INTERNATIONAL MARITIME ORGANIZATION

IMO

E

MARITIME SAFETY COMMITTEE
85th session
Agenda item 19

MSC 85/19/1
11 September 2008
Original: ENGLISH

# GENERAL CARGO SHIP SAFETY

## Formal Safety Assessment – Preparatory Step

**Submitted by Germany, Norway and IACS**

**SUMMARY**

| | |
|---|---|
| ***Executive summary:*** | This document reports on the initial steps of an FSA study on General Cargo Ships relating to analysis of casualty data |
| ***Strategic direction:*** | 5 |
| ***High-level action:*** | 2.1.1, 5.2.1 and 12.1.2 |
| ***Planned output:*** | 12.1.2.2 |
| ***Action to be taken:*** | Paragraph 9 |
| ***Related documents:*** | MSC/Circ.1023 – MEPC/Circ.392, MSC 82/21/19, MSC 83/20/1, MSC 83/20/3, MSC 83/20/5 and MSC 83/INF.2 |

## Introduction

1 The Maritime Safety Committee, at its seventy-fourth session, and the Marine Environment Protection Committee, at its forty-seventh session, approved Guidelines for Formal Safety Assessment (FSA) for use in the IMO rule-making process, as set out in MSC/Circ.1023 – MEPC/Circ.392. A subsequent consolidated version with amendments can be found attached to document MSC 83/INF.2.

2 At MSC 82, the issue of general cargo ship safety was brought to the attention of the Committee in the submission by the Russian Federation (MSC 82/21/19). This submission highlighted the disparity between the fraction of general cargo ships of the world fleet (17% in number of ships) and the share of this ship type of all total losses (42%) and of all fatalities (27%) for the period 1999 to 2004. It was further explained that approximately 73 general cargo ships were lost each year in this period. Additionally, it was stated that in 2004, based on Paris MoU statistics, general cargo ships had the second highest rate of port State control inspections with deficiencies (60% of inspections of general cargo ships compared with an average of 54% for all types of ships) and detentions (8% of inspections of general cargo ships compared with an average of 6% for all types of ships).

3 At MSC 83, a number of submissions were received relating to general cargo ship safety. In particular, documents MSC 83/20/1 (Argentina), MSC 83/20/3 (RINA) and MSC 83/20/5 (Republic of Korea) all contained various data relating to general cargo ship safety based on information from Lloyds Register Fairplay (LRF) database.

4 In the opinion of the co-sponsors, prior to analysing and recommending specific Risk Control Options (RCOs), the available data should be analysed in more detail, preferably following a co-ordinated approach. Therefore, IACS has undertaken the preparatory step of an FSA study, addressing the issue of general cargo ship safety, and some preliminary results are reported at: http://www.iacs.org.uk/publications/publications.aspx?pageid=4&sectionid=6.

This is a bulky document of more than 40 pages in volume. At this stage of the Committee's discussions on this issue, it was not considered an appropriate use of valuable IMO resources to submit this report as part of a document to this meeting. However, the report could be submitted to a future session, perhaps when a working group is allocated to consider substantively the issues that have been raised and the documents submitted under this agenda item. Notwithstanding these comments, provided in the annex to this document, is a copy of the conclusion section of the report and a copy of the FN diagram referred to therein.

5 General cargo ship safety is influenced by regulations, and prior to recommending new RCOs the risk level implicit in current regulations needs to be established. As a preparation for considering the effects of new regulations, the information provided at Annex II to the report referred to in paragraph 4 above, has been prepared describing what is believed to be the main changes in the regulatory framework in the period 1994 to 2007.

**Summary of results from the study**

6 The analyses of historical data on general cargo ships (in the period 1 January 1997 to 31 December 2006) show that:

.1 the safety level of general cargo ships lies within the tolerable risk region. However, it should be made ALARP (As Low As Reasonably Practicable) – see also subparagraph .7 below;

.2 the accident frequency for general cargo ships is estimated at $2.7*10^{-2}$ accidents per ship-year;

.3 no total loss was reported for general cargo ships larger than 20,000 GT in this period;

.4 the risk level with respect to total loss is dominated by foundering, wrecked/stranded and collision accident categories;

.5 the average individual risk from ship accidents is $2.8*10^{-4}$ fatalities per ship-year;

.6 the average individual risk from personal accidents is about 20% higher than the individual risk from ship accidents;

.7 a Potential Loss of Life from ship accidents, equal to $2.7*10^{-2}$ fatalities per ship-year, is higher than for:

LNG carriers ($9.32*10^{-3}$ fatalities per ship-year, MSC 83/INF.3) – by a factor of about 3;

container carriers ($3.52*10^{-3}$ fatalities per ship-year, MSC 83/INF.8) – by a factor of about 8; and

crude oil tankers ($1.26*10^{-2}$ fatalities per ship-year, MEPC 58/INF.2) – by a factor of about 2; and

.8 about 13,000 of the active general cargo ships (58% of all ships GT > 499) are older than 25 years.

