta,\tau) + R_p(\Delta,\tau) + R_{aw}(\tau) \qquad (A2)$$

The friction drag coefficient depends on the wetted length, which is a function of load and trim, as is the wetted area. Hence the friction drag is a function of load and trim.

Calm Water Drag

The major drag component is the induced drag, cf. Figure 17, and it is therefore appropriate to re-arrange Equation (A1) in the form:

$$R_T - \Delta \tan\tau = R_f + R_p \qquad (A2)$$

The typical behavior of the quantity on the left-hand side of this equation is shown on Figure A1 for a speed of 14.64 fps (30 knots). At high trim the curves approach an asymptote that is independent of load. At low trim the drag increases sharply due to the increase in profile drag, which reflects the progressive immersion of the bow. At trims above the knee of the curve the friction drag component predominates. Since this drag is a function of the wetted length the same data is shown as a function of wetted length on Figure A2. (The quantity MWL is the mean distance of the leading edge of the wetted area forward of the transom.) In this presentation the parametric effect of load is collapsed.

It was found empirically for this hull that wetted length was related to the load, speed and trim by:

$$MWL/b = 134.75\sqrt{(C_{L_b}/\tau)} \qquad (A3)$$

where $C_{L_b} = \Delta/\frac{1}{2}\rho V^2 b^2$

b = beam

With the aid of this equation and Figure A2 it is possible to interpolate for the calm water resistance at arbitrary values of trim and load.

Added Resistance in Waves

The rough water tests were all made at a model displacement of 31 lb (55,000 lb full-scale). From the total resistance in waves the calm water drag was subtracted, to determine the added resistance in waves. The calm water drag was estimated, with the aid of Equation (A3) and graphs corresponding to Figure A2, at the observed mean trim in waves for a displacement of 31 lb.

A plot of the results obtained in shown on Figure A3. This added resistance is assumed to be independent of load in the model range of 25 lb to 34 lb. At a speed corresponding to 15 knots the S-5 showed no added resistance in waves.

The method described was used to estimate the total model resistance of Configuration S-5, without chine flaps, at model displacements corresponding to 45,000, 50,000, 55,000 and 60,000 lb, speeds corresponding to 15, 20, 25 and 30 knots, and for appropriate integral values of trim, to form the basis for Tables 3 to 6.

Resistance Expansion

The 1/12-scale model results were expanded from fresh water at 70°F (62.3 lb/cu.ft) to sea water at 59°F (64 lb/cu.ft). Denoting model quantities by suffix m and the full-scale ship values by suffix s, the following expression was used to obtain the full-scale results:

$$R_{T_s} = \left[R_{T_m} - (C_{f_m} - C_{f_s})\frac{1}{2}\rho_s V_m^2 S_m\right](\Delta_s/\Delta_m) \qquad (A4)$$

In determining the wetted area it was assumed that above 7.32 fps (15 knots) the flow detached from the break in the buttock lines, cf Figure 2. The skin friction coefficient was determined from the ATTC correlation line without roughness allowance. The Reynolds number was based

on the distance from the leading edge of the wetted area to the trailing edge of the flap.

At speeds corresponding to 15 knots and less the frictional drag accounts for only 3% of the total resistance. For these speeds, therefore, the simple expansion:

$$R_{T_s} = R_{T_m} (\Delta_s / \Delta_m) \tag{A5}$$

was used, with an error of the order of 1%.

The displacement ratio is:

$$\Delta_s / \Delta_m = 1775 \tag{A6}$$

DRAG INCREMENTS RELATIVE TO S-5

The method of determining the resistance increment relative to Configuration S-5 is best explained by an example. To find the increments for Configruation P-1 at 20 knots, for instance, the total model resistance in waves at 9.76 fps is plotted as shown in Figure A4. The corresponding smooth curve for S-5 is also shown. The increment in model resistance is then read off at trims of 12, 13, 14 and 15 degrees.

The increments determined in this manner are expanded to full scale and presented in Tables 7 and 8 using the equation:

$$\delta R_s = \delta R_m (\Delta_s / \Delta_m) \tag{A7}$$

By implication, therefore, it is assumed that the frictional drag component of all configurations is the same as that determined for Configuration S-5.

TABLE A1

SMOOTH WATER DATA FOR CONFIGURATION 2-1
WITHOUT CHINE FLAPS LCG = 12.5 IN.

RUN	SPEED FPS	LOAD LB	TRIM DEG	TRANSOM FLAP ANGLE DEG	DRAG LB	MWL IN
1	4.89	31.0	-0.20	0.0	1.76	23.0
11	4.89	28.2	2.42	0.0	4.09	25.0
17	4.89	33.8	2.45	0.0	4.68	25.0
42	7.30	28.3	15.20	15.0	9.79	20.5
41	7.30	30.6	16.00	15.0	11.30	20.5
2	7.22	30.8	18.30	0.0	12.88	20.0
16	7.30	24.4	20.10	0.0	9.87	19.0
12	7.30	22.6	21.30	0.0	9.87	17.5
10	7.30	25.6	22.00	0.0	11.97	
4	7.32	26.9	22.40	0.0	12.84	16.5
18	7.30	28.0	23.00	0.0	13.23	17.3
43	9.75	29.6	10.90	15.0	7.58	18.5
40	9.76	31.7	12.33	15.0	9.03	17.0
380	9.75	31.0	12.70	10.0	9.24	
39	9.76	31.8	13.54	12.5	9.57	17.0
381	9.75	31.0	13.70	7.5	9.41	
382	9.75	31.0	14.80	5.0	9.80	
13	9.75	26.1	16.00	0.0	8.42	14.0
7	9.76	27.8	17.20	0.0	9.82	15.5
5	9.73	27.0	17.50	0.0	10.03	15.5
19	9.76	30.5	18.50	0.0	11.53	14.5
44	12.20	30.2	7.50	12.5	5.99	17.5
166	12.19	31.0	7.80	12.5	7.35	
38	12.20	32.9	8.17	12.5	6.71	17.0
31	12.20	32.7	9.47	10.0	7.31	15.5
32	12.20	32.2	11.40	5.0	7.99	18.5
14	12.19	26.8	11.50	0.0	6.67	13.5
6	12.18	28.8	12.40	0.0	7.97	13.5
8	12.20	29.2	12.40	0.0	7.98	13.5
20	12.19	31.2	13.50	0.0	8.80	13.0

TABLE A1.2

WITHOUT CHINE FLAPS LCG = 12.5 IN.

