Marine Safety Investigation Unit

Transport Malta

MARINE SAFETY INVESTIGATION REPORT

Safety investigation into the collision between the

Maltese registered vehicle carrier

TONGALA

and the Republic of Korea registered

BO SPRING

in position 19° 51.20'N 119° 56.5'E

on 07 May 2015

201505/005

MARINE SAFETY INVESTIGATION REPORT NO. 07/2016

FINAL

Investigations into marine casualties are conducted under the provisions of the Merchant Shipping (Accident and Incident Safety Investigation) Regulations, 2011 and therefore in accordance with Regulation XI-I/6 of the International Convention for the Safety of Life at Sea (SOLAS), and Directive 2009/18/EC of the European Parliament and of the Council of 23 April 2009, establishing the fundamental principles governing the investigation of accidents in the maritime transport sector and amending Council Directive 1999/35/EC and Directive 2002/59/EC of the European Parliament and of the Council.

This safety investigation report is not written, in terms of content and style, with litigation in mind and pursuant to Regulation 13(7) of the Merchant Shipping (Accident and Incident Safety Investigation) Regulations, 2011, shall be inadmissible in any judicial proceedings whose purpose or one of whose purposes is to attribute or apportion liability or blame, unless, under prescribed conditions, a Court determines otherwise.

The objective of this safety investigation report is precautionary and seeks to avoid a repeat occurrence through an understanding of the events of 07 May 2015. Its sole purpose is confined to the promulgation of safety lessons and therefore may be misleading if used for other purposes.

The findings of the safety investigation are not binding on any party and the conclusions reached and recommendations made shall in no case create a presumption of liability (criminal and/or civil) or blame. It should be therefore noted that the content of this safety investigation report does not constitute legal advice in any way and should not be construed as such.

MARINE SAFETY INVESTIGATION UNIT
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CONTENTS

LIST OF REFERENCES AND SOURCES OF INFORMATION iv

GLOSSARY OF TERMS AND ABBREVIATIONS v

SUMMARY vii

1 FACTUAL INFORMATION 1
1.1 Vessel, Voyage and Marine Casualty Particulars 1
1.2 Description of Vessels 2
1.2.1 *Tongala* 2
1.2.2 Crew members on board *Tongala* 3
1.2.3 *Bo Spring* 5
1.3 Location of the Accident and Prevailing Weather Conditions 5
1.4 Narrative 6
1.4.1 Events on *Tongala* 6
1.4.2 Events on *Bo Spring* 9

2 ANALYSIS 10
2.1 Purpose 10
2.2 Bridge Procedures on *Tongala* 10
2.2.1 The OOW as the sole look-out during hours of daylight 10
2.2.2 Missing barriers on the three ARPA sets 11
2.2.3 Keeping a proper lookout by sight and hearing and by all available means 11
2.3 The Discussion between the Master and the OOW 13
2.4 The Conduct of the Navigational Watch and Situation Awareness on *Tongala* 15
2.5 The Conduct of the Navigational Watch on *Bo Spring* 20

3 CONCLUSIONS 22
3.1 Immediate Safety Factor 22
3.2 Latent Conditions and other Safety Factors 22
3.3 Other Findings 23

4 ACTIONS TAKEN 23
4.1 Safety Actions Taken During the Course of the Safety Investigation 23

5 RECOMMENDTIONS 25

LIST OF ANNEXES 26

LIST OF REFERENCES AND SOURCES OF INFORMATION

Crew members MV *Tongala*

Managers MV *Tongala*

GLOSSARY OF TERMS AND ABBREVIATIONS

AIS	Automatic Identification System
ARPA	Automatic Radar Plotting Aid
BA	British Admiralty
BNWAS	Bridge Navigational Watch Alarm System
BPM	Bridge Procedures Manual
CBT	Computer-based training
COG	Course over Ground
ColRegs	Convention on the International Regulations for Preventing Collisions at Sea, 1972
CPA	Closest Point of Approach
DNV GL	Det Norske Veritas Germanischer Lloyd
DWT	Deadweight
E	East
ECDIS	Electronic Chart Display and Information System
(G)	Gyro course
GHz	Giga Hertz
GPS	Global Positioning System
GT	Gross Tonnage
Hrs	Hours
Iwo	In way of
kW	Kilowatt
KRS	Korean Register of Shipping
LOA	Length Overall
LT	Local Time
M	Metres
MRM	Maritime Resource Management
MSIU	Marine Safety Investigation Unit

MSM	Minimum Safe Manning
MV	Motor Vessel
N	North
NM	Nautical Miles
OOW	Navigational Officer of the Watch
RPM	Revolutions per Minute
SOG	Speed over the Ground
STCW	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended
(T)	True Course
UAE	United Arab Emirates
UTC	Universal Time Constant
VDR	Voyage Data Recorder
VHF	Very High Frequency

SUMMARY

On 07 May 2015, the Marine Safety Investigation Unit (MSIU) was notified by the managers of MV *Tongala*, that at about 0730 UTC (07 May 2015 at about 1530 LT), their vessel was involved in a collision with the Republic of Korea registered general cargo *Bo Spring*. The collision happened off the coast of the Philippines, in position 19º 51.2' N 119º 56.5' E. *Tongala* was on a ballast voyage from Fujairah, United Arab Emirates (UAE), to Nagoya, Japan.

Preliminary information indicated that the collision occurred when *Tongala* was proceeding on a course of 051°(T), while *Bo Spring* was crossing from the starboard side on a Northerly course.

As a result of the collision, *Tongala* sustained structural damages to her starboard quarter side, above the waterline, in way of (iwo) car decks nos. 3, 5 and 6 and the engine-room. *Tongala* sailed under her own power to Zhoushan IMC-Yongyue Shipyard in China for detailed inspections and repairs. *Bo Spring*, which sustained damages to her bow section, also sailed under her own power to Shanghai Minnan Shipyard in China for repairs.

No injuries and / or marine pollution were reported as a result of this casualty.

The safety investigation concluded that in a typical crossing situation and in good visibility with vessels in sight of one another for around one hour, both navigational officers of the watch (OOWs) did not have an accurate situation awareness of the dynamic context around their respective ships.

One recommendation has been made to the managers of *Tongala*, to address the use of off-centre radar displays during navigational watches.

During the course of the safety investigation, the MSIU had very limited information on *Bo Spring*, her crew members and the dynamics leading to the collision from the vessel's perspective. To this effect, the MSIU was unable to analyse and report on a more detailed operational context and perhaps enhance the possibility of preventing similar future accidents by making recommendations to the managers of *Bo Spring*.

1 FACTUAL INFORMATION

1.1 Vessel, Voyage and Marine Casualty Particulars

Name	*Tongala*	*Bo Spring*
Flag	Malta	Republic of Korea
Classification Society	DNV GL	KRS
IMO Number	9605786	9109938
Type	Vehicle carrier	General cargo
Registered Owner	Wilhelmsen Lines Shipowning Malta Ltd	Bobae Shipping Co. Ltd
Managers	Wilhelmsen Lines Car Carriers Ltd	Hanchang Corporation Ltd
Construction	Steel (Double hull)	Steel
Length overall	199.99 m	114.11 m
Registered Length	194.13 m	107.8 m
Gross Tonnage	61106	7656
Minimum Safe Manning	15	*Unknown*
Authorised Cargo	Ro-ro (vehicles)	Bulk cargo
Port of Departure	Fujairah, UAE	*Unknown*
Port of Arrival	Nagoya, Japan	*Unknown*
Type of Voyage	International	*Unknown*
Cargo Information	In ballast	*Unknown*
Manning	25	*Unknown*
Date and Time	07 May 2015 at 1535 (LT)	
Type of Marine Casualty or Incident	Serious Marine Casualty	
	Serious Marine Casualty	Serious Marine Casualty
Location of Occurrence	19° 51.20’N 119° 56.50’E	
Place on Board	Cargo & Tank Areas – closed deck cargo space Engine Department – engine-room Ship – over side	Ship - forecastle
Injuries/Fatalities	None	None
Damage/Environmental Impact	None	None
Ship Operation	On passage	On passage
Voyage Segment	Transit	Transit
External & Internal Environment	Fresh breeze, calm seas and low swell and good visibility	
Persons on Board	25	*Unknown*

1.2 Description of Vessels

1.2.1 *Tongala*

The Maltese registered *Tongala* (Figure 1) is a 61106 gt, vehicle carrier, owned by Wilhelmsen Lines Shipowning Malta Limited and managed by Wilhelmsen Lines Car Carriers Ltd of the UK. The vessel was built by MHI Nagasaki Shipyard & Machinery Works, Japan in 2012 and is classed by Det Norske Veritas Germanischer Lloyd (DNV GL).

The vessel has a length overall (LOA) of 199.99 m, a moulded breadth of 32.36 m and a moulded depth of 36.02 m. The vessel has a summer draught of 11.0 m and a summer deadweight (DWT) of 22585 tonnes. *Tongala* has a standard car carrier design, fitted with 12 car decks, capable of taking 6459 vehicles.

Propulsive power is provided by a 7-cylinder Misubishi 7UEC60LSII, two-stroke, single acting slow speed diesel engine, producing 14315 kW at 105 rpm. This drives a fixed pitch propeller to give a service speed of about 19.50 knots.

