Investigation report

C4/2006M
C5/2006M

M/S HOBURGEN on 7.10.2006 and M/T ARCTICA on 14.10.2006, ramming of edge mark Tröskeln Östra

Translation of the original Finnish report

SUMMARY

M/S HOBURGEN ON 7 OCTOBER 2006 AND M/T ARCTICA ON 14 OCTOBER 2006, RAMMING OF EDGE MARK TRÖSKELN ÖSTRA

This investigation report involves two separate instances of vessels ramming the very same deep-water route edge mark, southwest of the Åland Islands in the northern Baltic Sea.

The Bahamas-flagged Ro-Ro freighter M/S HOBURGEN, enroute from Rauma, Finland, to Beirut, rammed edge mark *Tröskeln Östra* in the Åland Sea on 7 October 2006 at 21:53. Due to traffic the vessel had changed course towards the port side of the deep-water route. At the last moment the Officer of the Watch (OOW) tried to change course but the port side of the superstructure of the HOBURGEN hit the edge mark. The radar reflector and the lighting equipment of the edge mark were destroyed and its helicopter platform (helideck) fell to the sea. What was left of the edge mark above the surface were three metres of the steel frame. The vessel sustained small holes, dents and abrasions above the waterline. However, there were no leaks.

A week later, on 14 October 2006 at 05:40, the Netherlands Antilles-flagged product tanker M/T ARCTICA, sailing with water ballast from Zelzate to Rauma rammed the stump of Tröskeln Östra, which the HOBURGEN had damaged the week before. This happened because the mate was concentrating on monitoring and analysing other traffic. The frame tube of the edge mark was further bent and the vessel sustained a tear on the starboard side of her bow above the waterline. The ARCTICA radioed that she did not require any assistance.

Neither instance involved any malfunctions or shortcomings in the vessels' equipment. As regards the HOBURGEN ramming, it is evident that there were shortcomings in the lighting and functioning of Tröskeln Östra, which made it extremely difficult for the ARCTICA to spot the stump of the frame.

Vessel Traffic Service (VTS) records of the accidents show that virtually all vessels sailing in this zone either fail to make a voyage plan in accordance with the traffic in the deep-water route or ignore the voyage plan if it is made. This results in unpredictability in navigation practices, creating traffic safety risks. Vessel traffic in its present form in the zone highlights the importance of an attentive look-out on the bridge.

The investigators believe that imprudent and unpredictable navigation practices, caused by unorganized traffic, as well as the absence of a look-out from the navigational team on the bridge contributed to the accidents of the HOBURGEN and the ARCTICA.

During the investigation VTS records showed that in the Automatic Identification System (AIS) message of one vessel the heading information was approximately 60 degrees in error. Two different displays possible for this erroneous data facilitated two completely dissimilar (different) information contents for the vessel motion (at s single point of time) in the two recordings available for the investigators.

The investigation commission recommends that, as soon as possible, improvements in traffic arrangements in the sea area should be carried out according to the the Åland Sea traffic separation scheme, proposed to the International Maritime Organization (IMO) and also the establishment of traffic monitoring there.

Users must be made aware of the possible misleading display modes of AIS information in electronic chart displays concerning target heading and speed. The investigation commission recommends that the Finnish Maritime Administration warn Finnish shipping, and inform the IMO, of the dangerous display modes in AIS messages.

When it comes to close proximity multi-vessel traffic situations in relatively narrow fairways, manoeuvring and any possible action taken to avoid collision in high-risk conditions shall be made with due regard to the observance of good seamanship and under the International Regulations for Preventing Collisions at Sea (Rules of the Road). In such conditions the look-out should never be excused from his duties.

ABBREVIATIONS

AIS	Automatic Identification System
COG	Course Over Ground
CPA	Closest Point of Approach
DNV	Det Norske Veritas, an independent foundation with the objective of safeguarding life, property, and the environment
DW Route	Deep-water Route
ECDIS	Electronic Chart Display and Information System
HDG	Heading
IMO	International Maritime Organization
kt	knot(s)
LR	Lloyd's Register of Shipping
LT	Local Time
M/S	Motor/Ship
M/T	Motor/Tanker
NMEA	National Marine Electronics Association specification
nm	Nautical mile
OOW	Officer of the Watch
RO-RO	Roll On - Roll Off
UTC	Coordinated Universal Time

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INTRODUCTION

Sailing from Rauma to Beirut the M/S HOBURGEN rammed edge mark Tröskeln Östra in the northern Baltic Sea on 7 October 2006 at 21:53 Finnish time. Turku Radio heard of this when Stockholm Radio called them to ask whether Turku Radio would be issuing a navigational warning about the incident. Accident Investigation Board of Finland (AIBF) was informed of the event on Monday, 9 Oct 2006, whereupon the investigation began. By then the Swedish Maritime Administration *Sjöfartsverket* had already recorded material relevant to the investigation.

On 14 October at 08:40 the Finnish Maritime Rescue Coordination Centre (MRCC Finland) informed the AIBF duty officer that the M/T ARCTICA had rammed the already damaged edge mark Tröskeln Östra. According to radar recordings the collision occurred at 05:40 Finnish time. The ARCTICA was enroute to Rauma for chemical cargo but did not continue the voyage after the collision.

Accident Investigation Board of Finland decided to handle both events as a single investigation, naming Master Mariner Toimi **Sivuranta** as Investigator-in-Charge and Major (ret'd) Pertti **Siivonen** as member of the commission. Chief Marine Accident Investigator of AIBF Martti **Heikkilä** has been specialist in the investigation. MSc Jaakko **Lehtosalo** assisted the investigation commission in analysing the electronic chart recordings of the M/S HOBURGEN. R&J Language Service translated the investigation report into English.

The investigation tried to find common grounds that explained the technical and human factors which led to both rammings.

Statements on the investigation report. Pursuant to Section 24 of the Decree on Accident Investigations (79/1996) the final draft report was promulgated to the maritime authorities as well as the masters of both vessels and shipping companies for statement and possible comments. This report was amended according to the attached statements.

Figure 1. M/S HOBURGEN *(© Elisa Pihkala)*

Figure 2. M/T ARCTICA

1 OVERVIEW OF THE ACCIDENT AND THE INVESTIGATION

1.1 The vessels

1.1.1 General information

Name of vessel	M/S HOBURGEN	M/T ARCTICA
Type	Ro-Ro freighter	Product tanker
Flag	The Bahamas	The Netherlands Antilles
Owner	Gotland Steamship Ab	Bonam Shipping Ltd
IMO number	8009088	6920147
Call sign	C6RK5	PJLI
Year built	1986	1969
Gross/Net tonnage	9080/2724	2653/1258
Total length	121.48 m	100.80 m
Breadth	21.00 m	12.58 m
Draught	5.30 m	6.65 m
Speed	15 knots	12.8 knots
Propulsion power	2 x 2612 kW	3179 kW
Passenger capacity	12	-
Cargo capacity	1225 trailer metres and 175 car metres	
Class	LR 100 A1 Ro-Ro Cargo Ship LMC UMS	DNV IACS

1.1.2 Manning

According to information received from the Swedish maritime authorities both the HOBURGEN and the ARCTICA were manned in accordance with requirements.

M/S HOBURGEN

On the accident voyage the HOBURGEN was manned as presented in the table below. The information is based on the vessel's crew roster. In addition, there were two Finnish and two Swedish peacekeepers onboard tasked to oversee and look after the peace-keeping materiel which was being shipped.

Duty on the ship	**Manning at the time of the incident**
Master	1
Mates	3
Chief engineers	3
Deck hands	5
Engine crew	3
Other crew	2
TOTAL	17

M/T ARCTICA

The investigators did not have access to the ARCTICA's crew roster at the time of the incident. The table below is based on the ARCTICA's maritime accident report.

Duty on the ship	Number as per Minimum Safe Manning Document	Manning at the time of the incident
Master	1	1
Mates	2	3
Chief engineers	2	3
Deck hands	2	3
Engine crew	1	2
Other crew	0	1
TOTAL	8	13

1.1.3 Bridge equipment

M/S HOBURGEN

The navigation equipment on the HOBURGEN included:

1. JRC, S-band radar
2. Decca bridge master, X-band radar, serial number 65626/CAK/A
3. Autopilot SEM 200
4. ADVETO electronic chart
5. Baltic Sea navigation chart BA 2337

Figure 3. The HOBURGEN, general view of the bridge.

The station of the Officer of the Watch (OOW) was at the two radar displays, port of midship. From this position he had a clear view ahead, unobstructed by the foremast. The autopilot was positioned, easily reachable, starboard of the radar displays.

M/T ARCTICA

The bridge of the ARCTICA was an example of the ship's era, the 1960s. The navigation room which included the chart table was at the back of the bridge, separated by a door. There was no direct view to the bridge nor the outside from this space. Nautical charts and a GPS device were in the navigation room.

Equipment required in manoeuvring and handling the vessel was positioned in separate consoles at the front of the bridge. All three radar displays, two of which in working order at the time, were at the consoles.

The navigation and positioning equipment of the ARCTICA was as follows:

1. Radar: Racal-Decca Bridgemaster 65620 CAH
2. Radar: Racal-Decca Bridgemaster 65514 CDH
3. Autopilot: Decca Pilot 450
4. GPS receivers: Racal-Decca MK 90 and Furuno (both in the navigation room)
5. AIS-receiver: FURUNO Universal AIS FA-100
6. Nautical chart in the navigation room: Paper chart BA 2337 (1:120 000)

Figure 4. General view of the bridge of the ARCTICA. The navigation room was a separate space behind the wheelhouse

1.1.4 Cargo

The HOBURGEN carried 150 containers and 850 lane metres of materiel on wheels. The cargo was the property of the Finnish peacekeeping contingent in Lebanon. Two Finnish and two Swedish peacekeepers escorted this materiel. The cargo was not damaged in the collision.

At the time of the incident the **ARCTICA** was carrying water ballast.

1.2 The accidents

1.2.1 Location

Both vessels rammed the same edge mark located at the southern part of the *Märket* passage, Tröskeln Östra, whose WGS-84 coordinates are 59°39.57' N and 019°55.19' E. The location of Tröskeln Östra is shown in figures 6a and 6b. The edge mark had also been rammed in 1986 and 1990, and was broken off both times.

Tröskeln Östra was a steel-frame edge mark, fixed to the seabed. The height of the mark from the surface was 20 m, as was its identification light. There was a helideck on top of the mark (fig. 5). The helideck had solar panels for charging the batteries of the lights.

