

Maritime Casualties and International Regulations

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1. Prologue

In London, on 20 January 1914, the International Conference on the Safety of Life at Sea concluded the establishment of a Convention, which had been considered since April 1912 when the passenger ship "Titanic" collided with an iceberg and sank claiming 1500 lives.

This international convention, SOLAS, was amended in 1929, 1948, 1960 and 1974, and is now called "SOLAS 1974 as amended" (hereafter called "SOLAS 1974").

The formulation of SOLAS regulations, so far, especially amendments, has been closely associated with the occurrence of marine disasters.

Since SOLAS 1974 was adopted, the International Maritime Organization (IMO) has agreed that any technical regulations may be amended by a tacit acceptance procedure. This tacit acceptance system enables early implementation of adopted technical regulations, and is based upon the consideration that existing practice must be changed when unacceptable casualties occur.

However, there have been concerns over indiscriminate formulation of an international regulation based on maritime casualty. The casualty of the passenger ship "Herald of Free Enterprise", which sailed with an open bow door and capsized off Zeebrugge harbor, called forth considerable debate in IMO meetings as to a preventive measure in relation to structural change. Critics contend that mere operational failure cannot be a justification for a change in ship structure.

Recently, the Formal Safety Assessment (FSA) system has been attracting international interest and is considered in the IMO for possible adoption as international regulation. The FSA, a scientific and systematic approach to safety procedures, if adopted, will serve as a guidelines for formulating international regulations.

The looming question is, however, can a result obtained by FSA be as influential on the adoption of new regulations as is a serious disaster? Would an FSA outcome persuade people of the

necessity of new regulation, especially in relation to structural change of an existing ship? It is thought that in spite of the adoption of new regulation based on FSA, hasty extraordinary decisions by IMO for adoption of new regulations following internationally sensational maritime disasters may continue.

The classification societies of China, Japan and Korea, i. e., CCS, NK and KR are presently working together on an FSA study from the viewpoint of the Asian region, taking into account the gravity and possible influence of the FSA on the marine industries of China, Japan and Korea. It will be worthwhile to review briefly the FSA system and its prospect in this KIN - CIN Joint International Symposium on the Safety of Shipping and the History of Maritime Communication.

This paper also discusses the human element issues which are under serious consideration in IMO in relation to maritime casualties which occur due to human error.

2. The inter-relation of Maritime casualties and IMO regulations

1) SOLAS and its amendments

On the 14th of April 1912, just before midnight, a passenger ship, "Titanic", collided with an iceberg in the Atlantic Ocean on her maiden voyage from Southampton, England to New York. As a result, 1,500 passengers and crew died and the luxury cruise liner sank.

In the ensuing official investigation, various problems affecting the safety of the ship were revealed and an international conference was called to devise a set of international standards for the safety of life at sea. The resulting Convention, adopted in London on 20 January 1914, set standards related to the safety of navigation, subdivision, fire safety, and radio communication of ships.

This so called "SOLAS Convention 1914" was amended in 1929, especially to accommodate additional regulations on the prevention of collision. It was further amended in 1948, 1960 and 1974. It is noteworthy that these subsequent amendments were in general due to the necessity for compatibility with the development of ship technology, in particular the following rearrangements:

1948 SOLAS Extended application to ships of 500 gross tons and over and subdivided regulations further to replace the existing 1929 SOLAS.

1960 SOLAS Newly included the regulations on nuclear ships and rearranged the whole text to replace the existing SOLAS 1948, as this was the first Convention adopted since the official

establishment of IMCO in 1958.

1974 SOLAS Adopted a tacit acceptance procedure for technical amendments and rearranged the whole text to replace the existing SOLAS 1960, but fixed the title of SOLAS as "SOLAS 1974 as amended," despite further amendments to SOLAS 1974.

This decision to establish a tacit acceptance procedure in 1974 is important as it permits automatic implementation of adopted technical regulations at a pre-arranged date.

Previously, it was very difficult to fulfill the conditions for implementation prescribed in the Convention as the 1960 SOLAS requires that any amendment comes into force twelve months after the date on which the amendment is accepted, in writing, by two-thirds of the contracting governments.

In fact, under that explicit procedures, there have been six times amendments adopted to the 1960 SOLAS, but none of them were implemented.

Thanks to this tacit acceptance procedure of the 1974 SOLAS Convention, a new regulation adopted in the IMO has been brought into force without delay. The 1981 amendments to SOLAS entered into force in 1984; the 1983 amendments in 1986; and the 1988 amendments in 89/90/92.