Figure 1: MV *Tongala*

Tongala was equipped with the required navigation equipment as listed on her Record of Equipment for Cargo Ship Safety Equipment Certificate - Form E (**Annex A**). The list included three radars, two X-band and one S-band, all three with Automatic Radar Plotting Aids (ARPA) facilities. According to the VDR data, the X-band ARPA was connected to the Global Positioning System (GPS) and the vessel's course and speed made good over the ground were also displayed.

The bridge layout was spacious. The chartroom was an integral part of the bridge, fitted behind the central navigation instrument console (Figure 2). The vessel was also fitted with an electronic chart display and information system (ECDIS).

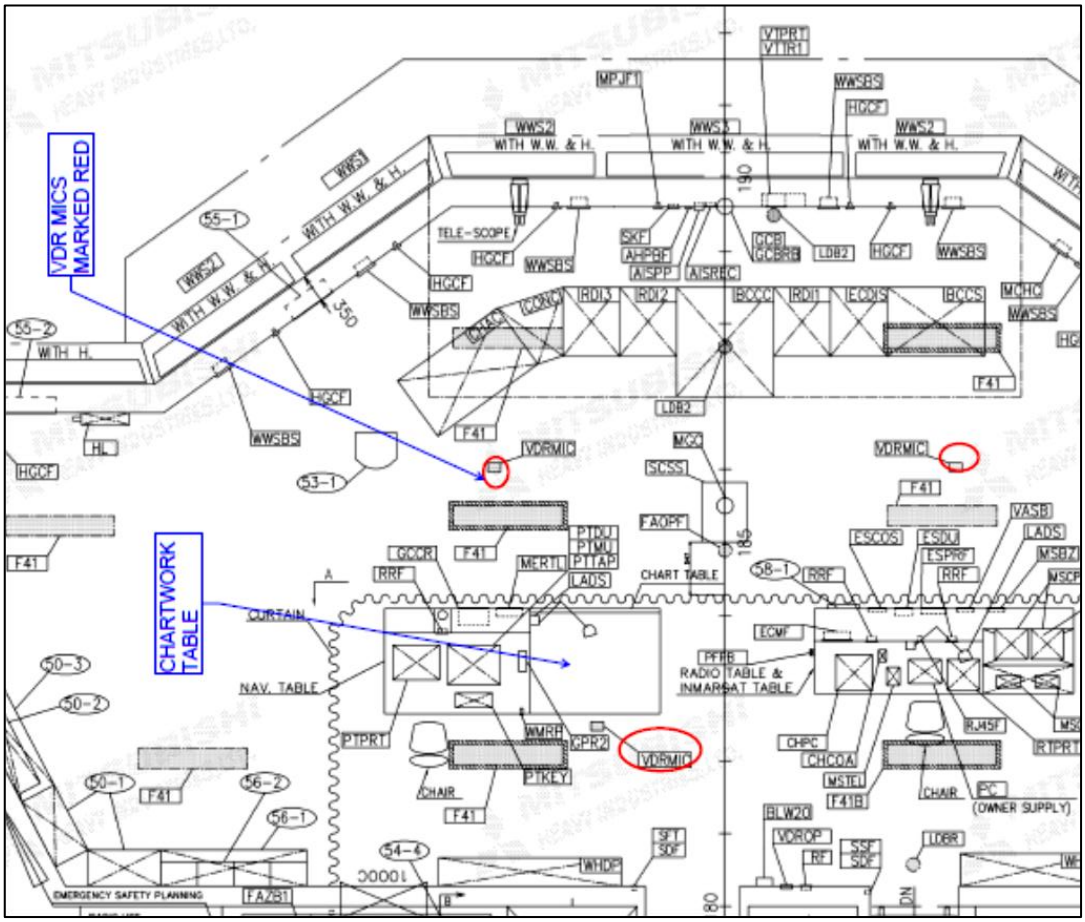

Figure 2: Bridge layout, showing position of chartroom and VDR microphones (red)

1.2.2 Crew members on board *Tongala*

At the time of collision, *Tongala* had a crew of 25 officers and ratings. The crew compliment was in accordance with, and in excess of the Minimum Safe Manning (MSM) Document issued by the flag State Administration on 22 March 2014 and

valid until 28 August 2017. A copy of the MSM Document is attached with this safety investigation report as **Annex B**.

The crew consisted of 13 Indian nationals and 12 from the Philippines. The 14 officers, including two third mates and two deck cadets, were Indian nationals, except for the chief mate who was a Filipino national. The remaining crew members were Indians and Filipinos. The working language on board was English.

According to the gathered evidence, the second mate was the navigational officer of the watch (OOW) at time of collision. There was no other crew member on the bridge.

The vessel was operating on the traditional three-watch system. However, since there were two third mates on board, the second mate was on the 0000-0400 and the 1200-1600 watches and one of the two third mates kept the 0800-1200 and the 2000-2400 watches. The other third mate kept the 0400-0800 watch, while the chief mate kept the 1600-2000 watch. Although he did not keep a navigational watch, the master was on call at all times.

The master was 42 years old. He had been at sea since 1992, having started his sea-going career when he joined another Company as a trainee seaman. He obtained his OOW certificate in 2004 (issued by the Indian authorities), his chief mate's certificate in 2006 and his Certificate of Competency in terms of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), regulation II/2 in 2009. He joined Wilhelmsen Lines Car Carriers Ltd. in 2007 as a second mate. He had served a total of 39 months as chief mate and had been serving as a master for 14 months. He joined and took command of *Tongala* on 09 February 2015, in the port of Shanghai, China.

The OOW was 26 years old. He had obtained his Certificate of Competency in terms of STCW regulation II/2 in 2012. This Certificate was issued by the Indian authorities and endorsed by the flag State Administration in accordance with the provisions of the Convention. He first joined Wilhelmsen Lines Car Carriers Ltd in 2007 as a deck cadet and had been working for the Company ever since. His first trip on *Tongala* was in 2014 as a third mate. He was then promoted to second mate and

had sailed again on *Tongala*. This was, in fact, his second trip on the vessel, signing on board in December 2014.

1.2.3 *Bo Spring*

The Republic of Korea registered *Bo Spring* is a 7656 gt general cargo vessel, owned by Bobae Shipping Co. Ltd of the Republic of Korea and managed by Hanchang Corporation Ltd, also of the Republic of Korea. The vessel was built by Higaki Shipbuilding Co. Ltd, Japan in 1994 and is classed by Korean Register of Shipping (KRS).

Bo Spring has a length overall of 114.11 m, a moulded breadth of 19.60 m and a moulded depth of 13.20 m. The vessel has a summer draught of 7.432 m and a summer DWT of 9038 tonnes. *Bo Spring* has two cargo holds and a grain capacity of 16606 tonnes. She is fitted with a tween deck and two MacGregor cargo hatches, complete with two cargo cranes and one derrick.

Propulsive power is provided by a 6-cylinder B&W 6L35MC, two-stroke, medium speed diesel engine, producing 3884 kW at 210 rpm. This drives a fixed pitch propeller to give a service speed of about 12.80 knots.

1.3 Location of the Accident and Prevailing Weather Conditions

The collision happened in position 19° 51.12'N 119° 56.53'E, *i.e.*, about 84 nautical miles (nm) Northwest of the Babuyan Islands, in the Luzon Straits, South China Sea.

At the time of the collision, the weather was very good with a visibility of about 12 nm. The sky was partially overcast with a Northerly force 3 wind.

1.4 Narrative[1]

1.4.1 Events on *Tongala*

After finishing unloading her cargo of cars, *Tongala* sailed in ballast condition, from the port of Jebel Ali, United Arab Emirates (UAE) on the 24 April 2015, bound for Nagoya, Japan via Fujairah, UAE for bunkers.

According to the master and second mate, the vessel followed the prepared passage plan. Until 07 May 2015, *i.e.* the day of the casualty, the voyage was uneventful.

On 07 May, *Tongala* was sailing in the South China Sea, approaching the Luzon Straits on a course of 048^0(T) (Figure 2). It was observed that the traffic density was getting heavier.

