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OF IMO INSTRUMENTS  
9th session  
Agenda item 4

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**LESSONS LEARNED AND SAFETY ISSUES IDENTIFIED FROM THE ANALYSIS OF  
MARINE SAFETY INVESTIGATION REPORTS**

**Report of the Correspondence Group on Analysis of  
Marine Safety Investigation Reports**

**Submitted by Sweden**

**SUMMARY**

*Executive summary:* This document contains the Report of the Correspondence Group on Analysis of Marine Safety Investigation Reports.

*Strategic direction, if applicable:* 7

*Output:* 7.4

*Action to be taken:* Paragraph 28

*Related documents:* III 9/4/1 and III 9/4/2

**Terms of reference**

1 The Sub-Committee on Implementation of IMO Instruments (III), at its eighth session, taking into account the work completed at the session, established the Correspondence Group on Analysis of Marine Safety Investigation Reports, under the coordination of Sweden,<sup>1</sup> with the following terms of reference, using IMO Space facilities (III 8/19, paragraph 4.57):

- .1 based on the information received from Administrations on investigations into casualties, conduct a review of the marine safety investigation reports assigned by the Secretariat, prioritizing very serious marine casualties which have occurred since 1 January 2010 involving SOLAS ships, and prepare a summary list of draft lessons learned from marine casualties, where available;

\* Re-issued on 27 June 2023 with minor amendments to paragraph 22.4, Annex 1 Lessons learned cases 1 and 13

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- .2 review the draft text of lessons learned from marine casualties, for the Sub-Committee's consideration prior to release in accordance with the agreed procedure;
- .3 develop a proposal for a new output on guidelines addressing the identified safety issues of seafarers exposed to risk of falls from height (including, but not limited to, access to and egress from the location where the work will be conducted, working from height and work over the side), with the Sub-Committee on Human Element, Training and Watchkeeping (HTW) as the coordinating body;
- .4 identify safety issues and make recommendations that needed further consideration by the Sub-Committee, taking into consideration the discussion at the Working Group;
- .5 carry out further analysis on both potential safety issues, collision with fishing vessels and ISM code related concern on unsatisfactory implementation of safety management systems and draw conclusions and make recommendations;
- .6 develop a proposal for a new output for preventing loss of containers at sea;
- .7 use all safety issue cases, including the safety issue identified in document III 8/4/3, as samples for an interim application to test the updated Procedure for identifying and forwarding safety issues for its suitability; and
- .8 submit a report to III 9.

2 In addition to the above, MSC 106, having noted that an output on "Development of measures regarding the detection and mandatory reporting of containers lost at sea that may enhance the positioning, tracking and recovery of such containers" was currently on the agenda of the CCC Sub-Committee, instructed the Correspondence Group to take the ongoing work in the Sub-Committee into account when developing the proposal for the new output (MSC 106/19, paragraph 14.3).

### **Members of the Correspondence Group**

3 Representatives of the following Member Governments, intergovernmental and non-governmental organizations participated as members of the Group: Antigua and Barbuda; Argentina; Australia; the Bahamas; Belgium; Brazil; Canada; China; Croatia; Denmark; France; Germany; Greece; Hong Kong, China; Indonesia; Islamic Republic of Iran; Japan; Liberia; Lithuania; the Marshall Islands; Myanmar; Kingdom of the Netherlands; New Zealand; Nigeria; Panama; Papua New Guinea; the Republic of Korea; the Russian Federation; Singapore; South Africa; Sweden; Türkiye; the United Kingdom; the United States; European Commission (European Maritime Safety Agency (EMSA)); Marine Accident Investigators' International Forum (MAIIF); International Chamber of Shipping (ICS); ; International Association of Classification Societies (IACS); Companies International Marine Forum (OCIMF); INTERTANKO; International Group of Protection and Indemnity Associations (P&I Clubs); Institute of Marine Engineering, Science and Technology (IMarEST); The International Transport Workers' Federation (ITF); and World Shipping Council (WSC).

## **Review of the marine safety investigation reports**

4 The list of 28 marine safety investigation reports, concerning 27 occurrences, which have been reviewed by the analysts as members of the Correspondence Group is annexed to document III 9/4/1. Overviews of the analyses and of observations on the quality of the reports are presented in paragraphs 21 and 22, and 25 and 26, respectively.

## **Review of lessons learned**

5 During the work of the Correspondence Group, a total of 13 Lessons Learned has been compiled and ready for release, as set out in annex 1 of this report.

6 According to the procedure, the Lessons Learned are scripted by the Member States, reporting the occurrence into the Global Integrated Shipping Information System (GISIS). The Correspondence Group has observed the same as previous intersession, namely that the number of Lessons Learned is less than the number of reported occurrences, and the quality more widely spread than before the change of procedure. This may be a consequence of the new procedure (as described in III 8/WP.3, paragraph 11). During this intersession, a number of 121 reports, classified as very serious casualties, have been reported into GISIS by Member States. Subsequently, ideally the number of Lessons Learned should be the same. Hence, the Correspondence Group finds reason to suggest that an evaluation of the procedure may be held by the Casualty Analysis Working Group, if established during III 9.

## **Proposal for a new output on guidelines of falls from height**

7 A proposal for a new output on guidelines addressing the identified safety issues of seafarers exposed to risk of falls from height (including, but not limited to, access to and egress from the location where the work will be conducted, working from height and work over the side) has been developed. The proposal contains the finding that no IMO guidelines addressing the issue currently exist, and those flag and coastal States that have issued guidance or recommendations do not address all the safety issues associated with such work. Consequently, there is no single source that can be used as a basis when developing safe work procedures for working from height or over the side.

8 The Correspondence Group has considered that there is no additional administrative requirements or burdens, nor is there any negative implications for the human element. Instead, there will be benefits with direct contribution to improving safety to seafarers, and since there is an average of 14 persons per year fatally injured between 2016 and 2021, the output should be addressed as a matter of urgency.

9 The HTW Sub-Committee will be the coordinating body for the work on this output, according to the proposal. The proposal is enclosed as annex 2.

## **Identification of safety issues and recommendations for further consideration**

10 During the analysis process of the investigation report no safety issues were raised by the analysts.

## **Analysis on collision with fishing vessels**

11 Although some data from GISIS regarding collisions with fishing vessels has already been collected and analysed, no recommendation has yet been made by the Correspondence Group since the data is found insufficient. The fishing vessels are subject to different legislation, i.e. national, compared to international shipping. The performance is indeed

different and the culture may also differ. This could lead to the conclusion that one reason for collisions with fishing vessels may be different prerequisites and conditions. Hence, one way forward would be to strive for equating those differences.

12 A natural approach would be to compare requirements of technical equipment used for preventing accidents, e.g. Automatic Identification Systems (AIS) and Very High Frequency (VHF), and find out to what extent this equipment is used on fishing vessels. A specially designed questionnaire for that purpose is attached in annex 3.

13 However, if such a questionnaire is to be put forward to Member States, the opportunity to complete data also in other aspects should be used. The Correspondence Group thus recommends that the working group, if established, is tasked to complete the questionnaire with the ambition to collect data for enabling potential other conclusions.

### **Analysis on IMS Code-related concern on unsatisfactory implementation of safety management systems**

14 The Correspondence Group was instructed to carry out further analysis on potential safety issues about ISM Code-related concern on unsatisfactory implementation of safety management systems, draw conclusions and make recommendations. Hence, an extract from GISIS was made available, including those reports containing the words "ISM" or "SMS". A total of 62 relevant reports were found and have been analysed. The analysis is enclosed in annexes 4 and 5.

15 The analysis was mainly aimed at finding common safety issues, and whether the reports show signs of not fully implemented ISM/SMS. The result was, inter alia, that a common safety issue was lack of risk assessment, and that a majority of the cases indicated a not fully implemented ISM/SMS. Furthermore, in many cases the ISM deficiency could have been detected during an inspection. It seems, according to the result, that the problem is not the ISM itself, rather how the ISM is implemented.

16 Realizing the importance of this issue, the Correspondence Group concluded that any action, if such is taken, has to be thoroughly examined and considered if a successful result is to be achieved. Hence, a discussion on how to progress is eligible. The proposed forum for such a discussion is the Casualty Analysis Working Group, if established.

### **Proposal for a new output for preventing loss of containers at sea**

17 The Corresponding Group was tasked to develop a proposal for a new output for preventing loss of containers at sea, taking into account the instruction from MSC 106 (paragraph 2 above). This task has caused some concern within the Correspondence Group, since a similar proposal was prepared elsewhere in the Organization for the 107th session of the Marine Safety Committee (MSC 107/17/12). Hence, a discussion took place in the Correspondence Group on whether the task should be completed or aborted. The duplication of work stream and not streamlined versions of the two proposals was highlighted. As the Correspondence Group proposal was almost completed, it was finally decided to finalize the task.

18 The analysis in the Correspondence Group's proposal reveals, inter alia, the following issues:

- .1 extreme motions and accelerations due to a high GM without any maximum limit for GM;

- .2 encountered transversal accelerations at design limits, leading to failure of container structure and/or lashing equipment;
- .3 the existing Code for safe stowage and securing cannot be used to calculate design accelerations; and
- .4 maximum size of containerships continues to increase, resulting in a need to review the concept of lashing of containers, and possible amendments of technical and operational standards.

19 The Correspondence Group has considered that there is no additional administrative requirements or burdens, nor is there any negative implications for the human element. Instead, there will be benefits with improving safety of seafarers.

20 The loss of containers at sea has an impact on marine environment. Further, since the loss of **MSC Zoe** and the connected analysis, there have been several other large occurrences. Due to this, the output should be addressed as a matter of urgency. The proposal is enclosed as annex 6.

### **Test of the updated procedure for identifying and forwarding safety issues**

21 The Correspondence Group on analysis of marine safety investigation reports was tasked to use safety issue cases as samples to test the suitability of the updated Procedure for identifying and forwarding safety issues (as found in III 8/WP.3 annexes 2 and 3). This has been done during the intersession by using the experiences from the development of the proposed new outputs addressing falls from height and loss of containers as well as the Safety Issue defined in document III 8/4/3. The Procedure has also been compared with other relevant national procedures. The result is that the Procedure is found to be working fine. Hence, the Correspondence Group suggests that the result of the testing of the Procedure is brought to the attention of the Casualty Analysis Working Group, if established, for final confirmation, taking into account that MSC 106 had approved the updated procedure as set out in annex 25 to MSC 106/19 (MSC 106/19, paragraph 14.6).

### **Overview of marine safety investigation report analysis**

22 Of the 28 marine safety investigation reports analysed, concerning 27 marine casualties, 23 were prepared by the marine safety investigation authority of the flag States and four by the marine safety investigation authority of the coastal or substantially interested States. One (1) marine casualty was reported by both flag State authorities involved. With regard to the marine casualties covered by the marine safety investigation reports that were analysed during this intersession, and based upon the analyses, the following was noted:

- .1 all 27 occurrences were very serious marine casualties;
- .2 4 occurred in 2018, 3 occurred in 2019, 11 in 2020, 9 in 2021;
- .3 30 ships were involved, including eight bulk carriers (27%), four general cargo ships (13%), three containerships (10%), three fishing vessels (10%), two product tankers (7%), two ore carriers (7%), one oil tanker (3%), one passenger ship (3%), one refrigerating ship (3%), one LPG tanker (3%) and four other (13%);
- .4 the following numbers of type of marine casualties, dead or missing persons, and serious injuries resulting from each type of marine casualty involved;

Type of marine casualty	Marine casualties	Dead or missing persons	Serious injuries
Collision	3	14	0
Fire/explosion	5	8	2
Stranding/grounding	2		
Man-over-board	5	5	
Occupational accident	4	4	1
Enclosed space	1	1	
Cargo handling	1	1	
Poisoning	1	3	
Damage to ship or equipment	1	2	
Machinery damage	3	5	3
Other	1	1	
<b>Total</b>	<b>27</b>	<b>44</b>	<b>6</b>

- .5 the following numbers of dead or missing persons and serious injuries related to each type of ship involved; and

Type of ship	Number of dead or missing persons	Number of serious injuries
Bulk carrier	19	2
Oil tanker	1	
Container vessel	4	
LPG tanker	1	
General cargo	4	
Ore carrier	2	
Open hatch	2	
Product tanker	4	1
Deck cargo	3	
Drilling rig	3	
Passenger vessel	1	3
<b>Total</b>	<b>44</b>	<b>6</b>

- .6 no report contained information on oil leaking into the sea.

23 The marine casualty of the collision between bulk carrier **SBI Perseus** and the fishing vessel **Min Jin Yu 05119** (GISIS ref. C0013046) may be mentioned due to the number of lost or missing persons. Early in the morning the bulk carrier on her route between Malaysia and China collided with the fishing vessel. The collision resulted in minor damage and scratches on the bulk carrier, but the sinking of the fishing vessel. Of the fishing vessels crew of 14, 12 were lost and only 2 survived.

### Feedback on the quality of marine safety investigation reports

24 Marine safety investigation reports selected for analysis during the intersessional analysis process also underwent quality evaluation based on the criteria given in chapter 2, paragraph 2.12 of the Code of the International Standards and Recommended Practices for a Safety Investigation into a Marine Casualty or Marine Incident (Casualty Investigation Code), adopted by resolution MSC.255(84). The evaluation of the reports did not include the quality of the investigation itself. As agreed by FSI 20 (FSI 20/19, paragraph 5.3.2), in order to provide feedback on the quality of the reports, the completed quality evaluation forms were made available on GISIS – without disclosing the analysts' identities – to the corresponding reporting marine safety investigation authorities, purely for information purposes and for these

authorities to act as they deemed appropriate for their internal quality assurance processes. If a report was selected for analysis during the intersessional analysis process, a quality evaluation form would be completed online by the analyst. The feedback did not have to be approved, agreed or discussed between the analyst and the reporting marine safety investigation Authority.

25 With these criteria in mind, the following procedure was adopted:

- .1 if a marine safety investigation report is selected for analysis during the intersessional analysis process, a quality evaluation form is completed online by the analyst;
- .2 the name of the analyst will appear on neither the analysis nor the quality evaluation form; and
- .3 only the reporting marine safety investigation Authority for each individual report and form may access the quality evaluation form as deemed appropriate for its internal quality assurance process.

### **Observations on the quality of marine safety investigation reports**

26 The following has been observed with regard to the quality of marine safety investigation reports (figures in square brackets relate to previous intersessions, reported in III 8/4):

- .1 28 [36] marine safety investigation reports were reviewed during the intercession by members of the Group. In all 28 cases (100%) [97%] quality evaluation forms were completed and submitted to GISIS by the analysts.
- .2 16 reports (57% of the evaluated reports) [74%] met the quality criteria set out in paragraph 2.12 of the Casualty Investigation Code.
- .3 12 reports (43% of the evaluated reports) [26%] contained inappropriate or insufficient information according to the requirements of the Casualty Investigation Code. The areas where information was inappropriate or missing (with reference to paragraph 2.12 of the Casualty Investigation Code) were identified by the analysts as follows:
  - .1 summary outlining the basic facts of the marine casualty or marine incident and stating whether any deaths, injuries or pollution occurred as a result (paragraph 2.12.1) (one report);
  - .2 identity of the flag State, owners, operators, the company as identified in the safety management certificate, and the classification society (subject to any national laws concerning privacy) (paragraph 2.12.2) (three reports);
  - .3 where relevant, the details of the dimensions and engines of any ship involved (paragraph 2.12.3a) (two reports);
  - .4 description of the crew, work routine and other matters, such as time served on the ship (paragraph 2.12.3b) (nine reports);

- .5 a narrative detailing the circumstances of the marine casualty or marine incident (paragraph 2.12.4) (two reports);
  - .6 analysis and comment on the causal factors including any mechanical, human and organizational factors (paragraph 2.12.5) (five reports);
  - .7 a discussion of the marine safety investigation's findings, including the identification of safety issues, and the marine safety investigation's conclusions (paragraph 2.12.6) (three reports); and
  - .8 where appropriate, recommendations with a view to preventing future marine casualties and marine incidents (paragraph 2.12.7) (three reports).
- .4 The question of whether the accident had been reported by more than one flag State, and if there were any discrepancies in the reports, has been answered negatively in the only case.
- .5 Other comments or observations relating to the quality of the report were also noted in some cases, describing the analyst's view of the report.
- .1 In some cases shortcomings in the report were noted, such as lack of details, references and certain information. Observations have been noted, including: not clear from the investigation report if there had been any causal factors; information was limited mostly from one side due to the missing crew on board the fishing vessel; report contained various mechanical factors but little human and organizational factors; human and organizational factors are referenced but not discussed in detail.
  - .2 In yet some cases credits were given, such as well-written and detailed report; the investigation report is of good quality and indicates that the investigation was thorough; report was well written; a precise and a wonderful investigation report, good job, thank you to the investigators; report was very well written and comprehensive, covering all aspects of the casualty and the causal factors; the report also looked into the relevant organizational and other elements, which makes it a good-quality report.

