Investigation report

C 1/2000 M

ms OCEAN PRIDE, grounding at Orrengrund, March 6, 2000

SUMMARY

The Norwegian cargo vessel OCEAN PRIDE owned by the Pride-Petrus Company grounded in the Finnish archipelago at Orrengrund in the evening of the 6th of March 2000. The vessel was registered at the Norwegian NIS register and had a seven member multinational crew. The vessel was bound for Kotka from Ventspils.

A southerly storm was prevailing in the Orrengrund area with gusts up to 24 m/s. The visibility was poor. The master got the advice to proceed to an unofficial pilot boarding place at the western tip of the Orrengrund island. The master regarded this as an order and followed it. When the mate left the bridge to pick up the pilot the master was left alone on the bridge.

Slightly before the official pilot boarding place the master turned to port with the autopilot to heading 000° towards the western tip of the Orrengrund Island. Next, he tried to turn with the autopilot further to port to heading 340° with the intention to round the west shore of the Orrengrund island, but the steering gear did not react. He switched to manual but the steering gear did not obey his orders. He tried the autopilot again and manual steering the second time in vain. The steering gear did not respond. The Master's next move was to turn the emergency steering wheel to port. The steering gear responded but slowly. The vessel was already too close to the shore and stranding could not be avoided. The Master's last operational measures aimed to limit the consequences of the grounding. The imminent causes of the accident were the storm, bad visibility, steering gear failure and poor manual steering system.

The investigation found several hidden latent errors with regard to the vessel. The master did not know the procedures related to the unofficial pilot boarding place. He was not aware of the fact that the VTS centre will not provide steering commands for reaching the new pilot boarding place.

The previous master had requested an increase in the manning for the Baltic traffic but the company had not agreed. The small manning led to a situation were the master had to violate the STCW rules for fitness on duty for his own part. The master was alone and there was not a one-man navigation and steering point. He had to navigate with the radar in poor visibility and he had to steer simultaneously. The master had to deviate from his original passage plan. This situation would have required accurate steering commands by the pilot organisation but the master did not get the information he needed.

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Figure 1. ms OCEAN PRIDE photographed on March 14, 2000 at the port of Sunila, Kotka.

1 GENERAL DESCRIPTION AND INVESTIGATION OF THE ACCIDENT

1.1 Vessel

1.1.1 General data

Name	OCEAN PRIDE
Home port	Kristiansand
Type	general cargo vessel
Identification code	LAZF4
IMO number	7396666
Nationality	Norwegian
Year of construction	1974
Length max	87,89 m
Measured length	79,79 m
Width	14,41 m
Draught, max	4,82 m
Capacity	2750 t
Gross	2592
Net	1054
Machine power	1765 kW
Speed	14,0 knots
Classification	Germanischer Lloyd AG, 100 A5 E3
Ice category	IA

1.1.2 Vessel registration documents

The list of registration documents is based on the maritime accident report.

Safety certificate:

-	structure	valid until	May 31, 2004
-	equipment	valid until	May 31, 2004
-	radio	valid until	May 31, 2004

IOPP (environmental protection)	valid until	May 31, 2004
Life rafts	inspected	March 26, 2000
Cargo mark	valid until	May 31, 2004
Error of magnetic compass	inspected	July, 1999

Inspections of classification society:

-	structure	valid until	May 31, 2004
-	machinery	valid until	January 27, 2004
-	toilet waste water	valid until	May 31, 2004

Area of traffic	unlimited
GMDSS radio traffic areas	A1, A2, A3

Appendices of the Maritime Declaration:

Manning certificate	issued January 20, 1999

1.1.3 Crew and traffic limitations

The manning certificate stipulated the manning of the vessel at 9 persons, but under certain conditions it could be 7 persons. The vessel had a crew of seven. All were Lithuanian citizens except the chief engineer who was Estonian. The master had not visited Kotka previously.

Table 1. Manning requirements of the OCEAN PRIDE and crew on the voyage.

Requirement in manning certificate		**On board the vessel according to the crew list:**
	Permitted exceptions	
Master	1)	Master
First mate	1)	First mate
Mate	1) 2)	
Chief engineer		Chief engineer
Radio operator	3)	
Cook		Cook
Seaman		Seaman
Seaman		Seaman
Ordinary seaman		Ordinary seaman

1) The watch officers shall have a Restricted Operator's Certificate (ROC) for radio traffic.

2) The position of mate may be left vacant according to the wishes of the master if the watch arrangements of the first mate are changed according to Chapter 7 of the NIS legislation and if the employment contract of the master permits this.

3) The position of radio operator may be left vacant if one of the navigators on the watch roster carries a General Operator's Certificate (GOC) for radio traffic.

The number of crew on the ship was within the acceptable limits. Exceptions 2) and 3) of the crew certificate were applied. The manning was the smallest possible.

Table 2. Experience of the crew of the OCEAN PRIDE in years.

Information of the maritime service of the watch crew in years				
	Age	Maritime service as officer	Maritime service in present office	Office accepted
Master	47	28	8	Feb 3, 2000
First mate	44	23	15	Feb 11, 2000
Chief engineer	61	41	30	Feb 25, 2000
Seaman	30		19	Feb 11, 2000
Seaman / engineer	37		15	Feb 11, 2000

The crew was very experienced but all were new on the OCEAN PRIDE. The Master had been on the ship one month out of a two-month contract.

According to the Norwegian manning certificate of the vessel, the working hours were 8 hours a day, whereas the working hours including overtime could not exceed 14 hours per day. The total working hours per week could not exceed 56 hours on average. The working hours of the watch officers at the time of the accident according to the maritime accident report are presented in the following table.

Table 3. Working hours of the crew of the OCEAN PRIDE before the accident.

Working time	Working time before the accident			Time of watch duty at the time of accident	Watch system
	Past 24 hours	Past 48 hours	Past week		
Master	19 hours	35 hours	70 hours	17 h 44 m	2-watch system
First mate	16 hours	29 h 15 m	67 h 30 m	12 hours	
Chief engineer	16 hours	24 hours	60 hours	11 hours	
Seaman	9 hours	35 hours	74 hours	9 hours	No system
Seaman	8 h 30 m	20 hours	64 hours	8 h 30 m	No system

At the Maritime Declaration hearing, the Master considered the number of crew too small on the trips to Kotka, since the loading and unloading require performance of numerous tasks.

1.1.4 Cockpit and equipment

The cockpit equipment list presented here has been drawn up from the maritime accident report.

Radar	Furuno 20" FR 2110
Radar	Furuno FR 810 DA
Gyro compass	C.Plath
Magnetic compass	C.Plath
Autopilot	C.Plath
Angular deviation alarm	GAZ
Depth sound	ATLAS
Satellite navigator	GPS Furuno GP-50
Fog horn	ZÖLLNER Automat

Figure 2. Bridge of the OCEAN PRIDE.

1.1.5 Passage plan

The vessel had a passage plan according to which the pilot was supposed to board south of Orrengrund at the official pilot boarding place marked on the chart. The plan continued to Kotka along the fairway passing Orrengrund on the south side[1]. The accident investigators interviewed the first mate who confirmed that the passage plan had been programmed into the GPS from the port of departure to the port of destination[2].

1 Hearing of Master at the Maritime Declaration session, page 2.
2 Interview of first mate.

1.2 Accident events

1.2.1 Weather

The weather information is based on the maritime accident report and on the data of the Kotka Coast Guard station and Kotka traffic service.

Wind direction: 170° - 190°
Wind speed: 17 - 24 m/s
Wave height: 3 - 4 m.
Direction of waves: about 180°
Visibility: 0.4 - 0.9 nautical miles. Snowing.
Temperature: about -2°C

1.2.2 Accident voyage

The trip from Ventspils to the Kotka VTS area[3] had proceeded normally, according to the Master. Neither does the ship's log show any exceptions from the normal routines. The position of the vessel had been taken at regular intervals and marked on the chart. From time to time, the location coordinates had been transferred to the log as GPS readings.

The Master reported to the VTS centre on March 6, 2000 at 18:31 (ship time) that the vessel was about half an hour away from the pilot boarding position. VTS acknowledged reception of the report and notified the vessel that the pilot boarding position was west of Orrengrund. At 18:59 the pilot contacted the ship and repeated the information of the VTS centre of the changed pilot place: "We will be expecting you west of Orrengrund in the western entrance channel". At that time, the ship had passed the Tainio light house and was exactly on the approach line. The Master acknowledged this announcement and reported that the pilot ladder was on the port side. After the mate went down to receive the pilot the Master was left alone on the bridge.

Events of the grounding. The pilot reported to the vessel at 19:03: "Full speed, western entrance channel west of Orrengrund". At the time, the vessel was turning onto new true heading (360°).

During the turn, the ship had travelled to about 0,2 nautical miles east of the fairway line leading to the west side of Orrengrund. At the end of the turn, she was approximately on the green sector line of the sector beacon of the western tip of Orrengrund, about 0,9 nautical miles south of the shoreline of Orrengrund island.

The approach took place on autopilot at true heading 360°. At 19:14, when the vessel was 0,4 nautical miles away from the Orrengrund shoreline, the Master tried to adopt

[3] The Kotka piloting service at the time in question is called Kotka VTS in the text of the report, although this name became official only in the autumn, on October 1, 2000.

new true heading 340° for the vessel, but the autopilot did not obey the new steering command but left the rudder 10° to starboard.

The Master used the switch to turn to the manual steering (tiller) mode which did not react to the steering commands either. He switched the autopilot back on and realised that the steering was still not functioning. He repeated once more the switch over to manual steering and back to autopilot without any effect on the rudder.

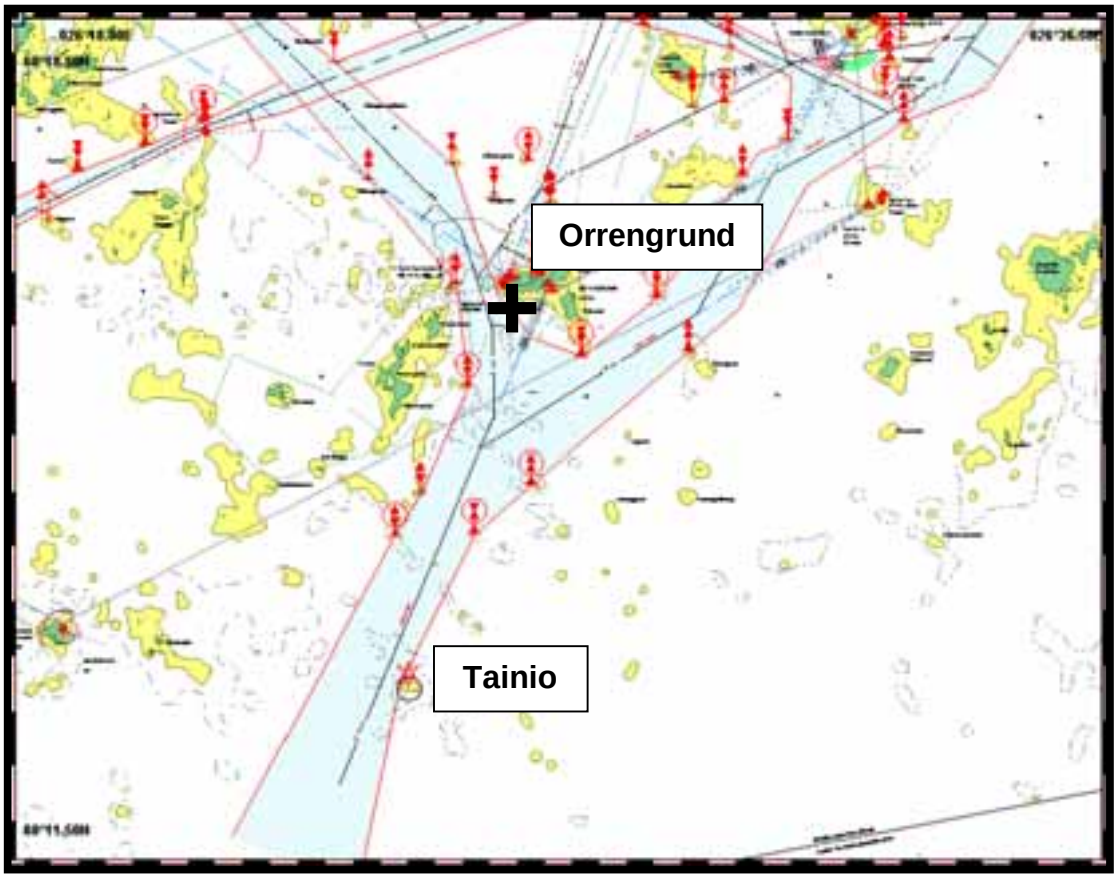

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Figure 3. Location of grounding of the OCEAN PRIDE on the shore of Orrengrund (marked with X). (The vessel was approaching Orrengrund from the south on the 10-metre fairway past the Tainio light house).

The Master ordered the machine ”slow ahead”, soon after gave the order ”stop” and finally ”full reverse”[4] while preparing to activate the emergency steering system (hydraulic wheel). Since the emergency steering was not operating at full power, the wheel was heavy to turn and it took more time than normal for the rudder to reach extreme port.

Soon after the Master had managed to turn the wheel to extreme port, at 19:16, the bow section of the hull of the ship hit the bottom rocks.

[4] According to the master reversing of the main engine takes 15-20 seconds.