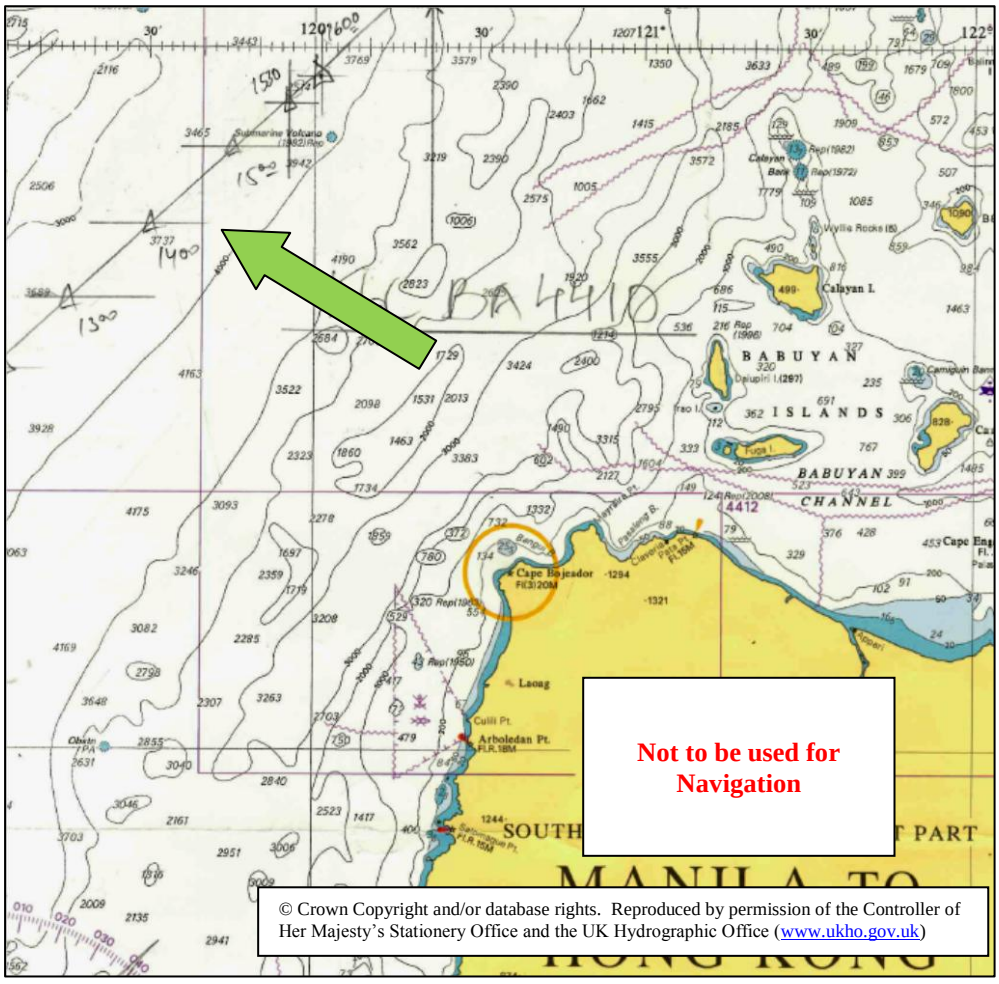

Figure 2: Extract from BA Chart 3489, which was in use on 07 May 2015

[1] *Tongala*'s VDR data was in LT and UTC. All entries in the *Tongala*'s logbook and other documents were in ship's time (UTC + 8 hrs). For consistency and ease of comparison with other information obtained from other sources, all times in the 'Narrative' section are in ship's time, with the occasional reference to the UTC.

According to the VDR data, a number of vessels were in the vicinity of, or passed close to *Tongala* from 1200 (Figures 3 and 4) to the time of collision at 1535.

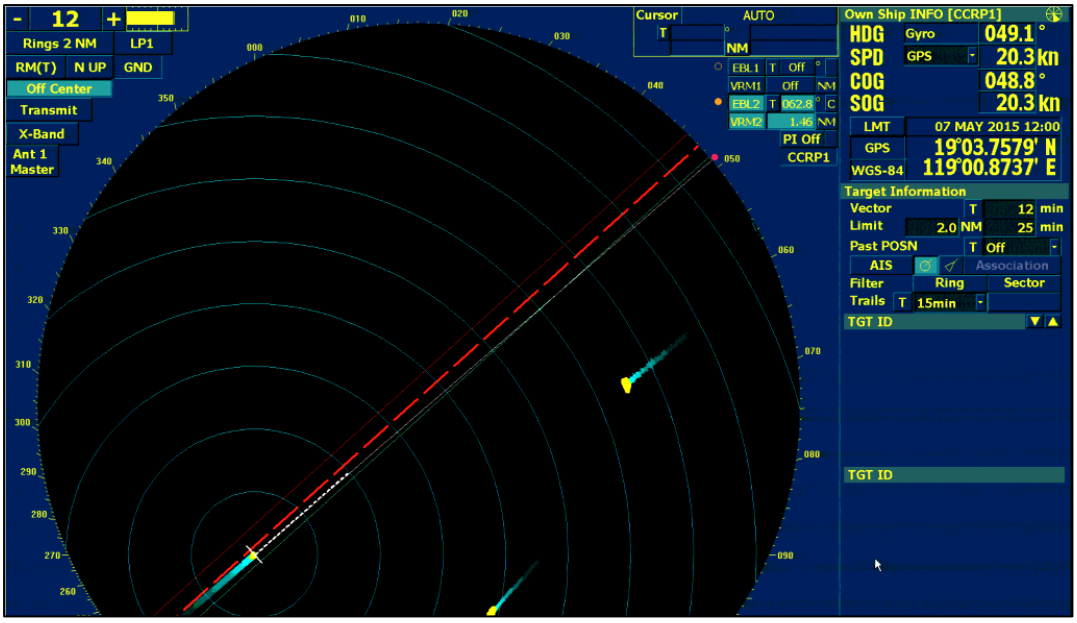

Figure 3: Radar screen shot at 1200 on 07 May 2015

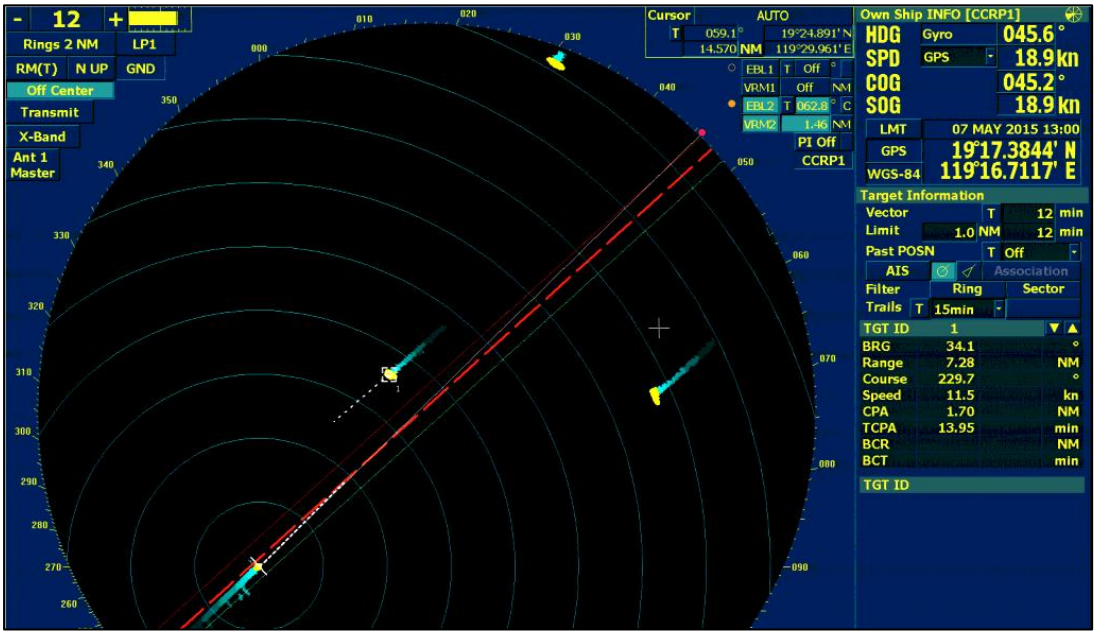

Figure 4: Radar screen shot at 1300 on 7 May 2015

When the second mate took over the watch from the third mate at 1200 (LT) (*i.e.* 0500 (UTC) on 07 May 2015), the bridge equipment was reported to be all functioning well, including the General Alarm and the ship's whistle which were

reportedly tested at 1200. All three radars/ARPA sets and the ECDIS were running normally.

The starboard X-band and the S-band ARPA radars were both set on North-Up, in relative motion on the 12 nm range scale with an off-centred display. With this setting, both radars were scanning approximately 18 nm ahead. The port X-band ARPA radar was on the six nm range scale, *i.e.* scanning approximately nine nm ahead. Evidence suggested that no collision warning alarms were programmed on the ARPA radar sets. The ECDIS was set to a scale so that a target about 24 nm ahead could be displayed on the screen[2]. The vessel's speed over ground (SOG) was 20.2 knots.

The second mate was the sole look-out on the bridge after he took over the navigational watch.

At around 1228, the master arrived on the bridge and engaged in a conversation with the OOW. In his discussion, the master contemplated whether or not to move the clocks forward by one hour during that evening. He then discussed the chart corrections[3]. The master expressed his aim to have the pending chart done prior to his signing-off. The master also mentioned the other charts which were not part of the voyage plan. The OOW replied that he would be able to correct these charts as well.

After the master left the bridge at around 1243, the OOW started working on the passage plan for the next voyage, namely from Singapore to Suez. This required the preparations of a number of charts.

By 1314, the OOW's work in the chartroom was well underway. The VDR recordings indicated that he was intensely immersed in the task, pulling charts out of the drawers and making the necessary changes to them[4]. At this time, *Tongala* had a vessel on her starboard beam at 1.5 nm and two other targets / vessels, one on the port side at 11 nm and the other seven nm away on his starboard side. Other vessels came within *Tongala*'s radar range, including *Bo Spring* which was on the radar about one hour before the collision, *i.e.*, at 1432.

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2 The X-band and S-band radars, the ECDIS and the AIS were fully integrated.

