

REPORT OF THE SYMBOLS AND TERMINOLOGY GROUP

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I. GENERAL

1. MEMBERSHIP AND MEETINGS

In May 1985 the Executive Committee of the 18th International Towing Tank Conference (ITTC) reorganised the former Information Committee, earlier Presentation Committee, to form a Symbols and Terminology (SaT) Group in the newly established ITTC Secretariat.

The membership of the SaT Group was appointed by the Executive Committee in due course as follows:

Prof. Bruce Johnson (Chairman)
Dr. David Clarke
Dr. Norihiro Matsumoto
Prof. Carlo Podenzana-Bonvino (Secretary)
Prof. Michael Schmiechen

The SaT Group Meetings took place:

at Wageningen (NL), October 1985
at Berkeley (USA), July 1986
at Trondheim (N), June 1987

2. RECOMMENDATIONS OF THE 17TH ITTC

The task of the SaT Group for the 18th ITTC was to carry out Recommendations 1 through 5, related to the ITTC Standard Symbols, of the Information Committee of the 17th ITTC:

- The Information Committee should continue to monitor and co-ordinate the development of new symbols by the Technical Committees.
- The Conference should adopt the new symbols for hydrostatics included in Appendix 4 and the Information Committee should then include these in the ITTC Standard Symbols.
- The Information Committee should restructure the ITTC Standard Symbols according to the outline proposal in Appendix 6 and include new symbols agreed by the Technical Committees.
- The Information Committee should continue to revise the Dictionary of Ship Hydrodynamics as required.
- The Information Committee should continue co-operation with other organizations to achieve a common agreement on symbols and terminology.

II. REVIEW ON SYMBOLS AND TERMINOLOGY OF IMPORTANCE TO THE ITTC

1. INTRODUCTION

The SaT Group took up its work immediately after it was established in a first meeting at Wageningen in October 1985, coming up with the plan to produce the present draft of a restructured and enlarged list of ITTC Standard Symbols 1987. The first raw draft was discussed at Berkeley in July 1986, and the present version was finalized at Trondheim in June 1987.

As regards to the document, it is evident that it is still a draft. All the ITTC Community, the Technical Committees in particular are invited to contribute to the continuing task of updating and further perfection. The guiding principles and rules behind the project are outlined in the following.

At this stage it is appropriate to acknowledge with thanks the tremendous work done by the former Presentation and Information Committees and the Technical Committees in their respective fields. It is only on the basis of this work that the present work could have been undertaken.

2. CLASSIFICATION

The prime concern in setting up this revised and enlarged list of ITTC Standard Symbols was to design an adequate system for the classification of concepts. As soon as the work started it became clear that the outline proposed by the Information Committee of the 17th ITTC (Proc.17th ITTC (1984) Vol.1,p.56) had to be reconsidered in view of the problems at hand.

Subsequently the following design requirements and goals have been established:

- produce a coherent document meeting the present and possibly future requirements of the ITTC community in general and particular user groups;
- establish an open ended matrix structure that can be easily expanded as requirements arise, without the need of restructuring and repetition or too many explicit cross-references;
- keep departures from the well established

and widely accepted structure in general and in detail to a minimum.

After a series of attempts to meet these requirements the structure as listed in the table of contents evolved very much in line with the past development of the symbols e. g. by the High Speed Craft Committee and others. The essential features are the subject areas of rather limited scope, organized in a sort of hierarchical order. Ideally each subject area represents a complete and coherent model of the micro-universe under consideration, e. g. rigid body motions, hull geometry, propulsor performance, etc. This structure is shown in Appendix 1.

The concepts related to a given subject area or model are designated by the Standard Symbol and called by their Name (Title). Their meaning can in principle only be concluded from the context of the model i. e. logically by so-called implicit definitions, to be derived from an explicit statement of the model, ideally an axiomatic system or any equivalent.

The problem is that traditionally in lists of standard symbols these explicit models are missing for various reasons. One is that many subject areas under discussion are far from being developed and understood to the extent necessary. A consequence of this situation is that the symbols proposed are not always as coherent as necessary for advanced and systematic work where the explicit models and an adequate notation are prerequisites.

The problem under discussion is of course the same in ISO and national Standards of Symbols. In order to avoid the dilemma indicated the Standard of Symbols should not only standardize past practice and jargon but try to take the lead and step forward.

