

# REPORT

Sjø 2012/09



## REPORT ON INVESTIGATION INTO MARINE ACCIDENT M/V GODAFOSS V2PM7 GROUNDING IN LØPEREN, HVALER ON 17 FEBRUARY 2011

*This report has been translated into English and published by the Accident Investigation Board Norway (AIBN) to facilitate access by international readers. As accurate as the translation might be, the original Norwegian text takes precedence as the report of reference.*

*AIBN has compiled this report for the sole purpose of improving safety at sea. The object of a safety investigation is to clarify the sequence of events and root cause factors, study matters of significance for the prevention of maritime accidents and improvement of safety at sea, and to publish a report with eventually safety recommendations. The Board shall not apportion any blame or liability. Use of this report for any other purpose than for improvements of the safety at sea should be avoided.*

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## NOTIFICATION OF THE ACCIDENT

On Thursday 17 February at approximately 20:30, the accident investigator on duty received notification that the container vessel *Godafoss* had run aground and was leaking oil to sea outside Hvaler. The vessel was outbound from the Port of Borg in Fredrikstad. The process of gathering further information about the grounding was initiated immediately, and a request was submitted for the VDR data to be secured.<sup>1</sup> The vessel's flag state of Antigua & Barbuda was notified. At midnight, the Norwegian Coastal Administration (NCA) classified it as a national oil-spill response incident. On Friday morning the AIBN arrived at the scene of the accident and began gathering information about the grounding. It was decided that the safety investigation should be conducted in collaboration with the flag state and the Icelandic Marine Accident Investigation Board (IMAIB). The AIBN would head the investigation work.

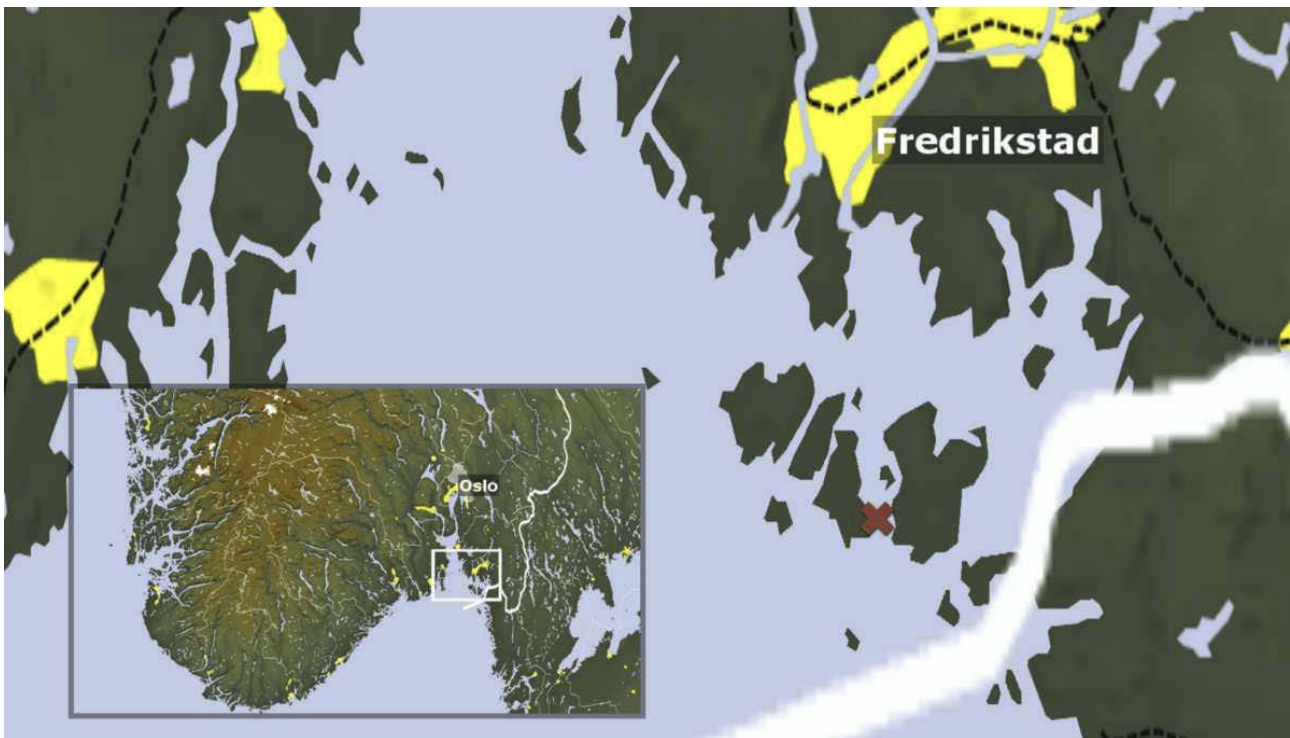


Figure 1: The container vessel *Godafoss* grounded on 17 February 2011 at Kvernskjærgrunnen in Løperen, Hvaler municipality.

## SUMMARY

On Thursday 17 February 2011 at 19:52, the container vessel *Godafoss* ran aground at Kvernskjærgrunnen in Løperen, between the islands of Asmaløy and Kirkøy in Hvaler municipality. Weather conditions in the area were good. The accident resulted in acute oil pollution in the Oslofjord and along the coast of Southern Norway. The waters in which the vessel ran aground had been defined as a national park in 2009, in which most of the protected area is seabed and seafloor.

The investigation points out that there was inadequate teamwork on the bridge in terms of planning and conducting the voyage. There was insufficient communication and coordination between the

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<sup>1</sup> VDR – Voyage data recorder

vessel's bridge team and the pilot before and during the voyage. In particular, this applies to the point at which the pilot disembarked and the master took over the navigation. The deck officer on watch accompanied the pilot down to the pilot ladder while the vessel was still in Løperen. This left the master alone on the bridge. This was in darkness and in narrow navigational waters, when navigation required a great deal of attention. *Godafoss* was loaded in such a way that visibility from the bridge did not satisfy regulatory requirements. The master incorrectly understood how the voyage was to continue through and out of Løperen. The master's decisions and interpretation of the surroundings remained uncorrected and led to the grounding of *Godafoss* at Kvern skjær beacon at 19:52 at a speed of 14 knots, resulting in acute oil pollution.

The investigation examines relevant parts of the shipping company's safety management system. This mainly concerns the use and allocation of crew resources on board, and the manner in which navigation is planned and conducted.

The investigation has discovered that a majority of pilots sometimes disembarked before reaching the pilot boarding ground at Vidgrunnen. This weakened an important barrier against undesirable incidents in the compulsory pilotage area. The procedure regarded as applicable at the time of the accident could be understood to mean that this was acceptable practice. When this procedure was drawn up, inadequate barriers were established to prevent harm to human life, vessels or the environment. The fact that the fairway passed through a newly established national park seems not to have been considered while the procedure was being prepared, in addition to which, better use could have been made of the NCA's own nonconformity reports.

The AIBN proposes two safety recommendations in this report.

It proposes **one** safety recommendation to the shipping company Eimskip, and expects it to make improvements to its own safety management system.

It proposes **one** safety recommendation to the NCA in the report. The latter addresses the way in which procedures are prepared and also the fact that it is expected that the same procedures will be approved and complied with by everyone in the organisation.



Figure 2: *Godafoss* aground at Kvern skjær beacon on 18 February 2011. Photo: Fredrikstad Blad

## ENGLISH REPORT

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### 1. FACTS

#### 1.1 Details of the vessel and the accident

##### *Ship's details*

Name of vessel	: MV Godafoss
Call sign	: V2PM7
IMO number	: 9086796
Owner of the vessel	: Gfoss Line Ltd. St. Johns, Antigua
Shipping company	: Eimskipafélag Íslands ehf., Reykjavik, Iceland
Responsible for ISM	: Eimskipafélag Íslands ehf., Reykjavik, Iceland
Home port	: St. Johns
Flag state	: Antigua & Barbuda
Type	: Container vessel
Year of build	: 1995
Construction material	: Steel
Length overall	: 165.60 m
Gross tonnage	: 14,664
Deadweight	: 17,042 tonnes
TEU	: 1,457 (twenty-foot equivalent unit)
Engine power	: 1 diesel engine of the Kawasaki MAN B&W 7S60MC type with 20,128 hp (14,785 kW)
Service speed	: 19.5 knots
Other relevant information	: KaMeWa controllable pitch propeller. Bow and stern thrusters of 1,200 hp (900 kW) each.

##### *Details of the accident*

Time and date	: At 19:52 (local time) on 17 February 2011
Accident location	: Kvernskjærgrunnen in Løperen, Hvaler municipality
Persons on board	: 12 crew members and one passenger. All were Icelandic citizens
Injured persons/fatalities	: No
Damage	: Hull damage to the vessel and acute pollution as a result of heavy fuel oil into the sea

## 1.2 The sequence of events

The sequence of events from departure in Reykjavik until arrival at the quay at Øra terminal in the Port of Borg in Fredrikstad was documented in the vessel's log book and confirmed in interviews with the crew. Time, course, speed and verbal communication on the bridge after departure from the Øra terminal are documented by data from the vessel's own VDR. Time, course and speed have been compared with and confirmed by the AIS<sup>2</sup> tracking data that was saved automatically by Horten Vessel Traffic Service (VTS<sup>3</sup>) from the time of the vessel's departure on 17 February up to the time when the vessel ran aground at Kvernskjærgrunnen that same evening.

On 10 February 2011, the vessel left Reykjavik for a new voyage on the scheduled route between Reydarfjordur, Torshavn, Rotterdam, Fredrikstad, Hålsingborg, Århus, Torshavn and back to Reykjavik.

On 11 February, while en route from Reydarfjordur on the east coast of Iceland, the vessel encountered severe weather, resulting in the support for the boom of the forward deck crane on the port side being knocked overboard. The crane boom rotated uncontrolledly with the vessel's movements, because it was then only attached by the wire hook to one fixed point on the deck. In order to gain control of the situation, the vessel changed course so that it had the sea and wind astern. The accident with the crane and the necessary reduction in speed to 4-5 knots while the severe weather passed meant that the vessel was approximately 24 hours delayed by the time it reached its first port. The vessel was unable to make up the delay and it therefore arrived in all ports 24 hours behind schedule.

On arrival in Reydarfjordur, the crane jib was secured by placing it diagonally across to the starboard side, aft of the forward lantern mast. Support for the crane jib was arranged by placing a 'half' container on the foremost third tier of containers.

The vessel continued from Reydarfjordur to the Faroe Islands and Rotterdam. In Rotterdam it took on board 500 tonnes of heavy fuel oil into bottom tanks numbers 5 and 7 on 16 February. It was later estimated that the vessel had about 700 tonnes of heavy fuel oil and just under 100 tonnes of marine diesel on board when it ran aground.

*Godafoss* embarked the pilot at the pilot boarding ground, bound for Ørakaia in Fredrikstad on 17 February at 09:02, and arrived at Øra container terminal in the Port of Borg at 10:05.

Problems with offloading a stone crusher and its conveyor belt led to a delayed departure from Fredrikstad. The stone crusher should originally have been offloaded in Hålsingborg, where it would have been necessary to hire a crane to get it ashore. It was decided to offload it in Fredrikstad, where two cranes were already available, and overland transport to Sweden could be arranged.

*Godafoss* was to call at Hålsingborg at 07:00 on the following day. The pilot came on board at Øra at approximately 17:15, in time for the original planned departure time of 17:30, but the stone crusher was not fully offloaded until 18:25.

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<sup>2</sup> Automatic Identification signal

<sup>3</sup> Horten Vessel Traffic Service

When the vessel left Fredrikstad at 18:44, its forward and aft perpendicular draughts were calculated at 5.71 and 7.22 m, respectively. The cargo consisted of 439 containers of mixed cargo. As a consequence of the vessel's draught with an aft trim of 1.51 m, the positioning of the deck cargo and the boom of the forward crane lying diagonally across the forward containers, the visibility line from the bridge was later calculated to have lain a maximum of 650 m forward of the bow.<sup>4</sup>

At 18:30, the chief mate took over the bridge watch from the second officer. The engine room was manned. One of the able seamen was on sea watch for four hours from 16:00-20:00.

The pilot on board *Godafoss* called the VTS control centre at 18:34 and notified that the vessel was ready for departure. The traffic controller on duty at Horten VTS did not observe any traffic in Glomma or Løperen, and gave the necessary outbound clearance.

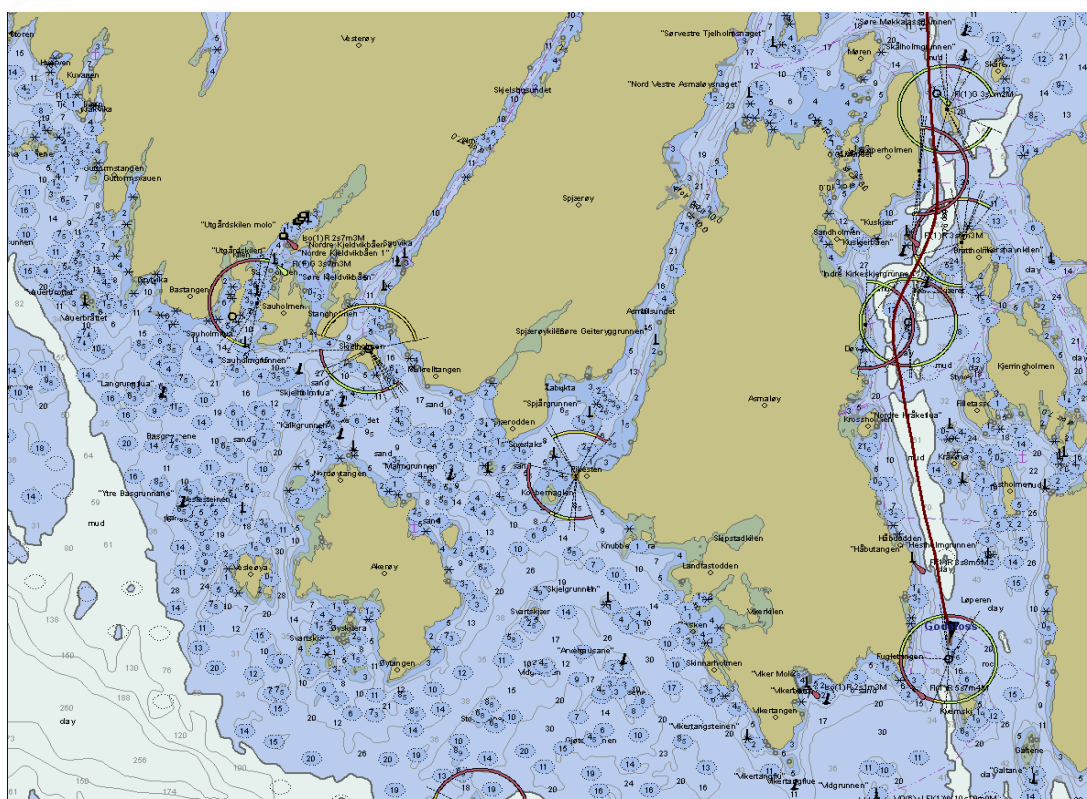


Figure 3: The last part of *Godafoss*' voyage in Løperen on 17 February 2011 (shown by the red line).

At 18:44 *Godafoss* left the quay. The master and pilot were on the bridge during departure. The master stood at the starboard wing position on the bridge and manoeuvred the vessel away from the quay. The able seaman on watch and the chief mate released the forward mooring lines, while two other members of the deck crew released the aft mooring lines.

<sup>4</sup> The visibility line means the distance from the bridge to the point of intersection with the surface of the sea. The AIBN has carried out calculations to determine the visibility line from the bridge; see Annex B: Calculation of visibility line from bridge.



The vessel was lying starboard side to the quay and went a short distance up the river in order to turn 180 degrees off Fuglevikstrand, by turning to starboard. There was relatively light current in the river that evening. The master now stood at the centre position on the bridge, and he and the pilot jointly carried out the turning manoeuvre. The crew members who had taken in the mooring lines had remained forward and aft in order to check and report on distances during the turn.

At 19:05 the vessel had been turned around and was heading out of the river. The master remained standing in the centre position beside the helm and engine controls, and steered the vessel out manually. He increased the vessel's speed to 7.5 knots. The vessel was being navigated visually<sup>5</sup> and with the aid of starboard radar. It has been reported that the starboard radar (S-band, 10 cm) had been set to display a North-up radar image. The port radar (X-band, 3 cm) was still in standby mode.

The chief mate returned to the bridge, while the able seaman on watch remained on deck to carry out routine duties.

At 19:07 the pilot asked the master if it was alright for him to leave/disembark early. This was accepted by the master, although no completely specific location was agreed.

At 19:08 when *Godafoss* on its way out passed the quay at which it had been docked, the pilot telephoned the Skipstadsand pilot station and notified them that the vessel had been delayed. At the same time, he agreed to disembark across from Skipstadsand. He then telephoned his family and told them when he expected to be home that evening.

At 19:15, immediately after *Godafoss* passed the ranges<sup>6</sup> at Alshus, the master increased speed.

At 19:16 when *Godafoss* was outside the series of buoys (across from Femdal and Hestholmen, 0.5 nmi north of Flyndregrunnen beacon), the pilot proposed switching from manual steering to autopilot. This was accepted by the master.

The pilot then took over the navigation and manoeuvring of *Godafoss*. That means that the pilot stood on the starboard side of the wheelhouse's centre position, beside the helm and engine controls. It was the pilot that made changes to the course that the autopilot should maintain and that made adjustments to the speed (by changing the pitch of the propeller blades).<sup>7</sup> According to the pilot, the master was standing opposite him on the port side most of the time, paying attention to the progress of the voyage. The master has since stated that he felt that there had been less communication between himself and the pilot during the voyage than he had been accustomed to. The chief mate was busy with paperwork that was due and with checking emails via the computer located beside the chart table. No positions were plotted on the nautical chart or noted in the deck log book on the outbound voyage. The able seaman on watch remained on the main deck, also known as A deck. This allocation of duties was retained until the pilot left the bridge.

At 19:19 the master pointed to the chart plotter and asked the pilot where he would disembark. The pilot explained that he planned to disembark somewhere near Skipstadsand

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<sup>5</sup> Visual navigation: navigation based on navigator's sight and judgement of distance.

<sup>6</sup> Pairs of beacons and/or daymarks that define a line down the centre of a channel (fairway marks). Source: NCA

<sup>7</sup> Main engine running at constant rpm.

on the vessel's starboard side. The chief mate notified the able seaman on watch about this by hand-held UHF radio.

At 19:20, just after *Godafoss* passed Flyndregrunnen, the vessel had a speed of 15-15.5 knots, which was maintained until it had passed Løperungen.

At 19:27 the pilot telephoned the pilot station via mobile telephone and informed them that *Godafoss* would very soon be at Løperungen. He confirmed that he would disembark on the inside of Løperungen, and would do so on the starboard side.

At 19:28 the chief mate asked whether there was a north-easterly wind. The pilot confirmed that there was.

At 19:37, while *Godafoss* was due east of Løperhuet beacon, the pilot reduced the speed somewhat, and the container vessel started to make a starboard turn.

At 19:38 the pilot summoned the pilot boat and informed them that *Godafoss* was out of Løperhølet. The pilot boat confirms that they had understood what was said. Immediately after that, the pilot boat left Skipstadsand pilot station.

At 19:41 the master changed the port radar (X-band, 3 cm) from standby to active. After this, the port radar image displayed North-up, True Motion, distance 1.5 nmi and Off-centre. The sea clutter function was activated. At about this time, the pilot puts his jacket on, to signal that he is about to leave the bridge. *Godafoss* was now between the beacons (sector lights) of Lubbegrunn and Dødvikpynten and in the white sector of Kvernskjærgrunnen beacon. The distance to Kvernskjærgrunnen was approximately 1.5 nmi. The speed was around 10 knots.

At 19:42, just after *Godafoss* had passed the beacons (sector lights) at Lubbegrunn and Dødvikpynten, the speed was still coming down. The chief mate asked whether the pilot would disembark in this area, and the master confirmed that he would.

Just after that, the pilot asked the master if he found everything in order. The master confirmed that he did. The pilot then called the pilot boat via VHF, stating that he was on his way down in order to disembark. The pilot boat was already on its way to *Godafoss*.

The pilot called up Horten VTS, stating that he would disembark in a few minutes and that *Godafoss* would continue outbound to the sea. The traffic controller acknowledged receipt of the information from the pilot and went on to report that the *Color Viking* passenger ferry was en route from Strømstad to Sandefjord.

The pilot passed on to the master the information that the *Color Viking* was coming from Strømstad and was heading in a westerly direction.

At 19:43 the pilot took his leave and left the bridge together with the chief mate. *Godafoss* was then abeam off Skipstadsand on a steady course of 173° doing 8 knots. The vessel was heading just east of Kvernskjærgrunnen beacon, sailing near the boundary between the white and red sectors. The distance to Kvernskjærgrunnen was 1.4 nmi; see Figures 3 and 4.

The Kvernskjærgrunnen sector beacon has indirect lighting of the concrete column on which the beacon is mounted. There is a green stripe painted around the column, which designates that it may also be used as a lateral daymark on the eastern side of the fairway. Apart from

Kvernskjærgrunnen beacon, Håbutangen and Fugletangskjær were the closest beacons at that time. The latter two both have red flashing lights, marking the fairway's western lateral side boundary.

When the pilot left the wheelhouse, the master took over all tasks relating to the navigation and manoeuvring of the vessel. He was now alone on the bridge. It is understood that from this point on, navigation was based primarily on visual observations. It has been stated in interviews that there were belts of firm ice alongside the land on the starboard side near Håbu, as well as floes of drift ice moving out of Løperen with the current.

At 19:45 the pilot and chief mate arrived at the pilot ladder on the vessel's starboard side. This had been made ready by the able seaman on watch, who had also ensured that the deck was illuminated. The pilot boat arrived alongside *Godafoss*. Just before the pilot entered the pilot boat, he leaned over the rail and noticed that *Godafoss* was in the white sector of Kvernskjærgrunnen.

At 19:46 the pilot had disembarked. At this time, *Godafoss* was 0.6 nmi north of Håbutangen on a course of 172° with a speed of 7.2 knots. The vessel's course was east of Kvernskjærgrunnen beacon and the vessel was near the boundary between the beacon's white and red sectors. The distance to Kvernskjærgrunnen itself was 1 nmi.

The chief mate began to return to the bridge, while the seaman on watch retrieved the pilot ladder before going to the cloakroom on A deck to wait for the change of watch at 20:00.

At 19:47, just after the pilot boat turned around and headed back to Skipstadsand,

The engine telegraph on the bridge was changed to a setting that would give the vessel a final speed of around 14 knots.

At 19:48 *Godafoss* made a slight course adjustment to port. At that time, its speed had increased to 9 knots and the distance to Kvernskjærgrunnen was 0.75 nmi (1,389 metres). In this area, it should be possible to observe red flashes to starboard from the Håbutangen and Fugletangskjær lateral lights. The vessel was still on the boundary between the white and red sectors of Kvernskjærgrunnen beacon. (Figure 4:)

Håbutangen has a red flash every three seconds (F I R 3s), Fugletangskjær flashes red every five seconds (F I R 5s) and Kvernskjærgrunnen beacon is occulting every six seconds. (Occ 6s)

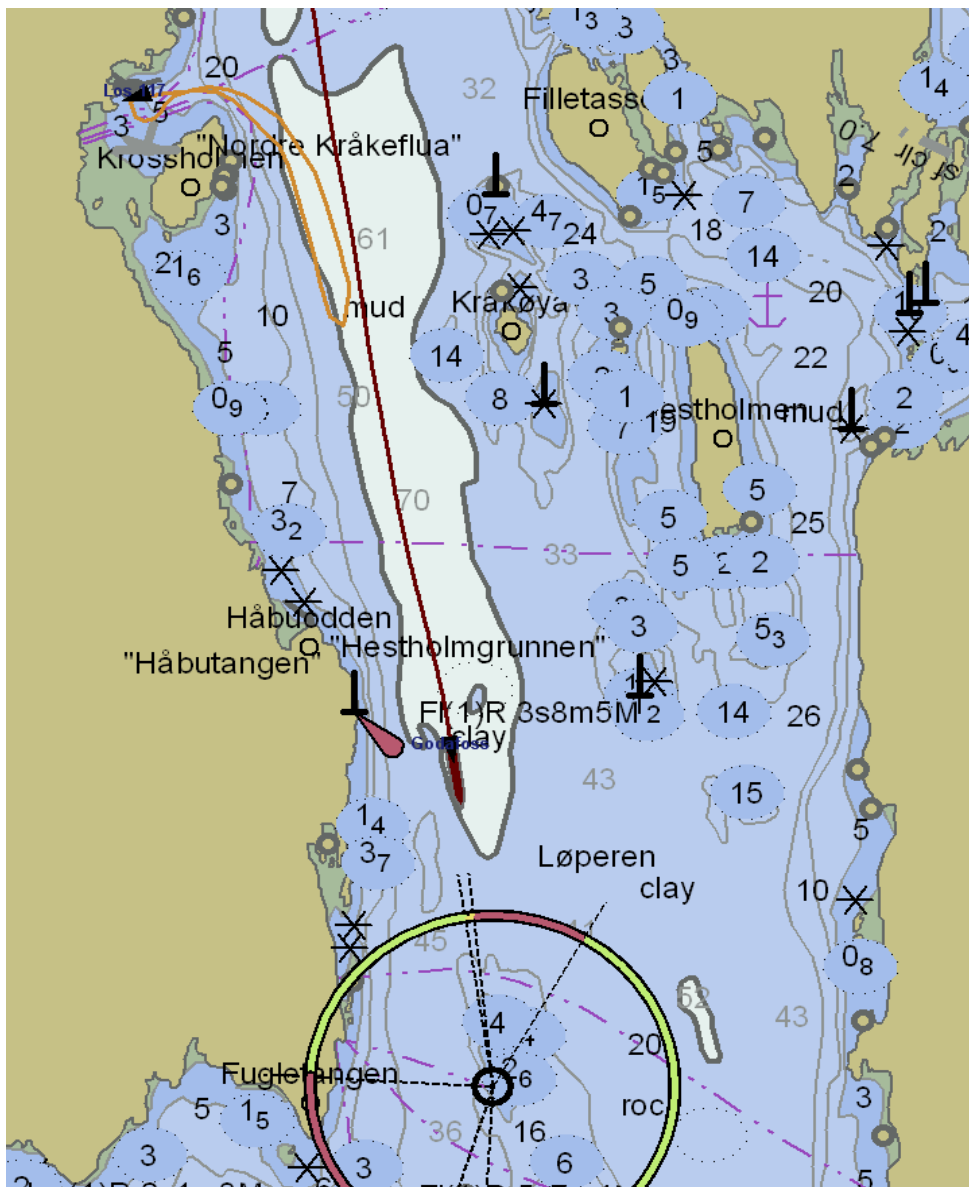


Figure 4: The voyages of Godafoss and the pilot boat Los 117. The nautical chart shows the position of the vessels at 19:50 (local time). This was just after Godafoss has passed due east of Håbu. The red line indicates the voyage of Godafoss. The yellow line indicates the voyage of Los 117. The chart shows the sector lights from the white, red and green sectors of Kvernsholmen beacon.

