MARS

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## In this bulletin…

**MARS 202632**
Fumigation disaster

**MARS 202633**
Collision in a TSS

**MARS 202634**
Twisted ship

**MARS 202632**

## Fatal phosphine gas poisoning during underway fumigation

A bulk carrier had been loaded with a cargo of cassava chips. Before departure, shore-based fumigators placed aluminium phosphide tablets on top of the cargo in each hold. The hatches were closed and the crew sealed the hatch coamings with tape before departure. The fumigation personnel provided a written handover to the Chief Officer, but apparently did not explain the risks associated with the fumigation to the crew.

Roughly 36 hours after departure, with the wind astern and the vessel's speed slightly exceeding wind speed, gas escaping through the hatch and access covers began accumulating on the forward deck instead of dispersing. The accommodation air conditioning was running in recirculation mode, putting the accommodation under negative pressure. Several weathertight doors could not fully close, so contaminated air was drawn into the accommodation and recirculated through every space served by the system. The crew were unaware of these conditions.

Watchkeepers in the wheelhouse, which had the highest air-change rate, fell ill first, suffering from chest tightness, nausea, vomiting, breathlessness and fatigue. Crew and even the Master initially attributed this to food poisoning or Covid-19. Repeated negative antigen tests reinforced the food-poisoning theory. As symptoms spread through the crew over several hours, no one connected the symptoms to the fumigant gas.

At one point, the Master felt ill too. He asked the Chief Mate to relieve him on the bridge as he felt too weak to continue the bridge watch. When the Chief Engineer visited the Master in his cabin sometime later, he found him vomiting severely and his clothes soaked in sweat. The Chief Engineer telephoned the company's Marine Superintendent to report that 17 crew members, including the Master, were experiencing persistent vomiting and limb weakness.

The Chief Engineer and another crew stopped the vessel and anchored, awaiting search and rescue (SAR) resources. By the time the rescue services arrived at the vessel, about 12 hours after the Master had started to feel unwell, he had passed away. In all, thirteen of the 21 crew died from illness. Forensic findings confirmed toxic pulmonary oedema consistent with phosphine poisoning.

The investigation subsequently found, among other things, that the vessel's crew were not familiar with the IMO's Recommendations on the Safe Use of Pesticides on Board Ships. Also, the vessel was not equipped with phosphine gas detection equipment, nor did the crew conduct safety inspections or concentration monitoring of phosphine gas after departure.

### Lessons learned

- Underway fumigation with aluminium phosphide is inherently hazardous. Vessels undertaking it must carry phosphine gas detection equipment, and gas concentrations should be checked regularly throughout the voyage – not just at loading.
- Recirculation-mode air conditioning can pull contaminated outside air into an entire accommodation block if door and hatch seals are imperfect. The weathertight integrity of accommodation doors deserves the same attention as hatch covers.
- Wind direction and relative vessel speed affect whether fumigant gas escaping from

holds disperses or accumulates near the accommodation. Route and speed planning after fumigation should account for this.
- Symptoms of phosphine poisoning (nausea, vomiting, chest tightness, breathlessness) overlap with seasickness, food poisoning and viral illness.
- Fumigation contractors and ships' officers should ensure the crew receive a clear safety briefing on the specific risks of the fumigant used – not just paperwork sign-off – and that warning signs are posted at treated holds.
- When carrying fumigated cargo, the vessel's company should have dedicated safety management procedures for fumigation, including risk assessment, equipment provision and shore support, rather than treating it as a routine cargo operation.

**As edited from China MSA report published March 2025**

## MARS 202633

# TSS collision

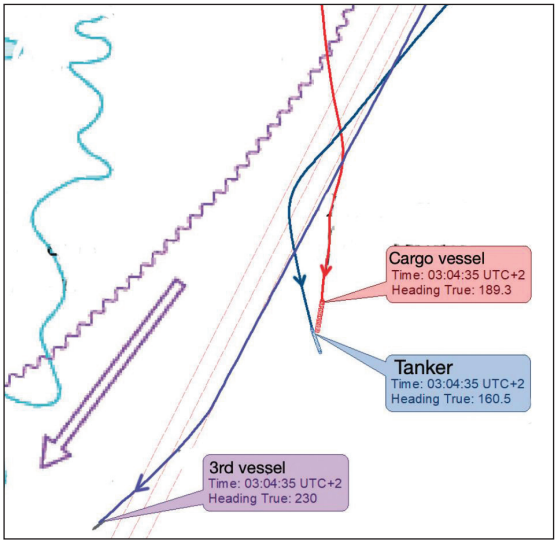
A bulk carrier was overtaking an oil tanker in a Traffic Separation Scheme (TSS) at night, in good visibility. The bulk carrier, moving at over 16 knots, had already passed several slower vessels that evening and was closing on the tanker from astern. A third vessel was also ahead, and was also passing the tanker. The bulker's bridge team – Master, OOW, and a lookout who had briefly left the bridge – had focused on each overtaking situation individually rather than maintaining long-range radar and ECDIS scanning.

