REPORT OF INFORMATION COMMITTEE

I. GENERAL

MEMBERSHIP AND MEETINGS

The Committee appointed by the 15th ITTC consisted of the following members:

Dr.Ir. M.W.C. Oosterveld - Chairman
Prof. B. Johnson
Mr. G. Knight
Dr. T. Koyama
Mr. M.D. Miles
Dr. E. Nikolaev
Prof. M. Schmiechen
Mr. H. Sierra

Mr. Miles was elected as the Secretary at the first meeting of the Committee at the end of the 15th ITTC. Mr. Sierra resigned from the Committee in January, 1979 due to a change in professional affiliation. The Committee was returned to full strength with the appointment of Prof. S. Marsich of the University of Genova in June, 1979.

The Committee has met five times since being appointed at the 15th Conference:

Berlin	November 1978	5 attending
East Cowes	April 1979	7 attending
Leningrad	April 1980	7 attending
Tokyo	October 1980	8 attending
Wageningen	January 1981	6 attending

RECOMMENDATIONS OF THE 15th ITTC

The recommendations of the 15th Conference regarding the tasks of the Information Committee were as follows:

1. Symbols and systems for presentation of data should continue to be developed as specific requirements arise.

2. Arrangements should be made for translation of the Dictionary of Ship Hydrodynamics into the agreed ITTC languages.

3. Collaboration should continue with other international organizations to achieve common agreements on symbols and terminology.

4. A unified Catalogue of Experiment Facilities should be published in loose-leaf binders using the new standard formats proposed in Section 5. Subsequent updates should also be distributed as required.

5. A Group Discussion of new hydrodynamic test facilities and related systems of instrumentation should be organized and adequately documented by the Committee for future Conferences.

6. A basic software exchange should be set up within the ITTC using the procedure given in Section 6.7 and a catalogue of available software should be maintained.

7. A detailed review of the design and structure of data banks for model test and ship trials data should be prepared.

8. Standard formats for seakeeping data should be developed in conjunction with the Seakeeping Committee for computer-compatible media.

9. Overall author and subject indices should be prepared for the Proceedings of previous Conferences.

10. The draft catalogue of documentation services should be expanded to cover all known services which deal with subjects of importance to the ITTC.

11. A Newsletter should be set up according to the procedure described in Section 9.6 in order to facilitate the informal exchange of information within the ITTC. This Newsletter should be published approximately twice a year as an experiment for the next Conference period.

II. REVIEW OF METHODS FOR PRESENTATION AND EXCHANGE OF INFORMATION OF IMPORTANCE TO THE ITTC

1.0 INTRODUCTION

The main tasks of the Information Committee may be summarized as follows:

(i) Development of the ITTC List of Standard Symbols and the ITTC Dictionary of Ship Hydrodynamics and the periodic revision of these documents in order to keep them up to date.

(ii) Organization of procedures for the exchange of information on towing tank systems and techniques.

(iii) Development of standard systems for the presentation of data.

The Information Committee has also been charged by the Executive Committee with the task of giving shape to an ITTC Newsletter. In addition to facilitating the informal exchange of technical information, this newsletter should also provide information concerning the organization of the forthcoming Conference.

The Information Committee has reviewed the current List of Standard Symbols and the Dictionary of Ship Hydrodynamics in close co-operation with the various Technical Committees and has reached the conclusion that extensive additions are necessary. These pertain primarily to new fields of study which are now being covered by both the long-established committees and those which were newly-formed at the 15th Conference. Contacts with other Organizations such as the ISSC, IAHR,

ISO, SNAJ, SNAME and RINA have shown that the ITTC Standard Symbols have been incorporated in the only similar activities which have been reported to the Committee.

Concerning the exchange of technical information, the Committee is pleased to report that the Catalogue of Facilities has now been completed as a separate document using the new formats. More than 85 percent of the ITTC member organizations have sent in descriptions of their facilities for the Catalogue. A number of organizations outside the ITTC have also submitted descriptions. The Catalogue has been distributed to all member organizations of the ITTC and also to those organizations outside the ITTC which contributed to it.

In further attempts to encourage and facilitate the exchange of technical information, the Committee has set up a Catalogue of Computer Programs and has also organized the publication of Material of Interest as part of the Newsletter. This material consists of short individual contributions on technical topics of interest to the ITTC community. Updates for the Catalogue of Facilities and the Catalogue of Computer Programs have also been distributed via the Newsletter.

The exchange of information on towing tank systems and techniques will also be served by a group discussion on Facilities and Instrumentation which has been organized by the Information Committee for the 16th Conference. This group discussion will consist of two parts:

Part 1: Invited Papers

Five papers will be presented during this part of the session on instrumentation topics of interest to most ITTC member organizations. The topics and the authors were selected in close co-operation with the Technical Committees.

Part 2: New Hydrodynamic Test Facilities

During this part of the session, ITTC delegates will have the opportunity to present short contributions describing their new hydrodynamic test facilities.

Keen interest has been observed in both parts of this group discussion.

With regard to the development of standard systems for the presentation of data, a review of the design, structure and implementation of computer data banks for model test and ship trials data has been carried out. A standard format for the exchange of seakeeping data on computer-compatible media has also been developed in consultation with the Seakeeping Committee.

The Information Committee was given the task to prepare overall author and subject indices for the Proceedings of previous Conferences in order to provide better access to the wealth of information contained in them. It soon became obvious, from various trial attempts, that the preparation of detailed indices would be a major undertaking far beyond the resources of the Committee. It was therefore decided to prepare a guide to previous Conferences based primarily on the tables of contents instead. Such a guide should still be quite helpful in locating information.

Finally, an ITTC Newsletter was set up and published at fairly regular intervals. This Newsletter consists of two parts.

The first part includes news from the Executive Committee, the Advisory Council and the Technical Committees concerning their activities in relation to the forthcoming ITTC Conference. The first part also includes news from member organizations and a calendar of events. This part is intended to serve the wishes of the Executive Committee and the Advisory Council to improve communication between the member organizations during the period between Conferences.

The second part includes individual contributions on technical subjects to be published as Material of Interest and contributions to the Catalogue of Computer Programs. This part also includes updates for the Catalogue of Facilities. The objective of this part of the Newsletter is to improve the exchange of technical information between member organizations of the ITTC.

The Newsletter was sent to all ITTC member organizations, to all members of Committees and Panels and to a limited group of additional organizations and individuals.

The activities of the Information Committee are described in greater detail in the following sections. All numbers in square brackets [] designate references which are listed in Section 12.

2.0 SYMBOLS AND PRESENTATION OF DATA

A continuing task of the Committee is to develop new symbols and standard methods for presentation of data as specific requirements arise. Effective fulfillment of this task clearly requires close co-operation with the Technical Committees. This is especially true of the newly-formed committees where the need for new nomenclature is usually greatest.

All of the Technical Committees were consequently requested to review the current list of symbols [1] in order to determine if they are still adequate for their respective fields of interest. The basic objective was to establish draft recommendations for the committees of the 17th Conference in order to rectify any problem areas.

In the course of developing a standard format for seakeeping data on computer-compatible media, the Committee found that the present list of symbols was quite inadequate for the purpose. This is especially true for computer-aided time domain analysis. The Seakeeping Committee was consequently asked whether the agreed symbols should be changed or supplemented by a more complex operational system of notation. The Information Committee feels that the eventual adoption of such a system by one of the future Conferences would not necessarily lead to changes in individual systems which have already been developed and are in use by various member organizations. It would rather serve the purpose of a common reference notation.

The Seakeeping Committee is fully aware of the insufficiency and inadequacy of the present list of symbols and agrees that they should be updated and supplemented where necessary by the Seakeeping Committee of the next Conference.

It is evident that similar situations exist in other fields as well. The Performance Committee has reported that some recently evolved symbols associated with the 1978 Prediction Method are not included in the standard list. Some other symbols are being used with meanings slightly different to those defined in the standard list. One example is ΔC_F as used in the 1978 Prediction Method.

The Propeller Committee found that there are no symbols for the geometry of the surroundings of the propeller in the aperture such as clearances in different directions. The definitions of fluctuating shaft and bearing forces are also insufficient. It is the opinion of the Propeller Committee that shaft forces are forces induced by the propeller, in the shaft and bearing forces are the reaction forces in the bearings.

Extensive additions to the current list of symbols will also be necessary in the fields of High Speed Craft, Ocean Engineering and Ship Performance in Ice-Covered Waters. It is therefore recommended that joint action be undertaken by the Information Committee and the Technical Committees of the 17th ITTC in order to revise the list of standard symbols to meet present requirements. Corresponding additions to the Dictionary of Ship Hydrodynamics are discussed in the next section.

