MARINE SAFETY INVESTIGATION REPORT

Safety investigation into the grounding of the Maltese registered passenger ship

HORIZON

in Stavanger, Norway

on 25 July 2016

201607/035
MARINE SAFETY INVESTIGATION REPORT NO. 16/2017

FINAL

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# CONTENTS

LIST OF REFERENCES AND SOURCES OF INFORMATION ........................................ iv

GLOSSARY OF TERMS AND ABBREVIATIONS .................................................. v

SUMMARY ............................................................................................................. vi

1 FACTUAL INFORMATION ................................................................................. 1
  1.1 Vessel, Voyage and Marine Casualty Particulars ......................................... 1
  1.2 Description of Vessel .................................................................................. 2
    1.2.1 General ................................................................................................. 2
    1.2.2 Bridge layout and navigational equipment ............................................ 2
  1.3 Bridge Manning at the Time of the Accident ............................................. 4
  1.4 Environment .............................................................................................. 5
  1.5 Narrative .................................................................................................... 5
    1.5.1 Background ......................................................................................... 5
    1.5.2 Events leading to the grounding ............................................................ 7
    1.5.3 Post grounding events .......................................................................... 8
  1.6 Damage to the Vessel ................................................................................ 9

2 ANALYSIS ........................................................................................................ 10
  2.1 Purpose ....................................................................................................... 10
  2.2 Fatigue and Alcohol .................................................................................. 10
  2.3 The Grounding ........................................................................................... 10
  2.4 Passage Planning and Monitoring .............................................................. 11
  2.5 Bridge Team Management ......................................................................... 12
  2.6 Aspects of Communication ....................................................................... 13
  2.7 Other Factors ............................................................................................ 14
    2.7.1 On board announcements to the passengers ....................................... 14
    2.7.2 Language barriers .............................................................................. 14

3 CONCLUSIONS ................................................................................................. 16
  3.1 Immediate Safety Factor .......................................................................... 16
  3.2 Latent Conditions and other Safety Factors ............................................. 16
  3.3 Other Findings ......................................................................................... 17

4 ACTIONS TAKEN ............................................................................................. 18
  4.1 Safety Actions Taken During the Course of the Safety Investigation ........ 18

5 RECOMMENDATIONS ...................................................................................... 18
LIST OF REFERENCES AND SOURCES OF INFORMATION

Master of MV *Horizon*

Voyage Data Recorder of MV *Horizon*

ECDIS of MV *Horizon*

Pilot on board MV *Horizon*

Information from the Norwegian Coastal Administration

Company’s internal investigation report on the accident
# Glossary of Terms and Abbreviations

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRM</td>
<td>Bridge Resource Management</td>
</tr>
<tr>
<td>ECDIS</td>
<td>Electronic Chart Display and Information System</td>
</tr>
<tr>
<td>DNV GL</td>
<td>Det Norske Veritas Germanischer Lloyd</td>
</tr>
<tr>
<td>GT</td>
<td>Gross tonnage</td>
</tr>
<tr>
<td>HW</td>
<td>High water</td>
</tr>
<tr>
<td>iwo</td>
<td>In way of</td>
</tr>
<tr>
<td>Kmhr⁻¹</td>
<td>Kilometre per hour</td>
</tr>
<tr>
<td>kW</td>
<td>Kilowatt</td>
</tr>
<tr>
<td>LT</td>
<td>Local time</td>
</tr>
<tr>
<td>m</td>
<td>Metres</td>
</tr>
<tr>
<td>MSIU</td>
<td>Marine Safety Investigation Unit</td>
</tr>
<tr>
<td>MV</td>
<td>Motor vessel</td>
</tr>
<tr>
<td>No.</td>
<td>Number</td>
</tr>
<tr>
<td>NPP</td>
<td>Navigation Policy &amp; Procedure</td>
</tr>
<tr>
<td>OOW</td>
<td>Navigational officer of the watch</td>
</tr>
<tr>
<td>RPM</td>
<td>Revolutions per minute</td>
</tr>
<tr>
<td>SOLAS Convention</td>
<td>International Convention for the Safety of Life at Sea, 1874, as amended</td>
</tr>
<tr>
<td>UTC</td>
<td>Universal Time Coordinated</td>
</tr>
<tr>
<td>VDR</td>
<td>Voyage data recorder</td>
</tr>
<tr>
<td>VHF</td>
<td>Very high frequency</td>
</tr>
<tr>
<td>VTS</td>
<td>Vessel Traffic Service</td>
</tr>
</tbody>
</table>
SUMMARY

At about 1408 (UTC +2) on 25 July 2016, the Maltese registered passenger ship *Horizon* ran aground on the rocky bank ‘Plentinggrunnen’ soon after departing her berth in Stavanger, Norway. At the time of the accident, she had 1615 passengers and 612 crew members on board. The vessel, whose forward draught was 7.55 m, grounded on a marked shoal that was charted at 5.3 m.

