Report of investigation into a fatal accident on board the Hong Kong registered bulk carrier "*Zhen Zhu Hai*" at sea on 17 January 2023

The Hong Kong Special Administrative Region
Marine Department
Marine Accident Investigation Section

21 June 2023

Purpose of Investigation

The purpose of this investigation, conducted by the Marine Accident Investigation Branch (MAIB) of Marine Department, is to determine the circumstances and the causes of the incident with the aim of enhancing the safety of life at sea and avoiding similar incidents in future.

It is not intended to apportion blame or liability towards any particular organization or individual except so far as necessary to achieve the said purpose.

The MAIB has no involvement in any prosecution or disciplinary action that may be taken by the Marine Department resulting from this incident.

Table of contents **Page**

Summary

On 14 January 2023, the Hong Kong registered bulk carrier "Zhen Zhu Hai" (*the vessel*) departed Imbituba, Brazil, and bound for Barra Dos Coqueiros, Brazil (*the loading port*) for loading bulk maize, with an estimated arrival time on 18 January 2023.

For preparing cargo holds to load the cargo of maize in *the loading port*, *the vessel* crew carried out the paintwork in two groups commencing at 0900 hours on 17 January 2023 by means of the pneumatic painting machine. Four (4) deck crew (*the deck team*) (i.e., bosun, carpenter, purser and steward[1]) were assigned as a group to conduct the paintwork for the hatch coaming of No.3 cargo hold (*the paintwork*), and six (6) engine crew were assigned to do the paintwork in No.4 cargo hold. The bosun was the leader of *the paintwork* with the purser and the steward assisting the painting on-site. At 0940 hours, *the deck team* completed *the paintwork* at the fore hatch-coaming of No.3 cargo hold (*the hold*) and planned to shift to the starboard main deck to paint the hatch-side coaming of *the hold*. At about 0942 hours, the bosun turned off the pneumatic painting machine and collected the paint rod and pipe. When the bosun walked forward and was about 6 to 7 meters away from the fore hatch-coaming of *the hold*, he suddenly heard someone screaming and the sound of a falling object hitting against the tank top of *the hold* (*the tank top*). The bosun immediately ran to check *the hold* and found the purser lying *on the tank top*. The crew of *the vessel* was organized immediately to rescue the purser. The purser was found to have no pulse, pupils appeared dilated, both legs broken without apparent wounds and bleeding in other parts of his body. Although first aid was applied to the purser onboard by the crew immediately, including Cardiopulmonary Resuscitation (CPR) and shore emergency telemedicine, the steward (i.e. the doctor of *the vessel*) declared the purser dead on board *the vessel* at 1340 hours. Afterwards, *the vessel* deviated to Vitoria, Brazil, and the body of the purser was delivered ashore on 18 January 2023.

[1] The steward also acted as a licensed doctor on board as he received professional medical clinic training.

The investigation identified the contributory factors leading to the accident were that the shipboard risk assessment for *the paintwork* was not carried out properly according to the requirements of the "Code of Safe Working Practices for Merchant Seafarers" (*the Code*[2]); the crew failed to follow the requirements of *the Code* and the shipboard safety management system (SMS) to take necessary preventive measures when working aloft; *the paintwork* was not supervised properly on site according to *the Code* and shipboard SMS requirements; *the shipboard training plan* was not planned properly to follow shipboard SMS requirements; and the shipboard training on working aloft was ineffective .

[2] *The Code* is a publication required to be carried onboard Hong Kong ships pursuant to the Merchant Shipping (Seafarers) (Code of Safe Working Practices) Regulation (Cap. 478M).

