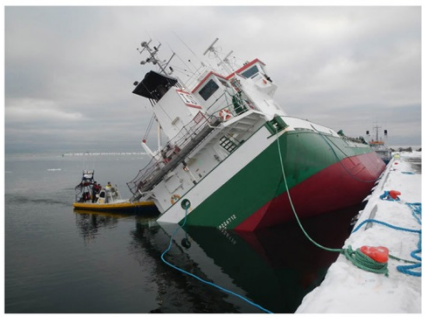
Statens haverikommission
Swedish Accident Investigation Authority



Final report RS 2018:04e

ATLANTIC – Grounding outside of Oskarshamn, Kalmar County on 23 September 2017

File no. S-154/17

21 August 2018

SHK investigates accidents and incidents from a safety perspective. Its investigations are aimed at preventing a similar event from occurring in the future, or limiting the effects of such an event. The investigations do not deal with issues of guilt, blame or liability for damages.

The report is also available on SHK´s web site: www.havkom.se

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This document is a translation of the original Swedish report. In case of discrepancies between this translation and the Swedish original text, the Swedish text shall prevail in the interpretation of the report.

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Content

General observations

The Swedish Accident Investigation Authority (Statens haverikommission – SHK) is a state authority with the task of investigating accidents and incidents with the aim of improving safety. SHK accident investigations are intended to clarify, as far as possible, the sequence of events and their causes, as well as damages and other consequences. The results of an investigation shall provide the basis for decisions aiming at preventing a similar event from occurring in the future, or limiting the effects of such an event. The investigation shall also provide a basis for assessment of the performance of rescue services and, when appropriate, for improvements to these rescue services.

SHK accident investigations thus aim at answering three questions: *What happened? Why did it happen? How can a similar event be avoided in the future?*

SHK does not have any supervisory role and its investigations do not deal with issues of guilt, blame or liability for damages. Therefore, accidents and incidents are neither investigated nor described in the report from any such perspective. These issues are, when appropriate, dealt with by judicial authorities or e.g. by insurance companies.

The task of SHK also does not include investigating how persons affected by an accident or incident have been cared for by hospital services, once an emergency operation has been concluded. Measures in support of such individuals by the social services, for example in the form of post crisis management, also are not the subject of the investigation.

The investigation

SHK was informed on 23 September 2017 that a serious casuality involving the general cargo vessel ATLANTIC with the registration OZ2060 had occurred outside of Oskarshamn in Kalmar County, the same day at 04:05 hrs.

The accident has been investigated by SHK represented by Mr. Mikael Karanikas, Chairperson, Mr. Dennis Dahlberg, Investigator in Charge, Mr. Anders Porseryd, Operations Investigator until 15 January 2018, Mr. Rikard Sahl, Operations Investigator and Mr. Alexander Hurtig, Investigator Behavioural Science.

Mr. Patrik Jönsson has participated in the investigation in the capacity of coordinator on behalf of the Swedish Transport Agency.

Investigation material

Interviews have been conducted with crew members from the ATLANTIC, the pilot who was in the area at the time of the grounding, the Swedish Transport Agency's inspector, the shipping company Venus Shipping and the classification society DNV GL. Information has been obtained from the Police and Coast Guard.

A meeting of the interested parties was held on 13 March 2018. At the meeting, SHK presented the facts discovered during the investigation that were available at the time.

Final report RS 2018:04e

Ship particulars	
Flag/register	Faroe Islands
Identification	ATLANTIC
IMO identification/call sign	8002731/OZ2060
Vessel data	
Type of ship	General cargo vessel
New building shipyard/year	JJ Sietas Schiffswerft Hamburg/1980
Gross tonnage	2,195
Length, over all	79.77 metres
Beam	12.8 metres
Draft, max	4.0 metres
Deadweight at max draft	3,017 mt
Main engine, output	MAK, 1,028 kW
Propulsion arrangement	One fixed blade propeller
Lateral thruster	Bow propeller, 147 kW
Rudder arrangement	Conventional rudder
Service speed	10 knots
Ownership and operation	Venus Shipping
Classification society	RINA (classification certificate)/DNV GL (ISM[1], ISPS[2] and MLC[3] certificate)
Minimum safe manning	5

Voyage particulars	
Ports of call	Visby – Oskarshamn
Type of voyage	International
Cargo information/passengers	Ballast
Manning	8

Marine casualty or incident information	
Type of marine casualty or incident	Grounding
Date and time	23/09/2017 04:05
Position and location of the marine casualty or incident	57º13,078N 016º30,772E
Weather conditions	Wind around East, 1–3 m/s
Consequences	
Personal injuries	No
Environment	No
Vessels	Hull damage

[1] ISM – International Safety Management.
[2] ISPS – International Ship and Port facility Security
[3] MLC – Maritime Labour Convention,

Figure 1. ATLANTIC aground. Image: Swedish Coast Guard.

SUMMARY

During a voyage from Visby to Oskarshamn, the vessel ATLANTIC ran aground just south of Oskarshamn. The master, who was alone on the bridge at the time and had the Bridge Navigational Watch Alarm System (BNWAS) turned off, has stated that he fell asleep just after he made the turn north of Öland towards Oskarshamn. The information is supported by the vessel's AIS track, which shows that no course corrections were made following the turn.

After the vessel ran aground, both of the nautical officers were arrested by the police and taken ashore, as a result of which the vessel was without a nautical officer in charge for some time.

The cause of the accident was deficiencies in the monitoring of the navigation due to the master falling asleep during his watch on the bridge and because there was no lookout.

Contributing causes to the master falling asleep included an accumulated sleep deficit and the fact that he was working on a two-watch system, which had likely contributed to the sleep deficit over a longer period of time. The master was under the influence of alcohol at the time of the grounding. Furthermore, the Bridge Navigation Watch Alarm System (BNWAS) had been turned off, which could have prevented the master from falling asleep or at least alerted the rest of the crew.

A contributing cause to the lack of a lookout on the bridge was the vessel's limited crew, in combination with the shipping company's ISM providing insufficient support to the master, which had not been noted in the classification reviews of the shipping company and the vessel.

Safety recommendations

Venus Shipping is recommended to:

- Review its safety organisation system and go over it with their masters in order to ensure that they understand its importance, whilst also mitigating the risk of other masters making similar adjustments for corresponding perceived needs (see section 3.3) *(RS 2018:04 R1).*

- Review its auditing and inspection system in order to ensure that the matter of work and rest periods is satisfactorily handled, so that deviations can be detected (see section 3.3) *(RS 2018:04 R2).*

DNV GL is recommended to:

- Carry out a general review of their auditing and inspection system and thereafter take necessary measures (see section 3.5) *(RS 2018:04 R3).*

The Swedish Transport Agency is recommended to:

- Take the initiative for a collaboration meeting with the relevant authorities and organisations in order to ensure that there is a consensus on how to handle situations like the one that arose in this case in the future, in order to ensure an effective and safe rescue and salvaging operation that also satisfies the interests of the police (see section 3.6) *(RS 2018:04 R4).*

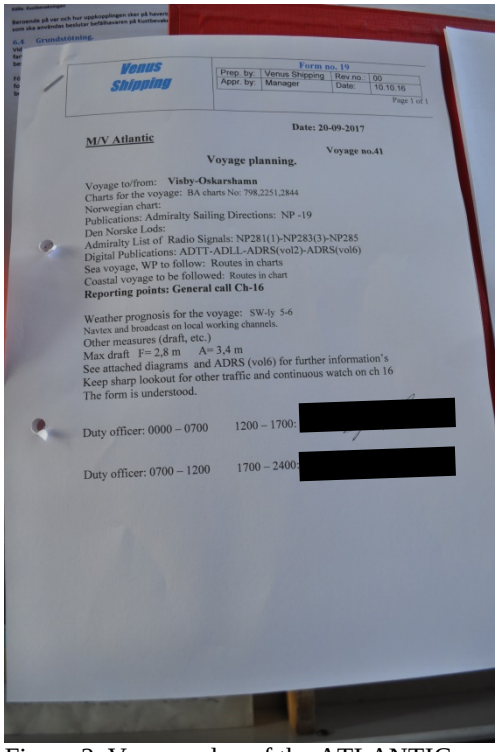
1. FACTUAL INFORMATION

1.1 History of the voyage

1.1.1 The grounding

On 21 September 2017, the vessel ATLANTIC departed Oskarshamn with a cargo of pebbles and gravel that was to be unloaded in Visby. This was the second of a total five voyages between Oskarshamn and Visby that the ship had been chartered for. The ATLANTIC arrived at Visby and started unloading the cargo at 06:00 hrs on the morning of 22 September, using its own excavator, and kept unloading all day up until 18:00. The vessel departed Visby without cargo around 19:30 that same night with the intention of arriving in Oskarshamn the next morning.

The chief officer completed the voyage plan to Oskarshamn. The voyage plan consisted of a first page containing information regarding charts, publications and weather (see figure 2). The second page of the voyage plan consisted of turning points and courses, as well as the distances between these.



