DMAIB
DANISH MARITIME ACCIDENT INVESTIGATION BOARD

WORLD BORA & RABA

Marine accident report on collision

19 FEBRUARY 2019

MARINE ACCIDENT REPORT ON COLLISION WITH WORLD BORA AND RABA ON 19 FEBRUARY 2019

published by

DMAIB
Danish Maritime Accident Investigation Board
Batterivej 9
DK-4220 Korsoer
Denmark

The report is issued on 23 December 2019.

Photo: WORLD BORA after the collision
Source: DMAIB

The investigations are carried out separately from the criminal investigation, without the application of legal evidence procedures and with no other basic aim than learning about accidents with the purpose of gaining and promoting an understanding of safety. Consequently, any use of this report for other purposes may lead to erroneous or misleading interpretations.

Content

Board statement

In the morning the 19th February 2019, the Danish crew transfer vessel (CTV) WORLD BORA and Cyprus-registered general cargo vessel RABA collided in the Baltic sea 2 nm east of Rügen, Germany, while under way; WORLD BORA from Mukran, Germany, transfering industrial personnel to the wind-farm Wikinger, and RABA from Koege, Denmark, to Szczecin, Poland.

The ships only suffered minor damages to their hull and interior, but most of the crew and some of the industrial personnel on WORLD BORA suffered serious secondary impact injuries. Therefore, the Danish Maritime Accident Investigation Board (DMAIB) in agreement with the German authorities initiated an investigation of the accident to establish the circumstances leading to the collision between WORLD BORA and RABA.

From interviews it was initially established that the master on WOLRD BORA did not see RABA before the collision, and that the master on RABA saw WORLD BORA, but did not realise the risk of collision until moments before the collision. The main purpose of the investigation was therefore to clarify why the master on WORLD BORA did not see RABA, and why the master on RABA did not realise the risk of collision until the ships were at close quarters.

After the mapping of events, DMAIB was able to identify the underlying circumstances of the accident, which were closely related to the work practices on the bridge on both ships. Work practises which distracted the watchkeeping officers from the primary duty of keeping lookout and navigating the ship.

Narrative

In this section, the course of the events will be described from the involved persons' perspective and with the knowledge available at the time of the accident.

The course of events covers the period from 0700 to 0800 on 19 February 2019.

Background

WORLD BORA

WORLD BORA was a Crew Transfer Vessel (CTV) operating on a charter out of the Port of Mukran in the northern part of Germany. From Mukran the vessel serviced the wind farm Wikinger, northeast of Mukran, approximately 1 hour of sailing from Mukran. WORLD BORA was certified to transport 24 industrial personnel.

WORLD BORA was manned with a crew of four: one master, one chief officer and two ABs.

The master had been on board the vessel for approx. three years and been in the offshore wind industry for ten years. The chief officer had been on board the vessel for approx. eight months.

In the morning on the 19 February 2019, the crew prepared the ship which was to carry 11 industrial personnel to the Wikinger wind farm.

RABA

RABA was a general cargo ship mainly operating in Northern European waters. RABA was manned with a crew of six: one master, one chief officer, one engineer and three ABs. The master had signed on RABA in Koege, Denmark, on 16 February 2019 during port stay and had not been on the ship before.

The ship departed from Koege on 18 February 2019 and was bound for Szczecin in Poland. In the morning on 19 February, the ship was located midwater off Rügen, Germany.

Figure 1: WORLD BORA
Source: World Marine Offshore

Figure 2: RABA
Source: Baltramp Shipping

Course of events

WORLD BORA

In the early morning of 19 February 2019, in Mukran in Germany, the master on WORLD BORA started up the engines before 11 industrial personnel had embarked the vessel. Meanwhile, the chief officer completed the pre-departure checklists. The voyage from Mukran to the wind farm had a duration of approx. one hour. The 11 industrial personnel were seated in the lounge on the main deck and watched the safety video during the departure (figure 3). They were sitting in the lounge chairs, relaxing, drinking coffee and talking.

During departure, the master and chief officer were on the bridge. The chief officer manoeuvred WORLD BORA out of the harbour to the open sea. When the ship had a steady northerly course in the open waters, towards the wind farm, the master took the watch. The time was 0715 am, and the master told the chief officer to go to the mess room to have his breakfast.

On the bridge, the master monitored the traffic in the vicinity. It was clear weather, the visibility was good and the sea calm. WORLD BORA passed at a safe distance from a vessel at anchor. The master changed the course to a north-easterly course one minute later. WORLD BORA had reached the service speed of approx. 18 knots.

He then again monitored the traffic, and the master did not see any vessels in the vicinity which posed a risk of collision.

The master felt the need for a cigarette and went out on the aft upper deck. By the door on the aft part of the bridge, an ashtray was mounted – outside on the bulkhead just next to the door – and from this spot he could see out of the front windows and listen to the VHF radio (figure 4). When he had finished his cigarette, it occurred to him that he had to make some changes to the hotel booking for one of the ABs signing off later that day. The master wanted to check up on this matter, and he sat down by the computer located on a desk by the door.

Suddenly, he was violently knocked over and hurled to the front of the bridge and struck the chair by the conning station. When the master came to himself he looked out the front windows and saw a ship. He realised that a collision had occurred. The time was 0733 am. Shortly after, the chief officer came stumbling to the bridge. The master saw that he was seriously injured, but asked him to take over the watch, because he had to check if any of the industrial personnel and crew were injured.

Figure 3: Lounge on WORLD BORA
Source: DMAIB

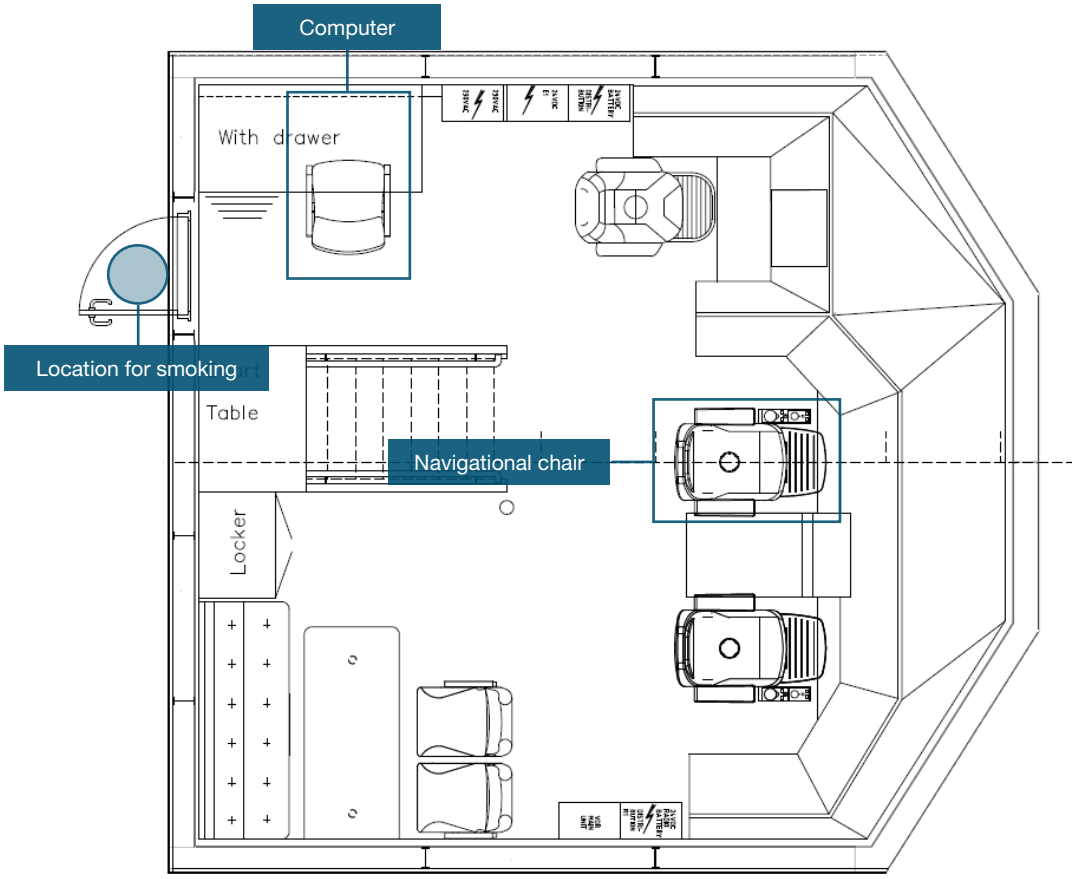

Figure 4: Bridge layout
Source: World Marine Offshore/DMAIB

The master hurried below and quickly realised that several of the industrial personnel were injured and needed immediate medical care. He rushed to the bridge. On the stern of the other ship he saw the name RABA. He called RABA and asked if they were okay, and the master on RABA confirmed that they were all okay on board RABA.

