# Investigation report

C2/2008M

# MS SERENA F, stranding north of Hiittinen on 6.3.2008

Translation of the original Finnish report

## SUMMARY

SERENA F, a fishing support vessel, sailing under the Russian flag, had since the beginning of the year 2008 been anchored in the Hiittinen region at 59°53,08'N and 22°27,55'E and bought sprat and Baltic herring from Finnish fishermen. SERENA F had packaged and deep-frozen the fish it had bought in her hold.

On Monday 6 March 2008, it was SERENA F's intention to sail to Hanko to replenish her stores. For the transfer, a pilot had been ordered to arrive at 6.30 a.m. Preparations were made for the departure by starting the main engine in advance by order of the chief mate already at 5.40 a.m. When the engine was started, the vessel was anchored with her left anchor, from which six shackles of anchor chain had been cast.

After the main engine started, the pitch of the propeller changed into a position driving the vessel forward (full ahead). When the chief mate noticed this after a few minutes while the vessel was already moving, it was simultaneously discovered that the control devices of the propeller did not function properly. After the eventual stopping of the engine, the vessel, dragging the anchor, still ran, at a speed of approximately six knots, aground near the shore of the Norröarna islands to the north of Långnäs in Rosala. According to the ship's log, SERENA F ran aground on the rocks at 59° 52.8' N and 22° 26.9' E at 5.49 a.m., but according to the VTS recording the time was 5.42.

After a leakage check performed from the inside of the vessel, the main engine was restarted in order to get the vessel off the ground. This time the steering of the main engine and the propeller functioned flawlessly. After fifteen minutes try with the engine astern without result engine was stopped.

At the time of the event, the water level was +60 centimetres. Soon after the stranding, the water level sank significantly and SERENA F stuck more firmly on the rocks. Measured with the echo sounder of the coast guard vessel slightly to the front of the engine room at the side of the vessel, there was approximately one meter less water than required by the draught of the vessel. The measurement was performed at midday by RV 243 when it was mooring at the side of SERENA F. The depth measurements from the vessel gave a corresponding result.

SERENA F was pulled off the ground by the joint pull of the second and third tugboats arrived on the scene on 7 March 2008 at 4.35 p.m. During the pulling off, the vessel received additional bottom contacts and apparently her rudder was damaged. After the pulling off, SERENA F was towed to Naantali, where her fish load was loaded into another vessel.

The reason for the stranding is likely to be the insufficient check of the steering system of the propeller prior to starting the engine. The supervision and watch keeping after the starting have been insufficient, too. The measures refer to a slight panic after the problems occurred and the danger involved in the situation became clear.

The investigators emphasise the significance of care and attentiveness after a long and relatively idle stationary period. Trusting in old memory and routines may, at that time, be dangerous. In a corresponding situation, the investigators recommend that the measures in check lists be performed with emphasised formality and that an adequate manning be kept in key places.

## THE ABBREVIATIONS USED

| | |
|---|---|
| COLREG | Convention on the International Regulations for Preventing Collisions at Sea |
| GPS | Global Positioning System |
| MRCC | Maritime Rescue Co-ordination Center |
| VTS | Vessel Traffic Service |
| VHF | Very High Frequency |

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## FOREWORD

When making preparations for sailing to replenish stores in Hanko, SERENA F ran aground due to a malfunction in the steering of the propeller at 58°52.8'N and 22°28.9' E on 6 March 2008 at 5.49 a.m. Unless stated otherwise, the times of the vessel have been used. The clock of the vessel was in Finnish winter time. The arrival of the pilot at the site revealed the stranding. The traffic guidance and the maritime rescue system were informed of the event by the pilot at 06.23-06.30 a.m. and radio contact to the vessel was established only after that. The duty officer of the Accident Investigation Board was notified by the MRCC at 12.24 and started a preliminary study. The Accident Investigation Board started the investigation and appointed, as chairman of the investigation board, major (ret.) Pertti **Siivonen** and Licentiate of Technology, Olavi **Huuska** was appointed member.

The knowledge of O Huuska in the Russian language was utilised during the investigation and the aim was to clarify the apparent oddities relating to the stranding, for example, the running aground on the rocks dragging the anchor.

The investigator visited the vessel on 10 March, 14 March, and 9 April as well as on 21 April. The discussions held and observations made during the visits have been recorded in memos by the investigators. Documents were obtained for the investigation from the vessel, the Finnish Maritime Administration and the manufacturer of the propeller. In addition, there were photographs and a video taken by the Border Guard of the vessel aground and being dragged from the rocks by the tugboats as well as a video recorded by the divers. Also the VTS recording was available. The investigators took photographs onboard the vessel. In addition, there was information on the vessel in the Internet.

**The purpose of accident investigation** is the improvement of safety and therefore no issues of guilt or damages are handled. With regard to its contents and style, the Investigation Report has not been written so as to be meant to be used in legal action. The conclusions and safety recommendations presented in the Investigation Report do not constitute an assumption on guilt or liability in damages.

**Statements on the Investigation Report.** The final draft of the Investigation Report was sent on 19 January 2009 for a statement under section 24 of the Decree on Accident Investigation (79/1996) and possible comments to the maritime and rescue authorities, the Master of the vessel and the shipping company as well as to the pilot, the Russian Maritime Register of Shipping in Finland as well as to the manufacturer of the propeller. The statements are appended to this Investigation Report. The Investigation Board has reviewed the Investigation Report on the basis of the statements and supplemented it where it has deemed it necessary. The investigation report has been translated into English by Kymen Kielipalvelu Oy.

The Investigation Board presents recommendations to improve safety.

The Appendices are a collection of material drafted during the investigation and forming its basis as well as relevant documents.

# 1 EVENTS AND INVESTIGATIONS

## 1.1 Vessel

*Figure 1. SERENA F on ground on 6 March 2008*

### 1.1.1 General information

| | |
|---|---|
| Name of the vessel | M/S SERENA F (1997), EX BOEIER (1980), EX ODON (1986), EX BERENICE (1992) |
| Type | Fish processing vessel |
| Flag | Russia |
| Class | Russian Maritime Register of Shipping KM* |
| Shipping company | Transfish LTD |
| Home port | Murmansk |
| Call sign | UCWR |
| IMO No. | 7904853 |
| Year and place of construction | 1980, the Netherlands |
| Displacement | 2,881 t |
| DWT | 1,389 t |
| Gross | 1751 |
| Net | 704 |
| Length, max | 77.25 m |
| Length, perpendicular | 69.60 m |
| Width | 12.50 m |
| Height to freeboard deck | 8.0 m |
| Draught | 5.23 m |
| Engine power | 1 x 2060 kW |
| Speed | 13.5 kn |
| Crew | 32 |

The vessel is a fish processing plant. She was built in 1980 at the shipyard of Scheepswerf & Machinefabriek Ysselwerf B.V., located in Capelle a/d IJssel in the Netherlands, for Dutch owners. The vessel has a concrete-filled keel. In 1983, the vessel was lengthened by 10.19 m and a Becker rudder was installed. The vessel has a controllable pitch propeller in a nozzle. The vessel has sailed under different names for several owners. For her present owner, Transfish Ltd, Murmansk, the vessel was transferred in 2006.

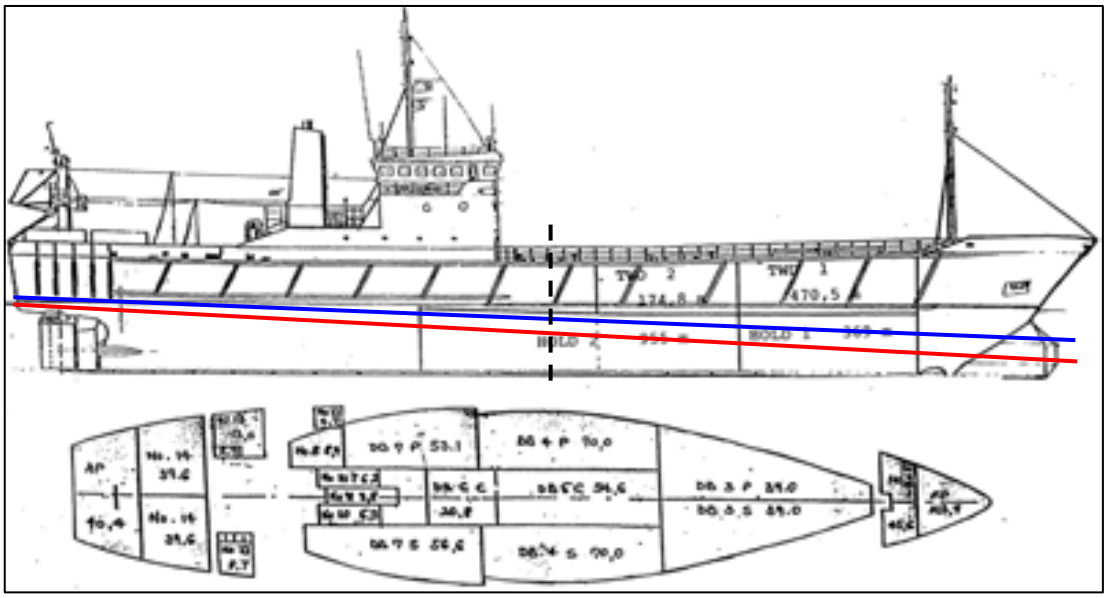

*Figure 2. SERENA F, general arrangement. The waterline of the vessel in anchor is marked in blue[1]. The average waterline of the vessel on the rocks estimated on the basis of photographs and videos as well as on calculations made onboard the vessel is marked in red[2]. The longitudinal inclination of the vessel's bottom was about 3 degrees.*

### 1.1.2 Manning

SERENA F had a crew of 32 men and one Norwegian fish broker. The Master of the vessel had changed around 10 January 2008. The crew of the vessel comprised also a chief mate, a second mate and three engineers, a chief engineer, an electrical engineer as well as officers relating to the fish processing equipment. The vessel was fairly new to the shipping company as she had transferred to it in 2006.

### 1.1.3 The bridge and its equipment

The bridge of SERENA F is equipped with modern navigation equipment. An electronic nautical chart was connected to the radar screen (figure 3). The screen of the echo sounder and the control equipment of the engine/propeller (figure 3) have been placed in the immediate vicinity of the chart/radar display and a one-person steering place has thus been formed to the right of the centerline. The older paper-chart navigation equipment is on the centerline behind the magnetic compass and the helm.

1 Stability calculation made onboard the vessel on 5 March 2008 at 12 noon.
2 An average of the depth measurements made by the crew of the vessel on the right and left sides, Appendix 2.

The operator's console of the steering gear is situated to the left of the operator's console of the propeller and the main engine. The emergency control buttons of the steering gear are located in the console. The emergency control buttons of the propeller are on the right side.

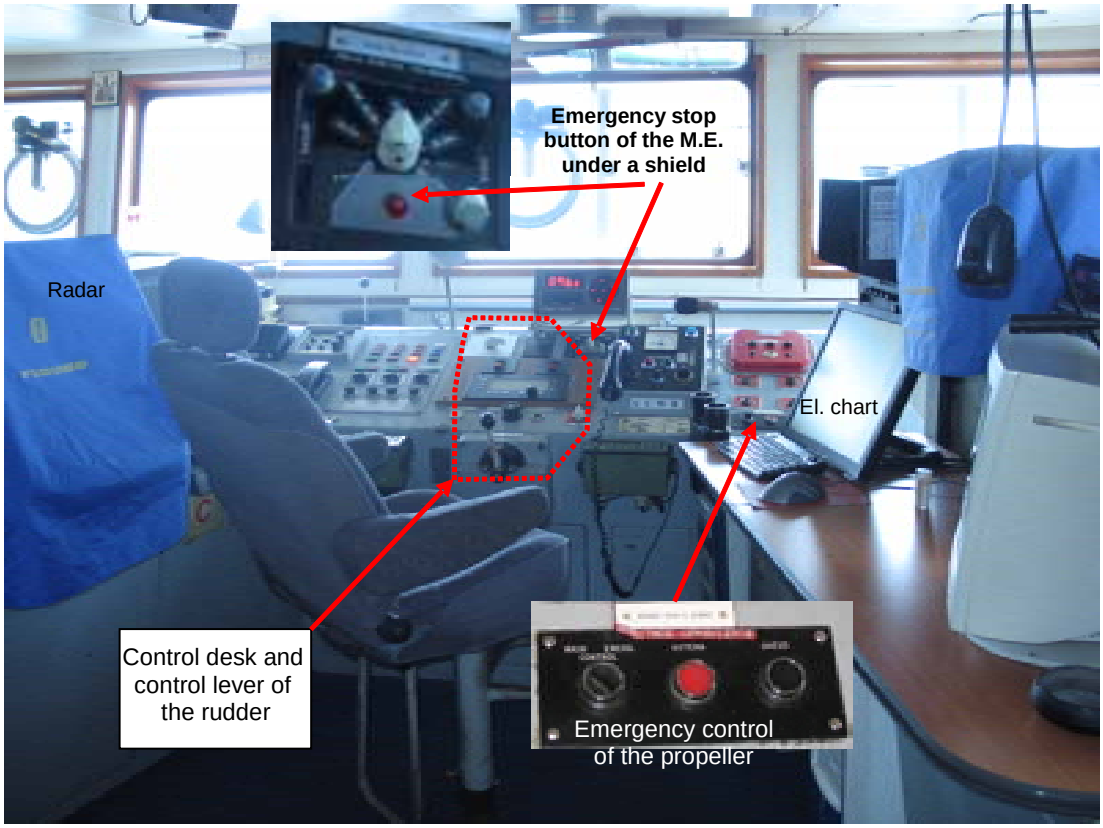


*Figure 3. The operator's console of SERENA F. M.E. means main engine.*

### 1.1.4 Machinery and engine room

The vessel is equipped with a medium-speed diesel engine, type MaK 8M 453 AK, 2060 kW, speed of rotation 600 rpm. The auxiliary engines are also manufactured by MaK, 1x856 kW, 1x705 kW and 1x235 kW (emergency generator). The propeller of the vessel is a four-blade, controllable pitch propeller in a nozzle manufactured by J.W.BERG Propulsion (nowadays BERG Propulsion). Its operator's consoles on the bridge and in the engine control room (Figure 4) are original.

