



INVESTIGATED BY THE MAIB ON BEHALF OF THE ISLE OF MAN ADMINISTRATION

Report on the investigation of a  
fatal accident during mooring operations  
on board the bulk carrier

***Mona Manx***

at Puerto Ventanas, Chile

on 26 August 2021



**This investigation was carried out by the UK Marine Accident Investigation Branch (MAIB) on behalf of the Isle of Man Administration in accordance with the Memorandum of Understanding between the MAIB and the Red Ensign Group Category 1 registries of Isle of Man, Cayman Islands, Bermuda and Gibraltar.**

**Extract from  
The Isle of Man Merchant Shipping  
(Accident Reporting and Investigation)  
Regulations 2001 – Regulation 4:**

*“The fundamental purpose of investigating a casualty, an accident, or an incident under these Regulations is to determine its circumstances and the causes with the aim of improving the safety of life at sea and the avoidance of accidents in the future. It is not the purpose to apportion liability, nor, except so far as is necessary to achieve the fundamental purpose, to apportion blame.”*

**NOTE**

Under Section 4 of the Isle of Man Merchant Shipping Act 1985 a person is required to answer an Inspector’s questions truthfully. If the contents of this report were subsequently submitted as evidence in court proceedings then this would contradict the principle that a person cannot be required to give evidence against themselves. Therefore, the Isle of Man Ship Registry makes this report available to interested parties on the understanding that it shall be inadmissible in any judicial proceedings whose purpose, or one of whose purposes, is to attribute or apportion liability or blame.

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## **GLOSSARY OF ABBREVIATIONS AND ACRONYMS**

2/O	- second officer
AB	- able seaman
C/O	- chief officer
CCTV	- closed-circuit television
COSWP	- Code of Safe Working Practices for Merchant Seafarers
DIRECTEMAR	- General Directorate for Maritime Territory and Merchant Marine
IMSR	- Isle of Man Ship Registry
ISM Code	- International Safety Management Code
km	- kilometre
m	- metre
MCA	- Maritime and Coastguard Agency
MPX	- master/pilot exchange
OCIMF	- Oil Companies International Marine Forum
PPE	- personal protective equipment
SMS	- safety management system
STCW	- International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended
UMMS	- Union Marine Management Services Pte. Ltd
UTC	- universal time coordinated
VDR	- voyage data recorder
VHF	- very high frequency

**TIMES:** All times referred to in this report are UTC -4 unless otherwise stated.

Image courtesy of [Isle of Man Ship Registry](#) (LT Uglund Management Ltd)



*Mona Manx*

## SYNOPSIS

On the morning of 26 August 2021, the second officer of the Isle of Man registered bulk carrier *Mona Manx* was fatally injured when he was struck by a recoiling mooring line while the vessel was berthing at Puerto Ventanas, Chile. The line had become entrapped between the vessel and the berth, probably in way of a fender, then suddenly released as the vessel manoeuvred astern under its own power.

The investigation concluded that the second officer was struck because he was standing in the danger zone of the tensioned mooring line when it released and that:

- It is highly probable that the second officer moved to the danger zone to obtain an improved view of the mooring line as the vessel manoeuvred.
- *Mona Manx* was manoeuvred astern under its own power in contravention of the port's procedures.
- The risks associated with mooring lines detailed in the Code of Safe Working Practices for Merchant Seafarers did not include the hazards associated with line entrapment and vertical recoil.
- Not all available information on the safe berthing of *Mona Manx* was discussed during the master/pilot exchange before the vessel entered the port.
- *Mona Manx's* manoeuvre astern with mooring lines deployed was not the subject of a toolbox talk nor risk assessed by the vessel's crew and the hazard associated with mooring line recoil was not mitigated.
- It is possible that congested radio communication reduced the crew's ability to safely conduct the berthing operation.

*Mona Manx's* management company, Union Marine Management Services Pte. Ltd, has taken action to improve crew awareness of the guidance provided in the Code of Safe Working Practices for Merchant Seafarers and reviewed the requirements for safety briefings before arrival at port. Additionally, the Maritime and Coastguard Agency has amended The Code of Safe Working Practices for Merchant Seafarers to include guidance highlighting the potential vertical component of a recoiling mooring line and the risks associated with mooring line entrapment. Puerto Ventanas S.A., the operator of the port of Puerto Ventanas, has held a series of toolbox talks with its shore staff detailing the safety lessons to be learned from this accident.

Recommendations have been made to Puerto Ventanas S.A. and Quintero Port Authority to provide clear instructions for masters and pilots on the use of engines alongside and to ensure that the risks associated with mooring line entrapment are considered and included in the master/pilot exchange.

## SECTION 1 – FACTUAL INFORMATION

### 1.1 PARTICULARS OF *MONA MANX* AND ACCIDENT

<b>SHIP PARTICULARS</b>	
Vessel's name	<i>Mona Manx</i>
Flag	Isle of Man
Classification society	Nippon Kaiji Kyokai
IMO number/fishing numbers	9801706
Type	Bulk Carrier
Registered owner	Mona Marine Ltd
Manager(s)	Union Marine Management Services Pte. Ltd, Singapore
Construction	2017
Year of build	Steel
Length overall	199.90m
Registered length	196.13m
Gross tonnage	35,606
Minimum safe manning	15
Authorised cargo	Dry bulk
<b>VOYAGE PARTICULARS</b>	
Port of departure	Callao, Peru
Port of arrival	Puerto Ventanas, Chile
Type of voyage	International
Cargo information	Ballast
Manning	20
<b>MARINE CASUALTY INFORMATION</b>	
Date and time	26 August 2021 at 0836 (UTC – 4)
Type of marine casualty or incident	Very Serious Marine Casualty
Location of incident	Puerto Ventanas, Chile
Place on board	Port side aft, main deck
Injuries/fatalities	1 fatality
Damage/environmental impact	None
Ship operation	Mooring operation
Voyage segment	Arrival
External & internal environment	Fine and clear; wind south-easterly force 2; swell south-west 0.7m
Persons on board	21



