Appendix 2

Tasks and Structure of the 27th ITTC Technical Committees and Groups

1. STRUCTURE OF TECHNICAL COMMITTEES

The structure of the technical committees has changed slightly from the 26th ITTC and now includes six General Committees, six Specialist Committees and one Group.

2. TERMS OF REFERENCE 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 to 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 and evaluations, and quality assurance of designs. The General Committees will develop detailed plans in accordance with Conference Recommendations and their 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 fora. Procedures and Guidelines shall contain only techniques which are applicable in commercial practice.

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

1. General technical conclusions
2. Recommendations to the Full Conference, which require actions such as, e.g., adopting ITTC procedures.
3. Proposals for future work of the General Committee and identification of tasks, which may be appropriate for Specialist Committees. These proposals shall be submitted to the Advisory Council which 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 establishing Procedures and/or Guidelines. Procedures and Guidelines shall contain only techniques which are applicable in commercial practice.

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 Full Conference, which require actions such as, e.g., 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 which 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 dissolved upon completion of their respective tasks.

3. MECHANISM FOR IDENTIFYING NEW SPECIALIST TECHNICAL COMMITTEES

As part of their Terms of Reference, the General Committees 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 27TH ITTC

4.1. General Committees

- Resistance
- Propulsion
- Manoeuvring
- Seakeeping
- Ocean Engineering
- Stability in Waves

4.2. Specialist Committees

- CFD in Marine Hydrodynamics
- Detailed Flow Measurement Techniques
- Performance of Ships in Service
- Hydrodynamic Noise
- Hydrodynamic Modelling of Marine Renewable Devices
- Ice

4.3. Groups

- Quality Systems Group

5. TASKS OF THE TECHNICAL COMMITTEES AND GROUPS OF THE 27TH ITTC

5.1. General Terms of Reference

1. All committees shall observe the Terms of Reference and general obligations. The committees are expected to perform all the tasks defined in this document. However, should a committee be unable to do this, it shall consult the Advisory Committee with regard to reduction of the work.

2. Each technical committee shall consider any unfinished items from previous committees and report to the Advisory Council by 1st December 2011 in order to clarify whether these items should be included in the Terms of Reference.

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

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

5. Procedures and Guidelines must be in the format defined in the ITTC Recommended Procedure 4.2.3-01-03, Work Instruction for Formatting ITTC Recommended Procedures, and they will be included in the ITTC Quality Manual. Symbols and terminology must be in accordance 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 new procedures for uncertainty analysis in experiments shall follow the ISO (1995) 'Guide to the Expression of Uncertainty in Measurements' (also known as ISO-GUM). It is not required to update existing procedures on uncertainty analysis to follow this standard. If a procedure for uncertainty analysis is for other reasons updated, it shall follow the ISO standard.

7. Committees that have a task to review ITTC Recommended Procedures shall identify and report any changes proposed in their first annual report to the Advisory Council. The changes approved by the Advisory Council should be implemented in the second year and the draft revised procedure submitted to the Advisory Council for comment.

8. Committees that have a task to write new procedures or guidelines shall submit an outline of these with their first annual report to the Advisory Council. The outline shall be reviewed by the Advisory Council and comments made to the committees. The draft new procedure or guideline shall be prepared during the second year and submitted to the Advisory Council for review.

9. All new and revised procedures shall, as far as feasible, include procedure for uncertainty analysis.

10. New and revised draft procedures shall subsequently be updated, incorporating the comments made by the Advisory Council, and in February of the third year be submitted to the Quality Systems Group for formal check and to the Advisory Council for final review and approval.

11. Committee reports to the Conference should be structured in line with the terms of reference of the committee and in accordance with Recommended Procedure 4.2.3-01-02, Guidelines for Preparation of Technical Committee and Working Group Reports

5.2. Terms of Reference 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 2011 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 and
   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. Implement updated uncertainty analysis spreadsheet for resistance test.

