Investigation report

C6/2010M

# M/S NORDLAND (NLD), Grounding in the Archipelago Sea on 13 October 2010

Translation of the original Finnish report

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

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**Olycksutredningscentralen**
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## SUMMARY

## M/S NORDLAND (NLD), GROUNDING IN THE ARCHIPELAGO SEA ON 13 OCTOBER 2010

On 12 October 2010 at 22:30 the Netherlands-flagged MS NORDLAND, in ballast condition, departed Turku for Pietarsaari. The master, a pilot and a lookout were on the bridge. However, immediately prior to the accident the lookout was not on the bridge. The ship's joystick hand steering was used as the vessel cast off and only later, on the fairway, was the ship's autopilot switched on. The pilot used the ship's only radar. No suitable electronic navigational charts for the voyage were available. The autopilot settings were as follows: ROT° Min 20, Off Course 20°, Rudder limit 20°, Yawing 1, Rudder 4 and Cnt. Rudder 5.

While the pilot independently steered the vessel the master monitored the passage on his own computer and paper chart. This was done in complete silence. No communication ensued when the vessel approached wheel over points (WOP). The pilot kept adjusting the course without informing the master of his decisions.

Upon approaching the Rönngrund narrows the course over ground (COG) was 268°. At 00:02, abeam of Östra Långgrundet island, 0.25 NM from it, the pilot first set the autopilot heading to 300°, followed by 324° and then 335°. When he noticed that the turn could not be completed as he had planned, and that the radar return of the east spar buoy was lost in sea-clutter, he requested the use of hand steering. By the light of a torch the master located the rudder control button and engaged the joystick hand steering, which the pilot then commenced to use. At this point the vessel was in the red sector of Rönngrund, on a 310° COG. The pilot turned the steering 20° to starboard, which increased the rate of turn (ROT) to 54°/min. Soon after this the pilot placed the rudder amidships. Right then, at 00:07 and at the heading of 338°, the vessel ran aground between Paukut and Hopialuoto islands at 60°16.2’N 021°47.2’E.

The inaccuracy of ships positioning in mid-turn contributed to the accident. Other contributing factors included inadequate bridge team resource management and steering, as far as dividing the turn into three segments is concerned, as well as unsuitable autopilot settings for navigating in the archipelago. Unsatisfactory application of the vessel's Safety Management System (SMS) at the practical level is considered to be the root cause of the accident.

**Lessons learned**

A properly prepared safety management system *per se* does not render a sound system. Its usefulness also relies on effective practical implementations as well as frequent reviews. Meticulous voyage planning, an elemental issue, also deserves to mentioning. This includes a clear delegation of responsibilities for the voyage. It is imperative that the bridge team share a common view of the steering inputs which are required during the voyage.

Safety Investigation Authority, Finland recommends that the shipping company and Finnpilot Pilotage Ltd take prompt action in applying bridge resource management in such a manner that the ship's crew and the pilot share a common view on the voyage plan and its implementation as well as the use of steering controls and the steering manoeuvres to be executed. Another recommendation is given to shipping company to take action which brings the port side radar and the electronic chart system up to par with the navigational requirements of the archipelago.

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## ABBREVIATIONS

| | |
|---|---|
| AIS | Automatic Identification System |
| BRM | Bridge Resource Management |
| DGNSS | Differential Global Navigation Satellite System |
| DGPS | Differential Global Position System |
| ECS | Electronic Chart System |
| GOFREP | Gulf of Finland Reporting |
| GRT | Gross tonnage |
| IMO | International Maritime Organisation |
| MRCC | Marine Rescue Co-ordination Centre |
| ROT | Rate of Turn (°/min) |
| SMS | Safety Management System |
| STCW | Standards of Training, Certification and Watchkeeping |
| S-VDR | Simplified Voyage Data Recorder |
| RCDS | Raster Chart Display System |
| VDR | Voyage Data Recorder |
| VTS | Vessel Traffic Service |
| WOP | Wheel Over Point |


*Figure 1. M/S NORDLAND (Photo: Finnish Border Guard)*

## FOREWORD

Safety Investigation Authority, Finland (SIA) learned of the accident on 13 October 2010, the day of the accident. The vessel came loose in the evening of the same day and sailed to Naantali under its own power for damage inspection. The following day a SIA investigator interviewed the master, collected pertinent material and took a closer look at the bridge. SIA appointed captain Juha **Sjölund** as investigator-in-charge, accompanied by captain Sakari **Häyrinen** and psychologist Krista **Oinonen** as members of the investigation commission. The investigation commission commissioned M.Sc.(Tech.) Jaakko **Lehtosalo** to analyse the information in the Simplified Voyage Data Recorder (S-VDR). Finnish Transport Agency sent the related Vessel Traffic Service (VTS) recording to the investigation commission.

On 20 October 2010 the investigators travelled to Tallinn, Estonia, where the vessel was docked for repairs. They looked at the damage to the vessel, interviewed the crew, obtained additional related material and secured the S-VDR recording.

The maritime declaration was given on 11 November 2010 at the Maritime Court of Varsinais-Suomi. The leader of the investigation team attended the hearing. In addition to the master, the pilot, too, was given the opportunity to present his point of view regarding the course of events.

In addition, the pilot was separately interviewed at SIA premises on 19 January 2011.

All times in this report are in UTC+3.

The the draft final report has been sent for statements according to the 28§ of the Safety Investigation Act (525/2011) to the Finnish Transport Safety Agency, Finnpilot Pilotage Oy, shipping company, the Pilot of the vessel and the Master of the vessel. A summary compiled on the basis of the statements is attached to the Investigation Report. The statements were considered when finalizing the Investigation Report.

The investigation report has been translated into English by R&J Language Service.

The material used in the investigation is stored at the Safety Investigation Authority, Finland.

# 1 FACTUAL INFORMATION

## 1.1 Vessel information

### 1.1.1 General information

| | |
|---|---|
| Name of vessel | M/S NORDLAND |
| Type | General cargo vessel |
| Flag | The Netherlands |
| Home port | Groningen |
| IMO number | 92229087 |
| Year of build | 2001 |
| Class | LR +100 A1, +LMC, UMS, SCM |
| Length o.a. | 119.98 m |
| Breadth max. | 15.2 m |
| Deadweight | 7795 mt |
| Draught | 7.03 m |
| Gross tonnage | 5052 |
| Net tonnage | 2663 |
| Service Speed | 14 knots |

### 1.1.2 Manning

The vessel had a multinational crew of twelve persons. The crew were mainly from the Netherlands, Indonesia, the Philippines and Poland. The vessel had three deck officers: an experienced master from the Netherlands (born in 1947), an Indonesian chief officer (born in 1969) and a second officer from the Netherlands (born in 1963).

### 1.1.3 The wheelhouse and its equipment

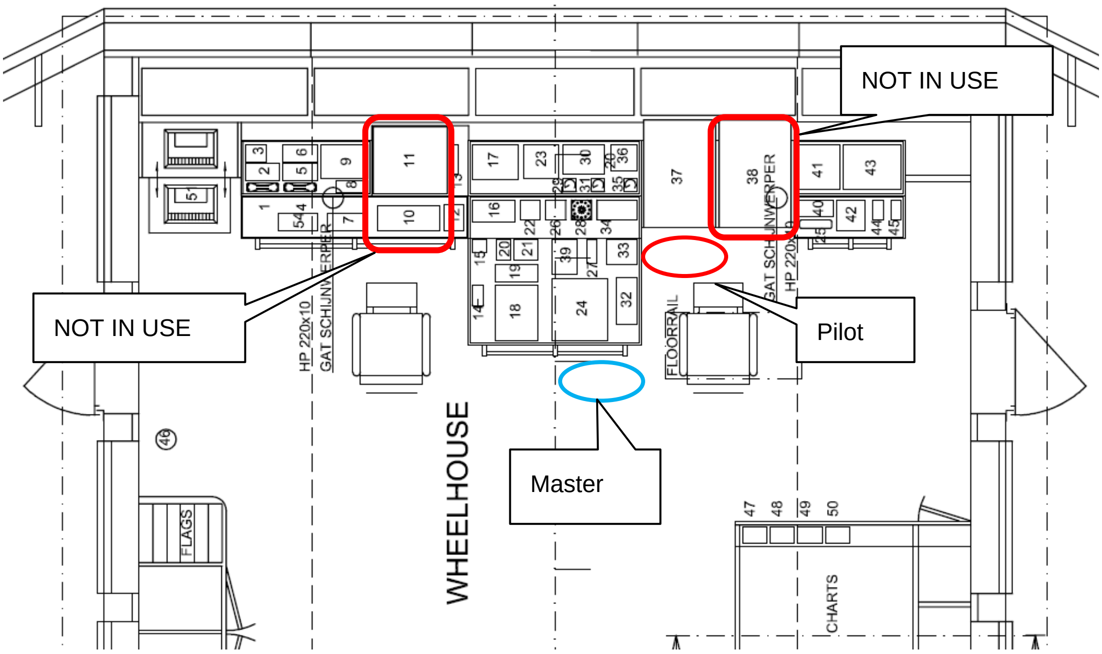


*Figure 2. The wheelhouse of MS NORDLAND as well as the positions of the master before the the accident and the pilot at the time of the accident.*

*Table 1. Legend for figure 2.*

| | | |
|---|---|---|
| 37 | Kelvin Hughes 3 cm radar | |
| 34 | Autopilot Pilotstar D | |
| 32 | Main control panel and steering control (joystick) | |
| 24 | Propeller blade pitch control | |
| 36 | Gyrocompass secondary display | |
| 10,11 | Multifunction display and keyboard | Not in use |
| 38 | Electronic chart display | Not in use |

The blue ellipse in figure 2 indicates the position where the master stayed before the accident. In addition he moved between the chart table and the port side navigation position during the pilotage. The red ellipse indicates pilot's position. The pilot navigated by radar (no. 37) and changed course by autopilot (no. 34). The master did not see the headings the pilot entered into the autopilot.

### 1.1.4 Machinery and engine room

| | |
|---|---|
| Main engine | MAK 8 M 32, 3840 kW. |
| Auxiliary engines | 4 x Scania DI 12 45 M, 259 kW each. |
| Bowthruster | |

### 1.1.5 Passengers and cargo

The vessel carried no passengers or cargo.