Venus Shipping

Form no. 19

Prep. by: Venus Shipping | Rev.no. 00
Appr. by: Manager | Date: 10.10.16

Page 1 of 1

M/V Atlantic

Date: 20-09-2017

Voyage no.41

Voyage planning.

Voyage to/from: **Visby-Oskarshamn**
Charts for the voyage: BA charts No: 798,2251,2844
Norwegian chart:
Publications: Admiralty Sailing Directions: NP -19
Den Norske Lods:
Admiralty List of Radio Signals: NP281(1)-NP283(3)-NP285
Digital Publications: ADTT-ADLL-ADRS(vol2)-ADRS(vol6)
Sea voyage, WP to follow: Routes in charts
Coastal voyage to be followed: Routes in chart
Reporting points: General call Ch-16

Weather prognosis for the voyage: SW-ly 5-6
Navtex and broadcast on local working channels.
Other measures (draft, etc.)
Max draft F= 2,8 m A= 3,4 m
See attached diagrams and ADRS (vol6) for further information's
Keep sharp lookout for other traffic and continuous watch on ch 16
The form is understood.

Duty officer: 0000 – 0700 1200 – 1700: [redacted]

Duty officer: 0700 – 1200 1700 – 2400: [redacted]

Figure 2. Voyage plan of the ATLANTIC.

According to information provided in interviews with the crew, both the master and the chief officer were on the bridge at the departure from Visby. Shortly thereafter, the chief officer went to rest, and the master had the watch alone on the bridge up until midnight, when the chief officer returned to take the watch. The master left the bridge for approx. one hour in order to eat and shower, and then returned to take the watch on the bridge again. The intention was for him to remain on

watch up until the arrival at Oskarshamn, so that the chief officer could get some rest, as the latter would have a great workload with calculating the cargo, handling ballast and loading once the vessel arrived at Oskarshamn.

There was no lookout on the bridge during any part of the voyage. The reason for this, according to the master, was that the crew had worked so hard during the unloading in Visby that they needed to rest in preparation for the loading in Oskarshamn.

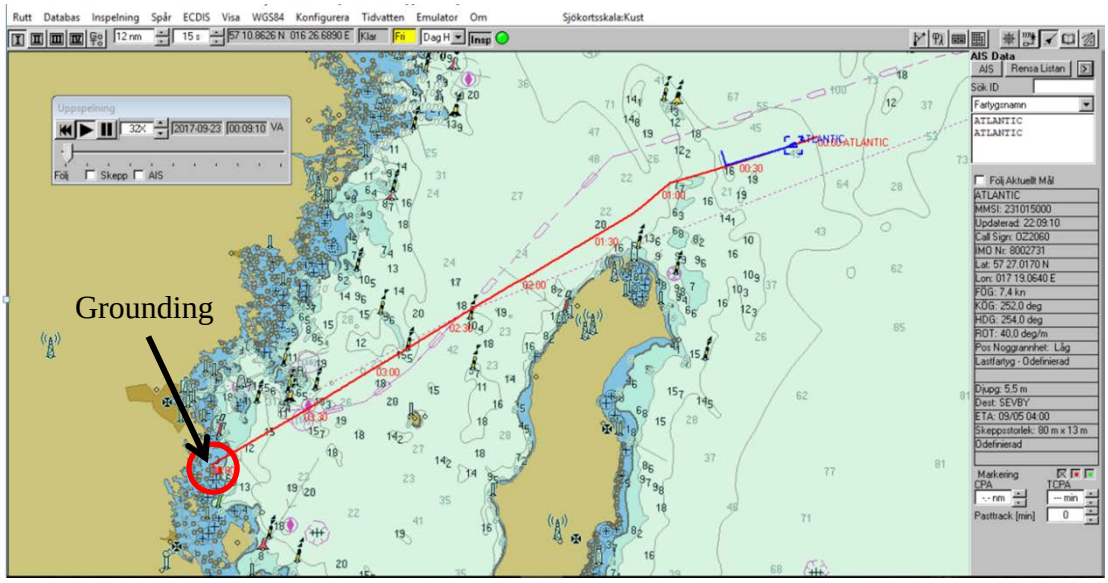


Figure 3. AIS track of the ATLANTIC.

According to the master, he turned north of Öland (see Figure 3), but shortly afterwards he fell asleep on the bridge and only woke up when he heard someone call the ATLANTIC over the VHF[4]. It turned out to be a pilot boat that had noticed the ship's position.

The following VHF call was recorded between the pilot boat PILOT 748 and the master of the ATLANTIC on 23 September at 04:07. The master slurred his words throughout the conversation.

– ATLANTIC, ATLANTIC. Oskarshamn pilot calling channel one six.

– Yes ATLANTIC here.

– Channel one three, one three.

– One three.

– ATLANTIC here, ATLANTIC here.

– Yes ATLANTIC. Oskarshamn pilot. You have a very strange position. Can you confirm everything is okay?

– Yes, everything okay.

[4] VHF (Very High Frequency) – radio communication system.

– ATLANTIC. Oskarshamn pilot. You seem to be in a very shallow position. Can you please confirm everything is okay?

– Yeah is everything okay.

Shortly afterwards, just after four o'clock in the morning on 23 September, the ATLANTIC ran aground (see figure 4).

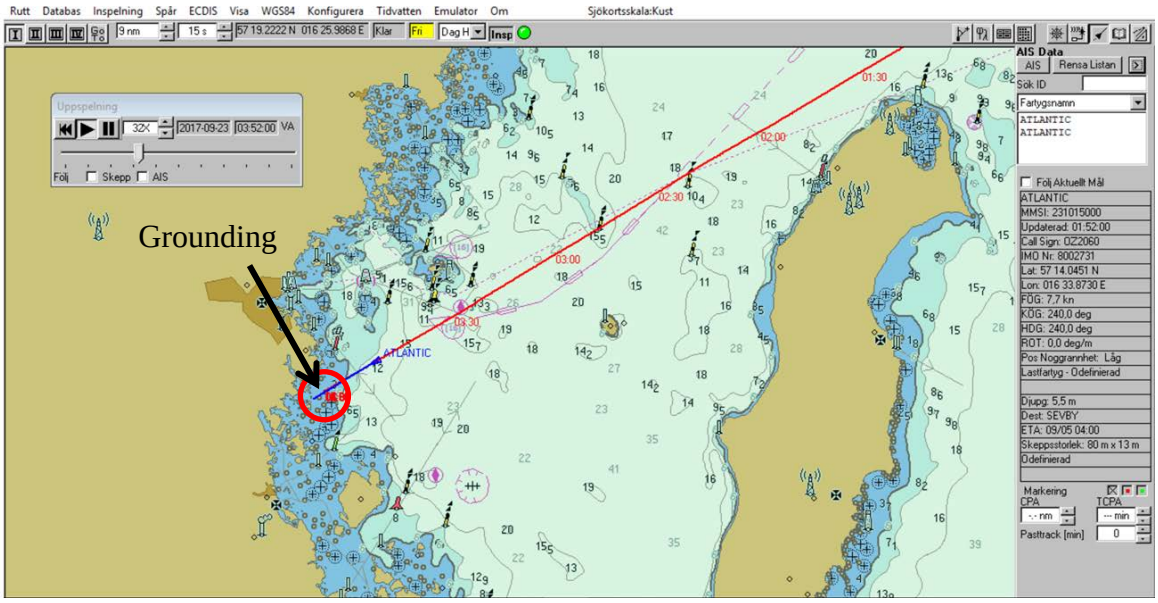


Figure 4. AIS track of the ATLANTIC.

1.1.2 Rescue operation, etc.

At 04:20 on 23 September, the pilot planning centre in Malmö sent out an alert to JRCC[5] that a vessel (ATLANTIC) was in a strange position outside of Oskarshamn. Once the Swedish Coast Guard's command and control centre in Gothenburg had been informed and made contact with the pilot planning centre, the JRCC called the vessel over VHF and eventually received confirmation that it was grounded.

At 04:25, the JRCC dispatched a number of surface units to assess the situation on site and to attempt to establish contact with someone on board in order to ensure that no-one was injured. The Swedish Transport Agency was informed shortly thereafter, which decided to send an inspector to the vessel.

At 04:50, the pilot boat arrived at the ATLANTIC. The pilot boat confirmed that the ship had ran aground, but that it was trying to manoeuvre free. The JRCC then requested the ATLANTIC to stop the manoeuvring and wait for rescue services.

The police, alerted by the coast guard, arrived in Oskarshamn, where they were picked up at 06:19 by the Swedish Sea Rescue Society

[5] JRCC – (Joint Rescue Coordination Centre): Air-sea rescue centre that is part of the Swedish Maritime Administration.

vessel SSRS BURRE for onwards transportation to the ATLANTIC. At 06:39, the SSRS BURRE reached the ATLANTIC and five police officers boarded the vessel.

At 06:58, the Coast Guard vessel KBV 313 arrived at the vessel, and three officers boarded the ATLANTIC.

When the police came on board, both the master and the chief officer came under suspicion of being drunk on duty. Both tested positive in a breathalyser test, at which point the police officers decided to arrest them and take them in for a body search. The coast guard officers agreed with the decision to take both of the nautical officers ashore.

