Tasks and Structure of Technical Committees and Groups of the 31st ITTC

1. STRUCTURE OF THE TECHNICAL COMMITTEES AND GROUPS FOR 31ST ITTC

1.1 Technical Committees

As decided by the 29th Full Conference, there is no longer a distinguishment between the permanent committees and Specialist Committees. They are all named Technical Committees. The following Technical Committees are proposed for the 31st ITTC:

- Resistance
- Propulsion
- Manoeuvring
- Seakeeping
- Ocean Engineering
- Stability in Waves
- Full Scale Ship Performance
- Cavitation and Noise
- Ice
- Wind Powered and Wind Assisted Ships

1.2 Groups

- Quality Systems Group
- Group on Overlap

2. TERMS OF REFERENCE FOR THE TECHNICAL COMMITTEES AND GROUPS

2.1 Technical Committees

Each Technical Committee will be responsible for its specified subject area. It will review the state-of-the-art, identify the need for research and development, and carry out longer term studies with broad impact.

Each Technical Committee will submit a report on the results of its work to the Full Conference. The conclusions and the recommendations of the Technical Committee report 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.

In addition, each Technical Committee shall submit proposals for future work of the Technical Committee and identification of tasks, which may be appropriate for new Technical Committees. These proposals shall be submitted to the Advisory Council which will compile the proposals and present them to the Full Conference.

2.2 Groups

Groups may be established from time to time by the Executive Committee to carry out specific tasks for the Conference, which are generally not technical issues.

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

1. General conclusions
2. Recommendations to the Full Conference, which require actions such as, e.g., adopting ITTC procedures.

In addition, each Group shall submit proposals for future work and identification of tasks, which may be appropriate for Technical Committees. These proposals shall be submitted to the Advisory Council which will compile the proposals and present them to the Full Conference.

3. MECHANISM FOR IDENTIFYING NEW TECHNICAL COMMITTEES

As part of their Terms of Reference, the Technical 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 Technical Committee when it reviews the draft recommendations of the Technical Committees, the Advisory Council will prepare and agree on a statement of the technical aims and objectives for the work of the new Technical Committee.

Independent of the proposals of the Technical Committees, the Advisory Council will keep the requirement for new Technical Committees under continuous review.

When the Advisory Council has agreed on the need for a new Technical 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 Technical Committee, it will present the proposal to the Full Conference for approval.

4. TASKS OF THE TECHNICAL COMMITTEES AND GROUPS OF THE 31ST ITTC

4.1 General Tasks

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 Council with regard to reduction of the work.

2. All committees shall identify areas of mutual interest with other committees and the concerned committees shall establish active cooperation/liaison in these areas.

3. All committees shall cooperate with the Group on Overlap.

4. All committees shall endeavour to identify benchmark data and submit these to the ITTC Secretary for inclusion in the benchmark data repository on the ITTC website. Each committee shall appoint a member responsible for this.

5. 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.

6. All committees shall monitor and propose possible application of combined CFD/EFD methods.

7. All committees shall monitor and propose possible application of AI methods in their area.

8. 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 Committee and Group Reports.

4.2 Requirements to new and revised Recommended Procedures and Guidelines

In the preparation of new or revision of existing Recommended Procedures and Guidelines, the committees shall observe the following:

1. Some committees are given the task to either write a new procedure or guideline on a specific subject, or to update an existing procedure or guideline with regard to a specified subject. When this is the case, the new or updated procedure or guideline shall follow the structure and instructions given in procedure 4.2.3-01-01, Guide for the Preparation of ITTC Recommended Procedures, follow the instructions given in 4.2.3-01-03, Work Instruction for Formatting

ITTC Recommended Procedures, and use the template given in the same Work Instruction.

2. The annex of these Terms of Reference contains a list of existing Recommended Procedures and Guidelines with the identification of which committee is responsible for maintaining each procedure or guideline. The committees are not obliged to review and update all the procedures and guidelines they are responsible for. However, if a committee finds that a revision is recommended, it shall describe the recommended revision and seek approval from the Advisory Council to implement the recommended revision. Recommendations for modifying procedures or guidelines shall preferably be sent together with the first committee progress report so that the modifications may be implemented during the second year, if approved by the Advisory Council.

4.3 Terms of Reference for the Technical Committees

Resistance Committee

1. Update the state-of-the-art for predicting the performance of different ship concepts emphasizing developments since the 30th ITTC Conference. The committee report should include sections on:

   a. The potential impact of new technological developments on the ITTC, including, for example new types of hull coatings, appendages and rudders.
   b. New experimental techniques and extrapolation methods.
   c. New benchmark data.
   d. The practical applications of computational methods to performance predictions and scaling.
   e. The need for R&D for improving methods for model experiments, numerical modelling and full-scale measurements.

2. Monitor the experience of ITTC members using CFD-based form factors and continue comparative studies on CFD methods for form factor derivation. Investigate the use of CFD and combined CFD/EFD methods in scaling processes for a more precise speed/power prediction including correlation with sea-trial data and numerical friction line. Pay special emphasis on the scaling of transom flow (wetted, dry and partially dry). Update the Recommended Procedures related to CFD-based form factor and transom scaling.

3. Investigate the requirements for testing and numerical evaluation of high-speed marine vessels. Address the need of updating 7.5-02-05-01, HSMV Resistance Test.

4. Investigate the use of CFD and combined CFD/EFD methods in scaling processes for a more precise speed power prediction. The issue with high priority is scaling of transom flow (wetted, dry and partially dry).

5. Investigate scaling of sinkage and trim in deep water, as well as their effect on the form factor.

6. Investigate the scale effects for ships advancing through shallow/restricted waters.

7. Review and analyze state of the art and advances in CFD methods for roughness allowance treatment (for both wall resolved and wall function RANS), recommend best practices and propose incorporation in ITTC Procedures and Guidelines. Promote adoption of the revised 7.5-03-01-01, gather feedback related to its use, and summarize conclusions along with possible further improvements.

