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The Evaluation of Cone Capsule as an Alternative Hull form for Portable Tsunami Lifeboat to Support Evacuation System in the Coastal Regions and Small Islands

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Abstract

Several attempts have been made to reduce the risk of tsunami disasters such as the development of early warning systems, evacuation procedures training, coastal protection and coastal spatial planning. Although many efforts to mitigate the impact of the tsunami in Indonesia was made, no one has developed a portable disaster rescue vehicle/shelter as well as a lifeboat on ships and offshore building, which is always available when a disaster occurs. The aim of the paper is to evaluate the performance of cone capsule shaped hull form that would be used for the portable tsunami lifeboat. The

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The Evaluation of Cone Capsule as an Alternative Hull form for Portable Tsunami Lifeboat to Support Evacuation System in the Coastal Regions and Small Islands

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Abstract. Several attempts have been made to reduce the risk of tsunami disasters such as the development of early warning systems, evacuation procedures training, coastal protection and coastal spatial planning. Although many efforts to mitigate the impact of the tsunami in Indonesia was made, no one has developed a portable disaster rescue vehicle/shelter as well as a lifeboat on ships and offshore building, which is always available when a disaster occurs. The aim of the paper is to evaluate the performance of cone capsule shaped hull form that would be used for the portable tsunami lifeboat. The investigation of the boat resistance, intact stability, and seakeeping characteristics was made. The numerical analysis results indicate that the cone capsule is reliable as an alternative hull form for the portable tsunami lifeboat.

1. Introduction

Tsunamis are waves that propagate in all directions and occur because of an impulsive disturbance on the seabed. The impulsive disorders occur because of changes in the shape of the geological structure of the seabed vertically and in a short time. The changes were caused by three main sources, namely tectonic earthquakes, volcanic eruptions, or a landslide that occurred on the seabed. Based on the three sources, the main cause of the tsunami in Indonesia is a tectonic earthquake.

Indonesia is a country prone to tsunamis, especially the coastal areas which deal directly with the meeting of the Eurasian Plate, the Indo-Australian and Pacific, among others, the western part of Sumatra Island, southern part of Java, Nusa Tenggara, the northern part of Papua, Sulawesi and Maluku, and the eastern part of the Borneo Island, [1].

Tsunami in Aceh on December 26, 2004, killed about a quarter million lives around the Indian Ocean region. History tsunami disaster within the last twenty years shows that at least ten tsunami disaster in Indonesia (see Figure 1), [1]. Nine tsunamis of them are destructive tsunami and caused casualties and material, the tsunami in Flores on December 12, 1992 which claimed more than 2000 lives, the tsunami in Banyuwangi, East Java (1994), Biak (1996), Maluku (1998), Banggai, Sulawesi Utara (2000), Ransiki, West Papua (2002), a large tsunami in Aceh (December 2004), the tsunami in Nias (2005), West Java (2006), Bengkulu (2007), and Mentawai (2010), [1]. Impact damage caused by the tsunami has destroyed residential areas and the number of casualties.

Based on data from the Meteorology and Geophysics, it shows that arrival time of the tsunami that occurred in Indonesia, generally between 10-60 minutes, [2]. It is determined that tsunamis occurring in

Application Side Casing on Open Deck RoRo to Improve Ship Stability

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Abstract. RoRo is a vessel that can transport passengers, cargo, container and cars. Open Car Deck is favourite RoRo Vessel in developing countries due to its small GT, small tax and spacious car deck, but it has poor survival of stability. Many accident involve Open Car Deck RoRo which cause fatalities and victim. In order to ensure the safety of the ship, IMO had applied intact stability criteria IS Code 2008 which adapted from Rahola's Research, but since 2008 IMO improved criteria become probabilistic damage stability SOLAS 2009. The RoRo type Open Car Deck has wide Breadth (B), small Draft (D) and small freeboard. It has difficulties to satisfy the ship's stability criteria. Side Casings which has been applied in some RoRo have be known reduce freeboard or improve ship's safety. In this paper investigated the effect side casings to survival of intact dan damage ship's stability. Calculation has been conducted for four ships without, existing and full side casings. The investigation results shows that defect stability of Open Deck RoRo can be reduce with fitting side casing.

1. Introduction

RoRo vessel is the most successful ship which able to carry passenger, goods and vehicles at same time. Besides the flexibility of the cargo, this type of vessel also able to operate in river, strait and even sea. This type of vessel also equipped with ramp door installed in after, side or forward of the hull as the entrance of the payload. The first RoRo was used in 1891 to carry train crossing strait which not connected with bridge. The first RoRo was equipped with rail which connected to a pier [1]. In Second World War, the principal of RoRo vessel was used to carry tank and other fighting vehicles as landing craft. The extreme popularity of RoRo was occurred during 1940 to early 1950s, RoRo used as short route ferry which pushes the development of land and sea transportation. Until 1994, there are 4,600 RoRo vessel to serve vehicles, mix of container and vehicles [2].

There are several problems of RoRo vessel, those are: lack of watertight, stability, low freeboard, safety of cargo, safety equipment and crew safety [2]. IMO has applied detail many rules such as SOLAS, MARPOL, MEPC, ILLC etc [3]. Nevertheless, there are still numerous accident occurred. Based on the accident data of ship with size >150GT from 1993-2013. The data shows averagely 150 ship lost each year. General cargo provides the highest contribution, it contributes 42% and RoRo vessel contributes 6% from total accident [4] [5]. however based on casualties data, the RoRo vessel accidents demand 1/3 of total loss of lives due to ship accidents [2]. The accident data also stated that more than 70% of RoRo accidents is collision case which followed by the capsized of the vessel less than 10 minutes [2].

Small size RoRo are mostly operated in archipelagic country to connect its spread islands [6]. Open deck RoRo vessel is the highest number of RoRo type which used by archipelagic country. The car deck in RoRo is designed open to reduce GT in order to decrease tax, also decrease usage of ventilation. There are numerous bad records of this vessel which taken loss of lives and goods due to lack proper application of safety standard [7]. Defect stability and damage compartments are the main factors of the sink of RoRo vessel. Also, the economical perspective of small GT become the contributor also. IMO has issued IS Code 2008 for intact stability and SOLAS 2009 which affect for cargo and passenger including RoRo vessel. If this regulation must be applied for developing country, there will be a lot of existing vessel must be