The master quickly assessed that there was no water ingress and decided to immediately return to the nearest port, Sassnitz. Underway, the master called the authorities and the company and informed them about the collision with RABA. He asked the authorities to send ambulances to the port, so the injured industrial personnel and crew could be treated upon arrival.

At 0801 am WORLD BORA arrived in Sassnitz. It was not until the ship reached the port that the master realised that he was seriously injured. The industrial personnel and the crew were examined by medical personnel and brought to nearby hospitals.

RABA

In the morning of 19 February 2019, RABA was en route to Szczecin. At 0600 am, the master came to the bridge (figure 5, next page) and took over the watch. On the bridge was also an AB on watch.

During his watch, the master familiarised himself with the bridge while he was monitoring the ships in the vicinity visually and on the radar. The master had observed two fishing ships MAGARETE and SIRIUS which RABA passed at 0708 am. 15 minutes later the master plotted WORLD BORA on the radar and saw that the CPA was 0.6 nm. The master did not consider this to pose any danger of a close quarter situation with WORLD BORA, and he thus continued his familiarisation with the bridge.

The engineer came to the bridge and had a short conversation with the master and then left the bridge again. The master was relaxed as the weather was clear, and the visibility was good.

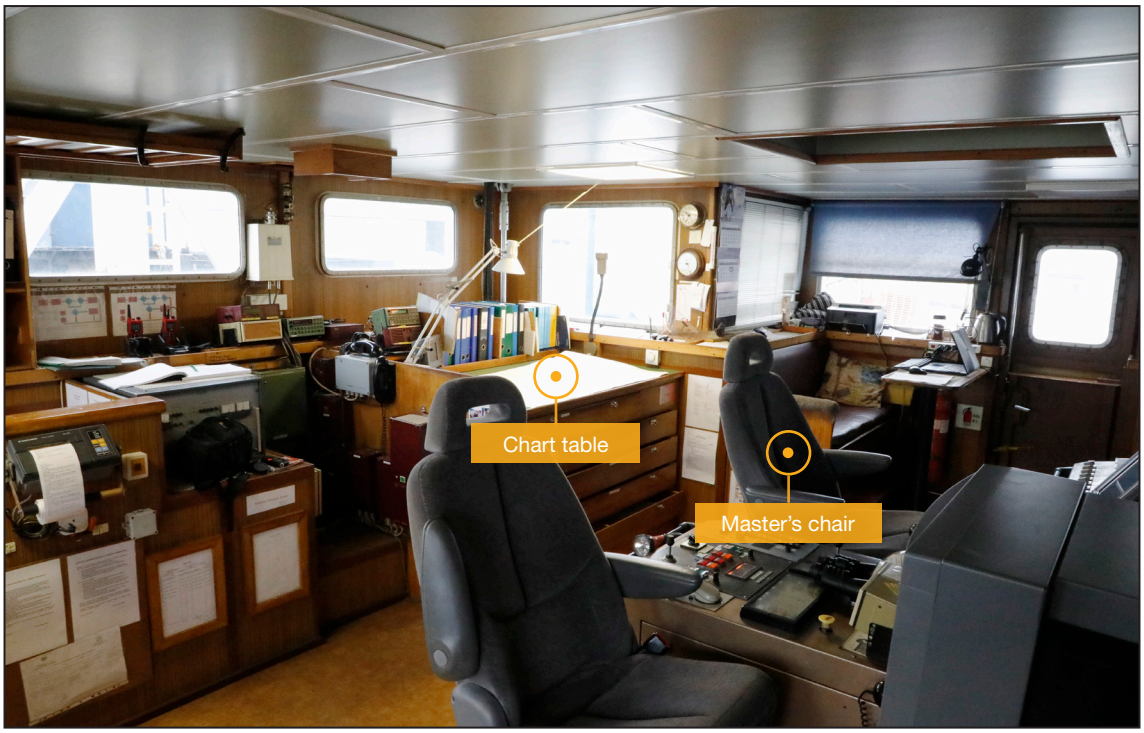

Figure 5: Bridge on RABA
Source: DMAIB, 2019

After having used the bridge computer and finishing paper work by the chart table, the master sat down in the port side navigational chair.

Suddenly, the lookout saw a ship at close quarters and informed the master. Immediately, the master called SIRIUS at VHF channel 16. The master received no response. He repeated the call shortly after, again without reply. The ship approached quickly and was now so close that a collision was unavoidable, and the master noticed that the bridge on the other ship seemed to be unmanned. As the master realised that the ship was going to collide with RABA, he altered the course to port to minimise the impact.

At 0733 am, RABA was hit by the other ship forward of the superstructure on starboard side. Shortly after, RABA received a call from the master on WORLD BORA, asking if the crew on board RABA was okay. The master on RABA was confused as he thought they had collided with SIRIUS, but told WORLD BORA that they were all okay on RABA.

WORLD BORA left the scene, heading for shore. The master on RABA inspected the damage to his vessel and assessed it to be minor. After establishing that the ship was still seaworthy, RABA set course for Sassnitz.

Investigation

In this section, DMAIB presents the collected data that has been deemed relevant for understanding the circumstances of the collision between WORLD BORA and RABA on 19 February 2019.

Approach

On the day of the accident, DMAIB together with the German Federal Bureau of Maritime Casualty Investigation (BSU) started an investigation on WORLD BORA and RABA.

From interviews it was initially established that the master on WOLRD BORA did not see RABA before the collision, and that the master on RABA saw WORLD BORA, but did not realise the risk of collision until moments before the collision. The main purpose of the investigation was therefore to clarify:

- Why the master on WORLD BORA did not see RABA.
- Why the master on RABA did not realise the risk of collision until the ships were at close quarters.

To answer these questions, DMAIB mapped the course of events for both ships based on interviews with the crew members, radar images and VHF communication from Vessel Traffic Service (VTS) Warnemünde and AIS.

After the mapping of events, DMAIB was able to identify the underlying circumstances of the accident, which were found to be closely related to the ships' work practises on the bridge. The mapping of events and the investigation into the underlying circumstances to the collision will be described in the following sections.

Mapping the events prior to the collision

WORLD BORA

15 minutes after WORLD BORA's departure from Mukran at 0701 am, the chief officer left the bridge, and the master was alone navigating the ship and keeping lookout. At 0719 am, the master made a course alteration, looked at the radar and did not identify any object which posed a risk of collision. WORLD BORA was still situated close to shore, and the radar was therefore set to a radius of 3 nm. Based on an analysis of the sequence of events, a conservative estimate for when the master could have looked at the radar before the collision was 0721 am. At 0721 am, RABA was at a distance greater than 3 nm and hence was not within WORLD BORA's radar coverage (figure 6, next page).

The weather was good and the sea was calm. As the traffic situation did not cause concern, the master went out on the deck on the port aft side of the bridge to smoke. From this location, he was able to see out of the bridge windows and keep an eye on the traffic visually. The master kept lookout from this position for approx. 4 minutes. In this time, the master did not observe any changes to the traffic that gave cause for concern. The visibility was good at the time of the accident, and it is possible that RABA could be sighted visually.

However, from the master's stationary position by the door, RABA could remain hidden behind a window bar (figure 7, next page).

When the master had finished his cigarette, he went directly to the computer located near the exit to the aft deck where he had been smoking and did not pass the radar. As the master had not observed any change in the traffic situation while smoking, he deemed that the current traffic rendered him time to briefly carry out some administrative work. At this point RABA was within radar coverage, but the master's lookout was impaired by the distance to the radar and the blind angles on the bridge.

The master estimated that he was at the computer for 1-2 minutes before the collision, however, logs from the computer show that the master was active on the computer from 0725 am to 0733 am, when the collision occurred. It is likely that the master lost his sense of time while being caught up by computer work and hence did not realise that lookout was not kept for 8 minutes, neither on the radar nor visually (figure 8, page 13). During the 8 minutes with no lookout, WORLD BORA travelled a distance of 2.5 nm. Hence, the master did not see RABA approaching on a collision course.

