SEVENTH FRAMEWORK PROGRAMME

SST–2007–TREN–1 SST.2007.2.2.4. Maritime and logistics co-ordination platform SKEMA Coordination Action
"Sustainable Knowledge Platform for the European Maritime and Logistics Industry"

SKEMA Consolidation Study

Methods for assessing safety and security performance

WP No2 – SKEMA Consolidation Studies
Task T3.2: Methods for assessing safety and security performance
SKEMA Subject Index: SE3.2
Responsible partner: VTT
Contributing partner: CETLE
Planned submission date: Version 1- 31/12/2008; Version 2-15.06.2009
Actual submission date: Ver 1 18/12/2008 Ver 2 3.6.2009
Distribution group: Consortium
Dissemination level: PU (Public)
Contract Number: 218565
Project Start Date: 16th June 2008 **End Date:** 15th May 2011
Co-ordinator: Athens University of Economics and Business

Document summary information

Version	Authors	Description	Date
1	T Nyman VTT	Final draft	18/12/2008
2	T Nyman VTT	Draft ver 2	3/6/2009

Quality Control

	Who	Date
Checked by Task and WP Leader		
Checked by Peer Review		
Checked by Quality Manager		
Approved by Project Manager		

SE 3.2 Methods for assessing safety and security performance

SE3.2.1 Review of collision and grounding risk analysis methods which can utilize the historical AIS data and traffic patterns in seawaters

SE3.2.2 Evaluation of methods to estimate the consequence costs of an oil spill

SE3.2.3 Dynamic risk management methods – ship risk indexes

Fields	Instructions
Document Type [e.g. Paper, Book, Report, Article, SKEMA Study, Other, etc]	**SKEMA Study**
Title	**SE3.2 Methods for assessing safety and security performance**
Version	
Date	**14.5.2009**
Authors [Name, Affiliation]	**Tapio Nyman**
Publisher / Contributors	
ISSN	
Language	English
Category [Review, Methodology, Design, Product Description, Market Survey, etc]	**Review**
Abstract	In safety assessment the study concentrates on two steps of the FSA process: Step 2 “Assessment of risks” and Step 4 “Cost benefit assessment of the risk control options”. In step 2 the topic is: Review of collision and grounding risk analysis methods which can utilize the historical AIS data and traffic patterns in seawaters. In Step 4 the topic is: Evaluation of methods to estimate the consequence costs of an oil spill. In security assessment the study concentrates on definition of ship risk indexes as a method of dynamic risk management.
Key Findings / Conclusions	
Study limitations	
Relevant countries	
Related Documents [title, author, description, type of relationship, PDF]	
Topics Addressed in SKEMA Subject Index	**SE1.6 Regulatory Framework for Maritime and Intermodal Transport** **SE4.2.3 Safety and security support systems**
Relevant Stakeholders	– Maritime administrations – Ship owners – Port authorities – Policy makers – Coast Guards
Policies Addressed	**PE1.3.3 Sea/Water pollution** **PE1.3.6 Environmental risk management** **PE1.1.2.4 Safety and Security** **PE1.1.2.5 Surveillance activities**
Policy implications /	

recommendations	
Key words	risk assessment, collision, grounding, AIS data, ship risk index
Document PDF or URL	

Summary

In safety assessment the study concentrates on two steps of the FSA process: Step 2 “Assessment of risks” and Step 4 “Cost benefit assessment of the risk control options”. In step 2 the topic is: Review of collision and grounding risk analysis methods which can utilize the historical AIS data and traffic patterns in seawaters. In Step 4 the topic is: Evaluation of methods to estimate the consequence costs of an oil spill. In security assessment the study concentrates on definition of ship risk indexes as a method of dynamic risk management.

Methods for assessing safety and security performance

Contents

1. Objectives

In maritime the Formal Safety Assessment (FSA) process is the main ‘tool’ for risk assessment. It is recommended by the IMO and its main objective is to guide rule makers to make cost effective decisions in order to improve the maritime safety [1]. If correctly applied, FSA applications are transparent, traceable and repeatable. FSA acts in a pro active way: it should put emphasis not only on risks which have lead to accidents, but also on risks which may have severe consequences.

Several FSAs has been performed for different sea areas and the methods used in the analyses differ. The objective of this study is to highlight some of the best practices how to perform FSAs in order to find risk control options to avoid collisions and groundings. Examples of performed FSAs can be found in references [3]…[7].

