Appendix 1

Interim Tasks and Structure of the 26th ITTC Technical Committees and Group

1. STRUCTURE OF TECHNICAL COMMITTEES

The structure of the Technical Committees remains in principle unchanged from the 25th ITTC. Thus there are five General Committees and 8 Specialist Committees and 1 Group.

2. TERMS OF REFERENCES FOR THE GENERAL AND SPECIALIST TECHNICAL COMMITTEES AND GROUPS

2.1 General Committees

Each General Committee will be responsible for a general subject area. It will review the state-of-the-art, identify the need for research and development, and carry out longer terms studies with broad impact.

An important part of the work of the General Committees will be establish Procedures and Guidelines to help the ITTC Member Organizations maintain their institutional credibility with regard to quality assurance of products and services such as predictions, evaluation and project assurance of designs. The Committee will develop detailed plans in accordance with Conference Recommendations and its work should be directed towards the techniques and understanding of physical and numerical modelling as a means of predicting full-scale behaviour. While maintaining an awareness of progress, fundamental theoretical studies and fundamental aspects of numerical fluid computation should be covered by other forum.

Each General Committee will submit a report on the results of its work to Full Conference. The conclusions and the recommendations of the general Committee should be structured as follows:

1. General technical conclusions
2. Recommendations to the Conference, which require Conference actions as adopting ITTC procedures.
3. Proposals for future work of the General Technical Committee and identification of tasks, which may be appropriate for Specialist Committees. These proposals shall be submitted to the Advisory Council. The Council will compile these proposals and present them to the Full Conference.

2.2 Specialist Committees

The ITTC Advisory Council will propose Specialist Committees. Each Specialist Committee will be responsible for studying a specific technical problem. The Specialist Committees will be appointed for a limited duration. It is expected that they will complete their tasks within maximum two ITTC periods

(6 years). They shall interact closely with the appropriate General Committees. The tasks of a Specialist Committee can include to establish and/or Procedures and Guidelines.

Each Specialist Committee will present a final report on the results of its work to the Full Conference and interim reports on progress if the duration of the committee spans more than one Conference. The conclusions and the recommendations of the Specialist Committee should be structured as follows:

1. General technical conclusions
2. Recommendations to the Conference, which require Conference actions as adopting ITTC procedures.
3. Proposals for future work of and identification of tasks, which may be appropriate for Specialist Committees. These proposals shall be submitted to the Advisory Council. The Council will compile these proposals and present them to the Full Conference.

2.3 Groups

Groups may be established from time to time by the Executive Committee to carry out specific tasks for the Conference, which are not technical issues. Membership of a Group should not exceed three consecutive terms of three years, but the Executive Committee may make exceptions. Also normally Groups shall have fewer members than the Technical Committees. Such Groups shall be disestablished upon completion of their respective task objectives.

3. MECHANISM FOR IDENTIFYING NEW SPECIALIST TECHNICAL COMMITTEES

As part of their Terms of Reference, the General Committee shall consider the need for new tasks and include appropriate proposals in their technical reports. If the Advisory Council identifies a need for a new Specialist Committee when it reviews the draft recommendations of the General Committees, the Council will prepare and agree a statement of the technical aims and objectives for the work of the Specialist Committee.

Independently of the proposals of the General Committees, the Advisory Council will keep under continuous review the requirement for Specialist Committees.

When the advisory Council has agreed the need for a new Specialist Committee, the draft statement of technical aims and objectives will be presented to the Executive Committee for endorsement. If the Executive Committee approves the formation of a new Specialist Committee, it will present the proposal to the Full Conference for approval..

4. PROPOSED STRUCTURE OF THE TECHNICAL COMMITTEES AND GROUP FOR 26TH ITTC

4.1 Technical Committees for the 26th ITTC

General Committees

- Resistance
- Propulsion
- Manoeuvring
- Seakeeping
- Ocean Engineering

Specialist Committees

- Uncertainty Analysis
- CFD in Ship Hydrodynamics
- Scaling of Wake Field
- Surface Treatment
- High-Speed Craft

- Stability in Waves
- Vortex Induced Vibrations
- Detailed Flow Measurements

Group

- Quality System Group

5. TASKS OF THE TECHNICAL COMMITTEES AND GROUPS OF THE 26TH ITTC

5.1 General Terms of Reference

1. All committees shall observe the terms of reference and general obligations.

2. All committees shall identify areas of mutual interest with other committees and the concerned committees shall establish active co-operation in these areas.