3 The second mate was responsible for the chart corrections.

4 Extracts from the VDR data are reproduced in **Annex C**.

The OOW continued with his chart work in the chartroom right up until 1535 when the collision occurred. *Bo Spring* struck the starboard side quarter of *Tongala,* in way of (iwo) car decks nos. 3, 5 and 6 and the engine-room. When the collision occurred, the OOW ran around the bridge, picking up the ringing phone and replying '*I do not know'* to a question which was made from the other end of the line.

1.4.2 Events on *Bo Spring*

It has been explained elsewhere in this safety investigation report that the MSIU had no information on how the dynamics of the events evolved on board *Bo Spring*.

However, on the basis of the extracts from *Tongala*'s VDR data, it was clear that *Bo Spring* maintained a steady course right up to the collision. No warning signals were heard from *Bo Spring*.

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 Bridge Procedures on *Tongala*

2.2.1 The OOW as the sole look-out during hours of daylight

On the day of the casualty, the OOW was the sole look-out on the bridge. This was in accordance with the Company's Bridge Procedures Manual (BPM), Watch Manning Level 1[5]. It is to be noted that a single look-out during daytime is the norm at sea and does not contravene international requirements[6]. However, a number of factors need to be kept into perspective before deciding on the minimum level of look-outs on the bridge, mainly:

- keeping a proper lookout by sight and hearing at all time[7]; and
- the OOW is not to take any duties which would interfere with the safe navigation of the ship[8].

These factors were also reflected in the Company's BPM, *i.e.*: "when the OOW is to be the lookout during daytime, the OOW understands that he shall not engage in activity, such as Chart corrections, when he is the sole lookout."[9]

Although the number of crew members on *Tongala* was in excess of the minimum stipulated by the flag State Administration, the possibility of utilising the extra crew members when deciding on the watchkeeping arrangements on his vessel[10] did not appear to have been considered. In fact, notwithstanding the workload on the OOW,

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5 BPM, section 2 (Bridge Resources Management), sub-section 2.4 – Watch Manning Levels.

6 STCW, regulation VIII/2 and section A-VIII/2.

7 ColRegs rule 5; STCW Code section A-VIII/2, part 4-1 (Principles to be observed in keeping a navigational watch).

8 STCW, section A-VIII/2, part 4-1 (Principles to be observed in keeping a navigational watch).

9 BPM, sections 2.3.4 and 3.2.4.

10 *Tongala* had a full complement of deck officers, an extra third mate and two deck cadets.

the MSIU did not come across any evidence which indicated that the additional crew members were being considered to carry out the urgent tasks that distracted the duty OOW from his navigational watch[11].

2.2.2 Missing barriers on the three ARPA sets

As already explained in sub-section 1.2.1, *Tongala* was equipped with three ARPA sets (two 9 GHz and one 3 GHz) and an ECDIS.

It was clear from the VDR audio data that no collision warning alarms were set on any of the ARPA sets. Furthermore, the Automatic Identification System (AIS) was not displayed (at least not on the starboard X-band radar), which was interphased with the VDR.

All three ARPA sets had been set up with an off-centre, displaying a longer range in the ahead position. However, this mode carries an important disadvantage, *i.e.* the reduction in the scanning range on the vessel's beams and abaft the beams. It is to be noted that in terms of the ColRegs, a vessel is deemed to be crossing when it approaches the other vessel from a direction forward of the two points abaft the beam of the other vessel[12]. Hence, in a crossing situation, as it was in this case, the scanning range on *Tongala*'s starboard beam and up to two points abaft the starboard beam was important.

2.2.3 Keeping a proper lookout by sight and hearing and by all available means

During the day of the casualty, the weather was fine with very good visibility (over 10 nm). With *Tongala* having an air draft of around 52 m and *Bo Spring* being a vessel of 7656 gt, the 'the combined distance to the horizon' was well over 10 nm. Hence, it was possible that at 1435, when *Bo Spring* was on *Tongala*'s radar for the first time at a distance of around 15 nm, *Bo Spring* was visible to the OOW on *Tongala* (Figure 5). This was about one hour before the collision happened.

[11] This point is discussed further in sub-section 2.3.

[12] A compass point of 11¼°.

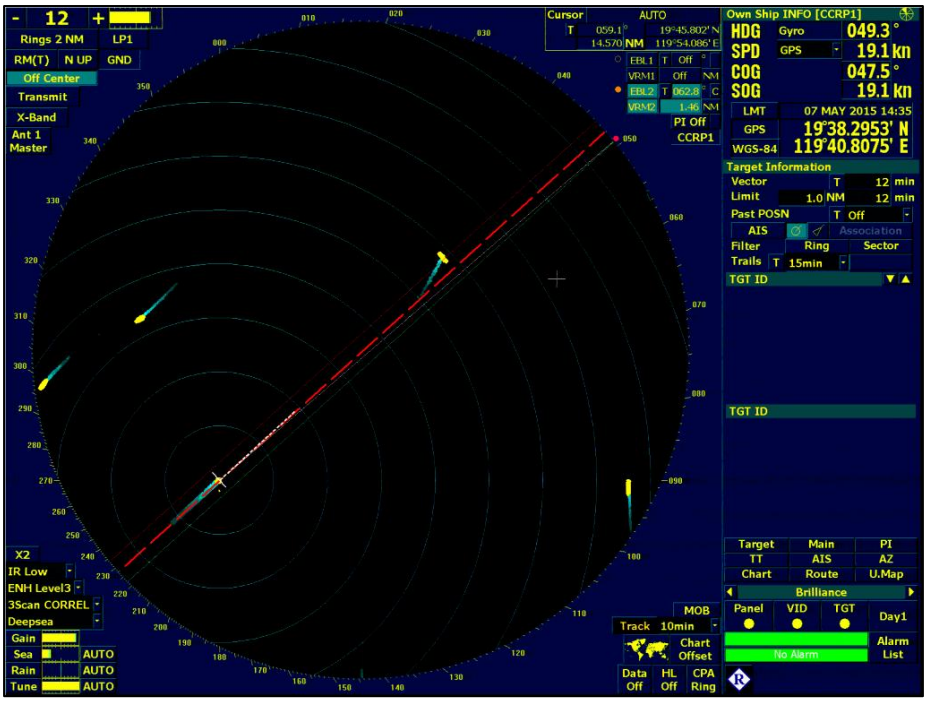

Figure 5: Screen shot at 1435

In the meantime, the OOW had spent long periods of time in the chartroom. Although the chartroom was not a separate room from the bridge, it was located at the after end of the bridge (Figure 6). Even with the night curtains drawn open, the sight from the area was not a clear one especially on the vessel's beams.

Figure 6: *Tongala*'s chartroom

Furthermore, it seems that the chartroom's night curtain was normally drawn and stowed on the starboard side of the railing and hence it would have obstructed the view of the OOW on the starboard side. *Bo Spring* was approaching *Tongala* from the starboard side, about four points forward of the starboard beam and it is most likely that the OOW, from his position, would not have visually noticed the approaching vessel.

Analysis of the VDR data did not indicate that sound signals were heard at any point in time before the casualty happened. However, it has to be pointed out that with the bridge being of the fully enclosed type, it was rather difficult to keep a lookout by hearing; more so with the OOW immersed in his work inside the chartroom.

With the vessel having a fully enclosed bridge, the vessel should have been fitted with sound reception facilities on the outside so as to have the same effect as if the vessel's bridge wing doors were kept open[13]. However, according to the VDR audio data, no sound from the other vessel's approach was heard inside the bridge right up to the collision.

Maintaining a navigational watch by all available means, refers also to the appropriate use of available navigational equipment. Whilst it has already been explained that there were potential issues with the adopted setting of the ARPA sets (and the ECDIS alarm because this was not captured on the VDR)[14], the MSIU did not come across evidence which would have confirmed that long-range scanning was done taking into consideration that the vessel was making over 20 knots.

2.3 The Discussion between the Master and the OOW

Upon joining *Tongala,* the master had written his 'Master's Special Orders', which also incorporated the Company's BPM and the Standing Instructions. These included, but were not limited to, the conditions that had to be met when the OOW was the sole look-out on the bridge. The 'Master's Special Orders' were signed by all the navigational officers and cadets.

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[13] *Tongala*'s BPM, section 3.2.4.1.

[14] During the course of the safety investigation, it transpired that the ECDIS alarm volume had been set at zero.

Notwithstanding, the Company's procedures were not followed in what seemed to be, *a prima facia,* a deviation from the Company's procedures.

Academic studies identify a number of factors which can influence a person's decision to deviate from company's procedures. Of particular interest are two levels, which have been identified as factors influencing procedural deviation. The two levels encompass direct motivators and behavioural modifiers. The potential saving in time and the demonstration of skill to work under pressure (especially after the master had drawn the attention of the OOW on the charts which required corrections) were two typical examples of factors influencing procedural variability.

On the other hand, deviations from company's procedures are highly susceptible to influences from management. The master was fully aware of the watchkeeping duties of the OOW. There was no attempt, however, to mitigate the workload by sharing it amongst other crew members. The MSIU found it possible that no additional crew members were assigned with the OOW because it was not the intention of the master to put pressure on the OOW. In fact, during the course of the safety investigation, it was clarified that the master was willing to simply record the actual correction status on his handover notes, rather than expecting that these corrections were done prior to his signing off.

