Maritime Casualties Occurred Onboard Ships Registered under the Central American Region Flag States

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Abstract

This research is based on the information compiled on the occurrence of maritime casualties onboard ships registered under Central American Region (CAR) flag States. Due to nonexistence of writing reports in anyone of the countries that are integrating this Region, the information was compiled by the author through personal communication with the people involved in the casualties. The information was compiled by typing up the text and digitizing on the computer for the respective data base. For each casualty occurred, the following information was compiled, date and type of the casualty, position of the ship at the time of the casualty, dimension of the ship, number of people affected by the casualty, and cause and consequences of the casualty. Based on the number of people affected (death and disappear) by the casualties occurred was calculated the mortality rate by 100,000 persons and then compared with the Japanese mortality rate. Furthermore were analyzed the CAR maritime authorities competences and then were compared to that the Japanese counter part. In addition, the implementation rate of the International Maritime Organization (IMO) and International Labor Organization (ILO) conventions ratified by the CAR countries were analyzed. The objective of this research was to compiled and analyze the occurrences of maritime casualties happened on board the ships registered under the CAR Flag States, in order to determine the causes of these accidents. The results of the analysis enable us to better understand of the maritime safety situation of the ships that are registered under the CAR flag States. In order to reduce the occurrence of maritime casualties are proposed a series of measures based on the differences found then the comparison between CAR and Japan. Based on the results of this research, is possible to conclude that the inaccessibility of atmospheric information and the lack of safety measures onboard has been the main cause of the maritime casualties happened in the Pacific side of the CAR.

Keywords: Maritime Casualties, Central American Region, Maritime Safety, Maritime Traffic, Fatality Rate

1. Introduction

CAR and their Maritime Casualties Problematic

According to the provisions of article 94 of the United Nations Convention on the Law of the Sea(1) (UNCLOS), as duties of the flag State “each State shall cause an inquiry into every marine casualty or incidents of navigation on the high seas involving a ship flying its flag and causing loss of life or serious injury to national of another State or the marine environment, the flag State and the other State shall cooperate in the conduct of any inquiry held by that other State into any marine casualty or incident of navigation”. Also, under relevant IMO conventions, such as SOLAS(2) regulation I/21 and MARPOL 73/78(3) articles 8 and 12, “each Administration undertakes to conduct an investigation into any casualty occurring to ships under its flag subject to those conventions and to supply the IMO with pertinent information concerning the finding of such investigations”. The Load Lines Convention(3) article 23 also requires the investigation of casualties. In addition to these international regulations, many countries around the world who have rights on their line coast have issued national legislation on maritime casualties and marine pollution that can occur in their maritime jurisdiction. In compliance with the international regulations mentioned above, many countries have established specific authorities to carry out maritime casualty investigations, such MAIA in Japan, MAIB in the United Kingdom, and NTSB in the USA. According with Porras et al(4), in spite of the existence of international conventions

ratified by some countries that are conforming the CAR and national regulation with respect to the occurrence of

maritime casualties and marine pollution, the information concern to the majority of maritime casualties occurred in this Region, have not been reported in official documents. Based on this, is it evident the nonexistence of maritime casualties register and analysis in all CAR. At this point, it is important to emphasize about the relevance for any country of have a adequate data base on the maritime casualties occurred, because based on the data compilation process, it is possible to carry out the scientific analysis in order to determine the cause of these casualties and so to decide that measures to reduce these accidents may be taken. Also, based on Porras et al[5], the Maritime Sector of the CAR is supported by the existence of one defined maritime organization coordinated by national, maritime and port authorities, which are also supported by national legislation. In general, the CAR maritime authorities have among their responsibilities competences such as harbour master control, vigilance maritime (in some countries under the Naval Forces coordination), Port State Control; in addition, they also have responsibilities on ships and crews related to competences such as Ship Property Register, Ship Inspection Certification, Ship Navigation Certification, Tonnage Certification and Crews Competences Certification. In this work, the information collected about the maritime casualties occurred between 1980 and 2004 on the Pacific side of the CAR was analyzed and the results obtained are presented.