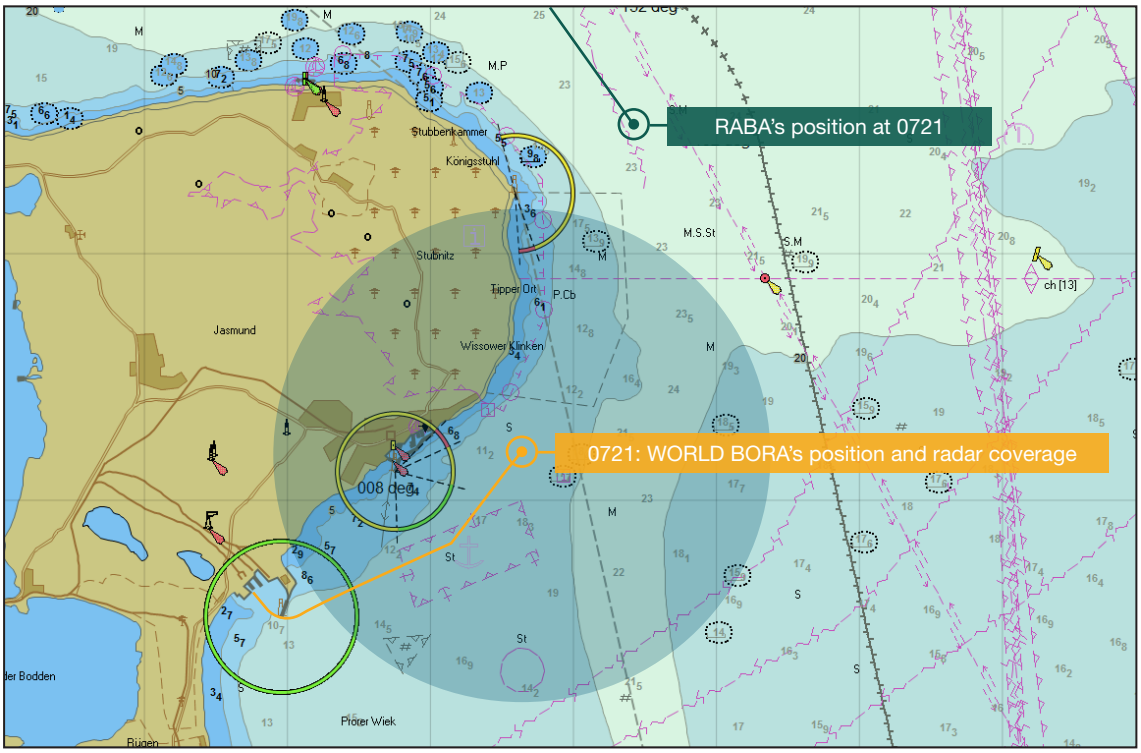

Figure 6: RABA outside WORLD BORA's radar coverage at 0721 am.
Source: © Made Smart Group BV 2019; © C-map Norway AS 2019/DMAIB

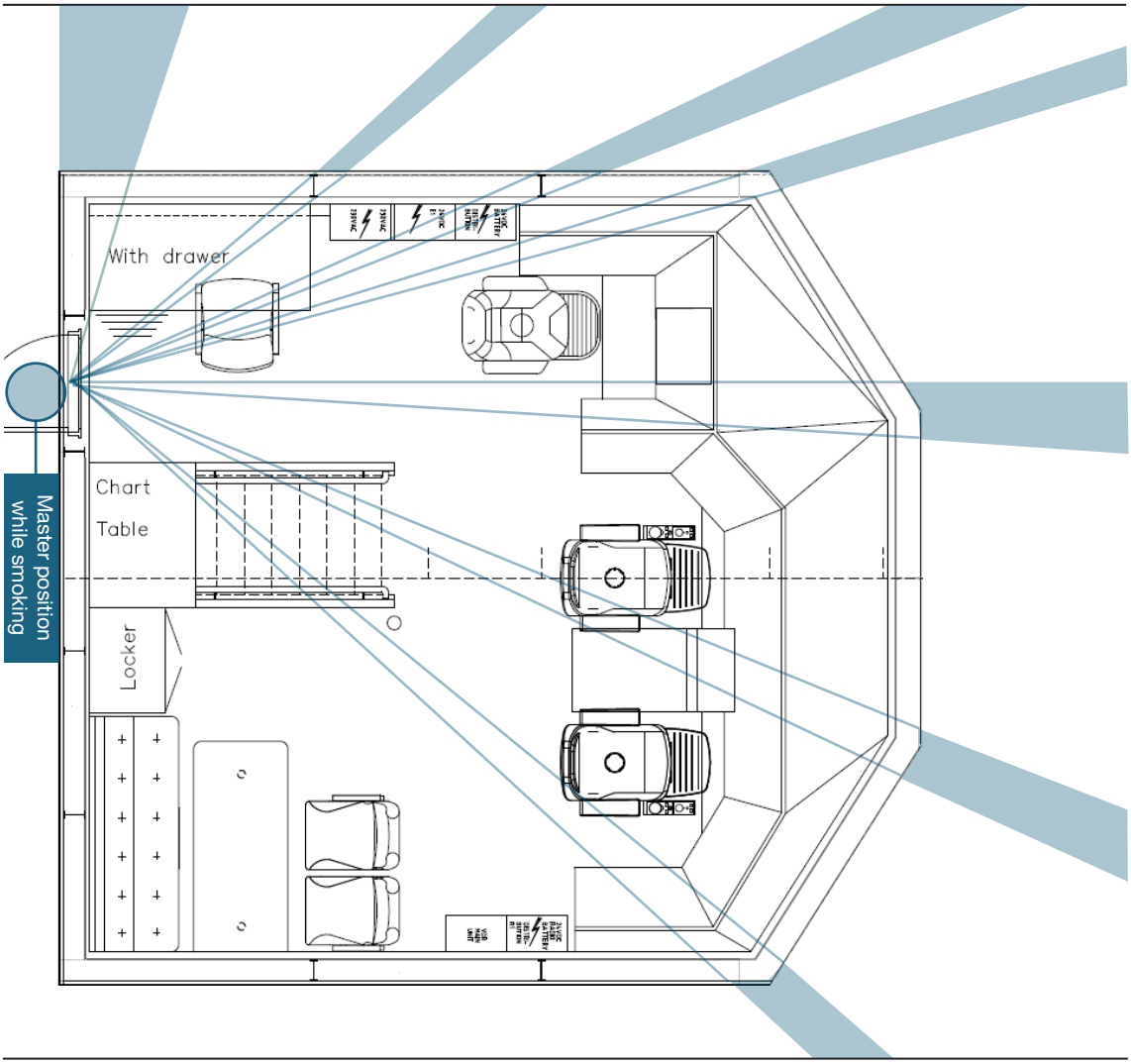

Figure 7: Blind angles on the bridge from the master's stationary position while he was smoking.
Source: World Marine Offshore/DMAIB

