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The contribution of risk management in ship management: The case of ship collision

Hristos Karahalios *

Business College of Athens, 95, Posidonos blvd, Glyfada PC 16674, Greece

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ABSTRACT

Ship operators are developing their business in a competitive and highly regulated industry. For ship operators is important to utilize management systems in reducing potential threats to shipboard crew and cargoes carried. This paper enhances the risk management principles in respect to financial damages related to a ship collision. A methodology is proposed involving a performance management system to measure the expected costs and benefits of a ship's collision caused to its ship operator. As essential parts of the research methodology, Fuzzy Sets and Analytic Hierarchy Process (AHP) are referred to design scorecards, which identify key points for accident prevention on board ships. The ship operators may use the results in evaluating their management systems through taking into account the economical burden that will be generated to ship operators in case of a collision incident. In this paper, the expected benefits of risk management, the principle root causes and consequences of bulk carriers collisions are discussed.

1. The challenges of modern ship management

The "2012 Review of Maritime Transport" published by the United Nations Conference on Trade and Development reveals that the total volume of goods loaded worldwide in 2011 was 8.7 billion in tonne (UNCTAD, 2012). At the same time, the world fleet was more than 1.5 billion deadweight in tonne in January 2012. The above figures show how important the sea trade is for the wealth of the nations. On the other hand, it is the obligation for ship operators to provide ships of high standards. A ship operator may own ships or manage a fleet for ship-owners (Klikauer and Morris, 2003). The definition of a ship operator in this paper is therefore any person, or company, who has the responsibility for the operation of its own ships or manages ships of other owners. Typical examples of a ship operator would be a ship-owner, ship manager or bareboat charterer. A ship operator is not different from any other profit-seeking service firms in the shipping industry (Triantafylli and Ballas, 2010), in a sense that profit will necessitate the long-term business survival of the company especially during depressed market cycles.

A ship operator makes a profit by hiring the space of each ship that he operates to transfer cargo for a voyage or a specific period (Li and Cullinane, 2003). From a commercial perspective, the ship operator has contractual obligations in a charter party as the carrier. The shipper requires a carrier to care for the suitability of his vessel in order to fulfil the transportation of cargo with safety. The carrier is obliged to provide a ship constructed, equipped, supplied and staffed according to the international regulations on the design and operation of vessels in order to execute the voyage safely and to overcome those risks it is anticipated to meet during the charter known as ordinary perils of the sea (Plomaritou et al., 2011). Therefore, the selection of appropriate vessels to carry out shipping activities is crucial for charterers and the technical reliability will be one of the most important factors for selection purposes (Yang et al., 2011). Furthermore, the acquisition of a ship requires a high capital. High capital requirements can discourage potential entrants of firms that can profitably enter the industry (Triantafylli and Ballas, 2010).

After several efforts eventually, a common regulatory regime became reality when an agency of the United Nations, International Maritime Organization (IMO) was established in 1948 to promote safe, secure and efficient shipping on clean oceans (Dahlstrom et al., 2011). Since then the legislative framework developed by the IMO consists of about 50 conventions (Perepelkin et al., 2010). To some degree the regulations imposed by the IMO established a common and acceptable foundation, and as a result safety at sea was improved significantly within just a few decades. Notwithstanding their justification, such regulations have imposed significant changes upon the business of ship operators because they must operate their ships under a complex maritime regulatory regime, which consists of regulations posted by flag states, coastal states, and the IMO (Mitroussi, 2004b; Alderton and Winchester, 2002). Ships visit ports of different states on a regular

* Address: 111, S. Trikoupi Str., Piraeus PC 18539, Greece. Tel.: +30 697798 7223.
E-mail address: hristos_karahalios@hotmail.com

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basis and consequently they are subject to different regulatory regimes. When a foreign ship calls in a port, the ship, crew and its equipment should comply with the requirements of international regulations (Cariou et al., 2009). If a ship is found to deviate from these standards then the authorities will pose penalties such as detention from sailing (Knapp and Franses, 2007). In addition, some states have extended their jurisdiction through their Exclusive Economic Zones (EEZ). Hence, a ship sailing in the area of EEZ, even if it does not intend to call a port of that state, may have to comply with some restrictions (Keyuan, 2002).

A further challenge for a ship operator is that the shipping industry suffers from a negative public opinion. This was caused because various stakeholders were often ready to lower IMO standards if this meant increase in the profit margin. In this context the shipping industry created negative externalities, which contributed to the creation of a low public image (Fafaliou et al., 2006). Consequently, in the case of an accident public opinion will press governments and authorities for immediate punishment against the ship operator (Sampson, 2004; Chantelauve, 2003). An involvement of a ship operator's ship in an accident may result in bad reputation for his company, heavy finance consequences, loss of lives, and even prison convictions for his employees (Chen, 2000). From this point of view, it is beneficial for ship operators to comply with the maritime regulations while they are pursuing their basic goal, which is to create profits for their shareholders. Fafaliou et al. (2006) suggested that these ship operators apply a standard level of operation and conform to requirements of regulations and conventions, no matter what the costs of compliance are.