The fact that the OOW gave the matter top priority seemed to be indicative that this message was not captured (possibly even due to the reasons mentioned above); rather, it may have inadvertently created an environment which encouraged the OOW to deviate from Company procedures. Moreover, the hierarchal gap between the master and the junior OOW may have 'prohibited' the latter to ask for additional resources, a clarification, which would have possibly avoided a misunderstanding.

2.4 The Conduct of the Navigational Watch and Situation Awareness on *Tongala*

The safety investigation raised several concerns on the conduct of the navigational watch by the OOW.

The VDR data suggested that as from 1314 onwards, the OOW was engaged in the chartroom, preparing for the vessel's next passage plan when at that time there was another vessel on *Tongala*'s port beam at a CPA of 1.5 nm (Figure 7).

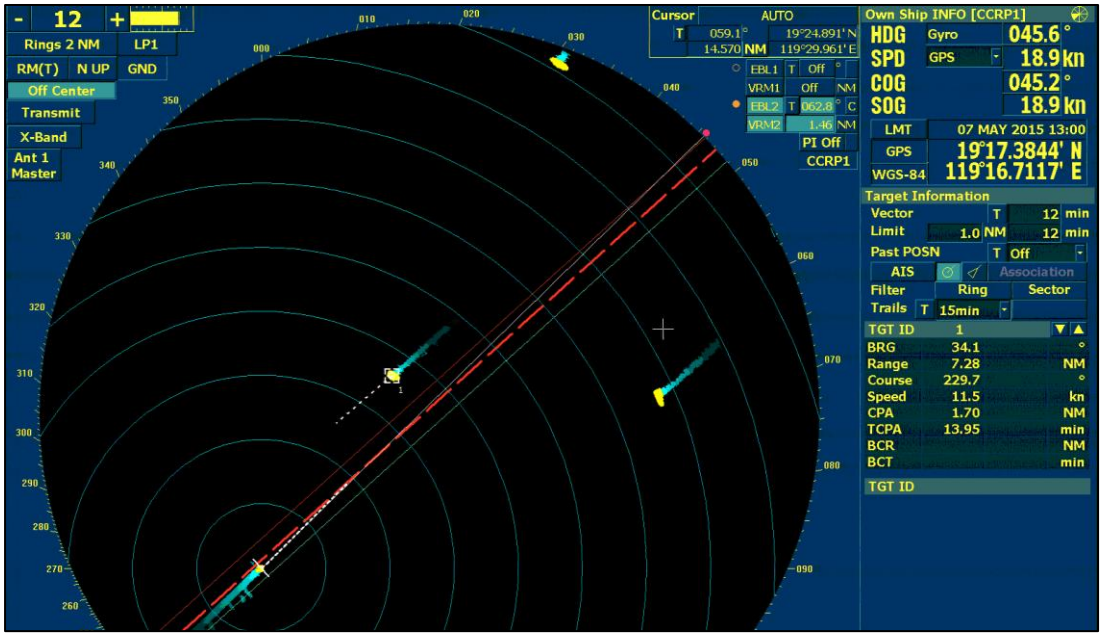

Figure 7: Screen shot at 1300

Given the multiple tasks which had to be carried out, the OOW decided to utilise the time of the navigational watch to work in the chartroom. This was a risky decision, considering that several other ships sailed past *Tongala* although none came relatively close to her. Analysis of the radar data revealed that one of these vessels was being overtaken by *Tongala* and was almost dead ahead at around 1435 (Figure 8). This was approximately the same time when *Bo Spring* first appeared on the radar screen at a distance of about 15 nm, bearing about four points on the starboard bow. At no time were any of these vessels/targets acquired by the OOW, at least not on the X-band radar, which was interphased to the vessel's VDR.

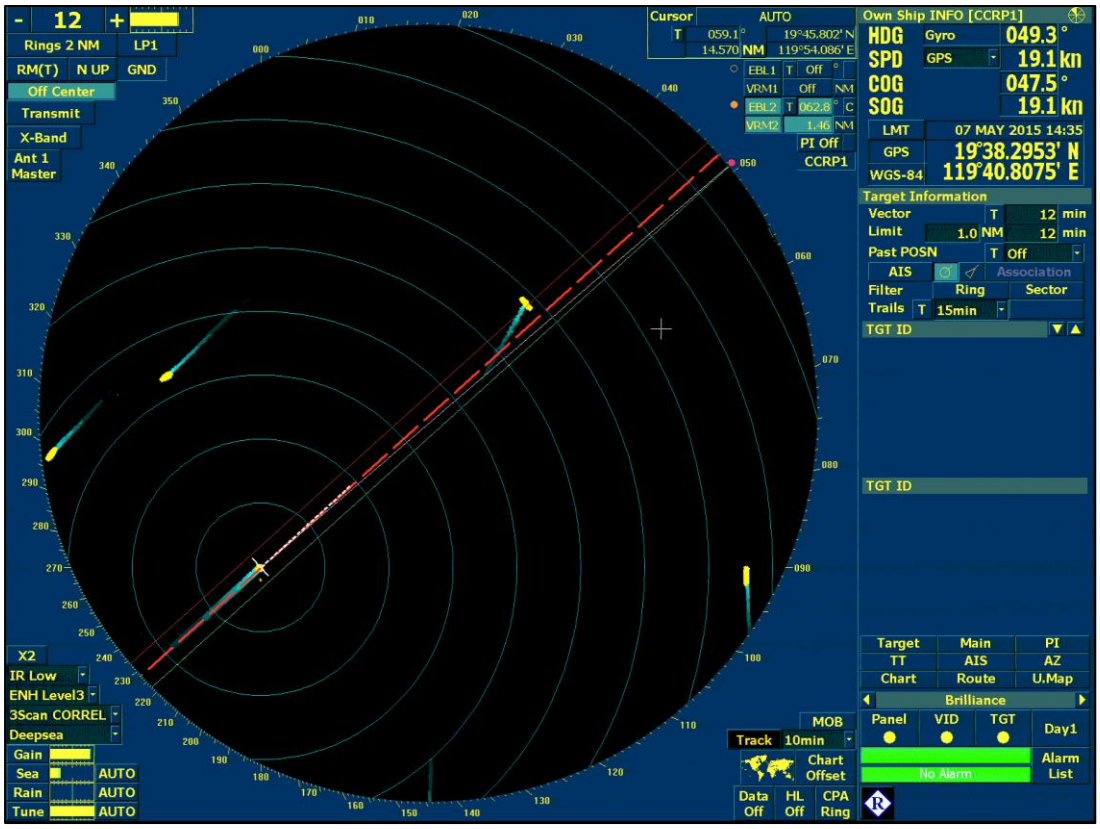

Figure 8: Screen shot at 1435

Further analysis indicated that although the vessel's course steered was claimed to be 048° (G), according to the VDR data, the vessel's heading was varying between 046° (G) and 052° (G). However, from 1500 onwards, the vessel's heading was a steady 052° (G) indicating that the OOW had adjusted the vessel's course to 051° (G)[15] at that time (Figure 9).

[15] The OOW had recalled that the course adjustment was done at around 1515.

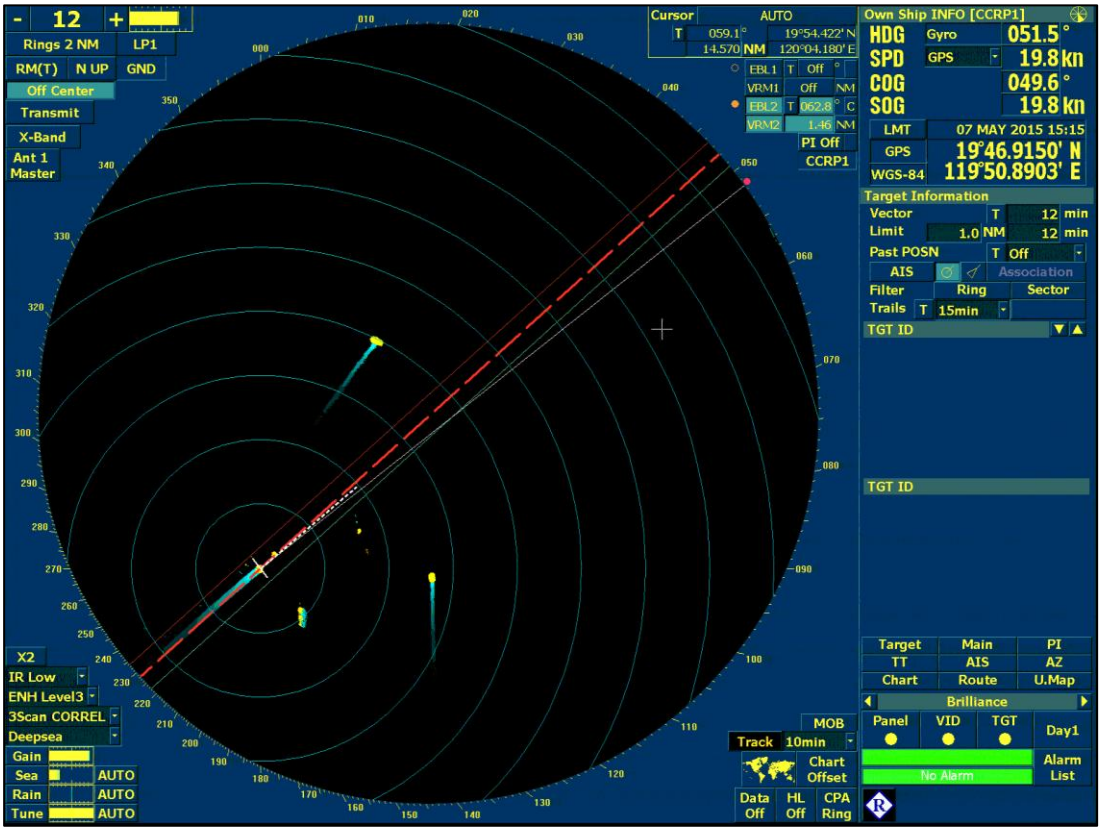

Figure 9: Screen shot at 1515

Whether this alteration was done at 1500, when *Bo Spring* was eight nm off, or at 1515, when *Bo Spring* was five nm off, it is clear that the OOW was totally unaware of *Bo Spring*, which was approaching *Tongala* on a steady bearing from the starboard side. Moreover, this small alteration of course to starboard made the close-quarters situation with *Bo Spring* more dangerous.