## 1.2 BACKGROUND

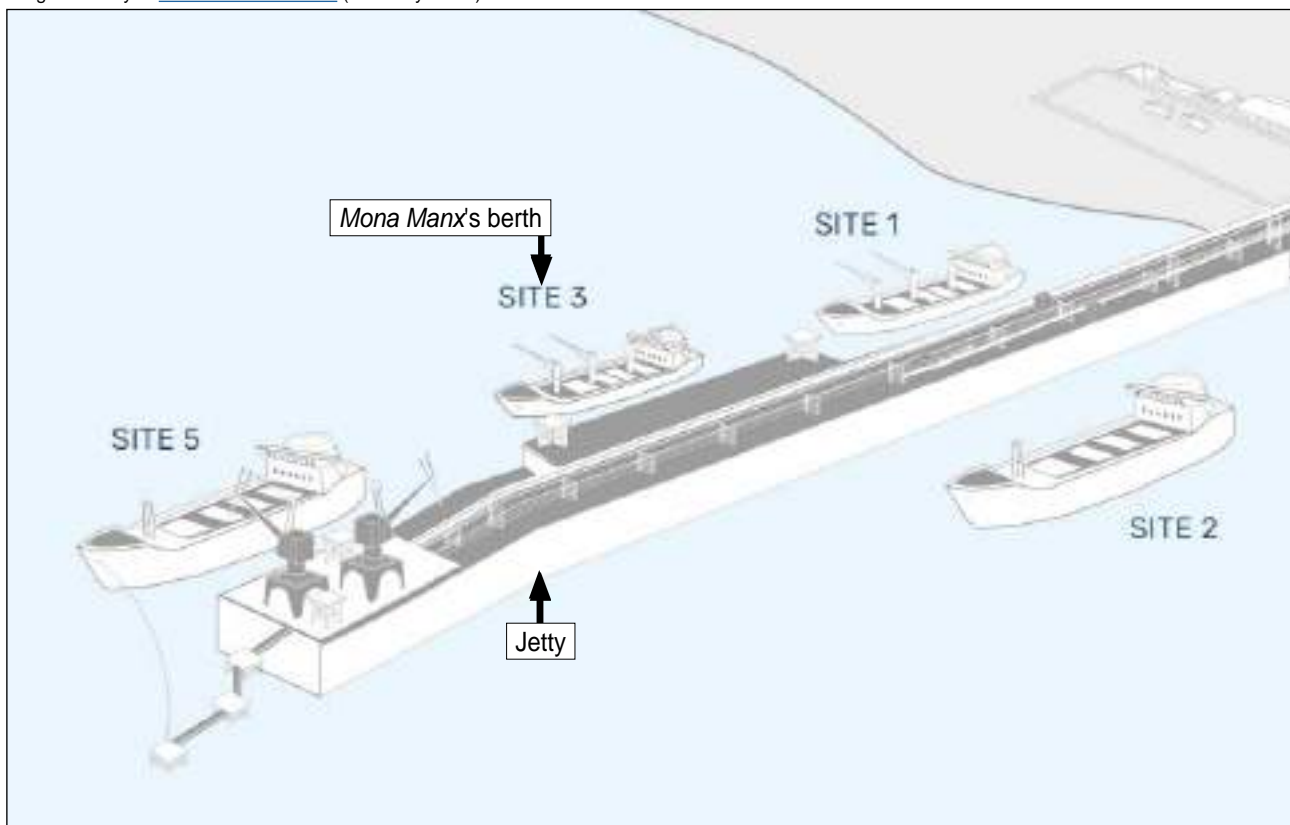
This investigation into a very serious marine casualty by the Marine Accident Investigation Branch on behalf of the Isle of Man Ship Registry (IMSR), a member of the Red Ensign Group, was conducted remotely as contemporaneous access to the vessel and port was not possible due to COVID-19 travel restrictions. The remote investigation resulted in difficulties and delays in obtaining evidence from the accident location despite the invaluable assistance of the General Directorate for Maritime Territory and Merchant Marine (DIRECTEMAR).

## 1.3 NARRATIVE

At 1451 on 23 August 2021, the bulk carrier *Mona Manx* anchored off Puerto Ventanas, Chile to await berthing instructions.

At 0736 on 26 August, *Mona Manx's* crew started to heave anchor in preparation to depart the anchorage and proceed to Site 3 of the general cargo terminal (**Figure 1**). At the same time, a local pilot boarded the bulk carrier and joined the master, third officer and an able seaman (AB), the helmsman, hereafter referred to as AB3, on the vessel's bridge.

Image courtesy of [Puerto Ventanas S.A.](#) (edited by MAIB)



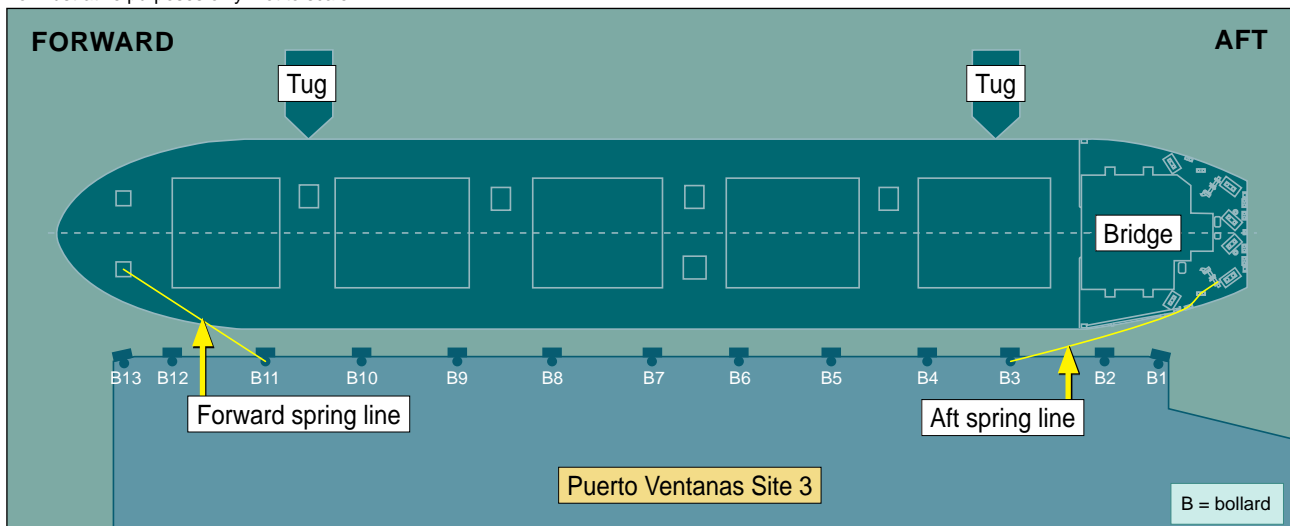
**Figure 1:** Puerto Ventanas site location

While the anchor was being recovered, the master/pilot exchange (MPX) and checklist was completed. The pilot explained to the master that two tugs would assist with the berthing operation. The pilot then confirmed that *Mona Manx* would be moored port side to the berth with two springs and four head/stern lines forward and aft, respectively. The pilot then briefed the master on the required manoeuvres for the approach to the berth.

At 0748, *Mona Manx's* anchor was aweigh and the vessel began to make its way towards the berth. Shortly afterwards, one of the tugs was made fast on the starboard shoulder forward and the other on the starboard aft quarter.

Following the pilot's advice, *Mona Manx* was manoeuvred into position adjacent to the berth using its own engine and the attending tugs. At 0818, the starboard anchor was released to facilitate a 180° turn onto the berth. The engine control was set to *stop* when *Mona Manx* was positioned parallel to the berth and the two tugs were used to hold the vessel alongside against the berth's fenders (**Figure 2**).