Human errors, technical and mechanical failures, and environmental factors are commonly underlined factors leading to shipping accidents with different percentages (Celik et al., 2010). In order to avoid such errors a ship operator must find appropriate human resources to fulfil positions on board his ships and ashore. Availability and quality of human resources are the cornerstones for a rational management system of a company. A main certification standard for the shipping industry is the Standards of Training Certification and Watch-keeping for Seafarers (STCW) which was introduced in 1978, and amended in 1995. Its main objectives are the establishment of an international system for training, supervision, assessment, and certification, the assurance that mariners have knowledge and competence to do their job, the assignment of responsibilities to all parties involved, and the establishment of control mechanisms for the verification of the above-mentioned purposes (Triantafylli and Ballas, 2010). However, due to changes in crew labour resources, it is common for ships to be manned by crew members from the Far East when their ship operator is based in Europe. A ship registered under an open registry may have limited restrictions regarding manning such as crew nationality and manpower. As a result, some companies operate their ships with cheap labour from developing countries overlooking their lack of skills (Klikauer and Morris, 2003). However, despite the wage differential separating the two tiers, highly-paid national seafarers are not yet fully supplanted by lower-paid third-party national ones (Tsamourgelis, 2009). This phenomenon clashes with the typical theoretical model of cost minimization or profit maximization. It could be an indication that a high number of ship operators give emphasis to the high standards of their seamen.

Personnel training has been identified as a source of competitive advantage for a ship operator (Triantafylli and Ballas, 2010). However, there are not many IMO regulations setting the appropriate standards that an individual involved in a shore management position should have. Such a regulatory gap allows a ship operator a great degree of flexibility in choosing personnel ashore increasing his liability for these choices. Demand for human resources ashore is sometimes generated by regulations to cover specific positions as Designated Person Ashore (DPA) required by the International Management Code for the Safe Operation of Ships and for Pollution Prevention (ISM Code) (IMO, 2010). In a similar way the International Code for the Security of Ships and of Port Facilities (ISPS Code) introduced the position of the Company Security Officer (CSO) (IMO, 2003). The initial version of the ISM Code did not include specific requirement that would qualify an individual as a DPA. To overcome this problem an IMO circular was issued in 2007 stating the qualifications, training and experience necessary for undertaking the role of the designated person (IMO, 2007). Emphasis is given that a preference is given to persons who have a degree in management, engineering or physical science, or an experienced certified ship officer. On the other hand, section 11 of Part A of the ISPS Code requires each shipping company to designate a person to act as the CSO for one or more ships, depending on the number or types of ships the company operates. The qualification and training standards for a CSO are clearly stated in the ISPS Code.

In a case of an accident a ship operator should be in the position to prove conformance with the above commercial and regulatory obligations. Otherwise, the company will be financially exposed to claims. One of the main threats for a ship is collision with another vessel. According to the 1972 International Rules for Collision Avoidance (COLREGS), collision is a situation where the blame falls on both parties. The collision is a hazard that could put at risk at least two vessels per incident. As per COLREGS requirements when two power-driven vessels are crossing so as to involve risk of collision, both ships should take action in order to avoid the collision (Chauvin and Lardjane, 2008). The consequences of a ship collision were examined in the past in terms of pollution (IMO, 2008a), structural damage (Tagg et al., 2002), stability issues (Vanem and Skjong, 2004) and emergency evacuations (Vanem and Skjong, 2005). Pedersen and Zhang (2000) suggested that for side shell damage due to ship–ship collisions, larger vessels are expected to have somewhat smaller damage relative to the dimensions of the ship than smaller vessels.

Early studies remarked that collision avoidance proficiency undoubtedly has elements of knowledge and skill such as regulatory and procedural knowledge, understanding ship handling characteristics and use of navigation equipment, which can be successfully taught, learned, and assessed in conventional ways (Taylor, 1998). At present, due to technological advances and to new maritime regulations, there is an increasing demand for new nautical marine instruments to be installed in the bridge, and the breadth of navigational information complicates on-duty officers' decisions (Tsou and Hsueh, 2010). Stitt (2003) argued that some navigation equipment such as Automatic Identification System (AIS) will be a useful tool to provide additional information, but should not alter the way in which the COLREGS are to be applied. Nevertheless, Chauvin and Lardjane (2008) in their study noticed that deck officers do not always perform a maneuver according to COLREGS. From the above literature, the results for a ship involved in a collision could include loss of life, damages to own ship, to other ships and to the environment. In a collision incident/accident, the most likely cause would be human error on both ships involved. Therefore, the ship operator will be liable for own damages and damages to third parties.

In this paper, it is proposed that ship operators should be able to measure crucial managerial issues by using a measurement system. Drawing from the above literature review, it appears that the key elements that should appear in such a measurement system are customer satisfaction, regulatory compliance, human resources and emergency preparedness. In Section 2 the literature is extended to identify benefits and weaknesses from existing measurement systems used in the shipping industry. Section 3 proposes a research methodology of a management system tool