REPUBLIC OF THE MARSHALL ISLANDS

Maritime Administrator

CHRIS CASUALTY INVESTIGATION REPORT

Seafarer Lost Overboard

Baltic Sea | 24 May 2018

Official Number: 4472

IMO Number: 9381172

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AUTHORITY

An investigation, under the authority of the Republic of the Marshall Islands laws and regulations, including all international instruments to which the Republic of the Marshall Islands is a Party, was conducted to determine the cause of the casualty.

Maritime Administrator

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PART 1: EXECUTIVE SUMMARY

On 24 May 2018, the Republic of the Marshall Islands-registered bulk carrier CHRIS, managed by Chandris (Hellas) Inc. (the "Company"), entered the Baltic Sea from The Sound[1] on a ballast voyage from Hamburg, Germany to Riga, Latvia. The Bosun, while recovering the combination pilot ladder with the assistance of two Able Seafarers Deck (ASD) 1 and ASD2, fell overboard. He and the ASDs were not wearing lifejackets nor safety harnesses while performing this task. A Search and Rescue (SAR) effort involving Danish and Swedish vessels and helicopters, along with CHRIS and two other merchant ships was unable to locate the Bosun.

The Republic of the Marshall Islands Maritime Administrator's (the "Administrator's") marine safety investigation determined the causal factors that contributed to this very serious marine casualty include:

1. ineffective onboard hazards management as evidenced by not implementing risk control measures identified on the completed pre-task hazards assessments, including:
   (a) not issuing a Working Aloft or Over Side Permit for the recovery of the accommodation ladder;
   (b) the Chief Officer (C/O) assigning the Bosun to supervise the task rather than either supervising it himself or assigning the Second Officer (2/O) to supervise it; and
   (c) not using a lifejacket and safety harness with lifeline; and
2. the existing environmental conditions, including the ambient lighting and the water temperature at the time the Bosun fell overboard.

The Administrator's investigation determined additional causal factors that may have contributed to this very serious marine casualty include the effects of fasting on cognitive function, reaction time, and physical performance.

1 The Sound (or Øresund in Danish, Öresund in Swedish), is the eastern-most passage between Denmark and Sweden leading to the western Baltic Sea.

PART 2: FINDINGS OF FACT

The Findings of Fact are based on the information obtained during the Administrator's marine safety investigation.

1. Ship particulars: *see* chart to right.

2. On the evening of 24 May 2018, CHRIS entered the Baltic Sea from The Sound while on a ballast voyage from Hamburg, Germany to Riga, Latvia. The ship's drafts were 4.3 meters (m) forward and 7.1 m aft. The midships freeboard was about 14 m.

3. The weather was reported as good with clear skies, winds of Beaufort Force 3-4 and seas of 0.5 m. No swell was reported. The visibility was reported as more than 5 nautical miles (NM). Sunrise was at 0445.[2] Sunset was at 2128 and civil twilight ended at 2221.[3]

4. The Company's risk assessment library includes separate risk assessments for rigging and recovering the accommodation ladder and the pilot ladder.

5. In preparation for recovering the combination pilot ladder, a risk assessment for recovering the accommodation ladder was conducted by the C/O and the 2/O, and a second risk assessment for recovering the pilot ladder was completed by the C/O. It was reported that a Working Aloft or Over Side Permit was not issued since the task of recovering the pilot ladder was conducted on the Main Deck.

6. The C/O assigned the Bosun to supervise and participate in the recovery of the combination pilot ladder with assistance from the ASD1 and ASD2. He then conducted a Toolbox Talk with the three crewmembers during which he reviewed the risk assessments that had been completed and the required personnel protective equipment (PPE) that should be worn. In addition to coveralls, gloves, safety boots, and safety helmets, the required PPE included lifejackets and safety harnesses with line.

7. At 2145, The Sound pilot disembarked and the Bosun along with the ASD1 and ASD2 began to recover the combination

SHIP PARTICULARS

Ship Name
CHRIS

Registered Owner
Pyramid Navigation Company E.S.A.

ISM Ship Management
Chandris (Hellas) Inc.

