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GUIDELINES ON EARLY ASSESSMENT OF HULL DAMAGE AND POSSIBLE NEED FOR ABANDONMENT OF BULK CARRIERS

1 The Maritime Safety Committee, at its seventy-sixth session (2 to 13 December 2002), considered recommendations for decision-making emanating from various formal safety assessment (FSA) studies on bulk carrier safety. In particular, the Committee agreed that a circular should be prepared addressing bulk carriers which may not withstand flooding of any one cargo hold and containing information on the action to be taken in case of flooding of such holds, making sure that the professional judgement of the master is not undermined.

2 The Committee, at its seventy-ninth session (1 to 10 December 2004), having considered the recommendations made by the Sub-Committee on Ship Design and Equipment at its forty-sixth session, the Sub-Committee on Safety of Navigation at its forty-ninth and fiftieth sessions and the Sub-Committee on Standards of Training and Watchkeeping at its thirty-fifth session, approved Guidelines on early assessment of hull damage and possible need for abandonment of bulk carriers, as set out in the annex. Some common causes of hull damage are contained in the Appendix to the annex.

3 Member Governments are invited to urge companies, as defined in the ISM Code, that operate bulk carriers flying their flag, to issue ship specific guidance, based on the annexed Guidelines, to the masters of such bulk carriers with a view to improving the precautionary measures and procedures for emergencies on board their ships. This ship specific guidance should be brought to the attention of all crew members during familiarization training.

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ANNEX

GUIDELINES ON EARLY ASSESSMENT OF HULL DAMAGE AND POSSIBLE NEED FOR ABANDONMENT OF BULK CARRIERS

1 Provoked by the disappearance and loss of a number of bulk carriers from mid 1970s onwards the international shipping community has grown increasingly concerned that such ships are particularly vulnerable to rapid loss. Consequently, IMO has been taking action over the years to address this problem and to find appropriate solutions. Among such actions, the Organization has adopted amendments to the 1974 SOLAS Convention, by introducing chapter XII in 1997 (amended in 2002), and other related provisions in chapter II-1, and has also amended the Guidelines on the enhanced programme of inspections during surveys of bulk carriers and oil tankers (resolution A.744(18)) on several occasions. More recently, a number of formal safety assessment (FSA) studies on bulk carrier safety have been carried out. From these studies, the Maritime Safety Committee of IMO concluded at its seventy-sixth session in December 2002 that bulk carriers do deserve continued special attention and a number of measures were approved to address the issues identified, both structural and operational.

2 Records of bulk carrier losses indicated, in a large proportion of the cases studied, that ship's masters often appeared to be unaware of the imminent danger they were in. Many lost their lives together with the other seafarers on board as a consequence. Ship losses were frequently so rapid that the ship did not have time to send a distress signal.

3 The records studied show that in the event of loss of hull integrity, in many cases, bulk carriers should be evacuated as quickly as possible. EARLY ASSESSMENT OF THE SITUATION IS THEREFORE IMPERATIVE, COMBINED WITH ALERTING A MARITIME RESCUE CO-ORDINATION CENTRE, ALERTING ALL PERSONNEL ONBOARD AND MAKING PREPARATIONS FOR EVACUATION. This is of particular importance for single skin bulk carriers which may not be capable of withstanding flooding of any cargo hold.

4 Companies should consider the following advice carefully with a view to improving their own precautionary measures and procedures for emergencies. The advice applies equally to ships other than bulk carriers when carrying dense cargoes.

Heavy cargoes

5 In most cases in which bulk carriers have been lost, heavy cargoes such as iron and other dense ores are a common factor. Ships are also vulnerable when carrying certain break-bulk cargoes such as steel products. This could include other ship types. The small volume taken up by the cargo in the ships' holds results in a large unoccupied space. This provides potential in a flooding scenario for large volumes of water to rapidly destroy the ship's residual buoyancy and, in the case of smaller vessels, its stability. Larger vessels are also highly susceptible to structural failure due to increases of weights caused by the influx of water.

6 Heavy cargoes place high loads on the structure, and structural failure is therefore more probable when subjected to the additional forces associated with flooding.