1. Description of *the vessel*

Ship name	:	ZHEN ZHU HAI (Figure 1)
Flag	:	Hong Kong, China
Port of registry	:	Hong Kong
IMO number	:	9738088
Type	:	Bulk Carrier
Year built, shipyard	:	2015, Tianjin Xinggang Shipbuilding Heavy Industry Co., Ltd., China
Gross tonnage	:	24,748
Net tonnage	:	13,171
Length overall	:	179.99 meters
Breadth	:	30.00 meters
Depth	:	15.00 meters
Engine power, type	:	6050 kW, MAN B&W, 5S50ME-B9.2
Classification society	:	China Classification Society
Registered owner	:	ZHEN ZHU HAI SHIPPING LIMITED
Management company	:	COSCO SHIPPING Bulk Co., Ltd.

Figure 1: ZHEN ZHU HAI

2. Sources of evidence

2.1 Information provided by the Master, the crew members and the management company (*the Company*) of *the vessel*.

3. Outline of events

(All times were local time UTC - 3 hours)

3.1 At 0520 hours on 14 January 2023, *the vessel* departed Imbituba, Brazil after discharging the cargo of petroleum coke and bound for *the loading port* to load maize in bulk, with an estimated arrival time on 18 January 2023.

3.2 At 0730 hours on 17 January 2023, the Master of *the vessel* approved the deck and engine departments for the paintwork in the No.3 and No.4 cargo holds including working aloft.

3.3 At 0810 hours, the deck and engine departments held the toolbox meeting. During the meeting, the work distribution, the person responsible for the safety and the main risks for *the paintwork* were identified, and the relevant risk assessments and onboard training were carried.

3.4 At 0900 hours, *the vessel* crew carried out the paintwork in two groups. They wore safety working suits, safety shoes, safety helmets, gloves, goggles and masks. The bosun, carpenter, purser and steward were assigned as *the deck team* to conduct *the paintwork*, and six (6) engine crew were assigned to paint the No.4 hold.

3.5 The bosun was the supervisor of *the deck team*. The carpenter conducted *the paintwork* using a pneumatic paint sprayer machine (Figure 2) with the assistance of the purser and the steward, including moving the sprayer machine and tidying up the flexible hose.

Figure 2: pneumatic sprayer machine and spray gun tied up with the rod

3.6 The carpenter stepped on a portable ladder and bent his body over the hatch-end coaming to paint the lower part of the hatch coaming. The spray gun tied on a 3 meters rod was used for painting while the hatch cover was partially opened with a clearance of about two (2) meters above the top of the coaming of *the hold* (Figures 3 & 4).