8. Evaluate the guideline 7.5-02-02-03 for the determination of the frictional drag reduction factor α. Investigate new techniques for the determination of C_F for surfaces with reduced skin friction and extrapolation methods for different Reynolds numbers, for example friction test tunnels using the pressure loss along the test section to determine

the wall shear stress and, finally, the frictional resistance coefficient. Evaluate the model test procedure for flat plates with an Air Lubrication System at different Reynold numbers. Collect examples of air lubrication practice in model tests as well as full-scale data, if available. Develop a guideline for establishing the injection pressure and air- flow rate scaling approach.

Propulsion Committee

1. Update the state-of-the-art for predicting the performance of different ship concepts emphasizing developments since the 30th ITTC Conference. The committee report should include sections on:
   a. The potential impact of new technological developments on the ITTC, including, for example new types of propulsors, rudders and hull and propeller coatings.
   b. New experimental techniques and extrapolation methods.
   c. New benchmark data.
   d. The practical applications of computational methods for performance predictions and scaling.
   e. The need for R&D for improving methods of model experiments, numerical modelling and full-scale measurements.

2. Conduct a benchmark study on propellers focusing on the effect of Re at model scale and scaling methods for full-scale predictions. CFD calculations would be run at a range of Re at model scale and full scale, along with open-water model tests at a range of Re. The study could use the two propellers that were provided for the previous benchmark study run by the 28th ITTC.

3. Investigate the issue of laminar flow effects in self-propulsion tests of propeller with low blade area.
   a. Review literature on the subject.
   b. Conduct a survey how ITTC members tackle this issue, and which scaling method they use for low blade area propellers.
   c. Investigate whether it is sufficient to conduct the open water test at only two different Reynolds numbers for full scale extrapolation.
   d. Suggest modification to Recommended Procedures 7.5-02-03-01.1, 7.5-02-03-01.3, 7.5-02-03-01.4 and 7.5-02-03-02.1 with regard to these effects.
   e. Investigate how CFD can be used to improve scaling methods or used in combination with EFD.

4. Investigate the issue of extrapolation of model tests with ducted propellers to full scale taking into account the different Re-numbers. Identify the need and change the procedures mentioned under 3.d, if necessary.

5. Update Load variation test method in 7.5–02-03–01.4, 1978 ITTC Performance Prediction Method.
   a. Review the Load Variation Test contained in procedure 7.5-02-03-01.4 and harmonise it with the Propulsion Test Procedure 7.5-02-03-01.1 and procedure 7.5-04-01-01.1. Take into account that the load variation test at present is applied for two different tasks:
      i. for the correction of the external tow force (skin friction force) during the propulsion test with small difference of the resistance-ratios. No added resistance is taken into account.
      ii. as preparation for the analysis of speed power trials (7.5-04-01-01.1, Appendix D, Chapter J.2 and ISO 15016) where the difference of the resistance-ratios is much bigger, and which should be included in the performance prediction method. The dependencies of propulsion efficiencies and rate of revolution with power increase apply to this case. The purpose of this task should be clearly stated. Co-operate with the Full-Scale Ships Performance Committee. Supply a

calculated Example as given in Appendix A of Procedure 7.5-02-03-01.4.

iii. To avoid further confusion, it should be considered to rename task ii as e.g., "Determination of overload factors".

b. Review the effectiveness of the Load Variation Test method in shallow water and develop a new method, if necessary.

~~6. Continue work on updating the guideline for correlation factors developed by the AC WG on Correlation during the 30th ITTC. Cooperate with the Full-Scale Ship Performance Committee. *(AC may decide to continue the WG in which case this task is deleted).*~~

7. Investigate the requirements for testing and numerical evaluation of high-speed marine vessels. Address the need of updating 7.5-02-05-02, HSMV Propulsion Test.

8. Investigate the use of CFD methods in scaling processes for a more precise speed power prediction. The issues with high priority are:
   a. Effective-wake scaling
   b. Energy-saving devices

9. Develop a guideline for conducting full-scale performance evaluations for energy saving methods (ESM).

Manoeuvring Committee

1. Update the state-of-the-art for predicting the manoeuvring behaviour of ships, emphasizing developments since the 30th ITTC Conference. The committee report should include sections on:
   a. the potential impact of new technological developments on the ITTC, such as unmanned ship and autonomous navigation
   b. new propulsion and steering technologies and their impact
   c. AI and data-based technology and their application to ship manoeuvring.

2. Update procedure 7.5-02-06-02, Captive Model Test, with regard to hexapod tests.

3. Update procedure 7.5-02-06-04, Uncertainty Analysis for Manoeuvring Predictions, based on Captive Manoeuvring Tests and 7.5-02-06-03, Validation of Manoeuvring Simulation Models, reflecting the outcome of SIMMAN and any other new developments.

4. For procedure 7.5-03-04-01, Guideline on Use of RANS Tools for Manoeuvring Prediction,
   a. update numerical simulation procedure in calm water and in waves,
   b. update the example on simulation based on derivatives in calm water,
   c. add an example of direct manoeuvring simulation in waves.
   d. Ask the Seakeeping Committee to review the updated procedure and reflect their comments on the procedure.

5. Update procedure 7.5-03-04-02, Validation and Verification of RANS Solutions in the Prediction of Manoeuvring Capabilities. Add an example of manoeuvring in waves, if possible.

6. Liaise with the authorities/organizations/associations on marine autonomous vessels, check the validity of existing ITTC procedures for standard manoeuvring trials when applied to maritime autonomous surface ships (MASS).

7. Collect model- and full-scale benchmark data for surface and underwater vehicles and include the benchmark data in procedure 7.5-02-06-06, Benchmark Data for Validation of Manoeuvring Predictions. Liaise with Full-Scale Ship Performance Committee, review and collect benchmark data for full-scale manoeuvring tests.

8. Review the guidelines for low-speed manoeuvring tests and full-scale manoeuvring trials, and, if needed, update procedures 7.5-02-06-01, Free Running Model Tests, and 7.5-04-02-01, Full Scale Manoeuvring Trials, implementing the low-

speed tests and/or bow-thruster test procedures.