At 07:49, the sea rescue services were terminated by JRCC. There was no threat to life and the vessel was not taking in water nor leaking oil. However, environmental rescue services were engaged until 26 September at 08:50.

Figure 5. The ATLANTIC aground. Image: Swedish Coast Guard.

Since there was no nautical officer on board the ATLANTIC once the police had arrested the master and the chief officer, the shipping company, which had been informed of the incident, appointed the only officer on board the vessel, i.e. the chief engineer, as the shipping company's representative on board the grounded vessel.

After around 30 hours, following pressure from other parties involved, the police realised that the salvaging operation could not be initiated without having at least one nautical officer on board. As a result, the chief officer was brought back on board the vessel under constant

around-the-clock surveillance by two police officers for the duration of the salvaging operation.

1.2 Injuries to persons

No injuries to persons arose.

1.3 Damage to the vessel

Following the grounding, the following damage to the vessel was noted:

- Indentation near the bulb, approx. 30 mm in length, between frames 123 and 122.
- A slight indentation aft of the echo sounder stretching 1,000 mm astern.
- Indentation on the starboard side of the centre line, approx. 20–33 mm in length, between frames 109 and 106.
- The bilge keel on the starboard side was damaged, with 7.2 metres bent flat down against the hull and 6.5 bent up flat against the hull.

1.4 Accident site

The accident occurred 4.9 M south-west of the vessel's planned turning point in towards Oskarshamn, which had been passed 42 minutes before the grounding.

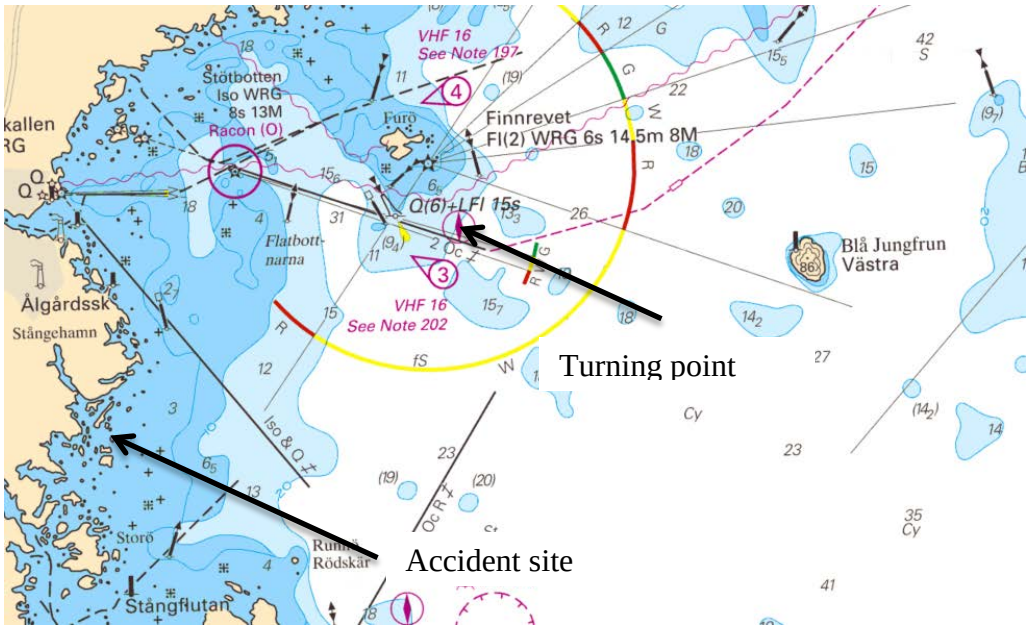


Figure 6. Approach to Oskarshamn. © Sjöfartsverket permit no. 18-00310.

Pilotage is compulsory in Oskarshamn for general cargo vessels that are more than 90 metres in length and more than 16 meters in width. The ATLANTIC was thus not subject to compulsory pilotage.

1.5 The vessel

1.5.1 General

The ATLANTIC was built in 1980 in Hamburg, Germany. The vessel has one cargo hold with a total cargo capacity of 4,564 m^3. The bridge, engine room and living quarters are all located in the aft portion of the vessel. The main engine is of the make MAK with an output of 1,028 kW. The vessel is a self-unloader, i.e. it is equipped with an excavator and the crew carries out the unloading work.

The ATLANTIC is equipped with a conventional rudder and the ship's propulsion consists of a propeller with fixed blades.

Figure 7. The bridge of the ATLANTIC.

The bridge is fitted with a console that has Anschütz autopilot, manual steering and engine manoeuvres. The navigation equipment includes two radar sets, GPS[6], BNWAS[7] (see section 1.5.2) and GMDSS[8] with several VHF stations. However, there was no approved electronic navigational chart on board at the time of the accident, neither in the form of ECDIS[9] nor ECS[10]; but an electronic navigational chart was used on board which was neither up to date nor approved for navigation.

[6] GPS (Global Positioning System) – a satellite navigation system.
[7] BNWAS – Bridge Navigational Watch System.
[8] GMDSS (Global Maritime Distress and Safety System) – a system for emergency signalling from vessels.
[9] ECDIS (Electronic Chart Display and Information System) – an electronic chart system that can be used as a replacement for paper charts.
[10] ECS (Electronic Charting System) – an electronic chart system that cannot be used as a replacement for paper charts.

There were corrected paper charts on board for navigation, but there was no correct chart for the voyage, only an internationally small scale chart that was not sufficiently detailed.

1.5.2 Bridge Navigational Watch Alarm System (BNWAS)

BNWAS is a system used to monitor the activity on the bridge and to notice if the officer of the watch is incapacitated and unable to fulfil their duties. BNWAS sets off an alarm at regular intervals which must be actively reset by the officer of the watch. If the system is not reset, it will at first set off an alarm in selected crew cabins. If this does not lead to a reset, a general alarm is triggered to warn the entire crew.

Pursuant to Chapter 3, Section 19 of the Swedish Transport Agency's regulations and general advice (TSFS 2011:2) on navigational safety and navigational equipment, a vessel of the ATLANTIC's size shall be equipped with BNWAS. In accordance with the same provision, the BNWAS shall always be operational during a voyage (cf. Chapter V, Regulation 19 of SOLAS).

The ATLANTIC was equipped with BNWAS. However, the system was disengaged at the time.

1.5.3 Voyage Data Recorder (VDR)

A VDR is a system installed on a vessel to collect and save important information regarding communication and data from components and instruments on board, with the aim of facilitating the investigation of maritime accidents. IMO resolution A. 861(20) on Performance standards for shipborne Voyage Data Recorder (VDR) states the information that a VDR shall register. According to the requirements in the resolution, a VDR is to record data including the vessel's position, heading, speed, radar data, rudder order, engine order, VHF traffic and communications and mandatory alarms on the bridge.

In accordance with Sections 26–27 of the Transport Agency's regulations and general advice concerning navigation safety and navigation equipment (TSFS 2011:2), all vessels with a gross tonnage of 3,000 or more are to be equipped with a VDR in order to facilitate the investigation of accidents. Vessels fitting the above description built prior to 1 July 2002 may use an S-VDR (simplified) instead of a VDR. According to Section 28, the information collected is to be made available to the relevant authority within the EU in the event of an accident within its territorial waters.

Since the ATLANTIC had a gross tonnage of less than 3,000, there is no requirement for a VDR or S-VDR. Nor was the ATLANTIC equipped with either of these systems.

1.5.4 Work and living environment

On 25 September 2017, SHK conducted a visit on board the vessel. The general impression was that both general areas and the cabins were dirty and unkept.

According to information from the crew, they did not have any fresh fruit or vegetables on board, and it had been around three weeks since their last provisioning. The food was starting to run out and they had no fresh goods. The master has stated that he had informed the shipping company on two occasions on the status of the food supplies, but that he had received no reply.

1.6 The crew

The crew of the ATLANTIC consisted of eight people. One master, one chief officer, one chief engineer, one motorman and four able seamen deck (one of whom was responsible for cooking).

1.6.1 The master

The master had commanded various ships since 2008, and had been working for Venus Shipping since 11 September 2017 as the master of the ATLANTIC. The master had called the port of Oskarshamn several times before the accident.

Working hours

The master and the chief officer were working according to a two-watch system. This means that they divided up the bridge watch between themselves. The master would regularly take the bridge watch between 07:00 and 12:00 in the morning and between 17:00 and 24:00 in the evening. At times, these periods would shift by an hour or so.

In the work and rest log, the master had noted the hours that constituted resting periods. In the three days preceding the grounding, the resting periods were registered in accordance with the regular schedule.

Table 1 shows the actual distribution of the master’s time.

Table 1. The master's own information about how he divided his time three days prior to the grounding.

