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Swiss Transportation Safety Investigation Board STSB

Final Report by the Swiss Transportation Safety Investigation Board STSB

on the marine casualty concerning the
Swiss-flagged general cargo ship SABINA

off the island of Bornholm, Denmark,

on 15 October 2015

General information on this report

In accordance with

Part I, Chapter 1 of the Code of the International Standards and Recommended Practices for a Safety Investigation into a Marine Casualty or Marine Incident (Casualty Investigation Code): Resolution MSC.255(84), adopted by the International Maritime Organization's Maritime Safety Committee on 16 May 2008; as well as

Article 2, paragraph 1 of the Ordinance on the Safety Investigation of Transportation Incidents (OSITI, SR 742.161) of 17 December 2014 and as amended on 1 January 2025,

the sole purpose of an investigation into a marine incident is to prevent further casualties or incidents from occurring. It is expressly not the purpose of the safety investigation or this report to establish blame or determine liability.

Should this report be used for purposes other than those of casualty prevention, this statement should be given due consideration.

In accordance with Part III, Chapter 16 of the Casualty Investigation Code, proper identification of causal factors which led to the marine casualty or marine incident includes a methodical investigation, going far beyond the immediate evidence and looking for underlying conditions which may cause other future marine casualties or marine incidents. According to the Casualty Investigation Code, safety investigations should, therefore, be seen as a means of identifying not only immediate causal factors but also failures that may be present in the whole chain of responsibility.

In accordance with Article 2, paragraph 2 of the Ordinance on the Safety Investigation of Transportation Incidents, the technical, operational, organisational and systemic causes and circumstances that led to the incident are to be the subject of a safety investigation.

The German version of this report constitutes the original and is therefore definitive.

Text passages set in italics in quotation marks (*'example'* or *"example"*) are literal quotations from the investigation files on which this final report is based or translations thereof. However, if the quotation marks are used in a modalising function, the text passage is set vertically (i.e. not in italics) (*'example'* or *"example"*).

All information, unless otherwise indicated, relates to the time of the incident.

All the times mentioned in this report, unless otherwise indicated, are given in coordinated universal time (UTC). For Denmark (Aalborg, Bornholm), Central European Summer Time (CEST) was the local time (LT), with the relationship between Denmark's LT, CEST and UTC being $LT_{\text{Denmark}} = \text{CEST} = \text{UTC} + 2 \text{ h}$. SABINA's crew was working in ship's time (ST). The ship's time when leaving the port of Aalborg corresponded to the region's local time, i.e. $ST_{\text{departure}} = LT_{\text{Denmark}} = \text{CEST} = \text{UTC} + 2 \text{ h}$. Throughout 15 October 2015, roughly half a day before the casualty, the ship's time was set to the local time of the destination port in Finland (LT_{Finland}), meaning that at the time of the casualty, the relationship between the different time systems was as follows: $ST_{\text{casualty}} = LT_{\text{Finland}} = LT_{\text{Denmark}} + 1 \text{ h} = \text{UTC} + 3 \text{ h}$.

For confidentiality reasons, this report uses the masculine form for all parties concerned, irrespective of their actual gender.

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Course of the investigation

The casualty took place on 15 October 2015 at 23:43:38 UTC. The Swiss Transportation Safety Investigation Board (STSB) received notification of the incident on 16 October 2015 at 09:37 UTC. The STSB opened the investigation on SABINA at 04:30 UTC on 18 October 2015, after the vessel docked at the port of arrival of Kotka (Mussalo), Finland.

Switzerland, as the flag state, carried out the safety investigation. The STSB informed the competent authority in Denmark about the marine incident, as it had taken place in Danish territorial waters. Denmark decided not to initiate a safety investigation for this incident.

This final report is published by the STSB.

Summary

Ship particulars

Name of vessel	SABINA
Type	General cargo ship
Flag	Switzerland
Owner	MV Sabina AG, Switzerland
Shipping company	Enzian Ship Management AG, Switzerland
Classification society	Lloyd's Register (Romania) S.R.L.
Call sign	HBEB
IMO ¹ number	9205718
Length	127.87 m
Gross tonnage	5,968

Date, time and location

Date	15 October 2015
Time	23:43:38 UTC
Location	Off the coast near Rønne, Bornholm island, Denmark

Voyage particulars

Port of departure	Aalborg (DKAAL), Denmark
Port of arrival	Kotka/Mussalo (FIKTK), Kotka, Finland
Manning	12 people

¹ IMO: International Maritime Organization. IMO is a specialised agency of the United Nations.

Synopsis

In the early hours of 15 October 2015, SABINA cast off from Aalborg (Denmark) for her voyage to Kotka (Finland). Late at night on 15 October 2015, SABINA passed a waypoint without changing course as had been set out in the passage plan. At this point in time, the officer of the watch (OOW) was the sole person on the bridge. Shortly afterwards, the OOW left the bridge and went to his cabin to take some painkillers for a headache. The bridge was unmanned from that point onwards. The bridge navigational watch alarm system (BNWAS) was in 'off' mode. Once in his cabin, the OOW experienced some kind of blackout; he collapsed and remained on the floor. Less than an hour later, SABINA ran aground off the west coast of Bornholm island (Denmark).

No one was injured in the incident. The vessel was seriously damaged.

This incident was classified as a marine casualty.

Causes, contributing factors and risk-increasing factors

Direct causes

The accident in which the general cargo ship SABINA ran aground off the coast of Bornholm, Denmark, at night occurred due to the ship sailing without someone on the bridge for a considerable period of time and the crew being unable to intervene in a timely manner.

The following aspects have been identified as the direct causes of the accident:

- The officer of the watch, who was unfit for duty, carried out his duties without a lookout and left the bridge without having previously arranged for a replacement officer.
- For a duration of approximately one hour, during which course changes would have been planned and necessary, and until shortly before grounding, the bridge was unmanned.
- The crew members, who were all asleep at the time, were not warned of the impending collision with the island of Bornholm by the bridge navigational watch alarm system (BNWAS) or by the shipping company.

Directly contributing factors

The following aspects have been identified as directly contributing factors of the accident:

- Equipment available on the bridge of the general cargo ship could have enabled safe navigation but was not used by the officers of the watch. This can be attributed to a lack of instruction; inadequate knowledge of systems; and, possibly, to a BNWAS which, in terms of ergonomics, featured an unfavourable design.
- Certain crew members lacked adequate awareness concerning the limits of human performance and fatigue. This resulted in a problematic handover of the watch to the officer of the watch on duty, inadequate situational awareness, and risk-taking.
- On the occasion of the flag state inspection the week before the accident, the Swiss Maritime Navigation Office did not intervene even though rest period regulations had not been followed.

Systemic causes

The following aspects have been identified as the systemic causes of the accident:

- The obligation to use the BNWAS was neither enforced nor systematically monitored by the shipping company and the supervisory authority.
- As various incidents around Europe have shown, it was not unusual among cargo ships to deliberately let the BNWAS being switched off during navigation.

Systemically contributing factors

The following aspects have been identified as systemically contributing factors of the accident:

- Within the shipping company, a working environment debilitating safety prevailed, and the ships' crews were insufficiently supported and monitored.
- The approach to the issue of fatigue in the shipboard management system was inappropriate.
- The International Safety Management (ISM) Code² requirements regarding shipping companies' in-house training were loosely interpreted by the shipping company. This was accepted by the supervisory authority.
- International standards regarding the training of seafarers in topics relating to human factors and bridge resource management, the requirements a safety management manual must meet, the shipping companies' in-house training, and crew support and fleet monitoring by shipping companies were non-existent, inadequate or incomplete.

Risk-increasing factors

The following aspects have been identified as risk-increasing. Even when not or not provably having affected the development of the accident, these factors nevertheless should be remedied to improve safety:

- The officers of the watch showed a poor handling of the master's standing orders³.
- The familiarisation of new crew members with the operating procedures of the ship and the shipping company was ineffective.
- The minimum safe manning document contained sections which were not conducive to safety.
- The continuation of the sea passage following the accident was high-risk.
- A checklist for the start of the sea passage did not exist, and the content of the checklist for changing over the watch was inadequate.
- The supervision over the Swiss fleet of ocean-going cargo vessels by the supervisory authority was largely ineffective, especially with regard to the flag state inspections, the understanding of the authority's own rights and responsibilities, and its business processes, as a consequence of lacking resources and a lack of expertise.
- With regard to safety, the impact of federal guarantees on supervision was problematic.
- The voyage data recorder had been defective for several months before the accident.

Safety recommendations and safety advice

13 safety recommendations and 5 pieces of safety advice were issued as part of this investigation.

² ISM Code: The International Management Code for the Safe Operation of Ships and for Pollution Prevention (International Safety Management Code)

³ Standing orders: See section 1.15.6.2.

Sources of information

This final report is based in particular on the following information and sources:

- Evidence gathering on site;
- The voyage data recorder (VDR);
- Statements and written accounts from the crew members of SABINA and the pilot of KRONVIKEN;
- Documents, records, reports and statements from affected individuals and organisations;
- The shipping company's written guidelines and procedures;
- The written passage plan;
- The deck logbook and bell book;
- Records relating to working hours;
- The classification society's damage report;
- The vessel's technical documentation and certificates;
- Investigation reports from other safety investigation authorities.

1 Factual information

1.1 Background, voyage and incident

1.1.1 Background

At the time of the accident, SABINA was a 128-metre-long general cargo ship (see Figure 1), which was operated by the shipping company Enzian Ship Management AG (referred to as just Enzian in this report) from when it was commissioned in 2000 until it was sold in 2017. During this time, i.e. until 1 June 2017, it sailed under the Swiss flag.

While English was the official working language on board SABINA – all shipping company documents were written in English, and communication between the vessel and the shipping company was conducted in English – the crew members generally communicated with each other in Russian or, depending on the situation, in Ukrainian.



Figure 1: SABINA, a 128-metre-long general cargo ship, pictured here during sea trials in 2000. The paintwork shown is different to the livery on the day of the casualty. Source and copyright: Damen Shipyards Cargo Vessels.

Departing from Brindisi (Italy), SABINA arrived in the port of Aalborg (Denmark) at noon on 4 October 2015. SABINA was loaded with a bulk cargo of around 8,200 tonnes of loose fly ash. On the day of arrival, the crew started to discharge SABINA. Over the 11 days that followed, all the cargo from SABINA was discharged. However, the unloading process was interrupted time and again for several hours and even for whole days due to unfavourable weather conditions (strong wind and rain) and technical issues.⁴

On 5 and 6 October 2015, SABINA was subjected to a flag state inspection. This was carried out by the Swiss Maritime Navigation Office (SMNO) (see section 1.13.3.2.5).

⁴ The port operations' statement of facts shows that between 00:00 LT_{Denmark} on 8 October 2015 and the completion of the discharge on the day of departure (15 October 2015), deck work was carried out for a duration of 79 hours and 40 minutes. In comparison, the time during which deck work was interrupted amounted to 91 hours and 10 minutes. No work was carried out on deck on 7 October 2015. The following were recorded as deck work: "discharging", "shifting alongside", "closing/opening of hatch pontoons". As for the time without any deck work, the following notes were recorded: "no work due to rain", "[...] strong wind", "[...] shore technical breakdown", "[...] awaiting completion of repairs", "[...] awaiting Bobcat from shore".

On the passage from Brindisi to Aalborg, three deck officers had been part of the crew: the master, chief officer and second officer. The second officer disembarked in Aalborg as part of a scheduled relief. On 7 October 2015, a new second officer came on board for SABINA's onward voyage (see section 1.11.1.2). On the same day, the chief officer and chief engineer familiarised the new crew member with certain safety-related peculiarities and working principles on board.⁵ The chief officer and chief engineer had already been part of SABINA's crew on the passage from Brindisi to Aalborg.

Between 8 and 11 October 2015, various technical inspections, training events, and emergency and safety drills took place.

Discharge operations were completed on 15 October 2015, the day of departure.

Between joining on 7 October 2017 and the day of departure, the second officer was busy with voyage planning and other voyage preparation work. At times, he was also involved in discharging work (see section 1.11.1.2).

The bridge navigational watch alarm system⁶ (BNWAS) was in 'off' mode while the vessel was docked at Aalborg (see section 1.12.6).

1.1.2 Voyage and incident

1.1.2.1 Voyage planning

SABINA's next passage was to be from Aalborg to Kotka (Finland) in the Gulf of Finland. The passage plan⁷ was prepared by the second officer and approved by the master. The intentions were to leave Aalborg sailing through the eastern section of the Limfjord to then cross the Kattegat following a south-easterly direction (see Figure 2). Subsequently, the Øresund and the Drogden channel respectively were to be passed southwards. At the Falsterborev traffic separation scheme (TSS), the vessel was to turn from a southerly to an easterly course. As per the passage plan, the ship was due to sail eastward around the southern end of the Swedish mainland via waypoints⁸ 297 and 298 and then enter the Bornholmsgat TSS from the west. At waypoints 299 and 300, the plan was to change the course in two stages from approximately east to north-east. By making these course changes in the precautionary area⁹, SABINA was to join the TSS's northern zone, safely passing the Bornholmsgat strait between the Swedish mainland and the Danish island of Bornholm (see section 1.9.2). The plan was to then cross the Baltic Sea heading towards the north-east, passing between the island of Gotland

⁵ This familiarisation was carried out using checklist S-015, '*Familiarisation of joining crew*'. There is no evidence to suggest that the navigation equipment on board SABINA, the publications and charts relevant for navigation, and the upcoming sea passage to Kotka were discussed during this familiarisation, even though such discussion of these topics is stipulated by the shipping company (see section 1.13.1.3). In contrast, there is evidence that this part of the familiarisation did not take place.

⁶ A bridge navigational watch alarm system (BNWAS) is a technical system that generates an alarm on the bridge or other areas of the ship if the sensors connected to the system do not register any activity on the bridge during a defined period of time (see sections 1.12.6 and 1.14).

⁷ A passage plan is a description of a ship's voyage. At Enzian, the passage plan included, among other things, information about the schedule of the trip (planned waypoints, courses and distances, speed); the draft; the expected weather conditions; and the expected sea state.

⁸ The numbered waypoints were not officially defined geographic locations but markers determined by the crew for voyage planning purposes.

⁹ The precautionary area of the Bornholmsgat traffic separation scheme connects centrally the various lanes of this traffic separation scheme. These lanes are attached to the north-east, the west and the south-west of the precautionary area. The purpose of the precautionary area is to allow traffic following the Swedish south coast to make the necessary crossing and merge with traffic bound for the north-east or south-west (see section 1.9.2).

and the Baltic mainland, and ultimately turning east into the Gulf of Finland north of the Estonian island of Hiiumaa.

The passage from Aalborg to Kotka was scheduled to take three days.



Figure 2: Intended voyage of SABINA according to the passage plan (dotted line). From Aalborg via the eastern section of the Limfjord, Kattegat, Øresund, Drogden and the Falsterborev traffic separation scheme (TSS); along waypoints (WPs) 297, 298, 299 and 300; through the Bornholmsgat TSS and Bornholmsgat itself (all shown); and into the open Baltic Sea heading to Kotka, Finland (not shown). Base map: Wikimedia Commons.

1.1.2.2 Start of the voyage

In the early hours of 15 October 2015, at 00:50 UTC (02:50 LT_{Denmark} or ST_{departure}), SABINA was fully discharged. As early as 00:00 UTC, the master had started to make final administrative preparations for the upcoming voyage. After the pilot came on board at 02:40 UTC, SABINA cast off from Aalborg at 03:10 UTC.

According to the entry in the deck logbook, the ‘*Departure checklist bridge*’ (see section 1.14.3) had been completed. The bridge navigational watch alarm system (see sections 1.12.6 and 1.14) had not been turned on during the preparations for the departure from Aalborg.

SABINA had no cargo on board and was sailing in ballast. Following the passage from Brindisi to Aalborg, and after discharging the cargo of fly ash, the holds were to be cleaned and made ready for new cargo during the onward journey to Kotka. This work was due to be carried out by the able-bodied seamen (ABs).

From about 04:00 UTC to 10:00 UTC, AB 1 slept in his cabin.

At 05:05 UTC, SABINA was 4.5 nautical miles east of the Limfjord estuary in the Kattegat. The pilot disembarked here. The passage through shallow waters was completed, and the sea passage began (i.e. start of sea passage or SSP). From that point onwards, the chief officer was on navigational watch, while the second officer retired to his cabin to get some rest. Even at the start of the sea passage, the bridge navigational watch alarm system (BNWAS) was not activated. As a matter of fact, the BNWAS was not activated during the remainder of the voyage until, at least, the time of the accident.

1.1.2.3 Day and evening preceding the incident

From 07:30 UTC on 15 October 2015, the second officer checked various safety equipment on board SABINA. According to his statement, there had not been sufficient time to do so before the ship's departure.

From 10:00 UTC to 13:00 UTC, the master and second officer were on navigational watch together. The reason for this dual staffing was the second officer's induction to watchkeeping duties on board SABINA and the master's appraisal thereof.

From 11:00 UTC to about 16:00 UTC, able-bodied seaman (AB) 1 performed physically demanding cleaning duties in the cargo holds together with the other ABs. After that, AB 1 went to his cabin to have dinner. At 19:00 UTC or 20:00 UTC,¹⁰ he went to bed.

Meanwhile, at 12:00 UTC, the ship's clocks had been put forward by one hour, setting the ship's time from 14:00 to 15:00 (from $ST_{\text{departure}} = \text{UTC} + 2 \text{ h}$ to $ST_{\text{casualty}} = \text{UTC} + 3 \text{ h}$).

At 13:00 UTC (16:00 ST_{casualty}), the chief officer took over the watch, relieving the master and second officer from their watchkeeping duties. The course of the voyage from this point onwards is shown in Figure 3. From 15:10 UTC onwards, the chief officer was supported by AB 2, who was posted on the bridge as a lookout. Sunset was at 16:10 UTC. At that time, SABINA passed the Drogden channel between Copenhagen (Denmark) and Malmö (Sweden).

At the handover of the watch at 13:00 UTC, the chief officer advised the second officer to get some rest. The second officer, however, remained on the bridge and completed some work with the chief engineer until about 15:00 UTC. Subsequently, the second officer temporarily took over the watch from the chief officer again, for about half an hour, allowing the latter to have his dinner in the mess. The second officer then also had dinner, went to his cabin at about 19:00 UTC, and went to bed at about 19:15 UTC.

At 17:00 UTC, the master had taken over the watch from the chief officer and AB 2. So that AB 3 could rest a little longer after having worked hard in the holds, the master had given AB 3 – who was assigned as a lookout – leave of absence. For the first two hours of his four-hour shift, the master was therefore the sole person on watch, i.e. without a dedicated lookout. AB 3 served as lookout from 19:00 UTC. At that time, SABINA was approximately nine nautical miles south of Trelleborg (Sweden) following a course of 108°.

At 19:45 UTC, SABINA reached waypoint 298, where the course was changed to 096° (see Figure 3).

¹⁰ It was not possible to conclusively reconstruct when AB 1 went to bed.

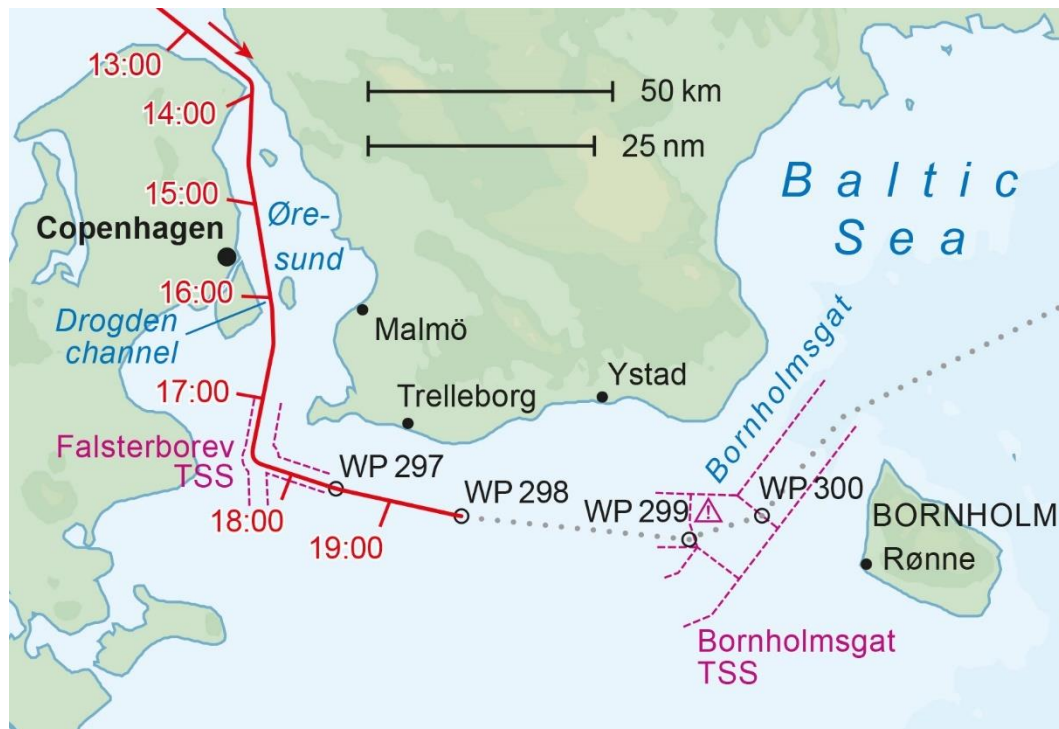


Figure 3: SABINA's actual track from Øresund to waypoint (WP) 298 (red line) with time markers in UTC. SABINA's intended route, as set out in the passage plan, from WP 298 through Bornholmsgat and towards the open Baltic Sea (grey, dotted line). Base map: Wikimedia Commons.

1.1.2.4 Handover of the watch from the master to the second officer

For the four hours between 21:00 UTC (15 October 2015) and 01:00 UTC (16 October 2015), the second officer was assigned as the officer of the watch (OOW), and AB 1 was assigned as the lookout.

The second officer got up at approximately 20:40 UTC and prepared for his upcoming navigational watch. He had been sleeping in his cabin since 19:15 UTC for about one and a half hours. As he now had a sore neck and a headache, he took two painkiller tablets (see section 1.11.1.2). While still in his cabin, the second officer telephoned AB 1 in his cabin and informed him that he was given leave of absence for the upcoming watch. The second officer stated that he had wanted to relieve the AB because the ABs had been working hard in the holds on 15 October 2015 and would have to continue this work the following day.

At 20:59 UTC, the second officer entered the wheelhouse¹¹ to take over the 21:00 UTC watch, where he found the master and AB 3 on navigational watch. Subsequently, the master handed over the watch to the second officer. During the handover, a tug and tow, beacons, as well as a traffic separation scheme were mentioned. After the master had entered SABINA's location on the nautical chart and in the deck logbook,¹² he went to his cabin and subsequently went to bed. At the time of the handover, SABINA was approximately 15 nautical miles south of Ystad (Sweden) following a course of 096° (see Figure 8).

¹¹ The wheelhouse is the enclosed area of the bridge.

¹² The deck logbook records information concerning navigation. There are also other logbooks, such as the one kept in the engine room for recording engine-related events.

The second officer said that he felt “*very tired*” when he took over the watch and still had a headache despite having taken painkillers. He said the handover of the watch was rather brief because he and the master were fatigued.

1.1.2.5 Night watch of the second officer

As AB 1 had not turned up at the bridge at 21:00 UTC, AB 3 stayed on the bridge for the time being.¹³ At 21:05 UTC, the officer of the watch (OOW), i.e. the second officer, again rang AB 1 in his cabin and asked him to come to the watch after all. Five minutes later, AB 1 entered the wheelhouse. In turn, AB 3 said goodbye shortly thereafter and left the bridge.

During the first few minutes of their watch, the second officer and AB 1 (hereafter referred to as the ‘lookout’) talked about the tug and tow that had just been overtaken and about the handover of the watch that had taken place just a few minutes earlier. The pitch of the controllable pitch propeller and the engine were also mentioned on several occasions. Apart from that, the second officer and the lookout talked about various things seemingly unrelated to one another.

From 21:16 UTC onwards, the second officer repeatedly and clearly asked the lookout to go back to bed because of the hard work in the holds the day before and what he would need to do the following day. At the same time, the lookout reminded the second officer not to fall asleep. The second officer sounded tired during this period and kept yawning, but on several occasions, reassured the lookout that he was fit for duty. At one point, the second officer also mentioned his phone and that they now had “*good connection*” – presumably referring to the network coverage for his mobile phone. On another occasion, he stated that one could now “*have a lie-down and sleep*” on the bridge. Following another few prompts to go to bed, the lookout finally gave in at 21:30 UTC, left the bridge and went to his cabin. From that point onwards, the second officer was the sole person on the bridge.

The second officer subsequently tried to keep himself awake by remaining busy. For the period from 21:30 UTC onwards, the voyage data recorder (VDR) captured various noises, suggesting that the second officer was awake although tired. Repeatedly, radio communication between other stations could be heard on the bridge, as well as the call-out “*to all stations*” from the coast radio station Lyngby Radio.

At 22:05 UTC, SABINA passed waypoint 299 but without changing course from 096° to 074°, as set out in the passage plan (see Figure 4, Figure 5 and Figure 8).

Twice, at 22:04:44 UTC and 22:27:53 UTC, three beeps sounded on the bridge emitted by one of the Furuno GP-150 bridge GPS devices (see section 1.12.3.3). At 22:10 UTC, a continuous beep can be heard for just short of two minutes, the origin of which could not be clarified.

Between 22:30 UTC and 22:45 UTC, the second officer sporadically fell asleep in the wheelhouse.¹⁴ During this time, no alarm or warning sounds or any radio messages to SABINA could be heard in the wheelhouse. Only some static from the radio equipment could be heard occasionally.

¹³ ABs on watch are relieved from their watchkeeping duties independently of the masters and officers, i.e. the master or officer on watch waits for the relieving master or officer, and independently, the AB on watch waits for the relieving AB.

¹⁴ This could be proven beyond doubt by his snoring recorded on the VDR.

At 22:45 UTC, SABINA left the precautionary area that centrally connects the three zones of the Bornholmsgat TSS (see section 1.9.2), heading towards 096° (see Figure 7).

Meanwhile, the second officer's headache had continued to intensify. He also felt lightheaded. He therefore left the bridge at 22:45 UTC and went to his cabin to take some more tablets (see section 1.11.1.2). He did not want to wake the master, who was tired and asleep by this point. The second officer wanted to "*avoid trouble*". According to his statements, he also thought that it would be quicker to find some tablets in his cabin than in the sickbay, as he was not yet sufficiently familiar with the sickbay to find suitable painkillers quickly.¹⁵ Once in his cabin, the second officer experienced some kind of blackout; he collapsed and remained on the floor. When the bridge was left by the second officer at 22:45 UTC, it was and remained unmanned from that point onwards. The information available suggests that SABINA's autopilot (see section 1.12.2) was operating in 'heading control' mode, therefore keeping the ship on a course of 096°.

The following pages show SABINA's respective positions at 22:05 UTC, 22:25 UTC, 22:35 UTC and 22:45 UTC; waypoints 299 and 300; and the surrounding traffic as recorded by the shipboard automatic identification system (AIS)¹⁶.

¹⁵ In actual fact, SABINA did not have a separate sickbay. The medicine cabinet was in the master's cabin.

¹⁶ Automatic identification system (AIS): Standardised technology for the automatic exchange of navigational data via radio data transmission. Using the AIS, it is possible to record, track and monitor a voyage. AIS data are vital to understanding the overall situation at sea, both on board and ashore.

