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The Naples warped hard chine hulls systematic series

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ABSTRACT

An experimental study was carried out to evaluate still water performance of a Systematic Series of hard chine hulls in planing and semiplaning speed range. Models of the Naples Systematic Series (*NSS*) were of varying length-to-beam ratios of the parent hull. The parent hull, shaped with warped bottoms, was derived from a pre-existing hull extensively tested in a towing tank. This hull was validated by many work boats built in the last fifteen years. To simplify the construction of vessels with rigid panels (aluminium alloy, plywood or steel) the original hull form was transformed to obtain developable hull surfaces. The models were tested at $Re > 3.5\times10^6$, in speed ranges $Fr=0.5–1.6$ and $Fr_\nabla=1.1–4.3$. The series studies the influence of L_P/B_C and Ⓜ ratios that vary respectively in the ranges of 3.45–6.25 and 4.83–7.49, for two positions of CG. All the models were tested both with and without interceptors. To enable model-ship correlation following the ITTC recommendations, in addition to the resistance coefficients of the models, dynamic wetted lengths and surfaces were provided as tables. To facilitate the implementation of Velocity Predict Programs, all the data (resistances, lengths and surfaces) were also furnished in polynomial form. In addition to the use of series in the design field, this study was done to provide data to improve the numerical simulations of a planing craft. With this aim, in addition to the resistance data, the wave profiles, obtained by wave cuts, were provided to carry out validation procedures.

1. Introduction

The design of high-speed craft is strongly conditioned by two anti-synergetic needs: reduction of fuel consumption (for economic and environmental considerations) and improvement of comfort on board (that with high speeds has typically got worse). To reach an effective balance between these needs, it is important to increase the deadrise angles from stern to bow. It is possible to do this containing the rising deadrise in the forward part of the hull (monohedral hull) or to do the same variation of deadrise on the whole length (warped hull). The warped solution enables to shape the forward of the bottom with higher deadrise angles respect the mean value chosen. This option needs the utmost attention to avoid inadequate sectional area curve (typically evaluated by A_T/A_X ratio) as shown in Begovic and Bertorello (2012). Often, to balance the sectional area curve, the best option is rising of the keel line towards the stern. The combination of these solutions (warped bottom and rising keel line) improves the comfort minimizing the vertical accelerations but reduces the hull efficiency due to the rising of the dynamic trim that increases the resistance induced by the lift, the main component of the pressure resistance on high speed planing crafts.

To overcome this shortcoming, the interceptors have proved high effective working as trim correctors and as high lift devises (De Luca and Pensa, 2012). Both these actions reduce the resistance induced by the lift particularly in the speed range of $Fr=0.5–0.8$ ($Fr_\nabla=1–3$), where the trim angles are high and the lift has not completely replaced buoyancy.

Consistent with these aims, a new systematic series of hard chine hulls (*NSS*) was designed at the naval division of the *Dipartimento di Ingegneria Industriale* (*DII*) of the *Università degli Studi di Napoli "Federico II"*. The parent hull, designed taking into account the use of interceptors, is characterized by deadrise angles constantly growing from astern to forward and by an A_T/A_X that is lower, but near to 1.0. Both these characteristics assure good performance over a wide range of speeds if an interceptor is working on the hull.

Unlike the *NSS*, the more well known systematic series with a single chine (Hubble, 1974; Keuning and Gerritsma, 1982; Keuning and Alii, 1993; Taunton and Alii, 2010) – has a constant β along the third astern of the hull. This is also true on a series whose A_T/A_X is lower than 1– (Clement and Blount, 1963); on these hulls the reductions of A_T/A_X are obtained by homothetic reductions of the transversal sections that keep β constant. Two Series, the *USCG* Series, (Kowalyshyn and Metcalf, 2006) and the double chine *NTUA* Series (Grigoropoulos and Loukakis, 2002), are exceptions: the bottom of the *USCG* is quite – but not absolutely – monohedral whereas on the *NTUA* Series it is markedly warped. For both series, the A_T/A_X ratio loses its content because A_T

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Nomenclature

A_T	area of transom
A_X	area of maximum transverse section
B_{CT}	chine breadth at transom (m)
B_C	maximum chine breadth (m)
B_{WL}	maximum waterline breadth (m)
CG	centre of gravity
C_A	correlation allowance coefficient
C_F	frictional resistance coefficient
C_R	residuary resistance coefficient
L*i*	length of interceptor (% B_{CT})
L_P	maximum chine length (m)
L_{WL}	waterline length (m)
L_{WLD}	dynamic waterline length (m)
i	depth of interceptor (mm)
i_E	half angle of entrance (deg)
L_{CG}	longitudinal position of centre of gravity (m)
Fr	Froude number
Fr_∇	Froude displacement number
Re	Reynolds number
R_P	pressure resistance
R_P	pressure resistance
R_T	total resistance
R_{Ti}	total resistance of model with interceptors
S_W	wetted surface (m^2)
S_{WD}	dynamic wetted surface (m^2)
T_H	height of towing point from baseline (mm)
T_L	towing point distance from transom (mm)
V_M	model speed (m/s)
V_S	ship speed (m/s)
W	weight of the model (kg)
β_T	deadrise angle at transom (deg)
$\beta_{0.5}$	deadrise angle at 50% L_{WL} (deg)
$\beta_{0.75}$	deadrise angle at 75% L_{WL} (deg)
λ	scale factor
ν_S	kinematic viscosity (salt water)
τ_S	trim at rest (deg)
τ	dynamic trim (deg)
∇	hull volume of displacement at rests (m^3)
Ⓜ	length-displacement ratio ($L/\nabla^{1/3}$)
DII	Dipartimento di Ingegneria Industriale
NSS	Naples Systematic Series

has the highest value of the sectional area curve.

The following tables summarize the main hull data of the series for reference (Table 1).

Beyond the evident task to make available a number of hulls that meet contemporary needs, the *NSS* was designed from *ITTC Resistance Committee* recommendations that push for new benchmarks for validation of numerical simulation, particularly in a speed range where hydrodynamic lift is significant (De Luca and Alii, 2016). For a more in-depth study on the reliability of CFD procedures, in addition to the resistance data, experimental wave elevations obtained by longitudinal cuts of wave patterns are provided in Appendix E.

Table 1
(a, b) Hull data for reference series.

Series	L/B range	Ⓜ range	B_{TC}/B_C
Clement & Blount; 1963	2.00 7.00	2.97 8.46	0.66
Keuning & Gerritsma; 1982	1.95 6.82	2.99 8.36	0.66
Keuning & Alii; 1993	3.41 7.00	3.29 8.25	0.66
Hubble – A; 1974	3.20 9.26	4.0 10.0	0.35
Hubble – B; 1974	2.32 9.28	4.0 10.0	1.00
Kowalyshyn & Metcalf; 2006	3.24 4.50	4.98 0.87	0.96
Taunton & Alii; 2010	3.77 6.25	6.25 8.70	1.00
Grigoropoulos & Loukakis	4.00 7.00	6.18 10.00	*
NSS	3.24 5.86	4.83 7.49	0.95

Series	A_T/A_X	β_T (deg)	$\beta_{0.50}$ (deg)	$\beta_{0.75}$ (deg)
Clement & Blount; 1963	0.8	12. 5	13.0	19.2
Keuning & Gerritsma; 1982	0.8	25.0	26.0	30.7
Keuning & Alii; 1993	0.8	30.0	31.2	35.8
Hubble – A; 1974	0.100.12	14.627.9	14.829.9	22.038.0
Hubble – B; 1974	1.0	16.330.4	21.237.4	35.053.0
Kowalyshyn & Metcalf; 2006	*	16.6	22.5	34.4
Taunton & Alii; 2010	1.0	22.5	22.5	35.3
Grigoropoulos & Loukakis	*	10.0	22.5	38.0
NSS	0.94	13.2	22.3	38.5

Finally, to facilitate the implementation of the performance of *NSS* within the Velocity Predict Program (*VPP*), the complete set of data required for model-ship correlations are given in polynomial forms.

2. Tested models

2.1. Parent hull

The parent hull of the series, C1 model, was derived from a pre-existing model, C954, that had shown good performance, registered by an intensive experimental program in a towing tank, with and without interceptors (De Luca and Alii, 2010). The C954, designed in 1995, were also frequently chosen as a working boat hull assuring good performance in still and rough waters (especially in short sea conditions). To simplify building of the hulls, the C954 hull form was changed to obtain the plating as developable surfaces. Fig. 1 shows the not-developable zones (red colour) that are those most drastically changed. Evaluation of the developability of the surfaces was done thru analysis of the Gaussian curvature. Fig. 2 shows a comparison between

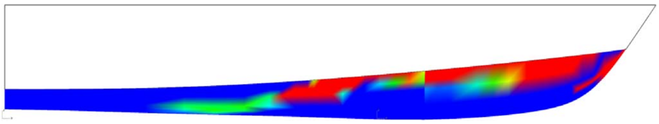


Fig. 1. C954: Variations of the Gaussian curvature. (For interpretation of the references to color in this figure, the reader is referred to the web version of this article).

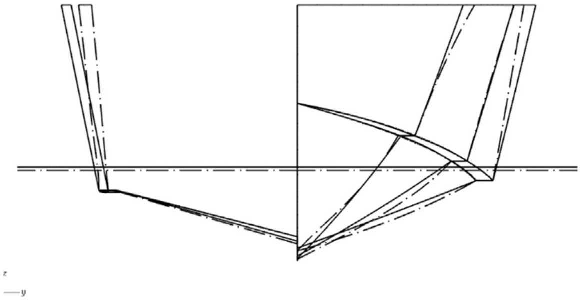


Fig. 2. Comparisons between C1 (solid line) and C954.

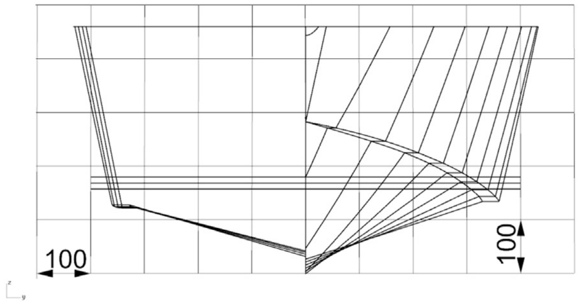


Fig. 3. C1: Transversal sections (units: mm).

the transversal sections of the C954 and C1 hulls and highlights the substantial identity of the C1 and C954 models.

Figs. 3 and 4 show the transversal and longitudinal sections of parent hull C1.

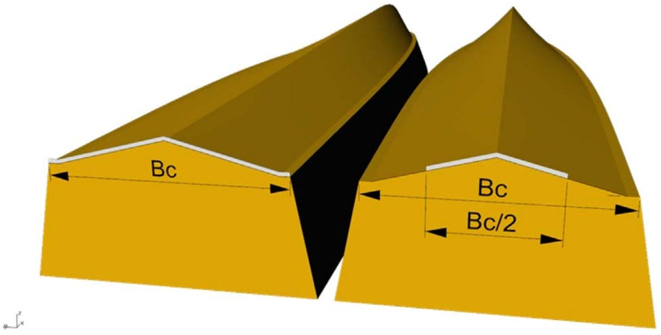


Fig. 5. Interceptors positioning.

2.2. Derived models

NSS is composed of five models: a parent hull and four derivate models. The four models derived from C1, were developed by scaling depth and breadth, by the same reduction factors, to maintain homothetic forms of all the transversal sections; these transformations increased both slenderness ratios: L/B and Ⓜ. It has to be noted that the hulls derived by the procedure in the above description have the same transversal area curves and, consequently, the same hull coefficients (C_B, C_P, C_W, *etc.*). Table 2 summarizes scale reduction factors for depth and breadth and the slenderness ratios of the five models in the series.

Table 2
Scale factors and slenderness ratios.

Model	reduction factors	L_P/B_C	Ⓜ
C1	/	3.45	4.83–5.25
C2	0.888	3.89	5.23–5.69
C3	0.776	4.45	5.47–6.22
C4	0.664	5.19	6.06–6.90
C5	0.552	6.25	6.86–7.49

3. Experimental program & results

3.1. Experimental program

The experimental program, in terms of speed range, dimensions of the models and load conditions is summarized in the Tables 3 and 4.

The highest speed tested on the models with interceptors were limited, mostly, at the Fr for which the resistances were higher than those measured on bare hull or when the dynamic trim was too low.

Wherever possible interceptors as long as the transoms breadths were chosen to minimize the edge effects and maximize the effectiveness. Consistently, on models C1, C2 and C3 the interceptors were as long as the transoms, whereas on models C4 and C5, to avoid fixing interceptors whose depth is smaller than 2 mm, as shown in Fig. 5, the lengths of these were the half of the transom breadths.

Finally, tests of wave cuts were performed on the C2 Model displacing 96.82 kg. The wave heights were measured at V_M=3.5, 4.5 and 5.5 m/s Fr=0.721, 0.928 and 1.134 respectively), at 1125 and 1625 mm from the centre-line.

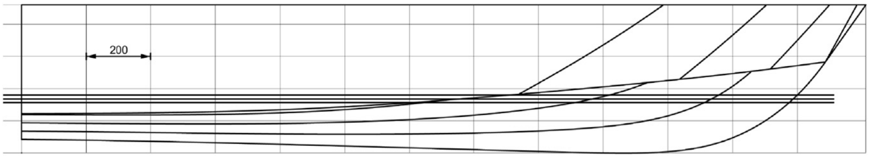


Fig. 4. C1: Longitudinal profile (units: mm).

3.2. Experimental procedure

Tests were performed in the towing tank of the Naval Division of the *DII* with main dimensions of 136×9.0×4.5 m (Length, Width and Depth). The models were tested, without turbulence stimulators, at Re $> 3.5\times10^6$. Towing force was applied horizontally at the towing points with positions as identified by the coordinates shown in the next table.