3. Committees should co-operate with the Quality Systems Group in their work on procedures and the Specialist Committee on Uncertainty Analysis in their work on uncertainty analysis.

4. In their work, all committees shall follow the guidelines given in Recommended Procedure 1.0-03, "General Guideline for the Activities of Technical Committees, Liaison with the Executive Committee and Advisory Council".

5. Procedures must be in the format defined in the Manual of ITTC Recommended Procedures and they will be included in the ITTC Quality Manual. Symbols and terminology should agree with those used in the current version of the ITTC Symbols and Terminology List. If necessary, new symbols should be proposed in collaboration with the Quality Systems Group.

6. All procedures for uncertainty analysis in experiments should follow the ISO (1995) 'Guide to the Expression of Uncertainty in Measurements' (also known as ISO-GUM.)

7. Committees that have a task to review ITTC Recommended Procedures should identify and report any changes needed in their first annual report to the Advisory Council. The changes approved by the Advisory Council should be implemented in the second year.

8. Committee reports to the Conference should be structured in line with the terms of reference of the committee.

5.2 Terms of References for the General Committees

Resistance Committee

1. Update the state-of-the-art for predicting the resistance of different ship concepts emphasising developments since the 2008 ITTC Conference. The committee report should include sections on:
    a. the potential impact of new technological developments on the ITTC,
    b. new experimental techniques and extrapolation methods,
    c. new benchmark data,
    d. the practical applications of computational methods to resistance predictions and scaling,
    e. the need for R&D for improving methods of model experiments, numerical modelling and full-scale measurements.

2. Review ITTC Recommended Procedures relevant to resistance (including procedures for uncertainty analysis).
    a. Identify any requirements for changes in the light of current practice, and, if approved by the Advisory Council, update them.

b. Identify the need for new procedures and outline the purpose and content of these.
c. With the support of the Specialist Committee on Uncertainty Analysis, review and if necessary amend, Procedures 7.5-02-02-03, 04, 05 and 06 "Uncertainty Analysis spreadsheets for measurements of resistance, speed, sinkage and trim and wave profile" and Procedure 7.5-03-02-01 "Uncertainty Analysis in CFD Example for Resistance and Flow to bring them into line with the ISO approach adopted by the ITTC.

3. Identify the parameters that cause the largest uncertainties in the results of model experiments, numerical modelling and full-scale measurements related to resistance.

4. Survey and document the range of practices adopted for turbulence stimulation. Update parts of Recommended Procedure 7.5-01-01-01, Model Manufacture which deal with turbulence stimulation, paying particular attention to different kinds of bulbous bows and high-speed ships. Liaise with the Specialist Committee on High-Speed Craft.

5. Review ITTC Recommended Procedures relevant to scaling and extrapolation methods including theoretical and experimental investigations of the friction line. *Note: At the present time the ITTC does not consider introducing a new friction line without extensive validation*.

6. Make the concept of form factor consistent in all relevant ITTC procedures. Include the form factor in the formulation of the ITTC 1957 friction line as an option in ITTC Recommended Procedure 7.5-02-02-01, "Resistance Tests".

7. Review methods used for the scaling of appendage resistance, especially in relation to the problem of pod drag scaling. Ensure that the appendage drag scaling is treated consistently for resistance, propulsion and the 1978 Powering Performance Prediction Method. Liaise with the Propulsion Committee.

8. Continue the tests in the ITTC worldwide series for identifying facility biases. Prepare a common calculation sheet to analyze the results of the tests. Check and record the model dimensions regularly.

