The Summary of the Cooperative Experiment on Wigley Parabolic Model in Japan

The executive members

H.Kajitani and H.Miyata
The University of Tokyo

M.Ikehata
Yokohama National University

H.Tanaka and H.Adachi
Ship Research Institute

M.Namimatsu and S.Ogiwara
Ishikawajima-Harima Heavy Industries Co.,Ltd.

Abstract

(International Towing Tank Conference)

The 16th ITTC Resistance Committee made a proposal of cooperative experimental research program for ship resistance and flow around hull to construct standard data base. In Japan ~~three~~ four organizations, the University of Tokyo (UT), Ship Reseach Institute(SRI) and Ishikawajima-Harima Heavy Industries Co.,Ltd.(IHI) responded to the proposal of the Committee and Yokohama National University(YNU) joined this program in the later time . They conducted the experiments on the Wigley parabolic model in order to investigate the scale effect of ship resistance using geosim models of a 6 m length in IHI, 4 m length in SRI, 2.5 m length in UT and 2 m length in YNU. The experiments were separately performed on the following items and cooperatively analyzed.

(1) Resistance test,
(2) Wave pattern analysis,
(3) Wake survey,
(4) Wave profile measurement, and
(5) Pressure measurement on hull surface.

(cont'd)

YNU separately performed the measurement of boundary layer around the hull. The report of the cooperative experiment was presented to the Resistance Committee of the 17th ITTC at Varna, Bulgaria, in September, 1983. This paper describes the summary of the report, extracting principal data of experiments in order to serve as a reference for the theoretical prediction of ship resistance.

Nomenclature

C_T $R_T/\frac{1}{2}\rho U^2 S$	Total resistance coefficient
C_W $R_W/\frac{1}{2}\rho U^2 S$	Wave resistance coefficient derived from towing test
C_{WP} $R_{WP}/\frac{1}{2}\rho U^2 S$	Wave resistance coefficient derived from wave pattern analysis
C_{F0}	Frictional resistance coefficient (Schoenherr)
C_{PR}	Resistance coefficient derived from integrating hull surface pressure
C_P	Pressure coefficient = $(p-p_0)/\frac{1}{2}\rho U^2$
Fn	Froude number = $U/\sqrt{gL}$
S	Wetted surface area at rest defined by S=Cs.L(2D+B) Cs=0.661
L	Waterline length (=Lpp for Wigley model)
B	Beam at midship
D	Draft at midship
H,H_0	Total head ($H_0=U^2/g$)
Rn	Reynolds number = LU/ν
THL	Total head loss =$(H_0-H)/H_0$
U	Model speed of advance
b	B/2
d_F, Δd_F	Draft at FP, its increase from the rest
d_A, Δd_A	Draft at AP, its increase from the rest
g	Gravitational acceleration = 9.8 m/sec^2
k	Three dimensional form factor on flat plate skin friction
k_0	Wave number = g/U^2

l	$L/2$
t	Trim (positive for bow up) $= (d_A - d_F)/L$
τ	$2k_o \cdot L.t$
s	Sinkage $= (\Delta d_F + \Delta d_A)/2L$
σ	$2k_o\, L.s$
ξ	Nondimensional wave elevation $= k_o \zeta(x)$
$\zeta(x)$	Wave elevation
ν	Kinematic viscosity
ρ	Mass density
x,y,z	Coordinate system fixed in space
x',y',z'	Coordinate system fixed in ship
FR	Free to sink and trim
FX	Fixed to sink and trim
S-FR.T-FX	Free to sink, fixed to trim

1. General notes

A) Model size

	IHI	SRI	UT	YNU
L (m)	6.0	4.0	2.5	2.0
B (m)	0.6	0.4	0.25	0.25
D (m)	0.375	0.25	0.156	0.125

Hull form; $y = B/L\left[1-(2x/L)^2\right]\left[1-(z/D)^2\right]$

B) Items of experiment

	IHI	SRI	UT	YNU
1 Resistance test	FR	FR,FX	FR,FX, S-FR.T-FX	FR,FX
2 Wave pattern analysis	FR	FR,FX	FR,FX, S-FR.T-FX	FR
3 Wake survey	FR	FR	FR	FR
4 Wave profile on hull	FR	FR,FX	FR,FX, S-FR.T-FX	
5 Pressure on hull	FR	FR	FR, FX	

C) Boundary condition

	IHI	SRI	UT	YNU
Turbulent stimulator stud Height*Spacing (mm) at x/l=-0.9	3*10	3*10	2*10	2*10
Tank section, BT*DT (m)	10*5	18*8	3.5*2.35	8*3.5
Towing height from keel (mm)	330	255	103	
Speed measurement	Current speed	Ground speed	Ground speed	Ground speed

2. Results of resistance test and wave analysis

Figure 1 shows the total reststance (C_T),frictional resistance(Schoenherr,C_{FO}), wave resistance (Cw) and wave pattern resistance (Cwp) for three models of 6.0m, 4.0m and 2.5m length on the condition of free to sink and trim (FR). Wave resistance is derived using form factor on skin friction.

Wave pattern resistance is derived by the method of Newmwn-Sharma. Distance of measuring plane of wave profile from the center line of the model is as follows,

	IHI	SRI	UT	YNU
y/l	1.667	1.0	1.4	4.0

Figure 2 shows C_T ,C_{FO},Cw and Cwp for two models of 4.0m and 2.5m length on the condision of FX.

Figure 3 shows C_T ,C_{FO},Cw and Cwp for the 2.5m length model on the condition of FR, FX and S-FR,T-FX .

Figure 4 shows the sinkage and trim of three models of 6.0m, 4.0m and 2.5m length.

Figure 5 shows C_T,C_{FO} ,Cw and Cwp of the 2.0m length model on the condition of FR and FX.

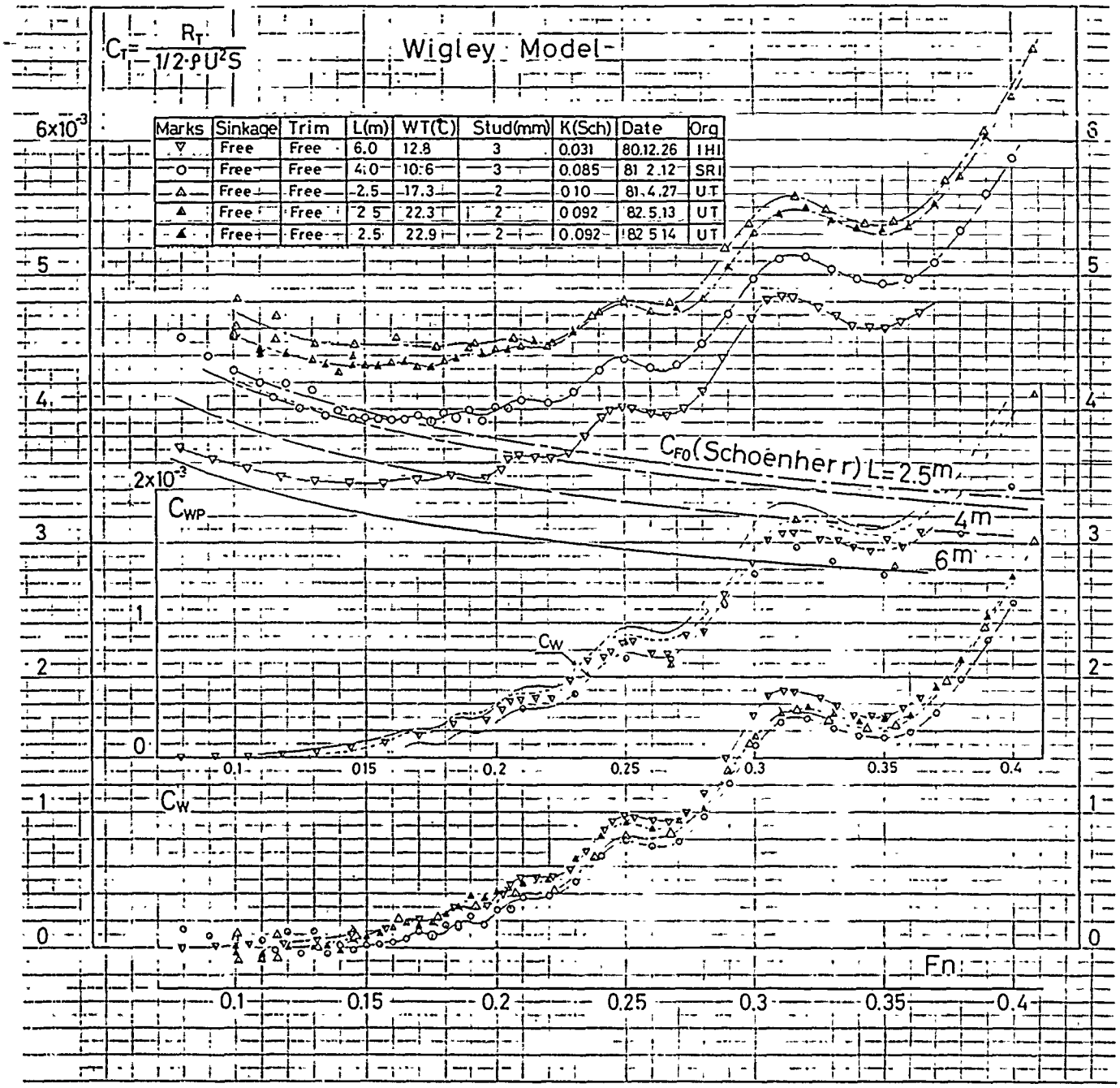
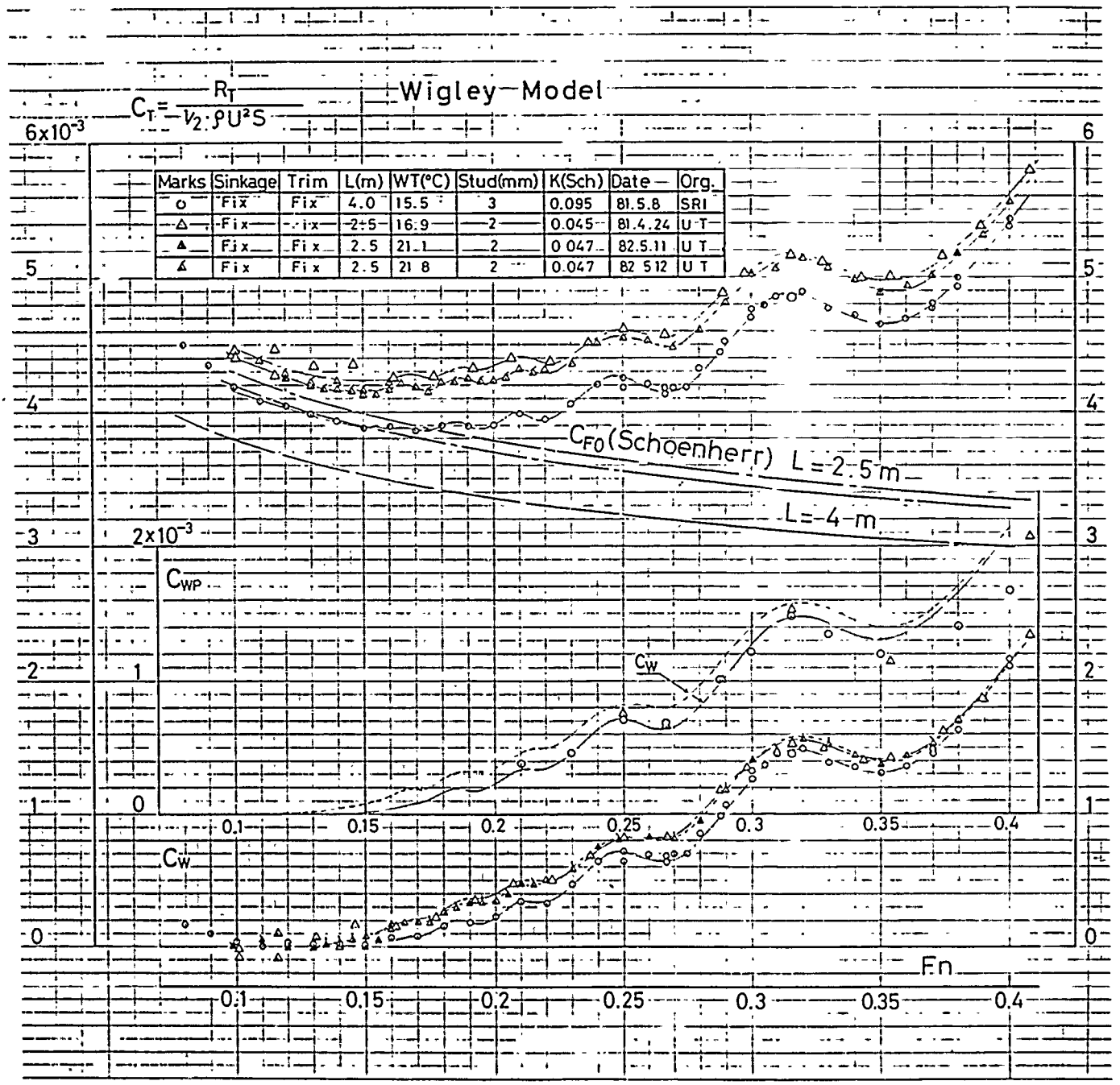


Fig.1 The results of resistance test and wave pattern analysis
(Free to sink and trim)



Marks	Sinkage	Trim	L(m)	WT(°C)	Stud(mm)	K(Sch)	Date	Org.
○	Fix	Fix	4.0	15.5	3	0.095	81.5.8	SRI
△	Fix	Fix	2.5	16.9	2	0.045	81.4.24	U-T
▲	Fix	Fix	2.5	21.1	2	0.047	82.5.11	U-T
◭	Fix	Fix	2.5	21.8	2	0.047	82.5.12	U-T

Fig.2 The results of resistance test and wave pattern analysis
(Fixed to sink and trim)