27 The analysts were also tasked to identify which annexes in GISIS had been completed for the marine safety investigations in addition to the marine safety investigation report submitted to GISIS. Of the 28 marine safety investigation reports, annex 1 had been completed in all 28 cases, annex 2 had been completed in 17 cases, and annex 3 had been completed in 12 cases. Annex 4 (Information from Casualties involving Dangerous Goods or Marine Pollutants in packaged form on board ships and in port areas) had been not been completed in any case, annex 5 (Damage Cards and Intact Stability Casualty Records) had been completed in six cases, annex 6 (Fire Casualty Record) had been completed in six cases, annex 7 (Questionnaire related to the Global Maritime Distress and Safety System) not in any case, annex 8 (Fatigue Factors Data Compilation sheet) in one case, annex 9 (Incidental Spillages of Harmful Substances of 50 tonnes or more) in five cases, and annex 10 (Life-Saving Appliance casualty record) in five cases.



**Action requested of the sub-committee**

28 The Sub-Committee is invited to approve the report of the Correspondence Group in general and, in particular, to:

- .1 approve the draft text of Lessons Learned from marine casualties and their release on the IMO website in accordance with the agreed procedure (paragraph 5 and annex 1);
- .2 note the observation regarding Lessons Learned and refer it to the Casualty Analysis Working Group, if established, for evaluation (paragraph 6);
- .3 consider the proposal for a new output for the development of guidelines addressing risks of falls from height, and take action as appropriate (paragraphs 7 to 9 and annex 2);
- .4 instruct the working group, if established, to complete the questionnaire for collecting data for the work for preventing collisions with fishing vessels and continue the work of further analyzing these casualties (paragraphs 11 to 13 and annex 3);
- .5 refer the result of the analysis on ISM Code related concern on unsatisfactory implementation of safety management systems to the working group, if established, for further analysis and consideration (paragraphs 14 to 16 and annexes 4 and 5);
- .6 consider the proposal for a new output on preventing the loss of containers at sea, and take action as appropriate (paragraphs 17 to 20 and annex 6);
- .7 note the result of the test of the updated Procedure for identifying and forwarding safety issues, and bring the result to the attention of the Casualty Analysis Working Group, if established, for final confirmation, taking into account that MSC 106 had approved the updated procedure (paragraph 21);
- .8 note the overview of marine safety investigation report analysis and refer it to the Casualty Analysis Working Group, if established, for review (paragraphs 22 and 23); and
- .9 note the observations on the quality of marine safety investigation reports and take action as deemed appropriate (paragraphs 26 and 27).

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## ANNEX 1

### LESSONS LEARNED FROM MARINE CASUALTIES

#### 1 OCCUPATIONAL ACCIDENT

##### **Very serious marine casualty: Fatality under fallen load**

##### **What happened:**

A ship berthed to commence unloading operation. While the carbon anode cargo was being unloaded, a row of cargo in the hold fell over, and the stevedore who was unlashng the sling of steel plate at that time perished under the fallen load.

##### **Why did it happen:**

Following the accident investigation, it was concluded that the factors that contributed to the accident were leaving the stacking level of the load units over the tolerable level during the unloading procedure, not taking into account for the balancing considerations produced by the non-standard sizes of load units, and the way the job was done, with no effective monitoring and decision-making mechanisms.

##### **What can we learn:**

- Shipping companies should review the SMS procedures to clearly identify risks involved in different tasks and provide clear guidance to its fleet of ships accordingly.
- The Terminal representatives/Stevedoring Companies engaged with loading/unloading operations on board should carry out risk assessment effectively prior to the commencement of the tasks.

##### **Who may benefit:**

Ship Operators/Managers/Owners, Terminal Representatives, Stevedores.

#### 2 OCCUPATIONAL ACCIDENT

##### **Very serious marine casualty: Fatal strike by mooring line**

##### **What happened:**

The ship was moored alongside an anchored ship for ship-to-ship transfer of grain using its cranes. The crew was unfamiliar with the operation. When the loading process approached the end, one crane needed to reach a part of a cargo hold on the smaller ship that was not accessible. Therefore, the smaller vessel needed to reposition two to three meters forward to continue the loading. The master decided the smaller vessel to be warped ahead using the vessel's mooring lines. No additional crew members other than the watch crew and the chief officer participated in the mooring operation. One AB and the chief officer were posted on the aft mooring station. When the operation was about to commence, the chief officer stood beside the vessel side close to the spring lines. The SMS stated a team of three crewmembers at each mooring station and the chief officer supervising during mooring operations. At this time, the deck of the larger vessel was about eight meters higher. Both aft spring lines were led through the same open design fairlead. When the winch started to pull one of the spring lines,

and the tension increased, the line skipped over the open design fairlead and struck the chief officer's head, which collapsed unconscious. It took two hours until a medical professional could treat the injured Chief Officer, who was declared deceased.

**Why did it happen:**

- The mooring line sprang free because the fairlead in use was open and the lines had developed a hazardous upward lead during cargo operations as the difference between the vessels' freeboard increased.
- The chief officer stood close to the tensioned spring lines when the warping operation commenced.
- Only the watch crew on deck was attending the mooring operation.
- It took two hours before the casualty could be treated by a medical professional.

**What can we learn:**

- An insufficient amount of crew attended the warping operation.
- The SMS manual for the vessel was missing a proper guidance regarding ship-to-ship transfer operations.
- There was limited time for the crew to conduct an appropriate risk analysis of the operation.
- The mooring arrangement was unsuitable for ship-to-ship operations and the crew had limited knowledge and experience of open design fairleads.

**Who may benefit:**

All deck officers and ratings.

**3 MAN OVERBOARD****Very serious marine casualty: Fatality when crew member fell overboard from ladder****What happened:**

In June, a gas carrier was transiting in the South Atlantic Ocean, bound for a Brazilian port. In the morning after handing over the navigational watch to the Third Officer, the Chief Officer tasked two crew members to carry out painting work for the undersides of two separate stairway landings from the boat-deck.

After the crew members collected the required tools, they began the painting work using telescopic rods connected to roller-brushes. About an hour into the painting work, one of the crew members saw the other carrying a portable A-frame ladder to the boat-deck.

Shortly after, the crew member who collected the ladder was seen sitting on top of the ladder carrying out the painting and then losing his balance when the ladder tilted, while the vessel was altering course. The crew member and the ladder fell overboard.

Man overboard (MOB) procedure was carried out and with the assistance of a nearby fishing vessel. The lifeless body of the lost crew was brought onboard the vessel, and attempts to resuscitate the crew were unsuccessful.

### **Why did it happen:**

The investigation revealed that the use of the portable ladder was not considered necessary for the painting work, when the crew members were assigned and briefed for the work in the bridge. The use of the portable ladder, as stated in the Safety Management System (SMS), required a risk assessment and a permit-to-work to be carried out before approved by the Master.

The crew member had used the portable ladder without consulting anybody. Although provided with a stop-work authority card, the other crew member did not execute this authority, missing the opportunity to stop the using of the portable ladder.

The investigation also revealed that there was a difference in the understanding of the SMS requirement for the type of work activities to be entered in the "Change of Bridge Watch" checklist by the watchkeeping officers (the CO and 3O), resulting in the 3O not being aware of the painting work on the open-deck.

### **What can we learn:**

The SMS practice onboard appeared to be ineffective, as shown:

- The importance of carrying out toolbox meeting and information highlighting the task that would be undertaken by the crew onboard to be made available to the Officer on watch, in particular, where the duty crew was involved with the task.
- A crew missed the opportunity to exercise a "stop work" authority required by the SMS when he saw the other crew carrying an A-frame ladder which had not been approved for the task being performed.

### **Who may benefit:**

Officers and Crew.

## **4 OCCUPATIONAL ACCIDENT**

### **Very serious marine casualty: Fatality when crew member disassembled valve under pressure**

#### **What happened:**

In the early hours of September, while transiting south-westerly in the Indian Ocean for a Brazilian port, an Ore carrier experienced an exhaust temperature anomaly from the main engine. The engine crew subsequently assembled in the engine-room and emergency replacement of a fuel oil injector valve (FOIV) was initiated.

After the fuel oil high-pressure pipe had been removed from the engine cylinder cover, the Fourth Engineer and supervising engineer (Second Engineer) left the main engine to the spare parts room, while the Third Engineer (3E) was alone on the cylinder head platform.

Shortly after, a loud bang was heard and the 3E collapsed on the platform with the fuel oil injector valve (FOIV) and its securing nuts nearby. The 3E was bleeding from the right-side of his face with fainting pulses. Immediate first aid was given on board and the vessel deviated to the nearest port for shore medical assistance, but the 3E succumbed to the injuries before medical treatment could be provided.

### **Why did it happen:**

The investigation revealed that the securing nuts of the FOIV were removed by the 3E while the engine RPM had not attained zero. The FOIV expelled from the cylinder cover with substantial force on to the 3E's face.

While the investigation team could not establish the reasons for the 3E's removal of the FOIV without waiting for the RPM to be zero, the investigation revealed that the engine crew relied on memory and observations on how the FOIVs were removed previously and with varied interpretations of the safety precautions stipulated in the engine manual.

There was also an absence of supervision in terms of task assignment(s) to the engine crew. The engine's data records retrieved from the main engine revealed that certain safety precautions were not carried out.

### **What can we learn:**

- This incident iterates the importance of compliance to safety precautions, especially for ship engine where the omission of any steps can result in undesired outcome for both the engine and personnel.
- The purpose of each safety precaution should be well comprehended, and verification processes be established to ensure that work is safe to commence.
- These can be achieved through appropriate checklist(s) as part of a permit-to-work system with enhance scope in training encompassing these safety precautions.

### **Who may benefit:**

Shipping community.

## **5 DANGEROUS SPACE/FALL FROM HEIGHT**

### **Very serious marine casualty: Fatality and injury when crew entered cargo hold**

#### **What happened:**

A bulk carrier, alongside discharging coal, was requested by stevedores to provide additional lighting. The officer of the watch tasked two crew to complete the task. Whilst entering the hold via the enclosed Australian ladder, crew 1 collapsed and fell to the bottom of the ladder. Crew 2, on witnessing this, entered the ladder trunking to provide assistance. He also collapsed and fell to the bottom of the ladder. A rescue operation was initiated and both crew were recovered alive and, after a delay, transferred to hospital. Crew 2 recovered some time later but crew 1 was fatally injured – a post-mortem identified exposure to hydrogen sulphide as the cause of death.

#### **Why did it happen:**

Neither crew considered themselves at risk of exposure to harmful or toxic gases when they started the task as the hold was open and almost empty of cargo. The officer of the watch did not foresee entry into a dangerous space, and was not present, so the atmosphere was not tested in line with the company's enclosed space entry procedures. Although the hold was open, the design of the Australian ladder's trunking meant that there was no natural ventilation of the space as cargo blocked the lower exit.

Despite delays in their recovery, both casualties were breathing when they were recovered to the deck, but no medical assistance arrived to assist. They were eventually taken to hospital by car, significantly delaying access to medical care.

**What can we learn:**

Cargo holds are dangerous spaces and each cargo presents its own hazards. The importance of effectively communicating these hazards and conducting a thorough risk assessment cannot be overstated. Realistic drills can improve speed of casualty recovery from dangerous spaces. Sadly, assistance from shore may not be forthcoming.

**Who may benefit:**

The shipping community.

## **6 OCCUPATIONAL ACCIDENT**

### **Very serious marine casualty: Fatality when crew was lost over-board**

**What happened:**

In September a containership was underway from a port in the North Pacific Ocean enroute to Mexico.

Early in the morning, the Bosun came to the bridge to take job orders from the Chief Officer who was keeping the 0400H-0800H navigational watch. The Bosun could not find the Chief Officer and informed the Master, who turned the ship around on a reciprocal course. Nearby Coast Guard was alerted for search and rescue efforts, which spanned till the next day to no avail.

**Why did it happen:**

Why it happened could not be determined with certainty. However, the marine safety investigation revealed that the Company's SMS on bridge watchkeeping was not implemented as there was no lookout on the bridge with the Chief Officer. In addition, the established procedures for mitigating the risk of a single watchkeeper were not complied with, as the Bridge Navigational Watch Alarm System (BNWAS) had been switched off.

**What can we learn:**

- The importance of BNWAS activated for the safety of navigation.
- The bridge to be manned appropriately at all times.
- The availability of a convenient avenue for the fleet personnel to report unsafe practices on board including solo watch during hours of darkness.
- Amended the pre-departure and watch handover checklist in the SMS to require the checking and recording of the BNWAS status during the pre-departure checks and navigation watch handover respectively.
- Amended the SMS procedures to require the Master to be solely accountable for ensuring the key of BNWAS is in the possession of the Master to avoid the inappropriate practice of switching off the BNWAS.
- Master to be notified when there are variations to the approved watchkeeping schedule.

**Who may benefit:**

All Shipping Community.

**7 FIRE**

**Very serious marine casualty: Fatalities when crew fought fire and abandoned the ship**

**What happened:**

While on route, a 150,000 GT Container Carrier encountered a severe fire in one of the cargo holds. Self-sustaining decomposition of a Class 9 cargo caused smoke and fire to spread in the cargo hold. The cargo was carried in block stowage exacerbating and accelerating the decomposition process. The crew responded to the fire by cooling and subsequent release of CO<sub>2</sub>. The respond was however not successful, and the crew eventually abandoned the vessel. Four of the crew was not accounted for and declared missing, and yet another was deceased while being transported ashore.

**Why did it happen:**

As most of the evidence were destroyed by fire, it is not possible to conclusively determine the cause of the fire. One or more containers in the cargo hold containing Sodium Dichloroisocyanurate Dihydrate (SDID) were compromised by self-decomposition of the SDID. The block stowage of the SDID further exacerbated the rate of reaction and heat production which resulted in an uncontrollable spread of the fire. The actual temperature at which exothermic decomposition is initiated is much lower than the values typically declared by the shipper, and the presence of free water and/ or stowage of the SDID in large packages or consignments leads to further substantial depression of the onset temperature.

Given the susceptibility of SDID to exothermic decomposition in the presence of free water or impurities, serious consideration must be given to the prospect that the decomposition could be initiated as a direct result of the inherent properties of the cargo itself.

**What can we learn:**

Special Provisions (SP135) within the IMDG Code allows for the classification and carriage of SDID under Class 9 (UN no.3077), thus not recognising the potential thermal instability of this material, possibly as a result of legacy carriage requirements recognised nearly 40 years prior. As a result, despite these secondary hazards, SDID was stowed under-deck where the main fixed firefighting means in this area was CO<sub>2</sub>, which is ineffective to tackle fires associated with such materials.

Noting the secondary hazards presented by SDID, which are not captured in the current provisions of the IMDG Code, the provisions in the IMDG Code would need to be reviewed. Firefighting response for SDID, an oxidiser, required the use of abundant water, which could not have been achieved promptly, given the existing statutory requirements for firefighting measures for container fires under-deck.

Adoption of standards/ guidance like those prepared by American Bureau of Shipping (ABS) and DNV-GL, as a risk-mitigating measure, should be considered. Regardless of amendments to the statutory requirements, dangerous goods with oxidising properties such as SDID should be considered for stowage on-deck, away from direct sunlight, where water could be used more effectively.



There was a delay in decision making to allocate resources better for the abandoning of ship while attempting to fight the fire.

**Who may benefit:**

Seafarers, flag Administrations, recognized organizations, shipowners, ship operators, charterers, shippers, consignees, salvors, container terminals, SAR authorities, HAZMAT agencies.

**8 FIRE**

**Very serious marine accident: ship total loss due to fire**

**What happened:**

In June during cargo discharge operations while alongside a fire broke out in the internal cargo handling spaces of a self-unloading (SUL) bulk carrier.

The ship's crew initiated an emergency response but shipboard efforts to control the fire were ineffective. The fire soon established itself and spread to the exterior of the ship, setting the discharge boom on deck alight. The ship's crew were evacuated and shore firefighting services from ashore took charge of the response to the fire. The fire was contained and eventually extinguished about five days after it started.

The ship sustained substantial structural damage, including breaches of two fuel oil tanks, and key components of the SUL system were largely destroyed. The ship was declared a constructive total loss and subsequently dispatched to be recycled. There were no serious injuries or pollution of the sea reported.