For illustrative purposes only: not to scale



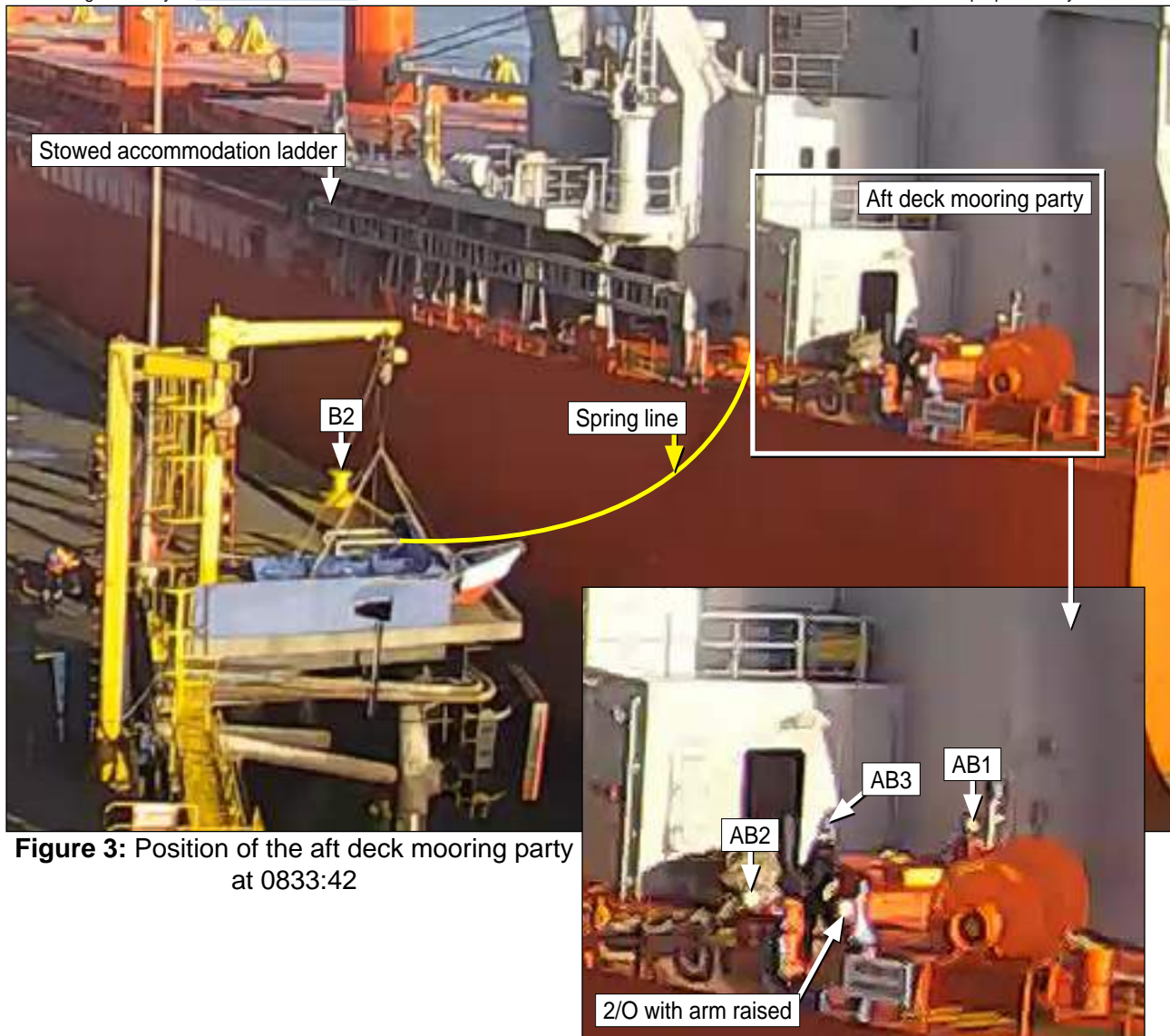
**Figure 2:** Representation, showing tugs holding *Mona Manx* alongside

During the manoeuvre onto the berth, the pilot and master moved to *Mona Manx's* port bridge wing, where they could better see the line of the ship's side.

The aft mooring party comprised two other ABs (AB1 and AB2) and a second officer (2/O) and was joined by AB3, who had been released by the bridge team, as the first spring lines were sent ashore from the forward and aft mooring decks. AB1 was at the port winch controls from where there was a good all-round view of the port side of the mooring deck. The 2/O and AB2 were positioned at the side of the ship and monitoring the running out of the first spring line, which passed through the rolling fairlead. On seeing that AB3 had arrived at the mooring station, the 2/O used hand signals and shouted instructions that the crew were to send a total of two springs and four stern lines ashore, and that the second spring would be the next line to be connected.

At 0830, with the first spring fastened to bollard 3 ashore (**Figure 2**), AB2 prepared a heaving line to send the second spring line ashore. Port control then advised the pilot that *Mona Manx* needed to move 30m astern to align with the cargo loading arm. Accordingly, the master instructed the mooring party crews to adjust the spring lines when the vessel manoeuvred astern, and to monitor them in case they became caught on the protruding jetty fenders. The 2/O and the chief officer (C/O), who was stationed at the forward mooring station, used verbal and visual signals to relay these instructions to their respective mooring parties.

At 0832:42, *Mona Manx's* engine control was set to *dead slow astern*, and the vessel began to move astern, eventually reaching a speed of 0.5 knots. During the manoeuvre, the forward mooring party heaved in the slack on the forward spring and the aft deck mooring party slackened down the aft spring (**Figure 3**).



**Figure 3:** Position of the aft deck mooring party at 0833:42

At 0835:50, *Mona Manx* was almost in position and its engine control was set to *stop*. At the same time the 2/O moved forward to monitor the situation, stepping over the aft spring line on the mooring deck. As *Mona Manx* continued to move slowly astern the 2/O ducked under the stowed accommodation ladder to make his way forward to the Panama lead at the vessel's side, making a brief stop there at 0836 (**Figure 4**) before turning and moving forward again.

At 0836:11, the 2/O arrived near the forward end of the accommodation ladder (**Figure 5**) and looked over the side rail directly above the slack spring line while using a very high frequency (VHF) radio (**Figure 6**). A few seconds later, the spring line tightened and then slackened. At 0836:23, the 2/O appeared to use the VHF radio again as the spring line came under tension once more.

At 0836:31, a linesman on the quay was moving forward towards the tensioned spring line when a loud bang was heard as the line suddenly released and recoiled vertically upwards (**Figure 7**). The linesman quickly moved away but the spring line struck the 2/O under his chin and he was lifted off his feet and thrown backwards, causing his head to strike the accommodation ladder that was behind and above him. The force of the impact threw his safety helmet backwards, and his VHF radio was catapulted into the water as he collapsed onto the deck.