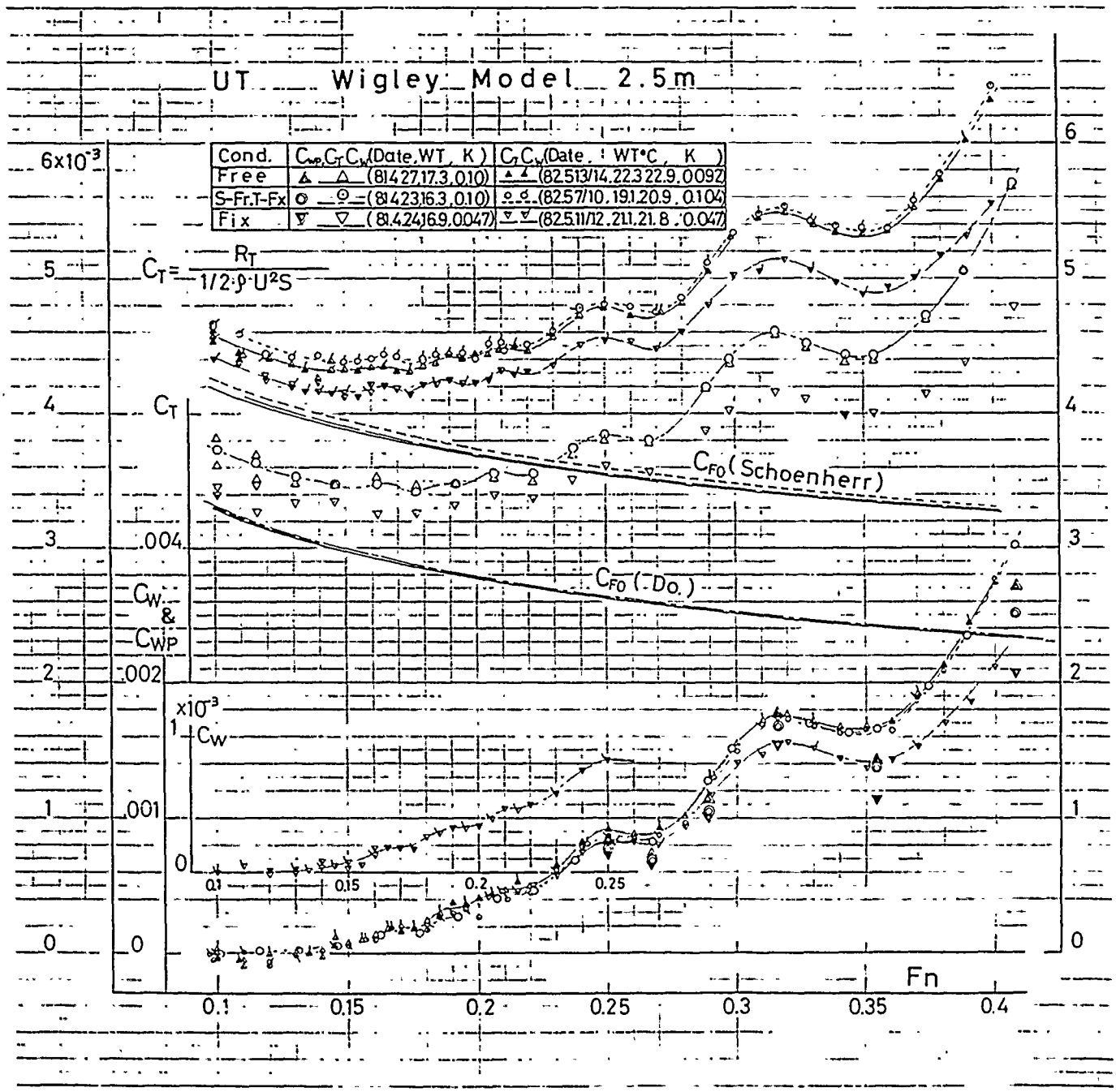


Fig.3 The results of resistance test and wave pattern analysis of 2.5m model

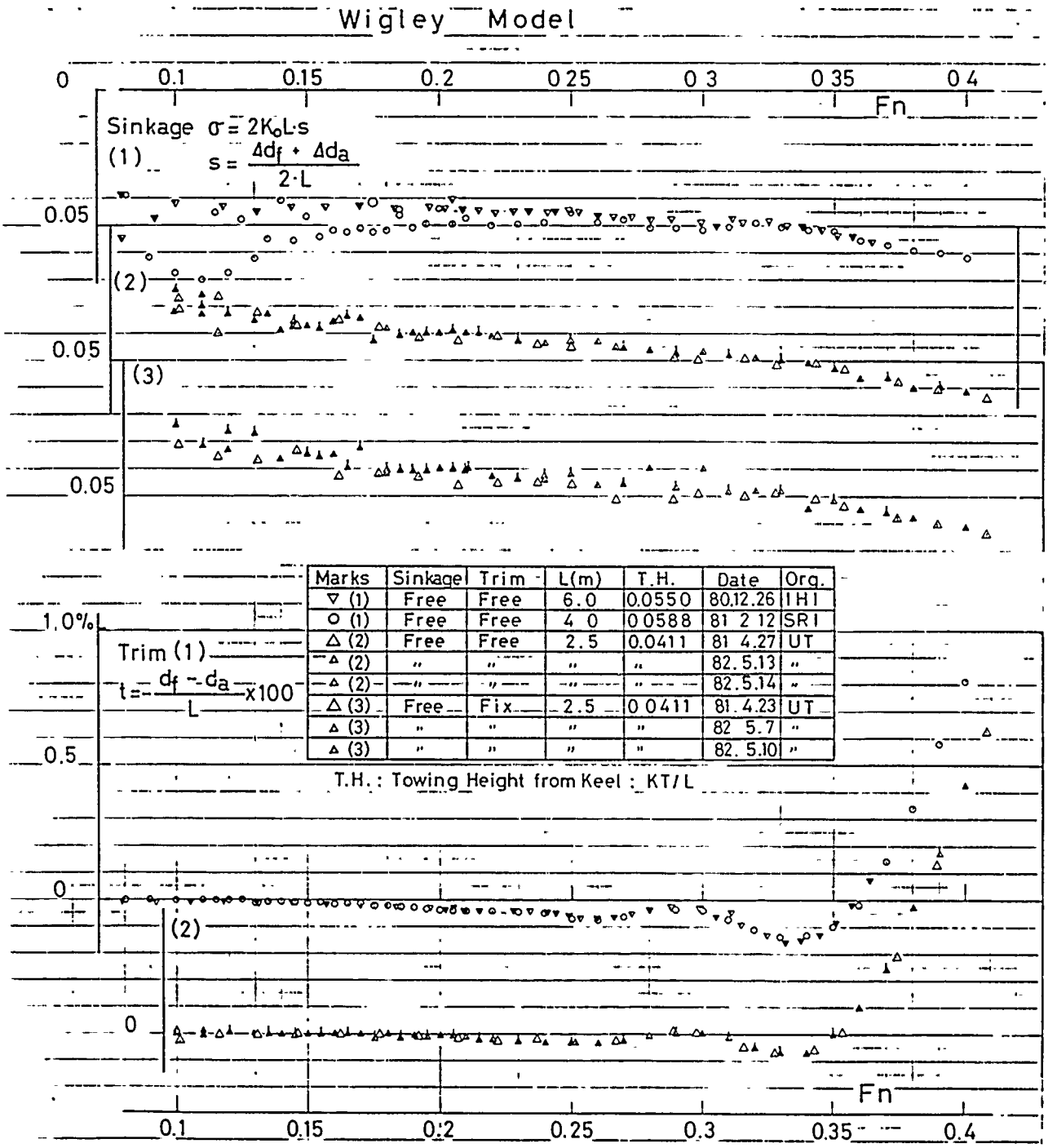


Fig.4 The results of sinkage and trim measurement

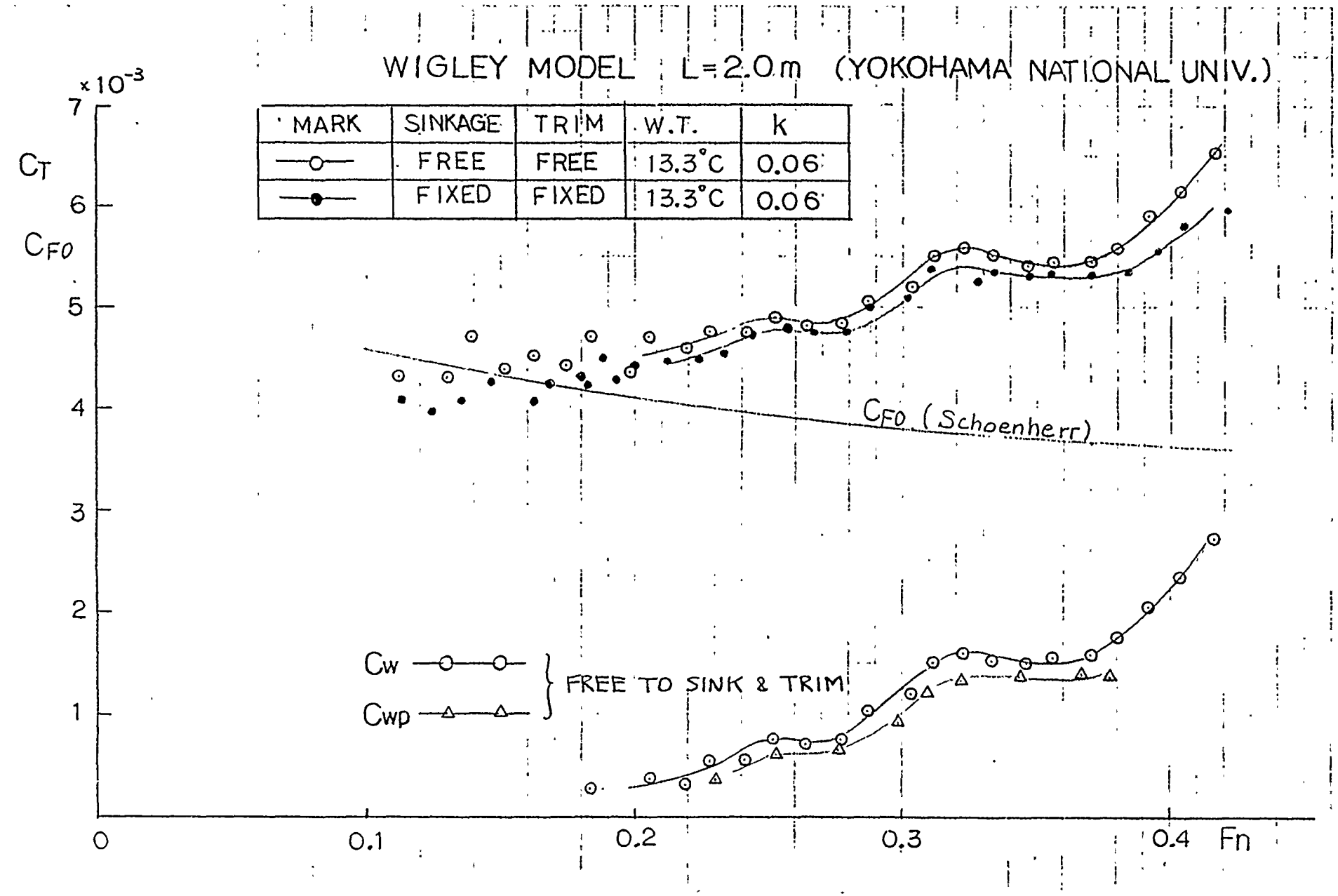


Fig.5 The results of resistance test and wave pattern analysis of 2.0m model

3. Results of wake survey

Condition of wake survey

	IHI	SRI	UT	YNU
Position of measuring section from AP (x/l)	1.0	1.0	1.0	1.0

	Froude number					Water Temp(°C)
IHI (FR)		0.267		0.316		16.6
SRI (FR)	0.250	0.267	0.289	0.316		10.6
UT (FR)	0.250	0.267	0.289	0.316		20.9
YNU (FR)	0.230	0.276	0.309	0.343	0.377	

Figure 6 shows an example of the contour of nondimensional total head loss (H -H)/H for three models of 6.0m, 4.0m and 2.5m legth on the condition of FR.

Figure 7 shows an example of comparison of horizontally integrated total head loss for three models of 6.0m, 4.0m and 2.5m length.

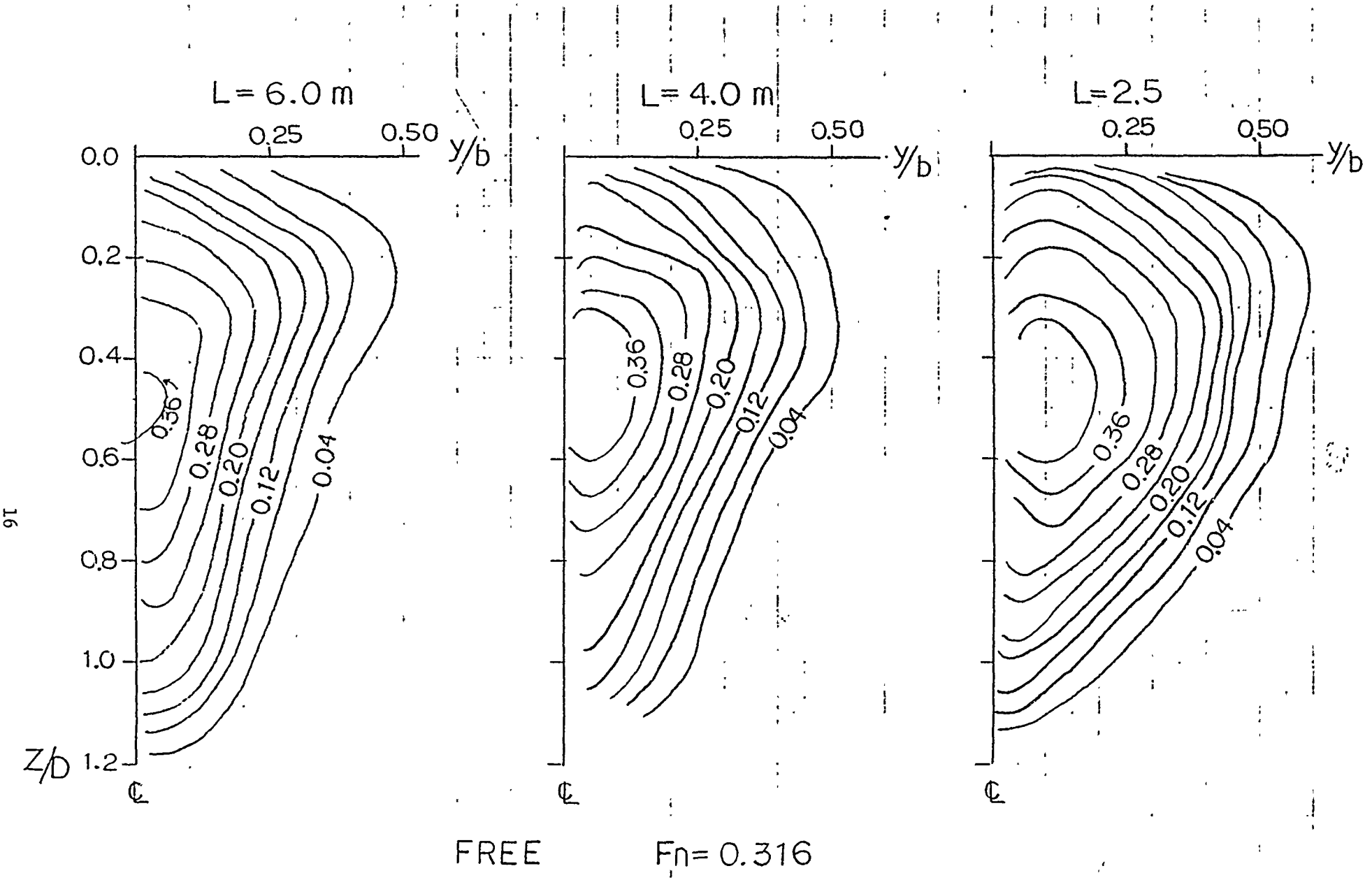


Fig.6 The contour of total head loss $(H_o - H)/H_o$

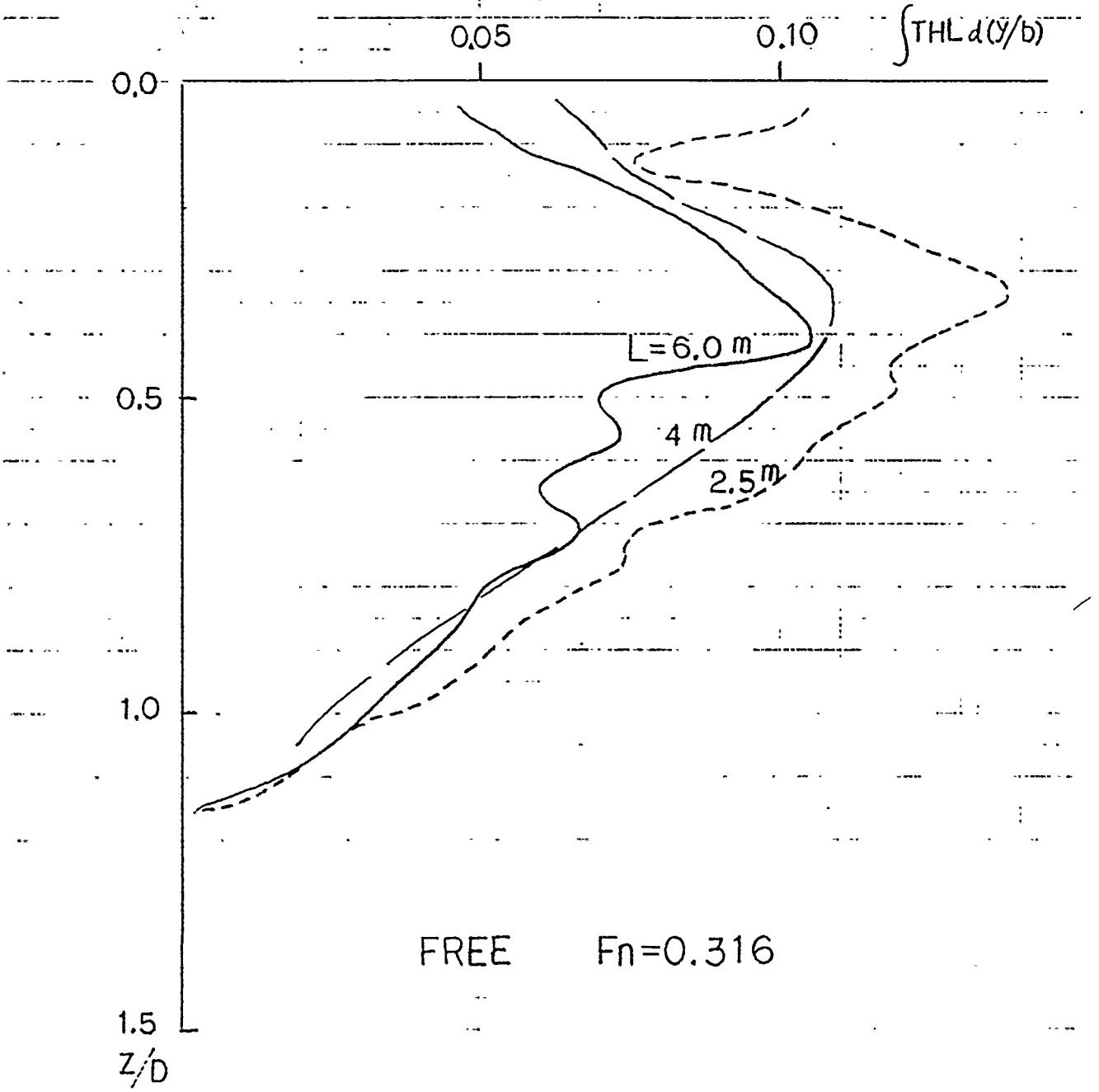


Fig.7 The comparison of horizontally integrated total head loss

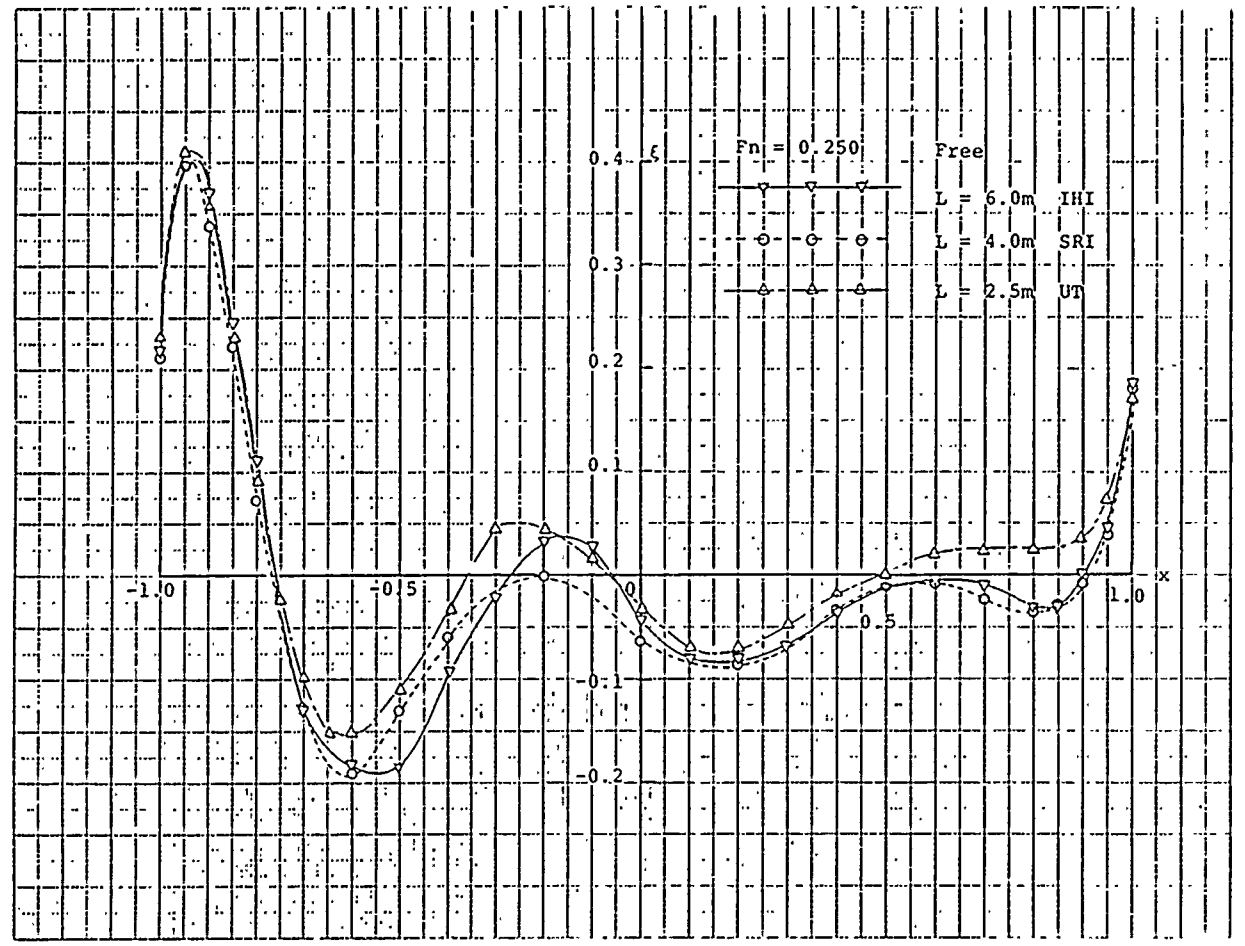
4. Results of wave profile measurement on the hull