Propulsion Committee

1. Update the state-of-the-art for predicting for propulsion systems emphasising developments since the 2008 ITTC Conference. The committee report should include sections on:
   a. the potential impact of new technological developments on the ITTC including new types of propulsors, azimuthing thrusters and propulsors with flexible blades,
   b. new experimental techniques and extrapolation methods,
   c. new benchmark data,
   d. the practical applications of computational methods to the propulsion systems predictions and scaling,
   e. new developments of experimental and CFD methods applicable to the prediction of cavitation,
   f. the need for R&D for improving methods of model experiments, numerical modelling and full-scale measurements.

2. Review ITTC Recommended Procedures relevant to propulsion (including procedures for uncertainty analysis).
   a. Identify any requirements for changes in the light of current practice, and, if approved by the Advisory Council, update them.
   b. Identify the need for new procedures and outline the purpose and content of these,
   c. With the support of the Specialist Committee on Uncertainty Analysis,

review and if necessary amend, Procedure 7.5-02-05-03.3 "Waterjets - Uncertainty Analysis Example for Propulsion Test" to bring it into line with the ISO approach adopted by the ITTC.

3. Identify the parameters that cause the largest uncertainties in the results of model experiments, numerical modelling and full-scale measurements related to propulsion.

4. Check the possibility of adopting the findings of the Powering Performance Committee of 25th ITTC for improving the ITTC-78 method.

5. Follow developments in the field of podded propulsion with a view addressing the lack of model-scale and full-scale data in the public domain noted in procedure 7.5-02-03-01.3, "Podded Propulsor Tests and Extrapolation". Investigate the possibility of improving the procedure including separating it into logical parts such as resistance, propulsion, and extrapolation. Liaise with the Resistance Committee

6. Comment on the impact of developments of propellers for ice going ships in the view of the increasing operations in ice covered waters and changes in regulations.

Manoeuvring Committee

1. Update the state-of-the-art for predicting the manoeuvring behaviour of ships emphasising developments since the 2008 ITTC Conference. The committee report should include sections on:
    a. the potential impact of new technological developments on the ITTC
    b. developments in manoeuvring and course keeping in waves.
    c. new experiment techniques and extrapolation methods,
    d. new benchmark data
    e. the practical applications of computational methods to manoeuvring predictions and scaling.
    f. the need for R&D for improving methods of model experiments, numerical modelling and full-scale measurements.

2. Review ITTC Recommended Procedures relevant to manoeuvring (including procedures for uncertainty analysis).
    a. Identify any requirements for changes in the light of current practice, and if approved by the Advisory Council, update them.
    b. Identify the need for new procedures and outline the purpose and content of these.
    c. With the support of the Specialist Committee on Uncertainty Analysis, review and if necessary amend, Procedure 7.5-02-06-04, "Force and Moment Uncertainty Analysis Example for Planar Motion Tests" to bring it into line with the ISO approach adopted by the ITTC.

3. Based on results of the SIMMAN workshop held in 2008:
    a. Evaluate capabilities and drawbacks of simulation tools.
    b. Update the procedure 7.5-02-06-03, "Validation of Manoeuvring Simulation Models".

4. Based on results of the SIMMAN workshop held in 2008:
    a. Evaluate the capabilities and discrepancies of time domain RANS based simulations,
    b. Produce a guideline on validation and verification of the RANS tools, and a guideline on the use of these tools in the prediction of manoeuvring capabilities.

5. Write a procedure on Uncertainty Analysis for free running model tests based on results of the SIMMAN workshop.

6. Review developments in ship manoeuvring in restricted waters (bank effects, muddy bottoms, ship-ship interaction, etc). Produce draft outlines of procedures for experimental and numerical methods that will serve as a basis for Recommended Procedures for manoeuvring in restricted waters.

Seakeeping Committee

Note: The Seakeeping Committee is primarily concerned with the behaviour of ships underway in waves. The Ocean Engineering Committee covers moored and dynamically positioned ships and the modelling and simulation of waves, wind and current.

1. Update the state-of-the-art for predicting the behaviour of ships in waves emphasising developments since the 2008 ITTC Conference. The committee report should include sections on:
    a. the potential impact of new technological developments on the ITTC
    b. new experiment techniques and extrapolation methods,
    c. new benchmark data
    d. the practical applications of computational methods to sea-keeping predictions and scaling.
    e. the need for R&D for improving methods of model experiments, numerical modelling and full-scale measurements.