3. Continue the analysis of the ITTC worldwide series for identifying facility biases.

4. Review definitions of surface roughness and develop a guideline for its measurement.

5. Review results from tests that correlate skin friction with surface roughness.

6. Review trends and new developments in experimental techniques on unsteady flows and dynamic free surface phenomena.

7. Review new developments on model manufacturing devices and methods.

8. Review the development and evaluate improvements in design methods and the capabilities of numerical optimization applications, such as Simulation Based Design environments, with special emphasis on design of new ship concepts, geometry manipulation and parameterization, surrogate models and variable fidelity applications. (The fundamental assumption that an optimal hull shape is one that minimizes the calm water resistance may no longer be appropriate given the developments in CFD that give the designer the ability to make assessment of both wave and viscous effects for added resistance in waves as well as the interaction between hull-propulsor and appendages.)

Propulsion Committee

1. Update the state-of-the-art for predicting for propulsion systems emphasising developments since the 2011 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.
   g. Monitoring the developments regarding high-speed marine vehicles

2. Review ITTC Recommended Procedures relevant to propulsion and
   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. Liaise with the Specialist Committee on Performance of Ships in Service, especially regarding power prediction and consequences of EEDI.

4. Assess where CFD results can be introduced to support experimental model testing by monitoring status of CFD to perform full scale powering, resistance, cavitation and wake simulations and their correlation with full scale data. Identify the needs for hybrid procedures combining experimental and numerical methods.

5. Prepare a state-of-the-art review of modelling and scaling unconventional propulsion and wake improving devices.

6. Examine methods of target wake simulation, e.g. “smart” dummy approach.

7. Examine wake fraction scaling for twin screw ships and show the consequences on existing procedures.

8. Examine the possibilities of CFD-methods regarding scaling of

conventional and unconventional propeller open water data. Initiate a comparative CFD-calculation project.

9. Develop guidelines for hybrid propulsor testing.

10. Continue with the monitoring of existing full scale data for podded propulsion. If there is available data, refine the existing Procedure.

Manoeuvring Committee

1. Update the state-of-the-art for predicting the manoeuvring behaviour of ships emphasising developments since the 2011 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.
    g. the effects of free surface, roll, sinkage, and trim in numerical simulation of manoeuvring.

2. Review ITTC Recommended Procedures relevant to manoeuvring and
    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. Complete the work on the Procedure 7.5-02-06-04, Uncertainty Analysis; Forces and Moment, Example for Planar Motion Mechanism Test, based on ISO approach. The present procedure 7.5-02-06-04 and the subsection on uncertainty analysis in the Procedure 7.5-02-06-02, Captive Model Test Procedure, prepared by the 23rd ITTC are based on the ASME approach. In view of the work already carried out for the procedure 7.5-02-06-04, consider to keep the elaborated ASME example as one of the Appendices to the to-be-renewed 7.5-02-06-04.

4. Based on results of the SIMMAN workshop held in 2008 and its next edition, continue the already initiated work to generate a guideline on Verification and Validation of RANS tools in the prediction of manoeuvring capabilities. Liaise with the QSG with respect to definitions of Verification and Validation.

5. Restricted waters:
    a. Produce a guideline for experimental methods.
    b. Complete the initiated one for numerical methods which may serve as a basis for recommended procedures for manoeuvring in restricted waters.

6. Free running model tests:
    a. Update the procedure 7.5-02-06-01, Free Running Model Test

Procedure, in particular to include objective statements on the initial conditions of free manoeuvring model tests.

b. Elaborate the already initiated procedure on uncertainty analysis for free running manoeuvring model tests, including an example.

7. Scale effects in manoeuvring:
   a. Report on knowledge and collect, analyse and summarize data on scale effects for manoeuvring predictions.

8. Review developments in methods and draft a validation procedure of combined manoeuvring and seakeeping with respect to simulation. Liaise with the Seakeeping Committee and the Stability in Waves Committee.

