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Analysis of Dominant Factor on The Effects of Shipping Accidents Bassed on National Transportation Safety Committee (NTSC) Investigation

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Abstract. Sea Transportation technically cannot be separated from safety factors. In this case, cruise safety system is the key factor that should always be a concern. There are a few things that need to be fulfilled to make sure the safety of the cruise, so it can be considered as seaworthy and get permission to sail with the published of cruise agreement letter by the local harbormaster. Ship is one of contents in National Cruise Safety Reference in Indonesia which it is stated on Constitution number 17, 2008 about cruising. Graphic shows that sea accident over the year is increasing with a disserve impact. The main purpose of this research is to find out the most dominated cruise accident case based on National Transportation Safety Committee (NTSC) investigation in Jakarta. The burnt ship is being the major concern in this case. Based on the report of National Transportation Safety Committee (NTSC), several cases that cause the ship accident, like: human error, technical factor, and load factor. The conclusion of this paper is to identify which dominant factor that can be the cause of ship accident, and also the efforts to minimize the fire accident to happen.

Keywords: sea transportation, accidents, fire, cruise safety

1. Introduction

Sea transportation is one of the transportation sectors which has an important role to support people's movement and transport activity. sea transport also has a role in trading support between islands which has been one of the government's target in making economy development. [1]

Sea transportation technically cannot be separated from safety factor. Dangers that still become threats are storm, fog, and sea movement such as wave, current, coral reef. That makes the safety aspect needs to be prioritized and guaranteed. National Cruise Safety Reference in Indonesia about ship as a sea transportation is stated on Constitution number 17, 2008 about cruising in chapter I about general provisions article I section 34 "Cruise safety is a ship condition that already fulfill material requirement, construction, structure, engine and electricity, stability, arrangement and equipment including rescue tool equipment and radio, ship electronics, which proven by certificate after several check and test be done". [2], [3]

Several factors concerning ships accident consist of human error, technical factor, load factor. Accordingly this research is aiming to know the dominant factor that causes such issue. This research focuses specifically on all territorial waters in Indonesia. Therefore the result of this research is expected to get an insight and also how to overcome or to minimize ship accident happening.

The following is the percentage of cruise accident cases in Indonesia:

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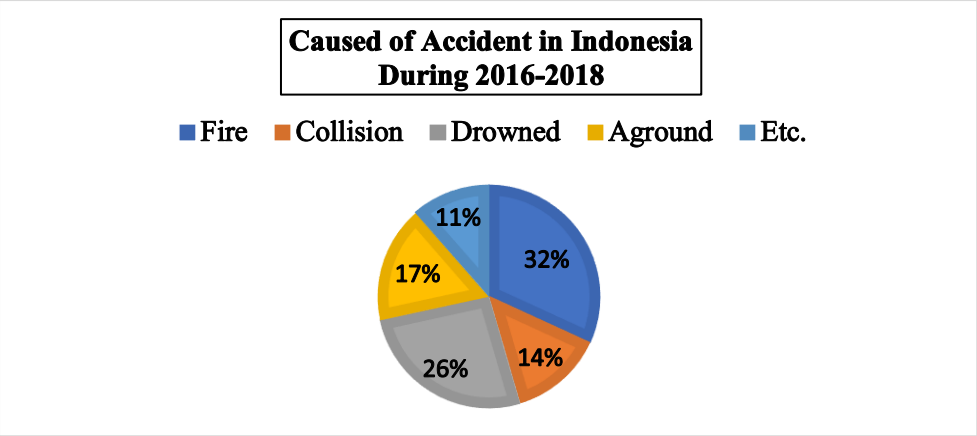

Figure 1. Chart of Caused of Accident in Indonesia During 2016-2018, Source : National Transportation Safety Committee (NTSC)

According to National Transportation Safety Committee (NTSC), there were 88 cruise accident happened between 2016 and 2018. These were mostly caused by fire factor, which the amount were 28 cases or 31,81%.Fire is one of the risks which the factor caused by fire spark either it is small or big, happens in a place, situation, and or unwanted time, harmful, and very difficult to control. Fire can happen during ship sail activity. Fire in ships can occur in places that prone to fire, such as the engine room, cargo room, ship's supply store room, electrical installation and accommodation room for skipper and crew. (Sabitha & Sunaryo, 2015). According to National Transportation Safety Committee (NTSC), fire can be categorized as serious casualty, that is because unification of three components which are heat, oxygen, and fuel.