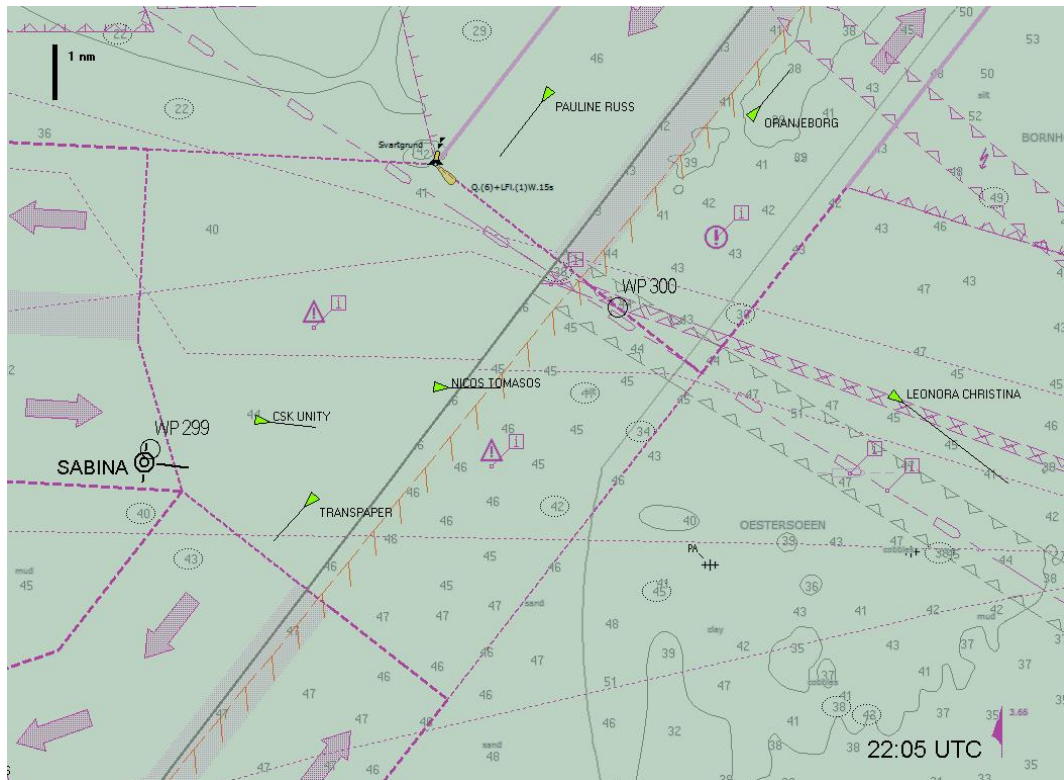


Figure 4: Waypoints, SABINA’s position and the traffic at 22:05 UTC as recorded by the AIS. SABINA passes waypoint 299 and maintains a course of 096°. CSK UNITY is sailing a virtually identical course and is about two nautical miles ahead of SABINA, to her port side.

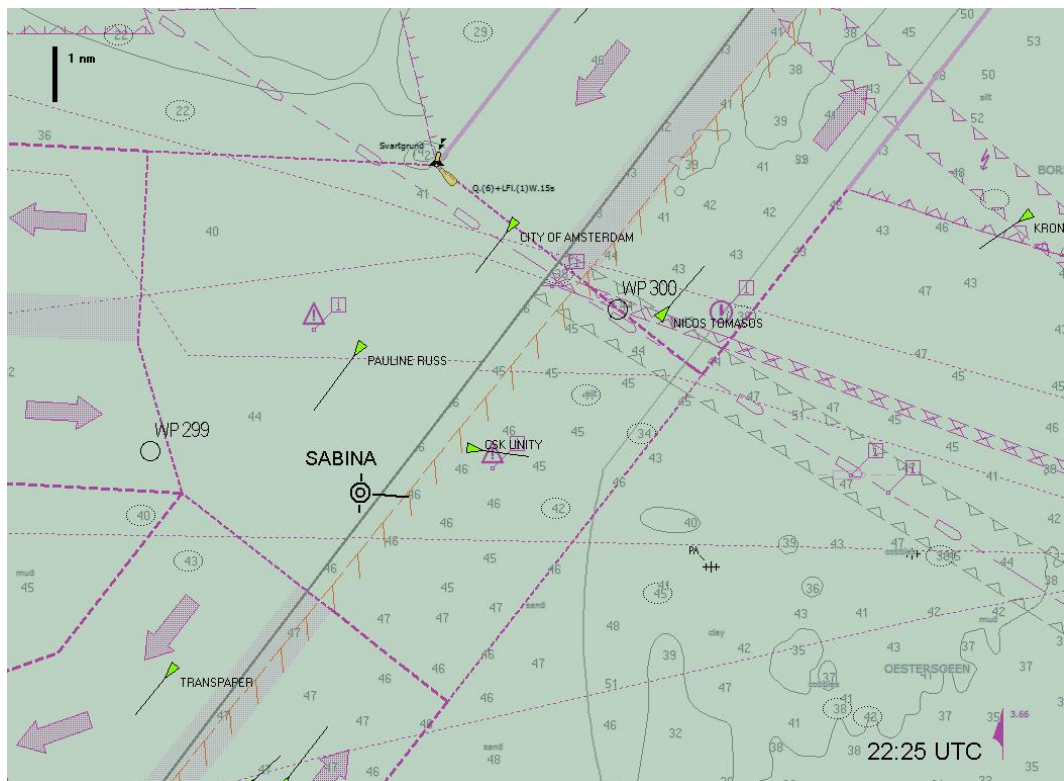


Figure 5: Waypoints 299 and 300, SABINA’s position and the traffic at 22:25 UTC as recorded by the AIS. SABINA is still holding a course of 096°. CSK UNITY also maintains its course and distance to SABINA. KRONVIKEN can be seen in the top right corner.

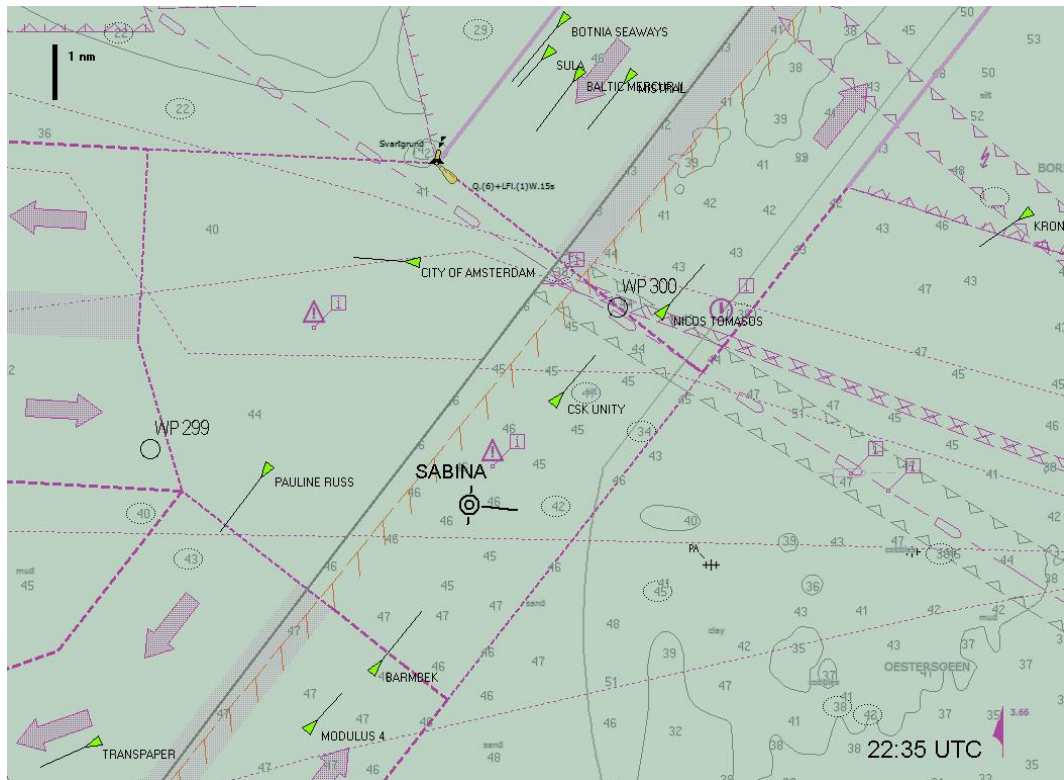


Figure 6: Waypoints 299 and 300, SABINA’s position and the traffic at 22:35 UTC as recorded by the AIS. SABINA is still holding a course of 096°. CSK UNITY changed course, now heading towards a north-easterly direction. BARMBEK approaches from the south-west.

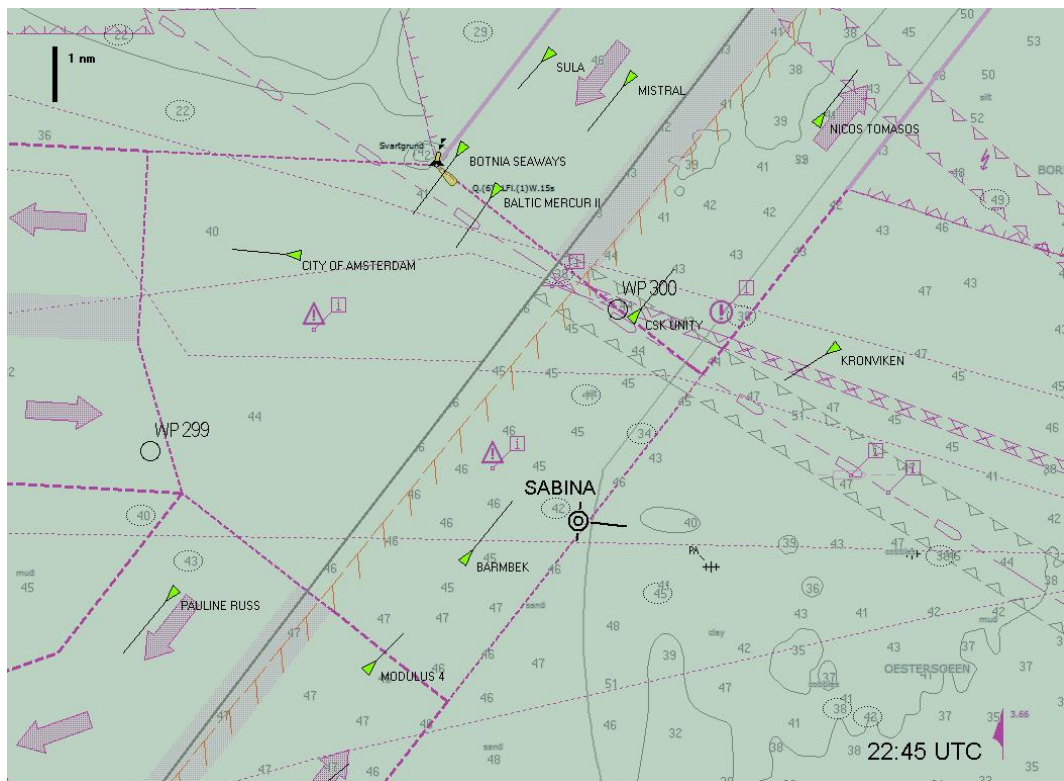


Figure 7: Waypoints 299 and 300, SABINA’s position and the traffic at 22:45 UTC as recorded by the AIS. SABINA still holds a course of 096° and leaves the precautionary area of the Bornholmsgat TSS. The boundaries of the Bornholmsgat TSS and its precautionary area are shown with purple, dashed lines.

1.1.2.6 Unmanned bridge and grounding

From 22:45 UTC on 15 October 2015 (corresponding to 01:45 ST_{casualty} on 16 October 2015), SABINA was sailing towards the Danish island of Bornholm with an unmanned bridge, following a course of 096° and travelling at a speed of about 12 knots (approximately 1.2 nautical miles per 6 minutes or 0.2 nautical miles per minute). At that time, SABINA was approximately 15 nautical miles south-east of the southern end of the Swedish mainland. The distance to the west coast of Bornholm island was 12.5 nautical miles.

At 22:50 UTC, the transit pilot on duty on board KRONVIKEN – a crude oil tanker sailing under the flag of Norway – first attempted to make radio contact with SABINA. According to AIS data,¹⁷ the crude oil tanker was on SABINA's port side and four nautical miles ahead following a course of 247° at that time, and it passed SABINA a little later at a distance of about two nautical miles. Via their AIS, the Danish transit pilot on board KRONVIKEN had shortly before established that SABINA's destination port was Kotka in Finland (and not Rønne on Bornholm) and that SABINA had obviously strayed off course. As SABINA failed to respond to the first message, the KRONVIKEN pilot made another four communication attempts on channel 16¹⁸ during the next five minutes. These radio messages also went unanswered, which is why the pilot rang the Danish Maritime Assistance Service (MAS) at 22:56 UTC using his mobile phone to inform them that SABINA was sailing off course. The MAS received the message and informed the Danish Joint Rescue Coordination Centre (JRCC),¹⁹ the Maritime Surveillance Centre South (MOCS)²⁰ on Bornholm and the Danish coast radio station Lyngby Radio about the situation (see section 1.9).

The MOCS had first attempted to contact SABINA by radio at 22:55 UTC. According to its statement, the MOCS was not alerted to the unfolding situation surrounding SABINA by KRONVIKEN's unanswered radio communications, which the MOCS could have heard, nor by transmission of SABINA's destination port via the AIS, which the MOCS could have consulted. Rather, it was SABINA entering a specific zone off the island of Bornholm that prompted the MOCS to contact the vessel as a matter of routine. However, the attempt proved unsuccessful, as SABINA did not answer. Another attempt at 23:20 UTC also failed to get a response from SABINA.

At 22:57 UTC, Lyngby Radio attempted to contact SABINA via digital selective calling (DSC). The attempt was unsuccessful; SABINA did not answer.

At 23:01 UTC, Lyngby Radio made its first attempt to contact SABINA conventionally by radio. SABINA did not answer. By 23:36 UTC, Lyngby Radio had made another 13 attempts to contact SABINA, all of which were to no avail.

At 23:06 UTC, Rønne Port Control on Bornholm was informed of the situation (by the MOCS), and shortly thereafter Rønne Police was informed (by the JRCC). Rønne Port Control sent the following radio message to SABINA at 23:13 UTC: "*Motor Vessel SABINA, Motor Vessel SABINA, Hotel Bravo Echo Bravo, this is Rønne Port Control, Bornholm island. You have thirty minutes before you run aground on*

¹⁷ SABINA's on-board AIS only sporadically received and recorded KRONVIKEN's position during this phase.

¹⁸ Channel 16 is the marine distress frequency.

¹⁹ In Denmark, the Joint Rescue Coordination Centre (JRCC) acts as the Maritime Rescue Coordination Centre (MRCC), among other things. The operational consoles of the JRCC and MAS are located in the same building and room on the Danish mainland.

²⁰ At the time of the accident, the Maritime Surveillance Centre South (*Maritimt Overvågningscenter Syd* or MOCS) was a service offered by the Danish naval forces and was located on the island of Bornholm. The MOCS identified itself over the radio as 'Danish Navy Bornholm' and was also contacted by other stations under the name '*Bornholm's Marine Distrikt*'.

the Bornholm island if you don't change your course." The distance of SABINA to the west coast of Bornholm island at that time was 6.5 nautical miles.

At 23:14 UTC, i.e. 01:14 local time on Bornholm, the JRCC alerted the Rønne Rescue Station (Rønne RST). The equipment at Rønne RST includes a 16-metre-long rescue vessel, MADS JAKOBSEN. At 23:31 UTC, the rescue vessel with a crew of four cast off from the port of Rønne. It passed the outer breakwaters of the port at 23:32:45 UTC and headed towards SABINA – by then, SABINA was 2.4 nautical miles from the coast of Bornholm (see Figure 9). Just a few minutes later, at about 23:37 UTC, MADS JAKOBSEN approached SABINA from the front. The rescue vessel's crew sounded the ship's horn several times and shone the searchlight alternately into SABINA's wheelhouse and other superstructural parts.

At the same time, around 23:36 UTC, the MAS informed SABINA's shipping company about the situation. Thereafter, the shipping company made several attempts to contact their ship via satellite phone within a few minutes. The calls reached the bridge at SABINA, but were not answered.

At about 23:38 UTC, MADS JAKOBSEN made a tight turn to starboard onto SABINA's course and approached SABINA from astern until physical contact was made between the two vessels. With the intention of attracting someone's attention on SABINA, the rescue vessel's crew used an axe and a bolt cutter to bang on SABINA's port-side shell plating below the superstructure²¹ for several minutes (see Figure 10).

SABINA's fitter, asleep in his cabin just below the bridge deck, was woken up by the rescue vessel's horn, the beam of the searchlight, and the banging by MADS JAKOBSEN's crew. Wondering what was going on, he looked out the port-side window of his cabin and spotted the MADS JAKOBSEN crew banging tools against SABINA's side. Through the front window of his cabin, the fitter then saw the brightly lit coast of Bornholm, or rather the town of Rønne and the port. SABINA was approximately 0.5 to 1 nautical mile off the coast of Bornholm at the time and was moving towards the coast at a speed of roughly 13 knots. The fitter immediately recognised the danger of the imminent collision with the island of Bornholm. He left his cabin and ran upstairs to the wheelhouse. He saw that the bridge was unmanned, so he ran downstairs again and immediately woke the master, who had not been woken by MADS JAKOBSEN's noise and light signals. Without delay, the master went upstairs to the bridge deck. At 23:42:20 UTC, he reached the wheelhouse, set the engine control system to the 'full astern' position and put the helm hard to starboard.

During its turn to starboard, SABINA struck the seabed off the west coast of Bornholm on several occasions between 23:43:38 UTC and 23:45:15 UTC and grounding²² could be heard in the wheelhouse. The shortest distance between the vessel's hull and the rocky coast was between 20 and 50 metres.²³ The ship's speed was temporarily reduced to approximately five knots during the turning and braking manoeuvre. The yaw to port of SABINA's stern during the vessel's turn to starboard had also slightly damaged MADS JAKOBSEN, whose crew was banging on SABINA's port-side hull below the ship's superstructure at the time.

²¹ SABINA's superstructure is located above its stern.

²² The nautical charts show water depths ranging between 5.3 and 7 metres for this area. SABINA crossed the 6-metre depth contour displayed on the nautical charts which protrudes from the coast into the sea at this point at least twice (see Figure 9). According to the nautical chart, the seabed there is made up of cobbles.

²³ As only the position, and accordingly the track travelled, of SABINA's VDR GPS antenna was recorded, and as the vessel's dynamic behaviour is not fully known, the track travelled by SABINA's bow – and thus the shortest distance to the coast – can only be identified as within the range provided.

At 23:47 UTC, the Danish fishery protection vessel HAVØRNEN²⁴ contacted SABINA's master by radio, requesting him to stop his vessel and drop anchor. SABINA's master replied that he would slowly sail to a "safe position" and anchor there. HAVØRNEN acknowledged this message and added that she would follow SABINA.

Gradually, more and more members of the crew on board SABINA were woken by their colleagues, the noise generated by MADS JAKOBSEN, or the grounding. Starting at 23:49 UTC, the master gave various instructions on how to prepare and execute the anchor manoeuvre.

At roughly the same time, the fitter found the second officer lying on the floor of his cabin. The fitter poured water over the second officer's head. The second officer then regained consciousness, stood up, went to the bridge and offered his help. However, this offer was rejected by the master.

At 00:05 UTC on 16 October 2015, SABINA dropped anchor. The anchor location was about 0.6 nautical miles south of the entrance to the port of Rønne.

Due to the fact that SABINA did not stop during or immediately after its turn between 23:43 UTC and 23:45 UTC, but continued its journey to the anchor location, the MAS officer on duty did not assume at this stage that SABINA had suffered a grounding.

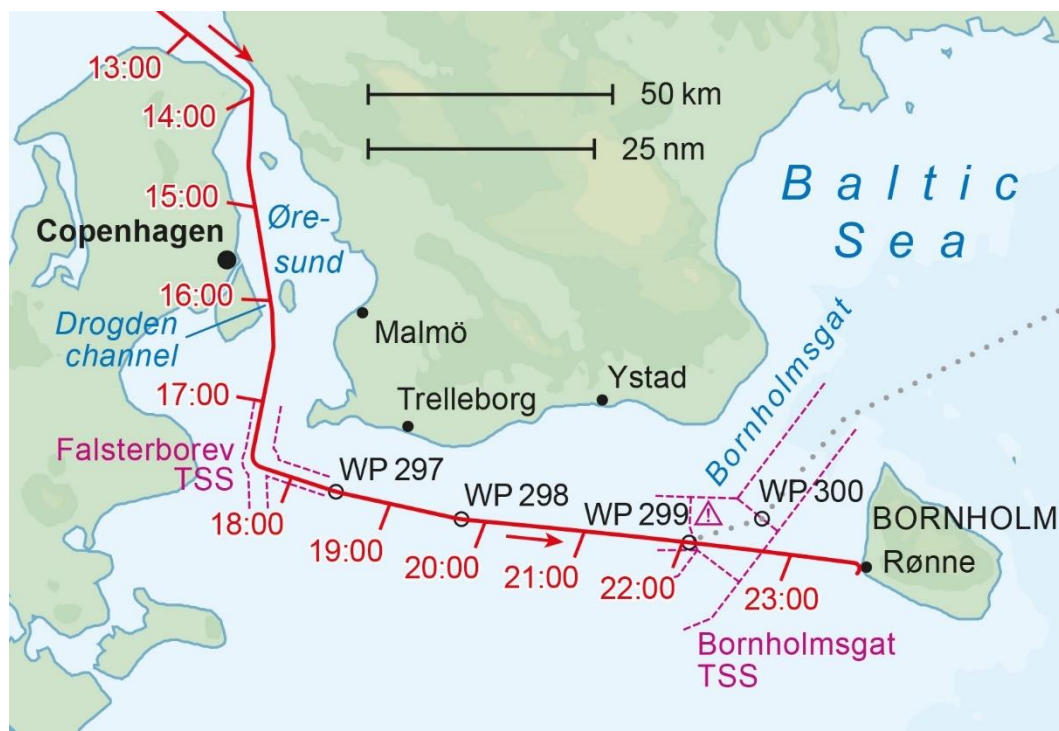


Figure 8: SABINA's actual track from Øresund to the position of grounding off Bornholm (red line) with time markers in UTC. SABINA's intended route, as set out in the passage plan, from waypoint (WP) 299 through Bornholmsgat and towards the open Baltic Sea (grey, dotted line). Base map: Wikimedia Commons.

²⁴ HAVØRNEN was sent to the accident site by the Danish authorities to act as the on-scene coordinator.

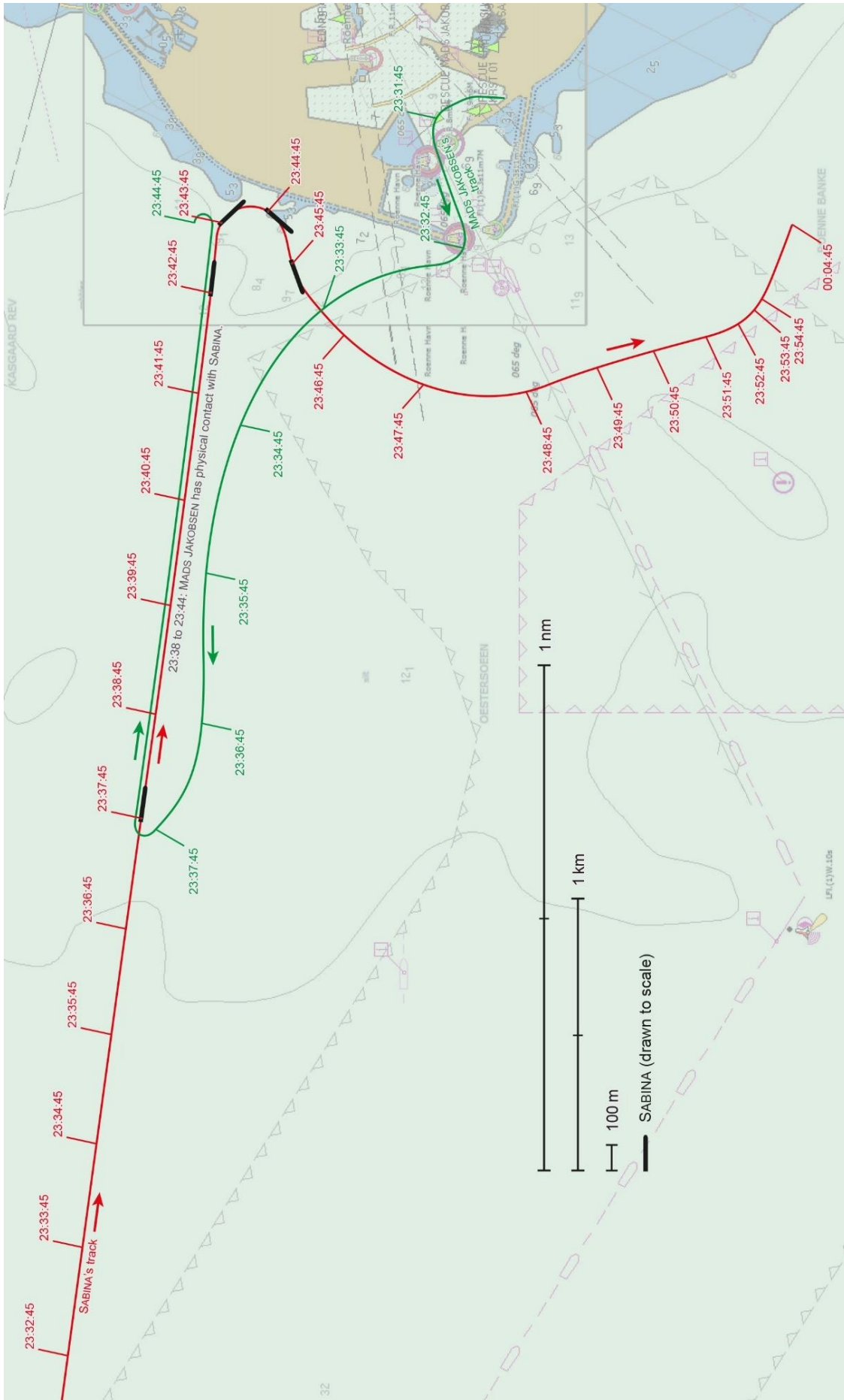


Figure 9: Tracks of SABINA (red) and MADS JAKOBSEN (green) off Bornholm. Outlines of SABINA drawn as icons to scale. Track of SABINA displayed up to the location of anchorage. Track of MADS JAKOBSEN shown until turning away from SABINA. Times in UTC.

1.1.3 Continuation of the sea passage to Kotka and Tallinn

Assuming Danish authorities would soon come aboard, the crew deployed the pilot ladder and made further preparations. SABINA's hull was inspected for leaks, and the crew also performed alcohol breathalyser tests on themselves (see section 1.11). According to the vessel's management team, initially no leaks were detected.

HAVØRNEN looked for any oil spillage around SABINA. No oil could be detected on the water's surface.

At 01:16 UTC, the port authority of Rønne contacted SABINA by radio. After clarifying some of the port authority's queries via radio communication, SABINA was given clearance to continue her journey to the planned destination. At approximately 01:45 UTC, the anchor was weighed, and SABINA continued her sea passage to Kotka.

Following the casualty, the second officer was discharged from watch duty by the master. From that point onwards, watchkeeping duties were to be performed by the master and the chief officer. However, no corresponding entry was made in the deck logbook. An excerpt from the deck logbook with a formal statement by the master confirming that he considered or deemed his ship with the remaining crew seaworthy for the voyage in question was not submitted to the Swiss Maritime Navigation Office (SMNO) (see section 1.13.3.2.7).

According to SABINA's management team, the early morning inspection rounds did not reveal any leaks either. It was around noon on the following day (16 October 2015) that leaks were finally detected. Firstly, water was dripping from the pipe tunnel²⁵ into the engine room through a cable run. Secondly, the sounding of the ballast tanks revealed that water had accumulated – and was continuing to accumulate – in double bottom tank number 7; this tank had been empty when the ship left the port of Aalborg.

Also around noon on 16 October 2015, the second officer collected his urine sample in two test tubes for toxicological analysis (see section 1.11.1.2).

In the early morning of 18 October 2015, SABINA arrived at the port of Kotka. According to the second officer, no one paid attention to observing rest periods; it was more important to reach their destination.

That day, the other crew members, in particular the master and AB 1, now also collected their urine samples for toxicological analysis (see sections 1.11.1.1 and 1.11.1.3).