Figure 5. Edge mark Tröskeln Östra. (Source: Finnish Maritime Administration)

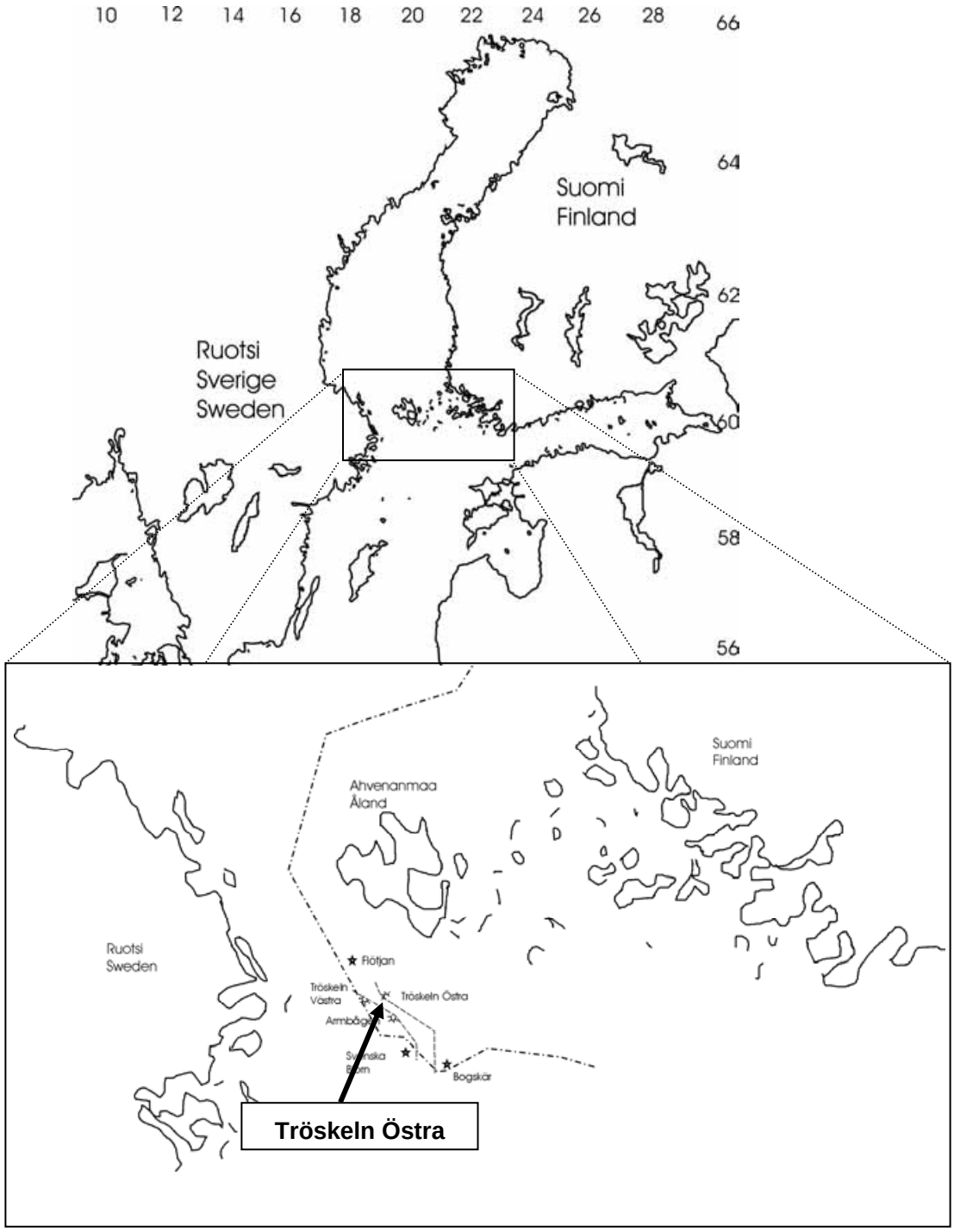

Figure 6a. Location of Tröskeln Östra.

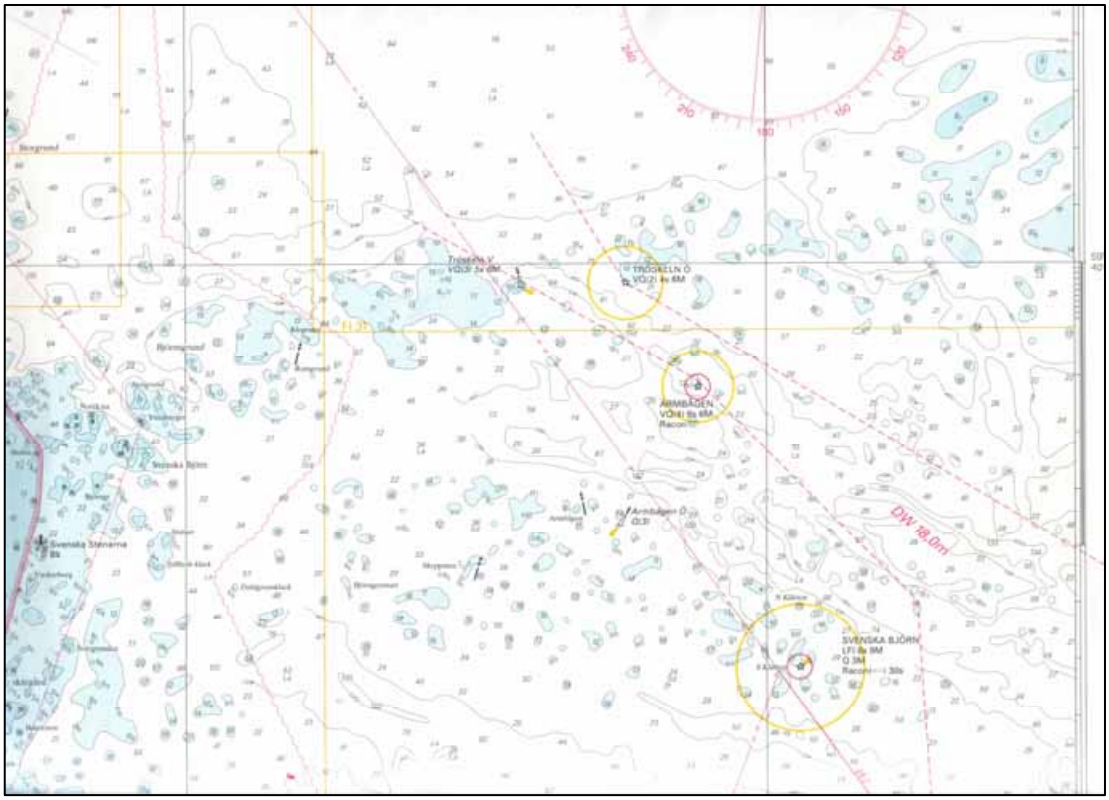

Figure 6b. The 18 m deep-water route to the Gulf of Bothnia (DW 18.0m).

Edge marks and outer limit lines delineating the 18 m deep-water route to the Gulf of Bothnia were marked to navigation charts in 1986.[1] The deep-water route was required to ensure coal shipping by deep draught vessels from Poland to *Tahkoluoto*, Pori. The deep-water route is not compulsory, especially, for vessels whose draught is clearly less than 18 metres. There are a couple of 10–12 metre shoals on both sides of the deep-water route, close to the edge lines.

1.2.2 The accident voyages

M/S HOBURGEN

Meteorological conditions. According to observations made on the HOBURGEN on 7.10.2006 the weather in the area was good. Visibility was good, wind was southwesterly at 14-15 m/s and the moonlit sky was clear.

The accident voyage. The HOBURGEN departed Rauma for Beirut on 7.10.2006 at 09:00. The third mate began his watch the same evening at 21:00 Finnish time. The master considered the mate to be conscientious and meticulous. The mate had slept well and felt rested as his watch began. Visibility was good in the moonlight. The mate was at the two radar displays port of midship from where he had a clear view forward. Even the foremast did not obstruct his view.

[1] AIB investigation report *B5/2000M, MV JANRA, Capsizing in Northern Baltic 23.12.2000.*

The HOBURGEN was equipped with S-band and X-band radars. The S-band (10 cm wavelength) radar display range was selected to 12 nautical miles and the X-band (3 cm) radar to 6 nautical miles. An electronic chart (ECDIS) was also available, indicating the GPS position of the vessel. Steering was under automatic pilot until the time of the collision. The material made available to the investigators does not indicate how and in what format the HOBURGEN's voyage plan was made. Data recorded in and downloaded from the electronic chart program indicates that it registered AIS messages (time, position, heading and vessel information).

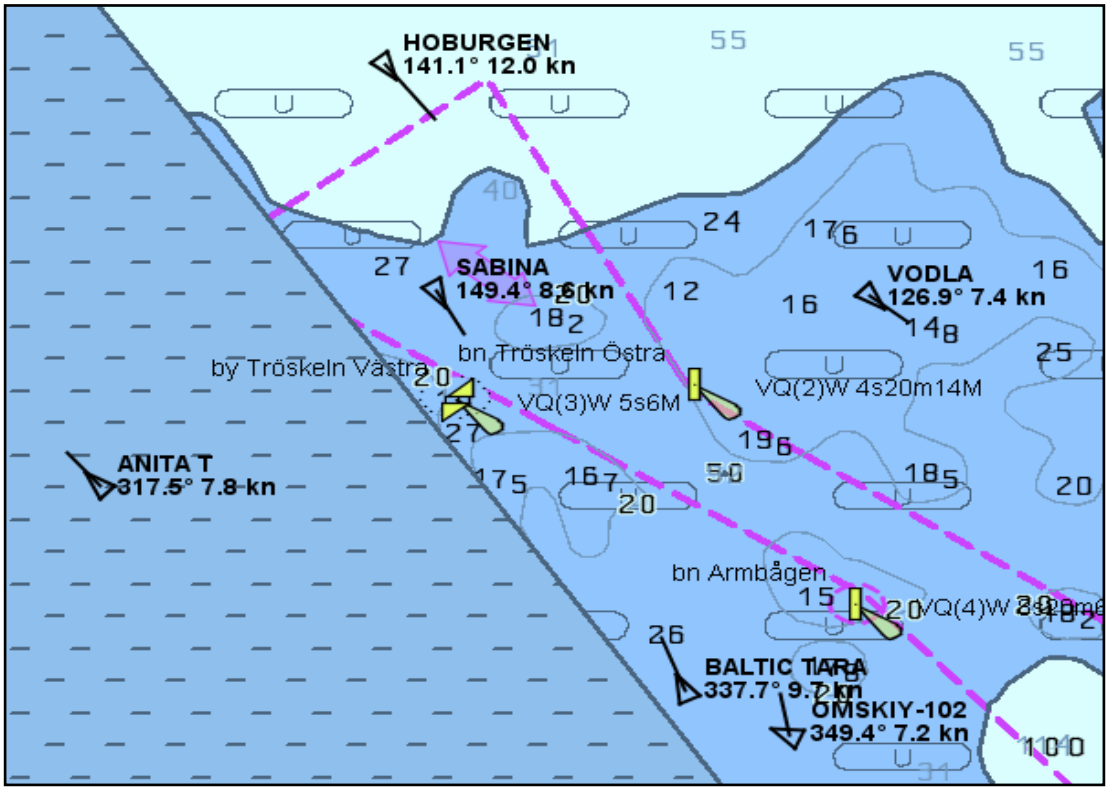

Figure 7. Traffic situation according to AIS messages as the HOBURGEN approached the deep-water route zone. (Source: Finnish Maritime Administration, VTS recordings, Archipelago VTS)

The HOBURGEN approached the narrowing deep-water route delineated by edge marks on a southeasterly course on the port side of the route. Two vessels, heading north, were coming towards it. Their tracks came very close to that of the HOBURGEN. At 21:45:12 Finnish time the third mate altered course 10 degrees to port from course 142 degrees to course 132 degrees. This happened 7 minutes and 40 seconds before the collision. At 21:50 the look-out (deck cadet) asked for permission to leave the bridge for a moment. The third mate excused the cadet, ordering him to make a safety round while he was outside.