**Why did it happen:**

The investigation concluded that the fire originated in vessel's C-Loop space and was likely the result of a failed bearing in the ship's conveyor system which created the heat necessary to ignite the rubber conveyor belt. The investigation also determined that the ship did not have an emergency contingency plan for responding to fire in the ship's SUL spaces and that there were technical failures of the ship's alarm systems during the emergency response to the fire. Furthermore, some aspects of the shipboard response likely aided the fire's development while others increased risk by removing shipboard capability.

The investigation found that the risk of fire in the vessel's C-Loop space was identified and documented by the ship's operators as being unacceptable about five years before the fire.

This risk rating was primarily due to the absence of an effective means of fire detection and fire suppression for the SUL system spaces. However, measures taken to address the risk were either inadequate or ineffective. Furthermore, the lack of adequate regulatory requirements or standards related specifically to the fire safety of SUL ships have been a factor in several fires, including the ship. The investigation also identified that the regulatory oversight of the vessel did not identify any deficiencies related to the safety factors identified by this investigation, or to the ship's inherent high fire safety risk and management of that risk. In addition, the investigation identified a safety issue related to the marine firefighting capability of the shore based fire fighters as well as other safety factors related to the inconsistent conduct of ship's drills and the port's emergency response plans.

### **What can we learn:**

The investigation into the fire has highlighted the inadequacy of fire safety regulations and standards for the cargo handling spaces on board self-unloading bulk carriers. The effectiveness of a shipboard response to a fire depends primarily on the ability to detect the fire at an early stage and quickly extinguish it at the source. Where it has been identified that the lack of such systems has resulted in the risk of a fire in a space being unacceptable, suitable control measures need to be implemented in order to reduce the risk to an acceptable level.

The introduction of mandatory minimum standards for suitable fire detection and extinguishing systems, to address the known high fire risk spaces of self-unloading bulk carriers, can significantly reduce the risk of major fires in these spaces. Additionally, the introduction of standards governing the fire resistance properties of conveyor belts used in shipboard systems can help reduce the likelihood of ignition in the first place.

### **Who may benefit:**

Operators and crew of self-unloading bulk carriers and other vessels exposed to similar risks, State firefighting agencies, National maritime regulators, Classification societies.

## **9 COLLISION**

### **Very serious marine accident: Vessel sinking after collision**

#### **What happened:**

On a night a bunker tanker was enroute to an anchorage after supplying bunkers with the Master in charge, assisted by the Chief Officer. An unlit boat, as it seemed, was then approaching on the tanker's starboard bow. The approaching boat was a wooden coaster and the situation resulted in a collision. Eventually the wooden coaster broke up and sank. All the nine crew of the wooden coaster were rescued by a passing tug soon after.

The incident occurred in fair weather with party cloudy sky and good visibility. The sea state was calm and easterly wind was light less than five knots. The bridge of the wooden coaster was manned by the Master.

#### **Why did it happen:**

The investigation revealed that the wooden coaster was not manned by qualified crew and operated with non-standard navigational lights and had not maintained a proper lookout.

The tanker also did not maintain a proper lookout despite having the Chief Officer as a part of the Bridge team and the workload for navigation was on the Master, who did not notice the presence of the wooden coaster until very near to the time of collision.

#### **What can we learn:**

The course and speed for both vessels remained nearly unchanged until very close to the collision indicated that the bridge teams had likely not kept a proper lookout and did not recognise the presence of each other until both vessels came very close.

With the tanker's Chief Officer focusing on a non-navigation related task, the bridge team's workload was on the Master, who in addition to steering was communicating on the VHF and

operating the telegraph for navigating the tanker with respect to the bigger vessels in the vicinity.

The Master continued the tanker's passage instead of staying near the location to check of the wooden coaster needed assistance.

The absence of a radar reflector and proper navigation lights on the wooden coaster, did not allow the bridge team of the vessel to monitor the presence of the coaster to timely assess a risk of collision.

The wooden coaster was manned by persons who were not qualified to operate a craft in the waters.

In addition to not maintaining a proper lookout on board the wooden coaster, the skipper had also not navigated the vessel with caution when approaching.

**Who may benefit:**

Shipping Community in particular, Navigators on the importance of maintaining proper lookout.

## **10 MAN OVERBOARD**

### **Very serious marine casualty: Crew washed overboard**

**What happened:**

A capsized bulk carrier, loaded to its summer draught marks, was on passage around the southern tip of Africa in May. In marginal conditions, the bosun and second officer were repairing a leak on the deck's fire main. Having completed the task, both crew members went for a coffee break. Shortly thereafter, work on deck was suspended due to the increased wave and swell height. After their break, the bosun and second officer went back on deck to collect their tools when an unusually large wave struck on the vessel's starboard beam and washed the bosun overboard. A search and rescue operation was initiated, but the bosun was not recovered.

**Why did it happen:**

A heavy weather warning had been received that morning but had not been incorporated into the work plan - tasks on deck continued as conditions deteriorated. Guidance on heavy weather was not robust and did not include a threshold for what constituted heavy weather. The decision to stop work on deck was made in time but no additional protection was afforded to the crew who went on deck to secure the loose items in line with the heavy weather checklist. The vessel was loaded to its summer draught but was in relatively high latitudes in winter, just 13 nautical miles from the winter zone load line.

**What can we learn:**

When expecting heavy weather, a timely termination of all operations on deck is vital to ensure the safety of the crew. If the crew are required to go on deck during deteriorating weather conditions, a thorough risk assessment should be performed and effective risk reduction measures, such as adjusting course and speed, implemented. Personal Protective Equipment (PPE) such as a harness, safety line and a floatation device should be worn as a minimum.

**Who may benefit:**

The shipping community.

## **11 COLLISION BETWEEN GENERAL CARGO SHIP AND FISHING VESSEL**

### **Very serious marine casualty: Fishing vessel lost**

**What happened:**

In the afternoon, whilst navigating close to the coast, a coastal general cargo ship collided with a wooden hulled fishing vessel in restricted visibility. The fishing vessel was severely damaged and sank while being towed to port. The cargo ship suffered minor damage. There were no injuries.

**Why did it happen:**

The vessels collided in fog because neither watchkeeper was keeping an effective lookout: the wheelhouse on board the fishing vessel had been left unattended and the officer of the watch onboard the cargo vessel was distracted from lookout duties with administrative work. The general cargo ship did detect the fishing vessel on radar but, as it did not have a correlating Automatic Identification System (AIS) transmission, the bridge team tried to confirm the echo's validity visually, delaying the decision to alter course until it was too late. At the time of the collision, both were power driven vessels as defined by COLREGs, neither was making the required sound signals.

**What can we learn:**

Navigation in restricted visibility requires heightened vigilance. Proper use of bridge equipment is crucial to provide an early warning of potential dangers with radar becoming the 'eyes' of the watchkeeper. Reliance on AIS for ship detection can result in smaller vessels going unseen. Properly mounted radar reflectors help ensure wooden-hulled boats give good radar echoes on other ships' radar screens. Sounding of fog signals provides an additional means for detection in restricted visibility.

**Who may benefit:**

Ship managers, watchkeepers, fishing vessel owners, seafarer training institutions.

## **12 COLLISION CONTAINERSHIP AND FISHING VESSEL**

### **Very serious marine casualty: Crew missing and fishing vessel sank**

**What happened:**

An almost 2,000 (20 foot equivalent units) TEU containership collided with a 31-metre fishing vessel on the high seas. The collision occurred during daylight hours in good weather with visibility of more than 5 NM as the containership was passing through a group of fishing vessels that were all drifting. None of the fishing vessels were engaged in fishing. The fishing vessel capsized and sank. Two of the fishing vessel's crew members are missing. The containership had minor damage. At the time of the collision, only the Officer on Watch (OOW) was on the bridge of the containership and there was not a watch stander on duty on the fishing vessel.

**Why did it happen:**

- Neither the containership nor the fishing vessel were maintaining an effective lookout as required by the COLREGs.
- Ineffective navigational watchstanding on board the containership due to the OOW prioritizing other watchkeeping tasks over maintaining an effective lookout and collision avoidance.
- The fishing vessel did not have a watchstander on duty.
- Both of the containership's radars were in standby and were not being used for vessel detection and collision avoidance even though both were operational.
- Over reliance by the containership's OOW on AIS information for vessel detection and collision avoidance.
- The containership's OOW was alone on the bridge had not called the duty ASD to the bridge to provide assistance.

**What can we learn:**

- The importance for all vessels to maintain an effective lookout at all times.
- The importance of making use of radar, if fitted and operational, for vessel detection and collision avoidance.
- The danger of over reliance on AIS information for vessel detection and collision avoidance.
- The dangers of prioritizing other watch keeping duties over collision avoidance.
- The hazards of one person watch standing.

**Who may benefit:**

Ship managers, seafarers, fishing vessel owners, seafarer training institutions.

## **13 MAN OVERBOARD**

### **Very serious marine casualty: Crew fell over-board when rigging pilot ladder**

**What happened:**

Prior to sunrise, a 51,500 deadweight (DWT) chemical/oil products tanker was preparing for arrival. At approximately 0515, the Bosun and an ASD started rigging the combination pilot ladder on the ship's port side in order to embark a pilot. After they lowered the accommodation ladder over the side, they noticed that the lower platform was not parallel to the water and needed adjusting. The ASD went down the ladder without wearing a lifejacket and safety harness with a lifeline attached to the ship as required by the shipboard safety management system. The Bosun did not tell the ASD to return to the ship's deck when he saw him start down the accommodation ladder. In addition, the Bosun did not inform the Master or OOW that the ASD was going down the ladder. The ASD fell overboard while he was adjusting the lower platform of the accommodation ladder.

The Bosun immediately informed the Master and OOW that the ASD had fallen overboard. He then threw a lifebuoy overboard. Neither the Master nor the OOW released the MOB lifebuoy from the bridge wing when the MOB was reported. The Master then ordered the vessel turned to starboard rather than to port, which increased the possibility that the ASD being struck by or forced under the ship's hull. The SAR operation did not find the ASD.

**Why did it happen:**

- Ineffective pre-task planning due to it being rushed and the attention of both the Master (who was conducting the pre-task Toolbox Talk) and the OOW (who was the officer responsible for the planned task) being divided between navigating the ship and reviewing the procedures, required PPE, and relevant risk assessments with the crew members assigned to rig the combination pilot ladder.
- Not wearing a lifejacket and a safety harness with lifeline attached to the ship while working over the side.
- Ineffective supervision by the OOW of the Bosun and the ASD while they were rigging the combination pilot ladder.
- Lack of communication between the Master, OOW, Bosun and ASD.
- Multiple crew members not identifying an unsafe condition.
- Inadequate preparedness of the Bridge Team for a MOB emergency.

**What can we learn:**

- To be effective, the attention of crew members participating in a pre-task Toolbox Talk cannot be divided.
- The importance of wearing appropriate PPE (e.g. lifejacket and safety harness with a lifeline attached to the ship) when working over the side.
- The importance of effective supervision by the officer or another crew member who is responsible for planned job or task and the crew members who are conducting it.
- The need of timely and effective communications.
- The importance of crew members being able to identify an unsafe condition and then taking action (e.g. exercising stop work authority) so that the situation can be addressed.

**Who may benefit:**

Ship managers, masters, seafarers.

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## ANNEX 2

### PROPOSAL FOR A NEW OUTPUT FOR THE DEVELOPMENT OF GUIDELINES ADDRESSING RISKS OF FALLS FROM HEIGHT

#### Introduction

1 This proposal is submitted in accordance with the *Organization and method of work for the Maritime Safety Committee and the Marine Environmental Protection Committee and their subsidiary bodies (MSC-MEPC.1/Circ.5/Rev.4)*, taking into account resolution A.1111(30) on *Application of the Strategic Plan of the Organization*.

2 III 7 reviewed data obtained from the GISIS module on Marine Casualties and Incidents (MCI) for occupational accidents and determined that falls from height occurred more commonly than other type of occupational accidents. Based on this, the Sub-Committee directed the intersessional Correspondence Group on Analysis of Marine Safety Investigation Reports (Casualty Analysis Correspondence Group) that was formed following III 7 to conduct further analysis of available marine safety investigation reports and to make recommendations for addressing this safety issue.

3 III 8 noted the analysis of the intersessional Casualty Analysis Correspondence Group (III 8/4, annex 6) and endorsed the recommendation of the Working Group on Analysis of Marine Safety Investigation Reports (Casualty Analysis Working Group) to develop a proposal for a new output on guidelines addressing the risk of falls from height (including, but not limited to, access to and egress from the location where the work will be conducted, working at height and work over the side) with the HTW Sub-Committee as the coordinating body.

4 MSC 106 noted the III Sub-Committee's analysis of this safety issue and its instructions for the intersessional Casualty Analysis Working Group formed after III 8 to develop a proposed new output for the development of guidelines addressing this safety issue (MSC 106/19, paragraph 4).

#### Background

5 The Casualty Analysis Correspondence Group formed after III 7 reviewed 70 marine safety investigation reports involving falls from height, including falls overboard, that occurred during the 5-year period between 2016 and 2021. Details of this review and the recommendations that were made for consideration by the III Sub-Committee are found in document III 8/4, paragraphs 20 to 22 and annex 6.

6 At III 8, the Sub-Committee reviewed the work that was conducted by the Casualty Analysis Correspondence Group and approved the development of a proposed new output for the development of guidelines addressing risks of falls from height (including, but not limited to, access to and egress from the location where the work will be conducted, working at height and work over the side) to reduce the number of these occupational fatalities by providing practical guidance to ship operators and seafarers.

#### IMO objectives

7 The proposal is directly related to strategic direction 6 (addressing the human element) of the Organization's *Revised strategic plan of the Organization for the six-year period 2018-2023* (resolution A.1149(43)) through the development of guidelines intended to improve the safety of seafarers by providing clear, practical guidance addressing safety issues associated with the risk of falls (including, but not limited to, access to and egress from the location where the work will be conducted, working at height and work over the side).

## Need

8 Of the 70 marine safety investigation reports reviewed between 2016 and 2021 by the Casualty Analysis Correspondence Group after III 7, 69 reports identified that the person who fell was fatally injured. This is a clear indication that the consequences of falls from height or falls overboard are likely to be severe.

9 Of the persons who were fatally injured due to falls from height, 97% were ship crew members. This is a rate of approximately 14 persons (of whom 13 are seafarers) per year who are being fatally injured as a result of falls from height or falls overboard.

10 The fact that between 2016 and 2021 almost 14 persons a year were fatally injured on board ships world-wide when they fell while working at height, either accessing or egressing from the location where the work was conducted, or working over the side clearly indicates that there a need for the Organization to issue clear, practical guidance addressing the safety issues associated with the risk of falls. Such guidance will assist ISM mangers and flag States by providing a common approach for improving the safety of seafarers by controlling the hazards associated with working from height or over the side on board ships world-wide.

## Analysis of the issue

11 Although the specific circumstances of each of the falls from height or over the side between 2016 and 2021 that were investigated differed, the review of these 70 marine safety investigation reports identified the following safety issues:

- .1 the procedures in vessel manager's safety management systems for working from height or over the side are not always being implemented and are not always achieving their intended purpose;
- .2 pre-task risk assessments and safety meetings or toolbox talks appear to be ineffective and most were based on generic risk assessments rather than on a task specific risk assessment that took existing conditions into account;
- .3 tasks that involve the risk of falling from height are not always considered as "working from/at height" so that no control measures to avoid falls or minimize their consequences were identified or implemented;
- .4 personal protective equipment (PPE) intended to reduce the risk of falls while working from height or over the side was not used or was not appropriate for the planned work;
- .5 onboard safety training did not appear to be achieving its intended purpose; and
- .6 onboard management supervision and control of seafarers performing shipboard tasks that require working from height or over the side is ineffective and needs to be improved.

Additional details are set out in document III 8/4, annex 6.

12 No IMO guidelines or recommendations addressing falls from height (including, but not limited to, access to and egress from the location where the work will be conducted, working at height and work over the side) currently exist. Although some flag and coastal States have issued guidance or recommendations regarding safe work practices for working



from height or over the side, these do not address all of the safety issues associated with such work. The implication is that there is not a single source that ISM managers can use as a basis when developing safe work procedures for working from height or over the side.

### **Analysis of implications**

13 It is considered that the proposed new output will not lead to any additional administrative requirements or burdens and in this regard, the completed administrative checklist, as set out in annex 6 to the *Organization and method of work of the Maritime Safety Committee and the Marine Environment Protection Committee and their subsidiary bodies* (MSC-MEPC.1/Circ.5/Rev.4), is set out in annex 1.

### **Benefits**

14 Addressing the safety issues associated with falls from height (including, but not limited to, access to and egress from the location where the work will be conducted, working at height and work over the side) will directly contribute to improving seafarer safety in much the same way that Assembly resolution A.1050(27) on *Revised recommendations for entering enclosed spaces aboard ships* has done.

