

# **FINAL REPORT**

## **FATAL INJURY ON BOARD OCEAN GLORY EN-ROUTE FROM TAIWAN TO SINGAPORE ON 8 JANUARY 2017**

**MIB/MAI/CAS.008**

**Transport Safety Investigation Bureau  
Ministry of Transport  
Singapore**

**22 January 2018**

## The Transport Safety Investigation Bureau

*The Transport Safety Investigation Bureau (TSIB) is the air and marine accidents and incidents investigation authority in Singapore, responsible to the Ministry of Transport. Its mission is to promote aviation and marine safety through the conduct of independent and objective investigations into air and marine accidents and incidents.*

*The TSIB conducts marine safety investigations as required by SOLAS Regulation XI-1/6 in accordance with the International Maritime Organisation's (IMO) Code of the International Standards and Recommended Practices for a Safety Investigation into a Marine Casualty or Marine Incident (Casualty Investigation Code), as adopted by Res. MSC 255(84).*

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## SYNOPSIS

On 6 January 2017, the Ocean Glory in ballast condition departed Kaohsiung, Taiwan for Singapore before proceeding to its next loading port in Australia. At Singapore, the vessel was expected to take bunkers while carrying out some repairs.

On 7 January 2017, while en-route from Taiwan to Singapore, the vessel's crew commenced washing of cargo holds with seawater, in preparation for carriage of grain cargo. The last cargo carried onboard was limestone in bulk. No.1 and No.2 cargo holds were washed without any incident.

On 8 January 2017, at about 0900H, the vessel's crew began to clean No.3 cargo hold with seawater.

At about 1000H, after the upper aft section of No.3 cargo hold had been washed, the Able-Bodied Seaman detached his safety harness lifeline from the securing point on the platform, and began his climb up the vertical ladder. During this climb, as he was nearing the top of the ladder, he fell backward and down from a height of about 12 metres (m) to the bottom of the cargo hold and suffered multiple injuries.

The Master deviated his vessel's passage to Qui Nhon in Vietnam, the nearest port, for the injured seaman to seek medical treatment. However, the seaman succumbed to his injuries about seven hours after the occurrence.

The TSIB classified the occurrence as a Very Serious Marine Casualty and launched an investigation.

The investigation identified that the seaman lost his grip of the vertical ladder while climbing. His safety harness was not connected to any strong point or fall arresting device.

The seaman's inability to grip the vertical ladder could have been due to the following:

- Wet cargo hold
- Wet gloves worn by the seaman
- Slippery surface as a result of the seawater wash
- Exertion from his climb up the vertical ladder immediately after some physical activities

## DETAILS OF VESSEL

Name	Ocean Glory
IMO Number	9227637
Call Sign:	9V5128
Flag:	Singapore
Classification society	Nippon Kaiji Kyokai (NKK)
Ship type	Cargo Ship (Bulk Carrier)
Builder	Sanoyas Hishina Meisho, Japan
Year Built	2001
Owner/Company	Ocean Glory Maritime Pte Ltd
Manager	Apex Ship Management Pte Ltd
Gross tonnage	27,575
Length overall	187.30 m
Beam	32.20 m
Moulded depth	16.55 m
Summer Draught	11.70 m
Summer Freeboard	4.90 m
Main engine(s)	Sulzer 6RATA48T
Total power	9800 PS x 110 RPM

## View of Ocean Glory



# 1 FACTUAL INFORMATION

All times used in this report are Ship's Mean Time (UTC + 8H).

## 1.1 Sequence of events

1.1.1 On the morning of 6 January 2017, Ocean Glory departed Kaohsiung, Taiwan, anchorage for Singapore to carry out repairs<sup>1</sup> and bunkers. The vessel was to load grain from Australia after bunkering in Singapore. The vessel was estimated to arrive Singapore on 12 January 2017.

1.1.2 In the evening of 6 January 2017, the Master conducted a routine Safety Committee Meeting on the Bridge for all ship's personnel. During the meeting, the Master highlighted the importance for all ship's personnel to wear proper Personal Protective Equipment (PPE) while performing work on board.

