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Under-reporting of maritime accidents

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ABSTRACT

The majority of current maritime regulations has been developed following a reactive approach, often as ad-hoc response to serious accidents, and are characterised as being prescriptive leaving limited space for adapting equivalent solutions rather those described in the regulations. On the premise of providing a more proactive approach for the proposal or the evaluation of regulations, the Formal Safety Assessment (FSA) has been introduced. In the context of FSA, the analysis of accident data is considered to be very important for providing potential input on developing more balanced, proactive and cost-effective regulations. However, it has been argued that the validity of historical data may be undermined by uncertainties. This paper is aimed at showing evidence on serious under-reporting in accident databases, which can be considered as the main contributor to questioning the direct and uncritical use of historical data. By analysing the 10-year tanker accident data from the Lloyd's Register FairPlay (LRFP) and the Norwegian Maritime Directorate (NMD) for vessels registered in Norway, it is found that the reporting performance has an upper bound of 41% for NMD and 30% for LRFP. Furthermore, based on comparison between LRFP data and self-assessment by Flag States, it is seen that accidents reported by the Flag States are also incomplete.

1. Introduction

Regulatory changes in the maritime industry are often distilled from past experience, mainly related to ship accidents. The decisions on how to improve safety are often carried out on an ad-hoc basis, influenced by public pressure or reputation aspects. Quick fixes have therefore been preferred and an assessment of the costs and benefits of such solutions has not always been performed. These regulations are often characterised as being prescriptive, leaving only limited room for other equivalent solutions to a safety problem than those prescribed. This is a matter of concern in periods of rapid technology advancements where regulatory developments are too slow to cope with industrial needs and the principle of technical equivalence may become an obstacle to innovation. Furthermore, the risk associated with the safety of the issue under consideration, i.e. a specific system or operation, has not been evaluated explicitly. However, safety objectives and functional requirements would be more useful, requiring safety goals/performances to be met both for technical and operational aspects. This can be achieved through the consideration of accident scenarios. As an example, reducing the probability of collision and grounding events is facilitated with improved bridge design management also addressing human interaction with navigation systems. When fire scenarios are developed, crew actions related to detection, fire fighting and assisting evacuation are modelled to predict their effects. Therefore, by introducing risk analysis and cost-benefit assessment into the traditional decision-making process as well as incorporating operational aspects, the capability for cost-effective safety solutions is increased (Skjong, 2003; Breinholt et al., 2007).

To this end, Formal Safety Assessment (FSA) has been developed by the International Maritime Organization (IMO) as a structured and systematic methodology, aimed at enhancing maritime safety, including protection of life, health, the marine environment and property by using risk analysis and cost-benefit assessment. Thus, the process is comprised of the following steps: (1) hazard identification, (2) risk analysis, (3) identification of risk control options (RCOs), (4) cost-benefit assessment and (5) recommendations for decision-making (IMO, 2007). Moreover, FSA can be used as a rational decision support tool to help in the evaluation of new regulations for maritime safety and protection of the marine environment or in making a comparison between existing and possibly improved regulations, with a view to achieving a balance between the various technical and operational issues, including the human element and between maritime safety or protection of the marine environment and costs. One of the most beneficial characteristics of FSA is the proactive nature, i.e. by trying to find out what might go wrong before the accident occurs. This is achieved through reliability analysis, probabilistic modelling of failures and the development of accident scenarios. Hence, the advantage of maritime regu-

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lations is that they encapsulate the accumulated wisdom from accident experience and from the judgement of many experienced professionals worldwide who have contributed to verifying and improving them as well as the utilisation of advanced tools and analytical models (HSE, 2002; IMO, 2007).

In connection with the above, data concerning incident reports, near misses and operational failures may be very important for the purpose of making more balanced, proactive and cost-effective legislation. Such data must be reviewed objectively and their reliability, uncertainty and validity be assessed and be reported. Therefore, their assumptions and limitations should be described and consideration should also be given to potential improvements in those data in anticipation of an FSA implementation (i.e. a better specification for recording relevant data including the primary causes, underlying factors and latent factors associated with a casualty) (IMO, 2007).

