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COMPENDIUM OF SHIP MOTION CALCULATIONS USING LINEAR TIME-DOMAIN ANALYSIS

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by

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Introduction

Over the past four years a three-dimensional time-domain seakeeping computer code has been developed at The University of Michigan. The code uses linear system theory to determine the hydrodynamic forces acting on a vessel due to forced oscillations (radiation forces) or due to incident waves (exciting forces). It is based on the Neumann-Kelvin potential flow model and solves the problem directly in the time domain rather than the traditional frequency domain. In the Neumann-Kelvin approach the body boundary condition is satisfied on the exact body surface and the linearized free surface condition is used. This approach brings in the three-dimensionality of the body surface and some of the forward speed effects. It does not account for the nonlinearities of the free surface and neglects certain other forward speed effects.

This report is a complete summary of the computations made using the time-domain program. A series of papers (see for instance Liapis and Beck (1985), King (1987), King et al (1988)) have been written to describe the theoretical derivation and numerical techniques used in the computations. Those papers also present a selection of the results given here.

Here all results are presented in terms of the frequency-domain coefficients in the equations of motion since few results are available in the time domain, and because the time-domain memory functions are much more difficult to interpret. For comparison, results from three-dimensional frequency-domain calculations and strip theory are shown. Where available, experimental results are also presented on the same figure. The complete data set of both time and frequency-domain representations is available on request.

Laplace's equation is assumed to govern the flow and the velocity potential is given in terms of several independent parts. In the fluid domain:

$$\nabla^2 \Phi_T = 0$$

$$\underline{V}_T(x,y,z,t) = \nabla \Phi_T(x,y,z,t)$$

where

$$\Phi_T(x,y,z,t) = -U_0 x + \Phi_0(x,y,z) + \phi_0(x,y,z,t) + \Phi(x,y,z,t) \tag{1}$$

and

$-U_0 x + \Phi_0$ = potential due to steady translation

ϕ_0 = incident wave potential

$$\Phi(x,y,z,t) = \sum_{k=1}^{7} \phi_k(x,y,z,t)$$

k = 7 is the diffracted wave
k = 1,2,...,6 are the potentials due to the body motions surge, sway, heave, roll, pitch, and yaw, respectively.

To meet the appropriate condition, $\frac{\partial \Phi_T}{\partial n} = 0$ on the body surface S_0, the following body boundary conditions are specified for the various potentials:

$$\frac{\partial \Phi_0}{\partial n} = U_0 n_1$$

$$\frac{\partial \phi_7}{\partial n} = -\frac{\partial \phi_0}{\partial n}$$

$$\frac{\partial \phi_k}{\partial n} = n_k \dot{\zeta}_k + m_k \zeta_k \quad k = 1,2,\ldots,6 \qquad \text{on } S_0 \tag{2}$$

where n_k, representing the generalized unit normal, is defined as

$$(n_1, n_2, n_3) = \underline{n}$$

$$(n_4, n_5, n_6) = \underline{r} \times \underline{n}$$

$$\underline{r} = (x,y,z)$$

and m_k, resulting from the steady forward motion, is defined as

$$(m_1, m_2, m_3) = -(\underline{n}\cdot\nabla)\underline{W}$$

$$(m_4, m_5, m_6) = -(\underline{n}\cdot\nabla)(\underline{r} \times \underline{W})$$

$$\underline{W} = \nabla(-U_0 x + \Phi_0)$$

ζ_k is the displacement in the kth mode of motion, and the overdot represents the derivative with respect to time. The linearized free surface condition is written as

$$\left(\frac{\partial}{\partial t} - U_0 \frac{\partial}{\partial x}\right)^2 \phi_k + g \frac{\partial}{\partial z}\phi_k = 0 \qquad \text{on } z = 0 \tag{3}$$

with g being the acceleration of gravity and the calm water surface being denoted as S_f. The initial condition for the unsteady potentials is

$$\phi_k(x,y,z,t) \to 0 \quad \text{as } t \to -\infty \quad k = 1,2,\ldots,7$$

Since the disturbances generating the unsteady potentials originate in the neighborhood of the origin

$$\nabla\phi_k(x,y,z,t) \to 0 \quad \text{as } r \to \infty \quad k = 1,2,\ldots,7$$

The boundary condition for the diffracted wave potential is:

$$\frac{\partial\phi_7}{\partial n} = -\frac{\partial\phi_0}{\partial n} = -\underline{n}\cdot\nabla\phi_0 \tag{4}$$

where $\nabla\phi_0$ is the perturbation velocity on the body surface due to an arbitrary incident wave system.

For all the computations with forward speed a further approximation has been made in the body boundary condition. Because the m_j terms involve the derivatives of $\underline{W}$ they are difficult to compute. Therefore, $\underline{W}$ is approximated by $\underline{W} = (-U_0, 0, 0)$ and the m_j's reduce to $m_j = (0, 0, 0, 0, U_0 n_3, -U_0 n_2)$. This is the same approximation used in strip theory calculations. While there is no additional computational burden for the time-domain calculations in using the correct m_j's, a good method to compute them accurately is not available at the present time. As will be seen in the results, this approximation apparently introduces discrepancies between the theoretical and experimental results.

The results are presented in terms of nondimensional coefficients in the equations of motion. All forces and moments are consistently resolved in a

right hand coordinate system whose origin is on the centerplane at midship on the calm waterline. The z-axis is positive upwards and the x-axis is positive out the bow. In the frequency domain, the equations of motion are written as:

$$\sum_{k=1}^{6} \left(-\omega_e^2 (M_{jk} + A_{jk}) + i\omega_e B_{jk} + C_{jk} \right) \eta_k = F_j$$

where

M_{jk} = an element of the mass matrix

A_{jk} = added mass in mode j due to motion in mode k

B_{jk} = damping in mode j due to motion in mode k

C_{jk} = frequency independent restoring force coefficients

F_j = total exciting force in mode j = $F_{jo} + F_{j7}$

F_{jo} = Froude-Krylov exciting force

F_{j7} = diffraction exciting force

ω_e = frequency of encounter = $\omega - U_0 k \cos(\beta)$

β = relative angle to wave direction ($\beta = \pi$ for head seas)

U_o = constant forward speed

η_k = complex amplitude of displacement in mode k

The time dependence is implicitly $e^{i\omega_e t}$ and all phase angles are defined relative to the crest of a wave at midships. Table 1 presents the form of the nondimensional coefficients. All the nondimensionalization is done in terms of the following variables:

ρ = density of fluid

L = length of vessel

∇ = displaced volume of vessel

g = acceleration of gravity

A = nominal incident wave amplitude

The results plotted in the figures include all the added mass and damping coefficients for both the horizontal and vertical planes of motion and the exciting forces for the vertical plane in head seas. The exciting forces for nonhead seas have not been presented because no experimental data are available for comparison.

$$A_{11}^* = \frac{A_{11}}{\rho\nabla} \qquad A_{13}^* = \frac{A_{13}}{\rho\nabla} \qquad A_{15}^* = \frac{A_{15}}{\rho\nabla L}$$

$$A_{31}^* = \frac{A_{31}}{\rho\nabla} \qquad A_{33}^* = \frac{A_{33}}{\rho\nabla} \qquad A_{35}^* = \frac{A_{35}}{\rho\nabla L}$$

$$A_{51}^* = \frac{A_{51}}{\rho\nabla L} \qquad A_{53}^* = \frac{A_{53}}{\rho\nabla L} \qquad A_{55}^* = \frac{A_{55}}{\rho\nabla L^2}$$

$$B_{11}^* = \frac{B_{11}\sqrt{(L/g)}}{\rho\nabla} \qquad B_{13}^* = \frac{B_{13}\sqrt{(L/g)}}{\rho\nabla} \qquad B_{15}^* = \frac{B_{15}\sqrt{(L/g)}}{\rho\nabla L}$$

$$B_{31}^* = \frac{B_{31}\sqrt{(L/g)}}{\rho\nabla} \qquad B_{33}^* = \frac{B_{33}\sqrt{(L/g)}}{\rho\nabla} \qquad B_{35}^* = \frac{B_{35}\sqrt{(L/g)}}{\rho\nabla L}$$

$$B_{51}^* = \frac{B_{51}\sqrt{(L/g)}}{\rho\nabla L} \qquad B_{53}^* = \frac{B_{53}\sqrt{(L/g)}}{\rho\nabla L} \qquad B_{55}^* = \frac{B_{55}\sqrt{(L/g)}}{\rho\nabla L^2}$$

TABLE 1a. Nondimensional vertical mode coefficients.

$$A_{22}^* = \frac{A_{22}}{\rho\nabla} \qquad A_{24}^* = \frac{A_{24}}{\rho\nabla L} \qquad A_{26}^* = \frac{A_{26}}{\rho\nabla L}$$

$$A_{42}^* = \frac{A_{42}}{\rho\nabla L} \qquad A_{44}^* = \frac{A_{44}}{\rho\nabla L^2} \qquad A_{46}^* = \frac{A_{46}}{\rho\nabla L^2}$$

$$A_{62}^* = \frac{A_{62}}{\rho\nabla L} \qquad A_{64}^* = \frac{A_{64}}{\rho\nabla L^2} \qquad A_{66}^* = \frac{A_{66}}{\rho\nabla L^2}$$

$$B_{22}^* = \frac{B_{22}\sqrt{(L/g)}}{\rho\nabla} \qquad B_{24}^* = \frac{B_{24}\sqrt{(L/g)}}{\rho\nabla L} \qquad B_{26}^* = \frac{B_{26}\sqrt{(L/g)}}{\rho\nabla L}$$

$$B_{42}^* = \frac{B_{42}\sqrt{(L/g)}}{\rho\nabla L} \qquad B_{44}^* = \frac{B_{44}\sqrt{(L/g)}}{\rho\nabla L^2} \qquad B_{46}^* = \frac{B_{46}\sqrt{(L/g)}}{\rho\nabla L^2}$$

$$B_{62}^* = \frac{B_{62}\sqrt{(L/g)}}{\rho\nabla L} \qquad B_{64}^* = \frac{B_{64}\sqrt{(L/g)}}{\rho\nabla L^2} \qquad B_{66}^* = \frac{B_{66}\sqrt{(L/g)}}{\rho\nabla L^2}$$

Table 1b. Nondimensional horizontal mode coefficients.

$$F_1^* = \frac{F_1}{\rho\nabla g}\frac{L}{A} \qquad F_3^* = \frac{F_3}{\rho\nabla g}\frac{L}{A} \qquad F_5^* = \frac{F_5}{\rho\nabla g A}$$

Table 1c. Nondimensional vertical mode exciting force coefficients.

Computations have been performed using time-domain analysis for a variety of hull forms at both zero and forward speed. Complete results are presented for a Wigley-type mathematical hull, a Series 60 C_b=.70 parent form, the ITTC standard containership, and the SL-7 containership. The principal ratios for each of the vessels are given in Table 2.

SHIP	L/B	B/T	CB	XCG (%L)	ZCG (%L)	FN
Wigley	10.0	1.60	0.561	0.0	NA	0.2, 0.3
Series 60	7.0	2.50	0.700	+5.0	NA	0.2
ITTC	6.89	2.67	0.572	-1.42	+0.011	0.0, 0.275
SL-7	8.32	3.08	0.550	-4.38	NA	0.3

TABLE 2. Principal ship characteristics.

The calculations in the program are performed using a panel method. Typically, 150 to 200 quadrilateral panels are used to approximate the wetted surface of the hull. As computations proceeded it became clear that more panels would be required to assure good convergence of the results. Given the relatively small number of panels, their distribution was very important with minor changes sometimes causing significant changes in the results. Some of the difficulties are discussed below.

The method of Hess and Smith (1964) was used to fit four points of the ship's geometry to a plane quadrilateral, minimizing the distance from the four points to the plane. Because this fitting caused some points to lie slightly above the free surface or on the wrong side of a symmetry plane, it was necessary to force the points on these boundaries to lie exactly on the boundary as well as on the quadrilateral. Although the distance from these boundary points to the panels was thus not quite a minimum, the change was very slight, and great improvement in the numerics was obtained by using this modified fitting.

In addition, long thin panels near the free surface in regions that were not wall-sided tended to give numerical problems. This was most evident for the ITTC containership near the cruiser stern. The rather large improvements between the 149 and 169 panel results for the containership were effected mainly by altering the paneling in this region to avoid any long thin panels.

A thorough discussion of some of the results presented here is contained in King et al (1988), but a few general conclusions are warranted here. In general, the results of the time-domain calculations and strip theory agree. For heave and pitch the time-domain predictions for the cross coupling terms are in better agreement with experiments. Neither method captures the behavior of A_{35} for the SL-7 in which the trend of the coefficient with frequency is opposite that for any of the other ships studied here (see Figure 282).

For pure heave and pitch, the strip theory often gives results closer to the experimentally measured values. In pure pitch the time-domain prediction of added mass tends to near or below zero for large Froude numbers (see Figure 71, Wigley hull, Fn=0.3), and is well below the experimentally measured values and the strip theory predictions. Figure 235 shows the effect of the forward speed hydrostatic term on A_{55} for the ITTC containership at Fn=0.275. Since the hydrodynamic component of C_{55} is a function only of the m_j's, it appears that the approximation of these terms in the body boundary condition may have had a significant effect on the pitch coefficients. In addition, the values of all the coefficients will be affected to various degrees by the approximation to the m_j's. For surge motion, very few calculations (except those of Guevel and Bougis (1982) for the Series 60) and no experiments were available for comparison.

Complete horizontal mode experiments for the ITTC containership and a few for the Series 60 hull were available. For sway and yaw, remarkably good agreement was obtained at Froude number 0.0 for the ITTC ship between the strip theory and time-domain predictions and the experiments. However, at Froude number 0.275 the differences in the predictions of the two methods are much greater than for the corresponding vertical plane coefficients. The time-domain method seems to model the forward speed effects more

accurately than strip theory, giving the correct character of the experimental curves, although there appears to be a constant shift in the absolute value of the coefficients. Whether this is due to some experimental conditions, an error in interpretation of the experimental coordinate system or the approximation of the m_j's is not known. Because of viscous effects, neither method is good for predicting the roll coefficients.

The RAO's were calculated only for the SL-7 in heave and pitch. Because the time-domain method underpredicts the heave and pitch damping, the predictions were not in good agreement with experiments.

The strip theory and time-domain Froude-Krylov exciting force coefficients are in good agreement for all the ships. The diffraction force predictions, however, show quite different characteristics especially at the higher Froude numbers. Since for most ships the diffraction force is much smaller than the Froude-Krylov force, the net effect is that the total exciting force coefficients are similar.

In the figures, the results labeled TD are the time-domain calculations, and the number of panels used in the calculations is given. Those results labeled strip theory were obtained using the program SHIPMO written by Beck and Troesch at The University of Michigan. This program is based on the method of Salvesen, Tuck and Faltinsen (1970) extended to include surge. For the Wigley hull form, the results of experiments by Gerritsma are shown. These experiments were performed at the Technische Hogeschool Delft in work partially sponsored by the H-5 panel of the Society of Naval Architects and Marine Engineers. They were obtained by private communication and have not yet been formally published. For the Series 60 hull, three-dimensional frequency-domain calculations by M.-S. Chang (1977), Inglis and Price (1981, method IP2), and Guevel and Bougis (1982) are included. The unified strip theory results were taken from Sclavounos (1984). Calculations by Troesch (1981) and experimental results from Gerritsma (1960 and 1964), and Vugts (1970) are also given. The experimental results for the ITTC containership were taken from Okhusu (1983 and unpublished) and Kasiwagi (1985) and were shifted from center of gravity to midships coordinates. Heave and pitch experiments on the SL-7 were performed by O'Dea and Jones (1983).

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WIGLEY HULL, FN=0.2

1 SURGE ADDED MASS FOR A WIGLEY HULL, FN=0.2

2 SURGE DAMPING FOR A WIGLEY HULL, FN=0.2

3 SURGE-HEAVE ADDED MASS FOR A WIGLEY HULL, FN=0.2

4 SURGE-HEAVE DAMPING FOR A WIGLEY HULL, FN=0.2

5 SURGE-PITCH ADDED MASS FOR A WIGLEY HULL, FN=0.2

6 SURGE-PITCH DAMPING FOR A WIGLEY HULL, FN=0.2

7 HEAVE-SURGE ADDED MASS FOR A WIGLEY HULL, FN=0.2

8 HEAVE-SURGE DAMPING FOR A WIGLEY HULL, FN=0.2

9 HEAVE ADDED MASS FOR A WIGLEY HULL, FN=0.2

10 HEAVE DAMPING FOR A WIGLEY HULL, FN=0.2

11 HEAVE-PITCH ADDED MASS FOR A WIGLEY HULL, FN=0.2

12 HEAVE-PITCH DAMPING FOR A WIGLEY HULL, FN=0.2

13 PITCH-SURGE ADDED MASS FOR A WIGLEY HULL, FN=0.2

14 PITCH-SURGE DAMPING FOR A WIGLEY HULL, FN=0.2

15 PITCH-HEAVE ADDED MASS FOR A WIGLEY HULL, FN=0.2

16 PITCH-HEAVE DAMPING FOR A WIGLEY HULL, FN=0.2

17 PITCH ADDED MASS FOR A WIGLEY HULL, FN=0.2

18 PITCH DAMPING FOR A WIGLEY HULL, FN=0.2

19 SWAY ADDED MASS FOR A WIGLEY HULL, FN=0.2

20 SWAY DAMPING FOR A WIGLEY HULL, FN=0.2

21 SWAY-ROLL ADDED MASS FOR A WIGLEY HULL, FN=0.2

22 SWAY-ROLL DAMPING FOR A WIGLEY HULL, FN=0.2

23 SWAY-YAW ADDED MASS FOR A WIGLEY HULL, FN=0.2

24 SWAY-YAW DAMPING FOR A WIGLEY HULL, FN=0.2

25 ROLL-SWAY ADDED MASS FOR A WIGLEY HULL, FN=0.2

26 ROLL-SWAY DAMPING FOR A WIGLEY HULL, FN=0.2

27 ROLL ADDED MASS FOR A WIGLEY HULL, FN=0.2

28 ROLL DAMPING FOR A WIGLEY HULL, FN=0.2

WIGLEY HULL, FN=O.2

29 ROLL-YAW ADDED MASS FOR A WIGLEY HULL, FN=0.2

30 ROLL-YAW DAMPING FOR A WIGLEY HULL, FN=0.2

31 YAW-SWAY ADDED MASS FOR A WIGLEY HULL, FN=0.2

32 YAW-SWAY DAMPING FOR A WIGLEY HULL, FN=0.2

33 YAW-ROLL ADDED MASS FOR A WIGLEY HULL, FN=0.2

34 YAW-ROLL DAMPING FOR A WIGLEY HULL, FN=0.2

35 YAW ADDED MASS FOR A WIGLEY HULL, FN=0.2

36 YAW DAMPING FOR A WIGLEY HULL, FN=0.2

37 MAGNITUDE OF SURGE EXCITING FORCE FOR A WIGLEY HULL, FN=0.2

38 PHASE OF SURGE EXCITING FORCE FOR A WIGLEY HULL, FN=0.2

39 MAGNITUDE OF HEAVE EXCITING FORCE FOR A WIGLEY HULL, FN=0.2

40 PHASE OF HEAVE EXCITING FORCE FOR A WIGLEY HULL, FN=0.2

41 MAGNITUDE OF PITCH EXCITING FORCE FOR A WIGLEY HULL, FN=0.2

42 PHASE OF PITCH EXCITING FORCE FOR A WIGLEY HULL, FN=0.2

43 MAGNITUDE OF SURGE FROUDE-KRYLOV FORCE FOR A WIGLEY HULL, FN=0.2

44 PHASE OF SURGE FROUDE-KRYLOV FORCE FOR A WIGLEY HULL, FN=0.2

45 MAGNITUDE OF HEAVE FROUDE-KRYLOV FORCE FOR A WIGLEY HULL, FN=0.2

46 PHASE OF HEAVE FROUDE-KRYLOV FORCE FOR A WIGLEY HULL, FN=0.2

47 MAGNITUDE OF PITCH FROUDE-KRYLOV FORCE FOR A WIGLEY HULL, FN=0.2

48 PHASE OF PITCH FROUDE-KRYLOV FORCE FOR A WIGLEY HULL, FN=0.2

49 MAGNITUDE OF SURGE DIFFRACTION FORCE FOR A WIGLEY HULL, FN=0.2

50 PHASE OF SURGE DIFFRACTION FORCE FOR A WIGLEY HULL, FN=0.2

51 MAGNITUDE OF HEAVE DIFFRACTION FORCE FOR A WIGLEY HULL, FN=0.2

52 PHASE OF HEAVE DIFFRACTION FORCE FOR A WIGLEY HULL, FN=0.2

53 MAGNITUDE OF PITCH DIFFRACTION FORCE FOR A WIGLEY HULL, FN=0.2

54 PHASE OF PITCH DIFFRACTION FORCE FOR A WIGLEY HULL, FN=0.2

55 SURGE ADDED MASS FOR A WIGLEY HULL, FN=0.3

56 SURGE DAMPING FOR A WIGLEY HULL, FN=0.3

57 SURGE-HEAVE ADDED MASS FOR A WIGLEY HULL, FN=0.3

58 SURGE-HEAVE DAMPING FOR A WIGLEY HULL, FN=0.3

59 SURGE-PITCH ADDED MASS FOR A WIGLEY HULL, FN=0.3

60 SURGE-PITCH DAMPING FOR A WIGLEY HULL, FN=0.3

61 HEAVE-SURGE ADDED MASS FOR A WIGLEY HULL, FN=0.3

62 HEAVE-SURGE DAMPING FOR A WIGLEY HULL, FN=0.3

63 HEAVE ADDED MASS FOR A WIGLEY HULL, FN=0.3

64 HEAVE DAMPING FOR A WIGLEY HYLL, FN=0.3

65 HEAVE-PITCH ADDED MASS FOR A WIGLEY HULL, FN=0.3

66 HEAVE-PITCH DAMPING FOR A WIGLEY HULL, FN=0.3

67 PITCH-SURGE ADDED MASS FOR A WIGLEY HULL, FN=0.3

68 PITCH-SURGE DAMPING FOR A WIGLEY HULL, FN=0.3

69 PITCH-HEAVE ADDED MASS FOR A WIGLEY HULL, FN=0.3

70 PITCH-HEAVE DAMPING FOR A WIGLEY HULL, FN=0.3

71 PITCH ADDED MASS FOR A WIGLEY HULL, FN=0.3

72 PITCH DAMPING FOR A WIGLEY HULL, FN=0.3

73 SWAY ADDED MASS FOR A WIGLEY HULL, FN=0.3

74 SWAY DAMPING FOR A WIGLEY HULL, FN=0.3

75 SWAY-ROLL ADDED MASS FOR A WIGLEY HULL, FN=0.3

76 SWAY-ROLL DAMPING FOR A WIGLEY HULL, FN=0.3

77 SWAY-YAW ADDED MASS FOR A WIGLEY HULL, FN=0.3

78 SWAY-YAW DAMPING FOR A WIGLEY HULL, FN=0.3

79 ROLL-SWAY ADDED MASS FOR A WIGLEY HULL, FN=0.3

80 ROLL-SWAY DAMPING FOR A WIGLEY HULL, FN=0.3

81 ROLL ADDED MASS FOR A WIGLEY HULL, FN=0.3

82 ROLL DAMPING FOR A WIGLEY HULL, FN=0.3

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83 ROLL-YAW ADDED MASS FOR A WIGLEY HULL, FN=0.3

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85 YAW-SWAY ADDED MASS FOR A WIGLEY HULL, FN=0.3

86 YAW-SWAY DAMPING FOR A WIGLEY HULL, FN=0.3

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89 YAW ADDED MASS FOR A WIGLEY HULL, FN=0.3

90 YAW DAMPING FOR A WIGLEY HULL, FN=0.3

91 MAGNITUDE OF SURGE EXCITING FORCE FOR A WIGLEY HULL, FN=0.3

92 PHASE OF SURGE EXCITING FORCE FOR A WIGLEY HULL, FN=0.3

93 MAGNITUDE OF HEAVE EXCITING FORCE FOR A WIGLEY HULL, FN=0.3

94 PHASE OF HEAVE EXCITING FORCE FOR A WIGLEY HULL, FN=0.3

95 MAGNITUDE OF PITCH EXCITING FORCE FOR A WIGLEY HULL, FN=0.3

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97 MAGNITUDE OF SURGE FROUDE-KRYLOV FORCE FOR A WIGLEY HULL, FN=0.3

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99 MAGNITUDE OF HEAVE FROUDE-KRYLOV FORCE FOR A WIGLEY HULL, FN=0.3

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101 MAGNITUDE OF PITCH FROUDE-KRYLOV FORCE FOR A WIGLEY HULL, FN=0.3

102 PHASE OF PITCH FROUDE-KRYLOV FORCE FOR A WIGLEY HULL, FN=0.3

103 MAGNITUDE OF SURGE DIFFRACTION FORCE FOR A WIGLEY HULL, FN=0.3

104 PHASE OF SURGE DIFFRACTION FORCE FOR A WIGLEY HULL, FN=0.3

105 MAGNITUDE OF HEAVE DIFFRACTION FORCE FOR A WIGLEY HULL, FN=0.3

106 PHASE OF HEAVE DIFFRACTION FORCE FOR A WIGLEY HULL, FN=0.3

107 MAGNITUDE OF PITCH DIFFRACTION FORCE FOR A WIGLEY HULL, FN=0.3

108 PHASE OF PITCH DIFFRACTION FORCE FOR A WIGLEY HULL, FN=0.3

109 SURGE ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2

110 SURGE DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2

111 SURGE-HEAVE ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2

112 SURGE-HEAVE DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2

113 SURGE-PITCH ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2

114 SURGE-PITCH DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2

115 HEAVE-SURGE ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2

116 HEAVE-SURGE DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2

117 HEAVE ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2

118 HEAVE DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2

119 HEAVE-PITCH ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2

120 HEAVE-PITCH DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2

121 PITCH-SURGE ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2

122 PITCH-SURGE DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2

123 PITCH-HEAVE ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2

124 PITCH-HEAVE DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2

125 PITCH ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2

126 PITCH DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2

127 SWAY ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2

128 SWAY DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2

129 SWAY-ROLL ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2

130 SWAY-ROLL DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2

131 SWAY-YAW ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2

132 SWAY-YAW DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2

133 ROLL-SWAY ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2

134 ROLL-SWAY DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2

135 ROLL ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2

136 ROLL DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2

SERIES 60 CB=.70 HULL, FN=0.2

137 ROLL-YAW ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2

138 ROLL-YAW DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2

139 YAW-SWAY ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2

140 YAW-SWAY DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2

141 YAW-ROLL ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2

142 YAW-ROLL DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2

143 YAW ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2

144 YAW DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2

145 MAGNITUDE OF SURGE EXCITING FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2

146 PHASE OF SURGE EXCITING FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2

147 MAGNITUDE OF HEAVE EXCITING FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2

148 PHASE OF HEAVE EXCITING FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2

149 MAGNITUDE OF PITCH EXCITING FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2

150 PHASE OF PITCH EXCITING FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2

151 MAGNITUDE OF SURGE FROUDE-KRYLOV FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2

152 PHASE OF SURGE FROUDE-KYLOV FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2

153 MAGNITUDE OF HEAVE FROUDE-KRYLOV FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2

154 PHASE OF HEAVE FROUDE-KRYLOV FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2

155 MAGNITUDE OF PITCH FROUDE-KRYLOV FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2

156 PHASE OF PITCH FROUDE-KRYLOV FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2

157 MAGNITUDE OF SURGE DIFFRACTION FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2

158 PHASE OF SURGE DIFFRACTION FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2

159 MAGNITUDE OF HEAVE DIFFRACTION FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2

160 PHASE OF HEAVE DIFFRACTION FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2

161 MAGNITUDE OF PITCH DIFFRACTION FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2

162 PHASE OF PITCH DIFFRACTION FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2

163 SURGE ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0

164 SURGE DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0

165 SURGE-HEAVE ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0

166 SURGE-HEAVE DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0

167 SURGE-PITCH ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0

168 SURGE-PITCH DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0

169 HEAVE-SURGE ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0

170 HEAVE-SURGE DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0

171 HEAVE ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0

172 HEAVE DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0

173 HEAVE-PITCH ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0

174 HEAVE-PITCH DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0

175 PITCH-SURGE ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0

176 PITCH-SURGE DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0

177 PITCH-HEAVE ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0

178 PITCH-HEAVE DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0

179 PITCH ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0

180 PITCH DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0

181 SWAY ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0

182 SWAY DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0

183 SWAY-ROLL ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0

184 SWAY-ROLL DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0

185 SWAY-YAW ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0

186 SWAY-YAW DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0

187 ROLL-SWAY ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0

188 ROLL-SWAY DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0

189 ROLL ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0

190 ROLL DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0

ITTC CONTAINERSHIP, FN=0.0

191 ROLL-YAW ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0

192 ROLL-YAW DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0

193 YAW-SWAY ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0

194 YAW-SWAY DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0

195 YAW-ROLL ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0

196 YAW-ROLL DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0

197 YAW ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0

198 YAW DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0

199 MAGNITUDE OF SURGE EXCITING FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0

200 PHASE OF SURGE EXCITING FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0

201 MAGNITUDE OF HEAVE EXCITING FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0

202 PHASE OF HEAVE EXCITING FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0

203 MAGNITUDE OF PITCH EXCITING FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0

204 PHASE OF PITCH EXCITING FORCE FOR THE ITTC CONTAINER SHIP, FN=0.0

205 MAGNITUDE OF SURGE FROUDE-KRYLOV FORCE FOR THE ITTC CONTAINERSHIP FN=0.0

206 PHASE OF SURGE FROUDE-KRYLOV FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0

207 MAGNITUDE OF HEAVE FROUDE-KRYLOV FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0

208 PHASE OF HEAVE FROUDE-KRYLOV FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0

209 MAGNITUDE OF PITCH FROUDE-KRYLOV FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0

210 PHASE OF PITCH FROUDE-KRYLOV FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0

211 MAGNITUDE OF SURGE DIFFRACTION FOR THE FORCE ITTC CONTAINERSHIP, FN=0.0

212 PHASE OF SURGE DIFFRACTION FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0

213 MAGNITUDE OF HEAVE DIFFRACTION FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0

214 PHASE OF HEAVE DIFFRACTION FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0

215 MAGNITUDE OF PITCH DIFFRACTION FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0

216 PHASE OF PITCH DIFFRACTION FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0

217 SURGE ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275

218 SURGE DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275

219 SURGE-HEAVE ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275

220 SURGE-HEAVE DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275

221 SURGE-PITCH ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275

222 SURGE-PITCH DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275

223 HEAVE-SURGE ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275

224 HEAVE-SURGE DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275

225 HEAVE ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275

226 HEAVE DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275

227 HEAVE-PITCH ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275

228 HEAVE-PITCH DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275

229 PITCH-SURGE ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275

230 PITCH-SURGE DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275

231 PITCH-HEAVE ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275

232 PITCH-HEAVE DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275

233 PITCH ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275

234 PITCH DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275

235 EFFECT OF FWD SPEED HYDROSTATIC TERM ON A55 FOR THE ITTC CONTAINERSHIP, FN=0.275

236 SWAY ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275

237 SWAY DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275

238 SWAY-ROLL ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275

239 SWAY-ROLL DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275

240 SWAY-YAW ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275

241 SWAY-YAW DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275

242 ROLL-SWAY ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275

243 ROLL-SWAY DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275

244 ROLL ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275

245 ROLL DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275

246 ROLL-YAW ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275

247 ROLL-YAW DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275

248 YAW-SWAY ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275

249 YAW-SWAY DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275

250 YAW-ROLL ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275

251 YAW-ROLL DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275

252 YAW ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275

253 YAW DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275

254 MAGNITUDE OF SURGE EXCITING FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275

255 PHASE OF SURGE EXCITING FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275

256 MAGNITUDE OF HEAVE EXCITING FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275

257 PHASE OF HEAVE EXCITING FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275

258 MAGNITUDE OF PITCH EXCITING FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275

259 PHASE PITCH EXCITING FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275

260 MAGNITUDE OF SURGE FROUDE-KRYLOV FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275

261 PHASE OF SURGE FROUDE-KRYLOV FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275

262 MAGNITUDE OF HEAVE FROUDE-KRYLOV FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275

263 PHASE OF HEAVE FROUDE-KRYLOV FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275

264 MAGNITUDE OF PITCH FROUDE-KRYLOV FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275

265 PHASE OF PITCH FROUDE-KRYLOV FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275

266 MAGNITUDE OF SURGE DIFFRACTION FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275

267 PHASE OF SURGE DIFFRACTION FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275

268 MAGNITUDE OF HEAVE DIFFRACTION FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275

269 PHASE OF HEAVE DIFFRACTION FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275

270 MAGNITUDE OF PITCH DIFFRACTION FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275

271 PHASE OF PITCH DIFFRACTION FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275

272 SURGE ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3

273 SURGE DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3

274 SURGE-HEAVE ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3

275 SURGE-HEAVE DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3

276 SURGE-PITCH ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3

277 SURGE-PITCH DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3

278 HEAVE-SURGE ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3

279 HEAVE-SURGE DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3

280 HEAVE ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3

281 HEAVE DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3

282 HEAVE-PITCH ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3

283 HEAVE-PITCH DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3

284 PITCH-SURGE ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3

285 PITCH-SURGE DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3

286 PITCH-HEAVE ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3

287 PITCH-HEAVE DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3

288 PITCH ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3

289 PITCH DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3

290 SWAY ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3

291 SWAY DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3

292 SWAY-ROLL ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3

293 SWAY-ROLL DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3

294 SWAY-YAW ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3

295 SWAY-YAW DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3

296 ROLL-SWAY ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3

297 ROLL-SWAY DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3

298 ROLL ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3

299 ROLL DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3

SL-7 CONTAINERSHIP, FN=0.3

300 ROLL-YAW ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3

301 ROLL-YAW DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3

302 YAW-SWAY ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3

303 YAW-SWAY DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3

304 YAW-ROLL ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3

305 YAW-ROLL DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3

306 YAW ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3

307 YAW DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3

308 MAGNITUDE OF SURGE EXCITING FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3

309 PHASE OF SURGE EXCITING FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3

310 MAGNITUDE OF HEAVE EXCITING FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3

311 PHASE OF HEAVE EXCITING FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3

312 MAGNITUDE OF PITCH EXCITING FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3

313 PHASE OF PITCH EXCITING FORCE FOR THE SL-7 CONTAINER SHIP, FN=0.3

314 MAGNITUDE OF SURGE FROUDE-KRYLOV FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3

315 PHASE OF SURGE FROUDE-KRYLOV FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3

316 MAGNITUDE OF HEAVE FROUDE-KRYLOV FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3

317 PHASE OF HEAVE FROUDE-KRYLOV FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3

318 MAGNITUDE OF PITCH FROUDE-KRYLOV FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3

319 PHASE OF PITCH FROUDE-KRYLOV FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3

320 MAGNITUDE OF SURGE DIFFRACTION FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3

321 PHASE OF SURGE DIFFRACTION FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3

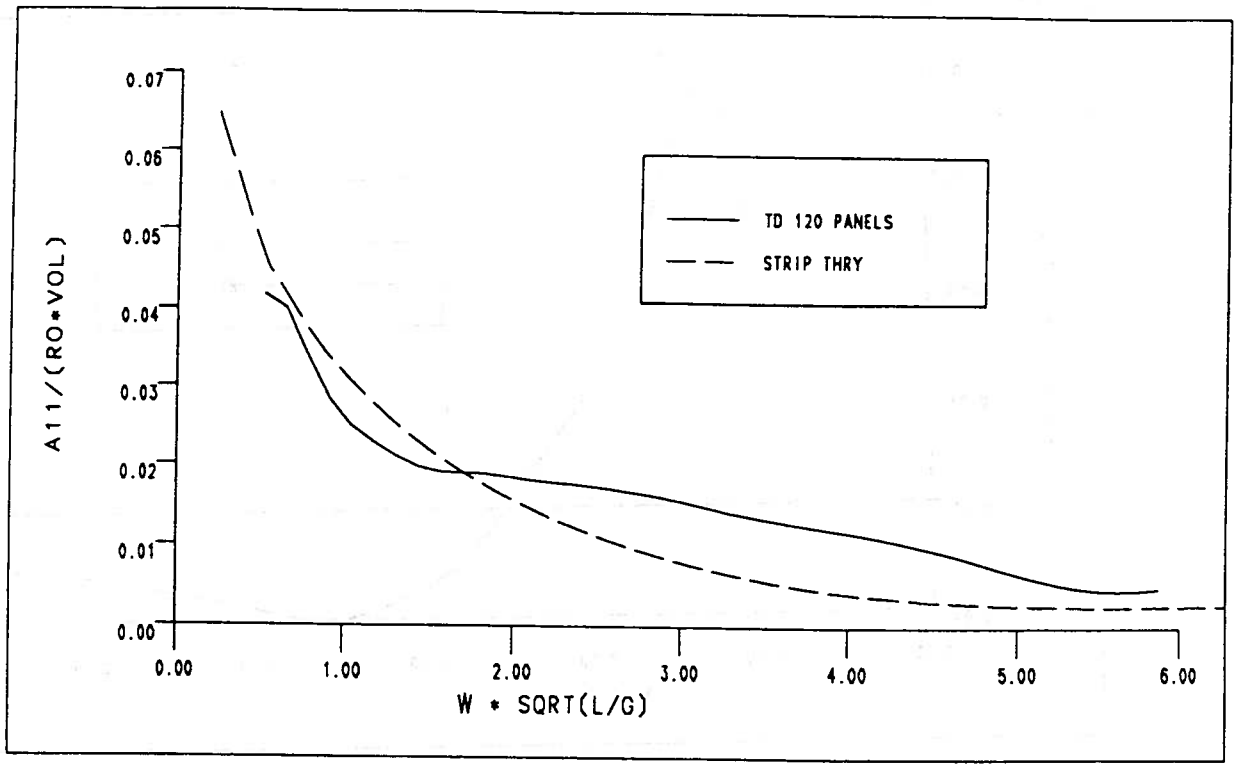
322 MAGNITUDE OF HEAVE DIFFRACTION FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3

323 PHASE OF HEAVE DIFFRACTION FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3

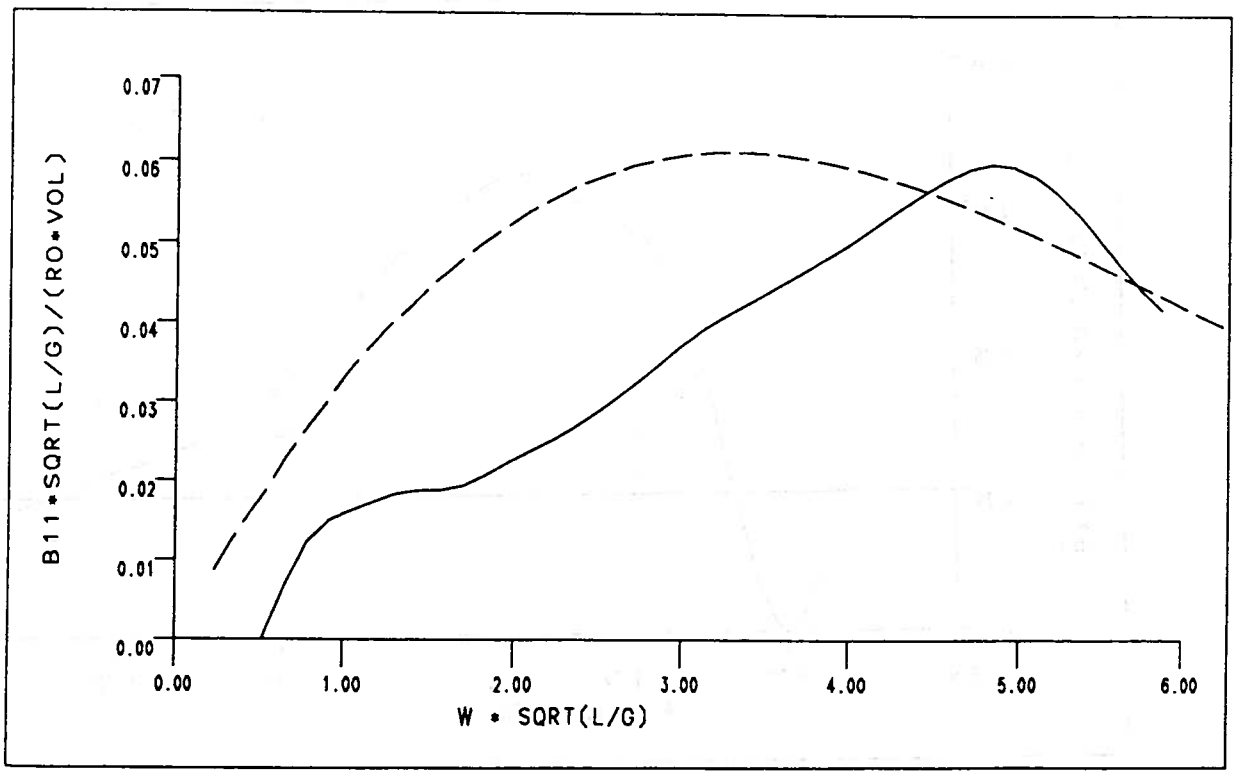
324 MAGNITUDE OF PITCH DIFFRACTION FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3

325 PHASE OF PITCH DIFFRACTION FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3

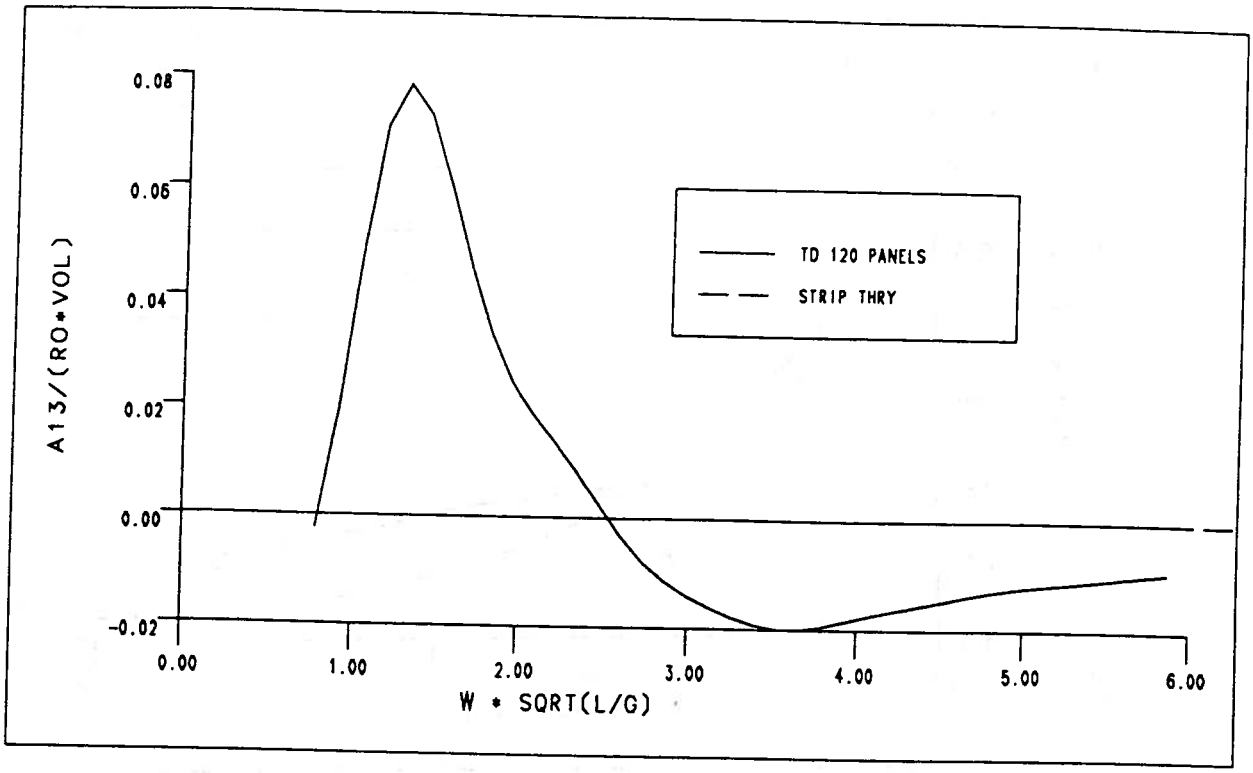
WIGLEY HULL, FN=0.2



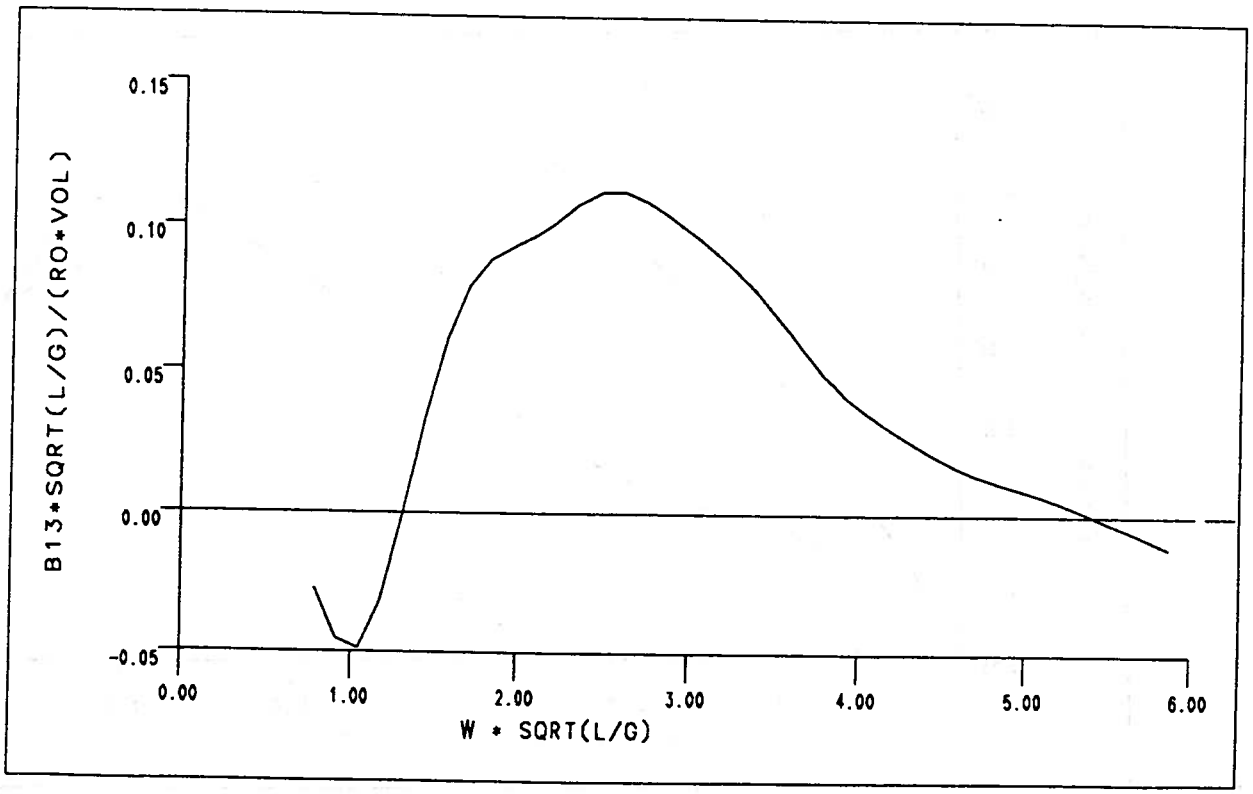
SURGE ADDED MASS FOR A WIGLEY HULL, FN=0.2
FIGURE 1



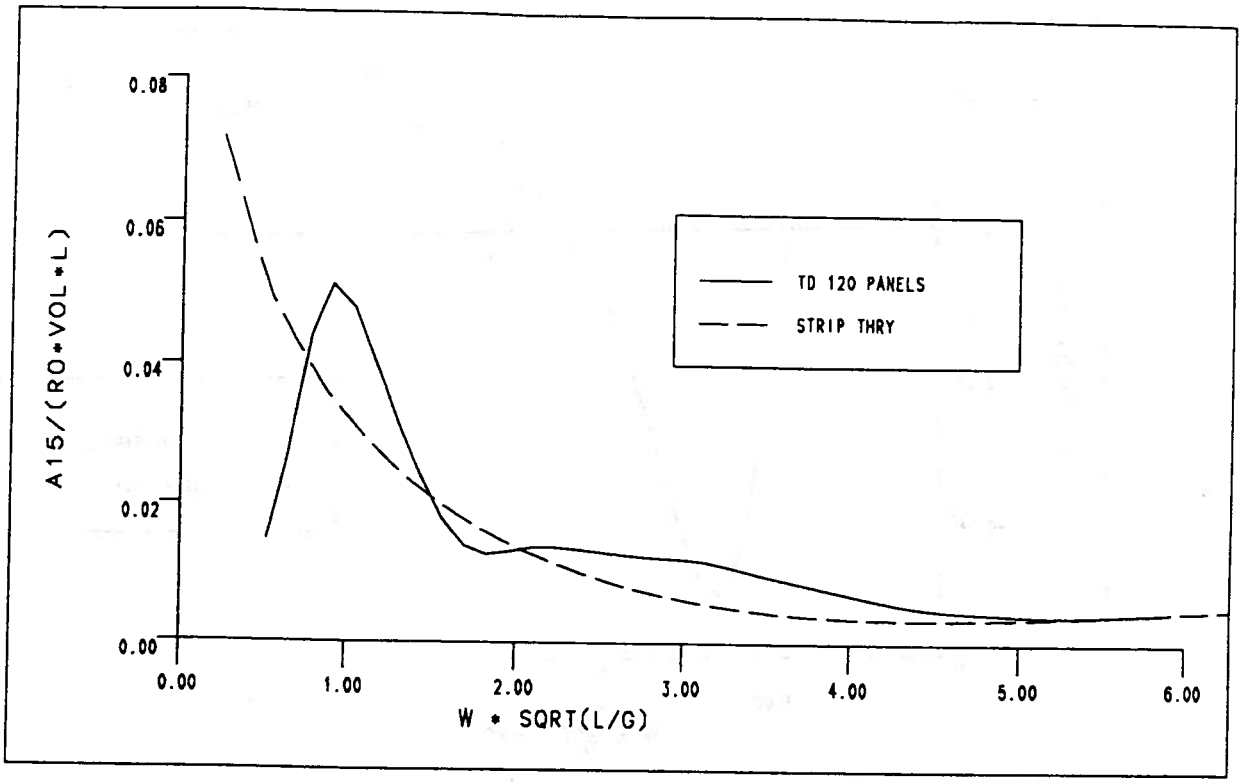
SURGE DAMPING FOR A WIGLEY HULL, FN=0.2
FIGURE 2



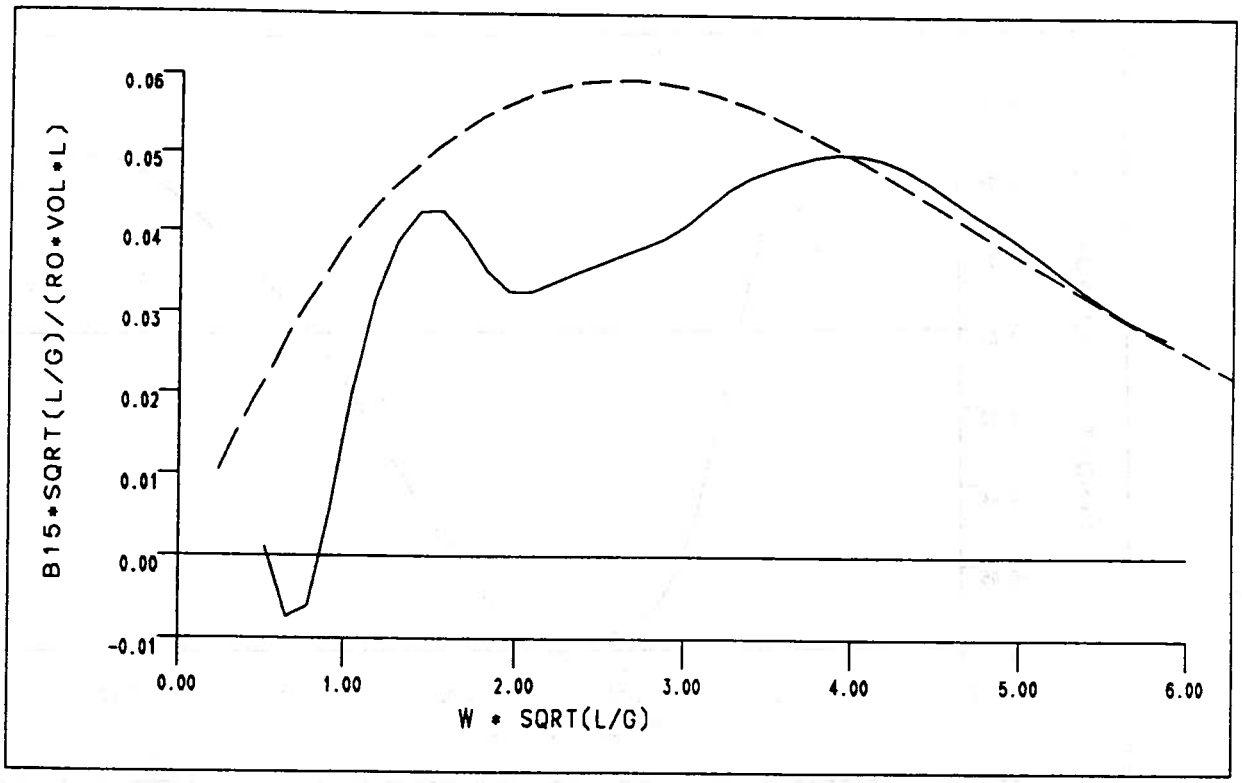
SURGE-HEAVE ADDED MASS FOR A WIGLEY HULL, FN=0.2
FIGURE 3



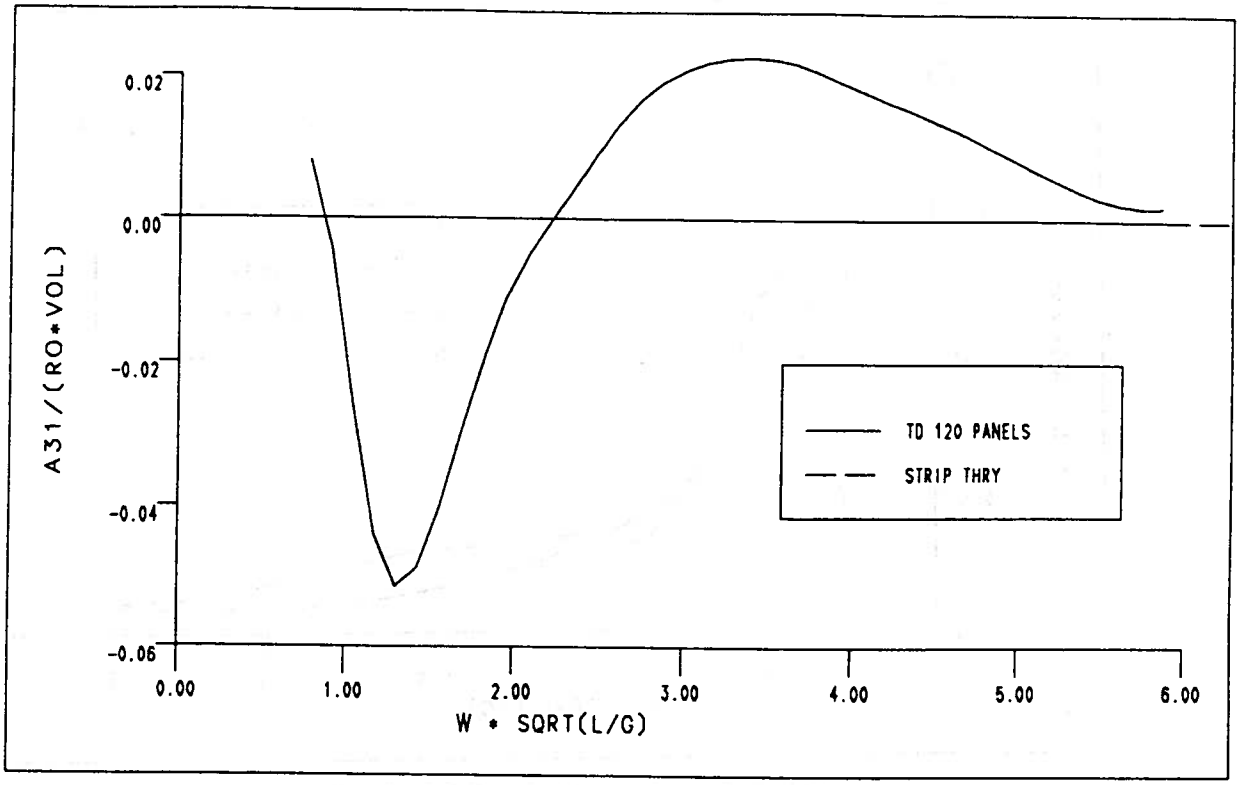
SURGE-HEAVE DAMPING FOR A WIGLEY HULL, FN=0.2
FIGURE 4



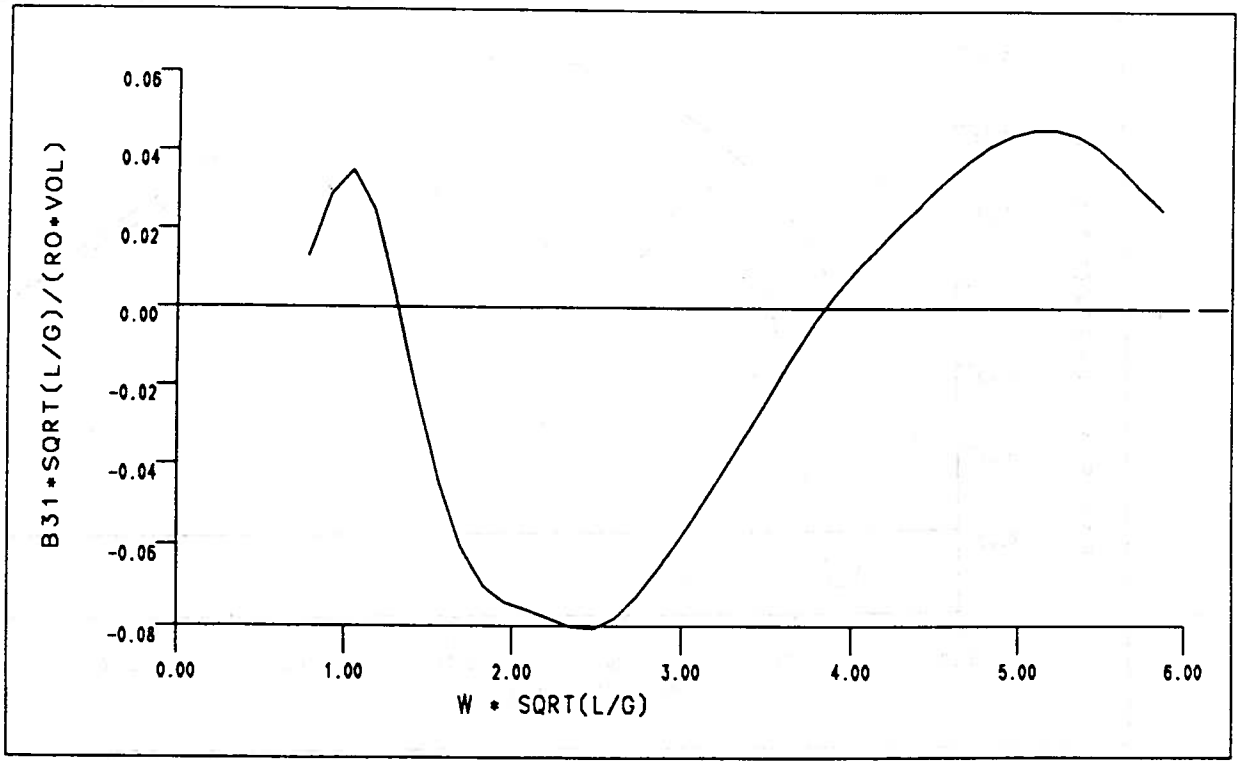
SURGE-PITCH ADDED MASS FOR A WIGLEY HULL, FN=0.2
FIGURE 5



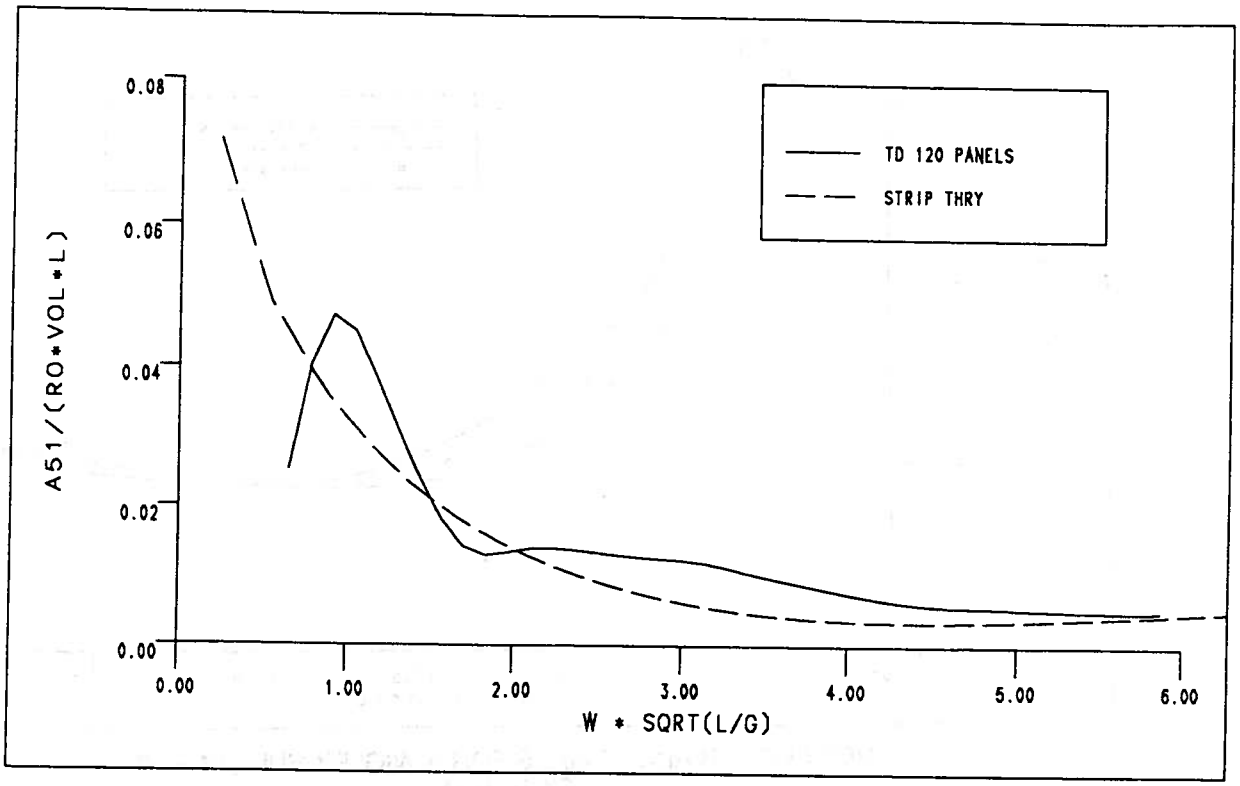
SURGE-PITCH DAMPING FOR A WIGLEY HULL, FN=0.2
FIGURE 6



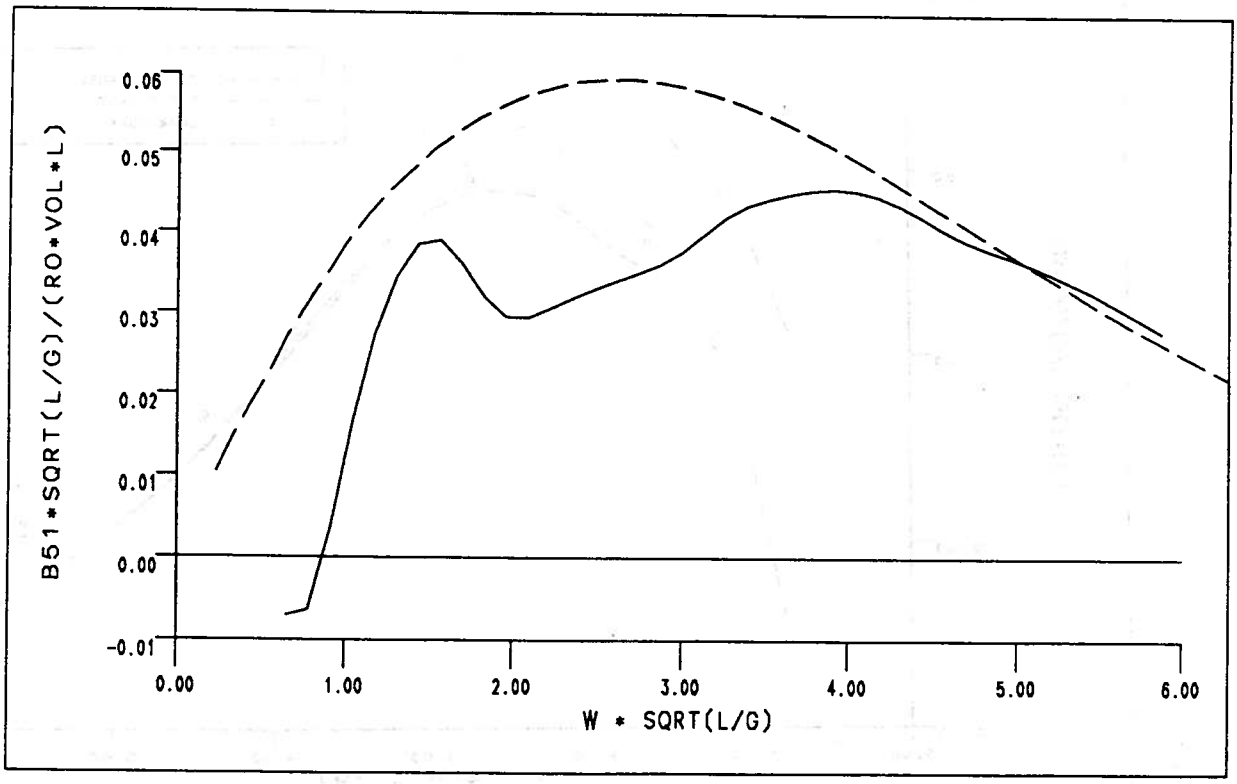
HEAVE-SURGE ADDED MASS FOR A WIGLEY HULL, FN=0.2
FIGURE 7



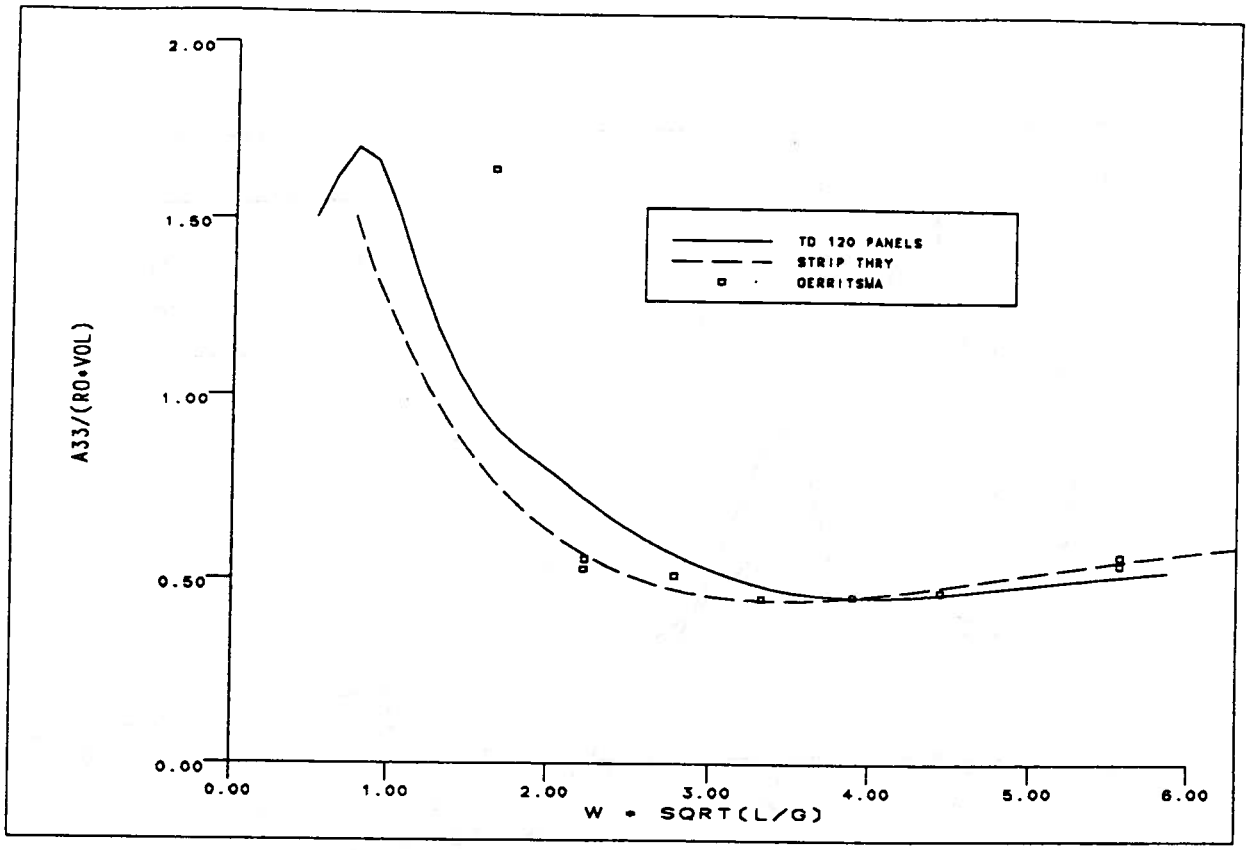
HEAVE-SURGE DAMPING FOR A WIGLEY HULL, FN=0.2
FIGURE 8



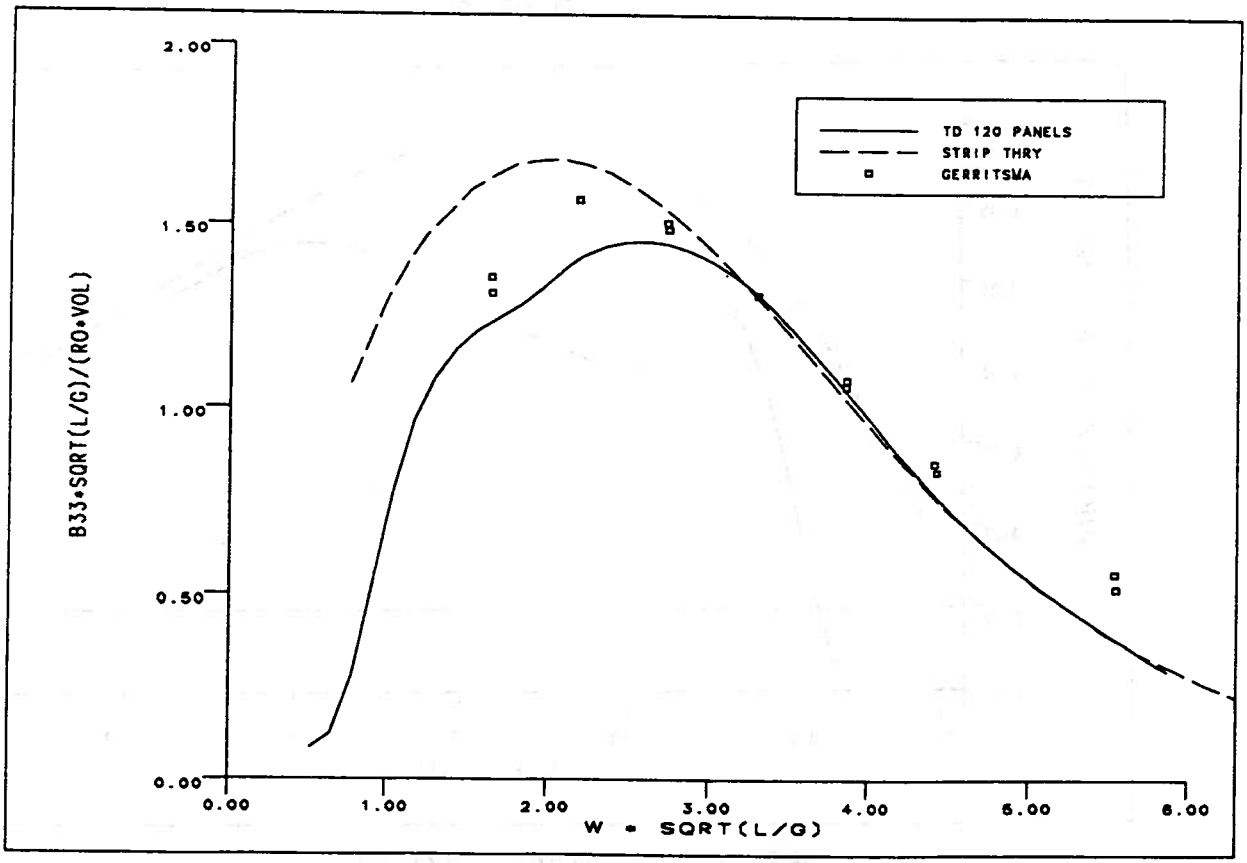
HEAVE ADDED MASS FOR A WIGLEY HULL, FN=0.2
FIGURE 9



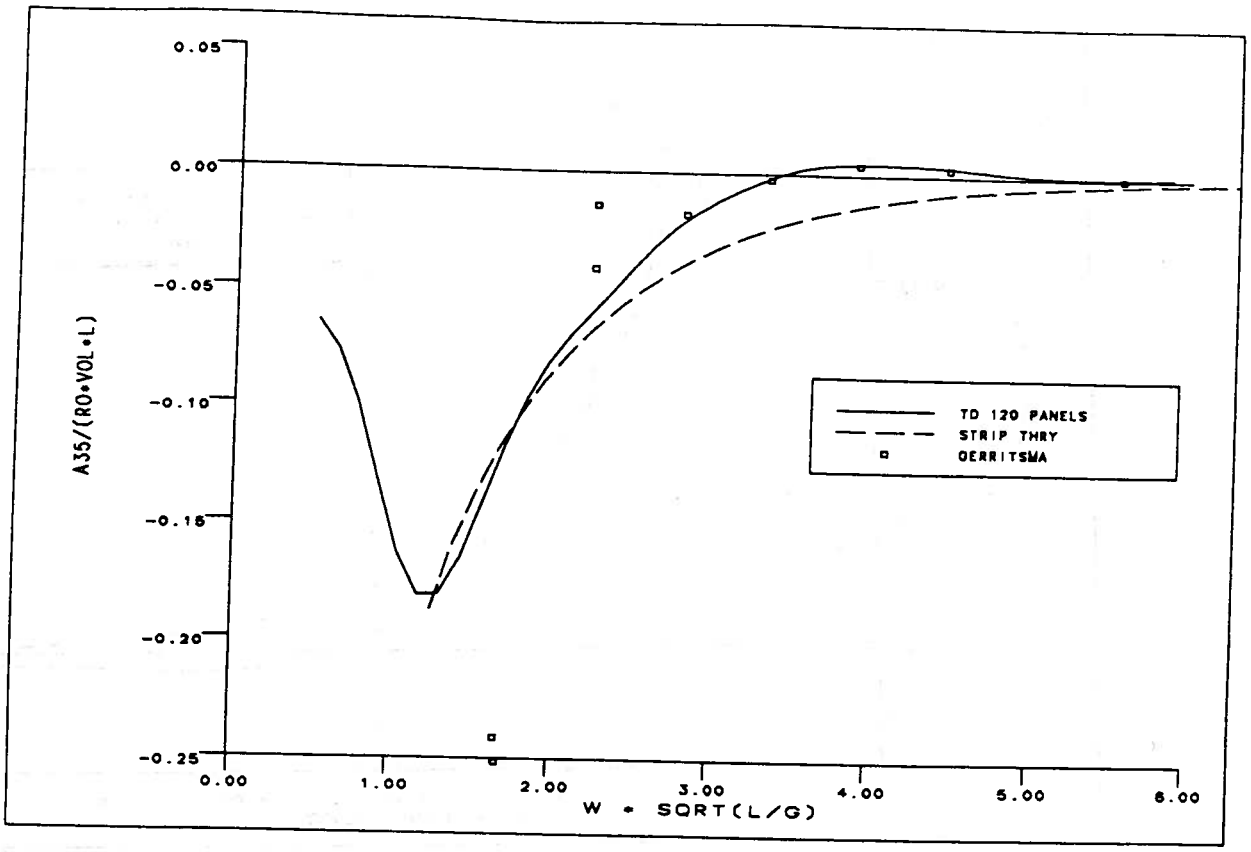
HEAVE DAMPING FOR A WIGLEY HULL, FN=0.2
FIGURE 10



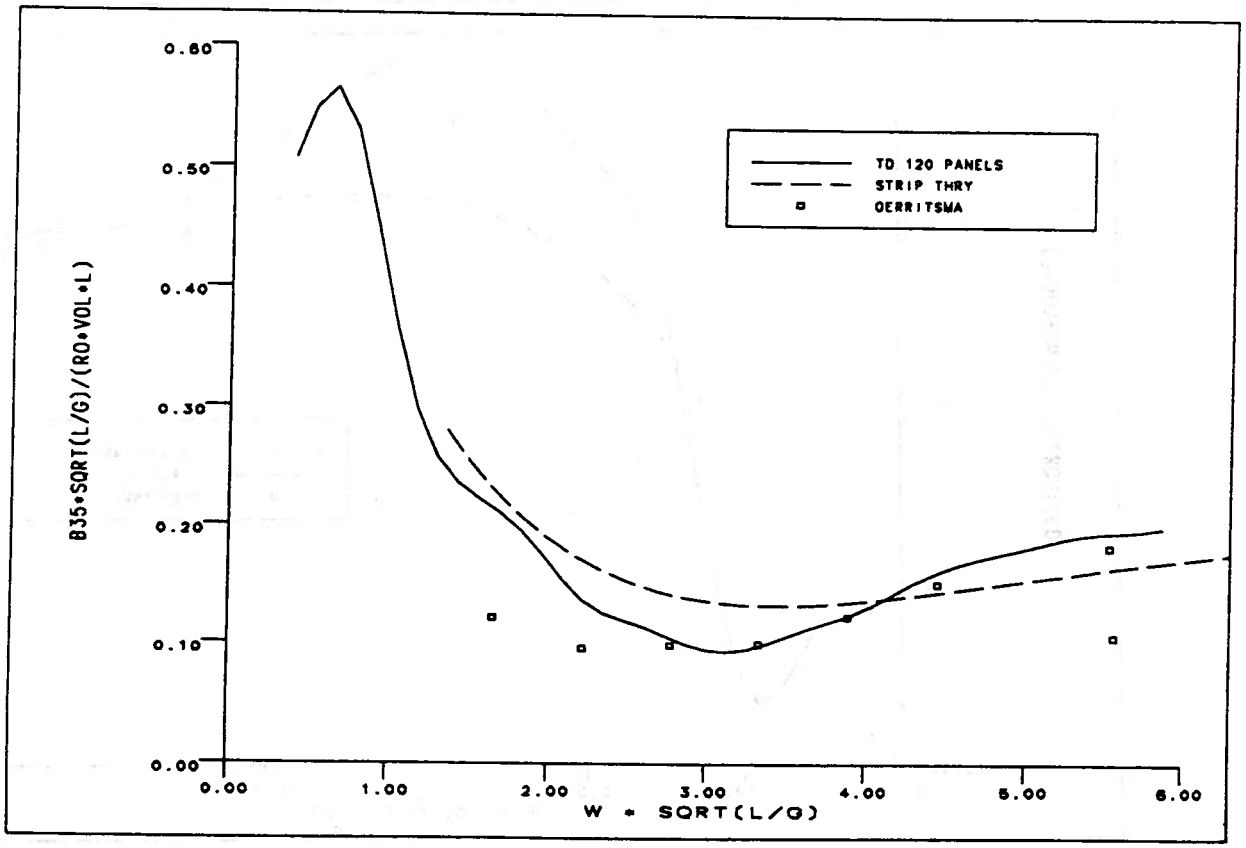
HEAVE-PITCH ADDED MASS FOR A WIGLEY HULL, FN=0.2
FIGURE 11



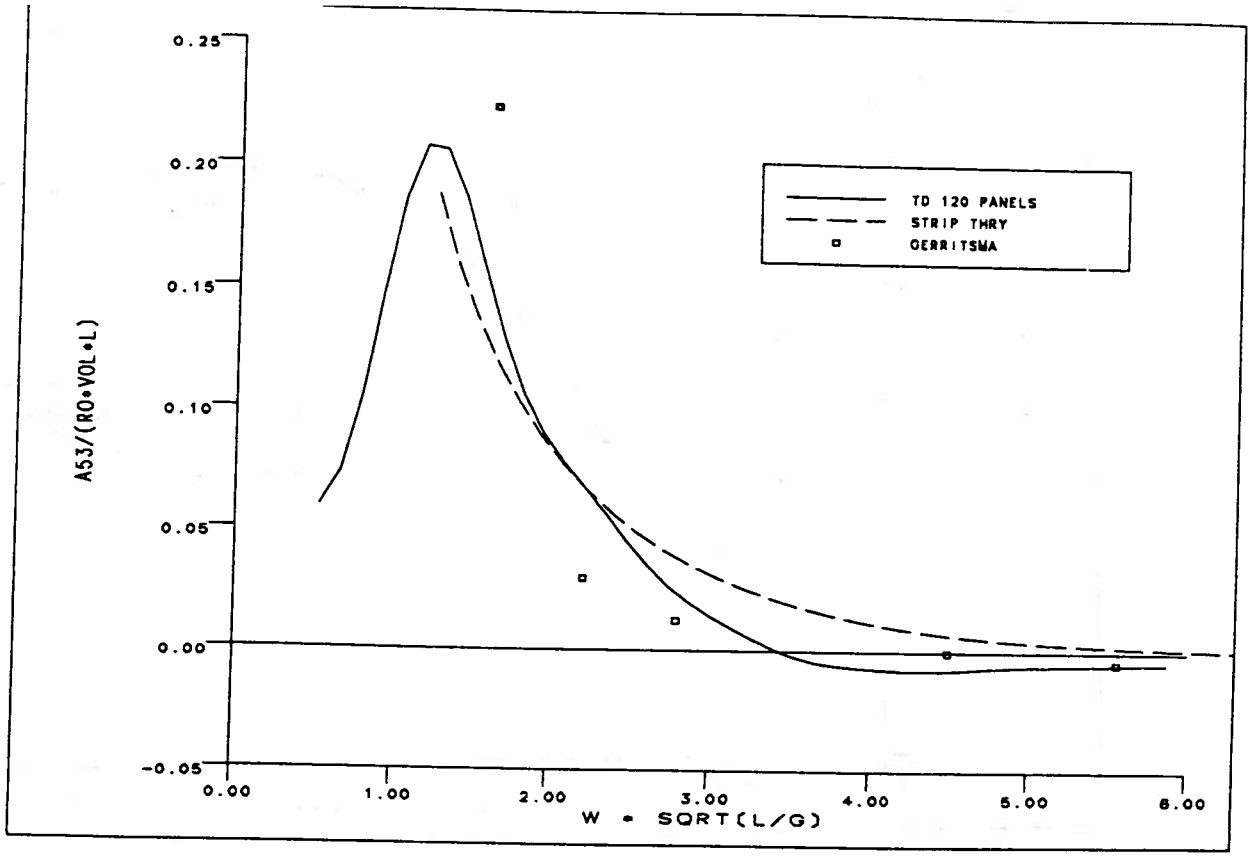
HEAVE-PITCH DAMPING FOR A WIGLEY HULL, FN=0.2
FIGURE 12



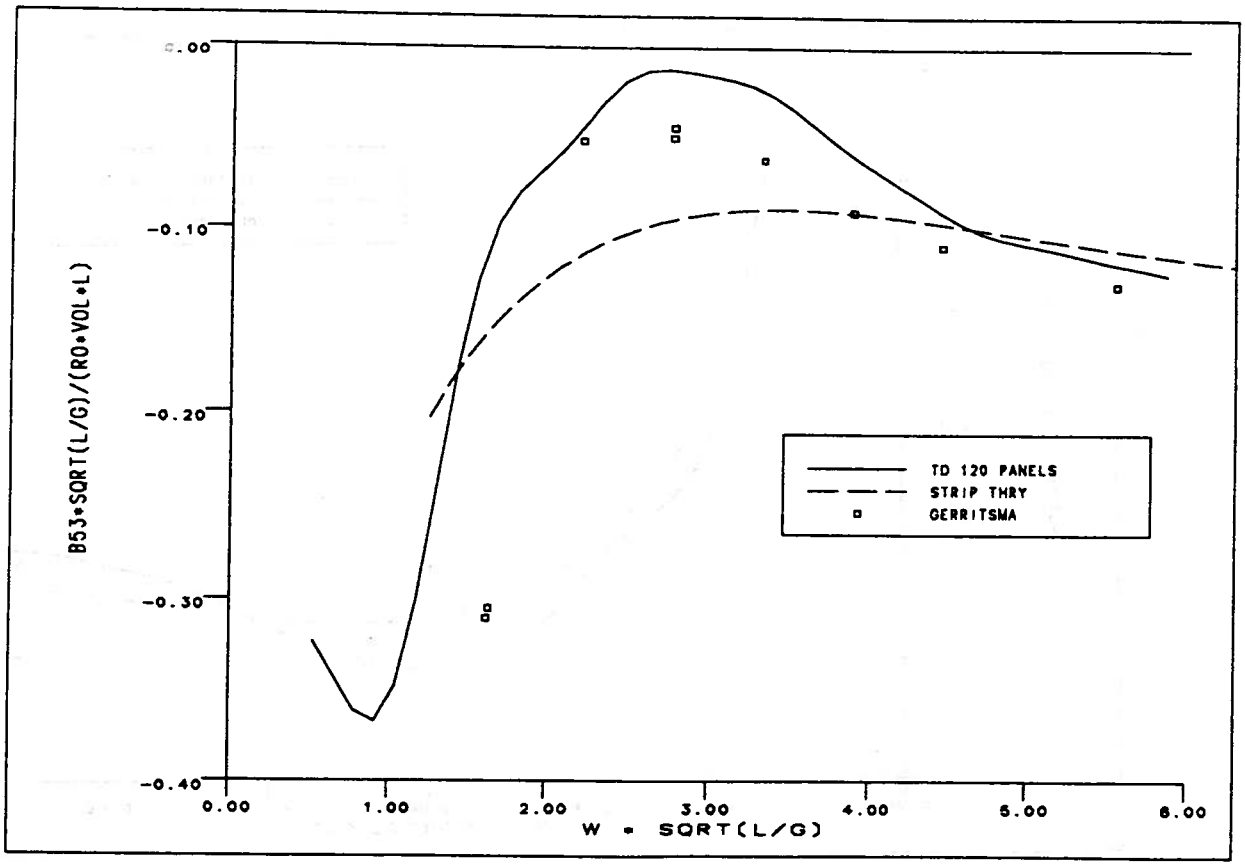
PITCH-SURGE ADDED MASS FOR A WIGLEY HULL, FN=0.2
FIGURE 13



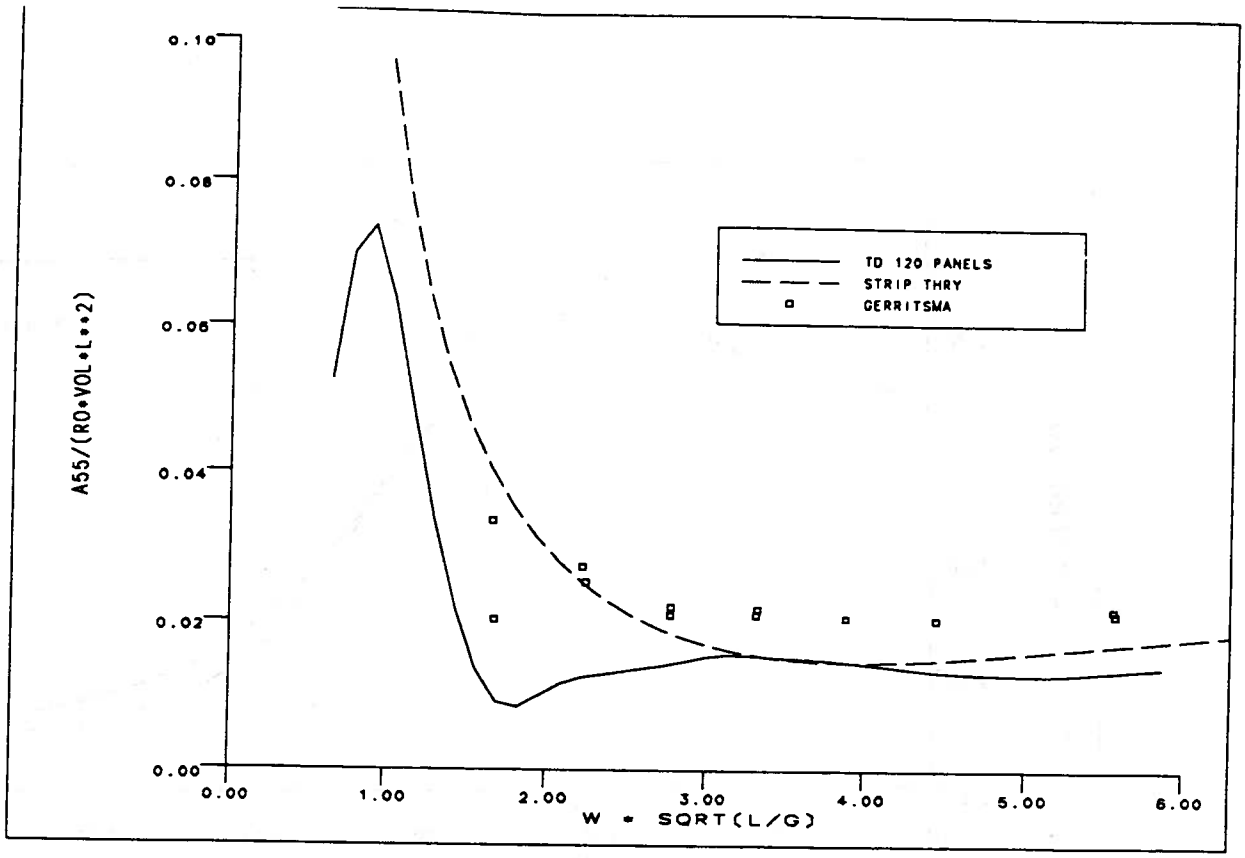
PITCH-SURGE DAMPING FOR A WIGLEY HULL, FN=0.2
FIGURE 14



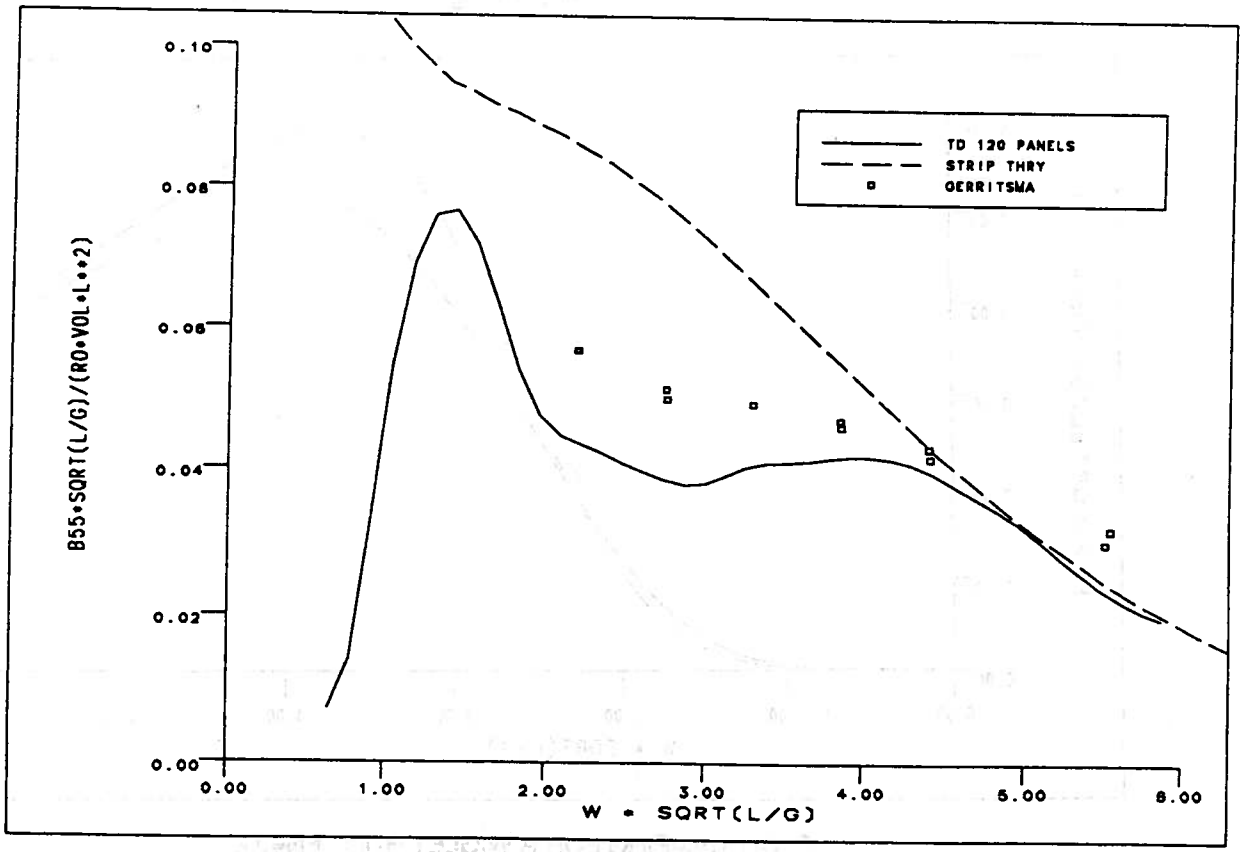
PITCH-HEAVE ADDED MASS FOR A WIGLEY HULL, FN=0.2
FIGURE 15



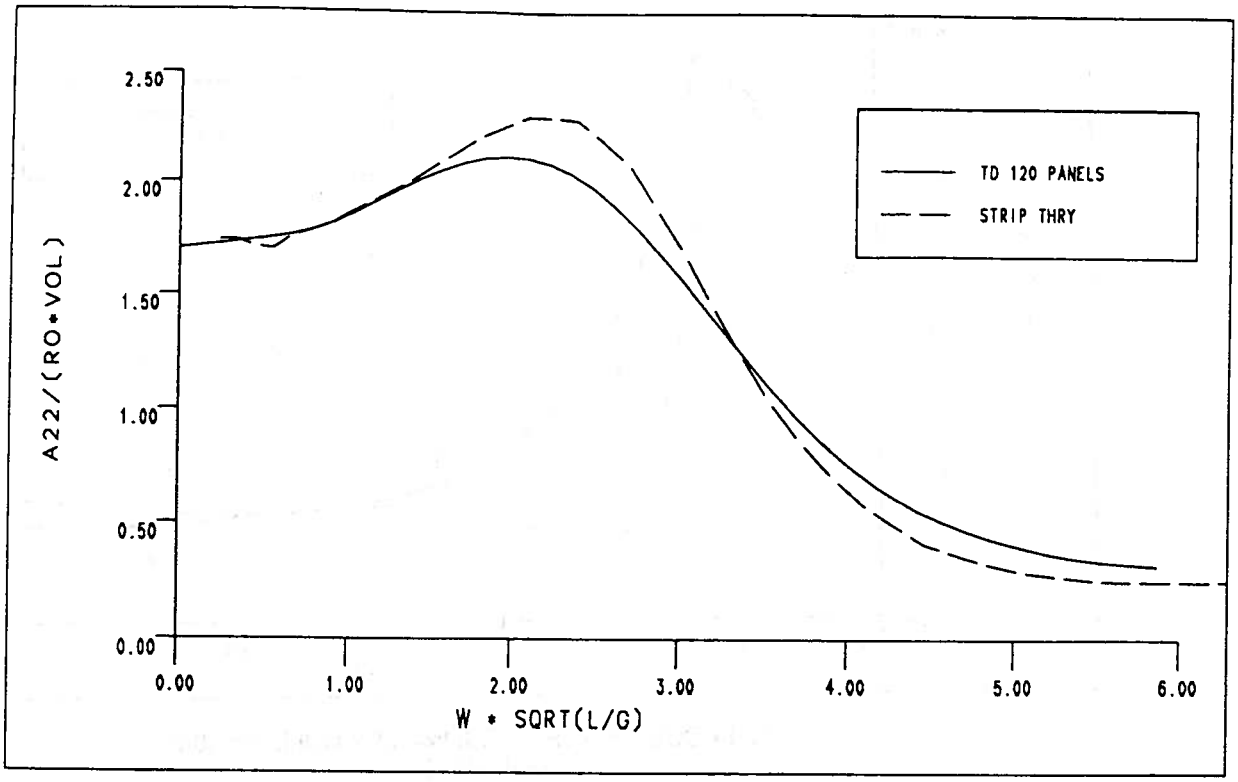
PITCH-HEAVE DAMPING FOR A WIGLEY HULL, FN=0.2
FIGURE 16



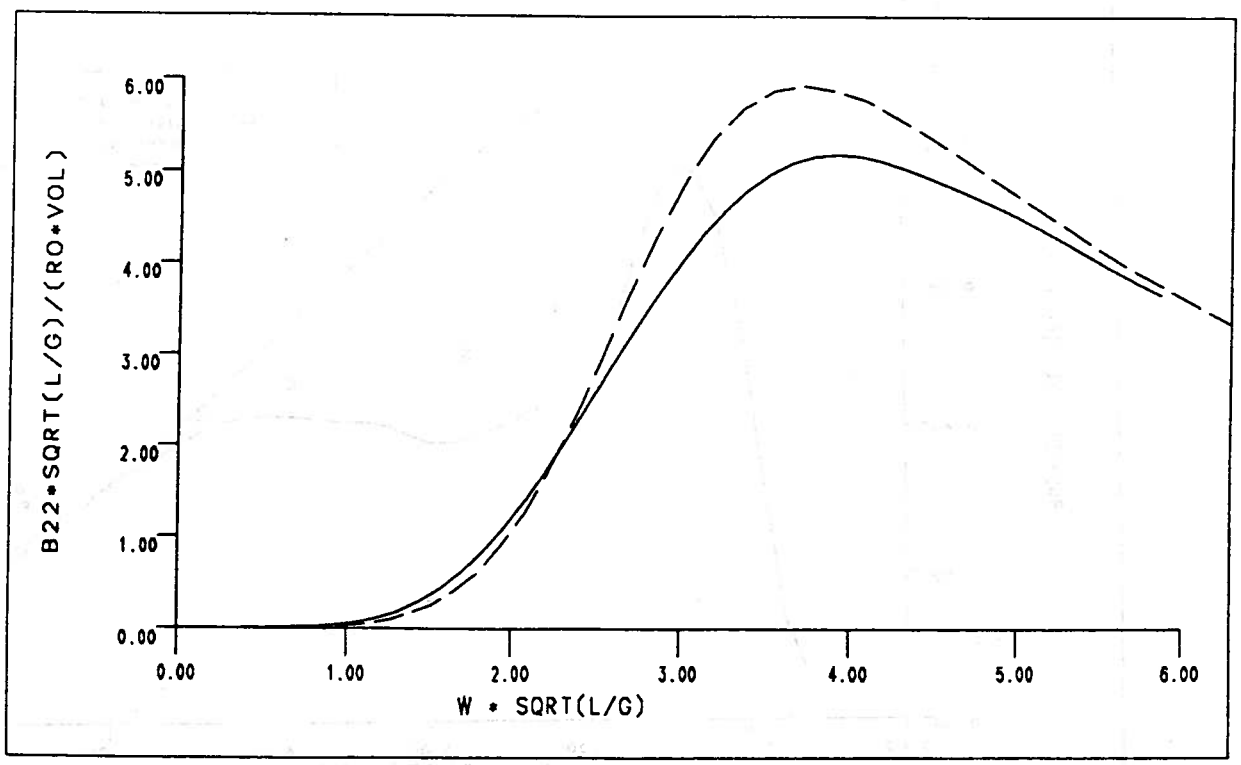
PITCH ADDED MASS FOR A WIGLEY HULL, FN=0.2
FIGURE 17



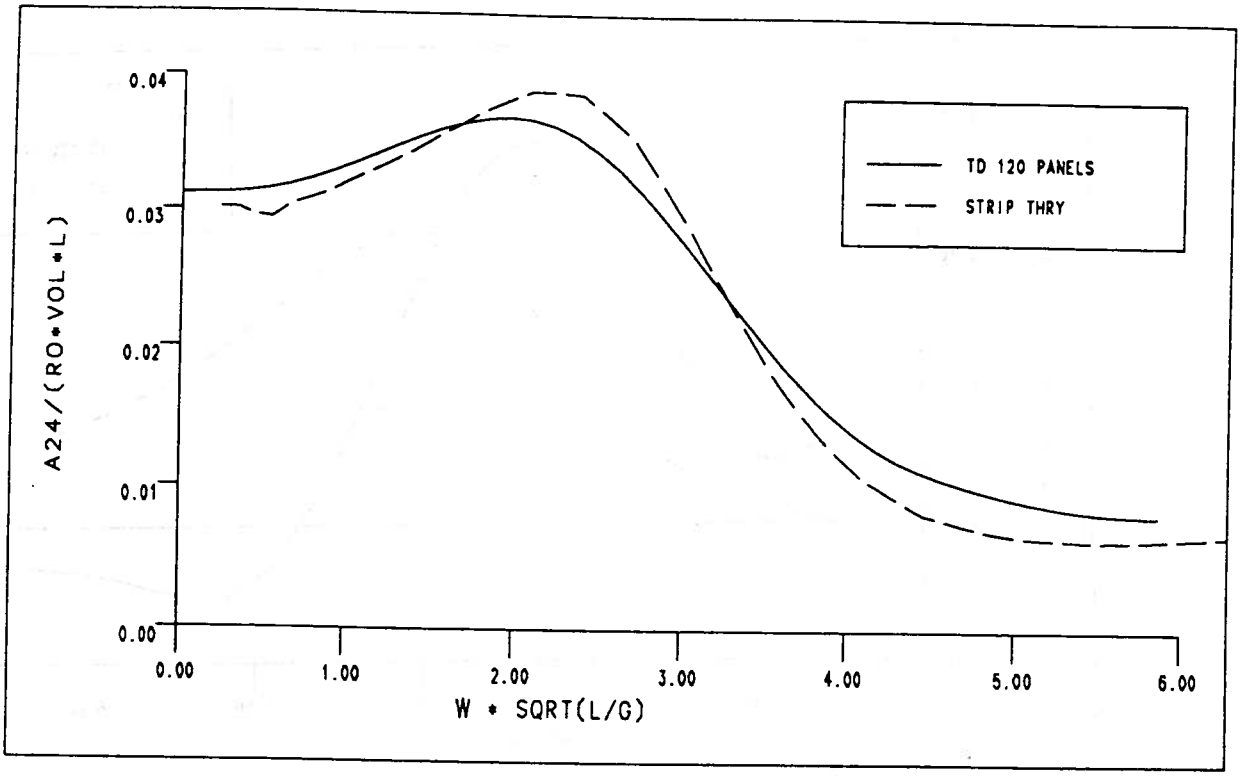
PITCH DAMPING FOR A WIGLEY HULL, FN=0.2
FIGURE 18



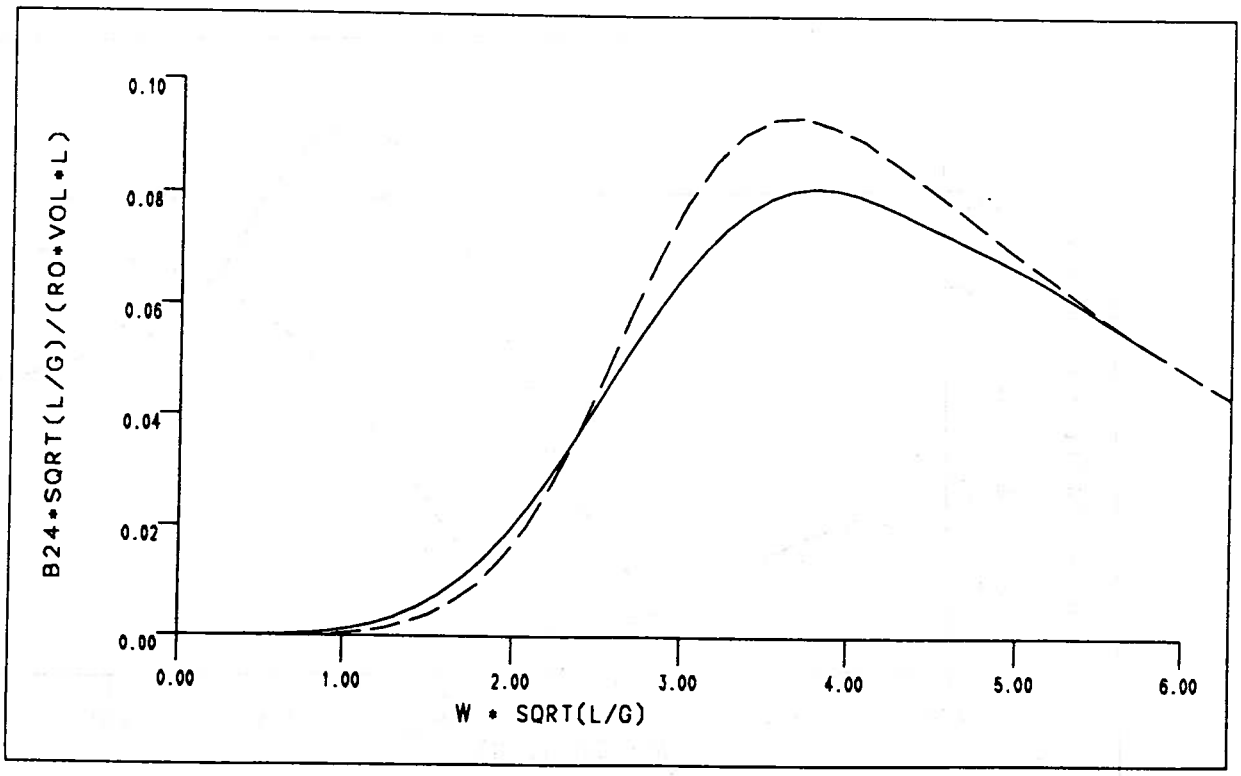
SWAY ADDED MASS FOR A WIGLEY HULL, FN=0.2
FIGURE 19



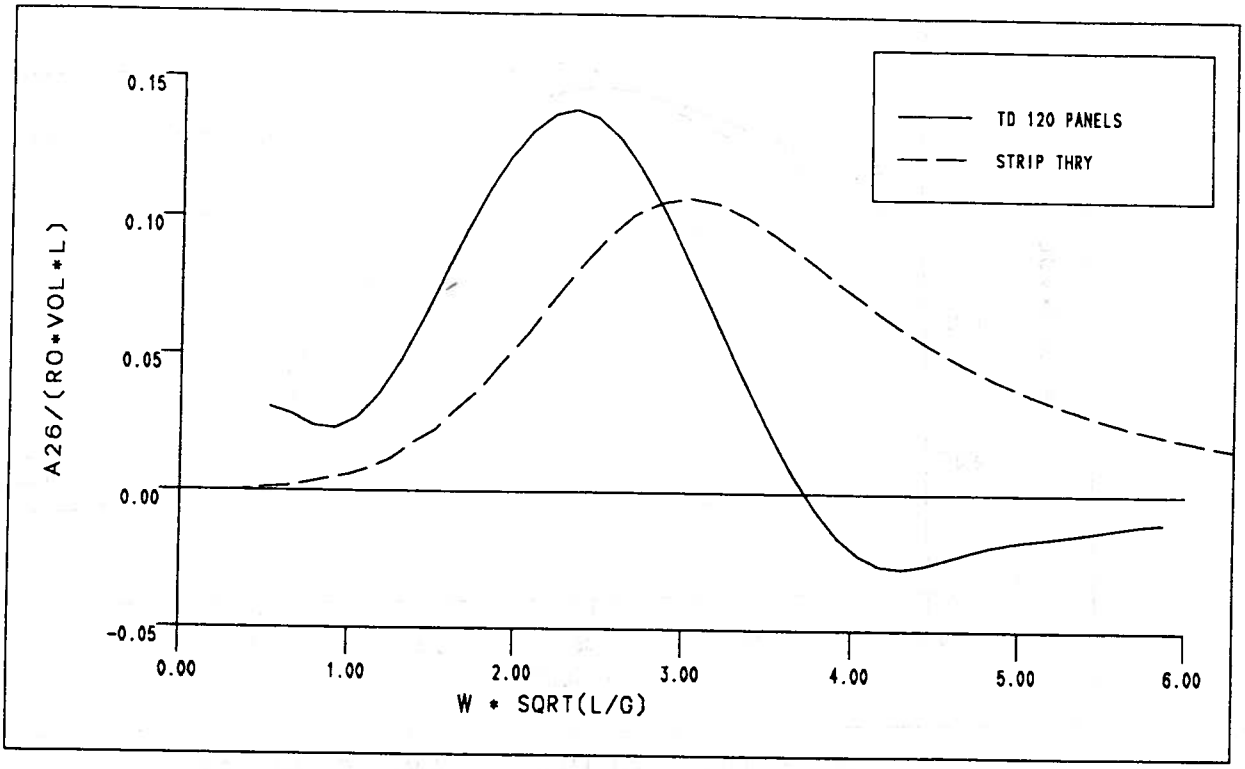
SWAY DAMPING FOR A WIGLEY HULL, FN=0.2
FIGURE 20



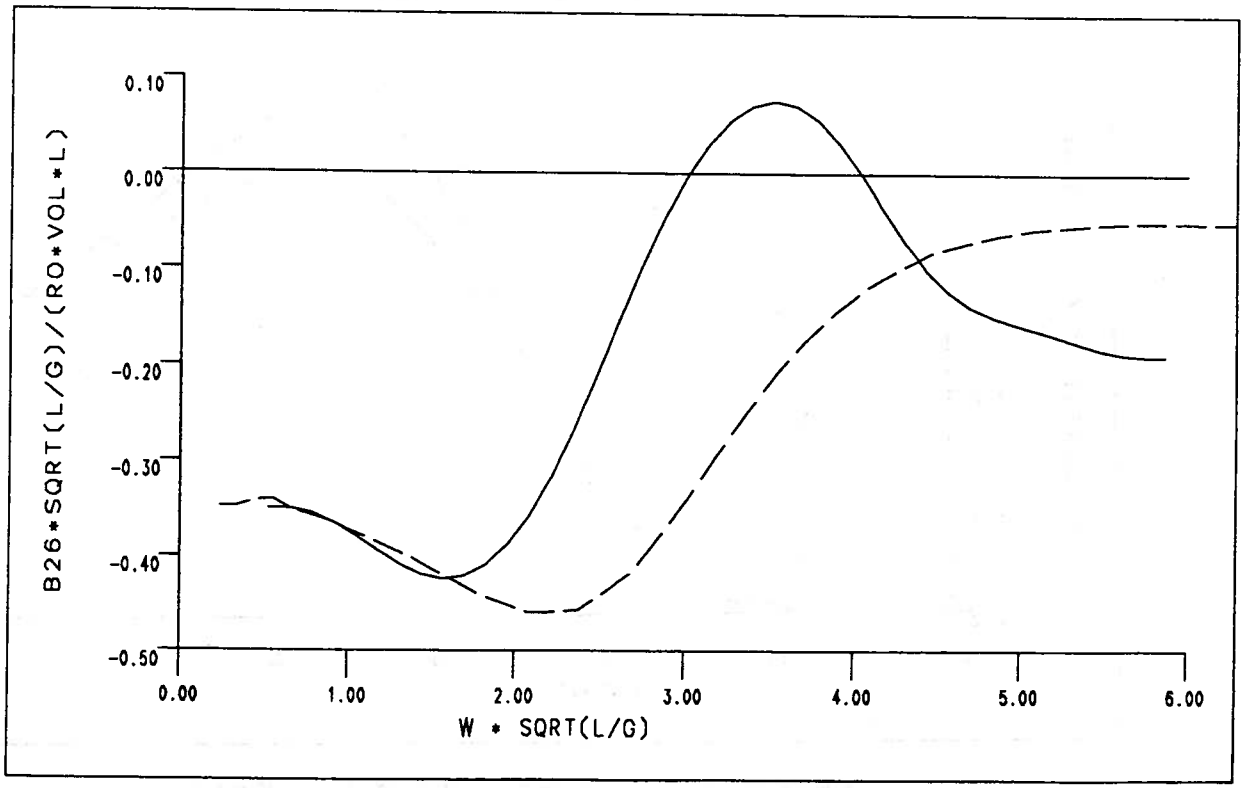
SWAY-ROLL ADDED MASS FOR A WIGLEY HULL, FN=0.2
FIGURE 21



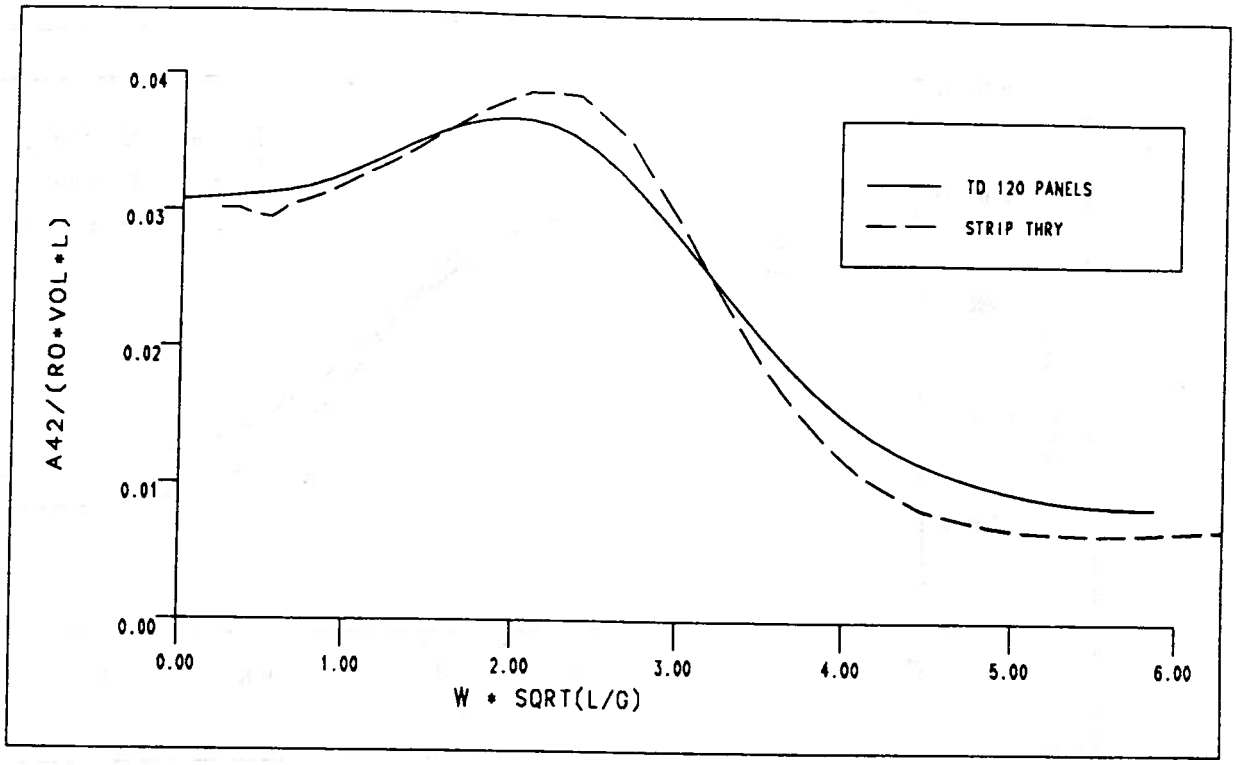
SWAY-ROLL DAMPING FOR A WIGLEY HULL, FN=0.2
FIGURE 22



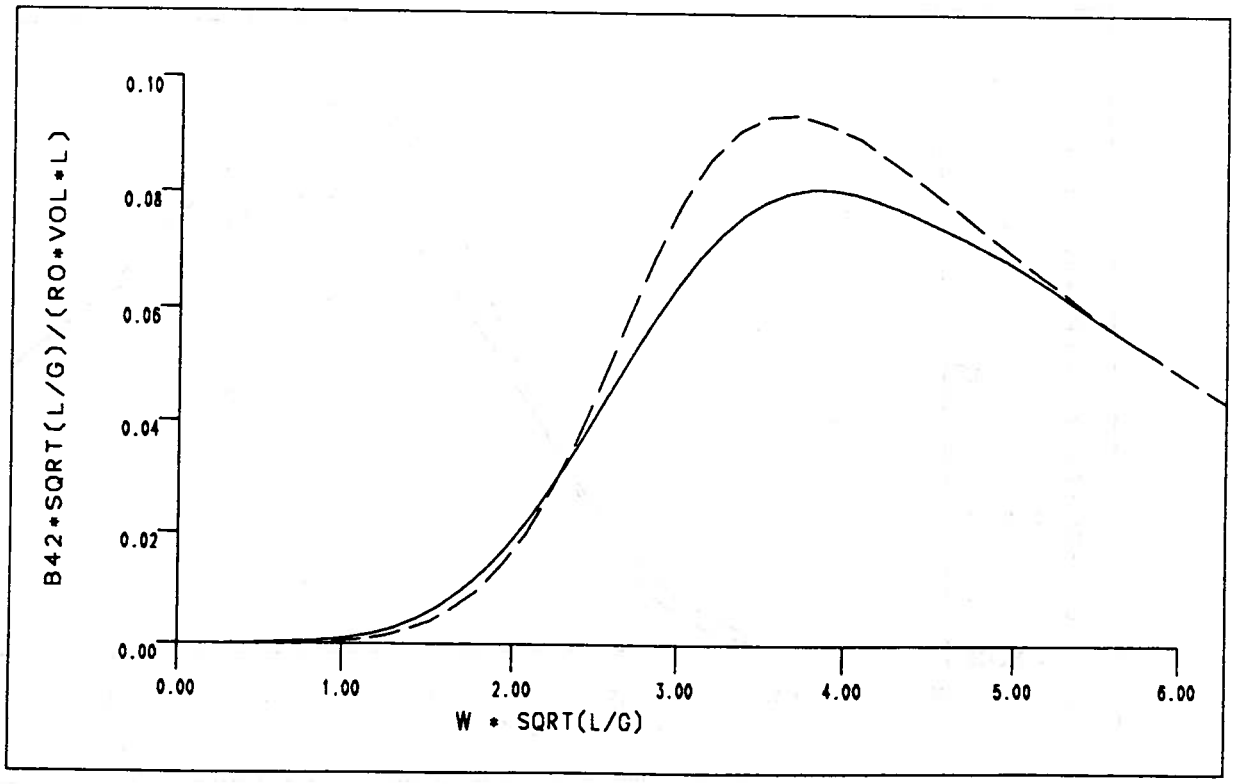
SWAY-YAW ADDED MASS FOR A WIGLEY HULL, FN=0.2
FIGURE 23



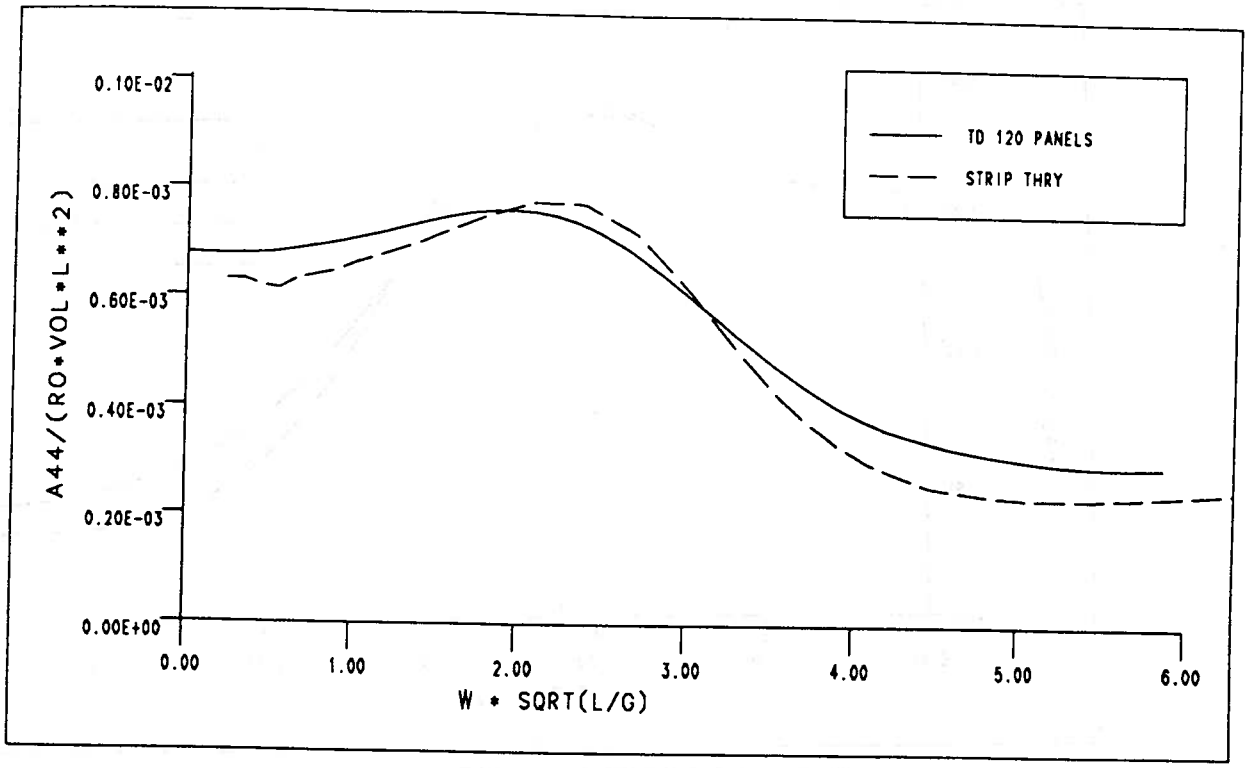
SWAY-YAW DAMPING FOR A WIGLEY HULL, FN=0.2
FIGURE 24



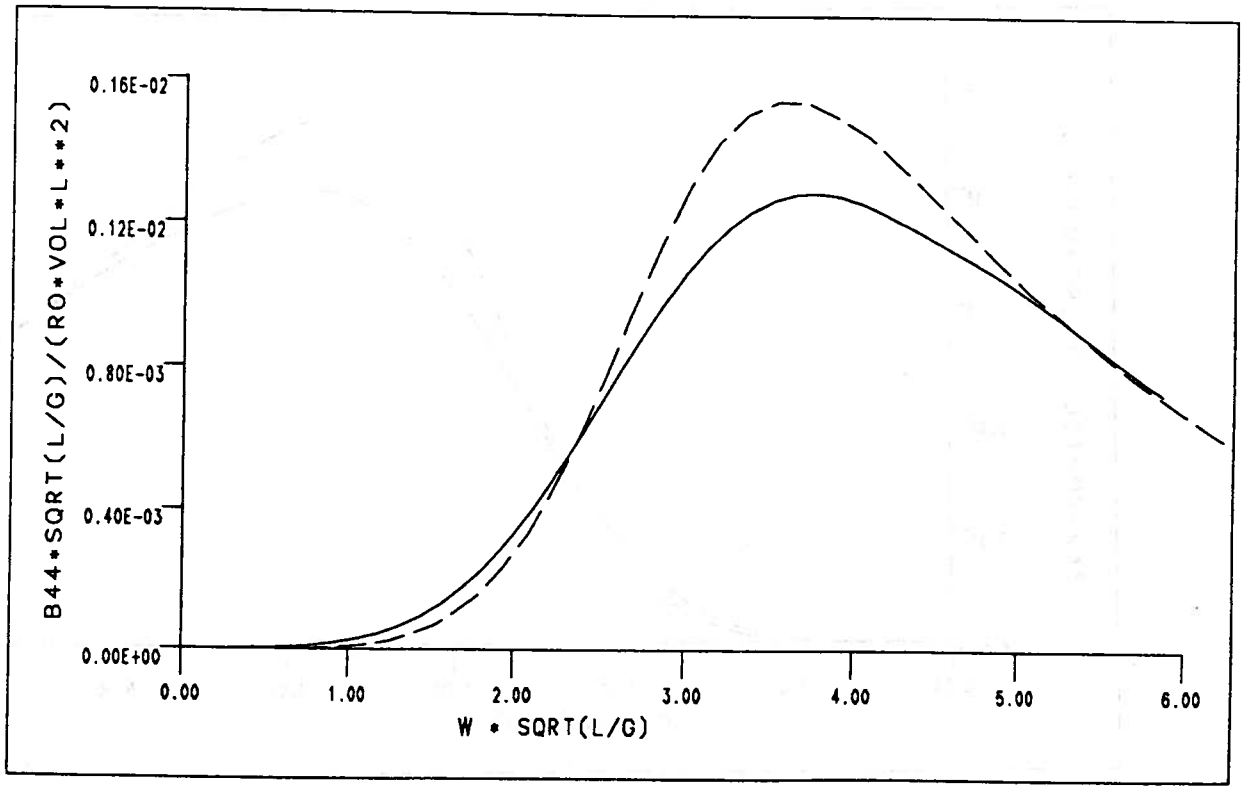
ROLL-SWAY ADDED MASS FOR A WIGLEY HULL, FN=0.2
FIGURE 25



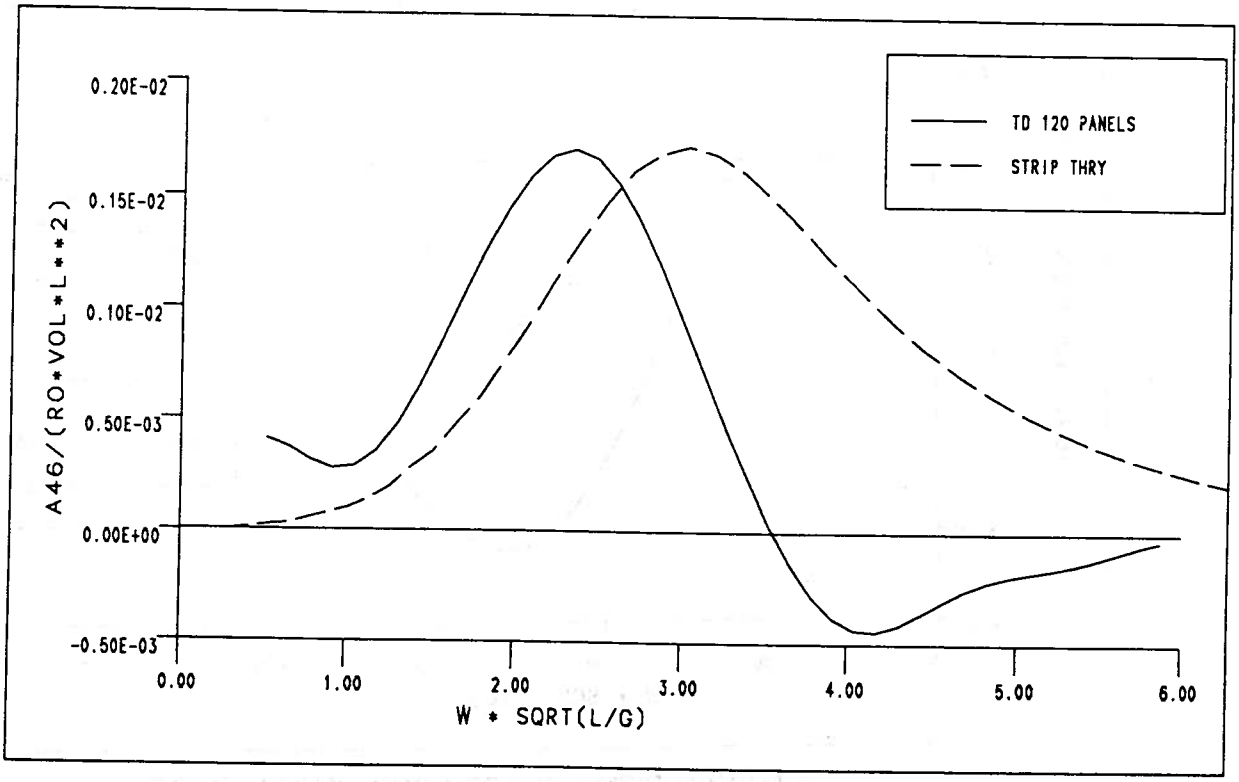
ROLL-SWAY DAMPING FOR A WIGLEY HULL, FN=0.2
FIGURE 26



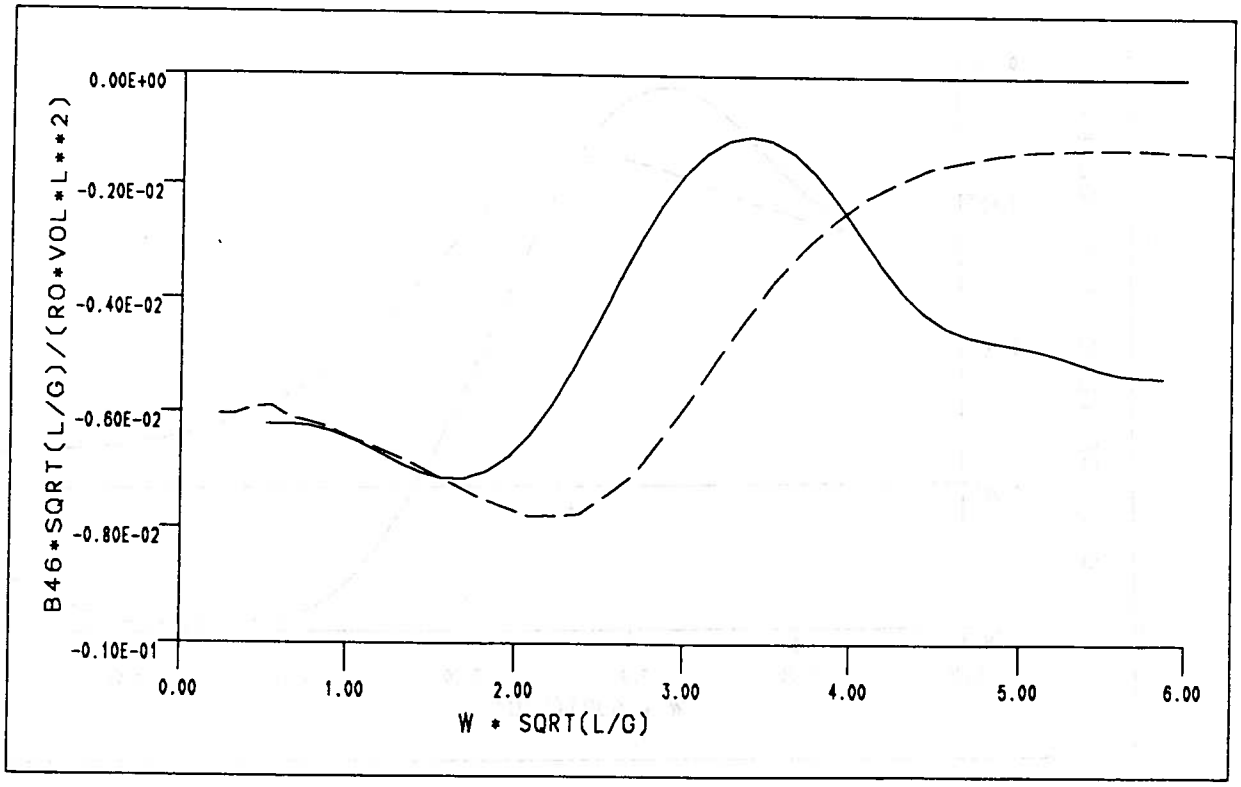
ROLL ADDED MASS FOR A WIGLEY HULL, FN=0.2
FIGURE 27



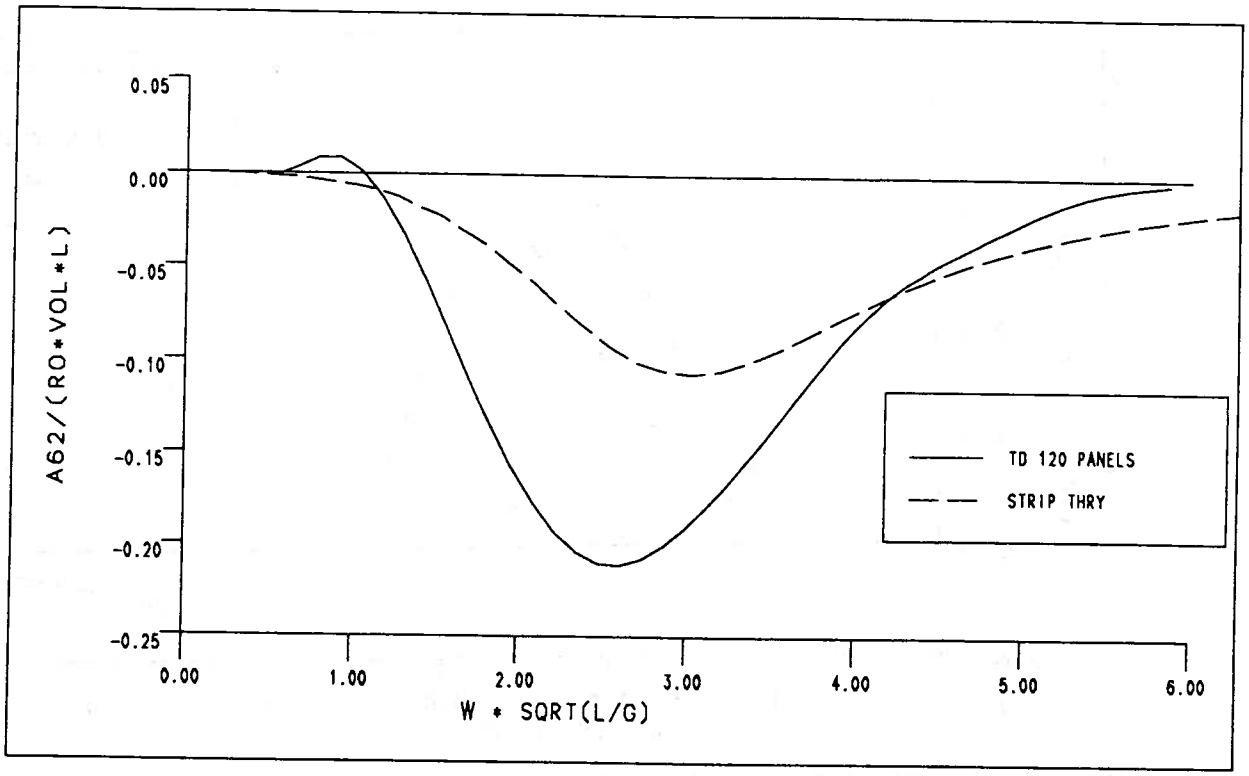
ROLL DAMPING FOR A WIGLEY HULL, FN=0.2
FIGURE 28