3.0 DICTIONARY OF SHIP HYDRODYNAMICS

In accordance with Recommendation 2, the Information Committee was to make arrangements for the translation of the Dictionary of Ship Hydrodynamics [2] into the agreed ITTC languages. It was reported at the 15th Conference that a translation into Chinese has been initiated. The Krylov Institute has completed a Russian translation which will soon be published and a translation into Japanese is now in preparation. A German translation is also considered worthwhile but it has had to be postponed.

On the whole, the present edition of the Dictionary gives a comprehensive list of the main terms from all fields of hydrodynamics of conventional ships. The expanding activities of the ITTC may necessitate a new, enlarged edition, however. New Committees on Ocean Engineering and Ships in Ice-Covered Waters were appointed at the 15th Conference and a Panel on High-Speed Marine Vessels was also established. In addition to introducing new sections reflecting the profiles of recently-established Committees such as these, it would be expedient to make some additions to the current sections and also to provide more precise definitions in certain cases.

It has been brought to the attention of the Committee by Dr. G. Lewison that the present definition of wave direction angle relative to the X axis is incomplete. If it is assumed that wind and waves would normally come from roughly the same direction, the wave direction angle should be measured clockwise in order to correspond with the definition of the relative wind direction. This is in contrast to the conventions used in several seakeeping prediction programs such as SCORES, for example.

Other problems of definition arise in connection with the concepts of lift and cross force as Prof. S. Tamiya has pointed out in an enlightening essay on lift, drag and resistance [3]. The problem cannot be resolved in general even by resorting to body and flow axes. Prof. Tamiya therefore suggests that the symbol C for cross force either be deleted from the List of Standard Symbols or that its definition be carefully revised.

The Information Committee proposes on the contrary, however, that the concept and its symbol be retained and that the definition be left to the particular context in which the symbol is used. This philosophy is based on the facts that words divorced from language (i.e. context) are meaningless and that

science often takes advantage of different contexts for convenience. It is consequently impossible to provide a single definition for a useful concept which is satisfactory for all purposes without impairing the originality of the researchers.

The need to introduce some further additions also became apparent when the Russian translation of the Dictionary was being edited. The nature of possible revisions may be illustrated by the following examples pertaining to the Manoeuvrability Section. There is no term in this section to denote the capacity of the ship to move along a pre-set trajectory. The term "steering" is not equivalent to such a concept because it denotes keeping the ship on a given course which is a process but not a property.

The Manoeuvrability Section also does not contain the terms required to characterise the manoeuvrability of a ship quantitatively. Such terms will have to be defined in the future. Furthermore, the section does not include instability indices of a ship which has no straight-line stability. Such indices should include the following:

(1) the minimum rudder angle of a turning ship which can change the direction of turning;

(2) the diameter of the ship's turning at zero rudder angle;

(3) the dimensionless angular velocity of the ship's turning at zero rudder angle.

It is also desirable to introduce such terms as rudder chord, rudder height, dynamic heel when the ship starts turning, etc.

In view of the above considerations, it is recommended that the Technical Committees of the next Conference be requested to prepare draft proposals for the revision and extension of the Dictionary.

4.0 COLLABORATION WITH OTHER ORGANIZATIONS

In accordance with Recommendation 3, the Committee has approached various organizations concerning the adoption of the ITTC Standard Symbols and the Dictionary of Ship Hydrodynamics. The organizations contacted were as follows:

- the International Ship Structure Congress (ISSC)
- the International Association for Hydraulic Research (IAHR)
- the International Standards Organization (ISO)
- the Society of Naval Architects and Marine Engineers (SNAME)
- the Royal Institution of Naval Architects (RINA)
- the Society of Naval Architects of Japan (SNAJ)

Responses have so far been received from the ISSC, the IAHR, the ISO and the SNAJ. The only similar document reported to the Committee incorporates the present ITTC Standard Symbols.

In view of the various intentions to systematically extend the List of Standard Symbols and the Dictionary, collaboration with other institutions and organizations will have to be continued as necessary and desirable. Individuals who are interested in this important

matter and who are aware of relevant developments elsewhere are invited to notify the Information Committee.

5.0 ITTC CATALOGUE OF FACILITIES

A new, unified ITTC Catalogue of Experiment Facilities was distributed to member organizations in November, 1980 by the Information Committee in accordance with Recommendation 4. This catalogue was also sent to other organizations which had submitted descriptions of their major facilities. The standard format for this catalogue is described in Reference 4.

The catalogue includes towing tanks, seakeeping and manoeuvring basins, circulating water channels and cavitation tunnels. It is arranged alphabetically by country and by city within each country. Appendix 1 contains a current table of contents for the catalogue which lists both the member organizations and the other establishments which submitted contributions.

The catalogue is maintained on standard A4 paper in loose-leaf binders so that each organization can readily update its own copy as required. 150 copies of sheets describing new or updated facilities should be sent to the following address:

Professor Bruce Johnson,
Naval Systems Engineering Department,
United States Naval Academy,
Annapolis, Maryland 21402,
U.S.A.

Prof. Johnson will periodically send the new sheets to all organizations which hold copies of the catalogue. New sheets will also usually be distributed with the ITTC Newsletter. It is hoped that this catalogue will become a permanent document of the ITTC and that member organizations will endeavour to keep their copies up to date. This should tend to simplify the questionnaires distributed by the Technical Committees since some of the required information will be readily available from the catalogue.

The Information Committee gratefully acknowledges the financial support of the Naval Sea Systems Command of the U.S. Navy in providing the binders and mailers for the Catalogue. It also thanks those individuals who prepared the catalogue sheets and the staff of the USNA Hydromechanics Laboratory who assembled the catalogue for its initial distribution.

6.0 ORGANIZATION OF THE GROUP DISCUSSION ON FACILITIES AND INSTRUMENTATION

Member organizations of the ITTC display a keen interest in exchanging information on new hydrodynamic test facilities and associated systems of instrumentation. This is evident from the example of the 14th ITTC where the contributions on this topic alone occupy more than 200 pages in the Proceedings. The exchange of information on new test facilities and instrumentation is indeed one of the principal objectives of the ITTC and it has become increasingly important in the last decade due to the intensive development of "tankery" at the majority of ITTC member organizations. The following table was compiled from the current Catalogue of Facilities and it shows the rate of growth of the number of model basins and hydrodynamic tunnels at ITTC member organizations since 1960.

	1960	1970	1980
No. of Model Basins	67	98	137
No. of Tunnels	32	52	76

It must be noted, however, that the revised format of the 15th ITTC, which was aimed at restricting the length of the Conference and the bulk of the Proceedings, has unfavourably affected the opportunities for the exchange of information on new facilities. The Presentation and Information Committee of the 15th ITTC recognized this problem and proposed that a group discussion on this topic be organized at future Conferences and documented in a suitable manner. This proposal was adopted as Recommendation 5 for the Information Committee.

The Group Discussion on Facilities and Instrumentation will be included in the Session on Systems and Techniques at the 16th Conference. It will consist of two parts as follows:

Part 1: Five short papers will be presented on invitation. These will deal with particular developments in instrumentation which are of interest to the ITTC community.

Part 2: This part will provide the opportunity for individual ITTC delegates to give short presentations describing new hydrodynamic test facilities at their respective organizations.

The following topics and authors have been selected for Part 1 of the Group Discussion as the result of discussions with various Technical Committees of the 16th ITTC.

(1) "Three-Dimensional Position Measuring Systems", L. Abelseth and O. Rotvold, Norwegian Hydrodynamic Laboratory

(2) "Measuring System for Sea Trials", O. Nishihara, K. Tajima and N. Matsumoto, Nippon Kokan K.K.

(3) "State of the Art Review of Wave Generation and Analysis", B. Johnson (Information Committee) in collaboration with S. Takezawa (Seakeeping Committee)

(4) "New Wave Generation Techniques for Seakeeping Tests", S. Takezawa, Yokohama National University

(5) "Laser Doppler Velocimeter Flow Measurements", A. Lammers and J. Laudan, Hamburg Ship Model Basin

7.0 SOFTWARE EXCHANGE CATALOGUE

A catalogue for computer software has been started using the format proposed by the 15th ITTC. The catalogue, which is updated using the Newsletter, provides information on existing software and where it can be obtained. The programs which have been submitted so far are listed in Appendix 5.

Interested members should contact the originating establishment directly. The Information Committee will thus not take an active part in the operation of any exchange but will merely provide an information service by maintaining a catalogue of available software.

The categories for programs remain as follows:

(1) General programs

(2) Test analysis programs

(3) Prediction programs

(4) Correlation programs

(5) Simulation programs

(6) On-line systems and routines

(7) Mathematical routines and algorithms

(8) Information retrieval

Two areas have been identified which require attention. Firstly, the "Terms of Availability" should mention any computer network having access to the program. Programs which are available only for processing data should also be mentioned. This will assist establishments having no computing facilities and those who only wish to contract the use of a program.