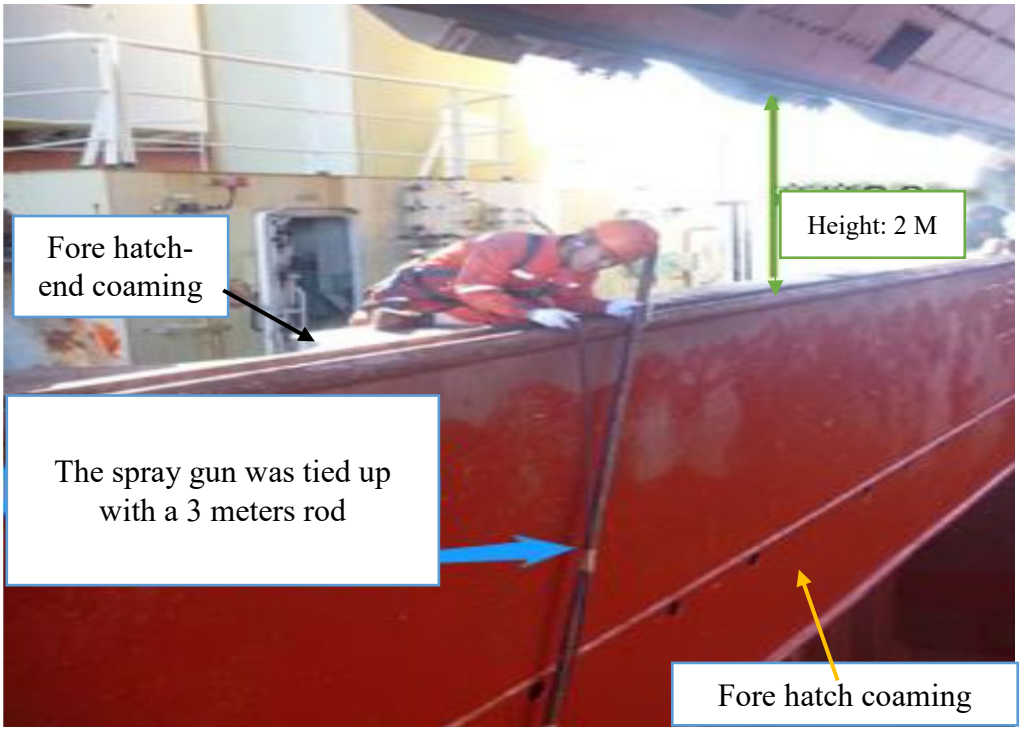

Figure 3: the simulated painting

Figure 4: Portable ladder used on the painting site

3.7 At 0940 hours, *the paintwork* of the fore hatch coaming of *the hold* was completed, and the bosun turned off the paint machine. After tidying up the working site with the steward, the bosun moved to the starboard side of *the hold* to continue *the paintwork*. The carpenter handed over the painting rod to the purser, stepped down from the ladder, and then entered the pump room to start the hydraulic pump to open the No.4 hatch cover as informed by the Master, who was checking cargo holds condition and took photos on the main deck.

3.8 At 0942 hours, when the bosun was about 6 to 7 meters away from the fore hatch coaming of *the hold*, he suddenly heard someone screaming and the sound of a falling object hitting against *the tank top* (Figure 5 & 6). The bosun immediately ran to check *the hold* and found the purser lying *on the tank top.*