3. ORGANISATION

As has been emphasized the development of symbols is a continuing process and as the subject develops, further amendments and additions, as approved by the Conference, will be included in future editions of the list.

In order to avoid any extra problems the symbols are arranged in alphabetical order in each subject area as in previous lists. Further continuous page numbering has been discarded.

A loose leave organisation was found to be the most appropriate in view of new drafts to be in-

corporated. This of course requires each subject area to carry an indication of its status and date as shown in the table of contents.

The symbols in the first column of the tables are primarily intended for use in technical writing and mathematical expressions. The following notes are relevant:

1. No rules are laid down as to whether subscripts are to be shown by capital or lower case letters, although the letters shown in the lists are in the preferred style.
2. In a number of instances alternative symbols are given and the second choice is sometimes given in parenthesis.
3. When required, the suffixes M and S should be introduced to distinguish between quantities referring to model and ship respectively.
4. No distinction is made between letter symbols printed or typed in either Roman or Italic.
5. Greek letters and special signs are spelt out where they first occur in the list.
6. Physical quantities denoted by the symbols may be measured in any units, preferably in SI Units stated in column 3, s. below. Quantities involved in non-dimensional coefficients must be expressed in consistent units.
7. Where for one reason or another departures from the standard symbols are made, these departures should be clearly indicated and stated.

The symbols in the second column of the tables have been chosen so that their meaning is readily apparent. They have been constructed from the CCITT International Telegraph Alphabet, restricted character set. They are therefore suitable for use in a wide range of situations e. g.:

Telex messages
Letters
Computer printouts etc.

To ensure that the symbols can be used in a wide range of programming languages they have been kept to less than six characters long. The symbols should be used as defined, and, in accordance with modern programming practice, should have their type explicitly declared before use.

The following rules were applied in the derivation of the symbols:

1. Only upper case letters A-Z and digits 0-9 have been used.
2. Greek letters have been spelled out, if necessary in abbreviated form or with changed spelling.
3. The Froude 'circular' symbols are defined by the prefix CIRC.
4. All symbols start with a letter.
5. Indices are suffixed to the main symbol on the same line, without spacing.
6. No one symbol should be used for different concepts.
7. All symbols are to be as short as possible.

A final remark on the Computer Symbols: in the computer, the letter O and the figure 0 (zero) have fundamentally different meanings, but owing to their resemblance they can be easily confused. Thus it is necessary to distinguish rigorously between them. In the tables this is done with a slash through the letter, viz: Ø for the letter as opposed to 0 for the figure zero. Unfortunately, some equipment manufacturers reverse this convention.

The fourth column in the tables contains the names (Titles) of the concepts denoted by the symbols in the first and the second columns, while the fifth column contains a definition, if possible formal, except for the basic concepts, or an explanation.

The last column used to contain the dimensions of the concepts but following modern standardisation practice the SI-Units have now been introduced and the column was shifted to the third position for various reasons. The dimensions of dimensionless quantities as well as their units are 1, they are measured in counts or "absolute units", which sometimes are given names, e.g. rad, rev but this practice usual in natural languages (sheets of paper or bottles of wine) is found to be not very useful in formal systems.

See in Appendix 2 a sample of the prepared draft.

A number of translations of the List of ITTC Standard Symbols into languages other than English has been made including French, German, Italian, Japanese, Russian, Spanish and others; for obvious

reasons these translations are no longer up-to-date as the present list in English.

Apart from the organizations represented on the ITTC these symbols have been recommended for use in technical writing on naval architecture by a number of organizations concerned with marine matters including: The Royal Institution of Naval Architects, the American Society of Naval Architects and Marine Engineers and the American, British, Canadian, Australian and Italian Navies.

In 1985 the Draft International Standard ISO/DIS 7463 Shipbuilding - Symbols for computer applications - has been published. The symbols are based on the list approved by the ITTC in Ottawa 1975 and a related list produced by the ISSC in 1974, inconsistencies having been removed.

