Final Report

MAN OVERBOARD

MANDARIN GRACE

AT STRAIT OF ÇANAKKALE, OFF AEGEAN SEA, TURKEY

ON 23 August 2019

MIB/MAI/CAS.068

Transport Safety Investigation Bureau
Ministry of Transport
Singapore

3 June 2021

The Transport Safety Investigation Bureau of Singapore

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

TSIB conducts marine safety investigations in accordance with the Casualty Investigation Code under SOLAS Regulation XI-1/6 adopted by the International Maritime Organization (IMO) Resolution MSC 255(84).

The sole objective of TSIB's marine safety investigations is the prevention of marine accidents and incidents. The safety investigations do not seek to apportion blame or liability. Accordingly, TSIB reports should not be used to assign blame or determine liability.

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SYNOPSIS

On 23 August 2019, the Singapore flagged bulk carrier Mandarin Grace (MG) was enroute from Pohang, Republic of Korea to the port of Rota, Turkey (via transit through the Strait of Çanakkale) for the discharge of its cargo. During the approach to the Pilot station for the vessel's transit, the Bosun (BSN) who was being assisted by two crew, fell overboard while rigging the combination ladder (a combination of the pilot ladder and the accommodation ladder) in preparation for the boarding of Pilot.

The vessel reported the occurrence to the Turkish Straits Vessel Traffic Service (TSVTS) while concurrently carrying out man overboard (MOB) recovery manoeuvres. The Turkish Coast Guard responded for the search and rescue (SAR) operations with two rescue boats and one helicopter, but the BSN could not be located. MG was subsequently instructed by the TSVTS to drop anchor outside the Strait of Çanakkale for inspection and investigation formalities.

The Transport Safety Investigation Bureau classified the occurrence as a very serious marine casualty.

At the request of the Pilot Control Station, the ship's crew were attempting to rig a combination ladder, despite the freeboard being less than 9m. The investigation revealed that it is highly probable that the lower platform of the accommodation ladder was very close to the waterline. The BSN had likely lost his balance when standing on the lower platform when the sea swell of about 2m came into contact with lower platform. The BSN was not wearing personal protective equipment (PPE) such as a flotation device or a safety harness while working on the accommodation ladder. The Company's SMS had not specified that rigging the accommodation ladder was considered as work over-side, which required these PPE to be donned. There was no risk assessment or toolbox meeting carried out to mitigate the risks of falling overboard.

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VIEW OF THE VESSEL[1]

DETAILS OF THE VESSEL

Name	Mandarin Grace (MG)		
IMO Number	9569267		
Call Sign	9V8352		
Classification society	China Classification Society (CCS)[2]		
Ship type	Bulk carrier		
Year Built	2011		
Operators / ISM[3] Managers (Company)	Mandarin Grace Shipping Pte Ltd / Dasin Shipping Pte. Ltd.		
Gross tonnage	33,034GT		
Length overall	189.99m		
Breadth	32.26m		
Moulded Depth	18.00m		
Designed Draught	13.07m	Actual Mean Draught	9.35m
Summer Freeboard[4]	5.20m	Actual Freeboard	8.65m
Main engine(s)	MAN - B & W, Type 6S50MC NCR 9480Kw*127RPM		
Propellers	4 Bladed, Right-handed, Dia. 6.0m, Fixed Pitch 3983mm		

[1] Photo referenced from www.marinetraffic.com.
[2] CCS was also the Recognised Organisation (RO) for carrying out International Safety Management (ISM) audit and issuance of ISM related certificates.
[3] As per the ISM Code for the safe operation of ships and for pollution prevention – ISM Code.
[4] Freeboard of a vessel is the distance measured from the waterline to the upper edge of the deck level.

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1 FACTUAL INFORMATION

All times used in this report are Local Time (LT) unless otherwise stated. Turkey is three hours ahead of Coordinated Universal Time (UTC).

1.1 Narrative

1.1.1 Mandarin Grace (MG) departed Pohang, South Korea on 14 July 2019 with approximately 35,420MT of steel coils to be discharged in Turkey (Rota followed by Gemlik), Slovenia (Koper) and Italy (Ravenna). Thereafter, MG arrived at the Strait of Çanakkale, Turkey on 23 August 2019 at 0030H and drifted outside the Strait.

1.1.2 At about 0730H, MG proceeded to Çanakkale Pilot Station with an estimated time of arrival of about 1030H. The Bridge was manned by the Master, the Third Officer (3O) as the Officer of the Watch (OOW) and an Able Seafarer Deck (ASD) at the helm. The vessel was requested by the Pilot Control Station to arrange for a combination ladder[5] on the vessel's port side, 1m above the water. The 3O relayed the information to the Bosun (BSN) accordingly at about 0830H on the walkie talkie.

1.1.3 Between 0830H and 0920H, the BSN was on deck with two Ordinary Seamen (OS-1 and OS-2) to prepare the combination ladder. According to the OS-1, the BSN went down to the accommodation ladder with the remote control for controlling the movement of the accommodation ladder and instructed the OS-1 to lower the pilot ladder. The OS-1 recalled that when the accommodation ladder and pilot ladder were in position (aligned), the BSN instructed the OS-1 to secure the pilot ladder on deck and to prepare the magnets[6] (see **figure 1**) to be lowered down. According to the Company the lower platform at the time of occurrence was reportedly about 2-3m above the water level.

[5] Requirements as per SOLAS Chapter V, regulation 23 (Pilot transfer arrangements) – 3.3.2 an accommodation ladder in conjunction with the pilot ladder (i.e. a combination arrangement), or other equally safe and convenient means, whenever the distance from the surface of the water to the point of access to the ship is more than 9m. The accommodation ladder shall be sited leading aft. When in use, means shall be provided to secure the lower platform of the accommodation ladder to the ship's side, so as to ensure that the lower end of the accommodation ladder and the lower platform are held firmly against the ship's side within the parallel body length of the ship and, as far as is practicable, within the mid-ship half-length and clear of all discharges. The reference of accommodation ladder includes a sloping ladder used as a part of pilot transfer arrangements (Ref: SOLAS V/23.2.5).

[6] The magnets are used to secure the accommodation ladder and pilot ladder to the ship side.

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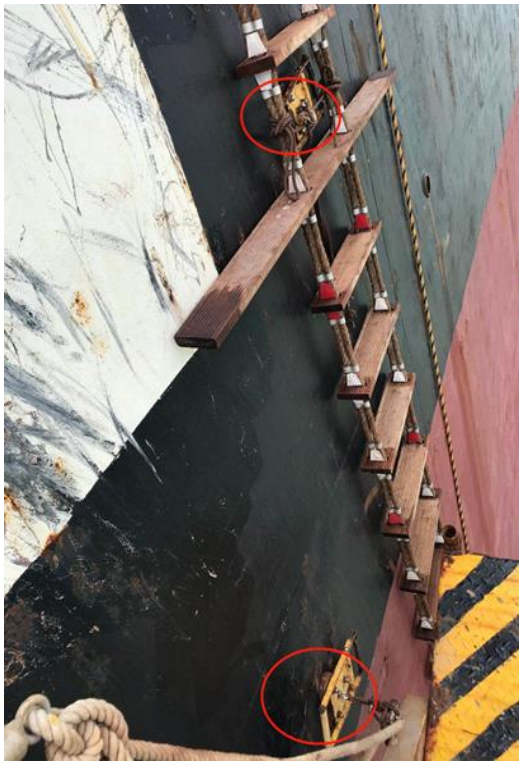

Figure 1 – Magnets arrangement demonstrated after the occurrence as intended to be used on MG – Annotated by TSIB – *(Source: The Company)*

1.1.4 At about 0920H, both the OS-1 and OS-2 recalled hearing a loud sound (rattling of the accommodation ladder). Looking over-side, the duo noted that the BSN had fallen into the sea. Both the OS-1 and OS-2 ran aft to the poop deck and the OS-1 deployed a lifebuoy with self-igniting light and buoyant lifeline[7] (see **figure 2** showing a similar lifebuoy) into the water and went up to the Bridge. While keeping an eye on the BSN, the OS-2 met the Fourth Engineer (4E) who was performing some routine work near the accommodation.