2. Method

Each one of the countries located in the Pacific side of the Central American Region, was visited by the researchers for the Data Compilation Process. In each country, all the possible information sources were visited and consulted: Coastguard Service, Government Naval Forces, major Newspapers, Harbor Master Office, COCATRAM office (Maritime Transportation Central American Commission), Fishermen Cooperatives, Government and Regional Fishery Departments, ILO Regional Office, IMO Governments Delegates. However, due to the lack of historical reports available at these offices and entities, the researchers were forced to collect the information via personal communication in each of these countries. The researchers obtained information from sources such as maritime workers associations and cooperatives, Fishermen Cooperatives members (El Salvador, Guatemala and Nicaragua), fishermen independents, and ship-owners. In addition, researchers compiled all the information contained in the neglected daily hand workbooks that were kept since 1980 by the Coast Guard Service of Costa Rica. The information was compiled by typing up the text and digitizing on the computer for the database. For each accident, the following information was compiled; date and type of the accident, position of the ship at the time of the accident, building material and length, type of ship involved in the accident, number of people affected by the accident, and cause and consequences of the accident. During the investigation, near 3,000 data entries were compiled and then analyzed.

Furthermore weekly sea surface temperature satellite images and information about hurricanes and tropical torments, corresponding to the selected period of time were obtained from National Oceanographic Atmospheric Administration (NOAA)[6] and analyzed. Based on the compiled information and existing census[7], the Central American Region mortality rate was calculated and then, the result was compared to the Japanese mortality rate, which was based on calculated the information provide by Japan Coast Guard Statistics[8], Marine Accident Inquiry Agency[9] and Japan Fisheries Agency[10].

On the other hand, the analysis of the CAR maritime organization components was carried out based on the information compiled from each of the CAR countries. All the information was obtained from the respective CAR maritime authorities[11], national legislation and the existing IMO[12] and ILO[13] international conventions related to maritime affairs and ratified by this Region. The data on different authorities (national, port and maritime), were analyzed for their specific competency in aids to navigation and lighthouse operation and maintenance, harbour master control, maritime vigilance control and port state control. In addition, their competency with respect to the ships and crews, such as ship property register, ship inspection certification, ship navigation certification and ship tonnage certification were also analyzed. Furthermore, their competency with respect to the maritime education and the crew competency certification as well the legislation in which the maritime authorities based their competency were also analyzed. In order to establish a comparison parameter, the compiled CAR information was compared with the Japanese compiled information obtained from the respective sources. From the comparison, the differences among the CAR and Japan organization were obtained. The reason why Japan was selected as the country of comparison with CAR is because Japan is an island country with long maritime tradition and it has a record of maritime casualties. The other important reason, which can be observer in Fig.5, is based on the historic decrease of the number of Japanese fatalities and missing persons occurred onboard from 1980.

3. Results

3.1 Type of ships involved in the maritime casualties

The type of ships that was involved in the maritime accidents on the Pacific side of the Central American Region between 1980 and 2004 are presented in Fig. 1. Fig. 1 shows that 95% of all maritime accidents happened onboard on fishing boats.

Fig. 1 Ship's type involved in the maritime casualties occurred

3.2 Maritime casualty's types occurred on the CAR

Based on the compiled data, various types of maritime casualty's occurrences between 1980 and 2004 on the CAR are graphed as Fig. 2. Fig. 2 shows that Capsize (41%) and Machinery Failure (36%) account for the majority of the maritime accidents in this Region. The occurrence of other types of maritime accidents was relatively low and included Ships Missing (7%); Sinking (6%) and others (10%).

Fig. 2 Maritime Casualties types occurred

3.3 Ships characteristics and their incidence within the maritime casualties occurred

The analysis of the information obtained during this research revealed that the characteristics of the ships, specifically decked or undecked, played significant role in the occurrences of accidents. Figure 3 presents the characteristics of the ships that
encountered maritime accidents between 1980 and 2004.