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. For the 31st ITTC, the modelling and simulation of waves, wind and current is the primary responsibility of the Ocean Engineering Committee, with the cooperation of the Seakeeping and the Stability in Waves Committees.

1. Update the state-of-the-art for predicting the behaviour of ships in waves, emphasizing developments since the 30th 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. On-board and real time data collection, including collection system, data quality, ocean environmental data, monitoring system.

2. Complete collection and analysis of the benchmark test data for added resistance in waves, acquired in the 30th ITTC, and utilize this data to update or generation of the related ITTC procedure or guideline. Focus shall be on oblique waves where data is scarce.

3. Update ITTC procedure 7.5-02-07-02.1, Seakeeping Experiments, including the standardized number(s) of encounter waves in model-scale and full-scale measurements.

4. Collect numerical simulation data to investigate the topic of 'voluntary' speed reduction for vessels smaller than 100m in length and recommend the sea state for the computation of Weather factor *fw* for small ships.

5. Finish and publish the draft "Guideline for determining Minimum Propulsion Power to Maintain the Manoeuvrability of Ships in Adverse Conditions" prepared by the 30th ITTC Seakeeping Committee. Investigate whether there are any technical issues or shortcomings in MEPC.1/Circ.850/Rev.3 and, if so, prepare a submission to IMO MEPC on the subject.

6. Create a new guideline for verification and validation of CFD methods for seakeeping analysis.

Ocean Engineering Committee

Note: The Ocean Engineering Committee covers moored and dynamically positioned ships and floating structures. For the 31st ITTC, the modelling and simulation of waves, wind and current is the primary responsibility of the Ocean Engineering Committee with the cooperation of the Seakeeping and the Stability in Waves Committees.

1. Provide a survey of the state-of-the-art of the relevant developments in the field of ocean engineering and ocean renewable energy, emphasizing developments since the 30th ITTC Conference. The committee report should include sections on:
   a. the potential impact of new technological developments on the ITTC
   b. new experimental techniques
   c. new benchmark data
   d. the practical applications of computational methods to prediction
   e. the need for R&D for improving methods of model experiments and numerical modelling.

2. Consider whether floating solar (photovoltaics platforms), ocean thermal energy and deep-sea mining require specific guidelines beyond the present guidelines for wave energy, current energy and offshore wind (for instance deep water large diameter risers).

3. Review and report on specific AI developments and applications in this field.

4. Review and report on comparisons between full-scale measurements, model-scale

measurements, and numerical predictions.

5. Review and report on the way arrays of ocean energy systems can be tested and simulated.

6. Review and report on how the hydro-elasticity of ocean energy systems can be evaluated experimentally and simulated computationally.

7. Review and report on wind, current and sea state modelling in model tests and simulations for ocean energy systems.

8. Finalise the general guideline on modelling wind and wind loads for ships and offshore structures started by the Seakeeping Committee of the 30th ITTC. Wind loads shall in principle be in all six degrees-of-freedom, but may be reduced to those modes of motion relevant for the specific applications.

Stability in Waves Committee

Note: The Stability in Waves Committee covers the stability of intact and damaged ships in waves. For the 31st ITTC, the modelling and simulation of waves, wind and current is the primary responsibility of the Ocean Engineering Committee with the cooperation of the Seakeeping and the Stability in Waves Committees.

1. Update the state-of-the-art for evaluating the stability of ships in adverse weather conditions, emphasizing developments since the 30th ITTC conference. The committee report should include sections on:
   a. the potential impact of new technological developments on the ITTC
   b. new experimental techniques
   c. new benchmark data
   d. the practical applications of computational methods to prediction
   e. the need for R&D for improving methods of model experiments, numerical modelling.

2. Develop a new procedure for the qualitative validation of time-domain simulation tools for direct stability assessment under the IMO Second Generation Intact Stability Criteria (IMO 2020, MSC.1/Circ. 1627), particularly including
   a. calculation of backbone and roll repose curves,
   b. finding surf-riding equilibrium
   c. evaluation of heel during a turn in calm water
   d. simulation of a straight captive run in stern quartering waves
   e. calculation of a heel angle caused by drift and wind.

3. Update of procedure 7.5-02-07-04.6 with Extrapolation Methods, particularly addressing the technical issues which are not covered by current ITTC procedures.

4. In the current procedures, check the format of the parts that are too descriptive and revise the procedures to conform to the current format.

Full-Scale Ship Performance Committee

1. Update the state-of-the-art for investigation of full-scale ship performance, emphasizing developments since the 30th ITTC Conference. The committee report should include sections on:
   a. the potential impact of new technological developments on the ITTC
   b. new measuring techniques
   c. new benchmark data
   d. the practical applications of numerical simulation to full scale ship performance
   e. the need for R&D for improving methods of full-scale measurements and numerical modelling.

2. Focus on the short wave issue and further investigate the quadratic transfer function (QTF) extrapolation method in short waves for the evaluation of added resistance in waves (ARW).

3. Conduct a sensitivity study on the influence of discrepancies in evaluation of ARW on final corrections to the sea trials; study how ARW affects the final speed-power curves. Perform a comparative study of the influence of directional energy spreading on the wave correction in speed/power trials.

4. Carry out a comparison of validated methods on the larger set of ship types by using real-ship parameters. It should not be limited to organisations performing model tests. Consider the possibility of selecting among the methods for wave, wind and current corrections in speed/power trials depending on the availability of ship form data.

5. Monitor and explore further measurement techniques applicable in speed/power trials and in-service monitoring: Lidar wind measurements, thrust measurement and wave spectra measurement.

6. Provide technical support to ISO and IMO in furthering development of approaches to in-service performance monitoring.

7. Collect the full-scale data to evaluate the frictional resistance reduction by air lubrication system and validate correlation of actual reduction rate (ADR) and estimated reduction rate (EDR) to predict performance at full loading conditions.

8. Investigate cases with crosswind in head/following waves to find the necessity of correcting the issue of ship running with stable drift angles.

9. Investigate the effect of bio-fouling related roughness, monitoring effect of roughness and analyse methods for evaluating ship performance in service.

10. Extend the sea trial procedure to include new metrics such as ADR and EDR, along with the methodologies for measurements.

