#

Investigation report#

C2/2011M

F/V WILLEMPJE HOEKSTRA UK 33 (NLD) and M/V BIRKA TRANSPORTER (FIN), Collision off the Netherlands on 14 February 2011

Translation of the original Finnish report

This investigation report was drawn up to improve safety and to prevent further accidents. The report does not address the question of any possible responsibility or liability for the accident. The investigation report should not be used for purposes other than the improvement of safety.

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SUMMARY

The Finnish-flagged BIRKA TRANSPORTER was on her voyage from Sweden to Amsterdam on 14 February 2011 when she collided with the Dutch trawler WILLEMPJE HOEKSTRA in the Vlieland Traffic Separation Scheme in international waters off the Netherlands. The collision took place at approximately 4:00 UTC. WILLEMPJE HOEKSTRA had started her voyage from the port of Den Helder, the Netherlands at 1.35 UTC. She was on her way to fishing grounds in the North Sea.

The Chief Officer of BIRKA TRANSPORTER took the watch at 3:00 UTC. The weather and visibility were good. The lookout was released from lookout duties four minutes after the watch change, and the OOW continued the voyage alone on the bridge. WILLEMPJE HOEKSTRA was detected on the radar screen for the first time at 3:25:30 UTC. At 3:50:50, the dangerous target alarm on the ARPA radar was activated, showing that WILLEMPJE HOEKSTRA was approaching from the left side at a distance of 2.8 NM in a bearing of 193 degrees. BIRKA TRANSPORTER's course was approximately 226 degrees and WILLEMPJE HOEKSTRA's 300 degrees. WILLEMPJE HOEKSTRA was not fishing at that time and was to be considered a normal sea-going vessel with duty to give way to a vessel approaching from the right side.

When WILLEMPJE HOEKSTRA was about to pass ahead of BIRKA TRANSPORTER, the OOW noticed that there was smoke coming out from the funnel of the fishing boat, which indicated according to the OOW that the vessel was stopping. The OOW estimated that it would be a close quarter situation and decided to slow down by taking the pitch levers to zero and to turn the rudder manually to starboard. Shortly after this, the OOW made a crash stop by putting the engines full astern. BIRKA TRANSPORTER started to turn to the port. Although BIRKA TRANSPORTER's heading began to change slightly before the impact took place its course over ground did not change discernibly. The collision took place at 4:00:43 UTC, and BIRKA TRANSPORTER's bow hit the fishing vessel's forward part on the port side.

The direct cause of the accident was the inadequate, unclear and late collision avoidance actions by the WILLEMPJE HOEKSTRA and BIRKA TRANSPORTER's late and unsuccessful attempt to avoid collision. Contributing factors were the possible fatigue of the OOW and the absence of a lookout on BIRKA TRANSPORTER as well as the possible lack of lookout onboard WILLEMPJE HOEKSTRA due to the rigging activities of the fishing equipment.

The investigation was mainly based on information received from the owners of BIRKA TRANSPORTER, the vessel's S-VDR and the maritime declaration. Only few information concerning WILLEMPJE HOEKSTRA was received and her skipper refused to co-operate with the investigation.

Both vessels failed in this case to comply with the COLREGS, and as a result of complacency, two well-equipped and modern ships collided in conditions of good visibility, even though each knew a risk of collision existed. No additional lookout was present in the wheelhouse of BIRKA TRANSPORTER.

The owner of BIRKA TRANSPORTER provided information about actions taken after the collision. The Safety Investigation Authority (SIAF) has issued a safety recommendation to The Finnish Transport Safety Agency, Trafi. It is recommended for Trafi to ensure, that the training on bridge resource management given to deck officers becomes permanent practice onboard the Finnish vessels.

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GLOSSARY OF ABBREVIATIONS AND ACRONYMS

AIBF	Accident Investigation Board of Finland
AIS	Automatic Identification System
ARPA	Automatic Radar Plotting Aid
BCR	Bow Crossing Range
Cable	Measure of distance equal to 0.1 nautical mile
COLREGS	The Merchant Shipping (Distress and Prevention of Collisions) Regulations 1996 (as amended)
CP	Controllable-Pitch Propeller
CPA	Closest Point of Approach
DGPS	Differential Global Positioning System
DNV	Det Norske Veritas
DWT	Dead Weight Tons
GMDSS	Global Maritime Distress Safety System
GPS	Global Positioning System
GT	Gross tonnage
IMO	International Maritime Organization
ISM Code	International Management Code for the Safe Operation of Ships and for Pollution Prevention
Knots	Speed in nautical miles per hour
kW	Kilowatt
LOA	Length Over All
MAIB	Marine Accident Investigation Branch (UK)
NM	Nautical Miles (1852 m)
OOW	Officer of the Watch
OS	Ordinary Seaman
Ro-Ro	Roll on – Roll off
SMS	Safety Management System
STCW	International Convention on Standards of Training, Certification and Watchkeeping
S-VDR	Simplified Voyage Data Recorder
TCPA	Time to Closest Point of Approach
TSS	Traffic Separation Scheme
UTC	United Time Co-ordinated
VDR	Voyage Data Recorder
VHF	Very High Frequency (radio)
VTS	Vessel Traffic Services

INTRODUCTION

The Accident Investigation Board of Finland (AIBF) was informed by the Netherlands Shipping Inspectorate of the collision between the Dutch-flagged fishing vessel WILLEMPJE HOEKSTRA and the Finnish-flagged Ro-Ro vessel BIRKA TRANSPORTER on 14 February 2011. A port state inspector boarded the Ro-Ro vessel that day and provided the AIBF with initial data. The accident site is located in international waters off the Netherlands coast.

After a preliminary examination of the collision, the AIBF issued investigation decision C2/2011M on launching an investigation into the collision on 23 March. The investigation authority of the fishing vessel's flag state announced that they would not perform a separate investigation.

The AIBF Investigator Captain Micael **Vuorio** was appointed as investigator-in-charge for the case and Investigator, M.Sc. (Tech) Ville **Grönvall** and AIBF's Chief Accident Investigator Martti **Heikkilä** were appointed as investigators. The investigation was carried out in cooperation with the Netherlands Shipping Inspectorate. Micael **Vuorio** resigned duty as investigator-in-charge, and AIBF Investigator Captain Juha **Sjölund** was appointed as investigator-in-charge on 27 September 2011.

The investigation was mainly based on information received from the owners of BIRKA TRANSPORTER, the vessel's VDR and the maritime declaration. Only some information concerning WILLEMPJE HOEKSTRA was received and her skipper refused to co-operate with the investigation.

Statements concerning the investigation. Under Section 28 of the Safety Investigation Act (525/2011), the final draft of the report was sent for statement to the Finnish Transport Safety Agency and to the owners of the BIRKA TRANSPORTER and the WILLEMPJE HOEKSTRA. In addition, the final draft was sent for information and possible comments to the Masters and the Chief Officers of both vessels as well as the Netherlands Shipping Inspectorate and the Dutch Safety Board.

The material used in the investigation is kept on file at Accident Investigation Board Finland.

All times in this investigation report are reported in UTC.

1 OVERVIEW OF THE ACCIDENT AND THE INVESTIGATION

1.1 The vessels

1.1.1 General information

M/V BIRKA TRANSPORTER

Figure 1. M/V BIRKA TRANSPORTER. *(© Ruud Coster)*

Name of Vessel	M/V BIRKA TRANSPORTER (ex M/V HAMNÖ 1991–2002)
Type	Ro-Ro vessel
Flag	Finnish
Owner	Birka Cargo Ab Ltd, Finland
Manager	Birka Cargo Ab Ltd, Finland
Charterer	Holmen Paper Ltd.
IMO Number	8820858
Call Sign	OJCW
	Hull yard Brodogradiliste "Sava", Yugoslavia
Year of construction	1991
Yard number	303
Outfitting Yard	Fosen Mek. Verksteder A/S, Norway, NB 41
Class	DNV +1A 1, EO, Ice 1 A*, Finnish Ice Class 1 A
Gross/Net tonnage	6620/1986
DWT	5745 t (summer freeboard)
Cargo capacity	1278 lane meters
Total length	122 m
Breadth	19 m
Draught	6.35 m
Speed	16.5 kt

Engine and Propulsion power	Wärtsilä Vasa 16V32D, 5920 kW
Propeller	Ulstein - Liaaen EACG, CP propeller
Bowthruster	1 off Brunvoll, 400 kW

Birka Cargo Ab Ltd. is a shipping company specialized in the transport of forestry products, unitized general cargo and trailers on Ro-Ro vessels. Birka Cargo, formerly United Shipping Ltd. Ab, was founded in 1990 and is a part of the Eckerö Group. Birka Cargo presently operates a fleet of 7 Ro-Ro vessels under the Finnish flag. The vessels are chartered to three different companies.

BIRKA TRANSPORTER was built at Fosen Mek. Verksteder A/S Shipyard, Norway as M/S HAMNÖ. She was handed over on February 1991. The vessel has 5 sister ships[1]. After the handover, HAMNÖ was in traffic between Finland and Germany until 2000. After 2000, the vessel's operating area has been northern Europe. The name HAMNÖ was replaced by BIRKA TRANSPORTER in 2002.

UK 33 WILLEMPJE HOEKSTRA

Figure 2. WILLEMPJE HOEKSTRA (© Ruud Coster)

Name of Vessel	WILLEMPJE HOEKSTRA
Type	Beam trawler
Flag	The Netherlands
Owner	Gebr. P en T de Boer bv
Call Sign	PIPL
IMO Number	8705826

1 M/V GRANÖ, M/V STYRSÖ, M/V AKNOUL, M/V AHTELA and M/V AMBER.

Port letters and number	UK33
Home port	Urk, the Netherlands
Year and Place of construction	1986 Scheepswerf Bodewes Gruno, Foxhol Netherlands
Year and Place of conversion	2003 Scheepswerf Metz, Urk, the Netherlands[2]
Construction	Steel – all welded
Gross tonnage	426[3]
Total length	40.73 m
Breadth	8.50 m
Draught	4.73 m
Propulsion power	1471 kW[4]
Classification society	Not classed

1.1.2 Manning

BIRKA TRANSPORTER

BIRKA TRANSPORTER was safely manned during the voyage with a sufficient number of 10 crew members according to the Minimum Safe Manning Document valid until 20 November 2014. There were no passengers onboard.

The Master had a sea experience of 7 years. The Master had studied at the seaman school in 1999, for a watch officer certificate in 2003–2004 and for a master mariner certificate in 2007–2009. The Master has been with the same company and mostly on same type of ships since the beginning of his career, as Master since 2009 and on BIRKA TRANSPORTER since August 2010. The Master held a captain's licence issued by the Finnish Maritime Administration.

The OOW had a sea experience of 17 years. The OOW studied at a seaman school in 1983–1984 and has worked at sea ever since. The OOW studied for the Watch Officers' certificate in 1990–1992 and for the Master Mariner's certificate in 1994–1996. The OOW started to work as an officer in 1992 and has been Chief Officer in the company since 1997 and on BIRKA TRANSPORTER since 2009. The Chief Officer has also served as Master on sister vessel BIRKA SHIPPER on two occasions. The Chief Officer held a captain's licence issued by the Finnish Maritime Administration.

When the collision took place, there were two persons on watch: the Chief Officer as an OOW and an OS as a lookout. At the time of the collision, the lookout was not on the bridge.

The OOW on BIRKA TRANSPORTER had been working for 79.5 hours in the preceding week, 24 hours in the preceding 48 hours and 12 hours in last 24 hours. Before the watch during which the accident occurred, the OOW had been off duty for 6 hours, and prior to that, 8 hours the day before from 8.00–16.00. At sea, the OOW normally sleeps

[2] The trawler was lengthened by 1.35 m, from 39.38 m to 40.73 m
[3] The gross tonnage increased from 410 to 426 during the conversion
[4] In 2007, the original 1750 kW engine was replaced by a 1471 kW engine

for 3.5 hours at night and 4 hours in daytime, but this rhythm is broken when calling at a port. According to the OOW, this type of sleeping periods are suitable, but sometimes rough weather disturbs the quality of sleep. Some physical discomfort was waking the OOW several times (hourly) during these sleeping periods.

WILLEMPJE HOEKSTRA. The number of crew onboard and their experience is unknown. Their working or sleeping periods is unknown.

1.1.3 Wheelhouse arrangement

BIRKA TRANSPORTER

The wheelhouse on BIRKA TRANSPORTER is closed with covered bridge wings. The navigation console has a cockpit lay-out for two persons.

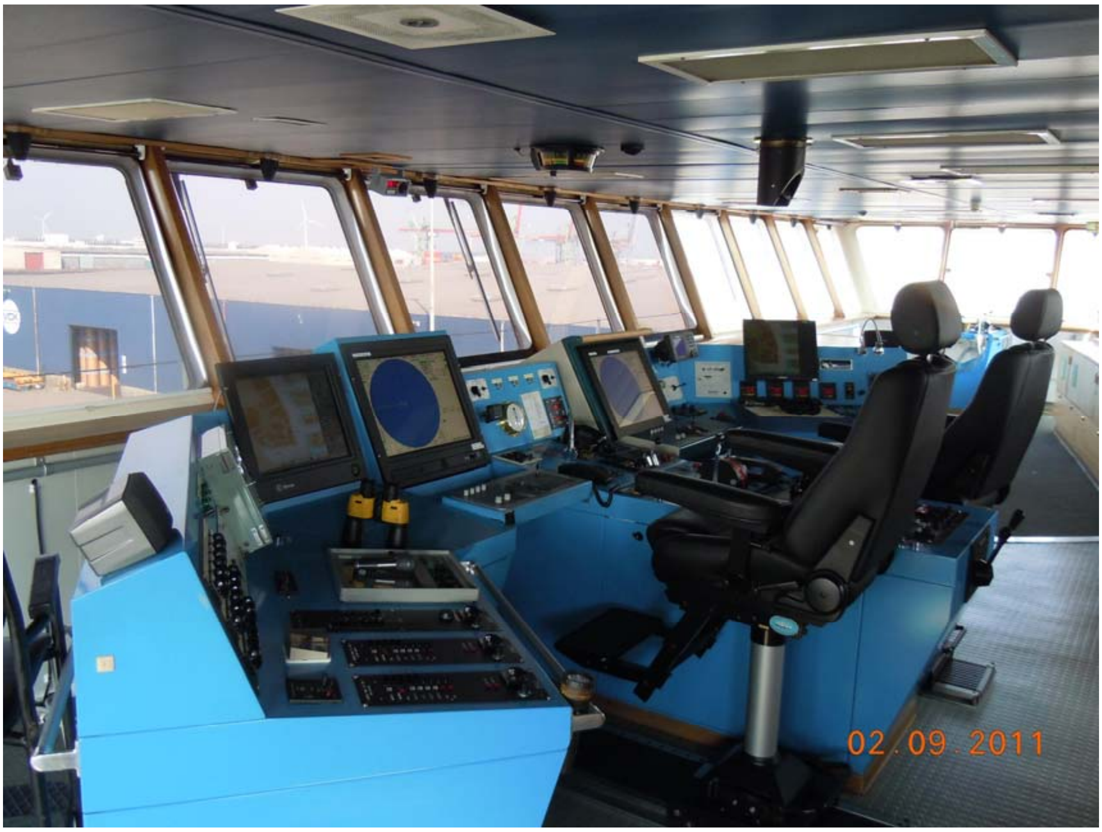
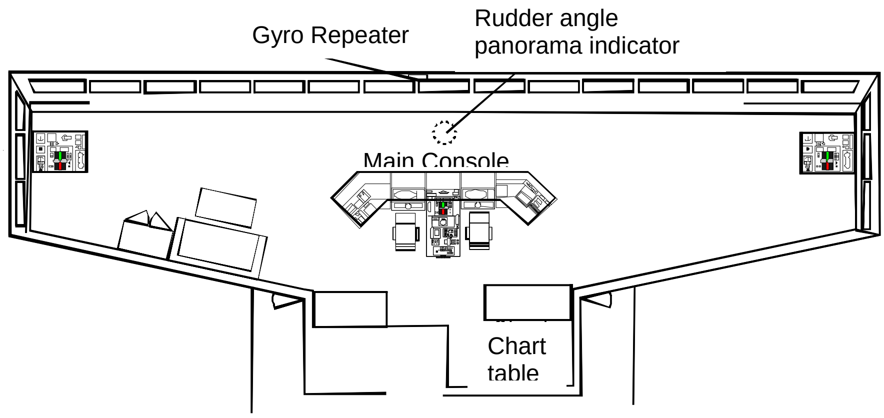


Figure 3. The wheelhouse on BIRKA TRANSPORTER. The further chair was the conning position prior to the collision.

Table 1. Navigation equipments based on the accident report.

Equipment	Type
ARPA radar in use	SAM 1000
ARPA radar in stand by mode	SAM 1000
Gyro compass	Sperry X MK1
Magnetic compass	C.Plath
Autopilot in use	SAM Trackpilot 9401
Echosounder in use	Skipper Ed161
Satellite positioning equipment	Saab R4, DGPS
Electronic Chart	Transas 3000

BIRKA TRANSPORTER also had an AIS (Automatic Identification System) onboard. A GMDSS (Global Marine Distress and Safety System), two GPS receivers, and one DGPS receiver were placed in the chart table area. The ships' main controls and the compass are found between the radars.