Flag State
Republic of the Marshall Islands

IMO No.	Official No.	Call Sign
9381172	4472	V7XF8

Year of Build	Gross Tonnage
2006	39,736

Net Tonnage	Deadweight Tonnage
25,754	76,629

Length x Breadth x Depth
218 x 32.2 x 19.5 meters

Ship Type
Bulk Carrier

Document of Compliance Recognized Organization
Lloyd's Register

Safety Management Certificate Recognized Organization
Lloyd's Register

Classification Society
Nippon Kaiji Kyokai

Persons on Board
20

2 Unless otherwise stated, all times are ship's local time (UTC +2).

3 Civil twilight is a period of incomplete darkness. In the evening, it begins at sunset and ends when the center of the sun is 6° below the horizon.

pilot ladder, which had been rigged on the port side. All wore safety helmets, coveralls, and safety boots. The Bosun's coveralls were navy blue. None of the seafarers engaged in this task were wearing lifejackets or safety harnesses with line. It was reported that lifejackets and safety harnesses were available.

8. The pilot ladder can be rigged at one of three positions *(see Figure 1)*. The after-most position is used when the ship's freeboard at midships is 9 m or less. The two forward positions are used when the freeboard is more than 9 m and rigging a combination pilot ladder is required.[4] On 24 May 2018, the pilot ladder was rigged in the middle position. Access to the pilot ladder was through an opening in the ship's side rail that could be closed using chains. These chains had to be open when rigging or recovering the pilot ladder.

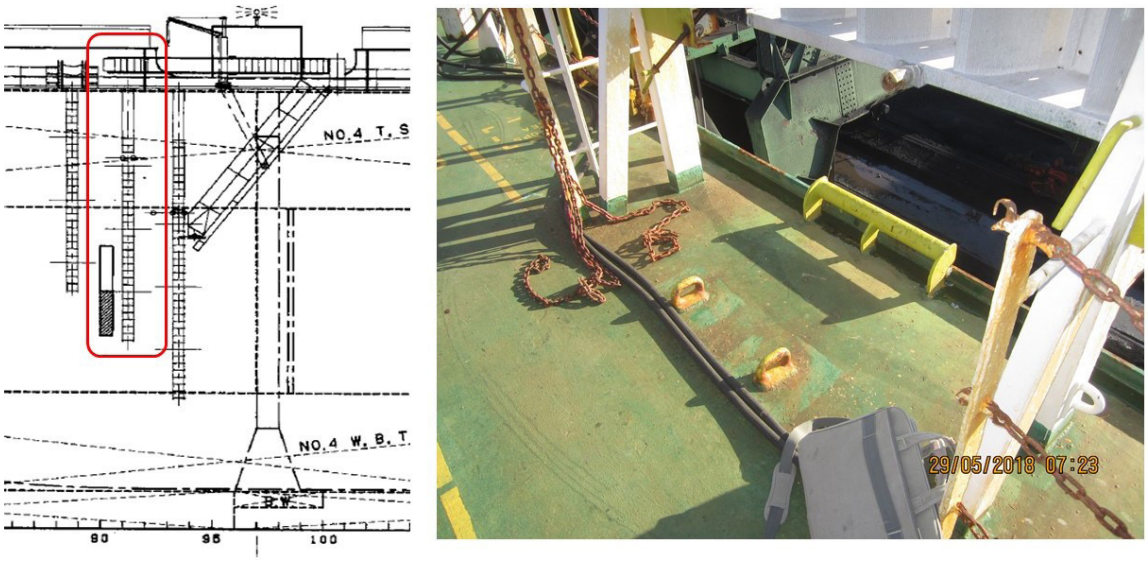

Figure 1: On the left is a portion of the General Arrangement drawing showing the location of the pilot boarding area on the ship's starboard side. The arrangements on the port side are identical. On 24 May 2018, the pilot ladder was rigged in the middle position, which is circled in red.[5] On the right is a picture of this position on the port side while looking aft showing the opening in the rail. The picture was taken after the ship arrived at Riga. The chains used to close this opening are open. The two pad eyes on the deck are for securing man-ropes when required by the pilot. The electric cables and bag were not present on 24 May 2018. The accommodation ladder is in the stowed position outboard of the rail.