Structure

7 Deterioration of structure through corrosion, fatigue and damage is identified as a principal factor in the loss of many bulk carriers. Failing to identify such deterioration may lead to sudden and unexpected failure. Bulk carrier crews may be unaware of the vulnerability of these vessel types. The consequential loss of a ship carrying heavy cargo can be expected to be very rapid, should a major failure occur.

Forward flooding

8 Spaces forward of the collision bulkhead will, in the event of flooding, significantly affect the trim of the ship and reduce freeboard at the bow. In extreme weather this further threatens the ship as green seas come inboard and impact on hatch covers and other fittings that protect the water or weathertight integrity of the ship. Shell plating in the region of the bow protects the fore peak tank and other spaces as do air pipes and ventilators. If any of them are damaged the ship's ability to resist further escalation of flooding is compromised.

Early assessment

9 When it occurs or is likely to occur, masters should quickly assess damage to their ships by being alert to water ingress and its consequences. The following guidelines are given to assist them in this assessment.

Unusual motion or attitude

10 If a ship takes on an unusual trim or heel, or if her motions become changed, breach of the hull envelope should be suspected immediately:

- Unusual collections of water on decks may be indicating trim or heel abnormality.

- Sudden changes of heel or trim will indicate flooding or in smaller ships with lighter cargoes it may indicate cargo shift.

- Jerky lateral motions can be indicative of large scale sloshing as would be the case if a hold were flooded.

- On smaller ships, slowing of the ship's roll period may indicate excessive water within the hull - a serious threat to stability. Ships fitted with GM meters should be able to identify any unexpected changes in GM.

- Increases of water boarding forward decks may indicate flooding of a forward compartment. Trim and freeboard changes are notoriously difficult to assess from an after bridge.

11 **Methods of detection**

- Hatch covers may be dislodged by pressure and/or sloshing from within a hold if flooding occurs through side shell or bulkhead.

- Sudden pressurization of compartments adjoining those that are damaged or flooded will indicate failure of internal subdivision, most notably bulkheads.

- Spaces may be monitored, either using gauging or bilge/water level alarms. Forward store spaces can also be monitored audibly using "talkback" telephones that may be fitted in forward spaces. Anchor impacts and water in the space can be detected using telephones of the type that remain active until switched off from the bridge.

- Hull Stress Monitors, where fitted, may be able to detect unexpected longitudinal hull girder bending. Torsional stresses may also be detected through differential changes between port and starboard strain gauges.

- Visual monitoring from the bridge using binoculars, where fitted, by closed circuit television, can give indication of abnormal water on deck and local damage. However, assessment of trim or freeboard using this method is difficult.

- Assessment of trim changes can in certain conditions be detected by noting the level of the horizon, when visible, against a known reference point on the foremast.

- Draught and trim can be assessed using draught gauges. Changes are much more discernible using this method than by visual means from above decks.

Early readiness for evacuation

12 In the event of identifying or even suspecting that the ship may have sustained damage, ship's personnel should immediately be called to their emergency stations. A HIGH PRIORITY SHOULD BE PLACED ON PREPARING EQUIPMENT FOR EVACUATION. Abandonment should however only be invoked on the spoken orders of the master following assessment of the risk.

13 Contact with a Maritime Rescue Co-ordination Centre (MRCC) and/or owners should be made early if the master has any suspicion that the ship is damaged. An URGENCY signal is justified and this should be upgraded to DISTRESS if the ship is confirmed as damaged.

Training

14 Masters should place a strong emphasis on evacuation training so that donning of protective suits and lifejackets, launching of survival craft, and operation of EPIRBs and SARTs is a familiar process to all ships' personnel. Also included should be shutdown procedures for main and auxiliary machinery, which can, if left running, hinder launching of survival craft.

Investigation

15 Masters may wish to investigate any suspected water ingress more closely but preparations for evacuating the ship should be made WITHOUT DELAY and concurrent with any investigation. Remote methods of observation are preferable to sending personnel onto decks, particularly in bad weather and/or at night. Deck floodlights should be used if necessary to try and identify abnormalities. Detrimental effects on watchkeepers' night vision are of secondary importance in such circumstances.