At 19:49 *Godafoss* was maintaining a course of  $168^{\circ}$  and still heading east of Kvernsholmen beacon. The distance to Kvernsholmen was then 0.6 nmi (1,111 m). *Godafoss* began a slight turn to starboard 13 seconds later.

At 19:50 *Godafoss* was across from Håbutangen and its red flash every three seconds. The vessel held a course of  $173^{\circ}$  and its speed had increased to 13 knots. *Godafoss* was still heading just east of Kvernsholmen beacon, along the boundary between the white and red sectors. The vessel was probably now in the red sector. The distance to Kvernsholmen was 0.4 nmi (741 m). At 19:50:22 *Godafoss* made a slight course adjustment to port.

Sometime after 19:50 the chief mate returned to the bridge. He first went to look out through one of the wheelhouse windows. He observed ice in the water and was on his way to the chart table to write in the log book when *Godafoss* ran aground at a speed of 14 knots.

At 19:51:35 the Kvernskjærgrunnen sector beacon may have disappeared from the master's sight, as a consequence of the limited visibility over the foreship. That would have made the distance from the bow to Kvernskjærgrunnen beacon approximately 410 m. The distance between the point of grounding and the beacon was 245 m. The bow was therefore one ship's length, or approximately 165 m, from the point of grounding. (The time stated is based on calculations in Annex B).

At 19:51:44 *Godafoss* began to turn slightly to starboard again. During this period the master was presumably adjusting the chart plotter or radar. The course was 167° and the speed was 14 knots.

Fourteen seconds later, at 19:51:58, *Godafoss* ran aground at Kvernskjærgrunnen.

*Godafoss* settled on Kvernskjærgrunnen in the direction of 192° and began to list to port. Immediately after the grounding, the master gave the order to shut down the main engine.

The able seaman on watch and the off-watch crew came out onto A deck. It was confirmed that all members of the crew were accounted for and uninjured.

At 19:57 the master informed Horten VTS that *Godafoss* had run aground at Kvernskjær. Horten VTS confirmed that the control centre was now observing the vessel's position. The control centre further informed the vessel that it would initiate the necessary onward notification process. The traffic controller immediately contacted the pilot boat and asked them to return to *Godafoss*. The traffic controller notified the NCA's Department for Emergency Response, the head of the VTS and the head of pilot services. The master informed his shipping company in Iceland.

The chief mate ensured that the draught around the vessel was sounded. A safety inspection was then carried out to enable the crew to determine if any tanks and compartments had water ingress and to rule out the possibility that a fire had started.

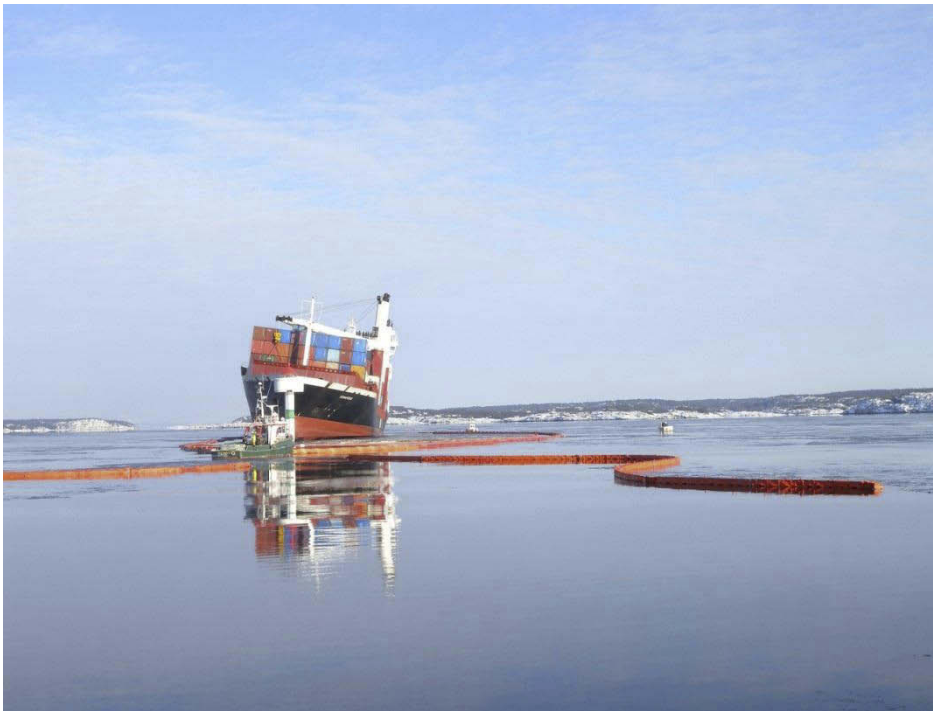


Figure 5: Godafoss on Kvernskjærgrunnen on 18 February 2001 with a list of approximately 7 degrees to port.

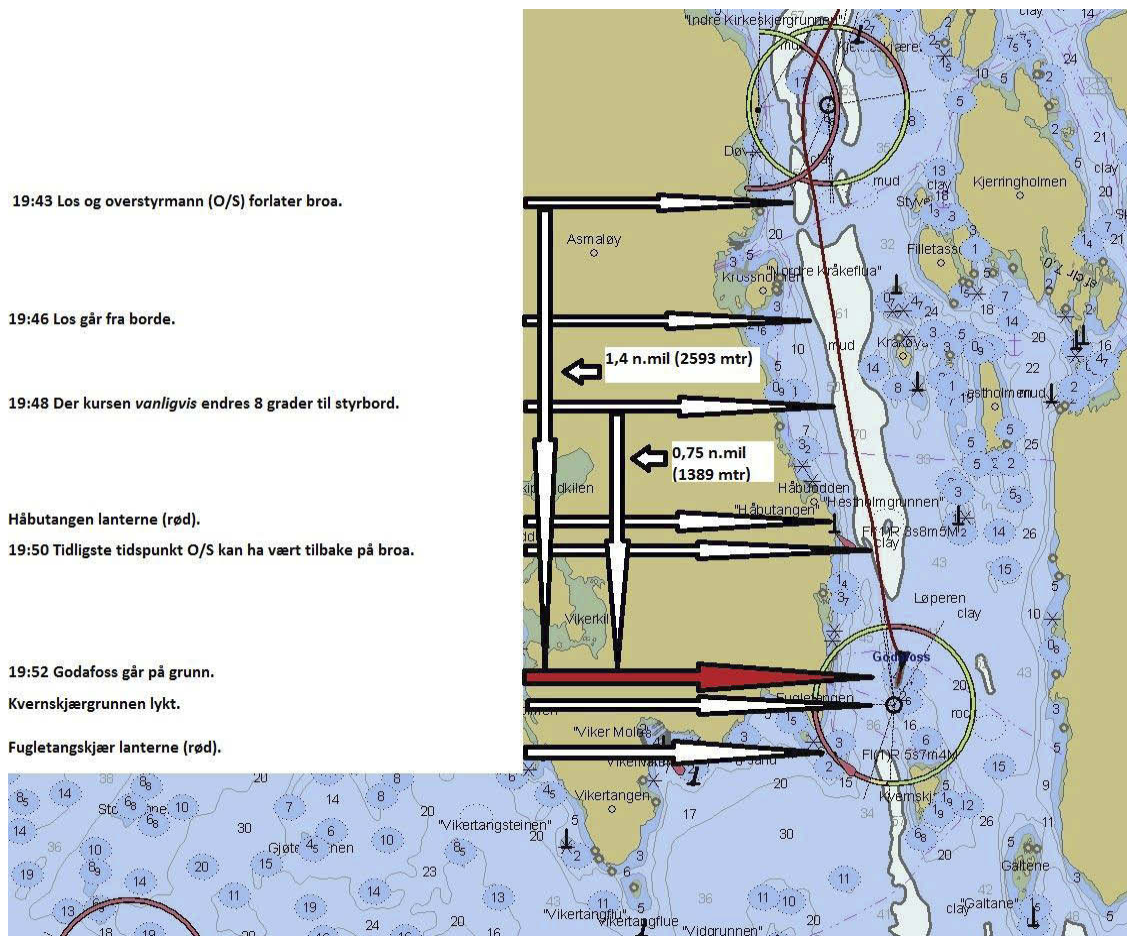


Figure 6: Bearing and comments.

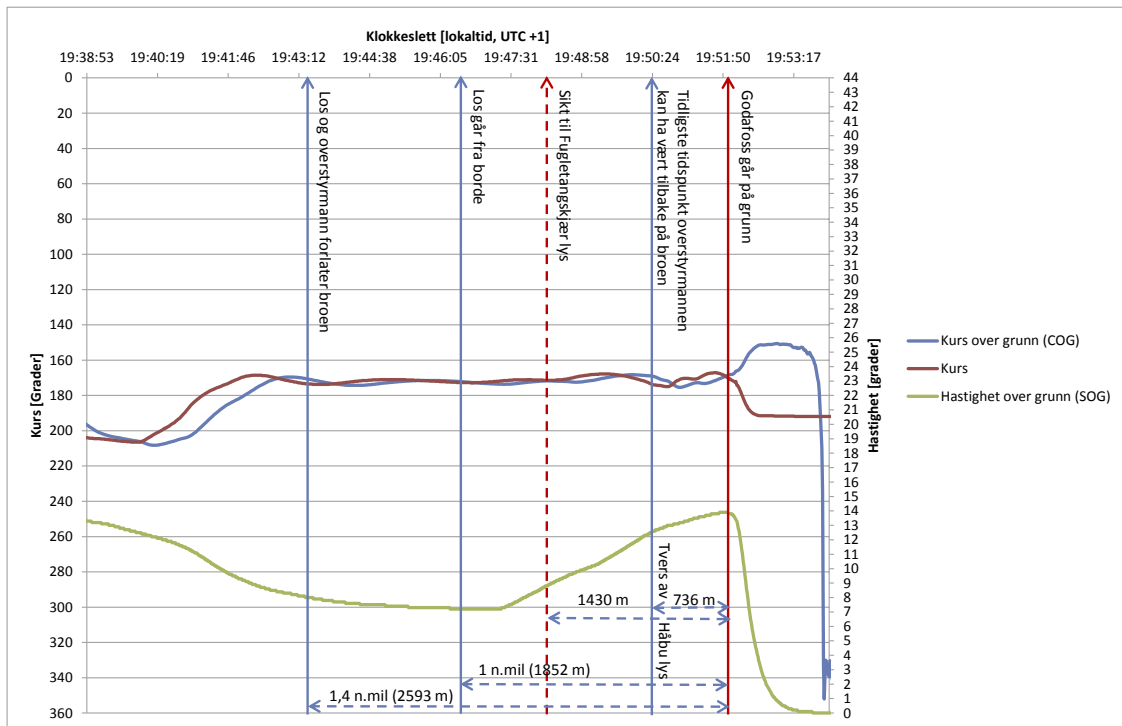


Figure 7: Graphic representation of Godafoss' changes in course and speed in the period immediately before and at the moment of grounding. Times are stated in local time (UTC+1).

### 1.2.1 Extent of damage

The grounding resulted in acute oil pollution and structural damage to the hull, but no injuries to the crew. It was confirmed early on that the vessel had about 700 tonnes of heavy fuel oil on board and had registered leaks from two tanks midships, each with a capacity of 250 tonnes of fuel oil. The vessel took a list of about seven degrees after the grounding, and oil was quickly observed in the water. The NCA estimates that approximately 50 tonnes of heavy fuel oil of the IFO 380 type leaked out of the vessel. As a consequence of the potential scale of oil pollution from *Godafoss*, the NCA initiated a national oil-spill response operation in the course of the evening of the accident.

Action was taken against oil pollution through five Inter-municipal Committees against Acute Pollution (IUA)<sup>8</sup> along the Oslofjord and the coast of Southern Norway.

On the morning of 24 February, after the deck cargo had been lifted off, *Godafoss* was pulled off the rocks and towed to an anchorage at Kjerringholmen for emergency transfer of the fuel oil and offloading of the remaining cargo. On 28 February *Godafoss* sailed from Hvaler under its own steam, but in convoy with a tug boat, to the repair yard in Odense in Denmark. The AIBN has since obtained information from the classification society DNV that as a result of the grounding, about 200 tonnes of steel were replaced at the yard. The repairs to the vessel were completed and its class certificate reissued on 13 April 2011.

<sup>8</sup> Inter-municipal committee against acute pollution



Figure 8: Godafoss under tow to the yard in Odense in Denmark, where DNV conducted the classification society's survey in the period between 5 March and 14 April 2011. All photos were taken by DNV while the vessel was undergoing repair.

### 1.3 Weather conditions

The AIBN has obtained information from the Meteorological Institute that also confirms eye-witness observations: *'Weather conditions were good, with a moderate north-easterly breeze. The moon was almost full after dark, with a snow-covered landscape that provided good contrasts and meant that conditions for visual night navigation were extremely good that evening. The sea was calm in Løperen, with a weak southerly current (about 0.4 knots). Ice was drifting southwards in Løperen and there was some ice lying alongside the shore.'*

### 1.4 Eimskip shipping company and the container vessel Godafoss

Eimskipafélag Íslands ehf (Eimskip) was established in 1914 and is the oldest shipping company in Iceland.<sup>9</sup> Since its beginning, the shipping company has shipped goods to and from Iceland. The vessels operated by Eimskip sail in the North Atlantic. The shipping company operates a fleet of 16 vessels and has sailing routes to Canada, Greenland, the United Kingdom, the Faroe Islands, Belgium, the Netherlands and Scandinavia.

*Godafoss* is a container vessel built at Ørskov shipyard in Denmark in 1995. *Dettifoss*, which has also sailed routes that include the Port of Borg, is the sister ship of *Godafoss*.

Since *Godafoss* was delivered in 1995, the vessel has had two owners. Gfoss Line Ltd took over *Godafoss* on 1 September 2000, and on the same date, Eimskip took over that shipping company's assignments for the vessel. The vessel was registered at St Johns, Antigua on 1 December 2000. *Dettifoss*' flag was changed correspondingly at about the same time.

<sup>9</sup> Between 2007 and 2009 the shipping company was called HF Eimskipafélag Íslands.



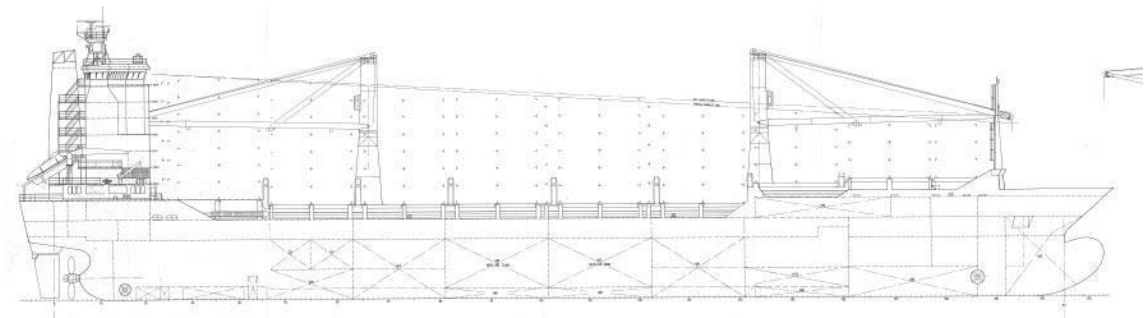


Figure 9: Profile of Godafoss.

Every two weeks *Godafoss* sailed a scheduled route from Reykjavik to Reydarfjordur (both in Iceland) via Torshavn (Faroe Islands), Rotterdam (Netherlands), Fredrikstad (Norway), Hälsingborg (Sweden), Århus (Denmark), Torshavn and back to Reykjavik. The shipping company also operates the sister ship *Dettifoss*, which sailed the same route.

*Godafoss* has been classified by Det Norske Veritas (DNV) since it was built in 1995. The vessel had a valid class certificate at the time of the accident. It had no relevant outstanding classification or official orders.

DNV had also carried out inspections on behalf of the flag state, with the exception of ISM which had been delegated to Germanischer Lloyd.

All certificates from the authorities were valid at the time of the accident.

There were no outstanding inspections, except for the flag state inspection. The previous flag state inspection had been carried out on 15 December 2009, and the deadline for the next inspection was 27 December 2010 (+/- 3 months) When the flag state carried out its inspection of *Godafoss* on 15 December 2009, it concluded that the vessel was generally in excellent condition, with only a few minor comments.

#### 1.4.1 The vessel's crew

The vessel's crew consisted of 12 signed-on crew members and one passenger.

A master and two deck officers were on board. The deck officers, i.e. the chief mate and second officer, worked a six hour navigation watch followed by six hours of rest. The changes of watch were at 00:00, 06:00, 12:30 and 18:30. The watch arrangement was also observed while the vessel was in port.

There were five able seamen on board. Two of these, the bosun and one able seaman, worked as daymen from 08:00 to 17:00. The remaining seamen were on a three-watch system, with four hours of sea watch and eight hours off. The sea watches were from 00-04, 04-08, 08-12, 12-16, 16-20 and 20-24. In addition to the sea watches, the able seamen on watch worked an average of four hours overtime per day. The crew also included two engineers, one electrician, one motorman and one cook. The police tested all members of the bridge team for alcohol after the accident. There was no indication that there had been any alcohol intake prior to the accident.

##### 1.4.1.1 *The master*

The master (age 65) had many years' experience at sea. He began sailing for Eimskip as an able seaman in 1964, after spending two years working for the Icelandic Coast Guard. He

became a mate in 1969 and acted as relief master for several years while he was sailing as chief mate, until 1996 when he started working full-time as master on the Eimskip vessel *M/V Laxfoss*. He has been master of *M/V Godafoss* since 2009. The master held a valid Class 1 certificate as master mariner, from Iceland and the same class exemption certificate from the flag state, as well as pilot exemption certificates for some of the ports in which Eimskip operates. In recent years, the master had completed a range of courses, including the transportation of dangerous goods, crisis management and bridge team management, in addition to radar and ARPA courses.

The master was last seen by a marine medical examiner on 12 January 2011, and the results had been satisfactory.

He had been sailing on *Godafoss* on the scheduled route to the Port of Borg in Fredrikstad for two years. That means that he has sailed into and out of Løperen a total of about 24 times as master of this vessel.

The master signed on for a new round voyage on 10 February 2011.

Because of the bad weather off Iceland, and the delay in arrival and departure times at the ports, the master had got less sleep than usual. However, according to information from the shipping company, the master's resting and working hours were within regulatory requirements (see also section 1.5).

The master had experienced previous occasions when the pilots had disembarked before Vidgrunnen, but the evening of the accident was the first time that he had known a pilot to disembark as far north in Løperen as by Skipstadsand.

#### 1.4.1.2 *Chief mate*

The chief mate (age 51) had many years' experience as a deck officer. He had been at sea for about 35 years, and had been sailing for Eimskip since 1981. He first signed on as a chief mate towards the end of the 1980s. He had called at Fredrikstad several times on a different, smaller container vessel.

The chief mate held valid certificates for his position.

During recent years, the chief mate has completed courses in marine medicine, radar and ARPA, as well as a course in handling dangerous cargoes.

The chief mate began sailing on *Godafoss* in November 2010, and has sailed the complete voyage three times since then. He signed on for a new round voyage on 10 February 2011.

According to information supplied by the shipping company after the accident, the mate's rest and working hours were within regulatory requirements.

The chief mate was last seen by a marine medical examiner on 16 August 2010, and the results had been satisfactory.

#### 1.4.1.3 *Second officer*

The second officer (age 62) had many years' experience as a deck officer. He had been sailing for Eimskip for the last 12 years. For the past two years, he had been sailing on *Godafoss* as second officer. He signed on for a new round voyage on 10 February 2011.

The second officer had valid certificates. In recent years, he had completed courses in marine medicine, advanced firefighting, the use of lifeboats, refresher courses in basic safety and firefighting, and an ARPA course.

The second officer was last seen by a marine medical examiner on 12 August 2009, and the results had been satisfactory.

According to information supplied by the shipping company after the accident, the mate's rest and working hours were within regulatory requirements.

#### 1.4.1.4 *Able seaman on watch*

The able seaman on watch first went to sea in 1978. He has been employed by Eimskip since 1986 and has been sailing with *Godafoss* for the past 11 years. He signed on on 10 February.

From the time *Godafoss* left Reykjavik until the time of the accident, the seaman had been working an average of 12 hours per day (a total of 25 overtime hours). During the same period, the other deck crew had worked 14 (35), 13 (30), 12 (23) and 14 (31) hours, respectively. The numbers in brackets show the total number of overtime hours worked during that period.

None of the three able seamen who took part in the watches had been instructed to be on the bridge when it sailed out of Øra, but were on call to act as lookouts if necessary.

#### 1.4.2 Loading conditions

Only containers up to 20 feet long and nine feet wide may be stowed in the first row, above hatch 1 of the cargo hold. Above the other hatches, 2-8, and on the poop deck, a combination of 20 foot and 40 foot containers may be stowed, with 11 containers per row. Containers with a length of 45 feet may also be stowed above cargo hold hatches 5 and 6 and on the poop deck. It is also possible to stow containers with a length of 48 feet on the poop deck.

When *Godafoss* sailed from Ørakaia, it was loaded with 439 containers. Of these, 203 were stowed on deck and were 40 feet and 20 feet long. Some were standard containers with a height of 8.5 feet, while others were of the 'high cube' type with a height of 9.5 feet. In the first row, standard containers were stored in three tiers, with nine in the row. These containers were 20 feet long, 8 feet wide, and 8.5 feet high (6.058 x 2.438 x 2.591 m).

The crane boom was lying diagonally towards the starboard side on a provisional support formed by an open-top, half-height container placed upside-down in the first row of containers. The container was 1.293 m high and had no top or sides, only end walls that were probably collapsible. Visibility over the foreship was restricted by the foremost row of containers as well as by the crane boom.

The AIBN has obtained information about the vessel's loading condition at the time of the accident. Mean draught, trim and trim angle have been calculated based on this information. This information and calculations are as follows:

	I.	II.	III.
Information taken from:	On board <i>Godafoss</i> , vessel's log book	On board <i>Godafoss</i> , loading condition from vessel's loading software, dated 20 February 2011.	Sent from the shipping company, loading condition from vessel's loading software, dated 18 February 011.
Draught [metres]:	Draughts read fore and aft on departure from Fredrikstad were 6.00 m and 7.40 m, respectively	Draughts at fore and aft perpendicular were 5.71 m and 7.22 m, respectively	Draughts at fore and aft perpendicular in this condition were calculated to be 5.72 m and 7.17 m, respectively
Calculated mean draught [metres]:	6.700	6.465	6.445
Calculated aft trim [metres]:	1.40	1.51	1.45
Calculated trim angle [degrees]:	0.515	0.565	0.543

The information about the loading condition received from the shipping company (column III in the table) corresponds to column II above, with the exception that the total container weight was reduced by 63.4 tonnes and the centre of gravity of the remaining container weight was moved 0.35 m forward, 0.6 m down and 0.02 m to port.

#### 1.4.3 Visibility line

Figure 10 shows a drawing that was posted on the bridge. It shows a visibility line marked 'Loaded (d 8.95 m)', drawn relatively high above the point marking the top of the first three tiers of containers. The visibility line's point of intersection with the sea is stated to be 325 m forward of the bow. The other visibility line on the sketch is marked 'Ballast (da 6.3 m df 4.0 m)' with a visibility line plotted 134 m forward of the bow.

