ITTC COOPERATIVE EXPERIMENTS ON A SERIES 60 MODEL AT SHIP RESEARCH INSTITUTE — FLOW MEASUREMENTS AND RESISTANCE TESTS*—

By

Haruya TAKESHI**, Takanori HINO**, Munehiko HINATSU**, Yoshiaki TSUKADA**, Junichi FUJISAWA**

ABSTRACTS

The cooperative experimental program for resistance tests and flow measurements of model ships was proposed by the 16th International Towing Tank Conference (ITTC) and the results were reported at the 17th ITTC.

Following this program, nine organizations in Japan including Ship Research Institute performed the cooperative experiments on a Series 60 model (C_B=0.6) which is one of the four hulls used in the ITTC program.

This report describes the experiments carried out at the Ship Research Institute, which include the resistance test, the wave profile measurement, the wave analysis, the viscous flow field measurement and the wake survey. The measuring procedures of each experiment are presented and the results are shown in figures and tables.

CONTENTS

* Received on January 12, 1987
** Ship Propulsion Division

1. INTRODUCTION

The cooperative experimental program for resistance tests and flow measurements of model ships was proposed by the 16th International Towing Tank Conference (ITTC) and the results were reported at the 17th ITTC[1].

Following this program, nine organizations in Japan, Ship Research Institute, Akishima Laboratories (Mitsui Zosen) Inc., Hiroshima University, Ishikawajima-Harima Heavy Industries Co., Ltd., Kyushu University, Nippon Kokan K. K., Sumitomo Heavy Industries Ltd., University of Tokyo and Yokohama National University, performed the cooperative experiments on a Series 60 model (C_B=0.6) which is one of the four hulls used in the ITTC program.

This report describes the experiments which were carried out at the Ship Research Institute in the Japanese cooperative experiments.

2. MODEL SHIP

The model ship used in this experiment is Todd's Series 60 model (block coefficient C_B=0.6), whose length is 7 meters. The model is made of wood. The 2mm-high studs are planted at S. S. 9 1/2 with interval of 10mm. Particulars of model ship are shown in Table 2. 1. Bodyplan is shown in Fig. 2. 1. Accuracy of manufacture of this model is presented in Table 2. 2.

3. EXPERIMENTAL CONDITION

In the experiments, the resistance test, the wave profile measurement, the wave analysis, the wake survey and the viscous flow field measurement are carried out. Test conditions of each experiment are shown in Table 3. 1, where Fn is Froude number ($=U/\sqrt{gLpp}$) (U is the ship speed and g is the gravitational acceleration.) and $l=Lpp/2$. In the wave analysis, several cases of the probe position are adopted in accordance with the location of probe at the other institutes participating in this cooperative experiment. The water temperature of each experiment is listed in Table 3. 2.

4. MEASURING PROCEDURES

All experiments were made at the towing tank of the Ship Research Institute. Dimensions of the tank are shown in Table 4. 1.

4.1 Resistance test

The resistance test was carried out under the free condition. The range of Fn is 0.07—0.34 and its interval is 0.01.

The speed relative to ground, the speed relative to water, the resistance force and the dippings at both F. P. and A. P were measured. The speed of the towing carriage is used as the speed relative to ground. The speed relative to water was measured by the current meter of the blade-wheel type the dimensions of which are shown in Table 4. 2. The current meter was set 8.4m afore the F. P. and 2/3 draft below sill water surface. The resistance force was measured by the resistance dynamometer of the strain gauge type which has the capacity of 20 kg and the accuracy of 0.05% of the full scale. The dippings were measured by the trim meter of the potentiometer type.

At each speed, the location of measurements were from 20m before the center of the tank to 20m behind.

Time interval between each run is set to be 15 minutes.

4.2 Wave profile measurements

The wave profiles along the hull surface were measured by the photographs at Fn=0.18, 0.22, 0.25, 0.28, 0.30, 0.32 and 0.34.

The horizontal and vertical scales were drawn on the model surface for this purpose. The photographs were taken by the three 35mm cameras.

4.3 Wave analysis

The wave analysis by the longitudinal cut method was carried out at the six speeds and the four measuring positions as listed in Table 3. 1. The current meter was not used in this measurements. However, to investigate the effect of the current meter on the wave pattern resistance, some measurements were made with the current meter attached on the towing carriage.

The wave meter of the capacitance type is used to measure the wave height. Thg optical signal projector on the towing carriage and the receptor on the tank wall are used for the synchronization. The outputs from the wave meter and the synchronizing signal were recorded in the magnetic tapes.

4.4 Viscous flow field measurement

Viscous flow field was measured using 5-hole Pitot tube. The 5-hole Pitot tube is the NPL type (apex angle is 100 deg.) and its diameter is 5 mm. The model ship was fixed to the towing carriage in order to assure the accuracy of measuring position. The Froude number was set to be 0.18 in the measurement.

The positions of measurement are shown in Table 4.3. The Pitot probe is set 5mm apart from the hull surface initially in each measurement. The minimum interval of the measuring position is 5mm, which is mainly used to measure the flow near the hull. This interval is changed suitably to 5 or 10mm.

4.5 Wake survey

Wake survey was carried out using a comb-type Pitot tubes. The diameter of the probe is 4mm. The ship speeds were set to be Fn=0.25 and Fn=0.30. The measurement section is assigned after 40% ship length from A. P.. Measured total head loss is integrated over the measurement section in order to get the viscous resistance.

5. RESULTS

5.1 Resistance test

The resistance coefficients are calculated from the measured data. No blockage correction is made. Speed relative to water is used in the calculation.

The residual resistance coefficient $C_R(=R_R/\frac{1}{2}\rho U^2 S)$ is calculated by using the I. T. T. C. 1957 Ship Model Correlation Line. And the wave making resistance coefficient C_W $(=R_W/\frac{1}{2}\rho U^2 S)$ is calculated by Schoenherr's friction line. The from factor K is determined by assuming the C_W at Fn=0.01 to be zero.

From the measured dippings d_F and d_A (at F. P. and A. P. respectively), the mean sinkage σ $(=\frac{2}{Fn^2}s)$ and the trim τ $(=\frac{2}{Fn^2}t)$, where $s=(d_F+d_A)/2Lpp$ and $t=(d_A-d_F)/Lpp$, are calculated.

The resistance curves and the trim and the sinkage curves are shown in Fig. 5.1.1 and 5.1.2, respectively. Also, the data are listed in Table 5.1.

5.2 Wave profile measurements

The wave heights along the hull surface are measured on the coordinates fixed to the ship. By considering the dipping of the ship, the wave configurations relative to the still water plane are obtained.

The wave profiles are shown in Fig. 5.2.1～5.2.7 and the data are listed in Table 5.2.1～5.2.7.

5.3 Wave analysis

The Newman-Sharma method is used in the analysis. The amplitude functions for the measurements at y/l=1.0 are shown in Figs. 5.3.1～5.3.6 and tabulated in Tables 5.3.1～5.3.6. The wave pattern resistance coefficients C_{WP} $(=R_{WP}/\frac{1}{2}\rho U^2 S)$ are plotted in Fig. 5.1.1 and shown in Table 5.1. The comparisons of weighed amplitude functions of four measuring positions are shown in Figs. 5.3.7~5.3.12. The differences due to the measuring position are little in both the amplitude functions and the wave pattern resistance coefficients listed in Table 5.3.7. Also, little effect of the current meter on the wave pattern resistance is observed in Figs. 5.3.13. and 5.3.14. The detailed discussions of the wave analysis in the cooperative experiments are in reference 2).

5.4 Viscous flow field measurement

Figs. 5.4.1~5.4.6 show the velocity distribution on the horizontal plane of z/l=−0.0008, −0.00125, −0.0025, −0.0050, −0.0075 and −0.0100, respectively. Near the waterplane around ship's stern, a "concave" profile is obtained at a boundary layer edge. Since the position of this concave seems to coincide with a crest line of stern wave, this may be due to a wave effect. Boundary layer thickness becomes thinner around the bottom of ship.

Figs. 5-4.7~5.4.11 show the velocity components on the cross section of square station (S.S.) 1, S.S. 1/2, S.S. A.P., S.S. −1/2 and S.S. −1. The existence of longitudinal vortices is recognized from these figures.

5-5 Wake survey

Figs. 5.5.1 and 5.5.2 show the distributions of total head loss at Fn=0.25 and 0.30, respectively. Also, the data are presented in Table 5.5.1 and 5.5.2. Near the free surface, a loss of total head is recognized in case of Fn=0.25, which is not in case of Fn=0.30. This seems to be due to the interaction with stern waves. The lump of head loss exists around z/d=1.0. Figs. 5.5.3. and 5.5.4 show the sideward distribution of total head loss at Fn=0.25 and 0.30, respectively.

Integrating the total head loss along y-axis, the depthwise distribution of integrated total head loss is obtained. Figs. 5.5.5 and 5.5.6 are thus obtained at Fn=0.25 and 0.30. Total head loss concentrates near the free surface and around z/d=1.0 as mentioned above. The viscous drag is obtained by the integral of the depthwise distribution of the head loss. Fig. 5.5.7 shows the results of the separation of resistance. Because the water temperature at the wake survey is different from that at the resistance test, The results of the resistance test are converted so that the Reynolds numbers are equal to those at the wake survey for a comparison. The viscous drag obtained by the integration of the total head loss agrees well with $(1+K)\,C_{FO}$ which is the viscous resistance coefficient by the analysis of the resistance test. Total resistance obtained by the sum of the viscous resistance and wave pattern resistance agrees very well with the measured total resistance at the resistance test.

ACKNOWLEDGEMENT

The authors would like to express their sincere gratitudes to Prof. Hisashi Kajitani of the University of Tokyo who organized this cooperative experiments in Japan. The authors gratefully acknowledge the suggestions and advises of all the members of CES60 (Cooperative Experiments on Series 60) group. The authors also would like to thank Dr. Hiraku Tanaka, the head of ship propulsion division of Ship Research Institute, to give them the opportunity to perform this work.

REFERENCES

1) Proceedings of the 17th International Towing Tank Conference (1984)
2) Ishii, T. et al. : Scale Effect on Wave Pattern Resistance (Consideration on Results of ITTC Cooperative Experiments), J. Soc. Nav. Archit. Japan, Vol. 161 (1987) (to appear)

Table 2.1 Particulars of model ship

Length between perpendiculars	Lpp	7 m
Breadth	B	0.9333 m
Draft	d	0.3733 m
Displacement	∇	1.462 m^3
Wetted surface area	S	8.3491 m^2

Table 2.2 Accuracy of manufacture

W.L. \ S.S.	1/2	3/4	1	1 1/2	2	3	4	5	6
4	-0.043 0.107	0.021 -0.021	0.129 0.171	-0.043 0.064	0.021 0.064	-0.043 0.021	-0.021 0.107	-0.021 0.193	0.000 0.129
7	-0.021 0.043	0.000 0.000	0.021 0.021	-0.021 0.043	-0.021 -0.086	0.000 0.129	0.021 0.043	0.064 0.064	0.107 0.171
L.W.L	-0.107 -0.150	-0.107 -0.171	-0.064 -0.107	-0.150 -0.171	0.021 -0.086	0.000 0.171	0.021 0.021	0.064 0.086	0.021 0.171

W.L. \ S.S.	7	8	8 1/2	9	9 1/4	9 1/2	9 3/4	
4	0.107 0.129	0.000 0.129	0.021 0.150	0.021 0.150	-0.043 0.129	0.193 0.086	-0.064 0.150	PORT STARBOARD
7	0.193 0.193	0.150 0.171	0.043 0.171	0.064 0.064	0.000 0.129	0.150 0.086	0.086 0.150	
L.W.L	0.150 0.171	0.150 0.193	0.064 0.171	·0.086 0.171	0.064 0.107	0.064 0.129	0.043 0.171	

Accuracy = $(y - y_m)/(B/2) \times 100$, y = offset data
y_m = measured data

Table 3. 1 Test condition

Resistance test	Fn = 0.07 - 0.34, 0.01 each
Wave profile measurement	Fn = 0.18, 0.22, 0.25, 0.28, 0.30, 0.32, 0.34 (measured by photograph)
Wave analysis	Fn = 0.22, 0.25, 0.28, 0.30, 0.32, 0.34, y/l= 0.40, 0.70, 1.00, 1.4286
Wake survey	Fn = 0.25, 0.30 , 0.4Lpp aft from A.P.
Viscous flow field measurement	Fn = 0.18, x/l = 0.8, 0.9, 1.0, 1.1, 1.2 z/l =-0.0125, -0.025, -0.05, -0.075, -0.010

$Fn=U/\sqrt{gLpp}$, l=Lpp/2

Table 3. 2 water temperature

Resistance test	21.7 , 21.5 (°C)
Wave profile measurement	21.5
Wave analysis	21.8
Wake survey	16.8,16.6,16.3 (Fn=0.25) 15.8,15.6 (Fn=0.30)
Viscous flow field measurement	11.8,11.6,11.4

Table 4. 1 Dimensions of the towing tank

Length	400 m
Breadth	18 m
Water depth	8 m

Table 4. 2 Particulars of current meter

Diameter	100.0 mm
Boss ratio	0.200
Pitch	106.2 mm
Pitch ratio	1.062
Blade No.	2
Rake angle	0.000 deg
Blade section	Troost-B

Table 4. 3 Position of measurement

S.S.	1 , 1/2 , A.P. , -1/2 , -1
z/l	-0.0125 , -0.025 , -0.05 , -0.075 , -0.1

l=Lpp/2

Table 5. 1 Results of resistance test

W.T.:21.70 RO: 101.750 NU: 0.96363D-06 AK: 0.101

U (M/S)	FN	RN (E+6)	RT (KG)	CT (E-3)	CFI (E-3)	CRI (E-3)	CFS (E-3)	CRS (E-3)	CWS (E-3)	DF/0.5L (E-3)	DA/0.5L (E-3)	S (E-3)	T (E-3)	SIGMA (E-3)	TAU (E-3)	TIME
0.577	0.070	4.191	0.531	3.753	3.510	0.243	3.395	0.358	0.015	0.222	0.110	0.083	-0.056	34.170	-22.937	12:00
0.662	0.080	4.809	0.678	3.641	3.421	0.220	3.316	0.325	-0.010	0.359	0.199	0.139	-0.080	43.703	-25.018	13:08
0.746	0.090	5.419	0.842	3.560	3.347	0.214	3.249	0.311	-0.017	0.403	0.173	0.144	-0.115	35.494	-28.402	13:26
0.828	0.100	6.015	1.024	3.515	3.284	0.232	3.192	0.323	0.001	0.556	0.230	0.196	-0.163	39.286	-32.629	13:43
0.909	0.110	6.603	1.223	3.484	3.229	0.256	3.142	0.342	0.025	0.820	0.416	0.309	-0.202	51.354	-33.524	14:35
0.992	0.120	7.206	1.437	3.439	3.178	0.260	3.097	0.342	0.029	0.883	0.399	0.320	-0.242	44.653	-33.763	14:54
1.072	0.129	7.787	1.665	3.410	3.135	0.276	3.057	0.353	0.044	1.173	0.583	0.439	-0.295	52.453	-35.219	16:02
1.154	0.139	8.383	1.922	3.398	3.094	0.304	3.020	0.378	0.073	1.315	0.615	0.482	-0.350	49.716	-36.089	16:19
1.235	0.149	8.971	2.185	3.373	3.057	0.315	2.987	0.386	0.084	1.564	0.723	0.572	-0.421	51.422	-37.837	16:36
1.317	0.159	9.567	2.471	3.354	3.023	0.331	2.956	0.399	0.099	1.902	0.862	0.691	-0.520	54.660	-41.126	16:56
1.399	0.169	10.163	2.772	3.334	2.992	0.342	2.927	0.407	0.111	2.179	0.975	0.789	-0.602	55.286	-42.205	17:13
1.481	0.179	10.758	3.088	3.314	2.962	0.352	2.900	0.414	0.121	2.448	1.099	0.887	-0.674	55.477	-42.192	17:32
1.564	0.189	11.361	3.427	3.298	2.935	0.364	2.874	0.424	0.134	2.836	1.301	1.034	-0.767	58.036	-43.051	17:58
1.646	0.199	11.957	3.832	3.329	2.909	0.420	2.851	0.479	0.190	3.187	1.462	1.162	-0.862	58.874	-43.688	18:20
1.727	0.209	12.545	4.289	3.386	2.885	0.500	2.829	0.557	0.271	3.563	1.692	1.314	-0.936	60.442	-43.042	18:40
1.810	0.218	13.148	4.702	3.379	2.862	0.517	2.808	0.571	0.287	4.013	1.925	1.484	-1.044	62.188	-43.729	19:01
1.894	0.229	13.758	5.160	3.386	2.840	0.546	2.787	0.599	0.318	4.350	2.075	1.606	-1.138	61.419	-43.499	19:21

W.T.:21.50 RO: 101.750 NU: 0.96822D-06 AK: 0.101

U (M/S)	FN	RN (E+6)	RT (KG)	CT (E-3)	CFI (E-3)	CRI (E-3)	CFS (E-3)	CRS (E-3)	CWS (E-3)	DF/0.5L (E-3)	DA/0.5L (E-3)	S (E-3)	T (E-3)	SIGMA (E-3)	TAU (E-3)	TIME
1.820	0.220	13.158	4.738	3.367	2.862	0.505	2.807	0.560	0.276	4.276	1.920	1.549	-1.178	64.183	-48.811	14:20
1.912	0.231	13.823	5.179	3.335	2.838	0.497	2.785	0.550	0.269	4.677	2.137	1.703	-1.270	63.959	-47.699	14:40
1.983	0.239	14.337	5.639	3.376	2.821	0.556	2.769	0.607	0.327	5.109	2.331	1.860	-1.389	64.907	-48.456	15:00
2.065	0.249	14.929	6.135	3.387	2.802	0.586	2.751	0.636	0.358	5.664	2.603	2.067	-1.531	66.511	-49.254	15:19
2.147	0.259	15.522	6.886	3.517	2.783	0.734	2.734	0.782	0.507	6.129	3.000	2.282	-1.564	67.943	-46.571	15:39
2.229	0.269	16.115	8.029	3.804	2.766	1.038	2.718	1.086	0.811	6.374	3.583	2.489	-1.395	68.751	-38.532	15:58
2.310	0.279	16.701	9.548	4.213	2.750	1.463	2.703	1.510	1.237	6.617	4.397	2.754	-1.110	70.803	-28.540	16:16
2.395	0.289	17.315	11.120	4.564	2.733	1.831	2.688	1.876	1.605	6.881	5.165	3.012	-0.858	72.014	-20.528	16:36
2.478	0.299	17.915	12.485	4.787	2.718	2.069	2.674	2.113	1.843	7.196	5.528	3.181	-0.834	71.064	-18.633	16:58
2.562	0.309	18.523	13.564	4.865	2.703	2.162	2.660	2.205	1.936	7.945	5.849	3.448	-1.048	72.093	-21.909	17:20
2.645	0.319	19.123	14.448	4.862	2.689	2.173	2.646	2.215	1.949	8.721	5.985	3.677	-1.368	72.123	-26.830	17:41
2.730	0.330	19.737	15.402	4.865	2.675	2.190	2.633	2.232	1.966	9.533	6.364	3.974	-1.584	73.166	-29.169	18:02
2.815	0.340	20.352	16.704	4.963	2.661	2.301	2.621	2.342	2.077	10.036	7.038	4.268	-1.499	73.893	-25.954	18:24

Table 5. 2. 1 Wave profiles along the hull at Fn=0.18

WAVE PROFILE
CONDITION : FULL
TRIM : 0 %
FN : 0.180
V (M/S) : 1.490

ORG. : SRI
LPP (M) : 7.0
W.T. : 21.5
DATE : 1985.9.28

	X/L	ZO(MM)	DZ(MM)	Z(MM)	XI
A 1/8	1.025	30.4	3.8	26.6	0.23494
AP	1.000	26.2	3.8	22.4	0.19734
1/4	0.950	23.1	4.0	19.1	0.16893
1/2	0.900	16.9	4.1	12.8	0.11315
3/4	0.850	13.5	4.2	9.3	0.08209
1	0.800	11.1	4.3	6.8	0.05986
1 1/4	0.750	10.4	4.4	6.0	0.05264
1 1/2	0.700	7.2	4.6	2.6	0.02335
1 3/4	0.650	5.6	4.7	0.9	0.00818
2	0.600	4.3	4.8	-0.5	-0.00434
2 1/4	0.550	1.9	4.9	-3.0	-0.02657
2 1/2	0.500	0.0	5.0	-5.0	-0.04438
2 3/4	0.450	-6.7	5.1	-11.8	-0.10458
3	0.400	-7.0	5.3	-12.3	-0.10827
3 1/4	0.350	-6.7	5.4	-12.1	-0.10666
3 1/2	0.300	-3.3	5.5	-8.8	-0.07768
3 3/4	0.250	-0.9	5.6	-6.5	-0.05754
4	0.200	2.6	5.7	-3.1	-0.02768
4 1/4	0.150	2.6	5.9	-3.3	-0.02872
4 1/2	0.100	3.5	6.0	-2.5	-0.02182
4 3/4	0.050	1.7	6.1	-4.4	-0.03875
5	0.000	1.0	6.2	-5.2	-0.04597
5 1/4	-0.050	-3.8	6.3	-10.1	-0.08939
5 1/2	-0.100	-4.6	6.4	-11.0	-0.09750
5 3/4	-0.150	0.0	6.6	-6.6	-0.05793
6	-0.200	1.2	6.7	-5.5	-0.04838
6 1/4	-0.250	-3.1	6.8	-9.9	-0.08738
6 1/2	-0.300	-7.9	6.9	-14.8	-0.13080
6 3/4	-0.350	-5.6	7.0	-12.6	-0.11154
7	-0.400	-4.3	7.2	-11.5	-0.10110
7 1/4	-0.450	-0.8	7.3	-8.1	-0.07124
7 1/2	-0.500	2.2	7.4	-5.2	-0.04580
7 3/4	-0.550	10.5	7.5	3.0	0.02643
8	-0.600	19.0	7.6	11.4	0.10043
8 1/4	-0.650	23.9	7.7	16.2	0.14265
8 1/2	-0.700	16.7	7.9	8.8	0.07804
8 3/4	-0.750	12.8	8.0	4.8	0.04257
9	-0.800	14.5	8.1	6.4	0.05654
9 1/4	-0.850	17.8	8.2	9.6	0.08463
9 1/2	-0.900	29.3	8.3	21.0	0.18511
9 3/4	-0.950	43.8	8.4	35.4	0.31209
FP	-1.000	26.3	8.6	17.7	0.15655