Later that day, divers examined SABINA's hull. This revealed breaches in the shell plating on the underside of the hull and damage to the propeller and rudder. Water ingress was limited to one water ballast tank and the pipe tunnel. The decision was made to transfer SABINA to a dry dock in Tallinn (Estonia) for repair work. The transfer was carried out the night of 18/19 October 2015. The crew for the transfer from Kotka to Tallinn was identical to the crew for the passage from Aalborg to Kotka.

On the evening of 18 October 2015, the SMNO was notified of the incident via a three-page report written by the master which outlined the causes identified by the master and the post-incident actions taken. In that report, there were clear indica-

²⁵ The pipe tunnel leading from the engine room towards the forecabin contains the water pipes for the ballast tanks. The pipe tunnel must not be mistaken for the shaft tunnel, which leads from the engine room to the stern and houses the driveshaft (see Figure 12).

tions that the bridge navigational watch alarm system (BNWAS) had not been activated during the incident and that this circumstance played a significant role in the incident (see section 1.13.3.2.11).

On the morning of 19 October 2015, SABINA arrived in Tallinn and was towed to the dry dock. SABINA was dry-docked by the afternoon and examined in greater detail (see section 1.3). Over the following 10 days, repair work on SABINA was undertaken.

It could not be clarified whether SABINA's crew switched on the BNWAS for their onward journey to Kotka and Tallinn following the accident.

1.1.4 Date, time and location

The following information relates to the first grounding.

Date	15 October 2015
Time	23:43:38 UTC
Light conditions	Night
Location	Off the coast near Rønne, Bornholm island, Denmark
Coordinates	55°06.1'N 014°41.0'E (WGS ²⁶ 84)

1.2 Injuries to persons

There was no damage to persons.

1.3 Damage to the vessel

1.3.1 Classification of the damage

SABINA was severely damaged. The damage was classified as material damage as per the Casualty Investigation Code (CIC).²⁷

1.3.2 Plate damage above the waterline

Below the superstructure, superficial damage to the shell plating was found on the port side and above the waterline, apparently from the knocks by the crew of MADS JAKOBSEN (see Figure 10).

²⁶ WGS 84: World Geodetic System 1984.

²⁷ Material damage to a ship according to the Casualty Investigation Code: Damage sustained by a ship in relation to a marine casualty that significantly affects the structural integrity, performance or operational characteristics of the ship and requires major repair or replacement of one or more major components, or the destruction of the ship.

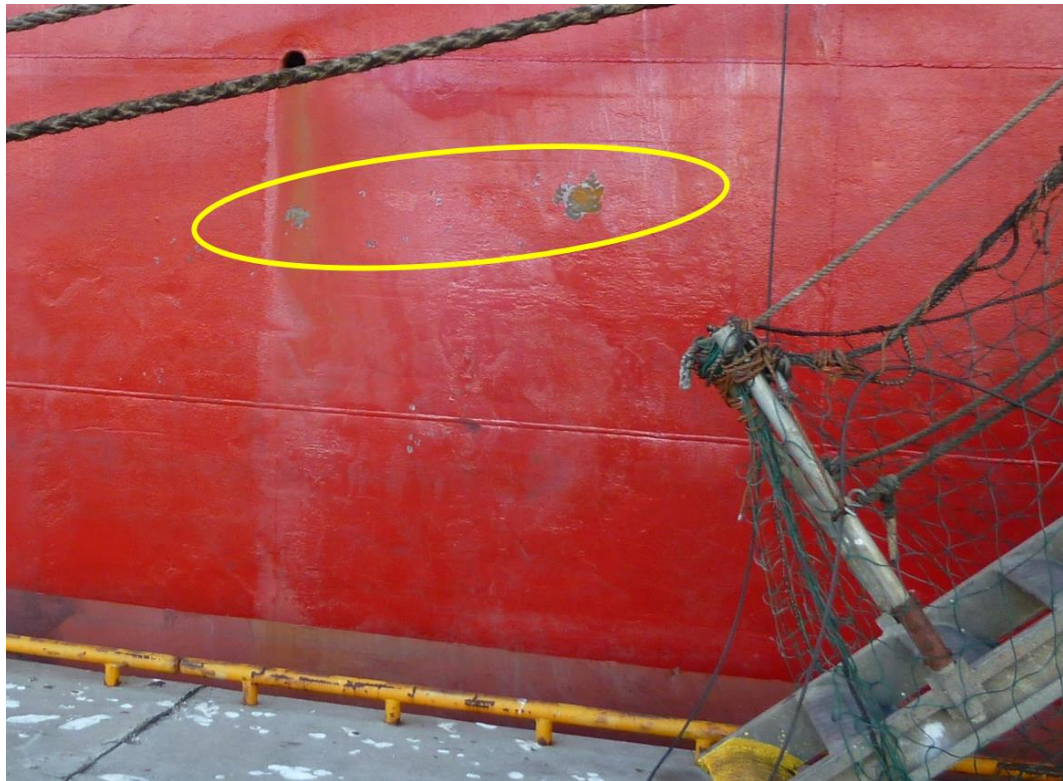


Figure 10: Superficial damage to SABINA's port-side shell plating below the superstructure (marked in yellow). The photograph was taken in the port of Kotka.

1.3.3 Damage to hull and steering system below the waterline

The following damage to SABINA's hull and steering system was found in the dry dock:

- Outer hull breached between frames²⁸ 32 and 35 in the areas of the port-side double bottom water ballast tank²⁹ and the pipe tunnel (see Figure 11 and Figure 12). The pipe tunnel was flooded.
- Across a length of 7 metres and a width of 1 metre: up to 10-centimetre-deep dents and scratches in the shell plating between frames 28 and 38 in the areas of the port-side double bottom water ballast tank,³⁰ the leak oil tank³¹ and the thermal oil drain tank³² (see Figure 12).

²⁸ SABINA is based on a transverse frame design.

²⁹ The ballast tank in question is referred to as 'DB tank WB PS' in the vessel's 'Hold and tank capacities' table and clearly identified with the number 21. The two double bottom ballast tanks between frames 31 and 51 (one each on the starboard and port side) are also referred to as 'double bottom number 7' – counting from the bow, these tanks constitute the seventh pair of double bottom ballast tanks.

³⁰ See footnote above concerning 'DB tank WB PS'.

³¹ The oil tank in question is referred to as 'leak oil 29–30 PS' in the vessel's 'Hold and tank capacities' table and clearly identified with the number 43. This tank is located on the port side between frames 29 and 30 and has a capacity of 1,117 m³.

³² The oil tank in question is referred to as 'thermal oil drain 25–29 SB' in the vessel's 'Hold and tank capacities' table and clearly identified with the number 26. This tank is located between frames 25 and 29 and has a capacity of 3,754 m³. The designation 'SB' for starboard is misleading or indeed factually incorrect, as the tank is actually on the port side (PS).

- Across a length of 5.5 metres and a width of 1 metre: up to 5-centimetre-deep dents and scratches in the shell plating between frames 54 and 63 in the area of the starboard-side double bottom water ballast tank.³³
- Across a length of 13 metres and a width of 1.4 metres: dents and scratches in the shell plating between frames 10 and 32 in the area of the keel plate. Between frames 10 and 18, the damage was within the classification society's tolerances.
- Deformed structural components (frames, floor plates, stringers) in the damaged areas of the double bottom described above.
- Dents and scratches on the bottom plate of the rudder blade.



Figure 11: SABINA in dry dock in Tallinn. View from aft towards the bow. Breaches, dents and scratches in the areas of the port-side double bottom water ballast tank and pipe tunnel, as well as dents and scratches in the areas of the port-side double bottom water ballast tank, pipe tunnel, leak oil tank (marked 'LEAK OIL PS') and thermal oil drain tank (marked 'OIL DRAIN PS'). The water that had entered SABINA's double bottom pours out of the breaches in the double bottom and onto the drained dry dock.

³³ The ballast tank in question is referred to as 'DB tank WB SB' in the vessel's 'Hold and tank capacities' table and clearly identified with the number 20. The two double bottom ballast tanks between frames 51 and 67 (one each on the starboard and port side) are also referred to as 'double bottom number 6' – counting from the bow, these tanks constitute the sixth pair of double bottom ballast tanks.

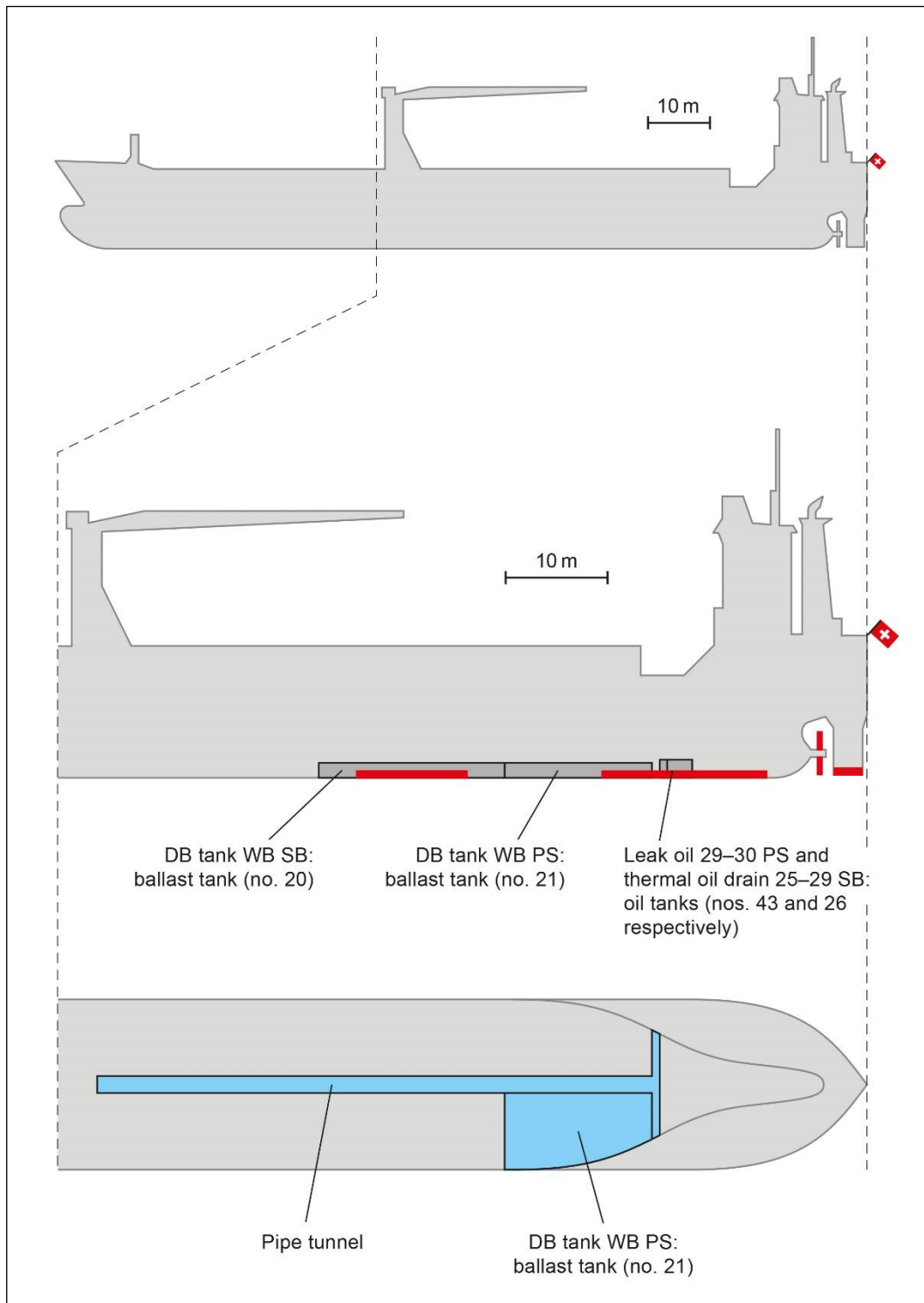


Figure 12: Top illustration: Full profile of SABINA. Middle illustration: Profile including damaged areas (marked in red) on the rudder, propeller and underside of the hull in the areas of the ballast and oil tanks between frames 10 and 38 and between frames 54 and 63. Bottom illustration: Plan view. Volumes into which water could penetrate after grounding (ballast tank and pipe tunnel, marked in blue, see Figure 11). Tank numbers in parentheses relate to the numbering in the ‘Hold and tank capacities’ table. Illustrations and markers are generalised.

1.3.4 Damage to the propulsion system

1.3.4.1 Damage to the propeller blades

The leading edge of one of the ship's propeller blades exhibited a 35-centimetre-long and up to 5-centimetre-deep serration (see Figure 13).

There were also superficial scratches or grinding marks on the leading edges of all propeller blades. The marks aligned with the propeller's direction of rotation. Along the chord line, the area of the marks was approximately 15 centimetres wide.

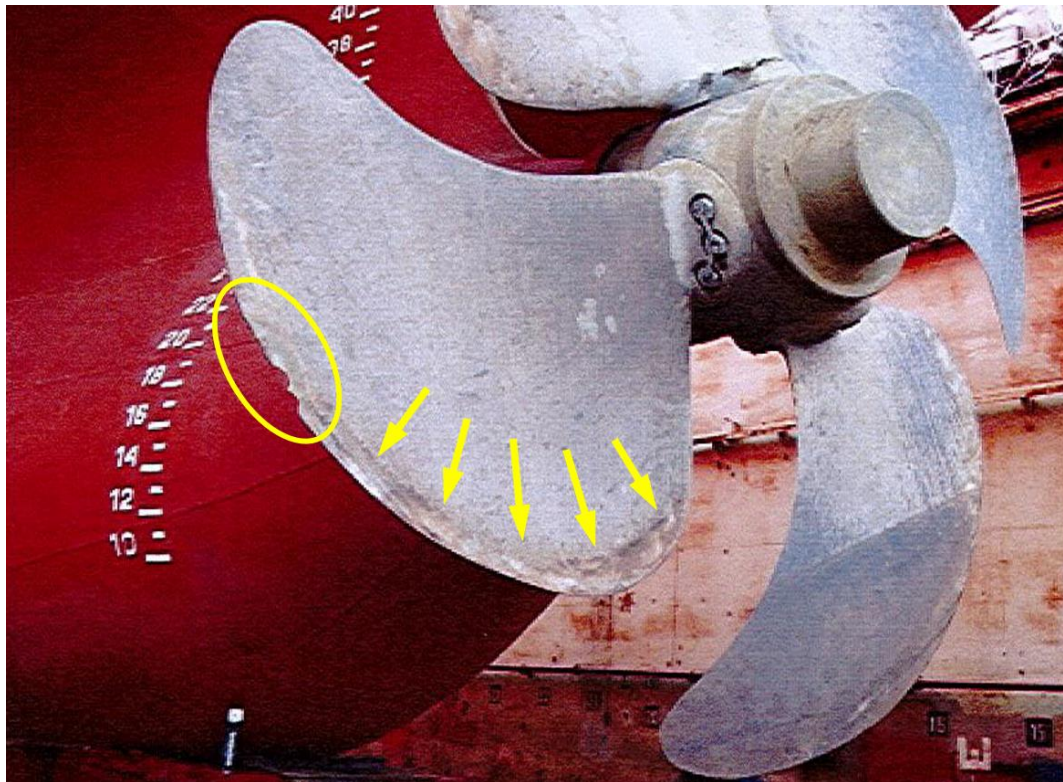


Figure 13: SABINA in dry dock in Tallinn. Serration 35 centimetres long and up to 5 centimetres deep is visible in the leading edge of one of the ship's propeller blades (yellow ellipse). Scratches or grinding marks on the leading edges of the propeller blades are also visible (yellow arrows, marked on one blade only).

1.3.4.2 Damage to the engine

A broken tension bolt and broken springs on the vibration damper were found on the engine.

1.4 Damage to the cargo

There was no cargo on board.

1.5 Third-party damage

The MADS JAKOBSEN rescue vessel was slightly damaged when it made physical contact with SABINA. Specifically, at least one headlight was broken. There was no material damage as defined by the Casualty Investigation Code (CIC).

1.6 Environmental impact

The marine incident did not have any significant environmental impact.

1.7 Classification of the incident

As per the Code of the International Standards and Recommended Practices for a Safety Investigation into a Marine Casualty or Marine Incident (Casualty Investigation Code), this incident under investigation was classified as a marine casualty.

1.8 Voyage particulars

Port of departure	Aalborg (DKAAL), Denmark
Port of arrival	Kotka/Mussalo (FIKTK), Kotka, Finland
Type of voyage	International merchant shipping
Cargo information	No cargo
Nominal drafts ³⁴	3.4 m (bow), 5.1 m (stern)
Manning	12 people

1.9 Characteristics and infrastructure of the shipping route

1.9.1 Natural conditions, hazards and traffic density

The natural conditions of the Baltic Sea in the area of the Swedish south coast and off Bornholm are considered moderate. Extreme events are rare and special hazards are generally not expected.

The Baltic Sea is relatively shallow. The Bornholmsgat TSS is generally more than 40 metres deep (see Figure 4 to Figure 7). On the last section of the route travelled by SABINA, the water depth decreases as follows (see Figure 9):

- 20-metre depth contour: approximately 1.5 nautical miles off the coast near Rønne
- 10-metre depth contour: approximately 300 metres off the coast near Rønne

In the area of Øresund, the Swedish south coast and off Bornholm, maritime traffic is generally quite dense, particularly due to fishing, merchant shipping and high-speed vessels (ferries). In especially busy regions, traffic flow is regulated by traffic separation schemes (see section 1.9.2).

1.9.2 Bornholmsgat traffic separation scheme

The Bornholmsgat traffic separation scheme (TSS) runs between the Swedish mainland and the Danish island of Bornholm. It includes the main lanes heading from north-east to south-west and vice versa; inshore traffic zones; a precautionary area in the south-west; and two additional lanes, respectively a continuation to the west and south-west (see Figure 14 as well as various figures in section 1.1.2).

The purpose of the precautionary area is to allow traffic following the Swedish south coast to make the necessary crossing and merge with traffic bound for the north-east or south-west. The additional lanes attached to the precautionary area serve to channel the traffic approaching the junction.

³⁴ Without taking hydrodynamic effects into account.

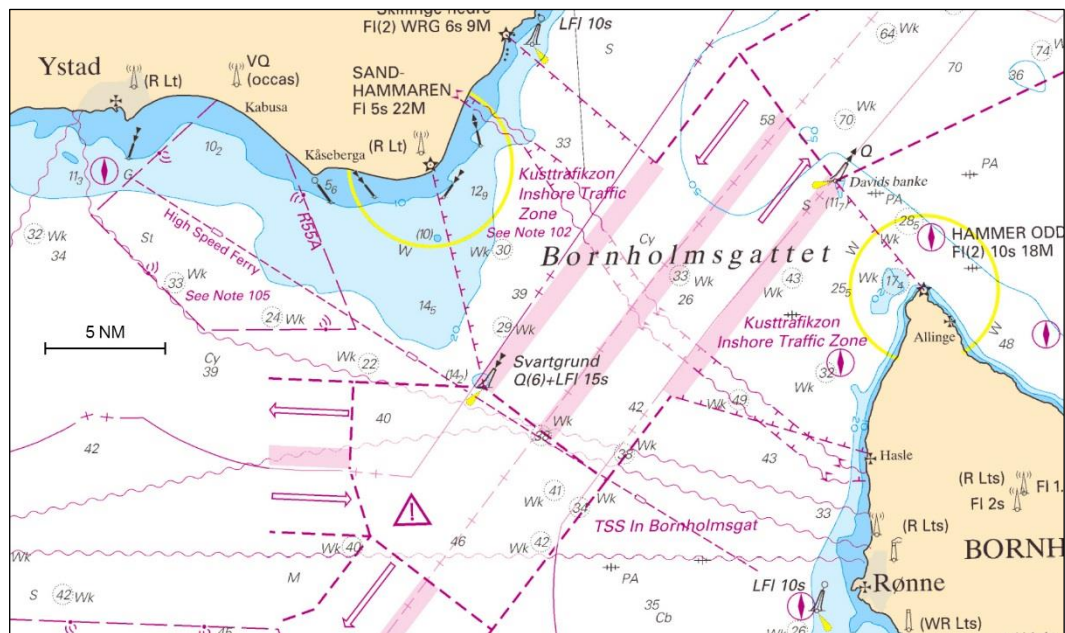


Figure 14: The section from the Swedish nautical chart SE 74/839 (published on 16 May 2014) shows the area between the Swedish south coast and the Danish island of Bornholm – the Bornholmsgat (*Bornholmsgattet*). The Bornholmsgat TSS as well as the towns of Rønne on Bornholm and Ystad on the coast of Sweden are clearly visible. The scale of the image does not correspond to the original scale of the paper nautical chart.

1.9.3 Traffic monitoring and control

Traffic is not controlled in the Bornholmsgat area as there is no maritime traffic control centre there. There is therefore no obligation for traffic to report their passage. For the coast radio stations, ports and rescue stations in the region, as well as for the Danish Maritime Surveillance Centre South (*Maritimt Overvågningsscenter Syd* or MOCS) on Bornholm, there is nevertheless a technical possibility of tracking the traffic situation in the Bornholmsgat area by using AIS receivers or radar systems. The MOCS also has certain surveillance responsibilities (see section 1.9.7).

1.9.4 The coast radio station Lyngby Radio

Lyngby Radio is the Danish coast radio station. It uses a network of remote stations to communicate via digital selective calling (DSC) or radiotelephony. Lyngby Radio identifies itself with the call sign 'Lyngby Radio'. Acting on behalf of the Danish Joint Rescue Coordination Centre, one of Lyngby Radio's responsibilities is to coordinate radio communication in the event of a maritime emergency in Danish waters.

1.9.5 Joint Rescue Coordination Centre

In Denmark, the Joint Rescue Coordination Centre (JRCC) acts as the Maritime Rescue Coordination Centre (MRCC), among other things. At the time of the accident, the operational consoles of the JRCC were located in Aarhus.

1.9.6 Maritime Assistance Services

The purpose of the Maritime Assistance Services (MAS) is to handle shipping incidents that do not constitute a maritime emergency but do require special measures to avert the hazard or situation that might develop into a hazard. At the

time of the accident, the Danish MAS office was located in Aarhus, in the same building and same room as the JRCC.

1.9.7 Maritime Surveillance Centre South

At the time of the accident, the Maritime Surveillance Centre South (*Maritimt Overvågningscenter Syd* or MOCS) was a service offered by the Danish naval forces and was located on the island of Bornholm. It monitored the waters in southern Denmark and along the borders with Sweden, Germany and Poland. This monitoring was of a military nature and primarily served to protect Danish interests in the territorial waters of Denmark. When a vessel passed certain zones that fell under its responsibility, this vessel would – as a matter of routine – be contacted by the MOCS via radio, be identified and asked about its intentions.

In addition to using radio equipment for listening in and communicating on civilian radio frequencies, the MOCS used radar and AIS receivers. The MOCS identified itself over the radio as ‘Danish Navy Bornholm’ and was also contacted by other stations under the name ‘Bornholm’s Marine District’. In the event of an incident, the MOCS coordinated the local police and naval forces, as well as the resources of the fisheries inspectorate, the local maritime rescue station and the port authority of Rønne.

1.9.8 Rønne Rescue Station

Rønne Rescue Station reports to the Danish Ministry of Defence. The rescue service is – similar to the Swiss fire brigade – predominantly organised with staff providing a part-time public service. The Rønne Rescue Station is staffed by about a dozen volunteers. At any one time, a team of four volunteers is on standby to respond. In the event of an emergency, they crew the 16-metre MADS JAKOBSEN rescue vessel (see Figure 15) assigned to the Rønne Rescue Station.



Figure 15: The 16-metre-long MADS JAKOBSEN rescue vessel on an exercise in 2009. Source and copyright: Danish Ministry of Defence.

1.9.9 Fisheries inspectorate

The Danish fisheries inspectorate has a fleet of two larger units. One of them is the fishery protection vessel HAVØRNEN, which regularly patrols Danish waters. In the event of an accident, the crew of HAVØRNEN can act as on-scene coordinators with Danish sovereign powers.

1.10 Meteorological information

1.10.1 General weather conditions

There was a high-pressure system over the Baltic and an area of low pressure with its centre above Northern Italy. The south-western Baltic Sea was between these two weather systems. Since 13 October 2015, the wind had been blowing from the east. The average wind speed and gusts over Bornholm reached their peak in the early afternoon on 15 October 2015 (average wind speed measured up to 21 knots, gusts up to 31 knots). The wind then subsided until the morning of 16 October 2015. At around midnight on 15/16 October 2015, a warm front reached the island of Bornholm from a south-easterly direction.

1.10.2 Sea state

Computer modelling for the night of 15/16 October 2015 shows significant wave heights of one to two metres for the open sea west of Bornholm.

1.10.3 Weather at the time of the incident

The following information relates to Bornholm Airport³⁵ and the time between 22:50 UTC (15 October 2015) and 00:20 UTC (16 October 2015).

Weather and clouds	Overcast (cloud cover of 8 oktas) with the cloud base dropping from 2,800 ft to 1,000 ft, intermittent drizzle
Visibility	Between 5 and 8 km
Wind	From 090 to 100 degrees at 11 to 13 knots
Temperature/dew point	8°C/7°C
Atmospheric pressure (QNH)	1,021 hPa (pressure reduced to sea level, calculated with the values of the standard atmosphere)

1.10.4 Astronomical information

Light conditions	Night
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1.11 Information on people concerned

1.11.1 Vessel's crew

The ship's crew on board SABINA consisted of the following 12 people:

- Master;
- Chief officer;
- Second officer;
- Chief engineer;

³⁵ Bornholm Airport is located 5 kilometres south-east of the port of Rønne.

- Second engineer;
- Electrician;
- Able-bodied seaman 1 (AB 1);
- Able-bodied seaman 2 (AB 2);
- Able-bodied seaman 3 (AB 3);
- Fitter;
- Wiper;
- Cook.

The seamen are numbered at random for the purpose of this report.

The following section only includes information relating to the crew members directly involved in the casualty.

1.11.1.1 Master

Nationality	Russian
Year of birth	1981
Certificate of competency	'Master and chief mate' according to section A-II/2 of the STCW Convention ³⁶ (see section 1.15.2.4), issued on behalf of the Government of the Russian Federation by the harbour master of Vladivostok (Russia)
Endorsement	Endorsement for the certificate of competency according to section A-II/2 of the STCW Convention, issued by the SMNO on 16 July 2015, valid until 31 December 2016

Since 2012, the master had served six tours of duty on board ocean-going cargo vessels, all in the rank of chief officer and totalling more than 15 months. He joined SABINA in the rank of chief officer on 7 July 2015 and was appointed master of SABINA on 9 September 2015 after completing three voyages. The passage from Aalborg to Kotka was his third voyage acting as SABINA's master.

During the days while in the port of Aalborg, the master worked regular hours from about 08:00 to 18:00 ship's time.

At 00:00 UTC on 15 October 2015, when the master started to make final administrative preparations for the upcoming voyage, he had been off work for roughly eight hours.

When the master handed over the watch to the second officer at 21:00 UTC on 15 October 2015, he had not slept for at least 21 hours. According to the records of work and rest hours relating to the previous 24 hours, he was due four hours of rest at 21:00 UTC.

According to the test record, the alcohol breathalyser tests which the crew on board SABINA took themselves in the hour immediately after the casualty provided the master with a negative result. It is not clear what measuring device was used (see section 1.12.8).

³⁶ STCW: International Convention on Standards of Training, Certification and Watchkeeping for Seafarers.

The toxicological analysis of the master's urine sample produced negative results for alcohol and nine other substances. The urine sample had been collected in a test tube on 18 October 2015 (see section 1.1.3).

1.11.1.2 Second officer

Nationality	Ukrainian
Year of birth	1984
Certificate of competency	'Officer in charge of a navigational watch' according to section A-II/1 of the STCW Convention (see section 1.15.2.4), issued by the Government of Ukraine
Endorsement	Endorsement for the certificate of competency according to section A-II/1 of the STCW Convention, issued by the SMNO on 12 December 2014, valid until 31 December 2016

Since 2007, the second officer had served 10 tours of duty on board various ocean-going vessels. These tours lasted from three to eight months. Until March 2013, the second officer held the rank of ordinary seaman or able-bodied seaman (AB). On the last three tours, he acted as second or third officer, serving for more than 16 months in total. The second officer's last tour of duty before joining the crew of SABINA was on SCL AKWABA, another general cargo ship operated by Enzian Ship Management AG. This tour lasted from November 2014 to May 2015. The passage from Aalborg to Kotka was the second officer's first voyage on board SABINA. He joined SABINA on 7 October 2015 (see section 1.1.1).