7 The investigation of the occupational risk for a sub-group of ships – ships registered in Norway (NOR) or the Norwegian International Ship register (NIS) – indicates that:

.1 the occupational risk is about 20% higher than the risk due to ship accidents yield an individual risk of $2.8*10^{-4}$ fatalities per ship-year;

.2 the frequency of a serious injury is about ten times higher than the frequency of a fatality; and

.3 the total individual risk of fatality for a crew member is about $6*10^{-4}$ annually (ship accidents and personal accidents combined).

8 The investigation of historical data on general cargo ships found in databases indicates that:

.1 the issue of the completeness of incident reporting is unsolved and thus an unknown percentage of underreporting exists;

.2 when broken down to sub-categories (e.g., flag, classification society etc.), the results are dominated by uncertainties; and

.3 in order to complete an FSA of high quality, it is essential to complement the available data sources with additional data, which needs to be provided by flag States and any other organizations which have relevant data to contribute.

**Action requested of the Committee**

9 The Committee is invited to consider the information provided and take action as appropriate.

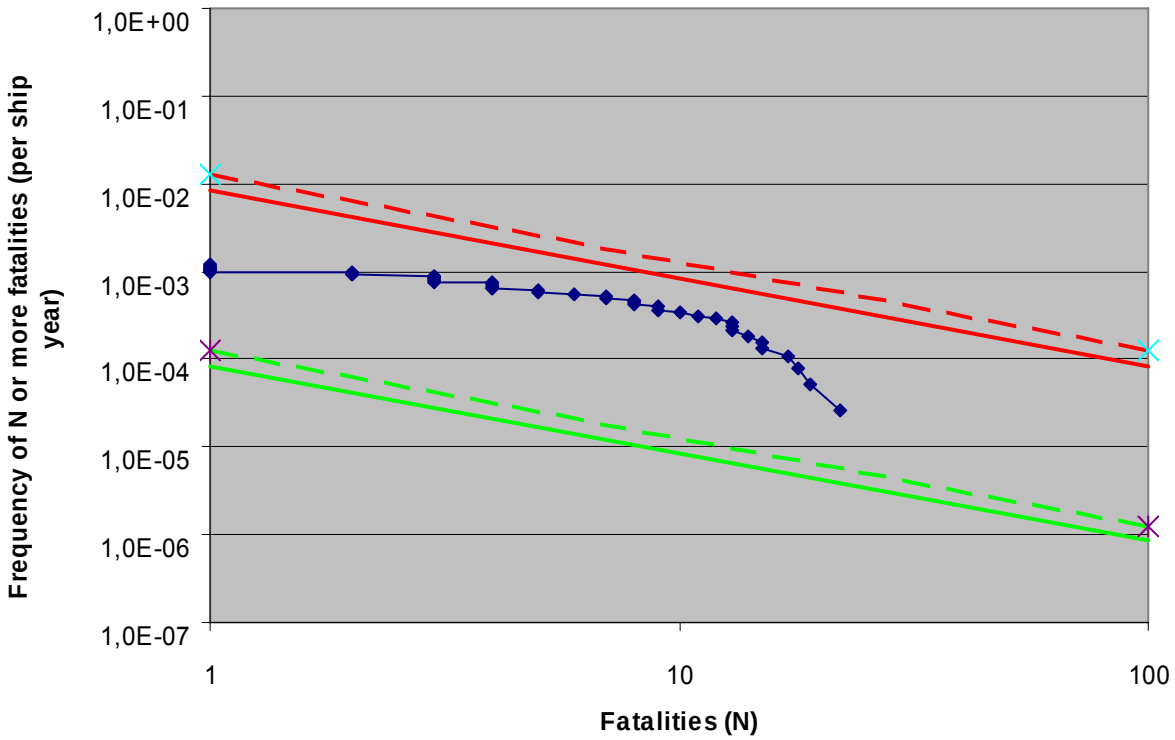
***

ANNEX

# CONCLUSIONS FROM IACS REPORT ON "FORWARD SAFETY ASSESSMENT OF GENERAL CARGO SHIPS – PREPARATORY STEP"

IACS
INTERNATIONAL ASSOCIATION OF CLASSIFICATION SOCIETIES LTD.