[7] The lifebuoy deployed into the water was unable to be retrieved.

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Figure 2 – Lifebuoy with self-igniting light and buoyant lifeline – *(Source: UEİM[8])*

1.1.5 On learning about the man overboard (MOB) from the OS-2, the 4E noted that the BSN was about 100m from the ship's stern and immediately informed the Bridge using walkie talkie about the MOB situation. The OS-2 subsequently went to the Bridge[9]. The 4E then proceeded to prepare the rescue boat for launching. MG at the time was on a course of 040°T and doing a speed of about 10 knots (kt).

1.1.6 Upon being notified by the 4E at about 0925H, the 3O raised the MOB alarm[10], noted down the ship's position and went to the Bridge wing to keep a lookout. The Master who had the conn at that time instructed for MG to be turned to port for a subsequent recovery (see **figure 3**). The Chief Officer (CO) on hearing the alarm went to the rescue boat station to prepare the rescue boat for launching, and the Second Officer (2O) came to the Bridge.

[8] Turkish Transport Safety Investigation Centre, Ulaşım Emniyeti İnceleme Merkezi (UEİM).
[9] The Bridge composition at this time comprised the Master, 3O, ASD-1, OS-1 and OS-2.
[10] Per Company's Safety Management System (SMS) for recovery of MOB, the emergency alarm signal was three long blasts.

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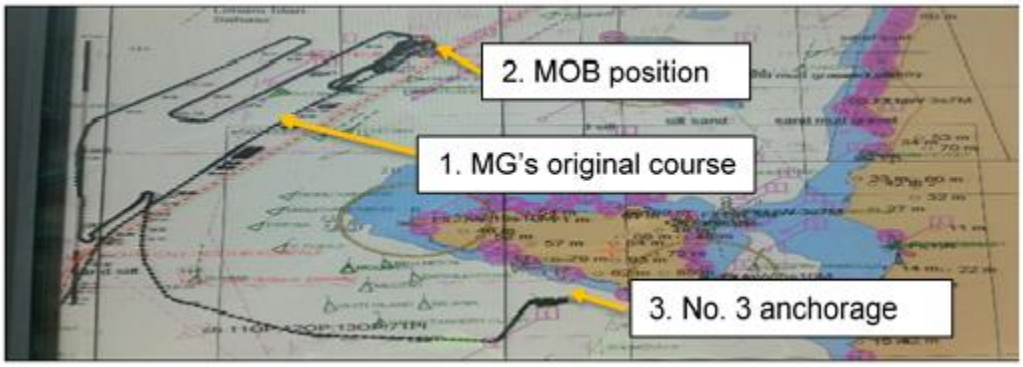

Figure 3 – Course and track of MG – Annotated by TSIB – *(Source: The Company)*

1.1.7 The 2O informed Sector Kumkale of the MOB via VHF Ch 13 and 16 and assisted the Master with manoeuvring the vessel.

1.1.8 Once the rescue boat was ready to launch, the CO relieved the 3O on the Bridge and sent him to the rescue boat station to await orders to launch the rescue boat. The 4E was also on standby at the rescue boat station. The Bridge team was unable to locate the BSN in the water and both the 3O and 4E were asked by the Master to return to the Bridge to assist in the lookout duties[11]. The rescue boat was subsequently not launched and was put on standby.

1.1.9 Distress messages were broadcast subsequently at about 1018H via MF/HF[12] and at about 1025H via VHF[13]. By about 1030H, one rescue boat from the Turkish Coast Guard arrived on-site and commenced search and rescue (SAR) efforts.

1.1.10 By about 1120H another Coast Guard boat arrived. The two Coast Guard boats were supplemented by a SAR helicopter from 1155H to 1245H to carry out a search of the area. At about 1450H, Sector Kumkale instructed MG to stop SAR efforts, and to drop anchor at No. 3 anchorage.

1.1.11 Once MG was anchored, in addition to the Turkish Coast Guard, TSIB's

[11] The Bridge composition at this time comprised the Master, CO, 2O, 3O, 4E, ASD-1, OS-1 and OS-2.

[12] The MF/HF radio works on Medium Frequency:

- Medium Frequency (MF) ranges from 300KHz to 3MHz. The common frequencies used for marine radios are frequencies in the 2MHz band. MF provides mid-range communication services generally less than 200 nautical miles (nm).
- High Frequency (HF) ranges from 3MHz to 30MHz. The frequencies commonly used from marine radios are frequencies in the 4, 6, 8, 12 and 16MHz band. HF provides long range communication services generally more than 200nm.

[13] Very High Frequency (VHF) ranges from 30MHz to 300MHz. The frequency range for marine radios are in the 156 – 174MHz band. VHF is utilised to provide short range communication services, generally about 25nm.

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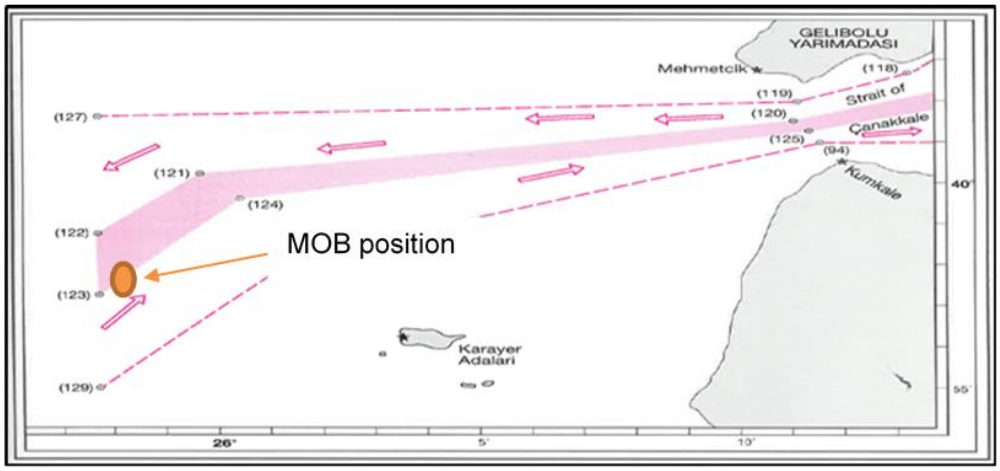
counterparts from the UEİM boarded the vessel at the request of TSIB, to obtain related information and conduct interviews on board regarding the occurrence. Investigators from UEİM confirmed that the three deck crew involved in the rigging of the combination ladder were not wearing a lifejacket and/or safety harness and lifeline at that time of occurrence.