RUN	SPEED FPS	LØAD LB	TRIM DEG	TRANSØM FLAP ANGLE DEG	DRAG LB	MWL IN
51	14.64	30.6	4.60	12.5	4.97	17.5
36	14.63	33.3	4.71	12.5	5.29	17.8
34	14.65	33.0	5.92	10.0	5.71	17.0
26	14.65	33.0	5.95	10.0	5.68	16.5
52	14.65	30.3	6.40	7.5	5.20	16.0
377	14.62	31.0	6.90	7.5	5.84	
24	14.65	33.1	7.00	7.5	6.10	14.5
25	14.65	33.2	6.99	7.5	6.04	15.8
378	14.62	31.0	7.40	5.0	6.06	
23	14.65	33.0	7.90	5.0	6.36	14.5
379	14.62	31.0	8.40	2.5	6.46	
15	14.62	27.4	8.50	0.0	5.59	13.0
22	14.65	32.8	8.80	2.5	6.75	13.3
9	14.64	30.0	9.20	0.0	6.71	P
21	14.65	32.6	9.90	0.0	7.21	P
46	17.08	30.7	2.30	12.5	6.24	20.0
45	17.08	30.7	2.40	12.5	7.20	20.5
37	17.08	33.5	2.89	12.5	6.25	20.3
27	17.08	33.5	3.75	10.0	5.03	17.5
50	17.08	30.7	3.70	10.0	4.58	16.5
47	17.08	30.4	4.10	7.5	4.55	15.5
49	17.08	30.5	5.20	5.0	4.85	14.5
28	17.08	33.3	5.64	5.0	5.46	15.0
35	17.08	33.2	5.67	5.0	5.53	15.0
48	19.52	30.8	2.80	7.5	4.58	17.0
30	19.50	33.6	3.14	7.5	4.96	16.5
53	19.52	30.7	4.00	5.0	5.80	P
29	19.50	33.4	4.13	5.0	5.00	14.0

NOTE: P indicates porpoising condition.

TABLE A1.3

WITHOUT CHINE FLAPS LCG = 12.7 IN.

RUN	SPEED FPS	LØAD LB	TRIM DEG	TRANSØM FLAP ANGLE DEG	DRAG LB	MWL IN
54	4.89	31.0	0.97	0.0	4.52	25.0
55	7.30	26.4	20.80	0.0	11.31	17.5
56	9.76	28.4	16.30	0.0	9.76	15.0
57	12.20	29.3	12.10	0.0	7.60	13.5
58	14.65	30.1	8.90	0.0	6.24	13.0
61	17.08	30.7	4.20	7.5	4.64	17.5
60	17.08	30.7	5.10	5.0	4.88	15.0
59	17.08	30.5	6.90	0.0	6.71	P

WITHOUT CHINE FLAPS LCG = 13.5 IN.

78	7.30	28.6	10.92	15.0	10.47	21.5
63	7.30	26.5	18.70	0.0	10.35	19.5
77	9.76	29.3	10.38	15.0	8.79	20.5
64	9.76	29.2	15.47	0.0	9.37	16.0
76	12.20	30.1	7.75	12.5	6.56	17.3
65	12.20	29.1	11.48	0.0	7.35	14.0
74	14.65	30.3	4.52	12.5	5.20	19.0
75	14.65	30.3	5.89	7.5	5.21	17.0
66	14.64	30.2	8.54	0.0	6.74	

NOTE: P indicates porpoising condition.

TABLE A1.4

WITHOUT CHINE FLAPS LCG = 13.5 IN.

RUN	SPEED FPS	LOAD LB	TRIM DEG	TRANSOM FLAP ANGLE DEG	DRAG LB	MWL IN	
71	17.08	30.8	2.48	12.5	11.94	23.0	
70	17.08	30.7	3.32	10.0	5.18	18.8	
69	17.08	30.7	4.12	7.5	5.06	18.5	
68	17.08	30.5	4.92	5.0	4.97	17.0	
72	19.52	30.8	2.76	7.5	4.77	17.5	
73	19.50	30.7	3.66	5.0	4.74	16.0	

WITHOUT CHINE FLAPS LCG = 10.5 IN.

347	9.75	31.0	13.70	15.0	9.82	
348	9.75	31.0	14.80	12.5	10.23	
349	9.75	31.0	15.90	10.0	10.67	
336	9.75	31.0	20.40	5.0	23.37	
335	9.75	31.0		5.0	11.98	
376	14.62	31.0	6.20	10.0	5.93	
375	14.62	31.0	7.40	7.5	6.30	P
374	14.62	31.0		5.0		P

NOTE: P indicates porpoising condition.

TABLE A1.5

WITH CHINE FLAPS LCG = 12.5 IN.

RUN	SPEED FPS	LØAD LB	TRIM DEG	TRANSØM FLAP ANGLE DEG	DRAG LB	MWL IN
196	7.30	31.0	8.00	15.0	11.09	
88	7.30	29.7	12.79	15.0	8.66	18.0
198	7.30	31.0	16.10	0.0	10.87	
79	7.30	27.6	18.44	0.0	10.57	18.5
195	9.75	31.0	7.30	15.0	6.56	
89	9.75	30.4	7.49	15.0	5.92	20.0
194	9.75	31.0	11.70	0.0	8.14	
80	9.76	29.0	12.17	0.0	7.38	12.5
90	12.20	30.7	4.44	12.5	4.60	17.5
190	12.19	31.0	4.50	12.5	4.92	
192	12.19	31.0	7.70	0.0	6.04	
82	12.20	30.4	7.98	0.0	5.65	12.8
92	14.65	30.9	2.06	12.5	4.06	18.0
188	14.63	31.0	2.30	12.5	5.09	
186	14.63	31.0	3.40	7.5	4.38	
91	14.65	30.7	3.43	7.5	4.12	14.8
184	14.63	31.0	4.10	5.0	4.60	
93	14.65	30.7	4.11	5.0	4.24	18.0
84	14.65	30.6	4.74	2.5	4.41	13.5
83	14.64	30.6	5.46	0.0	4.73	P
87	17.08	30.9	1.98	7.5	4.10	16.0
178	17.06	31.0	2.10	7.5	4.32	
86	17.08	30.8	2.66	5.0	4.06	P
180	17.06	31.0	2.80	5.0	4.30	
94	19.50	30.9	1.11	7.5	4.48	16.5
179	19.49	31.0	1.30	7.5	4.95	
95	19.52	30.8	1.78	5.0	4.29	14.3
181	19.49	31.0	1.90	5.0	4.55	

NOTE: P indicates porpoising condition.

TABLE A2

SMOOTH WATER DATA FOR CONFIGURATION S-1
WITHOUT CHINE FLAPS LCG = 12.5 IN.