1.1.3 Also during the meeting, the Chief Officer indicated that, in preparation for the next grain loading, the vessel's cargo holds<sup>2</sup> would be washed<sup>3</sup> to grain standard, while on passage to Singapore. The washing team would be headed by the Chief Officer. The team members would comprise the Bosun, three Able-Bodied Seamen (AB1, AB2 and AB3), one Ordinary Seaman (OS) and one Deck Cadet (DC). They were grouped as follows:

- Cleaning Group 1 would comprise the Bosun and AB1
- Cleaning Group 2 would comprise AB2 and the OS
- Cleaning Group 3 would comprise AB3 and the DC

1.1.4 On the morning of 7 January 2017, the Chief Officer, Bosun and AB1 conducted a risk<sup>4</sup> assessment<sup>5</sup> as per the shipping company's Safety Management System for cargo hold washing operations. The Master approved the risk assessment (see paragraph 1.12). The Chief Officer conveyed the contents of the risk assessment to the other members of the washing team.

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<sup>1</sup> To effect repair for damages (hawse pipe) sustained during vessel's anchor stay in Taiwan.

<sup>2</sup> Sweeping of remnants of the previous cargo from the cargo holds was completed during vessel's stay in port.

<sup>3</sup> Cargo hold cleaning to grain standard would include, sweeping, seawater wash, fresh water wash and drying of the bilges.

<sup>4</sup> Risk is "a combination of the probability, or frequency, of occurrence of a defined hazard and the magnitude of the consequences of the occurrence." (ISO 8402:1995/BS 4778). Risk in occupational safety and health is most commonly defined as the likelihood that a person may be harmed or suffers adverse health effects if exposed to a hazard.'

<sup>5</sup> Assessment of risk is the determination of quantitative or qualitative estimate of risk related to a well-defined situation and a recognized threat (also called hazard). Quantitative risk assessment requires calculations of two components of risk: the magnitude of the potential loss, and the probability that the loss will occur.

- 1.1.5 At about 0800H, the washing team began cleaning No.1 cargo hold. The team completed the cleaning of No.1 and No.2 cargo holds by the end of the day without any incident.
- 1.1.6 On 8 January 2017 at about 0800H, after the crew had prepared hoses for seawater washing of No. 3 cargo hold, the Chief Officer carried out a toolbox meeting<sup>6</sup> for specific allocation of washing tasks as follows:
- Cleaning Group 1 was to wash the lower section of the cargo hold, hopper space, tank top and bilges with seawater;
  - Cleaning Group 2 was to wash the upper aft section, forward section, forward and aft ladders and below the cross-deck with seawater; and
  - Cleaning Group 3 was to wash the hatch covers and coamings with seawater.
- 1.1.7 At about 0900H, in fair weather condition with east northeast wind of about 10 knots, the Master stopped the vessel's engine to adjust her estimated time of arrival to Singapore. The vessel was thus adrift (underway<sup>7</sup>). However, the Chief Officer was not aware of the Master's action to stop the vessel's engine.
- 1.1.8 At about the same time, the washing team proceeded with their respective cleaning tasks at cargo hold No.3. The team members were equipped with personal protective equipment (PPE), which included safety harness, helmet with chin-strap, rain coat, rubber gloves and sea boots.
- 1.1.9 Cleaning Group 1 (Bosun and AB1) entered No.3 cargo hold through the forward booby hatch, and went down the spiral staircase to the bottom of the cargo hold.
- 1.1.10 AB2 from Cleaning Group 2 entered No.3 cargo hold through the aft booby hatch, and went down the vertical ladder to the first (uppermost) platform. The OS positioned himself on the main deck to assist AB2.