The propeller of the vessel is usually steered from the bridge with the equipment of the operator's console in figure 4. The drive gear of the propeller pitch is hydraulic but its control is pneumatic. The propeller may be steered also from the engine control room or from the emergency control console of the propeller shaft[3]. Also the bridge is equipped with an emergency control of the propeller, which functions with press buttons, figure 3. The operator's consoles of the bridge and the engine control room have switches for the transfer of the control place and signal lights indicating the control place.

[3] According to the equipment description of the manufacturer of the propeller, emergency control from the propeller shaft requires preparatory measures and therefore its use was not possible in this case.

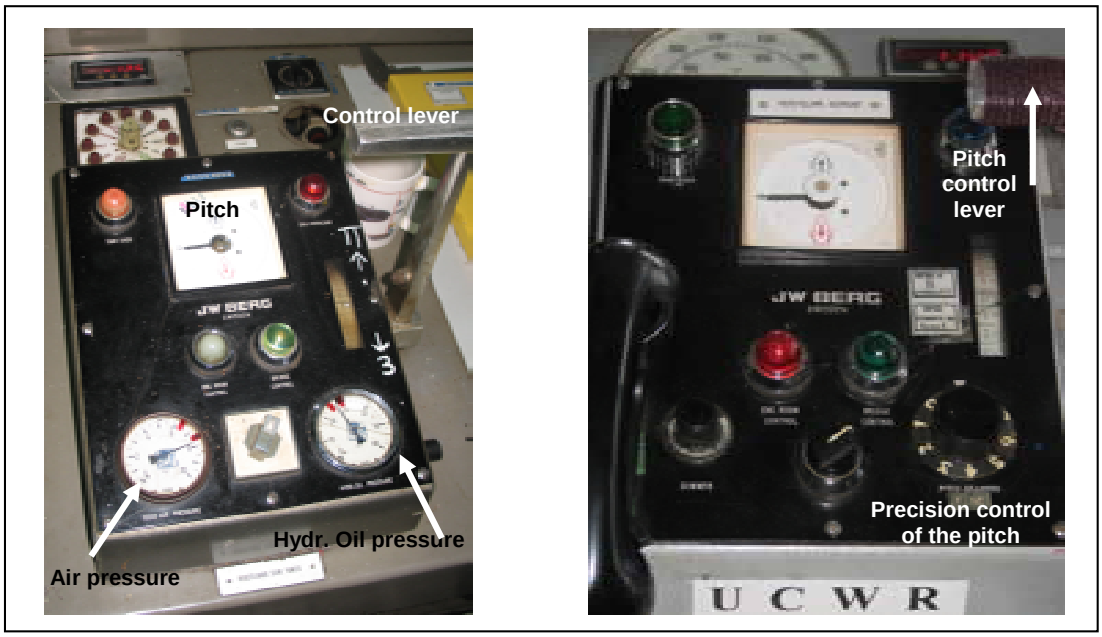


*Figure 4. The operator's console of the propeller in the engine control room (on the left, Π means "ahead" and 3 means "astern"), and on the bridge (on the right). The console of the bridge is equipped with a warning that the pitch may not exceed 5. The meters of the engine control room have limits for recommended pitch and pressure.*

### 1.1.5 Other systems

SERENA F attends to the packaging and storage of the fish acquired in the form of right rectangular prisms in a temperature of -25 degrees. The cooling agent is Freon 22. There are two cold storage holds with a total volume of 1969 $m^3$.

The weight of the anchor of the vessel is estimated to be 1.6 tons and the size of the anchor chain 40 mm and the weight of one shackle 985 kg[4].

### 1.1.6 Cargo

SERENA F had been in the Hiittinen–Hanko waters buying Baltic herring and sprat from Finnish trawlers with the aid of a Norwegian broker. The vessel had arrived on the scene at the turn of 2007–2008. On 16 February 2008, the vessel had been to Hanko to replenish her stores. Some 170 tons of processed fish was deep-frozen in the cold storage holds. The displacement of the vessel was about 2000 tons in the morning of 6 March 2008.

[4] The Rules of the American Bureau of Shipping (these have been used as they are available in the Internet freely) for vessels of under 90 meters and the homepage of one manufacturer of anchor equipment, www.wolterboer.nl. A shackle is 27.5 meters of anchor chain.

## 1.2 The accident event

### 1.2.1 Weather conditions

According to the entries of the Coast Guard station in Hiittinen, the wind at 7.00 a.m. was 17 m/s from the direction 175° and at 9.05 a.m. 13 m/s from the same direction. During the day, the wind turned to the west and weakened and it snowed at times. The sea water height was + 60 cm and it dropped more than 10 centimetres during the day. The water-level was still getting lower at all the closest water height measurement stations (Hanko, Turku and Foglö, figure 16) on the following days.

The next figure contains the wind data from the Vänö station on 5–7 March 2008[5]. Vänö is situated about 14 km to the west of the accident site. At the time of the accident, the wind velocity was at its maximum and the wind was from the south-west. The visibility was fair, it was snowing. The sun rose at 7.12. The nautical twilight began at 5.43 and the civil twilight[6] at 6.31.

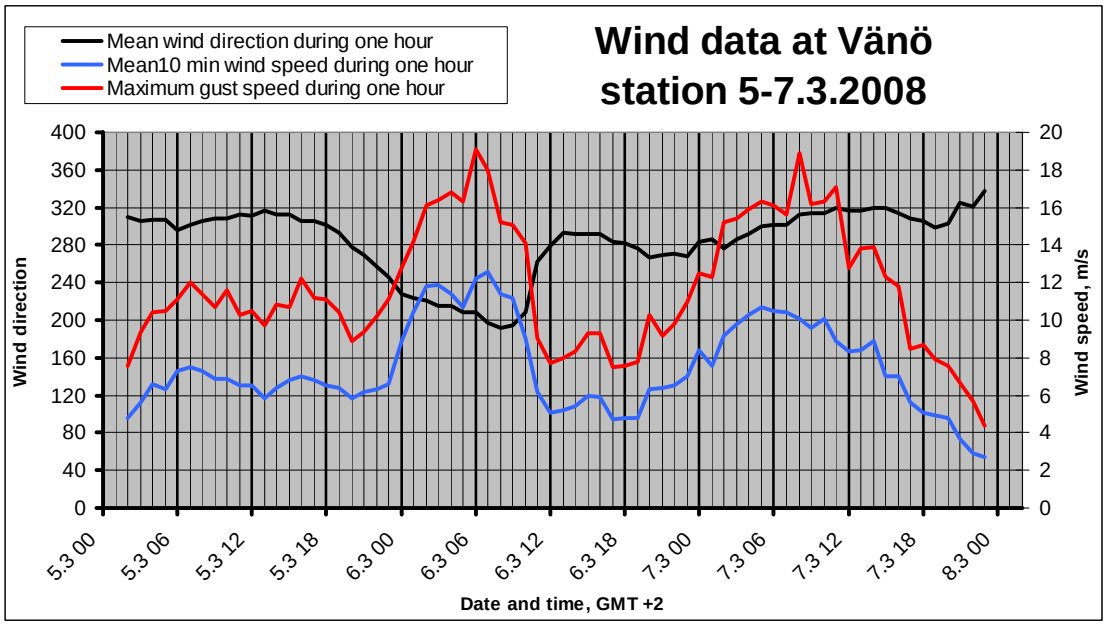


*Figure 5. Wind data from the Vänö meteorological station of 5–7 March 2008.*

[5] Graphic presentation drawn up in accordance with the table in the e-mail from the Finnish Meteorological Institute of 30 May 2008.

[6] During the nautical twilight, the sun is 6 to 12 degrees below the horizon. It has been named that because the horizon is still clearly visible and more and more stars begin to appear in the sky and in the old days, the seafarers were able to use the sextant to determine their position. During the civil twilight, the sun is 0 to 6 degrees below the horizon. It is called that because in the Middle Ages the craftsmen or citizens had still enough light to carry on their activities. The brightest stars appear.

### 1.2.2 The accident voyage and its preparation

SERENA F had since 16 February 2008 been anchored in the Hiittinen region at 59°53.08'N and 22°27.55'E[7] (place of the anchor). Of the left anchor chain, there were six shackles out, i.e., 165 metres. The sea bottom at that place was of clay[8]. In the morning of 6 March 2008, it was SERENA F's intention to sail to Hanko to replenish her stores[9].

The chief mate was alone on the bridge. According to the order of the Master, the main engine was to be started at 6.00 a.m. A pilot had been ordered to the vessel for 6.30 a.m. The intention was to lift the anchor only after that. Preparations for the start were started on 6 March at 5.30 a.m. when the chief mate gave the order to start the main engine. The III engineer was in the engine control room.

The main engine had been warmed up for an immediate start. Before the start of the engine at 5.25, the engine control room and the bridge, ordered by the chief mate, checked the functioning of the steering of the propeller and the steering engine as well as the clocks and no malfunctions were reported regarding the check[10]. The engineer checked also the function of the cooling-water pump. At 5.40 a.m., the engineer started the main engine. The engine was started to 400 rpm and the pitch indicator of the propeller showed zero. The engineer raised the "idle running revolutions" to 480 rpm at 5.44 a.m. After a while, the chief mate noticed that the propeller's pitch indicator was in position 5, i.e., "full ahead". SERENA F moved towards the shore and the chief mate pulled the engine order lever to the full astern position but the pitch indicator did not change to correspond to the setting. He repeatedly tried to gain control of the propeller pitch, but he did not succeed. The chief mate called the Master to the bridge at 5.47 a.m. The chief mate called the engine room by telephone and notified that the steering of the propeller did not function. He ordered that the steering of the propeller be transferred to the engine room and set in the full astern position. It was no longer possible to avoid the grounding by using the rudder[11]. At 5.48 a.m., after finding the attempts useless, the chief mate gave the order to stop the main engine by pressing the emergency stop button. The engineer stopped the main engine. The vessel continued to move towards the shore at a speed of 6 knots. Those on the bridge were not able to change the direction of the vessel.

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7 The place is estimated from the drawing of the Master. The entry in the log 59°52.8'N and 22°07.8'E is unclear and apparently erroneous. Before leaving for Hanko on 16 February, the place was entered as 59° 53.0' N and 22° 27.5 'E.

8 Vessel's log

9 The previous visit of the vessel to Hanko had been on 16 February 2008. At that time, the main engine was started while the vessel was anchored and waiting for a pilot. Nothing unusual took place at that time and the entries in the logs are therefore short.

10 The statements of the chief mate, III engineer and the ship's investigation committee.

11 Master's statement to the management of the Transfish Company on 6 March 2008.

### 1.2.3 The site

The stranding took place between the Norrörarna islands north of Långnäs in Rosala, figures 6, 7 and 8. The shores of the islands and shoals are of smooth rock with a small slope.