## 1.2 Accident information

### 1.2.1 Weather conditions

According to the Finnish Meteorological Institute, the weather conditions at two nearby weather stations were as follows:

Fagerholm, 12 October at 24:00:

Temperature 6.6°C. Wind 4.4 m/s, gusting to 4.8 m/s. Wind direction 282°.

Rajakari, 12 October at 24:00

Temperature 7.1°C. Wind 7.2 m/s, gusting to 10.0 m/s. Wind direction 280°.

Good visibility

### 1.2.2 History of the accident voyage

Prior to the arrival of the pilot the master had completed the SMS-required departure preparations. The pilot boarded the vessel at 22:20. The master advised the pilot to fine-tune the radar to suit himself and the conditions, and to check the radar settings. The vessel cast off from berth 26 at 22:30. Departure preparations did not include briefing the passage plan with the master. The autopilot was set as follows: ROT° Min 20, Off Course 20°, Rudder limit 20°, Yawing 1, Rudder 4 and Cnt. Rudder 5. Both the pilot and the master were aware of the settings.

At 22:35 the master turned the vessel in the docks basin, after which he handed over the con of the vessel to the pilot. As per customary practice, the pilot began to steer the vessel with the autopilot.

The pilot requested that the speed be raised to 8 knots. The channel from Turku harbour is well marked and clearly lit with lateral ice buoys.

The pilot manoeuvred the vessel from the position which is to the right of the bridge centreline. The joystick hand steering is located in the centre console, left of the steering position. The master monitored the vessel's movement behind the centre console in the middle of the bridge and executed the pilot's engine commands.

On the fairway's Pikisaari–Kalkkiniemi leg the pilot requested that the speed be raised to 10 knots.

As the vessel was arriving at Kuuva fairway crossing, it met the FINNLINK ferry from Naantali which was maintaining 16 knots. The ferry turned ahead of MS NORDLAND at approximately 1 NM. MS NORDLAND began to follow the ferry, increasing its speed to 12 knots.

The speed was further raised to 14 knots near Rajakari island.

The master had been tracking the progress of FINNLINK from Naantali, both visually and on radar. By doing so, he was able to envisage how the fairway would turn at the southern end of Airisto Bay. The passage continued in complete silence while the pilot independently steered with the autopilot. The pilot did not inform the master of his course changes.

A couple of course corrections were made on Airisto Bay. After having passed Orhisaari island MS NORDLAND was turned to a course of 251.9°, at which time the vessel was on the Haapaluoto line, sailing at 14 knots.

At 24:00 the master fixed the position of the vessel with the DGPS navigator. They were northwest of Väärämaa on a COG of 268°, at the junction of the Tammennokka–Rågrund line and the nautical chart's longitude line.

According to the pilot's account he commenced the turn to starboard on 13 October at 00:02 by entering 300° as the autopilot's heading. The vessel was still off the 324° Järvikari–Kuiva Kalsaari line and the rudder angle pointed to starboard. Then the vessel was turned to headings 324° and 335°. The master stood in the middle of the bridge behind the centre console and monitored the turn. However, he did not see the headings the pilot entered into the autopilot.

The master observed that, suddenly, the vessel was not turning any more. When the turn ended the rudder angle indicator was moving back from BB, having returned from BB 10° > 0°, whence the turn continued with a SB rudder angle. At that point in time the vessel had just crossed the 324° Järvikari–Kuiva Kalsaari line. The pilot and the master have said that the autopilot acted a little slowly.

The master noticed that the Rönngrund sector light, while still white, was turning to red. As the vessel again began to turn to starboard, the pilot requested that automatic steering be switched over to hand steering. The master, standing in the middle of the bridge behind the centre console and the pilot, selected the hand steering. Immediately after this the vessel made bottom contact.

The master had completed this voyage four times before.

The vessel had no technical problems. Apart from the second radar which was unsuitable for navigation in the archipelago and the electronic chart system which was devoid of suitable navigational charts for the area, all equipment functioned normally during the voyage.

### 1.2.3 The accident site

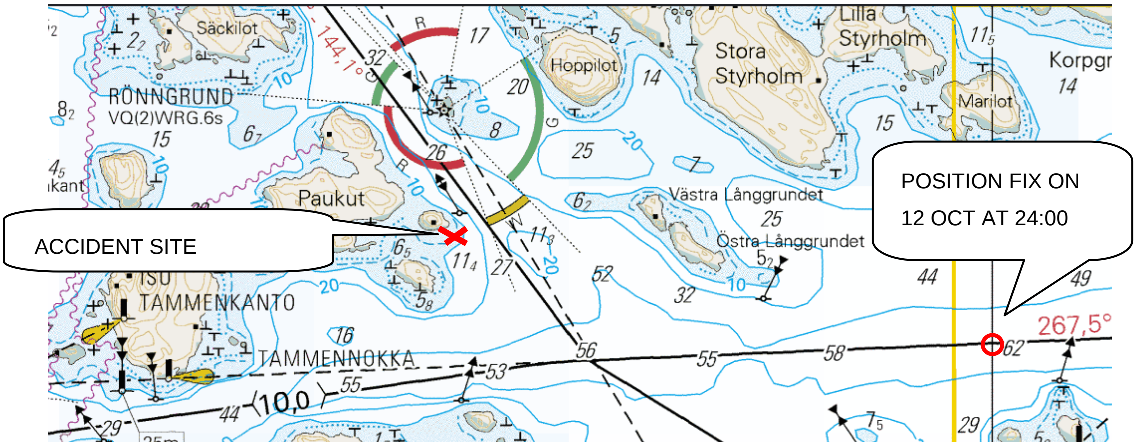


*Figure 3. The accident site and the final position fix on 12 Oct at 24:00. (© Finnish Transport Agency / Source: Sailmate)*

The accident site is located west of the 10 m Airisto – Isokari channel, southwest of the east spar buoy which is south of the Rönngrund sector light, at 60°16.2’N 021°47.2’E between the islands of Paukut and Hopialuoto.

The channel has lit beacons and a sector light at Rönngrund as well as leading lights on the 324° Järvikari–Kuiva Kalsaari line to the north. The vessel was grounded where there was an island with some trees to the port of the bow. In daylight the master noticed that the east spar buoy was approximately 20–30 m to the starboard of the bow.

Rönngrund is a Vessel Traffic Service (VTS) reporting point. Vessels are required to report to Archipelago VTS 20 minutes before entering the narrows. There are discernible currents in the narrows, especially at northerly and southerly winds. However, more detailed information regarding the currents does not exist.

### 1.2.4 The occurrence

The depiction is based on information obtained from the S-VDR recording, which was superimposed on a chart, as well as the VTS recording.

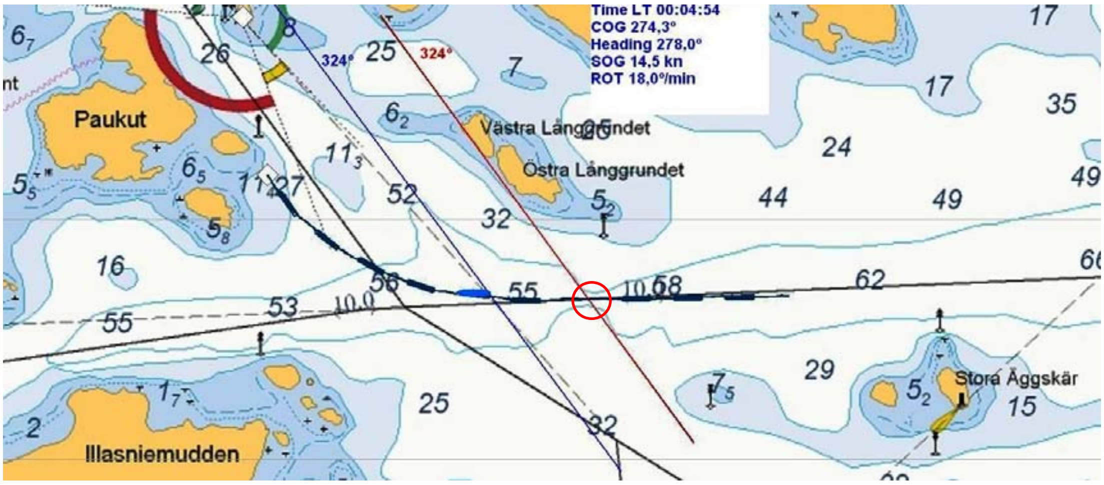


*Figure 4.* *The ship symbols are plotted on the basis of the S-VDR recording. The red circle indicates the point where the pilot, according to his passage plan, intended to commence the turn to starboard on a COG of 269° at 14.5 knots. The pilot said that he set the autopilot heading to 300°. As per the VDR recording the heading at the position of the light blue ship symbol was 278°. The vessel continued to move in an almost straight line with a COG of 272° for 67 seconds after the pilot, according to his account, changed the heading. The Rönngrund sector light changes from green to white. The distance between the blue and the red ship symbols is 0.27 NM and the change in heading at that time is 9°. There is a delay in the onset of the turn, which can partially be explained by the fact that the vessel only begins to turn 80 metres after receiving the steering input. (Chart: The Finnish Transport Agency, presented using Uusi Loisto programme)*