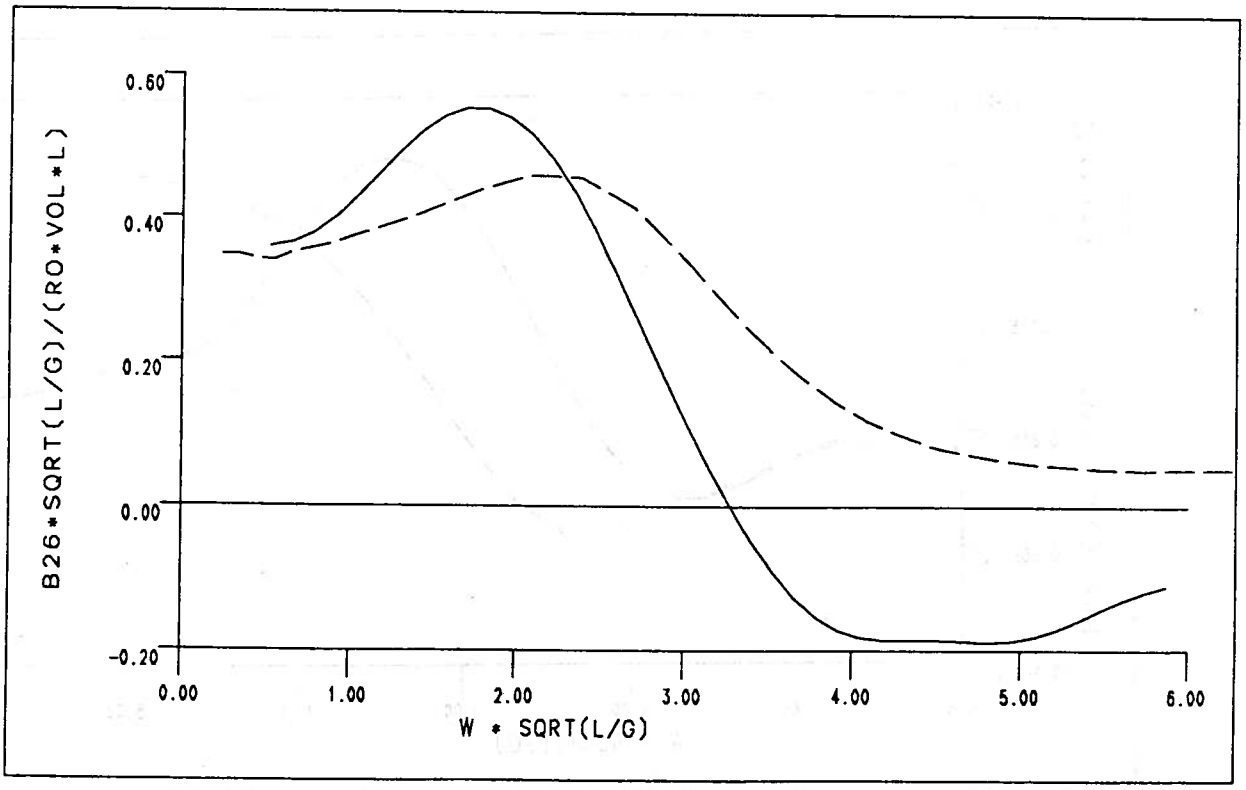
ROLL-YAW ADDED MASS FOR A WIGLEY HULL, FN=0.2
FIGURE 29



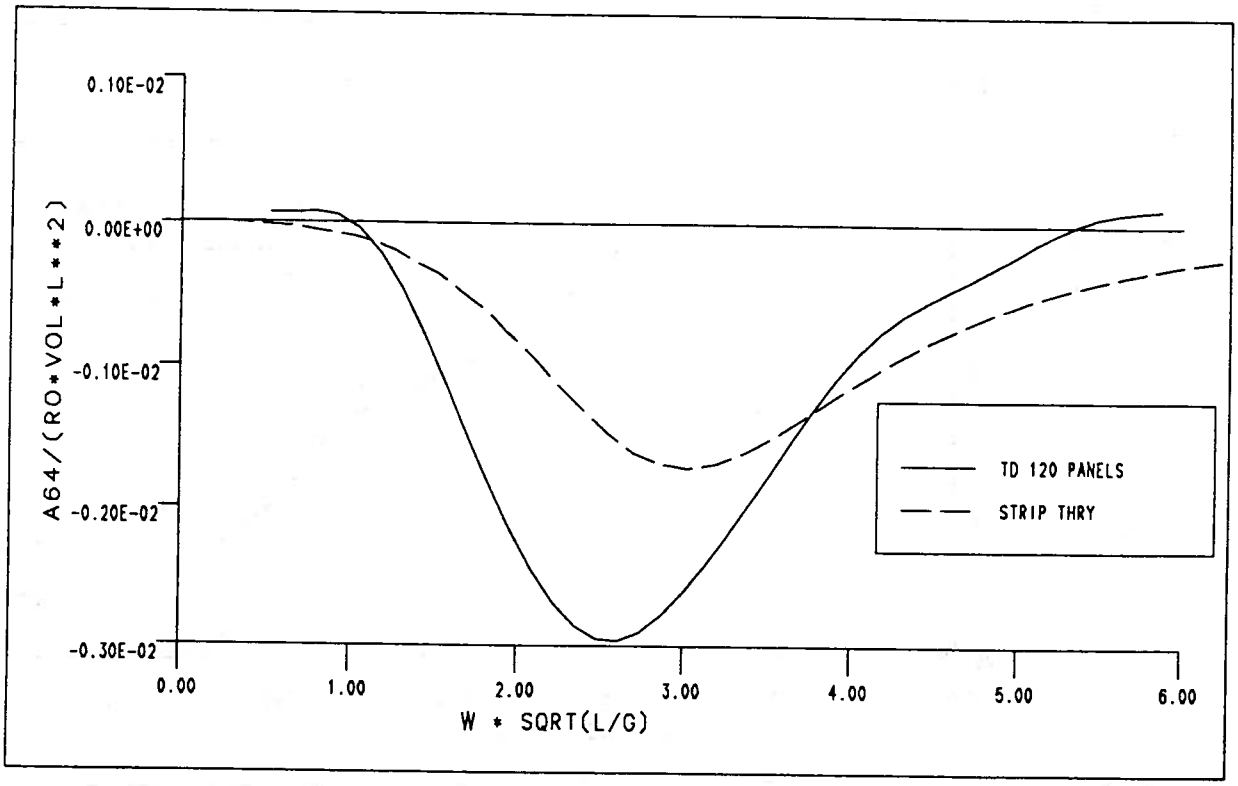
ROLL-YAW DAMPING FOR A WIGLEY HULL, FN=0.2
FIGURE 30



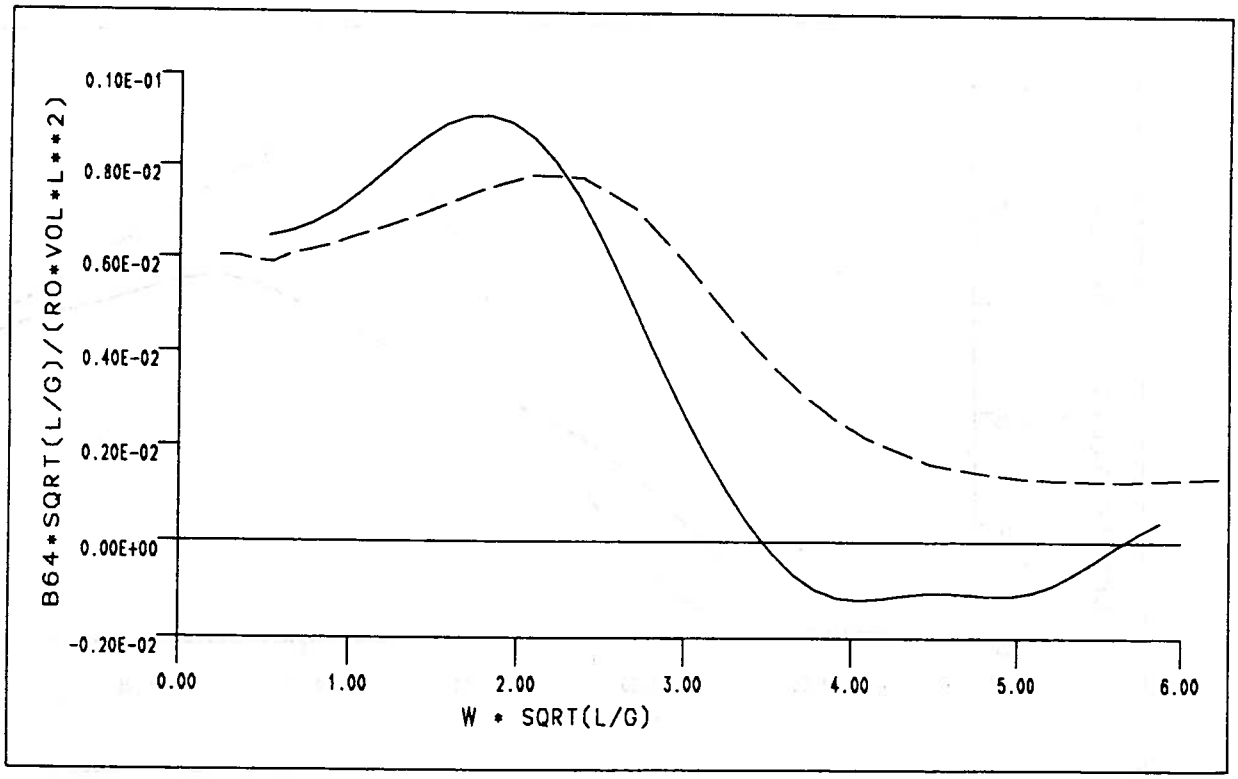
YAW-SWAY ADDED MASS FOR A WIGLEY HULL, FN=0.2
FIGURE 31



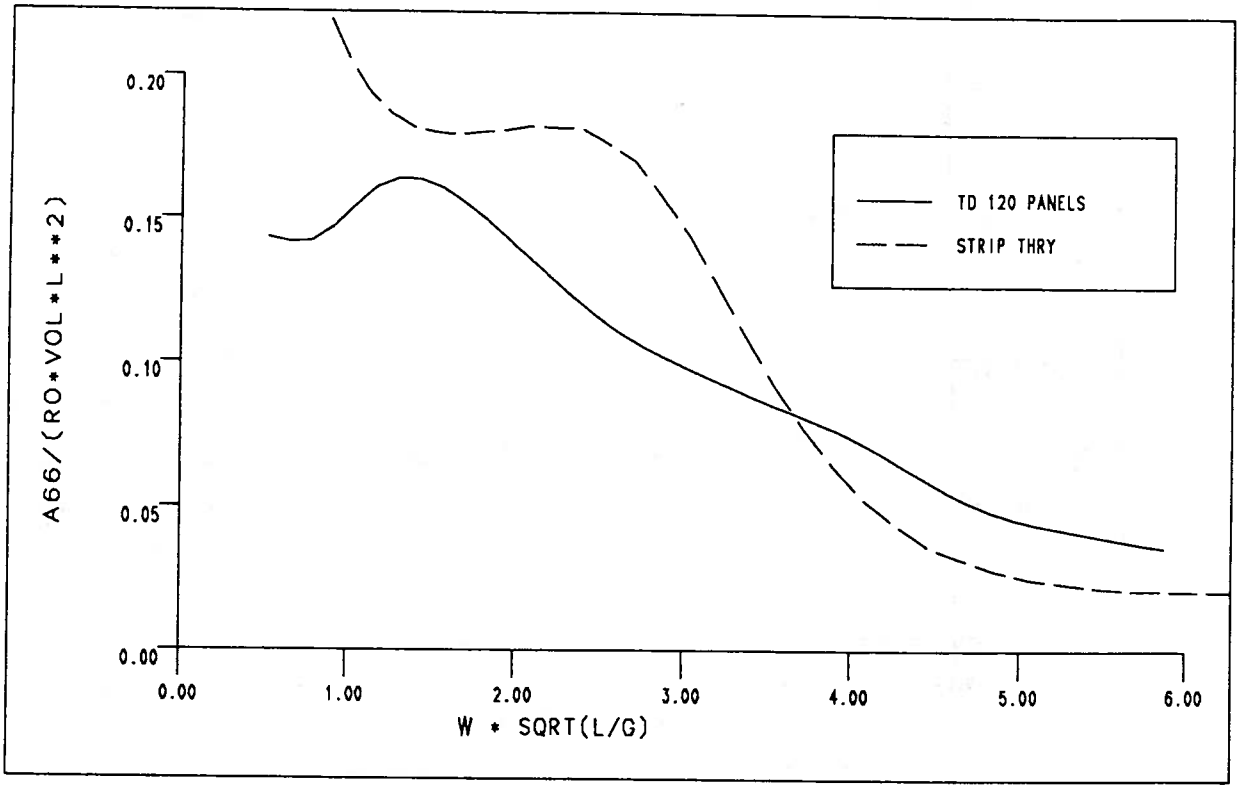
YAW-SWAY DAMPING FOR A WIGLEY HULL, FN=0.2
FIGURE 32



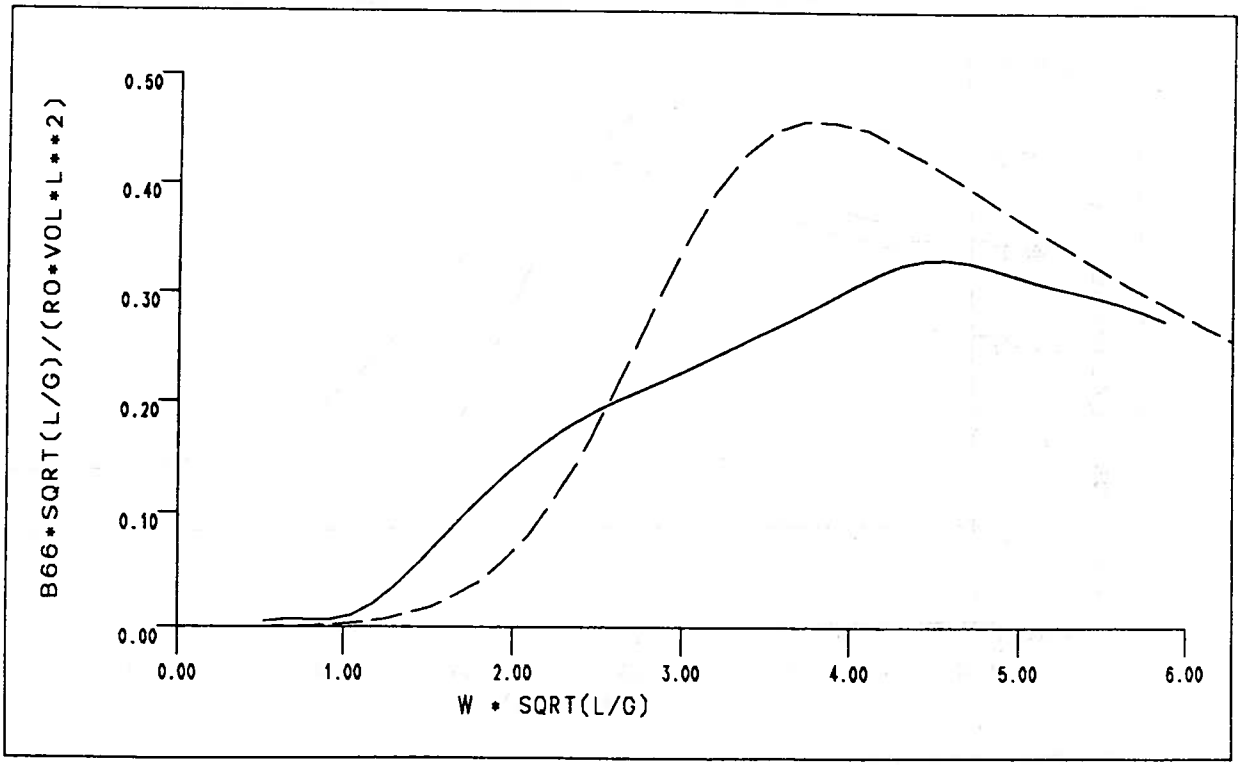
YAW-ROLL ADDED MASS FOR A WIGLEY HULL, FN=0.2
FIGURE 33



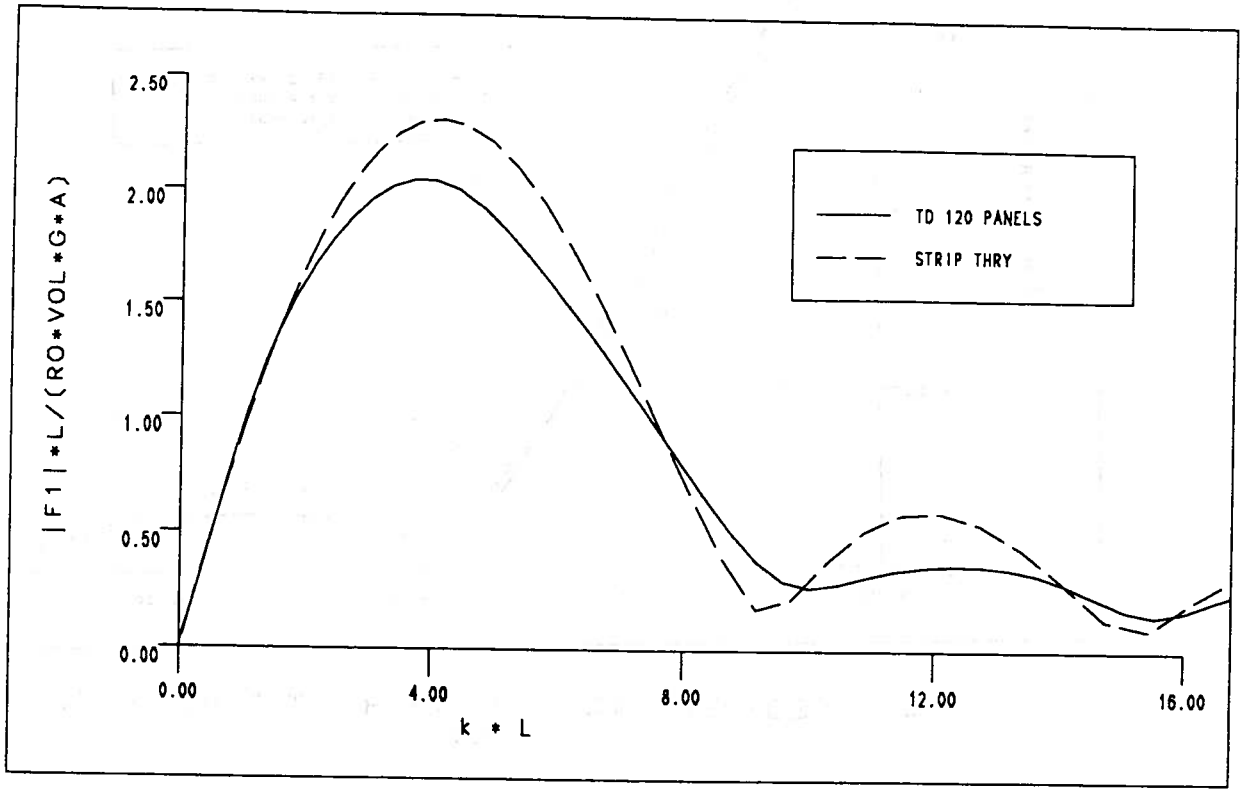
YAW-ROLL DAMPING FOR A WIGLEY HULL, FN=0.2
FIGURE 34



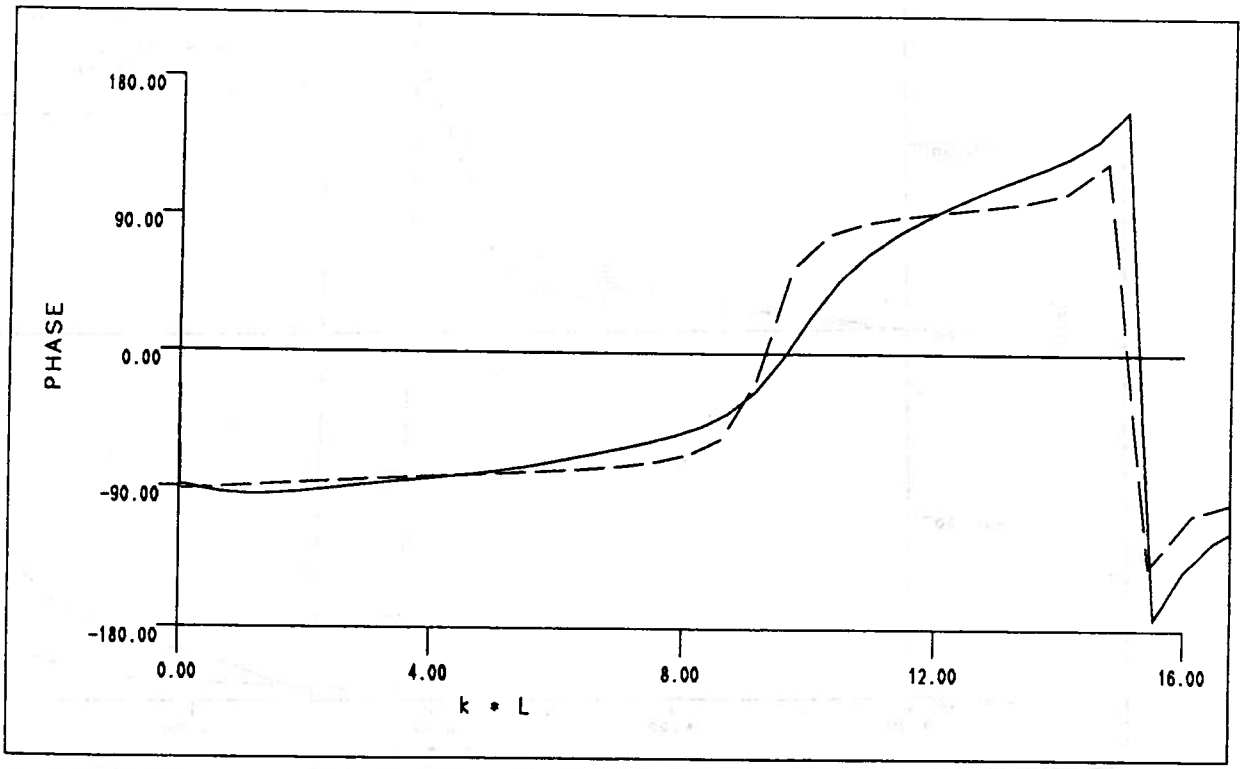
YAW ADDED MASS FOR A WIGLEY HULL, FN=0.2
FIGURE 35



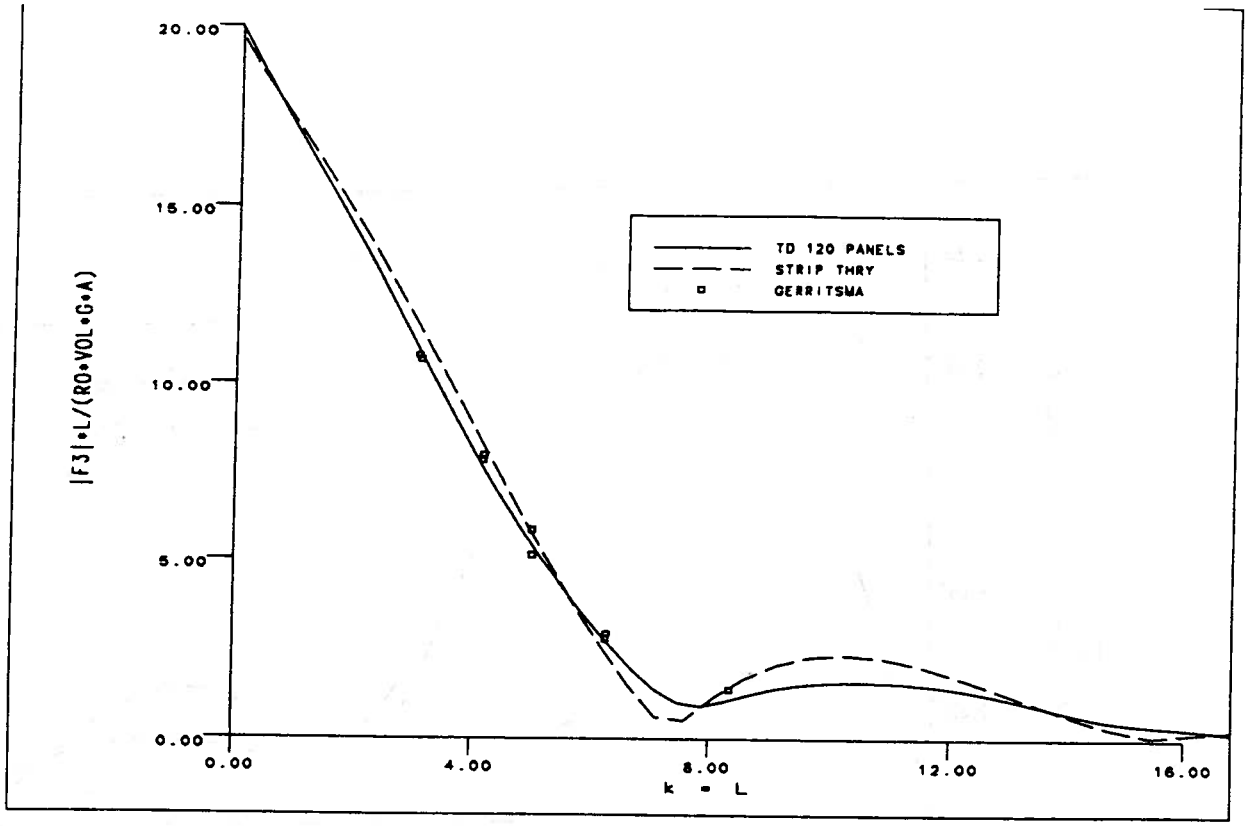
YAW DAMPING FOR A WIGLEY HULL, FN=0.2
FIGURE 36



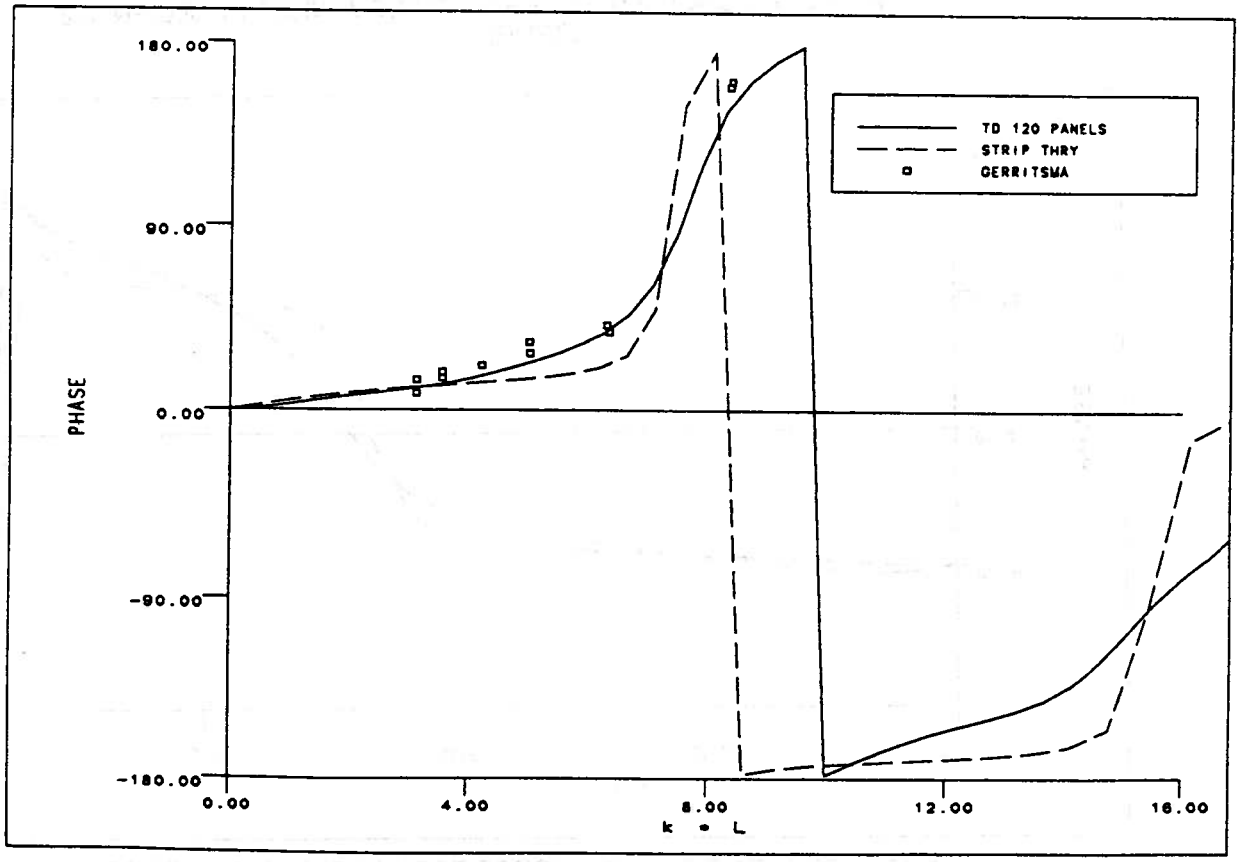
MAGNITUDE OF SURGE EXCITING FORCE FOR A WIGLEY HULL, FN=0.2
FIGURE 37



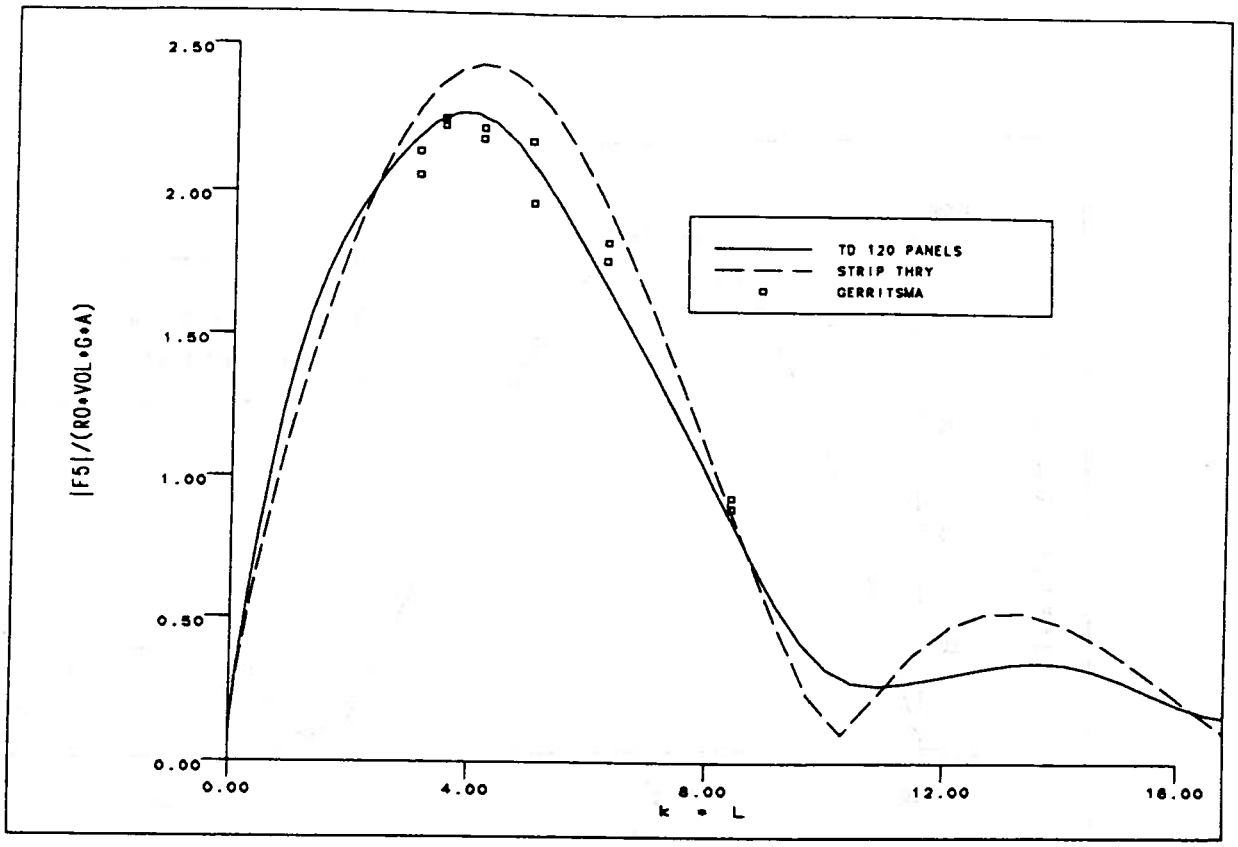
PHASE OF SURGE EXCITING FORCE FOR A WIGLEY HULL, FN=0.2
FIGURE 38



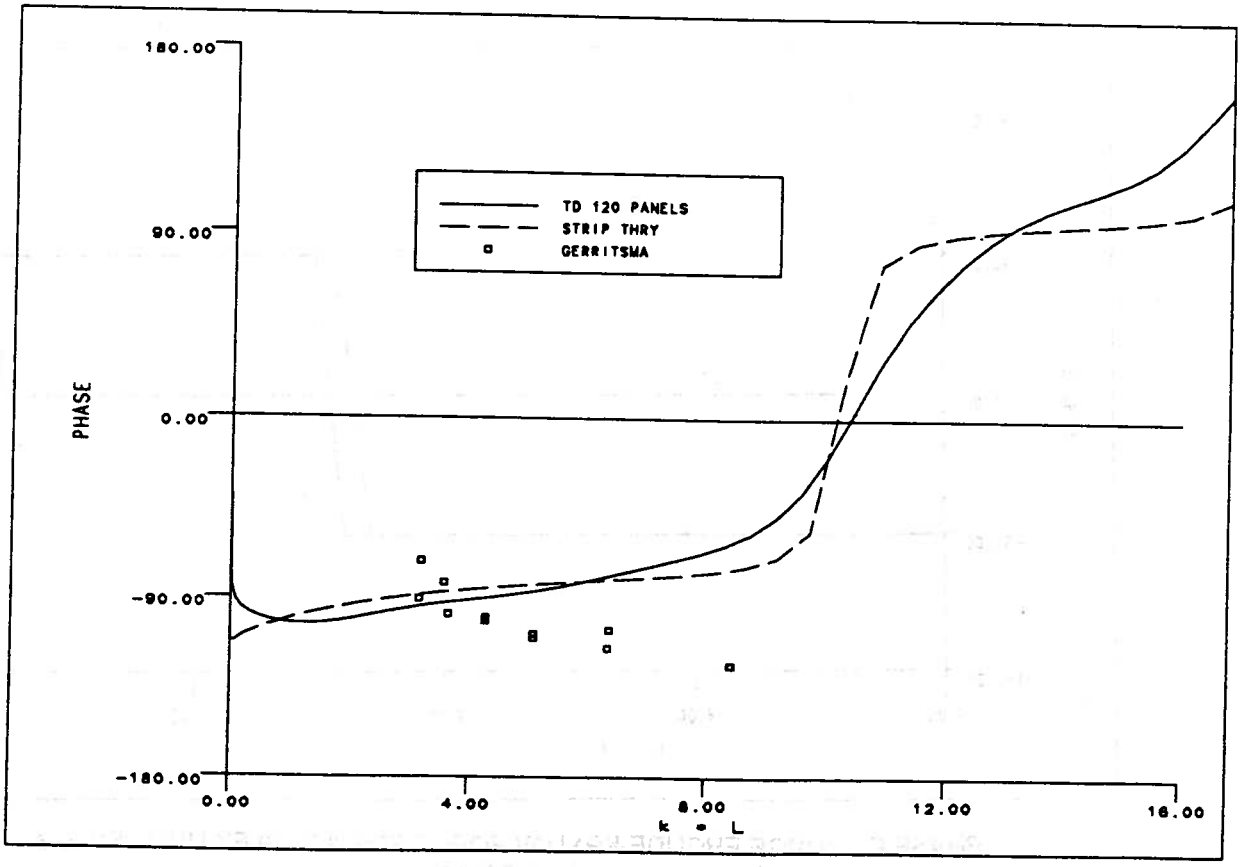
MAGNITUDE OF HEAVE EXCITING FORCE FOR A WIGLEY HULL, FN=0.2
FIGURE 39



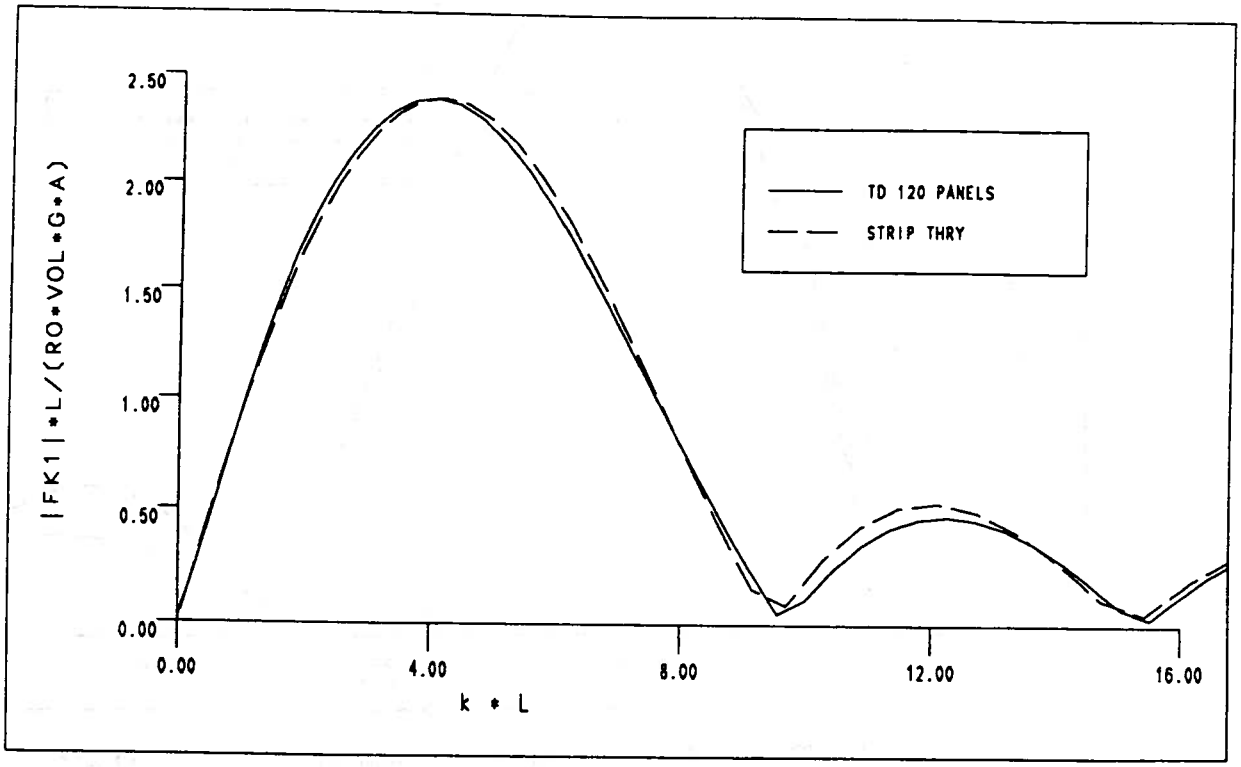
PHASE OF HEAVE EXCITING FORCE FOR A WIGLEY HULL, FN=0.2
FIGURE 40



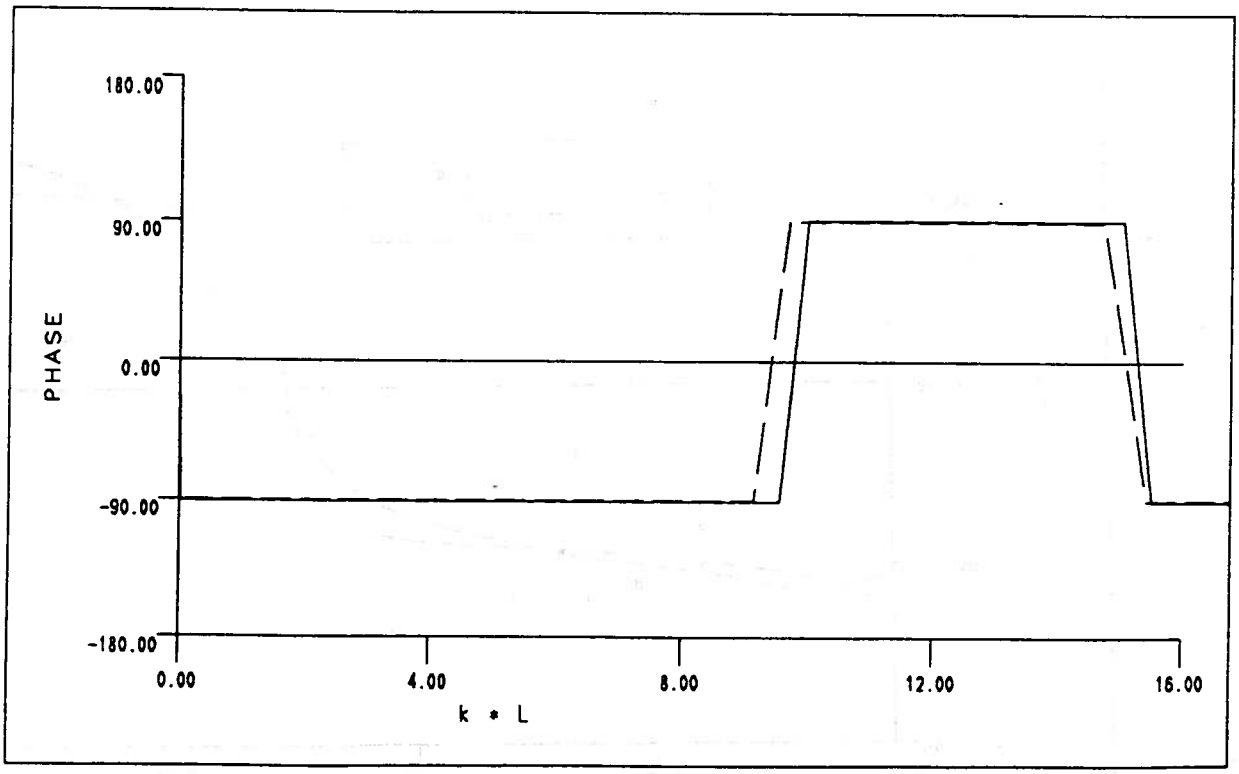
MAGNITUDE OF PITCH EXCITING FORCE FOR A WIGLEY HULL, FN=0.2
FIGURE 41



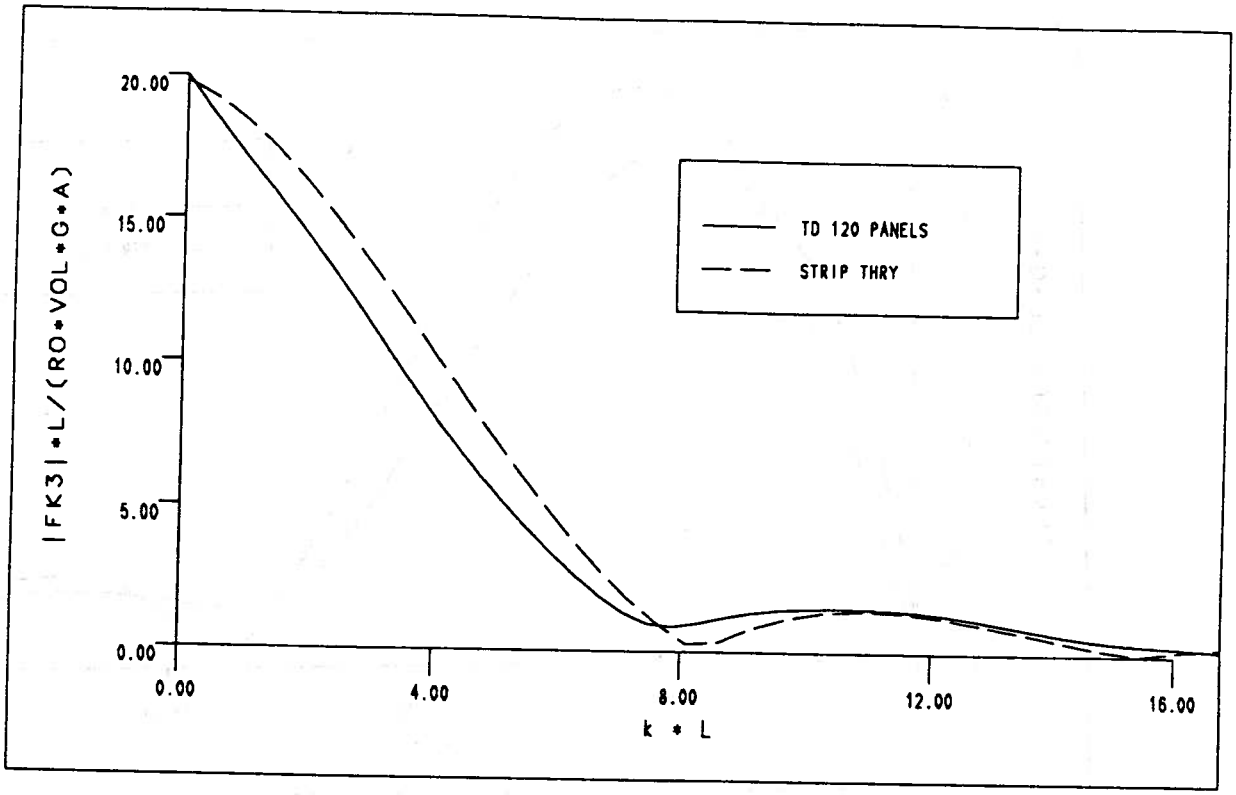
PHASE OF PITCH EXCITING FORCE FOR A WIGLEY HULL, FN=0.2
FIGURE 42



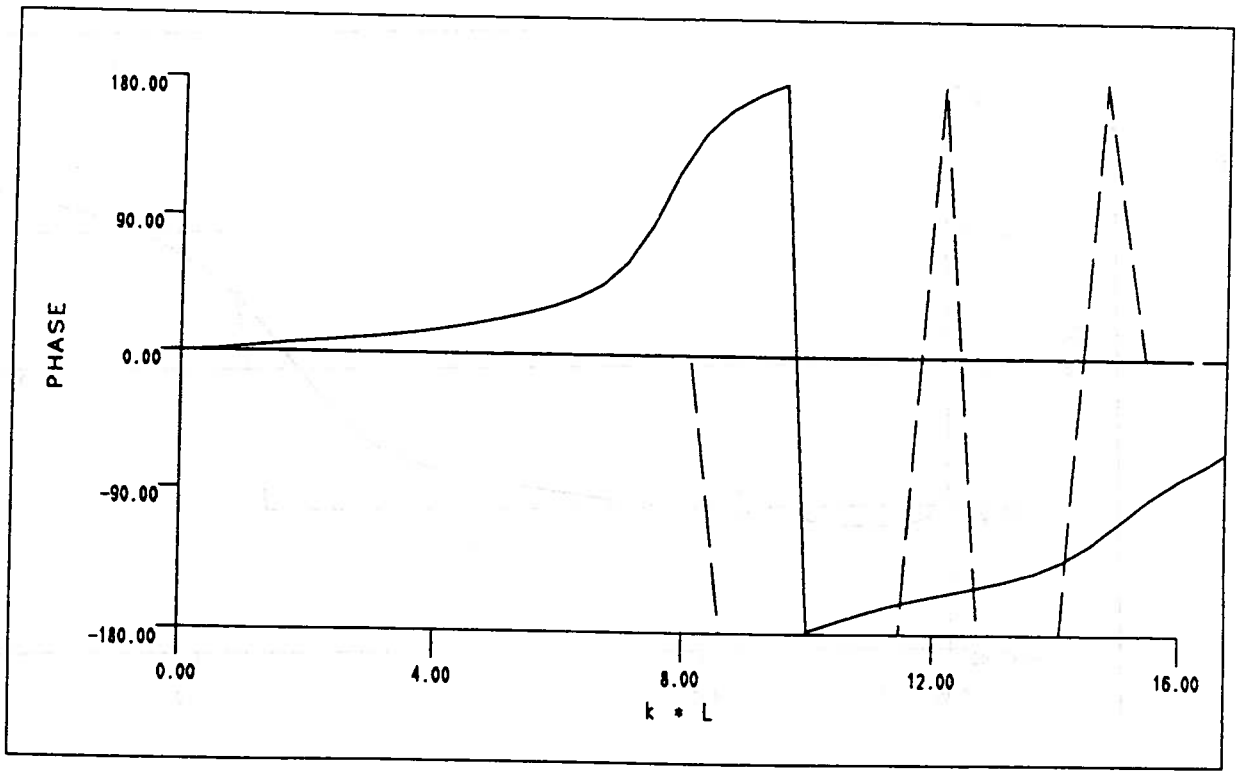
MAGNITUDE OF SURGE FROUDE-KRYLOV FORCE FOR A WIGLEY HULL, FN=0.2
FIGURE 43



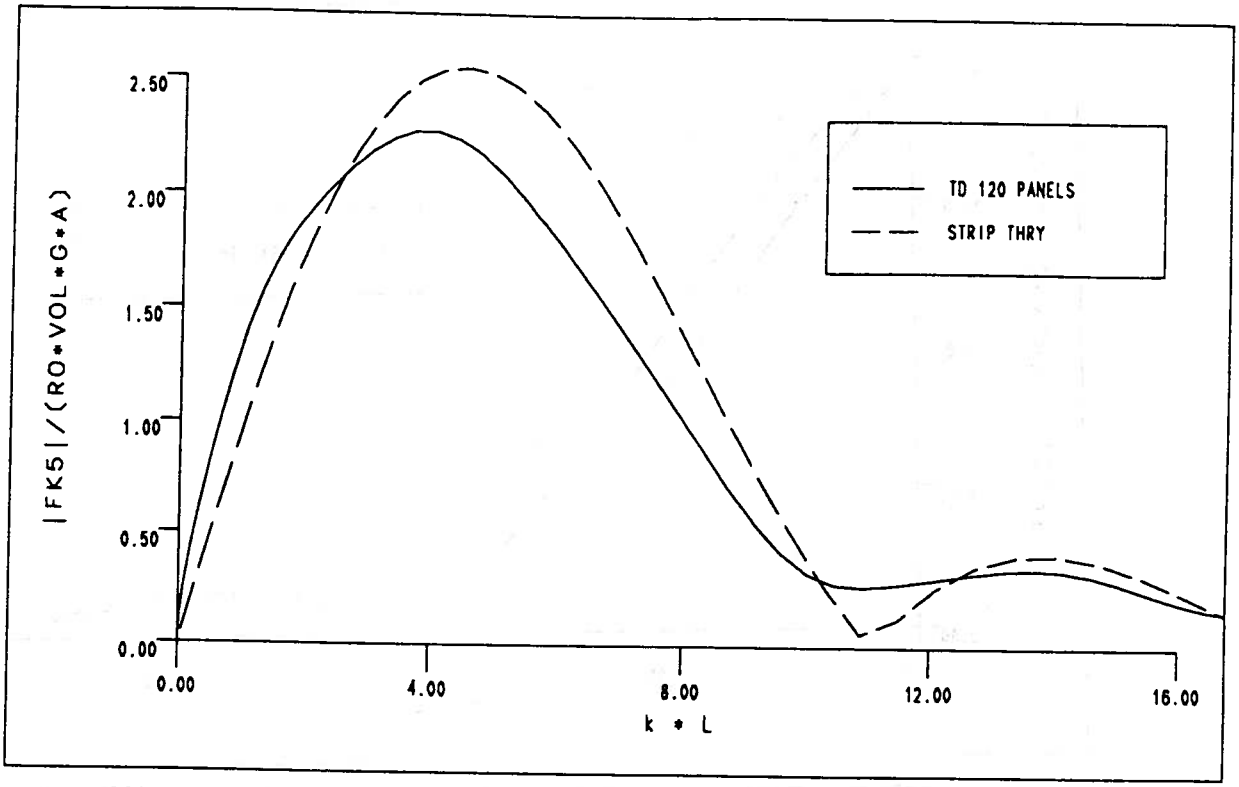
PHASE OF SURGE FROUDE-KRYLOV FORCE FOR A WIGLEY HULL, FN=0.2
FIGURE 44



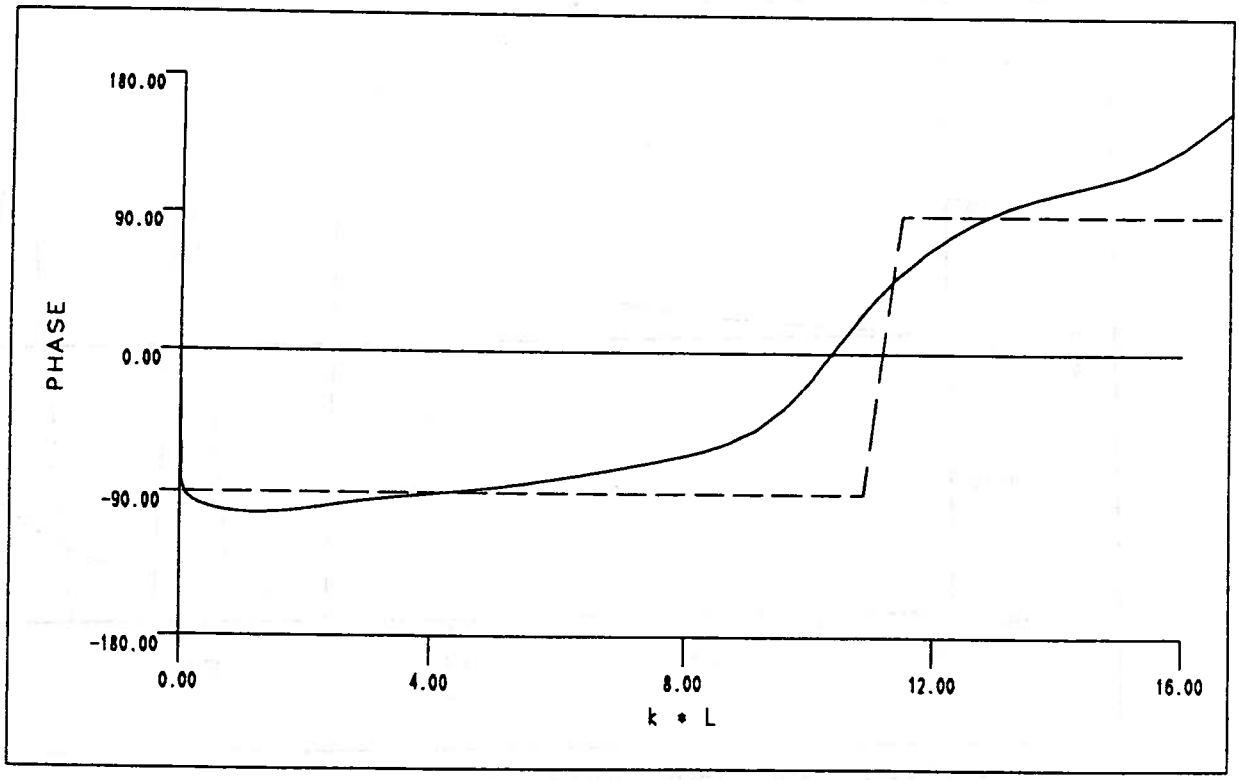
MAGNITUDE OF HEAVE FROUDE-KRYLOV FORCE FOR A WIGLEY HULL, FN=0.2
FIGURE 45



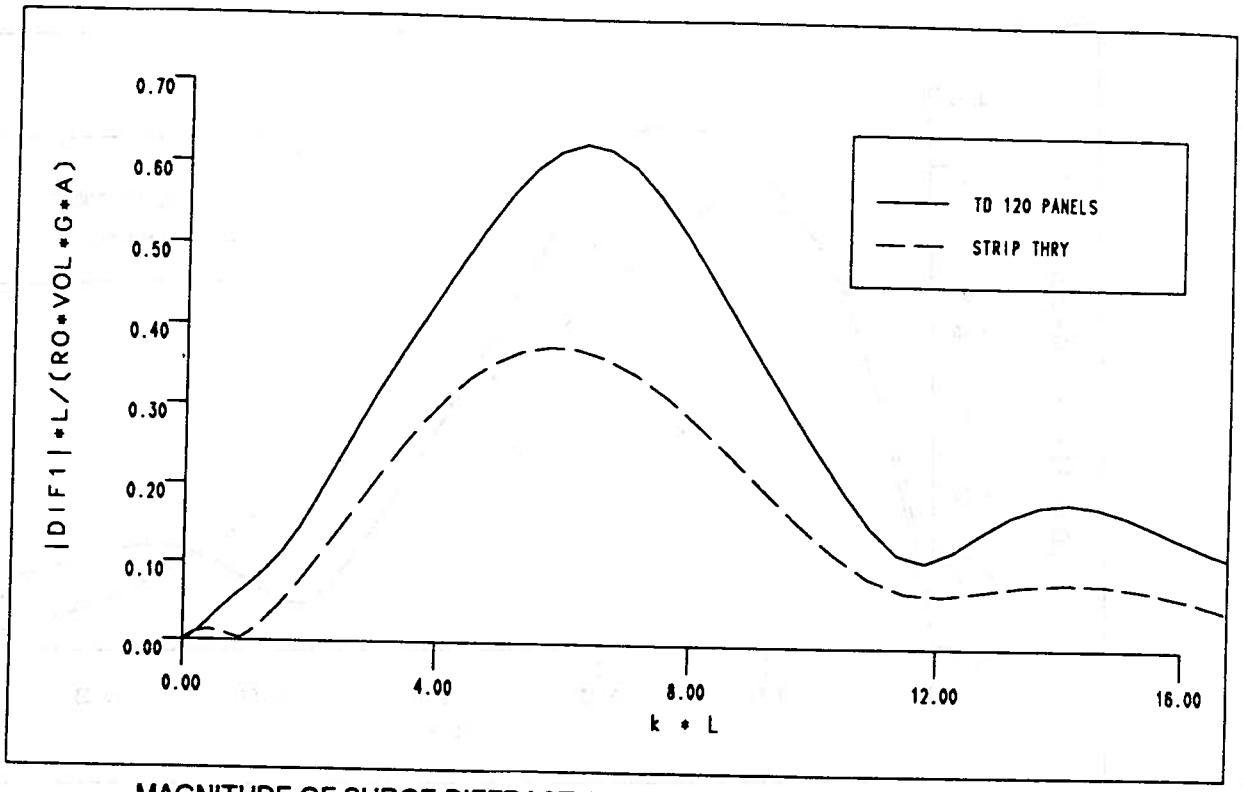
PHASE OF HEAVE FROUDE-KRYLOV FORCE FOR A WIGLEY HULL, FN=0.2
FIGURE 46



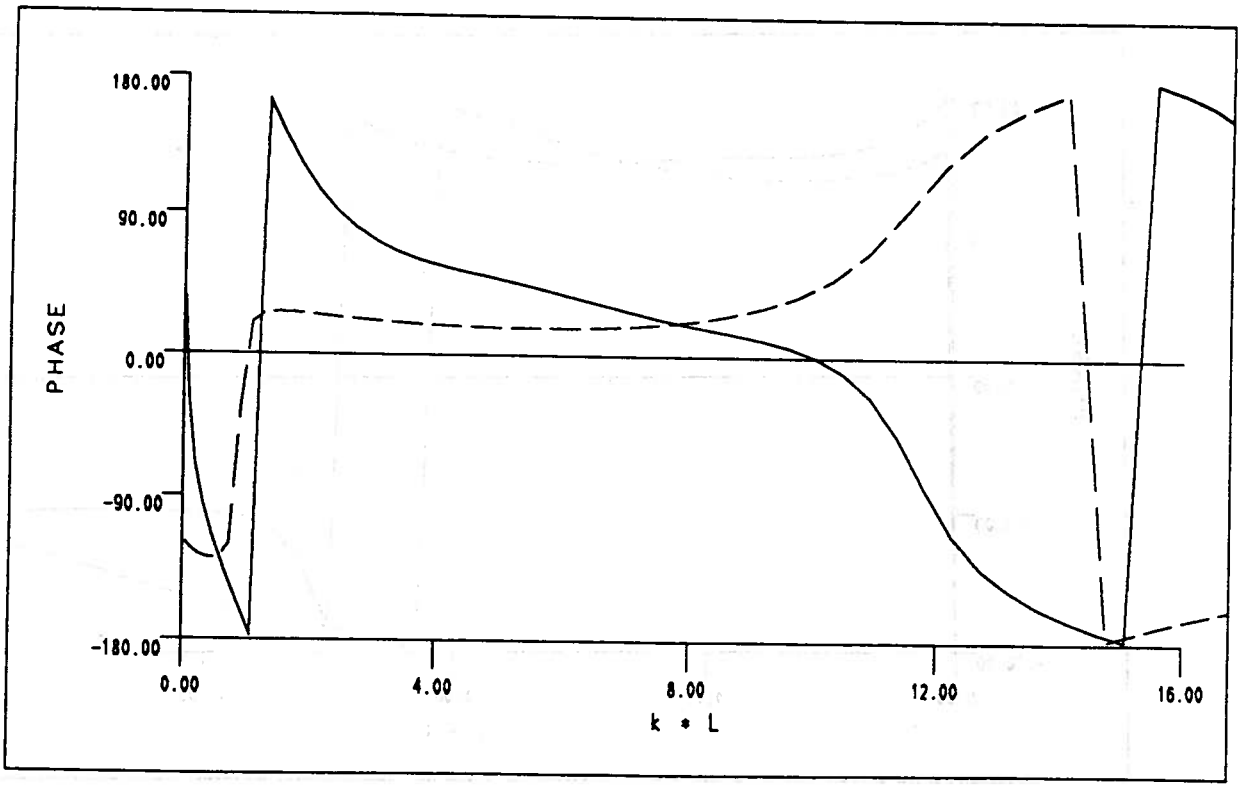
MAGNITUDE OF PITCH FROUDE-KRYLOV FORCE FOR A WIGLEY HULL, FN=0.2
FIGURE 47



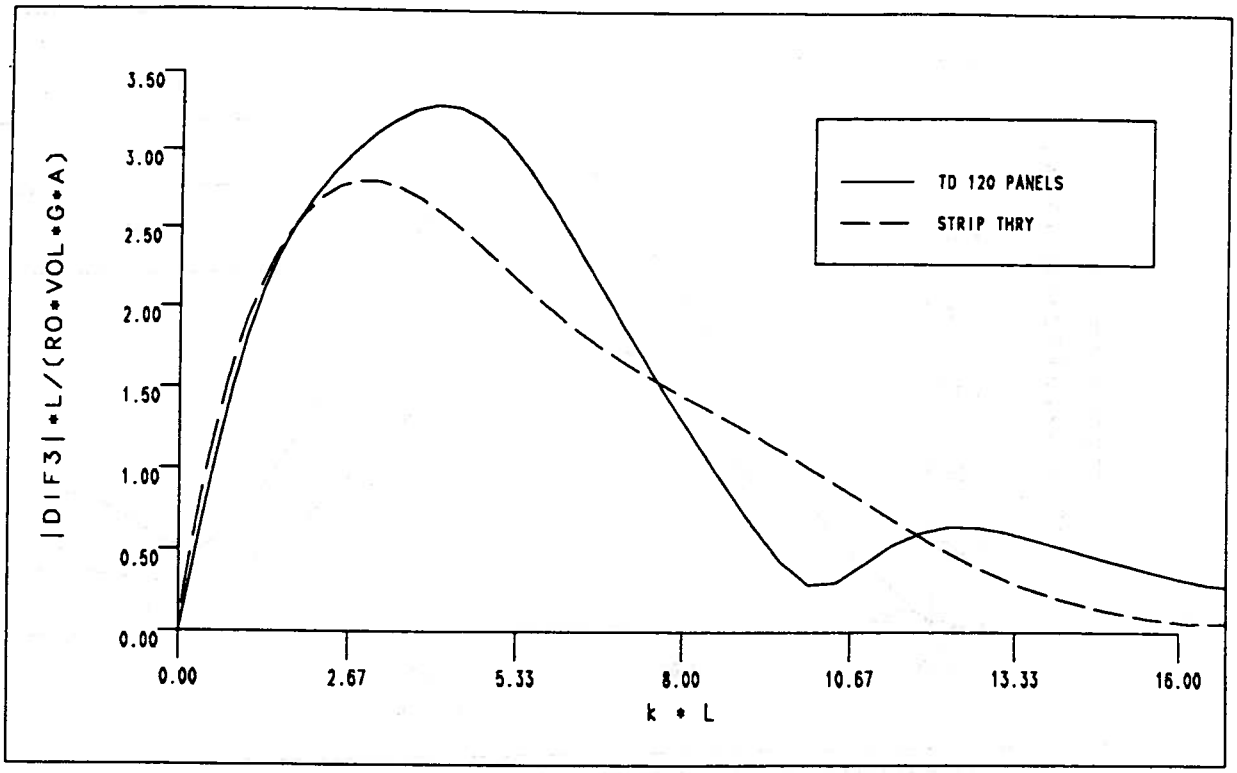
PHASE OF PITCH FROUDE-KRYLOV FORCE FOR A WIGLEY HULL, FN=0.2
FIGURE 48



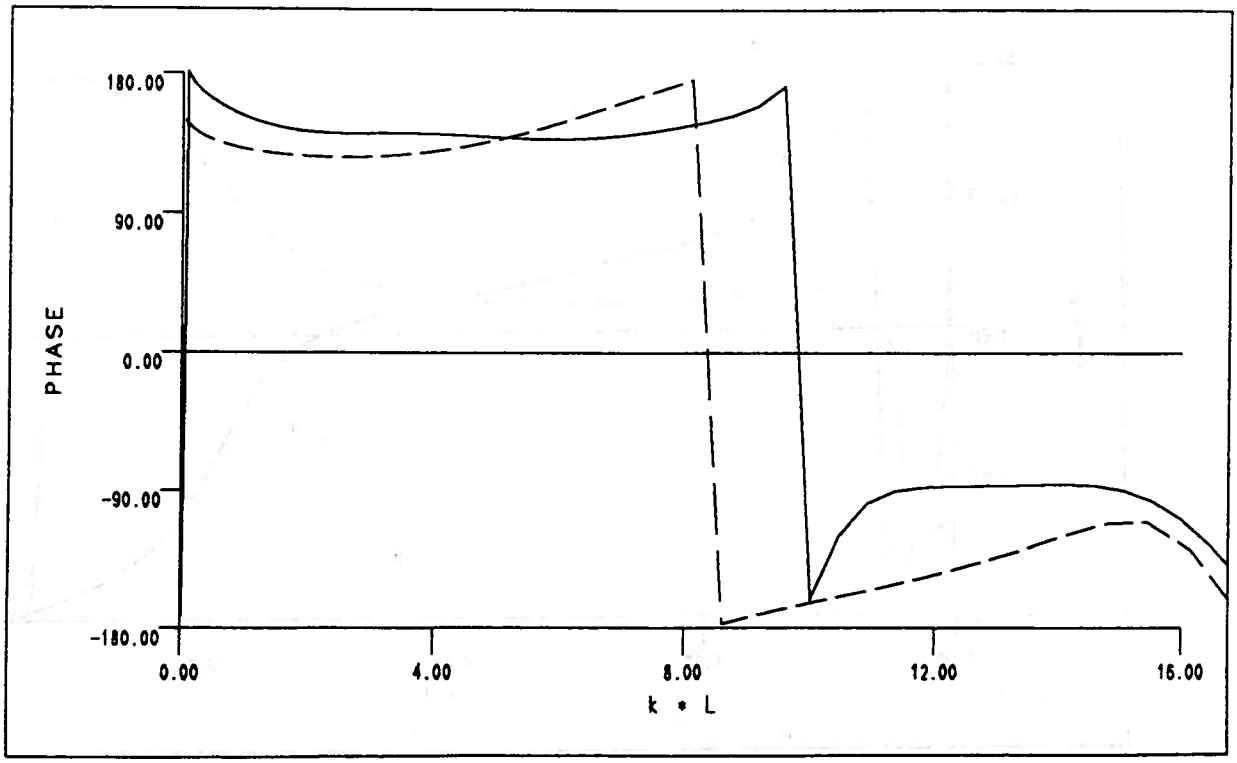
MAGNITUDE OF SURGE DIFFRACTION FORCE FOR A WIGLEY HULL, FN=0.2
FIGURE 49



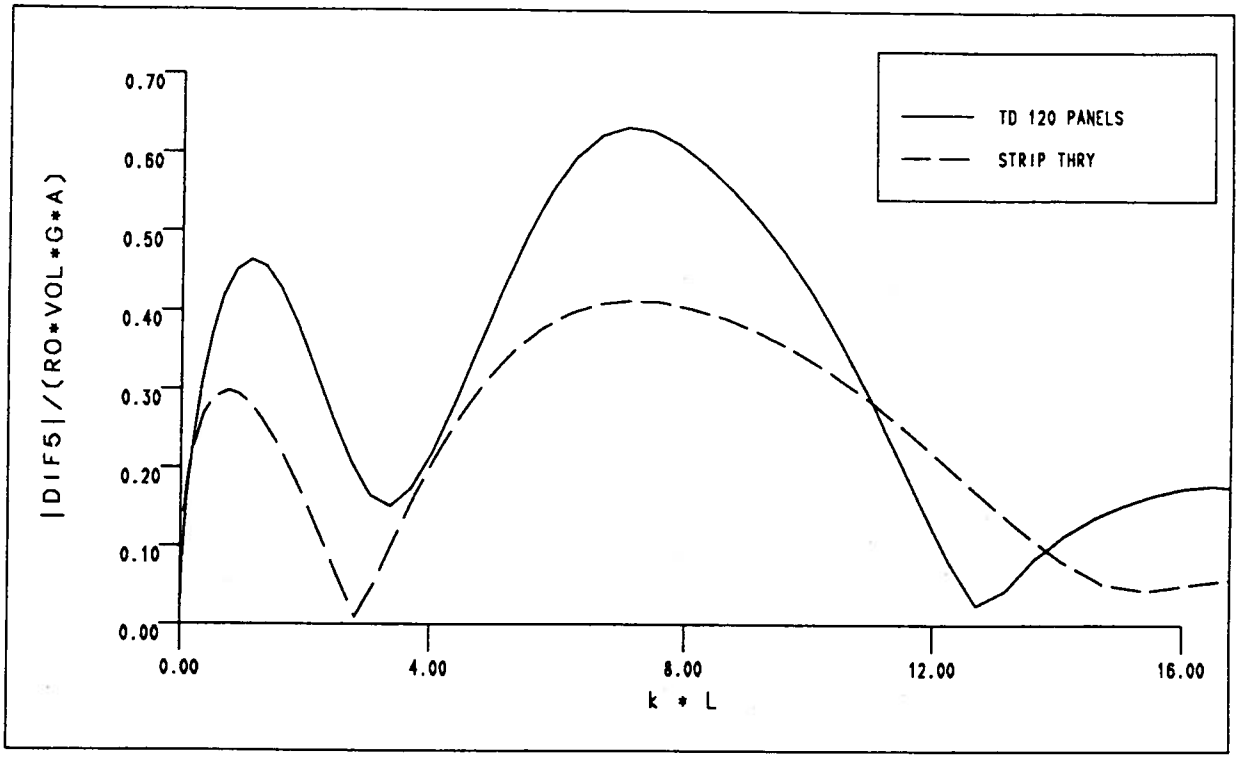
PHASE OF SURGE DIFFRACTION FORCE FOR A WIGLEY HULL, FN=0.2
FIGURE 50



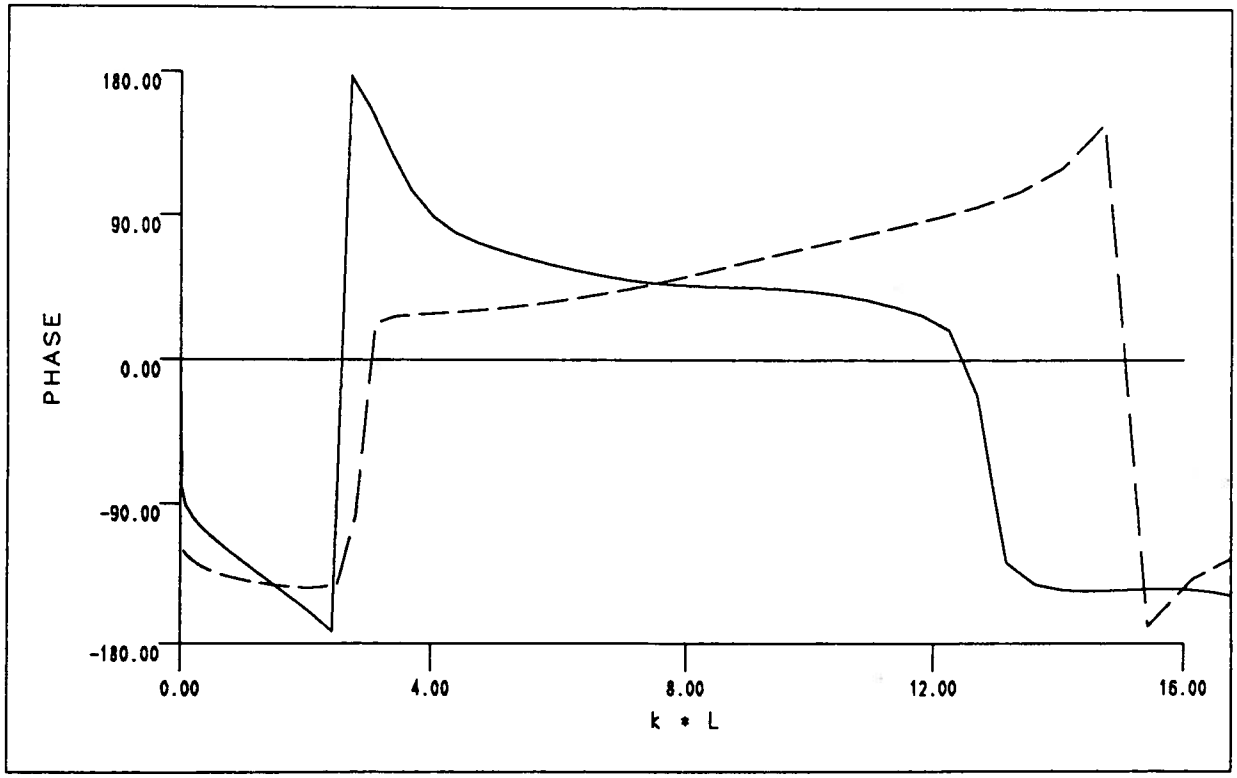
MAGNITUDE OF HEAVE DIFFRACTION FORCE FOR A WIGLEY HULL, FN=0.2
FIGURE 51



PHASE OF HEAVE DIFFRACTION FORCE FOR A WIGLEY HULL, FN=0.2
FIGURE 52

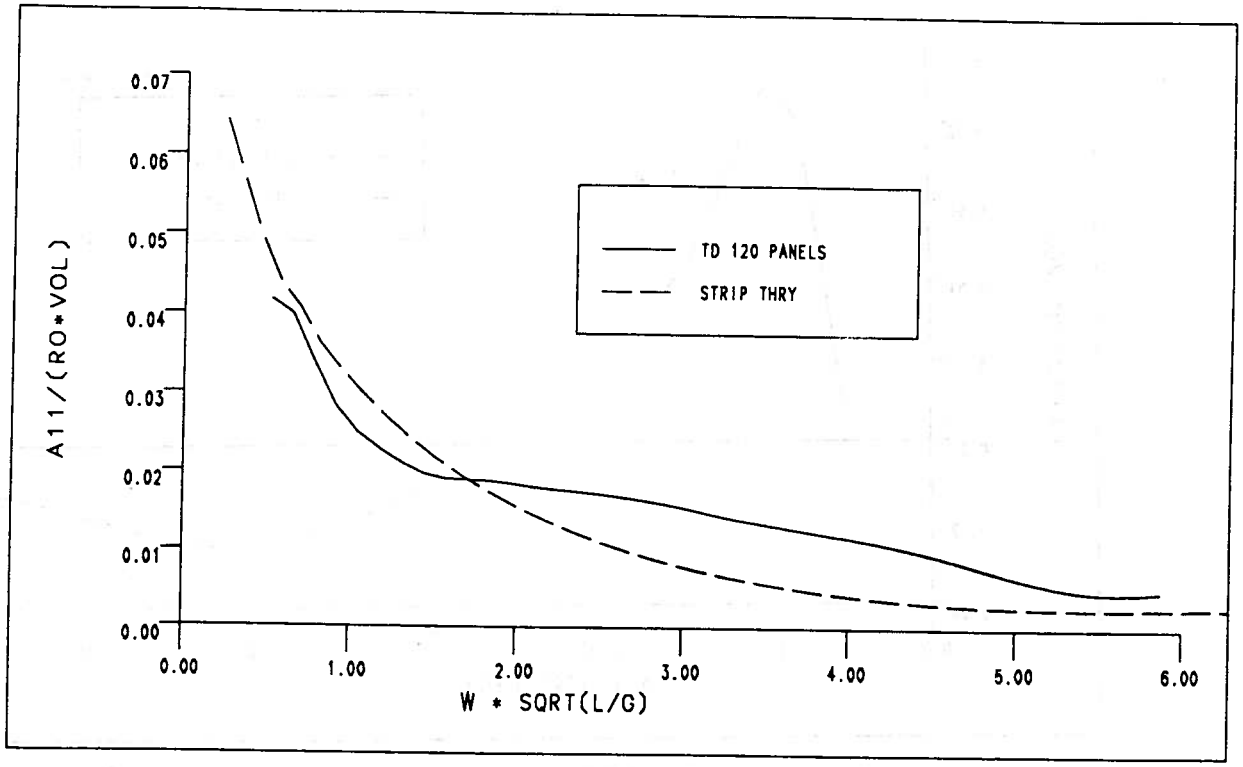


MAGNITUDE OF PITCH DIFFRACTION FORCE FOR A WIGLEY HULL, FN=0.2
FIGURE 53

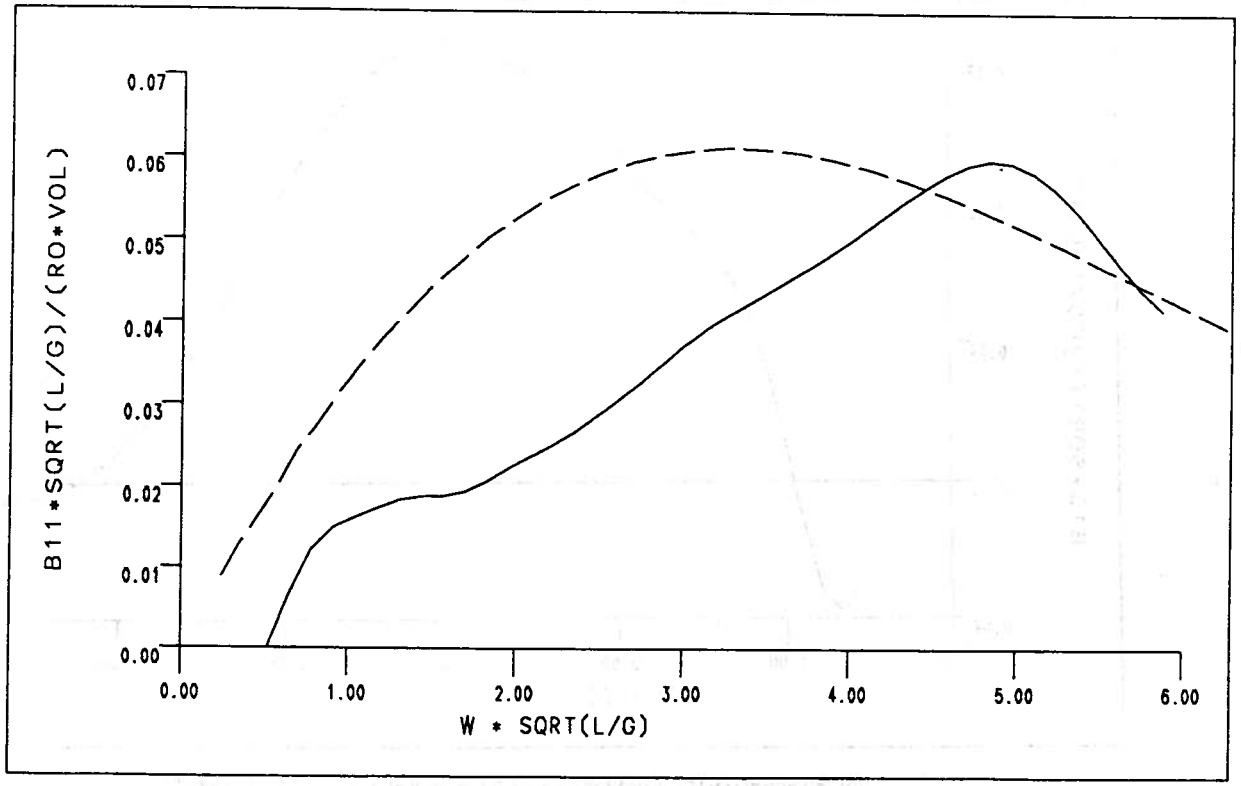


PHASE OF PITCH DIFFRACTION FORCE FOR A WIGLEY HULL, FN=0.2
FIGURE 54

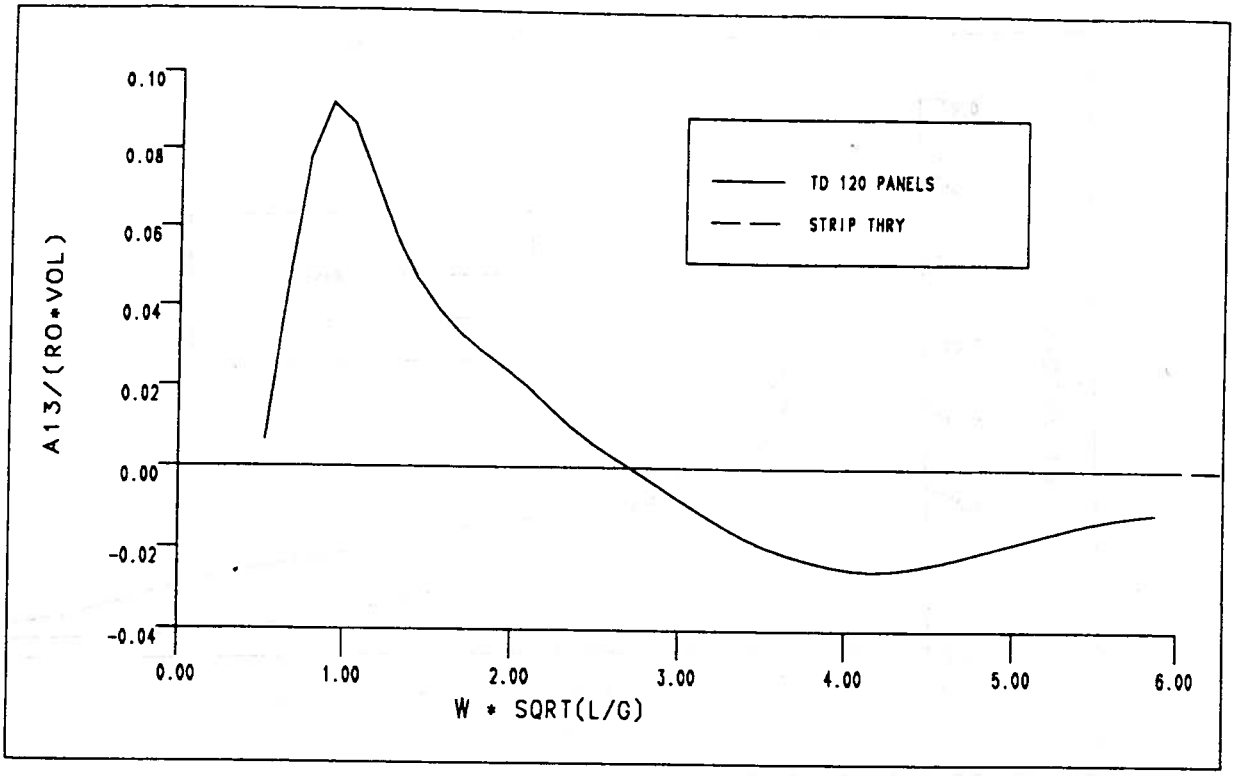
WIGLEY HULL, FN=0.3



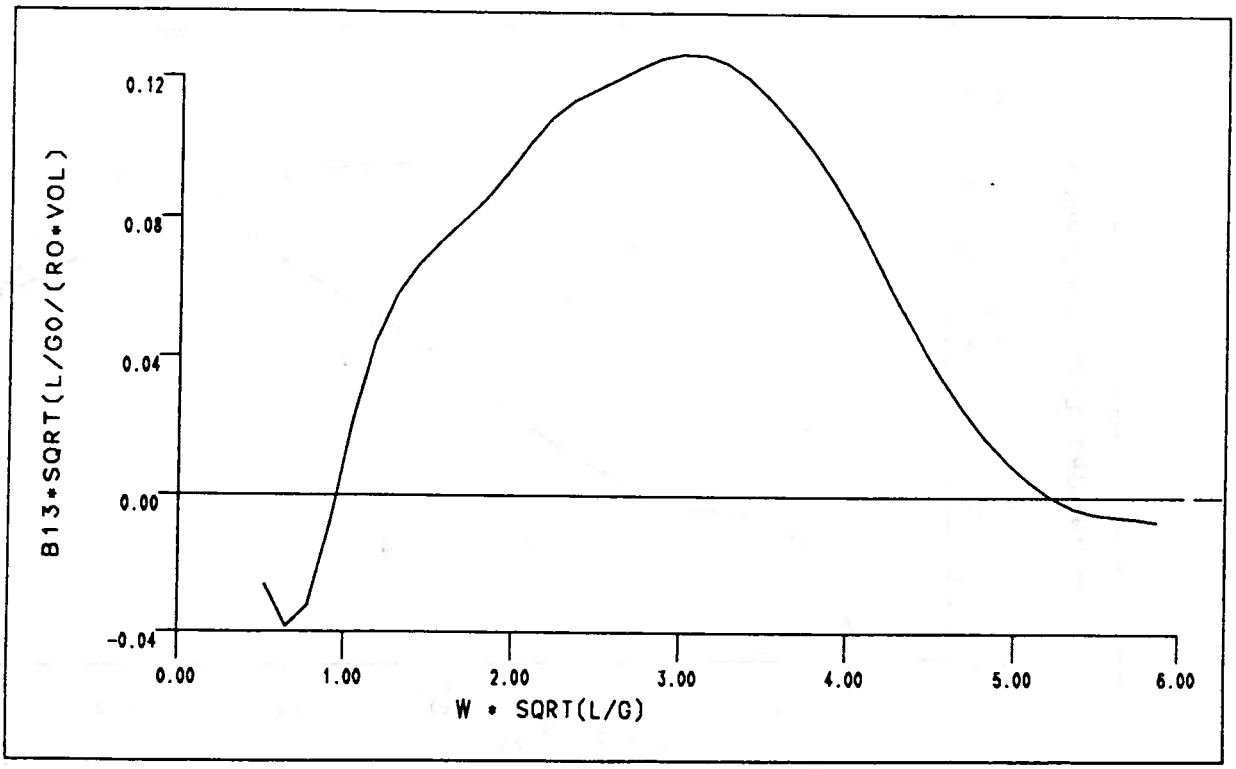
SURGE ADDED MASS FOR A WIGLEY HULL, FN=0.3
FIGURE 55



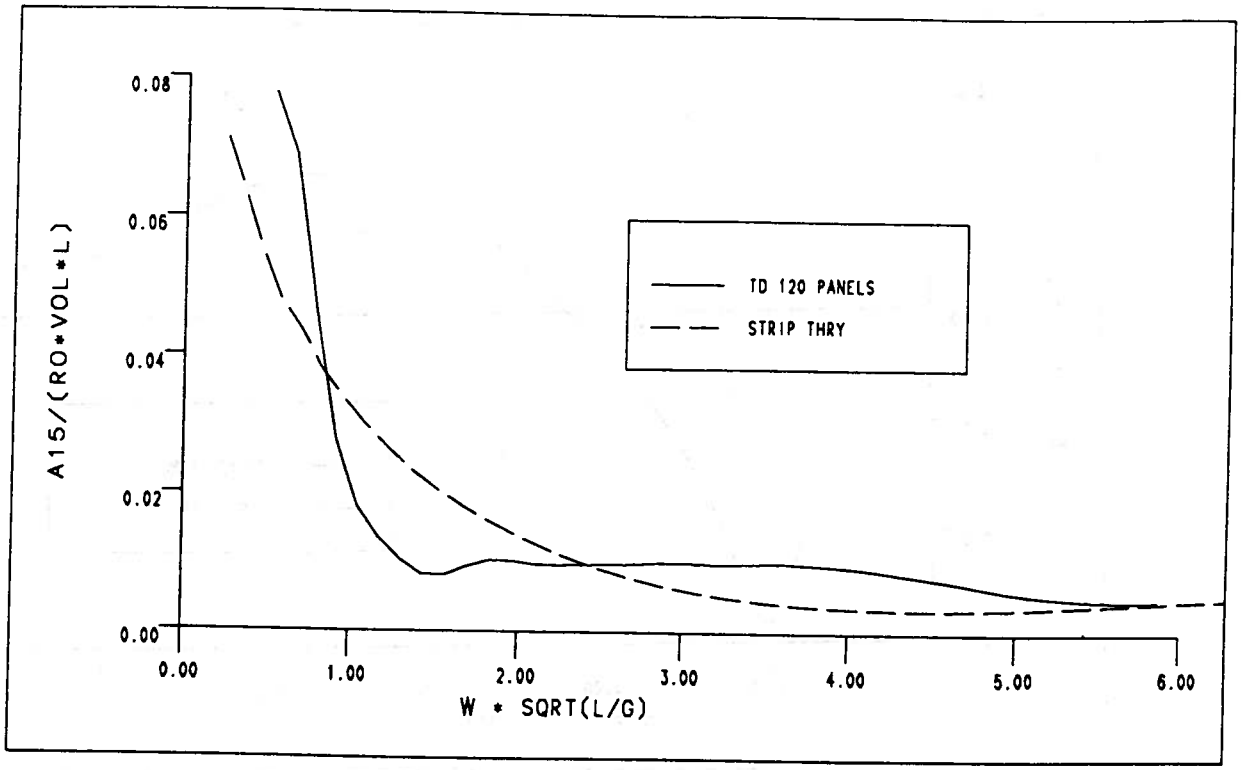
SURGE DAMPING FOR A WIGLEY HULL, FN=0.3
FIGURE 56



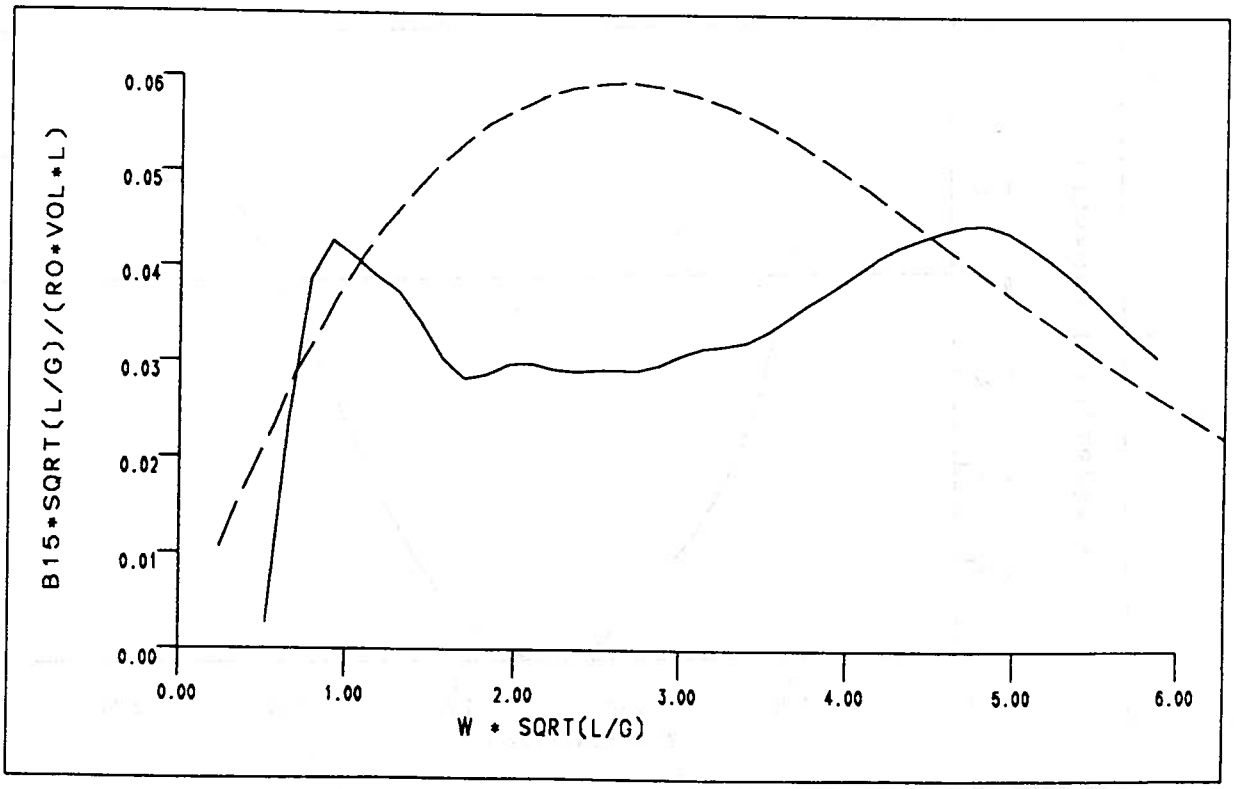
SURGE-HEAVE ADDED MASS FOR A WIGLEY HULL, FN=0.3
FIGURE 57



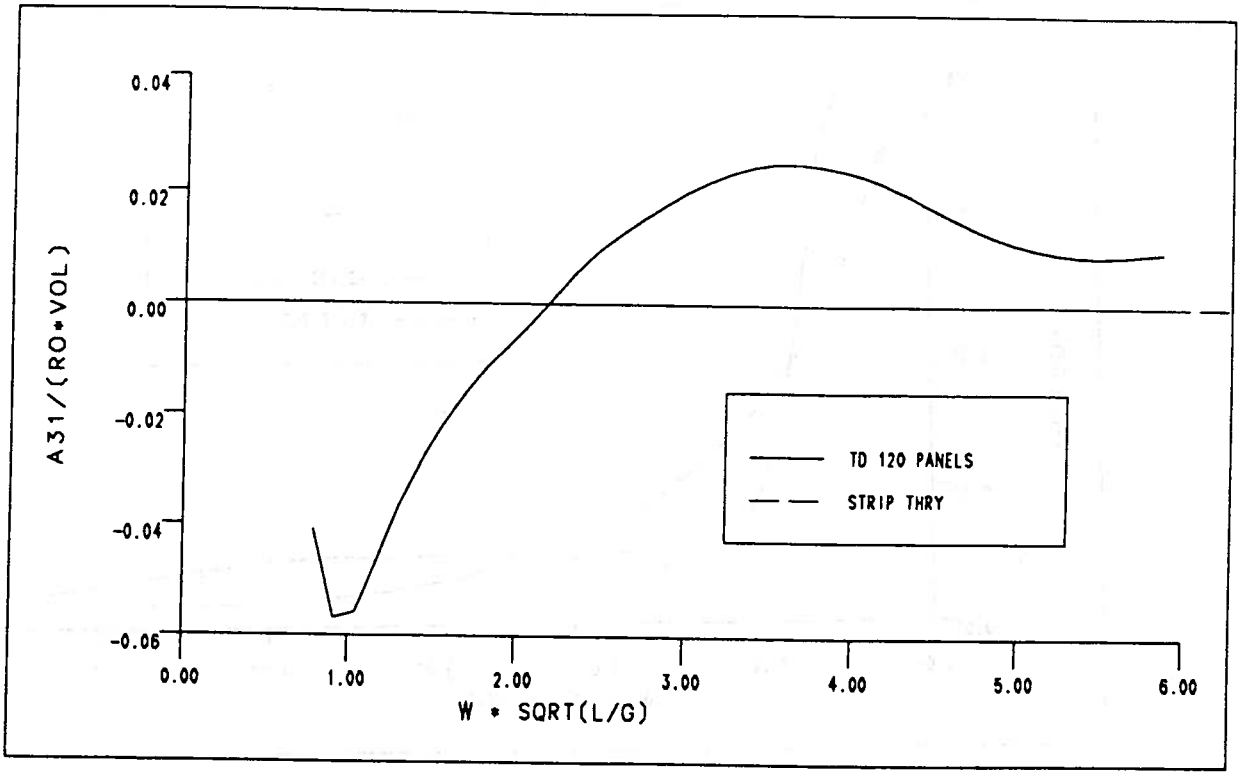
SURGE-HEAVE DAMPING FOR A WIGLEY HULL, FN=0.3
FIGURE 58



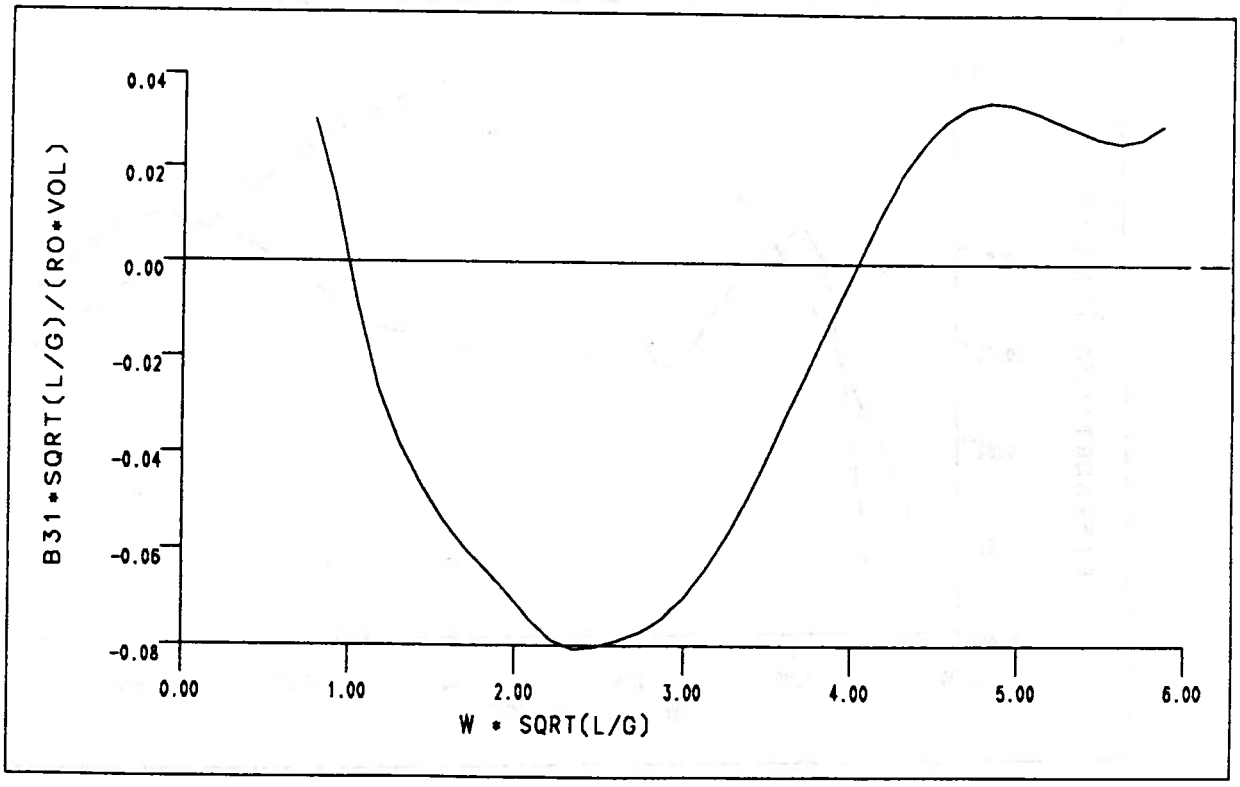
SURGE-PITCH ADDED MASS FOR A WIGLEY HULL, FN=0.3
FIGURE 59



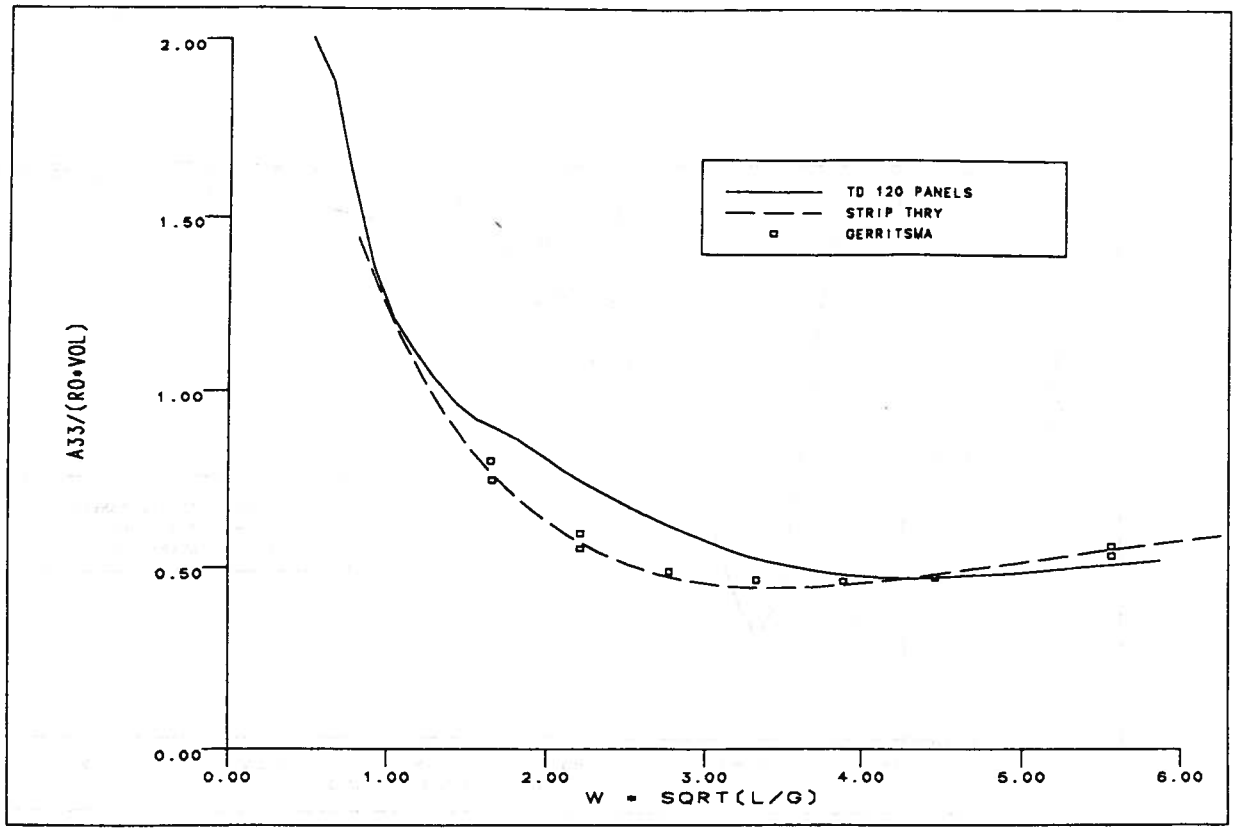
SURGE-PITCH DAMPING FOR A WIGLEY HULL, FN=0.3
FIGURE 60



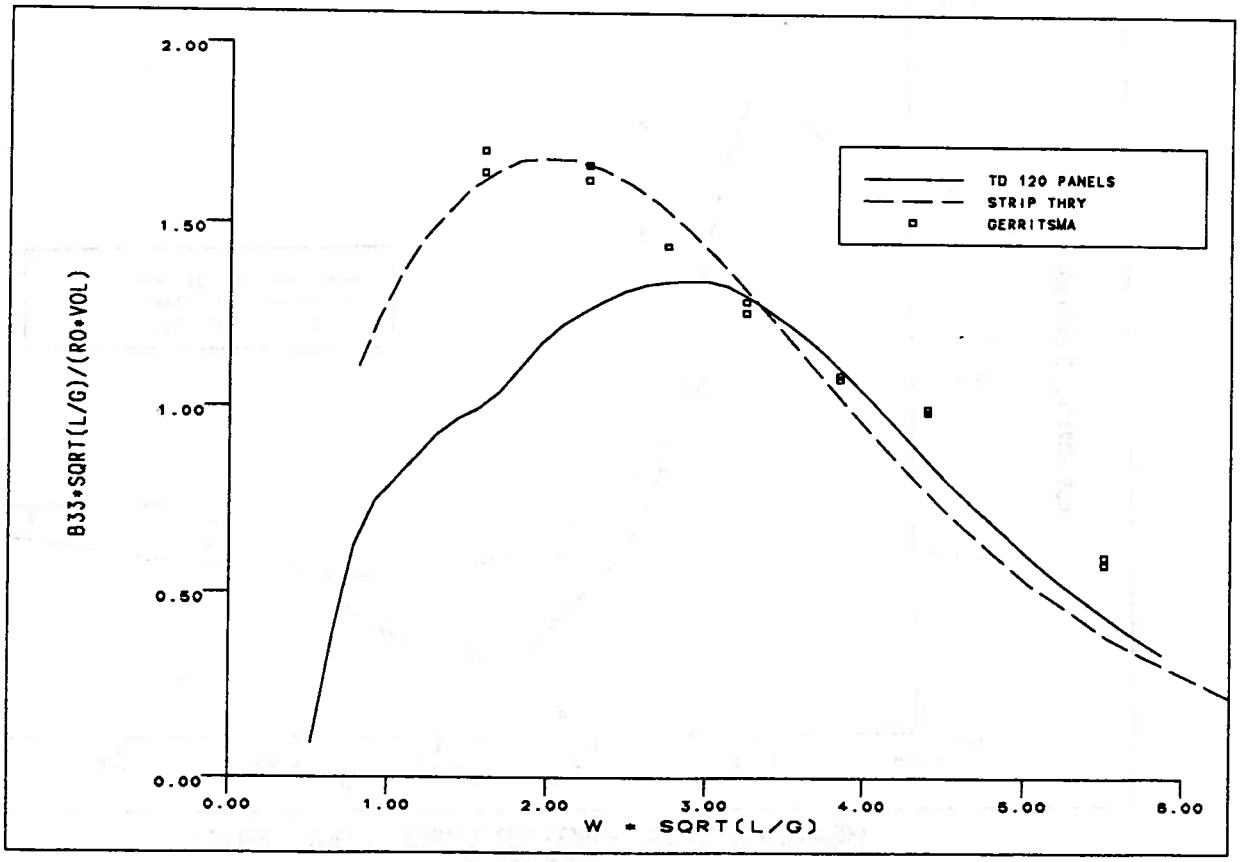
HEAVE-SURGE ADDED MASS FOR A WIGLEY HULL, FN=0.3
FIGURE 61



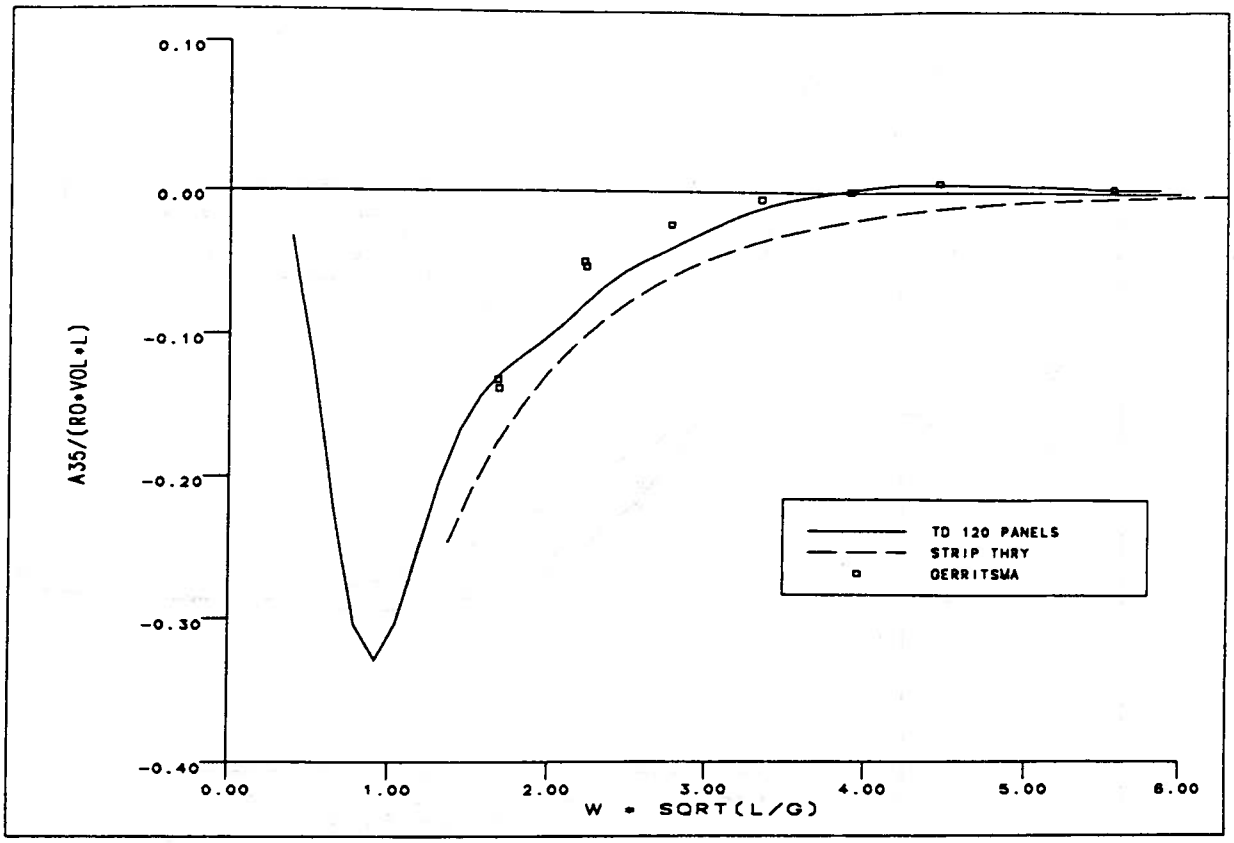
HEAVE-SURGE DAMPING FOR A WIGLEY HULL, FN=0.3
FIGURE 62



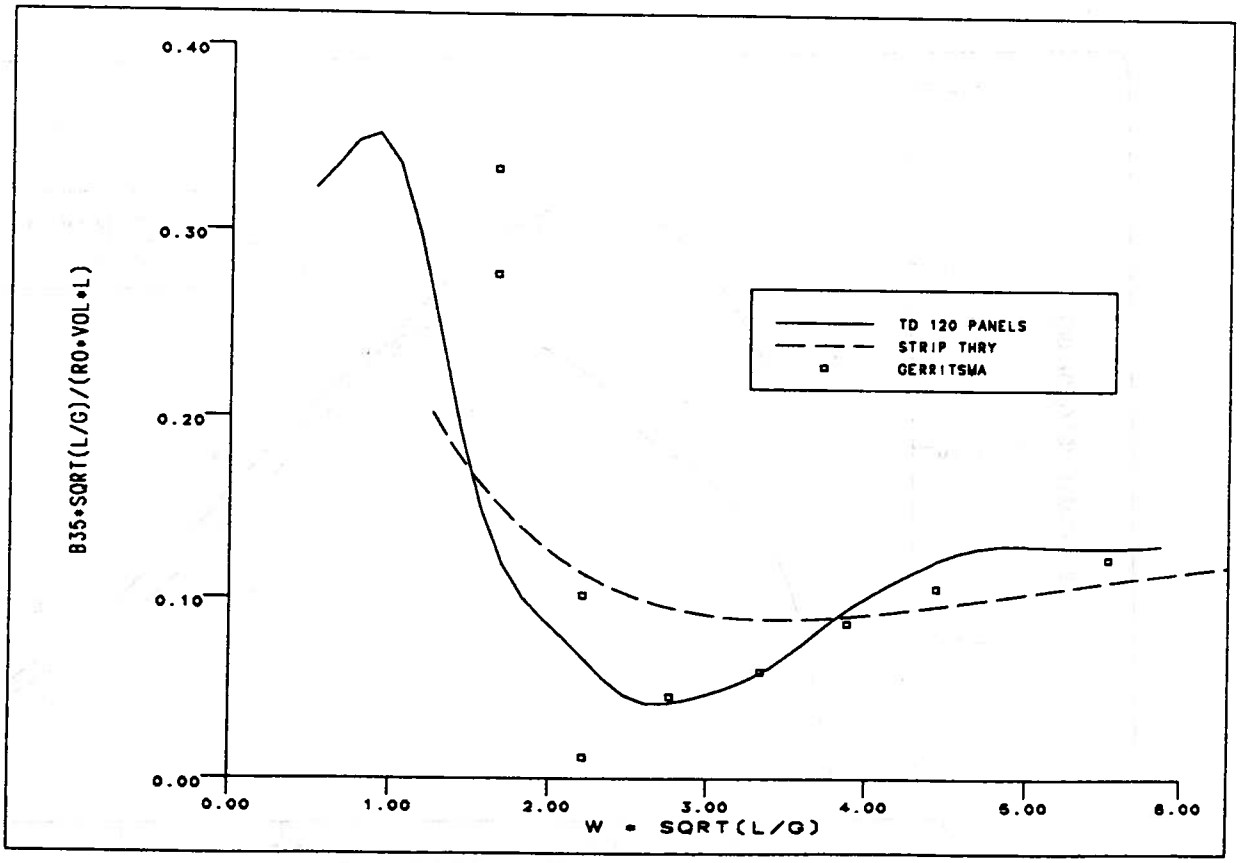
HEAVE ADDED MASS FOR A WIGLEY HULL, FN=0.3
FIGURE 63



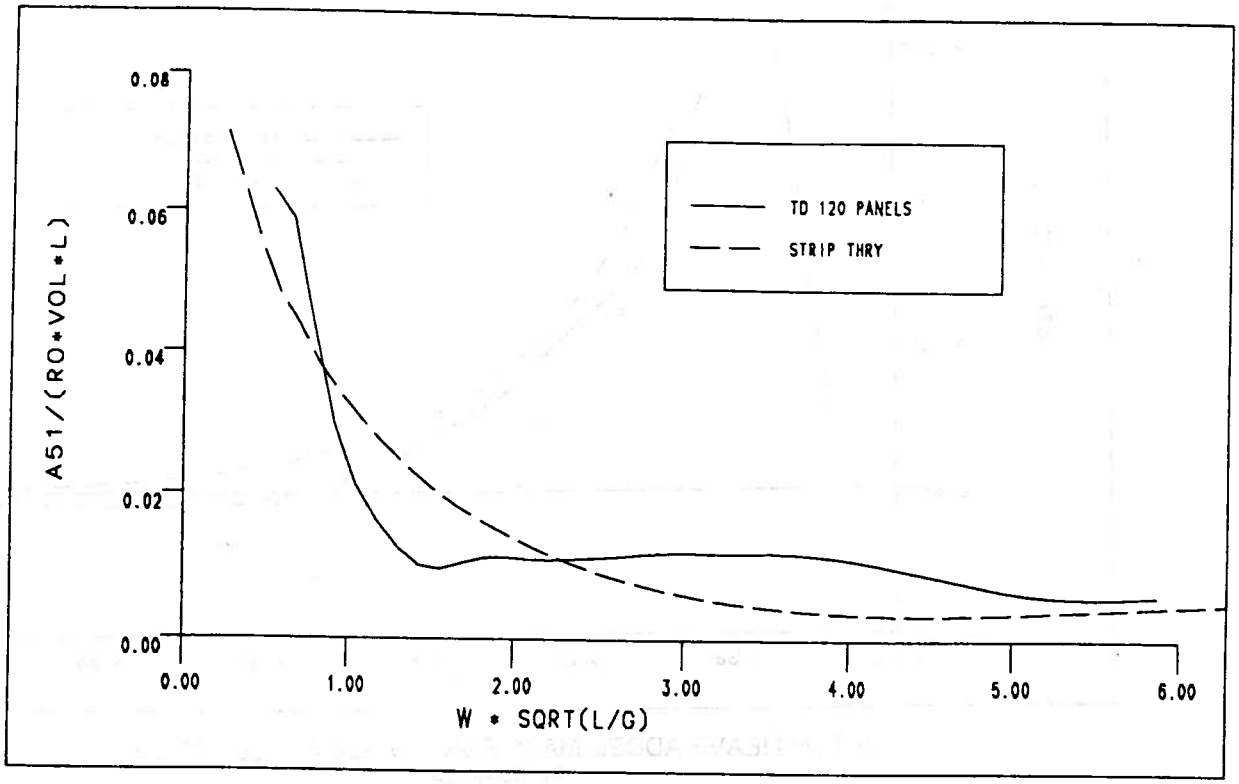
HEAVE DAMPING FOR A WIGLEY HULL, FN=0.3
FIGURE 64



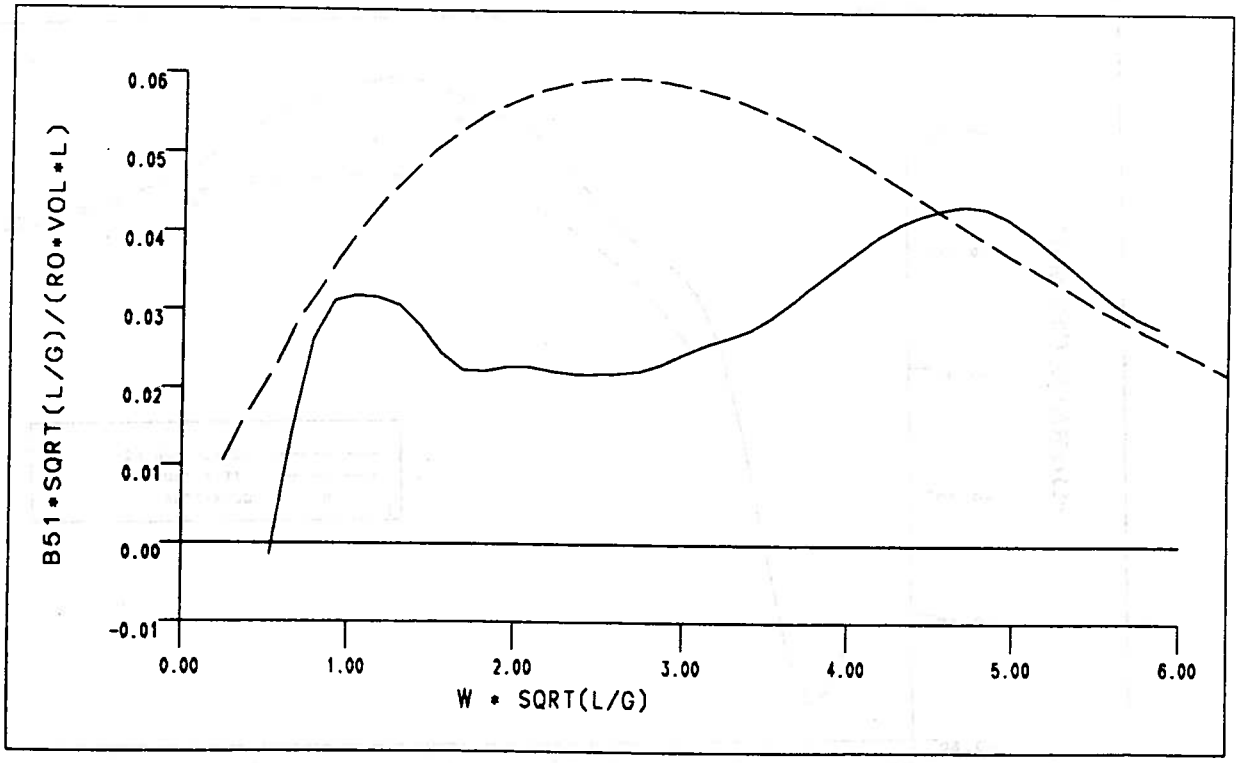
HEAVE-PITCH ADDED MASS FOR A WIGLEY HULL, FN=0.3
FIGURE 65



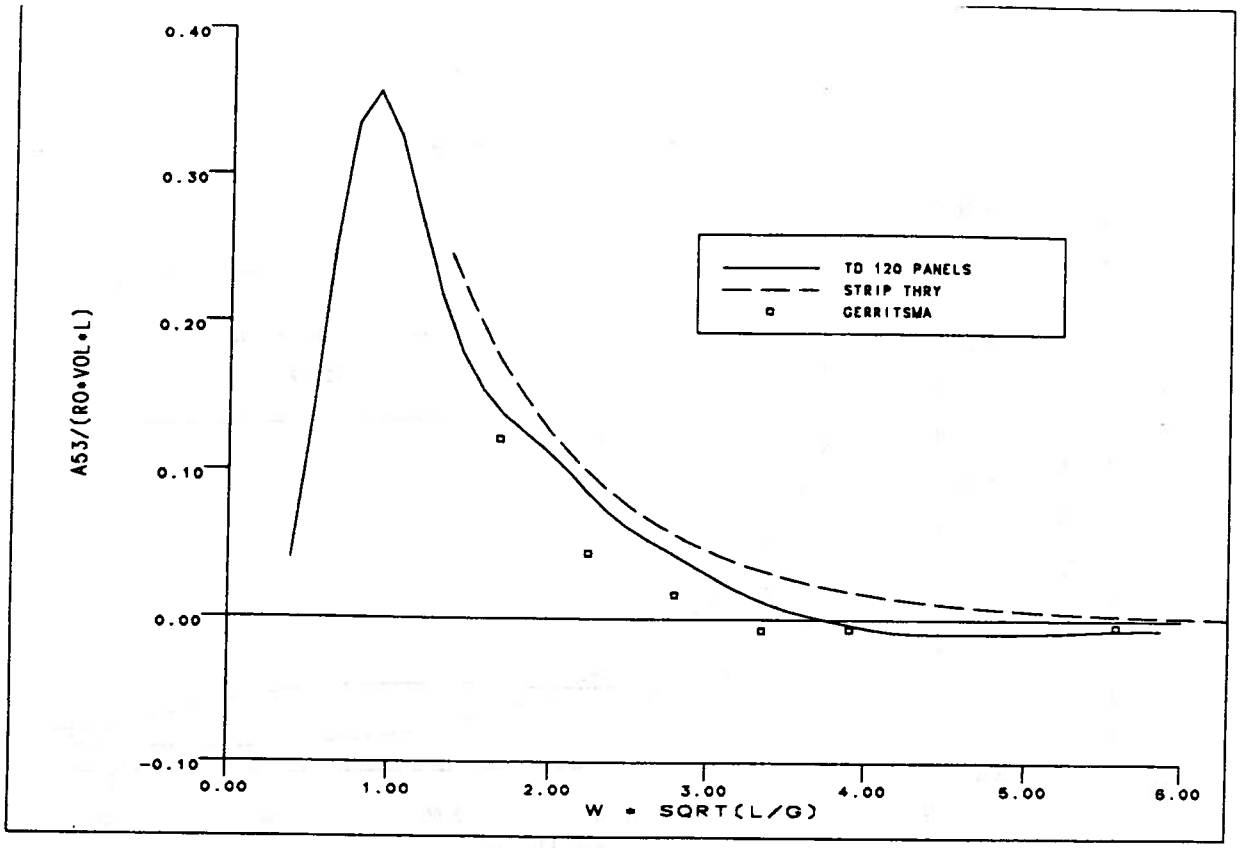
HEAVE-PITCH DAMPING FOR A WIGLEY HULL, FN=0.3
FIGURE 66



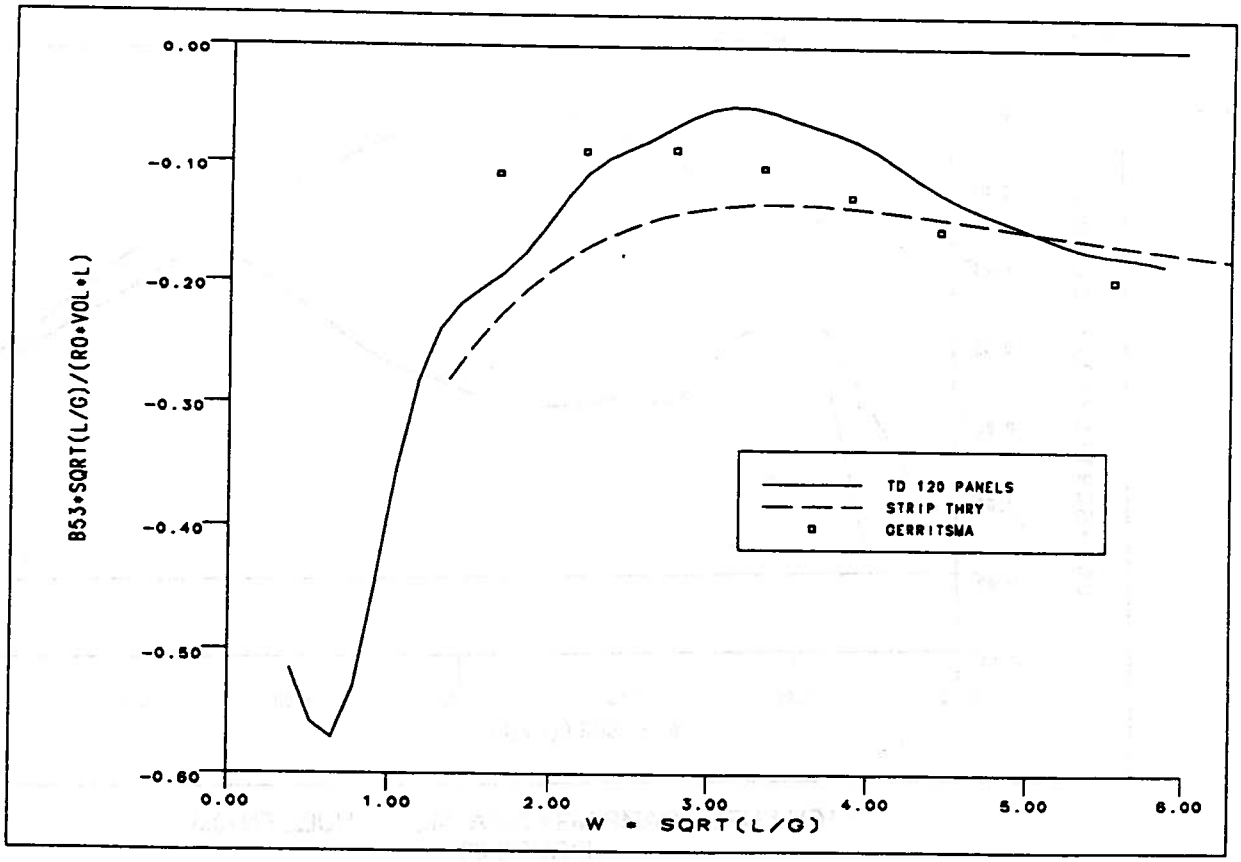
PITCH-SURGE ADDED MASS FOR A WIGLEY HULL, FN=0.3
FIGURE 67



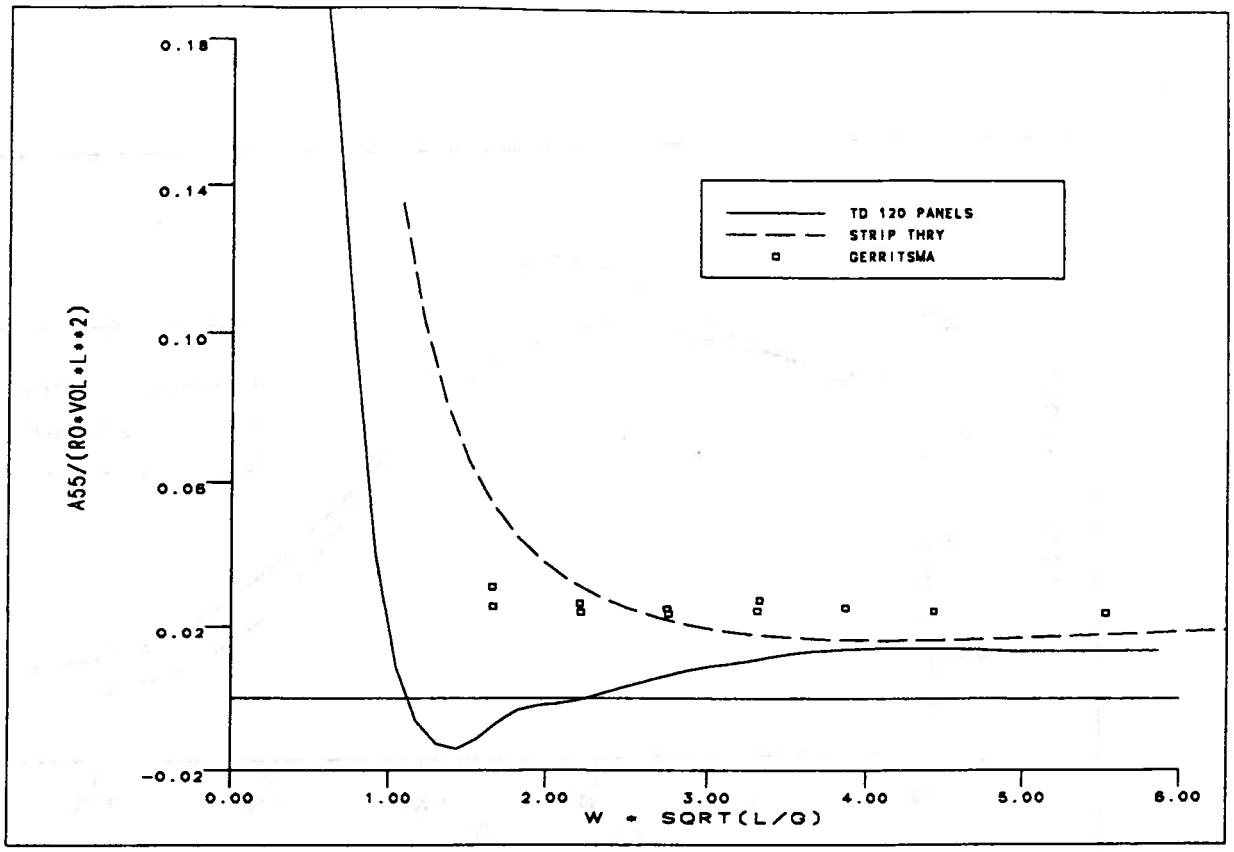
PITCH-SURGE DAMPING FOR A WIGLEY HULL, FN=0.3
FIGURE 68



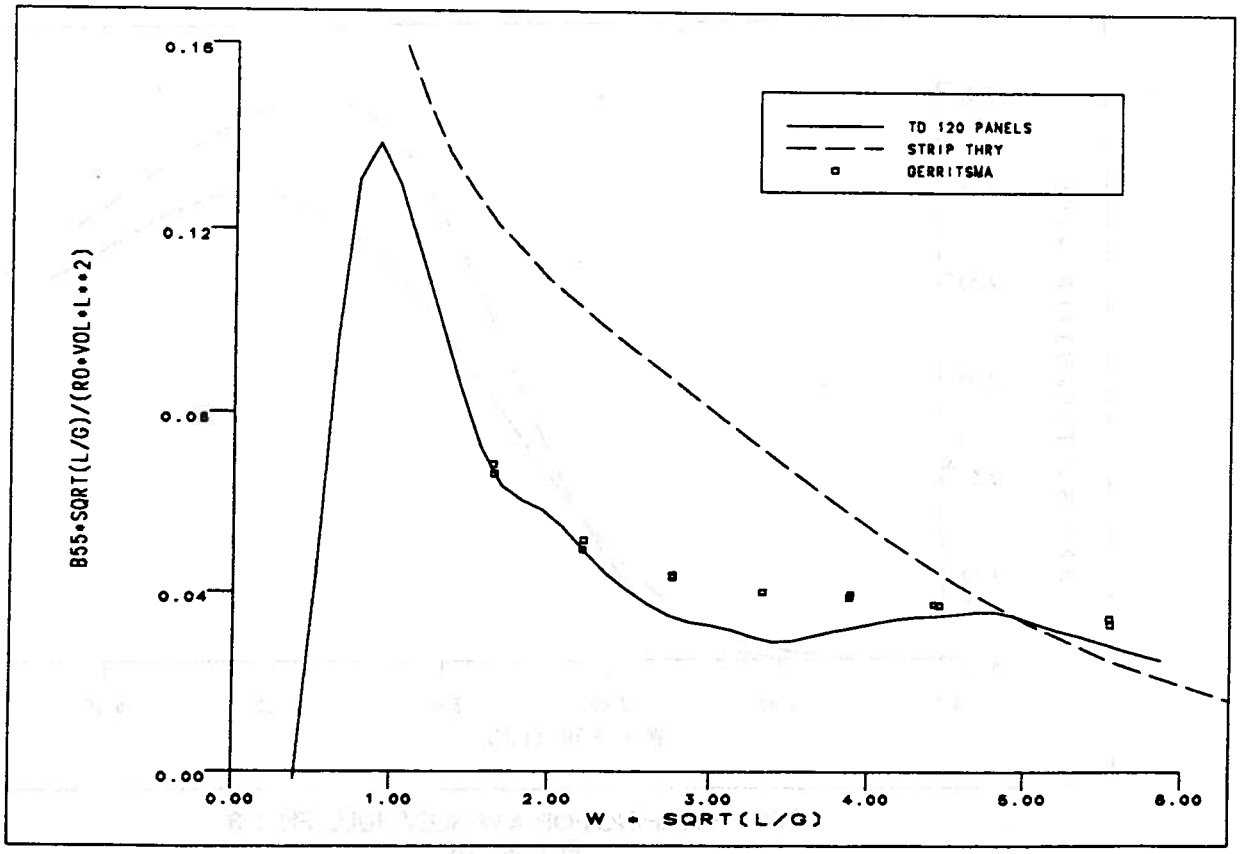
PITCH-HEAVE ADDED MASS FOR A WIGLEY HULL, FN=0.3
FIGURE 69



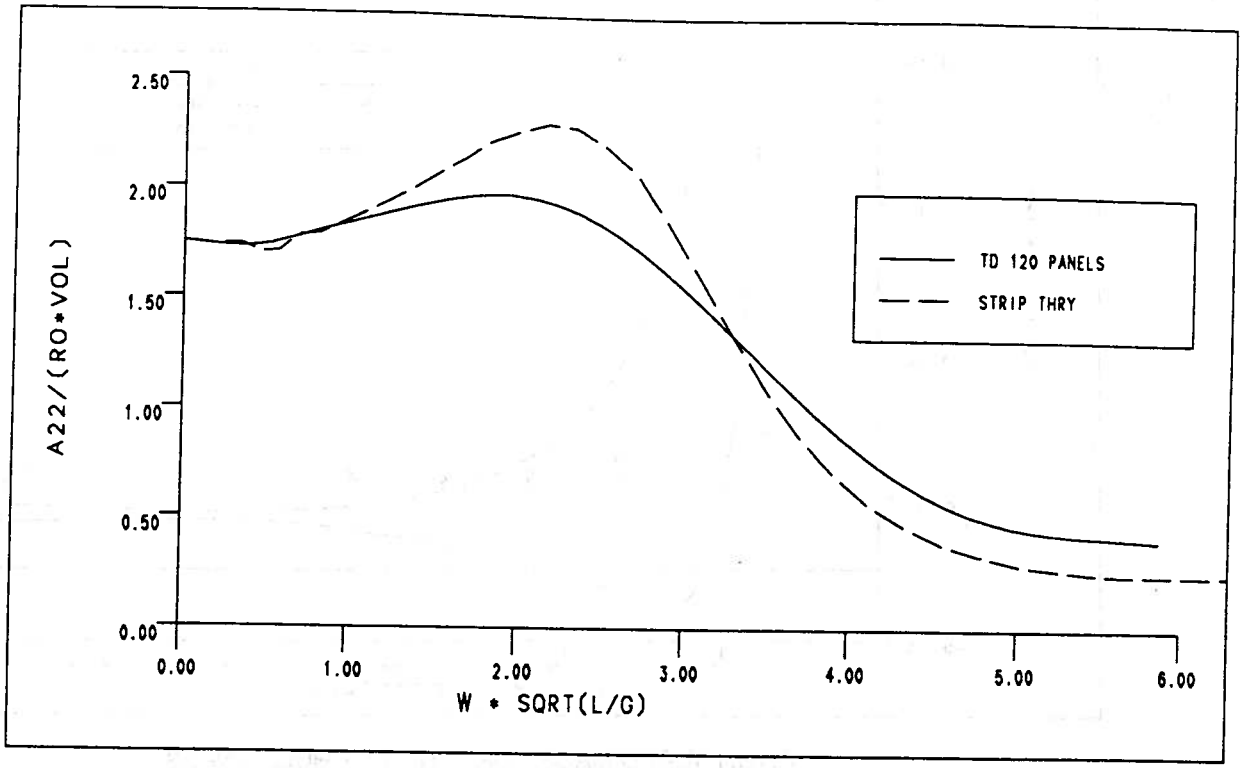
PITCH-HEAVE DAMPING FOR A WIGLEY HULL, FN=0.3
FIGURE 70



