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A pilot study focusing on people, human-machine-systems and organisations as risk and safety factors in maritime activities

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Introduction and objectives With the approach that an efficient risk management has to be performed at different organisational levels, a multi-disciplinary pilot study is performed with the objectives to create a base for further studies on maritime risks in the Sound area between Denmark and Sweden. One part of this project is focusing on the role of people, human-machine systems and organisation as risk and safety factors. The objective of the part reported in this paper is to get an overview on normal procedures for maritime activities in the Sound area. Especially latent conditions, safety barriers and the safety culture are of interest. As pointed out by Rasmussen (1) many major accidents are caused by systematic migration of organisational behaviour under influence of pressure toward cost-effectiveness in a competitive environment. Another objective is to find traces of migration forces.

Material and Method The Sound area is one of the most intensely trafficked waters in the world. This water area is highly complex, featuring increasing international vessel traffic within intersecting traffic patterns, limited water depths, ports with high activity, numerous ferry-services, extensive maritime leisure activity and a bridge/tunnel under construction which will link the two countries.

Information is obtained by a) reviewing literature about the etiology of accidents, b) studying marine accident reports, c) interviewing key persons (ship's crews) with extensive maritime experience and d) observing work routines on board ships.

Results and Discussion Preliminary findings indicate that migration forces can be expressed for example through reconstruction of vessels leading to complications in using systems and performing work tasks on board. Results also suggest that navigational aids that are available tend not to be used optimally which in part could be due to work organisation.

1. Rasmussen J. Market Economy, Management Culture and Accident Causation: New research Issues? Proceedings 2nd Int Conf on Safety Science 1993. Budapest. Meeting Budapest Organizer Ltd.



A pilot study focusing on people, human-machine-systems and organisations as risk and safety factors in maritime activities

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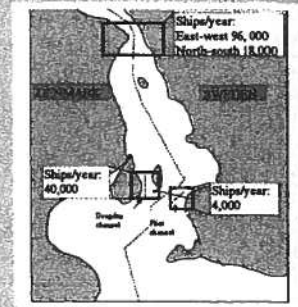
Introduction and goals of the study

This poster presents the ergonomic part of an ongoing multidisciplinary pilot study with the objective of identifying and describing maritime risks in the Sound Area. This part concentrates upon the role which people, human-machine-systems and organisations on board ships and in association with maritime activity in the area play as risk and safety factors.

The main goals of the study are to:

- Analyse the system responsible for maritime transports.
- Get an overview on normal procedures for maritime activities in the area.
- Collect information about the 'safety culture' on board ships.
- Find strengths and weaknesses in human-machine systems on board ships.

This poster concerns the last two points.



The Sound Area

The Sound Area between Sweden and Denmark is one of the most intensely trafficked waters in the world, with complex intersecting vessel traffic patterns, limited water depth, excessive pleasure boat activity, a sensitive environment and a bridge/tunnel under construction linking the two countries. This high level of complexity increases the probability of both maritime accidents and very negative consequences of them.

Safety culture on board ships

Safety culture concerns general attitudes and behaviours towards safety in an organisation, and is thus important for the prevention of occurrence of accidents. An organisation's safety culture can be described by the following dimensions:



Method

The safety culture is studied by means of a questionnaire to be completed by crew members of different organisational levels on board and by means of interviews. The questionnaire is currently under development.

¹ James Reason, *Managing the Risks of Organisational Accidents*, Aldershot, 1997.

General conclusions

- Weaknesses exist in the human-machine-systems on board ships. Thus further study is required in order to be able to suggest improvements.
- Safety culture is important and requires focused attention and further study in maritime activities

Human-machine systems on board ships

Human-machine systems have to be carefully designed, in order for the equipment to be a reliable aid and improve a ship's operational efficiency and safety.



The study includes:

- Interface design
- Physical layout
- Training in using equipment

Method

Information is gathered through site visits on board ships using both observations and interviews of the crews.

Preliminary results:

- Reconstruction of vessels can lead to complications using systems and performing work tasks on board (e.g. installation of additional equipment on deck destroyed the vital sight during docking).
- Additions to navigation stations on the bridge can create poorly arranged, crowded stations, creating latent conditions in the system and increasing the likelihood of active failures.
- Interface design of the navigation stations, as well as the positioning of the stations on the bridge, can cause unnecessary problems.
- Manufacturer standards can stand in the way in the pursuit of making user-friendly interfaces.
- Navigational aids that are available tend not to be used optimally for both personal and organisational reasons.

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