The models were restrained in surge, sway, yaw and roll, but were free in pitch and heave. All the measurements were sampled at 500 Hz. Resistance, trim and sinkage were analyzed both in time and in frequency domain to assure the goodness of each test.

Finally, wave elevations were measured by two capacitive probes. The data logger was synchronized with the motion of the model to identify its actual position in respect to the wave pattern. Probe measurements were sampled at 100 Hz.

3.3. Results: resistance and trim

The experimental program was finalized to test both hulls, with and without interceptors. The results of the tests are reported without post-fairing. The dimensions of the interceptors tested were chosen according to previous experiments on similar models. Data obtained, although reliable and useful, cannot be considered exhaustive as optimum interceptor's depths for any displacement and trim.

The dynamic trim angles of the models C1, C3 and C5, referred at two conditions - *i.e.*, trimmed, at rest, by the stern 0.0° and 1.0° – are presented in Figs. 6–8.

Figs. 9–11 show the R_T/W and R_{Ti}/R_T ratios of the same models with and without interceptors. The complete set of data for all five models is shown, as table, in Appendix A.

The data highlights the effectiveness of the interceptors over a wide range of speeds, especially in hump zones. In particular:

- higher resistance reductions occur at speeds that are growing with L/B ratio;

Table 3
Main hull dimensions and speed range.

Model		C1	C2	C3	C4	C5
L_{OA}	m	2.611	2.611	2.611	2.611	2.611
L_{WL}	m	2.374	2.374	2.374	2.374	–
		2.387	2.387	2.387	2.387	2.387
		2.400	2.400	2.400	2.400	2.400
		–	–	2.415	2.415	2.415
B_{WL}	m	0.733	0.651	0.569	0.487	–
		0.737	0.654	0.572	0.489	0.407
		0.743	0.660	0.577	0.493	0.410
		–	–	0.581	0.497	0.413
L_{CB} (τ_S=0)		0.944	0.944	0.944	0.944	–
		0.943	0.943	0.943	0.943	0.943
		0.945	0.945	0.945	0.945	0.945
		–		0.949	0.949	0.949
B/T		4.667	4.667	4.667	4.667	–
		4.397	4.397	4.397	4.397	4.397
		4.121	4.121	4.121	4.121	4.121
		–	–	3.839	3.839	3.839
Δ	kg	92.25	72.74	55.54	40.66	–
		106.07	83.63	63.86	46.75	32.31
		122.78	96.82	73.93	54.12	37.40
		–	–	86.23	63.13	43.62
S_W	m^2	1.53	1.36	1.18	1.00	0.87
		1.61	1.42	1.24	1.06	0.91
		1.70	1.50	1.30	1.11	0.96
		–	–	1.38	1.18	–
Fr		0.5–1.6	0.5–1.6	0.5–1.6	0.5–1.6	0.5–1.6
Fr_∇		1.1–3.6	1.2–3.7	1.2–3.8	1.3–4.1	1.4–4.2
i	mm	0.0	0.0	0.0	0.0	0.0
		3.0 ± 0.2	3.0 ± 0.2	2.0 ± 0.2	2.0 ± 0.2 (0.5 B_{CT})	2.0 ± 0.2 (0.5 B_{CT})
i_E (L_{WL}=2.387)	deg	23.7	21.1	18.9	16.3	13.7
τ_S	deg	0.0	0.0	0.0	0.0	0.0
		1.0	1.0	1.0	1.0	1.0

- maximum effectivenesses of the devices are inversely proportional to L/B;
- the speed range of performance improvement is wider for the model with a higher L/B.

The Fig. 12 shows the efficiency ratio, in model scale, of the five models. The curves refer to bare hulls (without interceptors) and τ_S=0.

- at fixed Ⓜ, the higher the speed, the higher has to be the L/B ratio;
- at the lowest Fr the efficiency is directly proportional to Ⓜ;
- when increasing speed, this trend changes and the efficiency becomes – increasingly - inversely proportional to Ⓜ and to the L/B ratio.

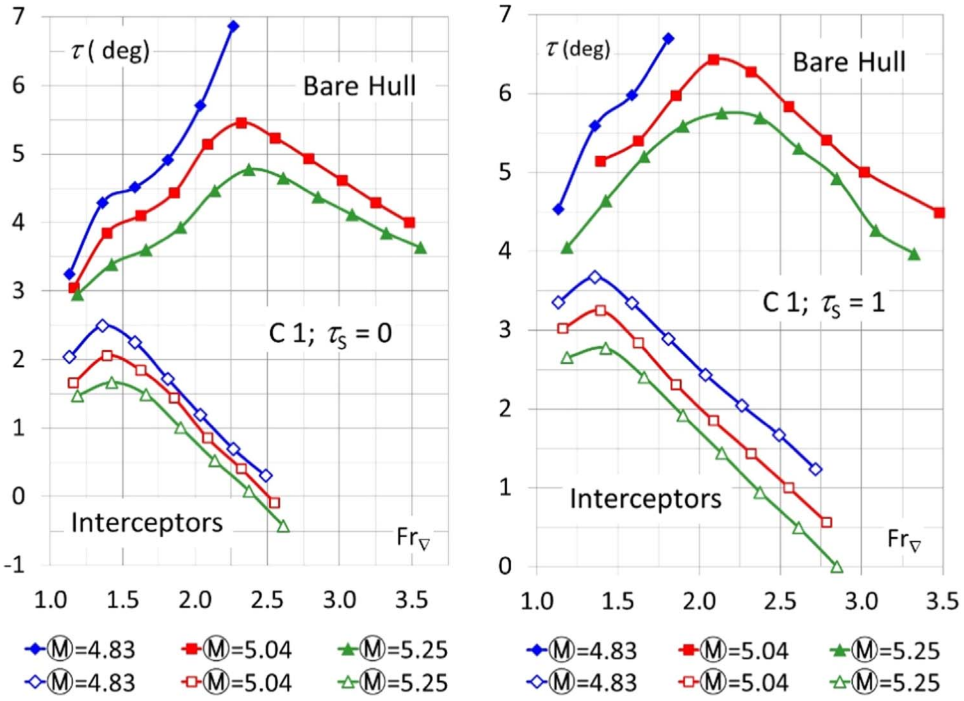


Fig. 6. C1: Dynamic trim curves (empty symbol are referred to interceptor).

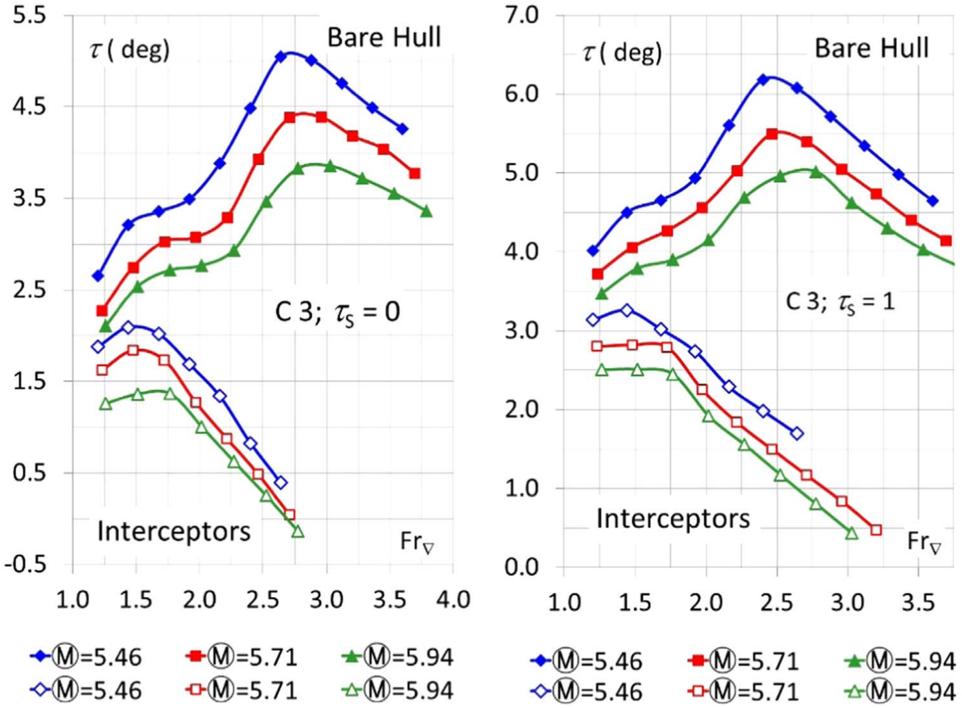


Fig. 7. C3: Dynamic trim curves (empty symbol are referred to interceptor).

Table 4
Towing point coordinates.

Model		C1	C2	C3	C4	C5
T_H	mm	191	171	154	145	134
T_L	mm	945	945	945	945	945

For a rough evaluation of hull potentialities with interceptor (we remember that in this study interceptors depths haven't been optimized), Fig. 13 shows hull efficiencies of the models with interceptors.

It must be highlighted that the best performances with interceptors occur with τ_S=0 or 1 depending on the model and on the displacement. Nevertheless, in Fig. 13, all the curves refer to τ_S=0.

The continuous curves are the same as the previous figure, whereas the dotted curves refer to the models (one deg trimmed by the stern) with interceptors.

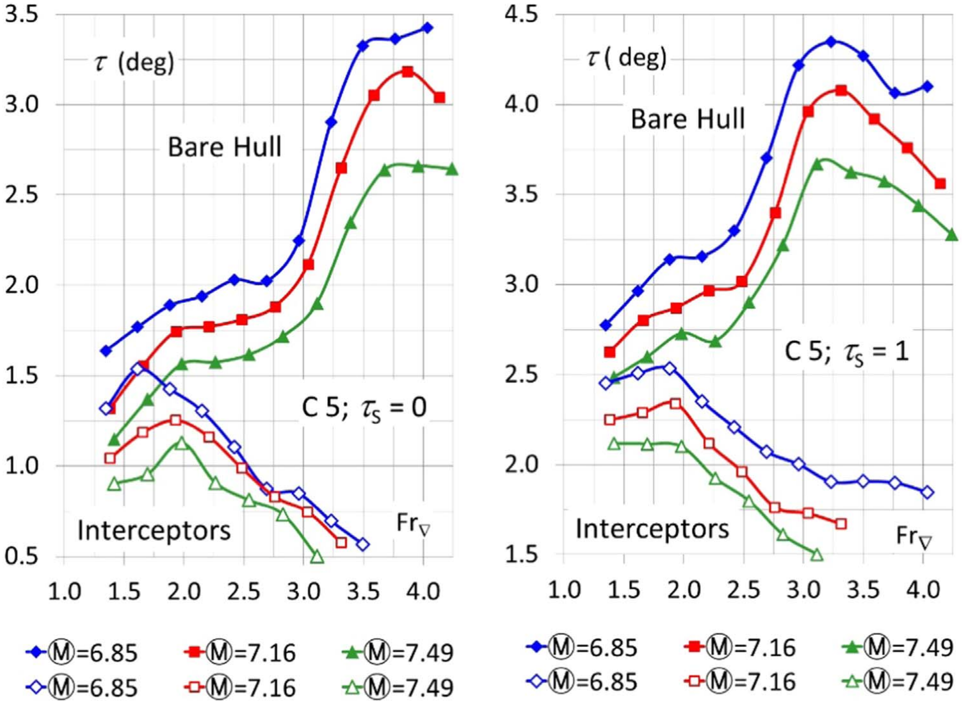


Fig. 8. C5: Dynamic trim curves (empty symbol are referred to interceptor).

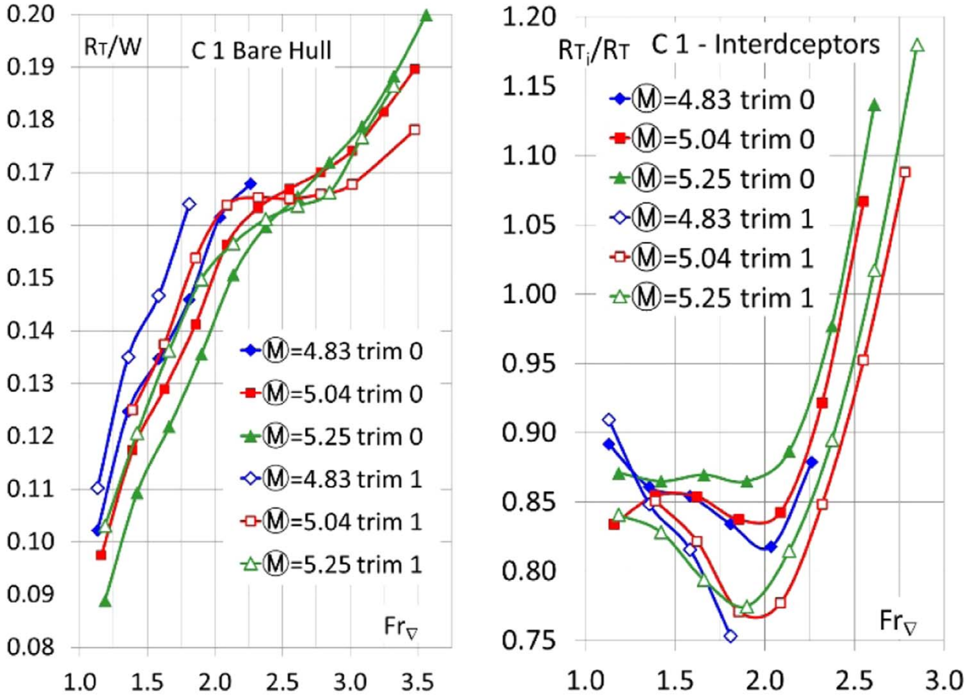


Fig. 9. C1: Hull and Interceptor efficiencies.