According to his statements, the second officer had never received instruction on the functionalities and operation of the bridge navigational watch alarm system during the period between his joining SABINA and the incident.

During the days in the port of Aalborg, the second officer and the chief officer alternated on watch duty in a six-on-six-off schedule. This means that every six-hour shift of watchkeeping (on duty) was followed by six hours of rest (off duty) and that one of these two officers was off while the other was on duty. During his shifts, the second officer was busy with inspection rounds, mooring line adjustments, voyage planning and other voyage preparation work assigned to him by the shipping company. He also had to familiarise himself with the ship and its systems for his first sea passage on board SABINA. As the scheduled six-hour shifts were apparently insufficient for the work at hand, the second officer, according to his statements, was also working during what should have been a rest period – in his words – “*until he was totally exhausted*”. At times, even when off duty, the second officer was involved in discharging the ship working as a crane operator. The second officer stated that he slept about two to three hours each time he was off duty in port. In addition, he slept poorly because he felt under pressure at work.

After leaving port and while off duty, the second officer completed work that had been left undone while in port.

On 15 October 2015, by the time he started his watch at 21:00 UTC, the second officer had slept four or five hours in total during the two periods listed below:

- 04:00 or 05:00 UTC³⁷ to 07:30 UTC 2.5 or 3.5 hours
- 19:10 UTC to 20:40 UTC 1.5 hours

³⁷ It was not possible to conclusively reconstruct when the second officer went to bed.

For the second officer, the following rest periods were documented in the software that recorded work and rest hours for 15 October 2015 (time system is unknown for all entries):

- 04:00 to 09:30
- 11:30 to 12:00
- 16:00 to 24:00

Following the casualty, the second officer was discharged from watch duty by the master.

The two painkillers the second officer took shortly before going on watch were (analgesic) Farmadol tablets. Their active ingredient is paracetamol³⁸, which at the standard dosage is not associated with impairing side effects.

Three weeks after the casualty, the second officer underwent a medical examination in Odessa (Ukraine). The check-ups were of neurological, cardiological, internal and psychiatric nature. The findings resulting from the examination did not reveal an increased risk of impaired consciousness.

According to the test records, the alcohol breathalyser tests which the crew on board SABINA took themselves in the hour immediately after the casualty provided the second officer with the following results: the first test was negative, the second positive and the third negative. It is not clear what measuring devices were used (see section 1.12.8).

The toxicological analysis of the second officer's urine sample produced negative results for alcohol and nine other substances. The urine sample had been collected on the day after the casualty (see section 1.1.3).

1.11.1.3 AB 1

Nationality	Ukrainian
Year of birth	1988
Certificate of proficiency	'Rating forming part of a navigational watch' according to section A-II/4 of the STCW Convention (see section 1.15.2.3), issued on behalf of the Government of Ukraine by the harbour master of Odessa (Ukraine)

AB 1 joined SABINA at the beginning of September 2015. The passage from Copenhagen to Kotka was his fifth voyage on board SABINA.

During the night of 14/15 October 2015, AB 1 first assisted in discharging operations and was subsequently then involved in work associated with departure.

On 15 October 2015, the day of the casualty, by the time he started his watch at 21:10 UTC, AB 1 had slept seven or eight hours in total during the two periods listed below:

- 04:00 or 05:00 UTC³⁹ to 10:00 UTC 5 or 6 hours
- 19:00 UTC to 21:05 UTC⁴⁰ 2 hours

³⁸ The analgesics containing paracetamol best known in Switzerland include Panadol and Dafalgan.

³⁹ It was not possible to conclusively reconstruct when AB 1 went to bed.

⁴⁰ With a short interruption by a telephone call from the second officer at about 20:40 UTC.

According to the test record, the alcohol breathalyser tests which the crew on board SABINA took themselves in the hour immediately after the casualty provided AB 1 with a negative result. It is not clear what measuring device was used (see section 1.12.8).

The toxicological analysis of AB 1's urine sample produced negative results for alcohol and nine other substances. The urine sample had been collected on 18 October 2015 (see section 1.1.3).

1.11.1.4 Fitter

Nationality	Ukrainian
Year of birth	1956

1.11.2 Passengers

There were no passengers on board.

1.12 The vessel and its operation

1.12.1 Ship particulars

Name of vessel	SABINA
Type	General cargo ship
Manufactured by	Damen Shipyards Cargo Vessels, Netherlands
Design	Damen Combi Freighter 9200G
Flag	Switzerland
Owner	MV Sabina AG, Switzerland
Shipping company	Enzian Ship Management AG, Switzerland
Classification society	Lloyd's Register (Romania) S.R.L.
Certificate of class	Hull: ✕ 100A1 (unrestricted seagoing), strengthened for heavy cargoes, container cargoes in holds and on upper deck hatch covers, LI (loading instrument) Machinery: ✕ LMC (Lloyd's machinery certificate), UMS (unmanned machinery space)
Call sign	HBEB
IMO ⁴¹ number	9205718
MMSI number	269052000
Year of manufacture	1998 (keel laying), 2000 (delivery)
Yard number	804
Length	127.87 m
Beam	15.93 m
Construction	Steel
Gross tonnage	5,968

⁴¹ IMO: International Maritime Organization. IMO is a specialised agency of the United Nations.

Net tonnage	3,422
Max. displacement	12,131 tonnes
Deadweight	9,230 tonnes
Maximum draft	7.45 m
Main engine	MaK 9M32
Max. power of main engine	4,320 kW
Max. speed	14.7 knots
Head reach of crash stop trial ⁴²	520 m
Advance at 90° change of heading ⁴³ to starboard	265 m
Advance at 90° change of heading to port	270 m
Minimum safe manning	11 people ⁴⁴
Maximum manning ⁴⁵	12 people
Accommodation	For 12 people

1.12.2 Steering control system

At the time of the accident, SABINA was equipped with a 'Pilotstar D' autopilot manufactured by Raytheon Anschütz. This system allowed the rudder to be controlled directly, i.e. manually, and also offered the two essential operating modes 'heading control' and 'track control'.

In 'manual control' mode, signals could be sent to the rudder hydraulics to adjust the rudder position. This control could be operated on the system itself, as well as through the tiller in the wheelhouse and on the bridge wings.

In 'heading control' mode, the system could be led by either a magnetic compass or a gyrocompass. For each change of course, the desired heading had to be set by rotary knob or arrow keys. The autopilot then ensured that the set heading was maintained.

In 'track control' mode, the autopilot enabled the vessel to sail to preselected waypoints without further intervention by the crew. Once a waypoint has been reached, the course changes automatically; the system automatically compensates for side wind or drift effects. Having said that, it was not possible to use 'track control' mode

⁴² Head reach in a crash stop trial or stopping test is the distance the ship travels along its original course, sailing at full speed and full load, measured from the position at which the order for full astern is given to the position at which the vessel stops. The rudder is kept amidship during this test. Measured from midship point (centre of the ship in lateral and longitudinal direction).

⁴³ The advance at 90° change of heading in the turning circle manoeuvring trial is the distance the ship travels along its original course, sailing at full speed and full load, measured from the position at which the order for full rudder deflection is given to the position at which the vessel has completed the 90° change of heading (measured from midship point).

⁴⁴ According to the minimum safe manning document issued by the Swiss Maritime Navigation Office (SMNO), the following crew were required: master (II/2 according to STCW), chief officer (II/2), another officer of the watch (II/1), three ABs (II/4), cook, four engineering and machinery crew (two III/2, one III/4, one VI/1). See section 1.13.3.2.7.

⁴⁵ Rescue equipment was available for this number of people.

on board SABINA as the autopilot was not connected to an electronic position determination system or navigation receiver (i.e. GPS device).

1.12.3 Systems for position determination and navigation

1.12.3.1 Traditional systems and methods

As there were no approved and redundant electronic chart display and information systems (ECDIS) on board SABINA, official paper nautical charts had to be made available to the crew and manually updated at all times.

Within sight of landmarks or seamarks, the ship's position could be determined terrestrially by using the charts, and on the open sea, the position could be determined by celestial navigation. Both traditional methods require favourable meteorological conditions.

1.12.3.2 Radar systems

Although radar systems are primarily intended for collision avoidance, they can also be used for position determination – provided that landmarks or seamarks shown on the nautical charts are within the radar's range.

SABINA had two Furuno radars on board. These offered an extensive range of functions for navigation, target detection, collision avoidance and manoeuvre planning. They were connected to GPS and AIS equipment, which increased the functionality of the radar units and allowed the AIS-generated traffic situation to be displayed on the radar screens.

In particular, the radars were capable of setting a 'target alarm'. This alarm emits a visual and acoustic warning when the radar system detects a ship or land mass in a defined area in front of your own ship. The radars also offered a 'watch alarm' capability. This alarm emits a visual and acoustic warning when a preselected period of time has elapsed – similar to a simple kitchen timer.

The radar units allow these alarms to be relayed to an external alarm or warning system, such as a bridge navigational watch alarm system (BNWAS). On board SABINA, however, the radars were not connected to the BNWAS.

1.12.3.3 GPS devices

For navigation, SABINA's bridge was primarily equipped with three Furuno GP-150 GPS devices. These were connected to each other and could be used not only for satellite-based determination and display of the vessel's position, but also for navigation using preselected waypoints. In practice, SABINA's crew mainly used these GPS devices for position determination and navigation. The devices were not connected to the autopilot, meaning that it was not possible to automatically follow a series of preselected GPS waypoints.

Furuno GP-150 GPS devices allow various alarms to be programmed:

- The 'arrival alarm' emits a warning before arriving or on arrival at a preselected waypoint; the 'alarm range' for this alarm (radius around the waypoint) can be set individually.
- The 'cross track error alarm' emits a warning if the vessel deviates from its intended course over ground (determined by two consecutive waypoints).

The cross track error alarm was tested after the casualty and produced an audible warning in SABINA's wheelhouse. The arrival alarm could not be tested.

The Furuno GP-150 GPS device emits a short sequence of three beeps if the GPS signal is suddenly lost and the position cannot be redetermined for one minute

(‘GPS error’). An identical sequence of three beeps is also emitted if the position accuracy falls below a defined value (‘DOP error’). If the GPS error or DOP error persists, the warning sounds every three minutes. If the arrival or cross track error is pending, the device emits a continuous acoustic warning characterised by short interruptions (“*beeeep, beeeep, beeeep, beeeep, beeeep...*”).

The Furuno GP-150 has the capability of relaying such alarms to an external alarm or warning system, such as a bridge navigational watch alarm system. On board SABINA, however, the GPS devices were not connected to the bridge navigational watch alarm system.

GPS receivers were also installed in other equipment that requires position data for their intended purpose. These include marine VHF radios, the AIS, satellite telephones and the voyage data recorder (see section 1.12.7).

1.12.3.4 Echo sounder

For measuring the depth of the water below SABINA, the vessel was equipped with a Furuno FE-700 echo sounder. The device allows a ‘shallow depth alarm’ to be programmed. This alarm sounds as soon as the water level falls below a set depth. The Furuno FE-700 also has the capability of relaying this alarm to an external alarm or warning system, such as a bridge navigational watch alarm system. On board SABINA, however, the echo sounder was not connected to the bridge navigational watch alarm system.

No acoustic alarm matching the device’s shallow depth alarm could be heard on the VDR audio recordings.

1.12.4 Equipment for telephony and marine radio

In SABINA’s wheelhouse, there were two satellite telephones for voice communication with shore-based stations (e.g. with the shipping company).

For DSC alerting, the wheelhouse had medium-frequency radio equipment available at all times.

For marine communications, SABINA’s wheelhouse was equipped with three built-in VHF radios. All three were capable of digital selective calling (DSC) and – depending on the urgency of the incoming DSC alert – could sound an alarm when being contacted.

1.12.5 Automatic identification system

SABINA was equipped with a Furuno FA-150 AIS transponder. By connecting the radar equipment to the AIS, the system could use radar as well as AIS data. In particular, the radar image could be supplemented by also displaying the AIS-generated traffic situation (see section 1.12.3.2).

1.12.6 Bridge navigational watch alarm system

1.12.6.1 Technical design of the bridge navigational watch alarm system

SABINA was equipped with a Navgard bridge navigational watch alarm system (BNWAS) manufactured by Martek Marine Ltd. The device had been retrofitted in the vessel in May 2013. This was likely done with the aim of complying with IMO

resolutions MSC.282(86)⁴⁶ and MSC.128(75)⁴⁷ (see section 1.14). According to its 'Record of equipment for cargo ship safety (form E)', issued by Lloyd's Register on 3 August 2015, SABINA was required to be equipped with a BNWAS. For further details relating to mandatory equipment, please see section 1.14.1.

The purpose of a BNWAS is to alert the rest of the crew in case the bridge team becomes incapable of performing their watchkeeping duties or if the bridge is un-manned. This is to minimise the duration of such a situation and limit its consequences. The system also assists in calling for bridge support quickly and at any time (see emergency call key below).

SABINA's BNWAS consisted of the following components:

- Control panel with status and operating display, status lights, built-in infrared motion sensor,⁴⁸ reset key and emergency call key. The control panel was installed on the port side of the bridge control console (see Figure 16 and Figure 17);
- Three reset push buttons, one each on the starboard side of the bridge control console (see Figure 17), the starboard bridge wing and the port-side bridge wing;
- Alarm sounders to emit an acoustic warning in the master's, chief officer's and second officer's cabins, as well as on the mess deck.

The Navgard BNWAS features four different operating modes: 'Off', 'On', 'Auto' (in this mode, it activates automatically when the autopilot is on) and 'Port security' (intrusion alarm). A green status light on the control panel indicates which operating mode is active (see Figure 16). Everything suggests that the four operating modes 'Off', 'On', 'Auto' and 'Port security' of the BNWAS on board SABINA could indeed have been used.

As part of this investigation, the manufacturer of the Navgard bridge navigational watch alarm system (Martek Marine Ltd) was confronted with the observation that the only difference between the system's lights indicating whether the BNWAS is 'on' or 'off' is that the lights are two separate indicators on the control panel – both are green, and they are only about one centimetre apart from each other. When asked what considerations led to this type of design, Martek Marine Ltd responded with the following statement: "*The system is MED-certified for maritime use in accordance with the IMO performance standards.*"⁴⁹

As per the system design, the Navgard BNWAS's alarm sequence up to and including the 'Stage 2' alarm works as listed below. The STSB has made selective tests on board SABINA to verify this:

1. If no activity is detected during a dormant period of between 3 and 12 minutes⁵⁰ (by the infrared motion sensor, the reset push buttons or the reset key on the

⁴⁶ IMO Resolution MSC.282(86) adopted on 5 June 2009 concerns the adoption of amendments to the International Convention for the Safety of Life at Sea (SOLAS). This resolution regulates the obligation to equip vessels with a BNWAS, or rather by when such a system must have been installed.

⁴⁷ IMO Resolution MSC.128(75) adopted on 20 May 2002: Performance standards for a bridge navigational watch alarm system (BNWAS).

⁴⁸ Lloyd's Register accepted SABINA's BNWAS on 7 May 2013. Although Lloyd's Register procedures require that if an installed or to-be-installed BNWAS features a motion sensor, the flag state authority must have explicitly given permission ('clear acceptance') for this, Lloyd's Register was unable to produce such permission from the SMNO. Lloyd's Register admitted this error.

⁴⁹ MED referring to Marine Equipment Directive 96/98/EC.

⁵⁰ At the time of the incident, the dormant period of the BNWAS on board SABINA was probably set to 12 minutes.

control panel), the red reset push buttons illuminate and flash, and the 'Stage 1' status light also flashes. The manufacturer refers to this alarm as 'Stage 0 alarm'.

2. If no activity is detected during the next 15 seconds (by the infrared motion sensor, the reset push buttons or the reset key on the control panel), an acoustic alarm is emitted on SABINA's bridge, and the 'Stage 1' status light on the control panel illuminates continuously. The manufacturer refers to this alarm as 'Stage 1 alarm' or 'First stage audible alarm'.
3. If no activity is detected during the subsequent 15 seconds (by the infrared motion sensor, the reset push buttons or the reset key on the control panel), SABINA's crew are alerted by the 'Stage 1' acoustic alarm sounding on the bridge and also by an additional alarm sounding in the master's, chief officer's and second officer's cabins. That alarm also sounds in the mess, and the 'Stage 2' status light on the control panel stays illuminated continuously. The manufacturer refers to this alarm as 'Stage 2 alarm' or 'Second stage remote audible alarm'.

The emergency call key on the control panel serves to set off the 'Stage 2' alarm immediately and at any time, e.g. if the bridge team urgently needs help.

From a technical point of view, the Navigard BNWAS can be connected with any NMEA-capable⁵¹ bridge instrument. This would allow alarms generated by other bridge equipment (e.g. an arrival and/or off-track alarm from a GPS device, a collision alarm from an AIS or radar unit, or a depth alarm from an echo sounder) to also be emitted via the BNWAS. However, as the equipment on board SABINA was not connected in that manner, SABINA's BNWAS in 'on' mode was only capable of responding to inactivity in the detection range of the control panel's motion sensor, as well as to inactivity relating to the reset push buttons and reset key.

The Navigard BNWAS can be switched on or off via a numerical code.

The Navigard BNWAS has achieved type approval from the classification society Lloyd's Register.

On board SABINA, the control panel of the BNWAS installed on the port side of the bridge control console (see Figure 17) was visible from the port-side seat in front of the console. However, it was not visible from the starboard seat in front of the console and from other locations on the bridge.

1.12.6.2 Operation of the bridge navigational watch alarm system

Only the master and chief officer knew the numerical code for turning the system on or off. The BNWAS on board SABINA was switched off from the time of the vessel's port call in Aalborg to the time of the incident.

The master, chief officer and AB 1 stated to the STSB that SABINA's BNWAS was normally switched on, apart from when the ship was in port. According to statements made by the master, he must have forgotten to switch it on when leaving Aalborg. The chief officer, second officer and AB 1 supported this assumption. The master attributed the omission to his fatigue.

The master, as well as the chief and second officers, stated that they had not noticed that the BNWAS had remained switched off after leaving Aalborg. All three attributed this oversight to the system having one or more motion sensors; since while on watch they would move on the bridge, it was therefore only logical that

⁵¹ The term 'NMEA-capable' refers to electronic equipment for ships compliant with the National Marine Electronics Association (NMEA) standard 0183.

normally they would not be prompted (visually or acoustically) by the system to press a reset push button.

In a later interview, the second officer made the following comments to the STSB as to why he had not requested the master to activate the BNWAS: *“How can I request this, master is master [...]. If he’s doing it that way, he must have a good reason for it.”*

According to the statements made by the second officer, he had never been instructed on how the sensors worked or the functionality and operation of the bridge navigational watch alarm system during the period between his joining SABINA and the incident. The second officer believed that the BNWAS installed on SABINA had three infrared motion sensors.

For further details relating to the requirements for the operation of a BNWAS, please see section 1.14. For further details relating to the use of the BNWAS on board SABINA after the casualty on 15 October 2015, please see section 1.18.



Figure 16: BNWAS control panel, installed at waist level on the port side directly adjacent to the bridge control console (see Figure 17). The status and operating display is located in the centre, with three groups of four status lights positioned above it. As the device shown is switched off, the green 'Off' status light is illuminated. Below that, there are eight keys to the left and right of the display. The reset key is bottom right, while the red emergency call key is top left. The white 'key' in the centre above the text 'World's No. 1 BNWAS' is the lens of the built-in infrared motion sensor.

Figure 17:
Bridge control panel on board
SABINA.

- 0 – Seat in front of radar, port side
- 1 – Seat in front of radar, starboard
- 2 – VHF radio
- 3 – VHF radio
- 4 – BNWAS reset push button
- 5 – GP-150 GPS device, starboard
- 6 – Radar monitor, starboard
- 7 – GP-150 GPS device, port side
- 8 – Radar monitor, port side
- 9 – BNWAS control panel (concealed)



1.12.7 Voyage data recorder

The International Convention for the Safety of Life at Sea (SOLAS, or SOLAS Convention) contains stipulations specifying that SABINA is only permitted to embark on international voyages with a voyage data recorder (VDR) installed. The functioning of the voyage data recorder and peripheral equipment must be inspected annually by the shipping company.

As part of phase-in provisions to meet the SOLAS Convention, SABINA was only required to be installed with a simplified voyage data recorder (S-VDR), that is, a VDR with a limited range of features. An S-VDR must record and store at least the following parameters relating to the last 12 hours: date and time, the ship's position, speed over ground, course over ground, radar data every 15 seconds and AIS data (if radar data is not available). The voices and sounds on the bridge also had to be recorded via microphones, and radio communications had to be recorded on a separate audio track.

Since 3 February 2015, SABINA was equipped with a G4-type VDR manufactured by Interschalt Maritime Systems AG. Between the period when the device was installed and first tested (3 February 2015) and the time of the accident, this VDR had not yet been subjected to an annual inspection by the shipping company. An inspection would have been due in February 2016 at the latest. The parameters that the built-in VDR and connected peripherals were able to record as per their design met and exceeded the minimum requirements for an S-VDR. However, due to a technical defect on a circuit board of the VDR, some of the data were stored incorrectly or not at all, affecting parts of the AIS data relating to SABINA, the accurate GPS signal provided, the ship's course and turning rate, the water depth and time-related data. In particular, the respective active operating mode of the BNWAS (see section 1.12.6) was not recorded. A VDR-internal backup GPS receiver enabled the recording of approximated positional and speed data. This meant that the requirements for an S-VDR, in terms of the parameters that need to be recorded, could be met despite the defect on the circuit board.

The defect had existed since 10 May 2015 and was not rectified until 11 April 2016. The system displayed a visual error message regarding the defect. The equipment also indicated the malfunction acoustically when it performed its weekly automatic system self-test. After each test, the crew acknowledged and muted this acoustic warning. The visual error message was permanently displayed. Based purely on the error message displayed, it was not possible to assess whether or not the voyage data recorder met the requirements for an S-VDR.

The multi-page 'Departure checklist bridge' for SABINA provided by Enzian (form S-010) included the following item to be checked:

"All navigation equipment in good order including VDR"

The deck logbook's page relating to the day of the ship's departure from Aalborg contained the following entry signed by the master:

"Departure c/l completed".⁵²

The defect on the VDR also went undetected during the flag state inspection carried out by the Swiss Maritime Navigation Office on 5 and 6 October 2015. The device had been classified as 'operational' during the flag state inspection (see section 1.13.3.2.5.2). The error message, however, was noticed and interpreted to mean that only one of the two radars was connected to the VDR. Thus, the flag state inspection report stated that only one of the two radars were connected. It is

⁵² c/l: checklist

neither common nor required by law for this category of vessel to record data from both radars.

1.12.8 Alcohol breathalyser testers

There were two alcohol breathalysers on board SABINA: an Alcoscan ACL-1 and an Alcoscent DA-7000. The STSB did a test using the Alcoscent DA-7000 breathalyser on 18 October 2015, which produced the display 'bad'. According to the manual, this means that the measurement is unreliable and the sensor should be replaced.

1.13 Organisations, their management and procedures

1.13.1 Enzian Ship Management AG (shipping company)

1.13.1.1 Business model and financial situation

The Swiss shipping company Enzian Ship Management AG (referred to as just Enzian in this report) operated the general cargo ship SABINA until 2017. SABINA was owned by MV Sabina AG. The company's operations included freight contracting and chartering, as well as the maintenance and inspection⁵³ of its fleet.

The company went into liquidation in summer 2017. Enzian's last ship under the Swiss flag, SCL AKWABA, was removed from the Swiss register on 22 September 2017 and was therefore no longer under the supervision of the SMNO from that point onwards.

1.13.1.2 Management system

The SOLAS Convention and the International Management Code for the Safe Operation of Ships and for Pollution Prevention (International Safety Management Code, or just ISM Code) required Enzian to develop, implement and maintain a safety management system. As per the ISM Code, a shipping company's safety management system is described and defined in its safety management manual. With the aim of meeting the requirements of the SOLAS Convention and the ISM Code, Enzian kept a manual called 'shipboard management system'. Enzian's shipboard management system therefore acted as the company's safety management manual as per the ISM Code.

The shipboard management system comprised over 200 pages. The shipping company also provided about 140 forms for various recurring ship-related jobs. The shipboard management system referred to some of these forms, but the shipping company did not take the view that this made the forms part of the shipboard management system.⁵⁴ Some of these forms were made up of a checklist or were labelled as such – for example, the 'Departure checklist bridge' (see section 1.14.3). In contrast, the watch handover checklist used on board SABINA was not part of the checklists and forms provided by the shipping company (see section 1.14.4).

According to the ISM Code (paragraph 1.2.3.1), a shipping company's safety management system must ensure compliance with mandatory rules and regulations. It

⁵³ A shipping company's work referred to as 'inspection' includes, in particular, the provision of technical and operational support.

⁵⁴ Enzian's shipboard management system included the following sentence in its preliminaries: "*The hyperlinked documents [...] given in this manual [...] are inserted for reference and guidance purposes and do not constitute requirements under the SMS and ISM Code.*" It was not clear whether 'SMS' referred to Enzian's shipboard management system (manual) or the safety management system (including the manual with all the procedures defined therein as well as all the work carried out or documented in accordance with this manual, e.g. completed forms).

must also ensure that applicable codes, guidelines and standards recommended by the IMO, flag state authorities, classification societies and maritime industry organisations are taken into account (paragraph 1.2.3.2). To this end, the safety management system should include, in particular, “*instructions and procedures to ensure safe operations of ships [...] in compliance with relevant international and flag state legislation*” (paragraph 1.4.2, and also, according to section 7: “*The Company should establish procedures, plans and instructions, including checklists as appropriate, for key shipboard operations concerning the safety of the personnel, ship and protection of the environment.*”). Compliance with these requirements, in addition to compliance with other requirements from the ISM Code, is a prerequisite for obtaining a document of compliance. Enzian’s document of compliance relevant to the time of the casualty was issued by Lloyd’s Register on 8 May 2012. The document declared that it had been issued “*under the authority of the Government of Switzerland*” based on a “*verification*” carried out on 4 April 2012. The document of compliance also declared that Enzian’s safety management system had been audited and that it met the requirements stipulated by the ISM Code.

In the shipboard management system’s ‘Health, safety, quality and environmental protection policy’, the shipping company pledged to comply with the applicable national and international safety regulations. According to the master’s job description, “*he will apply relevant local, national and international rules and regulations*”. He also “*ensures that the ship complies with flag state law, regulations, notices and requirements*”.

The safety management certificate for SABINA that is relevant to the date of the casualty was issued on 13 May 2013 by Lloyd’s Register. The certificate declared that it had been issued “*under the authority of the Government of Switzerland*” based on a “*verification*” carried out on 16 January 2013. The certificate also declared that SABINA’s safety management system had been audited and met the requirements stipulated by the ISM Code. The lead auditor from Lloyd’s Register, who, together with an associate, performed the ‘verification’ on 16 January 2013, noted in his audit report that the safety management system on board SABINA was well implemented in the vessel’s daily operations. There were no further ‘verifications’, ‘intermediate verifications’ or ‘additional verifications’ of SABINA until her casualty on 15 October 2015.

1.13.1.3 Familiarisation of the ship’s crew with safety culture and operating procedures

According to Enzian, new crew members were familiarised with the company’s operating procedures when they joined the ship. Enzian stated that each new crew member was introduced to the job by a standing crew member within the first 24 hours on board and that this induction usually took half a working day.

To familiarise new crew members of any rank with the general principles of shipboard work safety and hygiene as well as with the emergency systems (lifeboats, fire-fighting equipment, etc.) on board SABINA, Enzian provided the checklist S-015 ‘Familiarisation of joining crew’. In its shipboard management system, Enzian stipulated that joining second officers must also be familiarised as follows with:

- The navigation equipment;
- The nautical publications and charts;
- The upcoming sea passage;
- The sickbay and medicine cupboard.