For illustrative purposes only: not to scale

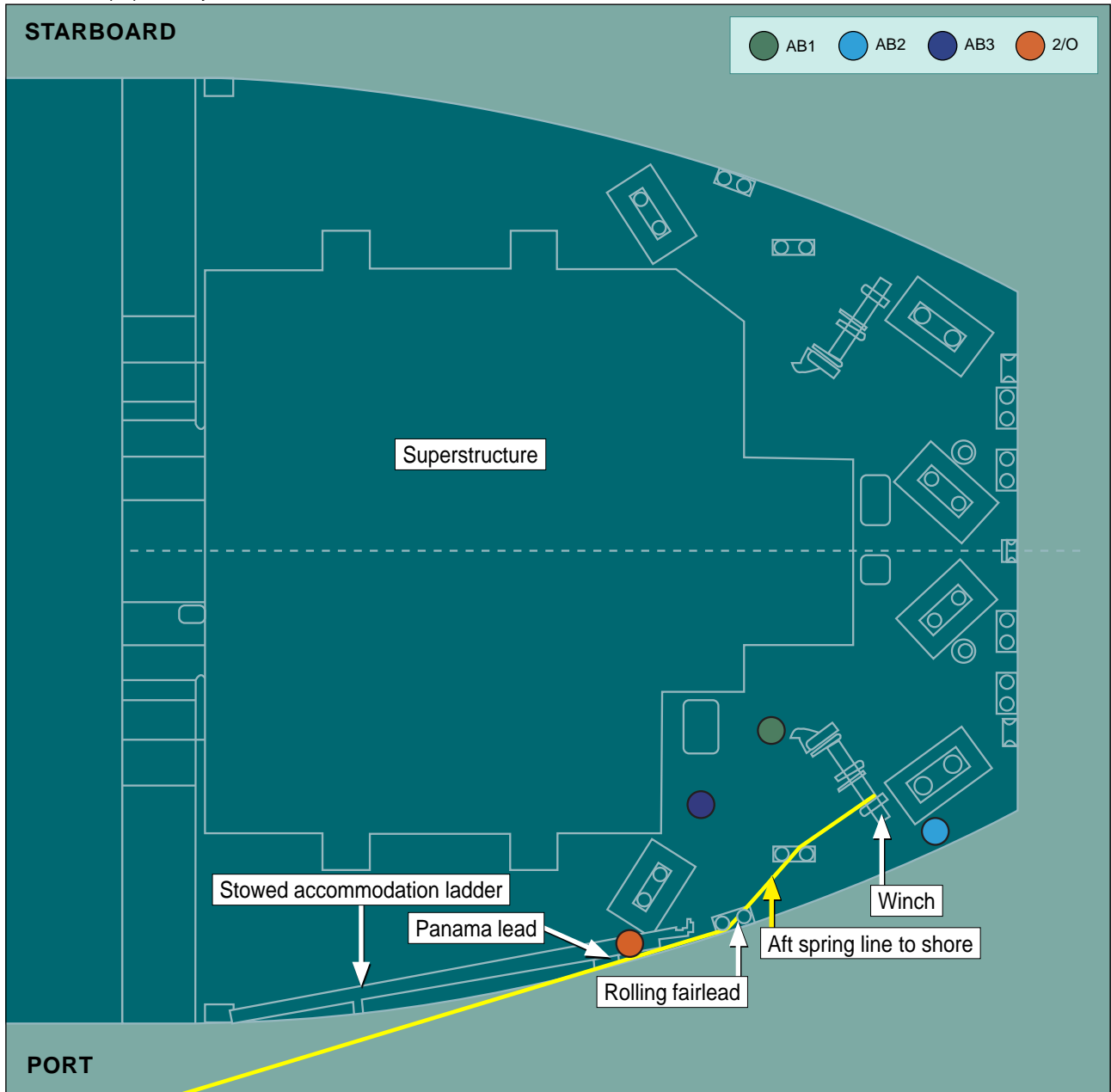


Figure 4: Position of the aft deck mooring party at 0836



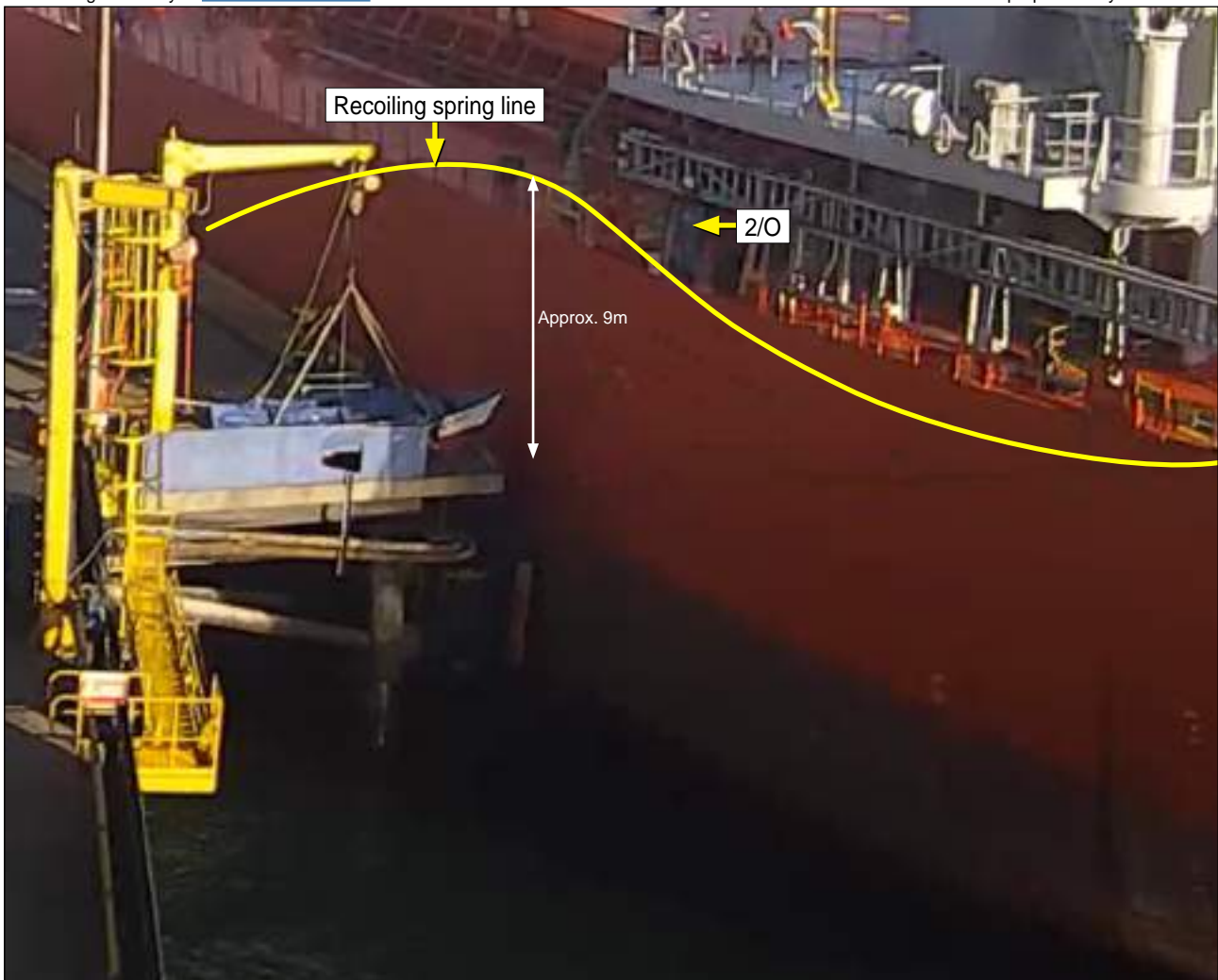


Figure 5: Position of the 2/O at 0836:11

For illustrative purposes only: not to scale



Figure 6: Representation, showing the position of the 2/O at the ship's rail



**Figure 7:** Aft spring line recoiling upwards at 0836:31

### 1.3.1 Post-accident response

The 2/O was found by AB3, who had made their way forward to search for him. On seeing the 2/O lying in a large pool of blood, AB3 immediately ran back to the aft mooring deck and used AB1's VHF radio to notify the master that the 2/O had been seriously injured. Within seconds, the pilot requested medical assistance from the port and then directed the tugs to hold *Mona Manx* alongside. The berthing operation was suspended.

At 0839, a shore gangway was placed on board *Mona Manx* and the port's medical team boarded the vessel a minute later. At 0850, the 2/O was pronounced deceased at the scene.

## 1.4 ENVIRONMENTAL

The weather was fine and clear. The wind was south-easterly, blowing at Beaufort force 2. A low south-westerly swell was running at a height of about 0.7m.