RUN	SPEED FPS	LØAD LB	TRIM DEG	TRANSØM FLAP ANGLE DEG	DRAG LB	MWL IN
96	4.90	30.9	4.37	0.0	3.53	23.5
110	7.30	27.8	13.59	15.0	9.39	20.5
97	7.30	24.8	21.27	0.0	10.41	15.0
111	9.76	30.0	10.21	15.0	7.50	20.0
118	9.76	29.5	11.18	12.5	7.47	18.5
391	9.75	31.0	12.50	10.0	9.21	
389	9.75	31.0	13.40	7.5	8.82	
390	9.75	31.0	14.60	5.0	9.35	
98	9.76	29.3	16.76	0.0	9.43	16.5
112	12.19	30.1	6.65	12.5	5.77	20.0
116	12.19	30.1	7.90	10.0	5.97	17.8
99	12.19	29.2	11.87	0.0	6.88	13.8
117	14.65	30.4	4.71	10.0	5.02	20.0
101	14.64	30.5	5.57	7.5	4.81	17.5
388	14.62	31.0	6.00	7.5	5.42	
386	14.62	31.0	7.00	5.0	5.39	
387	14.62	31.0	7.90	2.5	5.77	
102	17.08	30.8	3.50	7.5	4.50	19.5
105	17.08	30.5	4.46	5.0	4.45	17.0
106	17.08	30.5	5.37	2.5	4.65	15.0
108	19.52	30.8	3.17	5.0	4.61	
107	19.50	30.7	4.06	2.5	4.61	15.5

TABLE A2.2

WITH CHINE FLAPS LCG = 12.5 IN.

RUN	SPEED FPS	LØAD LB	TRIM DEG	TRANSØM FLAP ANGLE DEG	DRAG LB	MWL IN
138	7.30	29.9	12.30	15.0	8.01	19.5
133	7.30	29.8	12.88	15.0	8.26	19.0
119	7.30	27.6	13.96	2.5	7.56	18.0
120	7.30	27.6	14.81	0.0	7.93	
139	7.30	29.0	17.36	0.0	9.96	16.5
134	9.76	29.9	6.87	15.0	5.36	17.5
121	9.75	31.0	10.95	0.0	6.35	15.0
136	12.19	30.8	3.98	12.5	4.39	18.8
122	12.20	31.3	7.37	0.0	4.96	
128	14.64	30.8	3.05	7.5	4.00	17.0
129	14.64	30.7	3.72	5.0	3.99	15.0
130	14.65	30.7	4.35	2.5	4.08	14.0
123	14.64	31.7	5.00	0.0	4.11	13.5
127	17.08	30.8	1.74	7.5	4.30	18.8
125	17.08	30.8	2.40	5.0	3.96	16.5
126	17.08	30.8	3.00	2.5	3.94	14.2
132	19.52	30.9	1.53	5.0	4.53	17.5
131	19.52	30.8	2.11	2.5	4.25	15.0

WITH CHINE FLAPS AND FULL SPAN TRANSOM FLAP

LCG = 12.5 IN.

237	7.30	30.7	6.90	5.0	9.68	
238	7.30	29.6	10.40	5.0	7.21	21.0
241	7.30	29.3	11.50	2.5	7.22	20.0
240	7.30	28.4	12.50	2.5	7.46	
242	9.75	30.4	8.00	2.5	5.54	17.0

TABLE A3

SMOOTH WATER DATA FOR CONFIGURATION S-3
WITHOUT CHINE FLAPS BOW RAMP EXTENDED
LCG = 12.5 IN.

RUN	SPEED FPS	LØAD LB	TRIM DEG	TRANSØM FLAP ANGLE DEG	DRAG LB
415	9.75	31.0	12.20	10.0	8.16
413	9.75	31.0	13.30	7.5	8.37
414	9.75	31.0	14.50	5.0	8.89
412	14.63	31.0	6.10	7.5	5.02
411	14.63	31.0	7.10	5.0	5.18
410	14.63	31.0	8.00	2.5	5.52

WITHOUT CHINE FLAPS BOW RAMP RETRACTED
LCG = 12.5 IN.

450	7.31	31.0	11.80	10.0	11.49
448	7.31	31.0	14.30	5.0	11.78
449	7.31	31.0	17.90	0.0	12.53
447	17.06	31.0	5.50	5.0	4.52

TABLE A3.2

WITH CHINE FLAPS BOW RAMP EXTENDED LCG = 12.5 IN.

RUN	SPEED FPS	LØAD LB	TRIM DEG	TRANSØM FLAP ANGLE DEG	CHINE FLAP ANGLE DEG	DRAG LB
500	7.31	31.0	14.70	10.0	10.0	9.63
497	7.31	31.0	14.90	7.5	15.0	9.87
469	7.31	31.0	15.60	7.5	10.0	9.98
468	7.31	31.0	15.70	7.5	5.0	9.98
466	7.31	31.0	16.40	7.5	0.0	10.27
462	9.75	31.0	8.40	7.5	10.0	5.96
463	9.75	31.0	9.30	7.5	5.0	6.22
467	9.75	31.0	10.40	7.5	0.0	6.73
461	14.62	31.0	1.60	7.5	10.0	11.29
460	14.62	31.0	2.60	7.5	5.0	3.79
459	14.62	31.0	3.70	7.5	0.0	4.04
493	14.62	31.0	4.00	7.5	-5.0	3.98
458	14.62	31.0		2.5	0.0	

TABLE A4

SMOOTH WATER DATA FOR CONFIGURATION S-5

WITHOUT CHINE FLAPS LCG = 12.5 IN.

RUN	SPEED FPS	LOAD LB	TRIM DEG	TRANSOM FLAP ANGLE DEG	DRAG LB	MWL IN	Z* IN
267	4.88	25.0	1.39	2.5	3.52	28.0	3.78
409	7.32	25.0	2.64	10.0	9.27	27.9	3.62
405	7.31	25.0	5.07	7.5	8.91	27.5	3.91
404	7.32	25.0	7.09	5.0	9.22	27.1	4.28
268	7.32	25.0	8.45	2.5	8.95	26.2	4.56
399	7.32	25.0	8.53	2.5	9.05	26.1	4.53
398	7.31	25.0	8.55	2.5	9.10	26.2	4.53
414	7.31	25.0	10.47	0.0	9.06	26.0	4.83
410	7.31	28.0	3.52	10.0	10.54	28.0	4.10
407	7.32	28.0	5.69	7.5	10.32	27.7	4.41
406	7.32	28.0	5.70	7.5	10.42	27.6	4.42
403	7.31	28.0	7.93	5.0	10.53	27.0	4.75
400	7.31	28.0	9.47	2.5	10.57	26.3	5.01
413	7.32	28.0	11.28	0.0	10.63	25.7	5.32
411	7.32	31.0	4.41	10.0	12.04	28.0	4.64
408	7.32	31.0	6.42	7.5	11.68	27.8	4.88
402	7.32	31.0	8.76	5.0	11.97	27.3	5.25
401	7.32	31.0	10.33	2.5	12.12	26.5	5.51
412	7.32	31.0	12.19	0.0	12.20	25.5	5.79
391	9.76	25.0	7.46	7.5	8.68	24.6	3.27
392	9.76	25.0	9.88	5.0	6.55	22.7	3.35
269	9.76	25.0	11.39	2.5	6.11	20.9	3.47
397	9.76	25.0	11.44	2.5	6.11	20.8	3.45
390	9.76	28.0	8.86	7.5	9.64	24.4	3.62
393	9.76	28.0	11.06	5.0	7.67	22.6	3.68
396	9.76	28.0	12.63	2.5	7.49	21.0	3.80
389	9.76	31.0	10.09	7.5	10.71	24.7	4.00
394	9.76	31.0	12.33	5.0	9.11	22.4	4.06
395	9.76	31.0	13.74	2.5	8.89	21.6	4.19

*Note: Z is the transom draft defined as the immersion, relative to still water level, of a point formed by the intersection of the aft perpendicular with the base line.