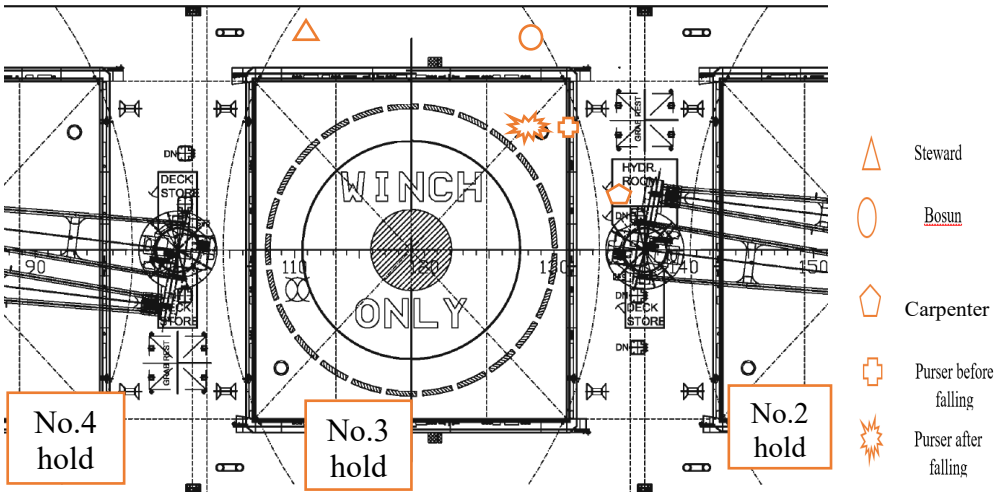

Figure 5: positions of *the deck team of the paintwork* at time of accident

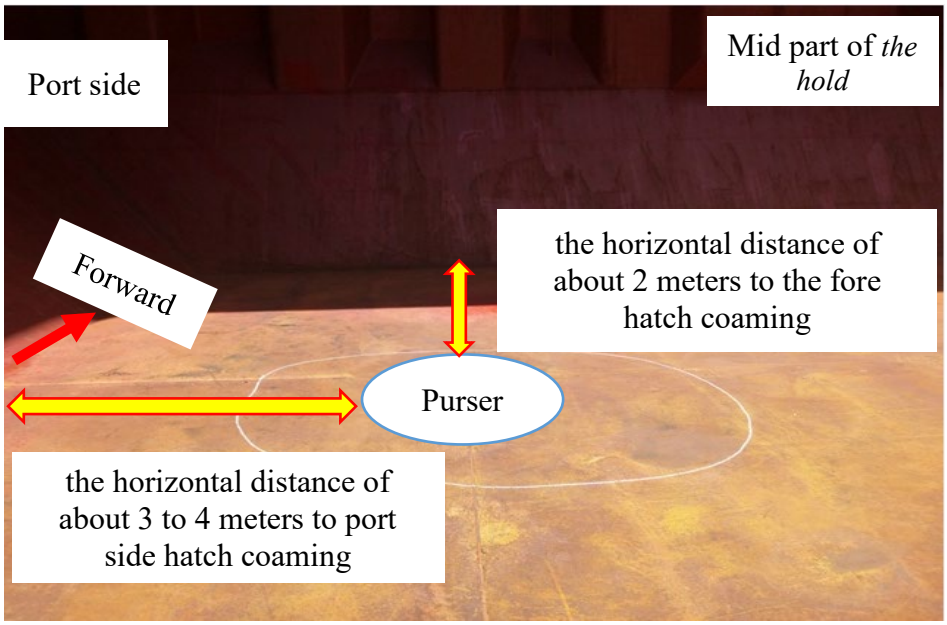

Figure 6: position of the purser on *the tank top*.

3.9 The Master immediately organized emergency rescue team to rescue the purser when receiving the report. When the Master arrived at the accident scene with the bosun, carpenter and steward, he found that the purser was lying unconsciously on *the tank top* with no pulse, pupils appeared dilated, both legs broken, and no apparent wounds and bleeding in his body. The purser wore a safety helmet, safety shoes and safety working suit but no safety belt or harness. Afterwards, the steward applied CPR to the purser on-site.

3.10 At 1020 hours, the Master reported the accident to *the Company* and

contacted Salvador MRCC for urgent rescue assistance. Under *the Company* and Salvador MRCC arrangement, *the vessel* proceeded to the nearest rendezvous in Salvador for urgent shore medical rescue.

3.11 At 1025 hours, the purser was shifted to the ship hospital by stretcher while CPR and shore emergency telemedicine were continuously applying to him.

3.12 At 1340 hours, the steward (i.e. the doctor of *the vessel*) confirmed that the purser had no vital signs and reported it to *the Company*. At 1912 hours, the Salvador MRCC instructed *the vessel* to proceed to the port of Vitoria because the helicopter could not arrive at night for rescue.

3.13 At 0405 hours on 18 January 2023, *the vessel* arrived at Vitoria anchorage. At 1345 hours, the body of the purser was delivered ashore.

4. Analysis

Certificates and manning

4.1 The statutory trading certificates of *the vessel* were valid and in order. *The vessel* was manned by 22 crew members, who joined *the vessel* on 18 August 2022, including the Master and fulfilled the requirements stipulated in the Minimum Safe Manning Certificate of *the vessel*.

4.2 The Master had about fifteen years of experience as a master. He possessed a master Certificate of Competency issued by China, valid until 30 October 2024.

4.3 The Chief Officer (C/O) had about five months of experience as a chief officer. He possessed a chief officer Certificate of Competency issued by China, valid until 7 December 2026.

4.4 The Second Officer (2/O) had about ten years of experience as a second officer. He possessed a second officer Certificate of Competency issued by China, valid until 29 November 2025.

4.5 The Third Officer (3/O) had about one year of experience as a third officer. He possessed a third officer Certificate of Competency issued by China, valid until 16 December 2026.

4.6 The Chief Engineer (C/E) had about two years of experience as a chief engineer. He possessed a chief engineer Certificate of Competency issued by China, valid until 9 July 2024.