Even more, the setting used on the radar sets contributed to the inaccuracy of the assessment of the situation. As indicated elsewhere in this safety investigation report, the three available radar sets were all set North-Up, on relative motion and off-centred with the starboard X-band and S-band radars / ARPAs on the 12 nm range and the port X-band radar / ARPA on the six nm range. This 'off centre' set up gave the OOW an increased range ahead but contributed to a reduction in the range on the vessel's starboard beam and on the quarter.

It seemed that ranges were not changed during the watch, suggesting that no long-range scanning was done on the 24 and 48 nm ranges.

The issue of inaccurate situation awareness was, however, also evident when the situation was more critical. In fact, at 1524, while the OOW was still in the chartroom working on the next passage plan, *Bo Spring* was just four nm off with a CPA of 0.19 nm (Figure 10). As yet, no acquisition of the target was made.

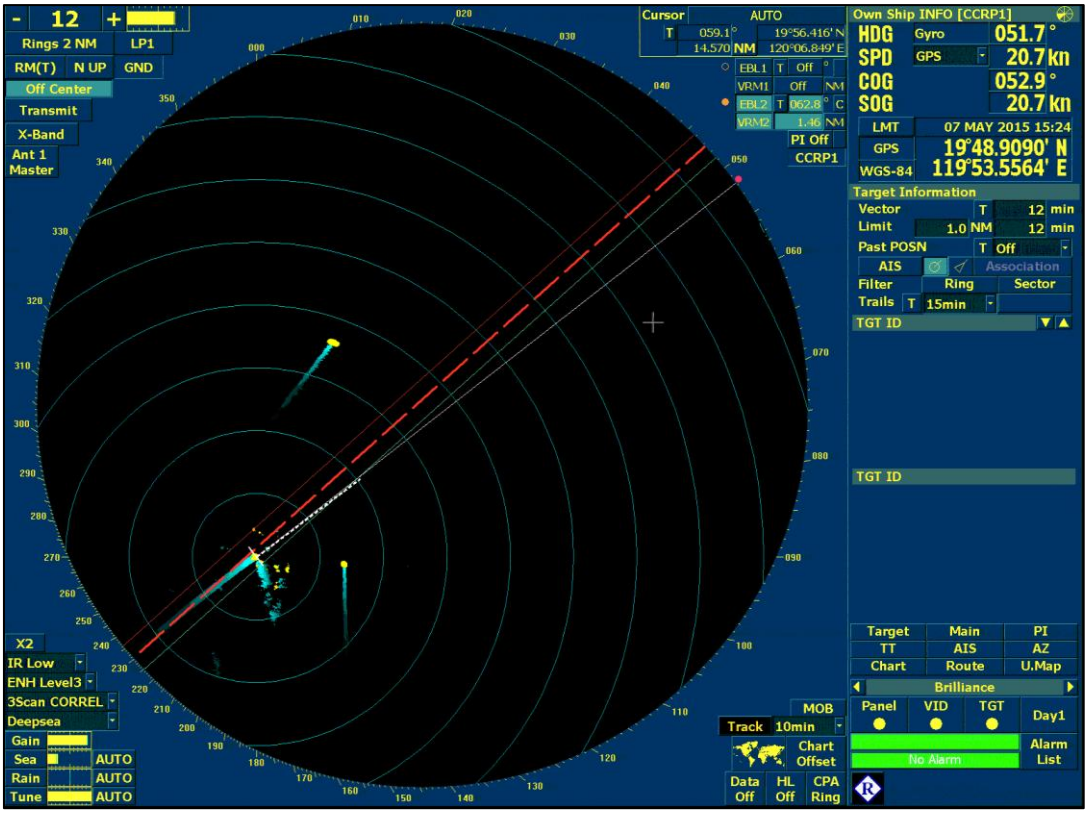

Figure 10: Screen shot at 1524

The matter was also analysed even by taking into consideration the fact that at 1532 (Figure 11), *i.e.*, one minute before the collision and when *Bo Spring* was less than one nm away (CPA was 0.09 nm), no alarms were heard on the bridge.

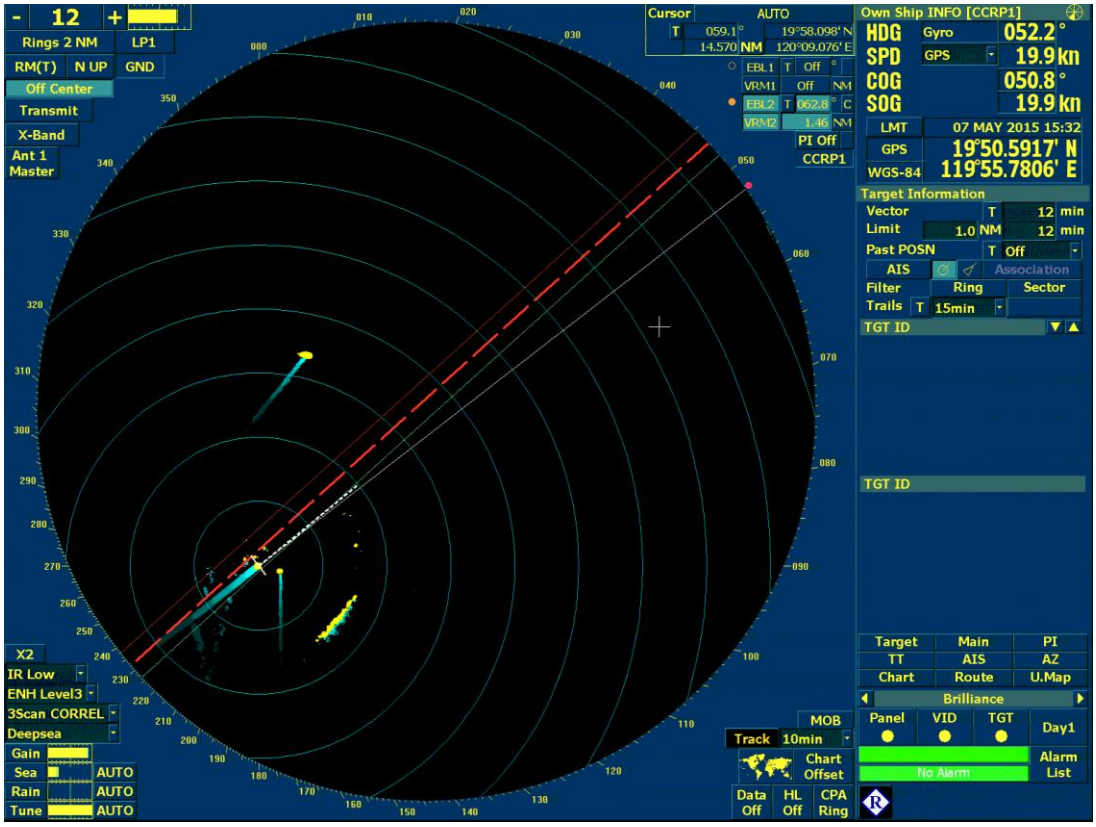

Figure 11: Screen shot at 1532

The absence of alarms was considered to have made the situation more complex. Without any alarms, the OOW in the chartroom had no immediate and perceivable knowledge of the effects on the ship (in terms of the risk of collision).

The task which the OOW had, *i.e.* to maintain a safe navigation watch relied on an accurate knowledge of the target state. The perception of the target state would have been the outcome of the OOW's interpretation of the context, based on a set of observations and data input to help out in the identification of the present state system. Without these crucial signals, the mapping of the meaningful states of the situation remained doubtful and inaccurate – to an extent that the close quarter situation, and ultimately the collision were not avoided.

2.5 The Conduct of the Navigational Watch on *Bo Spring*

The MSIU was extremely restricted in its analysis of the events happening on board *Bo Spring* due to the lack of data.