TABLE A4.2

WITHOUT CHINE FLAPS LCG = 12.5 IN.

RUN	SPEED FPS	LØAD LB	TRIM DEG	TRANSOM FLAP ANGLE DEG	DRAG LB	MWL IN	Z IN
386	12.19	25.0	6.05	7.5	6.20	22.8	1.98
385	12.19	25.0	7.74	5.0	4.67	20.4	2.09
270	12.20	25.0	8.83	2.5	4.98	19.1	2.22
378	12.20	25.0	9.34	2.5	5.20	18.8	2.24
377	12.20	25.0	10.27	0.0	5.55	17.7	2.31
387	12.19	28.0	7.06	7.5	6.55	22.6	2.20
383	12.20	28.0	8.72	5.0	5.62	19.9	2.32
379	12.20	28.0	10.42	2.5	6.24	18.9	2.45
382	12.20	28.0	10.85	5.0	6.39	18.3	2.50
376	12.20	28.0	11.23	0.0	6.66	17.8	2.57
388	12.19	31.0	8.08	7.5	7.15	22.4	2.44
384	12.19	31.0	9.64	5.0	6.64	20.2	2.52
380	12.20	31.0	11.13	2.5	7.21	18.6	2.66
381	12.20	31.0	11.79	5.0	7.57	18.2	2.73
375	12.20	31.0	12.09	0.0	7.74	18.1	2.77
271	14.65	25.0	6.58	2.5	4.28	18.3	1.57
369	14.65	25.2	4.08	7.5	6.62	23.2	1.43
368	14.65	25.2	5.56	5.0	4.17	19.8	1.49
363	14.65	25.2	6.59	2.5	4.37	18.1	1.56
361	14.64	25.2	7.79	0.0	4.80	16.2	1.63
362	14.64	25.2	7.82	0.0	4.82	16.5	1.64
370	14.65	28.2	4.85	7.5	6.43	22.6	1.57
367	14.65	28.2	6.24	5.0	4.81	19.8	1.65
364	14.65	28.2	7.32	2.5	5.11	17.9	1.70
360	14.64	28.2	8.52	0.0	5.63	17.3	1.80
371	14.65	31.2	5.64	7.5	6.32	22.0	1.70
366	14.65	31.2	6.93	5.0	5.58	19.7	1.78
365	14.65	31.2	8.01	2.5	5.93	17.8	1.89
359	14.64	31.2	9.17	0.0	6.43	17.0	1.96

TABLE A4.3

WITHOUT CHINE FLAPS TRANSOM FLAP DEFLECTION = 0 DEGREES

RUN	SPEED FPS	LØAD LB	TRIM DEG	TRIM MØMENT IN-LB	DRAG LB	MWL IN	Z IN
262	4.88	25.0	1.93	0.0	3.47	28.0	4.07
272	4.88	25.0	5.31	14.9	3.94	27.9	4.49
280	4.88	25.0	7.37	29.8	4.11	27.5	4.77
282	4.88	25.0	12.21	58.6	4.90	25.5	5.48
251	4.88	28.0	2.30	0.0	3.69	28.0	2.95
273	4.88	28.0	5.16	14.9	4.00	27.9	4.77
277	4.88	28.0	7.46	29.7	4.26	27.8	5.14
285	4.88	28.0	12.26	58.6	5.27	26.1	5.86
256	4.88	31.0	2.44	0.0	3.92	28.0	4.70
274	4.88	31.0	5.34	14.9	4.18	28.0	5.14
275	4.88	31.0	7.73	29.7	4.48	28.0	5.52
288	4.88	31.0	12.35	58.6	5.52	26.4	6.24
304	7.32	25.0	6.74	-29.8	9.58	27.8	4.61
263	7.32	25.0	12.34	0.0	8.77	25.4	5.14
281	7.32	25.0	14.70	29.0	8.31		5.03
283	7.32	25.0	18.18	57.0	9.03	20.8	5.22
306	7.31	28.0	7.08	-29.8	11.23	27.9	5.13
252	7.31	28.0	12.86	0.0	10.29	25.4	
279	7.32	28.0	15.32	28.9	10.02	23.8	5.52
286	7.32	28.0	19.06	56.7	10.68	22.3	5.72
335	7.32	31.0	8.29	-29.7	12.40	27.8	5.63
372	7.31	31.0	12.02	0.0	12.12	26.1	5.80
334	7.32	31.0	12.43	0.0	12.22	25.9	5.88
373	7.32	31.0	14.08	14.5	11.95	25.4	5.95
374	7.32	31.0	16.41	28.8	11.98	24.2	6.09
276	7.32	31.0	16.82	28.7	12.16	23.6	6.17
290	7.32	31.0	20.19	56.3	12.75	22.3	6.28
333	7.31	33.0	11.07	-29.4	13.26	26.8	6.08

TABLE A4.4

WITHOUT CHINE FLAPS TRANSOM FLAP DEFLECTION = 0 DEGREES

RUN	SPEED FPS	LØAD LB	TRIM DEG	TRIM MØMENT IN-LB	DRAG LB	MWL IN	Δ IN
316	9.76	25.0	9.62	-59.2	10.65	25.3	4.27
305	9.76	25.0	11.82	-29.4	6.65	22.3	3.77
264	9.76	25.0	14.58	0.0	7.24	18.9	3.85
284	9.76	25.0	15.79	57.7	7.88	16.7	3.49
313	9.76	28.0	11.05	-58.9	11.04	24.9	4.58
307	9.76	28.0	13.07	-29.2	8.03	21.9	4.16
253	9.76	28.0	15.50	0.0	8.53	19.4	4.22
287	9.76	28.0	16.89	57.4	9.36	18.1	3.90
309	9.76	31.0	13.09	-58.4	11.83	24.5	4.90
308	9.76	31.0	14.27	-29.1	9.58	22.2	4.56
259	9.76	31.0	17.52	0.0	10.66	19.6	4.74
291	9.76	31.0	18.00	57.1	10.98	17.9	4.33
324	12.20	25.0	8.19	-89.1	8.82	20.9	2.92
317	12.20	25.0	9.53	-59.2	5.53	21.0	2.69
265	12.20	25.0	10.69	0.0	5.73	17.7	2.37
298	12.20	25.0	12.11	58.7	6.32	14.0	2.05
296	12.20	25.0	13.57	87.5	6.75	P	1.87
326	12.20	28.0	9.25	-88.8	9.22	21.6	3.11
314	12.20	28.0	10.22	-59.0	6.16	26.3	2.85
254	12.20	28.0	11.83	0.0	6.89	18.2	2.62
295	12.20	28.0	13.84	87.4	7.83	13.7	2.14
320	12.20	29.0	9.64	-88.7	8.93	23.0	3.15
328	12.20	31.0	10.25	-88.6	9.69	21.3	3.34
310	12.20	31.0	11.27	-58.8	7.82	21.1	3.10
260	12.20	31.0	13.46	0.0	8.63	17.8	2.93
293	12.20	31.0	14.56	87.1	9.16	14.2	2.43

