



A novel flexible model for piracy and robbery assessment of merchant ship operations



Sascha Pristrom^a, Zaili Yang^a, Jin Wang^{a,*}, Xiping Yan^b

^a Liverpool Logistics, Offshore and Marine (LOOM) Research Institute, Liverpool John Moores University, Liverpool, UK

^b National Engineering Research Center for Water Transport Safety (WTSC), Wuhan University of Technology, Wuhan, ITS Center, China

ARTICLE INFO

Article history:

Received 20 April 2015

Received in revised form

6 June 2016

Accepted 2 July 2016

Available online 5 July 2016

Keywords:

Maritime security

Maritime piracy

Hijacking

Best management practice

ABSTRACT

Maritime piracy and robbery can not only cause logistics chain disruption leading to economic consequences but also result in loss of lives, and short- and long-term health problems of seafarers and passengers. There is a justified need for further investigation in this area of paramount importance. This study analyses maritime piracy and robbery related incidents in terms of the major influencing factors such as ship characteristics and geographical locations. An analytical model incorporating Bayesian reasoning is proposed to estimate the likelihood of a ship being hijacked in the Western Indian or Eastern African region. The proposed model takes into account the characteristics of the ship, environment conditions and the maritime security measures in place in an integrated manner. Available data collected from the Global Integrated Shipping Information System (GISIS) together with expert judgement is used to develop and demonstrate the proposed model. This model can be used by maritime stakeholders to make cost-effective anti-piracy decisions in their operations under uncertainties. Discussions are given on industrial response to maritime piracy in order to minimize the risk to ships exposed to attacks from pirates. Further recommendations on how maritime security and piracy may be best addressed in terms of maritime security measures are outlined.

© 2016 Elsevier Ltd. All rights reserved.

1. Introduction

Internationally, more than 55,000 merchant ships carry more than 8.4 billion tonnes of goods each year [19]. It is important to understand how maritime security issues are addressed through the most efficient use of available resources. It is also necessary to carefully assess and prioritise the maritime security risks and opportunities we face, in order to allocate our resources rationally.

Maritime security is defined as “the advancement and protection of a nation's interests, at home and abroad, through the active management of risks and opportunities in and from the maritime domain, in order to strengthen and extend the nation's prosperity, security and resilience and to help shape a stable world” [19]. While risk is defined as “a combination of the probability of occurrence of an undesired event and the degree of its possible consequences” [60], this study focuses on the occurrence likelihood of attacks from pirates, having known that the involved consequences are usually severe. Maritime security issues broadly include:

- Terrorism affecting a nation and its maritime interests, including attacks against cargo or passenger ships.
- Disruption to vital maritime trade routes as a result of war, criminality, piracy or changes in international norms.
- Attack on a nation's maritime infrastructure or shipping.
- The transportation of illegal items by sea, including weapons of mass destruction (WMD), controlled drugs and arms; and
- People smuggling and human trafficking.

Maritime piracy needs to be distinguished from other clusters within the maritime security domain as maritime terrorism, armed robbery and theft are driven by different motives [49]. It is noted that the modus operandi of pirates is very different from that of terrorists but both phenomena are constantly evolving and may develop characteristics that make a distinction between them more and more difficult. While piracy is, to some extent, predictable depending on sea areas (Piracy High Risk Area (HRA) versus low risk areas), weather conditions and/or the implementation of Best Management Practices (BMP), maritime terrorism cannot be confidently predicted and is still debated [49]. Whereas pirates seek financial gains from attacks, terrorists pursue a political agenda. Pirates as well as terrorists that attempt to attack a ship at sea face challenges unknown, compared to attacks carried out ashore [45].

* Corresponding author.

E-mail address: j.wang@jmu.ac.uk (J. Wang).

This paper presents a novel model which can be used for predicting the likelihood of a ship being attacked by pirates given the characteristics of the ship, environment conditions and the maritime security measures in place. The rest of the paper is organized as follows. Section 2 reviews the current status through investigating recent maritime piracy accidents. Section 3 is dedicated to developing a new model for estimating the occurrence likelihood of successful hijacking of a ship in the Western Indian/Eastern African Region. In Section 4, a case study is presented to demonstrate the proposed model. Industrial response to maritime piracy is discussed in Section 5. The paper is concluded in terms of possible application of the proposed model in Section 6.

2. Current status

2.1. Maritime piracy patterns

The shipping industry and international organisations have made enormous effort in the resolution to the menace of piracy. Several States have sent naval assets to the HRA to protect merchant shipping from attacks and several UN organisations have dedicated expert teams to improve the situation. The International Maritime Organization (IMO) supported the setting up of a regional cooperation agreement, the Djibouti Code of Conduct, aimed at assisting littoral States that are affected by Somali piracy to implement a set of measures to suppress piracy using their own resources. The IMO was also instrumental in establishing the framework for collaboration among the littoral states of the Straits of Malacca and Singapore and the South China Sea, the so-called Regional Cooperation Agreement on Combating Piracy and Armed Robbery against Ships in Asia (ReCAAP) agreement [25]. A major step in addressing maritime crime in the Gulf of Guinea region has been made in June 2013 when Heads of States or their representatives from 25 West and Central African countries signed the Code of Conduct concerning the repression of piracy, armed robbery against ships, and illicit maritime activity in West and Central Africa.