9. The ASD2 descended the accommodation ladder to release the pilot ladder from the accommodation ladder.[6] After he came back up on deck, the three crewmembers began to recover the pilot ladder. The Bosun and ASD1 were standing in or near the ship's rail opening when heaving on the pilot ladder *(see Figures 1 and 2)*. The ASD2 was standing inboard of the rail while heaving on the line attached to the bottom of the ladder *(see Figure 2)*.

4 See the International Convention for the Safety of Life at Sea (SOLAS), 1974, Chapter V, regulation 23.

5 Imabari Shipbuilding Co., Ltd., M.S. "CHRIS" General Arrangement, Drawing No. C-0200, dated 4 November 2006.

6 Not reported was the starting time for recovering the combination pilot ladder.

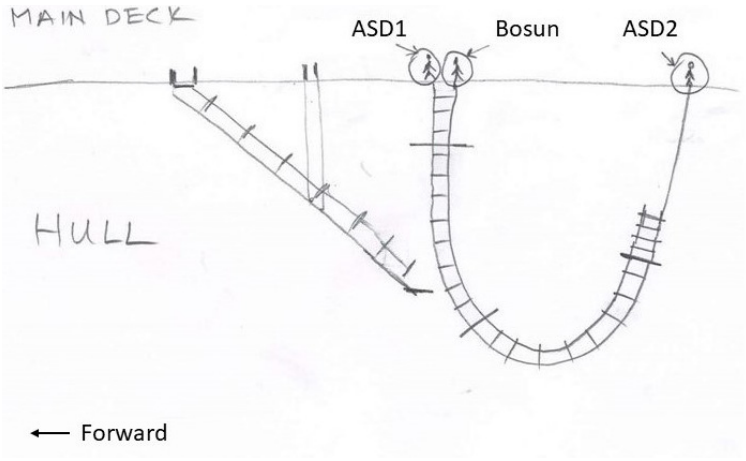

Figure 2: Location of the Bosun, ASD1, and ASD2 while recovering the port side pilot ladder. The ship's rail is not shown.

10. At 2154, the Bosun fell overboard while heaving on the pilot ladder. CHRIS's position was approximately 4.5 NM southwest of the Øresund Bridge and Tunnel. The ship was on a southerly course making a speed of around 8 knots and increasing, with the engine full ahead.

11. The two ASDs immediately raised the alarm, and from the ship's port side, threw a lifebuoy fitted with a light that landed approximately 15 m from the Bosun. The ASDs also kept sight of the Bosun. They reported seeing the Bosun trying to swim to the lifebuoy before losing sight of him about five minutes after he fell overboard.

12. Immediately after hearing the report of the Man Overboard (MOB), the 2/O, who was the Officer of the Watch (OOW), released a lifebuoy fitted with a self-activating light and smoke signal from the portside bridge wing. The Master ordered the rudder hard to port, the engine half ahead and began to maneuver the ship back to the position where the Bosun fell overboard. The OOW reported the MOB to the pilot boat and made a distress call on a very high frequency radio. He then announced the MOB on the ship's Public Address system.

13. On receiving the MOB report, the pilot boat returned to the area and began searching for the Bosun.

14. When they received the distress message from CHRIS, Joint Rescue Coordination Center (JRCC) Denmark started a SAR operation. A SAR helicopter was immediately launched and was on-scene at 2217. JRCC Denmark also requested assistance from JRCC Sweden. In addition to CHRIS, the SAR operation included three Danish and Swedish naval and Coast Guard vessels, two Danish SAR helicopters, two pilot boats, and two other merchant ships.

15. The water temperature was 13° Celsius (C). For an uninjured person in working clothes, such as coveralls, the estimated survival time is one to three hours. However, falling into water less than 15° C can induce cold shock.[7]

7 Cold shock is characterized by a large gasp followed by severe hyperventilation. It is also characterized by a sudden, large increase in heart rate and blood pressure. Although these effects typically last two to three minutes, they can be fatal. *See* Transport Canada, Survival in Cold Waters: Staying Alive (Publication TP13822E), 01/2003, pp. 10, 14 and 20.