Fig. 3 Ships characteristics and their incidence within casualties

The maritime casualty's types occurred between 1980 and 2004 are tabulated as percentages according to the ship's characteristics in Table 1.

Table 1 Casualty's types occurred onboard undecked and decked ships, expressed as percentages

	Undecked ships	Decked ships
Capsized	65%	----
Machinery failure	21%	60%
Ships Missing	9%	3%
Grounding	----	9%
Flooding	----	9%
Sinking	4%	7%
Collision	----	6%
Fire	----	6%
Thunderbolt	1%	----

3.3.1 Undecked ships characterization

Those ships characterized as undecked vessels (shown in Photo 2) are generally shorter than 8 meters in length, propelled by one or two outboard motors and usually constructed of fiberglass. Today, fishermen onboard undecked vessels sail over 100 nautical miles in search of sharks without any type of communication device and generally only equipped with GPS and magnetic compass. These undecked vessels accounted for 63% of all the maritime accidents compiled in this Region.

Photo 1 Undeck type of ship used in this Region

3.3.2 Decked ships characterization

On the other hand, decked ships (shown in Photo 2) are generally longer than 8 meters in length, propelled by internal motors, often with mechanical working power and usually constructed of wood. Over 50% of this fleet use second-hand engines, which are designed for land vehicles. Today the fishermen onboard decked vessels sail between 300 and 2,000 nautical miles in a search of productive fishing zones only equipped with GPS, magnetic compass and usually with SSB radio communication system. This type of ships is actually used along the Pacific side of the CAR.

Photo 2 Decked ship type used in this Region

3.4 Persons affected by the maritime casualties

Based on the information compiled during this investigation, the number of people affected by the maritime accidents on the Pacific side of the Central American Region is presented in Fig. 4. Fig. 4 indicates that the total number of persons affected (injured, dead and missing persons) by the maritime casualties has an increasing trend.

Fig. 4 Persons affected by the maritime casualty's occurrences

3.4.1 Persons affected by maritime casualties occurred in relation to ships characteristics

The influence of the maritime casualties happened between 1980 and 2004 on the persons were sorted according to the characteristics of the ships and tabulated as Table 2.

Table 2 Occurrences of Maritime Casualties

	Undecked ships	Decked ships
Deaths	867 persons (42%)	121 persons (15%)
Disappear	862 persons (41%)	174 persons (21%)
Injured	359 persons (17%)	524 persons (64%)

Table 2 shows that the combined number of dead and missing persons between 1980 and 2004 in undecked ships is almost 6 times higher than those observed in decked ships. On the other hand, the number of injured people onboard deck ships was fewer than those occurred onboard undecked ships. The possible reason is the long working hours causing fatigue and the use of mechanical systems without any safety measures.

3.4.2 Fatality Rate

Based on the number of death and missing persons caused by the maritime casualties occurred between 1980 and 2004 on the Pacific side of the CAR, the fatality rate (fatality per 100,000 persons) was calculated. In order to establish a reference point, these fatality rates were compared the Japanese maritime accident fatality rates which calculate was based on the information provided by Japan Coast Guard Statistics[8], Marine Accident Inquiry Agency[9] and Japan Fisheries Agency[10]. The right vertical axis of the Fig. 1 represents the fatality rate by 100,000 persons and the left vertical axis represents the number deaths and missing persons due to maritime casualties. The Japanese mortality rate is shown in circles and the CAR values are represented by triangles. The black vertical columns represent the number of dead and missing Japanese persons during maritime casualties occurred and the grey column represents those in the CAR case. Fig.1, shown the historic decreasing of the amount of Japanese dead and disappear persons from 1980, and the maintenance of a low fatality rate. At world-wide level the fatality rate for the maritime sector is almost unknown due to the scarce statistics information compiled by the respective governments, but from Fig. 5 is possible observed that the CAR values are too high.