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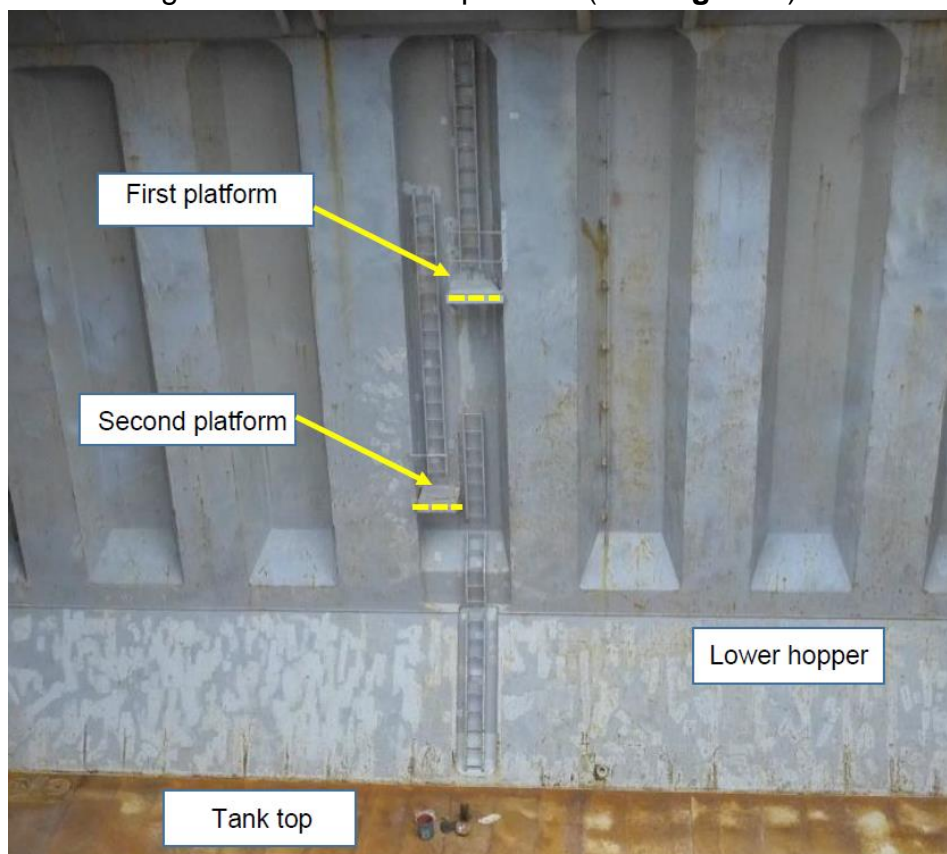
<sup>6</sup> Tool-box meeting is an informal group discussion that focusses on the safety issue associated with the task of cargo hold cleaning. The meeting not documented.

<sup>7</sup> Underway means vessel is not at anchor, or made fast ashore, or aground. A vessel that was adrift would move easily to the effect of seas and swells.



*Fig. 1 - Cargo hold No.3 viewed from vessel's portside*

- 1.1.11 Cleaning Group 3 (AB3 and DC) began seawater wash of forward coaming and hatch covers of No.3 cargo hold from the main deck.
- 1.1.12 The Chief Officer was supervising the cleaning operation from the main deck, near the forward section of No.3 cargo hold. At about 0955H, the Chief Officer saw that AB2 had completed seawater wash of the upper aft section of the cargo hold from the first platform (See **Figure 2**).



*Fig.2 – First platform of No.3 cargo hold aft section*



- 1.1.13 At that time, while directing DC on the hatch coaming washing, the Chief Officer noted that AB2 had his safety harness lifeline<sup>8</sup> secured to the railing of the first platform where AB2 was standing, and that AB2 was directing OS to hoist up the seawater hose. Seeing Cleaning Group 2 was progressing well with their work, the Chief Officer continued with directing DC on the hatch coaming washing.
- 1.1.14 Meanwhile, at about 1000H, at No.3 cargo hold aft section, after OS had completed removing the seawater hose from inside the hold, AB2 started climbing up the vertical ladder. At about that time, the Chief Officer, who happened to look in the direction of AB2 who was climbing the vertical ladder<sup>9</sup> from the first platform, saw AB2 suddenly fall backward, from a height of about 12 m to the bottom of the cargo hold. The Chief Officer immediately reported the accident to the Master.
- 1.1.15 The Chief Officer saw that AB2 was trying to stand up. He asked the Bosun (who was inside the hold) via handheld walkie-talkie to tell AB2 to lie down and stay still inside the cargo hold. The Chief Officer then entered the cargo hold from the forward spiral ladder to reach AB2 to assess his condition.
- 1.1.16 The Master, upon receiving the accident report, sounded the emergency alarm for all crew, including the ship's emergency team, to proceed to No.3 cargo hold.
- 1.1.17 Equipped with first aid equipment (stretcher, resuscitator set and first-aid satchel), the emergency team arrived on site to assist AB2.
- 1.1.18 The emergency team reported that AB2 had dislocated his right wrist and complained of severe abdominal pain. The emergency team also reported that he had difficulty breathing. The emergency team carefully removed AB2's PPE to facilitate his breathing and secured him on to the stretcher.
- 1.1.19 AB2 had his safety harness firmly secured to his body, the safety line and the securing hook were intact. His other PPE, i.e. rubber gloves and sea boots were in normal condition. However, his safety harness lifeline was not secured<sup>10</sup>.

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<sup>8</sup> Safety harness lifeline is about 1.5 m long.

<sup>9</sup> The Chief Officer recalled that AB2 was standing on about the eighth step (from top) of the vertical ladder, with his hand holding at about the third step (from top).

<sup>10</sup> Without restraining harness to prevent fall, all climb up/ down a ladder should use the three-point contact technique as a matter of good practice and basic seamanship.