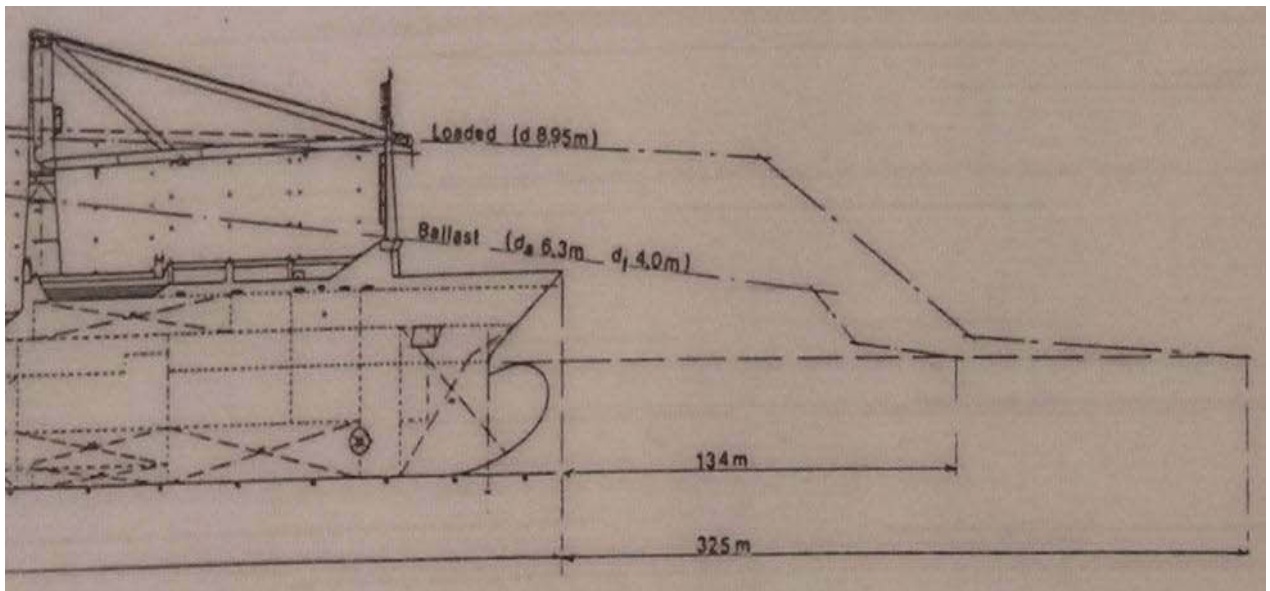


Figure 10: Sketch regarding lines of sight posted on the bridge of Godafoss.

#### 1.4.4 Navigational equipment

*Godafoss* had paper nautical charts from the British Admiralty (BA) for the relevant sailing area. BA 879 with a scale of 1:50,000 was on the chart table when the AIBN was on board, and it was stated that this chart had been used on the inbound and outbound voyage when the vessel called at Fredrikstad. The paper charts were up to date. There were no positions plotted on the chart on 17 February for outbound sailing from Port of Borg.

Two Furuno radars were installed, of which one was an X-band (3 cm), located on the port side and one was an S-band (10 cm), located on the starboard side. It was stated that both radars were working satisfactorily. The X-band radar was in standby mode until the pilot left the bridge.

The vessel was equipped with a chart plotter of the Navi-Sailor 3000 type with Transas charts (raster charts). The electronic chart system was located at the starboard coning position on the bridge.

The autopilot was of the Adaptive Micropilot SEM 1000 type. There was some uncertainty regarding autopilot settings prior to the grounding. It is usually set to adapt to sea conditions and automatically restrict rudder movements in relation to the vessel's speed.

#### 1.4.5 Planning the passage

##### 1.4.5.1 *Passage plan*

The passage plan for the voyage from Fredrikstad to Hälsingborg gave a description of the outbound voyage from Fredrikstad, and this is shown in Figure 11.

M/V GODAFOSS, V2PM7

Fredrekstad to Helsingborg

EIMSKIP

Nr. í Siglingi	Nr. í GPS minni	Lat.	Long.	Nafn	Heildar vegalengd sigld	Stefna	Vegalengd milli vegpunkta
1		59°01.38'N	010°58.15'E	Fredrekstad			
2		59°00.96'N	010°55.93'E	FRK Lóðs	R=12		1 sjm
3		59°01.00'N	010°53.89'E	Trestene	1 sjm	281°	3 sjm
4		59°01.69'N	010°45.97'E	N Torbjö	4 sjm	241°	2 sjm
5		59°01.19'N	010°45.21'E	NV Torbjö	6 sjm	213°	2 sjm

Figure 11: The first part of the passage plan from Fredrikstad to Hälsingborg. At point no ('Nr. í Siglingi') 1, the plan indicates the position at the quay in Fredrikstad. Point no 2 indicates the position at the pilot boarding point at Vidgrunnen. The plan indicates the distance between these two waypoints to be 12 nautical miles (r=12).

1.4.5.2 Electronic chart system

A passage description from Fredrikstad to Hälsingborg was retrieved from the electronic chart system. The route was plotted in an extremely approximate way, and passed over shallows and rocks in some places. When the deck officers were asked why this was so, they replied that the electronic chart system could only be used as a kind of reference, and could not normally be used to control the voyage in this area.

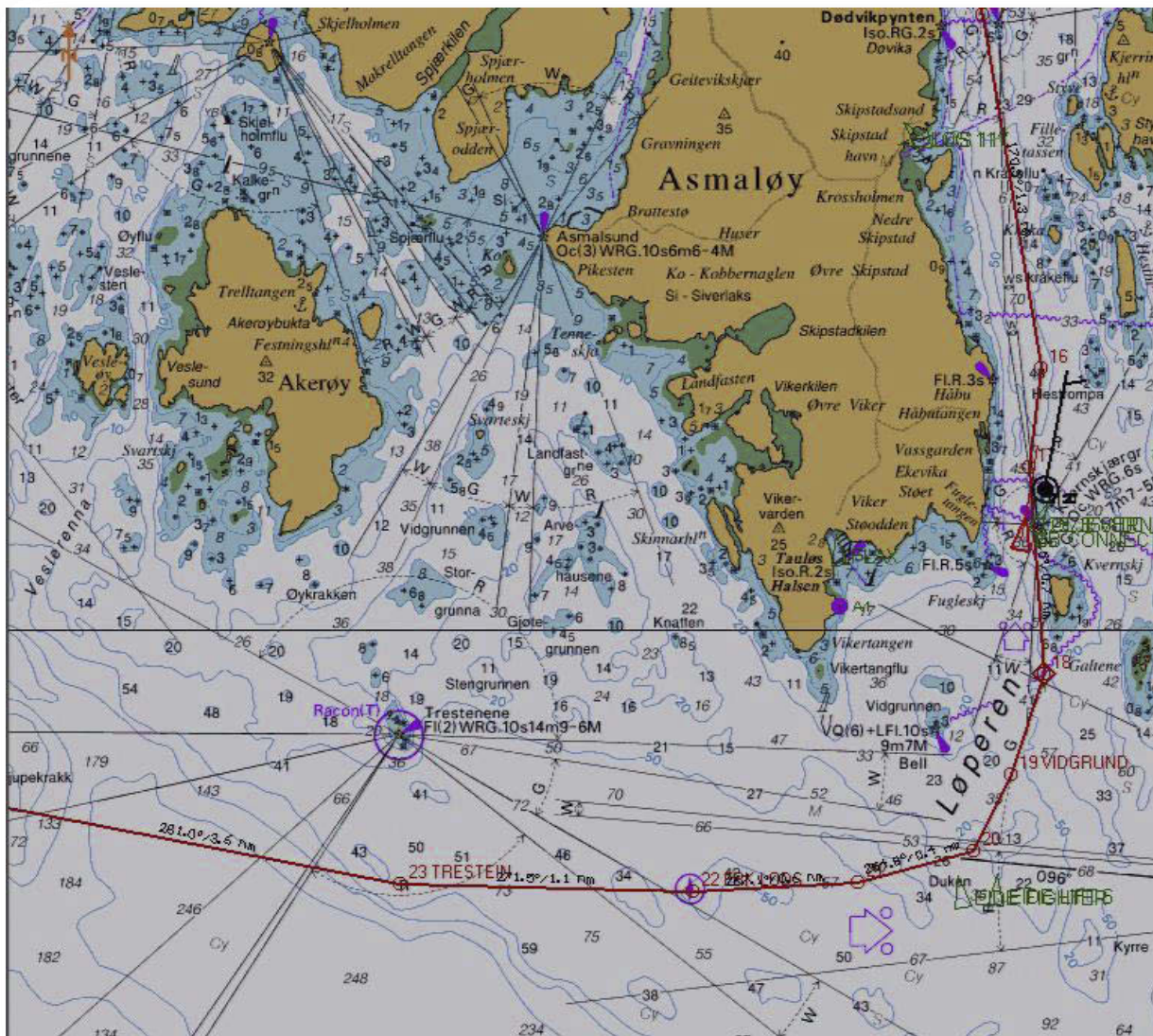


Figure 12: Reconstruction of what was shown by the electronic chart system at the time of the accident. The red line indicates the planned route between Fredrikstad and Hälsingborg.

#### 1.4.6 Navigation practice into and out of the Port of Borg

The master and the deck officers had extensive experience of calling at the Port of Borg. They therefore regarded it as unnecessary to have a detailed passage plan or to review the passage plan for each voyage. Nor did the shipping company require a detailed passage plan for the vessel.

While sailing in open water, the procedure was to note the position in the log book every two hours. There was no procedure for setting out positions on the chart while sailing with a pilot.

It was stated that *Godafoss* usually had an aft trim of between 1.0 and 1.5 m when departing from the Port of Borg.

The master had great faith in the pilots, both in terms of how well they knew the area and also how well they were able to manoeuvre the vessel. In the master's experience, when the vessel was approaching the Port of Borg, the pilot always boarded before the pilot boarding point at Vidgrunnen. When departing from the Port of Borg, the pilot occasionally disembarked while the vessel was still in Løperen. The master thought that this was the first time the pilot had disembarked this early in Løperen. Pilots may have disembarked nearer to Håbu.

The deck officers stated that they did not usually take any direct part in the navigation while the pilot was on board. They were accustomed to the pilot standing on the starboard side of the bridge's centre position and manoeuvring the vessel in addition to controlling its speed. The master tended to stand on the port side. If the master had to carry out other tasks, the mate on watch temporarily took over the master's position.

The practice was for the mate on watch to accompany the pilot down onto the deck. The chief mate thought that it was normal for the pilot to disembark in Løperen, but that this usually took place further south than it did on 17 February.

One of the able seamen thought that it was normal for the pilot to disembark in Løperen. The times that this was not the case were when it was foggy. The able seaman had observed pilots disembarking both in the same area and further south in Løperen. He had not observed pilots disembarking further north than this location.

One of the routine duties of the able seamen on watch was to rig and take in the pilot ladder. The able seaman remained on deck with the mate on watch during the time that it took the pilot to embark and disembark.

#### 1.4.7 Vessel's safety management system

A safety management system is a structured and documented system that shall enable a company's personnel to implement the company's safety and environmental protection policies effectively. The system is designed to ensure compliance with compulsory rules and regulations, and to ensure that current regulations, guidelines and standards recommended by the organisation (International Maritime Organization – IMO) are taken into consideration.

When the safety management system is approved, the shipping company is issued with an approval certificate (Document of Compliance – DoC) that documents that the company is complying with the requirements of the code. A Safety Management Certificate (SMC) is also issued to the vessel to testify that the company and the on-board management are operating the vessel in accordance with the approved safety management system.

The shipping company's safety philosophy is to put the safety of its employees first, and to prevent any harmful impacts on the environment as a result of the shipping company's operations. The objective is to ensure that the employees have safe working conditions, thereby safeguarding their health, and to ensure that operations are in accordance with national and international laws, rules, requirements and codes.

The master has overall responsibility on board for all the crew, and should ensure that all operations are in accordance with international regulations and the shipping company's safety management system. The master works with the shipping company's safety



consultant (designated person) to ensure that the safety management system is evaluated annually.

Regarding rest periods, the system states that the crew should endeavour to comply with the rest period provisions set out in the Standard of Training, Certification and Watchkeeping Convention (STCW), in Icelandic: ‘Leitast skal við að uppfylla hvíldarákvæði í STCW’, which the AIBN has had translated into English: ‘every endeavour should be made to comply with the rest period provisions set out in the STCW’. On board, it is the master who must ensure that the crew comply with these provisions. In order to check that the rules are being followed, timesheets must document all crew hours, and must be kept on board the vessel. It appears that on some of the vessels’ routes, there is a risk that deck officers do not get enough rest in accordance with STCW (it has not been defined which routes these are, and the AIBN has not received confirmation about whether this applies to the route which *Godafoss* was sailing on 17 February). In such cases, the master should ensure that the deck officers get enough rest by taking on some aspects of their duties himself.

It is claimed that the bridge procedures are mainly based on Chapter A-VIII of the STCW code. It must be emphasised that the master is primarily responsible for the vessel’s management and does not go on watches, but takes part where necessary and should ensure that the watch schedule is organised in such a way as to provide a safe navigation watch at all times.

Work process SMSVF004 describes work and watch changes on the bridge during voyages. Its purpose is to ensure that safety is attended to during voyages and that the crew member taking over the watch is updated as necessary in connection with watch changes, about the current situation and what is expected to happen. The work process is based on Chapter A-VIII of the STCW code. The able seaman on watch shall assist the officer on the bridge when the master considers this to be necessary. He shall look out for other vessels and anything else in the vicinity that could be of consequence to safe navigation, and should inform the officer on watch of any hazards as soon as possible. He should notify the officer on watch, regardless of whether he thinks that the officer is aware of such hazards or not. He shall man the helm and steer according to navigational commands from the master or officer on watch if this is considered to be necessary. The able seaman on watch shall conduct inspection rounds of the vessel and check refrigerated containers. The procedure for handling refrigerated containers states that readings should be taken from these three times a day as follows:

- At 06:00 or 08:00 (depending on the situation on board)
- At 12:00 or 16:00 (depending on the situation on board)
- At 20:00 (allowing enough time for maintenance before night-time, if necessary).

The procedure points out that, if some special refrigerated containers require more careful monitoring, the frequency should be increased.

With regard to the lookout, it confirms that a lookout should be in place at all times, in accordance with rule 5 (COLREG).<sup>10</sup>

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<sup>10</sup> Maritime regulations rule 5 regarding preventing collisions at sea.

*The person acting as lookout shall not have any other duties that could prevent that person from keeping a good lookout. The duties of the person acting as lookout and the person navigating the vessel cannot be regarded as the same. Thus, the helmsperson shall not be considered to be the lookout, except on small vessels or where the helmsperson has a good view from the steering position, and where there is no impairment of night vision or other impediment to the keeping of a proper lookout.*

The officer on watch may be the sole lookout on the bridge provided that on each such occasion the situation has been carefully assessed and full account has been taken of factors including weather, visibility, other marine traffic, hazards in close proximity to the vessel, and provided that assistance may be summoned immediately if necessary.

When determining the bridge watch, the master shall take into account factors such as visibility, weather, waves, marine traffic, the need for paying attention when the vessel is sailing in or approaching separate passages<sup>11</sup>, the additional workload occasioned by work that needs to be performed, the knowledge and skills of crew members, the vessel's size and visibility from the bridge, and the configuration and design of the bridge in terms of whether anything may prevent the officer on watch from seeing or hearing what is happening in the vicinity of the vessel.

Regarding the watch plan for the bridge, it states that the bridge must never be unmanned. Factors to be taken into account include weather conditions, visibility, whether it is night or day, whether there are any potential hazards in the proximity of the vessel that could make it necessary for the officer on watch to pay attention to the vessel's passage, the use and functioning of navigational equipment that may be used for safe navigation, and whether the vessel is fitted with automatic steering.

The officer on watch should keep watch on the bridge and not leave the control panel unless he is satisfactorily replaced. Even when the master is present at the control panel, this officer shall also be responsible for safe navigation, unless the master has specifically informed him that he himself has assumed responsibility for the watch.

At intervals, and as often as necessary in order to ensure that the vessel is sailing according to the correct course, the vessel's course, location and speed shall be confirmed by using the necessary navigational equipment. The officer on watch shall not undertake any duties that could interfere with safe navigation.

The bridge procedures state that it is particularly important for the officer on watch to ensure that a proper lookout is maintained at all times. On vessels with separate chart rooms, the officer on watch may enter the chart room for short periods in order to carry out essential work, if this is necessary. On such occasions, he should ensure that it is safe to do so, and that a proper lookout is still maintained.

When steering by autopilot, it is dangerous to let events develop to the point where the officer on watch is without assistance and must break off from lookout duty.

The officer on watch shall use radar when visibility is poor or expected to be poor. The radar shall be reset often enough to enable observation of any obstructions. It must also be ensured that the best range scale for the radar has been selected. The bridge procedure describes that

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<sup>11</sup> Traffic separation schemes (TSS).

when sailing along the coast or in areas of dense traffic, the nautical chart with the largest scale suitable for that area shall be used, and that the chart shall be up to date. The officer on watch shall have a good knowledge of all navigational and sea marks in use. When there is a pilot on board, it states that this person shall not assume the responsibility or duties of the master or the officer on watch relating to the safety of the vessel. The master and the pilot shall exchange information about aspects such as how the voyage shall proceed, situations in the area, and information about the cargo, draught and navigational aids. The master and/or the officer on watch shall work closely with the pilot and maintain an accurate check on the progress of the voyage and the location of the vessel. The bridge procedure states that if there is any doubt as to the pilot's plans, the officer on watch shall seek clarification from the pilot. If there is any uncertainty about the plan, the master shall be contacted.<sup>12</sup>

#### 1.4.8 Review of the shipping company's and vessel's safety management system by public authorities

Germanischer Lloyd (GL) has carried out ISM audits of *Godafoss* and the shipping company since 2006. The vessel had a valid Safety Management System (SMC) and the shipping company had a valid Document of Compliance (DoC) for this type of vessel at the time of the accident.

#### 1.4.9 Internal audit on board *Godafoss*, shipping company's risk assessments and improvement measures

The shipping company has carried out the following internal audits on board *Godafoss*.

- March 2008: There were no observations or nonconformities.
- January 2009: Two nonconformity reports were issued, relating to the general state of maintenance.
- January 2010: There were no observations or nonconformities.

The purpose of internal audits is to verify that the safety management system is in accordance with the ISM Code and to assist the shipping company in its work of continually improving this.

The shipping company informed us that the shipping company's internal audits include navigational practice wherever this was possible and was deemed to be necessary. No members of the vessel's bridge team were aware that any kind of risk analysis had been carried out which examined bridge manning procedures related to when and where the pilot boards or disembarks. In addition, the shipping company has not been able to document that such an analysis had been considered or carried out. Eimskip has not received any written or verbal nonconformity reports regarding pilotage procedures in Løperen. After the accident, based on the master's and navigators' experience, the shipping company has gained the impression that it was very unusual, although not unheard of, for the pilot to disembark so early.

When asked what the shipping company's opinion is about the fact that pilots disembark in Løperen, Eimskip replied that it thinks that this is completely unacceptable. The shipping

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<sup>12</sup> The summary of Eimskip's safety management system has been translated from the Icelandic original.

company explained that the master is in a difficult position when the pilot wants to disembark early, and that through the years the master and pilots have developed a good enough relationship for the master to want to keep the pilot happy.

## 1.5 Official requirements for manning, rest periods, lookout and visibility line

The flag state Antigua and Barbuda updated its maritime law on 15 March 2001 in which the safe manning principle, rest periods and lookout requirements are based on the IMO resolution A.890(21) which was adopted on 25 November 1999 and approved by the flag state. The principles reviewed by IMO resolution A.890(21) are based on the articles set out in the 1978 STCW Convention and later IMO resolutions signed before the accident. The flag state has issued a specific communication that concerns lookouts during hours of darkness. This refers to a serious accident in the United Kingdom and emphasises that, in accordance with the STCW Convention, which applies to all Antigua and Barbuda registered vessels, it is prohibited to operate a vessel on which the bridge officer on watch is the only lookout after the onset of darkness.

### 1.5.1 Manning requirements

IMO resolution A.890(21), which describes and stipulates principles for safe manning, has been ratified by the flag state and shall form the basis of safe manning as required by the vessel's Minimum Safe Manning Certificate. Paragraph 3.3 of the resolution refers to the STCW Convention, and its first point states that the size of the crew shall ensure safe navigation and handling of the vessel under all conditions. The certificate emphasises that safe manning is based on the minimum number of persons that is deemed to be necessary to comply with the requirements of the STCW Convention and contains the proviso that the certificate will no longer be valid and will be withdrawn if the vessel no longer complies with the E0 requirement (unmanned engine room). It is the master's responsibility to ensure that the watch arrangements on board satisfy the minimum requirements of the STCW Convention.

Crew members and positions requiring a certificate as stated in the Minimum Safe Manning Certificate are to be regarded as the minimum number of crew required in order to sail the vessel from A to B. Additional crew who are regarded as necessary for cargo handling, control, maintenance or watchkeeping arrangements and in order to comply with the requirement for rest periods, are the responsibility of the owner and it is the duty of the master to enforce any requirements.

According to the Minimum Safe Manning Certificate issued by the flag state of Antigua and Barbuda, the minimum requirement on board *Godafoss* was 12 persons (see Annex I). This includes the master, chief mate, deck officer and three able seamen for navigational watches.

Standards relating to watchkeeping from Chapter VIII, Section A-VIII/1 of the STCW Convention

#### *Fitness for duty*

1. All persons who are assigned duty as officer in charge of at watch or as rating forming part of a watch shall be provided a minimum of 10 hours of rest in any 24-hour period.

2. The hours of rest may be divided into no more than two periods, one of which shall be at least 6 hours in length.
3. The requirements for rest periods laid down in paragraphs 1 and 2 need not be maintained in the case of an emergency or drill or in other overriding operational conditions.
4. Notwithstanding the provisions of paragraph 1 and 2, the minimum period of ten hours may be reduced to not less than 6 consecutive hours provided that any such reduction shall not extend beyond two days and not less than 70 hours of rest are provided each seven-day period.
5. Administrations shall require that watch schedules be posted where they are easily accessible.

### 1.5.2 Lookout requirements

The STCW code stipulates the following requirements for the lookout:

A proper lookout shall be maintained at all times in accordance with rule 5 of the International Regulations for Preventing Collisions at Sea, 1972 (COLREG)<sup>13</sup>, and shall serve the following purpose:

- maintaining a permanent state of vigilance, by the use of sight, hearing and other available means, with regard to any significant change in the operating environment,
- fully appraising the situation and the risk of collision, grounding and other hazards to navigation,
- detecting ships and aircraft in distress, shipwrecked persons, wrecks, objects in the sea and other hazards to safe navigation.

The lookout must be capable of devoting his full attention to the task of keeping a proper lookout, and shall not carry out or be assigned any other duties that could interfere with this task. The duties of the lookout and helmsperson are separate, and the helmsperson shall not be considered to be the lookout while steering, except on small vessels from which there is an unobstructed all-round view from the steering position, and there is no (reduced night vision) or other impediment to the keeping of a proper lookout. The officer on the bridge in charge of the watch may be the sole lookout in daylight, provided that on each such occasion, the situation has been carefully assessed and it has been established without doubt that it is safe to do so, and that all relevant factors have been fully taken into consideration, including but not limited to:

- weather conditions
- visibility
- traffic density

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<sup>13</sup> Convention on the international regulations for preventing collisions at sea, Part B, Rule 5

- proximity to navigational hazards
- the attention required when navigating in or near traffic separation schemes,
- that assistance is immediately available and can be summoned to the bridge if required by any change in the situation.

### 1.5.3 Requirements for visibility line

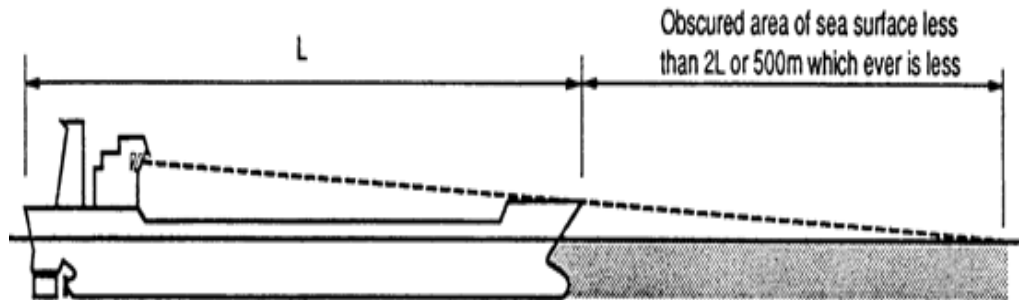


Figure 13: The figure illustrates the minimum requirements for visibility from the bridge. The dotted line is the visibility line from the bridge to the point of intersection with the surface of the sea.

By the visibility line is meant a line drawn from eye level at the lookout position on the bridge, over the vessel's highest forward point. The minimum requirements regarding distance forward of the bow to the point at which the visibility line intersects with the surface of the sea are provided for in Chapter 5, rule 22 *Navigation bridge visibility* of SOLAS, as quoted below. The minimum requirement with regard to blind sectors on each side of the centre line are also given in SOLAS.

