Breakthrough in real time ship motion prediction

Ship motions are often critical for offshore operations. Rather than 'waiting on weather', a new system is now available that predicts quiescent motion periods.

Offshore operations such as float-over-installation and LNG loading connection only need a short quiescent period in vessel motions.

To predict such quiescent periods, the Onboard Wave and Motion Estimator (OWME) Joint Industry Project developed an onboard system capable of determining vessel motions some two minutes in advance. A potential application of this technology is in helicopter landing.

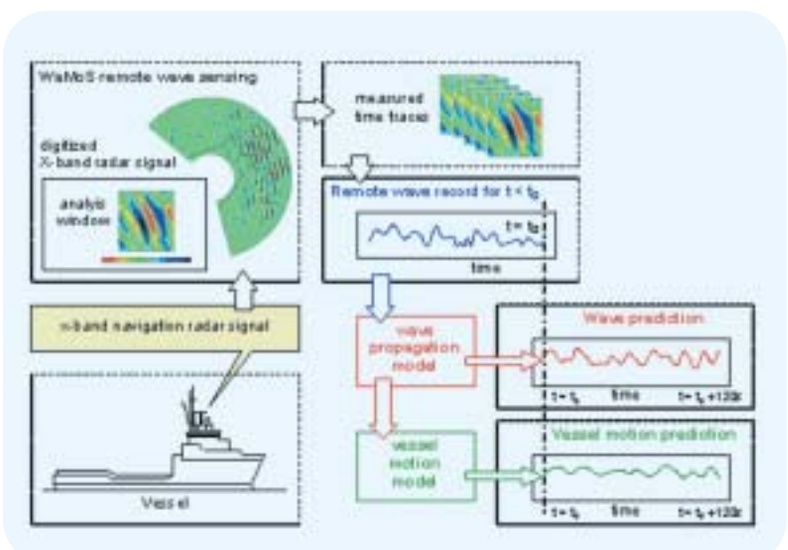
The OWME SYSTEM

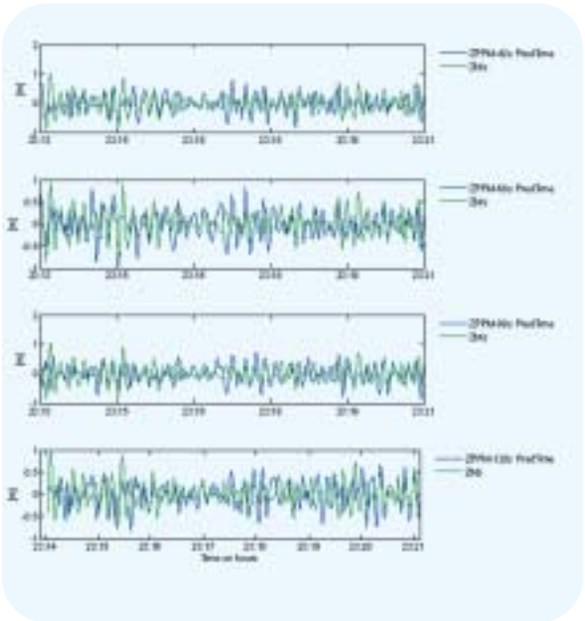
The system measures the waves at a distance of 1 mile from the vessel into the wave direction. X-band radar images are processed to derive the full, 3-D wave elevations based on the existing WAMOS-II system.

These wave elevations are then used as input for a numerical model that propagates the waves to the vessel's location. Applying ship motion theory on these waves, the vessel motions in all six modes are then computed.

The OWME system is basically data processing of standard navigation radar signals. Special attention was paid to the min-

OWME real time prediction system





Vessel heave motion measured versus predicted 42, 60, 90 and 120 sec. ahead

imum computational time as this time decreases the advance prediction time.

Partnership

For development and testing MARIN formed a partnership with Ocean-WaveS and Delft University of Technology, which was assisted by the University of Oslo. The three-year Eureka project was supported by StatoilHydro, Total, SBM, Gusto, Seaflex and Sirehna, as well as the Dutch Ministry of Economic Affairs. After extensive laboratory testing of the Individual components such as the wave propagation model in short crested seas, the system was installed onboard a light well intervention vessel operating at the Gulfaks field, offshore Norway, September last year. The vessel was further equipped with a down-looking wave radar on the bow and with accurate motion sensors. A compact wave buoy was moored in the WAMOS II window for direct comparisons.

The results illustrated show that the OWME system is capable of predicting quiescent periods of vessel motion up to two minutes in advance and can thus, contribute to the workability of offshore operation in otherwise limiting sea states. Helicopter Operations for Offshore Ships can gain from this breakthrough.

HELIOS Joint Industry Project

Helicopter services have been used by the offshore industry for decades. Traditionally the helicopters landed on fixed production platforms or stable semi submersibles. Nowadays helicopters have to operate on FPSO's, drill ships and relative small well intervention and offshore service vessels.
At the same time these vessels operate more and more in harsh environments and around the year. As helicopter services form a critical link in offshore logistics there is a need for better physical understanding of helicopter operations in relation to (small) ships to optimize these services. It is recognized that the present operational limits are based on strict roll and pitch inclinations and heave amplitude whereas deck accelerations and wind are not accounted for.
Another important factor is the visibility of the vessel motions by the pilot which is often lacking when the heli deck is mounted on the bow.
Both safety and operability can be improved by incorporating all key parameters in the operational envelopes.

For this purpose MARIN, WS Atkins, Kongsberg, National Aerospace Laboratory NLR and TU-Eindhoven, have initiated the Joint Industry Project HELIOS. The study investigates the current practice of helicopter operations on board offshore vessels including the relevant CAA regulations and flight procedures in the various countries and sectors.
Also insight will be gained into the physics of helicopter operations in relation to offshore ships. To this end the turbulent wind field around heli decks on various ships will be studied in detail using both computational tools such LES CFD and wind tunnel testing. Special attention will be given to the dispersion of exhaust gases produced by e.g. gas turbines on FPSO's.

This information will be processed to develop a methodology for assessment of operational envelopes and to draw up recommendations for design of ships and heli decks. Potential support systems such as OWME and data transmission from the vessel to the helicopter will be evaluated. Furthermore helicopter-ship simulators for testing and training will be developed.

In the 3 year HELIOS JIP the partners will closely co-operate with the participating oil companies, helicopter operators, vessel operators, suppliers and the Civil Aviation Authorities. The project is still open for new participants.

For further information please contact:
h.v.d.boom@marin.nl. or www.marin.nl