*Figure 6. SERENA F between the Norrörarna islands. Tugs AJAX and HECTOR trying to pull off the vessel (without a success). A picture taken by the Border Guard helicopter on 6 March 2008.*

*Figure 7. SERENA F, aground.*

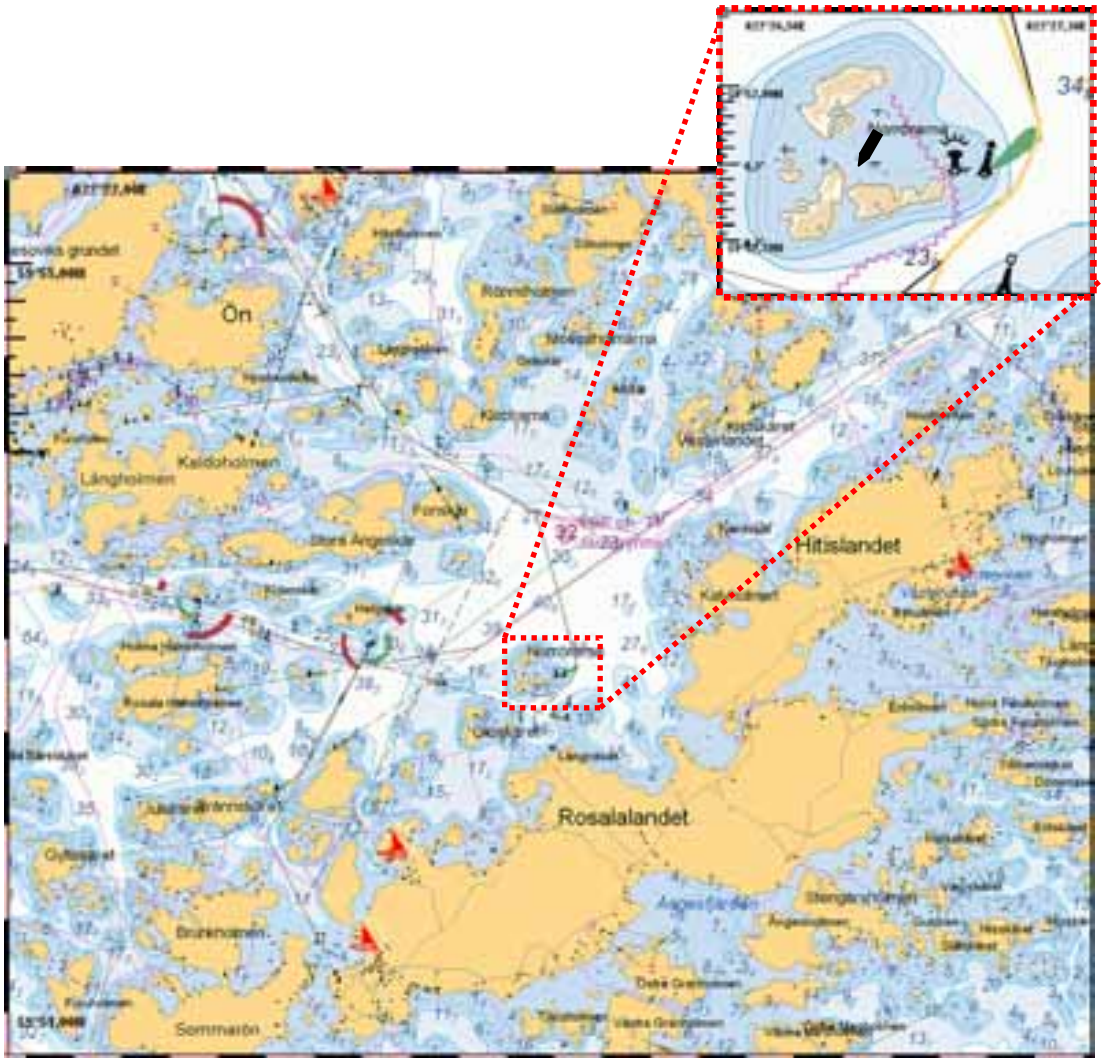



*Figure 8. The site. Based on figure 6, the grounding site is where the black vessel is placed in the figure. (© FMA)*

### 1.2.4 Event

A few minutes after the engine was stopped, at 5.49 a.m., SERENA F touched the bottom for the first time. The vessel's speed at that point was still approximately 6 knots and therefore the bottom received still more contacts. Finally SERENA F stopped a few metres from the shore of the island, figures 6, 7 and 8. The anchor was dragging along. The ship's log states that the vessel ran aground at 5.52.

### 1.2.5 Measures after the event

After the stranding, measures were taken onboard the vessel in accordance with check list no. 6. The lights were changed to correspond to the situation "vessel aground". The watertightness of the shell plating was visually checked and no leaks were detected. At 6.10 a.m., the main engine was started (propeller in the position full speed astern and pitch at 5) and an attempt was made to get the vessel off the rocks. Now the propeller steering was functioning. The attempt did not succeed and the main engine was stopped at 06.25 a.m.. The water level height measurements were started in the bilge wells and

tanks and the cargo holds were checked, too. The vessel's list to port was 10 degrees. The emptying of the forepeak was started at 6.30 a.m. and stopped at 8.40 a.m. At 7.40 a.m., the management of the company and the agent were notified of the situation of the vessel. The Master ordered a tugboat. At 8.00 a.m., the measurement of draughts around the vessel was started. The stability of the vessel was checked.

### 1.2.6 Damage to persons

There was no damage to persons.

### 1.2.7 Damage to the vessel

On the basis of the underwater check performed by divers and the checks performed onboard the vessel, there were no leaks. The steering gear, rudder, rudder stock and the bottom support of the rudder were damaged. The last mentioned had twisted upwards, the rudder stock had moved upwards c. 80 mm and the rudder had twisted slightly to the side. Some of the sensors of the sounders at the bottom of the vessel had been damaged and a few dents of approximately 10 mm in depth were detectable in the bottom plating. One sensor had come loose and hinged on the cable. The casing of another sensor had sunk slightly into the hull. The vessel had rested mainly on her keel. The keel had sunk most approximately in the front of the engine room. Some of the damage may have arisen when the vessel was pulled off. Seawater had flown into one tank. Any deviations of the shaft line shall be detected only after docking. On the basis of the divers' check, it seems that the bilge keels were not damaged.

The Russian Maritime Register of Shipping and the Finnish Maritime Authorities found the vessel to be unseaworthy.

*Figure 9. The twisted Becker rudder of the vessel (on the left), the broken lower part of the rudder shaft (in the middle) and the detached sensor of a probe (on the right). Pictures were taken from a video recorded by the divers soon after the vessel was taken off.*

### 1.2.8 Other damage

The fish cargo was later transferred to another vessel and it remained usable.

### 1.2.9 Navigation and communications equipment

The navigation and communications equipment remained functional.

### 1.2.10 Registration equipment

No recordings of the vessel's chart software have been available with the exception of the Master's drawing. According to it[12], the vessel departed from her anchoring place at 59°53,08'N and 22°27,55'E (figure 13). The stranding took place at 59°52,79'N and 22°26,91'E. Calculated on the basis of these co-ordinates, the vessel travelled some 850 meters. The direction was to the south-west.

### 1.2.11 The operation of the VTS system and supervision systems

The Archipelago VTS recorded the movements of the vessel. The VTS used two radars, the echoes of which are shown as green and red in figure 11. The more accurate radar is in Örö (red echo) and the other in Flackskärsgrund (green echo). The investigators had access to a VTS video recording, the times of which deviate from the log entries of the vessel, figure 10[13]. The time corrected according to the VTS shall be used in the analysis. According to that the vessel was stationary approximately at 05.32 a.m.

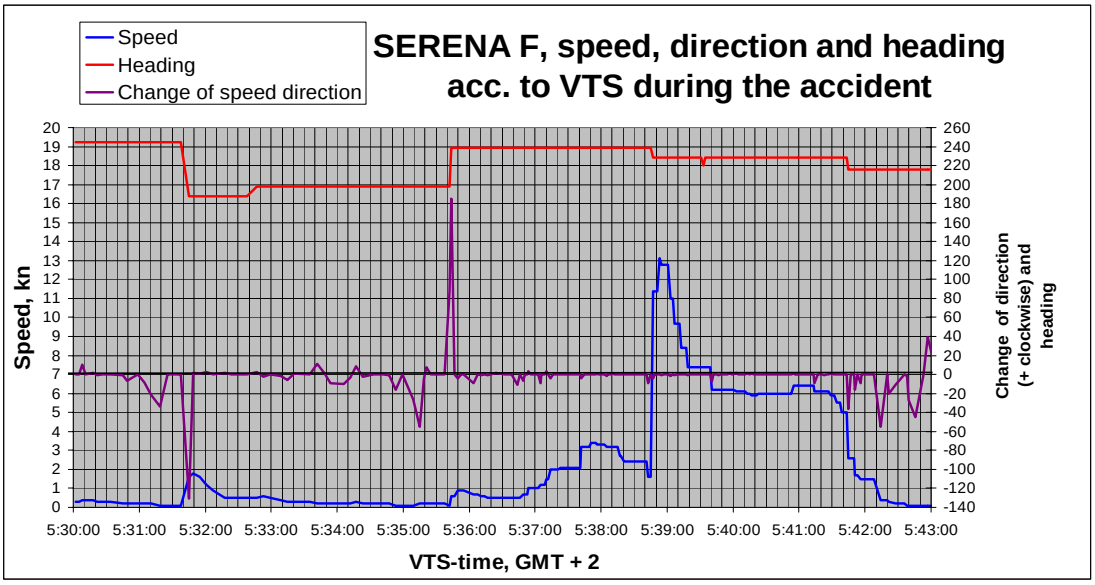



*Figure 10. The speeds and alignment of the vessel from anchoring to stranding in accordance to the VTS. The vessel turned slightly to the left at the same time when she curved to the left. (The reality of the big changes in the speeds indicated in the figure and the reasons for such registration shall be handled in point 2, Analysis.)*

[12] Co-ordinates estimated from the drawing. The co-ordinates of the anchoring place entered in the vessel's log are unclear and clearly erroneous. The stranding had first been entered as having happened at 59°52,8'N and 22°26,8'E.

[13] According to the video, the vessel starts moving approximately at 05.32 a.m. and runs aground at 05.42 a.m.. The logs state that the main engine started at 05.40 a.m. (400 RPM) and at 05.44 a.m. (480 RPM) and that the vessel ran aground at 05.49 a.m..

According to the VTS registration, the speed was 13.1 knots at its highest at approximately 05.39 a.m. and, at approximately 05.42 a.m., the vessel ran aground.

The time difference between the clocks of the vessel and the VTS appears to be approximately 7 minutes so that the vessel's clock is ahead.

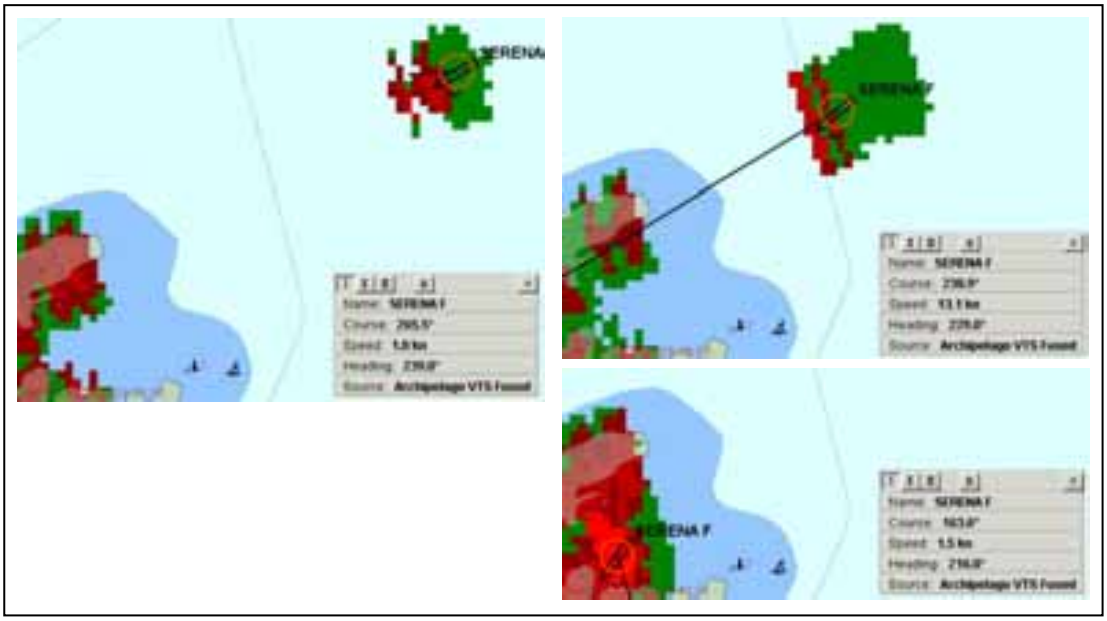


*Figure 11. Positions of SERENA F on the VTS screen:*
*as the speed increases (upper left, at 05:37:00),*
*as the speed is at maximum (upper right, at 05:38:53) and*
*grounded (lower right, at 05:42:01)*

## 1.3 Rescue operations

### 1.3.1 Alerting activities

According to the vessel's log, the vessel called "Archipelago" VTS on channels 16 and 71 at 6.30 a.m.

### 1.3.2 Getting the rescue operations started

The vessel had ordered a pilot to come at 6.30 a.m. The pilot arriving in a taxi boat noticed that SERENA F was firmly aground. He notified the VTS thereof, which notified MRCC Turku, West Finland Coast Guard District, thereof at 6.23 a.m. MRCC Turku rechecked the situation by contacting the pilot as they had not been able to contact the vessel on channels 16 and 71. The patrol boat of Hiittinen, RV 243, called to the rescue mission, picked up the pilot at approximately 7.00 a.m. and went to the scene to check the situation. In addition, the patrol vessel MERIKARHU as well as helicopter OH-HDV, which was on a patrol flight were called to the rescue. At 07.03 a.m., VTS got in contact with the vessel and was informed of the situation. Slightly later also MRCC Turku got in contact with the vessel.

The patrol vessel TURSAS arrived on the next day and exchanged tasks with the patrol vessel MERIKARHU. The oil-prevention vessel HALLI arrived on the scene later for possible oil leaks.

In order to pull off the vessel, the owner concluded a salvage contract with Alfons Håkans Salvage Company.

The crew was not evacuated from the vessel at any stage.

### 1.3.3 Rescue of the vessel

At 7.40 a.m. on 6 March 2008, a coast-guard vessel arrived to the side of the vessel carrying a pilot and a coast guard officer, who boarded the vessel. The deck officers were subjected to a breath analyzer test and there was nothing suspicious. The coast-guard vessel MERIKARHU arrived at the scene at 9.40 a.m. The pilot left the vessel at 11.40 a.m. At 12.10 p.m., two representatives of Alfons Håkans and a maritime investigator boarded the vessel. At 1.05 p.m., the divers began the check of the grounded vessel, which they completed at 1.30 p.m. In the check performed by the divers, no leaks or significant damage were discovered in the hull of the vessel and it was possible to start the pulling off. The tugboat AJAX (Bollard pull 30 t) arrived at the scene at 1.30 p.m. After preparations, the tugboat tried to pull off SERENA F from the ground, however, without success. Håkans sent a stronger tugboat, the HECTOR, to assist (Bollard pull 50 t). At 6.39 p.m., the HECTOR tried the pulling off but did not succeed either. The pulling off was tried also using both tugboats but without success, see figure 6.