### **Industry standards**

15 Whilst there is some guidance available addressing safe work practices for working from height on board ships, the guidance that is available does not address all of the safety issues associated with such work.

### **Proposed output**

16 The proposed output title is "Guidelines addressing the risk of falls from height." As discussed in paragraph 3, such guidelines would include, but not be limited to, falls that may occur not only while a seafarer is working at height or over the side, but also while accessing or egressing from the work site. Under this output the III Sub-Committee proposes the development of guidelines that address each of the safety issues identified in paragraph 11.

17 The Sub-Committee on Human element, Training and Watchkeeping (HTW) Sub-Committee would be the coordinating body for the work on this output.

18 The proposed output in SMART terms (specific, measurable, achievable, realistic, and time-bound) is as follows:

- .1 **Specific** – the output, as described in paragraph 16, is clear and specific;
- .2 **Measurable** – the output consists of one specific result: guidelines addressing the safety issues identified in paragraph 11;
- .3 **Achievable and realistic** – the output should be both achievable and realistic given the Organization's experience developing resolution A.1050(27) on *Revised recommendations for entering enclosed spaces aboard ships*;
- .4 **Time-bound** – the completion of the work is envisaged to take [four] sessions of the HTW Sub-Committee with a target year of completion [2028].

### **Human element**

19 The completed checklist for considering human element issues by IMO bodies as set out in annex 5 of the *Organization and method of work of the Maritime Safety Committee and the Marine Environment Protection Committee and their subsidiary bodies* (MSC-MEPC.1/Circ.5/Rev.4), is set out in annex 2. The proposal is not considered to have negative implications for the human element. Rather, the guidelines, if used by ISM managers, will improve seafarer safety.

### **Urgency**

20 Given the fact that an average of 14 persons were fatally injured due to falls from height or over the side each year between 2016 and 2021, the III Sub-Committee proposes that the output should be addressed as a matter of priority and as soon as practicable. In this regard, the proposed output, if approved, should be included in the Strategic Plan of the Organization and priorities for the [next] biennium.

### **Action requested of the Committee**

21 The Committee is invited to consider the proposal in paragraphs 16 to 18 and take action as appropriate.

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### ANNEX 3

#### III CORRESPONDENCE GROUP ON CASUALTY INVESTIGATION QUESTIONNAIRE ON FISHING VESSEL COLLISIONS

The III Sub-Committee's Correspondence Group is seeking information about collisions involving fishing vessels to better understand the prevalence of this type of occurrence. Your cooperation is appreciated. In order to ensure that there is sufficient time for data analysis, please complete your responses and submit to [the Secretariat?] by [date].

- .1 Does your State casualty data include collisions involving fishing vessels?
  - .1 If yes, please complete the table following these questions.
- .2 Does your State casualty data include near-misses involving fishing vessels?
  - .1 If yes, please complete the table following these questions.
- .3 As a type of occurrence, do collisions with fishing vessels occur more frequently than with other vessel types?
- .4 Are fishing vessels registered in your State required to carry AIS?
  - .1 What other means of communication (VHF, etc.) are required to be carried by fishing vessels?



Date/ Time (local)	Vessel 1 type	V1 flag	Vessel 2 type	V2 flag	Collision or near- miss	Number of Persons injured/ Persons killed	Severity (MI/MC/ SMC/VSMC)	Summary (including contributing factors, if available)	Link to report (where applicable)

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## ANNEX 4

### ISM CODE RELATED CONCERN ON UNSATISFACTORY IMPLEMENTATION OF SAFETY MANAGEMENT SYSTEMS

#### Introduction

1 The Correspondence Group on Analysis of Marine Safety Investigation Reports raised a concern during the work to identify casualties occurring more frequently than others that a number of investigations show an underlying cause to serious and very serious accidents, consisting of the inspection system failing to observe deficiencies in the implementation of the provisions of the International Safety Management (ISM) Code by the company as well as ship specific SMS. This hinders the safety systems to work satisfactorily (III 7/4/Add.1, paragraph 13).

2 The Working Group on Analysis of Marine Safety Investigation Reports was therefore instructed to, during IMO III 7, note the ISM Code-related concern on unsatisfactory implementation of safety management systems and take action as appropriate (III 7/4/WP.3, paragraph 3.8).

3 The Correspondence Group on Analysis of Marine Safety Investigation Reports continued to address the subject, following their instructions (III 7/17, paragraph 4.40.6), and concluded that it is complex and may be approached from different angles, trying to understand why procedures and safety routines are not followed in those casualties where unsatisfactory implementation of Safety Management System (SMS) is identified (the sharp-end approach), or investigating whether the SMS is sufficiently and relevantly framed, and, if not, identifying how it could be improved (the blunt-end approach) (III 8/4, paragraphs 23-25).

4 Following the instructions in document III 8/19, paragraph 4.57.5, the Correspondence Group has performed an analysis based on Marine Safety Investigation Reports, reported to GISIS. The result is presented in this document.

#### Background

5 Marine Safety Investigation Reports were extracted from Global Integrated Shipping Information System (GISIS), with help from the secretariat, using six parameters: incident date is on or after 2010-01-01; event and consequences contains the phrase "ISM"; event and consequences contains the phrase "SMS"; issues raised/lessons learned contains "ISM", issues raised/lessons learned contains the phrase "SMS", and one or more report. 62 cases were found. One case was excluded as it was concerning suicide.

#### Analysis

6 The main goal of the analysis of the 61 cases was to provide answers to two main questions: Can we see any common safety issue in the investigation reports analysed? Do the investigation reports show signs of not fully implemented ISM/SMS?

7 The types of accidents were: fire/explosion 11 cases, collision 10 cases, stranding/grounding 9 cases, man-over-board 8 cases, enclosed space 6 cases, fall from height 4 cases, mooring/anchor handling 3 cases, handling lifting devices 3 cases, and 7 cases were categorized as other.

8 Out of 61 cases, 52 reports identified SMS as a contributing factor.

9 Out of 61 cases, the analysts identified SMS as a contributing factor in 59 cases where the main problems were that the SMS was not complete or not followed, including not following written procedures. Lack of risk assessment and risk analysis was also identified as well as lack of common language.

10 Out of 61 cases, 40 involved bulk carriers and general cargo ships.

11 Out of 10 collisions, 4 were between a containership and a fishing vessel.

12 Out of 6 enclosed space accidents, 5 were on board bulk/ore carriers.

13 Out of 61 cases, 34 were assessed where the ISM-deficiency could have been detected during an inspection.

### **Conclusions**

14 The analysis of the abovementioned marine safety investigation reports identified that in most cases the ISM/SMS were not fully implemented as in not being complete or not being adhered to. There is a need for further analysis as to why this is the case. The challenge with this is that most marine safety investigation reports do not provide in-depth information to this question.

15 One way forward could be to encourage the investigating bodies to include the underlying reasons for the incompleteness of the SMS (responsibility mainly with shoreside management) as well as lacking compliance (on board) which could be, e. g. lack of resources (people, time, etc.), contradictions within the SMS itself or a lacking safety culture.

16 It was assessed that the ISM deficiencies could have been detected during an inspection in 34 out of 61 cases showing the importance of proper inspections.

17 Some reports mentioned safety culture. A safety culture implies that the organisation has carefully considered, and documented, in what way work with risk and safety issues is supposed to be carried out. A safety culture also implies that all personnel possess knowledge about and accept the way in which this work is supposed to be done, and that everyone acts in accordance with the intentions agreed. Lack of a sound safety culture may be one explanation to why procedures and routines are on the one hand incompletely addressed in the SMS and on the other hand not followed on board.

18 Another way forward could be to address the importance of a sound safety culture and to develop tools on how to review safety culture both on board and for shoreside management.

19 The reason why some type of ships are more involved than others in different types of accidents has not been further analysed.

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**ANNEX 5**  
**CONCLUSION**

<b>Overhead questions:</b>			
Can we see any common safety issue in the investigation reports analyzed?			
Does the investigation reports show signs of not fully implemented ISM/SMS?			
<b>Conclusions:</b>			
52 of 61 investigation <b>reports</b> identify SMS as a contributing factor			
5 of 61 of the <b>accidents</b> was assessed to happen despite a fully implemented SMS			
in 34 of 61 the ISM-deficiency could have been detected during an inspection			
40 of 71 <b>accidents</b> invilved bulk and general cargo vessels			
4 of 10 of the <b>collisions</b> was between a container vessel and some sort of a fishing vessel			
5 of 6 accidents related to <i>enclosed spaces</i> happened on-board bulk/ore carriers			

**Analysis**

	<b>Overhead questions:</b>					
	Can we see any common safety issue in the investigation reports analysed?					
	Does the investigation reports show signs of not fully implemented ISM/SMS?					
	<b>Number of reports:</b>	61	100%	<b>Reports no:</b>	<b>Remark:</b>	
	<i>Does the report identify SMS as a contributing factor?</i>					
	Yes:	52	85%		52 of 61 (85%) identify SMS as a contributing factor	
	No:	5	8%	6, 17, 33, 53, 61	5 of 61 (8%) do not identify SMS as a contributing factor	
	Not clearly:	4	7%	10, 30, 57, 58	4 of 61 (7%) do not clearly identify SMS as a contributing factor	
	<b>Type of accident</b>					
	Fire - explosion	11				
	Collision	10		9, 20, 21, 54	4 of 10 were between a container vessel and some sort of a fishing vessel	
	Stranding - grounding	9		6, 23, 28, 33, 36, 45	6 of 9 were a general cargo ships	
	Man overboard	8			No 38 (mooring) where a crewmember went overboard during shifting is not included	
	Enclosed space	6		2, 16, 26, 37, 51	5 of 6 were onboard a bulk/ore ship	
	Other	7				

	Mooring - Anchor handling	3					
	Fall from height - incl falls into tanks/void space	4					
	Handling lifting devices	3					
		61					
	<b>In which area was the SMS a contributing factor?</b>						
A	Risk assessment	6			18, 27,31, 42,47, 58		
B	Risk analysis	4			5, 24, 54, 60.		
C	ISM not fully implemented (or ISM-audits not effective)	14			2, 29, 34, 50, 54. 13, 15, 41, 46, 49, 55, 57, 59, 62		
D	Lack of written procedures	7			7, 35, 36. 30, 40, 48, 52,		
E	Not following written procedures	11			45, 56, 60. 14, 20, 25, 26, 28, 33, 39, 58	No 45 and 56: it is not known if there were any written procedures or not. No 60 did both lack written procedures and did not follow written procedures that were in place. No 28?	
F	SMS not complete or not followed	17			2, 4, 5, 9, 12, 16, 17, 19, 21, 22, 23, 42, 51, 61, 63. 32, 44	No 61 seems to have followed procedures normally, but not in this event	
		59				2 reports were assessed to not have SMS as a contributing factor (53, 61)	

	<b>In any other way?</b>					
	Risk assessment	5		11, 18, 40, 44, 58		
	Risk analysis	2		35, 38		
	ISM not fully implemented (or ISM-audits not effective)	9		39, 7, 16, 36, 42, 45, 47, 48, 60		
	Lack of written procedures	1		52		
	Not following written procedures	8		35, 20, 26, 32, 33, 37, 50, 63		
	SMS not complete or not followed	7		9, 24, 25, 27, 28, 30, 41	No 9, SMS and the master's standing orders were contradictory to another part of master's standing orders (slow down when necessary but keep the timetable)	
	Lack of common language	4		3, 19, 31, 51		
		36				
	<b>Was there ever a possibility to identify this ISM-deficiency (if any) during an inspection</b>					
	Yes	34		2,3,4,5,6,7,8,9,14,15,16,17,18,19,20,23,24,25,27,30,31,32,35,36,37,39,41,42,44,47,48,51,55,60		
	Maybe/probably	13		Maybe 33,40,45,52,54,56,59,62,63. Probably 28,29,38,46,49		
	Probably not/unlikely/hard to say	5				

No	9		10,13,22,34,50,53,57,58,61		
	61				
% where it was assessed that there was a possibility to identify the ISM-deficiency during an inspection	56%				
<b>Type of vessel</b>					
Bulk carrier	19		2,10, 13,15, 16,17,18,19,22,26,27,32,37,40,41,46,48,51,55		
General cargo	21		4,5,6,11,23,25,28,29,29, 33,36,38,45,47,49,50, 52,56,57,61,62		
Tanker	8		3,10,31,35,44,50,53,62		
Container	9		7,8,9,12,14,20,21,54,60		
Fishing vessel	6		9, 15,20, 21,46, 54		
Other	8		24,30,34,39,42,58,59,63		
Ships involved	71				
%					
Bulk & general cargo	56%				

**All accidents**

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2	C0013 572	Bulk Carrier	Others	Yes	Lack of properly implemented SMS; No identification of enclosed spaces; Not following SMS procedure; Poor safety culture.		Yes, by identifying risks and compare to vessel's needs; To check with crew the knowledge about SMS.		A
3	C0013 010	Crude Oil Tanker	Fire and pollution	Yes		Lack of common language	Yes, by checking existence of proper maintenance.		A
4	C0012 925	Open Hatch Cargo Ship	Fall Overboard	Yes	SMS was inconsistent in one aspect; SMS procedure was not followed fully.		Yes, by comparing different documents regarding the same aspects.		A
5	C0012 968	General Cargo Ship	Occupational Accident	Yes	Checklists missing certain information; Insufficient risk analysis; New crew not orientated of SMS procedures.		Yes, insufficient risk analysis should have been identified; In sufficient checklists should have been identified.		A
6	C0013 172	General Cargo Ship	Stranding/grounding	No. However, the report says poor BRM, non-compliance with SOLAS, MLC and COLREG was accepted on board	It was accepted to not follow regulations, hence SMS was not effectively implemented.	No	Yes. E.g. the habit of not using BNWAS and the fact that the OOW was not duly certified should have been detected.		A
7	C0013 580	Containership (Fully Cellular)	Missing: assumed lost	Yes	Lack of written procedures (i.e. BNWAS activation not on checklist); Key to BNWAS connected to BNWAS at all times opposite company rules, available for anyone to switch on/off; All OOW's daily coding in log that BNWAS was in use.	Report states "indicative that the entries were a 'paper exercise' to show compliance".	Yes, e.g. by checking the whereabouts of the BNWAS key; checking the knowledge of officers and crew by interviews - should be simple in an audit.		A
8	C0011 136	Containership (Fully Cellular)	Man over Board while rigging Pilot Ladder	Yes	No Safety Analysis or Safety Procedure had been done for the jog (rigging pilot ladder).	No	Yes, the lack of Risk Analysis and Safety Procedure had been easy to identify.		A

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9	C0012 211	Contain er ship (Fully Cellular) & fishing vessel	Collision	Yes	The SMS was embracing circumstances for preparing such a navigation heavy workload situation, but was not adhered to. A simpler instruction, like a matrix, would have been simpler for OOW to follow.	Yes, it notes that in one aspect the SMS and the master's standing orders were contradictory to another part of master's standing orders (slow down when necessary but keep the timetable).	Yes, the contradiction should have been possible to notice. Further, a PROPER audit could have resulted in easier procedures and checklists.		A
10	C0010 811	Oil Tanker & Bulk Dry (general, ore) Carrier	Collision	Not really, but suggests development of the system		The report claims that the procedures for navigation should be more detailed.	No, there seem to be no apparent correlation to the accident and poor SMS.		A
11	C0012 209	General Cargo Ship	Serious injury to ship's crew	Yes	No supervision of new crew, not following procedure (acceptance of crew riding on pontoon when lifted by crane).	Not effectively implemented in regard to risk assessment and supervision	It should have been possible to identify this style when interviewing.		A
12	C0011 015	Contain er ship (Fully Cellular)	Stranding/ grounding	Yes	SMS was lacking instructions for preventing typhoon damage.	No	It should be possible to foresee a need for an action plan in case of a typhoon.		A
13	C0011 005	Bulk Carrier	Fire or explosion	Yes	There should have been a procedure for that specific cargo (ANBF).	No	No, unlikely to identify. ANBF was under circumstances given not dangerous cargo.		A
14	C0011 006	Contain er ship	Stranding/ grounding	Yes	Actions by bridge team were not following internal procedures.		Yes, with a proper audit it should be possible to identify deficiencies.		A
15	C0010 503	Fish Catching Vessel & Bulk Dry (general, ore) Carrier	Collision	Yes, but indirectly (the report does not mention SMS)	The watch-keeping standards were non-existent (mate doing paperwork instead of looking out, whilst the lookout was working on deck).		Yes, an audit would have identified the habit of doing paperwork during watches.		A
16	C0010 978	Bulk Carrier	Accidents with life-saving appliances	Yes	SMS was not including enclosed spaces: Internal audit was incomplete, insufficient and not signed.	Yes, the implementation seems to have been sloppy	Yes. The implementation of SMS was clearly insufficient and would easily have been discovered.		A
17	C0010 361	Bulk Dry (general,	Accidents with life-	No, not directly.	The accident was investigated by two authorities, and one concludes	No	Yes, it would have been possible to see that a risk assessment of		A

