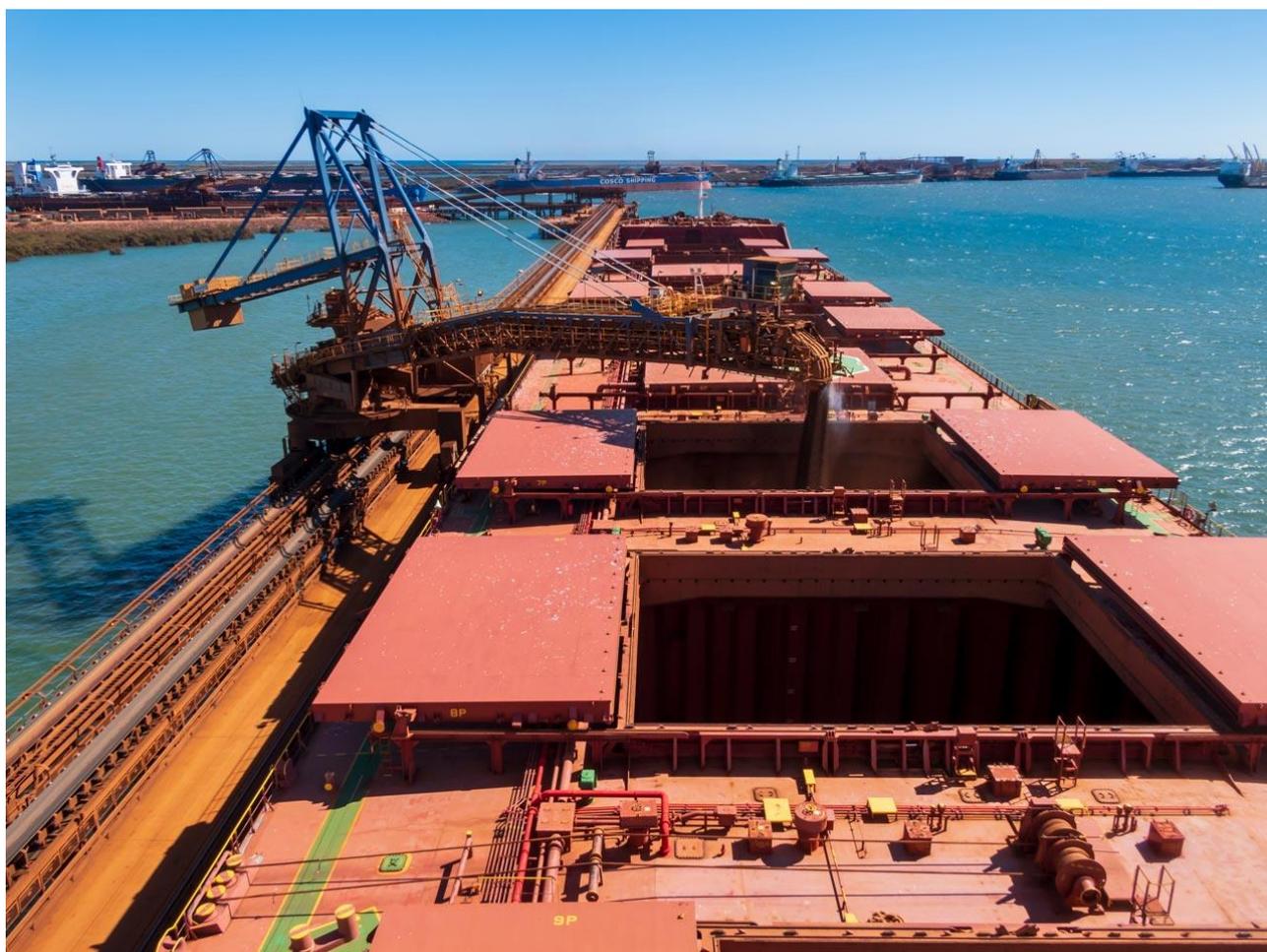


BULK CARRIER OPERATIONAL SAFETY: NO ROOM FOR COMPLACENCY

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INTRODUCTION

Previous MM Risk Bulletins on bulk carrier safety focused on the liquefaction dangers of IMSBC Code Group 'A' cargoes (e.g., nickel ore) which can cause a vessel to capsize suddenly, with high levels of crew deaths. This Risk Bulletin focuses on other serious bulk carrier hazards. They include Group 'B' cargo fires, hull distortion damage during loading and discharging, hull stresses at sea due to excessively high stability, flooding of cargo holds and void spaces and crew injury and death