Enzian stated that the shipboard management system, including the company’s operating procedures, had also been made available to all crew members in digital form, not just from the time when they joined the ship but from when they signed

their contract several weeks before joining. On the one hand, the shipping company expected its crew members to read over 200 pages on the shipboard's management system; on the other hand, the company doubted that the crew actually read all these pages.

A thorough induction course to the company's safety and corporate culture, or assessments to test the crew's knowledge regarding the company's operating procedures or shipboard management system, did not take place prior to a member of crew joining the ship. This was also not required by the SMNO.

According to the shipping company, shipboard audits had assessed the crew's knowledge of the operating procedures.

1.13.1.4 Regarding the issue of fatigue

The section 'Rest hours' in the shipboard management system only describes how to record working hours and rest periods. The aim of preventing fatigue among crew members by keeping to or exceeding the required minimum rest periods for safety purposes was not mentioned in the shipboard management system. There were also no mentions of any specific strategies to prevent fatigue on board. To clarify the issue of fatigue, the shipboard management system points to document S-105 'What is fatigue?'. That document provides five pages on the subject of fatigue and also contains some fatigue prevention strategies. Recommended strategies included, for example, asking family members to be quiet if you wanted to sleep, and tips were given on how to minimise the effects of fatigue while driving a car. Issues such as irregular working hours, overtime, tight staffing levels and challenges with night watch or similar issues were not addressed in document S-105.

1.13.1.5 Software for recording work and rest hours

On board SABINA, working hours and rest periods were recorded using the ISF Watchkeeper 3 software. If the work and rest hours recorded in the software do not comply with STCW requirements (see section 1.15.2), the software will point this out.

1.13.1.6 Internal audit of SABINA following the casualty

Between 22 and 25 October 2015, a representative of the Enzian shipping company conducted an audit on board SABINA. In the audit log (internal form O-042) and in three 'Non-conformity and system improvement notes' (internal form O-043), the auditor recorded various issues and requested that the master rectify them:

- The working hours recorded using the Watchkeeper software (see section 1.13.1.5) did not correspond to the hours actually worked.
- On many occasions, the officer of the watch (OOW) was conducting the navigational watch by himself, even at night-time. In fact, the audit log said that at night the OOW was more often on bridge duty by himself than with the support of a lookout. It went on to say that this contradicted the regulations and the shipping company's guidelines (see section 1.15).
- The notes said that it was clear that the second officer did not have enough sleep when he took over the watch at 21:00 UTC on 15 October 2015, and that it was the master's responsibility to ensure that officers of the watch get enough sleep.

1.13.1.7 Other management and monitoring measures

The Enzian shipping company did not monitor its fleet in real time from a shore-based location (see section 1.21). It also did not make proactive or preventative use of its vessels' VDR data to continuously improve safety, e.g. as part of a voyage operations quality assurance programme (see section 1.20).

1.13.2 Lloyd's Register (classification society)

Lloyd's Register Group Limited (referred to as Lloyd's Register or LR in this report), together with various subsidiaries, forms a global ship classification society. In addition to its traditional business activity, i.e. the technical classification of ships, Lloyd's Register also offers other services. Those services include audits and the issuance of statutory certificates for shipping companies (e.g. documents of compliance according to the ISM Code) and for ships (e.g. safety management certificates according to the ISM Code). Some of these certificates are issued under the authority of the Government of the Swiss Confederation (see section 1.13.3.2.6).

At the time of the accident, Lloyd's Register was relevant for SABINA and the Enzian shipping company, in particular, as the issuer of the following documents and certificates:

- SABINA's certificate of class (see section 1.12.1);
- The record of equipment for cargo ship safety (form E) (see section 1.12.6.1);
- The shipping company's document of compliance (see section 1.13.1.2);
- SABINA's safety management certificate (see section 1.13.1.2).

Lloyd's Register only reviewed Enzian's entire shipboard management system, or rather the safety management manual (see section 1.13.1.2), on first issuing the document of compliance – which was in 2002. A Lloyd's Register employee invested roughly one working day on this 'document review' and was meant to make sure that the shipboard management system conformed with ISM requirements using an 18-point checklist. The verification as to whether the company had laid down written procedures for the central and safety-relevant tasks ('key shipboard operations concerning the safety of the personnel, ship and protection of the environment' according to the ISM Code), plans and instructions, as well as the verification as to whether the various tasks had been defined and assigned to qualified personnel, was dealt with in one single check point (of the mentioned 18 check points). This check point read in full as follows: 'Shipboard Operations (ISM 7.0)'. The verification as to whether the company had established procedures to ensure that new safety-relevant personnel would receive proper familiarisation with their duties, wherein instructions would be identified, documented and given, was also dealt with in one single check point. This check point read in full as follows: 'Training (ISM 6.0) – Familiarisation'.

It was Lloyd's Register's position that the ISM Code does not include a specific requirement demanding the presence of statements or guidance concerning fatigue management in the safety management manual. For this reason, a document of compliance could be issued if the safety management manual did not include procedures or instructions concerning the problem of fatigue and related issues such as irregular working hours, overtime hours, tight staffing levels or watchkeeping duties at night.

Lloyd's Register did not carry out a review of the entire shipboard management system, i.e. a document review, as part of their annual verifications from 2003 onwards or when they reissued the document of compliance for the Enzian shipping company in 2007 and 2012. During their annual verifications and when reissuing

the document of compliance every five years, the contents of the shipboard management system were only inspected at random.

Lloyd's Register also made a point of stating that passing a document review of a safety management manual did not mean that the manual was then approved. Furthermore, Lloyd's Register drew attention to the fact that they did not provide shipping companies with checklist templates or templates of entire safety management manuals, as this would contradict the ISM Code and also the idea behind IMO Resolution A.1118(30).

1.13.3 Swiss governmental authorities

1.13.3.1 Historical background

With 50 ocean-going cargo ships, Switzerland possessed the world's largest merchant fleet of any landlocked country in 2017.⁵⁵ As part of the mandate set out in article 102 of the Federal Constitution (SR 101) to ensure that the country is supplied with essential goods, the Swiss Confederation supported Swiss shipowners in financing seagoing cargo vessels with guarantees in favour of the lenders (so-called federal guarantees). This created an incentive for ships to be brought under the Swiss flag and for them to be used more easily and effectively for the country's supply needs in the event of a crisis or war. In Switzerland, the Federal Office for National Economic Supply (FONES) of the Federal Department of Economic Affairs, Education and Research (EAER) decided on the granting of guarantees. A default on a guarantee for a single ship may result in a financial loss for the Confederation amounting to several million Swiss francs.

Such a federal guarantee had been granted for SABINA. This amounted to 21.7 million Swiss francs.⁵⁶

Since mid-2017, as a result of a decision by the Federal Council at the end of 2016, no new federal guarantees have been granted for ocean-going cargo ships. The last of the currently existing federal guarantees expires in 2032. However, the relevant foundations in the constitution, law and regulation still exist, allowing the federal government to approve new loans for federal guarantees at any time without changing the legal basis; thus, further federal guarantees could be granted. It should also be noted that ocean-going cargo ships can be operated under the Swiss flag even without federal guarantees.

While the Federal Office for National Economic Supply (FONES) decides on the granting of guarantees, the Swiss Maritime Navigation Office (SMNO) was responsible for the safety and technical supervision of ocean-going vessels.

1.13.3.2 Swiss Maritime Navigation Office (supervisory authority)

1.13.3.2.1 Rights and responsibilities of the SMNO according to the law

Article 8, titled 'Supervision', of the Swiss Federal Law on Navigation under the Swiss Flag (Navigation Act, SR 747.30 (*Bundesgesetz über die Seeschifffahrt unter der Schweizer Flagge*)) states that maritime navigation under the Swiss flag is subject to the superintendence of the Federal Council. Direct supervision is the responsibility of the Federal Department of Foreign Affairs (FDFA). The FDFA has delegated this direct supervision to the Swiss Maritime Navigation Office (SMNO).

⁵⁵ Report of the Swiss Federal Audit Office: *Audit de l'octroi et de l'accompagnement de l'enregistrement de la flotte commerciale battant pavillon suisse*. 2017.

⁵⁶ In 2017, Enzian Ship Management AG (operator / shipping company) and MV Sabina AG (owner) respectively fell into financial difficulties. Following the sale of SABINA to an owner abroad, the Swiss Confederation incurred a bottom-line financial loss of roughly 6.5 million Swiss francs as a result of the federal guarantee for the vessel.

Within the FDFA, the SMNO reports to the Directorate of International Law (DIL); in terms of administrative law, the SMNO is a department within DIL.

According to the wording of the law, the SMNO has a duty to monitor the application of the provisions on maritime navigation under the Swiss flag.⁵⁷ Consequently, the SMNO is the supervisory authority for maritime navigation under the Swiss flag. In this role, the SMNO is also referred to as the ‘flag state authority’.

For the enforcement of the legislation, article 9 of the Navigation Act authorises the SMNO to carry out inspections on board Swiss seagoing vessels. The SMNO’s flag state inspections (see section 1.13.3.2.5) are based on this authorisation.

Article 30 of the Navigation Act stipulates that only the SMNO’s approval may permit an ocean-going vessel to navigate.

Article 31 further specifies that a ship entered in the register of Swiss seagoing vessels must at all times meet the requirements under which it has been permitted to navigate at sea.

With regards to the operational safety of seagoing vessels, article 47 specifies that article 31 will also apply if the owner of a Swiss ocean-going vessel fails to comply with the regulations issued by the Federal Council concerning a seagoing vessel’s equipment, manning and safety, and the protection of human life. These regulations include, in particular, the International Regulations for Preventing Collisions at Sea (COLREGs, see section 1.15.1) and the Standards of Training, Certification and Watchkeeping for Seafarers (STCW Convention, see section 1.15.2).

Pursuant to article 15 of the Navigation Act, the SMNO is the authority to report any contraventions as defined in the Navigation Act’s penal and disciplinary provisions to the authorities of the Canton of Basel Stadt, who will prosecute and judge any criminal offences (see section 1.13.3.2.8).

The SMNO’s rights and responsibilities as they understand them are described in sections 1.13.3.2.4 and 1.13.3.2.8.

1.13.3.2.2 The SMNO’s position and responsibilities according to the Federal Department of Foreign Affairs

On its English website, the Federal Department of Foreign Affairs (FDFA) writes the following:

“The FDFA’s Swiss Maritime Navigation Office is responsible for the Swiss merchant fleet.”

The FDFA also writes on its English website that the SMNO provides the following “services”, in particular:

- *“Monitors compliance by ships, shipowners and shipping companies with national and international construction, security, equipment and environmental protection standards [...].”*
- *“Reports any unlawful acts committed on Swiss vessels [...].”*

The SMNO’s rights and responsibilities as they understand them are described in sections 1.13.3.2.4 and 1.13.3.2.8.

⁵⁷ The text of the German-language version of the Navigation Act reads: *“hat die Bestimmungen [...] durchzuführen und ihre Anwendung zu überwachen.”*

The text of the French-language version of the Navigation Act reads: *“d’assurer et de contrôler [...] l’application des dispositions.”*

1.13.3.2.3 The SMNO's resources

In each year prior to 2019, the SMNO employed eight permanent members of staff and, at various points in time, one or two interns. The permanent staff's employment corresponded to an equivalent of around 6.3 full-time employees, which, according to statements made by the SMNO, meant that the SMNO was the smallest office within the entire Federal Administration.

Based on various sources from the SMNO, the STSB estimates that this employment equivalent of 6.3 full-time employees was roughly divided as follows within the SMNO's individual roles:

Line management responsibilities (head and deputy head):	0.65 FTE
Rhine navigation:	1.4 FTE
Maritime navigation – supervision and enforcement relating to nautical, technical and operational matters:	0.45 FTE
Maritime navigation – supervision and enforcement relating to personnel matters: ⁵⁸	1.2 FTE
Maritime navigation – representation in international organisations:	0.4 FTE
Sports navigation and recreational boating:	1.1 FTE
Political business:	0.2 FTE
Business support, secretarial work and IT:	0.9 FTE

None of the SMNO's eight permanent members of staff had undergone any in-depth nautical or technical training.

The nautical, technical and operational concerns relating to commercial maritime navigation were handled by one inspector. This inspector was the SMNO's sole flag state superintendent and as such was charged with carrying out the inspections on Swiss ocean-going cargo vessels. He also represented Switzerland in various international organisations and stayed in contact with the classification societies accepted by Switzerland. Furthermore, he was responsible for drafting the implementing regulations for Switzerland when new international regulations were adopted and for introducing them to the Swiss shipping companies, as well as for issuing exemption approvals for shipping companies and carrying out other administrative tasks. The inspector's responsibilities also included dealing with amendments to the laws and employment law-related matters of seafarers. Since his employment in 2006, he has been the sole and de facto unpaid provider of the SMNO's 24/7 on-call service, which was primarily offered to Swiss shipping companies for information and assistance from the flag state.

According to his statement, the inspector was in charge of supervising 26 Swiss ocean-going cargo vessels in 2006 when he started working for the SMNO. He remained as the sole superintendent until 2015 (and beyond). Throughout this entire period, his employment corresponded to 100% of a full-time job despite the fact that the Swiss seagoing fleet he was responsible for saw an almost linear increase to 49 ships between 2006 and 2016, meaning that the number of ships nearly doubled. In 2017, the number reached a peak of 50 ocean-going cargo vessels.

⁵⁸ This responsibility primarily comprised the inspection of the qualifications of seafarers who Swiss shipping companies intended to employ for services on their Swiss seagoing vessels, as well as the issuance of official endorsements.

For the SMNO, the situation was apparently unsatisfactory. According to the SMNO's statements, in the years leading up to SABINA's casualty on 15 October 2015, the SMNO management therefore repeatedly approached the director of the Directorate of International Law (DIL) within the FDFA to request additional personnel to support the increase in supervisory activities required and to allow for more flag state inspections. According to the SMNO's management at the time, on one occasion, the acting director promised the SMNO's management an increase in resources if the fleet reached or exceeded a size of 40 ocean-going cargo vessels. This mark was reached in 2011 and exceeded about a year later. The promised increase in resources, however, never materialised.

1.13.3.2.4 Rights and responsibilities of the SMNO according to its own interpretation

According to its statements to the STSB, the SMNO describes itself as a supervisory authority but also as a service provider agency. They stated that as a service provider agency, for example, they regularly issued exemption approvals for the shipping companies, and that they lacked the human resources to properly exercise their role as a supervisory authority. For technical and operational supervision, they had therefore heavily relied on the classification societies (see section 1.13.3.2.6).

One of the few jobs the SMNO carried out in its role as a supervisory authority was to perform flag state inspections on board the vessels (see section 1.13.3.2.5). According to statements made by the SMNO, their flag state inspections focused primarily on the vessels' compliance with international conventions. However, the SMNO officer responsible for conducting flag state inspections mentioned to the STSB that the SMNO did not consider itself to be "*the police*", but rather an authority "*that helps*" shipping companies pass the port state controls⁵⁹ without any deficiencies.⁶⁰

When asked about the inspection regarding the crew's actual use of the BNWAS aboard Swiss ocean-going vessels through sampling and analysing VDR data (concerning the technical feasibility, see section 1.20), for what the SMNO lacks the expertise required, the person responsible replied that checking the ship's recent compliance with international regulations based on records was not the supervisory authority's primary responsibility during a regular flag state inspection. The point of a flag state inspection, he said, was to check that everything is correct at the current time: "*If everything is in order today, then all is well.*"

The SMNO's view concerning their options for sanctions is set out in section 1.13.3.2.8.

1.13.3.2.5 Flag state inspections

1.13.3.2.5.1 Flag state inspections in general

As the supervisory authority, the SMNO set itself the target of subjecting each of the ocean-going cargo vessels under its supervision to an annual flag state inspection carried out by an SMNO superintendent. With a fleet of well over 40 vessels in 2015, this would have consequently meant more than 40 flag state inspections per year. According to statements made by the SMNO, they carried out an average of three flag state inspections per year. However, in the six years from 2010 to 2015, the SMNO conducted 15 flag state inspections in total, i.e. an average of only 2.5 flag state inspections per year. When applied to the size of the fleet, this

⁵⁹ A port state control is the inspection of a foreign vessel in port, carried out by the country's port authority.

⁶⁰ This view largely corresponds to the view of the FDFA's Directorate of International Law, according to which the aim of a flag state inspection is to ensure that the ship will easily pass a subsequent port state control.

means that, on average, each vessel was inspected by the SMNO less than once every 16 years. This fact can also be illustrated by the following: Between 2010 and 2020, a total of 43 ocean-going cargo ships left the Swiss flag. As many as 27 of these 43 vessels had never been subjected to a flag state inspection by the SMNO while having sailed under the Swiss flag, and 13 of the 27 ocean-going cargo ships had been sailing the world's oceans under the Swiss flag for 10 years or longer.

The SMNO's view regarding the execution of flag state inspections is set out above, in section 1.13.3.2.4.

1.13.3.2.5.2 Flag state inspection on board SABINA on 5 and 6 October 2015

On 5 and 6 October 2015, SABINA was – for the first time ever – subjected to a flag state inspection. This inspection took place in Aalborg (Denmark) and was carried out by the SMNO's inspector, the authority's employee responsible for technical supervision. The decision to conduct a flag state inspection on SABINA was made because "numerous" deficiencies had been identified during port state controls on this ship in the months and years prior.⁶¹

The flag state inspection report comprising 35 pages – of which 23 pages are annexes – includes the following points:

- "Voyage data recorder: Fitted – Yes. Operational – Yes. Comment – 1 radar not connected."
- "Bridge navigation watch alarm system (BNWAS): Fitted – Yes. Operational – Yes. Comment: Tested in presence of the inspector."
- "Does the master understand and perform his safety management system responsibilities? – Yes."
- "Minimum hrs of rest (10 hrs [of rest] in 24h divided into 2 periods – one at least 6 hours) – Random check (see copy) – Yes."
- "Standing orders issued/followed? – Yes."

Regarding the inspection of the VDR, the SMNO did not sample and analyse VDR data, i.e. data from the voyage data recorder. According to statements made by the SMNO, they lacked the necessary expertise to do so. Please refer also to section 1.12.7.

As for the inspection concerning the bridge navigational watch alarm system, the question of whether it was fitted and fully operational if switched on was the only item on the checklist with regard to the BNWAS. The inspection did not assess how the BNWAS was actually used – neither by consulting technological means (e.g. VDR data) nor by effectively using other means (e.g. methodical interviews of the crew). For the assessment of how the BNWAS was actually used, the inspector relied in particular on the statements made by a few crew members only.⁶²

Regarding the inspection of the master's safety management system responsibilities, the most significant of these responsibilities are set out in section 1.13.1.2. Apart from the statement that this item was normally checked via an informal chat with the master, which is not documented, the SMNO was unable to explain how it had resulted in a 'yes' assessment.

⁶¹ According to the SMNO, four port state controls carried out from 2013 to 2015 revealed a total of 15 deficiencies.

⁶² Based on the fact that during the flag state inspection of 5 and 6 October 2015, the "on-board test [of the BNWAS] was successful", even after the casualty off Bornholm concerning SABINA, the SMNO saw "no reason" for carrying out further checks on the use of the BNWAS.

As for the inspection concerning compliance with the minimum hours of rest, this assessment was achieved primarily by using the hours-of-work-and-rest records the crew had written themselves. According to the SMNO, these records were corroborated by spot-checking deck logbook entries and by talking to the master and, if necessary, to the officers. The SMNO was unable to explain how it had in its inspection report arrived at a 'yes' response, despite the fact that the stipulated minimum rest periods had not been observed by at least one crew member according to the records documenting hours of work and rest. A printout generated by the ISF Watchkeeper 3 software for recording work and rest hours (see section 1.13.1.5), referenced as 'copy', was attached to the inspection report. The printout related to the master's work and rest hours in August, who at that time held the rank and role of chief officer. The printout reveals that the requirement of 10 hours of rest in each 24-hour period was not met between 14:30 on 10 August 2015 and 21:30 on 11 August 2015 (it's not clear what time systems were used for this). The SMNO's inspection report did not document or highlight this discrepancy. Nevertheless, the SMNO confirmed following the accident that it had identified this discrepancy during their flag state inspection. According to the SMNO, a 'no' response for this checklist item would not have entailed any (different or negative) consequences as the SMNO *"couldn't just have handed out fines because of this"* (see sections 1.13.3.2.8 and 1.13.3.2.9). The SMNO was of the opinion that they could only advise the crew that such cases required an exemption approval from the SMNO (see below).

Regarding the inspection on standing orders, although the report of a flag state inspection always included the checklist item *"Standing orders issued/followed?"*, the standing orders were not reviewed at each flag state inspection. The SMNO could not explain how it had arrived at a 'yes' response in its inspection report. In the wake of the accident, the SMNO did not acknowledge as problematic that the master's standing orders had not been countersigned by the chief officer or the second officer. The SMNO did not wish to comment on the fact that the 'Master's standing orders' file still contained the original wording from the shipping company's sample text.

The radar equipment, echo sounder and GPS devices were also rated as *"fitted"* and *"operational"* in the inspection report.

Under 'Remarks and deficiencies', the following comment was made in the inspection report:

"Exemptions from rest period have to be requested from the SMNO".

The SMNO's responsible employee stated that he had added this comment because of non-compliance with the rest period requirements.

Apart from the two mentioned check items concerning the safety management system and the standing orders respectively, the inspection did not include any other assessments concerning knowledge of procedures or regulations.

According to the Directorate of International Law, the SMNO superintendent had concluded during his flag state inspection that the safety regulations had been fully complied with under the master who was in charge at the time of the inspection.

The superintendent's appraisal in the inspection report related to the end of the flag state inspection. This means that (technical) failings identified during the flag state inspection and subsequently rectified by the crew by the end of the inspection are neither documented in the report nor sanctioned.

The flag state inspection and, in particular, the report prepared during the inspection were not subjected to any quality control or review process within the SMNO

that could have identified content-related discrepancies or an inadequately conducted flag state inspection.

SABINA was not subjected to any further flag state inspections following her flag state inspection on 5 and 6 October 2015 until she was removed from the Swiss register on 1 June 2017. After four accidents had come to light that occurred between June of 2015 and June of 2016 involving Enzian vessels sailing under the Swiss flag, the SMNO was still convinced that especially the accident under investigation was only the result of failures of individual crew members.

1.13.3.2.6 The SMNO's delegating of responsibilities to classification societies

The SMNO has assigned a considerable part of its supervisory duties to non-governmental organisations – the classification societies recognised by the SMNO. The SMNO has been formally delegating full powers to the classification societies, enabling them to perform statutory tasks.⁶³ These tasks include, in particular, shipboard technical and nautical audits. These audits are needed so various certificates required on a national and international level can be issued – a task that is also carried out by the shipping companies. These services, i.e. audits and certificate issuance, are requested and paid for by the shipping companies. The classification societies are not remunerated by the SMNO for these services.

In the case of SABINA, the London-based classification society Lloyd's Register (LR) is of particular importance. In a written agreement between the SMNO and LR, effective from 30 September 2013, the SMNO, as the flag state authority, had delegated certain powers to LR, enabling the classification society to perform statutory functions and carry out certification services.⁶⁴ The issuance of certificates required by law according to the ISM Code (in particular the document of compliance and the safety management certificate, see section 1.13.1.2), was an explicit part of this agreement. As this agreement was not made until 30 September 2013, it could not have applied to the document of compliance issued on 8 May 2012 and the safety management certificate issued on 13 May 2013. For the period prior to 30 September 2013, there was no written agreement between the SMNO and LR. Nevertheless, the document of compliance issued for the shipping company Enzian and the safety management certificate issued for SABINA on 13 May 2013 contained the declaration that this certificate had been issued "*under the authority of the Government of the Swiss Confederation*".

The SMNO acted on the assumption that a classification society issuing a document of compliance under the authority of the Government of the Swiss Confederation would check the entire safety management manual of the shipping company concerned, including the checklists referenced therein, which – from the SMNO's point of view – were part of said manual. (Enzian referred to their safety management manual as the 'shipboard management system'.) The SMNO believed that in this context, a safety management manual would be audited for the following criteria as a minimum:

- Completeness in terms of the respective shipping company's procedures that are relevant to safety;
- No conflicting statements as to regulatory or legal requirements;

⁶³ See article 9, paragraph 4 of the Swiss Navigation Act.

⁶⁴ Excerpts from the agreement between the SMNO and LR dated 30 September 2013: "*The purpose of this Agreement is to delegate authority to perform statutory functions and certification services [...]*" And: "*LR is hereby authorised to perform statutory functions and certification services comprising the assessment of ships [...] in order to determine their compliance with the applicable requirements of the international conventions, codes and national requirements [...], and the issue of relevant certificates [...]*."

- Consideration of best practice;
- Use of plain and simple language;
- Consistency of content throughout the entire manual;
- The relevance of the content to the shipping company concerned and its operations.

The SMNO assumed that it would take one person approximately 3 to 50 days to thoroughly inspect a manual against the set criteria and that the safety management manual would be considered ‘approved’ once the audit was passed. The SMNO assumed that a thorough audit of this kind would be conducted each time a document of compliance was issued – that is, when it is issued for the very first time as well as every five years when reissued. The SMNO also assumed that a shipping company’s safety management manual and the checklists contained therein would to a large extent correlate to the classification society’s corresponding templates.

Under ‘Verification and monitoring’, IMO Resolution A.739(18) – adopted on 4 November 1993 and made mandatory by the SOLAS Convention – requires flag state supervisory authorities (the Administration) to establish a system to ensure the adequacy of the work delegated to classification societies. According to that resolution, this system must contain at least five elements, two of which are mentioned here:

- “*Procedures for communication with the organisation.*”
- “*Procedures for reporting from the organisation and processing of reports by the Administration.*”

The SMNO could produce neither a documented system as per IMO Resolution A.739(18) nor any documented procedures regarding communication with the classification societies and the processing of classification society reports.

In practice, the SMNO’s supervision of the classification societies recognised by the Office was limited to sporadic visits. Between 2010 and 2015, LR had apparently been visited exactly once: by one employee, in Hamburg, for half a day in October 2013 – although the SMNO could not produce a report or minutes of a meeting relating to this visit. The SMNO was unable to determine whether such a visit had ever taken place at LR prior to this occasion. An audit of the procedures for issuing a certificate, such as a document of compliance or safety management certificate, did not form part of such visits. Instead, the SMNO trusted the classification societies to do a thorough job. For this reason, the correct issuance of certificates in accordance with the rules was not verified.

1.13.3.2.7 Determination of minimum safe manning by the SMNO

According to article 12 of the Swiss Ordinance Implementing the Federal Law on Navigation under the Swiss Flag (Navigation Ordinance, SR 747.301 (*Seeschiffahrtsverordnung*)), the SMNO – pursuant to the resolutions of the IMO and after hearing from the groups concerned – decides the minimum number of crew required on board a vessel and issues a certificate for this, namely the ‘minimum safe manning document’. According to the same article, the crew on board a Swiss ocean-going vessel must be sufficient in number and competency to guarantee the safety of the vessel, the safety of navigation and the protection of human life at sea and to ensure that the vessel is operated properly, that the provisions on working hours are observed and that excessive demands on the vessel’s crew due to overtime work are avoided as much as possible.

The SMNO's freedom to determine the minimum number of crew required (as well as the freedom of shipping companies and masters to set watchkeeping duties) is in fact restricted by article 26 of the Swiss Navigation Ordinance, which states that *"the duty of the officers and ratings on deck and engine room service at sea [...]"* must be *"divided daily into three watches"*.⁶⁵ The article goes on to state that *"the master may undertake watch duty [...]"* in long-distance coastal navigation.⁶⁶ Conversely, the SMNO interpreted the latter rule to mean that on the high seas, the master must not be involved in watchkeeping, at least not on a planned basis.