The mate remained alone on the bridge, concentrating on visually monitoring the traffic in the area. As per his account the RACON (radar beacon) of the lighthouse *Armbågen* was clearly visible on the radar screen. He also remembers having seen the light of the

buoy Tröskeln Västra. He has no recollection of having seen Tröskeln Östra; as far has he is concerned it was unlit. He had a clear view ahead, unobstructed by cargo or the foremast.

The third mate saw the lantern lights of the oncoming ship. According to his understanding it changed course to port, resulting in its red light disappearing from view.

Suddenly, a couple of minutes after the look-out had vacated the bridge, the third mate noticed the partial silhouette of Tröskeln Östra above the foremast. The steering control was starboard of the radar displays, readily accessible to the mate. The HOBURGEN was making 11.8 knots and the mate immediately changed course to starboard.

The bow passed the edge mark on the starboard side as it was turning. Right after this the third mate tried to turn to port, lest the stern hit the edge mark. It took approximately 20 seconds for the HOBURGEN to pass the edge mark. Nevertheless, it hit the port wing of the bridge at 21:53:12 and, soon after, the stern on the port side.

The third mate admitted that he was startled when the edge mark suddenly appeared in front of the bow. He insisted that the edge mark was unlit at the time of the incident. He also stated that the edge mark was high enough and in such a direction that, had it been lit, he should have spotted it. At the time of the incident the third mate was concentrating on visually tracking the two oncoming vessels as well as on the lighthouse Armbågen.

The third mate remembered that the moon was shining slightly from the port.

The deck cadet, who was the look-out, remembers having seen a RACON radar target and the radar echoes of two vessels prior to vacating the bridge. He had also visually seen the navigation lights of the oncoming ships as well as the light of a sea mark. In addition to being the look-out, as an apprentice he was also participating in watchkeeping by monitoring the radar and reporting his observations to the OOW (third mate). Approximately two minutes after he left the bridge he heard the crash and returned to the bridge.

Action after the incident. After the collision took place the master sprinted to the bridge and asked the third mate what had happened. When he replied that he believed the HOBURGEN had hit a beacon the master reduced speed and the chief mate, who had now arrived on the bridge, switched over to manual steering.

The master went to the port wing of the bridge where he was met by heavy smoke released by a life buoy's smoke signal, which had come loose in the collision.

On 7.10.2006 at 22:14 (UTC+2h) the master notified the Swedish MRCC that the HOBURGEN had rammed edge mark Tröskeln Östra and sustained cosmetic damage only. No leaks were detected.

He also reported that the HOBURGEN would continue to the port of Oskarshamn for inspection and any other required action. He also asked the MRCC to issue a navigational warning regarding the collision.

At the behest of the Swedish MRCC, Turku Radio issued the navigational warning requested by the master of the HOBURGEN.

Damage to the vessel. The first damage detected was the life buoy's smoke signal, which had activated on the port wing of the bridge as a result of the collision. The port wing of the bridge was also damaged in the collision. The next damage was found approximately 10-15 metres aft from the first point of impact, where the railing of the rescue station was damaged. The vessel hit the edge mark the hardest at approximately 5-6 metres fore of stern (fig. 8). There, the vessel sustained dents and three holes in the side of the hull at different heights above the waterline. The hole closest to the waterline was an approximately 1.5 m long slash below the fender list, approximately one metre above the waterline. It was stopped up with rags and wooden wedges from the inside of the hull right after the collision.

Figure 8. The HOBURGEN in the port of Oskarshamn after the collision. The person in the photo is not one of the ship's crew.

M/T ARCTICA

Meteorological conditions. According to the ARCTICA's accident report the weather in the area was as follows: Visibility over 10 nm, northerly wind at 3 m/s, wave height approximately 0.5 m and air temperature +11° C.

The accident voyage. On 10.10.2006 the ARCTICA departed Zelzate, Belgium, for Rauma, Finland. She was carrying water ballast. The passage had proceeded to the Åland Sea where the conditions in the small hours 14.10.2006, as per the accident report entries, were good (good visibility, weak northerly wind and low wave height).

The ARCTICA had no electronic chart. Instead, she used the Admiralty's paper chart No. 2337 (Ålands Hav) with the scale of 1:120 000. Tracks were drawn by pen on the chart. The chart also had permanent markings for the Closest Points of Approach (CPA) and courses (fig. 9). The ARCTICA was not following the track marked on the chart.

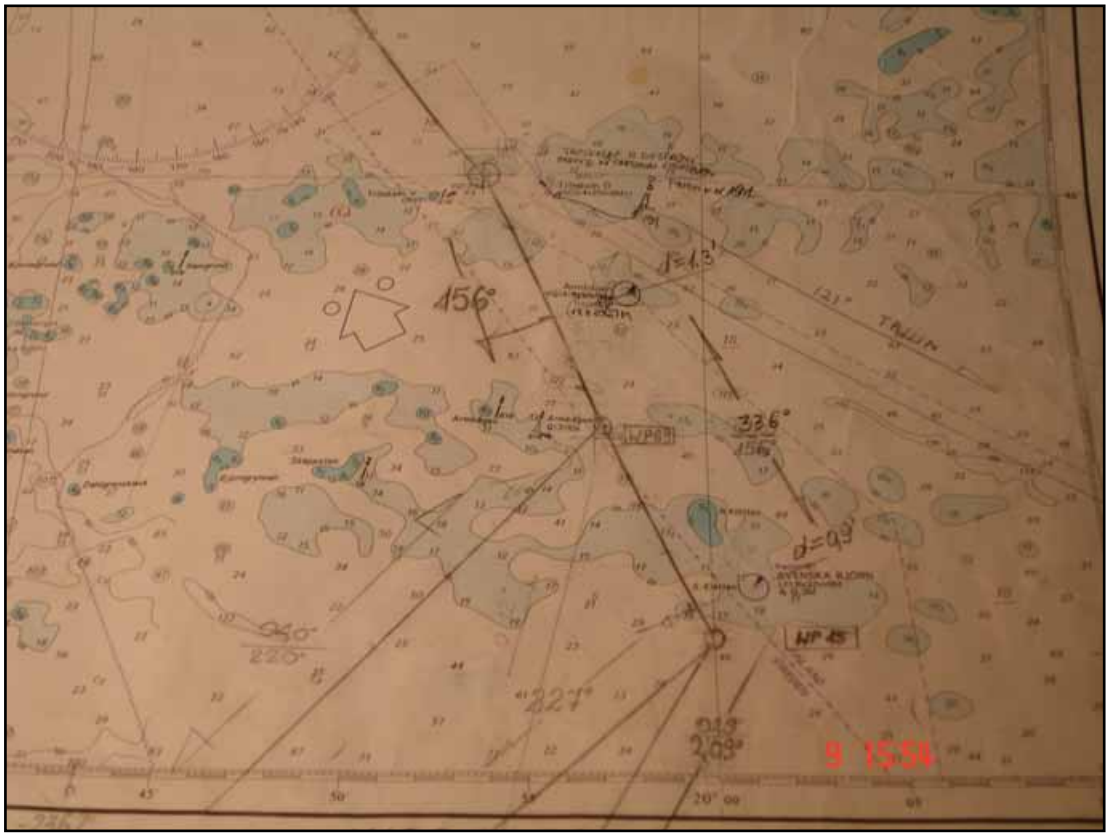

Figure 9. A photo of the ARCTICA's navigation chart which was used at the time of the incident. The chart displays tracks, courses and the most important CPAs.

At the time of the incident onboard the ARCTICA both of her radars were on use for navigation and positioning. The autopilot, the GPS receiver and the AIS receiver were also on.

The chief mate was carrying out watchkeeping alone on the bridge. He entered his last positioning record on 14.10.2006 at 05:00 Finnish time by measuring the true bearing and distance from the lighthouse *Svenska Björn*. At that time the true bearing to the lighthouse was 090° and the distance was 1.3 nm.

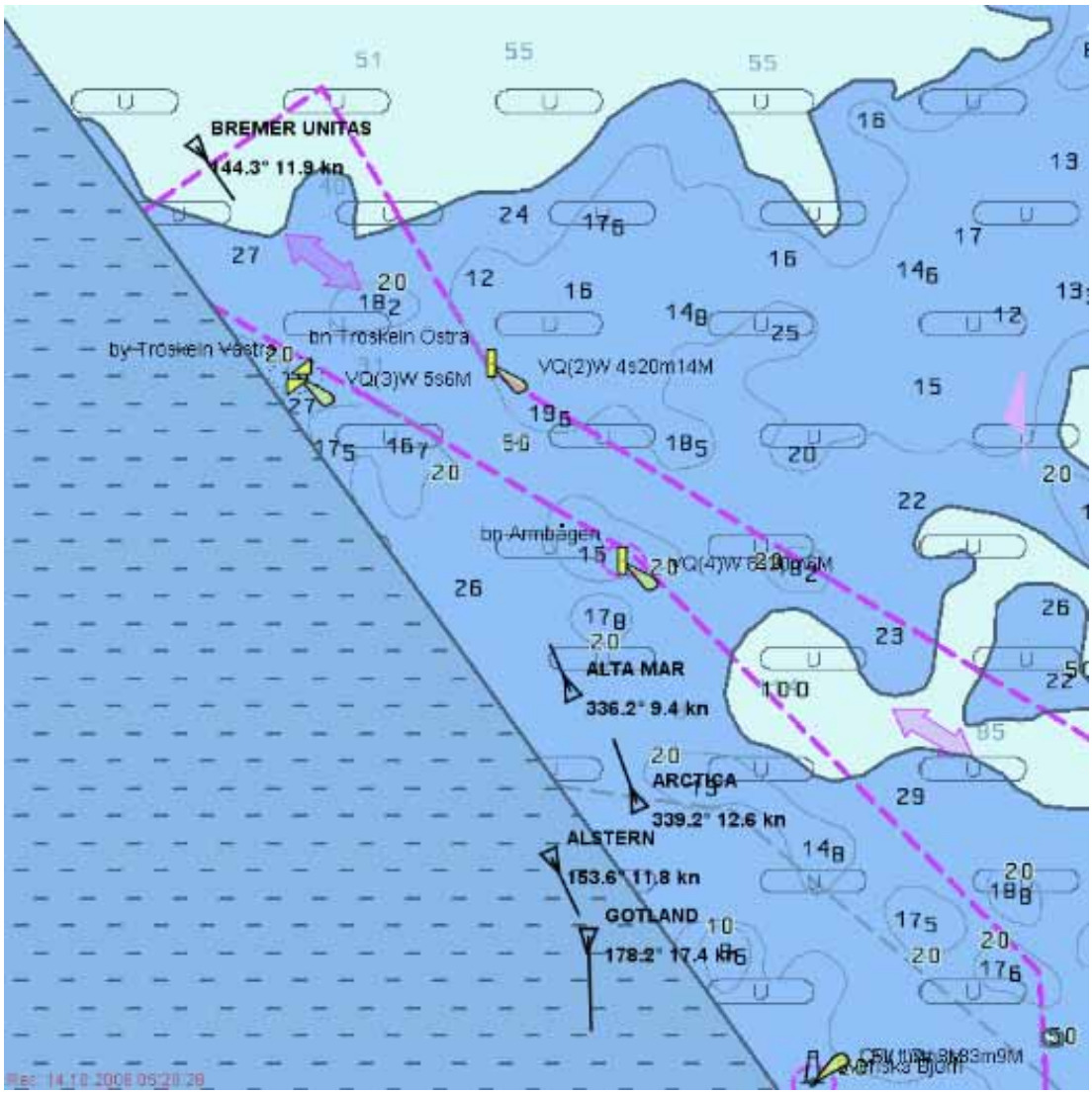

Figure 10a. Traffic situation at 05:20:20 as the ARCTICA changed course from 337 degrees to 342 degrees. (Source: Finnish Maritime Administration, VTS records, Archipelago VTS)

After this, according to Archipelago VTS AIS records, the situation developed as follows:

After having passed the Svenska Björn the ARCTICA met two oncoming ships (the ALSTERN and the GOTLAND) and then began to overtake the slower moving ALTA MAR from the starboard side. In addition, slightly farther ahead the BREMER UNITAS was heading towards them. Just after having passed the Svenska Björn the true heading of the ARCTICA was 337°. At 05:20:20 (fig. 10a), approximately 2 nm south of the sea mark Armbågen, the ARCTICA began turning gradually to starboard. By doing so

she evidently wanted to allow more manoeuvring room for the ALTA MAR, approximately 1.5 nm ahead and slightly to the port of her.