The positive development in the suppression of piracy and armed robbery against Somalia-based piracy can be attributed to the fact that many organizations have made efforts to address maritime piracy activities in Somali waters and the wider Western Indian Ocean. For example, the United Nations Political Office for Somalia (UNPOS)¹ started developing and implementing the National Security and Stabilization Plan through active engagement with the Federal Government of Somalia.

Modern pirates use state-of-the-art equipment in their operations [47]. Their crimes range from simple robbery to murder and hijacking of entire ships for ransom demand. Modern piracy became a significant threat in the late 1990s and early years after the Millennium in South East Asia and in particular the Malacca Strait whereas the current piracy hot-spots are the waters off the coasts of West and East Africa. However, incidents in the Malacca Strait are rising and syphoning oil cargo from product tankers – similar to incidents in the Gulf of Guinea – has been reported also for this region. By analysing the available statistical material from the IMO's monthly piracy reports during the period 2000–2009, it is found that incidents off and around the African continent have led to fewer deaths as compared to those in South China Sea and Malacca strait [47]. This demonstrates that the attack rates on specific vessel segments and the recorded incidents for each

Table 1

All incidents of piracy and armed robbery from 1 July 1994 to 01 December 2014 (Source: IMO GISIS database).

Ship type	Total number	Ship type	Total number
Bulk carrier	1425	Gas Tanker	169
Tanker	1228	Reefer	95
General cargo ship	949	Ro-Ro	75
Container ship	933	Car carrier	38
Chemical tanker	580	Passenger ship	21
Special purpose ^a	406	Ferry	13
Small craft ^b	381	Barge	49
unspecified	275		
Total:	6637		

^a Includes: dredgers, landing crafts, heavy load carriers, MODUs, offshore supply ships, research ships, tugs.

^b Includes: fishing vessels, dhows, yachts.

geographical area develop their own trends. The highest occurrences of piracy incidents during the period from 1 January 2007 to 1 December 2014 are the waters off the East African coast; this was by far the most dangerous area for ships to become a victim of piracy. The statistics of incidents show that three other piracy hotspot areas are: the South East Asia region comprising the South China Sea and its adjacent waters, the Indian Ocean and West Africa (Source: IMO Global Integrated Shipping Information System (GISIS database)).

The ship type that has been mostly attacked since 1994 is bulk carriers, followed by tankers and general cargo ships as shown in Table 1 which may be a reflection of the proportion of ship types in operation in conjunction with their vulnerability to pirate attacks. This gives the average number of attacks per month as 27.1 (i.e. $6637/(20 \times 12 + 5)$).

As the intention of pirates is not necessarily to hijack a ship, it is useful to analyse the attacks where pirates managed to board the ship (a piracy/robbery incident in Table 1 may not necessarily lead to a boarding incident). For 4109 successful boarding events during the period from 1 July 1994 to 1 December 2014 the highest rate of boarding while the ship was underway is for the category 'Special purpose', followed by 'Oil tankers', 'Small craft' and 'General cargo'. The ship types categorised under 'Special purpose' and 'Small craft' are listed at the bottom of Table 1. It underlines that ships with a slow speed and low freeboard are particularly at risk of becoming a victim of piracy. Gas carriers and bulk carriers are of less risk of being boarded while steaming. This is largely due to their relatively high freeboard.

Ships with the highest risk of becoming a victim of piracy off the East African coast are small craft (31% of the total pirate attacks). However, the risk for general cargo ships (20%), bulk carriers (18%) and chemical tankers (12%) while steaming in the piracy-infested waters off the coast of Somalia is significantly higher than that in the other regions around the world. Due to the success in the suppression of Somalia-based piracy the number of attacks has significantly decreased since the second half of 2012. The last successful hijacking of a SOLAS ship (i.e. a ship that is large enough to fall under the International Convention for the Safety of Life at Sea) was in May 2012.

A significant difference with regard to the type and number of incidents off Africa exists in comparison to South America where the boarding rate while steaming is significantly lower. However, in South America, small craft are still exposed to the greatest threat of becoming a victim of piracy, followed by chemical tankers and container ships.

In the case of West Africa the statistics are closer to the worldwide average in the sense that the highest threat by ship type while steaming is for small craft and special purpose ships. The ratio of boarding is well below 20% for tankers, general cargo

¹ The United Nations Assistance Mission in Somalia (UNSOM) was established on 3 June 2013 and replaced UNPOS. The different regions of Somalia together with the Federal Government of Somalia now work on the implementation of the Integrated Strategic Framework.

Download English Version:

<https://daneshyari.com/en/article/806171>

Download Persian Version:

<https://daneshyari.com/article/806171>

[Daneshyari.com](https://daneshyari.com)