16. None of the SAR crews in helicopters and vessels sighted the Bosun.[8] His safety helmet was recovered by one of the pilot boats. At 0208 on 25 May 2018, JRCC Denmark suspended the search. CHRIS was released and permitted to continue its planned voyage.

Human Factors

17. When CHRIS departed Hamburg, the ship's complement consisted of 20 officers and ratings. All held documents issued by the Administrator appropriate for their position on board.

18. The Master had 42 years of service at sea and 30 years in rank. At the time of the incident, he had been with the Company for 10 years. He joined CHRIS on 16 April 2018.

19. The 2/O had 12 years at sea and had sailed in his current rank for one and a half years. At the time of the incident, he had worked on ships in the Company's managed fleet for 12 years. He had been on board CHRIS for just under five months.

20. The Bosun had been at sea for 29 years, with three years in rank. At the time of the incident, he had been with the Company for 12 years and had joined CHRIS on 16 April 2018.

21. ASD1 had been on board CHRIS since 17 November 2017 and ASD2 had been on board since 7 October 2017.

22. Before the incident, the involved crewmembers had received the amount of rest mandated by the International Maritime Organization's (IMO's) Seafarers Training, Certification and Watchkeeping (STCW) Code,[9] Section A-VIII/1, paragraphs 2 and 3 and the International Labour Organization's Maritime Labour Convention, 2006, regulation 2.3.

23. The Bosun did not stand watches and typically worked 10-11 hours a day *(see Table 1)*.[10] His regular routine was briefly interrupted when CHRIS got underway from Hamburg on 22 May 2018.

Table 1: Bosun's Hours of Work

Dates	Morning	Afternoon	Evening	Late Evening
1–16 May 2018	0600–1200	1300–1700		
17–21 May 2018	0600–1200	1400–1800		
22 May 2018*	0600–1000	1200–1600	1930–2030	2100–2130
23 May 2018	0600–1200	1300–1700		
24 May 2018**	0600–0800		1800–1830	2130–2200

** CHRIS departed Hamburg. ** The ship transited The Sound.*

8 To date, the Bosun's body has not been located.

9 As amended by STCW/CONF.2/34, The Manila Amendments to the STCW Code.

10 As previously stated, the Bosun fell overboard at 2154.

24. Many of the ship's officers and ratings, including the Bosun, were observing Ramadan, which began on 17 May 2018. They were fasting during daylight hours.[11] During the month of Ramadan, a buffet was provided so crewmembers who were fasting could eat and drink between sunset and sunrise.[12]

Safe Work Procedures and Emergency Readiness

25. The Company's Safety Management System (SMS) includes procedures for working aloft and over the side. These procedures require that crewmembers performing the work be briefed on the work that is to be completed and the associated hazards. They also require that crewmembers wear a lifejacket and a safety harness when working over the side.

26. The Company also has a procedure in place which requires risk assessments for rigging the accommodation and pilot ladders. Hazards that were identified for both tasks include falling overboard. The risk assessment for rigging the accommodation ladder requires that the C/O or 2/O supervise the task, the completion of a Working Aloft or Over Side Permit, and the use of a lifejacket and safety harness by the crewmembers performing the work, to address this hazard. The risk assessment for rigging a pilot ladder requires the use of a lifejacket but does not include a requirement to complete a Working Aloft or Over Side Permit or the use of a safety harness since the task of recovering the pilot ladder is conducted on the Main Deck.

27. The C/O and crewmembers, when interviewed, reported that lifejackets and safety harnesses with lines were always worn by crewmembers while rigging or recovering the combination ladder. However, they acknowledged lifejackets and safety harnesses were not worn during the recovery of the combination ladder after CHRIS completed the transit of the Baltic Strait. It could not be confirmed if the crewmembers wore lifejackets and safety harnesses while rigging the combination ladder earlier that day.