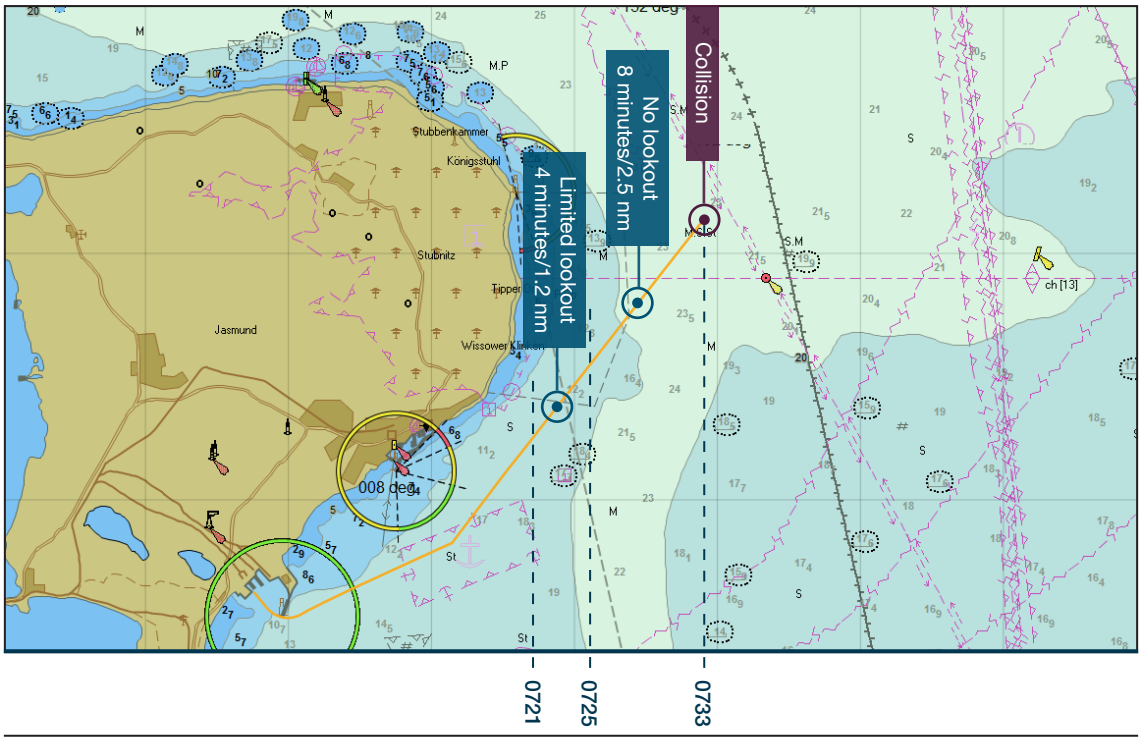

Figure 8: Lookout on World Bora before the collision
Source: © Made Smart Group BV 2019; © C-map Norway AS 2019 /DMAIB

RABA

On RABA, the master identified WORLD BORA on the radar at 0724 am with a CPA of 0.6 nm. According to the CPA, WORLD BORA would pass in front of RABA and hence the master did not consider RABA to be on collision course with WORLD BORA (figure 9).

In the time frame between 0724 am and 0731 am, the master was occupied with activities on the bridge other than navigation, such as conversations with other crew members, registering fuel oil numbers and familiarising himself with the bridge. During this period, the AB on the bridge kept a visual lookout.

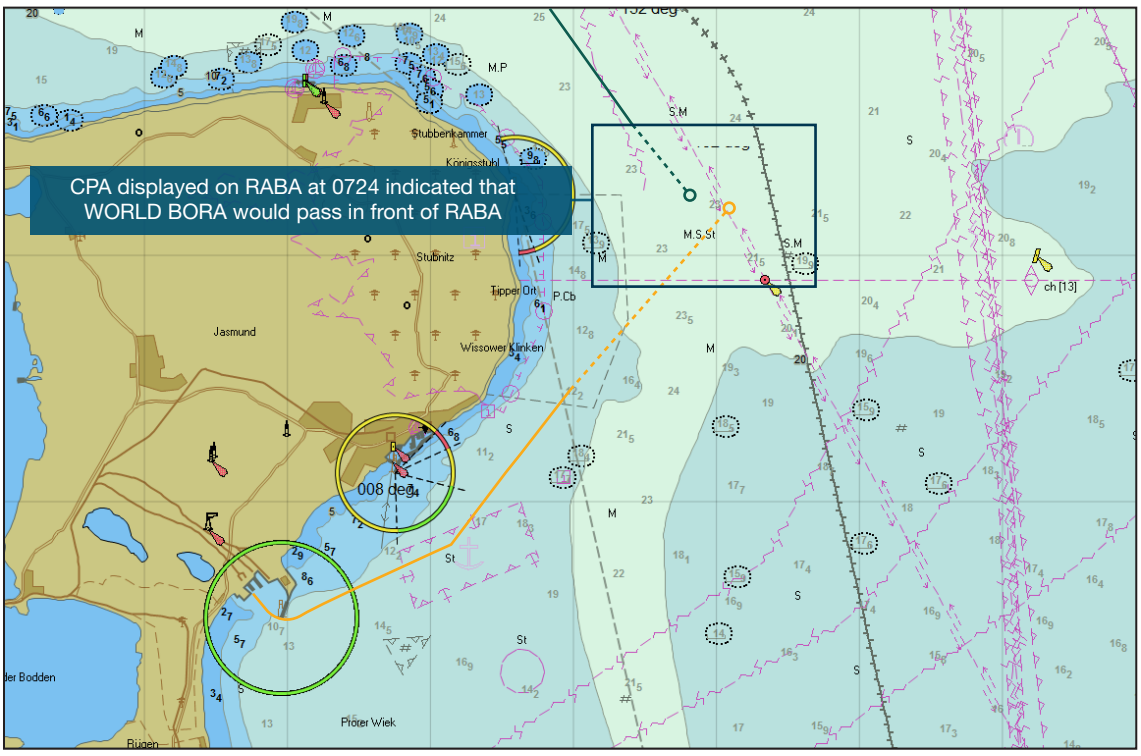

Figure 9: CPA of 0.6 nm displayed at 0724 (reconstruction).
Source: © Made Smart Group BV 2019; © C-map Norway AS 2019 /DMAIB

At 0731 am, the AB notified the master that he observed a ship on RABA's starboard side. At this point, the distance between the two ships was 0.7 nm. The master immediately realised that the ships were about to be in a close quarter situation and took action by attempting to call the approaching ship (figure 10). Due to the stressful situation, the master made an error by calling the wrong vessel on channel 16. He waited 30 seconds and then repeated the call.

During these 30 seconds, the distance between the two ships was reduced to 0.4 nm. Again, he waited 38 seconds for a reply from the other vessel, but now realising that a collision was inevitable, he altered RABA's course to port to minimise the impact of the collision (figure 11). Figure 12, next page, shows the angle of impact.

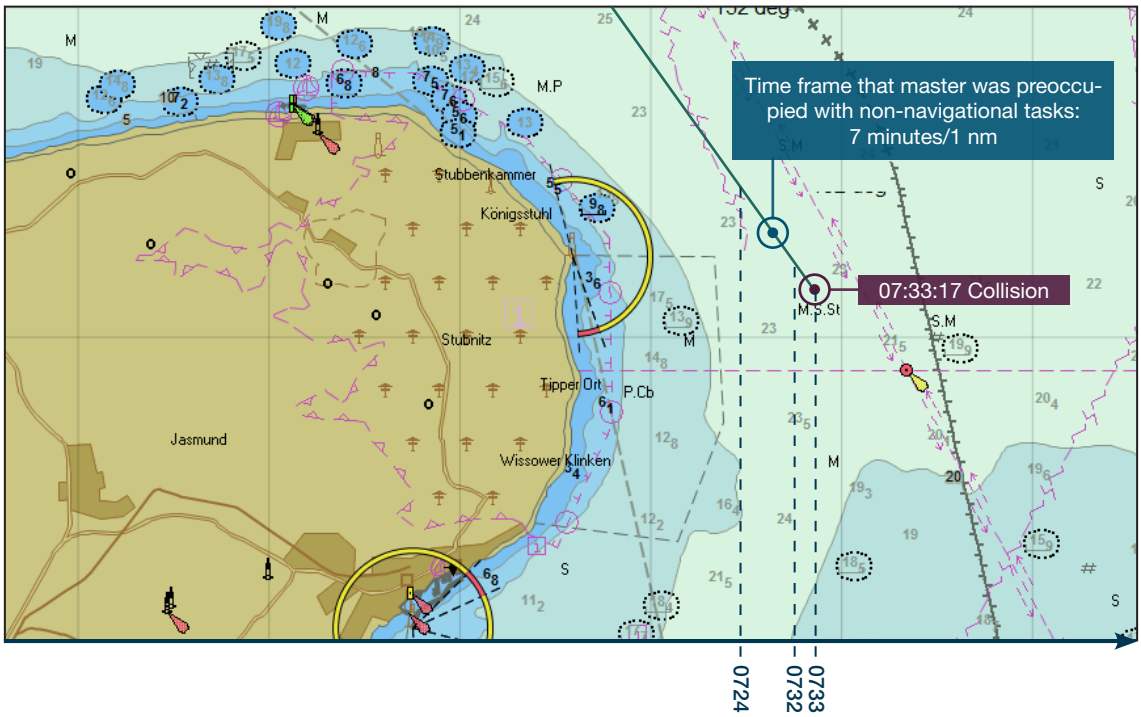

Figure 10: Lookout on RABA before the collision.
Source: © Made Smart Group BV 2019; © C-map Norway AS 2019 /DMAIB