On the next day, the tugboat UKKO from Neste arrived at the scene (Bollard pull 70 t).


*Figure 12. The tugboat UKKO.*

70 t of weight was added to the stern of SERENA F and the forepeak was empty. The vessel was pulled off the ground with the help of the tugboats UKKO and HECTOR on 7 March 2008 at 4.35 p.m. After the pulling off, the divers restudied the damage and recorded the state of the underwater part of the vessel on video. No leaks or oil spills were detected. The video and the report of the divers have been used above to describe the damage. In the evening, the vessel departed, towed by the HECTOR and the AJAX, to Naantali, where she arrived on 8 March at 5.20 a.m.

## 1.4 Separate investigations conducted

### 1.4.1 Investigations onboard the vessel and at the scene

The investigator was onboard the vessel on 10 March, 14 March, 9 April as well as on 21 April. The discussions held and observations made during the visits have been recorded by the investigators. The following documents were obtained from the vessel:

- draft of general arrangement,
- tank diagram,
- drawing of the shaft line,
- drawing of the rudder,
- stability calculation before and after the grounding,
- Master's drawing of the route of the vessel,
- the water depth measurements after the grounding,
- copies of the ship's log of 16 February, 6 March, 7 March and 8 March 2008,
- copies of the engine log of 16 February, 6 March and 7 March 2008,
- reports of the ship's officers on their actions at the time of the accident,
- reports of the investigators of the Russian Maritime Register of Shipping and Finnish Maritime Administration on investigations after the accident, and
- the final document of the vessel's own accident commission.

In addition, there are photographs and a video taken by the Border Guard of the vessel aground and of the situation where the tugboats are pulling it from the rocks as well as a video recorded by the divers. Also the VTS recording was available. The investigators took photographs while onboard the vessel. In addition, there was information on the vessel in the Internet. The Master submitted answers to the questions of the investigators in writing.

### 1.4.2 Technical investigations

The investigation concentrated on clarifying the functioning of the main engine and the steering system of the propeller. The investigators contacted the manufacturer of the propeller equipment, the BERG Propulsion company. From the company they obtained a pneumatics chart of the propeller's steering as well as a drawing of the adjustment mechanism of the propeller pitch. In addition, answers to questions were obtained.

### 1.4.3 Actions of the crew and the passengers

In accordance with their routines, the crew performed the inspection of the watertightness of the vessel and determined the position of the vessel and the depths of water on both sides of the vessel on the rocks. No leaks were detected. There was nothing to comment in the alcohol test performed by the coast guard.

The Master of the vessel appointed an investigation commission comprising three crew members to establish the cause of the accident. According to statement 11 March of the commission, the preliminary cause for the accident was that "the steering system of the adjustable blade propeller lacked compressed air, due observation of the position of the vessel by the chief mate was lacking on the bridge, after the starting of the main engine" (a translation from the Russian).

In later discussions and in the answers by the Master given to the questions by the investigation committee it was added that the compressed air valve needed for the steering of the propeller was erroneously closed when the main engine was started. At that time, according to the officers of the vessel, - when the pressure in the hydraulics system was correct and the compressed air pressure was lacking - the blades of the controllable pitch propeller automatically turned to the position "full ahead"[14]. The reason for the valves being closed was deemed to be failed observation in the engine room.

## 1.5 Provisions and regulations guiding the operations

### 1.5.1 Operating instructions

Some check lists relating to actions in different situations have been obtained from the vessel.

### 1.5.2 International Conventions and Recommendations

The vessel complied with the regulations relating to vessels in anchor and aground and the marking of diving (COLREG 72)[15] and the recommendations relating to measures to be taken after grounding.

[14] The manufacturer of the propeller has confirmed this.
[15] International Regulations for Preventing Collisions at Sea.

# 2 ANALYSIS

**The basic technical reason** for the accident was in the engine room; the valve of pressure air was shut. Managing the abnormal situation was, however, the responsibility of the person on the bridge. Managing the situation was impeded by the fact that there was no person on the bridge at the critical moment and communication between these two parties was not continuous.

The investigators consider that **the basic human reasons** for the accident were, first of all, insufficient preparation for the start of the main engine after a long anchoring period. The consequence was that a decisive valve was shut and, due to that, the steering of the propeller did not function as expected. The second reason was that there was no supervision of the departure of the vessel on the bridge for a few minutes at the decisive time and that the main engine was not stopped immediately when the steering failed. The idea to use the rudder engine came too late, right before the grounding.

There was a delay in giving the distress signal and an attempt was made to take the vessel off the ground with own engine power even though possible damage had not been fully clarified or the rocks examined. The engine crew had apparently quickly noticed the closed compressed air valve and opened the valve.

## 2.1 The course of the events

### Movement of the vessel

The vessel started to move with the anchor on the bottom and she sailed approximately 850 metres in about ten minutes. The wind kept the vessel anchored in about the direction south-west – north-east, which caused the direction of the vessel when she started to move, figure 13. The final route was due to the effects of the anchor and the wind.

The difference between the VTS time and the vessel's time appears to be approximately 7 minutes. According to the VTS, the vessel ran aground at about 5.42 a.m. whereas, according to the ship's log, at 5.49 a.m. No other explanation has been found for this difference than that the vessel's clock had slowly gone ahead.

Figure 13 indicates the anchoring circle of the vessel based on the drawing of the Master and the estimated place of the anchor (black dot).

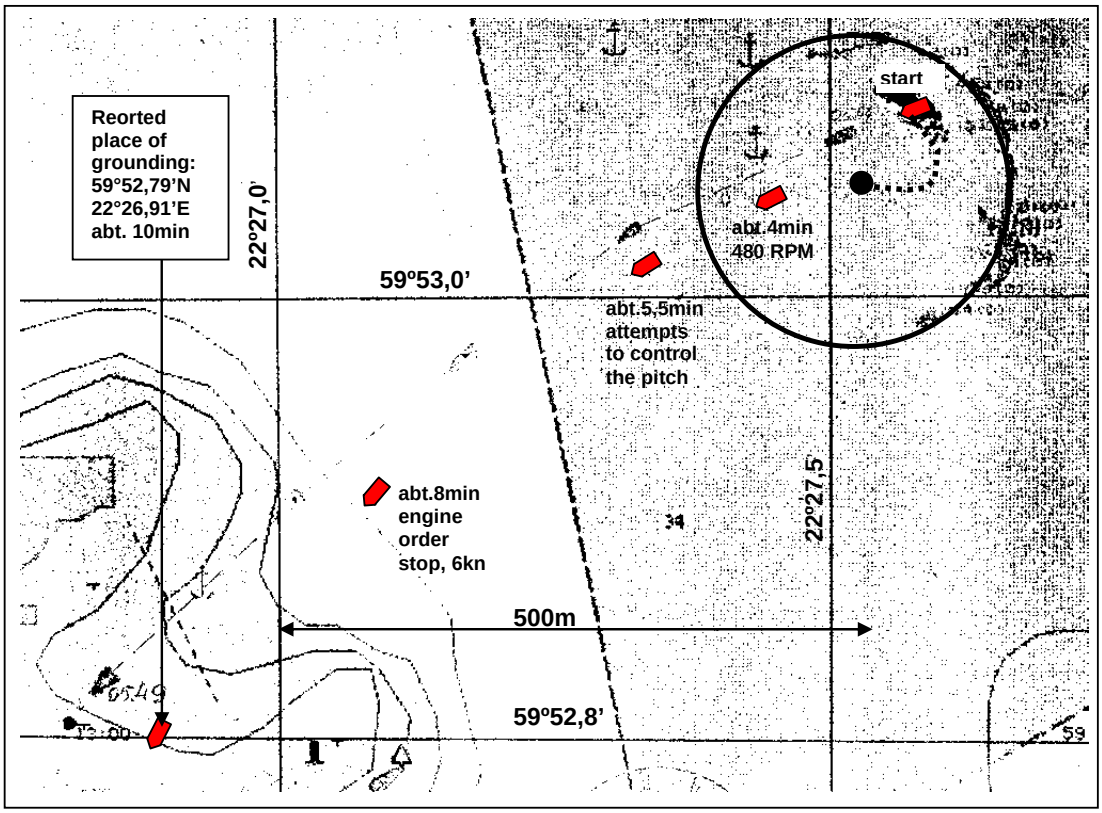



*Figure 13. The starting and sailing of SERENA while anchored. (Extract from the drawing of the Master). The red vessel indicates the understanding of the investigators of the location of the vessel at different times calculated from the start of the engine. The dotted line indicates the assumed route of the anchor chain.*

The speed of the vessel changed stepwise apparently due to the changing braking effect of the anchor (figures 14 and 15). With the help of the VTS data (changes in speed, position and direction), the starting moment has been estimated as being at approximately 5.32 a.m. with 400 RPM. After about four minutes, the III engineer raised the revolutions to 480 RPM. According to the VTS, the speed of the vessel was for a while about 13 knots, but the investigators do not consider it possible as the documented speed of the vessel is 13.5 knots (cf. more about the topic below). Figure 14 presents the opinion of the investigators on the progress of the speed. At approximately 5.39 a.m., the main engine was stopped. The time of running aground can be clearly seen as a rapid decrease in speed and changes in direction.

The maximum revolutions of the propeller were 480 RPM so that the vessel did not operate with full power (maximum 600 rpm). Part of the power of the vessel was consumed to overcome the resistance of the water, but there was enough power also to drag the anchor. The anchor and chain weighing approximately 6 tons were dragging along the bottom. When applying the friction/holding coefficient 1–2, the force braking the vessel is estimated to be 6–12 tons. Depending on the type of the bottom, the braking power may have varied even more. As the water was getting shallower, even more chain was dragging along the bottom.

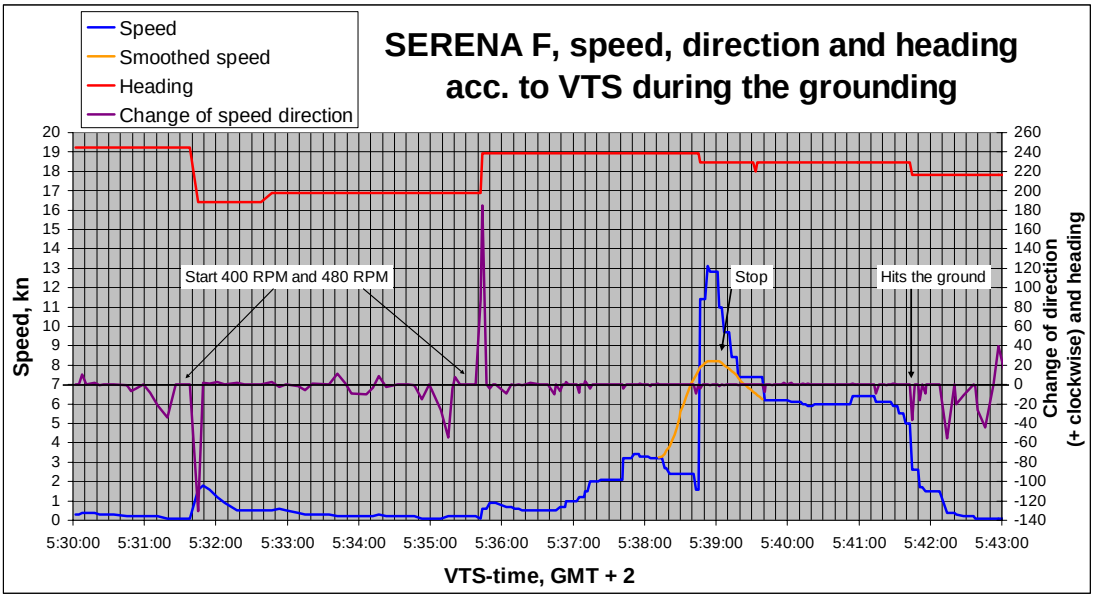



*Figure 14. Figure 10 again added with the results of the analysis. The differences in times correspond fairly well to the entries in the ship's log and the machine logs. There seems to be an approximate 7-minute difference in time between the logs and the VTS data.*

When the vessel started, her speed increased slowly, which made it more difficult to detect it. According to VTS data, only after approximately 7 minutes did the speed increase to its maximum and it decreased soon thereafter. All in all, it took approximately 10 minutes from the start to grounding, which is the same as in the vessel's logs.