Table 5. 2. 2 Wave profiles along the hull at Fn=0.22

WAVE PROFILE
CONDITION : FULL
TRIM : 0 %
FN : 0.220
V (M/S) : 1.820

ORG. : SRI
LPP (M) : 7.0
W.T. : 21.5
DATE : 1985.9.28

	X/L	ZO(MM)	DZ(MM)	Z(MM)	XI
A 1/8	1.025	40.0	6.6	33.4	0.19753
AP	1.000	37.8	6.7	31.1	0.18391
1/4	0.950	34.4	6.9	27.5	0.16257
1/2	0.900	26.1	7.1	19.0	0.11223
3/4	0.850	22.6	7.3	15.3	0.09031
1	0.800	15.8	7.5	8.3	0.04885
1 1/4	0.750	13.5	7.8	5.7	0.03402
1 1/2	0.700	12.9	8.0	4.9	0.02925
1 3/4	0.650	9.4	8.2	1.2	0.00732
2	0.600	3.0	8.4	-5.4	-0.03177
2 1/4	0.550	-4.3	8.6	-12.9	-0.07619
2 1/2	0.500	-10.9	8.8	-19.7	-0.11646
2 3/4	0.450	-14.0	9.0	-23.0	-0.13602
3	0.400	-14.6	9.2	-23.8	-0.14079
3 1/4	0.350	-9.6	9.4	-19.0	-0.11243
3 1/2	0.300	-5.4	9.6	-15.0	-0.08879
3 3/4	0.250	3.0	9.8	-6.8	-0.04031
4	0.200	10.0	10.0	-0.0	-0.00011
4 1/4	0.150	11.8	10.2	1.6	0.00932
4 1/2	0.100	7.3	10.4	-3.1	-0.01852
4 3/4	0.050	2.7	10.6	-7.9	-0.04696
5	0.000	-3.5	10.8	-14.3	-0.08487
5 1/4	-0.050	-10.0	11.0	-21.0	-0.12455
5 1/2	-0.100	-14.0	11.3	-25.3	-0.14944
5 3/4	-0.150	-11.1	11.5	-22.6	-0.13350
6	-0.200	-7.9	11.7	-19.6	-0.11578
6 1/4	-0.250	-7.1	11.9	-19.0	-0.11227
6 1/2	-0.300	-3.6	12.1	-15.7	-0.09278
6 3/4	-0.350	-1.0	12.3	-13.3	-0.07862
7	-0.400	1.9	12.5	-10.6	-0.06268
7 1/4	-0.450	5.2	12.7	-7.5	-0.04437
7 1/2	-0.500	5.5	12.9	-7.4	-0.04381
7 3/4	-0.550	6.5	13.1	-6.6	-0.03912
8	-0.600	6.7	13.3	-6.6	-0.03915
8 1/4	-0.650	11.0	13.5	-2.5	-0.01493
8 1/2	-0.700	15.7	13.7	2.0	0.01166
8 3/4	-0.750	26.7	13.9	12.8	0.07553
9	-0.800	37.1	14.1	23.0	0.13585
9 1/4	-0.850	47.4	14.3	33.1	0.19558
9 1/2	-0.900	60.0	14.6	45.4	0.26891
9 3/4	-0.950	66.9	14.8	52.1	0.30852
FP	-1.000	35.5	15.0	20.5	0.12150

Table 5. 2. 3 Wave profiles along the hull at Fn=0.25

WAVE PROFILE
CONDITION : FULL
TRIM : 0 %
FN : 0.249
V (M/S) : 2.065

ORG. : SRI
LPP (M) : 7.0
W.T. : 21.5
DATE : 1985.9.28

	X/L	ZO(MM)	DZ(MM)	Z(MM)	XI
A 1/8	1.025	57.3	9.0	48.3	0.22211
AP	1.000	54.0	9.1	44.9	0.20633
1/4	0.950	44.1	9.4	34.7	0.15959
1/2	0.900	35.6	9.6	26.0	0.11929
3/4	0.850	30.9	9.9	21.0	0.09646
1	0.800	23.7	10.2	13.5	0.06213
1 1/4	0.750	18.8	10.5	8.3	0.03838
1 1/2	0.700	11.5	10.7	0.8	0.00359
1 3/4	0.650	5.0	11.0	-6.0	-0.02751
2	0.600	-4.5	11.3	-15.8	-0.07241
2 1/4	0.550	-9.6	11.5	-21.1	-0.09708
2 1/2	0.500	-19.5	11.8	-31.3	-0.14382
2 3/4	0.450	-20.4	12.1	-32.5	-0.14919
3	0.400	-18.4	12.3	-30.7	-0.14122
3 1/4	0.350	-12.8	12.6	-25.4	-0.11672
3 1/2	0.300	-5.6	12.9	-18.5	-0.08485
3 3/4	0.250	3.0	13.1	-10.1	-0.04656
4	0.200	10.0	13.4	-3.4	-0.01561
4 1/4	0.150	11.9	13.7	-1.8	-0.00811
4 1/2	0.100	11.2	13.9	-2.7	-0.01256
4 3/4	0.050	2.6	14.2	-11.6	-0.05332
5	0.000	-1.3	14.5	-15.8	-0.07248
5 1/4	-0.050	-6.5	14.7	-21.2	-0.09761
5 1/2	-0.100	-7.5	15.0	-22.5	-0.10344
5 3/4	-0.150	-7.7	15.3	-23.0	-0.10559
6	-0.200	-9.6	15.5	-25.1	-0.11555
6 1/4	-0.250	-11.8	15.8	-27.6	-0.12689
6 1/2	-0.300	-11.7	16.1	-27.8	-0.12766
6 3/4	-0.350	-10.9	16.3	-27.2	-0.12522
7	-0.400	-9.1	16.6	-25.7	-0.11818
7 1/4	-0.450	-7.6	16.9	-24.5	-0.11251
7 1/2	-0.500	-4.3	17.1	-21.4	-0.09858
7 3/4	-0.550	1.0	17.4	-16.4	-0.07545
8	-0.600	9.0	17.7	-8.7	-0.03991
8 1/4	-0.650	21.5	18.0	3.5	0.01632
8 1/2	-0.700	38.2	18.2	20.0	0.09185
8 3/4	-0.750	50.3	18.5	31.8	0.14623
9	-0.800	61.8	18.8	43.0	0.19786
9 1/4	-0.850	73.0	19.0	54.0	0.24811
9 1/2	-0.900	83.6	19.3	64.3	0.29560
9 3/4	-0.950	101.1	19.6	81.5	0.37480
FP	-1.000	43.4	19.8	23.6	0.10836

Table 5. 2. 4 Wave profiles along the hull at Fn=0.28

WAVE PROFILE
CONDITION : FULL
TRIM : 0 %
FN : 0.279
V (M/S) : 2.310

ORG. : SRI
LPP (M) : 7.0
W.T. : 21.5
DATE : 1985.9.28

	X/L	ZO(MM)	DZ(MM)	Z(MM)	XI
A 1/8	1.025	77.5	15.3	62.2	0.22849
AP	1.000	72.9	15.4	57.5	0.21124
1/4	0.950	60.0	15.6	44.4	0.16314
1/2	0.900	49.0	15.8	33.2	0.12202
3/4	0.850	34.9	16.0	18.9	0.06952
1	0.800	24.7	16.2	8.5	0.03134
1 1/4	0.750	11.2	16.4	-5.2	-0.01896
1 1/2	0.700	-0.9	16.6	-17.5	-0.06412
1 3/4	0.650	-14.7	16.8	-31.5	-0.11552
2	0.600	-19.7	16.9	-36.6	-0.13460
2 1/4	0.550	-25.6	17.1	-42.7	-0.15699
2 1/2	0.500	-28.2	17.3	-45.5	-0.16725
2 3/4	0.450	-23.0	17.5	-40.5	-0.14886
3	0.400	-7.6	17.7	-25.3	-0.09301
3 1/4	0.350	4.7	17.9	-13.2	-0.04854
3 1/2	0.300	12.9	18.1	-5.2	-0.01914
3 3/4	0.250	23.6	18.3	5.3	0.01945
4	0.200	25.7	18.5	7.2	0.02645
4 1/4	0.150	24.2	18.7	5.5	0.02023
4 1/2	0.100	20.4	18.9	1.5	0.00556
4 3/4	0.050	6.6	19.1	-12.5	-0.04585
5	0.000	-3.3	19.3	-22.6	-0.08292
5 1/4	-0.050	-17.0	19.5	-36.5	-0.13396
5 1/2	-0.100	-27.2	19.7	-46.9	-0.17214
5 3/4	-0.150	-30.3	19.9	-50.2	-0.18424
6	-0.200	-35.8	20.1	-55.9	-0.20515
6 1/4	-0.250	-35.1	20.2	-55.3	-0.20330
6 1/2	-0.300	-35.7	20.4	-56.1	-0.20621
6 3/4	-0.350	-31.5	20.6	-52.1	-0.19150
7	-0.400	-24.5	20.8	-45.3	-0.16650
7 1/4	-0.450	-15.4	21.0	-36.4	-0.13379
7 1/2	-0.500	-6.7	21.2	-27.9	-0.10255
7 3/4	-0.550	11.6	21.4	-9.8	-0.03604
8	-0.600	27.3	21.6	5.7	0.02091
8 1/4	-0.650	44.5	21.8	22.7	0.08337
8 1/2	-0.700	62.1	22.0	40.1	0.14731
8 3/4	-0.750	76.8	22.2	54.6	0.20059
9	-0.800	91.0	22.4	68.6	0.25203
9 1/4	-0.850	95.4	22.6	72.8	0.26748
9 1/2	-0.900	100.3	22.8	77.5	0.28477
9 3/2	-0.950	102.9	23.0	79.9	0.29360
FP	-1.000	60.0	23.2	36.8	0.13531

Table 5. 2. 5 Wave profiles along the hull at Fn=0.30

WAVE PROFILE
CONDITION : FULL
TRIM : 0 %
FN : 0.299
V (M/S) : 2.478

ORG. : SRI
LPP (M) : 7.0
W.T. : 21.5
DATE : 1985.9.28

	X/L	ZO(MM)	DZ(MM)	Z(MM)	XI
A 1/8	1.025	59.6	19.3	40.3	0.12872
AP	1.000	53.9	19.3	34.6	0.11029
1/4	0.950	44.7	19.5	25.2	0.08046
1/2	0.900	33.7	19.6	14.1	0.04488
3/4	0.850	25.9	19.8	6.1	0.01952
1	0.800	16.7	19.9	-3.2	-0.01031
1 1/4	0.750	3.0	20.1	-17.1	-0.05451
1 1/2	0.700	-6.2	20.2	-26.4	-0.08434
1 3/4	0.650	-15.0	20.4	-35.4	-0.11289
2	0.600	-18.6	20.5	-39.1	-0.12485
2 1/4	0.550	-15.4	20.7	-36.1	-0.11510
2 1/2	0.500	-9.1	20.8	-29.9	-0.09546
2 3/4	0.450	2.1	21.0	-18.9	-0.06018
3	0.400	10.0	21.1	-11.1	-0.03543
3 1/4	0.350	25.2	21.2	4.0	0.01263
3 1/2	0.300	28.8	21.4	7.4	0.02365
3 3/4	0.250	29.6	21.5	8.1	0.02574
4	0.200	25.4	21.7	3.7	0.01187
4 1/4	0.150	15.0	21.8	-6.8	-0.02179
4 1/2	0.100	1.0	22.0	-21.0	-0.06695
4 3/4	0.050	-7.0	22.1	-29.1	-0.09295
5	0.000	-24.3	22.3	-46.6	-0.14864
5 1/4	-0.050	-35.7	22.4	-58.1	-0.18549
5 1/2	-0.100	-46.5	22.6	-69.1	-0.22043
5 3/4	-0.150	-48.2	22.7	-70.9	-0.22632
6	-0.200	-49.0	22.8	-71.8	-0.22934
6 1/4	-0.250	-48.6	23.0	-71.6	-0.22853
6 1/2	-0.300	-44.5	23.1	-67.6	-0.21591
6 3/4	-0.350	-34.4	23.3	-57.7	-0.18413
7	-0.400	-25.8	23.4	-49.2	-0.15715
7 1/4	-0.450	-8.7	23.6	-32.3	-0.10303
7 1/2	-0.500	-5.2	23.7	-28.9	-0.09233
7 3/4	-0.550	11.9	23.9	-12.0	-0.03821
8	-0.600	38.8	24.0	14.8	0.04719
8 1/4	-0.650	54.0	24.2	29.8	0.09524
8 1/2	-0.700	83.1	24.3	58.8	0.18766
8 3/4	-0.750	96.7	24.5	72.2	0.23060
9	-0.800	108.0	24.6	83.4	0.26620
9 1/4	-0.850	108.7	24.7	84.0	0.26797
9 1/2	-0.900	110.9	24.9	86.0	0.27453
9 3/4	-0.950	106.1	25.0	81.1	0.25874
FP	-1.000	64.5	25.2	39.3	0.12549

Table 5. 2. 6 Wave profiles along the hull at Fn=0.32

WAVE PROFILE
CONDITION : FULL
TRIM : 0 %
FN : 0.319
V (M/S) : 2.645

ORG. : SRI
LPP (M) : 7.0
W.T. : 21.5
DATE : 1985.9.28

	X/L	ZO(MM)	DZ(MM)	Z(MM)	XI
A 1/8	1.025	76.5	20.8	55.7	0.15597
AP	1.000	70.4	20.9	49.5	0.13854
1/4	0.950	57.9	21.2	36.7	0.10285
1/2	0.900	41.8	21.4	20.4	0.05707
3/4	0.850	25.2	21.7	3.5	0.00990
1	0.800	16.5	21.9	-5.4	-0.01515
1 1/4	0.750	9.3	22.1	-12.8	-0.03599
1 1/2	0.700	5.8	22.4	-16.6	-0.04646
1 3/4	0.650	2.3	22.6	-20.3	-0.05694
2	0.600	0.5	22.9	-22.4	-0.06265
2 1/4	0.550	3.0	23.1	-20.1	-0.05632
2 1/2	0.500	10.0	23.3	-13.3	-0.03738
2 3/4	0.450	14.3	23.6	-9.3	-0.02600
3	0.400	23.5	23.8	-0.3	-0.00090
3 1/4	0.350	24.2	24.1	0.1	0.00039
3 1/2	0.300	24.8	24.3	0.5	0.00140
3 3/4	0.250	21.7	24.5	-2.8	-0.00795
4	0.200	11.8	24.8	-13.0	-0.03636
4 1/4	0.150	-1.0	25.0	-26.0	-0.07289
4 1/2	0.100	-18.1	25.3	-43.4	-0.12147
4 3/4	0.050	-33.3	25.5	-58.8	-0.16472
5	0.000	-48.7	25.7	-74.4	-0.20854
5 1/4	-0.050	-58.5	26.0	-84.5	-0.23667
5 1/2	-0.100	-63.7	26.2	-89.9	-0.25190
5 3/4	-0.150	-64.2	26.5	-90.7	-0.25398
6	-0.200	-65.1	26.7	-91.8	-0.25717
6 1/4	-0.250	-57.0	26.9	-83.9	-0.23515
6 1/2	-0.300	-48.6	27.2	-75.8	-0.21228
6 3/4	-0.350	-33.9	27.4	-61.3	-0.17177
7	-0.400	-18.0	27.7	-45.7	-0.12789
7 1/4	-0.450	-0.5	27.9	-28.4	-0.07954
7 1/2	-0.500	20.9	28.1	-7.2	-0.02025
7 3/4	-0.550	42.4	28.4	14.0	0.03931
8	-0.600	65.8	28.6	37.2	0.10420
8 1/4	-0.650	86.0	28.8	57.2	0.16012
8 1/2	-0.700	103.6	29.1	74.5	0.20876
8 3/4	-0.750	115.4	29.3	86.1	0.24114
9	-0.800	126.1	29.6	96.5	0.27045
9 1/4	-0.850	126.0	29.8	96.2	0.26950
9 1/2	-0.900	121.4	30.0	91.4	0.25594
9 3/4	-0.950	111.2	30.3	80.9	0.22669
FP	-1.000	61.7	30.5	31.2	0.08735

Table 5. 2. 7 Wave profiles along the hull at Fn=0.34

WAVE PROFILE

CONDITION	: FULL		ORG.	: SRI	
TRIM	: 0 %		LPP (M)	: 7.0	
FN	: 0.340		W.T.	: 21.5	
V (M/S)	: 2.815		DATE	: 1985.9.28	

	X/L	ZO(MM)	DZ(MM)	Z(MM)	XI
A 1/8	1.025	80.8	24.5	56.3	0.13925
AP	1.000	79.6	24.6	55.0	0.13596
1/4	0.950	65.3	24.9	40.4	0.09994
1/2	0.900	54.2	25.2	29.0	0.07184
3/4	0.850	39.1	25.4	13.7	0.03384
1	0.800	28.4	25.7	2.7	0.00672
1 1/4	0.750	23.4	25.9	-2.5	-0.00629
1 1/2	0.700	19.3	26.2	-6.9	-0.01708
1 3/4	0.650	14.0	26.5	-12.5	-0.03084
2	0.600	13.2	26.7	-13.5	-0.03347
2 1/4	0.550	11.9	27.0	-15.1	-0.03733
2 1/2	0.500	15.0	27.3	-12.3	-0.03031
2 3/4	0.450	17.0	27.5	-10.5	-0.02602
3	0.400	13.0	27.8	-14.8	-0.03656
3 1/4	0.350	10.8	28.0	-17.2	-0.04265
3 1/2	0.300	5.2	28.3	-23.1	-0.05715
3 3/4	0.250	0.9	28.6	-27.7	-0.06843
4	0.200	-7.3	28.8	-36.1	-0.08936
4 1/4	0.150	-19.6	29.1	-48.7	-0.12044
4 1/2	0.100	-37.4	29.4	-66.8	-0.16511
4 3/4	0.050	-49.6	29.6	-79.2	-0.19594
5	0.000	-67.0	29.9	-96.9	-0.23962
5 1/4	-0.050	-77.4	30.1	-107.5	-0.26600
5 1/2	-0.100	-78.8	30.4	-109.2	-0.27011
5 3/4	-0.150	-78.7	30.7	-109.4	-0.27051
6	-0.200	-68.1	30.9	-99.0	-0.24494
6 1/4	-0.250	-59.6	31.2	-90.8	-0.22457
6 1/2	-0.300	-47.1	31.5	-78.6	-0.19430
6 3/4	-0.350	-30.5	31.7	-62.2	-0.15389
7	-0.400	-7.0	32.0	-39.0	-0.09641
7 1/4	-0.450	19.3	32.2	-12.9	-0.03201
7 1/2	-0.500	36.1	32.5	3.6	0.00890
7 3/4	-0.550	62.9	32.8	30.1	0.07454
8	-0.600	84.4	33.0	51.4	0.12706
8 1/4	-0.650	105.9	33.3	72.6	0.17959
8 1/2	-0.700	124.6	33.6	91.0	0.22520
8 3/4	-0.750	137.9	33.8	104.1	0.25745
9	-0.800	144.3	34.1	110.2	0.27263
9 1/4	-0.850	143.1	34.3	108.8	0.26901
9 1/2	-0.900	133.8	34.6	99.2	0.24536
9 3/4	-0.950	118.9	34.9	84.0	0.20786
FP	-1.000	58.6	35.1	23.5	0.05806