After the course change the new true heading was 342°. The ARCTICA was now heading directly towards edge mark Tröskeln Östra. At 05:25 the distance to it was approximately 3.2 nm.

The ARCTICA´s heading varied between 341°-342° until approximately 30 seconds before impact when she seems to have turned 2-3 degrees to port while maintaining her speed. At 05:40:31 AIS-recorded time, her bow hit the remaining stump of Tröskeln Östra. This caused a rapid turn to the port, towards 325 degrees, and her speed momentarily decreased from approximately 13 kt to 11.5 kt.

Soon the vessel regained its previous heading and its speed began to increase. She continued under her own power and approximately 3.5 hours after the collision she turned to Falkenberg in southern Sweden for repairs.

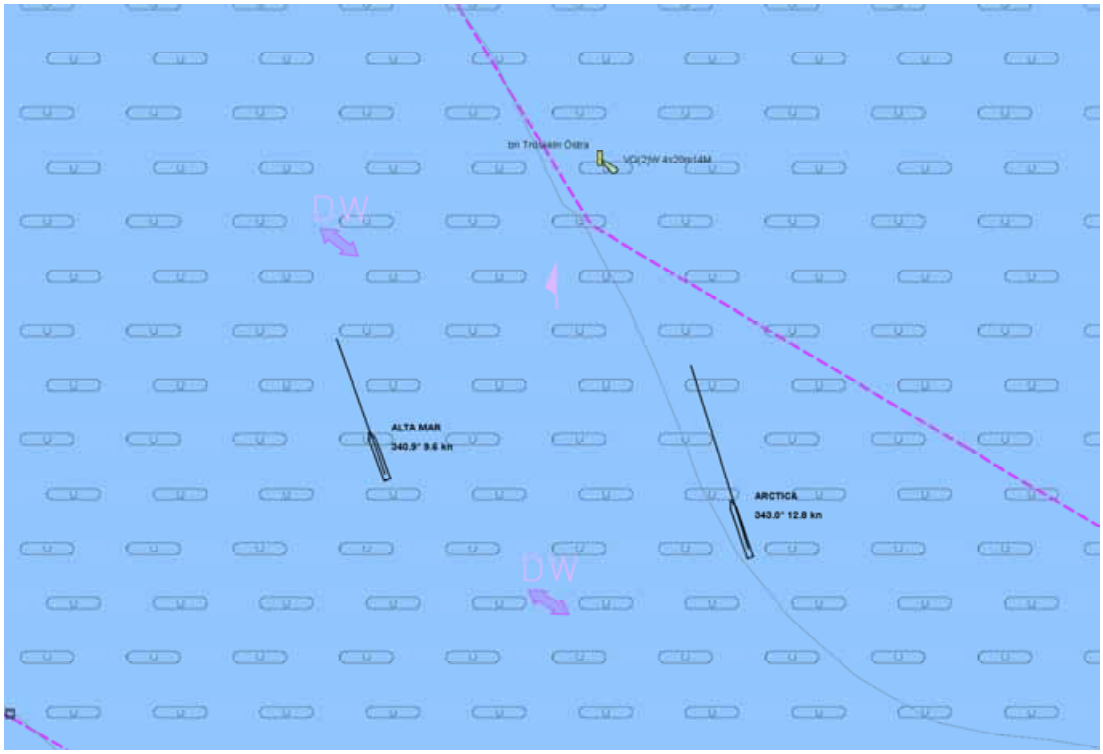

Figure 10b. The ARCTICA overtaking the ALTA MAR a couple of minutes before the collision. (Source: Finnish Maritime Administration, VTS records, Archipelago VTS)

Action after the incident. At approximately 06:25 Finnish time the ARCTICA tried to report the collision to Stockholm VTS. However, Stockholm VTS could not read her message loud and clear. At that time Archipelago VTS called her on VHF Channel 13 and asked whether they required any assistance. The ARCTICA declined assistance. At 09:00 Finnish time she was heard informing Stockholm VTS that her next port of call

would be Falkenberg. Soon after, southwest of the lighthouse *Flötjan*, the ARCTICA turned back and continued at 13 kt towards Falkenberg.

Damage to the vessel. The ARCTICA reported having sustained a 1 m x 2 m tear approximately 2 metres above the waterline and a 20 cm large hole on her starboard side where the ballast tank is located. The spot, with the now repaired damage, is shown in figure 11. When the damage was assessed, leaks were detected in the forepeak, the bow thruster compartment and the foremost starboard ballast tank. Because of the leaks they decided to put her in dock for repairs. There was no danger of sinking but the vessel turned towards a dry dock in Sweden a few hours after the collision.

Figure 11. The ARCTICA in Oulu after repairs. The white ellipse in the photo indicates the spot where she sustained the damage.

1.2.3 Injuries to persons

Neither accidents resulted in injuries to persons.

1.2.4 Damage to edge mark Tröskeln Östra as well as previous ramming incidents with deep-water route edge marks

Damage to Tröskeln Östra. When the HOBURGEN rammed the edge mark it was bent just above the surface and the helideck fell to the sea. There was no lighting on the edge mark after the collision. Figure 12 shows Tröskeln Östra after the collision.

The ARCTICA rammed the frame of the same edge mark on 14.10.2006 at approximately 05:40 Finnish time. As a result of the collision the frame tube was bent even fur-

ther at the waterline and the previously fallen helideck disappeared from view. Figure 13 shows Tröskeln Östra after the collision with the ARCTICA.

Figure 12. Tröskeln Östra after the collision with the HOBURGEN. (Source: The Border Guard)

Figure 13. Tröskeln Östra after the collision with the ARCTICA. (Source: The Border Guard)

Previous ramming incidents with deep-water route edge marks. Prior to the HOBURGEN's and the ARCTICA's collisions the edge marks of the Åland Sea deep-water route had been rammed six times from 1986–2000 resulting in major damage to the edge marks and/or the vessels that hit them. The edge marks in question are Tröskeln Östra and Tröskeln Västra (an ice buoy since 2000), which form a gate to the narrowest point of the deep-water route when approached from north. The table below lists the previous collisions reported to the Finnish Maritime Administration and which resulted in legal action. The instances presently being investigated are also included in the table.

Edge mark	Time	Ship / Flag	Damage
Tröskeln Östra	16.09.1986 at 04:25	IBN SINA / Egypt	Edge mark broken
Tröskeln Västra	02.10.1986 at 01:13	SVANÖ / Finland	Helideck came loose
Tröskeln Östra	09.05.1990 at 00:20	FINN/BOARD / Finland	Edge mark broken
Tröskeln Västra	22.11.1998 at 15:00	SKAGENBANK / The Netherlands	Edge mark broken
Tröskeln Västra	15.01.1999 at 02:10	AROS NEWS / Antigua and Barbuda	Rammed the stump of the mark
Tröskeln Västra	23.12.2000 at 03:07	JANRA / Germany	Edge mark broken, the JANRA capsized
Tröskeln Östra	07.10.2006 at 21:53	HOBURGEN / The Bahamas	Edge mark broken
Tröskeln Östra	14.10.2006 at 05:40	ARCTICA / The Nether-lands Antilles	Rammed the stump of the mark

Planned safety equipment repairs and traffic arrangements. According to the Finnish Maritime Administration at least the edge mark Tröskeln Östra is going to be rebuilt. After the JANRA rammed Tröskeln Västra it was replaced with a light buoy (a large ice buoy).

In the spring of 2008 Finnish and Swedish maritime authorities made a proposal to the NAV sub-committee of the IMO regarding the establishment of a comprehensive traffic separation scheme and amended deep-water route for the Åland Sea. According to the decision from the Maritime Safety Committee (MSC) the scheme enters into force on 1.1.2010. Furthermore, Finnish and Swedish authorities have talked about setting up a bilateral traffic monitoring system for the zone.

1.2.5 Recorders

AIS messages recorded both vessels' passages into Finnish and Swedish AIS registers. Moreover, the Border Guard's radars recorded the vessels' tracks at the time of the collisions. In addition to these the investigators also had access to the HOBURGEN's ECDIS records, indicating targets' position and heading (HGD) in addition to AIS vessel information.

1.2.6 Functioning of the VTS and monitoring systems

Neither monitoring nor VTS systems could warn the Officer of the Watch of the HOBURGEN of the impending collision. The ARCTICA was aware of the navigational warning issued on the damaged edge mark.

Figure 14 shows the AIS-recorded traffic situation in the vicinity of Tröskeln Östra on 7.10.2006 at 21:45. The HOBURGEN changed course 10 degrees to port (from course 142 degrees to course 132 degrees) at that time.

The AIS symbol of the OMSKIY-102 (figure 14) drew the attention of the investigators. The symbol shows that her heading and her Course Over Ground (COG) diverged by approximately 60 degrees. Her speed was approximately 7.0 knots which means that a drift angle of this magnitude was hydrodynamically impossible. Therefore the AIS transmitter of the OMSKIY-102 broadcast an incorrect heading.

Figure 14. Image of the FMA's AIS picture on 7.10.2006 at 21:45 when the HOBURGEN altered its course 10 degrees to port. The information content in the image corresponds to the situation picture at Archipelago VTS (Source: Finnish Maritime Administration, VTS records, Archipelago VTS)

1.3 Rescue operations

Distress Alerts. In addition to normal VHF radio traffic related to the events, neither vessel initiated distress or Urgency Communication.

1.4 Other investigation

Investigation of the accident vessels and at the site of the accident

Representatives of the Swedish Maritime Administration (Sjöfartsverket) came aboard the HOBURGEN when she was docked at Oskarshamn and copied the HOBURGEN's ECDIS records from the time of the collision. MSc Jaakko Lehtosalo, at the behest of the investigation commission, analysed the file and printed the information on a navigation chart for further analysis.

When the ARCTICA arrived in Falkenberg, Sweden, on 16.10.2006, the Swedish maritime authority inspected the vessel and wrote a maritime accident report of the occurrence. One of the investigators went aboard the ARCTICA when she was at port in Oulu on 9.11.2006.