*'Ships of not less than 55 m in length, as defined in regulation 2.4, constructed on or after 1 July 1998, shall meet the following requirements:*

*The view of the sea surface from the conning position shall not be obscured by more than two ship lengths, or 500 m, whichever is less, forward of the bow to 10° on either side under all conditions of draught, trim and deck cargo.*

*No blind sector, caused by cargo, cargo gear or other obstructions outside of the wheelhouse forward of the beam which obstructs the view of the sea surface as seen from the conning position, shall exceed 10°. The total arc of blind sectors shall not exceed 20°. The clear sectors between blind sectors shall be at least 5°. However, in the view described in 1.1.1, each individual blind sector shall not exceed 5°.*

*Ships constructed before 1 July 1998 shall, where practicable, meet the requirements of paragraphs 1.1.1 and 1.1.2. However, structural alterations or additional equipment need not be required.'*

*Godafoss*, constructed in 1995, has a maximum stated length of 165.60 m. The visibility line should therefore meet the surface of the sea a maximum of 331.20 m forward of the bow, in order to comply with the regulation introduced in July 1998. It is apparent from the above text that this Solas rule also applies to vessels built before this date, as long as it is possible for them, from a practical point of view, to comply with the requirement without having to undergo structural changes or alterations. See also section 2.7.

## 1.6 Navigational waters

### 1.6.1 Navigation through Løperen

The fairway from Vidgrunnen to Fredrikstad is approximately 18 km long and is narrow and winding in some places. In Røsvikrenna in particular, there is sometimes a strong outgoing current from Glomma combined with side winds. The NCA has identified that the area may constitute a critical risk factor for voyages into and out of the Port of Borg. Based on the level of risk, the fairway is already regulated by the Norwegian Maritime Traffic Regulations, which specify restrictions for factors such as reduced visibility and darkness.

A local state pilot has clarified for the AIBN the following voyage description for outbound night voyages in the waters in the southern part of Løperen:

‘Voyages in darkness with good visibility in the southern part of Løperen are usually navigated with the aid of sector beacons and lateral lights, plus additional radar checks of the voyage. The radar may also be used as an aid to detecting other vessels of all sizes, and thus act as an anti-collision aid.

When an outgoing vessel passes west of Lubbegrunnen beacon (Oc (3) 10 s WRG) at a sufficient distance, Kvernskjærgrunnen beacon (Oc 6 s WRG) changes from the red to the white sector, to show that the vessel is clear of the western part of Lubbegrunnen. The vessel then continues to head for Kvernskjærgrunnen beacon in the white sector, or it may change course a few degrees to starboard in order to increase the passing distance to Håbutangen. The course must ensure that Håbutangen light (FI R 3s) is well to starboard of the bow. While sailing south towards Håbu, Fugletangskjær light (FI R 5s) will become visible, and in some cases the vessel may sail on or just across the boundary between the white and red sectors of Kvernskjærgrunnen beacon. On passing Håbu beacon, the course is then changed to starboard and set to pass between Kvernskjærgrunnen beacon and Fugletangskjær light. Kvernskjærgrunnen beacon will relatively quickly change from the white to the green sector. Vidgrunnen light (VQ (6) W LFI 10 s) will gradually come into view. After passing Vidgrunnen, the vessel may change course to starboard for the onward voyage westward past Torbjørnskjær lighthouse, or to port towards Sekken and Kosterfjorden’.

The Norwegian pilot does not describe the route to Fredrikstad in Løperen in detail.

Information regarding the historical development of beacon marking in Løperen may be found in Annex J.

In January 2011, the pilot supervisor in Fredrikstad initiated the measure of sending relevant shipping agents descriptions of recommended navigation routes for vessels that would be entering the area covered by Fredrikstad pilot station. (See Annex G).

### 1.6.2 Outer Hvaler National Park

The place where the vessel ran aground is part of an archipelago, which, in 2009, was defined as a national park, most of which is made up of the seabed and seafloor.<sup>14</sup>

The national park is one of the most important areas for outdoor recreation and fishing in the Oslofjord. Some of the world's largest inshore cold-water reefs can be found here, including the 1,200 metre long Tisler reef just south of Løperen, which is particularly important, acting as a backbone in the diversity of local marine life. The norwegian area borders with the Kosterhavet Marine National Park on the Swedish side. The two national parks are currently a major protection area. The area has a magnificent, unspoiled coastal landscape and is an extremely important area of biological diversity.

The northern boundary of Outer Hvaler National Park runs through Løperen (Figure 4). Kvernskjærgrunn, on which *Godafoss* ran aground, is just inside the boundary of the national park, and as early as 2006 was made into one of several protected lobster reserves along the Skagerrak coast.

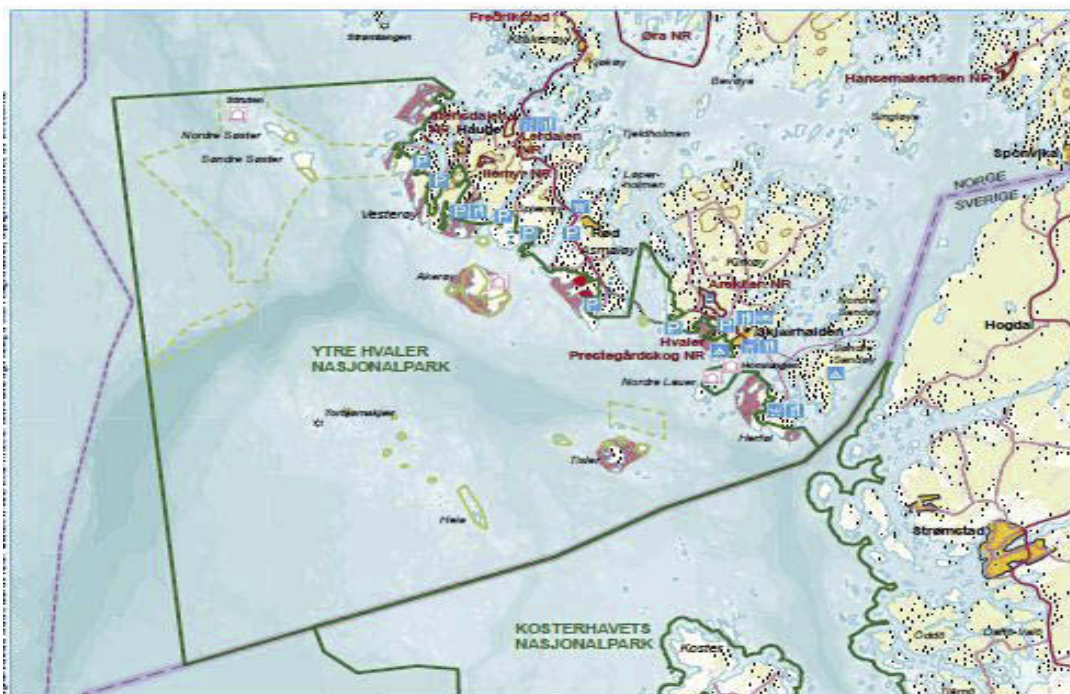


Figure 14: Map section showing the boundaries of Outer Hvaler National Park and Kosterhavet Marine National Park. Source: Norwegian Directorate for Nature Management

### 1.6.3 Information about the national park on nautical charts and in publications

Interviews with the crew on board *Godafoss* reflected a general ignorance of the newly established Outer Hvaler National Park. The vessel was using British Admiralty (BA) chart no 879 with a scale of 1:50,000. The boundaries showing the extent of the National Park have not been added to this nautical chart, nor any information that it has been established.

<sup>14</sup> From the Norwegian Directorate for Nature Management, <http://www.dirnat.no/nasjonaltpark>



The same is true of Norwegian Chart no 1, which covers the Oslofjord area from Færder-Hvaler to Halden. We must assume that the vast majority of foreign registered vessels that call at the Port of Borg will use British Admiralty charts. Updated details and information about the National Park require the Norwegian Hydrographic Service to implement these in its nautical charts and publish them in an Efs (Norwegian Notice to Mariners). This information can then be announced in an NTM (Notice to Mariners) and reflected in BA nautical charts. It is true that the publications ‘*Den norske los*’ (The Norwegian Pilot) and the ‘Admiralty List of Sailing Directions’ for this area provide recommendations, referring commercial traffic to the waters west of Torbjørnskjær lighthouse while awaiting pilots at Vidgrunnen. However, there are no mandatory rules on how vessels should sail up to or away from the pilot boarding mark at Vidgrunnen, or on whether any restrictions apply to the National Park requiring vessels to select alternative routes.

It therefore appears that the VTS control centre and pilotage services do not have a mandate to clearly pass on unambiguous instructions to commercial vessels or be able to strictly enforce these instructions in relation to such vessels.

#### 1.6.4 Conditions around Outer Hvaler National Park

When Outer Hvaler National Park was being established, the County Governor of Østfold sent proposals for environmental impact assessments and proposals for protection to various bodies for comments. One of these bodies was the NCA.

In its comments, the NCA questioned the County Governor’s conclusion that it had fulfilled its duty to notify, and it did not agree with the proposals for protective provisions.<sup>15</sup> This was because the NCA had plans to improve the fairway to Fredrikstad, which could involve the need for measures that would come into conflict with the proposed protective provisions.

The County Governor took most of the NCA’s comments into account. This was expressed in the County Governor’s recommendations to the Norwegian Directorate for Nature Management on the protection of Outer Hvaler National Park. The recommendations of the Directorate and the County Governor have formed the basis of the Ministry of the Environment’s decision concerning the National Park, introduced by Royal Decree on 26 June 2009, which includes the statement: ‘It is a condition of the resolution regarding protection of the National Park that this may not be an impediment to plans to deepen and improve the fairway into the Port of Borg.’

In the NCA’s action plan for 2010 – 2019<sup>16</sup>, one of the planned measures is to improve the fairway for marine traffic to and from Fredrikstad. This measure proposes dredging a section of approximately 3 km at Røsvikrenna. This will increase the width from 90 to 150 metres. The measure also includes re-marking the fairway in Røsvikrenna. This is based on the fact that the NCA has identified that the area poses a critical and high risk to marine safety.

The NCA also plans to improve the fairway marks between Vidgrunnen and Røsvikrenna (see Annex H).

As mentioned in section 1.6.3, the *Godafoss* investigation has discovered that there is a lack of information for users about routes in the newly established Swedish-Norwegian national

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<sup>15</sup> Letter from the NCA to the County Governor of Østfold, ref. 07/01995-3, dated 13 August 2007.

<sup>16</sup> From [www.Kystverket.no](http://www.Kystverket.no)

park when awaiting pilots at Vidgrunnen. Facts about the national park and its boundaries appeared to be unknown to those crew members of *Godafoss* who were interviewed by the AIBN after the accident on 17 February 2011. Swedish nautical charts of the area have the park's boundaries drawn in for areas of the national park covered by these charts, but the corresponding Norwegian nautical charts do not yet have them drawn in. Nor is there any such information on the British Admiralty nautical chart used by *Godafoss*, since local corrections such as these will only be made if information has been received from national geographic authorities.

Consequently, after the National Park was established on 9 September 2009, the AIBN has found that the area's new status is not reflected to any significant degree in revised sailing instructions or on nautical charts available to mariners at the present date. Quite the reverse; since the National Park was established, several accidents and near accidents have been reported, in which the potential for loss of human life and/or acute pollution was very much present.

- Mid June 2010. The Chinese-flagged bulk carrier *Top Wing*, destined for Øra with a cargo of soya, came in on the wrong side of the green stake at Torbjørnskjær lighthouse and passed close to some ten-metre deep shallows with a draught that exceeded this. The 187 metre long vessel had 350 tonnes of heavy fuel oil on board. The vessel had not yet arrived at the area of compulsory pilotage, but was within the National Park.
- 10 November 2010. The Faroese-flagged ro-ro vessel *Cometa* grounded on Fugletangskjær at the approach to Løperen. The vessel had approximately 180 tonnes of heavy fuel oil on board. No injuries or environmental emissions. Compulsory pilotage did not apply to this vessel, since the crew on board had a pilot exemption certificate for the area. The vessel ran aground inside the national park.
- 11 January 2011. Bahamas-flagged bulk carrier *Orient Bulker*, destined for Øra with a cargo of soya, sailed outside the pilot corridor and up Blåkollrenna along the buoys marking the boundary with Tisler in bad weather, darkness and very treacherous waters. The vessel had misinterpreted the normal approach fairway and had not yet arrived at the pilot station. The 177-metre long bulk carrier had over 200 tonnes of heavy fuel oil on board. The vessel sailed through the eastern area of the National Park and passed close to the specially protected coral reef at Tisler.
- 5 October 2011. The Maltese-flagged cargo vessel *Noah* grounded at Kuskjær in Løperen during its approach to the Port of Borg. According to its AIS tracking data, the vessel did not follow the north-west route around Torbjørnskjær/Mefjordbåen, but came in between N. Koster and Heia and continued west of Tisler. Compulsory pilotage did not apply to this vessel, since the crew on board had a pilot exemption certificate for the area. The vessel had 20 tonnes of diesel on board. No injuries or environmental emissions. The vessel sailed through the national park and passed the specially protected coral reef at Tisler.

The four incidents above have all been recorded by official sources since June 2010.

The AIBN notes that the accident involving *Godafoss* has triggered a broad debate about general maritime safety, the mandate of the VTS and the role of the pilotage services in the outer Oslofjord, with an assumed focus on increased protection of the national park. With a view to improving monitoring and control of commercial marine traffic in and around the national park, proposals have come from local parties suggesting that a mandatory sailing corridor be established for commercial traffic west of Torbjørnskjær. The AIBN notes that good proactive safety measures and better cooperation could be a positive and welcome reaction in the wake of an undesirable incident.

## 1.7 The pilotage service

### 1.7.1 Current regulations on compulsory pilotage and marine traffic

The regulations relating to compulsory pilotage in Norwegian waters<sup>17</sup> were in force at the time of the accident. They were drawn up pursuant to the Pilotage Act.<sup>18</sup> One of the purposes of the regulations is to ensure an effective pilotage service, which can contribute to the safety of traffic at sea, and thereby protect the environment. Pilotage is defined as guidance relating to vessels' navigation and manoeuvring.

Section 5 defines the areas of compulsory pilotage. This means that vessels subject to compulsory pilotage have a duty to use a pilot from the pilot boarding field at Vidgrunnen. One of the paragraphs is worded as follows: *Irrespective of the pilot boarding fields specified on the nautical chart, each individual pilot shall determine in consultation with the vessel concerned where the pilot is to board or disembark.*

This paragraph was added by amending regulations of 7 December 2010 and entered into force on 1 January 2011. The background to including the above paragraph in the regulation was a desire to codify by regulation that pilots could board in locations other than the pilot boarding field. The practice had already been incorporated in the agency's internal guidelines. The most relevant source of law relating to the purpose of the paragraph can be found in the preparatory document to the amending regulations. The comments describe Section 5, fourth paragraph as follows:

*'The third paragraph of the provision is new, and is intended to ensure the safety of the pilot and the pilot boat. It will therefore be possible to vary the exact boarding position, depending on wind force, wind direction, wave height and other traffic.'*

The Regulations relating to maritime traffic in certain waters include requirements that apply to the fairway between Løperen and Fredrikstad.<sup>19</sup> The provisions stipulate aspects such as capacity limitations, points for meeting and passing other vessels and daylight requirements. It stipulates a number of requirements regarding where and how vessels may meet and pass each other in the fairway between Vidgrunnen and Fredrikstad. On the stretch between Vidgrunnen beacon and the north end of the quay at De-No-Fa, the entire voyage must take place in daylight by vessels with a length of more than 165 metres or a draught greater than

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<sup>17</sup> Regulations of 23 December 1994 no 1129: *Forskrift om plikt til å bruke los i norske farvann* (Regulations on compulsory pilotage in Norwegian waters – in Norwegian only).

<sup>18</sup> Act no 59 of 16 June 1989 relating to the Pilotage Service (*Lov av 16. juni 1989 nr.59 om losjenesten m.v.* - in Norwegian only) section 13.

<sup>19</sup> Regulation of 15 December 2009 No 1684: *Forskrift om sjøtrafikk i bestemte farvann* ('Regulations relating to maritime traffic in certain waters' – in Norwegian only), section 24.

9 metres. The NCA may grant dispensation from the regulation if there are special grounds for doing so, and if it is deemed to be justifiable from a safety perspective. According to the regulations, it is not possible to issue pilot exemption certificates for vessels with a length of 150 metres or more.<sup>20</sup>

### 1.7.2 Composition of the NCA's quality control system

From 1 May 2009, the NCA switched to an intranet-based quality control system (QCS) and existing instructions for pilot services were gradually replaced by procedures and underlying instructions in the new QS.

A number of instructions were drawn up and included in the procedure LOS 9 'Pilot services – Operations'.

On 22 June 2010, a new set of instructions were laid down in LOS 9.5 'Pilot guidance over a distance from pilot boat' (see Annex G). The purpose of the instructions is to ensure that the following practice is adhered to: 'When safety dictates that disembarkation/boarding must take place in sheltered waters before the normal pilot boarding ground.' The instructions include the following wording:

*'When a pilot who has been allocated a pilotage assignment has assessed that the weather conditions are such that for safety reasons boarding or disembarkation cannot take place at the normal boarding ground, a pilot may guide the vessel seeking pilotage over a distance from the pilot boat.'*

On the same day, a separate set of instructions were established for the head of pilot services: LOS 9.8 'Local boarding restrictions', see (Annex C). The instruction includes the following:

*'The head of pilot services is responsible for ensuring that each maritime traffic department has introduced restrictions that take into account local conditions relating to the use of pilot boats within that department's area of responsibility. On the basis of experience, these restrictions shall define limits as to when boarding and disembarkation may take place at the various pilot boarding grounds.'*

*'The restrictions shall be part of and implemented in the pilot services' QA system. The local restrictions shall be set out in the form of instructions, with pertaining appendices as required. The head of pilot services shall be responsible for approval of same in the QA system.'*

The two above-mentioned sets of instructions have been in force in their current form since 23 June 2010.

Before the NCA introduced the intranet-based quality system, the 'Pilot Book' constituted the service instructions for state pilots. The 2001 edition of the 'Pilot Book' included the following passage:

*'If for safety reasons a vessel must be directed beyond the normal boarding ground, the pilot is obliged, even while on board the pilot boat, to guide the vessel if possible,*

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<sup>20</sup> Section 11.

*with those aids he has at his disposal until boarding can take place. Similarly, if the pilot must disembark in a location other than the boarding ground, the pilot is obliged to guide the vessel as far as the normal pilot boarding ground.'*

The 'Pilot Book' did not go into more detail about what came under 'safety reasons'.

### 1.7.3 Instructions on performance of pilotage services

The NCA's instructions LOS 9.4 on performance of pilotage services applied to all state pilots<sup>21</sup> (see Annex E).

The purpose of the instructions is to set standards for how pilots should act before, during and after a pilotage assignment. These include the following:

*'The state pilot shall plan the pilotage assignment in consultation with the vessel's commander and bridge team.*

*The state pilot shall not take over navigation or manoeuvring before relevant information has been exchanged with the vessel's commander or officer in charge of the watch, for example about the vessel's position, course and speed.*

*The state pilot shall clearly express when he or she is taking over or relinquishing command.*

*Pilot guidance shall be communicated in a clear and unambiguous manner, so as to prevent misunderstandings.*

*The state pilot shall check that his or her guidance on speed, rudder use and course is repeated and implemented.*

*During pilotage, the state pilot shall monitor and check the vessel's position, heading and speed.*

*The state pilot shall be a part of the vessel's bridge team and shall help to ensure that the bridge team works together and communicates in an optimum manner (BRM).*

*If during a pilotage assignment, the state pilot finds that the prerequisites for good BRM are not present, the state pilot shall make the best of the situation in order to carry out the assignment safely. In such instances, the situation shall be logged in Njord, and the nonconformity shall be reported to the head of pilot services, in order that the shipping company or shipping agent may be notified. The state pilot may take precautionary action to prevent environmental damage.'*

### 1.7.4 Instructions for traffic regulation during boarding operations at Vidgrunnen

Instructions that were considered to be the instructions applying on 17 February 2011 to the pilots, head of pilot services and VTS centre for the Oslofjord are quoted below. These instructions were not formally included in the NCA's quality control system. The instructions were considered to apply to the VTS centre and the pilot service. The instructions include the following points:

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<sup>21</sup> NCA instruction LOS 9.4 'Conducting pilotage', dated 7 July 2010.

*'Horten VTS is responsible for ensuring that large vessels with a length of more than 125 metres or a draught greater than 7 metres that intend to sail up Løperen do not pass Trestenen beacon without the permission of the pilot assigned to the vessel.*

*If the seas are high, Horten VTS may consult with the pilot and direct the vessel to the north of Tisler for boarding/disembarkation.*

*In high seas, pilot disembarkation shall take place at the pilot boarding ground north of Tisler. However, disembarkation may also take place between Håbu beacon and the boarding ground if the pilot and the master find that it is justifiable from a safety perspective.'*

The boarding position is defined as the position at which the pilot is taken on board or disembarks. The pilot boarding ground is a field marked on nautical charts with the pilot boarding symbol. The symbol is a guide to where the pilot should board or disembark. The NCA understood this to be an area with its western boundary south-west of Trestenen beacon and its eastern boundary south of Løperen.

The instructions did not specify what was meant by 'justifiable from a safety perspective' more clearly. When various people in the pilot service were asked about this, they explained that the term involved an assessment of the standard of the vessel's navigational technology, the experience of the bridge team in sailing the waters, and whether the pilot had confidence in the bridge team, primarily the master.

#### 1.7.5 Background to the current instruction for pilot disembarkation

##### 1.7.5.1 *The practice that was established among the pilots of Fredrikstad*

For many years, it has been the practice of the pilots in Fredrikstad to disembark whilst en route through Løperen. However, the AIBN has not received clear answers to the question of how often this was done, whether there were different practices among the pilots, and whether the vessel's size and draught, weather conditions and other conditions limited this practice; see also section 1.8.

##### 1.7.5.2 *Immediate measure by the head of pilot services and head of VTS, March 2010*

After near-accidents and reported non-conformities, the head of pilot services and head of the VTS made a joint decision to introduce the following immediate measure in March 2010:

*'Pilot disembarkation shall take place at Vidgrunnen. If for safety reasons the pilot must disembark inside Kvernskjæret, the pilot boat shall lead the way until the vessel reaches Vidgrunnen beacon.'*

In March 2010, the decision was also taken to appoint two working groups, one for the west side and one for the east side of the Oslofjord. Their mandate was to prepare proposals for instructions for the pilot boarding fields of Færder and Vidgrunnen. The working groups were composed of the traffic controller, pilot supervisor and the pilot boat supervisor. The head of the VTS headed the working groups.

#### 1.7.5.3 *Nonconformity reports from the vessel traffic service (VTS) concerning pilot disembarkation practice*

In the course of April 2010, two nonconformity reports were sent to the head of the VTS centre. In both cases, the nonconformity reports concerned the fact that the pilot had disembarked in Løperen.

On the first occasion, the pilot disembarked at dusk. At the time, the vessel was in the area north of Håbu, in the red sector of the light from Kvernskjær beacon and sailing towards Kvernskjærgrunnen. There was a fresh breeze and moderate sea. On the second occasion, the pilot disembarked in daylight. The vessel had passed Håbutangen and was on course to pass between Fugletangskjær and Kvernskjærgrunnen. There was a moderate breeze and slight sea.

The NCA has since been unable to locate these nonconformity reports or document how they were followed up.

Following the accident, NCA employees have remarked that the background for these nonconformity reports must be seen in the light of what has been described as an internal professional struggle.

#### 1.7.5.4 *Fredrikstad - the pilots' opinion of what the instructions should be*

In May 2010, the pilots in Fredrikstad held a meeting, at which the practice for boarding and disembarkation at Vidgrunnen was discussed. The majority of the pilots agreed on the following wording, which was forwarded to the head of pilot services and the head of VTS as input for the work of establishing a new set of instructions.

*'Boarding/disembarkation at the Vidgrunnen pilot boarding ground:*

*Boarding shall take place at the pilot boarding ground unless otherwise indicated by VTS/ the pilot.*

*Large vessels shall be boarded before passing Trestein beacon.*

*The VTS centre is responsible for ensuring that large vessels do not pass Trestein beacon without permission from the pilot.*

*Disembarkation shall take place at the pilot boarding ground or north of Tisler when the sea is very rough. Disembarkation can nevertheless take place between Håbu beacon and the boarding ground when the pilot and the master find this justifiable from a safety perspective.*

*The VTS centre shall always be informed prior to disembarkation.'*

#### 1.7.5.5 *The final process of establishing the instructions*

In connection with departmental meetings held in June 2010, the working group's draft was presented, together with input from the pilots. Based on the discussions at these meetings, a set of proposed instructions were sent to the NCA's head office. These were the instruction (see section 1.7.4) that were deemed to be applicable by VTS and the local pilotage service when *Godafoss* ran aground. The instruction were deemed to cover both traffic controllers and pilots. The head of pilot services received no feedback on the instructions from the head office and they were not included in the NCA's management system.

#### 1.7.5.6 Use of tugboat when calling at Fredrikstad

Los 9.7.1.1.OSA – *Fastsetting av krav og begrensninger for Oslofjorden sjøtrafikkavdeling*<sup>22</sup> ('Definition of requirements and restrictions for the Oslofjorden Department for Maritime Traffic – in Norwegian only) defines requirements for fairways and quays in the traffic area, including the following requirements relating to Fredrikstad:

*'When going alongside the quays in Fredrikstad harbour, the use of a tugboat with at least 15 TBP<sup>23</sup> shall be considered for vessels of more than 12,000 dwt. In addition, the use of a tugboat shall be considered for smaller vessels with reversible engines and/or without thrusters. The same applies when the wind speed exceeds 12m/s or the water flow rate exceeds 1,200 m<sup>3</sup>/s.'*

*Godafoss* has a dead weight of 17,042 tonnes (dwt). As the pilots considered the manoeuvrability of *Godafoss* and her sister vessel to be good, a tugboat was not normally used when calling at or departing from Øra container terminal.