As the range to the tanker closed to under a mile, the bulk carrier's Master became concerned about the tightening CPA. He asked the OOW to call the tanker on VHF to establish intentions. The resulting conversation, conducted in English by non-native speakers, was ambiguous and each bridge team came away with opposite understandings. The tanker's Master believed the agreement was that they would ease slightly to port while the bulk carrier passed them to starboard. The bulk carrier's OOW, relaying the conversation in his own language to his Master (who had not listened to the call directly), reported the opposite: that the tanker did not want to be passed to starboard.

Acting on this second-hand understanding, the bulk carrier's Master ordered a gradual series of small helm movements to port, now intending to pass down the tanker's port side. No sound signals were made, and the manoeuvre was carried out incrementally; it went unnoticed by the tanker's bridge team.

Meanwhile, the tanker's Master – who had been on the bridge continuously for over 14 hours and was probably fatigued – was preoccupied with a separate crossing vessel on their port bow and a narrowing turn in the TSS ahead. Believing the bulk carrier would pass safely to starboard, he ordered hard-to-port to begin a full round turn to increase his sea room with the crossing vessel. Unfortunately, a visual check astern and a sound signal were not made before the turn began.

Only when the tanker's lookout spotted the bulk carrier close on the port quarter did the bridge team realised the danger. Both vessels attempted last-minute avoiding action, but with neither team understanding the other's intentions, a collision ensued. Both vessels sustained significant structural damage but there were no injuries or pollution.






### Lessons learned

- VHF is not a substitute for compliance with the Collision Regulations. It should only be used, if at all, early enough to allow a resolved, unambiguous plan to be established – not as a late-stage fix for a closing CPA.
- If the officer with the con delegates a VHF exchange to another, they should listen to it directly rather than relying on a second-hand summary, particularly where a language relay is also involved.
- Unambiguous course alterations should be made decisively, not through a gradual series of small helm orders.
- Before any large alteration of course, always check for traffic in the direction you are about to swing into – including astern.
- The Collision Regulations require long-range scanning, not just short-range collision avoidance. This would in this case have allowed earlier, larger, and less ambiguous action.

**As edited from MAIB (UK) report 7/2018**

## MARS 202634

# Twisted ship

A six-hold panamax bulk carrier had loaded a full cargo of iron ore, but crew were unable to close three of the forward hatch covers. Each hold had two hinged hatch-panels forward and two hinged panels aft. The hatch covers were of the standard McGregor type hydraulically operated sliding panels.

As the hatch covers were being closed the leading rollers tended to skew off the guiding trackway in the hatch coaming, unable to roll further. The hatchway was no longer a rectangle but had become a parallelogram, whereas the hatch panels remained undistorted.

It was suspected that the vessel had slightly 'twisted'. This was established by taking freeboard measurements at various points on both sides of the vessel. The readings clearly confirmed the torsional twist of the vessel. Diagonal measurements of the hatch coamings also confirmed twisting of the vessel. The three aft holds were re-opened and an inspection of the cargo stow showed that iron ore in these three holds was slightly to starboard of centreline, whereas the cargo in the forward three holds was slightly to port of centreline.

Bulldozers were used to level the cargo in each hold and diagonal measurements were periodically taken to ascertain if levelling the cargo was having the desired results. Finally, the torsion of the vessel was corrected, and the hatch covers were successfully closed.

### Lessons learned

- The vessel had broader than normal hatch squares, being a combination bulk/container type, thus more susceptible to torsional forces.
- Even a slightly uneven distribution of heavy cargo was sufficient to twist the vessel so that some hatches could not be closed.
- Manuals usually mention maximum trim and heel conditions but a note on the need for proper cargo trimming/ballasting the vessel to avoid coaming deflections during loading is equally useful.
- When making the loading/discharge plan, consider the potential need to close hatch covers at any time, for example if it rains. Continuous proper distribution of heavy cargo is a good practice to avoid nefarious twisting effects.



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