Sea Trials and Model Tests for Validation of Shiphandling Simulation Models

SimVal NEWSLETTER

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This is the fifth newsletter of the Knowledge-building Project for the Industry "Sea Trials and Model Tests for Validation of Shiphandling Simulation Models" supported by Research Council of Norway. This project aims to improve present validation methodology for shiphandling simulation models. It includes captive and free-sailing model tests as well as sea trials with selected case vessels. The fifth newsletter describes activities taking place in the period January – March 2015 and a brief description of planned work for the second quarter of 2015.

Activities ongoing in January - March 2015

Papers for OMAE 2015

The project partners have prepared 5 papers for a special OMAE 2015 session on" Marine Simulation Models and Their Validation Techniques (SESSION 6-1-1)". OMAE 2015 takes place in St. Johns, Newfoundland May 31 – June 5. Here is a list of the actual papers for this session:

- Vahid Hassani, Ørjan Selvik, Andrew Ross, Dariusz Fathi, Florian Sprenger, Tor Einar Berg: **Time Domain Simulation Model for Research Vessel Gunnerus**

- Andrew Ross, Vahid Hassani, Ørjan Selvik, Edvard Ringen, Dariusz Fathi: **Identification of Nonlinear Manoeuvring Model Tests for Marine Vessels using Planar Motion Mechanism Tests**

- Sergey Gavrilin and Sverre Steen: **Uncertainty of Sea Trials Results Used for Validation of Ship Manoeuvring Simulation Models**

- Katrien Eloot, Guillaume Delefortrie, Marc Vantorre and Frans Quadvlieg: **Validation of Ship Manoeuvring in Shallow Water through Free-Running Tests**

- Felipe R. Masetti, Pedro C. de Mello and Eduardo A. Tannuri: **Validation of a Modular Mathematical Model for Low-Speed Maneuvering using Small Scale Tests with an Oceanographic Research Vessel**

PhD and PostDoc work at NTNU

NTNU continued working with results of full-scale trials of R/V "Gunnerus" and VeSim simulation model. PhD student Sergey Gavrilin considered application of validation metrics to the problem of manoeuvring simulation models validation. He showed that the area validation metric is a useful instrument in quantification of difference between simulation and experimental results. An example is shown
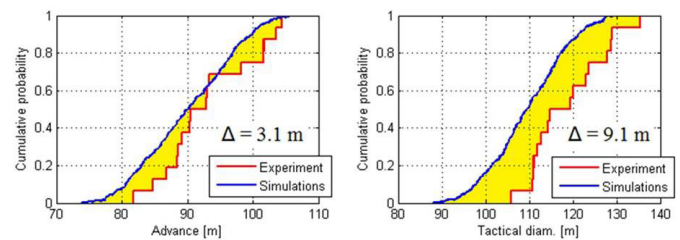

Figure 1 Area validation metric applied to advance and tactical diameter in turning circle trial

in Figure 1. He investigated the effect of number of experimental points on quality of the validation when the model is in good agreement with experiments.
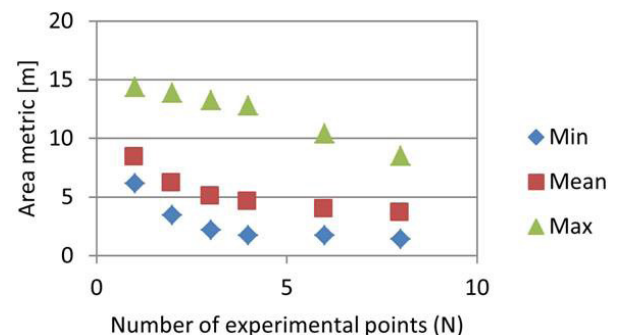

Figure 2 Effect of number of experimental points on the area validation metrics

As it follows from Figure 2, the most significant effect of increasing number of experimental points is observed when it is small. He applied u-pooling technique to validation, which, together with area validation metric, allows assessing model quality and ranking different models according to their precision. U-pooling appeared to be useful applied to parameters with high uncertainty. Finally, he prepared a draft paper for publication in Ocean Engineering Journal.

Please turn the page.

Kick-off for shallow and confined water work package

A kick-off meeting involving Belgian and Norwegian research partners took place mid March 2015. Topics discussed were:

- Validation of benchmark shallow water studies for SIM-MAN case vessels KVLCC2 and KCS.
- Further development and validation of a simulation model for an ultra large container vessel based on captive and free-sailing model tests.
- Model validation based on observations from full scale manoeuvres in confined waters

This work package will be managed by Katrien Eloot (Flanders Hydraulics Research) and Marc Vantorre (Ghent University)

Case vessel related activities

VeSim model for NTNU's research vessel Gunnerus

Naked hull experimental captive model tests were successfully carried out in 2014. These tests were processed, passed through IDSIMAN, and combined with MARINTEK's in-house propulsion modules, resulting in a powerful simulation model. These tuning procedures are being finalised, and the resultant manoeuvring model will be released in March 2015 along with comprehensive comparisons to full scale trials. This work led to two papers accepted to the OMAE2015 conference in St. Johns, Newfoundland, which will be presented in May/June 2015.

VeSim model for gas ferry Landegode

The experimental captive model tests on the gas ferry Landegode were completed in 2014. The data processing and application of MARINTEK's in-house manoeuvring tool, IDSIMAN, has been completed. Work is ongoing to combine this manoeuvring code with existing rudder and propulsion modules, which should complete shortly.

Case vessel Island Condor

After finishing the manouevring model for Gunnerus and Landegode, focus will be put on the finalizing the manoeuvring model for Island Condor. The VeSim simulations will be conducted in co-operation with Rolls-Royce Marine.

Figure 3 Island Condor at quay in Stavanger.

Rolls-Royce Marine has developed a propulsion model for their Azipull unit which is installed on Island Condor.

Planned activities for April - June 2015

Meeting with partners in Singapore will take place at Singapore Maritime Academy 30th April. In connection with the May Steering Committee Meeting partner workshops will be held to discuss outcomes of WP 1 – "State-of-the-art review on validation of shiphandling simulation models" and WP 2 "Experience from sea trials with the case vessels RV GUNNERUS, LNG ferry LANDEGODE and offshore vessel ISLAND CONDOR". Project participants will meet and give paper presentations at OMAE 2015 May 31 – June 5, St. Johns, Newfoundland.

MARINTEK will continue deep water model validation studies for Norwegian case vessels. Flanders Hydraulics Research will investigate the shallow water model for an ultra large container vessel.

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