#### 1.7.6 Organisation and management

The NCA is the Ministry of Fisheries and Coastal Affairs' agency for maritime transport, maritime safety, ports and acute pollution response.<sup>24</sup>

'The NCA seeks actively to ensure efficient and safe maritime transport through addressing the transport sector's need for navigability and efficient ports. The NCA prevents and limits the damaging effects of acute pollution, and contributes to a sustainable development of the coastal zone.'

The head office is located in Ålesund and there are five regional offices with responsibility for operating the pilotage services and work on fairways and aids to navigation, including lighthouses, within their geographical areas. The regions exercise authority pursuant to the Norwegian Act relating to harbours and fairways, the Norwegian Pilotage Act with pertaining regulations and parts of the Norwegian Pollution Control Act. Oslofjorden Maritime Traffic Department belongs to region South-East.

The head of pilot services is the head of Oslofjorden Maritime Department and thereby also the manager for the pilots, the pilot supervisor and the pilot boat skippers serving the Port of Borg.

Pursuant to the procedure *Los 9 – Lostjeneste – Operasjonell drift* ('Pilot 9 – Pilotage Services – Operation') dated 27 January 2010, the responsibilities of the Department for Maritime Traffic include the following:

*'The Department for Maritime Traffic is responsible for preparing and maintaining necessary procedures pertaining to and complimenting these instructions. The procedures are subject to approval by the person with professional responsibility in the Department for Maritime Safety.'*

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<sup>22</sup> Version of 1 April 2009.

<sup>23</sup> Tonnes bollard pull

<sup>24</sup> The information was obtained from [www.kystverket.no](http://www.kystverket.no)



*'The Department for Maritime Traffic is responsible for procuring, preparing and maintaining necessary specifications, manuals and guidelines pertaining to this procedure.*

*The Department for Maritime Traffic shall administer the pilotage services and monitor compliance with compulsory pilotage rules in its various departments pursuant to applicable laws and regulations, in addition to:*

- *health, safety and environmental requirements;*
- *allotted budgets;*
- *the NCA's general pilotage guidelines;*
- *the NCA's local pilotage guidelines.'*

The person with professional responsibility in the Department for Maritime Safety means the pilot inspector in the NCA's Department for Maritime Safety. The Department for Maritime Safety is one of the departments at the NCA's head office.

#### 1.7.7 The pilot

The pilot had attended the Norwegian Naval Academy and served in the Norwegian navy for 15 years. He started as a trainee pilot in February 1998 and passed his first pilot exam in Bergen in July 1998. In 2008, the pilot moved to Fredrikstad, and he passed his pilot exam for the area in December that year. In total, he has been a pilot for 13 years.

The pilot went on duty on Monday 14 February. On 16 February, he returned from a pilotage assignment at 22:30 His first pilotage assignment after that was on board *Godafoss*. He had boarded *Godafoss* at 17:15. The pilot's work load satisfied the rules on rest periods between pilotage assignments. The police tested the pilot for alcohol content in the blood after the accident. The test showed zero alcohol intake.

#### 1.7.8 Horten Vessel Traffic Service (VTS)

Horten VTS was established in 1999 and is located in the Port of Horten. Geographically, the VTS centre is responsible for the navigational waters within an area delimited by a straight line from Tønsberg Tønne across Sydostgrunnen to the baseline, along the baseline as far as the border with Sweden and along the border with Sweden as far as the shore. The scope of Horten VTS's operations is the navigational waters between these lines and a line drawn along the N 59° 48' parallel (at Spro/Steilene at Nesodden). These navigational waters are called Sector 1. Together with Bunnefjorden, the navigational waters north of sector 1 are called sector 2 and fall under the scope of Oslo VTS. Sector 1 is in turn divided into two areas, with the navigational waters between Spro/Steilene and Hollenderbåen being designated as position 1 and operating on VHF channel 19. Position 2 covers the remaining waters in sector 1 and operates on VHF channel 18. The vessel ran aground in position 2 of sector 1.

All traffic of vessels over 24 metres, and all inbound vessels carrying dangerous goods, regardless of size, are required to notify the VTS centre. The same applies to all vessel movements within the area.

The NCA's website lists the following tasks for its VTS centres (see Annex K):

6. *The VTS centres' tasks:*

- *to grant sailing permission to vessels before they sail into the VTS area and before they leave port;*
- *to provide information to and regulate vessel traffic;*
- *to intervene to enforce the regulations as necessary;*
- *to monitor and immediately contact the vessels on suspecting engine problems, incorrect course or anything else that is out of the ordinary;*
- *to summon, direct and provide assistance to vessels as necessary;*
- *to be a part of the NCA's first-line acute oil spill response organisation.*

Two traffic controllers were on duty during the evening of 17 February. When interviewed, the traffic controller on duty for position 2 stated that they understood their primary tasks to be to monitor vessel traffic in the area and to ensure that the vessels complied with the applicable provisions of the current Maritime Traffic Regulations. In an interview, the traffic controller pointed to the need to control vessel traffic so that vessels would not meet in the narrowest locations and, as far as possible, for the VTS centre to focus particularly on vessels sailing without a pilot.

## 1.8 Pilot disembarkation in Løperen

The instructions, which were deemed to apply to pilots and traffic controllers on 17 February 2011, allowed disembarkation between Håbu beacon and the boarding ground when the pilot and the master found this to be 'justifiable from a safety perspective'. The AIBN has sought to understand what the phrase 'justifiable from a safety perspective' meant to the pilots.

The fact that the instructions state by way of introduction that disembarkation shall take place at the pilot boarding ground north of Tisler when the sea is very rough, must mean that the phrase was not primarily understood to apply to pilotage in very rough seas.

When asked, some of the pilotage service personnel explained the phrase as meaning an assessment of the standard of the vessel's navigational technology, the bridge team's experience of sailing through the navigation channel and whether the pilot trusted the bridge team, primarily the master. These were aspects that are understood have been considered important when the pilot suggested disembarking at Skipstadsand, before *Godafoss* ran aground. It probably also played a role that the vessel and crew were well-known by the pilots in Fredrikstad, since the vessel had sailed the same route for a number of years. Moreover, there was a common cultural understanding, giving rise to mutual trust and respect. At the same time the AIBN is nevertheless under the impression that the pilots differ in their understanding of what kind of practice should be deemed to be justifiable from a safety perspective. Some thought it was justifiable to disembark in Løperen, across from Skipstadsand pilot station. Others thought it was justifiable to disembark in Løperen, but not further north than Håbutangen. Yet others thought that it was not justifiable to disembark in Løperen at all.

There were also arguments as to whether the practice could be deemed to be justifiable when it was dark and whether vessel size played a role. This reinforces the point that there were

differences of opinion among the pilots in the area as to whether disembarkation in Løperen was 'justifiable from a safety perspective' in the case of *Godafoss* and *Dettifoss*.

The AIBN has also been told that, over the years, early pilot disembarkation has been the express wish of some of the vessels making regular calls. The reason is that this gives the vessels an opportunity to get up a good speed on sailing out through the channel between Fugletangskjær and Kvernskjæret before turning at Vidgrunnen. In this way they avoided slowing down at the pilot boarding ground. In other words, this was an agreed and established practice seen as being in the interest of all parties, and thus not perceived as immediately increasing the risk, provided that the vessel's crew was experienced.

In order to increase its understanding of pilot disembarkation practice in Løperen and at Vidgrunnen, the AIBN conducted a more thorough review. The review looked into whether it was possible to identify particular characteristics relating to this practice, in terms of vessel type, the size of the vessel, cargo category, port of departure, which pilot was on board, light conditions, and wind and sea conditions.

For the whole of 2010, SHT reviewed all vessels leaving the Port of Borg (Fredrikstad, Sarpsborg, etc.) and sailing through Løperen. This involved a total of 523 pilotage assignments.

In the case of *Godafoss* and *Dettifoss*, all sailings from Fredrikstad during the period 17 April 2009 to 17 February 2011 were reviewed. This involved a total of 90 pilotage assignments. *Godafoss* and *Dettifoss* are sister vessels, sailing the same route on alternate voyages and operated by the same shipping company.

Based on the collected data, the points at which the pilots disembarked were grouped as follows:

1. Løperen – from Skipstadsand to Håbutangen
2. Løperen – from Håbutangen to north of Vidgrunnen. 'North of Vidgrunnen' includes those cases in which the pilot boat comes alongside the vessel north of Vidgrunnen and *prior to* changing to a westerly course.
3. Vidgrunnen – the pilot boarding mark, and also areas south of Vidgrunnen such as Duken and Bergholen
4. South and west of Trestenene
5. Unknown

Although both the first two categories must be deemed to constitute disembarkation in Løperen, they differ according to whether the pilot disembarks before or after Håbutangen. In practice, the difference for most vessels consists of whether the pilot disembarks before or after the change of course at Håbu.<sup>25</sup>

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<sup>25</sup> In the case of some of the vessels sailing east of Lubbegrunnen, the course is not necessarily changed at Håbu.

We also investigated whether there were differences in practice relating to the periods during which disembarkation took place. The periods were defined on the basis of the NCA's amendment of the instructions for pilot disembarkation at Vidgrunnen.

1.8.1 Sailings with *Godafoss* and *Dettifoss* from Fredrikstad between 17 April 2009 and 17 February 2011 – a total of 90 pilotage assignments

In the case of *Godafoss* and *Dettifoss*, it was normal practice for the pilots to disembark in Løperen. No relationship has been observed between pilot disembarkation point and visually observed wave heights. In other words, pilot disembarkations took place in Løperen during both calm and very rough seas. Correspondingly, disembarkation took place at Vidgrunnen during both calm and very rough seas.

Wind conditions cannot be observed to have made any significant difference to the frequency with which disembarkation from *Godafoss* and *Dettifoss* took place in Løperen, with the exception that disembarkation did not take place at Håbutangen in westerly or south-westerly winds.

However, what we can observe is a clear difference in practice between the pilots. During the period seen as a whole, i.e. from 17 April 2009 to 17 February 2011, six of the pilots disembarked in Løperen at least every other time. Five of these pilots disembarked *before* reaching Håbu on one or more occasions. Disembarkation *before* Håbu took place a total of 18 times during the period. Four pilots never disembarked from *Godafoss* or *Dettifoss* in Løperen.

Before the introduction of immediate measures by the head of pilot services, disembarkation took place in Løperen in the case of 70% of all pilot assignments on *Godafoss* and *Dettifoss*; see Figure 15. That is a significantly higher proportion than for the total number of vessels that sailed out Løperen under pilotage.

From the time that the head of pilot services introduced immediate measures (17 March 2010) and until the time of the accident, there are significantly fewer observations of disembarkation in Løperen from *Godafoss* and *Dettifoss* in the dark.

From the beginning of 2011 until the time of the accident, every third disembarkation during outbound voyages with *Godafoss* and *Dettifoss* took place in Løperen. Disembarkation at Vidgrunnen took place during both calm and very rough seas.

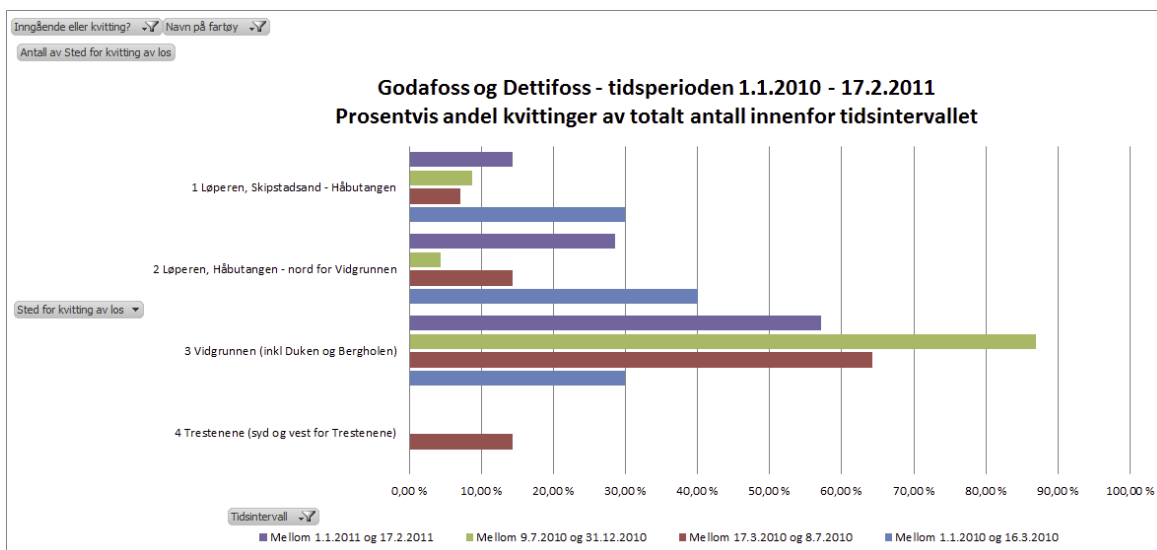


Figure 15: Breakdown in per cent on place of disembarkation for Godafoss and Dettifoss from 1.1.2010 to 17.2.2011. Percentage share is in relation to the total within the same time period.

### 1.8.2 Outbound vessels sailing through Løperen in 2010 – a total of 522 pilotage assignments

Based on an analysis of all outbound vessels under pilotage through Løperen in 2010, only a few, if any, external conditions have placed limitations on when pilot disembarkation in Løperen has been deemed unacceptable by the great majority of pilots. This practice has not been significantly limited by whether the vessel concerned was a cargo vessel or a tanker, whether the voyage took place in daylight or in the dark, whether the wind was light or strong, wind direction, high or low seas or place of departure. In those cases when the pilot disembarked in Løperen, there were less than five cases in which the pilot boat remained in Løperen until the vessel reached Vidgrunnen.

For a long time, it has been normal practice for most of the pilots to disembark while the vessels were in Løperen, i.e. in the area where the vessel has been passing through a narrow navigation channel and before the pilot boarding ground at Vidgrunnen. This established practice may have been understood to be a time-honoured practice and it is understood to be part of the experience transferred to new pilots being trained for these waters.

Two observations from the analysis seem to have influenced the practice surrounding pilot disembarkation in Løperen. Firstly, pilot disembarkation in Løperen did not take place from vessels with a length of more than 165. Hence *Godafoss* and *Dettifoss* were the longest vessels from which disembarkation took place in Løperen. Secondly, a relationship can be observed between a change of practice regarding pilot disembarkation in Løperen and amendment of the applicable instructions from the NCA.

A considerable reduction in the practice of disembarkation in Løperen can be observed following the immediate measure introduced by the head of pilot services in March 2010, see Figure 16. When the new instructions were perceived to be applicable in July 2010, it once again became more common for pilots to disembark in Løperen. After that, pilot disembarkation in Løperen took place in the case of approximately 40% of all vessels under pilotage.

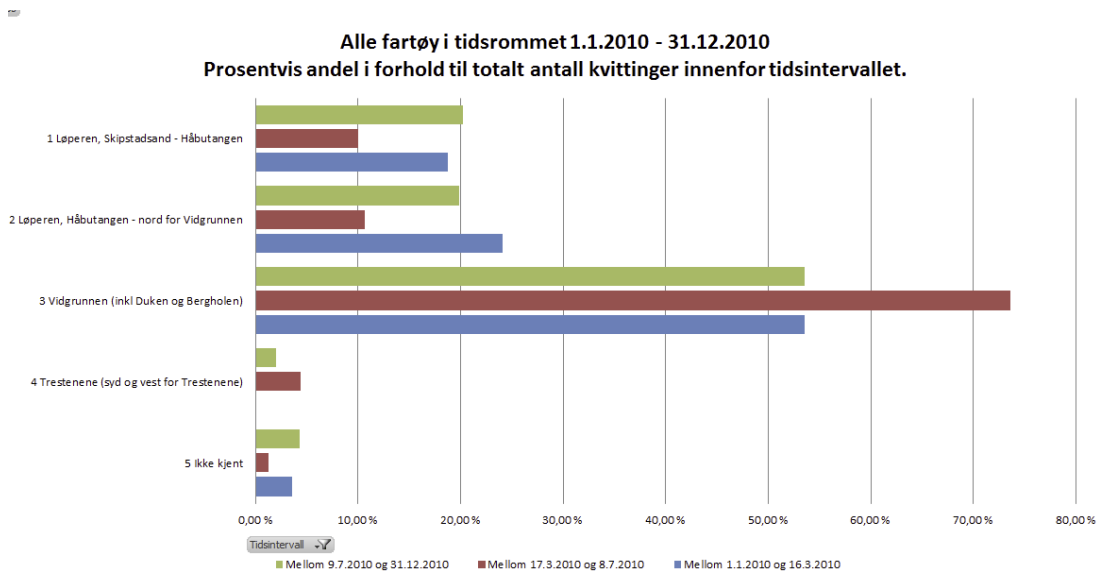


Figure 16: Break-down in per cent on pilot disembarkation points for all vessels in 2010. Percentage share is in relation to the total within the same time period.

Hence, the survey provides few, if any, indications of a relationship between the practice of pilot disembarkation in Løperen and external conditions such as observed wave heights.

What is not evident from the figures, on the other hand, are the pilots' assessments regarding whether they consider the vessel to be in a good state of repair, its manoeuvring capabilities and the crew's abilities and experience of navigating the waters in question.

## 1.9 Theory concerning relevant human and organisational factors

In order to clarify immediate and underlying factors, the analysis was based on the concepts of situational awareness, degree of activation, confirmation bias and bridge resource management. By way of introduction, these concepts are therefore briefly described below.

### 1.9.1 Situational awareness

Endsley (see Martinussen and Hunter, 2008, p. 155) defines situational awareness as 'the perception of elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future'.

The definition lists three levels of situational awareness:

1. The first level is the perception of important information in the environment.
2. The second level is the comprehension of the meaning of this information in relation to the situation one is in.
3. The third level is the use of this information to predict how it may affect the situation in the near future. Use of the concept of situational awareness can form the basis for understanding the decisions made by operating personnel.

A study by Grech, Horberry, & Smith, (2002) of 177 marine accidents in eight countries showed that 71% of these accidents could be related to situational awareness.

1. As much as 59 % of these could be linked to situational awareness at level 1, i.e. misperception of the environment,
2. while 33% concerned level 2, i.e. mis-integration and miscomprehension of the information from level 1, in relation to defined goals and plans.
3. Only 9% concerned level 3, i.e. the ability to use the information that had been perceived, integrated and understood to predict events that could occur in the near future.

### 1.9.2 Degree of activation

People are exposed to a continuous stream of influences/information (Ursin, Zahl-Begnum, 1993). In order to reduce the cognitive load, the brain selects what it deems to be important information from the environment. What are assumed to be unnecessary sensory impressions are filtered out through a gradual reduction in the person's orientation responses. In other words, the person discards sensory impressions that are deemed to be unnecessary. This means that, over time, the nervous system is able to suppress sensory impulses for which a person has no need. This is called habituation and is defined as a gradual decrease in an elicited behaviour resulting from the repeated presentation of an eliciting stimulus.

There is a necessary relationship between the physiological activation of the nervous system and a person's behaviour. Habituation is closely linked to the concept of activation. The concept of activation reflects the degree of activity in the cerebral cortex and the wakefulness of the organism. Various degrees of activation can be observed in the form of behavioural states varying from sleep to absolute wakefulness. Figure 17 shows the relationship between activation, behavioural states and performance. The figure shows that performance, that is the ability to perform, increases with increased activation of the central nervous system. This will nevertheless depend on the complexity of the work being performed. When solving more complex tasks, the level of activation must not be too high. Tasks requiring attentiveness and monitoring are the most sensitive to activation. Activation can be described as follows:  $\text{activation} = \text{perceived value} - \text{actual value}$

The perceived value is what a person expects to happen while the actual value is what actually happens. Activation increases as the gap between perceived value and actual value widens.

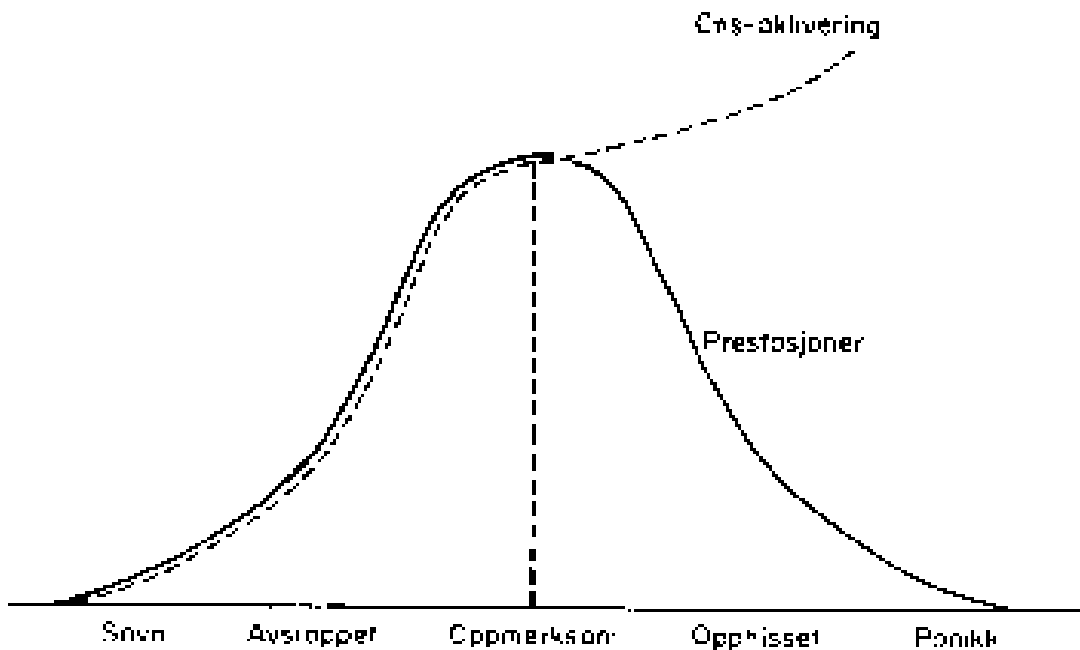


Figure 5: Den inverterte U-kurven.

Figure 17: The inverted U curve. (Ursin and Zahl-Begnum, 1993)

In order to increase activation and get a response from the individual, the actual value must increase enough to exceed the perceived value (for example an alarm).

Low activation can often occur when you are exposed to a monotonous sound (6-42 Hz), vibrations, a monotonous task or little activity, darkness, when you sit or stand still for some time, where control is fully automated, and when you feel comfortable warmth. Perceived mastery or control of a situation (by oneself or someone else) can also lead to a low level of activation and reduced attentiveness. Increased automation can have the same effect insofar as the monitoring person starts to rely on the technology and becomes more relaxed and less attentive. What happens is that one moves towards the left in the figure (approaching or already in a state of drowsiness).

A low degree of activation leads to low responsiveness, i.e. one's response to discrepancies or deviations is delayed. The degree of activation can be further reduced by tiredness (reduced muscular power), drowsiness (lower sleep threshold). Adaptation (lowered sensory responsiveness) also lowers the ability to respond.



### 1.9.3 Confirmation bias

People have a marked tendency to look for information that supports what they most believe at any time. This is known as confirmation bias (Kirkebøen, 2007). In order to assess whether a situation has been correctly understood, one looks for information confirming one's own point of view. As a result one can easily fail to register valuable information from the surroundings. In such cases it is essential to seek information that disproves one's own perception of the situation, i.e. to ask oneself whether one could in fact be wrong. Excessive focus on information that confirms our own understanding of a situation means that we focus less on information that raises doubts about the correctness of our understanding.

The analysis of the accident is also based on the concept of bridge resource management (BRM). Navigation involves leading a vessel *and* controlling these operations.<sup>26</sup> The concept of BRM is a maritime adaptation of the concept of Crew Resource Management (CRM) used in aviation. BRM is used to describe important principles for optimum utilisation of available resources (man and technology) to ensure a safe voyage. Important principles include matters relating to teamwork, communication, leadership, decision-making, resource allocation and how tasks are performed and affected by factors like stress, attitudes and understanding of risk. The BRM principles include preparation and planning of the voyage, the voyage itself and an evaluation of the voyage on arriving at the destination.<sup>27</sup>

The main objective of a well-functioning bridge team is to ensure that individual team members' undesirable actions or inaction are registered by the team, who will take necessary action to maintain control of the vessel. This reduces the risk of exposing the vessel and crew to danger. The AIBN believes that in order to achieve the objective and improve the safety of navigation in coastal waters, it is necessary to have a well-functioning bridge team that includes the pilot.

### 1.9.4 Normal practice

What is meant by 'normal practice' is the way in which tasks are performed and that is perceived as the ordinary way of doing things. Such a practice may have developed over time and may be based on interaction between the parties. It may consist of several different ways of performing a task, depending on the form of interaction, and without any of the various ways being perceived as reducing control of the situation. Normal practice does not necessarily correspond to approved practice or what is defined in procedures or instructions.