Following the grounding, the vessel used her own propulsion to come off the shoal but these attempts were unsuccessful. The master then requested the assistance of a tug, which was able to pull her off the shoal. *Horizon* was able to re-berth and assess the damage.

The vessel sustained hull damage to the port side bottom and keel forward. This consisted of ruptures to the forepeak tank and the ballast water deep tank no. 2. Temporary underwater repairs were made to the vessel and *Horizon* was able to sail after 30 hours to complete her cruise.

The safety investigation concluded that the grounding occurred because the planned swing of the vessel's bow to port was initiated early.

The MSIU has made a number of recommendations to the managers of *Horizon*, Pullmantur Cruise Ship Management Ltd., aimed at improving the safety of navigation on board vessels under its management.
# FACTUAL INFORMATION

## 1.1 Vessel, Voyage and Marine Casualty Particulars

<table>
<thead>
<tr>
<th>Name</th>
<th>Horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flag</td>
<td>Malta</td>
</tr>
<tr>
<td>Classification Society</td>
<td>DNV GL</td>
</tr>
<tr>
<td>IMO Number</td>
<td>8807088</td>
</tr>
<tr>
<td>Type</td>
<td>Passenger</td>
</tr>
<tr>
<td>Registered Owner</td>
<td>Pullmantur Cruises Pacific Dream Ltd.</td>
</tr>
<tr>
<td>Managers</td>
<td>Pullmantur Cruises Ship Management Ltd.</td>
</tr>
<tr>
<td>Construction</td>
<td>Steel (Double bottom)</td>
</tr>
<tr>
<td>Length overall</td>
<td>208.00 m</td>
</tr>
<tr>
<td>Registered Length</td>
<td>181.64 m</td>
</tr>
<tr>
<td>Gross Tonnage</td>
<td>47427</td>
</tr>
<tr>
<td>Minimum Safe Manning</td>
<td>20</td>
</tr>
<tr>
<td>Authorised Cargo</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Port of Departure</td>
<td>Stavanger, Norway</td>
</tr>
<tr>
<td>Port of Arrival</td>
<td>Hellesylt, Norway</td>
</tr>
<tr>
<td>Type of Voyage</td>
<td>Short International</td>
</tr>
<tr>
<td>Cargo Information</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Manning</td>
<td>612</td>
</tr>
<tr>
<td>Date and Time</td>
<td>25 July 2016 at 14:08 (LT)</td>
</tr>
<tr>
<td>Type of Marine Casualty</td>
<td>Serious Marine Casualty</td>
</tr>
<tr>
<td>Place on Board</td>
<td>Ship / Forepeak tank and ballast tank</td>
</tr>
<tr>
<td>Injuries/Fatalities</td>
<td>None reported</td>
</tr>
<tr>
<td>Damage/Environmental Impact</td>
<td>None</td>
</tr>
<tr>
<td>Ship Operation</td>
<td>Unberthing / manoeuvring</td>
</tr>
<tr>
<td>Voyage Segment</td>
<td>Departure</td>
</tr>
<tr>
<td>External &amp; Internal Environment</td>
<td>Daylight, good visibility; wind Southwesterly Force 3 and sheltered waters</td>
</tr>
<tr>
<td>Persons on Board</td>
<td>1615 passengers and 612 crew members</td>
</tr>
</tbody>
</table>
1.2 Description of Vessel

1.2.1 General
The Maltese registered Horizon is a passenger vessel built in 1990 at Jos L Meyer GmbH, Papenburg, Germany. She has a gross tonnage (GT) of 47,427 and is classed by DNV GL. Horizon is owned by Pullmantur Cruises Pacific Dream Ltd., and managed by Pullmantur Cruise Ship Management Ltd., which is based in Spain.