2 ANALYSIS

When it comes to the chains of events resulting in accidents at sea, the human factor is almost always present, one way or another. Technical issues or external aspects alone cannot explain all of the causal factors of the two accidents at hand. In this analysis the investigators attempted to establish the issues contributing to those human factors which ultimately resulted in the collisions.

2.1 The use of a look-out in enhancing safety

The use of a look-out. Pursuant to the Rules of the Road: *Every vessel shall at all times maintain a proper look-out by sight as well as by hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision*.

Neither OOW considered arrival in the deep-water route (the HOBURGEN) or passage in it (the ARCTICA) particularly risky. Consequently, neither vessel raised the level of bridge team resources from that of normal routine. The deep-water route is only 0.8 nm wide at its narrowest point. The edge marks (Tröskeln Östra and Västra as well as Armbågen) create close proximity traffic situations in the open sea. The ARCTICA did not use a look-out as required by international regulations and the OOW of the HOBURGEN lowered the safety level by excusing the look-out from the bridge, even when several vessels were spotted in the deep-water route as well as in its immediate vicinity.[2] The fact that the OOW was alone on the bridge on both vessels can be regarded as both a mistake and unnecessary risk taking.

Look-out training. The education of a deck officer includes practical experience through supervised on-the-job training. This paves the way for proper bridge team resource management. Experience accrued as an apprentice lays the foundation for the future deck officer's behaviour and values. If trainee OOWs, as part of their training, learn to employ efficient look-outs as a matter of routine, they are also bound to train attentive look-outs of their own after having received their licences.

Vessel-specific orientation must also emphasize the importance of a look-out, thus stimulating and improving the working atmosphere on the bridge as well as the level of ship safety. [3]

> *When it comes to safety it is of paramount importance that **bridge team resource management**, including the look-out, works seamlessly and efficiently and that all procedures and duties are clearly known to all. Findings and observations which may improve safety must immediately be reported to all parties. Good coordination and*

[2] According to AIS records in figure 13 several shallow-draught vessels sailed part of their passage outside of the deep-water zone

[3] Several accident investigations have established that the look-out was absent from the bridge when an accident occurred. What's more, even when the look-out was on the bridge, he was not a member of the navigational watch on the bridge (Investigation reports C 3/2003 M and C 3/2007 M).

communication may even help sustain the state of alertness. The investigators think that the absence of a look-out from the navigational watch on the bridge was a contributing factor in the accidents of the HOBURGEN and the ARCTICA.

2.2 Human factors in navigation

The investigation of the accidents of the HOBURGEN and the ARCTICA established common and underlying human factors as well as those relating to on the spot decision making. These included actual navigation on the bridge and the dual character of the sea area as a deep water route in the open sea, avoidance of traffic as well as detecting the edge mark and its remains.

The traffic guidance effect of the marked deep-water route. The dual character of the area consists of the open sea with delineated deep-water route. Only deep draught vessels *must* use the route. However, it has become routine practice that also other traffic may/can follow the deep-water route as well as enter and exit it so long as they comply with maritime collision avoidance rules.

The water in the area is so deep that few vessels must take the edge marks into account. This is because the edge marks were constructed with deep draught vessels entering the Gulf of Bothnia in mind. Nevertheless, the edge marks have created an unofficial passage in the fairway, enticing even shallow draught vessels to sail between them.

A vessel proceeding along the course of a narrow channel or fairway shall keep as near to the outer limit of the channel or fairway which lies on her starboard side as is safe and practicable (Rules of the Road). This applies to those vessels that, due to draught or displacement, must use the designated deep-water route. However, confusion with regard for which of vessels the deep-water route is actually compulsory as well as differing interpretations of the rules may impact the route selection of vessels in the area and the safety of these selections (fig.14).

In practice vessels opt for the straightest and shortest route, the so-called “inside curve” through the area. This results in some of the vessels sailing right into oncoming traffic, complicating the observance of the International Regulations for Preventing Collisions at Sea.

Still, many vessels whose draught would not require them to follow the deep-water route seem to regard the passage through the gate of Tröskeln Västra and Tröskeln Östra as compulsory, thereby clearly endangering other traffic.

Voyage planning and traffic situations in accidents. According to the IMO’s binding regulations the master shall ensure that a voyage plan[4] be prepared for each passage. When preparing a voyage plan for a deep-water route one shall take into account any

[4] IMO STCW Convention and STCW Code, Chapter VIII, Section A-VIII/2, Part 2 – VOYAGE PLANNING: *The intended voyage shall be planned in advance, taking into consideration all pertinent information.*

possible deep draught vessels[5] in the route. They shall observe the right-hand traffic fairway rule. Therefore, in accordance with good seamanship, all other vessels in the deep-water route should also observe these rules.

Judging by VTS records of these accidents virtually all vessels in the area either failed to prepare a voyage plan as per these principles or ignored the prepared plan. The HOBURGEN was seemingly in the “oncoming lane” (fig.14). If she indeed followed a voyage plan, it was a risky one. The ARCTICA did not follow the track marked on the map. She overtook the ALTA MAR, which was sailing in the sea lane, from the starboard side and took a course which led her directly into Tröskeln Östra (figures 9 and 10b). By preparing and observing a voyage plan which takes the special conditions of the deep-water route into account one can improve the safety of traffic in the zone.

Furthermore, the HOBURGEN, evidently in an attempt to yield to oncoming traffic, changed course to port. This was in violation of the spirit of the rules of manoeuvring and navigation. As regards the HOBURGEN accident, the BALTIC TARA also used the “oncoming lane” as she entered the deep-water route zone (figure 14).

When it comes to the HOBURGEN accident, the tracks of the BALTIC TARA and OMSKIY-102 (fig.14), as well as those of the ARCTICA and ALTA MAR (fig. 10), are clearly more precarious than those parallel or clearly perpendicular to the deep-water route. This is because they merge with deep-water route traffic at oblique angles.

Detecting the edge mark, its remains and other traffic. The OOW on the HOBURGEN altered course 10° to port approximately 1.5 nm, i.e. seven minutes, before entering the passage delineated by the deep-water route edge marks (fig. 15). This can be understood as an action to avoid collision. The HOBURGEN and M/S OMSKIY-102, heading toward each other, would have ended up in a near head-on situation in which the Closest Point of Approach would have been less than 0.3 nm (CPA<0.3). The situation was even more hazardous because the HOBURGEN kept to the port edge of the deep-water route. A change of course to port, considering the oncoming traffic, was easier than collision avoidance to starboard, as prescribed by the Rules of the Road.

The change of course increased the risk of ramming Tröskeln Östra. The OOW may have been concentrating on visually tracking his traffic. As per his account he should have been able to spot the edge mark, had it been lit. The need for the help of a competent look-out was evident. In close proximity situations the tendency is to focus on the initial threat, thereby simplifying a complex situation and ignoring other factors until the situation is over.

[5] IMO Assembly Resolution A.893 (21) 25 November 1999 GUIDELINES FOR VOYAGE PLANNING: *3 PLANNING, 3.2 The detailed voyage or passage plan should include the following factors: 3.2.2 the main elements to ensure safety of life at sea…should include…3.2.2.7 use of ships' routeing systems.*

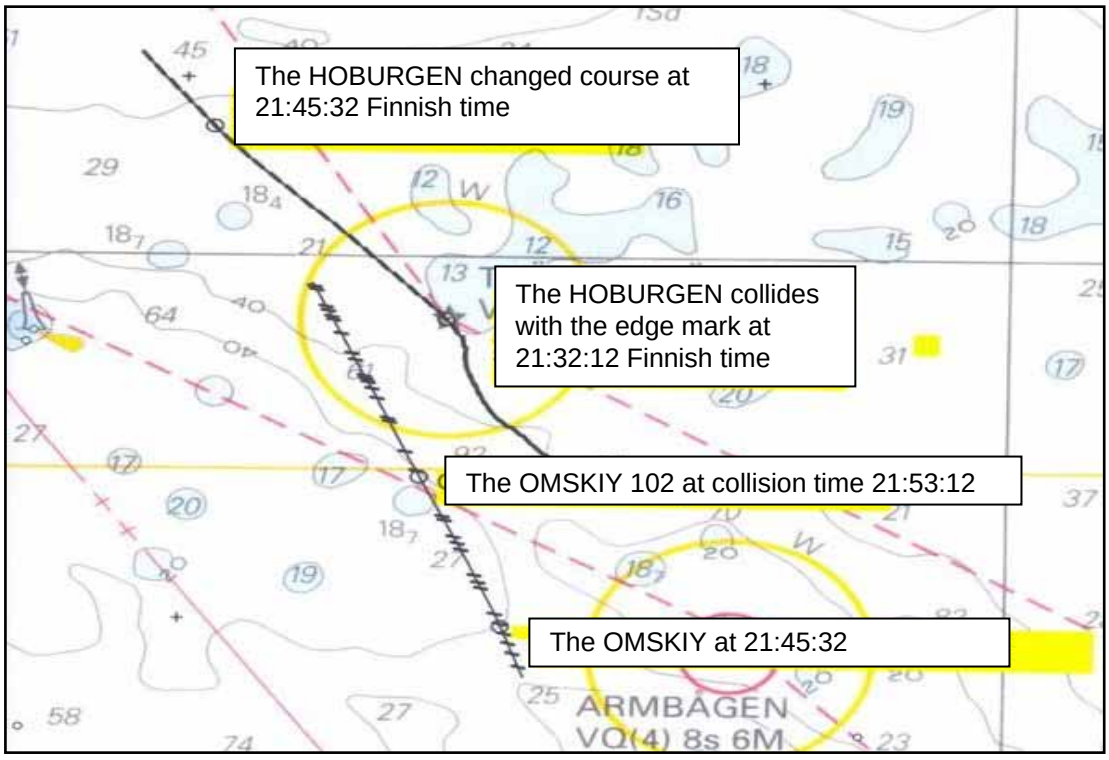

Figure 15. The HOBURGEN's Advento-recorded tracks (HOBURGEN / OMSKIY 102), superimposed on a chart.

After passing the lighthouse Svenska Björn, the OOW of the ARCTICA first had to focus on the two oncoming ships (the ALSTERN and the GOTLAND) and then the vessel they were about to overtake (the ALTA MAR), which is why he paid less attention to tasks related to positioning. What made matters worse was the fact that the navigation room was a separate space behind the bridge and that there was no radar screen in it, which would have made it easier and faster for him to plot their position on the chart.

After passing sea mark Armbågen the ARCTICA was less than one nautical mile from the ALTA MAR. Therefore, her OOW was probably giving his full attention to overtaking the vessel ahead. At approximately 0.5 nm from Tröskeln Östra, the distance to the ALTA MAR, travelling just ahead and to the port side, was approximately 0.4 nm and both vessels were holding nearly identical courses. Had the collision not occurred the ARCTICA would have passed the ALTA MAR at approximately 0.25 nm past the edge mark.

It was difficult to discern the faint radar return of Tröskeln Östra because the radar echo was under the ship's heading line, from time to time. Furthermore, it was hard to visually spot the unlit target in the dawn light. The danger of radar echoes being blocked by the heading line on long straight legs must not be forgotten.