Condition of measurements

	Froude number
IHI (FR)	0.250 0.267 0.289 0.316
SRI (FR)	0.250 0.267 0.289 0.316
SRI (FX)	0.250 0.267 0.289 0.316
UT (FR)	0.250 0.267 0.287 0.316 0.354 0.408
UT (FX)	0.250 0.267 0.289 0.316 0.354 0.408
UT(S-FR.T-FX)	0.250 0.267 0.289 0.316 0.354 0.408

Figure 8 shows the comarison of wave profile on the hull on the condition of FR, where ξ is nondimensional wave elevation (= $g\zeta(x)/U^2$)

Table 1 gives nondimensional wave elevation for three models of 6.0m ,4.0m and 2.5m length.



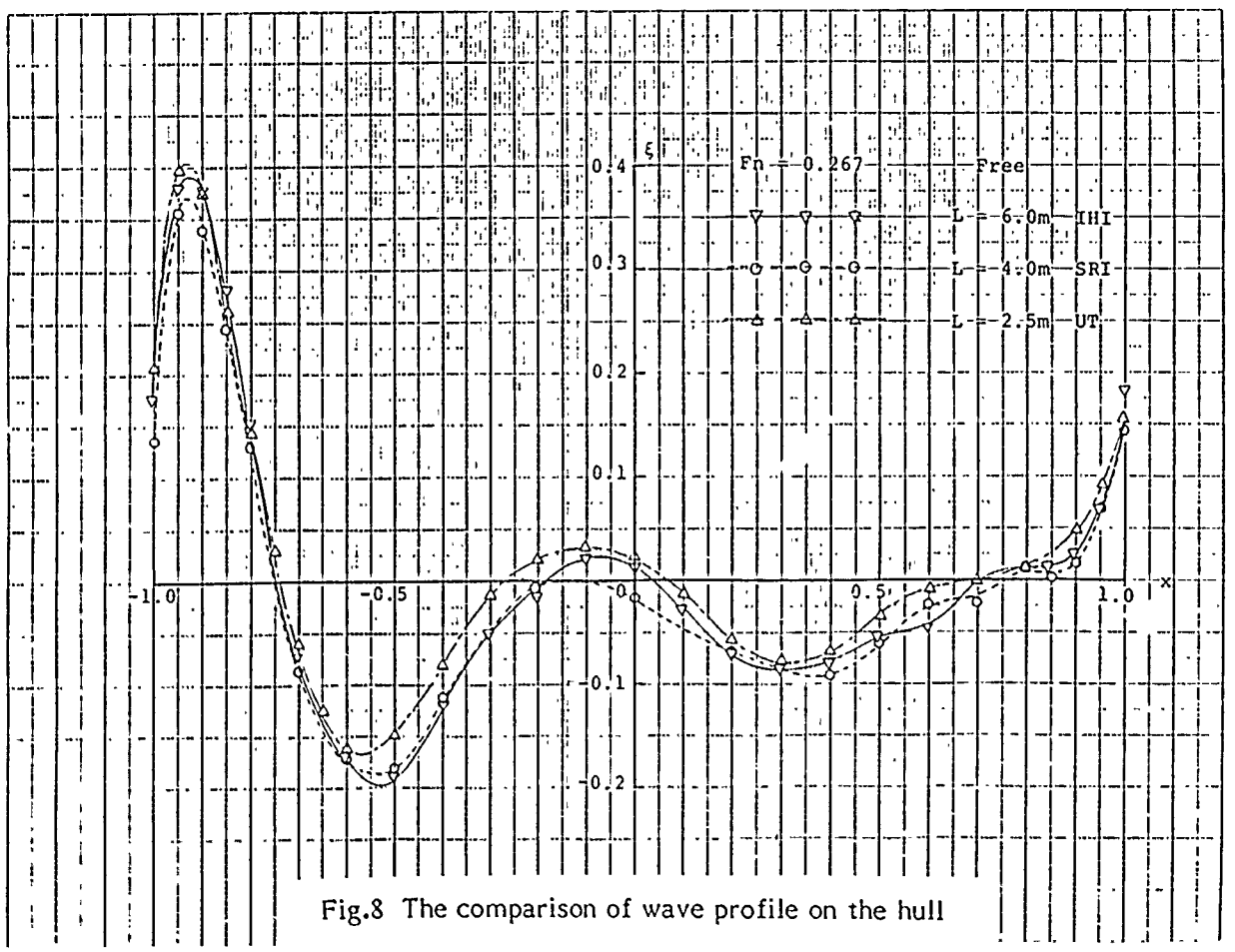
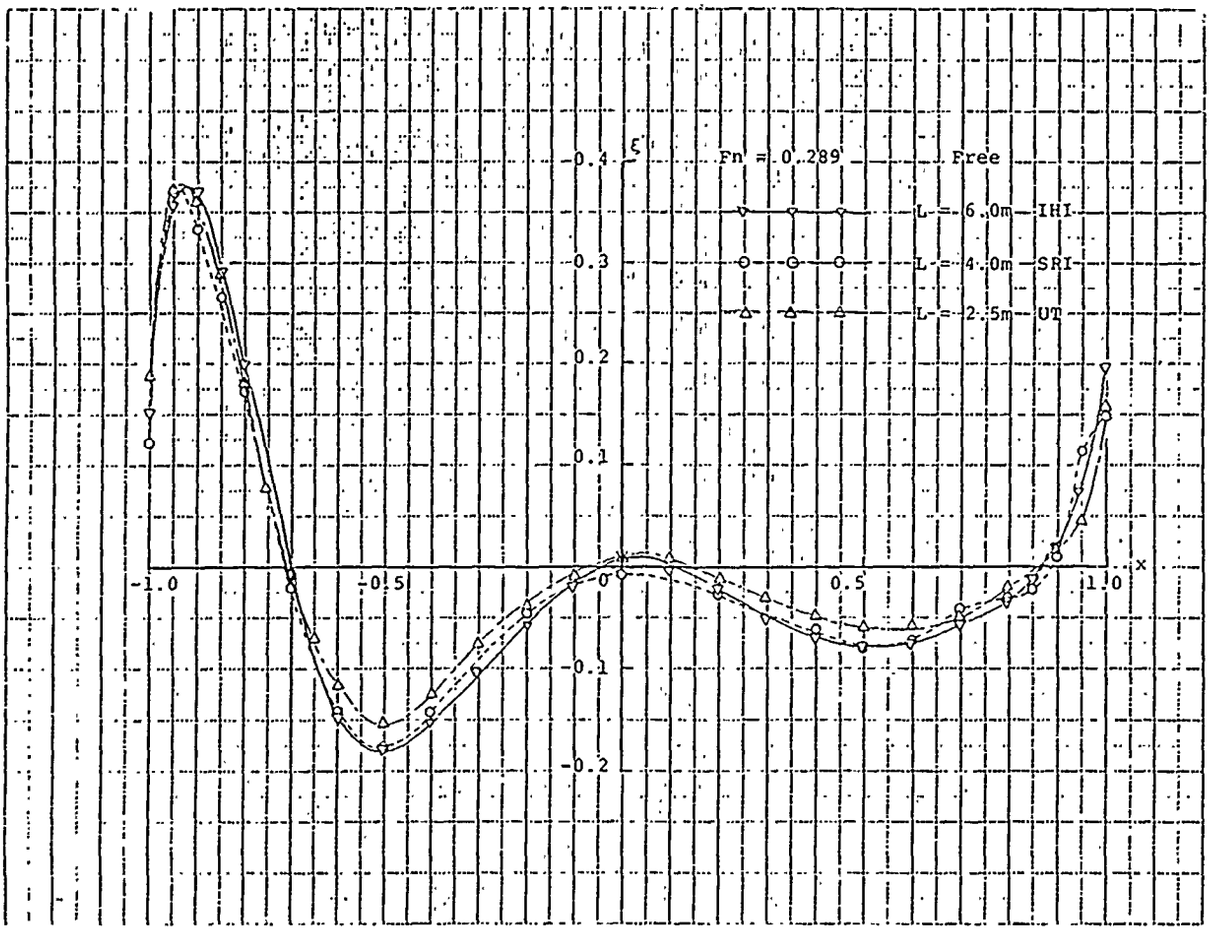


Fig.8 The comparison of wave profile on the hull



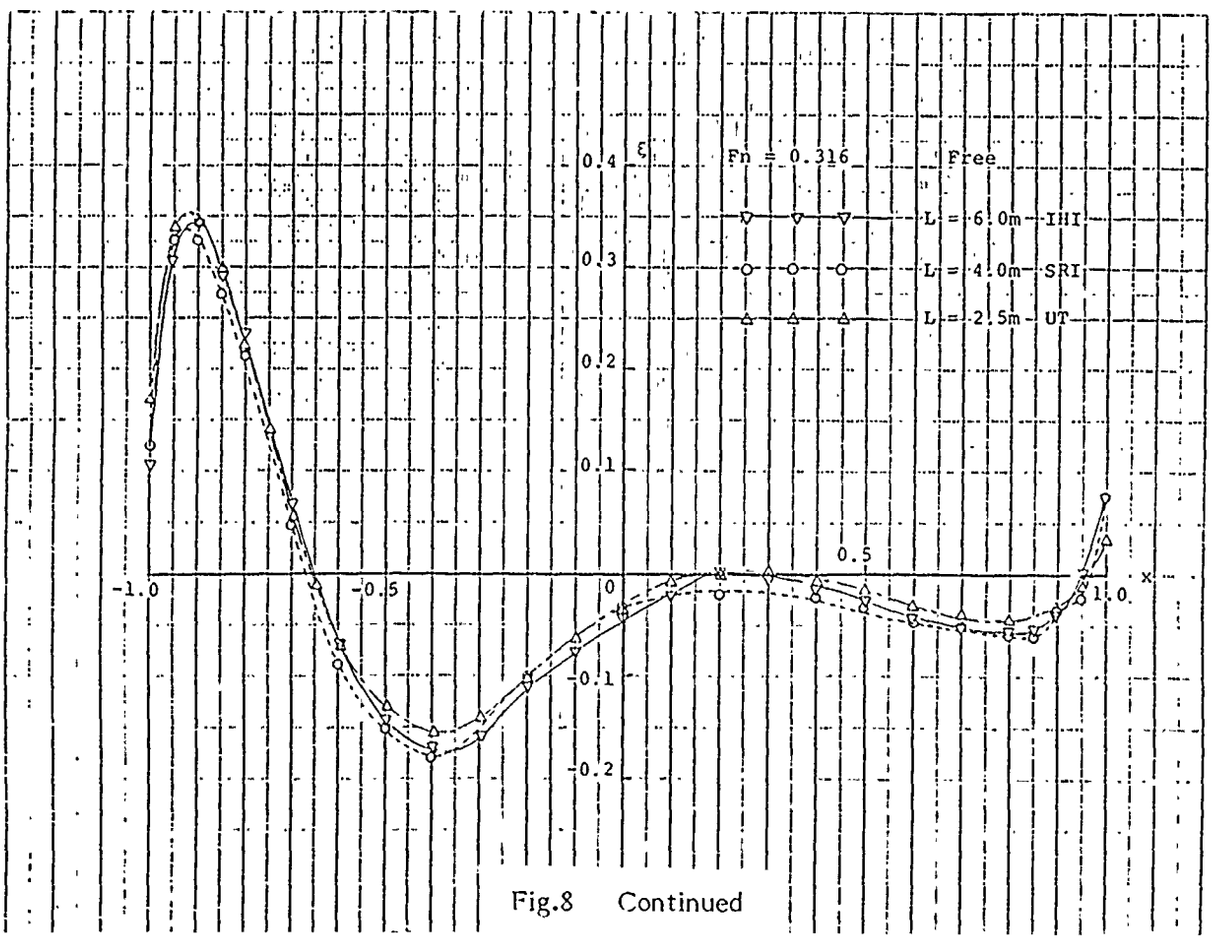


Fig.8 Continued

Table 1 The nondimensional wave elevation on the hull

	$g\zeta/U^2$ Free L=6.0m (IHI)			
2X/L	FN= .250	FN= .267	FN= .289	FN= .316
-1.000	.177	.218	.149	.109
-.950	.378	.400	.354	.306
-.900	.374	.373	.370	.343
-.850	.281	.245	.290	.294
-.800	.151	.113	.198	.237
-.700	-.077	-.131	-.010	.068
-.600	-.174	-.183	-.149	-.071
-.500	-.191	-.134	-.181	-.147
-.400	-.120	-.091	-.157	-.169
-.300	-.050	-.021	-.108	-.162
-.200	-.016	.034	-.056	-.111
-.100	.022	.024	-.020	-.080
.000	.014	-.044	.012	-.045
.100	-.027	-.081	-.003	-.021
.200	-.073	-.079	-.023	.003
.300	-.086	-.068	-.050	-.003
.400	-.080	-.035	-.070	-.015
.500	-.056	-.013	-.078	-.027
.600	-.046	-.004	-.078	-.043
.700	-.003	-.011	-.057	-.052
.800	.012	-.031	-.037	-.058
.850	.013	-.031	-.013	-.054
.900	.027	.002	.019	-.041
.950	.070	.045	.072	.007
1.000	.187	.184	.196	.077

	$g\zeta/U^2$ Free L=4.0m (SRI)			
2X/L	FN= .250	FN= .267	FN= .289	FN= .316
-1.000	.213	.137	.121	.120
-.950	.397	.355	.370	.327
-.900	.338	.340	.333	.325
-.850	.223	.245	.266	.275
-.800	.074	.130	.173	.212
-.700	-.127	-.085	-.021	.047
-.600	-.192	-.172	-.141	-.090
-.500	-.132	-.181	-.176	-.151
-.400	-.060	-.113	-.142	-.179
-.200	-.003	-.008	-.045	-.103
.000	-.064	-.017	-.038	-.022
.200	-.087	-.069	-.028	-.020
.400	-.034	-.094	-.061	-.023
.500	-.011	-.061	-.085	-.033
.600	-.008	-.023	-.074	-.049
.700	-.023	-.022	-.041	-.050
.800	-.035	.013	-.030	-.060
.850	-.029	.003	-.022	-.062
.900	-.009	.015	.011	-.035
.950	.037	.070	.113	-.023
1.000	.180	.143	.149	.076

	$g\zeta/U^2$ Fixed L=4.0m (SRI)			
2X/L	FN= .250	FN= .267	FN= .289	FN= .316
-1.000	.192	.175	.186	.155
-.950	.440	.392	.408	.340
-.900	.368	.329	.324	.330
-.850	.248	.252	.258	.278
-.800	.104	.133	.192	.228
-.700	-.136	-.070	-.036	.065
-.600	-.160	-.168	-.132	-.076
-.500	-.120	-.175	-.168	-.140
-.400	-.032	-.112	-.144	-.155
-.200	-.016	.000	-.048	-.100
.000	-.056	-.007	-.012	-.030
.200	-.090	-.070	-.024	-.005
.400	-.088	-.070	-.072	-.015
.500	-.072	-.063	-.084	-.035
.600	-.048	-.049	-.084	-.055
.700	.008	.014	-.054	-.060
.800	.016	.007	-.042	-.050
.850	.016	.007	-.024	-.050
.900	.024	.007	.006	-.045
.950	.080	.042	.084	-.030
1.000	.224	.154	.162	-.075