11. Cooperate with the AC Working Group on Correlation as required.

Cavitation and Noise Committee

1. Update the state-of-the-art for evaluating cavitation and hydrodynamic noise, emphasizing developments since the 30th ITTC conference. The committee report should include sections on:
   a. the potential impact of new technological developments on the ITTC
   b. new experimental techniques
   c. new benchmark data
   d. the practical applications of computational methods to prediction
   e. The need for R&D for improving methods of model experiments, numerical modelling.

2. Review and update the current ITTC Guidelines / Procedures on Noise model and full-scale measurement with focus on calibration, reverberation and instrumentation.

3. Review the state of the art on cavitation model testing (cavitation appearance, hull pressure fluctuation, thrust break down, cavitation erosion, bubble injection for noise reduction) and noise model testing with a special focus on propellers operating in ice conditions.

4. Conduct Round Robin Test on the basis of Nawigator XXI (as organized within the 30th ITTC Conference)- collect and analyze data, summarizing the main findings.

5. On the basis of the findings from the Round Robin Test, propose improvements to the accuracy for underwater radiated noise (URN) measurements at model scale for the measurement of propeller noise in tunnels or towing tank facilities.

6. Review the current CFD methods for cavitation and noise. Prepare data and launch a CFD benchmark test campaign (noise, wake simulation, tip vortex cavitation, cavitation inception) possibly within Nawigator XXI.

7. Monitor progress for signal processing in two domains (cavitation and noise) and use

of data, machine learning, and AI approaches (data driven simulations).

8. Monitor the use of energy saving devices for efficiency improvement and ways to manage both propulsion efficiency and noise generation simultaneously (energy saving devices and noise emissions).

9. Revise methods (CFD or empirical) for improved scaling of propeller inflow / wake evaluation methods such as dummy model technique.

10. Review state of the art on cavitation and noise measurements at full scale taking into account different requirements from different Classification Societies (Silencing Notations).

11. Monitor and review studies on the cavitation and noise of wind powered ships.

Ice Committee

1. Update the state-of-the-art for investigation of ship performance in ice, emphasizing developments since the 30th ITTC Conference. The committee report should include sections on:
   a. the potential impact of new technological developments on the ITTC
   b. new experimental techniques
   c. new benchmark data
   d. numerical modelling of ice resistance and ice-ship interaction
   e. the need for R&D for improving methods of measurements and numerical modelling.

2. Revise and finalize interim Guideline 7.5-02-04-02.5, Experimental Uncertainty Analysis for Ship Resistance in Ice Tank Testing, including review done by external experts concerning general uncertainty.

3. Establish and conduct simple benchmark test in order to investigate fundamental uncertainty analysis of model ice properties (flexural strength and other ice properties), collect and summarize findings.

4. Establish standard for simple ice-breaking model (possibly cone) for resistance measurements to verify ice tank characteristics.

5. Develop a Guideline related to testing fixed structures in ice. The Guideline should include subdivision such as: pile foundation structures, shallow foundation structures and ice induced vibration tests and encompass scaling issues for vertical structures.

6. Monitor advances on performance prediction in deformed ice (especially brash ice) including high uncertainty following TraFi Guidelines (Finnish Swedish Ice Class Rules) and report in a form of outline for a guideline.

7. Review State of the Art on numerical modelling of ice resistance and ice-ship interaction.

8. Monitor advances related to snow ice features including surface interaction between ship and hull.

9. Monitor and review methods for propulsor (propeller) - ice interaction.

Wind Powered and Wind Assisted Ships Committee

1. Update the state-of-the-art for investigation of wind powered and wind assisted ships, emphasizing developments since the 30th ITTC Conference. The committee report should include sections on:
   a. the potential impact of new technological developments on the ITTC
   b. new measuring techniques
   c. new benchmark data
   d. numerical modelling of wind powered and wind assisted ships

2. Review and monitor new wind propulsion technologies·

~~3. Review and align the use of terminology and definitions to ensure consistent alignment with industry as the technologies evolve.~~

4. Review and monitor the progress in developing performance prediction methods for wind powered/wind assisted ships.

5. Continue to improve Recommended Procedure 7.5-04-01-02 (sea trial). Perform uncertainty analysis and sensitivity analysis of various models and assumptions. Collect experience on the use of sea trials for wind powered/wind assisted ships in practice, including uncertainty analysis.

6. Continue to improve Guideline 7.5-02-03-01.9, Predicting the Power Saving of Wind Assisted Ships. Perform uncertainty and sensitivity analysis of the various models and assumptions. Recommend one source for wind statics and routing methods for the voyage simulations.

7. Review and assess experimental and numerical methods for seakeeping and manoeuvring assessment of wind assisted ships. Develop Guidelines on manoeuvring and seakeeping tests of wind assisted ships including Software-in-the-loop (SIL), roll damping effects, uncertainty. Liaise with other committees.

8. Review the development of methods for full-scale force measurements for wind propulsion devices, onboard and on land.

9. Review and assess wind tunnel tests of wind propulsion technologies including methods, data, experiences, scale effects. Give recommendations as to necessary requirement for wind tunnel set-up (wind speed, Reynolds number, blockage).

~~10. Monitor and support the development of regulations affecting the design and operation of wind powered ships, such as EEDI, Colreg, class rules etc.~~

~~11. Review and monitor the use of anti-heel and anti-drift devices on wind powered ships.~~

12. Continue to review and collect data on empirical corrections: effect of leeway and heel on resistance components and propulsive efficiency, effect of reduced propeller flow on rudder effectiveness.

4.4 Terms of Reference for the Groups

Quality Systems Group

1. Support the Technical Committees in their work on Recommended Procedures and Guidelines. Supply the chairmen of the new committees with the MS Word versions of the relevant documents.

2. Maintain the Register of ITTC Recommended Procedures and Guidelines.

3. Introduce New Uncertainty Analyses Guidelines to include data anomalies in Machine Learning Algorithms.

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

5. Update the ITTC Symbols and Terminology List.

6. Harmonize the uncertainty symbols list with Annex J of JCGM 100:2008.

7. Update the ITTC Dictionary of Hydromechanics.

8. Support the technical committees dealing with stochastic processes with guidance on development, revision, and update of procedures for the inclusion of confidence bands on their computational and experimental results.