BIRKA TRANSPORTER Bridge Layout

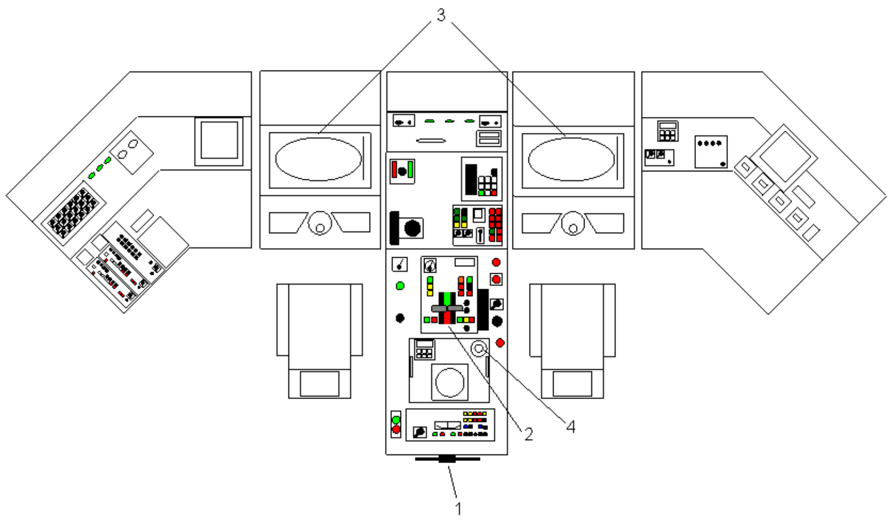


Figure 4. Wheelhouse and main console on BIRKA TRANSPORTER. Only navigation equipment relevant to this accident is displayed. The OOW was using the right conning position.

1) Hand steering

2) Pitch control

3) Radars

4) Steering tiller

The position of S-band radar antennas on BIRKA TRANSPORTER

The position of the radar antenna is an important piece of information for the correct ARPA calculation. The setup in use in the ARPA radar was checked regarding the position of the radar antenna on BIRKA TRANSPORTER[5].

The Main Console

The ship's main controls and the compass are located between the conning positions in the main console. A control for manual steering is located in front of the compass. Both conning positions contain the same the same steering equipment. The helmsman's position is in the aft end of the main console (Figure 5). The control switch for the steering position is located at the helmsman's position.

Figure 5. The helmsman's position is at the end of the main console.

5 Distances of the radar antenna of the S-band (10 cm) ARPA radar and its set up values:
- distance to bow: 101,5 m (drawing), 105 m (in ARPA)
- distance to stern: 20,5 m (drawing), 17 m (in ARPA)
- distance to starboard: 9,5 m (drawing and in ARPA)
- distance to port: 9,5 m (drawing and in ARPA)

Selection between different controls for steering. There is no Follow Up steering onboard. Non Follow Up steering controls are on the bridge wing, Helmsman's position and between the conning positions.

If autopilot steering is requested, the switch beside the helmsman is switched to AUTO. Control is then transferred to the NFU/AUTO switch in front of the compass. If this switch is turned to the AUTO position, control is transferred directly to the autopilot, which begins to follow the actual heading in the HEADING mode.

If manual steering is requested, the switch is turned to the NFU position, and NFU steering control beside the radar is activated. The switch can be turned in either direction to activate NFU steering.

If NFU steering at the Helmsman's position is used as an override when the autopilot is activated, the rudder will move as long as the wheel is being turned. When the wheel is released, the rudder will return to amidships, the autopilot will be activated and it will begin to follow the actual heading in the HEADING mode.

1.1.4 Cargo

BIRKA TRANSPORTER carried 4560 tons of paper reels on her main deck and in the lower hold. The cargo was loaded in Hallstavik and Braviken in Sweden, and the destinations were Amsterdam, the Netherlands and Chatham, England. The vessel also had 281,7 tons of bunker, 41 tons of fresh water and 189 tons of ballast water, totalling 5123,6 tons of dead weight. WILLEMPJE HOEKSTRA did not carry any cargo as she was heading for the fishing grounds.

1.2 The accident

The descriptions of the event are based on the maritime declaration, interviews with BIRKA TRANSPORTER's Master and Chief Officer, BIRKA TRANSPORTER's VDR recording, the official collision report[6] by the Netherlands Maritime Police and WILLEMPJE HOEKSTRA's survey report.

1.2.1 Location

According to BIRKA TRANSPORTER's S-VDR-recording, the collision took place in position[7] 53°04.178N, 004°12.797E at 4:00:43 UTC (Figure 6). The collision site is located in the southbound lane of the Vlieland Traffic Separation Scheme (TSS), near the island of Texel, in international waters off the Netherlands.

[6] Netherlands Maritime Police official collision report: Northsea number: EA 545
[7] Source: BIRKA TRANSPORTER's S-VDR recording

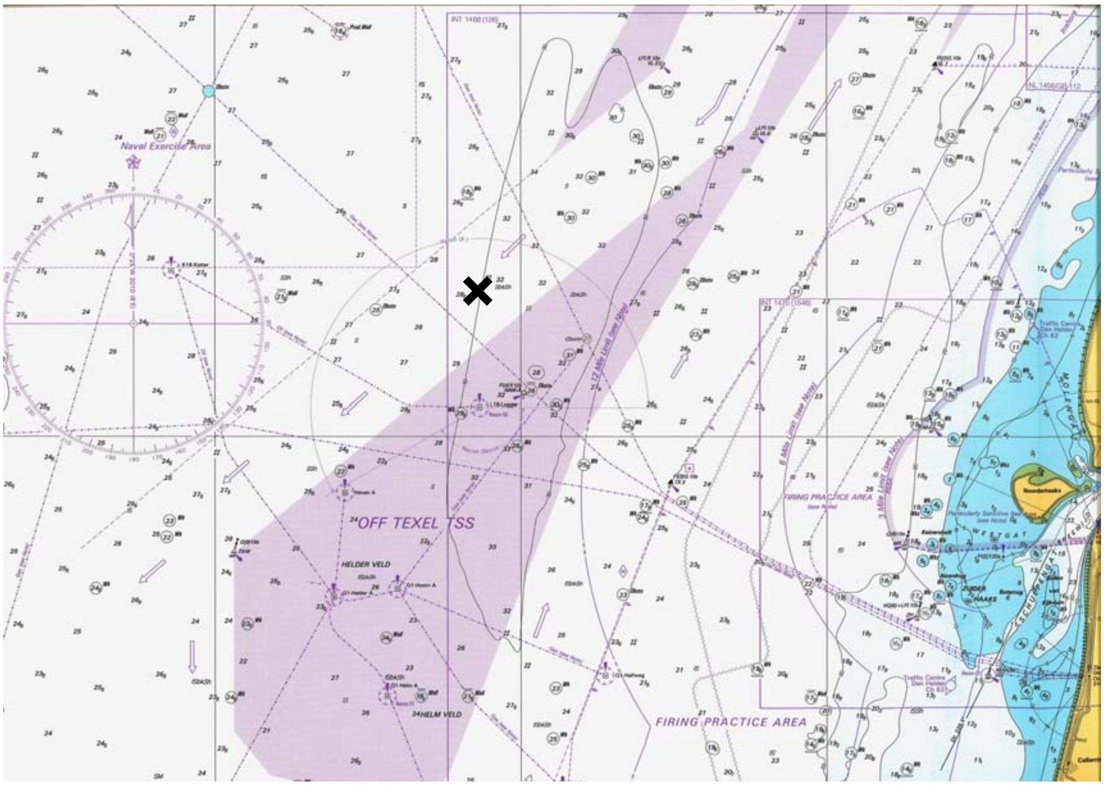


Figure 6. The black cross on the chart marks the collision site. (© British Admiralty)

1.2.2 Environmental conditions

The accident took place at 4:00:43 UTC. The environmental conditions were as follows:

The weather was measured by the off-shore installation Q1, 12 nautical miles south from the collision. At the time of the collision, the wind was from south-east (147 degrees), speed 11.8 m/sec. The sea state was one metre. According to the weather forecast broadcasted by the Coast Guard, the visibility was more than 10 km. BIRKA TRANSPORTER's logbook gives similar weather information.

According to the information recorded at the De Kooy airfield in the Netherlands, the Astronomical twilight[8] began at 5.04 UTC, the nautical twilight[9] at 5.44 UTC and the civil twilight[10] at 6.25 UTC. Sunrise was at 7.00 UTC. It was thus dark at time of the collision.

According to the current map[11] the current at the accident site was approximately 0.6 knots from a north-easterly direction.

8 Astronomical twilight is the time when the centre of the sun is between 12° and 18° below the horizon.

9 Nautical twilight is the time when the centre of the sun is between 6° and 12° below the horizon.

10 Civil twilight begins when the geometric centre of the sun is 6° below the horizon and ends at sunrise.

11 Bundesamt für Seeschifffahrt und Hydrographie: http://www.bsh.de/aktdat/modell/stroemungen/no/noe.htm

1.2.3 The accident voyage

BIRKA EXPORTER

BIRKA TRANSPORTER sailed from Braviken, Sweden at 22:50 UTC on 11 February 2011 with Amsterdam, the Netherlands as its destination. The draught was forward 5.60 m and aft 6.70 m.

On the night of the accident 14 February 2010 the Chief Officer took over the watch at 3:00 UTC as the vessel was approaching the Dutch coastal area. The Chief Officer as the OOW and one lookout were on the bridge. The weather was good with east south-easterly wind force 5. The lookout was released from lookout duties four minutes after the watch change to take on cleaning duties in the mess room. The OOW continued the voyage alone on the bridge from 3:04 UTC.

At 3:25:30 UTC, WILLEMPJE HOEKSTRA's echo could be seen on the radar screen for the first time. The range of the radar screen was 6 NM the whole time. At 3:27 UTC, a wheel over point was reached and the course was changed by the trackpilot to 226.2 . The DGPS was used as a speed sensor, and the speed used in the ARPA calculation was the speed over ground.

At 3:35 UTC, WILLEMPJE HOEKSTRA was plotted on BIRKA TRANSPORTER's ARPA Radar. At 3:46:36 UTC, the ARPA data of WILLEMPJE HOEKSTRA was activated, showing a closest point of approach (CPA) of 0.24 NM and a bow crossing range (BCR) of 0.36 NM (Figure 7).

At 3:50:50, the dangerous target alarm on the ARPA radar activated, showing that WILLEMPJE HOEKSTRA was approaching at a distance of 2.8 NM in the bearing 193 degrees (Figure 8). The time to the closest point of approach (TCPA) was 10.03 minutes, and the CPA was 0.35 NM. Dangerous target limits in the ARPA radar were set to CPA 0.5 NM and 10 minutes.

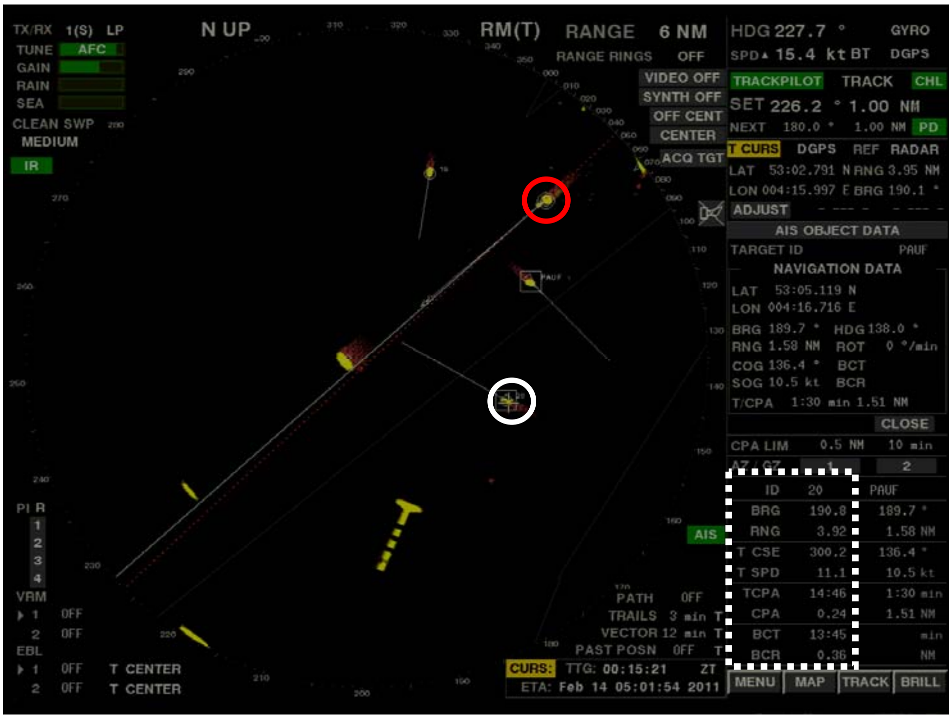


Figure 7. At 3:46:36. Time to the collision is circa 14 min. WILLEMPJE HOEKSTRA's (white circle) ARPA data (rectangle shown in white dash line) was activated. BIRKA TRANSPORTER is marked with a red circle. CPA is 0.24 miles and TCPA 14.46 min.

Figure 8. At 3:50:50. Time to the collision is circa 10 min. Dangerous target alarm was activated (white arrow). CPA 0.35 NM and TCPA 10.03 min.

At this stage, the OOW observed the movements of the fishing vessel both visually and by radar. It could be observed that the deck lights were on and the beams were in an upright position. The OOW observed the decreasing of the CPA but was not worried at any stage.

When WILLEMPJE HOEKSTRA was about to pass ahead of BIRKA TRANSPORTER, the OOW noticed smoke coming out of the trawler funnel and assumed that it was stopping. The smoke could be seen from the deck lights. The OOW estimated that it would be a close quarter situation and decided to slow down by taking the pitch levers to zero and to turn the rudder manually to starboard from the helmsman's position. Shortly after this, the OOW completed a crash stop by putting the engines to full astern. The compass was not monitored and the movement of BIRKA TRANSPORTER was unpredictable for the OOW. The OOW did see that there would be a collision.

The collision took place at 4:00:43 UTC; BIRKA TRANSPORTER's bow hit WILLEMPJE HOEKSTRA's forward part on the starboard side (Figure 9).

Figure 9. At 4:00:43 the collision took place according to the S-VDR audio.

WILLEMPJE HOEKSTRA

WILLEMPJE HOEKSTRA left the port of Den Helder at 1.35 and headed for North Sea fishing grounds. At 3:15 she was at the TSS and crossed the lane according to the COLREGs with an approximate angle of 90 degrees. She was steaming a course of 294 degrees at 9.5 knots and wasn't fishing.

According to the skipper[12] of WILLEMPJE HOEKSTRA, the fishing vessel's engines were idling and they were preparing the fishing equipment for fishing. According to the S-VDR recording by BIRKA TRANSPORTER, their speed was approximately 6 knots at its lowest (Chapter 1.2.7, Figure 12). They saw BIRKA TRANSPORTER changing her course towards the fishing vessel. According to him, they started to reverse to avoid collision. Approximately 30 seconds prior to the collision the skipper uttered an exclamation on the VHF without address. The collision impact was light.

1.2.4 Events immediately after the collision

WILLEMPJE HOEKSTRA tried to contact BIRKA TRANSPORTER by VHF. The response of the OOW was "just a moment". The chief engineer and the lookout entered the bridge on BIRKA TRANSPORTER alarmed by the vibrations caused by the crash stop. The OOW called the Master to the bridge.

The Master entered the bridge at 4:05 and took over the command. The ship was already stopped and the trackpilot was still active. WILLEMPJE HOEKSTRA was drifting beside BIRKA TRANSPORTER on the port quarter. The Master noticed that the fishing vessel's deck lights were on and the trawler beams were in upright position. The lookout was sent forward to check for damage in the bow, and the chief officer went to the ballast control room to check water levels in ballast tanks. A general alarm was not activated.

The Master tried to get in contact with WILLEMPJE HOEKSTRA by VHF. After a few attempts, the fishing vessel replied at 4:10 and reported that they were not in danger. The Netherland Coast Guard was informed about the collision at 4.13 by the Master of BIRKA TRANSPORTER.

WILLEMPJE HOEKSTRA left the scene at 4:35. They started trawling, but a crew member soon noticed that the vessel was taking in water to the storage/bow thruster room. The trawl was lifted up. At 4:43 the Netherlands Coast Guard informed BIRKA TRANSPORTER that WILLEMPJE HOEKSTRA was taking in some water and a Navy ship would be assisting. At 5:07 BIRKA TRANSPORTER got permission to proceed to its destination port from the Netherlands Coast Guard.

1.2.5 Injuries to persons

No personal injuries were sustained in the accident.

[12] The information is based on a newspaper interview (www.opurk.nl)

1.2.6 Damage to the ships

BIRKA TRANSPORTER sustained damage to her bow on her starboard side. According to the survey report by the DNV, there were several buckled vertical shell plating stiffeners between the forecastle deck and the first stringer inside forepeak tank (Figure 10) at center line. One stiffener was found to be cracked. Shallow dents on shell plating located in way of buckled frames.