1.3. Rescue activity

1.3.1 Initiation of rescue activity

Emergency traffic. The Master informed the Kotka traffic control centre of the grounding at 19:20. The Maritime Declaration did not specify the frequency on which the conversation was conducted. The log of the ship contained the following notes:

- 19:20 *"Informed pilot Orrengrund"*
- 19:25 *"All to whom it may concern informed. Leakage DB1 st side, and forepeak"*

According to the maritime rescue log of Maritime Rescue Coordination Centre Turku, "Mayday traffic ceased" on March 7, 2000, after midnight at 00:19.

Initiation of rescue activities on shore. The Kotka VTS centre and the coast guard stations share their offices, so information about an accident is quickly passed from one organisation to the other. The Kotka Coast Guard Station notified MRCC Turku of the grounding of the OCEAN PRIDE at 19:19. The MRCC called patrol vessel MERIKARHU to the scene at 19:21 and an Agusta Bell 412 helicopter, OH-HVD, of the Helsinki guard squadron at 19:25. The helicopter arrived at the scene at 20:23 and after inspecting the situation of the ship, put down at Orrengrund. The MERIKARHU arrived at 23:45 and her Master was appointed commander of the accident scene (OSC) at 23:00.

The MRCC contacted the OCEAN PRIDE on VHF at 19:21, 19:49 and 20:10. On both later occasions, the ship reported that there was no need for evacuation of the crew. Ice breaker APU reported to the Maritime Rescue Coordination Centre at 19:29 that she would be unable to assist because of the weather. The patrol boat of the Kotka Coast Guard Station was also unable to set out in the prevailing conditions. The air temperature in Kotka was -2 degrees at 20:45, the wind speed 17-24m/s and the wind direction 190 degrees.

The MRCC notified the Maritime Inspector of the Ship Inspection Division of the Gulf of Finland at 19:40 and the helicopter picked him up at Loviisa and transported him to the OCEAN PRIDE at 23:20. The duty officer of the Finnish Environment Institute reported to the MRCC that oil prevention vessel HYLJE had been alerted at Upinniemi and that she would set out at about 02:00. Tug NEPTUN started towards the scene at 23:25 and the MRCC was notified that the accident vessel had contracted with the rescue company Alfons Håkans.

Initiation of rescue activities on board. Immediately after the grounding of OCEAN PRIDE after 19:25 the Master made sure that the crew and cargo were all ok. A leakage was observed in vessel's double bottom tank number DB 1 S (right side) and in fore peak. A leakage in the tank DB 1 P (left side) was observed at 22:15. Later at night it was observed that the double bottom tanks 3 and 4 on both sides were leaking. Observations of the above mentioned leaks were made during sounding and de-ballasting and when air was noticed coming out from air pipes. A small leakage was also observed in cargo hold at 00:16. Because of that the water level had risen at first 6-8 cm per hour in

the cargo hold but the leakage was held in check by pumping. Extracts of the log book concerning the rescue of the vessel and cargo are in enclosed table 4.

1.3.2 Rescue of the vessel and her damage

The wind velocity increased to 24-25 meters after the grounding according to the log book. Because of that refloating was not even tried. The vessel was hammering, pitching and rolling while grounded.

The tugboats NEPTUN and ATLAS arrived at the vessel on 7th of March and stayed to secure the cargo discharging. Barge ELEVATOR and tugboat KRAFT arrived to the vessel on 9th of March at 02:35. The deck cargo was discharged to the barge during the same night at 03:25-04:15. The transferring of the cargo in hold was started at 04:35. At 18:53 so much cargo had been transferred to the barge that OCEAN PRIDE refloated. The vessel was immediately anchored and divers inspected closely the vessel's damage.

Oil prevention vessel HYLJE and patrol boat MERIKARHU were securing the situation during the rescue operation. There were altogether 70-80 tons of fuel oil in the vessel. Although the double bottom fuel tanks were observed to be damaged no oil leakage was observed from the vessel. Water pressure prevented fuel oil from leaking out into the sea.

Anchor was lifted up on 10th of March at 00:34. NEPTUN and ATLAS started to tow the vessel towards Kotka Sunila harbour. Tugboat VIIKARI also assisted in towing. The harbour was reached at 05:40. The discharging of the cargo still in the vessel was started at 08:00.

OCEAN PRIDE's damages were inspected in Sunila and the following description of the damaged compartments is based on maritime accident report made by the Master. The fore peak and double bottom tank number DB 1 S (right side) were damaged in the grounding. While grounded because of the waves the vessel was hitting into the rock and additionally to the original damage damage to the double bottom tanks DB number 1 P (left side) and DB number 3 and 4 and 5 on both sides and to double bottom fuel tanks number 3 and 4 in the midship were holedsprang. The leakage to the hold's fore part bilge was sprang due to the damage in the de-ballasting pipe.

According to the diver's inspection in Sunila there were several 0,5 m deep dents in the stern of the vessel but rudder and propeller were undamaged. The whole bottom of the vessel from from midship to bow was damaged. On the right side almost the entire bottom was open at 3-4 m width and it had risen about a meter. On the left side the bottom had risen from 3 m width and it had tears. In the midship there were dents and small cracks. The bow propeller was in order but there were cracks in the stem.

Kotka's Rescue Centre received information of the vessel with damaged fuel tanks arriving to Sunila from newpaper. The damaged double bottom tanks were emptied in Sunila before the permission to transfer the vessel was given. According to the representative of the Classification Society 43,4 tons of oil was pumped out of the tanks and he estimated that there was 11 tons of oil missing or still in the damped tanks.

An authorised service company inspected the operation of the steering gear and the tillers at port on 14th of March. Both were reported to function normally.

Table 4. Extracts of the log book concerning the rescue of the vessel and cargo.

6.3.	19:25	All to whom it may concern informed leakage in DB No.1 st side and forepeak
	19:30	All OK with the crew and cargo No leakage from GO tanks No leakage in the hold. Wind 15-16
	22:15	DB No.1, port side full. wind 24-25 m/sec
	22:45	De-ballasting from DB No.3
	23:20	Sounding in DB Nos 1,2,3 p/side and starbord side. Water in DB No.1 p/side
	24:00	De-ballasting from DB No.1-2-3 investigate of leakage in this tank. Wind 15-16 m/sec tug/boat ”NEPTUN” not agreed to start towing operation due to weather condition, the ship is hammering, pitching and rolling
7.3.	00:16	Small leakage in the hold
	02:30	Wind increased to 20-24 m/sec, stop engine
	02:45	Leakage in GO tanks No.3 and No.4 center. Water in hold arriving 8 sm per hour De-ballasting from hold
	04:00	Stopped pumping from hold
	08:00	same level in the hold only in bilges Made soundings around vessel
	12:45	Director of salvage company on board
	13:45	Navy boat made soundings around vessel
	13:50	Tug ”NEPTUN” port side along side
	23:40	Tug ”ATLAS” st/side alongside
8.3.	22:40	NAVY vessel ”MERIKARHU” dropped anchor in the area of w part of ORRENGRUND island in standby position
9.3.	02:35	Barge ”LEVATOR” with tug ”KRAFT” port side alongside
	03:00	Made fast, tow line from aft part to tug ”NEPTUN”. tug ”NEPTUN” in stand by position
	03:25	Commenced discharging with barge crane ”LIEBHERR” from deck
	04:15	Deck cargo off
	04:35	Commenced discharging from the hold
	18:53	Ship seafloated under way
	19:02	Dropped port anchor
	19:25	Tug ”NEPTUN” st/side alongside
	20:05	F=2.80 A=5.20
	20:12	BARGE ”LEVATOR” with tug ”KRAFT” off
	20:20	Diver’s inspection commenced
	23:40	P.O.B.
10.3	00:05	Made fast tow line FOR Tugboat ”NEPTUN”
	00:14	Made fast tow line AFT Tug ”ATLAS”
	00:34	Anchor up. Proceeding to Kotka (Sunila)
	05:40	All lines fast st/side alongside
	08:00	Commenced discharging

Figure 4. OCEAN PRIDE at the shore of Orrengrund.

1.4 Investigation of the accident

MRCC Turku reported the grounding of the OCEAN PRIDE to the duty officer of the Accident Investigation board on March 6, 2000 at 20:00. The situation was monitored from this time on and information gathered. The Accident Investigation Board made the decision to investigate the accident on March 7, 2000. Martti **Heikkilä**, Chief Accident Investigator of the Accident Investigation Board and Toimi **Sivuranta,** Captain from the Kymenlaakso Polytechnic were appointed as investigators of the accident. Kari **Larjo**, Master Mariner, served as an expert.

The Master of the OCEAN PRIDE gave a Maritime Declaration about the accident at the Kotka Maritime Court on March 14, 2000. The investigators of the Accident Investigation Board were present at the Maritime Declaration session and the minutes of the session were used as an investigation document.

The ship simulators of the Kymenlaakso Polytechnic were used for simulation runs in order to study the accident events.

The final draft of the report was sent for comments to maritime and rescue authorities as well as to the ship owner and the master. A comment was received from the MRCC and some text changes have been made accordingly.

2 ANALYSIS

2.1 Practice for pilot boarding at Orrengrund

The practice for pilot boarding for ships bound for Kotka or Hamina in spring, 2000 is described in the following. The practice is applied to ships of less than a 10-metre draught. The information is based on the interview of the supervisor of the Kotka piloting service.

The Kotka piloting service at the time in question is called Kotka VTS in the text of the report, although this name became official only in the autumn, on October 1, 2000.

The incoming vessel requests a pilot 24 hours before arriving at the pilot boarding position by contacting the Kotka piloting service or Kotka VTS by telephone or telefax. The request may also be placed through the ship's representative.

The incoming ship reports to the same location 6 hours before arriving at the pilot boarding position.

The ship confirms her arrival 3 hours before reaching the pilot boarding position, usually by VHF telephone by directly contacting the Kotka piloting service or Kotka VTS. In connection with this report, the ship is requested to report to the traffic control by VHF telephone half an hour before arriving at the pilot boarding position.

Kotka VTS confirms for example the following in connection with the report given half an hour before arriving at the pilot boarding position:

- traffic situation in the area
- place and height of pilot ladder from the water surface
- conditions, weather
- specification of pilot boarding position

The pilot boarding position is located at the site marked on the nautical chart on the incoming lit fairway at about 1,5 nautical miles in heading 203 degrees from the island of Orrengrund.

Depending on the weather, the pilot boarding position may be moved to a more sheltered location, usually to the west side of Orrengrund. **The ship is notified of this** and requested to continue her passage along the western entrance channel, west of Orrengrund island.

At this point it is possible for the vessel and the pilot boat to establish direct VHF contact with one another.

Vessels with more than a 10-metre draught use the deep channel.

Regulation concerning the pilot boarding position. The decision of the National Board of Navigation on the boarding and positions for pilots was issued on February 8, 1988[5]:

> 'The boarding positions are marked on nautical charts and the piloted trips are presented in lists confirmed by the National Board of Navigation. In exceptional conditions the pilot may, based on his own judgement or that of the duty officer of the piloting station **with the consent of the Master of the ship** board the vessel or leave it at other points along the fairway or at open sea, provided there is a valid and accepted reason for this.'

The previous decisions had been given on April 2, 1972 and on April 10, 1987. The Chancellor of Justice has criticised the old directions because the term "exceptional conditions" was not specified in them.

It is not possible for the master to know what constitutes exceptional conditions under the prevailing practice. He cannot agree on the pilot position together with the pilot since he is not familiar with the official regulations governing the piloting. It is natural that the master expects the pilot to represent the official view of the maritime administration and therefore he interprets the advice of the pilot as directions by the maritime administration.

2.2 Boarding of pilot on March 6, 2000

Communication between piloting service and ship. The VHF traffic preceding the accident is reported based on the surveillance tape of Kotka VTS. The times in the text are corrected to represent ship time. The Master occupied the bridge alone.

At 18:31

OCEAN PRIDE to VTS: *Half an hour to pilot position.*
VTS to OCEAN PRIDE: *Pilot boarding position is west of Orrengrund.*

At this time the vessel was about 4,4 miles south west of the Tainio light house. The Master was on the bridge with the mate. It is not known whether the Master understood the meaning of the message. The Tainio light house was passed at 18:55.

At 18:59 (Figure 5)

Pilot to OCEAN PRIDE: *We are waiting you west side of Orrengrund, western entrance.*
OCEAN PRIDE to pilot: *Ok. Pilot ladders port side.*

Since the reports reveal that the mate and the seaman placed the pilot ladder, it is likely that the Master occupied the bridge alone. Considering the conditions, the entire conversation was brief and the content of the presentation did not correspond to the situation.

At 19:03

Pilot to OCEAN PRIDE: *Full speed west side of Orrengrund, western entrance.*

[5] National Board of Navigation Bulletin nr. 6/88, Feb. 8, 1988.

