The Improper Look-out that Leads to Ship Collisions in Japan

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Keywords: Improper look-out, Collision, Accident Analysis, Time occurrence zone

1. Introduction

To prevent risk of collision, International Maritime Organization (IMO) has developed rules for navigation, called as The 1972 International Regulation for Prevention of Collisions at Sea (COLREGs). In rule 5 about Look-out, it is written that every vessel shall at all times maintain a proper look-out by sight and hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and the risk of collision (Llana and Wisneskey, 2006). However, the term of proper and improper is a vague word which the criteria of proper and improper cannot be determined. Proper look-out is very important because until now most of collision was caused by improper look-out. Authors have re-analyzed ship collisions in Indonesia, Japan and UK. The results shows that the ship collisions was dominantly caused by improper look-out (Mutmainnah and Furusho, 2015 and 2016). In the previous paper, the discussion of the accident analysis are not discussing more detail about improper look-out because they focused on the methodology that can be used to re-analysis the accident. The aim of this paper is to discuss more detail about improper look-out that has dominated the cause of collision as well as the failure that effect the improper look-out. All the improper look-out will be broken out to be used as knowledge for everyone.

2. MOP Model for the Improper Look-out in Japan

There are several articles that review what the mean of proper lookout is, such as Llana and Wisneskey (2006) and The ACTs project consortium (2016). There are 3 ways of look-out that is stated in COLREGs rule 5, namely by sight, by hear and by all available means. First, by sight means observing another vessel by naked eye or binoculars. Second, by hearing means detecting another vessel by her sound signals. Third, by all available means includes using several navigational tools, such as Radio Detection and Ranging (RADAR), Differential Global Positioning System (DGPS) satellite navigation equipment, Automatic Identification Systems (AIS), Night vision equipment, Information and communication via Very High Frequency (VHF) from other vessels or Vessel Traffic System (VTS), Information from navigational warnings or any other Navigation and piloting instruments.

This paper re-analyze 20 collisions in Japanese Maritime Traffic System (MTS) to break down the failure of proper look-out or from now on, it will be written as improper look-out, as well as the causative factors that are leading to the failure (causing factors) and affected by the failure (caused factors) and analyzed by MOP model.

2.1 Collisions in Japanese MTS

The data that are analyzed in this paper refer to the collision accident reports in Japan from 2008 to 2013 published on Japan transportation safety board’s (JTSB) website. In this paper, the authors re-analyzed all the collision reports, which were written in English and published on the JTSB website between 2008 and 2013. During that period, the number of collisions that happened at day, night, and twilight were 7, 7, and 6, respectively [10]. In total, 20 collisions have been re-analyzed which involve 40 ships (JTSB, 2016).

In this study, same as our previous paper (Mutmainnah, Sulitryono and Furusho, 2015), the time occurrence has been divide into three groups, namely, day, night, and twilight time. Different with our previous paper, this research will focus on the improper look-out that is the most common failure in Japanese MTS. Authors would like to break down the detail improper look-out that lead to accidents, the caused and the causing factors.

2.2 MOP Model Analysis

MOP Model is a model developed by authors that can be utilized to describe characteristics of MTS which is a socio-technical environment system with epidemiological model concept that consists of latent condition, barriers, and active condition. Figure 1 shows MOP model image.

As shown in the figure 1, MOP model is drawn three-dimensionally as a three-sided inverted pyramid that has four corners, representing the 4M (Man, Machine, Media, and Management) factors, and six edges, representing an interaction between two 4M factors that are connected by the edges. The edges, called line relations, show that the system is a result of interactions among the 4M factors. On that figure, M1, M2, M3 and M4 means Man, Machine, Media, and Management, respectively. Failures that are classified into the corner of the MOP model do not occur only because of that particular corner. Often, the failure is caused by other corner which means the corners are related. It implies that the line relations connecting those corners are also contributing to the instability of the system.

There are to steps in MOP model to characterize accidents in MTS. First is Corner Analysis (CA) that represented by the 4 M factors and second is Line Relation Analysis (LRA) which is connecting between 2 factors.

2.2.1 Corner Analysis (CA)

In this step, all failures that caused accidents are traced and...
listed, called causative factors (CF), and then divided based on the definition of each corner of the MOP model. Three steps of accident development are also carried out in this stage: the beginning of the accident, the accident itself, and the evacuation process; these stages are labeled as Stage 1, Stage 2, and Stage 3, respectively (Nurwahyudi, 2014).

2.2.2 Line Relation Analysis (LRA)

This line relation analysis step connects one corner to the other corners that are related to the causative factors that occurred, such as those caused by other factors even affecting others. The causative factor in a corner that is related to another corner is marked to the related corner, and then the line relation that connects these corners is obtained.

In this study, authors would like to provide the new development of MOP model in this step. The analysis focus on how is the line relation of improper lookout from the previous step. The connected CFs other than the listed improper look-out are traced so then the factors that causing improper lookout and factors that caused by improper look-out can be known.

3. Results and Discussion

After getting the result that improper look-out (M11-02) is the most common CF, the improper look-out is broken down in more detail. Based on explanation above, improper look-out is divided into 3 ways, namely by sight (M11-021), by hearing (M11-022) and by all available means (M11-023). However, there is additional improper lookout named as M11-024 (at all). This improper look-out means that the seamen of the ships were not conduction any proper look-out neither by sight, hearing, nor all available means.

From the analysis, we could not get any special characteristics for each time occurrence. Most probably because the number of cases that being re-analyzed are not so many. However, we can get 8 CFs that are affected or affecting improper lookout, namely M11-03: careless in monitoring/identifying any accident risk, M11-04: careless by misunderstanding condition (wrong judgment), M11-06: careless in deciding course alteration, M11-09: careless in blasting sound signal, M12-01: lack of knowledge in operating navigational equipment (unfamiliar), M13-01: Focus of the seamen was destructed, M14-01: Master was not on the bridge, and M43-01: Poor Application of Safety Management System. From 8 CFs, only 1 CF that is not belong to M1. It means that failure in keeping proper look-out is highly related to other M1.

CF that the most causing factor to the improper look-out is M13-01: Focus of the seamen was destructed. There were 12 ships that were not focus in conducting look-out because there are several things to do. In example, on fishing area, there were many fishing vessels around, thus the vessel A was focus to avoid vessel C, D, etc, then did not realize that there were vessel B in front of the vessel. Other example, a fishing vessel was engaging in fishing activity and did not maintain look-out.

Improper look-out affecting other CF in M1. The most affected CF is M11-03: careless in monitoring/identifying any accident risk. This CF is also have high number of failure. Out of 23 failures, 13 of them happen because of improper look-out. It make sense because if seamen fail to maintain proper look-out at Stage 1 on the development of accident, seamen will fail to identify any accident risk as well as if it happens at stage 2.

Seamen will fail to monitor the accident risk.

4. Conclusions

MOP model has been more developed in this paper until 2nd step, namely Line Relation Analysis in detail. Here are some conclusions that authors gain from this study:

1. MOP Model can be more developed depend on the aim of analysis.
2. The most common causing CF that lead collision in Japanese MTS is improper look-out.
3. CF that causing improper look-out mostly is focus of the seamen was destructed (M13-01) from M1 and CF that caused by improper look-out mostly is careless from seamen in monitoring/identifying any accident risk (M11-03) from M1 as well.

References

(1) Japan Transportation Safety Board’s (JTSB) (2016), http://www.mlit.go.jp/jtsb/marrep.html