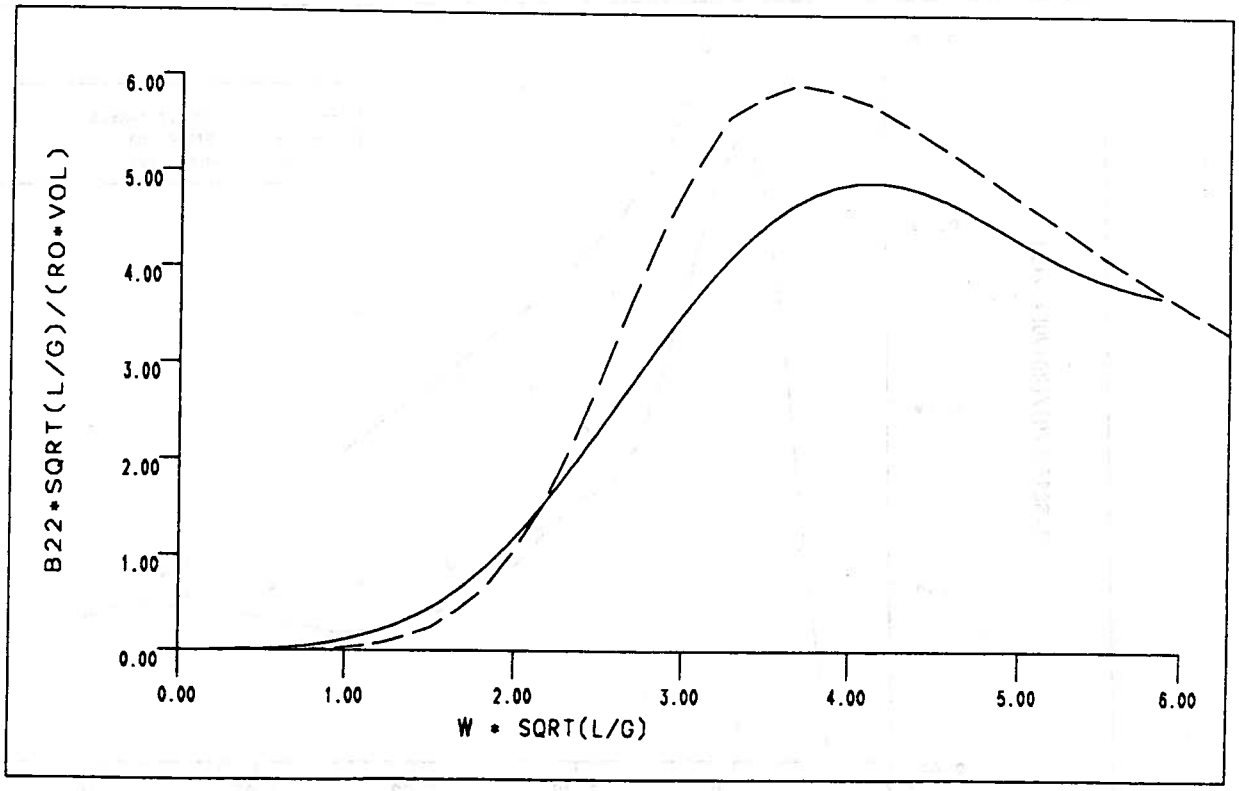
PITCH ADDED MASS FOR A WIGLEY HULL, FN=0.3
FIGURE 71



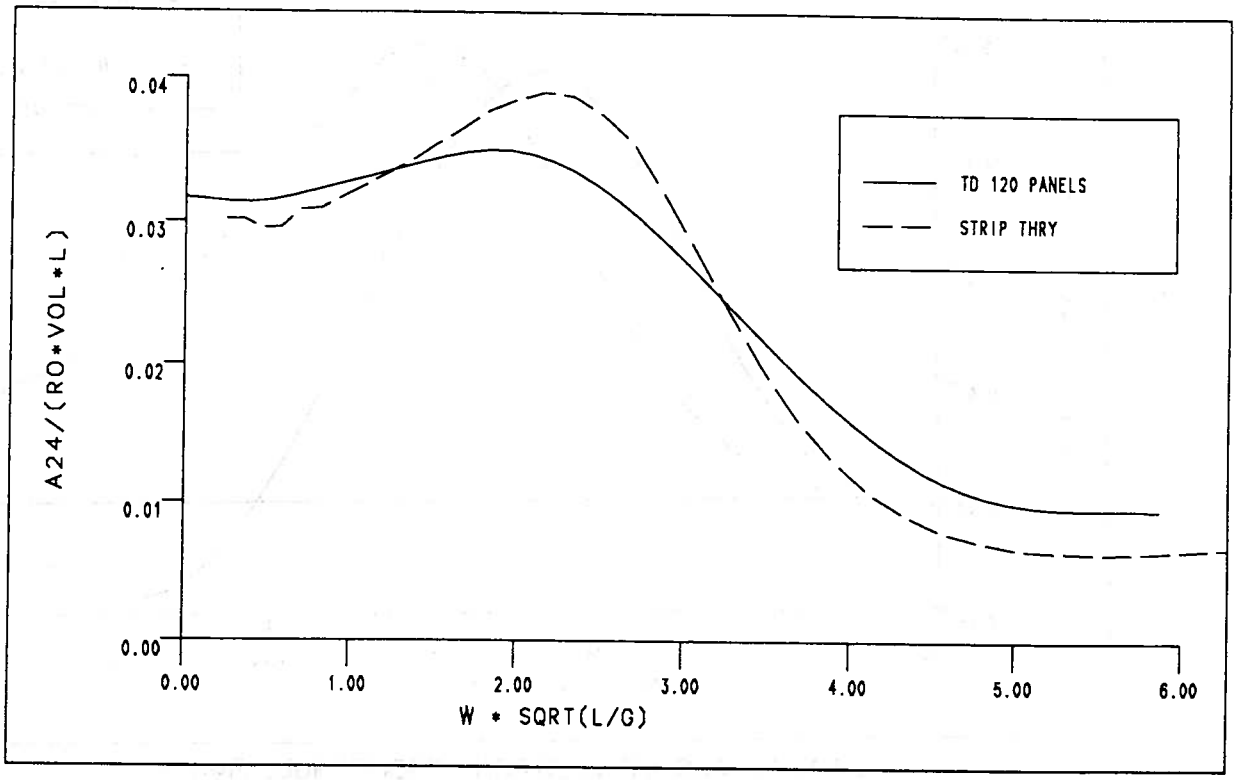
PITCH DAMPING FOR A WIGLEY HULL, FN=0.3
FIGURE 72



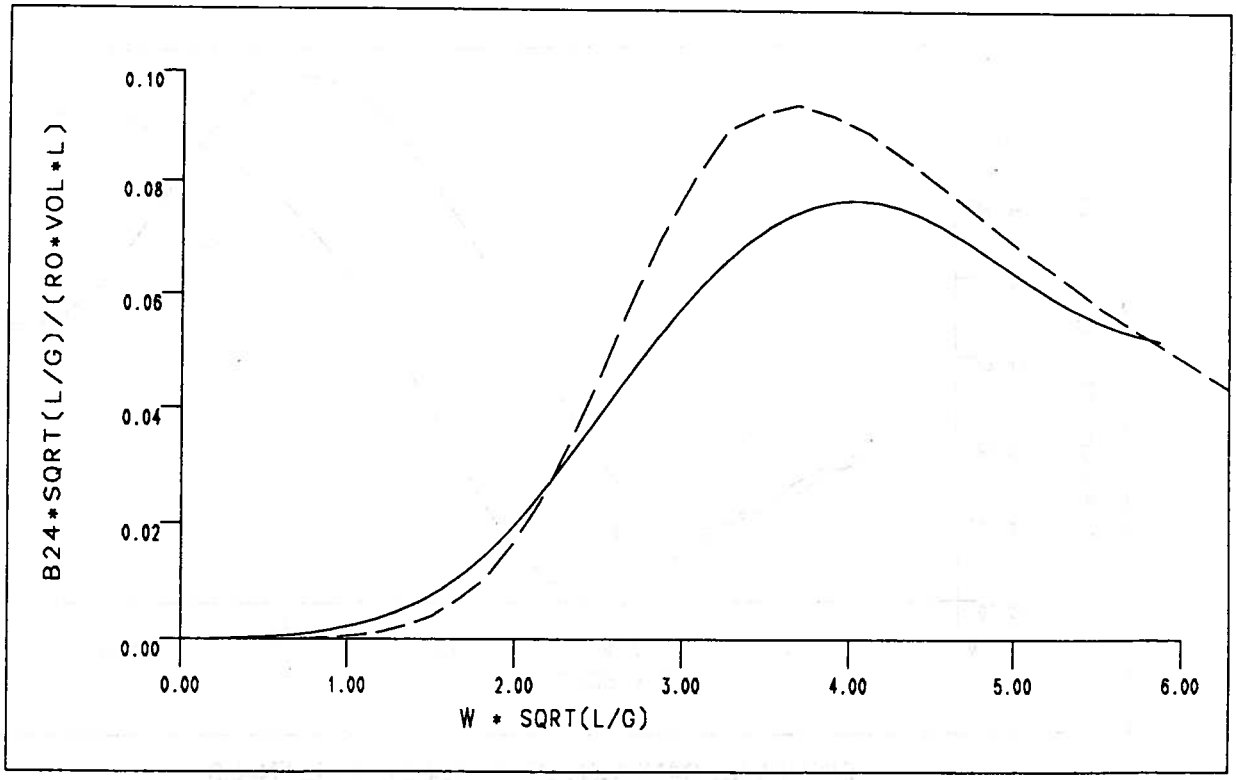
SWAY ADDED MASS FOR A WIGLEY HULL, FN=0.3
FIGURE 73



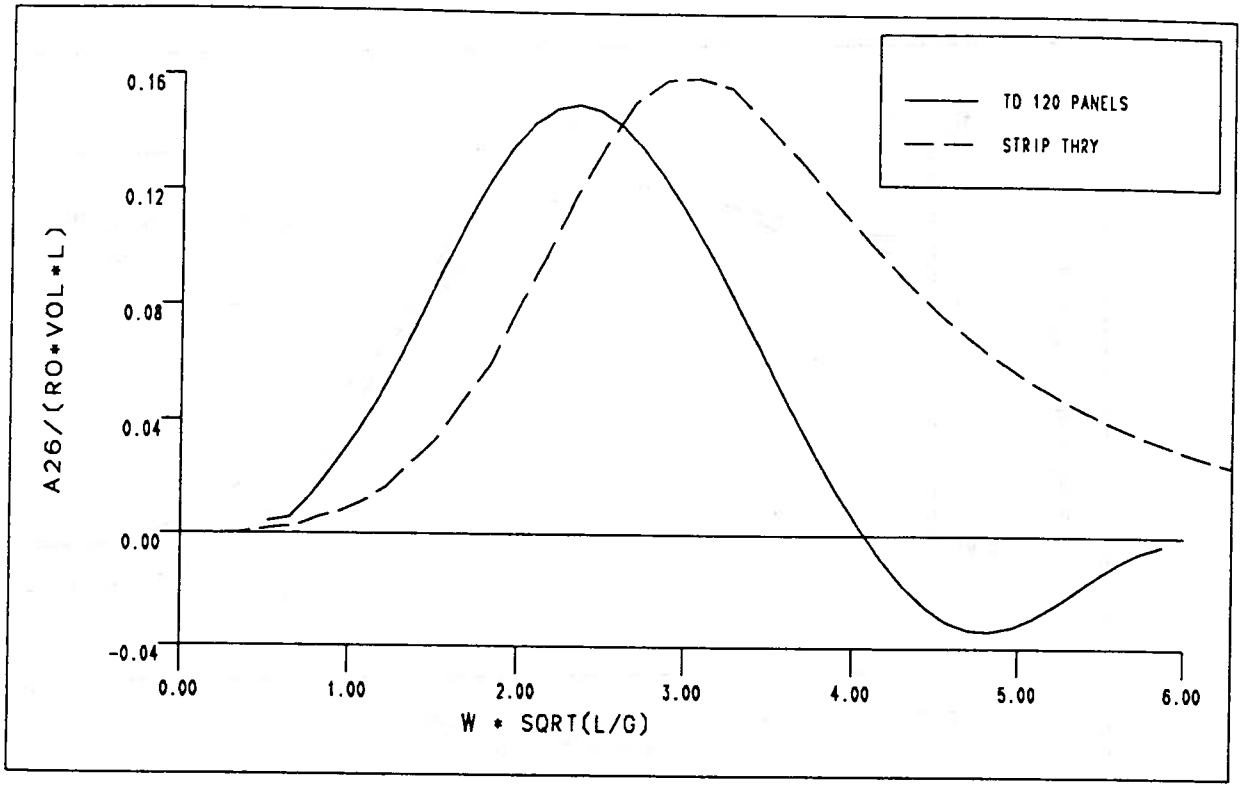
SWAY DAMPING FOR A WIGLEY HULL, FN=0.3
FIGURE 74



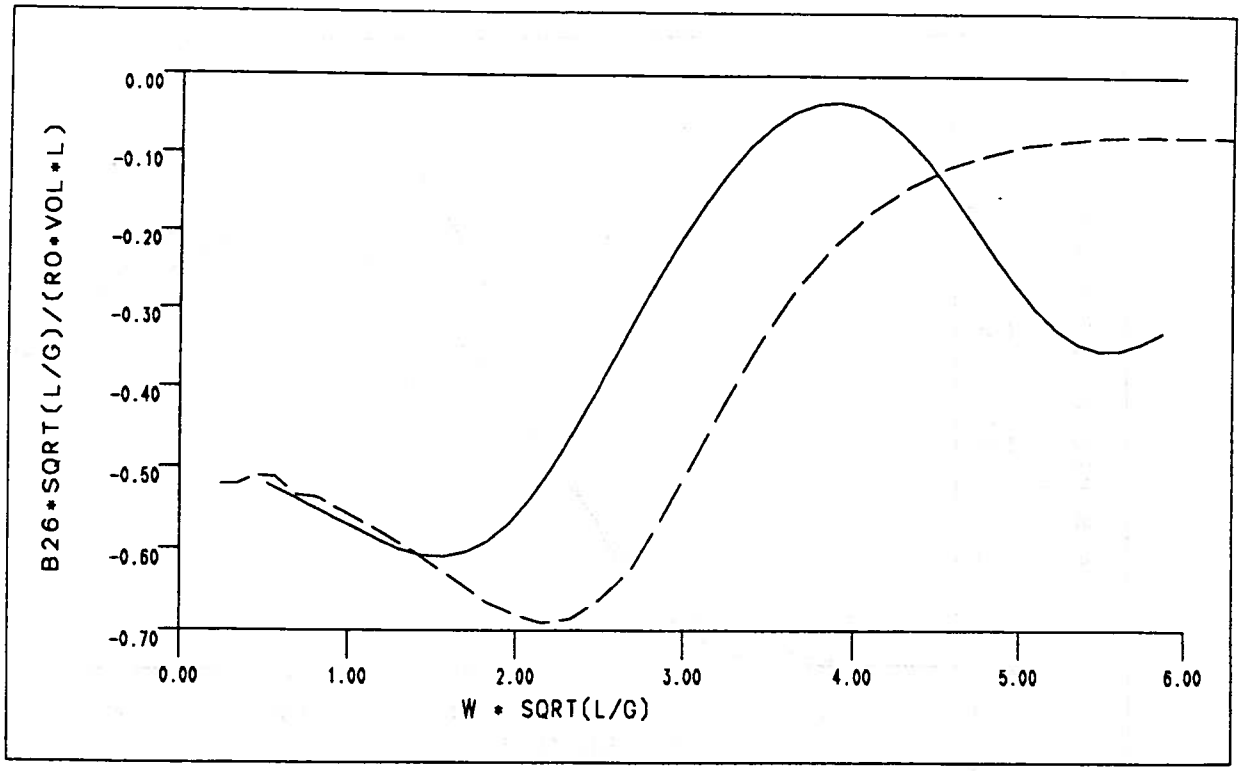
SWAY-ROLL ADDED MASS FOR A WIGLEY HULL, FN=0.3
FIGURE 75



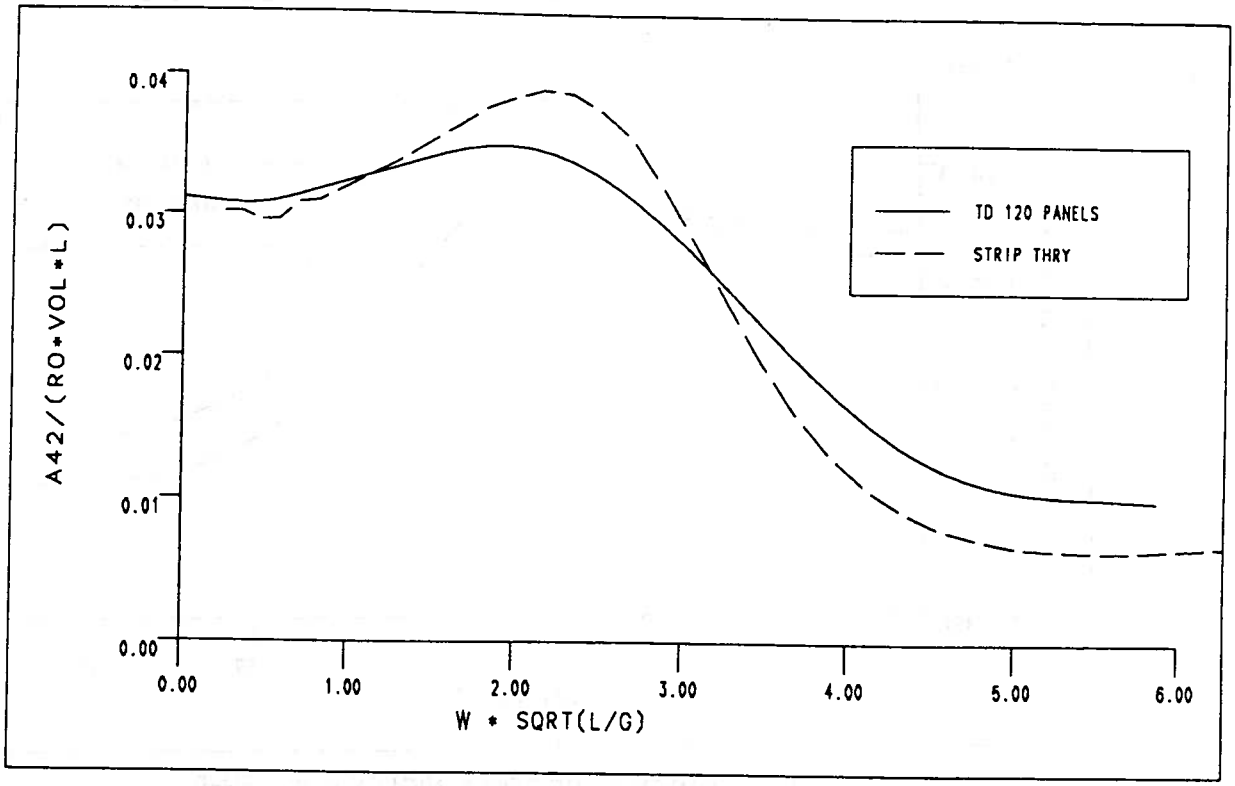
SWAY-ROLL DAMPING FOR A WIGLEY HULL, FN=0.3
FIGURE 76



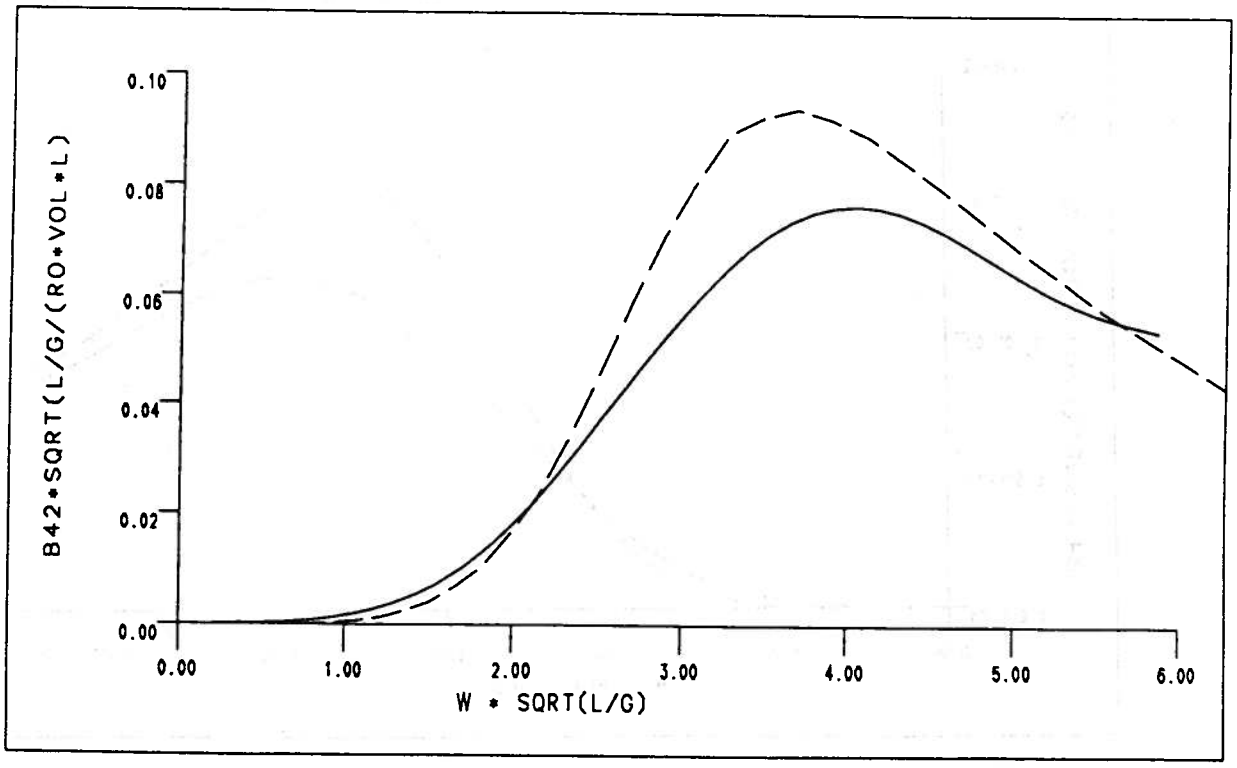
SWAY-YAW ADDED MASS FOR A WIGLEY HULL, FN=0.3
FIGURE 77



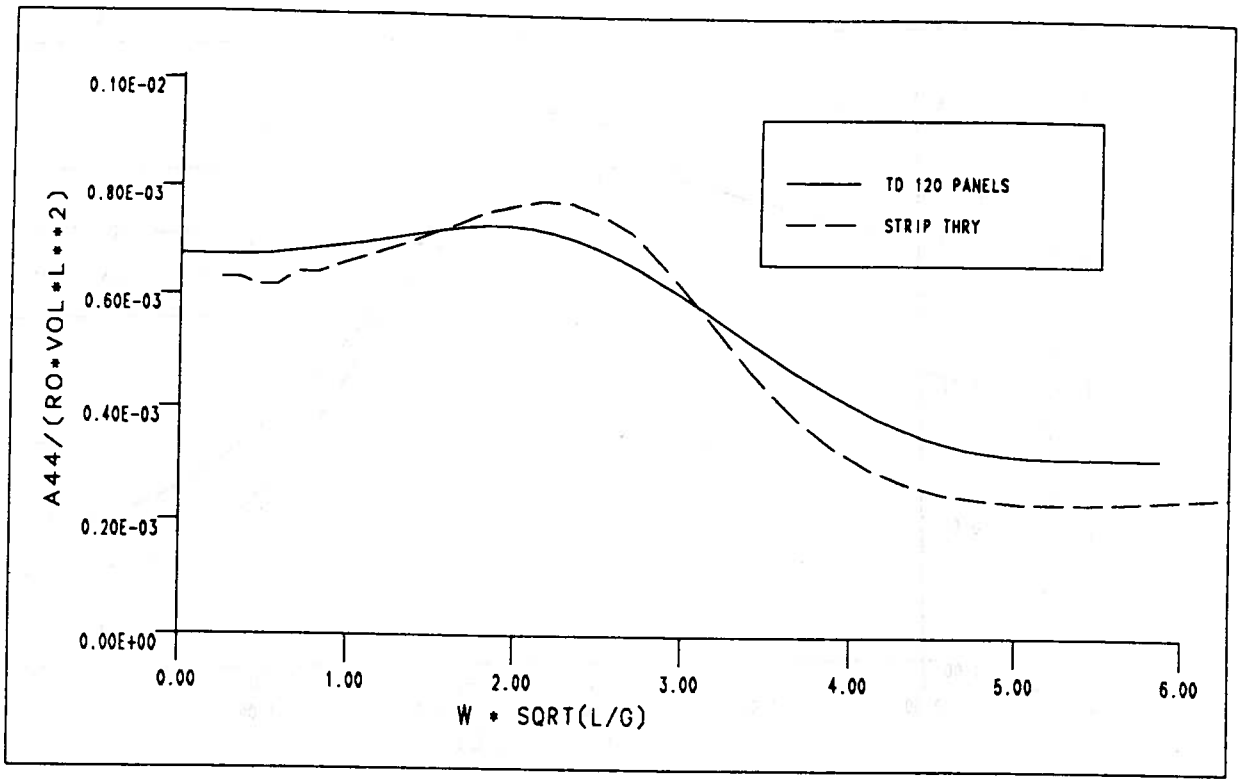
SWAY-YAW DAMPING FOR A WIGLEY HULL, FN=0.3
FIGURE 78



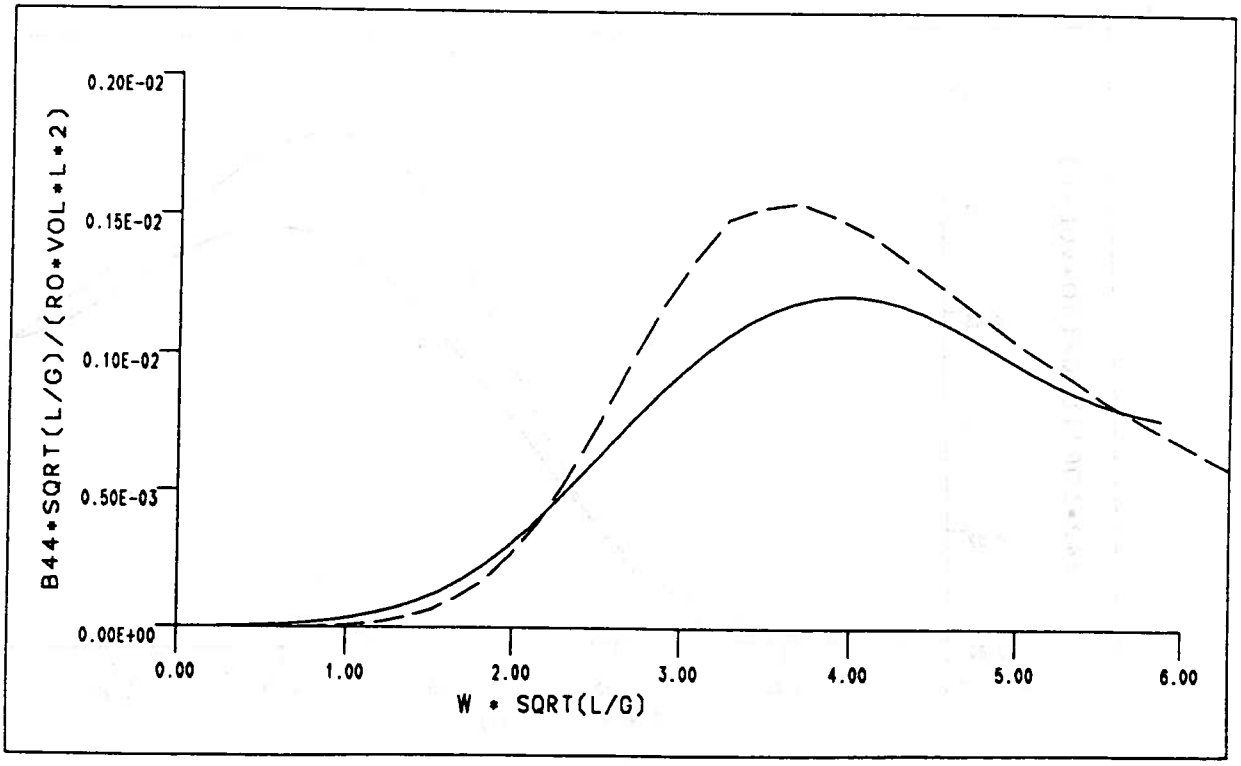
ROLL-SWAY ADDED MASS FOR A WIGLEY HULL, FN=0.3
FIGURE 79



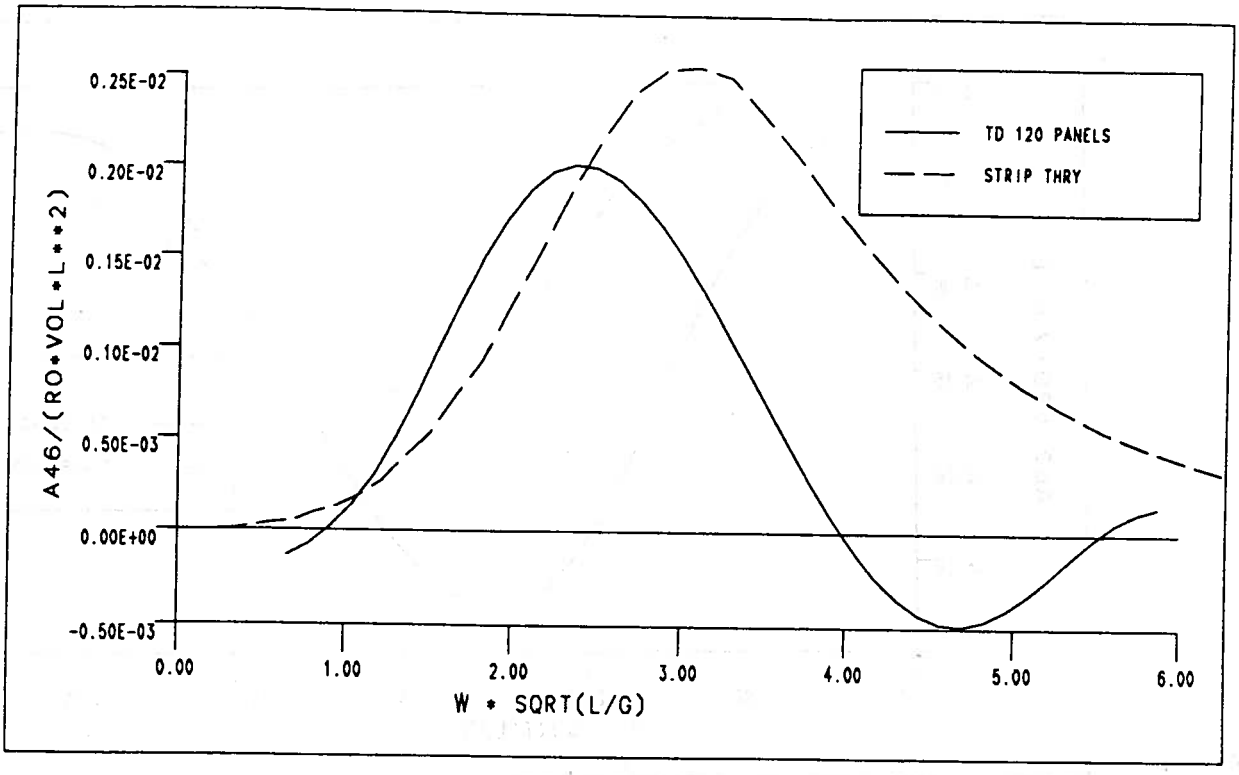
ROLL-SWAY DAMPING FOR A WIGLEY HULL, FN=0.3
FIGURE 80



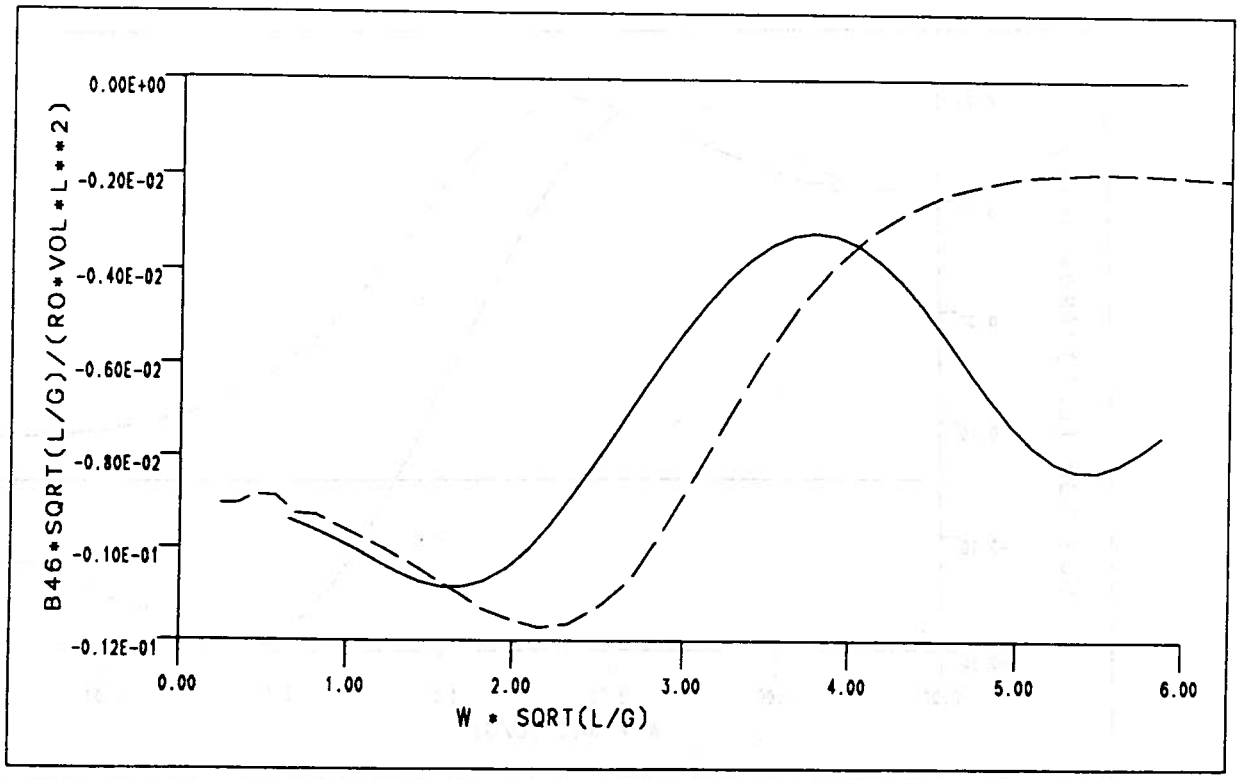
ROLL ADDED MASS FOR A WIGLEY HULL, FN=0.3
FIGURE 81



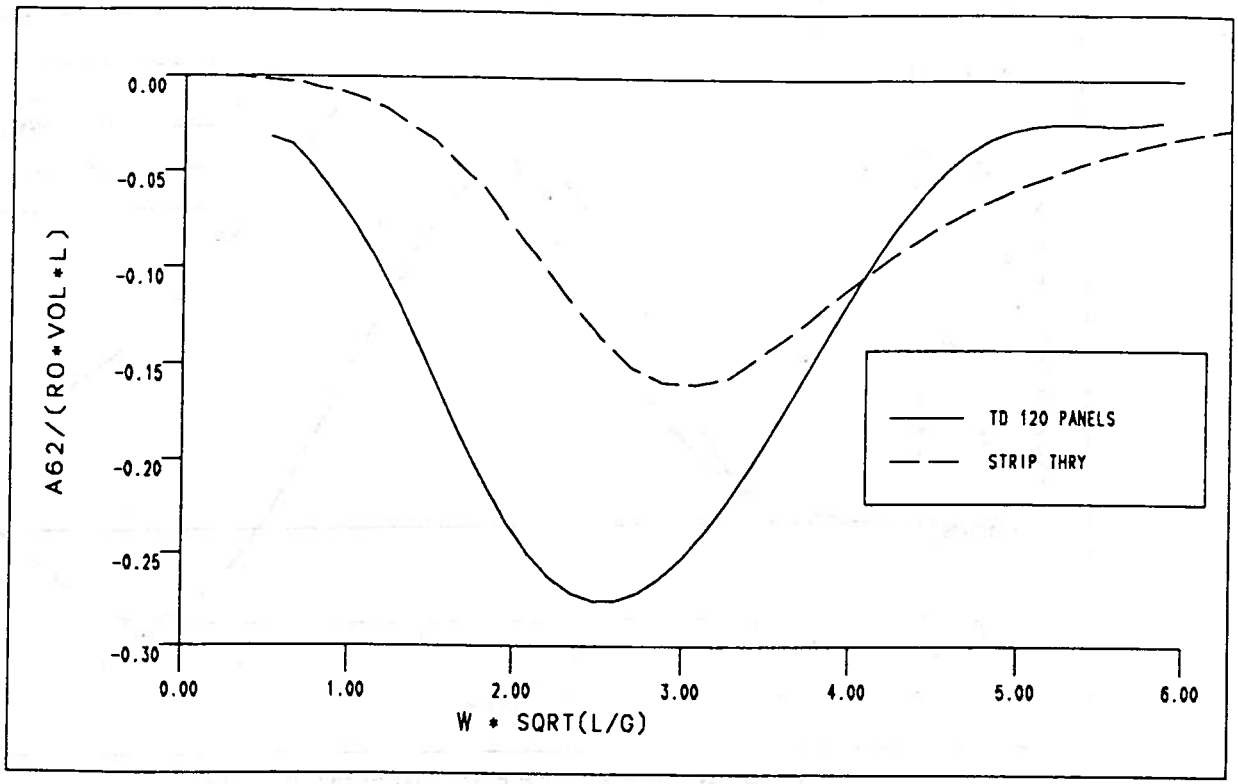
ROLL DAMPING FOR A WIGLEY HULL, FN=0.3
FIGURE 82



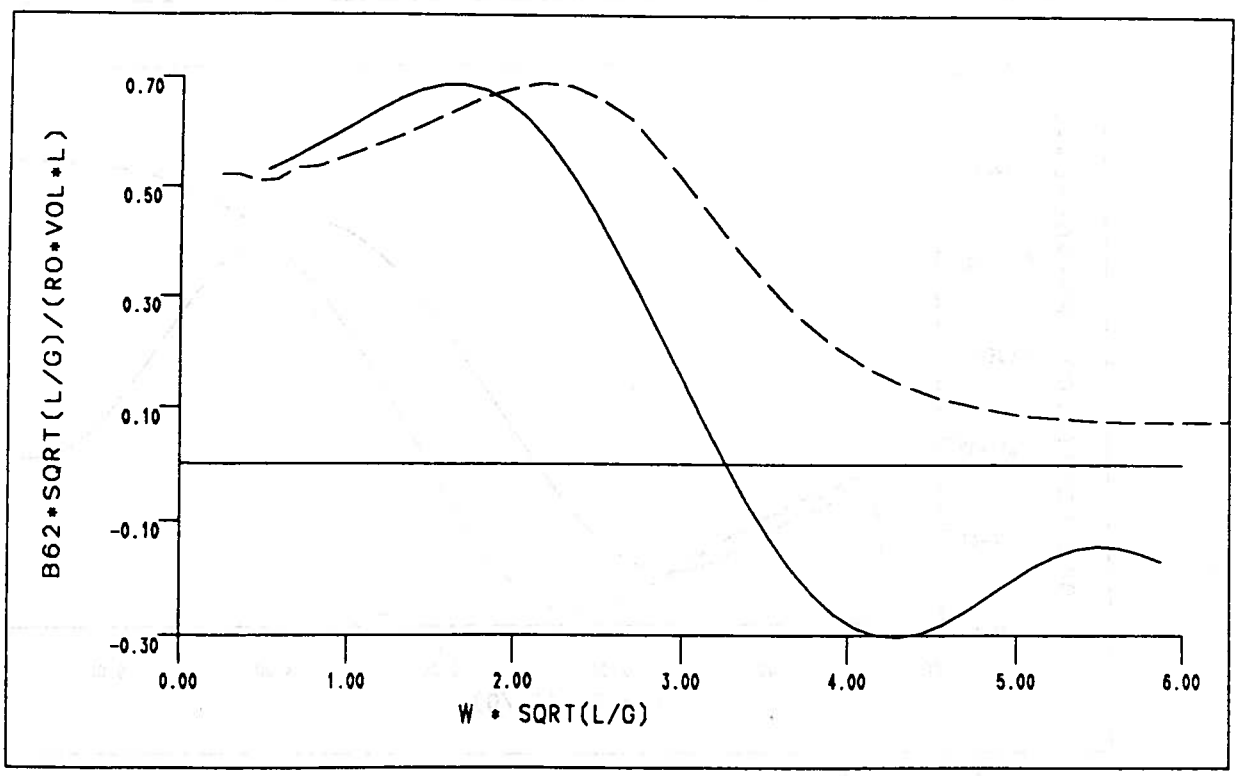
ROLL-YAW ADDED MASS FOR A WIGLEY HULL, FN=0.3
FIGURE 83



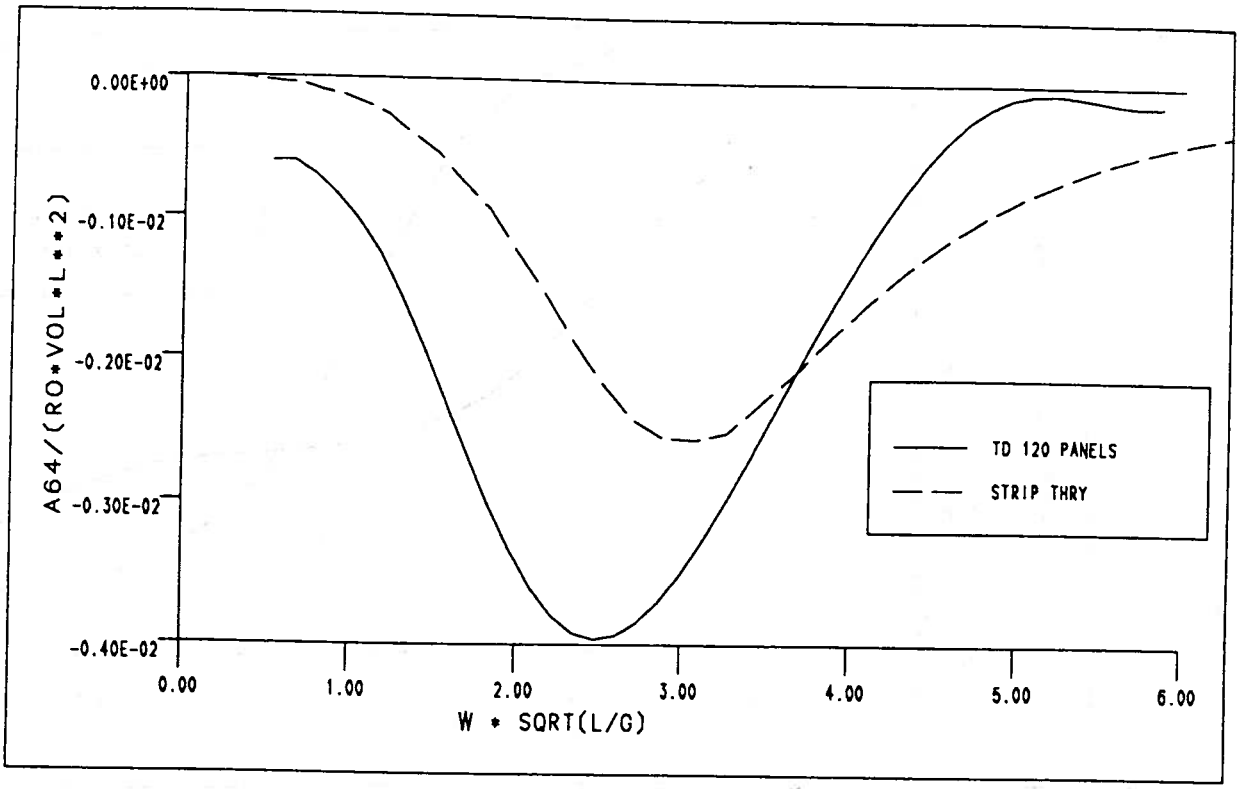
ROLL-YAW DAMPING FOR A WIGLEY HULL, FN=0.3
FIGURE 84



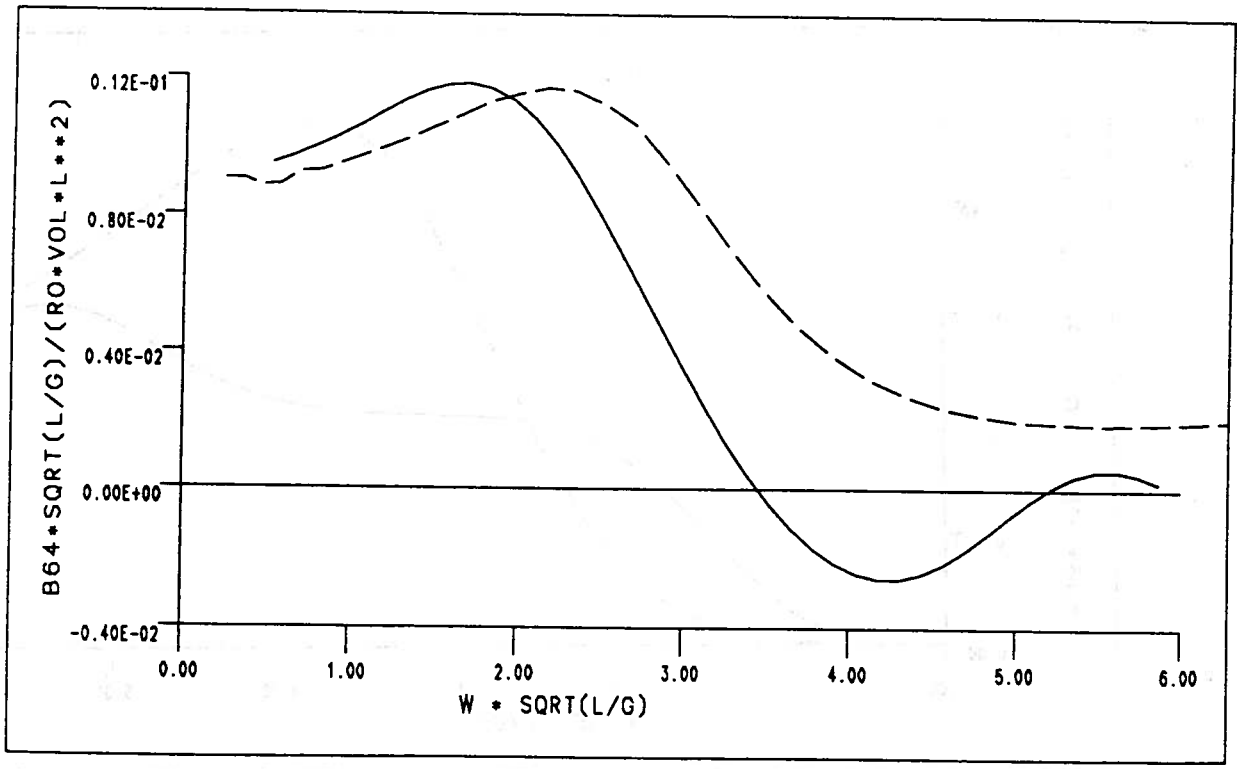
YAW-SWAY ADDED MASS FOR A WIGLEY HULL, FN=0.3
FIGURE 85



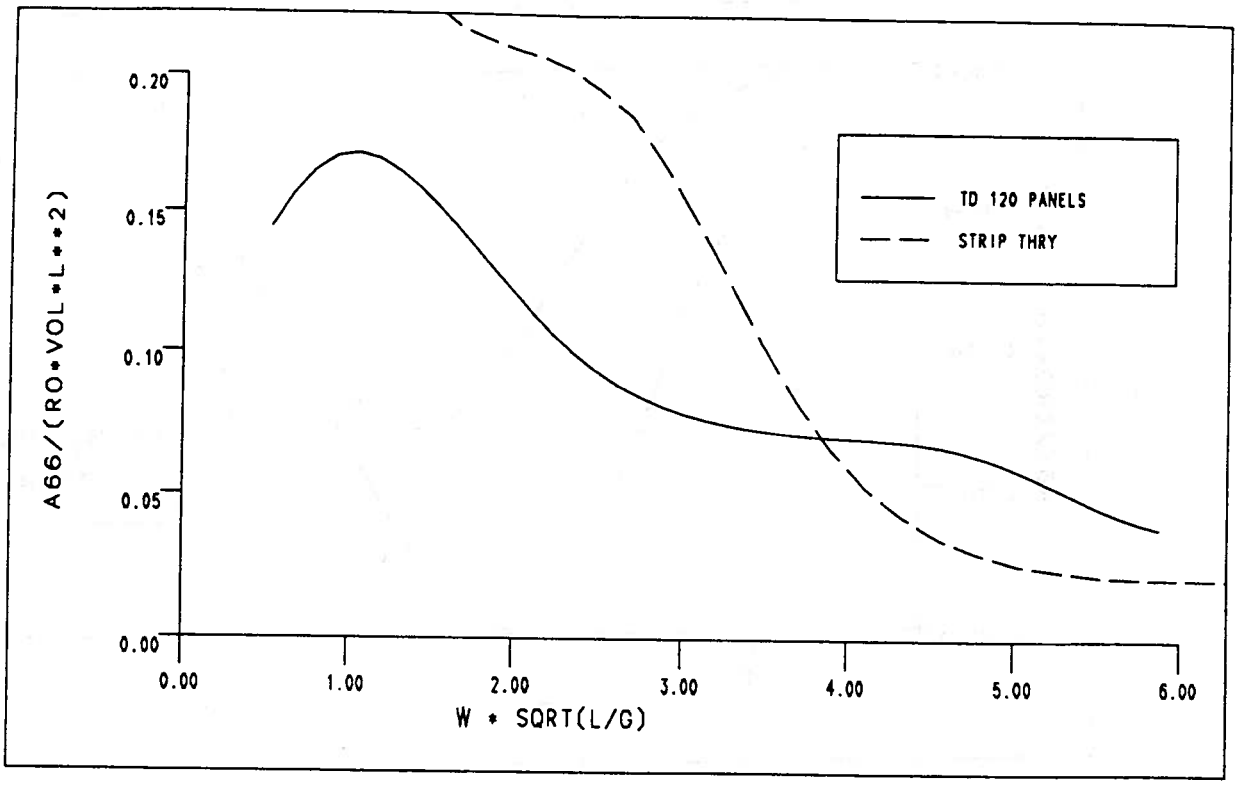
YAW-SWAY DAMPING FOR A WIGLEY HULL, FN=0.3
FIGURE 86



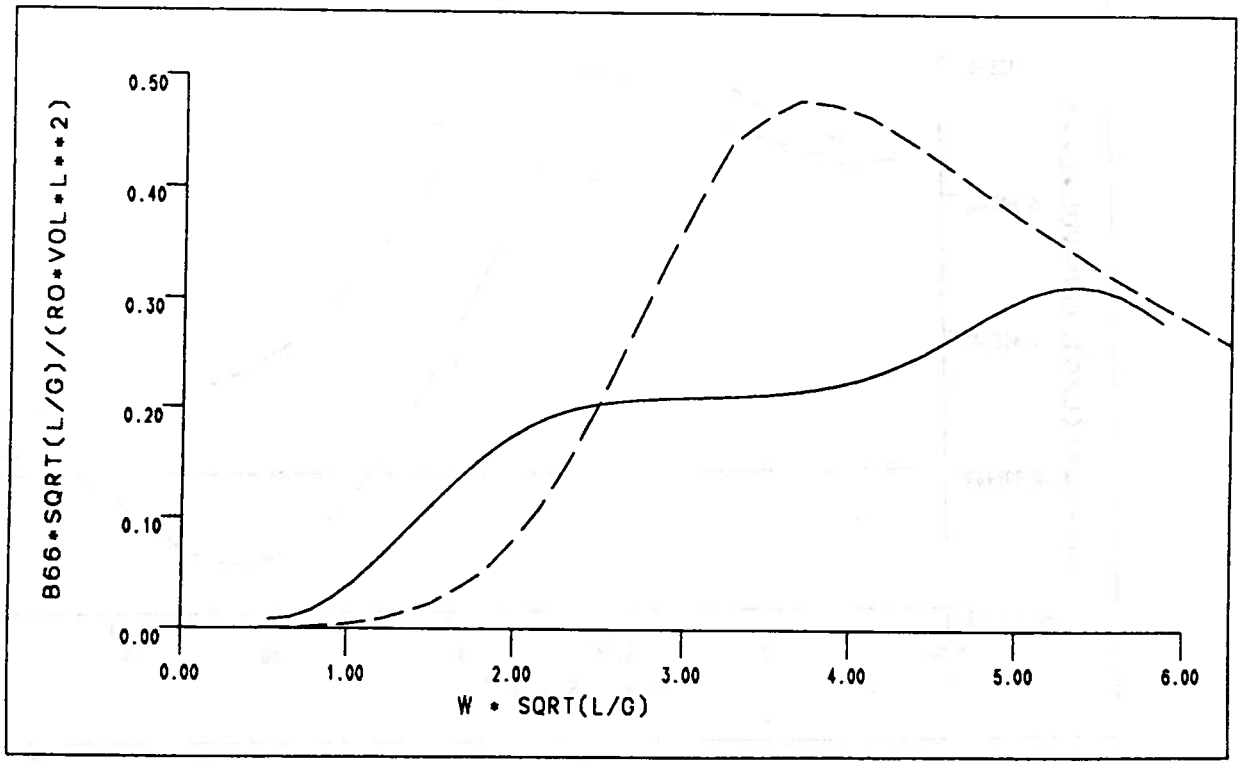
YAW-ROLL ADDED MASS FOR A WIGLEY HULL, FN=0.3
FIGURE 87



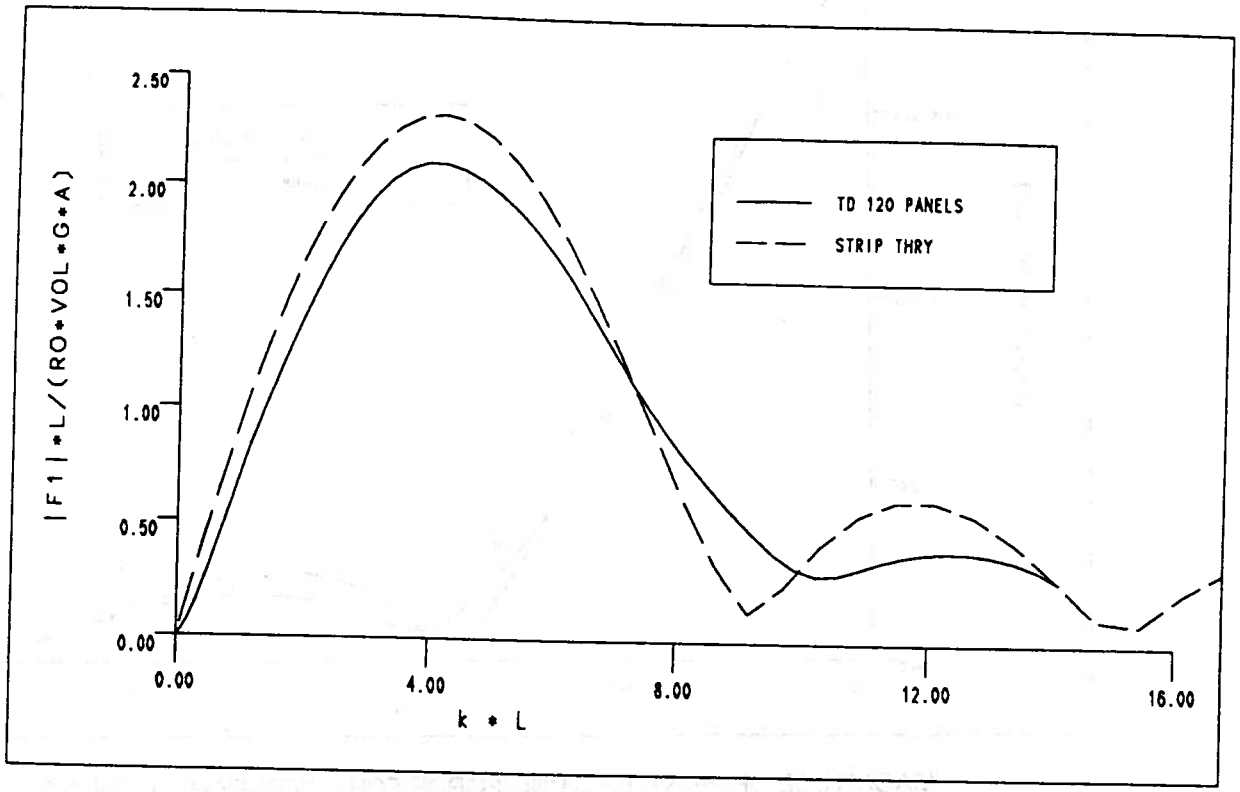
YAW-ROLL DAMPING FOR A WIGLEY HULL, FN=0.3
FIGURE 88



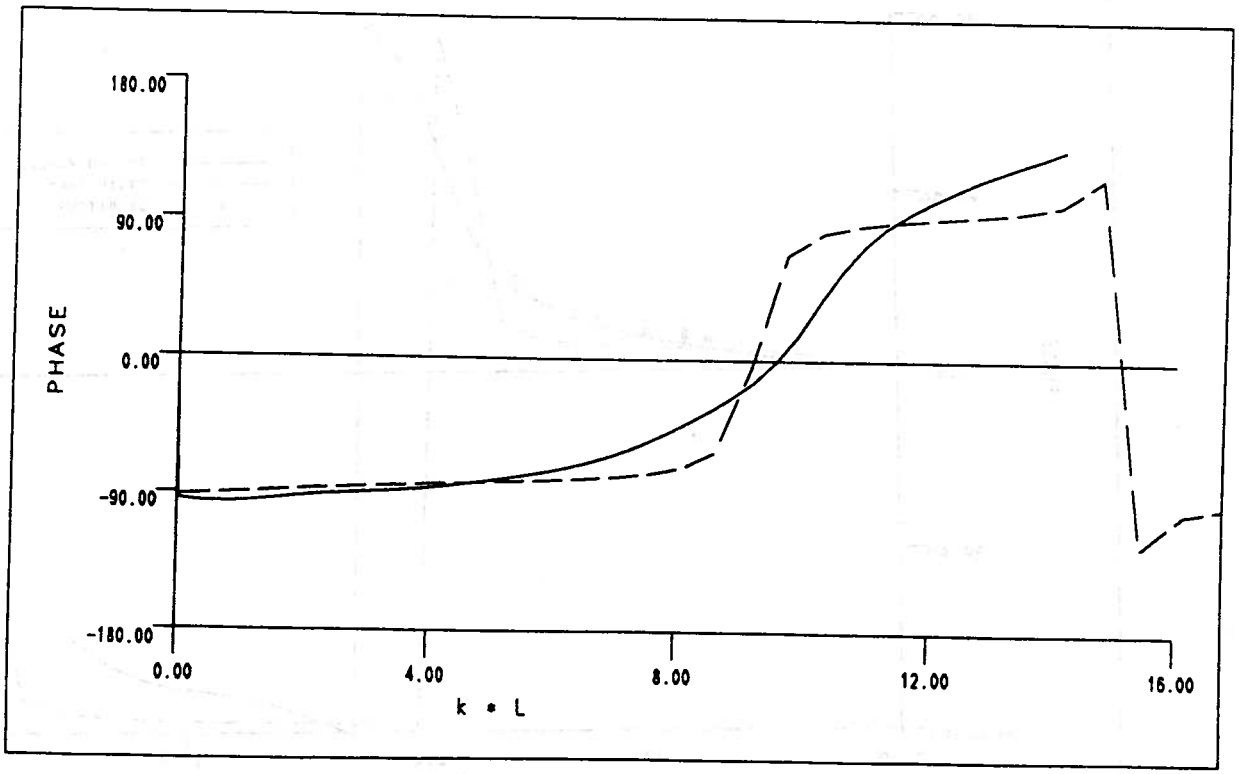
YAW ADDED MASS FOR A WIGLEY HULL, FN=0.3
FIGURE 89



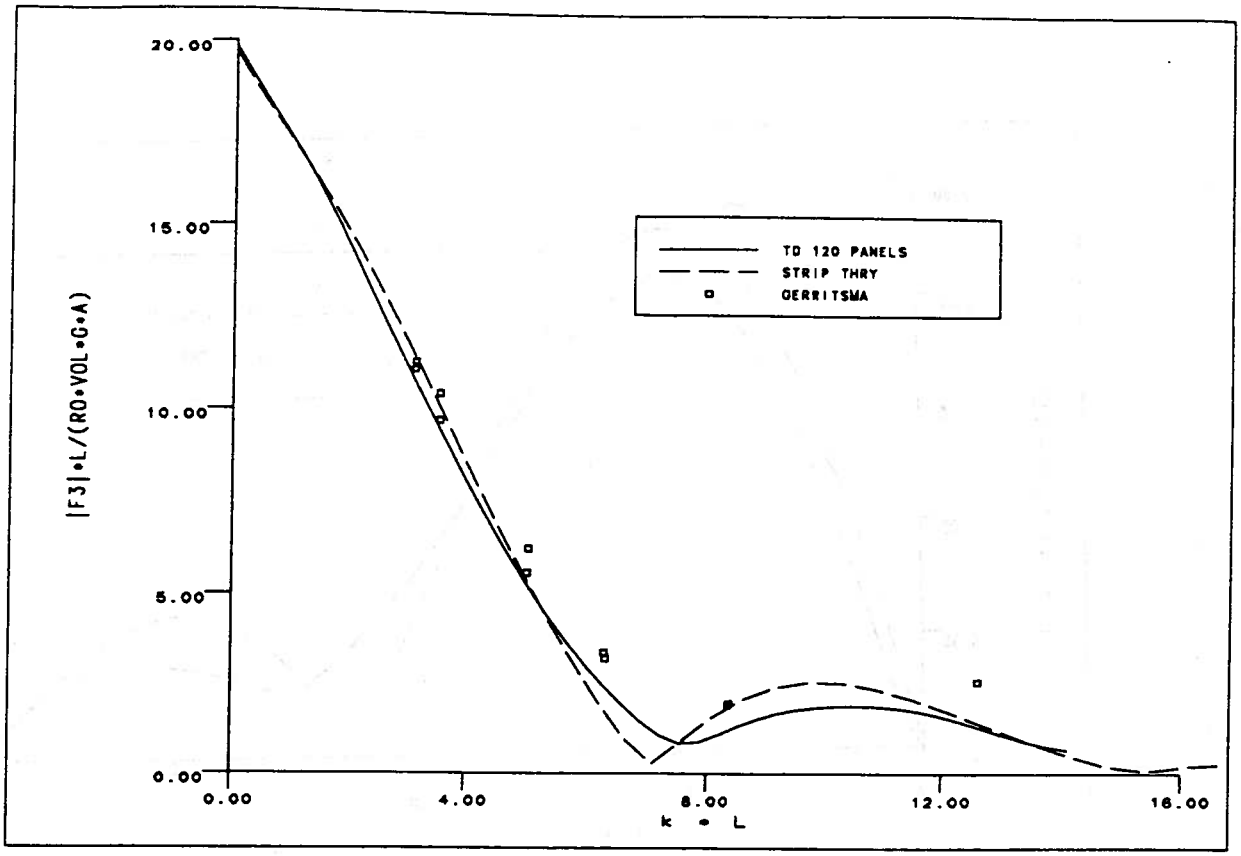
YAW DAMPING FOR A WIGLEY HULL, FN=0.3
FIGURE 90



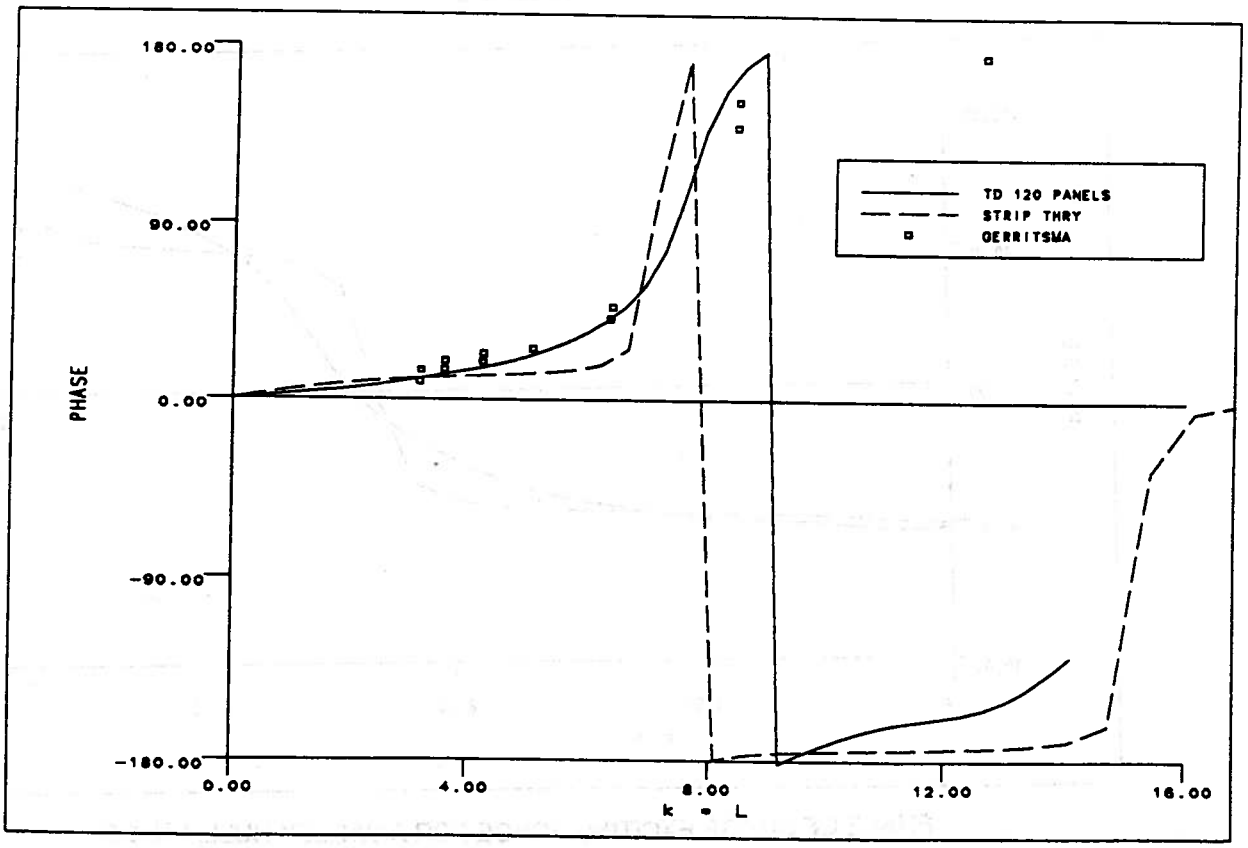
MAGNITUDE OF SURGE EXCITING FORCE FOR A WIGLEY HULL, FN=0.3
FIGURE 91



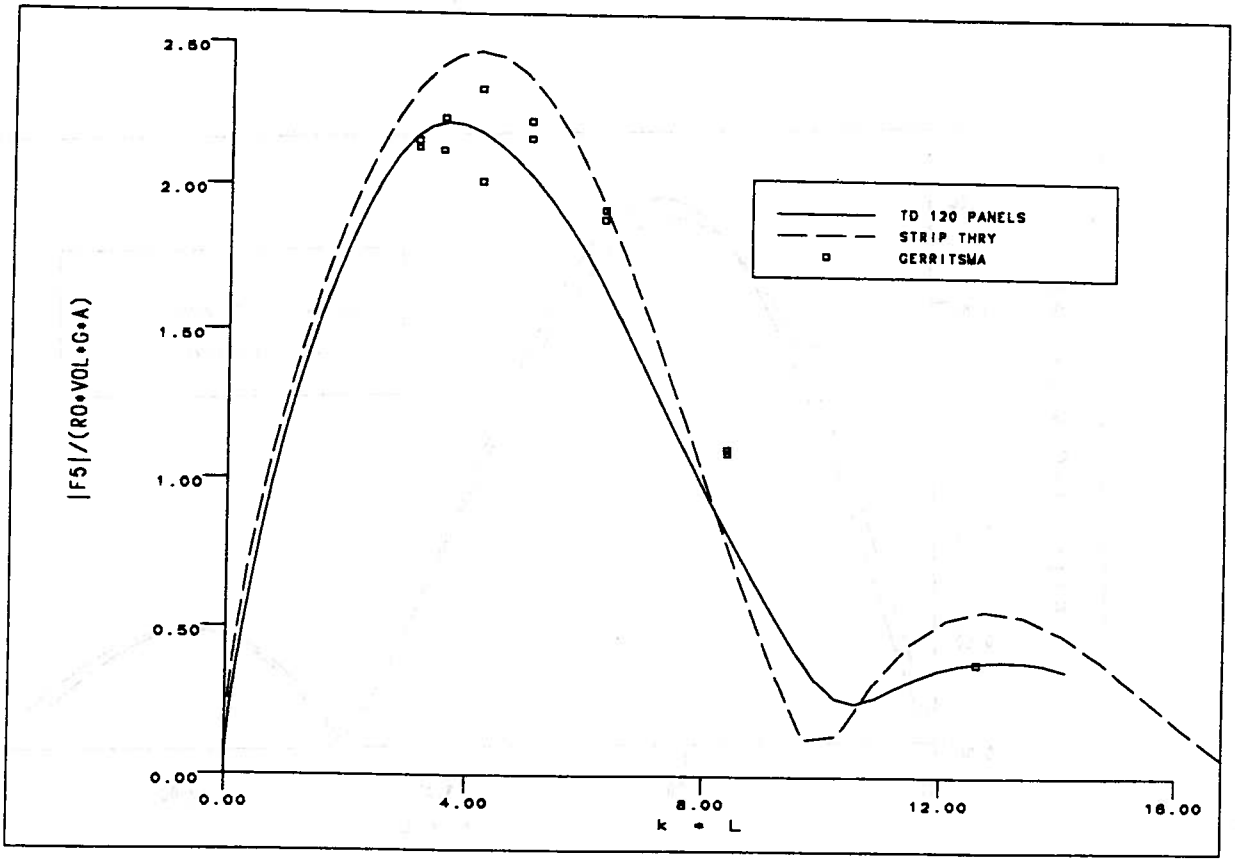
PHASE OF SURGE EXCITING FORCE FOR A WIGLEY HULL, FN=0.3
FIGURE 92



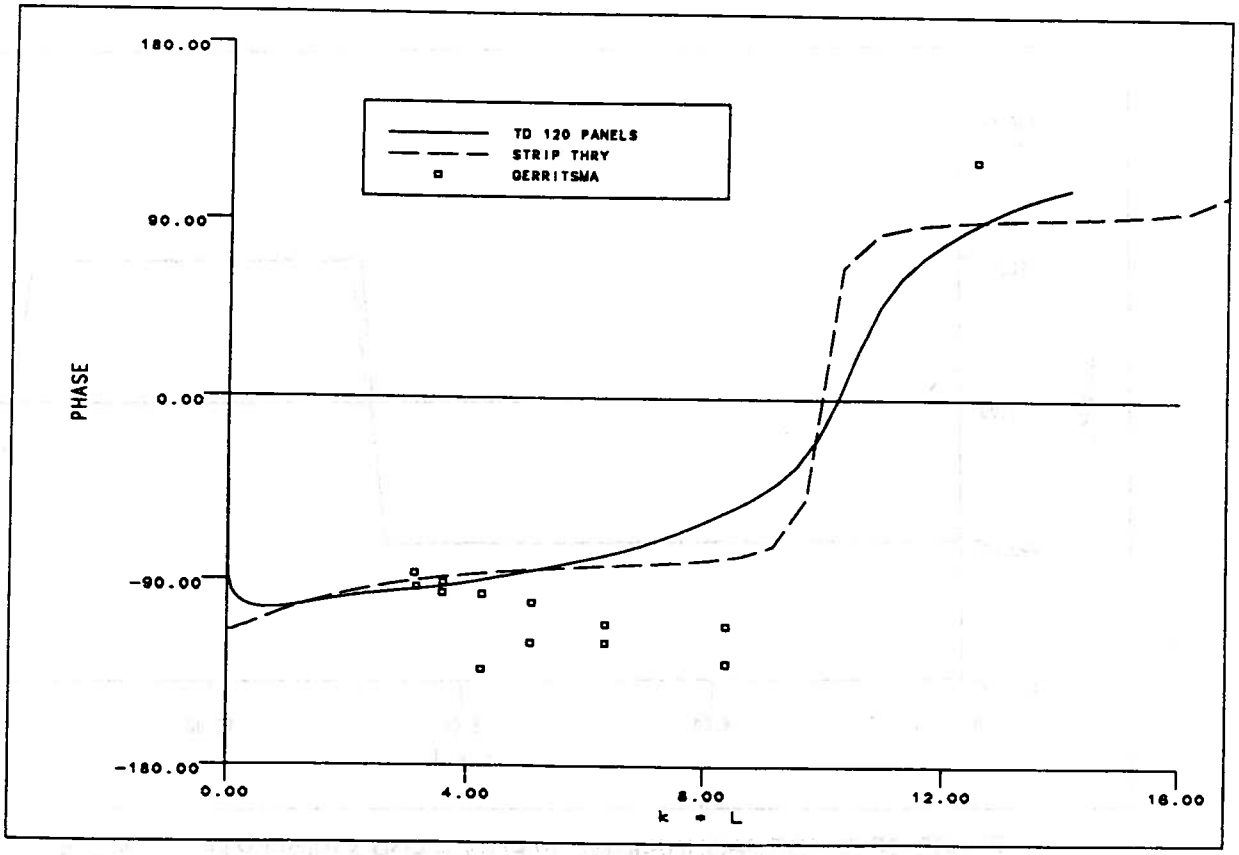
MAGNITUDE OF HEAVE EXCITING FORCE FOR A WIGLEY HULL, FN=0.3
FIGURE 93



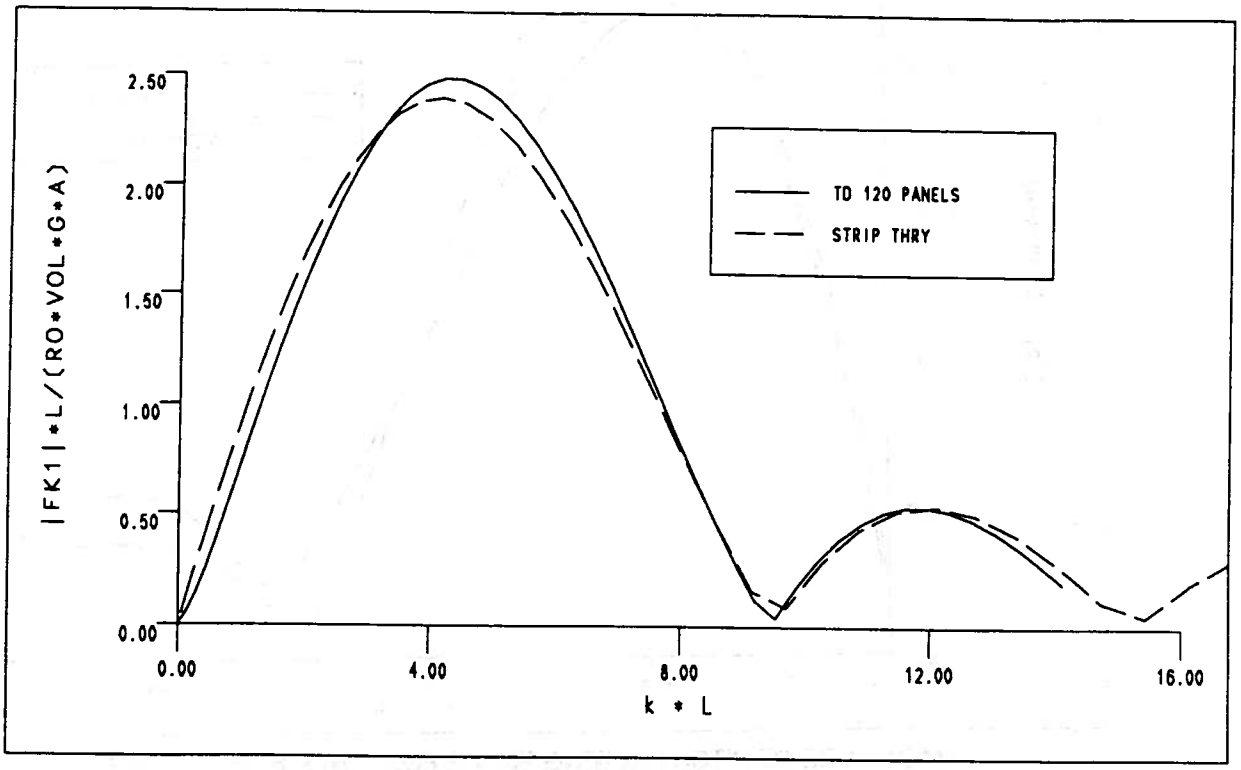
PHASE OF HEAVE EXCITING FORCE FOR A WIGLEY HULL, FN=0.3
FIGURE 94



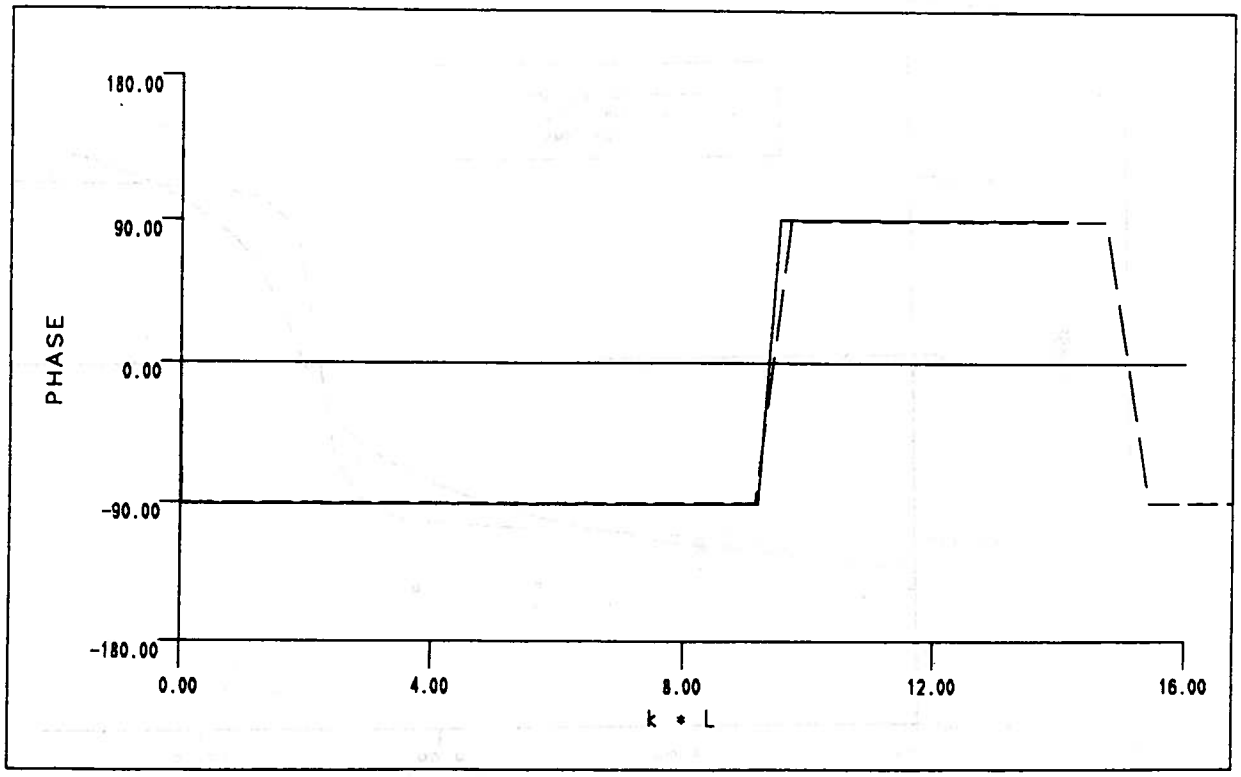
MAGNITUDE OF PITCH EXCITING FORCE FOR A WIGLEY HULL, FN=0.3
FIGURE 95



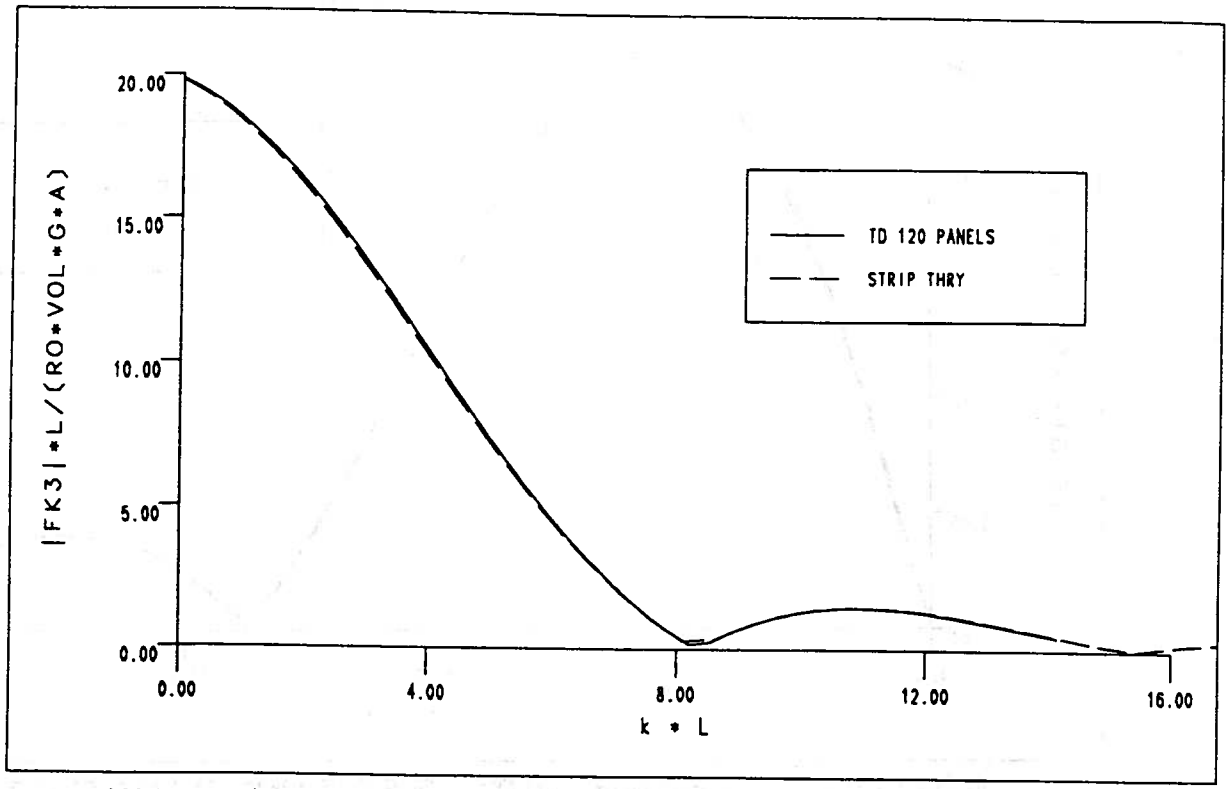
PHASE OF PITCH EXCITING FORCE FOR A WIGLEY HULL, FN=0.3
FIGURE 96



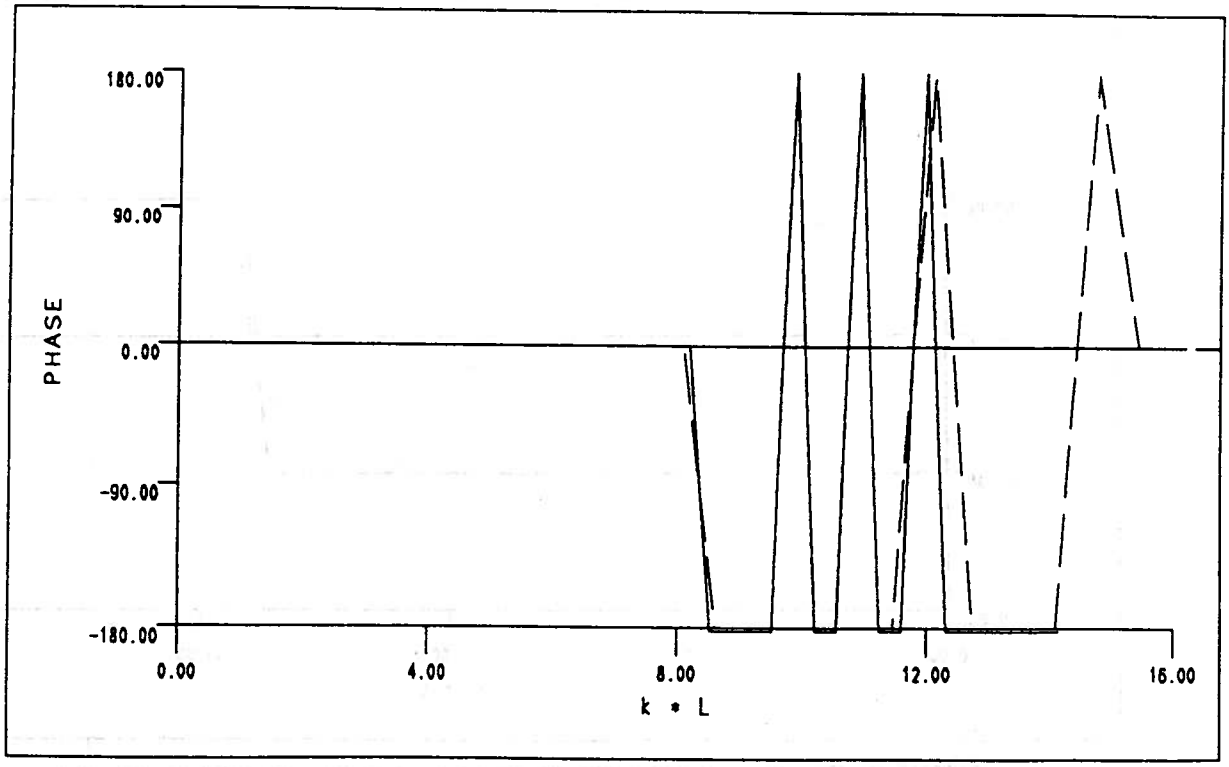
MAGNITUDE OF SURGE FROUDE-KRYLOV FORCE FOR A WIGLEY HULL, FN=0.3
FIGURE 97



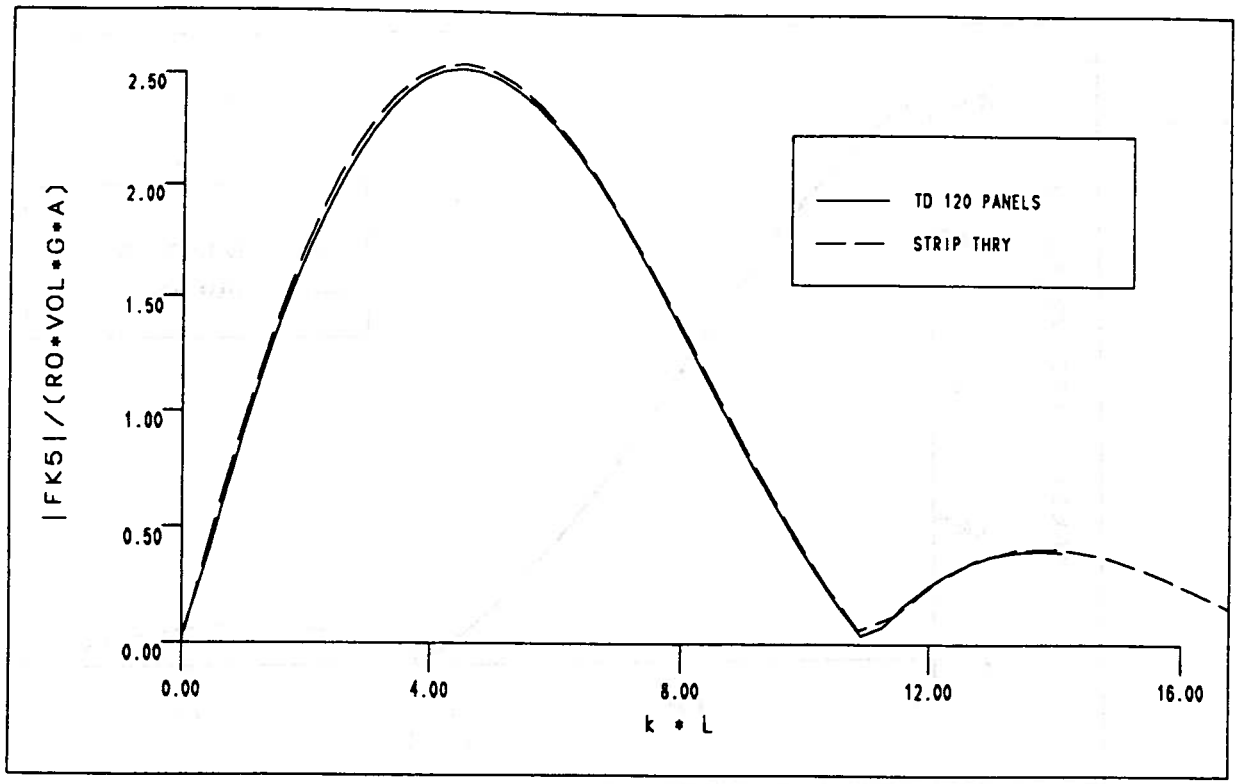
PHASE OF SURGE FROUDE-KRYLOV FORCE FOR A WIGLEY HULL, FN=0.3
FIGURE 98



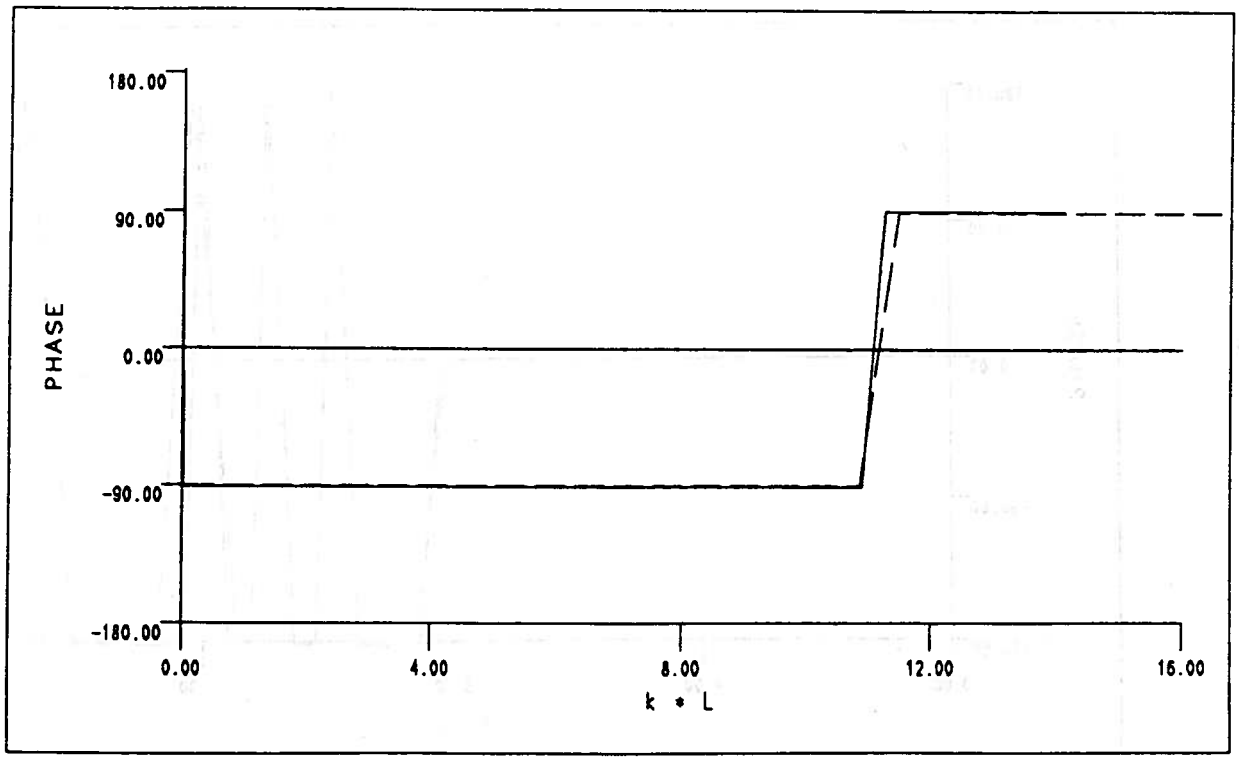
MAGNITUDE OF HEAVE FROUDE-KRYLOV FORCE FOR A WIGLEY HULL, FN=0.3
FIGURE 99



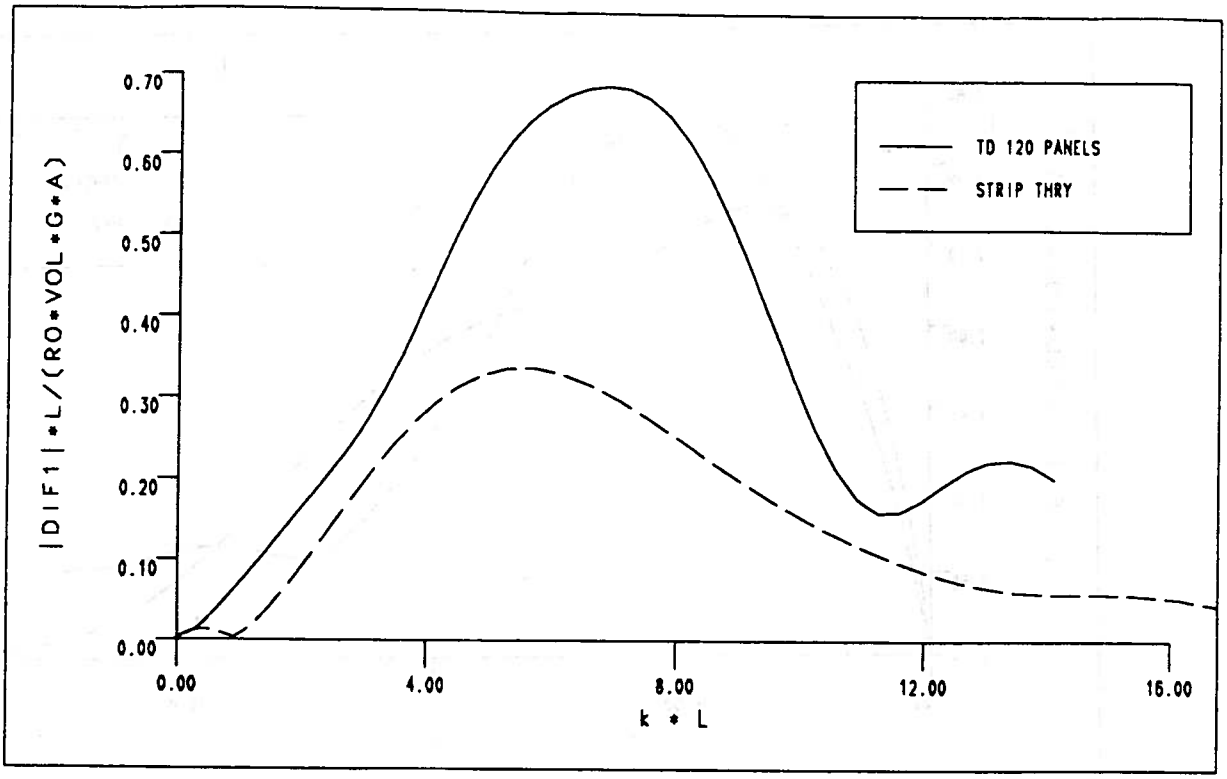
PHASE OF HEAVE FROUDE-KRYLOV FORCE FOR A WIGLEY HULL, FN=0.3
FIGURE 100



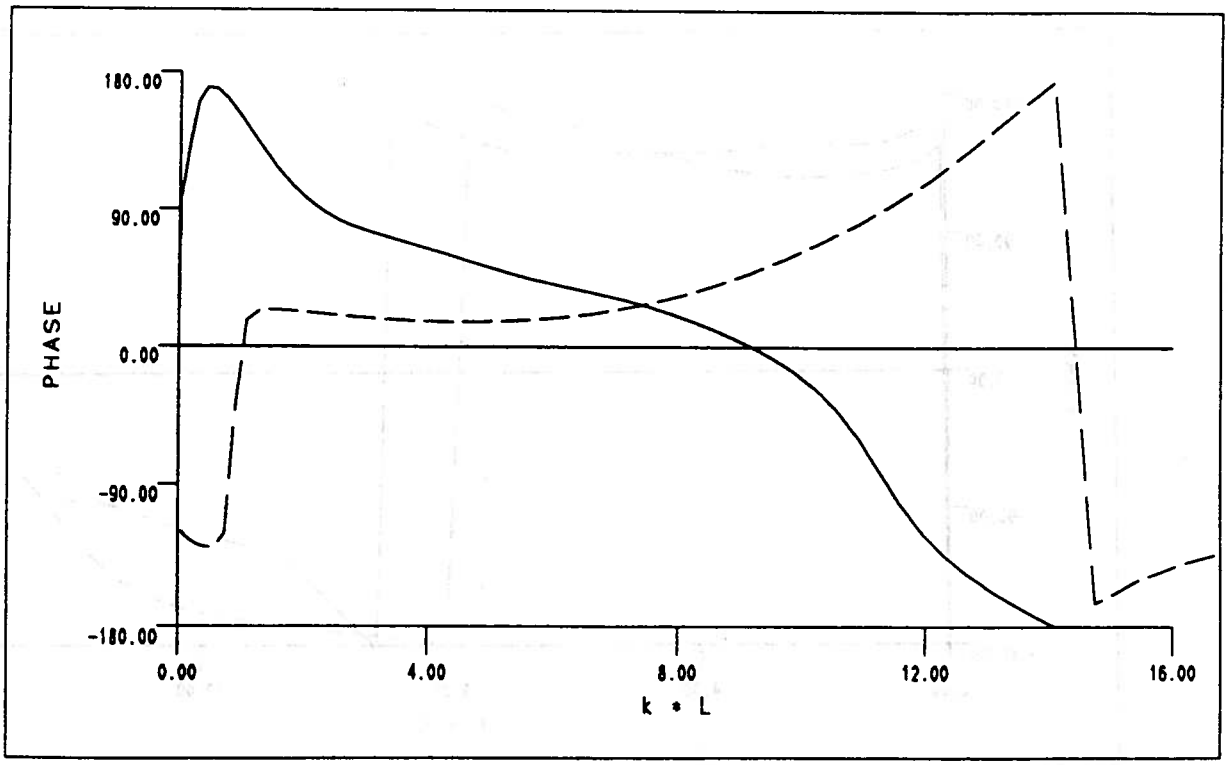
MAGNITUDE OF PITCH FROUDE-KRYLOV FORCE FOR A WIGLEY HULL, FN=0.3
FIGURE 101



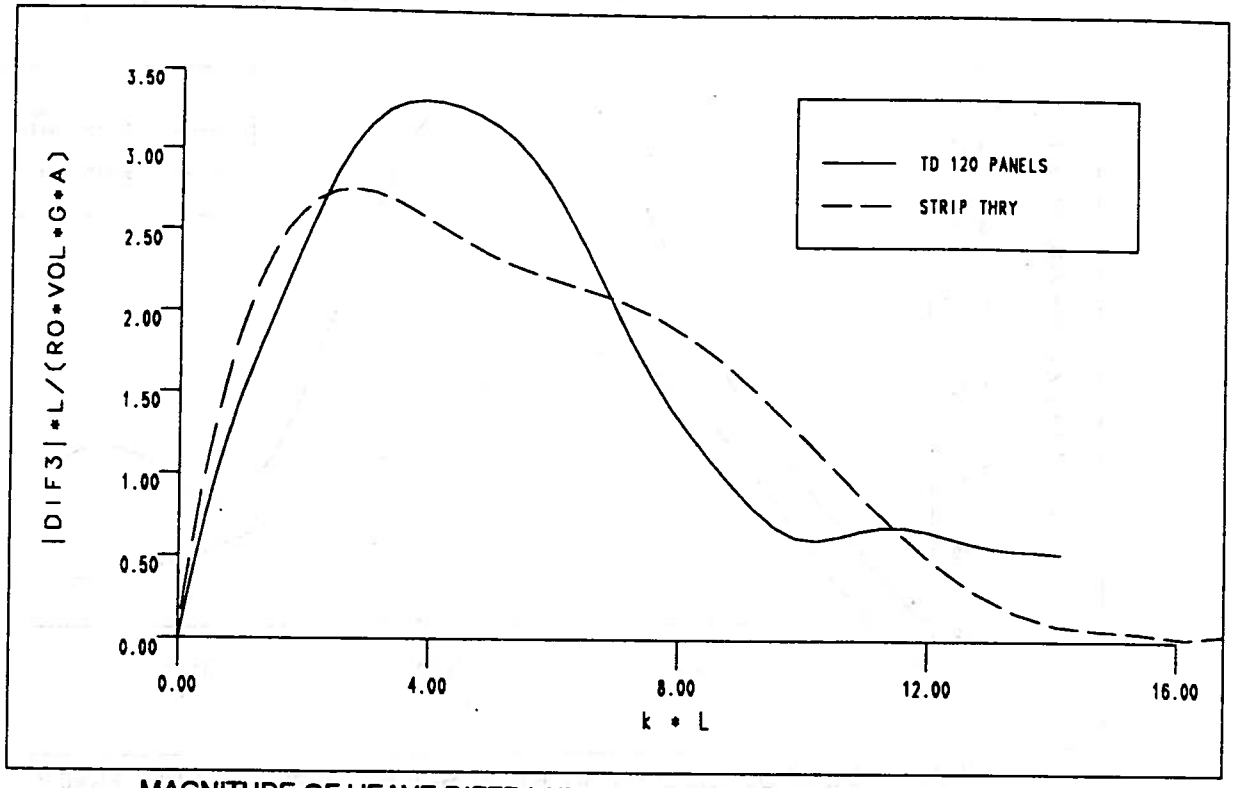
PHASE OF PITCH FROUDE-KRYLOV FORCE FOR A WIGLEY HULL, FN=0.3
FIGURE 102



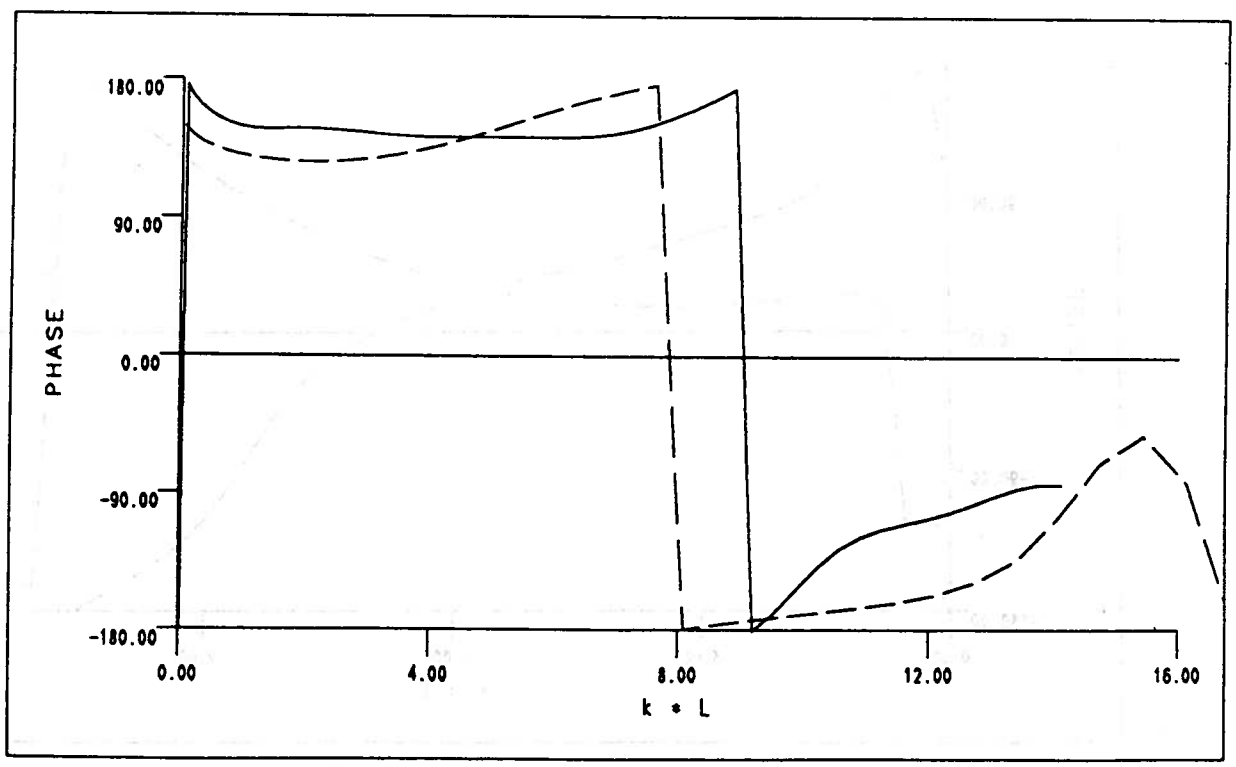
MAGNITUDE OF SURGE DIFFRACTION FORCE FOR A WIGLEY HULL, FN=0.3
FIGURE 103



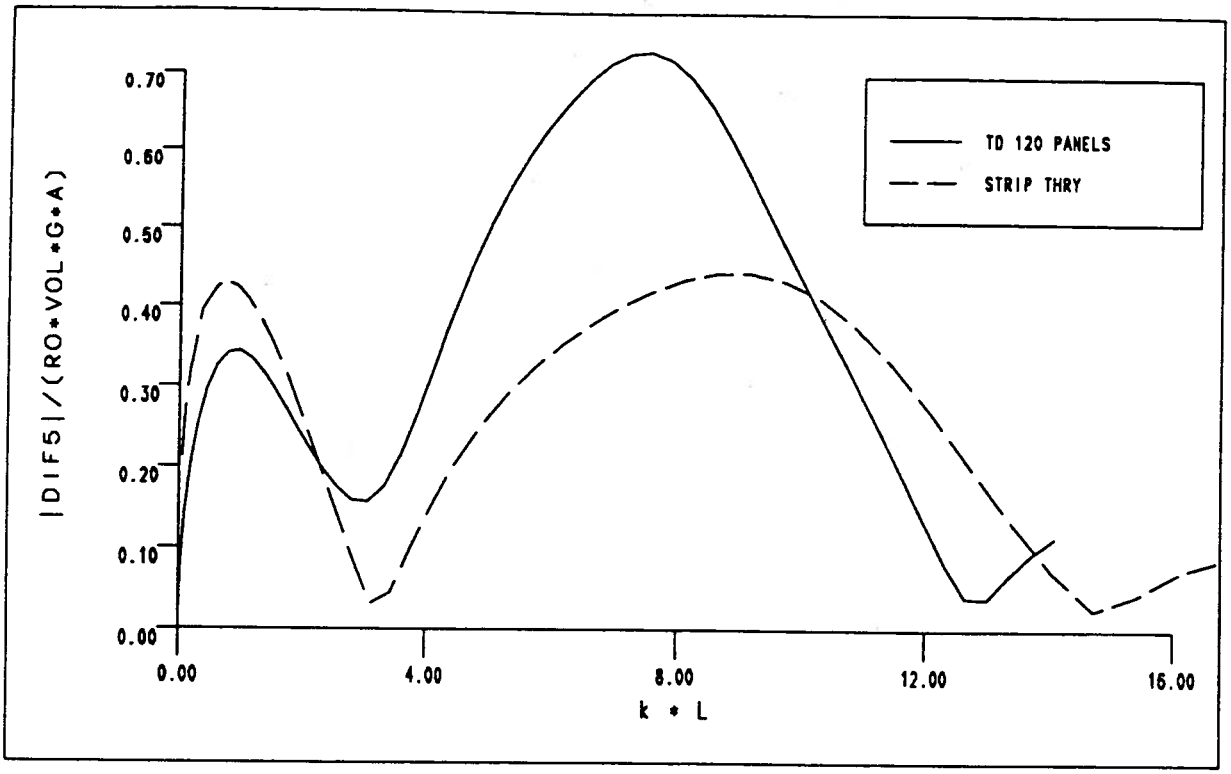
PHASE OF SURGE DIFFRACTION FORCE FOR A WIGLEY HULL, FN=0.3
FIGURE 104



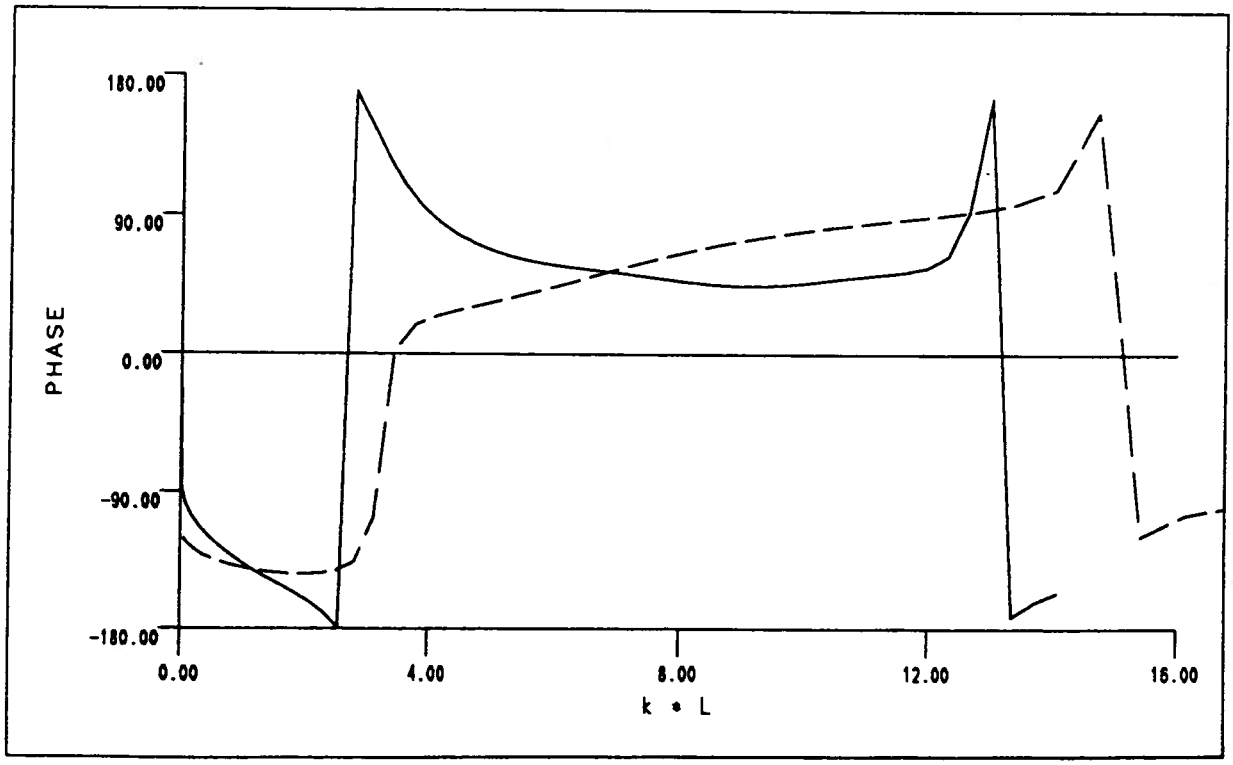
MAGNITUDE OF HEAVE DIFFRACTION FORCE FOR A WIGLEY HULL, FN=0.3
FIGURE 105



PHASE OF HEAVE DIFFRACTION FORCE FOR A WIGLEY HULL, FN=0.3
FIGURE 106

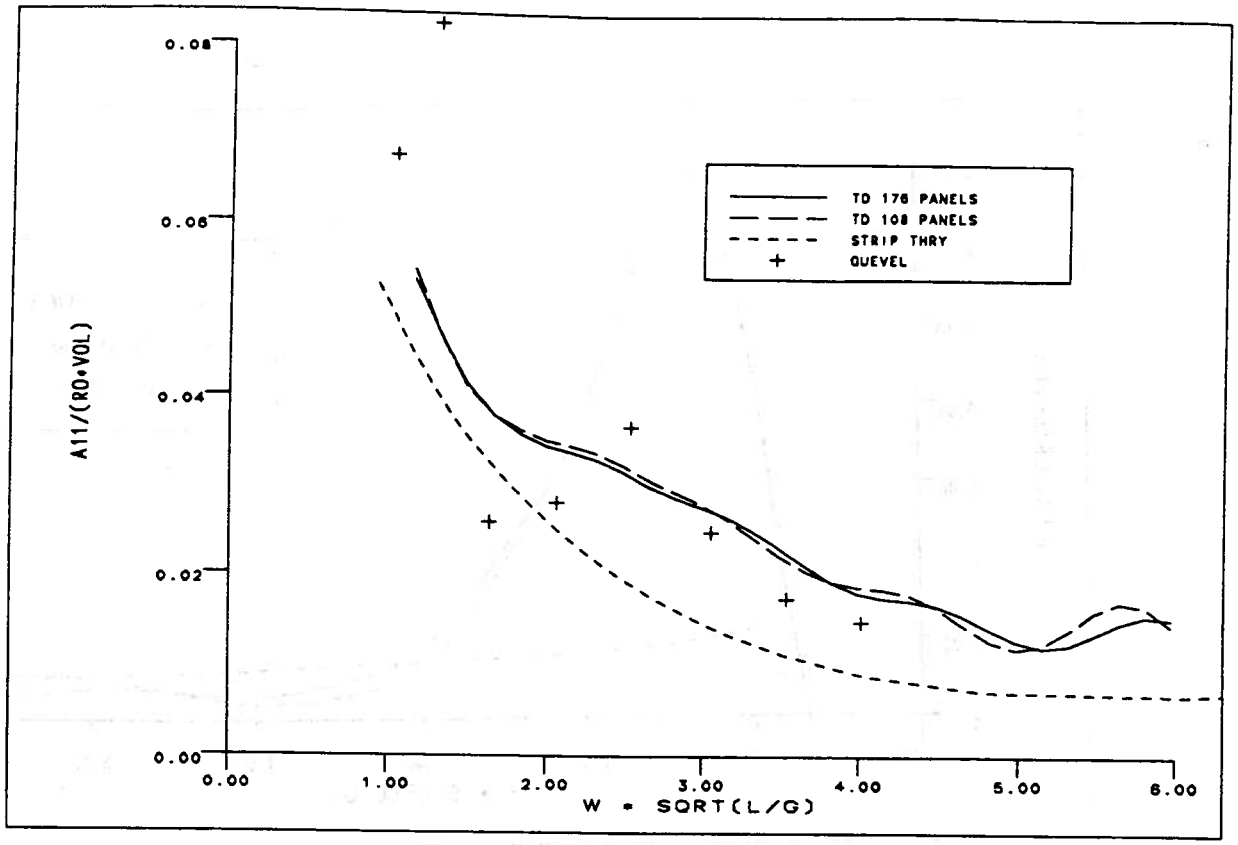


MAGNITUDE OF PITCH DIFFRACTION FORCE FOR A WIGLEY HULL, FN=0.3
FIGURE 107

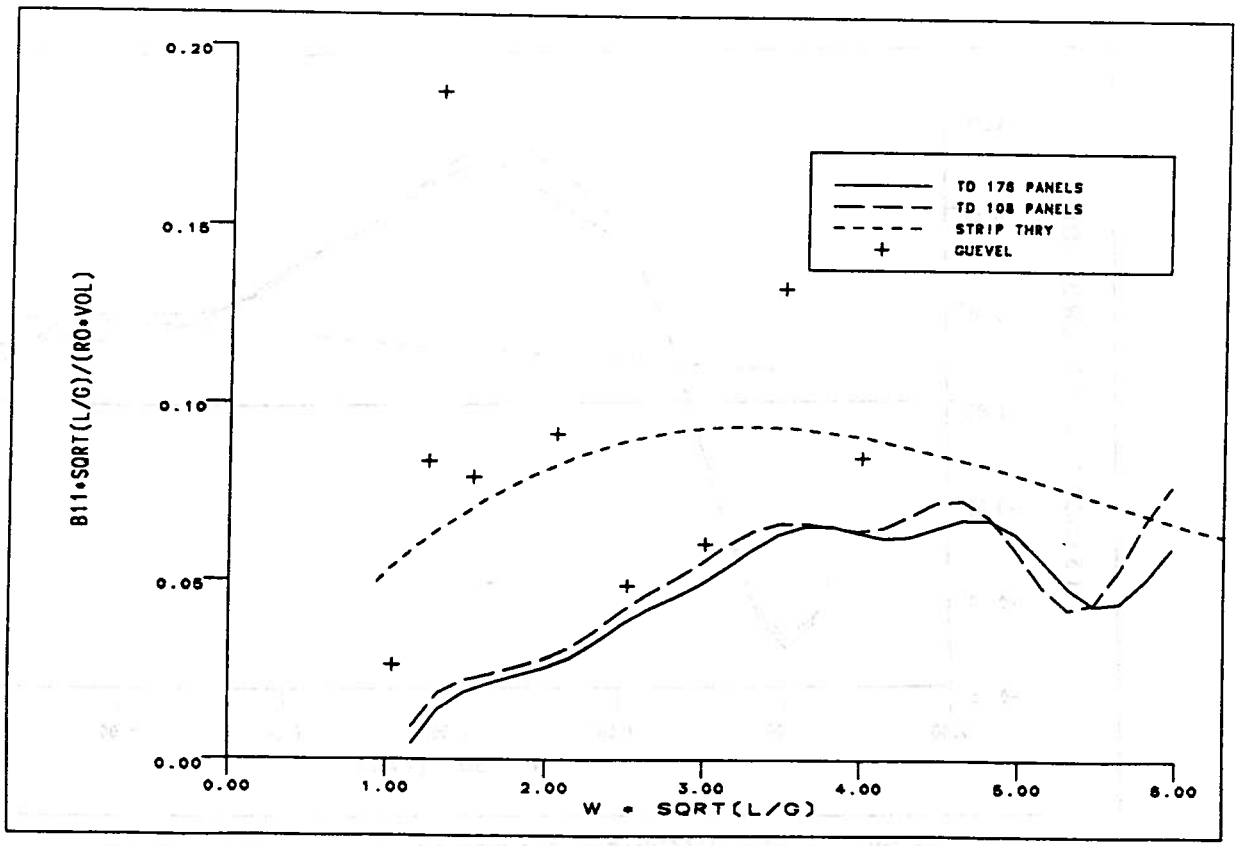


PHASE OF PITCH DIFFRACTION FORCE FOR A WIGLEY HULL, FN=0.3
FIGURE 108

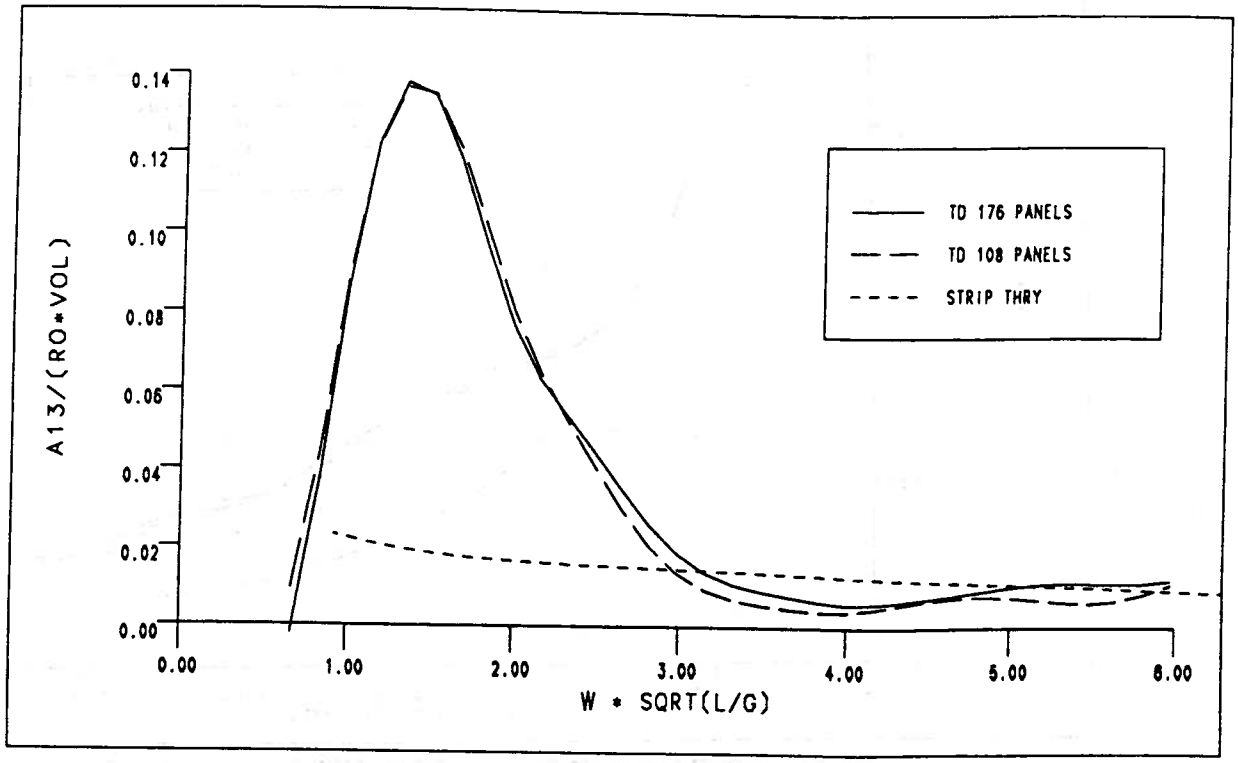
SERIES 60 CB=.70 HULL, FN=0.2



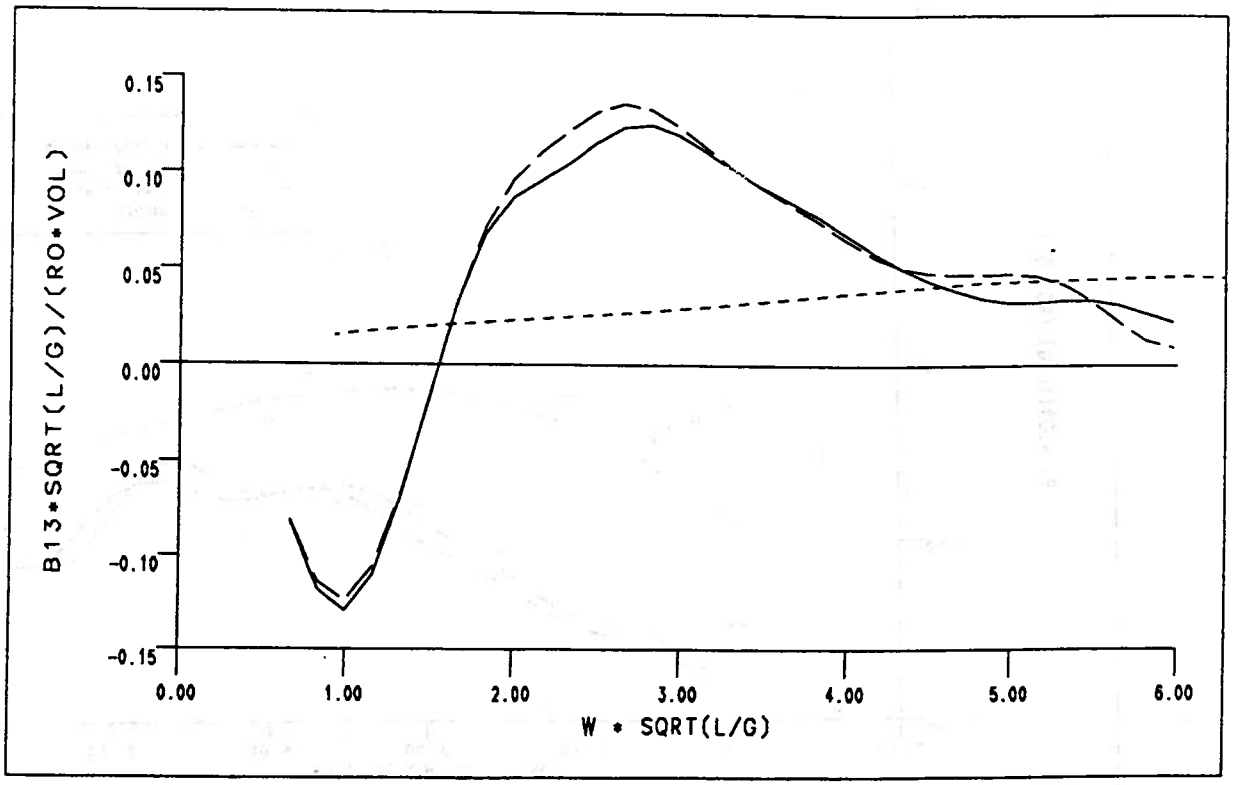
SURGE ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 109



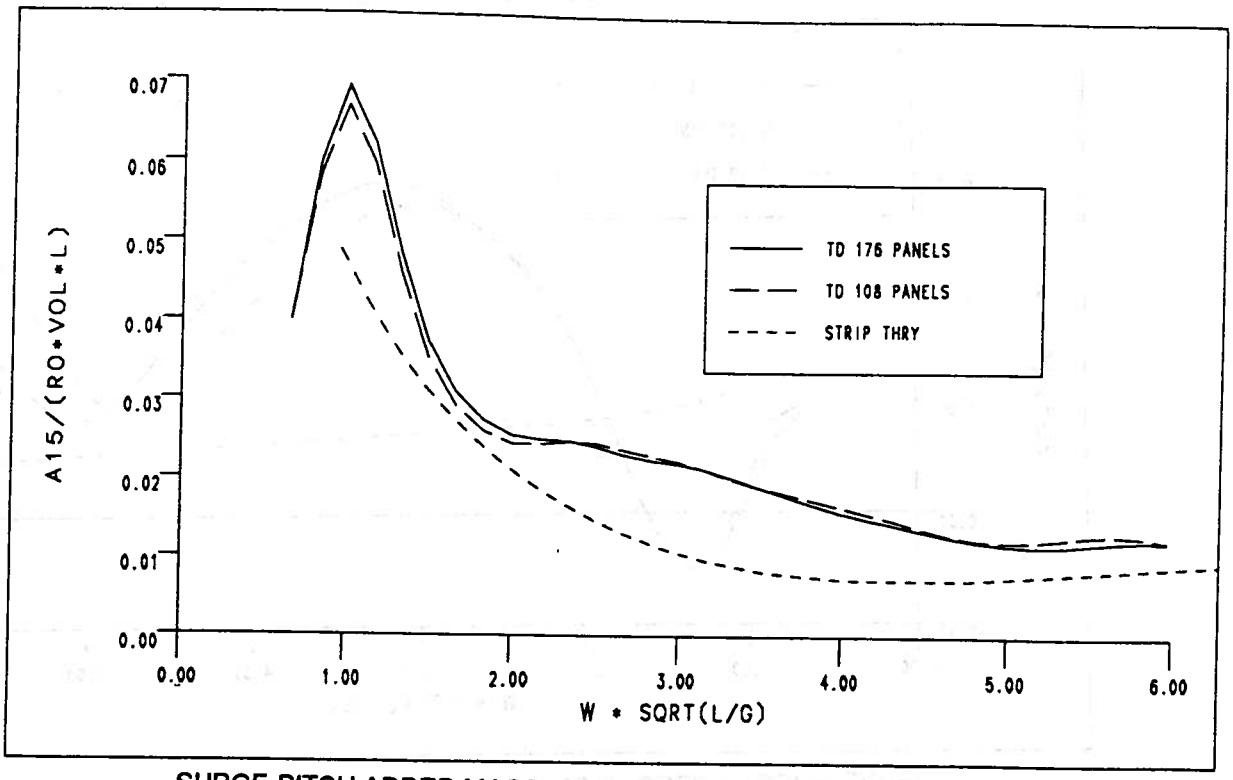
SURGE DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 110



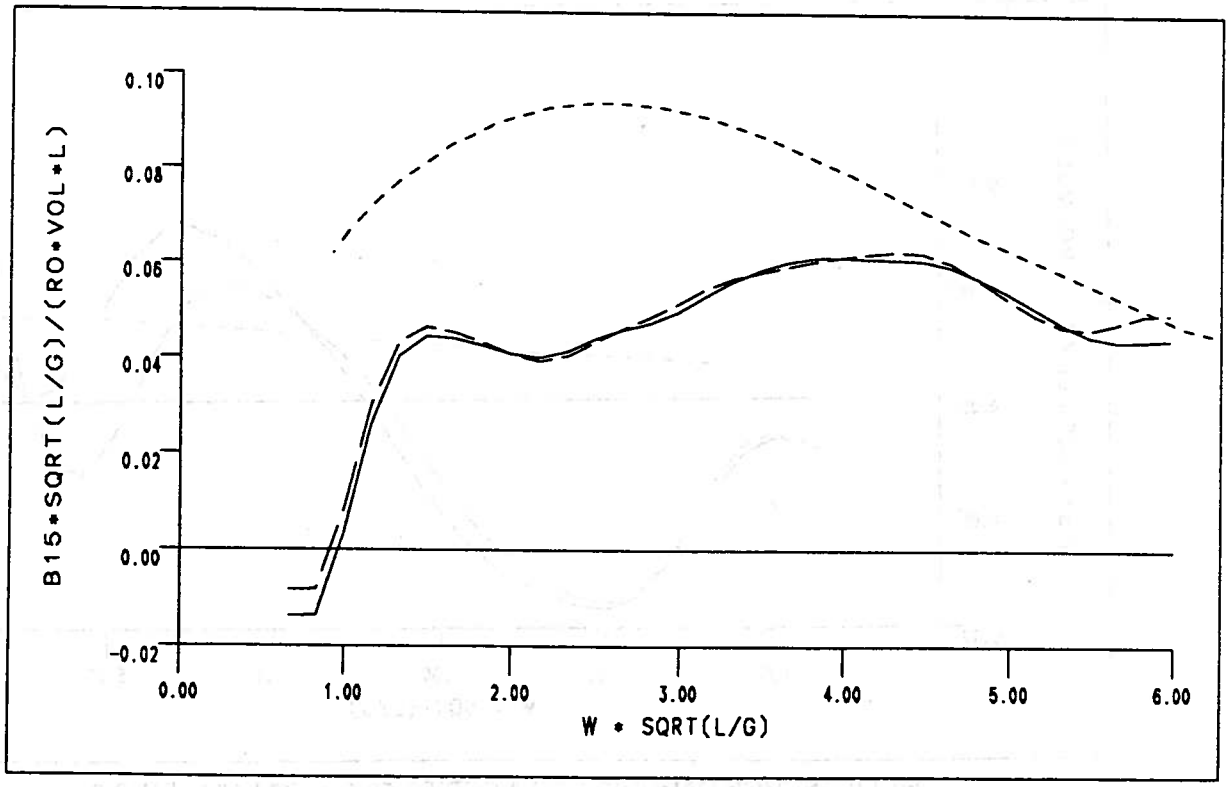
SURGE-HEAVE ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 111