From the curves shown, it is possible to observe that:

- the relations of proportionality between R/W and L/B and between R/W and Ⓜ of the hull with interceptors are the same as that of bare hulls as explained above;
- at the highest Fr, the efficiency
  - is inversely proportional to Ⓜ,
  - is improved by interceptors only on models with high L/B ratios (C4 and C5);
- intermediate Fr provide the highest improvements in performance and an inverse proportionality to Ⓜ is observable;
- at lowest Fr, the performance variations:
  - are positive only on models with low L/B ratios (C1, C2 and, partially, C3),
  - fixing L/B (for a single model) the improvements are substantially constant with Ⓜ.

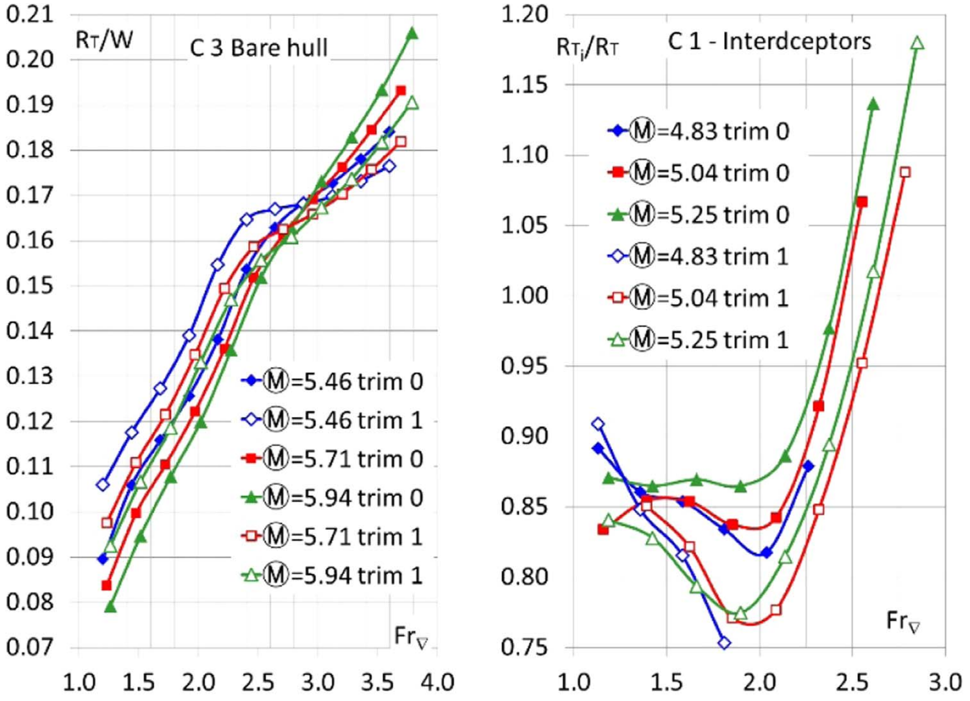


Fig. 10. C3: Hull and Interceptor efficiencies.

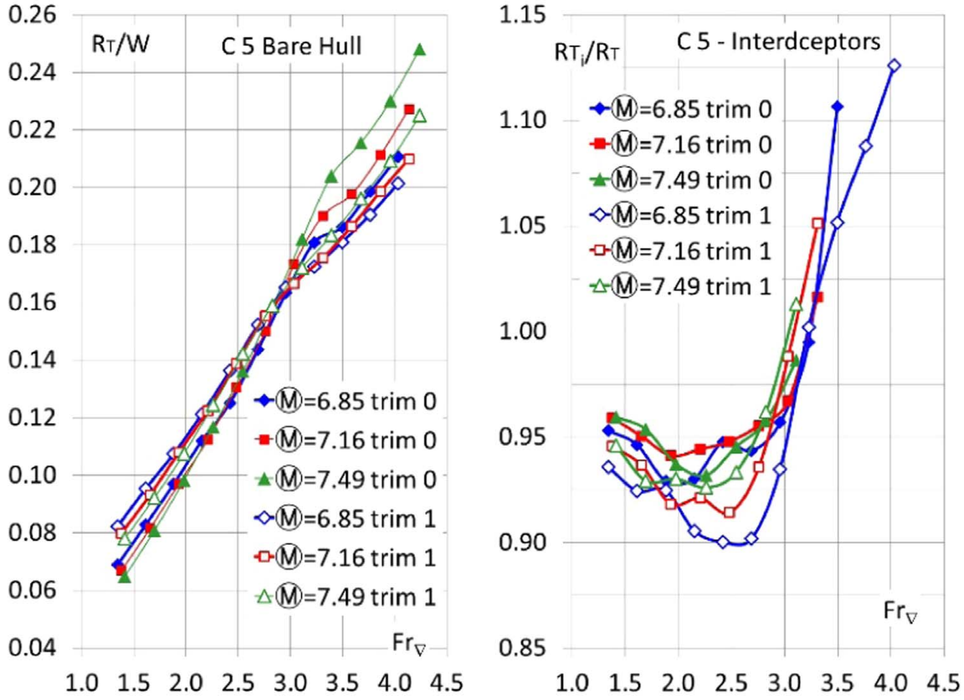


Fig. 11. C5: Hull and Interceptor efficiencies.

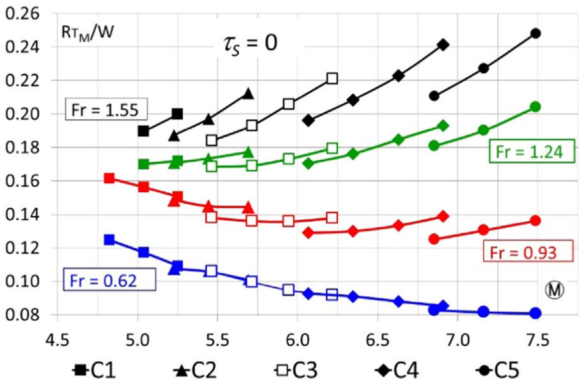


Fig. 12. Synopsis of the Hull efficiencies of the Series.

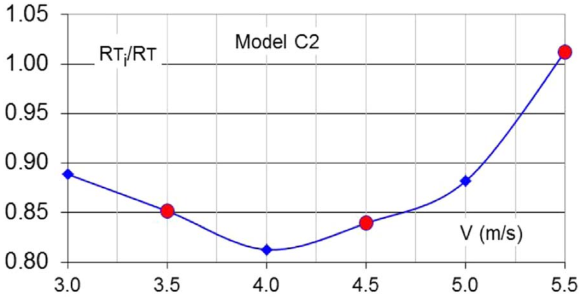


Fig. 14. C2 Model: Interceptor effectiveness.

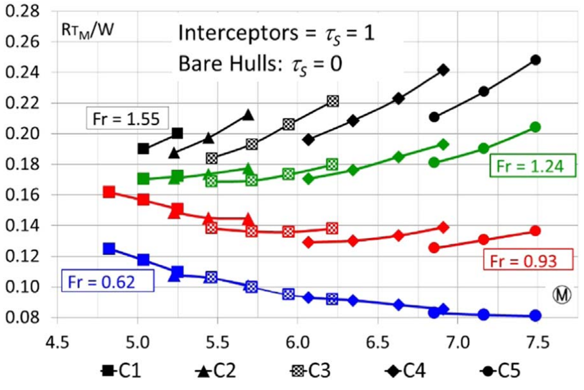


Fig. 13. Comparison between of the efficiencies of the models with and w/o Interceptors (dotted lines for interceptors).

3.4. Results in polynomial form

In order facilitate the implementation of data in *VPP* and to have a more flexible representation of the data, three polynomials in two variables, Ⓜ and Fr, were formulated referring to τ_S=0 and i=0. This representation of the results, moreover, allows for performance evaluation of intermediate displacements and speeds.

The polynomial expressions give the following functions:

$C_R = p_1(\text{Ⓜ}, Fr)$,
$S_{WD} = p_2(\text{Ⓜ}, Fr)$,
$L_{WLD} = p_3(\text{Ⓜ}, Fr)$,

with:

$$C_R = A_3\text{Ⓜ}^3 + A_2\text{Ⓜ}^2 + A_1\text{Ⓜ} + A_0$$
$$S_{WD} = B_3\text{Ⓜ}^3 + B_2\text{Ⓜ}^2 + B_1\text{Ⓜ} + B_0$$
$$L_{WLD} = C_3\text{Ⓜ}^3 + C_2\text{Ⓜ}^2 + C_1\text{Ⓜ} + C_0$$

and

$$A_i\ (Fr) = a_{i4}\ Fr^4 + a_{i3}\ Fr^3 + a_{i2}\ Fr^2 + a_{i1}Fr + a_{i0}$$

$$B_i\,(Fr) = b_{i4}\,Fr^4 + b_{i3}\,Fr^3 + b_{i2}\,Fr^2 + b_{i1}Fr + b_{i0}$$
$$C_i\,(Fr) = c_{i4}\,Fr^4 + c_{i3}\,Fr^3 + c_{i2}\,Fr^2 + c_{i1}Fr + c_{i0}$$

Due to the great number of coefficients, the polynomial formulas, for convenience, will be expressed with the vectors and the matrices as defined below:

$$(Fr)^T = \{1, Fr, Fr^2, Fr^3, Fr^4\};$$
$$\underline{Ⓜ}^T = \{1, Ⓜ, Ⓜ^{\,2}, Ⓜ^{\,3}\};$$

whereby the polynomials can be expressed as the product of the vectors: Fr and Ⓜ for the matrices A, B and C.

$$C_R = (Fr)^T \cdot A\ \underline{Ⓜ}$$
$$S_{WD} = (Fr)^T \cdot B\ \underline{Ⓜ}$$
$$L_{WLD} = (Fr)^T \cdot C\ \underline{Ⓜ}$$

In addition to the capability to predict resistance at intermediate speed and displacements, the supply of data as continuous functions allows, in the development of the project, to evaluate the sensibility of resistance respect Ⓜ (*i.e.,* the weight) that is the most affected by uncertainty in the development of a project. Indeed, the continuous polynomial functions allow an easy evaluation of a partial derivative through the use of the same coefficients. Defining

$$\underline{Ⓜ}_{\,i}^{\,T} = \{0, 1, 2Ⓜ, 3Ⓜ^{\,2}, 4Ⓜ^{\,3}, 5Ⓜ^4\}$$

it is possible to evaluate the partial derivative of C_R, S_{WD} and L_{WLD} to Ⓜ as follows:

$$\partial C_R/\partial Ⓜ = (Fr)^T \cdot A\ \underline{Ⓜ}_{\,i}$$
$$\partial S_{WD}/\partial Ⓜ = (Fr)^T \cdot B\ \underline{Ⓜ}_i$$
$$\partial L_{WLD}/\partial Ⓜ = (Fr)^T \cdot C\ \underline{Ⓜ}_i$$

This is quite useful by providing an evaluation of error propagation on resistance due to Ⓜ.

$$\delta C_R\ (Ⓜ) = |\partial C_R/\partial Ⓜ|\delta Ⓜ$$

In short, in this way the designer can estimate the maximum error for resistance due to the error expected in Ⓜ which, especially in the first part of design, could be significant. Similarly, it is possible to evaluate the expression of the partial derivatives of Fr to appraise the sensitivity of the resistance to the speed.

The coefficients of the matrices have been obtained by applying a least-squares root fit procedure to the numerical results, similar to the optimization techniques used to find a set of design parameters, as described in Balsamo and Alii (2011).

3.5. *Results: wave elevations*

The curves shown in Appendix E highlight a noticeable reduction of the wave heights due to the work of the interceptors and the direct proportionality between wave heights and speed. It is of interest to observe that the effectiveness of the interceptors, as shown in Fig. 14, do not follow the same proportionality.

This circumstance shows that at higher speeds, the frictional resistance, as a component of the total resistance, increases its weight in respect to wave pattern resistance. This higher weight of the frictional resistance is due to a larger wetted surface induced by the lower trim effected by the interceptors. Consequently, to evaluate actual interceptor effectiveness, this must be referred to in the resistances at full scale, otherwise, in model scale the interceptor's effectiveness will be underestimated.

3.6. *Model-Ship correlation*

To make feasible model-ship correlations following ITTC recommendations, wetted lengths and surfaces of the models underway were reported for each test in Appendix A. To determine wetted surfaces, the boundaries of these surfaces were evaluated by camera documentation and assigned to hull surfaces in 3D-CAD. The identified surfaces include the reattached wetted area above the chines. Whisker spray areas, as a precaution, were excluded from the estimations of the wetted surfaces due to the uncertainty of their contribution to viscous resistance. With the same criterion of precaution, the dynamic wetted length taken into account for the Reynolds number was measured on the keel line (not as an average value between keel and chine lengths).

4. Conclusions & future work

This work presented a new hard chine Systematic Series, composed of five models, showing hull forms, geometric coefficients and a table of offset. The hull forms of the models were characterized by a very high level of developability of the plating. In tabular form and as a continuous function, C_R and dynamic S_W and L_{WL} are furnished to carry out very accurate model-ship correlations. The experimental tests highlight the good quality of the parent hull and show it to be in line with state-of-the-art technologies.

The experimental program on the Series is in progress to characterize the behaviour of the models on waves and to evaluate, for each model, the dependence on the interceptor effectiveness of the depth *i*. To the completion of the study on the models with interceptors, data in polynomial form will be furnished as done for the bare hulls.

Both these tests will be completed at the end of the 2017.

