

Safety, Security and Reliability Issues in Shipping Industry

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Abstract

The maritime industry is still characterized by prescriptive standards and reactive approaches in relation to safety and risk management to a large extent. It does not offer the full potential that concepts of resilience seem to suggest. This is to review the current ideas about safety regulations and risk management in the maritime industry. The concept of resilience engineering with its focus on system performance rather than system failure is a promising concept to be considered in the shipping business, but needs further investigation.

Keywords: - *Port security, SOLAS, IMO, AGCS, and ISPS Code*

1. Introduction

Safety, Security and Reliability are three important factors regarding to the shipping industry. The safe operation of ships and the safe handling of cargo are core principles for liner shipping companies. For the Security, Governments know that sea terrorism will only be contained when our seas are policed effectively. The need to have a structure that addresses maritime security capacity building and involves both regional and extra regional countries is understood if not yet practiced. Security risks have always been a challenge for the shipping industry, but today, they're providing more issues to overcome. For example, pirates pose a bigger threat for shipping, especially since the number maritime piracy and armed robberies on ships in Southeast Asia and West Africa has increased. Additionally, modern technologies could make ships more susceptible to cyberattacks. In a recent Reuters article, a NATO-accredited think tank said, "Increasingly, the maritime domain and energy sector has turned to technology to improve production, cost and reduce delivery schedules. These technological changes have opened the door to emerging threats and vulnerabilities as equipment has become more accessible to outside entities. The Reliability issues can be said as, Schedule reliability has become an area of topical interest following various initiatives by liner shipping companies recently, notably the new "Daily Maersk" policy by Maersk Line, which focuses on guaranteed punctual departures and arrivals. Shippers have demanded schedule reliability for some time in attempts to reduce uncertainties from their international supply chains.

2. Safety issues in shipping industry

Maritime safety is one of the imperatives of the maritime industry. Sea accidents occur under a set of circumstances in an area where each of the factors affecting these circumstances may, at a moment of time, alter its initial state and turn into another state that can be more or less predictable. A danger is a state of imminent distress, whereas a risk is a danger that can be predicted, but only to a certain extent.

The safe operation of ships and the safe handling of cargo are core principles for liner shipping companies. In addition to focusing on the safety of their own operations, shipping companies take steps to protect the public health and safety in the countries they transit.

Safety in shipping has improved significantly in the last decade with shipping losses declining by 50% since 2005. So concludes a recent report "Safety and Shipping Review 2014," issued by Allianz Global Corporate & Specialty (AGCS).

Container weight

Accurate cargo weight is an important factor in ensuring the safe operation of ships. Containers that are overweight, meaning that they weigh more than the declared weight provided by the shipper, create safety concerns for the ship, its crew, other cargo on board and the workers in the port facilities handling the cargo. Therefore, the World Shipping Council has been actively pursuing ways to improve the accuracy of container cargo weights that are provided to carriers prior to loading of the container aboard a ship.

Containers

Containers utilized by the liner shipping industry are constructed according to the International Convention for Safe Containers. These containers also meet more stringent standards regarding structural integrity and container strength, which are developed by the industry through the International Standards Organization (ISO). In addition to developing structural standards, the industry participates in a number of initiatives to improve the safe packing of containers and the safe handling of cargo containers.

Food Safety

As key participants in the international transportation of food, the World Shipping Council's member companies are committed to complying with all applicable international and U.S. food safety regulations.

Seafarers health

Because seafarers spend a significant percentage of their lives at sea, they invariably acquire illnesses from time to time. It is important that seafarers receive medical attention and be appropriately quarantined, when absolutely necessary, to ensure that illnesses are not spread to other crewmembers or to the public.

Safety at Sea

It should be borne in mind that the risk always implies the probability that an undesirable event may occur and that the only thing a man can do is to assess it. Risks in maritime shipping are mostly related to accidents at sea that can be, according to their causes, be divided as;

- Accidents caused by unintentional human error.
- Accidents caused intentionally by man.