~~9. Observe BIPM/JCGM standards for uncertainty analysis, in particular the uncertainty analysis terminology.~~

~~10. Review developments in metrology theory and uncertainty analysis and issue appropriate procedures.~~

11. Upload all the collected and verified benchmark data into the ITTC benchmark data repository.

12. Cooperate with technical committees to establish the ITTC benchmarks, including definition, raw data, data format, etc.

13. Before publication of new and revised procedures and guidelines:
    a. Perform a detailed review of all new and revised ITTC Recommended Procedures and Guidelines for compliance with ITTC quality requirements with regard to format, references, symbols, terminology, uncertainty analysis and parameter lists
    b. Either update the procedures in these aspects or cooperate with the relevant committee on these updates.

Group on Overlaps

1. Identify and record overlaps in the ITTC Recommended Procedures and Guidelines. In particular those listed below.

2. Waves
    a. Identify overlaps on phenomena and mathematical description and modelling of waves in the ITTC Recommended Procedures contained in the following chapters of the Register of the ITTC Recommended Procedures and Guidelines:
        i. Seakeeping
        ii. Environmental Modelling
        iii. Ocean Engineering
        iv. Manoeuvring
        v. Stability
        vi. Speed and Power Trials
        vii. High Speed Marine Vehicles
        viii. 1978 ITTC Performance Prediction Method (7.5-02-03-01.4)
    b. Merge the identified Recommended Procedures (Guidelines) on the description of waves and/or applicable parts of them into a Guideline to which the above identified Recommended Procedures in future can refer to.
    c. Merge the identified Recommended Procedures (Guidelines) on the modelling of waves (physically) and/or applicable parts of them into a Guideline to which the above identified Recommended Procedures and Guidelines in future can refer to.

3. Wind and current
    a. Identify and record overlaps regarding phenomena and description of wind and air resistance in the ITTC Recommended Procedures contained in the following chapters of the Register of the ITTC Recommended Procedures and Guidelines:
        i. Performance
        ii. High Speed Marine Vehicles
        iii. Environmental Modelling
        iv. Ocean Engineering
        v. Speed and Power Trials
    b. Merge the identified Recommended Procedures (Guidelines) on the description of wind and/or applicable parts of them into a Guideline to which the above identified Recommended Procedures in future can refer to.
    c. Merge the identified Recommended Procedures (Guidelines) on the modelling of wind (physically) into a Recommended Guideline to which the above identified Recommended Procedures and Guidelines in future can refer to.

4. CFD

a. Identify and record overlaps on CFD in the ITTC Recommended Procedures and Guidelines.
b. Merge the identified Recommended Procedures (Guidelines) containing overlapping CFD issues and/or applicable parts of them into Guidelines to which the above identified Recommended Procedures in future can refer to.