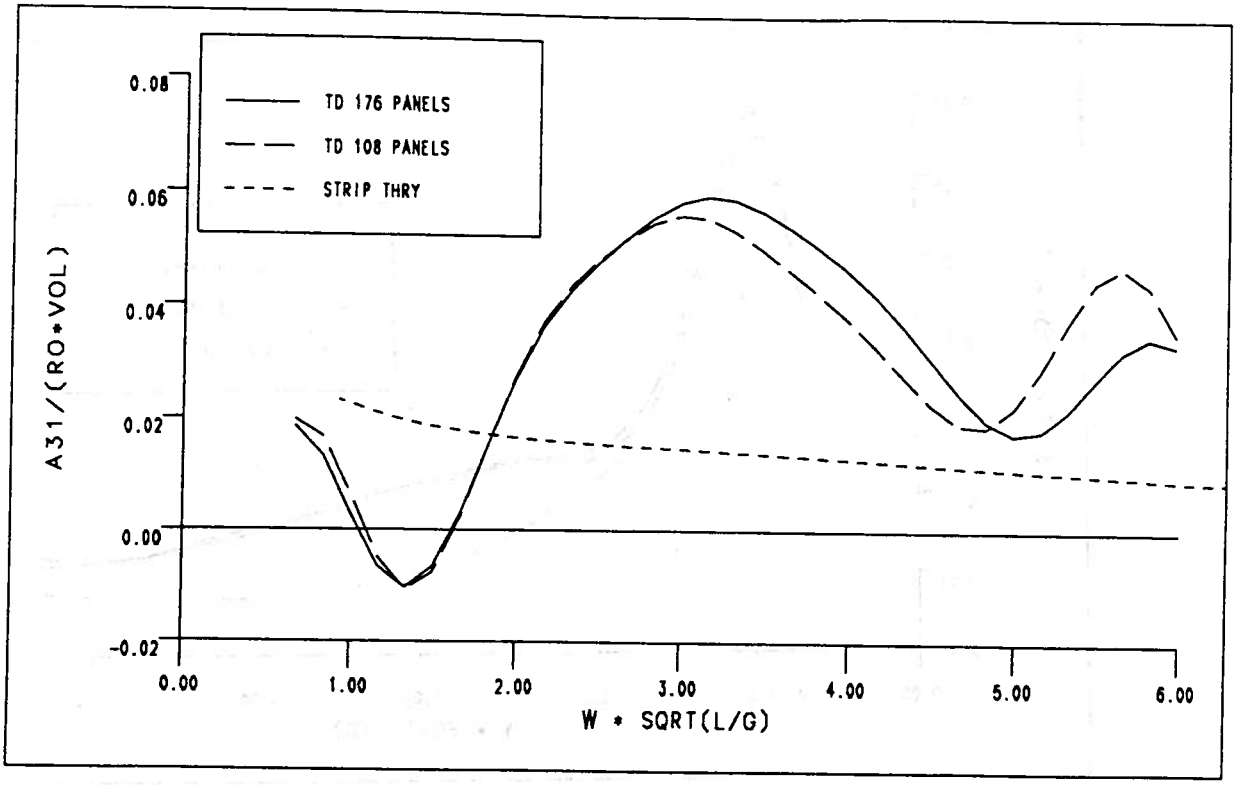
SURGE-HEAVE DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 112



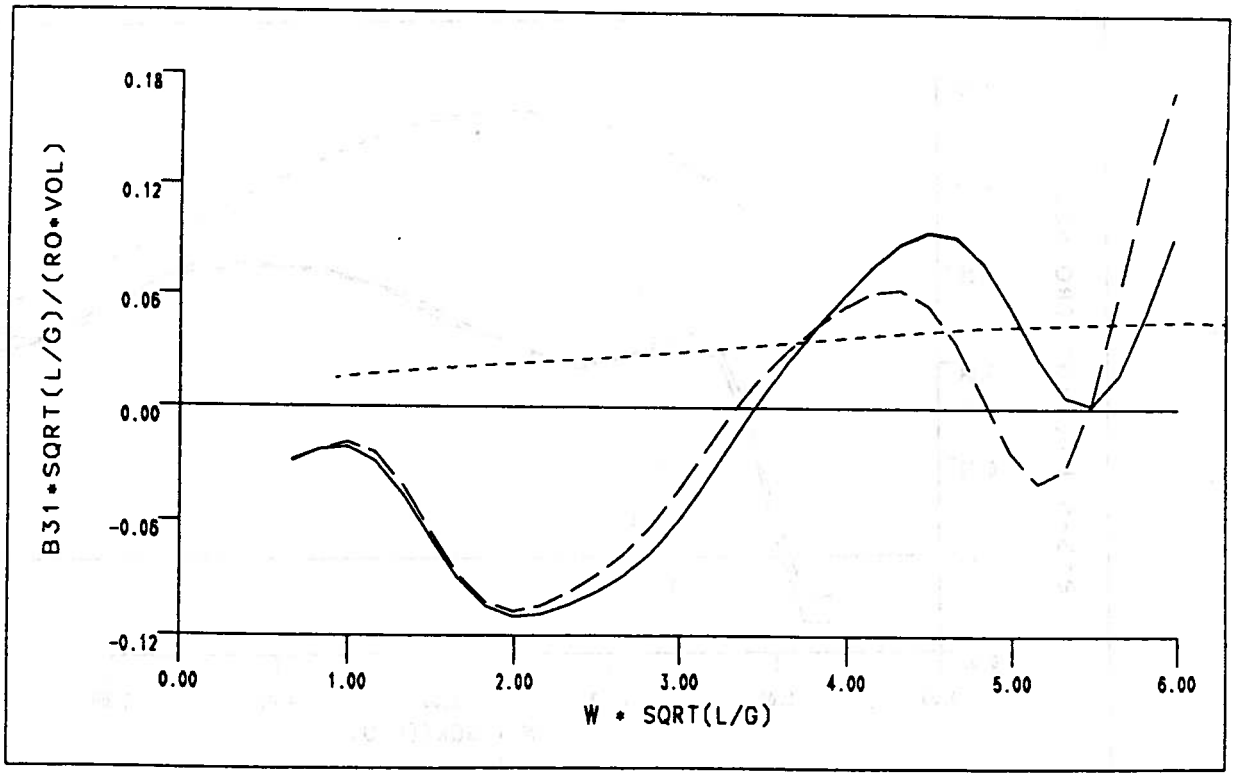
SURGE-PITCH ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 113



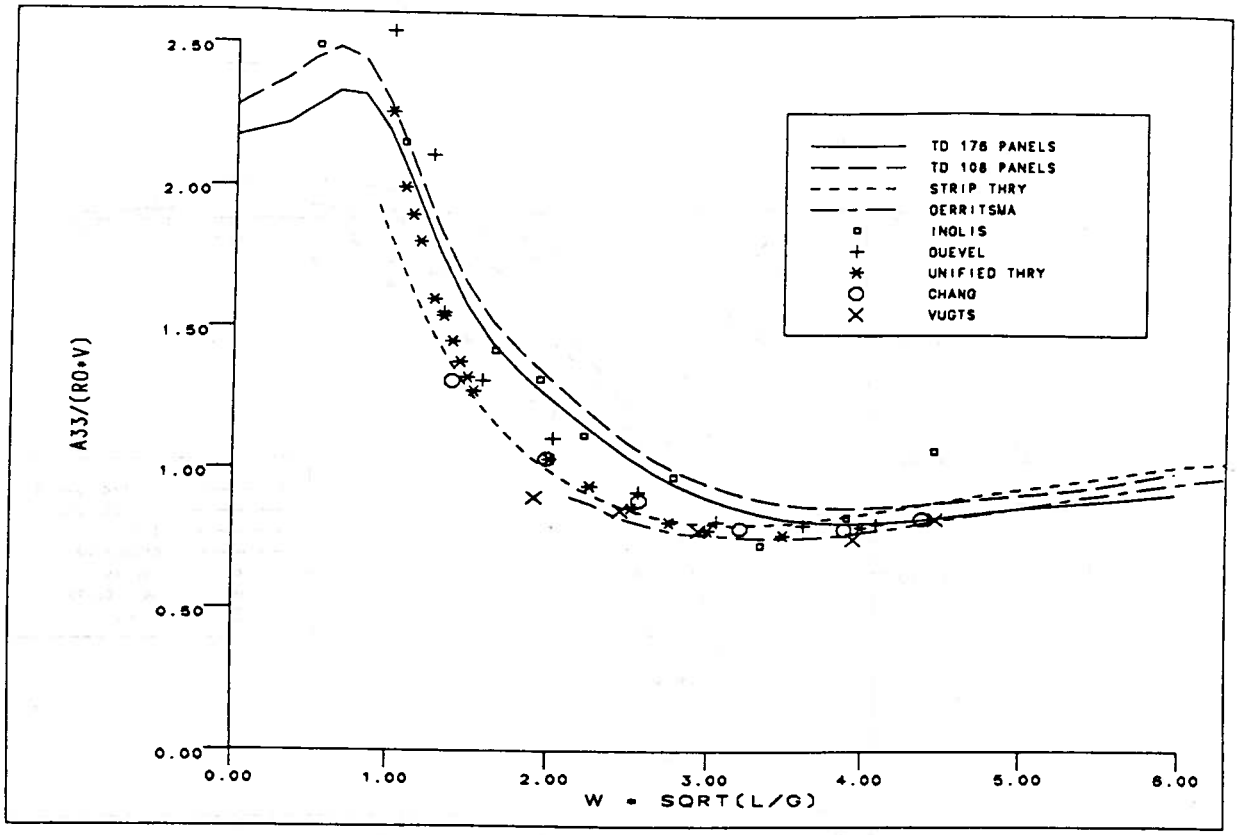
SURGE-PITCH DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 114



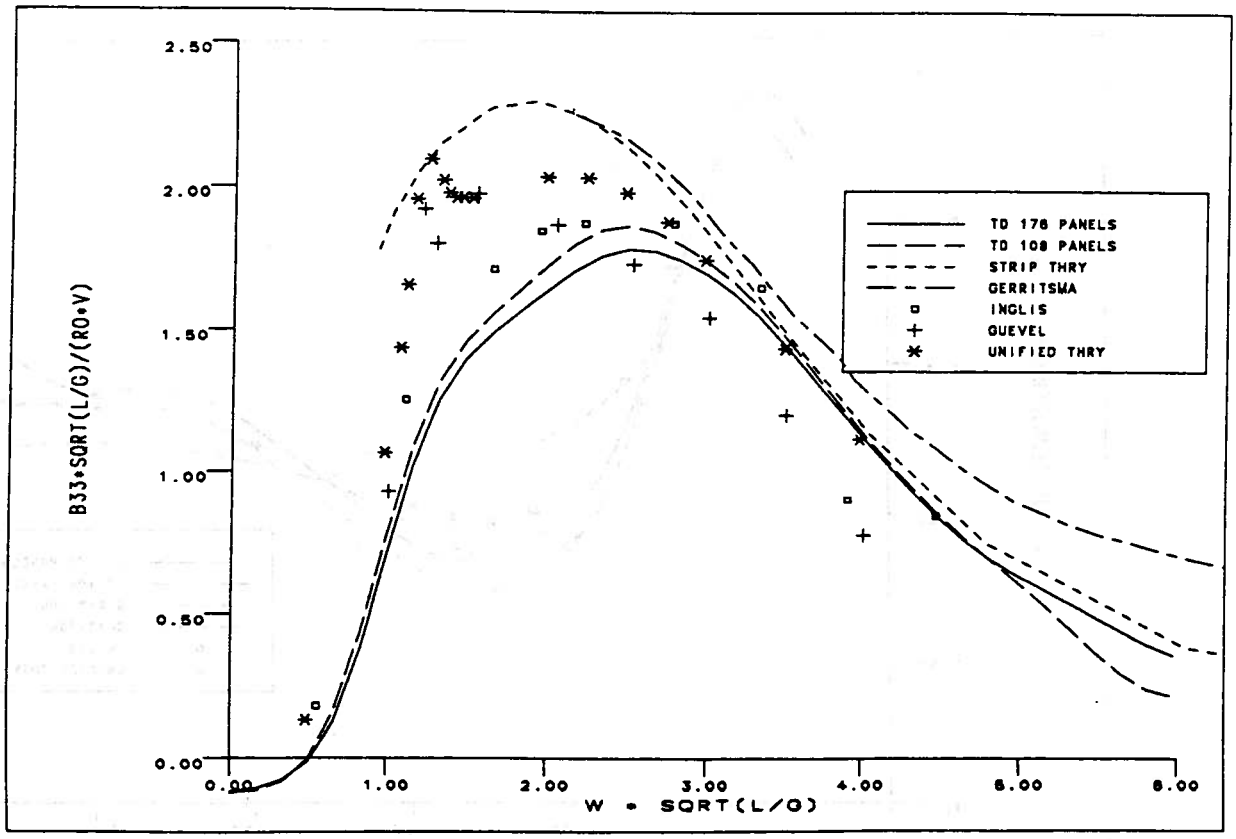
HEAVE-SURGE ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 115



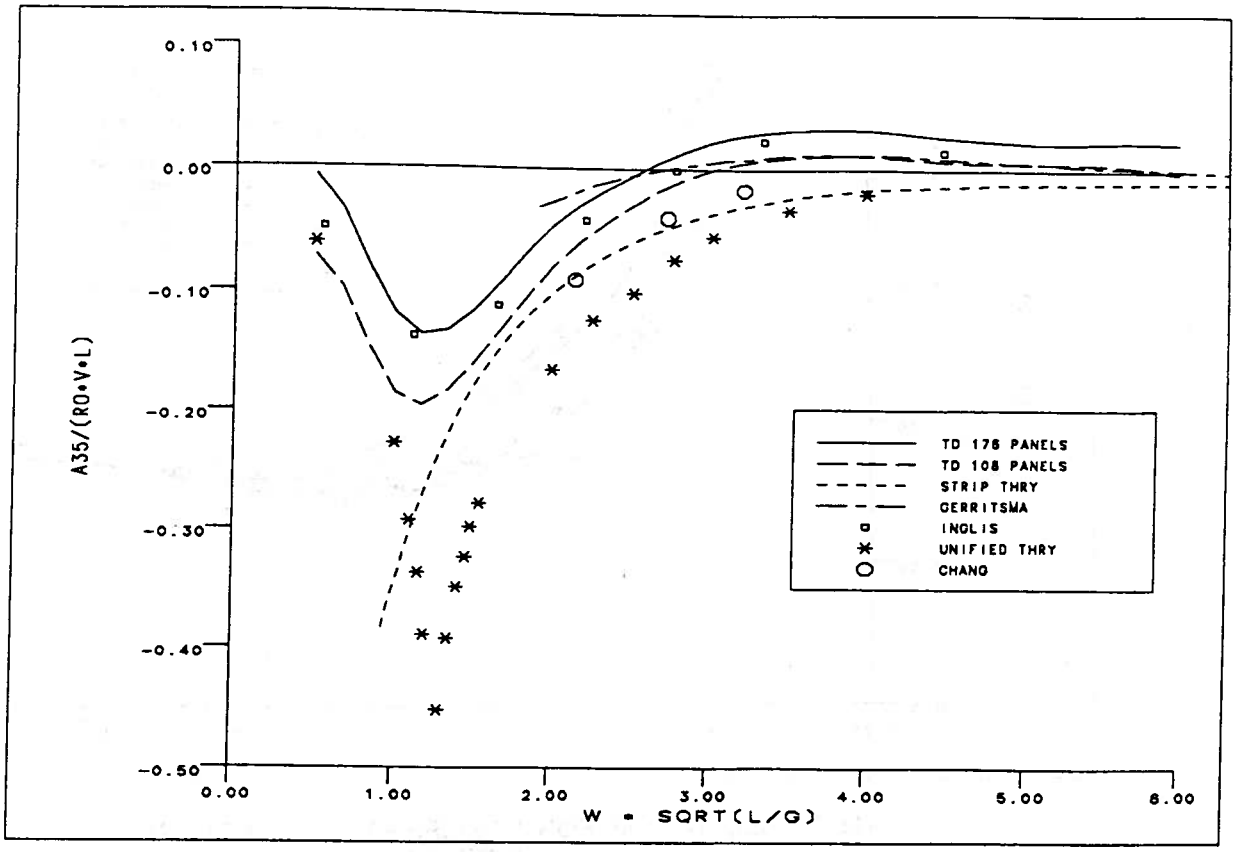
HEAVE-SURGE DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 116



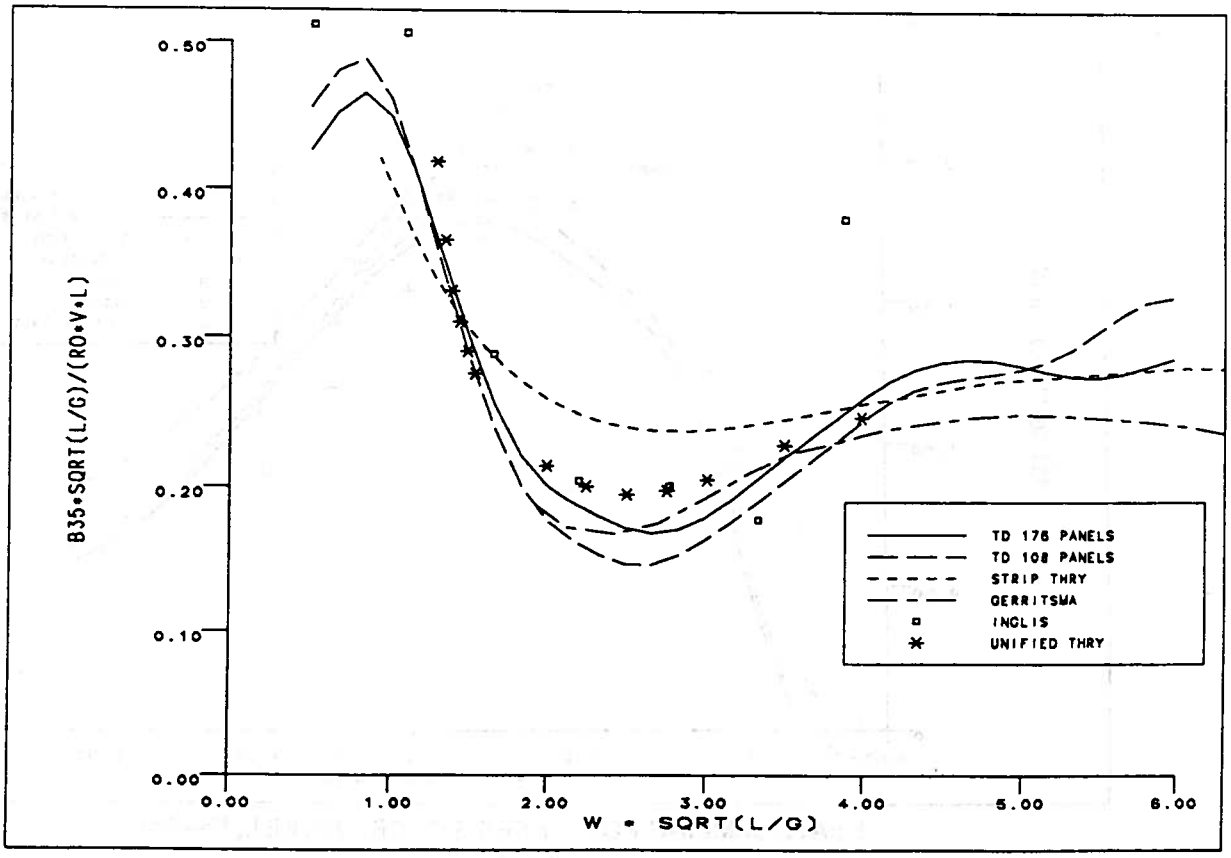
HEAVE ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 117



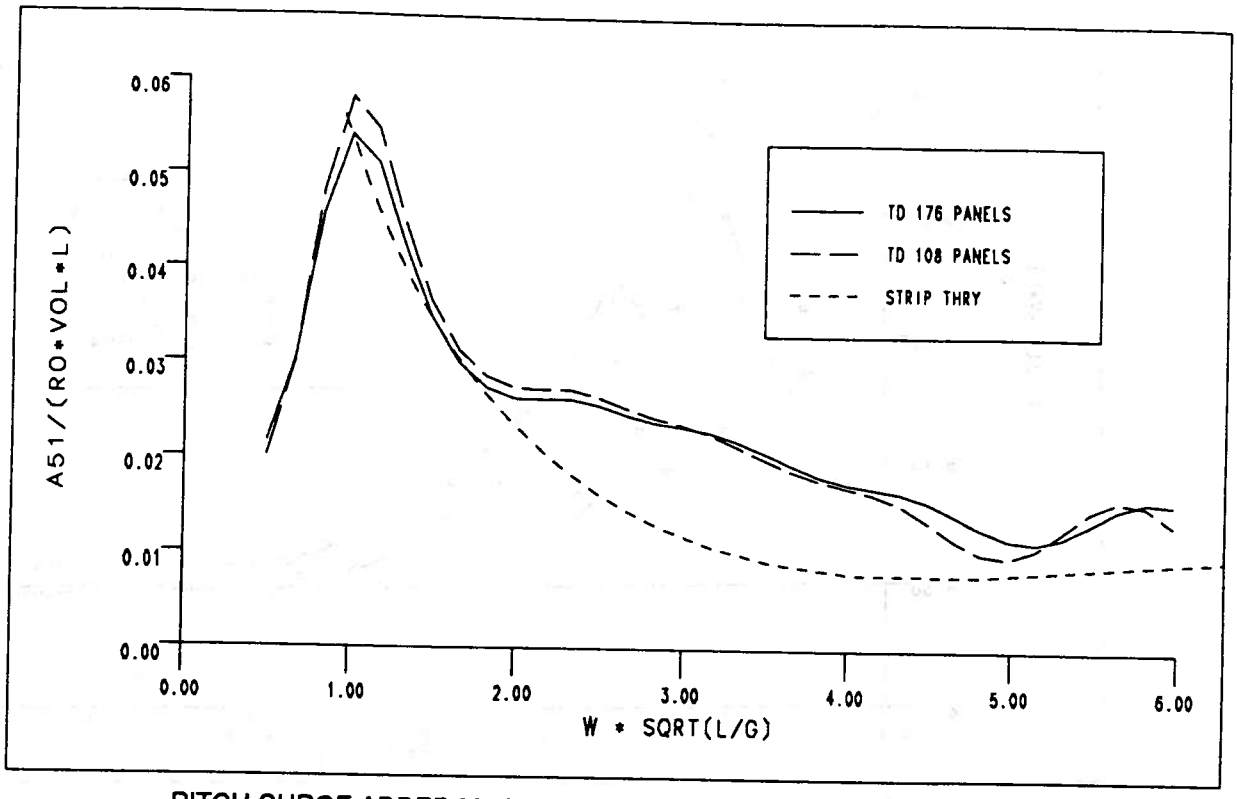
HEAVE DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 118



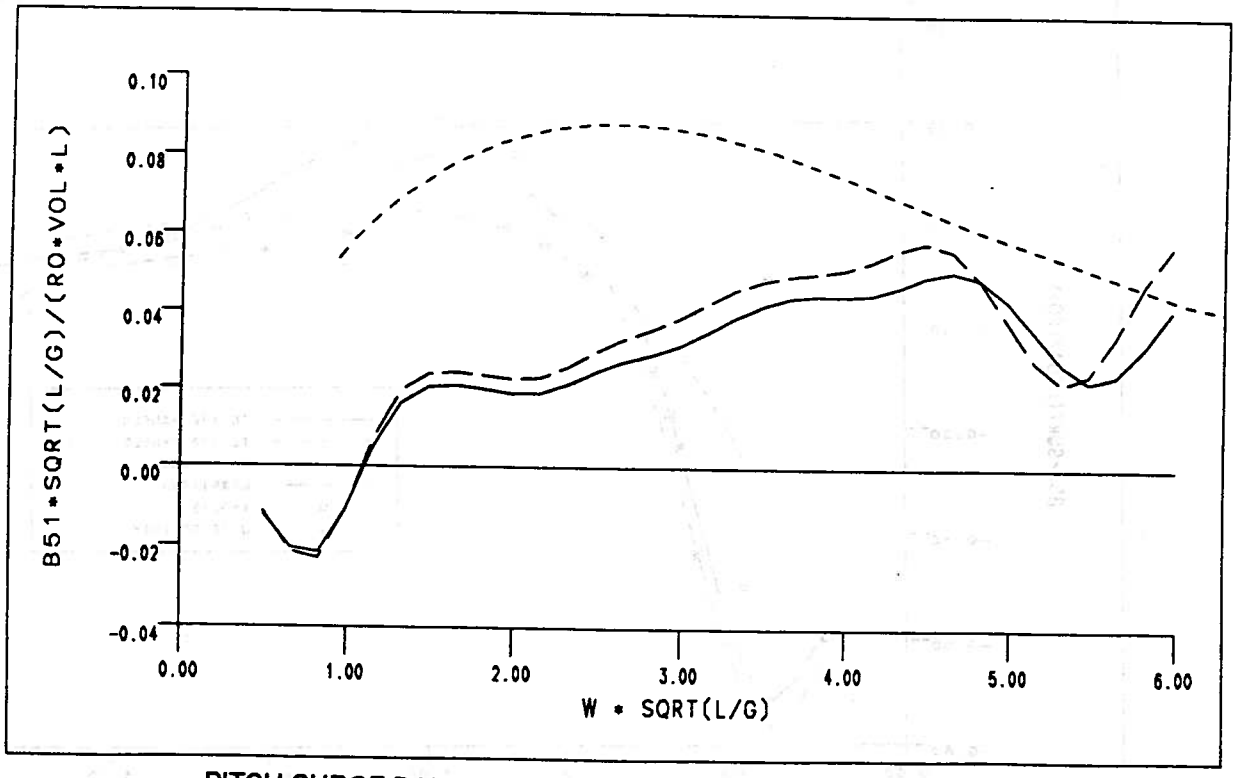
HEAVE-PITCH ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 119



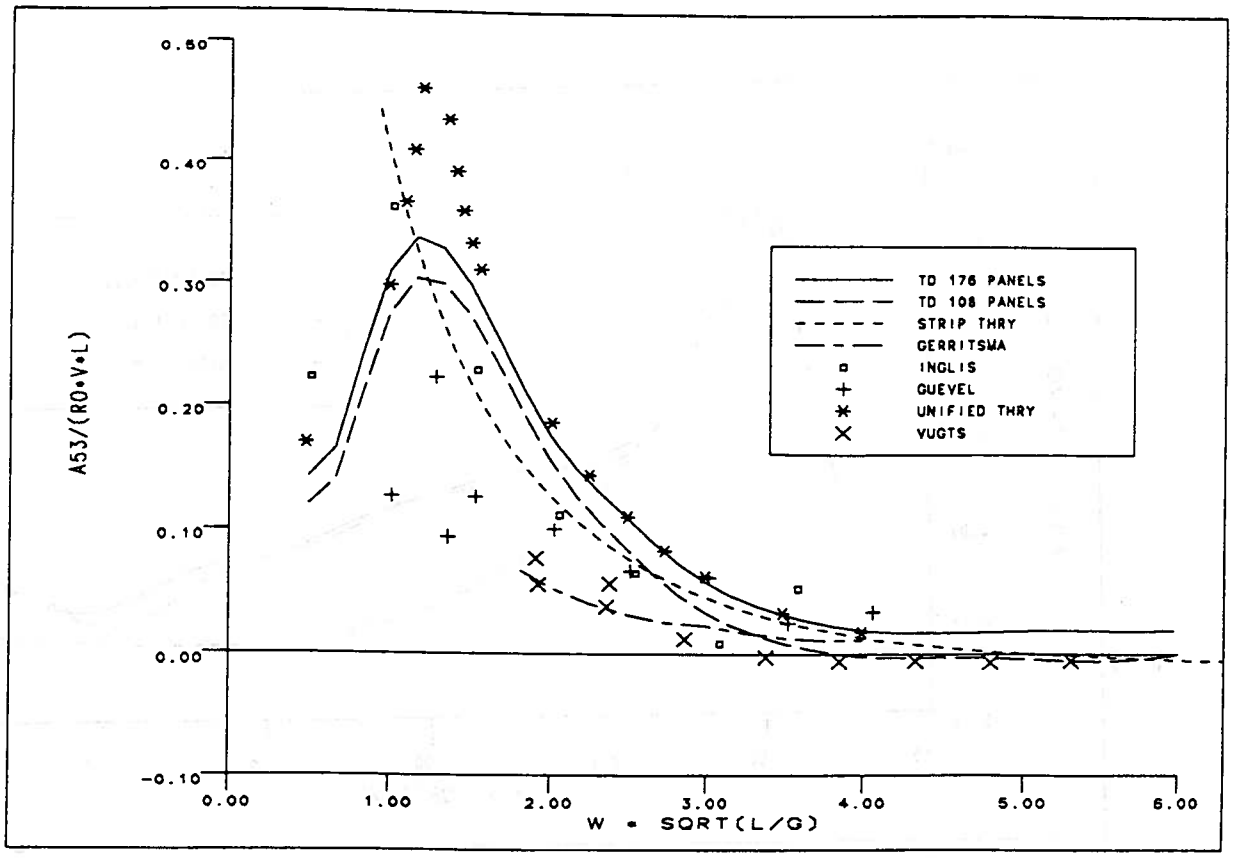
HEAVE-PITCH DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 120



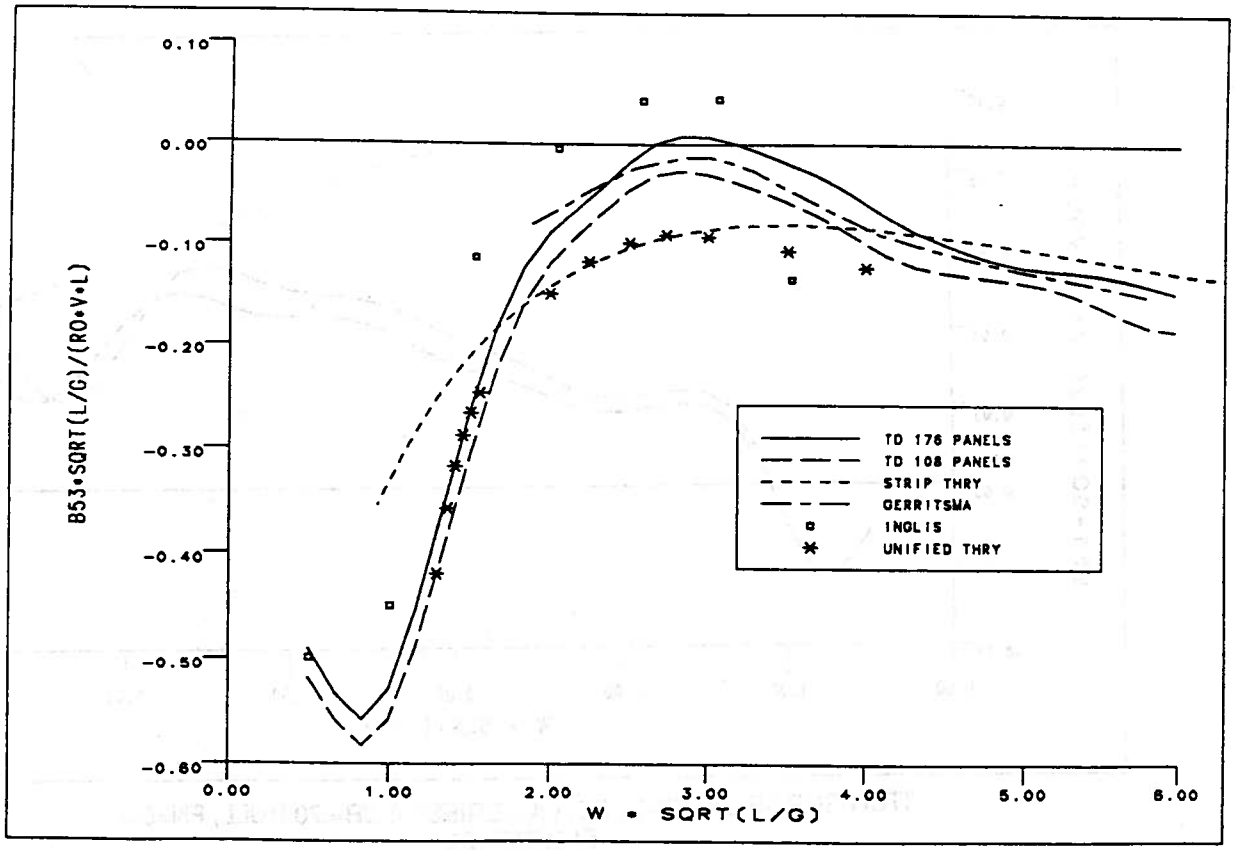
PITCH-SURGE ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 121



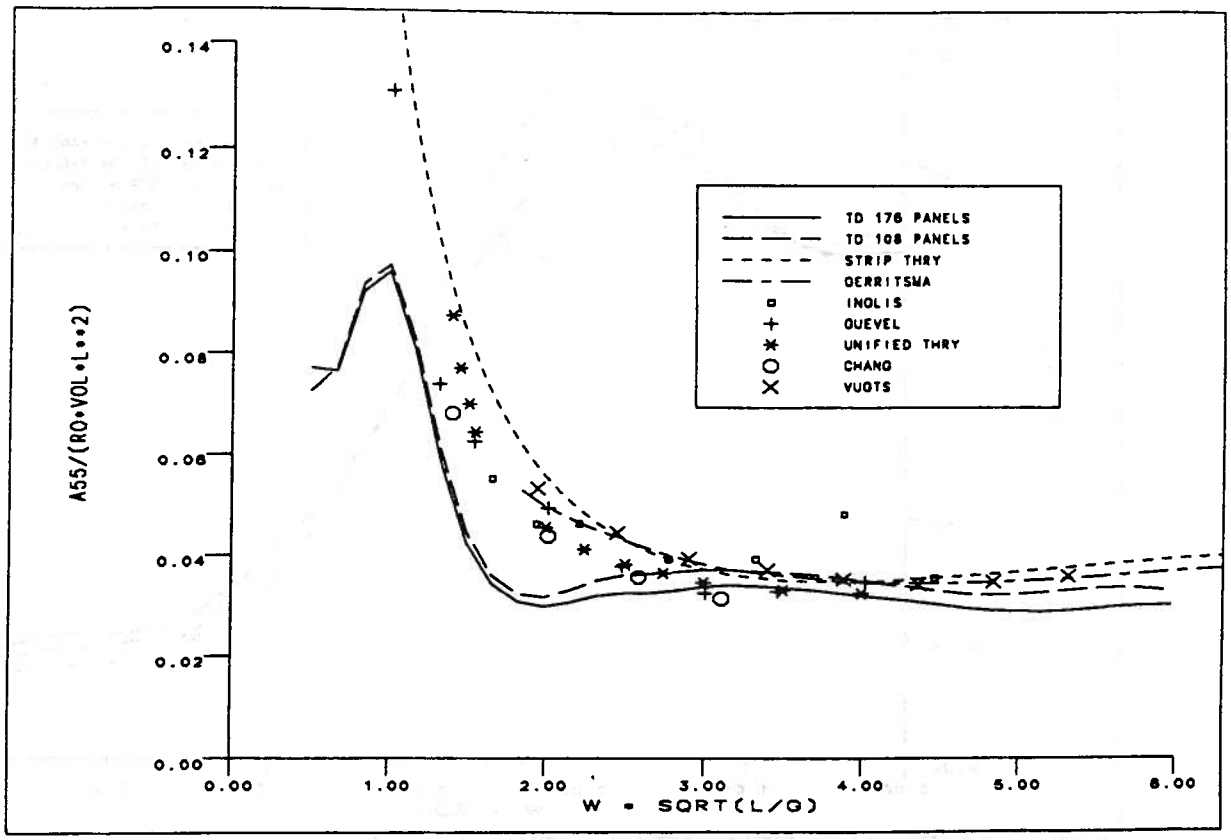
PITCH-SURGE DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 122



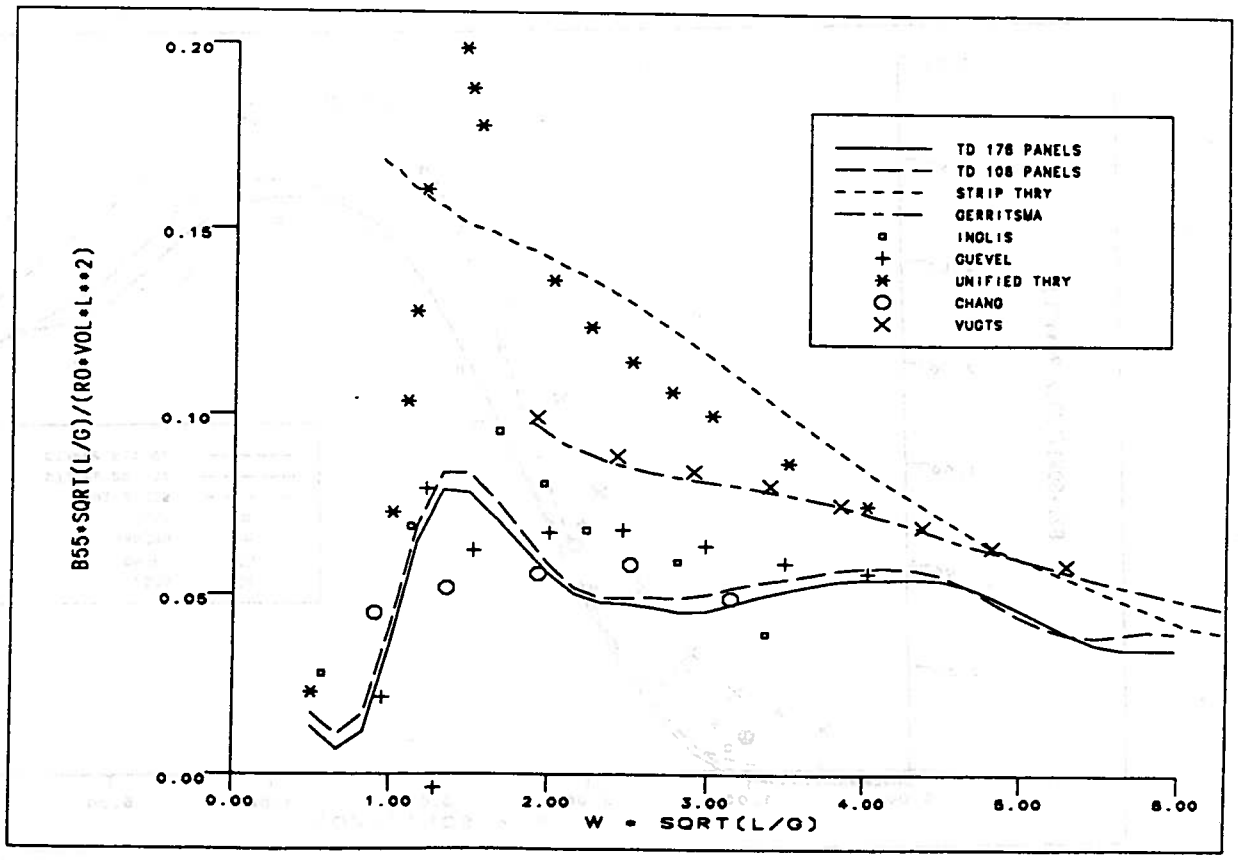
PITCH-HEAVE ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 123



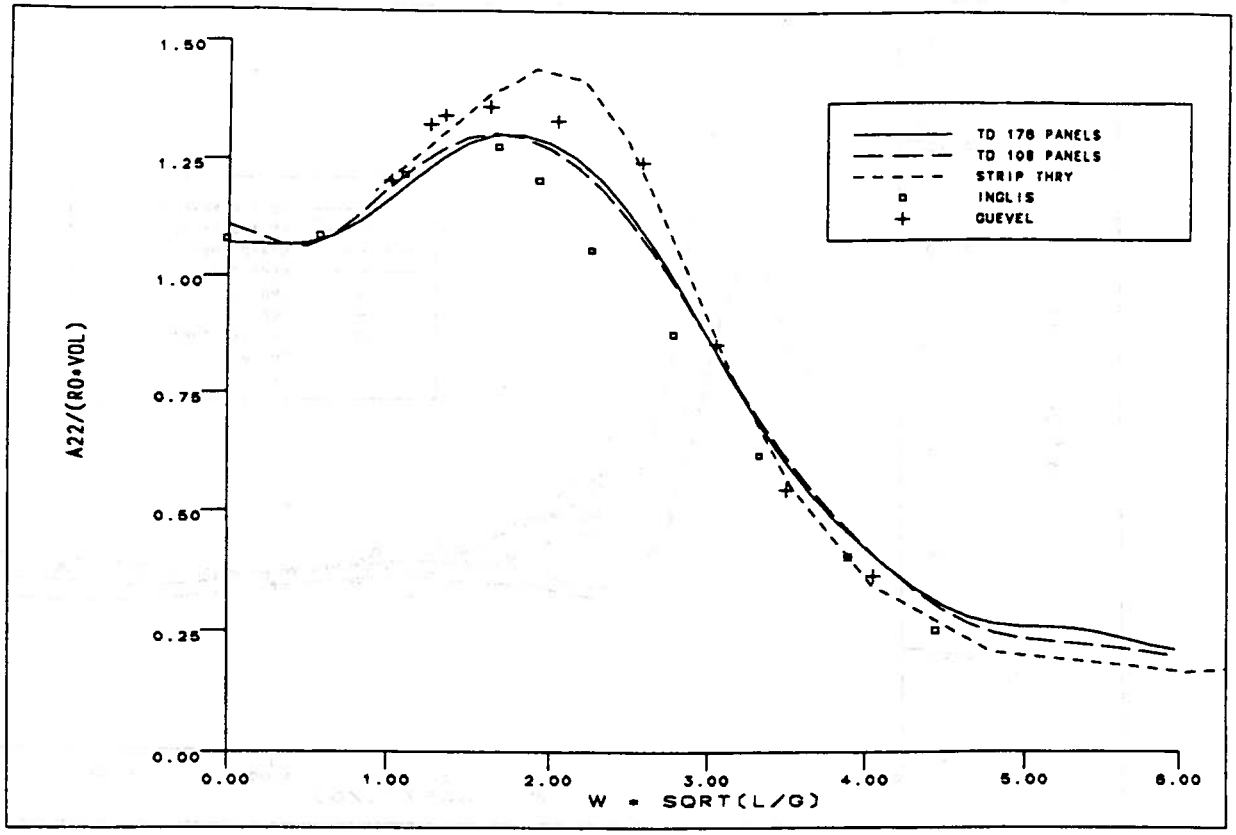
PITCH-HEAVE DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 124



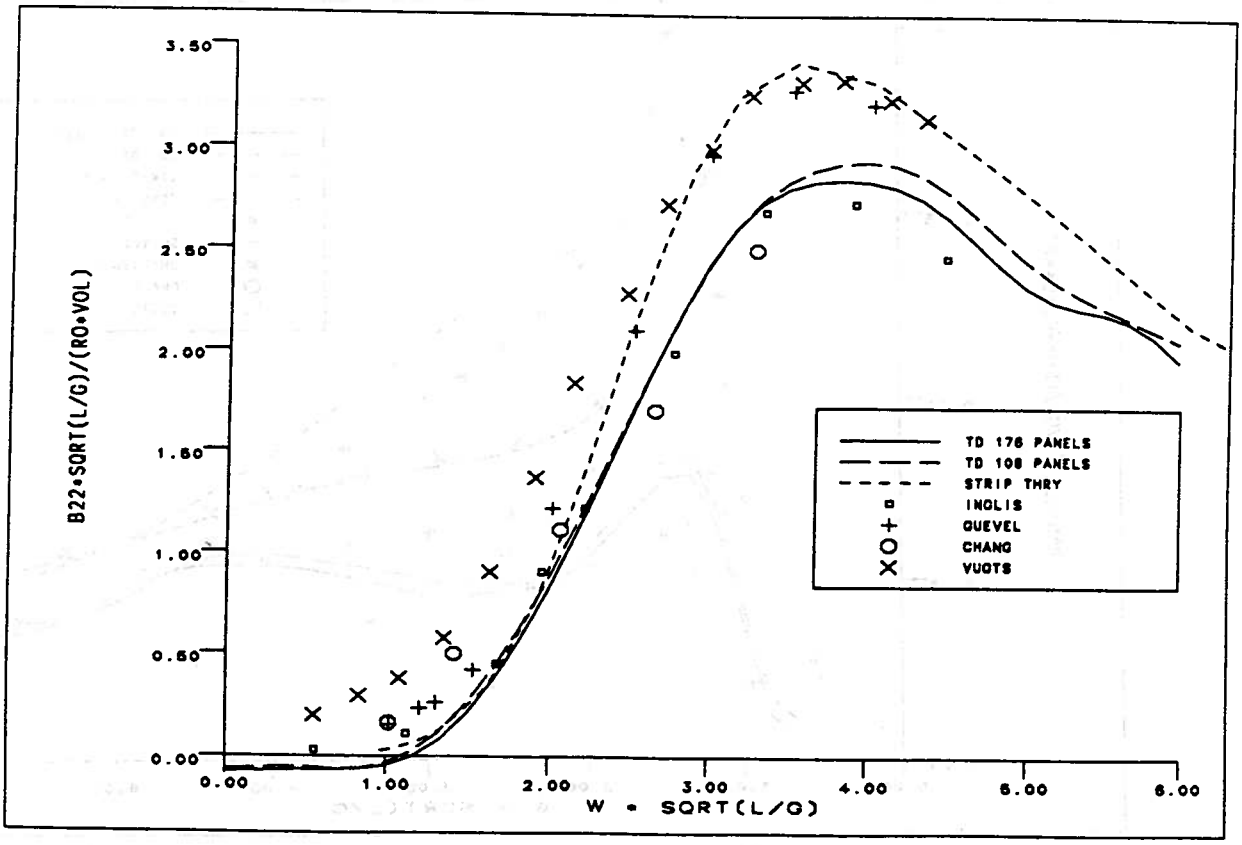
PITCH ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 125



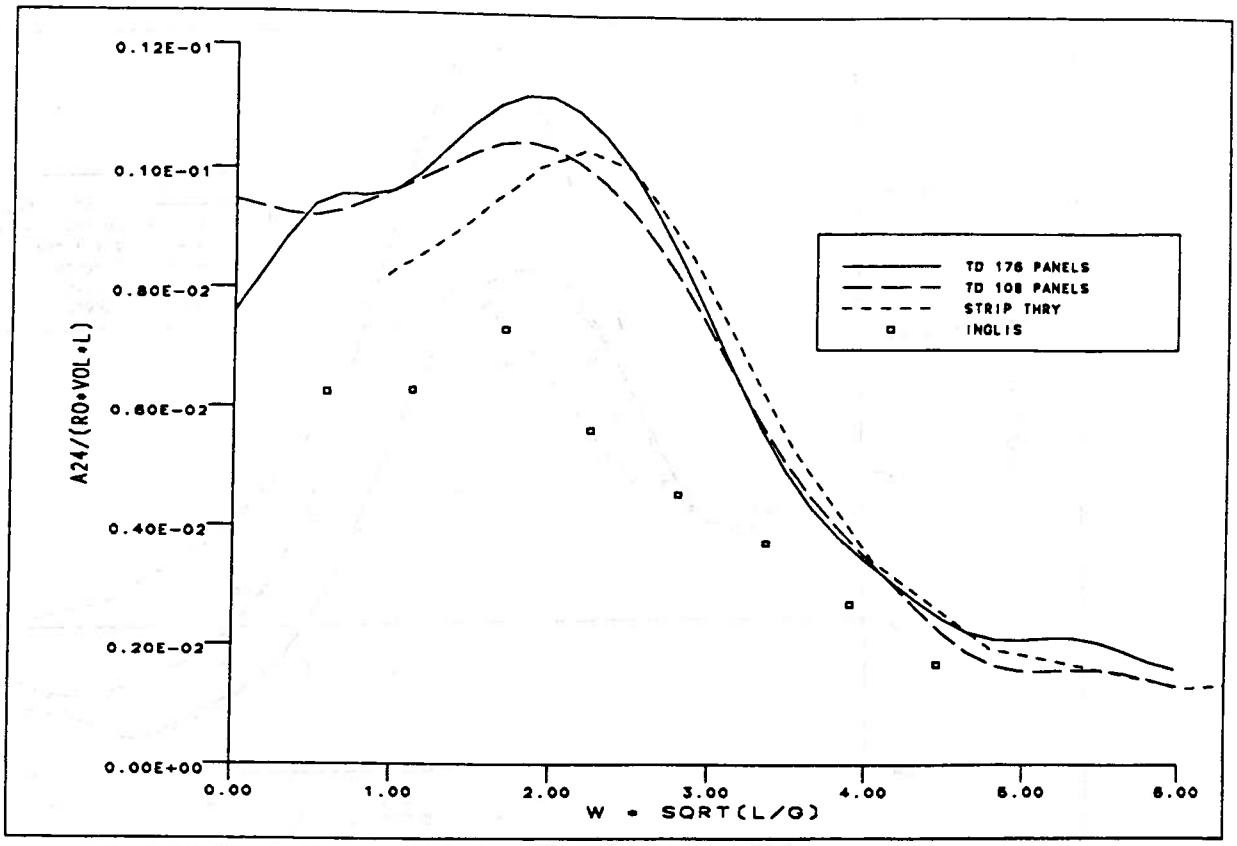
PITCH DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 126



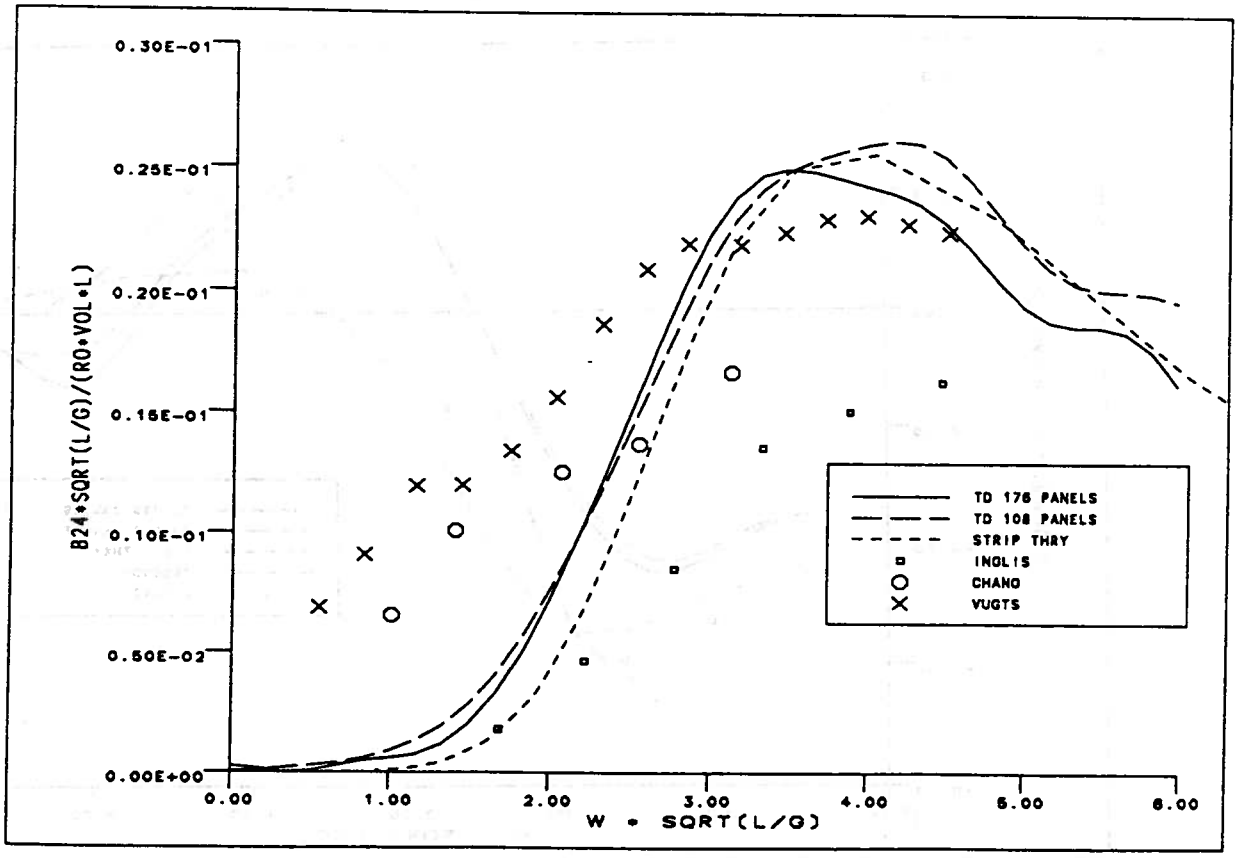
SWAY ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 127



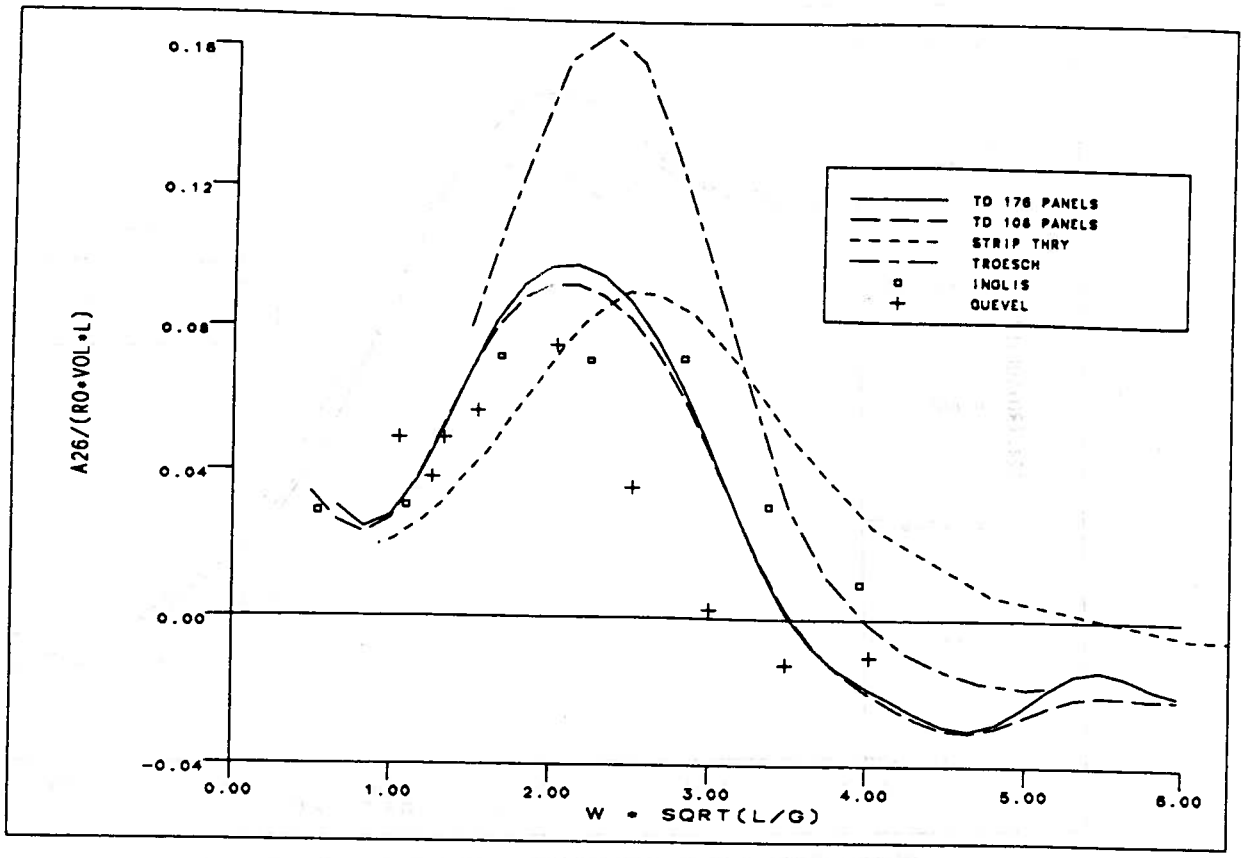
SWAY DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 128



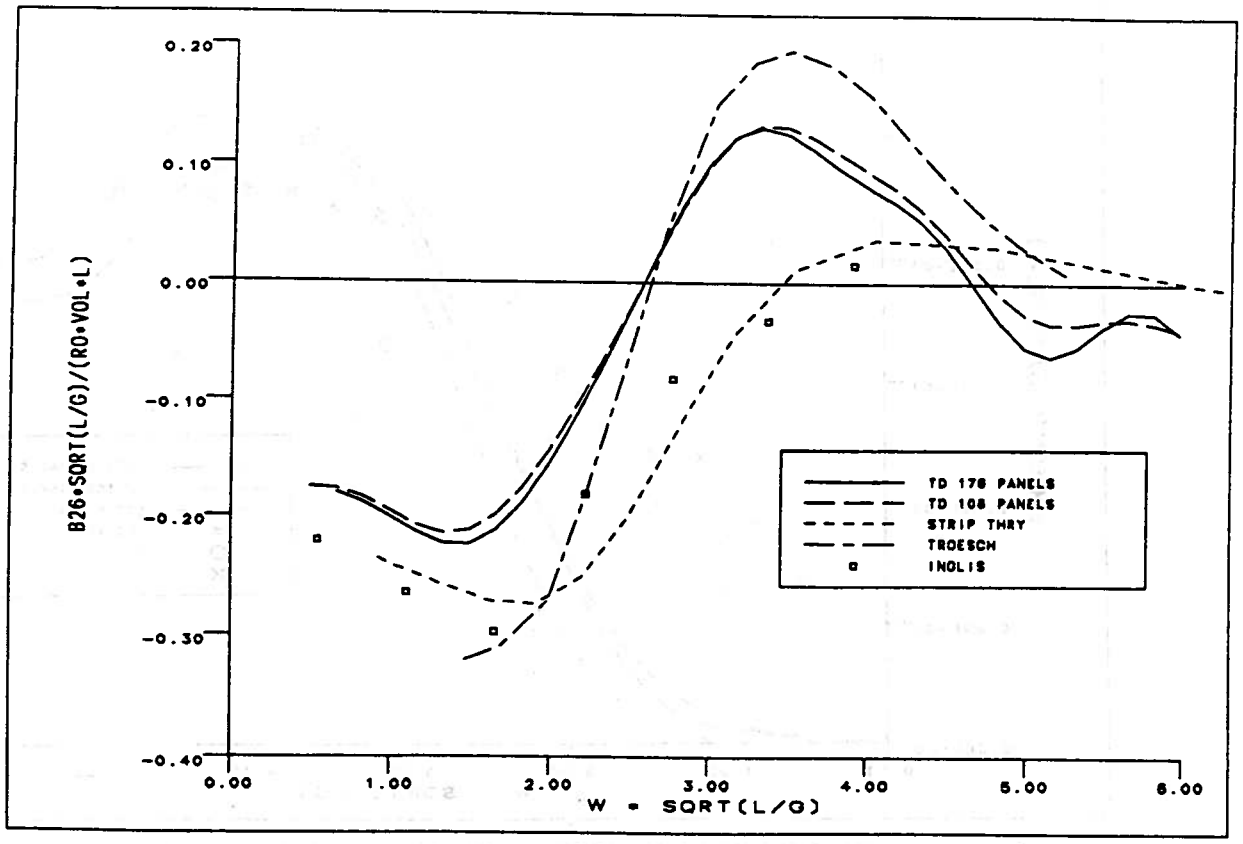
SWAY-ROLL ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 129



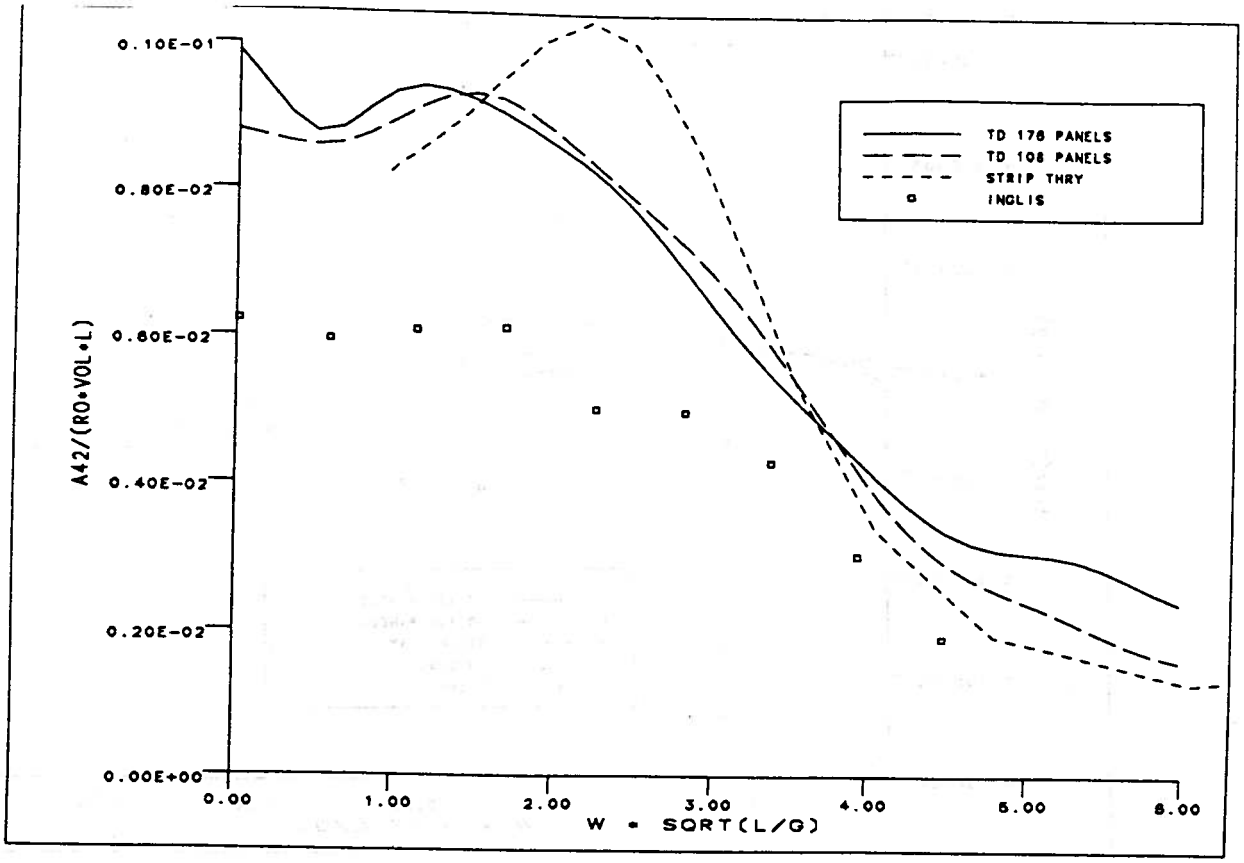
SWAY-ROLL DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 130



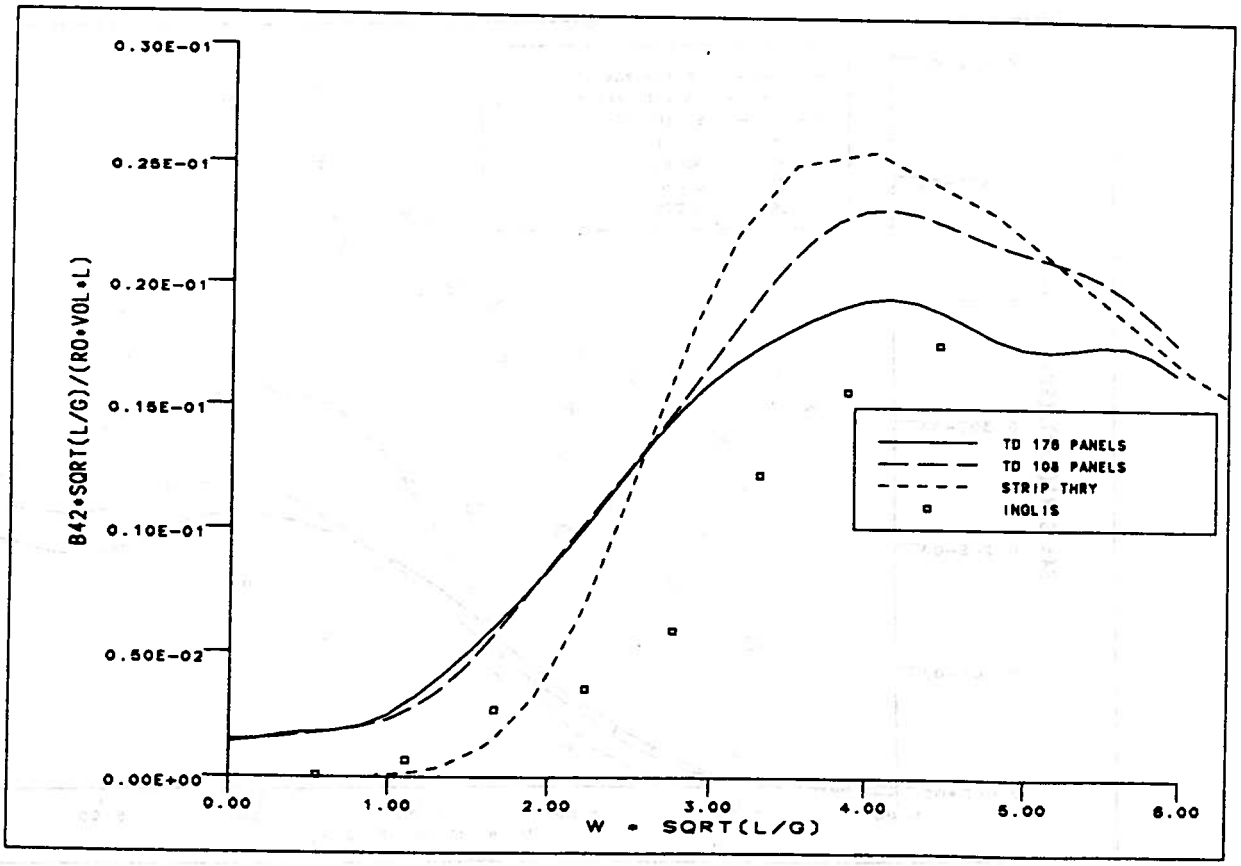
SWAY-YAW ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 131



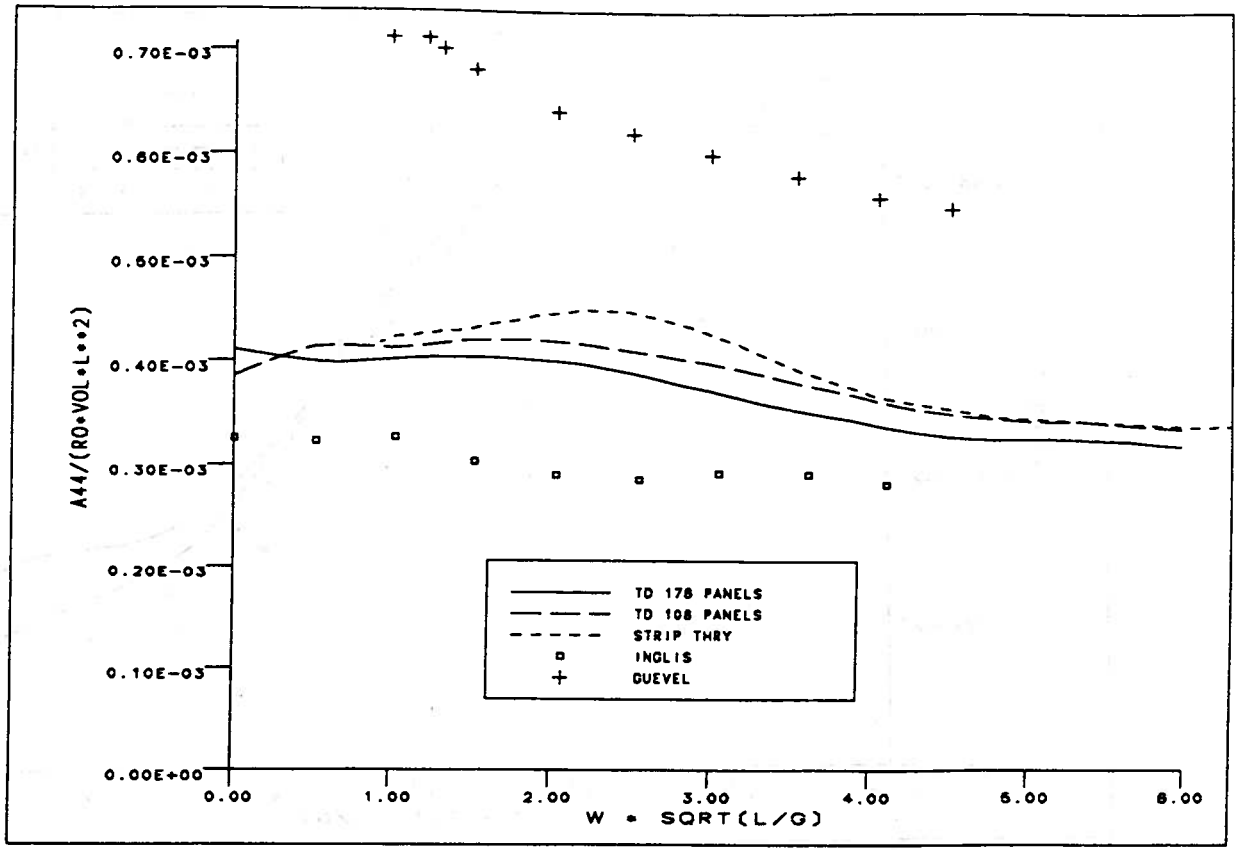
SWAY-YAW DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 132



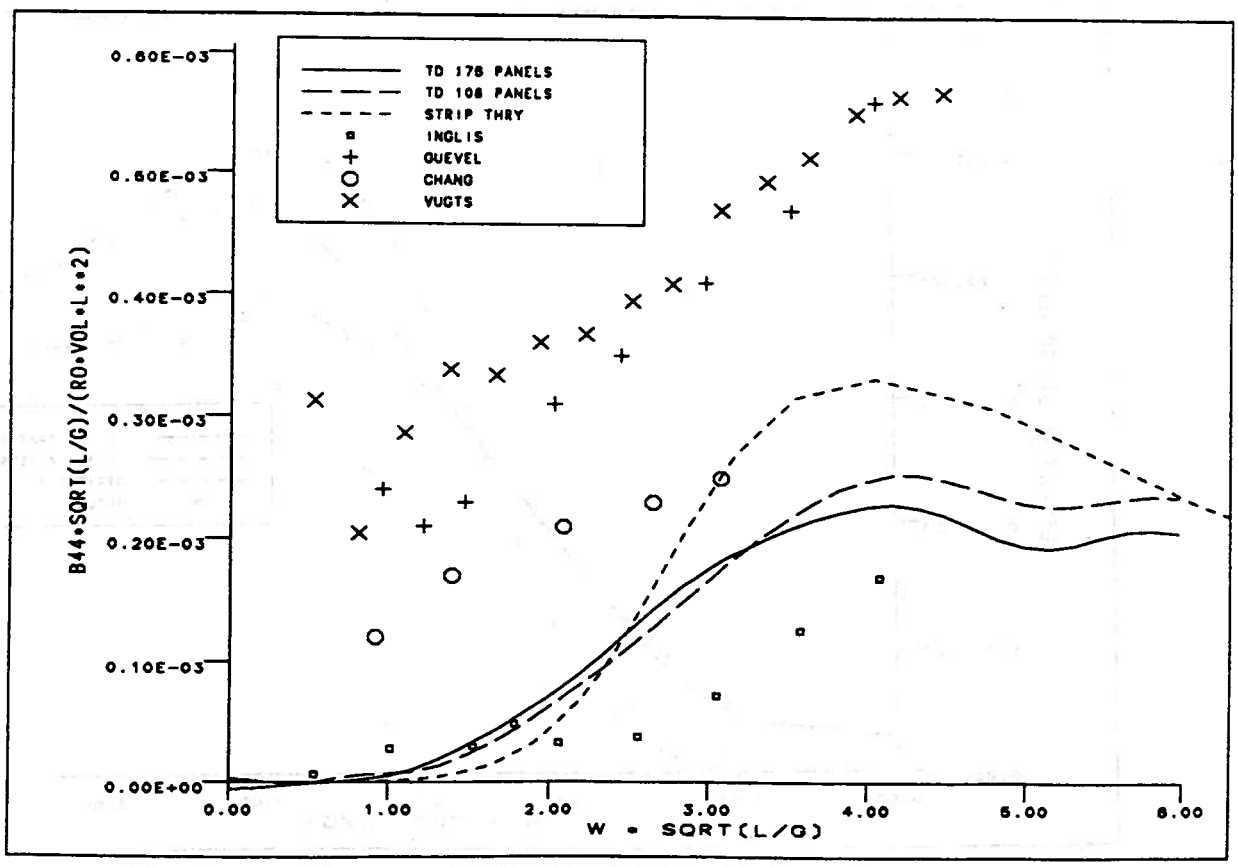
ROLL-SWAY ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 133



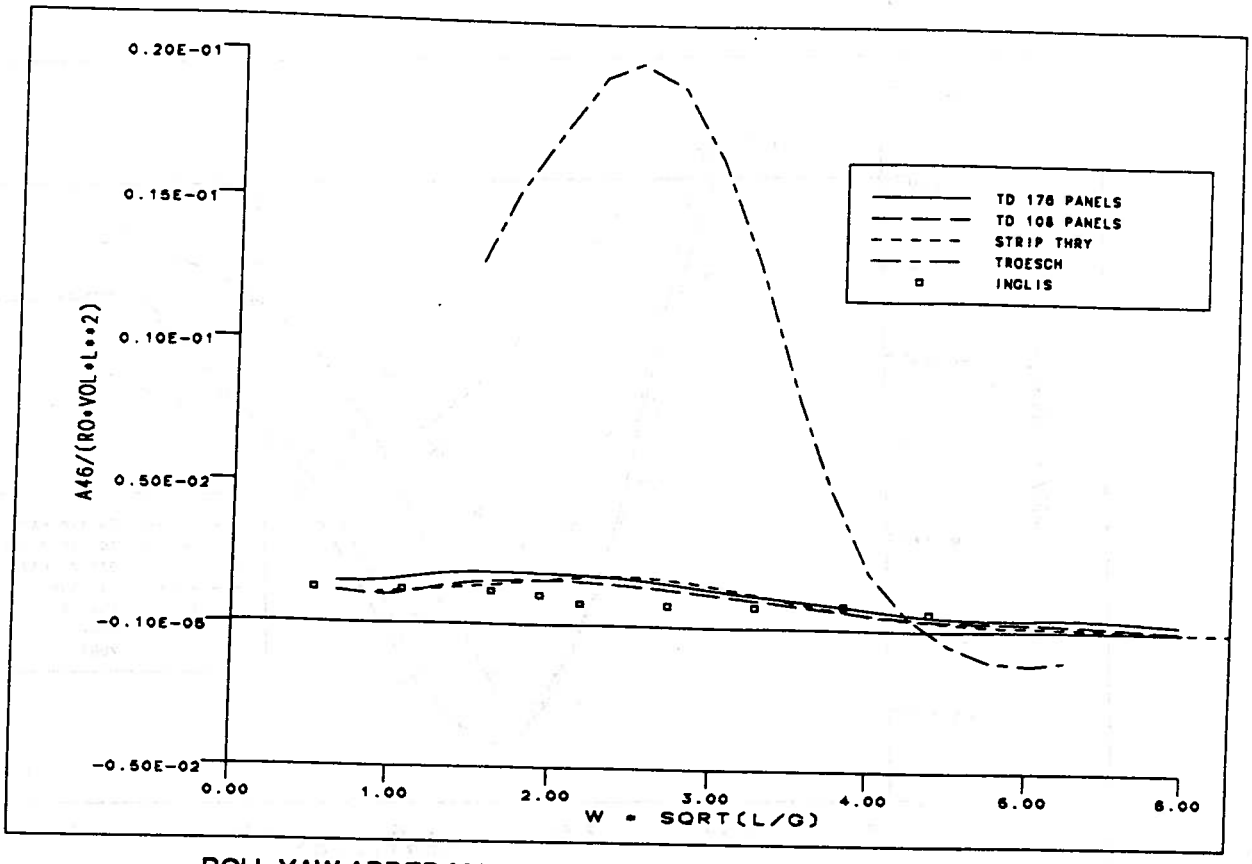
ROLL-SWAY DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 134



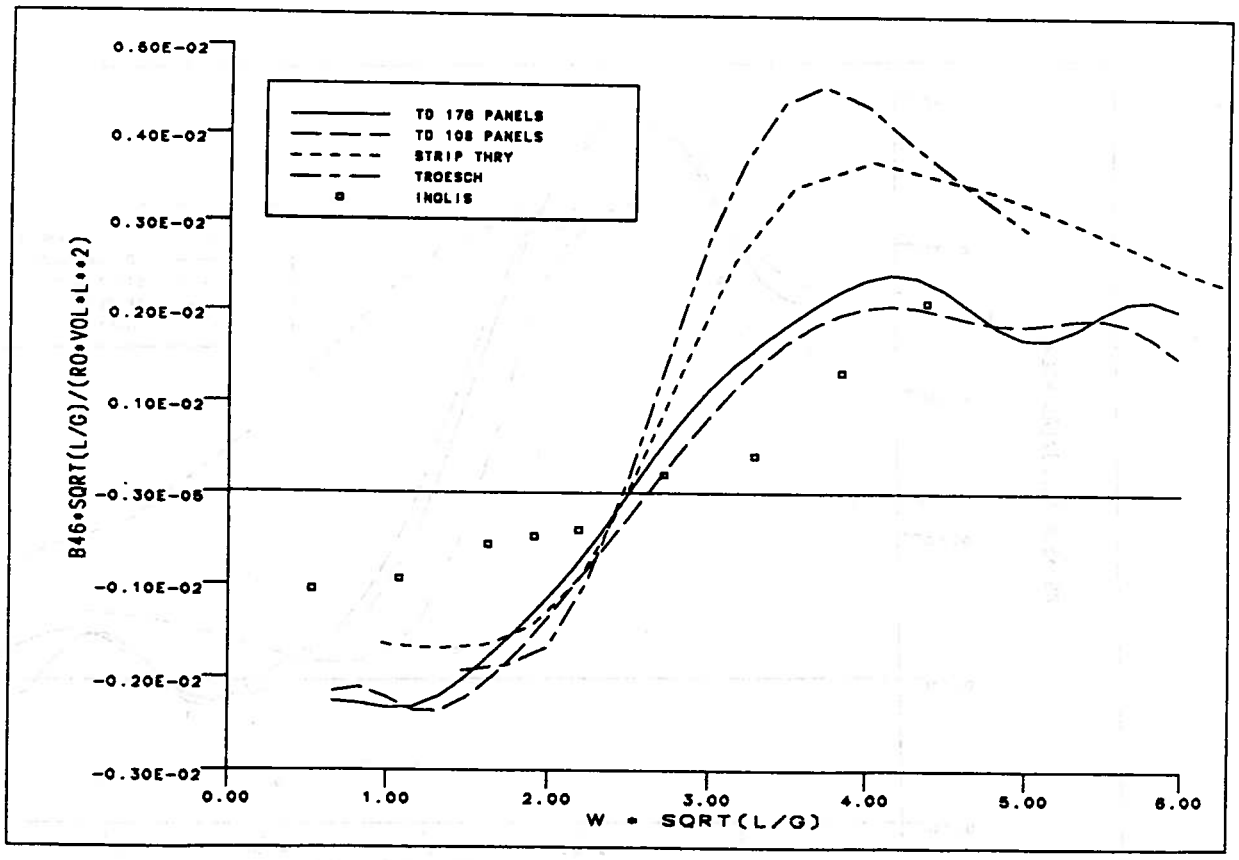
ROLL ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 135



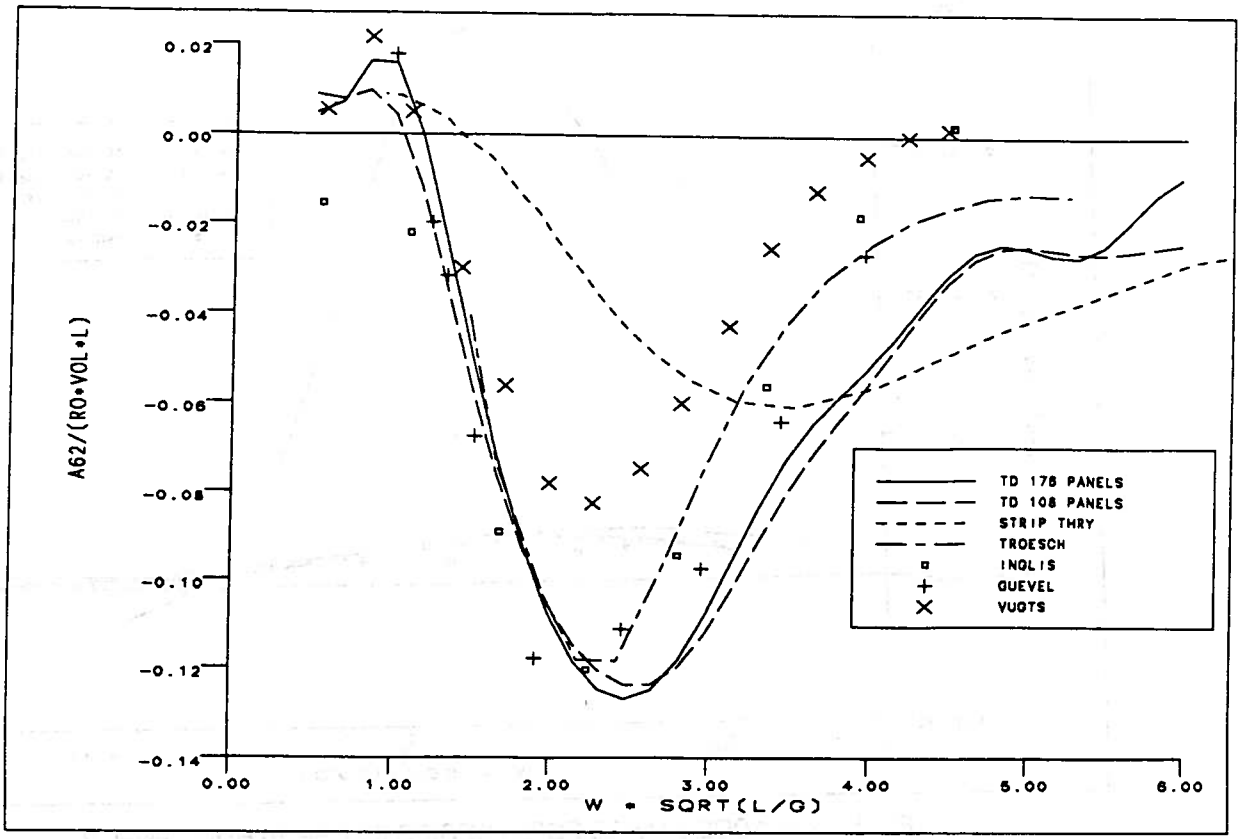
ROLL DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 136



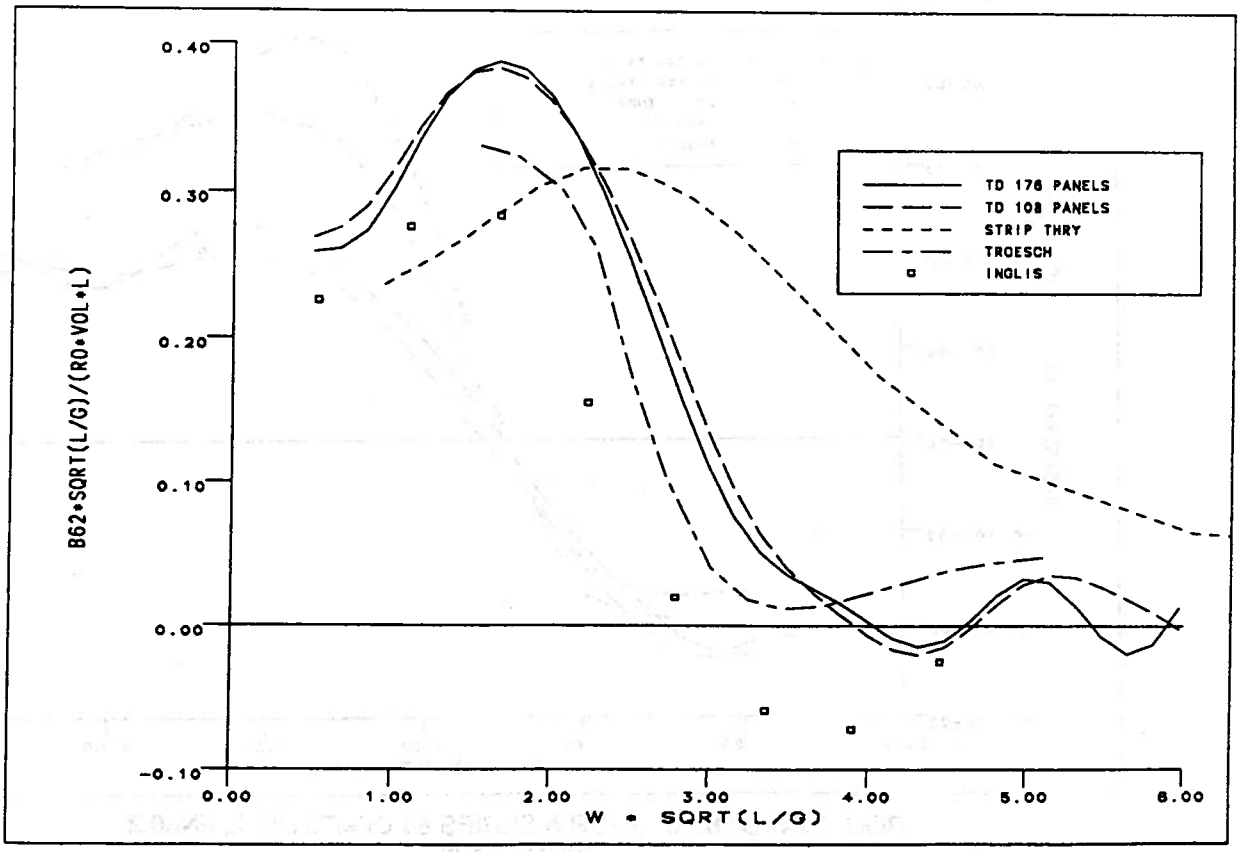
ROLL-YAW ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 137



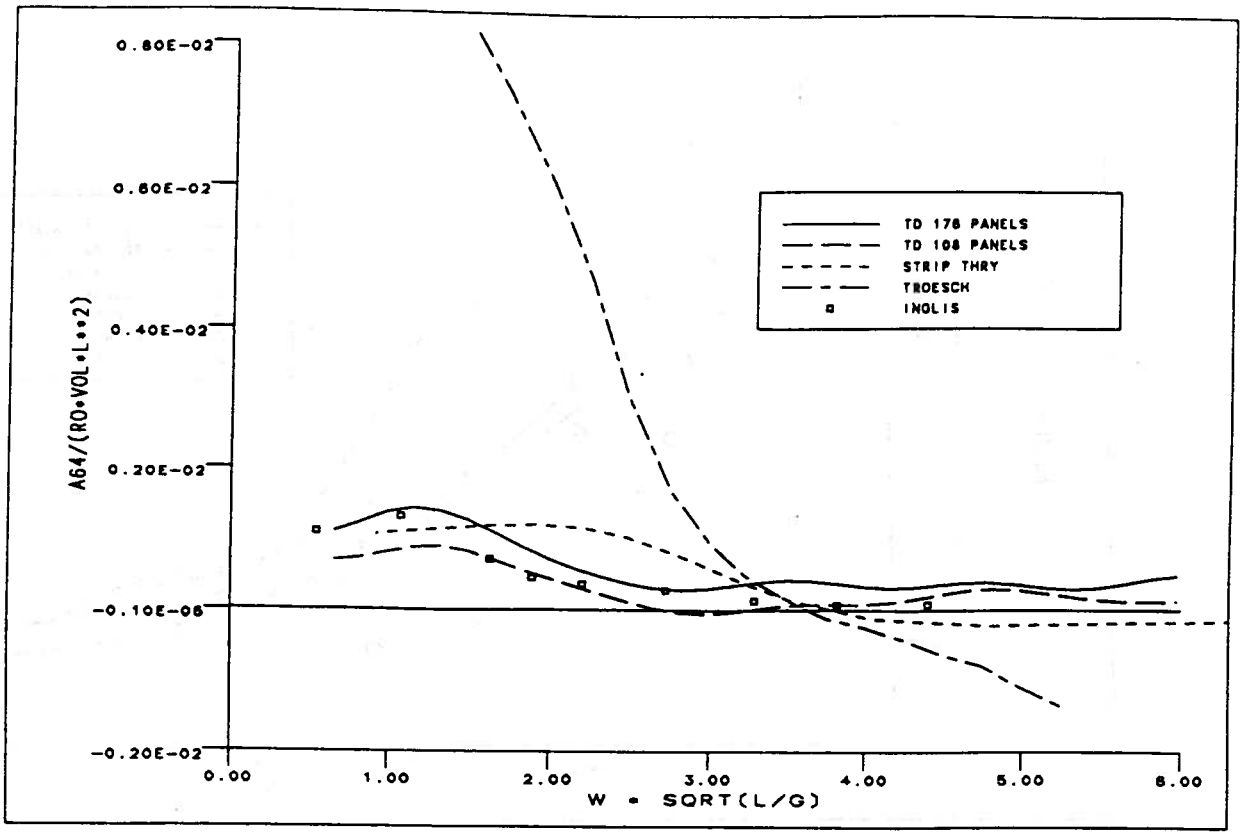
ROLL-YAW DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 138



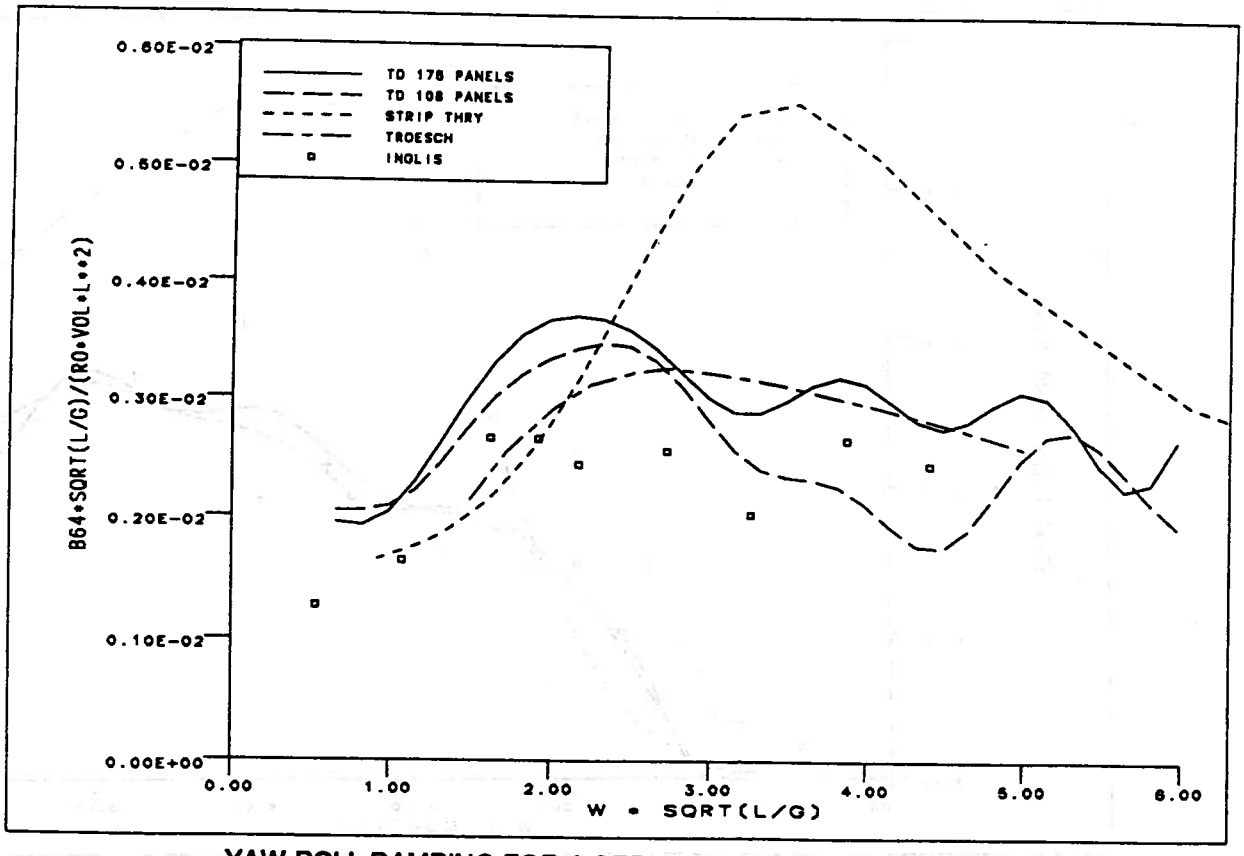
YAW-SWAY ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 139



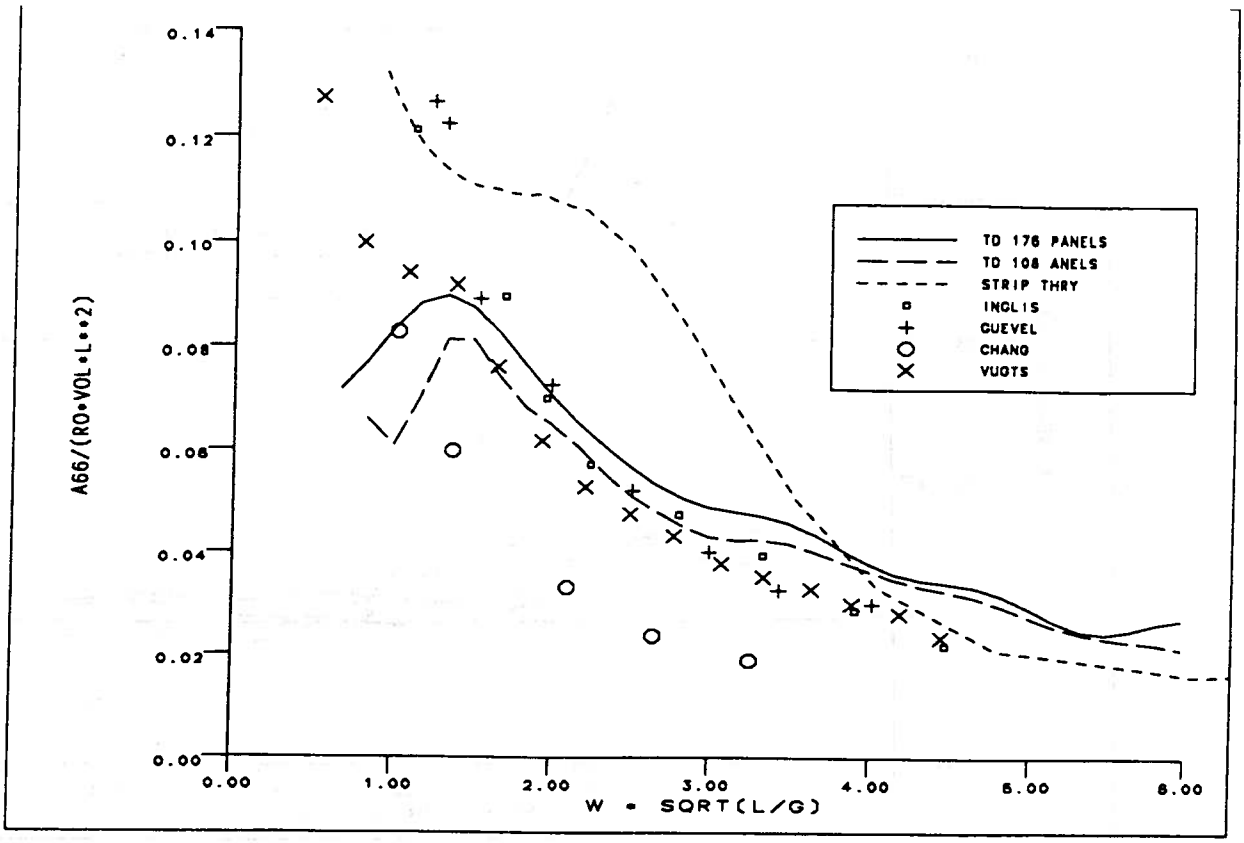
YAW-SWAY DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 140



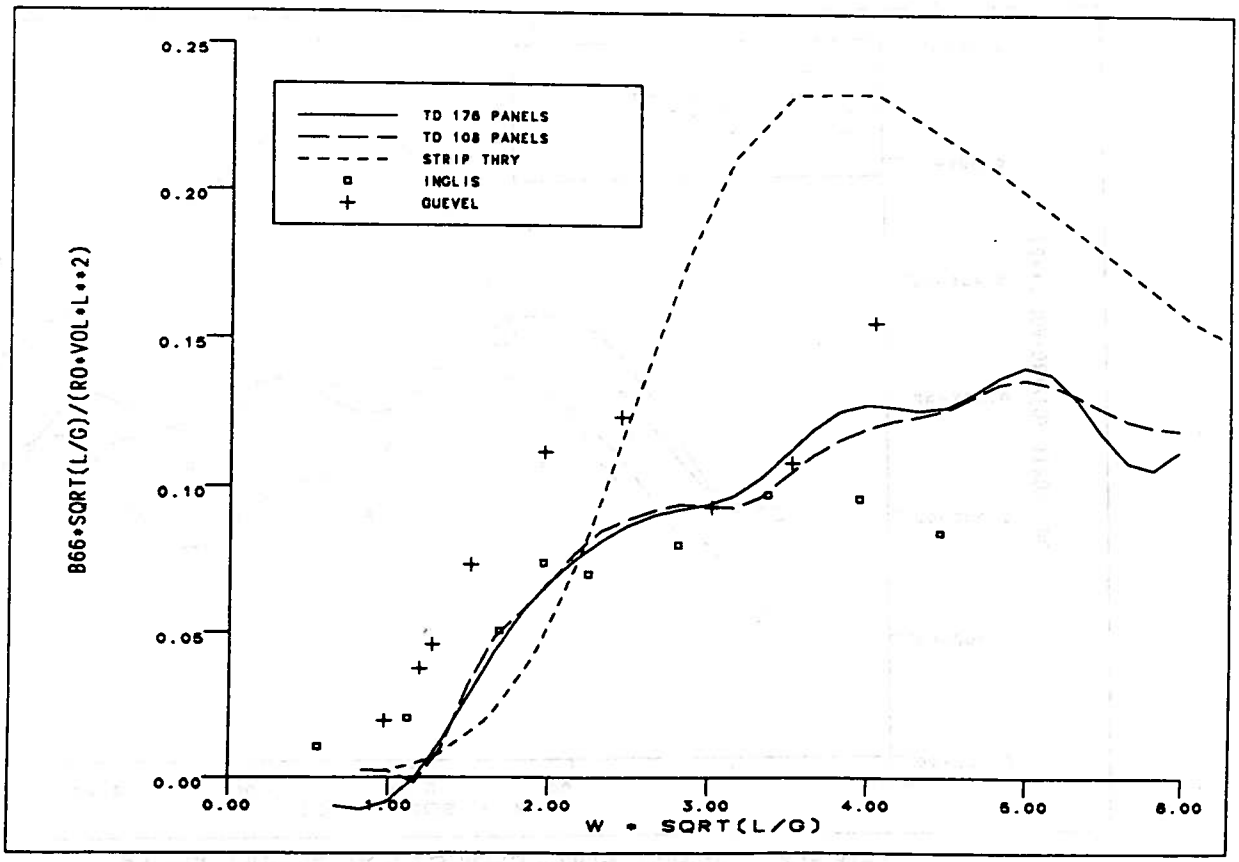
YAW-ROLL ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 141



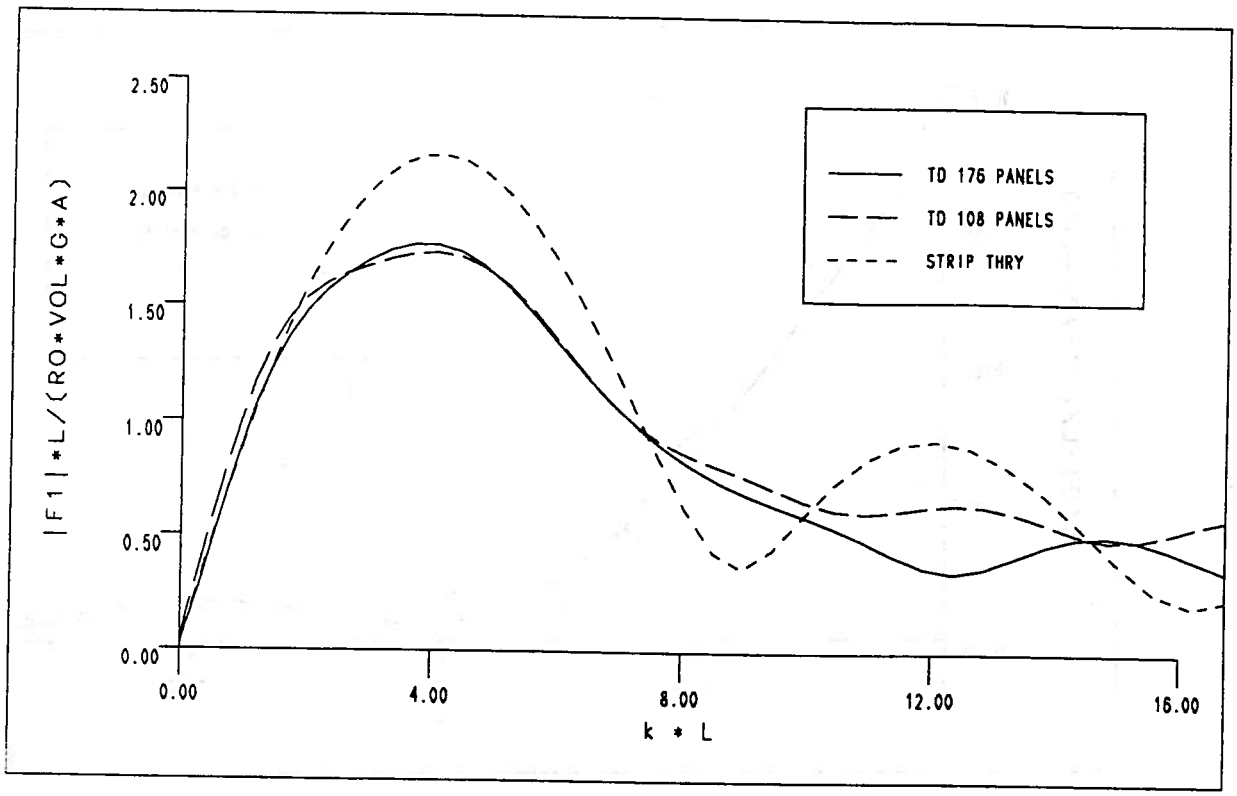
YAW-ROLL DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 142



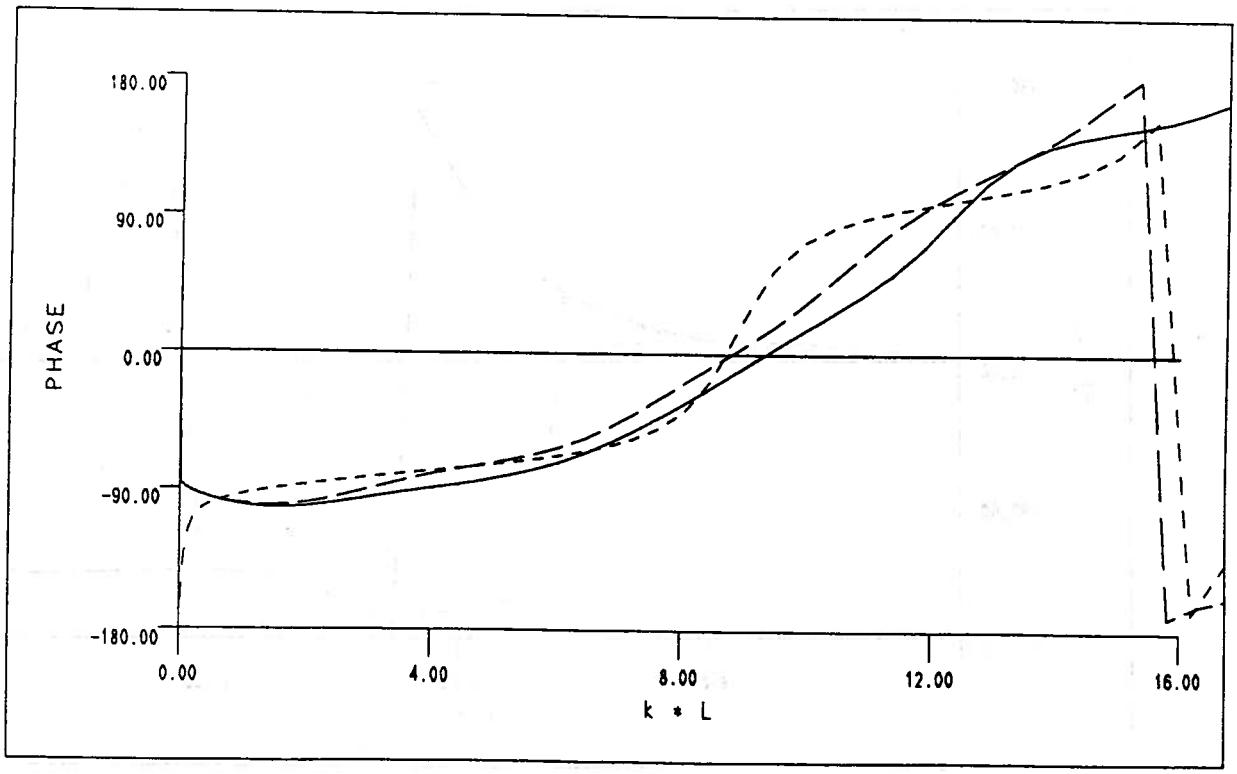
YAW ADDED MASS FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 143



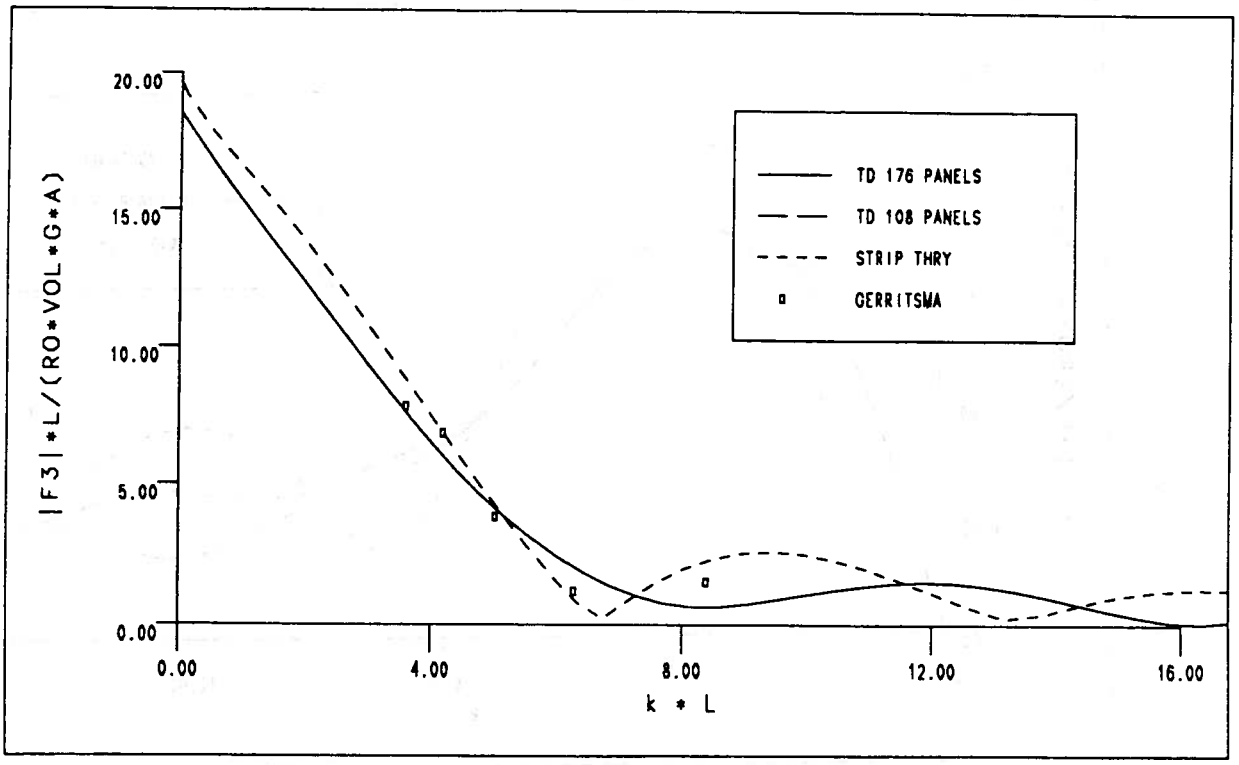
YAW DAMPING FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 144



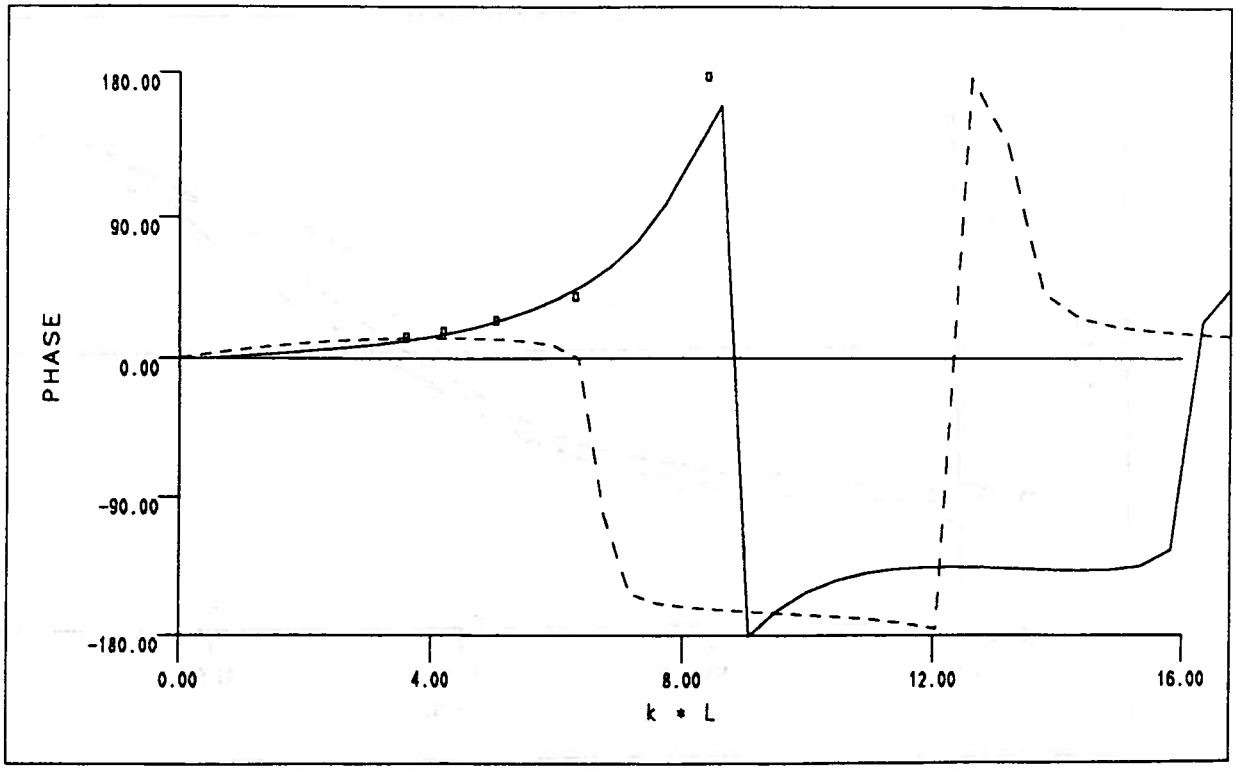
MAGNITUDE OF SURGE EXCITING FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 145



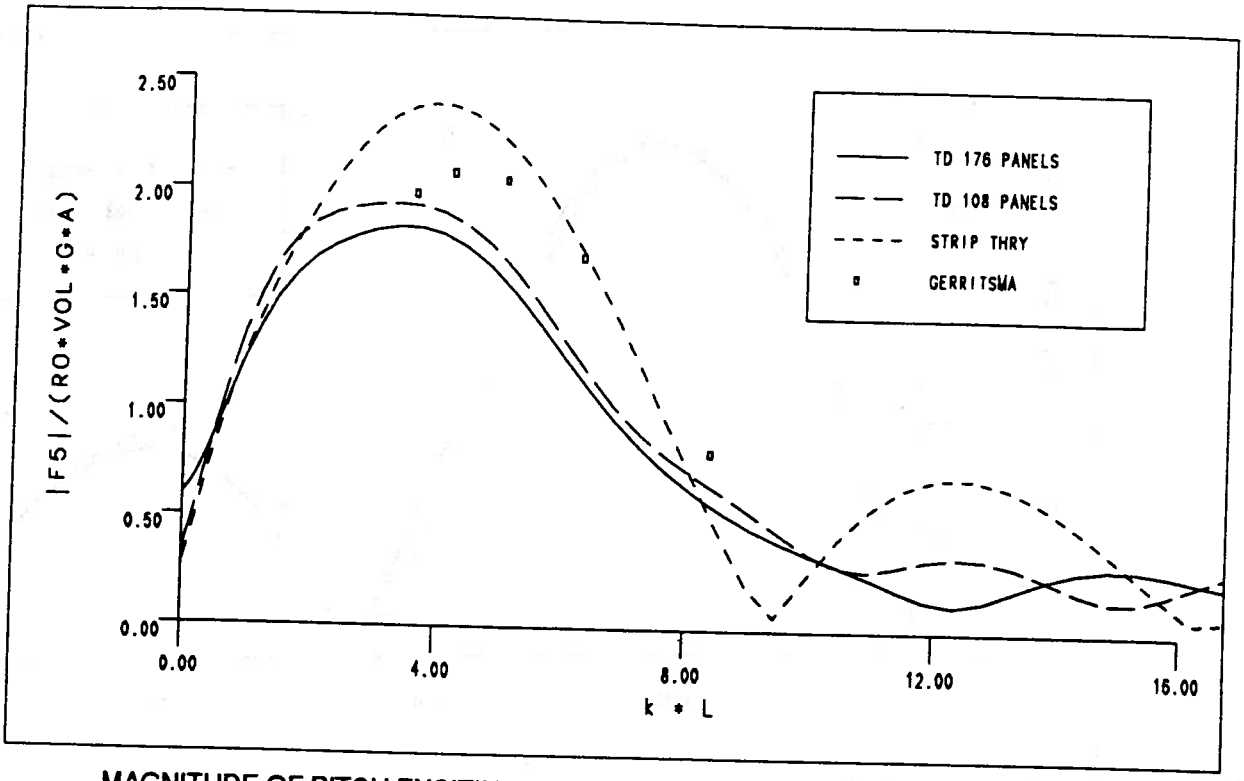
PHASE OF SURGE EXCITING FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 146



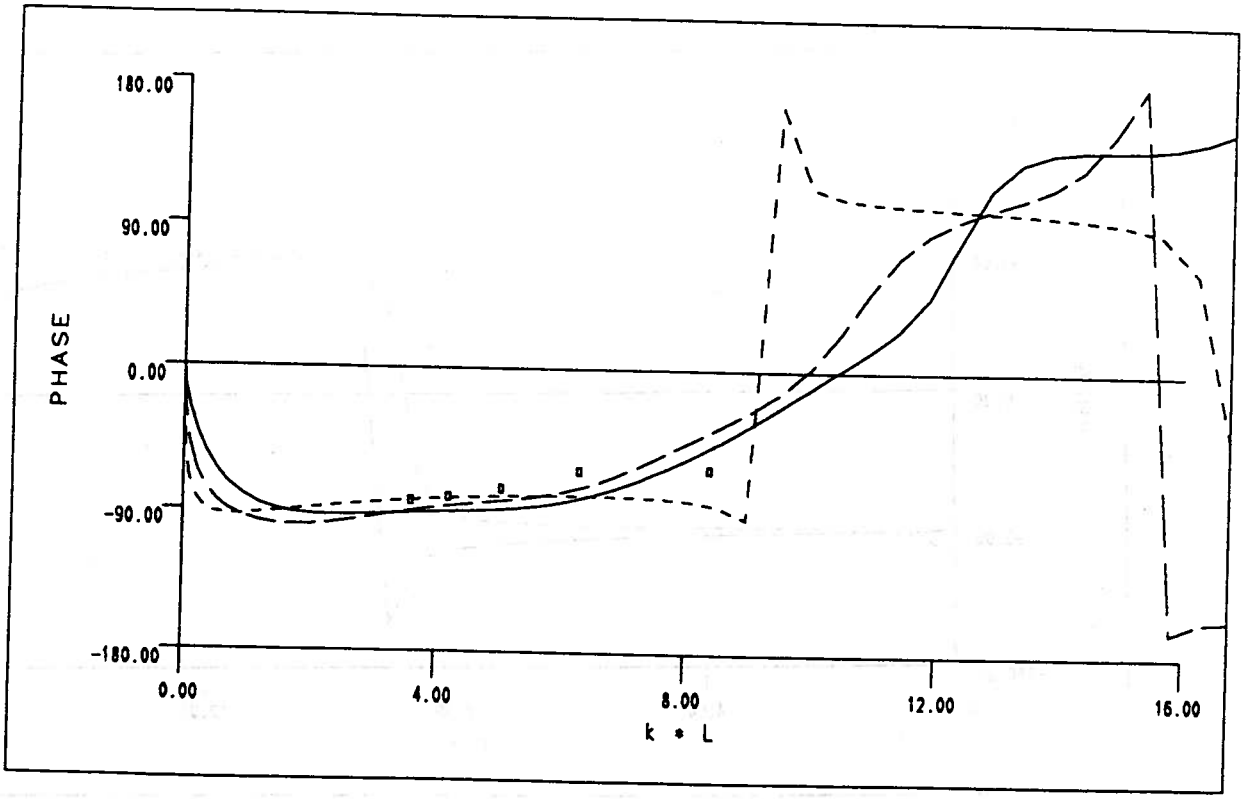
MAGNITUDE OF HEAVE EXCITING FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 147



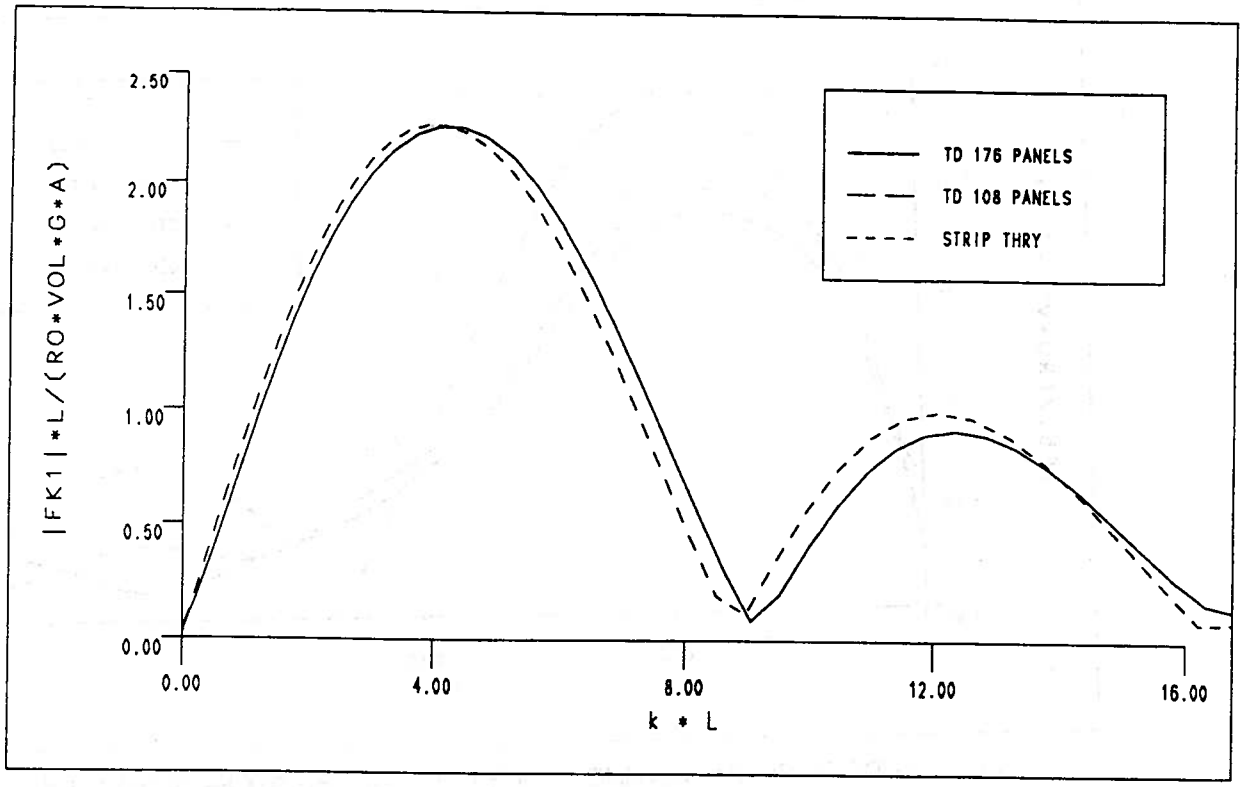
PHASE OF HEAVE EXCITING FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 148



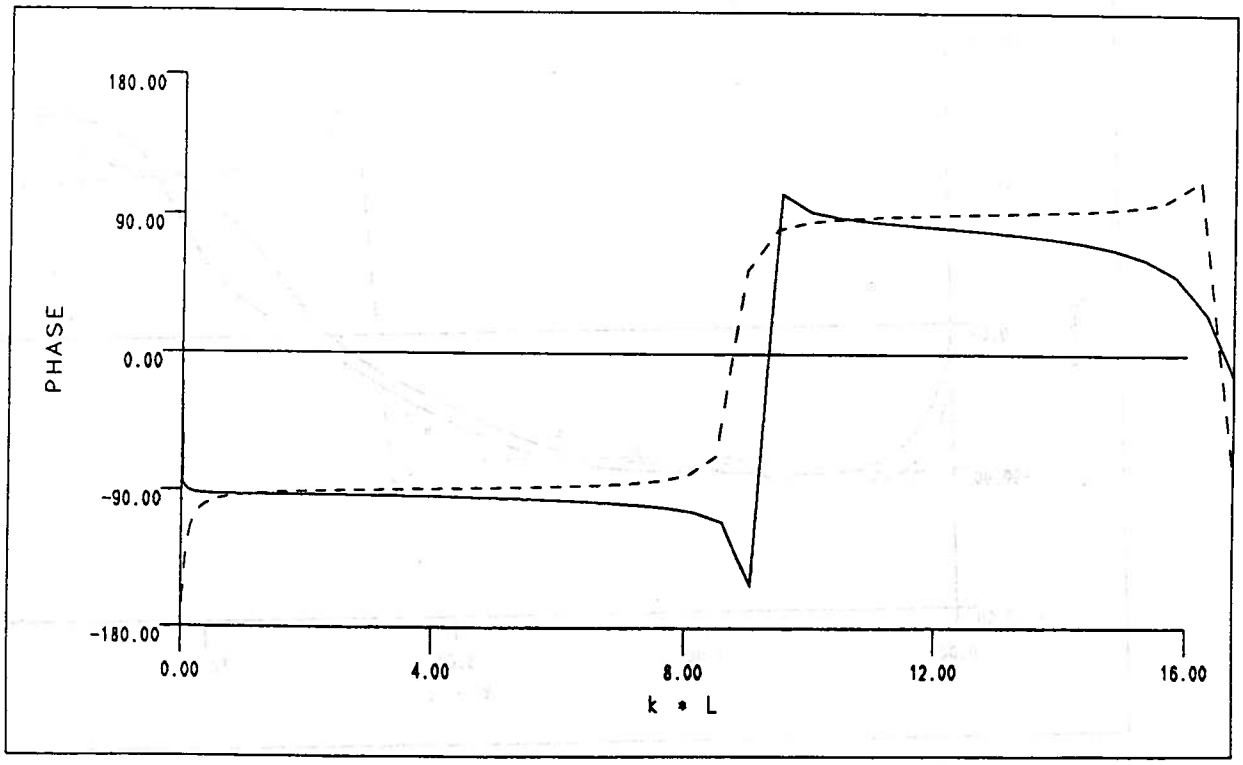
MAGNITUDE OF PITCH EXCITING FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 149



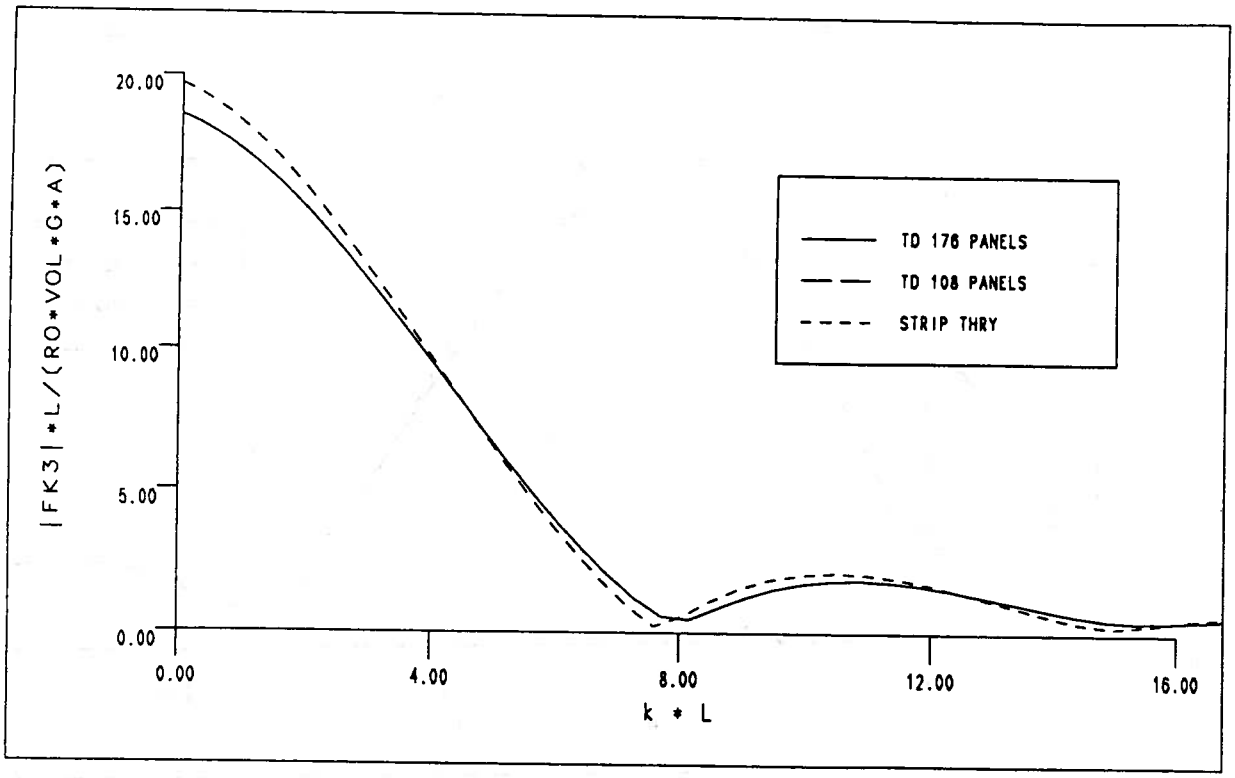
PHASE OF PITCH EXCITING FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 150



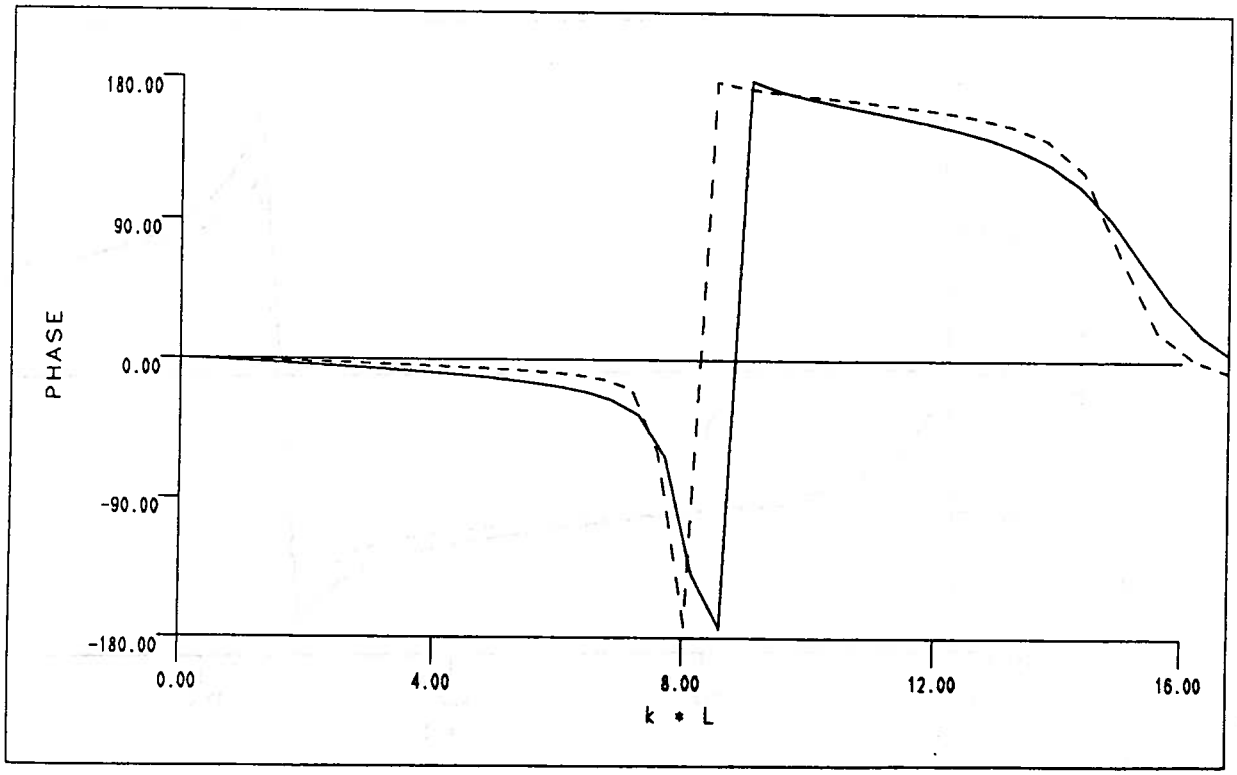
MAGNITUDE OF SURGE FROUDE-KRYLOV FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 151



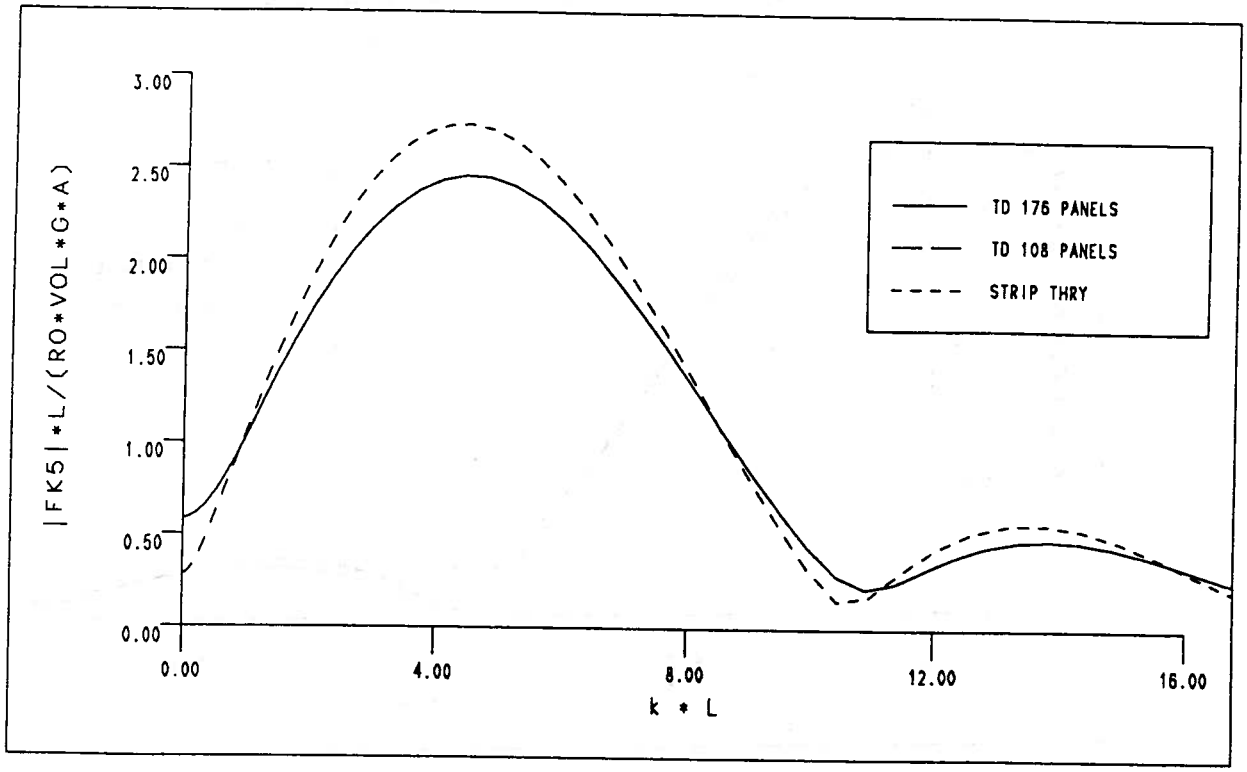
PHASE OF SURGE FROUDE-KYLOV FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 152