- 1.1.20 There were no signs of damage to the vertical ladder and its rungs. There was no report of anything unusual during the cleaning operation in the cargo holds the previous day.
- 1.1.21 At about 1030H, AB2 was evacuated from the cargo hold with the use of the ship's crane (See **Figure 3**) and was subsequently transferred to the ship's infirmary. The Master then reported the accident to the company's Designated Person Ashore<sup>11</sup> (DPA).



*Fig. 3 – Evacuation of AB2*

## **1.2 Post-accident narrative**

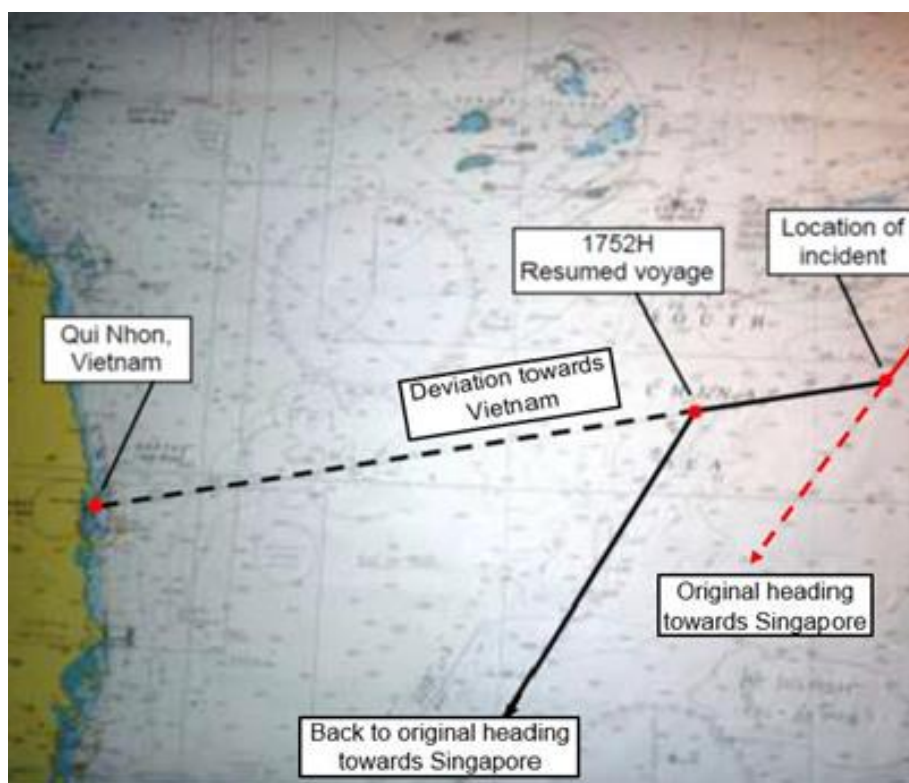
- 1.2.1 At about 1115H, after consulting the Medical First Aid Guide for Masters, the Master gave AB2 a tablet (5mg) of Diazepam<sup>12</sup> for AB2's complained of severe abdominal and back pain. Concurrently, continuous oxygen resuscitator was also provided to assist AB2's breathing.
- 1.2.2 As advised by the International Radio Medical Centre (C.I.R.M.)<sup>13</sup>, the Master administered one tablet of codeine (30mg) to AB2. AB2 was placed under constant observation and his medical condition was monitored and recorded.
- 1.2.3 The Master informed the company of his intention to deviate the vessel's passage to head for Qui Nhon in Vietnam, the nearest port for AB2 to receive proper medical treatment ashore, and about 315 nautical miles

<sup>11</sup> A Designated Person Ashore (DPA) serves as the link between the ships and shore management

<sup>12</sup> Diazepam, a controlled drug under the Master's care, is usually administered for the treatment of seizures, or muscle spasms. It is a sedative which has anxiety relieving and muscle relaxing effects

<sup>13</sup> The medical assistance (free of charge) of the C.I.R.M. is assured by doctors on call 24 hours. Ships at sea with sick or injured person on board can contact the C.I.R.M. by phone or email.

away, which was about a day's steaming at full speed (See **Figure 4**). The company concurred with the Master.