- Accidents due to technical failures.
- Accidents due to poor weather (wind, waves, lightning, etc).

it may be assumed that a system or its sub-system is likely to function properly within the set limits. In a wider sense, the safety of maritime transportation may be defined as a set of measures that are taken to protect human life, but also as a set of measures that are taken to protect material and non-material assets that are directly or indirectly related to maritime transportation. There are a large number of factors affecting the safety at sea, including shippers, ports and port authorities, coastal countries, international community, etc.



Figure 1. Safety at sea
Source: Kopacz; 2001; 201 [4].

In a narrower sense, the safety of maritime transportation implies the measures aiming at performing the carriage of cargo by sea without harmful effects on human life, cargo, vessel and environment. In order to obtain an adequate level of safety, a system of safety has to exist at the international level which will be capable of bringing adequate necessary measures and which will monitor the implementation of these measures by means of various instruments and through various institutions. The maritime system of safety at sea can be divided into the following components;

- Institutions bringing legal regulations (international conferences, International Maritime Organization and its institutions, etc.)
- Institutions in charge of the implementation and monitoring of security measures and standards.
- International maritime conventions and other legal instruments related to safety at sea.

Analysis of Safety from the standpoint of Technological Development of Maritime Industry

Since the 1970s, world seaborne trade has been growing due to the market globalization.

Generally speaking, from the ancient times up to present days, the transportation of goods by sea has remained one of the cheapest ways of shipping and the world seaborne trade has been growing steadily, particularly after the World War II. The number and size of merchant ships have increased due to major technological breakthroughs, yet maritime industry has remained a dangerous workplace. Today's world fleet consists of more than 100,000 vessels with the total tonnage of almost 1 billion GT. [8] since the 1912 RMS Titanic disaster that claimed 1513 lives [9], there have been many changes with regard to safety of navigation in terms of regulations and technology. The new technologies that have considerably affected the safety in maritime industry include the introduction of gyrocompass, RADAR, followed by ARPA RADAR for improved safety in maritime traffic, mandatory use of electronic charts (ECDIS) since 2012, Global Positioning System (GPS), Automatic Identification System (AIS) for identifying and locating vessels, vessel traffic service (VTS) for traffic control and monitoring, etc. However, it should be underlined that some research results show that the dependence on certain technologies may lead to accidents. Over the years, the progress in design and construction of ships has resulted in the improved safety at sea. The progress has been achieved not only in design, but also in the strength and the size of the vessels which have become increasingly larger. Maritime shipping has become considerably safer over the past decades and navigation appears to be safer than ever, but further development of technologies will bring new challenges that the shipping industry will have to deal with and that will require solutions for future problems.

Analysis of Safety from the Standpoint of Maritime Legislation.

The technological development of the maritime industry has increased the need for new conventions and guidelines that would define new boundaries of safety and efficiency. Safety and security management and implementation are very important aspects of modern shipping. The Port State Control (PSC), established on the basis of STCW convention in 1978, has greatly contributed to the safety and security in maritime shipping. The PSC is entitled to check any vessel at any port and prevent a vessel's departure if she does not meet safety requirements. The PSC encourages vessels to respect international safety and security standards, to prevent environmental pollution, and to observe other operational regulations. The performed inspections of vessels are uniform in order to ensure equal standards of safety and avoid the obstruction of fair market competition. There are more and more inspections worldwide, in accordance with the increase in maritime traffic. Classification societies also contribute to the safety at sea through applying international standards in designing and construction of vessels. The states whose ensigns the vessels are flying are the ones observing the IMO regulations. However, the "flags of convenience" appeared in the 1950s and some of them have been criticized for being loose in observing regulations and control, by failing to ratify international standards in national parliaments or by failing to implement ratified laws and regulations.

3. Security issues in shipping industry

The Challenge

Governments know that sea terrorism will only be contained when our seas are policed effectively. The need to have a structure that addresses maritime security capacity building

and involves both regional and extra regional countries is understood if not yet practiced. Such improvement requires leadership and inspiration from the United Nations. Until then, governments, maritime institutions and the maritime industry at large can all make (preferably cohesive) initiatives and contributions to containing the maritime security threat.