Table 5. 3. 1 Amplitude functions for y/l=1.0 at Fn=0.22

TH	S*	C*	2*PI*A(TH)**2	U	F(U)	G(U)
0.0	1.0192E-03	-.4312E-03	7.6944E-06	0.000	2.6465E-01	-.1120E 00
2.0	8.6553E-04	-.5547E-03	6.6401E-06	0.035	2.2428E-01	-.1437E 00
4.0	7.3223E-04	-.6395E-03	5.9382E-06	0.070	1.8853E-01	-.1647E 00
6.0	6.1846E-04	-.6983E-03	5.4668E-06	0.106	1.5756E-01	-.1779E 00
8.0	5.1818E-04	-.7400E-03	5.1274E-06	0.142	1.3008E-01	-.1858E 00
10.0	4.2396E-04	-.7621E-03	4.7782E-06	0.179	1.0445E-01	-.1877E 00
12.0	3.2820E-04	-.7559E-03	4.2666E-06	0.217	7.9033E-02	-.1820E 00
14.0	2.2106E-04	-.7096E-03	3.4712E-06	0.257	5.1832E-02	-.1664E 00
16.0	8.8473E-05	-.6114E-03	2.3982E-06	0.298	2.0124E-02	-.1391E 00
18.0	-.8753E-04	-.4530E-03	1.3377E-06	0.342	-.1924E-01	-.9960E-01
20.0	-.3243E-03	-.2338E-03	1.0041E-06	0.387	-.6868E-01	-.4950E-01
22.0	-.6289E-03	3.9812E-05	2.4947E-06	0.436	-.1279E 00	8.0941E-03
24.0	-.9889E-03	3.6352E-04	6.9749E-06	0.487	-.1924E 00	7.0726E-02
26.0	-.1378E-02	7.5112E-04	1.5482E-05	0.543	-.2558E 00	1.3941E-01
28.0	-.1786E-02	1.2295E-03	2.9538E-05	0.602	-.3153E 00	2.1705E-01
30.0	-.2233E-02	1.7809E-03	5.1256E-05	0.667	-.3739E 00	2.9817E-01
32.0	-.2703E-02	2.2739E-03	7.8389E-05	0.737	-.4280E 00	3.6005E-01
34.0	-.3016E-02	2.5461E-03	9.7880E-05	0.814	-.4504E 00	3.8020E-01
36.0	-.2942E-02	2.6386E-03	9.8110E-05	0.898	-.4131E 00	3.7058E-01
38.0	-.2577E-02	2.6757E-03	8.6714E-05	0.991	-.3395E 00	3.5246E-01
40.0	-.2146E-02	2.3651E-03	6.4090E-05	1.095	-.2644E 00	2.9139E-01
42.0	-.1441E-02	1.4510E-03	2.6272E-05	1.212	-.1656E 00	1.6674E-01
44.0	-.6137E-03	2.1293E-04	2.6516E-06	1.342	-.6559E-01	2.2755E-02
46.0	-.3179E-04	-.1252E-02	9.8584E-06	1.491	-.3149E-02	-.1241E 00
48.0	1.7558E-06	-.2254E-02	3.1920E-05	1.660	1.6078E-04	-.2064E 00
50.0	-.5331E-03	-.2529E-02	4.1977E-05	1.854	-.4496E-01	-.2133E 00
52.0	-.1096E-02	-.9820E-03	1.3608E-05	2.079	-.8483E-01	-.7600E-01
54.0	-.7160E-03	1.1807E-03	1.1981E-05	2.342	-.5064E-01	8.3516E-02
56.0	5.7200E-04	2.4204E-03	3.8865E-05	2.651	3.6813E-02	1.5577E-01
58.0	1.2747E-03	8.3947E-04	1.4637E-05	3.020	7.4276E-02	4.8917E-02
60.0	-.5650E-03	-.1558E-02	1.7251E-05	3.464	-.2964E-01	-.8173E-01
62.0	-.1709E-02	-.2272E-03	1.8669E-05	4.006	-.8021E-01	-.1067E-01
64.0	1.6797E-03	-.2119E-03	1.8009E-05	4.677	7.0033E-02	-.8834E-02
66.0	-.1479E-02	-.1035E-02	2.0473E-05	5.522	-.5431E-01	-.3800E-01
68.0	1.6192E-03	1.1467E-03	2.4736E-05	6.606	5.1846E-02	3.6715E-02
70.0	-.1211E-02	6.4636E-04	1.1846E-05	8.032	-.3342E-01	1.7831E-02
72.0	-.2340E-03	-.2878E-03	8.6457E-07	9.958	-.5481E-02	-.6742E-02
74.0	-.2818E-03	2.2997E-04	8.3139E-07	12.650	-.5506E-02	4.4923E-03
76.0	2.0502E-04	3.0234E-06	2.6416E-07	16.576	3.2635E-03	4.8126E-05
78.0	-.1692E-03	-.9661E-04	2.3845E-07	22.623	-.2129E-02	-.1216E-02
80.0	-.3890E-04	-.2735E-03	4.7952E-07	32.650	-.3711E-03	-.2610E-02
82.0	9.7408E-06	4.8676E-05	1.5483E-08	51.107	6.6326E-05	3.3144E-04
84.0	-.3950E-04	2.3192E-05	1.3184E-08	90.975	-.1744E-03	1.0236E-04
86.0	-.2316E-04	5.2967E-05	2.0989E-08	204.845	-.5556E-04	1.2709E-04
88.0	-.3141E-05	-.4646E-05	1.9794E-10	819.195	-.2664E-05	-.3940E-05

Table 5. 3. 2 Amplitude functions for y/l=1.0 at Fn=0.25

TH	S*	C*	2*PI*A(TH)**2	U	F(U)	G(U)
0.0	-.2062E-02	-.1220E-02	3.6053E-05	0.000	-.4144E 00	-.2451E 00
2.0	-.2081E-02	-.9170E-03	3.2498E-05	0.035	-.4174E 00	-.1839E 00
4.0	-.2083E-02	-.6655E-03	3.0043E-05	0.070	-.4151E 00	-.1326E 00
6.0	-.2069E-02	-.4625E-03	2.8240E-05	0.106	-.4080E 00	-.9120E-01
8.0	-.2046E-02	-.3026E-03	2.6865E-05	0.142	-.3974E 00	-.5879E-01
10.0	-.2007E-02	-.1869E-03	2.5534E-05	0.179	-.3827E 00	-.3563E-01
12.0	-.1942E-02	-.1227E-03	2.3800E-05	0.217	-.3620E 00	-.2288E-01
14.0	-.1836E-02	-.1187E-03	2.1260E-05	0.257	-.3331E 00	-.2154E-01
16.0	-.1669E-02	-.1804E-03	1.7705E-05	0.298	-.2938E 00	-.3175E-01
18.0	-.1424E-02	-.3063E-03	1.3324E-05	0.342	-.2423E 00	-.5213E-01
20.0	-.1086E-02	-.4853E-03	8.8908E-06	0.387	-.1780E 00	-.7955E-01
22.0	-.6542E-03	-.6966E-03	5.7377E-06	0.436	-.1029E 00	-.1096E 00
24.0	-.1445E-03	-.9148E-03	5.3892E-06	0.487	-.2176E-01	-.1378E 00
26.0	4.0717E-04	-.1117E-02	8.8857E-06	0.543	5.8493E-02	-.1605E 00
28.0	9.5031E-04	-.1288E-02	1.6094E-05	0.602	1.2985E-01	-.1760E 00
30.0	1.4246E-03	-.1412E-02	2.5277E-05	0.667	1.8462E-01	-.1830E 00
32.0	1.7604E-03	-.1475E-02	3.3143E-05	0.737	2.1574E-01	-.1808E 00
34.0	1.8897E-03	-.1468E-02	3.5978E-05	0.814	2.1840E-01	-.1697E 00
36.0	1.7788E-03	-.1375E-02	3.1754E-05	0.898	1.9336E-01	-.1494E 00
38.0	1.4220E-03	-.1130E-02	2.0732E-05	0.991	1.4498E-01	-.1152E 00
40.0	7.8221E-04	-.6703E-03	6.6675E-06	1.095	7.4591E-02	-.6392E-01
42.0	-.1019E-03	-.2445E-04	6.9027E-08	1.212	-.9065E-02	-.2175E-02
44.0	-.1056E-02	9.0642E-04	1.2169E-05	1.342	-.8735E-01	7.4973E-02
46.0	-.2140E-02	2.1427E-03	5.7629E-05	1.491	-.1641E 00	1.6432E-01
48.0	-.2840E-02	3.1046E-03	1.1123E-04	1.660	-.2013E 00	2.2004E-01
50.0	-.2533E-02	4.0808E-03	1.4495E-04	1.854	-.1654E 00	2.6638E-01
52.0	-.2072E-02	4.0558E-03	1.3032E-04	2.079	-.1241E 00	2.4294E-01
54.0	-.5575E-03	2.5508E-03	4.2835E-05	2.342	-.3052E-01	1.3965E-01
56.0	1.0455E-04	-.7691E-05	6.9046E-08	2.651	5.2078E-03	-.3831E-03
58.0	-.2996E-03	-.2160E-02	2.9873E-05	3.020	-.1351E-01	-.9741E-01
60.0	-.1535E-02	-.1938E-02	3.8395E-05	3.464	-.6232E-01	-.7870E-01
62.0	-.6206E-03	6.5211E-04	5.0920E-06	4.006	-.2255E-01	2.3693E-02
64.0	2.4734E-03	1.2112E-03	4.7657E-05	4.677	7.9819E-02	3.9087E-02
66.0	1.8122E-04	-.1086E-02	7.6131E-06	5.522	5.1505E-03	-.3086E-01
68.0	-.1296E-02	2.0952E-03	3.8133E-05	6.606	-.3211E-01	5.1924E-02
70.0	-.8403E-03	-.2063E-02	3.1185E-05	8.032	-.1794E-01	-.4406E-01
72.0	1.8986E-03	-.1308E-04	2.2649E-05	9.958	3.4422E-02	-.2371E-03
74.0	3.9221E-04	-.1440E-03	1.0968E-06	12.650	5.9299E-03	-.2177E-02
76.0	8.8191E-04	-.2996E-05	4.8870E-06	16.576	1.0865E-02	-.3691E-04
78.0	-.1582E-03	8.2323E-05	1.9987E-07	22.623	-.1541E-02	8.0177E-04
80.0	1.6976E-04	-.8495E-04	2.2642E-07	32.650	1.2536E-03	-.6274E-03
82.0	-.1071E-05	2.0813E-04	2.7219E-07	51.107	-.5642E-05	1.0969E-03
84.0	-.5490E-04	1.7561E-04	2.1270E-07	90.975	-.1875E-03	5.9992E-04
86.0	9.0462E-05	1.2279E-05	5.2368E-08	204.845	1.6800E-04	2.2803E-05
88.0	1.4774E-05	-.4698E-04	1.5252E-08	819.195	9.6973E-06	-.3084E-04

Table 5. 3. 3 Amplitude functions for y/l=1.0 at Fn=0.28

TH	S*	C*	2*PI*A(TH)**2	U	F(U)	G(U)
0.0	-.5837E-02	-.2469E-03	2.1444E-04	0.000	-.9356E 00	-.3958E-01
2.0	-.5630E-02	1.7318E-04	1.9937E-04	0.035	-.9006E 00	2.7702E-02
4.0	-.5492E-02	5.3065E-04	1.9129E-04	0.070	-.8729E 00	8.4342E-02
6.0	-.5416E-02	8.3381E-04	1.8870E-04	0.106	-.8518E 00	1.3113E-01
8.0	-.5413E-02	1.1114E-03	1.9184E-04	0.142	-.8388E 00	1.7223E-01
10.0	-.5479E-02	1.3801E-03	2.0056E-04	0.179	-.8332E 00	2.0988E-01
12.0	-.5606E-02	1.6426E-03	2.1443E-04	0.217	-.8333E 00	2.4416E-01
14.0	-.5786E-02	1.8929E-03	2.3285E-04	0.257	-.8374E 00	2.7398E-01
16.0	-.6006E-02	2.1202E-03	2.5486E-04	0.298	-.8432E 00	2.9769E-01
18.0	-.6249E-02	2.3100E-03	2.7885E-04	0.342	-.8480E 00	3.1351E-01
20.0	-.6490E-02	2.4464E-03	3.0228E-04	0.387	-.8485E 00	3.1981E-01
22.0	-.6695E-02	2.5155E-03	3.2141E-04	0.436	-.8403E 00	3.1570E-01
24.0	-.6815E-02	2.5117E-03	3.3146E-04	0.487	-.8185E 00	3.0166E-01
26.0	-.6792E-02	2.4461E-03	3.2743E-04	0.543	-.7782E 00	2.8026E-01
28.0	-.6570E-02	2.3526E-03	3.0603E-04	0.602	-.7160E 00	2.5638E-01
30.0	-.6121E-02	2.2822E-03	2.6815E-04	0.667	-.6326E 00	2.3587E-01
32.0	-.5461E-02	2.2733E-03	2.1986E-04	0.737	-.5338E 00	2.2220E-01
34.0	-.4651E-02	2.3026E-03	1.6926E-04	0.814	-.4288E 00	2.1225E-01
36.0	-.3747E-02	2.2570E-03	1.2024E-04	0.898	-.3249E 00	1.9567E-01
38.0	-.2740E-02	1.9940E-03	7.2155E-05	0.991	-.2228E 00	1.6214E-01
40.0	-.1594E-02	1.4810E-03	2.9750E-05	1.095	-.1213E 00	1.1263E-01
42.0	-.4077E-03	8.3889E-04	5.4659E-06	1.212	-.2892E-01	5.9507E-02
44.0	5.6188E-04	1.6761E-04	2.1602E-06	1.342	3.7066E-02	1.1057E-02
46.0	1.1584E-03	-.5444E-03	1.0293E-05	1.491	7.0848E-02	-.3330E-01
48.0	1.3388E-03	-.1200E-02	2.0315E-05	1.660	7.5677E-02	-.6785E-01
50.0	8.4236E-04	-.1633E-02	2.1219E-05	1.854	4.3855E-02	-.8503E-01
52.0	-.3361E-03	-.1561E-02	1.6023E-05	2.079	-.1605E-01	-.7458E-01
54.0	-.1668E-02	-.3798E-03	1.8379E-05	2.342	-.7281E-01	-.1659E-01
56.0	-.2487E-02	1.4613E-03	5.2290E-05	2.651	-.9882E-01	5.8054E-02
58.0	-.1915E-02	3.6015E-03	1.0455E-04	3.020	-.6889E-01	1.2955E-01
60.0	3.3034E-05	4.3796E-03	1.2052E-04	3.464	1.0699E-03	1.4184E-01
62.0	1.2250E-03	2.0422E-03	3.5634E-05	4.006	3.5498E-02	5.9177E-02
64.0	-.1165E-03	-.1854E-02	2.1676E-05	4.677	-.2998E-02	-.4771E-01
66.0	-.2621E-02	-.8771E-03	4.7985E-05	5.522	-.5940E-01	-.1988E-01
68.0	1.7118E-03	5.9250E-04	2.0616E-05	6.606	3.3833E-02	1.1711E-02
70.0	-.7413E-03	-.2427E-02	4.0475E-05	8.032	-.1262E-01	-.4134E-01
72.0	1.2786E-03	1.2698E-03	2.0403E-05	9.958	1.8489E-02	1.8361E-02
74.0	8.4201E-05	1.8778E-03	2.2199E-05	12.650	1.0153E-03	2.2643E-02
76.0	-.5103E-03	9.1828E-04	6.9344E-06	16.576	-.5014E-02	9.0231E-03
78.0	4.5235E-04	-.1503E-04	1.2871E-06	22.623	3.5137E-03	-.1168E-03
80.0	-.6216E-04	9.1271E-05	7.6620E-08	32.650	-.3661E-03	5.3757E-04
82.0	3.0709E-05	1.9861E-06	5.9498E-09	51.107	1.2908E-04	8.3480E-06
84.0	3.6850E-05	-.3232E-04	1.5095E-08	90.975	1.0040E-04	-.8806E-04
86.0	1.3916E-05	-.2020E-04	3.7791E-09	204.845	2.0611E-05	-.2991E-04
88.0	3.0263E-05	7.8550E-06	6.1421E-09	819.195	1.5843E-05	4.1122E-06

Table 5. 3. 4 Amplitude functions for y/l=1.0 at Fn=0.30

TH	S*	C*	2*PI*A(TH)**2	U	F(U)	G(U)
0.0	-.4691E-02	9.9978E-04	1.4454E-04	0.000	-.6548E 00	1.3957E-01
2.0	-.4477E-02	1.1235E-03	1.3388E-04	0.035	-.6237E 00	1.5651E-01
4.0	-.4361E-02	1.2240E-03	1.2889E-04	0.070	-.6036E 00	1.6942E-01
6.0	-.4330E-02	1.3056E-03	1.2853E-04	0.106	-.5931E 00	1.7882E-01
8.0	-.4387E-02	1.3913E-03	1.3307E-04	0.142	-.5920E 00	1.8776E-01
10.0	-.4525E-02	1.4971E-03	1.4276E-04	0.179	-.5993E 00	1.9828E-01
12.0	-.4740E-02	1.6303E-03	1.5787E-04	0.217	-.6136E 00	2.1104E-01
14.0	-.5024E-02	1.7921E-03	1.7880E-04	0.257	-.6333E 00	2.2590E-01
16.0	-.5373E-02	1.9812E-03	2.0603E-04	0.298	-.6569E 00	2.4225E-01
18.0	-.5778E-02	2.1939E-03	2.4003E-04	0.342	-.6829E 00	2.5929E-01
20.0	-.6234E-02	2.4243E-03	2.8110E-04	0.387	-.7097E 00	2.7599E-01
22.0	-.6730E-02	2.6638E-03	3.2913E-04	0.436	-.7355E 00	2.9114E-01
24.0	-.7252E-02	2.8999E-03	3.8326E-04	0.487	-.7585E 00	3.0330E-01
26.0	-.7779E-02	3.1157E-03	4.4124E-04	0.543	-.7762E 00	3.1088E-01
28.0	-.8279E-02	3.2925E-03	4.9875E-04	0.602	-.7857E 00	3.1248E-01
30.0	-.8698E-02	3.4165E-03	5.4870E-04	0.667	-.7829E 00	3.0750E-01
32.0	-.8967E-02	3.4914E-03	5.8181E-04	0.737	-.7633E 00	2.9719E-01
34.0	-.9011E-02	3.5516E-03	5.8943E-04	0.814	-.7234E 00	2.8511E-01
36.0	-.8782E-02	3.6561E-03	5.6855E-04	0.898	-.6630E 00	2.7603E-01
38.0	-.8292E-02	3.8391E-03	5.2457E-04	0.991	-.5871E 00	2.7186E-01
40.0	-.7595E-02	4.0224E-03	4.6406E-04	1.095	-.5030E 00	2.6642E-01
42.0	-.6686E-02	3.9761E-03	3.8019E-04	1.212	-.4130E 00	2.4562E-01
44.0	-.5409E-02	3.4675E-03	2.5941E-04	1.342	-.3108E 00	1.9921E-01
46.0	-.3631E-02	2.5448E-03	1.2351E-04	1.491	-.1934E 00	1.3555E-01
48.0	-.1659E-02	1.4938E-03	3.1305E-05	1.660	-.8165E-01	7.3534E-02
50.0	-.1612E-03	2.7021E-04	6.2212E-07	1.854	-.7311E-02	1.2251E-02
52.0	7.3488E-04	-.1439E-02	1.6408E-05	2.079	3.0574E-02	-.5988E-01
54.0	1.2059E-03	-.2971E-02	6.4595E-05	2.342	4.5851E-02	-.1130E 00
56.0	5.1417E-04	-.3190E-02	6.5613E-05	2.651	1.7789E-02	-.1104E 00
58.0	-.9337E-03	-.1952E-02	2.9420E-05	3.020	-.2925E-01	-.6115E-01
60.0	-.1582E-02	1.2285E-03	2.5207E-05	3.464	-.4462E-01	3.4650E-02
62.0	-.4862E-03	4.0448E-03	1.0428E-04	4.006	-.1227E-01	1.0207E-01
64.0	1.5786E-03	3.3802E-03	8.7447E-05	4.677	3.5383E-02	7.5763E-02
66.0	2.3532E-04	-.7998E-03	4.3674E-06	5.522	4.6452E-03	-.1579E-01
68.0	-.3053E-02	-.8500E-03	6.3104E-05	6.606	-.5255E-01	-.1463E-01
70.0	1.5039E-03	-.5570E-03	1.6160E-05	8.032	2.2303E-02	-.8261E-02
72.0	-.1600E-02	-.1478E-02	2.9802E-05	9.958	-.2014E-01	-.1861E-01
74.0	8.4506E-04	3.6345E-04	5.3170E-06	12.650	8.8740E-03	3.8166E-03
76.0	-.1915E-03	3.2894E-04	9.1034E-07	16.576	-.1639E-02	2.8148E-03
78.0	6.2419E-04	-.3206E-03	3.0938E-06	22.623	4.2224E-03	-.2169E-02
80.0	1.8345E-04	6.6992E-05	2.3964E-07	32.650	9.4094E-04	3.4362E-04
82.0	-.8910E-04	8.6831E-06	5.0353E-08	51.107	-.3261E-03	3.1784E-05
84.0	-.1280E-03	-.5121E-04	1.1939E-07	90.975	-.3037E-03	-.1215E-03
86.0	-.2855E-04	5.6902E-05	2.5469E-08	204.845	-.3682E-04	7.3396E-05
88.0	3.3331E-06	1.9378E-05	2.4291E-09	819.195	1.5196E-06	8.8343E-06