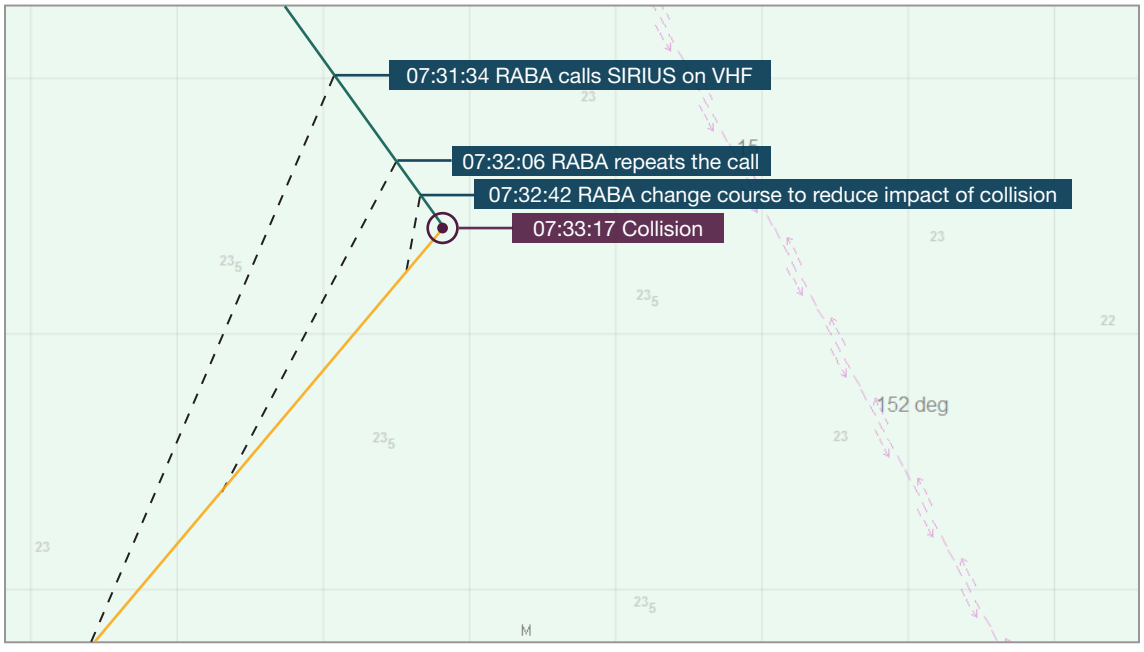

Figure 11: : Reduction of distance between the WORLD BORA and RABA during the attempt to avoid the collision.
Source: © Made Smart Group BV 2019; © C-map Norway AS 2019 /DMAIB

Figure 12: Angle of impact seen from WORLD BORA.
Source: World Offshore Marine

WORLD BORA – Work on the bridge

Watchkeeping schedules

WORLD BORA's ISM manual contained two different watchkeeping schedules: one for the ship being in a 24-hour charter and one for a 12-hour charter. When the ship was engaged in a 24-hour charter, the master and chief officer were on a 6 on 6 off watchkeeping schedule. In a 12-hour charter, the master and chief officer were to keep the navigational watch together for 12 hours. In the time periods not allocated to watchkeeping, the ISM schedule stated that the master and chief officer had non-watch keeping duties. According to the ship operator, non-watchkeeping duties included drills, planning of voyage, maintenance and communication with company, charterer and authorities.

According to the watchkeeping schedules for both 24-hour and 12-hours charters, it was not clearly stated when the officers had mandatory rest hours. (figure 13, next page).

At the time of the accident, WORLD BORA was engaged in a 24-hour charter. The ship was in port during the night, but available for the charterer at all hours. The crew rest hour schemes were filled in a month in advance and showed that the master's rest hours reflected the 24-hour watch-keeping schedule, while the chief officer's schedule reflected the 12-hour watchkeeping schedule.

This illustrates that the crew had divergent views on which schedule was applicable. In practice, their work hours were different from the ISM watchkeeping schedule and the rest hour schemes. The actual working hour practise will be described in the next section.

Work practice on the bridge

According to the watch schedule for 24-hour charters, the master on WORLD BORA was on watch from 06-12 and 18-00, while the chief officer was on watch from 12-18 and 00-06. The ship was, however, mainly alongside during the night, and the navigators therefore adjusted their work hours so that work tasks other than navigation were carried out in an effective manner either during the rest period or while keeping the navigational watch.

On the day of the accident, the chief officer stayed on the bridge 75 minutes longer than scheduled in the 24-hour watchkeeping schedule to gain experience manoeuvring the ship out of the port. For this type of training it was necessary to divert from the 6/6 watch scheme, because it required an overlap between the master's and the chief officer's watch.

24 Hour Charter

Stilling/Rang[2] Position/Rank	Planlagt daglig arbejdstid på søen Scheduled daily work hours at sea		Planlagt daglig arbejdstid i havn Scheduled daily work hours in port		Kommentarer[3] Comments	Samlet hviletid I døgnet Total daily hours of rest	
	Vagthold(Fra - Til) Watch keeping (from-to)	Ikke vagtholds-tjeneste (fra-til) Non Watch keeping Duties (from-to)	Vagthold (Fra-Til) Watch keeping (from-to)	Ikke vagtholds-tjeneste (fra-til) Non Watch keeping Duties (from-to)		At sea	In port
Fører /Master	06:00-12:00 18:00-24:00	00:00-06:00 12:00-18:00	08:00-16:00	16:00-08:00	To be adj. If ness.	12	16
Styrmand/mate	12:00-18:00 00:00-06:00	06:00-12:00 18:00-24:00	08:00-16:00	16:00-08:00	To be adj. If ness.	12	16
skibs.ass /OS	06:00-12:00 18:00-24:00	00:00-06:00 12:00-18:00	08:00-16:00	16:00-08:00	To be adj. If ness.	12	16
Skibs.ass 2/OS2	12:00-18:00 00:00-06:00	06:00-12:00 18:00-24:00	08:00-16:00	16:00-08:00	To be adj. If ness.	12	16
Mester/Ch. Eng	06:00-18:00	18:00-06:00	08:00-16:00	16:00-08:00	To be adj. If ness	12	16

Figure 13: Watchkeeping schedule for 24-hour charter
Source: World Offshore Marine

The master on WORLD BORA had administrative work besides his navigational work tasks. He would usually prioritise the administrative work with consideration to the charter's requests and land-based organisation. The master monitored and answered the incoming communication such as e-mails and phone calls throughout the day during his bridge watch and rest hours, while he attempted to maintain the crew sufficiently rested to engage in the 24-hour operation that the ship was chartered for. The decision of when to carry out administrative work was based on an assessment of traffic and weather situation.

On the day of the accident, the master assessed that the traffic and weather situation rendered sufficient space and time for him to handle administrative tasks, while he was responsible for the navigation of the ship.

Bridge layout

The bridge layout on WORLD BORA is depicted in figure 14. The layout was designed with two navigational chairs in the front part of the bridge and one chair on the port side for an engineer.

On the port side aft there was an office workspace and on the starboard side a meeting area was placed. Both the office workspace and the meeting area were an integrated part of the bridge's layout.

Additionally, the ship's phone was located on the bridge, which the charter and the land-based organisation used for communication with the bridge crew.

The layout of the bridge thus made it possible that the bridge crew took on administrative work and non-navigational communication during the bridge watch.

At the exit to deck aft on the bridge, an ash tray was mounted on the bulkhead close to the door. From this position, it was possible to visually monitor the traffic and listen to the communication on the VHF radio. The mounted ash tray shows that it was common and accepted on WORLD BORA that the officer left the navigational chairs during the bridge watch and temporarily keep lookout from aft bridge exit. Keeping a lookout from the smoking area entailed that the officer stood still as the space where limited. Even though the range of the vicinity from this spot was wide, the window bars could hide other vessels, if the officer did not change his perspective by moving around.

HSC requirements

WORLD BORA was certified by the Danish Maritime Authority (DMA) as a High-Speed Craft Cargo Ship (HSC-Cargo Ship). In the international regulation for high-speed craft, an increased risk of collision for this type of vessel is identified and acknowledged. To reduce the risk of hazardous situations arising, the requirements for bridge manning and operating compartment are stricter than for regular merchant vessel types. The bridge is required to be manned by two officers during voyage[1].