9. Support the organisation of a second SIMMAN workshop.

10. Manoeuvring criteria and relations to IMO:
    a. Report on manoeuvring criteria for ships not directly covered by IMO like POD and waterjet driven vessels, naval ships, inland ships, HSMV, etc.
    b. Study possible criteria for manoeuvring at low speed and in shallow waters and if warranted communicate findings to IMO.

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. The modelling and simulation of waves, wind and current is the primary responsibility of the Ocean Engineering Committee, with the cooperation of the Seakeeping Committee and the Stability in Waves Committee.

1. Update the state-of-the-art for predicting the behaviour of ships in waves emphasising developments since the 2011 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 and
   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. Introduce a definition of slamming.

3. Liaise with ISSC, the Ocean Engineering Committee, The Stability in Waves Committee and the Specialist Committee on Performance of Ships in Service.

4. Update existing ITTC Recommended Procedure 7.5-02-07-02.5, Verification

and Validation of Linear and Weakly Non-Linear Seakeeping Codes, to reflect the outcomes of the Verification and Validation workshop held in 2010.

5. Investigate methodology for Verification and Validation of fully non-linear seakeeping viscous flow codes.

6. Develop a guideline for the verification and outline further developments required for validation of hydroelastic seakeeping codes.

7. Jointly organize and participate in the joint ISSC/ITTC workshop on uncertainty in measurement and prediction of wave loads and responses.

8. Establish a numerical and experimental process for estimating *fw*, in the EEDI calculation. Liaise with the Specialist Committee on Performance In Service.

9. Develop a unified method for sloshing experiments drawing on the methods developed by the classification societies. Identify benchmark data for sloshing in LNG carriers.

10. Review and update the Procedure 7.5-02-05-04, Seakeeping Tests, for High Speed Marine Vehicles.

Ocean Engineering Committee

Note: The Ocean Engineering committee covers moored and dynamically positioned ships and floating structures. The modelling and simulation of waves, wind and current is the primary responsibility of the Ocean Engineering Committee, with the cooperation of the Seakeeping Committee and the Stability in Waves Committee.

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 2011 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 and
    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. Complete the VIV and VIM guideline and benchmark study initiated by the Specialist Committee in Vortex Induced Vibrations of the 26th ITTC. The report on the benchmark test shall include clear definition of all test parameters.

4. Complete and report on the wave run-up benchmark study for a single cylinder.

5. Carry out a wave run-up benchmark study for cases of four columns using the experimental data from Marintek.

6. Investigate and report on thruster-thruster interaction, ventilation and their scaling for DP systems.

7. Investigate and report on physical and numerical modeling of vessels in side-by-side operations with an emphasis on wave elevation in the gap.

8. Investigate and report on motions of large ships and floating structures in shallow water.

9. Jointly organize and participate in the joint ISSC/ITTC workshop on uncertainty in measurement and prediction of wave loads and responses.

Stability in Waves Committee

Note: The Stability in Waves Committee covers the stability of intact and damaged ships in waves. The modelling and simulation of waves, wind and current is the primary responsibility of the Ocean Engineering Committee, with the cooperation of the Seakeeping Committee and the Stability in Waves Committee.

1. Update the state-of-the-art for predicting the stability in waves, emphasizing developments since the 2011 ITTC conference. The committee report should include sections on:
    a. Definition of loss and survival of the ship;
    b. The amount of detail required for modeling the internal geometry of the ship;
    c. Leak and collapse pressures for water tight doors and bulkheads; and
    d. Modeling of extreme wave conditions.

2. Review ITTC Recommended Procedures relevant to stability and
    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. Investigate uncertainty analysis for intact and damaged model tests to complement current procedures.

4. Investigate the criteria for modeling wave spectra in the determination of dynamic instability of intact vessels, i.e. wave steepness, non-linearity, frequency contents of the spectrum, statistical distribution of wave and crest height and spatial behaviour of the waves.

5. Develop better understanding of uncertainties associated with the results from experiments and simulations of extreme motions of intact vessels in realistic irregular seaways and develop quantitative techniques which reflect the nature and magnitude of the phenomena.