Analysis methods of the maritime security are not as well-known as the methods for analysing the maritime safety. Determination of ship risk index is tool for dynamic risk management. In the study, the ship risk index will be defined [2].

2. Target stakeholders

- Maritime administrations
- Ship owners
- Port authorities
- Policy makers
- Coast Guards

3. Glossary terms

Maritime safety: Maritime safety is concerned with the protection of life and property through regulation, management and technology development of all forms of waterborne transportation.

Security: Security is the condition of being protected against danger or loss. In the general sense, security is a concept similar to safety. The nuance between the two is an added emphasis on being protected from dangers that originate from outside.

4. Specific issues and topics to be addressed

4.1 Safety assessment

FSA consists of the following five steps:

1. Identification of hazards
2. Assessment of risks
3. Generation of risk control options
4. Cost benefit assessment of the risk control options
5. Decision making recommendations concerning the options available

In safety assessment the study concentrates on two steps of the FSA process: Step 2 "Assessment of risks" and Step 4 "Cost benefit assessment of the risk control options". In step 2 the topic is: "Review of collision and grounding risk analysis methods which can utilize the historical AIS data and traffic patterns in seawaters". In Step 4 the topic is: "Evaluation of methods to estimate the consequence costs of an oil spill".

4.1.1 Review of collision and grounding risk analysis methods which can utilize the historical AIS data and traffic patterns in seawaters

Seven collision and grounding risk analysis methods applicable in FSA process are reviewed. Some of the methods are designed to utilize the AIS-data, all of them benefit from it. The reliability of AIS data is also discussed.

Five of the methods can be applied to all sea areas. One method is designed to be applied in congested and high volume traffic areas and one method is focussed on the close-quarters interaction of vessels in port approaches, harbours, and constrained waterways.

Some of the methods give only estimate for the collision and grounding probabilities whereas some methods estimate also the consequences of the accidents.
According a study reviewed, 8% of examined 400056 AIS messages contained erroneous data. The errors were in MMSI number, IMO number, position, course over ground, speed over ground.

4.1.2 Evaluation of methods to estimate the consequence costs of an oil spill

The study includes description of the oil spill consequence cost evaluation process. The process includes the following estimations:

- oil spill probability in accident
- size of oil spill
- effectiveness of oil combating operations at sea

- oil spreading and width of the contaminated coast area
- costs of oil combating operations at sea and shore cleanup costs
- costs of environmental damage
- costs of damage caused to sea-dependent means of livelihood.

There is mutual understanding that the following technical factors have an essential influence on the cost of oil spills:
- Type of oil,
- Physical, biological and economical characteristics of the spill location,
- Weather and sea conditions,
- Amount spilled and rate of spillage, and
- Time of the year, and effectiveness of clean-up.

The unit costs (costs per ton of spilled oil) depend on the size of the spill; the bigger the oil spill is the lower the unit costs are.

4.2 Security assessment

In security assessment the study concentrates on definition of ship risk indexes as a method of dynamic risk management.

References

1. IMO, 2007: Consolidated text of the Guidelines for Formal Safety Assessment (FSA) for Use in the IMO Rule-Making Process. (MSC/Circ.1023-MEPC/Circ.392)

2. van der Tak C., Degre T. and Glansdorp C. The importance of a risk based index for vessels to enhance maritime safety. Conference/Journal 10th IFAC Symposium on Control in Transportation Systems, Tokyo, Japan. 2003.

3. Friis-Hansen, P., Sonne Ravn, Erik. FSA on the Navigational Safety in the Baltic West. Proceedings of 3rd International Conference on Collision and Grounding of Ships, ICCGS 2004 (ISBN:) , pages: 71-80, 2004, Society of Naval Architects of Japan, Japan 2004.

4. Ramboll. Navigational safety in the Sound between Denmark and Sweden. The Royal Danish Administration of Navigation aand Hydrography, The Danish Maritime Authority and The Swedish Maritime Administration. Denmark 2007.

5. COWI. Risk Analysis for Sea Traffic in the Area around Bornholm. Søfartsstyrelsen Report no. P-065775-002. Denmark 2008.

6. VTT 2009. Åland Sea FSA. VTT Research report VTT-R-08328-08. Espoo 2009.

7. VTT 2002. The implementation of the VTMIS system for the Gulf of Finland. Formal Safety Assessment study. Commissioned by the Ministry of Transport and Communications and Finnish Maritime Administration. VTT Research report VAL34-013153. Espoo 2002.