during confined space entry and while doing hold cleaning and washing. Identifying and minimising these risks are discussed and special precautions are recommended.

BACKGROUND

Members should refer to the bulk cargo liquefaction dangers previously highlighted in the MMIA Risk Bulletins:

- [RB No. 2 – Bulk Cargo Dangers and IMSBC Code Update.](#)
- [RB No. 12 – Death by Bulk Cargo Liquefaction: Don't become a statistic!](#)
- [RB No 41 – IMSBC Code 2020 Edition: Changes for the good.](#)

Members who operate bulk carriers should read and provide copies of the abovementioned Risk Bulletins onboard their vessels.

NOTE: The [INTERCARGO Bulk Carrier Casualty Report, Years 2012 – 2021 and Trends](#), advises the last bulk carrier loss due to cargo liquefaction was the Indonesian flag 'NUR ALLYA' (DWT 52,378) in August 2019. All 27 crew were lost. Happily, no cargo liquefaction bulk carrier casualties were reported during 2020 and 2021. However, INTERCARGO cautions that: one, their loss data does not include bulk carriers under 10,000 DWT and, two, it is obtained from IMO and other websites which may be incomplete.

OTHER BULK CARRIER HAZARDS

As noted in the Introduction above, other serious hazards faced during the operation of bulk carriers include:

- **Group 'B' (materials possessing chemical hazards)** – are defined by the IMSBC Code at Section 9 and SOLAS regulation VII/7 as dangerous goods in solid bulk form. They include 'flammable solids', 'substances liable to spontaneous combustion', 'oxidising substances' and 'toxic substances'. The associated risks and their control must be carefully considered and planned.

NOTE 1: Coal provides a useful IMSBC Code Group 'B' cargo example. Reference to Appendix 1, Individual schedules of solid bulk cargoes, warns that: *"Coal may create flammable atmospheres, may heat spontaneously, may deplete the oxygen concentration, may corrode metal structures. Can liquefy [and become also a Group A cargo] if predominantly fine*

75% less than 5 mm coal".

NOTE 2: The Group 'B' cargo dangers of fire and shipboard fire extinguishing requirements or exemptions are detailed in IMO MSC.1/Circ.1395, latest revision, and are provided as supplement to the IMSBC Code, 2020 Edition. Sources of information on the Group 'A' cargo liquefaction dangers of predominantly fine coal are advised in the Background section above

- **Hull/structural damage during loading and discharging** – can and has caused bulk carriers to literally break in two and sink at the loading berth. These events have usually occurred due to high loading rates of heavy bulk cargoes, such as iron ore, which can exceed 10,000 m tons per hour. Such loading, without careful ship/shore pre-planning, can cause excessive hull bending and bulkhead shear force stresses which are well beyond a bulk carrier's design tolerance. Load planning and careful adherence is the key to avoidance.

NOTE 3: Critical guidance is provided by the 'BLU Code' (IMO Code of Practice for the Safe Loading and Unloading of Bulk Carriers') and the 'BLU Manual' (IMO Manual on Loading of Bulk Cargoes for Terminal Representatives). Both are included as supplements to the IMSBC Code, Edition 2020. They require that the ship and terminal representatives agree and sign a written loading plan in a stipulated format. The plan must ensure that the bending stresses, shear forces and torsional twisting experienced during the loading of the vessel will at no time exceed the maximum forces stated within the vessel's flag state Approved Loading Manual/ Hydrostatic Data Booklet.