Secondly, the Committee felt that contributions to the catalogue should be monitored so that the level of sophistication of the programs could be assessed. There might be a tendency, for example, to include only highly sophisticated programs. If this were the case, the Committee could then request other material as well.

The format of the standard Software Description Form [5] remains unchanged.

8.0 DATA BANKS FOR MODEL TEST AND SHIP TRIAL DATA

In view of the widespread interest in this subject indicated by the response to a questionnaire circulated for the 15th Conference, it was recommended that the Information Committee review the design and structure of computer data banks for model test and ship trial data. The development of data bank technology has been so rapid in recent years, however, that it seems quite impractical for the ITTC to have a standard design or structure for data banks.

It is quite common for most computer systems to provide a general purpose data base management system or DBMS. This tendency ranges from small scale minicomputer-based systems to very large scale systems. A Hewlett Packard desktop computer, for example, which is now used at several ITTC organizations, has a fully implemented modern data base management system. The DBMS package consists of two parts called IMAGE/45 and QUERY/45 and can be used for creating, accessing, querying and maintaining the data base. The minimum hardware requirement for this system is 187K bytes of random access memory and two floppy disk drives. DEC, Data General and other manufacturers have similar systems which can be used with hardware of appropriate capacity.

Under these circumstances, the Committee concluded that it is not practical to have a standard data base structure within the ITTC. The data base structure will depend on the particular DBMS being used at each establishment. It should be emphasized that the differences in the internal structure of the various systems being used will in no way hinder the exchange of data within the ITTC. The most important objective of data base management systems is to provide compatibility of data for a variety of applications. It will therefore be quite easy to standardize the format for the exchange of data when ITTC organizations have their own data banks and such exchange is necessary.

The Information Committee recommends that organizations implement data banks with an appropriate DBMS as soon as possible. The implementation of such data banks will encourage more efficient

use of accumulated data within an organization and will also simplify data exchange. International data communication networks will be greatly improved in the near future. A portion of the data bank of each organization might be shared to form an integrated ITTC data bank. For this purpose, data security, which is one of the main concerns of a DBMS, must be considered from the beginning of the implementation of each data bank. Appendix 2 contains a review of the design and structure of data banks.

9.0 STANDARD FORMAT FOR SEAKEEPING DATA

It was recommended at the previous Conference that a standard format be developed for the exchange of seakeeping data on computer-compatible media. This requirement originally arose from the experience of the Seakeeping Committee in evaluating computer programs to predict ship motions in six degrees of freedom. A large amount of data was received in 20 different formats and all of it had to be retyped manually before comparisons could be made. A standard format would obviously greatly reduce the amount of work involved in a project such as this.

A proposed standard format has been developed by the Information Committee and it is described in detail in Appendix 3. The original draft format dealt primarily with frequency domain data. It was reviewed by the Seakeeping Committee and it was also circulated to all member organizations in December, 1980 for comment. Some very useful suggestions were received and these have been incorporated in the final proposal. The main change has been to extend the format to handle time domain as well as frequency domain data.

The format accommodates all basic types of seakeeping data and has a modular structure to allow for future expansion. It can be used with magnetic tape, punched cards or diskettes.

It should be emphasized that this format is intended only for the exchange of data. Consequently, it is not proposed that any organization necessarily adopt it for internal use. A simple translation program could be used to convert from the normal internal format to the exchange format whenever data are being sent to another institution. Similarly, a companion translator could be used to convert incoming data if required.

It is recommended that this draft format be adopted as a standard since it would greatly facilitate the exchange of seakeeping data among ITTC member organizations.

10.0 AUTHOR AND SUBJECT INDICES

The Information Committee was to prepare overall author and subject indices for the Proceedings of previous Conferences in accordance with Recommendation 9. The basic idea behind this project was to provide more efficient access to the wealth of information stored in the Proceedings. This project was considered well worthwhile in the opinion of experts in the field of documentation but the Committee was also warned that it was facing a major undertaking.

It was therefore prerequisite to conduct a survey, analysis and evaluation of the problems involved. These were discussed not only for indices of the Proceedings of previous Conferences, but for future Conferences as well. Problems of editing, printing and distribution were considered in addition to possible

indexing procedures.

It was found that it would require a prohibitive amount of work to produce any type of detailed index for the Proceedings of all previous Conferences. Consequently, it was decided to establish a Guide to the Proceedings of previous Conferences instead. This Guide consists essentially of reproductions of their title pages and tables of contents. In view of the wide variety of formats, some of which include only names of contributions, attempts to compress and unify the tables of contents usually resulted in rather inadequate indices containing little useful information.

The Guide will be published under separate cover by the Information Committee. It includes a list of the Conferences with their respective locations and dates, a bibliography of the Proceedings and a proposed system for citation. The Guide will thus not only be of technical interest but should be of historical interest as well.

It is suggested for future Conferences that the Committees prepare sufficiently detailed tables of contents of the technical subjects covered in their respective Reports for ready publication in the Proceedings. In view of the rigorous structure of the Conferences and the organization of Committee work according to subject, additional indexing of past Reports is not considered necessary.

11.0 ITTC NEWSLETTER

During the last Conference, it was felt that some improvement was required in the exchange of information between the member organizations of the ITTC. As a consequence of reviewing the various problems related to the exchange of technical information, the Information Committee conceived the idea of publishing an ITTC Newsletter. It was concluded from subsequent discussions in the Advisory Council and in the Executive Committee that such a Newsletter might also serve to improve the exchange of information concerning the forthcoming Conference per se.

The Information Committee of the 16th ITTC was therefore charged by the Executive Committee with the task of developing an ITTC Newsletter. It was proposed that the Newsletter should be published approximately twice a year as an experiment for the next Co ference period. The Information Committee has published four Newsletters along these lines since the 15th Conference and these were issued in October 1979, June 1980, December 1980 and June 1981.

The Newsletter consists of two parts. The first part includes the following items:

- News from the Executive Committee concerning the progress made in organizing the 16th ITTC;
- News from the Technical Committees about the progress of their work;
- News from ITTC member organizations;
- A Calender of Events including symposia sponsored by the member organizations and international meetings related to the aims of the ITTC;
- A List of Contributions including Material of Interest and Catalogue Updates.

The second part of the Newsletter includes the following:

- Material of Interest: It was decided that this material must be made available in the form of brief synopses limited to two pages. These synopses must be prepared according to guidelines given in Reference 6.

- Catalogue of Test Facilities: This section contains updates which have been submitted for the Catalogue since its initial distribution in November, 1980. The updates must be prepared according to the guidelines given in Reference 4.

- Catalogue of Computer Programs: This section contains program descriptions submitted for the ITTC Software Exchange. These descriptions must be prepared on the standard software description form described in Reference 5.

The Information Committee believes that the Newsletter has generally been welcomed by the ITTC member organizations. The Executive Committee, the Advisory Council and the Technical Committees have responded very well in preparing contributions for it. As member organizations become more familiar with the Newsletter and a fixed schedule for publication is established, an increased number of contributions can be expected.

The complete Newsletter was sent to all member organizations of the ITTC and to all members of Committees and Panels. The first part of the Newsletter was also sent to a limited group of additional organizations and persons nominated by the Executive Committee.

The Information Committee recommends that publication of the ITTC Newsletter be continued using the present general format. This format is summarized in Appendix 4 which also contains a proposed schedule for publication. Appendix 5 contains a complete list of the Material of Interest which has been received so far together with lists of submissions for the Catalogue of Computer Programs and updates for the Catalogue of Facilities.

12.0 REFERENCES

(1) "International Towing Tank Conference Standard Symbols 1976", British Ship Research Association Technical Memorandum No. 500, May, 1976.

(2) "ITTC Dictionary of Ship Hydrodynamics", Royal Institution of Naval Architects Maritime Technology Monograph No. 6, Aug., 1978.

(3) Tamiya, S. "Lift, Drag and Resistance", Bulletin No. 602, Society of Naval Architects of Japan, Aug., 1979.

(4) "Standard Format for ITTC Catalogue of Facilities", Proc. of 15th ITTC, Part 1, Sept., 1978, pp. 189-194.

(5) "Software Description Form", Proc. of 15th ITTC, Part 1, Sept., 1978, pg. 204.

(6) "Guidelines for Contributions to ITTC Newsletter", Proc. of 15th ITTC, Part 1, Sept., 1978, pp. 211-213.

III. PRE-CONFERENCE RECOMMENDATIONS OF THE COMMITTEE

(1) Requests should be made to all Technical Committees to prepare draft proposals for the revision and extension of their respective sections of the list of standard symbols. The Information Committee should then revise the list of symbols accordingly and arrange for publication.