Fire should be paid attention in order it can be avoided to guarantee safety on the sea. There are several ways to handle ships fire, such as through crew training, preparation and prevention. Other than that, ship must be equipped with the best and the safest equipment to help dealing with the situation. On PM No. 20, 2015, about cruise safety standard which consist of human resource, facility and infrastructure, standard operational procedure (SOP), environment and sanctions. [5] Based on Decree of Directorate General of Sea Transportation, it is that harbormaster must check and ensure that ship is sea proper and know the total passenger onboard is not more than the allowed capacity, also to make sure that safety equipment are available also the fire extinguisher tools. There are mixed variety of training that become the requirement in cruise safety to overcome danger or emergency situation such as in ferry, lifeboat and fire trainings should be conducted once in a week. While in cargo, lifeboat and fire trainings should be conducted once in a month. These trainings should be recorded in ship's log book and if within one week (in ferry) or one month (cargo ships) there are no trainings, then it should be noted in log book along with the reasons.

Ship properness just like in article (I) mentioned that every ships must be fulfilled in accordance with their sailing region which are ship safety, pollution prevention from ship, ship's manning, ship's load line and loading, ship's crew welfare and passenger's health, ship's legal status, safety management and pollution prevention from ships, and ship's safety management. Fulfillment of every term and condition of ship's properness like stated in article (I) proved by the ship's paper and certificate.

Cruise/navigation safety existence will need facilities and infrastructures such as cruise information and cruise telecommunication. Those information can be linked to cruise plot regulator such as sea traffic separation scheme, two way route, recommended guide line, inner water route, avoidance area, awareness area, remote traffic area. Giving weather forecast such as technical guide for ship's crew on weather knowledge is needed. Moreover, there has to be

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citizen's involvement to watch over the cruise safety such as complaint box, socialization about cruise safety. Another equally important, law enforcement such as audit investigator officer, annulment of operational permission and ship's condition audit should always be monitored. Sea transportations or ships need to have safety appliances such as lifeboat equipped with lifeboat launcher or David, life raft, lifebuoy, life jacket, muster list and muster point, posters and safety signs, emergency life pump. Also fire extinguisher such as FFA (Fire Fight Appliances) which a fire distinguisher that needs to be onboard just like it was mentioned in SOLAS chapter II-2 such as international shore connection, fire man outfit equipped with breathing apparatus, life line which made from fireproof material with the length of 30m, emergency escape breathing device (breathing aid device, worn when someone trying to escape from smoke haze in a room to open air space), fire control/safety plan (permanently kept in an waterproof tube outside the main accommodation way). Each safety appliance which needs to be onboard must be checked regularly, weekly and also monthly.

In keeping the cruise safety, it should also be paid attention in the ship itself. Docking and ships maintenance are needed. This should be done in order to check and fix ships damages and also paint the hull. Indonesian Classification Bureau and harbormaster decide ship's docking periods depends on the age, used material as the hull also the condition and ship's needs regularly (annual) and also conduct certification. There are some docks that can be used, they are graving dock/dry dock, floating dock, slipway dock and lifting dock. **(Anisa, 2015)**

Beside human resources (skipper and crew), ships must have competent certificate. The certificate can be gotten based on training, previous education, and also through health check. Sailor checking is a valuation of sailor student's health, sailor candidate, who will work as a ship crew in a form of physical check, mental, laboratory, radiology, and other supporting check. [5]

2. Method

The study uses qualitative descriptive or exposes and explains factual events assisted by causal or fishbone analysis techniques to find out the most influential causes of ship fires. The focus of this research is on shipping accidents especially on ship fires throughout Indonesia's territorial waters. Method of data collection used primary data with interview techniques with the National Transportation Safety Committee in Jakarta and using secondary data with data collection in the form of documents or reports sourced from the National Committee Transportation.