2. Review ITTC Recommended Procedures relevant to seakeeping (including procedures for uncertainty analysis).
    a. Identify any requirements for changes in the light of current practice, and, if approved by the Advisory Council, update them.
    b. Identify the need for new procedures and outline the purpose and content of these.
    c. With the support of the Specialist Committee on Uncertainty Analysis review, and if necessary amend, the uncertainty analysis included in Procedure 7.5-02-07-02.1, "Sea-keeping Experiments" to bring it into line with the ISO approach adopted by the ITTC.

3. Write new procedure on the prediction of global wave loads. The procedure shall describe the design of the experiment, the set-up of the model and instrumentation, the test and the analysis.

4. Review methods used to predict power increase in waves from model tests. The methods considered should include both those based on experiments in regular waves and in irregular waves. Write a section of the committee report describing the alternative methods, and identifying those that are best current practice. Write a new procedure for the prediction of power increase in waves from model tests. The new procedure should include the direct irregular wave method and relevant material from procedure 7.5-02-07-02.2 "Prediction of Power Increase in Regular Waves from Experiments in Regular Waves. Procedure7.5-02-07-02.2 will be deleted at the conclusion of this task.

5. Organize a workshop on validation and verification of non-linear seakeeping codes, and select or develop a benchmark case for this Workshop. The results of the Work-shop will be used to develop the procedure on validation and verification of non-linear seakeeping computer codes.

6. Liaise with the ISSC and the Ocean Engineering Committee.

Ocean Engineering Committee

Note: The Ocean Engineering committee covers moored and dynamically positioned ships and floating structures and the modelling and simulation of waves, wind and current.

1. Update the state-of-the-art for predicting the behaviour of bottom founded or stationary floating structures including moored and dynamically positioned ships

emphasising developments since the 2008 ITTC Conference. The committee report should include sections on:
   a. the potential impact of new technological developments on the ITTC.
   b. new experimental techniques, extrapolation methods,
   c. new benchmark data,
   d. the practical applications of computational methods to prediction and scaling.
   e. the need for R&D for improving methods of model experiments, numerical modelling and full-scale measurements.

2. Review ITTC Recommended Procedures relevant to ocean engineering (including procedures for uncertainty analysis)
   a. Identify any requirements for changes in the light of current practice, and, if approved by the Advisory Council, update them.
   b. Identify the need for new procedures and outline the purpose and content of these.

3. Identify the parameters that cause the largest uncertainties in the results of model experiments, numerical modelling and full-scale measurements related to ocean engineering.

4. Conduct a study of numerical computations in comparison with existing benchmark data for
   a. Wave run-up on a fixed vertical cylinder.
   b. Vortex shedding from a circular cylinder for forced oscillation and fixed in a current.

5. Propose benchmark tests to investigate the hydrodynamic damping due to mooring lines.

6. Develop guidelines for hydrodynamic testing of marine renewable energy devices.

7. Write a procedure for the testing of dynamic positioning (DP) systems.

8. Liaise with the ISSC and the Seakeeping Committee

5.3 Terms of References for Specialist Committees for the period 2008-2011

Specialist Committee on Uncertainty Analysis

1. Monitor new developments in verification and validation methodology and procedures.

2. Update the ITTC Recommended Procedure 7.5-03-01-01 "Uncertainty Analysis in CFD, Uncertainty Assessment Methodology and Procedures" to take into account the revisions proposed by the Resistance Committee of the 25th ITTC.

3. Evaluate the state-of-the-art for evaluation of uncertainty and determine if any methods have evolved that better represent what the ITTC community is using for practical CFD computations.

4. Update ITTC Recommended Procedure 7.5-02-01-03, "Density and Viscosity of Water".
   a. Revise the formulae recommended by the ITTC, for the density, viscosity, and vapour pressure of water,
   b. Develop uncertainty expressions for these equations.
   c. Review existing procedures and propose changes to ensure consistent use of this information.

5. Write an ITTC Recommended Procedure: "Uncertainty Analysis for the 1978 ITTC Powering Prediction Method", including a realistic example. Liaise with the Propulsion Committee.