However, as already pointed out above, the two vessels should have been in sight of one another when they were at least 12 nm apart, *i.e.,* about 45 minutes prior to the collision. The fact that *Bo Spring* had *Tongala* on her port side, made *Bo Spring* the 'Stand On' vessel, and hence was required to maintain her course and speed.

It was clear from *Tongala*'s VDR and ECDIS data that *Bo Spring* neither sounded any warning signals nor did it take any action to avoid a collision in accordance with the relevant regulations. This raised doubts on the effectiveness of the lookout by the OOW on *Bo Spring*.

THE FOLLOWING CONCLUSIONS, SAFETY ACTIONS AND RECOMMENDATION 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

.1 The immediate cause of the collision was an inaccurate awareness of the situation on both vessels.

3.2 Latent Conditions and other Safety Factors

.1 Irrespective of the workload on the OOW, the MSIU did not come across any evidence which indicated that the additional crew members were being considered to carry out the tasks that distracted the duty OOW from his navigational watch.

.2 No collision warning alarms were set on any of the ARPA sets.

.3 The ECDIS alarm was not effective to draw the attention of the OOW.

.4 The OOW had spent long periods of time in the chartroom.

.5 The chartroom's night curtain was normally kept drawn and stowed on the starboard side of the railing and hence it would have obstructed the view of the OOW on the starboard side.

.6 The potential saving in time and the demonstration of skill to work under pressure were two typical examples of factors influencing procedural variability by the OOW.

.7 The hierarchy gap between the master and the junior OOW may have 'prohibited' the latter to ask for additional resources.

.8 Given the multiple tasks which had to be carried out, the OOW decided to utilise the time of the navigational watch to work in the chartroom.

.9 The OOW inside the chartroom missed on crucial signals, leading to a doubtful and inaccurate mapping of the meaningful states of the situation.

.10 It was clear from *Tongala*'s VDR and ECDIS data that *Bo Spring* neither sounded any warning signals nor did it take any action to avoid the collision.

3.3 Other Findings

.1 All three ARPA sets had been set up with an off-centre, displaying a longer range in the ahead position but with a reduction in the scanning range on the vessel's beams and abaft the beams.

.2 It seemed that ranges were not changed during the watch, suggesting that no long-range scanning was done on the 24 and 48 nm ranges.

4 ACTIONS TAKEN

4.1 Safety Actions Taken During the Course of the Safety Investigation

Following the accident, Wilhelmsen Lines Car Carriers Ltd. took the following actions:

- *Maritime Resource Management (MRM) Training* – The criteria for specific training in MRM has been enhanced to include a requirement for the training to be carried out every five years for masters, chief mates, second and third officers, chief and second engineers, and electricians. Previously, there had been no requirement for MRM refresher courses;
- *Voyage Data Recorder data as a training aid* – A review of technical capability has been carried out and the Company has decided to improve the interface functionality of the VDR units in order to allow downloads of targeted periods of time to be extracted. The primary scope is to have a valuable training aid by allowing the shipboard management team to review navigational practices on board. In addition, improvements in the Company's incident management processes are anticipated as a result of better access to VDR data for analysis. The Company has advised that this upgrade is taking place as part of a broader, fleet-wide project presently underway to improve the ECDIS provision;
- *Masters' random checks of navigational watchkeeping practices* – Following the accident, serving masters were instructed to carry out random checks on watchkeeping standards on board their vessels (including equipment alarm setting status) and to review and amend their respective Standing Orders if any deficiencies were noted. The Company has requested that this routine is

adopted as part of a three monthly process within the vessels' planned maintenance system,

- *Removal of the Bridge Navigational Watch Alarm System (BNWAS) reset function* – The facility to reset the BNWAS alarm function at the chart table is being removed on all Company vessels. The Company has advised that this action is designed to discourage OOWs from adopting poor watchkeeping practices;

- *Computer-based training (CBT) training in ColRegs application* – A review of the CBT records has been carried out to ensure that the Company specified ColRegs training has been completed by the required individuals, and deficiencies addressed as necessary;

- *Additional promotion criteria* – In order to facilitate the better appraisal of all shipboard personnel, the Company is considering a 'Crew Training Record Book'. The Book will record task achievement and hence competence standards, as an individual progresses along his/her career path. The Company believes that it will provide objective evidence which will allow serving masters to better assess the comparative competence and experience levels of their officers and crew;

- *Training Presentations and Experience Feedback* – Training presentations have been given at bi-annual officers' conferences in India and the Philippines to discuss the accident in detail. The presentations included the results of the root cause analysis, lessons learned and actions to prevent recurrence. These presentations have been supplemented by Global Experience Feedback summaries, which have been distributed fleet-wide;

- *Company's BPM and Navigational Watchkeeping* – The Company is amending its BPM to strictly prohibit a navigational OOW from carrying out tasks not related to a safe navigational watch (*inter alia*, chart corrections, voyage planning, routine testing and maintenance of equipment) when he/she is the sole look-out on the bridge.

5 RECOMMENDATIONS

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

Wilhelmsen Lines Car Carriers Ltd. is recommended to:

07/2016_R1 to inform crew members of the limitations in the use of using radar/ARPA sets with an off-centred display when this may affect the accuracy of situation awareness.

LIST OF ANNEXES

Annex A *Tongala*'s Cargo Ship Safety Equipment Certificate - Form E (Record of Equipment)

Annex B Minimum Safe Manning Certificate

Annex C Extracts from the VDR Data

Annex A *Tongala*'s Cargo Ship Safety Equipment Certificate - Form E (Record of Equipment)

Certificate No: **31432**
Date of issue: **2012-09-21**

RECORD OF EQUIPMENT FOR THE CARGO SHIP SAFETY EQUIPMENT CERTIFICATE
(FORM E)

This Record shall be permanently attached to the Cargo Ship Safety Equipment Certificate

Record of Equipment for Compliance with The International Convention for the Safety of Life at Sea, 1974, as modified by the Protocol of 1988 relating thereto

1 Particulars of ship

Name of Ship: **"TONGALA"**

Distinctive Number or Letters: **9HA2776**

2 Details of life-saving appliances			
1	Total number of persons for which life-saving appliances are provided	**38**	
		Aft	**Starboard side**
2	Total number of lifeboats	**1**	
2.1	Total number of persons accommodated by them	**38**	
2.2	Number of totally enclosed lifeboats (regulation III/31 and LSA Code, Section 4.6)	-	
2.3	Number of lifeboats with a self-contained air support system (regulation III/31 and LSA Code, Section 4.8)	-	
2.4	Number of fire-protected lifeboats (regulation III/31 and LSA Code, Section 4.9)	-	
2.5	Other lifeboats		
2.5.1	Number	-	
2.5.2	Type	-	
2.6	Number of freefall lifeboats		
2.6.1	Totally enclosed (regulation III/31 and LSA Code, Section 4.7)	**1**	
2.6.2	Self-contained (regulation III/31 and LSA Code, Section 4.8)	-	
2.6.3	Fire-protected (regulation III/31 and LSA Code, Section 4.9)	-	
3	Number of motor lifeboats (incl. in the total lifeboats shown above)	**1**	
3.1	Number of lifeboats fitted with searchlights	**1**	
4	Number of rescue boats	**1**	
4.1	Number of boats which are included in the total lifeboats shown above	-	
5	Liferafts		
5.1	Those for which approved launching appliances are required		
5.1.1	Number of liferafts	**2**	
5.1.2	Number of persons accommodated by them	**40 (2 x 20P)**	
5.2	Those for which approved launching appliances are not required		
5.2.1	Number of liferafts	**2**	
5.2.2	Number of persons accommodated by them	**40 (2 x 20P)**	
5.3	Number of liferafts required by regulation III/31.1.4	**1 (6P)**	

6	Number of lifebuoys	**15**
7	Number of lifejackets	**46**
8	Immersion suits	
8.1	Total number	**49**
8.2	Number of suits complying with the requirements for lifejackets	-
9	Radio installations used in life-saving appliances	
9.1	Number of search and rescue locating devices	
9.1.1	Radar search and rescue transponders (SART)	**2**
9.1.2	AIS search and rescue transmitters (AIS-SART)	-
9.2	Number of two-way VHF radiotelephone apparatus	**3**
3.	**Details of navigation systems and equipment**	
1.1	Standard magnetic compass *	**Provided**
1.2	Spare magnetic compass *	**Provided**
1.3	Gyro compass *	**Provided**
1.4	Gyro compass heading repeater *	**Provided**
1.5	Gyro compass bearing repeater *	**Provided**
1.6	Heading or track control system *	**Provided**
1.7	Pelorus or compass bearing device *	**Provided**
1.8	Means of correcting heading and bearings	**Provided**
1.9	Transmitting heading device (THD) *	-
2.1	a) Nautical charts	**Provided**
	b) Electronic Chart Display and Information System (ECDIS)	-
2.2	Back-up arrangements for ECDIS	-
2.3	Nautical publications	**Provided**
2.4	Back-up arrangement for electronic nautical publications	**Provided**
3.1	a) Receiver for global navigation satellite system*	**Provided**
	b) Receiver for terrestrial navigation system*	-
3.2	9 GHz radar *	**Provided**
3.3	Second radar:	
	a) 3 GHz *	**Provided**
	b) 9 GHz	**Provided**
3.4	Automatic radar plotting aid (ARPA) *	**Provided**
3.5	Automatic tracking aid *	-
3.6	Second automatic tracking aid *	-
3.7	Electronic plotting aid *	-
4.1	Automatic identification system (AIS)	**Provided**
4.2	Long-range identification and tracking (LRIT) system	**Provided**
5.1	Voyage data recorder (VDR)	**Provided**
5.2	Simplified voyage data recorder (S-VDR)	-
6.1	Speed and distance measuring device (Through the water) *	**Provided**
6.2	Speed and distance measuring device (over the ground in the forward and athwartship direction) *	**Provided**
6.3	Echo sounding device *	**Provided**

7.1	Rudder, propeller, thrust, pitch and operational mode indicator *	**Provided**
7.2	Rate of turn indicator *	**Provided**
8	Sound reception system *	**Provided**
9	Telephone to emergency steering position *	**Provided**
10	Daylight signalling lamp *	**Provided**
11	Radar reflector *	-
12	International Code of Signals	**Provided**
13	IAMSAR Manual, Volume III	**Provided**
14	Bridge navigational watch alarm system (BNWAS)	**Provided**

THIS IS TO CERTIFY that this Record is correct in all respects.