1.1.12 The crew confirmed that prior to the MOB, there was no significant rolling or pitching which could have contributed to the fall.

1.2 Location of occurrence

1.2.1 The Turkish Straits in north western Turkey connect the Aegean Sea and Mediterranean Sea to the Black Sea and consist of the Dardanelles, the Marmara Sea and the Bosporus. The Strait of Çanakkale is a deep channel approximately 32nm[14] linking the Aegean Sea with the Marmara Sea.

1.2.2 According to the IMO's Ships' Routeing, all vessels entering the Turkish Straits (see **figure 4**) are to participate in the reporting system (TUBRAP[15]) established by the competent authority[16] and to avail themselves of the services of a qualified Pilot to comply with the requirements of safe navigation.



[14] Approximately 60km. One nautical mile (nm) is 1.852km.
[15] Turkish Straits Reporting System.
[16] Turkish Straits Vessel Traffic Service (TSVTS) under the authority of the Turkish Coastal Safety and Salvage Administration provides information, navigational assistance and traffic organisation services. Duties include strategic planning, monitoring and managing traffic, the provision of information and assistance, and the coordination of rescue and salvage services. *Source*: https://www.un.org/.

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Figure 4 – Southern approach to Strait of Çanakkale – Annotated by TSIB –
(Source: IMO's Ships' Routeing)

1.3 Meteorological information

1.3.1 MG's Bridge logbook on the date of incident occurrence contained the following weather entries –

Time and weather conditions			
0800H	BF[17] 5		
0900H	BF 5		
1000H	BF 6		
		Force 5 Wind speed 17 – 21kt	Force 6 Wind speed 22 – 27kt

Table 1 – Bridge logbook weather records with BF sea states
(Source: The Mariners' Handbook)

1.3.2 Weather conditions at the time of occurrence were:

- Wind – Direction / Speed: NNE 020° / 24kt (BF 5)
- Current – Direction / Speed: SSW 220° / 2.3kt
- Visibility – Good
- Sea state (swell height) – 2m

1.4 Crew's qualifications, roster and roles

1.4.1 MG had a total of 21 crew including the Master. Three of the crew were from Indonesia and the remaining 18 from the People's Republic of China (PRC). Although the working language was English, the SMS procedures were in Mandarin and English. The Company permitted the use of Mandarin amongst the PRC crew for operational efficiency. Table 2 shows details of the crew

[17] Beaufort Force.

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involved at the time of the occurrence.

Designation on board	Nationality	Age	Qualification	Duration on board (month)	Experience on this type of ship (year)	In rank service (year)	Service w/ Company (contract)
Master	PRC	47	COC[18] – Master, STCW II/2, PRC	4.0	10	10	3
CO	PRC	43	COC – Chief Mate, STCW II/2, PRC	7.1		4	3
2O	PRC	48	COC – Second Mate, STCW II/1, PRC	7.5	6	6	7
3O	PRC	28	COC – Third Mate, STCW II/1, PRC	7.5	2	2	5
Bosun	PRC	43	Deck Rating, STCW II/5, PRC	7.5	3	3	2
OS-1	Indonesia	21	STCW VI/1, Indonesia	7.1	0	0	1
OS-2	Indonesia	21	STCW VI/1, Indonesia	7.1	0	0	1

Table 2 – Crew matrix of MG

1.4.2 The BSN was declared fit for sea service during the pre-employment medical checks. There was no evidence indicating that the BSN was under any medication prior to the occurrence. The BSN's work schedule was that of a day worker. The BSN's work and rest record from 1 August 2019 up to the time of occurrence on 23 August 2019 was in accordance with MLC 2006 requirements[19]. The BSN had reported to the Bridge at 0700H on the day of the occurrence for daily work orders.

1.4.3 From the interviews of both the OSes conducted by UEİM, the investigation team noted that it was the BSN's responsibility to check that the combination ladder was well secured when rigged. The Master's interview confirmed that rigging the combination ladder was a regular job of the BSN and the latter was experienced and well familiarised with the task.

[18] Certificate of Competency according to the Standards of Training, Certification and Watchkeeping (STCW) requirements.

[19] The minimum hours of rest for all seafarers are 10 hours in any 24-hour period; and 77 hours in any 7-day period. Hours of rest may be divided into no more than 2 periods, one of which shall be at least 6 hours in length.

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1.4.4 The two OSes (also day workers) were tasked to work with the BSN. The work and rest records for them indicated that they were in accordance with MLC 2006 requirements. The duo could not speak or understand Chinese but confirmed they could communicate with the BSN in basic English.

1.5 Rigging the combination ladder

1.5.1 According to the VDR recording, the Pilot Control Station requested MG to rig the combination ladder 1m above[20] the water level, although the vessel's freeboard was less than 9m at that time. Based on the information provided to the investigation team by the Pilot Control Station, Pilot boarding arrangements using the pilot ladder or combination ladder are although dependent on the freeboard of the vessel, when the freeboard of the vessel is close to 9m, a combination ladder for the safe embarkation of the Pilot due to the height of climb may be requested by the Pilot Control Station.

1.5.2 The Pilot Control Station further informed the investigation team that if the vessel cannot prepare a combination ladder when the freeboard of the vessel is less than 9m, Pilot will embark the vessel using only the pilot ladder. The request on this occasion was for the safety of the Pilot as the combination ladder would have facilitated a shorter climb for the Pilot. It was still the Master's discretion to accept or reject the request depending on the vessel's ability to make the necessary arrangements.

1.5.3 The investigation team also noted that MG was required to comply with IMO Resolution A.889(21)[21] on Pilot Transfer Arrangements, which required for the lower platform of the accommodation ladder to be in a horizontal position when in use.

1.5.4 The investigation team sought clarification from the flag Administration on the applicability of IMO Resolution A.1045(27)[22] to MG. It was confirmed that this resolution did not apply to MG considering that the equipment and arrangements for pilot transfer were installed prior to 1 July 2012, taking into account that the ship was delivered on 28 Jan 2011, and there were no further

[20] Implies the steps of the Pilot ladder were to be 1m above the water level.
[21] IMO Resolution A.889(21) on **PILOT TRANSFER ARRANGEMENTS** adopted in November 1999 contains recommendations to ensure pilot ladders, mechanical pilot hoists and their arrangements, use and maintenance conform to standards not inferior to those set out in the Annex to the present resolution.
[22] IMO Resolution A.1045(27) on **PILOT TRANSFER ARRANGEMENTS** was adopted in November 2011. MG was delivered in January 2011 and hence not required to comply with the requirements of IMO Resolution A.1045(27). In accordance with IMO Resolution A.1045 (27), the lower platform of the accommodation ladder should be in a horizontal position and secured to the ship's side when in use. The lower platform should be a minimum of 5m above sea level. Revokes IMO Resolution A.889(21).

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major modifications post-delivery, which require full replacement of existing equipment and arrangements as installed.

1.5.5 The investigation team also sought a similar clarification from CCS which confirmed that MG is not required to undergo modifications to achieve compliance with IMO Resolution A.1045(27).

1.5.6 Notwithstanding the above, the investigation team documented and illustrated MG's approved combination ladder arrangement plan (see **figures 5a – 5b**) with respect to her freeboard.