NOTE 4: The [IACS publication Bulk Carriers: Handle With Care \(Rev. 1, March 2020\)](#) provides an important and free introductory guide to the safe loading of bulk carriers. It should be considered as essential reading for all masters, crew and shore terminal staff involved in the loading of bulk cargoes.

- **Hull racking damage due to excessive stability** – can occur when bulk carriers are loaded in all holds with heavy and high-density cargo. The problem here is that the resulting centre of gravity of the cargo and the entire vessel will be very low and the vessel's righting force will be very high, together with a quick roll period. If the vessel encounters heavy beam seas and swell during the voyage, the rolling can become quite violent and cause hull distortion in a transverse direction. The areas deformed and weakened or buckled and permanently damaged will likely be the cargo hold side brackets

and beam knees. Both structures are essential to hull integrity and the avoidance of hull failure.

NOTE 5: Many bulk carriers have been designed and flag state approved to carry heavy bulk cargoes in alternate holds, with the holds in between left empty. This has the effect of raising the height of the cargo in the loaded holds, together with the overall centre of gravity. The result will be to increase the vessel's rolling period and therefore reduce beam sea racking stresses and possible hull damage. However, it is essential that alternate hold loading for heavy cargoes is only done in accordance with a bulk carrier's design criteria which will be clearly stated in the approved hydrostatic stability booklet. If alternate hold loading is not specifically approved, then this must not be done.

- **Cargo Hold and Void Space Flooding due Hull or Hatchcover failure**

Bulk carrier losses and crew deaths from foundering at sea during heavy weather peaked during the mid 1990's. The underlying causes were found to be due primarily to hull structure and/or hatchcover failures which resulted in flooding and sinking. This led to a significant upgrade of IACS Rules (now the Common Structural Rules for Tankers and Bulk Carriers 2015) and SOLAS, (by creation of a new Chapter XII, Additional Safety Measures for Bulk Carriers).

IACS Rules and SOLAS now require that all bulk carriers built after 1 July 1999, "*shall, when loaded up to their summer load line, be able to withstand flooding of any one cargo hold in all loading conditions and remain afloat in a satisfactory condition of equilibrium*". Survey requirements were also enhanced by SOLAS and are enforced through flag state and the IACS Enhanced Survey Process.

Bulk carrier losses have since decreased dramatically, with the above referenced INTERCARGO Report noting a total of five bulk carrier losses due to foundering, flooding, or weather causes during the 10 years from 2012 to 2021. However, five losses must still be considered as too many when they could likely have all been avoided by application of best industry management, operation, navigation and maintenance practices.

NOTE 6: SOLAS Chap II-1 and Chap XII-12 require the fitting of water level/ingress detectors on board all SOLAS defined bulk carriers* over 500 GT which trade internationally. They must be installed in each cargo hold, in each forward ballast tank and in each dry or void space (exclusive of the chain locker) located forward of the No. 1 cargo

hold. The detectors must be provided with audio and visual alarms which, for early warning and response purposes, should be installed on the navigation bridge. These detectors and alarms should be tested before the loading of every cargo** and the test results, along with any adjustments or repairs made, should be logged.

*SOLAS Chapter IX-1.6 defines a Bulk Carrier as a “a ship which is constructed generally with single deck, topside tanks and hopper side tanks in cargo spaces, and is intended primarily to carry dry cargo in bulk”.

** All testing must be subject to strict ISM Code ‘Permit to Work’ and ‘Confined Space Entry and Air Testing’ procedures.

NOTE 7: SOLAS Chap II-1, and new Reg. 23.3 as provided by Res. MSC.194(80), also requires the fitting of water level/ingress detectors on board all single hold vessels which are not strictly defined as bulk carriers (as above) by SOLAS. However, detectors are not required by SOLAS on board single hold vessels under 500 GT, or any vessel not trading internationally (i.e., NCVS/non-SOLAS vessels) or any single hold vessel fitted with side tanks.