NOTE: P indicates porpoising condition.

TABLE A4.5

WITHOUT CHINE FLAPS TRANSOM FLAP DEFLECTION = 0 DEGREES

RUN	SPEED FPS	LØAD LB	TRIM DEG	TRIM MØMENT IN-LB	DRAG LB	MWL IN	Δ IN
339	14.65	25.0	6.32	-119.3	7.05	22.8	2.13
325	14.65	25.0	6.84	-89.4	5.31	23.9	2.07
318	14.65	25.0	7.47	-59.5	4.72	19.7	1.95
266	14.65	25.0	7.83	0.0	4.71	16.2	1.66
303	14.65	25.0	8.58	29.7	5.01	14.8	1.56
302	14.65	25.0	10.32	44.3	5.96	P	1.41
299	14.65	25.0	11.15	58.9	5.78	P	1.21
337	14.65	28.0	7.07	-119.1	6.88		2.25
338	14.65	28.0	7.07	-119.1	6.90	22.5	2.27
327	14.65	28.0	7.55	-89.2	5.74	23.5	2.21
315	14.65	28.0	8.22	-59.4	5.51	19.2	2.11
255	14.65	28.0	8.66	0.0	5.59	16.3	1.84
301	14.65	28.0	9.75	59.1	6.08	13.5	1.62
321	14.65	29.0	7.75	-89.2	5.89		2.25
336	14.65	31.0	7.79	-118.9	6.96	22.2	2.37
329	14.65	31.0	8.12	-89.1	6.06	22.8	2.27
330	14.65	31.0	8.12	-89.1	6.11	20.8	2.27
332	14.65	31.0	8.57	-59.3	6.25	19.6	2.21
311	14.65	31.0	9.01	-59.3	6.84	19.3	2.30
261	14.65	31.0	9.39	0.0	6.57	17.1	2.03
300	14.65	31.0	10.48	59.0	7.00	13.3	1.81
294	14.65	31.0	12.41	87.9	8.54	P	1.56
322	14.65	32.0	8.46	-89.0	6.65	21.5	2.41

NOTE: P indicates porpoising condition.

TABLE A4.6

WITH 45 DEGREE CHINE FLAPS TRANSOM FLAP DEFLECTION = 2.5 DEGREES

RUN	SPEED FPS	LØAD LB	TRIM DEG	TRIM MØMENT IN-LB	DRAG LB	MWL IN	Z IN
149	0.00	25.0	-3.89	-44.9	0.00		1.76
148	0.00	25.0	-2.52	-30.0	0.00		2.10
145	0.00	25.0	-1.12	-15.0	0.30		2.41
131	0.00	25.0	0.05	0.0	0.11		2.65
137	0.00	25.0	1.94	15.0	-0.01		3.12
133	0.00	25.0	3.58	29.9	-0.02		3.45
135	0.00	25.0	5.33	44.8	0.00		3.88
142	0.00	25.0	7.16	59.5	-0.03		4.27
169	0.00	25.0	10.16	81.2	0.00		4.87
174	0.00	25.0	12.26	95.3	-0.05		5.28
213	0.00	28.0	-6.12	-74.6	0.03		1.47
212	0.00	28.0	-4.98	-59.8	0.02		1.77
203	0.00	28.0	-2.16	-30.0	-0.06		2.45
206	0.00	28.0	-0.71	-15.0	-0.38		2.79
118	0.00	28.0	0.60	0.0	-0.03		3.13
196	0.00	28.0	2.21	15.0	0.32		3.51
177	0.00	28.0	3.79	29.9	-0.02		3.80
187	0.00	28.0	5.45	44.8	-0.05		4.21
185	0.00	28.0	7.16	59.5	-0.04		4.62
193	0.00	28.0	12.27	97.7	0.21		5.62
218	0.00	28.0	15.12	115.8	0.07		6.14
239	0.00	31.0	-4.45	-59.8	0.01		2.23
238	0.00	31.0	-1.82	-30.0	0.00		2.86
110	0.00	31.0	0.84	0.0	0.11		3.46
219	0.00	31.0	3.98	29.9	0.12		4.18
224	0.00	31.0	4.09	29.9	0.00		4.27
234	0.00	31.0	5.58	44.8	0.14		4.57
225	0.00	31.0	7.24	59.5	-0.01		4.93

TABLE A4.7

WITH 45 DEGREE CHINE FLAPS TRANSOM FLAP DEFLECTION = 2.5 DEGREES

RUN	SPEED FPS	LØAD LB	TRIM DEG	TRIM MØMENT IN-LB	DRAG LB	MWL IN	Z IN
124	4.85	25.0	0.45	0.0	3.62	28.0	3.50
132	4.86	25.0	6.56	29.8	4.09	26.5	4.35
134	4.86	25.0	9.15	44.4	4.45	25.9	4.67
111	4.83	28.0	0.50	0.0	3.89		3.77
119	4.83	28.0	0.70	0.0	3.67	28.0	3.80
198	4.82	28.0	3.98	15.0	3.96	28.0	4.32
194	4.81	28.0	4.02	15.0	4.21	28.0	4.31
175	4.85	28.0	6.84	29.8	4.48	27.3	4.69
178	4.83	28.0	11.71	58.8	5.23	25.4	5.36
103	4.75	31.0	0.28	0.0	3.63	28.0	3.87
220	4.88	31.0	7.24	29.8	4.97	27.3	5.08
226	4.87	31.0	12.00	58.7	6.15	25.9	5.77
163	7.35	25.0	6.49	-14.9	8.32	26.1	3.84
125	7.37	25.0	8.96	0.0	7.83	24.9	4.06
136	7.37	25.0	11.25	14.7	7.25	23.4	4.12
139	7.38	25.0	13.22	29.2	7.05	21.8	4.20
140	7.38	25.0	14.76	43.5	7.39	20.6	4.27
141	7.38	25.0	16.09	57.6	7.93	19.7	4.37
164	7.35	25.0	16.11	57.6	8.05	19.6	4.41
165	7.35	25.0	18.16	78.4	9.02	18.6	4.50
199	7.37	28.0	5.32	-29.9	9.64	27.1	4.12
204	7.32	28.0	7.64	-14.9	9.47	26.3	4.30
112	7.35	28.0	10.02	0.0	9.11		4.51
120	7.35	28.0	10.09	0.0	8.97	24.7	4.55
195	7.34	28.0	11.94	14.7	9.18	24.3	4.59
197	7.34	28.0	11.98	14.7	8.87	24.0	4.59
176	7.38	28.0	14.12	29.1	8.74	22.6	4.68
179	7.35	28.0	16.95	57.4	9.41	20.0	4.84
250	7.34	31.0	6.27	-29.8	10.99	27.5	4.61
104	7.25	31.0	10.74	0.0	10.46	25.2	4.96
221	7.34	31.0	14.95	29.0	10.46	23.3	5.15
227	7.32	31.0	17.94	57.1	11.16	21.5	5.36