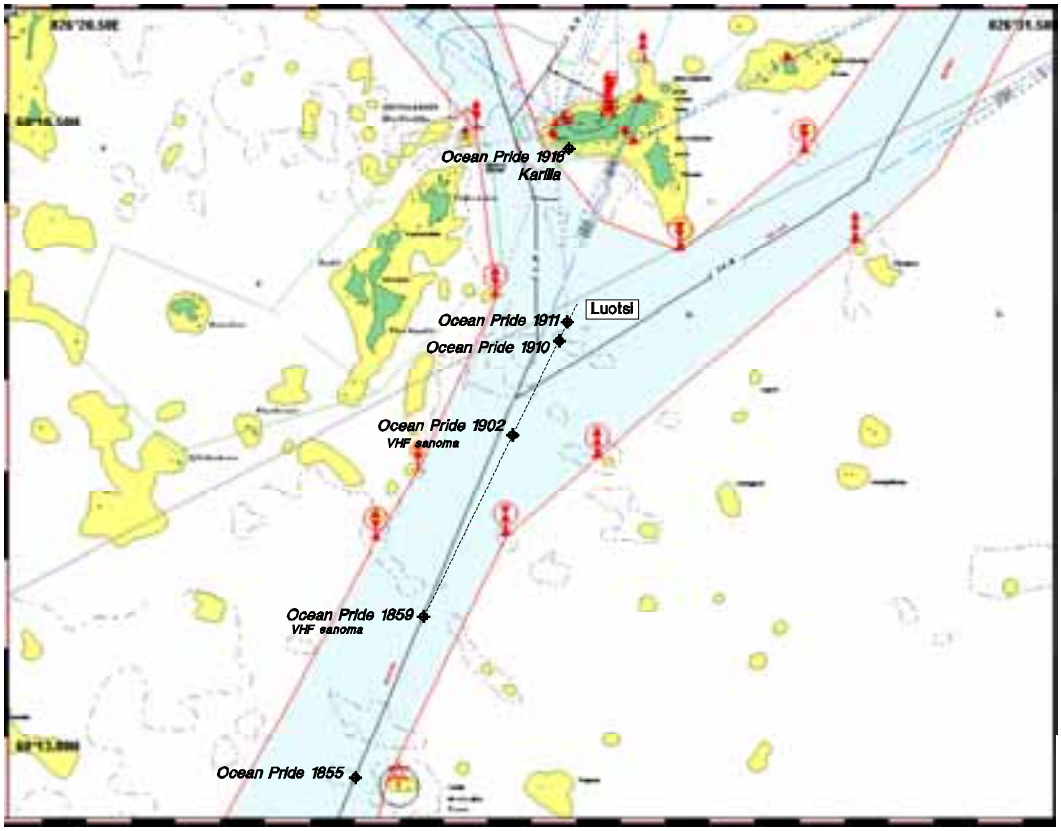

Figure 5. Position of the OCEAN PRIDE based on VTS registration.

The Master was defining the position and starting the turn on autopilot, which explains the missing reply of the Master. The turn was completed at about 19:11. The vessel was then at heading 000.

At 19:15:39

Pilot to VTS: *Are you monitoring the Ocean Pride?*

The vessel heads nearly straight on towards Orrengrund.

At 19:15:50
VTS to pilot: *Yes we are, but the echo is lost.*

At 19:16:01
Pilot to OCEAN PRIDE: *Ocean Pride, pilot boat calling.*
OCEAN PRIDE to pilot: *We have lost control (heavy disturbance in VHF traffic)*

At 19:16:30
Pilot to OCEAN PRIDE: *Immediately to port.*
OCEAN PRIDE to pilot: *We are aground.*

At 19:16:46
VTS to pilot: *Is the Ocean Pride aground?*
Pilot to VTS: *Lost steering and is aground south of the west tip of Orrengrund.*

2.3 Analysis of grounding by simulation

Reconstruction. The approach of the vessel towards the new pilot boarding position outside the original passage plan was simulated on the ship handling simulator of the Kymenlaakso Polytechnic. A model resembling the OCEAN PRIDE but about 10 m longer was used in the simulation. The simulations were run several times by steering along the route travelled by the vessel in similar weather and wave conditions. Figures 6a and 6b and the event table present the accident as simulated on the passage recorded by the VTS registration. The aim of the simulations was to establish the behaviour of the vessel at the rudder angles described by the Master. The approach in the tests was begun from the time of passing the Tainio light house at about 18:55. The passage from the starting point to the location of the ship at 19:14 could be negotiated without problems in all simulation runs.

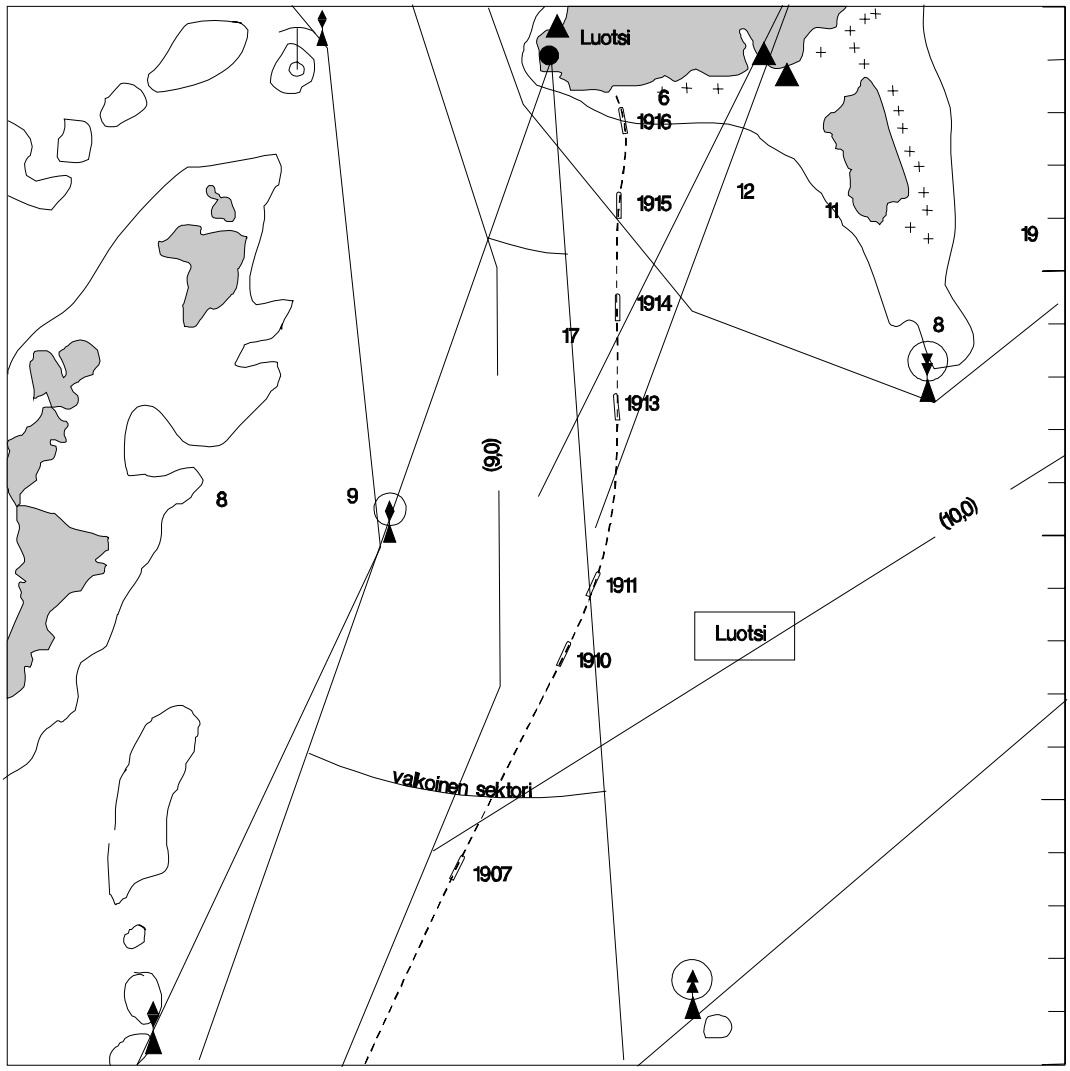

Figure 6a. The accident as simulated along the passage registered by VTS registration (desk top computer simulation).

Table 5. Data used in simulation. HDG = bow heading. COG = course over ground.

Time	HDG	COG	Speed	---
18:55	023	022,5	11	Passing of Tainio light house. Vessel steering along line 023°.
19:02	026	024,5	10,5	VTS image. Heading changes 2° to starboard.
19:03	025	024,5	10,4	Passing of west marker. Pilot order: 'Full speed west side of Orrengrund'.
19:07	026	025,5	10,5	Reconstructed positioning. Turn to line west of Orrengrund should have started here.
19:10	025,5	025	10,8	Vessel still travelling straight on autopilot.
19:10:30	025	024	10,8	Turn on autopilot to heading 000° begun.
19:11	024	024,5	10,8	Early stage of turn. Rudder was 15° to port.
19:13	355	355,5	10,7	Turn goes easily 5° over. According to simulation, rudder was still 5° to starboard.
19:13:30	359	000	10,7	Turn to heading 330° should have started.
19:14	359,5	000	10,6	According to Master, rudder was 10° to starboard. Master gave heading 340° to autopilot, but rudder did not turn.
19:14:10 20-40 seconds 19:14:50				Master switched to NFU steering. It did not work. Master switched back on to autopilot. It did not work. Rudder was still 10° to starboard. Master set machine power to slow ahead. Master began to turn emergency rudder to port.
19:15:10	000	000		Turning of emergency rudder to full port took 20 seconds.
  19:16	350			Rudder at full port. Machine power to full reverse. Vessel grounded.

Delay of turn. A rudder malfunction was simulated at the location of the OCEAN PRIDE at 19:14, where the Master had attempted to set the new heading 340° in the autopilot. This caused the rudder to turn to an angle of 10 degrees to starboard, which caused the test vessel to soon start to turn slowly to starboard. No clear cause explaining why the rudder turned to starboard was found in the investigation. It is known that there have been rudder machine malfunctions the reasons for which were identifiable only after the rudder machine had been taken apart.

After detecting the problem in the operation of the autopilot the Master had switched the steering on manual (tiller). The rudder had not reacted to the steering commands. According to his report, he had then switched the autopilot back on but realised that the rudder still did not react to the given heading change command. He had tried once more to gain control of the ship by manual steering but failed. The rudder had still remained at 10 degrees to starboard.

The simulations also aimed at realising the time delays described in the above. Here, 20-40 seconds was estimated to correspond to the time the master had used for trying the various steering methods. Next, the rudder was turned slowly, in about 20 seconds, to a position where the rudder was 35° to port. It was estimated that the Master had used this amount of time to turn the rudder to the corresponding angle using the emergency rudder of the accident vessel.

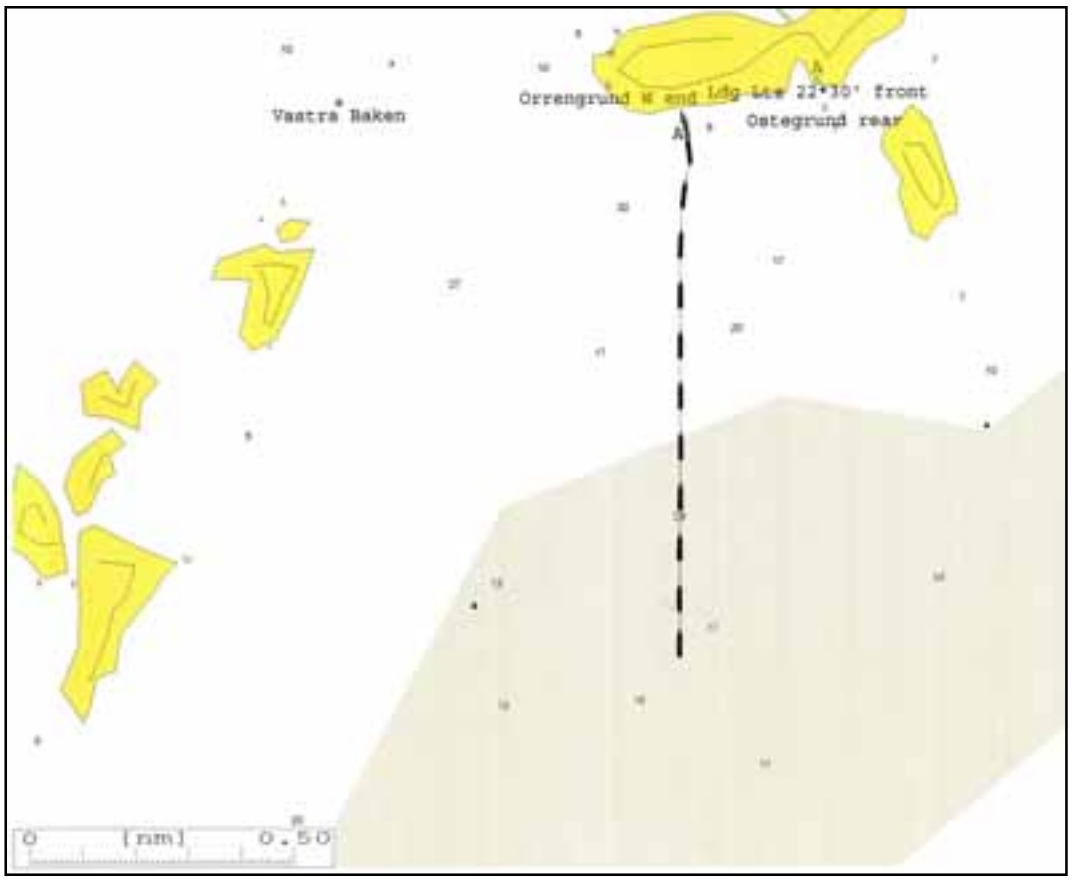

Figure 6b. Reconstruction of the grounding simulated by bridge simulator (Kymenlaakso Polytechnic, Kotka). The interval of the position markings of the vessel is 30 seconds.

Stopping of the vessel. The simulation tests attempted to reconstruct the machine commands ”slow ahead”, ”stop” and ”full reverse” to correspond to the accident situation, based on the report of the Master of his actions.