According to a estimation of acceleration of the vessel, with a force of 20–30 tons (the thrust minus the resistance of the sliding anchor with the chain and minus the resistance of the vessel), a vessel of 2000 tons accelerates 0.1–0.15 m/s², which corresponds to an increase in speed of approximately 2–3 knots/10 seconds. Due to the increase of the resistance with increasing speed, the acceleration decreases as the speed increases. In addition, with constant pitch, the thrust decreases as the speed increases. With these presumptions, it can be estimated that the acceleration of the vessel from standstill to 10 knots takes about 45 seconds when the resistance of the anchor is 5 tons and approximately 60 seconds when the resistance of the anchor is 10 tons. Correspondingly, acceleration from three knots to 10 knots takes 35 and 45 seconds. It can be noted that in figure 10, especially the steep increase in speed must be lowered; one possible speed development according to the investigators has been presented in figure 14. It is also likely that the top speed is not accurate. According to the investigators, an explanation for the abrupt increase in speed in the VTS recording is the change of the measuring radar in the middle of the recording, which may have been affected by the dead spots caused by the islands. This can be seen in figure 11: there the vessel moves from the green echo to the red echo.

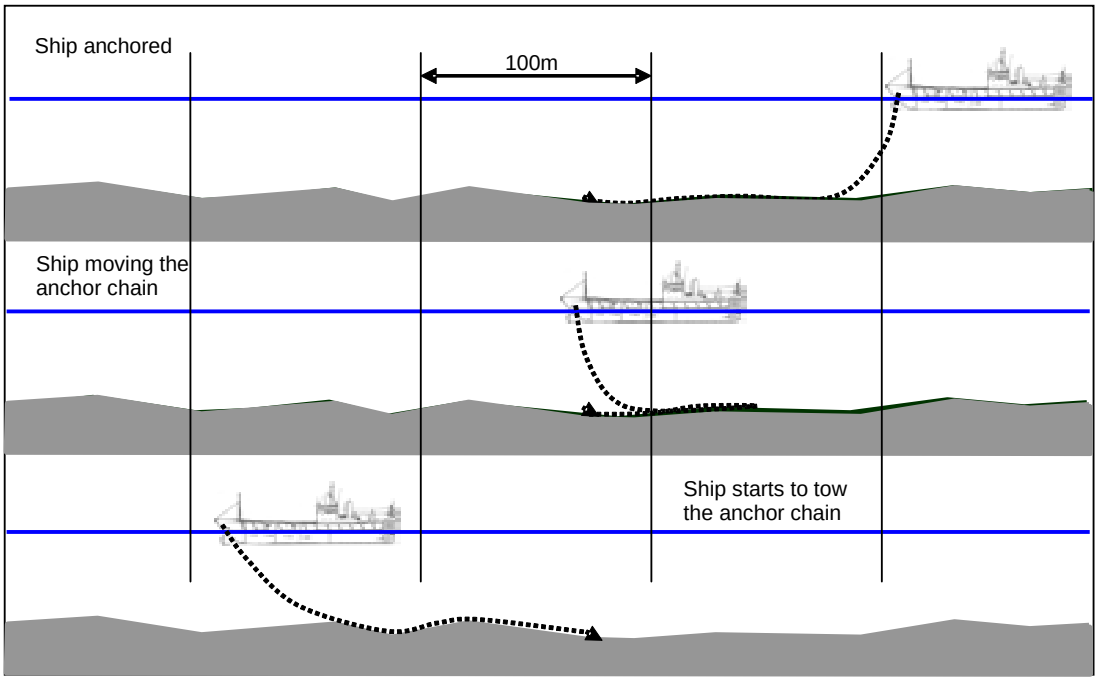
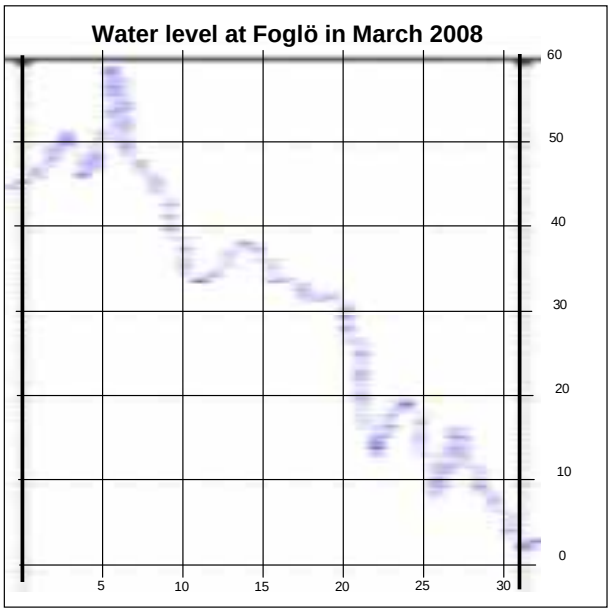



*Figure 15. A drawing of the dragging of the anchor. The first close to 400 metres.*

**The vessel aground and her pulling off**




The lowering of the water level kept the vessel tighter aground. The investigators do not know whether the water level estimate was utilised during the rescue. The water was at its highest in at least one year right around the date of the accident, figure 16. After that, the water level started to go down approximately 5 cm/day, although at first the water level went down approximately 10–20 cm/day (6 March)[16]. Due to the lowering of the water level, the vessel had to be pulled off as quickly as possible.

*Figure 16. Sea level in Foglö, March 2008. In the one-year curve, the water level was at its highest in March. The Turku and Hanko curves are almost identical.*

[16] Foglö, the variation in sea levels, 12-month statistics, Finnish Institute of Marine Research, Baltic Sea Now, sea level. (Internet)

The list of the vessel has not been taken into account in the estimates below. After the vessel had grounded, she has been estimated to have displaced about 1600 tons of water (figure 2). Thus the weight of the vessel against the rocks was about 400 tons. As the water level went down 10 cm the weight of SERENA F against the sea bottom increased by about 40 tons. The vessel lay on an inclined, although uneven surface, the approximate profile of which at the centre-line of the vessel has been presented in figure 17. It is based on the depth measurements done by the crew from both sides of the vessel[17] (a mean value has been calculated in the investigation). Due to the inclination, a small backwards-acting component of force affected the vessel. When the inclination of the bottom is 3 degrees, the component acting in that direction is approximately 20 tons. On the basis of the check of the divers and the calculations made during the investigation, it seems that the entire length of the vessel lay on the ground resting on her keel, however so, that the keel was above the ground in some parts. The ground seems to have been mostly rock with few stones as the bottom plating of the vessel remained almost undamaged and the bilge keels were not damaged.

Water had been pumped out from the fore peak of the vessel soon after the grounding for approximately two hours. In the evening of 6 March, before the new pulling off attempt, the pumping was continued and the fore peak emptied. The vessel had lost approximately 120 tons of weight. In addition, before the last successful pulling off attempt on 7 March, 15 tons of the ballast was moved aft a few metres. The emptying of the fore peak did not endanger the stability as the mass centre of the water was above the mass centre of the vessel.

The weight of the vessel after these measures was approximately 1880 tons. The water had gone down about 15 centimetres by the time of the freeing at 4.35 p.m. on 7 March, so that the increase in weight was 60 tons and the weight against the rocks 1880-1600+60 = 340 tons. The bollard pull of the tugboats HECTOR and UKKO available for pulling the vessel was 120 tons, the vessel's own thrust backwards about 30 tons and the component resulting from the list 20 tons, altogether 170 tons. With a friction co-efficient of approximately under 0.5 (170/340), the vessel started to move. The bollard pull of the tugboats HECTOR and AJAX was not sufficient (altogether 130 tons) although the water had, on 6 March at 10 p.m. gone down only approximately 10 centimetres and the weight increase was only 40 tons. At that time, the friction co-efficient have been at least c. 0.4 (130/320). We may conclude that the static friction co-efficient between the sea bottom and the bottom of the vessel was in the range of 0.4–0.5.

The use of the windlass in the pulling off attempt to give additional power has not come up at any stage. The use of the anchor could have helped in creating the first move (to overcome the static friction). The vessel might have moved sideways.

[17] The list of measures of MRCC Turku states that the echo depth sounding of RV 243 indicated that the water depth at the centre-point of SERENA F was 4.6 m. The corresponding result of the measurements by the crew was 4.7 m.

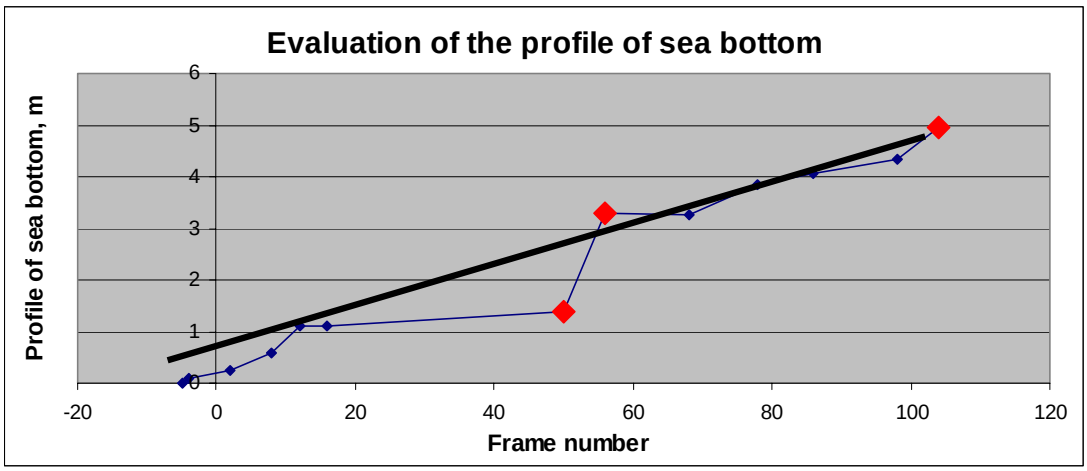



*Figure 17. The shape of the rocks based on measurements done from the vessel. Missing at the red dots is the result from the right. The possible keel line of the vessel has also been marked on the figure. On the basis of the figure, the inclination of the position of the vessel was approximately 3.1 degrees.*

On the basis of the bottom profile and the check performed by the divers, approximately 10 metres of the length of the vessel rested on her keel. The width of the keel has been estimated to be 15–20 centimetres on the basis of the video recorded by the divers. In that case, 460 tons rested on an area of approximately 1.5–2.0 m² in size. The average surface pressure is thus about 2–3 N/mm². The keel had a U-beam profile and it was filled with concrete. The compression strength of concrete is c. 50 N/mm$^2$. There was no sagging or crushing of the keel as the surface pressure remained small even though it in certain parts had clearly exceeded the average pressure.

The stability of the vessel weakened as she climbed on the rocks and it listed until the bottom of the vessel touched the ground. The lines drawing of the vessel has not been available, but it is likely that, due to the deadrise and the height of the keel, the list became the realised 10 degrees. The basic curves of stability of the vessel have not been available. On the basis of the summary table of the stability calculation (5 March) obtained from the vessel and the waterline of the stranded vessel, it has been estimated that the initial metacentric height decreased from 1.27 meters to zero and perhaps even to a negative value. The lowering of the water level weakened the stability, but the vessel did not list any more because it rested on the bottom. The emptying of the fore peak was an appropriate measure as the vessel was lightened by 6 percent. When the vessel was pulled from the rocks, her stability did not recover to the level prior to the stranding as the vessel was now trimming more astern. The necessary stability estimates were made onboard and the stability was found to be sufficient. (The transfers of liquids and weights had altered the situation; the calculation made on 8 March indicated that the initial metacentric height was 0.87 meters, which was sufficient, appendix 5.)

## 2.2 Pressure air valve

### Procedures and compliance therewith

In accordance with the logs and the final statement of the investigation commission of the vessel, the operation of the propeller and the rudder was checked onboard prior to starting the main engine[18]. If the valve was closed when the main engine was started, someone must have closed it for some reason. The check must have been only formal, based on memory, and no one had actually checked the position of the valve or the reading of the pressure gauge in the engine control room[19]. At 6.10 a.m. everything operated in a normal manner, so the valve must have been open at that time. The closed valve had thus been noted and it had been opened. The investigation committee of the vessel noted that one reason for the stranding had been the closed pressure air valve.

There could not have been an actual fault in the propeller steering system because soon after the stranding the order full astern was given and the system operated faultlessly as well as in connection with the pulling off.

On the basis of figure 18, the investigators assume that the said valve has been added later to the system or that it has been changed into a model that can better withstand continuous use. It is possible that one had wanted to get more pressure air when the vessel was not running. The Norwegian fish broker was still onboard the vessel and it is possible that pressure air was needed on the previous day in connection with the intake of the fish and that the valve was closed and no one had noticed this and opened it before the departure preparations.

The conclusion of the investigators is that the procedure relating to the starting of the engine was not complied with in all respects.

### Effect of the position of the pressure air valve

When the pressure air valve is closed, the steering system of the hydraulics of the propeller does not work. When the propeller is rotating, the pitch sets in the position "full ahead"[20]. At that time, the propeller may still be steered with push buttons, figure 3. The pressure gauge of the propeller steering system is only in the control console of the engine control room. It is possible that the knowledge of the mates on the operation of the propeller steering system is deficient because no one thought right away that the failure could be due to lack of pressure. If this had been noticed, the main engine could have been immediately stopped or emergency steering could have been used. No one apparently knew how to use it (or perhaps it was not in order).

[18] According to the manufacturer of the propeller, checking the pressure of the compressed air is sufficient.

[19] The investigation committee of the vessel states in its statement in Point 2 “During the starting of the main engine, the engineer and the electrical engineer were not in the engine room.”

[20] Notification of the manufacturer of the propeller and drawing P1-5839-A "Manouvering arrangement of oil distributor HD-4: max ahead 0.5 bar, zero pitch 3 bar and max astern 5 bar. The adjustment device is spring-loaded so that with small pressure, the pitch reaches the maximum.