The vessel has a length overall of 208.0 m and a beam of 29.3 m. Her depth is 20.9 m and the maximum deadweight is 5,632 tonnes at a summer draught of 7.70 m. Horizon’s propulsive power is provided by four MAN B&W, four-stroke diesel engines, producing a total of 19,960 kW at 514 rpm. These drive two, controllable pitch propellers at 130 rpm through clutches and single reduction tandem gearing. Horizon is also fitted with two 1,600 kW bow thrusters and one 1,000 kW stern thruster. The vessel’s service speed is about 19.0 knots.

The vessel is traded by her operators worldwide. At the time of the accident, Horizon was on a planned cruise, which had originated at Calais on 23 July, calling at Stavanger, Hellesylt / Geiranger, Flaam, Bergen and was scheduled to return to Calais on 30 July.

1.2.2 Bridge layout and navigational equipment
Horizon’s navigation bridge layout is a fully enclosed integrated design and would be considered standard for a ship of this age (Figures 2 and 3). The main conning console includes the radars, ECDIS, VHF radio communications, engine and thruster controls, and autopilot.

The bridge wings have engine and thruster controls and manoeuvring displays.

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1 One knot is equal to 1.852 km/hr.  

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Figure 2: Main console

Figure 3: Starboard console
1.3 Bridge Manning at the Time of the Accident

*Horizon*’s bridge was manned by the master and the incoming master, who was on a handover period. Additionally, the staff captain, safety officer, chief mate, second mate, a navigational officer cadet and two quartermasters were present on the bridge at the vessel’s departure. Furthermore, there was a local pilot on board. The bridge team were stationed as shown in Figure 4.

![Figure 4: Bridge Team](image)

The master and staff captain were Greek nationals, the incoming master was Romanian and the remaining officers came from Spain, Ukraine, Italy and Croatia. The quartermasters were from the Philippines and Indonesia.

The master held an unlimited master’s Certificate of Competency endorsed by the Maltese flag State Administration. He had joined the Company in 2012 as a staff captain and has been serving as a master with the Company since 2014.

The incoming master also held an unlimited master’s Certificate of Competency endorsed by the Maltese authorities. He had joined *Horizon* on 21 July, *i.e.* four days earlier. This was supposed to be his first command, having joined the Company as a watchkeeper in 2006. He had the con on departure and was manoeuvring the vessel at the time of grounding.
1.4 Environment

At 1400 on 25 July 2016, the Meteogram Local Forecast and the vessel’s records provided the following information:

- Wind speed: Gentle breeze
- Wind direction: South Southeast
- Sea: Calm
- Tidal range: 0.4 m
- Tidal height at 1400: 0.7 m (0.1 m below HW)
- Visibility: Good

1.5 Narrative

1.5.1 Background

At 0654 on 25 July 2016, Horizon arrived and berthed in the port of Stavanger. The vessel was expected to remain in port until 1330 the same day. The rest of the morning was uneventful. At about 1200 on 25 July 2016, the vessel commenced her pre-departure tests. No defects were found. The pilot boarded at 1235. The observed drafts on departures were recorded as 7.50 m forward and 7.60 m aft.

At about 1300, a pre-departure meeting was held on the bridge. The meeting was conducted by the staff captain and attended by all the required bridge team members.

The incoming master then briefed the bridge team of his intended manoeuvre when departing the berth, which consisted of the following steps:

1. Single up to two and two mooring lines;
2. Let go all aft so that the Southwesterly wind would assist the stern to open;
3. Once the stern opened, let go all lines;
4. Put the rudder hard to starboard and use the starboard engine astern;
5. Once the vessel had some stern way, the port engine is run ahead;
6. Let the stern open further and fall astern to clear the South spar mark (Figure 5) off the berth; and
7. Once the spar mark was clear by 30 m, use the thruster to swing the bow to port.

![Figure 5: Norwegian chart of the berth and ‘Plentinggrunnen’ shoal](image)

‘Plentinggrunnen’ shoal is located North Northeast of the North berth and is marked by two spar marks identified as North and South ‘Plentinggrunnen’. The Northern mark is green and the Southern mark is red. Both have flashing lights displaying corresponding colours. The shallow water area and the 5.3 m rock are clearly shown on the chart and bound by a 10 m contour line (Figure 5).