28. The most recent MOB drill was on 23 May 2018, the day before the Bosun fell overboard. The drill scenario was that an ASD fell overboard while working on the starboard Lifeboat Deck.

PART 3: ANALYSIS

The following Analysis is based on the Findings of Fact.

Bosun's Fall Overboard

The Bosun and ASD1 were near the ship's rail opening while recovering the pilot ladder *(see Figure 1)*. The beginning of the Bosun's fall overboard was not seen by either of the ASDs who were working with him. Although it cannot be determined with certainty how or why the Bosun fell overboard, possibilities include, that he tripped on one of the two pad eyes welded on the deck *(see Figure 1)* or lost his balance. As discussed below, the Bosun's fall overboard might also be related to the effects of fasting on his physiological functions and cognitive performance.

11 Ramadan fasting requires abstaining from food and drink between sunrise and sunset.

12 Mealtimes were otherwise: breakfast, 0700-0800; lunch, 1200-1300; and dinner, 1700-1800.

It is possible to survive a 14 m fall overboard. When hitting the water, the Bosun's body position would have been an important factor affecting the survivability from that height. The ASDs were able to maintain sight of the Bosun for about five minutes after he fell and reported seeing him trying to swim toward the lifebuoy that had been thrown to him. It is not known if the Bosun was able to reach the lifebuoy.

The Bosun fell overboard about 30 minutes after sunset. Although there would still have been some ambient light, it would have been diminishing as darkness fell. The low light, and the fact that the Bosun was wearing navy blue coveralls, would have made him hard to see from the helicopters and vessels that were searching for him. It would have been even harder to see him if he was unable to wave his arms to try and signal for attention.

The expected survival time for an uninjured person in 13° C water is one to three hours. This time is lower if a person is injured or incapacitated. It is possible the Bosun experienced cold shock in the first few minutes after he entered the water.

If the Bosun had been wearing a safety harness with a lifeline secured to the ship, his entry into the water could have been prevented and enabled the crew to recover him on board.

Safe Work Procedures and Emergency Readiness

The Company has procedures in place intended to manage hazards associated with various shipboard tasks, including rigging the accommodation and pilot ladders. These tasks require crewmembers to work near or over the side and the hazards associated with them include falling overboard. Means of controlling this hazard include completing the appropriate risk assessment, conducting a Toolbox Talk with the crewmembers doing the work, and using lifejackets and safety harnesses with lines. Additional means of controlling this hazard when rigging accommodation ladders include that the task be supervised by the C/O or the 2/O and issuing a Working Aloft or Over Side Permit.

Risk assessments for rigging the accommodation ladder and the pilot ladder were completed and a Toolbox Talk was conducted before the Bosun, with assistance from ASD1 and ASD2, began to recover the combination pilot ladder. Despite being required by the risk assessments and discussed during the Toolbox Talk, the crewmembers performing this task were not wearing lifejackets nor safety harnesses. In addition, although identified on the risk assessment for rigging the accommodation ladder, the task was neither supervised by the C/O or the 2/O nor had a Working Aloft or Over Side Permit been issued. These are indications of ineffective onboard hazards management.

The non-compliance with the requirements of the Company's safe work procedures resulted in ineffective hazards management associated with rigging and recovering the combination pilot ladder.

The actions taken by the Master and crewmembers immediately after the Bosun fell overboard indicate they were well prepared to respond to a MOB situation.

Human Factors

Although the Company had safe working procedures in place as required by the IMO's International Safety Management (ISM) Code, these do not relieve a seafarer, regardless of rank, of their individual responsibility for safety. The Bosun was an experienced seafarer and should have recognized the potential for falling overboard while recovering the combination pilot ladder. Based on his professional experience, he should also have been aware that a standard practice for managing this hazard is to wear a lifejacket and a safety harness with line.

It is not possible to determine why the Bosun did not wear a lifejacket and safety harness with line, or why he, as the senior rating engaged in the task of recovering the pilot ladder, did not require that the two ASDs wear this equipment. This is an additional indication of ineffective onboard implementation of the Company's safe working procedures.