*Fig. 4 - Vessel's deviation / resumption of passage*

- 1.2.4 At about 1645H, AB2 complained of severe pain. The Master administered one tablet of tramadol<sup>14</sup> (50mg), as instructed by C.I.R.M.
- 1.2.5 About half an hour later, the Master noted that AB2's vital signs were absent and his body temperature had dropped to about 34.6°C. The Master reported these signs to C.I.R.M. and the latter confirmed that these signs indicated that AB2 had passed on. The Master took the necessary steps to preserve the body in consultation with C.I.R.M.
- 1.2.6 The Master updated the company on C.I.R.M.'s confirmation of AB2's death. With the company's concurrence, the Master resumed his vessel's original voyage to Singapore, with an estimated arrival 4 days later, i.e. 12 January 2017. Permission was also granted by the Singapore Police Coast Guard, for the vessel to land AB2's body at Singapore.
- 1.2.7 According to the Master, since AB2 was in pain after the accident, he did not attempt to enquire from him how the accident had occurred.

<sup>14</sup> Tramadol is a narcotic-like pain reliever and is used to treat moderate to severe pain.

1.2.8 There was no report of any crew members, including AB2, being unwell during the cleaning operations.

1.2.9 According to the information from the vessel, for a clear uninterrupted climb up/down the ladder, since there was no securing arrangement, such as fall arresting devices to secure the safety harness's lifeline, it was a common practice for the crew to climb up/ down the ladder without having the safety harness's lifeline secured to any point.

### 1.3 Vessel's manning

1.3.1 The vessel had a crew of 22. The Master was of Myanmar nationality and all others (including AB2, the deceased) were Indonesians. All officers held valid STCW<sup>15</sup> certificates of competency and appropriate endorsements from Flag Administration, and all crew members held valid training certificates for their position on board.

1.3.2 The Master joined Ocean Glory on 22 July 2016 and had more than five years of command experience on various types of vessels, predominantly on bulk carriers. The Chief Officer joined Ocean Glory on 29 February 2016 and had about 1.5 years' experience in his current rank.

1.3.3 The working schedule for AB1, AB2 and AB3 was as follows:

- AB1 – 0400-0800H and 1600-2000H
- AB2 – 0800-1200H and 2000-2400H
- AB3 – 1200-1600H and 0000-0400H

During cargo hold cleaning, the watch-keeping and deck work schedule was as follows:

AB1	Bridge lookout duties	0400-0800H and 1800-2000H
	Cargo hold cleaning	1600-1800H
AB2 (Deceased)	Bridge lookout duties	2000-2400H
	Cargo hold cleaning	0800-1200H
AB3	Bridge lookout duties	0000-0400H
	Cargo hold cleaning	1200-1600H

1.3.4 AB2 was 60 years old and had been with the company for 35 years, serving on similar type of ships. He had been on board Ocean Glory for 6 months. He was certified medically fit for sea service on 15 June 2016 without any conditions by a maritime medical clinic approved by the competent authority

<sup>15</sup> The International Convention on Standards of Training, Certification and Watch keeping for Seafarers (or STCW), 1978 sets qualification standards for masters, officers and watch personnel on seagoing merchant ships.

in Indonesia. He had 16 hours of rest (including 8 hours of continuous rest) in the last 24 hours prior to the accident.

- 1.3.5 OS had about 3 years of seafaring experience.
- 1.3.6 Rest hour records were kept according to company's SMS. Rest taken by all officers and crew members complied with rest hour requirements under the STCW 95 convention and the Maritime Labour Convention<sup>16</sup>.

#### **1.4 Cargo holds**

- 1.4.1 The vessel has five cargo holds. Apart from No.1 cargo hold (relatively smaller), all other cargo holds were of similar dimensions (length 20.8 m X breadth 18.3 m X depth 14.55 m).
- 1.4.2 Each cargo hold has two access ladders<sup>17</sup>, one at the aft (See Fig. 2) and one at the forward (See **Figure 5**) section of the cargo hold.



*Fig. 5 - The forward access provided by spiral ladder*

- 1.4.3 The aft vertical ladder has three sections, first platform, second platform and tank-top. The last section between the second platform and the tank top was inclined over the lower hopper. (See **Figure 2**)
- 1.4.4 The intermediate platforms of the vertical ladder were provided with guard rail<sup>18</sup> (railing) with a height of about 1.2 m, to prevent accidental fall into the

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<sup>16</sup> Rest hour records maintained by AB2, indicated that he had adequate rest prior to the commencement of work.

<sup>17</sup> Cargo holds contain an inherent risk of falling from height when ladders without adequate protection are used. Every effort should be made to recognise this risk even though it may not be seen as a "working at height" activity.

<sup>18</sup> Guard-rail means a horizontal rail secured to uprights or structures and erected along an open or exposed side of any structure to prevent persons from falling.

cargo hold. The ladder portion was for a typical cargo hold construction and did not have any cage or railings around.