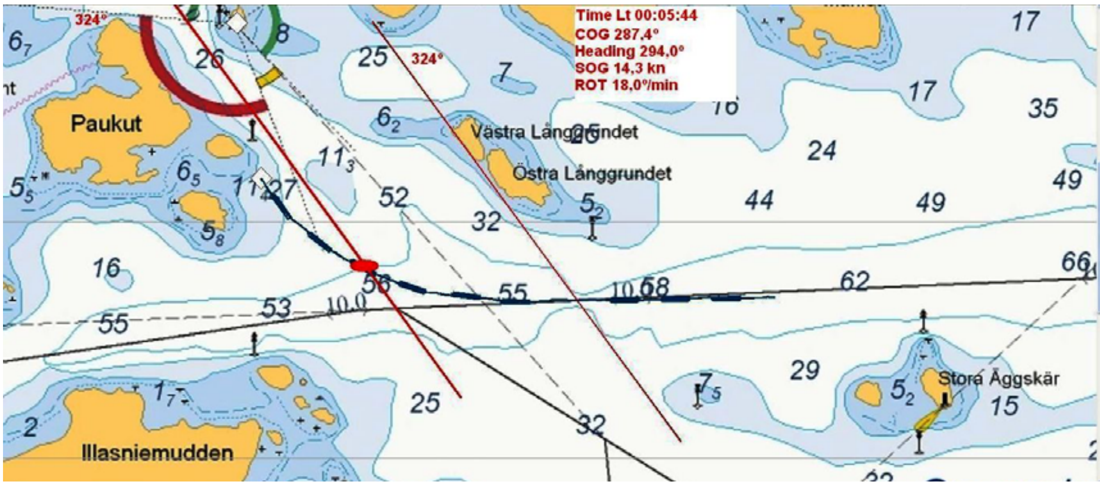


*Figure 5.* *The heading of the vessel is 294° at the position of the red ship symbol, when it was on the 324° Kuiva Kalsaari line. At the master's maritime declaration hearing the pilot said that, at this point, he set the autopilot to a heading of 335°. (Chart: The Finnish Transport Agency, presented using Uusi Loisto programme)*

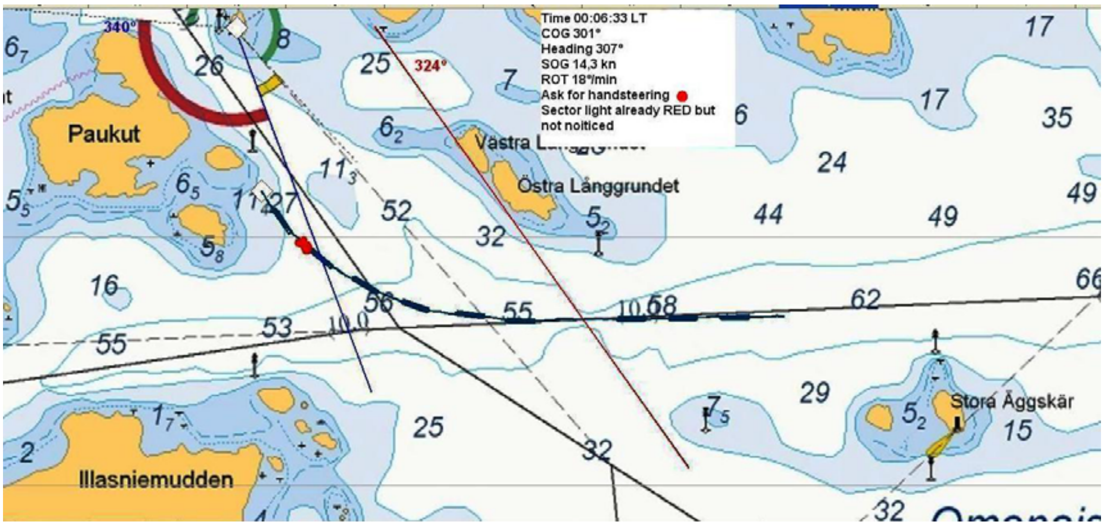


Figure 6. *The vessel was in the red sector of Rönngrund. Heading 307°. The pilot and the master noted that autopilot action was a bit slow. The east spar buoy had disappeared into sea-clutter on the radar display. The pilot asked for hand steering with which he then turned the rudder angle 20° to starboard. A moment later he eased the rudder, lest the stern hit the east spar buoy. (Chart: The Finnish Transport Agency, presented using Uusi Loisto programme)*

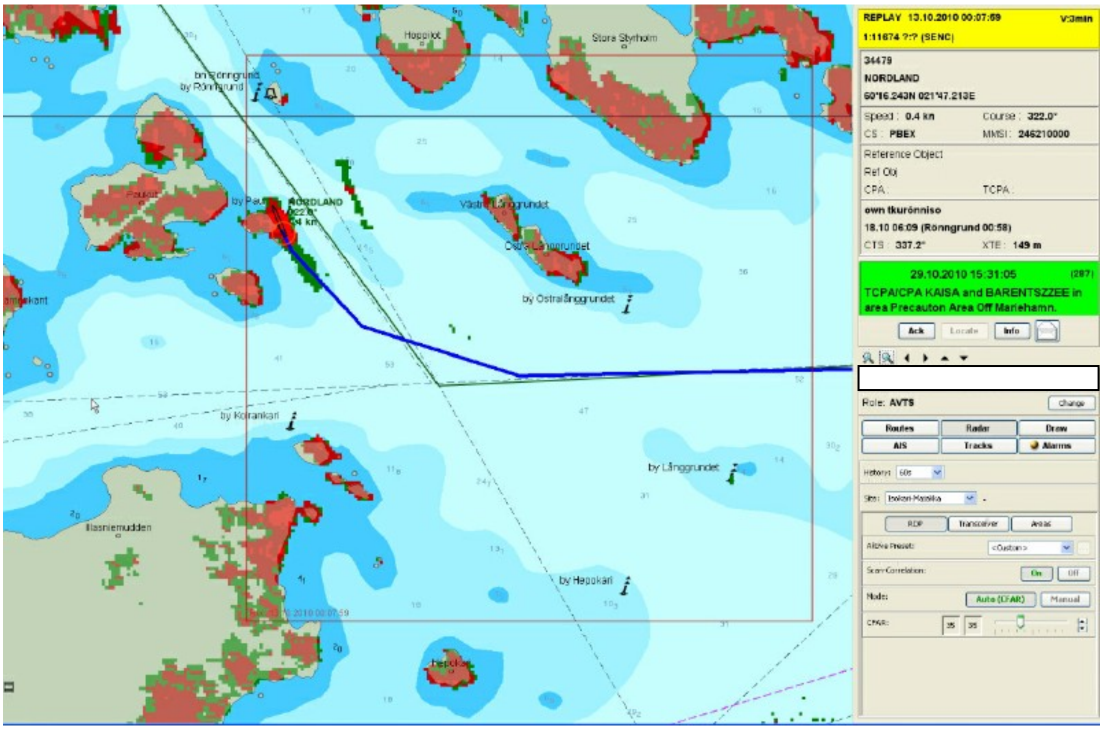


Figure 7. *Related VTS recording at 00:07:58. According to the S-VDR recording the grounding took place at 00:07:30. (© The Finnish Transport Agency)*

### 1.2.5 Injuries to persons

There were no injuries to persons.

### 1.2.6 Damage to the vessel

The following water ballast tanks sustained leaks: Forepeak, deeptank, side tanks 1 PS and 1 SB, side tank 2 PS and tank 3 centre. In addition, the bowthruster/pumproom sustained a leak. The damage was concentrated in the bow section. The propeller and the rudder remained intact.

*Figure 8. Damage to the port side of the bow.*

### 1.2.7 Other damage

The fuel tanks in the stern remained intact. Hence, there was no oil spillage.

### 1.2.8 Fire

There was no fire.

### 1.2.9 Navigation and communications equipment


*Figure 9. The pilot's steering position. The white ellipse shows the Pilotstar D autopilot.*

Figure 9 shows the 3 cm Kelvin Hughes radar display and paper charts a well as the DGPS navigator which were used in navigation and the Pilotstar D autopilot which was used in steering. A VHF telephone was used in communicating with the outside world.

The master said that the radar on the port side was not being used because it is unsuitable for navigation in the archipelago.

### 1.2.10 Data recorders

**VDR, S-VDR**

Voyage Data Recorders (VDR) collect analogue, sequential or digital data from many sources. Both models must store information related to date and time, position, speed and heading. They are also required to record bridge audio, VHF communications and radar data. As regards low-end S-VDR devices, radar data can be substituted by AIS information as an option.

**ECS**

The vessel was fitted with an Electronic Chart System (ECS). However, due to the lack of suitable chart material for the area in question, it was not used in navigation on the accident voyage. As the ECS system is not officially certified, navigation must be based on traditional paper charts and radar navigation.

**The pilot's computer**

The pilot had on his laptop computer situational view of other traffic displayed on chart and based on the AIS data. This device is not meant to be used for navigation and it was not in use during the accident voyage.

**The master's ECS**

The master's own laptop computer had an ECS system which stored the vessel's voyage information. This recording was not made available to the investigation.

### 1.2.11 Surveillance and VTS systems

**Services provided by VTS centres**

Information is given to all vessels whenever necessary when they report or when a vessel so requests. The information given comprises matters which affect the vessel's safe and smooth navigation. Examples of such information include traffic in the VTS area, weather conditions and circumstances, and the condition of the aids to navigation and the channels. The VTS monitors vessel movements and when necessary informs vessels of potential dangers to them. Vessel traffic is organised in order to improve traffic flow and safety. The aim is to prevent dangerous head-on and overtaking situations as well as congestion. VTS can separate vessel traffic according to the situation and conditions, so that vessels can approach each other in a safe area. VTS recorded the information at the time of the accident and provided it to the investigators.

### 1.2.12 Channel markers

The accident area is clearly delineated with fixed range markers and sector lights which aid navigation when the visibility is good. At the accident site the channel is somewhat narrow for vessels that need the channel's maximum depth. The channel is also marked with unlit spar buoys. It is difficult to discern the buoys on the radar in sea conditions that generate sea-clutter on the radar display.

### 1.2.13 Action after the occurrence

Immediately following the grounding the master sounded the general alarm and stopped the main engine. No injuries to the crew were reported. The surroundings of the vessel were checked for oil spillage. At 00:12 the grounding was reported to the authorities and to the shipping company. At 00:15 the crew began to sound the vessel's tanks and the depth of water around the vessel. Coast Guard representatives boarded the vessel at 01:10 and administered breathalyser tests to the master and the pilot. Both tests indicated zero blood alcohol. At 01:30 the crew sounded the bunker oil tanks. The crew continuously monitored the tank levels and the vessel's surroundings. An inspector from the Finnish Transport Safety Agency, Trafi, arrived at 09:05 to establish the situation. All of the tanks' levels were constantly monitored with repeated soundings.

## 1.3 Rescue and survival aspects

### 1.3.1 Distress Alerts

A general alarm was sounded at 00:07. The pilot reported the grounding to VTS and the Maritime rescue co-ordination centre (MRCC) at 00:12. A nearby Coast Guard vessel heard the report. At 00:12 the master reported the occurrence to the shipping company.