Also, since then, immediate response by the IMO in order to prevent recurrence of a serious sea casualty became possible without holding an international conference to amend SOLAS, as the technical amendments are adopted by an expanded MSC.

In fact, after May 1980, when SOLAS 1974 was adopted, SOLAS amendments were made so frequently that any maritime casualties occurring since then contributed to the SOLAS amendments anyway.

The followings are typical examples of maritime casualties which initiated SOLAS amendments.

- The capsizing of the Herald of Free Enterprise

In March 1987, the ro-ro ferry "Herald of Free Enterprise" lost stability when sea water was trapped in the car decks. The ship capsized and 189 passengers died. The IMO took immediate action to amend SOLAS to include the new requirements of the 1st and 2nd set of amendments.

The 1st set of amendments was entered into force on 22 October 1989 and the 2nd set of amendments on 29 April 1990.

The 1st set of amendments include:

- the indication lights on the navigation bridge indicating that the bow door was closed
- television surveillance or a water leakage detection system in ro-ro cargo spaces
- supplementary emergency lighting in all public spaces

The 2nd set of amendments include:

- Strengthening damage stability requirements for passenger ships, i. e., stability is maintained taking into account such factors as crowding of passengers onto oneside of the ship
- Masters to be supplied with data necessary to maintain sufficient intact stability, i. e., trim and operational limits

- Fire in the Scandinavian Star

On April 7, 1990, 159 lives were lost in the M/V Scandinavian Star which caught fire near the Norwegian coast. It was found that the absence of sprinklers on board the ship increased the number of victims. The IMO immediately embarked on the development of regulations that would prevent the recurrence of such an incident.

Major changes have been made in the requirements of chapter II-2 dealing with fire protection on new passenger ships. These changes include the fire integrity of bulkheads and decks, means of escape, fire pump size, etc., but the most significant requirement was to equip passenger ships carrying more than 36 passengers with automatic sprinklers.

- Foundering of the Estonia

The ro-ro ferry Estonia lost her bow doors in rough seas causing flooding in the car decks and sinking. 900 passengers died. The IMO immediately set up a panel of 20 international experts to recommend safety measures for ro-ro passenger ships. The SOLAS was amended in many aspects, inter alia, the installment of a collision bulkhead, according to the recommendation of the Panel of Experts.

2) MARPOL and its amendments

Like SOLAS, the MARPOL Convention was adopted as a consequence of serious maritime casualties. MARPOL 73/78 was adopted after a series of maritime casualties, inter alia, the grounding of the Torrey Canyon in 1967 off England's coast, the Argo Merchant in 1976 off the US east coast and the Amoco Cadiz in 1978 off the French coast, all of which resulted in tremendous oil-spills. Among them, the casualty of the Torrey Canyon brought an immediate international action through IMO, which adopted "the International Convention relating to Intervention on the High Seas in cases of Oil Pollution Casualties, 1969".

The Torrey Canyon casualty was so catastrophic that some 117,000M/T oil carried on board leaked into the sea. The British government decided to send an air strike force to bomb the ship and incinerate the remaining oil before there was total leaking into the sea.

The Argo Merchant casualty, which spilled some 32,000 M/T of oil, was the worst oil pollution case of all of the eleven major oil spill accidents on the US east coast since 1969. With this accident, President Carter made the statement that the US government would take every possible action to protect the US coasts from oil spills.

The Amoco Cadiz grounded and foundered due to failure of the steering gear and spilled some 170,000 M/T's of oil into the sea.

This disaster had eventually brought about the 1978 TSPP Conference where the 1978 PROTOCOL was added to MARPOL 1973 and the 1978 SOLAS PROTOCOL was adopted.

The MARPOL73/78 Convention (Annex 1), which combined MARPOL 1973 and the 1978 Protocol for a simultaneous world-wide implementation, was actually entered into force on 2 October 1983. For ships built before 1980, however, the requirements for installation of the sloptank and the oily water separator were given 3 years of the period of grace.

The Amoco Cadiz case was also the basis for the Paris Memorandum 1982, which was adopted by 14 European states requiring inspection of foreign ships by a port state and detaining sub-standard ships.

Another noteworthy maritime casualty relating to oil pollution is the grounding of the Exxon Valdez.

Shortly after midnight on March 24, 1989, the Exxon Valdez ran aground in Prince William Sound, Alaska, spilling more than 37,000 tons of crude oil. It was the largest tanker spill in United States history. This accident shocked the United States Congress which then passed the Oil Pollution Act 1990 (OPA 1990), which ruled that every tanker visiting US ports must be retrofitted with double hulls or retired in accordance with a timetable that began in 1995.