## **1.5 Cargo hold cleaning operation**

1.5.1 Since Ocean Glory was to load cargo of grain in Australia, after her stop in Singapore, the cargo holds were to be cleaned to grain cleaning standard<sup>19</sup>, which consisted of the following:

- Holds were to be cleaned, swept and washed down with seawater followed by washing / rinsing with fresh water;
- Holds were to be free from insects, odour, residue of previous cargo, loose rust scale, paint flakes etc.;
- Holds were to be dried, well ventilated and ready for the intended cargo, subject to shippers' and relevant surveyors' inspection.

## **1.6 Meteorological condition**

1.6.1 The weather was clear visibility, partly cloudy with northeast by east wind at about 10 knots. The state of the sea was large wavelets with scattered whitecaps (crests) beginning to break.

1.6.2 Air and Sea temperatures were logged to be about 23°C. The cargo hold was humid and wet owing to the washing process that was in progress.

## **1.7 Autopsy report**

1.7.1 The autopsy report of the Forensic Medicine Division of the Health Science Authority of Singapore indicated that the death was due to thoracic and pelvic injuries which were consistent with pattern of injuries sustained in a fall from height.

## **1.8 Toxicological report**

1.8.1 The toxicological analysis report of the Analytical Toxicology Division of the Health Science Authority of Singapore indicated the following:

- Alcohol and volatiles were not detected from the blood (oxalated) analysis.
- The following were detected from the blood (plain) analysis:
  - Diazepam - 0.03 µg/ml
  - Tramadol - 0.25 µg/ml
  - Other basic drugs - Not detected
- An analysis on urine samples detected the presence of Diazepam.

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<sup>19</sup> There are five cargo hold cleaning standards, viz. stringent cleaning, grain cleaning, normal clean, shovel clean and load on top (from the most to the least stringent).

## 1.9 Safety Management System (SMS)

- 1.9.1 The vessel held relevant certificates to indicate compliance with the International Safety Management Code and a functional Safety Management System (SMS), which amongst others, included organizational policies, procedures, manuals, checklists, etc. The company had a Zero Drug and Alcohol policy.
- 1.9.2 The vessel had carried out checks and training as indicated in the monthly safety committee meetings<sup>20</sup>, risk assessment<sup>21</sup> (RA), toolbox meeting<sup>22</sup>, etc., as required by the company's SMS.
- 1.9.3 For the operation of cargo hold cleaning, a risk assessment (RA) as per the company's SMS (APEX Form V.531) was carried out and duly completed on 7 January 2017 and approved by the Master and Chief Officer. (See **Figure 6**).

RISK ASSESSMENT AND RISK MANAGEMENT				APEX FORM V.531	
Record No: 006/M/2017		Section 1 - HAZARD ANALYSIS OF THE INTENDED WORK ACTIVITY		Section 2 - ASSESSMENT OF RISK FACTOR	
No.	Description of Identified Hazards	Existing control Measures to Protect Personnel from Harm	Likelihood	Severity of Harm	Risk Factor
1.	Hatch covers accidentally shifted if vessel rolling	To open hatch covers halfway with lashing wire attached.	3	2	HIGH RISK
2.	Tripping hazard / slip when washing hatch coaming & ladders platform	To don proper PPE (safety harness, Anti-slip boots) at all time. Both hands must be free when accessing ladders.	3	2	HIGH RISK
3.	Insufficient lighting, may cause injury or death to working crew	To provide adequate lighting by opening the hatch cover (as permitted for safe navigation).	3	2	MEDIUM RISK
4.	Water splash, debris, loose paint may drop into eye. Falling equipment above heads may cause injury.	Wearing the PPE such as safety belt or harness, clear goggle, safety helmet with chin straps, mask, gloves etc	3	2	MEDIUM RISK
5.	Crew may work in un-safe manner without supervision	Experienced person in attendance at the entrance to ensure all crewmembers working safely.	3	2	HIGH RISK
6.	Crew Working without permit and notifying head of department may cause un-noticed accident.	Train all crewmembers to enter only with permit issued.	3	2	HIGH RISK
7.	Crew not trained may cause injury or death	Conduct crew familiarization and briefing prior operation.	3	2	HIGH RISK
8.	Communication breakdown	Walkie talkie to be checked and tested before operation.			

*Fig.6 – Extract of RA for the task of cargo hold washing*

- 1.9.4 One of the hazards identified in the RA was the tripping/ slipping when washing hatch coaming and platforms/ladders. The risk matrix assigned a “High Risk<sup>23</sup>” factor to this hazard. The existing control measures were donning of proper PPE at all times, stating that both hands must be free when accessing ladders.