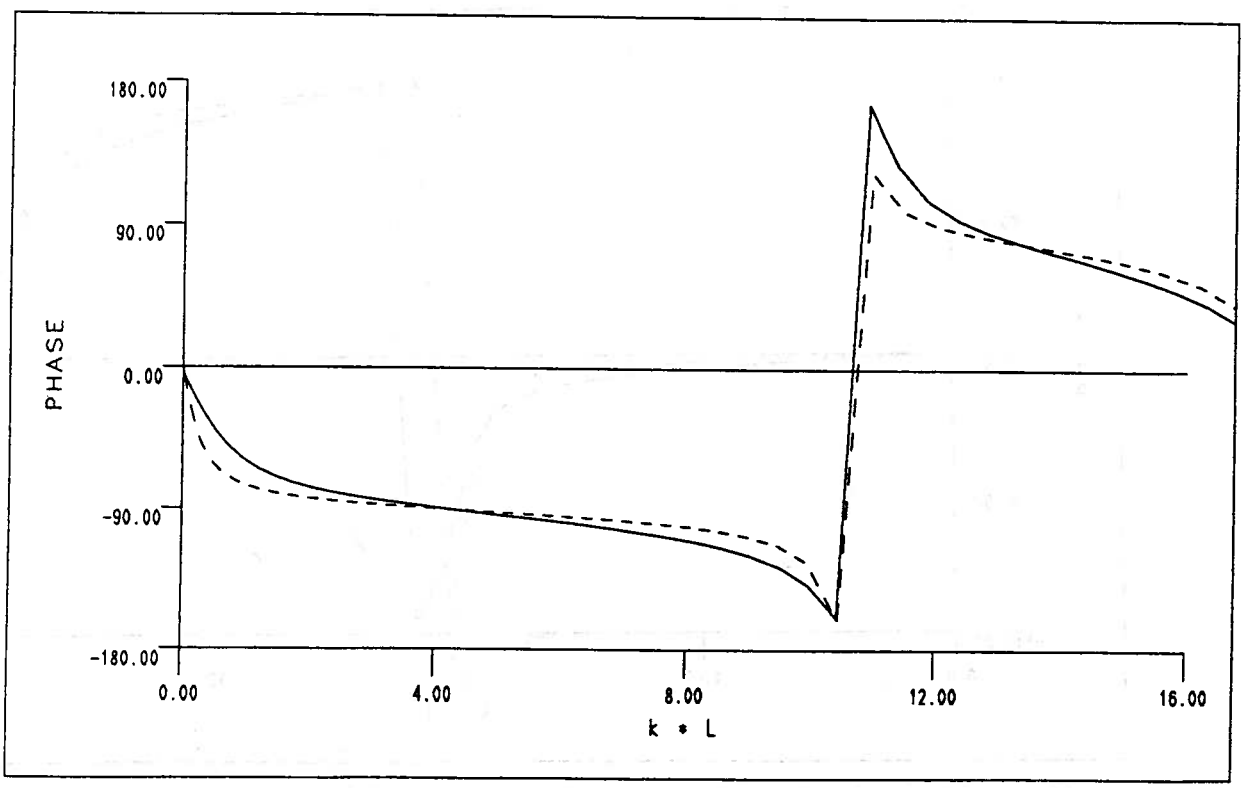
MAGNITUDE OF HEAVE FROUDE-KRYLOV FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 153



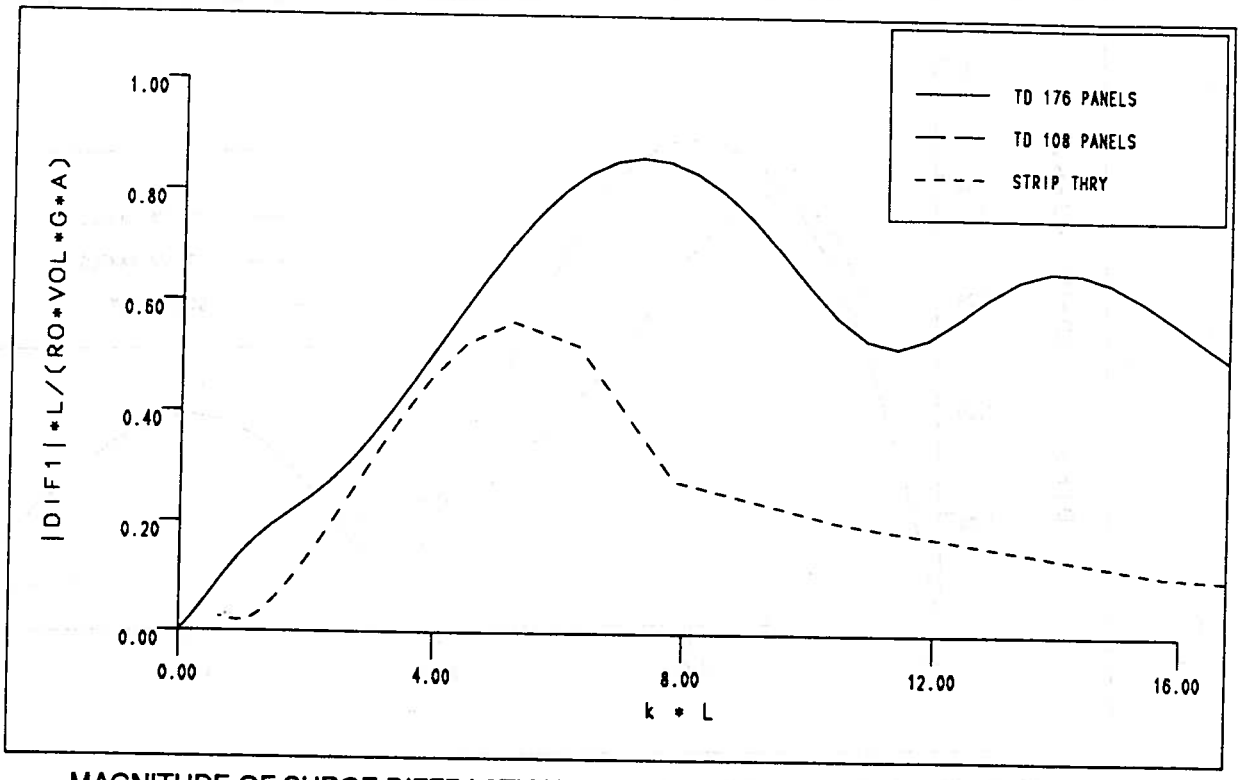
PHASE OF HEAVE FROUDE-KRYLOV FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 154



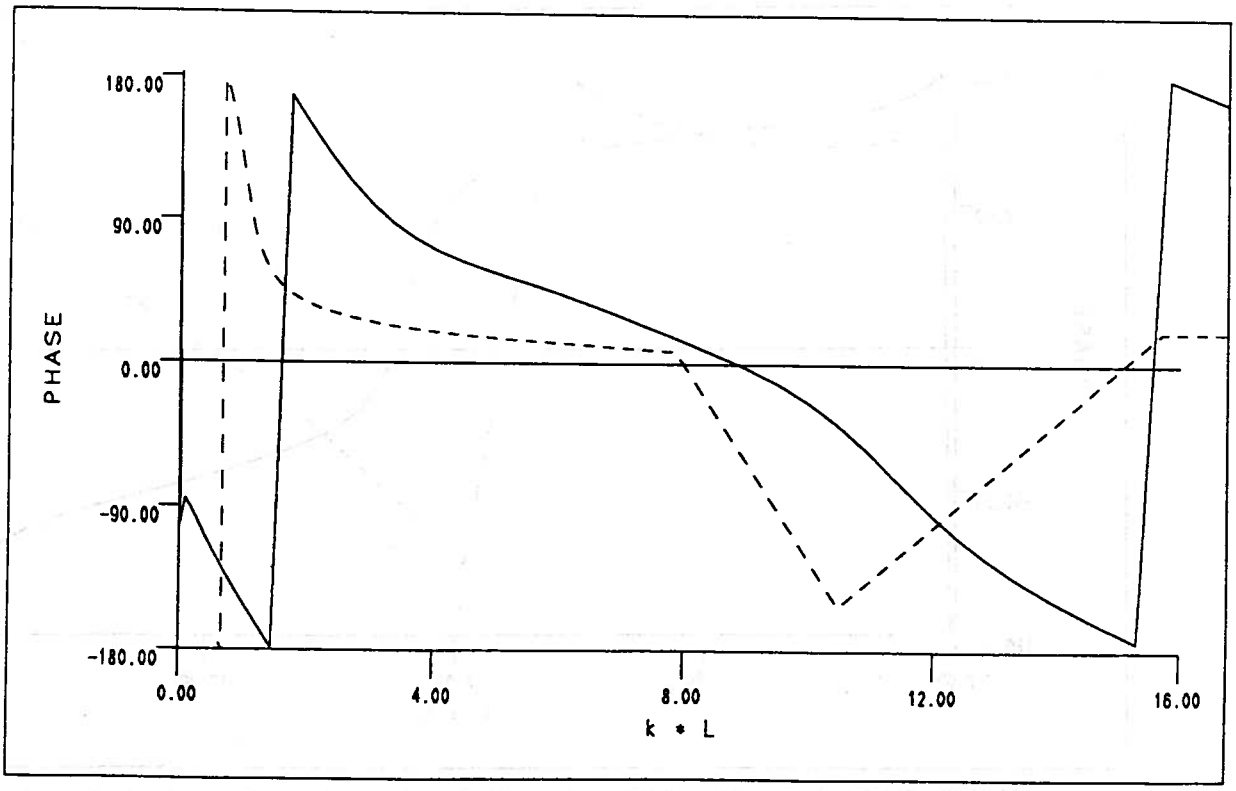
MAGNITUDE OF PITCH FROUDE-KRYLOV FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 155



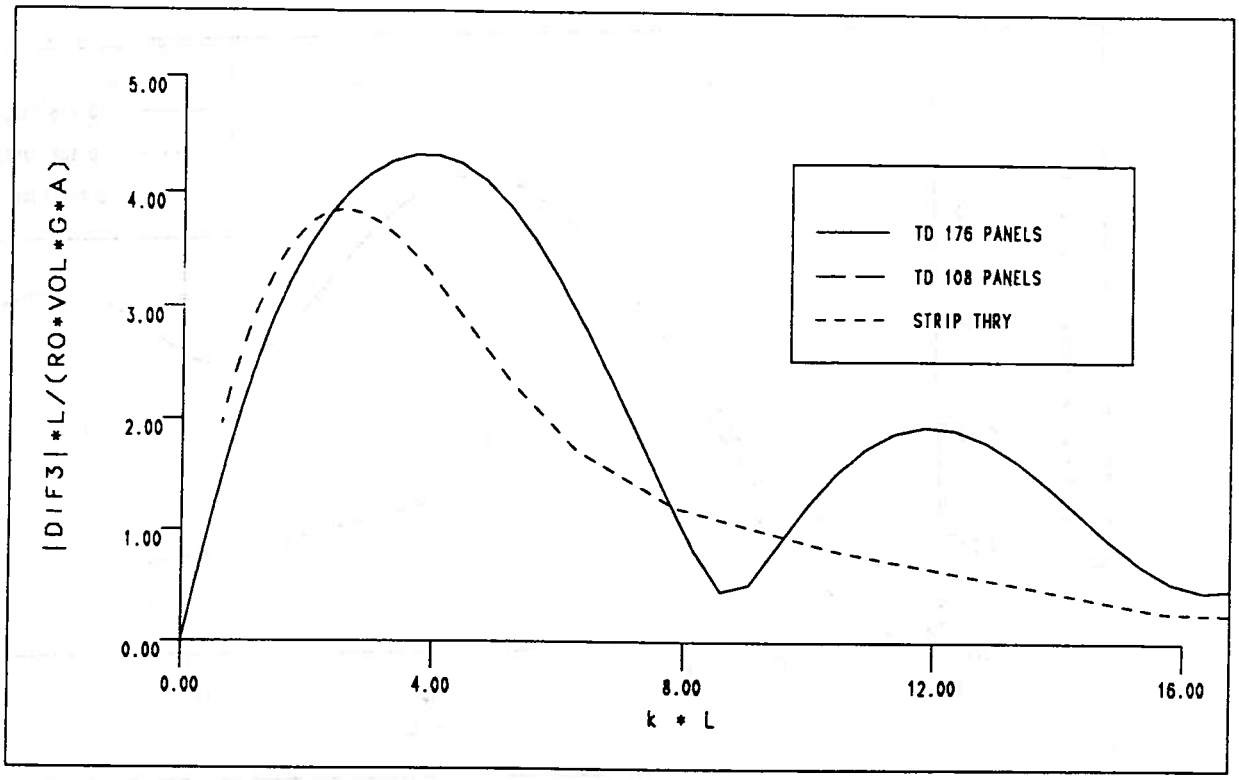
PHASE OF PITCH FROUDE-KRYLOV FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 156



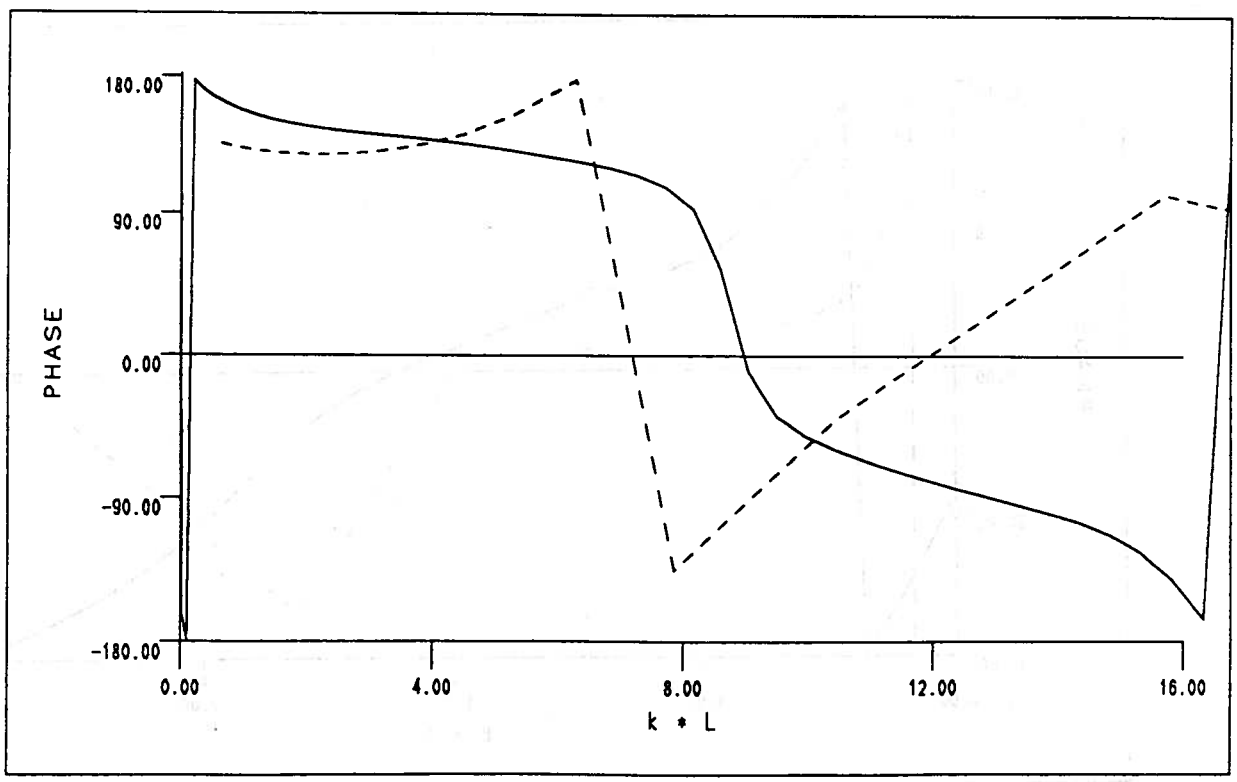
MAGNITUDE OF SURGE DIFFRACTION FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 157



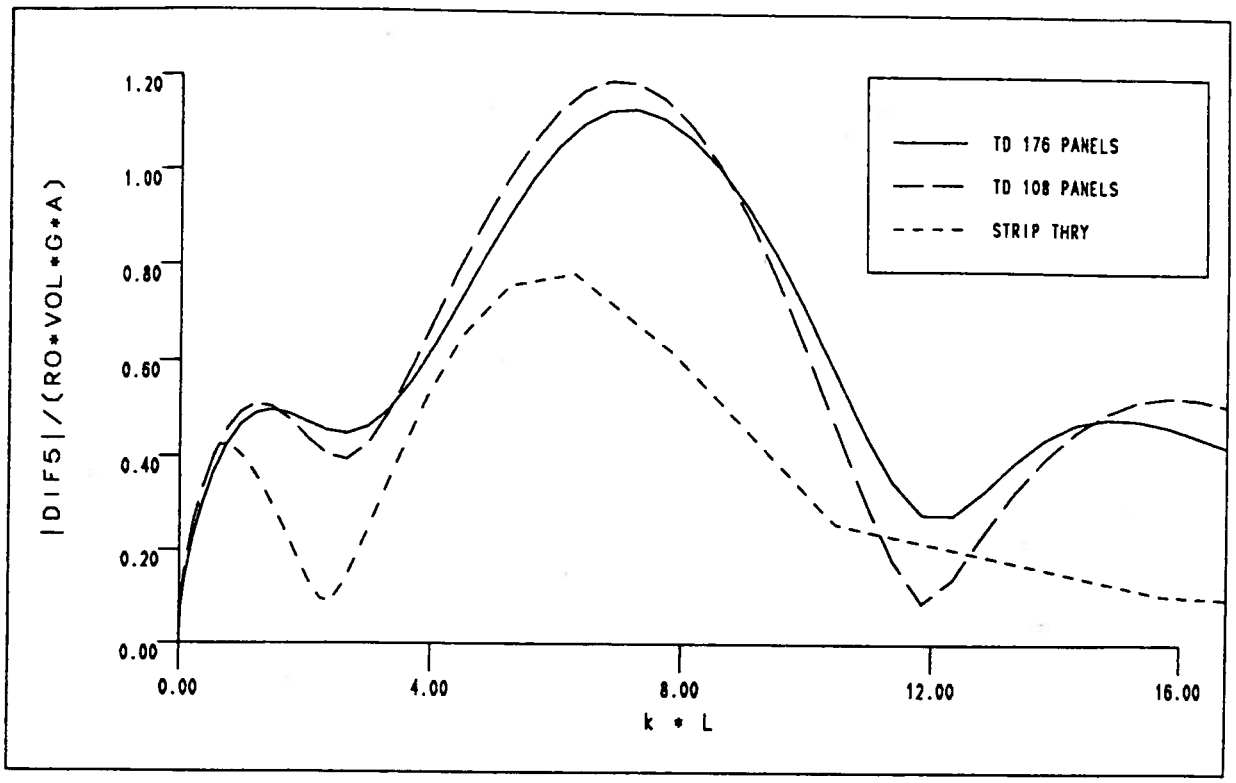
PHASE OF SURGE DIFFRACTION FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 158



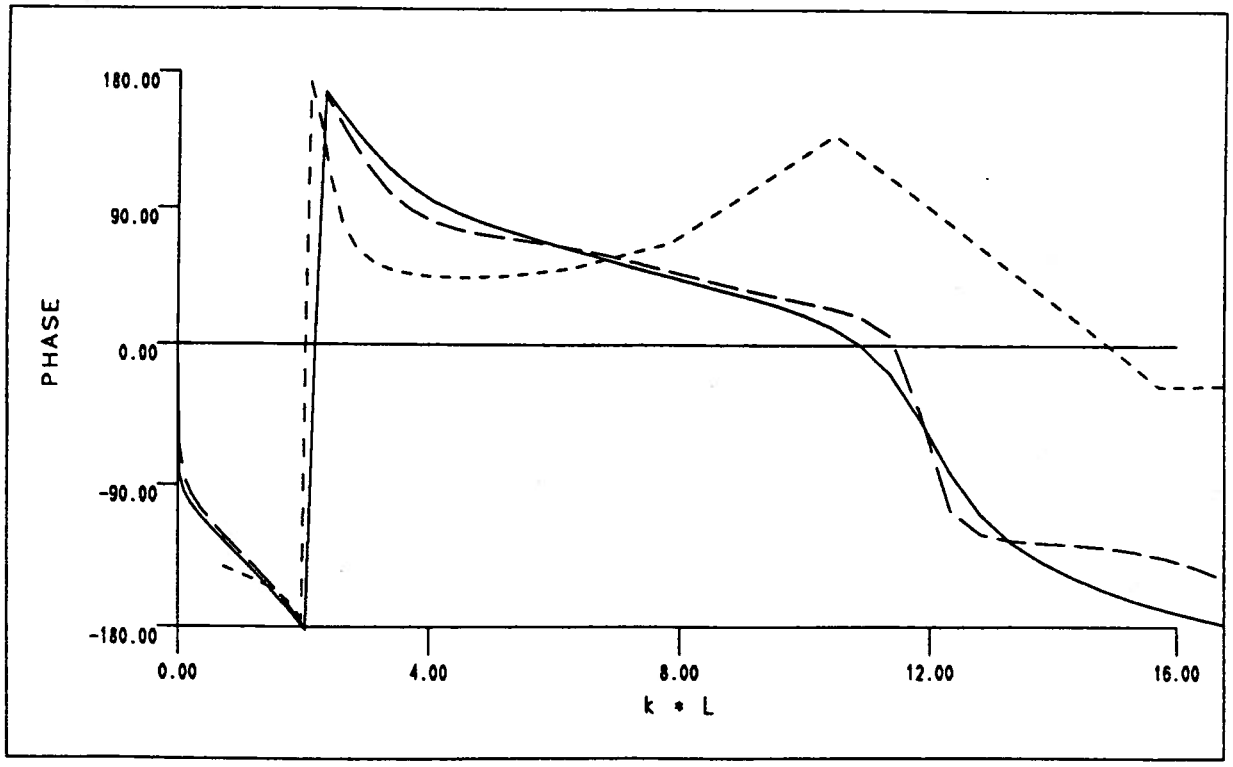
MAGNITUDE OF HEAVE DIFFRACTION FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 159



PHASE OF HEAVE DIFFRACTION FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 160

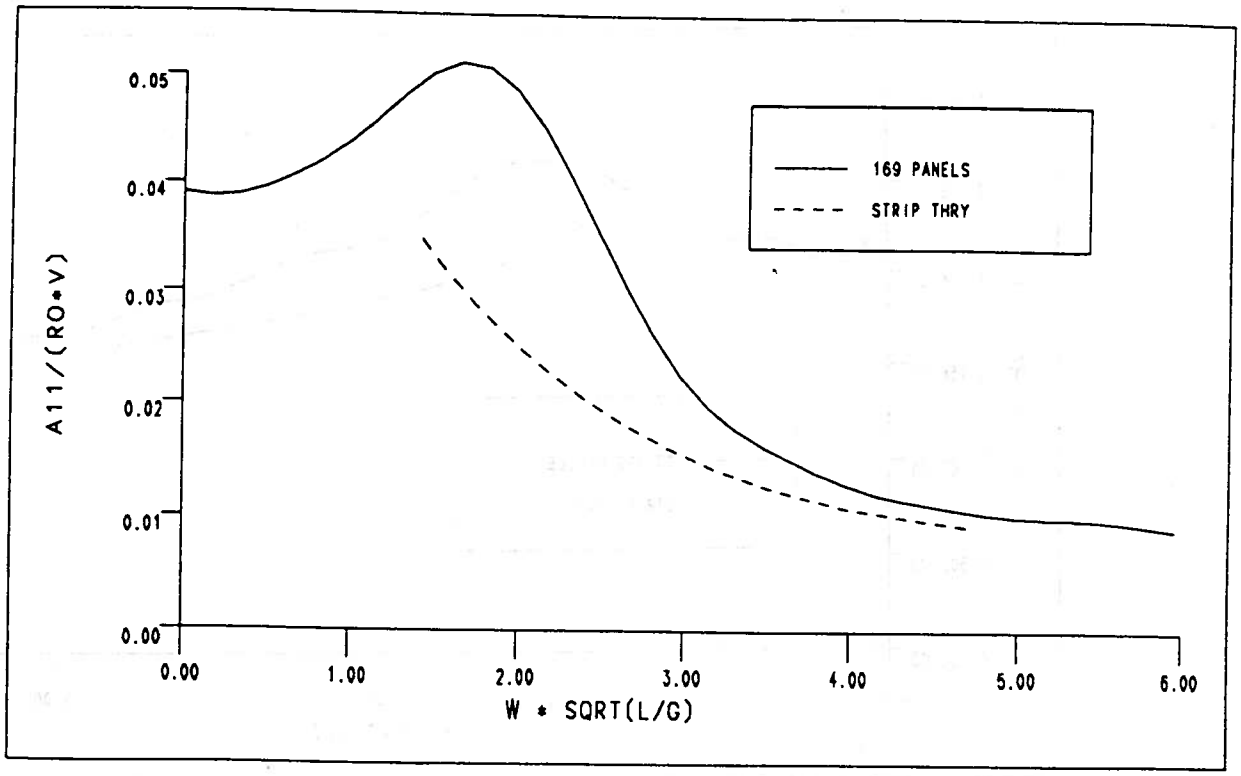


MAGNITUDE OF PITCH DIFFRACTION FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 161

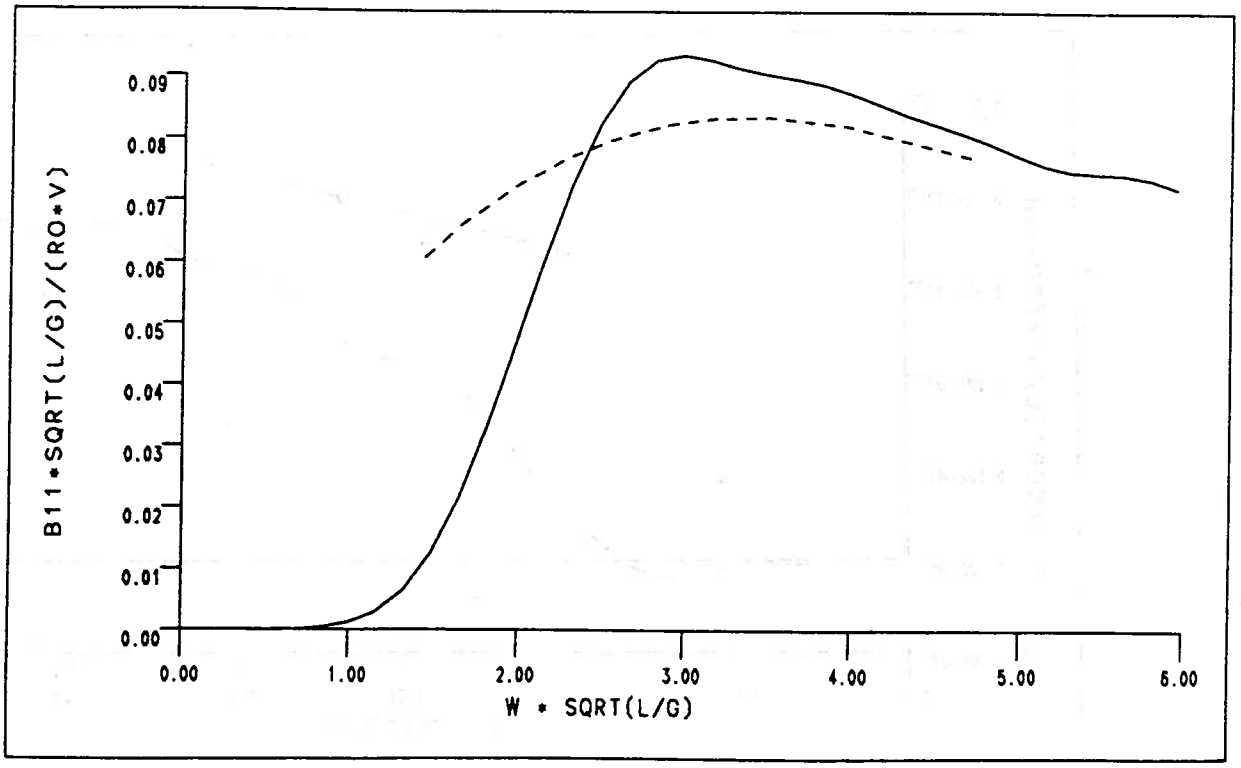


PHASE OF PITCH DIFFRACTION FORCE FOR A SERIES 60 CB=.70 HULL, FN=0.2
FIGURE 162

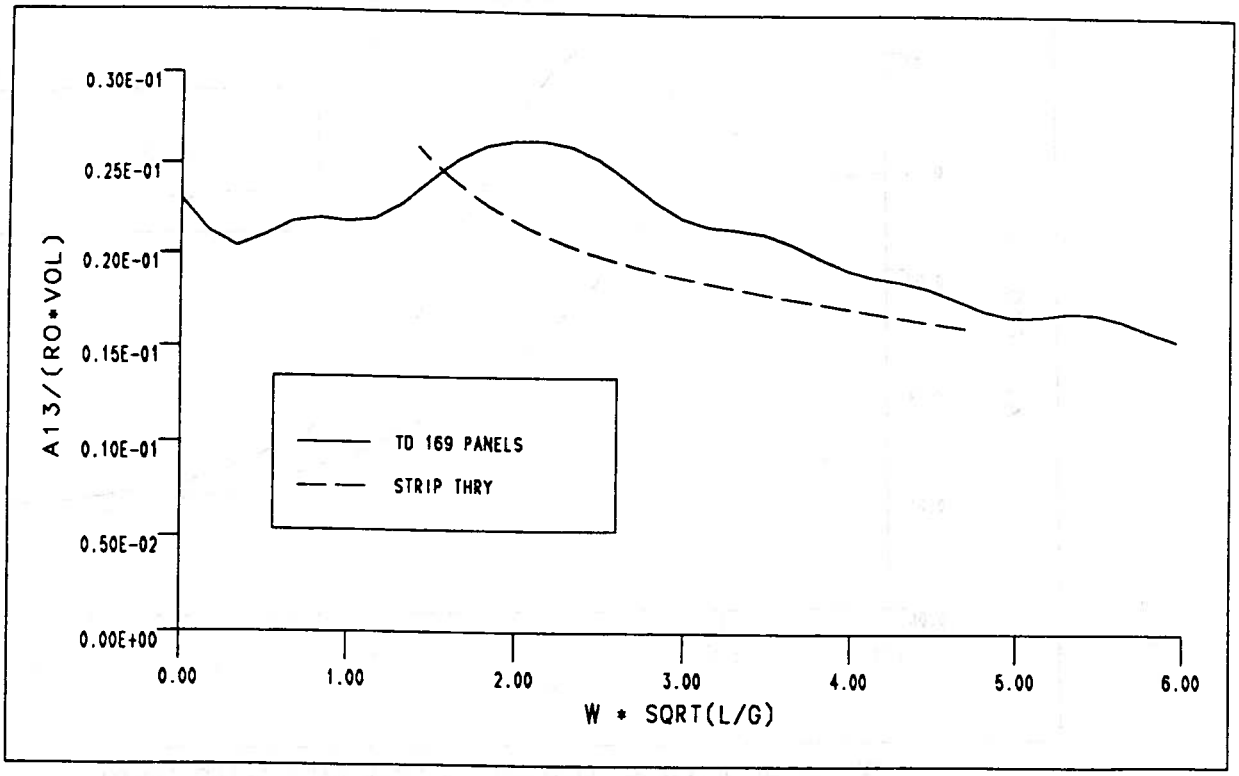
ITTC CONTAINERSHIP, FN=0.0



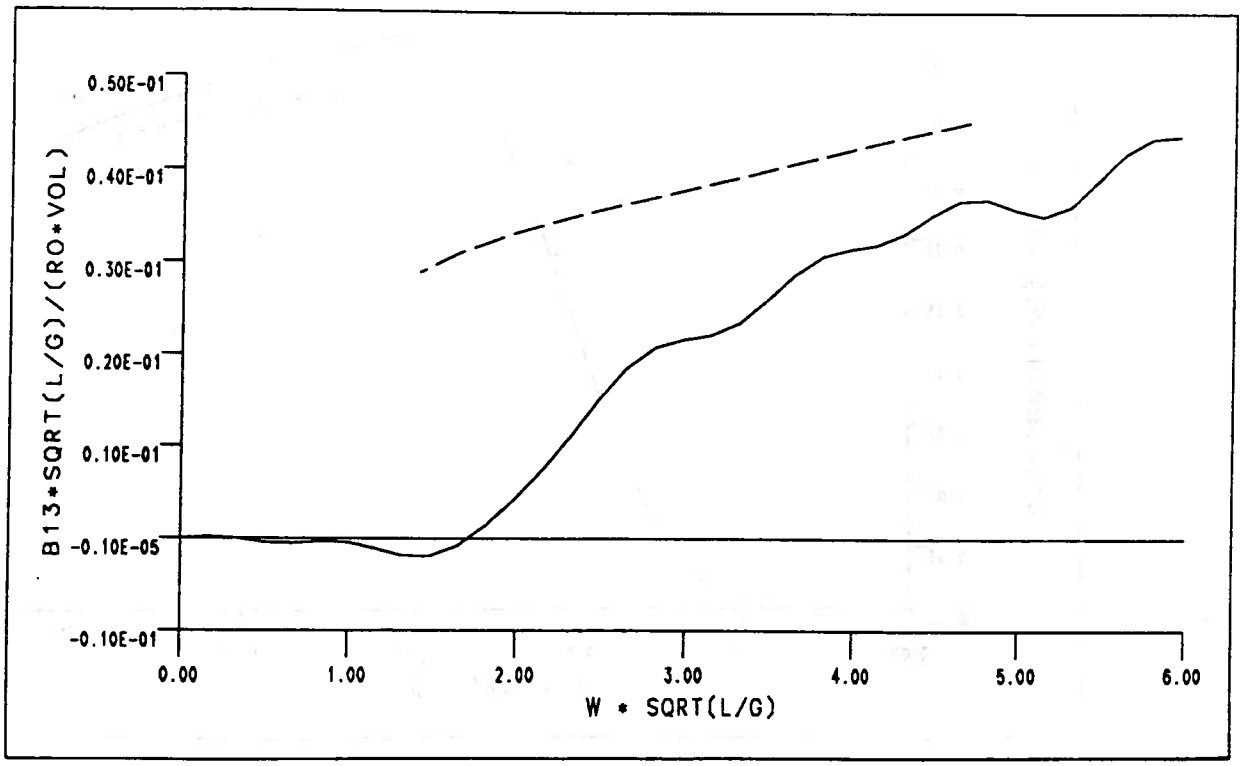
SURGE ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 163



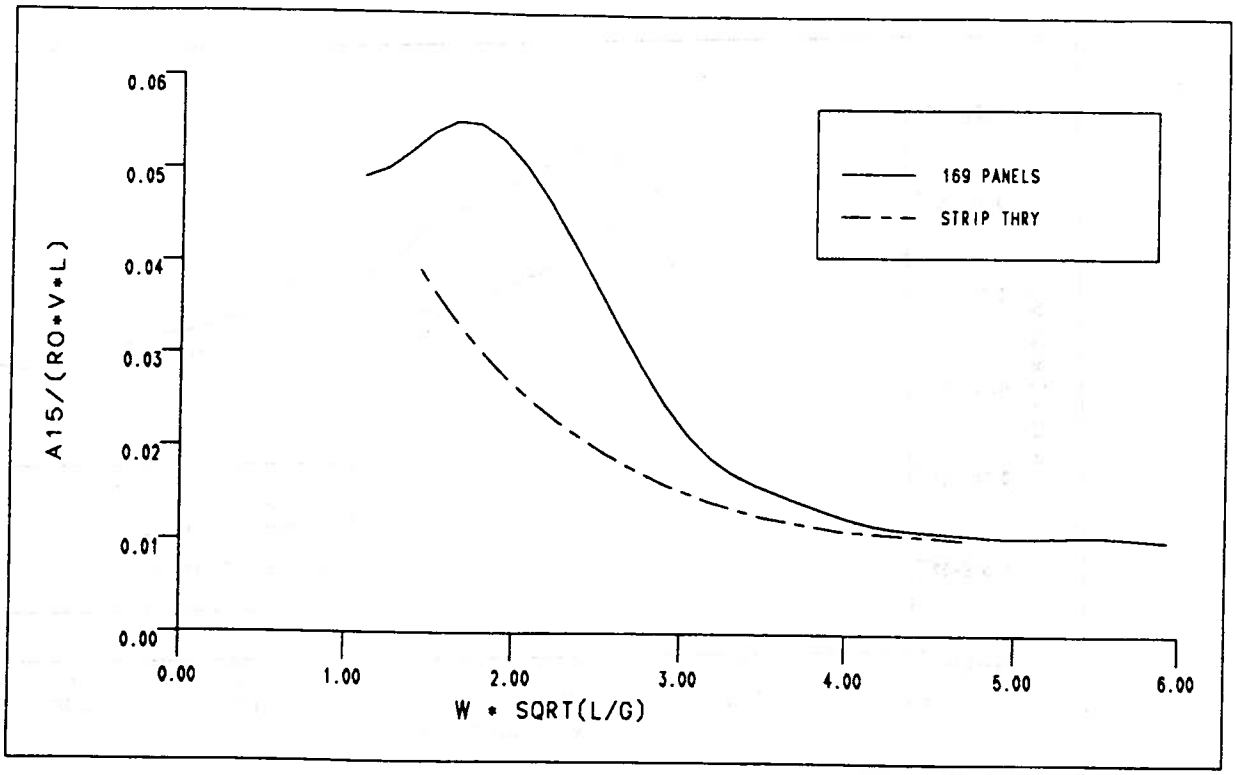
SURGE DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 164



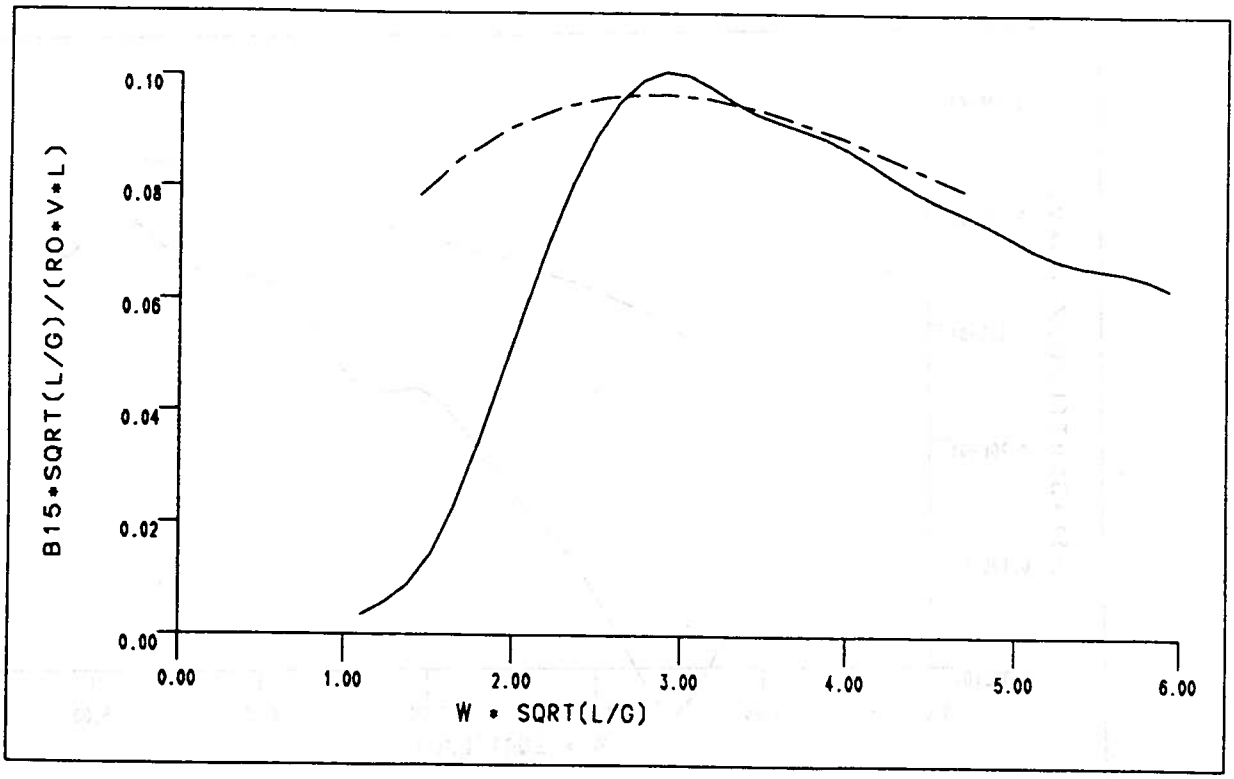
SURGE-HEAVE ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 165



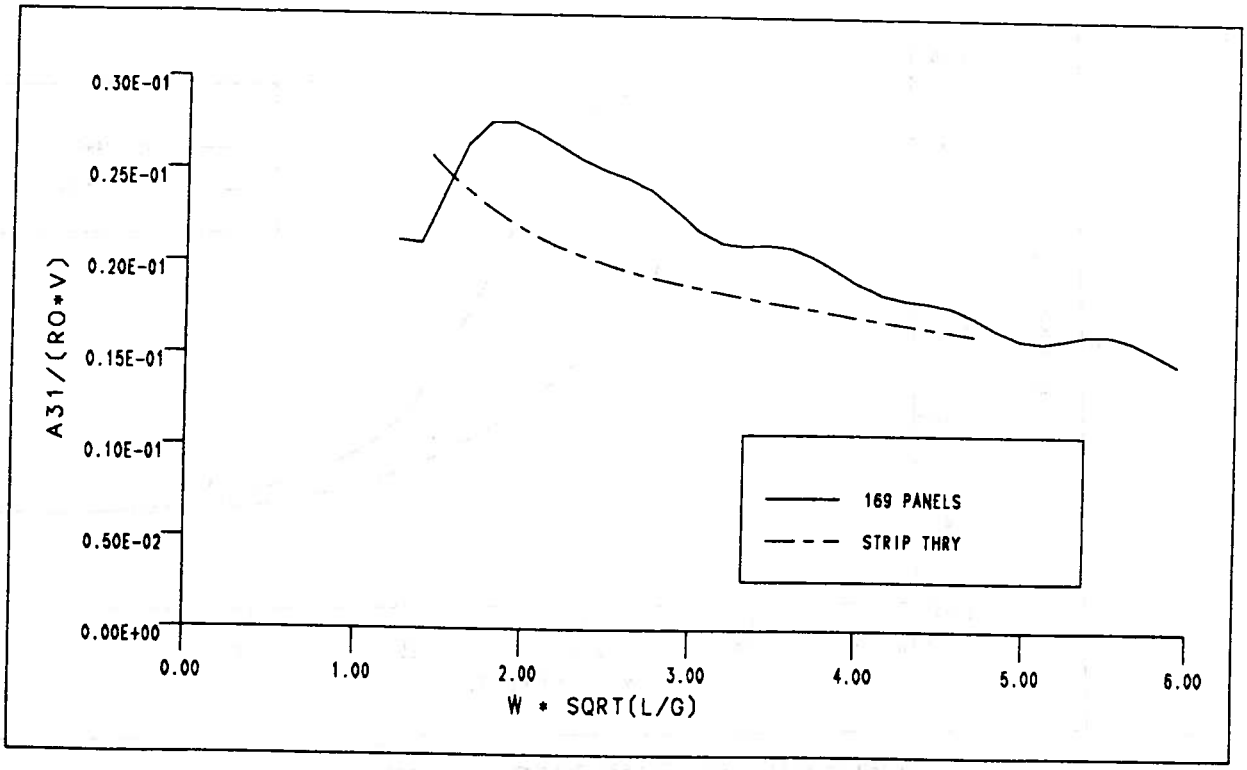
SURGE-HEAVE DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 166



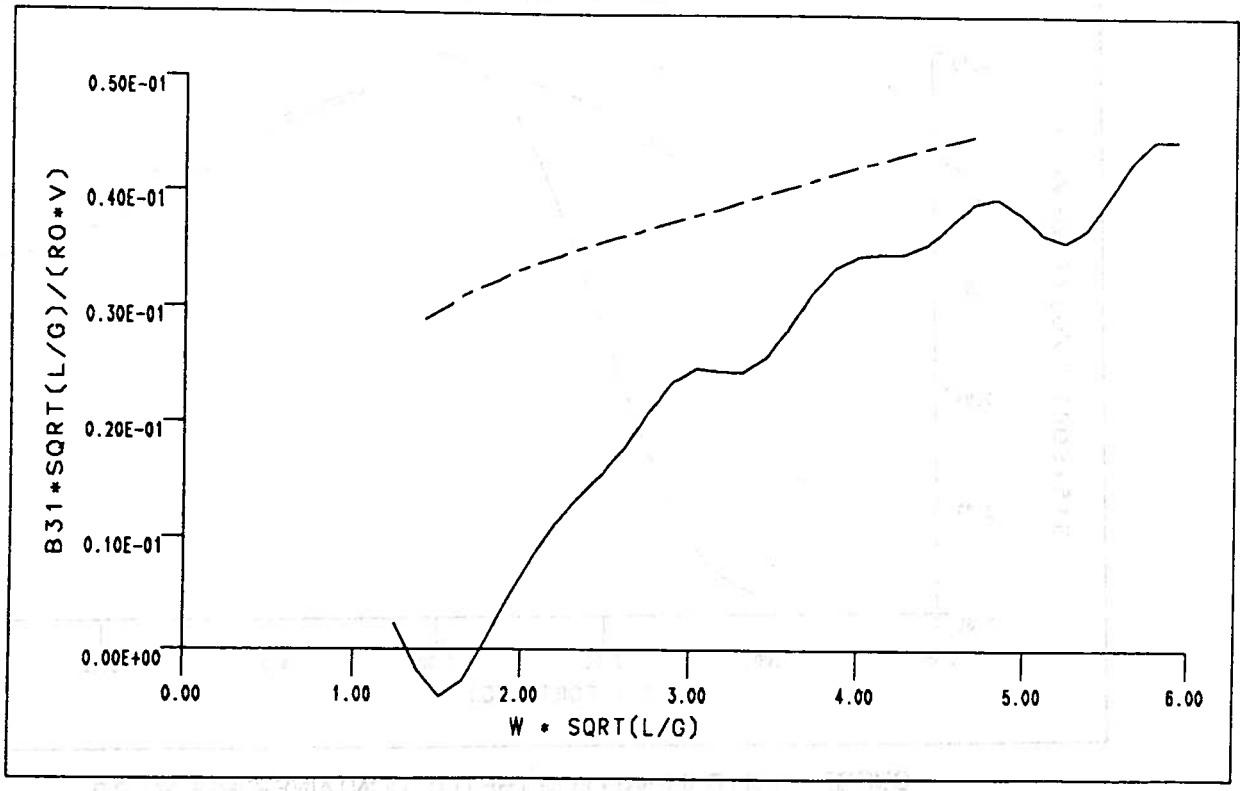
SURGE-PITCH ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 167



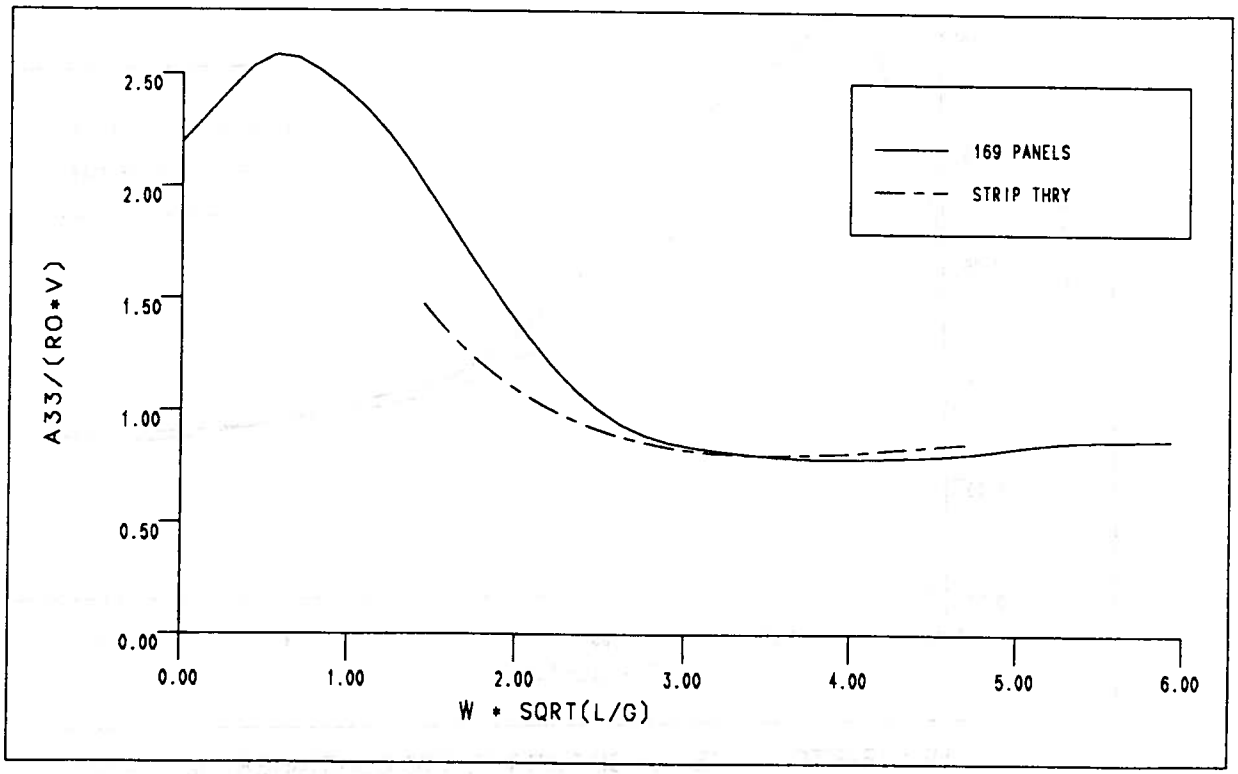
SURGE-PITCH DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 168



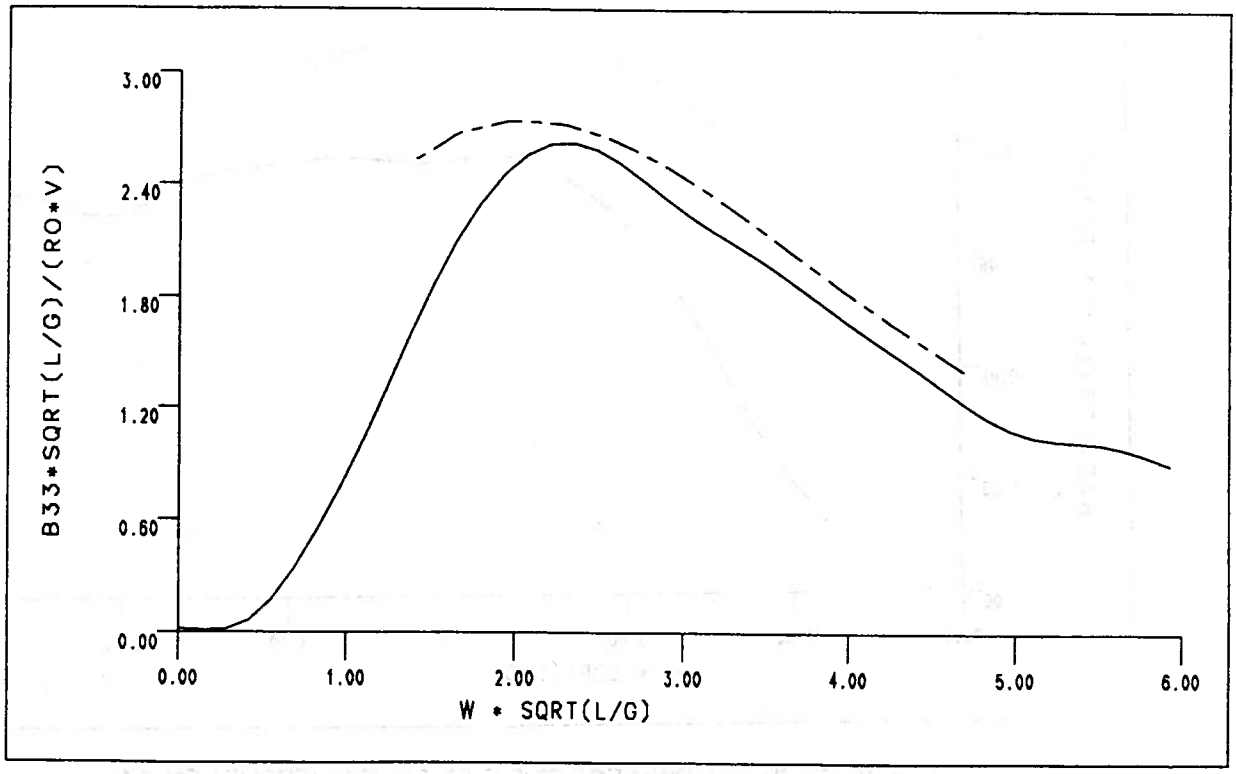
HEAVE-SURGE ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 169



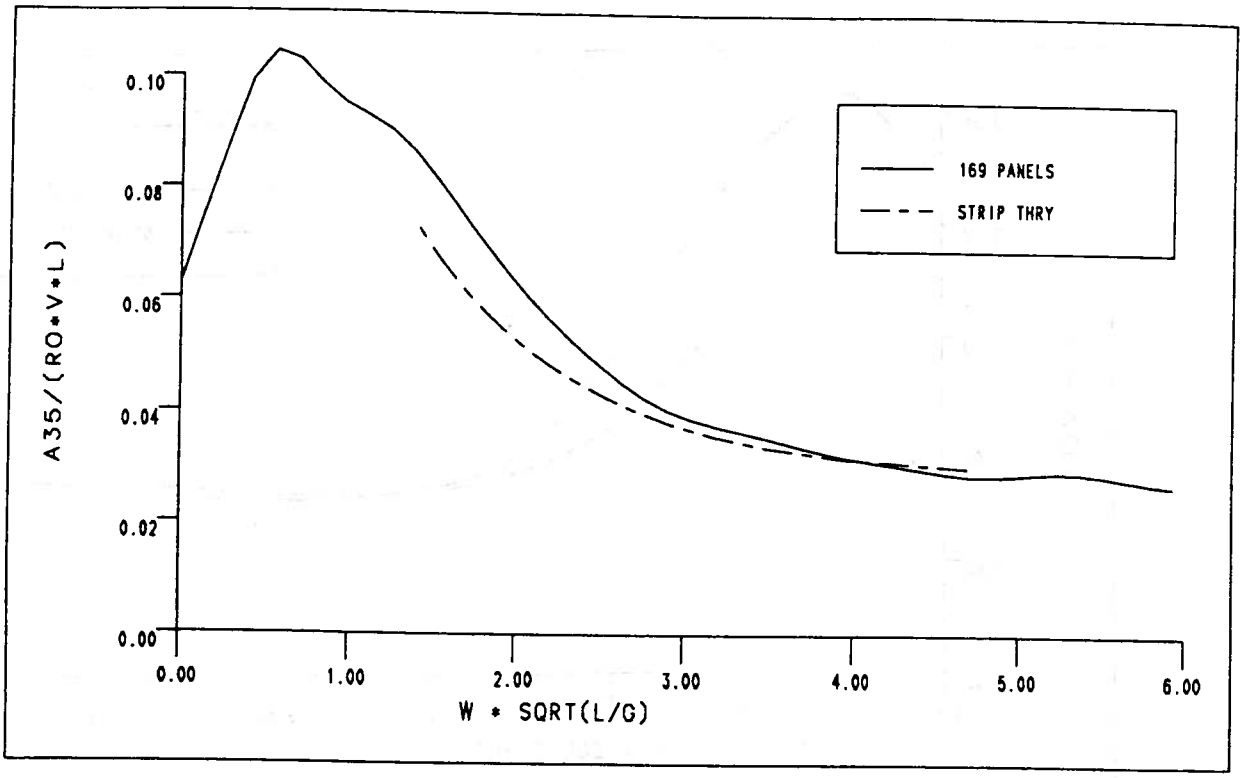
HEAVE-SURGE DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 170



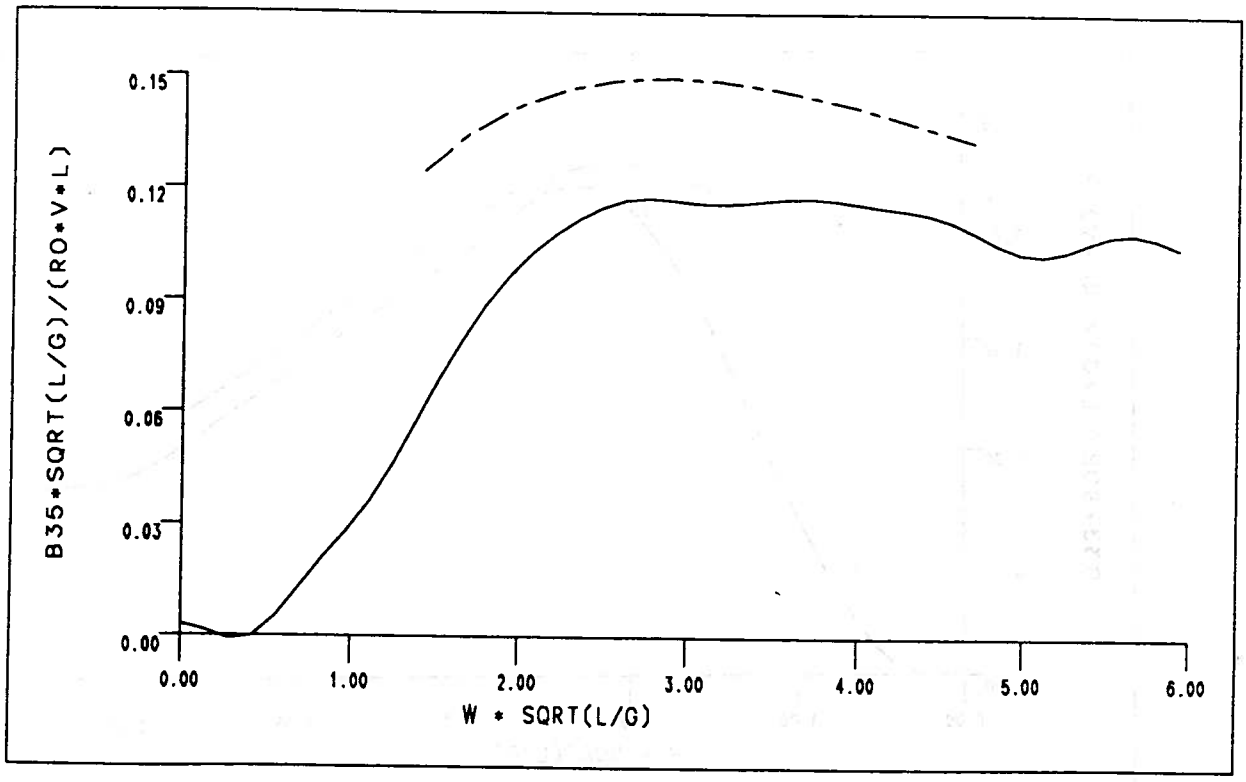
HEAVE ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 171



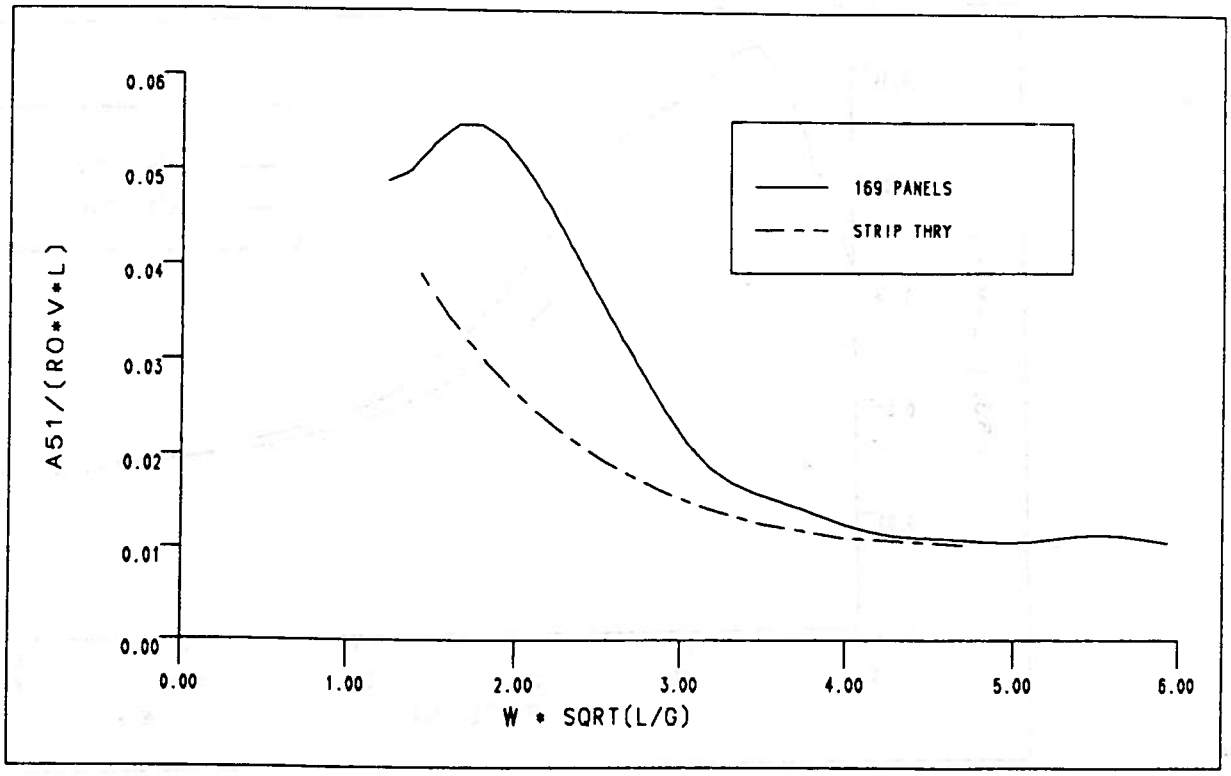
HEAVE DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 172



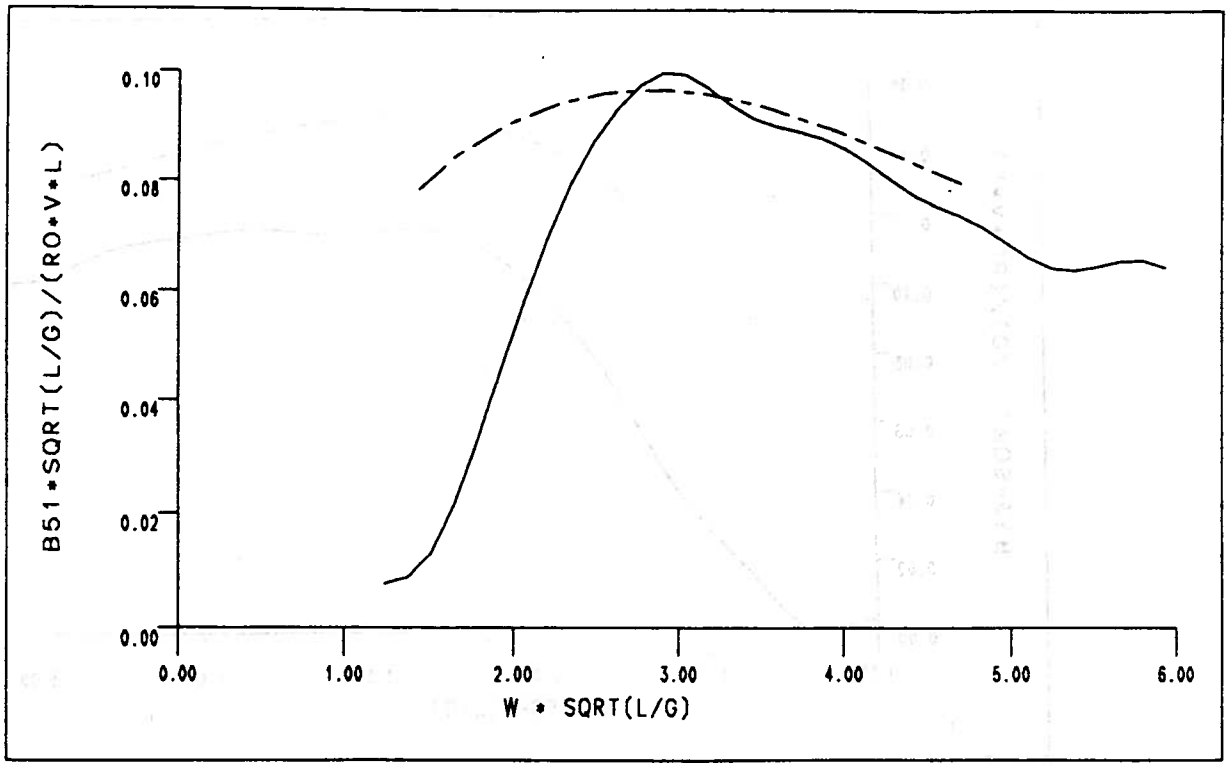
HEAVE-PITCH ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 173



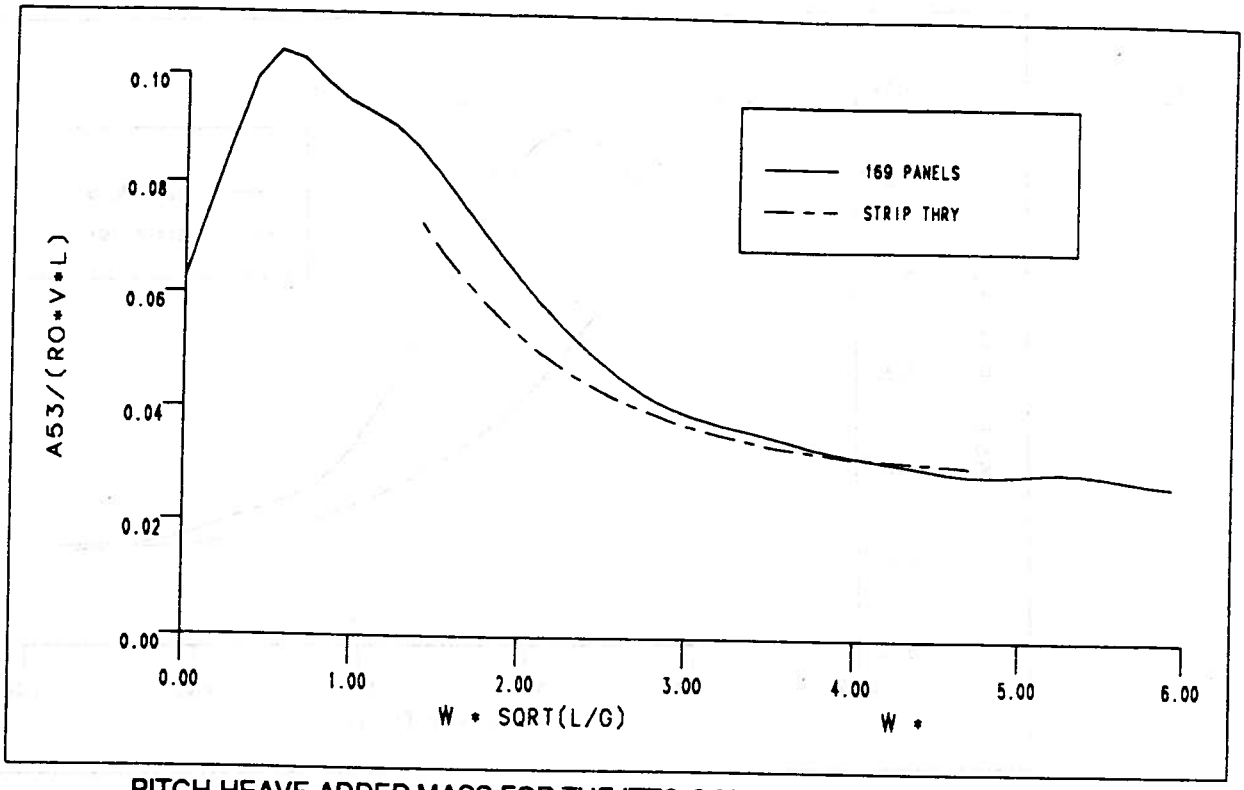
HEAVE-PITCH DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 174



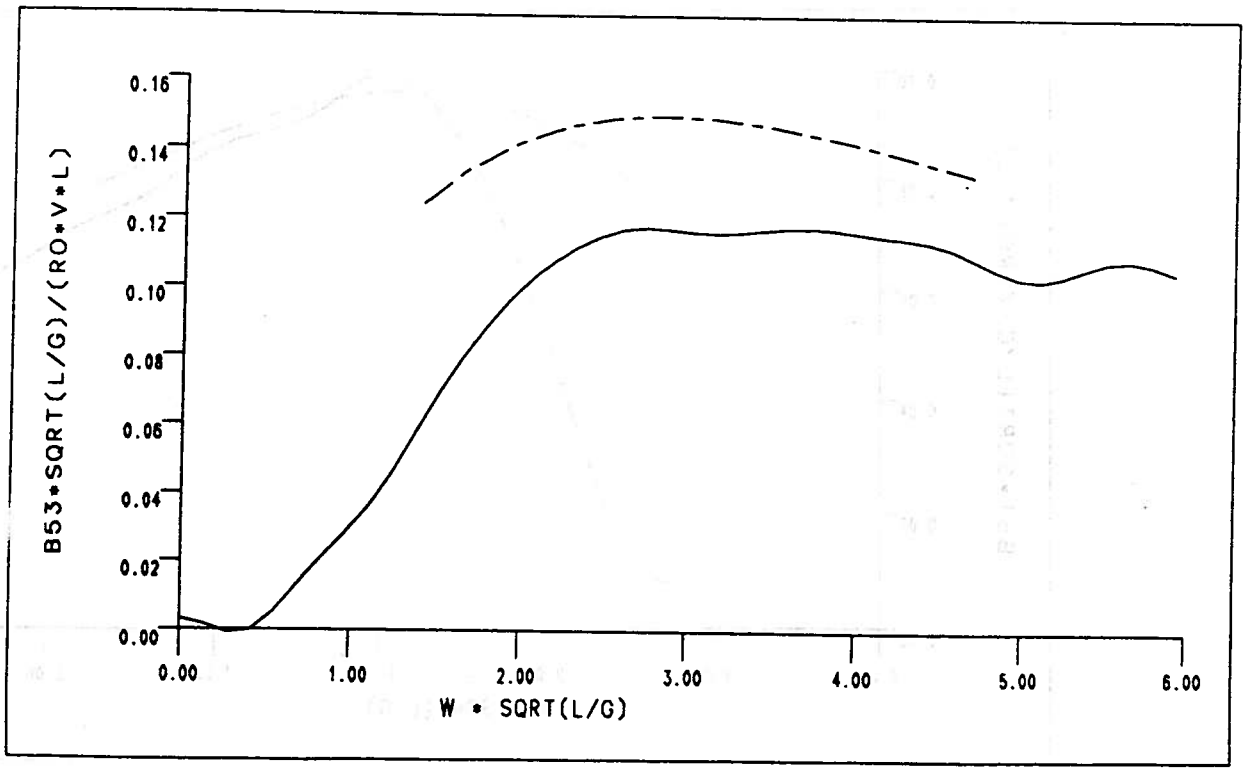
PITCH-SURGE ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 175



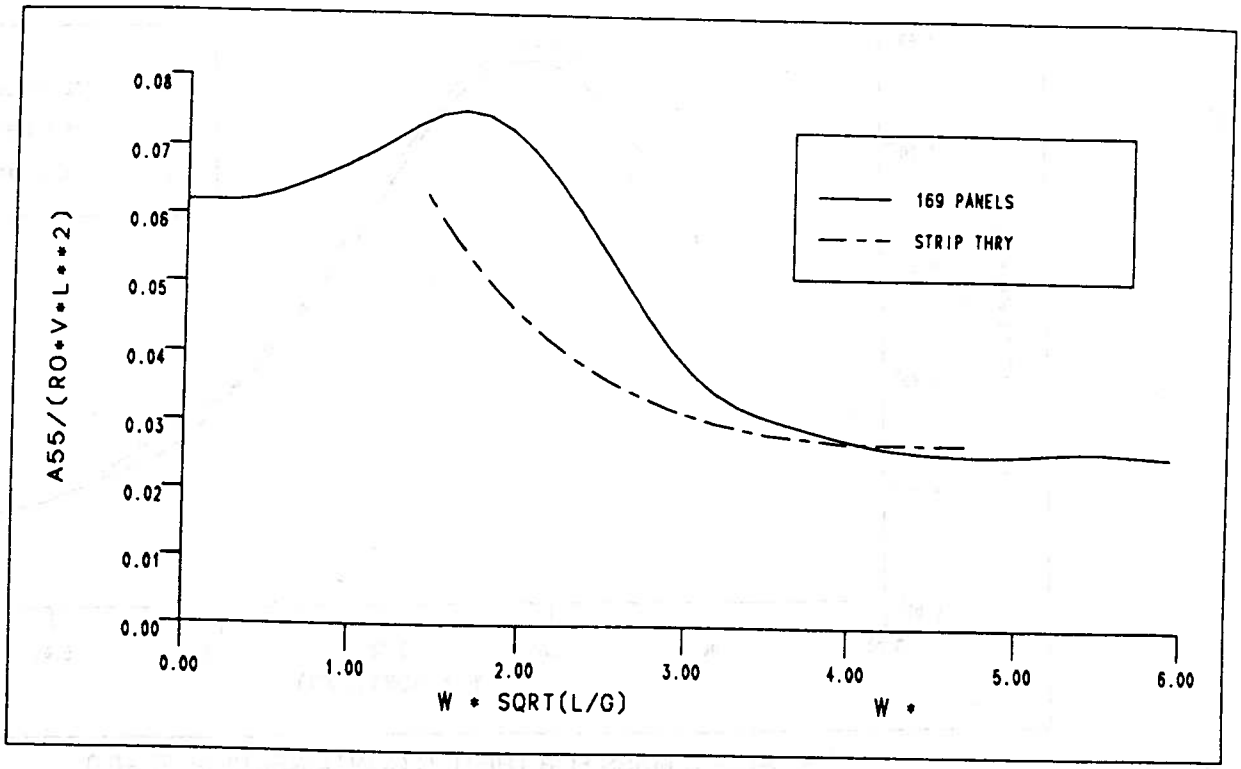
PITCH-SURGE DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 176



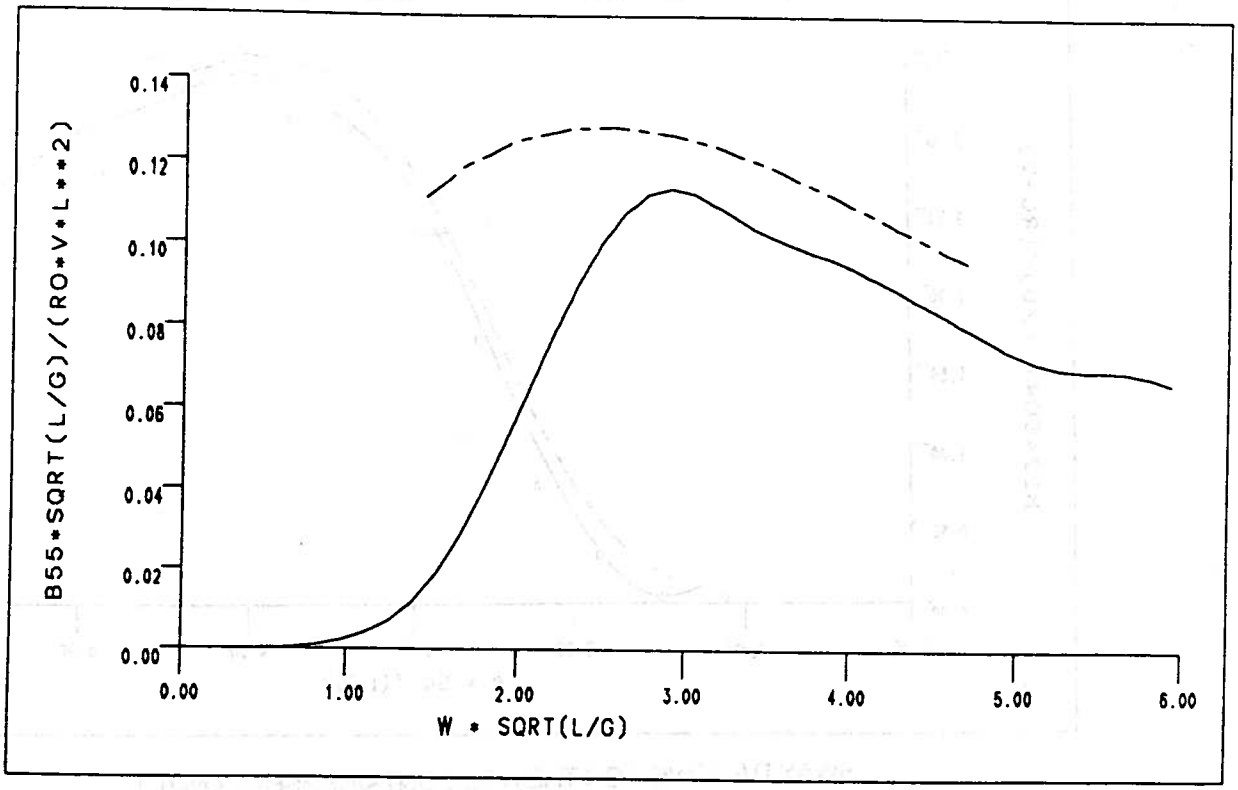
PITCH-HEAVE ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 177



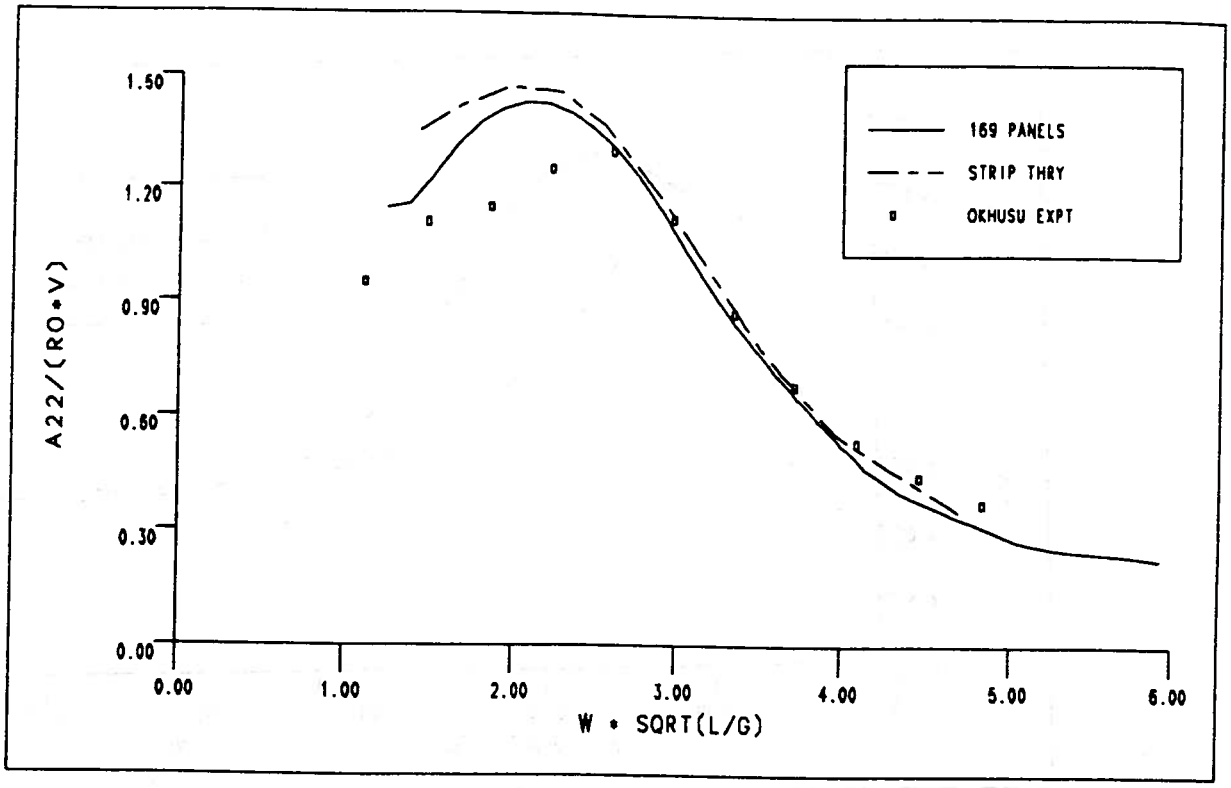
PITCH-HEAVE DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 178



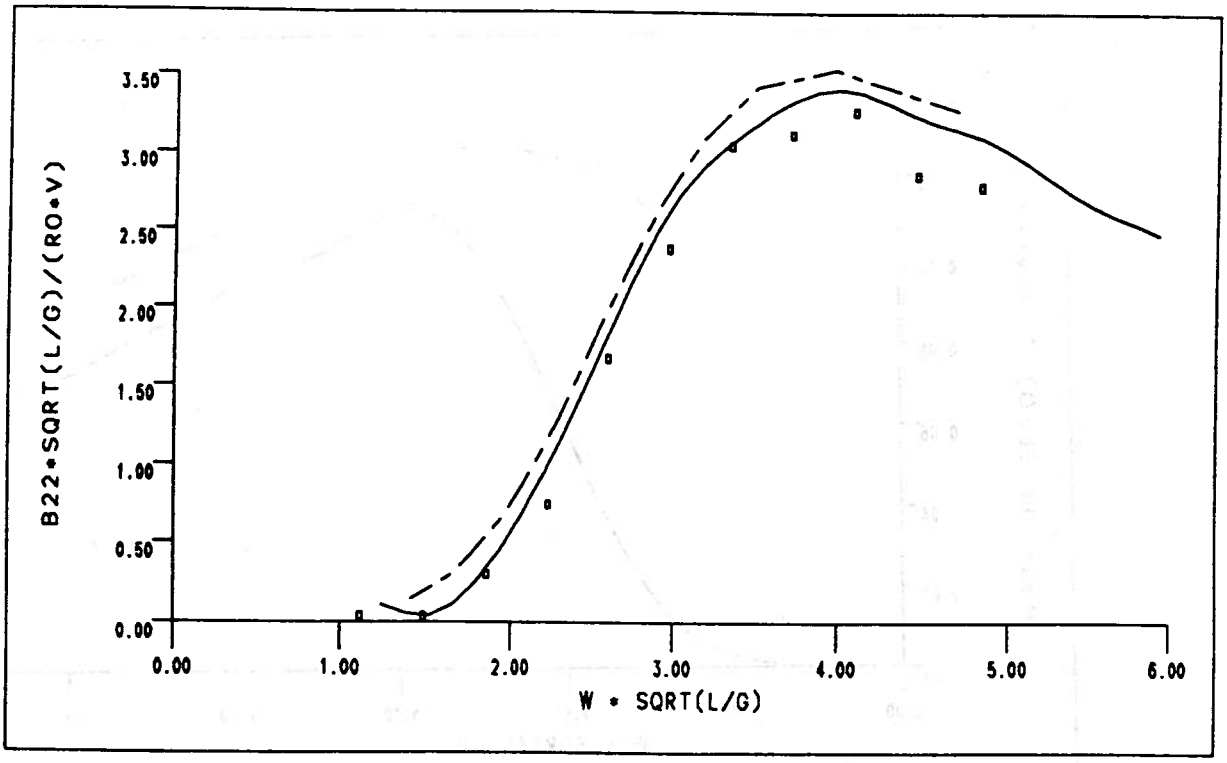
PITCH ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 179



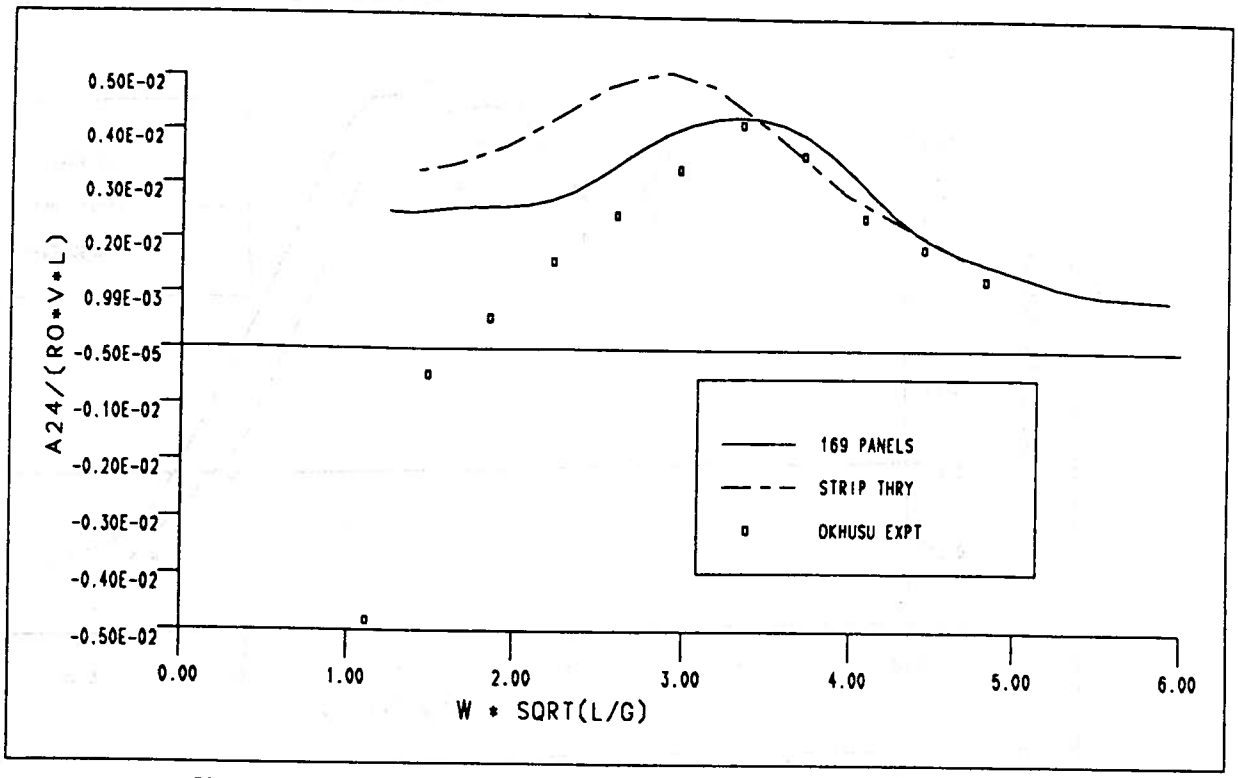
PITCH DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 180



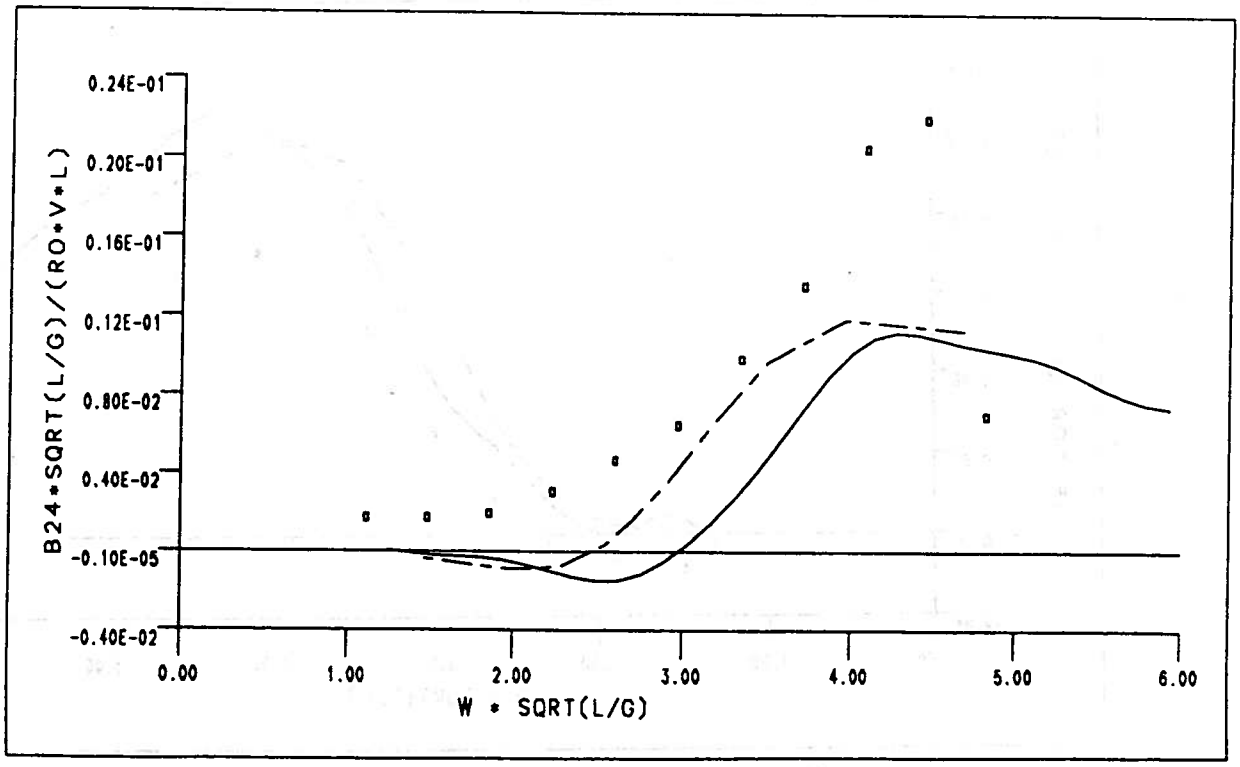
SWAY ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 181



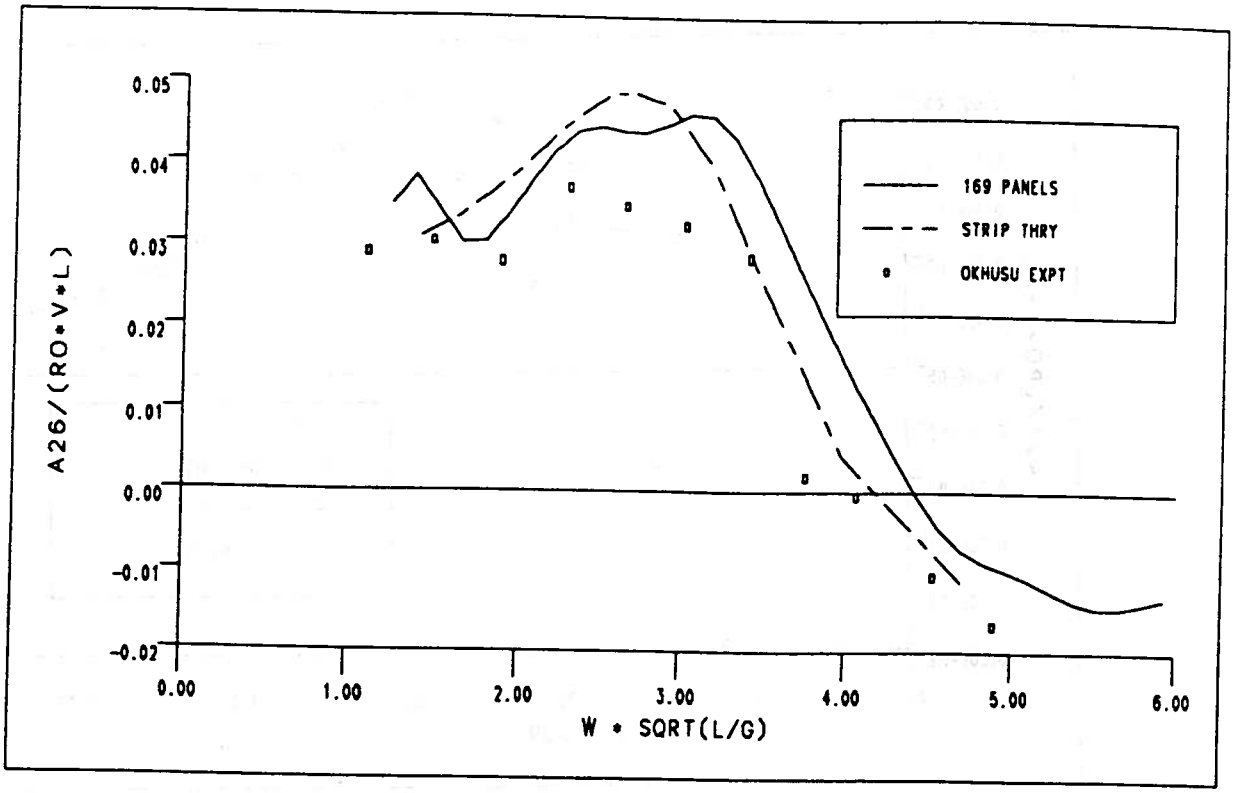
SWAY DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 182



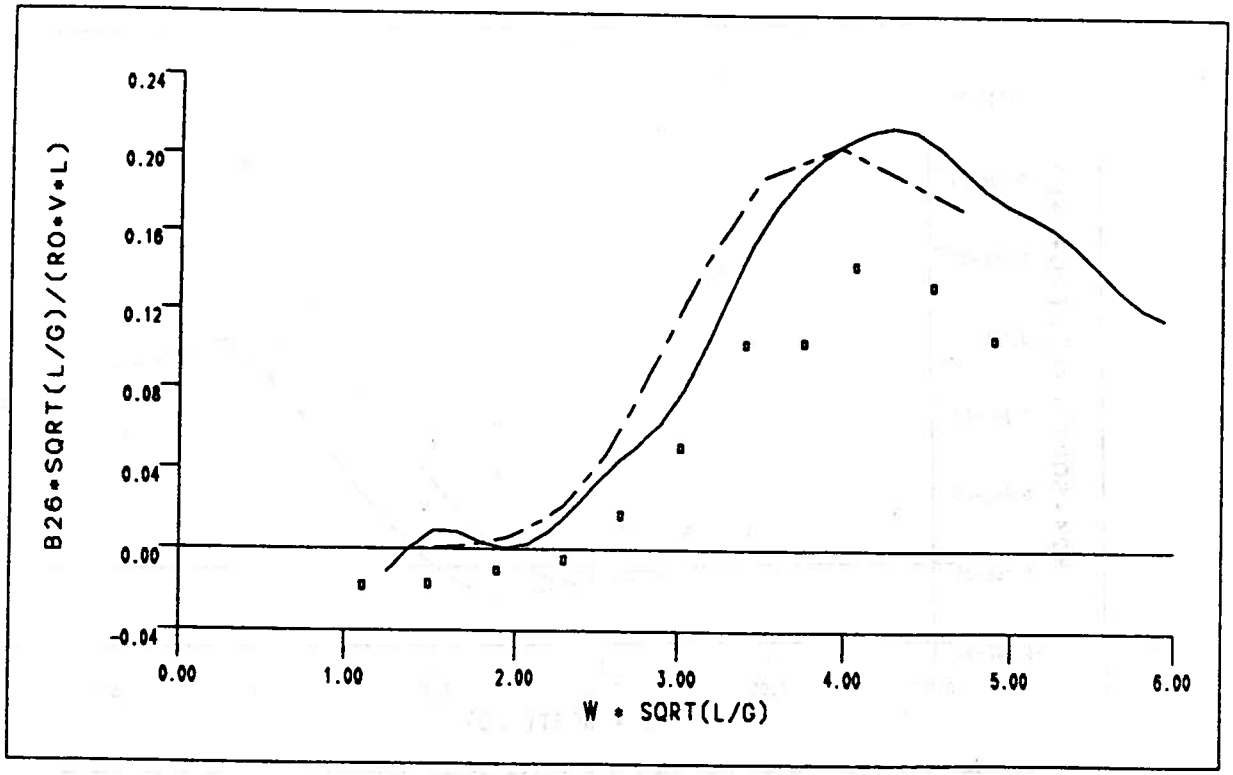
SWAY-ROLL ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 183



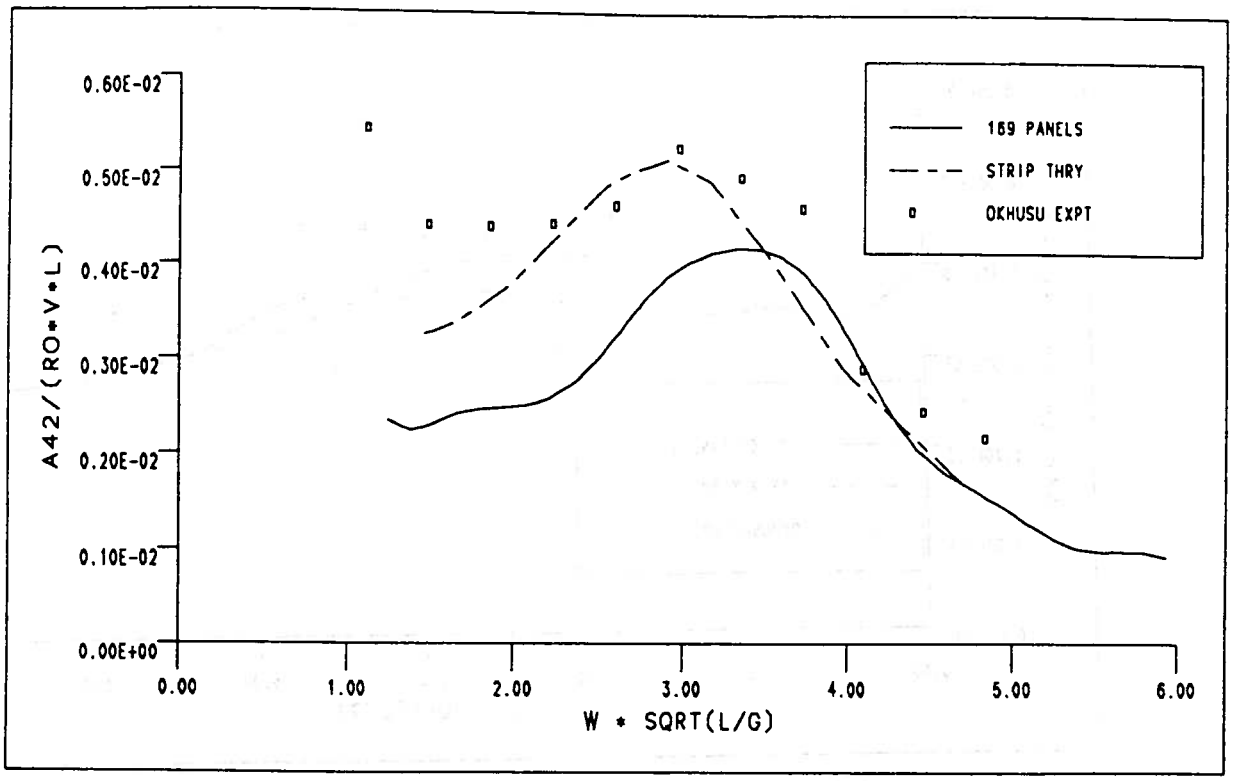
SWAY-ROLL DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 184



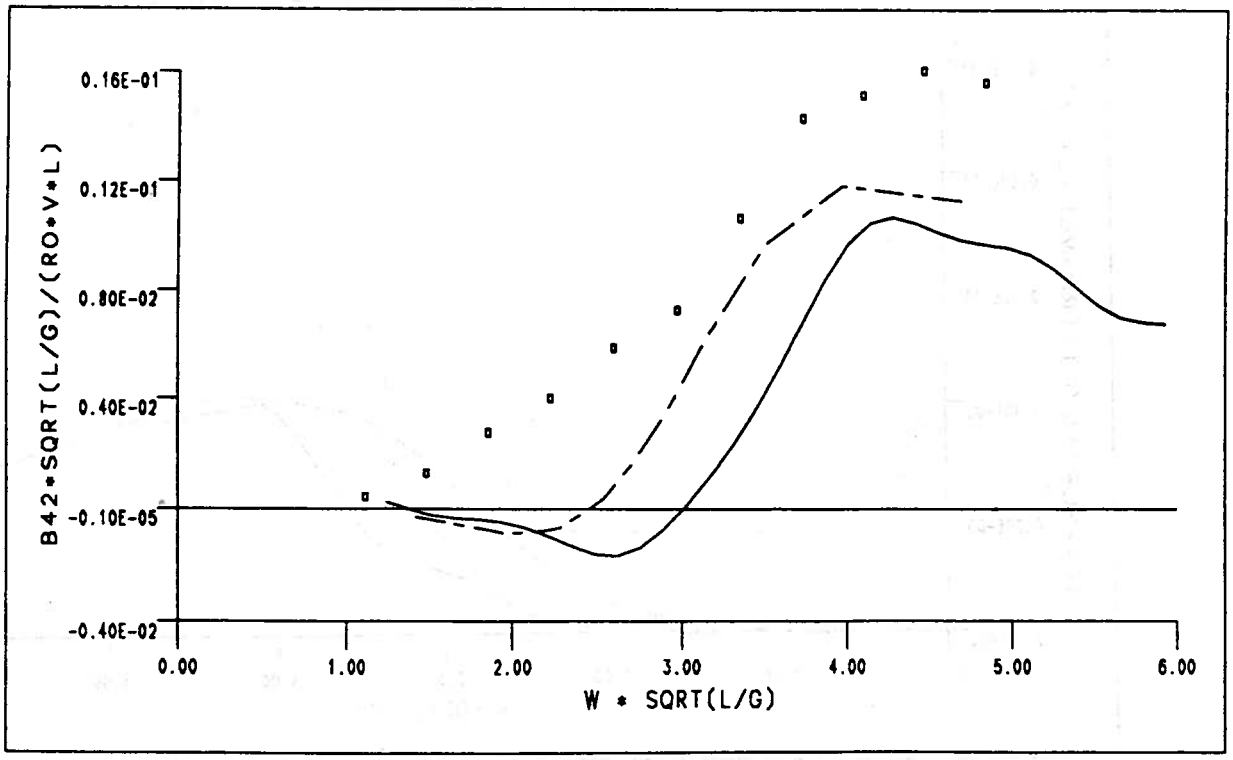
SWAY-YAW ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 185



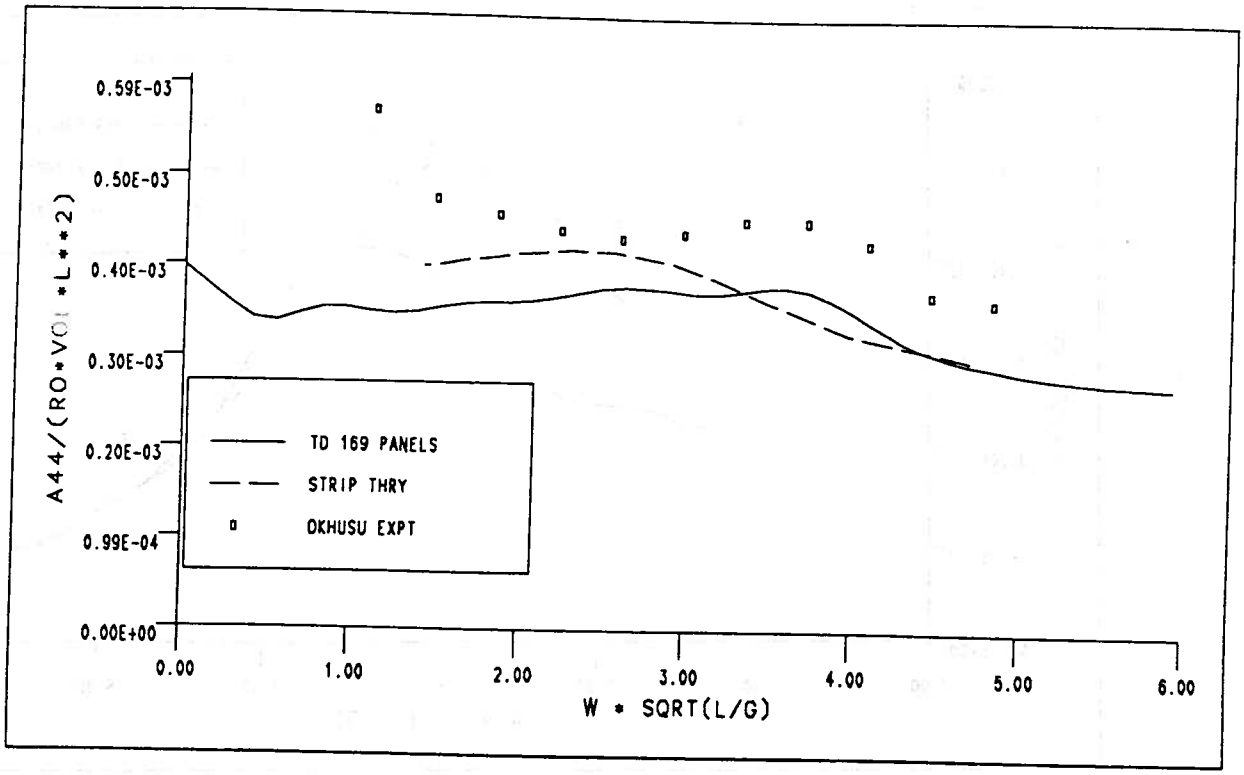
SWAY-YAW DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 186



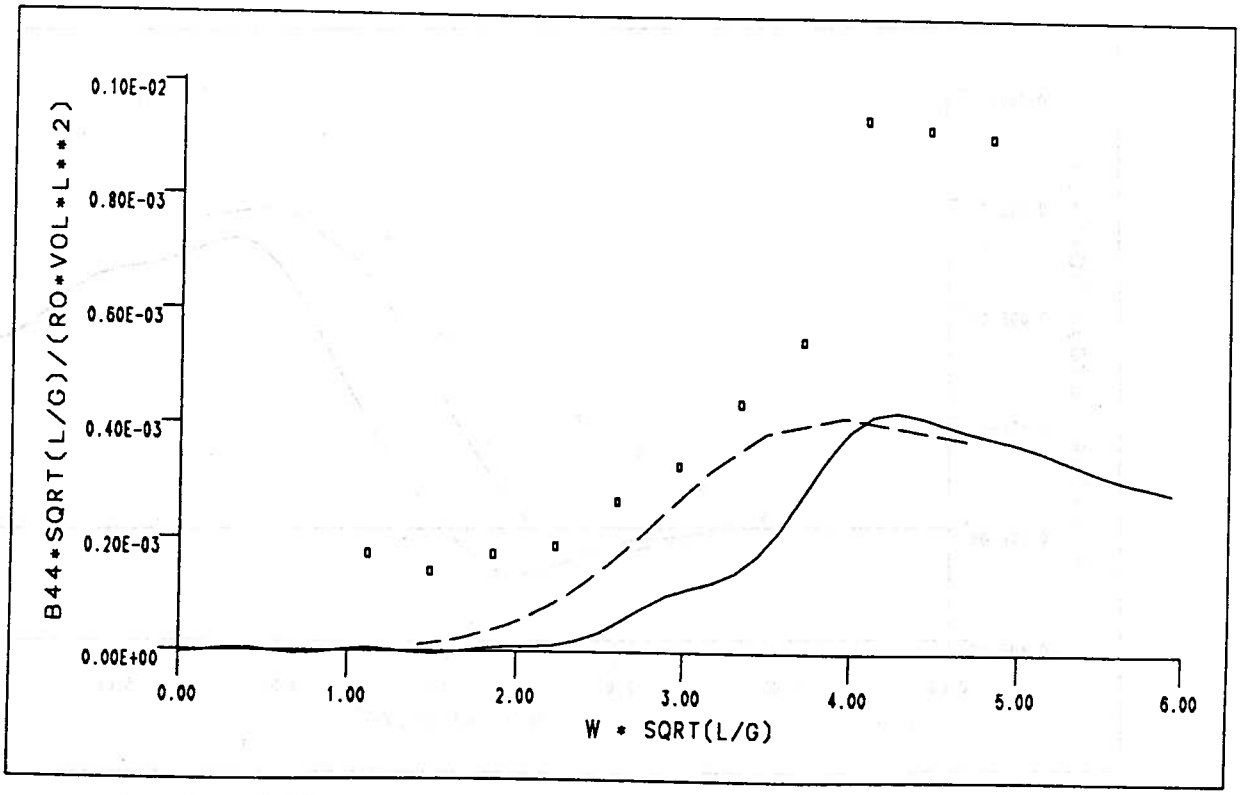
ROLL-SWAY ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 187



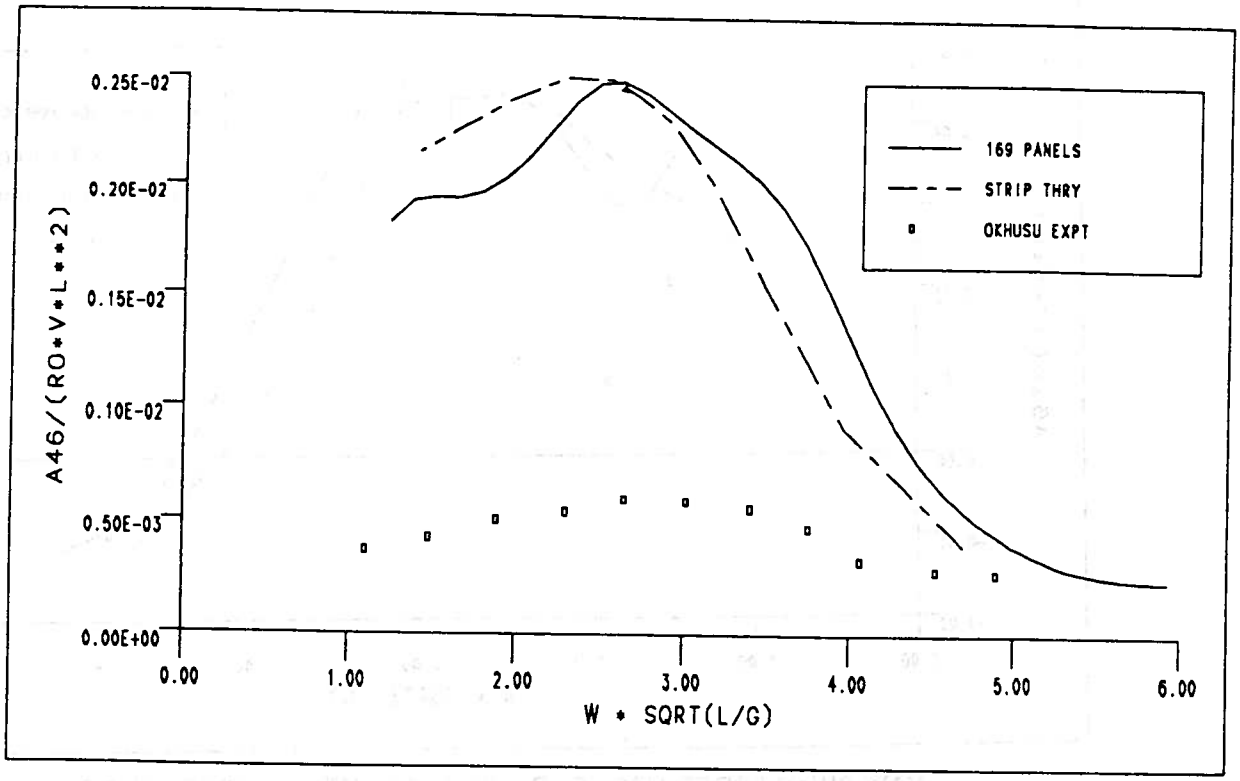
ROLL-SWAY DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 188



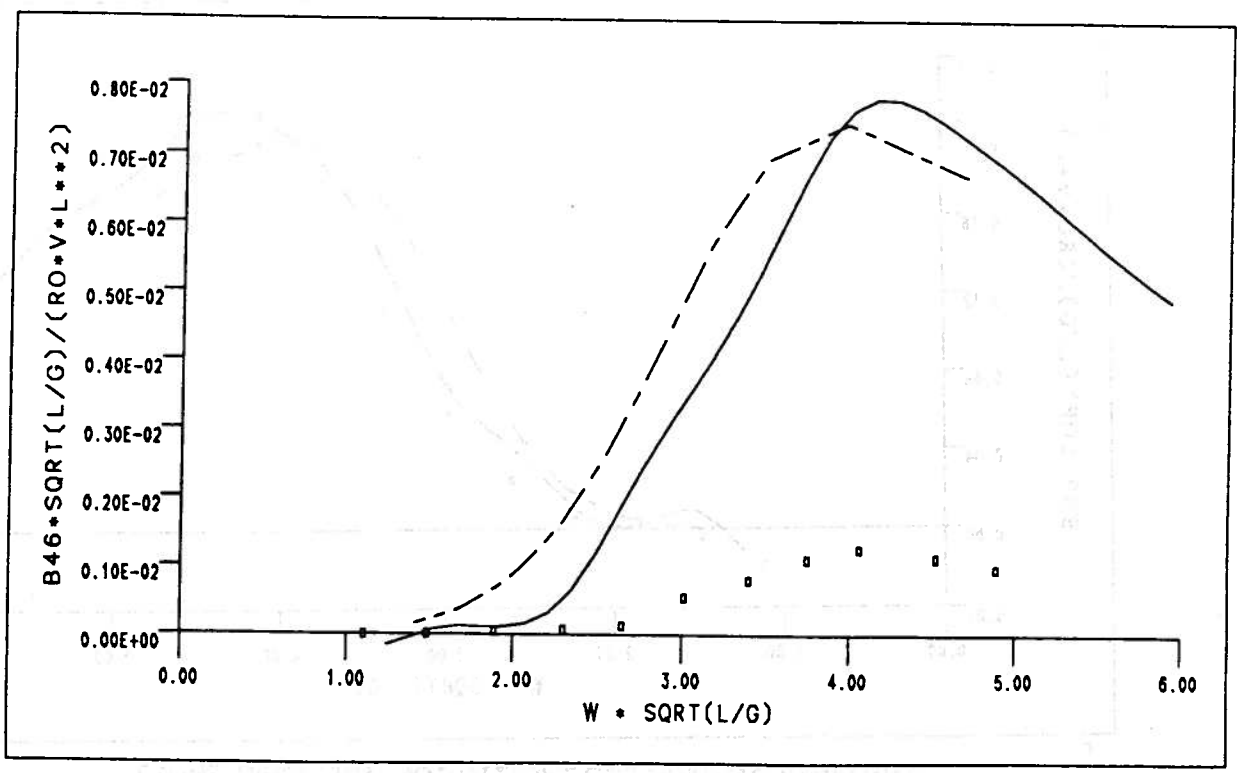
ROLL ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 189



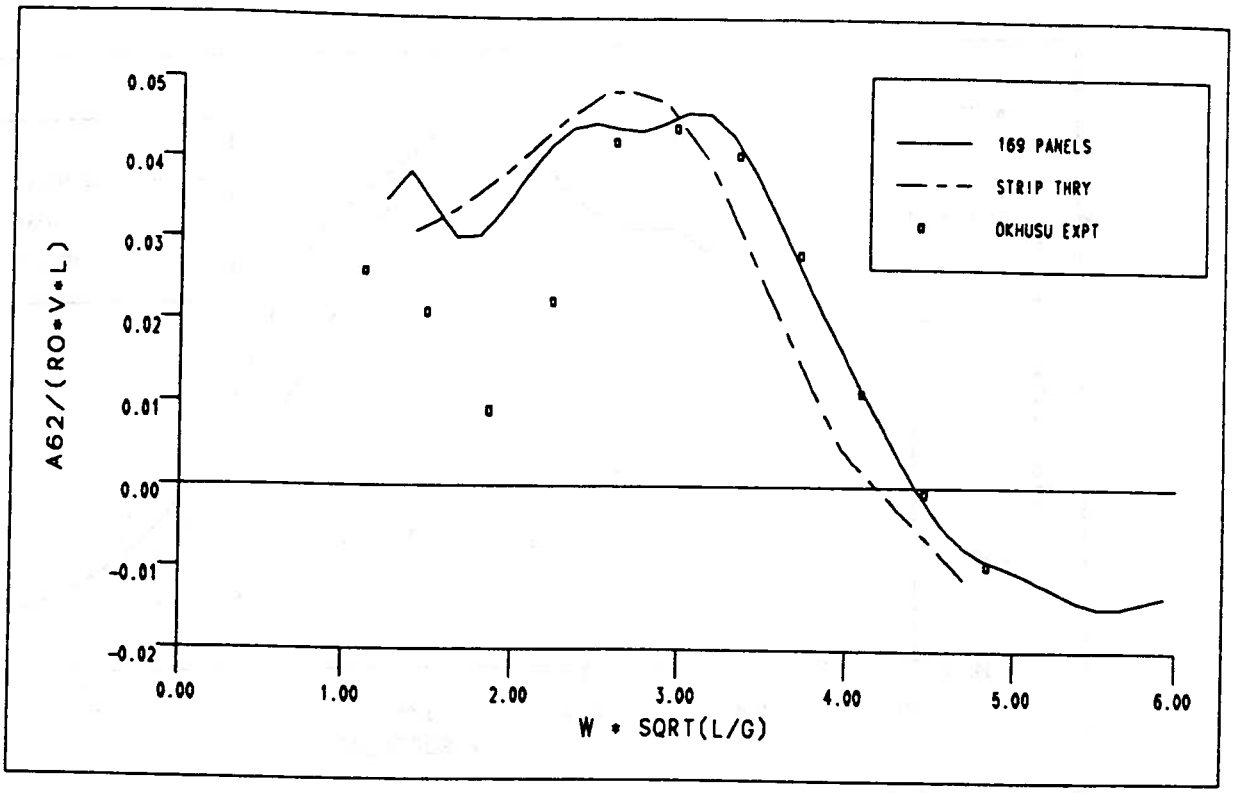
ROLL DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 190



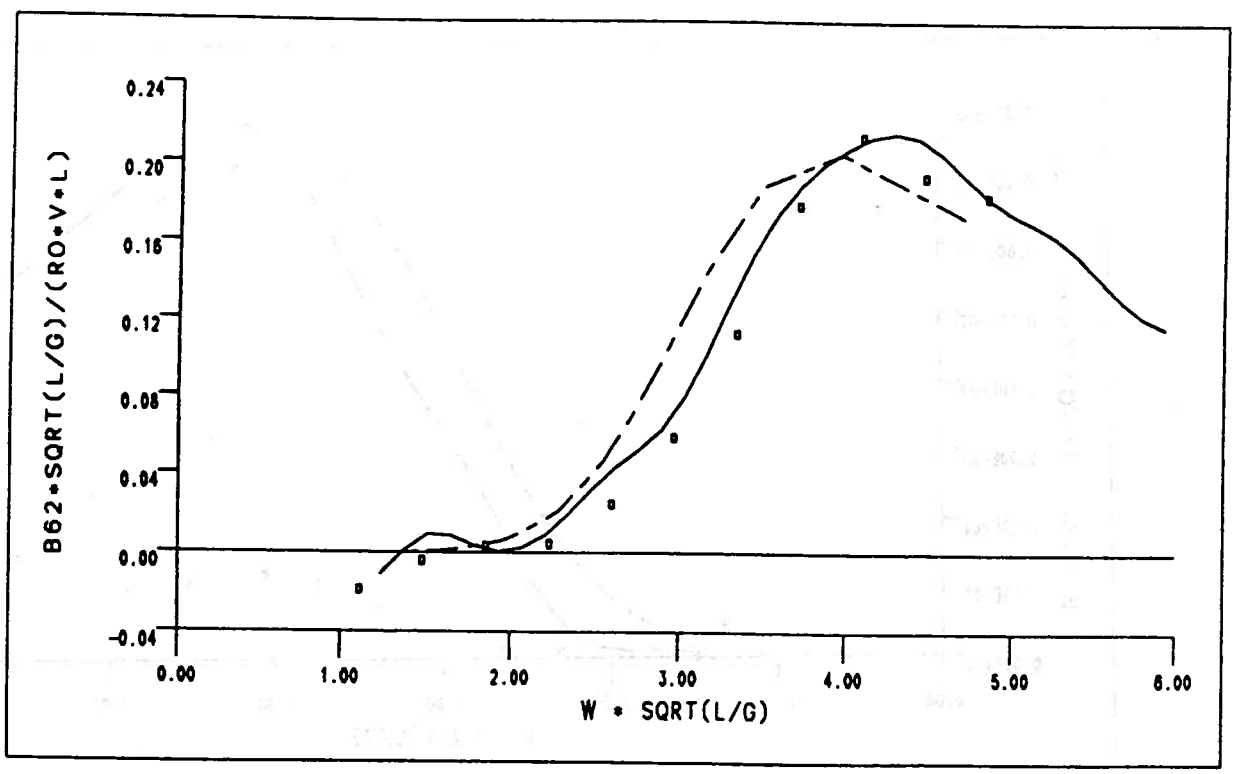
ROLL-YAW ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 191



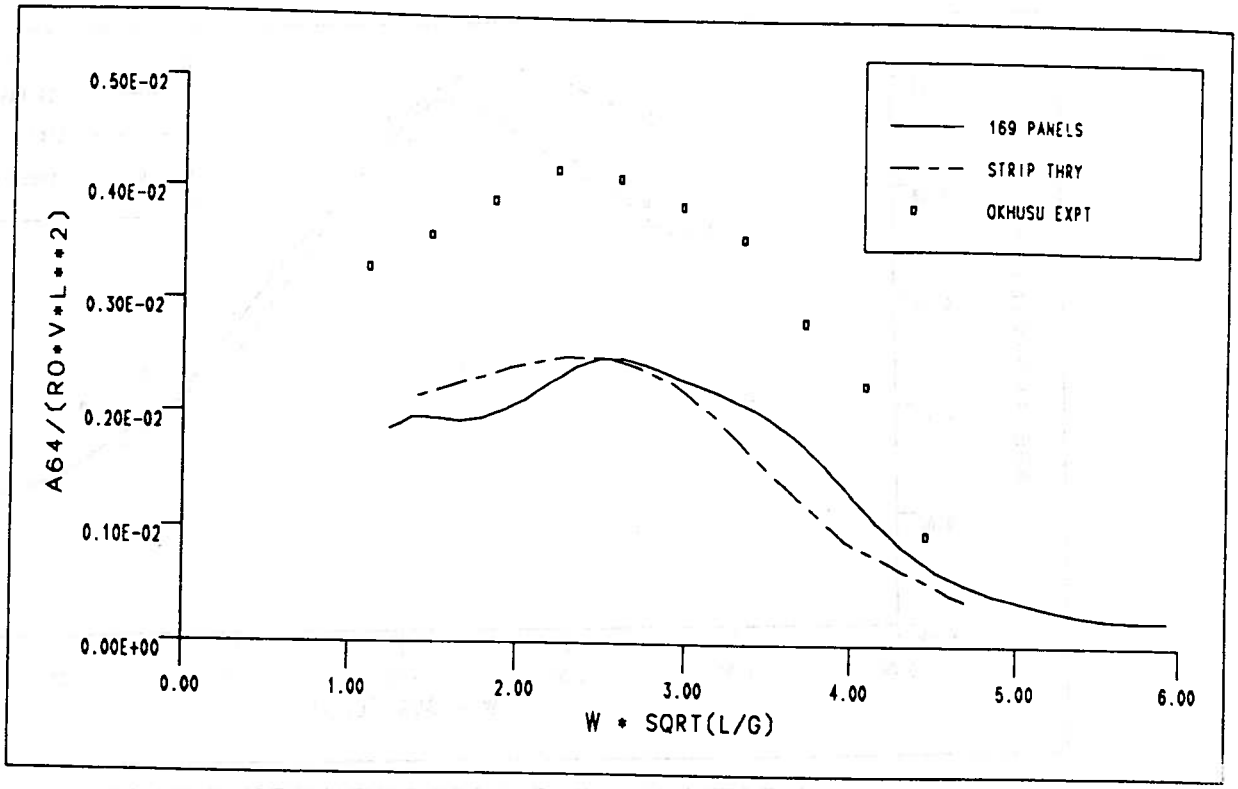
ROLL-YAW DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 192



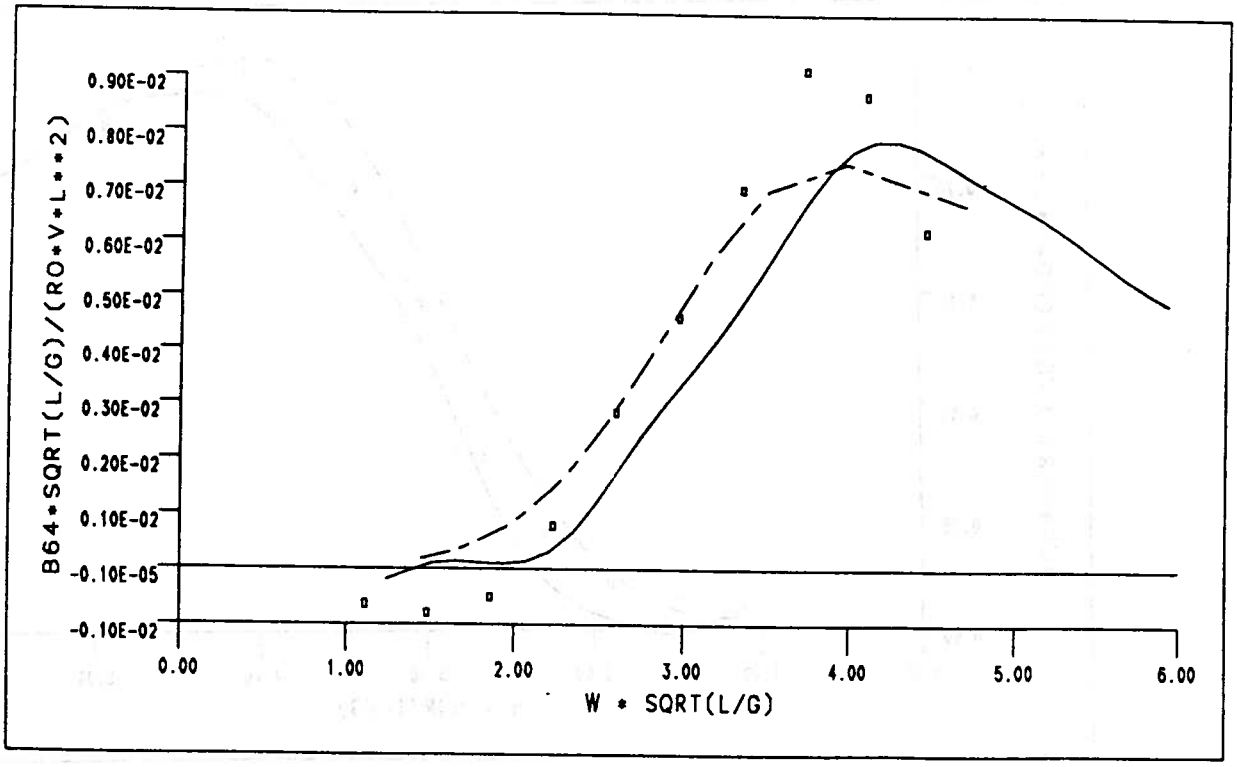
YAW-SWAY ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 193



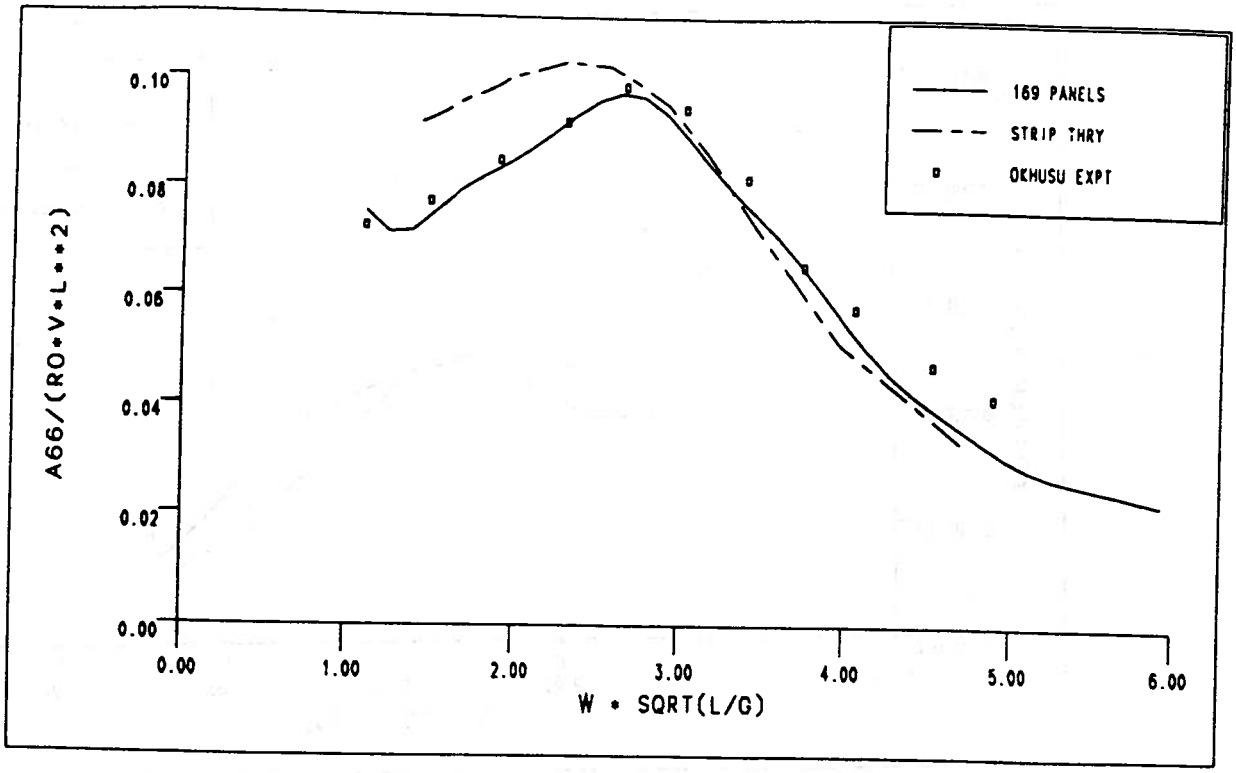
YAW-SWAY DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 194



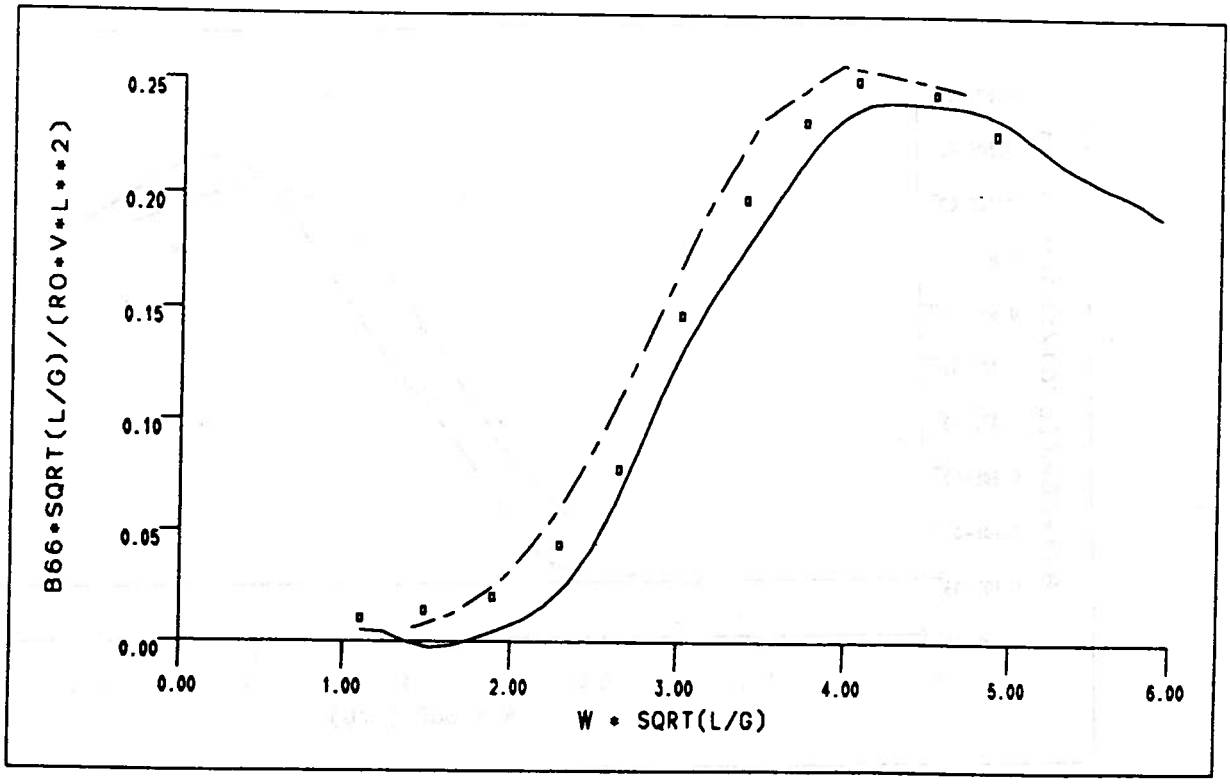
YAW-ROLL ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 195



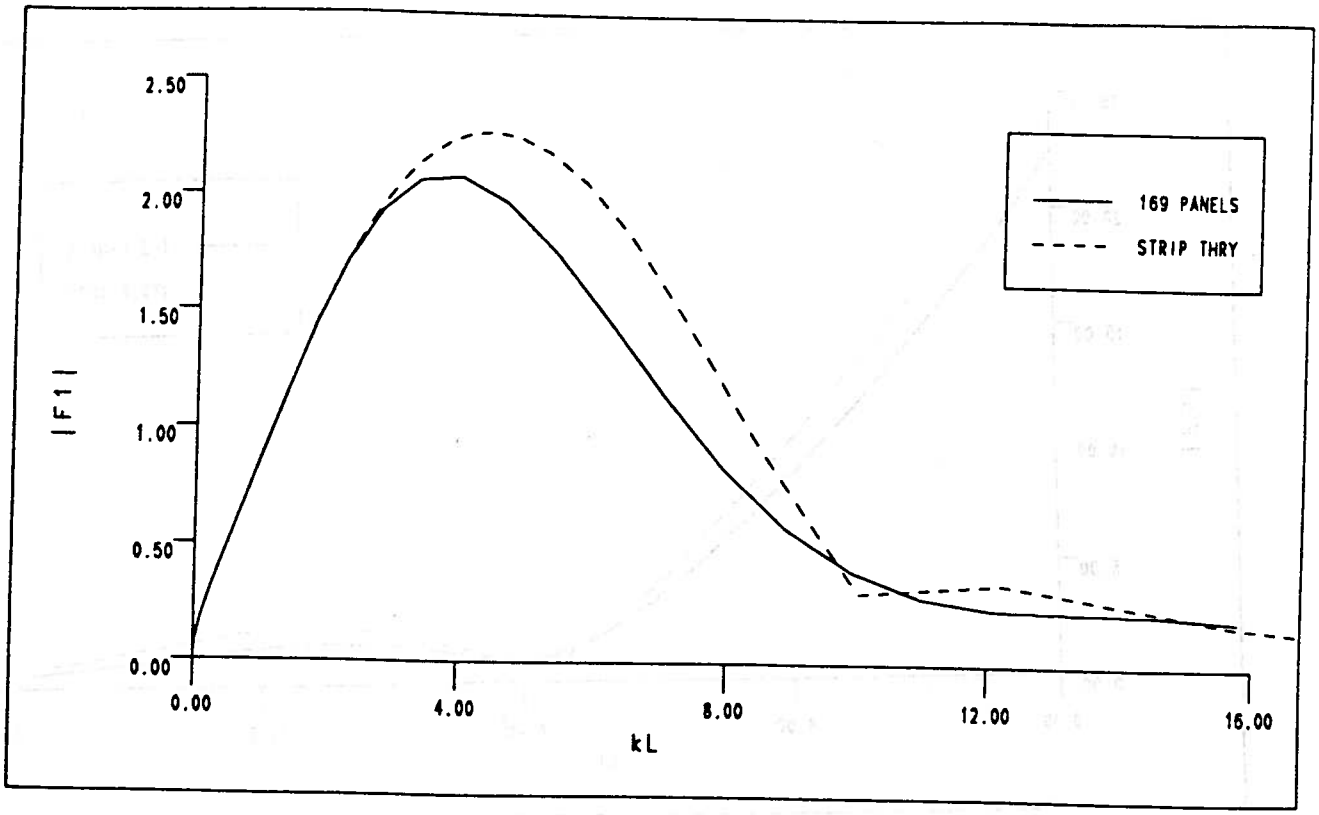
YAW-ROLL DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 196



