ONNETTOMUUSTUTKINTAKESKUS

Investigation Report

C2/2007M

MS CLAUDIA, grounding off Tornio on 23.10.2007

Translation of the original Finnish report

This investigation report has been written to improve safety and prevent new accidents. The report does not address the possible responsibility or liability caused by the accident. The investigation report should not be used for purposes other than the improvement of safety.

SUMMARY

The Dutch break bulk carrier CLAUDIA had loaded a cargo consisting of 4,781.5 tons of stainless steel in Tornio. The vessel departed from the harbour under pilotage along a fairway where fairway construction work was being done. When approaching a fairway part called “Portti” at the bend of the fairway, the pilot was blinded by the lights of the dredgers dredging in the area so that he could not see the lights of the buoys bordering the narrow passage. The sea clutter caused by the roll of the sea disturbed the vessel’s radar picture in such a way that the echoes generated by the buoys could not be discerned from the sea clutter of the nearby area. The turn was short and the vessel went aground and was damaged to its bottom. There were no environmental damages.

The CLAUDIA returned to Tornio, where its damages were surveyed and the cargo was unloaded. The vessel was docked in Gdynia, Poland, and it later returned to the Tornio traffic.

It came up in the investigation that the instructions with reference to the cooperation during the fairway construction work between the vessel traffic and those performing the dredging operations had not been detailed enough. The dazzling floodlights of the dredgers combined with the vessel’s inadequate route planning caused the turn ending at the gate of a narrow fairway to fail.

The investigators recommend that the fairway constructors specify traffic principles and procedures in their contracts. It should be made sure in the annual inspections and surveys that vessels have route plans. In addition to this, it is recommended that the Finnish Maritime Administration and the Finnish State Pilotage Enterprise form a workgroup to look into the availability of hand-held computers containing electronic charts suitable for pilots’ use.

THE ABBREVIATIONS USED

AIS	Automatic Identification System
ARPA	Automatic Radar Plotting Aid
DGPS	Differential Global Positioning System
DWAT	Dead Weight All Tonnage
DWCC	Dead Weight Cargo Capacity
GPS	Global Positioning System
GT	Gross tonnage
ECDIS	Electronic Chart Display and Information System
IMO	International Maritime Organization
ISM	International Safety Management (Code)
ISSC	International Ship Security Certificates
kn	Knot
LR	Lloyds' Register
MMSI	Maritime Mobile Service Identities
OOW	Officer on watch
RPM	Revolutions per minute
S-VDR	Simplified Voyage Data Recorder
SMG	Speed Made Good
SOG	Speed Over Ground
VDR	Voyage Data Recorder
VHF	Very High Frequency
VTS	Vessel Traffic Service
UTC	Universal Time Coordinated

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APPENDICES

Figure 1. M/S CLAUDIA *(© Wijnne & Barends)*

FOREWORD

The Accident Investigation Board Duty Officer received information about the grounding from MRCC Turku on 23 October 2007 at 20.26. The notification of the accident was sent to the authorities of the flag state, i.e. the Netherlands, on 24 October 2007. An Accident Board Investigator visited the vessel on 25 October 2007 and familiarized himself with the vessel and interviewed the Master. On the basis of the information about the accident and discussions with the flag state authorities, the Accident Investigation Board decided on 13 November 2007 to initiate an investigation on the MS CLAUDIA grounding in accordance with the Accident Investigation Act (373/1985) section 5. Marine Accident Investigator, Captain Risto **Repo** was appointed Investigator in Charge, and per their consent, Captain Kari **Larjo** and Captain Kaarlo **Heikkinen** were appointed as members.

An investigator was present at the maritime declaration at the Maritime Court in Oulu. Later the investigation received clarifying information from the CLAUDIA's shipping company, the pilots of the area, the Finnish Maritime Administration, the Border Guard and from the personnel of the company which had performed the dredging operation. Investigation assistance has been received from the maritime authorities of the Netherlands.

The final draft of the Investigation Report was sent for a statement as to the recommendations to Finnish Maritime Administration's Maritime Safety and Security and Fairways and Canals Functions, Finnish State Pilotage Enterprise, Finnish Port Association, Finnish Environment Institute and the dredgrer company and as to possible comments to the other parties involved. On the basis of the statements and comments, specifications were made in the Investigation Report.

1 EVENTS

1.1 The vessel

M/S CLAUDIA is a Dutch break bulk carrier. The shipping company is Wijnne & Barends, Hadelskade Oost 5, 9930 AC Delfzijl, Netherlands, PO Box 123

1.1.1 General information

Table 1. The general information on M/S CLAUDIA is based on the Accident Notification made by the master.

Home port	Delfzijl
IMO No.	920 1798
MMSI No.	245 772 000
Call sign	PCHE
Constructor and year of construction	Niestern Sander B.V. Delfzijl Yard hull No:904. 1999
ISSC (ISPS) Code	6056 / 2004
ISM Code	2672 / 2000
Classification society	LR
Ice classification	100 1A
DWCC summer	5200
DWAT	5438
Draught, summer	5,91m
Gross tonnage	4235
Net weight	2100
Length, max.	108.5 m
Breadth, max.	15.9 m
Max. speed	15 knots
Latest classification society inspection	26- 07-07, Szczecin
Latest authority inspection	06-08-07, Gdynia
Ship Safety Certificate valid until	06-11-2009

1.1.2 Manning

The vessel had a crew of nine persons. In addition to the master, the chief officer, the second officer, the chief engineer, the engineer, the cook, two deck ratings and an apprentice were on board the vessel. The master and the chief engineer were Dutch and the rest of the officers were Ukrainian. The crew was mainly Filipino, and one of the able seamen was from Cap Verde.

1.1.3 The bridge and its equipment

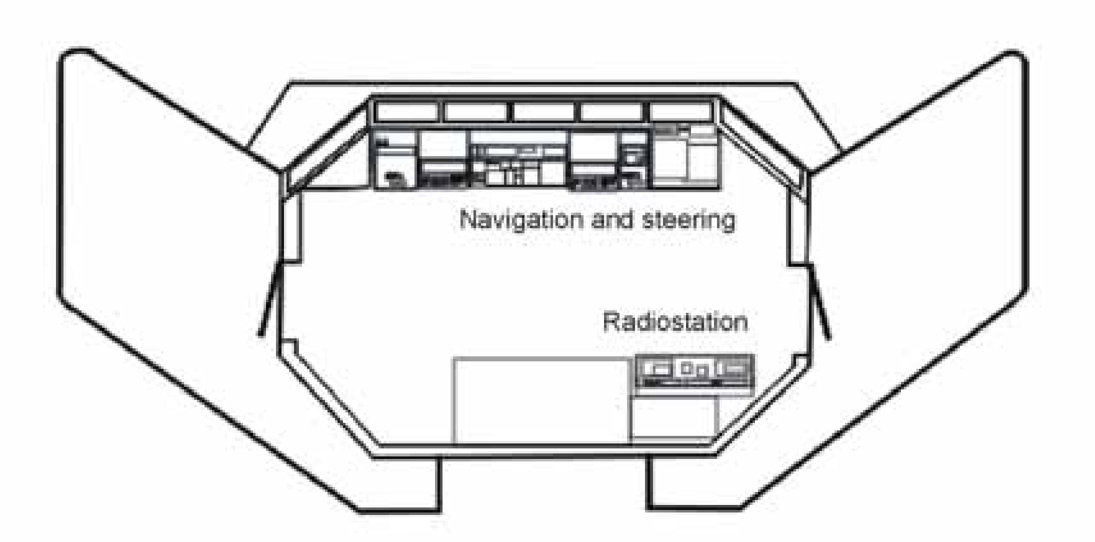

Figure 2. The bridge design of M/S CLAUDIA follows the 1973 plan of the German Sietas shipyard. The bridge arrangement sketch is based on the photos taken by the Accident Investigation Board.

The photo of the CLAUDIA (Figure 1) shows that the bridge construction is based on the German J.J. Sietas shipyard's design "Optimale Brücke" from 1973. Optimale Brücke became very popular, and it can be regarded as the starting point of modern bridge design. The leading idea was the cooperation of two persons, which was carried out in such a manner that two places of work were as close to each other as possible. The manoeuvring equipment was located between these persons and both of them had their own radar displays. The manoeuvring and navigation console was located backwards from the front wall so that display equipment could be protected from sunlight. This made it possible to install the most important manoeuvring and engine indicators above the front windows, directly under the ceiling.

The arrangement on the bridge of the CLAUDIA did not comply with the Optimale Brücke objectives. The navigational instruments were arranged in a long console located on the front wall of the bridge, which was customary in the 1960's. The GMDSS radio station was situated on the starboard back wall.

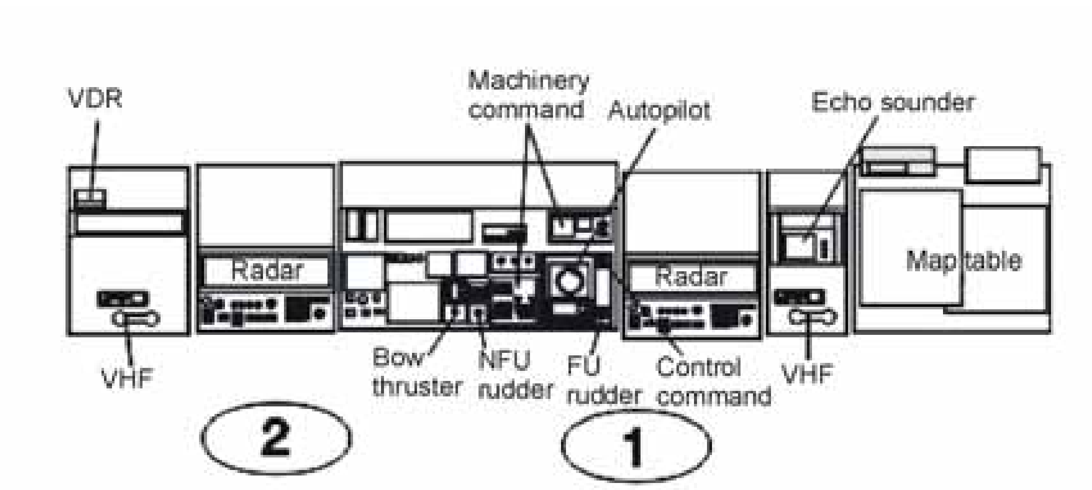

Figure 3. The manoeuvring and navigation console on board the CLAUDIA.

Two navigator's places of work can be discerned in the manoeuvring and navigation console. Place of work no. 1 is clearly the place of work of the watchkeeping officer. He/she has the radar in front of him/her. The radio telephone, echo-sounder and the nautical chart are located on the starboard side. The autopilot, FU (Follow Up, voyage steering), manoeuvring mode switch and engine controls are on the port side.

Place of work no. 2 clearly belongs to the assisting navigator. He/she has the radar and radio telephone in front of him/her. From this place of work it was not possible to both steer and to monitor the radar at the same time.

Table 2. List of the navigation equipment[1].

Device	Type	Device	Type
ARPA radar on the starboard side	FURUNO / FR 2115,[2] x – band	Fog-horn	good condition
Semi-ARPA radar, on the port side	FURUNO / FR 2115, x – band	Magnetic compass/ gyro deviation alarm	good condition
Gyro-compass	C.Plath Navigat	Echo-sounder	Furuno / FE-700
Magnetic compass	C.Plath Navipol	GPS/DGPS	Furuno / GP-80
Autopilot	C.Plath Navipilot v HSC	VDR	Danalac DM 300

1.1.4 Machinery

The manufacturer of the propulsion engine is MAK and the engine type is 6M32. The engine power is 2,880 kW.

[1] Maritime accident notification form filled in by the master.
[2] Information obtained from the shipping company. The master reported in the maritime accident notification the type of radar displays RDP 011.

1.1.5 Cargo

The CLAUDIA had loaded a cargo consisting of 4,781.5[3] tons of stainless steel. Some of the cargo was stowed in containers. There were 152 tons of ballast. The draught of the vessel at the bow was 5.25 metres and at the stern 6.6 metres.

1.2 The accident event

The account of the accident is based on the maritime declaration[4], the statement given by the pilot and the coastguard action report. There was a Voyage Data Recorder, VDR, on board the vessel, but its information was not verified after the accident. The equipment of the Bothnia VTS operated by the Finnish Maritime Administration did not function at the time of the accident.

1.2.1 Weather conditions

According to the master's statement, there was southwesterly wind (SW) Force 4–5.