<sup>20</sup> Safety Committee Meeting was last conducted on 6 January 2017, i.e. two days before the accident.

<sup>21</sup> Risk assessment was last carried out on 7 January 2017, i.e. a day before the accident.

<sup>22</sup> Toolbox meeting was conducted on 8 January 2017, prior to starting the cargo hold cleaning operation.

<sup>23</sup> High risk (from risk matrix) indicated the consequence as moderate and probability of occurrence as likely.

1.9.5 The RA did not identify fall from height as a hazard, although control measures to reduce this risk were documented (See **Figure 7**):

- Clear any grease and/or oil at work area & stairway with risk residual as “low risk<sup>24</sup>” factor.

Section 3 – ADDITIONAL CONTROL MEASURES TO REDUCE THE RISK OF HARM		Section 4 - RE-ASSESSMENT OF RISK / HAZARD ANALYSIS AFTER EXTRA CONTROLS		
No.	Further Risk Control Measures	Likelihood	Severity of Harm	Risk Factor
1.	Close all hatches if rolling effect could not be overcome by heading adjustment.	1	1	VERY LOW RISK
2.	Clear any grease and/or oil at work area & stairway. All tools must be properly secured / attached.	1	1	LOW RISK

*Fig. 7 – Extract of additional control measures*

1.9.6 The Master then issued a Permit to Work (PTW<sup>25</sup>) in accordance with the company’s SMS, for the work to commence. Two PTWs were issued, one for the work on 7 January 2017 and one for the work on 8 January 2017, each valid for 24 hours. The PTW for 7 January 2017 was duly closed out at 1700 on 7 January 2017.

### **1.10 Code of Safe Working Practices for Merchant Seafarers (COSWP<sup>26</sup>)**

1.10.1 The company’s SMS extensively referred to the Code of Safe Working Practices for Merchant Seafarers and a copy of the publication was provided on all ships within the company’s fleet. The Code published by the United Kingdom, Maritime and Coastguard Agency (MCA), provides best practice guidance for improving health and safety on board ship.

1.10.2 Chapter 8.10 and 17.2.6 of the COSWP require all personnel who are working at height (i.e. in any position from which there is a risk of falling) should wear a safety harness with lifeline attached to an arresting device at all times.

1.10.3 Chapter 17.1 of the COSWP requires that work at height should be subject to risk assessment, and suitable control measures should be taken to protect those who may be put at risk. Depending on the severity of the risk, a permit to work may be required (e.g. for working aloft).

<sup>24</sup> Low risk (from risk matrix) indicated low consequence and low probability of occurrence.

<sup>25</sup> Permit to Work (PTW) is typically required for work at heights activities where a person may fall from a height of more than three metres. The PTW must be endorsed by a work at heights safety assessor after conducting an assessment and inspection of the work to be carried out. The safety assessor must ensure that all works can be carried out safely.

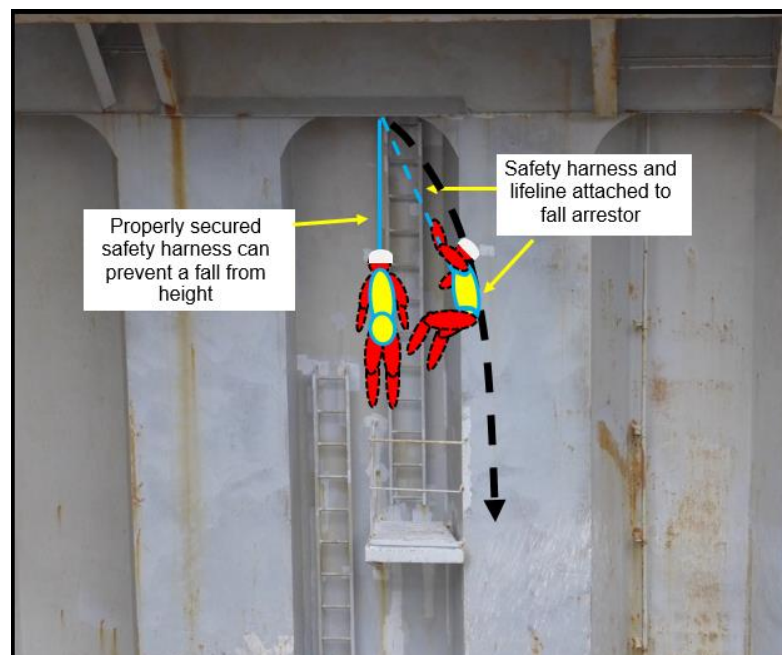
<sup>26</sup> Although COSWP carriage on board Singapore registered ships is non-mandatory, the publication is widely known in the industry for good recommendations on safe working practices on board ships.