Normal practice may be driven by what Snook defines as practical action.<sup>28</sup> 'Practical action' is defined as 'behaviour that is locally efficient, acquired in practice, anchored in the logic of the task and legitimized through unremarkable repetition'.

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<sup>26</sup> Encyclopaedia Britannica defines navigation as the 'science of directing a craft by determining its position, course, and distance travelled'. The term 'navigation' and the verb 'to navigate' can be understood in several ways.

<sup>27</sup> *Bridge Team Management, a practical guide*. Capt. A J Swift, 2nd Ed. 2004, Nautical Institute.

*Shipboard Bridge Resource Management*, Michael R Adams, 2003, Nor'easter Press.

<sup>28</sup> *Friendly Fire – The accidental shootdown of U.S. Black Hawks over Northern Iraq*, Scott A. Snook, 4<sup>th</sup> printing 2002, Princeton University Press

### 1.9.5 Practical drift

The concept of practical drift is described by Snook on the basis of definitions of organisational states. The concepts and the theory are based on an individual study of the establishment of an organisation in which an undesirable incident occurs after some years.

In the designer state, the organisation is designed on the basis of a theoretical situation and developed along the principle of the worst-case scenario. This state requires tight couplings between the sub-units in the system and for actions to be performed in accordance with defined procedures. This state is established on the drawing board and does not necessarily take account of the practical implications of procedural requirements or the fact that the designers may be tempted to over-dimension the requirements.

In a performer state, the design of the organisation is based on the pragmatic logic of local sub-units in accomplishing day-to-day tasks. This state involves loose couplings between the sub-units in the system and actions are driven by the logic of day-to-day tasks. Snook defines practical drift by how the dependency between the sub-units of an organisation and the logic of its members in the performance of its actions changes over time. He observes that in time, the seductive insistence of a pragmatic practice will loosen the grip of even the most rational and well-designed formal procedures. This will lead to a slow, gradual change in (local) normal practice away from the procedures. Over time, the local practical actions within the sub-units will drift away from the originally established procedures. In other words, over time, the organisation will drift from a designer state to a performer state.

### 1.9.6 Vulnerability

The concept of vulnerability can be defined as an expression of the functional problems encountered by a system when it is exposed to an undesirable incident, and the problems encountered by the system in resuming its activities after the incident has occurred.<sup>29</sup>

### 1.9.7 Relevant incidents

The potential to improve maritime safety by focusing more on BRM was emphasised in connection with the AIBN's investigations of *Federal Kivalina* and *Crete Cement*.<sup>30</sup> Following those accidents, the NCA introduced measures to learn from experience and the AIBN understands that this work is ongoing.

## 2. ANALYSIS

### 2.1 Introduction

The analysis of the grounding of *Godafoss* sought to identify immediate causes, barriers and underlying causes so as to describe related safety problems. In order to identify safety problems through this analysis, it therefore starts by describing factors that, through the introduction of measures, may prevent undesirable incidents from occurring as a result of misjudgements and actions on the part of individuals.

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<sup>29</sup> <http://www.idi.ntnu.no/grupper/su/publ/ese/nou2000-24-ordliste.html>

<sup>30</sup> Marine Reports 2010/01 and 2010/04

The investigation concentrated on factors related to the pilotage service, the operation of the vessel and the navigational channel.

Through interviews conducted at Horten VTS, the AIBN obtained an account of the chain of events in question and the VTS's understanding of its own mandate and tasks relating to monitoring of the navigational waters. The AIBN understands that a VTS centre is not immediately able to efficiently instruct a course change of a vessel sailing through narrow waters like the ones we find in parts of Løperen. A VTS centre's instructions about a course change are not seen as a sufficient substitute for the additional safety provided by the physical presence of a pilot on board, who establishes a professional collaboration on the bridge.

However, the AIBN notes that a misunderstanding arose on 17 February, between the VTS centre and the pilot concerning where the latter actually disembarked from the vessel. At 19.42, the pilot informed the VTS centre by VHF radio that he would disembark in a few minutes, and the message was received and confirmed. However, there was no further observation of the vessel and the pilot boat operations on the VTS centre's monitors. Nor was there any further radio contact between Horten VTS and *Godafoss* during the period from the time that the pilot left the vessel until the vessel ran aground. The VTS centre received a call from *Godafoss* and was made aware of the grounding approximately five minutes after the accident. The AIBN finds it surprising that a commercial vessel can be grounded in the fairway for such a relatively long period without this being registered by the VTS centre.

The AIBN has chosen to limit its investigation to matters relating to the chain of events and the immediate causes of the accident. This means that matters relating to salvaging the vessel and limiting oil-spill damage to the environment have not been discussed.

Based on the facts obtained and the analysis, it is clear that the following did not have any impact on the accident and the investigation was delimited as follows:

- There was nothing to indicate that any members of the bridge team or the pilot were under the influence of alcohol prior to the accident.
- There is no indication of technical problems relating to the vessel's manoeuvring and propulsion system, or navigational equipment.
- Based on a tip-off that Kløvningarna beacon was giving off a stronger light than before, the AIBN has checked this with the NCA's national coordinator. NCA had no information to be able to confirm this. The AIBN has not followed this up, as it is assumed to be of limited relevance to the accident.
- Based on the analysis of the chain of events and the identification of immediate causes, the AIBN has accepted the information it has received about the master's workload and health without further comment.

## **2.2 Pilot disembarkation in waters subject to compulsory pilotage**

The Regulations on compulsory pilotage in Norwegian waters allow for pilot disembarkation on the basis of a discretionary assessment, in order that people, vessels and the environment are not exposed to excessive risk. The instructions that were perceived as applicable to pilot disembarkation at Vidgrunnen were established in the course of spring

2010. The establishment of these instructions showed that, within the NCA, there were differences of opinion as to whether the practice of pilot disembarkation in Løperen should be allowed to continue.

The establishment of Outer Hvaler National Park appears to have been a factor that received particular attention during the preparation of the instructions for pilot disembarkation in Løperen. In the AIBN's opinion, it would be natural to raise the level of safety in an area established as a national park in relation to the normal level for the rest of the Norwegian coast.

The final instructions are largely identical to the proposal from the pilots in Fredrikstad. This meant that the instructions allowed for pilot disembarkation in Løperen when this was 'justifiable from a safety perspective'. The instructions do not state that it is necessary in such cases to accompany the vessel to the pilot boarding ground (pilot guidance over a distance from the pilot boat). This part of the instructions was thus not retained from the previous service instructions for state pilots (*Losboken 2001* - 'The Pilot Book 2001' – in Norwegian only) and the immediate measures introduced by the head of pilot services (March 2010).

The AIBN believes that the most important reason why the pilots wanted to continue to disembark in Løperen was that it allowed for flexible arrangements. It also saved time during assignments in that the pilot came ashore earlier than he would otherwise have done so. The primary reason for this practice was that it had been deemed to be justifiable by the vast majority of pilots over a long period of time. A requirement that the pilot boat should accompany the vessel out of Løperen would have meant that the time saved would have been lost.

Pilot disembarkation *before* Håbutangen beacon means that a change of course to starboard must be carried out after the pilot has left the bridge. This was not carried out when *Godafoss*<sup>31</sup> ran aground. Pilot disembarkation *after* Håbu means that the vessel will continue on the same course as it had through the final part of Løperen. For the pilot to disembark, the vessel must, normally, reduce its speed to 6-7 knots. This will take place in the narrowest part of the channel after Håbu, where the vessel may be exposed to side winds and drift. At lower speeds, the drift may increase, and it may be necessary to correct the course accordingly. However, the nature of the navigation channel shortens the time period for making corrections. The AIBN therefore believes that, in relation to the vessel's overall vulnerability, there is, in effect, little difference between pilot disembarkation before and after Håbutangen beacon.

The nonconformity report from the VTS centre reflected that there was disagreement within the NCA about whether the practice of disembarkation in Løperen was justifiable. The pilots understood this to be part of the professional struggle that was going on between the VTS centre and the pilotage service. It is well-known that problems can arise as a result of professional struggles within an organisation. The situation within the NCA cannot be regarded as unique in this respect. However, the NCA has been unable to provide all the nonconformity reports or to explain how they were followed up or by whom.

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<sup>31</sup> This is conditional on the vessel sailing west of Lubbegrunden, which is normal practice for big vessels.

At the same time as the aforementioned instructions were being prepared, the NCA prepared LOS 9.5 Pilot guidance over a distance from pilot boat. The latter instructions were created for those cases in which boarding at the pilot boarding ground involved a risk of serious injuries or material damage.

The AIBN thus notes that there is a contradiction between the purpose of the instructions for pilot disembarkation in Løperen, and the intention behind the Regulations on compulsory pilotage. This contradiction was not registered by the NCA when it was preparing the instructions that were understood to apply at the time of the accident.

The AIBN considers pilot disembarkation in Løperen as a further barrier-loss for the vessel and the navigational waters.

### **2.3 Collaboration between the vessel's navigation officers and the pilot**

The shipping company's management system makes it clear that, in the relationship between the master and the pilot, information shall be exchanged about how to conduct the voyage, the bridge team shall collaborate with the pilot and monitor the voyage, and any doubts about the pilot's plans shall be raised with the pilot.

In the NCA's LOS 9.4 instructions, a corresponding procedure is expressed in that the instructions emphasise planning of the pilotage assignment in collaboration with the bridge team.

In connection with the pilot's boarding of *Godafoss*, and before the vessel left the quay, there are no records of any complete clarification between the pilot and the vessel's bridge team about how the voyage was to be conducted. It is assumed that they had enough time to clarify this since the departure was delayed. Having regard to the fact that the pilot was familiar with the vessel and that the vessel's bridge team had sailed these waters many times before, it can be argued that such a conversation would be seen as superfluous by both parties. However, the incident underlines the need to always re-establish a common understanding between the pilot and the vessel's bridge team concerning how a routine voyage is to be conducted.

When heading out from Fredrikstad, the pilot gradually takes on all activities relating to navigation as a matter of routine. For 26 minutes, the pilot made all course adjustments (by means of the autopilot) and controlled the speed of the vessel himself. During the same period, there was hardly any communication between the pilot and the bridge team about navigation. The chief mate was busy checking emails while the master was mostly standing port side of the centreline and monitoring the voyage. The fact that the port radar remained on standby up to the time that the pilot left the bridge, tells us that the master was happy to monitor the voyage visually or by sight.

The pilot is expected to be familiar with the navigation channel and it is not necessarily seen as a problem that he navigates visually in fair weather, but it is remarkable that the officer on duty does not maintain a barrier by verifying the pilot's decisions by using radar and chart to monitor the voyage.

With two other navigators on the bridge, the chief mate used his time to carry out other tasks. The master must have trusted the pilot's skills and knowledge of the navigation channel. The pilot understood it to be the best solution to adjust the course and control the speed himself. This practice had the consequence that the chief mate was removed as a

safety barrier, in that he did not participate in the navigation. The low degree of interaction between the vessel's bridge team meant that there was a risk that the master's level of activation would be reduced.

The atmosphere on the bridge while the vessel was heading out has been described as 'easy-going'. It can be deduced from this that there was a good relationship between the pilot and the vessel's bridge team. The AIBN understands that both the pilot and the bridge team wished to avoid sending out signals that could be perceived as throwing doubt on the other party's professional skills. The form of communication between the pilot and bridge team is characterised by informal norms whereby silence is understood to mean that everything is in order. So as to avoid the risk of the other party getting the impression that his professional skills are being questioned, communication about navigation is reduced to a minimum. When the pilot was about to leave the bridge, he asked the master if everything was OK, which the master confirmed that it was. In other words, there was no final handover to ensure that there was a common understanding of the vessel's position and its continued course. This can be explained by respect for the master and his extensive experience. Moreover, it may have been perceived as a matter of course that everyone on the bridge knew where the vessel was and what course to take from there. This explains why the master's misconception regarding the continued voyage was not contested.

After the pilot disembarked at Skipstadsand, the master held the vessel on the course that had been set by the pilot before he left the bridge, and he observed a red light on the starboard side. At the same time, the master chose to issue a command to the engine room that would bring the vessel's speed up to 14 knots, immediately after the pilot had disembarked. Such a speed was not uncommon through the last part of Løperen and it suggests that the master understood the voyage to be a matter of routine and felt secure about the situation.

## 2.4 Human factors

When a person feels comfortable about a situation and trusts that the work performed by others can be relied on, that person's level of activation may be reduced. This is a common problem and can be recognised in many situations. (For a theoretical explanation of the concepts of activation level, confirmation bias and teamwork on the bridge, see section 1.9)

Based on previous experience of pilot disembarkation in Løperen, the master remembered it to have taken place further south, i.e. after setting the course to between Fugletangskjær and Kvernskjærgrunnen. It is possible that this master had not previously experienced a pilot disembarking north of Håbutangen, and the master assumed that *Godafoss* would stay on the course set by the pilot before he disembarked.

On the night of the accident there was ice along the shores of Løperen. This meant that the transition between sea and the low-lying land was diffuse. The ice may have created the impression that the vessel was closer to land on the starboard side (on the western side of Løperen) than was actually the case. The master said that he may have understood this as a confirmation that *Godafoss* should not be further west in Løperen. There was also some drift ice, which may have given rise to further uncertainty about what was land and what was ice. The voyage was carried out visually with hardly any use of navigational aids.

The master has afterwards explained that he understood the outbound voyage to be unproblematic and a matter of routine after the pilot had disembarked, but he accepted that

he must have focused on the wrong light and thus misread the fairway. In other words, a confirmation bias existed already when the pilot left the bridge.

The fairway in Løperen is marked by a combination of two systems – lateral marks and the use of sector lights. The AIBN has received confirmation that all lights in the navigation channel were working on the night in question. The sector light at Kvernskjærgrunnen and the red lateral lights at Håbutangen and Fugletangskjær have different characteristics (occluding and flashing, respectively). From the time that the pilot disembarked, *Godafoss* was close to the intersection between the white and red sectors of the light from Kvernskjærgrunnen, observed from the bridge on *Godafoss*. The master saw a red light from his position, without giving much thought to the light's characteristic.

The master's observation of a red light ahead, whose characteristic was not given much thought, in combination with confirmation that the vessel should not be further west in Løperen, was probably taken to be confirmation of the master's assumption that *Godafoss* should continue on the same course.

This can be explained by a low level of activation resulting in a misinterpretation of the environment (situational awareness, level 1). A low level of activation can occur as a result of a number of different circumstances. The outbound voyage on 17 February was a routine voyage and the master felt comfortable with the situation. Combined with a low level of activation, a gradual reduction in the master's orientation response as a result of getting used to the voyage (habituation) may have led him to assume that the two red lateral lights were not relevant to his navigation. Observations that confirmed that assumption were accepted, while other observations that did not fit in with the assumption were excluded.

The master had both an electronic chart system and a radar at his disposal. Nevertheless, according to the AIBN's understanding of the situation, when the pilot disembarked, the voyage was continued visually with hardly any use of available navigational aids. That may have been why mis-integration and a failure to understand available information arose (situational awareness, level 2). The master was also aware that the passage marked on the electronic chart system was not accurate enough to be used as a navigational aid in these waters. Nor did the master have a passage plan describing in detail how the voyage was to be conducted between the Port of Borg and the pilot boarding ground.

As a result of the above-mentioned factors, the master continued along approximately the same course. The normal course for outbound vessels included keeping the red light on the starboard side. A misperception of the environment and mis-integration or inadequate understanding of available information did not include the possibility of running aground (situational awareness, level 3).

The sector light from Kvernskjærgrunnen may have disappeared from sight from the bridge approximately 30 seconds before *Godafoss* ran aground. When a new stimulus catches our attention (orientation response), our activation system is affected.<sup>32</sup> At the time when the Kvernskjærgrunnen beacon may have disappeared from sight, the vessel was little more than a ship's length from running aground. The point at which activation in the form of a preventive manoeuvre could have been accomplished, had already passed.

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<sup>32</sup> The actual value exceeds the perceived value, see section 1.9.2.

## 2.5 Manning of the bridge

As the chief mate accompanied the pilot to the A deck, the master was left alone on the bridge for the final nine minutes before the grounding. At that point, the vessel was navigated by one person alone through a narrow navigation channel, in which a change of course should have been carried out after just a few minutes.

The STCW Code requires the presence of a lookout on the bridge in addition to a navigator on watch. Only in daylight and following a thorough evaluation can the watchkeeping function be left to the navigator on watch. As a minimum, the officer on watch and a dedicated lookout are specifically required to be present on the bridge at all times during navigation in the dark. If there are two navigators on the bridge, the requirement for a lookout can be waved. These guidelines and requirements are reflected in the shipping company's safety management system.

The AIBN is under the impression that, on board *Godafoss*, it had been practice for some time that the officer on watch fetched and accompanied the pilot, while the able seaman on watch rigged the pilot ladder on the A deck. This necessarily meant that that the master was left alone on the bridge and had to carry out all navigational tasks during the eight to twelve minute period this usually took. The AIBN does not know when this became normal practice, but understood it to be an established practice questioned by nobody.

There may be several reasons why this practice was allowed to develop and was accepted. Firstly, the International Maritime Pilots' Association (IMPA) has prepared guidelines for the rigging of pilot ladders<sup>33</sup> whereby it is ensured that boarding takes place in accordance with the requirements of the SOLAS Convention. Among other things, the guidelines recommend that the master or another officer is responsible during pilot boarding and disembarkation to ensure that the requirements of the SOLAS Convention are met. Secondly, the master had extensive experience and was familiar with the navigational waters, and he was therefore regarded by the pilots as having a good understanding of local navigation. Furthermore, on the night of the accident, the weather was fair, navigational conditions were good and the vessel had no technical problems. It may have been perceived as unnecessary to call on members of the deck crew during their off-duty period, so that they could participate in carrying out a routine task for which existing practice had apparently been accepted. There had been no mention of this practice in connection with internal or external audits of the safety management system.

The grounding of *Godafoss* illustrates very clearly the vulnerability associated with having just one person on the bridge when navigating in narrow waters. In addition to errors of judgement, situations that will require immediate measures to prevent undesirable incidents include the potential failure of technical equipment, sounding of alarms and acute illness. In narrow navigation channels like Løperen, it is necessary to take the right corrective actions quickly. In the case of *Godafoss*, it was necessary to alter the course by 8 degrees to starboard at Håbu in the course of approximately two minutes after the pilot disembarked.

In accordance with Eimskip's safety management system for the vessel, the able seaman on sea watch shall assist the navigator on watch. But the able seaman on sea watch had been assigned tasks in connection with rigging and de-rigging of the pilot ladder, in addition to

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<sup>33</sup> <http://www.impahq.org/downloads/rigging%20of%20ladders.pdf>



having a routine of regular rounds to check the refrigeration containers while the vessel was at sea. The shipping company must have been fully informed about these routines. The crew's acceptance of the fact that there was sometimes only one person on the bridge in narrow waters and after dark, must be seen in the light of this.

The AIBN believes that the tasks that were defined for the able seaman on sea watch were incompatible with the rule of having a lookout to assist the navigator on watch, which is an absolute requirement for voyages in the dark. The AIBN has reviewed the deck crew's hours of work and rest. They largely worked the maximum number of hours per day that is acceptable pursuant to the STCW Code.

The AIBN believes that other tasks, such as handling and inspecting the cargo, have been carried out at the expense of having a permanent lookout. A conflict has therefore arisen on board the container ship between satisfying the requirements for watchkeeping and carrying out internally assigned tasks. There appears to have been a lack of clarification concerning how to use crew resources for these tasks and at the same time ensure compliance with international requirement and regulations by which the shipping company is bound. The shipping company has thus been in conflict with the intentions behind its own safety management system. This led to a weakening of barriers against undesirable incidents and increased the risk of such incidences having very serious consequences.

The grounding of *Godafoss* illustrates that even the obvious can be misconstrued and it is always possible to make the wrong choices, not just in the case of navigators with little or no experience of navigating the fairway, sub-standard vessels or poor sailing conditions. It is essential, therefore, that the parties on the bridge collaborate and that there is adequate and relevant communication between them at all times.

Insufficient collaboration on the bridge has been observed on board vessels where the officers and the pilot did not know each other beforehand and the pilot takes complete control at the same time as the officers stand aside and regard their task as a secondary one once they have taken the pilot on board. It can also arise on board vessels where the parties know each other well from regular calls and where they can end up misunderstanding each other because further exchange of obvious information is understood to be superfluous.

## **2.6 Marking of the fairway**

In the dark, the basic first-hand information from the marking system consists of colour and light characteristics. The system requires that seafarers pays attention to the light characteristic and whether the source is a sector light or a lateral light. The AIBN has considered the degree to which navigation lights in Løperen are informative on the basis of the colours of the lights from beacons and lateral lights.

When the navigation lights in Løperen were reviewed and seen in relation to the IALA guidelines, it was observed that there is an inconsistency between the red/green sector beacons and the corresponding lateral lights in the same fairway. Løperen has a relatively high number of red lateral lights on the western side, but very few green ones on the eastern side. On the eastern side, only Løperungbåen is marked by a green lateral light. Because of the inconsistency between the lights to the east and west, such limited information as can be obtained from day marks with indirect lighting can probably easily be ignored, so that the eastern side can be perceived as providing no lateral navigational information whatsoever. The lateral day marks by the Kvernskjærgrunnen and Lubbegrunnen beacons provide

navigational information that cannot be verified by use of charts or lists of lights and beacons. Neither the charts nor the lists of lights and beacons contain any information about whether the lights work as lateral day marks supplementing the sector light.

The NCA is planning to update and place new marks along the fairway between Vidgrunnen and Røsvikrenna between 2014 and 2019.

## 2.7 Factors related to limitation of the visibility line

In the AIBN's opinion, *Godafoss* has a conventional design, allowing the visibility line requirements to be met without structural modifications or additional equipment. Although the vessel was built in 1995, it will therefore be subject to the visibility line requirements applying to vessels built after 1 July 1998, cf. section 1.5.3.

Based on the AIBN's calculations, it is clear that the visibility line from the bridge on leaving Øra in the Port of Borg did not meet the applicable official requirements, (see **Annex B: Calculation of visibility line from the bridge**). The vessel's visibility limitations are important in relation to the bridge team's possibility of having acceptable visibility during navigation. If there are excessive limitations in visibility length and sector, then vessels, lights and other navigational marks can disappear from sight before this is deemed to be safe pursuant to the regulations. Leisure craft and low lying objects, in particular, will soon disappear from the visibility line. Locally, the challenge this poses is greater in the summer months when there is a high level of leisure craft activity in the area around Hvaler and Fredrikstad.

*Godafoss* deemed the visibility line to be acceptable on 17 February, when some members of the bridge team estimated it to have been approximately 50-100 m forward of the bow, observed from the bridge. This is not consistent with the calculations, which show that the visibility line may have been as much as twice the length required by the regulations. This was due to the containers on deck, the crane boom that was lying diagonally across the containers and a draught which resulted in an aft trim.

The AIBN has therefore carried out control calculations of the IMO visibility line shown on the drawing General Arrangement II, dwg. no 180-01-05, which corresponds to the drawing posted as a guideline on the bridge.

The AIBN's calculations were carried out for four different draughts between 5.95 and 8.95 m, with the latter being the maximum permitted draught. For each draught, the visibility line was calculated for both zero trim and an aft trim of 1.50 m.

The results of the calculations are presented in Table A below. With a draught of 8.95 m and zero trim, the visibility line hits the sea's surface 320.62 m forward of the bow, a figure that is close to the one on the drawing that served as a guideline (325 m).

It is otherwise noted that, of the calculated visibility lines listed below, only the one for a draught of 8.95 m and zero trim meets the minimum requirement in SOLAS (331.20 m). In the drawing 'IMO visibility line', the visibility line passes 1.50 m above the top of the foremost third tier of standard containers (8.5 feet high). If four tiers of standard containers are stowed, or if the 'high cube' type is included (9.5 feet high), the visibility line is considerably lengthened.

Draught midships at LPP/2, Dm [m]	The visibility line meets the sea's surface forward of the bow [m], no trim	The visibility line meets the sea's surface forward of the bow [m], 1.5 m trim
8.95	320.62	411.70
7.95	339.32	434.61
6.95	358.02	457.53
5.95	376.72	480.44

Table A: Control calculations of the IMO visibility line which served as a guideline on board *Godafoss*.

*Godafoss* and *Dettifoss* did not normally sail at maximum draughts. It was also normal to trim the vessels to an aft trim of approximately 1.5 meters. It is normal for this type of vessel to sail with less than full draught and with an aft trim. The AIBN got the impression that the shipping company's shipboard guidelines for checking that visibility from the bridge satisfies regulatory requirements was partially deficient and that the shipping company could have focused more on the vessel's visibility line limitations.