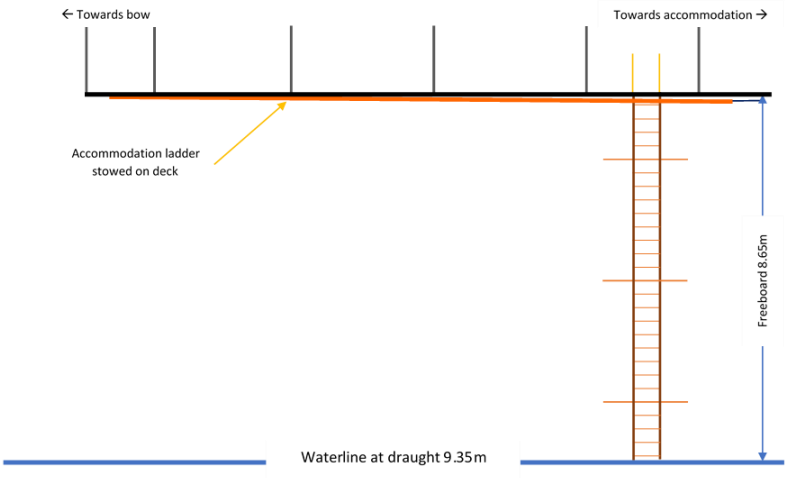

Figure 5a – Scaled illustration of accommodation ladder in stowed position at the prevailing draft

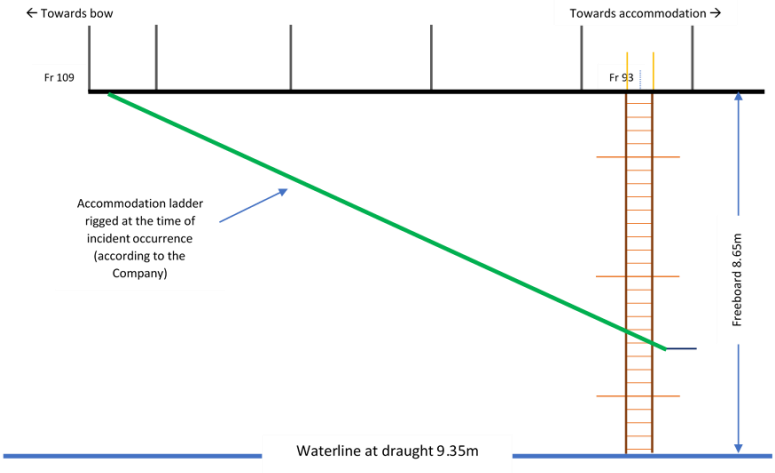

Figure 5b – Scaled illustration of combination ladder rigged with a freeboard of 8.65m. The accommodation ladder overlaps the rigged pilot ladder, at a height of 2.5m above the waterline

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1.5.7 It was also determined by the investigation team that in order for the Pilot to embark MG using the combination ladder with the freeboard of about 8.65m, the accommodation ladder would have to be lowered until the lower platform does not overlap the pilot ladder, bringing the lower platform very close to the waterline (see **figure 6**).

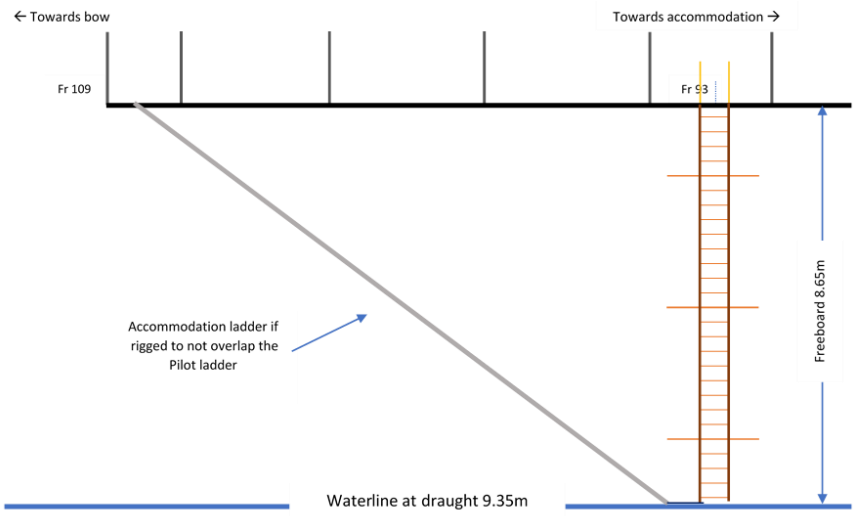

Figure 6 – Scaled illustration of accommodation ladder not overlapping the rigged pilot ladder, and the lower platfrom very close to waterline

1.6 The Company's SMS procedures

1.6.1 The Company operated as an in-house ship management arm of the parent Company and managed a total of 19 Supramax[23] bulk carriers engaging in worldwide trade.

1.6.2 A Document of Compliance certificate was issued to the Company by CCS on 5 December 2017 and valid until 4 December 2022.

1.6.3 A Safety Management certificate was issued by CCS to MG on 28 December 2015 and valid until 27 December 2020.

1.6.4 There was a personal protective equipment (PPE) matrix (see **figure 7**) which stated that crew working over-side were required to don a safety harness, lifeline, work vest (see **figure 8**) and have a lifebuoy on standby. At the time of the occurrence, the BSN had not donned a safety harness and lifeline nor a work vest when descending the accommodation ladder. Both the OSes

[23] From www.bulkcarrierguide.com/size-range.html – Medium-sized vessels ranging from 50,000 to 61,000 DWT (deadweight is a measure of the vessel's ability to carry cargo, stores, ballast water, provisions, etc.).

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confirmed that at the time of occurrence, neither of them had worn a safety harness.

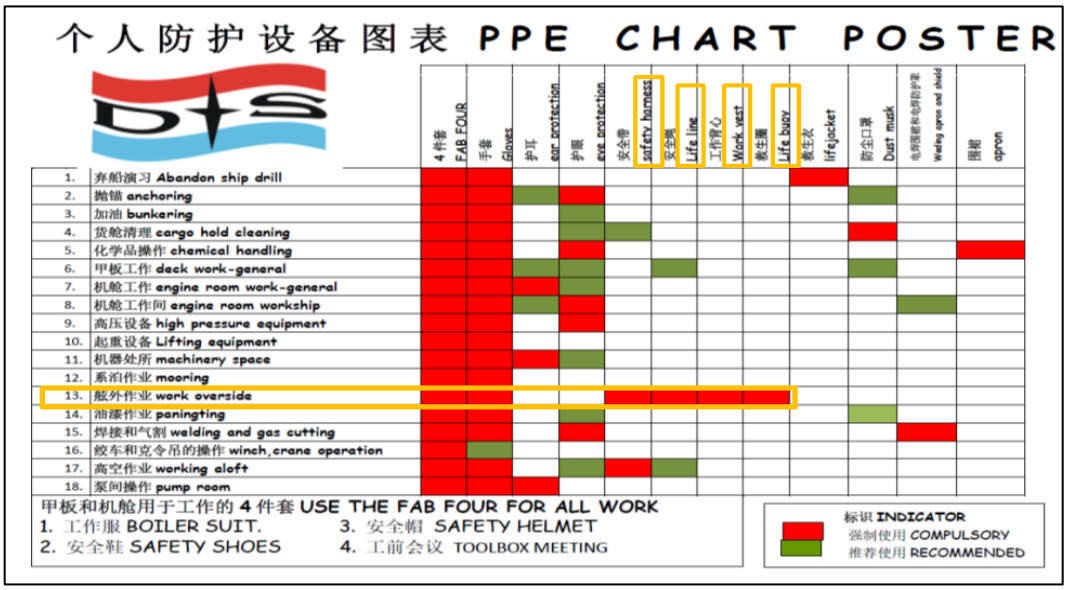

Figure 7 – PPE matrix – Annotated by TSIB – *(Source: The Company)*

1.6.5 As per the PPE matrix, a toolbox meeting was also required to be done for any work listed. According to the interviews obtained by UEİM, the crew were unable to recall whether a toolbox meeting was carried out on the day or for the previous times the accommodation ladder or the pilot ladder was rigged.