## 2 ANALYSIS

### 2.1 The occurrence

- 2.1.1 When AB2 had completed the seawater wash from the first platform, he proceeded to an unrestricted climb on the vertical ladder. For this, he had detached his safety harness lifeline from the securing point (railing) of the first platform.
- 2.1.2 AB2 most likely had lost his grip during his climb, thus resulting in his fall. The factors that caused him to lose his grip could include; wet and slippery ladder rungs, wet rubber gloves, tiredness as AB2 climbed the ladder after handling a fire hose with seawater for washing the hold, which could be a physically strenuous activity<sup>27</sup>.
- 2.1.3 Had AB2's harness been secured by way of a fall arresting device appropriately attached to the main deck, he would have been suspended with the device even if he lost his grip and thus would not have fallen into the hold.



*Fig. 8 – Illustration if a harness was secured to a strong point*

<sup>27</sup> The washing involved handling a seawater hose of about 5 bar pressure for about 30 minutes and directing the pressurised water at an upward angle, all this while inside the cargo hold in a tropical climate with wet clothing.

## **2.2 Safety Management System (SMS)**

- 2.2.1 The company's SMS made provisions for RA and Permits to Work for various tasks on board.
- 2.2.2 Although the vessel had carried out checks and training as indicated in the monthly safety committee meetings, risk assessment, toolbox meeting, etc., as required by the company's SMS, it was evident that the risk of falling from height while entering and exiting a cargo hold had not been adequately addressed in the process. The vessel was not provided with a fall arresting device and there was no procedure in place to ensure that the lifeline of the safety harness was connected to a strong point when entering and exiting from the ladder<sup>28</sup>, thereby making the presence of a safety harness ineffective.
- 2.2.3 It was evident that company's SMS<sup>29</sup> did not establish safeguards against all identified risks, in particular, the risk of falling when climbing up and down the vertical ladder to access the cargo hold.

## **2.3 Meteorological condition**

- 2.3.1 It was noted that at the time of the accident, the vessel was underway but not making way through the water, i.e. adrift. In this condition, the vessel's motion would relatively be more susceptible to the sea state condition, in particular, large wavelets.
- 2.3.2 However, there was no report of unusual or large movements of the vessel at the time of the accident. The weather conditions under these circumstances were unlikely to have played a part in the occurrence.

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<sup>28</sup> Cargo holds contain an inherent risk of falling from height when ladders without adequate protection are used. Every effort should be made to recognise this risk even though it may not be seen as a "working at height" activity. Accordingly climbing up and down on ladders should be done with a safety harness appropriately attached to a strong point.

<sup>29</sup> Para 1.2.2 of the ISM Code – safety management objectives of the company should inter alia:

- Provide for safe practices in ship operation and a safe working environment;
- Establish safeguards against all identified risks.

### **3 CONCLUSIONS**

*From the information gathered, the following findings are made. These findings should not be read as apportioning blame or liability to any particular organisation or individual.*

- 3.1 The causal factor of this occurrence was AB2 ascending a vertical ladder without connecting his safety harness to a strong point/ fall arresting device.
- 3.2 A damp and wet cargo hold, wet gloves and slippery surface of the ladder from seawater wash, physical activities performed by AB2 followed by his immediate climb up the vertical ladder to exit the cargo hold were likely to have affected his ability to grip the ladder effectively.
- 3.3 Risk assessment carried out as per the company's Safety Management System for cargo hold washing operations did not identify the risk of falling from height during climbing up or down the vertical ladder.

#### **4 SAFETY ACTIONS**

*During the course of the investigation and through discussions with the investigation team, the following safety action was initiated by the shipping company.*

4.1 Following the incident, the Company implemented the following preventive measures:

- Sharing of information and highlighting the circumstances of the accident with all crew members of its fleet of vessels;
- Equipped all vessels with a fall arresting device to be used when performing tasks involved in climbing on ladders of height of more than 2 m; and
- Increasing the frequency of audit and oversight of its fleet to ensure effectiveness of risk assessments conducted on board.

## 5 SAFETY RECOMMENDATION

*A safety recommendation is for the purpose of preventive action and shall in no case create a presumption of blame or liability.*

- 5.1 The company should revise its Safety Management System in order to ensure Risk Assessments and Permits to Work include risk mitigating measures of connecting safety harness to a strong point or fall arresting device, and supervision of personnel whenever there is a risk of falling from height above 2 m. **[TSIB-RM-2018-001]**

**End of Report**