Appendix A. Data for dynamic Model-Ship correlation

Note: the number before the symbol Δ indicate the test number.
C1 – Bare hull

T1; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
92.25	2.374	5.25	0	/	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	2.95	2.33	1.61	12.628	16.039
3.00	3.39	2.29	1.56	10.843	14.152
3.50	3.61	2.26	1.49	8.959	12.184

4.00	3.93	2.23	1.40	7.867	11.024
4.50	4.47	2.17	1.32	7.145	10.252
5.00	4.78	2.10	1.22	6.465	9.531
5.50	4.66	2.08	1.12	5.901	8.921
6.00	4.37	2.09	1.07	5.153	8.127
6.50	4.12	2.09	1.06	4.377	7.310
7.00	3.85	2.10	1.04	3.842	6.736
7.50	3.63	2.10	1.03	3.468	6.327

T2; Δ (kg)	L_{WL} (m)	Ⓜ	i (mm)	Li (% B_{CT})	τ_S (deg)
106.07	2.387	5.04	0	/	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	3.05	2.33	1.64	16.506	19.916
3.00	3.86	2.29	1.54	14.371	17.679
3.50	4.11	2.26	1.46	11.897	15.122
4.00	4.44	2.22	1.38	10.217	13.376
4.50	5.15	2.14	1.34	8.967	12.080
5.00	5.46	2.09	1.31	7.392	10.460
5.50	5.24	2.06	1.26	6.168	9.194
6.00	4.94	2.02	1.19	5.382	8.372
6.50	4.62	2.03	1.11	4.875	7.821
7.00	4.30	2.05	1.02	4.762	7.667
7.50	4.01	2.08	0.95	4.627	7.491

T3; Δ (kg)	L_{WL} (m)	Ⓜ	i (mm)	Li (% B_{CT})	τ_S (deg)
122.78	2.400	4.83	0	/	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	3.25	2.35	1.62	20.990	24.394
3.00	4.29	2.30	1.53	18.580	21.886
3.50	4.51	2.26	1.48	14.722	17.947
4.00	4.92	2.22	1.44	12.190	15.349
4.50	5.71	2.15	1.36	11.068	14.179
4.75	6.87	2.10	1.26	11.276	14.371

T4; Δ (kg)	L_{WL} (m)	Ⓜ	i (mm)	Li (% B_{CT})	τ_S (deg)
92.25	2.374	5.25	0	/	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	4.05	1.90	1.49	16.640	20.181
3.00	4.64	1.81	1.43	13.616	17.071
3.50	4.35	1.73	1.36	11.506	14.892
4.00	5.59	1.65	1.29	9.893	13.225
4.50	4.93	1.56	1.16	8.889	12.184
5.00	5.69	1.49	1.05	7.948	11.209
5.50	4.54	1.47	1.02	6.462	9.674
6.00	4.92	1.47	1.01	5.165	8.326
6.50	3.76	1.47	1.01	4.230	7.349
7.00	4.27	1.47	1.00	3.524	6.603
7.50	3.97	1.47	1.00	3.051	6.092

T5; Δ (kg)	L_{WL} (m)	Ⓜ	i (mm)	Li (% B_{CT})	τ_S (deg)
106.07	2.387	5.04	0	/	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	4.30	2.31	1.53	19.565	22.980
3.00	5.00	2.23	1.46	16.566	19.890

3.50	5.40	2.19	1.37	13.899	17.143
4.00	5.98	2.11	1.29	12.462	15.651
4.50	6.43	2.00	1.20	10.963	14.114
5.00	6.28	1.94	1.11	9.372	12.482
5.50	5.89	1.91	1.02	8.105	11.171
6.00	4.56	1.94	0.98	6.866	9.879
6.50	5.01	1.96	0.96	5.770	8.734
7.00	3.85	1.98	0.95	4.824	7.746
7.50	4.50	1.99	0.95	4.160	7.046

T6; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
122.78	2.400	4.83	0	/	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	4.53	2.30	1.49	25.220	28.639
3.00	5.59	2.23	1.44	21.922	25.246
3.50	5.98	2.19	1.39	17.567	20.811
4.00	6.70	2.10	1.41	14.398	17.588

C1 – Hull with interceptors

T7; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
92.25	2.374	5.25	3	100	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	1.48	2.36	1.62	10.555	13.957
3.00	1.67	2.35	1.55	9.091	12.383
3.50	1.49	2.35	1.48	7.450	10.652
4.00	1.01	2.35	1.46	6.064	9.191
4.50	0.53	2.36	1.43	5.378	8.438
5.00	0.08	2.37	1.41	5.107	8.109
5.50	−0.43	2.38	1.40	5.173	8.124

T8; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
106.07	2.387	5.04	3	100	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	1.66	2.37	1.66	13.061	16.461
3.00	2.06	2.35	1.63	11.073	14.365
3.50	1.85	2.35	1.59	8.642	11.846
4.00	1.44	2.35	1.57	6.763	9.890
4.50	0.85	2.35	1.55	5.780	8.842
5.00	0.41	2.37	1.54	5.237	8.240
5.50	−0.09	2.39	1.57	4.972	7.920

T9; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
122.78	2.400	4.83	3	100	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	2.04	2.38	1.68	17.715	21.112
3.00	2.50	2.36	1.63	14.510	17.801
3.50	2.25	2.35	1.60	11.060	14.262
4.00	1.72	2.35	1.58	8.561	11.688
4.50	1.20	2.36	1.59	6.957	10.017
5.00	0.70	2.38	1.59	6.047	9.048
5.50	0.30	2.38	1.59	5.659	8.610

T10; Δ (kg)	L_{WL} (m)	Ⓜ	i (mm)	Li (% B_{CT})	τ_S (deg)
92.25	2.374	5.25	3	100	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	2.65	2.32	1.41	14.502	17.915
3.00	2.77	2.30	1.41	11.040	14.344
3.50	2.40	2.30	1.41	8.197	11.410
4.00	1.92	2.31	1.43	6.170	9.306
4.50	1.44	2.32	1.44	4.954	8.024
5.00	0.94	2.33	1.45	4.280	7.291
5.50	0.50	2.35	1.46	3.954	6.911

T11; Δ (kg)	L_{WL} (m)	Ⓜ	i (mm)	Li (% B_{CT})	τ_S (deg)
106.07	2.387	5.04	3	100	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	3.02	2.33	1.63	15.735	19.147
3.00	3.25	2.31	1.58	12.383	15.688
3.50	2.84	2.30	1.56	9.230	12.444
4.00	2.31	2.30	1.54	6.999	10.138
4.50	1.85	2.31	1.52	5.614	8.686
5.00	1.44	2.32	1.52	4.783	7.797
5.50	1.00	2.33	1.50	4.331	7.294
6.00	0.56	2.33	1.48	4.228	7.145

T12; Δ (kg)	L_{WL} (m)	Ⓜ	i (mm)	Li (% B_{CT})	τ_S (deg)
122.78	2.400	4.83	3	100	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	3.35	2.35	1.64	20.225	23.630
3.00	3.67	2.31	1.62	15.709	19.013
3.50	3.34	2.30	1.54	12.175	15.390
4.00	2.89	2.31	1.49	9.417	12.555
4.50	2.44	2.31	1.47	7.564	10.636
5.00	2.04	2.32	1.45	6.383	9.397
5.50	1.67	2.32	1.38	5.924	8.889
6.00	1.24	2.32	1.30	5.910	8.830

C2 – Bare hull

T13; Δ (kg)	L_{WL} (m)	Ⓜ	i (mm)	Li (% B_{CT})	τ_S (deg)
72.74	2.374	5.69	0	/	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	2.22	2.35	1.42	10.677	14.082
3.00	2.83	2.32	1.42	8.024	11.324
3.50	3.07	2.29	1.32	6.839	10.056
4.00	3.24	2.25	1.25	6.059	9.210
4.50	3.70	2.20	1.18	5.531	8.629
5.00	4.18	2.15	1.08	5.227	8.280
5.50	4.24	2.12	1.02	4.758	7.769
6.00	4.13	2.10	0.98	4.187	7.158
6.50	3.94	2.08	0.95	3.699	6.633
7.00	3.78	2.09	0.92	3.374	6.269
7.50	3.56	2.10	0.90	3.157	6.016

T14; Δ (kg)	L_{WL} (m)	Ⓜ	i (mm)	Li (% B_{CT})	τ_S (deg)

83.63	2.387	5.46	0	/	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	2.50	2.34	1.56	12.457	15.863
3.00	3.18	2.32	1.56	9.049	12.350
3.50	3.40	2.29	1.48	7.402	10.620
4.00	3.60	2.24	1.42	6.282	9.435
4.50	4.10	2.20	1.27	6.109	9.207
5.00	4.72	2.12	1.17	5.634	8.695
5.50	4.75	2.07	1.05	5.539	8.562
6.00	4.60	2.05	0.97	5.195	8.178
6.50	4.41	2.04	0.96	4.325	7.269
7.00	4.10	2.04	0.92	3.912	6.821
7.50	4.47	2.03	0.88	3.625	6.501

T15; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
96.82	2.400	5.23	0	/	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	2.80	2.34	1.60	14.191	17.598
3.00	3.23	2.32	1.52	11.406	14.707
3.50	3.82	2.28	1.44	9.785	13.004
4.00	4.06	2.23	1.34	8.738	11.894
4.50	4.65	2.16	1.23	7.995	11.104
5.00	5.37	2.09	1.11	7.746	10.814
5.50	5.39	2.05	1.03	6.927	9.955
6.00	5.20	2.03	0.98	6.038	9.026
6.50	4.94	2.00	0.94	5.190	8.145
7.00	4.62	1.99	0.92	4.491	7.410
7.50	4.36	1.99	0.91	3.879	6.764

T16; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
72.74	2.374	5.69	0	/	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	3.66	2.04	1.46	11.501	14.997
3.00	4.06	1.88	1.36	9.554	12.986
3.50	4.35	1.79	1.31	7.760	11.126
4.00	4.76	1.69	1.18	7.273	10.591
4.50	5.21	1.60	1.02	7.267	10.547
5.00	5.24	1.50	0.94	6.444	9.702
5.50	5.04	1.45	0.89	5.532	8.754
6.00	4.75	1.39	0.84	4.808	8.002
6.50	4.46	1.38	0.81	4.262	7.415
7.00	4.17	1.36	0.80	3.645	6.765
7.50	3.93	1.36	0.80	3.189	6.271

T17; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
83.63	2.387	5.46	0	/	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	3.90	2.28	1.34	16.338	19.762
3.00	4.31	2.26	1.35	12.044	15.360
3.50	4.71	2.22	1.29	10.069	13.304
4.00	5.25	2.08	1.16	9.477	12.672
4.50	5.80	1.99	1.03	9.192	12.346
5.00	5.82	1.95	0.95	8.023	11.130
5.50	5.55	1.92	0.91	6.764	9.827
6.00	5.18	1.90	0.87	5.862	8.885

6.50	4.82	1.90	0.85	4.932	7.912
7.00	4.50	1.91	0.83	4.319	7.259
7.50	4.22	1.92	0.81	3.878	6.781

T18; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
96.82	2.400	5.23	0	/	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	4.27	2.30	1.48	19.780	23.199
3.00	4.83	2.25	1.41	15.119	18.438
3.50	5.09	2.22	1.33	12.289	15.524
4.00	5.62	2.12	1.24	10.994	14.179
4.50	6.28	2.00	1.13	10.378	13.529
5.00	6.41	1.95	1.04	9.192	12.299
5.50	6.12	1.89	0.97	7.957	11.029
6.00	5.72	1.86	0.89	7.060	10.093
6.50	5.34	1.85	0.86	5.979	8.973
7.00	4.99	1.87	0.84	5.187	8.138
7.50	4.62	1.92	0.84	4.328	7.231

C2 – Hull with interceptors

T19; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
72.74	2.374	5.69	3	100	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	1.11	2.36	1.39	8.337	11.739
3.00	1.22	2.34	1.39	6.512	9.808
3.50	1.14	2.32	1.40	5.069	8.279
4.00	0.77	2.34	1.40	3.947	7.077
4.50	0.29	2.36	1.41	3.406	6.467
5.00	−0.15	2.38	1.44	3.105	6.105

T20; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
83.63	2.387	5.46	3	100	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	1.37	2.36	1.44	10.441	13.843
3.00	1.56	2.35	1.46	7.814	11.106
3.50	1.52	2.35	1.46	6.089	9.292
4.00	1.02	2.35	1.43	4.919	8.045
4.50	0.55	2.36	1.41	4.199	7.259
5.00	0.10	2.37	1.41	3.807	6.810
5.50	−0.48	2.40	1.43	3.765	6.712

T21; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
96.82	2.400	5.23	3	100	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	1.64	2.36	1.55	12.560	15.962
3.00	1.81	2.36	1.52	9.988	13.279
3.50	1.86	2.35	1.49	7.670	10.872
4.00	1.33	2.35	1.45	5.934	9.060
4.50	0.91	2.36	1.44	5.058	8.118
5.00	0.41	2.38	1.48	4.269	7.269
5.50	−0.23	2.40	1.54	3.911	6.858

T22; Δ (kg)	L_{WL} (m)	Ⓜ	i (mm)	Li (% B_{CT})	τ_S (deg)
72.74	2.387	5.69	3	100	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	2.30	2.32	1.40	9.661	13.073
3.00	2.28	2.32	1.35	7.433	10.733
3.50	2.07	2.32	1.33	5.684	8.893
4.00	1.62	2.32	1.32	4.294	7.427
4.50	1.14	2.32	1.31	3.597	6.666
5.00	0.70	2.33	1.31	3.133	6.144
5.50	0.27	2.34	1.32	2.917	5.877