- **Bulk Carrier Crew Injuries and Deaths**

Accidents and resulting injuries and deaths can of course occur on board any type of vessel. However, the construction of bulk carriers and the nature of the cargoes they carry can often intensify these risks. The two most prevalent types of crew accidents occurring on board bulk carriers – apart from multiple deaths during a capsized – are highlighted below:

Entry into confined space deaths:

The circumstances and the causes of crew and shore worker deaths due to improperly controlled entry into atmospherically untested confined spaces on board all types of vessels have been reported in detail in, tragically, numerous cases. The immediate cause is almost invariably due to oxygen depletion from steel corrosion or, inside cargo holds, by reaction with a Group ‘B’ cargo oxidising substance. The underlying causes include inadequacies in crew training, SMS permits to work systems and equipment.

LESSONS LEARNED: [MAIB Summary Report MV SUNTIS](#) – deaths of three crew in the single cargo hold entrance area due to oxygen depletion caused by a cargo of IMSBC Code Group

'B' timber. Oxygen level was later measured at 5-6% with the IMSBC Code minimum requirement being 21%. Findings by the German DOT were that the vessel had no confined space entry permit system, no rescue plan and no rescue equipment. Further, that it was likely that the 2nd and 3rd deaths had occurred while these crew members were attempting to rescue the first victim.

Cargo hold cleaning and washing crew injuries and deaths:

Cargo hold cleaning on board bulk carriers is a frequently required to avoid cargo cross contamination and meet the pre-load inspection standards of shippers and charterers. Failure to meet required standards means down time and loss of hire revenue. This generates significant pressure on master and crew, especially on vessels with minimum manning certificate level crew. Consequently, safe working requirements may be forgotten or ignored by crew who may already be fatigued from working long hours. Not surprisingly, numerous cargo hold cleaning related injuries have occurred together with a significant number of crew deaths.

LESSONS LEARNED: [Singapore MOT Report MV OCEAN GLORY](#) – death of AB due to fall while climbing cargo hold vertical ladder. Findings were that the AB likely lost his grip during the climb, resulting in a 9-metre fall to the tanktop. Causative factors were wet and slippery ladder rungs, the AB's wet rubber gloves, his tiredness as he climbed the ladder following strenuous activity during seawater washing of the hold and, principally, his failure to attach his safety harness clip to a strong point while climbing. As such, owner's SMS risk assessment and safety procedures were considered inadequate.

CONCLUSION AND TAKEAWAY

Bulk carriers can, a first glance, appear to be simple vessels to operate in terms of their construction, operation, maintenance and requisite crew skills. Experienced and prudent bulk carrier owners will know that this is not the case and that there is 'no room for complacency'. Consequently – and as suggested by the IACS publication title referred to earlier – all bulk carriers need to be 'handled with care'.

This 'handle with care' process starts with ensuring a full understanding of the IMO conventions and regulations applicable to bulk carriers. MM Members who operate bulk carriers should therefore confer closely with their classification society – who may also provide flag state RO

services – to confirm that full regulatory compliance is always maintained in relation to their vessels' condition, manning and operation.

Regarding crew and vessel safety, Members need to make certain that all IMO mandated publications are on board and/or are electronically accessible to their bulk carrier masters. This includes the latest editions of SOLAS, the IMSBC Code, the Loadline Convention and (as reviewed in [MM Risk Bulletin No. 43](#)) the [Code of Safe Working Practices for Seafarers](#) (COSWP). Ready access to specialist textbooks, such as the well-known Nautical Institute publication, 'Bulk Carrier Practice' by Capt. J. Isbester (new 3rd Ed. being released in Sept 2022) are also recommended.

Finally, Members should also ensure that this Risk Bulletin is provided to all their DPAs, ship managers and masters with the instruction that the 'no room for complacency' and 'handle with care' advice and references provided should be considered for incorporation into all ISM Code or NCVS SMS Manuals and Procedures on board their bulk carriers.