## 1.5 MONA MANX

### 1.5.1 General

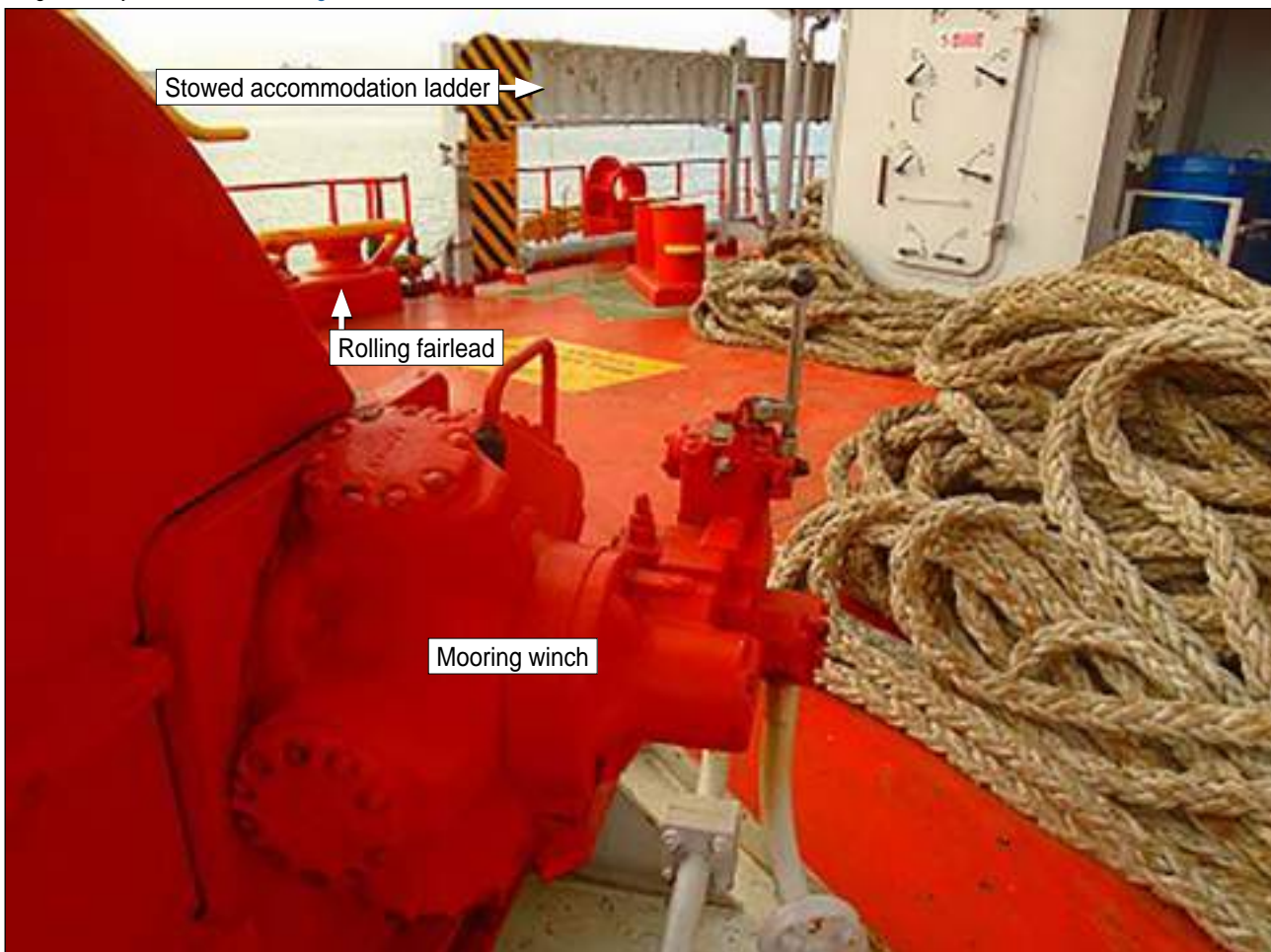
*Mona Manx* was an Isle of Man registered 35,606 gross tonnage bulk carrier owned by Mona Marine Ltd and operated by MX Bulk Management Ltd. The vessel traded worldwide, carrying a variety of solid bulk cargoes.

The ship's manager, United Marine Management Services Pte. Ltd (UMMS) based in Singapore, was responsible for ensuring compliance with the International Safety Management (ISM) Code.

### 1.5.2 Aft mooring deck arrangement

The aft mooring deck equipment was arranged symmetrically, with the port and starboard side each comprising a single winch and a combination of mooring bitts, Panama leads and rolling fairleads. The port side winch was sited so that its operator would be facing outboard to port when standing directly behind the controls (**Figure 8**).

Image courtesy of [Union Marine Management Services Pte Ltd](#)



**Figure 8:** *Mona Manx*'s aft mooring deck (view to port forward)

### 1.5.3 Mooring line entrapment and release

The aft mooring spring line was composed of high-strength copolymer. It was 220m in length and 68mm in diameter. The minimum breaking load of the spring line when new was 745 kilonewtons and it had been in use on board *Mona Manx* since July 2019.

The working length of the spring line from the estimated point of entrapment to the aft rolling fairlead was about 29m. On its release, the spring line took less than one second to recoil approximately 9m upwards (see **Figure 7**) and strike the 2/O.



#### 1.5.4 Safety management

The safety management system (SMS) for *Mona Manx* had been issued by UMMS. The *General Safety Hazard with Moorings* section provided guidance on the avoidance of snap-back zones<sup>1</sup>. Further, the section instructed that a toolbox meeting should take place before starting to move the vessel by warping<sup>2</sup> when alongside the berth. There was no requirement to formally log that a toolbox talk had been completed. The section also advised that good communication was to be maintained between the mooring stations and the bridge during the operation.

The SMS contained a port arrival checklist and a generic risk assessment for berthing operations, though did not identify the hazard of a line becoming trapped on a shoreside fixture or between the ship and shore during berthing.

The SMS for *Mona Manx* did not contain a procedure for using the vessel's engines to manoeuvre when alongside a berth.

#### 1.5.5 Crew

*Mona Manx's* 20 crew were Filipino nationals employed through a crewing agency in Manila, the Philippines.

The 2/O, Edwin Vargas, was 36 years old and 1.7m in height. His sea service in the 10 years before the accident was completed mainly on bulk carriers and he had been employed by UMMS since 2019, joining *Mona Manx* for the first time on 16 December 2020. He held a Chief Mate International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), 1978, as amended Certificate of Competency issued in the Philippines and endorsed by IMSR.

On the morning of the accident, the 2/O had been off duty since 0400, when he left the bridge at the end of his anchor watch. His record of work and rest for the previous week indicated that he had the opportunity for 14.5 hours of rest in any 24-hour period.

At the time of the accident the 2/O was wearing personal protective equipment (PPE) that included a coverall, safety boots, gloves, and a safety helmet without a chin strap attached. He was carrying a handheld VHF radio set to the single channel that the *Mona Manx* crew used to communicate with one another. Post-accident playback of *Mona Manx's* voyage data recorder (VDR) indicated that not all of the radio calls made at the time of the accident had been recorded.

The postmortem report determined the 2/O had suffered head trauma and spinal cord trauma, specifically fractures of the C2, C3 and T5 vertebrae. Toxicology reported a negative result for alcohol.

The master was 56 years old, had been employed by UMMS since 2011 and had previously served on board *Mona Manx*. The master held a Master Unlimited STCW Certificate of Competency issued in the Philippines and endorsed by IMSR.

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<sup>1</sup> An area where it is anticipated that a parted mooring line could recoil with great velocity after failing under tension.

<sup>2</sup> The action of moving a ship by hauling on a rope that is attached to a stationary object ashore.



## 1.6 PUERTO VENTANAS

### 1.6.1 Port and pilotage

Puerto Ventanas S.A was a privately owned terminal located 41km north of Valparaiso on the west coast of Chile.

Pilotage was compulsory at the port; one pilot was required for vessels under 220m length overall and two pilots for longer vessels. The pilotage service was provided by the Quintero Port Authority and operated with four authorised pilots, each undertaking the role of the 24-hour duty pilot for four consecutive days, followed by 4 days' rest.

*Mona Manx's* pilot was 59 years old and had 20 years' experience, of which 11 years had been served at Puerto Ventanas. The pilot was a Chilean national, held a Master Unlimited STCW Certificate of Competency and was authorised to provide pilotage services on any size of vessel within the port limits. *Mona Manx* was the pilot's first pilotage task after a 4-day rest period, and it was reported that the pilot was not tired.

The pilot's usual routine was to board a vessel that was due to berth at the port and brief the master on the approach to the berth and required number of lines and tugs. Vessels under pilotage at the port commonly used their engines to move alongside the berth on arrival; *Mona Manx's* pilot was unaware of any procedures to the contrary.

### 1.6.2 Berth arrangement

The port facilities had been developed through a series of construction projects to form the existing facility, which comprised an east/west jetty with berths along its north and south faces (see **Figure 1**).

Site 3 was located on the north face of the jetty and 13 rectangular fenders were fixed along its berth. Fitted in 1992, the fenders were constructed from rubber and steel and each one measured 3.1m wide and 2m high. The fenders were attached using flexible rubber mounts and chains and extended 1.2m from the face of the berth (**Figure 9**). At the time of the accident the sea surface level was about 3.28m below the jetty and the fenders were clear of the water.

