



Performance is also being assessed on liquid cargo handling simulators at Warsash Maritime Academy Picture: Andrew Linington

A total of 90 volunteer experienced seafarers are taking part in the simulations, which run for seven days at a time. The candidates will be recruited in exactly the same way as if they were going to sea to fulfil the same functions that will be required under simulated conditions. They will be checked for their health and suitability for the research.

Data collected from the experiments will be analysed using mathematical and regression modelling techniques to determine the effects of fatigue on the cognitive performance of maritime watchkeepers under different watch patterns.

Applied to all of this will be the overlay of significance of operation — enabling an assessment to be made of the seriousness of impact of lost performance, and whether it can be tolerated or mitigated.

The results of this data analysis will lead to the development of a fatigue management toolkit for use by interested parties such as ship managers, maritime regulators, flag states, port states and the International Maritime Organisation.

Developed and led by Warsash Maritime Academy, the project brings together academics from Southampton Solent University in the UK, Chalmers University of Technology in Sweden, the Stress Research Institute from Stockholm University and Bureau Veritas Marine Division, along with representatives from the European Community Shipowners' Associations, the European Transport Workers' Federation, the European Harbour Masters Committee, the International Association of Independent Tanker Owners, the Standard P&I Club, the UK Marine Accident Investigation Branch, and the UK Maritime & Coastguard Agency.

**Project Horizon aims** to build on existing knowledge, delivering academically rigorous and scientifically sound data, setting the following objectives for its work:

- to provide a realistic, high fidelity, voyage scenario in which watchkeeper cognitive performance can be measured
- to provide various watchkeeping patterns which will lead to fatigue in the watchkeeping officers
- to capture empirical data on the cognitive performance of the watchkeepers undertaking these watchkeeping patterns
- to analyse this empirical data to determine the effect of fatigue on the cognitive performance of the watchkeepers
- to develop a fatigue management toolkit for use by ship managers, maritime regulators, flag states, port states and the International Maritime Organisation
- to derive a set of recommendations that maritime regulators and ship managers can use to improve the safety and reliability of vessels

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Investigating the impact of fatigue  
on the cognitive performance  
and decision-making  
of ships' watchkeeping officers

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Shipping is a 24/7 industry, and seafarers work long hours to keep their ships running to schedule.

There is growing concern about the role of fatigue in maritime accidents — with sleepiness cited as a factor in some major disasters, such as the Exxon Valdez and the Shen Neng 1.



**Fatigue, not alcohol, was a key cause of the Exxon Valdez disaster in 1989**  
Picture: US Coast Guard

Project Horizon is a major multi-partner European research study that brings together 11 academic institutions and shipping industry organisations with the aim of delivering empirical data that will provide a better understanding of the way in which fatigue can affect ships' watchkeepers.

The €3.78m European Commission-funded project is making extensive use of bridge, engine and liquid cargo handling simulators in Sweden and the UK to examine the decision-making and cognitive performance of officers during a range of real-time, realistic scenarios.

Due to be completed on 30 November 2011, the 30-month research programme seeks to improve safety at sea by developing a fatigue management toolkit for the industry, as well as recommendations for improving work patterns at sea.

Alarm about the effect of fatigue at sea has been fuelled by a number of high-profile accidents. Project Horizon aims to build upon a growing body of evidence of seafarer fatigue problems gained from accident investigations and academic studies.

A study by the UK Marine Accident Investigation Branch indicated that fatigue was involved in around one-third of accidents over a 10-year period. In 2003, Swedish researchers found that 73% of officers taking part in a closed voting session admitted to having fallen asleep one or more times whilst on watch.

A 2004 report by UK Marine Accident Investigation Branch showed that one-third of the incidents it investigated between 1994 and 2003 involved a fatigued watchkeeper alone on the bridge at night, whilst a US Coast Guard study showed fatigue to have contributed to some 16% of critical vessel casualties and 33% of personal injuries.

A six-year research programme carried out by Cardiff University produced some disturbing findings, with one in four seafarers saying they had fallen asleep while on watch.

Similar research in Sweden has also reinforced the way in which work patterns at sea — and the six-on/six-off rota in particular — can result in dangerous levels of sleepiness, being built up by seafarers.



**Seafarers work long hours to keep ships running to schedule**  
Picture: Danny Cornelissen

**Project Horizon** involves some of Europe's leading fatigue and stress experts, who are working in a six-stage project to assess the impact of fatigue on the decision-making performance of watchkeepers and to determine the best ways of minimising risks to ships and seafarers.

The project began with a research, design and development study, drawing on experience from other sectors. A range of fatigue measurement tools and procedures were examined and selections made.



**Bridge simulator trials at the Chalmers University of Technology in Sweden**  
Picture: Mike Gerber

Experimental scenarios have been designed to enable the observation of certificated watchkeepers, undertaking watchkeeping routines, under test conditions in bridge, engineroom and liquid cargo handling simulators.

The project is replicating seagoing conditions, with sufficient experiments and candidates to ensure the statistical validity of the results. Researchers are using various means of measuring fatigue and the performance degradation it causes, and relating them to the operating circumstances of the candidates.