Table 5. 3. 5 Amplitude functions for y/l=1.0 at Fn=0.32

TH	S*	C*	2*PI*A(TH)**2	U	F(U)	G(U)
0.0	-.3416E-03	1.5935E-03	1.6687E-05	0.000	-.4194E-01	1.9561E-01
2.0	-.2857E-03	1.3974E-03	1.2783E-05	0.035	-.3500E-01	1.7118E-01
4.0	-.2956E-03	1.2221E-03	9.9323E-06	0.070	-.3597E-01	1.4874E-01
6.0	-.3709E-03	1.0694E-03	8.0500E-06	0.106	-.4467E-01	1.2879E-01
8.0	-.5088E-03	9.4797E-04	7.2730E-06	0.142	-.6038E-01	1.1250E-01
10.0	-.7078E-03	8.6452E-04	7.8439E-06	0.179	-.8243E-01	1.0068E-01
12.0	-.9697E-03	8.2430E-04	1.0177E-05	0.217	-.1104E 00	9.3833E-02
14.0	-.1298E-02	8.3198E-04	1.4943E-05	0.257	-.1439E 00	9.2217E-02
16.0	-.1700E-02	8.9181E-04	2.3156E-05	0.298	-.1828E 00	9.5891E-02
18.0	-.2181E-02	1.0072E-03	3.6263E-05	0.342	-.2267E 00	1.0468E-01
20.0	-.2749E-02	1.1796E-03	5.6224E-05	0.387	-.2752E 00	1.1810E-01
22.0	-.3411E-02	1.4077E-03	8.5541E-05	0.436	-.3278E 00	1.3529E-01
24.0	-.4171E-02	1.6848E-03	1.2716E-04	0.487	-.3836E 00	1.5496E-01
26.0	-.5031E-02	1.9978E-03	1.8412E-04	0.543	-.4414E 00	1.7528E-01
28.0	-.5980E-02	2.3255E-03	2.5870E-04	0.602	-.4991E 00	1.9407E-01
30.0	-.6992E-02	2.6411E-03	3.5103E-04	0.667	-.5534E 00	2.0904E-01
32.0	-.8015E-02	2.9194E-03	4.5717E-04	0.737	-.5999E 00	2.1852E-01
34.0	-.8969E-02	3.1513E-03	5.6782E-04	0.814	-.6331E 00	2.2245E-01
36.0	-.9758E-02	3.3610E-03	6.6923E-04	0.898	-.6478E 00	2.2314E-01
38.0	-.1030E-01	3.6096E-03	7.4815E-04	0.991	-.6412E 00	2.2477E-01
40.0	-.1055E-01	3.9568E-03	7.9806E-04	1.095	-.6146E 00	2.3045E-01
42.0	-.1053E-01	4.3754E-03	8.1684E-04	1.212	-.5720E 00	2.3768E-01
44.0	-.1018E-01	4.6847E-03	7.8907E-04	1.342	-.5143E 00	2.3666E-01
46.0	-.9292E-02	4.6441E-03	6.7797E-04	1.491	-.4352E 00	2.1752E-01
48.0	-.7598E-02	4.2116E-03	4.7414E-04	1.660	-.3289E 00	1.8231E-01
50.0	-.5228E-02	3.5648E-03	2.5156E-04	1.854	-.2084E 00	1.4213E-01
52.0	-.2800E-02	2.5532E-03	9.0212E-05	2.079	-.1024E 00	9.3408E-02
54.0	-.6088E-03	5.8593E-04	4.4861E-06	2.342	-.2036E-01	1.9591E-02
56.0	1.2782E-03	-.2034E-02	3.6251E-05	2.651	3.8888E-02	-.6187E-01
58.0	1.6080E-03	-.3932E-02	1.1338E-04	3.020	4.4293E-02	-.1083E 00
60.0	2.0363E-04	-.4239E-02	1.1314E-04	3.464	5.0505E-03	-.1051E 00
62.0	-.1203E-02	-.1477E-02	2.2788E-05	4.006	-.2669E-01	-.3276E-01
64.0	-.2817E-03	3.3311E-03	7.0218E-05	4.677	-.5552E-02	6.5655E-02
66.0	3.2184E-03	3.2173E-03	1.3012E-04	5.522	5.5867E-02	5.5848E-02
68.0	1.0066E-03	-.1083E-03	6.4401E-06	6.606	1.5236E-02	-.1640E-02
70.0	-.2679E-02	5.1039E-04	4.6747E-05	8.032	-.3494E-01	6.6559E-03
72.0	3.0250E-04	-.1308E-02	1.1329E-05	9.958	3.3497E-03	-.1449E-01
74.0	-.1025E-02	1.0961E-03	1.4147E-05	12.650	-.9463E-02	1.0121E-02
76.0	-.6212E-03	-.6751E-03	5.2884E-06	16.576	-.4675E-02	-.5080E-02
78.0	-.1040E-03	1.6813E-04	2.4551E-07	22.623	-.6183E-03	1.0001E-03
80.0	-.1579E-03	-.2916E-03	6.9073E-07	32.650	-.7122E-03	-.1315E-02
82.0	-.3914E-04	4.3117E-05	2.1305E-08	51.107	-.1260E-03	1.3879E-04
84.0	-.1525E-04	-.1271E-03	1.0298E-07	90.975	-.3182E-04	-.2652E-03
86.0	-.3890E-05	6.0403E-05	2.3020E-08	204.845	-.4412E-05	6.8512E-05
88.0	-.1460E-04	3.3914E-06	1.4119E-09	819.195	-.5854E-05	1.3596E-06

Table 5. 3. 6 Amplitude functions for y/l=1.0 at Fn=0.34

TH	S*	C*	2*PI*A(TH)**2	U	F(U)	G(U)
0.0	4.3627E-03	1.6060E-03	1.3580E-04	0.000	4.7427E-01	1.7459E-01
2.0	4.2838E-03	1.2467E-03	1.2507E-04	0.035	4.6470E-01	1.3523E-01
4.0	4.1897E-03	9.2134E-04	1.1563E-04	0.070	4.5160E-01	9.9310E-02
6.0	4.0648E-03	6.3613E-04	1.0636E-04	0.106	4.3352E-01	6.7845E-02
8.0	3.9116E-03	3.8978E-04	9.7093E-05	0.142	4.1108E-01	4.0962E-02
10.0	3.7292E-03	1.8029E-04	8.7582E-05	0.179	3.8460E-01	1.8594E-02
12.0	3.5107E-03	8.8774E-06	7.7440E-05	0.217	3.5391E-01	8.9492E-04
14.0	3.2454E-03	-.1204E-03	6.6269E-05	0.257	3.1856E-01	-.1181E-01
16.0	2.9197E-03	-.2019E-03	5.3816E-05	0.298	2.7801E-01	-.1922E-01
18.0	2.5179E-03	-.2303E-03	4.0169E-05	0.342	2.3175E-01	-.2119E-01
20.0	2.0234E-03	-.2017E-03	2.5980E-05	0.387	1.7939E-01	-.1788E-01
22.0	1.4188E-03	-.1147E-03	1.2731E-05	0.436	1.2076E-01	-.9761E-02
24.0	6.8812E-04	2.8617E-05	2.9803E-06	0.487	5.6046E-02	2.3308E-03
26.0	-.1812E-03	2.2223E-04	5.1667E-07	0.543	-.1408E-01	1.7267E-02
28.0	-.1196E-02	4.5641E-04	1.0292E-05	0.602	-.8837E-01	3.3731E-02
30.0	-.2352E-02	7.1871E-04	3.8010E-05	0.667	-.1649E 00	5.0375E-02
32.0	-.3635E-02	9.9606E-04	8.9252E-05	0.737	-.2409E 00	6.6025E-02
34.0	-.5011E-02	1.2782E-03	1.6807E-04	0.814	-.3133E 00	7.9906E-02
36.0	-.6430E-02	1.5629E-03	2.7511E-04	0.898	-.3780E 00	9.1887E-02
38.0	-.7816E-02	1.8631E-03	4.0565E-04	0.991	-.4310E 00	1.0274E-01
40.0	-.9077E-02	2.2158E-03	5.4855E-04	1.095	-.4682E 00	1.1429E-01
42.0	-.1012E-01	2.6825E-03	6.8812E-04	1.212	-.4866E 00	1.2905E-01
44.0	-.1085E-01	3.3223E-03	8.0897E-04	1.342	-.4854E 00	1.4863E-01
46.0	-.1122E-01	4.1172E-03	8.9775E-04	1.491	-.4655E 00	1.7078E-01
48.0	-.1114E-01	4.8837E-03	9.2934E-04	1.660	-.4270E 00	1.8721E-01
50.0	-.1036E-01	5.3044E-03	8.5075E-04	1.854	-.3657E 00	1.8728E-01
52.0	-.8533E-02	5.1846E-03	6.2637E-04	2.079	-.2765E 00	1.6798E-01
54.0	-.5653E-02	4.6029E-03	3.3391E-04	2.342	-.1674E 00	1.3630E-01
56.0	-.2432E-02	3.3418E-03	1.0732E-04	2.651	-.6551E-01	9.0036E-02
58.0	1.9028E-04	5.0977E-04	1.8603E-06	3.020	4.6417E-03	1.2435E-02
60.0	1.5132E-03	-.3355E-02	8.5099E-05	3.464	3.3236E-02	-.7368E-01
62.0	5.4378E-04	-.5325E-02	1.8000E-04	4.006	1.0686E-02	-.1046E 00
64.0	-.2097E-02	-.3698E-02	1.1354E-04	4.677	-.3660E-01	-.6454E-01
66.0	-.3275E-03	1.7695E-03	2.0348E-05	5.522	-.5034E-02	2.7202E-02
68.0	4.8316E-03	2.1039E-03	1.7449E-04	6.606	6.4762E-02	2.8201E-02
70.0	1.4516E-03	-.3617E-03	1.4062E-05	8.032	1.6764E-02	-.4178E-02
72.0	-.7843E-03	1.6019E-03	1.9988E-05	9.958	-.7691E-02	1.5709E-02
74.0	-.6170E-03	1.2665E-03	1.2471E-05	12.650	-.5045E-02	1.0357E-02
76.0	-.5260E-03	9.6414E-04	7.5793E-06	16.576	-.3505E-02	6.4248E-03
78.0	-.4429E-03	3.9415E-04	2.2085E-06	22.623	-.2333E-02	2.0763E-03
80.0	4.8443E-04	-.2687E-03	1.9283E-06	32.650	1.9350E-03	-.1073E-02
82.0	2.8297E-06	5.0907E-04	1.6284E-06	51.107	8.0662E-06	1.4511E-03
84.0	-.8596E-04	3.7707E-04	9.3981E-07	90.975	-.1588E-03	6.9672E-04
86.0	2.3318E-04	-.2141E-03	6.2974E-07	204.845	2.3422E-04	-.2151E-03
88.0	8.7720E-05	-.1040E-03	1.1629E-07	819.195	3.1143E-05	-.3693E-04

Table 5. 3. 7 Wave pattern resistance coefficients

$C_{wp}(S\ base) * 10^3$

y/l	0.4	0.7	1.0	1.0	1.4286	1.4286
current meter / Fn	without	without	without	with	without	with
0.22	0.17814	0.18101	0.18246		0.17935	
0.25	0.23152	0.22819	0.23625	0.22886	0.22725	0.23630
0.28	1.04893	1.03219	1.04391		1.02450	
0.30	1.65420	1.62851	1.64609	1.58755	1.68505	1.57617
0.32	1.66931	1.64478	1.65834		1.74620	
0.34	1.73559	1.70631	1.69333	1.74376	1.70895	1.67670

Table 5. 5. 1 Total head loss distribution at Fn=0.25

TOTAL HEAD LOSS DITRIBUTION AT FN=0.25

(NONDIM. BY UNIFORM FLOW HEAD)

Y/(B/2) Z/D	0.0	0.0429	0.0858	0.1287	0.1716	0.2145	0.2574	0.3003	0.3432	0.3861	0.4290	0.4719	0.5148	0.5577
0.0	0.3940	0.3790	0.3370	0.3190	0.3040	0.2990	0.2800	0.2590	0.2590	0.2690	0.2680	0.2750	0.2830	0.2770
0.0670	0.3490	0.3430	0.3150	0.2850	0.2390	0.2170	0.1850	0.1750	0.1760	0.1830	0.2040	0.2110	0.2120	0.1880
0.1340	0.3240	0.3240	0.3000	0.2550	0.1940	0.1770	0.1470	0.1370	0.1300	0.1260	0.1380	0.1440	0.1340	0.1040
0.2010	0.2860	0.2860	0.2590	0.2100	0.1480	0.1420	0.1210	0.1120	0.0920	0.0790	0.0720	0.0650	0.0490	0.0340
0.2680	0.2590	0.2490	0.2110	0.1670	0.1190	0.1150	0.1040	0.0980	0.0720	0.0540	0.0410	0.0310	0.0070	0.0
0.3350	0.2170	0.2020	0.1460	0.1120	0.0790	0.0760	0.0690	0.0660	0.0450	0.0300	0.0180	0.0090	0.0	0.0
0.4020	0.1810	0.1670	0.1000	0.0700	0.0480	0.0400	0.0360	0.0290	0.0220	0.0140	0.0050	0.0	0.0	0.0
0.4690	0.1550	0.1370	0.0780	0.0420	0.0250	0.0140	0.0100	0.0050	0.0	0.0	0.0	0.0	0.0	0.0
0.5360	0.1450	0.1240	0.0730	0.0350	0.0150	0.0090	0.0100	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.6700	0.1320	0.1030	0.0750	0.0530	0.0280	0.0150	0.0090	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.8040	0.1520	0.1470	0.1350	0.1170	0.0910	0.0670	0.0470	0.0270	0.0140	0.0070	0.0020	0.0	0.0	0.0
0.9380	0.2010	0.2010	0.1910	0.1680	0.1510	0.1170	0.0860	0.0440	0.0280	0.0130	0.0060	0.0020	0.0	0.0
1.0720	0.2390	0.2260	0.2110	0.1860	0.1580	0.1290	0.0940	0.0520	0.0250	0.0100	0.0	0.0	0.0	0.0
1.2050	0.2020	0.1860	0.1780	0.1540	0.1200	0.0920	0.0550	0.0340	0.0080	0.0	0.0	0.0	0.0	0.0
1.3390	0.0870	0.0800	0.0720	0.0620	0.0500	0.0350	0.0140	0.0080	0.0	0.0	0.0	0.0	0.0	0.0

Y/(B/2) Z/D	0.6006	0.6435	0.6864	0.7293	0.7722	0.8151	0.8580	0.9009	0.9438	0.9867	1.0296	1.0725
0.0	0.2670	0.2370	0.2220	0.2020	0.1820	0.1540	0.1270	0.0960	0.0620	0.0320	0.0140	0.0
0.0670	0.1520	0.1170	0.0790	0.0540	0.0270	0.0140	0.0	0.0	0.0	0.0	0.0	0.0
0.1340	0.0640	0.0500	0.0360	0.0210	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.2010	0.0220	0.0210	0.0170	0.0060	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 5. 5. 2 Total head loss distribution at Fn=0.30

TOTAL HEAD LOSS DITRIBUTION AT FN=0.30

(NONDIM. BY UNIFORM FLOW HEAD)

Y/(B/2) / Z/D	0.0	0.0429	0.0858	0.1287	0.1716	0.2145	0.2574	0.3003	0.3432	0.3861	0.4290	0.4719	0.5148	0.5577
0.0938	0.3550	0.3460	0.3260	0.2970	0.2620	0.2240	0.1970	0.1730	0.1540	0.1410	0.1300	0.1220	0.1200	0.1180
0.1340	0.3350	0.3230	0.3040	0.2680	0.2340	0.1980	0.1700	0.1450	0.1250	0.1050	0.0840	0.0680	0.0590	0.0490
0.2010	0.3120	0.2990	0.2760	0.2410	0.1990	0.1670	0.1440	0.1240	0.1060	0.0840	0.0570	0.0350	0.0220	0.0100
0.2680	0.3000	0.2880	0.2580	0.2200	0.1750	0.1460	0.1280	0.1120	0.0960	0.0750	0.0500	0.0230	0.0120	0.0
0.3350	0.2930	0.2780	0.2430	0.1960	0.1510	0.1180	0.1030	0.0930	0.0820	0.0670	0.0470	0.0220	0.0110	0.0
0.4020	0.2750	0.2620	0.2230	0.1600	0.1070	0.0780	0.0660	0.0630	0.0590	0.0480	0.0370	0.0200	0.0060	0.0
0.4690	0.2530	0.2400	0.1980	0.1250	0.0780	0.0470	0.0310	0.0250	0.0280	0.0250	0.0180	0.0110	0.0	0.0
0.5360	0.2340	0.2160	0.1670	0.0980	0.0570	0.0280	0.0150	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.6700	0.2080	0.1850	0.1360	0.0870	0.0570	0.0360	0.0220	0.0110	0.0	0.0	0.0	0.0	0.0	0.0
0.8040	0.1990	0.1800	0.1500	0.1150	0.0900	0.0750	0.0620	0.0520	0.0420	0.0330	0.0200	0.0090	0.0	0.0
0.9380	0.2140	0.2060	0.1940	0.1760	0.1540	0.1320	0.1080	0.0850	0.0600	0.0320	0.0110	0.0	0.0	0.0
1.0720	0.2520	0.2480	0.2360	0.2120	0.1860	0.1500	0.1170	0.0880	0.0600	0.0260	0.0	0.0	0.0	0.0
1.2050	0.2600	0.2520	0.2270	0.1980	0.1600	0.1260	0.0930	0.0610	0.0280	0.0030	0.0	0.0	0.0	0.0
1.3390	0.1930	0.1760	0.1530	0.1240	0.0870	0.0550	0.0300	0.0080	0.0	0.0	0.0	0.0	0.0	0.0
1.4730	0.0480	0.0460	0.0420	0.0330	0.0240	0.0150	0.0070	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Y/(B/2) / Z/D	0.6006	0.6435	0.6864	0.7293	0.7722	0.8151	0.8580	0.9009	0.9438	0.9867	1.0296	1.0725
0.0938	0.1130	0.1030	0.0840	0.0660	0.0490	0.0350	0.0250	0.0180	0.0130	0.0080	0.0040	0.0
0.1340	0.0400	0.0320	0.0140	0.0080	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.2010	0.0070	0.0040	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