TABLE A4.8

WITH 45 DEGREE CHINE FLAPS TRANSOM FLAP DEFLECTION = 2.5 DEGREES

RUN	SPEED FPS	LØAD LB	TRIM DEG	TRIM MØMENT IN-LB	DRAG LB	MWL IN	Δ IN
150	9.75	25.0	6.47	-44.7	9.84	25.2	3.28
147	9.76	25.0	8.28	-29.7	7.08	23.1	3.08
144	9.77	25.0	9.45	-14.8	6.04	21.7	2.99
126	9.77	25.0	10.40	0.0	5.64	20.4	3.06
138	9.78	25.0	11.54	29.4	6.02	18.5	2.91
155	9.76	25.0	12.99	58.5	6.72	16.5	2.87
166	9.75	25.0	14.20	80.0	7.25	15.4	2.81
173	9.78	25.0	14.97	94.2	7.51	14.3	2.75
207	9.76	28.0	6.64	-59.6	12.09	25.9	3.71
200	9.77	28.0	9.58	-29.6	7.78	22.9	3.39
205	9.74	28.0	10.57	-14.7	6.75	21.8	3.30
113	9.74	28.0	11.51	0.0	6.54	20.6	3.36
180	9.75	28.0	14.05	58.2	8.03	16.6	3.23
188	9.75	28.0	16.10	96.1	8.87	15.4	3.15
190	9.74	28.0	16.12	96.1	9.10	14.7	3.16
189	9.74	28.0	16.25	96.0	9.35	14.8	3.17
240	9.75	31.0	9.75	-59.1	13.15	25.1	4.33
237	9.76	31.0	10.82	-29.5	8.89	22.8	3.77
105	9.74	31.0	12.67	0.0	7.86	20.7	3.68
222	9.75	31.0	13.75	29.1	8.65	19.2	3.62
228	9.75	31.0	15.08	57.9	9.39	17.0	3.59
151	12.21	25.0	6.55	-44.7	5.70	22.2	2.01
146	12.22	25.0	7.45	-14.9	4.97	19.6	1.92
127	12.22	25.0	7.82	0.0	4.81	18.0	1.96
159	12.20	25.0	8.61	29.7	5.04	16.7	1.82
156	12.22	25.0	9.36	59.2	5.28	14.9	1.69
167	12.21	25.0	10.07	81.2	5.58	13.8	1.62
172	12.24	25.0	10.52	95.9	5.67	12.8	1.56

TABLE A4.9

WITH 45 DEGREE CHINE FLAPS TRANSOM FLAP DEFLECTION = 2.5 DEGREES

RUN	SPEED FPS	LØAD LB	TRIM DEG	TRIM MØMENT IN-LB	DRAG LB	MWL IN	Z IN
208	12.18	28.0	6.98	-59.6	7.68	22.8	2.34
201	12.22	28.0	7.86	-29.7	5.35	20.7	2.16
114	12.19	28.0	8.75	0.0	5.46	18.7	2.18
181	12.22	28.0	10.18	59.1	6.26	15.6	1.93
191	12.20	28.0	11.40	98.0	6.90	13.6	1.76
217	12.17	28.0	12.51	117.2	7.53	P	1.79
242	12.20	31.0	7.98	-59.4	7.50	22.5	2.45
246	12.20	31.0	8.81	-29.6	6.32	20.7	2.37
122	12.17	31.0	9.72	0.0	6.48	18.7	2.39
106	12.18	31.0	9.79	0.0	6.55		2.34
223	12.18	31.0	10.31	29.5	6.99	17.8	2.24
229	12.18	31.0	11.01	58.9	7.32	15.9	2.14
152	14.65	25.0	5.13	-44.8	4.54	20.9	1.48
128	14.66	25.0	5.76	0.0	4.35	17.7	1.40
160	14.64	25.0	6.30	29.8	4.38	16.1	1.30
157	14.65	25.0	6.78	59.6	4.45	14.4	1.18
168	14.64	25.0	8.79	81.5	5.44	P	0.97
214	14.65	28.0	5.37	-74.7	7.63	22.6	1.80
209	14.65	28.0	5.51	-59.7	5.78	21.7	1.69
202	14.66	28.0	5.98	-29.8	4.80	19.8	1.58
115	14.64	28.0	6.49	0.0	4.78	17.7	1.59
182	14.65	28.0	7.39	59.5	5.16	14.8	1.35
192	14.63	28.0	9.20	98.7	7.18	P	1.29
243	14.66	31.0	6.32	-59.6	5.86	21.2	1.81
247	14.66	31.0	6.67	-29.8	5.54	19.4	1.72
123	14.64	31.0	7.16	0.0	5.65	17.8	1.73
107	14.62	31.0	7.17	0.0	5.57		1.71
230	14.66	31.0	7.99	59.4	5.97	15.1	1.51

NOTE: P indicates porpoising condition.