### 1.3.2 Rescue operations

The rescue operation was planned on the day of the accident. A diver checked the damage to the vessel. Calculations were made with regard to increasing stern trim. The water level in the bowthruster/pumproom was kept in check by pumping to prevent the electric motor making contact with water. Together with the Trafi representative the master made a risk evaluation of required monitoring measures to be completed once the vessel came loose. The weather forecast was favourable for an attempt to release the vessel.

### 1.3.3 Passenger evacuation

No evacuation was implemented.

### 1.3.4 Salvage

At 18:30 the master received permission from the company and Trafi to attempt releasing the vessel from the ground with the assistance of the tugboats FAHRT and HURTIG. The tugboats fastened their lines and MS NORDLAND started her main engine. At 19:00 the release attempt was started, assisted by the tugboats. At first the main engine propulsion was slow astern, increasing gradually to full astern. At 19:15 the vessel was floating freely in the water and it was anchored nearby for diver inspection. The inspection did not reveal anything that would have prevented the vessel from returning to Turku. At 21:00 Trafi gave the permission to move the vessel.

## 1.4 Other investigation

### 1.4.1 Investigation of the accident vessel and at the site of the accident

An investigator visited the accident vessel to interview the master and to take a look at the navigation equipment. The investigators also travelled to Tallinn, Estonia, during the repairs so as to obtain additional material for the investigation and secure the S-VDR recording.

### 1.4.2 Tests and research

The investigators commissioned Simulco Ltd to analyse the S-VDR recording because, apart from the recorded audio, the data were mostly in numeric format. The numeric information was superimposed on a chart, which generated a picture of the vessel's track.

### 1.4.3 Crew action

Crew action was assessed on the basis of interviews with the master and the pilot, the maritime declaration as well as bridge audio recordings. Crew action was reviewed from the standpoint of pilotage legislation, regulations, and international – IMO and ICS – recommendations regarding bridge resource management.

### 1.4.4 Organisational and management information

The master is responsible for the vessel's safe passage and the implementation of the safety management system. Flag state authorities constitute the principal body that monitors the vessel and its operations. The company's responsibility is to provide for safe practices in ship operation and to ensure compliance with said practices.

The task of Finnpilot Pilotage Ltd is to promote the safety and effectiveness of vessel traffic. This is primarily achieved through pilotage services as well as other ancillary services and products. The activities of Finnpilot Pilotage Ltd are laid down in the Act on the State Pilotage Enterprise (938/2003) and the Pilotage Act (940/2003). Up until the end of 2010 the State Pilotage Enterprise was made up of Finnpilot Pilotage Ltd and Ice Advisors Oy, its subsidiary. As of the beginning of 2011 the State Pilotage Enterprise was transformed into a limited liability company. The newly founded company, Finnpilot Pilotage Ltd, inherited all rights and responsibilities of its predecessor.

The pilot acts as an advisor to the deck officers; this does not release the master/deck officers from their responsibilities for the safe navigation of the vessel. The pilot's statutory responsibilities and duties are explained in subparagraph 1.5.1 of this document.

### 1.4.5 Other investigation

The pilot provided an excerpt of his October 2010 working hour records to the investigation commission. On 10 October, 2010 his shift began at 12:30. On 11 October he worked from 01:00 to 16:40 and on 10 October, the day before that, from 12:30 to 16:30. According to the pilot's own account he felt fit for duty, nor did the investigators find any such shortcomings in work roster arrangements that would have contributed to the occurrence.

## 1.5 Statutes and codes

### 1.5.1 National legislation

Section 8 of the new Pilotage Act (1050/2010) entered into force on 2 August, 2010. It provides for the Pilot’s duties and responsibilities.

Section 8(1).

*The pilot is responsible for the pilotage operation. The pilot shall present the master of the piloted vessel with a passage plan based on up-to-date charts and any other information and instruction necessary for the safe passage of the vessel, and the pilot shall supervise any measures related to the steering and handling of the vessel that are of significance for the safety of vessel traffic and environmental protection.*

### 1.5.2 Regulatory provisions and guidelines

At the time of the accident Finland had no pilotage guidelines.

The Bridge Cooperation Manual published by the Finnish Maritime Administration is aimed at professional mariners. Nonetheless, it never was officially adopted, but rather mainly serves as a recommendation.

### 1.5.3 The operator's regulations

”Fleet Manual, Navigation”

Excerpts from the shipping company's guidelines 'Fleet Manual, Navigation'.

*5.3.2 Voyage planning*

> *It is the master's responsibility to prepare a detailed voyage or passage plan which should cover the entire passage from berth to berth.*
>
> *This should always be done prior to the commencement of the voyage or passage on form no. 19 'Voyage Planning' (cf. appendix 1).*
>
> *The purpose of pre-planning is to aid the master and the Officer of the Watch (OOW) to monitor the pilotage, alert the master/pilot of any changes to the passage plan, and to facilitate any necessary steps to avoid errors.*
>
> *When the vessel proceeds in pilotage waters, with or without a pilot, the following guidelines should be followed:*
>
> > *- During pilotage, the OOW shall continue monitoring the vessel's position as per the passage plan and advise the master/pilot of any abnormalities.*
> >
> > *Cognizant of the limitations of the vessel the OOW must be aware of the safety limits relevant to the voyage in question.*
> >
> > *These elements include, but are not limited to, the possible turning radius, safe bearings, safe passing distances and information obtained from pre-planning.*
> >
> > *- Aids to navigation, restrictions and malfunctions.*

'Fleet Manual, Navigation', cont'd:

*5.3.5 Leaving port*

> *At departure, prior to every voyage, the master should check that the necessary aids to navigation on the bridge are fully operational.*
>
> *This check should be entered into the ship's log.*

*The Company requires that this be done in accordance with the vessel-specific checklist.*

The master inspected the aids to navigation (cf. appendix 1) and, as per the checklist, he noted that they were in proper working order. It was later discovered that the second radar (multi-function display) and the electronic navigational chart were unsuitable for navigation in the archipelago.

'Fleet Manual, Navigation', cont'd:

*5.3.7 Pilot onboard*

*The presence of a pilot on board does not relieve the OOW from his obligations to the safety of the ship.*

*When the pilot boards the vessel, the master or the OOW must provide him with the following information:*

*- Pilot card.*

*- Shortcomings, if any, in the functioning of navigational aids.*

*- Ship's particulars.*

*As the pilot provides navigational instructions during the voyage, it is the responsibility of the master and/or the OOW to cooperate so that the voyage proceeds in accordance with good seamanship.*

*The master or the OOW must continuously keep the pilot informed of the speed, course and position of the ship.*

*Any change to the passage plan must be discussed with the pilot.*

The accident voyage was completed in accordance with the customary practice in such a way that the pilot steered the vessel by independently changing the autopilot headings. He did not inform the master of his actions, which did not comply with company guidelines.

### 1.5.4 International conventions and codes

International Regulations for Preventing Collisions at Sea (COLREGS)

**Part B, Section I(5). Look-out:**

*Every vessel shall **at all times** maintain a proper look-out by sight and hearing*

**Part B, Section I(6). Safe speed:**

*Every vessel shall **at all times** proceed at a safe speed*

**The amended ISM Code 2010. Entered into force on 1 July 2010.**

***1.2 Objectives***

*1.2.1*

*The objectives of the Code are to ensure safety at sea, prevention of human injury or loss of life, and avoidance of damage to the environment, in particular to the marine environment and to property.*

*1.2.2*

*Safety management objectives of the Company should, inter alia:*

*.1 provide for safe practices in ship operation and a safe working environment;*

*.2* ***assess all identified risks*** *to its ships, personnel and the environment and establish appropriate safeguards; and*

*.3 continuously improve safety management skills of personnel ashore and aboard ships, including preparing for emergencies related both to safety and environmental protection.*

*1.2.3*

*The safety management system should* ***ensure****:*

*.1 compliance with mandatory rules and regulations; and*

*.2 that applicable codes, guidelines and standards recommended by the Organization, Administrations, classification societies and maritime industry organisations are taken into account.*

**Risk assessment**

Risk assessment is a method which enables the determination of safe and environmentally friendly processes as far as practically possible.

Risk assessment should ensure that pre-emptive and preventive action reduces the intrinsic risks to a level that is as low as is reasonably practicable.

An efficiently operating safety managements system actively identifies hazards and continuously analyses risks, lest accidents happen before preventive measures are developed.

There is no universally accepted definition of risk, but the one commonly applied in most industrial contexts is:

*”A combination of the probability, or frequency, of occurrence of a defined hazard and the magnitude of the consequences of the occurrence.” (ISO-8402:1995/BS 4778)*

IMO defines risk as follows:

*”The combination of the frequency and the severity of the consequence.”*

*(MSC Circ.1023/MEPC Circ.392)*

### 1.5.5 Voyage Planning

IMO Resolution A.893(21) 'Guidelines for Voyage Planning' comprehensively provides for passage/voyage planning:

*The development of a plan for voyage or passage, as well as the close and continuous monitoring of the vessel's progress and position during the execution of such a plan, are of essential importance for safety of life at sea, safety and efficiency of navigation and protection of the marine environment*.

### 1.5.6 Bridge Resource Management

Bridge Resource Management (BRM) refers to how resources are handled on ships' bridges. Said resources include navigational aids, the voyage plan, communication, bridge personnel, a pilot knowledgeable of local conditions as well as external factors such as wind conditions. BRM aims to establish a uniform view among all persons working on the bridge regarding the implementation of the voyage. This is achieved by collectively briefing the passage plan and through a clear division of duties. By doing so it is possible to motivate all members of the group to solve potential problems.

Section B-VIII/2 of the 'Standards of Training, Certification and Watchkeeping for Seafarers' (STCW) Code urges shipping companies to develop and support BRM principles.

ISC BPG (Bridge Procedures Guide) 2007 Edition, Chapter 1.2.7.2 'Co-ordination and communication' emphasises the importance of BRM in different situations such as routines in navigation as well as pilotage and distress situations, etc. This aims to sustain situational awareness among the bridge team.