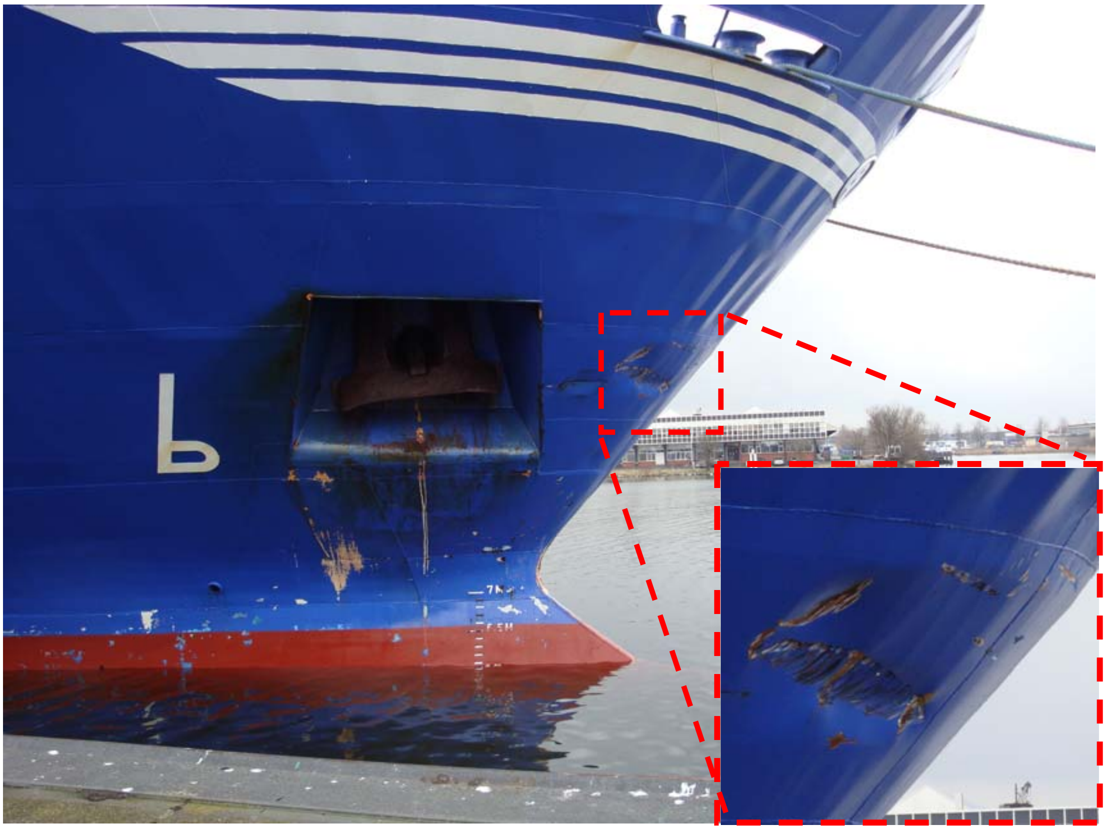


Figure 10. BIRKA TRANSPORTER's damage next to the stem.

WILLEMPJE HOEKSTRA sustained cracks to her starboard side approximately 2 meters below the waterline. The forward part of the bow thruster tunnel was dented approximately by 500 mm in length, while the grille in front of the bow thruster tunnel was deformed as well (Figure 11 on the left). Due to the cracks there was water ingress to her storage/bow thruster room (Figure 11 on the right).

The leaked water had been in contact with the electric switchboard of the bow thruster and fish processing pump, and it was thus alleged that the electric switchboard had been affected by water. The fixed stay of the starboard fishing derrick was damaged due to the impact. There was blue paint on the steel rope over a length of approximately 4 m, and the socket area at the forward end of the steel rope had also sustained some damage.

The total cost of the repair work was approximately EUR 43,000.

Figure 11. ***Left:*** *damage on the starboard side of WILLEMPJE HOEKSTRA, in the bow thruster tunnel.*
Right: *water inside the storage/bow thruster room on WILLEMPJE HOEKSTRA.*
(Figure on the left: © SCUA Rotterdam B.V.,
figure on the right: © Koninklijke Nederlandse Redding Maatschappij)

1.2.7 Recorders used

Data on the accident was obtained from the BIRKA TRANSPORTER's S-VDR recording and pitch log (a graph for the propeller pitch order and response), from the radar system in the VTS-centre of Den Helder, which monitors and gathers data on Dutch coastal areas. The information is presented more in detail in appendices 1 and 2.

In the figure 12 there are curves illustrating the motion data of both vessels until the accident.

In the figure 13 there is a radar plot from the Netherland Coastguard. According to the plot BIRKA TRANSPORTER maintained a steady course until 4:00:13, at which time the vessel started to turn to port. Also WILLEMJE HOEKSTRA maintained a steady course in the beginning of the situation. There is a gap of approximately 15 minutes in the track of the fishing vessel.

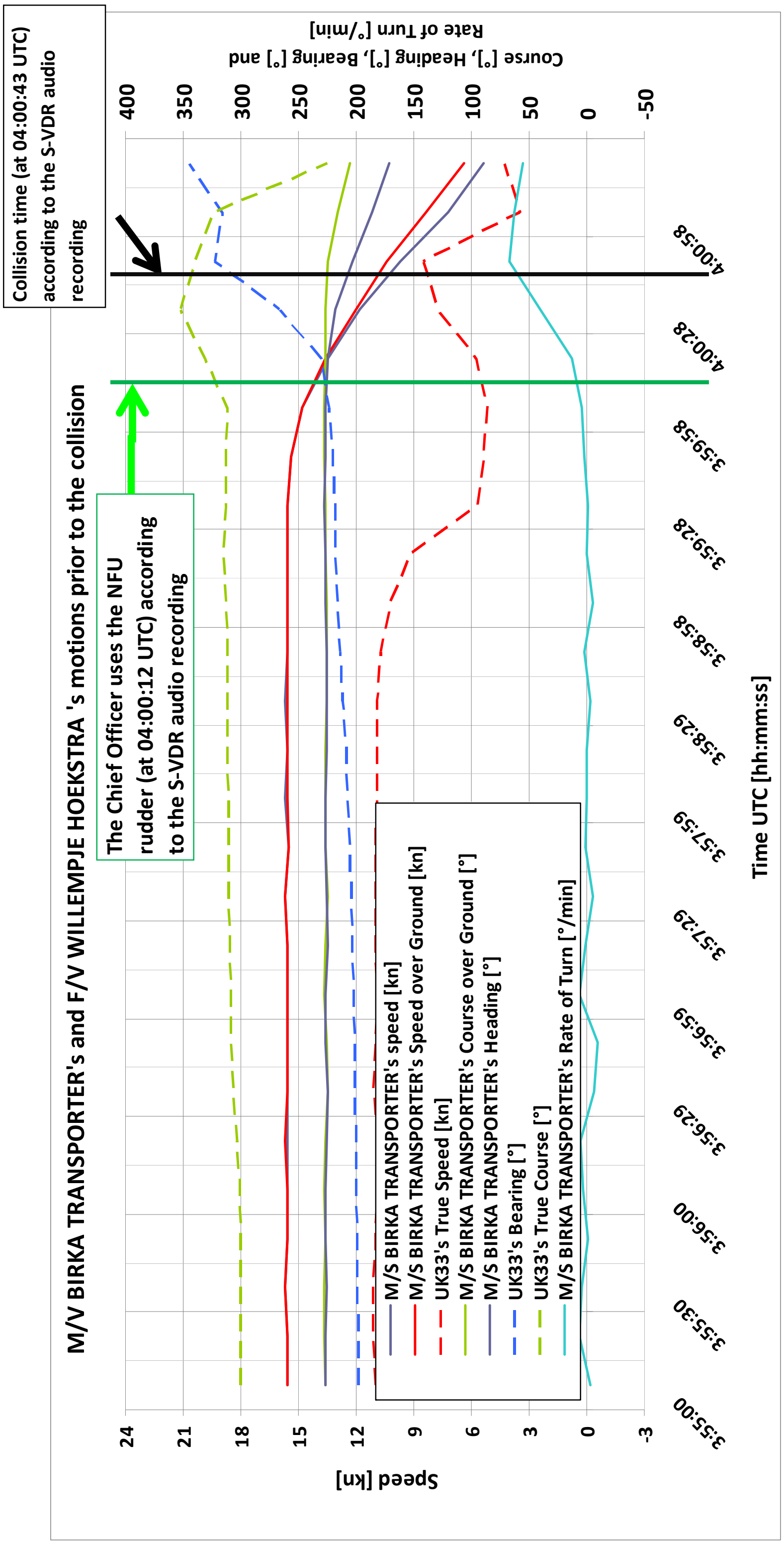


Figure 12. BIRKA TRANSPORTER's and WILLEMPJE HOEKSTRA's motion data prior to the accident based on recorded S-VDR data.

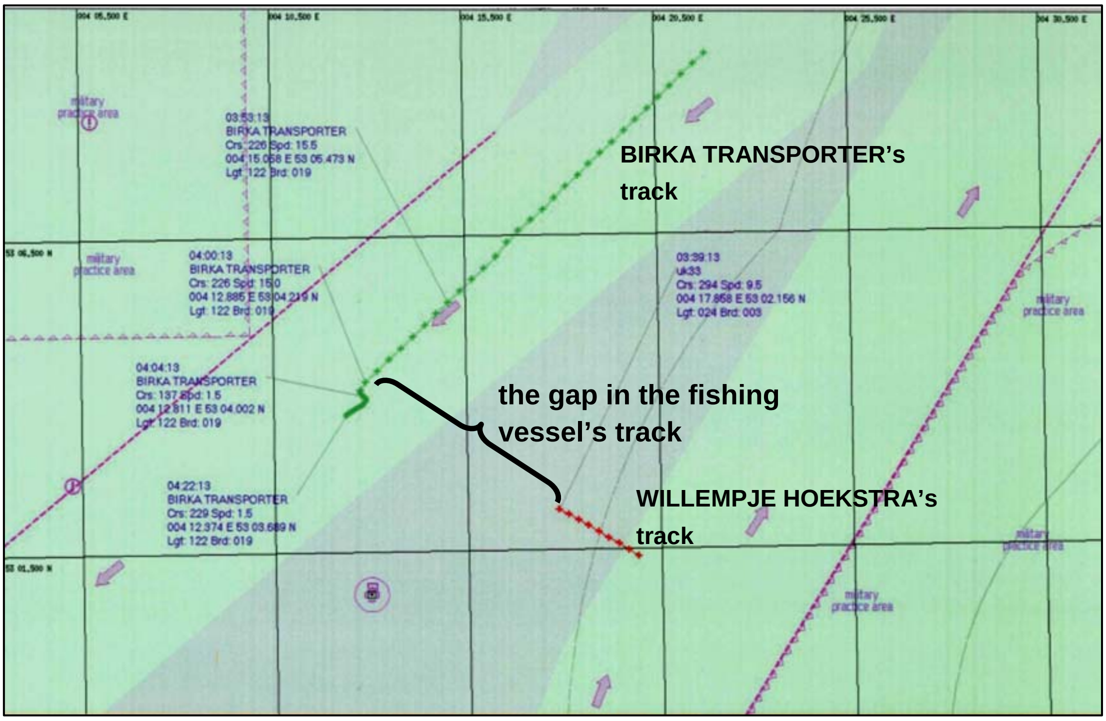


Figure 13. An overall picture of the situation provided by the Netherlands Coastguard Service. The Figure shows the tracks of both sides, BIRKA TRANSPORTER's in green and WILLEMPJE HOEKSTRA's in red. There is a gap of approximately 15 minutes in the track of the fishing vessel prior to the collision. (© Netherlands Coastguard)

WILLEMPJE HOEKSTRA was not required at the time of the accident to be fitted with a VDR or AIS and she carried neither. Hence, there were two recording sources for the vessels' movements; the S-VDR on BIRKA TRANSPORTER and the radar system of the Netherlands Coastguard Service in the city of Den Helder.

The gap in the track of WILLEMPJE HOEKSTRA in the radar recording prior to the collision was reconstructed using the BIRKA TRANSPORTER S-VDR ARPA data[13]. The ARPA data could be seen on the BIRKA TRANSPORTER's radar screen (Appendix 1) starting approximately 14 minutes prior to the accident.

13 ARPA data included WILLEMPJE HOEKSTRA's bearing, range, course and speed as well as the time to closest point approach, closest point approach, bow cross range as well as bow crossing time between these two vessels.

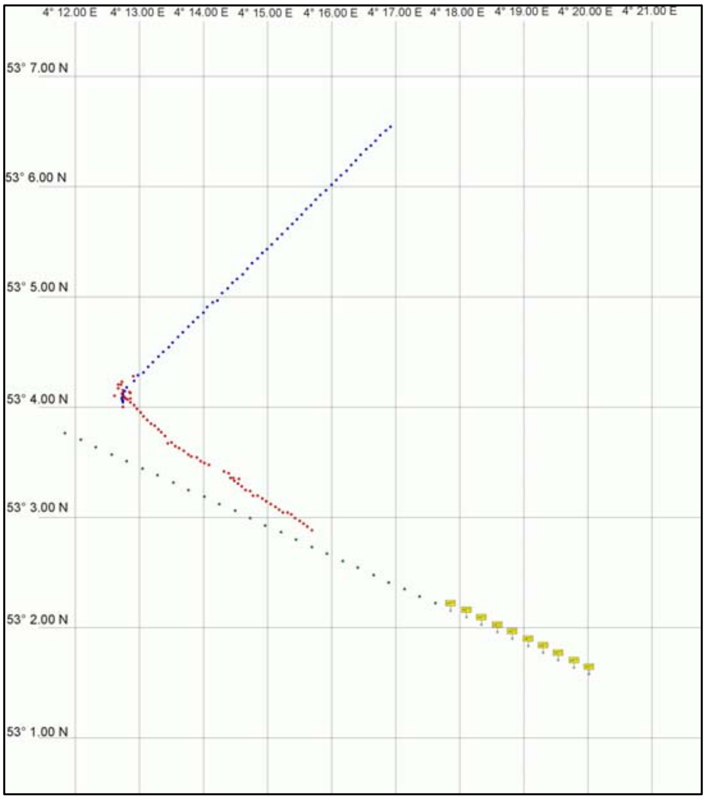


Figure 14. Vessel tracks derived from BIRKA TRANSPORTER's S-VDR. BIRKA TRANSPORTER's track is shown as blue dots (data from the S-VDR recording). WILLEMPJE HOEKSTRA's track is shown as red dots (data from S-VDR's ARPA data). The yellow marked track is WILLEPJE HOEKSTRA's track from the beginning of the situation (based on the radar plot). The track is extrapolated by dead reckoning until it crosses the track of BIRKA TRANSPORTER (marked as green dots).

According to the figures above it can be observed, that:

- Although BIRKA TRANSPORTER's heading began to change slightly before the impact took place its course over ground did not change discernibly until a few seconds prior to the collision.
- WILLEMPJE HOEKSTRA performed a slight course alteration to starboard prior to the collision. At this point, the distance between the vessels was some 1.4 NM. According to Figures 12 and 14, a sharper turn to starboard may have taken place just before the collision. However, at this point the fishing vessel was already so close to the radar antenna that the accuracy of the ARPA information was probably compromised.
- According to the S-VDR-recording, the collision took place in position 53°04.178N, 004°12.797E at 4:00:43 UTC. The exact collision time was concluded based on the S-VDR audio; the collision noise as well as the OOW's reaction. In Figure 14. the collision site has slightly different coordinates. This can also be explained by the closeness of the fishing vessel.

Crash Stop manoeuvre on BIRKA TRANSPORTER

The crash stop manoeuvre on BIRKA TRANSPORTER has been assessed using the S-VDR recording, which contains both the orders for propeller pitch and the actual pitch (Appendix 1).

The reduction of speed was initiated about a minute before the collision. The OOW started the speed reduction by adjusting the pitch lever to zero which took 30 seconds. After a few seconds the pitch was adjusted to full astern.

Figure 15 illustrates BIRKA TRANSPORTER's speed during the crash stop test and during the accident. The heading during the accident crash stop is also shown on the graph. The speed curve in the picture begins with a slope which not as steep as the corresponding one from the crash stop test. This is due to slowly setting the propeller pitch to zero in 30 seconds.

The speed of BIRKA TRANSPORTER reduced from 15.5 knots to 14 before the start of the actual crash stop (setting the lever from zero to full astern). At the time of collision the speed of the vessel was abt. 9.5 knots and her heading had changed from 226 degrees to 203 (the course over ground changed simultaneously from 226 degrees to 224).

BIRKA TRANSPORTER had almost stopped abt. two minutes after the collision when her heading was 135 degrees and speed slightly under two knots.

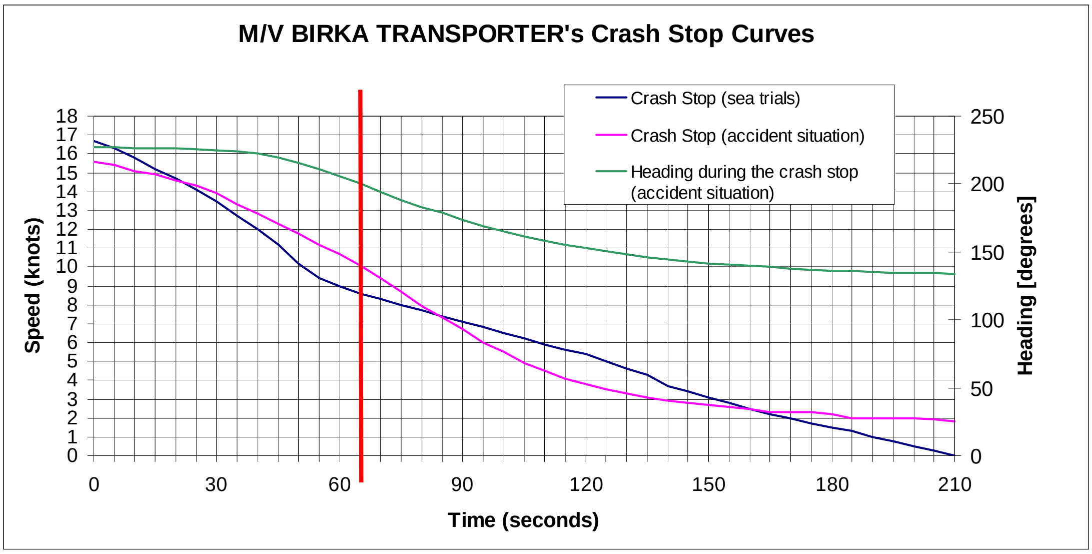


Figure 15. Crash stop manoeuvre of BIRKA TRANSPORTER at sea trials (blue line) and in the accident (red line). The green line illustrates the heading during the accident crash stop and the red vertical line the accident time. Sources: S-VDR data and BIRKA TRANSPORTER's crash stop test poster.