The IMO also adopted this double hull tanker requirement through the amending of Annex 1 of MARPOL73/78. This regulation, however, different from the OPA of the US, includes some alternative solutions such as hydrostatic balanced loading and mid-deck tanker. The IMO also adopted a new international convention providing for prompt reaction to oil spills. This International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990 was adopted in November 1990. Provisions are included in the Convention requiring ships and offshore platforms to have an oil pollution emergency plan.

3) Other Conventions adopted following maritime casualties

The International Convention on Standards of Training, Certification and Watchkeeping for

Seafarers, 1978 (STCW 1978) was adopted through a long discussion in the STW Sub-Committee of IMO. This Sub-committee was established in 1971 following the catastrophic disaster of the Torrey Canyon in 1967.

One of the lessons learned from the disaster was that the casualty could have been avoided if the crew had performed their duty properly.

The International Convention on Civil Liability for Oil Pollution Damage, 1969 was adopted after the Torrey Canyon disaster. This legislation dealt with compensating coastal states for the tremendous amount of damage and costs inflicted on their coastal waters.

The International Convention on Salvage, 1989 was adopted after the Amoco Cadiz disaster, which resulted in the amending of the existing principle of "No cure, no pay" in the 1910 Assistance and Salvage Convention. It was agreed that a No cure no pay principle cannot properly deal with a serious oil pollution accident.

3. FORMAL SAFETY ASSESSMENT (FSA)

FSA has been proposed to the IMO as an approach to marine safety which involves using the techniques of risk and cost-benefit assessment to assist in the process of establishing rules and regulations which will govern international shipping. It was first developed as a safety management tool in the 1970s. Since then, it has been adopted in a number of countries and in many industries such as the nuclear power industry, chemical process plants and the offshore hydrocarbon exploration and production industries. The shipping industry worldwide is now examining the approach through the IMO to see how it could be of benefit in the regulation of shipping safety.

The benefits of FSA as a regulatory tool within IMO include:

- a consistent regulatory regime which addresses all aspects of safety in an integrated way;
- cost effectiveness whereby safety investment is targeted where it will achieve the greatest benefit;
- a pro-active approach enabling hazards that have not yet given rise to accidents to be properly considered;
- confidence that regulatory requirements are in proportion to the severity of the risks;
- a rational basis for addressing new risks posed by ever changing marine technology.

FSA is a systematic approach and a systematic methodology aimed at enhancing marine safety, including protection of life, health, the marine environment and property by using cost/benefit assessments. The purpose of the FSA methodology is to be able to compare and rank hazards and

their underlying causes in terms of risk and then to be able to identify and rank proposals for risk control in terms of associated costs and benefits.

The main focus of the FSA methodology is the consideration of hazards posing a threat to safety of life. The methodology is, however, equally applicable to environmental, commercial or economic risks. In considering the costs and benefits associated with any particular safety of life risk-reduction measure, the methodology includes consideration of environmental and commercial /economic effects.

The FSA methodology comprises basically the following steps:

- Identification of hazards;
- Assessment of risks (frequency and consequence) associated with those hazards;
- Consideration of alternative ways of managing those risks;
- Cost benefit assessment of alternative risk management options;
- Decision on which option to select.

Substantial progress has already been made in the development of the FSA methodology that will help IMO approach safety in a risk-based, pro-active, comprehensive, consistent and cost effective way. When fully implemented, FSA will lead to an improved regulatory regime for international shipping. The research conducted and the work already concluded demonstrates the practicability and potential effectiveness of the FSA methodology's application to all maritime industries.

Example of FSA Implementation

KR is developing a project in which the FSA methodology is being applied: a structural safety assessment system (1). This research assesses the extent and probability of flooding in holds and uses steps 2 and 3 of the FSA methodology.

The research proceeds with the following steps:

- Working of modules such as load assessment, strength assessment, fatigue strength analysis, etc.
- Thickness loss modelling
- Accident scenario such as collapse of structural members
- Fault trees (yes - no in every collapse mode)
- Comparing structural safety according to the shape and arrangement of each structural member.

4. Maritime Casualty and Human Elements

It is widely known that the human factor contributes to the majority of marine accidents at sea. Data supplied by a UK insurance club indicates that only about 12% of major claims involve

structural failure. Extrapolating from this data then, about 80% of marine accidents are "human error" accidents. Even structural and mechanical failures may occur as a result, due in part to a lack of maintenance, which, in itself, is a matter of human failure related to prior human error. It was only in 1989 that IMO adopted Resolution A.675(18) committing the Organization to examine the human element amid growing evidence that the great majority of maritime casualties have been caused by poor management and operations rather than inferior structures, machinery and equipment.