Table 1 Continured

	$g\zeta/U^2$ Free L=2.5 m (UT)					
2X/L	FN= .250	FN= .267	FN= .289	FN= .316	FN= .354	FN= .408
-1.000	.232	.208	.192	.170	.133	.091
-.950	.410	.399	.374	.338	.267	.232
-.900	.360	.377	.365	.346	.324	.282
-.850	.232	.265	.288	.298	.299	.274
-.800	.091	.142	.182	.227	.241	.237
-.750	-.024	.030	.077	.139	.184	.201
-.700	-.100	-.059	.000	.059	.120	.158
-.650	-.151	-.126	-.068	-.013	.062	.107
-.600	-.151	-.160	-.116	-.068	.004	.061
-.500	-.112	-.148	-.154	-.132	-.085	-.018
-.400	-.035	-.081	-.125	-.155	-.130	-.067
-.300	-.043	-.013	-.077	-.136	-.137	-.098
-.200	-.043	.021	-.039	-.107	-.130	-.123
-.100	-.018	.032	-.012	-.066	-.117	-.125
.000	-.032	.022	.009	-.034	-.098	-.126
.100	-.070	-.012	.009	-.009	-.073	-.119
.200	-.070	-.056	-.011	-.001	-.047	-.110
.300	-.044	-.078	-.030	.000	-.028	-.098
.400	-.017	-.067	-.049	-.008	-.015	-.080
.500	-.009	-.033	-.059	-.015	-.006	-.067
.600	-.022	-.010	-.059	-.031	-.002	-.059
.700	-.023	.002	-.050	-.038	-.002	-.056
.800	-.023	.013	-.021	-.046	-.009	-.048
.900	-.037	.047	.021	-.029	-.015	-.025
.950	.075	.092	.046	-.013	.010	.000
1.000	.178	.160	.161	.035	.029	.025

	$g\zeta/U^2$ Fixed L=2.5 m (UT)					
2X/L	FN= .250	FN= .267	FN= .289	FN= .316	FN= .354	FN= .408
-1.000	.307	.246	.192	.160	.128	.086
-.950	.397	.358	.326	.312	.256	.235
-.900	.346	.336	.346	.328	.307	.288
-.850	.218	.224	.259	.264	.269	.274
-.800	.077	.101	.163	.192	.218	.230
-.750	-.064	-.011	.058	.104	.154	.187
-.700	-.141	-.090	-.019	.024	.090	.139
-.650	-.179	-.146	-.086	-.032	.032	.086
-.600	-.179	-.168	-.134	-.088	-.026	.043
-.500	-.128	-.157	-.163	-.144	-.102	-.029
-.400	-.051	-.112	-.144	-.160	-.141	-.086
-.300	.026	-.045	-.096	-.136	-.141	-.105
-.200	.013	-.011	-.058	-.104	-.134	-.115
-.100	-.026	.000	-.019	-.072	-.115	-.120
.000	-.077	-.022	-.010	-.048	-.096	-.120
.100	-.102	-.056	-.010	-.028	-.077	-.110
.200	-.090	-.078	-.029	-.016	-.058	-.096
.300	-.064	-.090	-.048	-.012	-.038	-.082
.400	-.026	-.078	-.058	-.016	-.026	-.072
.500	-.013	-.056	-.067	-.032	-.013	-.062
.600	.000	-.034	-.058	-.048	-.013	-.055
.700	-.013	-.011	-.048	-.056	-.019	-.043
.800	-.013	.000	-.019	-.064	-.026	-.029
.900	.000	.011	.019	-.040	-.013	-.014
.950	.026	.056	.048	-.016	.000	-.005
1.000	.141	.157	.125	.024	.038	.034

	$g\zeta/U^2$ FR-sink,FX-trim L=2.5 m (UT)					
2X/L	FN= .250	FN= .267	FN= .289	FN= .316	FN= .354	FN= .408
-1.000	.236	.206	.188	.174	.132	.088
-.950	.415	.396	.361	.342	.266	.231
-.900	.364	.374	.351	.350	.324	.289
-.850	.223	.261	.275	.286	.292	.283
-.800	.082	.128	.169	.206	.241	.264
-.750	-.033	.016	.063	.126	.177	.220
-.700	-.110	-.063	-.013	.046	.113	.167
-.650	-.174	-.141	-.081	-.026	.055	.114
-.600	-.174	-.163	-.138	-.074	-.003	.070
-.500	-.123	-.152	-.157	-.138	-.086	-.012
-.400	-.033	-.096	-.138	-.154	-.137	-.075
-.300	.031	-.029	-.090	-.138	-.137	-.115
-.200	.044	.016	-.042	-.108	-.131	-.125
-.100	.018	.027	.006	-.066	.118	-.131
.000	-.046	.016	.015	-.034	-.105	-.125
.100	-.085	-.029	.015	-.010	-.079	-.118
.200	-.085	-.074	.006	-.002	-.054	-.109
.300	-.046	-.074	-.004	-.002	-.035	-.095
.400	-.020	-.063	-.013	-.010	-.015	-.077
.500	.005	-.040	-.033	-.018	-.003	-.059
.600	.031	-.018	-.033	-.034	-.003	-.045
.700	.031	.004	-.023	-.042	.004	-.036
.800	.018	.016	-.004	-.042	-.003	-.027
.900	.031	.038	.025	-.034	.004	-.019
.950	.056	.072	.063	-.010	.017	.010
1.000	.184	.184	.159	.022	.055	.029

5. Results of pressure measurement on the hull surface

Condition of pressure measurements

	Froude number
IHI (FR)	0.104 0.250 0.267 0.289 0.316
SRI (FR)	0.250 0.267 0.289 0.316
UT (FR)	0.250 0.267 0.289 0.316
UT (FX)	0.250 0.267 0.289 0.316

Pressure resistance coefficient

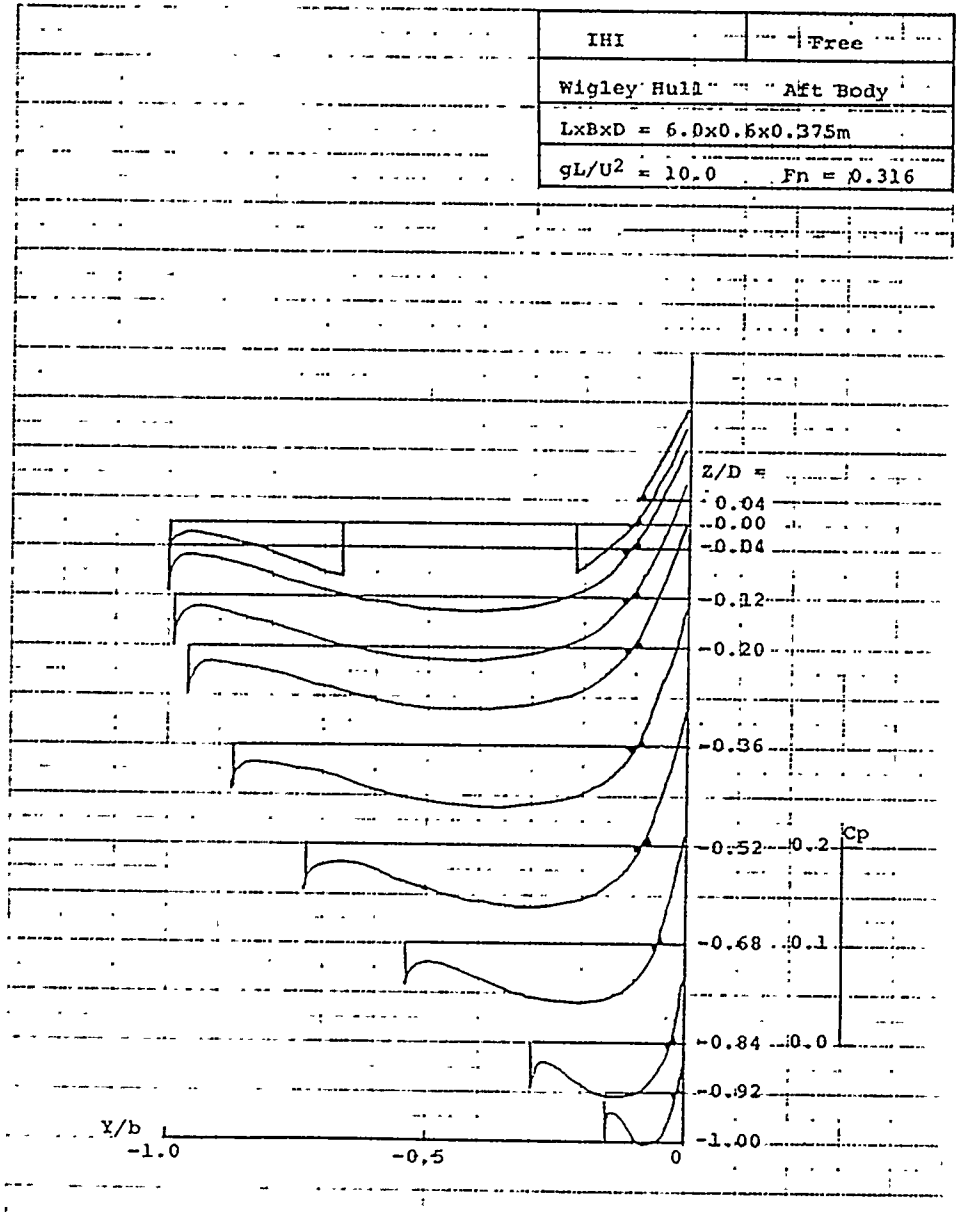
$$C_{PR} = Rp/(\frac{1}{2} \rho U^2 S)$$

	IHI	SRI	UT	
Fn	FR	FR	FR	FX
0.250	0.891×10^{-3}	1.150×10^{-3}	0.878×10^{-3}	0.941 10
0.267	0.916	0.979	0.920	0.827
0.289	1.280	1.374	1.318	1.221
0.316	1.803	1.998	1.866	1.786

Figures 9 through 11 show examples of the pressure distributions on the hull surface projected on the midship section for three models of 6.0m, 4.0m and 2.5m length on the condition of FR.

Figure 12 shows the comparison of horizontally integrated pressure for three models of 6.0m, 4.0m, and 2.5m length on the condition of FR.

Tables 2 through 5 give the pressure coefficient on the hull surface.



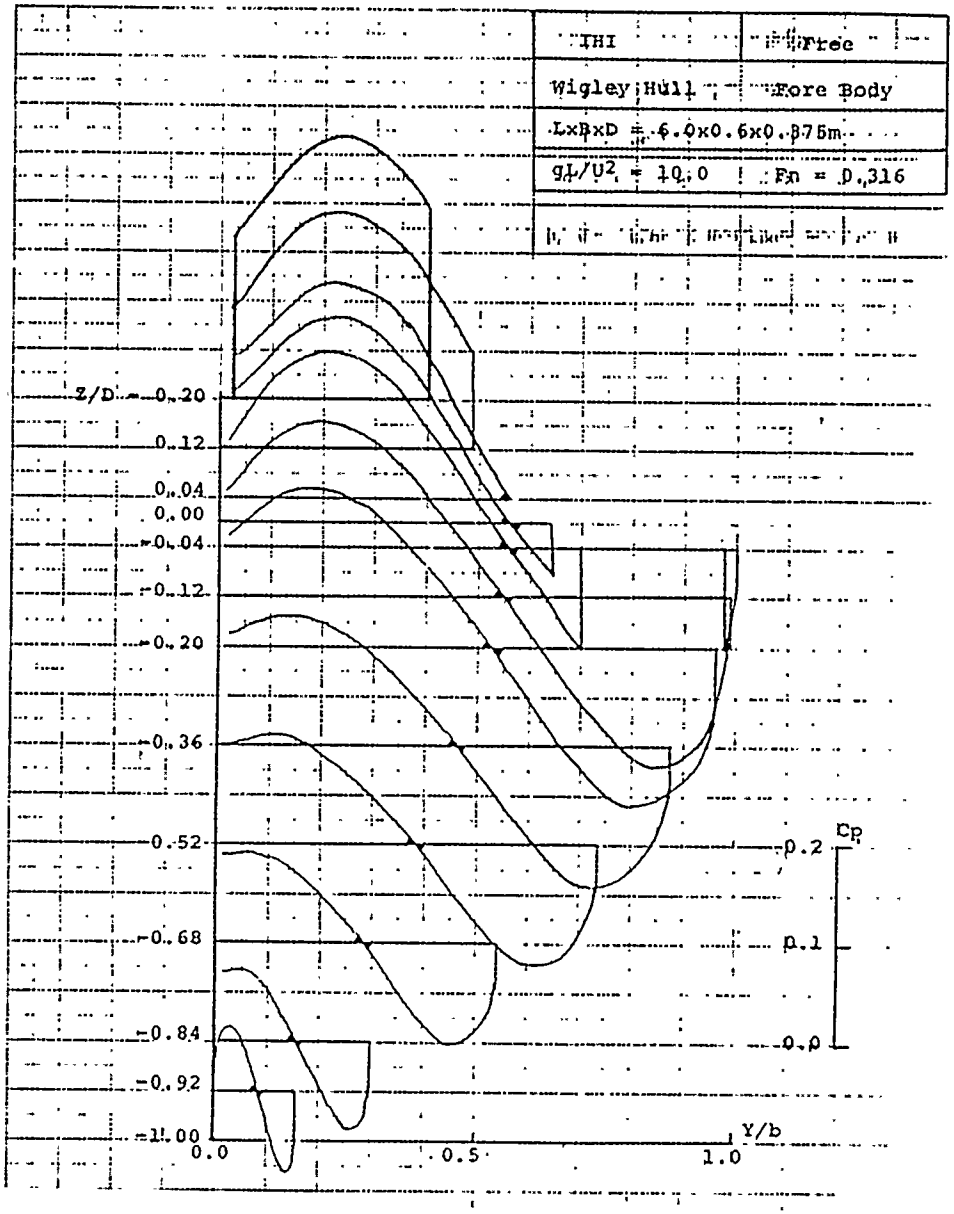


Fig.9 The pressure distribution on the hull of 6.0m model

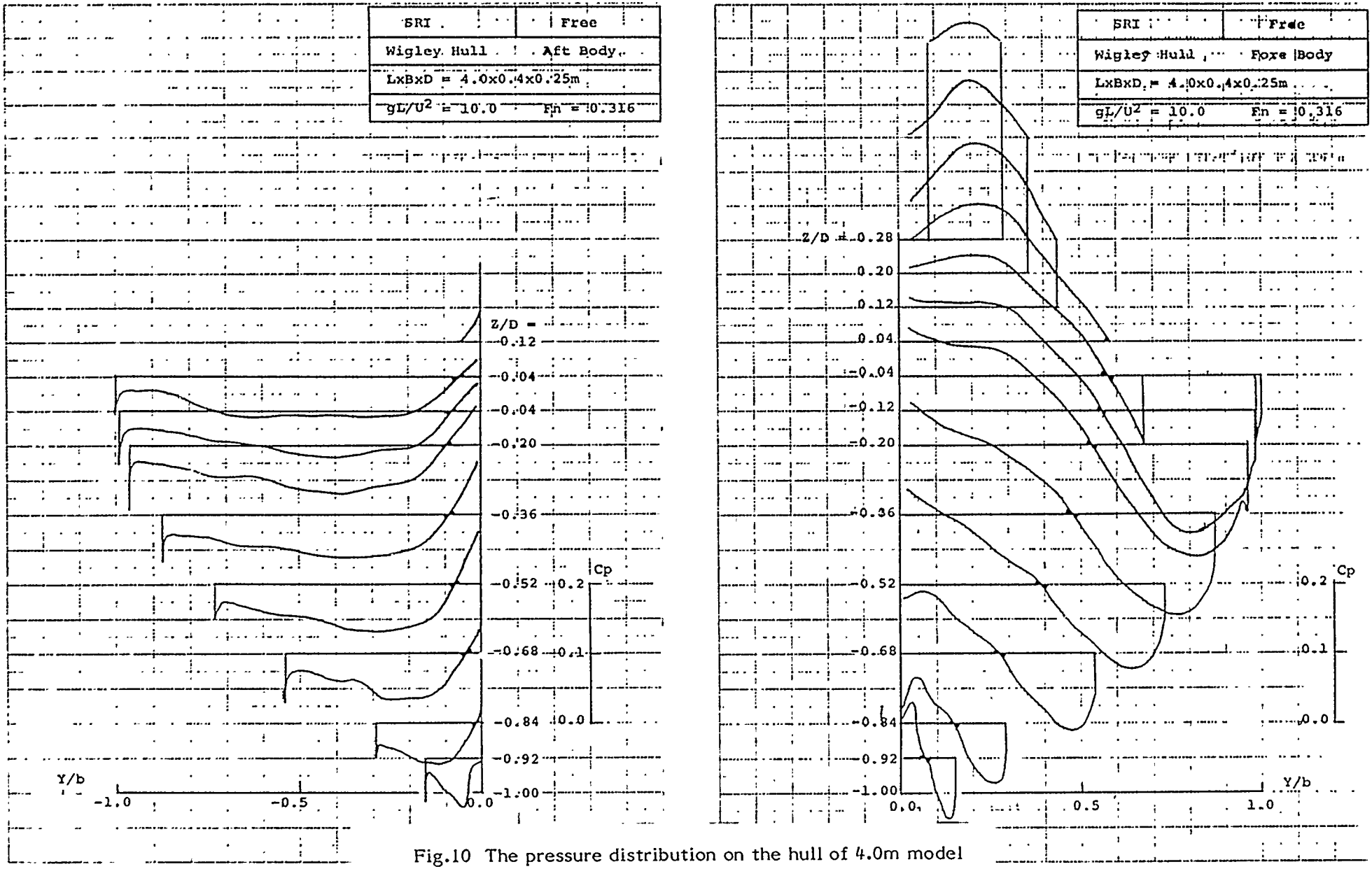
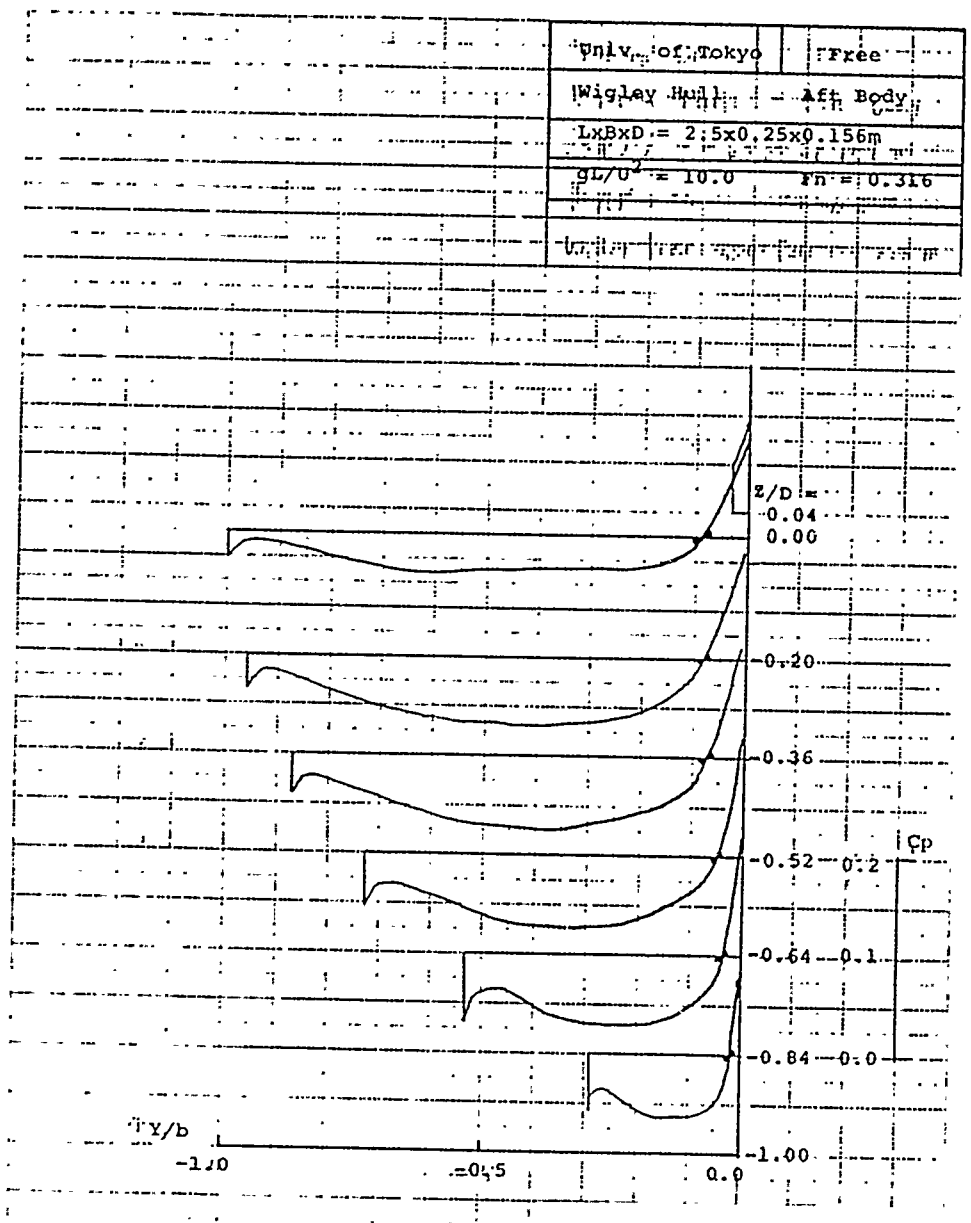