6. Review vulnerability criteria (including long term probability of loss of the ship) for intact and damaged ships, and outline further developments that are required.

7. Update ITTC Recommended Procedure 7.5-02-07-04.2, Model Tests on Damage Stability in Waves, paying specific attention to:

a. Investigate the significance of scale effects in air pressure on flooding model tests under atmospheric conditions. Comment on the need to perform flooding model tests under scaled air pressure conditions.
b. Investigate how to deal with the inertia due to the flood water mass.

8. Cooperate with IMO SLF subcommittee.

9. Investigate the roll damping for large amplitude roll motions in irregular seas. Review suitable data for future benchmarking of time domain computer codes.

5.3. Terms of Reference for Specialist Committees

Specialist Committee on CFD in Marine 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 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, Seakeeping and Ocean Engineering 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, steep and breaking wave simulation, seakeeping, ocean engineering and steady and unsteady flow field prediction at model and full scale.

2. Review the developments and identify the need for research in steady and unsteady computational fluid dynamics at full scale, including the implementation of real-time CFD analyses for the use in manoeuvring simulators.

3. Define which benchmark data are needed for CFD validation. Include the requirement for experimental data. Create a list of benchmark experimental data for validation of different aspects of CFD for hydrodynamics of ships and offshore structures, including the output needed from such experiments and the level of experimental uncertainty required.

4. Check the need for formal procedures and guidelines on CFD verification and validation in specific areas.

5. Update the guideline 7.5-03-02-03, Practical Guidelines for Ship CFD Applications.

6. Review use and validation of CFD methods for wake scaling and determination of nominal full-scale wake.

7. Develop procedure for RANS simulation of model scale and full scale nominal wakes.

8. Review recent developments in techniques for direct numerical simulation of wakes (LES, DNS, SPH, ect).

Specialist Committee on Detailed Flow Measurement Techniques

1. Survey and report on the existing detailed flow visualization, measurement techniques and data analysis methods.

2. Develop best-practice guidelines for the applications of PIV/SPIV in tow tanks and cavitation tunnels.

3. Develop experimental benchmarks for the verification of PIV/SPIV setup.

4. Perform an uncertainty analysis to assess PIV error sources beyond those considered in existing ITTC Recommended Procedure 7.5-01-03-03. These include peak locking errors, error due to improper light sheet overlap, effects of velocity gradients in the interrogation region, etc.

5. Develop a Guideline for SPIV uncertainty analysis.

6. Collaborate with the Specialist Committee on CFD to develop methods for the validation of CFD codes using detailed flow measurements.

Specialist Committee on Hydro-dynamic Modeling of Renewable Energy Devices

1. Review and update the guideline on wave energy converters.

2. Develop guidelines for the physical modeling of wind and current/tidal renewable energy systems, both floating and bottom fixed structures.

3. Produce a guideline for large scale tests in open environment.

4. Investigate and report on techniques for the modeling of power take-off (PTO) systems.

5. Review and report on techniques for the numerical modeling of renewable energy systems.

6. Investigate and suggest improvements for wind load modeling on wind turbine devices during physical model testing.

7. Identify the parameters that cause the largest uncertainties in the results of physical model experiments and the extrapolation to full scale.

8. Investigate and report on the correct modeling for renewable energy system arrays (farms).

Specialist Committee on Hydro-dynamic Noise

1. Create an overview of the characteristics of hydrodynamic noise sources (including machinery and equipment, e.g. sonars) and their influence on the marine environment

2. Create an overview of existing national and international regulations regarding hydrodynamic noise

3. Check the existing methods and develop relevant guidelines how to perform both model and full scale noise measurements

4. Identify scale effects in prediction of hydrodynamically generated noises (flow noise, cavitation noise,..)

5. Examine the possibilities to predict full scale values (correlation and operational requirements).

Specialist Committee on Performance on Ships in Service

The purpose of the Committee is to improve the performance predictions (especially for large ships) for service conditions covering the whole life cycle of the ship, keeping in mind the EEDI and EEOI development within IMO.