T23; Δ (kg)	L_{WL} (m)	Ⓜ	i (mm)	Li (% B_{CT})	τ_S (deg)
83.63	2.387	5.46	3	100	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	2.56	2.32	1.43	12.157	15.570
3.00	2.60	2.31	1.40	9.136	12.440
3.50	2.45	2.30	1.35	7.138	10.353
4.00	2.00	2.31	1.33	5.313	8.449
4.50	1.52	2.32	1.32	4.392	7.461
5.00	1.05	2.33	1.30	3.866	6.877
5.50	0.97	2.35	1.30	3.540	6.498

T24; Δ (kg)	L_{WL} (m)	Ⓜ	i (mm)	Li (% B_{CT})	τ_S (deg)
96.82	2.400	5.23	3	100	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	2.94	2.35	1.52	14.896	18.301
3.00	1.91	2.33	1.47	11.540	14.837
3.50	2.84	2.31	1.43	8.691	11.903
4.00	1.35	2.31	1.41	6.409	9.542
4.50	1.93	2.32	1.40	5.150	8.219
5.00	1.52	2.33	1.38	4.355	7.366
5.50	1.09	2.34	1.37	3.887	6.846
6.00	0.61	2.35	1.36	3.702	6.615

C3 – Bare hull

T25; Δ (kg)	L_{WL} (m)	Ⓜ	i (mm)	Li (% B_{CT})	τ_S (deg)
55.54	2.374	6.22	0	/	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	2.00	2.34	1.25	7.309	10.717
3.00	2.33	2.30	1.21	6.027	9.333
3.50	2.44	2.29	1.18	4.903	8.120
4.00	2.49	2.26	1.15	4.178	7.326
4.50	2.70	2.24	1.14	3.527	6.616
5.00	3.04	2.17	1.05	3.486	6.535
5.50	3.27	2.12	0.96	3.361	6.371
6.00	3.39	2.10	0.92	3.039	6.009
6.50	3.27	2.10	0.90	2.749	5.680
7.00	3.13	2.09	0.87	2.493	5.388
7.50	3.02	2.08	0.83	2.410	5.274

T26; Δ (kg)	L_{WL} (m)	Ⓜ	i (mm)	Li (% B_{CT})	τ_S (deg)

63.86	2.387	5.97	0	/	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	2.11	2.32	1.27	9.226	12.639
3.00	2.54	2.28	1.23	7.584	10.895
3.50	2.72	2.27	1.20	6.113	9.337
4.00	2.77	2.27	1.17	5.005	8.152
4.50	2.94	2.26	1.16	4.267	7.351
5.00	3.47	2.22	1.09	4.084	7.120
5.50	3.83	2.17	1.01	3.820	6.819
6.00	3.85	2.12	0.90	3.818	6.783
6.50	3.72	2.05	0.75	4.428	7.370
7.00	3.56	2.02	0.81	3.325	6.238
7.50	3.36	2.02	0.81	2.917	5.795

T27; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
73.93	2.400	5.72	0	/	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	2.27	2.34	1.26	12.217	15.623
3.00	2.75	2.32	1.16	10.671	13.973
3.50	3.03	2.30	1.26	7.324	10.538
4.00	3.08	2.28	1.22	6.087	9.231
4.50	3.29	2.25	1.15	5.526	8.612
5.00	3.93	2.19	1.00	5.884	8.927
5.50	4.38	2.12	0.92	5.539	8.550
6.00	4.39	2.05	0.88	4.883	7.866
6.50	4.19	2.01	0.86	4.240	7.192
7.00	4.04	2.00	0.80	4.014	6.931
7.50	3.78	1.99	0.73	4.092	6.978

T28; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
86.23	2.415	5.47	0	/	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	2.65	2.38	1.39	14.243	17.639
3.00	3.21	2.37	1.34	11.731	15.018
3.50	3.35	2.36	1.29	9.334	12.533
4.00	3.49	2.32	1.28	7.377	10.511
4.50	3.88	2.26	1.23	6.453	9.537
5.00	4.48	2.15	1.13	6.286	9.340
5.50	5.05	2.05	1.03	5.940	8.968
6.00	5.01	2.01	0.96	5.407	8.400
6.50	4.76	2.00	0.87	5.072	8.025
7.00	4.49	2.00	0.82	4.656	7.573
7.50	4.26	2.00	0.80	4.190	7.073

T29; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
55.54	2.374	6.22	0	/	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	3.27	2.25	1.18	10.450	13.883
3.00	3.47	2.23	1.17	7.855	11.179
3.50	3.69	2.20	1.17	6.090	9.330
4.00	3.82	2.14	1.06	5.682	8.863
4.50	4.21	2.06	0.99	5.107	8.242
5.00	4.33	2.00	0.91	4.635	7.728
5.50	4.28	1.95	0.85	4.188	7.243
6.00	4.11	1.92	0.82	3.451	6.469

6.50	3.84	1.90	0.80	3.104	6.084
7.00	3.60	1.90	0.77	2.906	5.850
7.50	3.37	1.90	0.74	2.708	5.616

T30; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
63.86	2.387	5.97	0	/	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	3.48	2.23	1.18	12.370	15.810
3.00	3.79	2.19	1.16	9.614	12.948
3.50	3.90	2.12	1.04	8.482	11.745
4.00	4.16	2.04	0.92	8.289	11.496
4.50	4.69	1.95	0.84	7.819	10.984
5.00	4.97	1.89	0.78	6.986	10.108
5.50	5.02	1.83	0.74	6.073	9.162
6.00	4.62	1.80	0.68	5.669	8.720
6.50	4.31	1.79	0.62	5.397	8.407
7.00	4.03	1.79	0.62	4.580	7.553
7.50	3.82	1.79	0.62	3.973	6.912

T31; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
73.93	2.400	5.72	0	/	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R 1000	C_T ×1000
2.50	3.72	2.28	1.20	15.582	19.005
3.00	4.06	2.24	1.24	11.286	14.608
3.50	4.27	2.20	1.23	8.630	11.871
4.00	4.56	2.15	1.06	8.486	11.662
4.50	5.03	2.08	0.88	9.159	12.288
5.00	5.50	1.98	0.79	8.687	11.785
5.50	5.40	1.90	0.73	7.791	10.859
6.00	5.05	1.85	0.65	7.448	10.485
6.50	4.74	1.83	0.56	7.658	10.659
7.00	4.40	1.82	0.59	5.938	8.904

T32; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
86.23	2.415	5.47	0	/	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	4.02	2.38	1.32	18.493	21.889
3.00	4.50	2.38	1.30	13.873	17.157
3.50	4.66	2.32	1.28	10.684	13.894
4.00	4.93	2.18	1.15	9.780	12.948
4.50	5.61	2.07	1.05	9.299	12.432
5.00	6.18	1.95	0.94	8.855	11.963
5.50	6.08	1.83	0.80	8.661	11.751
6.00	5.72	1.70	0.67	8.807	11.889
6.50	5.34	1.57	0.62	8.037	11.117
7.00	4.98	1.52	0.57	7.634	10.694
7.50	4.65	1.50	0.56	6.581	9.610

C3 – Hull with interceptors

T33; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
55.54	2.374	6.22	2	100	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000

2.50	1.12	2.29	1.22	6.990	10.410
3.00	1.18	2.29	1.18	5.475	8.784
3.50	1.23	2.27	1.16	4.367	7.589
4.00	0.82	2.27	1.14	3.628	6.774
4.50	0.56	2.29	1.11	3.284	6.361
5.00	0.08	2.30	1.13	2.925	5.943

T34; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
63.86	2.387	5.97	2	100	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	1.26	2.36	1.27	7.850	11.251
3.00	1.36	2.35	1.26	6.062	9.355
3.50	1.37	2.35	1.22	4.813	8.016
4.00	1.01	2.35	1.16	4.148	7.275
4.50	0.62	2.36	1.17	3.479	6.539
5.00	0.25	2.38	1.18	3.063	6.064
5.50	−0.14	2.39	1.20	2.871	5.821

T35; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
73.93	2.400	5.72	2	100	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	1.62	2.36	1.22	10.809	14.211
3.00	1.84	2.35	1.26	7.942	11.235
3.50	1.73	2.35	1.28	5.821	9.023
4.00	1.27	2.35	1.20	4.976	8.102
4.50	0.88	2.36	1.18	4.230	7.290
5.00	0.48	2.38	1.18	3.774	6.774
5.50	0.04	2.40	1.19	3.463	6.409

T36; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
86.23	2.415	5.47	2	100	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	1.88	2.39	1.32	13.438	16.832
3.00	2.09	2.35	1.25	10.912	14.206
3.50	2.02	2.35	1.22	8.482	11.683
4.00	1.69	2.34	1.18	6.696	9.826
4.50	1.34	2.37	1.16	5.526	8.583
5.00	0.83	2.35	1.14	4.924	7.931
5.50	0.39	2.40	1.16	4.409	7.356

T37; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
55.54	2.374	6.22	2	100	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	2.39	2.30	1.21	8.581	12.000
3.00	2.35	2.29	1.20	6.169	9.477
3.50	2.11	2.26	1.18	4.645	7.870
4.00	1.74	2.29	1.18	3.511	6.652
4.50	1.35	2.30	1.18	2.798	5.872
5.00	0.96	2.31	1.19	2.447	5.462
5.50	0.62	2.34	1.12	2.491	5.451

T38; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
63.86	2.387	5.97	2	100	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	2.51	2.30	1.09	11.619	15.036
3.00	2.51	2.30	1.08	8.525	11.831
3.50	2.45	2.30	1.09	6.239	9.454
4.00	1.92	2.30	1.08	4.786	7.925
4.50	1.56	2.30	1.11	3.692	6.766
5.00	1.18	2.31	1.10	3.272	6.288
5.50	0.81	2.34	1.09	2.945	5.905
6.00	0.44	2.35	1.10	2.776	5.690

T39; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
73.93	2.400	5.72	2	100	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	2.76	2.32	1.25	12.648	16.061
3.00	2.84	2.27	1.20	9.779	13.093
3.50	2.79	2.30	1.14	7.524	10.739
4.00	2.26	2.29	1.06	6.404	9.545
4.50	1.84	2.30	1.09	4.827	7.901
5.00	1.50	2.24	1.10	4.018	7.049
5.50	1.17	2.16	1.10	3.455	6.457
6.00	0.86	2.08	1.08	3.188	6.164
6.50	0.48	2.34	1.08	3.237	6.113

T40; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
86.23	2.415	5.47	2	100	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	3.14	2.33	1.27	16.298	19.707
3.00	3.26	2.33	1.22	12.634	15.932
3.50	3.02	2.31	1.20	9.347	12.561
4.00	2.74	2.27	1.16	7.236	10.381
4.50	2.29	2.25	1.15	5.770	8.856
5.00	1.98	2.30	1.12	5.015	8.033
5.50	1.70	2.31	1.03	4.912	7.879

C4 – Bare hull

T41; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
40.66	2.374	6.90	0	/	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	1.47	2.34	0.99	5.529	8.936
3.00	1.69	2.33	1.00	4.357	7.656
3.50	1.90	2.31	1.01	3.477	6.689
4.00	1.96	2.30	0.99	3.029	6.169
4.50	2.06	2.28	0.95	2.757	5.836
5.00	2.35	2.24	0.91	2.591	5.624
5.50	2.77	2.20	0.87	2.529	5.520
6.00	3.02	2.16	0.80	2.471	5.428
6.50	3.12	2.12	0.75	2.399	5.324
7.00	3.11	2.10	0.72	2.262	5.154
7.50	3.07	2.10	0.71	2.062	4.921

T42; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
46.75	2.387	6.63	0	/	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	1.84	2.31	0.95	7.577	10.992
3.00	2.04	2.31	1.00	5.848	9.150
3.50	2.25	2.30	1.03	4.342	7.556
4.00	2.27	2.29	1.03	3.484	6.624
4.50	2.31	2.28	0.99	3.147	6.225
5.00	2.66	2.25	0.95	3.043	6.073
5.50	3.17	2.20	0.91	2.861	5.852
6.00	3.46	2.15	0.85	2.694	5.652
6.50	3.47	2.10	0.81	2.493	5.423
7.00	3.44	2.07	0.76	2.352	5.252
7.50	3.34	2.04	0.70	2.444	5.318

T43; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
54.12	2.400	6.34	0	/	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	1.86	2.36	1.17	7.444	10.846
3.00	2.10	2.33	1.14	6.219	9.516
3.50	2.40	2.31	1.10	5.013	8.226
4.00	2.52	2.30	1.06	4.102	7.236
4.50	2.60	2.29	1.00	3.799	6.876
5.00	2.88	2.25	0.94	3.835	6.864
5.50	3.53	2.18	0.87	3.724	6.720
6.00	3.81	2.13	0.79	3.683	6.647
6.50	3.93	2.08	0.73	3.545	6.480
7.00	3.89	2.05	0.70	3.236	6.140
7.50	3.73	2.04	0.72	2.702	5.575

T44; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
63.13	2.415	6.06	0	/	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	2.14	2.36	1.21	9.462	12.864
3.00	2.48	2.34	1.12	8.174	11.470
3.50	2.61	2.32	1.08	6.744	9.954
4.00	2.64	2.30	1.06	5.345	8.483
4.50	2.88	2.28	1.01	4.787	7.866
5.00	3.50	2.22	0.95	4.743	7.779
5.50	3.97	2.16	0.89	4.493	7.494
6.00	4.28	2.12	0.83	4.203	7.169
6.50	4.41	2.08	0.78	3.857	6.791
7.00	4.34	2.03	0.74	3.528	6.436
7.50	4.16	2.00	0.70	3.318	6.201