People are the least alert in the small hours and in the early afternoon. Drowsiness increases after a meal. In addition to the time of day, a person's working alertness is affected by time spent awake, nourishment, the working environment - particularly if it is monotonous - as well as the ambient temperature (Ref: Investigation report S3/2004M).

The traffic congestion in the open sea drew the attention of the Officers of the Watch to the traffic situation in both instances. Therefore, they did not notice either the deep-water edge mark or its remains. Moreover, navigation in good visibility just before the collisions was solely based on visual observation.

Had the traffic congestion caused by the edge marks been prepared for, the risks they created could have been mitigated by planning a detailed, right-hand traffic-based voyage plan for the deep-water route zone.

Had the deep-water route been officially designated as a traffic separation scheme, vessels merging from the south would have had to cross the oncoming traffic lane at a 90 degree angle, followed by a turn to their own lane.

Even though the present deep-water route markings obligate only deep draught vessels, other vessels also sail in the route, sporadically complying with its markings. Vessels either fail to prepare voyage plans taking the deep-water route into account or simply ignore their prepared plans in the area. This results in unpredictability in navigation practices, creating a traffic safety risk. Vessel traffic in its present form in the area highlights the importance of an attentive look-out on the bridge.

The investigators think that imprudent and unpredictable navigation practices, caused by unorganized traffic, as well as the absence of a look-out from the navigational team on the bridge contributed to the accidents of the HOBURGEN and the ARCTICA. By preparing and following a voyage plan which takes the special conditions of the deep-water route into account one can improve the safety of traffic in the area.

2.3 Deliberation on traffic arrangements in the Åland Sea as well as deep-water route markings

Traffic flows in the Åland Sea. There are two intersecting traffic flows in the Åland Sea. Traffic from the southern Baltic Sea to the Bothnian Sea crosses the traffic between Sweden and the Åland Islands. Furthermore, vessels arriving from the Gulf of Finland merge into the south-north main flow south of this crossroads.

Up until now an 18 metre deep-water route has been the only traffic arrangement in the area. Finnish territorial waters were redelimited in 1995 at which time the outer boundary of the territorial sea of Finland was moved to the distance of 12 nm from the base points of the outer limits of the internal waters. Even after this enactment a segment of the deep-water route is in international waters.

Traffic flow is unorganized and vessels only follow the Rules of the Road in collision avoidance. It is difficult to foresee the intentions of other vessels. This is also clearly evident in the track selections of the accident vessels in this investigation, being that they were the result of the traffic situations. Both vessels yielded to other traffic and ended up at the outer limits of the deep-water route.

Traffic separation scheme rules are compulsory and clear, mandating the use of traffic lanes. Voyage plans, too, shall consider traffic separation schemes, should one sail in zones under such schemes. Traffic separation schemes make it easier to prepare voyage plans and harmonize traffic behaviour among vessels. Still, the observance of a traffic separation scheme does not relieve any vessel of her obligation under any other rule.[6]

Finland and Sweden submitted a proposal to the NAV sub-committee of the IMO pertaining to the creation of a traffic separation scheme and a deep-water route in the Åland Sea.[7] This proposal includes traffic separation zones inside the borders of the "North Åland Sea" and "South Åland Sea". Between them lies the intersecting zone for traffic between Sweden and the Åland Islands. Furthermore, merging lanes for vessels arriving from the Gulf of Finland are defined for the southern separation zone.

The proposed traffic separation scheme and the potential for traffic monitoring in the area also clarify traffic arrangements outside the separation zone. The plan separates traffic flows in the northerly and southerly lanes and simplifies traffic arrangements in intersecting areas. The best way to enforce compliance with the rules in the separation zone would be to establish internationally binding traffic monitoring arrangements in the area, similar to the GOFREP in the Gulf of Finland.

Remote monitoring of sea marks. The investigators think that some collisions with edge marks could have been avoided had their lights and RACON (Tröskeln Västra) worked as required. Since 2001 the radar mark Armbågen has been remotely monitored by satellite. Comparable remote monitoring systems would have alerted the authorities of edge mark malfunctions, enabling the issuance of navigational warnings. An ice-proof GPS/GSM antenna became available in the spring of 2008 and the first GPS-synchronized ice buoys are already in operation in the Archipelago Sea.

The edge marks in the area can be replaced by lighter sea marks or even by virtual marks. The water is so deep that few vessels must take the edge marks into account. This is because the edge marks were constructed with deep draught vessels entering the Gulf of Bothnia in mind. Still, Tröskeln Västra and Tröskeln Östra have created an unofficial fairway passage, “forcing” even shallower draught vessels to sail between them. Ship safety could be improved by replacing fixed sea marks with floating, remotely controlled and monitored buoys. This would also mitigate the cost of damage incurred by possible collisions.

2.4 Safety findings on AIS display modes

During the HOBURGEN investigation the investigation commission was provided with VTS-recorded AIS information. The data showed that the AIS symbol of the OMSKIY-102, which was involved in the traffic situation, indicated erroneous motion particulars.

6 International Regulations for Preventing Collisions at Sea (Rules of the Road), Rule 10.

7 *New traffic separation scheme and amended deep-water route “Åland Sea”*; proposal to NAV 54 meeting in the spring of 2008.

Her heading deviated significantly from her Course Over Ground (COG) (figures 16 and 17).

The variance between the heading and the COG in the OMSKIY-102's AIS symbol was approximately 60 degrees. Her speed was approximately 7.0 knots, which means that a drift angle of this magnitude was hydrodynamically impossible. Therefore, the AIS transmitter of the OMSKIY-102 broadcast an incorrect heading.

The two conflicting display modes of this erroneous information were noticed in information obtained from two separate sources that indicated the possibility of completely dissimilar information content to be presented of the state of the vessel at a single point in time.

Figure 16 shows how the OMSKIY-102, according to the selected AIS display mode, seems to be maintaining a heading of 275-280°, and so clearly passes the track of the HOBURGEN from the port in the head-on situation. In reality the COG of the OMSKIY-102 was 335°, as shown in figure 17. The attitude of the vessel symbol also shows the ships heading in figure 17.

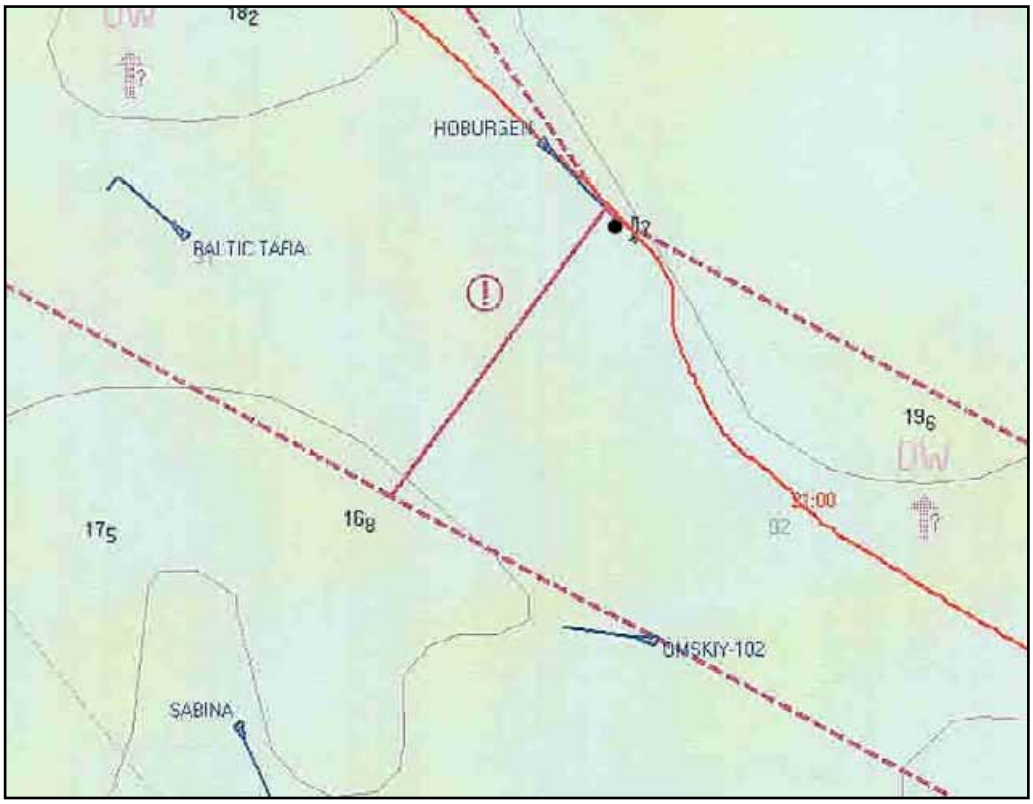

Figure 16. The electronic chart ADVETO's image of the situation; Sjöfartsverket's AIS-display. The OMSKIY-102 is on the bottom right. (Source: Sjöfartsverket).

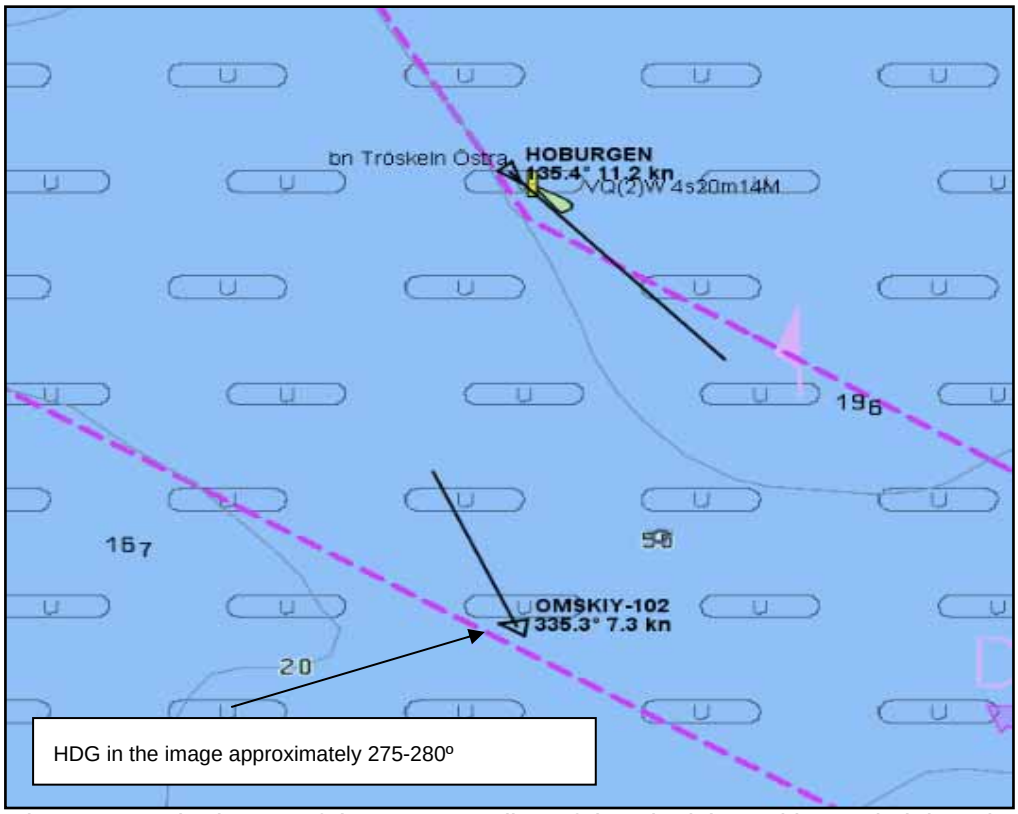

Figure 17. The image of the AIS recording of the Finnish Maritime Administration. (Note the heading of the tip of the symbol triangle; ca. 275–280°)