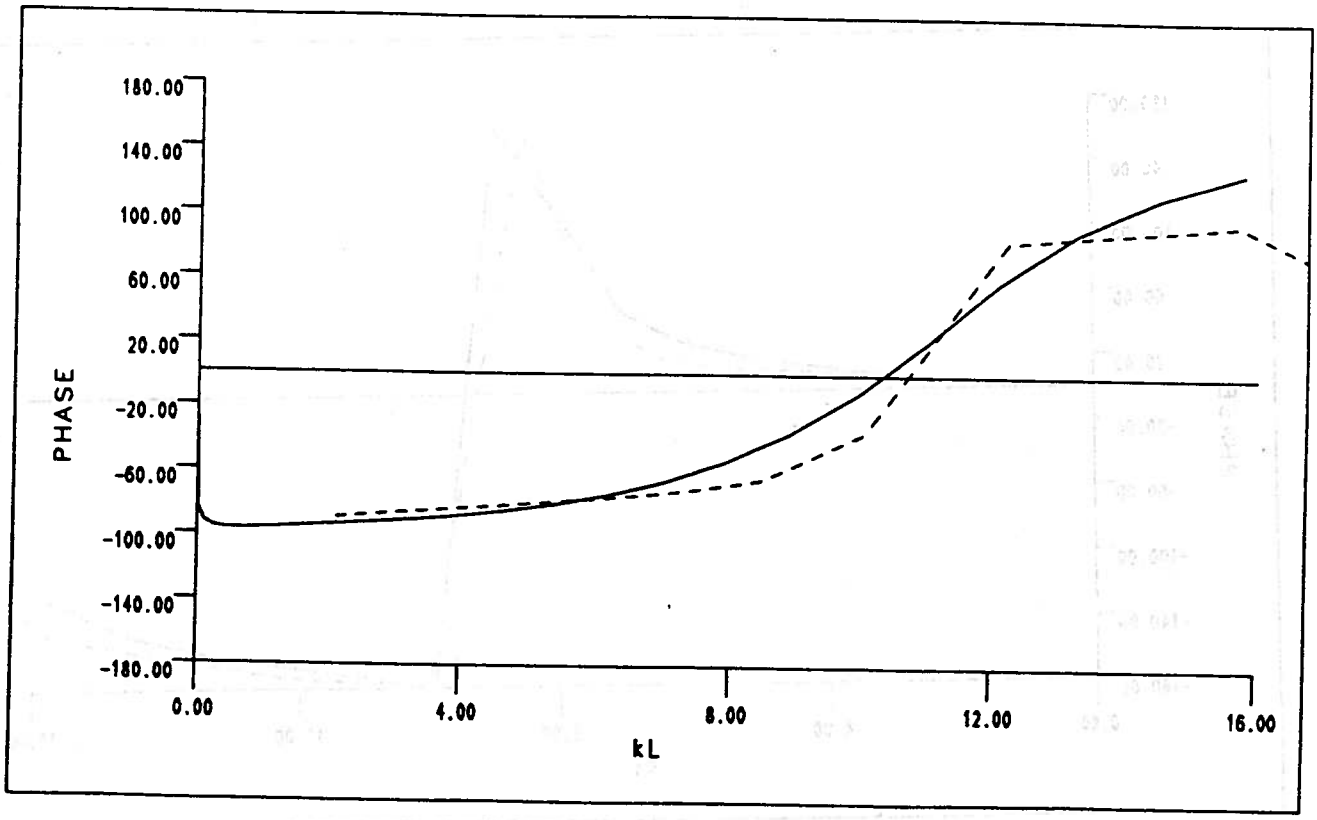
YAW ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 197



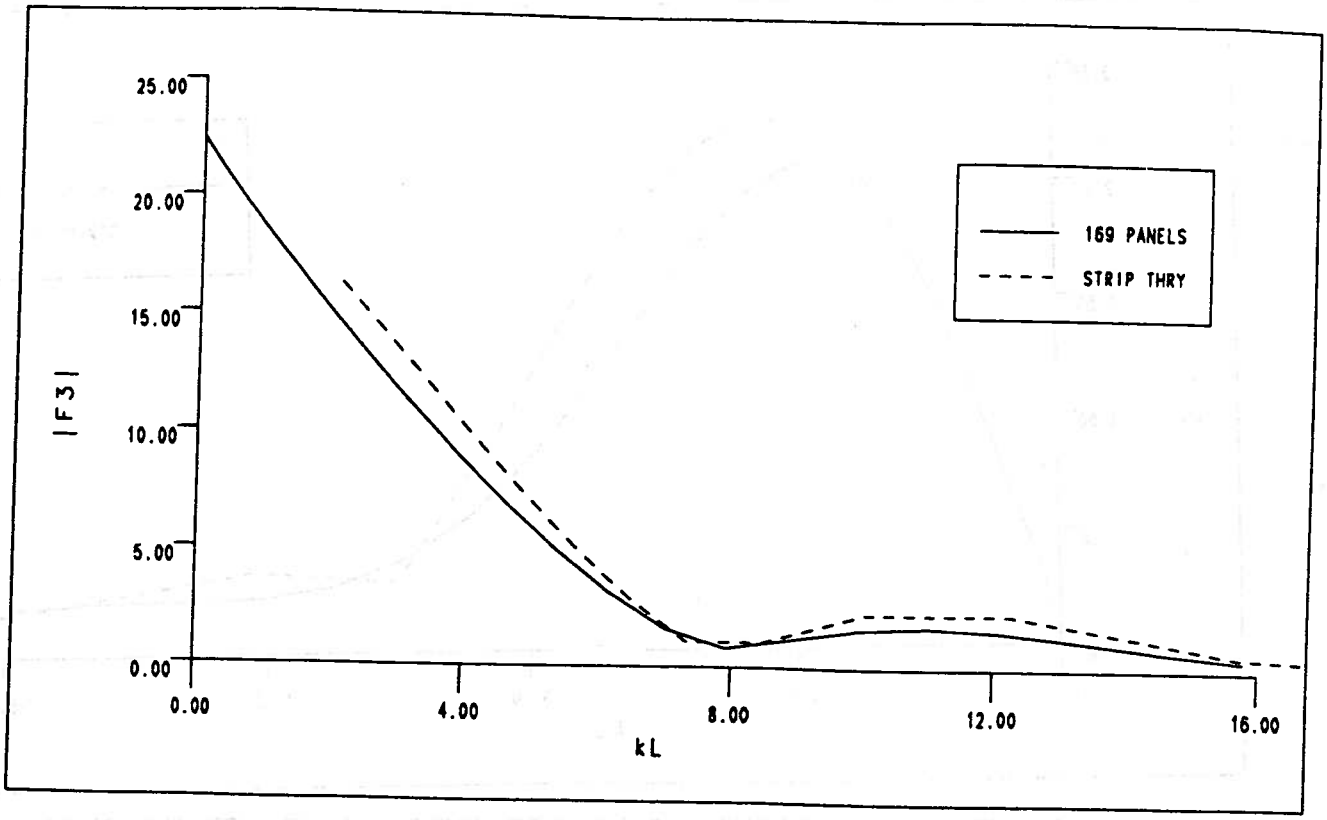
YAW DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 198



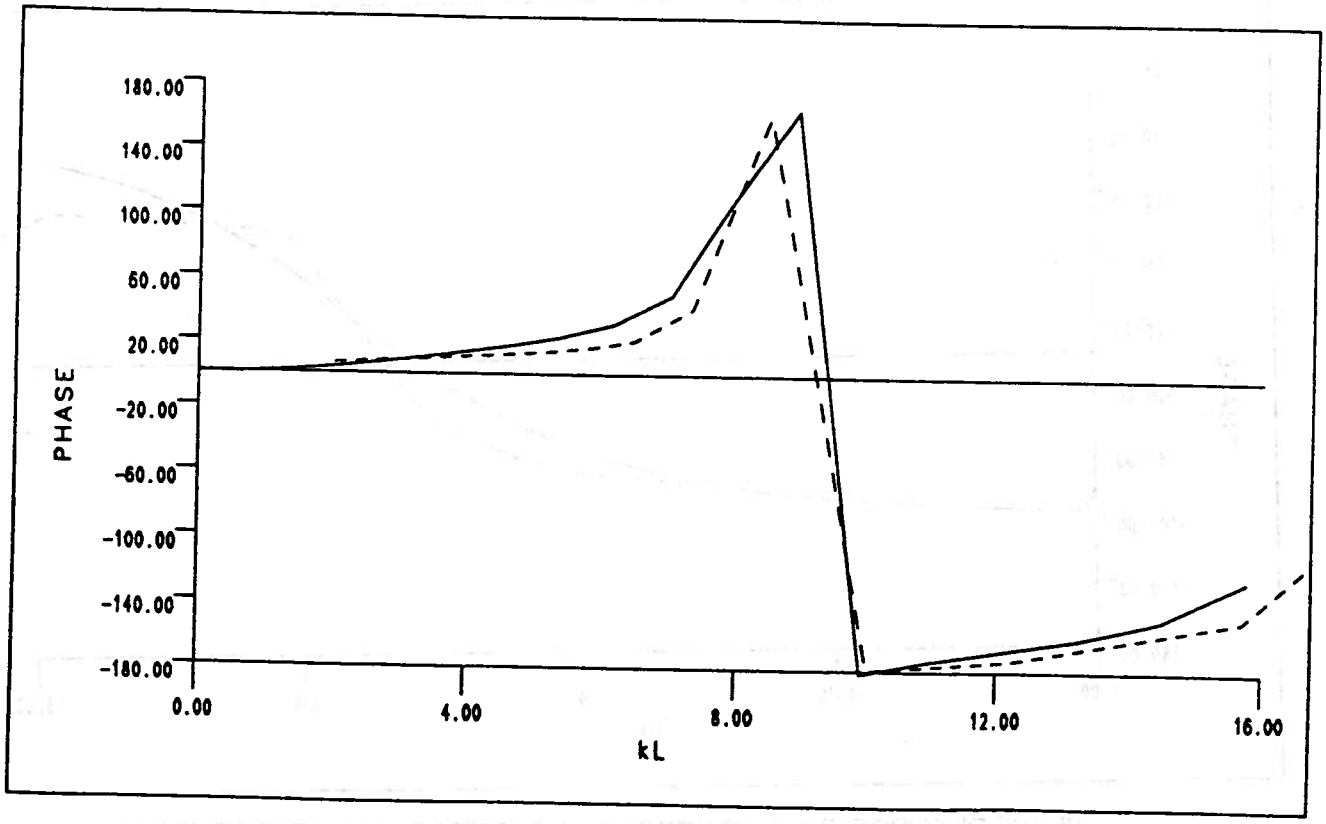
MAGNITUDE OF SURGE EXCITING FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 199



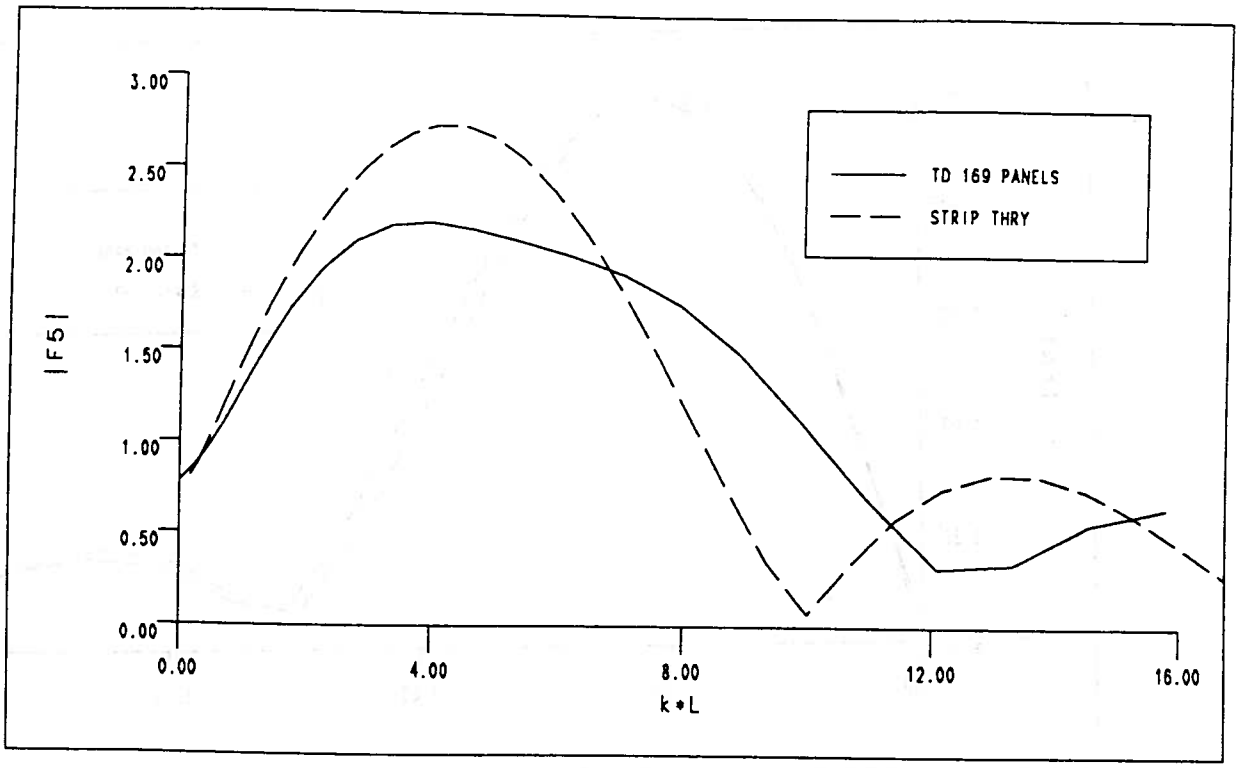
PHASE OF SURGE EXCITING FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 200



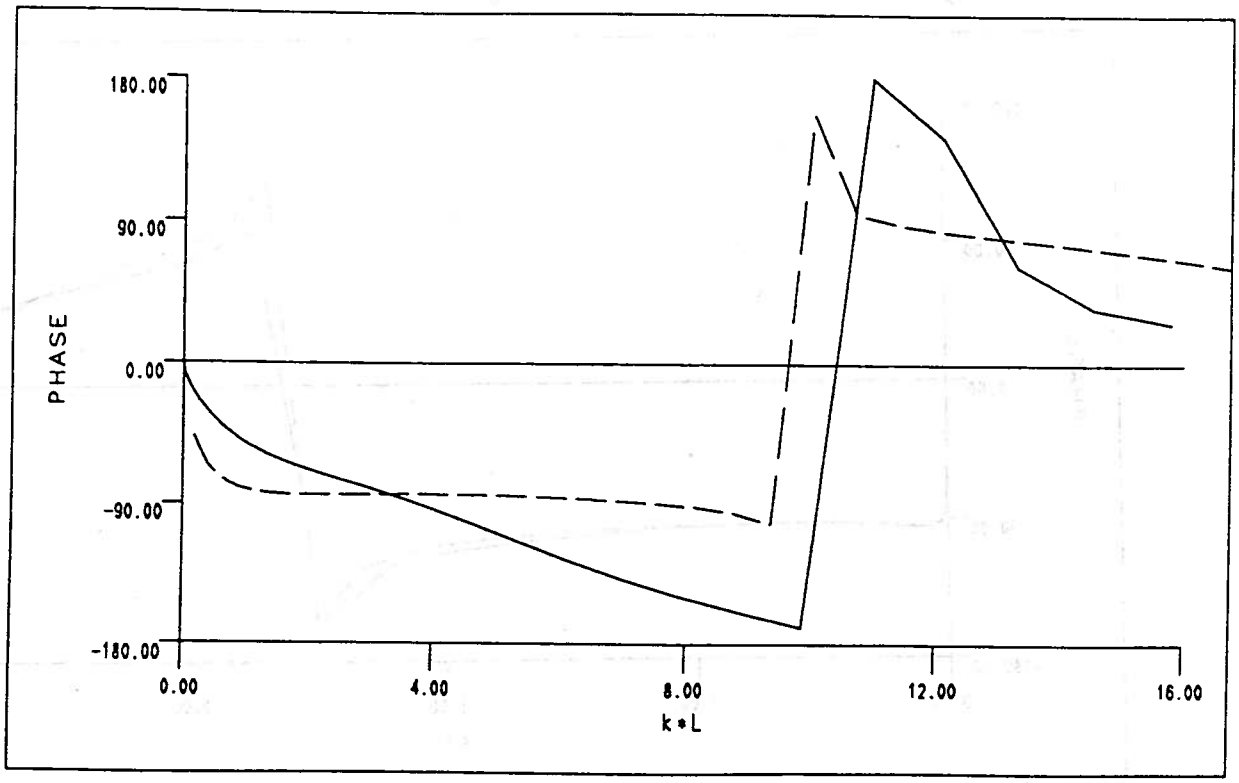
MAGNITUDE OF HEAVE EXCITING FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 201



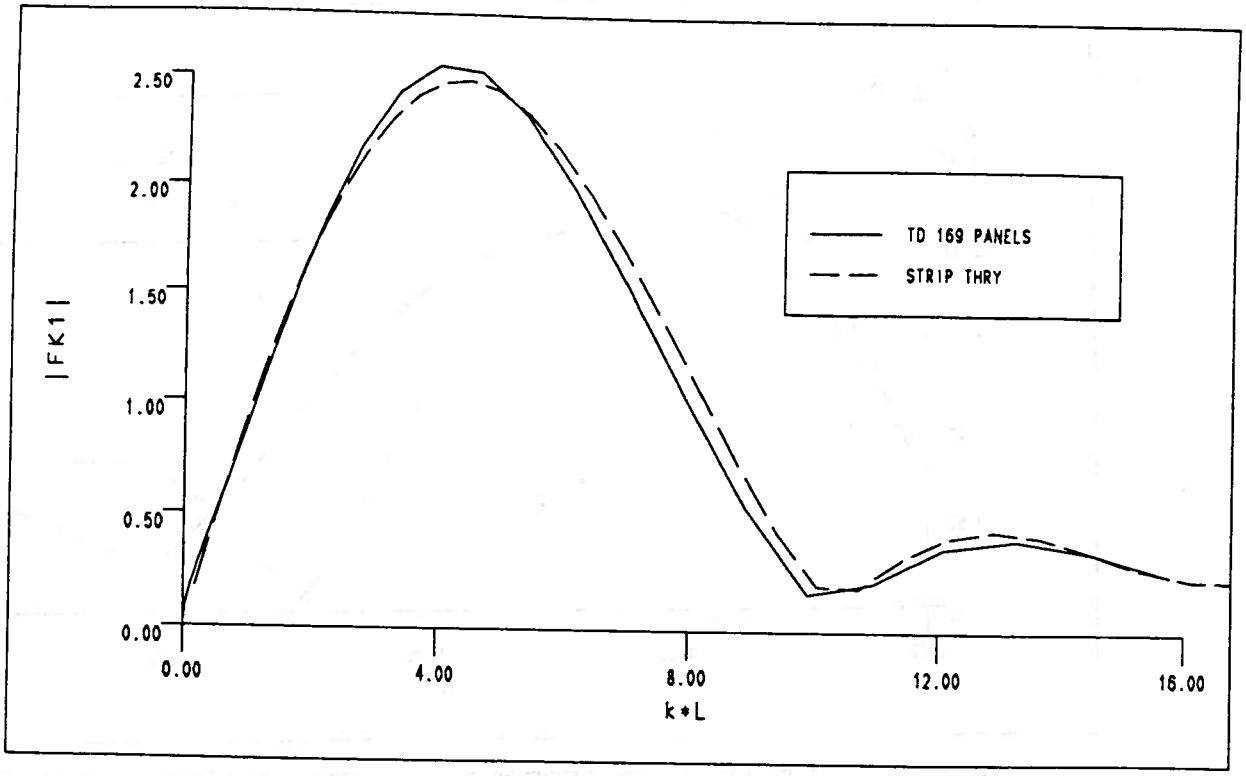
PHASE OF HEAVE EXCITING FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 202



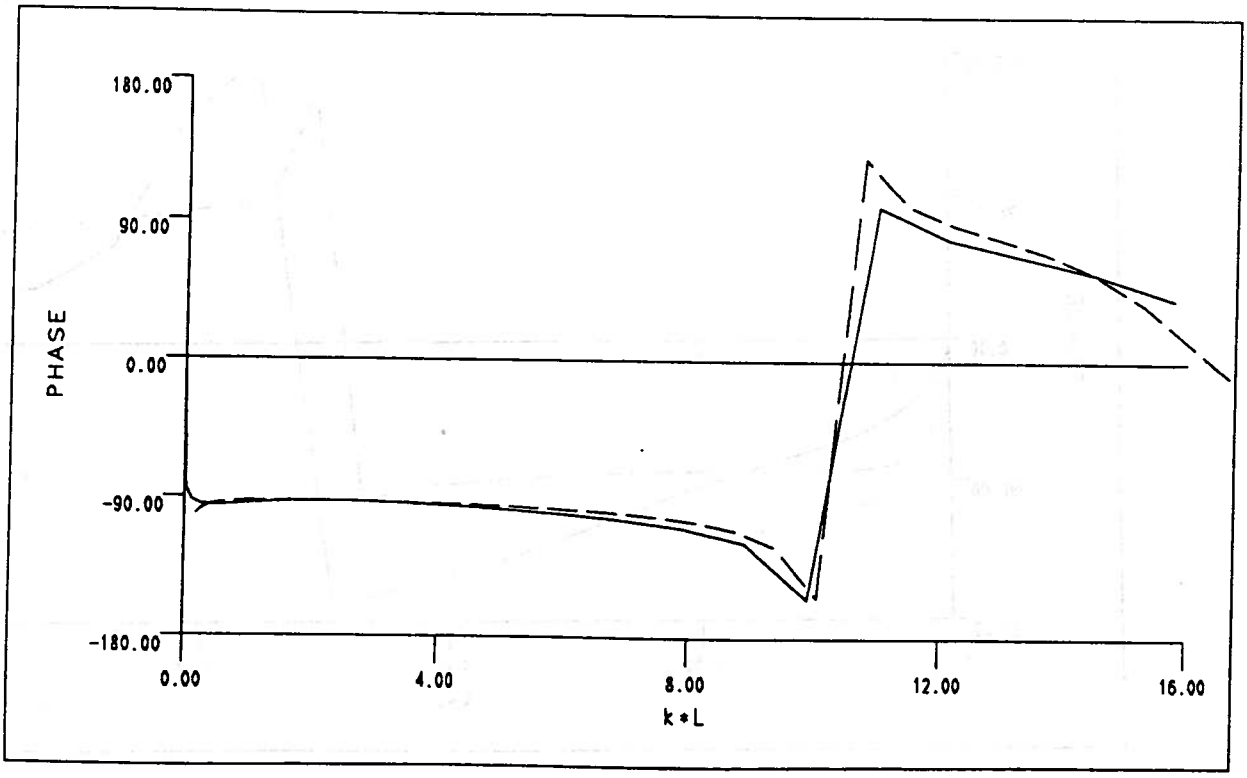
MAGNITUDE OF PITCH EXCITING FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 203



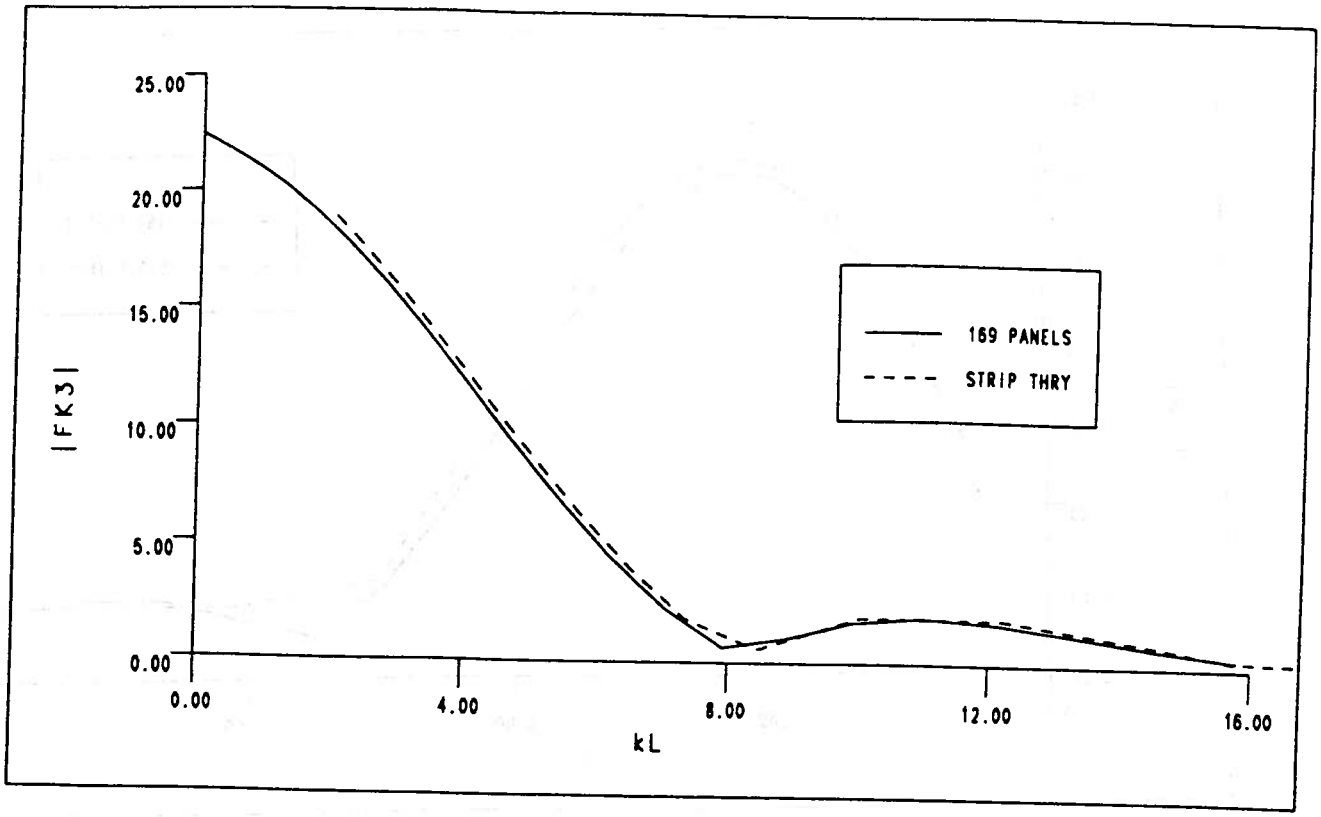
PHASE OF PITCH EXCITING FORCE FOR THE ITTC CONTAINER SHIP, FN=0.0
FIGURE 204



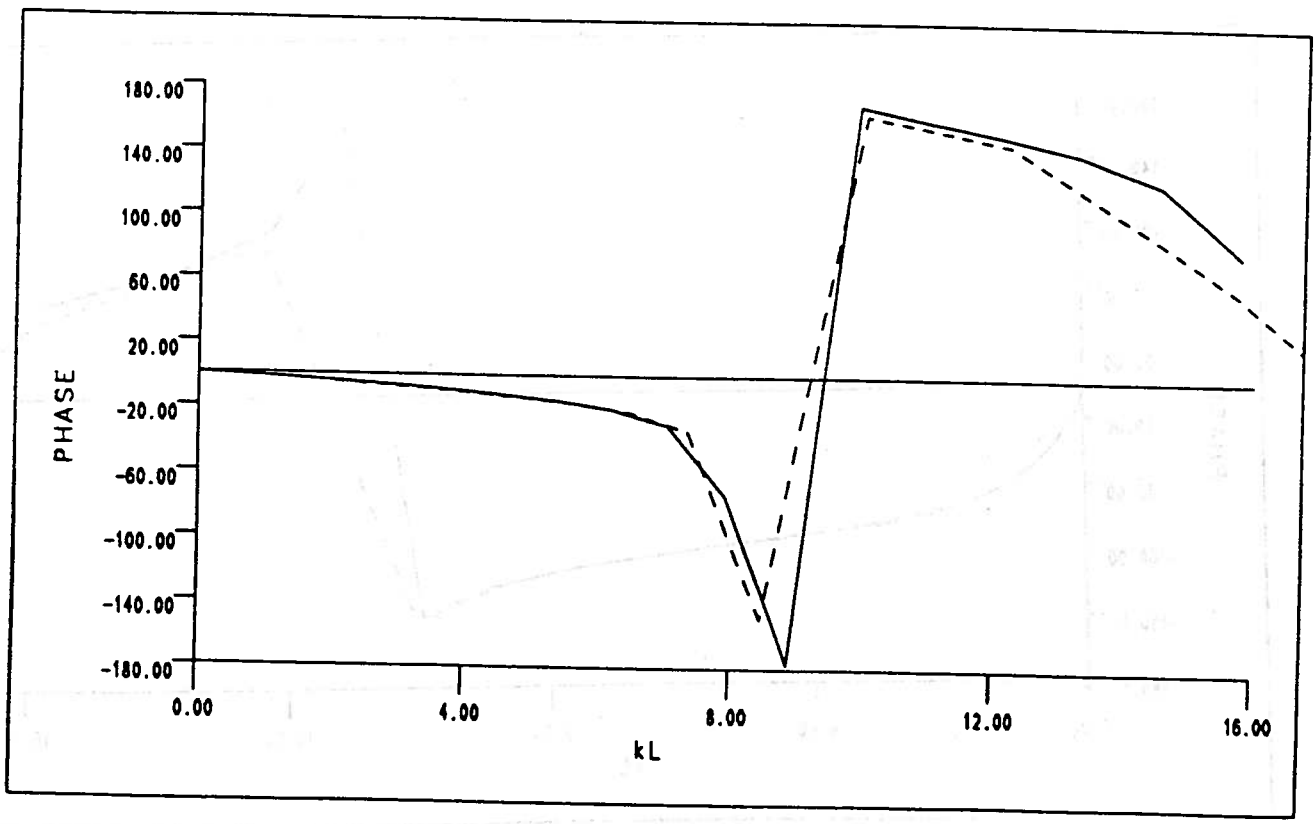
MAGNITUDE OF SURGE FROUDE-KRYLOV FORCE FOR THE ITTC CONTAINERSHIP FN=0.0
FIGURE 205



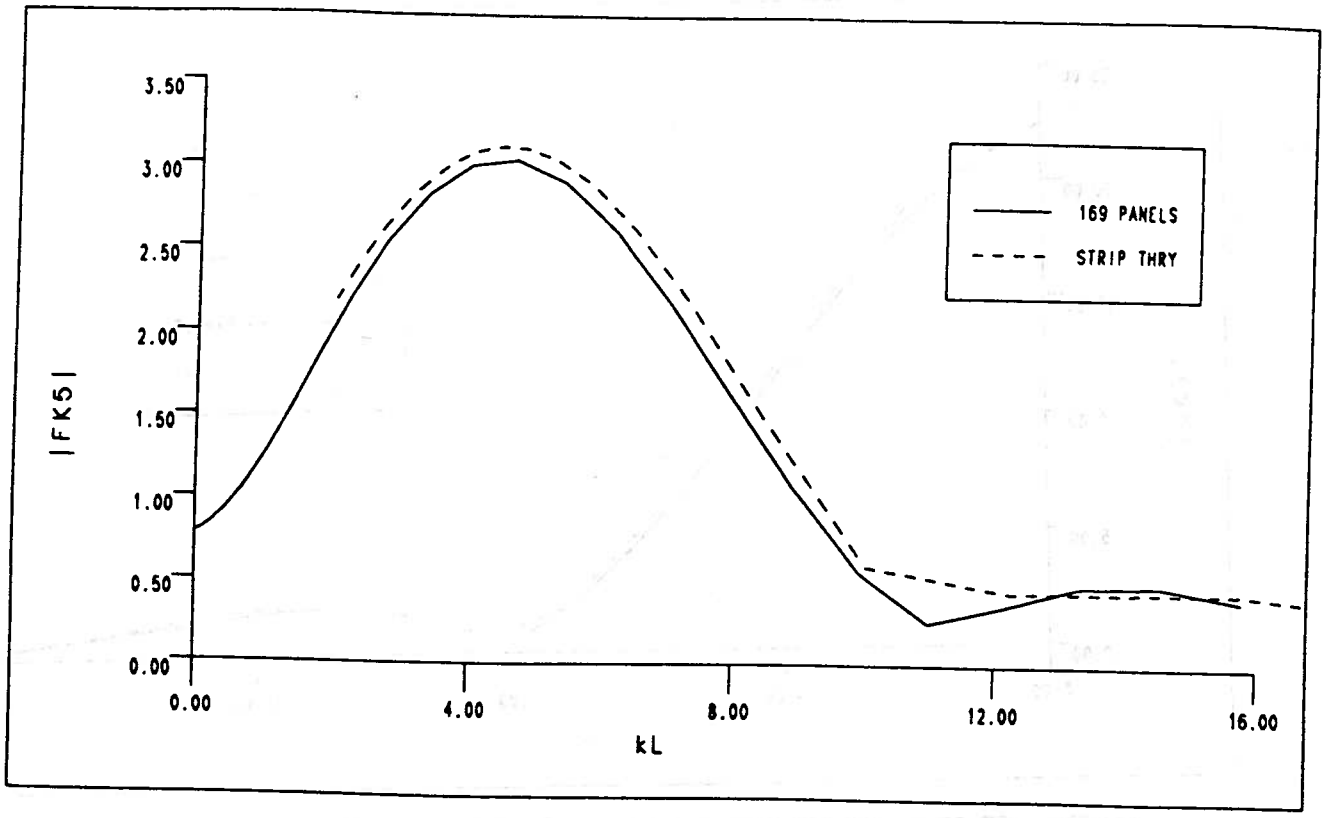
PHASE OF SURGE FROUDE-KRYLOV FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 206



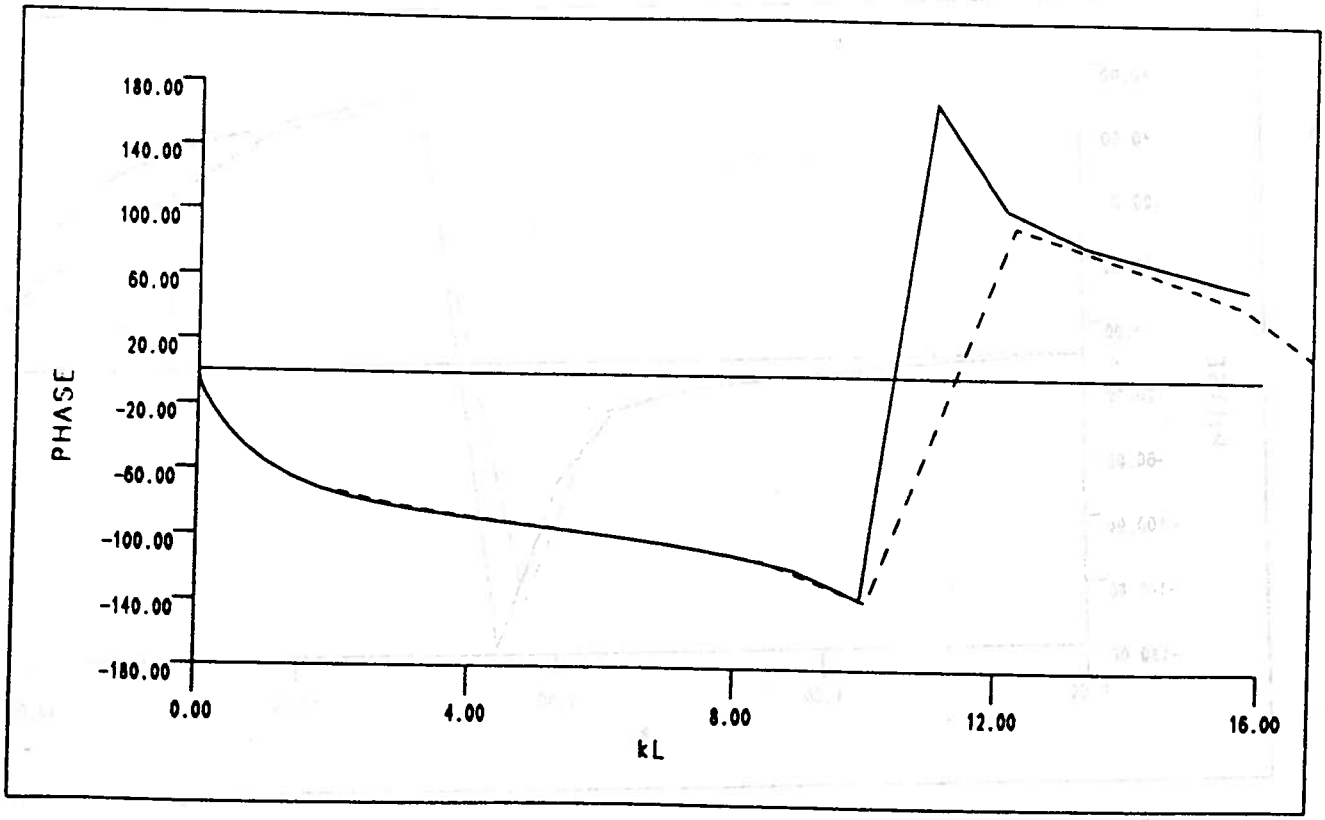
MAGNITUDE OF HEAVE FROUDE-KRYLOV FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 207



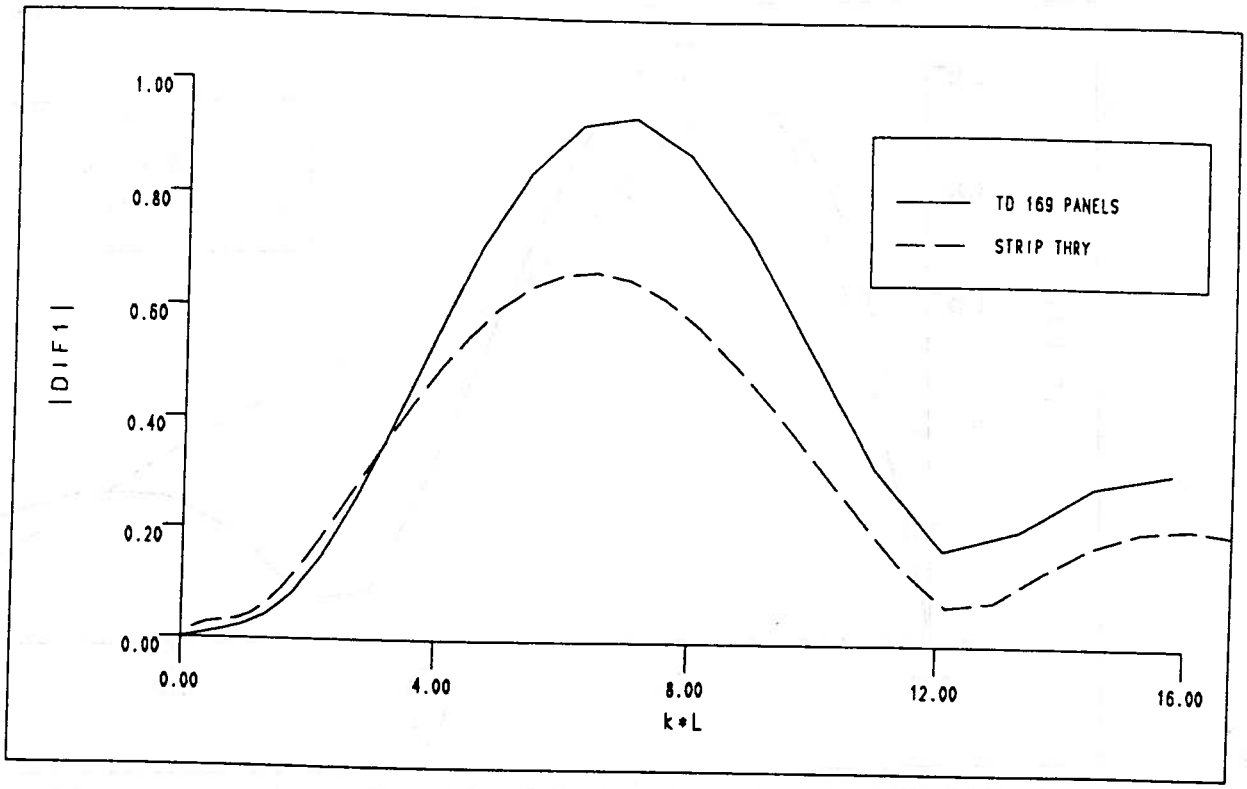
PHASE OF HEAVE FROUDE-KRYLOV FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 208



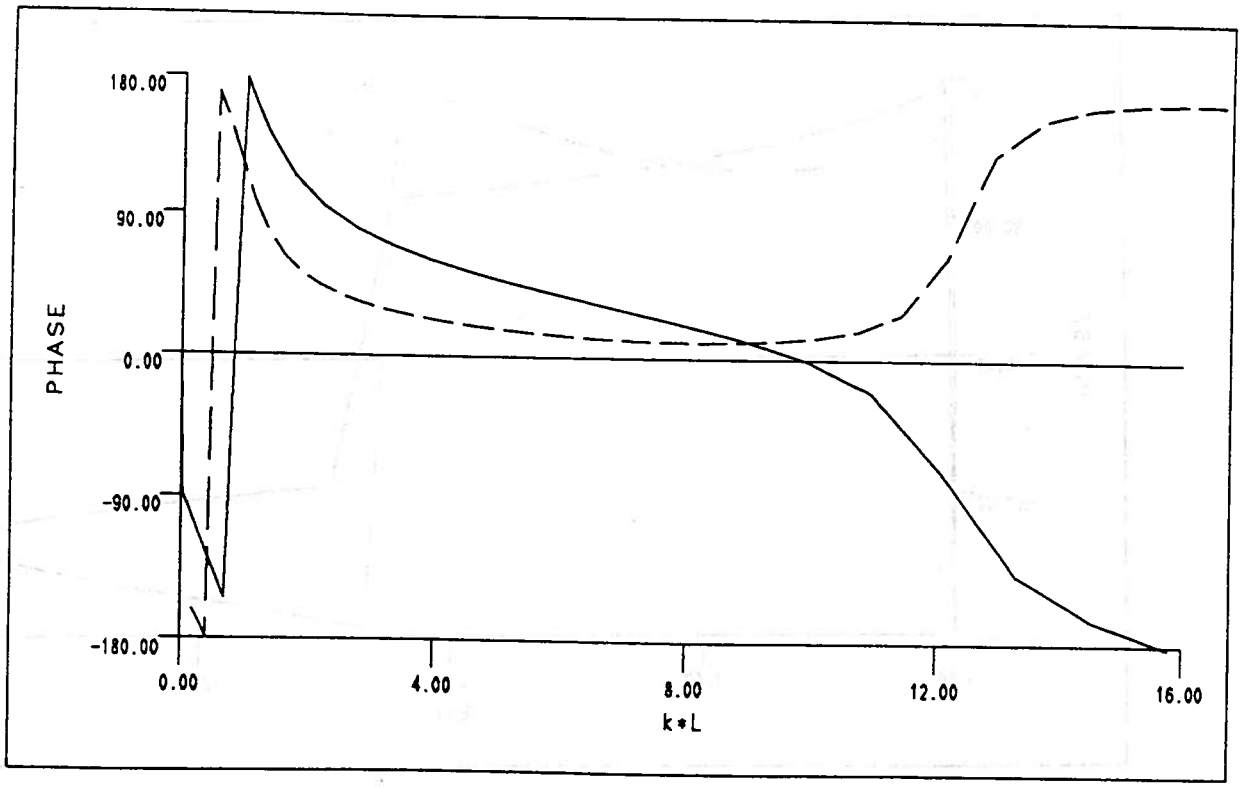
MAGNITUDE OF PITCH FROUDE-KRYLOV FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 209



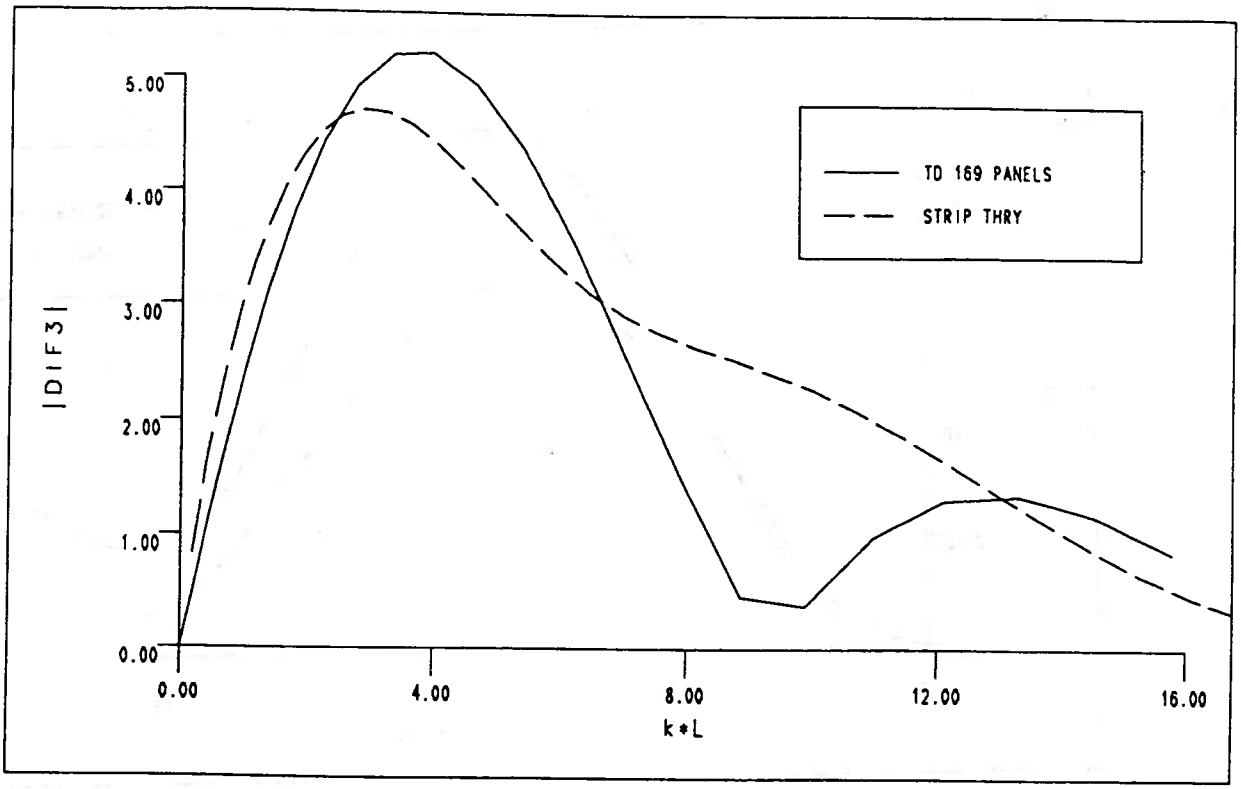
PHASE OF PITCH FROUDE-KRYLOV FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 210



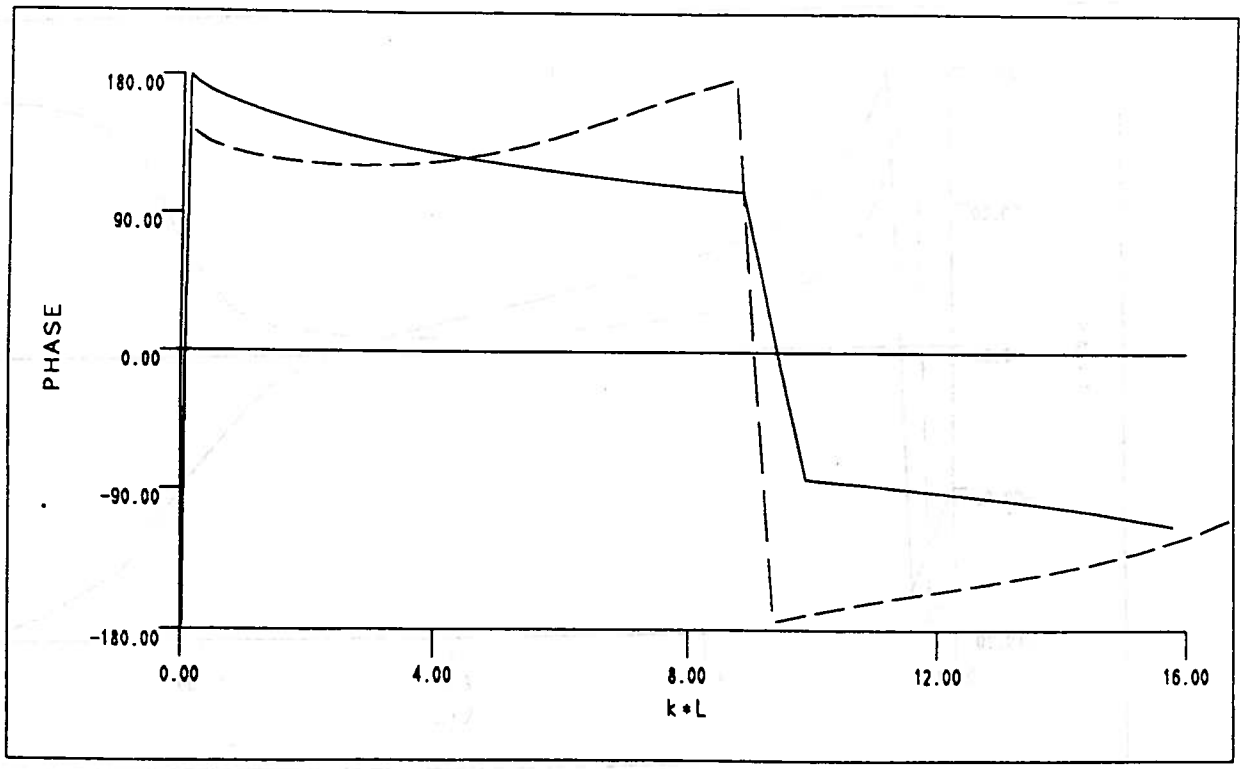
MAGNITUDE OF SURGE DIFFRACTION FOR THE FORCE ITTC CONTAINERSHIP, FN=0.0
FIGURE 211



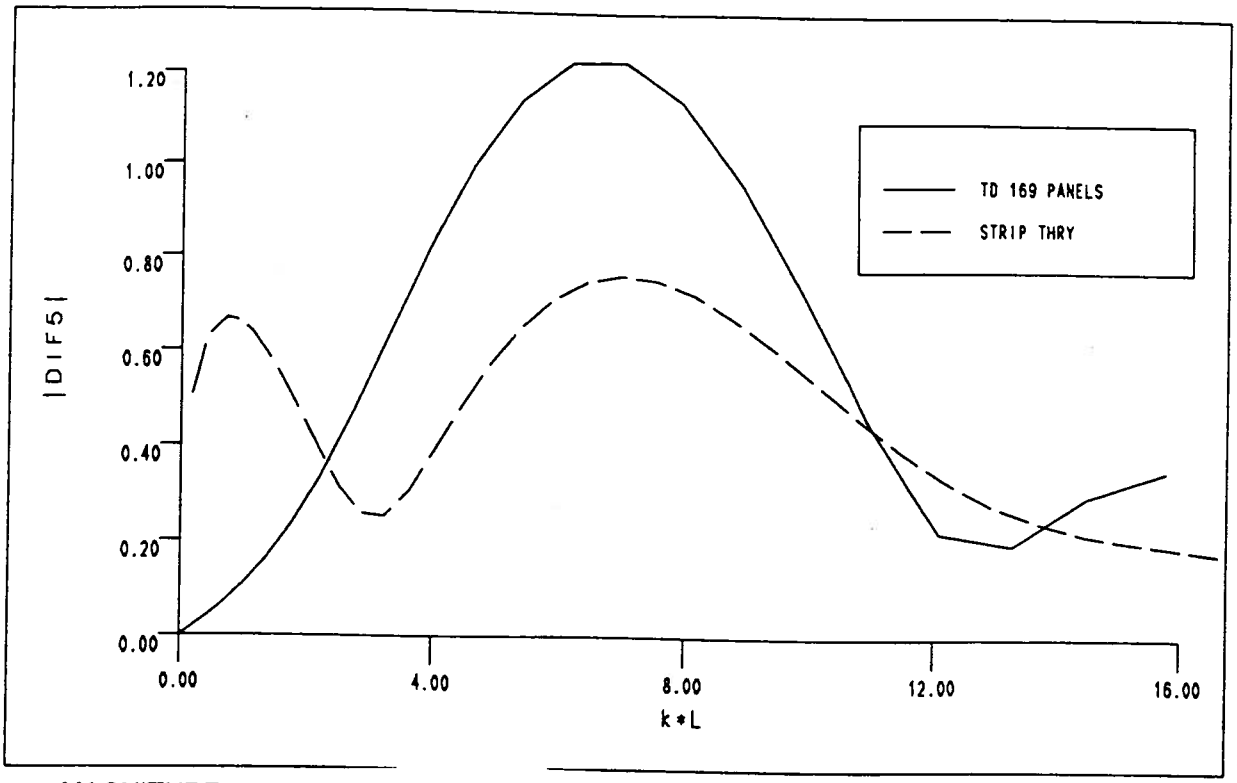
PHASE OF SURGE DIFFRACTION FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 212



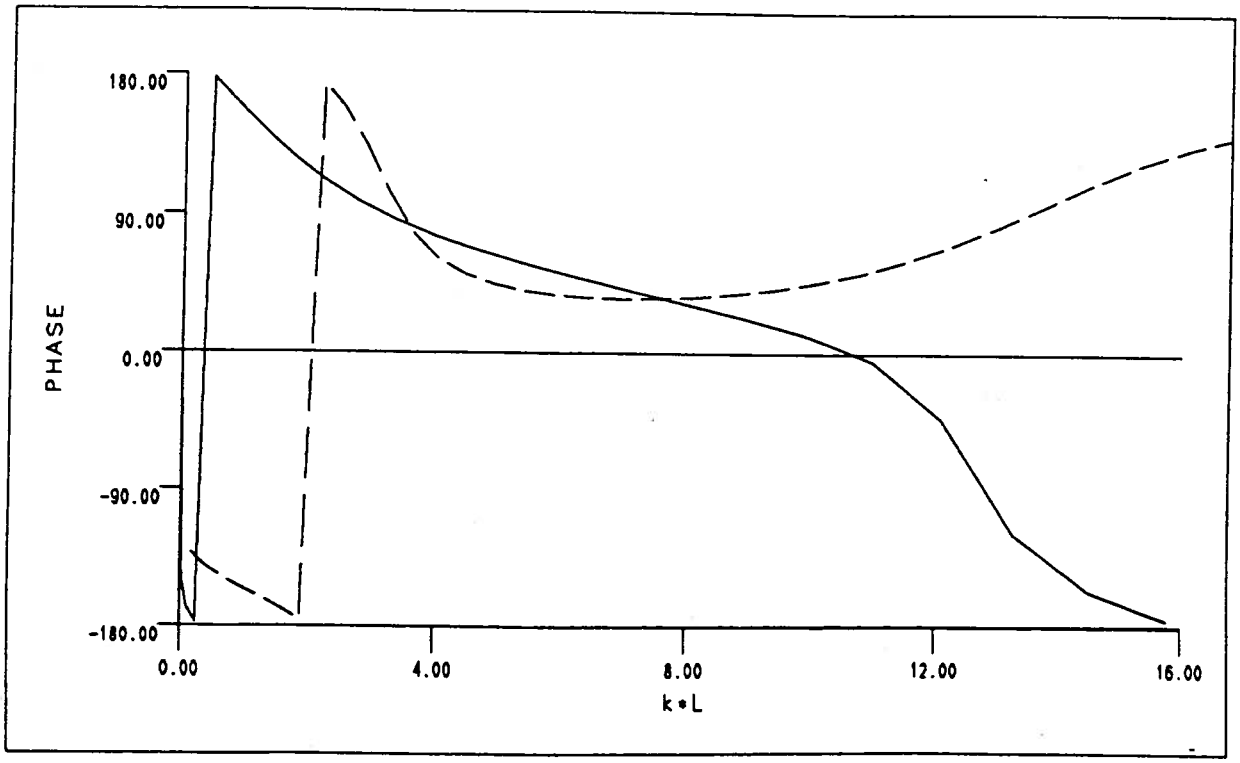
MAGNITUDE OF HEAVE DIFFRACTION FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 213



PHASE OF HEAVE DIFFRACTION FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 214

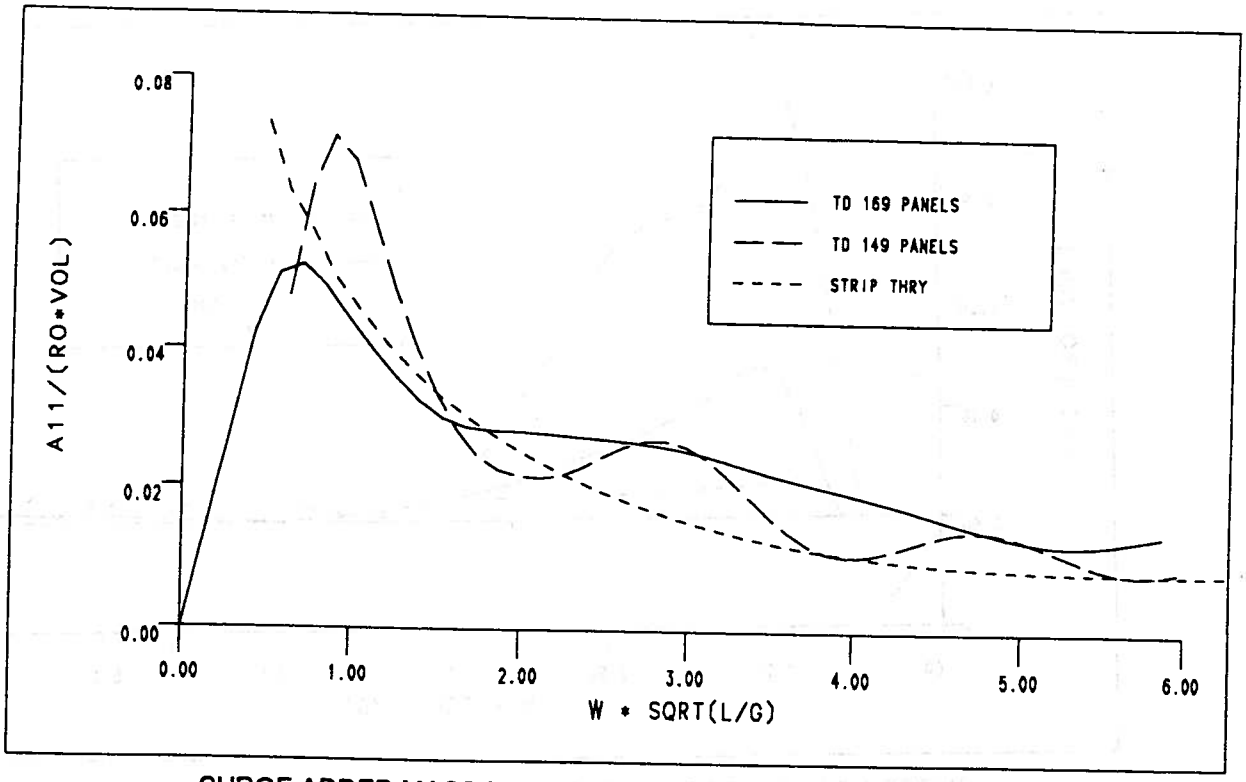


MAGNITUDE OF PITCH DIFFRACTION FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 215

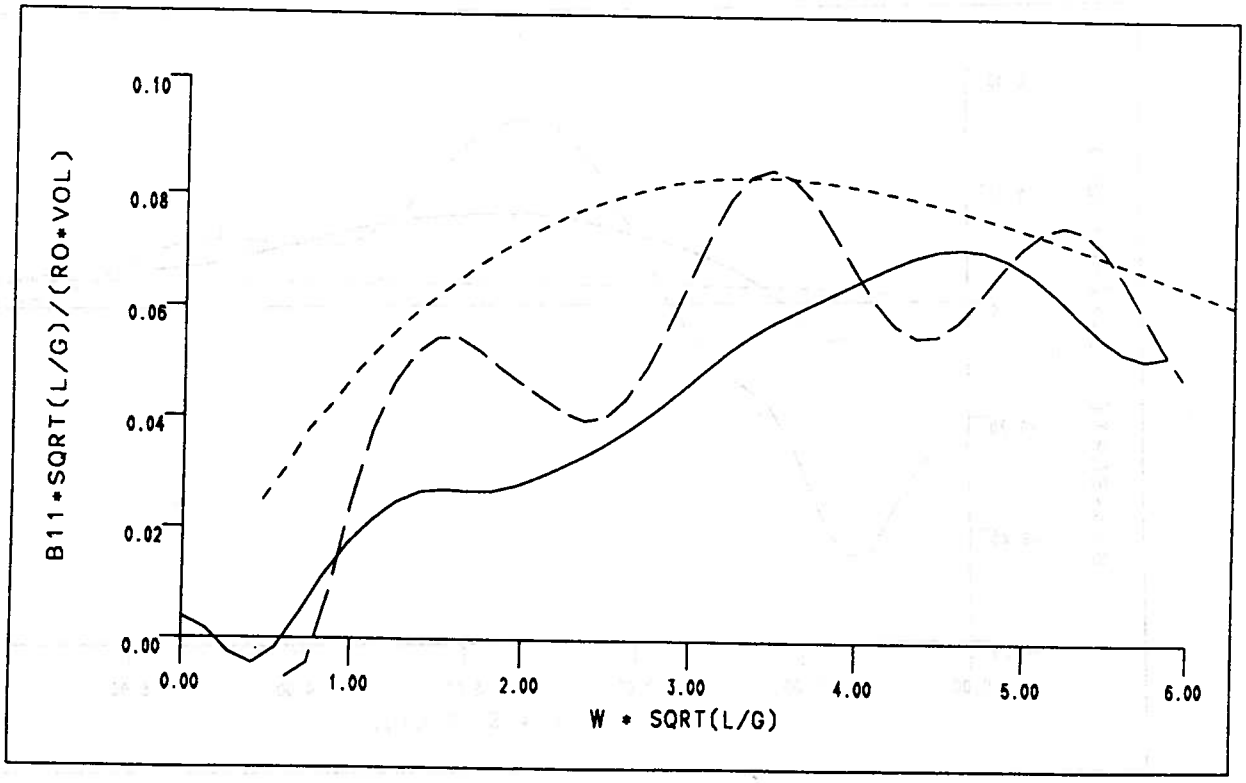


PHASE OF PITCH DIFFRACTION FORCE FOR THE ITTC CONTAINERSHIP, FN=0.0
FIGURE 216

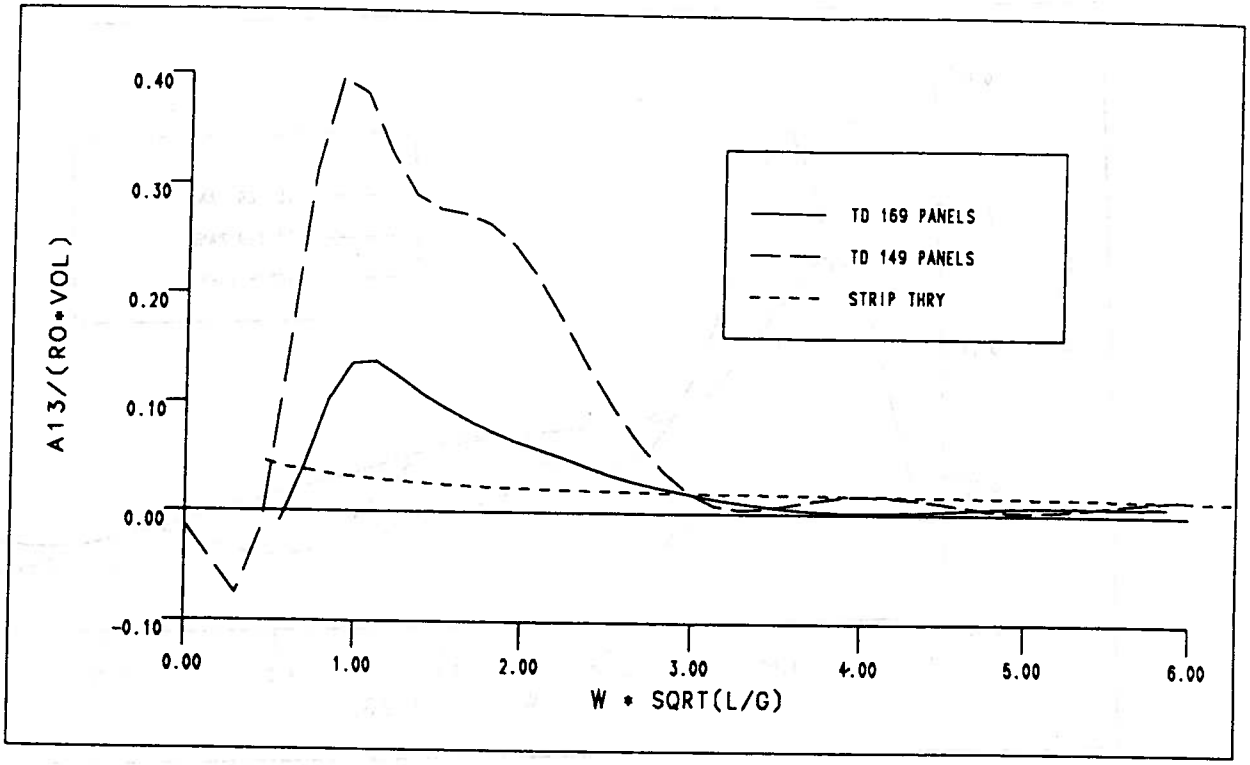
ITTC CONTAINERSHIP, FN=0.275



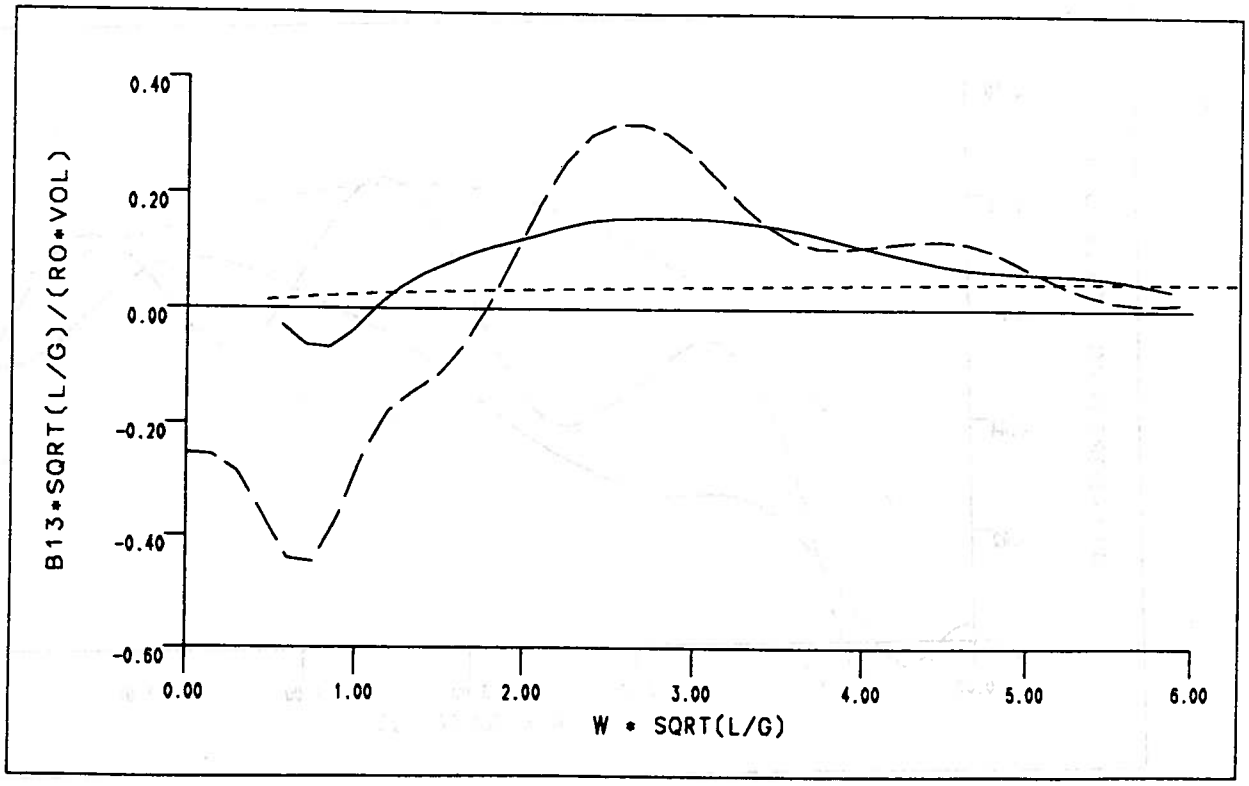
SURGE ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 217



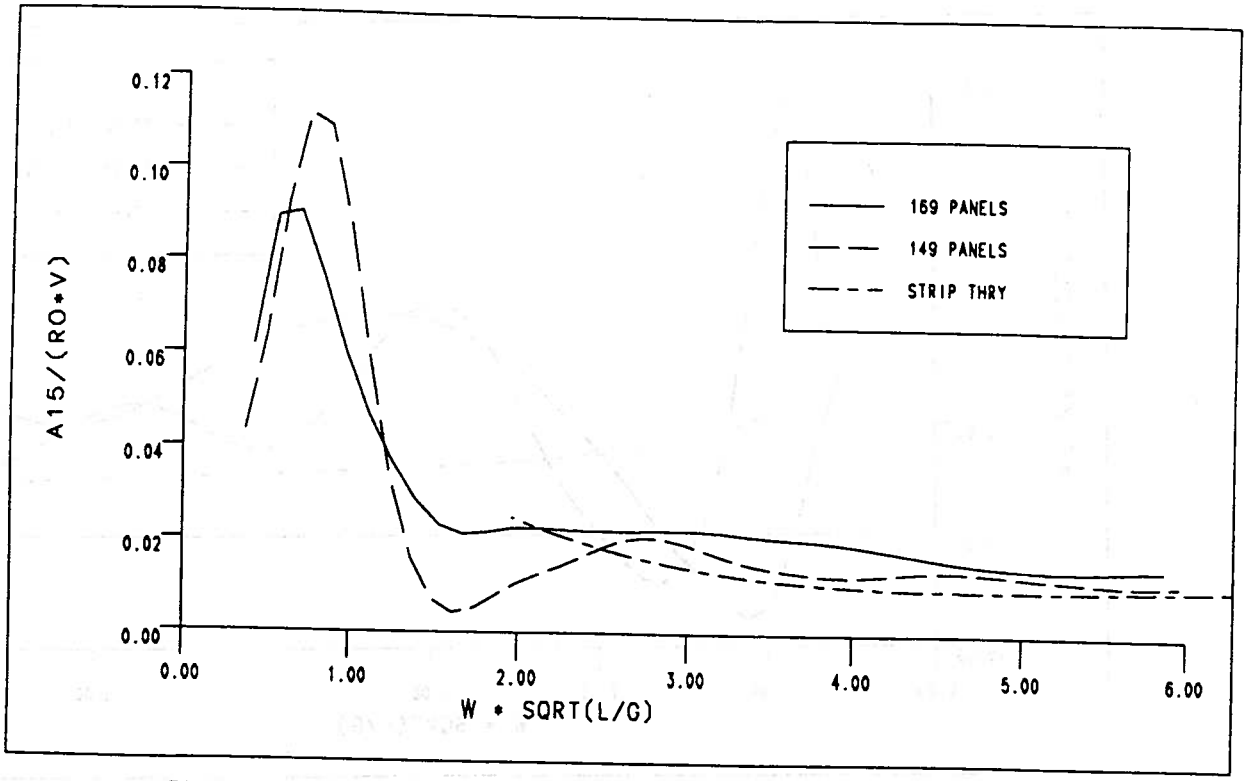
SURGE DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 218



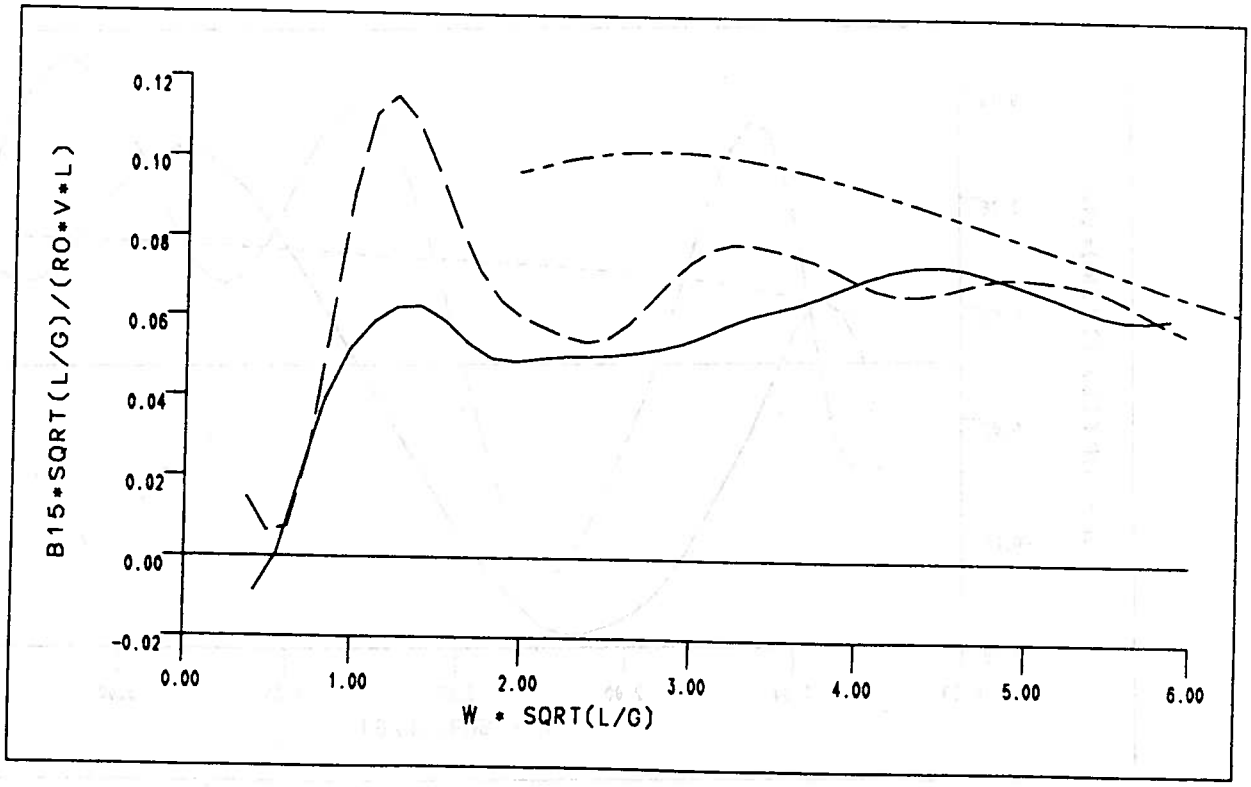
SURGE-HEAVE ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 219



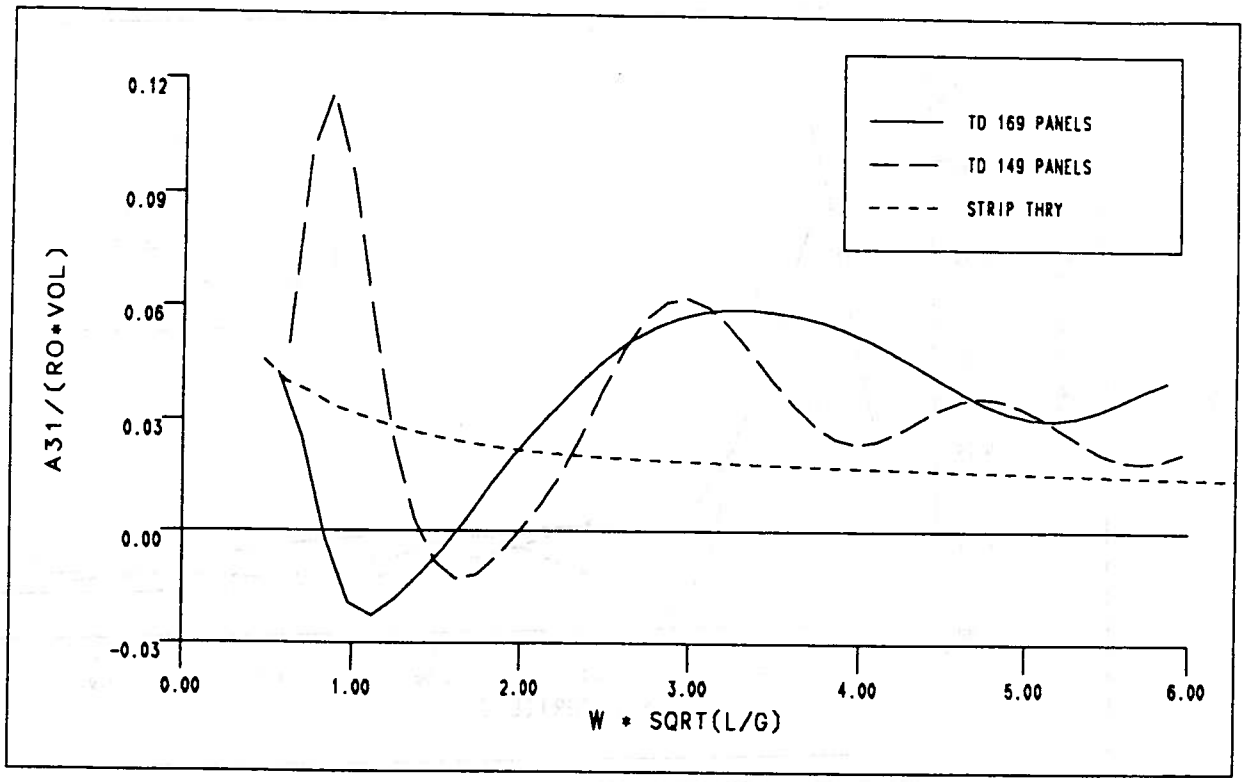
SURGE-HEAVE DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 220



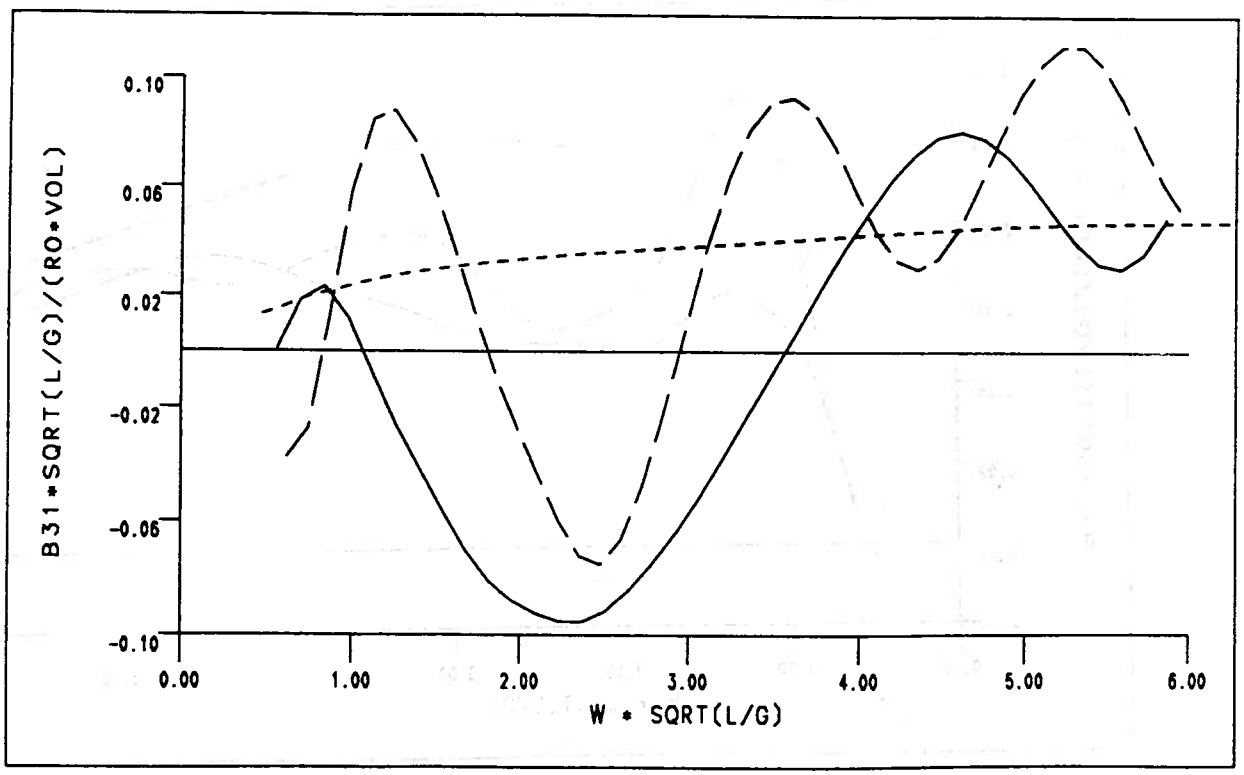
SURGE-PITCH ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 221



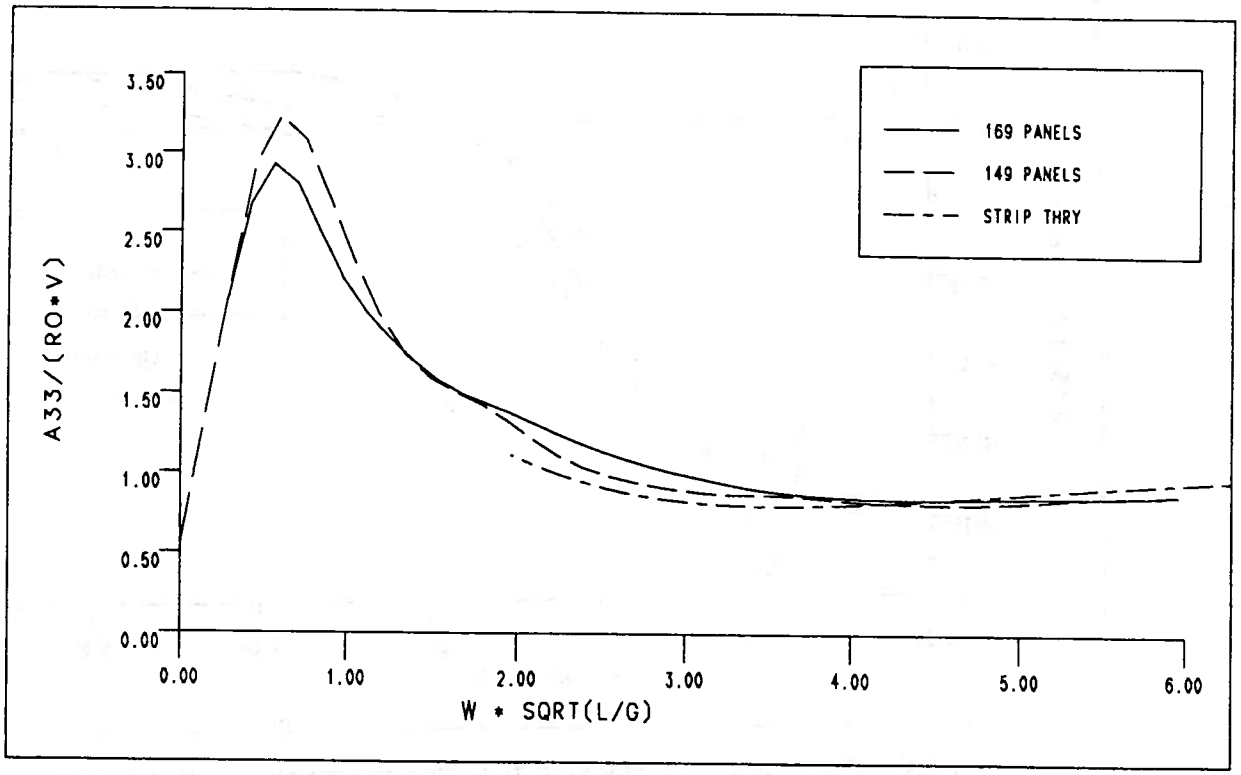
SURGE-PITCH DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 222



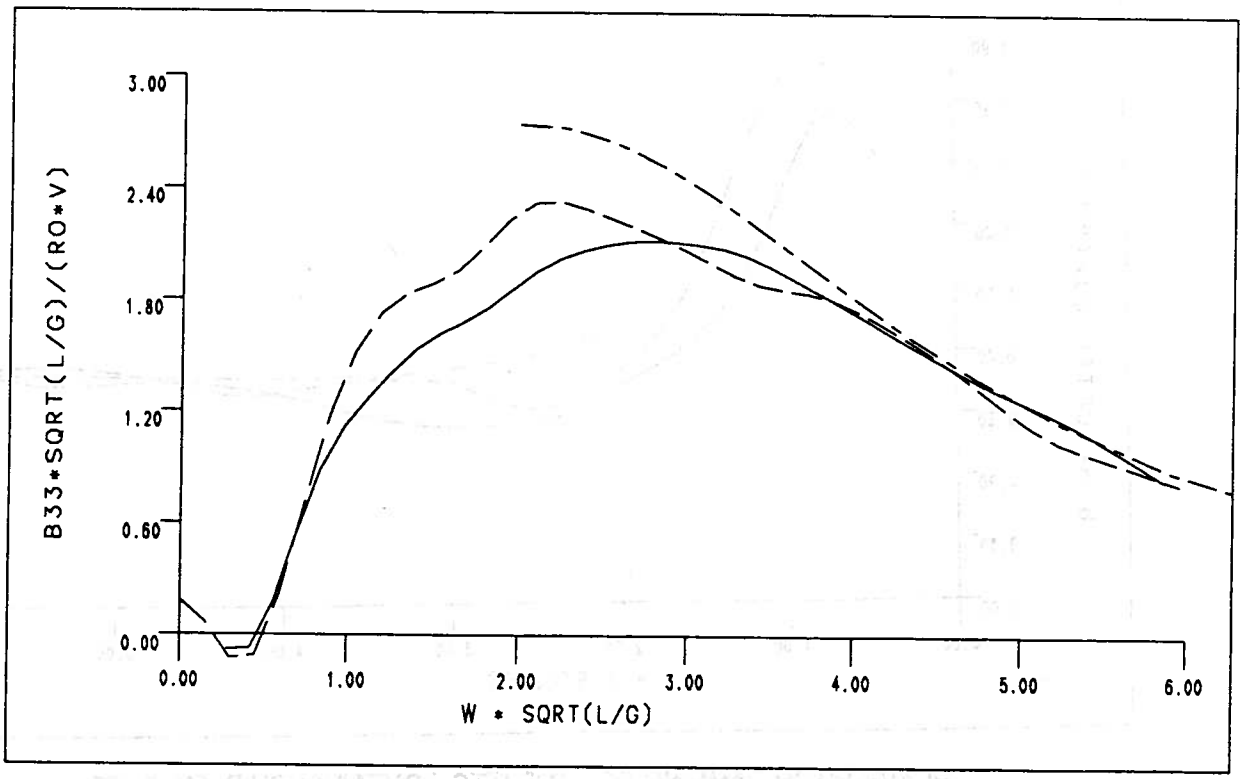
HEAVE-SURGE ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 223



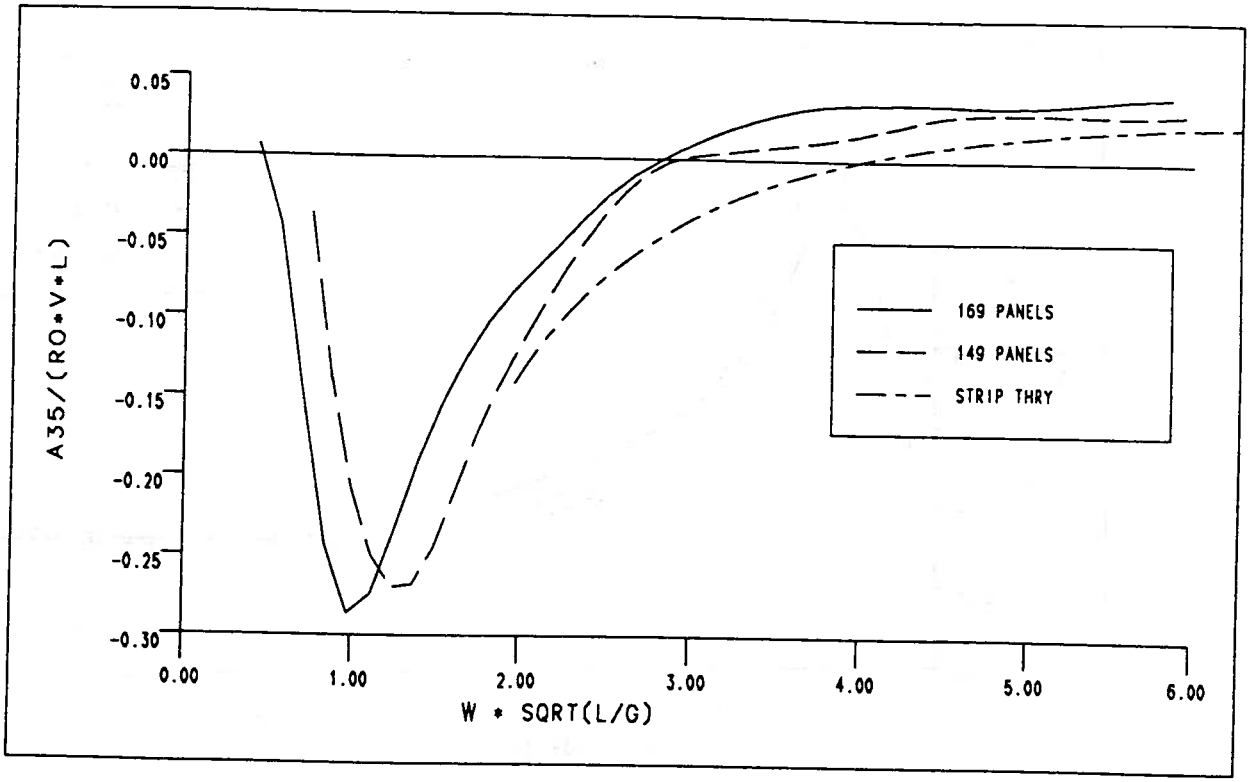
HEAVE-SURGE DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 224



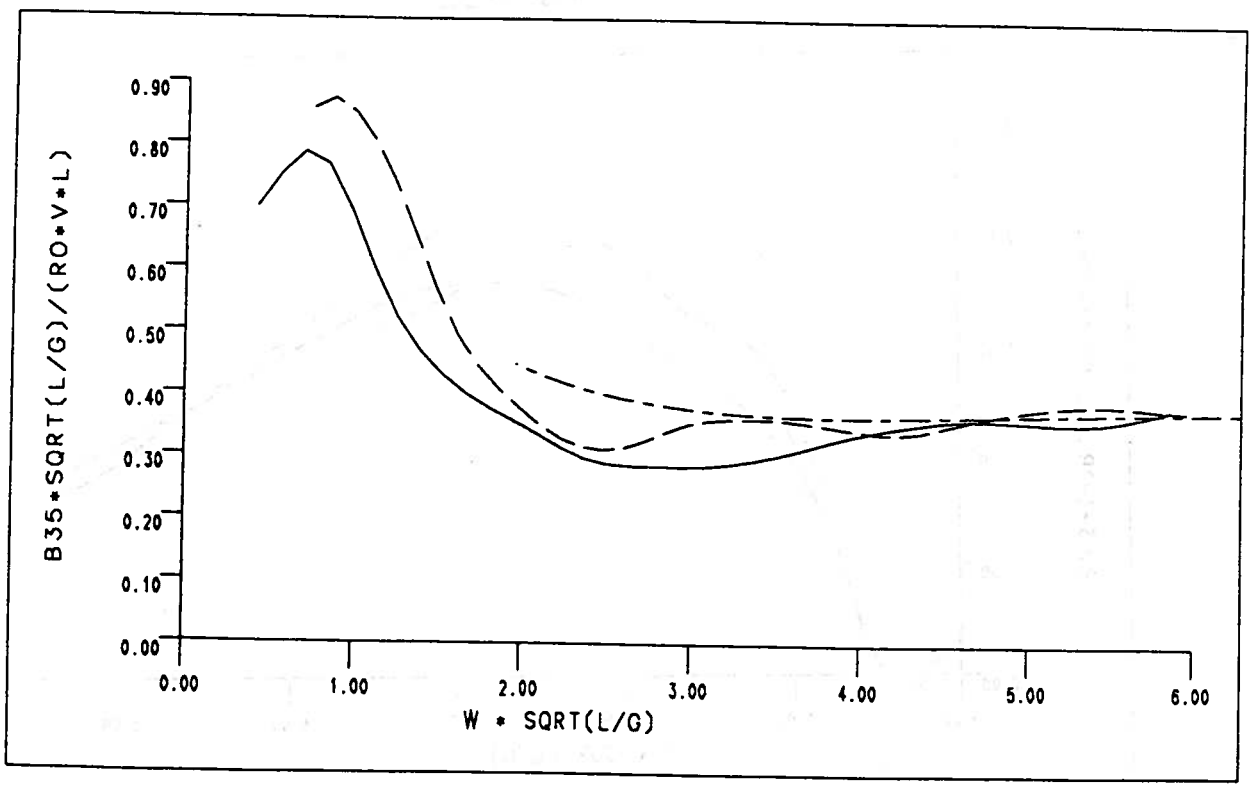
HEAVE ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 225



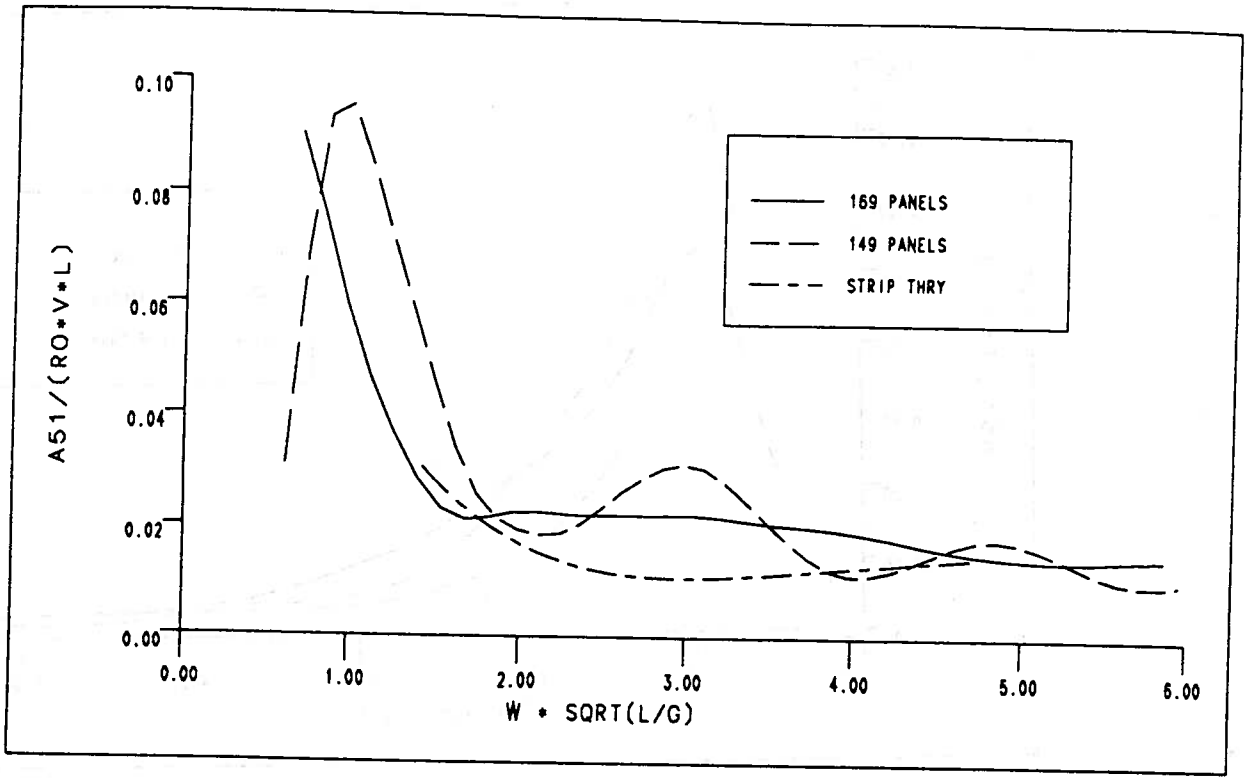
HEAVE DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 226



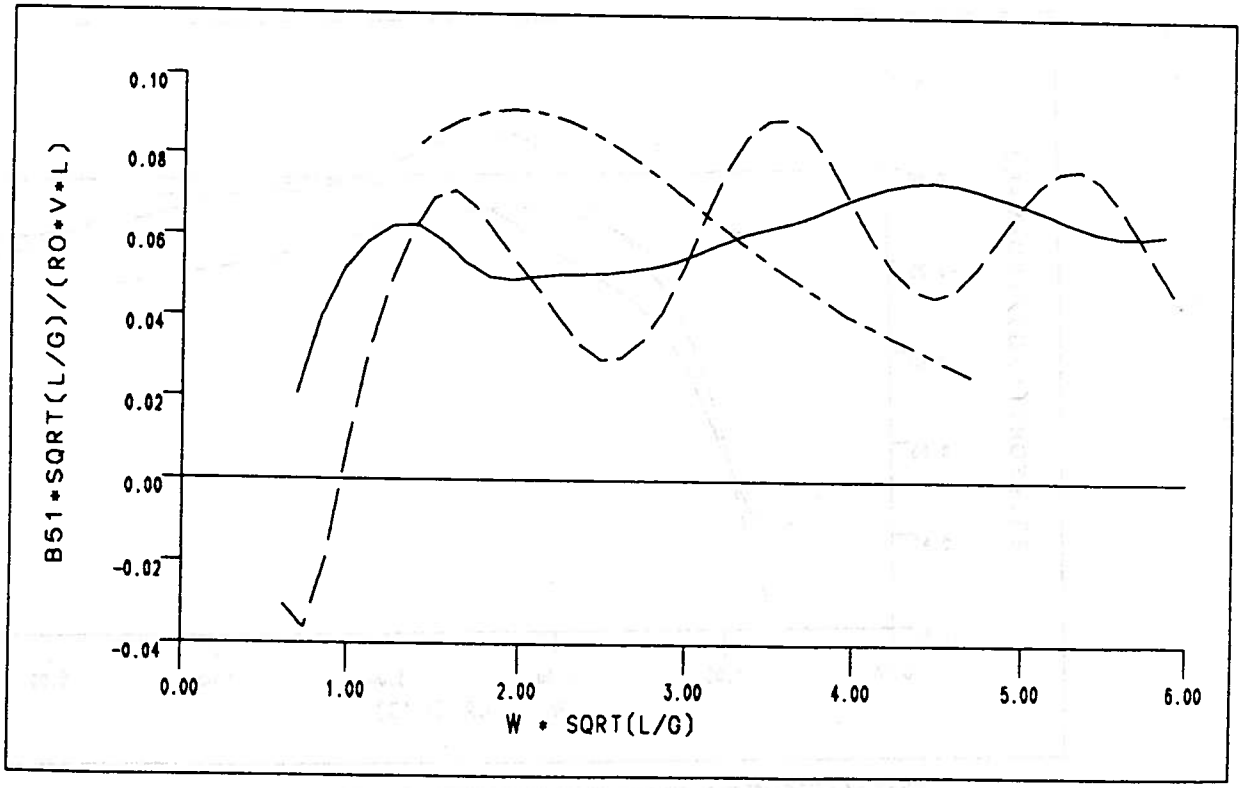
HEAVE-PITCH ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 227



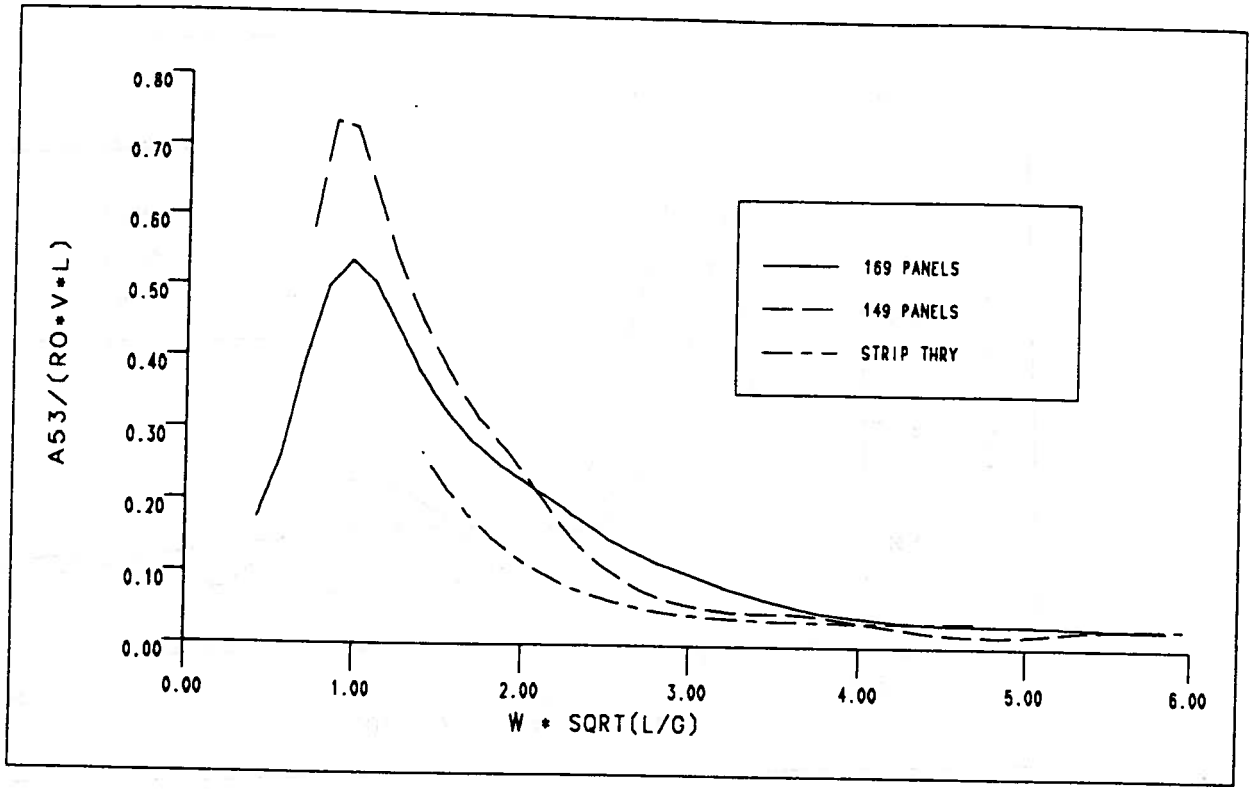
HEAVE-PITCH DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 228



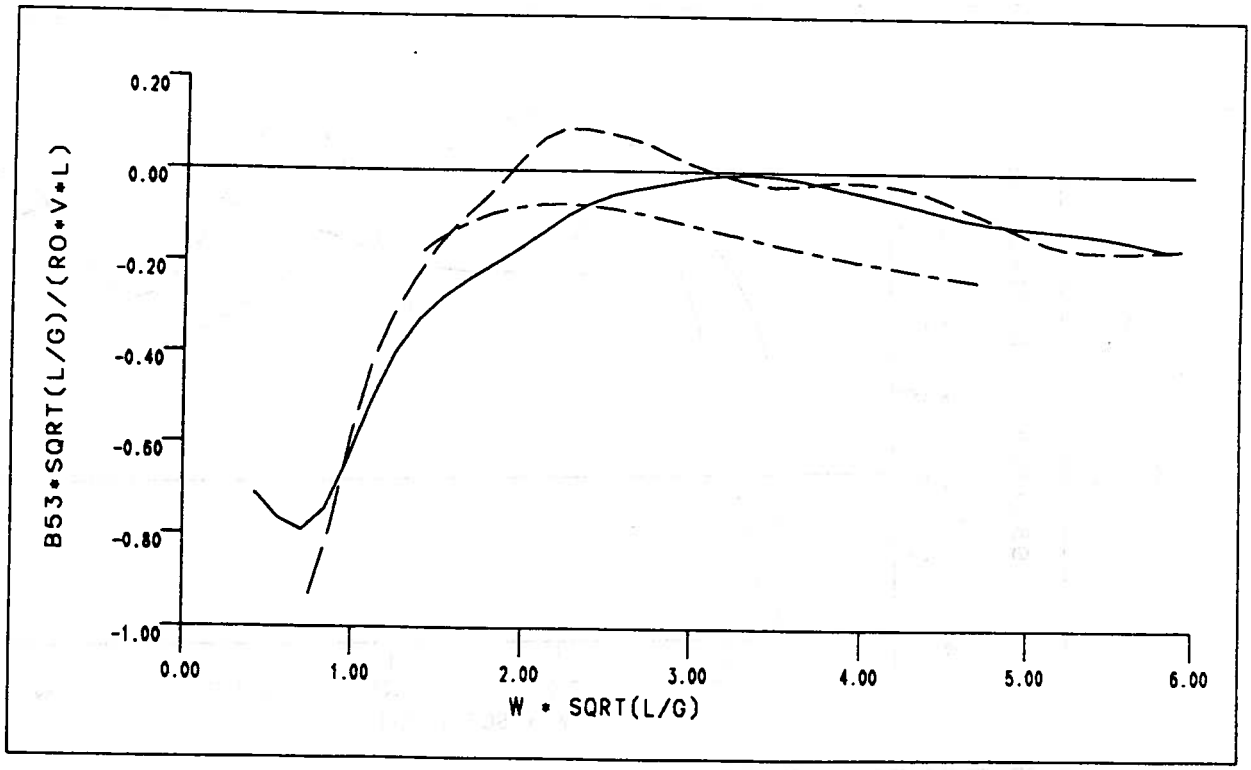
PITCH-SURGE ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 229



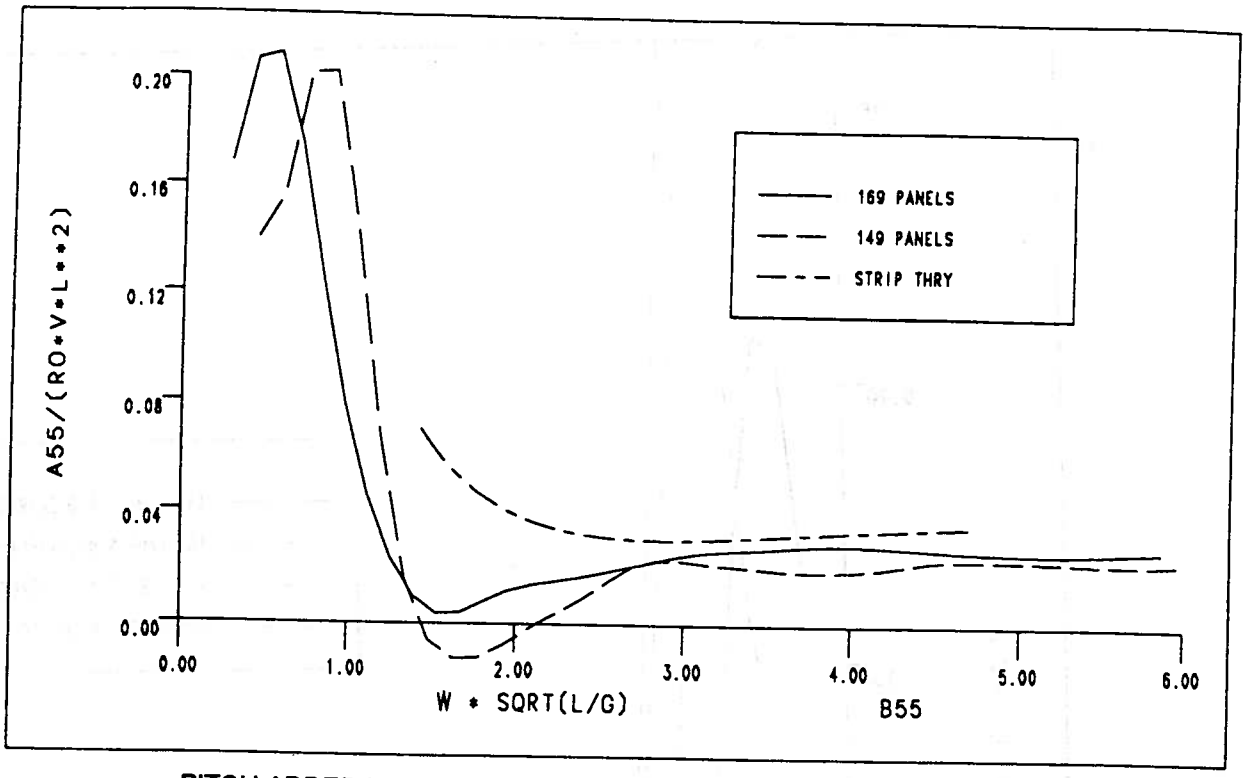
PITCH-SURGE DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 230



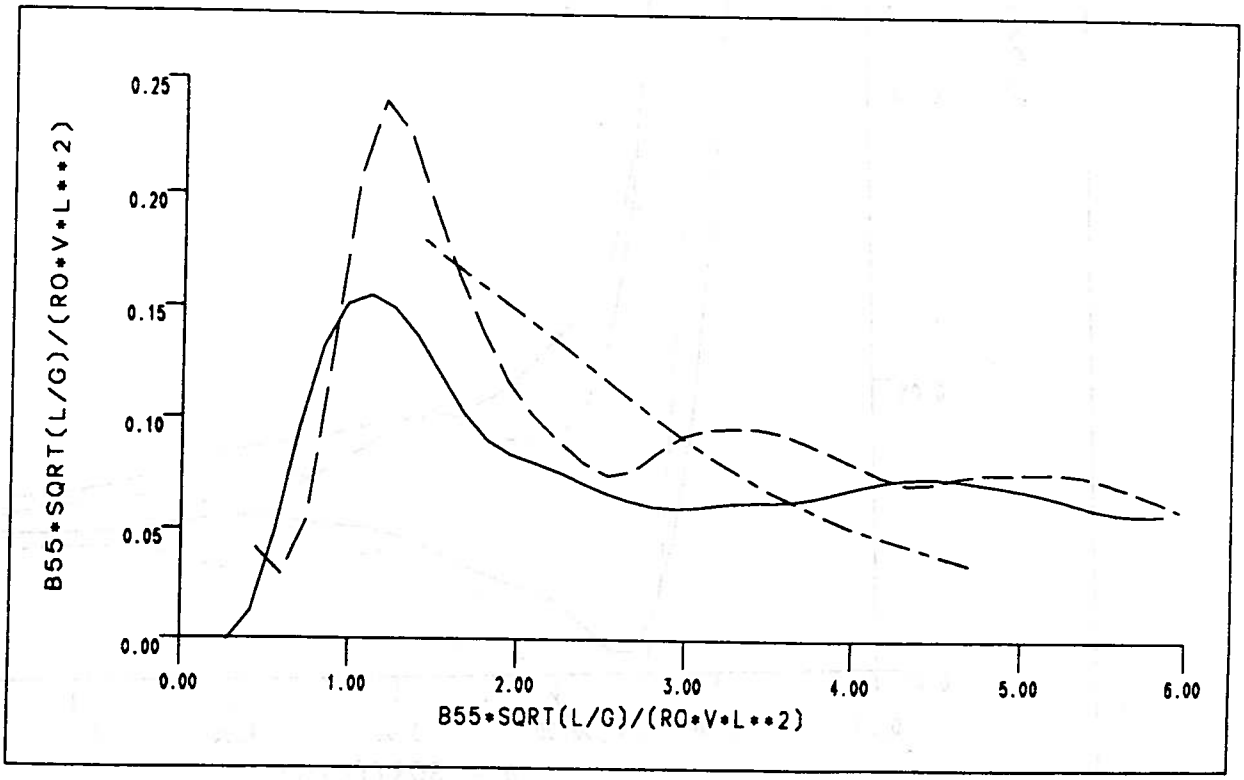
PITCH-HEAVE ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 231



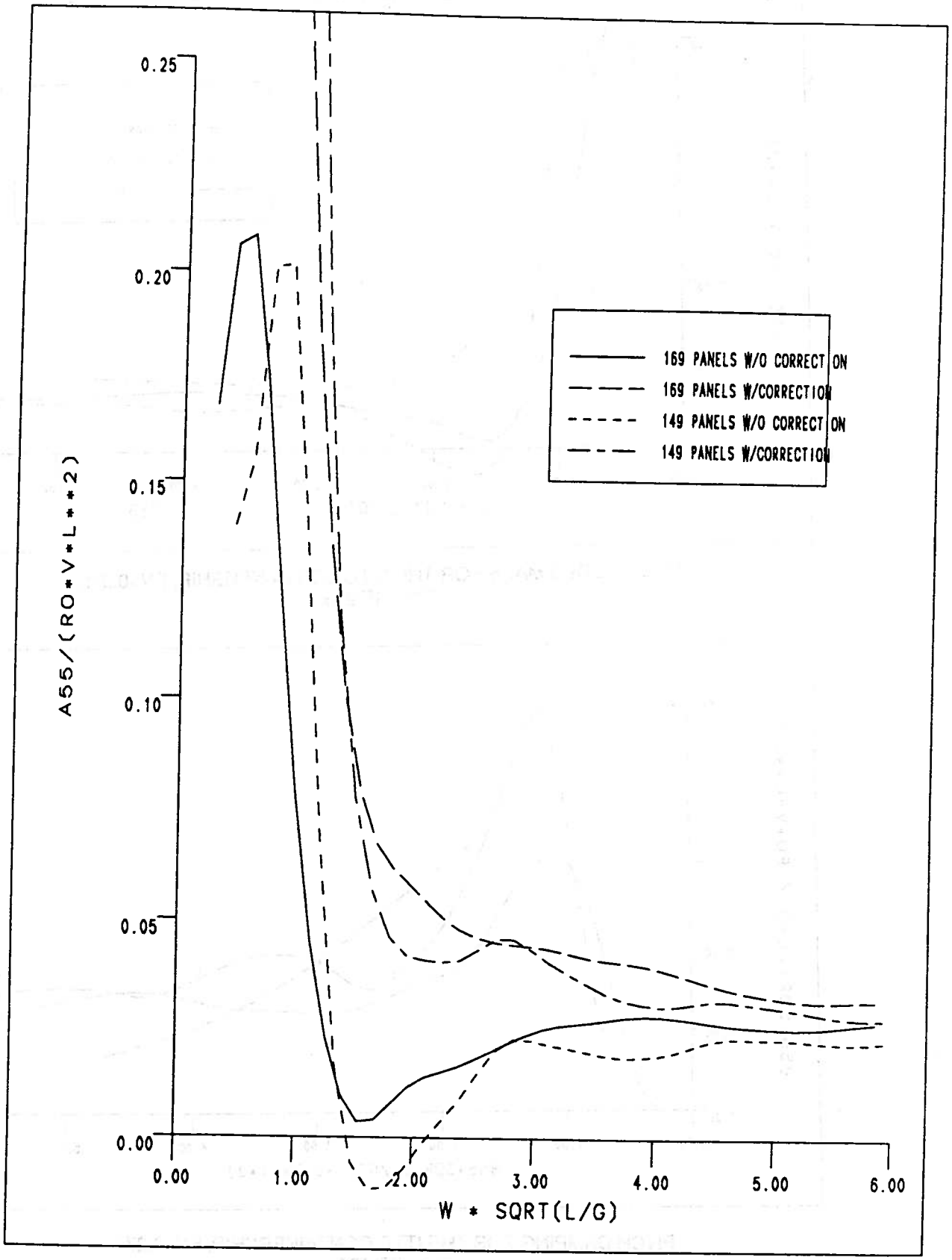
PITCH-HEAVE DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 232



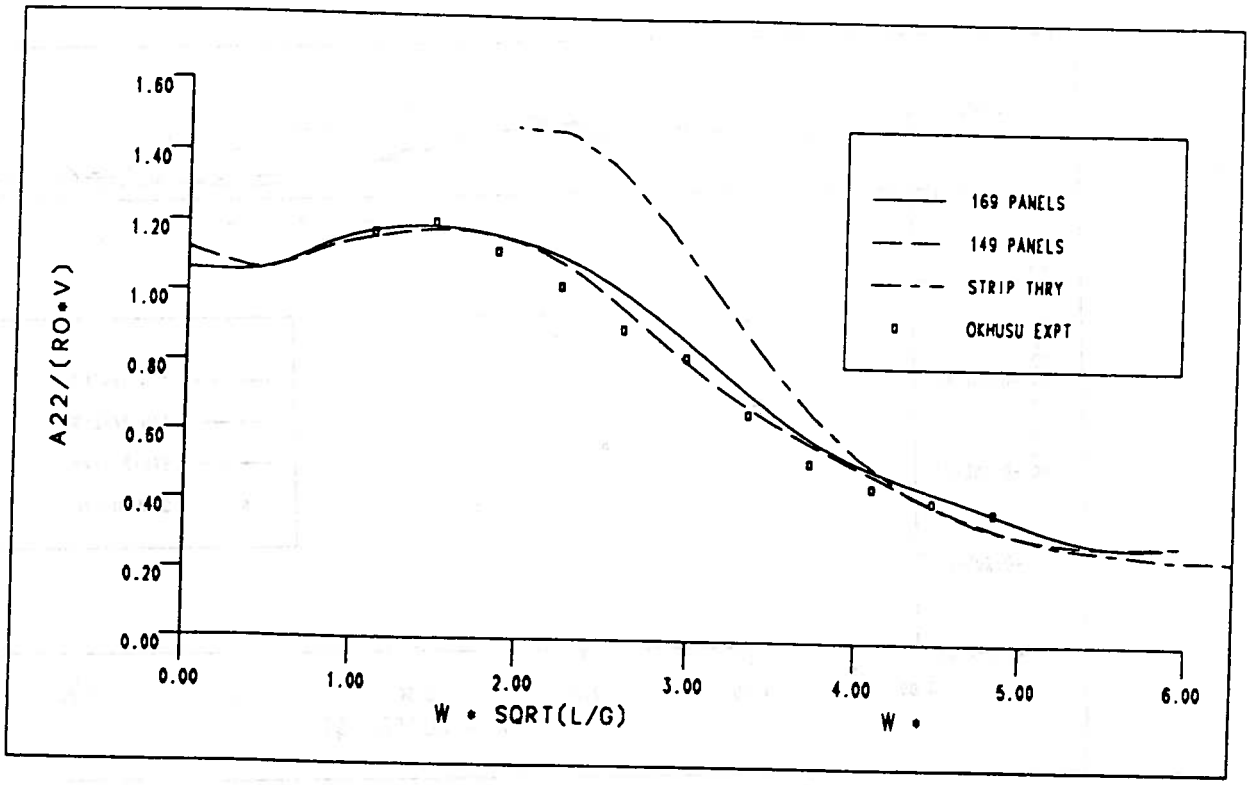
PITCH ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 233



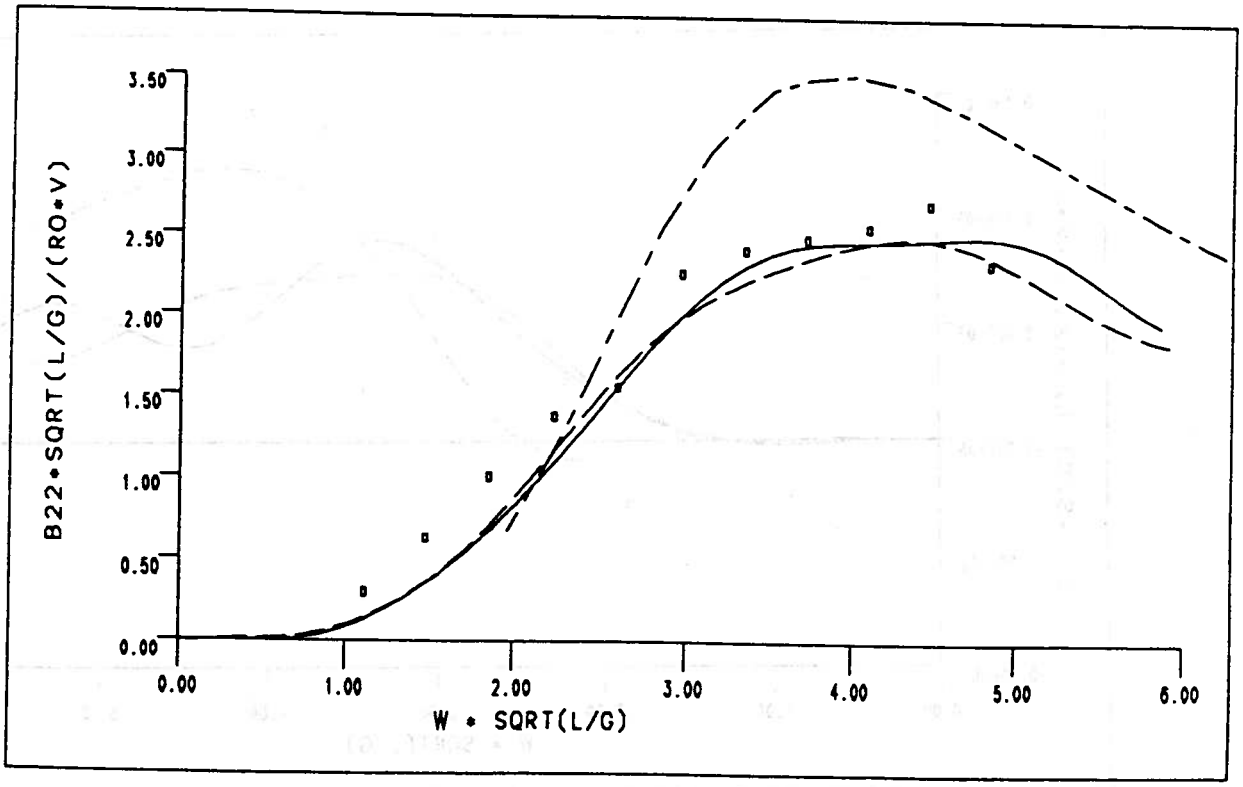
PITCH DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 234



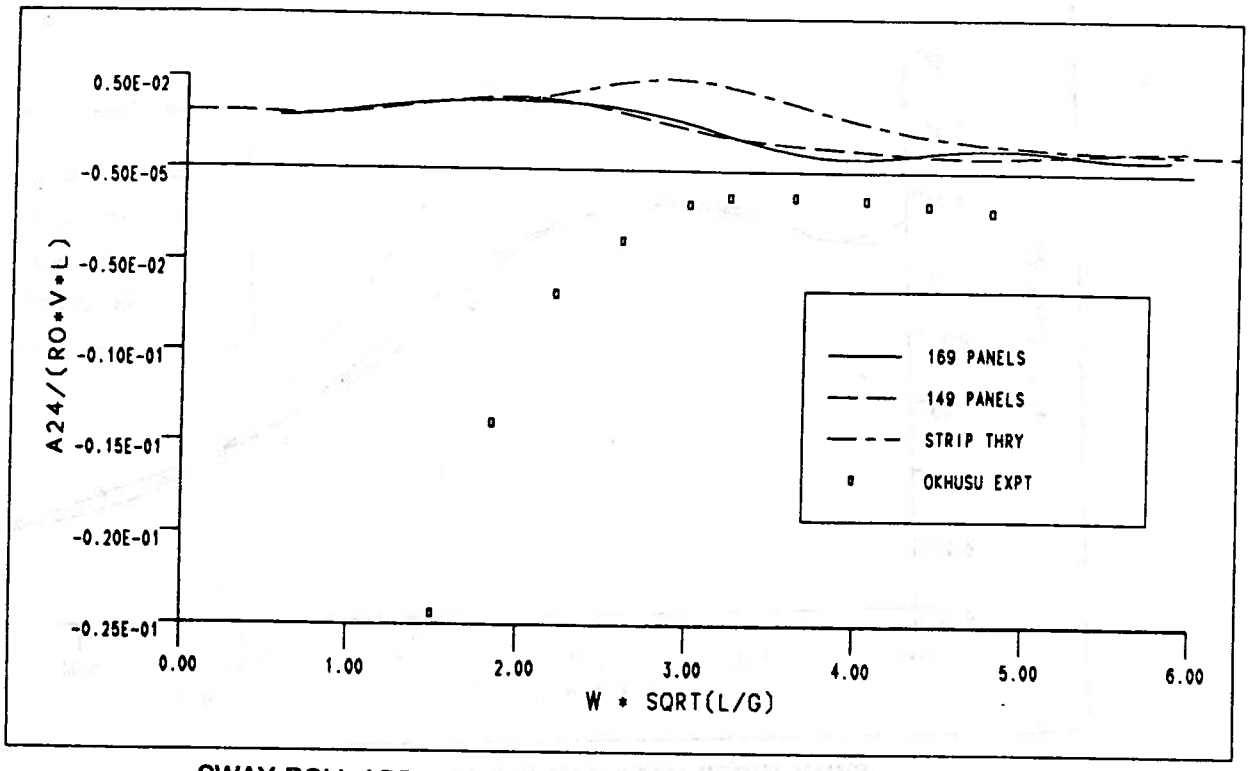
EFFECT OF FWD SPEED HYDROSTATIC TERM ON A55 FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 235



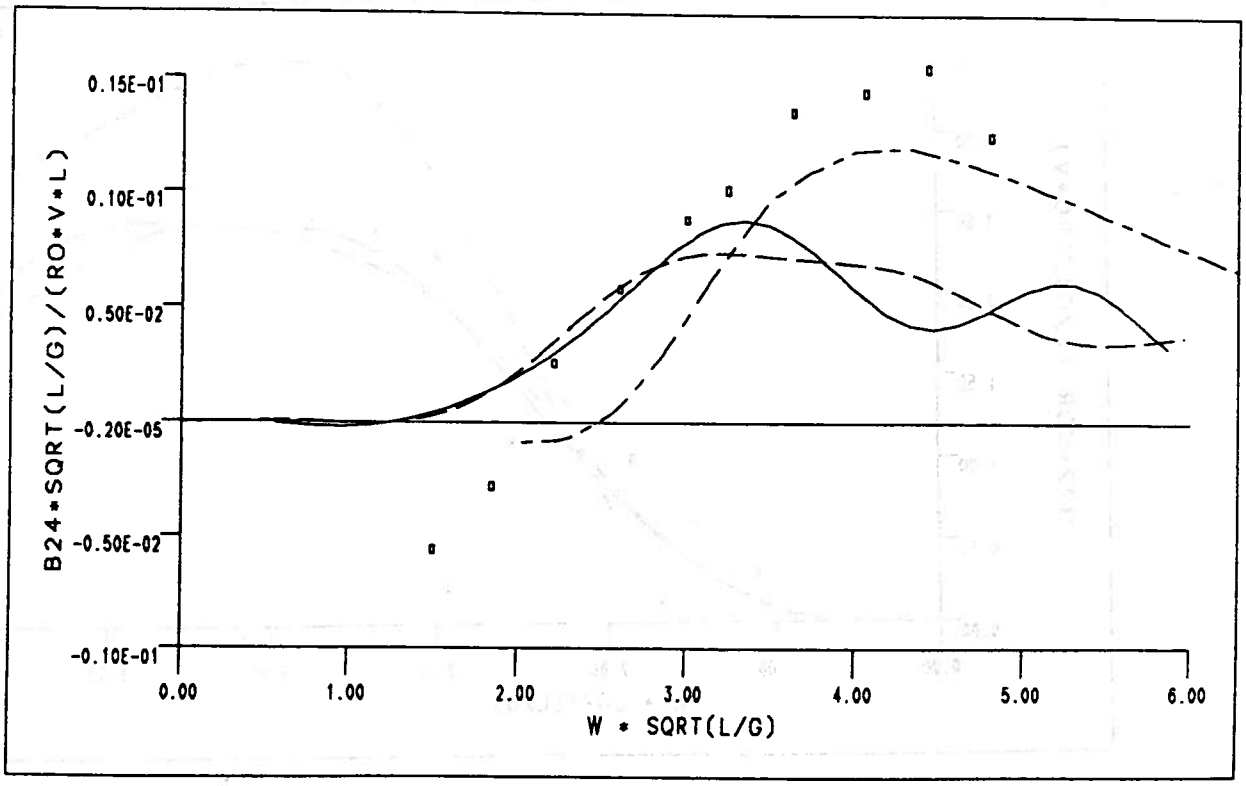
SWAY ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 236



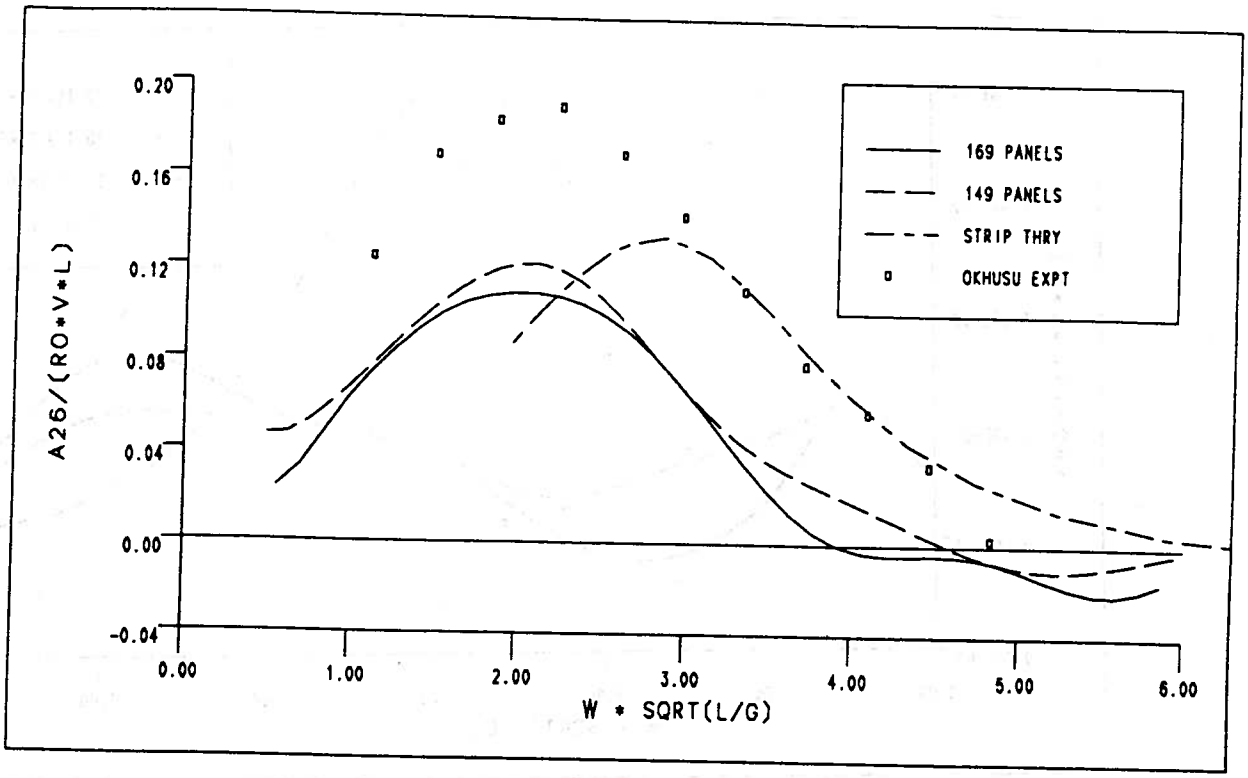
SWAY DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 237



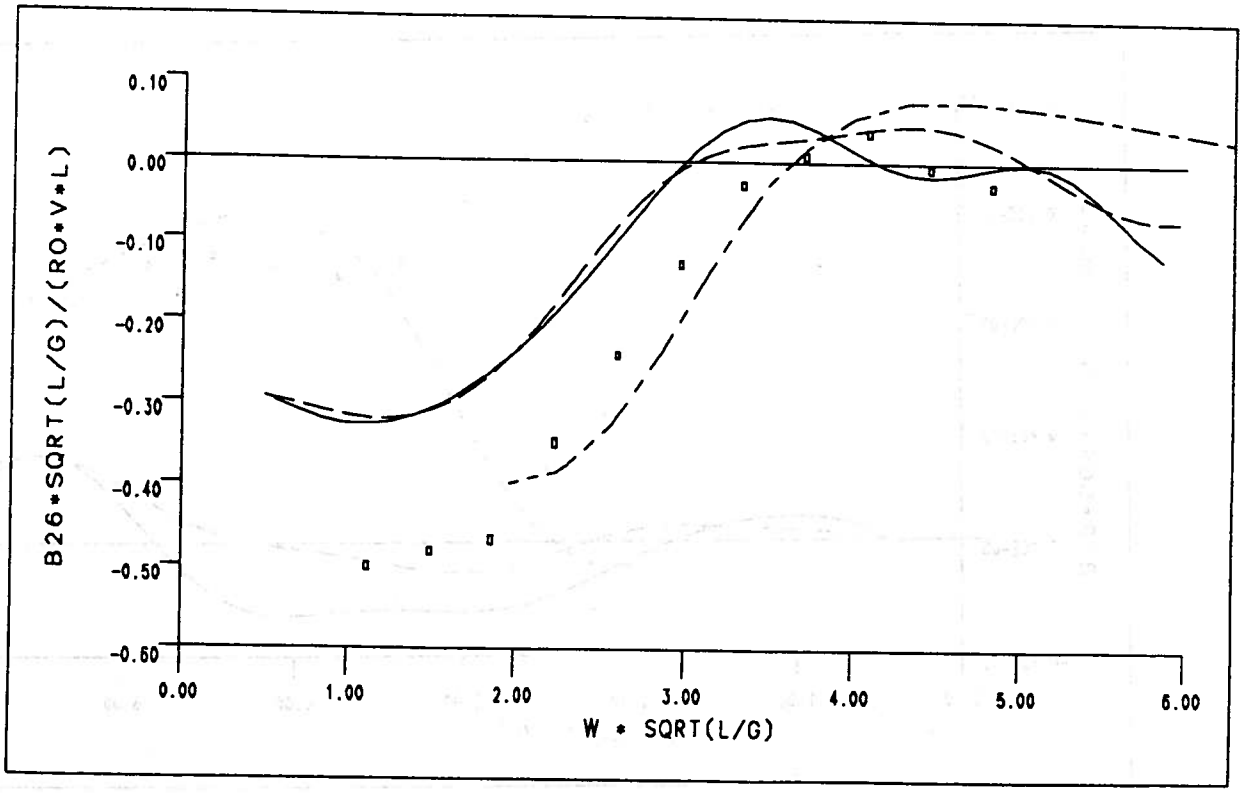
SWAY-ROLL ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 238