Number		Title	Effective Date	Revision	Pages	Committee
0		REGISTER	2021	8		**QSG**
1		**SCOPE**				
1.0-01		Description and Rules of the ITTC	2017	3	18	**EC**
1.0-02		Committee Structure of ITTC	2014	3	4	**EC**
1.0-03	G	General Guideline for the Activities of Technical Committees, Liaison with Executive Committee and Advisory Council	2017	1	9	**EC**
1.0-04	P	Decision Making Between Conferences	2014	0	4	**EC**
1.0-05	G	Guidelines for delegates representing ITTC vis-à-vis external bodies	2017	0	3	**EC**
1.0-06	G	Guidelines for ITTC Conference Organisers	2021	1	6	**EC**
4		**QUALITY MANAGEMENT SYSTEM**				
4.0-01	G	Guidelines for Benchmarking	2002	1	12	**QSG**
4.2		**DOCUMENT AND DATA CONTROL**				
4.2-01	P	Adoption or Modification of ITTC Recommended Procedures	2017	3	6	**EC**
4.2-02	P	Updating the ITTC Symbols & Terminology List	2017	3	5	**QSG**
4.2-03	P	Review of ITTC Recommended Procedures and Guidelines by the Advisory Council	2017	1	5	**EC**
4.2-04	P	Updating the ITTC Dictionary of Hydromechanics	2011	0	5	**QSG**
4.2.3		**Document Control**				
4.2.3-01		**Recommended Procedures and Work Instructions**				
4.2.3-01-01	P	Guide for the Preparation of ITTC Recommended Procedures	2024	4	6	**QSG**
4.2.3-01-02	G	Guidelines for Preparation of Technical Committee and Group Reports	2017	4	7	**QSG**
4.2.3-01-03	W	Work Instruction for Formatting ITTC Recommended Procedures	2024	5	11	**QSG**
4.2.4		**Control of Records**				
4.2.4-01		**Documentation of interim changes to ITTC Recommended Procedures and**				
4.2.4-01-01		Record of Interim decision regarding ITTC Recommended Procedures and Guidelines	2017	0	4	**EC**
7.5		**PROCESS CONTROL**				
7.5-01		**TEST PREPARATION**				
7.5-01-01		**Ship Models**				
7.5-01-01-01	P	Ship Models	2024	5	10	**RC**
7.5-01-02		**Propeller Models**				
7.5-01-02-01	P	(Terminology and Nomenclature for Propeller Geometry) Deleted	2017	Deleted		
7.5-01-02-02	P	Propeller Model Accuracy	2017	1	8	**PC**
7.5-01-03		**Instrumentation, Calibration**				
7.5-01-03-01	P	Uncertainty Analysis, Instrument Calibration	2017	2	17	**QSG**
7.5-01-03-02	P	Uncertainty Analysis, Laser Doppler Velocimetry Calibration	2008	0	14	**PC**
7.5-01-03-03	G	Guideline on the Uncertainty Analysis for Particle Image Velocimetry	2014	1	18	**PC**
7.5-01-03-04	G	Benchmark for PIV(2C) and SPIV(3C) setups	2017	1	18	**PC**
7.5-02		**TESTING AND EXTRAPOLATION METHODS**				
7.5-02-01		General				
7.5-02-01-01	P	Guide to the Expression of Uncertainty in Experimental Hydrodynamics	2014	2	18	**QSG**
7.5-02-01-02		(Uncertainty Analysis in EFD, Guidelines for Resistance Towing Tank Tests) Replaced by 7.5-02-02-02	2011	Deleted		
7.5-02-01-03	G	Fresh Water and Seawater Properties	2024	3	46	**QSG**
7.5-02-01-04	GC	Guideline on Best Practices for the Applications of PIV/SPIV in Towing Tanks and Cavitation Tunnels	2024	1	27	**PC**
7.5-02-01-05	G	(Model-Scale Propeller Cavitation Noise Measurements) Moved to 7.5-02-03-03.9	2021	Deleted		
7.5-02-01-06	P	Determination of a type A uncertainty estimate of a mean value from a single time series measurement	2021	1	9	**QSG**
7.5-02-01-07	G	Guideline to Practical Implementation of Uncertainty Analysis	2021	1	12	**QSG**
7.5-02-01-08	P	Single Significant Amplitude and Confidence Intervals for Stochastic Processes	2024	1	19	**SiW**
7.5-02-01-09	P	Avoiding self-repeating effect in time-domain numerical simulation of ship motion	2024	0	12	**SiW**
7.5-02-01-10	P	Procedure of Estimation of Frequency of Random Events by Direct Counting	2024	0	12	**SiW**
7.5-02-01-11	P	Statistical Validation of Extrapolation Methods for Time Domain Numerical Simulation of Ship Motions	2024	0	10	**SiW**
7.5-02-02		**Resistance**				
7.5-02-02-01	P	Resistance Tests	2021	5	14	**RC**
7.5-02-02-02	G	General Guidelines for Uncertainty Analysis in Resistance Tests	2021	3	13	**RC**
7.5-02-02-02.1	G	Example for Uncertainty Analysis of Resistance Tests in Towing Tanks	2021	1	16	**RC**
7.5-02-02-02.2	G	Practical Guide for Uncertainty Analysis of Resistance Measurements in Routine Tests	2021	1	7	**RC**
7.5-02-02-03	G	Resistance and Propulsion Test and Performance Prediction with Skin Frictional Drag Reduction Techniques	2017	0	13	**PC**
7.5-02-02-04		Wave Profile Measurement and Wave Pattern Resistance Analysis	2021	0	11	**RC**
7.5-02-03		**Propulsion**				
7.5-02-03-01		**Performance**				
7.5-02-03-01.1	P	Propulsion/ Bollard pull Test	2021	6	17	**PC**
7.5-02-03-01.2	P	(Uncertainty Analysis Example for Propulsion Test) Deleted	2021	Deleted		
7.5-02-03-01.3	P	Podded Propulsor Tests and Extrapolation	2021	2	21	**PC**
7.5-02-03-01.4	P	1978 ITTC Performance Prediction Method	2021	5	19	**PC**
7.5-02-03-01.5	G	Predicting Powering Margins	2017	2	10	**PC**
7.5-02-03-01.6	G	Hybrid Contra-Rotating Shaft Pod Propulsors Model Test	2017	1	11	**PC**
7.5-02-03-01.7	P	Performance Prediction Method for Unequally Loaded, Multiple Propeller Vessels	2021	1	11	**PC**
7.5-02-03-01.8	G	Scaling Method for ship wake fraction with pre-swirl devices	2024	1	7	**PC**
7.5-02-03-01.9	G	Guidelines for Predicting the power saving of a wind propulsion ship on a route at design stage	2024	0	27	**WPWAS**
7.5-02-03-02		**Propulsor**				
7.5-02-03-02.1	P	Open Water Test	2021	4	10	**PC**
7.5-02-03-02.2	P	(Uncertainty Analysis, Example for Open Water Test) Deleted	2021	Deleted		
7.5-02-03-02.3	P	Nominal Wake Measurements by LDV, Model Scale Experiments	2014	1	12	**PC**

