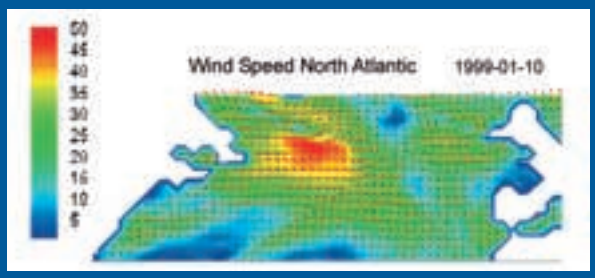
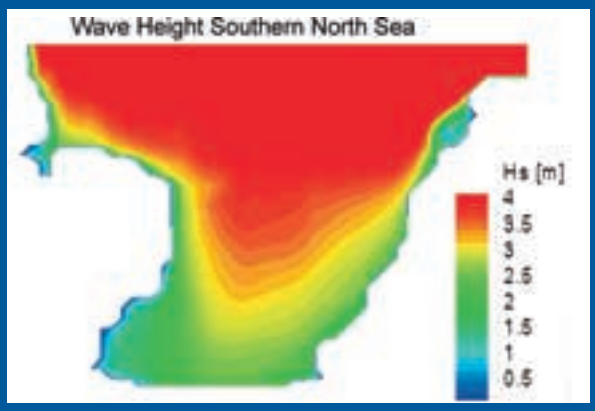
**From a seakeeping point of view, ship design is a fine balance between performance and risk, requiring an accurate and complete operational analysis. A review by Reint Dallinga, senior consultant Seakeeping.**



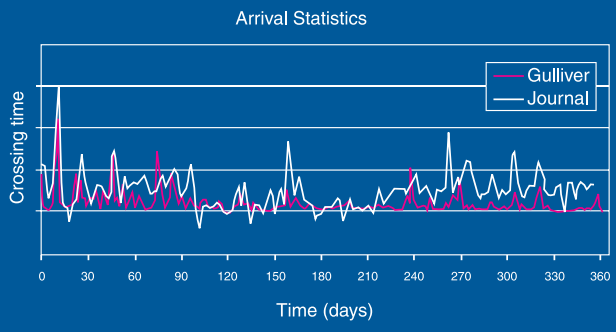

Traditional operability tools like MARIN's WASCO program combine criteria for tolerable behaviour, a wind-wave climate description and hydrodynamic characteristics of a specific vessel into exceedance statistics. These statistics are a function of ship speed and the combination of ship course and wave direction in a given operational area. The results are particularly useful in design comparisons and for establishing design values.

# GULLIVER, a ship designers' edge

## Reliability of a ship's service

This analytical approach makes it hard to account for the way the master operates the ship, who can face conflicting requirements regarding speed and course. Reducing speed or changing course to reduce motion sickness among passengers may result in an unacceptable delay on a tight schedule. Apart from lack of insight in the merits of prudent seamanship on the performance of a ship, the traditional analysis does not yield information on the reliability of a ship's service. For instance, since the persistence of wind speed and wave height and their directions are not covered with a scatter diagram, it is not possible to relate the ship's service margin to the number of trips with an unacceptable delay.

To overcome the above problems MARIN is developing the GULLIVER scenario simulation tool. It simulates the progress of a ship on a given route in discrete time steps (e.g. one hour) over a long period of time (e.g. five years). At each step in the simulation the wind and waves at the ship position are read from a wind-wave database. For open sea routes ECMWF hindcast data are used; for coastal routes the DUT wind-wave model SWAN is available for a dedicated hindcast.




Time series of crossings between Hook of Holland and Hull. GULLIVER results and real-crossing times obtained from the log are compared.

## Succesful simulation

The viability of the tool was proved this summer with the successful simulation of a ferry service between Hook of Holland and Hull. Detailed arrival statistics were generated for a five year period which were compared with the ship's log. Having secured a basic functionality, GULLIVER development will shift in the direction of more complex scenarios and intuitive and concise graphics of the simulation results. At the same time the tool will become available within MARIN consultancy. We expect to apply it in cases where a careful insight in the reliability and risk plays a vital role in the attraction of a particular design. Relevant areas are high speed ferries and special sea-river concepts in partly protected coastal waters. MARIN