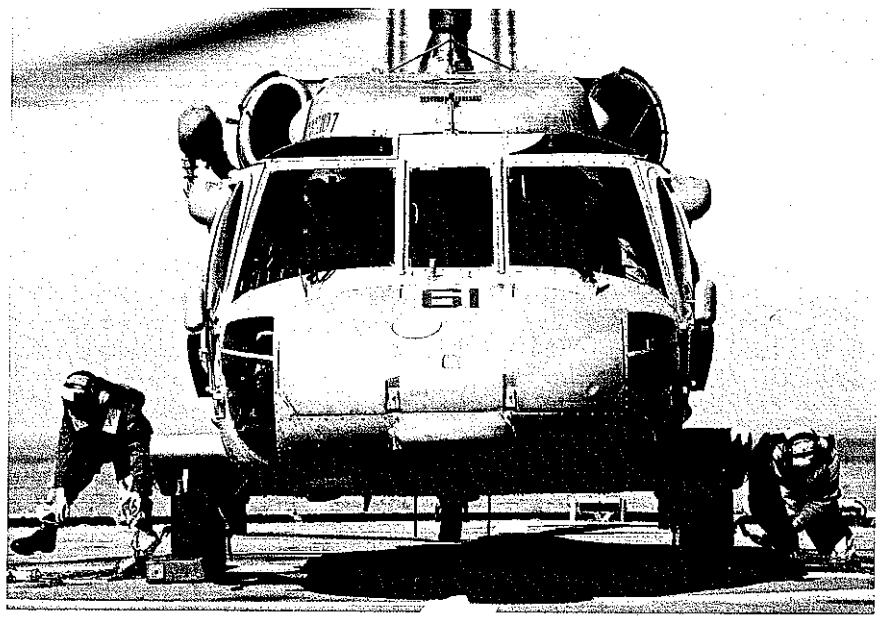
Vessel motion breakthrough could enhance helicopter ops

Working closely with the University of Delft and OceanWaves GmbH in Germany, Maritime Research Institute Netherlands (MARIN) has developed a new type of vessel motion prediction system – the Onboard Wave Motion Estimator (OWME).

The system can predict vessel motions up to two minutes ahead of actual motion, raising the possibility of a host of potential applications for the technology, including enhancing helicopter operations from offshore and naval vessels.

The ability to predict the motion of vessels is of critical importance in a number of sectors in the shipping industry, not least in the offshore sector, where the viability of certain types of operation depends very heavily on wave-induced motions and on the need for a short, quiescent period, in which to conduct an operation safely. Examples of operations such as these include float-over-installation, and remote operator vehicle (ROV) handling, but another is landing take-off of helicopters, which is also of central importance to naval operations.



The output from the HELIOS project could be used to enhance operability and safety levels for helicopters on warships.

In normal sea conditions, operations such as these can only be conducted in quiescent periods, and the 'go – no-go' decision for such operations is critical and requires a reliable estimation of vessel motion. At present ship motions are estimated by human observations, and by systems that extrapolate ship motion history, but which can only predict motions some 10 seconds in advance.

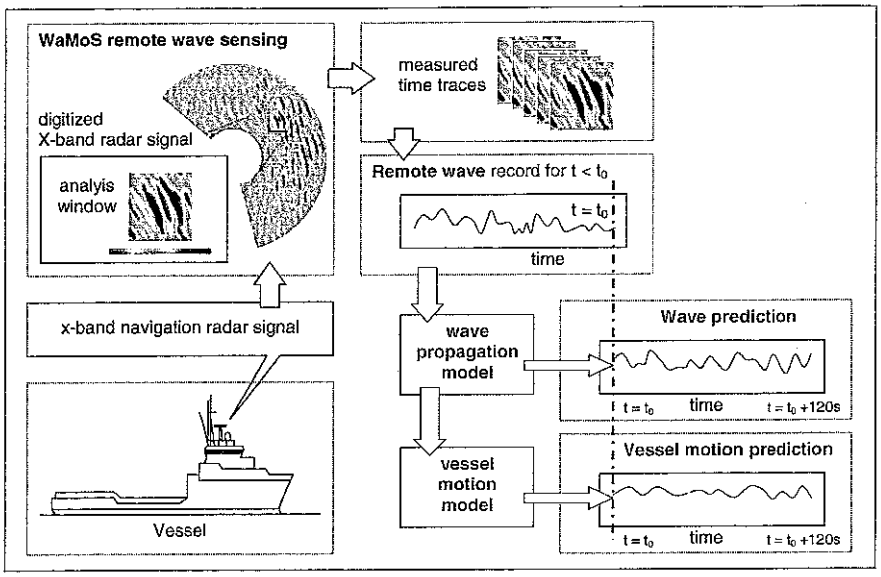
As MARIN's project leader, Henk van den Boom explained that MARIN has been working on the concept for several years, having first been prompted to look at the idea because of issues relating to LNG offloading operations. The work has been conducted as a Joint Industry Project (JIP) supported by StatoilHydro, Total, SBM/Gusto, Seaflex, Sirehna and the above-mentioned development partners. Funding for the OWME project was secured from the Dutch government and from the EUREKA, a pan-European network for market-orientated research and development.