T45; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
40.66	2.374	6.90	0	/	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	2.80	2.28	0.94	7.602	11.026
3.00	2.94	2.25	0.96	5.567	8.887
3.50	3.09	2.22	0.95	4.462	7.697
4.00	3.29	2.20	0.92	3.815	6.979
4.50	3.50	2.16	0.87	3.482	6.591
5.00	3.83	2.07	0.78	3.422	6.496
5.50	4.05	1.95	0.68	3.578	6.632
6.00	4.06	1.90	0.63	3.424	6.447
6.50	4.00	1.88	0.61	3.126	6.113

7.00	3.74	1.87	0.60	2.869	5.820
7.50	3.54	1.90	0.60	2.486	5.394

T46; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
46.75	2.387	6.63	0	/	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	3.06	2.28	0.97	9.253	12.677
3.00	3.16	2.30	1.00	6.619	9.923
3.50	3.34	2.30	1.00	5.263	8.477
4.00	3.54	2.23	0.95	4.549	7.704
4.50	3.85	2.14	0.85	4.521	7.634
5.00	4.30	2.00	0.76	4.533	7.626
5.50	4.49	1.90	0.70	4.214	7.283
6.00	4.40	1.91	0.68	3.667	6.687
6.50	4.22	1.94	0.64	3.385	6.355
7.00	4.03	1.94	0.62	3.043	5.975
7.50	3.87	1.94	0.61	2.677	5.576

T47; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
54.12	2.400	6.34	0	/	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	3.23	2.30	1.01	11.216	14.634
3.00	3.40	2.29	1.01	8.348	11.655
3.50	3.61	2.27	1.01	6.560	9.784
4.00	3.83	2.21	1.01	5.298	8.459
4.50	4.15	2.14	0.97	4.612	7.726
5.00	4.75	2.04	0.86	4.655	7.738
5.50	4.88	1.96	0.73	4.841	7.893
6.00	4.81	1.90	0.69	4.408	7.431
6.50	4.65	1.84	0.66	3.927	6.925
7.00	4.44	1.81	0.63	3.590	6.558
7.50	4.18	1.80	0.62	3.165	6.100

T48; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
63.13	2.415	6.06	0	/	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	3.46	2.30	1.01	14.545	17.964
3.00	3.72	2.27	1.02	10.579	13.892
3.50	3.92	2.24	1.01	8.456	11.686
4.00	4.08	2.21	0.97	7.179	10.340
4.50	4.41	2.16	0.93	6.274	9.382
5.00	4.97	2.05	0.83	6.228	9.308
5.50	5.40	1.90	0.72	6.304	9.373
6.00	5.37	1.78	0.68	5.697	8.753
6.50	5.13	1.69	0.65	4.984	8.025
7.00	4.82	1.68	0.62	4.441	7.447
7.50	4.61	1.70	0.60	4.044	7.008

C4 – Hull with interceptors

T49; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
40.66	2.374	6.90	2	50	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000

2.50	0.93	2.37	0.95	4.944	8.434
3.00	1.01	2.36	0.98	3.814	7.104
3.50	1.09	2.35	1.04	2.704	5.906
4.00	1.00	2.34	1.04	2.206	5.335
4.50	0.81	2.35	1.02	1.947	5.010
5.00	0.62	2.36	1.02	1.730	4.736
5.50	0.46	2.36	1.00	1.743	4.698
6.00	0.32	2.36	1.04	1.593	4.503

T50; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
46.75	2.387	6.63	2	50	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	1.35	2.36	0.99	6.489	9.891
3.00	1.42	2.35	1.11	4.228	7.520
3.50	1.42	2.35	1.08	3.478	6.680
4.00	1.34	2.34	1.07	2.718	5.846
4.50	1.13	2.34	1.07	2.214	5.280
5.00	0.93	2.34	1.06	1.956	4.965
5.50	0.80	2.35	1.04	1.961	4.919
6.00	0.69	2.35	1.04	1.880	4.793

T51; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
54.12	2.400	6.34	2	50	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	1.47	2.36	1.17	6.800	10.202
3.00	1.58	2.36	1.16	5.171	8.462
3.50	1.70	2.35	1.14	4.107	7.309
4.00	1.61	2.34	1.09	3.419	6.548
4.50	1.41	2.34	1.08	2.793	5.858
5.00	1.21	2.34	1.07	2.435	5.444
5.50	1.08	2.34	1.07	2.210	5.169
6.00	1.01	2.34	1.06	2.078	4.993
6.50	0.95	2.34	1.04	2.010	4.886

T52; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
63.13	2.415	6.06	2	50	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	1.65	2.37	1.14	8.946	12.345
3.00	1.90	2.36	1.16	7.152	10.442
3.50	1.92	2.35	1.16	5.422	8.624
4.00	1.82	2.35	1.14	4.272	7.399
4.50	1.64	2.33	1.11	3.661	6.729
5.00	1.49	2.31	1.08	3.173	6.188
5.50	1.41	2.31	1.08	2.780	5.747
6.00	1.37	2.31	1.07	2.531	5.453
6.50	1.36	2.31	1.07	2.238	5.136

T53; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
40.66	2.374	6.90	2	50	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	2.22	2.30	0.94	6.759	10.177
3.00	2.29	2.26	0.90	5.355	8.671
3.50	2.14	2.26	0.97	3.641	6.867
4.00	2.07	2.26	0.96	2.883	6.033

4.50	1.87	2.26	0.92	2.625	5.710
5.00	1.71	2.26	0.91	2.317	5.345
5.50	1.60	2.26	0.89	2.157	5.135
6.00	1.00	2.30	0.90	1.902	4.827

T54; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
46.75	2.387	6.63	2	50	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	2.45	2.32	0.97	8.313	11.725
3.00	2.51	2.30	1.02	5.727	9.032
3.50	2.49	2.29	1.00	4.452	7.669
4.00	2.34	2.28	0.99	3.441	6.584
4.50	2.14	2.28	0.97	2.821	5.900
5.00	2.02	2.28	0.94	2.526	5.549
5.50	1.95	2.29	0.93	2.277	5.248
6.00	1.89	2.29	0.90	2.144	5.070
6.50	1.78	2.29	0.98	1.519	4.406

T55; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
54.12	2.400	6.34	2	50	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	2.65	2.31	1.07	8.825	12.241
3.00	2.77	2.30	1.05	7.188	10.493
3.50	2.73	2.29	1.05	5.313	8.530
4.00	2.60	2.27	1.00	4.326	7.472
4.50	2.49	2.28	0.99	3.450	6.530
5.00	2.37	2.27	0.97	2.976	6.001
5.50	2.36	2.26	0.94	2.685	5.663
6.00	2.31	2.26	0.90	2.542	5.476
6.50	2.25	2.25	0.88	2.331	5.226
7.00	2.12	2.25	0.88	2.068	4.927

T56; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
63.13	2.415	6.06	2	50	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	2.91	2.31	1.07	11.805	15.221
3.00	3.08	2.30	1.13	8.624	11.929
3.50	3.06	2.30	1.09	6.964	10.178
4.00	2.93	2.30	1.07	5.213	8.352
4.50	2.74	2.29	1.04	4.243	7.320
5.00	2.69	2.29	0.98	3.850	6.871
5.50	2.72	2.27	0.95	3.446	6.422
6.00	2.75	2.28	0.92	3.069	5.999
6.50	2.76	2.25	0.89	2.782	5.677
7.00	2.63	2.24	0.83	2.803	5.664

C5 – Bare hull

T57; Δ (kg)	L_{WL} (m)	Ⓜ	*i* (mm)	L*i* (% B_{CT})	τ_S (deg)
32.31	2.387	7.49	0	/	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	1.15	2.34	0.89	4.158	7.565
3.00	1.37	2.33	0.86	3.485	6.784

3.50	1.57	2.31	0.84	2.985	6.198
4.00	1.58	2.28	0.80	2.778	5.921
4.50	1.62	2.28	0.79	2.462	5.542
5.00	1.72	2.26	0.77	2.324	5.352
5.50	1.90	2.22	0.74	2.307	5.294
6.00	2.35	2.19	0.70	2.343	5.291
6.50	2.64	2.15	0.66	2.117	5.034
7.00	2.66	2.12	0.63	1.970	4.858
7.50	2.65	2.10	0.60	1.937	4.797

T58; Δ (kg)	L_{WL} (m)	Ⓜ	i (mm)	Li (% B_{CT})	τ_S (deg)
37.40	2.400	7.18	0	/	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	1.32	2.34	0.95	5.063	8.469
3.00	1.56	2.33	0.92	4.131	7.428
3.50	1.75	2.32	0.90	3.443	6.654
4.00	1.77	2.31	0.89	2.801	5.938
4.50	1.81	2.30	0.88	2.457	5.532
5.00	1.88	2.28	0.85	2.305	5.328
5.50	2.12	2.24	0.80	2.431	5.413
6.00	2.65	2.19	0.74	2.457	5.405
6.50	3.05	2.13	0.68	2.261	5.184
7.00	3.19	2.08	0.63	2.258	5.157
7.50	3.04	2.03	0.58	2.353	5.228

T59; Δ (kg)	L_{WL} (m)	Ⓜ	i (mm)	Li (% B_{CT})	τ_S (deg)
43.62	2.415	6.86	0	/	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	1.64	2.37	0.98	6.390	9.790
3.00	2.03	2.34	0.96	5.071	8.366
3.50	1.89	2.33	0.94	4.178	7.386
4.00	1.94	2.32	0.91	3.625	6.760
4.50	2.03	2.30	0.88	3.110	6.183
5.00	2.02	2.30	0.85	2.936	5.955
5.50	2.25	2.27	0.80	2.916	5.892
6.00	2.90	2.15	0.75	2.908	5.866
6.50	3.32	2.08	0.64	3.112	6.047
7.00	3.36	2.03	0.60	2.962	5.873
7.50	3.43	2.01	0.60	2.607	5.488

T60; Δ (kg)	L_{WL} (m)	Ⓜ	i (mm)	Li (% B_{CT})	τ_S (deg)
32.31	2.387	7.49	0	/	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	2.49	2.27	0.86	5.970	9.396
3.00	2.60	2.24	0.85	4.490	7.812
3.50	2.73	2.21	0.84	3.551	6.789
4.00	2.69	2.18	0.82	3.027	6.197
4.50	2.90	2.16	0.78	2.727	5.835
5.00	3.22	2.10	0.71	2.759	5.826
5.50	3.67	1.99	0.61	3.064	6.108
6.00	3.63	1.93	0.58	2.694	5.709
6.50	3.57	1.89	0.57	2.313	5.296
7.00	3.44	1.85	0.55	2.104	5.060
7.50	3.28	1.79	0.48	2.426	5.365

T61; Δ (kg)	L_{WL} (m)	Ⓜ	i (mm)	Li (% B_{CT})	τ_S (deg)

37.40	2.400	7.18	0	/	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	2.63	2.28	0.89	7.245	10.669
3.00	2.80	2.25	0.85	5.754	9.073
3.50	2.87	2.21	0.82	4.846	8.083
4.00	2.97	2.20	0.78	4.152	7.315
4.50	3.02	2.17	0.76	3.640	6.746
5.00	3.40	2.10	0.71	3.503	6.570
5.50	3.96	1.97	0.60	3.841	6.890
6.00	4.08	1.85	0.55	3.570	6.606
6.50	3.92	1.77	0.53	3.235	6.251
7.00	3.76	1.74	0.50	3.101	6.090
7.50	3.56	1.71	0.45	3.248	6.208

T62; Δ (kg)	L_{WL} (m)	Ⓜ	i (mm)	Li (% B_{CT})	τ_S (deg)
43.62	2.415	6.86	0	/	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	2.78	2.35	0.98	8.325	11.730
3.00	2.96	2.30	0.92	6.685	9.991
3.50	3.14	2.25	0.86	5.682	8.908
4.00	3.16	2.23	0.84	4.682	7.838
4.50	3.30	2.19	0.83	3.989	7.088
5.00	3.70	2.10	0.77	3.882	6.949
5.50	4.22	2.00	0.67	4.126	7.167
6.00	4.35	1.93	0.62	3.739	6.753
6.50	4.27	1.87	0.58	3.471	6.461
7.00	4.06	1.80	0.54	3.289	6.260
7.50	4.10	1.73	0.50	3.288	6.243

C5 – Hull with interceptors

T63; Δ (kg)	L_{WL} (m)	Ⓜ	i (mm)	Li (% B_{CT})	τ_S (deg)
32.31	2.387	7.49	2	50	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	0.90	2.35	0.95	3.386	6.791
3.00	0.96	2.33	0.93	2.713	6.012
3.50	1.13	2.32	0.90	2.214	5.424
4.00	0.91	2.33	0.87	1.992	5.123
4.50	0.81	2.35	0.83	1.906	4.968
5.00	0.73	2.36	0.83	1.795	4.799
5.50	0.50	2.37	0.82	1.767	4.721

T64; Δ (kg)	L_{WL} (m)	Ⓜ	i (mm)	Li (% B_{CT})	τ_S (deg)
37.40	2.400	7.18	2	50	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	1.04	2.38	0.95	4.707	8.103
3.00	1.19	2.36	0.92	3.706	6.996
3.50	1.25	2.34	0.90	3.034	6.238
4.00	1.16	2.34	0.86	2.642	5.770
4.50	0.99	2.34	0.83	2.476	5.539
5.00	0.83	2.35	0.78	2.526	5.533
5.50	0.75	2.35	0.74	2.676	5.634
6.00	0.58	2.37	0.78	2.281	5.191

T65; Δ (kg)	L_{WL} (m)	Ⓜ	i (mm)	Li (% B_{CT})	τ_S (deg)
43.62	2.415	6.86	2	50	0

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	1.32	2.40	0.98	6.002	9.394
3.00	1.54	2.39	0.96	4.673	7.956
3.50	1.43	2.39	0.94	3.671	6.865
4.00	1.31	2.38	0.92	3.111	6.230
4.50	1.10	2.38	0.89	2.726	5.783
5.00	0.87	2.37	0.85	2.597	5.599
5.50	0.85	2.37	0.83	2.517	5.470
6.00	0.70	2.38	0.83	2.401	5.308
6.50	0.57	2.39	0.84	2.258	5.124