Image courtesy of [Puerto Ventanas S.A.](#)



**Figure 9:** Fenders at Puerto Ventanas Site 3

Cargo was loaded by means of a mobile loading arm that had been installed in 2015 and could travel the length of Site 3 so cargo could be loaded into different holds without repositioning the vessel. The maximum loading capacity of the loading arm was 1,500t an hour and this equipment was reported to be functional at the time of the accident.

### **1.6.3 Port operational guidance**

Puerto Ventanas S.A. used an integrated management system that was certified to ISO<sup>3</sup> 9001 (quality) and OHSAS<sup>4</sup> 18001 (health and occupational safety). The system included operation-specific procedures and risk assessments in its health and safety guidance. The procedures were available in Spanish only and contained a description of vessel manoeuvres on and off the berths, including that:

*e) Once the ship is close to the quay and in the longitudinal position desired and indicated by the shore personnel, the stern hawsers are passed, which must be kept away from the propellers.*

*g) No ship running manoeuvres are to be considered at this site.*

Further, the procedures also instructed those involved in vessel manoeuvring operations to:

*Note: in the event that the hawser is trapped between the dock defences or elsewhere, mooring crew personnel will use the boathook to move (push or pull) the hawser until it is free of obstacles so that they can continue to collect the hawser and work accordingly.*

The risk assessments did not include the hazard of mooring lines becoming entrapped between the vessel and the berth.

### **1.6.4 Port guidance for the master**

On 21 August 2021, while *Mona Manx* was still on passage, the local agent for Puerto Ventanas supplied the master with information about the general cargo terminal, including details about the berth orientation, draughts alongside and approaches to the berth. The instructions also included a requirement to drop the starboard side anchor in a port side approach to the berth. There were no instructions on manoeuvring *Mona Manx* alongside using its own engines.

## **1.7 GUIDANCE ON MOORING OPERATIONS**

### **1.7.1 Code of Safe Working Practices for Merchant Seafarers**

The IMSR had adopted the UK's Maritime and Coastguard Agency's Code of Safe Working Practices for Merchant Seafarers (COSWP) under its own Merchant Shipping (Code of Safe Working Practices) Regulations 1989, which were applicable to all IMSR vessels with the exception of fishing and pleasure craft. The regulations required copies of the COSWP to be available to ships' crew, with further copies made available for safety representatives and ship safety committee members.

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<sup>3</sup> International Organization for Standardization.

<sup>4</sup> Occupational Health and Safety Assessment Series.

Section 26.3.1 of the COSWP in force at the time of the accident<sup>5</sup> provided that:

*During mooring and unmooring operations, a sufficient number of seafarers should always be available both forward and aft of the vessel to ensure a safe operation... A responsible person should be in charge of each of the mooring parties... A suitable means of communication must be established between the responsible persons and the vessel's bridge team. If this involves the use of portable radios, then the ship should be clearly identified by name to prevent confusion with other users. All seafarers involved in such operations must wear protective clothing, including safety helmet, safety shoes and gloves, and be fully briefed on the berthing plan. [sic]*

Section 26.3.13 emphasised the hazardous nature of mooring decks and instructed that:

*When moorings lines are under strain, all personnel in the vicinity should remain in positions of safety, i.e. avoid the snap-back zones. It is strongly recommended that a bird's eye view of the mooring deck arrangement is produced to identify danger areas. Regardless of designated snap-back zones, seafarers should always be aware of other areas of potential danger – the whole mooring deck may be considered a danger zone.*

Annex 1.2 provided guidance on the preparation of risk assessments. On the hierarchy of controlling risks, the COSWP advised that the principles should, where possible, be applied in the following order:

- *try a less risky option (e.g. switch to using a less hazardous chemical);*
- *prevent access to the hazard (e.g. by guarding);*
- *organise work to reduce exposure to the hazard (e.g. put barriers between pedestrians and traffic);*
- *issue personal protective equipment (e.g. clothing, footwear, goggles); and*
- *provide welfare facilities (e.g. first-aid and washing facilities for removal of contamination).*

## **1.7.2 Effective mooring**

The Oil Companies International Marine Forum (OCIMF) publication *Effective Mooring* was referenced in both the vessel's SMS and the COSWP but was not available on board *Mona Manx*. The publication advised seafarers involved in mooring operations to:

*Where possible, ask the bridge team to monitor you and to make sure that your position is not at risk from possible snap-back.*

The publication also provided specific guidance on snap-back, warning seafarers:

*.. not to stand close to the line's path. You will be at risk of serious injury or death because you won't be able to react in time. [sic]*

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<sup>5</sup> 2015 edition – Amendment 5, October 2020.

## 1.8 PREVIOUS MOORING DECK ACCIDENTS

Between 2011 and 2023, the IMSR recorded 23 injuries and two fatalities, including this one, resulting from mooring deck accidents.

### 1.8.1 *Teal Bay*

On 30 August 2021, a deck officer on board the general cargo vessel *Teal Bay* was fatally injured when they were struck by a mooring line that sprang out of an open roller fairlead during a warping operation (MAIB report 9/2022<sup>6</sup>). The mooring line was being used to pull *Teal Bay* forward and it sprang free when its lead angle became too great for the open fairlead to restrain it. The IMSR was recommended to promulgate the safety lessons from this fatal accident to owners and operators of vessels listed on its register.

### 1.8.2 *Zarga*

On 2 March 2015, a deck officer suffered severe head injuries when they were struck by a parted mooring rope on board the liquefied natural gas tanker *Zarga* during a berthing operation at South Hook LNG terminal, Milford Haven, Wales (MAIB report 13/2017<sup>7</sup>). The investigation found that the area where the officer had been standing was clearly within the snap-back zone of the rope but had previously been designated as a safe area.

### 1.8.3 *Ocean Gold*

On 12 September 2015, the Hong Kong registered bulk carrier *Ocean Gold* was completing a berthing operation when a seaman was fatally struck by a recoiling spring line while recovering a heaving line. The findings of the Hong Kong Marine Department's report (published 28 December 2016<sup>8</sup>) included that the communication between the mooring teams was ineffective and that there was poor supervision of crew members.

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<sup>6</sup> <https://www.gov.uk/maib-reports/mooring-deck-accident-on-general-cargo-vessel-teal-bay-with-loss-of-1-life>

<sup>7</sup> <https://www.gov.uk/maib-reports/failure-of-mooring-line-on-board-lng-carrier-zarga-with-1-person-injured>

<sup>8</sup> <https://www.mardep.gov.hk/en/materials-and-publications/publications/reports/reports-of-marine-department/ereport/index.html>

#### 1.8.4 *Probo Bear*

On 10 April 2006, an AB was fatally injured when they were struck by a mooring line while operating a winch on the forecastle of the Marshall Islands registered oil-bulk-ore cargo carrier *Probo Bear*, as it manoeuvred alongside the berth to align the hold with the loading arm. The findings of the Australian Transport Safety Bureau's report (Marine Occurrence Investigation No.230<sup>9</sup>) included that lack of preparation and communication led to the manoeuvre starting before the crew on the forecastle were ready.

#### 1.8.5 *Retainer*

On 3 April 1987, a crewman on the tug *Retainer* sustained fatal injuries when he was struck in the chest by one of the two ropes connecting the tug to the barges it was towing. The MAIB preliminary examination<sup>10</sup> found that the accident occurred just after the crew had shortened the tow ropes in preparation for mooring and one of the crew had remained on the aft deck of the tug, ready to tend the ropes. As *Retainer* began a slow turn towards the moorings one of the tow lines became snagged on the front of one of the barges before becoming free under tension. As the snag cleared, it transmitted a wave along the tow rope that struck the crewman in the chest with significant force.

