



## Factors influencing survival in case of shipwreck and other maritime disasters in the Danish merchant fleet since 1970

Henrik L. Hansen<sup>a,\*</sup>, Jørgen Riis Jepsen<sup>a</sup>, Karsten Hermansen<sup>b</sup>

<sup>a</sup> Centre of Maritime Health and Safety (CMHS), Institute of Public Health, University of Southern Denmark, Denmark

<sup>b</sup> Marstal Maritime Museum, Marstal, Denmark

### ARTICLE INFO

#### Article history:

Received 23 October 2011

Received in revised form 4 March 2012

Accepted 20 March 2012

Available online 21 April 2012

#### Keywords:

Safety at sea

Maritime

Seafarers

### ABSTRACT

During the last 40 years, merchant ships have become safer and a number of new safety measures have been introduced. The purpose of the first part of this study was to investigate the trend of fatalities due to maritime disasters in the Danish merchant fleet over a 40-year period from 1970 to 2009, during which a total of 146 seafarers lost their lives. The relative risk of fatal accidents in the period 1990–2009 compared with the period 1970–1989 was 0.81 (CI: 0.58–1.14).

The second part of the study focuses on seafarers who abandoned a merchant ship in the period from 1990 to 2009. The purpose was to investigate factors influencing survival. During the 20-year period 44 incidents were identified involving a total of 267 seafarers. Among these, 51 did not survive. The fatality risk for seafarers on small and large ships was 3.68 and 0.64 per 1000 years at risk, respectively. Among the 171 seafarers who were rescued dry, one was injured and did not survive (0.6%). Out of 64 seafarers ending up in the water, 18 (28%) did not survive. Among the remaining 32 seafarers, 23 were with great certainty inside the vessel when it sank and another nine may have remained inside the sinking vessel. None of these survived. Suboptimal organisation of the evacuation process was of importance in some cases. Survival suits and automatic emergency transmitters (EPIRB's) have been shown to work in practice but their introduction has had limited influence on survival statistics.

© 2012 Elsevier Ltd. All rights reserved.

### 1. Introduction

Historically, merchant shipping has been and remains a dangerous occupation. The number of fatal occupational accidents is higher than in most shore-based occupations (Roberts, 2002). In addition, shipwreck and other maritime disasters cause human losses among the crew and explain about one third of all fatal accidents among crew aboard Danish merchant ships (Hansen, 1996).

The safety of shipping improved dramatically following the large-scale introduction of steam ships, and later motor ships, in the late 19th century. Not only became the work on board safer. Better construction of the ships in combination with superior navigational aids and search and rescue facilities reduced the risk of maritime disasters and their consequences to the crew. In response to the sinking of the RMS Titanic, the first International Convention for the Safety of Life at Sea (SOLAS) was passed in 1914 (IMO, 2000). The introduction of radio communication in the beginning of the 20th century and later the wide distribution of the radar had major influence on these achievements. The heavy losses of merchant seafarers during the Second World War

accelerated the development of maritime rescue equipment (Goethe and Laban, 1988). In depth analysis by the British Navy of the war casualties stimulated the research and development that has resulted in modern life jackets and inflatable life rafts (Golden, 1974).

In 1970, all Danish merchant ships in international trade had a sufficient number of lifeboats or life rafts to eventually evacuate all on board, emergency radio communication was available, and the considerable development of life jackets made them effective under most circumstances. In addition, the improved construction of the Danish merchant ships and the widespread use of radar and more advanced navigational aids like Loran and DECCA resulted in safer navigation.

Since then, the international regulations on safety at sea have been additionally strengthened (IMO, 2000) and successively implemented in Danish maritime legislation. The already existing life-saving appliances or arrangements were further improved and new measures came in. Consequent to the 1983 SOLAS amendments, survival suits for all crew-members of vessels without closed lifeboats were in place in the 1990s. Shortly afterwards, the ships were equipped with *Emergency Position Indicating Radio Beacons* (EPIRB) as a consequence of the introduction of the *Global Maritime Distress and Safety System* (GMDSS). The first satellite navigation systems were introduced in merchant ships in the

\* Corresponding author. Tel.: +45 51224659.

E-mail address: [hlhansen@cmss.sdu.dk](mailto:hlhansen@cmss.sdu.dk) (H.L. Hansen).

1970s and gradually became standard equipment in all ships. Advanced anti-collision radars became common in the 1990s. The simultaneous replacement of the vulnerable single hull ships by safer double hull ships not only reduced the risk of marine pollution but also improved the safety for the ships and their crews. These technical developments have had a major influence on safety at sea in merchant shipping. Still, however, maritime disasters remain a risk factor for seafarers of today.

This study includes two parts. The first part focuses on fatalities due to maritime disasters in the period from 1970 to 2009. The purpose was to investigate the trend of fatalities due to maritime disasters that has involved the Danish merchant fleet over the 40-year period and to identify the relative impact of the many new safety measures introduced during the period.