The IMO sets out the principles of minimum safe manning in Resolution A.1047(27), recommending guidelines according to which flag states should determine the minimum staff required on board a ship flying their flag and issue the minimum safe manning document to this effect. The objectives of the guidelines are *"to ensure that a ship is sufficiently, effectively and efficiently manned to provide the safety and security of the ship, safe navigation and operations at sea, safe operations in port, prevention of human injury or loss of life, the avoidance of damage to the marine environment and to property, and to ensure the welfare and health of seafarers through the avoidance of fatigue."* Essentially, the principles of minimum safe manning listed in the IMO resolution make clear that only the work that is ultimately conducive to safety, crew health or environmental protection should be taken into account when determining the required minimum staffing levels on board a ship. Various technological and operational factors should also be taken into account when determining the minimum safe manning, including these two in particular:

- *"Frequency of port calls, length and nature of voyages to be undertaken."*
- *"Trading area(s), waters and operations in which the ship is involved."*

The SMNO outlined its process for determining the minimum crew level required and the issuance of the minimum safe manning document for a vessel in Circular No. CH 47.⁶⁷

Under the title *'Principles of safe manning'*, subtitled *'Sufficient number of qualified persons'*, the SMNO Circular No. CH 47 states, among other things, that *"there should always be sufficient qualified persons on board to deal with peak workload conditions"*. The specific examples given relating to workload peaks included the cleaning of tanks in tankers and the preparation of cargo holds in dry cargo vessels.

Under the title *'Basic manning requirements'*, the minimum number of deck officers has been specified based on the vessel's deadweight. At a deadweight of 9,230 tonnes (see section 1.12.1), SABINA fell under a category for which three deck officers were required as a minimum. However, SABINA was close to the category for which four deck officers were required as a minimum.

The reasons stated by the SMNO as to why they based the number of deck officers required on a ship's deadweight included *"lived and proven practice to which ships are operated worldwide"* and the *"expected workload as well as the respective responsibilities of the ship's management team, which consists of the officers."*

⁶⁵ Based on the widespread practice, which was also followed by the crew on board SABINA, it must be assumed that what is meant by the regulation is that staff qualified for watchkeeping duties must be divided into three teams. Each day is then divided into six watches of four hours each, and each of the three teams must perform two such watches per day.

⁶⁶ The Navigation Ordinance defines long-distance coastal navigation *"as navigation between all the ports of Europe and the ports of the Mediterranean and Black Seas, as well as voyages of a similar type on overseas waters."* Based on this definition, SABINA was therefore on a long-distance coastal voyage.

⁶⁷ This document was prepared on 1 November 2013 and showed 1 January 2014 as its effective date.

In regard to the robustness and resilience of the operation at sea, the SMNO explained that a member of the crew becoming unfit for duty was considered in the procedures for the determination of minimum safe manning. However, the SMNO's employee in charge stated that with three deck officers, as was the case on SABINA, there really was indeed "*not much room*", and with just two deck officers, it would be "*challenging*" to maintain a continuous watch. According to the SMNO, ships are usually manned with more personnel than required by the minimum safe manning document, and therefore, a crew member becoming unfit for duty could usually be compensated for while staying within manning requirements.

On 15 December 2013, Enzian filed an application with the SMNO for the minimum safe manning document for SABINA, which was the valid certificate at the time of the accident. In its application, Enzian explained that the 'three-watch system'⁶⁸ was used on board SABINA while at sea, and the 'two-watch system'⁶⁹ was used in port. Enzian answered the question contained in the SMNO's application form as to whether crew members would be required for cargo operations as follows:

"Preparation of vessel's hatch covers/between deck panels prior to loading/dis-charging. Sweeping/washing/preparation of cargo holds between voyages/between cargoes (done by duty officer and crew)."

The SMNO application form filled in by Enzian contained a note stating that it was the shipping company's duty to notify the SMNO of any discrepancies in relation to the information set out in the application, in particular regarding the watch system used.

There was no reference to article 26 of the Swiss Navigation Ordinance or its contents in the SMNO's application form.

Enzian's completed application did not include any information regarding port call frequency, planned voyage particulars or the waters concerned – equally, the SMNO's form did not include any such questions. The application did not explicitly mention any details as to the type of operation the vessel would be involved in. As for the areas of shipping activity, the application only stated that SABINA was intended for "*unlimited voyages (worldwide)*".

The minimum safe manning document requested by Enzian for SABINA was issued by the SMNO on 19 December 2013. The vessel's minimum crew specified therein corresponded exactly to the manning level the shipping company had requested, including three deck officers⁷⁰ and three ABs. SABINA's manning during its voyage of 15 October 2015 met the minimum requirements as they had been requested by Enzian and accepted by the SMNO.

SABINA's minimum safe manning document issued on 19 December 2013 permitted SABINA's trading area to be worldwide. It also stated that SABINA would be considered "*safely manned*" worldwide if manned by at least the crew complement as defined in that document.

⁶⁸ The three-watch system refers to a schedule where three deck officers take turns in acting as the OOW – usually the master, chief officer and second officer – each being on navigational watch for six hours at a time.

⁶⁹ The two-watch system refers to a schedule where two deck officers alternate as the OOW – usually the chief officer and the second officer – each being on navigational watch for six hours at a time. This watch system is known to be prone to fatigue, rest violations and failure to maintain a proper watch. See IMO file 'Role of the human element – Seafarer fatigue, minimum manning and the mitigation of fatigue' dated 28 November 2014, as well as the 2014 annual report of the German BG Verkehr trade association's Marine Safety Department ('*Dienststelle Schiffssicherheit*').

⁷⁰ A deck officer is an officer who holds a certificate of competency that allows them to act as the person in charge of the navigational watch (i.e. as the OOW) – i.e. proficiency level II/2 or II/1. The deck officers on board SABINA included the master, chief officer and second officer.

SABINA's minimum safe manning document, as well as another minimum safe manning document⁷¹ issued by the SMNO and inspected by the STSB, had the following comment from the SMNO under the heading 'Exceptional circumstances':

"If the manning standards as contained in this document cannot be met in the case of unforeseen and unavoidable circumstances, the master is authorised to undertake the voyage to the port of destination with the remaining crew members, provided an adequate safe manning of the bridge, lookout and engine room attendance can be ensured. [...] In such cases, an entry has to be made into the logbook, stating the reasons for not being fully manned. An extract of the logbook has to be sent either before departure or immediately after arrival to the Swiss Maritime Navigation Office in Basel, with a formal statement from the master that he considers or considered his vessel seaworthy for the voyage in question with the remaining manning level. The crew has to be completed at the first opportunity."

This comment means not only that a vessel may continue its voyage to the destination port under certain circumstances if the minimum safe manning requirements are not met, but also that a vessel may start a voyage under certain circumstances if the minimum safe manning requirements are not met.

In the case under investigation, the deck logbook entry required by the minimum safe manning document for the continuation of the sea passage to Kotka and Tallinn was missing. Furthermore, Enzian as the operator did not comply with the obligation as per the SMNO's application form to inform the SMNO concerning any deviations from the submitted information, especially concerning the applied watch system. The master did not notify the SMNO of the incident until three days after the casualty, only after the SMNO requested him to do so. An extract from the deck logbook with a formal statement by the master confirming that he considers or considered his vessel seaworthy for the voyage in question with the remaining manning level was never submitted to the SMNO. In the opinion of the SMNO, it would not have been a problem to replace crew members or complete the ship's complement before continuing on from Bornholm towards Kotka.

1.13.3.2.8 The SMNO's role as regards to sanctions

Pursuant to article 15 of the Navigation Act, titled 'Criminal jurisdiction', the SMNO is the *"authority reporting [any] contraventions"* as defined in the Navigation Act's penal and disciplinary provisions to the authorities of the Canton of Basel Stadt, who shall prosecute and judge any criminal offences.⁷² The aforementioned penal and disciplinary provisions include, in particular, *"criminal offences against the safety of the ship and of navigation"*, *"criminal offences against order and discipline on board"* and *"criminal offences against the rules of order in Swiss navigation"*:

- Endangering the ship (article 128): Interfering with the management of the vessel or with the order and operations on board.
- Endangering the navigation (article 129): Disregarding the provisions of law or the recognised rules of navigation or the regulations of the maritime police thereby endangering a vessel or persons on board.
- Violation of the navigation rules (article 130): Violating the provisions of law or the recognised rules of navigation or the regulations of the maritime police.

⁷¹ The minimum safe manning document inspected was that of SCL BASILEA, issued by the SMNO on 15 July 2015.

⁷² The text of the German-language version of the Navigation Act reads: *"Verzeigende Behörde bei Übertretungen dieses Gesetzes ist das Schweizerische Seeschiffahrtsamt."*

The text of the French-language version of the Navigation Act reads: *"Les contraventions prévues par la présente loi sont constatées par l'Office suisse de la navigation maritime."*

- Leaving the post (article 138): Leaving one's post during a period of duty that is essential to the safety of the ship or to navigation, or falling asleep while on such duty.
- Failure to comply with the obligation to notify (article 149): Violating the statutory duty to report and provide information to the SMNO.

The sanctions include penal servitude, imprisonment, a fine or disciplinary action, depending on the offence committed. In the event of endangering the ship or the navigation, or when leaving the post, for example, certificates of competency may be withdrawn and the service on board Swiss seagoing vessels prohibited (article 152).

Regarding the criminal law provisions set out in the Navigation Act, the concerned employee of the SMNO stated to the STSB that the SMNO would lose its credibility among the shipping companies if the SMNO were to put such emphasis on the rules – rules which the SMNO was decreed to enforce as the regulatory authority – by reporting contraventions. Consequently, in the years from 2010 to 2017, the SMNO did not report any contraventions to the authorities of the Canton of Basel Stadt.

The Directorate of International Law took the view that the Swiss maritime legislation was “*not appropriate in all areas*” and that its implementation and enforcement was “*not effective in many cases*”. It went on to state that at the moment (November 2022), maritime legislation is currently being “*modernised*” – “*including the rules concerning sanctions*”.

1.13.3.2.9 Impact of federal guarantees on supervision

1.13.3.2.9.1 Situation presented to the STSB by SMNO employees

The following is based on statements made to the STSB during interviews by various people who had been working for the SMNO during the time of the accident under investigation. For reasons of comprehensibility and data protection, the statements are not presented here individually as quotations, but rather the content of the statements made is presented as close as possible to the original wording and in a summarised form.

In view of a vessel's initial approval, the SMNO felt bound, according to its statements, to the guarantees the Federal Office for National Economic Supply (FONES) had previously decided on granting.

In an interview, the SMNO management presented the situation to the STSB as follows. The SMNO had felt constrained by the federal guarantees which restricted its actions. The SMNO was told by senior members of the Federal Administration and by people within FONES that, if at all possible, no measures should be taken against the shipping companies that would have financial consequences for them. Namely, financial consequences would provoke the withdrawal of a guarantee, which should be avoided. There had been situations in which the SMNO had wanted to revoke the certificate of registry of certain ships, which would have meant that the ships in question would no longer have been permitted to sail. However, FONES had prevented this from happening by intervening with the FDFA's Directorate of International Law. Thereafter, the SMNO was de facto prohibited from imposing effective measures on the shipping companies.

The following sums up the statements made by various individuals within the SMNO during their interviews with the STSB. The hands of the SMNO as a supervisory authority had been tied with regard to the enforcement of legal requirements and sanctions. This was because the ocean-going cargo vessels under the SMNO's supervision all had a federal guarantee. This was also the reason why the

SMNO could not use the last resort, i.e. the ‘withdrawal of the flag’,⁷³ as that would have caused the federal guarantee of the ship in question to fall due. A flag withdrawal would also have required FONES’s approval. However, FONES certainly would not have approved a flag withdrawal for fear of the financial and political consequences of a bailout.

One of the lawyers from the SMNO presented the situation to the STSB as follows: With regard to its supervisory activities, the SMNO took the stance that, as a federal office, nothing could be done if legal provisions were violated, as any actions would be detrimental to the government’s financial interests. With regards to the conflicting objectives – enforcement of the legal provisions versus the financial interests of the government – the SMNO always decided in favour of the government’s financial interests.

1.13.3.2.9.2 Findings of the Control Committees of the Federal Assembly

In 2017 and 2018, the Federal Assembly’s Control Committees carried out an audit which examined, among other things, questions regarding the supervision of the Federal Department of Economic Affairs, Education and Research (EAER) over the Federal Office for National Economic Supply (FONES) and regarding the supervision of the Federal Department of Foreign Affairs (FDFA) over the Swiss Maritime Navigation Office (SMNO). In the Control Committees’ resulting report of 26 June 2018 concerning the federal guarantees for ocean-going cargo ships, the effects of the granting of guarantees on supervision are described as follows: The FDFA’s deputy secretary general during her hearing pointed to the fact that “*the SMNO, when it establishes [certain] findings, could revoke the certificate of registry [of a ship]*”; however, as a consequence, this particular ship would then be “*detained*”, which in turn “*would run counter to federal interests.*” The then head of the SMNO “*shared roughly this assessment and added that the Federal Council had, by issuing the ordinance on federal guarantees for ocean-going cargo ships, ‘put itself into captivity of the operators’, because this ordinance basically put the SMNO’s legal powers to enforcement out of action. He added that he had informed the DIL as well as the FONES about this problem.*” The Control Committees (CC) assessed this situation as follows: “*From the CC’s point of view, what is remarkable are the statements made by the FDFA [and SMNO] representatives at their hearings, according to which the legally provided power of revoking a certificate of registry for a ship financed with federal guarantees cannot in fact be applied because this would run counter to federal interests.*”

1.13.3.2.10 The SMNO’s experience with shipping companies in financial difficulties

The SMNO mentioned to the STSB that in their experience, a deterioration in a shipping company’s financial situation usually entailed a deterioration in the vessels’ safety.

According to the SMNO, this was also apparent with Enzian and its vessels.

The SMNO had known since April 2016 at the latest that Enzian was suffering from serious financial difficulties.

1.13.3.2.11 How the SMNO dealt with the marine casualty concerning SABINA

⁷³ The term ‘withdrawal of the flag’ is not defined at the SMNO. The staff of the SMNO understood this colloquialism to mean the withdrawal of the vessel’s maritime navigation approval, the withdrawal of a ship’s certificate of registry or the striking of the vessel off the register. Any of these outcomes would ultimately lead to the ship in question no longer being permitted to sail.

On the morning of 16 October 2015, the shipping company sent a short email to the SMNO notifying the SMNO of an incident involving SABINA off the coast of Bornholm. According to this email from the shipping company, the incident was a “*navigational incident*” in which the shipboard procedures had not been followed as required. The email failed to provide details. However, it reported that the vessel had not been damaged, no one on board had been hurt and the environment had not been harmed.

On the evening of 18 October 2015, the master submitted a three-page report about the accident off the coast of Bornholm to the SMNO. The file submitted was the completed form of the shipping company’s S-001 form, ‘Accident and hazardous (near-miss) situation reporting’. Irrespective of how the incident unfolded from his perspective, the master stated in the S-001 form, among other things, the following:

- A “*safety negligence*” on the part of the second officer had contributed to the occurrence of the incident.
- The master’s “*omission*” to regularly check the BNWAS had also contributed to the occurrence of the incident.
- As a consequence of the incident, the second officer had been “*discharged of watch till arrival*”, and the master and chief officer would now provide navigational watch.

The SMNO believed that the accident concerning SABINA had occurred “*purely [due to] a one-off human error*” made by the second officer and that the accident could not have been prevented in any way.

After SABINA’s casualty off the coast of Bornholm and after receiving the master’s comment in his report that the switched-off BNWAS had probably contributed to the accident, the SMNO did not conduct any investigations concerning the use of the BNWAS.

With regard to the casualty concerning SABINA off the coast of Bornholm or any of the events that followed, the SMNO did not initiate any sanctions (see section 1.13.3.2.8).

1.14 Requirements for a bridge navigational watch alarm system

1.14.1 International regulations and interpretations thereof

The question of whether SABINA was legally required to be fitted with a bridge navigational watch alarm system (BNWAS) at the time of her accident off the coast of Bornholm cannot be answered conclusively as part of a safety investigation. This is due to ambiguous and conflicting language in the SOLAS Convention regarding the implementation dates for ships built before 1 July 2002. Over the years, the SOLAS Convention has been amended, and an attempt was made later to correct these amendments.⁷⁴

According to its ‘Record of equipment for cargo ship safety (form E)’, issued by Lloyd’s Register on 3 August 2015, SABINA was required to be equipped with a BNWAS.

The shipping company had initially assumed that SABINA was required to be fitted with a BNWAS at the time of the accident off the coast of Bornholm. This assump-

⁷⁴ The IMO Resolutions MSC.282(86), adopted on 5 June 2009, and MSC.350(92), adopted on 21 June 2012, amending the SOLAS Convention are relevant in this context.

tion would also explain the retrofitting of the system (see section 1.12.6) and corresponding instructions to the company's crews (see sections 1.14.2 and 1.14.5). However, the shipping company changed its mind over the course of the investigation.

The SMNO held the view that – as a cargo vessel built prior to 1 July 2011, with a gross tonnage of over 3,000 tonnes and its “*first survey*” completed after 1 July 2012 – on 15 October 2015, SABINA was required to be equipped with a BNWAS.

The SOLAS Convention states that “*The bridge navigational watch alarm system shall be in operation whenever the ship is underway at sea*”.⁷⁵ The SMNO understood this rule to mean that if a BNWAS had actually been installed and could be used, the system had to be turned on whenever the vessel was at sea, regardless of whether the equipment was a mandatory requirement or not.

IMO Resolution MSC.128(75), ‘Performance standards for a bridge navigational watch alarm system (BNWAS)’, also states that the BNWAS “*should be operational whenever the ship’s heading or track control system is engaged*”, i.e. when the autopilot is active.

This IMO resolution also says that the operating mode should be security-protected so that access to these controls is restricted to the master only.

1.14.2 The shipping company’s information leaflet for new masters

As a standard practice, Enzian provided its crew members newly appointed as masters with a five-page information leaflet. This document, the ‘Briefing of master’, was emailed to SABINA’s master on the day of his appointment, 9 September 2015. The leaflet contained various information concerning commercial, organisational, legal and safety-related matters. Item 34 of 37 read as follows:

“Please do not forget that it is a SOLAS requirement that the bridge navigational watch alarm system MUST be in operation WHENEVER THE SHIP IS UNDERWAY AT SEA.” [Mark-up identical to original]

On the same day, the master sent an email acknowledging safe receipt of the file and having understood its content.

1.14.3 Departure checklist

The multi-page ‘Departure checklist bridge’ for SABINA provided by Enzian (form S-010) included the following two items:

“Bridge navigational watch alarm system switched on”

“BEFORE DEPARTURE Make an entry in the deck logbook ‘Form S-010 completed’ with any other comments that may be necessary in case of technical or operational problems and/or limitations and/or reporting to Authorities, Administration, Company” [Mark-up identical to original]

The checklist was meant to be a laminated template available on the bridge, to be completed before departure with the checked items recorded in the deck logbook.

A checklist copy specifically made for daily use could not be located on SABINA’s bridge. However, the deck logbook’s page relating to the day of the ship’s departure from Aalborg contained the following entry signed by the master:

⁷⁵ This provision was added to the SOLAS Convention with IMO Resolutions MSC.282(86), adopted on 5 June 2009, and MSC.350(92), adopted on 21 June 2012.

“Departure c/I completed”.

1.14.4 Checklist for changing over the watch

The ‘B12 Changing over the watch’ checklist was a laminated template available on the bridge with a box for each item to be ticked using a felt-tip pen. The checklist had been copied from the Bridge Procedures Guide published by the International Chamber of Shipping trade association without any changes made to the content or layout. The master had ordered the use of this checklist in the watch order book (see section 1.15.6.1). Unlike the departure checklist, the checklist for the handover of the watch was not provided and specified by the shipping company. The checklist for the handover of the watch did not form part of the shipping company’s documentation and, most notably, was not mentioned in the company’s shipboard management system.

The checklist for changing over the watch included the following sentence in its preliminaries:

“When changing over the watch, relieving officers should personally satisfy themselves regarding the following:”

This was followed by 13 checklist items, including these two:

“Standing orders and other special instructions of the master relating to navigation of the ship”

“The operational condition of all navigational and safety equipment being used or likely to be used during the watch”

None of the checklist items specifically mentioned the BNWAS.

The laminated checklist for the handover of the watch could be located on SABINA’s bridge. It was marked and signed for the days following the accident. The deck logbook contained several ‘B-12’ entries on the page for 15 October 2015, which were signed by the master, chief officer and second officer, suggesting that the checklist for changing over the watch had been completed five times that day. In particular, these entries include a combined entry for 12:00 ship’s time (15 October 2015) and 00:00 ship’s time (16 October 2015), signed once by the second officer, and a combined entry for 08:00 ship’s time (15 October 2015) and 20:00 ship’s time (15 October 2015), signed once by the master. On the page relating to 16 October 2015, there was also a ‘B-12’ entry for 00:00 ship’s time (16 October 2015), but this entry had not been signed.

1.14.5 Reminder from the shipping company

On the morning of 15 October 2015, Enzian emailed a reminder with the subject ‘Navigation lookout’ to all masters of its fleet, including SABINA’s master (see section 1.15.5). The email was primarily about the lookout, but it also made the following reference regarding the BNWAS:

“I take this opportunity to remind everyone that [...] the BNWAS must be switched on at all times during navigation, during daytime AND night-time when lookout is on the bridge.” [Mark-up identical to original]

In his email to the shipping company sent on the morning of 16 October 2015, the master confirmed that he had discussed the reminder with his officers on 15 October 2015. Although the master failed to specify what time system the date related to and the exact time, the choice of words used in the emails between the shipping company and the master implies that he had talked to his crew during the working day on 15 October 2015 and therefore before the casualty had occurred.

1.15 Requirements for staff going on watchkeeping duties

1.15.1 International regulations for preventing collisions

The International Regulations for Preventing Collisions at Sea adopted on 20 October 1972 (COLREGs or Collision Regulations) were declared applicable to Swiss seagoing vessels by the Federal Council's Navigation Ordinance. Under rule 5, the COLREGs stipulate the following:

“Every vessel shall at all times maintain a proper lookout by sight and hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision.”

1.15.2 International convention on seafarers' training and watchkeeping

1.15.2.1 Applicability of standards

The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers adopted on 7 July 1978 (STCW or STCW Convention) was declared applicable to Swiss seagoing vessels by the Federal Council's Navigation Ordinance. At the time of the accident, the version dated 3 August 2010 was in force (STCW/CONF.2/34, Manila Conference), and before that, the version of 1995.⁷⁶

1.15.2.2 Requirements for the training of seafarers with designated safety duties

Paragraph 2 of section A-VI/1 of chapter VI of the STCW Convention, under the heading 'Basic training', sets out the requirements for the training of seafarers with designated safety duties.⁷⁷ The details relating to the minimum standard of competence required are specified in the four tables A-VI/1-1 (personal survival techniques), A-VI/1-2 (fire prevention and firefighting), A-VI/1-3 (basic first aid) and A-VI/1-4 (personal safety and social responsibilities). Table A-VI/1-4 includes, but is not limited to, the following requirements regarding competence, knowledge, understanding and proficiency:

- *“Contribute to effective communications on board ship”;*
- *“Understand the principles of, and barriers to, effective communication between individuals and teams within the ship”;*
- *“Ability to establish and maintain effective communications”;*
- *“Contribute to effective human relationships on board ship”;*
- *“Importance of maintaining good human and working relationships aboard ship”;*
- *“Basic teamworking principles and practice, including conflict resolution”;*
- *“Understand and take necessary actions to control fatigue”;*
- *“Importance of obtaining the necessary rest”;*
- *“Effects of sleep, schedules, and the circadian rhythm on fatigue”;*
- *“Effects of physical stressors on seafarers”;*
- *“Effects of environmental stressors in and outside the ship and their impact on seafarers”;*

⁷⁶ Unless otherwise specified, the STCW Convention in this report refers to the 2010 version.

⁷⁷ The full name of this group of people is “Seafarers employed or engaged in any capacity on board ship on the business of that ship as part of the ship's complement with designated safety or pollution-prevention duties in the operation of the ship.” In practice, virtually all crew members on board an ocean-going cargo ship are included in this group of people.

- “*Effects of schedule changes on seafarer fatigue*”.

According to paragraph 3 of this section, seafarers with designated safety duties must, every five years, provide evidence of having maintained the required standard of competence resulting from tables A-VI/1-1 (personal survival techniques) and A-VI/1-2 (fire prevention and firefighting).⁷⁸ In contrast, these seafarers do not have to provide corresponding evidence every five years for the competencies resulting from table A-VI/1-3 (basic first aid) and, in particular, from table A-VI/1-4 (personal safety and social responsibilities) – it is sufficient to provide evidence for these skills only once.

1.15.2.3 Requirements for the training and certification of ratings forming part of a navigational watch

Section and table A-II/4 of chapter II of the STCW Convention detail the requirements for training and certification of ratings forming part of a navigational watch. The requirements listed here are essentially limited to technical or nautical aspects. The ability to assess one’s own fitness for duty and that of other crew members on navigational watch is not a requirement. The importance of notifying the master in the event of incapacity or suspected incapacity of the OOW or any other issues that might jeopardise safety is also not addressed. For the training and certification of ratings forming part of a navigational watch, the concept or culture of ‘speaking up’⁷⁹ is not a requirement either. Consequently, these aspects – that are not part of the training – are also not tasks to be carried out by ratings forming part of a navigational watch during such a watch.

The STCW Convention requires ratings forming part of a navigational watch to provide evidence of their competence only once.

1.15.2.4 Requirements for the training of deck officers

Sections and tables A-II/1 and A-II/2 of chapter II of the STCW Convention describe in detail the training requirements for deck officers (master, chief officer and other deck officers).

Table A-II/1 includes, but is not limited to, the following general requirements for officers in charge of a navigational watch regarding competence, knowledge, understanding and proficiency:

- “*Maintain a safe navigational watch*”;
- “*Thorough knowledge of the principles to be observed in keeping a navigational watch*”;
- “*The use of information from navigational equipment for maintaining a safe navigational watch*”;
- “*Knowledge of bridge resource management principles, including: (.1) allocation, assignment and prioritisation of resources, (.2) effective communication, (.3) assertiveness and leadership, (.4) obtaining and maintaining situational awareness [...]*”;
- “*Application of leadership and teamworking skills*”;

⁷⁸ In practice, the seafarers concerned attend a two- or three-day refresher course every five years.

⁷⁹ A ‘speak-up’ culture refers to an environment in which employees can openly raise issues and concerns, provide their feedback or make suggestions to supervisors without fear of retaliation, and in which supervisors take these concerns, feedback or suggestions on board, appropriately incorporating them into their actions and decisions. A speak-up culture can only work if both the employees and supervisors believe in the concept and act accordingly.

- *“Knowledge and ability to apply effective resource management: (.1) allocation, assignment and prioritisation of resources, (.2) effective communication onboard and ashore [...]”.*

Table A-II/2 includes, but is not limited to, the following general requirements for masters and chief officers⁸⁰ regarding competence, knowledge, understanding and proficiency:

- *“Maintain safe navigation through the use of information from navigation equipment and systems to assist command decision making”;*
- *“Evaluation of navigational information derived from all sources [...] in order to make and implement command decisions for collision avoidance and for directing the safe navigation of the ship”;*
- *“The interrelationship and optimum use of all navigational data available for conducting navigation”;*
- *“Use of leadership and managerial skill”;*
- *“Knowledge and ability to apply effective resource management: (.1) allocation, assignment and prioritisation of resources, (.2) effective communication on board and ashore [...]”.*

Tables A-II/1 and A-II/2 contain no explicit requirements relating to deck officer training, in particular, with regard to the following topics:

- Assessing one’s own fitness for duty;
- Assessing the fitness for duty of other crew members on navigational watch;
- Limits of human performance and ergonomics;
- Notifying the master in the event of incapacity or suspected incapacity of the OOW;
- Concept of a ‘speak-up’ culture;
- Optimally using all equipment for the safest possible bridge watch performance, in particular, effective use of the alarm systems available for maximum situational awareness (especially a BNWAS, but also a watch alarm similar to a simple kitchen timer, for example, or a target alarm from a radar device, an arrival alarm or cross track error alarm from a GPS device, or a shallow depth alarm from an echo sounder).

Regulation I/11, ‘Revalidation of certificates’, in conjunction with paragraph 1, ‘Professional competence’, of section A-I/11 of the STCW Convention indicates that masters and officers must revalidate their competence at least every five years if they wish to continue to serve at sea. Proof of competence may, for example, be demonstrated by practical experience (12 months of seagoing service during the preceding five years or three months of seagoing service during the preceding six months) or by passing an approved test or successfully completing an approved refresher course, although the content of such a test or refresher course is not specified.