1.3 Rescue operation

The collision occurred at 4:00:43. At 4:10 the Master of BIRKA TRANSPORTER, contacted WILLEMPJE HOEKSTRA by VHF. The trawler reported that they were not in distress. At 4:13 the Netherland's Coast Guard was informed of the collision by the Master of BIRKA TRANSPORTER.

The Coast Guard reported to BIRKA TRANSPORTER at 4:43 that the fishing vessel had taken in some water and that they would get assistance from the navy ship HR.MS.LUYMES. At 5:07, BIRKA TRANSPORTER got permission from the Netherland's coastguard to resume her voyage to Amsterdam.

Rescue boat JOKE DIJKSTRA received the rescue alert at 4.40. They were informed that there was a leak in the WILLEMPJE HOEKSTRA, and they proceeded at a speed of 30 knots towards the accident scene. HR.MS.LUYMES was nearby and also proceeded to the scene. The rescue boat moored on the side of WILLEMPJE HOEKSTRA at 5.50. Two men embarked on WILLEMPJE HOEKSTRA with pumps and hoses. HR.MS.LUYMES brought one additional pump. The pump capacity of these pumps was not enough, and the rescue boat thus applied one additional pump from the coastguard vessel LEVOLI BLACK.

The water level inside WILLEMPJE HOEKSTRA started to decrease. The situation was under control. After this, WILLEMPJE HOEKSTRA was escorted by LEVOLI BLACK and HR.MS.LUYMES towards the port of Den Helder. When they approached the anchorage outside Visser drydock, one pump was returned to LUYMES, while the others with the hoses remained onboard WILLEMPJE HOEKSTRA to keep the vessel floating until dry docking. WILLEMPJE HOEKSTRA arrived at the dry dock in Den Helder at 10.00 the same day.

1.4 Rules, regulations and guidelines

1.4.1 Watchkeeping

Extracts from the Finnish Transport Safety Agency’s Rules for Watchkeeping 213/03.04.01.00/2010

Free translation from Finnish:

A ship’s watch arrangements should aim to prevent fatigue from undermining the performance of the watch personnel. The duties of the crew should be so arranged that the watch at the start of the voyage and the following watches are adequately rested when starting the watch and, in general, fit for duty.

Lookout

Proper lookout should be maintained at all times in compliance with the Colregs. Rule No.5. The purpose of the lookout is:

.1 to maintain a continuous state of vigilance by sight and hearing, as well as by all other available means, with regard to any significant change in the operating environment;

.2 to fully appraise the situation and the risk of collision, grounding and other hazards to navigation; and

.3 to detect ships or airplanes in distress, shipwrecked persons, wrecks and goods from wrecks and other hazards which may compromise the safety of navigation.

The lookout should be able to focus on keeping an appropriate lookout, and he may not take on, or be ordered to complete, other duties that disrupt the lookout.

Additionally according to the Finnish Rules for Watchkeeping the bridge team on watch shall communicate appropriately in all situations.

1.4.2 Fatigue – Hours of work and rest

ln order to prevent fatigue, the STCW Code stipulates that bridge team members must take mandatory rest periods. Rest periods of at least 10 hours in any 24 hour period are required. lf the rest is taken in two separate periods, one of those periods must be at least 6 consecutive hours. However, the minimum period of 10 hours may be reduced to no less than 6 consecutive hours provided that any such reduction does not extend beyond two days, and no less than 70 hours of rest is allowed during each seven day period.

The lnternational Labour Organization (lLO) in its Convention ILO 180, which is subject to port state control, stipulates a minimum rest period of 77 hours for seafarers in any seven-day period. This requirement for rest period is also included in the ILO Maritime Labour Convention 2006 (MLC 2006), which comes into force in 2013. With MLC 2006 the requirement is likely to be more widely enforced.

1.4.3 COLREGS and Industry guidelines

COLREGS[14]

It should be noted that at the time of the accident, the fishing vessel was not fishing. She was showing normal navigational lights and should therefore be treated as a normal motor vessel.

Steering and sailing rules from COLREGS (Part B) particularly relevant to this case are:

Section I – Conduct of vessels in any condition of visibility
- Rule 5 - duty to maintain a proper lookout
- Rule 7 - duty to assess risk of collision

[14] Convention on the International Regulations for Preventing Collisions at Sea, IMO

- Rule 8 - actions to avoid collision
- Rule 10 - traffic separation schemes

Section II - Vessels in sight of one another

- Rule 15 - crossing situations
- Rule 16 - actions by give-way vessel
- Rule 17 - actions by stand-on vessel

The text of these rules is in Appendix 5.

The watchkeeping duties of the OOW include maintaining a lookout and general surveillance of the ship, collision avoidance in compliance with the COLREGS, recording bridge activities, and making periodic position checks on the navigational equipment in use.

The OOW will need to be conversant with the means and best practices of controlling the speed and direction of the ship, handling characteristics and stopping distances. The OOW should not hesitate to use helm, engines or sound signalling apparatus at any time.

Bridge Procedure Guide, ICS.[15]

Collision avoidance action. In general, early and positive action should always be taken to avoid collisions and, once action has been taken, the OOW should always make sure that the action taken is having the desired effect.

Collision avoidance and detection. In clear weather, the risk of collision can be detected early by taking frequent compass bearings of an approaching vessel to ascertain whether or not the bearing is steady and the vessel is on collision course. However, care must be taken when approaching ships at a close range. An appreciable bearing change may be evident under these circumstances but in fact, a risk of collision may still remain.

Electronic radar plotting can be used effectively for assessing the risk of collision. The OOW should take the opportunity to carry out radar plotting practice in clear visibility whenever possible.

Steering control. Steering control of the ship comprises manual steering, probably supplemented by an automatic pilot (autopilot) or other track control system.

In areas of high traffic density, in conditions of restricted visibility and in all other potentially hazardous situations, a helmsman should be available on the bridge, ready at all times to take over steering control immediately.

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15 Bridge Procedures Guide, 4th Edition 2007, International Chamber of Shipping ICS

When steering the ship under autopilot, it is highly dangerous to allow a situation to develop to a point where the OOW is without assistance and has to break the continuity of the lookout in order to take emergency action and engage manual steering.

A changeover between automatic and manual steering should always be made in good time under the supervision of the OOW

1.4.4 Safety Management System on BIRKA TRANSPORTER

The working language onboard is Swedish. The material of the safety management system (SMS) is also in Swedish (the complete text of the topics in the following list is in the Appendix 4). In Chapter *Company* of the SMS there is additional text about the support by the company to the vessel in a case of collision.

Chapter 5 Ship administration / Routines in the deck department

- Bridge Routines / At sea

- The Masters night order book

(there were no records in the night order book for the accident voyage)

Chapter 6 Safety system, instructions and checklist

- Accident to the ship / Collision

1.4.5 Regulations concerning AIS on fishing vessels

Since fishing vessels are not recognized by SOLAS Chapter V, no requirements regarding AIS transponders have applied to fishing vessels. European Commission Directive 2011/15/EU of 23 February 2011 requires that all fishing vessels over 15 meters be fitted with AIS by the end of May 2014. This will be an improvement in safety regarding communication between merchant vessels and fishing vessels in European waters.

1.5 Other investigations

1.5.1 Steering tests carried out on BIRKA TRANSPORTER after the accident

A steering test was carried out to find out the time it takes for the rudder to move from amidships to hard to starboard with one rudder pump activated, and how the ship performed a 90-degree turn to starboard due to this. The steering test was carried out in a loaded condition with a speed of approximately 15.5 knots.

The rudder moved from amidships to hard to starboard in 9 seconds, and the ship turned 90 degrees in 50 seconds. The turn radius was 1.8 cables.

1.5.2 Similar accidents

Previous safety studies (see Annex 6 of this report) have shown that poor lookout, inadequate passing distances and procedures and regulations that are intentionally violated against contributed to collisions.

2 ANALYSIS

2.1 Risk assessment of a close-quarter situation

Rules from COLREGS have been used to analysing this accident. Rules applicable in this case are in Appendix 5. In addition to these the safety management system and ships standing orders have been assessed.

Determination of the risk of collision must be based on several observations taken as accurately as possible. Small errors in bearings taken in the early stages of an encounter, or inaccurate plotting, are likely to have an appreciable effect on the assessment of the risk of collision. Assumptions made on the basis of scanty information have been a contributory cause in many collisions. When vessels are within sight of one another, visual compass bearings should normally give greater accuracy than radar bearings if the vessel is not rolling or pitching heavily. Bearings taken relative to the ship's structure can be very misleading in determining whether a risk of collision exists.

Several observations should be made at short and regular intervals to reduce the effects of random errors when there is a possibility of a close quarter situation developing.

When two vessels come close to each other without any changes of course and speed, a bearing to the other vessel that remains constant at long range but that changes rapidly at short range may be associated with a dangerous passing distance.

An appreciable change of bearing at greater ranges does not necessarily mean that there is no risk of collision. The other vessel may be making a series of small alterations which have not been observed.[16]

The environmental conditions were moderate, therefore those did not have any affect in to the development into the close quarter situation. The visibility was good.

The collision avoidance rules we see that they are complicated and do not give the OOW direct guidance for his decisions, because "ample time", "safe passing distance" or "close-quarter situations" are not specified. Their application is left to the OOW to carry out during the watch[17].

Safe passing distance. A safe passing distance is not defined because it depends on a number of factors. A safe passing distance is not the same if the other vessel is passing ahead or if it is passing astern.

A close-quarters situation. The distance at which a close-quarters situation first applies is not defined in NM. The rules discuss it, but decide that the distance cannot be quantified because it depends on a number of factors. Distance of 2 to 3 miles[18] can be considered as a close quarter situation In restricted visibility. The

16 *A Guide to Collision Avoidance Rules*, Cockcroft, A.N. and Lameijer J.N.F., Burlington, Cornwall 2004
17 Regulation 8
18 *A Guide to Collision Avoidance Rules*,

actions at open sea, in order to avoid close quarter situation should be initiated latest a distance of 3 NM to the other vessel, in case circumstances so allow.

The give-way vessel has to act in ample time which leads to a safe passing distance. The stand on vessel should maintain her heading and speed, un till it becomes apparent, that the give- way vessel do not act in ample time[19].

WILLEMPJE HOEKSTRA entered the traffic lane in a nearly 90-degree angle and was the give-way vessel. The OOW of the BIRKA TRANSPORTER did consider, that she had to maintain her heading and speed because she was on the traffic lane, and the WILLEMPJE HOEKSTRA was approaching from the left[20].

BIRKA TRANSPORTER expected to stand on, she maintained her course and speed in accordance with the regulation.

2.2 Lookout and communication between the vessels

Lookout

According to the skipper of the **WILLEMPJE HOEKSTRA**, the crew on the fishing vessel was concentrating on preparing the fishing equipment prior to the collision. At this point, keeping lookout often does not come first in their list of priorities. The deck lights were also on, which impedes visual observation.

During the accident there was no lookout posted on the bridge of the **BIRKA TRANSPORTER** except for the OOW. The custom onboard was to send down the lookout at 6:00 ship time, but that morning, the lookout was already released 3:04 UTC (4:04 ship time), because the OOW ordered the lookout to clean the mess room. According to the master, the lookout normally sits beside the other radar on the bridge.

The BIRKA TRANSPORTER safety management system requires to have lookout during the darkness. There have been deviations of these instructions onboard the ship as regards releasing the lookout at 6.00 regardless of whether it is dark or not.

A good bridge resource management practise onboard would be that the lookout monitors the other radar and discusses it with the OOW, but this was not the case in this situation. Had the lookout been present, it might have inspired a discussion between the lookout and the OOW about the risk of collision and its avoidance. Additionally, the availability of a helmsman could have made the efforts to avoid the collision easier for the OOW. The OOW could have only focused on observations and manoeuvres.

The duties of a lookout and a helmsman are separate, and the helmsman is not considered a lookout while steering.

[19] Regulation 16 and Regulation 17
[20] Regulation 10

Since steering at the helmsman's position was used during the avoidance manoeuvre, the OOW had to reach over backwards to be able to steer, and the motion of the ship was no longer observed.

During the developing close quarter situation, several duties were accumulated on the OOW of the BIRKA TRANSPORTER which were difficult to deal simultaneously.

Communication between vessels

There were no communication attempts to WILLEMPJE HOEKSTRA by the BIRKA TRANSPORTER prior to the collision. Immediately after the collision, the skipper of the fishing vessel did call by VHF without any address.The communication between the vessels began after the collision.

At open sea, a give-way vessel that approaches within two NM in a crossing situation can usually be considered to have left it too late to take action and therefore it is important for the stand-on vessel to get in connection with the opposite party by the VHF, five short rapid blasts of the whistle, or five short light signals.

The communication between the vessels did began after the collision. The degree of VHF communication between merchant vessels and fishing vessels varies a lot. Some officers have good experiences of VHF communication with fishing vessels while others think it is useless to try and contact fishing vessels as they will not respond. There can be several reasons to explain why communication between the two vessel types is not that common. They may include a lack of linguistic skills, difficulties in reaching the right fishing vessel, a lack of AIS data or just ignorance.

2.3 Actions before the collision

The situation could have been a near miss if no course and/or speed alterations had been made by either of the vessels, which is unacceptable in the light of COLLREGs. This option has been described in Appendix 2.

WILLEMPJE HOEKSTRA

According with the S-VDR of BIRKA TRANSPORTER the WILLEMPJE HOEKSTRA did small course alterations before the collision.

The course alterations of about 10 degrees to starboard made by WILLEMPJE HOEKSTRA four minutes before the collision cannot be considered early enough and substantial and the following course alteration from 310 degrees to 350, 40 seconds prior to the collision cannot be considered an action in ample time.

WILLEMPJE HOEKSTRA was the give-way vessel according to the COLREGS. Thus she should have taken action to avoid the collision – in a notable way – in ample time. Small course alterations should be avoided and they should not lead to another close quarter situation.

The late actions to avoid collision might indicate that other traffic was not efficiently observed, the COLREGS was incorrectly interpreted, or the attitude to those rules was inappropriate.

BIRKA TRANSPORTER

The use of ARPA functions. The OOW used the ARPA and AIS functions to determine if there is a risk of collision throughout the watch. According to the OOW, the ARPA data is reliable and there is no need to use the EBL to double check the movements of the target. The OOW used the 6 NM range on the radar and did not change the range even when WILLEMPJE HOEKSTRA was close. The work with radar was not active or efficient.

The ARPA data of WILLEMPJE HOEKSTRA was activated on BIRKA TRANSPORTERS ARPA radar circa 14 minutes before the collision, showing a Closest point of approach (CPA) of 0.24’ and Bow crossing range (BCR) of 0.36’. This can be considered the first warning for the OOW that a close quarter situation is developing.

The dangerous target alarm on the ARPA radar was activated about 10 minutes before the collision, showing that WILLEMPJE HOEKSTRA was approaching at a distance 2.8 NM in a bearing of 193 degrees. The TCPA was 10.03 minutes and the CPA 0.35 NM[21]. The dangerous target alarm did not result in any decision-making or activities by the OOW, the alarm was just acknowledged (See Appendix 1/3, Table 1). At this stage, the OOW should have requested the fishing vessel as the give-way vessel to declare her intentions by light signals or by the VHF. The OOW observed the movements of the fishing vessel both visually and by radar. The OOW observed the decreasing CPA on the radar, but took no action, and the situation was allowed to develop to a close quarter situation.

The avoidance manoeuvre. Shorty before the collision, as the OOW noticed smoke coming from the fishing vessel’s funnel indicating that she was stopping, the OOW decided to slow down the speed by taking the pitch levers to zero. After this the OOW turned the rudder manually to starboard from the helmsman’s position[22] and realized shortly after, that this action would not avoid the collision.

The OOW performed a crash stop by putting the engines to full astern and when doing that released the wheel at least once when reaching over to the engine controls. Because of the crash stop the heading of the BIRKA TRANSPORTER did simultaneously turn to the left towards WILLEMPJE HOEKSTRA. This turning became as a surprise to the OOW.

[21] Dangerous target limits in the ARPA radar were set to CPA 0.5 NM and 10 minutes.

[22] The steering at the helmsman’s position is an override steering system which will be activated when the wheel is turned. The autopilot will not be deactivated, just overridden. When the wheel is released, the autopilot will be activated and the present course of the gyro compass will be steered. Permanently the steering can be transferred between the conning positions using a separate switch.

The actions by BIRKA TRANSPORTER did not prevent the collision, when it became apparent that the fishing vessel does not give way.

Slowing down the speed of, or a crash stop, performed by the stand on vessel makes it more difficult for the give-way vessel to pass astern.

There was plenty of sea room for course alterations in ample time. The “hard over to starboard” helm order would have worked better in last minute collision avoidance manoeuvre. The impact of the crash stop in this case was mainly to mitigate the consequences of the impact.

Crash stop as a collision avoidance manoeuvre. The crash stop manoeuvre is very seldom, if ever, carried out by the bridge crew. The OOW on BIRKA TRANSPORTER had never executed a crash stop manoeuvre before, but he explained that the right way to do it had possibly been taught at school back in the olden days. There were no instructions onboard for completing a crash stop, and neither was it done during simulator training sessions. There is a crash stop manoeuvre poster on the bridge showing that the ship turns to starboard during the crash stop manoeuvre. This poster is included in Appendix 2 (Figure 3).