### 3. CONCLUSION

#### 3.1 The causes of failing barriers

Before *Godafoss* ran aground, barriers against injuries/damage and acute pollution of the environment had been weakened as a result of the following factors:

- Some of the requirements laid down in the shipping company's own safety management system on planning and carrying out navigation had not been complied with on 17 February 2011. Use of resources for tasks unrelated to safe operation, such as rigging of the pilot ladder and checking deck cargo, went at the expense of posting a dedicated lookout. The use of resources had not been sufficiently clarified in relation to those tasks that are necessary to ensure safe operation of the vessel. Nor was it documented that the voyage had been adequately planned. These circumstances are not regarded as unique to the night of the accident; they have probably persisted for some time and been accepted as normal and in accordance with acceptable practice by the vessel's crew. The shipping company has not detected this during internal audits, risk assessments or other improvement measures relating to the navigational conditions.
- When the pilot left the bridge, a conflict arose between the bridge crew requirements and the established practice whereby the navigation officer on watch accompanied the pilot down on the deck without this being compensated for by summoning a second person to man the bridge. A gap is observed between the use of available resources and navigational requirements on board the vessel. When the chief mate and the pilot had left the bridge, navigation was left to the master alone. The outbound voyage continued with hardly any use of other available navigational aids to check the visual perception of the channel. The speed was increased as soon as the pilot boat had left the side of the vessel. Even though it was not uncommon for *Godafoss* to sail out through the channel at a speed of around 12 to 14 knots, the

speed suggests that the master was already suffering from a confirmation bias and had overlooked the need for a subsequent change of course at Håbutangen after 2 minutes. The master observed a red light from Kvernskjæret beacon starboard of the bow and assumed that the course was correct. The time available for correcting the confirmation bias was inversely proportional to the increase in speed.

- A practice had been established whereby the pilots often disembarked from vessels before reaching the pilot boarding ground when this was deemed to be 'justifiable from a safety perspective'. This practice was tacitly accepted by the NCA, even though the navigational waters were part of a national marine park so that the highest possible safety level should have been required.
- When the pilot disembarked from *Godafoss* in Løperen, at a considerable distance before the pilot boarding ground, the pilot boat immediately headed back to Skipstadsand. The vessel was not offered 'pilot guidance over a distance from the pilot boat'.
- Nor did the VTS centre monitor the continued voyage through the channel during the minutes that lapsed from when the pilot disembarked at 19:46 until *Godafoss*, while accelerating its speed and holding a steady course, ran aground at Kvernskjær at 19:52.
- The crew had incorrect perceptions and information about the vessel's real visibility line. The visibility line information posted on the bridge was not consistent with the shipping company's procedures for placing the cargo and trimming the vessel. The visibility line was further lengthened by blind sectors forward of the bow as a result of the total height of the foremost containers. The situation was exacerbated by the crane boom that lay diagonally across the deck and the aft trim.

### **3.2 Collaboration between the vessel's navigation officers and the pilot**

The *Godafoss* grounding illustrates a safety problem in which the vessel's navigation officers and the pilot did not work as a unified bridge team. They did not jointly clarify how the outbound voyage was to be conducted after passing Skipstadsand where the pilot disembarked during the night in question.

If bridge resource management on a day-to-day basis poses challenges as a result of lack of clarity in the internal management system, cultural differences and/or language problems on board vessels under pilotage in Norwegian waters, this should be documented and included so that revised procedures are in line with and conducive to dealing with the realities.

### **3.3 The practice of pilot disembarkation in Løperen**

During pilotage of outbound vessels through Løperen, it has been a long-standing and not uncommon practice for the pilot to disembark before reaching the pilot boarding ground. This practice has been perceived as normal and unproblematic by the great majority of pilots, and it was an established practice that has probably been inherited by new generations of pilots. The analysis of all southbound vessels through Løperen in 2010 shows that there are few, if any, indications that the practice of disembarkation in Løperen was directly related to external conditions such as high seas. A survey of the routines does not reveal any immediate relationship between the place of disembarkation and observed wave heights. In

other words, pilot disembarkation took place in Løperen during both calm and very rough seas. Correspondingly, disembarkation took place at Vidgrunnen during both calm and very rough seas.

The instructions, which were deemed to apply to pilots and traffic controllers at the time of the accident, allowed disembarkation between Håbu beacon and the boarding ground when the pilot and the master found this to be 'justifiable from a safety perspective'. It appears that the term 'justifiable from a safety perspective' has gradually changed from only applying to cases when conditions at the pilot boarding ground meant that it was safer for the pilot to disembark further up the channel to also include cases in which it was deemed justifiable from a safety perspective for vessels making regular calls and having a permanent crew to sail the final section of the compulsory pilotage area alone.

The fact that the voyage passed through a recently established national park does not appear to have made any difference in relation to drawing up NCA's procedures, the pilots' practice of disembarking in Løperen or how nonconformities and near-accidents reports were followed up.

There is no documentation that nonconformity reports were included when the new instructions were prepared. An important tool for improving instructions and one's own practice was thus not utilised in an optimum manner when new instructions were prepared by the NCA.

### **3.4 The visibility line from the bridge on *Godafoss***

The vessel's visibility limitations are very important in relation to any bridge team's possibility of visual control and overview of the waters ahead. In relation to the events of 17 February 2011, the fact that the visibility line was exceeded is deemed to have been a negative factor, but not decisive.

### **3.5 Follow-up of the parties involved after the accident**

The AIBN has received a revised edition of the shipping company's management system relating to bridge procedures. The procedure is based on STCW Chapter VIII concerning watchkeeping and watchkeeping arrangements. The revised procedure describes in detail how one must strive to meet the STCW Code and its requirements. According to the shipping company, the procedure was revised in collaboration with the shipping company's insurance company, the onshore organisation and vessel crews. On 28 October 2011, the shipping company distributed a circular to all its vessels concerning 'best practice during navigation'. See Annex L.

After the accident, Eimskip claims that it has paid a great deal of attention to the visibility line on its container ships and it has stressed that the topic has been clearly addressed in meetings with vessel crews.

*Godafoss* and *Dettifoss* were removed from the route that included the Port of Borg in July 2011. Decreasing cargo volumes were given as the reason why *MV Electron* is now operating under a time charter for the shipping company, as a feeder ship between the Port of Borg and Torshavn in the Faroe Islands, where *Godafoss* and *Dettifoss* call regularly.

On 24 April 2012, the AIBN received Eimskip's internal accident report relating to the grounding on 17 February 2011. The shipping company's report was completed on 4 March 2012.

After the grounding, the NCA introduced new instructions for pilot boarding and disembarkation at Vidgrunnen. (See Annex D.)

*'All boarding/disembarkation shall take place at the pilot boarding ground/precautionary area at Vidgrunnen. If boarding/disembarkation has to take place in another position for safety reasons, VTS must be informed. The voyage from the pilot boarding ground to the alternative boarding position shall be carried out in accordance with the instructions LOS 9.5 "Pilot guidance over a distance from pilot boat".'* (See Annex F.)

The boarding ground/precautionary area is shown in Figure 18.

The NCA has explained that 'safety reasons' shall be understood to mean conditions under which high seas and strong winds at the boarding ground can expose people and materials to major risk during boarding and disembarkation to the pilot boat.

The AIBN understands that the NCA aims to define clear criteria for what is meant when it is stated that for 'safety reasons', disembarkation must take place somewhere other than in the primary position mentioned in the instructions.



Figure 18: Map of parts of Outer Hvaler. The shaded field shows the pilot boarding ground/precautionary area in accordance with the instructions LOS 9.8.1.OSA - Pilot boarding at Vidgrunnen. The instructions were adopted just after Godafoss ran aground.

For its part, the NCA is understood to have updated its procedures to prevent the recurrence of similar incidents, at the same time as specific plans are being drawn up for widening the fairway and installing new sea marks for sailing to the Port of Borg.

## 4. SAFETY RECOMMENDATIONS

The investigation of this marine accident has identified areas in which the Accident Investigation Board Norway deems it necessary to propose safety recommendations for the purpose of improving safety at sea.<sup>34</sup>

### **Safety recommendation MARINE no. 2012/08T**

The container vessel *Godafoss* ran aground at Kvernskjærgrunnen on 17 February 2011. The vessel was sailing with just one person on the bridge when the accident happened, despite the fact that the written shipboard procedures stated that the bridge should be manned by at least two persons. The investigation has shown that the shipping company's safety management system failed to identify this barrier breach.

The Accident Investigation Board Norway recommends that the shipping company revise its safety management system in order to ensure that its vessels are capable at all times of complying with the internal procedures for watchkeeping on the bridge and corresponding international requirements.

### **Safety recommendation MARINE no. 2012/09T**

The container vessel *Godafoss* ran aground at Kvernskjærgrunnen on 17 February 2011 in compulsory pilotage waters without a pilot on board. The pilot instructions allowed for the pilot to disembark while the vessel was still in compulsory pilotage waters provided that this was deemed to be justifiable from a safety perspective. However, the criteria for assessing what was 'justifiable from a safety perspective' were not clear. The instructions therefore allowed for different interpretations and practices in relation to a pilot's duties in these waters. The investigation has also shown that the nonconformity reports that were submitted could have helped to improve procedures and common practice in the Norwegian Coastal Administration (NCA) had they been followed up in a satisfactory manner. However, the nonconformity reports were not followed up to a satisfactory extent.

The Accident Investigation Board Norway recommends that the NCA follow up the handling of nonconformities in a satisfactory manner and ensure that all parties within its organisation with joint responsibility for safety at sea in a particular area have understood and accepted the applicable instructions and procedures.

Accident Investigation Board Norway  
Lillestrøm, 19 June 2012

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<sup>34</sup> The investigation report is submitted to the Ministry of Trade and Industry, which takes measures necessary to ensure that due consideration is given to the safety recommendations.

## **ANNEXES**



**Annex A: References**

Bull, N. (2008). Time for revision of seafarers vision testing? Article for discussion. *International Maritime Health*, 59, 1-4.

Grech, M., Horberry, T., & Smith, A. Human errors in maritime operations: analysis of accidents reports using the Leximancer tool. Presented at the Proceedings of the 4<sup>th</sup> Annual Meeting of the Human Factors and Ergonomics Society, Baltimore, MD, USA, September 30-October 4, 2002.

Kirkebøen, G. (2007). *Skjevheter i fagfolks skjønn: Hvordan kan beslutningstaking forbedres?* I Sunnevåg, K. J. (editors.): *Tilnærminger og utfordringer i prosjekters tidlige fase.* (s. 175-201). Concept Report No 17. The Concept Programme, Norwegian University of Science and Technology (NTNU), Trondheim.

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Ursin, H and Zahl-Begnum, O. H. (1993). *Biologisk psykologi.* Oslo, Tanum-Norli.

**Annex B: Calculation of visibility line from the bridge**

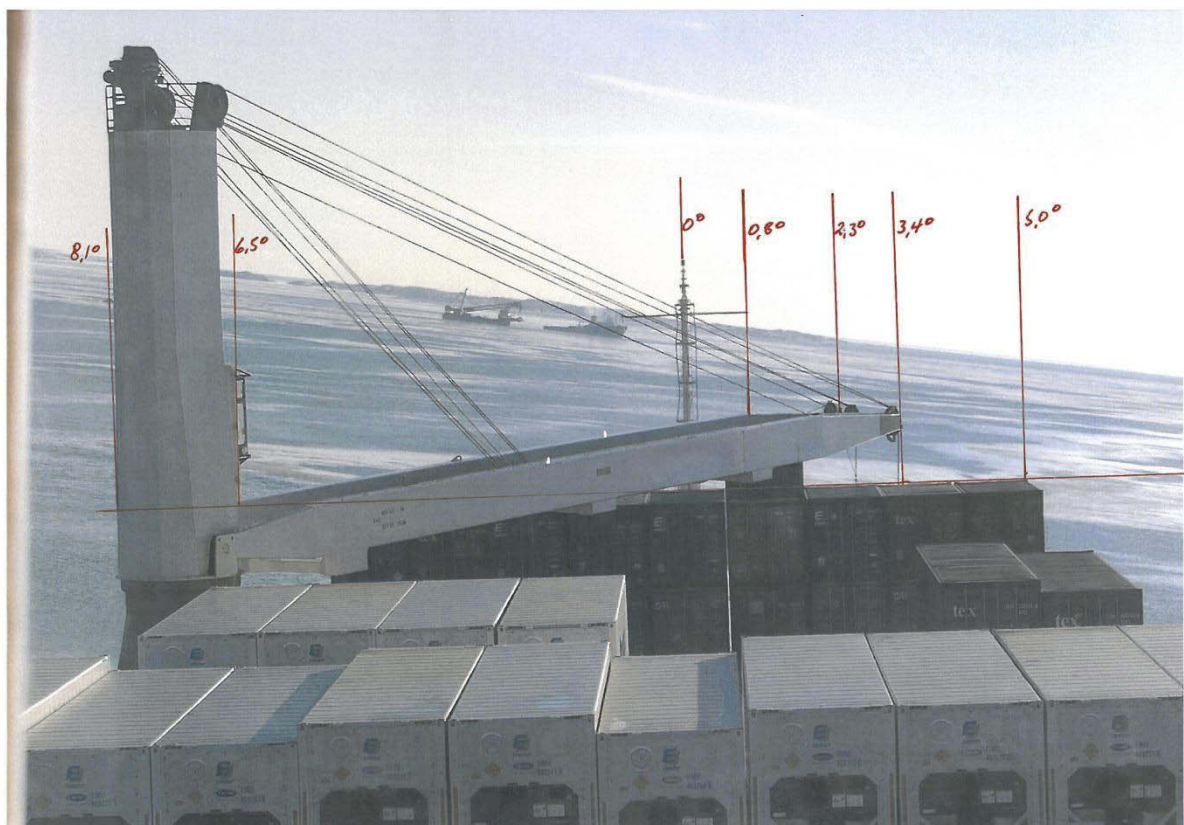
The information obtained by the AIBN about loading conditions at the time of the accident indicate three different conditions, and it has therefore been necessary to make calculations for all three conditions and compare the results as shown in the table below.

	Loading condition according to I (section 1.4.2), i.e. Dm = 6.70 m, trim of vessel = 0.515° aft	Loading condition according to II (section 1.4.2), i.e. Dm = 6.465 m, trim of vessel = 0.565° aft	Loading condition according to III (section 1.4.2), i.e. Dm = 6.445 m, trim of vessel = 0.543° aft
The visibility line meets the sea's surface forward of the bow [m]	506	525	519
Kvernskjærgrunn - a light disappears from sight forward of the bow [m]	309	323	320

The table shows the calculated visibility line under different loading conditions.

The values in the table are based on the sight line being 27.803 m above the keel at the forward end of the foremost row of containers. In comparison, the total height of four tiers of 8.5 feet standard containers in the foremost row is 28.33 m. The highest point on the crane boom lying diagonally across the containers was calculated to lie 28.45 m above the keel at the time of the grounding.

As is evident from the results, the differences in the stated loading conditions have only a minor impact on the calculated visibility line. The calculations were carried out for angles in relation to the vessel's longitudinal centreline as shown in the photo and table below.



The calculations were carried out for the loading condition mentioned in section 1.4.2, loading condition II.

	6.5° Port, above forward boom	0.8° Stb., above bend in forward boom	2.3° Stb., above forward boom tip	3.4° Stb., above aft boom tip	3.4° Stb., above forward edge of containers	5.0° Stb., above forward edge of containers
The visibility line meets the sea's surface forward of the bow [m]	341	607	650	638	339	340
Kvernskjærgrunnen beacon disappears from sight forward of the bow [m]	194	379	410	402	192	193

Calculation of visibility line and distance when Kvernskjærgrunnen beacon disappeared from sight.

Based on the calculations, it can be concluded that *Godafoss* did not meet the visibility line requirements. This was a consequence of the total height of the foremost containers on deck being too high, the boom that lay diagonally across the containers and the vessel's draught and aft trim.

Based on the assumption that *Godafoss* had a draught of 5.71 m and 7.22 m at the forward and aft perpendicular, respectively, the visibility line was approximately 650 m at the most, and over a larger segment.

The calculations also show that Kvernskjærgrunnen beacon may have disappeared from sight from the bridge when the distance between the bow and the beacon was 410 m or less. This means that the master lost sight of Kvernskjærgrunnen beacon when the bow was 165 m from running aground<sup>35</sup>, at the earliest. This distance corresponds to the length of the vessel. At a speed of 13.8 knots this distance would be covered in 23 seconds.

<sup>35</sup> There is a distance of 245 m between the point at which *Godafoss* ran aground and Kvernskjærgrunnen beacon.

**Annex C: 'Los 9.8 – Local boarding restrictions', dated 22 June 2010**

**Los**  
 Publisher/owner: Andor Antonsen  
 Approved: Haldor Sæther

**Instructions**  
**Los 9.8 – Local boarding**  
**restrictions**

Doc. ID: **I-LOS-09/01204-57**  
 Status: **Approved**  
 Checked: **22.6.2010 J. A.**  
 Valid from: **Bjørge**  
 Version: **1.5.2009 23.6.2010**  
 /date: **02 22.6.2010**  
 Page: **1 of 2**

**1 Purpose**

To ensure uniform understanding and support procedure LOS 9 *Lostjenesten – operasjonell drift* ('Pilotage Services – Operation' – in Norwegian only), so that boarding assignments are carried out in a safe and proper manner.

**2 Scope and area of application****What**

To establish restrictions that make it safe to carry out boarding assignments.

**Who**

The head of pilot services

**3 Topic and description****What**

To ensure that each individual department for maritime traffic has defined restrictions for carrying out boarding assignments in relevant boarding positions, which, among other things, take account of the following:

- Wave height
- Wind
- Current
- Risk of icing
- Visibility
- Variables relating to the type of vessel seeking pilotage services
- Alternative boarding position(s)
- The possibility of piloting from a pilot boat or at a distance
- Conditions for carrying out boarding assignments that deviate from the established restrictions

**How**

The head of pilot services is responsible for ensuring that each individual department for maritime traffic has introduced restrictions that take into account local conditions relating to the use of pilot boats within that department's area of responsibility. On the basis of experience, these restrictions shall define limits as to when boarding and disembarkation may take place at the various pilot boarding grounds.

The restrictions shall be part of and implemented in the pilotage service's QA system. The local restrictions shall be in the form of written specifications with pertaining appendices as required. The head of pilot services shall be responsible for approval of same in the QA system.

Should situations arise in which it is deemed justifiable to deviate from the restrictions, such deviations are subject to approval by the head of pilot services who shall document this in the comments field in Njord.

#### **4 Responsibility and authority**

**Officer responsible, Department for Maritime Safety**

- is the approver of these instructions
- can grant dispensation from these instructions

**Quality coordinator:**

- carries out quality control of these instructions

**The head of pilot services**

- is the publisher/owner of these instructions
- is responsible for maintenance of these instructions

#### **5 Tools/aids**

Local wave and weather observations and forecasts

#### **6 References and appendices**

Applicable specifications relating to restrictions on carrying out boarding assignments

**Annex D: 'LOS 9.8.1.OSA – Pilot boarding at Vidgrunnen', dated 2 March 2011**



**Los**  
**Publisher/owner:** Hans Jacob Liljebjelke  
**Approved:** Elise Rusten  
**Specification**  
**LOS 9.8.1.OSA – Pilot boarding at Vidgrunnen**

**Doc. ID:** S-LOS-09/01199-  
**Status:** 108  
**Checked:** Approved  
**Valid from:** J. A. Bjørge  
**Version** 2.3.2011  
**/date:** 00 1.3.2011  
**Page:** 1 of 2

**1 Purpose**

To ensure uniform understanding of and support the instructions LOS 9.8 - 'Boarding restrictions' and LOS 9.5 - 'Pilot guidance over a distance from the pilot boat'.

**1 Detailed description of**

**What**

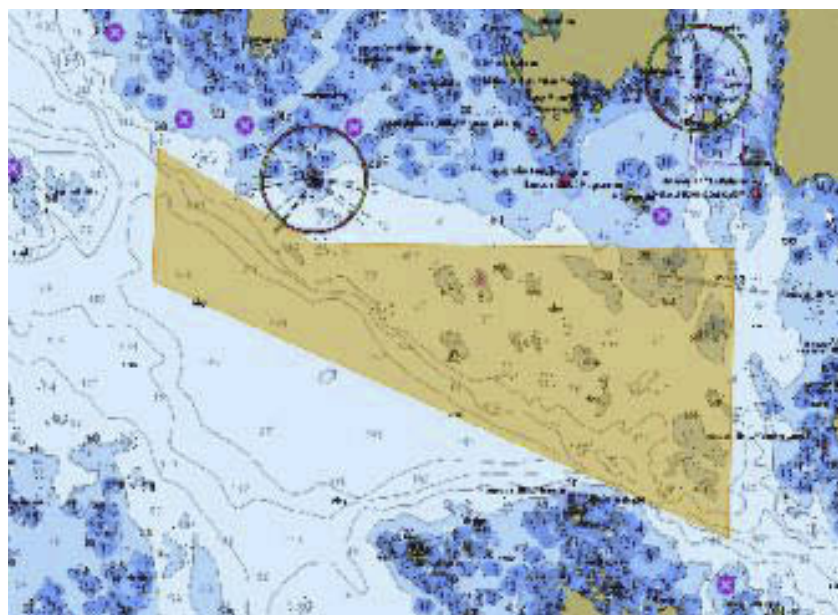
Concerns the pilot boarding ground at Vidgrunnen.

**Who**

The specification applies to the head of pilot services, pilots and pilot boat skippers.

**How**

All boarding/disembarkation shall take place in the pilot boarding area / precautionary area at Vidgrunnen. If boarding/disembarkation has to take place in another location for safety reasons, VTS must be informed. The voyage from the pilot boarding ground to the alternative boarding position shall be carried out in accordance with the instructions LOS 9.5 'Pilot guidance over a distance from pilot boat'.



**Annex E: 'Los 9.4 Performance of pilotage', dated 7 July 2010**

**Pilot**  
 Publisher/owner: Andor Antonsen  
 Approved: Haldor Sæther

**Instructions**  
**LOS 9.4 – Performance of pilotage**

Doc. ID: **I-LOS-I—01199-64**  
 Status: **Approved**  
 Checked: **7.7.2010 J A Bjørge**  
 Valid from: **7.7.2010**  
 Version **04 7.7.2010**  
 /date: **1 of 4**  
 Page:

**1 Purpose**

To ensure uniform understanding of the procedure LOS 9 'Pilot Services – Operations', so that pilotage is carried out in a safe and efficient manner.

**2 Scope and area of application****What**

To set standards for how pilots should act before, during and after a pilotage assignment.

**Who**

Applies to state pilots.

**3 Subject and description****Allocation, preparation and performance of the assignment**

- State pilots are allocated a pilotage assignment by a standard SMS text message. The same procedure is used when a previously assigned pilotage assignment is changed. When the pilot has received the message, he or she shall confirm acceptance of the assignment by sending a reply SMS message 'Pilot yes'. Should any circumstances prevent acceptance of the assignment, the pilot sends the reply SMS message 'Pilot no'. When the state pilot is unable to accept a pilotage assignment, he/she shall also provide an explanation about the reason for this. This explanation shall be sent by email as soon as practically possible, to the head of pilot services or to a person authorised by the head of pilot services (pilot dispatch centre).
- Before taking up a pilotage assignment, the state pilot shall, insofar as it is possible, familiarise him or herself with the assignment to ensure that he/she is as well prepared as possible in order to perform it in a safe and proper manner.
- Depending on the nature of the pilotage assignment, the state pilot is normally expected to procure information about the vessel's overall dimensions (draught, length, beam and air draught etc.), condition, manoeuvring ability and limitations.
- The state pilot shall plan the pilotage assignment in consultation with the vessel's master and officers on the bridge.
- The state pilot shall not take over navigation or manoeuvring before relevant information has been exchanged with the vessel's master or officer on watch, for example about the vessel's position, course and speed.

- Regardless of the method by which the vessel's master or officer on watch communicates that the pilot is to take over or be relieved, the state pilot shall mark that it is understood by saying, either:
  - o 'I am taking over' or
  - o 'You are taking over'.
- Pilot guidance shall be communicated in a clear and unambiguous manner, so as to prevent misunderstandings.
- The state pilot shall check that his or her guidance on speed, rudder use and course is repeated and implemented.
- During pilotage, the state pilot shall monitor and check the vessel's position, heading and speed.
- The state pilot shall be a part of the vessel's bridge team and shall help to ensure that the bridge team works together and communicate in an optimum manner (BRM).
- If during a pilotage assignment, the state pilot finds that the prerequisites for good BRM are not present, the state pilot shall make the best of the situation in order to carry out the assignment safely. In such instances, the situation shall be logged in Njord, and the nonconformity shall be reported to the head of pilot services, in order that the shipping company or shipping agent may be notified.
- The state pilot may take precautionary action in order to avert environmental damage, cf. the Norwegian Pollution Control Act, Chapter 5 of the Norwegian Act relating to ship safety and security, the Norwegian Act relating to harbours and fairways and Section 47 of the Norwegian General Civil Penal Code regarding self-defence.

## Reporting

- *Navigational warnings.* The state pilot shall report faults or defects in lighthouses, beacons, floating and fixed sea marks, electronic navigational aids and large items of drifting debris, wrecks, etc. This is normally done by notifying Navco by telephone, +47 22 42 23 31, or by sending an email to [navco@kvstverket.no](mailto:navco@kvstverket.no).
- *The Norwegian Maritime Directorate.* State pilots who, in the course of carrying out their pilotage assignment, become aware of vessels or mobile facilities that may have such serious faults or defects as to raise doubt about their seaworthiness, shall immediately inform the Norwegian Maritime Directorate through Njord or by telephoning the person on duty in the Norwegian Maritime Directorate on +47 52 74 50 00. The emergency telephone is always manned. During office hours, ask to be put through to the chief duty officer; after office hours, follow the instructions on the answering machine.
- *Norwegian Customs and Excise.* The state pilot has a duty to report to and to cooperate with the Norwegian Customs and Excise, cf. section 20 of the Norwegian Customs Act and the partnership agreement between the Norwegian Coastal Administration (NCA) and the Norwegian Directorate of Customs and Excise regarding the duty of assistance. The telephone number for notifying the operations centre at the Norwegian Customs and Excise is +47 22 34 66 30.
- *Department for Emergency Response.* The state pilot shall notify cases of acute pollution or the risk of such pollution. In cases of acute pollution, the state pilot shall notify the NCA's emergency



telephone number +47 33 03 48 00 in accordance with 1-LOS 01199 - 1 'Emergency response for pilots/pilot boat skippers'.