The pilot had received BRM training from his employer. However, he displayed apparent shortcomings in its practical implementation. Whereas the master had heard of BRM, he was uninformed of its subject matter. The master had a long history of working as a pilot in the Netherlands.

# 2 ANALYSIS

Apart from the second radar and the electronic chart system which were unsuitable for navigation in the archipelago, no such technical faults or malfunctions were detected in the vessel or its equipment that could have contributed to the accident. The autopilot functioned correctly early in the voyage and after the accident. According to the information received from the autopilot supplier the performance of the autopilot before the accident was charasteristic to the equipment. However technical fault cannot completely be excluded. This being the case, the analysis focused on human and organisational factors, as per the James Reason model[1].

The master said that the radar on the port side was not being used because it is unsuitable for navigation in the archipelago. The pilot said that the ECS system was not used for navigation on the accident voyage because the vessel lacked suitable chart data for the area.

## 2.1 On company guidelines

Since the ISM Code is loosely applicable, shipping companies are more or less given a free rein in setting up their safety management systems. Whilst extremely comprehensive systems are in place, rudimentary ones exist as well. The SMS system of the vessel in this investigation belongs to the latter category. For the most part the system includes sufficient instructions for safe navigation when the pilot is onboard. As previously stated, the SMS system should also **ensure** that the applicable codes, guidelines and standards recommended by the IMO, flag state, classification societies and maritime industry organisations are taken into account, and that the company should support this. Even though such support is noticeable in the company's regulations, it falls short of the entirety of the recommendations. The recommendations of the abovementioned bodies include a great deal of safety factors that need to be taken into consideration.

Had the recommendations of the company, the IMO and the ICS been put into practice, this accident could have been avoided. It appears that the implementation of the SMS system failed. Regrettably, this is often only found out after an accident.

## 2.2 Risk assessment

Characteristic of the ISM Code, the code itself does not provide an approach to the implementation of risk assessment. The responsibility remains with the company/shipowner. Nonetheless, the code requires that the shipping company ensure that applicable codes or standards as well as the recommendations of the maritime industry, the IMO and classification societies are taken into account. These sources provide relevant information which the shipping companies can tap into in order to start making risks assessments for their vessels and, consequently, draft the safest possible procedural guidelines. A responsible company must engage its entire staff in achieving this objective. It is vital to include the employees in this project. Risk analysis is by no means a

1 Reason, J. (1997). *Managing the risk of organizational accident.* Brookfield, VT: Ashgate.

new phenomenon in navigation. Tankers have implemented it for years and years and, in comparison to general cargo ships, they are pioneers in the safety of navigation.

If a company institutes a reasonably comprehensive SMS system it is already, as such, the outcome of risk assessment. This is true even if risk analysis-related terminology was not used in drafting the system. Also, a meticulously prepared passage plan can be regarded as pre-emptive risk control through which the persons in charge of navigation together take the risks of the voyage and their control into consideration.

The risk management process can be described as follows:

*The process whereby decisions are made to accept a known or assessed risk and/or the implementation of actions to reduce the consequences or probability of occurrence. (ISO 8402/1995 / BS 4778)*

There are quite a few models to be found in literature when it comes to implementation, yet no explicit, internationally adopted model exists.

The first and the most important stage is to recognise the hazards, as these determine the subsequent actions. As far as possible, hazard recognition should be based on the observation of operations. This is not necessarily as easy as it may seem. The persons tasked with this duty should have the proper training and/or guidance readily available. This way it makes it possible to guarantee that the matter is properly handled.

The process must be fully described and the terms used should be clearly defined. For example, hazards must not be confused with incidents and incidents should not be taken as consequences.

The risk caused by each hazard is assessed by its likelihood and possible consequences. Following this, the company's organisation determines the existing actions and whether they suffice. If not, actions which generate the optimal return in risk mitigation or even elimination should be launched.

The following BS8800-based risk assessment table (Table 2), developed to analyse the combination of likelihood and consequence, is straightforward, in common use and quite useful:

*Table 2. The BS8800-based risk assessment table, developed to analyse the combination of likelihood and consequence.*

| | Consequence | | |
|---|---|---|---|
| Likelihood | Slightly harmful | Harmful | Extremely harmful |
| Highly unlikely | Trivial Risk | Tolerable Risk | Moderate Risk |
| Unlikely | Tolerable Risk | Moderate Risk | Substantial Risk |
| Likely | Moderate Risk | Substantial Risk | Intolerable Risk |

*Table 3. Bridge Resource Management as an example*

| | |
|---|---|
| Hazard | Shortcomings in Bridge Resource Management |
| Description of incident | Failing to detect a navigational error |
| Consequences | Serious |
| Likelihood | Unlikely |
| Risk | 4 Substantial risk |

*Table 4. The IACS[2] table indicates the recommended response in each case.*

| | |
|---|---|
| Trivial | No action is required |
| Tolerable | No additional controls are required.<br>Monitoring is required to ensure control is maintained. |
| Moderate | Efforts are required to reduce risk.<br>Controls are to be implemented within a specified time. |
| Substantial | If work in progress, urgent action to be taken.<br>New work not to start until risk reduced. |
| Intolerable | Work shall not be started or continued until the risk has been reduced. If reduction is not possible, the activity shall be prohibited. |

Hazard: *Source of potential harm or a situation with potential for harm*[3].

## 2.3 Voyage plans

A look at the passage plan reveals that it was not prepared as carefully as required. Wheel over points (WOP) in narrow channels have proven critical because accidents in constricted fairways often occur at these very points. It is essential to determine the WOP, taking into account the ship's turning radius and speed. The passage plan was entirely devoid of these considerations. Nor were there any markings on the paper chart whatsoever which could have implied pre-planning, such as passing distances or bearings from critical navigational fixes.

From the perspective of navigational safety it is of utmost importance to adjust the speed in accordance with the prevailing conditions. However, the vessel's passage plan did not give any indication of speed changes to be made along the way. The passage plan was kept on a table in the bridge, which made it difficult to actively consult from the steering position. On the other hand, judging by its content, it would have not been that useful in archipelago navigation anyway.

On the basis of the aforementioned facts it can be stated that the recommendations of the ISM Code were largely overlooked on the vessel. Although the company's passage

2 IACS Guide to risk assessment in ship operations
3 SFS-IEC-60300-3-9

plan guidelines are somewhat limited in comparison to the IMO's recommendations, they, too, were mostly disregarded.

Even if errors in voyage planning can sometimes result from a lack of expertise, this is rarely the case. The investigators believe that, for the most part, the culprits include inadequate guidelines, laziness or even carelessness and workplace boredom.

**The pilot's passage plan**

The pilot had his own passage plan which relied on markings made on an up-to-date map. The pilot had marked the course over ground (COG) and distances from various fixed points in support of establishing the wheel-over points. This plan took the vessel to the western edge of Rönngrund opening, even though the waters on the eastern side of the fairway allow more manoeuvring room. By doing so, the safety margin to the west was quite limited. This plan was not made available to the bridge team in a sense that they could have actively monitored it. While the pilot knew the markings in his plan by heart, the master was not aware of them because the pilot had not briefed his plan to him. For reasons of practicality the plan was done in A4 size, making it easier to use at the steering position.

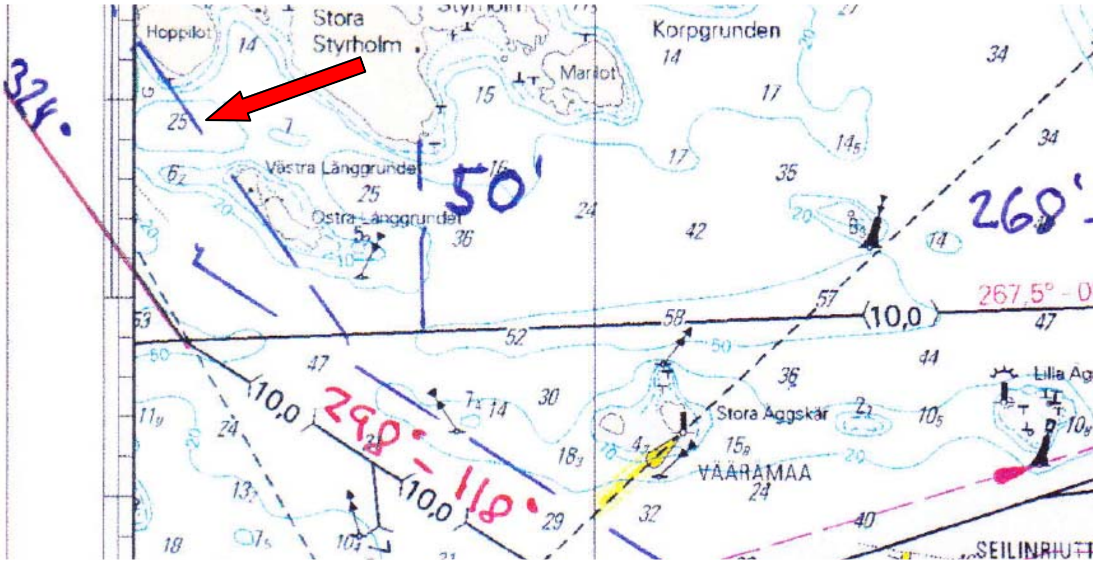


*Figure 10. An excerpt from the pilot's passage plan. The red arrow indicates the Electronic Bearing Line (EBL) on the 324º Kuiva Kalsaari line. It is intended for radar navigation, indicating the wheel over point (WOP) when the EBL separates from the island of Östra Långgrudet. The passage plan has been prepared as a general one and vessels with smaller draft have not been taken into account.*

## 2.4 The accident voyage

From the standpoint of bridge resource management it is important to diligently prepare for a voyage prior to unberthing. The passage plan is thoroughly studied and tasks are then delegated. The position and functioning of navigational equipment, including steering mode changes are thoroughly briefed to the pilot. Since these matters were not given the full attention they deserved the odds for safe navigation were not high.

The rate of turn (ROT) of the autopilot was set at 20°/min. Normally, a 30°-40°/min ROT is used in archipelago navigation; limiting the ROT to 20°/min will, naturally, slow the turn rate from what is customary in the archipelago. The rudder angle was limited to 20°, which limits manoeuvring, especially in difficult situations.