6. Complete the revision of Procedures 7.5-02-03-01.2 "Uncertainty Analysis Example for Propulsion test" and 7.5-02-03-02.2

"Uncertainty Analysis Example for open water test"

7. Work with other technical committees to develop or revise procedures related to uncertainty analysis.

8. Support the committees that have the task of harmonizing the ITTC Recommended Procedures that contain uncertainty analysis with the ISO approach. Coordinate the work and review proposed revisions.

Specialist Committee on CFD in Ship Hydrodynamics

Computational capabilities are making progress in the design and evaluation processes for many vehicles of interest including marine vehicles. Although inviscid methods are still often used, RANS codes, DES, LES and DNS are starting to play a larger role in the study of viscous flow fields generated by marine vehicles. It is inevitable that these methods will have an even larger role in the future as computer power increases and the application of such codes matures even further. However, it will still take considerable effort to have the confidence in these methods that currently exist with the same level as in model tests, since grid resolution, turbulence modeling and other sources of uncertainties are still major factors which affect the accuracy of solutions. In ITTC as the range of application of CFD has been extended the issues have been discussed in several committees, (Resistance, Manoeuvring, Propulsion and Seakeeping Committees for example). The purpose of this specialist committee is to comprehensively review the past work on the areas treated separately by those committees. General conclusions on the status of practical applications of CFD and suggestions for future CFD applications will be beneficial to all members of ITTC.

1. Review from an interdisciplinary perspective, the current status of CFD in areas of importance to the ITTC. Include resistance, propulsion, propulsors, manoeuvring, seakeeping and steady and unsteady flow field prediction at model and full scale.

2. Review the impact on CFD of different modelling techniques, such as particle methods or Cartesian grid methods.

3. Identify the need for research in the treatment of:
   a. the free surface, unsteady flows, and accurate modelling of turbulence,
   b. surface roughness and the ability to correlate the full-scale computation with real ship data.

4. Define which benchmark data are needed for CFD validation. Include the requirement for experimental data.

5. Liaise with the organizing committee for the 2010 CFD workshop in Goteborg. *(Note: There have been initial discussions between the ITTC AC and Professor L. Larsson, Chalmers University of Technology, that the Specialist committee on CFD could be a reference group or discussion partner to the organizing committee of the 2010 CFD workshop).*

Specialist Committee on Scaling of Wake Field

1. Define the physical nature of wake.

2. Review the existing scaling methods and available full-scale data.

3. Review the applicability of CFD methods for the prediction of full-scale wake. Liaise with the Specialist Committee on CFD in Ship Hydrodynamics.

4. Address the available options for simulating full-scale wake both numerically and experimentally including the limitations of existing test procedures. Liaise with Specialist Committee on Detailed Flow Measurement.

5. Write guidelines for methods of scaling of wake fields.

Specialist Committee on Surface Treatment

Ship coating systems have a big influence on the performance of a ship. A big step in the past was the so-called self-polishing paints because they guaranteed no resistance increase over a long period. The K_S value changed from K_S = 150E-6 m to K_S = 100E-6 m or lower. With the development of the environmental consciousness the use of these paints is not longer permitted and the paint manufacturers have developed new paints such as silicon based ones or others with a very hard and smooth surface. The experience with these paints regarding correlation is very poor from the viewpoint of model basins. Furthermore propellers are also painted nowadays and the paint manufacturers give figures for lower resistance and higher efficiency that must be reflected by the community. The purpose of this committee is to review the work done in the past and to draw general conclusions concerning the practical impact on ship performance, mainly from the correlation point of view.

1. Review state of the art of different surface treatment methods.

2. Review the possible impact on ship performance in the following areas in the light of the recent rapid development of coating systems:
    a. resistance (friction line),
    b. propeller characteristics,
    c. cavitation behaviour,
    d. comfort (propeller induced noise),
    e. acoustic signature.

3. Review the existing measurement methods for surface roughness at model-scale and at full-scale.

4. Propose methods that take in account surface roughness and other relevant characteristics of coating systems in model testing.
    a. Check the need for changes to the existing extrapolation laws.
    b. Study the roughness allowance for high-speed and conventional ships (hull, appendages and propellers).