According to the pilot, the wind was south-southwesterly (SSW) and the water level was +17 centimetres. The visibility was good, but the night was very dark. There was no light from the stars or from the moon. According to the master, the visibility was 8 nautical miles. The sun set approximately at 17.25[5].

According to the coastguard action list the wind was at 200° and its speed was 11 m/s; air temperature was 7° Celsius.

The roll of the sea resulted in a disturbing sea clutter in the radar display.

1.2.2 The voyage preparations

The pilot was ordered to the vessel at 17.00, and the pilot embarked the vessel at 18.53. The master informed about the draught, and said that the radar and GPS were switched on. The pilot reported to the VTS and received wind information. At the same time the pilot enquired about the dredgers in the fairway. Before the VTS had time to answer, the barge JUPITER announced that they would move aside. The dredgers informed that as far as they were concerned, there was no speed limit. The pilot informed the master about this.

The master has not brought forward anything special concerning the preparations for this particular voyage. He has stated that the vessel was seaworthy in all respects. At the maritime declaration the pilot said that everything was in order when he came to the bridge. The pilot knew both the master and the vessel from before.

[3] M/S CLAUDIA, Cargo Plan 23.10.2007.
[4] Maritime declaration documents, Oulu Local Court 14.11.2007, HH 07/10674.
[5] Maritime declaration.

1.2.3 The scene of the accident

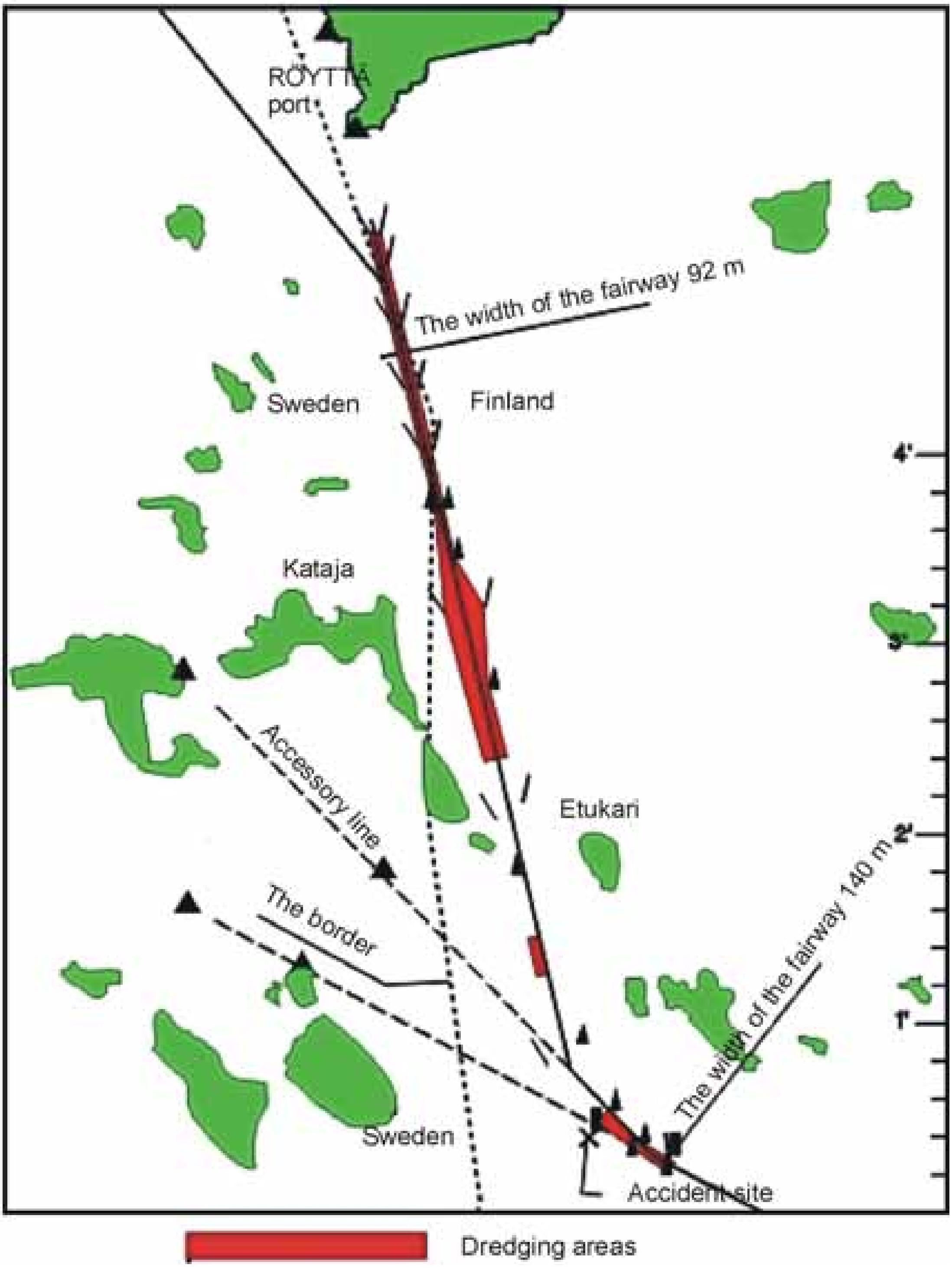

Figure 4. Dredging operations in the Röyttä fairway. The chart data and the dredging areas are copied from the Finnish Maritime Administration notices.

An eight-metre-deep fairway leading to the Röyttä harbour in Tornio parted from the ten-metre-deep Ajos fairway. After the dredging operations were completed, the draught was 9.0 metres. The distance from the crossing to Röyttä was 13 nautical miles. There were four fairway lines. The scene of the accident (Figure 5) is approximately 7.7 nautical miles north-west from the crossing of the Ajos and Röyttä fairways.

The fairway is 92 metres wide before the harbour for a distance of approximately two nautical miles.

The tonnage for the maximum-sized vessel for this particular fairway is 17,000 dwt, the vessel's length 164 metres and breadth 23 metres. The breadth of the one-way fairway is four times the breadth of the vessel, i.e. 92 metres, and the radius of the bends is 850 metres (0.45 nautical miles).

Due to the narrowness of the fairway, the Finnish Maritime Administration has given the following wind recommendations:

- Between Röyttä harbour – Kataja, at NE-S-NW winds the upper limit is 8 m/s.
- Between Kataja – Etukari, at NE-S-NW winds the upper limit is 15 m/s.

The wind limit is naturally prevalent concerning the narrowest part of the fairway, where the wind limit recommendation for a maximum-sized vessel is 8 m/s. Between Röyttä harbour – Kataja, the upper limit is 8 m/s at NE-S-NW winds. The visibility recommendation for the narrowest part of the fairway is one nautical mile[6].

The wind limits apply to the largest vessel allowed in the fairway, i.e. the design ship. The CLAUDIA was a small vessel, and she could operate also when the wind speed was higher.

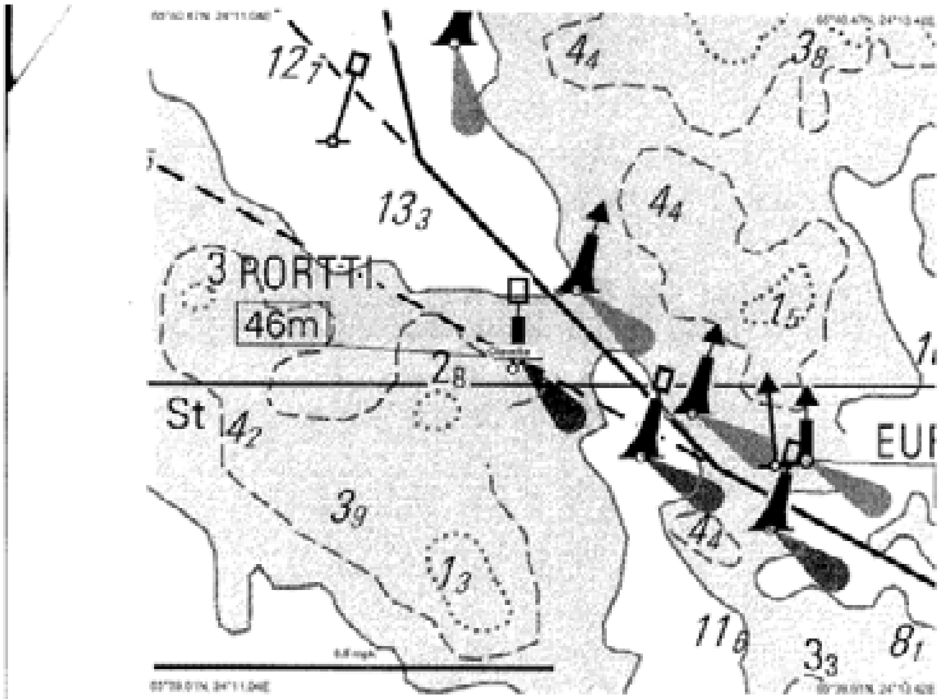

Figure 5. The scene of the accident in the Röyttä fairway[7].

[6] Information about the fairway is from the Finnish Maritime Administration Tornio 8-metre-fairway waterway chart 2.6.2004.

[7] The chart is supplied by the Border Guard. The chart is copied using a programme, which prints in the copy the coordinates for the measuring stick and the chart corners.

1.2.4 The event

The vessel departed from Röyttä harbour on 23 October at 19:00[8]. The draught at the bow was 5.25 metres and at the stern 6.6 metres. The master, pilot, chief officer and cadet were on the bridge. The watchkeeping rating came to the bridge after the departure. In the harbour area, the master manoeuvred the vessel himself. After the vessel had reached the straight direction of the fairway, the master asked the pilot to pilot. The master switched on the autopilot to the course 169°. The drift was 2°. The master started to monitor the pilotage. He stood behind the pilot. The distance to the following turn was approximately 5.1 nautical miles in the direction 167°. The speed was increased to 12 knots. According to the pilot, the speed was 11.6 knots. The pilot used the radar with a scale of 1.5 nautical miles and monitored the harbour lead in the buoyed fairway. When the vessel was approximately at Kataja (Figure 4), the pilot saw that the dredgers were still moving. The speed of the vessel was then 11.6 knots. The pilot asked on VHF channel 6 whether the fairway was free; the dredgers informed that they would exit the fairway. The discussion was carried out in Finnish. The master stated in the maritime declaration that he could not understand the discussion in Finnish.

The moving of the ATTILA was commenced at 19.05, and it was outside the fairway at 19.10. The CLAUDIA was then 3.7–3.8 nautical miles from the dredgers[9].

At Etukari the pilot changed the radar to 0.75’ scale.

According to the pilot, the master had on the previous voyages reduced speed before the turn. The master said that he had trusted the pilot. According to the master, the speed is usually reduced to 80% in the narrow passage, but this time this was not done[10]. There was no discussion on the matter.

The master reduced the speed to ten knots before the turn[11].

The pilot could not see the green buoy lights, because the barges' floodlights were too bright. The dredgers KUOKKA-PEKKA 2, ATTILA and the motor-driven barge JUPITER were on the north side of the fairway. Their floodlights formed “a chain of lights”. The pilot told that the floodlights also disturbed the visibility of the red lights of the fairway. According to the master, bright lights in a fairway are illegal. According to the pilot, the LED lights of the buoys were difficult to see from some angles. At the time of the accident the wind was SSW-erly, 10–12 m/s. The buoy lanterns had been installed in 2002. No official records on the measuring of the light effects on the lantern installations were made at the time. The wind and the sea incline the buoys, and the visibility of their lights decreases because the light sector gets smaller when there is an inclination.[12] The pilot could not see the light of the red border mark.

[8] According to the pilot, the departure took place at 19.05.
[9] Master of the barge JUPITER.
[10] The normal full speed of the vessel is 15 knots.
[11] The pilot’s report.
[12] A telephone conversation with SABIK Oy, MPV/LED light manufacturer, confirms this.

The pilot tried to find the buoys on the radar screen. He reduced the radar scale to a scale of 0.75 nautical miles. There was sea clutter on the radar. He told that he had noticed that in the radar types in question there is a characteristic feature, which in connection with a change of scale causes a need for 2–3 sweeps before the picture becomes stable. It was difficult for the pilot to deduce the starting point of the turn, as there were no fixed targets. He had to navigate on the basis of the buoys.

The pilot noticed that the turn came too late. He asked the master to switch over to manual steering. The master switched on the manual steering. The pilot gave the master the helm order "20 to port" and immediately after that "hard to port".