4.7 The purser had about three years of experience as a purser.

4.8 The steward had about eleven years of experience as a steward and ship doctor.

4.9 There were no abnormalities noted with regard to the certification and experience of the crew members concerned.

Fatigue, alcohol and drugs abuse

4.10 There was no evidence to show that the crew on board suffered from either fatigue at work or abuse of alcohol and drugs.

Weather and sea conditions

4.11 On the day of the accident, the sea was slight, and the visibility was good with northeasterly wind of Beaufort wind scale Force 4. The vessel was rolling at about three (3) degrees with slight pitching. The weather and the sea conditions might not be the contributory factors to the accident.

Cause of death

4.12 According to the investigation report of *the Company*, with the position of the purser lying on *the tank top* (Figure 6), and the painting rod being hung vertically inside the hatch coaming of *the hold* (Figure 7 & 8), it was deduced that the purser fell onto *the tank top* from the hatch coaming when he might carry out patch-painting using the painting rod with spray gun, resulted in losing his balance and falling into *the hold*.

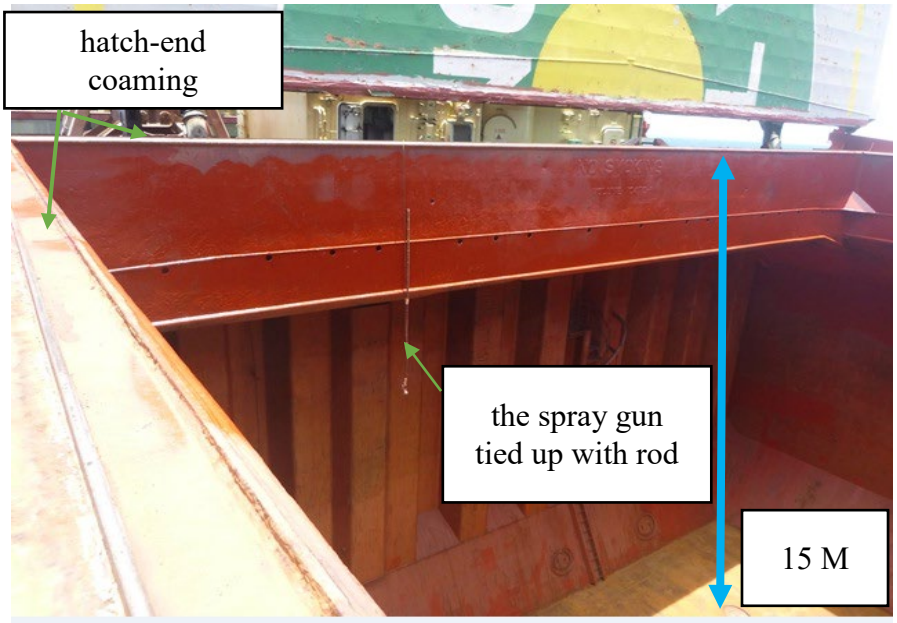

Figure 7: the accident scene

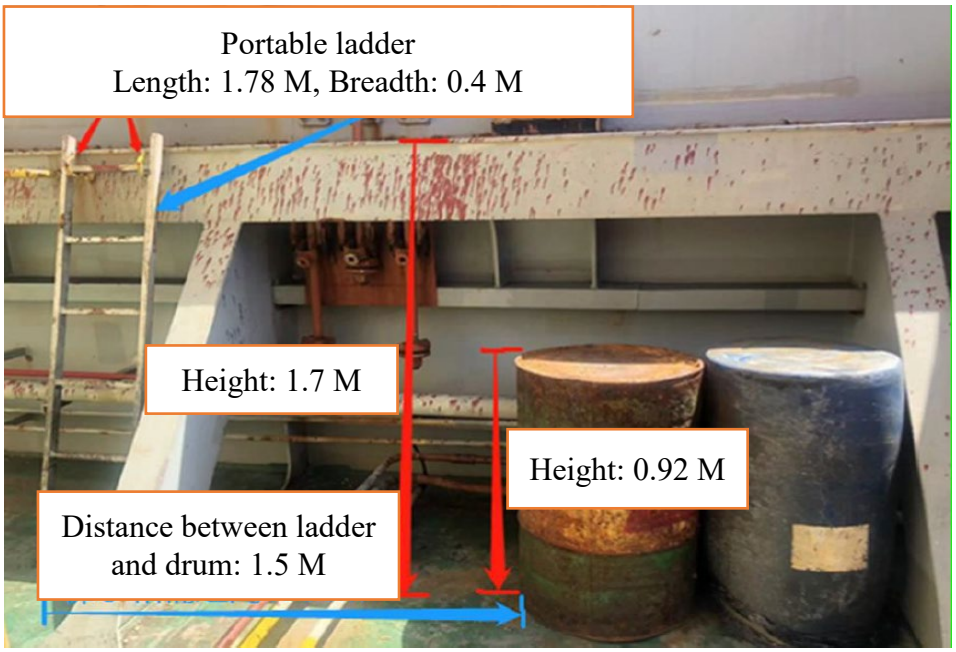

Figure 8: portable ladder and two empty oil drums nearby the corner of the hatch coaming

Toolbox meeting and Risk assessment

4.13 Section 1.2.5 of *the Code* states that a toolbox meeting should be carried out onboard before the work commences, including a clear understanding and awareness of any hazards and associated risks of the work and conducting an effective risk assessment. The effective risk assessment should identify who may be injured and how; determine the likelihood of injury arising; quantify the severity of the injury; identify and disregard inconsequential risks, etc.

4.14 According to paragraph 3.3, the deck department toolbox meeting was held before *the paintwork* on the day of the accident. The risk assessment related to *the paintwork* was carried out on board *the vessel*, including the work distribution, the person responsible for the safety and identifying the risks of *the paintwork,* such as falling from height, suffocation, slipping, high-pressure