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		ore) Carrier	saving appliances		that fall in the cargo hold was not identified as a risk in the SMS risk assessments.		cargo hold work was not done. That is confirmed by Safety Actions, which includes an update of SMS accordingly.		
18	C0010 460	Bulk Carrier	LOSS OF LIFE	Yes	There was no procedure for the job done. Risk Assessment forms were generic in nature and did not identify dangers to individual tasks.	Risk Assessments were near identical for all jobs, and a tick box culture onboard had developed.	Yes, the absence of individual assessments should have been identified.		A
19	C0010 260	Bulk Dry (general, ore) Carrier	Crew Fatality	Yes	The SMS did not cover appropriate inspection and verification procedure. Further, crew did not follow SMS procedures as they should have.	Yes, common English language was not used in between other nationalities, making others out of information loop.	Yes, the deviation from procedures should have been identifiable.		A
20	C0010 406	Container ship (Fully Cellular) & fishing boat	Collision	Yes	Bridge team did not follow ship's safety manuals regarding making engine ready for manoeuvring i.a.	Yes, voyage plan was not prepared or executed properly. Even irrelevant boxes were ticked and some checked items had in fact not been performed.	Yes, voyage plan irregularities had been possible to identify.		A
21	C0010 348	Container ship (Fully Cellular) & fishing vessel	Collision	Yes	OOW on vessel A did not follow SMS as regards to call master after collision.	No	Unlikely, it is not possible to foresee how an individual will react. The report automatically refers to "follow regulations", which is not so constructive as preventive action.		A
22	C0010 661	Bulk Carrier	MISSING	Yes	The SMS does not cover safety procedure for crew walking on deck.	No	No. The case is concerning an OOW walking on bridge wing to have a smoke and not returning. It is assumed that he fell over board. It is not likely that a procedure to wear safety shoes will be followed.		A
23	C0010 335	General Cargo Ship	Stranding/grounding	Yes	The SMS did not contain information about limiting forces as regards wind and ship manoeuvring when ballasted.	No	Yes, it would have been possible to see that a fair instruction for anchoring when ballasted was in place.		A
24	C0012 174	Drilling Ship	Contact	Yes	No formal training or follow up if the deceased was doing the job safely. The tasks were not subject of Risk Analysis.	Yes, the SMS was not fully operational or even understood.	Yes. A thorough audit would have discovered the flaws of the system.		A



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25	C0010 207	General Cargo Ship	Enclosed space entry fatality	Yes	Failure of two senior officers to follow simple documented procedures by entering an enclosed, locked space.	Yes, detailed shipboard operation regarding enclosed spaces was not in place. The type of cargo (timber) was not taken into consideration in the SMS.	Yes, it would have been obvious to find these shortcomings in an audit.		A
26	C0012 177	Ore Carrier	Enclosed Space Fatality	Yes	The entrance to the enclosed space was done by CHO even though he was warned by other crew due to gas smell. No PTW was executed. Still, this work was following directly after another closed space entry, where a PTW was in place.	Yes, the internal company report states that the PTW to the previous entrance was not properly done "Paperwork exercise only".	Hard to say since there was non-compliance with the procedures. But yes, it should have been possible to identify the attitude from the senior officers.		A
27	C0010 225	Bulk Carrier	Man over Board	Yes	No risk assessment nor procedures for recovery were existent.	Yes, a recommendation is that the company should focus on crew familiarization with SMS.	Yes, lack of references in the SMS could have been identified.		A
28	C0010 298	General Cargo Ship	Capsizing /listing	Yes	The cargo, wooden logs, was not lashed according to Cargo Securing Manual.	Yes, the SMS was not completed and well implemented in regard to sailing in rough seas.	Probably, since a recommendation is that SMS and DOC have to be reviewed, amended and audited.		A
29	C0009 556	General Cargo Ship	Collision	Yes	The crew of one vessel in the collision was, according to the report, not knowing their duties in an emergency. The report concludes that ISM was not made efficiently.	No.	Probably if a lifeboat drill had been performed during auditing.		A
30	C0009 510	Passenger/Ro-Ro Ship (Vehicles)	Fire or explosion	Yes, but not very clear	Clearer procedures for connecting electricity to trucks is needed.	Yes, the SMS says no passenger was allowed on car deck. Still there were drivers sleeping in their trucks.	Yes, e.g. it would have been easy to see that passengers were resting in their trucks.		A
31	C0010 306	LPG Tanker	Fire or explosion	Yes	PTW was deliberately not issued. Risk Assessment was not performed.	Yes, common language, English, was not understood by all.	Yes, e.g. language issues would be easy to identify.		A
32	C0009 451	Bulk carrier	Man over board	Yes	"... identified that the ship's safety management system procedures for working over the ship's side were not effectively implemented."	" the ship's crew routinely did not take all the required safety precautions when working over the side. It was also found that the crew had differing attitudes to taking	Yes.	"In practice, however, crewmembers had not made the connection between this risk, and using the permit to work system to	B

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						<p>safety precautions during work and recreation times as the safety culture on board was not well developed."</p>		<p>mitigate the risk. " Cape Splendor's safety management system (SMS) procedures for working over the side of the ship were not effectively implemented. As a result, the ship's crew routinely did not take all the required safety precautions when working over the side. Further, they did not consider that any such precautions were necessary if going over the side when not working. [Safety issue]</p> <ul style="list-style-type: none"> <li>• The safety culture on board Cape Splendor was not well developed and the ship's managers had identified it as such. A consequence of this inadequacy was the ineffective implementation of working over the side procedures, including the general belief by its crew that safe work practices applied only when working, and not during recreational activities. [Safety issue]</li> </ul>	

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33	C0009 272	General cargo	Cargo shifting	No, but written procedures were not followed	"The cargo inside cargo holds were not secured properly in accordance with cargo securing manual; some of the cargo collapsed and shifted to the port side and resulted in heavy listing of the vessel to port side"	" the master and crew did not follow the abandon ship procedure; without having switched off the engines, the vessel was still moving at sea without crew on board until she went aground. "	Maybe, if asked about cargo securing routines		B
34	C0009 196	Passenger vessel	Loss of life in bad weather, window breakage where seawater entered the restaurant	Yes	"While not specifically relevant to the event, the damage suffered or the onboard planning and response, it was the opinion of the investigators that the documented Safety Management System requires comprehensive review and, consequently, that the effectiveness of the ISM audit regime should be reviewed".		No.	"While not a causal factor in this event it is the opinion of the investigators that there were long-standing weaknesses in the survey regime performed by the Classification Society in respect of the International Convention on Load Lines. While not specifically relevant to the event, the damage suffered or the onboard planning and response, it was the opinion of the investigators that the documented Safety Management System requires comprehensive review and, consequently, that the effectiveness of the ISM audit regime should be reviewed. "	B
35	C0009 396	Chemical tanker	Loss of life after hot work explosion	Yes	Lack of written procedures	Not following written procedures. Lack of risk analysis.	Yes	Recommendation to "Make implementation audits towards ISM more effective".	B

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36	C0009 732	General cargo	Grounding	Yes	Inadequate written routines.	Sailed with not approved charts, sailed with ECS without proper training, paper charts in the wrong scale, amended voyage plan without following procedures.	Yes, some of the officers did not have flag-approved licences		B
37	C0009 536	Bulk carrier	Fatal occupational accident, enclosed space entry	Yes	Not following written procedures.	One recommendation to "conduct at least once every two months the enclosed space entry and rescue drill".	Yes	The crew member entered the enclosed space alone, without enough ventilation or checking the atmosphere. When found by two other crew members, they did the same mistake but fortunately survived.	B
38	C0009 322	General cargo	Fatal occupational accident during mooring operations	Yes	Not following written procedures.	Lack of risk analysis.	Probably not		B
39	C0009 517	Offshore supply vessel	Fire resulting in total loss of the vessel	Yes	There was a lot of things not working as it should and there were some uncertainties in the information in the report, but some of the crew stated that not all drills were conducted as they should even if they were documented as done. The crew did not have enough knowledge to understand how the equipment worked and the routines to activate the CO2 was not followed, as one example.	Yes. The ISM required the fire main to be kept under pressure at all times. This was not being implemented.	Yes, ie if the inspector asked the crew to perform a fire drill	Flag State inspection that was submitted before the accident, a large number of discrepancies were observed, regarding the maintenance of their equipment, especially in the main and auxiliary machinery, electrical system and general cleanliness of machinery spaces.	B
40	C0009 334	Bulk carrier	Fatal occupational accident when	Yes	"It was unsafe to let the fitter to go into the hawse pipe to carry out the work, the Safety Management System failed to provide safe	"It was unsafe to work in the hawse pipe with the anchor and chain stuck inside during voyage. Obviously, the	Maybe not since the crew did a risk assessment.	The crew did a risk assessment but among other recommendations the	B

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			handling the anchor		instruction to the fitter to carry out the job."	working team failed to conduct a risk assessment as required by ISM Code prior the work with potential hazards."		report states "internal audits and management reviews are conducted systematically to reveal system deficiencies for improvement in earlier stages".	
41	C0009 282	Bulk carrier	Fatal explosion in fuel tank (one dead, four severely injured)	Yes	The vessel and its management had several problems. The equipment was not of an approved type and the crew was not familiarised with the ships equipment.	The emergency exit door was not identified with reflective signs and arrows required by and SMS. The crew provided inadequate training and exercises for emergency escape routes to crew members. They did not familiar with the engine-room, unable to escape from the nearest emergency escape routes. Unfamiliarity caused the third engineer falling down from the stairs when he escaped from the engine-room with normal exit route.	Yes, especially as the equipment was not type-approved.		B
42	C0010 672	Ro-ro vessel	Crew member was crushed between two cargo containers and did not survive from the injuries.	Yes	The investigation found weaknesses in the company SMS related to risk assessment and SMS review process.	Yes, this was the fourth accident in less than one year in the company. (two were fatal).	Yes. The SMS risk assessment related to working on deck was insufficient. It did not identify the specific hazard of a crew member being crushed by a moving container, the potential severity of resulting harm, and the need to address the increased risk of an unsighted crew member being positioned in the container's path.	Manning was 17 (safe manning 13) The identified weakness of the risk assessment regime and ineffective SMS review processes on board the vessel would probably have been addressed before the accident had the company given a higher priority to the issues and had the MCA's	B

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								management of ISM Code audits and follow-up action been more effective.	
43	C0009 146	Cruise ship	Missing passenger , suicide? Not part of the conclusions						B
44	C0009 069	Chemical and product tanker	Fatal occupational accident, fell overboard and drowned during crew change	Yes	The ship's safety management system did not contain any procedures on the embarkation and disembarkation of personnel at sea. The crew members did not wear any lifejackets.	The launch that transported the crew from the ship was not suitable for the task. No risk assessment was made. After the chief engineer fell, he got a life buoy with a line, but despite that he drowned and was not given CPR in the launch.	Yes. Lack of written procedures for crew change at sea(?)	When the chief engineer reached the last step, a crew member in the launch got hold of him in order to help him down on the deck. The chief engineer did not let go of the pilot ladder as expected and shortly after the launch went down due to swell. As the boat went down, the crew member in the launch had to let go of his grip. At the same moment, the chief engineer lost his foothold and fell down the pilot ladder until his waist was in the water. He managed to get a grip of the ropes at the last step of the ladder. As the water rose due to swell, he was submerged in water to his chest and, when it fell, he was	B

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								almost out of the water. The chief engineer tried to climb up the ladder but was unable to do so. After the fall the launch moved away from the ship's side in fear of squeezing the chief engineer between the launch and the ship's side.	
45	C0008 866	General cargo (containers onboard)	Grounding	Yes (not in exact words, see next column)	The OOW, the master, fell asleep during bridge-watch when he was alone. Absence of look-out leading to situational unawareness, poor bridge resource management, inappropriate watch composition level, deviation from the original passage plan without making hazard identification and application of necessary controls while navigating close to coast in moderate weather during dark hours. It is not known if there were any written procedures that were not followed onboard.	After the vessel hit the rock and grounded, she suffered significant damages resulting in flooding of many tanks which posed a risk of foundering but the urgency message was not transmitted. Safety messages were also not transmitted on any frequency to warn passing shipping traffic. The Master attempted to re-float the vessel by using stern propulsion without analysing the consequences. Number of water ballast compartments were damaged and flooded and the situation was not evaluated prior to her re-floatation.	Maybe, hard to say from the information given	According to the masters' rest-hours the day and night before the accident, he had been able to get a good night's sleep but it is not known if he went ashore or not. He had been onboard for more than seven months.	B
46	C0008 825	Bulk carrier & fishing vessel	Collision with 13 persons missing	Yes (not in the accident itself, but in the aftermath, the rescue operation).	Lack of knowledge, training, in how to rescue persons from the water (including throwing lifebuoys).		Probably not	The bulk carrier turned to port in a close situation.	B
47	C0008 799	Multi-purpose	Fire, loss of life of	Yes	-The lack of a hot work permit meant no one had conducted to	It was stated in the report that "The vessel's officers as well as the landside working gang,	Yes. The report says that the SMS was working as it should when it comes to distinguish the	The shore contractor was found in the vessels' lower cargo	B

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		dry cargo	shore contractor		<p>make a proper risk assessment for the work.</p> <p>-The presence of shore workers may have confused the vessel's officers who may not have realized that it was their responsibility to supervise both the shore workers and crew members.</p> <p>-In the lower hold there was inflammable material.</p>	contracted to perform hot works on board, were lacking fundamental safety awareness and acted unprofessionally.	fire, even if they used CO2 when one shore personnel was missing. Lack of safety awareness and risk assessment.	hold. It is not known if he died from the fire or from the fall. He was missing at an earlier stage, but for some reason not searched for. There were some language-barriers prior to the hot work between the onboard personnel (chief officer) and the shore personnel. To extinguish the fire the ships CO2 was used despite that one shore personnel was missing.	
48	C0008 580	Bulk carrier	Occupational accident, loss of life after fall into forepeak void space	Not in words, but proper safety routines were not in place	Confined space entry procedures not in place, no procedures when open manholes are left unattended.	The master left the injured person with personnel without any formal medical education. The injured person was given pain-killers without informing the master or medical officer and without instruction on what to look for, i.e., symptoms of shock.	Yes. Lack of written procedures.		B
49	C0008 834	General cargo ship	Boiler-explosion with fatalities and other injuries	Yes	Lack of competence (stated in the report) and lack of controls to check that the personnel were competent to handle the task (start the boiler after service). Company procedure not followed by crew and the shipyard staff blanked off a safety valve by mistake.		Probably since there seems to have been a poor safety culture.	The ship management company of the vessel is required to review its safety management system and implement appropriate measures, such as crew training, internal audits and reviews, etc., in order to ensure that: i) staff are competent, experienced and well-trained prior to	B



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								assigning them for the relevant jobs; ii) staff should be asked to follow company procedures for the safe operation of all equipment and machinery onboard their ships; iii) staff should follow manufacturer's instructions in the operation and maintenance of all equipment and machinery on board; iv) proper culture of communication is to be established between field staff and company staff in that safety becomes the company's top priority.	
50	C0008 539	Oil/ chemical tanker & General cargo ship	Collision	Yes	None of the vessels had a look-out as they should, and this seemed to be "normal" but was not noted during any of the vessels ISM audits.	Onboard the oil/chemical tanker the general cargo vessel was spotted by the previous watch but not handed over to the OOW (and the look-out, who had been informed about the other vessel) was sent back to his cabin to be able to help the bosun during daylight later on. The general cargo vessel had the oil/chemical tanker in sight for about four hours prior to the collision. She was the stand-on vessel and was overtaken by the other.	No, if not detected during interviews with the crew that they did not keep a proper look-out during hours of darkness.	The general cargo vessel sank after 70 minutes. The rescue of the crew of 7 went well, they escaped in two liferafts and were picked up by a third vessel.	B

