

# Wind and current loads on ships



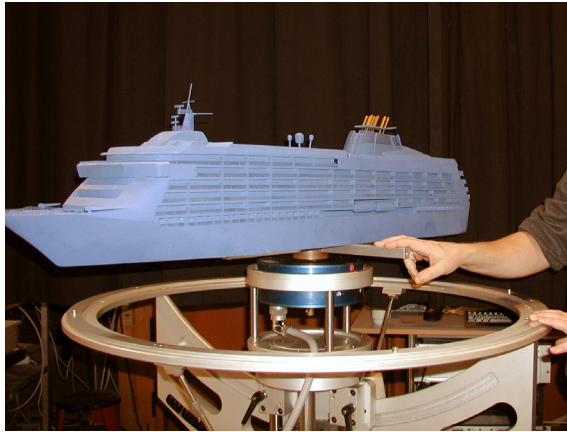
*A ship entering a harbour*

**Any vessel will be subjected to considerable wind and current forces during operations, which affect the operational requirements, stability, manoeuvring and propulsion just to mention a few - factors that all must be analysed in the initial design phase to assure a cost-effective vessel.**

## Issues

Our customers face a major challenge in optimizing the vessels' operational requirements while keeping costs on an acceptable level. Here the environmental loads the vessel is subjected to play a key role in regards to propulsion, dynamic positioning, mooring, manoeuvring and stability analysis. It is as such

essential to collect reliable data on the environmental loads in the initial design stage of the vessel. Other aspects that are important to analyse are: funnel performance, helicopter operations, passengers wind comfort and the working environment, e.g. the crews exposure risk to toxic gases and wind chill, just to mention a few.



*The ship model on the tilt-mechanism*



*The above-water part of a vessel in the wind tunnel*

### **We help you with your challenges**

FORCE Technology has performed environmental load tests on most types of vessels—ferries, yachts, cruise, navy and container vessels and oil and gas tankers, just to mention a few. As such our professional staff of naval architects can help you with almost any challenge that you may have in regards to the environmental loads, relevant for propulsion, dynamic positioning, mooring, manoeuvring and stability analysis.

### **Benefits**

Benefits outlined below assure far more cost-effective vessels.

Windtunnel tests at the design stage, can be used to ensure that the vessel lives up to the operational and class requirements with regard to propulsion, manoeuvring, dynamic positioning, mooring and stability.

Thruster units can be dimensioned to handle harbour manoeuvring up to a certain wind speed, as dynamic positioning units can be dimensioned to a certain combination of wind and current speeds.

If the windtunnel tests are performed in an early design stage, our staff of naval architects who have a very large experience with load tests, can recommend and test possible design alterations with the purpose to lower the wind loads e.g. to meet an operational requirement of a given service speed.

### **Test facilities and technical issues**

The tests are performed in one of our three wind tunnels. The model of the vessel typically has a length of 1.3 – 2.0 m.

To determine the environmental loads that the vessel will experience, the above-water part of the model is exposed to a wind profile, which resembles an ocean wind with regards to velocity distribution and turbulence intensity, while the underwater part is exposed to a uniform wind profile with low turbulence intensity to resemble a vertical current profile.

The longitudinal and transverse forces as well as the heeling and yawing moments are measured by means of a 6-component strain-gauge balance system, typically for wind directions from between 0° to 360° in incensement of 10°.

Non-dimensional force and moment coefficients are presented, from which the full-scale forces and moment can be directly calculated.



Further information:  
Kenn Jensen, tel. (direct) +45 72 15 77 84, kje@force.dk

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FORCE Technology Netherlands B.V. Tel. +31 71 523 5212	FORCE Technology USA Inc. Tel. +1 713 975 8300	FORCE Technology Norway AS Claude Monets allé 5 1338 Sandvika, Norway Tel. +47 64 00 35 00 Fax +47 64 00 35 01 info@forcetechnology.no	FORCE Technology Sweden AB Tallmätargatan 7 721 34 Västerås, Sweden Tel. +46 (0)21 490 3000 Fax +46 (0)21 490 3001 info@forcetechnology.se	FORCE Technology, Headquarters Park Allé 345 2605 Brøndby, Denmark Tel. +45 43 26 70 00 Fax +45 43 26 70 11 force@force.dk www.forcetechnology.com
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