Fig.10 The pressure distribution on the hull of 4.0m model



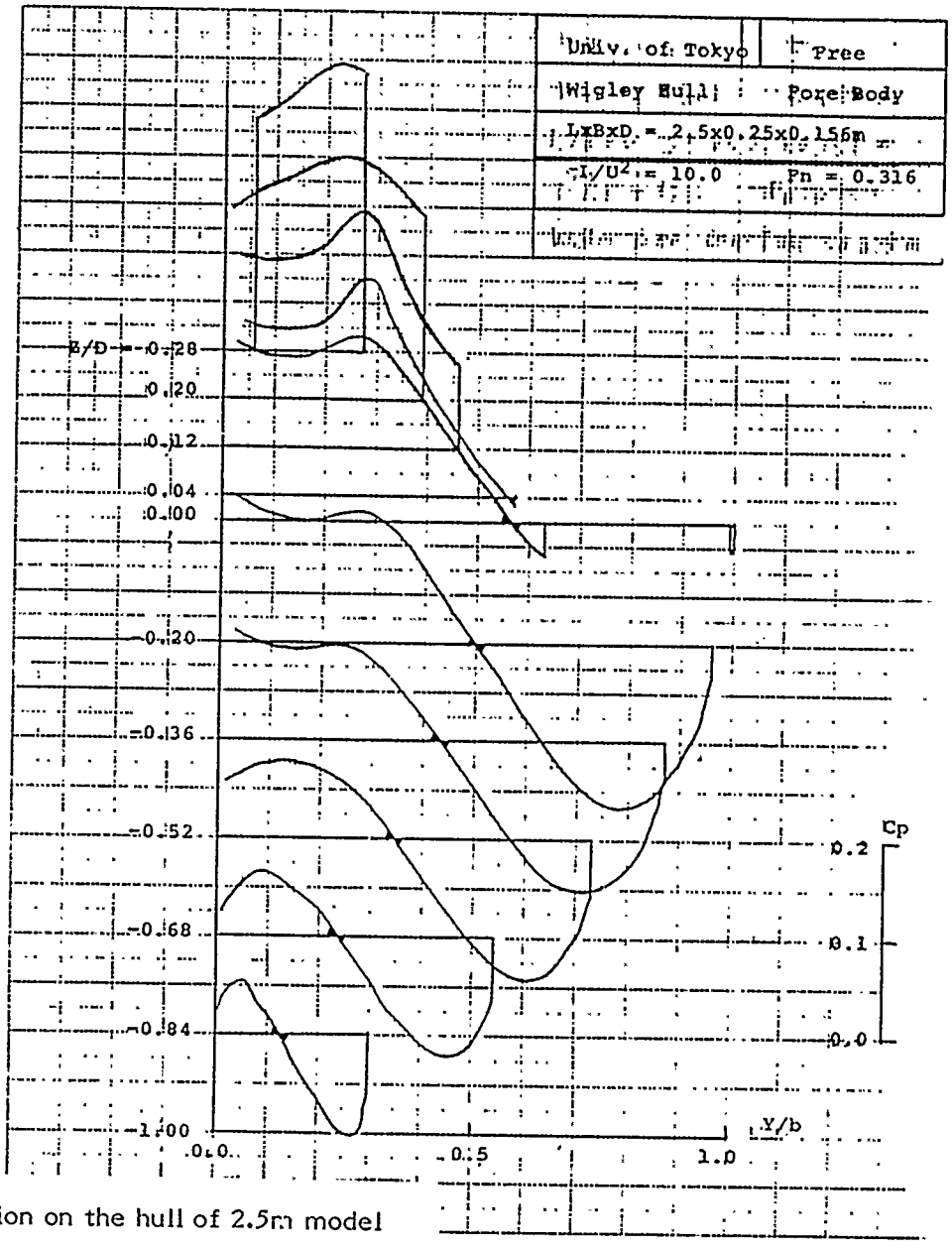
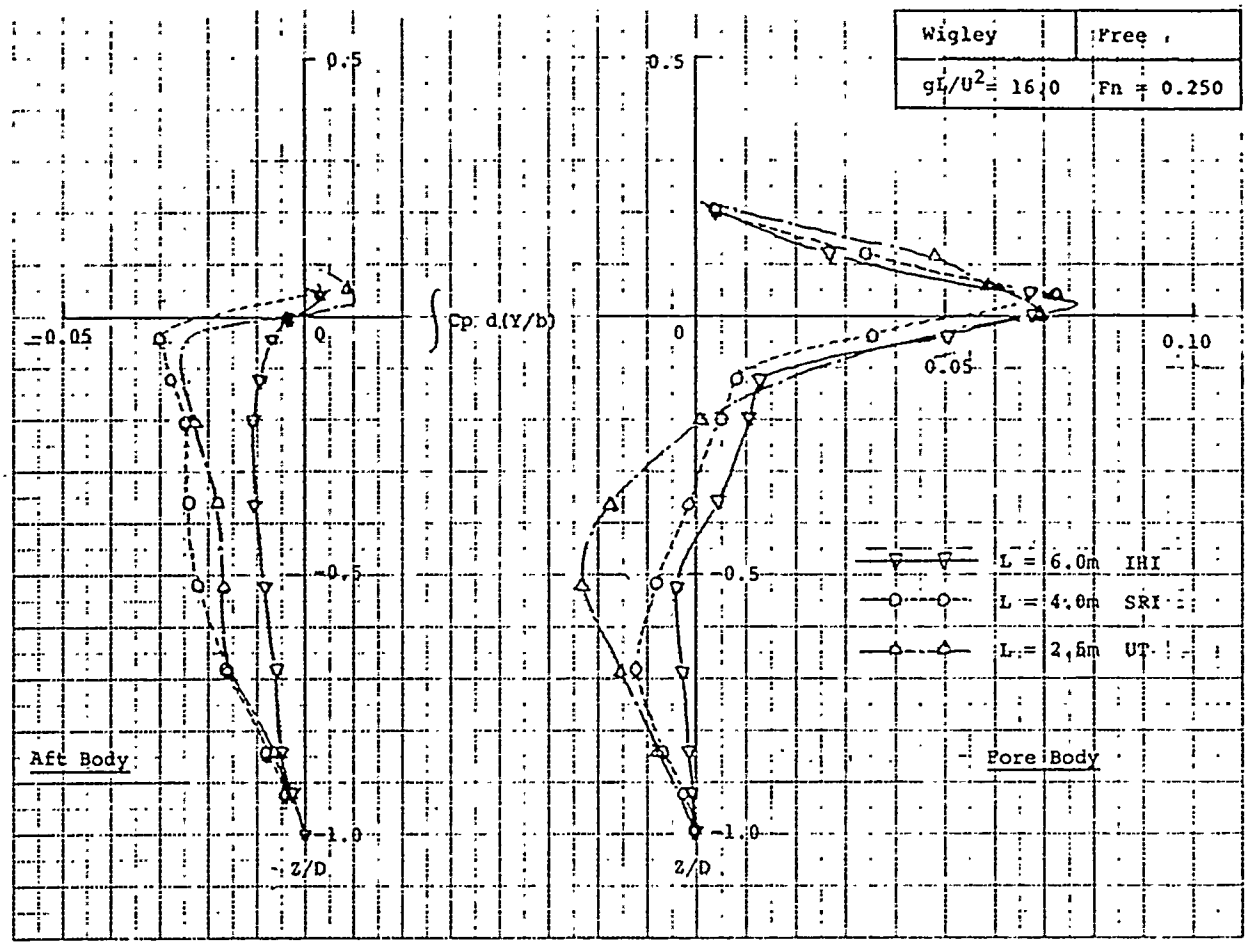


Fig.11 The pressure distribution on the hull of 2.5m model



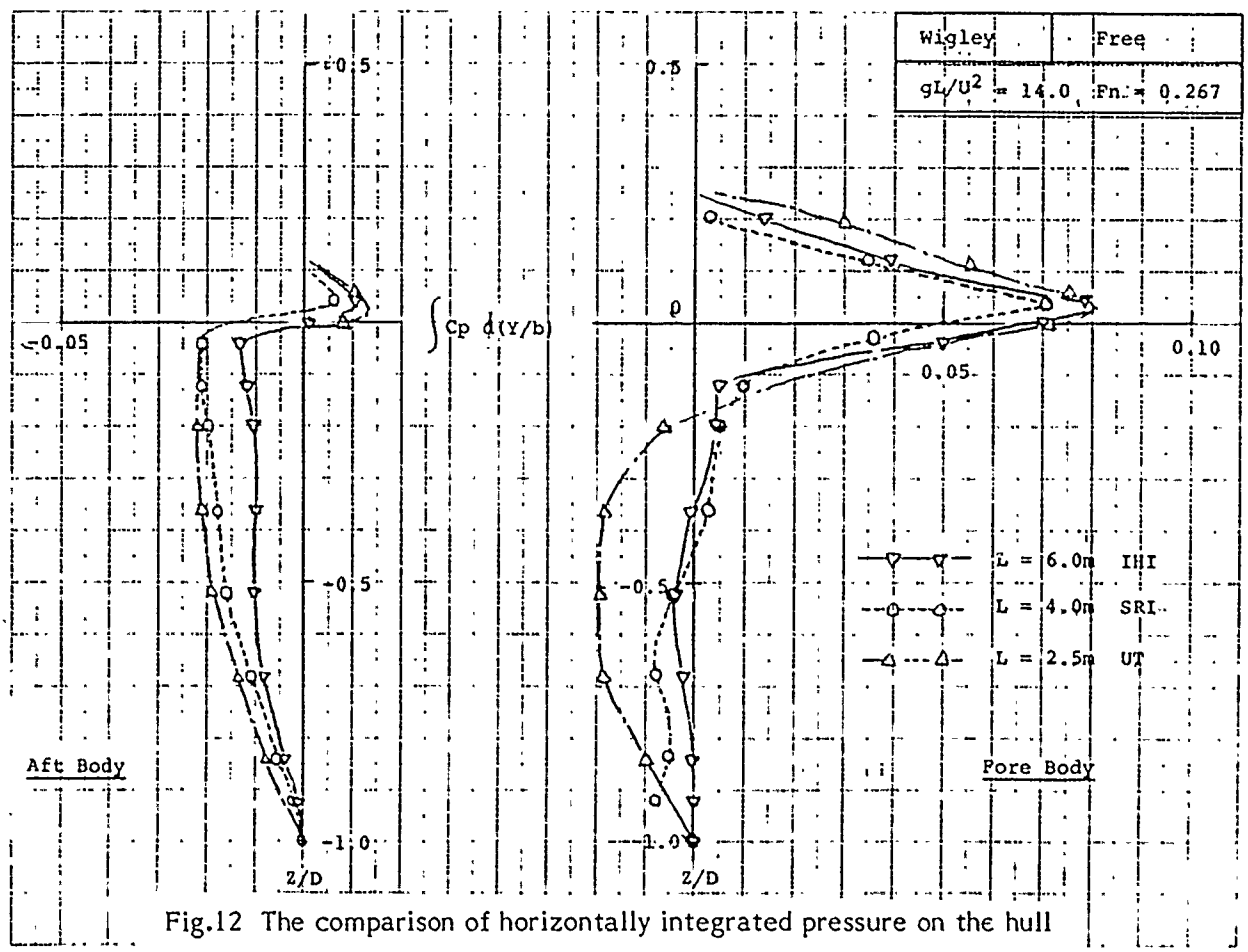
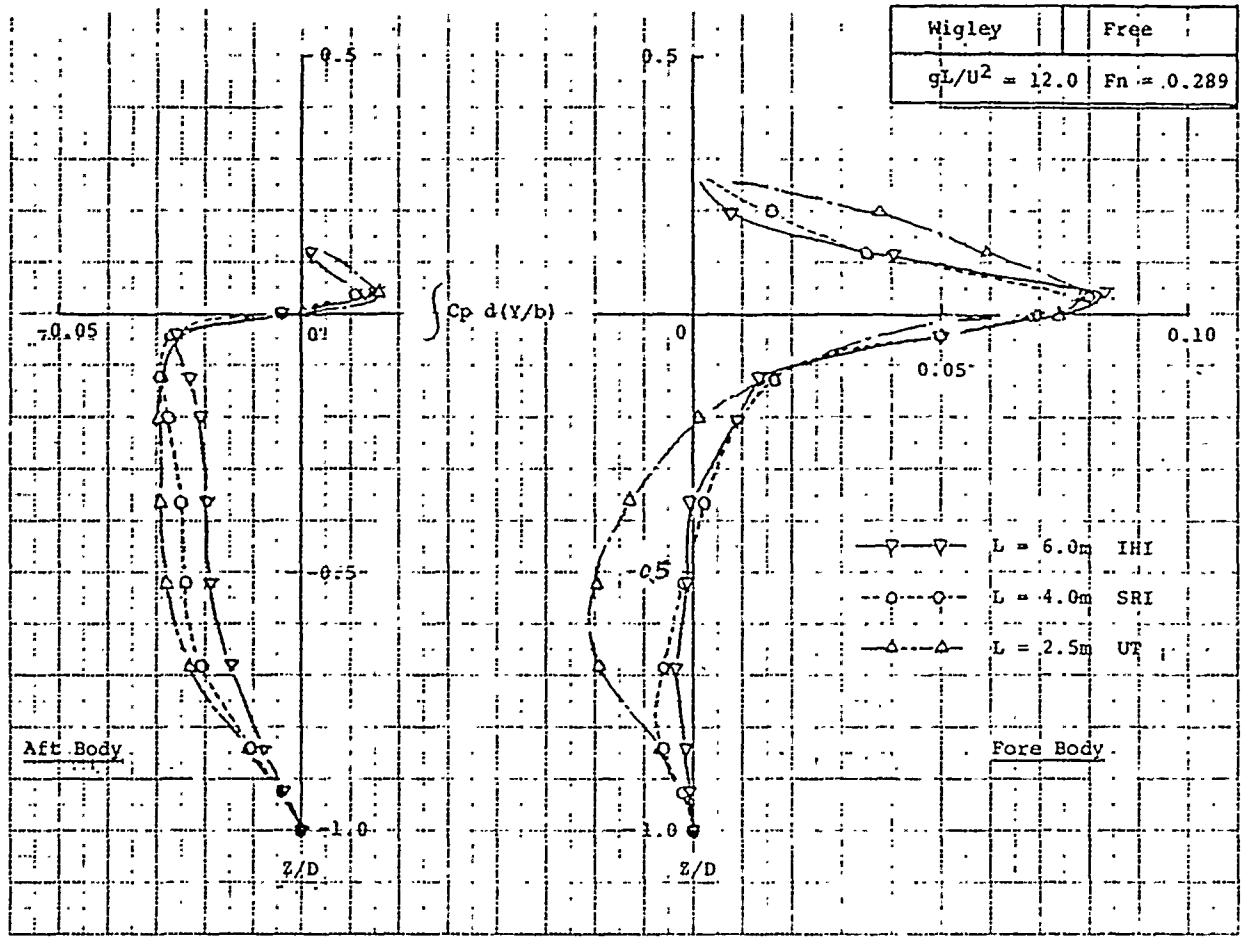