pipes injury, etc., and its corresponding preventive measures (i.e., wear personnel protective equipment, secure a safety line properly on the hatch coaming, maintain stable during *the paintwork*, and pay attention to obstructions, etc.). However, the investigation found that the person who might be injured and what type of injury with its

severity was not identified in the toolbox meeting. If the injury and the quantified severity to the crew assigned to *the paintwork* had been assessed during the risk assessment, including safety measures for the person responsible for the work, the accident might have been avoided. It was deduced that the shipboard risk assessment for *the paintwork* was ineffective.

Working aloft

4.15 Section 17.2.6 of *the Code* states that personnel working aloft should always wear a safety harness with a lifeline or other arresting device. Personnel working aloft should be under observation from a person on deck.

4.16 Sections 3.1 and 3.2 of "Working Aloft" of the shipboard SMS state that personnel working aloft should wear falling preventive device/safety harness, safety helmet, safety shoes, gloves, and a safety net if necessary, and the working aloft should be supervised and monitored properly on-site.

4.17 According to paragraph 3.9, when the purser was found lying on *the tank top*, he did not wear a safety harness or arresting device, and no safety net was rigged under the hatch coaming. As such, the purser failed to follow *the Code* and shipboard SMS requirements to take necessary preventive measures when working aloft.

4.18 The bosun was in charge of *the paintwork,* and the purser might carry out patch-painting alone, using the painting rod with spray gun, without necessary preventive measures, as mentioned in paragraph 4.12 above. It was deduced that the site of *the paintwork* was not supervised properly according to *the Code* and shipboard SMS requirements.

Shipboard training and safety awareness

4.19 Section 2 of the "Instructions for the shipboard training" of the shipboard SMS states that the ship master is responsible to make a proper shipboard voyage training plan (*the shipboard training plan*). *The shipboard training plan* should cover international conventions, shipboard SMS, safe shipboard operation, etc.