1.6.6 The ship was provided with work vests which were kept in the vicinity but had not been used by any of the crew on the day of the occurrence (see **figure 8**). It could not be established whether this non-usage of work vest was a practice on the ship in the past.

Figure 8 – Work vest provided on board MG – *(Source: UEİM)*

1.6.7 As per the SMS, the Company had identified falling into the water while working over-side as a risk. Additionally, a checklist (C-02) for working aloft / over-side, which although did not specifically include rigging a pilot ladder or

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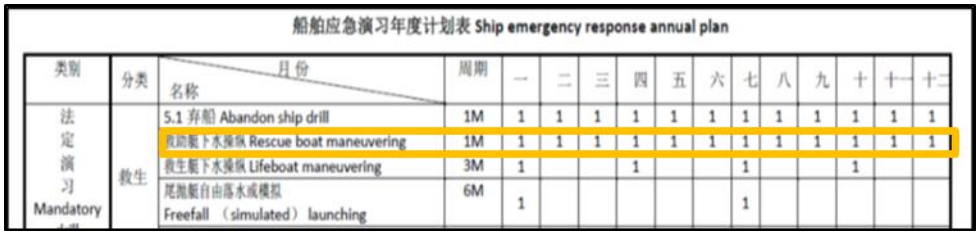
combination ladder, required the conduct of a risk assessment of the proposed work to be carried out. This checklist further required the use of a safety harness and lifejacket when working over-side. The last record of this checklist being used on MG was on 15 August 2019 for an unrelated task (not for rigging the ladder). There was also no documentary evidence that a risk assessment was done prior to rigging the combination ladder.

1.6.8 The investigation team was provided with documentation and declaration by the crew that they were familiar with the Company's SMS and aware of their duties.

1.6.9 The CO was responsible for the monthly maintenance and inspection of the accommodation ladder and pilot ladder. The investigation team sighted records for three months prior to the occurrence. The last inspection was carried out on 1 August 2019 and the accommodation ladder and pilot ladder were in operational condition and no defects had been reported.

1.6.10 The lower platform of the accommodation ladder was made of a chequered plate (for anti-skid[24] purpose) painted with anti-skid paint.

1.6.11 According to the annual drill schedule of the SMS (see **figure 9**), MOB drills were to be conducted quarterly. MG had carried out emergency drills for MOB on 4 July and 16 August 2019, and actions taken were also documented as per what were required in the muster list. All the crew on board MG at the time of the occurrence had participated in these two drills.



船舶应急演习年度计划表 Ship emergency response annual plan

类别	分类	月份 / 名称	周期	一	二	三	四	五	六	七	八	九	十	十一	十二
法定演习 Mandatory	救生	5.1 弃船 Abandon ship drill	1M	1	1	1	1	1	1	1	1	1	1	1	1
		救助艇下水操纵 Rescue boat maneuvering	1M	1	1	1	1	1	1	1	1	1	1	1	1
		救生艇下水操纵 Lifeboat maneuvering	3M	1			1			1			1		
		尾抛艇自由落水或模拟 Freefall （simulated） launching	6M	1						1					

Figure 9 – MG's drills schedule – Annotated by TSIB – *(Source: The Company)*

[24] IMO resolution MSC.1/Circ.1331 (Guidelines for construction, installation, maintenance and inspection/survey of means of embarkation and disembarkation). Industry practice from The Shipowners' Club and Classification Societies (DNV GL and ABS, documents 'Offshore gangways, September 2017' and 'Guide for certification of offshore access gangways, August 2016' respectively recommend that the surfaces of the *'walkway, treads and steps shall be of/coated with hard-wearing, oil resistant non-slip surface/coating'*. Gangway is a common term for accommodation ladders.

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1.7 Life Saving Appliances (LSA)

1.7.1 According to MG's LSA Plan, the vessel had a total of 14 lifebuoys with the following distribution –

Lifebuoy feature	**Location**	
Lifebuoy with light and smoke signal (MOB buoy)	Bridge deck (port) x 1	Bridge deck (starboard) x 1
Lifebuoy with self-igniting light[25]	Forecastle deck (port) x 1	Forecastle deck (starboard) x 1
	Upper deck forward of gangway (port) x 1	Upper deck forward of gangway (starboard) x 1
	Upper deck aft of gangway (port) x 1	Upper deck aft of gangway (starboard) x 1
Lifebuoy with buoyant lifeline (37m)	'B' deck (port) x 1	'B' deck (starboard)) x 1
Lifebuoy	Upper deck aft (port) x 1[26]	Upper deck aft (starboard) x 1
	Upper deck (in Suez room) x 2	

Table 3 – Distribution of lifebuoys as per MG's LSA plan

1.7.2 The lifebuoy deployed by the OS-1 was provided with a self-igniting light, buoyant lifeline (see **figure 2**) and was fitted on the port side aft shipside railing. This lifebuoy was lost and subsequently replaced by another on board.

1.7.3 MG had a fibre reinforced plastic (FRP) rescue boat which was located on "A" deck at the starboard side and had a capacity of six persons. The rescue boat was prepared for launching after the MOB but was not launched.

1.7.4 LSA items such as lifebuoys and rescue boat were inspected on a weekly and monthly basis, as required by SOLAS[27] and records maintained on board using a checklist, as part of the SMS. There were no known defects of any of the items recorded in the checklist.

[25] SOLAS Chapter V, regulation 23.7.1.2 (Pilot transfer arrangements) states that when persons are being transferred, a lifebuoy equipped with a self-igniting light is to be provided. Near the Pilot transfer arrangements, two lifebuoys were provided with self-igniting lights.
[26] The lifebuoy deployed by the OS-1 was fitted in this location.
[27] SOLAS III/20, as amended

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1.8 Additional information

1.8.1 UEİM requested the crew of MG to simulate the rigging of the combination ladder and took a video footage[28] of the process (see video screen grabs in **figure 10a**). Typically, the accommodation ladder was first rigged, thereafter the pilot ladder lowered from the main deck and secured to the main deck using shackles after estimating the height of the pilot ladder above the water level. (see **figure 10b**).