In all simulation cases the vessel hit the bottom rocks from directions that deviated a few degrees from the original approach heading (360°). The speeds varied between 5-10 knots depending on the delay used between detection of the rudder malfunction and activation of the emergency steering and issuing of the machine commands.

A situation where the autopilot was functioning normally all the time was also simulated. In these simulations, the turn was begun at 19:14 from the location intended by the Master. The vessel had time to execute a safe turn to the approach west of Orrengrund if the turn was continued, unlike the original, to heading 320° in order to maintain a safe distance to the rocky shores of the island.

The simulations also tested stopping the vessel after detection of the rudder malfunction by switching the machine to full reverse. In all these tests, the vessel stopped before hitting the bottom rocks. A crash-stop in these simulated conditions turned the port flank of the vessel nearly parallel to the shoreline so that the vessel was facing east when she stopped.

2.4 VTS use options and fairway alternatives.

The OCEAN PRIDE was 24 minutes away from the Tainio light house when the Master was informed that the normal boarding position would not be used. This meant that the Master would have to pilot the ship from the normal pilot boarding position to the place he was not familiar with and not prepared to steer to.

As the wind came from the south, Orrengrund provided no shelter on the western side. It was probably the pilot's intention to board on the north side of the island. It would have been difficult to turn the vessel and drive her back onto the fairway south of the island. It is probable that the pilot's intention was to continue on the 9 metre fairway in heading 020° and take the 9 metre inner fairway to Kotka.

The sudden change in the situation would have required accurate instructions from the pilot station. The Master would have needed the precise headings for approaching the new unofficial pilot boarding position. The heading of the vessel should have been from the south between Orrengrund and Västra Båken. The turn failed as the precise data was missing.

The pilot station would have had the opportunity to help the Master by applying the IMO principles for traffic control for the VTS but this was not done. The action of the pilot station was influenced by the standard operating practice of the piloting district that was based on the national piloting directions and on the IMO resolutions concerning VTS (see table below).

Table 6. Comparison of IMO resolutions on VTS.

	Guidelines for VTS Res. 578(14) 20.11.1983	**Guidelines for VTS Res. 857(20) 27.11.1997**
Recommendations promoting efficiency of VTS	(2.1.3.) Piloting integrated into VTS activity	(2.2.3.8) VTS sets standards and normal routines for navigators.
	III VTS LEVEL. (4.6) Traffic control. Traffic controlled according to official traffic regulations.	III VTS LEVEL. (2.3.3) Traffic control. Traffic controlled according to official traffic regulations.
Neutral system	I VTS LEVEL (4.4) Information service.	I VTS LEVEL (2.3.1) Information service. Content identical to Res 578, 1983
Recommendations reducing efficiency of VTS	II VTS LEVEL (4.5). Navigation services only at request of the Master or if deemed necessary.	II VTS LEVEL (2.3.2). Navigation services only at request of the Master or if deemed necessary.
	(2.1.5.) VTS not to distract traditional working relationship of pilot and master. (3.3.2) Master responsible at all times.	**(2.3.4) VTS must not give compass headings for steering or machine commands to Master or Pilot.** (2.6.2) Master responsible for vessel at all times. No passage plan or instruction of VTS shall limit the power of decision of Master in navigating and handling of ship.

The first IMO guideline on VTS stated in its introduction that all traffic safety systems maintained by the authorities shall be considered VTS systems as to their bases. These systems may be various level traffic information and traffic control systems. The IMO resolutions both promote and hinder the offering of help to the master.

According to the IMO resolutions, the pilot station is mainly a station giving out information, since it represents the lowest level of VTS. According to the resolutions a pilot station or a VTS station merely giving out information is not obligated to give navigation assistance. The Master of the OCEAN PRIDE was not informed of this.

The Finnish piloting directions[6] were more advanced than the IMO resolution. They provided the opportunity to pilot the ship from the pilot station or the pilot boat but retained the responsibility on the master. Section 15 of the directions stipulates the following:

15. If the vessel is given directions concerning her passage and such directions are based on radar observations obtained by the radars at the pilot station or in its boats, these directions shall be considered advisory in nature and the power of decision on their application shall remain by the vessel.

The opportunities for using the VTS in relation to the IMO regulations were poor but the Finnish piloting directions provided the opportunity to aid the master in his decision making while retaining the responsibility by him.

Alternative fairways to Kotka.

There are two official fairways marked on the chart for entering Kotka from the west sea, south of Tiiskeri (Figure 7).

Earlier, the only fairway leading to Kotka was the 9 metre inner fairway north of Orrengrund. The 10 metre fairway south of Orrengrund was completed in 1954 and the 15.3 metre fairway south of Kaunissaari in 1990.

The 10.0 m fairway. This fairway travels west of the Tainio light house to the south western side of Orrengrund and continues past the pilot boarding position, south of Orrengrund, winding towards Kotka rounding Kaunissaari island on the north side. From Kaunissaari, the fairway goes on to the Viikari strait, which is not far from the limits of the Kotka port area.

- The fairway line contains five bends between the Tainio light house and Kaunissaari. The heading changes in these are 27°-37°
- The lengths of the straight sections between the bends vary between 1,5’ - 4,0’
- There are nine fairway intersections between Tainio - Kaunissaari.

The straight fairway passages are marked by lit markers and the hazards by cardinal system buoys, markers and border markers. The fairway alignment is designed for visual navigation.

6 Piloting directions, National Board of Navigation Bulletin nr. 6/88, Feb 8, 1988.

A section of the 9,0 m fairway starts at the pilot boarding position marked on the chart and extends north passing Orrengrund on the west side. This section leads to the inner 9,0 m fairway coming from the west and further on back to the 10,0 m fairway north of Lålättan. In addition a short 7,3 metre fairway leads off from the north west side of Orrengrund. This fairway also intercepts east of Ljusa the above-mentioned inner fairway coming from the west.

Navigation on the fairway requires special concentration because of the frequent bends, partial narrowness of the fairway channel and the fairway intersections. During the boating season there is frequent pleasure craft traffic on the fairway and in its proximity.

The numerous echoes on the radar screen may make it more difficult to identify the targets. Misinterpretation of the radar image may cause hazardous situations. This is a disadvantage that can be reduced through experience.

The 15,3 m deep channel. This fairway passes south of the Tainio light house directly past the Kotka lighthouse to the south east side of Ristisaari, where it turns north to the east side of Kaunissaari and goes on from there into the Viikari strait.

- The fairway line contains one bend between the Kotka lighthouse and the eastern side of Kaunissaari. The heading change in this bend is 60°.
- The lengths of the straight sections in the corresponding section vary between 9,5'-5,5'
- There are two fairway intersections between the Kotka lighthouse - Kaunissaari.

The fairway is clearly marked with lit buoys and border markers according to the cardinal marking system. These markers are easily identifiable also on the radar screen. The Kotka lighthouse is located at the start of the fairway, out to sea. There is a sector light at the east end of the longest straight stretch and leading beacons at the north end of the north-south straight. Pleasure craft use this fairway only rarely.

This fairway is easy and safe to navigate both optically and by radar because it is wide, has few bends and the channel is clearly marked.

2.5 Conditions for navigation and steering

2.5.1 Cockpit arrangement and conditions for piloting

The navigation and steering equipment was located on a long console at the front of the bridge. There was free space all around the navigation console. The corridor between the console and the front wall facilitates maintenance and prevents the sun form glaring into the screens. The general cockpit arrangement is drawn based on photographs.

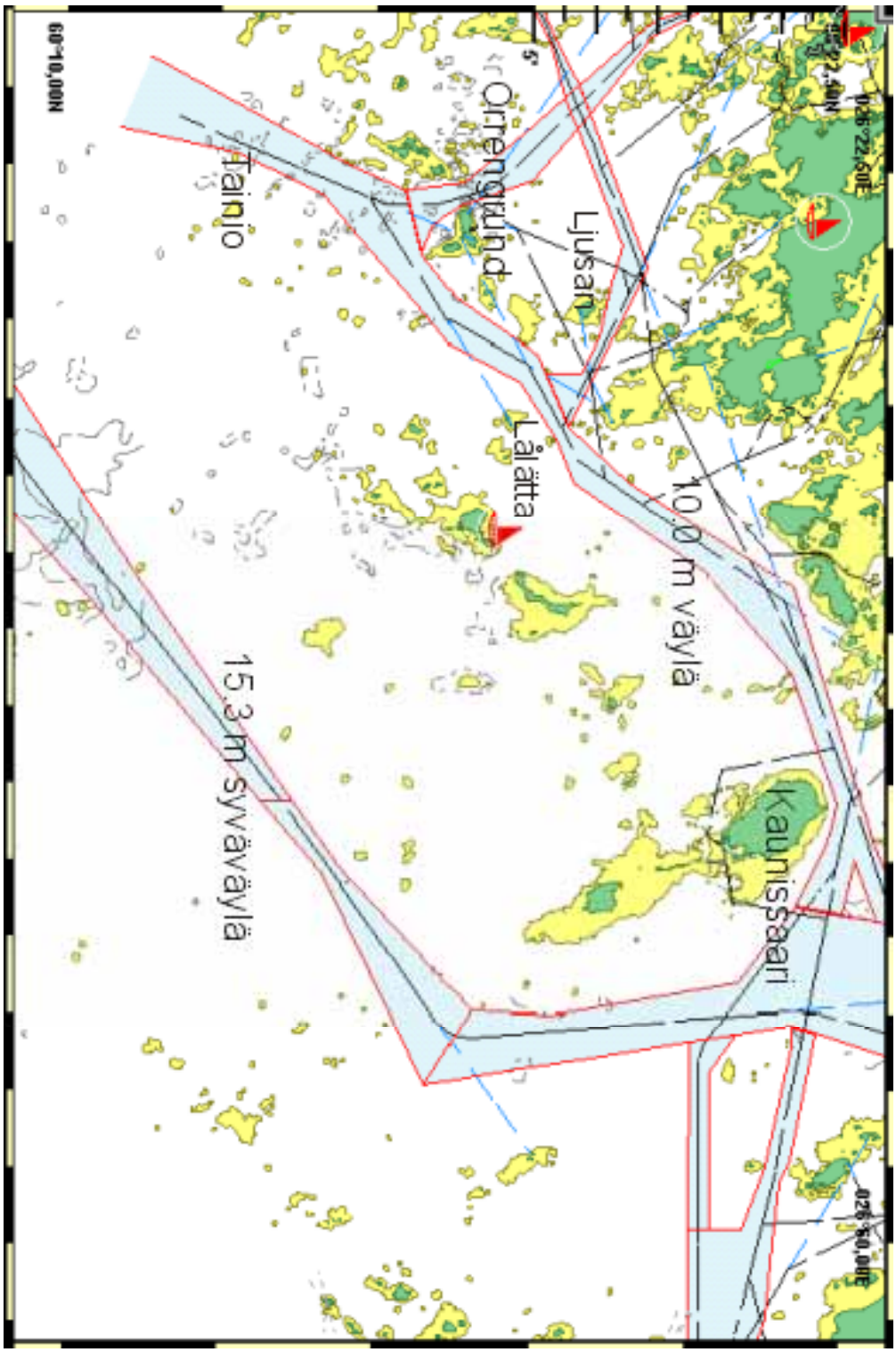

Figure 7. Fairway choices of the OCEAN PRIDE for entering Kotka.

Figure 8. Original one person navigation point of the OCEAN PRIDE.

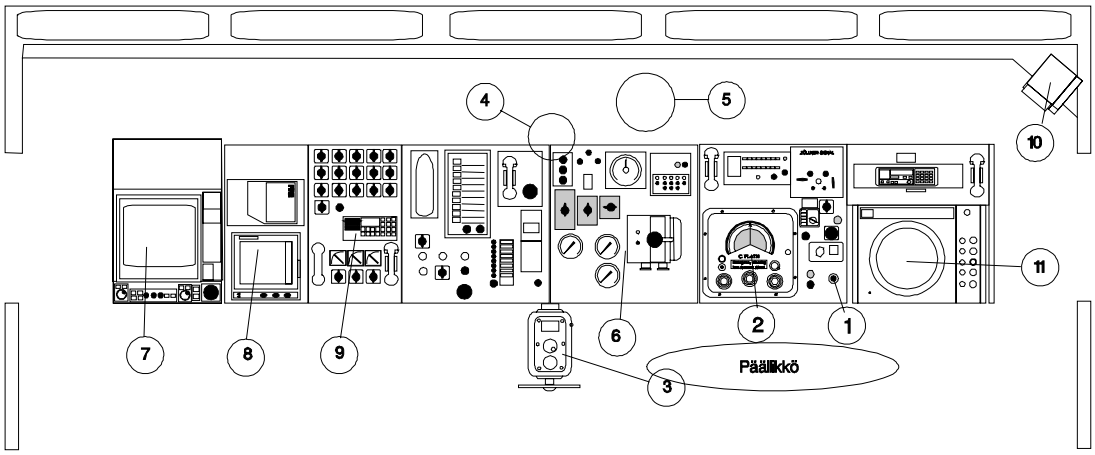

Figure 9. General cockpit arrangement of the OCEAN PRIDE. The Master's work point is drawn based on the Maritime Declaration.

Table 7. References for Figure 9. Main equipment of the bridge.

