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# EDUCATION AND TRAINING REQUIREMENTS FOR FATIGUE PREVENTION, MITIGATION AND MANAGEMENT

## Fatigue

**Submitted by the Netherlands**

**SUMMARY**

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| ***Executive summary:*** | This document informs the Sub-Committee on a recently conducted study commissioned by the Dutch Government concerning fatigue and fatigue prevention on board sea-going ships and its preliminary findings |
| ***Action to be taken:*** | Paragraph 19 |
| ***Related documents:*** | STW 36/17, paragraph 9.10, MEPC 53/INF.7, MEPC 53/24, paragraph 19.11, ISM Code, MSC/Circ.1014 |


## Introduction

1 This document informs the Sub-Committee among other things on a recently conducted general study commissioned by the Government of the Netherlands concerning aspects of fatigue and fatigue prevention on board sea-going ships. As the study and its findings have not been evaluated fully, only its preliminary findings can be presented at this stage. More details can be made available at MSC 81.

## Background

2 Interest in fatigue, including lack of sleep, as a factor in accidents at sea has in recent years grown. Accident reports indicate that some accidents, such as collisions and groundings, have happened as a result of fatigue or lack of sleep. Collisions and groundings are the most reported accidents, and comprise of about two third of all reported accidents. Although much is written and said about fatigue on board sea-going ships, general terms are often used as essential objective and detailed statistical data are missing.

3 Next to missing of essential statistical data it was also found that numerous measures to prevent fatigue on board sea-going ships have been introduced in recent years, without a proper analysis if such measures are feasible and/or effective, including their consequences and/or impact to the maritime industry.

4 MSC/Circ.1014 states in its introduction to the GUIDELINES ON FATIGUE that effective dealing with fatigue requires a holistic approach. There is no one-system approach to addressing fatigue, but there are certain principles (e.g., workload, rest, lifestyle, habits, and medication) that must be addressed in order to gain the knowledge and the understanding to manage this human element issue.

**Scope of the study**

5 To obtain an objective and more detailed view on fatigue aspects, including possible measures and their consequence and impact, on board sea-going ships a study is carried out with the following objectives:

.1 conduct a desk study based upon all available accidents data and literature, such as national and international studies and documents, to obtain insight in the issue of causality between fatigue and collisions and groundings;

.2 list possible likely and effective measures to control the risk of fatigue; and

.3 map out the impact and consequences of possible feasible and effective measures for the Dutch merchant fleet as a whole and maritime education and training.

**Preliminary findings of the study**

**Accident data and literature**

6 In the study several analyses on national and international accident reports were performed, such as the 1997 – 2005 Dutch Shipping Council investigations[1] and IMO Sub-Committee Flag State Implementation (FSI) Working Paper 2 (WP.2), of FSI 9 – 13[1] and reported on the MAIB Safety Study 1/2004 "Bridge Watchkeeping Safety Study" (July 2004) – based upon collisions, groundings, contacts and near collisions between 1994 and 2003[1], the Swedish maritime Safety Inspectorate study "Ships with only two navigators onboard" (22 September 2004) – based upon collisions and groundings in the years 1997 - 2002[1] as well as on a significant number of available relevant national and international publications.

7 The available accident reports and available publications indicate that approximately 11-25% of the collisions and groundings were, directly or indirectly, influenced by fatigue or lack of sleep. In absolute figures and in relation to the total number of ships and the total number of movement of ships the number of fatigue related collisions and groundings was found to be low. In several of the aforementioned cases, due to lack of clarity in the available information, a sound causal correlation with fatigue could not be determined. A distance relation between other human error-related collisions and groundings and fatigue could not be excluded. Similar to the commonly accepted figure for the human error for all industries, 60% – 80% of the collisions and groundings were found to be related to "human error".

[1] It should be born in mind that most of these accident investigations were based upon the regulations in force at that time, therefore often the effects/influence of new positive instruments such as the ISM Code, STCW95, Port State Control inspections on ILO 147 and ILO 180 and the use of MSC/Circ.1014 are not noticeable.

8 The reports have also been analysed as to the relation between the shift system in place and the occurrence of fatigue-related incidents. Apart from the analyses already performed by the MAIB study, the Dutch Shipping Council investigations could be used to study this relation more extensively. Although the latter data suggest that the two-shift system was more prone to groundings and collisions, the number of incidents was too small to draw this conclusion.

9 In both accident data analysis and in the literature study it was found that fatigue is created by several causes, such as:

.1 physical load, a.o. caused by long working hours, interrupted sleep, growing workload;

.2 perceptual work load, a.o. work load during watchkeeping, i.e., to deal with many signals, to take decisions at the right moment, continuous alertness, the burden of high frequency inspections, criminalization of seafarers, obstructions with regard to shore leave; and,

.3 health, a.o. unhealthy lifestyle (overweight, lack of exercise, alcohol abuse), ineffective use of rest periods, not recognizing fatigue.