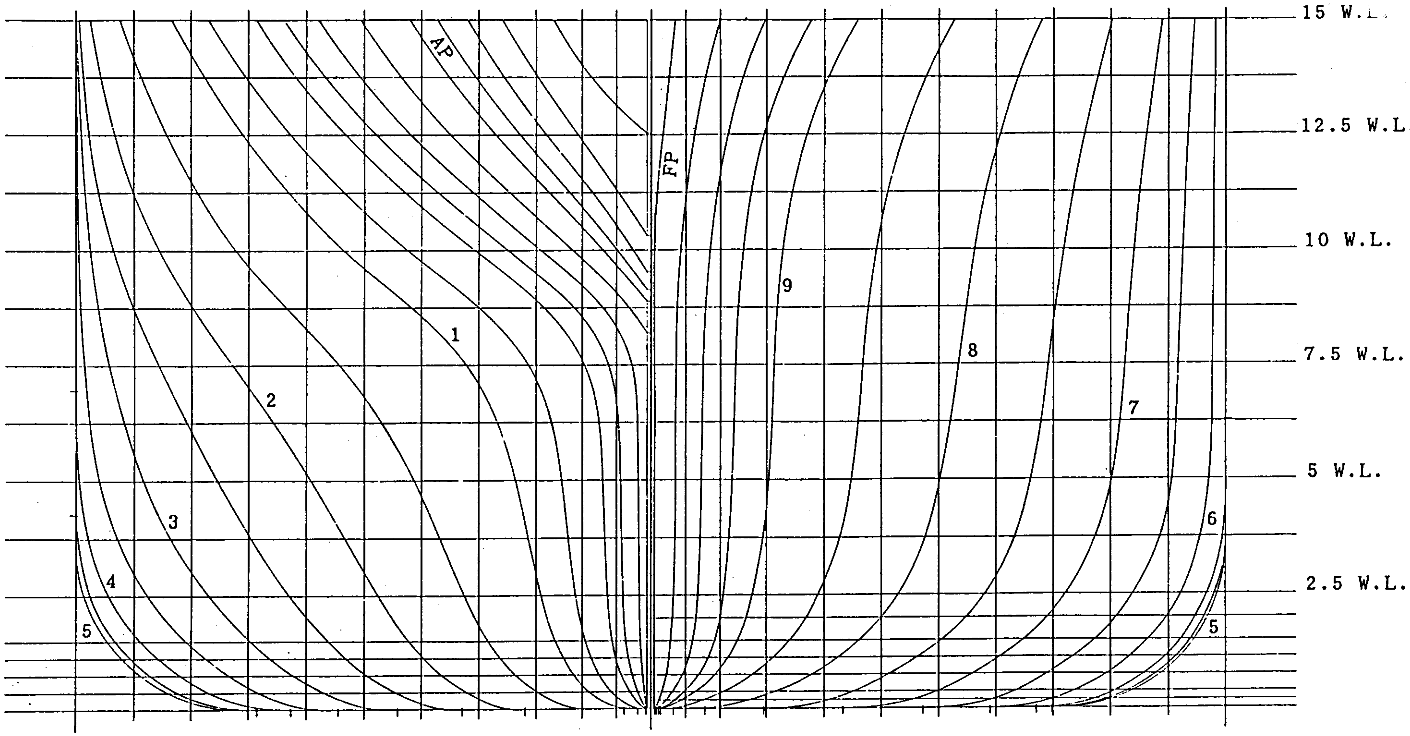

Fig. 4.1 Bodyplan

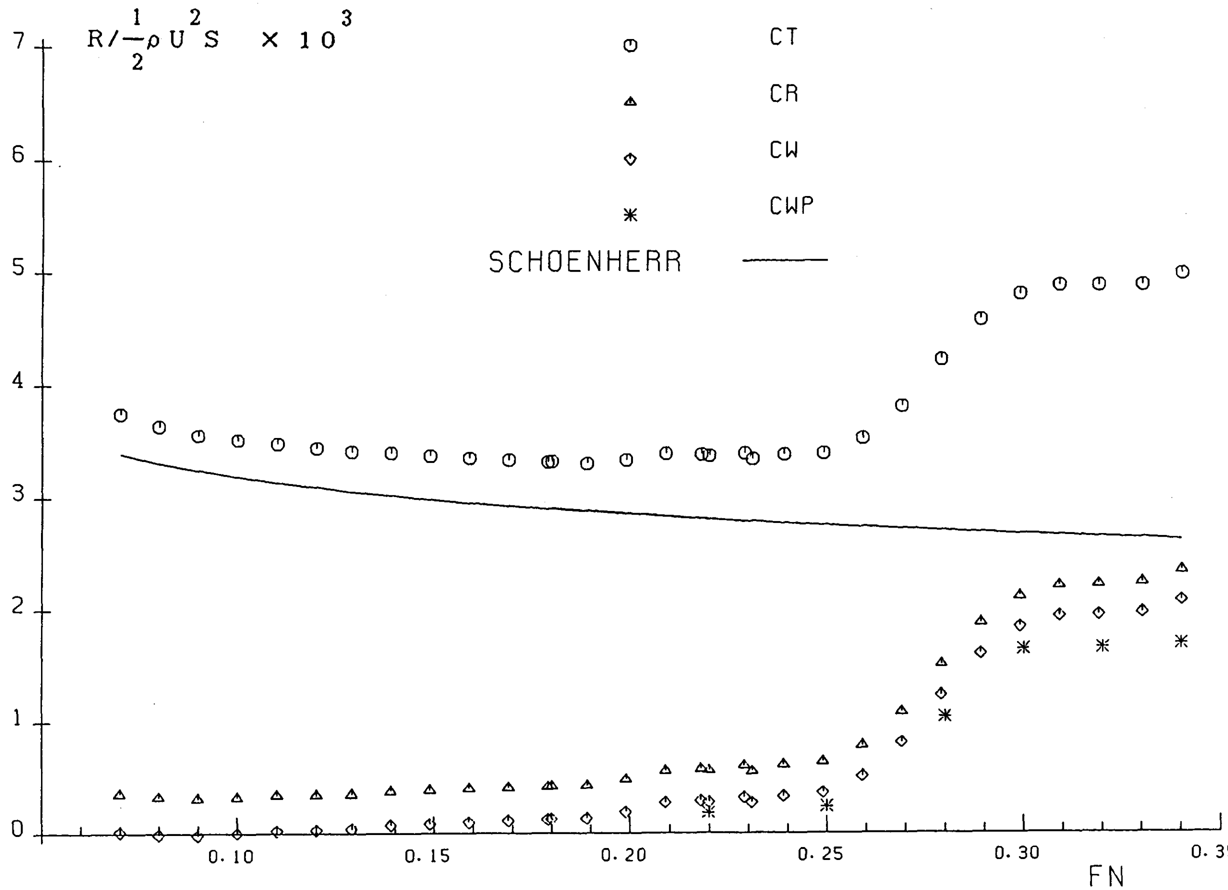

Fig. 5.1.1 Resistance curves

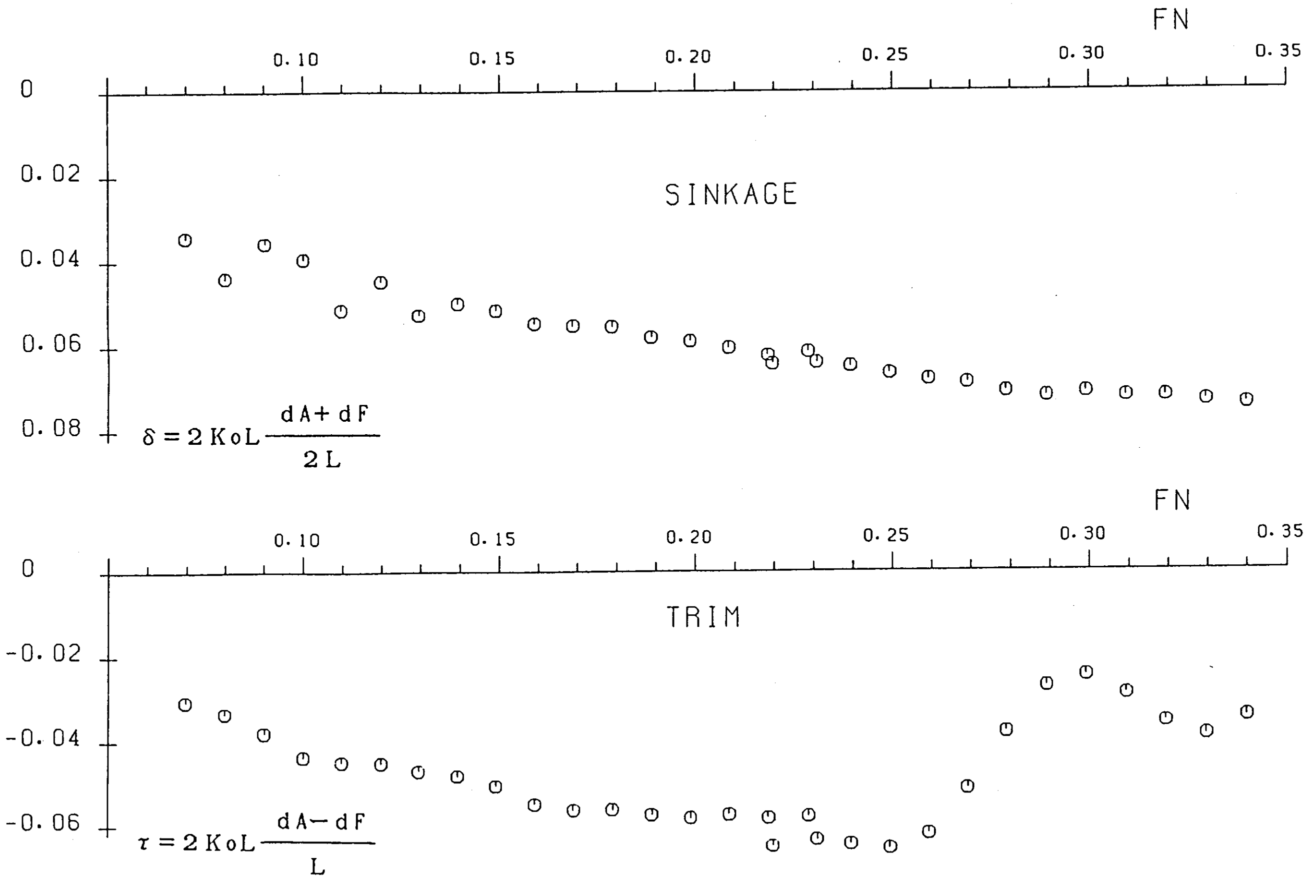

Fig. 5. 1. 2 Trim and sinkage curves

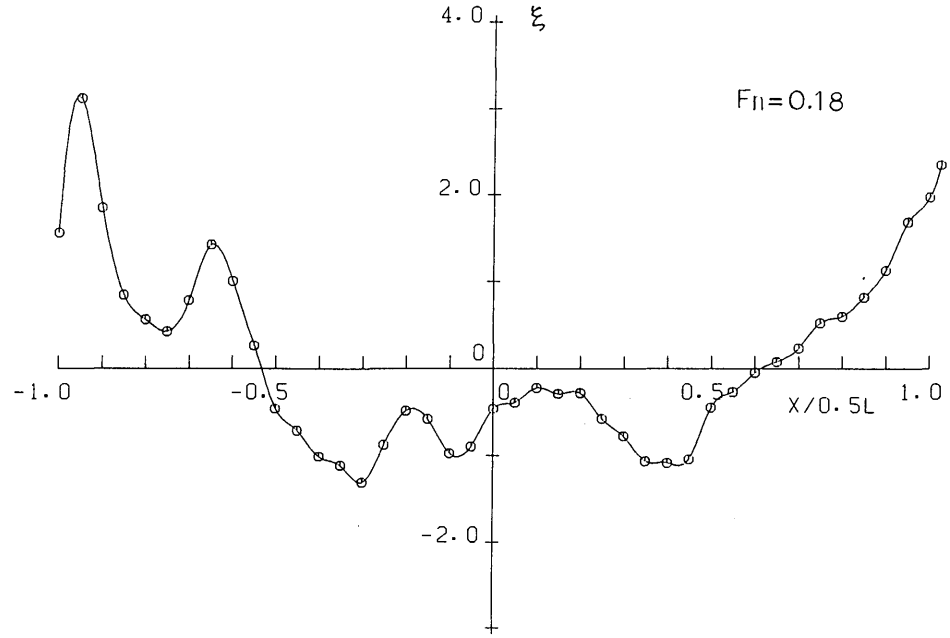

Fig. 5.2.1 Wave profile along the hull at Fn=0.18

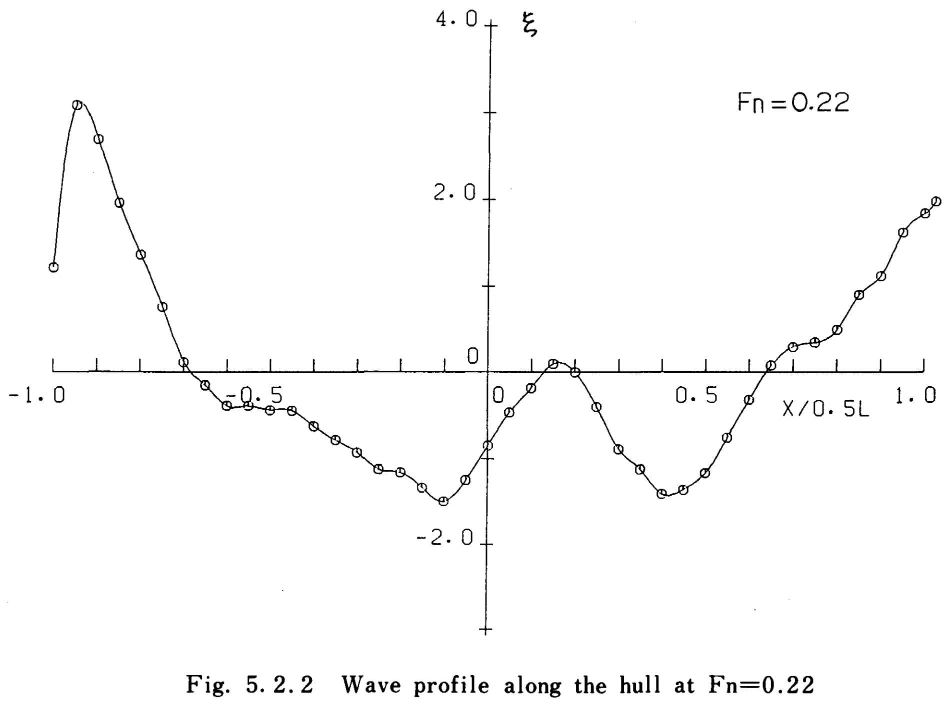

Fig. 5.2.2 Wave profile along the hull at Fn=0.22

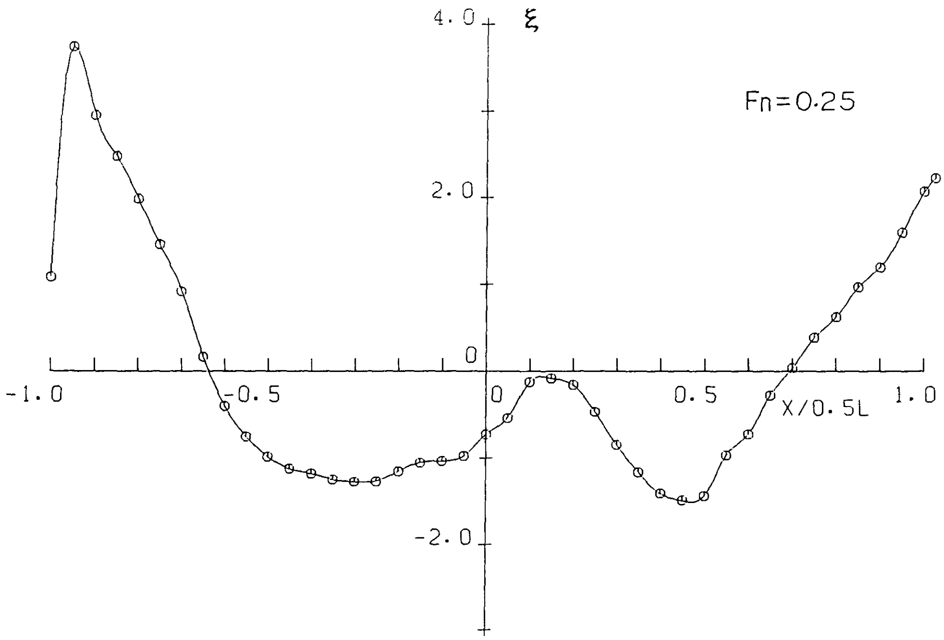

Fig. 5.2.3 Wave profile along the hull at Fn=0.25

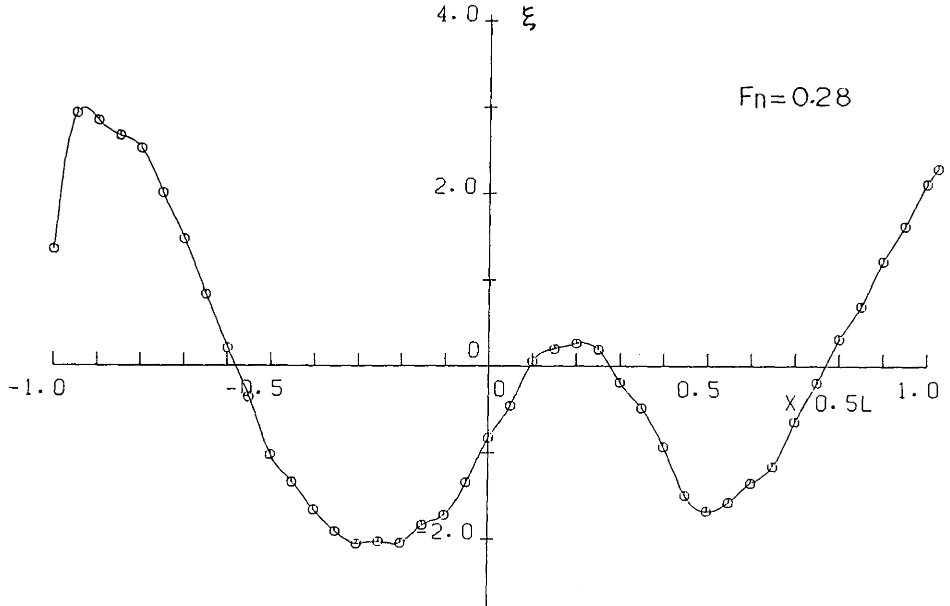

Fig. 5.2.4 Wave profile along the hull at Fn=0.28

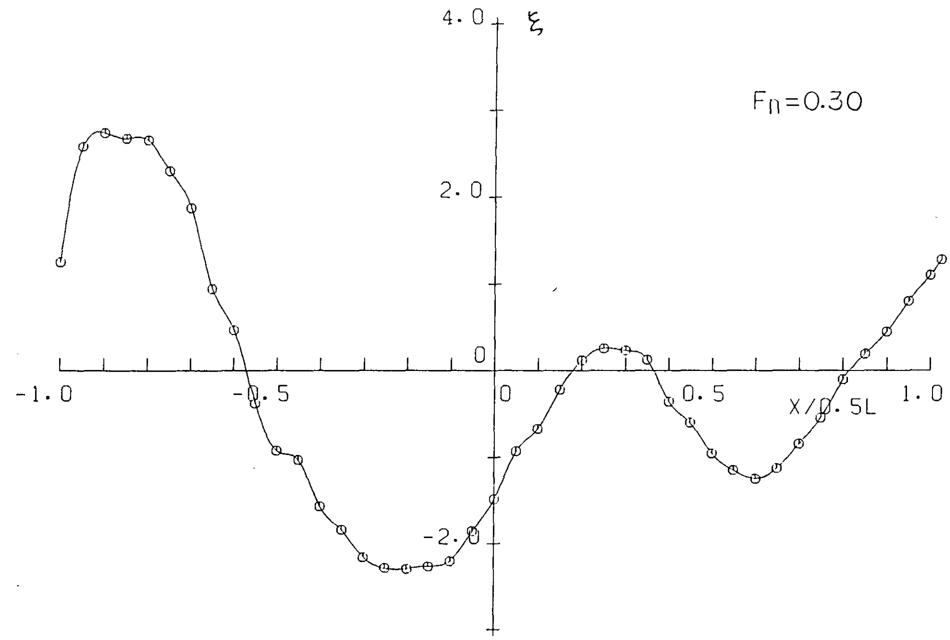

Fig. 5.2.5 Wave profile along the hull at Fn=0.30

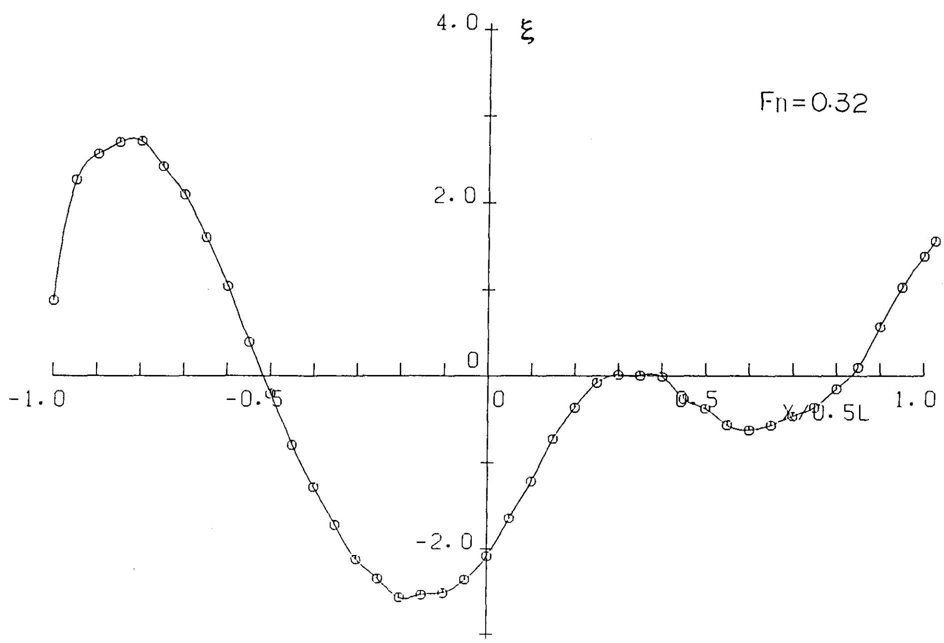

Fig. 5.2.6 Wave profile along the hull at Fn=0.32

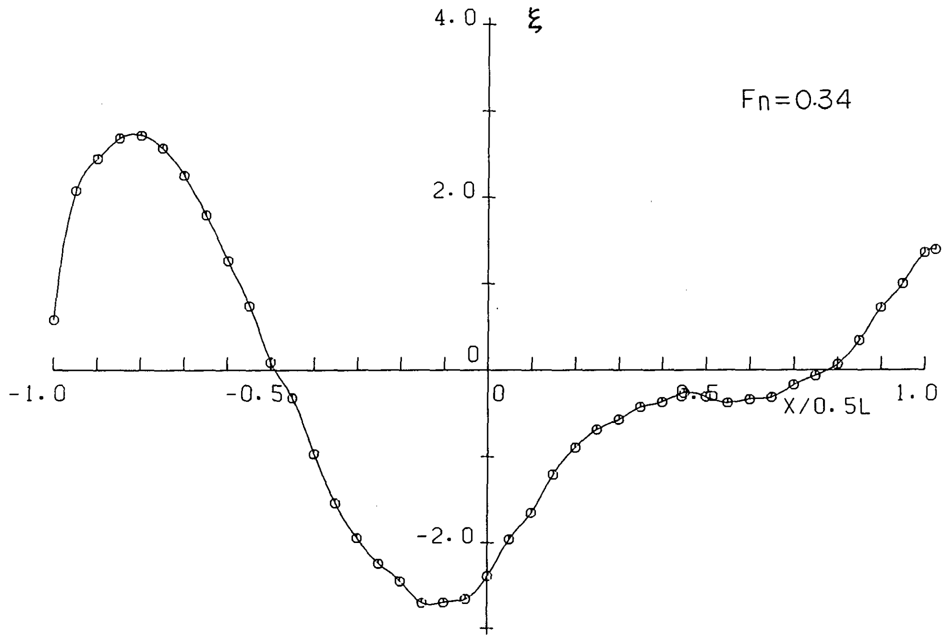

Fig. 5.2.7 Wave profile along the hull at Fn=0.34

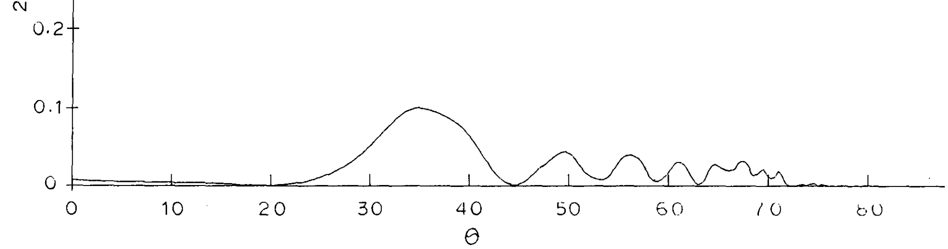

Fig. 5.3.1 Amplitude function for y/l=1.0 at Fn=0.22

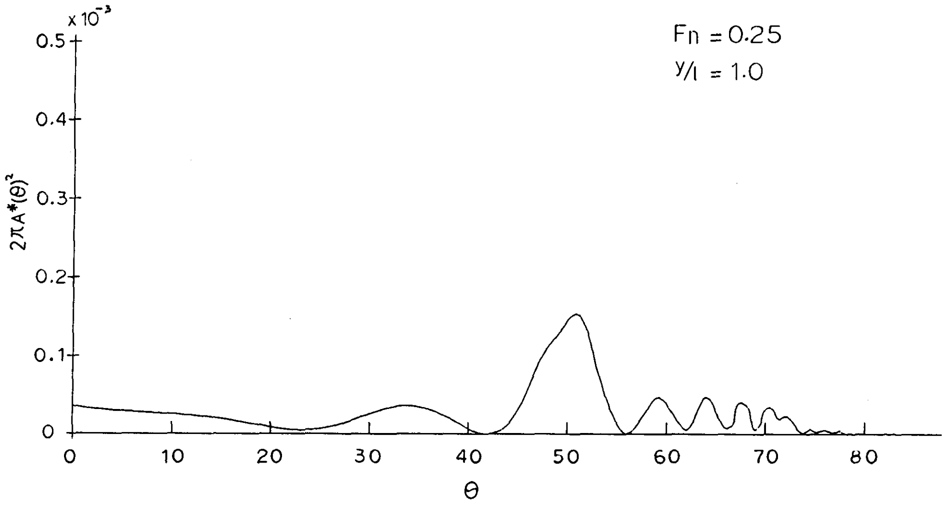

Fig. 5. 3. 2 Amplitude function for y/l=1.0 at Fn=0.25

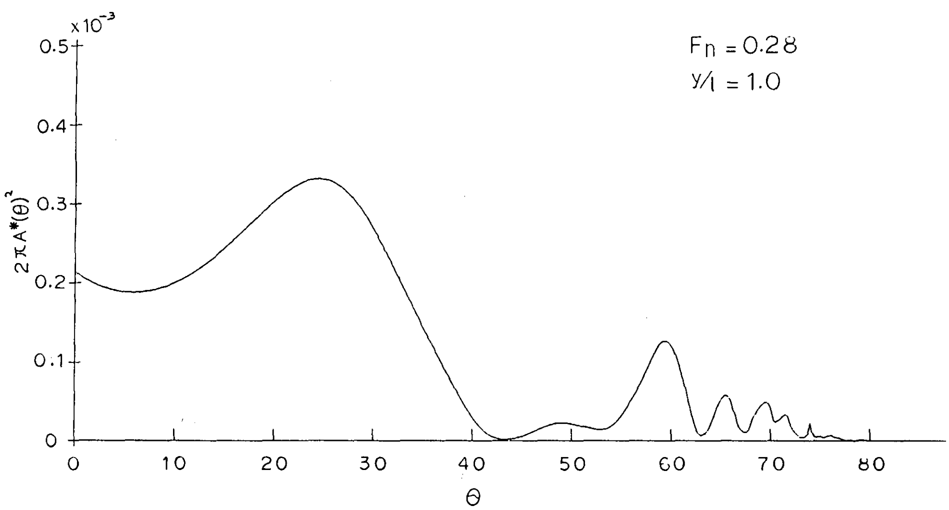

Fig. 5. 3. 3 Amplitude function for y/l=1.0 at Fn=0.28

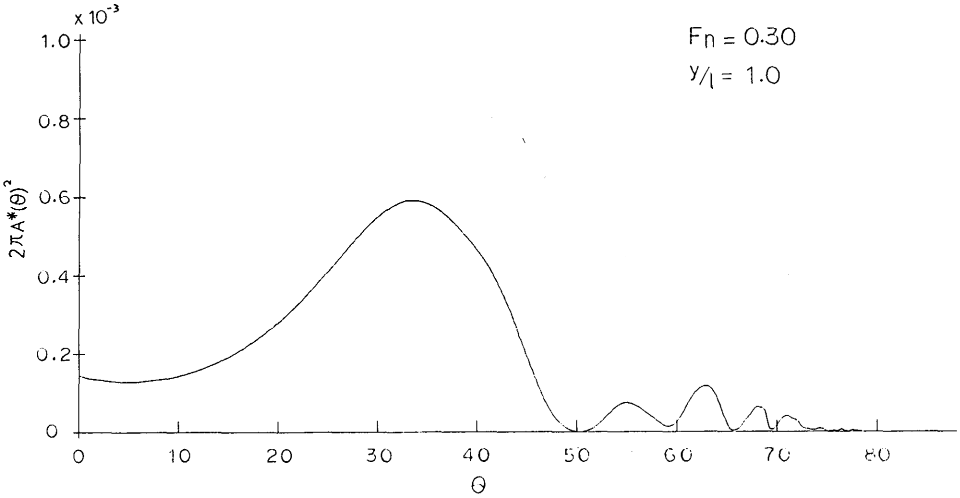

Fig. 5. 3. 4 Amplitude function for y/l=1.0 at Fn=0.30

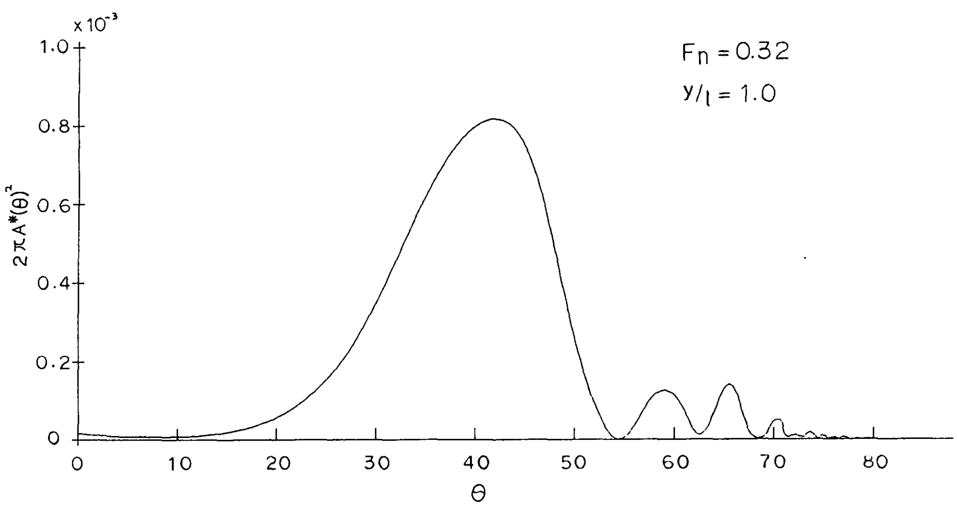