As mentioned in Appendix 2, in a crash stop the steering forces may disappear and the prevailing drift of the vessel may be dominant in determining the direction in which the vessel turns. The wind and waves as well as the sea current will also affect the direction in which the vessel turns. A crash stop poster is only partially trustworthy – the reach needed for a ship to stop as well as the time used for it are reliable from the measurements during ship trials, however the turning direction varies. This is highlighted by the fact that in tests, this direction varied between sister ships. Several of the reasons listed above may have influenced the vessel’s behaviour during the crash stop.

In order to control – as much as possible – the crash stop manoeuvre, the vessel should be given an initial turning rate to the desired direction before initiating the crash stop; thus when the manoeuvrability of the rudder is lost at some point, the vessel continues to turn because of the prevailing drift.

2.4 Fatigue

The effects of fatigue are particularly dangerous in the shipping industry. The technical and specialized nature of this industry requires constant alertness and intense concentration from its workers[23]. Fatigue is also dangerous because it affects everyone regardless of skill, knowledge and training. There is a definition by IMO for fatigue[24].

[23] This chapter contains extracts from Guidance on fatigue mitigation and management (MSC/Circ.1014.).

[24] “*A reduction in physical and/or mental capability as the result of physical, mental or emotional exertion which may impair nearly all physical abilities including: strength; speed; reaction time; coordination; decision making; or balance.”* IMO Circular MSC/Circ.813/MEPC/Circ.330, List of Human Element Common terms

The most common causes of fatigue known to seafarers are lack of sleep, poor quality of rest, stress and excessive workload. There are many other contributing factors, and each will vary depending on the circumstances (i.e. operational, environmental).

All sleep does not have the same quality and does not provide the same recuperative benefits. In order to satisfy the needs of the human body, sleep must have three characteristics to be most effective:

- Duration: Everyone's sleep needs are unique; however, it is generally recommended that a person obtain, on average, 7 to 8 hours of sleep per 24-hour day. Alertness and performance are directly related to sleep. Insufficient sleep over several consecutive days will impair alertness.

- Continuity: Sleep should be uninterrupted. Six one-hour naps do not bring the same benefits as one six-hour period of sleep.

- Quality: Just being tired is not enough to ensure a good sleep. An individual must begin sleep in synch with his or her biological clock to ensure good quality sleep. If the time of sleep is out of synchronization with his/her biological clock, it is difficult to sleep properly.

The Marine Accident Investigation Branch (MAIB) from UK has observed in its study on fishing vessels[25] that fatigue or sleep deprivation is endemic. It is widely accepted by the industry, and is either the main cause of many accidents or is judged to be a strong underlying factor. Many collisions, and a number of groundings, can be attributed to watchkeepers falling asleep when outward bound having sailed at around midnight.

There are some components in the work and rest periods, the duration of sleep, and the periods and quality of sleep of the OOW on BIRKA TRANSPORTER (see 1.1.2), which might have caused cumulative fatigue and impaired alertness in the watch. Research has shown that alertness and performance tend to be at their lowest during the early hours of the morning[26], because the early morning watches do not fill the above mentioned third criteria about the quality of sleep.

The OOW should have brought the sleeping difficulties to the attention of the master and the occupational health services in order to enable safer watchkeeping of the vessel.

2.5 Evaluation of the rescue operation

Right after the collision, the Master of the BIRKA TRANSPORTER contacted WILLEMPJE HOEKSTRA by VHF, he was allowed to know that the fishing vessel was not in distress. The Master of the BIRKA TRANSPORTER informed also at once to the Dutch coast guard about the accident. The examination of the condition of the smaller

[25] MAIB Report on the Analysis of Fishing Vessel accident Data 2002. Chief Inspector's foreword, at page3. http://www.maib.gov.uk/cms_resources/analysis_of_fishing_vessel_accident_data.pdf

[26] MAIB Bridge Watchkeeping Safety Study 1/2004, manning levels and fatigue, page 10. Available: http://www.maib.gov.uk Safety study S3/2004M Factors contributing to fatigue and its frequency in bridge work. Available: http://www.sia.fi

party was carried out accordingly. After having received permission from the Coast Guard, BIRKA TRANSPORTER resumed her voyage to Amsterdam.

After having received information about the leakage on board WILLEMPJE HOEKSTRA, three vessels were alerted to the rescue operation and BIRKA TRANSPORTER was informed about the situation. The rescue vessels arrived quickly at the accident site and the level of the water surface on board WILLEMPJE HOEKSTRA began to decrease by means of the delivered pumps by the rescue vessels. The trawler was escorted to the Den Helder drydock.

The rescue operations were carried out with emphasis on early action and rapidly.

3 CONCLUSIONS

3.1 Findings

1. Both vessels failed in this case to comply with the COLREGS. No additional lookout was present in the wheelhouse of BIRKA TRANSPORTER.

2. As a result of complacency, two well-equipped and modern ships collided in conditions of good visibility, even though each knew that a risk of collision existed. The environmental conditions were good and both vessels should have been able to observe each other in ample time.

3. Other traffic in the area would not have hampered manoeuvering measures significantly to prevent the collision when it is informed of the intentions in time and, that they are made so clearly that it is easy for other traffic to perceive the manoeuvering measures.

4. Thus, there was enough time and sea room for both of the vessels to complete their actions in order to avoid the collision.

5. With compliance of COLREGS, STCW and national regulations concerning watchkeeping it is possible to prevent this kind of accidents.

6. Crews of fishing vessels should bear in mind that they usually are the underdogs in a collision with a merchant vessel. Therefore it is even more important for them to comply with the COLREGs in an attitude of good seamanship.[27]

7. European Commission directive requires that all fishing vessels over 15 meters be fitted with AIS by the end of May 2014. This will be an improvement in safety regarding communication between merchant vessels and fishing vessels in European waters.

3.2 Cause of the accident

Both of the vessels allowed the situation to develop to a close quarter situation.

WILLEMPJE HOEKSTRA was the give-way vessel according to the COLREGS. She should thus have taken a collision avoiding action in ample time and in a notable way. However this non-compliance did not release BIRKA TRANSPORTER from acting in ample time to avoid the collision.

[27] Previous safety studies (see Annex 6 of this report) have shown that poor lookout, inadequate passing distances and procedures and regulations that are sometimes intentionally violated against contributed to collisions. In the investigation of a similar collision C5/2008M the investigators of SIAF and MAIB issued recommendations to the owners of both vessels regarding the use of lookout on the bridge and guidance for safe navigational watchkeeping, including the use of navigational equipment and the interpretation of the COLREGS.

The direct cause of the accident was the inadequate, unclear and late collision avoidance actions by the WILLEMPJE HOEKSTRA and BIRKA TRANSPORTER's late and unsuccessful attempt to avoid collision.

The possible fatigue of the OOW and the absence of the lookout on BIRKA TRANSPORTER as well as the possible lack of lookout on WILLEMPJE HOEKSTRA during the rigging of the fishing equipment were contributing factors in this accident.

4 ACTIONS TAKEN

Birka Cargo Ab Ltd

In accordance with the information received from the company, they have tried to ensure in several ways that the crews of the ships are complying with watch routines required by the SMS.

The company has arranged comprehensive simulator training for their officers. The training focuses on bridge resource management (BRM).

Additionally, the company has determined the risky areas on the routes of their ships.

5 SAFETY RECOMMENDATIONS

Both vessels failed in this case to comply with the COLREGS, and as a result two well-equipped and modern ships collided in conditions of good visibility, even though each knew that a risk of collision existed.

The owners of BIRKA TRANSPORTER have provided information on actions taken after the collision. These can improve navigational safety in case they become permanent practice onboard the company vessels.

With compliance of COLREGS, STCW and national regulations concerning watchkeeping it is possible to prevent this kind of accidents.

The Safety Investigation Authority recommends[28] that:

1) *The Finnish Transport Safety Agency, Trafi, shall ensure, that the training on bridge resource management given to deck officers becomes permanent practice onboard the Finnish vessels according to the watchkeeping routines defined in ships' Safety Management Systems. These should be especially applied in risky areas on the routes determined for the ships.*

Helsinki, 22.10.2013

Martti Heikkilä | Juha Sjölund | Ville Grönvall

[28] Safety recommendations shall in no case create a presumption of blame or liability.

SUMMARY OF THE RECEIVED STATEMENTS:

The Transportation Safety Agency emphasises in its statement that the Master of the vessel is primarily responsible for that, the watchkeeping of the vessel and the occupation of the bridge follow rules and instructions internationally agreed and national regulations and the Master's standing orders. Furthermore, Trafi mentions that in Finland the ones to be trained to be deck officers have got BRM education a rule. STCW, Manila, with the 2010 changes educational standards have been increased. By the training, human errors cannot avoided, however, probably, in all the cases. The fatigue also is a significant factor to which special attention must be paid. Regarding the safety recommendations Trafi makes a decision on the possible additional measures separately.

Ducth Safety Board did not have any comments from the draft of the investigation report.

Birka Cargo, in its statement, brings out some focusings to which attention has been paid in the final investigation report and, furthermore, they do not agree on all the analyses and conclusions of the investigation in all respects.

The legal advisor of the **Willempje Hoekstra** wants to bring out that the crew was well rested and did not suffer from the fatigue.

The received statements have been filed to The Safety Investigation Authority premises.

THE INFORMATION FROM THE BIRKA TRANSPORTER S-VDR

Data on the accident was obtained from the BIRKA TRANSPORTER's S-VDR[29] recording and pitch log (a graph for the pitch order and response). The S-VDR data included ECDIS and S-band radar pictures, AIS playback, GPS position, heading, course, rate of turn, speed as well as audio recording and VHF communication on the bridge. The radar and ECDIS pictures are stored 4 times per minute (thus playback is non-continuous), all other information is recorded on real time.

There were no actual recordings on the fishing vessel. However, ECDIS, AIS and radar extracts recorded by the BIRKA TRANSPORTER's S-VDR included ARPA target data. Thus WILLEMPJE HOEKSTRA's bearing, range, course, speed, time to closest point approach, closest point approach, bow cross range as well as bow crossing time can be seen on the radar screen starting approximately 14 minutes prior to the accident when the OOW on BIRKA TRANSPORTER activated the ARPA data on WILLEMPJE HOEKSTRA.

The graph in Figure 1 was drawn based on the S-VDR data. Because the ARPA target data in the radar extracts is the only recorded information on the fishing vessel, the radar extracts were also used as a data source for BIRKA TRANSPORTER's curves in order to enable a comparison between the two vessels. The time interval in the graph is thus 15 seconds.

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29 The S-VDR is fitted on existing cargo vessels according to the revision of SOLAS Chapter V. S-VDR records data and events occurring during navigation, which include: date and time, the ship's position, speed, heading, bridge audio, communication audio, radar/Electronic Chart Display (ECDIS) images and others.

Appendix 2/2 (8)

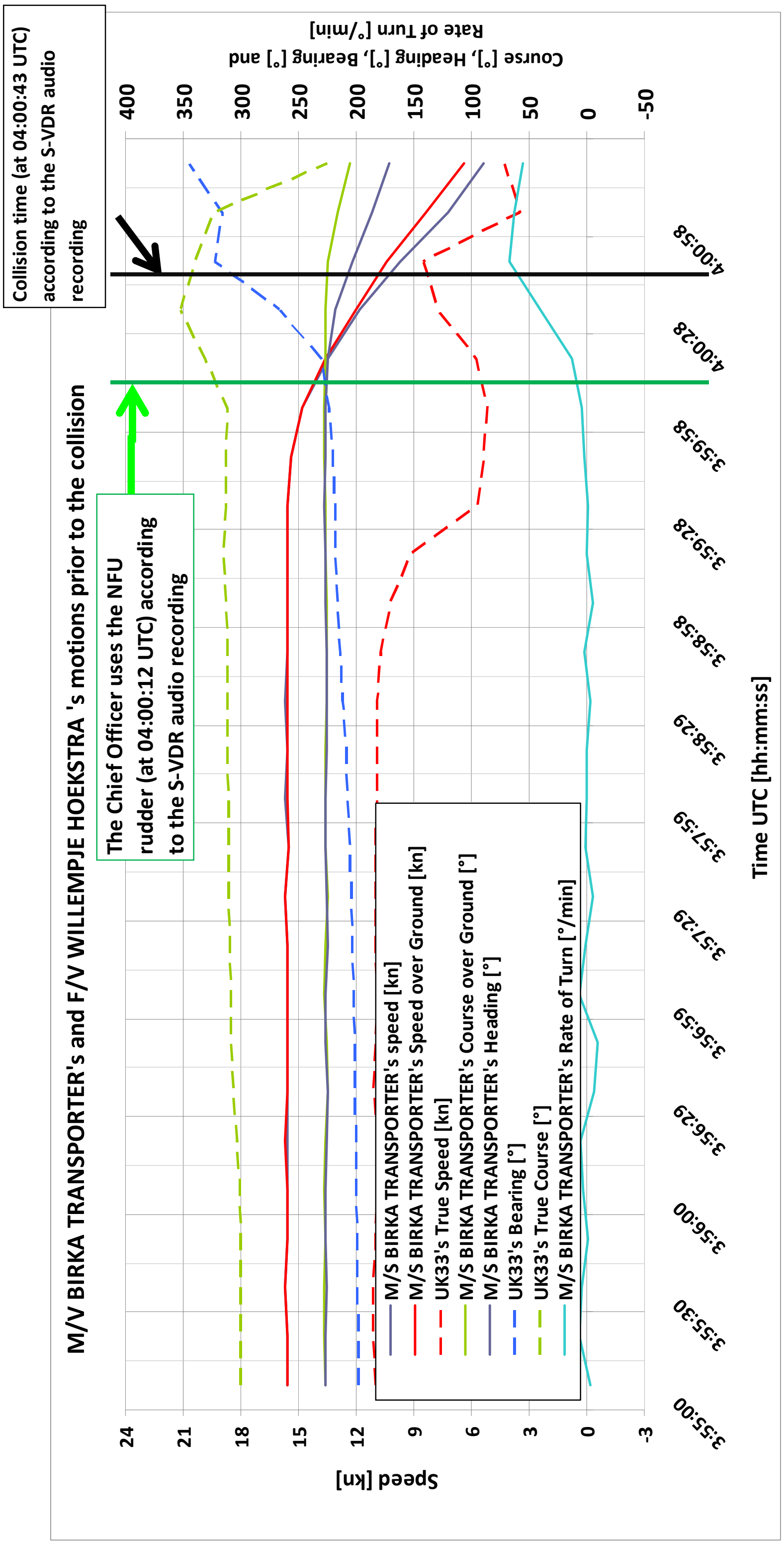

Figure 1. *BIRKA TRANSPORTER's and WILLEMPJE HOEKSTRA's movements prior to the accident based on recorded S-VDR data.*

Information obtained from the S-VDR recording

Table 2. Actions prior to the collision. The actions are based on the S-VDR recording. Appendix 1 illustrates actions in greater detail with multiple S-VDR snapshots.

Time	Action	Time to Collision
3:25:28	WILLEMPJE HOEKSTRA appears on BIRKA TRANSPORTER's radar screen.	circa 35 minutes
3:27:00	BIRKA TRANSPORTER's last turn before the collision was initiated. The course was changed to 226.2 degrees by the trackpilot. A steady course and speed were maintained thereafter.	circa 34 minutes
3:35:23	WILLEMPJE HOEKSTRA was plotted on BIRKA TRANSPORTER's ARPA radar, and circa 10 minutes later, ARPA target data was activated. At this point the CPA was 0.24 NM and BCR 0.36 NM.	circa 25 minutes
3:50:47	The dangerous target alarm on the ARPA radar was activated (dangerous target limits in the ARPA radar were set at CPA 0.5 NM and 10 minutes). At that time, the range was 2.8 NM, bearing 193 degrees, TCPA 10:03 minutes and CPA 0.35 NM.	circa 10 minutes
3:56:00	A course alteration to the right from 300 degrees to 310 degrees on WILLEMPJE HOEKSTRA was made. Up to this point, she had maintained a steady course and speed. At 3:58:30 (circa 2 minutes and 15 seconds to collision) WILLEMPJE HOEKSTRA's speed began to decrease, starting from 11 knots and ending with 5 knots at 4:00.	4.5 minutes
3:59:43	BIRKA TRANSPORTER's OOW deemed the situation as a close quarter situation and altered the pitch at first to zero and a few seconds later to full astern. At that time, the range was 0.29 NM, bearing 220.1°, TCPA 1.03 minutes and CPA 0.06 NM.	circa 1 minute
4:00:13	BIRKA TRANSPORTER's heading started to change from 226 degrees to 203 degrees, while the course over ground changed from 226 degrees to 224 degrees.	circa 30 seconds
4:00:25	A slurred exclamation, presumably by WILLEMPJE HOEKSTRA's Master, can be heard on the VHF channel. No other audio signals or VHF were used prior the collision.	circa 20 seconds
4:00:43	The collision took place according to the S-VDR audio recording. The speed of BIRKA TRANSPORTER reduced from 15.5 knots to approximately 9.5 knots before the collision occurred.	0
4:01:05	WILLEMPJE HOEKSTRA's Master calls HOLMEN CARRIER[30] on the VHF. The VHF call is repeated three times.	-
4:02:04	The OOW on BIRKA TRANSPORTER responds.	-

[30] The charterer's name, HOLMEN CARRIER, is painted on the side plating of BIRKA TRANSPORTER.