(2) Requests should be made to all Technical Committees to draft proposals for the revision and extension of their respective sections of the ITTC Dictionary of Ship Hydrodynamics. New sections are to be drafted where appropriate. The Information Committee should subsequently incorporate these drafts into a new edition of the dictionary.

(3) Co-operation should continue with other international organizations to achieve common agreements on symbols and terminology.

(4) The Information Committee should keep the ITTC Catalogue of Facilities up to date.

(5) A group discussion on new hydrodynamic test facilities and new instrumentation systems and techniques should be organized and suitably documented for the next Conference.

(6) The Catalogue of Computer Programs for the exchange of software should be maintained.

(7) The Information Committee should continue to monitor future developments in the field of data base management systems so that it can assist the Technical Committees in the exchange of data.

(8) It is recommended that the format described in Appendix 3 be adopted as a standard for the exchange of seakeeping data on computer-compatible media between ITTC member organizations.

(9) Standard formats for the exchange of other types of data on computer-compatible media should be developed as specific requirements arise.

(10) Requests should be made to the Technical Committees to provide sufficiently detailed tables of contents of the subjects covered in their respective reports. The format for these should be specified by the Organizing Committee for each Conference.

(11) The Information Committee should consider the adoption of a keyword system for the indexing of publications in the fields of interest to ITTC member organizations.

(12) The Information Committee should continue to publish the ITTC Newsletter.

APPENDIX 1

CURRENT TABLE OF CONTENTS OF

THE ITTC CATALOGUE OF FACILITIES

CATEGORIES

A - ITTC member organizations which have submitted descriptions of facilities.

B - ITTC member organizations which have not yet submitted descriptions of facilities.

C - ITTC member organizations which do not have experiment facilities. (Research Associations)

D - organizations outside the ITTC which have submitted descriptions of facilities.

COUNTRY	CITY	ORGANIZATION	CATEGORY	TOWING TANKS	SHALLOW WATER BASINS	SEAKEEP./MAN. BASINS	ROTATING ARMS	ICE TANKS	WAVE TANKS & FLUMES	CAVITATION TUNNELS	CIRC. WATER CHANNELS	WIND TUNNELS	OTHER FACILITIES
ARGENTINA	Buenos Aires	University of Buenos Aires	B										
AUSTRIA	Vienna	Vienna Model Basin	A	1									
BRAZIL	Sao Paulo	Cidade Universitaria	A	1						1			
BULGARIA	Varna	Bulgarian Ship Hydrodynamics Centre	A	1	1	1				1			
CANADA	Ottawa	National Research Council	A	1		1				1			
CHINA	Harbin	Harbin Shipbuilding Engineering Institute	D	1									
CHINA	Shanghai	Shanghai Chiao-Tung Univ.	A	1						1			
CHINA	Shanghai	Shanghai Ship Design and Research Institute	A	1		2				1		1	
CHINA	Wusih	China Ship Scientific Research Center	A	1		1	1			1		1	
DENMARK	Lyngby	Danish Ship Research Laboratory	A	1						1		1	
FED. REP. OF GERMANY	Berlin	Berlin Model Basin (VWS)	A	1	1				1	1	2		1
FED. REP. OF GERMANY	Berlin	Technical University of Berlin	B										
FED. REP. OF GERMANY	Duisburg	Versuchsanstalt fur Binnenschiffbau	B										
FED. REP. OF GERMANY	Hamburg	Hamburg Ship Model Basin (HSVA)	A	1	1			1		3			
FINLAND	Helsinki	Helsinki University of Technology	A	1		1							
FINLAND	Helsinki	Wartsila Icebreaking Model Basin	A					1					
FRANCE	Grenoble	Division Neyrpic	B										
FRANCE	Paris	Bassin d'Essais des Carenes	A	3			1		1	2			
FRANCE	Paris	Institut de Recherches de Construction Navale (IRCN)	C										

APPENDIX 1 (Continued)

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D - organizations outside the ITTC which have submitted descriptions of facilities.

COUNTRY	CITY	ORGANIZATION	CATEGORY	TOWING TANKS	SHALLOW WATER BASINS	SEAKEEP./MAN. BASINS	ROTATING ARMS	ICE TANKS	WAVE TANKS & FLUMES	CAVITATION TUNNELS	CIRC. WATER CHANNELS	WIND TUNNELS	OTHER FACILITIES
FRANCE	Toulouse	Centre d'Essais Aeronautique de Toulouse	D	1									
GERMAN DEM. REP.	Rostock	Institut fur Schiffbau	A	1						1			
GERMAN DEM. REP.	Rostock	Universitat Rostock Sektion Schiffstechnik	A	1			1			1			
INDIA	Kharagpur	Indian Inst. of Technology Dept. of Naval Architecture	A	1									
INDIA	Madras	Indian Inst. of Technology Hydraulic Eng. Laboratory	B										
INDIA	Poona	Central Water and Power Research Station	B										
ITALY	Genova	CE. TE. NA.	C										
ITALY	Genova	Istituto Policattedra di Ingegneria Navale	A	1							1		
ITALY	Napoli	Universita di Napoli	A	1									
ITALY	Roma	Istit. Nazionale per Studi ed Esperienzi di Arch. Nav.	A	2		1					1		
ITALY	Roma	Centro Esperienzi Idrodin. Ministrero Difesa Marina	B										
JAPAN	Akashi	Akashi Ship Model Basin	A	1									
JAPAN	Akashi	Kawasaki Technical Research Laboratory	D								1		
JAPAN	Fukuoka	Kyushu University	A	3		1							
JAPAN	Hiratsuka	Hiratsuka Research Laboratory (Sumitomo)	D	1		1			2	2			
JAPAN	Hiroshima	Hiroshima University	A	1							1		
JAPAN	Nagasaki	Nagasaki Technical Institute (Mitsubishi)	A	2		1				1			
JAPAN	Osaka	Technical Research Institute (Hitachi)	D								1		
JAPAN	Osaka	Osaka University	A	1		1					1		

APPENDIX 1 (Continued)

CURRENT TABLE OF CONTENTS OF

THE ITTC CATALOGUE OF FACILITIES

CATEGORIES

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B - ITTC member organizations which have not yet submitted descriptions of facilities.

C - ITTC member organizations which do not have experiment facilities. (Research Associations)

D - organizations outside the ITTC which have submitted descriptions of facilities.

COUNTRY	CITY	ORGANIZATION	CATEGORY	TOWING TANKS	SHALLOW WATER BASINS	SEAKEEP./MAN. BASINS	ROTATING ARMS	ICE TANKS	WAVE TANKS & FLUMES	CAVITATION TUNNELS	CIRC. WATER CHANNELS	WIND TUNNELS	OTHER FACILITIES
JAPAN	Osaka	University of Osaka Prefec.	D	1							1		
JAPAN	Tokyo	Akishima Laboratory, Mitsui	A	2					1		1	1	
JAPAN	Tokyo	National Research Institute of Fisheries Engineering	A	1							1		
JAPAN	Tokyo	Meguro Model Basin	A	3		1							
JAPAN	Tokyo	Shipbuilding Research Centre of Japan	A	2		1				1	2		
JAPAN	Tokyo	Ship Research Institute	A	3		2	1	1		1			
JAPAN	Tokyo	University of Tokyo	A	2		2				3	1		
JAPAN	TSU-City	TSU Research Laboratories (Nippon Kokan K.K.)	A	1					1		1		
JAPAN	Yokohama	National University of Yokohama	A	1									
JAPAN	Yokohama	Research Institute (IHI)	A	1		1							
KOREA	Busan	Busan National University	D	1									
KOREA	Daejon	Korea Research Institute of Ship	A	1									
KOREA	Inchon	Inha University	D	1									
KOREA	Seoul	Seoul National University	A	2									
THE NETHERLANDS	Delft	Delft University of Technology	A	2					1				
THE NETHERLANDS	Wageningen	Netherlands Ship Model Basin	A	3	1	1			1	3			1
NORWAY	Trondheim	Norwegian Hydrodynamic Laboratories	A	3		1				1			
POLAND	Gdansk	Ship Design and Research Centre	A	2						1			
SPAIN	Madrid	Canal de Experiencias Hidrodinamicas, El Pardo	B										
SWEDEN	Goteborg	Swedish Maritime Research Centre (SSPA)	A	1		1				2			

APPENDIX 1 (Continued)