Fig. 5. 3. 5 Amplitude function for y/l=1.0 at Fn=0.32

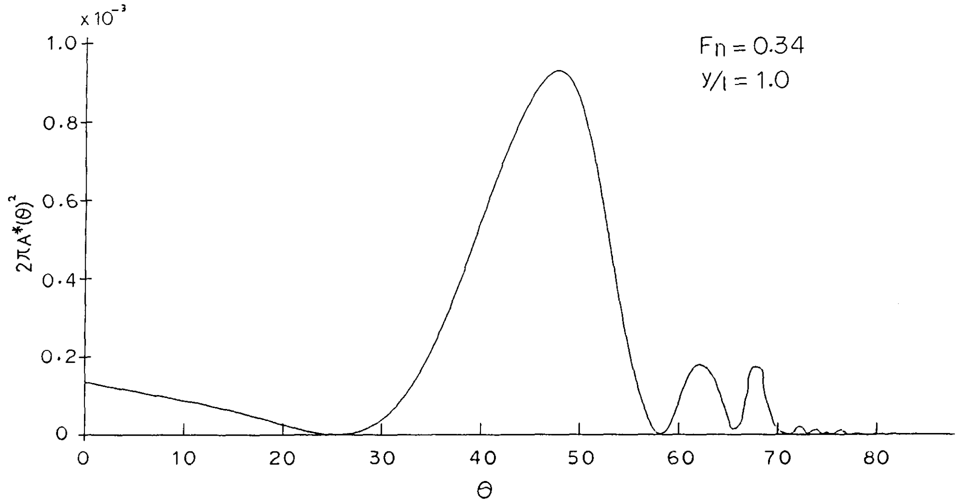

Fig. 5. 3. 6 Amplitude function for y/l=1.0 at Fn=0.34

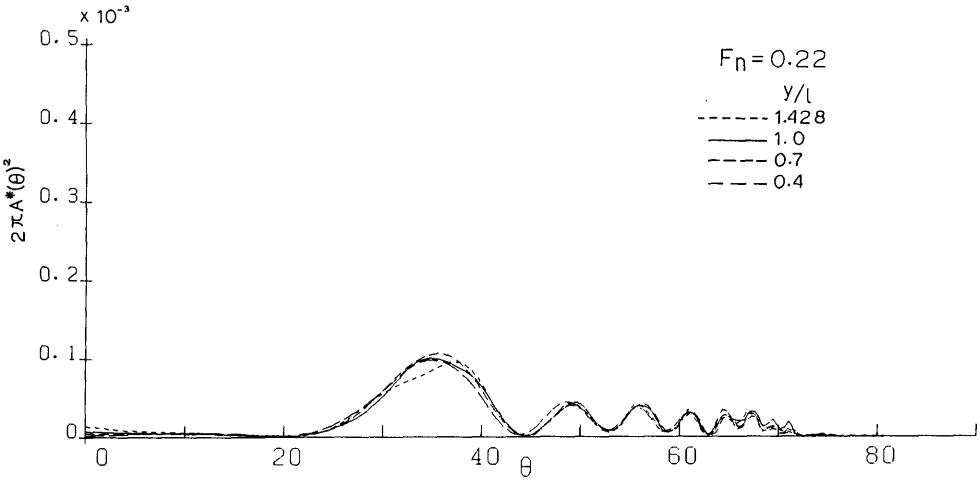

Fig. 5. 3. 7 Comparison of weighed amplitude functions for y/l=0.4, 0.7, 1.0 and 1.4286 at Fn=0.22

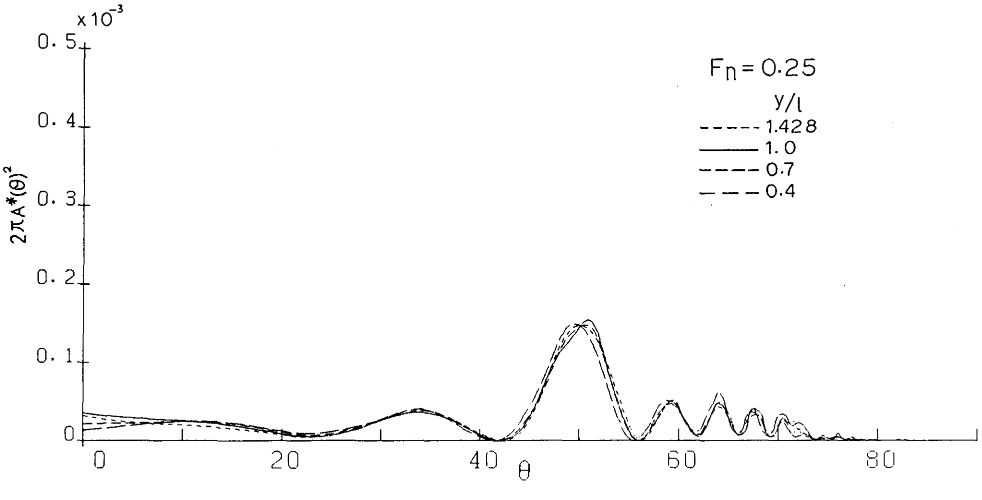

Fig. 5.3.8 Comparison of weighed amplitude functions for y/l=0.4, 0.7, 1.0 and 1.4286 at Fn=0.25

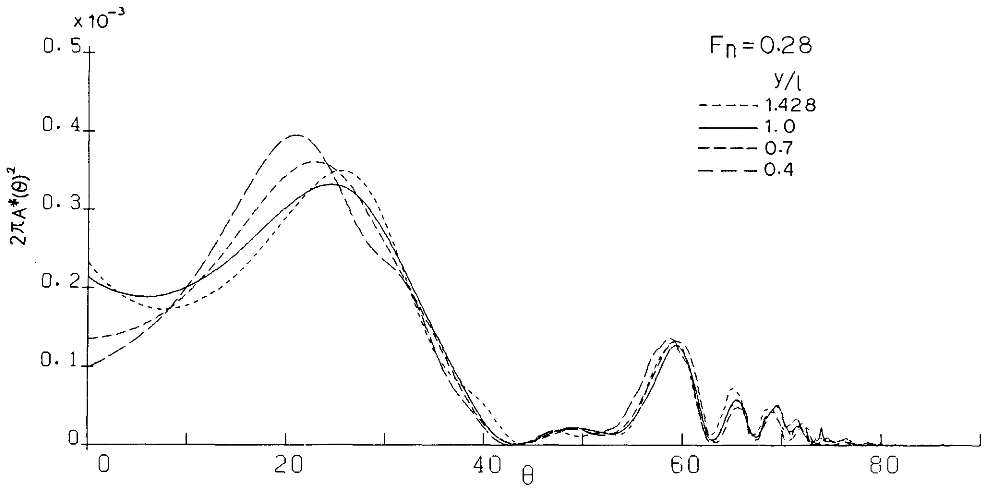

Fig. 5.3.9 Comparison of weighed amplitude functions for y/l=0.4, 0.7, 1.0 and 1.4286 at Fn=0.28

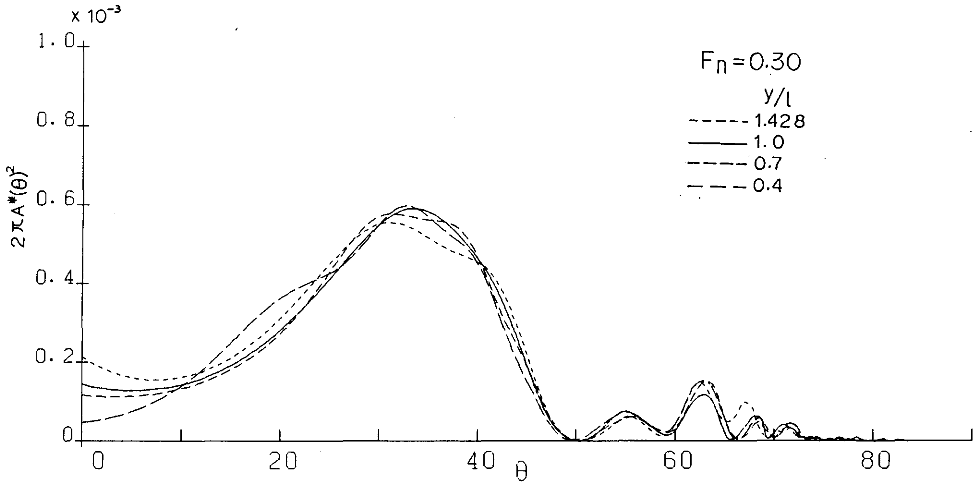

Fig. 5.3.10 Comparison of weighed amplitude functions for y/l=0.4, 0.7, 1.0 and 1.4286 at Fn=0.30

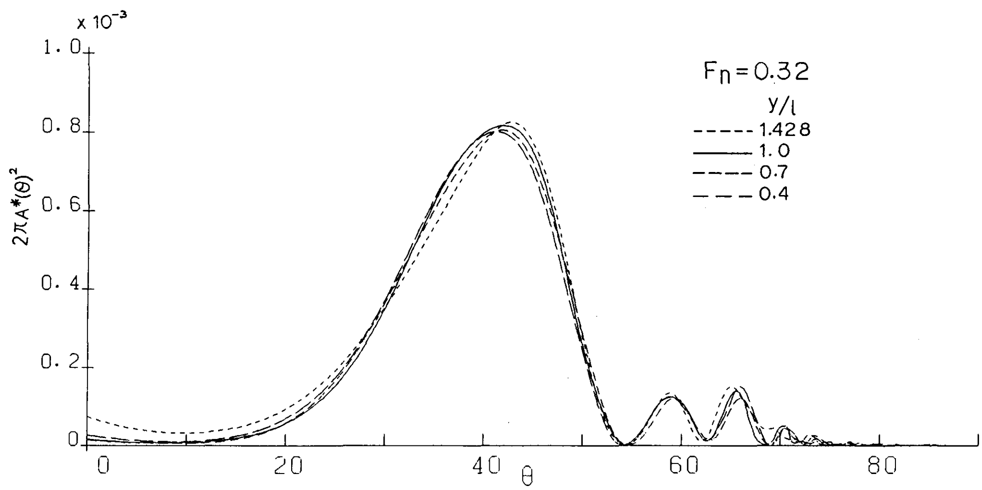

Fig. 5.3.11 Comparison of weighed amplitude functions for y/l=0.4, 0.7, 1.0 and 1.4286 at Fn=0.32

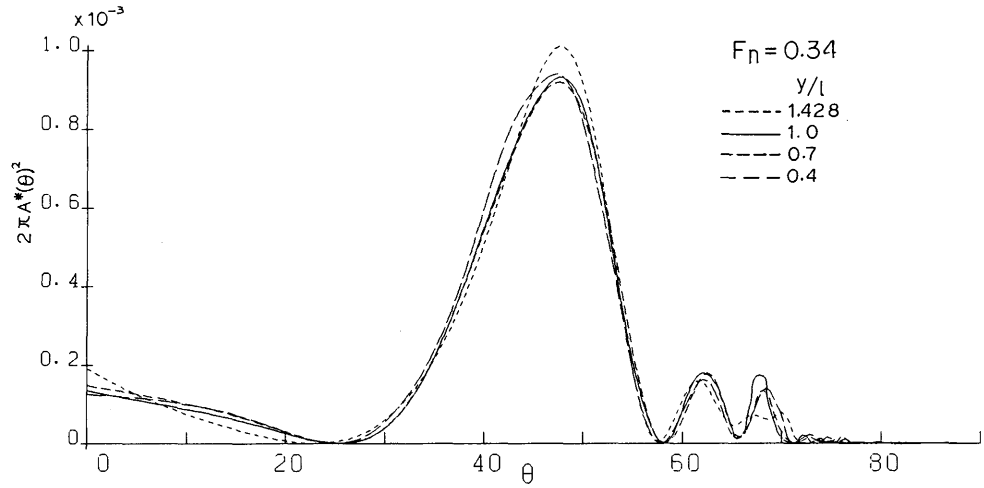

Fig. 5. 3. 12 Comparison of weighed amplitude functions for y/l=0.4, 0.7, 1.0 and 1.4286 at Fn=0.34

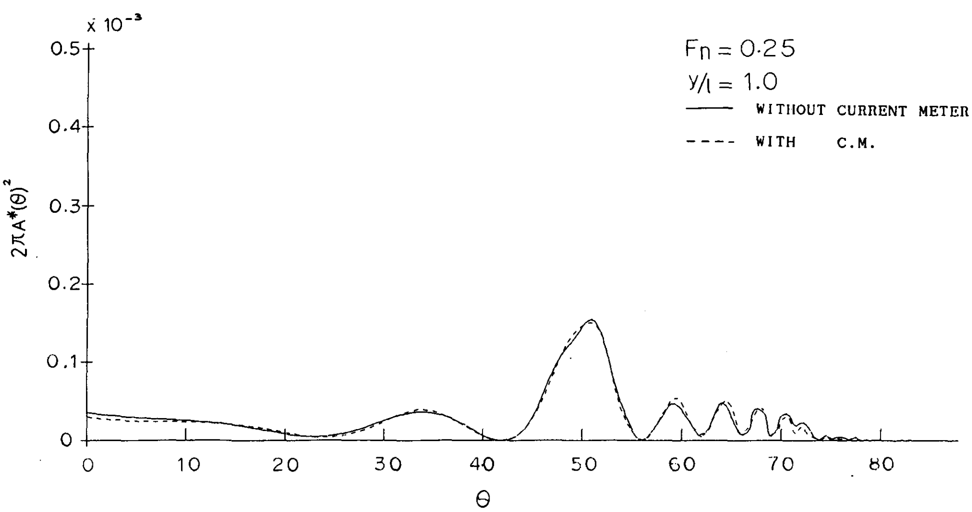

Fig. 5. 3. 13 Comparison of weighed amplitude functuins with and without the current meter for y/l=1.0 at Fn=0.25

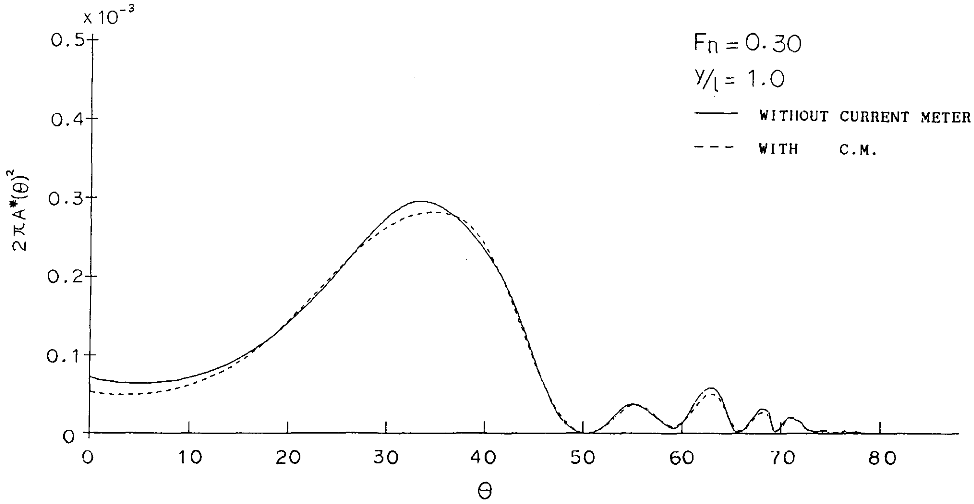

Fig. 5. 3. 14 Comparison of weighed amplitude functuins
with and without the current meter for y/l=1.0 at Fn=0.30