1	NFU-tiller	7	FURUNO FR 2110 radar, 20" screen
2	C.Plath NAVIPILOT autopilot	8	ATLAS 460 depth sound plotter
3	Rudder telemotor	9	SAILOR VHF 2047 radio telephone
4	Ceiling periscope for magnetic compass	10	FURUNO FA 810 DA radar
5	Rudder angle monitor in ceiling	11	DECCA RM 914 / RM 916 radar
6	Machine control and monitoring		

The vessel was constructed in 1974. One radar, depth sound and VHF radio telephone were on the left of the console. The fire alarm was behind the depth sound and the switches for the navigation lights and for the window wipers were behind the radio telephone.

The OCEAN PRIDE fulfilled the IMO requirements[7] concerning her navigation equipment. The bearing compasses required by IMO were probably situated in the bridge wings. Only one rudder angle monitor did not correspond to the practical needs.

It is possible that the ship had no log. No log is mentioned in the maritime accident report. It is possible that the speeds quoted in the Maritime Declaration were estimated from the tachometer. The regulations for vessels the size of the OCEAN PRIDE do not stipulate a log.

One could only see the magnetic bearing from the helmsman's position. The wheel in the middle cannot be considered the main steering position for the vessel since the helmsman had to use the magnetic bearing and the officer of the watch the gyro bearing. Therefore, the main steering position for the vessel was a combination of the autopilot and the NFU tiller. It can be assumed based on the Maritime Declaration that this is where the Master was operating before the accident (Figure 9). The location offered almost free visibility through the windows both ahead and to the sides.

The switch for the various steering modes (auto/tiller) and the stick used for manual steering (tiller) were both within an arm's reach, on the right side of the navigation point. In order to activate the emergency steering, one would have to take one step to the left.

Other sticks (tiller) for manual steering of the vessel were also available. One of these was located at the front of the navigation console right next to the front windows of the bridge. There was also a stick in each wing of the bridge. The sticks in the wings are activated from the selector switch.

Satellite navigator (GPS) and passage plan. The GPS device was situated on a chart desk at the rear of the bridge. The Master could not use it since he was unable to leave the navigation point. This prevented the use of the passage plan because the plan had been fed into the GPS device only.

No written passage plan was presented in the Maritime Declaration. The GPS installation would have required another person on the bridge to monitor the passage plan.

Radars. The Master had marked two FURUNO radars on the maritime accident report of the Finnish Maritime Administration. In addition to these, there was one DECCA radar on the bridge.

It was not possible to perform accurate radar navigation at the navigation point due to the location of the best radar. It was situated at the left end of the navigation console and therefore required moving aside a step or two from the actual navigation point (Figure 8).

[7] SOLAS Consolidated edition, 1997, Chapter V, reg. 12.

- The only radar complying with the IMO regulations[8] was a large FURUNO FR 2110 at the left end of the console. The diameter of the screen was 20 inches. The radar had a compass connection and true motion option. The electronic bearing and the variable range marker were easy to use. The adjustments for the radar video were preset for various situations. The control buttons were at the right edge under covers. The preset situations were saved as ROUGH SEA, COAST and HARBOUR selections which could then be activated on the keyboard. The radar came on the market in 1994-1995. The Master reported that the radar was in good condition. The FURUNO 2110 provided a good basis for piloting.

- The other FURUNO radar was a small FR 810 DA. It did not fulfil the IMO regulations. The radar came on the market in 1985 for use in work and fishing boats. A transformer for a compass connection was visible under the radar. The radar was a compass stabilised radar for relative motion with a 12 inch screen. It was located at the right front corner of the bridge. The aim of the installation was to make the radar visible from the autopilot. The Master reported that the radar was in good condition.

- The third radar was a DECCA RM 914. It represented the 1972 'solid state' series of Decca. The screen displayed relative motion and the radar had a compass connection. The screen was situated so that it could be used together with the autopilot. The control knob for the mechanical bearing was missing from the lower left corner of the screen. The radar had never had an electronic bearing. The missing control button points to the radar being inoperative. This is why the radar was not listed in the radar list in the maritime accident report. There was an old official inspection stamp on the upper right hand corner of the screen. The photograph shows the number 529 and year 1987.

In his Maritime Declaration the Master did not mention having used a radar but in the hearing in connection with the Maritime Declaration, the Master mentioned the distances 0,9 and 0,4 miles. He has gone over to one of the FURUNO radars to measure the distances. The task of the Master would have been considerably easier if he had had an operative radar next to the autopilot. It is possible that the old DECCA radar was abandoned already in 1988 upon the expiration of its inspection. A new radar should have been installed in place of the DECCA radar.

On the other hand, it is possible that the authorities of another flagging state have inspected the DECCA radar after 1988. The old German inspection stamp from 1987 may have been left on the radar by accident.

The best radar of the vessel, the large FURUNO FR 2110 with the 20 inch colour screen has been acquired in 1995 at the earliest. The old DECCA radar should have been removed and a new radar installed at the latest in connection with this radar installation. It is possible that the OCEAN PRIDE sailed between 1988 - 1995 for a time with radar equipment unsuitable for commercial navigation.

The navigation and steering point at the right end of the console was correctly designed. Since the DECCA radar had not been replaced the work point was reduced to a mere steering point.

[8] IMO, Res. A.477 (XII) 1981.

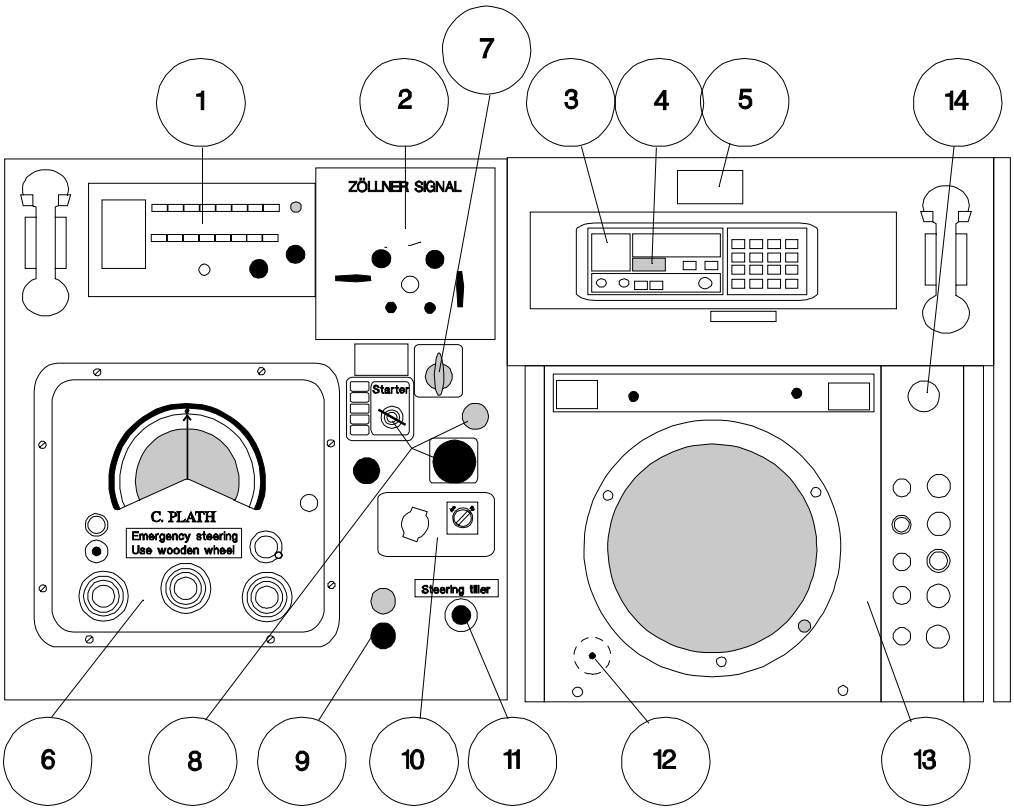

Figure 10. There was a navigation and steering point on the right side of the console.

Table 8. References for Figure 10. Equipment at the Master's work point.

1	DBEG sounder	8	Bow propeller controls
2	ZÖLLNER horn	9	Indicator lights without signs
3	FURUNO VHF FM-8500 telephone	10	RUDER MITSCHIFF ANZEIGE Aus / Ein
4	GMDSS DSC alarm button	11	NFU-tiller
5	Sign on radio identifications	12	Missing control of mechanical bearing of radar
6	Autopilot C.PLATH NAVIPILOT	13	Inoperative DECCA RM 914 radar
7	Autopilot / manual steering switch	14	Radar inspection stamp from 1987

Radio telephones. There were two VHF radio telephones in the console. The left side housed a SAILOR VHF radio telephone of the old radio system. It was probably meant to be used with the FURUNO radar on the left.

The right end of the console had a FURUNO VHF DSC FM 8500 radio telephone according to the new GMDSS emergency and safety traffic. It was probably meant to be used with the small FURUNO radar. Next to the telephone, there was a sign on the radio identifications for the vessel:

The radio equipment complied with the requirements.

ms OCEAN PRIDE
CALL SIGN LAZF4
MSI 259763000
DSC 259763000
AAIC NO 01
(Figure 10, ref. 5)

2.5.2 Machine control equipment.

The machine command relay intended for regulation of the speed of the vessel was situated directly in front of the steering point in such a way that it was possible to give machine commands from the navigation point without moving.

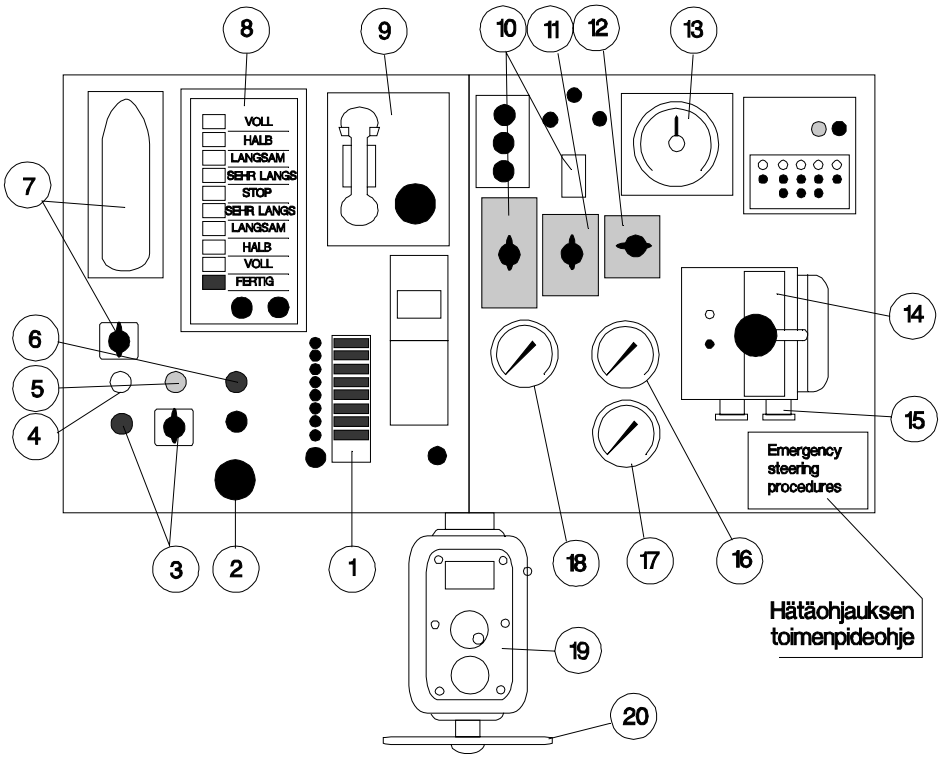

Figure 11. Machine controls of the OCEAN PRIDE in the middle console.

Table 9. References for Figure 11. Machine controls and surrounding equipment.

1	Alarm lights for main machine	11	Fire pump
2	Adjustment of brightness of magnetic compass	12	General Alarm for crew
3	Rudder machine ON / OFF. Sign off for rudder machine alarm	13	Direction of rotation and tachometer for propeller
4	Rudder machine active (white light)	14	Machine command relay
5	Rudder machine alarm (yellow light)	15	Fine tuning of propeller rotation speed
6	Rudder machine inactive (red light)	16	Air pressure for machine commands
7	'mimic' panel for navigation lights. Three phase switch for lights	17	Starting air pressure for main machine
8	Sign off system for machine commands (reserve system)	18	Lubrication oil pressure
9	Machine room telephone	19	Telemotor
10	Emergency stops	20	Wooden wheel. EMERGENCY STEERING with separate operation instructions.

There were no indicator lights or activation switches for rudder machine pumps in the panel. The controls for the main machine were logical.

A speed table had been glued to the upper left hand corner of the autopilot, to the right of the machine command relay (Table 10).

Table 10. Speed table.

Dead Slow	100 rpm	4 kn
Slow	140 rpm	6 kn
Half	170 rpm	8 kn
Full	250 rpm	12 kn

2.5.3 Steering equipment.

Based on the photographs taken on the bridge, the rudder machine of the OCEAN PRIDE operated on one rudder pump. On the other hand, the emergency sign below states the pumps in plural, 'steering motor pumps'. The pumps are obviously started from the same switch as the rudder machine. There were three steering options. The old wooden wheel and the telemotor were in the middle of the console. The autopilot and the NFU steering were on the right.

The emergency steering was a rudder operating by 'telemotor'. The manual wheel used for emergency steering was located in the middle of the navigation console of the vessel, next to the steering point for automatic steering, to the left of it. The hydraulic system of the telemotor starts and stops the rudder pump automatically when the desired rudder angle has been achieved. There was a sign of the emergency steering under the machine command relay (Figure 11):

> M / V OCEAN PRIDE
> EMERGENCY STEERING PROCEDURES
>
> In the event of power failure or loss of steering motor pumps use the wheel to engage the manual telemotor. By using the wheel this will bypass the electrical steering system.