Radar images illustrating the accident

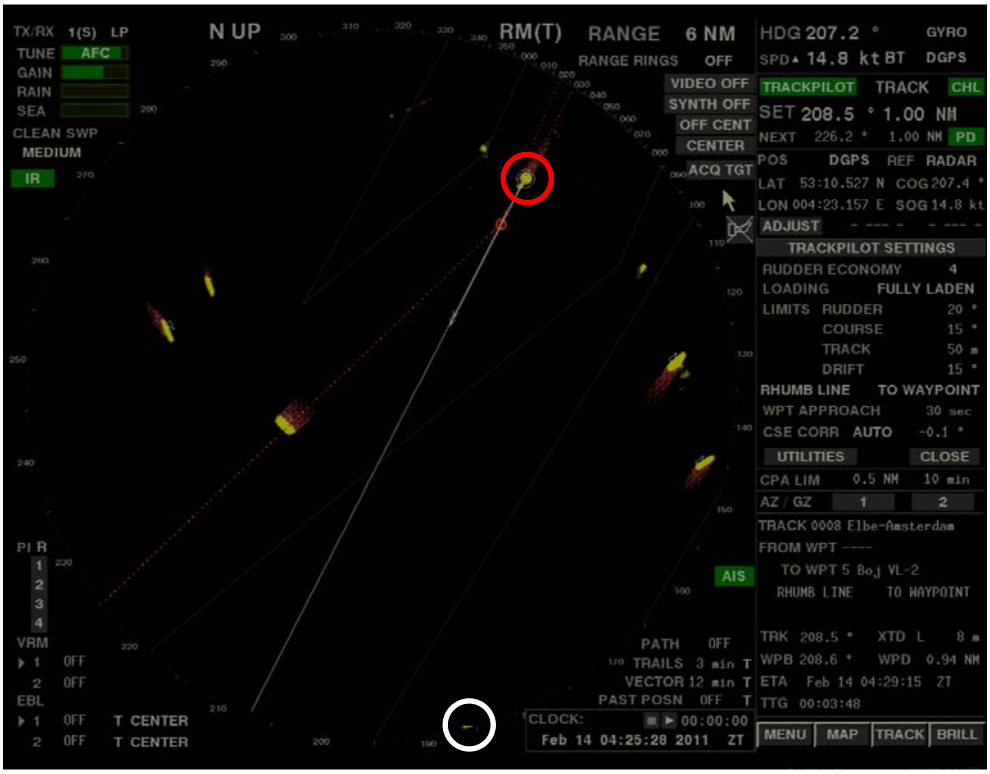

Figure 2. *At 3:25:28. WILLEMPJE HOEKSTRA (white circle) is in sight on the radar screen for the first time. BIRKA TRANSPORTER is marked as a red circle. Time to the collision is circa 35 minutes.*

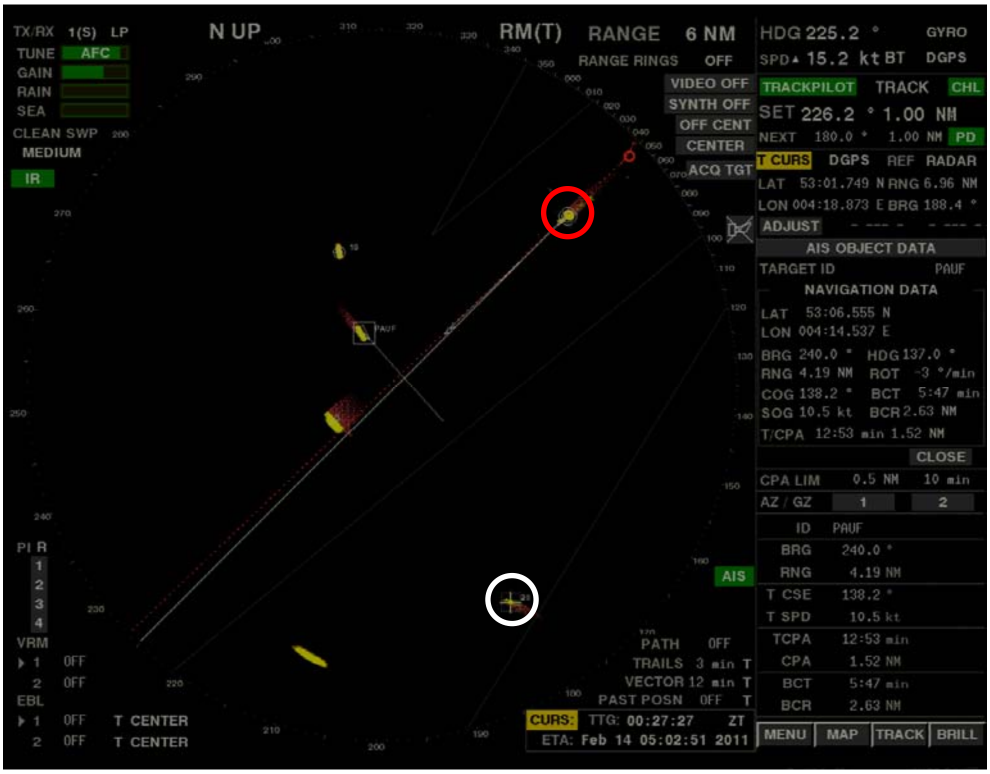

Figure 3 *At 3:35:23. WILLEMPJE HOEKSTRA (white circle) is plotted on BIRKA TRANSPORTER's ARPA radar. BIRKA TRANSPORTER is marked as a red circle. Time to collision is circa 25 minutes.*

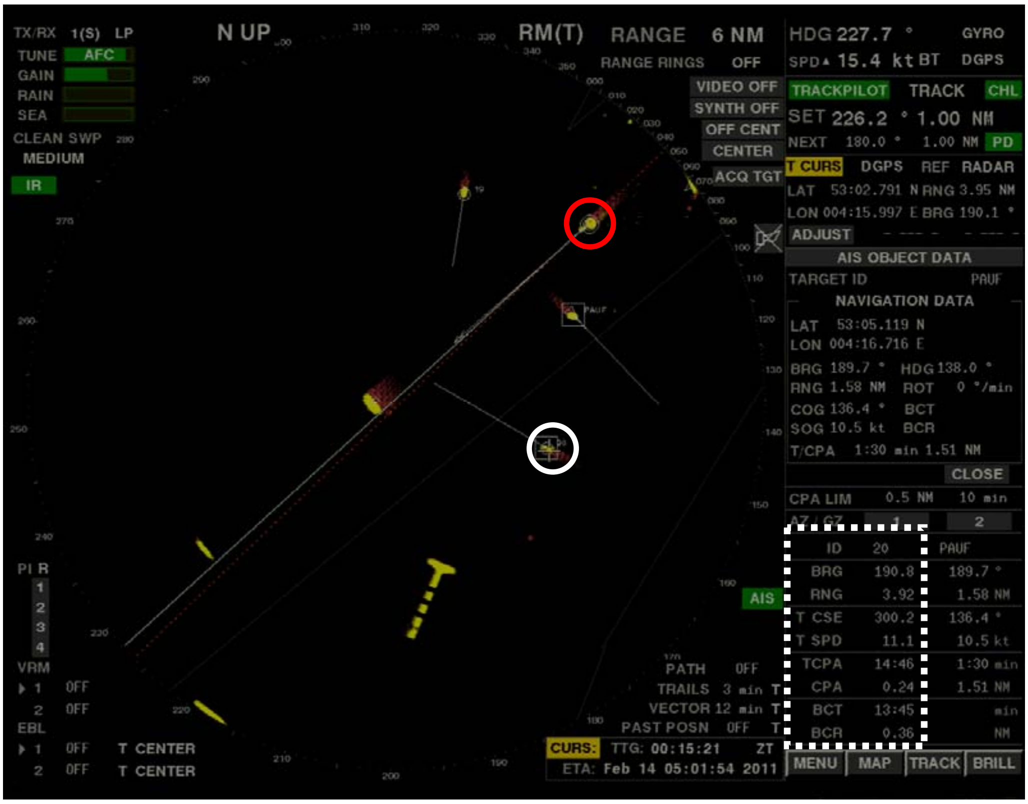

Figure 4. *At 3:46:34. WILLEMPJE HOEKSTRA's (white circle) ARPA data (rectangle in white dash line) is activated on BIRKA TRANSPORTER's (red circle) radar. Time to the collision is circa 14 minutes. CPA is 0.24 miles and TCPA 14.46 minutes.*

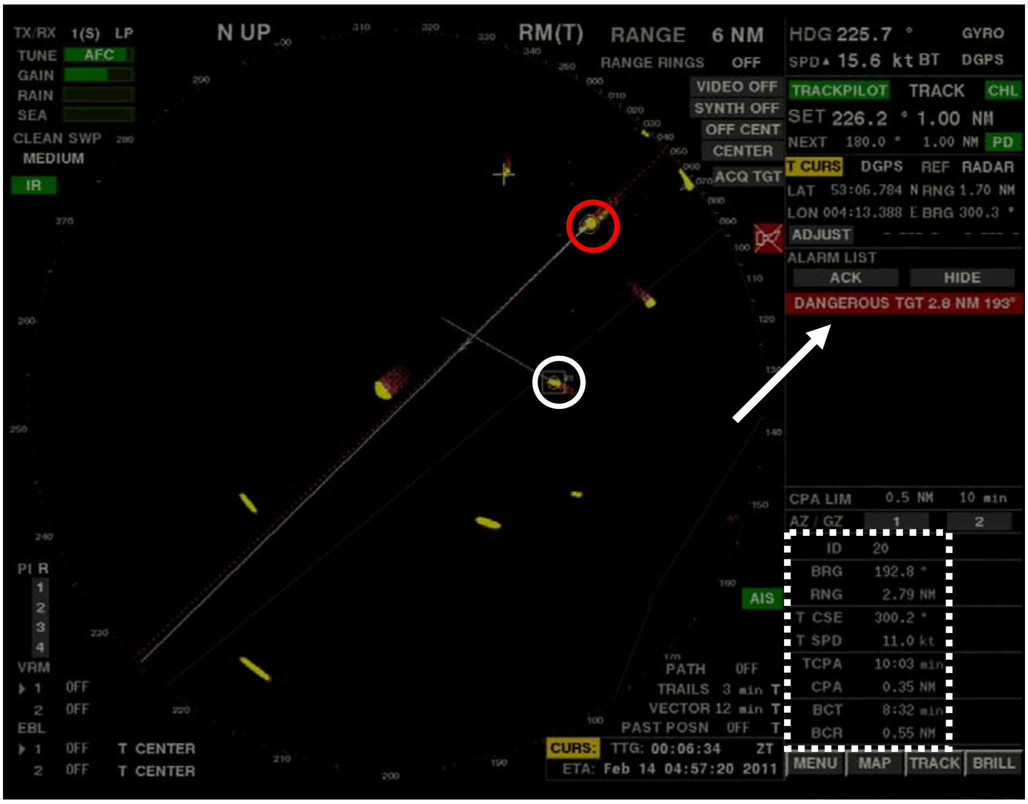

Figure 5. *At 3:50:47. Dangerous target alarm is activated on BIRKA TRANSPORTER's radar (white arrow). Target limits were set at CPA 0.5 NM and TCPA 10 min. CPA 0.35 NM and TCPA 10.03 minutes. Time to the collision is circa 10 minutes. The rectangle shown in white dash lines indicates WILLEMPJE HOEKSTRA's ARPA data.*

Figure 6. *At 3:59:43. BIRKA TRANSPORTER's speed starts to decrease. The white circle represents WILLEMPJE HOEKSTRA, the red circle BIRKA TRANSPORTER, and the rectangle in white dash lines is the ARPA data. Time to the collision is circa 1 minute. CPA 0.06 NM, TCPA 1.03 min.*

Figure 7 *At 4:00:43. The collision occurs according to the S-VDR audio.*

Crash Stop manoeuvre on BIRKA TRANSPORTER

The crash stop manoeuvre on BIRKA TRANSPORTER has been assessed using the S-VDR recording, which contains both the orders for propeller pitch and the actual pitch.

Figure 8 illustrates the pitch order and response of BIRKA TRANSPORTER in the actual accident situation. The reduction of speed was initiated about a minute before the collision. The OOW started the speed reduction by adjusting the pitch lever to zero during 30 seconds. After a few seconds the lever was set to full astern (indicated by a red arrow In the picture)

Figure 8. The pitch log from BIRKA TRANSPORTER. Pitch order is shown in green and pitch response in red. The time is approximately 12 minutes ahead of the S-VDR time.

Figure 9 illustrates BIRKA TRANSPORTER's speed during the crash stop test and during the accident. The heading during the accident crash stop is also shown on the graph. The speed curve in the picture begins with a slope which not as steep as the corresponding one from the crash stop test. This is due to slowly setting the propeller pitch to zero in 30 seconds.

The speed of BIRKA TRANSPORTER reduced from 15.5 knots to 14 before the start of the actual crash stop (setting the lever from zero to full astern). At the time of collision the speed of the vessel was abt. 9.5 knots and her heading had changed from 226 degrees to 203 (the course over ground changed simultaneously from 226 degrees to 224).

BIRKA TRANSPORTER had almost stopped abt. two minutes after the collision when her heading was 135 degrees and speed slightly under two knots.

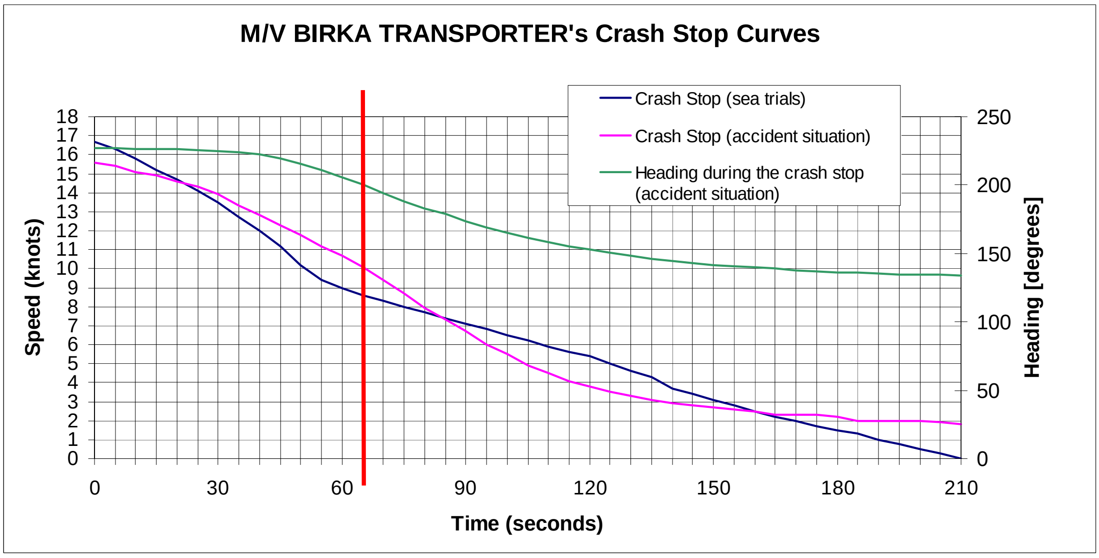

Figure 9. Crash stop manoeuvre of BIRKA TRANSPORTER at sea trials (blue line) and in the accident (red line). The green line illustrates the heading during the accident crash stop and the red vertical line the accident time. Sources: S-VDR data and BIRKA TRANSPORTER's crash stop test poster.

THE TRACKS OF THE VESSELS

Netherlands Coastguard Service's radar plot

The Den Helder VTS centre has a radar system, which monitors and gathers data on Dutch coastal areas. Ship tracks are produced using the AIS and radar data. The accident site is located in the Vlieland TSS (Traffic Separation Scheme), which is not a Vessel Traffic Services (VTS) area; it is under radar observation only.

The accident investigation commission was provided with an incident log including a few radar plots by the Netherlands Coastguard Service. According to the radar plot in Figure 1 BIRKA TRANSPORTER maintained a steady course until 4:00:13, at which time the vessel started to turn to port. Figure 1 shows that WILLEMJE HOEKSTRA also maintained a steady course in the beginning of the situation. For some reason, there is a gap of approximately 15 minutes in the track of the fishing vessel in the radar plot.

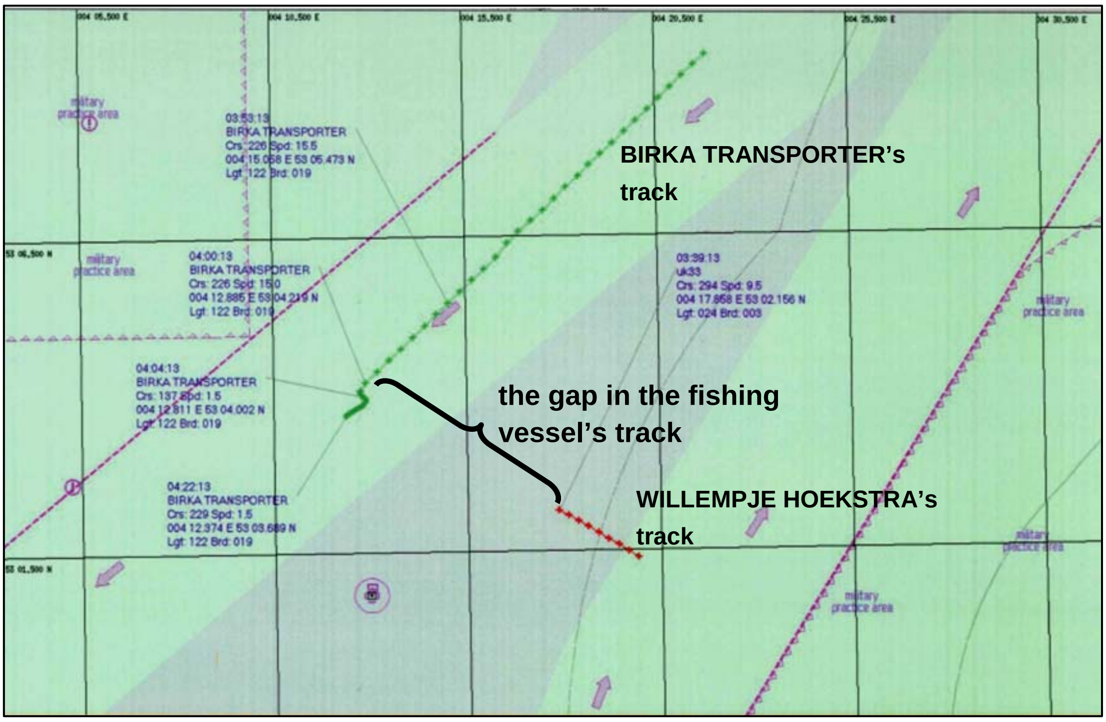

Figure 1. An overall picture of the situation provided by the Netherlands Coastguard Service. The Figure shows the tracks of both sides, BIRKA TRANSPORTER's in green and WILLEMJE HOEKSTRA's in red. There is a gap of approximately 15 minutes in the track of the fishing vessel prior to the collision.
(© Netherlands Coastguard Service)

The combined tracks of the vessels

General

WILLEMJE HOEKSTRA was not required at the time of the accident to be fitted with a VDR or AIS and she carried neither. Hence, there were two recording sources for the vessels' movements; the S-VDR on BIRKA TRANSPORTER and the radar system of the Netherlands Coastguard Service in the city of Den Helder.