Fig.12 The comparison of horizontally integrated pressure on the hull



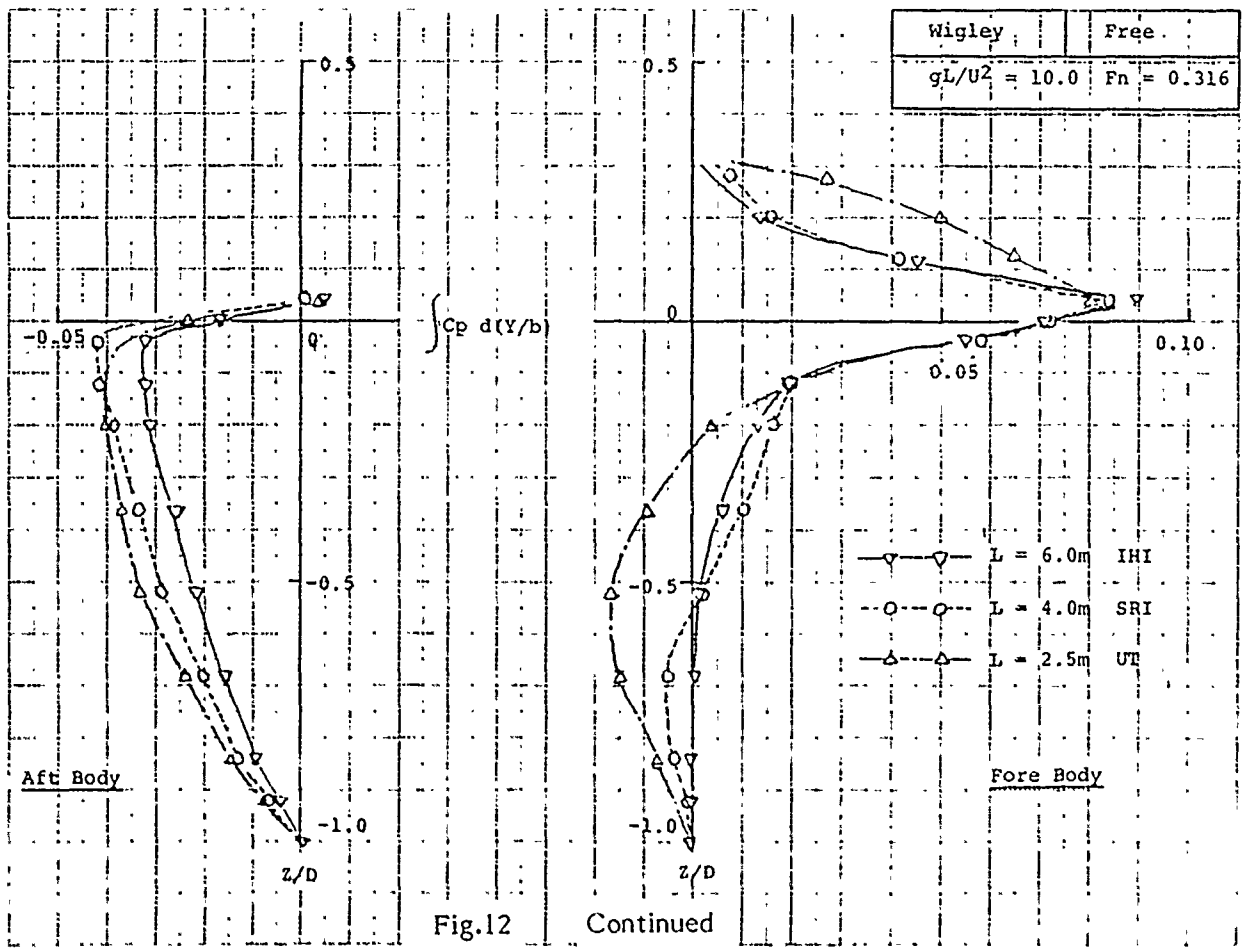


Fig.12 Continued

Table 2 The pressure coefficient on the hull of 6.0m model (FR)

Fn = 0.104 Free L=6.0 m (IHI)

ST.	10.000	9.750	9.500	9.250	9.000	8.500	8.000	7.500	7.000	6.000	5.500	5.000
2X/L	-1.000	-.950	-.900	-.850	-.800	-.700	-.600	-.500	-.400	-.200	-.100	.000
Z/D												
.000	.000	.139	.113	.026	.000	-.014	-.009	-.046	.000	.000	.000	.000
-.040	.959	.135	.100	.022	-.046	-.017	-.014	-.046	-.084	-.046	-.052	-.054
-.120	.968	.126	.077	.014	-.034	-.023	-.024	-.047	-.063	-.046	-.054	-.060
-.200	.976	.117	.058	.008	-.026	-.029	-.033	-.048	-.051	-.046	-.053	-.063
-.360	.987	.098	.035	-.001	-.021	-.038	-.045	-.048	-.046	-.044	-.046	-.060
-.520	.992	.077	.026	-.003	-.022	-.042	-.048	-.047	-.044	-.041	-.040	-.052
-.680	.994	.061	.022	-.004	-.021	-.041	-.045	-.044	-.041	-.036	-.037	-.041
-.840	.994	.049	.020	-.005	-.018	-.035	-.039	-.039	-.036	-.033	-.034	-.038
-.920	.000	.044	.019	-.014	-.016	-.032	-.035	-.035	-.034	-.033	-.033	-.036
-1.000	.000	.040	.018	-.004	-.015	-.028	-.030	-.030	-.031	-.034	-.031	-.037
DIPPING	.0016	.0016	.0016	.0016	.0016	.0015	.0015	.0015	.0015	.0014	.0014	.0014

ST.	5.000	4.500	4.000	3.000	2.500	2.000	1.500	1.000	.750	.500	.250	.000
2X/L	.000	.100	.200	.400	.500	.600	.700	.800	.850	.900	.950	1.000
Z/D												
.000	.000	.000	.000	-.037	-.046	.000	.000	-.018	-.001	.030	.083	.159
-.040	-.054	-.055	-.056	-.039	-.045	-.044	-.039	-.017	.001	.031	.083	.157
-.120	-.060	-.057	-.056	-.044	-.044	-.043	-.034	-.015	.004	.035	.084	.155
-.200	-.063	-.058	-.055	-.048	-.045	-.043	-.033	-.013	.005	.036	.084	.153
-.360	-.060	-.057	-.048	-.053	-.048	-.044	-.033	-.012	.003	.030	.080	.151
-.520	-.052	-.054	-.044	-.053	-.052	-.046	-.035	-.018	-.007	.018	.070	.147
-.680	-.041	-.052	-.038	-.049	-.049	-.044	-.036	-.024	-.014	.007	.054	.127
-.840	-.038	-.047	-.034	-.043	-.044	-.041	-.034	-.023	-.012	.004	.034	.083
-.920	-.036	-.044	-.032	-.039	-.043	-.039	-.033	-.022	-.009	.004	.024	.054
-1.000	-.037	-.042	-.031	-.034	-.038	-.038	-.032	-.018	-.007	.006	.016	.021
DIPPING	.0014	.0014	.0013	.0013	.0013	.0012	.0012	.0012	.0012	.0012	.0012	.0011

Fn = 0.250 Free L=6.0 m (IHI)

ST.	10.000	9.750	9.500	9.250	9.000	8.500	8.000	7.500	7.000	6.000	5.500	5.000
2X/L	-1.000	-.950	-.900	-.850	-.800	-.700	-.600	-.500	-.400	-.200	-.100	.000
Z/D												
.200	.000	.000	.372	.000	.000	.000	.000	.000	.000	.000	.000	.000
.120	.000	.266	.325	.239	.000	.000	.000	.000	.000	.000	.000	.000
.040	.000	.243	.283	.213	.097	.000	.000	.000	.000	.000	.000	.000
.000	.974	.233	.264	.200	.090	.000	.000	.000	.000	.012	-.007	.000
-.040	.979	.224	.246	.188	.083	-.097	.000	.000	-.080	.011	-.009	-.065
-.120	.986	.205	.216	.165	.071	-.091	-.168	-.153	-.057	.008	-.014	-.068
-.200	.991	.188	.189	.144	.059	-.086	-.158	-.144	-.059	.006	-.018	-.068
-.360	.997	.158	.147	.107	.039	-.077	-.139	-.124	-.055	.001	-.023	-.061
-.520	.998	.130	.116	.077	.024	-.068	-.119	-.101	-.061	-.005	-.026	-.052
-.680	.998	.105	.093	.054	.014	-.058	-.099	-.092	-.058	-.012	-.027	-.045
-.840	.999	.082	.076	.040	.009	-.046	-.079	-.071	-.052	-.019	-.027	-.041
-.920	.000	.071	.069	.036	.008	-.039	-.070	-.068	-.047	-.023	-.028	-.040
-1.000	.000	.061	.063	.034	.006	-.034	-.061	-.065	-.046	-.027	-.028	-.040
DIPPING	.0101	.0100	.0100	.0099	.0098	.0096	.0094	.0092	.0090	.0087	.0085	.0083

ST.	5.000	4.500	4.000	3.000	2.500	2.000	1.500	1.000	.750	.500	.250	.000
2X/L	.000	.100	.200	.400	.500	.600	.700	.800	.850	.900	.950	1.000
Z/D												
.200	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
.120	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
.040	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.176
.000	.000	.000	-.032	-.022	-.022	-.013	-.029	.000	-.029	-.011	.038	.174
-.040	-.065	-.100	-.034	-.027	-.020	-.012	-.026	-.035	-.026	-.028	.042	.173
-.120	-.068	-.095	-.037	-.034	-.019	-.013	-.022	-.029	-.023	-.005	.048	.173
-.200	-.068	-.090	-.040	-.040	-.020	-.016	-.021	-.026	-.022	-.004	.053	.174
-.360	-.061	-.079	-.045	-.046	-.028	-.024	-.026	-.027	-.023	-.006	.054	.177
-.520	-.052	-.067	-.048	-.047	-.033	-.030	-.031	-.030	-.024	-.007	.048	.170
-.680	-.045	-.058	-.049	-.046	-.035	-.034	-.033	-.028	-.023	-.005	.039	.147
-.840	-.041	-.052	-.050	-.041	-.033	-.034	-.032	-.025	-.020	-.002	.028	.099
-.920	-.040	-.052	-.049	-.038	-.031	-.032	-.030	-.023	-.016	.000	.022	.064
-1.000	-.040	-.051	-.049	-.034	-.029	-.030	-.029	-.020	-.011	.003	.016	.021
DIPPING	.0083	.0081	.0079	.0076	.0074	.0072	.0070	.0068	.0068	.0067	.0066	.0065

Table 2 Continured

Fn = 0.267 Free L=6.0 m (IHI)

ST.	10.000	9.750	9.500	9.250	9.000	8.500	8.000	7.500	7.000	6.000	5.500	5.000
2X/L	-1.000	-.950	-.900	-.850	-.800	-.700	-.600	-.500	-.400	-.200	-.100	.000
Z/D												
.200	.000	.000	.350	.000	.000	.000	.000	.000	.000	.000	.000	.000
.120	.000	.250	.309	.259	.000	.000	.000	.000	.000	.000	.000	.000
.040	.000	.230	.271	.226	.136	.000	.000	.000	.000	.000	.000	.000
.000	.974	.221	.254	.211	.127	.000	.000	.000	.000	-.006	.011	-.009
-.040	.979	.212	.238	.197	.119	-.060	.000	.000	.000	-.007	.010	-.012
-.120	.986	.195	.208	.170	.102	-.058	-.159	-.173	-.123	-.008	.007	-.016
-.200	.991	.178	.183	.147	.087	-.056	-.146	-.163	-.112	-.010	.003	-.018
-.360	.997	.149	.142	.106	.058	-.052	-.131	-.141	-.103	-.012	-.005	-.019
-.520	.998	.124	.113	.075	.037	-.048	-.115	-.119	-.096	-.016	-.012	-.021
-.680	.998	.100	.091	.057	.023	-.043	-.097	-.100	-.081	-.021	-.017	-.024
-.840	.999	.080	.074	.044	.017	-.035	-.076	-.083	-.067	-.026	-.020	-.026
-.920	.000	.069	.067	.041	.016	-.030	-.065	-.075	-.063	-.029	-.020	-.026
-1.000	.000	.059	.061	.040	.016	-.024	-.053	-.069	-.061	-.032	-.021	-.025
DIPPING	.0120	.0119	.0118	.0117	.0116	.0114	.0112	.0110	.0108	.0104	.0102	.0100

ST.	5.000	4.500	4.000	3.000	2.500	2.000	1.500	1.000	.750	.500	.250	.000
2X/L	.000	.100	.200	.400	.500	.600	.700	.800	.850	.900	.950	1.000
Z/D												
.200	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
.120	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.185
.040	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.064	.183
.000	-.009	.000	.000	.000	.000	.000	-.026	-.009	.007	.027	.057	.182
-.040	-.012	-.054	-.085	-.085	-.065	-.041	-.023	-.006	.008	.029	.070	.182
-.120	-.016	-.054	-.081	-.084	-.064	-.040	-.019	-.003	.008	.032	.074	.183
-.200	-.018	-.052	-.077	-.083	-.064	-.042	-.018	-.001	.009	.033	.076	.186
-.360	-.019	-.046	-.068	-.077	-.064	-.047	-.024	-.004	.008	.029	.076	.192
-.520	-.021	-.043	-.059	-.070	-.063	-.049	-.029	-.010	-.001	.016	.068	.185
-.680	-.024	-.040	-.052	-.064	-.060	-.051	-.030	-.012	-.008	.009	.056	.157
-.840	-.026	-.038	-.047	-.058	-.055	-.047	-.031	-.012	-.005	.012	.044	.106
-.920	-.026	-.036	-.044	-.054	-.051	-.044	-.030	-.010	.000	.015	.037	.071
-1.000	-.025	-.035	-.042	-.049	-.047	-.041	-.029	-.008	.006	.018	.027	.031
DIPPING	.0100	.0098	.0096	.0092	.0090	.0088	.0086	.0084	.0083	.0082	.0081	.0080

Fn = 0.289 Free L=6.0 m (IHI)

ST.	10.000	9.750	9.500	9.250	9.000	8.500	8.000	7.500	7.000	6.000	5.500	5.000
2X/L	-1.000	-.950	-.900	-.850	-.800	-.700	-.600	-.500	-.400	-.200	-.100	.000
Z/D												
.200	.000	.000	.310	.291	.000	.000	.000	.000	.000	.000	.000	.000
.120	.000	.225	.279	.259	.187	.000	.000	.000	.000	.000	.000	.000
.040	.000	.205	.250	.229	.165	.000	.000	.000	.000	.000	.000	.000
.000	.968	.196	.236	.214	.154	-.020	.000	.000	.000	.000	-.014	.006
-.040	.972	.188	.222	.200	.144	-.020	.000	.000	.000	-.057	-.015	.002
-.120	.979	.173	.198	.175	.124	-.020	-.120	-.171	-.160	-.057	-.018	-.003
-.200	.985	.159	.176	.152	.106	-.020	-.113	-.165	-.150	-.057	-.020	-.009
-.360	.993	.137	.139	.113	.075	-.020	-.101	-.146	-.134	-.054	-.026	-.015
-.520	.997	.118	.111	.087	.054	-.019	-.089	-.121	-.117	-.049	-.028	-.018
-.680	.998	.098	.090	.068	.041	-.019	-.075	-.100	-.100	-.048	-.029	-.022
-.840	.998	.077	.074	.054	.032	-.017	-.060	-.075	-.084	-.050	-.031	-.022
-.920	.000	.066	.067	.049	.028	-.016	-.053	-.073	-.079	-.052	-.033	-.024
-1.000	.000	.056	.061	.045	.024	-.014	-.046	-.068	-.074	-.053	-.035	-.025
DIPPING	.0127	.0126	.0126	.0125	.0125	.0124	.0123	.0123	.0122	.0120	.0120	.0119

ST.	5.000	4.500	4.000	3.000	2.500	2.000	1.500	1.000	.750	.500	.250	.000
2X/L	.000	.100	.200	.400	.500	.600	.700	.800	.850	.900	.950	1.000
Z/D												
.200	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
.120	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.175
.040	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.065	.178
.000	.006	-.003	-.025	.000	.000	.000	.000	-.040	-.019	.010	.069	.180
-.040	.002	-.005	-.026	-.071	-.080	-.082	-.068	-.039	-.017	.013	.072	.182
-.120	-.003	-.009	-.027	-.072	-.079	-.078	-.065	-.036	-.014	.017	.076	.186
-.200	-.009	-.012	-.028	-.071	-.078	-.076	-.064	-.036	-.014	.016	.078	.191
-.360	-.015	-.016	-.029	-.065	-.074	-.076	-.066	-.041	-.020	.010	.073	.198
-.520	-.018	-.018	-.029	-.060	-.071	-.074	-.066	-.046	-.028	.001	.061	.191
-.680	-.022	-.024	-.028	-.056	-.066	-.070	-.064	-.046	-.029	-.003	.049	.165
-.840	-.022	-.024	-.028	-.051	-.059	-.064	-.060	-.041	-.024	.000	.038	.112
-.920	-.024	-.025	-.027	-.047	-.056	-.061	-.056	-.037	-.020	.003	.031	.075
-1.000	-.025	-.025	-.026	-.044	-.053	-.058	-.053	-.033	-.013	.007	.023	.030
DIPPING	.0119	.0118	.0117	.0116	.0115	.0114	.0113	.0113	.0112	.0112	.0111	.0111