CURRENT TABLE OF CONTENTS OF

THE ITTC CATALOGUE OF FACILITIES

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SWEDEN	Kristine-hamn	KaMeWa Marine Laboratory	A							1	1		
UNITED KINGDOM	East Cowes	British Hovercraft Corp.	A	3		1			1		1		
UNITED KINGDOM	Edinburgh	University of Edinburgh	D						1				
UNITED KINGDOM	Feltham	National Maritime Institute	A	2	1	2			1	2	1		1
UNITED KINGDOM	Haslar	Admiralty Marine Technological Establishment	A	2		1	1			2	1		1
UNITED KINGDOM	Newcastle-upon-Tyne	University of Newcastle	A	1						1			
UNITED KINGDOM	Portsmouth	Vosper Thornycroft Ltd.	A							1			
UNITED KINGDOM	St. Albans	Vickers Ship Model Experiment Tank	B										
UNITED KINGDOM	Wallsend	British Ship Research Association	C										
U.S.A.	Annapolis	U.S. Naval Academy	A	2							1		
U.S.A.	Ann Arbor	University of Michigan	A	1									
U.S.A.	Berkeley	University of California	B										
U.S.A.	Bethesda	David Taylor Naval Ship Research & Development Center	A	3	1	1	1			3	1		
U.S.A.	Cambridge	Masschusetts Institute of Technology	A	1									
U.S.A.	Columbia	Arctec, Incorporated	A					1					
U.S.A.	Escondido	Offshore Technology Corp.	A						2				
U.S.A.	Hanover	U.S. Army Cold Regions Research & Engineering Lab.	A					3					
U.S.A.	Hoboken	Stevens Institute of Technology	A	1		1	1						
U.S.A.	Iowa City	University of Iowa	B										

APPENDIX 1 (Continued)

CURRENT TABLE OF CONTENTS OF

THE ITTC CATALOGUE OF FACILITIES

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U.S.A.	Laurel	Hydronautics, Incorporated	A	1							1		
U.S.A.	Plainfield	Chicago Bridge and Iron Co.	D						1				
U.S.A.	State College	Pennsylvania State University	A							4		2	2
U.S.S.R.	Leningrad	Krylov Ship Research Institute	A	3	1	3	1			6			1
U.S.S.R.	Leningrad	Leningrad Shipbuilding Institute	B										
U.S.S.R.	Moscow	Central Aero-Hydrodynamic Institute	B										
YUGOSLAVIA	Zagreb	Brodarski Institute	A							2			

APPENDIX 2

REVIEW OF THE DESIGN AND STRUCTURE OF DATA BANKS

1.0 DATA BASES

A data base is defined as a collection of interrelated data stored together without unnecessary redundancy and able to serve multiple appplications. The data are stored so that they are independent of programs which use the data. A common and controlled approach is adopted in adding new data and retrieving and modifying existing data within the data base. The data must be structured so as to provide a foundation for the development of future applications.

A data base management system (DBMS) is the general purpose software which enables the common and controlled access to the data base. Regardless of how the data are physically organized within the data bank, an application programmer can ask the DBMS to provide the data he requires in a suitable format for his particular application. The DBMS is a method of mapping the application programmer's logical data structure into the physical structure of the data as it is actually stored.

The independence of data from application programs is the most important feature of a DBMS for a multiple application environment as well as for future compatibility. Otherwise, a trivial change in the data structure for a single program is likely to initiate a chain reaction of modifications to other programs which may result in many new programming 'bugs'. A DBMS should permit the data for one application to be changed without causing the rewriting of other programs.

A data base consists of data records and associations among them. The overall logical description of a data base is called a schema. The schema is defined by the data base manager who is responsible for the whole data base. An application programmer using the data base does not need to know the entire data base schema. The programmer is concerned only with his particular applications and the records which he requires. Subschemas are defined for this purpose.

Subschemas are subsets of the schema which constitute a description of the data base from the viewpoint of the application programmer. In this way, it is not necessary to modify programs when the data base is changed as long as the subschema can be extracted from the schema.

2.0 LOGICAL DATA STRUCTURES

Schemas and subschemas are charts showing the record types (not the occurrence of a record itself) and the associations between them. The association between two records can be of two types.

The first type is the one to one mapping from record A to record B. At any instant in time, each value of A has one value of B associated with it. This association can be drawn as a line with a single arrow on it connecting A to B as shown in Fig. 1.

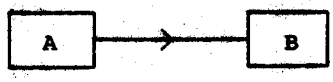


Fig. 1 - One to One Mapping

APPENDIX 2 (Continued)

The second type of association is the one to many mapping from record A to record B. This means that one value of A has either zero, one or many values of B associated with it. This association is designated by a line with double arrows from A to B (Fig. 2).

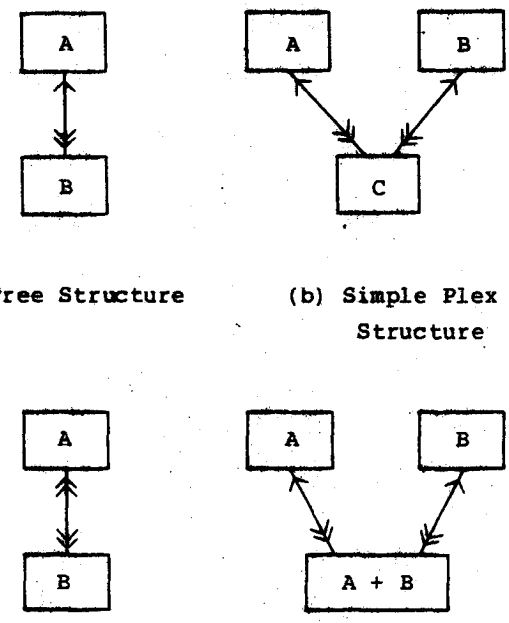
Fig. 2 - One to Many Mapping

For example, each record of EMPLOYEE.NAME has only one value of SALARY but may have zero, one or many values of CHILD.

The two basic data structures are the TREE structure and the PLEX or network structure. There is a mapping in both directions between any two interrelated records. There are consequently four possibilities for the forward and reverse directions. These are 1:1, 1:M, M:1 and M:M. 1:M is the elemental association of the TREE structure and M:M is the elemental association of the PLEX structure.

As shown in Fig. 3, a parent record in a TREE structure has zero, one or many child records whereas each child record has only one parent. In a PLEX structure, however, a child record has more than one parent.

There are two kinds of association in a PLEX structure. One is the SIMPLE PLEX structure in which a child has many parents but only one for the same type of record as shown in (b) of Fig. 3. The other kind of association is the COMPLEX PLEX structure shown in (c) in which a child has many parents for the same type of record. The COMPLEX PLEX structure can be reduced to the SIMPLE PLEX structure by adding a dummy record type as shown in case (d) of Fig. 3.



(a) Tree Structure (b) Simple Plex Structure

(c) Complex Plex Structure (d) Complex to Simple Conversion

Fig. 3 - Logical Data Structures

Most data base management systems provide TREE and SIMPLE PLEX structures. Only a few can manage the COMPLEX PLEX structure. The simpler structures are quite sufficient for towing tank data management, however.

3.0 DATA STRUCTURE AND STORAGE MEDIA CONSIDERATIONS FOR A MODEL TEST DATA BASE

An example of a structure for model test data is shown in Fig. 4. The data items in each record would be as follows:

(a) HULL, PROPELLER and RUDDER Principal Particulars:
L, B, T, CB, DP, AR, ...

APPENDIX 2 (Continued)

(b) EXP.MODEL
Combination of hull, propeller and rudder:

#HULL,#PROPELLER,#RUDDER for self propulsion test;

#HULL,**********,#RUDDER for a resistance test;
etc.

(c) TEST.ID
Test Identification:

TEST.CODE: RESISTANCE.TEST,
PROP.OPEN.TEST,
TURNG.TEST, ...

CONDITION: DRAFT, TRIM, CG,
M.MT.INERTIA, ...

(d) TEST.RESULTS

Analyzed Data: CW, CF, KT, KQ, ...
Raw Data: 2548, 3174, 8625, ...

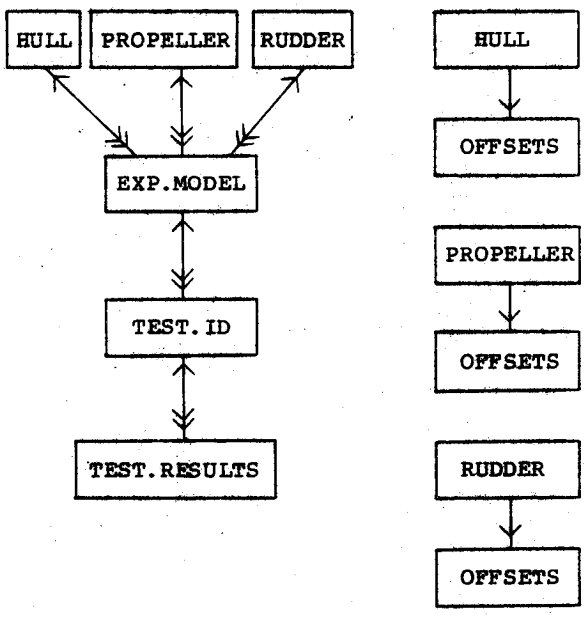


Fig. 4 - Example of a Model Test Data Structure

This data structure can easily be managed by a general purpose DBMS which is capable of handling TREE or SIMPLE PLEX structures.