3. Discussion and Result

3.1 Analysis of the number of ship fire cases

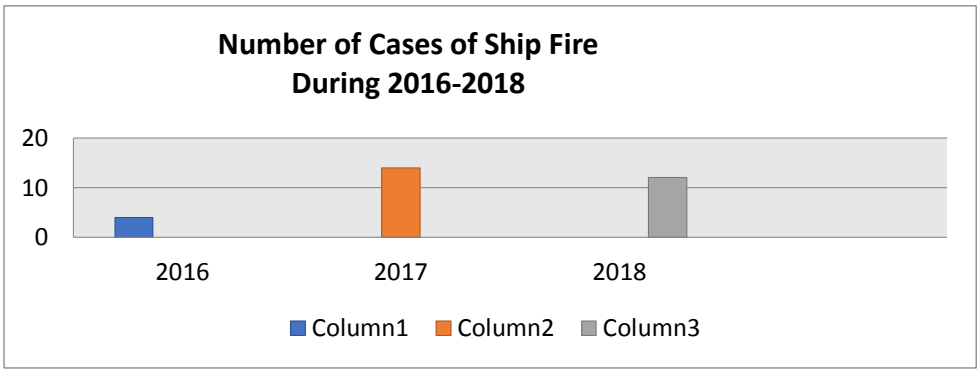

Table 1. Charts of Number of Cases of Ship Fire in Indonesia During 2016-2018, Source : National Transportation Safety Committee (NTSC)

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Based on ship fire data obtained through the National Transportation Safety Committee, in the year 2016 occurred 4 times the fire vessel. In the year 2017 there was an increase in the fire of ship to 14 times or increased from the previous year in the year 2018 recorded a decrease in the number of 12 times the ship fire. So that if it was accumulated from the range from 2016 to 2018, the case of ship accident caused by fire was recorded to reach 40 cases

3.2 Analysis Cause of Ship Fire Cases

Analysis showed in this chapter is the analysis the cause of ships fire which the investigation had a final status, not all cases can be shown because there were several ships fire cases status were still "compilation in progress" , "preface report draft", and "in response time", so the investigation has not yet been published by National Transportation Safety Committee.

No.	Dates – Ship's Name – Ship Type	Location	Factors Causing Fire		
			Human Error	Technics	Load Factor
1.	April 25, 2016 - The Self Propeller Oil Barge type of Kapuas Vessel	Around North Sea Belitung Island, Bangka Belitung Republic Of Indonesia			Fire triggered from pertalite's steam load and pertalite liquid that was still left inside the filter box and loading pipe on the canal that was about to be cleaned in pump room, which this kind of load is considered as a flammable material.
2.	September 16th 2016 - MV. Divine Success - Cement bulk cargo	Around Tanjung Priok Port, North Jakarta Republic of Indonesia		NTSC investigation found that the source of fire was from left side of A/E no. 1, there was a leak on binder bolt of high pressure fuel pipe no. 5	
3.	October 15th 2016 - SB. Bintang Fajar - Speed boat type ship	In Dermaga Jailolo, Halmahera Barat Maluku Utara		Fire started from adhere machine number two, when it was started there was a burst with fire. It was suspected that when pumping there was a fuel leakage, so it made fire spark	

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4.	January 1st 2017 - KM. Zahro Express (GT 106 No. 6960/Bc) - Ferry ship type	Around Jakarta Bay, DKI Jakarta Republic of Indonesia	NTSC investigation concluded that contributing factor in this fire was heat that exist because of generator's condition was not functioning well and there was a fuel left over exposure that was inside engine room caused fire		
5.	February 21st 2017 - KMP. Caitlyn (IMO No. 8602048) - Motorize ferry type ship	On Labuh Jangkar Area of Merak Port, Banten Republic of Indonesia	In accordance with investigation conducted by NTSC, there was a possibility that the official was careless about electrical appliance used. Then the element became hot and made the electrical pan's temperature increased and made a fire		
6.	October 29th 2017 - Dharma Kencana II - Ro-Ro (roll on-roll off)	Around 45 miles Northwest, Karimun Jawa Island, Central Java Republic of Indonesia			NTSC found factors that contribute, such as possibility that there was a flammable load that didn't reported and checked properly and then transported by truck and loaded to the ship
7.	March 14th 2017 - KM. Cantika Lestari 77 (GT 963 No. 2012/KKb) - ferry type ship	Around Shipyard of Samudera Puranabile Abadi Company, Bitung North Sulawesi Republic of Indonesia	Fire came from spark on a plate cutting process for dock extension which the left side was already rotten on KM. Geovani		
8.	April 21st 2017 – Layar Samudera (IMO 9182813) – Oil Products Tanker	Around Hative Besar Sea, Ambon Bay, Maluku Republic of Indonesia		Burst and fire incident happened on Layar Samudera because there were steam or gas and next mixed with oxygen. Steam or gas inside engine room yield because of premium load that entered into engine room	