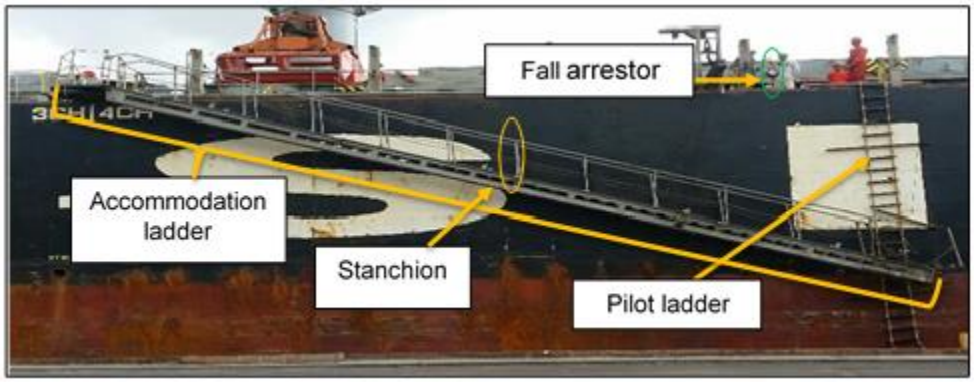

Figure 10a – Simulated rigging of the combination ladder with fall arrestor – Annotated by TSIB – *(Source: UEİM after the occurrence)*

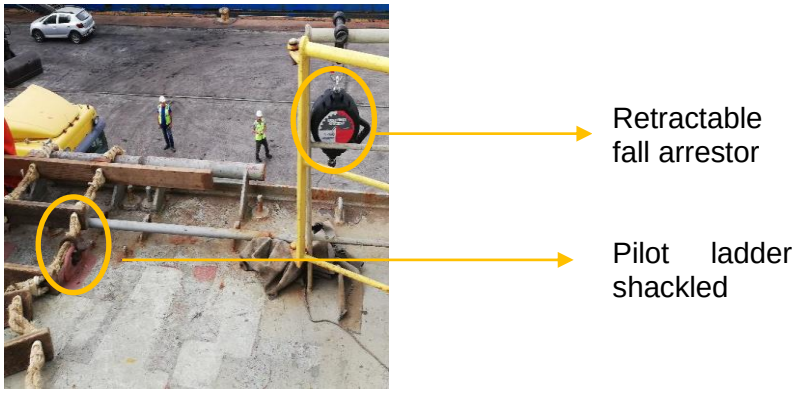

Figure 10b – Pilot ladder shackled on the main deck and retractable fall arrestor on main deck railing – Annotated by TSIB – *(Source: UEİM after the occurrence)*

1.8.2 During the simulation, the crew first lowered the accommodation ladder from the main deck level. Two crew each wearing a safety harness with an attached lifeline were on the ladder. One crew (Crew A) secured the lifeline to the retractable fall arrestor which was shackled on the ship's deck railing near the

[28] The video footage was provided to TSIB.

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lower end of the accommodation ladder (towards the pilot ladder) as per **figure 10b,** while the other (Crew B) remained near the top of the accommodation ladder. Crew A then raised the collapsible stanchions, railings and ropes running the length of the accommodation ladder.

1.8.3 During the process, Crew A was seen removing the lifeline from the fall arrestor as it restricted the movements and the ship's officer reminded Crew A to re-attach the lifeline to the fall arrestor (see **figure 10c**).

Figure 10c – Ship's officers reminding Crew A to connect the lifeline to the fall arrestor – *(Source: UEİM video screen grab)*

1.8.4 The investigation team observed from the video footage that the fall arrestor was fitted to the end of the railing on deck which did not stretch along the length of the accommodation ladder. With the fall arrestor fitted to this railing, the cable of the fall arrestor attached to the crew's lifeline would be slanting when the crew moved along the accommodation ladder (see **figure 10d**). To reduce the slant of the fall arrestor cable when the crew moved along the accommodation ladder, another crew would have to reattach the fall arrestor to another suitable point on deck. It was further observed that Crew B's lifeline was not connected to any strong point.

Figure 10d – Crew standing on the lower platform with the lifeline connected to the fall arrestor – *(Source: UEİM video screen grab)*

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1.8.5 MG was provided with two magnets[29], each tied to a piece of rope. The magnets were for securing the pilot ladder and the accommodation ladder to the hull to prevent lateral movement.

1.8.6 In practice, according to the Company, once the pilot ladder is rigged, the magnets would be lowered to the BSN (see **figure 11**) who would stand on the lower platform of the accommodation ladder and 'affix' one magnet to the accommodation ladder and the other to the pilot ladder. At the time of the occurrence, the magnets were still on deck as the two OSes were still in the process of securing the pilot ladder on deck with shackles.

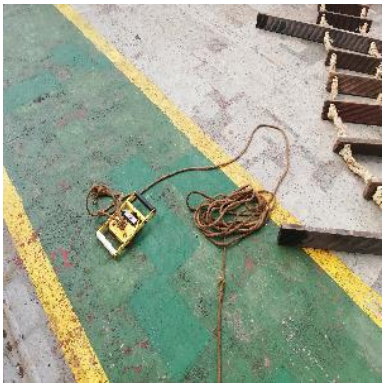

Figure 11 – Magnet with lowering rope – *(Source: UEİM)*

1.8.7 The investigation team also noted that although a fall arrestor was provided on board, there were no requirements for it to be inspected on a regular basis.

[29] The magnets were resin encapsulated neodymium magnet elements make and had been provided on board since 10 March 2016.

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2 ANALYSIS

2.1 The BSN's fall into the water

2.1.1 In the absence of a witness account to the actual occurrence, the investigation team attempted to establish how the BSN may have fallen into the water. The deck crew (OS-1 and OS-2) had last seen the BSN (who was not wearing a suitable flotation device or a safety harness and lifeline in accordance with the PPE matrix) making his way down to the accommodation ladder, after it had been lowered from the deck level and the railings had been erected. It was a practice for the deck crew to lower the magnets to the BSN to secure the pilot ladder and accommodation ladder to the hull.

2.1.2 As can be seen in **figure 5b**, the lower platform of the accommodation ladder would be overlapping the pilot ladder with a freeboard of about 9m and to maintain 2.5m above the waterline (according to the Company stated in paragraph 1.1.3), which is unsafe for a Pilot to embark. For the accommodation ladder not to overlap the pilot ladder, it would have to be lowered further to a position where the lower platform is very close to the waterline as illustrated in **figure 12**. Hence, to facilitate embarkation of the Pilot, it is highly probable that the BSN had lowered the accommodation ladder causing the lower platform to be very close the waterline.