Date 2008-07-28




**FN diagram for IACS class general cargo ship. Boundaries for intolerable and negligible risk calculated on basis of MSC 72/16 using updated figures for economic value and two q-values (dashed line: 1 and continuous line: 0.68).**

## *6 Conclusion*

This report summarises the results of an evaluation of historical data and determination of characteristic data for the ship type *general cargo ship* for the period 1997-01-01 to 2006-12-31. The evaluation is based on a group of ships selected using the following criteria:

- ships "due or delivered" after 1981-12-31 and before 2007-01-01;
- a gross tonnage greater than 499;
- classed by IACS society (based on the assignment in LRFP 2007);
- casualty reports classed "severe" and with IACS class assignment at date of incident.

This selection is considered to be representative for this ship type.

All data are taken from the Lloyds Register Fairplay PC-Register and Lloyds Register FairPlay Casualty database. LRFP distinguishes seven sub-categories in the category general cargo ship. The considered fleet consists of 4,596 vessels and yield 38,084 ship-years. About 95 % of these ships belong to the sub-category *a single or multi deck cargo vessel for the carriage of various types of dry cargo* (A31A2GX). Characteristic data with respect to the accident categories "total loss" and "fatality" (fatality covers the outcomes "killed" and "missing") are determined for the size categories:

- $500 \leq GT < 1{,}000$;
- $1{,}000 \leq GT < 20{,}000$;
- $20{,}000 \leq GT$.

The vast majority of ships and ship-years are found in the size category $1{,}000 \leq GT < 20{,}000$. In total 1,012 casualties were reported in LRFP for this selection taking into consideration the accident categories *collision, contact*, *foundering*, *fire and explosion*, *war loss*, *missing*, *hull and machinery*, *wrecked or stranded* and *miscellaneous*. Important accident categories with respect to the number of accidents are *hull and machinery*, *wrecked stranded* and *collision,* which account for about 70 % of all accidents. It is observed that the annual number of casualty reports increases from 1997 to 2006. In the same period the number of casualty reports for fatality and total loss does not increase. Thus, it may be concluded that the accuracy of monitoring is improved between 1997 and 2006. The average number of accidents per years is 122 which equates to an accident frequency of $2.7 \cdot 10^{-2}$ with respect to ship-years. On average the annual accident frequency increases for the period in focus.

The vast majority of total losses (109) is caused by the initiating event *foundering* (43 %) followed by wrecked stranded (21 %) and collision (18 %). The average annual frequency with respect to total loss is equal to $3 \cdot 10^{-3}$. This rate is comparable to the total loss rate for bulk carrier between 1995 and 2000 (MSC 83/20/1). It is noteworthy that there were no total losses for general cargo ships greater than 20,000 GT and built after 1982 in the ten year period from 1997 to 2006. No clear tendency with respect to relation of accidents and year built are observed.

For the investigated general cargo ships classified by IACS societies 316 fatalities were reported between 1997 and 2006, which yields an average number of fatalities per accident of 7.2. The fatality rate per ship-year is of $8 \cdot 10^{-3}$ (or 125 ship-years per fatality). Three years are identified (1998, 2004 and 2005) where the fatality frequency is significantly higher than the

IACS
INTERNATIONAL ASSOCIATION OF CLASSIFICATION SOCIETIES LTD.

average. These years contribute about 50 % of all fatalities in 28 % of the accidents with fatalities. Assuming an average crew of 14.7 per ship and an average annual stay of six months per crew member (50:50 scheme) the calculated individual risk is $2.8 \cdot 10^{-4}$. This value is the area of tolerable risk as proposed in MSC 83/INF.2 (maximum tolerable individual risk is $10^{-3}$ and the maximum negligible individual risk is $10^{-6}$). The calculation of potential loss of live for crew member yields $2.7 \cdot 10^{-2}$. The comparison with the outcomes of the FSAs for LNG (MSC 83/INF.3: $9.32 \cdot 10^{-3}$), for Container (MSC 83/INF.8: $3.52 \cdot 10^{-3}$) and crude oil Tanker (MEPC58/INF.2: $1.26 \cdot 10^{-2}$) shows that the risk with respect to life of a crew member on a general cargo ship is higher.

The FN diagram developed on the basis of an average ship size and using the economic data of 2007 (conservative data in relation to 2008 because presently extremely high rates are achieved). As shown, general cargo ships are in the upper region of the ALARP region. However, the boundary to intolerable risk is not touched.

The importance of occupational risk in the context of risk evaluation for crew on general cargo ships was noted (for instance in MSC 83/20/3). On the basis of data received by the Norwegian Maritime Directorate occupational risk is investigated with respect to ships registered to Norway or the Norwegian International Register. The results of the investigation show that the fatality rate for occupational accidents is about 20 % higher than for ship accidents ( occupational: 55 %; ship accident: 45 %). This corresponds well with values presented in IMO submission MSC 83/20/3 (60 % to 40 %).