4. REFERENCES

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- International Towing Tank Conference, Standard Symbols 1976, BSRA T.M. N°500, 1976.
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- ITTC Dictionary of Ship Hydrodynamics, RINA Maritime Technology Monograph N°6, 1978.
- Proceedings of the 17th ITTC, Report of Information Committee, Goteborg 1984.
- French Translation of ITTC Standard Symbols, published by Association Francaise de Normalisation (AFNOR).
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- Japanese Translation of ITTC Standard Symbols, Transactions of the Society of Naval Architects of Japan, N°538, 1974.
- Russian Translation of ITTC Standard Symbols 1971, Brodarski Institute, Publication N°28, Zagreb 1974.
- Simbolos Internacionales en Arquitectura Naval, Asociacion de Investigacion de la Construccion Naval, Publication 7/75, 1975, Madrid.
- Chinese Translation of ITTC Standard Symbols, published by CSSRC - Wusih.
- SSPA 101.

III. CONCLUSIONS AND RECOMMENDATIONS

1. CONCLUSIONS OF THE GROUP.

It is difficult, at this stage of the Group job, to state any conclusion, because of the relevant work still required to arrive to a definitive organisation of the subject. It is preferable to resume some points of the Group task, at this time, sufficiently developed and advanced.

- The proposal table of contents (see Appendix 1) seems to be fairly well adequate to the purpose, at the present state of the standard terminology and suitable of modifications which future requirements from ITTC people will need.
- Comments from Technical Committees concerning titles and symbols of the respective fields of operation were received and, if possible, taken into account in preparing the draft.
- Not all subchapters are, at the present, in the same updating state, and generally we can expect significant modifications in the fields we can define "not traditional", for example in the offshore structures sector.
- In the present draft the SaT Group still maintained some ancient symbols and titles, of common application still now, in many cases not correctly defined from dimensional viewpoint; this may be not necessary in the future.

2. DRAFT RECOMMENDATIONS TO THE CONFERENCE

- The Conference should adopt the structure of ITTC Standard Symbols outlined by the Symbols and Terminology Group and the new symbols inserted in the draft prepared and distributed by the SaT Group.

- The Conference should discuss the opportunity of reviewing and updating the ITTC Dictionary of Ship Hydrodynamics and the official translations of this into principal languages.

3. DRAFT RECOMMENDATIONS FOR THE FUTURE WORK OF THE GROUP.

- The Symbols and Terminology Group should continue to monitor and coordinate the development of new symbols by the Technical Committees.
- The SaT Group should restructure the ITTC Standard Symbols according to the outlined proposal in Appendix 1 and include new symbols agreed by Technical Committees.
- The SaT Group should continue cooperation with other organisations to achieve a common agreement on symbols and terminology.
- The SaT Group should plan, if agreed by the Conference, a revision of the ITTC Dictionary of Ship Hydrodynamics and of the official translations into principal languages of ITTC people, in order to have a coherently updated version of the whole.

APPENDIX 1

ITTC STANDARD SYMBOLS AND TERMINOLOGY

		Status	Date	Pages
SYMBOLS CLASSIFIED BY SUBJECTS				
1	General mechanics			
1.1	Fundamental concepts	Draft	1987	3
1.2	Fluid mechanics			
1.2.1	Parameters	Draft	1987	1
1.2.2	Flow fields	Draft	1987	2
1.2.3	Boundary layers	Draft	1987	2
1.2.4	Cavitation	Draft	1987	1
1.3	Solid body mechanics			
1.3.1	Properties	Draft	1987	
1.3.2	Forces	Draft	1987	
1.3.3	Rigid body motions	Draft	1987	
1.3.4	Elastic body motions	Draft	1987	
1.4	Environmental mechanics			
1.4.1	Waves	Draft	1987	
1.4.2	Wind			
1.4.3	Currents			
1.4.4	Ice	Draft	1987	
2	Ships in general			
2.1	Geometry and Hydrostatics			
2.1.1	Hull geometry	Draft	1987	4
2.1.2	Propulsor geometry	Draft	1987	2
2.1.3	Appendage geometry	Draft	1987	1
2.1.4	Hydrostatics	Draft	1987	5
2.2	Resistance and Propulsion			
2.2.1	Hull resistance	Draft	1987	3
2.2.2	Ship performance	Draft	1987	3
2.2.3	Propulsor performance	Draft	1987	4
2.2.4	Unsteady propeller forces	Draft	1984	3
2.3	Manoeuvring and Seakeeping			
2.3.1	Manoeuvring	Draft	1987	1
2.3.2	Seakeeping	Draft	1984	6
3	Special ships and vehicles			
3.1	Icegoing vessels			
3.1.1	Geometry			
3.1.2	Resistance and Propulsion	Draft	1984	2
3.1.3	Manoeuvring and Seakeeping			
3.2	Planing boats			
3.2.1	Geometry	Draft	1984	3
3.2.2	Resistance and Propulsion	Draft	1984	1