*Figure 18. The valves of the pressure air system of the vessel. The red valve pointing downwards is the one leading to the propeller steering system. It is in closed position in the figure. The following have been painted on the bulkhead from the left: "to the controllable pitch propeller", "to separators" and "to trawl gear".*

The pressure air system manifold of the vessel presented in figure 18 looks complicated, which may increase the possibility of faulty switching. The diagram indicating the control pneumatics of the propeller from the manufacturer of the propeller is shown in appendix 6.

## 2.3 Human factors

The Master of the vessel had ordered the start to take place at 6 a.m. when the lighting conditions started to be adequate. The pilot was ordered to arrive at 6.30 a.m. The chief mate gave the order to start the main engine already 30 minutes before the intended time without notifying anyone except the III engineer on watch. The crew of the vessel had prepared for a start taking place no earlier than at 6 a.m. The chief mate may have wanted to avoid starting during a watch change.

At 5.30–5.50 a.m. it was still rather dim so that the shores could not be seen. Instead, there were several line lights and blinking lights as well as illuminated edge marks in the vicinity. The movement of the vessel and her movement would have been noticed if attention had been paid to the lights at all times.

**The bridge**

The investigators conclude that after starting the engine, the chief mate had left the bridge to go to his cabin as he assumed that everything was going in a normal manner. The changes in the movement of the vessel were small during the first minutes and were therefore not noticed as no person was making observations of the surroundings at the time. In addition, the movements of the vessel at the early stages resembled the slow movement of a vessel in anchor. Also the wind was at its highest at that time and wind gusts were moving the vessel. Only the raising of the revolutions of the main engine and the jerks caused by the anchor apparently warned the chief mate, who visited his cabin. When adequately strong indications came from the movement of the vessel, he rushed to the bridge[21].

For a person being whole the time on the bridge it would have been possible to detect even a slow start and the wrong position of the propeller pitch immediately and to give an order to stop the main engine as well as to examine the cause for the disturbance. Due to the anchor, the vessel would have stopped within a distance shorter than normal. Thus stranding would have been avoided.

The investigators conclude that, when arriving late at the bridge, the startled chief mate did not find the best actions to manage the situation. Apparently it did not occur to him that the steering of the propeller did not function but he tried to get the pitch regulation under control. The emergency steering of the propeller was not used. By steering the vessel at an early stage with the rudder, it would have been possible to sail in a circle. No one apparently thought of using the emergency steering of the rudder. Nor was the lack of pressure in the propeller steering system noticed in the engine room and it was not notified to the bridge.

A start at the time of the watch change would have ensured that more persons would have been making observations at the critical hour.

The officers did not, according to the understanding of the investigators, have the preparedness brought by experience to handle a sudden exceptional situation due to a human error.

The vessel had been in anchor for a long time. The bridge had got used to the ordinary and very few routines of anchoring time. The natural assumption on the bridge is that everything is fine in the engine room and only minimal joint checks are carried out.

[21] Statements of the officers of observations made on the officers' deck at the time of the accident.

### Engine room

The start of the main engine of the vessel requires that certain checks are made in accordance with the check list. Going through the check list may have been partly superficial as the closed valve had not been noticed. The pressure gauge of the console of the engine control room has not been observed prior to the start; it is unlikely that the engine would have been started if the air pressure was insufficient.

The position of the lever of the propeller steering in the engine control room does not follow the position of the lever on the bridge[22]. However, the display of the pressure gauge of the pressure air should have warned the engineer that the propeller steering system was not working. Now the engineer observed the deviation only when a call came from the bridge. The engineer had not even then noticed the lack of steering pressure.

The vessel had been anchored for a long time. It is likely that prior to 6 March constant cleaning and maintenance work had been performed in the engine room and therefore the watch keeping had varied. On the other hand, routine checks may have been given less attention. They may have trusted that other people have done their duties.

The response of the Master to the question posed by the investigators regarding the maintenance of the propeller and the steering gear is as follows: "In connection with the start of a watch, a visual check is performed regarding the tightness of pipelines, oil leaks, the fastening of equipment. Once a month and always before the start of the main engine, the rudder and the propeller blades are turned as well as an entry is made in the machine log. Repairs of this equipment are not made by the crew of the vessel" (translated from the Russian).

## 2.4 Rescue operations

There was an unnecessary delay in the start of the rescue operations of the vessel. The vessel herself did not immediately give any distress signal. The VTS could have given the alarm earlier.

## 2.5 Other observations regarding safety

In the opinion of the investigators, the vessel's own attempt to get off the ground showed poor judgement and it included risk factors. There had not been enough time to establish the state of the vessel and the characteristics of the sea bottom under and near the vessel.

The time of the accident was affected by a few unfavourable factors: the water level was at its highest and it started to go down right after the stranding, the wind was from a direction that caused the vessel to move towards the Norrörarna islands, which were closest. In all other winds than those from the west and the south the vessel would have had more free water and the possibility to stop the vessel before stranding would have

[22] Response from the propeller manufacturer to the questions of the investigators.

been better. The vessel was lucky as the shore where the vessel stranded was gently sloping and not very stony. Due to the characteristics of the shore, the vessel did not suffer any leaks. In addition, the inclination of the shore was such that the vessel was stuck to the ground with all its length. The vessel did not move after grounding and therefore additional damage, for example the tearing of the bottom, was avoided.

The functionality of the push-button emergency steering of the propeller was not established during the investigation. This emergency steering has a direct effect on the hydraulics of the propeller pitch and it is independent of pressure air supply. According to the investigators, the preparations for a start must include the testing of this system. It is also unclear whether the functioning of the emergency control of the rudder was checked. The person on the bridge did not use them.

The watch on the bridge was about to end. The alertness of the chief mate may have lessened due to a nearly 6-hour watch at a time of day that is the worst from the perspective of human alertness, from 24–6. Before the watch, he had had a 6-hour rest after the previous watch. His alertness may have been deteriorated after the night shift and the continuous 6/6 rotation.

There was only one person on the bridge as was the normal routine but he left the bridge to go to his cabin apparently right after the start of the engine. When problems emerged, one person was not able to observe the surroundings adequately and at the same time try to affect the operation of the propeller. The presence of another person would have given a possibility to observe the surroundings and thus notice the start of the vessel[23]. In addition, he could have tried to concentrate on looking for other measures to manage the situation besides the turning of the lever of the propeller pitch.

[23] The chief mate called the Master to the scene but this took place too late as the former had been away and first tried to manage the situation alone.

# 3 CONCLUSIONS

When the engines of the vessel are running, the bridge must have constant manning, who may, where necessary, interfere in the course of events. In this case, the chief mate apparently left for a few minutes to go to his cabin, and therefore a possibility to interfere in the sudden departure of a vessel was missed. The slow moving of the vessel could not be noticed in the engine room.

The main engine was started after a long anchoring period without especially careful supervision and preliminary preparations and check. Thus the possibility to use the emergency systems had not been given the necessary attention and practice. In a departure situation after a long anchoring, it would have been reasonable to have a bigger manning on the bridge and in the engine room.

Due to startling, the best procedure was not found: the emergency steering of the propeller with push buttons to change the pitch in “full astern”-position in order to stop the vessel and after that stopping of the engine. In a sudden situation, a person aims at choosing the simplest and fastest solution based on experience. In this case, the action was directed at turning the steering lever of the propeller and no other alternatives were considered.

The pulling off attempt made by the vessel herself was made with haste without having time to check the damage and to examine the surroundings.

There was only one person on the bridge in accordance with the normal practice. One person is needed to monitor the surroundings and one to use and supervise the technical equipment.

# 4 RECOMMENDATIONS

When a vessel is anchored for a long time and the operations concentrate on receiving and processing fish, the routines of the bridge and the engine room differ from the routines required for departure. At the transition phase, certain checks may be carried out without the necessary thoroughness.

*The investigators recommend that the shipping company draw up a departure procedure to be followed after a period of a long anchoring including*

1. *The same checks and measures that have to be made and taken after leaving the dock including the testing of the emergency stops and emergency systems.*

2. *Instructions on an adequate manning on the bridge and in the engine room; at least two persons who check the measures taken by the other person.*

3. *Acknowledgements shall have to be made of all inspections and checks.*

Helsinki 3 March 2009

Pertti Siivonen

Olavi Huuska

**LIST OF SOURCES**

The following sources are stored at the Accident Investigation Board:

1. Documents in Russian obtained from the vessel and their translations in Finnish

2. Drawings of the propeller, the propeller shaft line and the rudder (obtained from the vessel and from the propeller manufacturer)

3. Exchange of e-mails with the propeller manufacturer

4. The video made by the divers, the VTS video, the video filmed from the Border Guard helicopter

5. Pictures of the vessel and her systems taken in different connections

6. Memos of the investigators in Finnish

7. Weather information from the Finnish Meteorological Institute, Vanö of 5 to 7 March 2008

# Appendices

| | |
|---|---|
| Appendix 1. | Damage Report of the Russian Shipping Register, Point 5 |
| Appendix 2. | Depth measurement protocol on the rocks on 6 March 2008 |
| Appendix 3. | The Master's drawing of the movements of the vessel from anchoring to the rocks |
| Appendix 4. | A drawing of the rudder |
| Appendix 5. | Stability calculation tables |
| Appendix 6. | BERG AB, Remote Control System, Pneumatic diagram P2-8399 |
| Appendix 7. | BERG AB, Arrangement of Oil Distributor, P1-5839-A |
| Appendix 8. | Finnish Maritime Administration's statement (in Finnish) |
| Appendix 9. | Comments from the Russian Maritime Register of Shipping (RMRS) |
| Appendix 10. | Berg Propulsion's comments |

## 5 ОПИСАНИЕ АВАРИЙНОГО СЛУЧАЯ И ЕГО ПОСЛЕДСТВИЙ*
## DESCRIPTION OF ACCIDENT AND ITS CONSEQUENCIES*

5.1 Описание аварийного случая
Description of accident

*1. The main engine was started up to prepare the ship for passage from p. Kasnas, Finland to p. Hanko, Finland having a ship's position staying on PS anchor (6 pcs. length were in water). For keeping the ship in immovable position with working main engine, the CPP propeller blades were fixed in zero position using control of wheel house. Having fixed zero position of CPP propeller blades (as it was indicated on control in a wheel house) the ship started to move forward with full speed staying at PS anchor. An attempt of ship's responsible person in wheel house to change the position of CPP propeller blades using the control in wheel house there was no changed regarding a actual position of the CPP propeller blades. The ship was grounded after passing about 800 with PS anchor and the following damages were found:*
*1. Rudder and steering gear were damaged - heel brace was bend to up direction and rudder stock was moved up about 80 mm with damaging of the hydraulic steering engine (the cap of upper steady bearing was tore away from base in the steering room, hydraulic steering gear was damaged due to moving up of rudder stock to 80 mm), the rudder plate was bend, heel pintle was damaged.*
*2. Rudder and steering gear were found in unfit condition.*
*3. The bottom plating is dented along the ship with split in way of about ( dimension of split is not exactly defined) frs. 43-62 (diesel tank No.5).*
*4. Diesel fuel tank No.5 is filled up with sea water up to sounding pipe and it was not found that the sea water is coming inside the ship's spaces.*
*5. The bottom plating is found in unfit condition.*
*6. The ship's stability is corresponded with the Stability Information Booklet No. 79/2095K-901-МИК.003.*

5.2 Последствия аварийного случая:
Consequences of accident:

5.2.1 Полная гибель судна
Total loss of ship [ ]

5.2.2 Потеря мореходных качеств судна
Loss of seaworthiness of the ship [X]

5.2.3 Гибель людей
Loss of lives [ ]
Количество жертв
Number of victims _____

5.2.4 Серьезные ранения
Serious injuries [ ]
Количество пострадавших
Number of injured _____

5.2.5 Серьёзное загрязнение окружающей среды**:
Serious pollution of marine environment**: [ ]

Груз/топливо _____ количество _____
Cargo/fuel (наименование / name) quantity (тонн / tons)