In the past operators have relied on a statistical approach to determining whether an operation was possible but, although useful, such an approach has obvious limitations. "When we started working seriously on the project, we wanted to predict vessel motion one minute in

A Royal Navy Lynx Mk 8 helicopter aboard HMS *Grafton* is tied down after landing

advance," Van den Boom said. "At the time it was really only possible to make predictions for 10-15 seconds at a time, equivalent to about one wave period."

MARIN started out working with a partner in the UK using laser radar (LIDAR) to measure wave motion, but settled on using data from X-band navigation radars of the type developed by OceanWaves in Germany (OceanWaves' WaMos system is an operational wave and current monitoring system designed for use in adverse environmental conditions. It measures and displays essential wave field parameters such as significant wave height, periods and directions as well as surface current speed and direction in realtime, and can operate from moving vessels).



Schematic showing how the OWME works.

Remote wave sensing

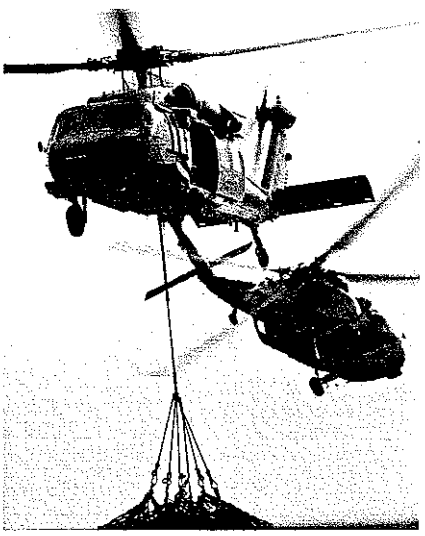
The successful approach, which was recently demonstrated on an offshore vessel operating in the North Sea, used remote wave sensing by means of an OceanWaves X-band radar, allied to data processing, application of an advanced wave propagation model, and the use of computed vessel motion characteristics based on the output of the propagation model.

"Platform motions originate from incident waves, so our approach is based on measuring the sea state with the X-Band radar up to 3km from the vessel," Van den Boom explained. "By digitising the sea surface the individual waves can be recorded. Individual waves are extracted and essential parameters deduced as input for the wave propagation model, which is used to predict the wave elevation at the platform. The final step is to compute the vessel motions from this wave elevation. Data fusion with the continuously recorded motions complements the system."

Critical in this computational method is, obviously, the time required to conduct the data processing – the greater the length of time the process takes, the more the time over which vessel motion can be predicted is reduced.

MARIN plans to continue to work on the OWME concept, refine and enhance it, and sees numerous opportunities for further development, not least using the concept to make naval helicopter operations safer and more efficient. For its part, OceanWaves says it is continuing to work on the commercialisation of OWME technology, refining the algorithms it uses and developing a Graphical User Interface, and is talking to potential partners about further trials.

Following on from the OWME project, MARIN is about to start using the output from the OWME project in another project dubbed Helicopter Operations from Offshore Ships (HELIOS), a two-year joint industry programme starting in September 2009. This project is also being sponsored by oil companies, offshore contractors, ship operators, helicopter operators, helideck manufacturers and some civil aviation authorities.



The wide range of operations carried out by naval helicopters would make a system such as the OWME especially useful.

Twin-track approach

The project will have a twin-track approach, focussing not just on naval helicopter operations, but on enhancing helicopter services in the offshore industry. "Increasingly, helicopters have to operate on smaller platforms and relatively small monohulls," Van den Boom explained. "They play a key role transporting personnel to and from seismic survey vessels, and form a critical link in offshore logistics."

There is, notes MARIN, a need for better physical understanding of helicopter operations in relation to smaller vessels in order to optimise operations. The aim of the HELIOS project is, therefore: to report on current practice regarding helicopter operations on vessels, including the relevant regulations and flight procedures in the various countries and sectors; provide insight into the physics of helicopter operations in relation to ships; examine workability criteria; develop a methodology for assessment of operational envelopes; and provide recommendations for design of ships and helidecks and support systems. The project will also examine the feasibility of a helicopter-ship simulator for training purposes. *WT*