Table 2 Continued

Fn = 0.316 Free L=6.0 m (IHI)

ST.	10.000	9.750	9.500	9.250	9.000	8.500	8.000	7.500	7.000	6.000	5.500	5.000
2X/L	-1.000	-.950	-.900	-.850	-.800	-.700	-.600	-.500	-.400	-.200	-.100	.000
Z/D												
.200	.000	.213	.260	.261	.233	.000	.000	.000	.000	.000	.000	.000
.120	.000	.196	.238	.233	.203	.000	.000	.000	.000	.000	.000	.000
.040	.000	.181	.217	.208	.175	.038	.000	.000	.000	.000	.000	.000
.000	.982	.174	.206	.196	.162	.038	.000	.000	.000	.000	.000	-.042
-.040	.985	.168	.197	.184	.150	.033	-.056	.000	.000	.000	-.078	-.043
-.120	.990	.157	.177	.163	.128	.027	-.060	-.133	-.169	-.124	-.078	-.046
-.200	.994	.146	.159	.143	.110	.022	-.063	-.133	-.159	-.118	-.076	-.047
-.360	.997	.128	.130	.110	.083	.014	-.067	-.125	-.141	-.103	-.074	-.045
-.520	.998	.110	.106	.086	.065	.008	-.060	-.107	-.122	-.089	-.068	-.043
-.680	.998	.092	.086	.069	.050	.005	-.048	-.085	-.102	-.080	-.061	-.043
-.840	.998	.072	.069	.057	.040	.005	-.036	-.068	-.086	-.077	-.066	-.044
-.920	.000	.061	.062	.052	.038	.006	-.032	-.062	-.081	-.076	-.061	-.045
-1.000	.000	.050	.056	.048	.036	.008	-.027	-.059	-.077	-.077	-.063	-.045
DIPPING	.0173	.0172	.0171	.0169	.0168	.0165	.0162	.0160	.0157	.0152	.0149	.0146

ST.	5.000	4.500	4.000	3.000	2.500	2.000	1.500	1.000	.750	.500	.250	.000
2X/L	.000	.100	.200	.400	.500	.600	.700	.800	.850	.900	.950	1.000
Z/D												
.200	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
.120	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
.040	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.091
.000	-.042	-.016	-.009	-.022	-.039	.000	.000	.000	.000	-.041	.003	.098
-.040	-.043	-.019	-.010	-.022	-.038	-.053	-.062	-.061	-.054	-.040	.005	.105
-.120	-.046	-.023	-.011	-.023	-.035	-.052	-.061	-.058	-.052	-.037	.008	.117
-.200	-.047	-.025	-.013	-.023	-.035	-.051	-.059	-.057	-.051	-.037	.009	.127
-.360	-.045	-.026	-.017	-.022	-.036	-.051	-.059	-.058	-.052	-.039	.010	.140
-.520	-.043	-.028	-.021	-.023	-.038	-.050	-.059	-.059	-.055	-.040	.005	.138
-.680	-.043	-.030	-.022	-.026	-.038	-.050	-.057	-.057	-.054	-.039	.000	.116
-.840	-.044	-.032	-.023	-.026	-.036	-.047	-.053	-.050	-.046	-.032	-.004	.065
-.920	-.045	-.033	-.023	-.024	-.034	-.045	-.052	-.047	-.041	-.027	-.008	.030
-1.000	-.045	-.034	-.023	-.021	-.032	-.044	-.051	-.043	-.033	-.022	-.012	-.008
DIPPING	.0146	.0143	.0141	.0135	.0132	.0130	.0127	.0124	.0123	.0122	.0120	.0119

Table 3 The pressure coefficient on the hull of 4.0m model (FR)

Fn = 0.250 Free L=4.0 m (SRI)

ST.	10.000	9.750	9.500	9.250	9.000	8.500	8.000	7.500	7.000	6.000	5.500	5.000
2X/L	-1.000	-.950	-.900	-.850	-.800	-.700	-.600	-.500	-.400	-.200	-.100	.000
Z/D												
.200	.000	.000	.326	.000	.000	.000	.000	.000	.000	.000	.000	.000
.120	1.000	.278	.311	.216	.000	.000	.000	.000	.000	.000	.000	.000
.040	1.000	.246	.274	.194	.066	.000	.000	.000	.000	.000	.000	.000
-.040	1.000	.217	.204	.174	.053	-.109	.000	.000	-.068	.004	-.018	-.072
-.120	1.000	.197	.179	.154	.049	-.105	-.169	-.146	-.067	-.007	-.022	-.099
-.200	1.000	.182	.162	.132	.047	-.096	-.158	-.131	-.069	-.013	-.028	-.098
-.360	1.000	.154	.123	.090	.030	-.073	-.131	-.111	-.070	-.026	-.043	-.061
-.520	1.000	.124	.090	.058	.002	-.070	-.112	-.094	-.065	-.030	-.033	-.046
-.680	1.000	.060	.054	.013	-.005	-.054	-.086	-.077	-.054	-.035	-.035	-.052
-.840	1.000	.060	.054	.013	-.005	-.054	-.086	-.077	-.054	-.034	-.028	-.039
-.920	1.000	.057	.052	.011	-.015	-.051	-.078	-.078	-.056	-.036	-.025	-.046
-1.000	1.000	.063	.017	.023	.011	-.054	-.054	-.063	-.058	-.030	-.029	-.074
DIPPING	.0070	.0069	.0068	.0068	.0067	.0066	.0065	.0063	.0062	.0060	.0058	.0057

ST.	5.000	4.500	4.000	3.000	2.500	2.000	1.500	1.000	.750	.500	.250	.000
2X/L	.000	.100	.200	.400	.500	.600	.700	.800	.850	.900	.950	1.000
Z/D												
.200	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
.120	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
.040	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.045	.070
-.040	-.072	-.099	-.102	-.048	-.039	-.027	-.028	-.044	-.038	-.031	.029	.099
-.120	-.099	-.088	-.103	-.050	-.032	-.022	-.035	-.048	-.034	-.031	.037	.114
-.200	-.098	-.081	-.096	-.054	-.041	-.022	-.038	-.047	-.034	-.030	.042	.127
-.360	-.061	-.072	-.091	-.056	-.046	-.029	-.036	-.042	-.034	-.024	.042	.144
-.520	-.046	-.066	-.075	-.061	-.045	-.032	-.044	-.049	-.038	-.027	.035	.114
-.680	-.052	-.057	-.058	-.051	-.043	-.026	-.050	-.044	-.042	-.026	.022	.083
-.840	-.039	-.045	-.062	-.051	-.039	-.035	-.042	-.044	-.040	-.018	.014	.050
-.920	-.046	-.052	-.048	-.043	-.038	-.035	-.039	-.053	-.038	-.005	.010	.020
-1.000	-.074	-.062	-.061	-.074	-.036	-.063	-.033	-.038	-.006	-.032	-.018	.002
DIPPING	.0057	.0056	.0054	.0052	.0051	.0049	.0048	.0047	.0046	.0046	.0045	.0044

Fn = 0.267 Free L=4.0 m (SRI)

ST.	10.000	9.750	9.500	9.250	9.000	8.500	8.000	7.500	7.000	6.000	5.500	5.000
2X/L	-1.000	-.950	-.900	-.850	-.800	-.700	-.600	-.500	-.400	-.200	-.100	.000
Z/D												
.200	1.000	.312	.334	.000	.000	.000	.000	.000	.000	.000	.000	.000
.120	1.000	.259	.303	.232	.000	.000	.000	.000	.000	.000	.000	.000
.040	1.000	.226	.252	.213	.112	.000	.000	.000	.000	.000	.015	.022
-.040	1.000	.204	.203	.187	.090	-.049	.000	.000	-.114	-.012	.004	-.028
-.120	1.000	.189	.177	.165	.081	-.051	-.155	-.177	-.114	-.022	-.004	-.053
-.200	1.000	.175	.162	.144	.077	-.053	-.146	-.157	-.110	-.027	-.009	-.014
-.360	1.000	.153	.127	.102	.053	-.041	-.123	-.130	-.104	-.038	-.029	-.035
-.520	1.000	.126	.095	.070	.021	-.043	-.104	-.107	-.089	-.039	-.022	-.025
-.680	1.000	.095	.079	.043	.013	-.047	-.096	-.097	-.085	-.042	-.027	-.036
-.840	1.000	.063	.060	.023	.008	-.038	-.081	-.084	-.067	-.041	-.022	-.027
-.920	1.000	-.060	-.058	-.020	-.003	-.036	-.073	-.086	-.069	-.042	-.020	-.036
-1.000	1.000	.066	.022	.031	.022	-.039	-.048	-.069	-.072	-.036	-.024	-.062
DIPPING	.0079	.0078	.0077	.0077	.0076	.0075	.0074	.0073	.0072	.0070	.0069	.0068

ST.	5.000	4.500	4.000	3.000	2.500	2.000	1.500	1.000	.750	.500	.250	.000
2X/L	.000	.100	.200	.400	.500	.600	.700	.800	.850	.900	.950	1.000
Z/D												
.200	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
.120	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
.040	.022	.000	.000	.000	.000	.000	.000	.000	.000	.014	.051	.101
-.040	-.028	-.054	-.084	-.084	-.075	-.043	-.014	-.010	.000	.007	.058	.116
-.120	-.053	-.046	-.088	-.088	-.069	-.039	-.022	-.013	.001	.006	.064	.123
-.200	-.014	-.043	-.081	-.088	-.075	-.038	-.025	-.015	.002	.006	.069	.128
-.360	-.035	-.041	-.077	-.082	-.074	-.045	-.025	-.014	-.001	.009	.067	.121
-.520	-.025	-.043	-.062	-.081	-.069	-.048	-.036	-.025	-.009	.001	.061	.137
-.680	-.036	-.039	-.053	-.067	-.064	-.040	-.043	-.022	-.016	.001	.046	.100
-.840	-.027	-.032	-.054	-.064	-.055	-.046	-.035	-.024	-.017	.006	.037	.069
-.920	-.036	-.040	-.042	-.057	-.053	-.046	-.030	-.033	-.025	.021	.035	.043
-1.000	-.062	-.050	-.054	-.088	-.049	-.076	-.024	-.020	.020	-.008	.004	.025
DIPPING	.0068	.0067	.0066	.0064	.0063	.0062	.0061	.0060	.0059	.0059	.0058	.0057

Table 3 Continued

Fn = 0.289 Free L=4.0 m (SRI)

ST.	10.000	9.750	9.500	9.250	9.000	8.500	8.000	7.500	7.000	6.000	5.500	5.000
2X/L	-1.000	-.950	-.900	-.850	-.800	-.700	-.600	-.500	-.400	-.200	-.100	.000
Z/D												
.200	1.000	.259	.321	.260	.000	.000	.000	.000	.000	.000	.000	.000
.120	1.000	.229	.269	.239	.161	.081	.000	.000	.000	.000	.000	.000
.040	1.000	.200	.228	.211	.142	.014	.000	.000	.000	.000	.011	.006
-.040	1.000	.186	.191	.186	.117	.007	-.092	-.125	.000	-.060	-.020	-.016
-.120	1.000	.174	.171	.166	.107	-.002	-.117	-.183	-.153	-.069	-.023	-.041
-.200	1.000	.165	.153	.146	.098	-.008	-.112	-.157	-.147	-.069	-.031	-.018
-.360	1.000	.146	.124	.103	.069	-.006	-.097	-.132	-.132	-.074	-.048	-.035
-.520	1.000	.120	.096	.074	.034	-.017	-.083	-.107	-.114	-.069	-.038	-.046
-.680	1.000	.093	.080	.047	.026	-.025	-.079	-.096	-.104	-.066	-.040	-.048
-.840	1.000	.062	.062	.026	.019	-.021	-.067	-.083	-.081	-.060	-.032	-.049
-.920	1.000	.059	.061	.025	.007	-.020	-.059	-.083	-.082	-.059	-.028	-.040
-1.000	1.000	.066	.023	.037	.032	-.025	-.037	-.067	-.083	-.051	-.032	-.060
DIPPING	.0087	.0087	.0087	.0087	.0086	.0086	.0086	.0085	.0085	.0084	.0084	.0083

ST.	5.000	4.500	4.000	3.000	2.500	2.000	1.500	1.000	.750	.500	.250	.000
2X/L	.000	.100	.200	.400	.500	.600	.700	.800	.850	.900	.950	1.000
Z/D												
.200	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
.120	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
.040	.006	.000	.000	.000	.000	.000	.000	.000	.000	.001	.078	.170
-.040	-.016	-.013	-.032	-.068	-.088	-.076	-.056	-.043	-.026	-.003	.078	.166
-.120	-.041	-.008	-.040	-.074	-.081	-.072	-.064	-.047	-.022	-.004	.076	.167
-.200	-.018	-.008	-.035	-.072	-.085	-.071	-.066	-.053	-.022	-.004	.074	.168
-.360	-.035	-.013	-.038	-.068	-.081	-.068	-.063	-.045	-.026	.003	.066	.152
-.520	-.046	-.021	-.031	-.069	-.073	-.069	-.071	-.056	-.035	-.011	.057	.141
-.680	-.048	-.022	-.028	-.056	-.066	-.069	-.074	-.051	-.040	-.012	.039	.102
-.840	-.049	-.017	-.033	-.054	-.058	-.051	-.062	-.050	-.038	-.006	.028	.060
-.920	-.040	-.027	-.023	-.049	-.057	-.061	-.056	-.059	-.047	.010	.026	.037
-1.000	-.060	-.039	-.038	-.083	-.054	-.092	-.048	-.044	.004	-.016	-.007	.006
DIPPING	.0083	.0083	.0083	.0082	.0082	.0081	.0081	.0081	.0080	.0080	.0080	.0080

Fn = 0.316 Free L=4.0 m (SRI)

ST.	10.000	9.750	9.500	9.250	9.000	8.500	8.000	7.500	7.000	6.000	5.500	5.000
2X/L	-1.000	-.950	-.900	-.850	-.800	-.700	-.600	-.500	-.400	-.200	-.100	.000
Z/D												
.280	.000	.000	.319	.000	.000	.000	.000	.000	.000	.000	.000	.000
.200	1.000	.226	.284	.251	.000	.000	.000	.000	.000	.000	.000	.000
.120	1.000	.196	.242	.231	.180	.000	.000	.000	.000	.000	.000	.000
.040	1.000	.178	.204	.199	.153	.065	.000	.000	.000	.000	.000	.000
-.040	1.000	.169	.178	.177	.133	.058	-.059	.000	.000	-.075	-.053	
-.120	1.000	.162	.159	.159	.120	.048	-.068	-.163	-.175	-.122	-.077	-.071
-.200	1.000	.155	.143	.141	.109	.035	-.070	-.139	-.161	-.120	-.081	-.094
-.360	1.000	.140	.117	.105	.079	.029	-.065	-.117	-.142	-.118	-.095	-.070
-.520	1.000	.117	.094	.076	.043	.013	-.057	-.096	-.121	-.104	-.075	-.046
-.680	1.000	.090	.080	.050	.035	-.001	-.058	-.085	-.110	-.095	-.071	-.062
-.840	1.000	.061	.064	.029	.026	-.003	-.051	-.074	-.086	-.085	-.060	-.045
-.920	1.000	.060	.078	.030	.014	-.003	-.044	-.075	-.086	-.084	-.054	-.058
-1.000	1.000	.065	.083	.040	.035	-.009	-.028	-.059	-.086	-.074	-.057	-.086
DIPPING	.0117	.0116	.0115	.0114	.0114	.0112	.0110	.0109	.0107	.0104	.0102	.0100

ST.	5.000	4.500	4.000	3.000	2.500	2.000	1.500	1.000	.750	.500	.250	.000
2X/L	.000	.100	.200	.400	.500	.600	.700	.800	.850	.900	.950	1.000
Z/D												
.280	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
.200	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
.120	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
.040	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
-.040	-.053	-.028	-.019	-.024	-.051	-.059	-.054	-.059	-.057	-.052	-.018	.027
-.120	-.071	-.027	-.024	-.028	-.043	-.047	-.063	-.067	-.054	-.054	-.008	.042
-.200	-.094	-.022	-.022	-.031	-.048	-.042	-.065	-.067	-.053	-.054	.001	.062
-.360	-.070	-.028	-.030	-.031	-.048	-.045	-.060	-.062	-.056	-.048	.004	.083
-.520	-.046	-.035	-.025	-.039	-.045	-.048	-.066	-.069	-.060	-.051	.004	.081
-.680	-.052	-.034	-.024	-.030	-.042	-.037	-.069	-.062	-.063	-.047	-.008	.037
-.840	-.045	-.029	-.032	-.034	-.039	-.047	-.057	-.059	-.059	-.034	-.012	.011
-.920	-.058	-.038	-.021	-.028	-.038	-.048	-.051	-.069	-.068	-.018	-.010	-.004
-1.000	-.088	-.050	-.036	-.063	-.037	-.079	-.047	-.055	-.021	-.049	-.043	-.035
DIPPING	.0100	.0098	.0097	.0094	.0092	.0091	.0088	.0088	.0087	.0086	.0085	.0084

Table 4 The pressure coeffic.ent on the hull of 2.5m model (FR)

Fn = 0.250 Free L=2.5 m (UT)