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<sup>9</sup> [https://www.atsb.gov.au/publications/investigation\\_reports/2006/mair/mair230](https://www.atsb.gov.au/publications/investigation_reports/2006/mair/mair230)

<sup>10</sup> <https://www.gov.uk/maib-reports/parting-of-tow-rope-on-tug-retainer-while-towing-barges-on-the-river-thames-england-with-loss-of-1-life>

## **SECTION 2 – ANALYSIS**

### **2.1 AIM**

The purpose of the analysis is to determine the contributory causes and circumstances of the accident as a basis for making recommendations to prevent similar accidents occurring in the future.

### **2.2 OVERVIEW**

*Mona Manx's* 2/O was fatally injured when he was struck on the head by a mooring line that had become snagged and then released under tension and vertically recoiled without warning.

The circumstances that led the 2/O to be in an area of danger above a mooring line under tension are analysed in this section of the report. The factors that contributed to the manoeuvre and the assessment of risks, both shore-based and shipborne, and the conduct of the mooring operation are also discussed.

### **2.3 THE ACCIDENT**

#### **2.3.1 The mooring line strike**

There was no evidence that the 2/O was tired when he reported for mooring party duties and he was not under the influence of alcohol, so it is unlikely his judgement was impaired.

At the time of the accident, *Mona Manx* was being manoeuvred 30m astern along the berth to align the single cargo hold that was due to be loaded with the shoreside loading arm. *Mona Manx's* hull shape and the lead of the line past the fenders meant it was inevitable that the 2/O would be unable to monitor the spring line and fenders from his initial position on the aft mooring deck at the vessel's starboard quarter. It is highly probable that the 2/O moved forward to the side deck and ducked underneath the accommodation ladder to improve his view of the aft spring line.

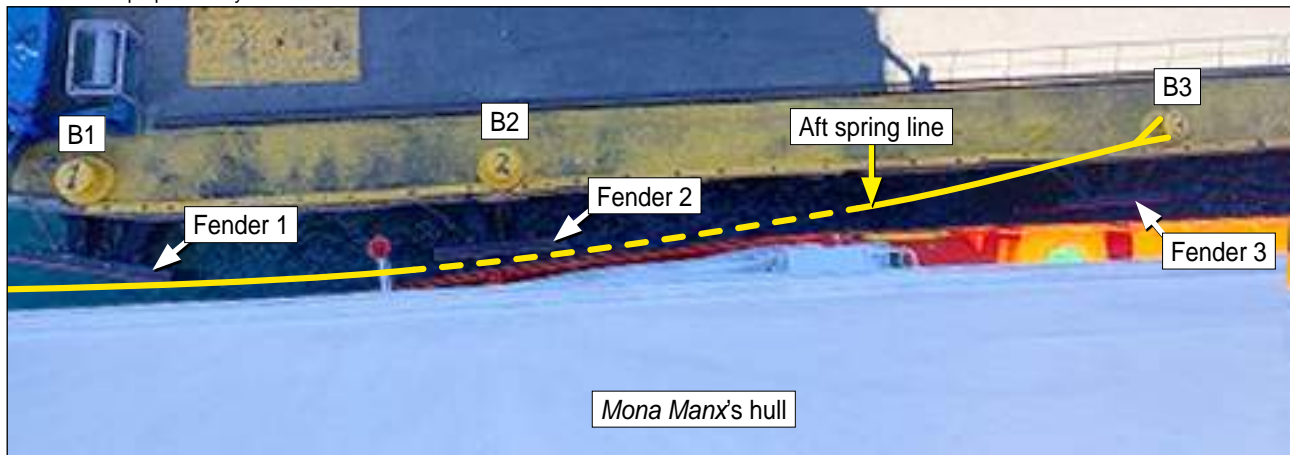
The 2/O's traumatic head and spine injuries were caused by the action of being thrown upwards and backwards into the stowed accommodation ladder by the force of the line striking his head. The 2/O's safety helmet was thrown off during the accident because, contrary to best practice, it was not secured by a chin strap; however, it is highly likely that he would have still suffered these catastrophic injuries had the safety helmet remained in place as the manner of force would have exceeded its design parameters. The safety helmets worn on board merchant vessels were typically intended to prevent a bump to the head, either within a space or due to a small object such as a hand tool falling from above, not to absorb the impact of being bodily catapulted into a metal structure.

#### **2.3.2 The entrapment and release of the spring line**

The fender was 3.1m in length and projected about 1.2m from the jetty so presented a potential risk of slack mooring lines becoming caught around or under it while manoeuvring a vessel alongside. *Mona Manx's* master had warned the 2/O of the danger of line entrapment on the fenders and the port's risk assessment included a procedure for linesmen to release a line caught upon the fender. Despite the foreseeable risk, no additional control measures were in place to prevent the entrapment or control the event once it occurred.

As *Mona Manx* moved astern it was necessary for the aft deck mooring party to slacken down the spring line and it is apparent that the line became entrapped during this operation, either under the fender or between *Mona Manx's* hull and the face of the fender (**Figure 10**). It is probable that as the vessel continued moving the line tensioned and *Mona Manx* momentarily moved away from the jetty, possibly due to the movement of the tugs' reducing thrust onto the vessel's side, allowing the bulk carrier to 'drift' off the fenders. The entrapped line released and the stored energy in the spring line caused it to displace upwards. The spring line deflected approximately 9m upward at an estimated speed of 18m per second, leaving the 2/O minimal opportunity to move out of its path.

For illustrative purposes only: not to scale



**Figure 10:** Representation of entrapment of aft spring line between *Mona Manx's* hull and the second fender

### 2.3.3 The manoeuvre

It is unclear why *Mona Manx* was required to manoeuvre along the quay to align itself with the loading arm rather than the loading arm be moved along the berth to align with the vessel's cargo holds, particularly as the distance equated to 15% of the bulk carrier's length.

The use of engines while running lines is generally avoided during mooring operations, to reduce the risks of mooring lines being drawn into a rotating propeller or rapid tensioning of a line rather than the risk of line entanglement on a shore fixture. The fatal accidents involving *Probo Bear* and *Teal Bay* demonstrate the risks involved in manoeuvring a vessel along a berth both by using a vessel's power and by warping.

The terminal's mooring procedure specifically stated that there should be *no ship running manoeuvres*, implying that a vessel should not use its engines while alongside. It is probable that the master of *Mona Manx* was unaware of this requirement because a copy of the terminal mooring procedure had not been provided. Given that a vessel's engines were often used while manoeuvring alongside a berth at Puerto Ventanas, it was also apparent that the pilots had not been provided with the mooring procedure. Further, as the possibility of manoeuvring *Mona Manx* under its own power while alongside was not discussed during the MPX the associated risks were not considered, reducing the ability of the MPX to contribute to the safety of the berthing operation.



### 2.3.4 Emergency response

The immediate raising of the alarm to notify the bridge team of the accident resulted in prompt and efficient actions to place a shore gangway on *Mona Manx* and facilitate the medical team boarding the vessel within minutes. Tragically, the severity of the 2/O's injuries meant that this commendable emergency response could not change the outcome of the accident.

## 2.4 RISK MANAGEMENT

### 2.4.1 Mooring operations

The 2/O had completed numerous mooring operations on *Mona Manx* and other vessels. It is possible that because he was not on the mooring deck he considered himself to be outside the danger zone and in a safe position 9m above the tensioned spring line. Further, it is possible he was unaware that the spring line was entrapped or did not fully understand the potential risk of vertical recoils.

A *birds eye view* was advised in the COSWP to monitor mooring operations. The master's position on the bridge wing afforded a view of the aft port quarter mooring deck, which provided the opportunity for the running of mooring lines to be seen (**Figure 11**). However, when the 2/O moved forward the master's view was restricted by the superstructure below so neither the 2/O's position nor the spring line could be adequately monitored.