Day	Bridge watch	Other work	Resting period	Sleeping during resting period
20 Sep 2017	07:00–12.00 17:00–24:00	12:00–17:00	00:00– 07:00	6 hrs
21 Sep 2017	07:00–12.00 17:00–24:00	03:00–07:00 12:40–13:40	00:00– 03:00	Approx. 3 hrs
22 Sep 2017	07:00–12.00 17:00–24:00	12:00–17:00	00:00– 07:00	6 hrs
23 Sep 2017	01:00–04:30 (grounding)		00:00– 01:00	None

The master slept for about six hours during the night between 21 and 22 September. From 07:00 on 22 September, he was on watch. According to the log, the master had a resting period between 12:00 and 17:00, which did not match the actual conditions. Instead, the master has stated that he was working all day. During loading and unloading, both the master and the chief officer needed to be involved in the work, and they were therefore unable to take rest as intended. When the master finished his watch at midnight on 23 September, he went to his cabin to shower. He then went back up to the bridge to relieve the chief officer. The master had thus not slept or rested since 06:00 on 22 September when he resumed the watch from the chief officer at around 01:00 on 23 September.

Alcohol

The master has stated that he became so stressed in conjunction with the grounding that he needed to drink alcohol in order to calm down. A breathalyser test was conducted around three and a half hours after the grounding, showing that the master had a breath alcohol concentration of 0.88 mg/l, which corresponds to approximately 1.76 per mille in the blood. This level exceeds the permitted concentration of 0.2 per mille. The police performed no other testes of the master.

The master has given conflicting answers regarding the amount of alcohol that he ingested. To the police on board the ship, he initially said that he had had around 15 grams of spirits (40 per cent alcohol), which corresponds to roughly 15 cl. He later said that the amount was 40–50 grams, i.e. around 40–50 cl. The latter corresponds better to the measured breath alcohol concentration.

Alcohol consumption impacts on the cognitive abilities. Effects that can be observed at a blood alcohol concentration between 1.5 and 2 per mille include impaired judgement and ability to take in information, slurred speech and decreased control of muscles and emotions, as well as difficulty maintaining balance.

1.6.2 Chief officer

At the time of the event, the chief officer had served as chief officer on different vessels for 15 years. He had been employed by the shipping company since 11 June 2017.

Working hours

The chief officer was working in the same way as the master, but had the watch between 00:00 and 07:00 at night and between 12:00 and 17:00 in the afternoon.

The chief officer has stated that he was supposed to be on watch at the time of the grounding, but that the master had relieved him after a couple of hours, telling him to get some sleep instead.

Medical information

The chief officer has stated that he had had beer and spirits earlier in the day on 22 September in Visby. He has furthermore stated that he did not consume any alcohol after 14:00. At around 08:00 on 23 September, the police carried out a breathalyser test on the chief officer, showing that he had a breath alcohol content of 0.88 mg/l, i.e. a blood concentration of 1.76 per mille.

Initially, the police was working on the assumption that the chief officer had been the one sailing the ship. The police therefore executed their protocol for verifying when the alcohol was consumed. This entails taking several consecutive blood and urine samples to determine the alcohol concentration in the body. The analysis of the National Board of Forensic Medicine showed a blood alcohol concentration of 1.94 per mille at 08:25. The urine sample taken half an hour earlier showed an alcohol concentration of 2.91 per mille.

The chief officer has stated that he was feeling intoxicated when he started his watch at midnight.

Additional information

The chief officer's three-month contract had expired on 1 September 2017, but he had not received any information about when he would be relieved. The shipping company and the chief officer had not, in accordance to MLC 2006[11], signed for an extension of the existing contract of employment.

1.6.3 Information from other crew members

All members of the crew were sleeping at the time of the grounding.

One crew member has stated that when he arrived at the bridge shortly after the grounding, the master was soundly asleep in one of the bridge chairs. In his opinion, the master appeared to be intoxicated.

Several crew members had seen the chief officer purchase alcohol and bring it on board when the vessel was moored in Visby.

1.7 Meteorological information

SHK has commissioned SMHI[12] to compile a summary of the weather conditions between the northern cape of Öland and Oskarshamn on the night and morning of 23 September 2017. The summary indicates that the wind was around easterly, 1–3 m/s. The air temperature was 14°C and the water temperature was 14°C. The significant wave height[13] was 0.1 metres in the direction of 106 degrees. The currents in the area were moving at 0.1 knots eastward during the night and morning.

1.8 Regulations and supervision

1.8.1 ISM code

As of 1 July 2002, all merchant vessels involved in international traffic that is covered by the IMO's maritime safety convention SOLAS must comply with the International Management Code for the Safe Operation of Ships and for Pollution Prevention (the ISM Code[14]). The only exception is the smallest ships (cargo vessels under 500 gross tonnage).

The aim of the ISM code is to provide an international standard for safe operation of vessels and to prevent pollution. The code establishes safety management targets and requires the shipping company, or other person who has assumed the responsibility of

[11] MLC – Maritime Labour Convention 2006.
[12] SMHI – Swedish Meteorological and Hydrological Institute.
[13] The wave height is generally given in terms of the significant wave height (SWH), i.e. the mean wave height of the top third of the waves. The highest waves are 1.6 to 1.8 times the SWH. A few isolated waves can reach double the SWH.
[14] The code has been implemented within the European Union through Regulation (EC) No 336/2006 of the European Parliament and of the Council on the implementation of the International Safety Management Code within the Community and repealing Council Regulation (EC) No 3051/951.

operating a vessel, to introduce a safety management system (SMS). The shipping company must produce and implement a policy to achieve the safety management targets. This includes providing the necessary resources and land-based support. Every company is expected to appoint at least one person ashore with direct access to the top management. Any procedures required by the code shall be documented and compiled in a safety manual (ISM manual), a copy of which shall be kept on board.

Verification, monitoring and evaluation shall take place through internal safety audits. The effectiveness of the safety management system shall be regularly evaluated. Audits shall take place according to documented procedures by staff who is independent in relation to the audited area. Any faults shall be rectified by management.

Supervisory inspections are carried out by the flag state or by a recognised organisation, in order to ensure that the requirements of the ISM code have been met. If the requirements are assessed to have been fulfilled, the shipping company is issued a document regarding its approved safety management system (Document of Compliance) and a certificate regarding the approved safety management system on board the vessel (Safety Management Certificate).

The Safety Management Certificate issued to a ship is valid for a period of no more than five years, and it is subject to at least one verifycation during that time.

1.8.2 Voyage planning

The international requirements for voyage planning applicable to the event are regulated in the international regulatory framework SOLAS, chapter V, regulation 34. It is stated here that the captain must make sure to check that the planning has been done with the help of a relevant navigational chart and nautical publications, and that IMO's guidelines and recommendations have been observed. The guidelines referred to are primarily Resolution A.893(21) IMO Guidelines for Voyage Planning. The requirements in SOLAS regarding voyage planning have been implemented in Sweden through Chapter 2 of the Swedish Transport Agency's regulations and general advice (TSFS 2011:2) on navigational safety and navigational equipment.

In accordance with *IMO Guidelines for voyage planning* A.893(21), the ship's route must be plotted on the navigational chart along with courses, hazardous areas and report points. The route planning shall also contain but not be limited to:

- A speed which is safe, taking into consideration the navigational risks along the planned route, the ship's manoeuvreability and its draught in relation to the water depth.
- Turning points, taking into consideration the ship's turn radius at the planned speed.

- Minimum depth beneath the keel in areas with limited water depth.
- Methods for position fixing and how often the ship's position is to be fixed.

1.8.3 Watch keeping

In chapter VIII STCW[15], there are international requirements regarding watch keeping (cf. the Swedish Transport Agency's regulations [TSFS 2012:67] regarding watch duty). The STCW states, for example, that the officer of the watch shall keep watch on the bridge and may under no circumstances leave the bridge unless properly relieved, and they shall ensure that a proper lookout is maintained at all times. The officer of the watch shall not hand over the watch to the relieving officer if there is reason to believe that the latter is not capable of carrying out their watch keeping duties. During the watch, a careful log shall be kept of any movements and activities concerning the ship's navigation.

For navigation in coastal waters, the chart on board that has the largest scale and which is most appropriate for the area shall be used. The chart shall be corrected in accordance with up-to-date information. The vessel's position shall be fixed frequently. When the conditions so allow, the position shall be fixed using more than one method.

1.8.4 Regulations for hours of work and rest at sea

The Maritime Labour Convention (MLC) and the STCW Code define requirements and goals for a crew member's physical and mental wellbeing. They include requirements for hours of work and hours of rest and stipulate that each member state must ensure that these hours are regulated[16]. The STCW Code looks especially at standards for watch keeping and defines the exceptions that can be made. The flag state of the ship ATLANTIC is the Faroe Islands, which has ratified the MLC and the STCW Code.

Under point 1 in Standard A2.3 under regulation 2.3 of the MLC, the terms hours of work and hours of rest are defined. Hours of work "means time during which seafarers are required to do work on account of the ship". Hours of rest "means time outside hours of work; this term does not include short breaks".

In accordance with the MLC, work may not exceed 14 hours in a 24-hour period or 72 hours in a seven-day period. In accordance with the Maritime Labour Convention and the STCW Code, hours of rest may not be less than ten hours in a 24-hour period or 77 hours in a seven-day period.