There was a gap of approximately 15 minutes in the track of WILLEMPJE HOEKSTRA in the radar recording prior to the collision, and the vessel tracks were thus reconstructed using the S-VDR data, including WILLEMPJE HOEKSTRA's ARPA data[31]. The ARPA data could be seen on the BIRKA TRANSPORTER's radar screen starting approximately 14 minutes prior to the accident when the ARPA data on WILLEMPJE HOEKSTRA was activated on BIRKA TRANSPORTER's radar.

When BIRKA TRANSPORTER's coordinates were known and WILLEMPJE HOEKSTRA's coordinates could be calculated using dead reckoning (range and bearing information), the vessel positions could be drawn.

Based on the S-VDR recording, in reality the fishing vessel slightly altered its course to starboard, and BIRKA TRANSPORTER, because of the crash stop manoeuvre, turned to port prior to the collision. The situation is illustrated in Figures 2 (large scale) and 3 (small scale). In Figure 2, an attempt was made to fill in the gap in the fishing vessel's track between the end of radar recording and the beginning of S-VDR recording by using dead reckoning.

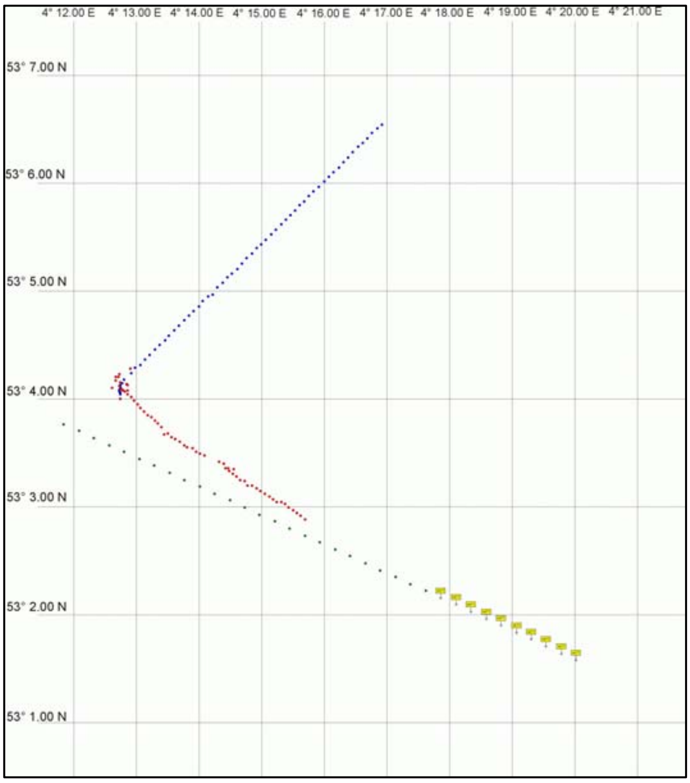

Figure 2. Vessel tracks derived from BIRKA TRANSPORTER's S-VDR. BIRKA TRANSPORTER's track is shown as blue dots (data from the S-VDR recording). WILLEMPJE HOEKSTRA's track is shown as red dots, and it is based on dead reckoning (data from S-VDR's ARPA data). The yellow signs are from the radar system, and dead reckoning calculations are marked as green dots.

[31] ARPA data included WILLEMPJE HOEKSTRA's bearing, range, course and speed as well as the time to closest point approach, closest point approach, bow cross range as well as bow crossing time between these two vessels.

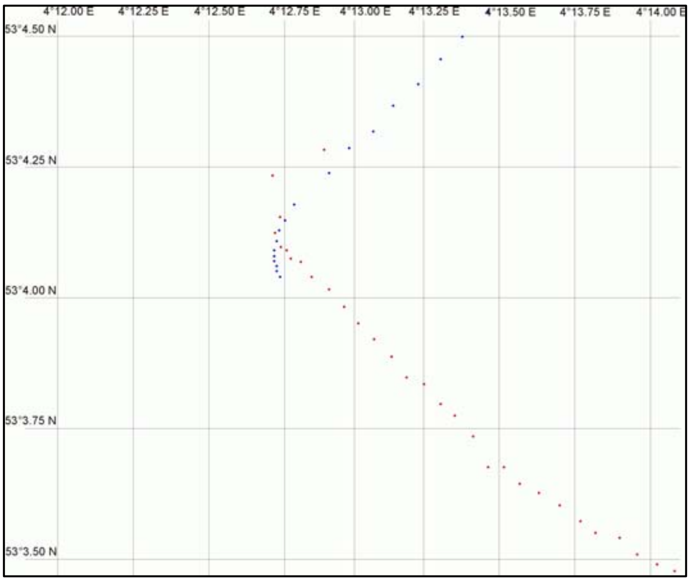

Figure 3. Enlargement of vessel tracks derived from BIRKA TRANSPORTER's S-VDR. BIRKA TRANSPORTER's track is shown as with blue dots and WILLEMPJE HOEKSTRA's track as red dots.

Deductions made from the information

- BIRKA TRANSPORTER did not alter her course until a few seconds prior to the collision. The course began to change discernibly before the impact took place.

- WILLEMPJE HOEKSTRA performed a slight course alteration to starboard prior to the collision. At this point, the distance between the vessels was some 1.4 NM. According to Figure 3, a sharper turn to starboard may have taken place just before the collision. However, at this point the fishing vessel was already so close to the radar antenna that the accuracy of the ARPA information was probably compromised. This can be seen in Figure 3, where the last two spots are presumably misplaced.

- According to the S-VDR-recording, the collision took place in position 53°04.178N, 004°12.797E at 4:00:43 UTC. The exact collision time was concluded based on the S-VDR audio; the collision noise as well as the OOW's reaction. In Figure 3. the collision site has slightly different coordinates. This can also be explained by the closeness of the fishing vessel.

Findings and interpretation

An attempt was made to calculate what the situation could presumably have been like if no course or speed alterations had been made by either of the vessels (Figure 4). The last positions, speeds and courses recorded by the radar system were used as starting values for dead reckoning.

According to Figure 4, it seems that instead of a collision, the situation could have been a near miss if no course and/or speed alterations had been made by the vessels.

Appendix 3/4 (4)

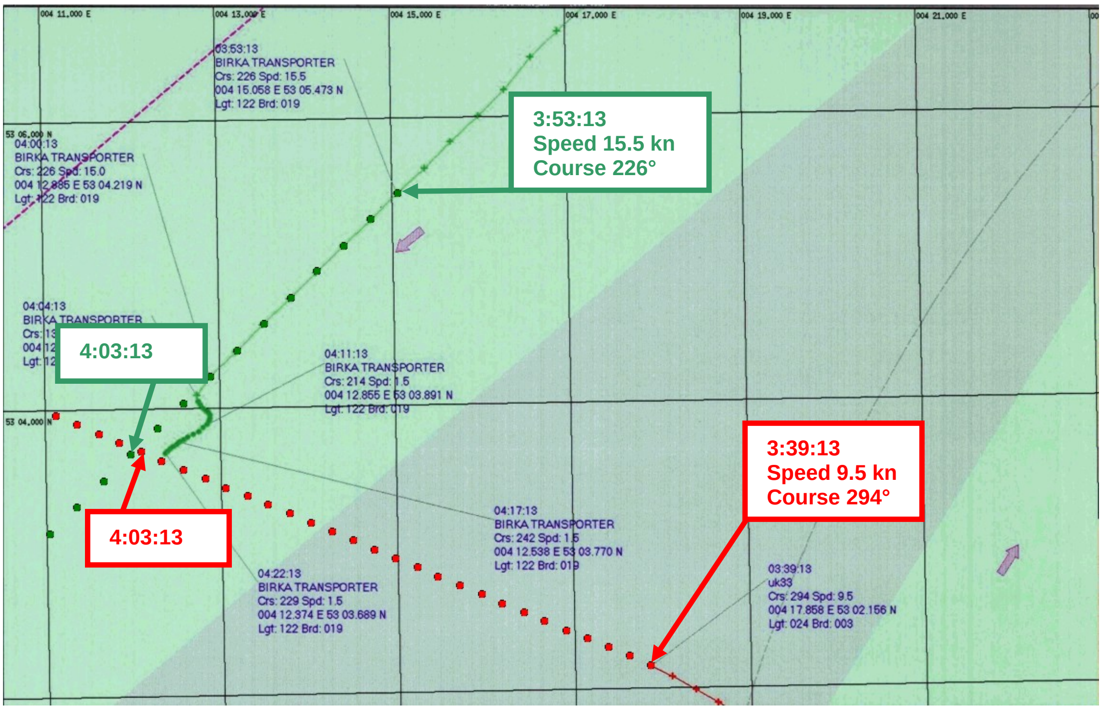

Figure 4. Vessel tracks calculated by means of dead reckoning. The Figure illustrates what the situation could have been like if no course or speed alterations had been made by the vessels. WILLEMPJE HOEKSTRA's track is shown as red dots and BIRKA TRANSPORTER's as green dots. The time interval between each spot is one minute. As starting values for calculations were used the last positions, speeds and courses recorded by the radar system.

CRASH STOP MANOEUVRE

1. General about the crash stop manoeuvre

A crash stop is a manoeuvre where a ship steaming ahead – normally at service speed – is stopped by altering the engine telegram to full astern, thus altering the propeller pitch (on CPP ships) from ahead to astern. The change in the direction of propeller thrust stops the vessel in shortest possible advance. A crash stop manoeuvre strains the vessel's propulsion engines and transmission heavily, and the manoeuvre is thus mostly avoided and only used in critical situations.

Commonly the only time a crash stop manoeuvre is executed during a ship's lifecycle is at the sea trials, where the systems, performance as well as general seaworthiness of a nearly completed vessel are tested with multiple tests.

2. Crash stop test

The crash stop test is started by proceeding straight at cruising speed. The main propellers are set to full reversing power, and the rudder is kept midships. The test ends when the vessel stops fully. The time, speed, position and heading are recorded. The final time to stop, track line, drift (distance travelled perpendicular to the original course) and advance (distance travelled along the original course line) are all calculated. A poster, demonstrating time, advance, turning and drift during the manoeuvre, is placed on the bridge.

According to the IMO, a vessel in a crash stop test should stop within the distance of 15 vessel lengths (X denoting advance in Figure 1). BIRKA TRANSPORTER's advance in the crash stop test was approximately 5.8 vessel lengths.

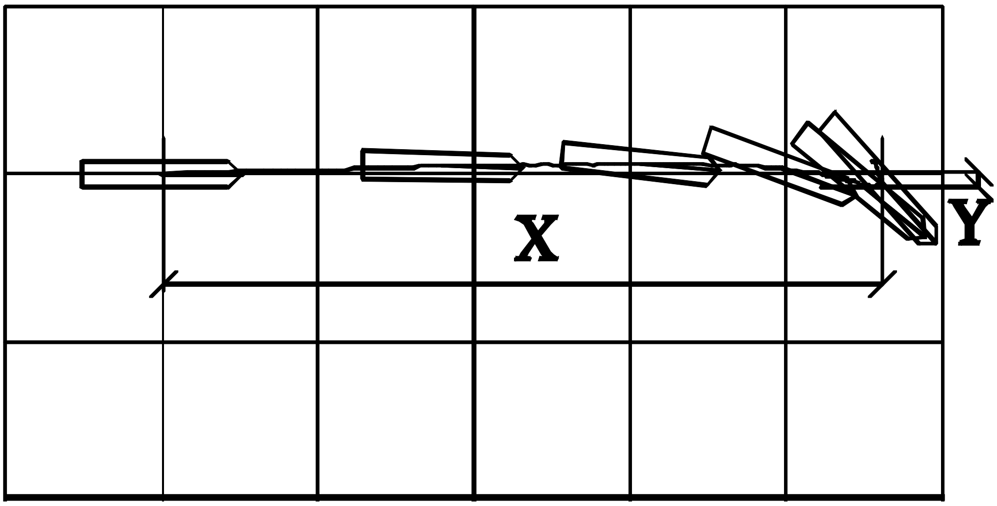

Figure 1. An illustration of a crash stop test. X = advance, Y = lateral.

3. Turn circle test

At sea trials, another common test is a turn circle test where the vessel is first steered straight ahead at the cruising speed. At the beginning of the test, the rudder is deflected 35 degrees to the side, and the vessel is allowed to turn a full circle. According to the IMO requirements, the vessel should not be allowed to proceed more than 4.5 vessel lengths during the first 90 degrees of the turn (Figure 2, X denoting advance).

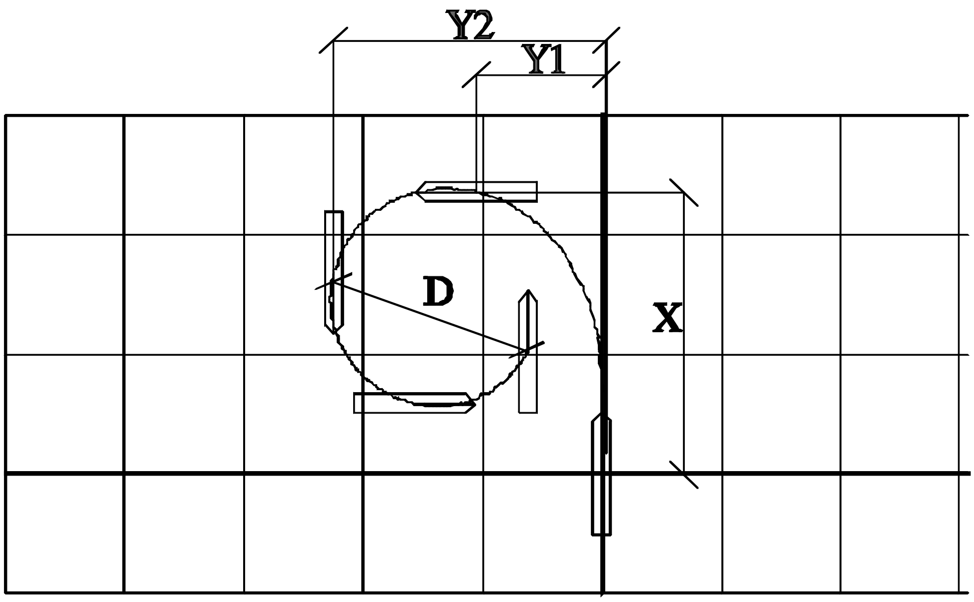

Figure 2. An illustration of a turn circle test. X = advance, Y1 = lateral, Y2 = tactical diameter, D = steady diameter.

4. Hydrodynamics and rudder function during manoeuvres

A rudder is used to control the hull's angle of attack (with relation to water); the hull force turns the vessel. When the rudder of a vessel proceeding straight ahead is turned to port, for example, the rudder – placed now crosswise in the propeller's slip stream – generates side forces, so-called manoeuvring forces. The side force caused by this starts to move the vessel to the opposite direction, i.e. to starboard. As a result, the flow of water meets the hull diagonally from the starboard side, and according to the wing theory, this generates a lateral side force to port. The point of application of the hull force is located close to the bow, causing a port-turning moment on the vessel.

The rudder is mainly placed in the propeller's slip stream. The faster the water flow to the rudder, the better the steering forces of the rudder. Even a minor increase[32] in the flow rate will increase the performance of the rudder. This applies in particular when the vessel is accelerating. At that time, the manoeuvring forces of the rudder are also high. Correspondingly, when the speed of the vessel is reduced, the slip stream around the rudder slows down, and the manoeuvrability of the vessel may decrease significantly.

Normally, when the vessel is stopped and the propeller pushes water forward, the flow field in front of the rudder becomes turbulent, the flow rate gets slower and the manoeuvrability of the rudder may disappear altogether. This is what happens in a crash stop manoeuvre.

[32] The forces generated by the water flow are, according Bernoulli's principle, proportional to the square of the flow rate, which means that

5. Turning direction during a crash stop manoeuvre

As mentioned previously, BIRKA TRANSPORTER has 5 sister ships. The investigators were able to get a crash stop poster from two of these vessels, M/S BIRKA EXPORTER (ex M/S GRANÖ) and M/S BIRKA SHIPPER (ex M/S STYRSÖ). When comparing these posters, it was noted that even though the vessels are similar, they turned to opposite directions during crash stop trials. This is illustrated in Figure 3.