The second part focuses on seafarers who abandoned a merchant ship in the period from 1990 to 2009. The purpose was to investigate the influence of ship size on the risk of being involved in a maritime disaster that demands evacuation, and to identify the factors with an influence on survival when seafarers have to abandon a merchant ship due a maritime disaster. Fatalities covered by the first part are also included in the second part. The common aim of the two parts is to identify areas where further attention may improve the future safety at sea.

## 2. Materials and methods

The fatalities included in the first part of the study have been retrieved from an already existing register on fatalities among seafarers signed on Danish merchant vessels described elsewhere (Hansen, 1996). This register is primarily based on information from the maritime authorities and has been continuously updated.

The incidents included in the second part of the study have been identified by the same sources already mentioned, and additionally by reviewing publications from the Danish Maritime Authorities and reviews of Danish maritime journals and magazines. Furthermore, information has been obtained by conducting some interviews of seafarers that have been directly involved in the disasters. Maritime disasters causing the loss of the ship have been identified as a part of another project based on information from a number of different sources (Hansen, 2009). Ships registered in Greenland and the Faroe Islands were excluded in this study. The study only includes merchant ships and the signed on professional seafarers. Passengers were excluded. The study includes all known evacuations and other incidents, where parts of or the entire crew had to leave the ship with short notice due to an emergency situation and include fatalities and survivors. Simple groundings, where the crew stayed on board or could have stayed on board because there were no immediate danger, are not included.

### 2.1. Time at risk

The periods of time seafarers are at risk of being involved in a maritime disaster were based on information from Danish Ship-owners' Accident Insurance Association (UFDS). Until 1994 UFDS had monopoly and obligation to accident insure all crew-members with the exception of crew signed on the rather limited number of ships owned by the Danish government. Following the subsequent liberalisation almost all ship-owners continued to use UFDS. The denominator in this study is based on figures supplied from UFDS on the number of positions on board. In practice, during the course of 1 year, each specific position onboard may be in use by several individual seafarers, one of whom, however, will be in active service at a certain time. One insured position on board is calculated as 1 year at risk. In the period 1970–1989, the cumulated number of insured person-years was 218,541 and during 1990–2009, the corresponding number was 145,110 years.

In the study of evacuations from 1990 to 2009, the incidents are divided into involvement of small and large ships, respectively. Large ships are defined as ships above 1599 Gross register tonnage (GRT). If the ship only is measured in Gross tonnage (GT), a large ship is defined as a ship measuring more than 2999 GT. The denominator data are totals and cannot be used to distinguish the time at risk on small and large ships. To estimate the time at risk in large ships, the number of large ships registered under Danish flag in the beginning of each calendar year was obtained from Statistics Denmark. The number of large ships each year varied between 204 and 265 ships. Assuming that ships that were in service in the beginning of the year were active during the whole year, the total number of their years of service was 4468. Estimating an average crew size of 20 members in the large ships, the number of insured person-years in the period from 1990 to 2009 was 89,380 years or 62% of the total time at risk in the period.

## 3. Results

The first part of this section describes the causes of maritime disasters leading to fatalities and the trend in the development of the number of fatalities in the 40-year period from 1970 to 2009.

### 3.1. Causes of maritime disasters leading to fatalities and trends of fatalities

During the 40-year period 1970–2009, a total of 146 seafarers lost their lives due to maritime casualties (Table 1). The category “Foundering due to loss of ship stability” includes all incidents with loss of the ships' stability irrespective of the causes for instability. This may include shifting of cargo and leakage causing flooding of holds or engine room. The category “Damage to the vessel” includes two incidents of weather conditions that resulted in direct damage to the ship's structure. Finally, the category “Other causes” includes four accidents involving three tugs and one anchor handling ship, respectively, all of which foundered due to external pulls from other vessels that were connected to the ships.

During the period from 1970 to 1989, there were 95 fatalities caused by 32 maritime casualties. Of these, five incidents involving large ships above 1599 GRT/2999 GT resulted in the loss of 18 seafarers. From 1990 to 2009, 15 maritime casualties resulted in the loss of 51 seafarers. Of these, one incident involved a large ship with a loss of one seafarer.

The relative risk for a fatal accident in the period 1990–2009 compared with the period 1970–1989 was 0.81 (CI: 0.58–1.14),  $p = 0.22$ . A seafarer who is active during his whole professional career will today spend about 20 years of active service at sea. The life-time risk of a fatal accident due to a maritime disaster will be 0.8% for the whole period and 0.7% for the period 1990–2009.

**Table 1**

Causes of 146 maritime disasters with at least one casualty, number of fatalities in each category and relative risk of fatalities divided into two periods of time. See text for further explanation of the classification.

Cause of maritime disaster	1970–1989	1990–2009
Grounding or stranding	2	2
Foundering due to loss of ship stability	49	22
Collisions	12	6
Fire or explosion	19	6
Damage to the vessel	12	0
Other causes	1	15
Number of fatalities	95	51
Number of years insured	218,541	145,110
Fatalities per 100,000 man-years at sea	43.5	35.1

Download English Version:

<https://daneshyari.com/en/article/589290>

Download Persian Version:

<https://daneshyari.com/article/589290>

[Daneshyari.com](https://daneshyari.com)