[15] STCW – International Convention on Standards of Training, Certification and Watch keeping for Seafarers.
[16] Regulation 2.3 of the MLC and Chapter 8, Section A-VIII/1 of the STCW Code "Fitness for duty".

According to the MLC, hours of rest may be divided up into a maximum of two periods per 24-hour period, and one of these must be a period of at least six hours. In addition, the time between these two periods may not exceed 14 hours. The STCW Code, which deals specifically with standards for watch keeping, allows certain exceptions. Up to three periods of rest can be allowed, though one of the periods within a 24-hour period must be at least six hours. The two other periods of rest may not be shorter than one hour each and exceptions can be made for up to two 24-hour periods over a seven-day period. The total hours of rest may not be less than 70 hours for a seven-day period.

Both the MLC and the STCW Code state that if a crew member must perform a task in order to ensure the immediate safety of the ship, persons on board or the cargo, the regulations shall not hinder this. In such cases, the captain shall be permitted to make exceptions to the regulations for a crew member, until normal operation is restored. As soon as possible after the ship has returned to normal operation, the crew member who has worked during scheduled hours of rest should be afforded the opportunity to take a sufficient period of rest.

1.8.5 Minimum Safe Manning

IMO resolution A.1047(27) states the Principles of Minimum Safe Manning. These principles state that the crew shall be able to maintain a safe navigation-, port-, machine- and radio watch in accordance with Rule VIII/2 of the 1978 STCW. The minimum safe manning certificate shall also provide the conditions for safe mooring and departure of the vessel, for maintaining safety and cleanliness in all available spaces to minimise the risk of fire, and for planning, monitoring and ensuring safe loading, stowage and securing of cargo.

According to the ATLANTIC's minimum safe manning certificate, which was issued by the ship's flag state of the Faroe Islands, the ship shall be manned by a crew of at least 5: Master (STCW II/2,3), chief officer (STCW II/2,3), chief engineer (STCW III/3), able seafarer deck (STCW II/5) and able seafarer engine (STCW III/5).

1.8.6 The master's role and interventions on board

The master has the overall responsibility for the vessel and shall ensure that it is seaworthy before and during a sea voyage. The concept of seaworthiness includes the vessel having the necessary equipment to prevent ill-health and accidents, being appropriately manned, having sufficient provisions and being equipped and loaded with cargo or ballast to ensure that there is no threat to the vessel, life or cargo (Chapter 1, Section 9 of the Swedish Maritime Code [1994:1009]).

If a vessel is in distress at sea, the master is obliged to do everything in their power in order to save those on board and protect the vessel and cargo. They shall, if possible, ensure that log books and other ship

documents are brought to safety and take measures to salvage the ship and cargo. As long as there is a reasonable chance that the vessel can be saved, the master may not abandon it unless their life is in serious danger (Chapter 6, Section 6 of the Swedish Maritime Code).

In accordance with Chapter 6, Section 7 of the Swedish Maritime Code, the highest ranking officer present shall make any decisions that cannot be deferred, if the master is absent or debilitated. If the master leaves the ship, they shall inform the highest ranking officer on board or another member of the crew, if no officer is available, and provide them with the necessary instructions. When the ship is not moored in port or at a safe anchorage, the master may not leave the vessel unless absolutely necessary. In case of imminent danger, they may not be away from the vessel. If the master dies or becomes incapable of heading the ship due to illness or other compelling reason, or if he abandon his post, the highest ranking officer shall take his place until a new master has been appointed. In such cases, the ship owner shall be notified immediately.

SHK has asked the police and the Coast Guard whether, and if so how, these provisions are considered in interventions on board vessels where a criminal investigation prompts the removal of the responsible nautical officers from the ship as the result of an arrest and decision to conduct a body search.

The reply from the police shows that there is no such basis for decisions or corresponding procedure to handle a similar situation. However, the Marine Police in Stockholm has stated that the main rule is to never deprive the ship completely of nautical competence. If, for example, everyone tasked with sailing the vessel were to be intoxicated, the police would have to “leave it be” and let the master stay on the bridge. Another possible solution would be to bring evidence-gathering instruments out to the vessel. The Marine Police in Stockholm has also stated that they have a 24-hour telephone line where a preliminary investigation officer can be reached at all times.

The Coast Guard has stated that they have an instruction regarding interventions in cases of drunk sailing (IKBV 2011:6), which includes the following under section 3.13 Moving a vessel.

> *If an intervention in a case of drunk sailing results in the master being removed from the vessel, and there is no authorised crew left on board who can be enrolled, one of the following alternatives can be applied.*
>
> - *Anchor the vessel*
>
> - *Tow the vessel to the nearest appropriate location*
>
> *In case of danger, where none of the above alternatives is possible, a Coast Guard officer is authorised to move the vessel pursuant to the provisions of the Penal Code regarding emergencies. There is no general obligation for the Coast Guard to inform the shipping company of an*

intervention against drunk sailing. However, in cases where the Coast Guard has anchored or moved the vessel in accordance with the above, the shipping company or other person in charge should be informed so that they can take the necessary measures. In this context, it should be emphasised that information regarding the suspect may be subject to secrecy.

1.8.7 Port state control

Inspection of foreign vessels is carried out in the form of a port state control. These inspections are carried out in order to verify that the vessel complies with applicable international regulations, and that there are no deficiencies in terms of safety or work environment on board. If the inspection results in the vessel being found not to comply with applicable regulations, and if it is not deemed seaworthy or has significant deficiencies, for example in the protection against ill-health or accidents, it can be detained.

Detention is a measure taken against the master and the ship owner, and it usually means that the vessel is prohibited from continuing its voyage until the deficiencies have been rectified. Various risk criteria determine which vessels that are to be inspected and at what interval, ranging between 6–36 months. These criteria are based on the vessel type, its age, the performance level of the flag state, the performance level of the shipping company, and the vessel history of earlier deficiencies and detentions.

In Sweden, port state control is carried out by the Swedish Transport Agency. This activity is regulated through the Port State Control Directive and the Paris Memorandum of Understanding Port State Control (Paris MoU). Paris MoU is an intergovernmental agreement between 27 countries. The ATLANTIC had undergone regular port state controls in accordance with the interval for its risk category. The last port state control prior to the grounding took place in Denmark in February 2017. The inspection resulted in four minor remarks on the ship.

A new port state control was carried out on board by the Swedish Transport Agency on the day of the grounding. The Transport Agency found a total of 23 deficiencies on board, which resulted in the vessel being detained.

The deficiencies included the following:

- According to the police report, the bridge officer in charge was under the influence of alcohol.
- There was no lookout on the bridge entered in the ship’s log.
- Chart 2844 was missing.
- There were no navigational entries in the ship’s log for the voyage from Visby.
- BNWAS out of order/disabled.

- Smoke detectors in the machine room were covered.
- Several fire doors were permanently held open.
- Approx. 30 % of all food in cold and dry storage had passed the expiration date. The amount of food and water was not sufficient to reach Oskarshamn.
- The ship's condition and stability at departure were unknown to the officer on board.
- The registration of resting periods did not correspond to the other logs.

1.8.8 Classification society supervision

Classification societies are private companies that originally worked with scoring (classification) of ship seaworthiness, in order to meet the increased need for safe merchant shipping.

SOLAS states that a ship subject to the Convention shall be constructed, built and maintained in accordance with the structural, mechanical and electrical requirements set by a classification society recognised by the vessel's flag state (Article II-1, rule 3.1). It is pursuant to this provision that the classification societies develop regulations with requirements on vessel construction. The vessel's compliance with the requirements is shown by a classification certificate issued by the societies directly pursuant to the international regulatory framework. It is thus mandatory for the vessel to have a classification certificate. The classification certificate of the ATLANTIC was issued by the classification society RINA.

The flag state is responsible for ensuring that all vessels under its flag have approved certificates. However, there is a possibility for the flag states, through their maritime authorities, to transfer certain tasks to approved organisations. The classification society DNV GL is one such approved organisation, and the ATLANTIC had been issued its ISM and MLC certificates by DNV GL. The shipping company's Document of Compliance (DOC) was also issued by DNV GL.

The latest ISM inspection of the ATLANTIC prior to the grounding took place on 11 April 2017 in Rostock. The vessel received no remarks in the inspection. The conclusion was that the ISM system was effectively implemented. On the same occasion, DNV GL also carried out an MLC inspection, in which the ATLANTIC received one minor remark.

Following the grounding, DNV GL carried out a renewed ISM inspection of the vessel. In that inspection, the ATLANTIC received several remarks, including the following:

- The checklist for the introduction of new nautical officers was vague, providing little support for newly engaged crew.
- A system to ensure that relevant charts are available on board must be implemented.
- Ship operating procedures are inadequate and inconsistent, for example in terms of cargo management and bridge procedures.

DNV GL also carried out an MLC inspection, with the following remarks:

- Rest hours to be as per requirement.
- Weekly and monthly inspection of accommodation completed with no records of the result of the inspections Instruction on what to inspect and how missing.