**Possible likely and effective measures to control the risk of fatigue**

10 With regard to controlling the risk of fatigue the following bottlenecks were identified:

**a. General**: ***fatigue*** is an undefined term and the following categories can be identified: *acute fatigue* – effects of a single duty period, *cumulative fatigue* – occurs when there is inadequate recovery between duty periods and *circadian rhythm effects* – impact of a human circadian rhythm that is not aligned with the day-night cycle. Therefore there is no likely single preventive measure for all these categories of fatigue.

**b. Specific**:

.1 work and rest schedule;

.2 pressure of time, physical load;

.3 perceptive mental burden;

.4 health; and

.5 manning composition.

**c. Administrative burden**: Another element identified as a contributing bottleneck to the risk of fatigue is the growing workload caused by the administrative burden. Examples for this growing administrative burden are a.o. the administrative process resulting from the ISM Code, ISPS Code, MARPOL, GMDSS, number of official inspections (e.g., Port State Control, ISM audits), non-official inspections (e.g., vetting, cargo hold/tank inspections) and growing number of port/shore related documents. As this burden is partly created by IMO instruments, IMO can partly resolve this itself.

11 Although all identified measures have not been evaluated satisfactorily yet, it appears to be an effective approach to enhance fatigue prevention through the ISM Code/Safety Management System. With the broad spectrum of the SMS a substantial part of the wide variety of potential causes of fatigue can be covered. Through the SMS, fatigue prevention can be managed in a comprehensive way, fitting in with the policy and specific organizational situation of the Company. The feedback from and periodical review of the SMS will enable the master and crew, the Company and the flag State authorities to take proper and timely action when needed.

12 Elements (non-limitative) identified which are or can be part of the SMS to control the risk of fatigue are the following:

.1 extend the period of rest through e.g., more flexible working schedule or alternative manning composition (e.g., use of dual capacity officers, if circumstances require, when a temporary alternative watch system can be introduced;

.2 optimize the organization of work e.g., attune nature and scale of work with available crew, optimize distribution of work on board, attune competencies with tasks, proper division of tasks/range of duties per position;

.3 proper personnel management, e.g., correct competencies, matching crewmembers, dual capacity trained crew, enlarging self-discipline of the crew;

.4 introducing a tool for *fatigue* prevention, e.g., based upon MSC/Circ. 1014 – Guidance of Fatigue Mitigation and management; and

.5 alcohol policy – to avoid alcohol abuse.

13 Other elements which could contribute in controlling the risk of fatigue are, national occupational health and safety legislation, the reduction of the administrative burden (including number of inspections), shifting tasks from ship to shore (e.g., administrative work, maintenance), the length of and the ratio between the period that the seafarer is on board and the period that she/he is at home, and last but not least education and training. In the Netherlands fatigue prevention related issues such as work planning and managing crew are part of the curriculum of the Ship Management Course[2]. Also elements such as a.o. 'healthy' ship design – reducing level of noise and vibrations, promotion of health on board and work saving adaptations and using new technological developments, e.g., Bridge Navigational Watch Alarm System (BNWAS) and Voyage Data Recorder (VDR) (to improve compliance) will contribute to controlling the risk of fatigue.

**Impact/consequences of measures taken**

14 Before enhancing existing measures or introducing new measures as mentioned above, it is of most importance to map out its impact or consequences. For this purpose a study on the impact of the measures to be expected, most needed, feasible and effective is part of the overall study.

[2] Successfully passing this course is part of the requirements to obtain a Netherlands Certificate of Competency at the management level.

15 Unfortunately the results of this aspect were not finalised at the moment of drafting this document.

**Conclusion**

16 In the reports and publications there is lack of clarity concerning the role of fatigue in relation to collisions and groundings to determine a sound causal correlation between fatigue and such accidents.

17 However, it is clear that fatigue, as a risk, results in impaired performance and diminished alertness. Fatigue is not only a risk for crewmembers carrying out navigational tasks, but also applies to the other areas, where it may threaten occupational health and safety, on board sea-going ships and is a complex and broad subject.

18 A good starting point in enhancing the control of the risk of fatigue is to enhance the integration of fatigue prevention measures, e.g., based upon MSC/Circ.1014 - GUIDANCE ON FATIGUE MITIGATION AND MANAGEMENT, in the Safety Management System under the ISM Code.

**Action requested of the Sub-Committee**

19 The Sub-Committee is invited to note the information provided.