1 International Code of Safety for High-Speed Craft (2000), reg. 18.1.3.6.

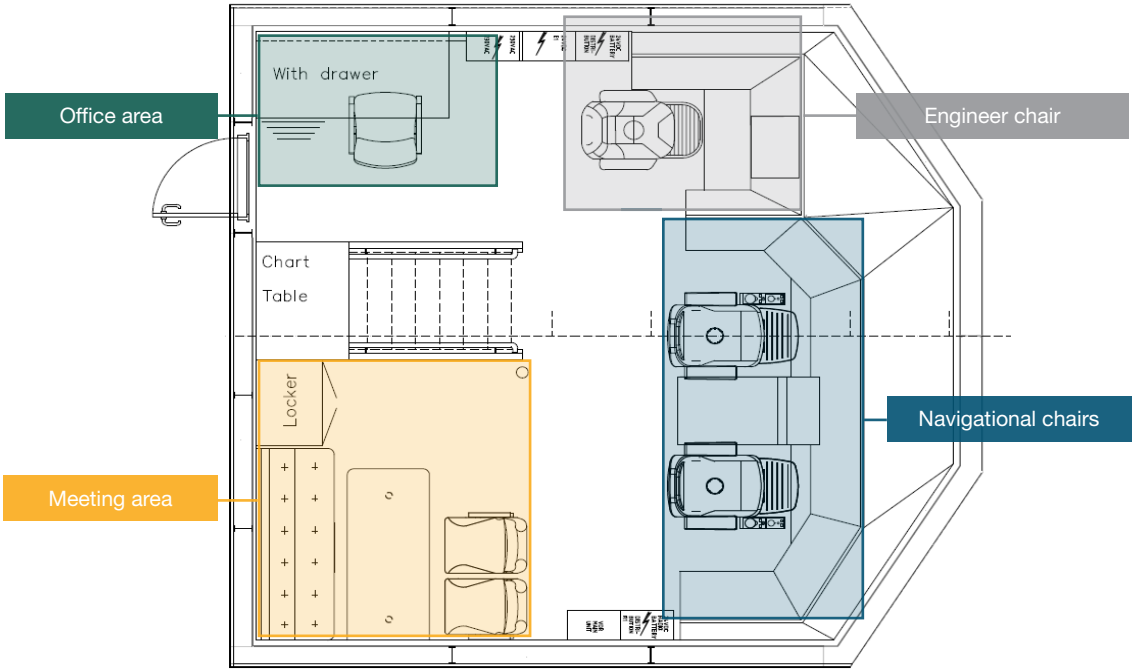

Figure 14: Bridge layout on WORLD BORA.
Source: World Marine Offshore/DMAIB

Furthermore, it is required that only activities essential for the safe operation of the ship are allowed in the operating compartment in order to minimise distraction for the officers[2].

On WORLD BORA, it was not possible to have two navigators on the bridge when the ship was engaged in a 24-hour charter, as the ship's navigational crew consisted of only two persons. It was normal practise that the bridge was manned by one officer, as the ship owner had the perception that this was accepted by the Danish Maritime Authority. That perception was based on The Minimum Safe Manning Document issued by DMA, which stated that the ship was to be manned by a master and a chief officer.

Additionally, the ship's ISM system, which included the watchkeeping schedule, had been approved by DMA. DMA has, however, never issued an exemption from the HSC requirements concerning the manning of the bridge.

The minimum safety manning document states the minimum manning for operating the ship, but it was the ship operator's responsibility that the manning was adjusted to the specific circumstances of the ship's operation to ensure that the HSC requirements were met. The DMA's approval of the ISM system was a verification that a system was in place, but did not approve the content of the specific document. DMA's approval of the ISM system was thus not an approval of the watchkeeping practises on WORLD BORA.

The bridge layout on WORLD BORA comprised an office area, telephone and a meeting area. This layout introduced the possibility for distractions and encouraged the bridge crew to take on work other than navigation during the voyage. In this respect, the bridge was not sanitised from disturbances as prescribed in the HSC requirements to the operating compartment.

2 International Code of Safety for High-Speed Craft (2000), reg. 15.4.1.2.

RABA – Work on the bridge

Watchkeeping schedule

On RABA, two navigational officers kept a 6 on 6 off watch schedule at sea and the same watch schedule in port, if discharging and loading were not stopped during the night. From sunset until sunrise, an AB acted as lookout.

Work practices on the bridge

At sea the watch schedule did not allow work outside the watchkeeping period, if the watchkeeping officer adhered to the minimum requirements for rest hours. Therefore it was common to do administrative work and have meetings on the bridge while keeping the bridge watch, if the navigational situation permitted such a disturbance. The chief officer's duties on deck were typically performed when the ship was in port, or when the ship was at anchorage. Other tasks, e.g. route planning, charts corrections etc., he would perform during his navigational watch or while on deck watch in port. The watchkeeping officer would normally have his meals in the mess room before taking over the watch, except breakfast, which was usually brought to the bridge.

While keeping the bridge watch, the watchkeeping officer would normally sit in the port side navigational chair.

As the ship was not equipped with an ECDIS or ECS, the navigator would move from the chair to a chart table located on the aft part of the bridge when plotting the ship's position.

The master had not been on the ship before, and on the day of the accident the master familiarised himself with the administrative tasks and with the bridge in general. During the morning he also spoke with crew members who needed to hand over information or ask questions, he filled in the fuel log, and he took his breakfast.

Most of these activities required the master's attention to be directed at the chart table and the entrance to the bridge on the aft part of the bridge, facing aft. The master's attention was therefore directed towards other tasks than navigation. Such distractions are common on this type of ship manned by two navigational officers, rendering no time for administrative duties and familiarisation when not keeping the bridge watch.

Bridge layout

An overview of the bridge can be seen in figure 15 There are three main working areas: the chart table, the office and the conning station.

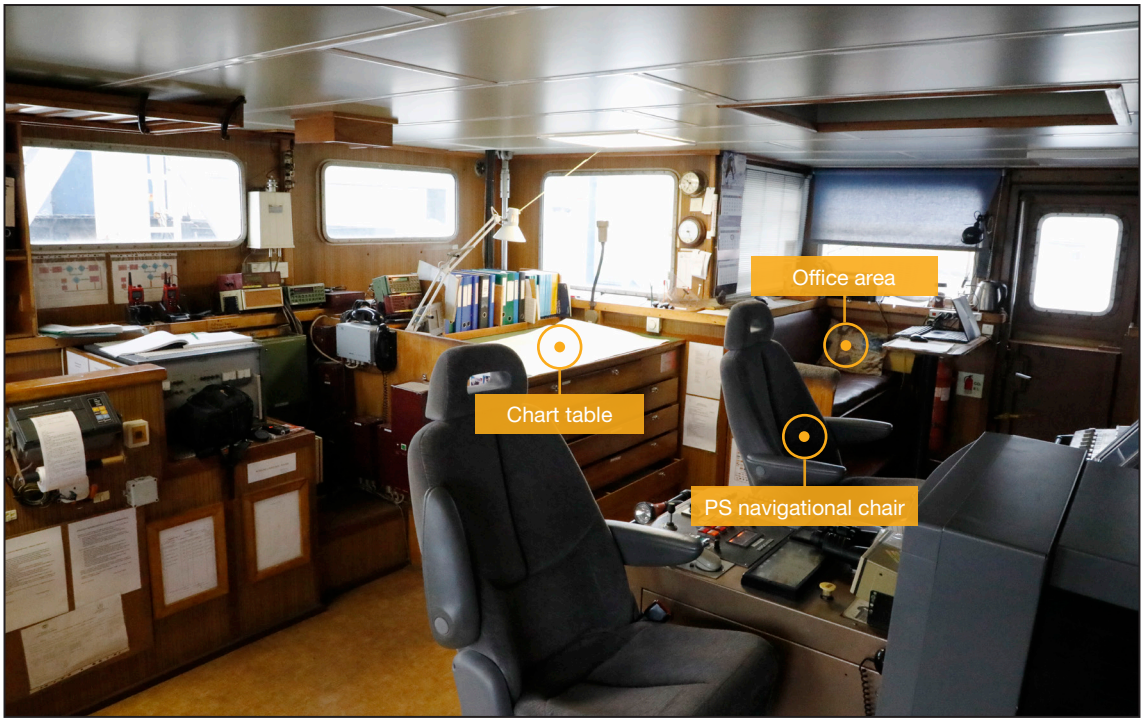

Figure 15: Bridge on RABA
Source: DMAIB

- The chart table, which was the only available working table on the bridge, was positioned in such a way that the navigational officer faced aft and was not be able to monitor the oncoming traffic while working at the table. The table was used for plotting the ship's position, making entries into the logbook and doing various paper work.