In the investigation, the helm orders were simulated by using a work-station simulator. According to the simulation, the rudder was turned 20° to port at 19:41:26 and hard to port after six seconds. The vessel did not turn enough. The master had reduced the speed, which was only 7–8 knots at the time of the grounding. The pilot went to the bridge wing. At that point he saw the border mark ahead to port. The pilot told the master to stop the propeller. The vessel stopped south of the border mark at 19.43. The master told that the speed had been 7–8 knots (Figure 6). At 19.45 it was established that the vessel was aground[13].

[13] It is stated in the written report given by the barge JUPITER's master that the CLAUDIA's pilot had informed the ATTILA at 19.35 that CLAUDIA had run aground. The time of the grounding varies 13 minutes in the written statements. The reconstruction made by the investigation is based on the time of grounding being 19.43.

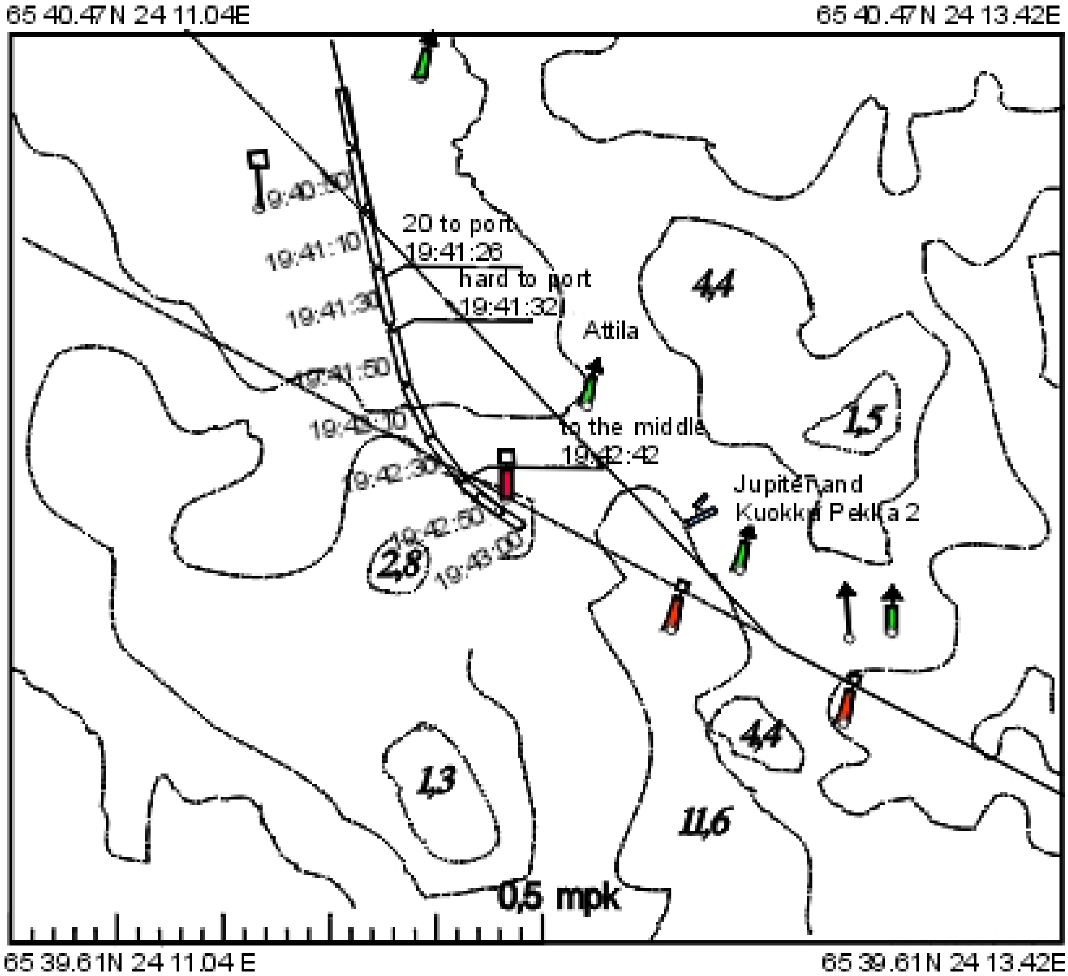

Figure 6. The accident event. At 19:41:26 the rudder 20° to port and at 19:41:32 35° to port[14].

There was a Voyage Data Recorder VDR on the vessel (Figure 3). The VDR data was, however, not available. However, the CLAUDIA's turn before the accident can be simulated to correspond accurately with the track of the vessel. The simulation is based on the following information[15]:

1. The vessel proceeded in the direction 167°.
2. The speed was 10 knots.
3. The distance between the track and the red navigation mark was 0.08'.
4. The first helm order was 20° to port.
5. The second helm order immediately after that was 35° to port.
6. According to a drawing made by the chief officer, the vessel ran aground 15 metres south of the border mark in the direction 120°.

The preconditions above are fulfilled when the rudder is turned 20° to port at 19:41:26 and 35° to port at 19:41:32.

[14] The chart has been drawn on the basis of a chart supplied by the Border Guard.
[15] ANS programme (Advanced Navigation System).

Table 3. Comparison between the CLAUDIA and the mathematical model used in the simulation.

M/S CLAUDIA	The dimensions of the mathematical model
Length 108 m	Length 95 m
Breadth 15.9 m	Breadth 15.5 m

The dimensions of the CLAUDIA and the model are close to each other. The speed was only 12 knots, i.e. the possible difference in the engine power does not have an effect.

Figure 7. A drawing made by the chief officer on the location of the grounding. The drawing describes how the vessel turned after running aground. When grounding, the course of the vessel was 120°.

1.2.5 Measures after the event

The master immediately ordered tank soundings to be taken. The draught of the vessel at the stern was 6.20 metres as it at the time of departure had been 6.6 metres. It was established that the vessel was aground at the stern. The bow was floating.

The pilot informed a maritime inspector and the chief pilot of the Gulf of Bothnia pilot station about the grounding. As a matter of precaution, he also warned the master of the tugboat JÄÄSALO about the possible assistance operation. After several attempts the pilot was able to get contact with the VTS-centre, which told that the Border Guard would send a patrol boat to the location.

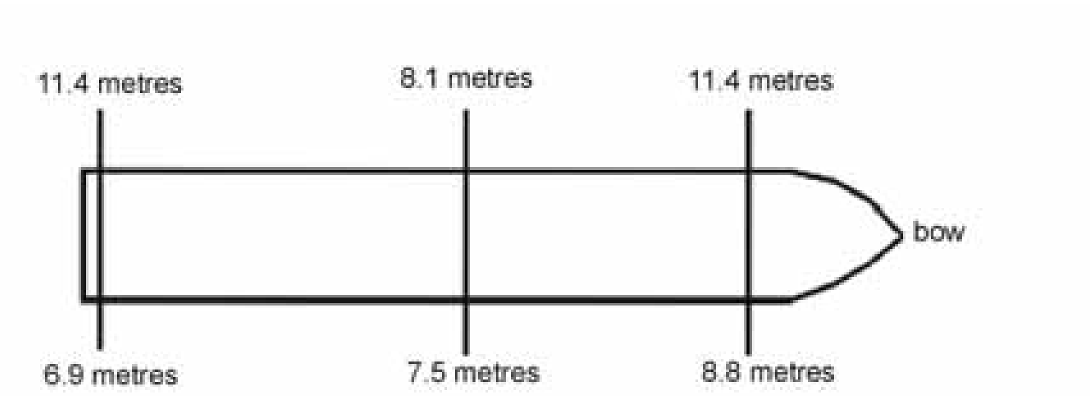

Figure 8. The soundings around the vessel confirmed that it was aground aft.

At no stage did the dredgers turn off their bright floodlights, and they continued the dredging operations immediately after the grounding[16]. The dredger ATTILA started to proceed back to the fairway between 19:50–19:57[17]. At 20.38 the pilot asked the dredger to move aside and the ATTILA to leave the fairway so that there would be enough space for the CLAUDIA to turn.

The CLAUDIA's crane was driven to the bow, and water was pumped to the forepeak. With the help of the moving of the weights, the vessel came off the ground at 19.54[18]. The CLAUDIA was turned, and she started to proceed back to Röyttä. The vessel behaved well, i.e. the propeller and the rudder were not damaged. The pilot phoned the vessel broker so that the broker would order the police to the shore to do the breathalyser test. The Border Guard helicopter searched the fairway and could not detect any patches of oil.

At 22.19 the CLAUDIA returned to Röyttä quay from where it had departed.

1.2.6 Injuries to persons

There were no injuries to persons.

[16] The master in the maritime declaration hearing.
[17] The master of the barge JUPITER.
[18] Maritime declaration.

1.2.7 Damages to the vessel

- There were leakages in tanks 3, 4 and 6. There were no oil leakages.
- The forepeak was dry. The DT tank was dry.
- STS 1 port was dry
- STS 1 starboard, water level one metre (ballast water).
- *Double-bottom tank (DB) 3 port was damaged, 42 cm of water.*
- Double-bottom tank (DB) 3 starboard was dry.
- *Double-bottom tank (DB) 4 port was damaged and full of water.*
- Double-bottom tank (DB) 4 starboard was dry.
- Double-bottom tank (DB) 5 port was dry.
- Double-bottom tank (DB) 5 starboard was dry.
- *Double-bottom tank (DB) 6 port was damaged. 8 cm of water.*
- Double-bottom tank (DB) 6 starboard 248 cm of ballast water.
- *The pipe channel was damaged. After the grounding an alarm of a serious danger was made.*

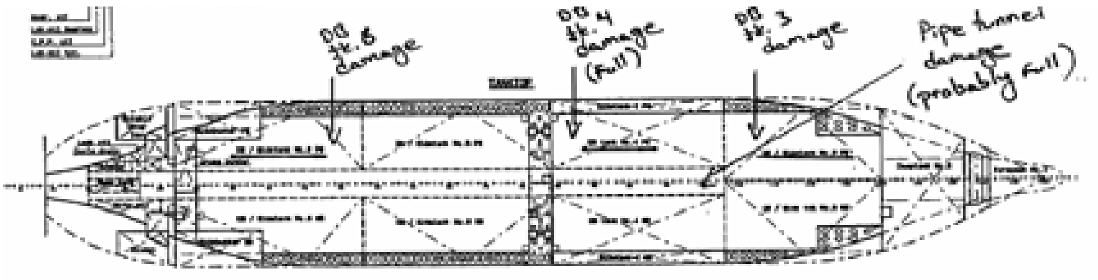

Figure 9. The damages to the bottom of the vessel in the sketch and the list above.

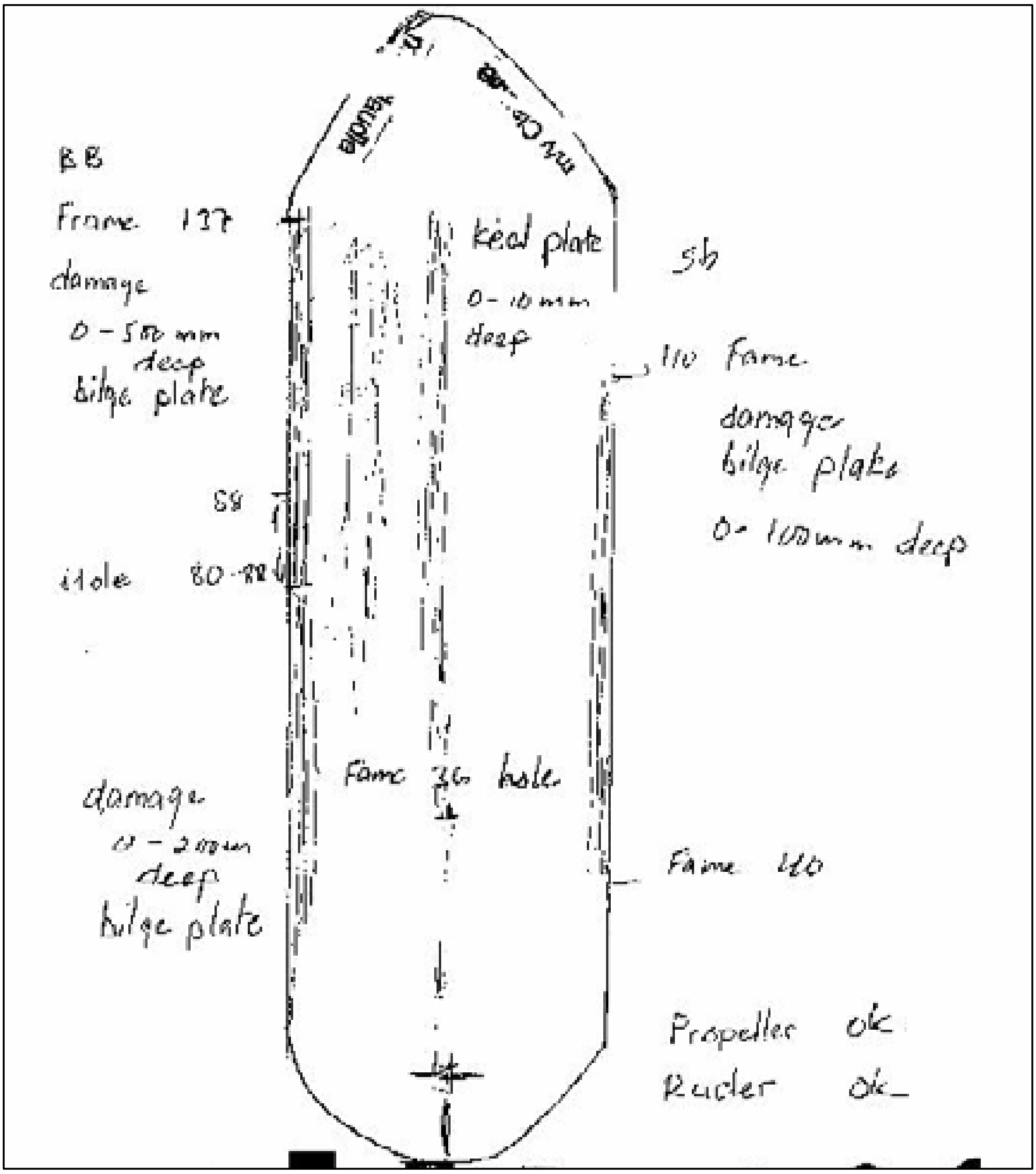

Figure 10. A drawing made by a diver on the damages to the bottom.