When the steering difficulties appeared, the Master operated according to procedure and activated the emergency steering. In connection with the Maritime Declaration he reported that the pump of the telemotor did not function at full power. The procedure described in the above does not mention anything about starting a separate pump. The telemotor wheel of the OCEAN PRIDE should be considered a reserve steering system and not an emergency system because its operation required other activities first. The switch over from the autopilot to manual steering shall fulfil the IMO time requirement of taking no more than three seconds[9]. This also applies to the emergency steering.

The use of the telemotor wheel required a separate helmsman, since it was not possible to monitor the navigation equipment from the steering point (Figure 9). There was no gyro compass or rudder angle monitor in the console in front of the wheel. The heading

[9] IMO Res. A.342(IX), par. 2.1, 1975.

had to be observed from the periscope of the magnetic compass up in the ceiling where the rudder angle monitor was also situated. The use of the telemotor was not designed for longer periods. There was a switch to the right of the autopilot (Figure 10, device 10), with the text ”RUDER MITSCHIFF ANZEIGE Aus / Ein” above it. The function of this switch did not become apparent when discussing the operation of the equipment with the Master. The switch is probably the original but disconnected switch between the autopilot and manual steering. The text of the switch in German only points to the switch being obsolete. English texts had been added to all the equipment in use.

Manual steering operated on the NFU principle (Non Follow Up). The manual steering was installed next to the autopilot (Figure 10, device 11). It is not possible to read the rudder angle from the position of the stick when the NFU steering is activated. The stick activates the rudder machine and the rudder stops when the stick is released. The rudder angle had to be verified from the monitor. The manual steering of the OCEAN PRIDE was laborious, since the user would have to keep an eye simultaneously on the rudder angle monitor in the ceiling and on the compass below in the panel of the autopilot. Because of the cumbersome nature of the NFU steering, the use of the stick would have required a separate helmsman. It would have been easiest to use FU (Follow Up) steering, but this option was not available on the OCEAN PRIDE.

The manual steering systems of the OCEAN PRIDE were deficient.

Autopilot C.PLATH NAVIPILOT.

The investigators had two manuals for the autopilots of C.PLATH[10]. The older of these corresponded to the photographs of the autopilot taken on the bridge of the OCEAN PRIDE. The publishing year was not printed in the manuals. The approximate times of the manufacture of the autopilots in question were verified from the Finnish agent. The NAVIPILOT type of autopilot on the OCEAN PRIDE came to the market at the turn of the 1960s and 1970s. The autopilot had functioned for more than a quarter of a century and according to the Maritime Declaration it was fully operational. This equipment is rare nowadays. According to knowledge, only one NAVIPILOT is still active in Finland.

The heading in the NAVIPILOT autopilot is changed by pressing and turning the course setting knob COURSE INPUT. The diamond shaped COURSE INDICATOR symbol is set at the new heading on the outer compass ring. When the knob is released, the automat starts the turn. The autopilot keeps the symbol and the heading at the compass arrow (Figure 13).

IMO published the first resolution on autopilots[11] at the time when the OCEAN PRIDE was completed. Although the NAVIPILOT was manufactured before publication of the resolution, it fulfilled nearly all of the future requirements by IMO. The resolution required a rudder angle limiter that the NAVIPILOT did not have. The rudder angle could be adjusted with the autopilot controls for RUDDER RATING, YAWING, RUDDER RESPONSE and RUDDER TRIMMING.

[10] C.PLATH, NAVIPILOT, Technical manual 10 105 - 0703 9040. Hamburg 60, Gertingstrasse 48.
C.PLATH, NAVIPILOT - EL, OPERATOR'S MANUAL. Type 2099 - 2100. Hamburg 60, Gertingstrasse 48.

[11] IMO, Res. A.342.(IX) 1974.

Figure 12. Photograph of the autopilot with the switch for the autopilot and manual steering (marked with arrow).

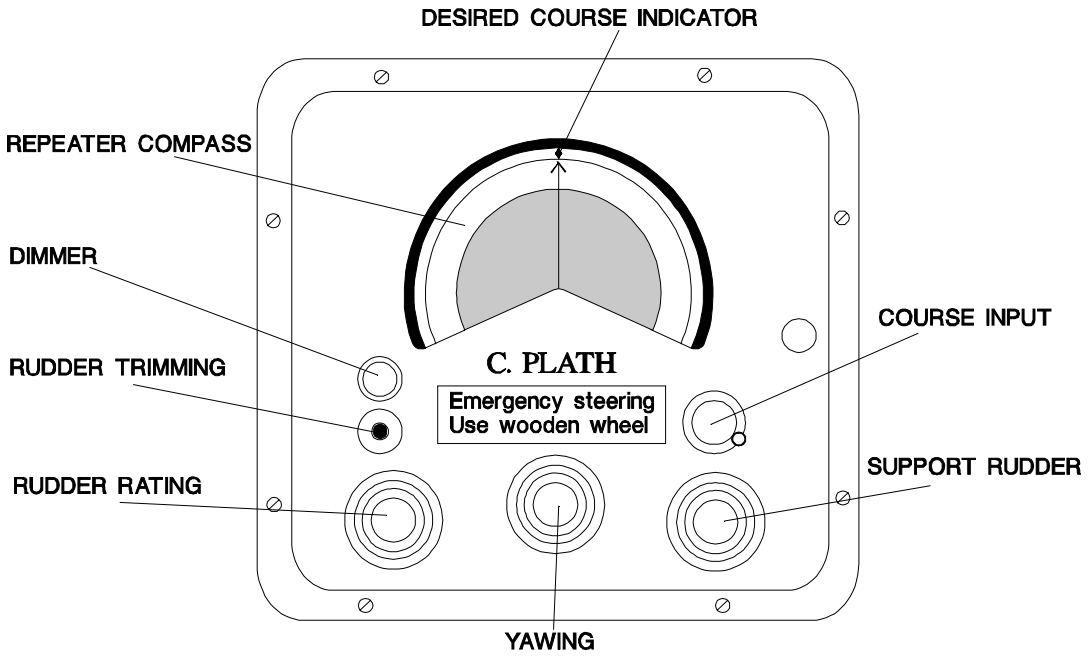

Figure 13. Operating panel of the C.PLATH NAVIPILOT autopilot of the OCEAN PRIDE.

RUDDER RATING (settings 1 - 4). At setting 1 the rudder reacts to course changes mildly and at setting 4 strongly. The normal setting is 2. The setting must be increased at slow speeds. The setting of the OCEAN PRIDE was 2 in the photograph taken on March 14, 2000.

YAWING (settings 1 - 8). Yawing regulates the turning speed. The normal average setting is 3. In good weather, setting 2 performs a tight turn. When the wave size increases the setting is turned up. The setting of the OCEAN PRIDE was 1 in the photograph taken on March 14, 2000. If the setting corresponds to the value in use at the time of the accident, the autopilot tried to execute the turn as quickly as possible. The wave height was 3 – 4 metres coming from the aft starboard side, which would have required a higher setting for Yawing.

SUPPORT RUDDER (settings 1 - 8). This setting regulates the turning speed of the vessel. The largest angular speed is reached with setting 8 and the device does not react to setting 1. The normal setting is 3. A large setting for Support Rudder prevents the heading from going ”over” at the end of the turn and helps maintain a precise course. The setting must be turned down in waves. The setting of the OCEAN PRIDE was 3 or 4 in the photograph taken on March 14, 2000.

The RUDDER TRIMMING setting is switched on or off. The function is activated by pressing down the Rudder Trim button. When this is done, the autopilot calculates the effect of asymmetrical forces affecting the ship in 2 – 3 minutes. The autopilot defines a new zero value for the rudder. The normal zero value can be returned by pressing the COURSE INPUT button. When a new heading is fed into the autopilot, the effect of Rudder Trimming is automatically erased.

In the accident situation, the Master of the OCEAN PRIDE attempted to turn from heading 360° to heading 340° south of Orrengrund, but the autopilot did not turn the vessel. The above settings did not prevent the ship from turning.

The manual of the autopilot states that 'if the rudder machine operates at two different speeds, the slower speed should be used'. The sign for the 'emergency rudder' mentioned the rudder pumps, so the vessel apparently had two rudder pumps. If the manual of the autopilot was observed, only one pump was active. This would explain why the 'emergency rudder' turned slowly when the Master attempted to turn to port.

The manual of the NAVIPILOT had a positive attitude about using the autopilot on the fairway. According to the manual, the Rudder Response setting should be 3 in the 'harbour cruising' situation, which means that its use was allowed provided that the settings were correct. The public opinion about using the autopilot during piloting changed in the 1970s to condemning it, although the regulations did not directly prohibit the use of the autopilot. This can be seen from the manual of the C.PLATH autopilot, NAUTOPILOT – EL, manufactured in the late 1970s. The manual contains the following recommendation: 'In restricted waterways, it is recommended to steer manually, especially in conditions of poor visibility'. The culture changed again in the 1990s with the market introduction of autopilots designed specially for piloting situations.

Figure 14. Selector switch for autopilot and manual steering.

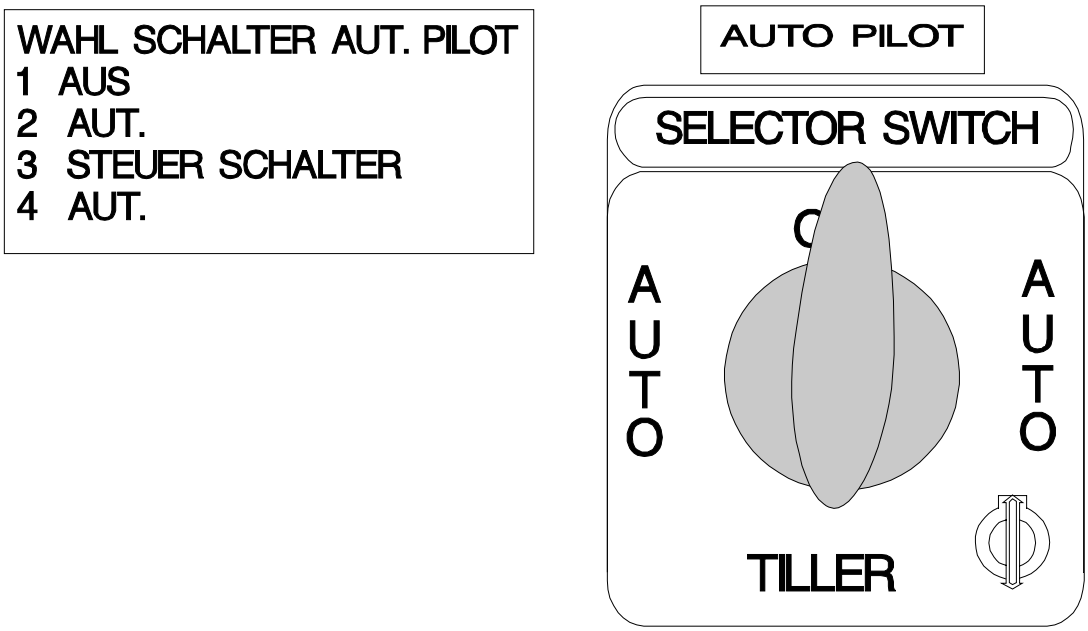

Figure 15. The Selector switch for autopilot and manual steering and the operating instructions for the switch to the left of it. The blunt end of the switch points to the selected function. In the picture, the TILLER mode is selected.

The selector switch for the autopilot and manual steering was situated on the right side of the autopilot. There were only two selections available, NAVIPILOT or NFU tiller.

The C.PLATH company considered the selector switch as an integral part of its equipment. The NAVIPILOT manual divides the NAVIPILOT into three functional sections as follows:

- Operating panel for autopilot,
- rudder angle feedback,
- selector switch.

The selector switch on the bridge of the OCEAN PRIDE is not manufactured by C.PLATH, since it does not carry the company stamp (Figures 12, 14 and 15). It is probably an ordinary four phase switch. Ergonomically the switch does not correspond to the functional entity of the NAVIPILOT.

The only thing that warned about a wrong selection was the asymmetrical connection of the axle of the switch to its oval handle. The blunt end of the switch indicated the selected operation. If the switch was turned sideways, the autopilot was always selected independent of which way the blunt end of the switch was pointing. This leads easily to the conclusion that the horizontal or vertical position of the switch handle determined the selection. The signs added to the confusion.

1. In the **OFF** position no steering system was operative. Only the shape of the switch warned against using this option. The black sign next to the switch said **AUS,** but the sticker attached above the switch read misleadingly **AUTO PILOT**. The texts were not consistent.
2. **AUTO** signified that the autopilot was active.
3. **TILLER** signified that the Non-Follow Up steering 'NFU tiller' was active.
4. **AUTO** was the same as in the opposite position.

The switch described above cannot have been manufactured by the C.PLATH company, since it was designed as an operative part of the steering system. It is not known to the investigators why the selector switch by the C.PLATH company was not used.

The TILLER position of the switch could have been installed similarly to the AUTO option, which would have replaced the OFF position by TILLER. This would have left only two choices without the possibility of an error. The ergonomic design of the selector switch was misleading. There should be no OFF option, since it is possible to encounter a situation where the OFF position is switched on unintentionally. This is a possibility also in the accident of the OCEAN PRIDE, since the Master reported having switched between the autopilot and manual steering modes twice using the switch, but none of the modes functioned. (Section 1.2.2).