- The office area was situated by a bench on the port side of the bridge. The ship's computer and printer were located on a table by the bench. This working area was mainly used by the master for communicating with the company, ports, agents, etc. By the bench were pillows, indicating that the bench was also used as a resting area. Working at the computer and using the printer entailed that the focus of the watchkeeping officer was directed away from the primary task of watchkeeping. Additionally, the view of the radar screen was impaired when sitting on the bench.

- The main conning station was by the port side navigational chair. From there the watchkeeping officer could reach all the relevant instrumentation for keeping the watch and manoeuvring the ship. From the seat were various blind angles, because the window frames were wide (21-37 cm).

Damages

WORLD BORA

In the HSC it is described that the consequences of collisions at high speed are balanced by stringent operational requirements and specially developed accommodation provisions to protect the persons on board. According to the HSC code, seats, life-saving appliances and items of substantial mass and their supporting structure shall not deform or dislodge under any loads up to those specified in the code in any manner that would impede subsequent rapid evacuation of passengers. Although WORLD BORA was constructed according to these provisions, the accident showed that the persons on board were exposed to significant forces from the impact of the collision.

The structural damage to WORLD BORA´s hull was limited, as the hydraulic soft bow absorbed the impact energy (figure 15). However, this absorption led to an abrupt and forceful de-acceleration from approx. 18 knots to a halt in less than 0.5 meters. The de-acceleration caused loose objects to be tossed about at high speed, while fastened objects were deformed and torn from the bulkhead, and fixtures dislocated.

The alighment between engine and gear was dislocated, and the life raft cradle on the vessel's starboard side was deformed, but it was still possible to launch the life raft after the collision. In the lounge and adjacent compartments, fixed furniture was torn from its supporting structures and hurled through the compartment (figure 16, next page).

Due to de-acceleration, the crew members and industrial personnel on WORLD BORA were thrown towards the nearest vertical surface with great force.

Both crew members and industrial personnel suffered secondary impact traumas such as spinal fractures, broken legs and head injuries. Three crew members suffered the most severe injuries. They were engaged in various activities on the ship, such as working in the engine room or preparing food in the galley, and were therefore not sitting in the seats wearing seat belts designed for collision impact. The industrial personnel suffered head injuries from impacting with the back of the chair in front or the window board. Some suffered injuries to the legs, because they sat by the emergency exit and were hurled a greater distance towards the front seat.

The seats on WORLD BORA were designed according to the provisions in the HSC Code and were provided with safety belts designed to withstand the acceleration force of collision. For the industrial personnel to be protected from the de-acceleration caused by the collision, they had to be seated and fastened during the transit to and from the wind farm. A procedure was in place to instruct the industrial personnel regarding when it was allowed to move around and when to be seated during various stages of the voyage. It included the use of a light signal mounted in the lounge which instructed the industrial personnel to be seated, when it was red. When it was green, the industrial personnel could move around.

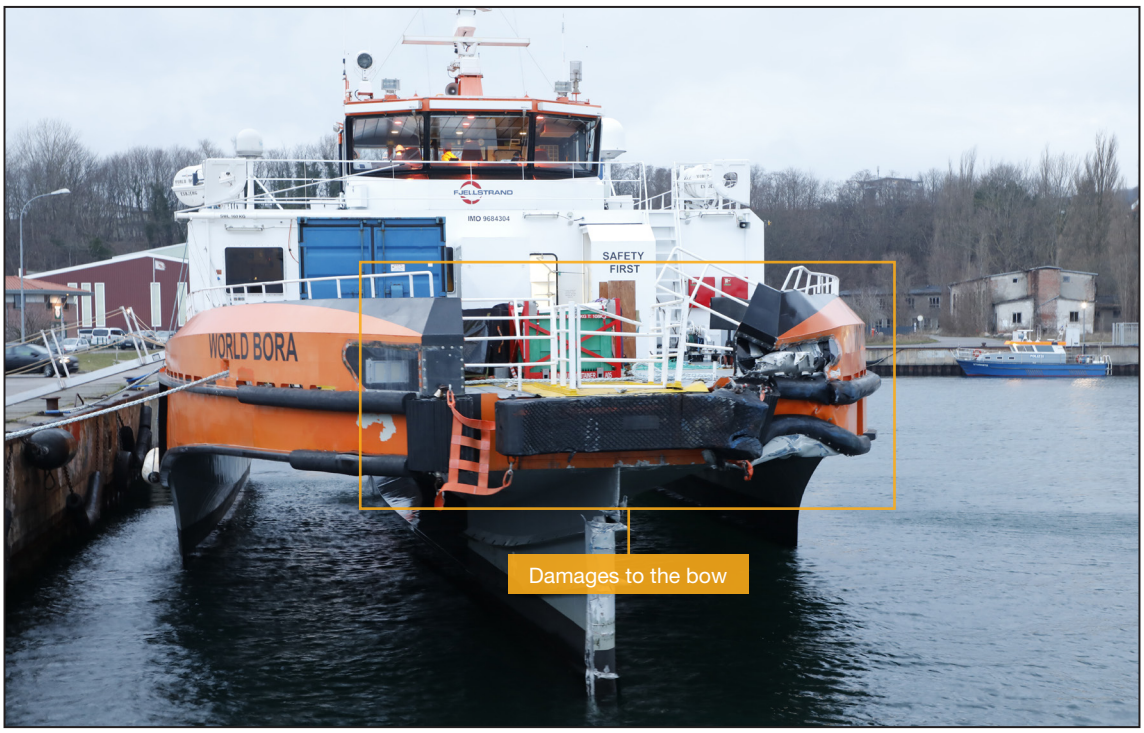

Figure 15: Damages to the bow
Source: DMAIB

Figure 16: Damage to WORLD BORA´s interior
Source: DMAIB

However, on the day of the accident, neither crew nor industrial personnel were fastened in their seat belts when the ships collided. It was not unusual that the crew members and industrial personnel were not seated during the entire voyage. The crew prepared and took their meals in the galley, rested in their cabins or worked on deck, while the industrial personnel walked around on the ship and went to the deck to smoke.

RABA

WORLD BORA collided with RABA on the starboard side, just forward of the superstructure (figure 17). The soft bow on WORLD BORA impacted with the base of the superstructure, which can be seen on the black smudging on the hull.

RABA suffered minor structural damages to the starboard quarter, which resulted in indentations on the shell plating in the area of the bulwark and the cargo hold. The impact also crushed and damaged several cables that ran along the coaming. In addition, a column used as a platform when stowing containers buckled, and the thrust bearing of a hydraulic cylinder was torn off.

The collision neither resulted in the release of hazardous substances nor in penetrations of the ship's shell plating below the waterline. No persons were injured.

Figure 17: Damages on RABA
Source: Federal Bureau of Maritime Casualty Investigation (BSU), Germany, 2019

Analysis & conclusion

In this section the narrative and the investigation data will be analysed to establish the circumstances and underlying factors for the collision between WORLD BORA and RABA.

On RABA, the master was observing the traffic in the area and did not identify any ships which posed a risk of collision. On the starboard side, WORLD BORA was observed crossing RABA's course, but was considered not to pose a risk of collision. The master did therefore not deem it necessary to keep out of the way. During the watch, as he got preoccupied with other duties, he lost track of time and did not follow up on the crossing ship he had previously observed.

Even though the AB kept a continuous lookout, he did not notify the master about the close quarter situation until a few minutes before the collision. It is likely that the AB did not realise the risk of collision, because he was not trained in detecting the risk of collision by means of visual bearing alone. The AB did not realise the danger, before it became evident that WORLD BORA was rapidly closing in on a collision course. Once the master observed WORLD BORA, the collision could only be avoided by immediately turning the ship. Forgetting about the crossing ship changed the situation from being early traffic de-conflicting to an emergency response, once WORLD BORA was detected.

It is unclear why the master attempted to contact WORLD BORA instead of turning the ship away immediately, or why he confused WORLD BORA with the fishing ship SIRIUS. It is likely that the short time to react in combination with the fact that the master was not familiar with the equipment on the bridge caused confusion, and he thus called the wrong ship in an attempt to avoid collision by requesting WORLD BORA to react to the risk of collision.

The underlying reason for why the master forgot to follow up on the traffic was his preoccupation with the activities he was engaged in while keeping the navigational watch. These activities were related to his function as watchkeeping officer and master of the ship. Additionally, he had recently signed on the ship, which made it necessary for him to familiarise himself with the bridge, the crew and the work tasks. The watchkeeping schedule necessitated this work practise which was facilitated by the layout of the bridge.