On 14 August 2017, DNV GL carried out a DOC revision of the shipping company's safety management system, noting the following:

- Amount of deviations for one vessel indicates lack of understanding/fulfillment of Company safety management system and adequate implemention on board.

On 3–4 January 2018, DNV GL carried out a new DOC revision to follow up on the SMS-related deficiencies noted in the Swedish Transport Agency's port state control following the grounding. During the revision, which was carried out by the inspector responsible for the revision of 14 August 2017, no deficiencies were noted.

1.8.9 Report to the classification societies in the event of an accident

In order to ensure that the classification society responsible for the ISM certification of a vessel is informed of deficiencies discovered – for example during a classification inspection, which may impact the implementation of the vessel's safety management system (SMS) – the International Association of Classification Societies (IACS) has issued certain procedural requirements[17]. If they discover any deficiencies, the inspector shall establish a report to be submitted to the responsible department of the inspector's classification society for review and a decision on whether the deficiencies impact on the implementation of the safety management system. If that is the case, the report shall be sent to the other classification society.

[17] IACS Procedural Requirement No. 17 – Reporting on deficiencies possibly affecting the implementation of the ISM Code on board during surveys.

Section 3.7 of Paris MoU states that if a port state control results in detention of the ship, the flag state and approved organisations that have issued certificates concerned by the deficiencies shall immediately be notified.

In the present case, RINA was informed of the accident by the shipping company. DNV GL became aware of the accident when SHK contacted them to gather information following the grounding. At a later stage, following the completion of their reports, DNV GL was informed by both RINA and the Swedish Transport Agency.

1.9 Organisational and management information

1.9.1 Venus Shipping

The company was founded in 1937 and currently controls seven vessels, primarily smaller bulk carriers. The company's head office is located in Vestbjerg, Denmark.

Venus Shipping assumed management of the ATLANTIC on 1 October 2016. The vessel has been for sale for the entire time that the shipping company has been managing it.

The ATLANTIC had a valid certificate and documentation of an approved safety management system. SHK has studied selected parts of the shipping company's ISM manual. This includes sections concerning voyage planning, bridge watchkeeping and navigation. Content from relevant parts of the manual are presented in the following section.

According to the shipping company, vessels in its fleet receive a large provisioning once per month and an intermediary provision of fresh supplies.

1.9.2 ISM manual

Voyage planning

The ISM refers to the ICS[18] Bridge Procedures Guide for voyage planning. The latter states that the voyage plan shall contain distances and courses for each part of the voyage and indications of whether any speed changes are necessary.

Pre-departure check-list

The ISM manual also contains a check-list with points to check before departure. This includes whether or not the voyage plan is complete and whether all charts and publications for the voyage are up to date.

[18] ICS – International Chamber of Shipping.

Bridge watch

According to the ISM manual, the master shall assign a bridge watch considering the weather, navigation and traffic conditions. It also states that the vessel shall be manned in such a way as to always comply with the regulations of its flag state and classification.

Emergency preparedness

The vessel's ISM manual specifies the actions that are to be taken in the event of a grounding. First, immediate measures are to be taken in terms of alerting the crew and shifting the engine to neutral. After this, a check shall be made for damage to the ship and injuries to the crew. Once the immediate actions have been completed, the coastal state, JRCC, the shipping company and other stakeholders are to be contacted.

Alcohol and drug policy

The ISM manual includes the following:

- Drinking alcohol during work hours in port or at sea is prohibited.
- When off duty, the shipping company permits each crew member to consume no more than 2 beers over a 24-hour period.
- It is not permitted to provide a crew member with alcohol for consumption on board.
- Bringing any form of alcohol on board is prohibited.

1.10 Fatigue

1.10.1 General

The Karolinska Sleepiness Scale (KSS) is a validated self-assessment scale for sleepiness. The scale is also used to describe the assessed level of sleepiness for a person on the basis of factual circumstances.

The scale goes from 1 to 9, with 1 to 3 being equivalent to a very alert state and 7 to 9 a state in which there is a great or very great risk of falling asleep. A person self-assessing themselves on a 5 or above is in a state that would commonly be described as feeling tired. The closer a person gets to 9 on the scale, the harder it is for them to stay awake.

The first signs of sleepiness can be slight cognitive changes which lead to simple mistakes. Sleepiness at this level can lead, for example, to the need for a certain amount of effort or reflection in order to remember something. If something in the surroundings changes and requires the person's attention, they would however normally have no problem refocusing themselves to deal with these requirements.

However, when the level approaches or exceeds 7 on the KSS, a person has greater difficulty perceiving, understanding and predicting their surroundings. The ability to plan and make decisions that are further ahead is particularly affected. In this state, decision-making is impaired in a comprehensive manner, both in terms of which decisions are made and also because it takes longer to make these decisions. At the same time, it becomes difficult for a person to perceive how close they actually are to falling asleep at a level of 7 and over on the KSS. Under stressful conditions, a person may also perceive themselves as less tired than they actually are.

Once the level is above 8, nearing 9, the person will struggle to stay awake and there is a very great risk of falling asleep. These levels have a significant negative effect on all cognitive functions.

The consumption of alcohol, with regards to fatigue, will generally have both stimulating and sedative effects. Several studies have shown that a greater intake will often have sedative effects. This means that alcohol consumption can contribute to an increased sleepiness.

1.10.2 Night work

The normal circadian rhythm for a person involves sleeping at night and being awake during the day. This rhythm is supported by a variation in daylight. A normal night's sleep or other main continuous period of sleep for a person with a normal circadian rhythm is between seven and nine hours. The amount of sleep required differs from one individual to the next, but is normally within this range. A main continuous period of sleep shorter than seven hours involves a varying degree of sleep deficit. Less than five hours' continuous sleep involves a critical deficit.

There are two principal physiological processes that affect a person's level of alertness or sleepiness. One is the circadian rhythm, the body's natural rhythm that regulates physiological changes at different times of the day, the other is the relationship between how much and when we sleep or are awake.

The body is therefore generally predisposed to sleeping at night and being awake during the day. People are most tired at night, normally sometime between 02:00 and 05:00. If someone who normally sleeps at this time is awake, they will be in a very sleepy state.

However, people can adapt to being awake at night and have their main period of sleep during the day. This is regulated by the second of the two processes mentioned above, i.e. the relationship between when and how much we sleep and are awake. By altering when the main period of sleep takes place, it is possible to adjust the body's circadian rhythm with approx. one to two hours per day. If given sufficient time to adapt, the body is therefore able to cope with, for example, shift

work, without this having a decisive impact on alertness and performance.

Night work, especially shift work, is still associated with certain risks. Even if a person is able to adapt to working at night, the circadian rhythm still means that there are critical times at which they are more tired than normal, e.g. during the aforementioned period between 02:00 and 05:00 at night.

Another factor that has an impact on sleepiness is how long a person has been awake. Being awake for a continuous period longer than 18 hours carries a high risk of reduced alertness. Other important factors are sleep disorders, snoring and medication. Any combination of these factors will further increase the level of sleepiness.

Several studies have shown that there are major sleep and recovery problems associated with working in a two-watch system. This system entails two officers on a rotating duty schedule, often in six-hour periods, i.e. six hours on duty followed by six hours of rest and another six hours on duty. One of the problems is that none of the resting periods over a 24-hour period allows for a consecutive period of sleep lasting at least seven hours. The general consequence is that a sleep deficit arises in such a system.

1.10.3 Model of the master's sleep/wake schedule

The master has stated that he was on watch at the time of the grounding and that he was alone on the bridge. He had taken over the watch from the chief officer, who was supposed to be on watch.

The master has further stated that he actually fell asleep while keeping watch on the bridge.

Based on information provided by the master regarding his sleep, wake and working hours (see section 1.6.1), a model has been produced using the software SWP (Sleep/Wake-Predictor). The model was produced to gain an objective measurement of the master's level of sleepiness. The software does not take into consideration any alcohol consumption, as the effects may vary between individuals and levels of intoxication.