T66; Δ (kg)	L_{WL} (m)	Ⓜ	i (mm)	Li (% B_{CT})	τ_S (deg)
32.31	2.387	7.49	2	50	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	2.12	2.30	0.94	4.731	8.149
3.00	2.12	2.29	0.92	3.380	6.689
3.50	2.10	2.28	0.90	2.654	5.874
4.00	1.93	2.26	0.86	2.315	5.463
4.50	1.80	2.26	0.81	2.206	5.291
5.00	1.61	2.27	0.78	2.070	5.096
5.50	1.50	2.28	0.76	1.942	4.914

T67; Δ (kg)	L_{WL} (m)	Ⓜ	i (mm)	Li (% B_{CT})	τ_S (deg)
37.40	2.400	7.18	2	50	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	2.25	2.30	0.91	6.498	9.916
3.00	2.29	2.28	0.88	4.903	8.213
3.50	2.34	2.27	0.86	3.858	7.081
4.00	2.12	2.26	0.84	3.150	6.299
4.50	1.96	2.26	0.82	2.646	5.731
5.00	1.76	2.26	0.79	2.482	5.509
5.50	1.73	2.27	0.76	2.401	5.376
6.00	1.67	2.28	0.72	2.403	5.331

T68; Δ (kg)	L_{WL} (m)	Ⓜ	i (mm)	Li (% B_{CT})	τ_S (deg)
43.62	2.415	6.86	2	50	1

V_M m/s	τ deg	L_{WLD} m	S_{WD} m^2	C_R ×1000	C_T ×1000
2.50	2.45	2.31	0.95	7.918	11.333
3.00	2.51	2.29	0.92	5.990	9.300
3.50	2.53	2.27	0.89	4.740	7.962
4.00	2.35	2.26	0.87	3.753	6.902
4.50	2.21	2.26	0.86	3.091	6.176
5.00	2.07	2.26	0.85	2.664	5.692
5.50	2.00	2.27	0.83	2.433	5.409
6.00	1.91	2.26	0.80	2.359	5.293
6.50	1.91	2.24	0.75	2.358	5.257
7.00	1.90	2.20	0.70	2.444	5.314
7.50	1.85	2.15	0.66	2.505	5.353

Appendix B. Offset tables of Parent model (C1)

X: distances from Transom (mm)
Y: distances from Centreline (mm)
Z: distance from Baseline (mm)
Half breadths of transversal sections

	X	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600
Z															
100		226	231	235	234	227	212	192	170	147	121	87	35		
200		357	364	371	375	375	367	351	327	295	224	166	96	9	
300		376	384	391	396	397	392	378	356	326	288	238	172	73	
400		396	403	411	417	419	416	404	385	357	321	275	214	126	
460		408	415	423	429	432	430	420	402	375	341	296	238	157	24

Heights of Keel line

X	0	200	400	600	800	1000	1200	1400	1600	1778	1800	2000	2200	2301	2400	2420	2499	2569	2600	2616
Z	42	40	36	32	27	21	16	10	4	0	0	4	47	100	180	200	300	400	444	460

X	0	200	400	600	800	1000	1200	1400	1600	1778	1800	2000	2200	2301	2400	2420	2499	2569	2600	2616
Z	42	40	36	32	27	21	16	10	4	0	0	4	47	100	180	200	300	400	444	460

Height and half breadths of Chines

	X	0	200	400	600	800	1000	1200	1400	1600	1740	1800	2000	2200	2400	2487
	Z	122	123	125	128	134	143	156	171	188	200	205	225	246	271	283
CHINE1	Y	341	349	356	360	360	353	339	318	291	268	256	209	148	56	0
CHINE2	Y	312	318	324	328	329	322	309	289	263	240	229	184	122	40	0

Appendix C. Uncertainty analysis

A high value of sampling rates have been used (oversampling technique) to overcome aliasing errors and to identify any unwanted sources of errors due to electricity network, so that the standard of 500 Hz have been chosen. That corresponds to 10 times of the frequency of the networks. The total error was evaluated according to the ITTC 7.5-02-02-02 procedure. It recommends a criterion for the estimation of the total error on the resistance coefficient $C_{T.}$ The method allows an evaluation of the error propagation due to resistance measurement, temperature, speed and geometries of the models (ITTC 7.5-01-01-01). The procedure shows that in essence the error is mostly influenced by the quality of the measurement of the load cell and, with a less effect, by the other parameters.

The total estimated errors are ±0.1 N on resistance measurement, ±0.05° on trim, ±0.001 m/s on speed and ±0.01 kg on weights.

In addition to that, an error related to the interceptor positioning could occur. In a previous work (De Luca and Pensa, 2012) a deep analysis of these errors had been done on models with comparable dimensions. The estimated maximum error allowed for the depth of the interceptor was 0.2 mm; it implies a maximum error on resistance of 1.1% and an average error of 0.5%.

The evaluation of the errors due to the uncertainties related to the weights, was conducted by the polynomial expressions above proposed, the maximum value is not higher than 0.2% due to an error of displacement evaluation of ±0.005 kg.

Appendix D. Polynomial coefficients. Matrices A, B and C were estimated for each model at zero trim condition

		A: CR					B: SW$_D$					C: LWL$_D$			
C1		Ⓜ^{0}	Ⓜ^{1}	Ⓜ^{2}	Ⓜ^{3}		Ⓜ^{0}	Ⓜ^{1}	Ⓜ^{2}	Ⓜ^{3}		Ⓜ^{0}	Ⓜ^{1}	Ⓜ^{2}	Ⓜ^{3}
	Fr^0	−52.3614304	20.31259152	−1.96762882	0	Fr^0	−2318.268824	915.7636824	−90.29357252	0	Fr^0	402.5795259	−153.504576	14.67169884	0
	Fr^1	286.4623048	−111.026144	10.75001148	0	Fr^1	12345.98475	−4857.027592	477.3767143	0	Fr^1	−1596.597844	610.8261395	−58.20175408	0
	Fr^2	−563.4842137	218.4820402	−21.16568117	0	Fr^2	−24860.01416	9746.053358	−954.6884175	0	Fr^2	1954.074722	−742.4499108	70.16202604	0
	Fr^3	473.6139554	−183.7480269	17.81253846	0	Fr^3	22628.89698	−8844.098459	863.7141402	0	Fr^3	−545.3332711	198.785597	−17.84833494	0
	Fr^4	−143.4809583	55.69598585	−5.402185962	0	Fr^4	−7849.469063	3060.691291	−298.2180626	0	Fr^4	−217.8527037	88.29350685	−8.964416704	0
C2		Ⓜ^{0}	Ⓜ^{1}	Ⓜ^{2}	Ⓜ^{3}		Ⓜ^{0}	Ⓜ^{1}	Ⓜ^{2}	Ⓜ^{3}		Ⓜ^{0}	Ⓜ^{1}	Ⓜ^{2}	Ⓜ^{3}
	Fr^0	−8.651492353	3.218243839	−0.296508998	0	Fr^0	732.2088962	−267.2739822	24.3531546	0	Fr^0	104.1696329	−39.23949492	3.737292	0
	Fr^1	33.3883941	−12.3731322	1.137265092	0	Fr^1	−2987.146141	1094.958332	−99.93880661	0	Fr^1	−386.1340358	150.2701096	−14.41143517	0
	Fr^2	−42.53857932	15.77020018	−1.449593462	0	Fr^2	3980.924468	−1459.987766	133.2488033	0	Fr^2	506.9454551	−199.6785252	19.31776421	0
	Fr^3	22.47021354	−8.341597912	0.767121541	0	Fr^3	−2196.437643	805.0132252	−73.39869198	0	Fr^3	−282.552569	112.4609204	−10.97157109	0
	Fr^4	−4.26237798	1.584736731	−0.145788018	0	Fr^4	436.8508255	−159.8801337	14.55293371	0	Fr^4	58.1727911	−23.36601492	2.29783155	0
C3		Ⓜ^{0}	Ⓜ^{1}	Ⓜ^{2}	Ⓜ^{3}		Ⓜ^{0}	Ⓜ^{1}	Ⓜ^{2}	Ⓜ^{3}		Ⓜ^{0}	Ⓜ^{1}	Ⓜ^{2}	Ⓜ^{3}
	Fr^0	−178.8484205	91.86445373	−15.69811469	0.892662744	Fr^0	24072.09927	−12368.37217	2115.663221	−120.4734834	Fr^0	2172.95883	−1213.96111	224.2424416	−13.69475688
	Fr^1	757.4182535	−388.8770127	66.44216236	−3.778246534	Fr^1	−108249.71	55663.56499	−9528.51592	542.9820032	Fr^1	−10595.08245	5897.256912	−1085.102718	66.05588453
	Fr^2	−1165.166612	598.1694266	−102.2048474	5.812606265	Fr^2	175570.7946	−90326.9141	15470.22269	−882.0293985	Fr^2	17214.95566	−9559.531624	1755.823644	−106.73832
	Fr^3	764.0525611	−392.2383513	67.02302685	−3.812187759	Fr^3	−120600.7041	62071.48541	−10635.44021	606.6355759	Fr^3	−11166.78459	6201.996297	−1139.578581	69.31062512
	Fr^4	−180.9056723	92.86895078	−15.86944899	0.902707054	Fr^4	29697.32456	−15289.73591	2620.647095	−149.5296535	Fr^4	2505.394884	−1393.985396	256.5915173	−15.63254025
C4		Ⓜ^{0}	Ⓜ^{1}	Ⓜ^{2}	Ⓜ^{3}		Ⓜ^{0}	Ⓜ^{1}	Ⓜ^{2}	Ⓜ^{3}		Ⓜ^{0}	Ⓜ^{1}	Ⓜ^{2}	Ⓜ^{3}
	Fr^0	187.0765705	−86.29968472	13.25994392	−0.678490385	Fr^0	−10022.97515	4689.579788	−729.8819608	37.7926063	Fr^0	−6601.847073	3045.958024	−467.6074895	23.89682474
	Fr^1	−727.2767657	335.5559617	−51.55991652	2.638111168	Fr^1	38588.77513	−18048.14245	2808.382332	−145.3931435	Fr^1	27942.50715	−12874.17572	1974.346768	−100.7935837
	Fr^2	1064.51692	−491.1727862	75.46822225	−3.861065346	Fr^2	−58848.86056	27495.67209	−4274.355049	221.0931301	Fr^2	−43591.99773	20073.68339	−3076.733767	156.9850673
	Fr^3	−688.7578524	317.8290221	−48.83610558	2.498529552	Fr^3	40991.38592	−19128.70231	2970.189313	−153.4670435	Fr^3	29516.09896	−13590.2982	2082.725207	−106.2525438
	Fr^4	164.3579935	−75.85526686	11.65676485	−0.596418867	Fr^4	−10591.21653	4937.139522	−765.8312619	39.53216426	Fr^4	−7295.373112	3359.58061	−514.9344665	26.27389189
C5		Ⓜ^{0}	Ⓜ^{1}	Ⓜ^{2}	Ⓜ^{3}		Ⓜ^{0}	Ⓜ^{1}	Ⓜ^{2}	Ⓜ^{3}		Ⓜ^{0}	Ⓜ^{1}	Ⓜ^{2}	Ⓜ^{3}
	Fr^0	−0.670234511	0.19409594	−0.01372601	0	Fr^0	161.6779709	−42.77732217	2.85219049	0	Fr^0	584.329822	−158.9955918	10.86261005	0
	Fr^1	3.653442358	−1.006500999	0.068687577	0	Fr^1	−606.1974058	159.9136185	−10.57224552	0	Fr^1	−2553.94212	696.8942509	−47.55769397	0
	Fr^2	−6.218715898	1.677445818	−0.112494121	0	Fr^2	818.4671671	−212.5019958	13.82127902	0	Fr^2	4048.515628	−1103.523494	75.22903207	0
	Fr^3	4.704098373	−1.25708063	0.083688226	0	Fr^3	−522.0803404	134.1237101	−8.628178068	0	Fr^3	−2757.646854	751.2371152	−51.18723833	0
	Fr^4	−1.314589281	0.350640185	−0.023330255	0	Fr^4	132.3696572	−33.98758905	2.184815407	0	Fr^4	681.0684735	−185.5581227	12.6448848	0

The reliabilities of the polynomials and of their coefficients have been verified point by point on the entire amount of experimental data. An example of the polynomial fitting is shown in the Fig. D1.

As indicator of the reliability the normalized root mean square deviation (NRMSD) has been chosen:

$\mathrm{NRMSD} = \{{}^{1}/_{n} \sum_{n} [(y_i - \hat{y}_i)/ y_i]^2\}^{0.5}$

where:

n = number of predictions

y_i = experimental value

$\hat{y}_i$ = predicted value

Next table shows the results referring to the three polynomials (C_R, S_{WD} and L_{WLD}).