1.2.8 Other damages

There was no environmental threat.

1.2.9 Fire

There was no fire.

1.2.10 Registration equipment

There was a Voyage Data Recorder (S-VDR) device on board the vessel. The master did not register a recording within 12 hours of the event. Therefore the recording was not at the disposal of the investigation.

VDR-devices are becoming mandatory on all vessels in international traffic within a transition period. Registering the data of the device and using it in the examination of abnormal situations is something new.

The shipping company of the vessel had not given permanent instructions as to the registering of VDR-data in an abnormal/accident situation before the accident occurred. The investigators received information from the flag state authority that such instructions were given to all the shipping company vessels after the event.

The Accident Investigation Board and the Border Guard have agreed that after an accident has occurred, the coast guards who come to the scene make sure that the vessel officers register the VDR-data.

1.2.11 The operation of the supervision and the VTS systems

The Bothnia VTS system was being renovated. It has not been possible to get reliable registration information. There were power failures at the VTS-centre during the accident.

1.2.12 Aids to navigation in the fairway

According to the maritime declaration, the navigation marks were in order.

1.3 Rescue activities

There was no emergency situation, and no distress alarm was given. Because of this, the radio communication was confidential and limited only to the information sent from one radio station to another station. There were no rescue activities.

1.3.1 Alerting activities

The Border Guard received information about the accident at 19.58.

There was no emergency situation corresponding to those presented in the Radio Regulation.

The Border Guard has registered the incident as an alarm situation.

The following parties were alarmed:

- Rovaniemi Air Patrol Squadron duty helicopter OH-HVE
- Kemi naval station's patrol boat PV 313
- The Finnish Lifeboat Institution/Tornio rescue vessel KARPPE
- Tornio Fire Brigade
- Finnish Maritime Administration inspector
- Finland's Environmental Administration,
- Duty Officer of the Oulu coast guard area
- Traffic manager of the western Finland maritime area, and
- Turku Radio.

MRCC Turku was in contact with MRCC Gothenburg, because the scene of the accident was very near Swedish territorial waters.

1.3.2 Rescuing the vessel

When the situation had been stabilized and there was equipment at the scene of the accident, the vessel got off the ground when the ballast was pumped and the deck crane was moved; the vessel proceeded back to Röyttä harbour. The cargo of the vessel was unloaded there, and the vessel proceeded to a shipyard in Gdynia, Poland, for reparation.

1.4 Dredging and using the fairway

The Tornio fairway had been improved by dredging operations which had continued for almost two open-water seasons. The contract work agreement had been signed on 26 June 2006, and the work in the fairway was supposed to be finalized by the end of 2007. Agreement upon the cooperation between the dredging operations and the fairway traffic had been made in a site meeting. The meeting memorandum[19] from 29 June 2007 on the traffic during the dredging operations includes extensive recordings on the contact information of the different parties and persons involved and the principles for communication. After the meeting the chief pilot sent the notes he had taken to the pilots in the area.

According to the chief pilot of the Bay of Bothnia pilot area[20], difficult situations started to occur towards the end of autumn 2007 as dredging operations interfered with navigation. He thought that the pressure to complete the work before the sea started to freeze could have been the reason.

[19] Memorandum, the Finnish Maritime Administration/fairway maintenance, Regional Waterways Division, West Finland, Diary number: 1360/65/2006

[20] Telephone conversation 8.1.2008.

2 ANALYSIS

The analysis is based on the investigation material, the maritime declaration and the minutes received on the maritime declaration. External factors and their effects on safe navigation are dealt with first.

2.1 Buoyage and the dredging operations in the fairway

Dredging operations during season 2007

The chief pilot, who had attended a meeting between the various parties as the pilot representative at the end of June, sent other pilots an e-mail, in which he told about the dredging operations and policies during the operations.

It had been informed that the timetable of the dredging operations was 10–12 weeks, depending on the weather. In other words, at the end of October the operations were clearly behind schedule. The wind limit for working in the outer working area had been informed to be approximately 8 m/s; "Portti" is such an area. The set wind limit was not followed, as the wind speed during the accident was 10–12 m/s.

As to communication it was agreed that the dredger ATTILA would be on call on VHF channel 6 and act as the contact ship of vessel traffic. The pod barges URANUS and JUPITER were also active on channel 6.

The pilot was supposed to inform about entering the dredging area two hours in advance when coming from the sea. The ship broker took care of the notifications on behalf of the departing vessel. The contact information[21] of the various persons involved had been listed to the full extent.

The dredging vessels were supposed to exit the fairway area completely if the fairway was used by a gas carrier.

The information and instructions sent by the chief pilot to other pilots are different from the memorandum kept in the meeting as to two entries:

The timetable for the contract is according to the memorandum 1.7.–31.12.2007. The wind limit is not mentioned in the meeting memorandum. According to a dredger foreman there were no weather limits restricting the operations; the direction of the wind and sea determined whether it was possible to dredge.

It is mentioned in the meeting memorandum that the agreed matters were also to be notified to vessels which had no pilot, but there was nothing about how this would be done and who would do it.

Assessed as a whole, the cooperation meeting covered matters quite well, but the safe integration of vessel traffic and dredging operations was not detailed enough. The meet-

[21] Company, person, telephone number.

ing was held in the summer, and nothing was mentioned about the dredger floodlights either in the memorandum or in the e-mail sent by the chief pilot.

Buoys and lights

The ice buoys used as fairway marking had been fitted with MPV/LED[22] lights. The visibility of the buoy lights can decrease if a buoy is inclined towards or away from the person who is looking at it. At the time of event, the wind and sea were relatively strong from the direction SSW. Although the buoys have probably been somewhat inclined, the inclination direction has been such that the lights have been visible from the CLAUDIA. On the other hand, the blinding effect caused by the floodlights of the dredger did prevent perceiving the light of the buoys.

Dredging operations from the pilot's and vessel's point of view

The aim of the dredging operations was to improve the maximum authorised draught and safety of the fairway. When dredging operations are performed, they do, however, cause extra requirements as to the safe navigation of vessels in the fairway. In some situations the dredgers keep in the fairway when vessels pass the dredging object. This reduces the margin required by the manoeuvring of the vessel in a continuously changing environment.

Dredging operations from the operation executer's point of view

The foreman on the dredger ATTILA told[23] that dredging is a continuous, round-the-clock shift work. A dredger does not have propulsion machinery of its own, but it is moved with the help of pod barges as side-towing. It was customary to start moving away from the fairway when the approaching vessel was at the distance of approximately four miles. AIS is a great help in the planning of this. On the whole, the passing of a vessel causes slightly more than half an hour of working time to be lost. Some pilots required the dredger to completely leave the fairway area; others did not require this if the dredger was in the fairway area but away from the centre line. When comparing different localities, the foreman told that in the Tornio fairway the dredgers were required to maintain on average longer distances from the fairway centre line than in the southern parts of Finland. The investigators' understanding is that the before mentioned requirement was caused by the narrowness of the fairway and the fact that the fairway was frequently used also by liquefied petroleum gas carriers.

There were no particular weather limits as to the dredger, and the vessels navigating in the area did not have to reduce their speed because of the dredger.

According to the foreman, the pilots/vessels never asked them to switch off the floodlights; only their own barges commented on the matter when fastening to the side of the dredger.

Vessel traffic in the dredging area is a factor which from time to time interrupts the operations, and this is something that simply has to be accepted. Making right-timed traffic

[22] SABIK Oy, MPV/LED, Led Ice Buoy Lantern
[23] Telephone interview 9.1.2008

notifications would be important. Occasionally a vessel reports that it will leave the port after five minutes, and the dredger which is at the dredging scene in the vicinity is moved away. The vessel, however, does not depart until after a couple of hours and time is lost.

On the whole, those constructing the fairway and those using it do not cooperate but instead try to bother each other as little as possible.

2.2 The character of pilotage operations

In the maritime declaration, the master and the pilot explained how the dazzling of floodlights had a decisive effect on the failure of manoeuvring. At the same time questions were asked, which gave the pilot the possibility to explain how pilotage differs from ordinary navigation. He explained how checklines have become history and how pilotage operations can be supported in the future.

The pilot was asked the following questions at the maritime declaration:

1) *How is this turn usually manoeuvred?*
2) *Could any buoys be seen on the radar?*
3) *Why was the checkline not used?*
4) *Had there been any means to stay in the fairway?*

The questions were central as to pilotage operations. The answers given by the pilot were clear, but in a situation such as a maritime declaration it was not possible for him to give an extensive statement. Therefore attention has been paid in the investigation to analysing the fundamental answers.

1. ”How is this turn usually manoeuvred?”

The pilot told that when the vessel reaches the first green buoy, it has already turned a couple of degrees and it has a small angular velocity. After this an even arc is maintained.

The pilot regulates the rudder angle in such a way that the vessel passes the buoys as shown in Figure 11. The relative movement of the buoys represents the pilot with the angular velocity and the speed of the vessel. The pilot can in his mind outline the turning radius graphically. He cannot interrupt following the relative movement of the buoys, not for a moment, because then he would lose control of the motion of the vessel. The pilot made this clear when he said that *“if the buoys cannot be seen, then there is no pilotage"*. The visibility of the buoys was of crucial importance.

The pilot cannot apply the bend radius theory into practice. The technical requirements do not support pilotage. There is not equipment suitable for bend navigation and pilotage on the vessels, because these are not required by authorities[24]. Pilots have not been allowed to come forth with demands for equipment that would be essential for the

[24] In the European river traffic, the following are required: an angular velocity gyroscope, automatic steering which turns on the basis of an angular velocity order, and a radar display which is always Head Up.

work. Angular velocity gyroscope is necessary when it comes to controlling turns. The cheapest way to calculate angular velocity is to use the gyro-compass. The most important thing for a pilot is to identify the momentary bend radius.

The normal turn described by the pilot was simulated on a working station simulator (Figure 11 and Table 4). The simulated turn was started at 00:32 when the stern of the vessel was approximately at the green buoy. The turn started with a helm angle of 8° (Table 4). The rudder angles were small during the whole turn. Wind affected the manoeuvring in the same way as in the accident situation. If the weather had been calm, the rudder angles would have been even smaller.