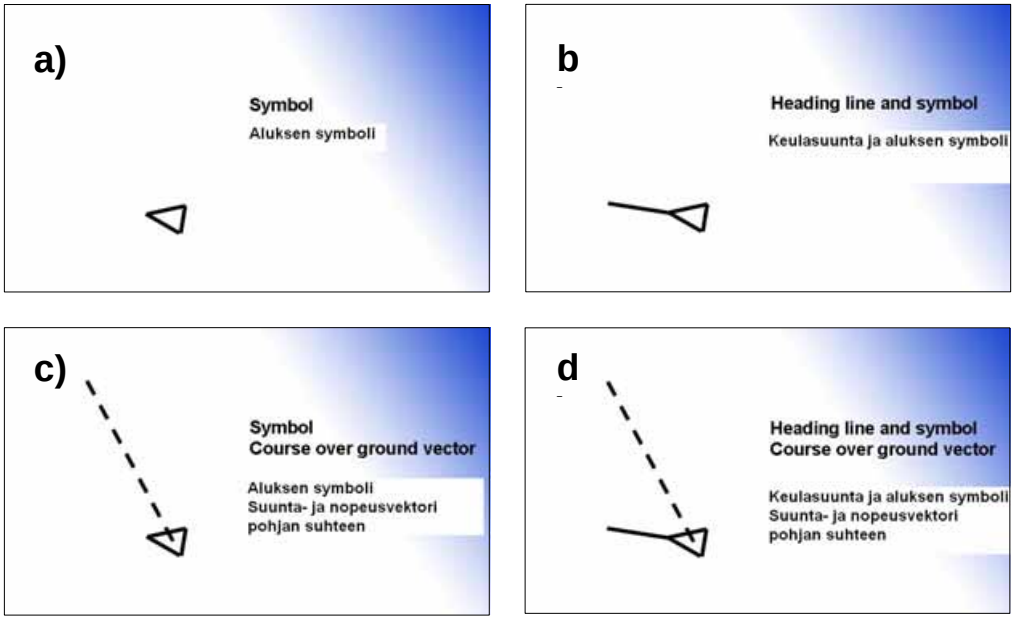

Figure 18. *Different modes of displaying AIS information on an electronic chart. The information content of different display modes:*
a): Position and heading (direction of the equilateral triangle),
b): Position and heading line,
c): Position and heading (direction of the equilateral triangle) as well as the COG vector,
d): Position and heading line as well as the COG vector.

Figure 18 shows the four different AIS display modes, all of which are possible on electronic charts. It is normally possible to select the mode in electronic charts, including ECDIS.

The symbol of the vessel in figure 18 is drawn in accordance with the same erroneous manner which the OMSKIY-102 transmitted. In other words, the symbol's incorrect heading points approximately 60 degrees to port from the vessel's true COG. Of the four modes of displaying AIS information (images a-d in figure 18) the material provided to the investigation commission included the modes b) on the top right (figure 16) and c) bottom left (figure 17).

The AIS message contains GPS-based speed and COG information as well as the heading (HDG) read from the gyro compass. Heading is indicated by a standard length vector (ca. 2 cm) as well as by the direction of the tip of the equilateral triangle (ship symbol). Speed and COG are indicated by a vector which begins from the centre of the ship symbol.

If the electronic chart is selected to display the AIS heading only, the chart will not indicate the vessel's COG.

The COG vector in AIS messages may differ substantially from the true heading, especially if the HDG is derived from an old gyrocompass. Its electric stepper motor-provided heading must be converted from analogue to digital protocol for the AIS transmitter to be able to handle the NMEA message standard (National Marine Electronics Association). If the heading in the NMEA message differs from the heading in the gyrocompass it is incorrectly transmitted to other vessels. As regards old gyrocompasses, the heading provided to the AIS transmitter must be manually synchronized into the converter according to the true reading of the compass. Whenever the compass is out of service due to maintenance or there is other interruption of electric power the converter reading must be checked. Failing to do this, the heading in the AIS message will be incorrect and electronic charts at the receiving end will display the wrong heading. Nonetheless, even if the AIS-transmitted heading were incorrect, the ship's compass on the bridge will display the correct heading.

If the display mode on the electronic chart is selected so that the incorrect AIS heading can be interpreted as COG, the OOW, reading the chart, receives inaccurate information of the situation which could possibly result in wrong decisions.

The investigators consider it dangerous if AIS messages broadcast incorrect headings. In addition, the fact that electronic charts provide the option of displaying only partial AIS information may constitute a danger. At the very least, this may be disturbing.

3 CONCLUSIONS

Findings

The Officer of the Watch on the HOBURGEN executed a 10° turn to port approximately seven minutes prior to arriving at the narrows formed by the deep-water route edge marks. This could be construed as taking action to avoid collision. The new course took the vessel directly towards edge mark Tröskeln Östra. The situation was even more precarious because the HOBURGEN kept to the port edge of the deep-water route. A change of course to port, considering the oncoming traffic, was easier than collision avoidance to starboard, as prescribed by the International Regulations for Preventing Collisions at Sea. The OOW may have been concentrating on visually tracking his traffic.

After passing the lighthouse Svenska Björn, the OOW of the ARCTICA first had to focus on the two oncoming ships and then pay attention to the vessel they were about to overtake. This is why he paid less attention to tasks related to positioning. Just after having passed the Svenska Björn, 20 minutes prior to the collision, he had changed course. The new course took the vessel towards the previously broken Tröskeln Östra. It is possible that the stump of the edge mark still above the surface did not provide a strong enough radar return to be discerned on the radar screen. The OOW was probably giving his full attention to overtaking the vessel ahead from the starboard side. Had the collision not occurred the ARCTICA would have passed the other vessel at approximately 0.25 nm past the edge mark.

Findings on the analysis

Even though the present deep-water route markings obligate only deep draught vessels, other vessels also sail in the route, sporadically complying with its markings. Vessel Traffic Service (VTS) records of accidents show that virtually all vessels sailing in this area either fail to prepare **voyage plans** taking the deep-water route into account or simply ignore their prepared plans in the area. This results in unpredictability in navigation practices, creating a traffic safety risk. Vessel traffic in its present form in the area highlights the importance of an attentive look-out on the bridge.

The investigators think that imprudent and unpredictable navigation practices, caused by unorganized traffic, as well as the absence of a look-out from the navigational team on the bridge contributed to the accidents of the HOBURGEN and the ARCTICA. By preparing and following a voyage plan which takes the special conditions of the deep-water route into account the safety of traffic in the area can be improved.

When it comes to safety it is of paramount importance that **bridge team resource management**, including the look-out, works seamlessly and efficiently and that all procedures and duties are clearly known to everyone. Findings and observations which may improve safety must immediately be reported to all parties. Good coordination and communication may even help sustain the state of alertness. The on-the-job training of

lookouts and keeping active lookout can essentially lead to improved safety of monitoring and elimination of unobserved errors.

The investigators think that **the absence of a look-out** from the bridge team was a contributing factor in the accidents of the HOBURGEN and the ARCTICA. The look-out must not be excused from the bridge in narrow fairways and close proximity multi-vessel traffic situations. The situation must be handled as a heightened risk situation and the manning of the team on the bridge shall be tailored accordingly. In a close proximity situation as many as possible should participate in look-out and monitoring responsibilities.

Finland and Sweden submitted a proposal to the NAV sub-committee of the IMO pertaining to the creation of a **traffic separation scheme** and a deep-water route in the Åland Sea[8]. The plan separates traffic flows in the northerly and southerly lanes and simplifies traffic arrangements in intersecting areas. The best way to enforce compliance with the rules in the separation zone would be to establish internationally binding traffic monitoring arrangements in the sea area, similar to the GOFREP in the Gulf of Finland. The proposed traffic separation scheme and the potentially improved monitoring in the zone also clarify traffic arrangements outside the separation zone.

Sea marks used in marking the deep-water route in this fairway passage could be replaced these days with buoys or even with “virtual” sea marks. Collisions with these would result in much less damage compared to sea marks fixed to the seabed, originally designed for severe ice conditions.

Safety findings

During the investigation it was discovered from VTS recordings that the **AIS message symbol** of one vessel showed that her heading and her Course Over Ground diverged by approximately 60 degrees. Her speed was approximately 7.0 knots which means that a drift angle of this magnitude was hydrodynamically impossible. Therefore the AIS message broadcast an approximately 60 degrees’ incorrect heading.

The two conflicting display modes of this erroneous information were noticed in information obtained from two separate sources that indicated the possibility of completely dissimilar information content to be presented of the state of the vessel at a single point in time.

It is normally possible to select four different AIS symbol display modes in electronic charts, including ECDIS. This may provide the OOW, reading the chart, incorrect information of the situation and may, on its part, possibly lead to wrong decisions.

[8] “The Finnish Maritime Administration in cooperation with the Swedish Maritime Administartion has proposed the new traffic separation scheme for Åland Sea to IMO. The IMO NAV Subcommittee approved the proposal in summer 2008 and it is for adoption in the next MSC. The traffic separation scheme is proposed to have its effective date for implementation 1 january 2010, when relevant sea charts are available.” The statement on this report 29.10.2008 by the Traffic department of the Finnish Maritime Administration.

The investigators consider it dangerous if AIS messages broadcast incorrect headings. In addition, the fact that electronic charts provide the option of displaying only partial AIS information may constitute a danger. At the very least, this may be disturbing.

The electronic charts, which can present the AIS and radar targets of other ships, should not solely form the basis of decision for evasive manoeuvres carried out according to the Rules of the Road. The investigation of the HOBURGEN case did not reveal, that AIS information had been used to prevent a collision. According to the Rules of the Road all relevant information should be used to prevent a collision and this includes also AIS information.

4 RECOMMENDATIONS

Traffic flow in the Åland Sea, especially in the deep-water route area, is unorganized and vessels follow international Rules of the Road only in collision avoidance. It is difficult to foresee the intentions of the other vessels. The above is also clearly evident in the track selections of the accident vessels in this investigation being that they were the result of the traffic situation. Both vessels yielded to other traffic, and ended up at the outer limits of the deep-water route.

In order to improve vessel traffic safety the investigation commission recommends that:

1. *The Finnish Maritime Administration pursue the establishment of the Åland Sea traffic separation scheme proposed to the IMO, as well as a traffic monitoring system in said zone as soon as possible*[9]*.*

The investigators consider it dangerous if AIS messages broadcast incorrect headings. In addition, the fact that electronic charts provide the option of displaying only partial AIS information may constitute a danger. At the very least, this may be disturbing.

In order to improve the situation display displayed in electronic charts the investigation commission recommends that:

2. *The Finnish Maritime Administration warn Finnish shipping of the hazardous possibility of AIS messages possibly displaying incorrect heading information.*

   The Finnish Maritime Administration's VTS Centres notify the vessel in question of its erroneous AIS message so that it can correct the information.