Navigating was done on the 3 cm radar which was on the starboard side and by autopilot. In the rear of the wheelhouse the master monitored the pilot's steering and used a paper chart. The pilot's working style was individualistic. He would independently execute course changes without informing of them beforehand. Company guidelines require cooperation with the pilot, and that he be kept aware of the position and the COG. Pursuant to the company's guidelines the master should demand that the pilot cooperate with him in navigation.

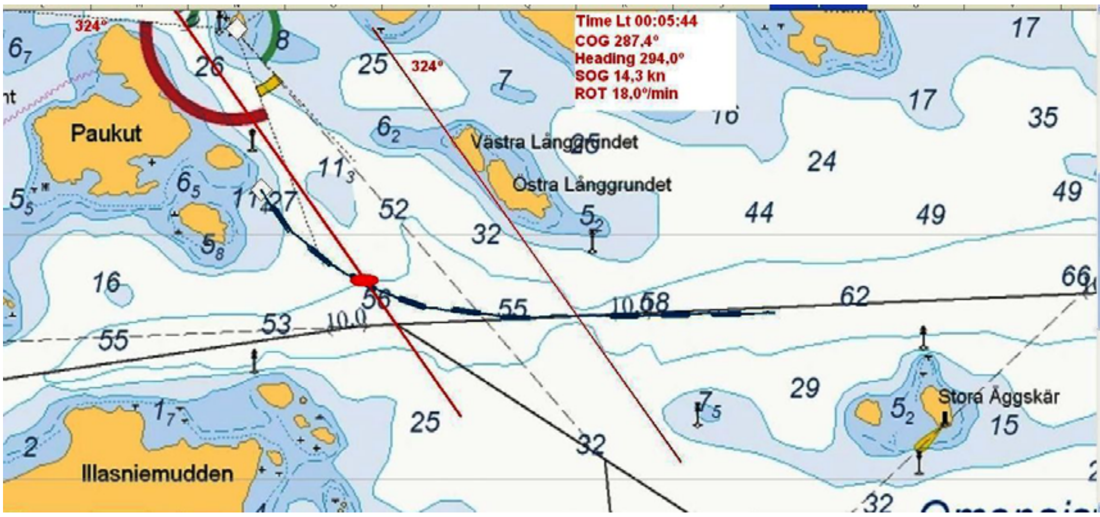


*Figure 11. In this phase of the turn (red ship symbol) it was already clear that the turn to the 324º Kuiva Kalsaari line would fail. Since the turn was still incomplete by 30° by terms of heading and even more by the COG, they should have made effective steering inputs at this stage, at the very latest, and changed over to hand steering. It is likely that the bridge team partially lost situational awareness of the ship's true position in relation to the fairway. The fact that the east spar buoy was lost in sea-clutter also contributed to this to some extent. A good indication of the loss of situational awareness is the steering input which attempted to prevent the stern from hitting the east spar buoy. (Chart: The Finnish Transport Agency, presented using Uusi Loisto programme)*

The turn was divided into three segments, which tends to confuse the autopilot and slow the turn. Normally turns are completed in two segments: the first segment aims to achieve the new course as close as possible, after which the heading is adjusted. Even though the pilot was familiar with the autopilot type in question, an input error cannot be excluded.

The track of the vessel gives no indication that the autopilot would have attempted to turn the vessel to a course of 300º.

The master's confidence in the pilot's manoeuvring skills and local knowledge, combined with the pilot's autonomous approach to steering/navigation, meant that the pilot took over the responsibility for navigation and steering.

## 2.5 Bridge Resource Management

The purpose of bridge resource management (BRM) is to optimise the resources of the personnel on the bridge so as to ensure safety and efficiency. When BRM is assessed, it is prudent to evaluate the concept of situational awareness.

Situational awareness (SA) encompasses the *perception* of elements in the given situation, *comprehension* of the current situation, and the ensuing *projection* of the future status[4]. Fundamental issues from the standpoint of goals and objectives relate to the perception of vital information from, among other things, the environment or navigational displays. In addition, comprehension and interpretation of perceived information, such as the state and position of the vessel, the relative position of surrounding obstacles (other vessels, seascape) as well as the condition of the vessel's equipment and systems occurs in relation to the objectives of the action at hand. In turn, projection denotes awareness about the perceived information and the consequences of selected action as well as anticipating and planning for the projection of the oncoming situation.

Due to shortcomings or errors in perception, interpretation or projection, SA may remain poor. For example, bad visibility or lacking communication may result in vital cues being lost from the standpoint of the objective. Unsatisfactory perception and interpretation often result in erroneous projection. In such cases the cues that follow the occurrence may lead the observer astray from the real objective, which only makes matters worse as regards SA.

It is not the only purpose of BRM to delegate duties between several persons. BRM also aims to bolster the SA of the bridge team by tapping into their human and technological resources. When it comes to a bridge team whose members carry out, partially or completely, overlapping duties and require identical information, we can talk about shared situational awareness, or *team SA*. For instance, in order to be able to carry out their respective duties (the duties and responsibilities are explained in detail in subchapters 1.4.4 and 1.5.1) the master and the pilot should share SA to the maximum possible extent during pilotage as regards the state and position of the vessel, among other things.

Given that team SA necessitates the sharing of information, its fundamental vehicle is communication. Furthermore, harmonised perception environments, such as identical displays and instrument panels aid the crew in sharing SA. Additionally, uniform work histories and training, including standardised procedures and models, support the creation of team SA.

[4] Endsley, M.R. (1995). Toward a theory of situation awareness. *Human Factors, 37*, 32-64.

Since the pilot independently carried out the pilotage through solo navigation and steering, he almost entirely bore the workload himself. He had to simultaneously monitor various visual cues such as the radar and gyrocompass, rudder angle, leading lights and sector lights, fairway markers, and the autopilot and its settings. He had to maintain SA regarding the position of the vessel by scanning these sources of information. The dark conditions also made it more difficult to take in the seascape. Moreover, the fairway markers were unlit and wave action generated sea-clutter on the radar picture. From the perspective of visual observation and attentiveness the task was stressful and, hence, prone to human error.

The pilot's workload is also increased by the fact that vessels that require pilotage do not have standardised wheelhouse arrangements. Rather, their equipment and handling characteristics are markedly dissimilar. It is obvious that the pilot lost SA in mid-turn, believing that the vessel was closer to the centreline of the channel. The fact that hand steering was engaged too late supports this view. Furthermore, a moment before the grounding the pilot made a steering input through which, according to his account, he aimed to prevent the stern from hitting the east spar buoy.

In reality, the east spar buoy was approximately one cable's length ahead, starboard of the bow along the course of the vessel.

The pilot carried out his duties on the bridge in a typical pilot-centred manner. He independently navigated and steered the vessel. The master monitored the pilotage from the background. The master did not have access to a radar picture nor an electronic navigational chart of the fairway. He followed the passage on his paper chart, unable to see the pilot's commands on the autopilot. The pilot did not inform the master of his action or his plans. Neither did the master ask the pilot of his intentions or in any manner intervene in his work. There was complete silence on the bridge.

As a result, this manner of working did not facilitate the utilisation of BRM in safe pilotage. Since the pilot did not inform the master of his actions, intentions or plans, the master had to monitor the passage without being able to make correct observations regarding the position of the vessel or the state of its systems. Nor could he adequately anticipate future events or required action. Correspondingly, the pilot did not receive any navigation-related information from the master as he steered the vessel in the fairway.

In addition, the failure to brief the voyage plan degraded bridge resource management. Since the passage plans were not briefed in the beginning of the voyage, neither the master nor the pilot had a uniform view regarding the execution of pilotage. This diminished the master's capacity in making navigation-related observations, assessing the correctness of action or in anticipating upcoming events. BRM should commence from the very moment when the pilot enters the bridge. The crew should explain the vessel's steering characteristics, the characteristics of navigation and steering equipment, the passage plan and the delegation of authority to the pilot. Moreover, they should have talked about the steering inputs and the manner of their implementation along the voyage.

At the time of the accident there were no binding BRM regulations as to the company or Finnpilot. Still, the company's SMS system requires cooperation with the pilot in steering the vessel. Whereas the pilot had received BRM training, the master was untrained in this field.

Given that the bridge team did not have a uniform picture regarding the passage plan or uniform procedures, and since there was no communication over observations, intentions or action, this degraded BRM and resulted in unsatisfactory team SA.

**The technical resources for BRM**

The aids to navigation should be fully operational on the bridge. When it comes to ergonomics, bridge design facilitates the work of two navigators. The vessel has an electronic chart system (ECS) which, however, cannot be used to its full extent. Clearly, an ECS which contains the charts for the area in question improves the accuracy of navigation in the archipelago by making it easier for the persons in charge of navigation to monitor the passage of the vessel in real time, and by making it possible for them to enter the appropriate passage plans, including wheel-over points, into it. To some extent the master used his personal navigation software on his laptop. This is a telltale sign of the fact that he wanted to use modern technology, in which the company is reluctant to invest. Without a doubt, the utilisation of only one radar between two persons navigating does not provide for normal navigation.

## 2.6 Application of the Rules of the Road

Rule 5 of the Colregs requires that *every vessel shall at all times maintain a proper lookout by sight and hearing*. This being the case, the importance of the matter is mentioned in no uncertain terms. Had the lookout been properly employed, he could have aided the navigators in their tasks. When the pilot lost the spar buoy in sea-clutter the lookout could have searched for it with the searchlight on the bridge wing. However, since he would have been ordered to look for the mark on the port side, as they assumed it was, this would have not resulted in visual contact. The lookout could also have been called to man the helm (Fig. 2, equipment no. 32) at which time the pilot could have concentrated on navigating only. Then the master would have had to move away from the position (Fig. 2) where he was prior to the accident. Then again, the tasks of the navigator and the helmsman should be kept apart; the navigator may not accept any other duties, nor can any be assigned to him. Provided that he is correctly utilised, the navigator can be an important resource on the bridge.

Rule 6 deals with safe speed and the requirement *at all times* in it leaves no room for interpretation. In other words, this rule must always be followed. Whereas speed is normally reduced in poor visibility, good visibility does not always infer full steam ahead.