7.5-02-03-02.4	P	Nominal Wake Measurement by a 5-Hole Pitot Tube	2011	1	12	**PC**
7.5-02-03-02.5	G	(Experimental Wake Scaling Methods) - Moved to 7.5-02-03-03.10	2024	Deleted		
7.5-02-03-03		**Cavitation**				
7.5-02-03-03.1	P	Model-Scale Cavitation Test	2024	5	12	**CAV**
7.5-02-03-03.2	P	Visual Description and Measurement of Cavitation Events	2024	3	21	**CAV**
7.5-02-03-03.3	P	Cavitation Induced Pressure Fluctuations Model Scale Experiments	2024	6	18	**CAV**
7.5-02-03-03.4	P	Cavitation Induced Pressure Fluctuations Numerical Prediction Methods	2024	3	11	**CAV**
7.5-02-03-03.5	P	Cavitation Induced Erosion on Propellers and Rudders, Model Scale Experiments and Numerical Guidance	2024	3	16	**CAV**
7.5-02-03-03.6	G	Podded Propulsor Model Scale Cavitation Test	2024	3	7	**CAV**
7.5-02-03-03.7	P	(Prediction of Cavitation Erosion Damage for Unconventional Rudders or Rudders Behind Highly-Loaded Propellers) Merged in 7.5-02-03-03.5	2024	Deleted		
7.5-02-03-03.8	P	Modelling the Behaviour of Cavitation in Waterjets	2024	1	16	**CAV**
7.5-02-03-03.9	G	Model-Scale Propeller Cavitation Noise Measurements	2024	3	27	**CAV**
7.5-02-03-03.10	G	Experimental Wake Scaling Methods for a Cavitation Test	2017	1	8	**CAV**
7.5-02-04		**Ice Testing**				
7.5-02-04-01	G	General Guidance and Introduction to Ice Model Testing	2021	3	9	**ICE**
7.5-02-04-02	P	Test Methods for Model Ice Properties	2024	4	19	**ICE**
7.5-02-04-02.1	P	Resistance Tests in Ice	2024	3	8	**ICE**
7.5-02-04-02.2	P	Propulsion Tests in Ice	2017	1	8	**ICE**
7.5-02-04-02.3	PC	Manoeuvring Tests in Ice	2024	2	6	**ICE**
7.5-02-04-02.4	P	(Tests in Deformed Ice) Deleted	2017	Deleted		
7.5-02-04-02.5	P	Experimental Uncertainty Analysis for Ship Resistance in Ice Tank Testing	2005	0	16	**ICE**
7.5-02-04-03	G	Guidelines for Modelling of Complex Ice Environments	2024	2	15	**ICE**
7.5-02-05		**High Speed Marine Vehicles**				
7.5-02-05-01	P	High Speed Marine Vehicles Resistance Test	2024	4	20	**RC**
7.5-02-05-02	P	High Speed Marine Vehicle Propulsion Test	2017	3	7	**PC**
7.5-02-05-03.1	P	Waterjet Propulsive Performance Prediction - Propulsion Test and Extrapolation	2011	2	10	**PC**
7.5-02-05-03.2	P	Waterjet System Performance	2017	2	10	**PC**
7.5-02-05-03.3	P	Uncertainty Analysis - Example for Waterjet Propulsion Test	2017	2	11	**PC**
7.5-02-05-04	P	HSMV Seakeeping Tests	2024	3	13	**SKC**
7.5-02-05-04.1	G	Excerpt of ISO 2631-1&3:1985, Seasickness and Fatigue	2024	1	7	**SKC**
7.5-02-05-05	G	Evaluation and Documentation of HSMV Manoeuvrability	2024	3	6	**MC**
7.5-02-05-06	P	HSMV Model Tests for Prediction of Structural Loads	2024	2	7	**SKC**
7.5-02-05-07	P	(Dynamic Instability Tests) Withdrawn	2021	Deleted		
7.5-02-06		**Manoeuvrability**				
7.5-02-06-01	P	Free Running Model Tests	2024	5	14	**MC**
7.5-02-06-02	P	Captive Model Test Procedure	2024	7	25	**MC**
7.5-02-06-03	P	Validation of Manoeuvring Simulation Models	2024	5	16	**MC**
7.5-02-06-04	P	Uncertainty Analysis for manoeuvring predictions based on captive manoeuvring tests	2024	4	48	**MC**
7.5-02-06-05	G	Uncertainty Analysis for free running model tests	2024	3	16	**MC**
7.5-02-06-06	G	Benchmark Data for Validation of Manoeuvring Predictions	2024	1	15	**MC**
7.5-02-06-07	G	Captive Model Test for Underwater Vehicles	2024	1	9	**MC**
7.5-02-07		**Loads and Responses**				
7.5-02-07-01		**Environmental Modelling**				
7.5-02-07-01.1	G	Laboratory Modelling of Multidirectional Irregular Wave Spectra	2017	1	14	**OEC**
7.5-02-07-01.2	G	Laboratory Modelling of Waves	2021	1	28	**OEC**
7.5-02-07-01.3	G	(Guidelines for Modelling of Complex Ice Environments) Moved to 7.5-02-04-03	2021	Deleted		
7.5-02-07-01.4	P	Confidence Intervals for Significant Wave Height and Modal Period	2024	1	6	**OEC**
7.5-02-07-01.5	G	Laboratory Modelling of Wind	2024	1	10	**OEC**
7.5-02-07-01.6	G	Laboratory Modelling of Currents	2024	1	8	**OEC**
7.5-02-07-02		**Seakeeping**				
7.5-02-07-02.1	P	Seakeeping Experiments	2024	8	35	**SKC**
7.5-02-07-02.2	P	Predicting of Power Increase in Irregular Waves from Model Tests	2024	7	13	**SKC**
7.5-02-07-02.3	P	Experiments on Rarely Occurring Events	2024	7	13	**SKC**
7.5-02-07-02.4	P	(Validation of Seakeeping Computer Codes in the Frequency Domain) Deleted	2014	Deleted		
7.5-02-07-02.5	P	Verification and Validation of Linear and Weakly Nonlinear Seakeeping Computer Codes	2024	4	24	**SKC**
7.5-02-07-02.6	P	Global Loads Seakeeping Procedure	2024	3	17	**SKC**
7.5-02-07-02.7	P	Sloshing Model Tests	2024	2	14	**SKC**
7.5-02-07-02.8	P	Calculation of the weather factor f_w for decrease of ship speed in waves	2024	2	19	**SKC**
7.5-02-07-03		**Ocean Engineering**				
7.5-02-07-03.1	P	Floating Offshore Platform Experiments	2021	3	12	**OEC**
7.5-02-07-03.2	P	Analysis Procedure for Model Tests in Regular Waves	2021	3	5	**OEC**
7.5-02-07-03.3	P	(Model Tests on Tanker-Turret Systems) Deleted	2014	Deleted		
7.5-02-07-03.4	P	(Active Hybrid Model Tests of Floating Offshore Structures with Mooring Lines) Deleted	2021	Deleted		
7.5-02-07-03.5	P	Passive Hybrid Model Tests of Floating Offshore Structures with Mooring Lines	2024	4	7	**OEC**
7.5-02-07-03.6	P	Dynamic Positioning System Model Test Experiments	2024	3	10	**OEC**
7.5-02-07-03.7	G	Wave Energy Converter Model Test Experiments	2024	3	20	**OEC**
7.5-02-07-03.8	P	Model Tests for Offshore Wind Turbines	2024	3	20	**OEC**
7.5-02-07-03.9	P	Model Tests for Current Turbines	2024	3	20	**OEC**
7.5-02-07-03.10	G	Guideline for VIV Testing	2021	1	16	**OEC**
7.5-02-07-03.11	G	Guideline for Model Tests of Stationary Multi-Bodies Operating in Close Proximity	2024	2	7	**OEC**
7.5-02-07-03.12	G	Uncertainty Analysis for a Wave Energy Converter	2024	2	18	**OEC**
7.5-02-07-03.13	G	Guideline for VIM Testing	2021	1	10	**OEC**
7.5-02-07-03.14	P	Analysis Procedure of Model Tests in Irregular Waves	2021	1	6	**OEC**
7.5-02-07-03.15	G	Uncertainty analysis - Example for horizontal axis turbines	2024	2	15	**OEC**
7.5-02-07-03.16	G	Model Construction of Offshore Systems	2024	1	11	**OEC**
7.5-02-07-03.17	G	Uncertainty Analysis for Model Testing of Offshore Wind Turbines	2024	1	27	**OEC**
7.5-02-07-03.18	G	Practical guidelines for numerical modelling of wave energy converters	2024	1	20	**OEC**
7.5-02-07-04		**Stability**				