   The Finnish Maritime Administration inform the IMO of the hazardous AIS message display possibility.

Vessel Traffic Service (VTS) records of accidents show that virtually all vessels sailing in this zone either failed to make a **voyage plan** in accordance with traffic in the deep-water route or ignored the voyage plan if it was made.

In order to ensure safe passage the investigation commission recommends that:

[9] Refers to the statement on this report 29.10.2008 by the Traffic department of the Finnish Maritime Administration (see also footnote 1).

3. *Shipping companies see to it that masters prepare and comply with voyage plans.*

Investigation revealed that because of the absence of a look-out on the bridge, the safety level on the bridge preceding both accidents was insufficient. It became more difficult to generate situational awareness from the prevailing conditions, which resulted in wrong conclusions and incorrect decisions.

In order to promote sound bridge team resource management the investigation commission recommends that:

4. *Shipping companies and masters emphasize the importance of look-outs in promoting safety. This includes correct methods in sustaining the level of alertness as well as sufficient training to guarantee the proficiency of the crew.*

Helsinki, 20.1.2009

Toimi Sivuranta

Pertti Siivonen

Martti Heikkilä

Appendix 1. Finnish Maritime Administration's (Maritime Safety function) statement

Merenkulkulaitos

Meriturvallisuus

21.10.2008

Dnro 2280/311/2008
MMk 71/2008
SAAPUNUT
27 -10- 2008
462/5M

Martti Heikkilä
Onnettomuustutkintakeskus
Sörnäisten rantatie 33 C
00580 Helsinki

Lausuntopyyntönne 26.9.2008, 422/5M

MS HOBURGEN 7.10.2006 JA MS ARCTICA 14.10.2006
TÖRMÄYS TRÖSKELN ÖSTRA – MERIMERKKIIN

Onnettomuustutkintakeskus on lähettänyt lausuntoa varten luonnoksen tutkintaselostuksesta C 4/2006M ja C5/2006M, *ms Hoburgen 7.10.2006 ja ms Arctica 14.10.2006, törmäys Tröskeln Östra – merimerkkiin*. Meriturvallisuuden merenkulun tarkastusyksikkö on tutustunut luonnokseen ja toteaa että tutkinta on suoritettu huolellisesti ja johtopäätökset ovat johdonmukaisia.

Merenkulkulaitoksen Meriturvallisuus-toiminto haluaa kuitenkin esittää seuraavat kommentit:

1. Turvallisuussuosituksissa esitetty kohta 1, Ahvenanmeren reittijakojärjestelmä, on suunniteltu ja esitetty, yhteistyössä Ruotsin hallinnon kanssa sekä se on hyväksytty Kansainvälisen Merenkulkujärjestön NAV- alakomiteassa kesäkuussa 2008. Se menee yleiskokouksen hyväksyttäväksi marras- joulukuussa 2008.
2. AIS-laite ei ole tarkoitettu törmäyksen välttämiseksi ja sitä ei tule käyttää tähän tarkoitukseen. Törmäyksen välttämiseksi on käytettävä aluksen tutkaa ja siinä mahdollisesti olevaa ARPA-toimintoa tai muuta vastaavaa menetelmää.
3. Matkasuunnitelman laatiminen on SOLAS vaatimus jota tulee noudattaa. Tämän suunnitelman laatiminen on hyvin vaihtelevaa, henkilökohtaisista prioriteeteista johtuen.

Merenkulkulaitoksen Meriturvallisuus-toiminto katsoo, että turvallisuus suosituksissa mainittu kohta 2 voitaisiin muotoilla niin, että varustamon turvallisuusjohtamisjärjestelmä alleviivaa, että AIS-laitetta ei tule käyttää yhteentörmäyksen välttämiseen.

Merenkulkulaitoksen Meriturvallisuus-toiminto toteaa, että tutkinta on huolellisesti tehty ja siinä on huomioitu tapahtumienkulkuun vaikuttaneet seikat kattavasti ja ammattimaisesti.

Yhteistyöterveisin

Merenkulun tarkastusyksikön päällikkö — Tapio Gardemeister

Merenkulunylitarkastaja — Marko Rahikainen

Merenkulkulaitos
PL 171, 00181 Helsinki, Puh. 020 4481, Faksi: 020 448 4355, www.fma.fi

Appendix 2. Finnish Maritime Administration's (Traffic Service) statement

SAAPUNUT 29.10.2008
03 -11- 2008 422/5M
472/5M

Onnettomuustutkintakeskukselle

Onnettomuustutkintakeskuksen Tutkintaselostuksen C4/2006M ja C5/2006M luvun 4. Turvallisuussuositukset

Merenkulkulaitoksen meriliikenteen ohjaus –toiminto on tutustunut kyseisiin raportteihin ja niiden perusteella annettuihin suosituksiin ja lausuu niiden johdosta seuraavaa:

Suositus 1:

Merenkulkulaitos jatkaa toimenpiteitä IMO:lle ehdotetun Ahvenanmeren reittijakojärjestelmän ja liikenteen valvonnan saamiseksi kyseiselle alueelle mahdollisimman pian.

Merenkulkulaitos yhteistyössä Ruotsin merenkulkulaitoksen kanssa on hakenut IMO:lta valtuutusta reittijakojärjestelmäksi Ahvenanmerelle. IMO:n Nav alakomitea hyväksyi kesällä 2008 hakemuksen ja se menee seuraavaksi IMO:n meriturvallisuuskomitean hyväksyttäväksi. Voimaan reittijakojärjestelmä esitetään tulevaksi vuoden 2010 alusta, kun tarvittavat merikortit alueesta ovat valmiina.

Liikenteen valvontaa alueella voidaan harkita, mikäli alukset eivät noudata tehdyissä seurantatoimenpiteissä reittijakojärjestelmiä. Alue on melko laaja hallittavaksi eikä kaikkiin tarvittaviin paikkoihin löydy sähköistystä tai tiedonsiirtokaapelointia. Ne on mahdollista hankkia mutta vaativat tarkan suunnittelun ja tarveharkinnan.

Suositus 2:

Merenkulkulaitos varoittaa suomalaista merenkulkua AIS-sanomien turvallisuutta vaarantavasta näyttötavasta, jos aluksen suuntatieto on sanomassa virheellinen.

Keulasuunnan ja kulkusuunnan esitystapa karttanäytöillä on ollut kansainvälisten suositusten ja standardien mukainen (IHO, IMO, IEC). Alushenkilöstön koulutuksessa tulisi kiinnittää huomiota siihen, että standardin mukaisia komentosiltalaitteita osataan käyttää ja niiden antamaa tietoa tulkita oikein (mm. tiedon ollessa ristiriitaista osataan epäillä virhettä).

IMO:n julkaisema Resolution 917(22) vuodelta 2001 painottaa aluksen vastuuta lähettämiensä AIS-tietojen oikeellisuudesta ja esim. sensoritiedon oikeellisuuden säännöllisestä tarkastamisesta, erityisesti rannikkovesillä. Toisaalta resoluutio muistuttaa AIS tiedon avustavasta luonteesta navigointitilanteessa (mahdollisuudesta virheisiin vastaanotetussa AIS tiedossa).

IMO:n Circular 1252 vuodelta 2007 antaa tarkemman suosituksen alusten AIS laitteiden vuosittaisesta tarkastamisesta. Suositus on annettu, koska lähetettyjen AIS-tietojen on havaittu sisältävän paljon puutteita. Toisaalta IMO Circular SN 227 antaa ohjeet asennuksesta aluksille. Kansallisesti asennuksesta vaaditaan asennusraportti. Tarkemmat tiedot löytyvät Merenkulkulaitoksen tiedotuslehdestä 9/12.12.2003.

Onnettomuustutkintaselostuksen suosittaman, aluksille mahdollisesti annettavan varoituksen olisi hyvä viitata edellä mainittuihin IMO:n julkaisuihin.

Suositus 2:

Merenkulkulaitoksen VTS-keskusten tulee huomauttaa alusta virheellisestä AIS-sanomasta, jotta virheellinen tieto voidaan korjata aluksilla

29.10.2008

AIS tietojen oikeellisuuden tarkastaminen ja virheistä huomauttaminen on jo nykyisin osa alusliikennepalvelun toimintaa VTS- ja GOFREP-alueilla. Ohjelma huomauttaa alusliikenneohjaajaa virheellisestä AIS-tiedosta ja hän voi avata työnäyttöön ikkunan, josta tarkemmin selviää vian kohde, jos se on matkakohtaisissa tiedoissa. Myös lähetteen sisältämät virheet saadaan tämän vuoden aikana näkyviin. Alusliikenneohjaaja huomauttaa alusta sekä tiedottaa Meriturvallisuus-toimintoa virheestä. Meriturvallisuus-toiminto käynnistää PSC toimenpiteen näiden johdosta ja esim. Suomenlahdella ilmoitukset ovat johtaneet noin 90 % :ssa tapauksista tarkastukseen, silloin kun aluksen määränpää on ollut Suomessa.

Suositus 2:

Merenkulkulaitos välittää IMO:lle tiedon AIS-sanomien turvallisuutta vaarantavasta näyttötavasta.

AIS-tietojen oikeellisuuden varmistaminen on IMO:n NAV komitean työlistalla. Kesäksi 2009 kehityspäällikkö Sonninen valmistelee esitystä Nav alakomitealle tutkimustuloksista Itämeren alueen vääristä AIS-tiedoista.

Lisäksi EU:n suositus on lähettää lippuvaltiolle huomautus virheestä. Valitettavasti lippuvaltioiden reaktioita ei yleensä ole.

Suositus 3:

Varustamot huolehtivat siitä, että päälliköt laativat aluksille matkasuunnitelmat ja että niitä noudatetaan.

Matkasuunnitelman tekeminen on pakollista. Vaatimus tulee STCW koodin A – osasta, luvusta VIII, osasta 2. Tämä on myös erikseen saatettu Suomessa kansallisesti voimaan Liikenneministeriön päätöksellä 1257/1999.

Yleisesti ottaen tulisi kiinnittää huomiota siihen, että matkasuunnitelma olisi tarvittavin osin alusliikennepalvelun käytössä.

Suositus 4:

Varustamot ja päälliköt korostavat vahtipäälliköille ja vahtimiehille tähystyksen merkitystä turvallisuuden ylläpitäjänä, mihin sisältyvät oikeat menetelmät vireystilan ylläpitämiseksi sekä riittävä koulutus henkilöstön osaamistason varmistamiseksi.

Varustamoiden huomiota tulisi erityisesti kiinnittää siihen, että STCW koodin A-osan VIII luvun 3:n osan määräyksiä vahdinpidosta noudatetaan tähystyksen osalta. Tarvittaessa tulisi jopa käynnistää selvitys tähystyksen todellisesta merkityksestä sekä sen oikeasta ja toimivasta suoritustavasta. Tähän liittyy riittävä koulutus vahtimiehille kaikkien havaintovälineiden hyödyntämiseksi komentosillalla yhteistyössä vahtipäällikön kanssa.

Vireystilan ylläpitämiseen liittyy paljon muutakin kuin tähystys ja siihen liittyvät toimenpiteet. Oikea mitoitus miehistössä ja meriturvallisuuden korostaminen henkilöstölle asenteiden parantamiseksi ovat keskeisiä tekijöitä.

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johtaja
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