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51	C0009 983	Bulk carrier	Occupational accident, enclosed space fatality	Yes	The enclosed space hatch did not have a visible warning notice in place in accordance with the SMS.	Even if there had been warnings signs in place, some crew members did not speak English and may not have understood the warning.	Yes, since the enclosed space entry did not have warning signs.	The vessel has enclosed space entry procedures and safety equipment as prescribed by the SMS concerning the identification and safe entry into enclosed spaces. The crewmen did not follow the safety procedures on board and made an unauthorised entry into the enclosed space. Following the SMS procedures is likely to have prevented injury and death. The cargo information supplied to the Master was inadequate and inaccurate relating to the dangers of the transportation of coal by ship. Ship staff and managers should continue to rely on the relevant information contained within the IMSBC Code. The cargo information supplied was not a direct factor in crewman entering the space.	B
52	C0008 872	Woodchip carrier	Breathing apparatus air compress	Yes	"The ship's safety management system did not provide the crew with appropriate guidance in relation to the operation and maintenance of the OBA sets".	The ship's fire fighting manual referred exclusively to fire fighting in the vehicle decks of a car carrier and was not ship specific.	Maybe, if the surveyor had looked at routines with non-mandatory equipment.	It was possible to connect an oxygen cylinder to the air-compressor. If this what not the case, the	B

Report no	GISIS no	Type of ship(s) involved	Accident type (ie collision)  or explosion	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (ie lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
								explosion would have been avoided. (lack of engineering safety measures).	
53	C0008 520	LNG carrier	Loss of life during ballast tank inspection	No	Procedures were in place and followed.		No. Procedures were in place and followed.	The ladder from the aft manhole of the centre deep tank was set inside the perimeter of the access manhole rim thus limiting the space available to pass a person's body through the manhole. This design requires a person to pull closer to the ladder in order to prevent hitting the ceiling of the tank (tank top) with their hard hat or head before passing through the manhole.	B
54	C0008 469	Container ship & Fish transport vessel	Collision with the loss of 11 lives	Yes	"the usefulness of internal and external ISM audits and other ship visits by superintendents in identifying competency issues among bridge watchkeeping officers was extremely limited." Lack of competence among the company officers, they had poor knowledge of COLREG. After the collision, the master undertook actions but did not raise any alarm outside the vessel which should have been done. No risk analysis was done regarding that the OOW was alone on the bridge in high density traffic, the ship speed or alternative route. (the lookout was conducting a fire-round when the collision happened).		Maybe, as there were no written instructions to handle the procedures (fire-round) in dense traffic.		B

Report no	GISIS no	Type of ship(s) involved	Accident type (ie collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (ie lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
55	C0008 511	Bulk carrier	Grounding in severe weather conditions, tropical cyclone	Yes	The problems onboard were in many areas. Malfunctioning bridge equipment for example. A lot of areas.		Yes.	The report indicates that the crew went to sleep after the problems (grounding) started to occur, can this be right?	B
56	C0008 411	General cargo	Occupational accident, explosion and fire when trying to use bottled oxygen as start air for generator	Yes	The report does not say if there were written procedures in place or not, but it says "it is strongly recommended that the company invests in intensive enlightenment and training on all shipboard safety issues to establish and support a safety culture. The company Safety Management System has to be enhanced accordingly." Training (?), risk assessment, procedures not in place or not followed.	No	Maybe. It is hard to say from the report if there were any procedures not followed, but if the procedures were missing, this could have been noted.		B
57	C0008 163	General cargo	Occupational incident, crew member tried to leave the ship during sea voyage	The report states that "To express the ISM Code in broad terms (see ISM Code Preamble 5.) specific human demands of ship crews related to coexistence and cooperation in a multicultural complex technical environment in a narrow isolated workplace remote of their home country and families need to be			No.	The cook was missing one morning, MOB alarm was raised, and days later the cook was recovered by another ship, wearing his survival suite and personal belongings. Most likely trying to leave the ship on purpose, not understanding the risks involved.	B

Report no	GISIS no	Type of ship(s) involved	Accident type (ie collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (ie lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
				emphasized as per Part A 6 of the Code (Resources and Personnel).					
58	C0007896	Multipurpose ship	Occupational accident, loss of life due to hot work explosion	In one way. The deceased conducted hot work without a hot work permit.	The crew member did not understand the risks of the hot work but should have known it required a hot work permit.	Yes. A hot work permit was not needed for hot work in the engine-room workshop, but this accident happened due to hot work on a sealed drum that was for oil and the accident would have happened even if the hot work (grinding) would have been done in the workshop.	No. The procedures were to have a hot work permit and this was not done.		B
59	C0007821	Platform, semi-submersible	Loss of life when lifeboat fell from 30 meters	Yes	The report states things like: "bad procedures", "Inadequate or ineffective barriers" "poor communication" "poor organization"		Maybe. Hard to say from the report, but it seems to be a poor safety culture onboard and maybe the lifeboat should not be lifted 30 meters with personnel onboard.		B
60	C0008129	Container vessel	Occupational accident, loss of life during lift inspection	Yes	This was the third fatal accident in the company over a period of eight months. A number of areas, such as written procedures not fully implemented, written procedures not followed, risk analyses did not cover all areas.	See previous comments. It was also noted that previous accidents and near-misses had not been reported. There were also 11 month contracts and poor communication, both onboard the vessel but also between company - ship. The safety culture needed improvement.	Yes. There were several ways to see signs of that the SMS was not fully implemented such as very few work procedures and minimal guidance on how to work safely, circular letters to the fleet were not routinely incorporated onboard and there were no, or very few, near misses reported from the crew.	Evidence from this and the two previous fatal accidents demonstrates that poor working practices and inadequate control of risks were systemic problems on company's vessels.	B
61	C0007867	General cargo	Occupational accident, loss of life caused by handling mooring ropes on	No	The SMS seems to have been well implemented but sadly not followed by the bosun who decided to work alone with the mooring winches and got trapped on the winch drum. Procedures seems to have been followed normally, but not in this case.		No	Maybe better risk awareness/training could have helped	B

Report no	GISIS no	Type of ship(s) involved	Accident type (ie collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (ie lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
			forecastle deck						
62	C0007 890	General cargo & chemical tanker	Collision	Yes	Text from the report states: "It appears evident that a striking gap existed between objectives defined and the practical shipboard execution of the company safety and environmental policy. The master's decision to run a one-man job on the bridge while departing from a busy port points towards lack of a sound and effective safety culture		Maybe, because the checklist (in this case departure-checklist but possible others too) were not "checked".	Excessive workload & stress were underlying factors.	B
63	C0007 978	Trailing suction hopper dredger	Failure of store crane, big weight fell and nearly injured people badly	Yes	The accident happened due to a lot of factors, but a fully implemented SMS should have made sure that the inspections and maintenance of the non-cargo handling crane was done in a more thorough way. The non-cargo handling crane was not suited for a rough environment, it was not installed to be easily accessed for inspections and the PMS was not suited for lifting devices.	The training and qualification of the crane operator was not in accordance with the company's instructions.	Maybe, since the PMS was not suited for a lifting device.		B

**Overhead questions:**  
 Can we see any common safety issue in the investigation reports analysed?  
 Does the investigation reports show signs of not fully implemented ISM/SMS?

**Fire-Explosion**

Report no	GISIS no	Type of ship(s) involved	Accident type (i.e. collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (i.e. lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
3	C0013 010	Crude Oil Tanker	Fire and pollution	Yes		Lack of common language	Yes, by checking existence of proper maintenance.		A
13	C0011 005	Bulk Carrier	Fire or explosion, ship evacuated due to cargo thermal decomposition	Yes	There should have been a procedure for that specific cargo (ANBF)	No	No, unlikely to identify. ANBF was under circumstances given not dangerous cargo.		A
30	C0009 510	Passenger /Ro-Ro Ship (Vehicles)	Fire or explosion, fire on car deck	Yes, but not very clear	Clearer procedures for connecting electricity to trucks is needed.	Yes, the SMS says no passengers were allowed on car deck. Still there were drivers sleeping in their trucks.	Yes, e.g. it would have been easy to see that passengers were resting in their trucks.		A
31	C0010 306	LPG Tanker	Fire or explosion, explosion due to hot work	Yes	PTW was deliberately not issued. Risk Assessment was not performed.	Yes, common language, English, was not understood by all.	Yes, e.g. language issues would be easy to identify.		A
35	C0009 396	Chemical tanker	Loss of life after hot work explosion	Yes	Lack of written procedures	Not following written procedures. Lack of risk analysis.	Yes.	Recommendation to "Make implementation audits towards ISM more effective"	B
39	C0009 517	Offshore supply vessel	Fire resulting in total loss of the vessel	Yes	There was a lot of things not working as it should and there were some uncertainties in the information in the report, but some of the crew stated that not all drills were conducted as they should even if they were documented as done. The crew did not have enough knowledge to understand how the equipment worked and the	Yes. The ISM required the fire main to be kept under pressure at all times. This was not being implemented.	Yes, ie if the inspector asked the crew to perform a fire drill.	Flag State inspection that was submitted before the accident, a large number of discrepancies was observed, regarding the maintenance of their equipment, especially in the main and auxiliary	B

Report no	GISIS no	Type of ship(s) involved	Accident type (i.e. collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (i.e. lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
					routines to activate the CO2 was not followed, as one example.			machinery, electrical system and general cleanliness of machinery spaces.	
41	C0009 282	Bulk carrier	Fatal explosion in fuel tank (one dead, four severely injured)	Yes	The vessel and its management had several problems. The equipment was not of an approved type and the crew was not familiarized with the ships equipment.	The emergency exit door was not identified with reflective signs and arrows required by and SMS. The crew provided inadequate training and exercises for emergency escape routes to crew members. They did not familiar with the engine-room, unable to escape from the nearest emergency escape routes. Unfamiliarity caused the third engineer falling down from the stairs when he escaped from the engine-room with normal exit route.	Yes, especially as the equipment was not type-approved.		B
47	C0008 799	Multi-purpose dry cargo	Fire, loss of life of shore contractor	Yes	-The lack of a hot work permit meant no one had conducted to make a proper risk assessment for the work. -The presence of shore workers may have confused the vessel's officers who may not have realized that it was their responsibility to supervise both the shore workers and crew members. -In the lower hold there was inflammable material.	It was stated in the report that "The vessel's officers as well as the landside working gang, contracted to perform hot works on board, were lacking fundamental safety awareness and acted unprofessionally	Yes. The report says that the SMS was working as it should when it comes to distinguish the fire, even if they used CO2 when one shore personnel was missing. Lack of safety awareness and risk assessment.	The shore contractor was found in the vessels lower cargo hold. It is not known if he died from the fire or from the fall. He was missing at a earlier stage, but for some reason not searched for. There were some language-barriers prior to the hot work between the onboard personnel (chief officer) and the shore personnel. To	B



Report no	GISIS no	Type of ship(s) involved	Accident type (i.e. collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (i.e. lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
								extinguish the fire the ships CO2 was used despite that one shore personnel was missing.	
49	C0008 834	General cargo ship	Boiler-explosion with fatalities and other injuries	Yes	Lack of competence (stated in the report) and lack of controls to check that the personnel was competent to handle the task (start the boiler after service). Company procedure not followed by crew and the shipyard staff blanked off a safety valve by mistake.			The ship management company of the vessel is required to review its safety management system and implement appropriate measures, such as crew training, internal audits and reviews, etc., in order to ensure that: i) staff are competent, experienced and well-trained prior to assigning them for the relevant jobs; ii) staff should be asked to follow company procedures for the safe operation of all equipment and machinery onboard their ships; iii) staff should follow manufacturer's instructions in the operation and maintenance of all	B

Report no	GISIS no	Type of ship(s) involved	Accident type (i.e. collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (i.e. lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
								equipment and machinery on board; iv) proper culture of communication is to be established between field staff and company staff in that safety becomes the company's top priority.	
56	C0008411	General cargo	Occupational accident, explosion and fire when trying to use bottled oxygen as start air for generator	Yes	The report does not say if there were written procedures in place or not, but it states: "it is strongly recommended that the company invests in intensive enlightenment and training on all shipboard safety issues to establish and support a safety culture. The company Safety Management System has to be enhanced accordingly. "Training (?), risk assessment, procedures not in place or not followed	No	Maybe. It is hard to say from the report if there were any procedures not followed, but if the procedures were missing, this could have been noted.		B
58	C0007896	Multipurpose ship	Occupational accident, loss of life due to hot work explosion	In one way. The deceased conducted hot work without a hot work permit.	The crew member did not understand the risks of the hot work but should have known it required a hot work permit.	Yes. A hot work permit was not needed for hot work in the engine-room workshop, but this accident happened due to hot work on a sealed drum that for oil and the accident would have happened even if the hot work (grinding) would have been done in the workshop.	No. The procedures was to have a hot work permit and this was not done.		B

**Collision**

Report no	GISIS no	Type of ship(s) involved	Accident type (i.e. collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (i.e. lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
9	C0012211	Containership (Fully Cellular) & fishing vessel	Collision	Yes	The SMS was embracing circumstances for preparing such a navigation heavy work load situation, but was not adhered to. A simpler instruction, like a matrix, would have been simpler for OOW to follow.	Yes, it notes that in one aspect the SMS and the master's standing orders were contradictories to another part of master's standing orders (slow down when necessary but keep the timetable).	Yes, the contradiction should have been possible to notice. Further, a PROPER audit could have resulted in easier procedures and checklists.		A
10	C0010811	Oil Tanker & Bulk Dry (general, ore) Carrier	Collision	Not really, but suggests development of the system		The report claims that the procedures for navigation should be more detailed.	No, there seem to be no apparent correlation to the accident and poor SMS.		A
15	C0010503	Fish Catching Vessel & Bulk Dry (general, ore) Carrier	Collision	Yes, but indirectly (the report does not mention SMS)	The watch-keeping standards was non-existent (mate doing paperwork instead of looking out, whilst the lookout was working on deck).		Yes, an audit would have identified the habit of doing paperwork during watches.		A
20	C0010406	Containership (Fully Cellular) & fishing boat	Collision	Yes	Bridge team did not follow ship's safety manuals regarding making engine ready for manoeuvring i.a.	Yes, voyage plan was not prepared or executed properly. Even irrelevant boxes were ticked and some checked items had in fact not been performed.	Yes, voyage plan irregularities had been possible to identify.		A
21	C0010348	Containership (Fully Cellular) & fishing vessel	Collision	Yes	OOW on vessel A did not follow SMS as regards to call master after collision	No	Unlikely, it is not possible to foresee how an individual will react. The report automatically refers to		A

Report no	GISIS no	Type of ship(s) involved	Accident type (i.e. collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (i.e. lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
							"follow regulations", which is not so constructive as preventive action.		
29	C0009556	General Cargo Ship & General Cargo Ship	Collision	Yes	The crew of one vessel in the collision was, according to the report, not knowing their duties in an emergency. The report concludes that ISM was not made efficiently.	No.	Probably if a life boat drill had been performed during auditing.		A
46	C0008825	Bulk carrier & fishing vessel	Collision with 13 persons missing	Yes (not in the accident itself, but in the aftermath, the rescue operation.	Lack of knowledge, training, in how to rescue persons from the water (including throwing lifebuoys).		Probably not.	The bulk carrier turned to port in a close situation.	B
50	C0008539	Oil/chemical tanker & General cargo ship	Collision	Yes	None of the vessels had a look-out as they should, and this seemed to be "normal" but was not noted during any of the vessels ISM audits.	Onboard the oil/chemical tanker the general cargo vessel was spotted by the previous watch but not handed over to the OOW (and the look-out, who had been informed about the other vessel) was sent back to his cabin to be able to help the bosun during daylight later on. The general cargo vessel had the oil/chemical tanker in sight for about four hours prior to the collision. She was the stand-on vessel and was	No, if not detected during interviews with the crew that they did not keep a proper look-out during hours of darkness.	The general cargo vessel sank after 70 minutes. The rescue of the crew of 7 went well, they escaped in two liferafts and were picked up by a third vessel.	B

Report no	GISIS no	Type of ship(s) involved	Accident type (i.e. collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (i.e. lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
						overtaken by the other.			
54	C0008469	Containerships & Fish transport vessel	Collision with the loss of 11 lives	Yes	"the usefulness of internal and external ISM audits and other ship visits by superintendents in identifying competency issues among bridge watchkeeping officers was extremely limited." Lack of competence among the company officers, they had poor knowledge of COLREG. After the collision, the master undertook actions but did not raise any alarm outside the vessel which should have been done. No risk analysis were done regarding that the OOW was alone on the bridge in high density traffic, the ship speed or alternative route. (the lookout was conducting a fire-round when the collision happened).		Maybe, as there were no written instructions to handle the procedures (fire-round) in dense traffic.		B
62	C0007890	Collision	Collision	Yes	Text from the report says: "It appears evident that a striking gap existed between objectives defined and the practical shipboard execution of the company safety and environmental policy. The master's decision to run a one-man job on the bridge while departing from a busy port points		Maybe, because the checklist (in this case departure-checklist but possible others too) were not "checked".	Excessive workload & stress were underlying factors.	B

Report no	GISIS no	Type of ship(s) involved	Accident type (i.e. collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (i.e. lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
					towards lack of a sound and effective safety culture.				