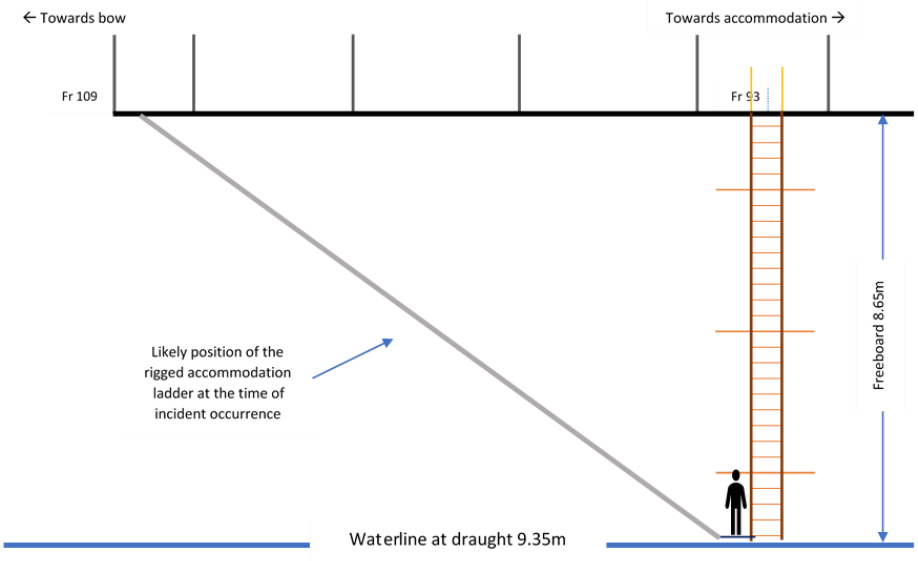

Figure 12 – Scaled illustration of the position of accommodation ladder likely rigged at the time of occurrence, with the lower platform very close to the waterline – *(Note: Person not to scale)*

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2.1.3 The swell at that time was about 2m and recalling that the OS-1 heard a sound and rattling of the accommodation ladder, it is plausible that while the BSN was on the lower platform in the process of rigging the accommodation ladder, the swell may have come into contact with the lower platform which was very close to the waterline, and caught the BSN unaware, causing him to lose balance and fall into the water.

2.2 Safety aspects of rigging the ladder and the Company's PPE requirements

2.2.1 Rigging the accommodation ladder on MG is no different from most ships of this size. There is always a risk of falling overboard when working on the ladder. The PPE matrix stipulated that working over-side required the crew to wear a safety harness, lifeline and a work vest. However, the checklist (C-02) for working aloft / over-side did not specifically include rigging a pilot ladder or combination ladder.

2.2.2 Although rigging the accommodation ladder was not specifically mentioned in this category of tasks, the risk of falling overboard during such a process is ever present. Despite this risk and being an experienced seafarer, the BSN had not donned a suitable flotation device or had a safety harness and lifeline connected to a strong point, while working / standing on the ladder.

2.2.3 Correlating the observations by UEİM during the simulated rigging of the combination ladder, it was evident that the crew (OS-1 and OS-2) were unfamiliar with the PPE to be donned while rigging the combination ladder safely and they had to be reminded by the ship's officers to connect the safety harness and lifeline to the fall arrestor. This seems to suggest that it was not a practice on board MG to use the fall arrestor when performing this task. It was likely that, despite being on board for approximately seven months, the crew (the BSN, OS-1 and OS-2) too had not taken the importance of using a fall arrestor, a safety harness, lifeline and a suitable flotation device for rigging the combination ladder safely into consideration, while performing the work.

2.2.4 The accommodation ladder, by nature of its design is lowered at an angle from the main deck. This means that connecting the safety harness with lifeline (typically 1m in length) to the railing on deck is not possible. However, connecting the safety harness with the lifeline to the railings of the accommodation ladder requires frequent connections/disconnections from the railings.

2.2.5 While such an arrangement minimises the risk of falling overboard, it requires

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repeated connection and disconnection of the lifeline of the safety harness and does not offer any protection if the wire of the accommodation ladder itself were to break. That is, with only the safety harness and lifeline connected to the railings of the accommodation ladder, the person would fall into the water together with the accommodation ladder should the wire holding the accommodation ladder fails. A retractable fall arrestor capable of being connected to an anchor point which moves along the main deck railing as the crew moves laterally, offers a safer alternative as the lifeline can stay connected to a strong point at all times.

2.3 Pilot transfer arrangements

2.3.1 At the time of the occurrence, MG's freeboard was about 8.65m with a mean draught of about 9.35m.

2.3.2 The accommodation ladder was built and fitted in accordance with IMO Resolution A.889(21) which was applicable at the time of MG's delivery and was not subject to the new requirements adopted by IMO Resolution A.1045(27), for the lower platform to have a minimum of 5m above the waterline, amongst others.

2.3.3 When MG received the request from the Pilot Control Station, there was no verification by officers on board as to whether the combination ladder could be rigged safely for the prevailing freeboard.

2.3.4 Had a verification been done, the officers would have been able to establish that the lower platform of the accommodation ladder would be very close to the waterline, as indicated in paragraphs 1.5.7 and 2.1.2, which would pose a risk to the person standing on the platform. Accordingly, for the safety of the person rigging the accommodation ladder and the person embarking, the Master or OOW of MG should have declined the request of combination ladder by the Pilot Control Station.

2.3.5 While the views of the Pilot Control Station were noted vis-à-vis the Master's decision to accept or reject the request for a combination ladder when the freeboard was less than 9m, it must be noted that such a request could create an undue pressure on the part of the ship's crew to comply.

2.3.6 Accordingly, there is merit for the SMS to empower the Master or OOW to decline requests from shore authorities whenever there is a risk in providing combination ladder for embarkation / disembarkation, especially when

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coordinating pilot transfer arrangements.

2.4 Actions taken during MOB

2.4.1 The OOW and Master became aware of the MOB on being notified by the 4E, by which time about five minutes had elapsed. It is uncertain whether an earlier notification by the crew (the OS-1 and OS-2) would have been instrumental in the survival of the BSN. However, neither of the two OSes had a walkie-talkie with them, which if available, could have been used by them to notify the MOB to the bridge early. Alternatively, either of the two OSes could have raised the alarm from a telephone located in accommodation nearest to them to alert the bridge of the MOB occurrence, instead of physically going up to the bridge.

2.4.2 The investigation team noted that deploying the lifebuoy from the poop deck was considered appropriate, even though there was a lifebuoy near the location of the fall. This was because MG was underway at a speed of 10kt and the BSN's location was about 100m away from the vessel within a short period.

2.4.3 At the time of the occurrence, MG was transiting the Turkish Straits. On being notified of the occurrence, the Master's actions to report to TSVTS (and carried out actions as advised) resulted in two rescue boats and one helicopter to render assistance. As such the decision not to launch the rescue boat in a busy strait is understandable.

2.5 Incidental observations

2.5.1 The investigation team noted that MG was provided with a retractable type fall arrestor, which was connected to the end of the deck railing (see **figures 9a-9d** and **13a**). The Company's SMS did not contain any specific procedures on how and where this fall arrestor was to be attached. Reviewing the video footage provided by UEİM during the simulated rigging of the combination ladder, it is also noted that the sections of the railing did not permit the fall arrestor to extend or move freely with the crew as the crew moved on the accommodation ladder.

2.5.2 In the absence of a continuous railing / fixed wire on deck, the crew would have to shift the fall arrestor at every section of the deck railing, thus defeating the purpose of having a fall arrestor for the safety of the crew.

2.5.3 The investigation team further noted that attaching the retractable fall arrestor

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at a single shackled anchor point on the railing could subject the crew to a swing fall[30] should the crew lose their footing (see **figure 13a**). In addition, the swing fall distance[31] is affected by the crew's position from the anchor point.

2.5.4 The further the crew moves away from the anchor point, the greater arc swing and the greater clearance required for the crew to be safe from any obstructions. The swinging motion could result in injuries. To minimise swing fall, the fall arrestor should be placed as directly above the crew as possible.