Several studies have documented the effects of fasting on circadian rhythms, physiological functions, and cognitive performance.[13] Although the Bosun's work hours before and during Ramadan were, with some exceptions, generally the same, it is possible these effects may have had some impact on the Bosun's cognitive functions, reaction time, and physical performance. These effects would be expected to have been more pronounced later in the day.[14]

The Bosun had received the required rest in the days before he fell overboard. However, he did experience a disruption in his regular routine when CHRIS departed Hamburg on 22 May 2018 *(see Table 1)*. While this disruption was not significant, it potentially could enhance, in the short-term, any effects he may have experienced as a result of fasting.

PART 4: CONCLUSIONS

These Conclusions are based on the above Findings of Fact and Analysis and shall in no way create a presumption of blame or apportion liability.

Causal factors that contributed to this very serious marine casualty include:

1. ineffective onboard hazards management as evidenced by not implementing the risk control measures that had been identified on the completed pre-task hazards assessments, including:
   (a) not issuing a Working Aloft or Over Side Permit for the recovery of the accommodation ladder;

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13 Some of these studies include: L. Iraki, A. Bogdan, F. Hakkou, N. Amrani, A. Abkari and Y. Touitou, *Ramadan Diet Restrictions Modify the Circadian Time Structure in Humans. A Study on Plasma Gastrin, Insulin, Glucose, and Calcium and on Gastric pH*, Journal of Clinical Endocrinology and Metabolism, 82 (1997): 1261-1273; J. B. Leiper, A. M. Molla and A. M. Molla, *Effects on Health of Fluid Restriction During Fasting in Ramadan*, European Journal of Clinical Nutrition, 57, Suppl 2 (2003): S30-S38; Ann C. Grandjean and Nicole R. Grandjean, *Dehydration and Cognitive Performance*, Journal of the American College of Nutrition 26, Sup. 5 (2007):549S-554S; Thomas Reilly and Jim Waterhouse, *Altered Sleep-Wake Cycles and Food Intake*: The Ramadan Model, Physiology & Behavior, 90 (2007): 219-228; R. J. Maughan, J. Fallah, and E. F. Coyle, *The Effects of Fasting on Metabolism and Performance*, British Journal of Sport Medicine 44(2010): 490-494; and, Ana Adan, *Cognitive Performance and Dehydration*, Journal of the American College of Nutrition 31(2) (2012): 71-78.

14 *See* Ho-Heng Tian, Abdul-Rashid Aziz, Weileen Png, Mohamed Faizul Wahid, Donald Yeo and Constance Png, *Effects of Fasting During Ramadan Month on Cognitive Function in Muslim Athletes*, Asian Journal of Sports Medicine, 2(3) (2011): 145-153.

(b) the C/O assigning the Bosun to supervise the task rather than either supervising it himself or assigning the 2/O to supervise it; and

(c) not using a lifejacket and safety harness with lifeline; and

2. the existing environmental conditions, including the ambient lighting and the water temperature at the time the Bosun fell overboard.

Causal factors that additionally may have contributed to this very serious marine casualty include the effects of fasting on cognitive function, reaction time, and physical performance.

PART 5: PREVENTIVE ACTIONS

In response to this very serious marine casualty, the Company has taken the following Preventive Actions.

1. All ships in its fleet were informed of the MOB incident.
2. The analysis identified root causes and actions taken which were included in its monthly bulletin "Lessons Learned," which is distributed to all ships in its fleet.
3. Reviewed and enhanced the "Permit to Work" procedure to include "Work in Exposed / Unprotected area(s)" which are areas not necessarily aloft and/or overboard.
4. Reviewed and amended the "Risk Assessment Library" to include a "Risk Assessment for working in exposed / unprotected area(s)."
5. Discussed the potential hazards resulting from fasting and its degrading effects on performance at a Company Safety Meeting.

PART 6: RECOMMENDATIONS

Considering the Preventive Actions taken by the Company, the Administrator does not have any Recommendations.

The Administrator's marine safety investigation is closed. It will be reopened if additional information is received that would warrant further review.