Risk Profiles of Major Ship Types

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ABSTRACT

This paper shows risk profiles of major ship types which were obtained by analyzing IHSF casualty and ship characteristics data-bases aiming at contributing to the step 2 of FSA introduced in the consideration of safety measures in the IMO. Individual risk, PLL and FN diagrams are considered as elemental indices which are components of risk profiles. Considered period is from 1978 to 2011, continuous 34 years. In this paper risk profiles of the former and the latter periods were compared and improvements of safety of such ship types are discussed. And the method for identifying ship groups which need emergent consideration of safety measures to improve safety is dealt with. In addition a method for prioritizing types of casualty when considering safety measures is also shown. Finally a new method for approximation of FN diagrams and also a new method for setting evaluation criteria by applying that are proposed.

KEY WORDS:  Risk profile; individual risk; societal risk; PLL; FN diagram; ALARP region

INTRODUCTION

A lot of accidents of ships have still occurred resulting not only huge property losses but also losses of a lot of precious lives and pollution of marine environment. This indicates necessity of more improvement on safety of ships. On the other hand in the IMO (International Maritime Organization) the FSA (Formal Safety Assessment) (IMO (2012)), the main procedures of which are risk assessment of considered ship group, estimation of risk reduction and cost increase by introducing risk control options (RCOs) which mean combinations of safety measures, have been applied to for evaluating justification of making the RCOs to be mandatory requirements. Until now several RCOs have been mandated after being proposed by FSA. EU funded research project SAFEDOR (Design for Safety /Operation /Regulation) proposed several RCOs by applying FSA methodology and Denmark submitted several information papers on the RCOs to IMO/MSC (Marine Safety Committee) and MEPC (Marine Environment Protection Committee). Those papers are Denmark (2007a,2007b,2008a, 2008b, 2008c).

In those papers risk levels analyzed using casualty databases are reported. National Maritime Research Institute (NMRI), Japan has maintained IHSF (Information Handling Services Fairplay) casualty and ship characteristics databases annually and analyzed risk of ships continuously and published the results at some international conferences (Kaneko and Miyazaki (2004), Kaneko (2009)). This paper shows risk profiles of major ship types which were obtained by analyzing the IHSF data-bases aiming at contributing to the step 2 of FSA, that is risk assessment. In this paper as major ship types LNG carrier, LPG carrier, chemical tanker, oil tanker, bulk carrier including ore carrier, general cargo carrier, container carrier, refrigerated cargo carrier, RORO cargo carrier, passenger/general cargo ship, RORO passenger ship and passenger/cruise ship are taken up. A ship in these ship types is of equal and above 100 GT. Individual risk, PLL (Potential Loss of Lives) and FN (Frequency vs. Number of fatalities) diagrams are considered as elemental indices which are components of risk profiles. Considered period is from 1978 to 2011, continuous 34 years.

In this paper risk profiles of the former period (1978-1994) and the latter period (1995-2011) were compared and improvements of safety of such ship types between the successive periods are discussed. Moreover a method by which a ship group which needs consideration on additional safety measures and a method for prioritizing types of casualty when considering safety measures are shown with an example. Finally a new method for approximation of FN diagrams and also a new method for setting evaluation criteria by applying that are proposed.

RISK PROFILE AND RISK ACCEPTANCE CRITERIA

Risk Profile

The word “risk profile” has been frequently used in the areas of food safety, operational risk etc. ISO 30001 defines the word as “A risk profile is a written description of a set of risks. A risk profile can include the risks that the entire organization must manage or only those that a particular function or part of the organization must address.” Here “risk profile” is used as the meaning of risk description of ships following to the definition by ISO 30001.

Risk is usually defined as multiplication of frequency and severity of consequence occurred in an accident. As risks related to a ship fatality risk, risk at sea pollution etc. These types of risk are common with engineering systems which are nuclear or chemical plants and air services etc. As risk expressions there are “individual risk” and