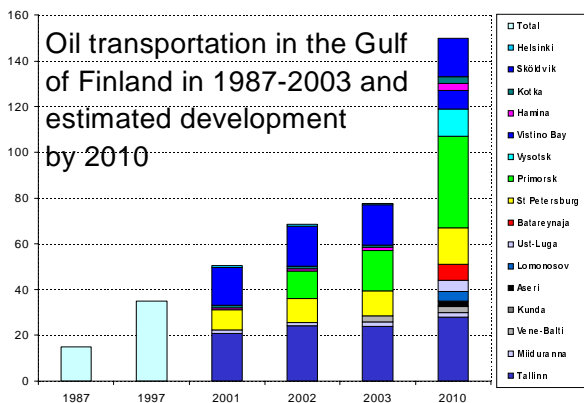


Research on vessel traffic information systems at VTT Industrial Systems

Background

The number of vessels transiting the Gulf of Finland has increased significantly during the last years and will further increase in the future. With the heavy passenger traffic between Helsinki and Tallinn, and the rapid development of Russian oil harbours, the traffic image has also diversified. The volume of oil transported in the gulf was 50 million tonnes in 2001, 77 million tonnes in 2003, and is expected to increase to 150 million tonnes by 2010. The increase in maritime traffic along the Gulf of Finland has necessitated the introduction of risk control measures for the gulf area. As one of the main measures, the mandatory Ship Reporting System for the Gulf of Finland (GOFREP) will be implemented on the 1st of July 2004.

The main safety concern related to the increasing ship traffic in the Gulf of Finland is the increase of the risk of collisions between different types of vessels, and environmental damage due to subsequent oil spills. In particular, the passenger vessel and recreational boat traffic, intersecting the tanker routes in the area between Helsinki and Tallinn, is seen to cause a potential threat to the safety of navigation and to the marine environment.



In the summer of 2000 Finnish Maritime Administration, VTT Technical Research Centre of Finland and Saint Petersburg Business Contact Centre started a joint preliminary survey on the advantages of implementing a joint VTMS (Vessel Traffic Management and Information System) for the Gulf of Finland. Encouraged by the results of the survey, the Ministries of Estonia, Finland and Russia signed a Memorandum of Understanding on Strengthening the

Cooperation to Further Enhance the Maritime Safety in the Gulf of Finland in 2001. The main points of the MoU were the need to adjust the traffic separation schemes of the gulf and to launch the development of a joint VTMS. The work was started immediately. As a result the first steps of the VTMS, the amended traffic separation schemes and the mandatory ship reporting system were submitted for approval to the IMO (International Maritime Organisation) Sub-Committee on Safety of Navigation (NAV) to its 48th session.

Statistical Analysis

VTT Industrial Systems conducted a statistical analysis of the Baltic maritime traffic in connection with the GOFREP development in 2001-2002. Analysis included the sea-borne traffic in 2000 up to 2015 in the Gulf of Finland. The ship calls were gathered directly from the statistics of selected ports (Finland and Estonia) or by estimating the annual figure from the Lloyds data for May 2000 (Russia). Based on traffic development scenarios for the Gulf of Finland, the total transportation rate will be two-fold, and the amount of oil transported will be three times higher already in 2010. The ship call figures or the uses of fairways will not directly be two- or three-fold, seeing that the average size of a cargo vessel will grow as well.

Formal Safety Assessment

A Formal Safety Assessment (FSA) study on the implementation of the traffic separation schemes and the GOFREP was made by VTT and Helsinki University of Technology in 2001-2002. The FSA was conducted to support the proposal submitted to IMO for the implementation of these risk control measures. The results of the study indicated that the implementation of the systems will significantly decrease the risk of ship-to-ship collisions and the related economic loss due to oil spill. The cost-benefit performance of the systems was assessed in terms of the expected total return of investing in a particular option. The results indicate that the investment in GOFREP can be recommended. The Reporting system was adopted by the IMO in its Maritime Safety Committee on 5th of December 2002 (Resolution MSC.139(76)).

Development of the GOFREP operation

The ensuring of safe and effective operation of the GOFREP has required development of both technical solutions and common operational procedures for the three cooperating countries. A common database is developed for the national Traffic Centres for storing the information on vessels transiting the gulf. In addition to the database, other relevant systems are utilised. One of these is the future AIS Helcom, a technical system for mutual exchange and deliveries of AIS (Automatic Identification System) information which should be fully operational by the 1st of July 2005 in all Baltic Sea countries. However, Estonia, Finland and Russia shall exchange AIS information already by the implementation of the GOFREP.

In accordance with IMO recommendations, joint operational procedures for the three countries have been developed since 2002 and the work has been encouraging. Finnish Maritime Administration and VTT have arranged three workshops for expert working groups consisting of representatives from all three countries. Workshops have been carried out at the Meriturva Maritime Safety Training Centre's Simulator Unit in Otaniemi, Finland. During these sessions the experts have developed joint procedures and evaluated the correctness and functionality of these by using simulations.

Simulation was used as a user-centred design (UCD) method for the procedure development. The aim of UCD is to produce a system that supports users in their joint core-task, and allows them to carry out their work with effectiveness, efficiency and satisfaction. Simulation is a UCD-method that can be used for requirements gathering, requirements validation, and also system validation especially in safety critical environments. In the development of GOFREP, the simulations provided a medium to acquire experience of the intended procedures in different kinds of operating situations. Also, the simulations enabled the participants to make comparisons and judgement between two or more prospective alternatives. During the development work the level of simulation was varied. The first simulations were simple pen and paper simulations and the last ones were carried out with a full scale simulator system. The lower level simulation provided basic information about the different stakeholders' roles in the operation of GOFREP whereas the higher level simulations helped for example to envision the future task load of the GOFREP-operators. Masters and ship officers from the Finnish merchant fleet cooperated in this development work and played an important role in the simulations

by creating the radio traffic of dozens of vessels and bringing the real world into virtual reality.



Work continues

As a result of the procedure development, a document of joint procedures for the Finnish, Estonian and Russian GOFREP operators has been written. This document provides guidance and instructions to their daily work. The development work of GOFREP still continues during the next months. Before the system starts operating, both the technical and operational preparedness will be tested to validate that the goals of operation can be achieved. In the first testing phase all three national GOFREP Traffic Centres verify the functionality of their operation. During the second phase the whole system i.e. equipment, interconnections, data transmissions and operational procedures will be tested.

Ship reporting systems are introduced to enhance maritime safety and to protect the environment. In order to accomplish this, the GOFREP operation will after its implementation be continuously reassessed both from the operational and technical point of view. The development of vessel traffic in the Gulf of Finland will make further demands to GOFREP, to which it has to adjust as an effective risk control measure. In addition to the needs for technical innovations, one of the future challenges in the development of ship reporting systems and vessel traffic services is the implementation of human-technology interaction (HTI) approach in the system design.

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