⁸⁰ It is not clear from section A-II/2 of the STCW Convention whether masters and chief officers need to meet the requirements from table A-II/2 in addition to the requirements from table A-II/1.

1.15.2.5 Standards regarding watchkeeping

The standards regarding watchkeeping are set out in chapter VIII of the STCW Convention. The first few paragraphs address the issue ‘fatigue of seafarers’. The following is included:

“All persons who are assigned duty as officer in charge of a watch or as a rating forming part of a watch and those whose duties involve designated safety [...] duties shall be provided with a rest period of not less than a minimum of 10 hours of rest in any 24-hour period and 77 hours in any 7-day period.”

This minimum rest period requirement applies to both navigational watches at sea and watchkeeping in port. The rest period requirements of the STCW Convention are also mirrored in the requirements set out by the International Labour Organization.⁸¹

In part 4 of chapter VIII, ‘Watchkeeping at sea’, two pages are devoted to the lookout, explaining rule 5 of the COLREGs (see section 1.15.1) in greater detail. These explanations include the following extracts:

“A proper lookout shall be maintained at all times in compliance with rule 5 of the International Regulations for Preventing Collisions at Sea, 1972, as amended [...]. The lookout must be able to give full attention to the keeping of a proper lookout and no other duties shall be undertaken or assigned which could interfere with that task. [...] The officer in charge of the navigational watch may be the sole lookout in daylight provided that [...] the situation has been carefully assessed and it has been established without doubt that it is safe to do so, [...] full account has been taken of all relevant factors, including [...] weather, visibility, traffic density [...].”

The SMNO understands this rule to mean that at least during the master’s and later the second officer’s night watches, over the course of which the accident unfolded, two people should have been on each navigational watch.

Part 4 of chapter VIII also discusses the taking over of the watch:

“The officer in charge of the navigational 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 the watchkeeping duties effectively, in which case the master shall be notified.”

Furthermore, under ‘Performing the navigational watch’, the responsibilities of the OOW are explained in great detail. Right from the beginning, it is made clear that:

“The officer in charge of the navigational watch shall keep the watch on the bridge [and] in no circumstances leave the bridge until properly relieved [...].”

The duties set out are limited to technical and nautical matters. In the responsibilities of watchkeeping crew members, the STCW Convention does not mandate that crews on navigational watch (deck officers and lookouts) should continuously monitor each other’s as well as their own fitness for duty and that the master or other crew members should be notified in the event of a watchkeeping crew member’s incapacity.

1.15.3 Circular from the shipping company

In August 2010, Enzian sent a company circular 1-2010, ‘Watch at sea’, to its crews stating the following:

⁸¹ International Labour Organization (ILO): Convention No. 180 – Seafarers’ Hours of Work and the Manning of Ships Convention, 1996.

“The company requires a double watch to be kept from sunset to sunrise [...]. In case of expected problems with compliance with rest hours, priorities have to be set and charterers have to be informed that work in port has to be carried out by stevedores (lashing, unlashing, driving cranes etc...) to ensure safety.”

1.15.4 The shipping company’s information leaflet for new masters

Item 35 of Enzian’s information leaflet for its new masters, described in section 1.15.2, which had also been sent to SABINA’s master on 9 September 2015, read as follows:

“The company requires that an ADDITIONAL LOOKOUT HAS TO BE ON THE BRIDGE FROM SUNSET TO SUNRISE and in addition whenever necessary outside of this period of time, in accordance with STCW, COLREGs, good seamanship and other applicable rules and regulations that may apply.” [Mark-up identical to original]

1.15.5 Reminder from the shipping company

On the morning of 15 October 2015, Enzian emailed a reminder with the subject ‘Navigation lookout’ to all masters of its fleet, including SABINA’s master. In this reminder, the master was asked to read the attached newspaper article titled ‘Lookout could have prevented boxship collision’ and discuss it with all watchkeeping officers. The email also contained the following information and clarifications:

“Make sure everyone understands that Enzian Ship Management AG promotes safety of life at sea, respects the rules and regulations without any exemptions and does not tolerate any exemptions in the posting of lookout as required by the COLREGs. The lookout MUST be on the bridge as required by the COLREGs.” [Mark-up identical to original]

“I take this opportunity to remind everyone that a short interview onboard makes it easy to determine breaches, that the VDR records everything, that false entries in the logbooks are illegal [...].”

In his email to the shipping company sent on the morning of 16 October 2015, the master confirmed that he had discussed the reminder with his officers on 15 October 2015. Although the master failed to specify what time system the date related to and the exact time, the choice of words used in the emails between the shipping company and the master implies that he had talked to his crew during the working day on 15 October 2015 and therefore before the accident had occurred.

1.15.6 Watch order book and the master’s standing orders

1.15.6.1 Watch order book

The watch order book shows the following special instruction from the master for 15 October 2015:

“Follow master order issued 14/10/15”

For 14 October 2015, the watch order book shows six special instructions from the master, including the following four:

- *“Follow master standing order.”* (see section 1.15.6.2)
- *“Follow COLREGs.”* (see section 1.15.1)
- *“Keep lookout.”*
- *“Change watch as per BPG C/L B-12 [Bridge Procedures Guide checklist ‘B12 Changing over the watch’].”* (see section 1.14.4)

The master's special orders for 14 and 15 October 2015 had been signed by the second officer.

On the page 'Acknowledged', which refers to the master's standing orders (see section 1.15.6.2), the second officer was not listed.

The watch order book's title page, which should state the names of the master and chief engineer, did not list persons in command for SABINA's passage from Aalborg to Kotka.

1.15.6.2 The master's standing orders

The master's standing orders for SABINA comprised two A4 pages and were dated 9 September 2015. The master's standing orders issued for SABINA still contained some of the sample text and instructions Enzian had provided with form S-087, 'Master standing orders'. The sample text had not been removed or replaced with content adapted for SABINA's voyage. Please note the following examples:

- “[...] *have your officers sign* [...]” (instruction from the shipping company for the master on how to use form S-087)
- “*Comply with the ‘Regulations for the Prevention of Collision at Sea’ at all times*” (standing order from the master, see section 1.15.1)
- “*To call for additional personnel when considered necessary to maintain a safe watch*” (standing order from the master)
- “*The officer of the leaving watch shall not attempt to hand over the watch if he has reason to believe that the officer taking the watch is not fit for duty. He shall call the master and remain on watch until relieved by the master or his designated representative.*” (standing order from the master)

Under the statement “*Master's standing orders have been read and understood*”, there was no signature from the chief officer or the second officer.

1.15.7 The SMNO's point of view

The SMNO, the authority responsible for the supervision of Swiss-flagged maritime navigation, mentioned to the STSB that in reality and for economic reasons ships may start their voyage despite some of the crew's non-conformance with minimum rest periods.

1.16 Requirements for a shipping company's in-house training

The International Management Code for the Safe Operation of Ships and for Pollution Prevention (International Safety Management Code, or ISM Code), declared mandatory by the SOLAS Convention, contains the following provisions:

- “6.1 – *The Company should ensure that the master is [...] fully conversant with the Company's safety management system [...].*”
- “6.3 – *The Company should establish procedures to ensure that new personnel [...] are given proper familiarisation with their duties. [...]*”
- “6.4 – *The Company should ensure that all personnel involved in the Company's safety management system have an adequate understanding of relevant rules, regulations, codes and guidelines.*”

1.17 IMO and EU requirements for flag states and flag state inspections

The IMO describes the relationship between flag states and flag state inspections⁸² on the one hand and port state controls⁸³ (PSCs) on the other hand as follows: *“The primary responsibility for ships’ standards rests with the flag state – but port state control provides a ‘safety net’ to catch substandard ships.”*⁸⁴ The primary responsibility for the ships’ compliance therefore lies with the state under whose flag the ship is flying, i.e. the flag state. An essential tool for upholding this responsibility is flag state inspections.

The European Commission describes the prevailing understanding in Europe regarding flag state inspections and port state controls as follows: *“Shipowners, who do not respect the rules and who sail under flags of flag states that do not enforce them properly, allow non-compliant ships to sail and trade around the world. This situation creates not only a competitive advantage for those ships but also a higher risk in terms of accidents, security or pollution. Such non-compliant ships are commonly referred to as ‘substandard’ ships. They are fought against by two lines of defence, where PSC is often referred to as the second line of defence whereas the first line of defence is the flag state itself. Hence, the primary responsibility for monitoring the compliance of ships with international standards for safety [...] lies with the flag state.”* And: *“As already emphasised, ‘substandard’ shipping is a global problem [...]. Hence, PSC [...] will continue to be relevant [...] because some flags are not doing a proper job. In other words, the need for PSC remains as long as there are differences in the standards and the quality of the controls across the different regions around the world, and as long as not all flag states carry out their obligations in full.”*⁸⁵

1.18 Use of the BNWAS on board SABINA after her casualty on 15 October 2015

Eight months after the casualty off the coast of Bornholm on 15 October 2015, SABINA was involved in another accident. SABINA was on a voyage from Damiette (Egypt) to Szczecin (Poland). During a passage through shallow waters near Świnoujście (Poland) on 19 June 2016, SABINA’s main engine sustained severe damage. The defects in the voyage data recorder (VDR) that had existed at the time of the casualty off Bornholm in October 2015 had since been repaired, and the VDR’s functionality had been expanded. Analysis of this VDR data revealed the following findings:

- Of the 40 hours and 20 minutes⁸⁶ of VDR data available and evaluated, the BNWAS had only been on during two periods totalling 10 hours and 26 minutes.
- The first period during which the BNWAS was on covered the four-hour watches of both the chief officer and second officer during the night from 17 to 18 June 2016. SABINA was in the Skagerrak and Kattegat area during this time. The BNWAS was activated during the master’s evening watch, roughly 30

⁸² A flag state inspection is the inspection of a vessel in port, carried out by an authority of the flag state (see section 1.13.3.2.5).

⁸³ A port state control is the inspection of a foreign vessel in port, carried out by the country’s port authority.

⁸⁴ <https://www.imo.org/en/OurWork/MSAS/Pages/PortStateControl.aspx>

⁸⁵ European Commission: Ex-post evaluation of Directive 2009/16/EC on port state control. Final report. 2017.

⁸⁶ The data analysed included the data captured since the VDR had been recording at 17:00 UTC on 17 June 2016 (entry into the Skagerrak strait north-west of Denmark) until the accident occurred at 10:20 UTC on 19 June 2016 (on the Mieliński Channel near Świnoujście). The voyage took SABINA through the Kattegat, the Great Belt and the Fehmarn Belt.

minutes before watch handover. During the master's watch the following morning, about an hour after taking over the watch, it was switched off again.

- The second period during which the BNWAS was on lasted about 54 minutes and relates to the morning of 19 June 2016. According to the duty roster, the master was on navigational watch at that time. SABINA was located east to south-east of the German island of Rügen during this period. About an hour after the BNWAS had been switched off again, the pilot came on board for shallow-water passage from Świnoujście to Szczecin.

Between the casualty on 15 October 2015 and the accident on 19 June 2016, all of SABINA's crew members had been replaced apart from the second engineer.

Furthermore, the STSB had been on board SABINA on several occasions for investigation work following the accidents: on 18 October 2015, 11 April 2016 and again for five days in June 2016. At each visit, the BNWAS had been switched off and SABINA was in port.

1.19 Occurrences of a similar nature

The occurrences summarised in the 115 represent a selection of similar events across the European region. The list only includes occurrences that took place prior to 15 October 2015. In all the incidents described in the 115, the vessel was equipped with a bridge navigational watch alarm system (BNWAS), but it was turned off.

Although all ships featured a BNWAS, the installation and operation of such a system had not yet been made mandatory for all the vessels concerned at the time of each incident.

No documented incidents could be found where the BNWAS was activated and a 'distraction' possibly associated with this had contributed to the incident.

All the information presented in the 115 concerning the occurrences of a similar nature stems from publicly accessible and freely available sources, in particular from the respective official safety investigation reports.

1.20 The use of VDR data other than for safety investigations

Even before the casualty involving SABINA on 15 October 2015, it was possible to use the VDR data in a proactive or preventive manner – both from a technical and, for shipping companies, a legal point of view. Regular and systematic analysis of operational data to improve maritime safety is referred to as voyage operations quality assurance (VOQA). After downloading and analysing the VDR data, shipping companies can use the findings to help improve their working methods and procedures on the bridge relevant to safety and to improve aspects relating to company culture, compliance and training. Whether or not safety investigation authorities such as the STSB are examining a particular incident as part of their research, VDR data can be used by shipping companies or supervisory authorities for their own investigations and to improve safety.

The shipping company Enzian did not use the VDR data recorded on board SABINA and its sister ships (see section 1.13.1.7). The SMNO did not require Swiss shipping companies to perform any VOQA. The SMNO's employee in charge of technical supervision did not know whether it was even possible from a legal point of view for the shipping companies or the supervisory authority to make such use of VDR data. The SMNO did not have the capability to download data from a VDR.

1.21 Shore-based support and monitoring of the fleet

For several years prior to the casualty involving SABINA on 15 October 2015, it has been common practice for some operators of large ocean-going ships to receive position and other data relating to their ships in real time and use computer software to automatically compare this information with passage plans. This allows an operator to intervene and influence actions on its ships even at short notice. It enables an operator, for example, to immediately contact the master if the ship deviates from its intended route or from the defined tolerance.

Enzian did not monitor its fleet in real time from a shore-based location (see section 1.13.1.7).

2 Analysis

2.1 Technical aspects

There are no indications of pre-existing technical defects that could have influenced or caused the accident.

However, SABINA's voyage data recorder (VDR) had been defective since 10 May 2015. For months, neither the crew nor the shipping company took any corrective action in response to the permanently displayed error message and the weekly acoustic warning. The defect also went undetected during the flag state inspection carried out by the Swiss Maritime Navigation Office on 5 and 6 October 2015. On the contrary, the device was classified as 'operational', which is difficult to understand. Furthermore, the inspection report noted that only one of the two radars was connected to the VDR. It is neither common practice nor required by law for this category of vessel to record data from both radars. Even when working through the departure checklist, which explicitly requires the voyage data recorder to be checked, the crew either did not notice the defect or chose to ignore it.

For the analysis of the bridge navigational watch alarm system (BNWAS), which was not activated, see section 2.2.3.

2.2 Human and operational aspects

2.2.1 Leaving the intended route

SABINA's course was not changed from an easterly to a north-easterly course on reaching waypoint 299, as was set out in the passage plan. The course was also not altered when the ship subsequently crossed the precautionary area.

The OOW must at all times have adequate situational awareness of the progress of the voyage, and he must be aware at all times when course alterations are due. The arrival alarm of a GPS device can be used as an aid for this and to easily determine the exact time of the course alteration.

A properly working GPS set-up (GP-150 equipment including satellite signals, antennas and cabling) with the arrival alarm activated would have emitted a continuous acoustic warning characterised by short interruptions just before⁸⁷ the ship reached waypoint 299. This alarm would have signalled to the OOW that a course alteration was due. However, this did not happen – the continuous acoustic warning was not emitted when waypoint 299 was reached. However, short sequences of beeps – indicating a problem with the GPS positioning – were audible on the bridge on reaching this waypoint (though this was probably coincidental) and then again about 23 minutes later.

It could not be established with certainty why the arrival alarm did not sound. Possibly, the alarm function had not been armed by a crew member, or there may have been a technical glitch with the GPS positioning.

The fact that the second officer, as the OOW, did not anticipate and execute the upcoming course alteration was due to a lack of situational awareness. A properly configured and working GPS system may have compensated for the lack of situational awareness regarding the progress of the voyage in the crucial aspect and moment. However, since the GPS system was probably not set up appropriately and the technical problem in determining the position via GPS was not recognised,

⁸⁷ Usually within a few minutes (depending on the speed travelled and the alarm range set).

the GPS system could not ensure that the inadequate situational awareness remained without consequences. Failing to notice an inappropriately programmed GPS device or failing to notice a technical problem with the GPS positioning equally attests to a lack of situational awareness.

For various reasons, it may be appropriate and safety-conscious to change course not at the waypoint as set out in the passage plan, but before or after it. In the case under investigation, it would have been good practice to maintain the easterly course of 096° until about 22:35 UTC and then join the flow of traffic coming from starboard heading to the north-east with one major (rather than two minor) course alterations (as CSK UNITY and those ships behind her did). Although the second officer never mentioned that he had this intention, it cannot be ruled out. Had he intended to do so on reaching waypoint 299, it would, for example, have been good practice to reprogram the GPS device accordingly, i.e. with the new waypoint, or to set the radar's watch alarm. However, neither happened.

The equipment available on SABINA's bridge, in particular the BNWAS and the 'watch alarm' function of the radar, and possibly also the 'arrival alarm' of the GPS devices and other systems, were not used by the officers of the watch, especially by the second officer.

The fact that the equipment and resources available, which are supposed to make the operation of a ship as safe as possible, were not used by the officers in charge was risky. Actively engaging with the navigational or safety-related equipment on the bridge would also have countered the tendency to fall asleep.

The standards contained in the STCW Convention regarding the training of seafarers in bridge resource management are not sufficient. International legislation, namely the STCW Convention, lacks the requirement for training and refresher courses for deck officers to enable them in making the best possible use of all equipment and alarm systems available for effective watchkeeping and maximum situational awareness.

2.2.2 SABINA's crew was not alerted in time to the situation by a member of the vessel's own staff

SABINA's crew was not alerted to the impending collision with Bornholm island in time, i.e. before the crew of the rescue vessel MADS JAKOBSEN intervened, by a member of the cargo vessel's own staff. The following aspects led to the fact that the crew on board SABINA was not informed in time about the impending collision with Bornholm island by a member of the vessel's own staff:

- The officer of the watch (OOW) was not fit for duty on his post;
- There was no replacement for the OOW;
- There was no lookout posted on the bridge.

The OOW posted on the bridge was unfit for duty when the accident was developing and could still have been prevented. The second officer, who was the OOW at the time the casualty took place and during the hours before, left the bridge at 22:45 UTC and went to his cabin to take some painkillers for his recurring headache. Once in his cabin, the second officer experienced some kind of blackout, then collapsed and remained on the floor. The bridge was unmanned from that point onwards.

An OOW leaving the bridge during his watch is not problematic as such. It only becomes problematic and risky if he does not arrange for a replacement officer to relieve him from his watchkeeping duties before leaving the bridge. If – as in the

case under consideration – there is also no lookout posted on the bridge, an OOW leaving the bridge must even be classified as ‘very high-risk’.

The fact that the second officer experienced the blackout in his cabin, where he wanted to take some painkillers to numb his headache, and not on the bridge, where he should have been on watch, is only of minor importance for the further development of the incident. This is because it must be assumed that the second officer would have experienced the blackout even if he had remained on the bridge. The incoming radio messages and telephone calls would probably not have been enough to make the second officer regain consciousness – or if they did, it would only have been by chance – in time for him to become fully aware of the impending collision with Bornholm island and avert the accident.

The possibility of an OOW experiencing a health problem while on duty can never be completely ruled out. However, the likelihood of experiencing an issue during the watch should be reduced by not starting watchkeeping duties when feeling unwell. In the case under investigation, the second officer was already suffering from a headache before going on watch and had taken some painkillers earlier. The fact that the second officer went on watchkeeping duties nevertheless was ‘high-risk’.

The second officer leaving the bridge without an OOW to replace him was not consistent with a safety-conscious, professional approach that seeks to ensure safe navigation at all times. The STCW Convention is clear in this regard and requires that *“The officer in charge of the navigational watch shall [...] in no circumstances leave the bridge until properly relieved”*.

The International Regulations for Preventing Collisions at Sea (COLREGs) – and, indirectly, the master’s standing orders – require that every vessel keep a proper lookout at all times by sight and hearing as well as by any other available means appropriate to the prevailing circumstances and conditions. Given that there was also no lookout posted on the bridge, this regulation that is instrumental in safety was no longer fulfilled at the latest from 22:45 UTC, when the second officer left the bridge.

In his capacity as OOW, the second officer had repeatedly asked the lookout to go to his cabin and go to bed from 21:16 UTC onwards. At 21:30 UTC, the lookout gave in, left the bridge and went to his cabin. From that point onwards, the second officer was the sole person on the bridge.

It is evident – as can be gathered from the comments he made at the time which were recorded on the voyage data recorder – that the second officer wanted to be alone on the bridge to sleep and make some phone calls. This alone shows a high-risk attitude towards the safety of the ship and its crew. The second officer repeatedly asking the designated lookout to go to bed indicates a lack of risk awareness and safety consciousness, as well as a serious overestimation of his own capabilities. Asking the lookout to leave the bridge does not comply with the shipping company’s rules and those set out in the STCW Convention, which stipulate that the OOW may be the sole lookout only in daylight and under certain circumstances.

It must be noted that on the very day of the accident, i.e. just a few hours before the casualty which was directly and essentially caused by asking the lookout to leave the bridge, the master had discussed with his officers a reminder from the shipping company that emphasised the importance of the lookout’s presence on the bridge and called the COLREGs to mind. Apparently, this reminder from the shipping company proved to be ineffective.

On the evening of 15 October 2015, the master, assigned as the OOW, gave the designated lookout leave of absence from 17:00 UTC to 19:00 UTC. In doing so, he set a bad example for his subordinates. Sunset was at 16:10 UTC. From this

point, at the latest, having an able-bodied seaman (AB) posted on the bridge as a lookout not only would have been safety-conscious but also was mandatory per the international regulations and guidelines stipulated by the shipping company. Given that maritime traffic is generally quite dense in the area concerned, it would have been safety-conscious to have an AB posted on the bridge to act as a lookout even before sunset. It is particularly noteworthy, and difficult to understand, that shortly before the master gave his lookout a leave of absence, he had discussed with his officers the shipping company's reminder, which had emphasised the importance of the lookout's presence on the bridge and called the COLREGs to mind.

A superior's call to go rest or enjoy time off creates an inner conflict for a lookout. On the one hand, even when having had plenty of sleep, some extra rest or free time is generally always welcome (in this instance, the motivation is to take the easy option). Refusing such an offer from a superior could also be perceived by the superior as impolite or possibly even as presumptuous (in this instance, the motivation is to avoid conflict). On the other hand, the AB in question obviously cared about the safety of the ship and acted in an exemplary, dutiful and safety-conscious manner when he ignored the initial prompts of the second officer and when he reminded the second officer not to fall asleep. At first, the lookout was able to resist the second officer's prompts, which were hardly safety-conscious. Later, however, taking the easy option and avoiding conflict proved to be the stronger motivators, and the lookout went to his cabin. Even if this behaviour may be understandable from a human perspective, for reasons of safety, it was problematic that the lookout was unable to withstand the pressure from the second officer. When the lookout abandoned his post, he left the OOW alone on the bridge. The lookout knew that the OOW had reached his physical limits. Notifying the master would have been the safest choice, but this did not happen.

2.2.3 SABINA's crew was not warned by the BNWAS

SABINA's crew members who were sleeping in their cabins were not alerted to the unmanned bridge in time, i.e. before the crew of the rescue vessel MADS JAKOBSEN intervened, by the bridge navigational watch alarm system (BNWAS).

The BNWAS could not perform its alarm function because it was switched off until, at least, the time of the accident. An activated BNWAS would have woken the master and chief officer by emitting an audible alarm in their cabins no later than 12 minutes and 30 seconds after the second officer, the OOW, had left the bridge. Had the BNWAS been switched on, the master and the chief officer would have been able to avert the imminent collision with Bornholm island at 22:58 UTC by altering the ship's course. At that time, SABINA was still at a safe distance of about 10 nautical miles off the island of Bornholm.

On 9 September 2015, about five weeks before the accident, SABINA's then chief officer was appointed master. As part of his appointment, the shipping company sent him an email, reminding him that the bridge watch alarm system must be in operation whenever the ship is underway at sea. The wording of this reminder was identical to the wording of the corresponding rule from the SOLAS Convention, regulations every master and nautical officer worldwide must be familiar with.

The master stated that he forgot to turn on the BNWAS when casting off from Aalborg at 03:10 UTC. This is difficult to understand given that turning on the BNWAS was an explicit item on the departure checklist. According to the entry in the deck logbook, this checklist had been completed on departure.

On the morning of 15 October 2015 (the day of the accident), the shipping company sent another email, requesting once again that the BNWAS be switched on at all times. The master then discussed this reminder with his officers during the

day. This means that just a few hours before the accident, which was directly and substantially caused by the BNWAS being switched off, the master had shared with his officers a reminder from the shipping company which made it abundantly clear that the BNWAS must be switched on at all times during navigation – and even during this specific briefing, the BNWAS was and remained switched off.

On the day of the accident and in the hours beforehand, the master and nautical officers were therefore fully aware of the requirement for the BNWAS to be switched on. This was not merely ‘at the back of their minds’; they had just been reminded by the shipping company that very day.

There were also several navigational watch changes between casting off from the port of Aalborg at 03:10 UTC and the handover of the watch at 21:00 UTC during which the officers concerned must have noticed that the BNWAS had not been switched on. The checklist for changing over the watch requires the relieving OOW to ensure that all navigational and safety equipment that will be used or is likely to be used during the watch is operational. The master had ordered the use of this checklist in writing, i.e. in the watch order book, and according to the records in the deck logbook, the checklist had been completed on several occasions prior to the accident – the records included, specifically, the handover of the watch at 21:00 UTC. Had the BNWAS been switched off inadvertently, it could have been switched back on or arranged to be switched on at this point.

The only conclusion that these facts present is that SABINA’s officers of the watch deliberately and against received instructions did not use the BNWAS. This constitutes a reckless violation of an established maritime navigation rule that is instrumental to safety. In the present case, the use of the BNWAS would most likely have prevented the ship from running aground off Bornholm island.

All this – together with the fact that even eight months after the casualty off the coast of Bornholm, SABINA’s BNWAS was still switched off during large parts of a sea passage even though the ship was navigated by a different crew – suggests that the BNWAS on board SABINA was often deliberately switched off when at sea. The fact that the shipping company felt compelled to send a reminder to its crews regarding the operation of the BNWAS – even before the casualty off the coast of Bornholm concerning SABINA – indicates that compliance with the BNWAS rules left much to be desired, not only on board SABINA, but also on other vessels in Enzian’s fleet.

The officers of the watch had an inadequate understanding of the benefits of a BNWAS and the need for a lookout, as well as a lack of risk awareness and safety consciousness. A BNWAS, with all its functionalities (automatic alarm if no activity is detected, manual alarm if help is urgently needed), is an important system for the safe operation of a ship. For periods in daylight, when there is often no lookout posted on the bridge alongside the OOW, and equally for periods at night with a naturally increased risk of falling asleep, this system seems vital for the safety of the ship and its crew. Even previous accidents of a similar nature which are well documented did not result in adequate levels of risk awareness and safety consciousness. Nor did these previous accidents lead to a better understanding of the purpose of having a bridge navigational watch alarm system and posting a lookout on the bridge. It is evidence of ignorance and attests to this cohort of officers having a risk-taking mindset.

2.2.4 Running aground

SABINA ran aground off the coast of Bornholm because its course was only altered after its crew had been warned by the crew of the rescue vessel MADS JAKOBSEN

and only at a time (23:42:20 UTC) when a grounding could only have been prevented by chance.⁸⁸ The underlying factors and circumstances of the late course alteration are described in sections 2.2.2 and 2.2.3.

2.2.5 Fatigue, insufficient situational awareness and recklessness

The second officer was fatigued when he started his watch. This is not only suggested by his own statements (he felt “*very tired*” when he took over the watch and noted that he had only slept about two to three hours per day in the days before). In addition, on 15 October 2015, he had only slept for four or five hours in total before he started his watch at 21:00 UTC. Shortly after their watch had started, the lookout had to remind the second officer not to fall asleep. The second officer sounded sleepy and kept yawning. Eventually, he actually fell asleep while on navigational watch.

The second officer’s fatigue resulted in insufficient situational awareness regarding his own performance (overconfidence), the operating status of electronic equipment, passage planning, the progress of the passage, the traffic situation in the vicinity (especially the track and progress of CSK UNITY) and his own ship’s course and position in relation to obstacles. Fatigue may also have been a factor in the second officer’s recklessness by first sending the designated lookout to his cabin and then leaving the bridge himself. It can, however, be assumed that the second officer’s fatigue had not been increased by taking the painkiller Farmadol.