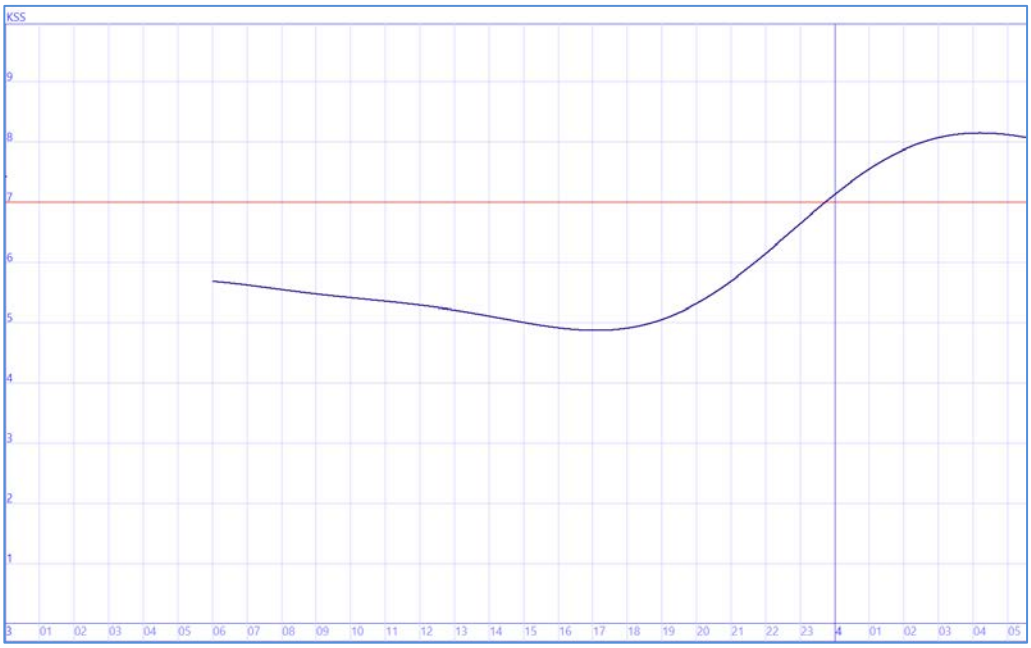


Figure 8. Model of tiredness levels for the master in the 24 hours leading up to the grounding. The software SWP – The Sleep Wake Predictor version 3.12.0 – was used for modelling.

The model indicates levels of sleepiness above eight on the KSS from midnight to the time of the grounding. The master had not slept or rested since 06:00 in the morning on the day before. This means that when he fell asleep, he had been awake and working for approximately 22 hours, which would put him in a very sleepy state. In addition, he took over the chief officer's night watch during hours when he would normally have his main continuous period of sleep. Furthermore, the master had a great total sleep deficit, as he usually only slept around six hours per night and because he had only slept for approximately three hours on the night between 20 and 21 September.

2. ACTIONS TAKEN

Following the accident, Venus Shipping has had several meetings with ship masters and company management to discuss the grounding, and they have decided to change the company's drug and alcohol policy.

Following the accident, DNV GL has produced new documentation to ensure that inspections are conducted in the same manner throughout the company.

DNV GL has also decided to send all Swedish and Danish ISM inspectors on a two-day course on the DNV GL inspection method. The course will also be open to other ISM inspectors in the region.

3. ANALYSIS

3.1 Fundamental aspects of the sequence of events

During a voyage from Visby to Oskarshamn, the vessel ATLANTIC ran aground just south of Oskarshamn. The master, who was alone on the bridge at the time has stated that he fell asleep just after he made the turn north of Öland towards Oskarshamn. The information is supported by the vessel's AIS track, which shows that no course corrections were made following the turn.

Central questions in the investigations include why the master fell asleep and why it was not discovered that he had done so. This in turn gives rise to questions regarding manning, working hours and bridge equipment as well as the implementation and inspection of the security management system.

Another pertinent question is how the rescue and salvaging operations were affected by both nautical officers being removed from the ship by the police.

3.2 Why did the master fall asleep?

The master and the chief officer were working according to a two-watch system. For the master, this meant that he was on watch between 07:00–12:00 and between 17:00–24:00. The time in-between was generally intended for rest. The master has indicated that his tasks would often not allow him to rest during the periods set aside for this purpose, as loading and unloading of the ship would require both the master and the chief officer to be present. Research has found that a two-watch system often leads to the accumulation of a chronic sleep deficit, as it becomes difficult to satisfy the need for sleep. SHK considers this matter in more detail in section 3.3.

Based on the description provided by the master regarding his actual working, resting and sleeping hours, SHK notes that he had an accumulated sleep deficit at the time of the grounding. In the three days preceding the accident, the master had had no more than six hours of sleep and little or no rest. He only slept three hours the two nights leading up to the grounding. At the time of the grounding, he was also working during the hours where he would normally have his nightly rest period.

The sleepiness model produced shows that the master's sleepiness level was above eight on the KSS at the time of the grounding. This in itself entails a great risk of falling asleep. Furthermore, the main task on the bridge in preparation of the arrival to Oskarshamn had consisted of monitoring the voyage on automatic steering. This meant that the level of effort was low, which in turn reinforced the feeling of sleepiness.

BNWAS was disengaged, which meant that there was no operational technical system to monitor activity on the bridge and to detect and raise the alarm if the officer of the watch became incapacitated. No explanation as to why BNWAS was disengaged has been provided during the investigation. Nor was there a lookout on the bridge who, in addition to keeping watch, could have noticed the master falling asleep. SHK considers the matter of manning in more detail in section 3.3.

In addition, it has been confirmed that the master had consumed alcohol, which is a factor that can have a negative impact on the risk of falling asleep. According to the master, he only consumed the alcohol after the grounding and only because he felt stressed by the situation. However, in the communications that the master had with the pilot boat and the JRCC in conjunction with the grounding and shortly thereafter, he can be heard significantly slurring his words, seemingly unaware of what has happened. Slurred speech is one of the effects of alcohol intoxication. Other crew members have furthermore stated that the master appeared to be under the influence of alcohol shortly after the grounding. An intake of alcohol in conjunction with the grounding would not have had such an immediate effect on speech and demeanour, as it takes about one hour for the alcohol to enter the blood stream and have this effect. It can therefore be ascertained that the master was influenced by alcohol before he fell asleep.

In summary, SHK notes that the conditions for the master being able to stay awake and to complete a safe voyage between Visby and Oskarshamn were very poor.

3.3 Manning, etc.

According to the ATLANTIC's minimum safe manning certificate, the vessel was to have a crew of at least five members. As the ATLANTIC is a self-unloading vessel, and every member of the crew would help with loading and unloading, the shipping company had added another three crew members, i.e. eight in total. Despite this, the master felt that the manning was insufficient to ensure that there was a lookout on the bridge for the voyage between Visby and Oskarshamn, or for the chief officer to take the night watch, considering the tasks that had been performed in Visby and that would be performed at Oskarshamn.

Work on a self-unloading vessel in coastal traffic, with constant loading and unloading operations in the day and sea voyages at night, requires appropriate manning and a clear schedule in order to ensure the conditions to maintain a continuous watch system and fulfil the requirements – regarding lookouts, for example – set out in the applicable regulations. The fact that the master has considered it acceptable to depart from the watch system and the lookout requirement, and that there has been no dialogue with the shipping company regarding the manning and its effects, is an indicator that the

safety management system has not been implemented. The remarks on the vessel from the port state control and DNV GL's ISM inspection following the grounding give a similar indication and also the fact that the vessel was missing correct charts for the voyage.

In SHK's view, the vessel's SMS also provides that master and crew with limited support in terms of how the bridge is to be manned and how the voyage plan is to be made and followed. The vessel's SMS only contained a general instruction for the manning to be in accordance with applicable regulations. Furthermore, in regard to the voyage plan, the shipping company has only referred to guidelines published by ICS on the subject, but they have not provided concrete examples of how this is to be handled on board.

Considering the above, the shipping company should review their safety management system and go over it with their masters in order to ensure that the latter understand its importance, while also mitigating the risk of other masters making similar "adaptations", for example when it comes to the maintenance of the watch system and the requirement for a continuous lookout, in case of a similar perceived need.

3.4 Regarding the two-watch system

As described in the above, research has shown that a two-watch system of this type provides poor conditions for rest and recovery. In addition, it provides support for establishing that the system often leads to a sleep deficit.

The main sleep period, corresponding to the normal night-time rest, should be between seven and nine hours. If it regularly goes below seven hours for a longer period of time, there is a risk of creating a sleep deficit. If it is not possible to utilize other resting periods for the intended period either, the risk is even greater that a sleep deficit arises. This is what happened in the present case.

Even if the longest resting period according to the rest log was seven hours, the master has not been able to sleep for at least seven hours. It always takes some time to fall asleep, and it is necessary to wake up before the next shift starts. This means that a seven-hour resting period does not correspond to seven hours of sleep. Even if the schedule in the present case is somewhat better than 6/6 (a rotating schedule of working six hours and then resting for six hours), it still does not allow enough time for a period of sleep corresponding to a normal night's rest.

Considering how the crew was actually working with loading and unloading, which required the nautical officers to be working during times set aside for rest, and the general design of the two-watch system, SHK notes that there were structural obstacles to sufficient resting and sleeping times.

As far as SHK has been able to ascertain in this case, the basic schedule for the nautical officers was in compliance with the provisions of the Maritime Labour Convention. After the accident, however, both the flag state and the classification society noticed that there were deviations in the rest logs and ship logs. These deviations have not been noticed in any of the shipping company's own inspections prior to the grounding, which indicates that there were flaws in their auditing system. The shipping company is therefore recommended to review its auditing and inspection system in order to ensure that the matter of work and rest periods is satisfactorily handled, so that deviations can be discovered. The classification society should furthermore, for example as part of the planned ISM course (see section 2), also discuss the matter of how to identify deviations between the schedule and actual outcome of work and rest periods in their ISM revisions.

3.5 Conditions on board

When SHK made a visit on board the vessel, and in the inspections carried out on the vessel following the grounding, it was noted that the general living conditions on board were deficient.