Model	C_R*1000 NRMSD	S_{WD} NRMSD	L_{WLD} NRMSD
C1	0.0154	0.0084	0.0036
C2	0.0146	0.0055	0.0031
C3	0.0380	0.0437	0.0055
C4	0.0325	0.0060	0.0030
C5	0.0249	0.0117	0.0038

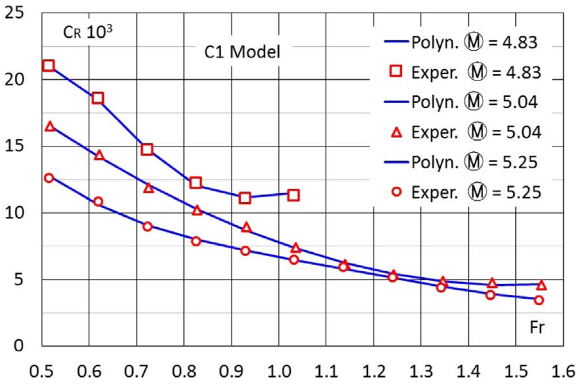
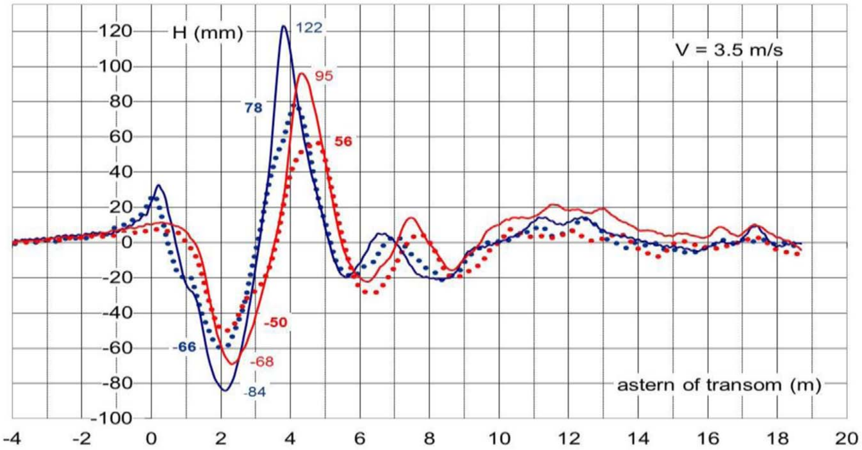
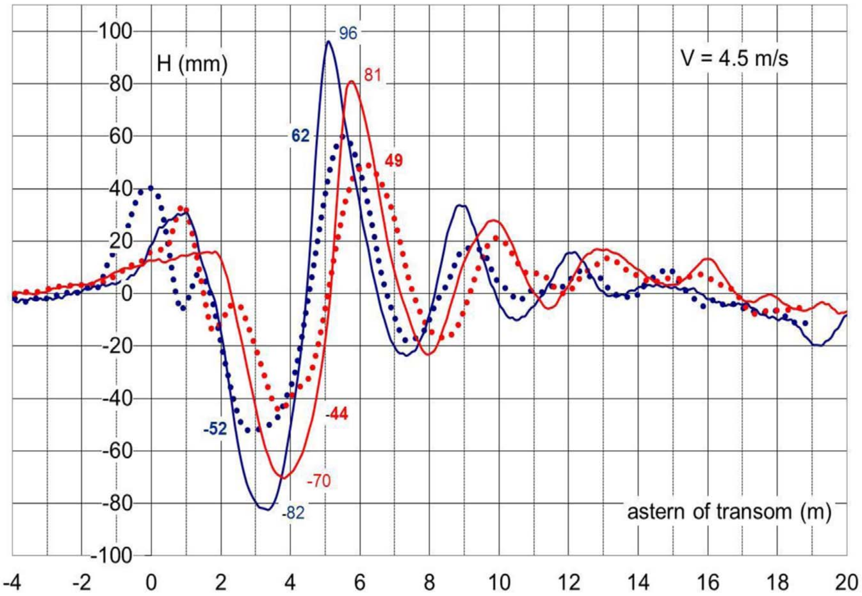


Fig. D1. Comparison between experimental and predicted data (C1 Model).

Appendix E. Wave cuts; Model C2





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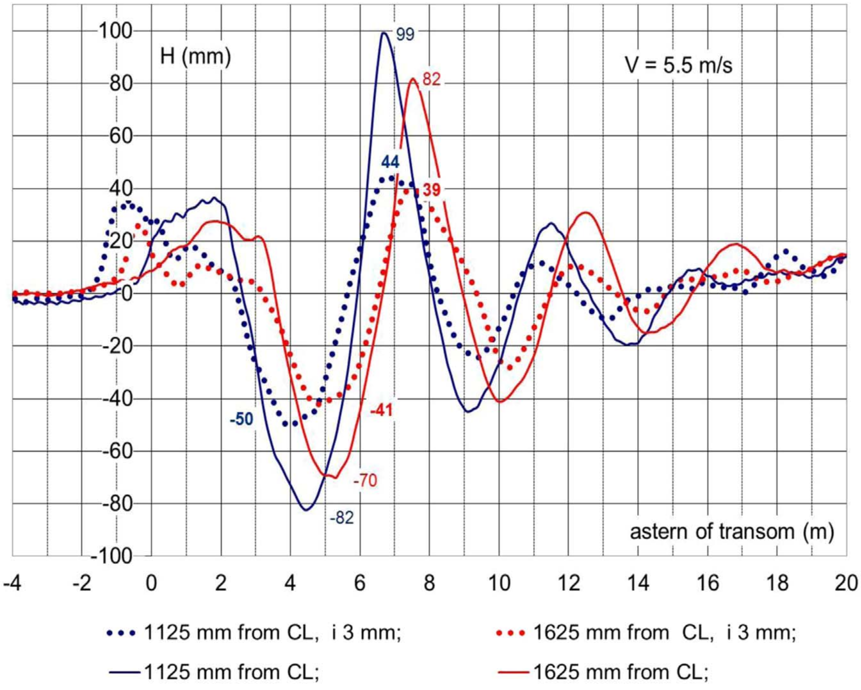

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Appendix F. Scaling example

To correlate model's experimental data and ship performances, two ways are available using:

- the dynamic data shown in Appendix A or
- the same data obtained by the polynomials whose coefficients are given in Appendix D.

Both the ways are carried out by the ITTC'57 procedures.

Next examples are referring to a ship whose main dimensions should be:

L_{OA}	52–53	m
B_{OA}	11.5	m
Δ	450	t
V_S	$\in (22, 30)$	kn

These dimensions identify the Model C4 and a scale factor λ =20.10. The ship reference dimensions will be: $L_{WL} = 48.2$ m, Ⓜ = 6.34, $V_S \in (22, 30)$ kn.

The ITTC'57 correlation procedure prescribes the relations:

- $V_M = V_S\ \lambda^{0.5}$ (in this case: $V_M \in (2.52, 3.44)$ m/s)
- $R_{TS} = C_{TS}\ (0.5\ \rho\ V_S^2\ S_{WD})$
- $C_{TS} = C_R + C_{FS} + C_A$
- $C_{FS} = \frac{0.075}{(\log_{10} Re - 2)^2}$

where C_A is the Correlation allowance coefficient.

By using the tables of data

For planing vessels, it is recommended to use the dynamic data L_{WLD} and S_{WD}. Therefore, referring to Table 43 of the Appendix A and for $C_A = 2 \times 10^{-4}$, the correlation procedures give the results shown in the next table.

	V_M=2.50 m/s V_S=21.8 kn	V_M=3.00 m/s V_S=26.1 kn	V_M=3.50 m/s V_S=30.5 kn
C_R	7.44×10^{-3}	6.22×10^{-3}	5.01×10^{-3}
L_{WLD} (m)	2.36	2.33	2.31
Re	4.468×10^{8}	5.295×10^{8}	6.122×10^{8}

C_{FS}	1.696×10^{-3}	1.659×10^{-3}	1.628×10^{-3}
C_{TS}	9.34×10^{-3}	7.90×10^{-3}	6.66×10^{-3}
S_{WD} (m^2)	1.17	1.14	1.1
R_{TS} (kN)	283.2	344.6	381.6

Obviously, for models with interceptors, the calculation procedure is the same. Nevertheless it has been highlighted that there is a significant scale effect in the correlation of the interceptor work in ship scale. In particular, in model scale the effectiveness of the interceptor (as trim corrector and as high lift device) is underrated. This underestimate is due to the non-proportional boundary layer and is growing with the scale factor. This theme is described in detail in (De Luca and Pensa, 2012).

By using the polynomials

It is possible to perform the same example using the polynomial expressions. The vectors $\underline{\text{Ⓜ}}$ and Fr should be calculate for the speeds of interest.

$\underline{\text{Ⓜ}}^T = \{1, \text{Ⓜ}, \text{Ⓜ}^2, \text{Ⓜ}^3\} = \{1, 6.341, 40.208, 254.961\}$

$V_S = 21.8$ kn:$\underline{Fr}^T = \{1, Fr, Fr^2, Fr^3, Fr^4\} = \underline{\{}1, 0.515, 0.265, 0.137, 0.070\}$

$V_S = 30.5$ kn:$\underline{Fr}^T = \{1, Fr, Fr^2, Fr^3, Fr^4\} = \underline{\{}1, 0.721, 0.520, 0.375, 0.270\}$

By the next expressions, it is possible to calculate CR, S_{WD} and L_{WLD}.

$CR = (\underline{Fr})^T \cdot \underline{A\ \text{Ⓜ}}$

$S_{WD} = (\underline{Fr})^T \cdot \underline{B\ \text{Ⓜ}}$

$L_{WLD} = (\underline{Fr})^T \cdot \underline{C\ \text{Ⓜ}}$

To be clear, the calculation of the CR at $V_S = 21.8$ kn is shown.

$$V1 : CR = (Fr)T \cdot A\text{Ⓜ} = (1,\quad 0.515,\quad 0.265,\quad 0.137,\quad 0.070) \cdot \begin{pmatrix} 187.0765705, & -86.2996847, & 13.25994392, & -0.6784904 \\ -727.276765, & 335.5559617, & -51.55991652, & 2.6381112 \\ 1064.51692, & -491.172786, & 75.46822225, & -3.8610653 \\ -688.757852, & 317.8290221, & -48.83610558, & 2.4985296 \\ 164.3579935, & -75.8552669, & 11.65676485, & -0.5964189 \end{pmatrix} \begin{pmatrix} 1 \\ 6.341 \\ 40.208 \\ 254.961 \end{pmatrix} = 0.0075214$$

The results are:

V_S kn	CR	S_{WD} (m^2)	L_{WLD} (m)
21.8	0.0075214	1.17	2.36
30.5	0.0050002	1.10	2.32

Now it is possible to repeat the same ITTC'57 procedures above shown and taking $\Delta CF=2\cdot10^{-4}$, it is possible to articulate the resistance by a single expression

$R_{TS} = \{[(\underline{Fr})^T\ \underline{A}\cdot\underline{\text{Ⓜ}}]+\{0.075/\{Log_{10}\{\{Vs\ [(\underline{Fr})^T\cdot\underline{C\ \text{Ⓜ}}]\ \lambda)/\nu s\}-2\}^2\}+\Delta CF\}^1/_2\rho[(\underline{Fr})^T\cdot\underline{B\ \text{Ⓜ}}]\ \lambda^2\ Vs^2$

V_S (kn)	Re_S	CF_S	CT_S	RT_S (kN)
21.8	4.465E+08	0.0016961	0.009418	286.2
30.5	6.135E+08	0.0016278	0.006828	382.5

By the following expressions it is possible to evaluate the sensitivity of the resistance to the displacement.

$\partial CR/\partial\underline{\text{Ⓜ}} = (\underline{Fr})^T\cdot\underline{A\ \text{Ⓜ}_i}$;

$\partial SWD/\partial\underline{\text{Ⓜ}} = (\underline{Fr})^T\cdot\underline{B\ \text{Ⓜ}_i}$;

$\partial LWLD/\partial\underline{\text{Ⓜ}} = (\underline{Fr})^T\cdot\underline{C\ \text{Ⓜ}_i}$;

$\underline{\text{Ⓜ}_i}^T = \{0, 1, 2\text{Ⓜ}, 3\text{Ⓜ}^2, 4\text{Ⓜ}^3, 5\text{Ⓜ}^4\}$

for $\text{Ⓜ} = 6.34\underline{\text{Ⓜ}_i}^T = \{0, 1, 12.682, 120.625\}$

whereas an increase of the displacement of 1.0% leads to reducing the Ⓜ of 0.02, the above mentioned expressions give the following derivatives.

V_S (kn)	$\partial C_R/\partial\text{Ⓜ}$	$\partial S_{WD}/\partial\text{Ⓜ}$	$\partial L_{WLD}/\partial\text{Ⓜ}$
21.8	−0.002524	−0.713	−0.15
30.5	−0.003053	−0.187	−0.04

The next expressions give the variations of C_R, S_{WD} and L_{WLD}:

$\delta CR = -\ \delta\underline{\text{Ⓜ}}\cdot\partial CR\ /\partial\underline{\text{Ⓜ}}$.

$\delta SWD = -\ \delta\underline{\text{Ⓜ}}\cdot\partial SWD\ /\partial\underline{\text{Ⓜ}}$.

$\delta LWLD = -\ \delta\underline{\text{Ⓜ}}\cdot\partial LWLD\ /\partial\underline{\text{Ⓜ}}$.

V_S (kn)	δC_R*	δS_{WD}*(m^2)	δL_{WLD}*(m)
21.8	0.000051	0.0143	0.0031
30.5	0.000061	0.0037	0.0008

Finally, it is possible to calculate the final readings of C_R, S_{WD} and L_{WLD} and, repeating the standard ship-model correlation, of the resistance variations.

V_S (kn)	$C_R+\delta C_R$*	$S_{WD}+\delta S_{WD}$* (m^2)	$L_{WL}+\delta L_{WLD}$* (m)
21.8	0.007572	1.18	2.36
30.5	0.005061	1.10	2.32

V_S (kn)	Re_S	CF_S	CT_S	$RT_S+\delta RT_S$ (kN)
21.8	4.471E+08	0.0016958	0.0094676	291.2
30.5	6.137E+08	0.0016277	0.0068890	387.2

Comparing the resistances evaluated through the two ways, it is possible to observe differences of 1.0% and 0.2%.

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