When the vessel was heading north, the Master turned the switch twice from the autopilot position, but the manual steering (NFU-tiller) did not work. This is possible, if the switch was turned to the OFF position and the rudder machine was functional in other respects.

2.5.4 Directions of the company

The signs on the bridge provided the only directions, since the vessel carried no written company directions. The vessel was built for a German shipping company in 1974, at which time the signs on the bridge were in German. The present nationality of the vessel is Norwegian. The language in the new signs was changed into English but the old signs also remained. The Master and the mate were Ukrainian born citizens of Lithuania. The chief engineer was Estonian. They would have needed clear instructions in English.

The only directions that could be observed were the instruction signs for the emergency steering attached on the steering panel and on the autopilot. The directions were deficient since the Master could not activate the emergency rudder by following the instructions.

The old NAVIPILOT autopilot had been in use 25 years and was still operative. The navigational culture concerning the use of the autopilot has changed twice between the completion of the OCEAN PRIDE and the accident. The original manual of the autopilot may no longer comply with the principles of the present ship owner for using the autopilot. The vessel apparently had the manual for the autopilot but there were no company directions. It would have been in the interest of the company to present its directions in the Maritime Declaration.

The Master had been contracted for only two months. All of the officers had been on the ship for only a month. In this time it is not possible to gain in-depth knowledge of the shortcomings of the vessel unless there are clear procedural directions for encountering them.

2.5.5 Manning of vessel and work times

Work times of the crew prior to the accident. The investigators paid attention to the work times reported in the maritime accident report. It can be deduced from the report that too short rest times contributed to the accident.

During the 24 hours before the accident, the Master had had only 5 hours of rest. The maximum work time allowed had been exceeded by five hours. The maximum allowable hours had also been exceeded concerning the first mate and the chief engineer. At the weekly level the differences between the work times of the officers and the crew appear more even. The maximum weekly work time allowed was exceeded in the case of one of the seamen as well (Table 3).

The new maritime accident report of the Finnish Maritime Administration was introduced in 2000. The section concerning the work times proved to be very important in determining the contributing factors to the accident.

There are fundamental differences in the definitions for working hours of the various organisations, although the basic purpose is the same. The significance of the rest times has become more important than that of the work times for maritime safety (Table 10).

The regulations of the STCW-95 convention concerning watches address only the rest times. It is possible to deviate from the stipulated 10 hours of rest per day on two days.

On the other hand, an unbroken rest period of six hours is an unconditional requirement for safe watching. No exception was granted from this.

The regulations of ILO follow the principles of the STCW, but they are somewhat more stringent concerning rest times. The ten hours of rest per day are unconditional. An unbroken period of six hours of rest must recur every 14 hours. The minimum rest hours per week exceed those of the STWC regulations by 7 hours. ILO also defines the maximum allowable daily and weekly working hours, unlike the STCW regulations.

Stipulations on work and rest times. The table below provides a comparison of the regulations for work time by IMO, ILO, and the Norwegian NIS register.

Table 11. Comparison of work and rest times defined by the STCW-95, ILO and the NIS register.

Work and rest times		**STCW-95**[12]	**ILO**[13]	**Ocean Pride, manning certificate**[14] **NIS-register**
Work time	Daily work time			8 h
	Maximum allowed daily work time incl. overtime		14 h	14 h
	Average work time per week			56 h
	Maximum allowed weekly work time		72 h	
	Work time per year			2912 h
Rest time	Minimum rest per day in two periods	10 h The rest time may be 6 hours on two consecutive days in exceptional circumstances	10 h No exceptions	
	Unbroken minimum rest time per day	6 h No exception	6 h The interval of the periods must not exceed 14 hours	
	Minimum rest time per week	70 h	77 h	

12 STCW-95, Section A-VIII/1, 1,2,4. Fitness for duty. London 7.7.1995.
13 ILO, Convention 180, Part II, Article 5. Geneve 8.10.1996.
14 Ms OCEAN PRIDE, manning certificate, NIS Act. Working hours, Sect. 7.

The Norwegian NIS regulations deviate from the approach of IMO and ILO in that they address only the work times. The maximum allowable daily work time in the NIS regulations is the same as in the ILO definition. The NIS makes an exception in that the regulations define the maximum work time per year as 2912 hours. This means 8 hours of work per day every day of the year. The definition does not address safe watching in the sense addressed by the STCW and ILO. The definition makes sense only when drawing up a rotation system. This is supported by the NIS regulation that the average weekly work time in a year is 56 hours, which also means 8 hours of work per day every day of the week. The work times may be 70 hours per week but when the holiday times are included in the yearly average, the average weekly work hours per year must be 56 hours. In this way it can be calculated that the holiday time is about 12 weeks per year without breaking the maximum daily and weekly hour limits. Equalisation of work times and holidays on the annual level leads easily to equalising fatigue on the weekly level. The IMO and ILO regulations have attempted to prevent this (Table 10).

Work times of the OCEAN PRIDE in the light of the regulations. According to the maritime accident report the work times of the OCEAN PRIDE did not comply with the stipulations of the STCW, ILO and the NIS register. The unacceptable work times were caused by the too small number of crew.

The manning certificate also included a NIS regulation whereby the Master and the ship owner shall ensure that the work time regulations are observed. The previous master of the OCEAN PRIDE had declared to the ship owner that the work hours of the manning certificate could not be observed because of the small crew. This had resulted in no change in the situation. The Master could shorten the work time of the others only by increasing his own. Normally the Master is not subject to work time legislation, but when he is performing regular sea watch the work time regulations are applied also to him.

The manning certificate also contains a rule in small print whereby the Master may not leave port if the principles of safe manning are not realised. The text is quoted in its entirety below:

> *'Furthermore, we would point out that **if the number or distribution of positions**, or qualifications in the required basic safety manning are **found to be inadequate, the ship cannot normally leave port**, cf. Section 7 in the manning regulations.'*

If the required work time limits cannot be observed, this rule is applied. According to this, the vessel should have remained in port until the rest times stipulated by the STCW would have been fulfilled.

The regulations become watered if their meaning is not made clear. The Master is required to understand both the words and the structure of the regulation, even if it is written in a foreign language. The ship owner should explain the meaning of the regulation, in other words, how it will be applied in practice. If the ship owner turns a blind eye on the fact that it is impossible to observe the regulations, a culture of bending the rules will be established in the shipping company. A practice violating the official regulations is created parallel to them with economic factors playing the deciding role. This kind of a culture strips the master of support in all safety-related decisions.

2.5.6 Summary of conditions for navigation and steering.

The piloting did not even begin, since the pilot never boarded the vessel. The cockpit arrangement did not provide favourable operating conditions for the Master in an unexpected situation.

The conditions for piloting were poor for the following reasons:

- There was no navigation and steering point for one person. The old inoperative radar had been left next to the autopilot and had not been replaced by a new one. There was no operative radar next to the steering systems. This made it impossible to concentrate the steering and positioning on one person. The Master had to move back and forth between the radar and the autopilot.
- The Master was alone on the bridge. The situation would have required a helmsman or a mate on the bridge.
- The crew numbered too few for the traffic in question, because the shipping company did not grant permission to increase the number of crew. The long working hours caused fatigue, which contributed to the accident.
- The old autopilot was not suitable for the controlled turns required by piloting but the Master was forced to use the autopilot since he was alone.
- The NFU steering is not suitable for radar navigation by one person because it requires concentrating on both the compass and the rudder angle monitor. The autopilot had a compass screen but the rudder angle monitor was up in the ceiling. This made the steering difficult.
- The mode switch for the steering system included a hazardous choice that switched all the systems off.
- The directions concerning the emergency steering system were not sufficient.

These deficiencies contributed to the chain of events leading to the accident.

2.6 Cooperation between the Master and the piloting service.

The cooperation is evaluated based on the difference between the aim and the practical execution. The Master and the pilot are expected to form a work team the primary task of which is to conduct the vessel safely to port.

2.6.1 Plan of pilot.

The pilot was not heard in the Maritime Declaration session and he was not interviewed. Based on the evidence material, it is known that the plan of the pilot was to board west of Orrengrund but it is not known, what would have followed in the plan.

There are two alternative 9 metre fairways north of Orrengrund. Both lead to the 9 metre inner fairway further to the north (Figure 16). The fairway shaded on the chart travels

north west of Orrengrund. The other unshaded fairway travels from the west tip of Orrengrund to heading 020°.

When the pilot reported to the OCEAN PRIDE at 18:59 ship time that the pilot boat would be expecting west of Orrengrund, the Master replied that the pilot ladder was on the port side. The pilot did not give new instructions on which side the pilot ladder should be fixed according to the new plan. The OCEAN PRIDE had prepared to board the pilot at the official pilot place, where the port side of the vessel offered shelter. The new unofficial pilot place west of Orrengrund would have required turning the vessel to face east in order to provide shelter for the pilot boat. It was not agreed in the radio traffic how the ship was to be turned at the pilot exchange. The intention was probably to give the instructions at the last minute. It can be assumed that the pilot's plan was to drive on the fairway leading north east, since he was content with the information about the ladder being on the port side. The pilot had apparently picked the fairway leading north east. The steep turn to starboard at the west tip of Orrengrund would have come as a surprise to the Master. According to the evidence, the choice of fairway was not reported to the Master.

Figure 16. Alternative fairways north of Orrengrund.

The pilot was unable to see the steering manoeuvres of the OCEAN PRIDE from the pilot boat.

2.6.2 VTS as mediator of cooperation.

The pilot asked the VTS if the vessel was being monitored by radar. The VTS replied affirmatively and reported that the radar echo of the OCEAN PRIDE had disappeared.

The reply of the VTS operator stated indirectly that the vessel had been monitored by radar. The meaning of the concept radar monitoring in the VTS directions has not become clear during the investigation. The options for the radar monitoring are that the operator monitors the passage of the vessel personally at the screen or that the monitoring is taken care of by ARPA technology.

In the accident, the VTS had the role of a telephone exchange operator between the pilot and the vessel. The VTS did not give directions for driving to the unofficial pilot boarding place.

2.6.3 Change to the Master's passage plan.

The Master had a passage plan. The purpose of the IMO resolution[15] and the STCW convention[16] was missed, when the pilot boarding position was moved to the west tip of Orrengrund. In a situation like this, the Master needs more precise directions from the VTS of how to drive to the new pilot boarding position and on which fairway to continue from there.

The force of the wind and the wave height created conditions where the Master had reason to doubt if the pilot could board. This was the Master's first trip to Orrengrund, so he did not know what was possible in the local conditions. In the new situation, the only thing he could do was to obey the pilot's orders. In practice, the pilot's announcement sounded like an order, but legally it was only information or at the most, a recommendation.

The pilot was in the boat at the western tip of Orrengrund and considered the piloting to begin only when he would enter the bridge. Therefore, piloting became the responsibility of the Master who was not informed of the fact that steering commands would be given only when the pilot enters the bridge. The Master was left on his own when the mate went to receive the pilot. The deficient arrangement on the bridge also contributed to the accident.

The piloting service failed when the void between the official pilot boarding place and the unofficial place was created leaving the piloting to the Master and not confirming it. The pilot was not familiar with the situation of the Master on the bridge.

Summary of the cooperation. It was revealed in the investigation that a situation where a ship travels in the piloting area without commands issued by a pilot may arise in the Finnish piloting service. This can happen despite the fact that the vessel is monitored by the piloting service on the radar. Furthermore, the Master is not informed that he will not be given steering commands. He is requested to pilot his vessel to unknown unofficial pilot boarding positions.

[15] IMO A.893(21) 1999.
[16] STCW CODE-95, Ch.II, Section A-II/1, Voyage Planning.

2.7 Distress signal

The international radio code requires that a vessel broadcast a distress signal in an emergency. Grounding in a storm is always an emergency.

The distress signal could have been broadcast most easily by the VHF DSC device of the GMDSS system by pressing a button. This would have sent the unspecified mayday signal to everybody. The mayday signal would have alerted all vessels in the area and all the maritime organisations.

The missing distress signal lead to the various organisations adopting ”unofficial” internal emergency procedures.

The Kotka Coast Guard Station passed the information to MRCC Turku at 19:19, immediately after the accident had occurred. MRCC Turku took prompt action and defined an alert situation immediately after it had been informed of the accident. ”Alert situation” is a definition by the maritime rescue directions of the Ministry of the Interior[17]. The alert situation remained within the organisation of the Frontier Guard. It was not passed on to civilian organisations. The situation would have required distress or urgency transmissions.

The MRCC did not consider the situation serious enough for raising an alarm according to the radio traffic code. The judgement apparently was that the situation could be controlled by the organisation itself. On the other hand, ice breaker APU reported to the MRCC 13 minutes after the accident, that she would not be able to assist because of the weather conditions. The master of the ice breaker considered the situation an emergency.

As the distress signal stipulated in the radio traffic code was missing the emergency traffic was conducted as internal communication in the various organisations. The communication falls under radio secrecy on other than emergency frequencies. The Maritime Rescue Coordination Centre had to draw conclusions based on the communication between the OCEAN PRIDE and other authorities.

The MRCC log for the 7th of March shows at 00:19, that ”MAYDAY traffic” had stopped. Based on this, the Maritime Rescue Coordination Centre had considered its communication emergency traffic all the time but this is not obvious from the radio traffic.