1. Cooperate directly with the AC and ITTC's representative in IMO with regard to EEDI.

2. Liaise with the Resistance, Propulsion and Seakeeping Committees as relevant, specifically with regard to estimating *fw*, in the EEDI calculation.

3. Monitor and review the state of the art for EEDI and EEOI prediction and determination methods, including CFD based ones.

4. Review the existing procedures for the ship model testing with regard to the requirements arising from the EEDI prediction process, including ITTC Recommended Procedure 7.5-02-07-02.2, Prediction of Power Increase in Irregular Waves from Model Tests, and liaise with the Seakeeping Committee to decide whether an update of the procedure is required.

5. Identify and describe the practical aspects of the EEDI prediction process involving ship model testing, and develop a guideline for EEDI prediction.

6. Take into account minimum power requirements for safe and effective manoeuvring with respect to the EEDI formula (sea margin).

7. Describe the type of data (and the quality of that data) that should be recorded during full scale monitoring trials, including the issues of surface roughness.

8. Review the existing ITTC trial test procedures in this context. Review the existing speed correction methods for Full Scale Trial Measurements including ISO 15016, and come up with recommendation if the problems are identified, taking into account the MARIN report as contained in document MEPC 62/5/5.

9. Review the technologies (hydrodynamic issues) for enhancement of the powering performance, such as

speed reduction, energy saving devices, hull form and propeller design etc.

10. Investigate the experimental and numerical possibilities to estimate the effect of manoeuvering and wind to the added resistance.

11. Look for full scale data that will allow to improve powering estimation taking into account the surface roughness (hull, appendages and propeller).

12. Examine the possibilities for numerical methods in the prediction of the influence of surface roughness on the power prediction.

Specialist Committee on Ice

1. Ice properties modeling (full scale and model scale) considering various conditions, ridges, pressurized ice, etc. for both offshore structures and ships.
    a. Review and update the state of the art, regarding new relevant ice conditions such as brash ice channels (related to Ice Class powering requirements) both in frozen channel and fresh channel
    b. Examine methods to model and measure various ice properties
    c. Gather information of scatter in model ice properties within one ice sheet (statistical distribution)

2. Define which existing ice related procedures need to be checked and if new ones need to be developed

3. Look into operational conditions in freezing seas (in view of the climate change) in terms of relevant modelling. Conditions needed to be modeled are for example:
    a. Brash ice channels
    b. Icing
    c. Ice and waves, wind, current; ice dynamics

4. Review the existing numerical methods (offshore structures and ships) concerning:
    a. Model ice failure
    b. Ice resistance, propulsion, manoeuvring, ice loads
    c. Operational simulation incl. positioning in ice

5.4. Terms of Reference for the Groups

Quality Systems Group

1. Include a definition of the terms Verification and Validation in the ITTC Symbols and Terminology List (to be done within first three months as a basis for the work of other committees).

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

3. Support the Technical Committees in their work on Recommended Procedures. Supply the chairmen of the new committees at the beginning of the period with the MS Word versions of the relevant procedures and the template for the production of new procedures.

4. Observe the development or revision of ISO Standards regarding Quality Control.

5. Update the ITTC Symbols and Terminology List.

6. Update the ITTC Dictionary of Hydromechanics.

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

8. Revise and update the existing ITTC Recommended Procedures according to the comments of Advisory Council, Technical Committees and the Conference.

9. Before the third AC Meeting, review and edit new ITTC Recommended Procedures with regard to formal Quality System requirements including format and compliance of the symbols with the ITTC Symbols and Terminology List.

10. Follow the implementation of the Benchmark data repository.

11. Support the technical committees with guidance on development, revision and update of uncertainty analysis procedures.

12. Observe ISO standards for uncertainty analysis, in particular the uncertainty analysis terminology.

13. Maintain Wiki for the 27th ITTC as a trial period and create link to it from the ITTC website.