The pilot thought that they should have only reduced speed had it exceeded 15 knots. Nevertheless, in this case the vessel approached the area with a maximum speed of 14.5 knots. Had the turn been successfully completed, this would certainly have sufficed. However, now they had no safety margins.

The investigation shows that the events followed one another at a fairly good clip. The bridge team did not have the time to notice the navigational errors. Obviously, a moderate speed provides more time to respond to any possible navigational errors. The investigators believe that the approach to the accident area should have been done at a moderate speed, not only because the pilot said that the site was considered to be challenging but also because the bridge team had limited possibilities to monitor the real-time progression of the situation due to the unavailability of the second radar and the electronic chart system.

## 2.7 On pilotage

According to the Finnsih pilotage act the pilot is acting as an adviser to the master during pilotage. It is totally normal, particularly on foreign vessels, that the pilot carries out the steering of the vessel according to customary practice. This very custom was also applied on this accident voyage. Related problems have been discussed in detail in the following safety study*: Piloting Practices and Culture in the Light of Accidents (S1/2004, Accident Investigation Board of Finland)*.

## 2.8 The course of events

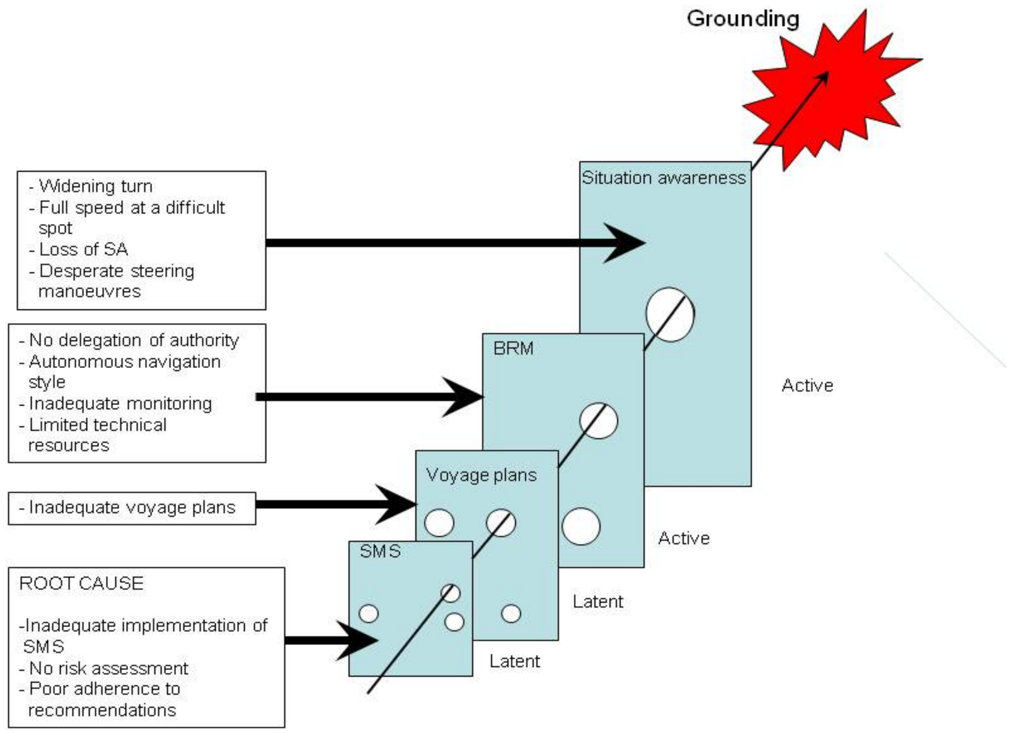


*Figure 12. The course of events, illustrated by the Reason model.*

# 3 CONCLUSIONS

## 3.1 Findings

1. Shortcomings could be detected in the implementation of the Safety Management System on the vessel due to inadequate compliance with regulations. When the vessel is at sea the master is responsible for its implementation.
2. The company/vessel had yet to start risk assessment.
3. The recommendations of the IMO and the maritime industry were not sufficiently utilised in bridge resource management or voyage planning.
4. The voyage plan did not fully comply with company guidelines.
5. The pilot's passage plan did not appropriately take advantage of the fairway area.
6. The condition of the navigational equipment on the bridge did not support being able to work normally.
7. The autopilot settings were poorly suited for navigation in the archipelago.
8. The voyage was started without a clear delegation of authority.
9. The pilot and the master did not brief each other about the voyage plan prior to unberthing.
10. For the most part, navigation was based on the pilot's autonomous performance.
11. There was inadequate communication during the voyage.
12. The workload almost entirely centred on the pilot.
13. Sea-clutter made it more difficult to observe objects on the radar display.
14. The turn was wider than normal prior to the grounding.
15. Full speed was used at a challenging spot.
16. There was no lookout during the moments preceding the accident.
17. There was a loss of situational awareness before the grounding.
18. Desperate last-minute steering inputs ensued before the grounding.

### 3.2 Contributing factors to the accident

This accident, too, has revealed 'standard causes', recurring in accident after accident. These include an imperfect implementation of the safety management system and, as a result, an inadequate voyage plan and/or its efficient monitoring. These were compounded by lacking, almost nonexistent, bridge resource management (BRM), which promotes the safe navigation of a vessel. It can be seen that the ones responsible for navigation want to operate within their so-called 'comfort zones'. Apparently, the IMO's voyage planning recommendation Res.A893(21) is considered to be impractical because it is laborious. It includes a number of issues that must be taken into consideration. Most groundings in the archipelago have occurred during turns. Hence, turn planning which allows for the vessel's turning radius and speed is one the aforementioned recommendation's key aspects. If autopilot steering is being used in turns, its settings must be suitable for archipelago navigation at the beginning of and during the voyage.

At the time of the accident there were no compulsory requirements regarding BRM training. Although the pilot had received BRM training, it was not put into action at the practical level. Even if company guidelines highlight cooperation with the pilot, its materialisation is left to the pilot: it either exists or does not exist. Pilotage which relies on one person's solo performance along the rocky shores of our coastline should by now be a thing of the past. Unfortunately, however, it is a recurring occurrence.

# 4 SAFETY ACTIONS IMPLEMENTED

No safety actions implemented during the investigation that could prevent this kind of incident from reoccurring have been brought to the attention of the investigation authority.

# 5 SAFETY RECOMMENDATIONS

Inadequate bridge resource management was found to be a contributing factor in this accident, as it is in many other accidents as well. A good environment for cooperation is established when, prior to unberthing, the pilot and the persons responsible for navigation brief each other on a properly prepared voyage plan as well as on the settings and functioning of the aids to navigation. Despite the fact that cooperation has been found to promote safe navigation, solo-style navigation is commonplace at the practical level.

Therefore, Safety Investigation Authority, Finland recommends that:

1. *The shipping company Feederlines Bv and Finnpilot Pilotage Ltd take prompt action in applying bridge resource management in such a manner that the ship's crew and the pilot share a common view on the voyage plan and its implementation as well as the use of steering controls and the steering manoeuvres to be executed.*

At the time of the accident the vessel's navigational equipment met the requirements and its bridge design facilitates almost identical monitoring opportunities for two navigators. The equipment in use at the time of the accident, however, did not provide preconditions for successful BRM.

Therefore, Safety Investigation Authority, Finland recommends that:

2. *The shipping company Feederlines Bv takes action which brings the port side radar and the electronic chart system up to par with the navigational requirements of the archipelago.*

Helsinki, on 5 November, 2012

Juha Sjölund Sakari Häyrinen Krista Oinonen

## SOURCES

The following sources of information are stored at Safety Investigation Authority, Finland.

1. Maritime Declaration, including appendices
2. The Master's interview
3. The pilot's interview minutes (confidential)
4. Res.A893(21)
5. ISM Code 1.7.2010
6. S-VDR recording
7. Feederlines Fleet Manual, Navigation part (SMS)
8. The ship's voyage plan
9. The pilot's passage plan
10. Bridge preparation checklist
11. IACS Guide to Risk Assessment in Ship Operations

# APPENDIX 1. BRIDGE PREPARATION CHECKLIST

| | | |
|---|---|---|
| FEEDERLINES BV GRONINGEN THE NETHERLANDS | CHECKLISTS<br>**CHECKLIST BRIDGE PREPARATION** | Page: 1 of: 2 |
| Document may not be disclosed to any third party without the prior approval of the management. | Document: Checklist Bridge Preparation<br>- **uncontrolled copy** - | Release: 3 |

| | |
|---|---|
| Port, date, voyage number?<br>3510039 Turku- Pietarsaari 12 Okt 2010 21:00 l.t. | ☑ |
| Steering gear, both units visually inspected and operating weel from all steering positions on the bridge, emergency supply, alarms and change-over tested, etc? | ☑ |
| Are propeller and rudder clear?? | ☑ |
| Tested rudder angle indicators? | ☑ |
| Tested clocks of bridge and ER, manoeuvring printer? | ☑ |
| Bridge control of the main engine including alarms working well from all control positions on the bridge and in the ER (test ahead and astern) | ☑ |
| Tested engine telegraph? | ☑ |
| Tested normal end emergency communication system bridge/ER? | ☑ |
| Tested bowthruster? | ☑ |
| Visually inspected the gyro compass, repeaters synchronized? | ☑ |
| Magnetic compass repeaters synchronized? | ☑ |
| Test autopilot and change-over to manual? | ☑ |
| Radars tuned and running, AIS operational and plotting aids ready for use? | ☑ |
| Electronic (navigational) equipment ready for use? | ☑ |
| Checked navigations lights (normal and emergency systems), lights and alarms? | ☑ |
| Tested communication facilities (internal/external/portable) and whistle? | ☑ |
| Update AIS voyage data? | ☑ |
| Charts, books, voyage planning ready for use? | ☑ |
| Binoculars, azimuthrings, instruments ready for use? | ☑ |

| Created by: | Checked by: | Instructed by: |
|---|---|---|
| hummel | hummel | hummel |
| Date: 14-2-2007 | Date: 14-2-2007 | Date: 14-2-2007 |

| | | |
|---|---|---|
| THE NETHERLANDS | **CHECKLIST BRIDGE PREPARATION** | 2 2 |
| Document may not be disclosed to any third party without the prior approval of the management. | Document: Checklist Bridge Preparation<br>- **uncontrolled copy** - | Release: 3 |

| | |
|---|---|
| Completion of this checklist entered in the ships log? | ☑ |

## APPENDIX 2. THE SHIP'S VOYAGE PLAN

**feederlines**
SHIPMANAGERS . CHARTERERS . AGENTS . BROKERS

Page 1 of 3
**Form no. 19**

### voyage planning

| | |
|---|---|
| Vessel | Nordland |
| Voyage no. | |
| Port of loading | Turku |
| Port of discharging | Pietersaari (Loading |
| Cargo | Ballast |
| Departure time | See Logbook |
| Time | See Logbook |
| E.TA. | See Logbook |
| Time | See Logbook |
| Equipment restrictions / failures | Nil |

| | Fore | | Aft | |
|---|---|---|---|---|
| Draft at departure | Fore | See Logbook | Aft | See Logbook |
| Draft at arrival | Fore | See Logbook | Aft | See Logbook |