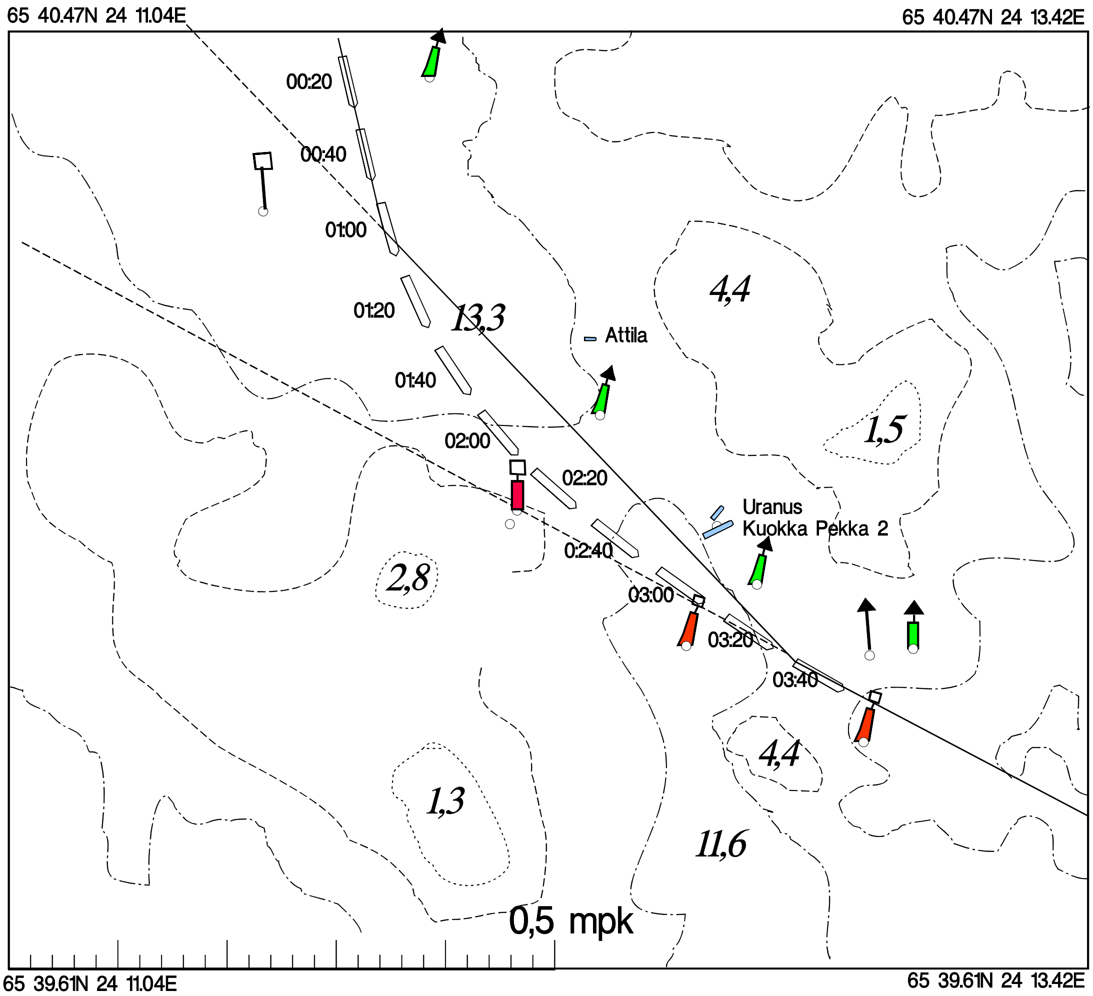

Figure 11. The turn described by the pilot was studied with the help of simulation. The times have been measured by the simulator clock starting from the starting moment.

Table 4. *The turn described by the pilot presented in numerical form. The table shows the turn illustrated in Figure 8. A negative value indicates a turn to port.*

Simulation clock	Speed [in knots]	Heading of the bow	Angular velocity ψ [°/min]	Turning radius, R [nautical miles]	Rudder angle [°]	Helm order
00:32	12,2	166,2	03,2	+3,6	-8,5	-10
00:40	12,2	165,7	11,1	+3,6	-6,5	-5
00:58	12,3	162,2	-14,3	- 0,82	-8,5	-10
01:00	12,3	161,7	-16,5	- 0,7	10,0	
01:07	12,4	159,0	-22,2	- 0,53	-5,3	-5
01:10	12,4	158,2	-22,0	- 0,53	-1,5	0
01:16	12,4	156,2	-19,9	- 0,59	-3,5	-5
01:20	12,4	154,8	-21,9	- 0,54	-5	
01:29	12,5	151,6	-24,8	- 0,48	-5	-0
01:39	12,5	147,7	-22,8	- 0,52	0	-5
01:45	12,6	144,5	-24,0	- 0,50	-0,1	0
01:50	12,6	143,0	-22,1	- 0,54	0	
01:54	12,6	141,5	-22,1	- 0,54	-4,9	-5
02:08	12,7	135,0	-24,5	- 0,49	-1,5	0
02:28	12,8	129,2	-17,5	- 0,69	0	5
02:40	12,9	126,9	-6,1	- 2,0	-1,8	-3
02:54	13,0	126,2	-0,8	- 15,1	-6,5	8
03:07	13,0	125,5	-7,6	- 1,6	-13,0	-8
03:10	13,0	124,5	-8,5	- 1,6	-4,5	-3
03:16	13,0	124,2	-6,6	- 1,9	-,6,5	-8
03:20	13,0	123,7	-8,7	- 1,9	-11,5	-13
03:23	12,1	123,0	-12,0	- 0,96	-8,1	-8
03:32	13,1	121,3	-12,1	- 1,0	-4,5	-3
03:50	13,2	118,6	-7,1	- 1,8	-3,0	-3

The change of course is 47° from the line 167° to the line 120°. The turn ends at 03:50. The mean value of the angular velocity in the simulations is 13.74°/min to port. The mean value of the speed is 12.63 knots. ($R \approx 0{,}955 \times (V / \psi)$, V = the speed in knots, ψ = angular velocity ° / minute). The approximate value of the bend radius is 0.88’. The middle part of the bend as measured from the chart is an even arc of 0.61’ (Figure 12). The sharper the turn, the shorter the even bend part of the turn. As to manoeuvring, gentle bends are the easiest ones to control.

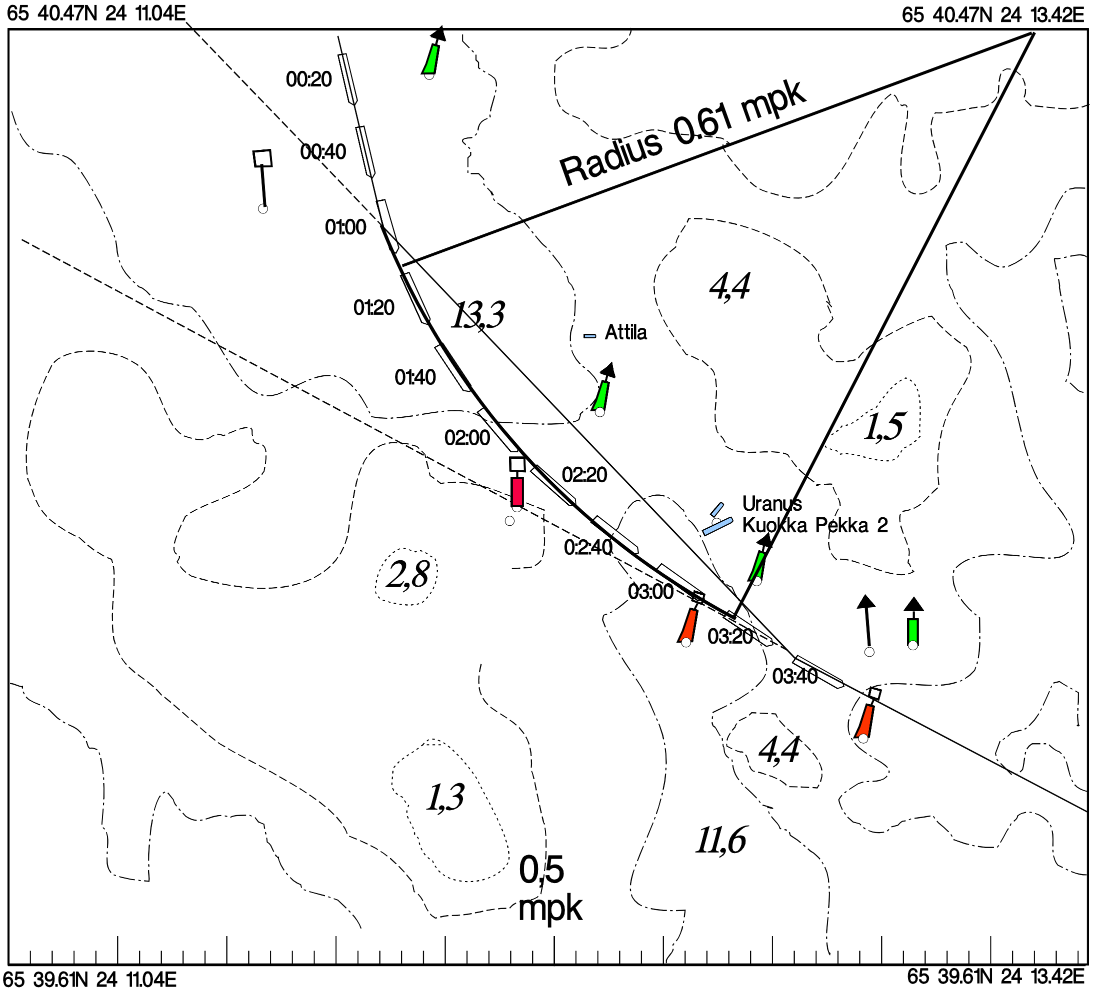

Figure 12. When measured from the chart, the even bend part is 0.61' nautical miles. At first the bend is gentle, then it stabilizes at the middle part of the bend, and becomes gentler again in the end.

The track describes how the vessel enters the narrow passage with an almost steady heading. This is the objective of piloting.

2. "Could any buoys be seen on the radar?"

To monitor relative movement on the radar is more difficult than to do it optically. When it is windy, the echoes caused by waves, i.e. sea clutter, disturb the interpretation of the radar picture. Reducing sea clutter becomes more important for the pilot than interpreting the motion of the vessel. It has to be noted that sea clutter has an adverse effect first on the controlling of the vessel's movement and after that on determining the position.

The effects of sea clutter on the radar picture are shown in Figure 13. The pilot has to concentrate to a disproportionate extent on the quality of the radar picture. The buoys can always be seen in the right position, but the specks caused by waves change places with every sweep made by the radar antenna.

Figures 13 and 14 illustrate the radar sea clutter according to the simulation clock of chart pictures 11 and 12 at 01:40. The temporary course of the vessel was 147°. As to the sea clutter, the figures are only the investigator's mental picture. There could have been considerably more sea clutter. There is less sea clutter in this figure so that it is possible for the reader to identify the positions of the buoys.

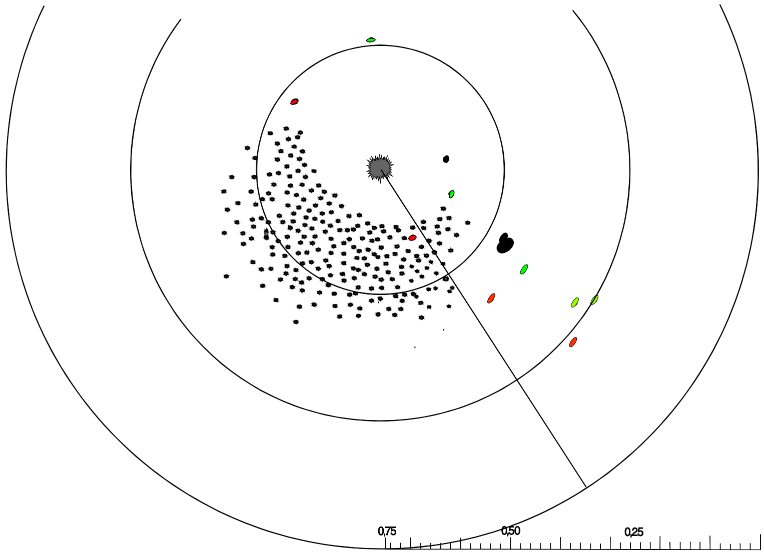

Figure 13. The normally used NORTH UP display. The scale is 0.75 miles from the centre to the side of the radar scope. For the sake of clarity, the navigation marks have been drawn using colours, but there were no colours on the radar display.