As a consequence of gaps in the present safety environment, it is understood that the human element must be addressed to achieve further improvements. Only a complete perspective of the vital balance and interaction between the "hardware" and the "software" (human ware) can lead to improved safety and the prevention of losses.

As mentioned earlier, the software is a major domain which should be highlighted in dealing with marine casualties. IMO has requested that member governments in investigating marine casualties determine exact causes. If an accident is believed to have been caused by human error, this result of the investigation must be reported to IMO so that action can be taken as necessary.

In this context, IMO has developed Assembly resolutions and Circulars in order to provide member governments with guidelines as to how to deal with the human element in maritime casualties. However, the most important step taken by the IMO in relation to the human element issue was that the new chapter 9 of SOLAS on safe management was adopted, and, subsequently, the ISM Code was developed and will be implemented internationally on 1 July 1998.

1) Assembly resolution on "Human element: vision, principles and goals for the organization"

This resolution declares that the vision, principles and goals of the IMO should be taken into account by IMO Committees and Sub-committees, especially in terms of the human element, when they are in the process of developing regulations.

2) Code for the Investigation of Marine Casualties and Incidents

The aim of this Code is to promote a common approach to the safety investigation of marine casualties and incidents, as well as to promote cooperation between States in identifying the

contributing factors leading to marine casualties. The objective of any marine casualty investigation is to prevent such casualties in the future. Investigations identify the circumstances of a casualty and establish the causes and contributing factors to the accident in order to understand why it happened and to prevent it from happening again.

Flag States should ensure that investigations are conducted into all casualties occurring to its ships. Where a casualty or incident occurs within the territorial waters of a State, the flag State and the coastal States should cooperate to the maximum extent possible and mutually agree which State should take the lead role in the investigation.

When a marine casualty investigation is carried out, it must be thorough and unbiased if it is to be effective in establishing the circumstances and causes of a casualty. Only through cooperation among states with a substantial interest in the casualty can a full analysis be made.

As soon as possible, the lead investigating State should ensure that a draft of the casualty report is sent to the substantially interested States, inviting their comments on the report. If the lead State receives comments within a mutually agreed period, it should amend the report draft to include the comments. If no comments are forthcoming, the lead State should submit the final draft to IMO for publication.

3) Code to assist flag states in the implementation of IMO instruments

These Guidelines are intended to provide flag States with a means to establish and maintain measures for the effective application and enforcement of major conventions for ship safety and pollution prevention, i. e., SOLAS, MARPOL, LL and STCW Conventions. These Guidelines include the specification for the obligation of flag states to provide qualified investigators who have a working knowledge and practical experience to conduct a proper investigation for marine accidents.

4) MSC/MEPC Circular on "Role of the human element"

This circular introduces a taxonomy on the human element in order to facilitate the work on the role of the human element with a view to promoting its use by member governments in reaching a common understanding of certain words and phrases relating to the human element, including "human error, alcohol/drug use, fatigue, excessive workload, inadequate knowledge of ship operations, poor job design and lack of perception, etc".

5. Epilogue

International Conventions will continue to be amended whenever a major maritime disaster occurs as has been the case in the past. Now, however, the international maritime community realizes the necessity of developing international regulations even without maritime disasters, in order to prevent accidents from occurring.

The FSA, in that context, will be the most important methodology that can be used in the shipping, shipbuilding and other maritime fields in the future.

The IMO recognizes that maritime casualties will never cease to occur unless the human element, in relation to maritime activities, is properly dealt with.

Therefore, the FSA and the human element have become the two major agenda items in IMO. It is obvious that mandatory regulations in relation to these two issues will be further brought forward.

The writer wishes to emphasize that matters relating to the human element can be more effectively thought out and pursued in the Asian maritime communities in light of the prevailing activities taking place in the areas of shipping, shipbuilding and crew manning.

It may be true that there has been a trend in IMO wherein the European states go forward in developing new regulations while the Asian countries deter them.

The recent capsizing of a passenger ship in an Asian country claimed 300 lives did not arouse the IMO's concern, while the capsizing of a passenger ferry in Europe, claiming fewer than 200 lives, led to comprehensive amendments to the safety Convention.

Asian maritime communities are able and should be more active in contributing IMO's efforts towards the development of measures for preventing maritime casualties.