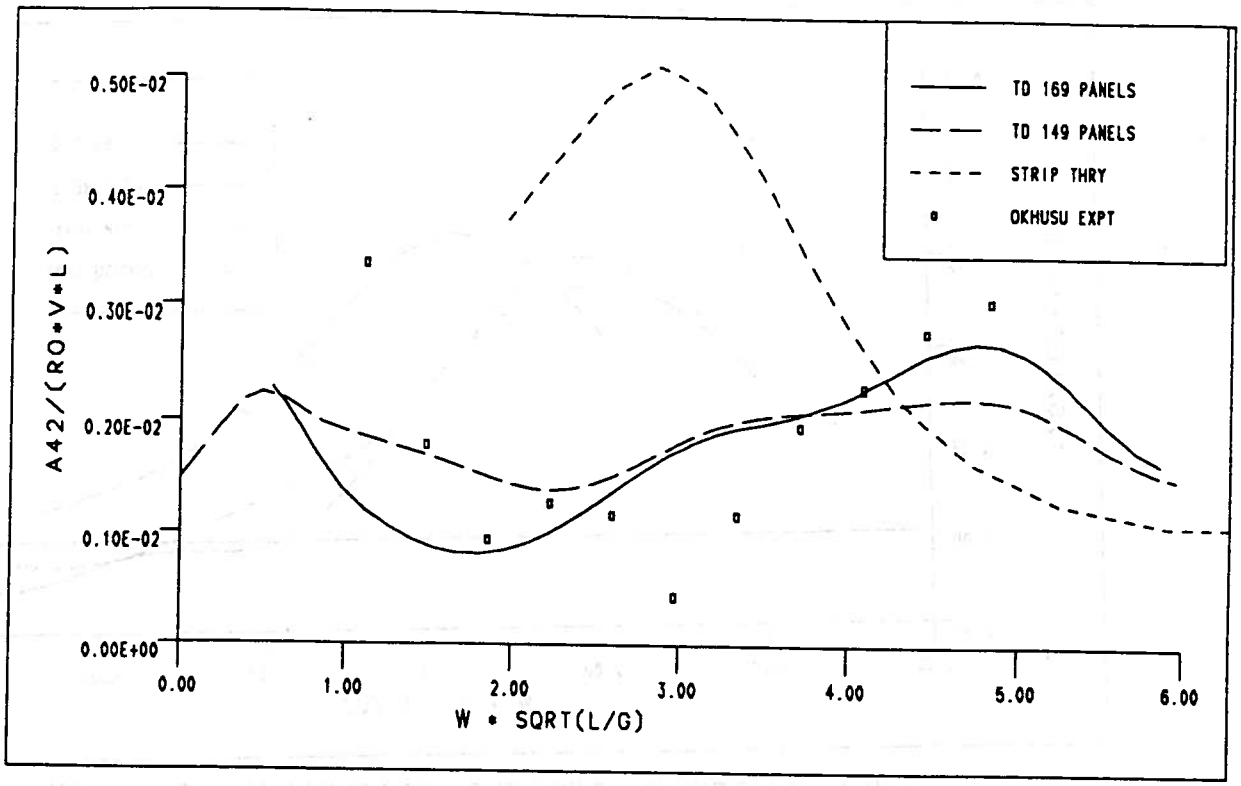
SWAY-ROLL DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 239



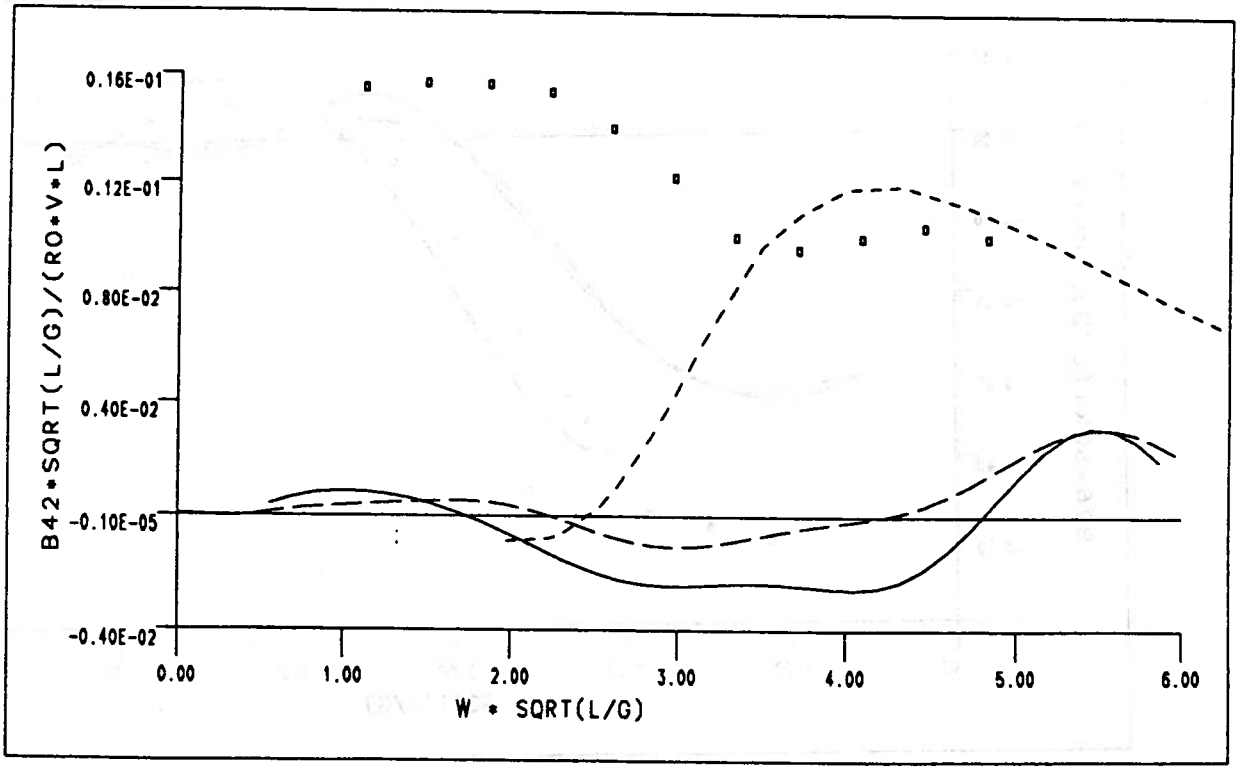
SWAY-YAW ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 240



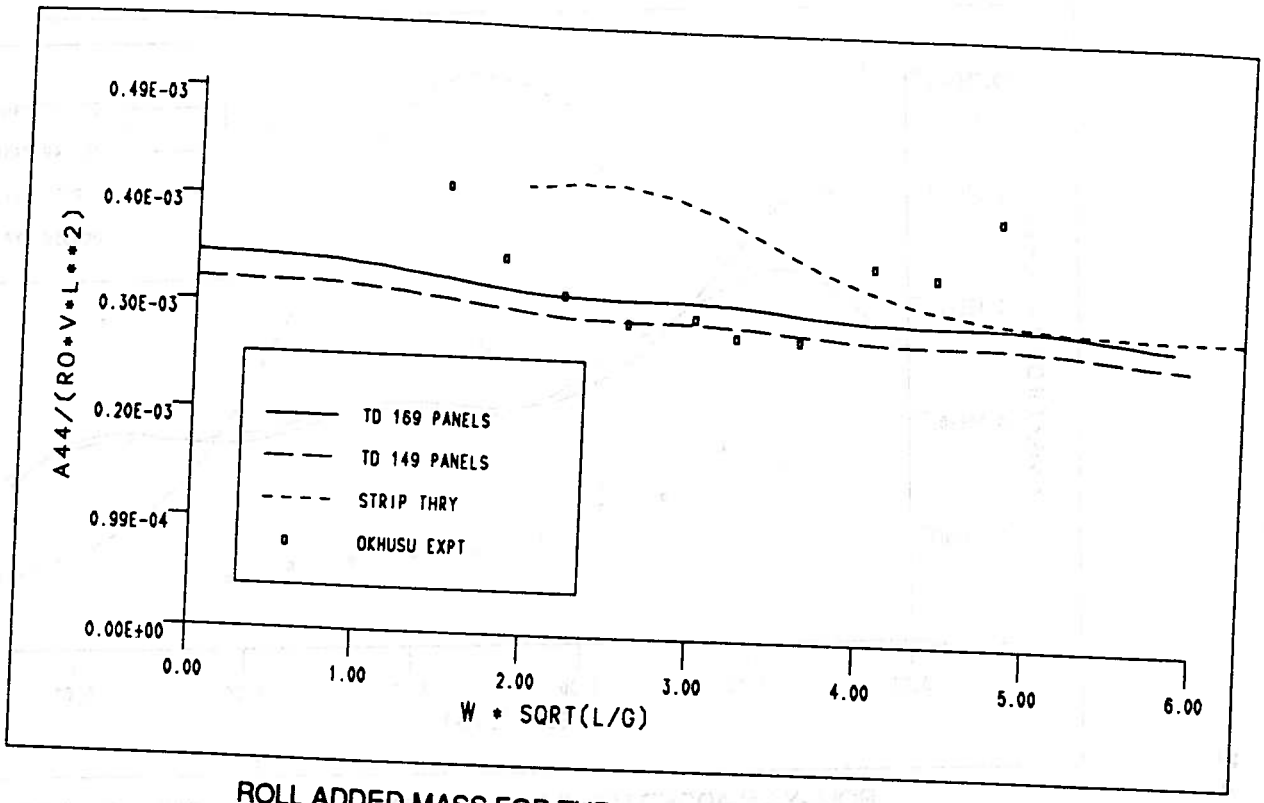
SWAY-YAW DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 241



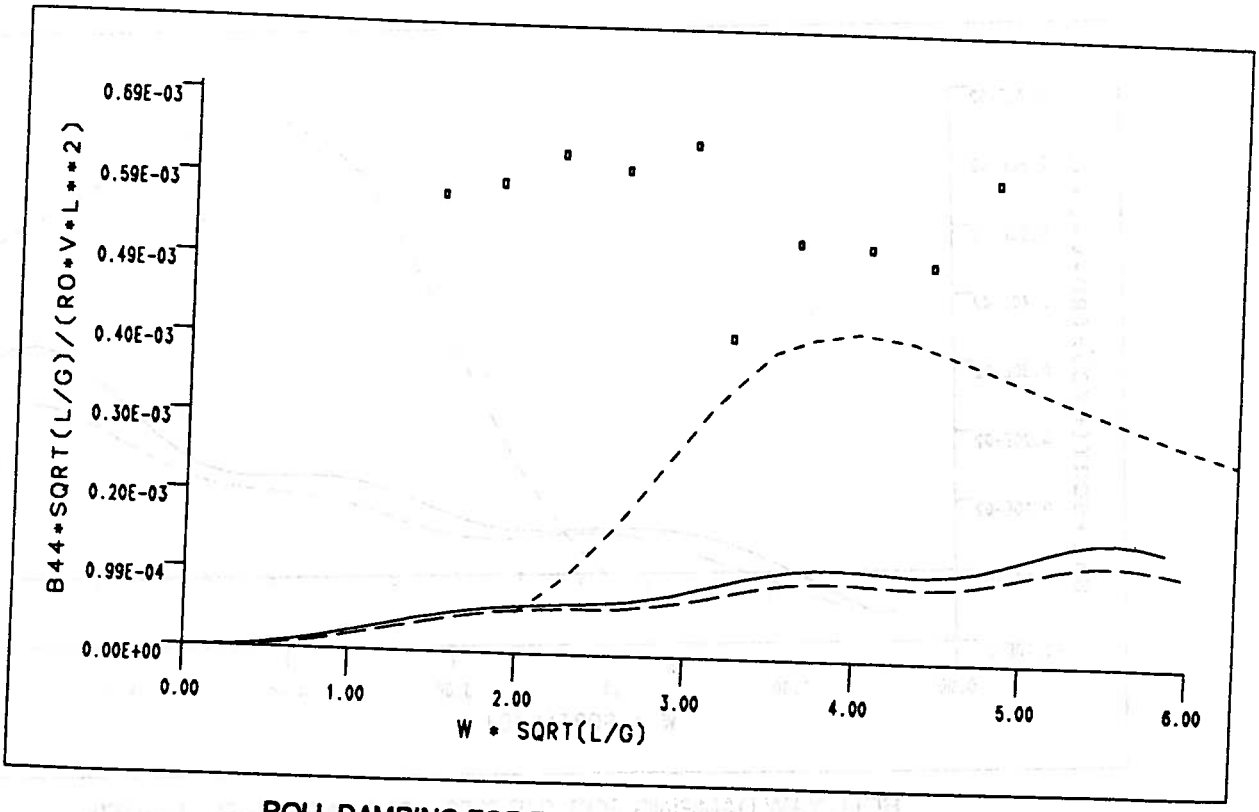
ROLL-SWAY ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 242



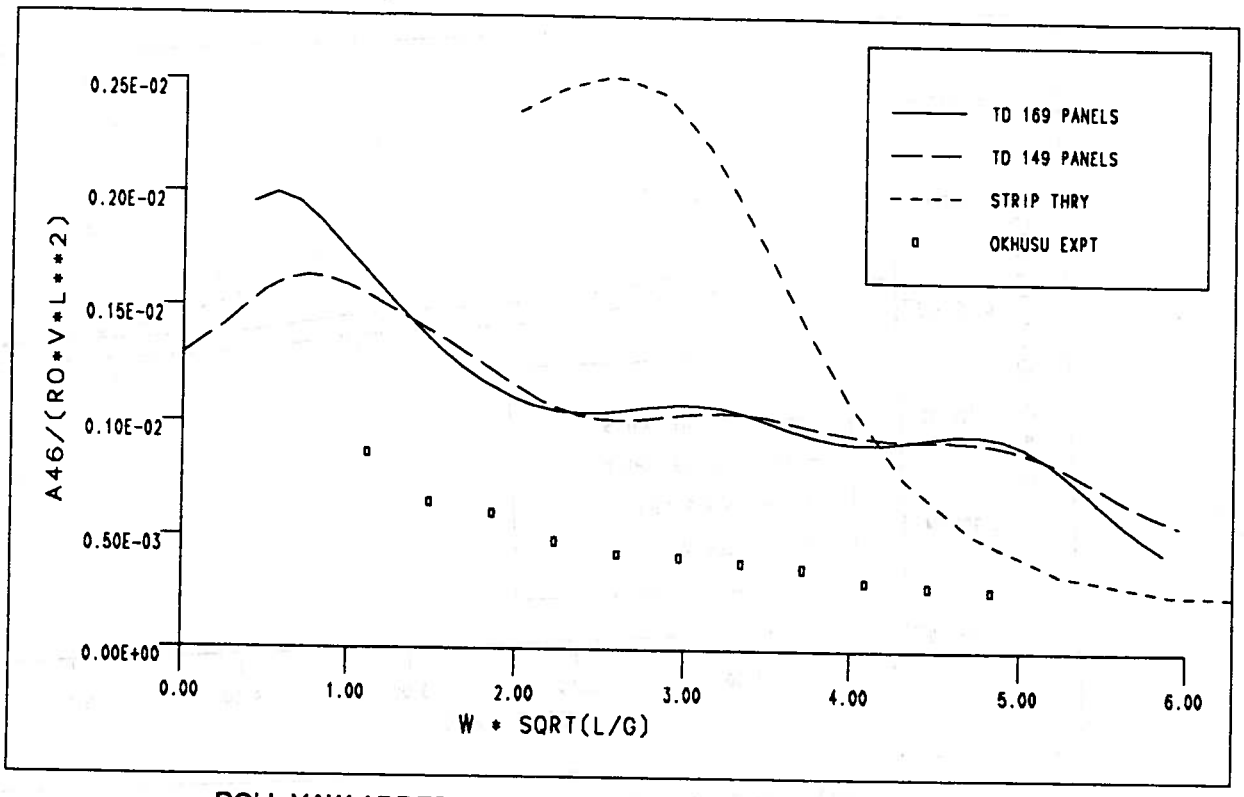
ROLL-SWAY DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 243



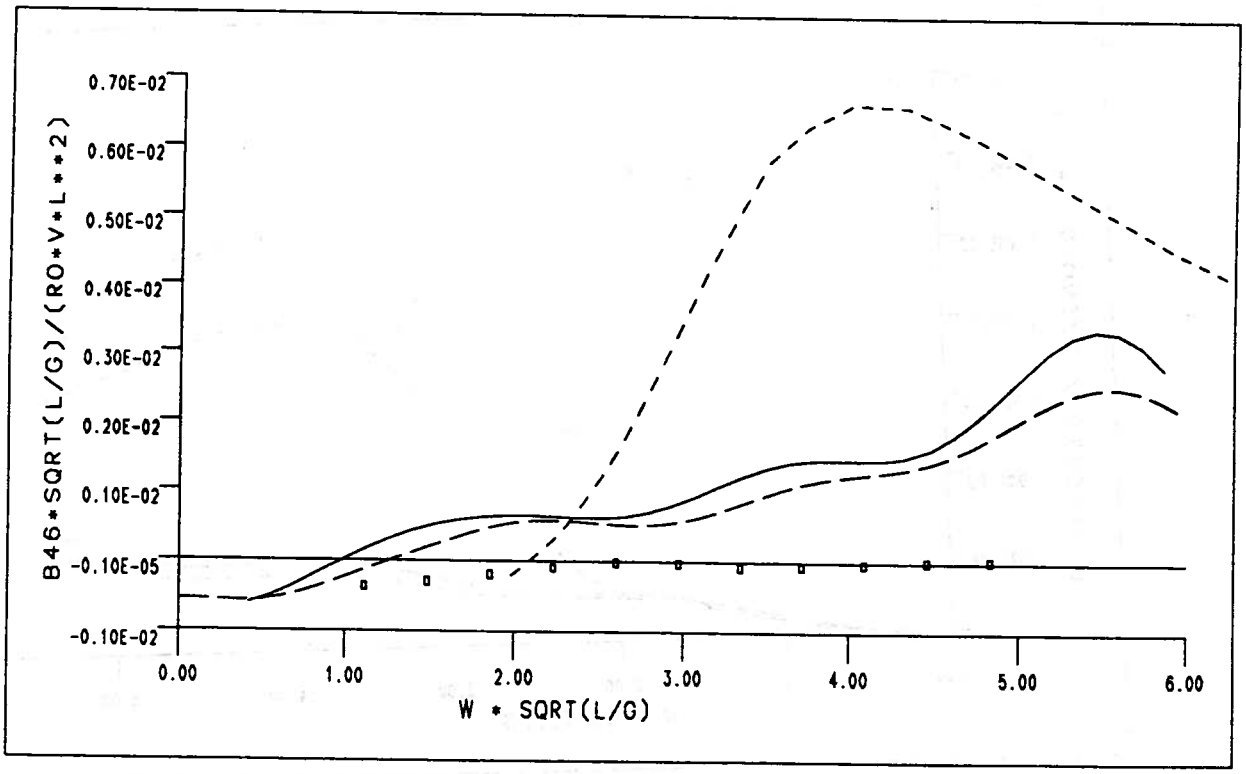
ROLL ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 244



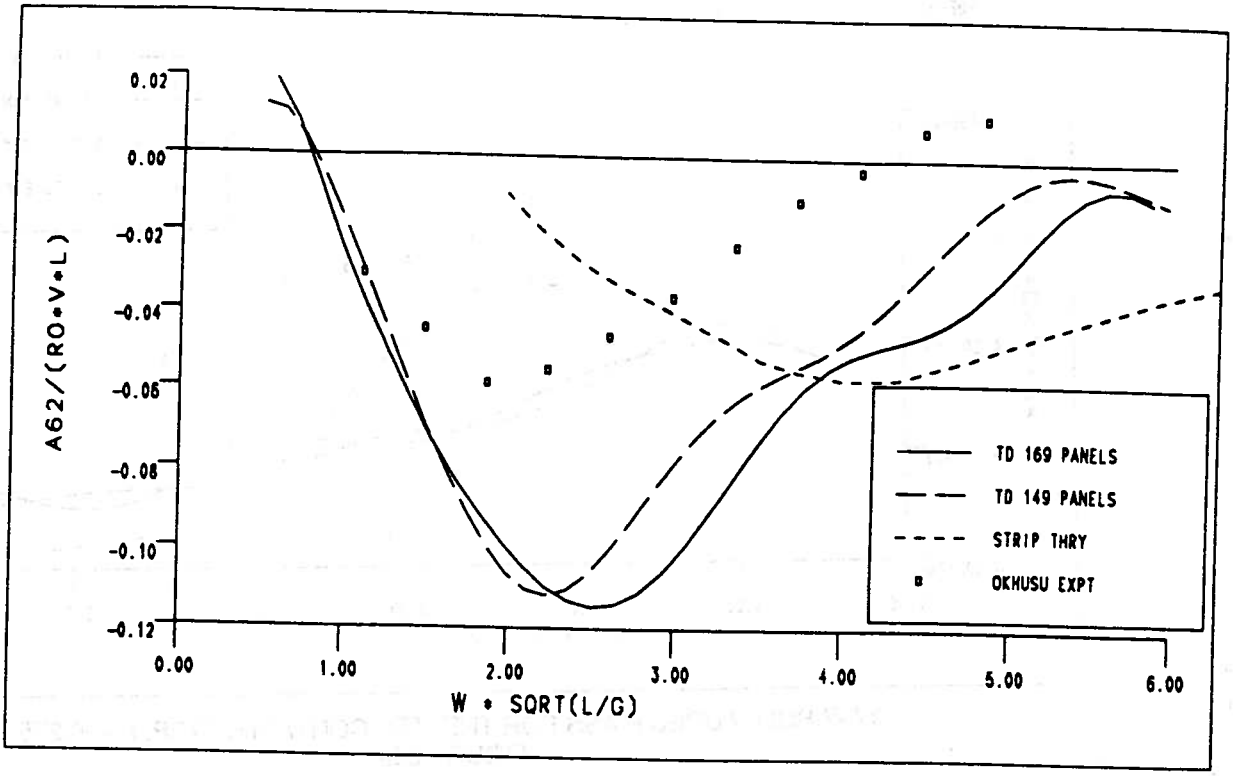
ROLL DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 245



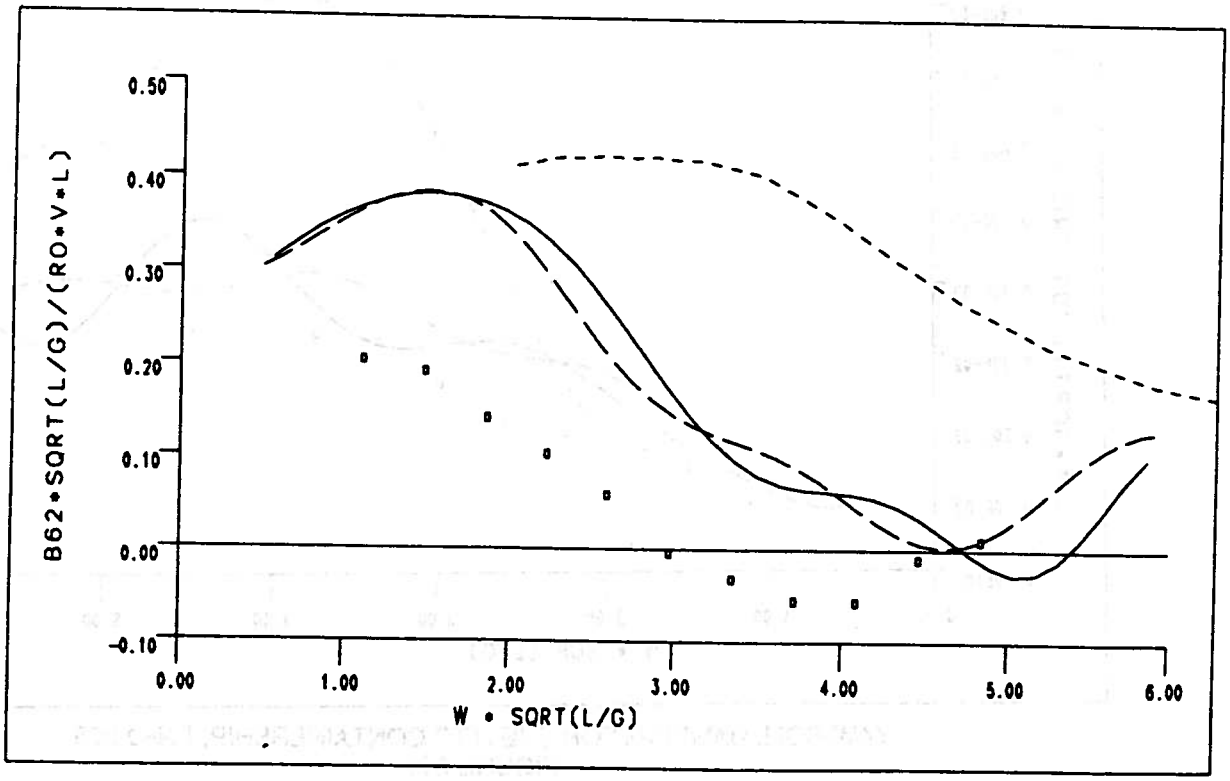
ROLL-YAW ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 246



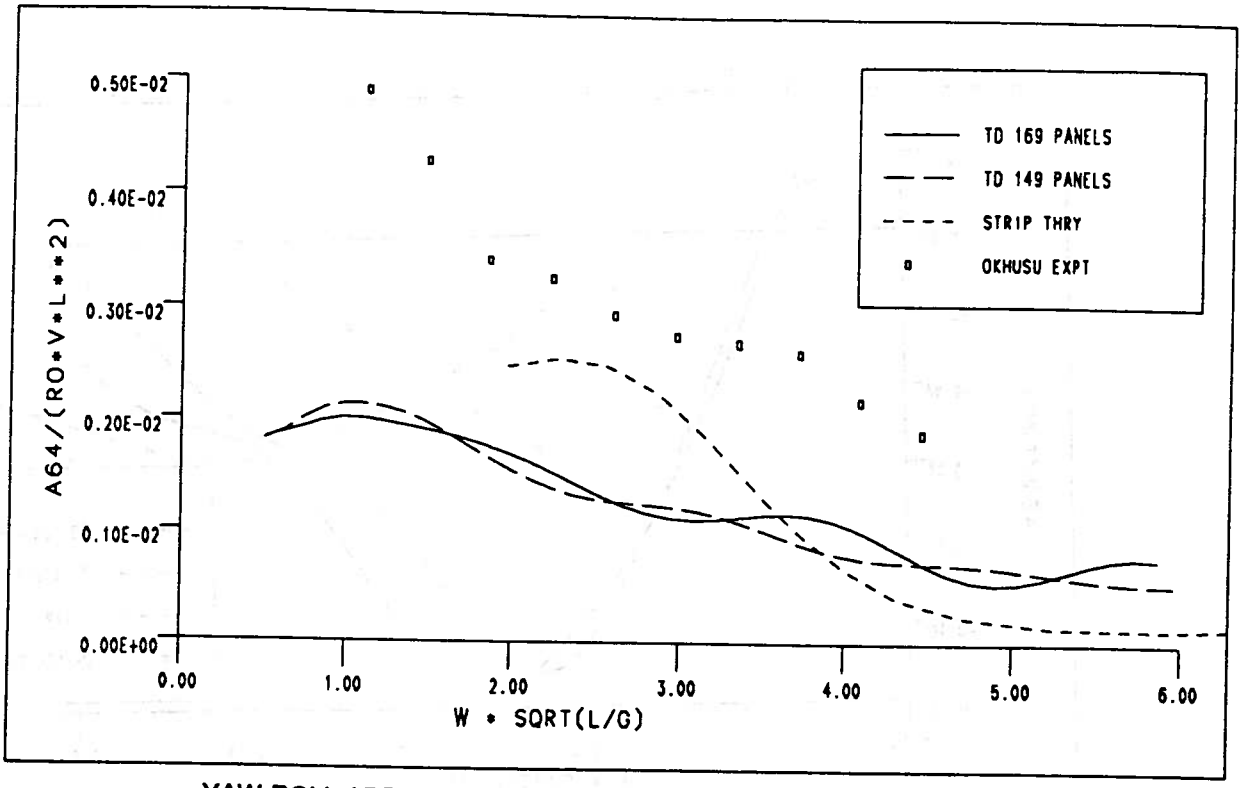
ROLL-YAW DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 247



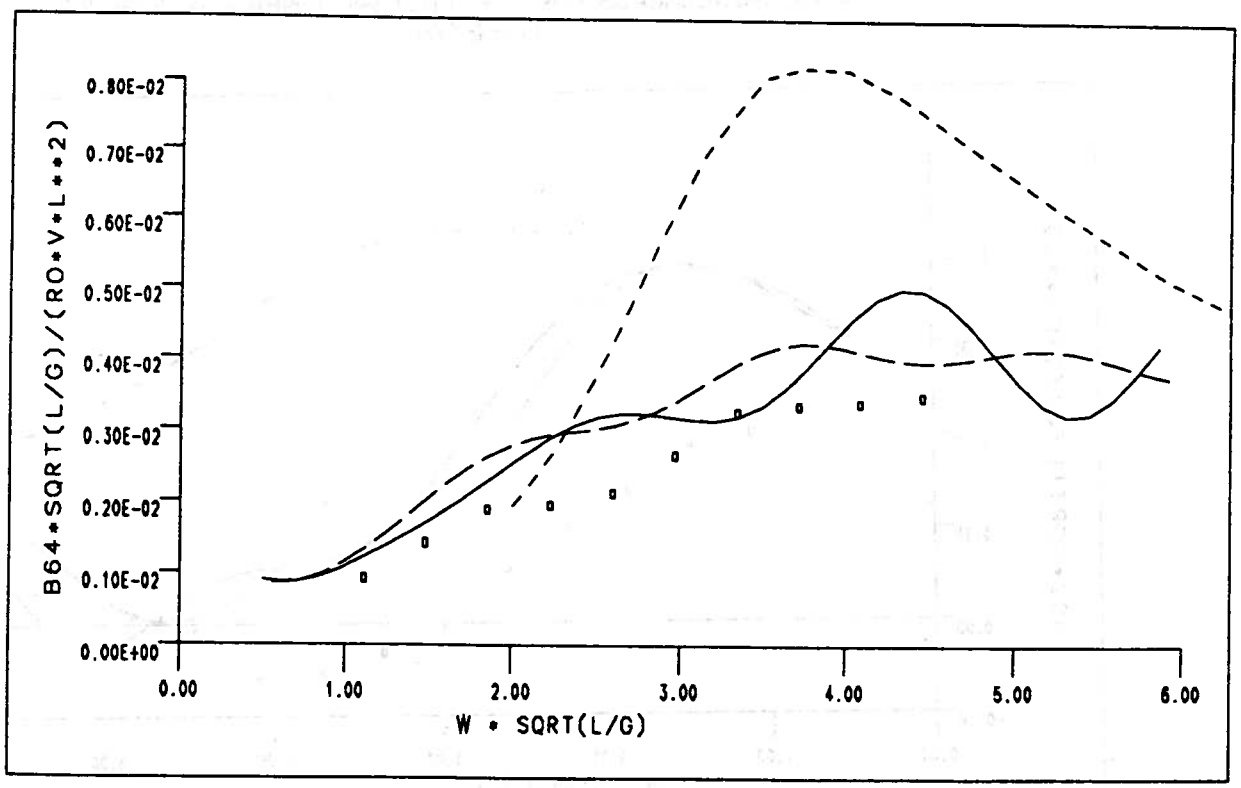
YAW-SWAY ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 248



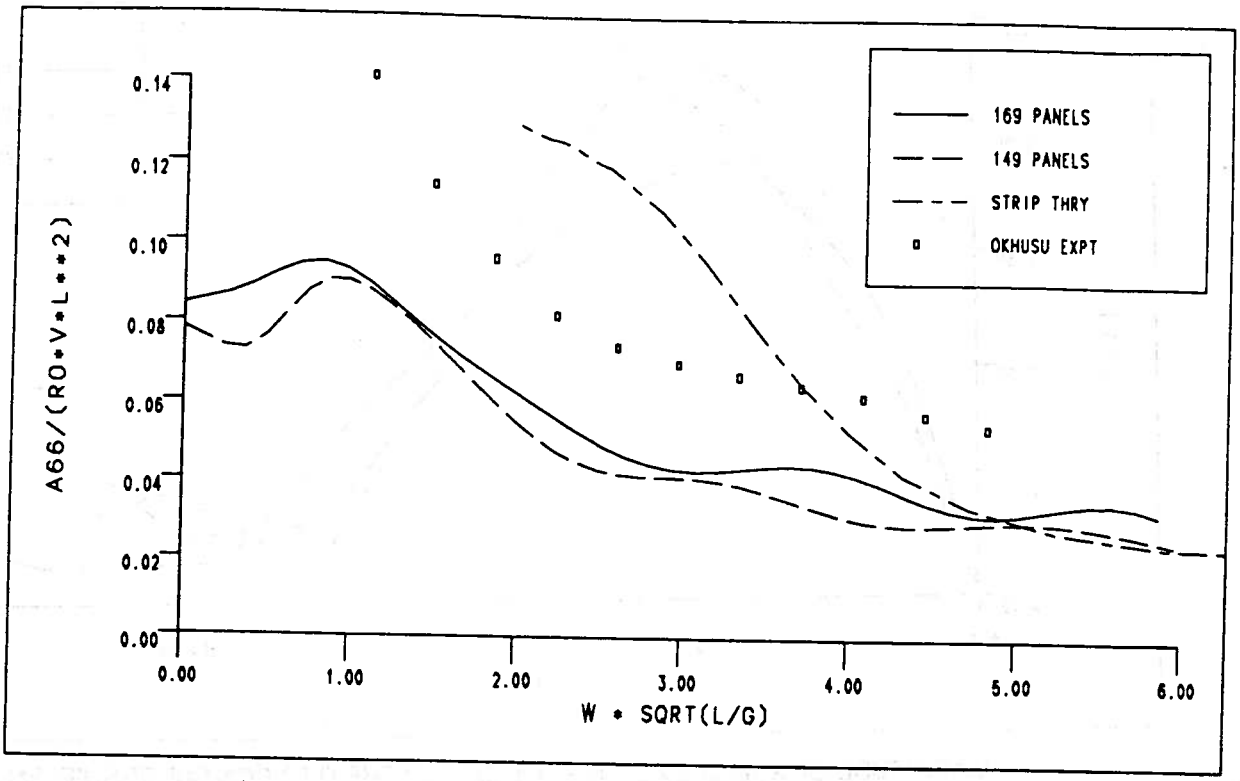
YAW-SWAY DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 249



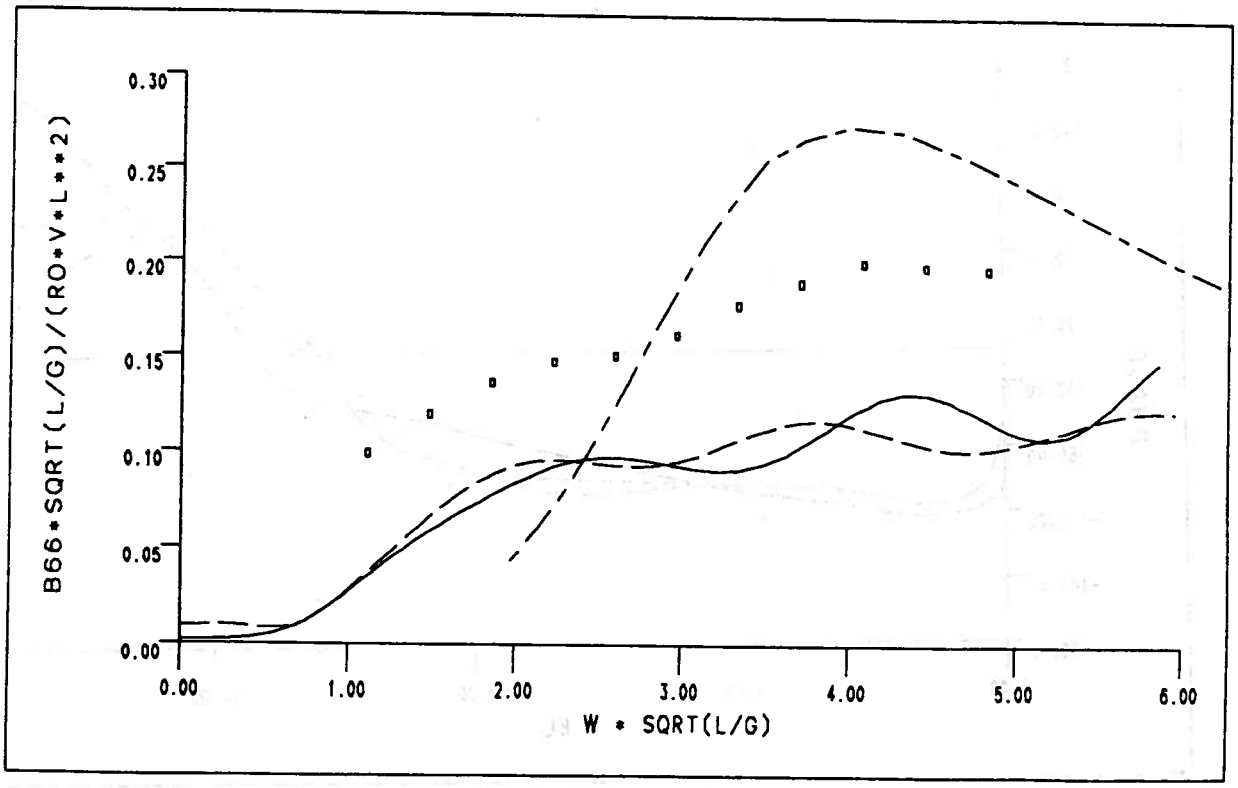
YAW-ROLL ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 250



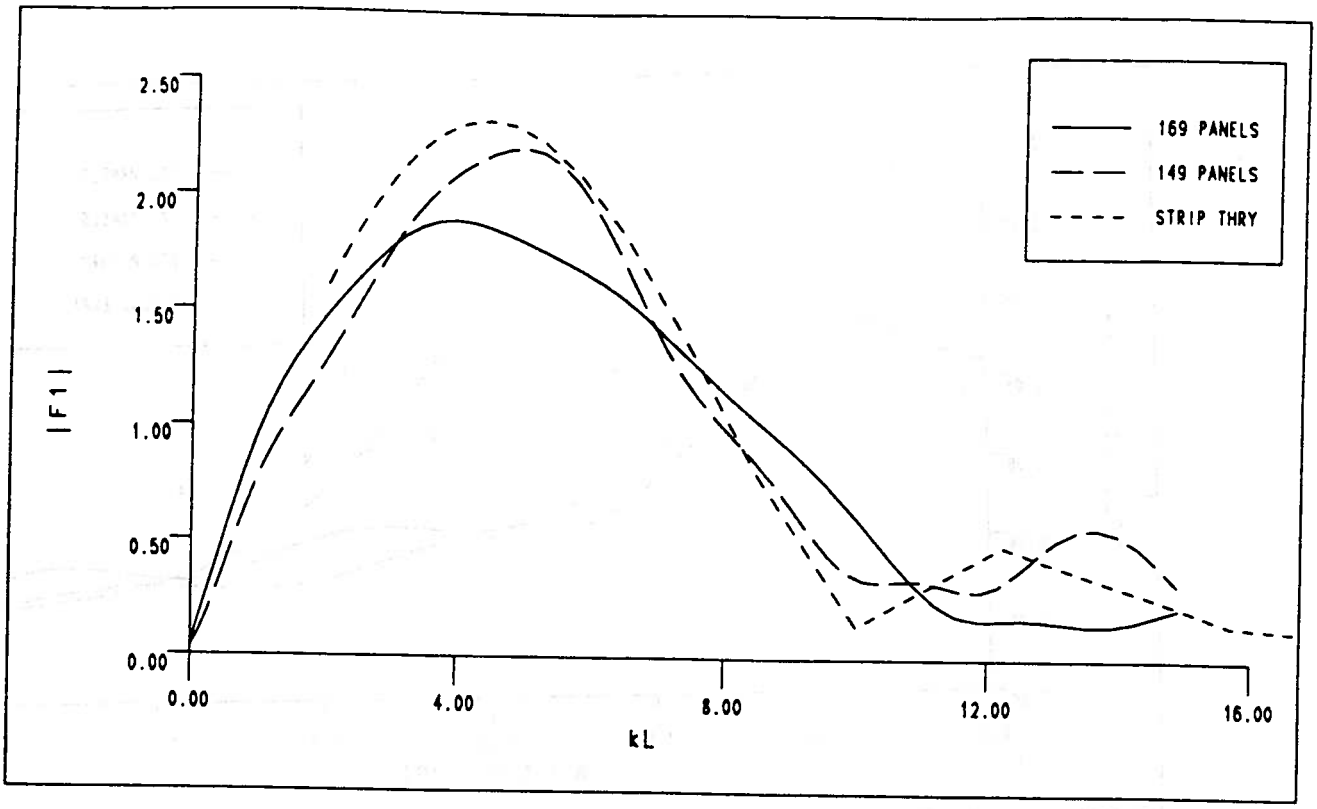
YAW-ROLL DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 251



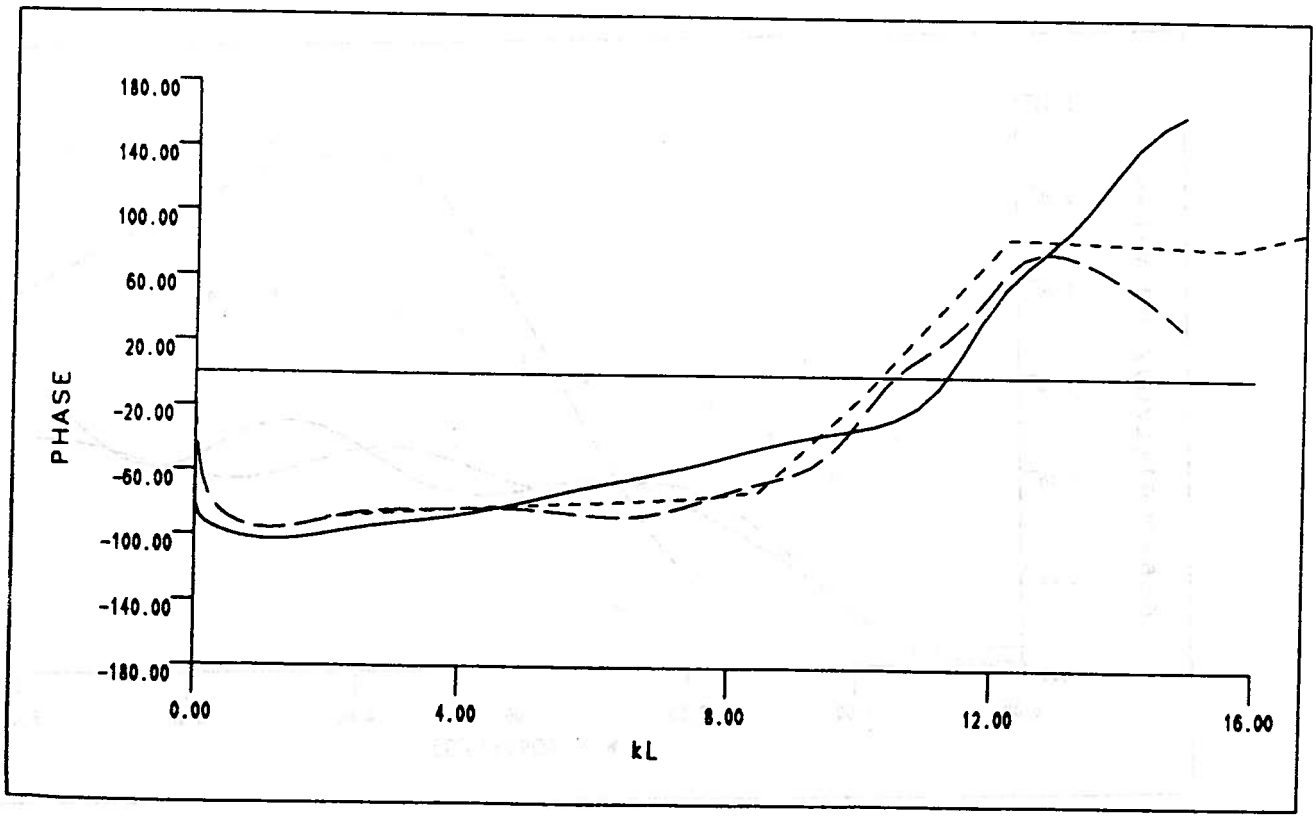
YAW ADDED MASS FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 252



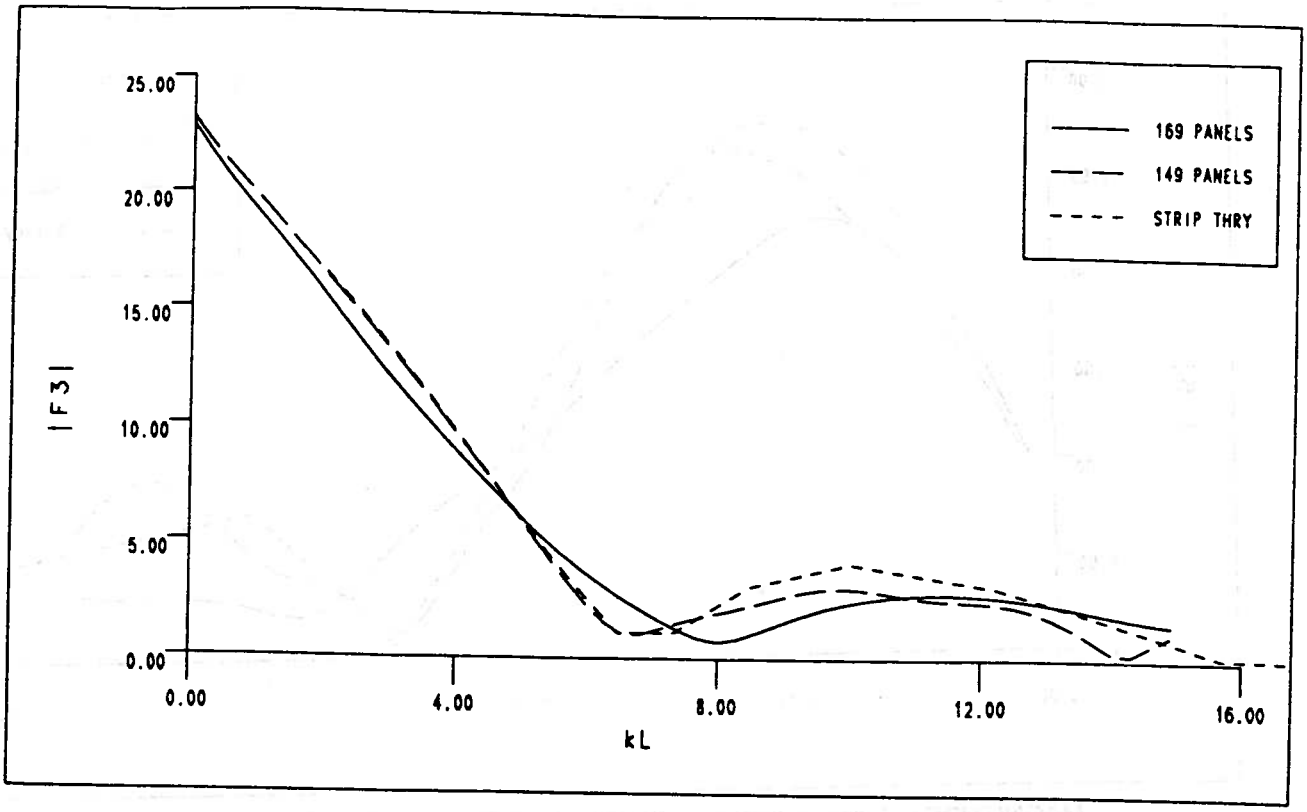
YAW DAMPING FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 253



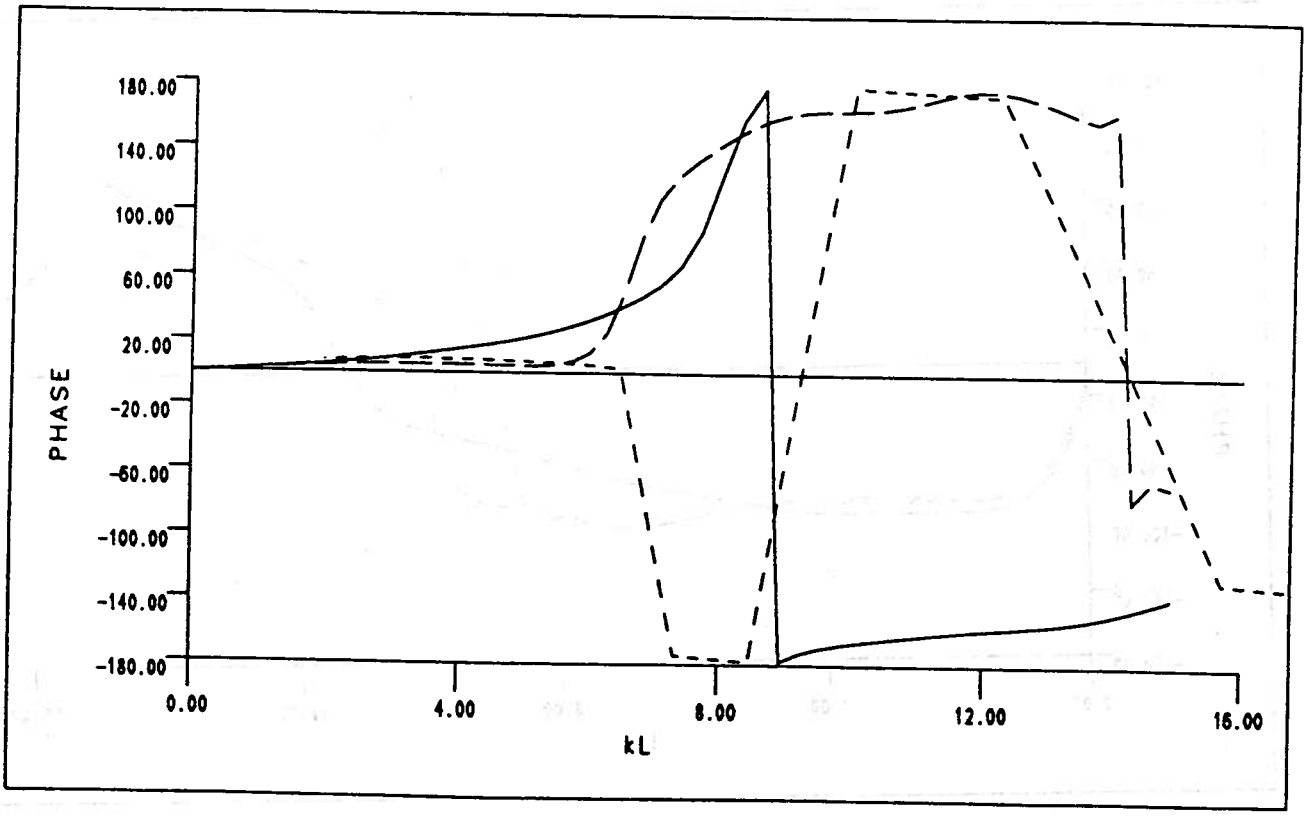
MAGNITUDE OF SURGE EXCITING FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 254



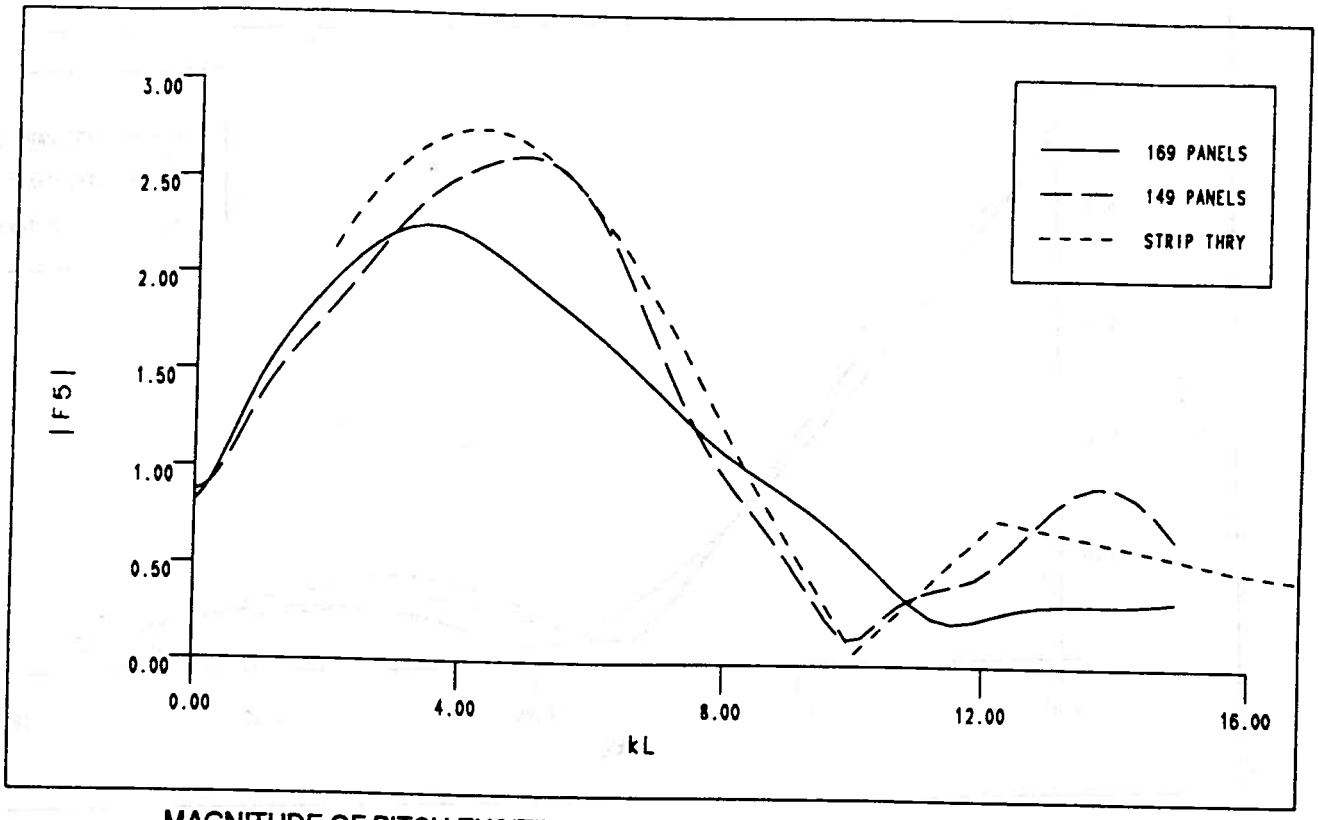
PHASE OF SURGE EXCITING FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 255



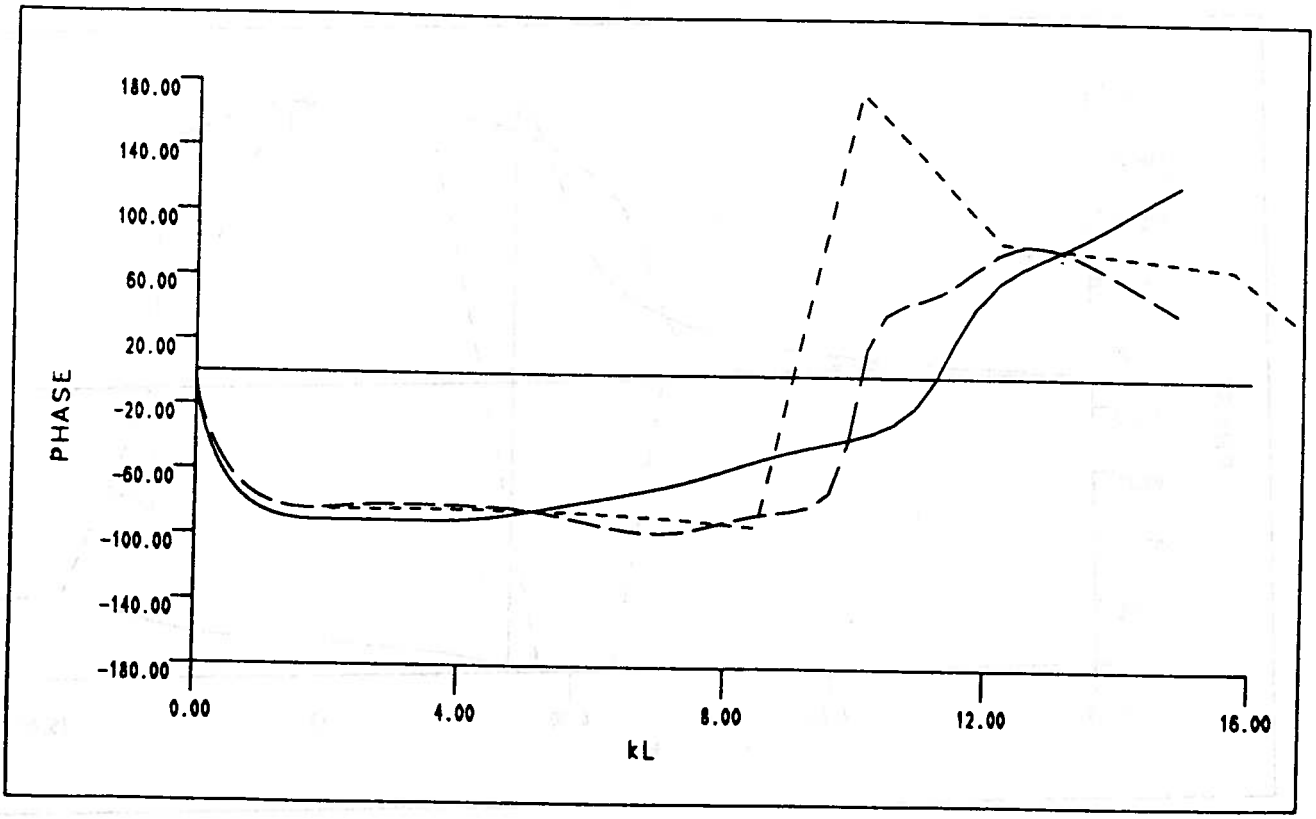
MAGNITUDE OF HEAVE EXCITING FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 256



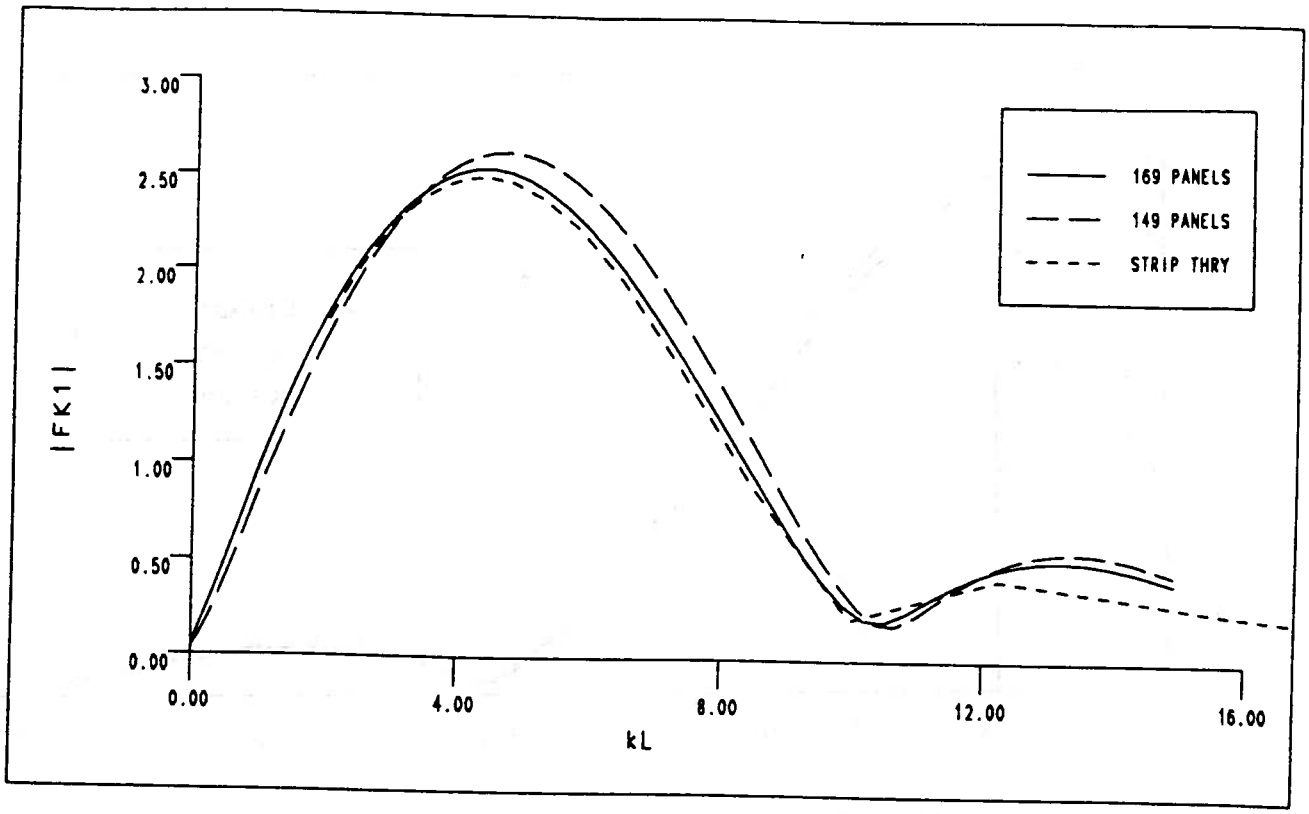
PHASE OF HEAVE EXCITING FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 257



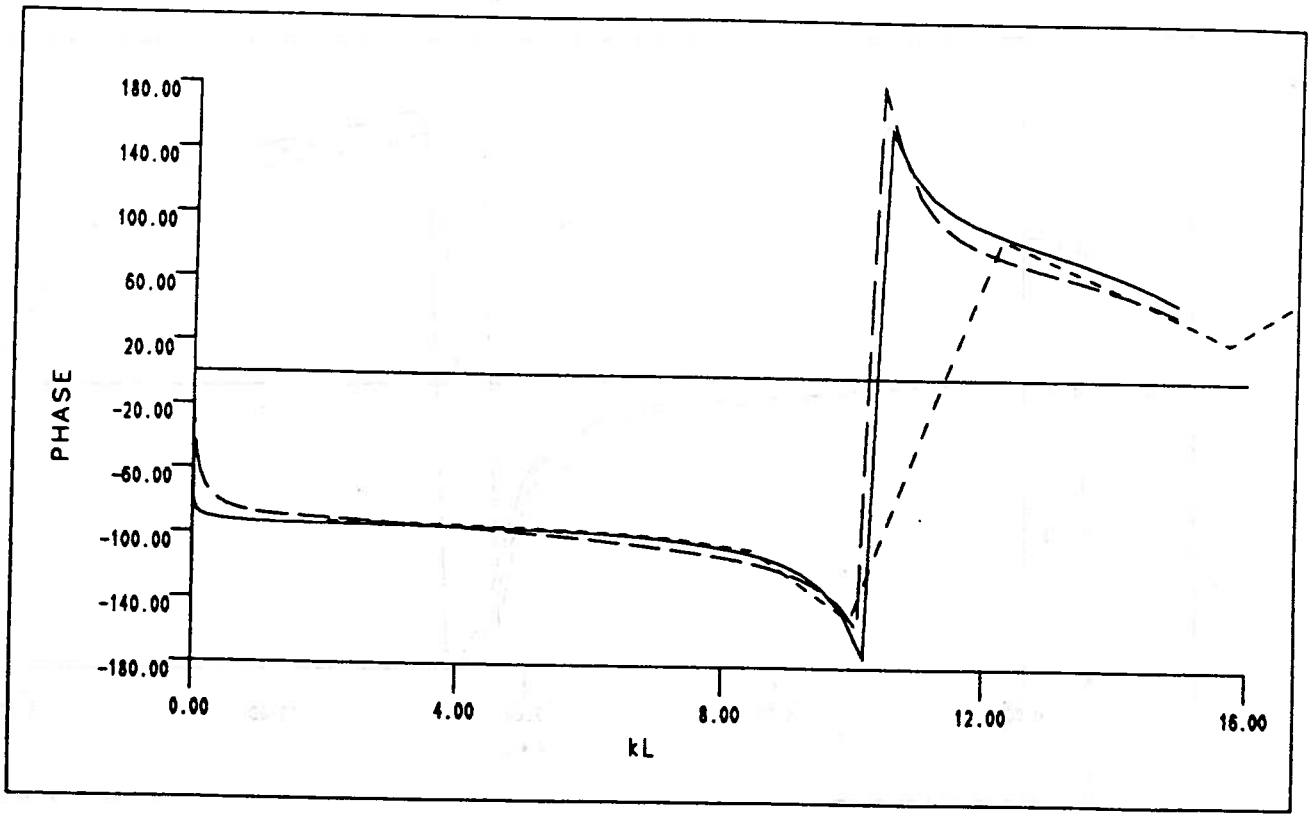
MAGNITUDE OF PITCH EXCITING FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 258



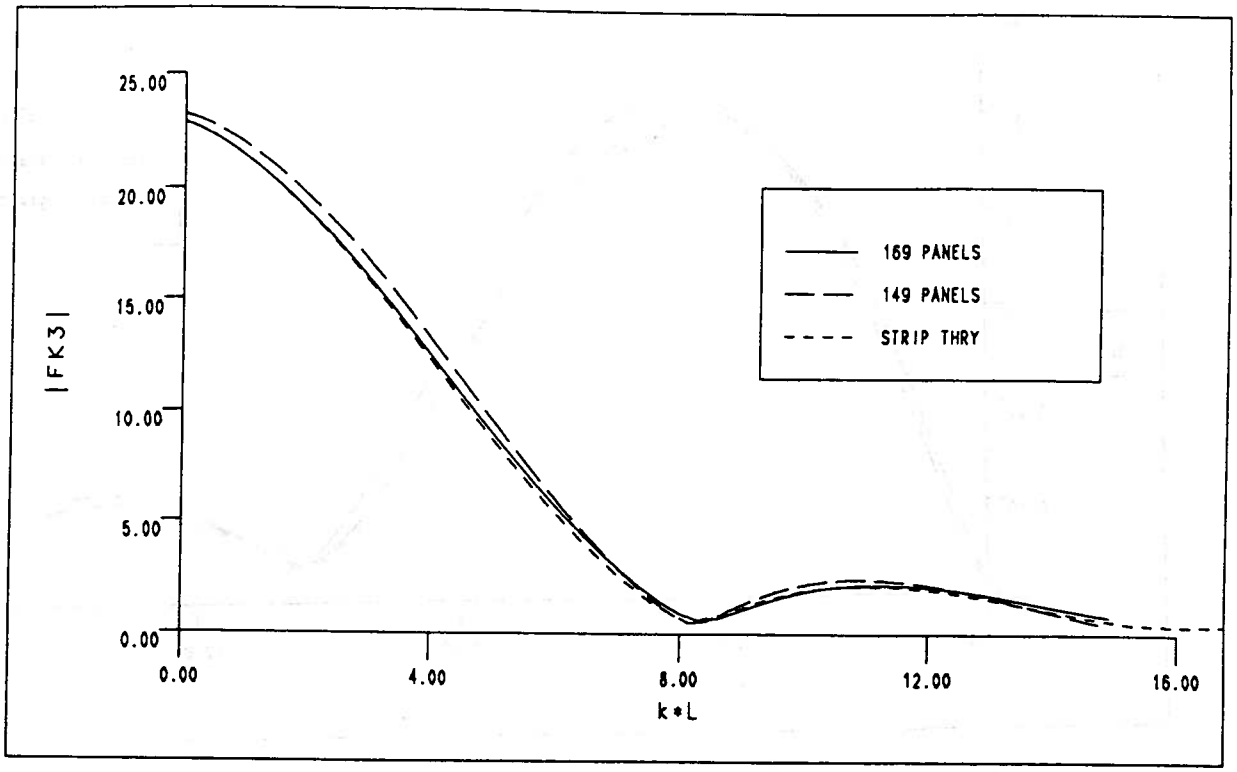
PHASE PITCH EXCITING FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 259



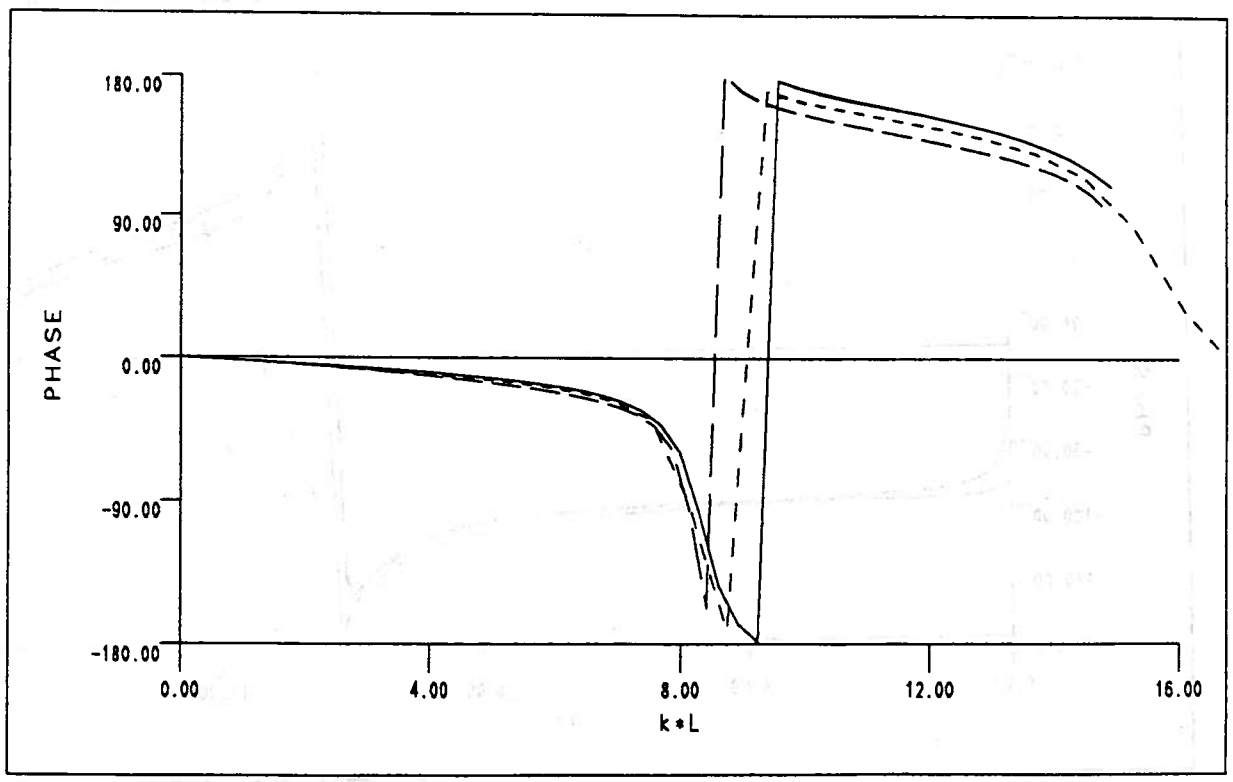
MAGNITUDE OF SURGE FROUDE-KRYLOV FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 260



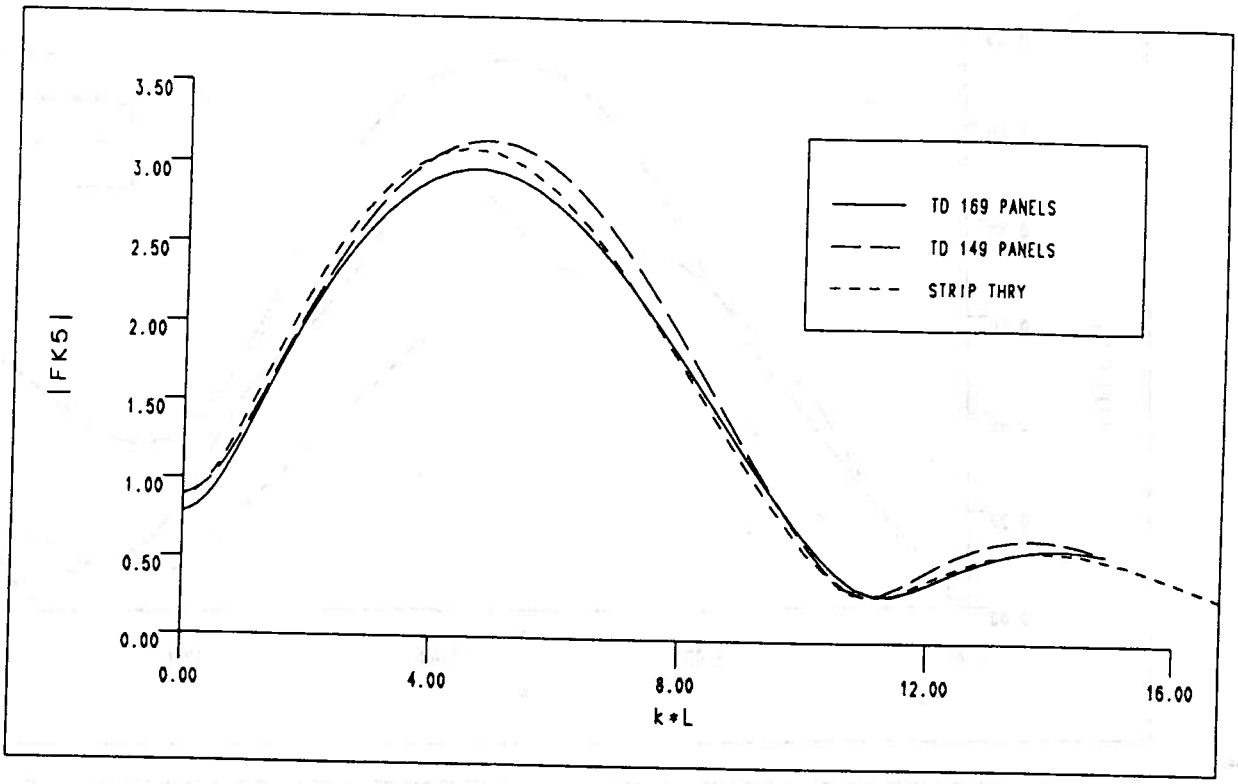
PHASE OF SURGE FROUDE-KRYLOV FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 261



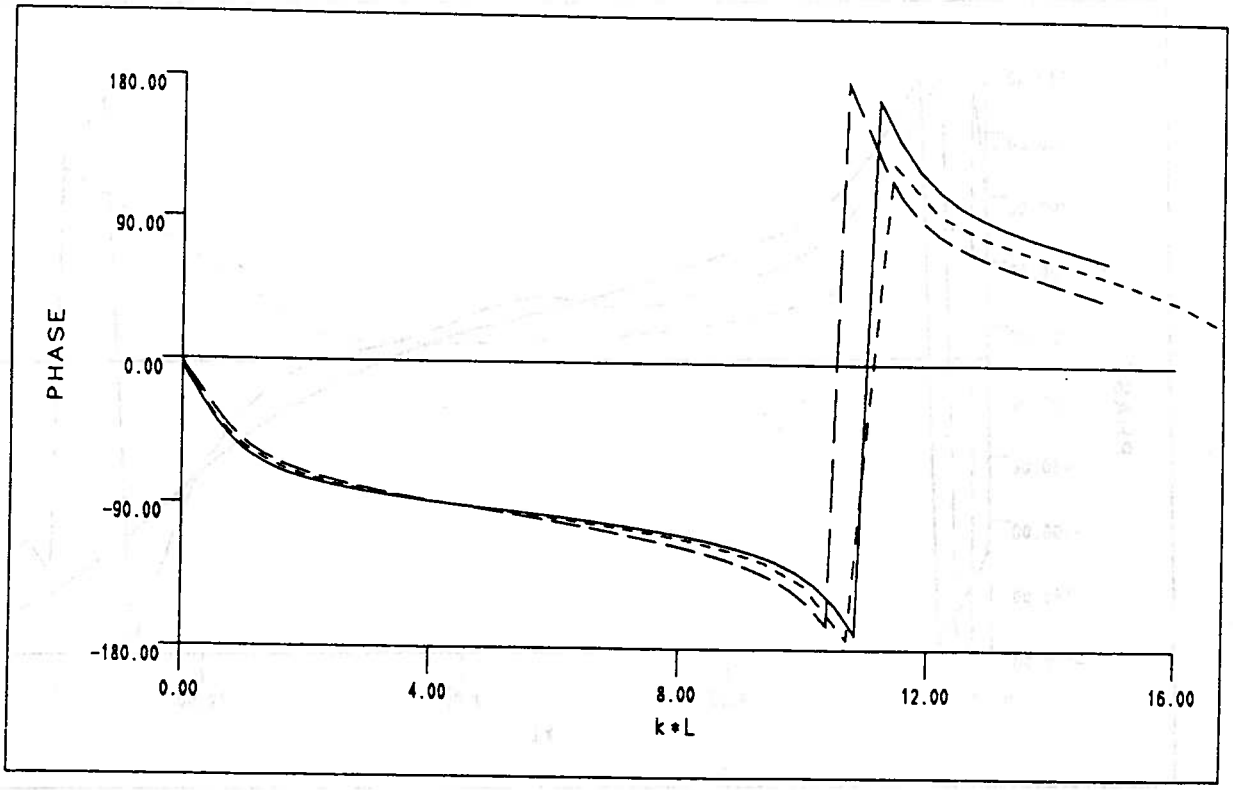
MAGNITUDE OF HEAVE FROUDE-KRYLOV FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 262



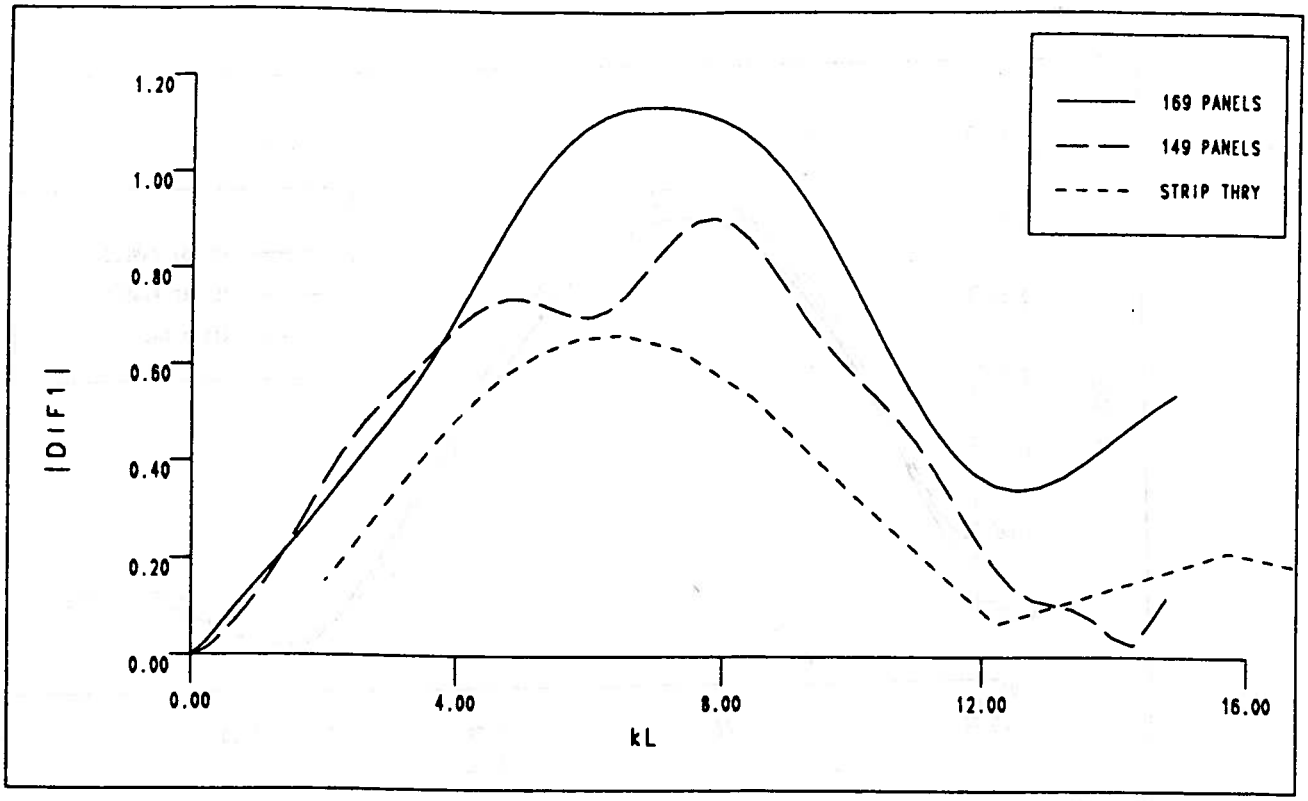
PHASE OF HEAVE FROUDE-KRYLOV FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 263



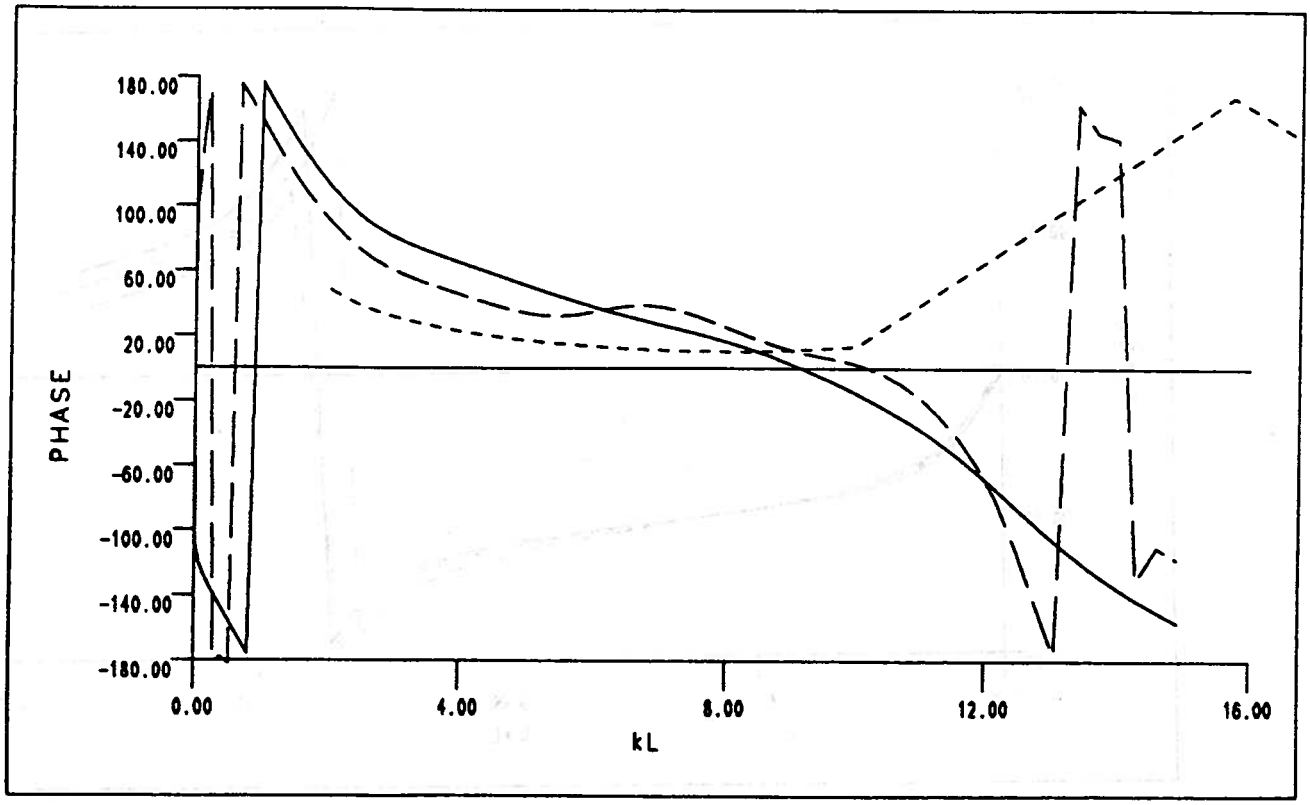
MAGNITUDE OF PITCH FROUDE-KRYLOV FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 264



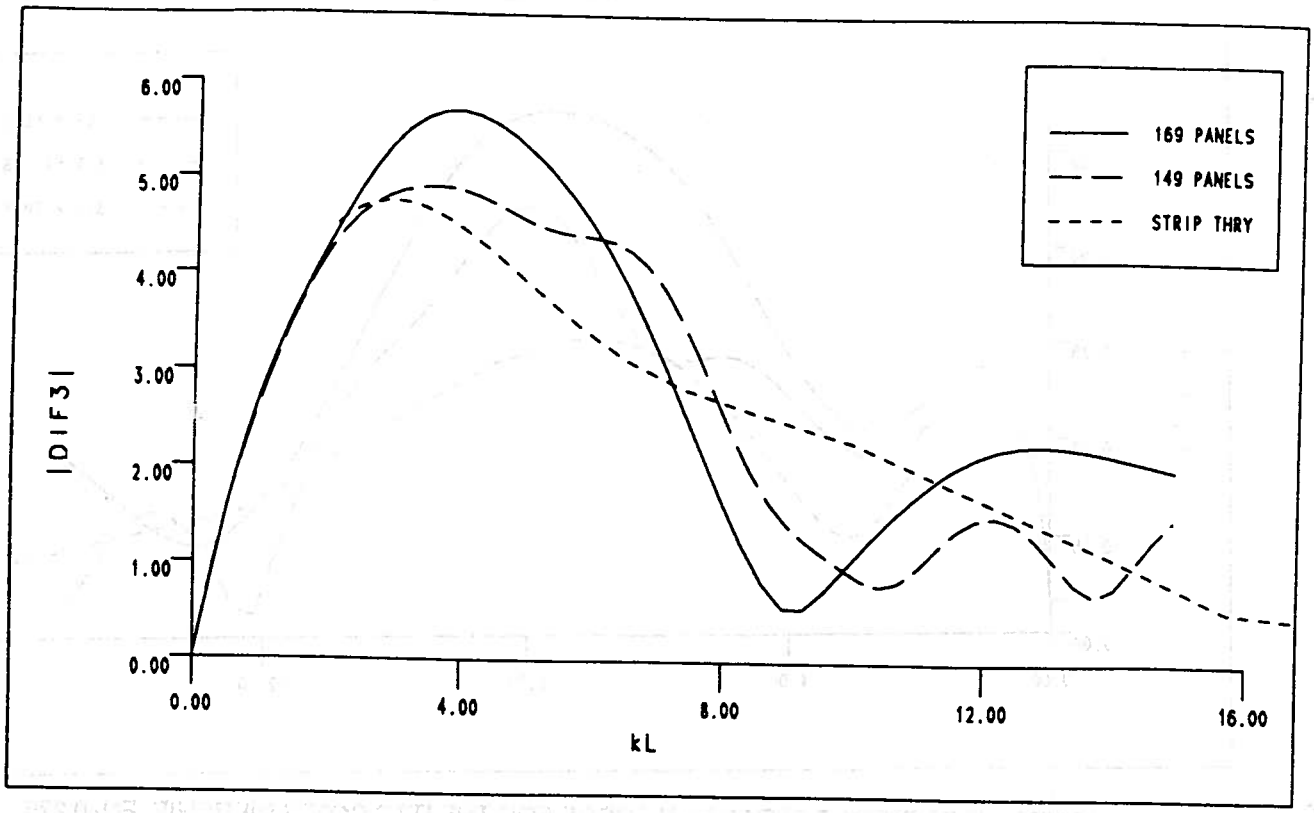
PHASE OF PITCH FROUDE-KRYLOV FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 265



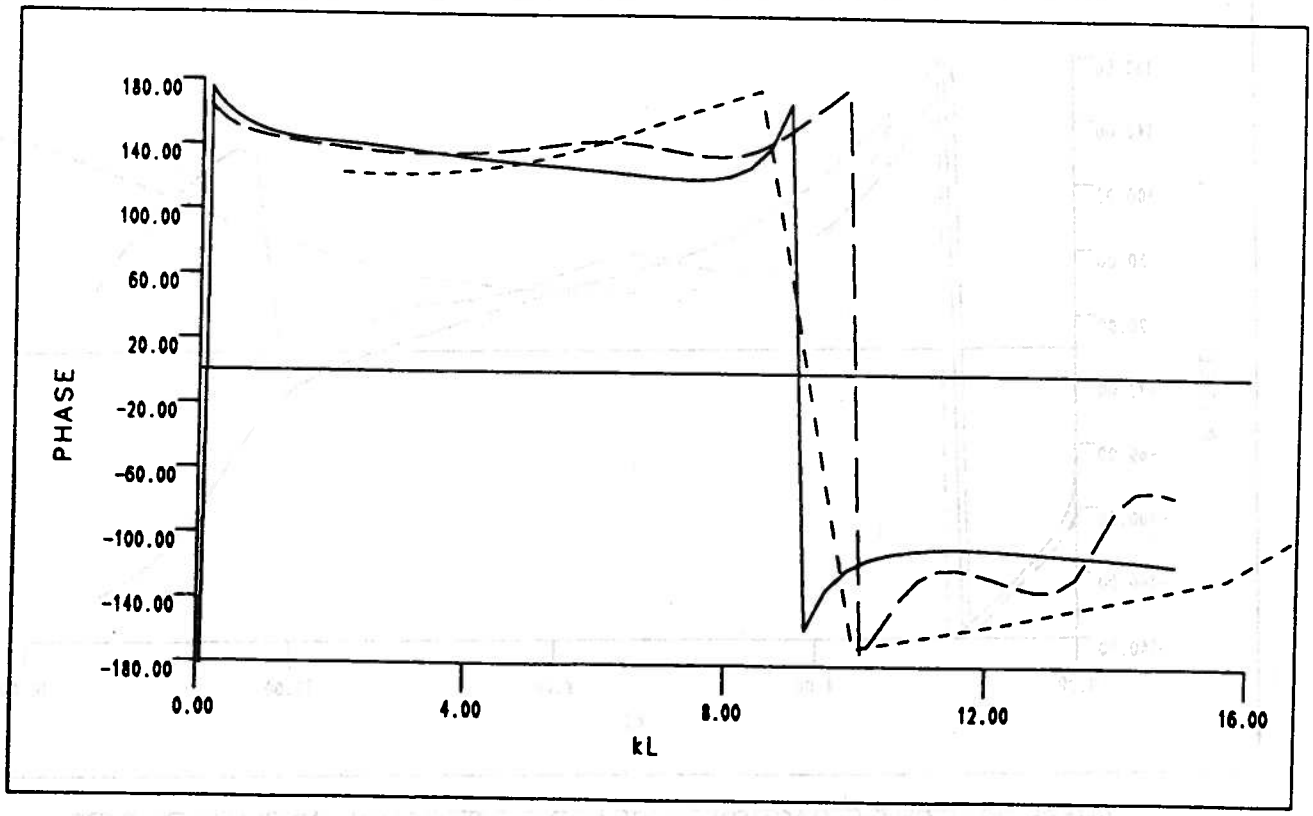
MAGNITUDE OF SURGE DIFFRACTION FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 266



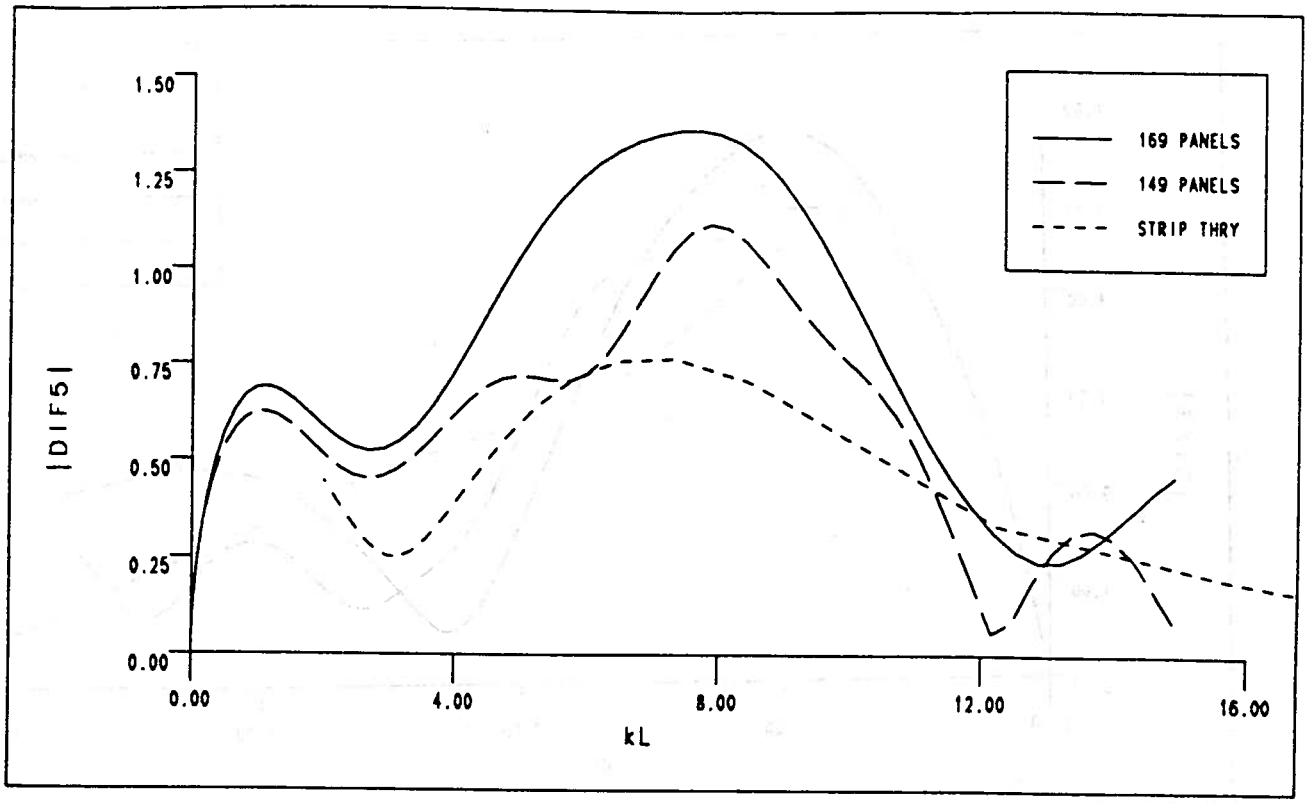
PHASE OF SURGE DIFFRACTION FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 267



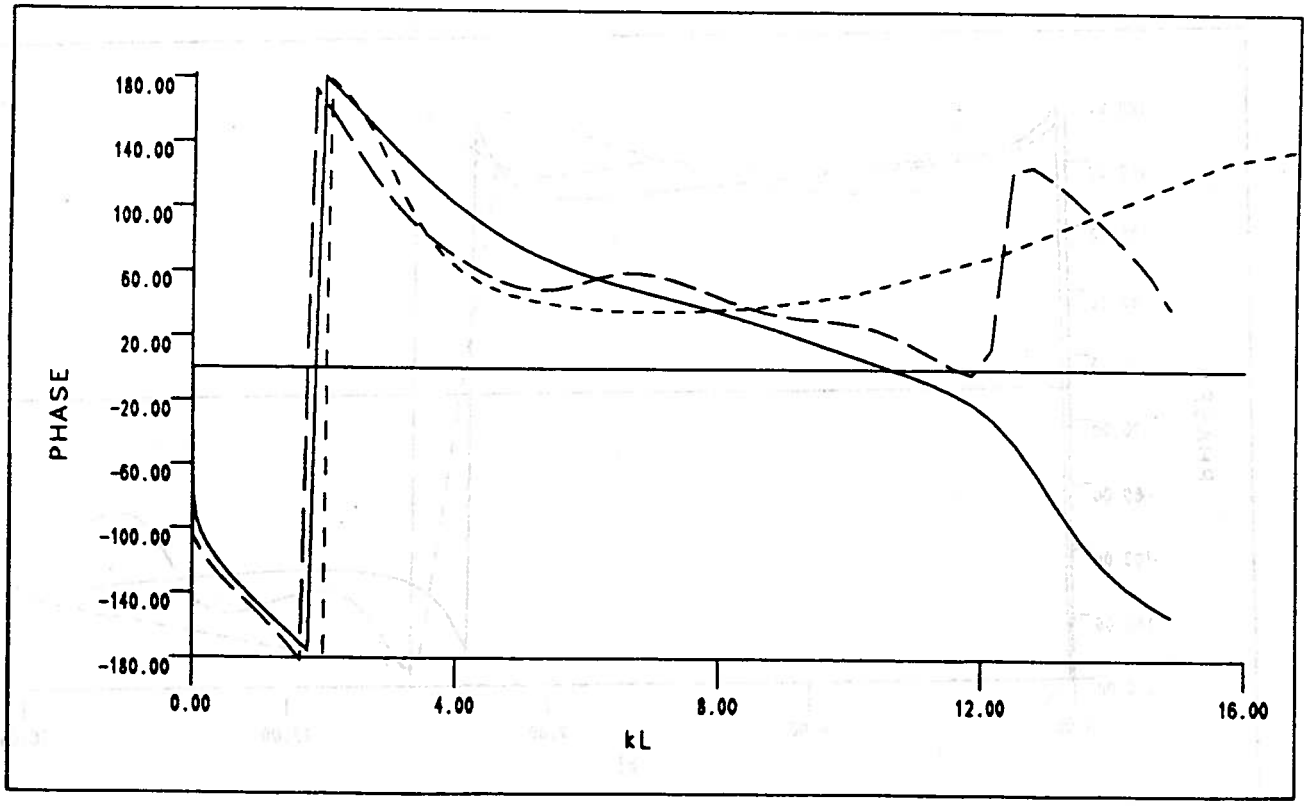
MAGNITUDE OF HEAVE DIFFRACTION FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 268



PHASE OF HEAVE DIFFRACTION FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 269

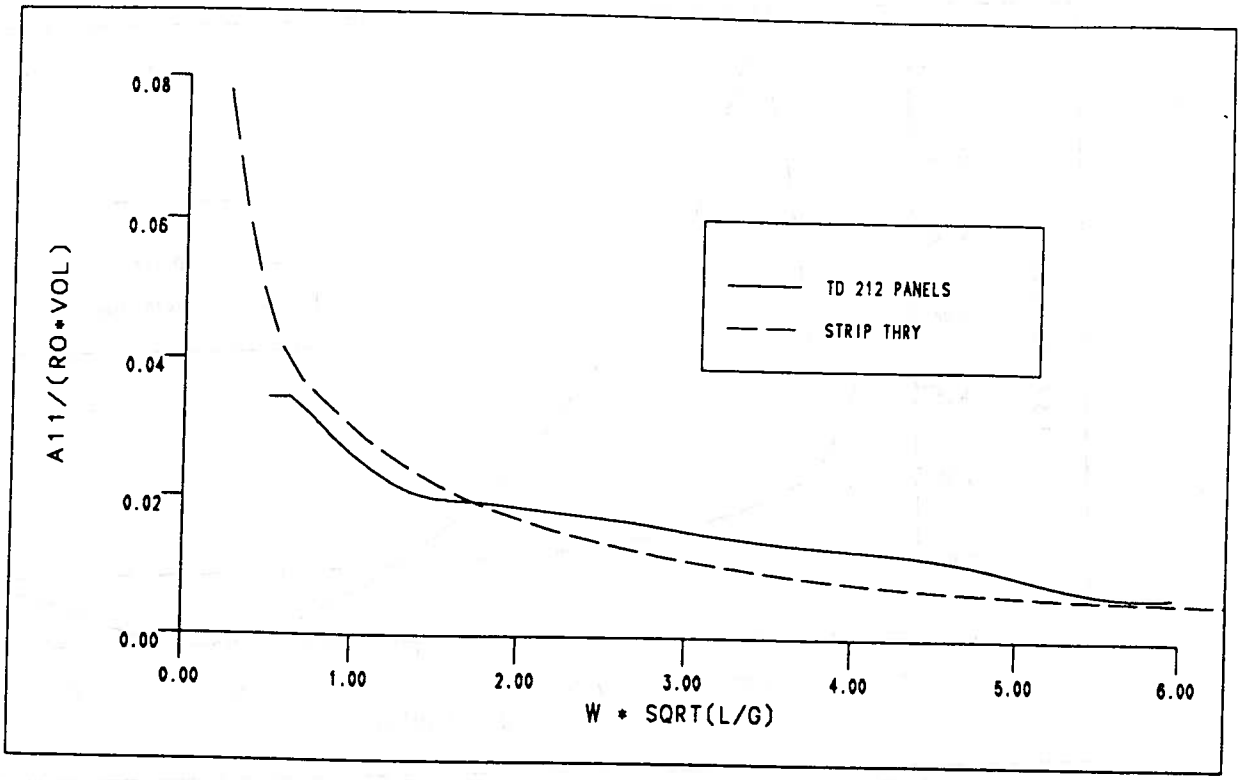


MAGNITUDE OF PITCH DIFFRACTION FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 270

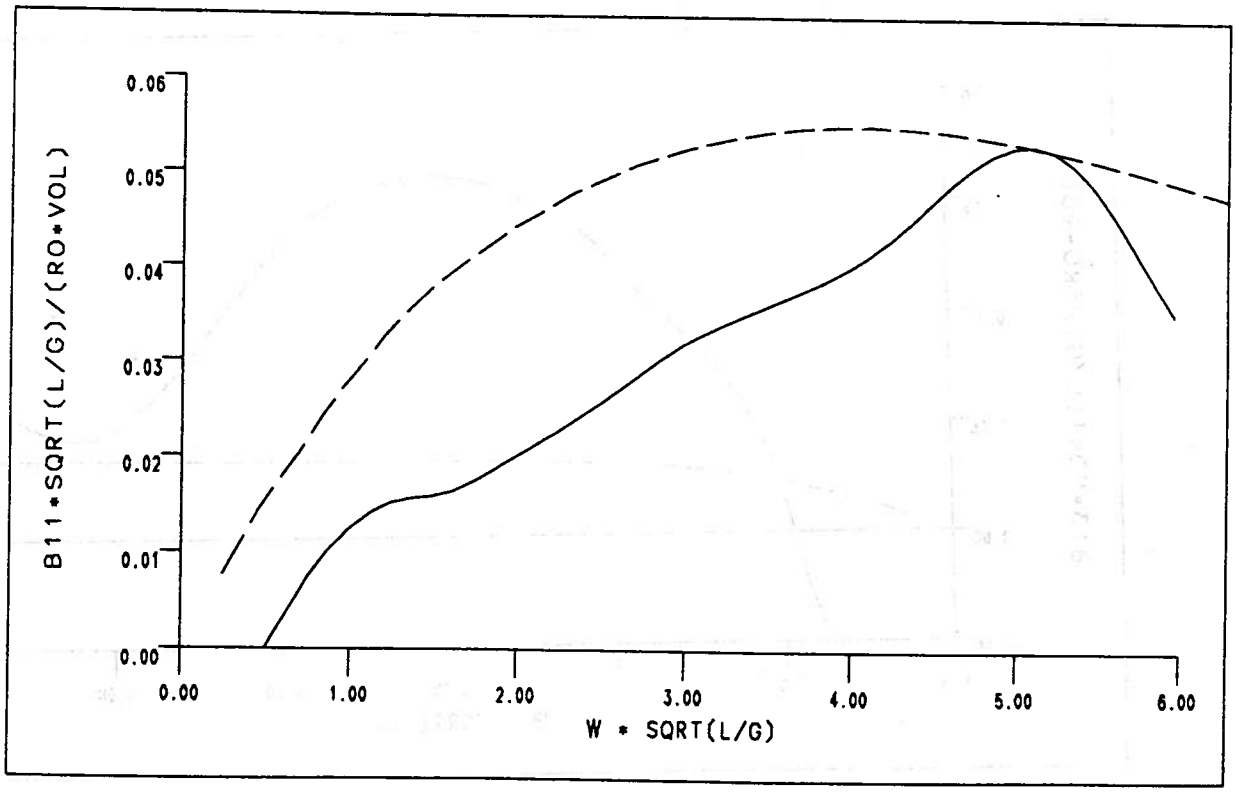


PHASE OF PITCH DIFFRACTION FORCE FOR THE ITTC CONTAINERSHIP, FN=0.275
FIGURE 271

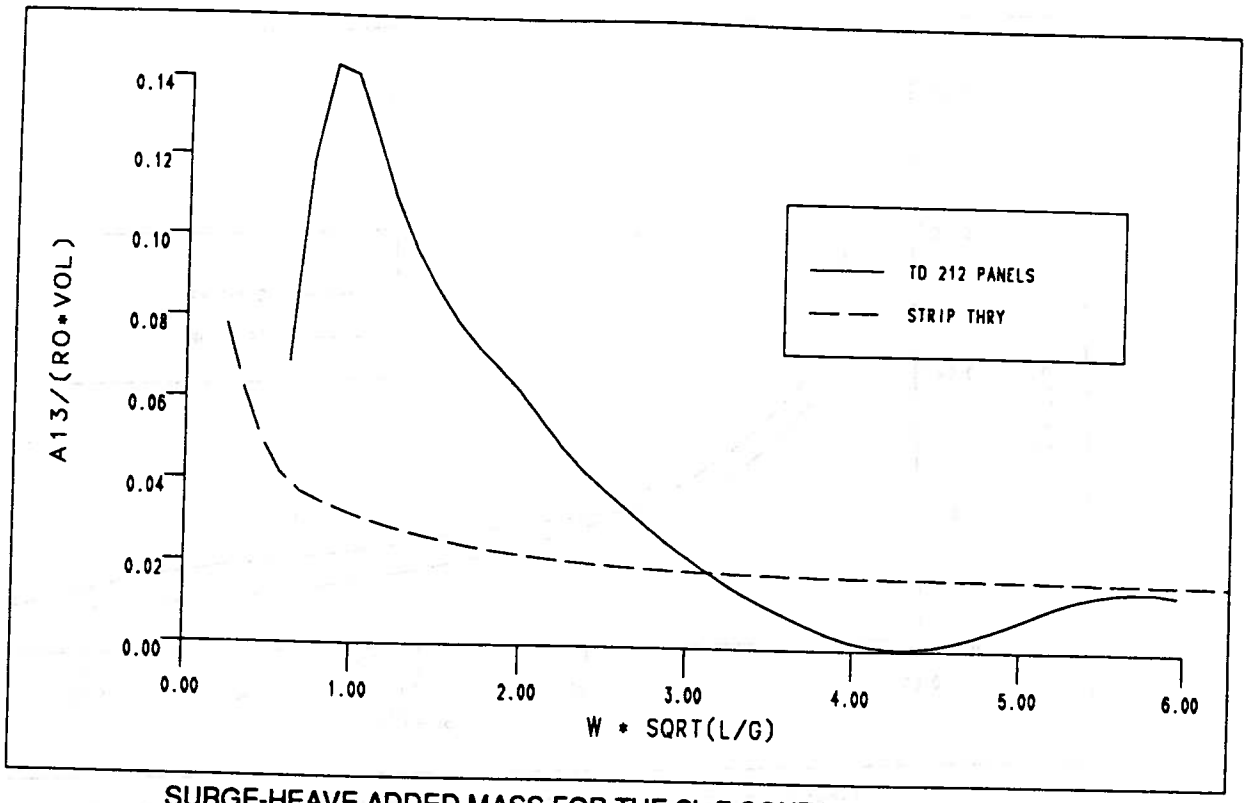
SL-7 CONTAINERSHIP, FN=0.3



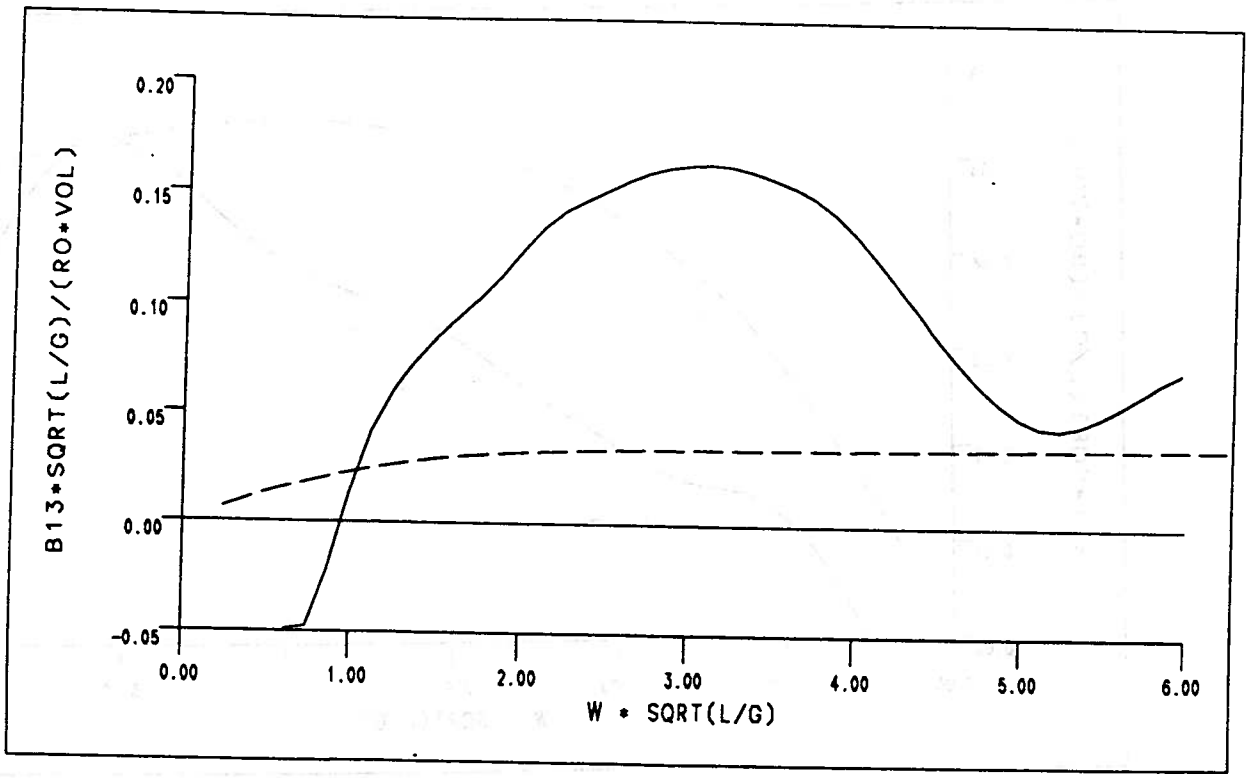
SURGE ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 272



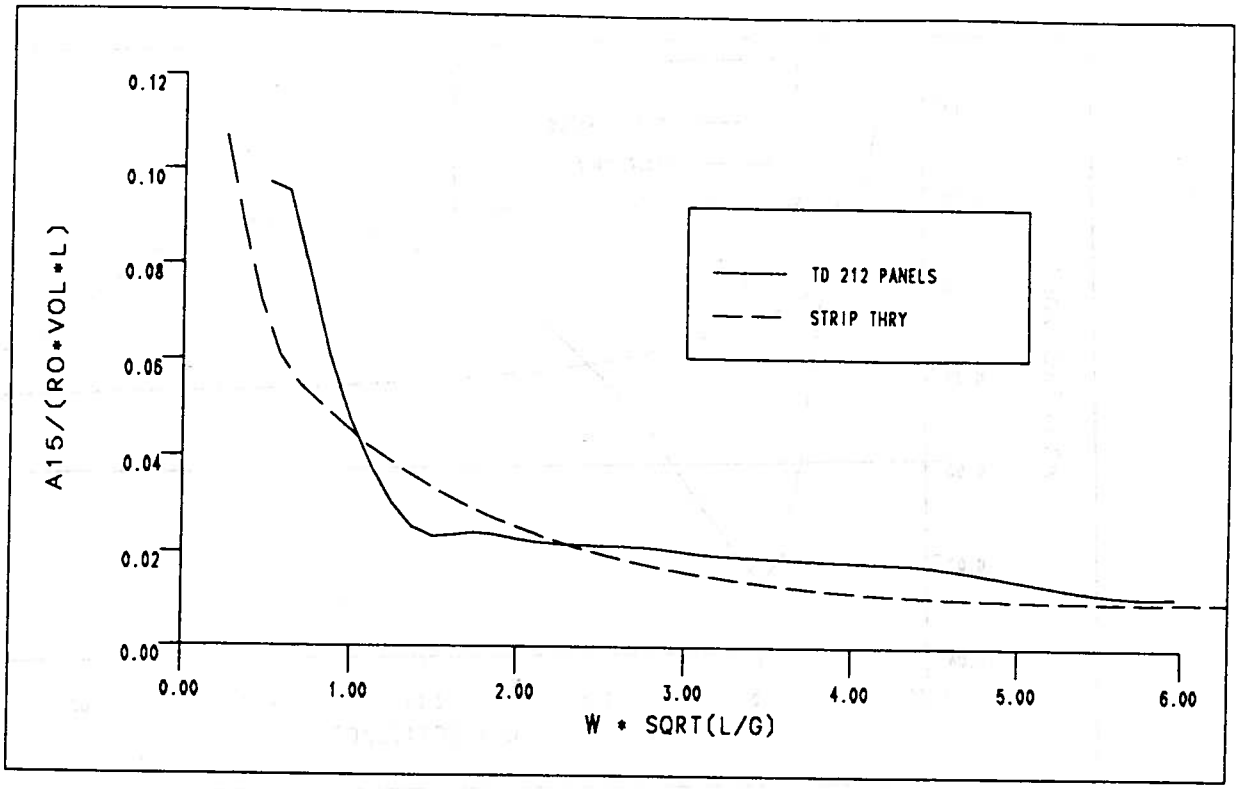
SURGE DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 273



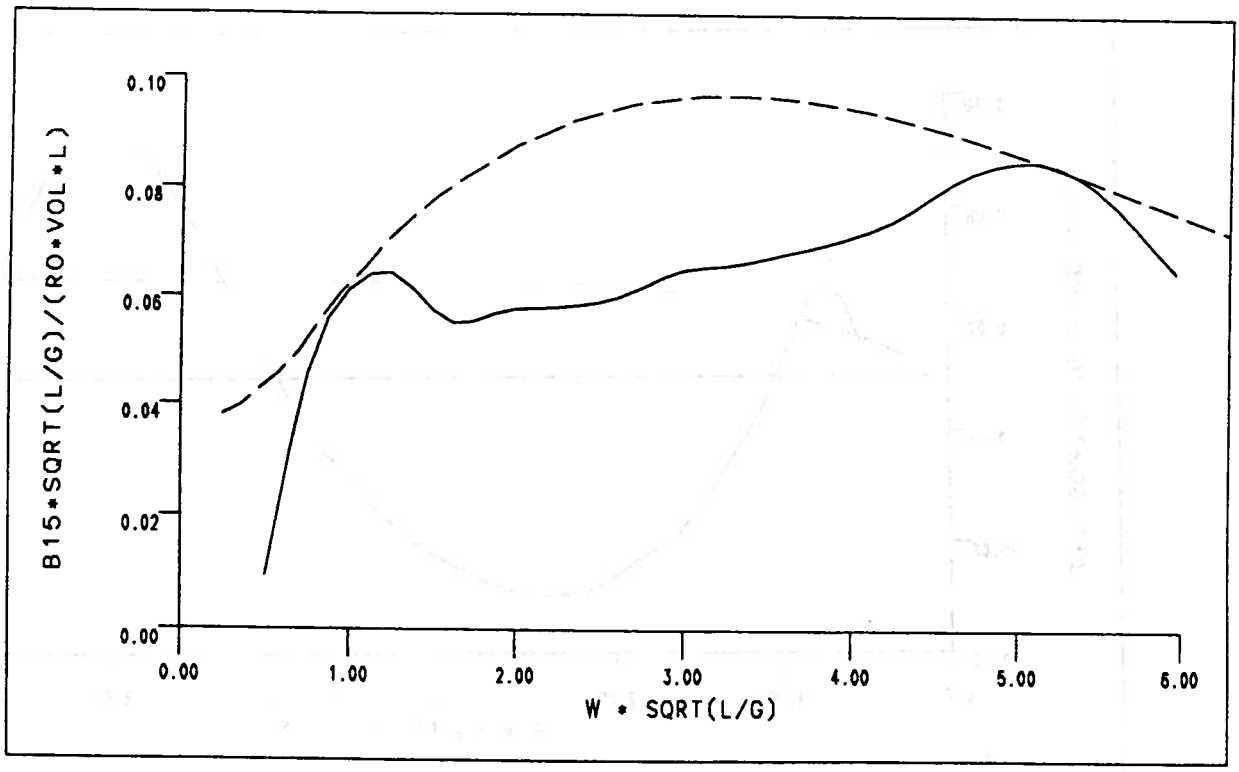
SURGE-HEAVE ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 274



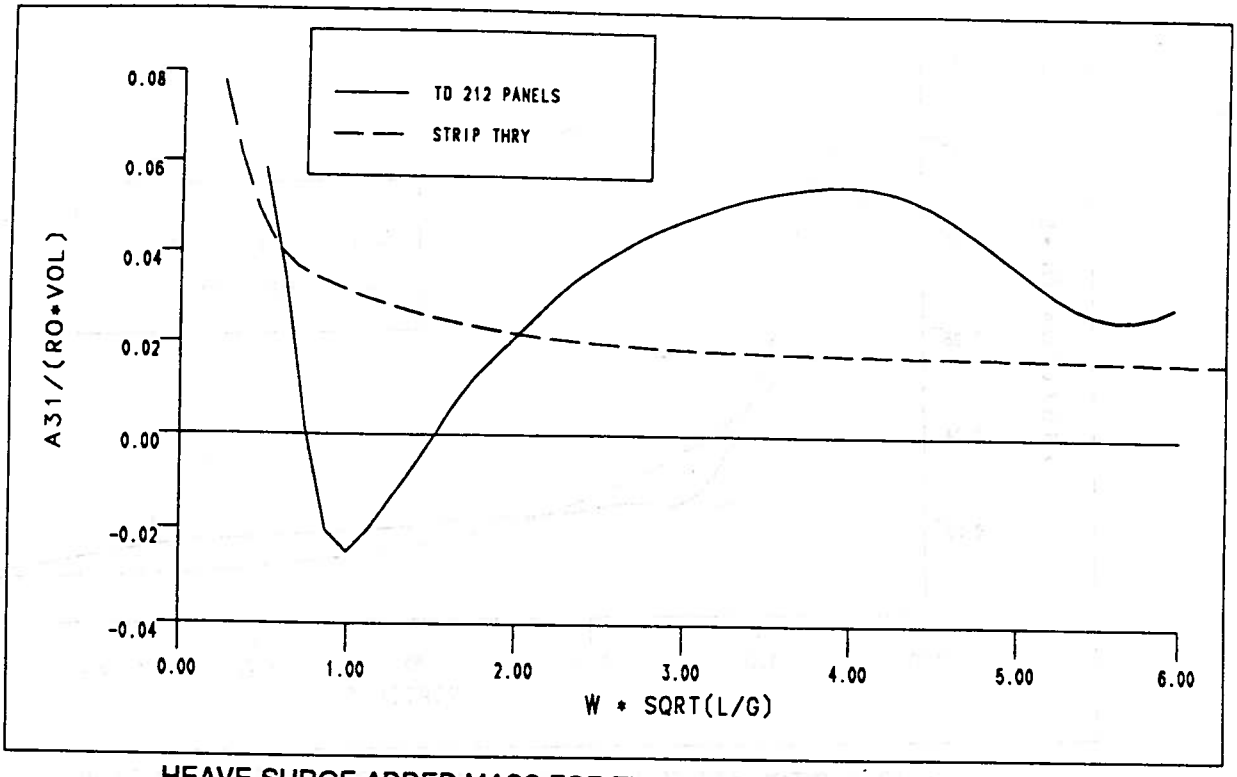
SURGE-HEAVE DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 275



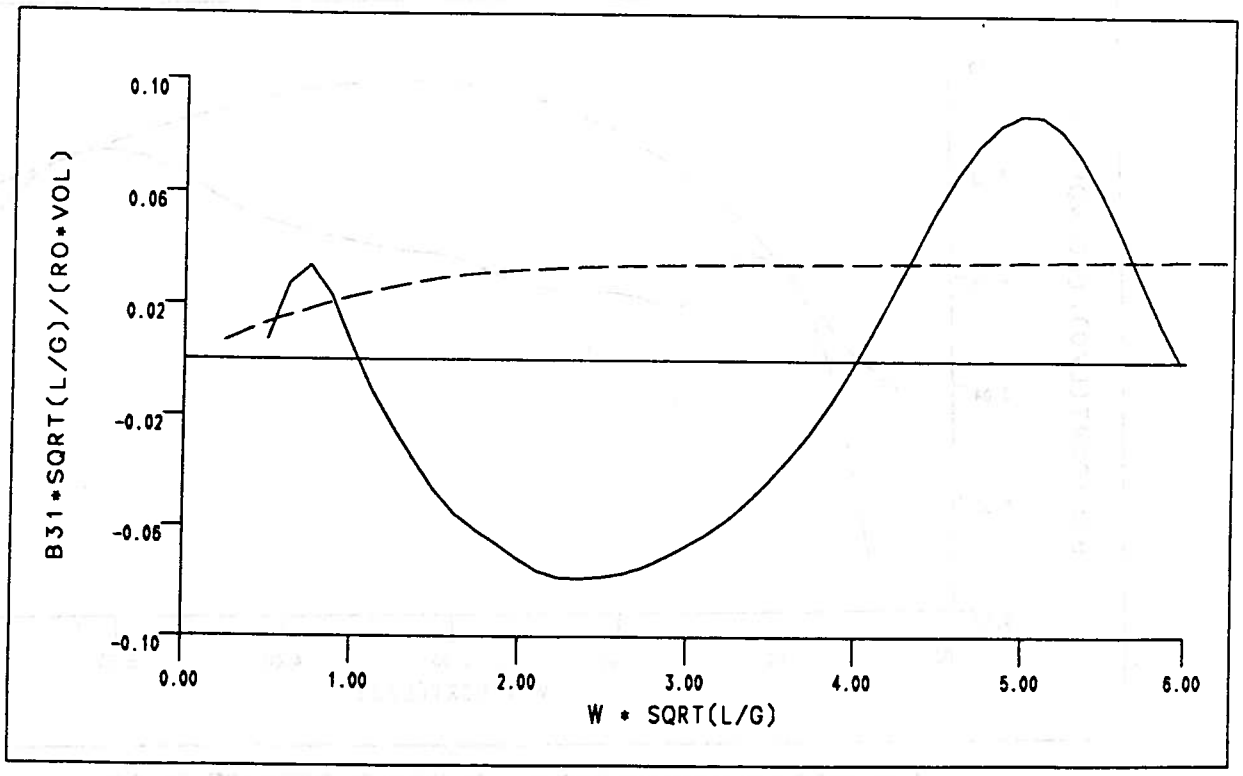
SURGE-PITCH ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 276



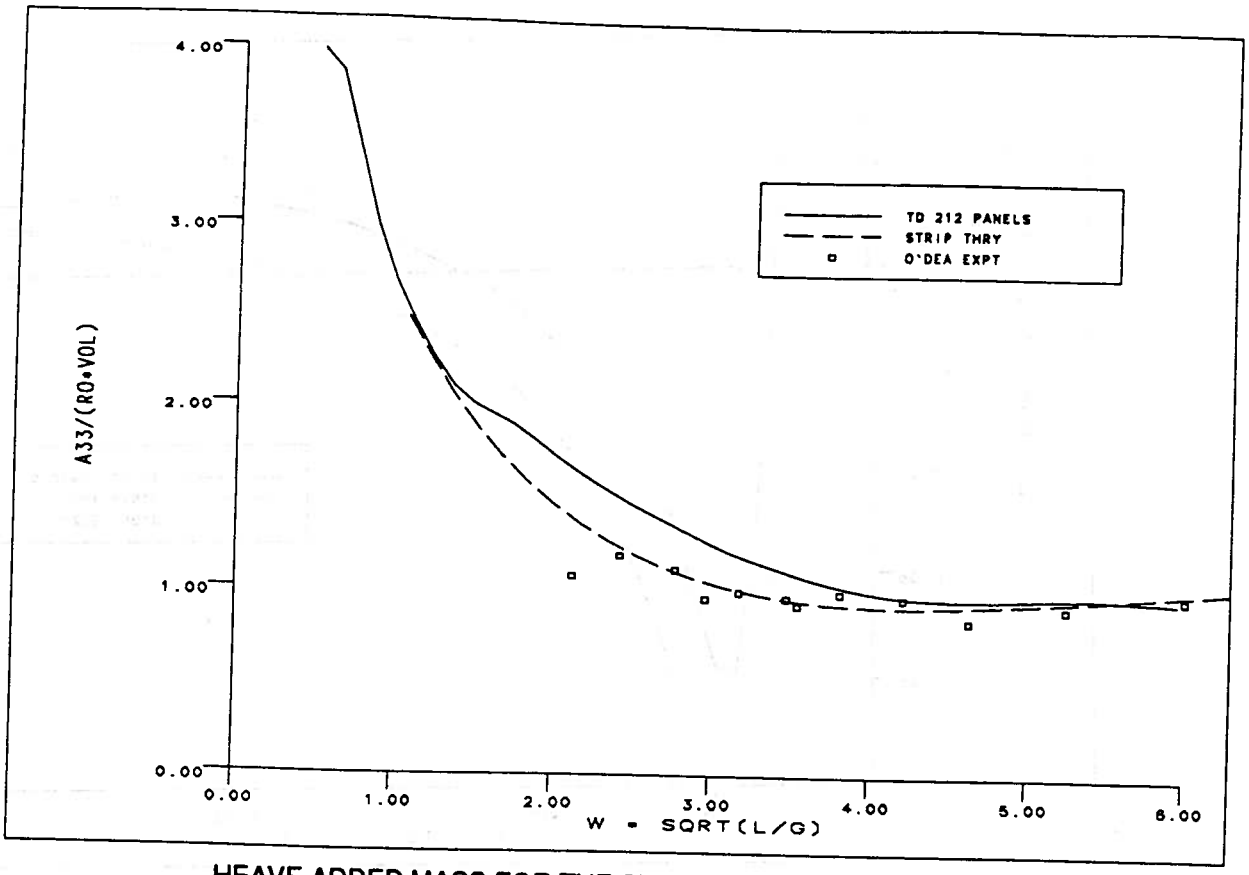
SURGE-PITCH DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 277



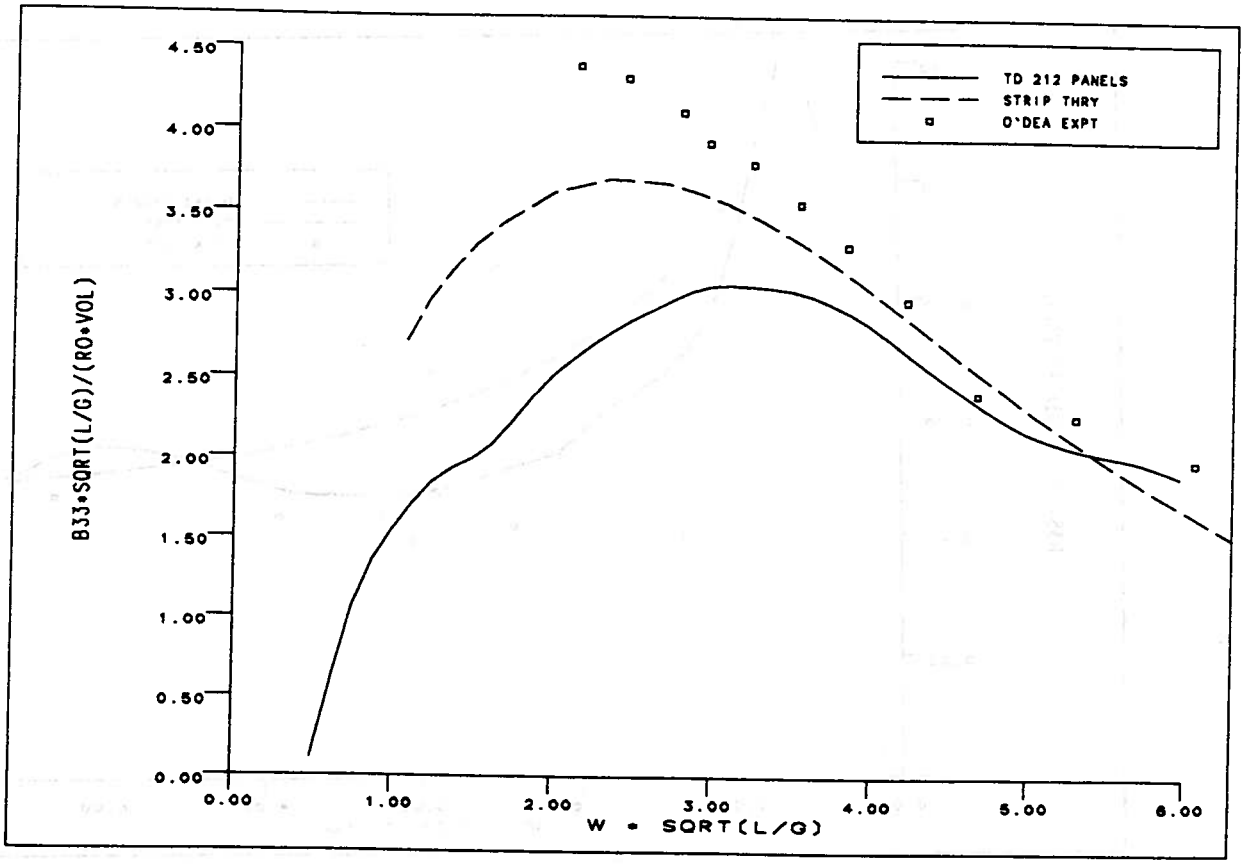
HEAVE-SURGE ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 278



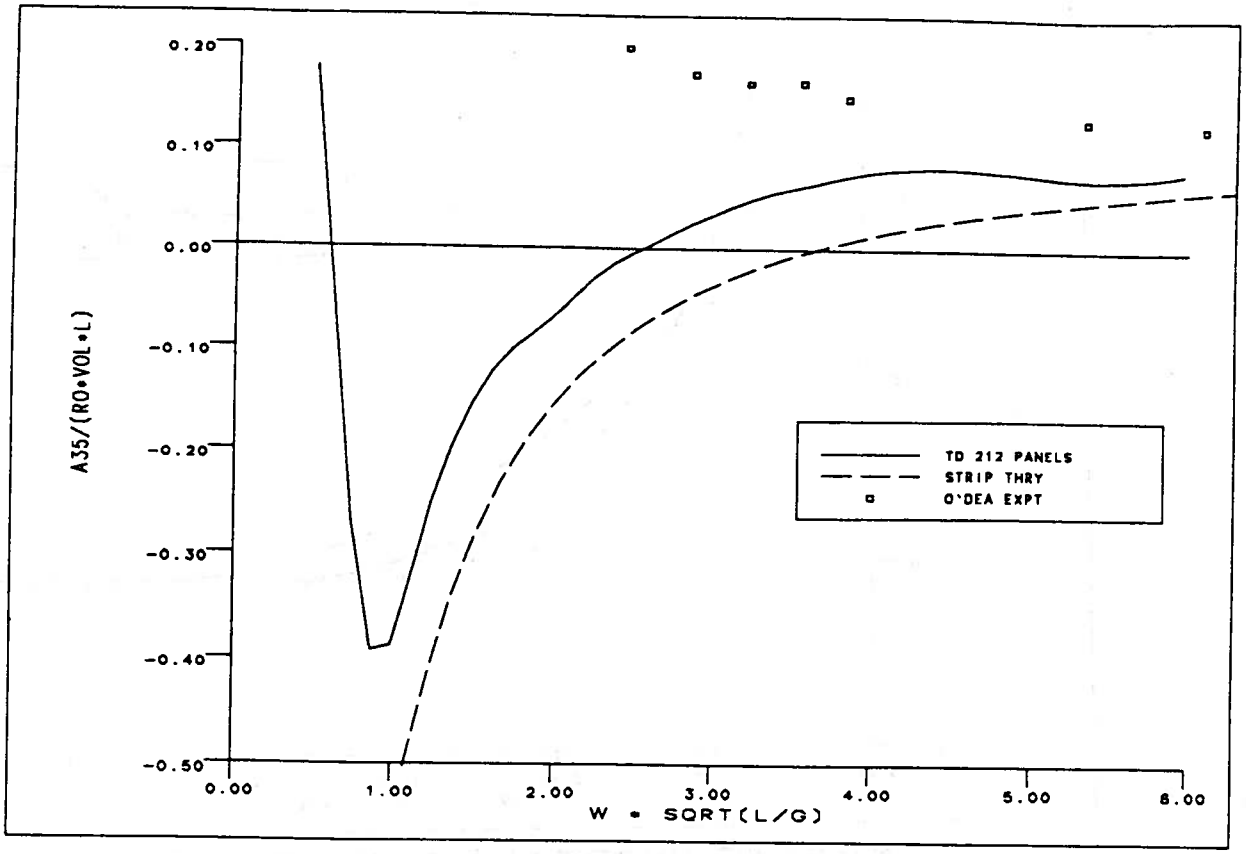
HEAVE-SURGE DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 279



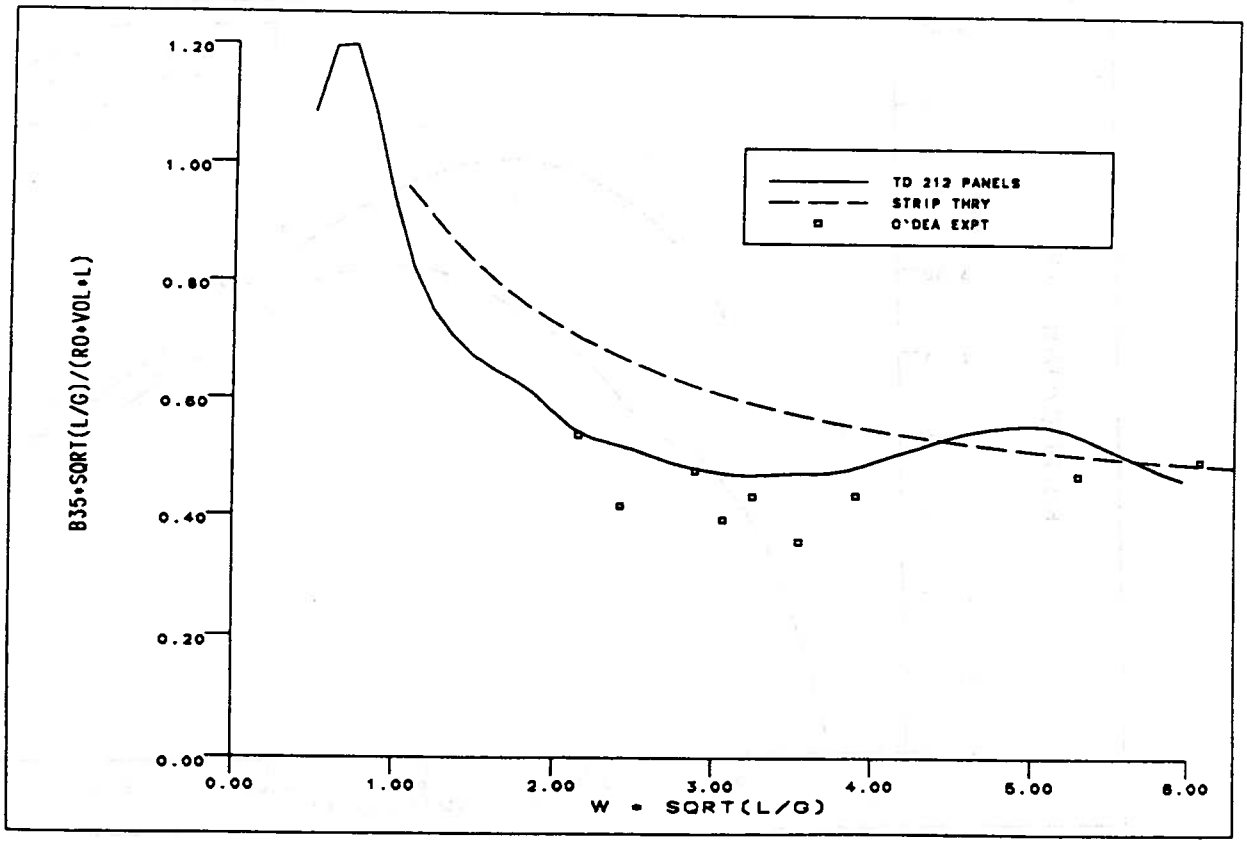
HEAVE ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 280