ST.	10.000	9.750	9.500	9.250	9.000	8.000	7.000	6.000	5.000
2X/L	-1.000	-.950	-.900	-.850	-.800	-.600	-.400	-.200	.000
Z/D									
.120	.000	.286	.296	.217	.000	.000	.000	.000	.000
.040	.936	.251	.239	.198	.055	.000	.000	.000	.000
-.000	.990	.242	.224	.187	.056	.000	-.048	.019	-.072
-.200	.999	.176	.149	.126	.045	-.185	-.077	.013	-.053
-.360	1.000	.125	.113	.086	.027	-.168	-.078	-.002	-.055
-.520	1.000	.089	.089	.057	.011	-.148	-.077	-.014	-.061
-.680	1.000	.068	.068	.036	.002	-.125	-.071	-.027	-.059
-.840	1.000	.051	.049	.020	.001	-.098	-.060	-.038	-.050
-1.000	1.000	.043	.049	.003	.001	-.073	-.044	-.012	-.043
DIPPING	.0040	.0039	.0039	.0039	.0039	.0038	.0037	.0036	.0035

ST.	5.000	4.000	3.000	2.000	1.000	.750	.500	.250	.000
2X/L	.000	.200	.400	.600	.800	.850	.900	.950	1.000
Z/D									
.120	.000	.000	.000	.000	.000	.000	.000	.000	.000
.040	.000	.000	.000	.000	.000	.000	.000	.003	.154
-.000	-.072	.000	-.044	-.011	-.028	-.029	-.012	.025	.141
-.200	-.053	-.087	-.049	-.019	-.034	-.034	-.019	.037	.155
-.360	-.055	-.082	-.048	-.027	-.037	-.034	-.015	.029	.164
-.520	-.061	-.078	-.049	-.036	-.036	-.037	-.013	.020	.170
-.680	-.059	-.074	-.049	-.045	-.035	-.037	-.013	.012	.151
-.840	-.050	-.065	-.047	-.048	-.038	-.039	-.015	.008	.100
-1.000	-.043	-.047	-.035	-.030	-.025	-.034	-.006	.007	.020
DIPPING	.0035	.0034	.0034	.0033	.0032	.0032	.0031	.0031	.0031

Fn = 0.267 Free L=2.5 m (UT)

ST.	10.000	9.750	9.500	9.250	9.000	8.000	7.000	6.000	5.000
2X/L	-1.000	-.950	-.900	-.850	-.800	-.600	-.400	-.200	.000
Z/D									
.200	.000	.279	.326	.000	.000	.000	.000	.000	.000
.120	.748	.247	.277	.238	.000	.000	.000	.000	.000
.040	.910	.218	.237	.228	.101	.000	.000	.000	.000
-.000	.972	.209	.220	.206	.101	.000	.000	.011	-.010
-.200	.997	.157	.146	.144	.071	-.175	-.113	-.002	-.008
-.360	1.000	.116	.113	.098	.045	-.157	-.113	-.009	-.016
-.520	1.000	.085	.089	.068	.021	-.139	-.108	-.021	-.030
-.680	1.000	.064	.068	.044	.007	-.121	-.099	-.038	-.041
-.840	1.000	.049	.049	.025	.001	-.098	-.083	-.046	-.042
-1.000	1.000	.043	.049	.006	.000	-.073	-.058	-.031	-.038
DIPPING	.0044	.0044	.0044	.0044	.0043	.0043	.0042	.0041	.0041

ST.	5.000	4.000	3.000	2.000	1.000	.750	.500	.250	.000
2X/L	.000	.200	.400	.600	.800	.850	.900	.950	1.000
Z/D									
.200	.000	.000	.000	.000	.000	.000	.000	.000	.000
.120	.000	.000	.000	.000	.000	.000	.000	.000	.000
.040	.000	.000	.000	.000	.000	.000	.000	.026	.162
-.000	-.010	.000	.000	-.041	-.005	.004	.022	.043	.151
-.200	-.008	-.068	-.084	-.056	-.016	-.003	.009	.049	.160
-.360	-.016	-.066	-.081	-.058	-.022	-.005	.006	.046	.171
-.520	-.030	-.064	-.077	-.061	-.024	-.015	.007	.036	.179
-.680	-.041	-.063	-.071	-.064	-.025	-.019	.007	.029	.167
-.840	-.042	-.056	-.066	-.068	-.027	-.022	-.001	.022	.120
-1.000	-.038	-.039	-.049	-.038	-.019	-.024	.011	.016	.035
DIPPING	.0041	.0040	.0039	.0039	.0038	.0038	.0038	.0038	.0038

Fn = 0.289 Free L=2.5 m (UT)

ST.	10.000	9.750	9.500	9.250	9.000	8.000	7.000	6.000	5.000
2X/L	-1.000	-.950	-.900	-.850	-.800	-.600	-.400	-.200	.000
Z/D									
.200	.000	.242	.304	.248	.000	.000	.000	.000	.000
.120	.768	.218	.248	.242	.144	.000	.000	.000	.000
.040	.934	.195	.213	.221	.137	.000	.000	.000	.000
-.000	.983	.188	.203	.206	.132	.000	.000	-.034	.005
-.200	1.002	.143	.138	.139	.096	-.139	-.133	-.053	.001
-.360	1.000	.106	.103	.098	.065	-.137	-.130	-.054	-.007
-.520	1.000	.079	.083	.068	.030	-.123	-.121	-.058	-.022
-.680	1.000	.059	.067	.044	.012	-.107	-.108	-.060	-.034
-.840	1.000	.047	.053	.025	.007	-.077	-.090	-.069	-.035
-1.000	1.000	.043	.049	.006	.000	-.052	-.069	-.042	-.026
DIPPING	.0050	.0050	.0050	.0050	.0050	.0050	.0051	.0051	.0051

ST.	5.000	4.000	3.000	2.000	1.000	.750	.500	.250	.000
2X/L	.000	.200	.400	.600	.800	.850	.900	.950	1.000
Z/D									
.200	.000	.000	.000	.000	.000	.000	.000	.000	.000
.120	.000	.000	.000	.000	.000	.000	.000	.000	.000
.040	.000	.000	.000	.000	.000	.000	.000	.077	.152
-.000	.005	-.017	-.050	-.053	-.017	-.012	.009	.076	.155
-.200	.001	-.024	-.072	-.083	-.046	-.026	-.003	.061	.162
-.360	-.007	-.030	-.068	-.084	-.052	-.028	-.005	.045	.175
-.520	-.022	-.035	-.065	-.084	-.052	-.035	-.007	.031	.181
-.680	-.034	-.041	-.061	-.083	-.050	-.037	-.008	.019	.167
-.840	-.035	-.035	-.056	-.058	-.050	-.039	-.011	.015	.120
-1.000	-.026	-.018	-.043	-.054	-.032	-.040	.003	.012	.035
DIPPING	.0051	.0051	.0051	.0052	.0052	.0052	.0052	.0052	.0052

Fn = 0.316 Free L=2.5 m (UT)

ST.	10.000	9.750	9.500	9.250	9.000	8.000	7.000	6.000	5.000
2X/L	-1.000	-.950	-.900	-.850	-.800	-.600	-.400	-.200	.000
Z/D									
.280	.000	.249	.000	.000	.000	.000	.000	.000	.000
.200	.000	.218	.243	.245	.000	.000	.000	.000	.000
.120	.811	.195	.206	.243	.162	.000	.000	.000	.000
.040	.910	.175	.178	.227	.150	.000	.000	.000	.000
-.000	.945	.171	.171	.218	.142	-.053	.000	.000	-.028
-.200	1.000	.131	.124	.135	.104	-.088	-.166	-.102	-.032
-.360	1.000	.100	.093	.098	.074	-.094	-.157	-.100	-.038
-.520	1.000	.073	.078	.068	.049	-.089	-.143	-.097	-.053
-.680	1.000	.055	.066	.044	.030	-.078	-.121	-.094	-.066
-.840	1.000	.046	.053	.025	.016	-.052	-.097	-.101	-.058
-1.000	1.000	.043	.049	.006	.000	-.036	-.073	-.070	-.048
DIPPING	.0068	.0068	.0067	.0067	.0067	.0066	.0064	.0063	.0062

ST.	5.000	4.000	3.000	2.000	1.000	.750	.500	.250	.000
2X/L	.000	.200	.400	.600	.800	.850	.900	.950	1.000
Z/D									
.280	.000	.000	.000	.000	.000	.000	.000	.000	.000
.200	.000	.000	.000	.000	.000	.000	.000	.000	.000
.120	.000	.000	.000	.000	.000	.000	.000	.000	.000
.040	.000	.000	.000	.000	.000	.000	.000	.000	.093
-.000	-.028	-.009	-.019	-.042	-.036	-.024	-.035	-.010	.102
-.200	-.032	-.015	-.035	-.062	-.067	-.059	-.051	-.015	.118
-.360	-.038	-.022	-.038	-.066	-.069	-.061	-.050	-.020	.129
-.520	-.053	-.030	-.038	-.066	-.069	-.065	-.047	-.025	.133
-.680	-.066	-.041	-.038	-.066	-.067	-.064	-.050	-.028	.126
-.840	-.058	-.039	-.037	-.060	-.061	-.063	-.052	-.029	.082
-1.000	-.048	-.018	-.020	-.037	-.049	-.062	-.026	-.028	-.001
DIPPING	.0062	.0061	.0060	.0058	.0057	.0057	.0057	.0056	.0056

Table 5 The pressure coefficient on the hull of 2.5m model (FX)

Fn = 0.250 Fixed L=2.5 m (UT)

ST.	10.000	9.750	9.500	9.250	9.000	8.000	7.000	6.000	5.000
2X/L	-1.000	-.950	-.900	-.850	-.800	-.600	-.400	-.200	.000
Z/D									
.120	.000	.305	.318	.000	.000	.000	.000	.000	.000
.040	.000	.265	.267	.237	.000	.000	.000	.000	.000
-.000	.992	.247	.246	.213	.054	.000	.000	.015	.000
-.200	.984	.171	.166	.137	.039	-.167	-.065	.001	-.052
-.360	.999	.124	.124	.095	.017	-.151	-.076	-.010	-.065
-.520	1.000	.091	.098	.065	-.001	-.136	-.078	-.014	-.072
-.680	1.000	.068	.075	.043	-.010	-.118	-.073	-.028	-.068
-.840	1.000	.052	.055	.025	-.011	-.085	-.062	-.051	-.057
-1.000	1.000	.042	.047	.016	.003	-.067	-.037	-.029	-.035
DIPPING	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

ST.	5.000	4.000	3.000	2.000	1.000	.750	.500	.250	.000
2X/L	.000	.200	.400	.600	.800	.850	.900	.950	1.000
Z/D									
.120	.000	.000	.000	.000	.000	.000	.000	.000	.000
.040	.000	.000	.000	.000	.000	.000	.000	.000	.127
-.000	.000	.000	.000	.000	.000	.000	.007	.026	.146
-.200	-.052	-.093	-.049	-.019	-.040	-.035	-.014	.028	.143
-.360	-.065	-.088	-.048	-.018	-.044	-.031	-.022	.024	.146
-.520	-.072	-.082	-.047	-.022	-.044	-.035	-.020	.018	.154
-.680	-.068	-.077	-.050	-.034	-.041	-.038	-.020	.012	.145
-.840	-.057	-.066	-.045	-.041	-.037	-.036	-.036	.008	.090
-1.000	-.035	-.040	-.027	-.020	-.028	-.036	.007	.008	.020
DIPPING	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

Fn = 0.267 Fixed L=2.5 m (UT)

ST.	10.000	9.750	9.500	9.250	9.000	8.000	7.000	6.000	5.000
2X/L	-1.000	-.950	-.900	-.850	-.800	-.600	-.400	-.200	.000
Z/D									
.120	.000	.273	.310	.244	.000	.000	.000	.000	.000
.040	.000	.239	.263	.226	.072	.000	.000	.000	.000
-.000	.985	.225	.241	.216	.080	.000	.000	-.009	.000
-.200	.990	.158	.150	.150	.063	-.161	-.110	-.010	-.017
-.360	.997	.116	.124	.106	.038	-.144	-.109	-.010	-.029
-.520	1.000	.086	.097	.072	.021	-.126	-.104	-.017	-.046
-.680	1.000	.063	.075	.049	.010	-.108	-.095	-.038	-.055
-.840	1.000	.050	.058	.029	-.005	-.078	-.080	-.052	-.053
-1.000	1.000	.042	.049	.028	.007	-.060	-.051	-.029	-.030
DIPPING	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

ST.	5.000	4.000	3.000	2.000	1.000	.750	.500	.250	.000
2X/L	.000	.200	.400	.600	.800	.850	.900	.950	1.000
Z/D									
.120	.000	.000	.000	.000	.000	.000	.000	.000	.000
.040	.000	.000	.000	.000	.000	.000	.000	.000	.135
-.000	.000	.000	.000	.000	-.013	.008	.035	.042	.146
-.200	-.011	-.064	-.087	-.044	-.019	-.006	.007	.040	.149
-.360	-.029	-.066	-.082	-.043	-.022	-.001	-.000	.039	.158
-.520	-.046	-.067	-.072	-.048	-.022	-.007	.001	.033	.167
-.680	-.055	-.068	-.068	-.059	-.021	-.018	.000	.029	.158
-.840	-.053	-.059	-.063	-.054	-.020	-.023	-.019	.021	.105
-1.000	-.030	-.037	-.043	-.031	-.018	-.023	.015	.016	.038
DIPPING	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

Fn = 0.289 Fixed L=2.5 m (UT)

ST.	10.000	9.750	9.500	9.250	9.000	8.000	7.000	6.000	5.000
2X/L	-1.000	-.950	-.900	-.850	-.800	-.600	-.400	-.200	.000
Z/D									
.200	.000	.310	.328	.000	.000	.000	.000	.000	.000
.120	.000	.250	.298	.250	.000	.000	.000	.000	.000
.040	.000	.222	.257	.233	.153	.000	.000	.000	.000
-.000	.973	.207	.236	.223	.142	.000	.000	.000	.000
-.200	.983	.149	.150	.150	.101	-.132	-.140	-.049	-.003
-.360	.990	.109	.117	.106	.059	-.120	-.131	-.049	-.017
-.520	1.000	.081	.095	.077	.035	-.109	-.113	-.052	-.037
-.680	1.000	.059	.078	.057	.021	-.097	-.098	-.060	-.048
-.840	1.000	.048	.065	.043	.012	-.065	-.089	-.068	-.046
-1.000	1.000	.042	.055	.034	.028	-.046	-.065	-.046	-.027
DIPPING	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

ST.	5.000	4.000	3.000	2.000	1.000	.750	.500	.250	.000
2X/L	.000	.200	.400	.600	.800	.850	.900	.950	1.000
Z/D									
.200	.000	.000	.000	.000	.000	.000	.000	.000	.000
.120	.000	.000	.000	.000	.000	.000	.000	.000	.000
.040	.000	.000	.000	.000	.000	.000	.000	.000	.144
-.000	.000	.000	.000	.000	.000	.000	.029	.056	.152
-.200	-.003	-.023	-.072	-.068	-.045	-.025	-.003	.047	.157
-.360	-.017	-.031	-.073	-.066	-.048	-.022	-.016	.039	.165
-.520	-.037	-.040	-.063	-.068	-.048	-.025	-.017	.031	.172
-.680	-.048	-.044	-.058	-.075	-.046	-.031	-.019	.022	.164
-.840	-.046	-.032	-.050	-.069	-.044	-.033	-.040	.015	.105
-1.000	-.027	-.019	-.032	-.050	-.039	-.033	.007	.012	.038
DIPPING	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

Fn = 0.316 Fixed L=2.5 m (UT)

ST.	10.000	9.750	9.500	9.250	9.000	8.000	7.000	6.000	5.000
2X/L	-1.000	-.950	-.900	-.850	-.800	-.600	-.400	-.200	.000
Z/D									
.200	.000	.257	.365	.000	.000	.000	.000	.000	.000
.120	.000	.213	.297	.255	.167	.000	.000	.000	.000
.040	.000	.187	.238	.222	.158	.000	.000	.000	.000
-.000	.965	.177	.213	.205	.154	.000	.000	.000	.000
-.200	.981	.132	.132	.146	.108	-.087	-.147	-.092	-.037
-.360	.989	.101	.094	.106	.071	-.079	-.138	-.094	-.053
-.520	1.000	.078	.079	.077	.044	-.077	-.120	-.094	-.069
-.680	1.000	.056	.078	.057	.026	-.074	-.105	-.089	-.073
-.840	1.000	.047	.064	.043	.022	-.047	-.093	-.080	-.063
-1.000	1.000	.042	.056	.028	.038	-.030	-.065	-.065	-.050
DIPPING	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

ST.	5.000	4.000	3.000	2.000	1.000	.750	.500	.250	.000
2X/L	.000	.200	.400	.600	.800	.850	.900	.950	1.000
Z/D									
.200	.000	.000	.000	.000	.000	.000	.000	.000	.000
.120	.000	.000	.000	.000	.000	.000	.000	.000	.000
.040	.000	.000	.000	.000	.000	.000	.000	.000	.000
-.000	.000	.000	.000	.000	.000	.000	.000	-.024	.071
-.200	-.037	-.016	-.038	-.052	-.071	-.057	-.044	-.021	.038
-.360	-.053	-.026	-.038	-.054	-.070	-.054	-.051	-.018	.118
-.520	-.069	-.035	-.040	-.057	-.067	-.056	-.057	-.021	.129
-.680	-.073	-.037	-.040	-.064	-.064	-.058	-.059	-.025	.120
-.840	-.063	-.026	-.031	-.058	-.060	-.058	-.072	-.024	.065
-1.000	-.050	-.016	-.015	-.038	-.058	-.054	-.015	-.024	.001
DIPPING	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000