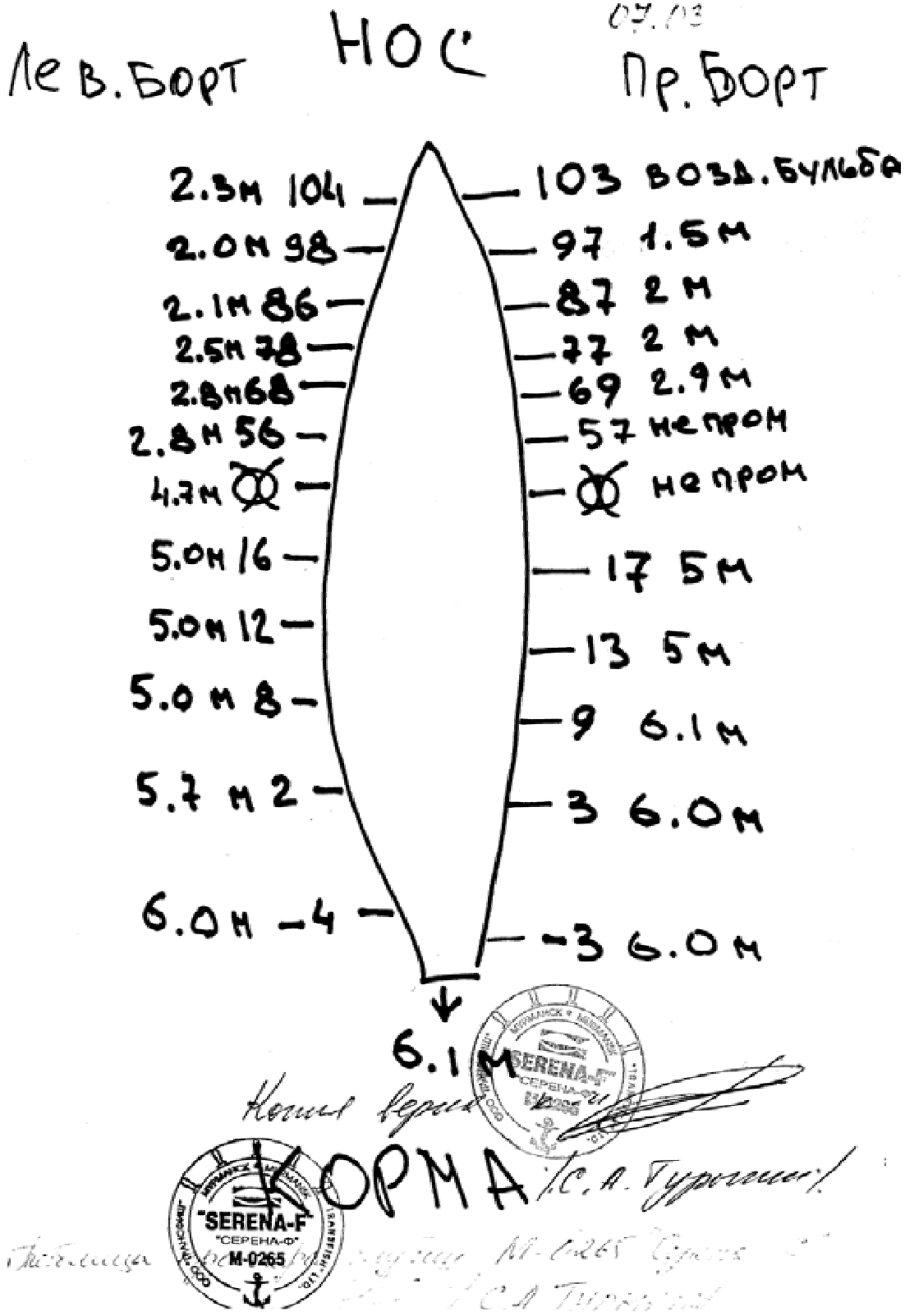
5.2.6 Загрязнение окружающей среды
Pollution of environment [ ]

5.2.7 Потеря эксплуатационных характеристик
Loss of performance characteristics [X]

5.2.8 Другие последствия
Other consequences

*Nil*

**Сброс вредных веществ в количестве 50 тонн и более.
Discharge of noxious substances with quantity of 50 tons and more.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Лев. Борт
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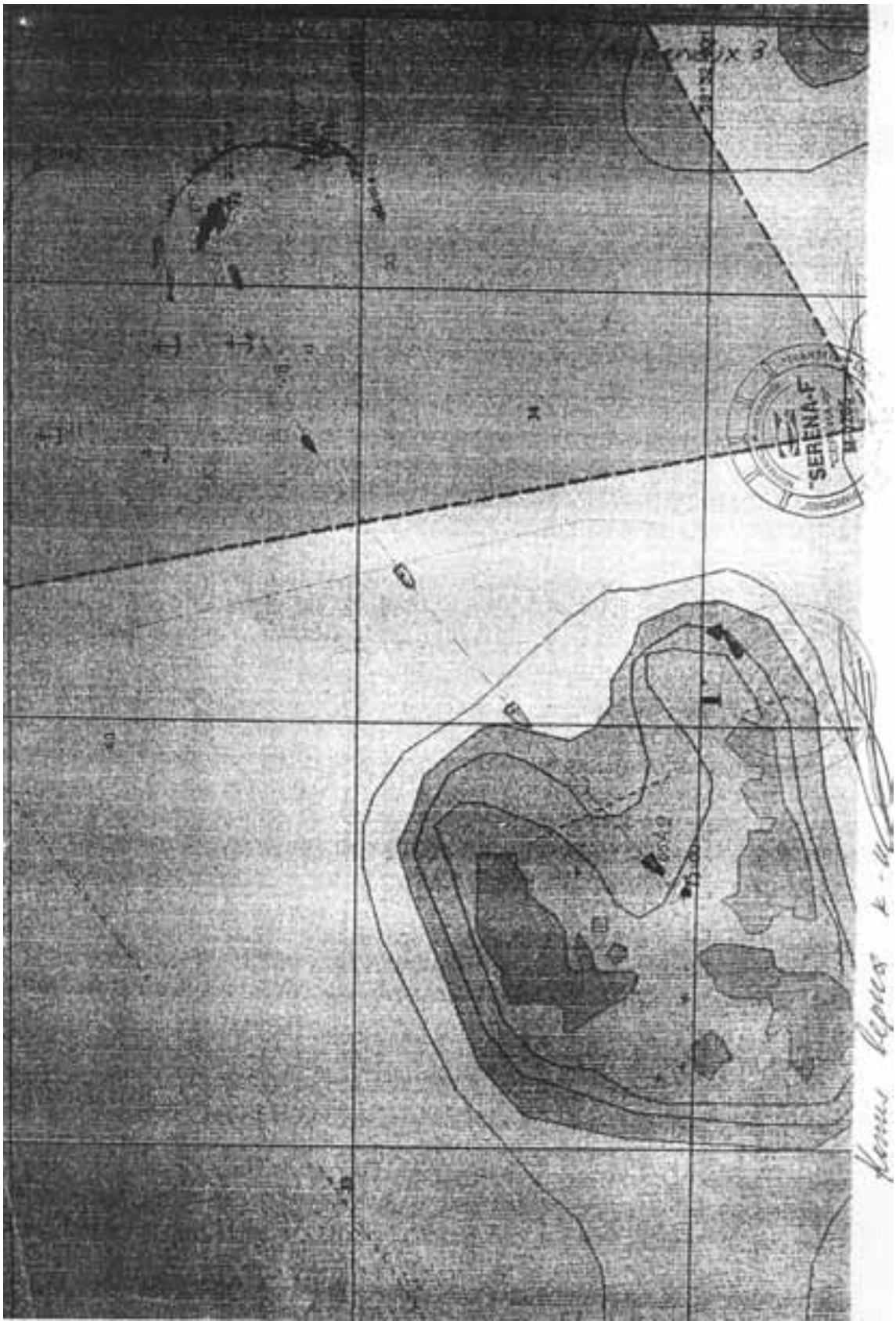
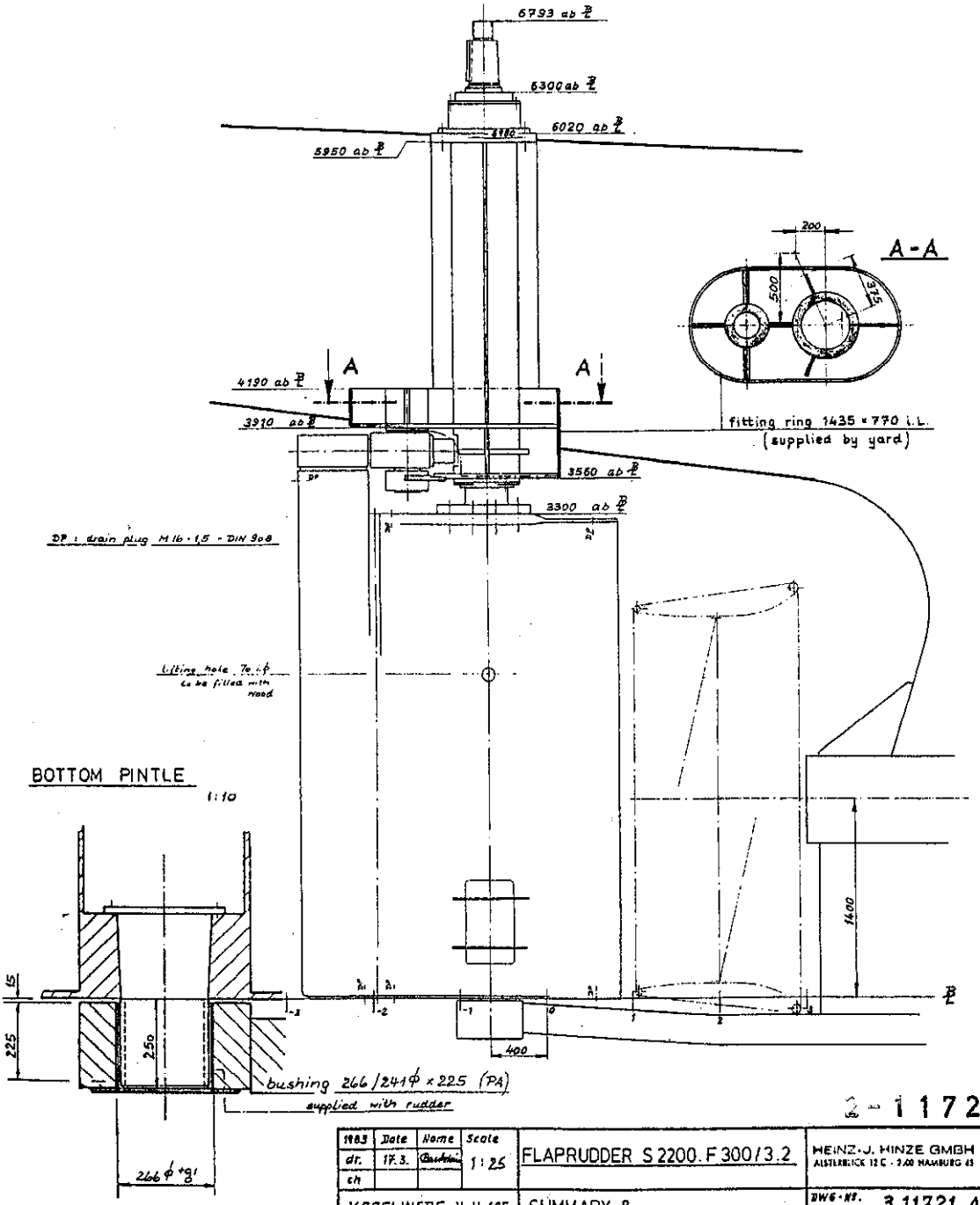
2.0м 98
2.1м 86
2.5м 78
2.8м 68
2.8м 56
4.7м
5.0м 16
5.0м 12
5.0м 8
5.7м 2
6.0м -4
103 возд. бульба
97 1.5м
87 2м
77 2м
69 2.9м
57 непром
непром
17 5м
13 5м
9 6.1м
3 6.0м
-3 6.0м
6.1м
SERENA-F
"СЕРЕНА-Ф"
M-0265
КОРМА

**Appendix 3**






2 - 1172

| 1983 | Date | Name | Scale | FLAPRUDDER S 2200. F 300/3.2 | HEINZ-J. HINZE GMBH ALSTERBLICK 12 C · 2000 HAMBURG 63 |
|---|---|---|---|---|---|
| dr. | 17.3. | Gaubatz | 1:25 | | |
| ch | | | | | |
| YSSELWERF Hull 195 M.S. „Boejer" | | | | SUMMARY & ARRANGEMENT DWG. | DWG-NR. 3.11721 A |

**Appendix 5**

# РАСЧЕТ ОСТОЙЧИВОСТИ РТМ "СЕРЕНА-Ф"

12.00 08.03.2008

| СТАТЬИ НАГРУЗКИ | Вес max,т | Масса,т | ПЛЕЧИ,м | | Моменты,тм | |
|---|---|---|---|---|---|---|
| | | | Xg | Zg | Mx | Mz |
| Цистерна ДТ №2, пр/б | | | | | 0,00 | 0,00 |
| Цистерна ДТ №2,л/б | | | | | 0,00 | 0,00 |
| Цистерна ДТ №3,пр/т | | 22,00 | 18,20 | 0,54 | 400,40 | 11,88 |
| Цистерна ДТ №3,л/б | | 22,00 | 18,20 | 0,54 | 400,40 | 11,88 |
| Цистерна ДТ №4,пр/б | | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Цистерна ДТ№4,л/б | | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Цистерна ДТ №5,дл | | 80,64 | 1,91 | 0,62 | 154,02 | 50,00 |
| Цистерна ДТ №6,дл | | 15,20 | -11,27 | 0,60 | -171,30 | 9,12 |
| Цистерна ДТ №7,пр/б | | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Цистерна ДТ №7,л/б | | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Цистерна ДТ №13,л/б расх. | | 2,00 | -25,61 | 4,40 | -51,22 | 8,80 |
| Цистерна ДТ №13,пр б отст. | | 10,00 | -25,61 | 4,40 | -256,10 | 44,00 |
| Цистерна ДТ №12,л/б котельн. | | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Цистерна СМ пр/б осн.зап. | | | | | 0,00 | 0,00 |
| Цистерна СМ пр/б осн.зап. | | | | | 0,00 | 0,00 |
| Цистерна ГМ пр/б | | | | | 0,00 | 0,00 |
| Цистерна цирк.масла №11,дл | | | | | 0,00 | 0,00 |
| Цистерна ПВ №14,пр/б | | 30,00 | -30,77 | 4,50 | -923,10 | 135,00 |
| Цистерна ПВ №14 л/б | | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Цистерна №8 шламовая,л/б | | 8,00 | -11,50 | 1,00 | -92,00 | 8,00 |
| Цистерна №10 сточная,пр/б | | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Цистерна №10 льяльная,л/б | | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Форпик №1 | | 25,58 | 31,68 | 4,04 | 810,37 | 103,34 |
| Ахтерпик №15 | | 35,72 | -35,35 | 5,09 | -1262,70 | 181,81 |
| Контейнер кормовой | | 5,00 | -12,00 | 10,50 | -60,00 | 52,50 |
| Судовое снабжение | | 5,00 | -10,14 | 5,30 | -50,70 | 26,50 |
| Промысловое снабжение | | 30,00 | -34,43 | 9,30 | -1032,90 | 279,00 |
| Трюм №1 | | 90,00 | 18,65 | 1,85 | 1678,50 | 166,50 |
| Твиндек №1 | | 10,00 | 15,32 | 4,80 | 153,20 | 48,00 |
| Трюм №2 | | 90,00 | 1,20 | 1,45 | 108,00 | 130,50 |
| Твиндек №2 | | 10,00 | 6,42 | 4,85 | 64,20 | 48,50 |
| Контейнер-токарн.мастерская | | 5,00 | 8,80 | 39,00 | 44,00 | 195,00 |
| Провизия | | 6,00 | -11,18 | 9,00 | -67,08 | 54,00 |
| Комплект с багажом | | 4,00 | -9,67 | 10,40 | -38,68 | 41,60 |
| Судно порожнем | | 1491,29 | -6,97 | 6,00 | -10394,29 | 6947,74 |
| Водоизмещение | | 1997,43 | -5,30 | 5,28 | -10586,98 | 10553,67 |
| Поправка ΔZg | | | | 0,07 | | |
| Исправленная ΔZg | | | | 5,35 | | |

| | |
|---|---|
| Осадка носом, м | 1,7 |
| Осадка кормой м | 5,45 |
| Осадка на миделе м | |