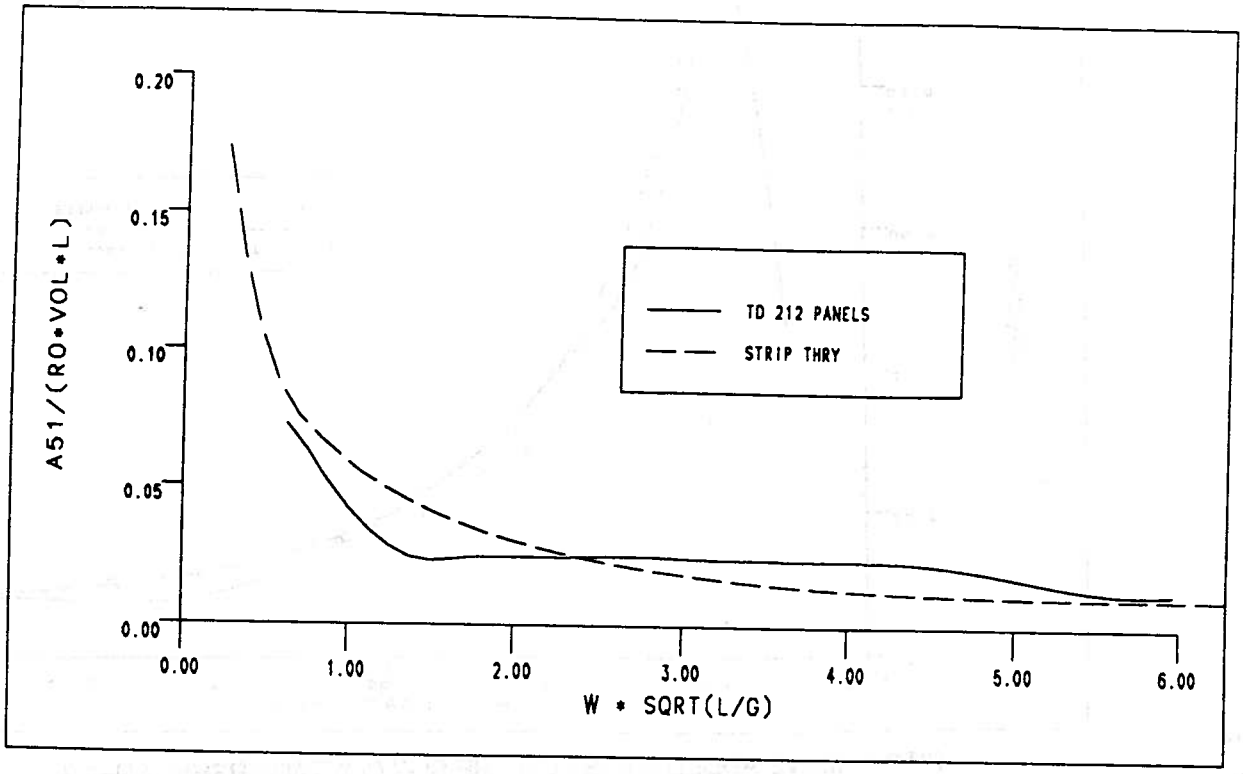
HEAVE DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 281



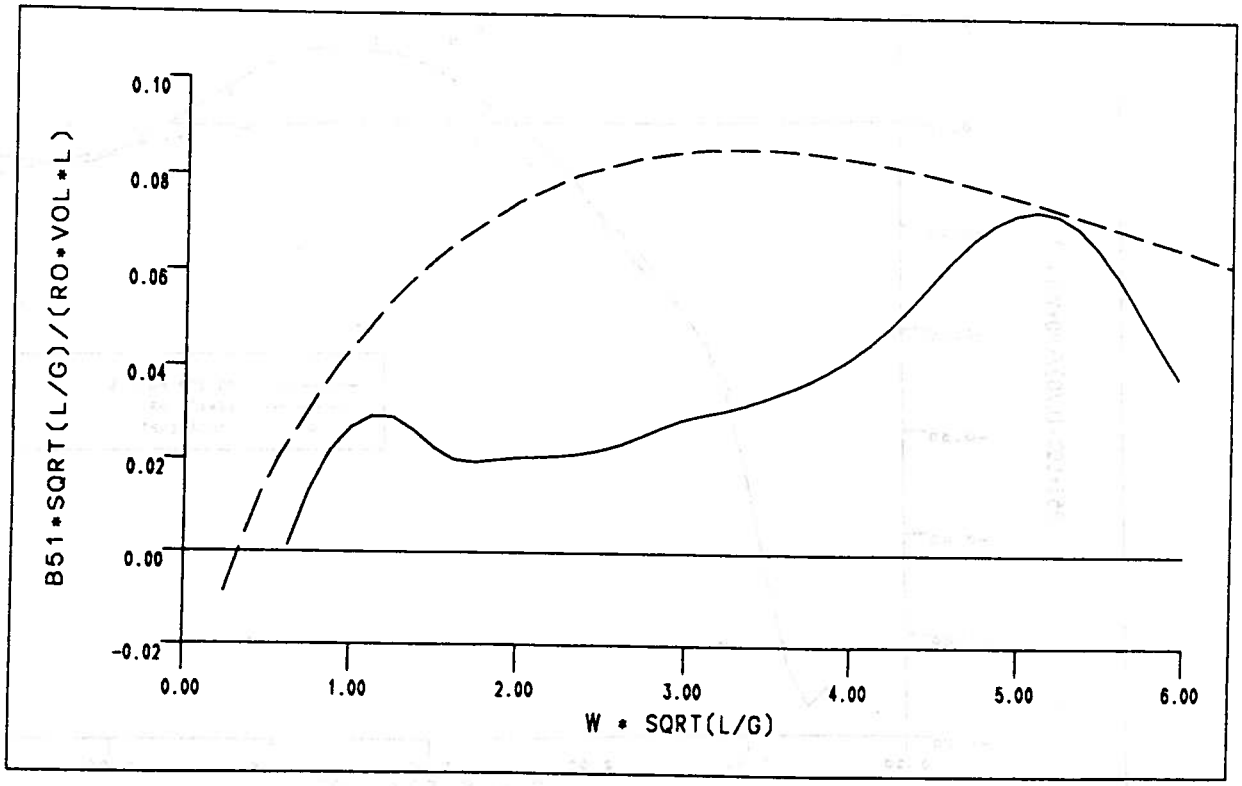
HEAVE-PITCH ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 282



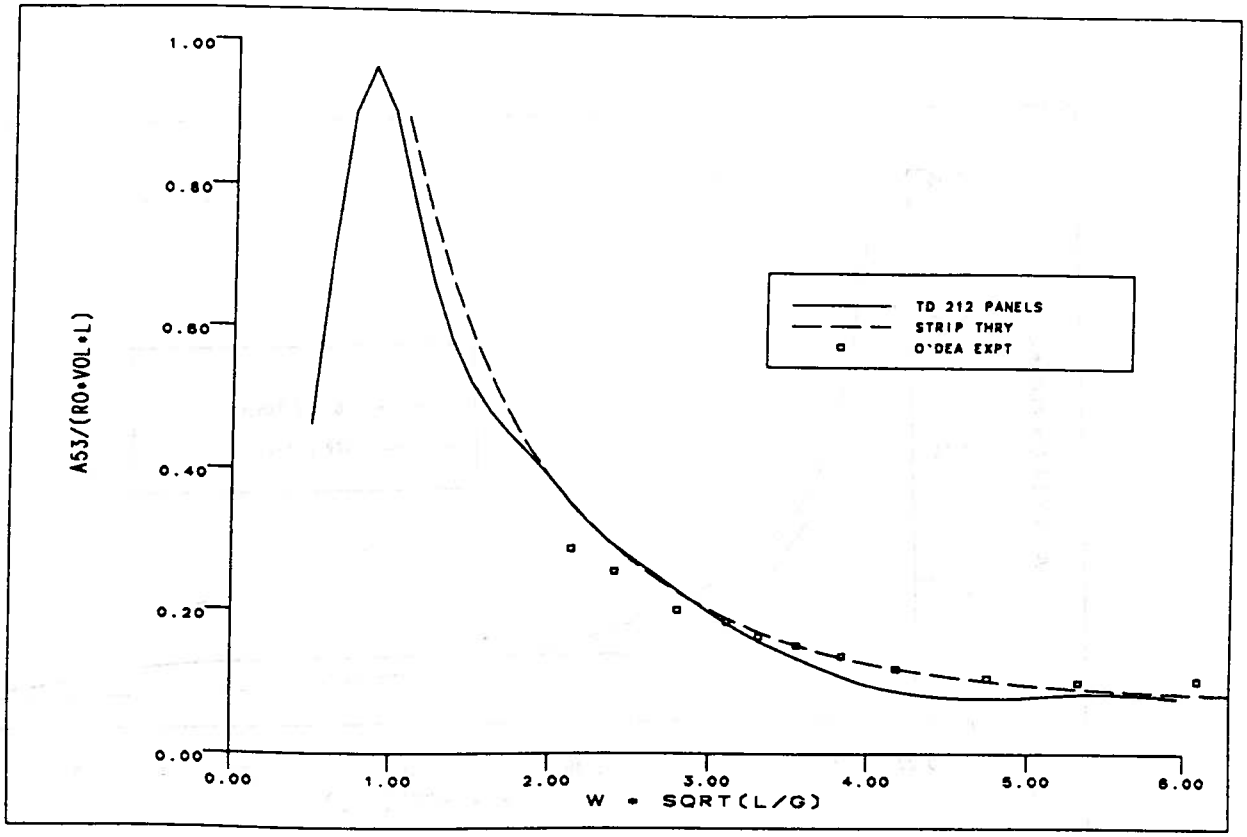
HEAVE-PITCH DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 283



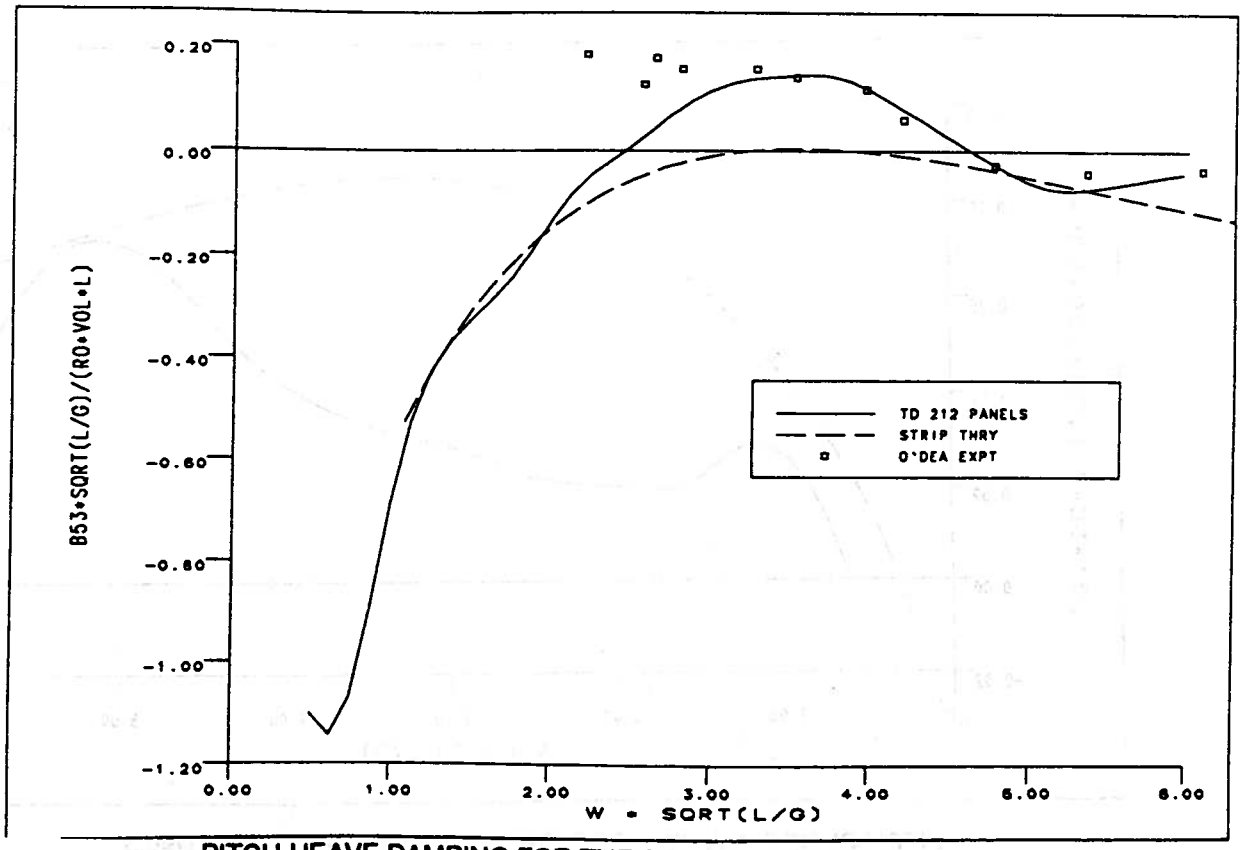
PITCH-SURGE ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 284



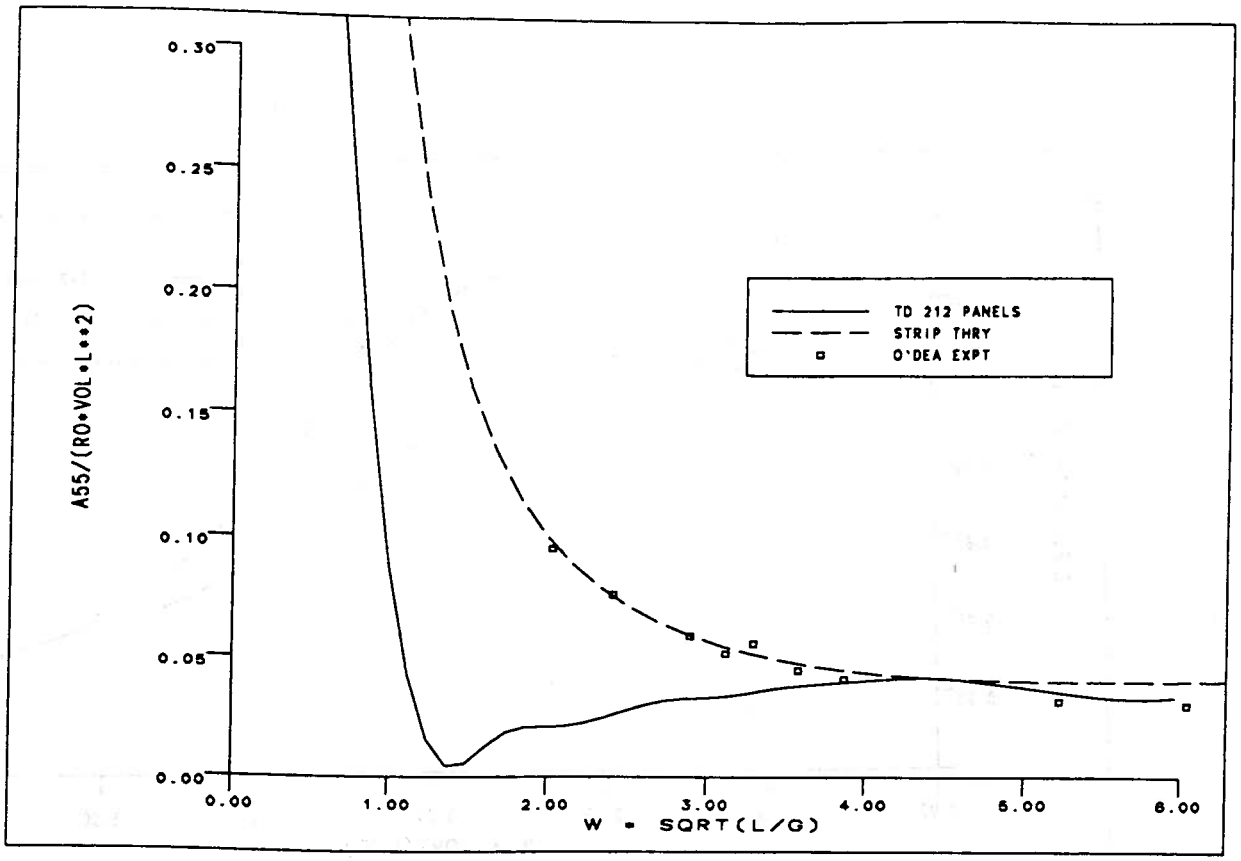
PITCH-SURGE DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 285



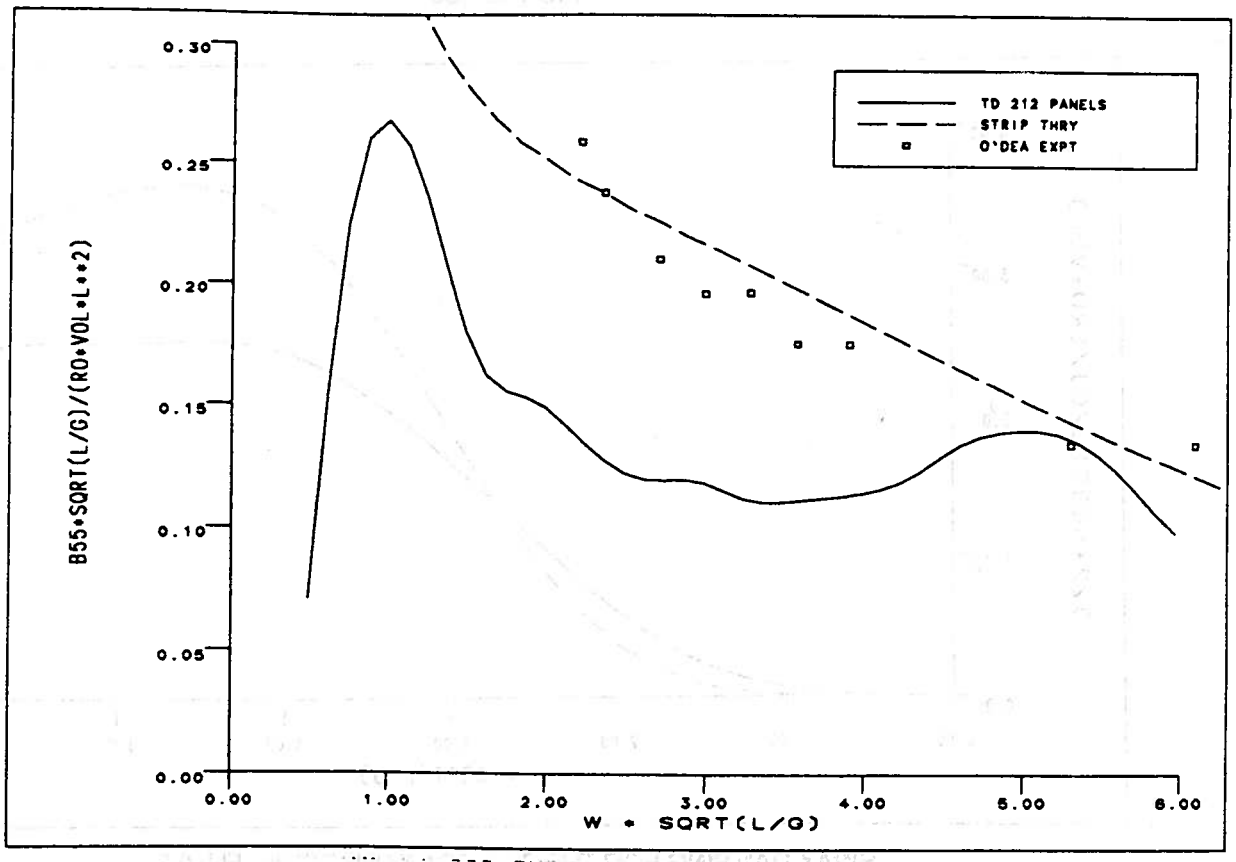
PITCH-HEAVE ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 286



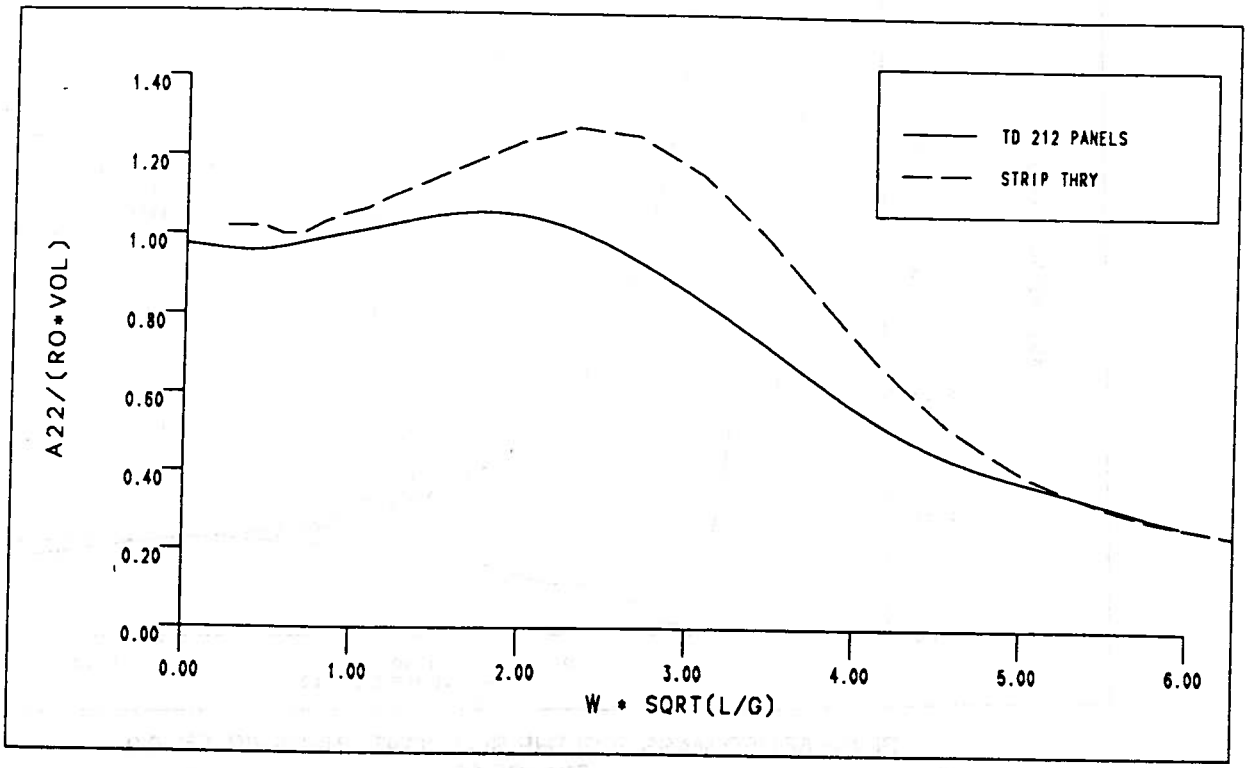
PITCH-HEAVE DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 287



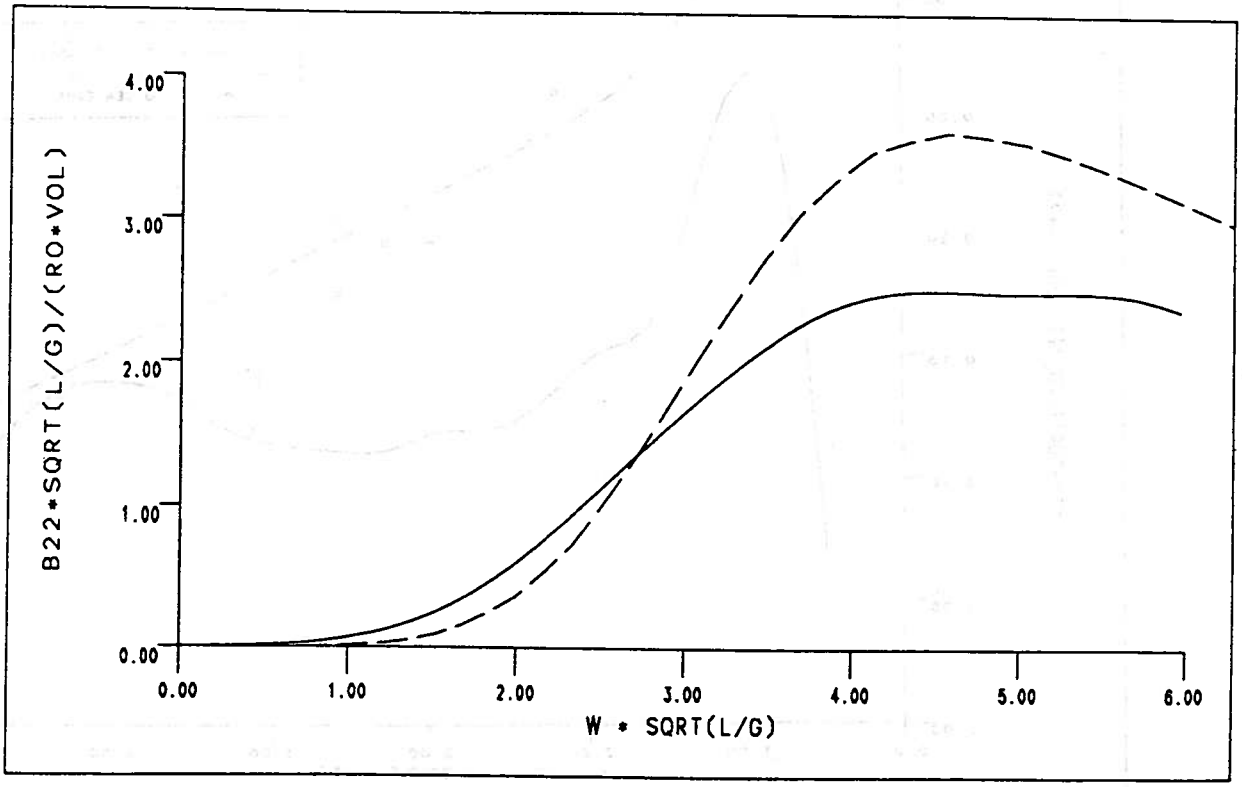
PITCH ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 288



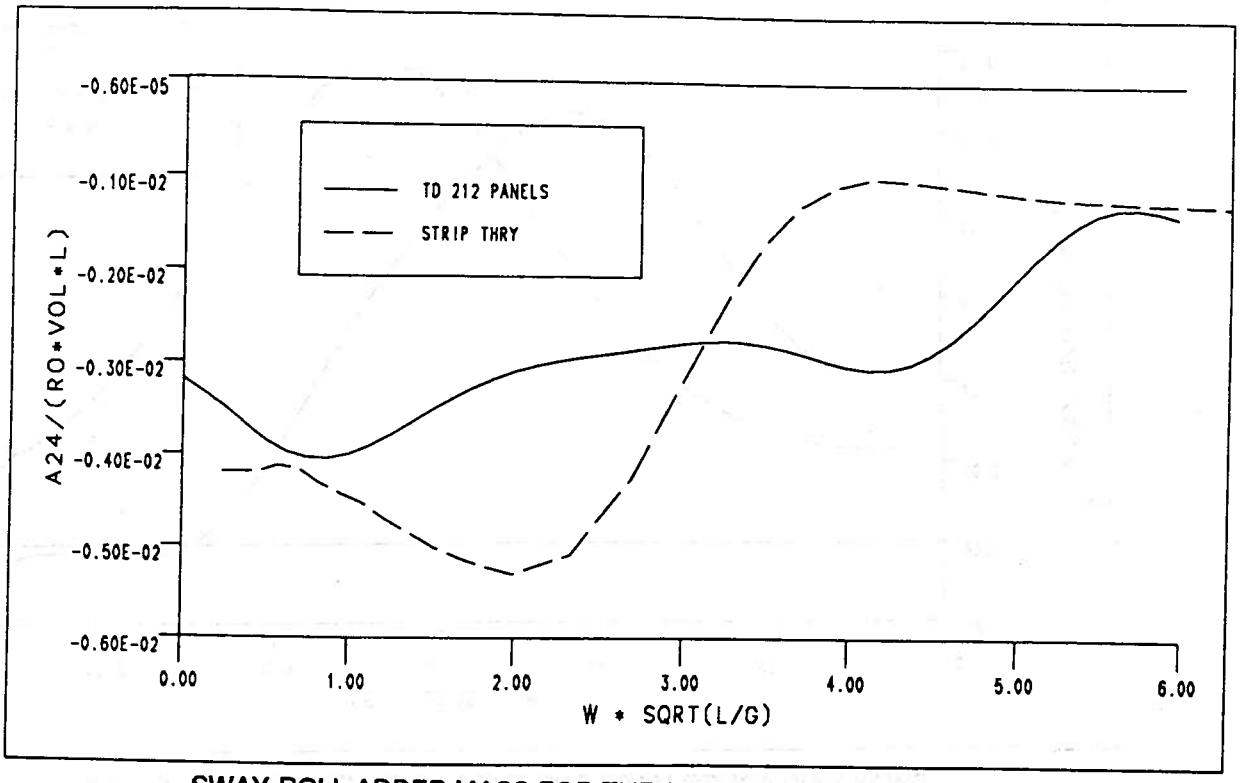
PITCH DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 289



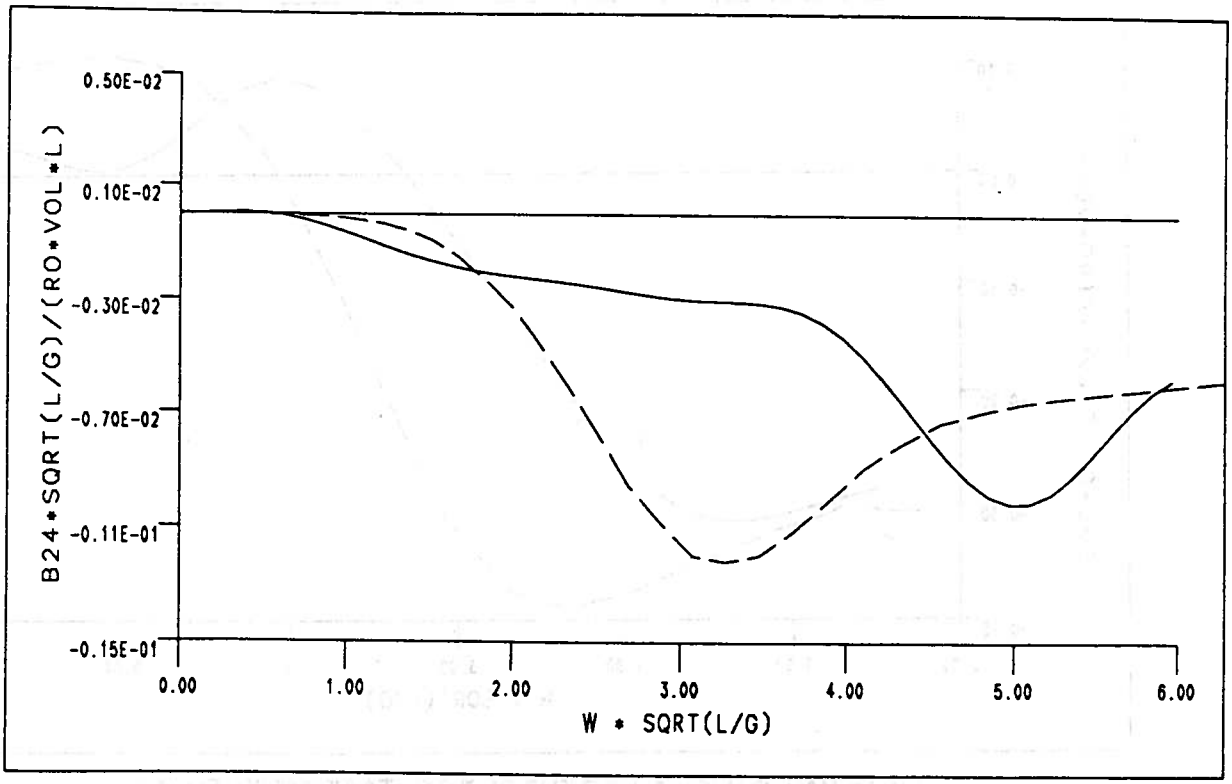
SWAY ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 290



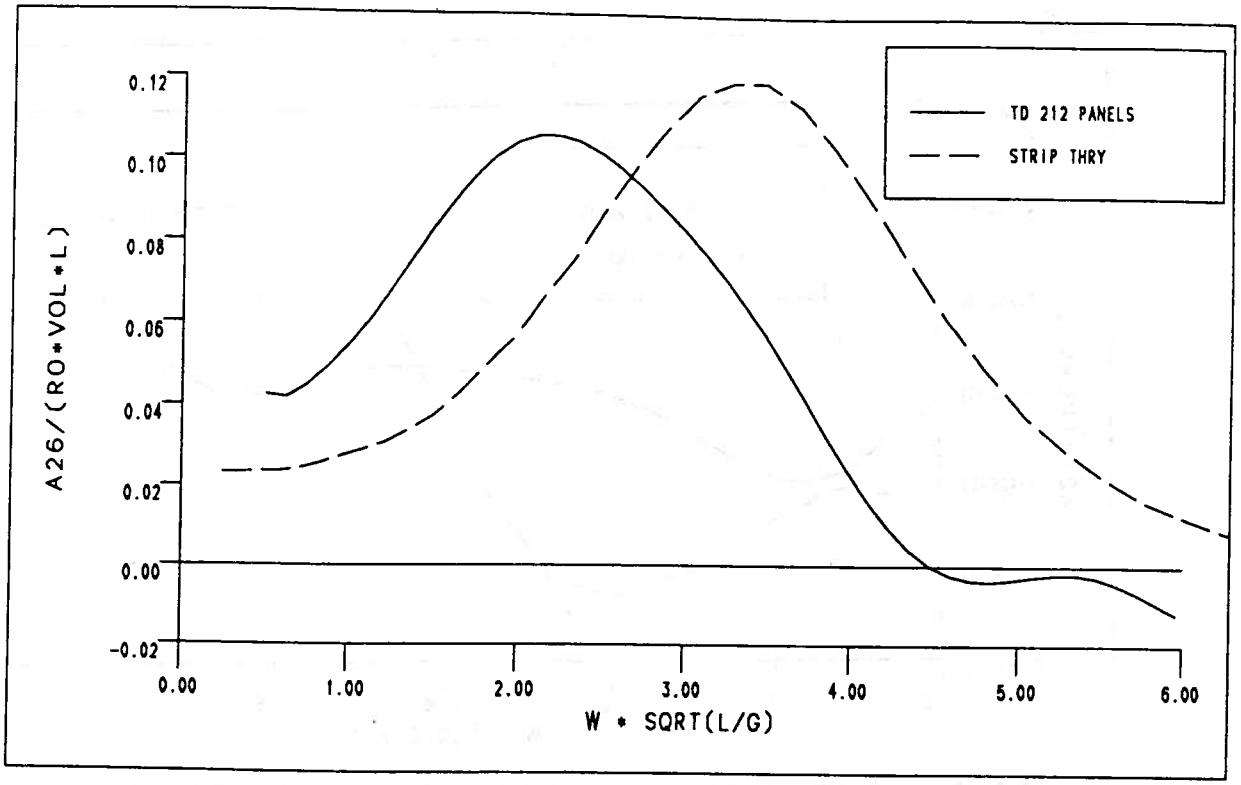
SWAY DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 291



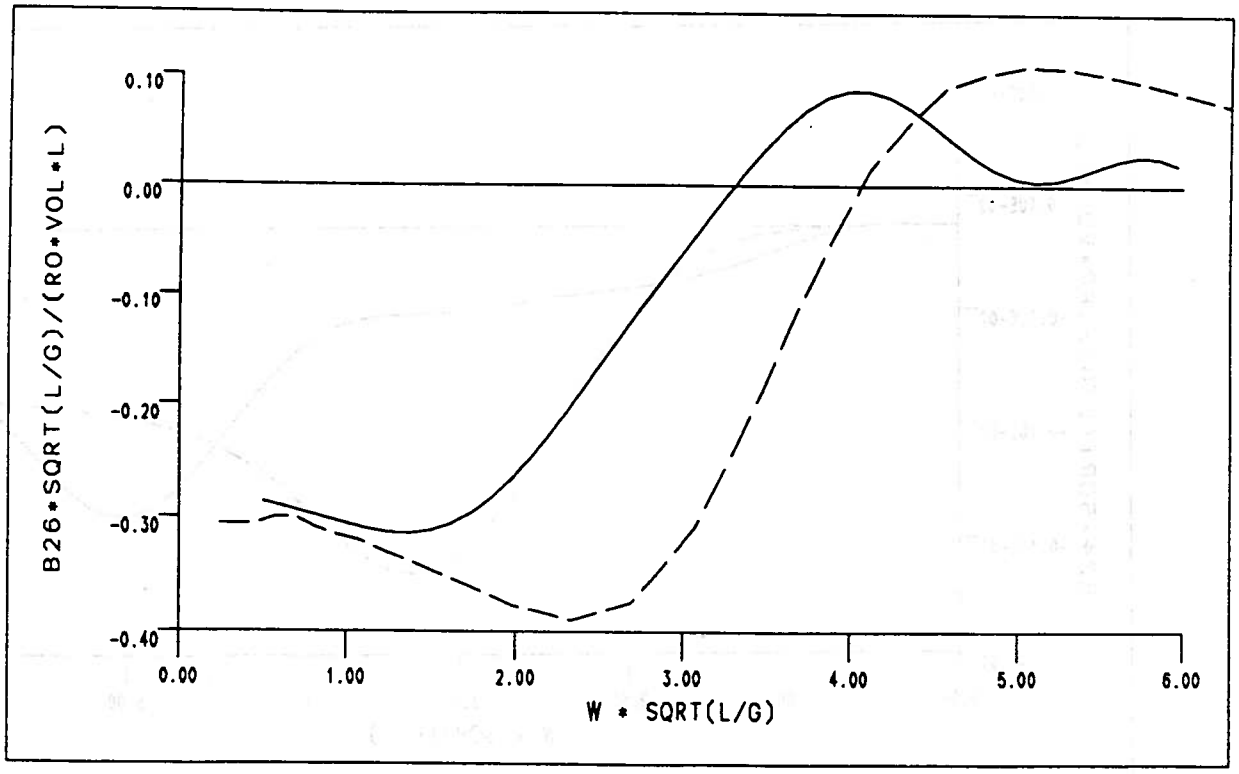
SWAY-ROLL ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 292



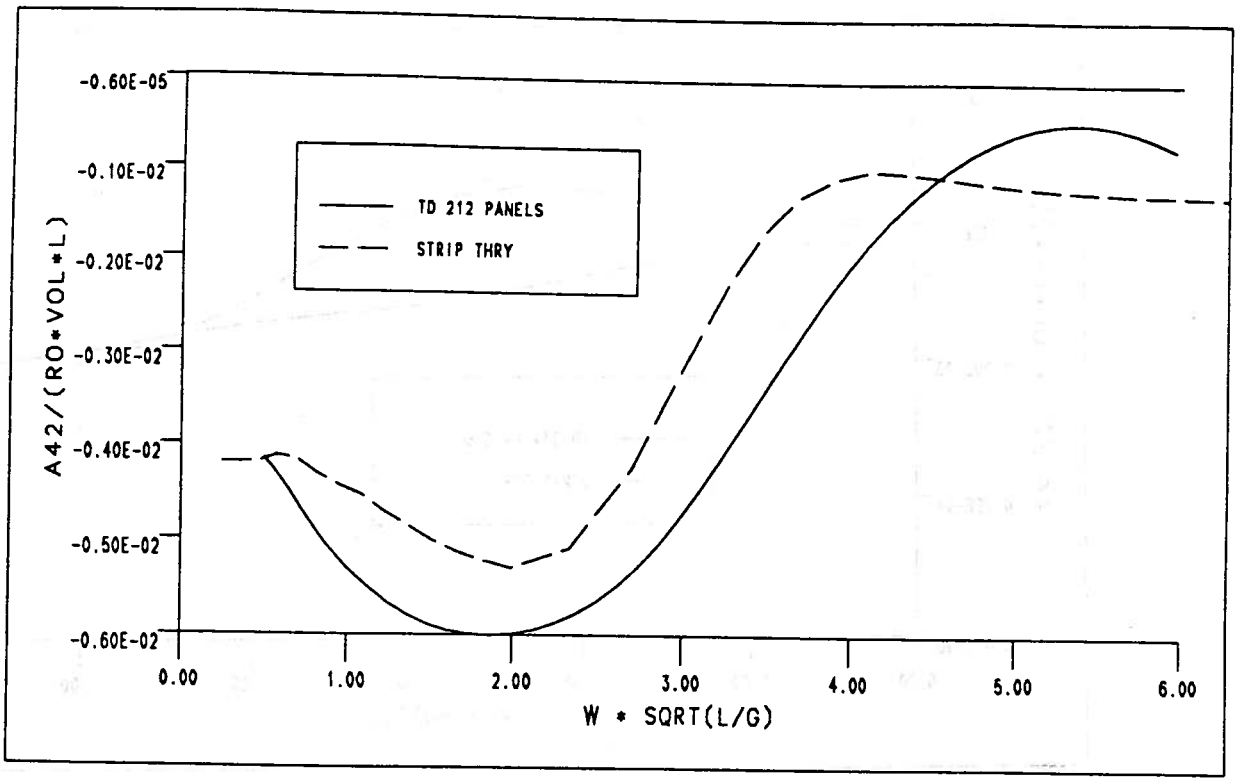
SWAY-ROLL DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 293



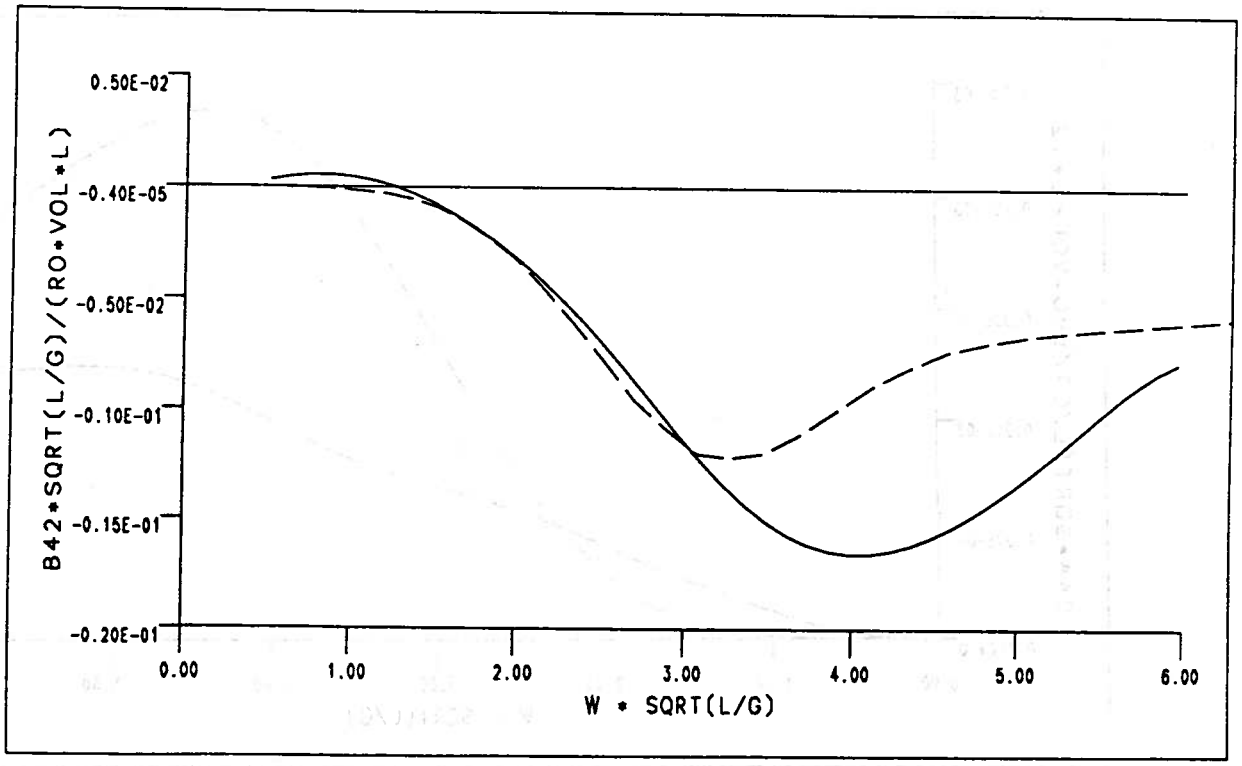
SWAY-YAW ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 294



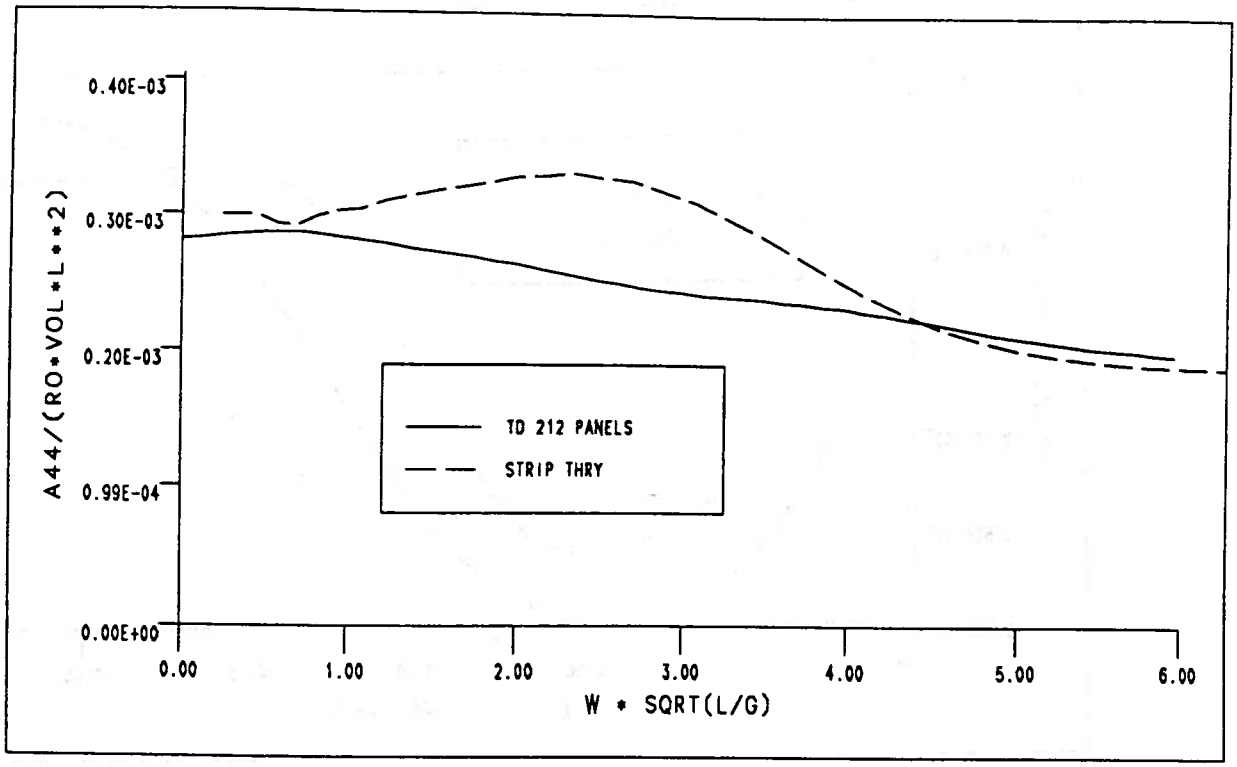
SWAY-YAW DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 295



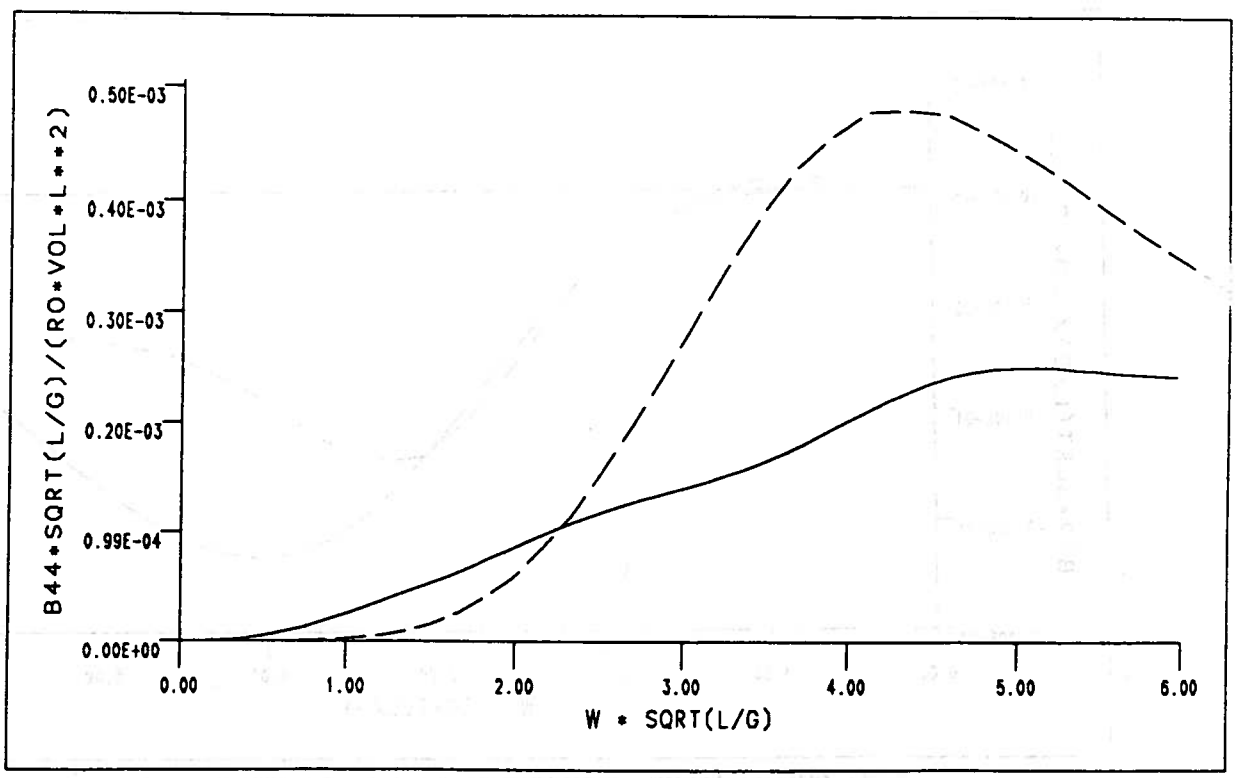
ROLL-SWAY ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 296



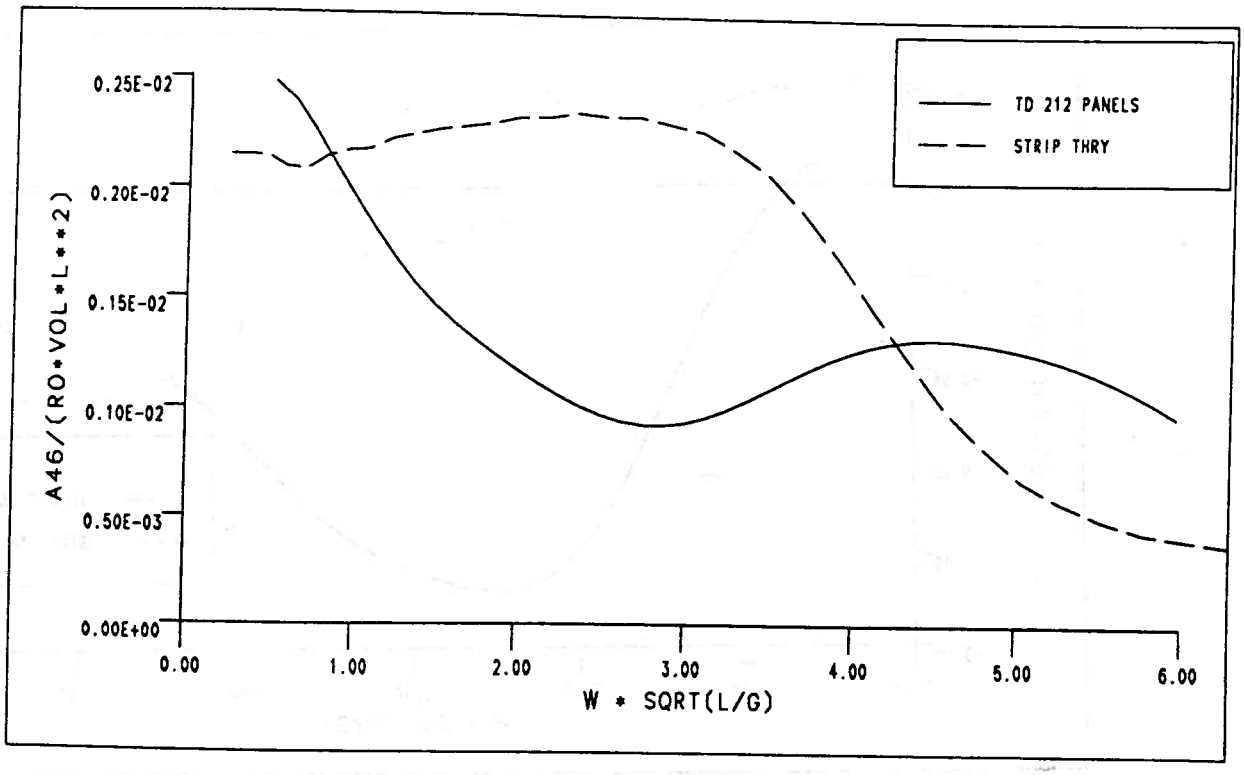
ROLL-SWAY DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 297



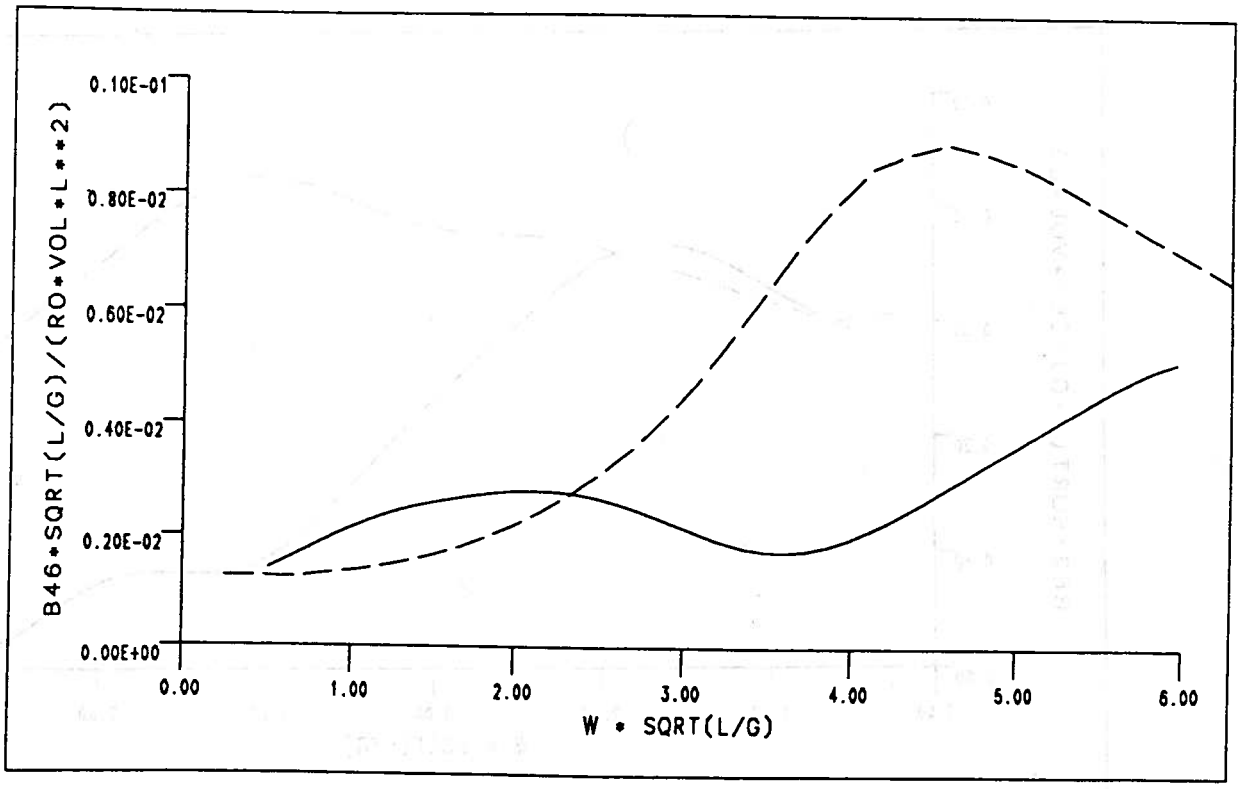
ROLL ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 298



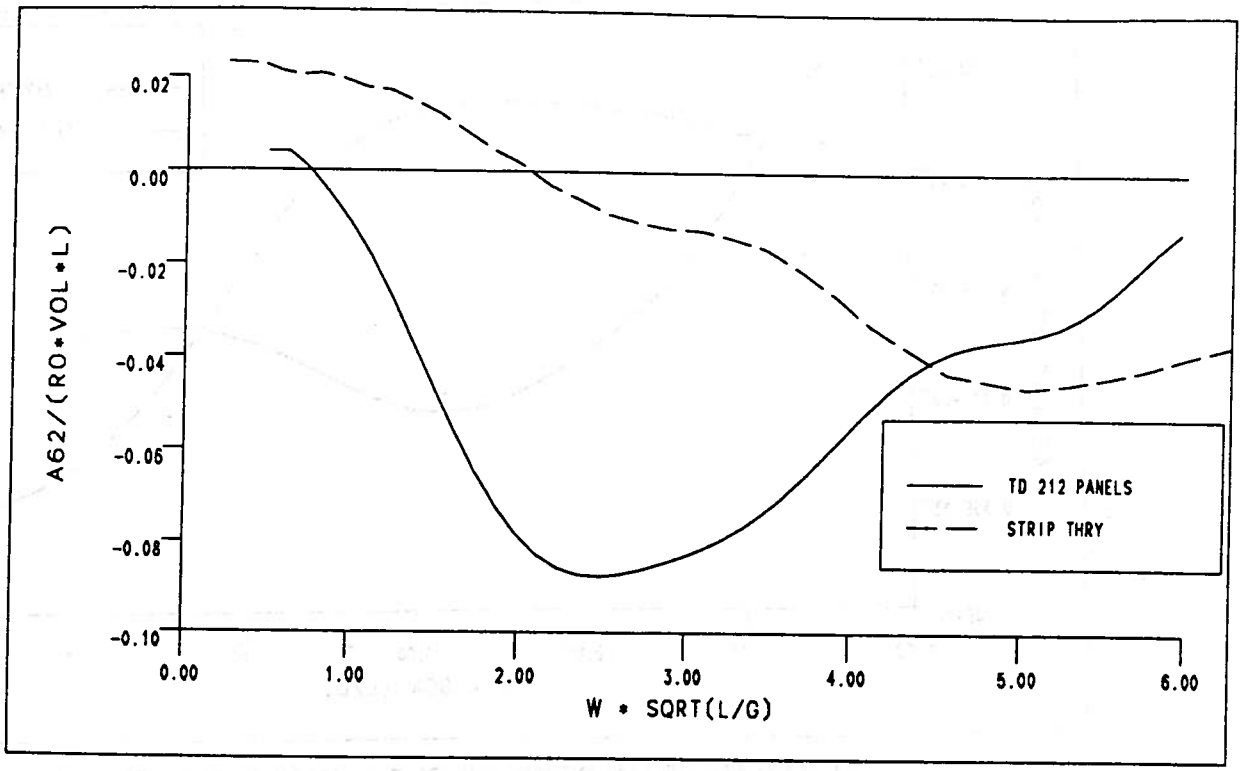
ROLL DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 299



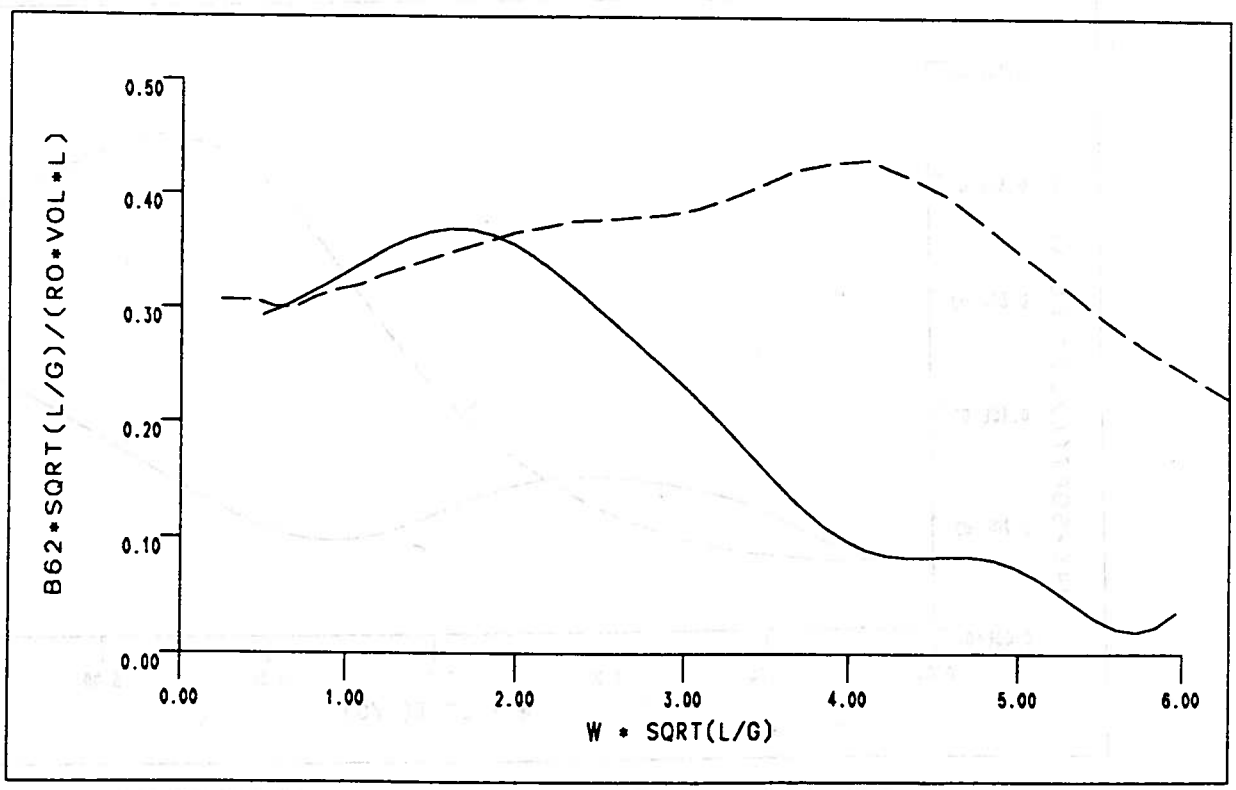
ROLL-YAW ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 300



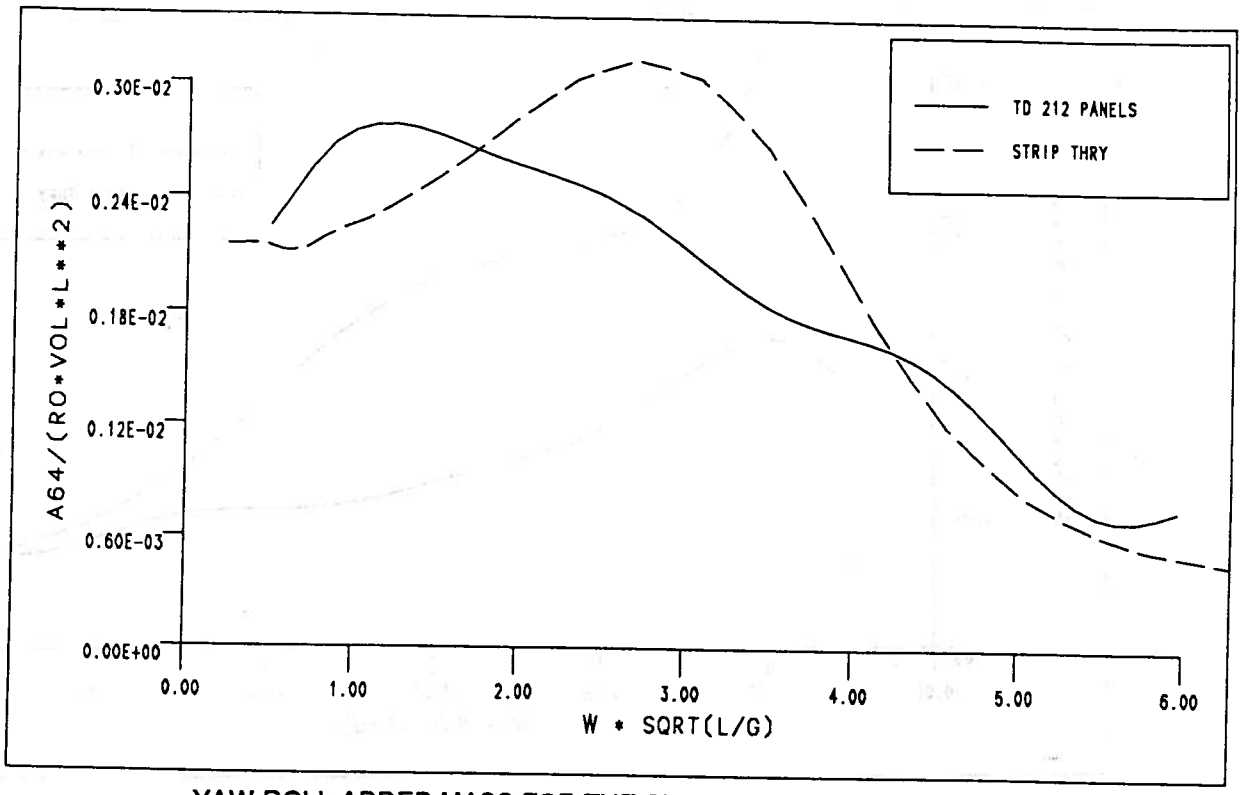
ROLL-YAW DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 301



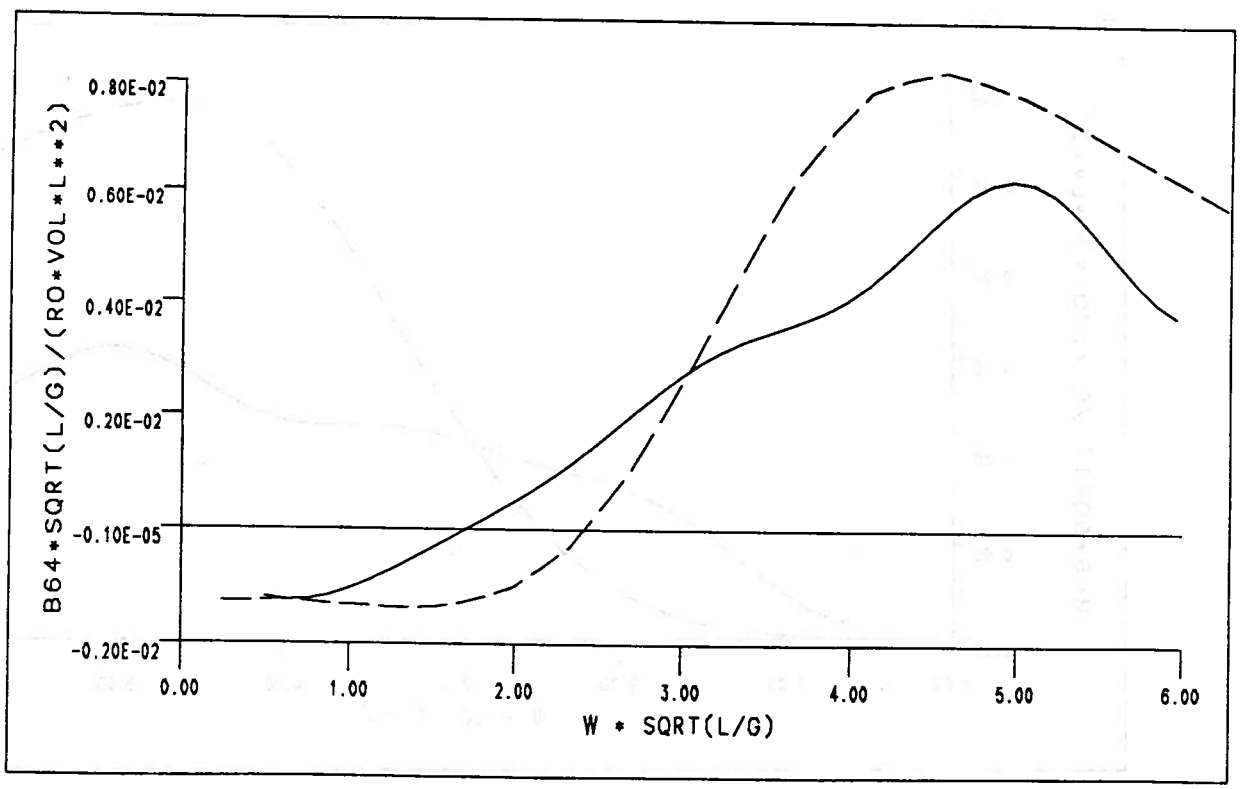
YAW-SWAY ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 302



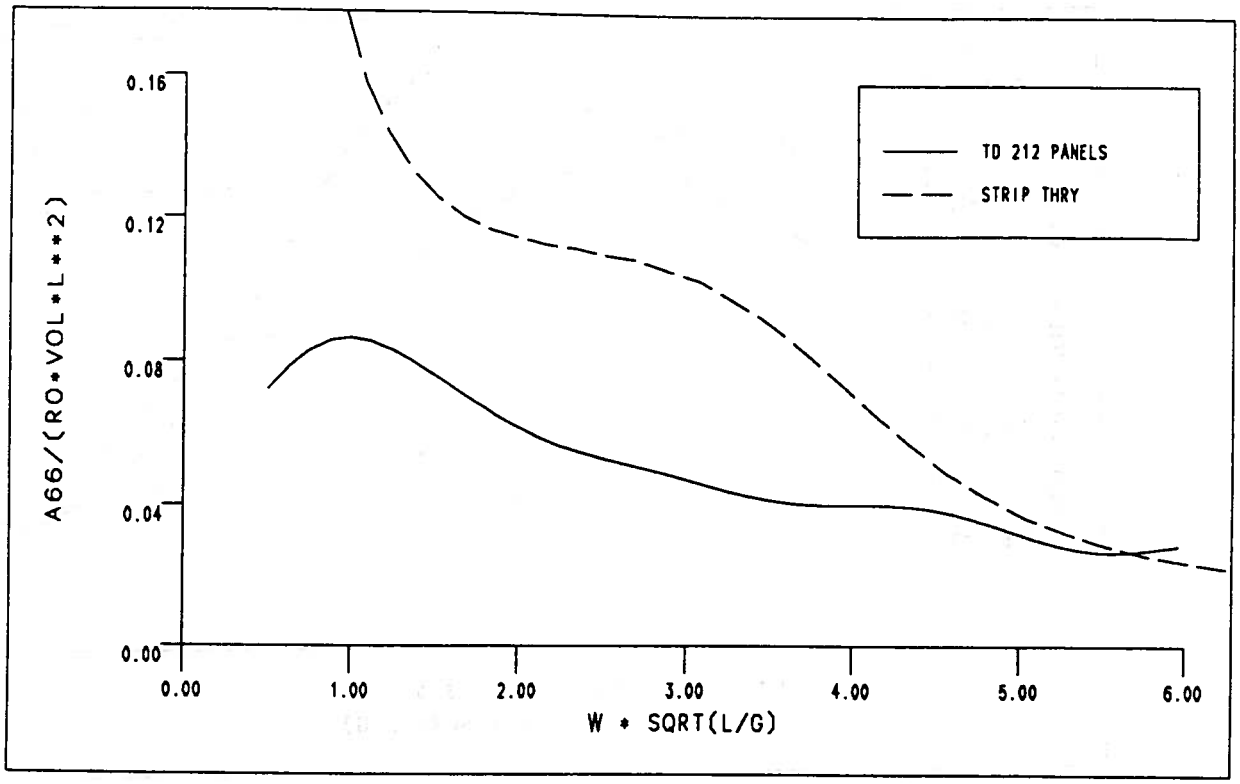
YAW-SWAY DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 303



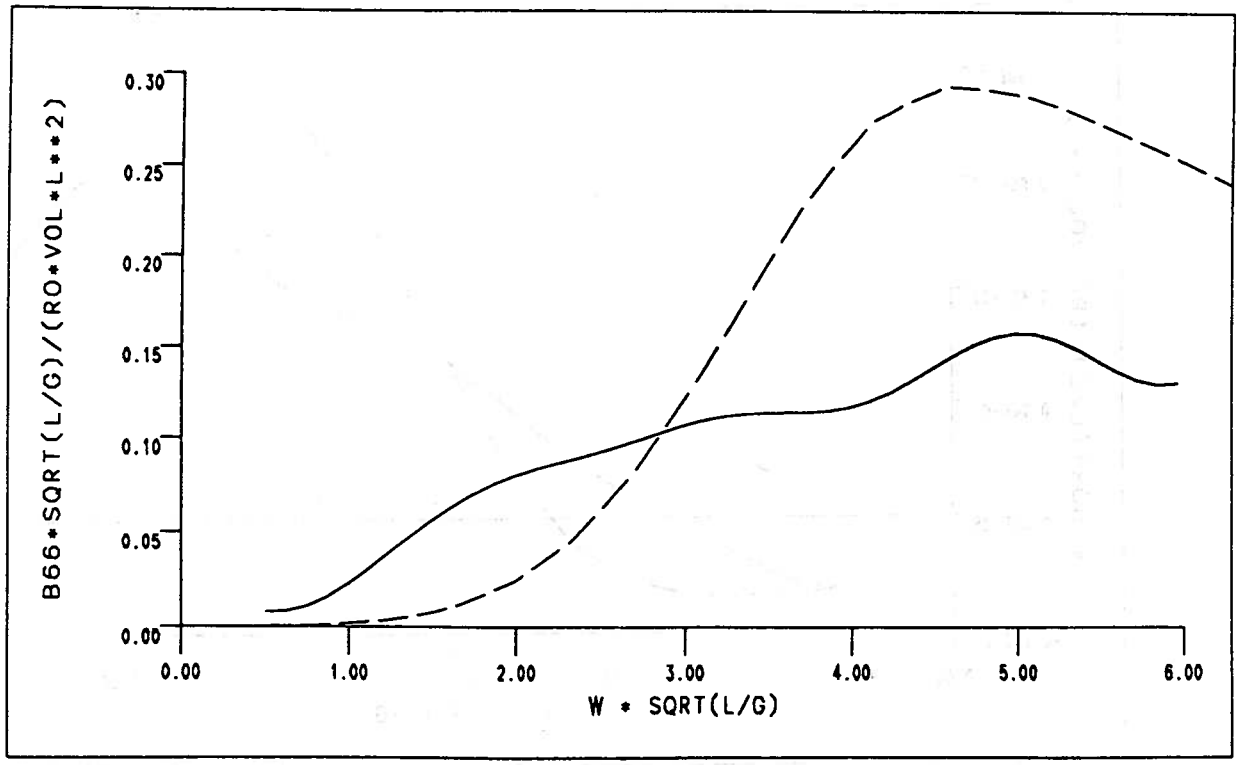
YAW-ROLL ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 304



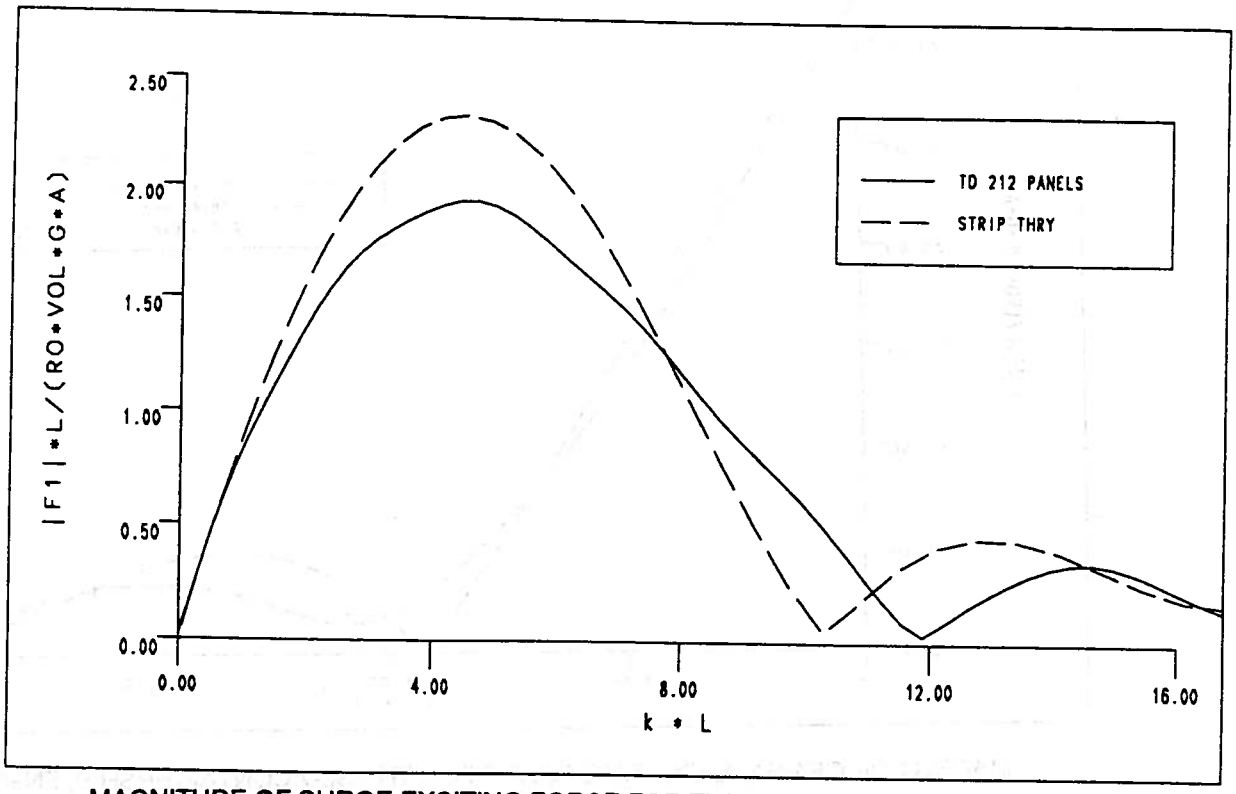
YAW-ROLL DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 305



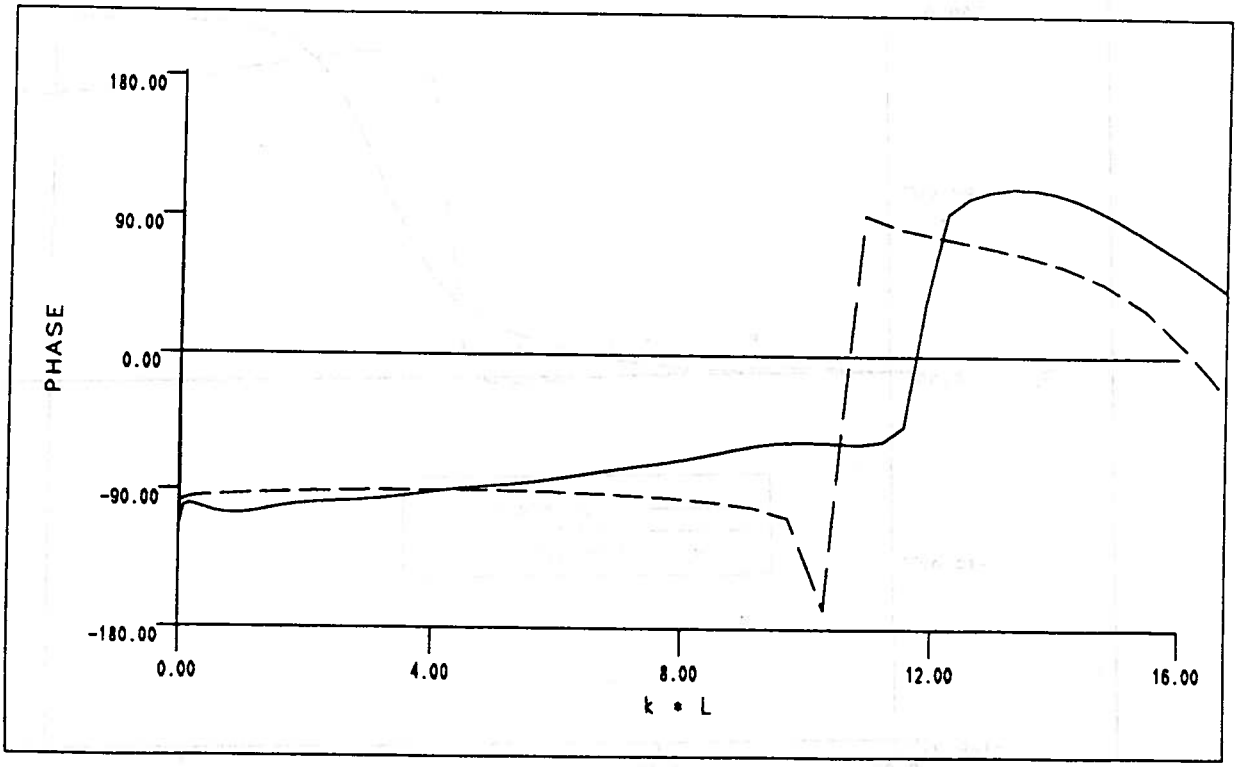
YAW ADDED MASS FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 306



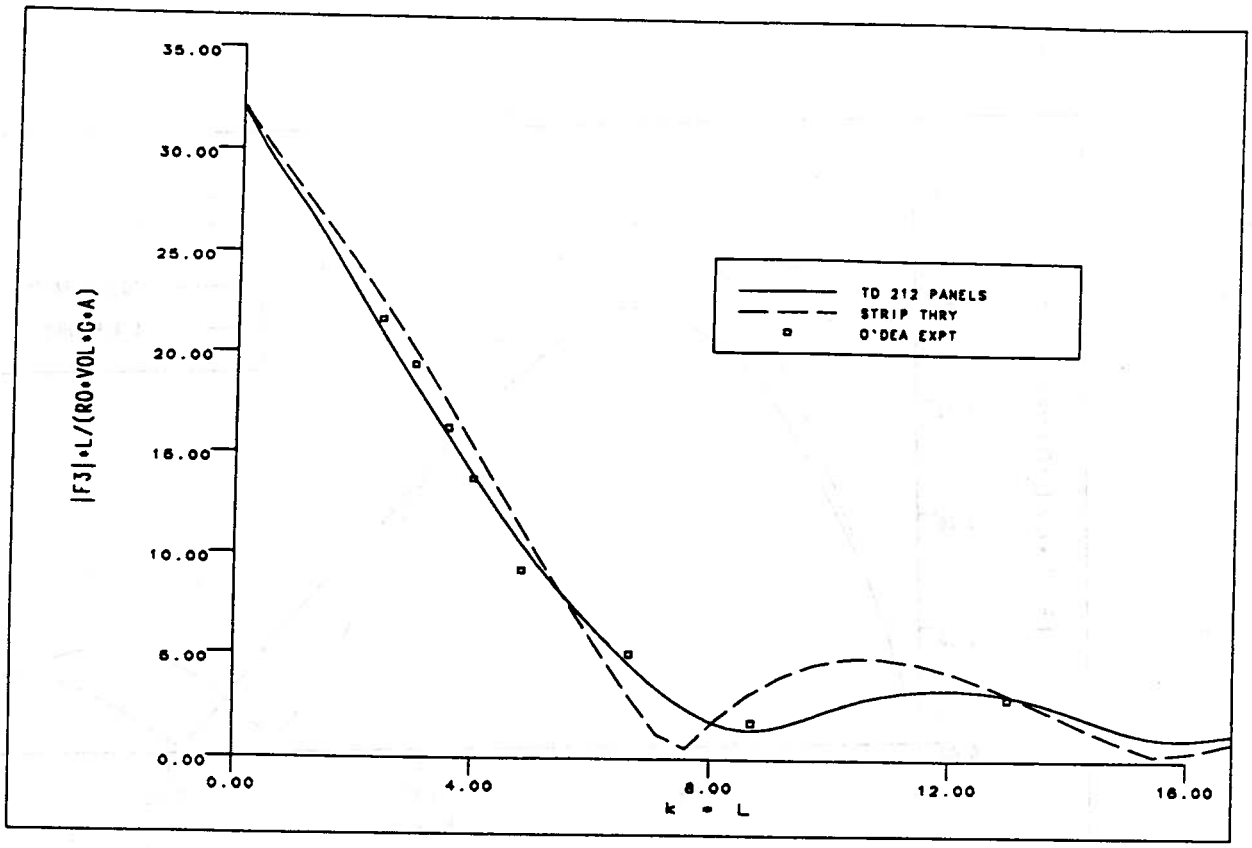
YAW DAMPING FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 307



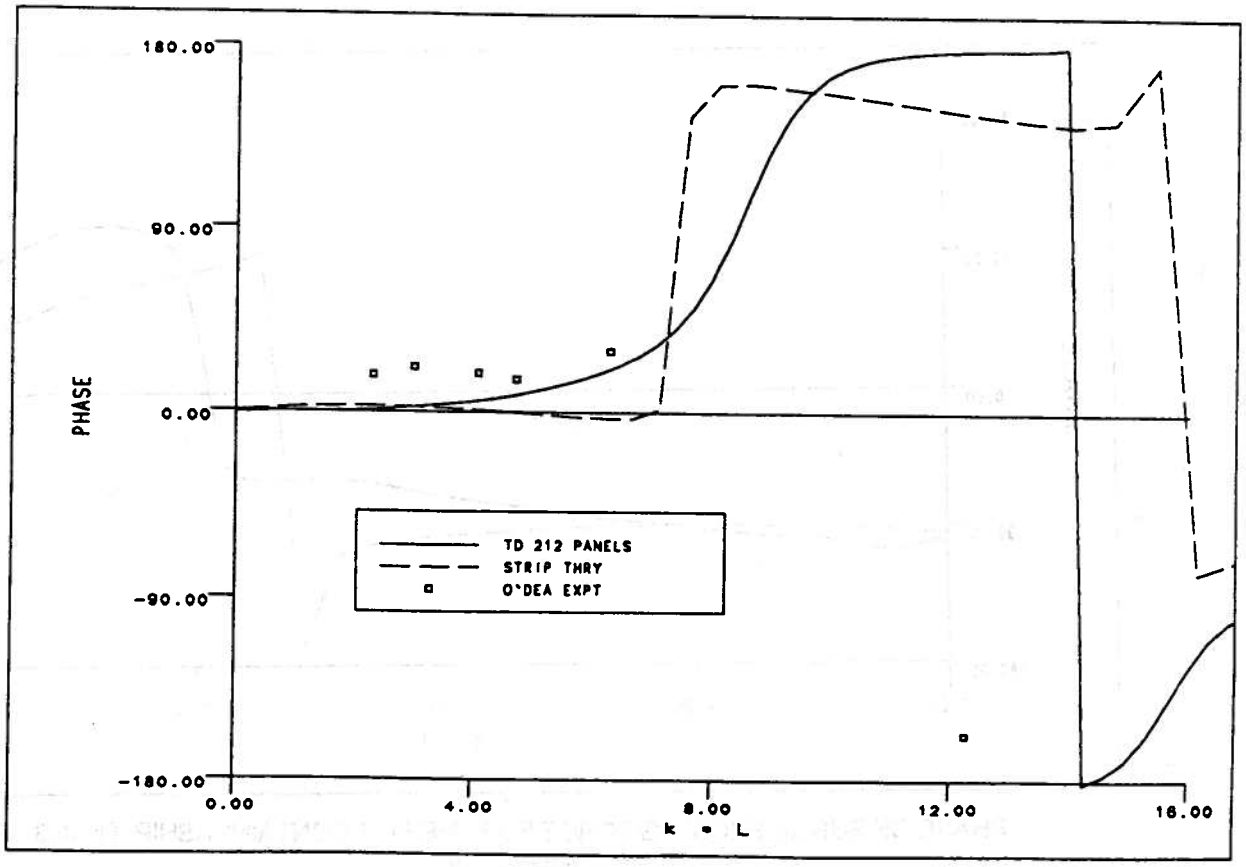
MAGNITUDE OF SURGE EXCITING FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 308



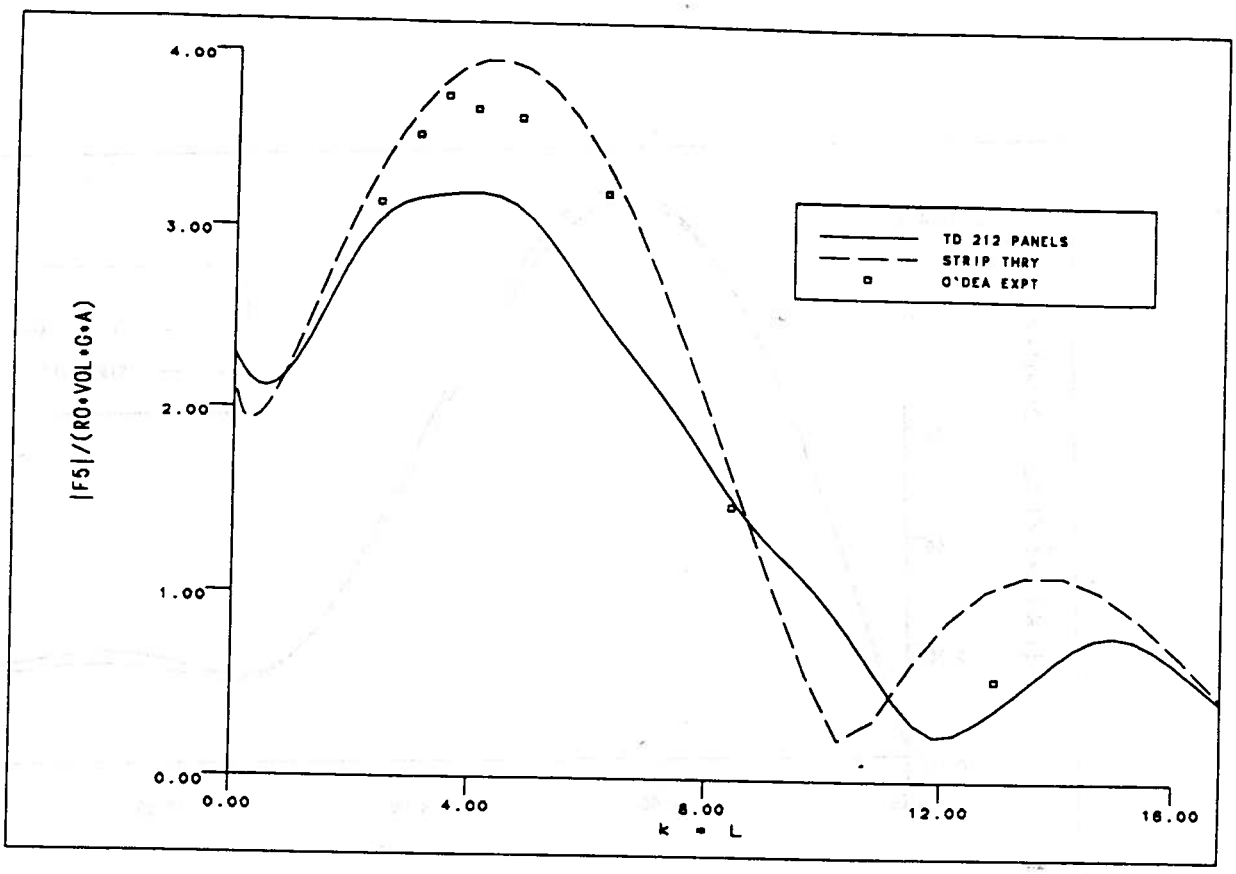
PHASE OF SURGE EXCITING FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 309



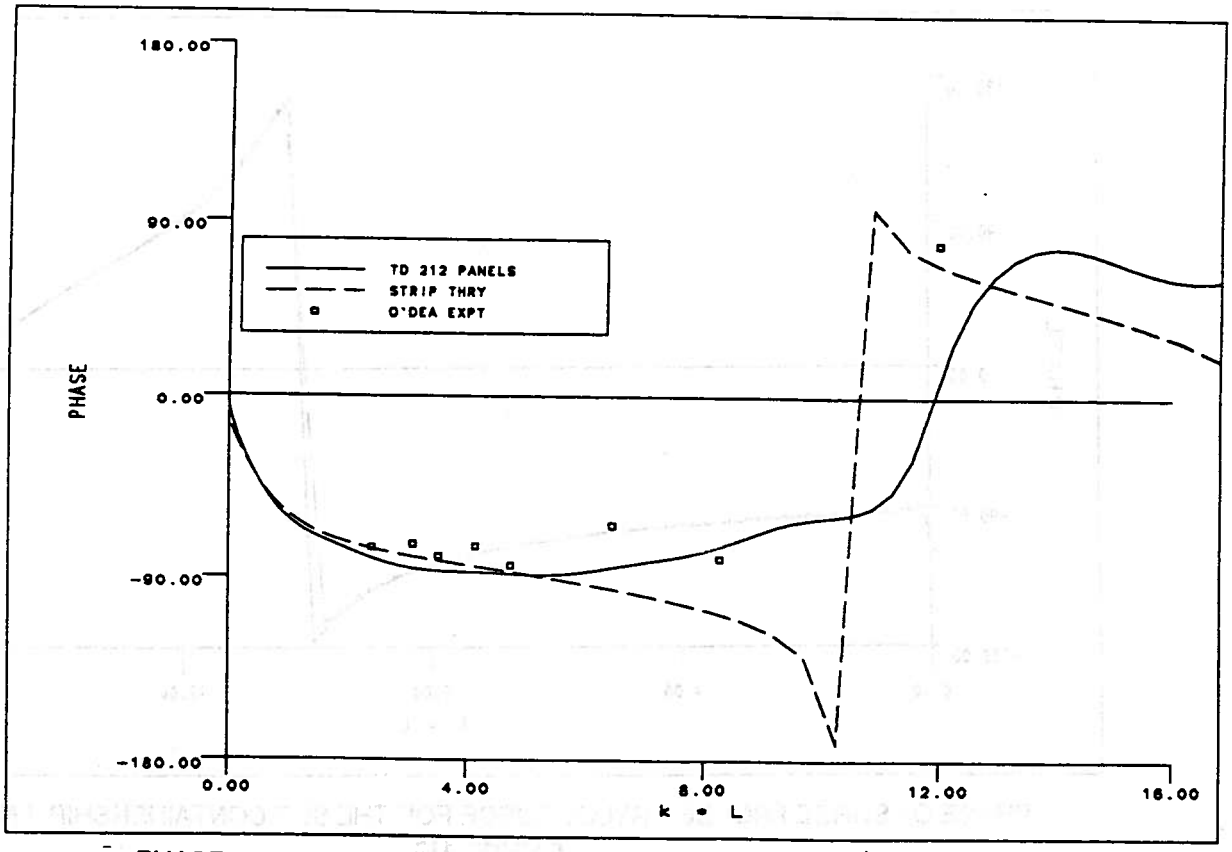
MAGNITUDE OF HEAVE EXCITING FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 310



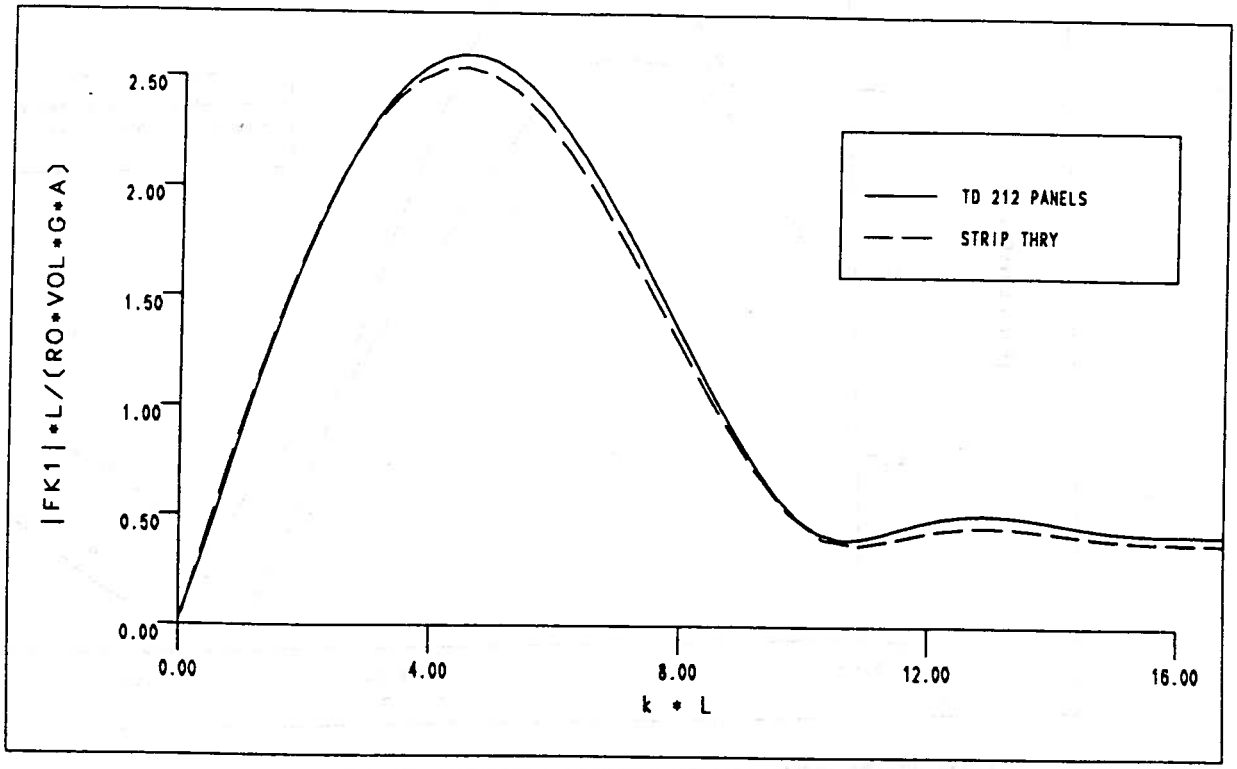
PHASE OF HEAVE EXCITING FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 311



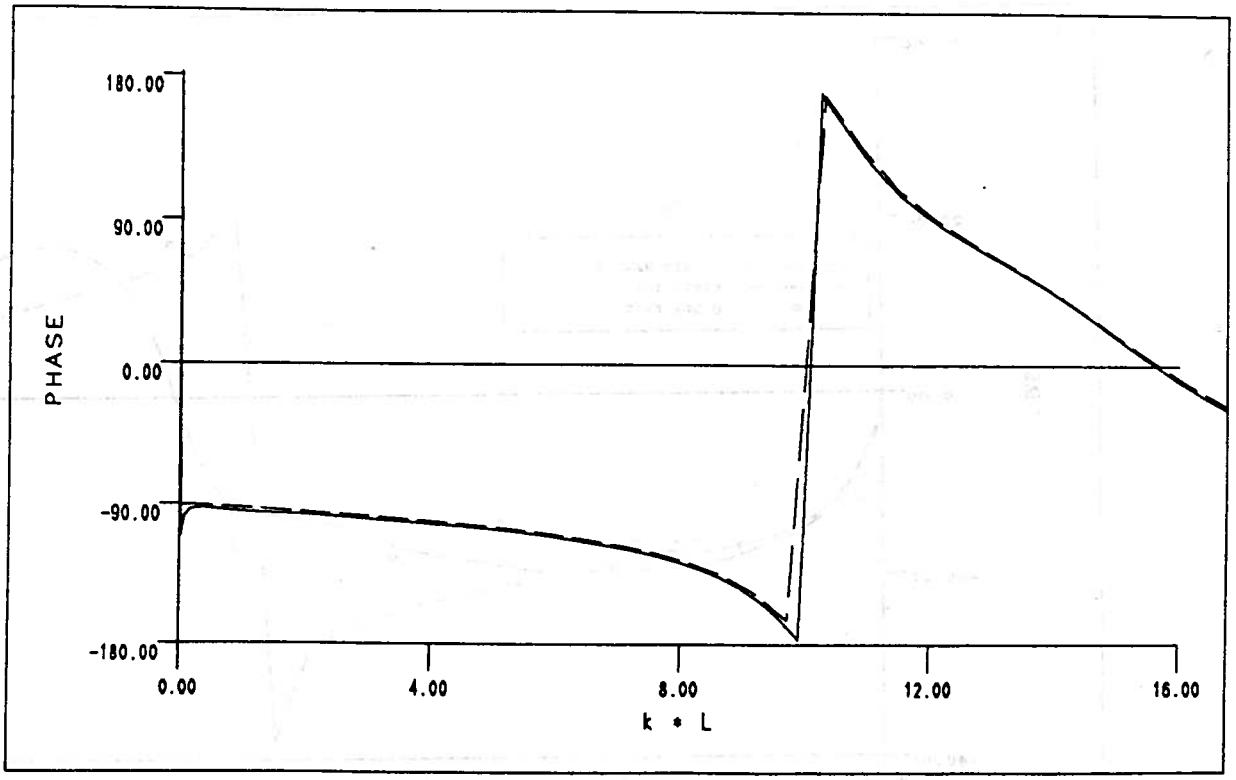
MAGNITUDE OF PITCH EXCITING FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 312



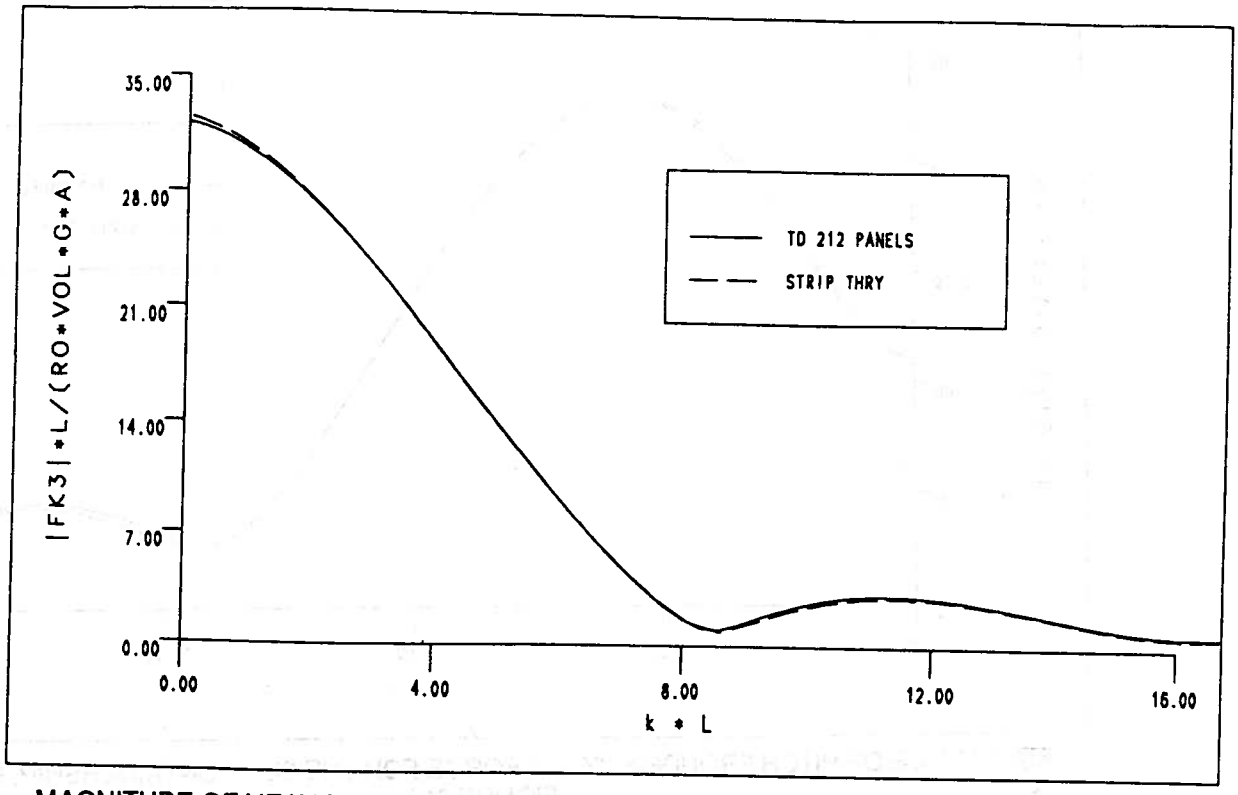
PHASE OF PITCH EXCITING FORCE FOR THE SL-7 CONTAINER SHIP, FN=0.3
FIGURE 313



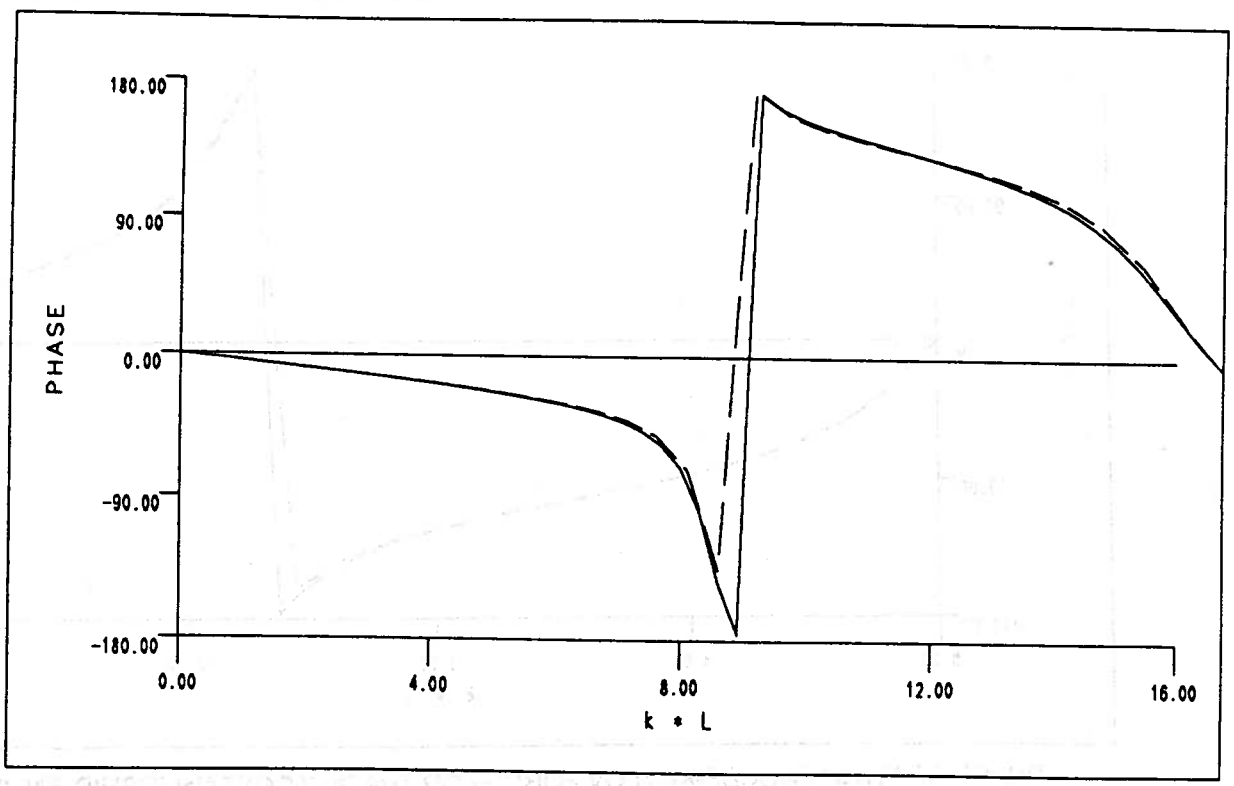
MAGNITUDE OF SURGE FROUDE-KRYLOV FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 314



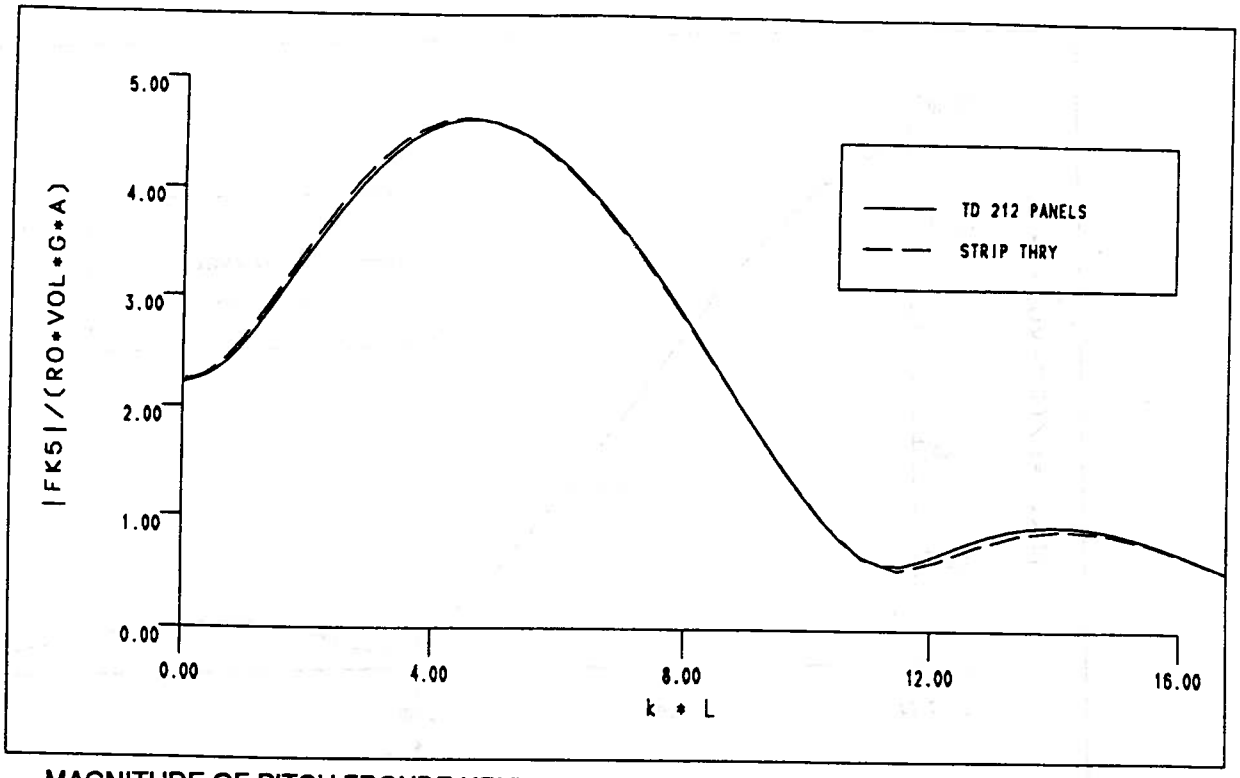
PHASE OF SURGE FROUDE-KRYLOV FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 315



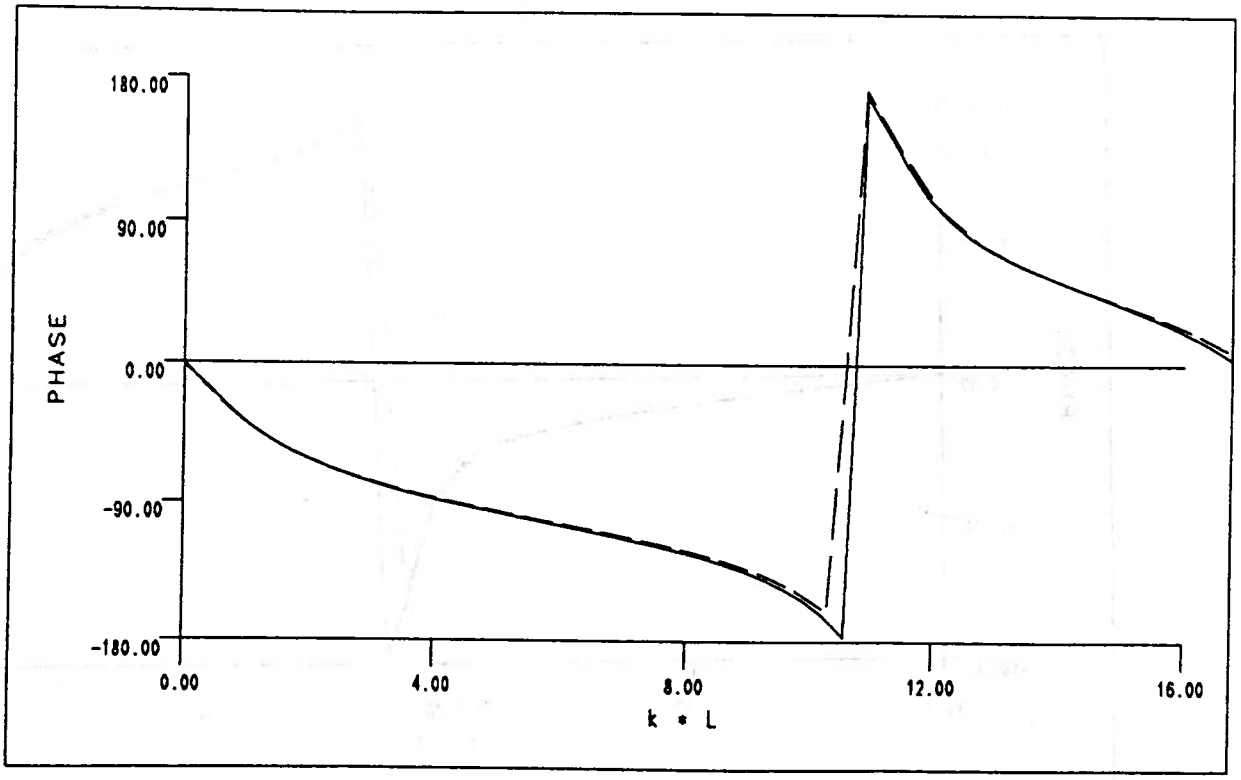
MAGNITUDE OF HEAVE FROUDE-KRYLOV FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 316



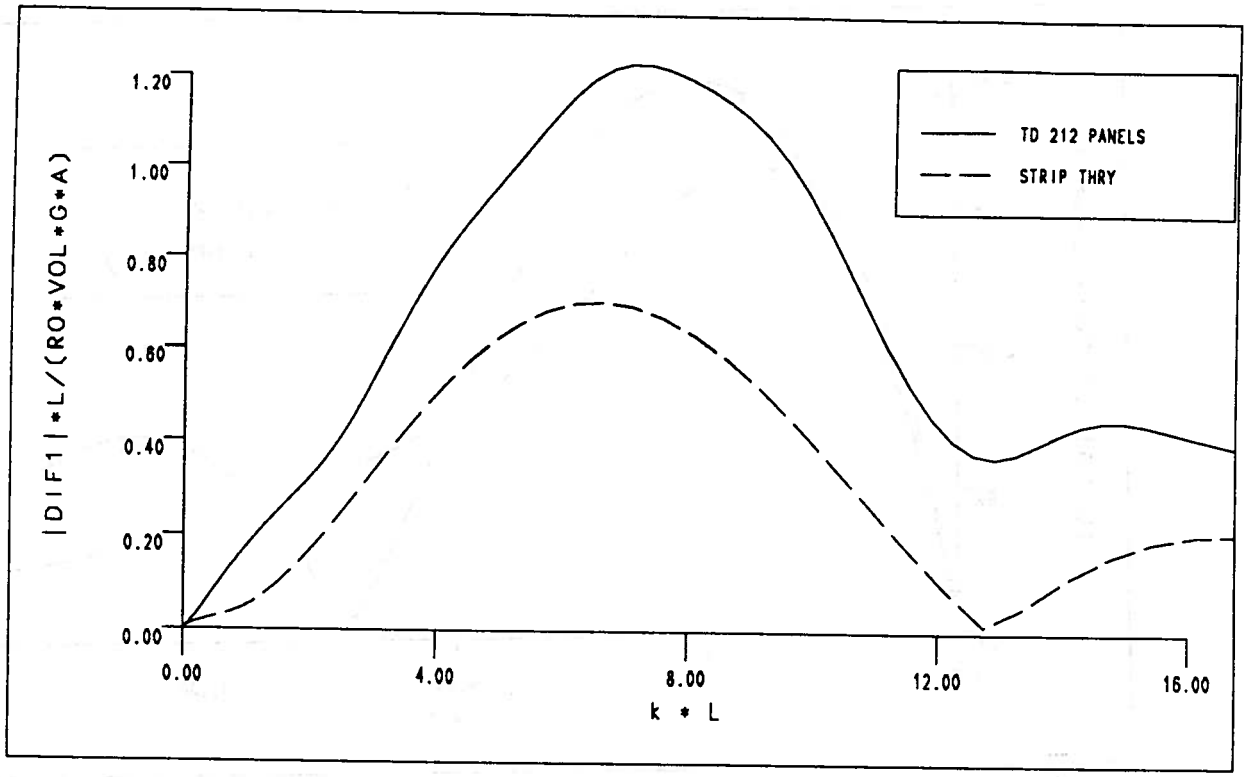
PHASE OF HEAVE FROUDE-KRYLOV FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 317



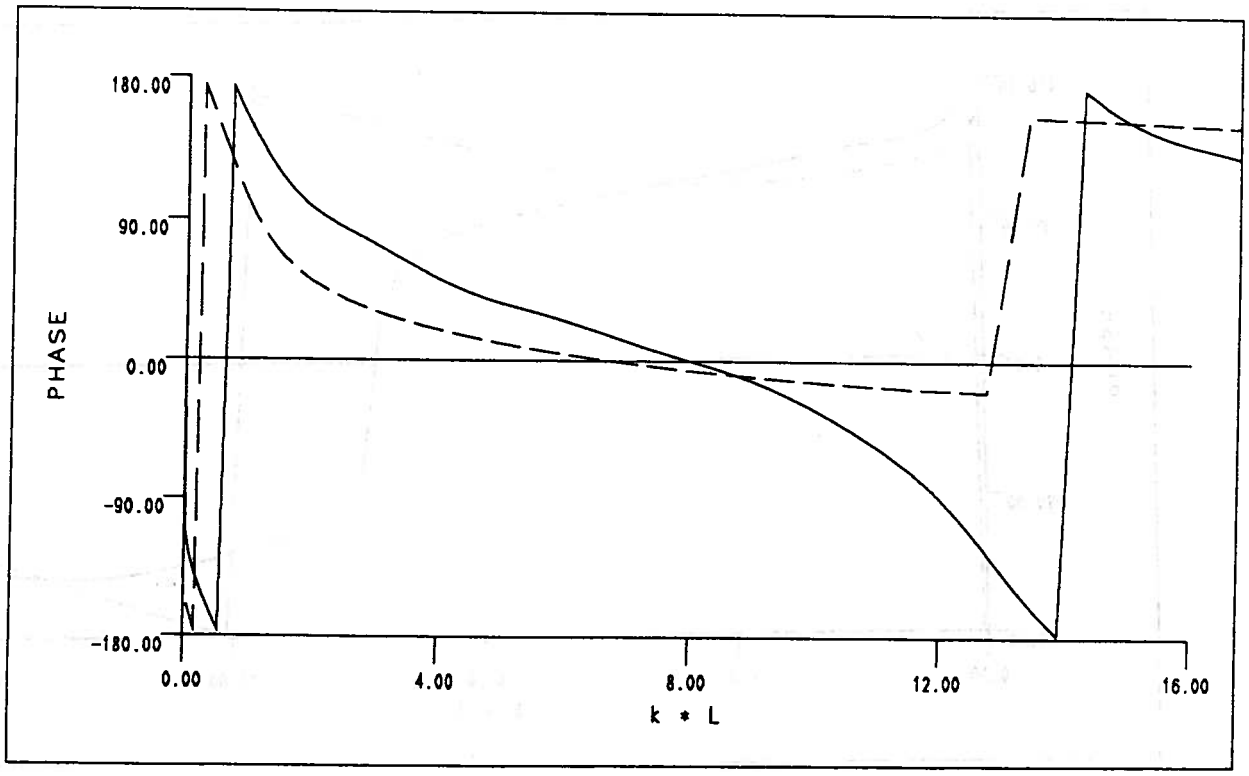
MAGNITUDE OF PITCH FROUDE-KRYLOV FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 318



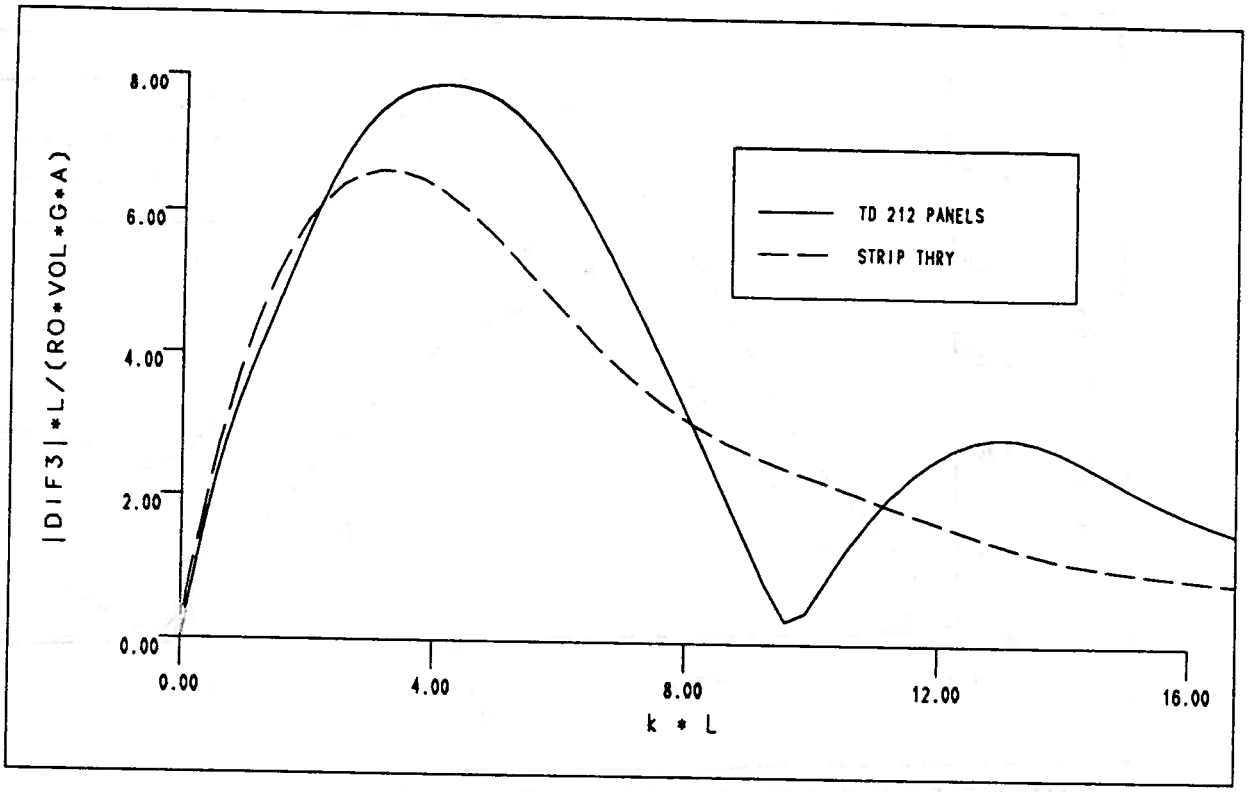
PHASE OF PITCH FROUDE-KRYLOV FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 319



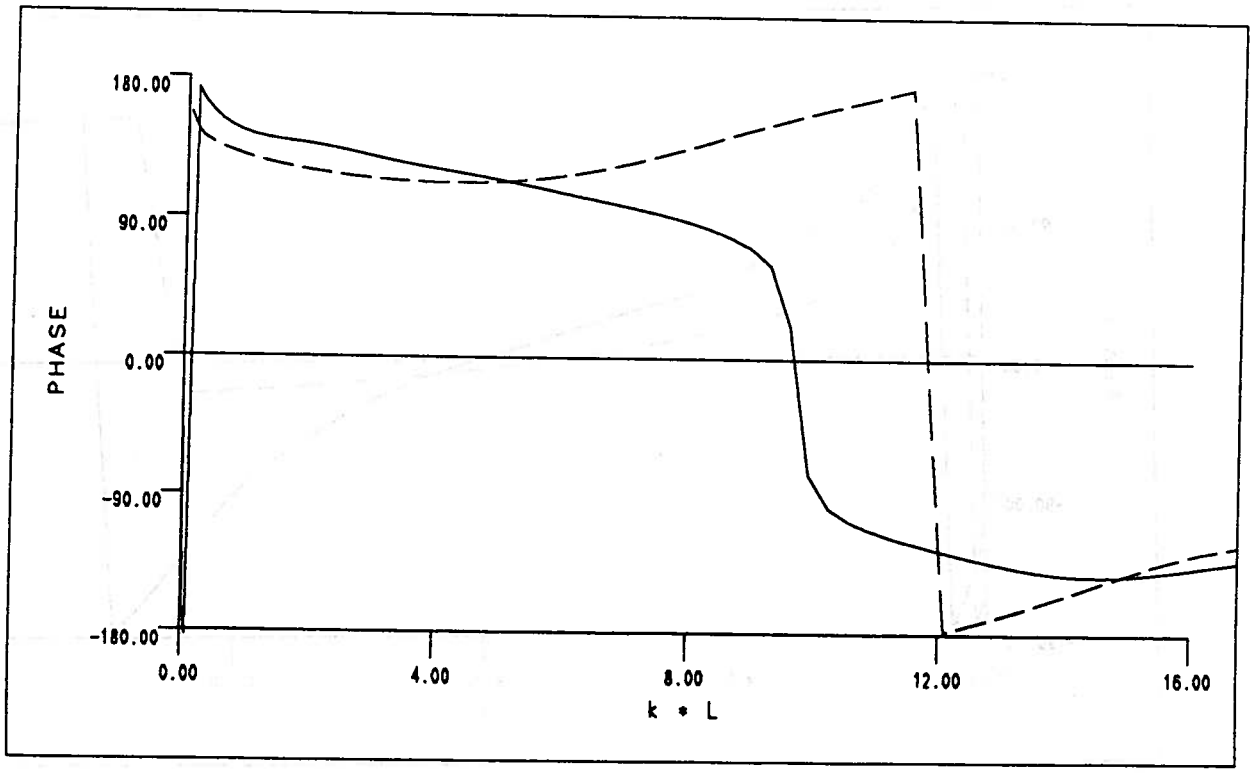
MAGNITUDE OF SURGE DIFFRACTION FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 320



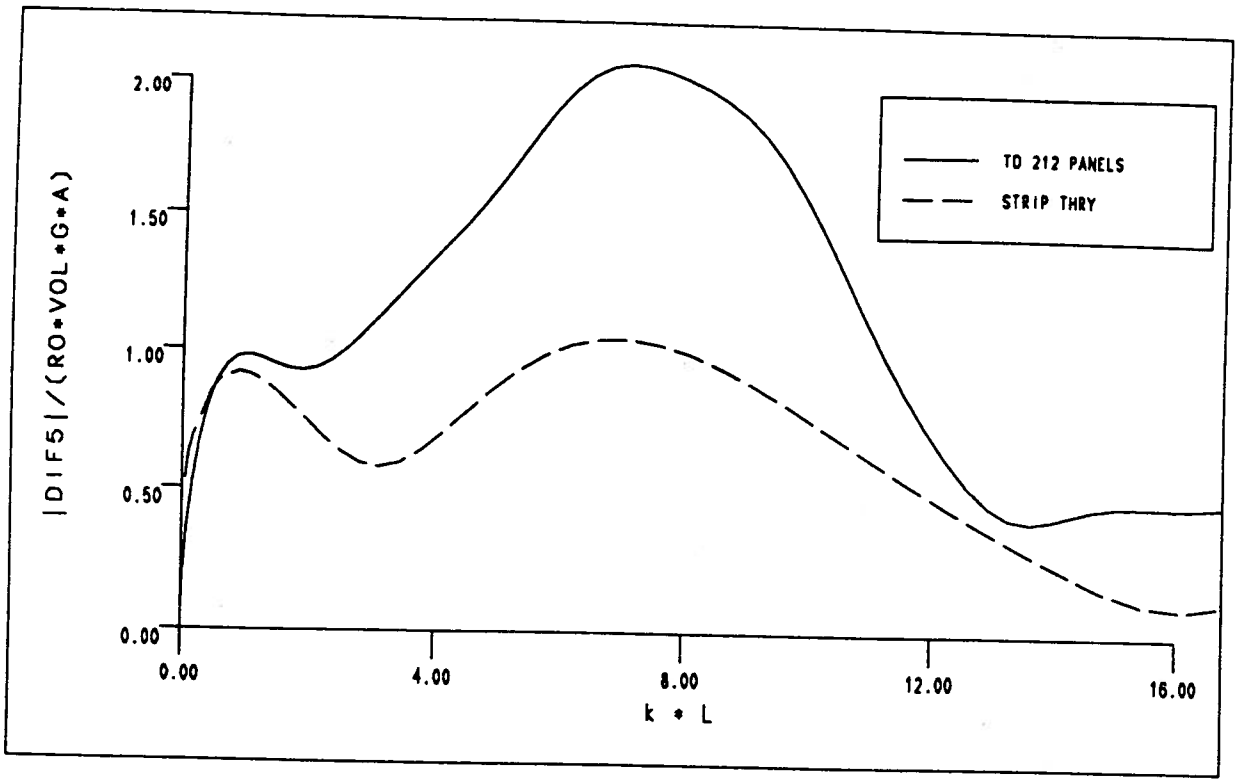
PHASE OF SURGE DIFFRACTION FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 321



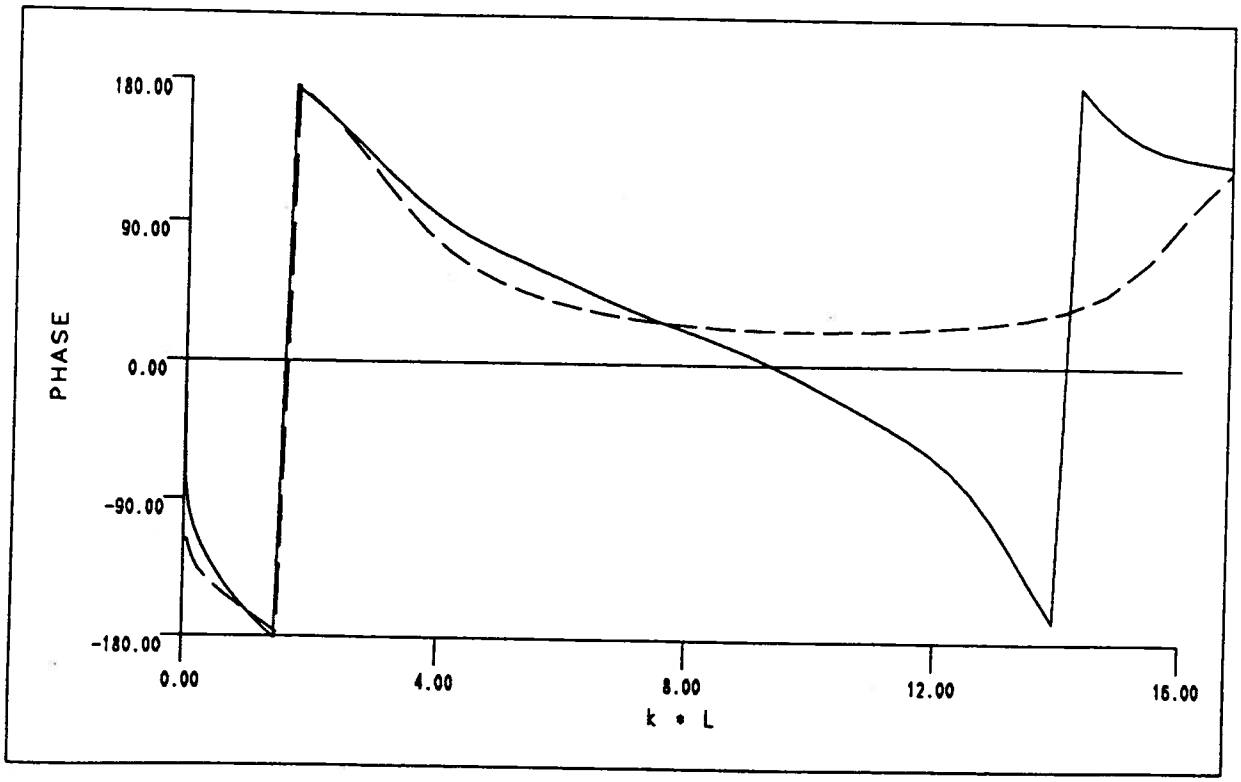
MAGNITUDE OF HEAVE DIFFRACTION FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 322



PHASE OF HEAVE DIFFRACTION FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 323



MAGNITUDE OF PITCH DIFFRACTION FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 324



PHASE OF PITCH DIFFRACTION FORCE FOR THE SL-7 CONTAINERSHIP, FN=0.3
FIGURE 325