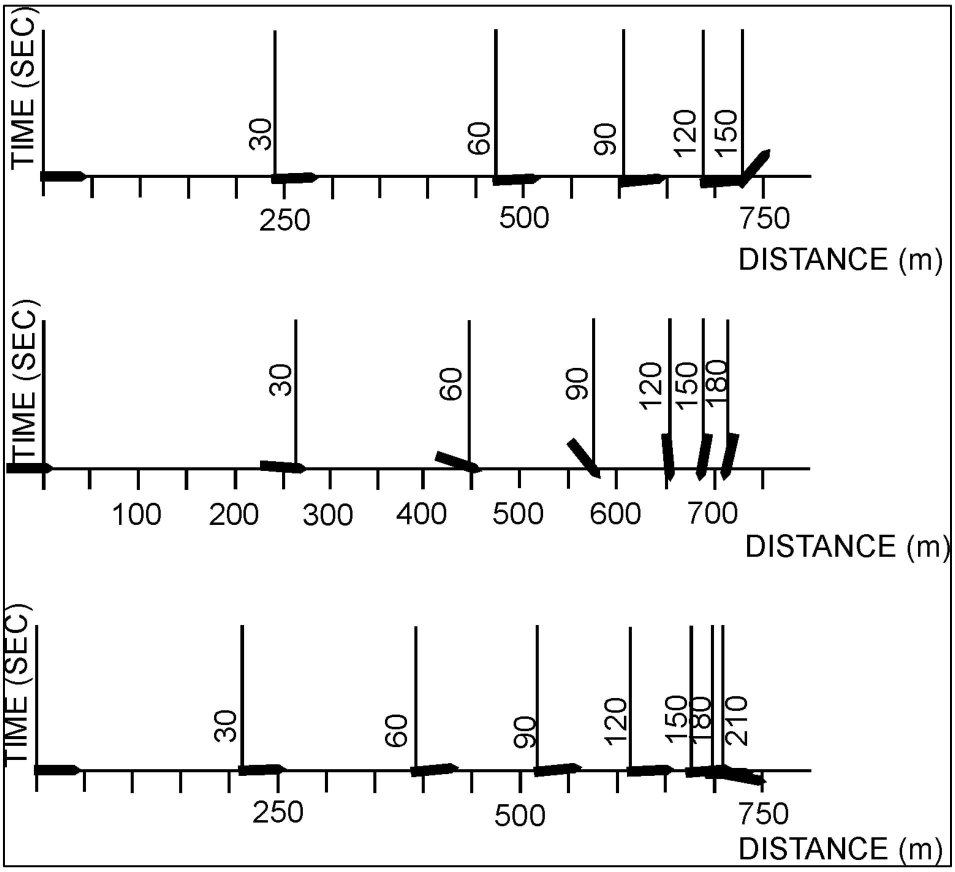

Figure 3. Differences in behaviour between sister ships in crash stop tests.

Above: M/S BIRKA EXPORTER
Middle: M/S BIRKA SHIPPER
Below: M/S BIRKA TRANSPORTER

As Figure 3 above illustrates, the turning direction of a ship in a crash stop may vary between sister ships, even though their hulls, rudders etc. are similar to each other.

As mentioned previously, when reversing at full power, the water flow around the rudder becomes turbulent, and the steering forces may thus disappear. When the rudder is no longer controlling the hull's angle of attack, the prevailing drift of the vessel may be dominant when turning direction is determined; the wind and waves as well as the sea current will also affect to the vessel's turning direction. However, once the manoeuvrability of the rudder is gone, the turning direction is unpredictable if no prior action is taken determining the direction of turn.

THE SAFETY MANAGEMENT SYSTEM OF THE BIRKA TRANSPORTER

Ships working language is Swedish. The Safety management system material is as in Swedish. Following text is translated from Swedish.

Chapter 5. Administration of the ship / Routines of the deck department

Bridge routines / At sea

- *The OOW is responsible of the ships safety during his/her watch*
- *The OOW must be familiar with the bridge equipment*
- *The OOW must always stay on the bridge*
- *The OOW must comply valid regulations and rules, Masters orders and instructions on the bridge.*
- *During darkness and in restricted visibility there must be one watchman/lookout on the bridge*
- *The OOW must not do such issues which might compromise the safety of the ship.*
- *The planned route has to be followed.*
- *At least one radar has to be in operation.*
- *Ships- and radiolog has to be maintained during the watch.*

Masters night orders

The Masters night order book has to be available for the OOWs on the bridge.
The Masters night orders may consist:

- *Standing orders*
- *Orders for the night*
- *Ordering pilot and details related to it.*
- *Circumstances when to inform Master.*
- *Instruction when in the anchorage, preparation for main engine readiness and when vessel is drifting.*
- *Instructions for restricted visibility.*
- *Increasing and decreasing speed.*
- *Other possible special circumstances and/or situations which may occur.*

There were no markings in the Masters night order book for the accident voyage.

Chapter 6 Safety Management System, Instructions and checklist

Ship accident / collision

- *Raise general alarm and order the crew to their stations*
- *Alert MRCC*
- *Consider possibilities to abandon the ship.*
- *Create the connection to other vessels and change all important information.*
- *If possible, offer assistance to the other vessel.*
- *Collect all information related to the incident.*
- *In case of need, update the position and keep it close to the radio equipment or other automatic transmitters.*
- *Evaluate the risk of oil pollution. In case of oil pollution check the SOPEP.*
- *Check ships stability.*
- *Inform the company.*

- *Be continually in contact to the MRCC and company response team.*
- *The Master is operationally responsible for the ship and makes decisions together with the local authorities and the other officers.*
- *Inform about the events, if necessary, the vessels in the vicinity.*
- *In case vessel is sinking transmit emergency message "MAYDAY" and activate EPIRB and SART.*
- *The Master decides about the evacuation and organizes it together with the OSC and the MRCC.*
- *In case of evacuation, a list of the evacuees has to be made and the injured has to be evacuated first.*

In addition, there is text concerning collision in Safety Management System chapter the Company related to the support given to the vessel in case of collision.

COLREGS RULES APPLICABLE IN THIS CASE

The following rules from Part B – Steering and sailing rules in the International regulations for preventing collisions at sea were used in analysing this accident.

Rule 8 - Action to avoid collision

(a) Any action taken to avoid collision shall be taken in accordance with the Rules of this Part and shall, if the circumstances of the case admit, be positive, made in ample time and with due regard to the observance of good seamanship.

(c) If there is sufficient sea room, alteration of course alone may be the most effective action to avoid a close-quarters situation provided that it is made in good time, is substantial and does not result in another close-quarters situation.

(d) Action taken to avoid collision with another vessel shall be such as to result in passing at a safe distance. The effectiveness of the action shall be carefully checked until the other vessel is finally past and clear.

(e) If necessary to avoid collision or allow more time to assess the situation, a vessel shall slacken her speed or take all way off by stopping or reversing her means of propulsion.

Rule 10 - Traffic separation schemes

(c) A vessel shall, so far as practicable, avoid crossing traffic lanes but if obliged to do so shall cross on a heading as nearly as practicable at right angles to the general direction of traffic flow.

(e) A vessel other than a crossing vessel or a vessel joining or leaving a lane shall not normally enter a separation zone or cross a separation line except:

(i) in cases of emergency to avoid immediate danger;

Rule 15 - Crossing situation

When two power-driven vessels are crossing so as to involve risk of collision, the vessel which has the other on her own starboard side shall keep out of the way and shall, if the circumstances of the case admit, avoid crossing ahead of the other vessel.

Rule 16 - Action by give-way vessel

Every vessel, which is directed to keep out of the way of, another vessel shall, so far as possible, take early and substantial action to keep well clear.

Rule 17 - Action by stand-on vessel

(a) (i) Where one of two vessels is to keep out of the way the other shall keep her course and speed.

(ii) The latter vessel may however take action to avoid collision by her manoeuvre alone, as soon as it becomes apparent to her that the vessel required to keep out of the way is not taking appropriate action in compliance with these Rules.

(b) When, from any cause, the vessel required to keep her course and speed finds herself so close that collision cannot be avoided by the action of the give-way vessel alone, she shall take such action as will best aid to avoid collision.

SIMILAR CASES INVESTIGATED PREVIOUSLY

1.1 Narrative

At 5:29 UTC on 8 December 2008, the UK registered, Dutch operated fishing vessel HENDRIK SENIOR and the Finnish Ro-Ro cargo ship BIRKA EXPORTER collided in international waters approximately 17 NM off the Netherlands coast. There were no injuries and no significant pollution. The investigation[33] was a joint investigation by Finland and the UK.

HENDRIK SENIOR was on a voyage from Harlingen in the Netherlands to her regular fishing grounds in the North Sea. She was crossing the south-bound lane of the Vlieland Traffic Separation Scheme, near West Terschelling, on an approximately west- north-westerly course. BIRKA EXPORTER was on a voyage from Finland to Antwerp, heading approximately south-southwest in the south-bound lane. It was dark; the environmental conditions were benign. Each vessel had detected the other, initially by radar and later visually.

HENDRIK SENIOR was the give-way vessel; the watchkeeper saw BIRKA EXPORTER but did not take early and substantial action to keep clear. Instead, HENDRIK SENIOR executed two consecutive starboard turns with a total heading change of 60 degrees towards the incoming vessel. BIRKA EXPORTER was the stand-on vessel, and she did keep her course. However, she subsequently failed to take appropriate avoiding action before the vessels had a head-on collision.

The evasive manoeuvre carried out by HENDRIK SENIOR was commenced too late and with too small a course change in respect to the approach course chosen by the trawler. The nearly head-on collision occurred at 5:29:01 UTC after HENDRIK SENIOR had turned to starboard practically to a course that was opposite to BIRKA EXPORTER's course. Due to the impact forces, HENDRIK SENIOR turned 180 degrees to port and slid alongside of BIRKA EXPORTER with their bows pointing in the same direction.

Both the actual position of the first contacts and the small angle of impact contributed to the relatively limited damage without any large holes below the waterline on the hull of HENDRIK SENIOR. The trawler could thus stay afloat using its own pumps and those of the KNRM lifeboat. However, the ice strengthened bulb of the BIRKA EXPORTER had the potential to cause severe damage to HENDRIK SENIOR. This could have been the result if the impact angle and its position had been only slightly different.

Both vessels suffered extensive damage. HENDRIK SENIOR was later declared a constructive total loss. BIRKA EXPORTER diverted to Amsterdam for repairs.

1.2 Conclusions

HENDRIK SENIOR and BIRKA EXPORTER were within sight of one another, each knew a risk of collision existed and both ships also had a range of modern navigational aids. However, both vessels failed to abide by the COLREGS, and as a result of complacency, two well-equipped and modern ships collided in conditions of good

[33] The entire investigation report *C5/2008M F/V HENDRIK SENIOR and M/S BIRKA EXPORTER, Collision in International Waters 17 NM off the Netherlands, on 8.12.2008* is available on the web page: http://www.onnettomuustutkinta.fi/en/Etusivu/Tutkintaselostukset/Vesiliikenne/Vesiliikenne2008/1274105392526

visibility. Bridge equipment was not used effectively, and no seaman lookout was present in either wheelhouse at the time.

The GOLREGS do not always support decision-making by the OOW, and such terms as ample time, a safe passing distance and a close-quarters situation are not quantified. The authorities are unable to do this because these factors depend on a number of factors, varying from ship to ship. Therefore it would be necessary for the master and the officers onboard to define guidelines regarding ample time, safe passing distance and close-quarters situation for their ship and traffic area.

The lookout routines onboard BIRKA EXPORTER were not complied with, even if they were part of the Ship management system. The ship was manned according to the minimum safe manning certificate. Due to a lack of deckhands, it thus had become customary on the ship to send down the lookout at 6:00 ship time (UTC+2). Because the time onboard was not adjusted to the time zone of the ship's position, the bridge was left without a lookout for several hours before sunrise.

The continuous use of the 6–12 NM range on the radar of BIRKA EXPORTER in congested waters cannot be considered to be correct. Before the collision, there had been several close-quarters situations with other vessels, but the range on the radar had not been changed. The requirement in the standing orders on BIRKA EXPORTER to use the second radar with a smaller range during night time and/or in conditions of reduced visibility might have been the proper procedure.

BIRKA EXPORTER maintained a steady course and speed until a collision became unavoidable, and at that time she was not able to take effective avoiding action in accordance with the COLREGS.

While no evidence was found that the watchkeeper on HENDRIK SENIOR was asleep, he was not alert immediately prior to the collision. HENDRIK SENIOR's watchkeeper demonstrated a complacent attitude to his bridge watchkeeping responsibilities, and he could also have made better use of the available resources. The minimum CPA of 0.2 cables set by the HENDRIK SENIOR's skipper was too small.

An important observation arising from this accident is that if proper safety margins are not maintained, a close-quarters situation can very quickly develop into an extremely serious one with possible catastrophic consequences.

Similar conclusions regarding fishing vessel collisions were also made in previous safety studies conducted by the MAIB. These safety studies have shown that poor lookout contributed to the majority of fishing vessel collisions, passing distances (including CPA) were too small, and procedures and regulations were sometimes intentionally violated. The issue of it being difficult to keep away from all the fishing boats in congested waters has also been raised, and fishing vessels coming very close to cargo ships is a common occurrence. Additionally, fishing vessels often have no AIS transmitters[34].

[34] An improvement to the recognition of fishing vessels on electronic navigation systems is coming with the new *DIRECTIVE 2009/17/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 April 2009 amending Directive 2002/59/EC establishing a Community vessel traffic monitoring and information system* which requires that progressively all fishing vessels over 15 metres long shall be equipped with automatic identification systems (AIS). #

1.3 Safety recommendations issued

The investigators issued recommendations to the owners of both vessels regarding the use of lookout on the bridge and guidance for safe navigational watchkeeping, including the use of navigational equipment and the interpretation of the COLREGS.

2 Other similar accidents and observations

The MAIB database covers 147 collisions between merchant ships (greater than 100 gt) and fishing vessels in the UK waters in the time period 1991–2009. The following short summaries involve similar safety issues to those identified in this investigation:

In January 2005, a fishing vessel collided with a tanker in conditions of good visibility. The fishing vessel was returning to port to land her catch and the skipper had left the wheelhouse unattended. Although the tanker had sighted the fishing vessel on her port bow, she was the stand-on vessel and expected the fishing vessel to take avoiding action. The tanker ultimately took avoiding action but this did not prevent the vessels from colliding. Fortunately, the fishing vessel sustained a glancing blow and relatively minor damage.

In October 2007, a collision occurred between a fishing vessel and a cargo vessel in conditions of good visibility. Neither vessel was keeping a proper lookout. The cargo vessel sighted the fishing vessel at a close range and took belated avoiding action. The fishing vessel suffered severe structural damage and sank with the loss of one life.

In September 2008, a collision occurred between a container vessel and a fishing vessel. Both vessels had detected each other some 10–15 minutes before the collision, but did not establish if there was a risk of collision. The fishing vessel's skipper then left the wheelhouse unattended to assist his crew with the mending of the trawl net, while the container vessel's master became dazzled with the glare of the sunlight. Neither took any avoiding action. The fishing vessel suffered significant damage to her hull and had to be towed to port.

In December 2009, a collision between a bulk carrier and a fishing vessel resulted in one fatality. The bulk carrier had altered her course to avoid collision, but this was rendered ineffective when the fishing vessel, which was not keeping a lookout, changed her course to start shooting her pots. The fishermen were forced to abandon their vessel as she lay semi-submerged on her port side. The fishermen were not wearing any form of buoyancy aid and did not have time to don their lifejackets.

In August 2010[35], a ro-ro passenger ferry collided with a fishing vessel off St Abb's Head. Prior to the collision, the ro-ro vessel's second officer had sighted a group of three crossing fishing vessels on the starboard bow. The fishing vessels were on a converging course, and when they were 1 mile from the ro-ro vessel, a prompt by the lookout made the second officer alter the ro-ro vessel's course to port using the autopilot. Seconds before the collision, the second officer ordered the AB to steer the vessel and alter further to port. The second officer also sounded one short blast on the vessel's whistle. The vessel's heading changed from 121 degrees to 98 degrees before the collision occurred.

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[35] MAIB Report No 4/2011. Available:
http://www.maib.gov.uk/publications/investigation_reports/2011/homeland___scottish_viking.cfm

The fishing vessel's wheelhouse was not manned continuously; the crew member on watch assisted the skipper with a net on the aft deck, and therefore the wheelhouse had to be left unattended for short periods of time before returning to check the navigational situation. The skipper scanned the forward horizon every now and then by looking through portholes on the aft bulkhead of the wheelhouse. The view was not unrestricted.

Shortly after the crew member had once again returned from the wheelhouse back to the aft deck, the skipper heard what he thought was two blasts on a whistle and also a warning of an imminent collision with a large vessel on the VHF radio. The skipper entered the wheelhouse at the last minute, made efforts to alter course and put the engine astern. These manoeuvres did not prevent the collision. The fishing vessel sank before the skipper and the crew member could release the life raft, and they were submerged. Neither man was wearing a lifejacket. As a result of the collision, the fishing vessel sank. The skipper was recovered from the sea but the crew member was lost.

Scottish Viking's watchkeeper failed to determine at an early stage if there was a risk of collision with Homeland, to sufficiently monitor or plot Homeland's track, and once a risk of collision was deemed to exist, to take sufficient action to avoid collision.

Homeland's watchkeeper did not determine at an early stage if there was a risk of collision with Scottish Viking, maintain a proper lookout from the wheelhouse, or detect or recognise a risk of collision with Scottish Viking until it was too late to take effective action.

3. MAIB Analysis of UK Fishing Vessel Safety 1992–2006

The record of fatalities as a result of collisions was almost three times the fatality rate from fires and explosions over the same period, and included a predominance of >24m vessel deaths.

This analysis showed that it is not unusual for serious collisions involving fishing vessels to result in human tragedy, not just damaged vessels.