TABLE A4.10

WITH 45 DEGREE CHINE FLAPS TRANSOM FLAP DEFLECTION = 2.5 DEGREES

RUN	SPEED FPS	LØAD LB	TRIM DEG	TRIM MØMENT IN-LB	DRAG LB	MWL IN	Z IN
153	17.15	25.0	3.97	-44.9	4.46	20.6	1.10
129	17.16	25.0	4.38	0.0	4.28	17.4	1.11
161	17.14	25.0	4.66	29.9	4.15	15.7	0.96
170	17.16	25.0	4.83	44.8	4.14	14.8	0.95
158	17.13	25.0	5.90	59.7	5.28	P	0.82
210	17.10	28.0	4.33	-59.8	5.32		1.32
215	17.09	28.0	4.56	-74.8	6.06	21.6	1.43
121	17.13	28.0	4.96	0.0	4.58	17.6	1.24
116	17.13	28.0	4.97	0.0	4.59		
183	17.16	28.0	5.53	59.7	4.69	14.5	1.03
244	17.09	31.0	4.98	-59.8	5.42	20.7	1.42
248	17.09	31.0	5.19	-29.9	5.31	19.1	1.34
108	17.12	31.0	5.41	0.0	5.20	17.5	1.33
232	17.09	31.0	5.90	44.8	5.35	15.4	1.21
231	17.09	31.0	6.65	59.6	6.88	P	1.19
154	19.64	25.0	3.13	-44.9	4.79	20.5	0.67
130	19.64	25.0	3.40	0.0	4.46	17.2	0.84
162	19.63	25.0	3.63	29.9	4.29	15.5	0.77
171	19.66	25.0	4.79	44.8	5.80	P	0.71
216	19.50	28.0	3.44	-74.9	6.78	21.9	1.10
211	19.55	28.0	3.49	-59.9	5.48	21.1	1.03
117	19.61	28.0	3.87	0.0	4.70	17.5	1.01
186	19.64	28.0	4.10	44.9	4.60	14.9	0.82
184	19.64	28.0	4.89	59.8	5.75	P	0.78
245	19.52	31.0	3.99	-59.9	5.53	20.5	1.14
249	19.52	31.0	4.08	-29.9	5.35	19.0	1.07
109	19.61	31.0	4.25	0.0	5.24	17.3	1.07
235	19.51	31.0	4.48	29.9	5.29	16.1	0.96
233	19.50	31.0	5.36	44.8	7.77	P	1.01

NOTE: P indicates porpoising condition.

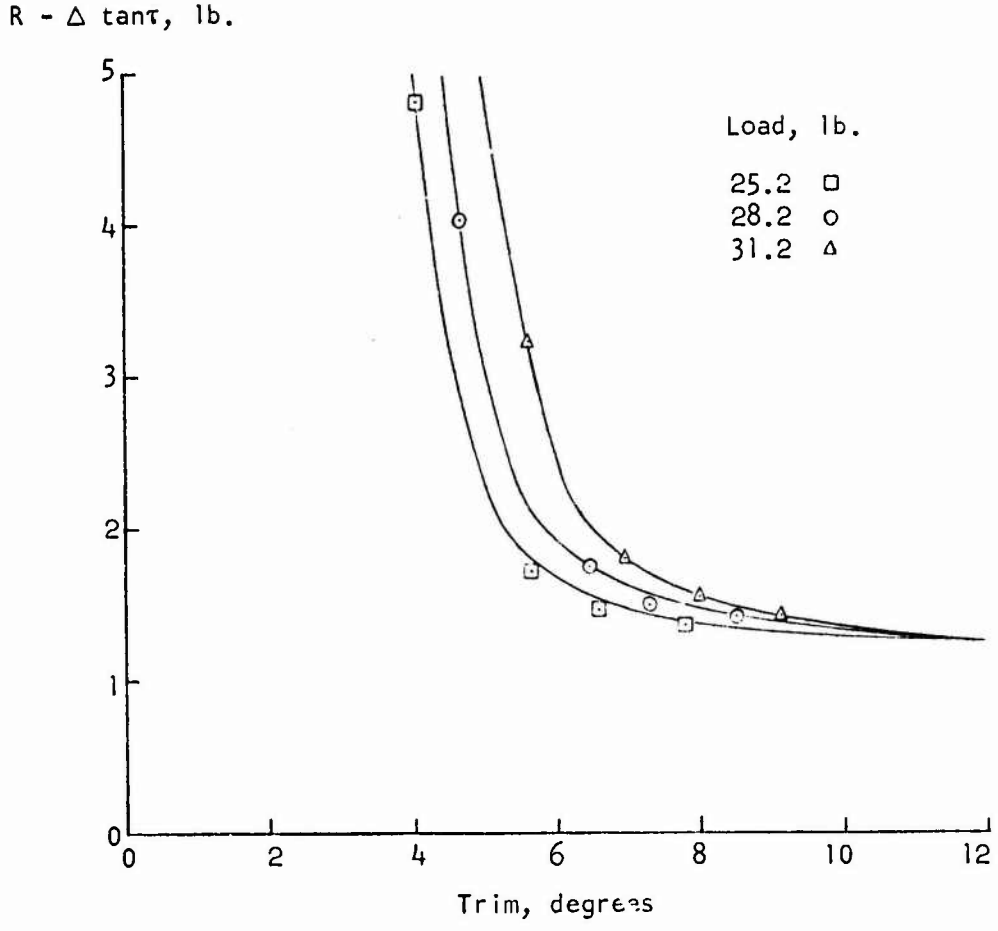


FIGURE A1 EFFECT OF TRIM ON DRAG, 14.64 FPS (30 KNOTS)

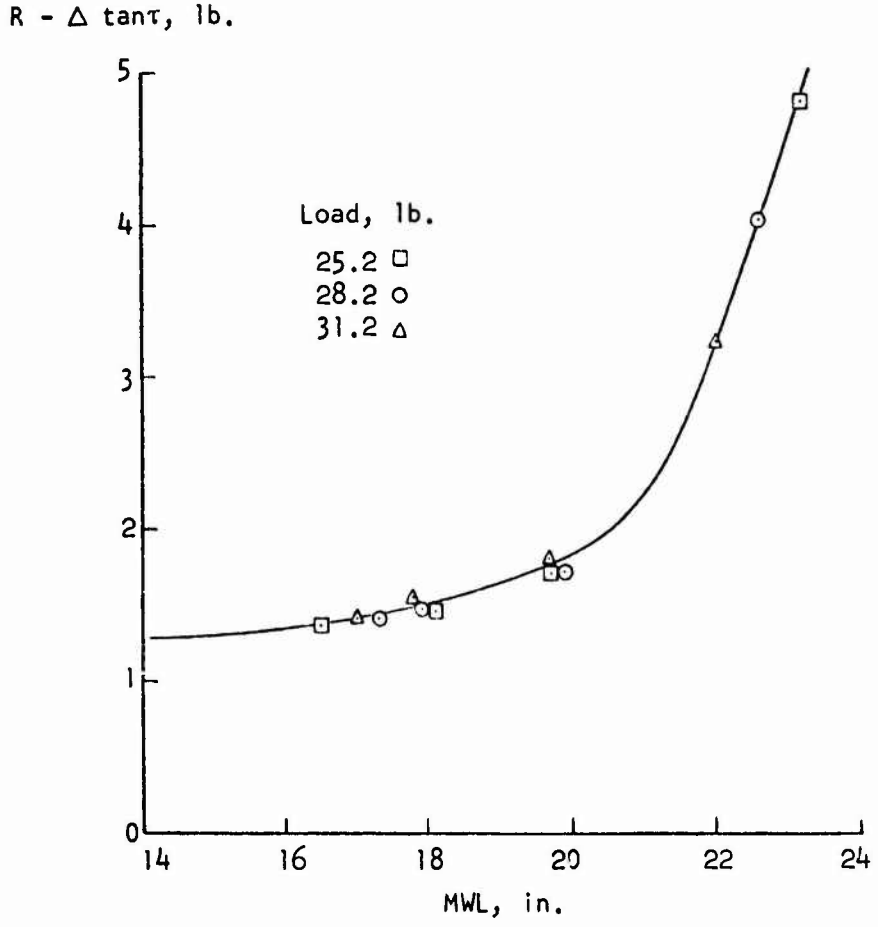


FIGURE A2 EFFECT OF WETTED LENGTH ON DRAG, 14.64 FPS (30 KNOTS)