Another consideration is the type of data storage media to be used. This decision depends upon the speed of retrieval required and the size of the data bank. The amount of data produced by a tank test can be roughly estimated as follows:

(a) Steady-State Tests:

200 bytes/run, 30 runs/day and 250 days/year = 6KB/day or 1.5MB/year.

(b) Dynamic Tests:

2 bytes (16-bit sample) x 10 channels x 1000 samples = 20KB/run.

30 runs/day and 100 to 150 days/year = 600KB/day or 100MB/year.

(c) Others:
Wake Field Measurement:

2 dimensional: 5 bytes x 30 x 30 points = 4.5KB/test.

3 dimensional: 40 to 100KB/test.

The capacity of storage media is increasing steadily. Typical values for current devices are as follows:

Disk: 30 to 200MB/drive

Magnetic Tape: 20 to 50MB/reel(1600BPI)
100 to 200MB/reel(6250BPI)

Floppy Disk: 250 to 1000KB/disk

Cassette Tape: 250KB/cassette

APPENDIX 2 (Continued)

Although it would be wasteful to store the raw data from tank tests in random access storage for quick retrieval after the immediate analysis has been completed, one should ensure that it is possible to store such data for ten years or so in order to allow future analysis with different techniques. Several types of data storage may be appropriate depending upon the objectives of the data. The following types of data banks would be suitable for model tests and ship trials:

(a) Data Bank for Quick Retrieval:

Data must be stored in random access media and structured for information retrieval. Data access in this system is made through the DBMS. The data stored in this data base would be the principal particulars, analyzed data, the keys for other data files, etc.

(b) Storage of Raw Data During Analysis:

These data should be temporarily stored in a random access file until the analysis has been completed. The file should be structured for multiple access by all of the programs required for the analysis procedures.

(c) Long Term Storage of Raw Data:

After analysis, the raw data should be copied to a removable medium such as magnetic tape for long term storage. This will permit future analysis if required. These data will be accessed very seldom so it would be sufficient to store the data keys in a data base of type (a).

APPENDIX 3

PROPOSED STANDARD FORMAT FOR EXCHANGE OF SEAKEEPING DATA ON COMPUTER-COMPATIBLE MEDIA

1.0 INTRODUCTION

The primary purpose of this format is to simplify the exchange of various types of seakeeping data between ITTC Member Organizations. A modular file structure has been used in order to provide a reasonable degree of flexibility. Data are organized into groups with each group containing a particular type of data such as a frequency response function or a wave spectrum. The number of groups is arbitrary and they may be arranged in any order. Each group contains parameters which specify the type of data stored in the group. A typical file is organized as follows:

SHIP DEFINITION GROUP
WAVE SPECTRUM GROUP # 1
WAVE SPECTRUM GROUP # 2
...
SHIP RESPONSE GROUP # 1
SHIP RESPONSE GROUP # 2
...
SHIP RESPONSE GROUP # N

The format can accomodate seakeeping data from a variety of sources such as model tests, computer predictions or full scale trials.

All ship responses are defined with respect to a moving co-ordinate system (x,y,z). This system moves in a horizontal plane with the mean velocity of the ship and the origin lies at the mean position of the ship cg. The x axis is towards the bow, the y axis is to starboard and the z axis is vertically downward. The positions for local responses such as accelerations or pressures are specified in a body axes co-ordinate system whose mean position coincides with the (x,y,z) system.

Any symbols which are not explicitly defined in this document are defined in References 1 and 2.

2.0 FILE STRUCTURE

The data are organized into one or more files with one file being used for each ship condition. A file consists of a set of data groups. A data group consists of a set of records. Each record contains 1 to 80 characters and is either a card or a card image.

Although magnetic tape will normally be used as the exchange medium, the records have been made card images so that other media such as diskettes or cards can also be used without changing the format. The card image record also facilitates editing the data file with standard Text Editors after it has been loaded into a user's computer system.

The record formats are defined in terms of Fortran format specifications since this language is used by the vast majority of ITTC member organizations.

Each data group has the following basic format where N is the number of

APPENDIX 3 (Continued)

records in the group:

RECORD	CONTENTS	FORMAT
1	K1, K2, K3, K4	(4I8)
2 to N-1	<Data Records>	variable
N	%	(A1)

K1, K2, K3 and K4 are integer variables which are used to specify the type of data contained in the Data Records. The format of the data records depends on K1 and is defined in the following sections. The group may contain any number of data records. The last record in a group contains % as its first character to mark the end of the group.

The % record is used to delimit the group instead of a record count in order to simplify editing of the file. If a record count were used, it would have to be updated each time records are inserted or deleted. The % record also allows the beginning of the the next group to be easily located in the event of a read error.

K1 identifies the basic class of data in the group as follows:

K1	CLASS OF DATA
1	Ship Definition
2	Uni-directional Wave Spectrum
3	Multi-directional Wave Spectrum
4	Time Domain Wave Data
5	Freq. Domain Ship Response Data
6	Time Domain Ship Response Data
9999	(End of File Marker)

The format of each of these classes is defined in the following sections. Other values of K1 may be used to define additional classes of data in the future. K1 values above 100 may be used to define special data groups for local use by an organization. When reading an exchange file, however, all data groups for which K1 > 100 are normally skipped.

Comment records may also be included anywhere in the file as an option to improve readability. Each comment record must contain * as its first character. All such records are skipped when processing the data.

3.0 FORMAT OF SHIP DEFINITION GROUP

RECORD(S)	CONTENTS	FORMAT
1	K1, K2, K3, K4	(4I8)
2	SDTEXT	(80A1)
3	L, B, T, XFG, ZKG, CB, CWP, CVP	(8F10.4)
4 to N-1	(User-defined Hull Definition Records)	variable
N	%	(A1)

K1 = 1
K2, K3, K4 = 0, 0, 0
SDTEXT = 80-character text string describing ship and condition.
L = reference ship length (m). (usually LPP)

APPENDIX 3 (Continued)

B = reference beam (m).
T = reference draught (m).
XFG = distance of centre of gravity from forward perpendicular (m).
ZKG = distance of centre of gravity from the moulded base or keel (m).
CB = block coefficient
CWP = designed load waterline coefficient
CVP = vertical prismatic coefficient

Note: There is too much variation in the methods used for detailed hull definition for a standard format to be defined. Thus, records 4 to N-1 are normally skipped when reading an exchange file. They may be used locally, however, for station offsets, mass distribution, etc.

4.0 FORMAT OF UNI-DIRECTIONAL WAVE SPECTRUM GROUPS

RECORD(S)	CONTENTS	FORMAT
1	K1, K2, K3, K4	(4I8)
2	WSTEXT	(80A1)
3	JMAX, DW, EDF	(I8,2F10.5)
4 to N-1	(S1ZET(J), J=1,JMAX)	(8F10.4)
N	%	(A1)

K1 = 2
K2 = a tag no. which is used to label each particular spectrum (1-9999).
K3, K4 = 0, 0
WSTEXT = 80-character text string describing the wave spectrum.
JMAX = number of tabulated power spectral Jensity values.
DW = $\Delta\omega$ between tabulated spectral values in radians per second (rps).
EDF = equivalent number of Chi-square degrees of freedom per spectral estimate.
S1ZET(J) = $S_\zeta(\omega)$ at ω = (J-1)*DW rps. S1ZET has units of m**2/rps.

Note: The parameter EDF applies only to measured spectra. EDF is formally defined as 2*(μ/σ)**2 where μ and σ are the mean and standard deviation of the power spectral density estimates S1ZET(J). It is calculated on the basis of the specific spectral analysis procedure used. EDF is usually given by 2*Be*Tr where Tr is the record length in seconds and Be is the effective filter bandwidth of the spectral analysis procedure in Hz.

APPENDIX 3 (Continued)

5.0 FORMAT OF MULTI-DIRECTIONAL WAVE SPECTRUM GROUPS

RECORD(S)	CONTENTS	FORMAT
1	K1, K2, K3, K4	(4I8)
2	WSTEXT	(80A1)
3	JMAX, KMAX, KSYM, DW, DMUW, EDF	(3I8,3F10.5)
4 to N-1	((S2ZET(J,K), J=1,JMAX), K=1,KMAX)	(8F10.4)
N	%	(A1)

K1 = 3

K2 = a tag no. which is used to label each particular spectrum (1-9999).

K3, K4 = 0, 0

WSTEXT = 80-character text string describing the wave spectrum.