16 In circumstances deemed justifiable for sending personnel onto decks that may be frequently awash with green water, at least two personnel should go to investigate. They should wear harnesses that attach them to a lifeline and to each other and should be in constant (radio) communication with the bridge. Each harness should be provided with two easily operated clips so that wearers are always attached to the ship's structure, even when passing across from one lifeline or structural attachment to another. Lifelines on both sides of the deck should be rigged at all times and progress along the deck should always be via the lee or sheltered side. When weather conditions deteriorate is not the time to begin rigging such measures. Fencing or shipside rails alone should not be relied upon without attachment by harness.

17 When a loss of hull integrity is known or suspected, personnel should **not** be sent onto decks that are being regularly submerged or deeply awash. In such circumstances the ship should be regarded as in imminent danger and priority should be given to preparations for evacuation.

Collision

18 In the event of a collision, masters should call the ship's personnel to emergency stations with a strong emphasis on preparing to evacuate the ship. This is particularly important and urgent in cases where a ship is loaded with dense bulk cargo[1]. Older designs of bulk carriers and small ships with fewer holds are particularly prone to sudden progressive flooding if the damage occurs abaft any strengthened bulkheads in the forward part of the ship. This type of damage is more probable resulting from collisions in dense traffic or overtaking manoeuvres.

Safety and survival

19 In the circumstances highlighted above, particular emphasis has been placed on being ready for early evacuation or abandonment of the vessel. For ships carrying high-density cargoes this is of importance while they are at sea. There may however be cases where abandonment may be the worst option and for bulk carriers as with other ship types this is most probably true in the event of grounding. In close proximity to shore, and especially in bad weather, life-saving craft launched from the ship are unlikely to save the occupants from the perils of the shoreline and the process of launching the craft probably carries much greater danger than remaining on board. Again, early contact with a Maritime Rescue Co-ordination Centre is important and the master should not hesitate to broadcast an Urgency or Distress message. When aground and although the ship may be severely damaged or broken in two, the accommodation blocks in such strandings usually survive long enough for helicopter evacuation, as organized and co-ordinated by the Maritime Rescue Co-ordination Centre, when weather conditions abate.

20 Companies are reminded that the master is the one who decides on whether or not the ship is to be abandoned. This guidance is provided to assist the master in making that decision and is based on the overriding principle that human life is more important than property.

21 Companies are also reminded that emergency contingency planning forms an integral part of the International Safety Management Code required by SOLAS chapter IX. They should therefore assess the actual risk to their ships with consideration of the information given in these Guidelines and provide in their Safety Management System appropriate advice to assist the master in assessing the action to take in a situation involving flooding of the ship.

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[1] Dense cargo should be understood as bulk ores that do not contact sides or bulkheads but should also include certain break-bulk cargoes such as steel products, which share similar characteristics.

APPENDIX

Causes of damage and failure

1 Damage to side shell, externally through contact with docksides or tugs and, internally from impact by cargo dislodging equipment during discharge, can result in initiating fractures and/or fatigue of the structure. In single side-skin bulk carriers, bulkheads, trunks and ballast tank boundaries, can present "hard spots" that concentrate forces where the change in construction occurs (e.g. longitudinal to transverse framing). This may lead to undetected fractures.

2 Internal degradation through corrosion may be accelerated through chemical action from certain cargoes. Welds in particular may be subject to "grooving" corrosion, in which the material forming the weld corrodes at a faster rate than the plating to which it is attached. Fatigue failure may result due to loss of cross-sectional area in the plating joints.

3 In ballast holds, sloshing forces due to partially filled spaces (such as may occur when changing ballast for environmental reasons) may result in damage to the structure. This damage may go unnoticed if it is in inaccessible positions. Sloshing is also a known cause of secondary damage after a space has become flooded.

4 Damage to bow plating such as is possible through impacts associated with swinging or loosely stowed anchors may cause an initiating fracture or fatigue in bow shell plating that could lead to failure and subsequent flooding. Internal integrity of forward spaces (that are usually used for ballast and/or stores) is therefore of vital importance. Corrosion degradation will seriously reduce the ability of plating and stiffening to withstand the forces to which it will be subjected. In larger ships, partially filled forepeak tanks may set up destructive sloshing forces unless the tank structure is designed for this.

5 External forces – horizontal and/or vertical - may cause hatch cover dislodgement. The cargo hatchway, if it loses its protection in this way, is a major access for water ingress and a serious threat to the integrity of the hull.

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