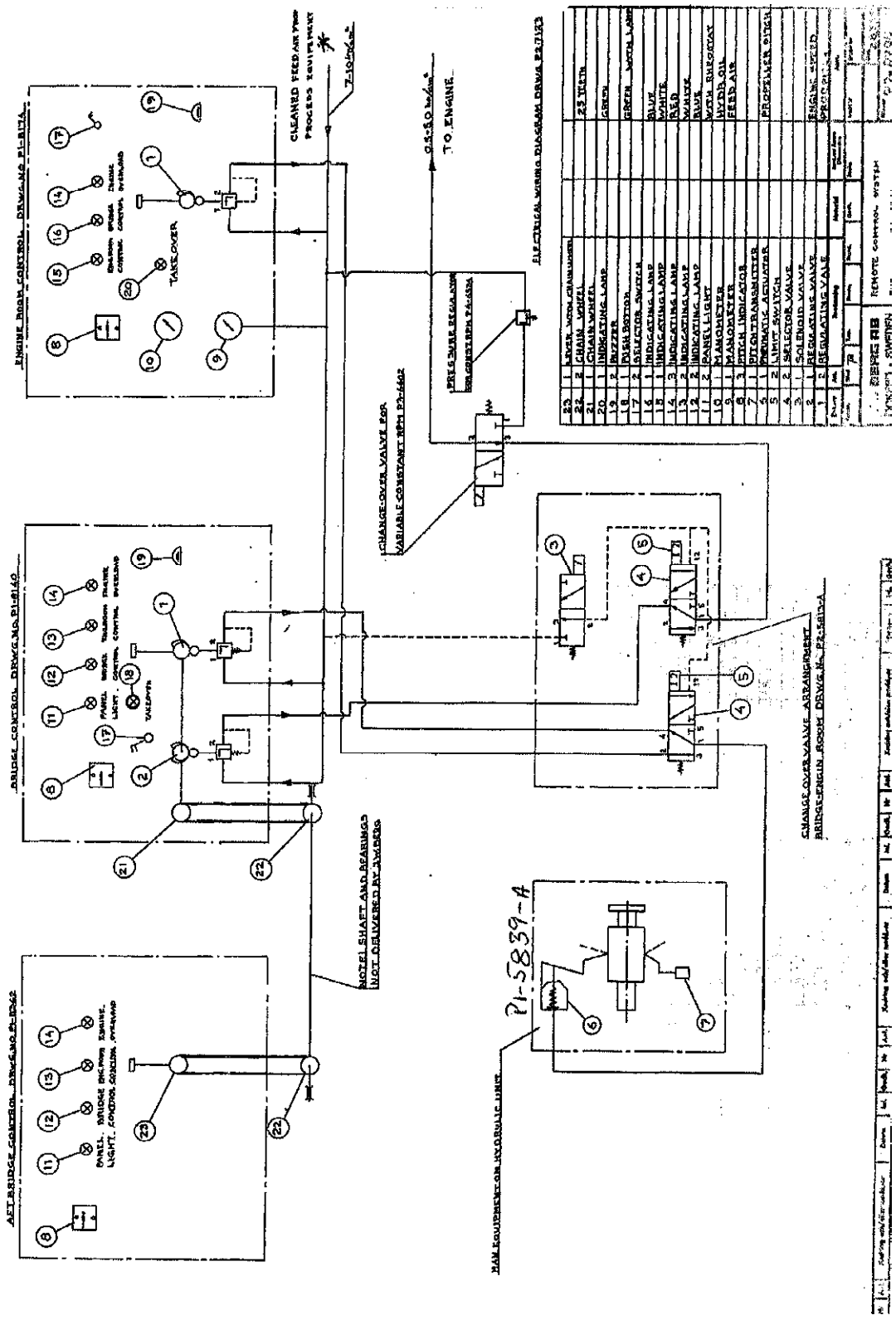
Zрас. 5,35 < = Zкр.5,48

h=6,15-5,28=0,87м.
Коэф.погоды 1,6

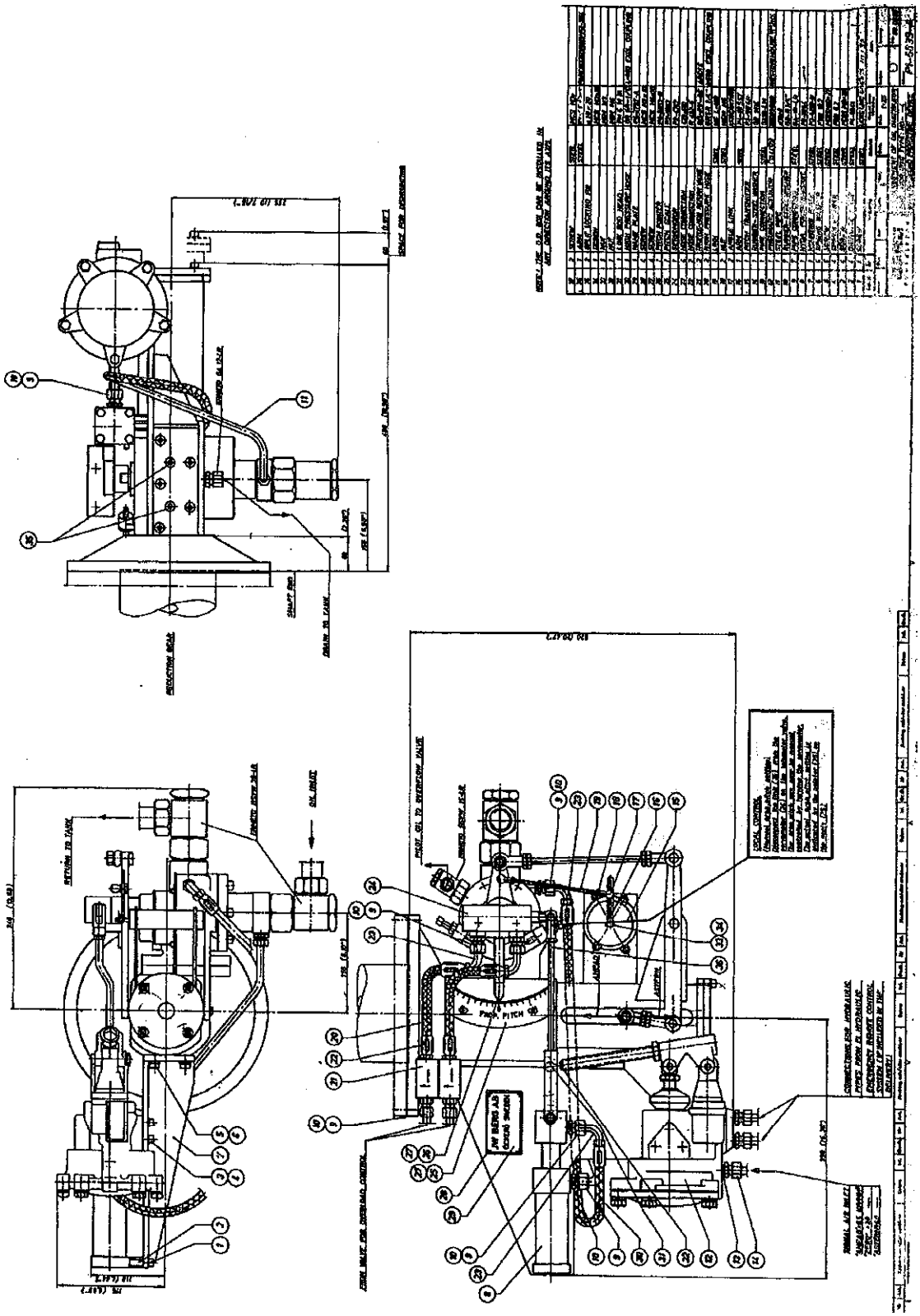
2-й пом .к-на Ложкин П.В.

Капитан Турыгин С.А.

**Appendix 6**


ENGINE ROOM CONTROL DRAWING P1-8174
BRIDGE CONTROL DRWG.No P1-8140
AFT BRIDGE CONTROL DRWG.No P1-8142
CLEANED FEED AIR FROM PROCESS EQUIPMENT
TO ENGINE
CHARGE-OVER VALVE FOR VARIABLE CONSTANT RPM P2-4402
PRESSURE REGULATOR REGISTERED P2-4334
ELECTRICAL WIRING DIAGRAM DRWG. P2-7123
MOTEL SHAFT AND BEARINGS NOT DELIVERED BY JWMDG
MAIN EQUIPMENT ON HYDRAULIC UNIT
P1-5839-4
CHANGE-OVER VALVE ARRANGEMENT
BRIDGE-ENGINE ROOM DRWG.No. P2-5810A
ZEISE AB
REMOTE CONTROL SYSTEM
TAKE-OVER

**Appendix 7**



Merenkulkulaitos

Dnro 640/331/2008

SAAPUNUT

11 -02- 2009

57/5M

Meriturvallisuus

9.2.2009

Onnettomuustutkintakeskus
Olavi Huuska
Sörnäisten rantatie 33 C
00580 Helsinki

Lausuntopyyntönne 19.1.2009, 18/5M

**KALASTUSTUKIALUS MS SERENA F,**
**RANTAANAJO HIITTISTEN POHJOISPUOLELLA 6.3.2008**

Onnettomuustutkintakeskus on lähettänyt lausuntoa varten luonnoksen tutkintaselostuksesta C 2/2008M. Meriturvallisuus-toiminnon merenkulun tarkastusyksikkö on tutustunut luonnokseen ja toteaa, että tutkinta on suoritettu huolellisesti ja johtopäätökset ovat johdonmukaisia.

Merenkulkulaitoksen Meriturvallisuus-toiminnolla ei ole asiaan lausuttavaa.

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

Yhteistyöterveisin,

Meriturvallisuusjohtaja — Tuomas Routa

Merenkulun tarkastusyksikön päällikkö — Tapio Gardemeister

MR/AV

**FROM:** **RMRS, Representation in Finland**

**TO:** **ACCIDENT INVESTIGATION BOARD**

**ATT:** **Mr.Pertti Siivonen, Marine Accident Investigator**

**SUBJECT:** **M/v "SERENA F", RS 794409**

**OUR REF:** **260-002-15.2-541 dd.20.02.2009**

**YOUR REF:** **18/5M dd.19.01.2009**

**CC:** **RS Head Office, Victor Khobotov, Head of Survey Division**

Dear Mr. Pertti Siivonen,

We would like to thank you for your letter 18/5M dd.19.01.2009 regarding the final draft of investigation C2/2008M Fish Processing Vessel M/S SERENA F, stranding north of Hiittinen on 6 March 2008.

Please be advised that your information was considered and duly noted by RS Representation in Finland and forwarded to RS Head Office.

Sincerely yours,

Vladimir Kochetov
Managing Director

**From:** Jan-Evert Benjaminsson - Berg Propulsion
**To:** 'Olavi Huuska'
**Cc:** Staffan Olsson (Dubai) - Berg Propulsion
**Sent:** Thursday, February 05, 2009 9:38 AM
**Subject:** Stranding of "SERENA F" Request for comments 18/5. Your ref. C2/2008M.

Dear Sirs,

I have looked into the report and can agree that the described reason to the malfunctioning
pitch control system are most possible according to what is written and described in the report.

**Rgds J-E Benjaminsson**
Phone: +46 31 97 65 53
Mobile: +46 707 988 889
Email: jan-evert@bergpropulsion.com