JMAX = number of frequencies at which the spectrum is tabulated.

KMAX = number of wave angles at which the spectrum is tabulated.

KSYM = 0 if spec. is not symmetric; KSYM = 1 if spec. is symmetric about $\mu = 0$.

DW = $\Delta\omega$ between tabulated spectral values in radians per second (rps).

DMUW = $\Delta\mu$ between tabulated spectral values in radians.

EDF = equivalent number of Chi-square degrees of freedom per spectral estimate.

S2ZET(J,K) = $S_\zeta(\omega, \mu)$ at ω = (J-1)*DW rps and μ = (K-1)DMUW radians. S2ZET(J,K) has units of m**2/(rps*radian).

Note: If KSYM=1, S2ZET is only tabulated over the μ range from 0 to π since $S2ZET(\omega, -\mu) = S2ZET(\omega, \mu)$. If KSYM=0, S2ZET is tabulated over the μ range from 0 to 2π. If KSYM=1, S2ZET is also assumed to be zero at angles greater than (KMAX-1)*DMUW. Thus, S2ZET is usually only tabulated over the range from 0 to $\pi/2$ when KSYM=1.

6.0 FORMAT OF TIME DOMAIN WAVE DATA GROUPS

This format can be used to store a general unidirectional time domain wave record. The time series samples are scaled as 16-bit integers in order to conserve space since wave records may be quite long. A single scaling factor SCF is used to convert the integer samples back to floating point wave elevation values in units of metres.

RECORDS(S)	CONTENTS	FORMAT
1	K1, K2, K3, K4	(4I8)
2	WVTEXT	(80A1)
3	XP, YP	(2F10.4)
4	JMAX, DT, SCF	(I8, 2E15.7)
5 to N-1	(M(J), J=1,JMAX)	(13I6)
N	%	(A1)

APPENDIX 3 (Continued)

K1 = 4
K2 = a tag number used to identify each particular wave record (1-9999).
K3 = wave probe index: K3 = 0 if the wave record was measured with a moving probe.
K3 = 1 if the wave record was measured with a fixed probe.
K4 = 0
WVTEXT = 80-character text string describing the wave record.
XP, YP = mean position of the wave probe in the moving co-ordinate system (x,y,z) in metres. If a fixed probe is used, (XP,YP) is the position of the probe at time t = 0.
JMAX = number of integer time series samples in the wave record.
DT = time interval between samples in seconds.
SCF = scale factor for integer time series. ZETA(t) = SCF*M(J) where ZETA is the wave elevation in metres and t = (J-1)*DT seconds. SCF must be chosen such that the absolute value of M(J) is less than 32768 for all J.
M(J) = sample J of scaled integer time series. M(J) = ZETA(t)/SCF at t = (J-1)*DT.

7.0 FORMAT OF FREQUENCY DOMAIN SHIP RESPONSE DATA GROUPS

RECORD(S)	CONTENTS	FORMAT
1	K1, K2, K3, K4	(4I8)
2	RSTEXT	(80A1)
3	MFP, NSF, WASH	(2I8, F10.5)
4	FN, XB, YB, ZB	(4F10.4)
5	NWD, (WD(J), J=1,NWD)	(I8, 7F10.2)
6 to N-1	WTT, (GR(J), J=1,NWD)	(F9.4, 7F10.5)
N	%	(A1)

Note: Any number of WTT, GR records may be included after record 5.

K1 = 5
K2 = type of ship response. (See Table 1)
K3 = type of incident waves. (See Table 2)
K4 = source of response data; K4=1 for model tests, K4=2 for full scale trials and K4=3 for computer predictions.
RSTEXT = 80-character text string describing the ship response data. This record is not processed but is included to make the file more readable for editing. For example, if K2=5 and K3=3, RSTEXT might be as follows:
ND PITCH FREQUENCY RESPONSE FUNCTION (AMPLITUDE)
MFP = fetch index for ITTC wave spectrum. (See Table 2)
NSF = wave spectrum spreading function parameter. (See Table 2)
WASH = wave amplitude, wave slope or significant wave height depending on the value of K3. (See Table 2)
FN = Froude Number.

APPENDIX 3 (Continued)

XB,YB,ZB = position at which the response has been measured or calculated in the body axes co-ordinate system. (m)

NWD = no. of wave direction angles at which the response is tabulated. NWD may range from 1 to 7. Additional data groups may be used when more than 7 wave directions are required.

WD(J) = wave direction angle in degrees relative to mean heading of ship. WD(J) = $\mu - \bar{\psi}$ if K3 < 6 ; WD(J) = $\mu_0 - \bar{\psi}$ if K3 > 5 .

WTT = nondimensional wave component frequency, average wave period or wave data tag number depending on K3. (See Table 2)

GR(J) = generalized ship response at wave direction WD(J). GR is either the amplitude or phase of a nondimensional frequency response function or a dimensional RMS or Average value in irregular waves. (See Table 2)

Note: When the file is written, format F10.5 is suitable for GR for most responses. Some responses may require a different decimal point position, however. Therefore, format F10.d may be used to write the GR records where d may range from 1 to 8. Format F10.5 can be always be used to read the records regardless of which value of d was used to write them. The actual decimal point position in the record will override the implicit position in the F10.5 specifier.

TABLE 1

K2	TYPE OF RESPONSE	RMSAV UNITS
1	Surge	m
2	Sway	m
3	Heave	m
4	Roll	deg
5	Pitch	deg
6	Yaw	deg
7	Surge velocity	m/s
8	Sway velocity	m/s
9	Heave velocity	m/s
10	Roll rate	deg/s
11	Pitch rate	deg/s
12	Yaw rate	deg/s
13	Surge acceleration (note 1)	m/s**2
14	Sway acceleration (note 1)	m/s**2
15	Heave acceleration (note 1)	m/s**2
16	Surge acceleration (note 2)	m/s**2
17	Sway acceleration (note 2)	m/s**2
18	Heave acceleration (note 2)	m/s**2
19	Roll acceleration	deg/s**2
20	Pitch acceleration	deg/s**2
21	Yaw acceleration	deg/s**2
22	Relative vertical motion	m
23	Relative vertical velocity	m/s
24	Relative vertical acc.	m/s**2
25	Hydrodynamic Pressure	kN/m**2
26	Longitudinal Force	kN
27	Longitudinal Shear Force	kN
28	Vertical Shear Force	kN
29	Torsional Moment	kNm
30	Horizontal Bending Moment	kNm
31	Vertical Bending Moment	kNm
32	Added Resistance in Waves	kN
33	Added Thrust due to Waves	kN
34	Added Torque due to Waves	kNm
35	Added RPM due to Waves	rpm
36	Added Power due to Waves	kW

Note 1: Accelerations 13-15 are relative to the moving co-ordinate system (x,y,z) and do not include gravity.

APPENDIX 3 (Continued)

Note 2: Accelerations 16-18 are accelerations 13-15 resolved along the instantaneous position of the body axes co-ordinate system with gravity included. Thus, 16-18 are the accelerations which would be sensed by accelerometers strapped down to the body axes at (XB,YB,ZB).

Note 3: Responses 26-31 are the dynamic forces and moments acting on the hull caused by the action of waves and ship motions. They are resolved along the body axes.

TABLE 2

K3	TYPE OF WAVES	MFP	MSF	WASH	WTT	GR
1	Regular, Constant Amplitude	0	0	ζ_A	$\omega\sqrt{L/g}$	H
2	Regular, Constant Amplitude	0	0	ζ_A	$\omega\sqrt{L/g}$	ϵ
3	Regular, Constant Slope	0	0	$k\zeta_A$	$\omega\sqrt{L/g}$	H
4	Regular, Constant Slope	0	0	$k\zeta_A$	$\omega\sqrt{L/g}$	ϵ
5	Specified Time Domain Wave Record	0	0	$\tilde{\zeta}_{any_{pt}}$	WVTAG	RMSAV
6	15th ITTC Spectrum with opt. spreading function	m	n	"	T_1	RMSAV
7	Specified uni-directional spectrum with opt. s.f.	0	n	"	WVTAG	RMSAV
8	Specified multi-directional spectrum	0	0	"	WVTAG	RMSAV

H = amplitude of nondimensional frequency response function. For example, if K2=4, $H = \Phi_A/(k\zeta_A)$ etc. The frequency response functions are made nondimensional by dividing by the following factors:

linear motion:	ζ_A	force:	$\rho g L B \zeta_A$
linear velocity:	$\zeta_A\sqrt{g/L}$	moment:	$\rho g L^2 B \zeta_A$
linear acceleration:	$\zeta_A g/L$	added resistance:	$\rho g \zeta_A^2 B^2/L$
angle:	$k\zeta_A$	added thrust:	$\rho g \zeta_A^2 B^2/L$
angular velocity:	$k\zeta_A\sqrt{g/L}$	added torque:	$\rho g \zeta_A^2 B^3 D/L$
angular acceleration:	$k\zeta_A g/L$	added rpm:	$g\zeta_A^2 B^2/(L D^3 V)$
hydrodynamic pressure:	$\rho g \zeta_A$	added power:	$\rho g \zeta_A^2 B^2 V/L$

ϵ = phase lead in degrees of frequency response function relative to wave elevation at midships. (See Ref. 1)

m = index specifying the type of ITTC wave spectrum. m=0 for open ocean spectrum $S(\omega)$. m=1 for limited fetch spectrum $S_f(\omega)$. (See Ref. 3)

n = index specifying type of spreading function used. n=0 for long-crested waves. Otherwise, n is the power of cosine used in the ITTC spreading function.

k = wave number = $2\pi/\lambda = \omega^2/g$.