The pre-departure checklist referred to the presence of the underwater rock as “stick marker 42” and the existence of the shoal to the port side of the vessel formed part of the briefing, which required a sharp look out and safe distance to be maintained.

As per the vessel’s guideline notes for departure, the planned departure manoeuvre was to hold the vessel’s bow with the bow thruster close to the pier, using the engines and rudders to open the stern off the berth by about 50 m. The intention was then to proceed at a slow speed astern for about 100 m in order to clear the shoal on the port bow. As soon as the ship had stopped, the bow was to be swung to port (Figure 6) until reaching the initial course of 322°.
1.5.2 Events leading to the grounding

At 1400, the pilot advised the master that the vessel had clearance from Vessel Traffic Services (VTS) to depart the berth. The incoming master, who had the con of the vessel, by prior agreement, ordered the mooring lines to be reduced to two and two. At about 1402, he then ordered all mooring lines except the forward springs to be let go.

At about 1403, the rudder was ordered hard over to starboard and the forward springs were also let go. The incoming master then set the starboard engine astern. The port wing lookouts reported that the distance to the spar mark was 20 m. The master acknowledged this and instructed them to report every five metres.

The vessel’s movement initially followed the plan with the stern moving off the berth and the bow being held close to the berth. At 14:04:03, the vessel started to move astern as a result of the increase in the astern pitch. The incoming master then used the stern thruster along with the main engine to come off the quay.

At 14:04:36, the port wing reported the spar mark at 30 m and the vessel’s speed astern increased.
At 14:05:18, the incoming master asked for the distance to the bow and was told by the forward mooring station that the bow was clear. He acknowledged this by stating “Clear, very good, we will start opening the bow.” Thereafter, the bow thruster was used to swing the bow to port.

At 14:06:21, the port wing reported that the bow was 25 m from the spar mark. The aft station reported that the stern was 120 m from Britannia, another passenger vessel moored astern of Horizon (Figure 6).

At 14:07:11, the incoming master ordered the rudder amidships and then hard to port. He also set both engines ahead. The master advised him that the vessel was moving ahead, which was acknowledged by the incoming master. The vessel’s speed ahead was noted to increase.

At 14:07:47, the pilot advised not to get too close to the shoal on the port side to which the master remarked that “you already have speed like 0.7.” Shortly afterwards, at about 14:08, a strong vibration was felt and at the vessel’s bow was observed to be aground on the 5.3 m rock.

Following the grounding, the master took over the con and for 10 minutes, attempted to use the engines and thrusters to come off the shoal without success.

1.5.3 Post grounding events
At 1418, the master called Code Bravo to assess the damage and at 1434 it was confirmed that the fore peak tank and deep tank no. 2 were flooding. At 1440, it was confirmed all other tanks were sound.

The pilot arranged for tug assistance and at 1446, a tug was made fast forward. By 1448, the vessel had been pulled clear of the shoal and returned to the berth at 1554.
1.6 Damage to the Vessel

Following an initial inspection by the crew members and a damage survey by the Classification Society, it was revealed that *Horizon* sustained damage to her port side forward:

- Puncture to the forepeak tank, in way of (iwo) frame 256 approximately 300 mm by 200 mm;
- Puncture to deep tank no. 2, iwo frame 242 approximately 300 mm by 80 mm;
- Several indentations to the hull plating;
- Speed log transducer damaged;
- Centre girder buckled in forepeak tank, iwo frames 6 and 7 (from collision bulkhead); and
- Internal damage to ballast deep tank no. 2, iwo frame 141 and centre girder between frames 141 and 140.

The damaged areas are indicated in Figure 7.

![Figure 7: Damaged areas in the hull as a result of the grounding](image)
2 ANALYSIS

2.1 Purpose

The purpose of a marine safety investigation is to determine the circumstances and safety factors of the accident as a basis for making recommendations, to prevent further marine casualties or incidents from occurring in the future.

2.2 Fatigue and Alcohol

The safety investigation found that the hours of work records were in order. Moreover, during the analysis of the voyage data recorder (VDR) playback, there were no identified indications of fatigue. Alcohol tests carried out shortly after the accident on all the crew members on duty on the bridge and the pilot were all negative. Therefore, fatigue and alcohol were not considered contributing factors to this accident.