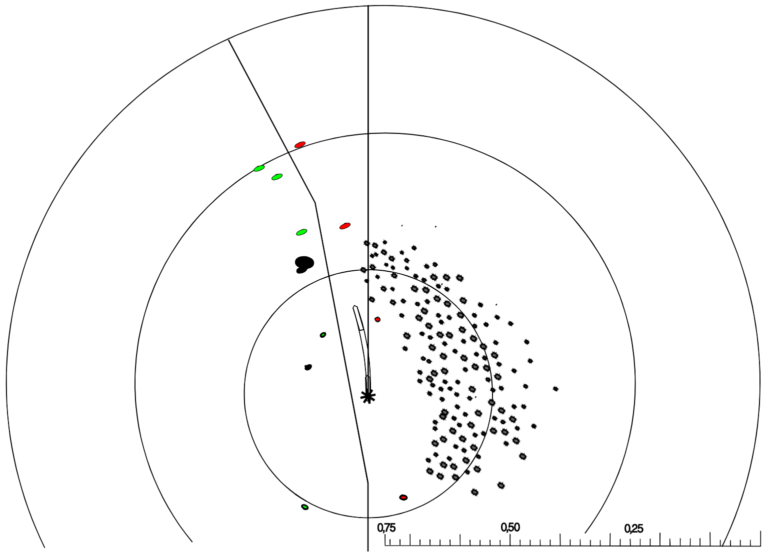

Figure 14. COURSE UP display gives the targets the same bearing as the view from the window. There is a 40-second-prediction of the motion of the vessel on the display. The temporary course of the vessel is 147°. The route plan describing the fairway line following the IMO requirements can also be seen on the radar display.

The COURSE UP display which shows a prediction of the vessel's motion makes monitoring relative movement easier, but sea clutter still disturbs. The vessel's officers can prepare for sea clutter by programming the navigation lines of nautical charts on the radar. This would indicate the deviations from the fairway.

The IMO technical standard recommends that it must be possible to programme a track in the radar[25]. The IMO gave recommendations on route planning as early as in 1973. The first STCW Code[26] in 1978 made requirements on route planning. The latest requirement on route planning was made in the revised STCW Convention in 1995[27].

There is a clear requirement on route planning supported by the technical standard of the radar. This should convince the seafarers and shipowners on the necessity of a plan.

As to bridge work, route planning is the most important requirement issued by authorities, and it has been in force since 1978. Later on it became mandatory in the national regulations.

Because the authorities do not control route plans, it has become customary not to make route plans. The controlling should be part of the normal annual seaworthiness inspections and Port State Control inspections. As early as in 1989 the Accident Investigation Board recommended that route plans should be checked in connection with inspections[28]. The Accident Investigation Board repeated the same recommendation in 1997[29], but the Finnish Maritime Administration declined and referred to the fact that route planning is an IMO recommendation. The Accident Investigation Board emphasized the importance of route plans with reference to bridge cooperation in 1998[30]. The Finnish Maritime Administration was of the opinion that its route planning instruction from 1995[31] was adequate. The instruction clearly declared that the Finnish Maritime Administration required a route plan. The Finnish Maritime Administration repealed its route planning instruction in 1998 by taking it off the list of valid Information Bulletins. The requirement on route planning has been published in a regulation by the Ministry of Transport and Communications[32] in 1997.

[25] IMO, Performance Standards for Shipborne Radiocommunications and Navigational Equipment. Res. MSC,192(79) 6 Dec. 2004. Adoption of the revised performance standards for Radar Equipment, Annex, paragraph 5.32.1 "It should be possible for the user to manually create and change, save, load and display simple maps / navigation lines / routes referenced to own ship or a geographical position".

[26] International Convention on Standards of Training, Certification and Watchkeeping for seafarers. 1978.

[27] IMO, STCW Code, Table A-II/2.

[28] TEBOSTAR – LADUSHKIN collision 5.9.1989. Investigation report 3/1989.

[29] MARJESCO grounding 1997. Investigation report 3/2001M.

[30] MARIE LEHMAN grounding 1997.

[31] Route plan required by the vessel, the Finnish Maritime Administration Information Bulletin 19/1.12.1995.

[32] Ministry of Transport and Communications Decision on the Manning of Ships, Certification of Seafarers and Watchkeeping 19.12.1997. The Finnish Maritime Administration Information Bulletin 2/19.1.1998.

The instructions on route planning have moved to the equipment manufacturers' manuals. In CLAUDIA's Furuno FR-2115 radar there is the option to programme the track, the shallow water boundary and the navigation marks manually according to the coordinates. A track which follows lines only would have helped to commence the turn at the right moment. The route plan must be made before the voyage. The same plan is always valid if the channel alignment of the fairway does not change. Now there was no route plan. A plan would have prevented the grounding.

3. "Why was the checkline not used?"

Background to the development of fairway navigation. There were not any fairway beacons at the end of the 19th century.[33] Fairways were not used for night-time navigation. Not many fairway lines were drawn. There were no extra navigation lines. In 1904 an illuminated fairway circled the coast of whole Finland[34]. All beacons were sector lights. On long, straight passages lines started to be used to support the marking. When vessels started to navigate the fairways at night, the problem of how to define the starting of a turn in dark came up. The need for a checkline had arisen. At first they were marked by using sector lights.

Radar changed navigation significantly when fairways started to be used for navigation also in restricted visibility in the 1950's. The turn had to be made without the help of beacons. In a straight fairway the position of the vessel could be easily checked at passing distances, but determining the position in turns was difficult. Groundings usually took place in turns. There were attempts to make bends easier by using new checklines. A major change in course was divided into two smaller turns. Despite this, there were still groundings.

At the beginning of the 1960's there were a lot of accidents and incidents. Finally, at the end of the 1960's, it was clear that radar navigation would have needed a new bend navigation theory and equipment adapted to its needs. The equipment was not modernized but checklines were added to the fairways. If there were not any checklines in the chart, pilots and masters planned these themselves. This became customary. It would have been easier to change the manoeuvring modes of vessels than to add checklines and beacons.

As to radar navigation, in the 1970's and 1980's the example set by the European river traffic, in which the ROT indicator was a requirement, was being followed. The use of angular velocity became more common when it was possible to give the autopilot turning orders by using angular velocity. Finally, in the 1990's it was possible to take the turns gently by using angular velocity orders. Checklines remained as reminiscences of the old manoeuvring way, which originated from the lack of correct bend geometry. The checkline is an old, historical phase, and CLAUDIA's pilot had deemed the use of it un-

[33] Jan Strang, Erkki-Sakari Harju and Seppo Laurell, Suomenlahden kartat 1880, Genimap 2006. ISBN 951-593-002-2.
[34] Kartblad till lista över Finska Fyrar och Mistsignalstationer. 1904. Öfverstyrelsen för Lots- och Fyrinrättningen i Finland. Helsinki 1905. Weilin & Göös Aktiebolag.

necessary. This was the correct action, because if he had monitored the stern lead, he would have simultaneously lost the idea of the motion of the vessel during the turn.

Piloting the CLAUDIA. The CLAUDIA's pilot did not follow the conservative checkline theory. He had planned his navigation according to the long bend. In this he applied the old way of piloting, which does not rely on equipment. In this method the pilot deduces the turn speed from the relative movement of the navigation marks in the window. It is possible to learn this way of manoeuvring on the basis of long experience. It requires advanced observation skills.

It is difficult for an outsider to understand that a pilot has to learn his/her job him-/herself[35]. As to piloting, there is no textbook to cite. The manoeuvring principle that the pilot followed was the correct one, but the dredgers’ bright floodlights and the sea clutter on the radar prevented it from succeeding.

The pilot and the master were asked why they did not monitor the checkline backwards. The pilot answered that he never monitored the checkline in question when proceeding southwards. When proceeding northwards, it is monitored. It is natural that the line is monitored when proceeding northwards. The line is in any case in the field of vision when the proceeding direction is towards the checkline. When proceeding southwards the line is left behind. The pilot said that the checkline is crossed twice when steering the gentle bend (Figure 9). The pilot himself could not look backwards. It is certain that the pilot loses the sense of relative movement which he has formed on the basis of navigation marks if the looks backwards.

The pilot does not think about the past when piloting a vessel. He/she anticipates. He/she does not think about the position they are in at that moment, because he/she has concentrated on it earlier. He/she concentrates on the future. For a pilot, the present is already part of the past. He/she concentrates on adjusting the rudder angle in such a way that he/she can deduce the future position of the vessel. He/she adjusts the future position all the time. He/she tries to see the vessel in some tens of seconds ahead in the future.

The questions which the pilot was asked at the maritime court showed that a pilot's job description was not clear to the persons asking the questions. Concepts corresponding with textbooks in navigation are often applied to a pilot's work. This is understandable as there is no textbook in piloting. A pilot should be heard in such a way that the listener takes his/her position. This is not easy to do if the person is not familiar with the fundamental nature of piloting.

4. “Had there been any means to stay in the fairway?”

The vessels’ bridge equipment is not primarily designed to meet the requirements of piloting. Piloting would require standardized manoeuvring equipment and radar displays. In this respect, the rule-makers have left the pilot alone. Not a single navigation device has been developed to meet the pilots’ needs.

[35] ”Learning by Doing”

Finally, a maritime authority representative asked the pilot: “Had there been any other means to stay in the fairway?” The pilot was surprised by the question, because it was something that he had hardly been asked before the accident. After a short reflection, he answered without hesitation: *"An electronic chartplotter".*

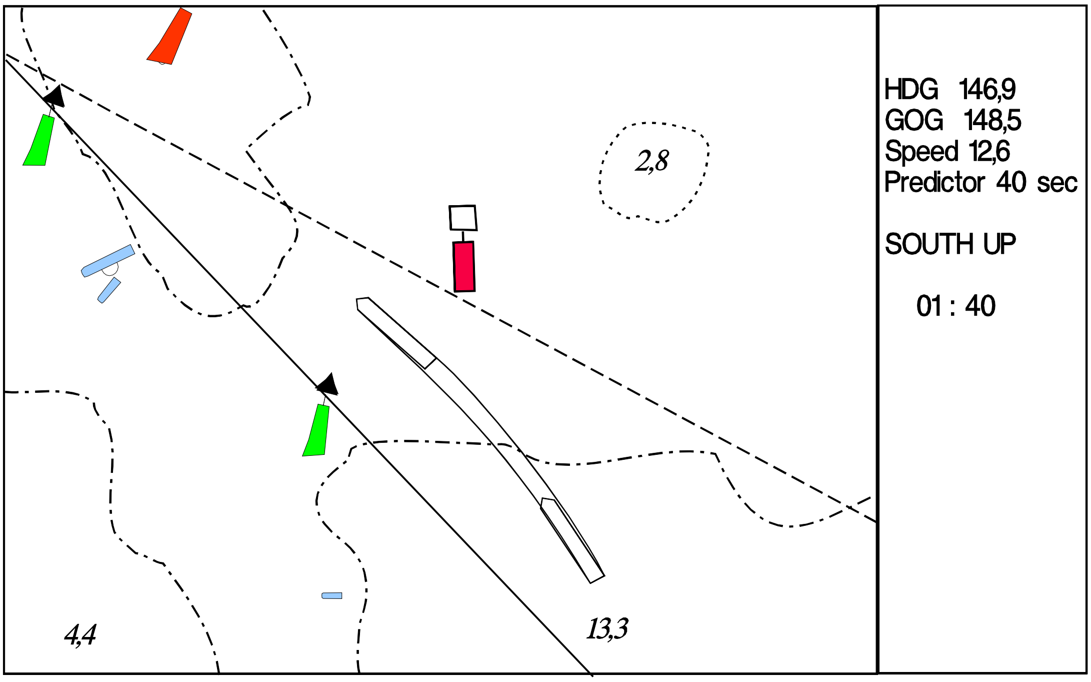

Figure 15. An example of an electronic chartplotter with its predictors; the most important numerical information on the right side of the picture. The chart is in this case turned “south up” so that it would better correspond with the visual view.

Figure 15 corresponds to the simulated situation in Figure 11 in accordance with the time 01:40.

A momentary bend radius, the length of which is 40 seconds, has been drawn on the chartplotter. The prediction presents the same motion of the vessel, which the pilot has always interpreted with the help of the fixed objects seen in the window and the field of vision. According to Figure 15, it is not necessary to change the rudder angle at 01:40. The chartplotter does not take into account the sea clutter of the radar or the dazzling effect of the floodlights.

Shipping companies and vessel masters could influence the development of navigational instruments.

Using a pilot is historically compulsory. This is why it has become a custom in seafaring that piloting is an individual performance. This has not given reason for the shipping companies to develop piloting techniques. The bridge instruments, which do not support pilotage, are a proof of this.

At the maritime court an authority representative asked the pilot what he would need and got a clear answer. The pilots should be equipped with portable electronic plotters.

Registration

Registrations in connection with this case did not succeed. On the other hand, documentation was very well kept. The maritime declaration with its hearings and appendices was clear and well documented. The master also gave a notification of the maritime accident to the Finnish Maritime Administration. The master's and the pilot's reports tallied. There are slight differences in the given times, which could have been corrected with the help of the VDR register.