The hygiene was poor, with heavily soiled general areas and cabins. Furthermore, the furniture and fittings in the general areas were very worn.

In its port state control, the Swedish Transport Agency noted that 30 per cent of the food in cold and dry storage had passed the expiration date. They also deemed the amount of food and fresh water to be insufficient for the remaining voyage to Oskarshamn.

It cannot be definitively concluded that these conditions contributed to the incident. However, the conditions for the crew to work and perform at a satisfactory level have been inadequate. A deficient working environment and diet also have a negative impact on the level of motivation and affect general well-being.

3.6 Rescue operation, etc.

In the event of an accident at sea, several Swedish authorities may have reason to take action based on their own area of responsibility. The Swedish Maritime Administration is responsible for searching for and rescuing people who are – or are suspected to be – in distress at sea, and for medical transport from vessels. The Swedish Coast Guard is responsible for rescue services in the event that oil or other hazardous substances have been spilled in the water or where there is an imminent risk of this happening. The Swedish Transport Agency is the supervisory and decision-making authority when it comes to violations of the right to use a vessel in accordance with the Ship Safety Act and the Act on Prevention of Pollution from Ships. These authorities also have tasks within the Maritime Assistance Service (MAS), which is a point of contact between a vessel that, while not in

distress at sea, is in need of assistance and various authorities concerned and to monitor and track the vessel's situation.

In order for these authorities to carry out their tasks in an emergency, it must normally be possible to maintain continuous contact with the master or another officer on board who has knowledge of the vessel and of navigation. The Swedish Maritime Code also requires the ship to always have a master on board, unless it is moored in port or other safe anchorage. If the master is incapable of sailing the ship or if he abandon his post, the highest ranking officer shall take his place until a new master has been appointed. The provisions of the Swedish Maritime Code thus state that, as a rule, there must always be a nautical officer on board.

In the present case, both the master and the chief officer were arrested on suspicion of gross drunk sailing and taken ashore. As a result, there was no responsible officer on board the ATLANTIC with nautical competence in a relatively serious emergency where there was a great uncertainty regarding the damage to the ship. It is of course questionable whether either of the nautical officers, due to their intoxication, were capable of providing any assistance in the situation at hand. However, in accordance with the Swedish Maritime Code, there must be a nautical officer on board. The situation was later resolved, as one of the nautical officers was brought back to the vessel where he was then able – under continuous surveillance by two police officers – to provide the authorities involved with information.

The event gives rise to questions of how effectively the involved authorities collaborate in the event of a maritime accident where the police has grounds to arrest the nautical officers on board. As far as the investigation has shown, there is a lack of knowledge and documentation for making decisions in this type of situation at police command centres. The Coast Guard has an instruction for interventions in drunk sailing; however, this does not fully deal with the complexity of the issue and appears primarily to target recreational vessels rather than commercial traffic.

In SHK's view, there is reason to develop a collaboration and to consider the introduction of a clear basis for decisions in similar matters. As the supervisory authority for shipping, the Swedish Transport Agency should therefore take the initiative for a collaboration meeting with the relevant authorities and organisations in order to ensure that there is a consensus on how to handle situations like the one that arose in this case in the future, in order to ensure an effective and safe rescue and salvaging operation that also provides for the interests of the police. In this context, it should also be noted that an intervention on board a vessel should normally be considered a rare event for the individual police officer, and there may therefore be a need for support in understanding the situation on board a vessel in conjunction with an accident.

3.7 The classification society

The ATLANTIC passed an ISM inspection by DNV GL without remarks five months prior to the accident. Despite this, a number of serious deficiencies were noted in the port state control and in the ISM revision carried out following the accident, which – considering their nature – cannot be assumed to have arisen after the first ISM inspection. This gives cause to assume that there were shortcomings in the implementation of the first ISM inspection.

Furthermore, DNV GL carried out revisions of the shipping company's safety management, i.e. DOC revisions, in August 2017 and January 2018. The circumstance that the revisions were carried out by the same inspector, and that no remarks were made following the many SMS-related deficiencies identified in the port state control and ISM inspection after the grounding, gives rise to a number of questions on how these DOC revisions were performed.

Against this background, there is cause for DNV GL to carry out a more general review of its revision and inspection system and then take any necessary measures.

SHK notes that DNV GL was not immediately informed of the grounding by the shipping company, RINA or the Swedish Transport Agency, who were all aware of the event. Based on the information at hand, there is no requirement for such information to be provided. The classification societies are subject to a relatively lengthy procedure in accordance with the IACS procedural requirements, and the Swedish Transport Agency's duty of information only becomes applicable once a decision is made to detain the ship. SHK believes that there is a certain potential for improvement in this regard to ensure that all involved classification societies immediately receive information in conjunction with an accident. However, the conditions are not such as to warrant a safety recommendation.

3.8 Other observations

The ATLANTIC did not have electronic charts on board. A digital chart provides greater opportunity to quickly gain a visual overview of the vessel's position in relation to its surroundings. There is no requirement to have such charts installed. However, SHK believes that it would be appropriate for the shipping company to invest in such equipment, in order to increase the safety of vessels navigating in these types of waters. This is also consistent with IMO's recommendations in SN.1/Circ.263 of 23 October 2007 for vessels navigating in and out of the Baltic Sea.

Since a vessel of the ATLANTIC's size is not subject to the requirement of being equipped with VDR, SHK has not been able to verify or confirm all of the information that has emerged. Naturally, if there was a requirement for this type of vessel to be equipped with VDR, more lessons could be learned from incidents and accidents

such as the present case, thus improving the basis of safety investigations relating to incidents and accidents. SHK finds no cause, in light of this accident, to further investigate the matter. There may however be cause for the Swedish Transport Agency and the Swedish Maritime Administration to further investigate the need and potential for expanded opportunities for recording.

4. REPORT

4.1 Findings

a) At the time of the grounding, the master was keeping watch on the bridge.
b) There was no lookout for the entire voyage between Visby and Oskarshamn.
c) No course corrections were made after the turn north of Öland.
d) The Bridge Navigational Watch System (BNWAS) had been disabled.
e) The master fell asleep while alone on watch on the bridge.
f) The master has stated that he drank alcohol after the grounding.
g) The master noticeably slurred his words when communicating with the pilot boat and with the JRCC, before the grounding.
h) The breathalyser tests performed on the master and the chief officer approximately three hours after the grounding showed that they both had a breath alcohol concentration of 0.88 mg/l.
i) The police decided to take both nautical officers ashore.
j) The master had accumulated a sleep deficit.
k) The vessel was manned by two nautical officers, one engineering officer and five other crew members.
l) The nautical officers were working according to a two-watch system.
m) The crew’s registered resting periods did not correspond to actual rest.
n) There were shortcomings in the classification revision of the shipping company and the vessel.
o) The general living conditions on board were deficient: the Swedish Transport Agency noted that the amount of food and fresh water was insufficient for the voyage to Oskarshamn.
p) The vessel did not have appropriate charts for the voyage.
q) The vessel was not subject to the VDR requirement.
r) The shipping company’s SMS did not provide the crew with sufficient support.
s) The police had not a basis for a decision in this type of situation.

4.2 Causes

The cause of the accident was deficiencies in the monitoring of the navigation due to the master falling asleep during his watch on the bridge and because there was no lookout.

Contributing causes to the master falling asleep include an accumulated sleep deficit and the fact that he was working on a two-watch system, which had likely contributed to the sleep deficit over a longer period of time. The master was also under the influence of alcohol at the time of the grounding. Furthermore, the Bridge Navigation Watch Alarm System (BNWAS) had been turned off, which could have prevented the master from falling asleep or at least alerted the rest of the crew.

A contributing cause to the lack of a lookout on the bridge was the vessel's limited crew, in combination with the shipping company's ISM providing inadequate support to the master, which had not been noted in the classification reviews of the shipping company and the vessel.

5. SAFETY RECOMMENDATIONS

Venus Shipping is recommended to:

- Review its safety organisation system and go over it with their masters in order to ensure that they understand its importance, whilst also mitigating the risk of other masters making similar adjustments for corresponding perceived needs (see section 3.3) *(RS 2018:04 R1).*

- Review its auditing and inspection system in order to ensure that the matter of work and rest periods is satisfactorily handled, so that deviations can be detected (see section 3.3) *(RS 2018:04 R2).*

DNV GL is recommended to:

- Carry out a general review of their auditing and inspection system and thereafter take necessary measures (see section 3.5) *(RS 2018:04 R3).*

The Swedish Transport Agency is recommended to:

- Take the initiative for a collaboration meeting with the relevant authorities and organisations in order to ensure that there is a consensus on how to handle situations like the one that arose in this case in the future, in order to ensure an effective and safe rescue and salvaging operation that also satisfies the interests of the police (see section 3.6) *(RS 2018:04 R4).*

The Swedish Accident Investigation Authority respectfully requests to receive, by **21 November 2018 at the latest,** information regarding measures taken in response to the recommendations included in this report.

On behalf of the Swedish Accident Investigation Authority,

Mikael Karanikas Dennis Dahlberg