Specialist Committee on High-Speed Craft

1. Review and identify numerical and experimental developments for the prediction of the behaviour of high-speed craft, especially multi-hull vessels, addressing seakeeping, powering, manoeuvring, far field waves and wash, air resistance and stability.

2. Identify validation data for new designs appropriate for benchmarking purposes. Include relevant data about the ship geometry and loading condition, allowing the validation of numerical techniques in realistic conditions including some or all of the major challenges: large domains, complex bathymetry and unsteady effects.

3. Review, identify any requirements for changes and, if approved by the Advisory Council, update ITTC Recommended Procedures applicable to high-speed craft.

4. Update the ITTC Symbols List for high-speed craft, especially with respect to waterjet propulsion, taking into account ISO 31 “The principles of Notation” and making the symbols consistent in the procedures for high-speed craft.

Specialist Committee on Stability in Waves

1. Update the state-of-the-art for predicting the stability of ships in waves, emphasising developments since the 2008 ITTC Conference. The committee report should include sections on:
    a. the potential impact of new technological developments on existing ITTC procedures,
    b. new experiment and extrapolation methods and the practical applications of computational

methods to stability predictions and scaling,
c. the need for R&D for improving methods of model experiments, numerical modelling and full-scale measurements,
d. the development of vulnerability criteria and assessment methods for intact ships considered by the IMO and navies.

2. Write a section of the committee report describing various cases and methods for numerical prediction of capsizing. This section shall serve as a framework for future development of procedures for numerical predictions of capsizing of ships. Develop a procedure for the prediction of capsizing of a damaged RoRo ship in irregular beam waves.

3. Carry out a benchmark test study of numerical codes for predicting onset and the magnitude of parametric roll in head seas by using experimental data selected by the 25th Committee and identify crucial elements for accurate predictions.

4. Review numerical techniques for assessing the survival time of damaged passenger ships and identify experimental data for their validation.

5. Develop a procedure for numerical estimation of roll damping moment of intact and damaged ships.

Specialist Committee on Vortex Induced Vibrations

1. Update the state-of-the-art for predicting vortex induced vibrations and motions emphasising developments since the 2008 ITTC in various current profiles at ultra-deep water.

2. Organize, conduct and report the results of benchmark VIV tests.

3. Prepare standard nomenclature for VIV and VIM investigations.

4. Write a procedure for VIV and VIM testing for marine applications

Specialist Committee on Detailed Flow Measurements

Understanding the complex and nonlinear phenomena by detailed flow field and wave field measurement has been one of the important advancements in ship hydrodynamics. For this purpose, the simultaneous multi-point measurements (plane or volume) using images are required. Some image based measurement systems have been used in ship hydrodynamics and also used in the towing tanks and full scale ships recently. Recently, some experiments have been conducted using image based measurement techniques to provide detailed field data for benchmarking of ship hydrodynamics unsteady CFD codes.

1. Review up to date measurement systems and methods available for ship hydrodynamics flow field measurements.

2. Describe applications of PIV, Stereo PIV, LDV, PTV, holography, on and off around-the-hull flow measurements, including flow separation, wake, vortex strength etc.

Figure 1, below, is an example of how a figure used in a single column should be arranged on the page.

5.4 Terms of Reference for the Groups

Quality Systems Group

1. Maintain the Manual of ITTC Recommended Procedures and Guidelines. Co-ordinate the modification and and re-editing of the existing procedures according to the comments made by ITTC member organizations at the Conference and by the Technical Committees.

2. Support technical committees in their work on Recommended Procedures. Supply the chairmen of the new committees at the beginning of the period with the WORD versions of the relevant procedures, and the WORD template for the production of new procedures. Inform them which ITTC Recommended Procedures to follow when reviewing or producing new procedures.

3. Update the ITTC Symbols and Terminology List.

4. Cross-check the ITTC Symbols List and the Dictionary with other standards e.g. ISO Standards.

5. Stimulate, monitor and support validation work within the Technical Committees.

6. Define benchmark data

7. Organize the storage and publication of benchmark data (website access)