For other transport industries, for instance road, the issue of accident data quality has been addressed extensively, as it is worthwhile noting that under-reporting of accident fatalities and injuries was identified between police and hospital records (Alsop and Langley, 2001; Sciortino et al., 2005; Amoros et al., 2006; Ward et al., 2006; Blincoe et al., 2002). The under-reporting in fatalities and injuries of recreational boat accidents as well as occupational fatalities in rural areas was discussed by Lawrence et al. (2006) and Schierhout et al. (1997) respectively. Concerns related primary to the reliability of the data on which safety measures of the civil aviation sector are based were raised by Brady (2005). With regards to maritime accident under-reporting, no detailed studies have been performed apart from the comments on the preparation of an FSA study related to general cargo ships (Germany Norway and IACS, 2008). This study concluded that an unknown percentage of accidents were missing from the records (i.e. that under-reporting existed) and in order to complete an FSA of high quality, it was necessary to complement the available data sources with additional data. Such data needed to be provided by Flag States and any other organizations which have relevant data to contribute. As a second example, an exercise was undertaken to check the under-reporting of fire and explosion accidents in chemical tankers between the Lloyd's Register FairPlay (LRFP) and the Norwegian Maritime Directorate (NMD) accident databases (Norway, 2008; Thomas and Skjong, 2009), and it was concluded that only about 30% of the occurred events was reported.

Based on the experience from other transport sectors and the indications from previous FSA studies, it must be assumed that under-reporting of accidents is a problem also for the most commonly available accident statistics used in the FSAs today. Thus, in the current study it is attempted to quantify the extent of this under-reporting issue by comparing casualty records from the NMD (2007) and LRFP (2008) accident databases covering years 1997–2007 for the tanker vessel segment. It should be also pointed out that this study is considered as an initial attempt to address the under-reporting of maritime accidents and is therefore of an exploratory nature. It needs to be emphasised that this paper is not intended in comparing the under-reporting of maritime accidents with the under-reporting appeared in other transport sectors, where definitely the integration of resources relevant to those sectors is required and is beyond the scope of the current study. In Section 2, a description is provided of the data sources used for the study. Section 3 describes the methodology used for analysis, whereas the results are given in Section 4. The comparison between the LRFP database with the relevant Flag State self-assessment forms is discussed in Section 5 for identifying the trend in other maritime accident sources. A brief discussion is entailed at Section 6 and finally the conclusions are provided in Section 7.

2. Data

This study is performed by considering the provided tanker casualty records from NMD (2007) and LRFP (2008) accident databases covering the period from February 1997 to February 2007. The number of records was 2209 from NMD and 2540 from LRFP. A brief description of these databases is given in the following sub-sections.

2.1. NMD database

The casualty records provided from NMD (2007) (February 1997 to February 2007), contain accidents of merchant vessels (excluding passenger) of more than 20 GRT (Gross Registered Tonnage) occurred in Norwegian territorial waters and of Norwegian nationality vessels trading worldwide. The recorded accidents are divided into the categories of fire/explosion, grounding, heavy weather, capsize, collision, contact, leakage, pollution/environmental damage, personnel, stability related, missing and other. Other data fields include the vessel's main particulars and identity (length, breadth, size (GRT), year of built, name, call sign, IMO number, flag, nationality), geographical location and position of the accident, time, date, environmental conditions (visibility, wind, wave height), operational phase (port manoeuvring, en route, etc.), navigation issues (type of chart, presence of pilot), cargo carried, extent of damage (serious, no damage, unknown), number of dead/injured, as well as details with regards to the causes (human error, procedural, organizational, equipment failure).

2.2. LRFP database

The casualty records from the LRFP (2008) accident database (February 1997 to February 2007), contain worldwide occurred accidents of merchant vessels of more than 100 GRT. These accidents are divided into the categories of foundered, wrecked/stranded, contact, collision, fire and explosion, missing, war loss/damage during hostilities, hull/machinery damage and miscellaneous. Other fields include the vessel's main particulars and identity (GRT, deadweight tonnage (DWT), year of built, name, call sign, IMO number, nationality, etc.), geographical location and position of the accident, date, environmental location (at sea, restricted waters, etc.), vessel status (in service, out of service, on voyage, etc.), severity (serious, not serious), pollution indication, number of killed/injured/missing, voyage details (origin and destination port/country, cargo type) as well as weather conditions (calm seas, heavy swell, storm, etc.). Each accident is complemented by a brief narration plus a breakdown up to the fifth sequence of events whereas detailed information about the extents of damage (type of compartment, system component, position on vessel) is mentioned.

3. Methodology

The reporting performance for a database can be defined as the ratio of the recorded accidents to the true number of accidents. Of course, no perfect account of the true number of accidents exists for the world shipping fleet. In an attempt for the current study to estimate the true number of accidents for a specific flag fleet of a particular vessel type M_f, suppose Fig. 1 and let the common records between the two databases be R_c, N be the registered accidents at NMD for a specific flag fleet of a particular vessel type and L be the records at LRFP for a specific flag fleet of a particular vessel type.