4.20 According to the shipboard records, four (4) *shipboard training plans* were made since the crew had joined *the vessel*, including the training of working aloft, enclosed space entry, and grain loading. The working aloft training for the crew was planned to be carried out on board *the vessel* on 18 August 2022 only. *The shipboard training plan* for the current voyage (i.e. from Imbituba, Brazil, to Santa Marta, Colombia via Barra Dos Coqueiros, Brazil) did not cover the working aloft and the painting work in the cargo hold, which did not follow the requirements of the "Instructions for the shipboard training" of the shipboard SMS. In addition, paragraphs 4.17 and 4.18 above reflected that the shipboard training on working aloft was ineffective.

5. Conclusions

5.1 On 14 January 2023, *the vessel* departed Imbituba, Brazil, and bound for Barra Dos Coqueiros, Brazil for loading bulk maize, with an estimated arrival time on 18 January 2023.

5.2 For preparing cargo holds to load the cargo of maize in *the loading port*, the vessel crew carried out paintwork in two groups commencing at 0900 hours on 17 January 2023 by means of the pneumatic painting machine. Four (4) deck crew (i.e., bosun, carpenter, purser and steward were assigned as *the deck team* to conduct *the paintwork*, and six (6) engine crew were assigned to paint in No.4 cargo hold. The bosun was the leader of *the paintwork* with the purser and the steward assisting the painting on-site. At 0940 hours, the deck crew completed *the paintwork* at the fore hatch-coaming of *the hold* and planned to shift to the starboard main deck to paint the hatch-side coaming of *the hold*. At about 0942 hours, the bosun turned off the pneumatic painting machine and collected the paint rod and pipe. When the bosun walked forward and was about 6 to 7 meters away from the fore hatch-coaming of *the hold*, he suddenly heard someone screaming and the sound of a falling object hitting against *the tank top*. The bosun immediately ran to check *the hold* and found the purser lying on *the tank top*. The crew of *the vessel* was organized immediately to rescue the purser. The purser was found to have no pulse, pupils appeared dilated, both legs broken, with no apparent wounds and bleeding in other parts of his body. Although first aid was applied to the purser onboard by crew immediately, including CPR and shore emergency telemedicine, the steward (i.e. the doctor of *the vessel*) declared the purser dead on board *the vessel* at 1340 hours. Afterwards, *the vessel* deviated to Vitoria, Brazil, and the body of the purser was delivered ashore on 18 January 2023.

5.3 The investigation revealed that the contributory factors leading to the accident were as follows:

(a) the shipboard risk assessment for the paintwork was not carried out properly in according to the requirements of *the Code*;

(b) the crew failed to follow the requirements of *the Code* and the shipboard SMS to take necessary preventive measures when working aloft;

(c) *the paintwork* was not supervised properly on site according to *the Code* and shipboard SMS requirements;

(d) *the shipboard training plan* was not planned properly to follow shipboard SMS requirements; and

(e) the shipboard training on working aloft was ineffective.

6. Recommendations

6.1 The management company should issue a circular informing all masters, officers and crew members of its fleet of the investigation findings and lessons learnt from this accident to:

(a) follow strictly the requirements of *the Code* to carry out a shipboard risk assessment for painting work;

(b) follow strictly the requirements of *the Code* and shipboard SMS to take preventive measures when working aloft;

(c) follow strictly the requirements of *the Code* and shipboard SMS to supervise the painting work on site;

(d) follow strictly the shipboard SMS requirements to make shipboard training plan; and

(e) enhance shipboard training of the crew on working aloft.

6.2 The management company should conduct an internal audit on board *the vessel* to ensure the crew follow strictly the requirements of *the* shipboard SMS when working aloft.

6.3 A Hong Kong Merchant Shipping Information Note is to be issued to promulgate the lessons learnt from this accident.

7. Submission

7.1 The draft investigation report, in its entirety, was sent to *the Company* and the Master of *the vessel* for comments.

7.2 By the end of the consultation, there was no comment received from the above-mentioned parties.