

## Chapter 58

# Assessing Human Reliability Behaviour from Use of Technology for Ships Navigating within Coastal Water

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### ABSTRACT

*The traditional approach to the study of human factors in the maritime field involves the analysis of accidents without considering human factor reliability analysis. The main approaches being used to analyze human errors are statistical approach and probability theory approach. Another suitable approach to the study of human factors in the maritime industry is the quasi-experimental field study where variations in performance (for example attention) can be observed as a function of natural variations in performance shaping factors. This chapter analyzes result of modelling for human error and human reliability emanating from the use of technology on board ship navigation in coastal water areas by using qualitative and quantitative tools. Accident reports from marine department are used as empirical material for quantitative analysis. The literature on safety is based on common themes of accidents, the influence of human error resulting from technology usage design, accident reports from MAIB, and interventions information are used for qualitative assessment. Human reliability assessment involves analysis of accidents in waterways emanating from human-technology factors. The chapter reports enhancement requirement of the methodological issues with previous research study, monitoring, and deduces recommendations for technology modification of the human factors necessary to improve maritime safety performance. The result presented can contribute to rule making and safety management leading to the development of guidelines and standards for human reliability risk management for ships navigating within inland and coastal waters.*

DOI: 10.4018/978-1-4666-8473-7.ch058

## INTRODUCTION

Humans have relied on oceans, lakes, and rivers to ship goods from one end to another throughout the recorded history. Today, over 90% of the world's cargo is transported by merchant ships due to various reasons; including the fact that it is the cheapest form of transportation. The shipping industry has a fairly good safety record, however maritime accidents have a high potential for catastrophes. Past experiences research reports indicate that in the shipping industry around 80% of all accidents are rooted in human error (Fortland, 2004). Safety has been an immense public concern, especially caused in operations risk like: nuclear power generation, nuclear weapons, aviation, chemical/petroleum processing, and marine transportation (Robb et al., 1996).

There are several basic aspects of maritime activity that make it unique. Ships are confined and isolated systems. They are sufficient on energy supply, they have a limited manpower and resources, and they have a limited response capacity to face emergencies. These particular characteristics make maritime trade a risky activity, where a fault in navigation or in usual port operations can lead to injuries or loss of life, to damage of property and sometimes irreparable damage to maritime environment (de la Campa Portela, 2005).

The main purpose of navigation is the safe and efficient sailing of the ship between diverse points which requires steering the ship's movement on a planned trajectory. The accident occurrence of factors affecting the ship's movement causes its limitation. The ship's sailing should be safe, so that it does not cause any navigational accident. A navigational accident is an unwanted occurrence which can cause loss of life or health, loss or damage to ship or cargo, the pollution of natural environment, damage to the hydro-technological structure, and economical loss due to delay in the port and associated activities.

This chapter presents the result of application of quantitative and empirical approach to analyze human factors for reliability assessment of ships navigating in coastal waters. The approach is based upon a theoretical framework of well-known models. It is possible to benefit from the causal connection between human errors and accidents. It is possible to get a fast and easy access to empirical material from historical data that are analysed, and are compared to field studies or laboratory studies. The use of modest approach to standard developments through qualitative and quantitative risk assessment and analysis methods in necessary for HRA is performed. Quantitative risk assessment and analysis for HRA are best analysed using Failure Modes and Effects Analysis (FMEA), Fault Tree Analysis (FTA), Event Tree Analysis (ETA). Computer Reliability software is used for quantitative risk While for the qualitative risk assessment and analysis method, some checklists and safety or review audits is emphasized.

## PASS WORK

Human factors deal with human abilities and limitations in relation to the design of systems, organizations, tools etc. Important parameters are safety, efficiency and comfort. Human errors and human factors are often studied separately; therefore, the relationship between them is often overlooked. According to Gordon (1998), they propose a framework for describing the relationships between underlying human factors and more immediately evident human errors. Gordon categorizes human factors as individual, group, or organizational, following the Rasmussen model "Perceptions on the Concept of Human Error" (Gordon, 1998) that categorize human errors as skills-based, rule-based, or knowledge-based.

System-induced errors reflect deficiencies in the way the total system was designed. They include mistakes in designating the numbers and

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