Restricted water during voyage ☒ Yes ☐ No

| | |
|---|---|
| If yes, describe the restricitions | Dep. Turku<br>Saaristomeri Archipelago passage<br>Nodra Kvarken<br>Arr. Pietersaari |
| Embarcation / disembarkation pilot(s) | Disemb. Turku - Isokari Pilot station (60 44.3 N 020 54.1 E)<br>Emb. Pietersaari - 1,5 nm of Kallan Lt |
| Weather forecast reports | VHF, MF/HF Radio, Navtex, Sat C, Globe Weather |

Reporting points during the voyage

| | | |
|---|---|---|
| Archipelago VTS | VHF ch. | 71 |
| West Coast VTS | VHF ch. | 09 |
| Bothnia VTS | VHF ch. | 67 |
| Pietersaari Pilot | VHF ch. | 13 |
| | VHF ch. | |
| | VHF ch. | |
| | VHF ch. | |
| | VHF ch. | |

| | |
|---|---|
| Nautical books & chats to be used | ALDRS Vol. 3 (1) and Vol. 6 (2)<br><br>See attachement for charts and waypoints |

Chart corrections up to date? ☒ Yes ☐ No
List of lights up to date? ☒ Yes ☐ No
Other book corrections up to date? ☒ Yes ☐ No

FeLi 19(1) 06/04

feederlines
SHIPMANAGERS . CHARTERERS . AGENTS . BROKERS



## voyage planning

Distance in miles: 291

| From | To | Distance in Miles |
|---|---|---|
| Turku Berth | Turku Pilot | 65 |
| Turku Pilot | Pietersaari Pilot | 220 |
| Pietersaari Pilot | Pietersaari Berth | 6 |

Anchoring locations available at arrival? ☒ Yes ☐ No Where? See remarks

| Port | In pilot NP | Page |
|---|---|---|
| Turku | 20 | 257 |
| Pietersaari | 20 | 322 |

**Remarks** For example extra port information

Pietersaari Anchorage: anchorage may be obtained by vessels, in depth of 9.0 m to 11.0m about 3,25 Nm from the head of inlet near Monas, a small village. Monas has a small harbour with limited facilities. On the NE side of the inlet lies Vexala, another small village.

feederlines

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**Form no. 19**

**Additional information (if applicable)**

**Signature master**

**Date**

12-10-2010

**Appendix 2/4(4)**

## Route #61

### Turku Berth - Turku Pilot North

| Nr. | Position Point | Latitude | Longitude | GC | Course | Distance | Rest |
|---|---|---|---|---|---|---|---|
| 500 | Turku Berth | 60°26,1 N | 022°13,0 E | | 241,0° | 2,9' | 61,5' |
| 501 | Iso Pukki | 60°24,7 N | 022°07,9 E | | 199,1° | 2,1' | 58,7' |
| 502 | Satara | 60°22,7 N | 022°06,5 E | | 203,1° | 6,3' | 56,5' |
| 503 | Kramppi | 60°16,9 N | 022°01,5 E | | 254,2° | 2,9' | 50,2' |
| 504 | Purha | 60°16,1 N | 021°55,8 E | | 267,0° | 3,8' | 47,3' |
| 505 | Ostra Langgrundet | 60°15,9 N | 021°48,2 E | | 322,9° | 2,6' | 43,5' |
| 506 | Kallsari | 60°18,0 N | 021°45,0 E | | 300,1° | 4,6' | 40,9' |
| 507 | Vasikkasaari | 60°20,3 N | 021°37,0 E | | 324,4° | 1,1' | 36,3' |
| 508 | Saukkoletto | 60°21,2 N | 021°35,7 E | | 358,3° | 1,7' | 35,2' |
| 509 | Ykskari | 60°22,9 N | 021°35,6 E | | 302,4° | 2,1' | 33,5' |
| 510 | Svartklubb | 60°24,0 N | 021°32,1 E | | 327,5° | 0,8' | 31,4' |
| 511 | Raklabb | 60°24,7 N | 021°31,2 E | | 339,1° | 3,7' | 30,6' |
| 512 | Isoletto | 60°28,2 N | 021°28,5 E | | 287,3° | 1,3' | 26,9' |
| 513 | Heponiemi | 60°28,6 N | 021°25,9 E | | 270,0° | 1,5' | 25,5' |
| 514 | Ankargrund | 60°28,6 N | 021°22,9 E | | 253,1° | 1,0' | 24,0' |
| 515 | Santasaari | 60°28,3 N | 021°20,9 E | | 280,2° | 4,5' | 23,0' |
| 516 | Kungsholm | 60°29,1 N | 021°11,9 E | | 315,4° | 2,4' | 18,5' |
| 517 | Jurmo | 60°30,8 N | 021°08,5 E | | 357,9° | 4,0' | 16,1' |
| 518 | Korra | 60°34,8 N | 021°08,2 E | | 308,5° | 1,4' | 12,1' |
| 519 | Svartorarna | 60°35,7 N | 021°05,9 E | | 341,7° | 5,5' | 10,7' |
| 520 | Iso Hauteri | 60°40,9 N | 021°02,4 E | | 314,0° | 5,2' | 5,2' |
| 521 | Turku N Pilot | 60°44,5 N | 020°54,8 E | | | | 0,0' |

## Route #01

### Turku - Pietarsaari

| Nr. | Popular Position Point | Latitude | Longitude | GC | Course | Distance | Rest |
|---|---|---|---|---|---|---|---|
| 1 | Isokari pilot | 60°44,5 N | 020°55,0 E | | 319,3° | 5,6' | 219,6' |
| 2 | Sandback | 60°48,8 N | 020°47,5 E | | 355,2° | 117,9' | 214,0' |
| 3 | Storkallegrund | 62°46,2 N | 020°26,5 E | | 359,2° | 33,0' | 96,1' |
| 4 | Norrkallan | 63°19,2 N | 020°25,5 E | | 33,9° | 15,7' | 63,1' |
| 5 | Nordvalen | 63°32,2 N | 020°45,0 E | | 72,6° | 9,3' | 47,4' |
| 6 | Ostra kvarken | 63°35,0 N | 021°05,0 E | | 75,4° | 38,1' | 38,1' |
| 7 | Pietarsaari pilot | 63°44,6 N | 022°28,0 E | | | | 0,0' |

## Route #62

### Pilot Pietarsaari - Berth Pietarsaari

| Nr. | Position Point | Latitude | Longitude | GC | Course | Distance | Rest |
|---|---|---|---|---|---|---|---|
| 525 | Pilot Pietarsaari | 63°44,6 N | 022°28,5 E | | 90,0° | 1,6' | 6,3' |
| 526 | Nygrundet | 63°44,6 N | 022°32,2 E | | 116,1° | 1,1' | 4,6' |
| 527 | Lilla Masskar | 63°44,1 N | 022°34,5 E | | 107,1° | 3,1' | 3,5' |
| 528 | Harbour Bassin | 63°43,2 N | 022°41,1 E | | 161,6° | 0,4' | 0,4' |
| 529 | Pietarsaari berth | 63°42,8 N | 022°41,4 E | | | | 0,0' |

***Steaming Times***

| | | | | | |
|---|---|---|---|---|---|
| @ 12,5' | day(s) 0:30 hrs | @ 13,0' | day(s) 0:28 hrs | @ 13,5' | day(s) 0:27 hrs |
| @ 14,0' | day(s) 0:26 hrs | @ 14,5' | day(s) 0:25 hrs | @ 15,0' | day(s) 0:25 hrs |

***Charts***

## APPENDIX 3. SUMMARY OF THE RECEIVED STATEMENTS

### Statement by the Finnish Transport Safety Agency

Finnish Transport Safety Agency did not have anything to state for final draft.

### Statement by Finnpilot Pilotage Oy

The Finnpilot stated that the cause of the accident was Master's careless attitude to the safety management and due to that defective leadership of his vessel. This can be seen from not complying with the company instructions on voyage plan and its monitoring.

Finnpilot had comments on the safety recommendation no one, which was addressed both to the ship owner and to the Finnpilot. Finnpilot's personnel face so often indifference in bridge resourse management implementation that Finnpilot would prefer to address this recommendation to a wider audience. According to the experience of the Finnpilot, bridge resource management is managed better than average in Finnish shipping companies and therefore it is needless to blame domestic interest groups with this issue. Instead the importance of the issue could be spread also to the international awareness via them. The bridge resourse management practices should be widely studied and the involved parties could be: navigation institutes, Finnish Transport Safety Agency, Finnish Shipwners, Finnish Ship Officer Association, Pilot Association and Finnpilot.

### Statement by the Pilot

The pilot stated about his status in connection to the events via his lawyer. In addition he made general observations and submitted opinions about the influence of the valid legislation to the actions of the persons involved and to the investigation and made observations on the characterizations used in the final draft.

The pilot did comment about the movements of the master in the bridge during the pilotage and questioned if a technical fault in the autopilot can be totally excluded.

The pilot noted also that he did not have an ECS chart program. Instead he had on his laptop computer situational view of other traffic displayed on chart and based on the AIS data. This device is not meant to be used for navigation and it was not in use during the accident voyage.

According to the pilot it was a pitch dark night and therefore the outlines of the islands and the horizon were not visible from the bridge.