Fig.5 Dead and missing persons and Fatality rate

3.5 Causes associated with the occurrence of the maritime casualties on the Pacific side of the CAR

3.5.1 Atmospheric conditions

Based on the analysis of the information compiled in this study (which included date and type of the accident, position of the ship at the time of the accident, building material and length, type of ship involved in the accident, number of people affected by the accident, and cause and consequences of the accident), was possible to conclude that the 49% of the maritime casualty occurrences on the Pacific side of the CAR between 1980 and 2004 are linked to atmospheric phenomenon, such as Hurricanes, Tropical Torments, El Nino and La Nina.

Fig 6 Influence of the atmospheric phenomena that occurred on the Pacific side of Central American Region

Fig. 6 shows the existence of an annual increase in the amount of maritime casualty's cases occurred until 1999. The occurrences of atmospheric phenomena are indicated by the arrows on the figure. The occurrence of the last atmospheric phenomenon in this Region is reported in 1999. However, based on the analysis of the weekly sea surface temperature satellite images archive by NOAA, this Region has continued to be affected by abnormal heating of the sea water temperature which has a similar effect to El Nino even after 1999.

Based on the above information, it can be assumed that one of the main causes of the maritime accidents in this Region are associated with atmospheric phenomena such as hurricanes, tropical storms, El Niño and La Niña.

As a result of the changes in sea temperature from El Niño and La Niña, the fish shoal tend move to areas where the ocean conditions are normal. In these cases, and according with Fig. 7, the Central American fishermen tend to have to sail further away from the coast in search of new fish ground. Due to the inexistence of atmospheric information the fishermen must move to others areas in search of fishing shoals. This is the case of thousands of fishermen, which onboard his undecked ships, must sail distances over 100 nautical miles away the coast, without any safety measures and any communication measures. A similar situation is faced by thousands of fishermen, which onboard his old decked ships, whose lengths are within 12 and 20 meters, must sail distances of 300 to 2,000 nautical miles away the coast. These situations frequently result in maritime accidents.

Fig. 7 Fishing grounds changes due to El Niño phenomenon

3.5.2 Safety measures

The Central American Region fleet is generally suitable for limit range navigation. However, the situation is that these ships do not remain within their autonomy range from the coast, and the fishermen sail long distance, with extra fuel on board, without any safety measures. Furthermore, the use of safety devices and electronic aids to navigation is not a common practice. Table 3, shows the safety and electronic navigation aids used in the CAR.

Table 3 Safety and electronic navigation aids used in the CAR

	Undecked ship	Decked ship
SSB	----	Δ
VHF	----	O
Radar transponder	----	Δ
GPS	Δ	O
Magnetic compass	Δ	O
Safety devices	----	Δ

Symbols used: ---- (0%); Δ (less than 50%) and O (100%)

3.5.3 Maritime Organization Components

The high fatality rate by 100,000 persons calculated (see section 3.4.2), was the base to suppose that the cause of this problematic would be the inexistence of a Maritime Organization on the CAR. In order to verified this hypothesis was obtained information from the CAR maritime authorities[11], national legislation and the existing IMO[12] and ILO[13] international conventions related to maritime affairs and ratified by this Region. From the information acquired the data on different authorities (national, port and maritime), were analyzed for their specific competency with respect to the ships and crews. In order to establish a comparison parameter the CAR compiled information was compared with the Japanese compiled information obtained from the respective authorities.

Among the differences observed between the two organizations, one of the main findings is that the Japanese Coast Guard works as an independent authority, and mainly carries out rescue tasks in maritime casualty events. They also conduct an investigation on each maritime casualty and write reports of all maritime casualties. In addition, the Coast Guard provides weather information to the maritime sector. In contrast, the CAR Naval Forces or Coast Guard Service only carries out the maritime vigilance function and rarely performs any rescue tasks. Table 4, shows the differences encounter between CAR and Japanese Coast Guard.