[17] Maritime Rescue Guide 1985, Ministry of Interior Frontier Guard Headquarters. According to the guide three emergency phases are distinguished: 1) Uncertainty phase, 2) Alert phase, 3) Distress phase.

3 CONCLUSIONS

3.1 Chain of events leading to grounding

The chain of events of the immediate causes for the accident was:

- Bad weather – south storm and limited visibility.
- Steering the OCEAN PRIDE to the unofficial pilot boarding position caused uncertainty on the ship, since no directions (steering commands) were given.
- The small manning of the ship had resulted in difficulties in observing the stipulated rest times for the entire crew. Thus, alertness had been compromised.
- The too small number of crew affected the Master especially. Due to his position, his work times were longer than those of the rest of the crew.
- The Master was on his first trip to Kotka and manned the bridge alone.
- There was no steering and navigation place for one person.
- The steering gear had a malfunction when the vessel should have been turned on autopilot to the fairway leading to the west side of Orrengrund. The malfunction caused the rudder to turn to an angle of 10 degrees to starboard.
- The Master switched over to manual steering from the autopilot. The rudder did not turn at this time. This was due either to the ergonomically unfeasible switch having been unintentionally turned to OFF or to the inactivity of the steering gear. In the OFF state both steering modes (auto/tiller) are disconnected causing the rudder to freeze at a certain rudder angle.
- The emergency steering system operated sluggishly since all rudder machine pumps were not active because the use of the autopilot required slower activity of the rudder machine.

3.2 Underlying factors in the accident

The following underlying factors contributing to the accident were discovered during the investigation:

- Change of pilot boarding position during the approach.
- The new pilot boarding position was not agreed with the Master. He only received a command to steer the vessel to the west side of Orrengrund and maintain full speed. It was not verified, whether the Master had understood the meaning of the message correctly.
- The long unbroken work time of the Master.

3.2.1 Unofficial pilot boarding place

The pilot's plan was to turn the ship immediately to the fairway leading north east of the west tip of Orrengrund. The turn has to be made before the pilot boards the vessel. The Master was not informed of this plan.

The Master had no information about the location of the unofficial pilot boarding place or of the plan to continue from there. He was only given the order to use the fairway on the west side of Orrengrund (western entrance, west of Orrengrund) by the VTS on the VHF telephone. The pilot repeated this and added the direction to maintain full speed.

With the scant local knowledge it would have taken time to figure on the chart where to drive. The Master who was alone on the bridge had no such time. Nevertheless, the Master did not inform the pilot that he was alone on the bridge and was unable to devote full attention to the radar.

The conditions for switching the pilot boarding position must be defined clearly and officially. The alternative pilot boarding positions are not marked on the charts. The fairway leading to an alternative pilot boarding position must be clear and easy to navigate.

3.2.2 Role of regulations as an underlying factor

According to the valid piloting directions[18] the pilot can begin the piloting in the pilot boat. The directions were based on the Piloting Decree of 1957[19]. The new Piloting Decree of 1994[20] excluded this possibility, but the old piloting directions still recognised piloting from the pilot boat. It is uncertain how much the controversy between the Piloting Decree and the piloting directions affected the decision of the pilot not to give directions from the pilot boat.

It was not discovered in the investigation whether Kotka VTS had any instructions at the time of the accident concerning the steering information that should be given to a vessel before the pilot enters the bridge.

The international regulations are also controversial. They urge to give information but to refrain from giving direct orders. The VTS guidelines of IMO take a very positive approach to giving directions to a ship from ashore[21], but the same guidelines prohibit the issuing of actual steering commands, which would have been necessary in the case of the OCEAN PRIDE. The regulations were imprecise.

Pilot's responsibility. According to the Piloting Act the pilot is responsible for the piloting. As a result, the pilots are not happy to accept responsibility of the commands related to piloting before they are actually on the bridge. Thus, the steering is left entirely to the Master, who is not familiar with the area, until the pilot enters the bridge.

18 Piloting directions Feb. 8, 1988, National Board of Navigation Bulletin 6/88, Section 19.
19 Decree 393/1957, § 13.
20 Decree 92/1998.
21 IMO A.857(20) 27.11.1997, Section 2.3.3, 'The traffic organization service concerns the operational management of traffic and the forward planning of vessel movements to prevent congestion and dangerous situations'.

The activities of the pilot and the VTS have arisen from the unclear or missing directions that do not provide support for the decision making. Clear steering commands are missing.

3.2.3 Role of shipping company in underlying factors

The investigation uncovered deficiencies in the interpretation of the manning orders by the shipping company and in the equipment and instructions on the bridge. Instructions according to the IMS code would have been necessary since the vessel had changed nationality and the crew was Lithuanian. The directions and maintenance of the safety level had been left at the Master's responsibility based only on the general regulations of maritime law.

Cockpit arrangement. The original radar of the OCEAN PRIDE fulfilled the international requirements. It was installed so that one person could navigate by radar and steer. The radar became old and obsolete but it was not removed from its original position whereby the one man navigation and steering point was lost.

The installation manual for the autopilot required a switch for the autopilot and manual steering manufactured by C.Plath. This requirement was not observed. The switch in use included a deceptive position where no system was active other than the emergency steering. The IMO resolution on autopilots requests that the positions of the switch are clearly indicated[22]. The investigators did not consider the switch of the OCEAN PRIDE to comply with the IMO regulations.

There was no rudder angle monitor at the steering point nor an FU (Follow UP) stick. The demands placed by the small number of crew had not been considered in the ergonomics of the bridge. The bridge arrangement reflected the minimisation of costs. The deficient arrangement required a crew of two or three in a piloting situation.

Manning. The manning certificate of the NIS register required that the working times are not violated. This required increasing the number of crew according to the situation. The Master proposed to the shipping company that the crew should be increased for the Baltic conditions but the opinions of the Master were ignored. The shipping company cut the decision power of the Master whereby it was impossible for him to carry his responsibilities in a way required by maritime law.

The shipping company should have provided the Master with clear operational directions and limits and accept the responsibility for the validity of these. The situation of the Master became difficult since he was not given the authority invested in his office or the support for decision making.

Directions of the shipping company. The multinational crew would have required clear directions and signs. The instruction for the autopilot recommended slow speed for the rudder pumps whereas the emergency rudder required the operation of all pumps. The above deficiencies can be remedied by the ISM code that will enter into force concerning the OCEAN PRIDE on June 1, 2002.

[22] IMO A.342(IX), Performance Standards for Automatic pilots, paragr.2.5, 1975.

3.3 Emergency traffic

It has been observed in the maritime accidents of recent years that the vessels do not broadcast a mayday signal according to the radio traffic code. As a result, the emergency radio traffic remains internal communication of the various organisations.

According to the GMDSS system, the organisation in charge of the rescue activities also handles the emergency traffic. If the vessel in distress does not broadcast a mayday signal, this can be remedied by the Maritime Rescue Coordination Centre sending out a mayday relay on her behalf. By this message, the MRCC informs all organisations of assuming command in the rescue operation. The Finnish Maritime Rescue Directions do not stipulate the correct and modern procedures. The Maritime Rescue Directions of the Ministry of the Interior are outdated and do not comply with the international radio traffic regulations.

4 RECOMMENDATIONS

4.1 Recommendations concerning the Orrengrund area

Alternative fairway. The 15,3 metre deep channel leading from the open sea to Kotka provides an alternative for the 10,0 metre fairway of Orrengrund. It is safe during the open water season in bad weather and it can be used by all vessels with a draught of less than 15,3 metres. The pilot boarding position for the deep channel is far out to the sea, where it is difficult for the pilot boat to go if the wind is strong.

Kaunissaari pilot boarding position. Another official pilot boarding position for the 15,3 metre deep channel should be established in the lee of Kaunissaari.

It is the recommendation of the investigator that the Navigation District:

1. *establishes another official pilot boarding position in the lee of Kaunissaari and sets the following requirements for its use:*
    - *This pilot boarding position shall be used when the official pilot boarding position of Orrengrund cannot be used.*
    - *It shall be verified from the master that the incoming vessel has a passage plan from the sea along the deep channel to the Kaunissaari pilot boarding position and the outgoing vessel has a passage plan from the pilot boarding position to the open sea.*
    - *The master shall be informed that the VTS will give steering information as necessary while the vessel is within the VTS area. The master shall use this information together with his passage plan.*

Wind limits. The boarding and discharge of the pilot should be secured by setting limits to the conditions. Temporary halting of traffic because of a strong wind depends at present solely on the decision of the pilot. It is difficult to make such a decision since all other parties expect the traffic to go on whatever the conditions. If the decisions are delegated solely to the pilots based on the fact that they are responsible for the piloting, the individual pilot is left without support for the decision making.

It is the recommendation of the investigator that the Navigation District:

2. *defines wind and wave limits for the official pilot boarding positions south of Orrengrund and in the open sea for the 15,3 metre deep channel and for the Kaunissaari pilot boarding position.*

Unofficial pilot boarding position. An unofficial pilot boarding position may be established north west of Orrengrund if its use is approved by the Navigation District. The Navigation District shall provide clear directions for its use.

It is the recommendation of the investigators that the Navigation District:

3. *shall provide official directions for the use of the unofficial pilot boarding position north west of Orrengrund including the following items:*

    - *exceptional conditions permitting the use of this pilot boarding position and*
    - *information given to the vessel about the location of the unofficial pilot boarding place and of a safe route to the pilot boarding place or out of it.*

4.2 General recommendations on boarding position of pilot

Wind limits. The pilots have requested wind limits for the pilot boarding positions. The Finnish Maritime Administration established a work group for studying the matter. The work group did not draft wind limits but decided that the pilots themselves should determine them. The Finnish Maritime Administration left the responsibility to the pilots. This has led to exceeding the officially undefined wind limits. An individual pilot does not wish to be the only one limiting traffic. The main task of the pilot is in controversy with the officially undefined wind limits unless the pilot receives support for the decision making from the Finnish Maritime Administration.

It is the recommendation of the investigators that the Finnish Maritime Administration:

4. *establishes wind and wave limits for the use of all official pilot boarding positions.*

Language of radio traffic. The radio traffic between the pilot, the VTS and the foreign master varies depending on whether the master participates in the conversation. According to IMO resolutions, the traffic should be in English at locations with international traffic. The master shall be able to understand also the conversation between the pilot and the VTS concerning the piloting. All traffic information by the VTS, the pilot and the master shall be given in English according to IMO Resolution A.578 (14).

It is the recommendation of the investigators that the Finnish Maritime Administration

5. *takes care of that all the VTS's and pilot's and master's traffic reports concerning foreign vessels are to be made in English and ensures that the masters of foreign vessels recognise their right to receive traffic information in English.*

Traffic information and steering commands of the VTS. In practical navigation, the VTS is expected to give clear steering commands. Contrary to such expectations, IMO Resolution A.857(20) forbids the issuing of steering commands to vessels. The role of the VTS is not clear to the masters, since the vessels do not usually carry the IMO resolutions.

The need for the traffic information given by the VTS is different if the vessel has a pilot/master with a piloting licence or does not have a pilot. The role of the VTS is to give continuous information even when the pilot or a master with fairway certificate is on the bridge.

If the vessel is approaching an official or unofficial pilot boarding position without a pilot, a situation may arise where the master who is unfamiliar with the fairway makes a mistake. In such a case, the VTS should give clear steering commands in order to secure maritime safety and to avoid environmental damage.

It is the recommendation of the investigators that the Finnish Maritime Administration:

6. *in exception to the IMO resolution, authorise the VTS centres to give steering commands early enough to vessels that approach an official pilot boarding position uncertainly.*

If the vessel is ordered to an unofficial pilot boarding position, the VTS shall give precise steering commands. If the VTS cannot give the commands, the unofficial pilot boarding position must not be used.

It is the recommendation of the investigators that the Finnish Maritime Administration:

7. *prohibit the use of an unofficial pilot boarding position in cases where the VTS does not give steering commands.*

4.3 Emergency traffic

The maritime rescue directions given by the Ministry of the Interior to the Coast Guard do not comply with the international radio regulations. Because the Accident Investigation Board has set up a workgroup to clarify the deficiencies of vessel's emergency traffic found in connection with the accident occurence, the investigators do not give safety recommendations on this issue.

The investigator board will not issue recommendations concerning the role of the shipping company since the ISM code will help removing in the future those hidden factors contributing to accidents that were discovered in the course of the investigation.

Helsinki, March 14, 2003

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Toimi Sivuranta

Kari Larjo

LIST OF SOURCES

The following sources are on file at the Accident Investigation Board:

1. Kotka District Court protocol n:o 812, 14.3.200, H00/647. OCEAN PRIDE's Maritime Declaration.

Protocol sources

1.1 Maritime Declaration given by the Master.

1.2 Maritime Accident Report.

1.3 Cargo Plan.

1.4 Deferred Damages.

1.5 Extract of OCEAN PRIDE's logbook 6.-10.3.2000.

1.6 Bemanningsoppgave, Manning Certificate.

1.7 Crew List.

1.8 Extract of OCEAN PRIDE's engine logbook 6.-10.3.2000.

Other Documents

2. Archipelago Sea Coast Guard, Maritime Rescue Coordination Centre, Maritime Rescue Log OCEAN PRIDE/6.3.2000.

3. Kotka Rescue Centre, Accident report n:o 52 285 0 000157.

4. Paper copies of Kotka VTS's registrations concerning OCEAN PRIDE's track 6.3.2000.

5. T:mi RAYDEC, Maintenance Report, ms OCEAN PRIDE, RUDDER CHECKING, 14.3.2000.