7.5-02-07-04.1	P	Model Tests on Intact Stability	2024	3	10	**SiW**
7.5-02-07-04.2	P	Model Tests on Damage Stability in Waves	2024	4	13	**SiW**
7.5-02-07-04.3	G	Predicting the Occurrence and Magnitude of Parametric Rolling	2024	4	24	**SiW**
7.5-02-07-04.4	P	Simulation of Capsize Behaviour of Damaged Ships in Irregular Beam Seas	2024	4	19	**SiW**
7.5-02-07-04.5	P	Estimation of Roll Damping	2024	2	45	**SiW**
7.5-02-07-04.6	P	Extrapolation for Direct Stability Assessment in Waves	2021	0	14	**SiW**
7.5-02-07-04.7	P	Inclining Tests	2021	0	11	**SiW**
7.5-02-07-04.8	P	Computational procedure for instantaneous GZ curve during time-domain numerical simulation in irregular waves	2024	0	10	**SiW**
7.5-03		**CFD**				
7.5-03-01		**General**				
7.5-03-01-01	P	Uncertainty Analysis in CFD, Verification and Validation Methodology and Procedures	2024	5	15	**RC**
7.5-03-01-02	G	Quality Assurance in Ship CFD Application	2021	2	5	**RC**
7.5-03-01-03	P	(CFD User's Guide) Deleted	2021	deleted		
7.5-03-01-04	P	(CFD Verification) Deleted	2021	deleted		
7.5-03-02		**Resistance and Flow**				
7.5-03-02-01	P	Uncertainty Analysis in CFD, Examples for Resistance and Flow	2024	2	13	**RC**
7.5-03-02-02	G	Benchmark Database for CFD Validation for Resistance and Propulsion	2024	3	10	**RC**
7.5-03-02-03	G	Practical Guidelines for Ship CFD Applications	2024	2	16	**RC**
7.5-03-02-04	G	Practical Guidelines for Ship Resistance CFD	2024	2	9	**RC**
7.5-03-02-05	G	Guideline on the CFD-based Determination of Wind Resistance Coefficients	2024	1	7	**FSSPC**
7.5-03-03		**Propulsion**				
7.5-03-03-01	G	Practical Guidelines for Ship Self-propulsion CFD	2024	1	8	**PC**
7.5-03-03-02	G	Practical Guidelines for RANS Calculation of Nominal Wakes	2024	1	9	**PC**
7.5-03-04		**Manoeuvrability**				
7.5-03-04-01	G	Guideline on Use of RANS Tools for Manoeuvring Prediction	2024	3	23	**MC**
7.5-03-04-02	G	Validation and Verification of RANS Solutions in the Prediction of Manoeuvring Capabilities	2024	3	15	**MC**
7.5-04		**Full Scale Measurements**				
7.5-04-01		**Speed and Power Trials**				
7.5-04-01-01.1	P	Preparation, Conduct and Analysis of Speed/Power Trials	2024	8	76	**FSSPC**
7.5-04-01-01.2	P	(Analysis of Speed/Power Trial Data) Merged into 7.5-04-01-01.1	2017	Deleted		
7.5-04-01-02	P	Conduct and Analysis of Sea Trial for Wind Assisted Ships	2024	0	16	**WPWAS**
7.5-04-02		**Manoeuvrability**				
7.5-04-02-01	P	Full Scale Manoeuvring Trials	2024	4	18	**MC**
7.5-04-02-02	G	UV Full Scale Manoeuvring Trials	2024	1	12	**MC**
7.5-04-03		**Ice Testing**				
7.5-04-03-01	G	Guidelines for Ship Trials in Ice	2024	1	14	**ICE**
7.5-04-04		**Hydrodynamic Noise**				
7.5-04-04-01	G	Underwater Noise from Ships, Full Scale Measurements	2024	3	32	**CAV**
7.5-04-05		**Model-ship correlation**				
7.5-04-05-01	G	Guideline on the determination of model-ship correlation factors	2021	1	12	**FSSPC**
7.6		**Control of Inspection, Measuring and Test Equipment**				
7.6-01		**Measuring Equipment**				
7.6-01-01	P	Control of Inspection, Measuring and Test Equipment	1999	0	20	**QSG**
7.6-02		**Sample Work Instructions**				
7.6-02-01	W	Verification of Steel Rulers	2024	0	8	**QSG**
7.6-02-02	W	Calibration of Vernier Callipers	2002	0	13	**QSG**
7.6-02-03	W	Calibration of Height Callipers	2002	0	12	**QSG**
7.6-02-04	W	Calibration of Micrometers	2002	0	15	**QSG**
7.6-02-05	W	Calibration of Dial Gauges	2002	0	15	**QSG**
7.6-02-06	W	Calibration of Chronometers with Pointer Indication	2002	0	9	**QSG**
7.6-02-07	W	Calibration of Chronometers with Digital Indication	2002	0	14	**QSG**
7.6-02-08	W	Calibration of Weights	2021	2	5	**QSG**
7.6-02-09	W	Calibration of a Load Cells	2021	1	9	**QSG**
7.6-02-10	W	Calibration of Non Self Indicating Weighing Instruments	2002	0	14	**QSG**
7.6-02-11	W	Calibration of Liquid-in-Glass Thermometers	2002	0	13	**QSG**
7.6-02-12	W	Calibration of Bourdon Tube Pressure Gauges, Pressure-Vacuum and Vacuum Gauges for General Use	2002	0	13	**QSG**