Table 4 Differences encounter between CAR and Japanese Coast Guard functions

Function	CAR	Japan
Maritime Vigilance	O	O
Aids to Navigation & Lighthouse	----	O
Rescue tasks	----	O
Atmospheric information transfer	----	O
Maritime Casualties Investigation, Report and Data base compilation	----	O

Symbols used: ---- (0%) and O (100%)

In reference to the Maritime Authority case, the Japanese organization carries out additional four tasks that are crucial in the prevention of maritime casualties. Such tasks are related to the Maritime Authority's competency of Ship building, Ship Machinery, Ship Safety Standards and Ship Technology. Fig. 8, shows the differences encounter between CAR and Japanese Maritime Authority.

Fig. 8 Differences encounter between CAR and Japanese Maritime Authority functions

4. Conclusions

Based on the information compiled the following conclusion was drawn:

In spite of the existence of a clear Maritime and Port Organization support by the presence of National Regulations and International conventions ratified by the CAR, there is not component within the CAR Maritime Organization that has assigned the responsibility of carrying out the investigation, write and submit the respective report during the occurrence of Maritime Casualties on board. This is the possible reason why government or any other official records are available recording these casualties. At the same time, the fact that the 49% of the maritime casualty occurrences on the Pacific side of the CAR between 1980 and 2004 are linked to atmospheric phenomenon such as hurricanes, tropical storms, El Niño and La Niña, is a clear indicator that this Region do not yet have the appropriate means to transfer atmospheric information to the maritime sector. The high amount of persons that annually dead and disappear obey to the non existence of rescue tasks, non practice of safety measures and the reduce maritime components employed by the CAR maritime authorities in the prevention of the maritime casualties.

5. Recommendations

In order to reduce the number of maritime casualties and hence the high amount of dead and disappear persons that occurs annually in the CAR, it is important to consider implementing a series of maritime casualty avoidance measures. Based on the results of this study, the following recommendations could be carried out by the CAR maritime authorities and governments.

It is fundamental to consider that this implementation of maritime casualty avoidance measures could take advantage of the existing resources in the CAR countries such as weather stations; vigilance ships, aircrafts and works base, scientific staff, organized groups, maritime education, hospitals and other facilities that could be used to attend regional casualties.

A second aspect that cannot be ignored for this implementation is the existence of a limiting factor, which is conforming by the reduced range of the ships and aircrafts used by the CAR authorities in order to watch over their EEZ. Considering the existence of fishing grounds located outside the Economic Exclusive Zone (EEZ), this limitation could be compensated by the voluntary adoption of the ship reporting system on the part of the CAR fleet and the active participation and collaboration through signed agreement with USA Naval Forces fleet that monitor the Pacific Coast of CAR in order to prevent maritime way drug traffic.

Based on the differences founded by Porras et al [(5)] between the CAR and Japan's maritime organization, we propose here the implementation of maritime casualty regional preventive measures. These measures are contained in table 4, and are based on assigning additional duties to the Coast Guard or Naval Forces through national regulations.

Table 5 Additional duties to be assigned to the CAR Coast Guard or Naval Forces through national regulations

FUNCTION	EXISTINT RESOURCES
Rescue tasks participation	Vigilance base, vigilance ships and vigilance aircrafts
Meteorological information distribution	Meteorological stations, organized groups
Maritime casualties investigation, report and data base compiled	Vigilance ships and vigilance aircrafts
Foundation of the Ship Reporting System	Vigilance base

In addition, in order to avoid the CAR marine casualties, it is important for the CAR maritime authorities to mandate measures that guarantee the effective use of electronic navigation aids and safety measures especially for those ships that work outside the EEZ. Furthermore, rigorous annual ship inspections could be added to further improve the proposed solution. The necessary education and training process could be supported by the respective CAR Maritime Education Centers. If a maritime casualty occurs, it could be attended by the Vigilance operation base closest to the accident location.

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