The fact that the registering of the VDR data was not verified indicates that using the device is something new. It was not felt necessary on the vessel or at the shipping company to utilize it in examining the abnormal situation. The vessel did not receive instructions on this from the shipping company. This may be the case in many other shipping companies and on many other vessels.

In connection with accident investigation there has also been situations, in which the shipping company has been reluctant to hand over VDR data and has intentionally not registered of the data.

The Accident Investigation Board and the Border Guard have agreed that after an accident has occurred, the coast guards who come to the scene make sure that the vessel officers register the VDR-data. The flow of information as to this agreement has not been successful.

2.3 Cooperation between the dredging operations and fairway usage

The accident, which has now been investigated, shows that fairway construction can endanger the safe traffic on the site. Before the dredging operations started, a meeting had been held on the cooperation of activities. The common "rules of the game" were agreed upon. It has become the investigation's impression that contracts do not describe the reconciling of everyday activities accurately enough. The point of view of the fairway user was not adequately emphasized so that safe navigation could have been guaranteed in all circumstances. It was agreed upon in the initial meeting that the dredgers would move away from the fairway, but there was no special mention of the floodlights in the instructions. It is important that the visibility of the navigation marks does not suffer due to other lights.

Communication on the VHF channels has not always run according to the standard procedures. The clarity of communications has suffered, and the calls and addresses have not been identifiable. This has caused misunderstanding and uncertainty as to the intentions of the other party. In the investigation the qualifications of the personnel of the different parties were examined e.g. as to radio operator's certificate. The qualifications were in order. It is the investigators' view that the perceived deviations from the standard procedures have been caused by the fact that a small group of persons who knows each other communicates almost all the time. They know each other's voices, and when the communication is only about "own" things, the radiotelephone traffic formalities are forgotten.

From the point of view of the actual vessel traffic, this kind of practice is a risk. Deviations must be dealt with always when standard procedures are not followed. There is no real external control. It is the investigators' opinion that the VTS centres could be active in this matter.

Agreeing upon cooperation should be done thoroughly and on an adequate level of precision. Deviations should be reported to all parties involved, and the agreements should be particularized when necessary.

3 CONCLUSIONS

3.1 Traffic restrictions / dredging restrictions, practices

The dredgers' dazzling floodlights. The master and the pilot told consistently that the dredgers' floodlights blinded them to such an extent that it was not possible for them to see the lights of the fairway border lights. They thought the dazzling effect was the cause of the accident. It is too late if the vessel has to ask for the lights to be switched off. The pilot said that if the fairway lights cannot be seen, then the piloting is usually not carried out. The situation was a surprise for the pilot, and it was not possible to interrupt the piloting.

However, the accident could have been avoided if the vessel had had a route plan programmed on the radar or if the pilot had had an electronic chart with route plans on a hand-held computer.

Route plan on the radar. The IMO resolution[36] proposes that it should be possible to programme the fairway line on the vessel's radar. This option was available on the CLAUDIA's Furuno radar. This makes route planning easy. A route track would have indicated to the pilot and the master that the turn comes too late. The recommendation on route planning has been in force since 1973, and a plan has been required since 1978. This issue has been repeated many times both in international and national regulations. Is spite of this, the maritime authorities do not check at their annual inspections nor at Port State controls that plans exist. Seafarers quickly learn that what is not checked does not need to be done.

Route planning is also looked into in connection with accident investigation. Plans are rare.

The IMO has facilitated route planning significantly by recommending that it should be possible to programme the track in the radar memory. In today's equipment this option is available. Plans are, however, not carried out, because the authorities have not supervised the matter. This situation has gone on for over one generation.

Electronic navigation chart. The maritime authority asked the pilot at the maritime court how similar incidents could be avoided in the future. The pilot thought about the question for a moment and answered without hesitation "an electronic chartplotter", i.e. an electronic navigation chart. Such equipment was not available on the vessel. The pilot cannot count on the fact that there would be a chartplotter on a vessel. He/she can also not count on the fact that a vessel's chart is absolutely correct and that the crew can use the device.

[36] IMO Resolution MSC192(79)2004 Annex 5.32 The display of maps, navigation lines and routes. "It should…"

The pilot has to have the plotter with him/her, and it must include a vector chart produced by the Finnish Hydrographic Office. As the pilot said, a chartplotter would have saved the situation.

VDR, voyage data recording, is nowadays a requirement for vessels. The data is meant not only for accident investigation[37] but also for deviation studies made by the vessel and the shipping company. The data recorded by the device can be utilized in many ways on the vessels. In connection with accident investigations, it has often been noted that data has not been registered or there is reluctance to hand it over. This shows that the objective of the IMO resolution has not been understood.

Shipowners should give instructions to vessels on the securing of voyage data always in connection with abnormal situations. Only in this way is there any possibility to intervene with the real causes of deviations.

[37] IMO resolution A.861(20) *To assist in casualty investigations, ships, when engaged on international voyages, subject to the provisions of regulation 1.4, shall be fitted with a voyage data recorder (VDR)*

4 SAFETY RECOMMENDATIONS

When drawing dredging contracts, it is important that the needs and on the other hand obligations of all parties are recorded in enough detail. Guaranteeing the safety of traffic requires that the compliance with the contracts is supervised and irregularities are handled immediately.

The Investigation Commission recommends that

1. *The fairway constructors would add to their contracts such a traffic-related principle that the construction work must not impede traffic in the fairway. Dazzling lights and radio traffic should be mentioned separately in the contracts.*

The IMO requirement on route planning has been in force for 30 years. The requirement has not been effective, because no inspection activities have been connected with it.

The Investigation Commission recommends that

2. *The Finnish Maritime Adminstration would verify in annual inspections and in Port State controls whether the vessel has a route plan. The inspection establishes the current situation. It is not intended to be used to present criteria for route planning.*

The pilot has no beforehand knowledge of the electronic chart device of the vessel he/she is going to pilot.

The Investigation Commission recommends that

3. *The Finnish Maritime Administration and the Finnish State Pilotage Enterprise would form a workgroup to look into the availability of hand-held computers containing electronic charts suitable for pilots' use.*

Helsinki 11 March 2008

Risto Repo   Kari Larjo   Kaarlo Heikkinen

Merenkulkulaitos

Merituruvallisuus

2693/331/2007
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3.6.2008

Onnettomuustutkintakeskus
Risto Repo
Sörnäisten rantatie 33 C
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Lausuntopyyntönne 5.5.2008, 213/5M

MS CLAUDIA
KARILLEAJO TORNION EDUSTALLA 23.10.2007

Olette lähettäneet kommentteja varten luonnoksen tutkintaselostuksesta C 2/2007M, *M/S CLAUDIA*, karilleajo Tornion edustalla 23.10.2007. Merituruvallisuus-toiminto on tutustunut luonnokseen ja toteaa, että tutkinta on suoritettu huolellisesti ja johtopäätökset ovat johdonmukaisia.

Merenkulkulaitoksen Merituruvallisuus-toiminto haluaa kuitenkin esittää seuraavat kommentit:

1. Merituruvallisuus-toiminnon tarkastajat tarkastavat aina varusteturvallisuus-, ISM- sekä satamavaltiotarkastuksessa, että reittisuunnitelma löytyy sekä tulomatkalta että seuraavalle matkalle.
2. Samalla myös tarkastetaan, että paperiset merikortit ovat saatettu ajan tasalle.
3. Mikäli aluksella on sähköinen merikorttijärjestelmä, tämän kartaston päivittäminen tarkastetaan.
4. Karttaplotteri ei ole virallinen termi ECDIS-järjestelmälle vaan elektroninen merikarttajärjestelmä. Merenkulkulaitos ei tule hyväksymään muita järjestelmiä paperisten merikorttien sijasta kuin tyyppihyväksytyt ECDIS-järjestelmät, jotka täyttävät kansainvälisesti asetetut normit ja käyttävät ainoastaan tyyppihyväksyttyjä ENC-merikortteja.
5. Suomessa ei ole merikarttalaitosta, vaan kartat ja karttojen tiedot tuottaa Merenkulkulaitos.
6. Satamavaltiotarkastuksiin voidaan ainoastaan valita aluksia, jotka ovat järjestelmän sisällä valittavissa tai velvoitettuja tarkastaa.
7. Tänä vuonna ParisMoU:n tehostetussa tarkastuskampanjassa on kohteena V-luku, sisältäen myös reittisuunnittelun.

Merenkulkulaitoksen Merituruvallisuus-toiminto ei katso voivansa yhtyä Tutkintaselostuksen johtopäätelmiin reittisuunnittelun puuttumisesta tai niihin liittyviin tarkastuksiin miten ne esitetään Tutkintaselostuksen johtopäätelmissä.

Merenkulunylitarkastaja Tapio Maskulin

Merenkuluntarkastaja Marko Rahikainen

Merenkulkulaitos 30.5.2008 V-545 274/5M

Onnettomuustutkintakeskus
Sörnäisten rantatie 33 C
00580 Helsinki

Lausuntopyyntönne 213/5 M 5.5.2008

Lausunto onnettomuustutkintaselostuksesta, C2/2007/M,
MS CLAUDIAn karilleajosta Tornion edustalla 23.10.2007

Pyynnöstänne Merenkulkulaitoksen Väylänpito lausuu asiakohdassa mainitusta onnettomuustutkintaselostuksesta seuraavaa:

1. Kohdassa 1.2.3 Tapahtumapaikka kerrotaan:
   "Maksimikokoisen aluksen vetoisuus tälle väylälle on 17000 dwt, aluksen pituus 164 metriä ja leveys 23 metriä. Yksisuuntaisen väylän leveys on 4 kertaa alusleveys eli 92 metriä ja kaarteiden säde 850 metriä (0,45 mailia)."

   Väylä on yksikaistainen, ei yksisuuntainen, ja sillä on kaksi ohitus- ja ankkurointipaikkaa. Väylän minimileveys on 92 metriä. Onnettomuuspaikalla väylän minimileveys on 140 m.

2. Kohdassa 1.2.4 Tapahtuma kerrotaan:

- "Poijujen lyhdyt on asennettu vuonna 2002. Tuolloisista lyhtyjen asennuksista ei tehty valotehojen mittauspöytäkirjoja. Tuuli ja merenkäynti kallistavat poijuja ja näin niiden valojen näkyvyys heikentyy kallistuessaan kun valosektori pienenee."

  Lyhtyjen valovoimia alettiin mitata vuodesta 2003 eteenpäin. Valmistajan mukaan vuosina 2002 ja 2003 valmistetuilla lyhdyillä ei ole mitään merkittävää eroa, joten näinä vuosina valmistettujen lyhtyjen valovoimien pitäisi vastata melko tarkasti toisiaan. Vuonna 2003 mitattujen lyhtyjen kiinteät valovoimat samalla teholla olivat vähintään 40 cd punaiselle ja 53 cd vihreälle (huonoimmat mitatut yksiköt). Onnettomuusalueen poijuviitoille ja poijuille rekisterissä ilmoitetut valotiedot (ilmoitettu kiinteä valovoima 40 cd, tehollinen valovoima 24 cd ja optinen kantama 3,5 M) pitävät siis paikkansa.

  Väylän käännöskohdan jälkeiset kelluvat turvalaitteet (turvalaitenumerot 22559, 22557, 22556 ja 22554) ovat tyypiltään poijuviittoja. Poijuviitat on kiinnitetty esijännittämällä, joten ne eivät juuri kallistele kovassakaan merenkäynnissä.

- "Luotsi yritti löytää poijut tutkan kuvalta. Hän pienensi tutkan mitta-alueen 0,75 mailin mitta-alueelle. Tutkassa näkyi aaltovälkettä. Hän sanoi havainneensa, että kyseisissä tutkatyypeissä on ominaisuus, joka mitta-alueelta vaihdettaessa aiheuttaa sen, että kuluu 2-3 pyyhkäisyä ennen kuin kuva vakiintuu jälleen selväksi. Luotsin oli vaikea päätellä käännöksen aloituskohtaa koska kiinteitä maaleja ei ollut. Oli ajettava poijujen mukaan".