2.3 The Grounding

The area where Horizon ran aground was well known to the bridge team. Not only was it clearly marked on the chart as a ‘no-go area’ (Figure 8), but the shoal was referred to in the ship’s ‘Guideline Notes for Departure’, which had been prepared by one of the deck officers, checked by another deck officer, and signed by the master. In addition, the visibility and weather conditions were good.

It was clear that the grounding occurred because the planned swing of the vessel’s bow to port was initiated early. Evidence indicated that the swing had been initiated when the distance to the South spar mark was only 30 m, which did not take into account that the shoal extended a further 60 m to 70 m Northwest of the spar mark (Figure 5). In addition, soon after the use of the bow thruster to swing to port, the wheel was put to port and the engines run ahead. Along with the thruster, this caused some headway, which would have further decreased the clearing distance to the shoal.
2.4 Passage Planning and Monitoring

As part of the passage planning, the vessel developed ‘Guideline Notes for Departure’, outlining the departure manoeuvres in a concise manner. It is the MSIU’s understanding that this must have been based on an in-depth study conducted by one of the vessel’s deck officers and master. The notes in the guideline stated that the vessel should have come astern by about 100 m before swinging the bow to port. It has been observed that the signature of the crew member carrying out the manoeuvre was not on the document and therefore, it was not excluded that he may have neither been aware of this requirement nor did anybody draw his attention during the briefing when he said that he was intending to clear the spar mark when it was at a distance of 30 m.

In line with good passage planning practices, the shoal had been marked as a “no-go area”, which signified that it is unsafe for the vessel to cross into. Notwithstanding this, the vessel entered the ‘no-go’ area despite two navigating officers tasked to monitor the vessel’s progress on the ECDIS, paper chart and radar. The MSIU believes that although the crew members were visually monitoring the vessel’s
progress, there were a number of reasons for this to be missed, which may be considered as missing defence systems.

It would appear that the safety contour on ECDIS was set at 30 m rather than a lower value. This setting did not trigger the ECDIS alarm because the setting was not in line with the vessel’s draft and required under keel clearance. Consequently, the bridge team members were not alerted of the imminent dangers. Moreover, since a turning circle had not been used on the ECDIS to monitor the vessel’s position, the bridge team was not in an ideal position to determine when and where it was safe to swing the vessel’s bow to port.

2.5 Bridge Team Management

The bridge was manned in excess of what one would normally expect to find on the bridge of a modern vessel. In fact, it was manned in excess of the Company’s requirement of two senior officers being present. Although one may raise the point that despite the excess number of officers, the grounding still occurred, the safety investigation identified a number of possible safety factors.

The ship’s management adopted a very good practice of providing the opportunity to the incoming master to carry out the departure manoeuvre for familiarisation purposes. This practice may actually be considered as an active familiarisation practice in terms of the Company’s safety management system. However, it was noticed that there was no intervention when the unberthing procedure was not going according to plan; for instance, at the time the incoming master had communicated his intentions of commencing the swing to port.

Moreover, although both the master and the pilot subsequently noted the vessel was moving ahead and getting closer to the shoal, it did not appear to the safety investigation that corrective action was taken to stop the forward movement and to allow the vessel to swing clear of the unmarked Western edge of the shallows. It would appear that both the master and the pilot did not get the necessary information which indicated the vessel’s position as with regards to its close proximity of the shallows.
At the time of the pre-departure briefing, the pilot had already boarded the vessel. The safety investigation was not aware as to whether he had formed part of the briefing and hence fully integrated into the bridge team, which may also be an explanation for the absence of any input at such a crucial stage of the departure manoeuvre.

2.6 Aspects of Communication

The analysis of the evidence indicated missing safety barrier systems on the bridge (use of navigational equipment). However, the safety investigation is of the view that the communication approach on the bridge played a significant part and influenced the way the dynamics of the accident developed.

A definition of ‘communication’ from another safety-critical domain is the transfer of information, ideas or feelings. It has been established that apart from transferring knowledge, communication it also establishes ‘predictable behaviour patterns’ – an important factor for the coordination of actions within a team.

By speaking his intentions just before the accident happened, the (relieving) master had actually provided an opportunity for two-way communication, whereby feedback was possible and the communication loop closed. The safety investigation was of the view that the communication issue on the bridge was not a matter of transmission failure, where the necessary information had not been communicated (by the relieving master). Rather, it would seem that the situation was more of a reception failure, where the communication channel existed, the critical information was passed, but it was either misinterpreted or not understood altogether.