	Status	Date	Pages
3.2.3			
3.2.3			
3.3			
3.3			
3.3.1	Draft	1984	3
3.3.2	Draft	1984	5
3.3.3	Draft	1984	
3.4			
3.4			
3.4.1	Draft	1984	1
3.4.2			
3.4.3			
3.5			
3.5			
3.5.1	Draft	1984	3
3.5.2	Draft	1984	2
3.5.3	Draft	1984	1
3.6			
3.6			
3.6.1	Draft	1984	2
3.6.2	Draft	1984	2
3.6.3			
3.7			
3.7			
3.7.1			
3.7.2			
3.7.3			
3.8			
3.8			
3.8.1			
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3.8.3			
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4.1			
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4.1.4			
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4.3.3			
4.4			
4.4			
5			
5			
5.1			
5.1			
5.1.1			
5.1.2			

- 5.1.3 Behaviour and Manoeuvrability
- 5.1.4 Strength and Fatigue

- 5.2 Semi-submersible Structures
 - 5.2.1 Geometry and Hydrostatics
 - 5.2.2 External Forces and Thrusting
 - 5.2.3 Behaviour and Manoeuvrability
 - 5.2.4 Strength and Fatigue

- 5.3 Structures in Ice
 - 5.3.1 Geometry and Hydrostatics
 - 5.3.2 External Forces and Thrusting
 - 5.3.3 Behaviour and Manoeuvrability
 - 5.3.4 Strength and Fatigue

- 5.4 Submersibles Structures
 - 5.4.1 Geometry and Hydrostatics
 - 5.4.2 External Forces and Thrusting
 - 5.4.3 Behaviour and Manoeuvrability
 - 5.4.4 Strength and Fatigue

- 5.5 Articulated and Flexible Structures
 - 5.5.1 Geometry and Hydrostatics
 - 5.5.2 External Forces and Thrusting
 - 5.5.3 Behaviour and Manoeuvrability
 - 5.5.4 Strength and Fatigue

APPENDIX 2

SAMPLE OF A PAGE OF THE LIST

ITTC Standard Symbol

Draft 1987

2 Ships in general

2.1.1 Hull geometry/3

Standard Symbol	Computer Symbol	SI Units	Name of concept	Definition or Explanation
C_{IT}	CWIT	1	Coefficient of inertia of waterplane, transverse	$12 \frac{I_T}{B^3 L}$
$C_{M,\beta}$ (beta)	CM	1	Midship section coefficient (midway between forward and aft perpendiculars)	$\frac{A_M}{BT}$
$C_{P,\phi}$ (phi)	CP	1	Longitudinal prismatic coefficient	$\frac{*V}{A_x L}$ or $\frac{V}{A_M L}$
C_{PA,ϕ_A}	CPA	1	Prismatic coefficient afterbody	$\frac{*V(afterbody)}{\frac{1}{2} A_x L}$ or $\frac{V(afterbody)}{\frac{1}{2} A_M L}$
C_{PE,ϕ_E}	CPE	1	Prismatic coefficient entrance	$\frac{*V(entrance)}{A_x L_E}$ or $\frac{V(entrance)}{A_M L_E}$
C_{PF,ϕ_F}	CPF	1	Prismatic coefficient forebody	$\frac{*V(forebody)}{\frac{1}{2} A_x L}$ or $\frac{V(forebody)}{\frac{1}{2} A_M L}$
C_{PR,ϕ_R}	CPR	1	Prismatic coefficient run	$\frac{*V(run)}{A_x L_R}$ or $\frac{V(run)}{A_M L_R}$

(*) The prismatic coefficient should generally be based upon maximum section area rather than on midsection area, as given in the 1960 Committee report, but it should be clearly stated which area has been used. Whatever ship length considered appropriate may be used for this and another coefficient, but this length should be clearly indicated and stated.