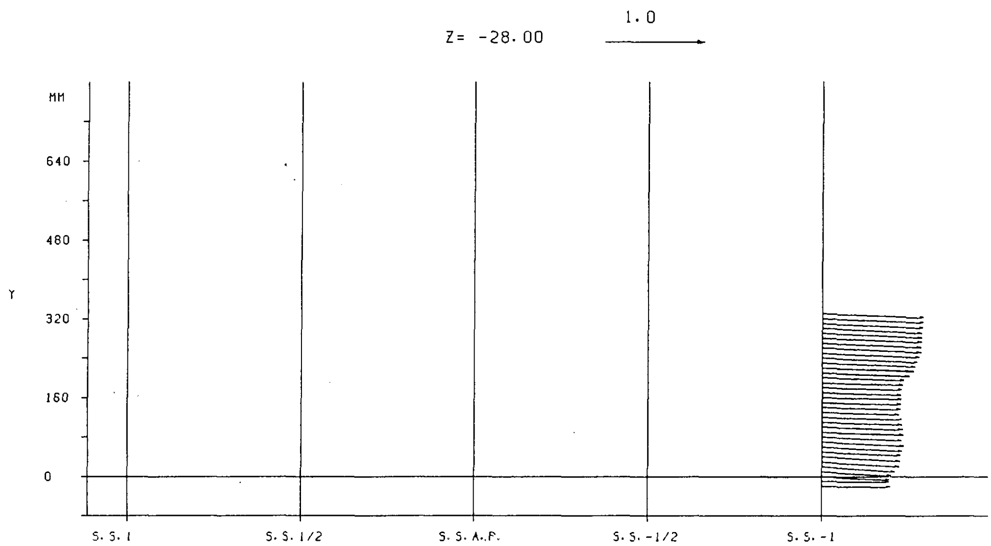

Fig. 5.4.1 Velocity distribution on the horizontal plane at z/l=−0.0008

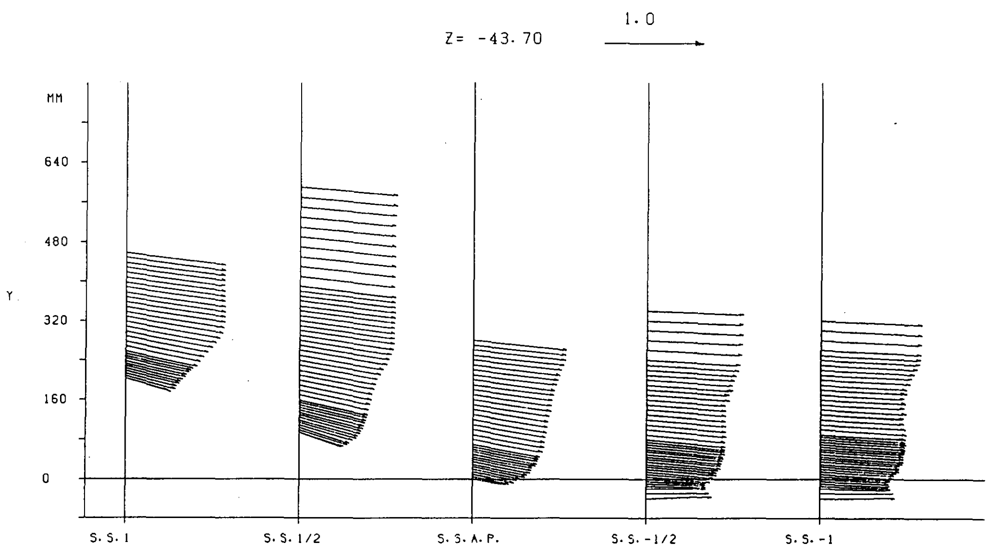

Fig. 5.4.2 Velocity distribution on the horizontal plane at z/l=−0.00125

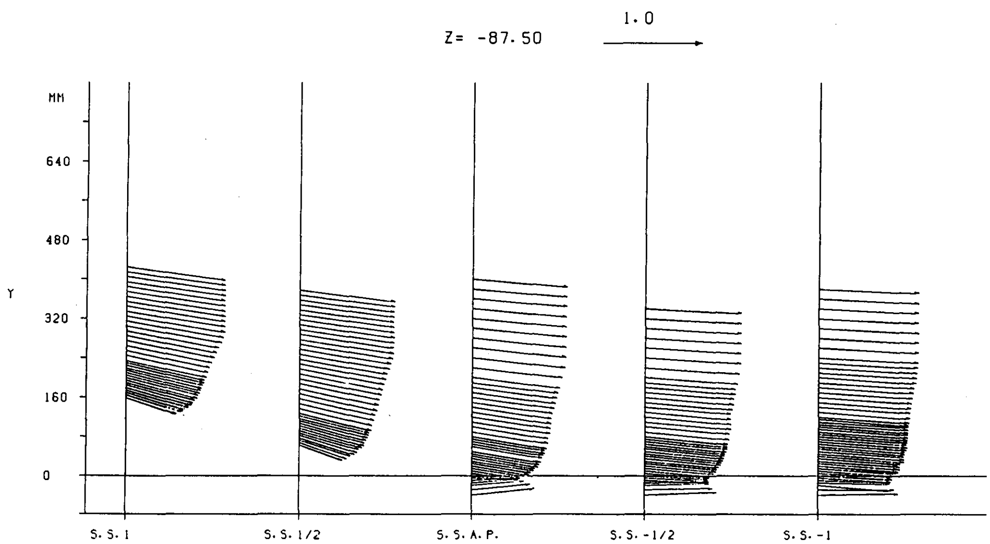

Fig. 5.4.3 Velocity distribution on the horizontal plane at z/l=−0.0025

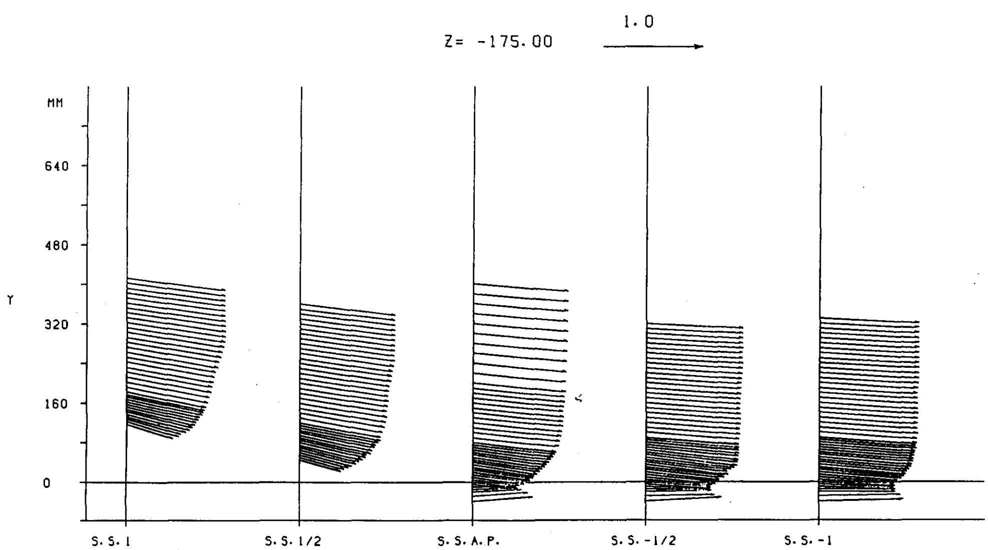

Fig. 5.4.4 Velocity distribution on the horizontal plane at z/l=−0.0050

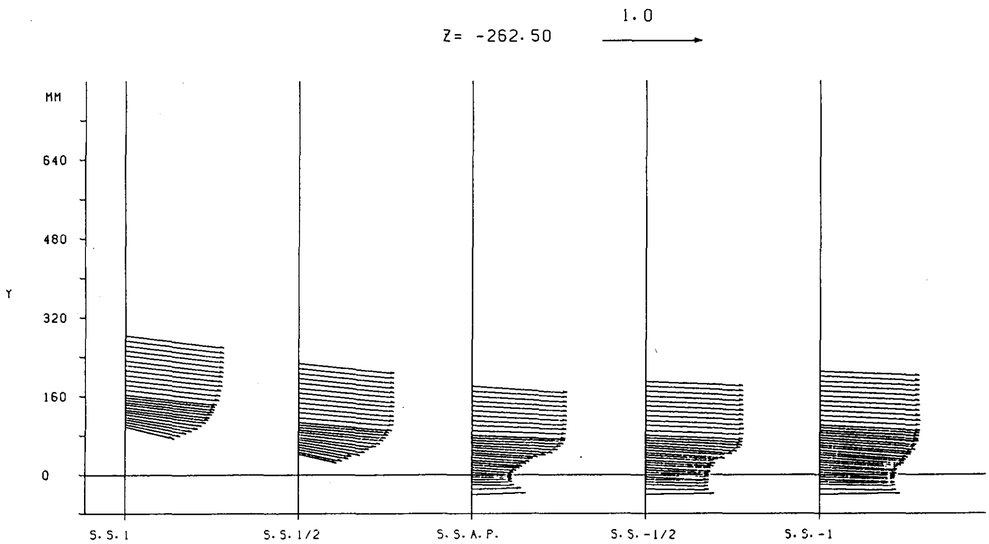

Fig. 5.4.5 Velocity distribution on the horizontal plane at z/l=—0.0075

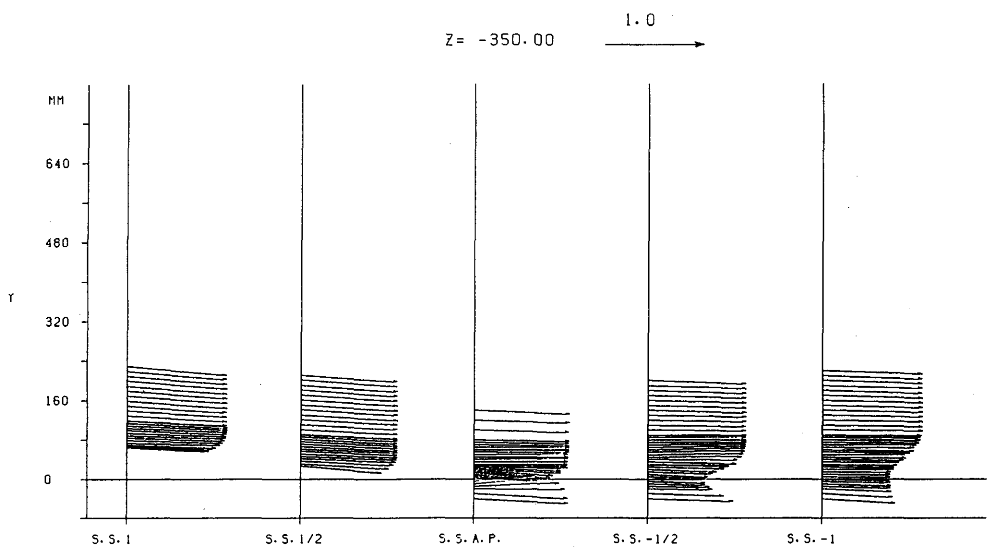

Fig. 5.4.6 Velocity distribution on the horizontal plane at z/l=—0.0100

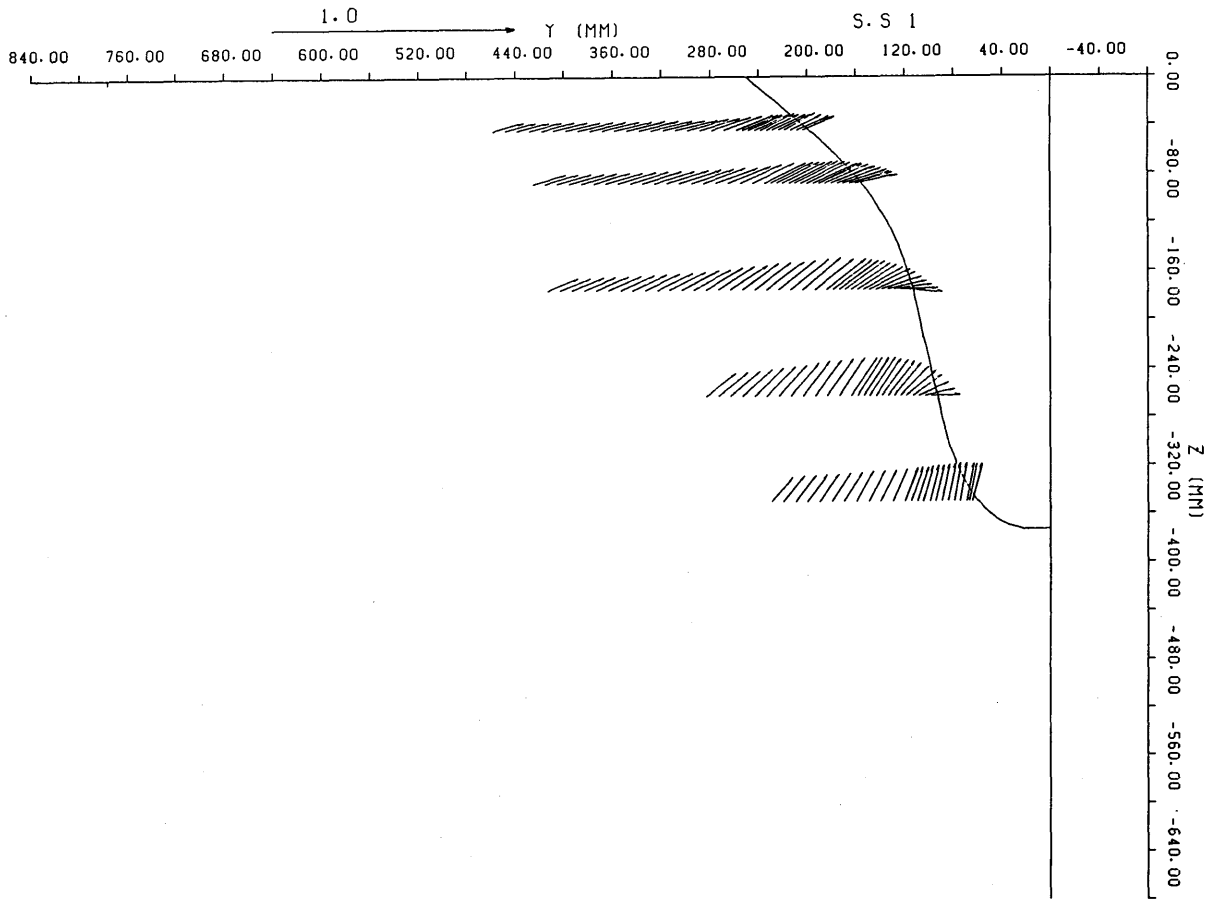

Fig. 5. 4. 7 Velocity distribution on the vertical plane at S.S. 1

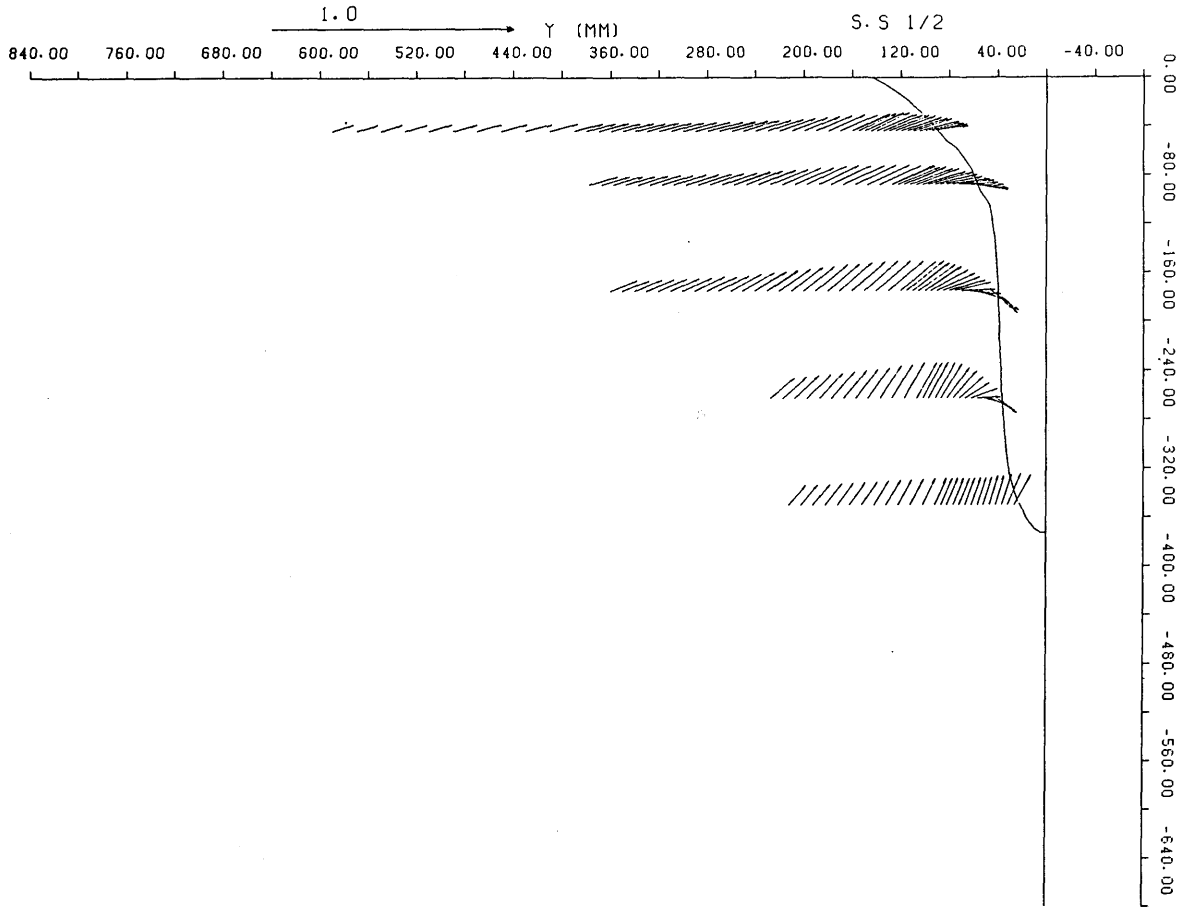

Fig. 5. 4. 8 Velocity distribution on the vertical plane at S.S. 1/2

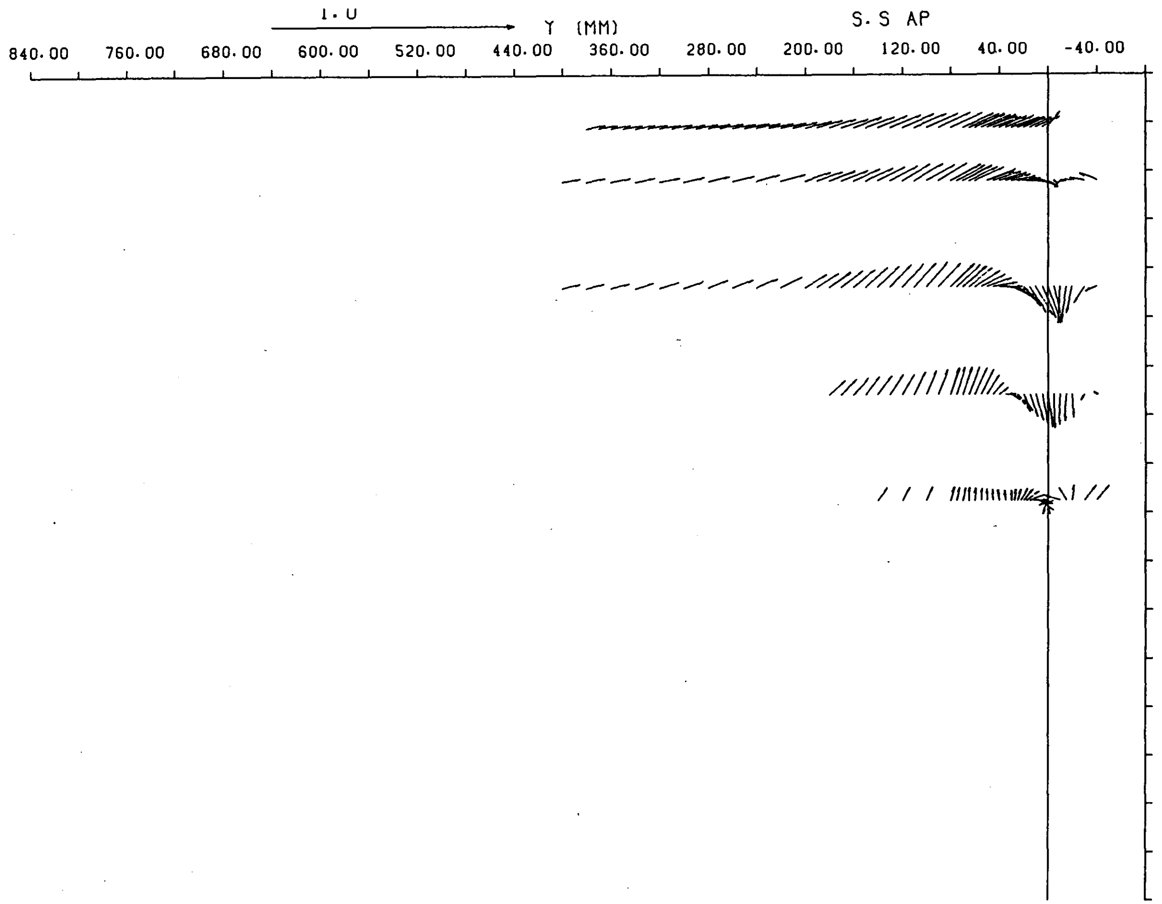

Fig. 5.4.9 Velocity distribution on the vertical plane at S.S. A.P.