Merenkulkulaitos	Postiosoite	Puhelin	Faksi	www.fma.fi
Porkkalankatu 5	PL 171	0204 481	0204 48 4355	etunimi.sukunimi@fma.fi
00180 Helsinki	00181 Helsinki			

Väylän käännöskohdan jälkeiset kelluvat turvalaitteet (tnrot 22559, 22557, 22556 ja 22554) ovat tyypiltään poijuviittoja, jotka ovat varustettuja hyvillä, kiinteillä tutkaheijastimilla (tutkasopeilla). X-taajuusalueella poijuviitat antavat keskimäärin n. 15-20 m^2 tutkapoikkipinta-alan. Poijuviittojen korkeus vedenpinnasta on 3-4 metriä. poijuviitat on kiinnitetty esijännittämällä, joten ne eivät juuri kallistele kovassakaan merenkäynnissä.

Merivälkkeen tilastollinen luonne riippuu tutkan erottelukyvystä eli mitä parempi erottelukyky, sitä paremmin myös pienet ja toisistaan lähellä olevat kohteet erottuvat tutkan PPI –näytöllä (Plan Position Indicator). Lähialueen välkkeen vaikutusta voidaan vähentää käyttämällä lähivaimenninta eli STC:tä (sensitivity time control) tai tutkan Sea Clutter –säätöä, jolla aaltovälke saadaan vähenemään/poistumaan tutkanäytöltä. Keskimääräisen erottelukyvyn tutkalla (X-taajuusalue) merivälkkeen dekorreloitumisaika on noin 10 ms, joten korjaus tapahtuu varsin nopeasti ja näytön pitäisi olla dekorreloitunut viimeistään toisella pyyhkäisyllä.

Merenkulkututkia käytetään usein vaakapolarisaatiolla, koska merivälkkeen vaikutus on tällöin vähäisempää. Horisontaalisessa polarisaatiossa on usein edullista käyttää matalan laajuuden tutkia (S-alue), jotta merivälke minimoituu.

Edellä esitettyjen perusteella, poijujen tutkavaste olisi pitänyt olla havaittavissa tutka PPI-näytöllä. Lisäksi olisi hyvä selvittää eikö laivalla todellakaan ollut myös S-alueen tutkaa käytössä. Lisäksi väylän kääntöpaikan läheisyydessä on molemmin puolin väylää reunamerkit, jotka näkyvät erittäin selkeinä tutkamerkkeinä tutkanäytöllä, mitkä eivät missään olosuhteissa voi sekoittua aaltovälkkeeseen.

3. Kohdassa 1.2.5 Toimenpiteet tapahtuman jälkeen kerrotaan "Ruoppaajat eivät missään vaiheessa sammuttaneet kirkkaita työvaloja ja jatkoivat ruoppausta heti karilleajon jälkeen. Ruoppaaja ATTILA alkoi siirtyä takaisin väylälle klo 19.50-19.57 välisenä aikana. Kello 20.38 luotsi pyysi ruoppaajaa siirtymään sivuun ja pyysi ATTILAa poistumaan väylältä, jotta CLAUDIAlle jäisi tilaa kääntyä".

   Kyseinen tapahtuma ei ollut ensimmäinen kerta, jolloin laiva ohitti ruoppaajat pimeässä. Ruoppaustöitä oli tehty jo lähes kahden avovesikauden ajan. Miksi häikäisyä ei havaittu aikaisemmin ja tiedotettu siitä ruoppaustyön toteuttajille, jotta kirkkaiden työvalojen sammuttaminen laivojen ohitustilanteessa olisi ohjeistettu.

4. Kohta 2.2 Luotsaustyön luonne

   Meriselityskuulustelussa luotsilta kysyttiin mm. "Miten tämä käännös yleensä ajetaan?"

   "Luotsi sanoi, että ensimmäisen vihreän poijun kohdalla on käännytty jo pari astetta ja aluksella on pieni kulmanopeus. Tämän jälkeen noudatetaan tasaista ympyrän kaarta.

   Luotsi säätelee peräsinkulmaa siten, että alus sivuuttaa poijut kuvan 11 mukaisesti. Poijujen suhteellinen liike kuvaa luotsille kulmanopeuden ja aluksen nopeuden. Luotsi pystyy mielessään hahmottelemaan kääntösäteen graafisesti. Hän ei voi keskeyttää hetkeksikään poijujen suhteellisen liikkeen seuraamista, koska silloin hän kadottaisi liiketilan hallinnan. Luotsi ilmaisi tämän selvästi sanoessaan, että *"jos poijut eivät näy, silloin ei luotsata"*. Poijujen näkymisellä oli ratkaiseva merkitys".

Kyseisessä kohdassa on kiinteä reunamerkki väylän kummallakin puolella osoittamassa väylän reunalinjaa. Satamasta tultaessa ko. kaarteen keskivaiheilla väylän oikealla puolella on reunamerkki "Portti" ja kaarteen lopussa väylän vasemmalla puolella reunamerkki "Europa". Reunamerkit näkyvät tutkassa kaikissa olosuhteissa, kuten edellä on jo todettu.

Käsityksemme mukaan kaarre voidaan ajaa pelkästään näiden reunamerkkien avulla. Poijuviitat voivat olla talvella pitkiäkin aikoja näkymättömissä jään alla.

5. Kohdassa 4 Turvallisuussuositukset kerrotaan

   "Ruoppaussopimuksia laadittaessa on tärkeää, että kaikkien osapuolten tarpeet ja toisaalta velvoitteet kirjataan riittävän yksityiskohtaisesti. Liikennöinnin turvallisuuden takaaminen edellyttää, että sopimuksien noudattamista valvotaan ja poikkeamiin tartutaan välittömästi.

   Tutkintalautakunta suosittelee, että

   1. väylien rakennuttajat liittävät sopimuksiinsa liikennöintiä koskevan periaatteen, että rakentaminen ei saa vaikeuttaa liikennöintiä väylällä. Häikäisevät valot ja radioliikenne tulisi mainita sopimuksissa erikseen".

Käsityksemme mukaan rakentaminen väylällä vaikeuttaa aina liikennöintiä jonkin verran, joten parempi muoto lauseelle olisi, että "rakentaminen ei saa tarpeettomasti vaikeuttaa liikennöintiä väylällä." Väylänpito ottaa vastaisuudessa huomioon em. suosituksen väylien rakentamisen urakkasopimuksissa.

Väylänpito
Johtaja

Keijo Kostiainen

FINNPILOT

23.5.2008

Onnettomuustutkintakeskus
Erikoistutkija Risto Repo
Sörnäisten rantatie 33 C
00580 Helsinki

VASTAUS LAUSUNTÖPYYNTÖÖN KOSKIEN MS CLAUDIAN KARILLEAJOA 23.10.2007

Viitaten Onnettomuustutkintakeskuksen tutkintaselostuksen (C2/2007M) turvallisuussuositelmiin ilmoitamme Finnpilotin toimenpiteet.

Luotsausliikelaitos on tehnyt päätöksen tilata Maris ECDIS900 PM ohjelmistoja sekä SeaMate 1 A laitteita norjalaiselta Maritime Information Systems AS:ltä. ENC-kartat tulevat olemaan luotsin kannettavassa tietokoneessa johon saadaan paikannus/navigointi tiedot SeaMaten avulla.

Helsingissä, 23.5.2008

Finnpilot
Operatiivinen johtaja

Jouni Kokkonen

FINNPILOT

SAAPUNUT

26 -05- 2008

244/5M

21.05.2008

LAUSUNTO ONNETTOMUSTUTKINTASELOSTUKSESTA C2/2007M , *M/S CLAUDIAN KARILLEAJO TORNION EDUSTALLA*

Tutkintaselostuksessa on mainintoja yhteistyöpalaverista, jossa sovittiin menettelytavoista kohtaamistilanteissa. Selostuksessa mm. todettiin, että työvalaistuksesta ei ole mainintoja palaverin muistiossa eikä alueluotsivanhimman sähköpostissa.

Tämä pitää paikkansa, koska ei liene tarpeellista erikseen mainita yhteistyöpalaverissa meriteiden sääntöjen ja muun merilainsäädännön voimassaoloa myös erityisesti ruoppaustilanteissa.

Sen sijaan on normaalia, että ruoppaustyössä käytetään pimeän aikaan työvaloja. Usein on työvalojen käyttäjän vaikea arvioida, miten ne häikäisevät muita väylällä liikkujia. Varmaankin on hyvä toimia kuten meriteiden säännöissä edellytetään. Sen lisäksi on vaikeaa löytää yhteistyöpalavereissa kaikenkattavia ohjeita muuttuviin työtilanteisiin muuttuvissa sää- ja valaistuolosuhteissa.

Tämän takia yhteistyöpalavereissa mm. ko. tapauksen kaltaisia tilanteita varten sovitaan menettelytavoista, miten toimitaan jos ongelmia ilmaantuu. Luonnoksessa viitatussa yhteistyöpalaverissa sovittiin juuri tämäntapaisia tilanteita silmälläpitäen menettelytavoista radioliikenteen osalta ja näin myös toimittiin.

Luonnoksessa on todistettavasti virheellisiä kirjauksia sivulla 16.

Ruoppaustyönjohtajan mukaan luotsit eivät koskaan pyytäneet sammuttamaan työvaloja. Tämä ei pidä paikkaansa, sillä työvaloista on huomautettu useasti. Tästä on mm. poikkeamakirjaus luotsi Kaj Hahtosen tutkintoajon yhteydessä 18.10.2007 M/S Gooteborgilla yöllä. Kirjauksen on tehnyt Merenkulkulaitoksen luotsitarkastaja Tuula Forsblom ja luotsivanhin Timo Markkanen.

Luotsausliikelaitos Perämeren luotsausalue,
Satamatalo
Alueluotsivanhin Poikkimaantie 16, 90400 Oulu

Timo Karjula 0400-867381
E-mail: timo.karjula@finnpilot.fi

Myös proomukaluston siirroista pois väylältä on huomautettu ennen ja jälkeen onnettomuuden. Tästä on myös kirjauksia.

Luonnoksessa väitetään myös, että alusten sivuutusnopeuksista ei sovittu erikseen. Tämäkään ei pidä paikkansa, sillä alkuvaiheessa sovittiin sivuutusnopeudeksi aina erikseen 10 solmua, kunnes siitä tuli normaali käytäntö ja sivuuttavan aluksen vauhdiksi valittiin 10 solmua tai nopeus, joka ei aiheuttanut peräaaltoja tai imuvaikutuksia.

Myös maininta siitä, että toiset luotsit eivät vaatineet siirtymään pois väylältä ja toiset vaativat. On tietenkin itsestään selvää, että kaikki laivat eivät ole samankokoisia, eikä niiden ohjailuominaisuudet ole samanlaisia. Tästä johtuen sama luotsi voi yhdellä kertaa vaatia pois väyläalueelta ja toisella kerralla siirtymään ainoastaan sivuun väylän keskilinjalta.

Tässä on siis selvästi kyseenalaistettu tarve siirtyä väyläalueen ulkopuolelle, joka oli myös havaittavissa vääränlaisena asenteena kohtaamistilanteissa.

Mitä tulee tutkijalautakunnan suositukseen Luotsausliikelaitokselle hankkia tietokoneita luotseille, on kyseinen hanke ollut jo käynnissä ainakin vuoden ennen mainittua onnettomuutta. Tällä hetkellä ollaan tilanteessa jolloin on valittu koneet ja järjestelmät, jotka otetaan käyttöön luotsausalueilla kuluvan kesän aikana. Lisäksi totean, että juuri nimenomaan kyseisellä väyläalueella on luotsien koekäytössä ollut kaksi taskutietokonetta, jotka on varustettu Tasku Loisto- karttaohjelmistolla.

Valitettavasti kyseisten laitteiden kuuluvuus on komentosillalla ilman ulkoista antennia ollut useasti niin heikkoa, että taskutietokoneiden hyödyntäminen ei ole onnistunut. Myös koneiden näyttö ja ohjelmisto olivat huonot eivätkä soveltuneet luotsauskäyttöön.

Sen sijaan nyt valitut ohjelmistot ja kannettavat tietokoneet ovat käyttökokemusten perusteella hyvin soveltuvia luotsauskäyttöön.

Alueluotsivanhin

Timo Karjula

Suomen Satamaliitto • Finlands Hamnförbund • Finnish Port Association

LAUSUNTO 1 (1)

Aura/TL

6.6.2008

Onnettomuustutkintakeskus

LOPULLINEN LUONNOS ONNETTOMUUSTUTKINTASELOSTUKSESTA C2/2007M MS CLAUDIA

Pyydettynä lausuntona Suomen Satamaliitto ilmoittaa, ettei sillä ole huomautettavaa otsikossa mainitusta lopullisesta luonnoksesta onnettomuustutkintaselostukseksi MS CLAUDIAN karilleajosta Tornion edustalla 23.10.2007.

SUOMEN SATAMALIITTO

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