### Stranding Grounding

Report no	GISIS no	Type of ship(s) involved	Accident type (i.e. collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (i.e. lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
6	C0013172	General Cargo Ship	Stranding/grounding	No. However, the report says poor BRM, non-compliance with SOLAS, MLC and COLREG was accepted on board	It was accepted to not follow regulations hence SMS was not effectively implemented.	No	Yes, e.g. the habit of not using BNWAS and the fact that the OOW was not duly certified should have been detected.	A	
12	C0011015	Containers hip (Fully Cellular)	Stranding/grounding	Yes	SMS was lacking instructions for preventing typhoon damage.	No	It should be possible to foresee a need for an action plan in case of a typhoon.	A	
14	C0011006	Containers hip	Stranding/grounding	Yes	Actions by bridge team were not following internal procedures.		Yes, with a proper audit it should be possible to identify deficiencies.	A	
23	C0010335	General Cargo Ship	Stranding/grounding	Yes	The SMS did not contain information about limiting forces as regards wind and ship manoeuvring when ballasted.	No	Yes, it would have been possible to see that a fair instruction for anchoring when ballasted was in place.	A	
28	C0010298	General Cargo Ship	Capsizing/ listing	Yes	The cargo, wooden logs, was not lashed according to Cargo Securing Manual.	Yes, the SMS was not completed and well implemented in regard to sailing in rough seas.	Probably, since a recommendation is that SMS and DOC have to be reviewed, amended and audited.	A	
33	C0009272	General cargo	Cargo shifting	No, but written procedures were not followed	"The cargo inside cargo holds were not secured properly in accordance with the cargo securing manual; some of the cargo collapsed and shifted to the port side and resulted in heavy listing of the vessel to port side".	"the master and crew did not follow the abandon ship procedure; without having switched off the engines, the vessel was still moving at sea without crew on board until she went aground."	Maybe, if asked about cargo securing routines.	B	
36	C0009732	General cargo	Grounding	Yes	Inadequate written routines.	Sailed with not approved charts, sailed with ECS	Yes, some of the officers did not have flag-approved licences	B	

Report no	GISIS no	Type of ship(s) involved	Accident type (i.e. collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (i.e. lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
45	C0008866	General cargo (containers onboard)	Grounding	Yes (not in exact words, see next column)	The OOW, the master, fell asleep during bridge-watch when he was alone. Absence of look-out leading to situational unawareness, poor bridge resource management, inappropriate watch composition level, deviation from the original passage plan without making hazard identification and application of necessary controls while navigating close to coast in moderate weather during dark hours. It is not known if there were any written procedures that were not followed onboard.	After the vessel hit the rock and grounded, she suffered significant damages resulting in flooding of many tanks which posed a risk of foundering but the urgency message was not transmitted. Safety messages were also not transmitted on any frequency to warn passing shipping traffic. Master attempted to re-float the vessel by using stern propulsion without analysing the consequences. Number of water ballast compartments were damaged and flooded and the situation was not evaluated prior her re-floatation.		According to the masters' rest-hours the day and night before the accident, he had been able to get a good night's sleep but it is not known if he went ashore or not. He had been onboard for more than seven months.	B
55	C0008511	Bulk carrier	Grounding in severe	Yes	The problems onboard were in many areas.		Yes.	The report indicates that the	B



Report no	GISIS no	Type of ship(s) involved	Accident type (i.e. collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (i.e. lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
			weather conditions, tropical cyclone		Malfunctioning bridge equipment for example. A lot of areas.			crew went to sleep after the problems (grounding) started to occur, can this be right?	

### Man Overboard

Report no	GISIS no	Type of ship(s) involved	Accident type (i.e. collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (i.e. lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
4	C00129 25	Open Hatch Cargo Ship	Fall Overboard	Yes	SMS was inconsistent in one aspect; SMS procedure was not followed fully.		Yes, by comparing different documents regarding the same aspects.		A
7	C00135 80	Containership (Fully Cellular)	Missing: assumed lost	Yes	Lack of written procedures (i.e. BNWAS activation not on checklist); Key to BNWAS connected to BNWAS at all times opposite company rules, available for anyone to switch on/off; All OOW:s daily coding in log that BNWAS was in use.	Report states "indicative that the entries were a 'paper exercise' to show compliance".	Yes, e.g. by checking the whereabouts of the BNWAS key; checking the knowledge of officers and crew by interviews - should be simple in an audit.		A
8	C00111 36	Containership (Fully Cellular)	Man over board while rigging Pilot Ladder	Yes	No Safety Analysis or Safety Procedure had been done for the jog (rigging pilot ladder).	No	Yes, the lack of Risk Analysis and Safety Procedure had been easy to identify.		A
22	C00106 61	Bulk Carrier	Missing	Yes	The SMS does not cover safety procedure for crew walking on deck.	No	No. The case is concerning an OOW walking on bridge wing to have a smoke and not returning. It is assumed that he fell overboard. It is not likely that a procedure to wear safety shoes will be followed.		A

Report no	GISIS no	Type of ship(s) involved	Accident type (i.e. collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (i.e. lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
27	C0010225	Bulk Carrier	Man over board	Yes	No risk assessment nor procedures for recovery were existent.	Yes, a recommendation is that the company should focus on crew familiarization with SMS.	Yes, the lack of references in the SMS could have been identified.		A
32	C0009451	Bulk carrier	Man over board	Yes	"... identified that the ship's safety management system procedures for working over the ship's side were not effectively implemented."	" the ship's crew routinely did not take all the required safety precautions when working over the side. It was also found that the crew had differing attitudes to taking safety precautions during work and recreation times as the safety culture on board was not well developed."	Yes.	"In practice, however, crew members had not made the connection between this risk, and using the permit to work system to mitigate the risk." <b>Cape Splendor's</b> safety management system (SMS) procedures for working over the side of the ship were not effectively implemented. As a result, the ship's crew routinely did not take all the required safety precautions when working over the side. Further, they did not consider that any such precautions were necessary if going over the side when not working. [Safety issue] • The safety culture on board <b>Cape Splendor</b> was not well developed and the ship's managers had identified it as such. A consequence of this inadequacy was the ineffective implementation of working over the side	B

Report no	GISIS no	Type of ship(s) involved	Accident type (i.e. collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (i.e. lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
								procedures, including the general belief by its crew that safe work practices applied only when working, and not during recreational activities. [Safety issue].	
44	C0009069	Chemical and product tanker	Fatal occupational accident, fell overboard and drowned during crew change	Yes	The ship's safety management system did not contain any procedures on the embarkation and disembarkation of personnel at sea. The crewmembers did not wear any lifejackets.	The launch that transported the crew from the ship was not suitable for the task. No risk assessment was made. After the chief engineer fell, he got a life buoy with a line, but despite that he drowned and were not given CPR in the launch.	Yes. Lack of written procedures for crew change at sea(?)	When the chief engineer reached the last step, a crew member in the launch got hold of him in order to help him down on the deck. The chief engineer did not let go of the pilot ladder as expected and shortly after the launch went down due to swell. As the boat went down, the crew member in the launch had to let go of his grip. At the same moment, the chief engineer lost his foothold and fell down the pilot ladder until his waist was in the water. He managed to get a grip of the ropes	B

Report no	GISIS no	Type of ship(s) involved	Accident type (i.e. collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (i.e. lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
								at the last step of the ladder. As the water rose due to swell, he was submerged in water to his chest and, when it fell, he was almost out of the water. The chief engineer tried to climb up the ladder but was unable to do so. After the fall the launch moved away from the ship's side in fear of squeezing the chief engineer between the launch and the ship's side.	
57	C0008163	General cargo	Occupational incident, crewmember tried to leave the ship during sea voyage	The report states that "To express the ISM Code in broad terms (see ISM Code Preamble 5.) specific human demands of vessel crews related to coexistence and cooperation in a multicultural complex technical environment			No.	The cook was missing one morning, MOB alarm was raised, and days later the cook was recovered by another ship, wearing his survival suite and personal belongings. Most likely trying to leave the ship on purpose, not understanding the risks involved.	B

Report no	GISIS no	Type of ship(s) involved	Accident type (i.e. collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (i.e. lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
				in a narrow isolated workplace remote of their home country and families need to be emphasized as per Part A 6 of the Code (Resources and Personnel).					

### Enclosed Space

Report no	GISIS no	Type of ship(s) involved	Accident type (ie collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (ie lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
2	C0013572	Bulk Carrier	Others	Yes	Lack of properly implemented SMS; No identification of enclosed spaces; Not following SMS procedure; Poor safety culture.		Yes, by identifying risks and compare to vessel's needs; To check with crew the knowledge about SMS.		A
16	C0010978	Bulk Carrier	Accidents with life-saving appliances	Yes	SMS was not including enclosed spaces: Internal audit was incomplete, insufficient and not signed	Yes, the implementation seems to have been sloppy	Yes. The implementation of SMS was clearly insufficient and would easily have been discovered.		A
25	C0010207	General Cargo Ship	enclosed space entry fatality	Yes	Failure of two senior officers to follow simple documented procedures by enter an enclosed, locked space.	Yes, detailed shipboard operation regarding enclosed spaces was not in place. The type of cargo (timber) was not taken into consideration in the SMS.	Yes, it would be obvious to find these shortcomings in an audit.		A
26	C0012177	Ore Carrier	Enclosed Space Fatality	Yes	The entrance to the enclosed space was done by CHO even though he was warned by other crew due to gas smell. No PTW was executed. Still, this work was following directly after another closed space entry, where a PTW was in place.	Yes, the internal company report states that the PTW to the previous entrance was not properly done "Paperwork exercise only".	Hard to say since there was non-compliance with the procedures. But yes, it should have been possible to identify the attitude from the senior officers.		A
37	C0009536	Bulk carrier	Fatal occupational accident, enclosed space entry	Yes	Not following written procedures.	One recommendation to "conduct at least once every two months the enclosed		The crewmember entered the enclosed space alone, without enough ventilation or checking the	B

Report no	GISIS no	Type of ship(s) involved	Accident type (ie collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (ie lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
						space entry and rescue drill"		atmosphere. When found by two other crew members, they did the same mistake but fortunately survived.	
51	C0009983	Bulk carrier	Occupational accident, enclosed space fatality	Yes	The enclosed space hatch did not have a visible warning notice in place in accordance with the SMS.	Even if there had been warnings signs in place, some crewmembers did not speak English and may not have understood the warning.	Yes, since the enclosed space entry did not have warning signs.	The vessel has enclosed space entry procedures and safety equipment as prescribed by the SMS concerning the identification and safe entry into enclosed spaces. The crewmen did not follow the safety procedures on board and made an unauthorised entry into the enclosed space. Following the SMS procedures is likely to have prevented injury and death. The cargo information supplied to the Master was inadequate and inaccurate relating to the dangers of the transportation of coal by ship. Ship staff and managers should continue to rely on the relevant	B



Report no	GISIS no	Type of ship(s) involved	Accident type (ie collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (ie lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
							information contained within the IMSBC Code. The cargo information supplied was not a direct factor in crewman entering the space.		

Other

Report no	GISIS no	Type of ship(s) involved	Accident type (i.e. collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (i.e. lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
11	C0012209	General Cargo Ship	Serious injury to ship's crew	Yes	No supervision of new crew, not following procedure (acceptance of crew riding on pontoon when lifted by crane).	Not effectively implemented in regard to risk assessment and supervision.	It should have been possible to identify this style when interviewing.		A
18	C0010460	Bulk Carrier	Loss of life	Yes	There was no procedure for the job done. Risk Assessment forms were generic in nature and did not identify dangers to individual tasks.	Risk Assessments were near identical for all jobs, and a tick box culture onboard had developed.	Yes, the absence of individual assessments should have been identified.		A
19	C0010260	Bulk Dry (general, ore) Carrier	Crew fatality	Yes	The SMS did not cover appropriate inspection and verification procedure. Further, crew did not follow SMS procedures as they should have.	Yes, common English language was not used in between other nationalities, making others out of information loop.	Yes, the deviation from procedures should have been identifiable.		A
24	C0012174	Drilling Ship	Contact	Yes	No formal training or follow up if the deceased was doing the job safely. The tasks were not subject of Risk Analysis.	Yes, the SMS was not fully operational or even understood.	Yes. A thorough audit would have discovered the flaws of the system.		A
34	C0009196	Passenger vessel	Loss of life in bad weather, window breakage where seawater entered the restaurant	Yes	"While not specifically relevant to the event, the damage suffered or the on-board planning and response, it was the opinion of the investigators that the documented Safety Management System requires comprehensive review and, consequently, that the effectiveness of the ISM audit regime should be reviewed".	No	"While not a causal factor in this event it is the opinion of the investigators that there were long-standing weaknesses in the survey regime performed by the Classification Society in respect of the International Convention on Load Lines. While not specifically relevant to the event, the damage suffered or the on-board planning and response, it was the opinion of the investigators that the documented Safety Management System requires comprehensive review and, consequently, that the effectiveness of the ISM audit regime should be reviewed."		B
42	C0010672	Ro-ro vessel	Crew member was crushed	Yes	The investigation found weaknesses in the company SMS related to risk	Yes, this was the fourth accident in less than one year	Yes. The SMS risk assessment related to working on deck was	Manning was 17 (safe	B

Report no	GISIS no	Type of ship(s) involved	Accident type (i.e. collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (i.e. lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
			between two cargo containers and did not survive from the injuries.		assessment and SMS review process.	in the company. (two were fatal).	insufficient. It did not identify the specific hazard of a crew member being crushed by a moving container, the potential severity of resulting harm, and the need to address the increased risk of an unsighted crew member being positioned in the container's path.	manning 13) The identified weakness of the risk assessment regime and ineffective SMS review processes on board the vessel would probably have been addressed before the accident had the company given a higher priority to the issues and had the MCA's management of ISM Code audits and follow-up action been more effective.	
52	C0008872	Woodship carrier	Breathing apparatus air compressor explosion	Yes	"The ship's safety management system did not provide the crew with appropriate guidance in relation to the operation and maintenance of the OBA sets".	The ship's fire fighting manual referred exclusively to fire fighting in the vehicle decks of a car carrier and was not ship specific.	Maybe, if the surveyor had looked at routines with non-mandatory equipment.	It was possible to connect an oxygen cylinder to the air-compressor. If this what not the case, the explosion would have been avoided. (lack of	B

Report no	GISIS no	Type of ship(s) involved	Accident type (i.e. collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (i.e. lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
								engineering safety measures).	