The head of pilot services of the Department for Maritime Traffic shall also be notified of the incident.

- Oslo Department for Maritime Traffic: +47 916 96 997
- Skagerrak Department for Maritime Traffic: +47 416 63 175
- Rogaland Department for Maritime Traffic: +47 951 90 554
- Western Norway Department for Maritime Traffic: +47 958 33 403
- Møre and Trøndelag Department for Maritime Traffic: +47 909 53 981
- Nordland Department for Maritime Traffic: +47 951 90 622
- Troms and Finnmark Department for Maritime Traffic: +47 951 45 682

- *Health Services.* The state pilot has a duty to report infectious disease, or suspected infectious disease, cf. the Act relating to the control of communicable diseases and the Regulations on the notification of, and measures to be taken in the event of serious incidents of significance to international public health. In such instances, the state pilot shall notify the municipal medical officer of the vessel's location or destination, or he/she shall contact the Norwegian Institute of Public Health, telephone number +47 21 07 70 00 during office hours, or the emergency number for Infectious Disease Control +47 21 07 63 48 outside office hours.

## 4 Responsibility and authority

### Officer Responsible in the the Department for Maritime Safety

- is responsible for approving these instructions
- may grant exemption from these instructions

### Quality coordinator

- is responsible for control of these instructions

### head of pilot services

- is publisher/owner of these instructions

## 5 Tools/aids

- All available navigational aids, information about the vessel's condition and equipment, VTS if within its area of operation.
- The Regulations relating to maritime traffic in certain waters, 'Recommended guidelines for pilotage' in each area, port regulations.

## 6 Terms and abbreviations

Pilotage: Guidance by pilots to vessels in connection with navigation and manoeuvring.

Head of pilot services: Head of a department for maritime traffic

Chief pilot: State pilot appointed as pilot supervisor.

Pilot: Person with a pilot's certificate issued pursuant to the Norwegian Pilotage Act.

State pilot: Pilot who is employed by the state.

Compulsory pilotage: Obligation to use a pilot or hold a pilot exemption certificate.

Njord: The NCA's pilot dispatch system.

Navco: The NCA system that receives and passes on navigational warnings.

## 7 References:

- *Regulations of 10 December 1991 No 810: Regulations relating to pilots' off-duty periods for safety reasons*
- *Regulations of 01/03/1968 No 3127: Regulations relating to state pilots' food and quarters on board*
- *Regulations of 11 December 1998 No 1273: Regulations relating to maritime traffic in certain waters*
- *Regulations of 25/07/1986 No 1607: Regulations relating to pilotage service during emergency response operations/war*
- *Regulations of 04/05/1995 No 459: Regulations mandatory fairways and reporting points for foreign, non-military vessels entering Norwegian territorial waters*
- *Regulations of 27/04/1999 No 537: Regulations concerning watchkeeping on passenger ships and cargo ships. Watchkeeping under different conditions and in different areas. Navigation with pilot on board, items 49 and 50.*
- *Act of 16 February 2007 No 9: Act relating to ship safety and security (the Ship Safety and Security Act).*
- *Regulations of 27/06/2008 No 744: Regulation on the obligation to report accidents and other incidents at sea*
- *Act of 17 April 2009 No 19: Act relating to harbours and fairways*
- *Act of 13/03/1981 No 06: Act concerning Protection against Pollution and concerning Waste (the Pollution Control Act).*
- *Act of 22/05/1902 No 10: Norwegian General Civil Penal Code (the Penal Code) Section 47.*
- *Act no 55 of 05 August 1994: Act relating to the control of communicable diseases*
- *Regulations of 21/12/2007 No 1573: Regulations on the notification of, and measures to be taken in the event of serious incidents of significance to international public health (the IHR Regulations) (Section 4)*

**Appendix F: 'LOS 9.5 – Pilot guidance over a distance from the pilot boat', dated 22 June 2010**

**Los**  
 Publisher/owner: Andor Antonsen  
 Approved: Haldor Sæther

**Instructions**  
**LOS 9.5 – Pilot guidance over a distance from pilot boat**

Doc. ID: **I-LOS-09/01199-54**  
 Status: **Approved**  
 Checked: **22.6.2010 J. A.**  
 Valid from: **Bjørge**  
 Version: **23.6.2010**  
 /date: **01 22.6.2010**  
 Page: **2 of 3**

Pilot guidance over a distance from a pilot boat shall not take place if it could endanger the pilot boat or its crew in any way or if the pilot boat skipper is unable to navigate the pilot boat in a safe and justifiable manner

In cases where pilot guidance over a distance from a pilot boat is not deemed to be justifiable, the pilot who is on board an outbound vessel and cannot disembark in a justifiable manner at the ordinary pilot boarding ground shall remain on board if this is the only option to ensure a safe voyage. This shall be done by agreement with the head of pilot services and the vessel's master.

**When pilot guidance over a distance is carried out from the pilot boat, the following criteria shall be met and complied with:**

- When a vessel is taking on board a pilot, the pilot boat shall be present at the ordinary pilot boarding ground, or in what is deemed to be the safest position under the prevailing weather conditions.
- When the pilot is disembarking from the vessel, the pilot boat shall accompany the vessel to the ordinary pilot boarding ground, or to what is deemed to be the safest position under the prevailing weather conditions
- The pilot shall have access to the use of Radar, VHF, ECDIS and AIS on board the pilot boat, and it is up to him/her to decide how the equipment is to be set. This must not give rise to any risk relating to the navigation of the pilot boat itself.
- The pilot shall occupy a position on board the pilot boat that provides him/her with an optimum visual view and satisfactory access to enable him/her to operate the necessary navigational aids. If this is only possible from the chief navigator's position on board the pilot boat, the pilot and pilot boat skipper in consultation shall agree on how this can best be resolved.
- Before pilot guidance over a distance from a pilot boat may take place, the vessel in question must have been positively identified and it must be possible to follow it by using a minimum of the following combinations:
  - Radar and automatic identification system (AIS) displayed on ECDIS or radar
  - Radar and visual identification
  - AIS displayed on ECDIS and visual identification
- The pilot boat skipper must be able to navigate on the instructions of the pilot insofar as this does not endanger the navigation of the pilot boat itself.
- If the area is covered by a set of maritime traffic regulations, the pilot shall observe these regulations as if he/she was on board the pilot-seeking vessel.

- When boarding, the pilot shall board the pilot-seeking vessel as soon as this is deemed to be justifiable and carry out normal pilotage from there.
- When disembarking, the pilot shall not disembark before this is considered to be justifiable, bearing in mind that, through the final part [of the compulsory pilotage area], pilot guidance will take place at a distance from the pilot boat.

#### **4 Responsibility and authority**

##### **Officer responsible, Department for Maritime Safety**

- is the publisher/owner of these instructions
- can grant dispensation from these instructions

##### **Quality coordinator**

- carries out quality control of these instructions

##### **Head of pilot services**

- is the publisher/owner of these instructions

#### **5 Definitions and abbreviations**

Pilot guidance over a distance from pilot boat:

*The provision of guidance to a vessel by a certified state pilot from a pilot boat.*

Ordinary pilot boarding ground:

*Pilot boarding positions identified in nautical publications and shown on official charts.*

#### **6 Tools/aids**

Radar

Pilot's computer

Nautical charts

The pilot boat's electronic chart system, provided that it meets the ECDIS requirements.

AIS receiver and transmitter

VHF radiotelephony

**Annex G: Recommended passage for vessels to Fredrikstad pilotage station**

*Sailing recommendations for ships to Fredrikstad pilot station.*

*Ships are to enter the Oslofjorden between*

*Færder lighthouse (N 59 01,6 & E 10 31,5), and*

*Torbjørnskjær lighthouse (N 58 59,8 & E 10 46,9).*

*After passing on the West side of Torbjørnskjær ships are to keep north of Medfjordbåen North cardinal (10 meter). And proceed eastwards to the Fredrikstad Pilot station.*

*The area from the Koster Islands in Sweden and up to Torbjørnskjær is absolutely recommended to be avoided. This area is a Swedish/Norwegian National park. The area is not suited for safe navigation because a lot of reefs and strong current.*

*Ships are to listen to Horten VTS on channel 18 at all times.*

*Call Fredrikstad pilot on ch 12 ½ hour before pilot station.*

*Hans Jacob Liljebjelke*

*Chief Pilot Fredrikstad'*

**Annex H: Excerpt from the NCA's action plan for 2010-2019**

Name of measure:

Port of Borg, Røsvikrenna, Østfold

Cost estimate: NOK 249 million

**Purpose of the measure**

The purpose of the measure to update the fairway is to improve safety and navigability for vessels approaching and leaving Fredrikstad. The aim is to achieve improved safety by providing more room for vessel manoeuvring, and thus increasing the safety margins by increasing the depth and width of the fairway. Improved navigability will be achieved by increasing the depth of the fairway, so that it can be used by vessels with greater draughts. The positive effects of improved safety and navigability will be realised through a simplification of the Maritime Traffic Regulations.

**Geographical description**

Røsvikrenna, the approach to the Port of Borg, lies in Fredrikstad Municipality in Østfold County. Nautical chart No 1. Fairway 1002 covers the area from Vidgrunnen to the Port of Borg. The planned measure concerns corridor 1.

**Current conditions**

The fairway from Vidgrunnen to Fredrikstad is approximately 18 km long and is narrow and winding in some places. Røsvikrenna between Flyndregrunnen and the Øra area is located at the upper part of the fairway. Røsvikrenna is approximately 90 m wide and 11 m deep. The current conditions, sometimes with a strong outgoing current from Glomma in combination with side winds, are critical risk factors to navigation. Based on the risk level, the fairway is regulated by the Norwegian Regulations relating to maritime traffic in certain waters (the Maritime Traffic Regulations). The regulations provide for restrictions on traffic under conditions of reduced visibility and when sailing at night.

**Planned measures**

An approximately 3 km long stretch will be dredged. The widening of the current fairway from 90 to 150 metres will take place on the eastern side. The depth in the dredged area will be increased to -13 m. The measure will include new sea marks.






*Map section showing the NCA's target of planning to update the sea marks in the fairway between Vidgrunnen and Røsvikrenna between 2014 and 2019.*



**Annex I: The vessel's Minimum Safe Manning certificate issued by the flag state authority**



## MINIMUM SAFE MANNING CERTIFICATE

Issued under the provisions of regulation V/14.2 of the  
INTERNATIONAL CONVENTION FOR THE SAFETY OF LIFE AT SEA  
(SOLAS 1974 as amended)  
under the authority of the Government of  
**ANTIGUA AND BARBUDA**

Name of ship	GODAFOSS	Call sign	V 2 P M 7	IMO number	9086796
Port of registry	St. John's	Gross tonnage	14664 GT	Main propulsion power [KW]	14785
Type of ship	Containership	Grade of periodically unattended machinery space	E 0		
Trading area	international voyages	GMDSS sea area	A1+A2+A3		

The ship named in this document is considered to be safely manned if, when she proceeds to sea, she carries not less than the number and grades/capacities of personnel specified in the tables below.


Grade/capacity	Number of persons	Certificate (STCW 95 – regulation)
Master	1	Reg. II/2    Reg. IV/2
Chief Mate	1	Reg. II/2    Reg. IV/2
Deck Officer	1	Reg. II/1    Reg. IV/2
Chief Engineer Officer	1	Reg. III/2
Second Engineer Officer	1	Reg. III/2
Engineer Officer	-	Reg. III/1
Rating forming part of a navigational watch	3	Reg. II/4
Rating Deck	2	
Rating forming part of an engineering watch	1	Reg. III/4
Rating Engine	-	
Cook	1	
<b>Total number</b>	<b>12</b>	

Special requirements or conditions, if any:

1. This certificate is automatically cancelled upon expiration, withdrawal or suspension of the E 0 notation.
2. Watchkeeping shall be arranged at the discretion of the master but shall never be of lesser standards than those prescribed by the STCW Convention and IMO Resolution A.890(21).
3. The grades and numbers of personnel listed above reflect the minimum number of persons necessary for the safety of navigation and operation. Additional personnel as may be considered necessary for cargo handling and control, maintenance or watchkeeping and as needed for required rest periods, are the responsibility of the owner and the master.

Issued on 01 September 2010 at Oldenburg

Date of expiry 31 August 2011



(Signature of issuing officer / seal of the Administration)

signed for and on behalf of  
**The Government of Antigua and Barbuda**

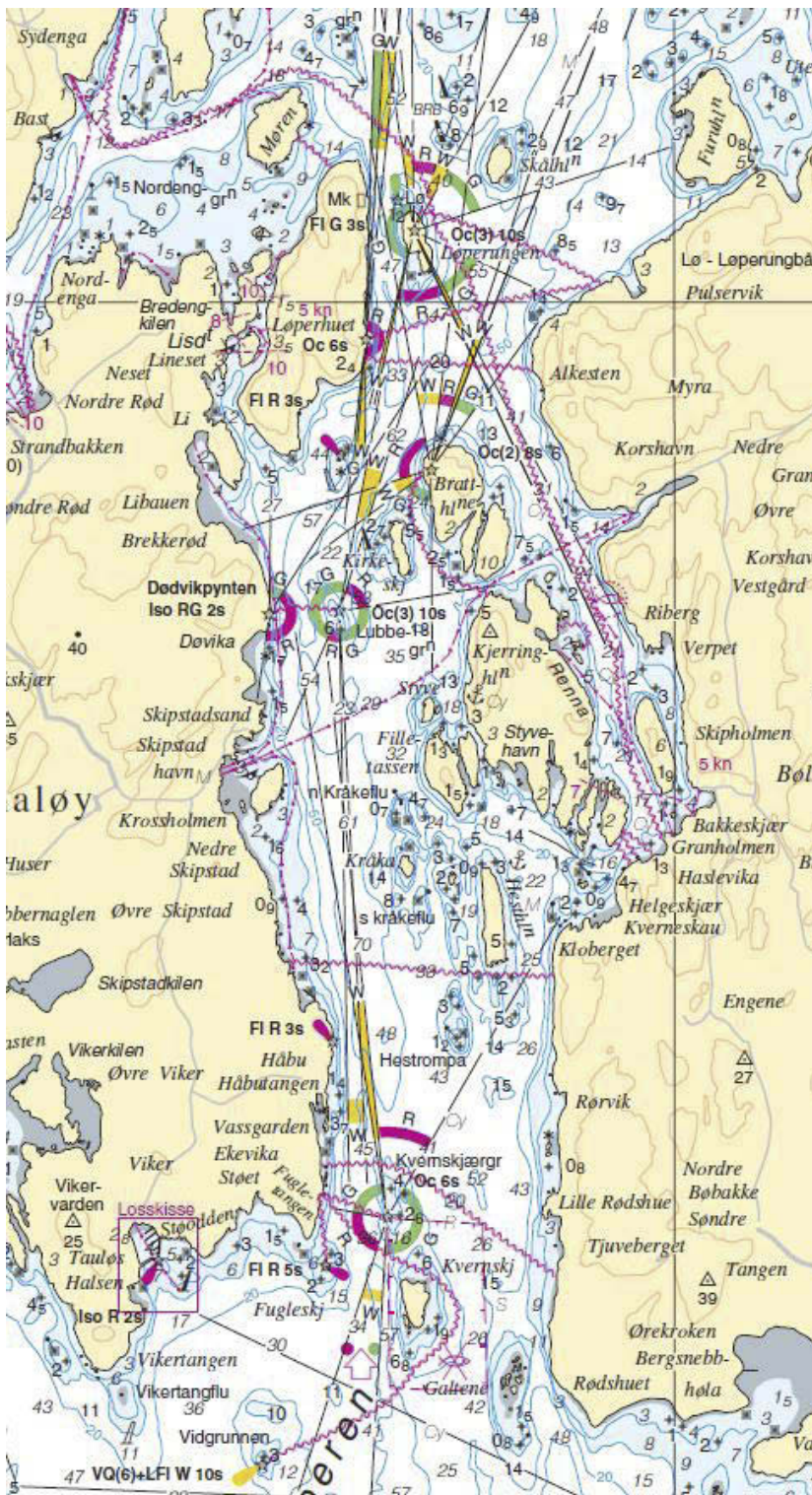
## Annex J: History of lights and beacons in Løperen

Figure 20 shows current lights and beacons in Løperen. The main features of light marks in Løperen from 1893 to date can be summed up as follows:

- A sector beacon was installed at Håbutangen in 1893. In 1983 this was changed to a red lateral light on a pole.
- Løperhuet got its sector beacon in 1900.
- Brattholmen got its sector beacon in 1911.
- Løperungen got its sector beacon in 1911.
- A beacon with white light was installed at Fugletangskjær in 1931. This was changed to a red light between 1980 and 1984.
- A light buoy with green light as installed at Kvernskjærgrunnen in 1938. In 1983, it was replaced by an indirectly lit sector beacon on a concrete column.
- A sector beacon was installed at Dødvikpynten in 1931. In 1983, it was modified to emit a red light by installing new glass screens. In 1987 this was changed again, with a new green sector towards the north.
- A light buoy with white light was installed at Lubbegrunnen in 1939. This was changed to an IALA west cardinal mark between 1980 and 1984 (white light). For a description of cardinal marks, see Figure 12. In 1983, it was replaced by an indirectly lit sector beacon on a concrete column.
- A beacon with red light was installed at Kuskjær in 1940.
- In 1949, a light and bell buoy with white light was installed at Vidgrunnen. This was changed to an IALA south cardinal mark between 1980 and 1984 (white light) In 1987, it was replaced by a light on a concrete column, but it was still a cardinal light.
- A light buoy with white light was installed at Løperungbåen in 1968. This was changed to a green light between 1980 and 1984. In 1991, it was replaced by a green lateral light on a pole.

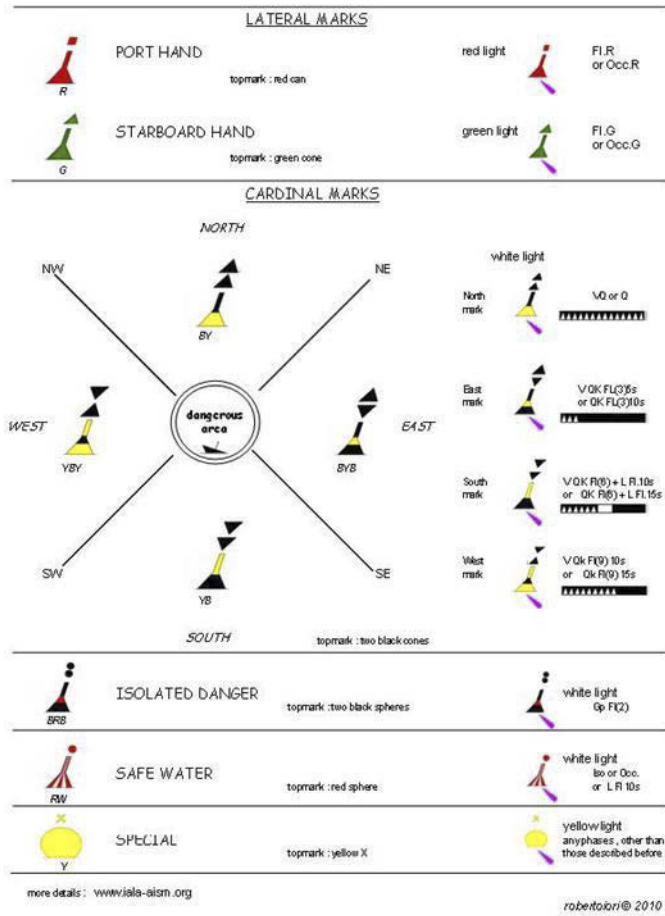
One of the beacons in Swedish navigational waters is also visible from this area when the visibility is good. This concerns the Klövningarna beacon (Iso 4 s WRG Racon M). It is the red sector that is visible, if at all.

In addition to the above, green day marks have been arranged in the form of painted green reflective belts around the concrete columns for the Kvernskjærgrunnen and Lubbegrunnen sector beacons. These belts are also indirectly lit, so as to have the effect of enabling some degree of 'daytime navigation' in the dark.



Section of Nautical Chart No 1 from June 2010.

IALA BUOYAGE SYSTEM 'A'



IALA buoyage system 'A'

## Annex K: Vessel Traffic Services

Published: 16 June 2011, Updated: 23/11/2011



The Vessel Traffic Service seeks to reduce the risk of marine accidents and contribute to the efficiency of vessel traffic.

### 5. The VTS centres' tasks:

- to grant sailing permission to vessels before they sail into the VTS area and before they leave port;
- to provide information to and regulate vessel traffic;
- to intervene to enforce the regulations as necessary;
- to monitor and immediately contact the vessels on suspecting engine problems, incorrect course or anything else that is out of the ordinary;
- to summon, direct and provide assistance to vessels as necessary;
- to be a part of the NCA's first-line acute oil spill response organisation.

The Vessel Traffic Service (VTS) offers three types of services, based on national regulations and international recommendations:

#### 6. 1. Information Services (INS)

This service shall provide important information at the right time to support nautical decision-making processes on board. A vessel may request information, and the traffic control service may provide unsolicited information and request clarification from the vessel as required.

INS provides information about the traffic situation, such as:

- Position, vessel identity, destination
- Meteorological and hydrographic information
- Relevant limitations/restrictions or activities in fairways
- Guidelines for mandatory reporting
- VHF channels that are used in the VTS area.

## **7. 2. Navigation Assistance Service (NAS)**

Navigation assistance is established either on the request of the vessel or when the traffic controller observes irregular navigation and deems it necessary to intervene. The vessel and the traffic control centre will agree on when the navigation assistance service starts and stops. This service entails close assistance to the vessel in question.

Examples of situations in which navigation assistance is provided:

- Difficult meteorological conditions
- Faulty or inadequate shipboard equipment
- Vessel deviating from the passage plan
- Assistance en route to an anchorage site or a pilot boarding buoy/ground
- Risk of running aground or collision.
- Vessel that is uncertain about or unable to determine its position.

The VTS centre can provide:

- Bearings and distance to nearby hazard or landmark.
- Recommended course to next waypoint.
- Position in relation to the fairway axis, navigational functions and/or waypoint.
- Support and information for the bridge team, relating to the current traffic situation.

## **8. 3. Traffic Organisation (TOS)**

This service seeks to prevent hazardous situations from developing and to ensure safe and efficient navigation through the VTS area. The traffic control centre provides information, advice and instructions to vessels. Vessels report before sailing into the VTS area and when leaving an anchorage site or quay, among other things to avoid critical situations as a result of traffic density.

Among other things, the Maritime Traffic Regulations regulate meeting and passing prohibitions and the granting of clearance to vessels to sail into a VTS area. Clearance can be granted without conditions, or subject to specific conditions such as:

- Use of particular fairways
- Sailing in a particular order in relation to other traffic.
- Clearance can be withheld when there is a valid reason for doing so.

## Annex L: Circular letter for Eimskip vessels



### CIRCULAR LETTER - CHAPTER 15 IN SAFETY MANUAL

ATTENTION Captains and navigational officers by Eimskip	FROM Eythor H. Olafsson	
SUBJECT Safe practices by navigation	OUR REF. EHO/22-11	DATE 28.10.11

Dear all,

The purpose of this circular is to emphasize the importance of safe practices by navigating our ships. In this context I would like to mention the following points:

- 1) Ships that are **not equipped with ECDIS** need to carry up-to-date paper nautical charts at all times. These charts are to be used for navigating the ship even though the ship is equipped with a navigational computer, like f.ex. Transas. Such a computer, when not ECDIS, is only a navigational aid. This means that a **route plan shall be plotted on the paper charts before the voyage starts and the actual positions of the ship shall also be plotted on the paper chart parallel with the navigational computer.**

Where a passage plan is planned using paper charts, care should be taken when transferring the details of the plan to an electronic chart display system like Transas. This includes:

- Positions are transferred to, and are verified on, electronic charts of an equivalent scale to that of the paper chart on which the position was originally plotted;
  - Any known difference in chart datum between that used by the paper chart and that used by the electronic chart display system is applied to the transferred positions;
  - The complete passage plan, as displayed on the electronic chart display system, is checked for accuracy and completeness before it is used.
- 2) When navigating with a pilot on board it is **extremely important** that the officer on watch keeps on standing watch and checks all actions of the pilot. The pilot is not the navigating officer, he is only a guide for the passage of the pilot area.
  - 3) The pilot should never be allowed to disembark before the ship is out of critical areas. The reason for this point is the recent grounding of Godafoss in Hvaler by Fredrikstad in Norway. It is clear that in that case the pilot left the ship in a critical position. The pilot is servicing you and should carry out his service in a proper way and ensure that his guidance is satisfactory. If not we need to complain about it as soon as possible to the appropriate pilot authority.

Also remember to familiarize yourselves with the SMSPR004 (Icelandic version SMSVF004) procedure in chapter 7 of the SMS and appropriate guidelines on bridge procedures.

Best regards

Eythor H. Olafsson

Cc: GYL, HPV, ASK, IJS, BIE, BTH, NIE, DHS, HJohanne