Sea Piracy

Piracy affects much less than 1% of 23,000 ships that pass through the Gulf of Aden and even less in the Indian Ocean. But the real cost of piracy is reflected in the need for fleet owners to pass on the extra fuel measured in tons per day required to divert around terrorist / piracy areas.

How can technology play its part?

Yet despite the fact that Oceans Beyond Piracy – a respected US based Think Tank reports that Somalian piracy costs the world economy at least US\$7 billion and other institutions believe that world sea terrorism is affecting world economies to the tune of at least US\$25 billion, the shipping sector remains remarkably unprepared. In piracy infested waters, shipping owners have resorted to the use of armed guards, often with success, but with significant cost, and technology measures often boil down to use of razor wire, some enhancements to physical protection and occasionally the provision of safe areas or Citadels. There is little investment in long term solutions that detect, track, identify, respond and record to prevent a terrorist act before it occurs and to optimize deterrence and avoidance. Nor has there been much enthusiasm for ship redesign to provide long lasting security capability or a detailed investigation by many shipping companies into what proven technologies exist and how they can best be system integrated and supported in relation to the threats and the risks.

What needs to be done to foster technology approaches?

- Defensive aids which includes light intensity and sound intensity devices
- Physical protection which includes the installation of safe havens or so called ‘Citadels’
- Underwater detection
- Above water detection
- accept radar targets and builds tracks of target movement over time
- examine tracks for pirate behavior
- when pirate behavior is found, direct a tailored countermeasure suite engagement of the pirate
- determine priority of targets and shifts countermeasure system to highest priority n select appropriate countermeasure for range and priority
- provide alarm data to ship crew n provide prioritized targeting data to security team

- Advanced intelligence capabilities, which include the ability to verify track formations of surrounding vessels, verify whether they are friend or foe and then recommend or take countermeasures.

The Importance of Port Security

Port security in simple terms refers to the security and law enforcement measures employed to safeguard a shipping port from terrorism and other unlawful activities and activists. It also refers to the measures employed to see that the treaties entered into with other countries are also enforced appropriately. In addition, port security also deals with maritime security – security of the marine commercial areas, coast lines, and beaches. Port security, a part of the maritime security, comes under the purview of the International Maritime Organization (IMO) and the International Ship and Port Facility Security Code that was introduced in the year 2002 as a part of the Safety of Life At Sea (SOLAS) convention. Apart from these two organizations, a lot of port security measures are incorporated from United Nation’s own marine security enforcement agenda.

The security levels under the ISPS code describe the current scenario related to the security threat to the country and its coastal region including the ships visiting that country. The security levels are decided by the cooperation of ship and port authority, keeping the current condition of national and international security. The local government sets the security level and ensures to inform port state and ships prior to entering the port, or when berthed in the port. All personnel on board ships and port state staffs are assigned with security duties, which are different for people of different levels. Moreover, frequent security drills are also carried out on board ships. As soon as the security level has been decided as per the ISPS code, it is displayed prominently on board vessel at the entrance of the ship. For any of the security levels, the following are the general points to be kept in mind:

- Checking the identity of all persons boarding/wanting to board the vessel
- Designated secure areas are established in liaison with the PFSO
- Segregate checked persons from those unchecked for ease of operation
- Segregating embarkation and disembarkation
- Identification of access points to be secured against unauthorized access
- Securing of areas that provide access to personnel
- Providing security briefings to all ship personnel on possible threats and the levels associated with the port
- Compliance with the SSP at all times

MARSEC Level 1

The normal level that the ship or port facility operates on a daily basis. Level 1 ensures that security personnel maintains minimum appropriate security 24/7. In this, all those liable to board must be searched. The frequency of the same should be specified in the SSP. Such searches are to be carried out in coordination with the port facility. It is important to remember the human rights angle of the individual being searched and the search should not violate their dignity.

- Minimum security measures are always maintained on board and in port
- Ship and port operation are carried out as per ship and port facility security plan
- Port facility ensures to keep the ‘no access’ areas under surveillance at all times

MARSEC Level 2

A heightened level for a time period during a security risk that has become visible to security personnel. Appropriate additional measures will be conducted at this security level.