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9.	May 17th 2017 - Asia Prima I (IMO No. 8905012) - Cargo ship type	On West Nilam,, Tanjung Perak Port, Surabaya Republic of Indonesia		Advance investigation result towards tank condition and pipeline showed that there was damage on fuel valve. The broken fuel valve caused leakage on oil in tank which cause fire	
10.	June 13th 2017 - Amelia-1 (IMO No. 8608901) - Liquefied Petroleum Gas (LPG) Tanker Ship	Around Paoterre Port, Makassar, South Sulawesi Republic Of Indonesia	There was a high possibility that this incident came from spark made by falling round bar 1 m length which can conduct electricity to battery pole		
11	May 19th 2017 - Mutiara Sentosa I (IMO 8718471) - Ro-Ro Type Ship	On the East Water Area Masalembu Island, East Java Republic Of Indonesia			A high possibility that fire ignited spontaneously because there were some kind of reactions that occurred because of friction between materials that was inside basin effected by material character from flammable stuff
12.	July 12th 2017 - Pekan Fajar - containership	On water 28Nm south of Bawean Island, East Java Republic Of Indonesia	From oil thermal residue and pressure test water which being heated over and over inside closed coil pipe without any circulation, caused the pressure and temperature raise and enough to made oil thermal to evaporate		
13.	May 25th 2018 - SPOB Srikandi 511 (IMO No. 9705811	On BBM Jetty III Pertamina Station, Banjarmasin Republik of Indonesia	From the data collected by NTSC investigation showed that source of fire was coming from the water surface about 30m behind SPOB Srikandi 511 and about 50m from the ship which was behind SPOB Srikandi 511		

Table 2. Analysis Cause of Ship of Fire Case
Source : National Transportation Safety Committee (NTSC)

3.3 Efforts in Preventing and minimize ships fire

Based on cause of ships fire from cases in NTSC investigation cases, the main prevention act that should and can be done is to eliminate one of the three element fire triangles which are heat, oxygen, and fuel so fire can be extinguished. From technical side: engine/electrical maintenance should be kept, fire extinguisher tools should be available in a good condition,

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ventilation or air way can work well. From human resource side/ship's crew: checking the rooms that prone to fire, limiting the use of flammable materials, knowing the basic system of fire triangle, giving warning to passenger if doing some violation or against the rules, checking electrical cables to reduce electrical current disturbance, doing responsibility based on each job description, doing firefighting drill regularly, getting used to fire extinguisher well and right, also making sure all safety peripheral and fire extinguisher can work properly. From passenger side: they must obey the safety rule on information board that can be seen in every corner of ship, smokers are not allowed to smoke carelessly in random places and throw cigarette butt in proper place, keep the room clean, every time want to rest pay attention to room surrounding to make sure everything is safe and there is nothing that can ignite fire, keep materials off from electrical current line.

4. Conclusion

The results of our analysis research on the case of ship accidents occurred in Indonesia territorial waters, can be concluded in the year 2016-2018. The dominant cause of ship accident caused by a fire, there were three factors that become the cause of fire vessel including human error, technical including vessel construction, as well as the load factor. Human error factor is an incident caused by the negligence of the ship and the children, consisting of the condition of the generator is not operating properly, and the exposure of the fuel remnants in the engine room, derived from Sparks (Spark) in the process of cutting the deck extension plate on the left sidelines, time thermal oil and water press test is heated continuously in a closed coil pipe without any circulation. Technical factors are the lack of maintenance and the design of the vessel is not suitable, consisting of leakage of the high pressure fuel pipe binding. A load factor is a position or placement against an improper load, consisting of derived from the Pertalite steam charge and the pertalite fluid, which is still left in the Sieve box and the load pipe, there is a flammable charge that is not reported and adequately inspected which is transported by truck and loaded onto the vessel.

Viewing this from the frequency, the dominant factor against the fire vessel from the vulnerable year 2016-2018 was human error. Therefore, below are the suggestions or recommendations to minimize the vessel fire case due to human error:

- Contionuous training on the crew and ships by the Syahbandar or the Indonesian Classification Bureau with the relevant parties.
- Simulation of periodic ship fires at least three months
- Familiarity or to cultivate safety culture.
- Inspection of construction and vessel machinery
- Improving the supervision by the authorities

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