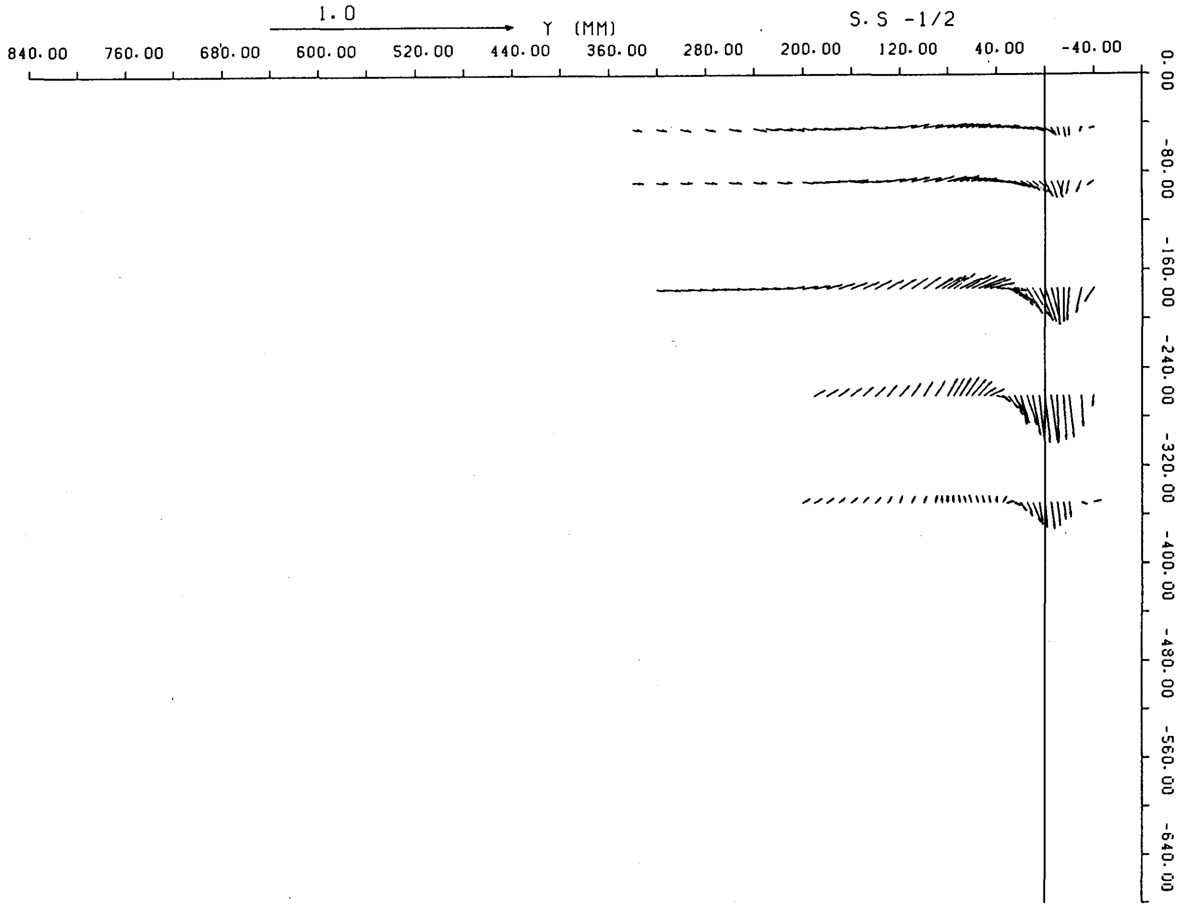

Fig. 5.4.10 Velocity distribution on the vertical plane at S.S. −1/2

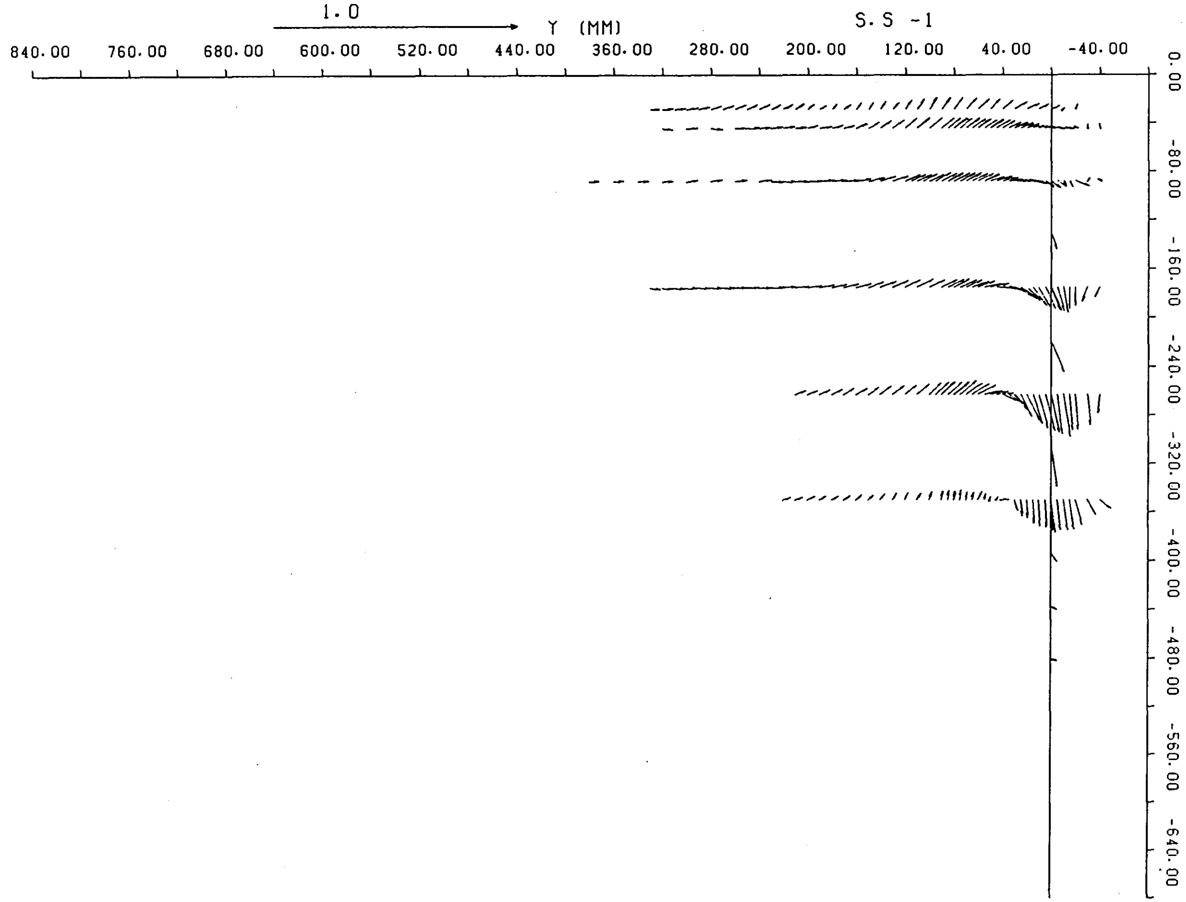

Fig. 5.4.11 Velocity distribution on the vertical plane at S.S. −1

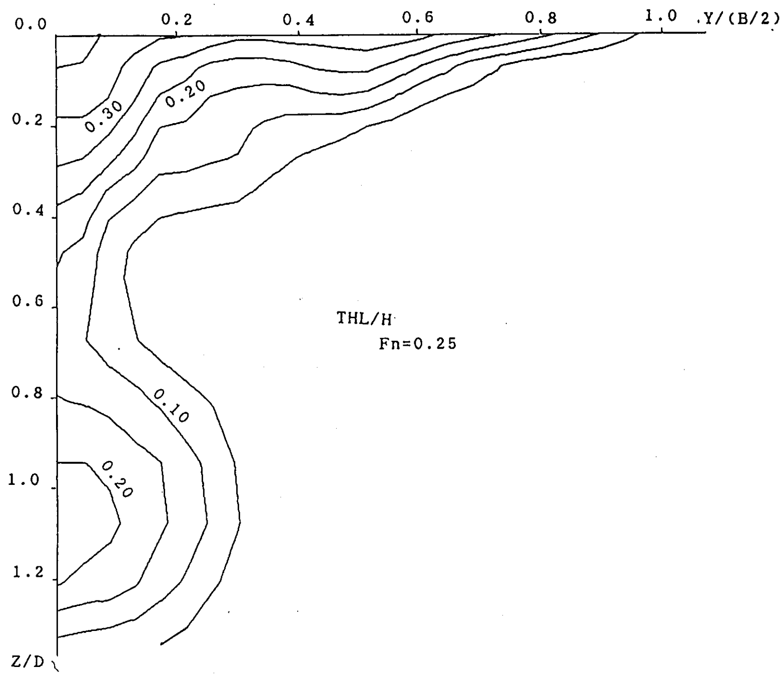

Fig. 5. 5. 1 Total head loss contour at Fn=0.25

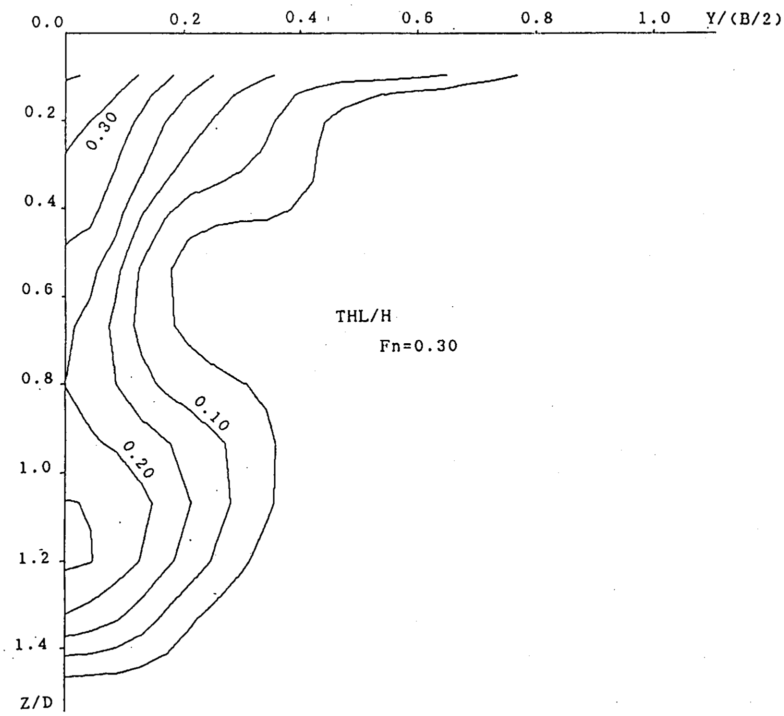

Fig. 5. 5. 2 Total head loss contour at Fn=0.30

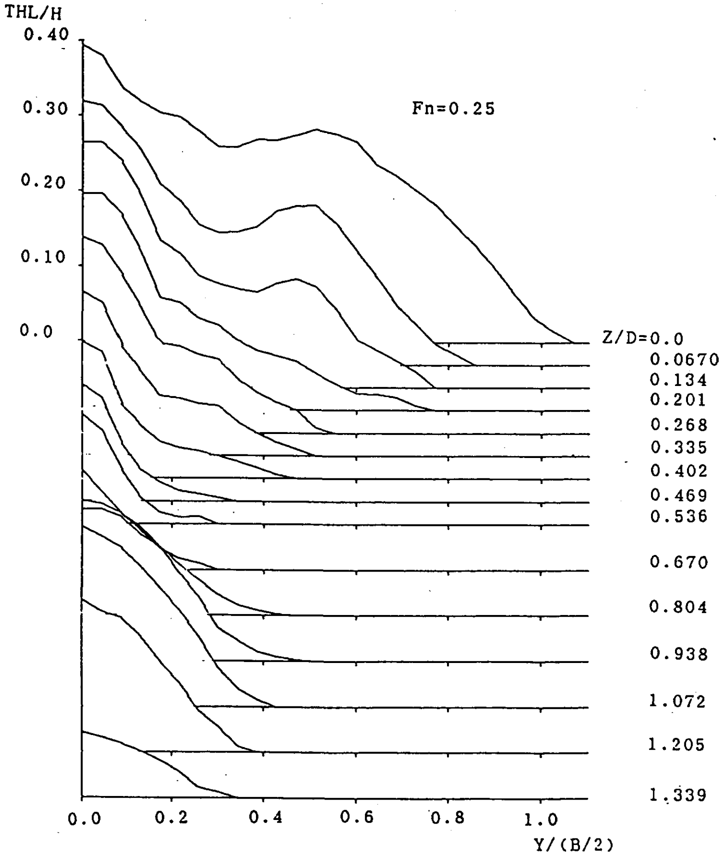

Fig. 5. 5. 3 Sideward distribution of total head loss at Fn=0.25

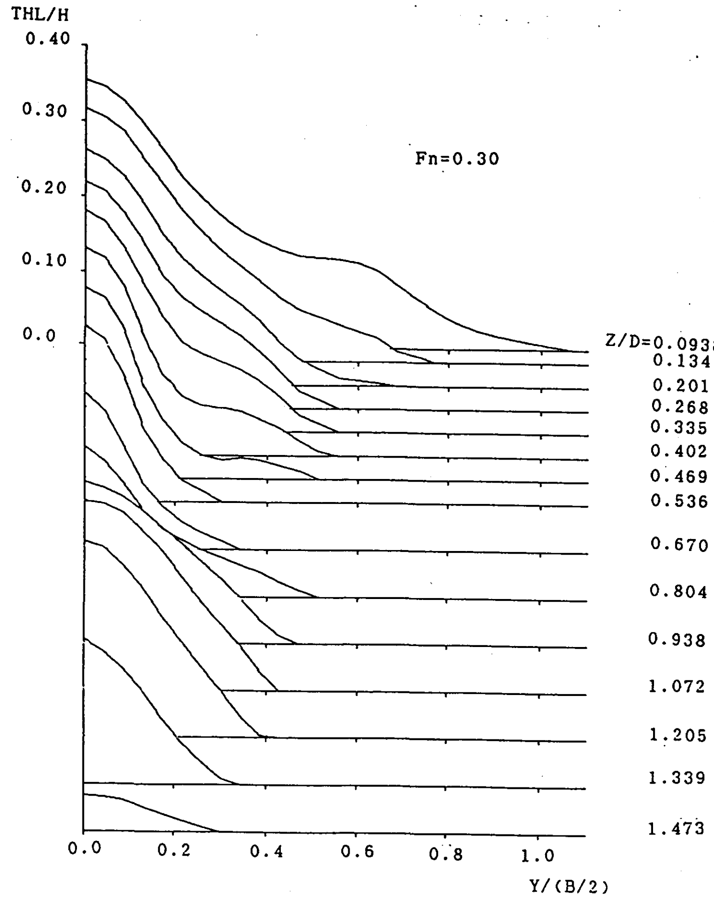

Fig. 5. 5. 4 Sideward distribution of total head loss at Fn=0.30

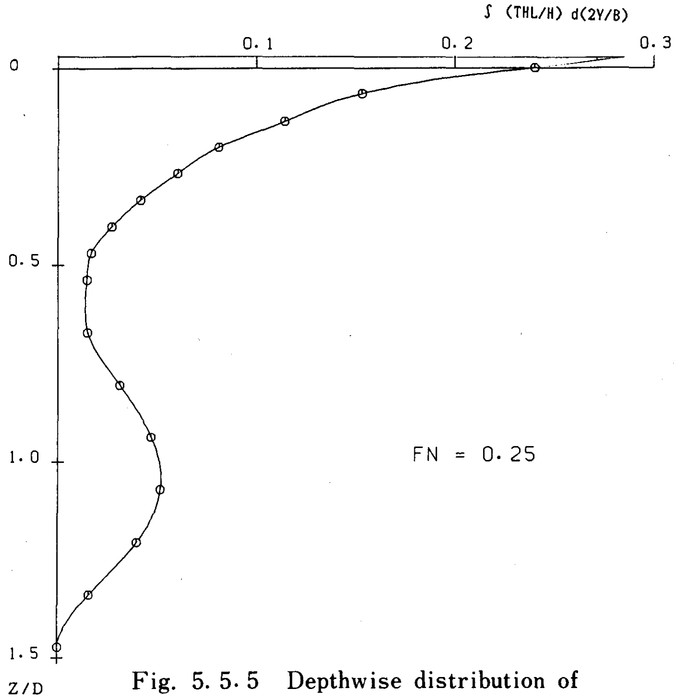

Fig. 5. 5. 5 Depthwise distribution of horizontally integrated total head loss at Fn=0.25

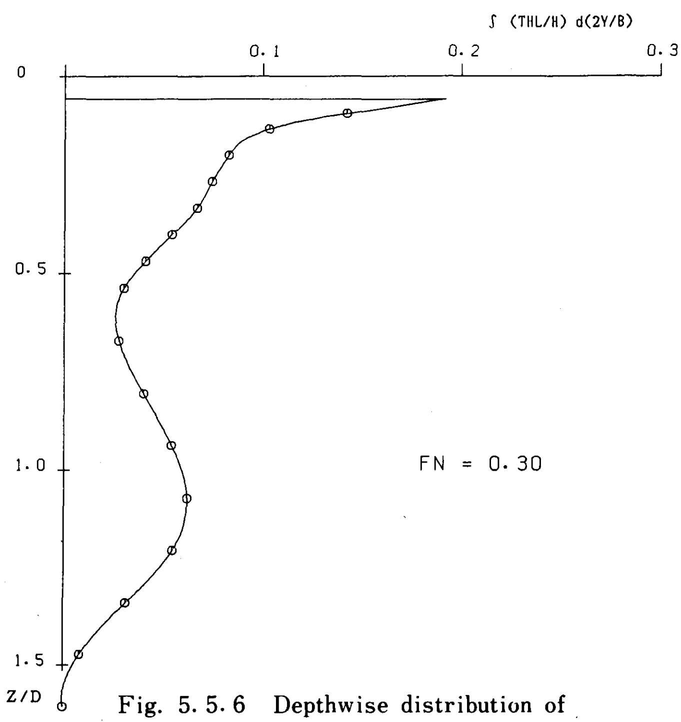

Fig. 5. 5. 6 Depthwise distribution of horizontally integrated total head loss at Fn=0.30

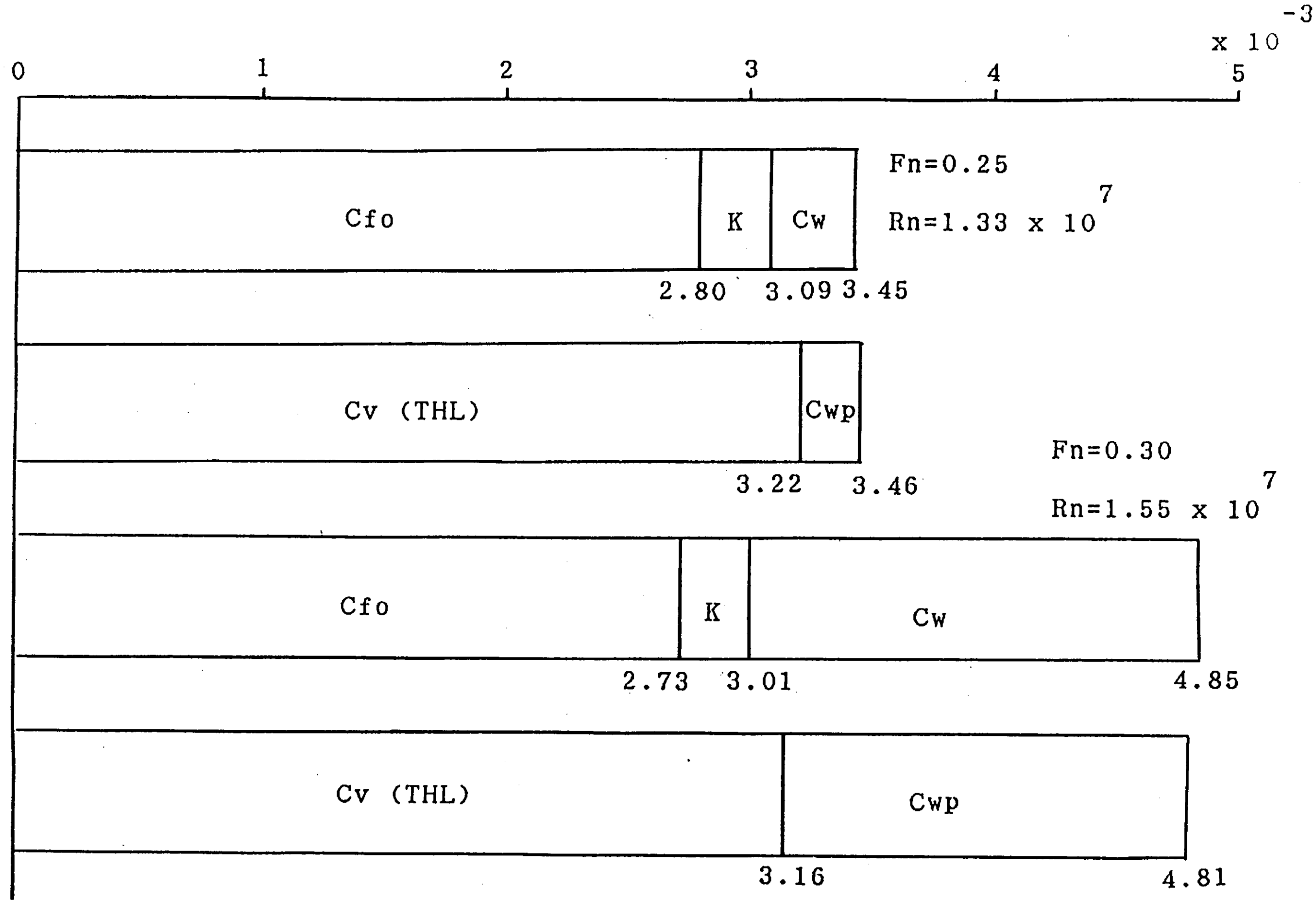

Fig. 5. 5. 7 Comparison of resistance components