At this level, the SSP should establish the measures to be applied to protect against the heightened risk. Higher vigilance and tighter control with regard to the security of the ship is in play here.

- Assigning additional personnel for patrolling the access areas
- Deterring waterside access to the ship
- Establishing a restricted area on the shore side of the ship
- Increasing the search frequency and detail of the persons due to board or disembark
- Escorting all visitors onboard
- Additional security briefings to the ship’s personnel to with emphasis in relation to the security level
- Carrying out a full or partial search of the ship

MARSEC Level 3

- Will include additional security measures for an incident that is forthcoming or has already occurred that must be maintained for a limited time frame.
- Ship and port authority mutually supervise loading and unloading operation of cargo and stores, ensuring access control and other minimum-security criteria.
- Minimum access in the ship is maintained at all times.

- Again, the SSP should be adhered to and with strong liaison with the port facility.
- Limiting access to a single, controlled access point Granting access strictly to authorized personnel or those responding to any security incident Suspension of embarkation and disembarkation Suspension of cargo operations and stores etc. If needed, the evacuation of the ship Close monitoring of the movement of the people on board Preparing for a full or partial search of the ship

Restricted Areas

The SSP must identify areas that are restricted which is to be established on board. The purpose of such areas is to restrict access, protect the personnel onboard, protect the cargo from pilferage or tampering etc. The restricted areas may include the navigation bridge, machinery spaces, spaces with security related equipment, ventilation spaces, spaces containing IMDG cargo, accommodation, any other areas specified as per the SSP.

4. Reliability issues in shipping industry

Defining Schedule Reliability

The Low Reliability Record of the Liner Shipping Sector These trade analyst reports, along with a range of academic studies suggest that the container liner shipping sector has characterized by poor rates of schedule reliability. For instance, the Drewry survey (Drewry Shipping Consultants, 2007) reported low reliability levels on worldwide liner services, with a 3 percentage of on-time vessel calls of about 52%. Veneman, et al. (2007) reported on a large survey which revealed that “over 40% of the vessels deployed on worldwide liner services arrived one or more days behind schedule”. And more recently, according to a report from Sea Intel Maritime Analysis, the global schedule reliability is noted as being still fairly low. It decreased from 63% in November to 59% in December 2011, which means it remains the case that over 40% of the vessels on global liner services arrive behind schedule.

Demand Perspective – why improved schedule reliability is craved by shippers?

The global marketplace for goods and services has become increasingly competitive and has become characterized by organizations frequently switching sources of supply and their location of manufacture to lower-wage economies, sometimes at a considerable distance away from the marketplace. This transition has been made partly possible due to the dramatic decreases in transportation costs brought about by the developments of the container liner shipping sector over recent decades. As a result, general cargo shipped in containers can be moved faster, cheaper, safer and in a much more controlled manner than in the days before the container system was invented and established. Thus there is a real need from the demand perspective to transform the schedule reliability of the container liner shipping sector which is at the heart of the global commerce system which has developed today. If this can be achieved there are significant opportunities for the breakthroughs that can be achieved through supply chain management excellence to be applied to extended

international supply chains. This clearly would be of huge benefit to shippers and their customers, but also to providers of container liner shipping too. To explore this, the supply side story is now set out.

Conclusion

This paper is conceived through the lens of three determining entities which have a profound impact on delivery schedule reliability, the safety and the security. The demand perspective of the shippers, the supply-side story from the providers and the ever-changing regulatory backdrop pertinent in the regions of the globe liner services operate within. It is certain that safety represents a crucial factor that affects all components of the maritime industry and that the safety of modern maritime shipping is the result of a set of initiatives, research, regulations and innovations. Despite great breakthroughs in technology and safety at the workplace, the marine industry is still a relatively dangerous place to work. It is true that the progress in construction, design, electronic appliances and helpful navigational devices fitted onto the bridge has resulted in the increased safety at sea.

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