The MSIU did not consider that there was a steep ‘power-index’ (status gradient) on the bridge – considering also that there were two master mariners, one of whom was to take over from the other. However, this may have not been the case with the two OOWs. The safety investigation did not dismiss the possibility that the presence of two master mariners on the bridge (and the pilot) may have influenced the extent of interaction between the OOWs and the rest of the bridge team.
What is definite, however, is that the bridge team members did not share a common mental model on the way the manoeuvre was evolving – although it is believed that every person on the bridge understood his role.

2.7 Other Factors

2.7.1 On board announcements to the passengers
Emergency code BRAVO was called at about 1418. However, there was no passenger announcement until 1500. Whilst the ship was not in any danger and the grounding had not caused anything more than a vibration, it may have helped to update the passengers to avoid any concerns which passengers may have had.

2.7.2 Language barriers
Although there were a number of different nationalities on the bridge, all orders were heard being given and acknowledged clearly in English. Language was therefore not considered a contributing factor to this accident.
THE FOLLOWING CONCLUSIONS, SAFETY ACTIONS AND RECOMMENDATIONS SHALL IN NO CASE CREATE A PRESUMPTION OF BLAME OR LIABILITY. NEITHER ARE THEY BINDING NOR LISTED IN ANY ORDER OF PRIORITY.
3 CONCLUSIONS

Findings and safety factors are not listed in any order of priority.

3.1 Immediate Safety Factor

The grounding occurred because the planned swing of the vessel’s bow to port was initiated early, *i.e.*, when the distance to the South spar mark was only 30 m.

3.2 Latent Conditions and other Safety Factors

.1 The swing became even more complex because the shoal extended a further 60 m to 70 m Northwest of the spar mark;

.2 Soon after the use of the bow thruster to swing to port, the wheel was put to port and the engines run ahead, which would have further decreased the clearing distance to the shoal because of the generated headway;

.3 The vessel did not come astern by the 100 m distance specified in the pre-departure guideline;

.4 It was not excluded that the crew member executing the manoeuvre may have not been aware of the 100 m distance;

.5 No one intervened when the crew member executing the manoeuvre communicated his intention to clear the spar mark when it was just at a distance of 30 m;

.6 The master and the pilot did not get the necessary information which would have indicated the vessel’s position as with regards to its close proximity of the shallows;

.7 The situation was more of a reception failure, where the communication channel existed, the critical information was passed, but it was either misinterpreted or not understood altogether;

.8 The presence of two master mariners on the bridge (and the pilot) may have influenced the extent of interaction between the OOWs and the rest of the bridge team;
The bridge team members did not share a common mental model on the way the manoeuvre was evolving.

3.3 Other Findings

.1 Fatigue and alcohol were not considered contributing factors to this accident;

.2 The area where Horizon ran aground was clearly marked on the chart as a ‘no-go area’ and the shoal was referred to in the ship’s ‘Guideline Notes for Departure’;

.3 The bridge was manned in excess of what one would normally expect to find on the bridge of a modern vessel;

.4 The ship’s management adopted a very good practice of providing the opportunity to the incoming master to carry out the departure manoeuvre for familiarisation purposes;

.5 By speaking his intentions just before the accident happened, the master had actually provided an opportunity for two-way communication, whereby feedback was possible and the communication loop closed.
4 ACTIONS TAKEN

4.1 Safety Actions Taken During the Course of the Safety Investigation

The Company took a series of safety actions as a result of this accident. The Company has reinforced the importance of good bridge resource management (BRM) practices and the need to follow the Navigation Policy & Procedure (NPP) Manual at all times to avoid incidents and accidents. A ‘lessons learned’ report was distributed through the reporting system so that all ships can learn from this accident.

Moreover, the Company has embarked on a project to amend and enhance the handover policy and handover templates across the fleet. It is anticipated that the implementation of the new policy will be initiated towards the end of 2017.

5 RECOMMENDATIONS

In view of the conclusions reached and taking into consideration the safety actions taken during the course of the safety investigation,

Pullmantur Cruise Ship Management is recommended to:

16/2017_R1 undertake a series of navigation audits and observations on board its manned vessels in order to better understand the dynamics of bridge team members and address any identified issues.