Issued at Nagasaki, Japan on 2012-09-21

for **Det Norske Veritas AS**

[redacted]

NORSKE VERITAS 1864 DNV HIROSHIMA

* Alternative means of meeting this requirement are permitted under regulation V/19. In case of other means they shall be specified.

Entries in boxes shall be made by inserting either a cross (x) for the answers 'yes' and 'applicable' or a dash (-) for the answers 'no' and 'not applicable' as appropriate.

Annex B Minimum Safe Manning Certificate

Transport Malta

MINIMUM SAFE MANNING CERTIFICATE

Issued in compliance with the International Convention for the Safety of Life at Sea 1974 Chapter V Regulation 14(2), and the Merchant Shipping (Safe Manning and Watchkeeping) Regulations 2003

This is to certify that in accordance with the principles and guidelines set out in Resolution 1047 (27) of the International Maritime Organisation, the ship named in this certificate will be considered to be safely manned when it proceeds to sea with not less than the numbers and grades of the personnel shown in this document, subject to any conditions stated hereunder.
The Engagement of additional personnel as necessary for cargo handling and control, maintenance, security and watchkeeping and for compliance with the required rest periods, is the responsibility of the owner/manager and the master.

Vessel

Name of Ship	TONGALA
Port of Registry	Valletta
IMO Number	9605786
Type of Ship	VEHICLE CARRIER
Gross Tonnage	61106
Registered Power	13240 kW
UMS*	Yes
Operating Company	Wilhelmsen Lines Car Carriers Ltd 3rd Floor, Friary House Briton Street, Southampton Hampshire SO14 3JL, United Kingdom

* Periodically unattended machinery space

Personnel

Grade/Capacity	Minimum STCW Reg	Number of Persons
Master	II/2	One
Chief Mate	II/2	One
OOW Navigational	II/1	Two
Chief Engineer	III/2	One
Second Engineer	III/2	One
OOW Engineering	III/1	One
Deck Rating	II/4	Four
Deck Rating	VI/1	Two
Engine Rating	III/4	Two

Trading area
UNLIMITED

Minimum Qualifications and Requirements

All Deck and Engine Room officers, are to be in possession of a Certificate of Competence and an Endorsement issued by the appropriate authority in compliance with the STCW Convention 78, as amended.

Furthermore all officers are required to be holders of an Endorsement issued under Regulation I/10, by the Merchant Shipping Directorate stating that the holder is competent to serve in a capacity on board ship with trading patterns, tonnage and registered power indicated.

Any shortages from the specified number of personnel should be referred for approval to the Merchant Shipping Directorate, Transport Malta.

Conditions

If the UMS or bridge control systems are not operational then an Engineering Watchkeeping Officer (Reg.III/1) and an Engine Rating (Reg.III/4) must be carried in addition to the above.

At least two Deck Officers must be holders of a GMDSS General Operator's Certificate (G.O.C), or otherwise vessel must carry a dedicated Radio Operator, holder of at least a GMDSS General Operator's Certificate (G.O.C).

Issued at Valletta Malta on the **22 March 2014**

This Certificate is valid until the **28 August 2017**

[redacted]

Merchant Shipping Directorate

Merchant Shipping Directorate, Malta Transport Centre, Marsa MRS 1917, Malta.
Voice: +356 21250360, 99494317 E-mail: mershipmalta.tm@transport.gov.mt Fax: +356 21241460

Annex C Extracts from the VDR Data

UTC	*LT*	*Co (T)*	*Action / Transcript*
0400	1200	048	*Tongala* Noon Position: 19° 04' N 119° 01' E; Speed 20.3 Knots; Conversation and laughter can be heard between the third mate and the Second mate on the Bridge as part of the handover of the watch. The General/Fire Alarm and the Fog Horn were sounded/tested. The X-band Radar/ARPA JMA-922B-9XA was on North Up, off-centred at 12 nm range. Two vessels/targets coming down on the starboard side.
0409	1209	048	Third mate left the Bridge. Noise/calls heard on the VHF radio.
0420	1220	048	*Tongala*'s speed 20.9 Knots. VHF active again.
0427	1227	048	Master arrives on the Bridge. Conversation between the Master and the second mate on whether or not to move forward the ship's clocks by one hour that evening and about the chart corrections which the Second mate was asked to bring up to date as the master was preparing his hand-over report.
0437	1237	048	One target/vessel on the radar, fine on the port bow, 19 nm away.
0438	1238	048	Target acquired: other vessel's speed 11 knots, Course 236° and CPA 2.6 nm but no name of the vessel.
0445	1245	046.5	Master left the bridge.
0450	1250	046	Another target/vessel on the radar 18 nm away on the starboard bow.
0500	1300	046	Own speed 19 knots. Other vessels/targets: on the port bow Course 230°, Speed 11.5 knots;, CPA 1.70 nm; another target on the port side, 18 nm away.
0514	1314	046	Target/vessel on the port beam, CPA 1.5 nm. While the other target on the port side at 11 nm away and the one on the starboard side at seven nm away. Clear sounds and noises can be heard relating to the handling of charts, opening and closing of chart drawers and the erasing of previous courses/cleaning of charts.
0516	1316	046	Closest target now abaft the beam. No other targets on the radar/ARPA had been acquired. Sounds/noises relating to the handling of charts continues.
0519	1319	046	Target on the port bow now 8 nm off. VHF radio very active. Sounds/noises relating to the handling of charts very clear.
0535	1335	052	Own course now 052°(G).
0540	1340	051	New target on the starboard bow 19 nm off.

0600	1400	049	Closest target on the starboard bow is a vessel being overtaken by *Tongala*. Another two new targets showing on the radar, one on the port bow and one on the starboard bow.
0615	1415	049	Now three targets on the portside. The vessel being overtaken is now fine on the starboard bow 14 nm off. Sounds and noises relating to the handling of charts remains very clear.
0630	1430	049	Vessel being overtaken now fine on the port bow at 12 nm off.
0632	1432	049	New target (*Bo Spring*) on the radar/ARPA, 18 nm off on the starboard side about 5 points on the bow. Sounds and noises relating to the handling of charts remains very clear.
0645	1445	049	Vessel being overtaken fine on the port bow at 10 nm off; *Bo Spring* is now 12 nm off on the starboard side. Sounds and noises relating to the handling of charts remains very clear.
0700	1500	052	Vessel being overtaken on the port bow at 9 nm off; *Bo Spring* is now 9 nm off on the starboard side. Sounds and noises relating to the handling of charts remains very clear.
0705	1505	053	*Bo Spring* is now 8 nm off on the starboard side. CPA 0.47 nm. Sounds and noises relating to the handling of charts remains very clear.
0710	1510	052	*Bo Spring* is now 6.5 nm off on the starboard side. CPA 0.05 nm. Sounds and noises relating to the handling of charts remains very clear.
0715	1515	052	Vessel being overtaken on the portside at 8 nm off; *Bo Spring* is now 5 nm off on the starboard side. CPA 0.09 nm. Sounds and noises relating to the handling of charts remains very clear.
0720	1520	052	*Bo Spring* is now 4 nm off on the starboard side. CPA 0.19 nm. Sounds and noises relating to the handling of charts remains very clear.
0725	1525	052	*Bo Spring* is now 4 nm off on the starboard side. CPA 0.12 nm. Sounds and noises relating to the handling of charts remains very clear.

0730	1530	052	*Bo Spring* is now 1.5 nm off on the starboard side. VHF radio active but the call is not clear enough to understand Sounds and noises relating to the handling of charts remains very clear.
0732	1532	052	*Bo Spring* is now less than one nm off. CPA 0.09 nm. Sounds and noises relating to the handling of charts remains very clear.
0735	1535	052	Position: 19°51.1'N 119° 56.5'E; collision/crushing noise can be heard; immediately the bridge telephone rings, and the second mate answered "*I do not know."*

NB: It is to be noted that the while the conversations and noises/sounds in the chartroom were very clear on the VDR voice recordings, the VHF calls were not. Conversations which took place on the bridge in the Indian language were translated to the English language by the managers.