**Mooring – anchor handling**

Report no	GISIS no	Type of ship(s) involved	Accident type (ie collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (ie lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
38	C0009322	General cargo	Fatal occupational accident during mooring operations	Yes	Not following written procedures.	Lack of risk analysis.	Probably not.	Crewman was pulled overboard from the forward mooring area when his foot became caught in the bight of a mooring rope as the ship was shifting berth.	B
40	C0009334	Bulk carrier	Fatal occupational accident when handling the anchor	Yes	"It was unsafe to let the fitter to go into the hawse pipe to carry out the work, the Safety Management System failed to provide safe instruction to the fitter to carry out the job."	"It was unsafe to work in the hawse pipe with the anchor and chain stuck inside during voyage. Obviously, the working team failed to conduct a risk assessment as required by ISM Code prior the work with potential hazards."	Maybe not since the crew did a risk assessment.	The crew did a risk assessment but among other recommendations the report says "internal audits and management reviews are conducted systematically to reveal system deficiencies for improvement in earlier stages"	B
61	C0007867	General cargo	Occupational accident, loss of life caused by handling mooring ropes on forecastle deck	No	The SMS seems to have been well implemented but sadly not followed by the bosun who decided to work alone with the mooring winches and got trapped on the winch drum. Procedures seems to have been followed normally, but not in this case.		No	Maybe better risk awareness /training could have helped.	B

**Handling lifting devices**

Report no	GISIS no	Type of ship(s) involved	Accident type (ie collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (ie lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
59	C0007821	Platform, semi-submersible	Loss of life when lifeboat fell from 30 meter	Yes	The report states things like "bad procedures", "Inadequate or ineffective barriers" "poor communication" "poor organization".		Maybe. Hard to say from the report, but it seems to be a poor safety culture onboard and maybe the lifeboat should not be lifted 30 meters with personnel onboard.		B

Report no	GISIS no	Type of ship(s) involved	Accident type (ie collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (ie lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
60	C0008129	Containership	Occupational accident, loss of life during lift inspection	Yes	This was the third fatal accident in the company over a period of eight months. A number of areas, such as written procedures not fully implemented, written procedures not followed, risk analyses did not cover all areas	See previous comments. It was also noted that previous accidents and near-misses had not been reported. There were also 11 months contracts and poor communication, both onboard the ship but also between company - ship. The safety culture needed improvement.	Yes. There were several ways to see signs of that the SMS was not fully implemented such as very few work procedures and minimal guidance on how to work safely, circular letters to the fleet were not routinely incorporated onboard and there were no, or very few, near misses reported from the crew.	Evidence from this and the two previous fatal accidents demonstrates that poor working practices and inadequate control of risks were systemic problems on company's ships.	B

Report no	GISIS no	Type of ship(s) involved	Accident type (ie collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (ie lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
63	C0007978	Trailing suction hopper dredger	Failure of store crane, big weight fell and nearly injured people badly	Yes	The accident happened due to a lot of factors, but a fully implemented SMS should have made sure that the inspections and maintenance of the non-cargo handling crane was done in a more thorough way. The non-cargo handling crane was not suited for a rough environment, it was not installed to be easily accessed for inspections and the PMS was not suited for lifting devices.	The training and qualification of the crane operator was not in accordance with the company's instructions.	Maybe, since the PMS was not suited for a lifting device.		B



Fall from height

Report no	GISIS no	Type of ship(s) involved	Accident type (ie collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (ie lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
5	C0012968	General Cargo Ship	Occupational accident	Yes	Checklists missing certain information; Insufficient risk analysis; New crew not orientated of SMS procedures.		Yes, insufficient risk analysis should have been identified; Insufficient checklists should have been identified.		A
17	C0010361	Bulk Dry (general, ore) Carrier	Accidents with life-saving appliances	No, not directly	The accident was investigated by two authorities, and one concludes that fall in the cargo hold was not identified as a risk in the SMS risk assessments.	No	Yes, it would have been possible to see that a risk assessment of cargo hold work was not done. That is confirmed by Safety Actions, which includes an update of SMS accordingly.		A
48	C0008580	Bulk carrier	Occupational accident, loss of life after fall into forepeak void space	Not in words, but proper safety routines were not in place	Confined space entry procedures not in place, no procedures when open manholes are left unattended	The master left the injured person with personnel without any formal medical education. The injured person was given pain-killers without informing the master or medical officer and without instruction on what to look for, i.e. symptoms of shock	Yes. Lack of written procedures.		B
53	C0008520	LNG carrier	Loss of life during ballast tank inspection	No	Procedures were in place and followed.		No. Procedures were in place and followed.	The ladder from the aft manhole of the centre deep tank was set inside the perimeter of the access manhole rim thus limiting the	B

Report no	GISIS no	Type of ship(s) involved	Accident type (ie collision)	Does the report identify SMS as a contributing factor	In which area was the SMS a contributing factor (ie lack of risk analyses, written procedures not ship specific etc)	Does the report relate to the implementation of ISM/SMS in any other way, if "yes", how	In your opinion, was there ever a possibility to identify this ISM-deficiency (if any) during an inspection prior to the accident?	Other comments	Analyst
								space available to pass a person's body though the manhole. This design requires a person to pull closer to the ladder in order to prevent hitting the ceiling of the tank (tank top) with their hard hat or head before passing through the manhole.	

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## ANNEX 6

### PROPOSAL FOR A NEW OUTPUT ON PREVENTING THE LOSS OF CONTAINERS AT SEA

#### Introduction

1 This proposal is submitted in accordance with the *Organization and method of work of the Maritime Safety Committee and the Marine Environment Protection Committee* and their subsidiary bodies (MSC-MEPC.1/Circ.5/Rev.4), taking into account resolution A.1111(30) on *Application of the Strategic Plan of the Organization*.

2 III 7 instructed the Working Group on Analysis of Marine Safety Investigation Reports (Casualty Analysis Working Group) to consider document III 7/4/7 related to the **MSC Zoe** marine safety investigation reports (GISIS ref. no. C0012974), for action as appropriate, taking into account document III 7/1/1/Add.1 (III 7/WP.3 paragraph 3.13).

3 III 7 noted the work of the Casualty Analysis Working Group on **MSC Zoe** marine safety investigation reports (III 7/WP.3 paragraphs 41 to 48) and instructed the Correspondence Group on Analysis of Marine Safety Investigation Reports (Casualty Analysis Correspondence Group), to continue the work intersessional and identify safety issues and make recommendations that needed further consideration by the Sub-Committee taking into consideration information provided on the marine safety investigation report on **MSC Zoe** (III 7/WP.3 paragraph 49.2).

4 III 8 noted the Report of the Casualty Analysis Correspondence Group (III 8/4) and the work on the **MSC Zoe** report (III 8/4 paragraphs 7 to 11). The Correspondence Group had invited the Sub-Committee to note the concerns raised in the investigation report of **MSC Zoe** and to consider instructing the Working Group to prepare a recommendation to the Maritime Safety Committee (MSC) for a new output on how containers are to be secured on deck (III 8/4 12.2).

5 III 8 established and instructed the Casualty Analysis Working Group to consider and advise whether those reports with safety issues reviewed by the analysts and considered by the Working/Drafting Group should be referred to the relevant committees and Sub-Committees indicating potential safety deficiencies, including the **MSC Zoe** (III 8/WP.3 paragraph 3.3).

6 Regarding the safety issue related to securing containers on deck, the Casualty Analysis Working Group had a very fruitful discussion and noted the information of the work being undertaken by the Top Tier joint industry project (JIP) on securing containers safety (MSC 104/17/4). The Working Group agreed to recommend the Sub-Committee to invite MSC to note discussions on document III 8/4 in the Working Group regarding how containers should be secured at sea and to instruct the Correspondence Group, if established, to develop proposal for a new output for preventing loss of containers at sea (III 8/WP.3 paragraphs 17 to 19 and 65.6).

7 III 8 agreed to invite MSC to note discussion on document III 8/4 regarding how containers should be secured at sea, taking into account that the work was being undertaken by the Top Tier joint industry project (JIP) on securing containers safety, as described in MSC 104/17/4, and instructed the Casualty Analysis Correspondence Group to develop a proposal for a new output for preventing loss of containers at sea (III 8/WP.1 paragraph 4.13.6).

8 MSC 106 noted with appreciation the update on the progress of the Top Tier joint industry project (JIP) on securing containers safety (MSC 106/INF.16 and MSC 106/WP.1/Rev.1 paragraph 18.39.2).

9 MSC 106 instructed the Casualty Analysis Correspondence Group to take into account the output on "Development of measures regarding the detection and mandatory reporting of containers lost at sea that may enhance the positioning, tracking and recovery of such containers" of the CCC Sub-Committee (MSC 106-WP.1-Rev.1 paragraph 14.3).

10 The Casualty Analysis Correspondence Group noted the submission of Denmark and co-sponsors to MSC 107 (MSC 107/17/12) and took into account the overarching approach of the new output.

## Background

11 In the night of 1 to 2 January 2019 the **MSC Zoe** lost 342 containers on six occasions, with the first two occasions not noticed by the crew. The investigation report of **MSC Zoe** (GISIS ref. no. C0012974) reveals that the ship was sailing with a high metacentric height (GM) in heavy weather conditions, shallow water conditions and a beam sea scenario. Due to this, **MSC Zoe** encountered a combination of four hydrodynamic phenomena: extreme motions and accelerations, contact or near contact with the sea bottom, green water, and slamming.

12 The incident with **MSC Zoe** resulted in severe pollution of the Wadden Sea area and its islands. The Wadden Sea area is designated as a Particularly Sensitive Sea Area (PSSA) and is included in the UNESCO World Heritage List, comprising a vulnerable ecologic system.

13 The growth of the capacity of containerhips has resulted in ships exceeding the valid ranges of most international technical regulations and standards for calculation. For example, the Code of Safe Practice for Cargo Stowage and Securing (CSS Code) cannot be used to calculate design accelerations for Ultra Large Containerships. Complicated, not transparent, software is needed to calculate whether the stowing plan is within the limits. Therefore, it cannot be checked whether the containers are loaded and secured in accordance with the regulations of the Cargo Securing Manual (CSM) and if the rules and guidelines regarding lashing have been complied with.

14 The investigation revealed that the encountered transversal accelerations by **MSC Zoe** were at the design limits, leading to failure of the container structure and/or the lashing equipment and subsequent container loss.

15 The investigation into the loss of containers by **MSC Zoe** also revealed that the concept of the lashing of containers on deck of these large and wide ships needs to be reviewed and international technical and operational standards need to be amended or developed where necessary.

16 The Australian Transport Safety Bureau (ATSB) recently investigated the loss of containers from the **YM Efficiency** and **APL England** while in Australian waters. The **YM Efficiency** lost 81 containers into the sea on 1 June 2018 during heavy seas. The **APL England** lost 51 containers into the sea on 24 May 2020 during heavy seas. Regrettably, the incidents with **MSC Zoe**, **YM Efficiency** and **APL England** are not isolated cases. In recent years the loss of containers from ships into the sea seems to become more frequent and appears worldwide on a larger scale. Even if there are no dangerous goods onboard, the content of the containers is likely to escape and float free over a period of years. The containers themselves are both hazardous to navigation and detrimental to the marine environment and ecology (MSC 104/17/4).

17 After the incident with the **MSC Zoe** the Maritime Research Institute Netherlands (MARIN) set up the Top Tier Joint Industry Project (JIP) on securing container safety. The project is a follow-up of the earlier Lashing@Sea JIP that addressed cargo securing safety in the period of 2006-2009. The initiative responds to changes in container shipping practice over the past decade, and reported incidents involving losses of containers overboard, for example as outlined in document MSC 104/17/4 (Australia et al). The project began in May 2021 and will run for three years. The primary objectives of the JIP are to identify and recommend improvements for transport, stowing and securing containers and related matters, and provide the technical understanding that is needed for safe designs and innovations into the future.

### IMO Objectives

18 The proposal is directly related to strategic direction 2 (integrate new and advancing technologies in the regulatory framework) and strategic direction 7 (ensure regulatory effectiveness) of the Organization's *Revised strategic plan of the Organization for the six-year period 2018-2023* (resolution A.1149(43)) through the development of new guidelines on the carriage of containers to prevent the loss of containers into the sea. This will enhance the safety of the ship's crew and the cargo, but will also reduce pollution of the marine environment. Both are within the scope of the IMO's mission.

### Need

19 The loss of containers at sea is a threat to the safety of navigation and the marine environment. The investigation of **MSC Zoe** has highlighted the need to revise, amongst others, the Code of Safe Practice for Cargo Stowage and Securing for very large containerships.

20 The investigation into the **MSC Zoe** also concluded that size of ships like the **MSC Zoe** exceed the valid range of most international regulations and standards for calculation as stated under paragraph 13.

### Analysis of the issue

21 The main cause of the loss of containers by **MSC Zoe** was the high stability (and thus short rolling period) at which the ship was sailing in a beam sea scenario in shallow water conditions where it encountered combination of four hydrodynamic phenomena as stated in paragraph 11. This led to the following issues:

- .1 extreme motions and accelerations due to sailing with a high GM. High stability is a safety risk that has not been recognised and formalised in the IMO Intact Stability Code and documents as the Stability Booklet. Current limits are only set for a minimum GM. The effects of high GM are underestimated;
- .2 the encountered transversal accelerations were at the design limits, leading to failure of the container structure and/ or the lashing equipment and subsequent container loss;
- .3 the lashing equipment and container structures present on ships like the **MSC Zoe** are the similar on all other types of containerships. The Code of Safe Practice for Cargo Stowage and Securing cannot be used to calculate design accelerations for ships like the **MSC Zoe**;

- .4 the maximum size of containerships continues to increase, as well as the average size of ships in the fleet. This investigation revealed that the concept of the lashing of containers on deck of these large ships needs to be reviewed and international technical and operational standards to be amended or developed where necessary; and
- .5 the **MSC Zoe** lost containers on six occasions. The first two were not noticed by the crew. If the first two had been noticed the necessary mitigating actions could have been taken and further container losses possibly avoided.

22 In general, the capacity of individual containerships has doubled over the last 15 years. This growth has resulted in containerships carrying more containers on deck. The investigation revealed that the concept of lashing of containers on deck of these large and wide ships needs to be reviewed; international technical and operational standards need to be amended or developed where necessary.

### **Analysis of implications**

23 It is considered that the proposed new output will not lead to any additional administrative requirements or burdens and in this regard, the completed administrative checklist, as set out in annex 6 to the *Organization and method of work of the Maritime Safety Committee and the Marine Environment Protection Committee and their subsidiary bodies* (MSC-MEPC.1/Circ.5/Rev.4), is set out in annex 1.

### **Benefits**

24 The incident with **MSC Zoe** resulted in severe pollution of the Wadden Sea area and its islands. The Wadden Sea area is designated as a Particularly Sensitive Sea Area and is included in the UNESCO World Heritage List, comprising a vulnerable ecologic system. Preventing the loss of containers at sea reduces the impact of such losses and is therefore beneficiary for the marine environment and the prevention of pollution.

### **Industry standards**

25 Although there are standards for carriage of containers concerning weight, construction, lashing and placement on board, at this stage there are no industry standards specifically addressing the issue of container loss at sea.

### **Proposed output**

26 The proposed output title is "The preventing of loss of containers at sea". As discussed in paragraphs 21 and 22, the existing technical and legal regulations for containerships regarding design limits of cargo securing equipment, approved loading and stability conditions and the consideration of shallow water effects and speed on ship motions and resulting in accelerations and forces need to be revised.

27 Under this output, the III Sub-Committee proposes that the (re)development of the following guidelines, but not limited to, need to be taken into account:

- .1 the International Code on Intact Stability (IS-Code) (Off-design stability conditions for very large containerships and Second Generation Intact Stability started in May 2020);

- .2 Code of Safe Practice for Cargo Stowage and Securing (CSS Code) for very large containerships;
- .3 Container Safety Convention and ISO 1496-1 Freight containers – Specification and testing respectively;
- .4 IMO Circular MSC.1/Circ.1228 dated 11 January 2007, Revised Guidance to the master for avoiding dangerous situations in adverse weather and sea conditions whether it works at all sea conditions;
- .5 Stability booklet include that all loading conditions should be checked on high accelerations/forces;
- .6 Cargo Securing Manual, include design limits of the cargo securing equipment in accordance to the design accelerations;
- .7 outcomes of Top Tier Joint Industry Project as mentioned in paragraph 17 and existing international working groups; and
- .8 the CCC Sub-Committee output on "Development of measures regarding the detection and mandatory reporting of containers lost at sea that may enhance the positioning, tracking and recovery of such containers".

28 Due to the diversity of the issues, the Maritime Safety Committee would be the coordinating body tasking the appropriate Sub-Committee(s) to coordinate the work on this output.

29 The proposed output in SMART terms (specific, measurable, achievable, realistic, and time-bound) is as follows:

- .1 **Specific** – the intended output will lead to the amendment and (re)development, if necessary, of international regulations on the carriage and storage of containers on ships;
- .2 **Measurable** – the outcome of the intended output can be measured by monitoring the loss of containers worldwide;
- .3 **Achievable and realistic** – the output should be both achievable and realistic given the existing international regulations and the initiatives already taken as described in paragraph 16;
- .4 **Time-bound** – the completion of the work is envisaged with a target year of completion 2028.

### Human element

30 The completed checklist for considering human element issues by IMO bodies as set out in Annex 5 of to the *Organization and method of work of the Maritime Safety Committee and the Marine Environment Protection Committee and their subsidiary bodies* (MSC MEPC.1/Circ.5/Rev.4), is set out in annex 2. The proposal is not considered to have negative implications for the human element. Rather, seafarer safety will improve if containers stay on board as expected.

## **Urgency**

31 The investigation into the **MSC Zoe** revealed that the loss of containers at sea has an impact on the marine environment, not only because the containers were lost in a PSSA. The limit of the growth of containerships has still not been reached, so ships larger than the **MSC Zoe** will be more likely to exceed the valid range of most international regulations and standards for calculations as stated under paragraph 13.

32 Since the loss of containers by the **MSC Zoe** in 2019, there have been several other large events, including:

- .1 **One Apus**, 1,800 containers were lost;
- .2 **Maersk Essen**, 750 containers were lost;
- .3 **ZIM Kingston**, 109 containers were lost;
- .4 **Dyros**, 90 containers were lost;
- .5 **Madrid Bridge**, 60 containers were lost; and
- .6 **MSC Shristi**, 46 containers were lost.

33 The III Sub-Committee proposes that the output should be addressed as a matter of priority and as soon as practicable. In this regard, the proposed output, if approved, should be included in the Strategic Plan of the Organization and priorities for the 2024-2025 biennium.

## **Action requested of the Committee**

34 The Committee is invited to consider the information provided above and the proposal for a new output on "The preventing of loss of containers at sea" as set out in paragraphs 26 to 28 and take action as appropriate.

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