T_1 = average wave period = $2\pi m_0/m_1$.

RMSAV = dimensional RMS or Average value of the response in the specified waves. RMSAV = RMS value if K2 < 32 and RMSAV = average value if K2 > 31. The dimensional units are listed in Table 1.

WVTAG = tag number K2 of the data group containing the incident wave description.

APPENDIX 3 (Continued)

8.0 FORMAT OF TIME DOMAIN SHIP RESPONSE DATA GROUPS

This format can be used to store time histories of ship responses. The time series samples are scaled as 16-bit integers in order to conserve space. A single scaling factor SCF is used to convert the integer samples back to the actual response values in appropriate physical units as listed in Table 1 of Section 7.

RECORD(S)	CONTENTS	FORMAT
1	K1, K2, K3, K4	(4I8)
2	RSTEXT	(80A1)
3	MFP, NSF, WASH, WTT, WD	(2I8, 3F10.5)
4	FN, XB, YB, ZB	(4F10.4)
5	JMAX, DT, SCF	(I8, 2E15.7)
6 to N-1	(M(J), J=1,JMAX)	(13I6)
N	$	(A1)

K1 = 6

K2 = type of ship response. (See Table 1 in Section 7)

K3 = type of incident waves. (See Table 2 in Section 7)

K4 = source of response data; K4=1 for model tests, K4=2 for full scale trials and K4=3 for computer predictions.

RSTEXT = 80-character text string describing the ship response.

MFP = fetch index for ITTC wave spectrum. (See Table 2 in Section 7)

NSF = wave spectrum spreading function parameter. (See Table 2 in Section 7)

WASH = wave amplitude, wave slope or significant wave height depending on the value of K3. (See Table 2 in Section 7)

WTT = nondimensional wave component frequency, average wave period or wave data tag number depending on the value of K3. (See Table 2 in Section 7)

WD = wave direction angle in degrees relative to mean heading of ship.
WD = $\mu - \bar{\psi}$ if K3 < 6; WD = $\mu_0 - \bar{\psi}$ if K3 > 5.

FN = Froude Number.

XB,YB,ZB = position at which the response has been measured or calculated in the body axes co-ordinate system (m).

JMAX = number of time series samples.

DT = time interval in seconds between time series samples.

SCF = scale factor for the integer time series. R(t) = SCF*M(J) where R is the physical response in the units of Table 1 in Section 7 and t = (J-1)*DT. SCF must be chosen such that the absolute value of M(J) is less than 32768 for all J.

M(J) = sample J of scaled integer time series where J = 1 to JMAX. M(J) = R(t)/SCF at t = (J-1)*DT seconds where R(t) is the dimensional ship response.

APPENDIX 3 (Continued)

9.0 MAGNETIC TAPE FORMAT

The best medium for exchange of seakeeeping data is magnetic tape. Standard 0.5 inch 9-track tape should be used with either 1600 bpi PE or 800 bpi NRZI format. The 1600 bpi density is preferred.

Each tape may contain one or more data files. Each file consists of fixed length tape blocks. Each block is 4000 bytes long and contains 50 card image records. Each card image record is padded with space characters if necessary so that it is exactly 80 bytes long. The last tape block in a file is also padded with blank records if necessary in order to maintain the fixed block length. The last file should be followed by two EOF marks to denote the end of data on the tape.

The tape should contain only the data files and should not have any label or header records. The binary character code may be either ASCII or EBCDIC but the code used should be marked on the tape reel. ASCII code is preferred since this is the most common code used in minicomputers.

Punched cards or diskettes may also be used as an alternative to magnetic tape in cases where the seakeeping data file is not too large. Cards may be punched in either 029 or 026 code with the 029 code being preferred.

It is not normally feasible to use diskettes unless both organizations have the same type of computer because of the wide variety of formats in use. If they are used, however, the seakeeping data file is processed just like any other formatted sequential Fortran data file.

10.0 REFERENCES

(1) Appendix III of Seakeeping Committee Report, Proc. of 10th ITTC, Vol. 1, Sept., 1963, pp. 220-226.

(2) "International Towing Tank Conference Standard Symbols 1976", B.S.R.A. Tech. Memo. No. 500, May, 1976.

(3) Seakeeping Committee Recommendation No.2, Proc. of 15th ITTC, Vol. 2, Sept., 1978, pp. 219-220.

APPENDIX 4

GENERAL FORMAT OF THE ITTC NEWSLETTER

PART 1:

- List of Contents
- News from the Executive Committee
- News from the Advisory Council
- News from the Technical Committees
- News from Member Organizations
- Calendar of Events
- List of Contributions to Part 2

PART 2:

- Material of Interest
- Updates for the Catalogue of Experiment Facilities
- Computer Program Descriptions for the Software Exchange

GENERAL NOTES

(1) The first page should have an ITTC logotype at the top similar to that used for the 16th ITTC Newsletter. Each issue should be numbered and dated.

(2) The Editor's address and telephone and telex numbers should be listed at the bottom of the first page of each issue.

(3) News from Member Organizations should include prominent personnel changes, special lectures, progress notes on the implementation of new facilities, etc.

(4) Part 1 should be typed in the same two-column format which is used for the Conference Proceedings and the pages should be numbered.

(5) Part 2 is designed to be detached from Part 1 so that recipients can file the various contributions by category in loose-leaf binders. It is therefore necessary to rigidly adhere to the guidelines for contributions given in the Report of the Presentation and Information Committee of the 15th ITTC.

PROPOSED PUBLICATION SCHEDULE FOR THE 17th ITTC NEWSLETTER

NEWSLETTER NO.	DEADLINE FOR SUBMISSION OF MATERIAL	DATE OF ISSUE
1	November 15, 1981	December 15, 1981
2	May 15, 1982	June 15, 1982
3	November 15, 1982	December 15, 1982
4	May 15, 1983	June 15, 1983
5	November 15, 1983	December 15, 1983
6	May 15, 1984	June 15, 1984

APPENDIX 5

LIST OF MATERIAL OF INTEREST AND CATALOGUE UPDATES

The following lists include all contributions received up to January, 1981. They do not include items which may have been submitted for Newsletter No. 4 in June, 1981.

MATERIAL OF INTEREST

0001 Nikolaev, E.P. and M.P. Lebedeva
Krylov Ship Research Institute
ON THE SCALE EFFECT IN SHIP MODEL MANOEUVRING TESTS
received 10-Apr-79

0002 Knight, G.
British Hovercraft Corporation Ltd.
SURVEY OF ROLL, PITCH AND YAW GYROSCOPES IN EUROPE AND THE USA
received 15-Apr-79

0003 Browne, R.P.
National Research Council of Canada
SHIP AND LOCK MODEL STUDIES
received 14-May-79

0004 Prokhorov, S.D. and B.M. Zelensky
Krylov Ship Research Institute
ON TOWING TANK SIMULATION OF UNSTEADY OUTFLOW FROM THE HOVERING CRAFT AIR CUSHION
received 15-May-80

CATALOGUE OF COMPUTER PROGRAMS

0001 Holtrop, J.
Netherlands Ship Model Basin
DESIGN-POWERING (DESP)
received 15-Nov-79

0002 Miles, M.D.
National Research Council of Canada
SPECTRAL ANALYSIS PACKAGE
received 15-May-80

0003 Knight, G.
British Hovercraft Corporation Ltd.
SUBROUTINE Q SORT
received 15-Oct-80

0004 Standing, R.G.
National Maritime Institute
NMI WAVE
received 15-Nov-80

CATALOGUE OF FACILITIES

0001 ICE MODEL BASIN
Ship Research Institute
Ministry of Transport
Tokyo, JAPAN
received 15-Nov-80

0002 DEPRESSURIZED TOWING TANK
Netherlands Ship Model Basin
Wageningen, The NETHERLANDS
received 15-Nov-80