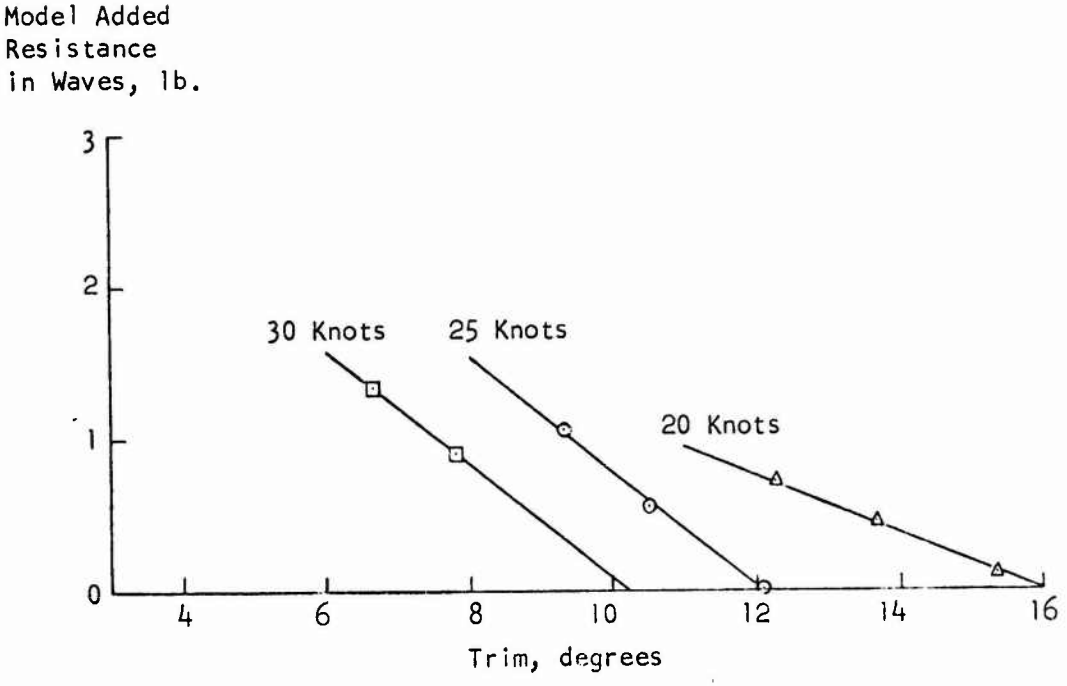


FIGURE A3 ADDED RESISTANCE IN WAVES

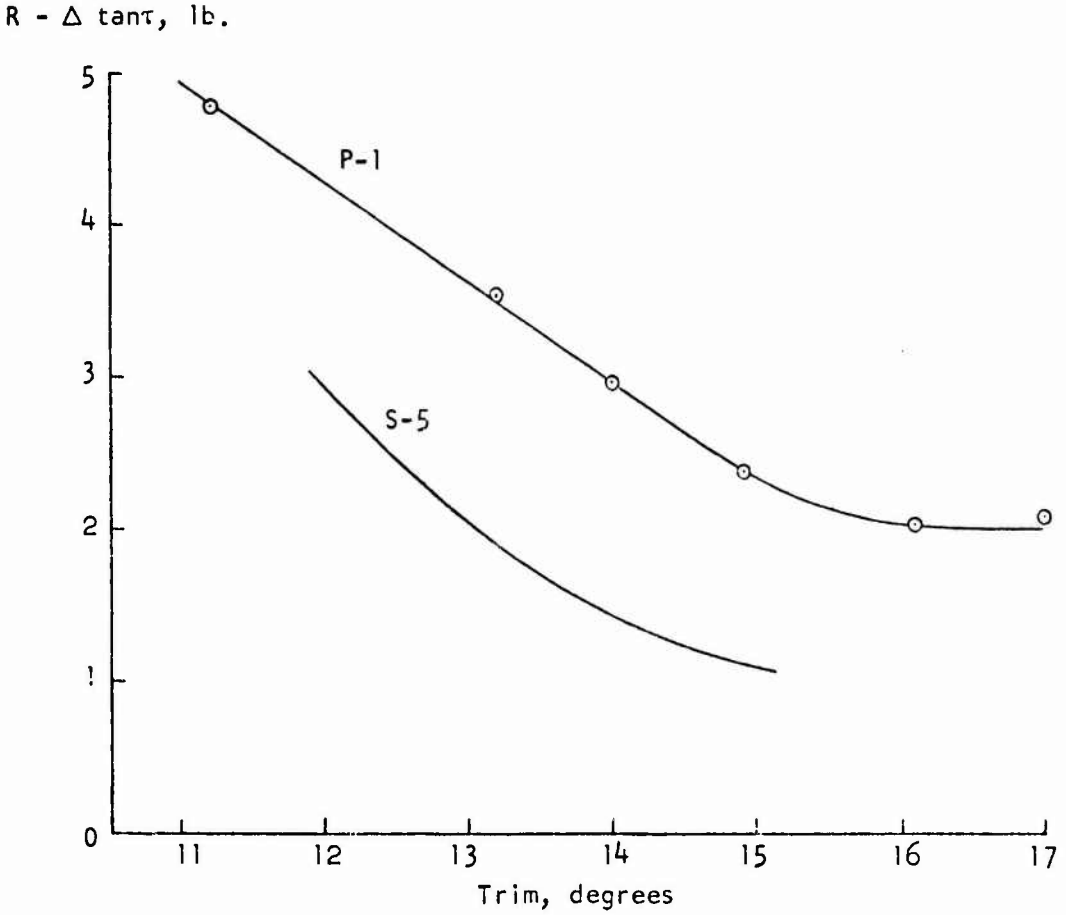


FIGURE A4 MODEL DRAG INCREMENT OF P-1 WITHOUT CHINE FLAPS AT SPEED CORRESPONDING TO 20 KNOTS

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