The awareness of snap-back zones was stated in the COSWP and the reality of being in way of a parted mooring line was apparent in the *Zarga* accident; however, the COSWP did not provide detail about the potential risks from vertical recoiling lines or line entrapment. The tragic outcome of this accident demonstrates the need for better understanding of the risks involved with mooring operations and the benefit of improved guidance on the risks associated with mooring line entrapment and release under tension.

### 2.4.2 Risk assessments and mitigation

While potentially less common than line failure under tension resulting in snapback, the sudden release of a tensioned line that has been led around a 'fixed' point (*Teal Bay*) or has become snagged (*Retainer*) and releases suddenly can result in fatal injuries. The hazard requires both that the tensioned line deviates from a straight path and is able to come free from its point of deviation. Sudden release of the line from its point of deviation, akin to releasing the string of a crossbow, can impart significant force on to any object in its path. The hazard can be present almost whenever slack in a line is being taken in, can manifest suddenly, and should be considered as part of toolbox talks before mooring.

Image courtesy of [Union Marine Management Services Pte Ltd](#)



**Figure 11:** View of aft mooring deck from *Mona Manx*'s port bridge wing



The operation of moving *Mona Manx* alongside the berth using the vessel's engines and with mooring lines deployed was not included in either *Mona Manx*'s SMS or the terminal risk assessments. The requirement in the SMS that the crew only conduct a toolbox talk before attempting to warp the vessel meant a toolbox talk was not completed and the opportunity to identify the potential hazards of line entrapment and release was missed. Consequently, risk mitigations such as moving the loading arm to accommodate *Mona Manx* in its initial position rather than moving the vessel or recovering the mooring lines before manoeuvring were not considered.

The *try a less risky option* principle at the top of the COSWP's hierarchy of controlling risks was not applied. The lower control principle of *issue personal protective equipment*, placed fourth in the order, was the only mitigation applied to protect the 2/O and this was insufficient.

## 2.5 COMMUNICATIONS

It was a requirement of the COSWP that, *A responsible person should be in charge of each of the mooring parties and, A suitable means of communication must be established between the responsible persons and the vessel's bridge team.*

The 2/O was responsible for the aft deck mooring party and had used verbal and hand signals to issue instructions to the crew, including the winch operator. When the 2/O moved forward of the aft mooring deck he was no longer in sight of the aft mooring party or the master on the bridge wing and became reliant on VHF radio communications. Given the mooring parties and bridge crew were using a single VHF channel during the berthing operation, it is possible that channel congestion meant not all communications could be heard at the mooring stations and on the bridge (nor were they recorded by the VDR). This might account for the 2/O not heeding the master's warning about monitoring the aft spring line and possibly made it difficult for the winch operator to act on any orders made to slacken the line.

Similar to the fatal accident involving a recoiling mooring line on board *Ocean Gold*, it is possible that poor communications led to ineffective supervision of *Mona Manx*'s aft deck crew and contributed to the aft spring line becoming trapped and tensioned.

## **SECTION 3 – CONCLUSIONS**

### **3.1 SAFETY ISSUES DIRECTLY CONTRIBUTING TO THE ACCIDENT THAT HAVE BEEN ADDRESSED OR RESULTED IN RECOMMENDATIONS**

1. *Mona Manx's* 2/O was fatally injured when he was struck on the head by the aft spring line, which became trapped, tensioned, and released when the bulk carrier manoeuvred astern along the berth under its own power. [2.3.1, 2.3.2]
2. It is highly probable that the 2/O moved forward to the side deck and ducked underneath the accommodation ladder to improve his view of the aft spring line, and this placed him in the danger zone of the tensioned mooring line. [2.3.1]
3. *Mona Manx* was manoeuvred astern under its own power in contravention of the port's procedures. [2.3.3]
4. *Mona Manx's* manoeuvre astern with mooring lines deployed was neither the subject of a toolbox talk nor risk assessed by the vessel's crew or port operator and hazards associated with mooring line recoil were not mitigated. [2.4.2]
5. The port's berthing procedures were neither provided to *Mona Manx's* master or pilot nor discussed during the MPX, thereby reducing the effectiveness of the MPX to assist a safe berthing operation. [2.3.3]

### **3.2 OTHER SAFETY ISSUES DIRECTLY CONTRIBUTING TO THE ACCIDENT**

1. The risks associated with mooring lines detailed in the COSWP did not include the hazards associated with vertical recoiling lines or line entrapment. [2.4.1]
2. It is possible that congested radio communication reduced the ability of *Mona Manx's* crew at the mooring stations and on the bridge to safely conduct the berthing operation. [2.5]

### **3.3 OTHER SAFETY ISSUES NOT DIRECTLY CONTRIBUTING TO THE ACCIDENT**

1. Despite a rapid emergency response, the severity of the 2/O's injuries were unsurvivable and he was declared deceased at the scene. [2.3.1, 2.3.4]

## SECTION 4 – ACTION TAKEN

### 4.1 ACTIONS TAKEN BY OTHER ORGANISATIONS

The **Maritime and Coastguard Agency** published the COSWP 2015 edition – Amendment 7, October 2022, which included amendments to the Anchoring, Mooring and Towing Operations chapter summarised below:

- Risk assessment and control measures should consider the mooring equipment at the berth, with consideration given to the snagging of lines on shoreside fixtures, such as a fender, that then come under tension and suddenly release.
- A snagged line under tension that then releases without breaking, might recoil in the horizontal or vertical plane, or a combination of both. Risk assessments should consider the possibility that lines under tension suddenly releasing or the recoil of a parted line might have a vertical component.
- Personnel should steer clear of lines under tension and avoid snap-back areas and entrapped lines due to the risk of a sudden release under tension.
- There may be danger areas that have not been identified as snap-back zones.
- Risk exists in any area, including side decks, where there is the potential for lines to come under tension or snap-back.

**Union Marine Management Services Pte. Ltd** has:

- Shared information about this incident fleetwide and instructed every master to discuss it with all staff, briefing them again about the hazards of mooring line snap-back and to stay away from snap-back areas.
- Reiterated the importance of toolbox talks; the mooring plan discussion with all station heads before starting mooring operations; and a buddy culture (behaviour-based safety) where all staff monitor actions and stop any unsafe acts.
- Instructed that training videos on effective mooring are screened for all staff on board.
- Started a review of its port arrival checklist, which will be amended to include briefing mooring station leaders on the correct mooring deck arrangement, fittings and mooring pattern to use for various berthing scenarios.
- Added the OCIMF *Effective Mooring* publication to the fleet standards library for all ships.

- Reviewed and updated its SMS procedures to provide clear instructions for:
  - vessels manoeuvring alongside using their engines; and
  - the risk of mooring line entrapment/release under tension during mooring operations.
- Updated its SMS procedures to include the requirement to conduct a dynamic risk assessment before starting an operation that is not covered by its generic risk assessments.

**Puerto Ventanas S.A** has completed a series of toolbox talks with its shore staff detailing the safety lessons learned from this accident.

## SECTION 5 – RECOMMENDATIONS

**Puerto Ventanas S.A** is recommended to:

- 2024/167** Review and update the information made available to masters and pilots before a port call, including:
- instructions that engines are not to be used to conduct manoeuvres while moored alongside; and
  - guidance on the risks associated with line entrapment on shore fixtures and fittings, such as fenders.

**Quintero Port Authority** is recommended to:

- 2024/168** Ensure that the master/pilot exchanges conducted by its pilots consider the risks associated with mooring line entrapment and recoil and vessels manoeuvring alongside using their engines.

Safety recommendations shall in no case create a presumption of blame or liability