On WORLD BORA the master never saw RABA approaching. He had set the course and did not see any ships that posed a risk of collision. He thus deemed it safe to smoke and do some administrative work while sporadically keeping visual lookout. When he became immersed in his work on the computer, he lost track of time which resulted in RABA not being observed prior to the collision.

WORLD BORA was operated as a conventional cargo ship and not as a HSC, which influenced the watch schedule and manning of the bridge. Consequently, there was not an additional person on the bridge to keep lookout, and the approaching RABA therefore went unnoticed while the master sat by the desk using the computer. Additionally, the layout of the bridge comprised both navigational station, office, meeting room and smoking area on the upper deck, which facilitated engaging in non-watchkeeping activities while keeping the navigational watch.

DMAIB has during other investigations found that watchkeeping is intertwined with other tasks than navigating the ship and keeping lookout. Bridge watchkeeping practices are highly dependent on a variety of factors, e.g. type of ship, trading pattern, bridge layout and the navigational situation (amount of traffic, confined vs. open waters). In waters where the watchkeeping officers consider it safe, they will direct their attention to other tasks such as writing in the logbook, updating charts, making phone calls or moving from the navigational station to read emails, file documents or go to the lavatory.

Most navigational bridges are fitted with office spaces and meeting areas which facilitates the watchkeeper directing their attention to other work tasks than navigation by having access to phones, binders and work computers with emails on which various administrative tasks can be completed. When watchkeepers have other duties than keeping the navigational watch, and the means to carry out those tasks have been made readily available, then it is to be expected that these work task will be carried out while keeping the navigational watch. How watchkeepers determine when it is safe to direct their attention to other tasks than navigation is subjective and depends on e.g. how experienced the watchkeeper is, the urgency of the task to be performed, and how the bridge layout is organised.

Even though these work practises are common and normally unproblematic, they became critical when the watchkeeping officers on RABA and WORLD BORA were simultaneously immersion in those activities when the ships were on a collision course.

Preventive measures

DMAIB has received information on the preventive measures taken by the involved parties as reponse to the accident. This information will be quoted in this section.

Actions taken by owners

Following the the investigation, DMAIB has received statements on actions taken from WORLD BORA's owner and operator World Marine Offshore and RABA's owner and operator Baltramp Shipping in connection to the collision as preventive measures. These statements are quoted below:

World Marine Offshore - Preventive actions

"In connection with the Collision between World Bora and Raba, World Marine Offshore have introduced preventive actions in different areas. The actions are as follows:

- *Seatbelts were already installed on World Bora – but immediately after the incident Seat belts were installed on all other vessels of our fleet.*
- *An "aviation approach" to Seatbelts is utilized. During the whole transit the industrial personnel must be seated.*
- *Emphasized to the Crew members that they must ensure that the signal lights in the passenger area are respected (red/green) by all industrial personnel. And that the area must be more frequently monitored.*
- *To emphasize the use of Seatbelts, the Safety video on all vessels has been updated.*
- *Our Masters Standing orders Form have been revised to state clearly that if the Duty Officer in any case or time needs to move from the Pilot chair, he must call for a lookout to come on the bridge. A lookout is also required during transit to and from the Windfarm.*
- *A new Procedure for Industrial Personnel (IP) check-in has been implemented to ensure that the IP's have seen the Safety video, have fastened their seat belts during the voyage - transit and transfer and have signed the sign-in log. This is linked to a new Industrial Personnel Check-in checklist introduced at the same time.*
- *A new Bridge watch procedure has been implemented with the aim to ensure, that the bridge watch is performed safe and in accordance with the existing legislation and as such avoid any dangerous situations to arise. The responsibilities for the Master and Duty officer are outlined and the procedure also points out, that the officer on navigational watch under no circumstances must leave the chair when the vessel is making speed through the water. Furthermore, the procedure highlights the voyage planning and that all required check lists and operational tasks must be executed before the vessel is leaving the berth.*
- *The Bridge Watch handover check list and Pre-departure check list have been updated with a new check point "Radar turned on with ARPA function running (visual and acoustic warnings activated)".*
- *An "Safety Flash" on proper use of the radar ARPA functions have been issued and sent to all vessels.*
- *World Marine Offshore has introduced a ban on the use of PC on the bridge while sailing and the only communication is VHF/Tetra.*
- *World Marine Offshore remains focused on safety onboard our vessels and will cooperate with DMA and other industry bodies in that respect.*
- *World Marine Offshore are looking into technical measures to ensure that if the Officer on duty leaves the chair, the vessel will automatically slow down. The speed reduction will be made in such a manner that it will not cause concern to the industrial personnel.*
- *World Marine Offshore will keep reviewing the procedures and maintaining a close look to safety and work practice onboard our vessels."*

Baltramp Shipping - Preventive actions

"In accordance with collision m/v Raba with World Bora Company's Management decided to:

- *Officer on watch during watch keeping is obliged to safe vessel steering and has absolute ban on performing office work (including computer use, etc.).*
- *If it is necessary to perform office work, Officer on watch calls the seaman on the bridge to conduct visual observation and on the radar.*
- *In areas with particularly heavy traffic, Officer on watch is obliged to call a seaman on the bridge to watch keeping."*

Appendix

SHIP PARTICULARS: WORLD BORA

Name of vessel:	WORLD BORA
Type of vessel:	CTV (Crew Transfer Vessel)
Nationality/flag:	Denmark
Port of registry:	Esbjerg
Call sign:	OWJW2
IMO-no.:	9684304
DOC company:	World Marine Offshore A/S
Classification society:	Bureau Veritas
Year built:	2014
Shipyard/yard number:	Fjellestrand AS/1694
Overall length:	31.32 m
Breadth overall:	12.56 m
Draught max.:	2.85 m
Gross tonnage:	352
Engine rating:	2,352 kW
Service speed:	22 knots
Hull material:	Aluminium
Hull design:	Single hull, trimaran

SHIP PARTICULARS: RABA

Name of vessel:	RABA
Type of vessel:	General cargo ship
Nationality/flag:	Cyprus
Port of registry:	Limassol
Call sign:	5BGM4
IMO-no.:	8415172
DOC company:	Baltramp Shipping
Classification society:	Polish Register of Shipping
Year built:	1984
Shipyard/yard number:	Schiffswerft und Maschinenfabrik Cassens GmbH/172
Overall length:	80.50 m
Breadth overall:	12.70 m
Draught max.:	5.30 m
Gross tonnage:	1,843
Engine rating:	745 kW
Service speed:	10.5 knots
Hull material:	Steel
Hull design:	Single hull

VOYAGE DATA: WORLD BORA

Port of departure:	Mukran, Germany
Port of arrival:	Wikinger wind farm, Germany
Voyage type:	International
Cargo information:	No cargo
Number of crew:	4
Pilot on board:	No
Number of industrial personnel:	11

VOYAGE DATA: RABA

Port of departure:	Koege, Denmark
Port of arrival:	Szczecin, Poland
Voyage type:	International
Cargo information:	In ballast
Number of crew:	6
Pilot on board:	No
Number of passengers:	None

WEATHER DATA

Wind - direction:	Southwest
Wave - height:	0,0 – 0,1 m
Visibility:	Good
Weather conditions:	Clear
Light/dark:	Light

MARINE CASUALTY INFORMATION

Type of marine casualty:	Collision
IMO classification:	Serious
Date, time:	19 February 2019, 07:33 LT
Location::	Baltic Sea, East of Rügen
Position:	54°33.3N / 013°44.7E
Ship's operation:	In passage
Human factor data:	Yes
Consequences:	Several seriously injured people on board the WORLD BORA, severe damage to the bow of the WORLD BORA, minor damage to the RABA's hull on the starboard side, damage to coaming and hatch cover.

SHORE AUTHORITY INVOLVEMENT AND EMERGENCY RESPONSE

Involved parties	Maritime Rescue Coordination centre (MRCC) Bremen, Waterway Police (WSP) Sassnitz, Local rescue Coordination Centre.
Resources used	Sea rescue cruiser HARRO KÖBKE and her crew, the crews of several emergency physician vehicles and ambulances, rescue helicopter
Actions taken:	Injured persons from WORLD BORA were brought to hospital.
Results achieved:	Injured persons from WORLD BORA received medical treatment.

RELEVANT CREW: WORLD BORA

Master:	52 years old. 20 years of experience at sea. 3 years at WORLD BORA. Certificate STCW- II/3 as Master.

RELEVANT CREW: RABA

Master:	68 years old. 45 years of experience at sea. 3 days at RABA. Certificate STCW- II/2 as Master.