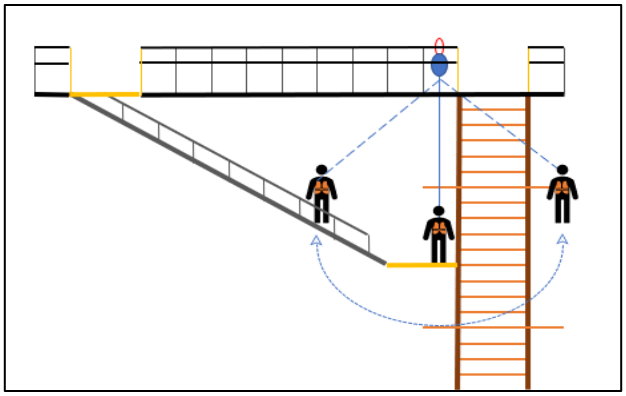

Figure 13a – Possible swing positions of a crew if the safety harness is attached to the retractable fall arrestor at a single fixed point as on the case of MG – Illustration by TSIB *(Not to scale)*

2.5.5 It is thus desirable to have a continuous rigging arrangement which allows the fall arrestor to move on the deck railing along the length of the accommodation ladder. As the crew descends/ascends the accommodation ladder, the fall arrestor moves along the deck railing. Such a continuous rigging arrangement of the fall arrestor would ensure that the crew is always connected to a strong point and is below the fall arrestor (see **figure 13b**) minimising the risk of swing fall.

[30] Defined from www.worksafe.com.sg – A pendulum-like motion that can occur when the operator falls and their connector device is in a position located horizontally away from the anchorage point. This is most likely to occur when connected to an anchorage point that is not positioned directly overhead.
[31] The difference in height from the time of fall to the point when the crew hits an object along his swing path.

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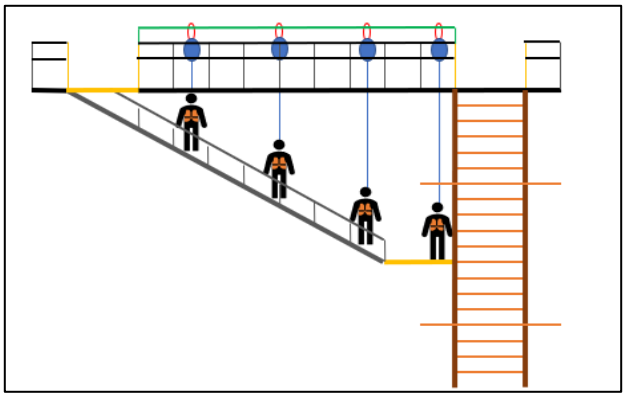

Figure 13b – Rigging arrangement where the retractable fall arrestor moves[32] along the deck railing when the crew moves along the accommodation ladder – Illustration by TSIB *(Not to scale)*

2.5.6 It is further noted that the Company considered rigging of embarkation arrangements as a routine task and did not require the crew to conduct a risk assessment. While rigging ladders may be routine in nature, it is not devoid of risks which may be different than the previous time. There was no evidence of a toolbox meeting conducted on the day of the occurrence, as required. It is desirable that all potential hazards are identified, and risks mitigated by at least a toolbox meeting on-site, while ensuring that the crew follow the requirements contained in the PPE matrix.

[32] Care must be taken to ensure that this movement is not free running, e.g. use of a system of carabiners and wire locks (cabloc).

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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 At the time of the occurrence, it is highly probable that the combination ladder was rigged with the lower platform of the accommodation ladder very close to the waterline. The BSN was on the lower platform without a suitable flotation device or a safety harness and lifeline connected to the ship. It is probable that the prevailing swell of 2m came in contact with the lower platform, causing the BSN to lose balance and fall into the water.

3.2 Rigging the accommodation ladder involves working over-side and carries an inherent risk of falling overboard. The SMS had recognised the risk of falling into the water for working over-side but this did not include rigging a combination ladder or a pilot ladder.

3.3 There was no risk assessment carried out for rigging the combination ladder and no toolbox meeting conducted, possibly as a result of the rigging of embarkation arrangements being treated as a routine task. There is merit to conduct a toolbox meeting on-site to ensure that the necessary checks and safety precautions are implemented i.e. to mitigate the risk of falling overboard.

3.4 The importance of using a safety harness with lifeline and a suitable flotation device for rigging the combination ladder safely, had not been taken into consideration for performing the work safely. Similarly, the use and purpose of the fall arrestor on board MG were underestimated and there were no provisions to rig the fall arrestor safely.

3.5 The Pilot Control Station's request for MG to prepare a combination ladder, despite the vessel's freeboard being less than 9m was acceded to by the ship's crew and there was no attempt to verify the appropriateness of the pilot transfer arrangements for the prevailing freeboard and weather conditions.

3.6 With the freeboard of 8.65m (below 9m), a pilot ladder should be sufficient for the safe embarkation of the Pilot. The Master and OOW must be empowered to decline requests from shore authorities when accommodating the request for a combination ladder for embarkation poses a risk to the crew rigging the combination ladder.

3.7 There was a delay in notifying the bridge of the MOB occurrence as the deck crew did not have walkie-talkies with them. Regardless, efforts to notify the bridge by the quickest means should be made.

3.8 The retractable fall arrestor on MG, although was intended to be used as desired, had limitations on where it could be connected. The Company's SMS

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did not specify on how the fall arrestor was to be fitted and used. There were no means for a rigging arrangement to ensure that the crew were directly underneath the fall arrestor at any given time when moving along the accommodation ladder to minimise the risk of swing fall.

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4 SAFETY ACTIONS

Arising from discussions with the investigation team, the organisation has taken the following safety action.

4.1 The SMS procedures on working aloft and outboard, specifically for rigging of pilot ladder was expanded to include drowning as a risk. The procedure was further amended to indicate that crew assigned for the task of rigging the pilot transfer arrangements should use a safety harness and to wear a lifejacket.

4.2 The SMS was further amended to ensure that any work outboard was to be carried out when the vessel is moving at slower than 5kt. When the vessel's speed is greater than 5kts, the outboard operation shall be prohibited, or reported to the Company for approval.

4.3 The Company made a warning sign to alert crew rigging the combination ladder to always wear safety harnesses and lifejackets and fixed it at the site.

4.4 The Company introduced a new SMS requirement which enabled the Master and duty officer to refuse requests from Pilot Station/Port Control if the pilot transfer arrangements with regard to the vessel's design constraints render such arrangements as unsafe for the Pilot's embarkation and crew rigging the ladder.

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5 SAFETY RECOMMENDATIONS

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

5.1 For the Company

5.1.1 To ensure rigging of pilot transfer arrangements is done appropriate to the prevailing freeboard and weather conditions. **[TSIB Recommendation RM-2021-022]**

5.1.2 To ensure a toolbox meeting is carried out on-site so that risks are identified prior to commencement of the rigging of the pilot transfer arrangements. **[TSIB Recommendation RM-2021-023]**

5.1.3 To include provisions in the Company's SMS for ensuring the fall arrestor is rigged appropriately and used for tasks where there is a risk of falling overboard or from a height. **[TSIB Recommendation RM-2021-024]**

5.1.4 To consider having a continuous rigging arrangement for the fall arrestor to ensure that the crew stay connected to the ship and are directly underneath the fall arrestor when working along the length of the accommodation ladder. **[TSIB Recommendation RM-2021-025]**

5.1.5 To include a provision in the Company's SMS in order to ensure crew use quickest available means to report emergency situations for prompt response. **[TSIB Recommendation RM-2021-026]**

- End of Report -

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