The handover of the watch at 21:00 UTC from the master to the second officer was problematic. From the standpoint of safety, the watch is only to be handed over to the relieving officer if the latter can effectively fulfil their duties, which are primarily to ensure the safety of the ship and its crew. Evidently, the second officer failed to meet this prerequisite, and it would seem that the master failed to notice. He let the second officer take over the watch and then went to bed. The fact that the master did not notice the second officer’s fatigue is hardly surprising, as after all, at the time of the watch handover at 21:00 UTC, the master himself was fatigued, having not slept for at least 21 hours, and therefore probably misjudged the situation and the relieving officer’s fitness for duty. The conversation relating to the handover of the watch was extremely brief, which corroborates that both crew members were tired.

According to the internationally applicable STCW Convention, the officer in charge of the navigational watch must not hand over to the relieving officer if there is reason to believe that the latter is not capable of carrying out the watchkeeping duties effectively. In such cases – according to the code – the master must be notified. If, as in this investigation, the master is the OOW to be relieved and the relieving OOW is unlikely to effectively perform their watchkeeping duties, the master must or would be required to make himself aware of this fact (‘hierarchical short circuit’). It is obvious that here, due to a lack of escalation options, the principle of an unbiased assessment of the problem by a third, higher-ranking person cannot be followed. It would be safety-conscious if an OOW could always turn to a third, higher-ranking person for help with problems regarding watchkeeping duties. However, by explicitly allowing the master to be involved in watchkeeping for long-distance coastal navigation, Switzerland’s Navigation Ordinance is exacerbating the issue of a lack of escalation options. The ordinance appears to make it impossible for

⁸⁸ A crash stop manoeuvre or a 90° change of heading to starboard or port might potentially have prevented the grounding (see ‘head reach in a crash stop trial’ and ‘advance at 90° change of heading’ in section 1.12.1 combined with Figure 9). However, these manoeuvres would also have borne certain risks. Besides, it cannot be expected of someone who was woken up just a few seconds earlier to assess such risks properly and instantaneously.

the SMNO to enforce the availability of sufficient deck officers so that the master does not normally have to be involved in watchkeeping, for example, through an appropriately devised minimum safe manning document. Therefore, Switzerland's national requirements for minimum safe manning are inappropriate and detrimental to safety.

A proportion of the ship's crew, at least the master and second officer, lacked adequate awareness of the limits of human performance in connection with fatigue.

There are two primary measures to maintain a safe level of physical and mental fitness for navigational watchkeeping:

1. Adherence to minimum rest periods and
2. The crew's assessment of their own fitness for duty.

The minimum rest periods stipulated by international regulations are intended to help ensure that the crew members' performance can be maintained at a safe level for the duration of a whole tour of duty. Compliance with the minimum rest periods is a prerequisite but not sufficient. Adhering to rest periods does not guarantee that the crew get sufficient sleep for a good recovery between shifts. It also does not guarantee that the crew's performance will not be affected by physical or psychological factors (illness, stress, anxiety, etc.). This problem is meant to be addressed through the assessment of the crew member on navigational watch: an officer in charge of the navigational watch must not hand over to the relieving officer if there is reason to believe that the latter is not capable of carrying out the watchkeeping duties effectively.

At least on the day of the accident, the master's working hours and rest periods did not comply with the stipulated minimum rest periods. As that compliance is a prerequisite for safe human performance, it is evident that the safe level of fitness for the navigational watch clearly could not be maintained here.

Allowing for the possibility that the second officer's recorded rest periods were not entirely true,⁸⁹ the minimum required rest periods were probably still observed on the day of the accident. So, although the first prerequisite for human performance at safe levels (compliance with minimum rest periods) was probably met, the actual sleep obtained (four or five hours) – combined with feeling physically unwell (a headache) and possibly other factors – was obviously still not sufficient for a safe navigational watch.

The facts as a whole give the impression that the primary aim on board SABINA was not to keep human performance at safe levels for navigational watch duties, but solely to comply with the stipulated minimum rest periods – which was not always achieved either.

2.2.6 Inadequate support and monitoring by the shipping company

Enzian did not offer the recently appointed master enough support and did not pay sufficient attention to the working methods actually followed on board SABINA.

The passage from Aalborg to Kotka was the master's third voyage in that rank. He had very little experience, having only been appointed master on 9 September 2015. Enzian failed to act in a safety-conscious manner through a lack of support for the master and by paying insufficient attention to the working methods actually followed on board SABINA. As a result, the extremely problematic situation in terms of safety was not recognised, i.e. that the master would ultimately not be

⁸⁹ The exact times cannot be ascertained with any degree of reliability, as the time system used for the recorded work and rest hours is unknown.

able to go to bed until 21 hours after he had started work and that he would be the designated OOW up until that point. Enzian also therefore failed to recognise the second officer's workload and its potential impact on the navigational watch. Similarly, the workload of the able-bodied seamen (in the holds and watchkeeping) was not discussed with the master, so no possible remedial measures could have been considered with regard to safety. Such measures could have included, for example, extending the length of the port calls to allow the ABs to clean the holds or hiring external staff to clean the holds while in port.

The shipping company was not able to intervene effectively when, at the latest from 22:45 UTC, SABINA followed a course that was not compatible with the passage plan and the intended port of arrival, and that led directly to the island of Bornholm. Until the MAS informed the shipping company about the situation at 23:36 UTC (seven minutes before the collision), Enzian was unaware of the fact that one of its own vessels was about to crash into Bornholm island. This lack of awareness was due to the shipping company not operating a system to monitor its fleet. If such a system had been in place in the present case, approximately one hour would have been available to intervene. The satellite telephone which the shipping company used later when attempting to contact SABINA was on the bridge and failed to wake the crew members who were asleep in their cabins.

International legislation lacks standards requiring shipping companies to offer effective crew support and fleet monitoring services (in-house or outsourced). From the perspective of safety, it is a failing that relatively simple technological means or organisational systems which would improve the fleet's safety are not mandatory and not used.

2.2.7 Non-intervention of the Swiss Maritime Navigation Office in the context of a flag state inspection

The Swiss Maritime Navigation Office (SMNO) did not intervene in the context of its flag state inspection carried out on 5 and 6 October 2015 regarding non-compliance with rest period regulations.

During an audit in the days following the accident, the in-house auditor of the Enzian shipping company noticed that the working hours recorded did not correspond to the hours actually worked. Put simply, this means that the crew had been working more than was safely permitted. It must be assumed – because of the virtually non-existent safety awareness on board – that this had been the case for some time.

In actual fact, during his flag state inspection on board SABINA on 5 and 6 October 2015, the SMNO superintendent also noticed that the minimum rest periods had not been observed. During a random check, the superintendent reviewed the records documenting the chief officer's hours of work and rest (i.e. the records of the master of the accident voyage concerned). This review revealed a discrepancy from the requirements set out in the STCW Convention and defined by the ILO. However, this finding had no consequences for the crew or the shipping company:

- The SMNO superintendent did not review any further records relating to other crew members – even though further irregularities were likely.
- The SMNO superintendent did not document the discrepancy in his inspection report. Therefore, it was not even possible to impose any regulatory consequences that could have resulted from the deviation. On the contrary, the inspection report explicitly attested compliance with the working hours and rest periods. This is difficult to understand. There was just a concluding note which mentioned that exceptions from rest period regulations had to be requested from the SMNO.

- The SMNO did not initiate any sanctions.

Statements made to the STSB by various SMNO staff give the impression that the SMNO staff did not understand their own role, rights and responsibilities as a supervisory authority and that they were too trusting and lacked a critical mindset. The SMNO also had a certain aversion to conflict and tended to focus on having good rapport with the supervised parties (see section 1.13.3). The result was ineffective supervision regarding the development of the accident under investigation.

2.2.8 Careless handling of the master's standing orders

The master himself, as well as his deck officers, exhibited careless handling of the master's standing orders. The master's careless handling manifested in him retaining some of the shipping company's sample text where he should have replaced it with content adapted for SABINA's voyage. Given that neither the chief officer nor the second officer had signed the master's orders, it can be concluded that they did not handle them carefully either.

Both the master and his deck officers failing to handle the standing orders carefully demonstrates that they were working in a manner that was not particularly systematic and indicates that the shipping company's and master's instructions were too superficial.

During its flag state inspection, the Swiss Maritime Navigation Office (SMNO) failed to notice that the master's standing orders had not been signed by the chief officer, who had already been on board for the passage to Aalborg. This contradicts the flag state inspection report, which states that the standing orders had been issued and followed.

Apart from the lack of signatures on the standing orders, various names and signatures were also missing from the watch order book. The various missing entries testify to a working method that was less than thorough which had prevailed on board SABINA for some time and had not been detected by the shipping company or the SMNO as the supervisory authority.

2.2.9 Ineffective familiarisation of new crew members

In practice, new crew members were familiarised with the specific operating procedures of the ship and the shipping company when they joined the ship: Enzian stated that each new crew member was introduced to the job by a standing crew member within the first 24 hours on board. However, this manner of familiarisation was ineffective. Just one day was not enough to effectively familiarise new staff with the ship's technicalities and with the desired and safe shipboard procedures. The second officer's statement that he had never been instructed in the functionalities and operation of the bridge navigational watch alarm system during the period between his joining SABINA and the incident corroborates this assessment. Missing entries in several documents also suggest that the familiarisation was not thorough or that the induction did not follow an appropriate, systematic process.

In view of the at times high-risk activities on board the seagoing vessel, the above testifies to a lack of safety consciousness on the part of Enzian as well as of the SMNO which, as a supervisory authority, accepted this situation. The inspection of the crew's procedural knowledge carried out during the shipping company's shipboard audits and any potential corrective measures that could have resulted from such inspections were obviously not effective.

2.2.10 Late response from the Maritime Surveillance Centre South

The *Maritimt Overvågningscenter Syd* (Maritime Surveillance Centre South, or MOCS) did not notice the SABINA veering off its intended route at 22:40 UTC or leaving the precautionary area at 22:45 UTC; the MOCS only noticed the vessel's position several minutes after the transit pilot on board the crude oil tanker KRONVIKEN had already flagged it.

All the essential information available to the transit pilot on board KRONVIKEN was also available to the MOCS (in particular radar and AIS data). Given that fact, in view of the MOCS's mandate – the monitoring of Denmark's territorial waters, even if primarily of a military nature – and for maritime safety reasons, it would have been desirable that the MOCS became aware of the developing situation earlier and attempted to contact SABINA earlier.

2.2.11 High-risk continuation of the sea passage following the accident

The second officer was discharged from watch duty by the master following the casualty. From then on, the master and chief officer took turns providing the navigational watch. Given that the master's fitness for duty was already severely impaired by his 21-hour working day before the second officer was discharged, it is obvious that the continuation of the sea passage to Kotka and Tallinn was also carried out with personnel insufficiently fit for duty. According to the second officer, no one paid attention to complying with rest period regulations; it was more important to reach their destination.

For the above reason, and with regard to the necessity to have a fit and vigilant officer of the watch, the decision to continue the sea passage following the accident off the coast of Bornholm was therefore high-risk. The shipping company should have recognised that the master, who had little experience in his new role, was no longer capable of adequately assessing the situation. The shipping company could then have come up with a safety-conscious solution. After all, at the time in question, SABINA was not in the middle of the ocean but at anchor off the Danish port of Rønne and therefore not far from support and relief options. Completing the crew at the first opportunity, as required by SABINA's minimum safe manning document under the heading 'Exceptional circumstances', would have been possible and appropriate at Rønne. However, this step was not taken. In the Finnish port of Kotka, the opportunity to complete the crew for the onward passage to Tallinn was missed once again.

SABINA's voyage from Aalborg to Kotka and Tallinn demonstrates how delicate a balance the operation of a seagoing vessel is with just three deck officers on board (master, chief officer and second officer). Even standard operations are problematic due to the lack of escalation options for the master's watch duties (see section 2.2.5). Should extra work be required, a deck officer become unfit for duty or any other irregularity occur, continuing the voyage would not be possible without substantially compromising safety.

The Swiss Maritime Navigation Office, which as the supervisory and licensing authority had defined the minimum number of crew required on board SABINA, was indeed aware of this weakness. However, the SMNO did not require shipping companies to have manning levels that would also prioritise safe operations at sea, even if extra work were required, a deck officer became unfit for duty or any other irregularity occurred. The SMNO's assumptions that the minimum manning levels it specified would be more than met by the shipping companies and that there would always be additional crew members on board their ships were incorrect. SABINA had accommodation for 12 people – the ship's minimum safe manning was

11. On this particular voyage from Aalborg to Kotka, the shipping company allocated the only additional space (i.e. the 12th berth) to an electrician – that is, to a person from the engine department, who as a rule cannot carry out any deck work or, due to a lack of relevant qualifications, be posted on navigational watch.

2.2.12 Inadequate and non-existent checklists

The checklist concerning the handover of the watch did not explicitly mention the BNWAS. Switching on the BNWAS could therefore be forgotten even when completing the checklist. Enzian did not provide a checklist for the handover of the watch or for the start of sea passage.

The master had ordered his deck officers to use a checklist concerning the handover of the watch but had provided this checklist himself – in contrast, the other checklists used on board SABINA had been provided by the shipping company. The master had not written the checklist for the handover of the watch specifically for SABINA but copied it from an industry guide without making any adaptations. This checklist was therefore very general and did not include any explicit items regarding the BNWAS.

The fact that the master requested the use of his watch handover checklist shows that he considered it necessary and useful. There was apparent non-compliance concerning the use of the BNWAS – if this had not been the case, the shipping company would hardly have deemed it necessary to issue a corresponding reminder to its crews prior to the accident. In view of this non-compliance, it was not safety-conscious of the shipping company not to have created a company- and ship-specific checklist for the handover of the watch and not to have requested the use of this checklist. In the interests of safety, this checklist must include an explicit item regarding the use of the BNWAS. Such an explicit checklist item would also have made it harder to leave a BNWAS that had been deactivated deliberately switched off when taking over the watch. It would also have been conceivable to include such an item in a checklist for the start of the sea passage – another checklist Enzian did not have at the time of the accident.

In this context, it is worth mentioning that the Hellenic Bureau for Marine Casualties Investigation found very similar problems during its investigation into the casualty concerning INCE INEBOLU that occurred on 5 September 2014. At the time of that accident, there was no explicit mention of the BNWAS in the checklist for the handover of the watch – just as with SABINA. In its accident investigation report, the Bureau suggested explicitly mentioning the BNWAS in the checklist concerning the handover of the watch in future – to ensure that the system's operation is checked at each handover.

The mandatory international standards are lacking in regard to the obligation to provide process documentation and work instructions that are ergonomic and instrumental in safety.

2.2.13 Ruling out the consumption of alcohol

Within the hour following the casualty, SABINA's crew took alcohol breathalyser tests. This produced two negative results and one positive result for the second officer. There were no records as to which measuring device was used for which result, and one of the breathalysers that may have been used had a sensor that was unreliable and should have been replaced. All urine samples tested negative.

The VDR's audio and voice recordings, which were carefully analysed, did not reveal any evidence of alcohol consumption. Nor did any of the crew members accuse another crew member of having consumed any alcohol when they spoke to the STSB, even if this would have exonerated some of those involved.

This allows the conclusion to be made that the master, second officer, or other crew members were not under the influence of alcohol during the relevant period leading up to the accident.

2.2.14 Ruling out the problematic effects of the painkillers taken

As the second officer had a sore neck and a headache about 20 minutes before starting his night watch, he took two Farmadol tablets. However, taking this painkiller was not problematic, as its active ingredient is paracetamol, which is not associated with any side effects. Any kind of negative impact on the officer's physical performance while on watch, such as increased fatigue, dizziness or reduced responsiveness, was therefore not to be expected.

It is, however, a problem to start a navigational watch when feeling unwell (see section 2.2.2), even if one's impaired wellbeing can temporarily be helped by medication.

2.3 Organisational and systemic aspects

2.3.1 Debilitating working environment

For their respective watches after sunset, the master and second officer gave leave of absence to the respective lookouts. By doing so, the master set a bad example for his subordinate officers.

The second officer took over the watch from the master while feeling unwell. It is likely that the second officer did not want to be a burden to the master so soon after his joining SABINA by saying he was unfit for the upcoming watch. Although this is understandable to a certain extent, it does indicate that the second officer lacked safety consciousness and risk awareness.

The second officer, as the OOW, also failed to organise a replacement officer before leaving the bridge. The reason given for this behaviour was that he did not want to wake the master because the latter was tired and would be asleep by now. According to his statements, the second officer wanted to "*avoid trouble*". This justification may be understandable, but again it testifies to the second officer's lack of safety consciousness and risk awareness.

The actions taken and the actions not taken by the master and second officer show that the working culture on board SABINA was not safety-conscious or risk-aware, which put the safety of the ship and its crew at risk.

The shipping company's in-house crew training regarding its safety culture was insufficient. Enzian did not put its staff through a thorough induction course on safety culture or carry out any assessments to test the crew's knowledge regarding this matter. In fact, the means used by Enzian to familiarise its crew with maritime safety give the impression that the shipping company was out of touch with reality. And to a large extent, these means proved to be ineffective. Enzian expected, for example, that new crew members would thoroughly understand and learn its 200-plus-page shipboard management system in their spare time; the same applies to the written bulletins and reminders Enzian sent to its crews.

Given that (new) crew members were not properly inducted into the organisation's safety culture by Enzian, the absence of an effective safety culture on board SABINA is hardly surprising.

The international standards regarding shipping companies' in-house crew training are inadequate. The ISM Code's vaguely worded requirements for shipping companies' in-house training leave a lot of room for interpretation. Above all, they allow for the interpretation that a thorough induction by the shipping company into its

safety culture, including assessments to check the training's effectiveness, is not mandatory. Consequently, Enzian did not provide its crew members with any such training or assessments. Lloyd's Register, as the classification society that issued the document of compliance in accordance with the ISM Code and "*under the authority of the Government of the Swiss Confederation*", i.e. under the authority of the Swiss Maritime Navigation Office, accepted this.

2.3.2 Inadequate enforcement by the SMNO regarding the requirement to use a BNWAS

The SMNO did not enforce the requirement to use a BNWAS with the shipping companies and crews. Yet, as was the case with SABINA, the SMNO had only just carried out a flag state inspection on board the vessel a few days before the accident. The relevant report explicitly states that SABINA's BNWAS was tested during the flag state inspection. While the SMNO superintendent checked that the BNWAS was operational, for the assessment of how the equipment was actually used, he relied on statements made by only a few crew members. However, based on the findings uncovered during this investigation, it must be concluded that the information provided by the crew members in those SMNO interviews regarding the actual use of the BNWAS was not accurate. The SMNO did not employ any technological means to assess how the BNWAS was used, nor did the SMNO use any other means for corroboration.

Thus, the appraisal concerning the BNWAS during the flag state inspection and, ultimately, the SMNO's supervision regarding the crew members' compliance with international legislation were ineffective.

2.3.3 Inappropriate approach to the issue of fatigue in the shipboard management system

Enzian's shipboard management system and document S-105, 'What is fatigue?', referenced therein did not sufficiently cover the issue of fatigue. The aim of preventing fatigue among crew members by keeping to or exceeding the required minimum rest periods for safety purposes was not mentioned in the shipboard management system. The system itself did not put forward any strategies to prevent fatigue. Though document S-105 did, the strategies recommended there were unsuitable for life and work aboard an ocean-going vessel. Topics that are important to operations on board a seagoing ship, such as irregular working hours, unforeseen jobs, tight staffing levels and challenges with night watch, were not addressed in document S-105. The way the issue of fatigue was covered gives the impression that it was included in document S-105 just for appearances' sake – as a box-ticking exercise. Enzian's shipboard management system and document S-105 were inappropriate for the prevention of fatigue on board SABINA.

The ISM Code's vaguely formulated requirements for a shipping company's safety management manual leave much latitude for defining the concrete contents of such a manual. Above all, they allow for the interpretation that it is not mandatory to cover the issue of fatigue and address topics which are important to operations on board a seagoing vessel, such as irregular working hours, unforeseen jobs, tight staffing levels and challenges with night watch. Consequently, Enzian did not cover such issues in its safety management manual. Lloyd's Register, as the classification society that issued the document of compliance in accordance with the ISM Code and "*under the authority of the Government of the Swiss Confederation*", i.e. under the authority of the Swiss Maritime Navigation Office, accepted this.

2.3.4 Inadequate international standards regarding the training of seafarers in topics relating to human factors

The standards contained in the STCW Convention regarding the training of seafarers in topics relating to human factors are not sufficient. International legislation, namely the STCW Convention, contains certain standards for the training of seafarers with designated safety duties – which in practice includes virtually all crew members on board a seagoing cargo vessel – in topics relating to human factors (A-VI/1-4, 'Personal safety and social responsibilities'). However, evidence of competence in this regard is only required once for each seafarer. The STCW Convention currently does not require seafarers to attend regular refresher courses or provide new evidence of their competence. In contrast, for topics relating to personal survival techniques and to fire prevention and firefighting, for example, seafarers must provide corresponding evidence of competence every five years.

The requirements for the training and certification of ratings forming part of a navigational watch, as set out in section and table A-II/4 of chapter II of the STCW Convention, are essentially limited to technical or nautical aspects. The requirements do not include the ability to assess one's own or other crew members' fitness for duty on navigational watch or the ability to notify the master in the event of incapacity or suspected incapacity of the OOW or any other issues that might jeopardise safety. For the training and certification of ratings forming part of a navigational watch, the concept or culture of 'speaking up' is not a requirement either.

In addition to the training relating to human factors for seafarers with designated safety duties described above, the training of masters (A-II/2) and deck officers (A-II/1) also contains certain, albeit rudimentary, requirements for topics relating to human factors. Although there is a provision for regularly revalidating a competence by passing a test or completing a refresher course, this is probably hardly ever applied in practice, as proof of competence can also be demonstrated by practical experience. The master and second officer on board SABINA had sufficient practical experience, meaning that they did not need to pass a test or attend a refresher course. However, particularly with regards to topics relating to human factors, practical experience alone does not seem adequate to learn about the latest safety concepts, emerging problem areas in the industry and developments in the global safety culture.

It can be assumed that the majority of crew members do not attend any extra training, neither in terms of course contents nor training frequency, in addition to what they are required to attend by international law. The fact that individual crew members on board SABINA – specifically the master, second officer and lookout – did not act in the interests of safety with regards to human factors is understandable to a certain extent against this backdrop; nevertheless, it is a failing for safety reasons.

2.3.5 Inadequate knowledge of the bridge navigational watch alarm system

The second officer had not been instructed on the functionality and operation of the bridge navigational watch alarm system (BNWAS) between his joining SABINA and the incident. The master as well as the chief officer and second officer exhibited inadequate knowledge of the ship's BNWAS.

All three of the aforementioned crew members gave the following reason for not noticing that the BNWAS had remained switched off after leaving Aalborg: The system had one or more motion sensors, and while on navigational watch, the crew members would move on the bridge, meaning that it was therefore only logical that normally they would not be prompted (visually or acoustically) by the system to press a reset push button. However, this logic does not quite add up, as the only

motion sensor of the BNWAS was located on the system's control panel, which had been installed in a corner next to the bridge control console. Large areas of the bridge were therefore not covered at all by this single motion sensor.

Inadequate knowledge of shipboard systems is problematic for a number of reasons. It can, for example, mislead users into a false sense of security. It can also cause scepticism about the system and lead to it being used inappropriately or not being used at all.

Mandatory international standards are incomplete with regard to ship-specific instructions for new crew members.

2.3.6 Sections in the minimum safe manning document that are not conducive to safety

SABINA's minimum safe manning document, issued by the SMNO, had a comment under the heading 'Exceptional circumstances' which explained what should be done if the rules concerning the minimum number of crew as set out in the minimum safe manning document could not be met due to unforeseen and unavoidable circumstances. However, this comment contains contradictions: On the one hand, it clearly states that the crew must be completed at the first opportunity. On the other hand, it says that a formal statement from the master must be submitted to the SMNO either before departure or immediately after arrival. With this section, the SMNO implies that a voyage that has not yet begun may still be started with an incomplete crew. This comment represents a regulation with an emphasis on trading aspects, which is not conducive to safety. A comparison with a minimum safe manning document issued for another Swiss-flagged seagoing cargo vessel showed that this regulation was also present on that document.

SABINA's minimum safe manning document also permitted the ship's trading area to be worldwide and stated that SABINA was considered "*safely manned*" worldwide if manned by at least the crew complement as defined in this document. The minimum number of crew required according to this document included two deck officers (chief officer and second officer) in addition to a master. However, the Swiss Navigation Ordinance indicates that three teams must alternate for watch duty at sea and that, apart from on long-distance coastal navigation, the master must not be involved in watchkeeping. Complying with this rule for worldwide voyages and navigation on the high seas would therefore have required three deck officers in addition to the master: a chief officer, second officer and third officer. Thus, the permission contained in SABINA's minimum safe manning document stood in contrast with a safety-related provision set out in the Swiss Navigation Ordinance.

2.3.7 Supervision by the Swiss Maritime Navigation Office being little effective

Certain aspects of the supervision by the Swiss Maritime Navigation Office (SMNO) developing little effect have already been set out in other sections (see sections 2.2.7, 2.2.8, 2.2.9, 2.2.11, 2.3.1, 2.3.2, 2.3.6 and 2.3.8). The section below outlines the underlying causes for these aspects' ineffectiveness.

- Frequency of flag state inspections: These inspections were carried out too infrequently. Although the SMNO had set a target of subjecting each of the ocean-going cargo vessels under its supervision to one flag state inspection carried out by an SMNO superintendent per year, in reality, each of these vessels was inspected less frequently than once every 16 years, on average. Because the frequency of flag state inspections was too low, the SMNO did not obtain an adequate picture of the ships' operations at sea and therefore was not able to supervise the fleet's operations effectively.
- Objectives and content of flag state inspections: The SMNO did not consider its primary role to be checking and enforcing the applicable rules on the ships, but

rather as a helper and partner of the shipping companies to assist them in passing port state controls. Trust was of greater importance to the SMNO than policing. Any deficiencies found remained without consequences even though legal instruments were available to address them. Written records were checked by the SMNO only little critically. Technical equipment for data collection was not used during flag state inspections.

- Understanding of one's rights and responsibilities: The SMNO saw itself more as a service provider for the shipping companies (it was meant to supervise) than as a supervisory authority. Statements made by various SMNO staff give the impression that the SMNO staff were too trusting and lacked a critical mindset. The SMNO also had a certain aversion to conflict and tended to focus on having good rapport with the supervised parties. However, this approach is not consistent with the role assigned to the SMNO by Switzerland's Navigation Act. For technical and operational supervision, the SMNO heavily relied on the classification societies. Even if it is understandable that authorities outsource or delegate certain tasks or work due to a lack of resources, the outsourcing authority should at the very least ensure that the organisation mandated with the job actually carries out the work in line with the outsourcing authority's expectations. This was not the case here.
- Resources and their use: Despite the significant growth in the fleet over the years, the SMNO's staffing levels have not increased. More staff would have been a necessity to supervise the now larger fleet. The reason for the limited staff is, on the one hand, that the SMNO's superiors did not create any additional positions within the SMNO and, on the other hand, that the SMNO was not particularly insistent in its demands for more staff. As a result, the SMNO had too few resources to carry out effective supervisory activities and made inappropriate use of the available resources.

Therefore, the supervision of the Swiss seagoing merchant fleet by the Swiss Maritime Navigation Office (SMNO) was only of little effect.

2.3.8 Problematic impact of federal guarantees on supervision

The fact that the Swiss Confederation acted simultaneously as supervisory body (SMNO) and guarantor (FONES) led to a constant conflict of objectives and interests. An interruption of operations ordered by the supervisory authority due to safety issues had the potential to affect the government's financial interests. Just the enforcement of regulations instrumental in safety, possibly through effective financial sanctions, could have caused shipping companies financial difficulties. The SMNO reported feeling perpetually constrained and that "*their hands were tied*". The SMNO felt exposed to undue pressure by senior members of the Federal Administration and by people within FONES to not take any measures against the shipping companies that would have serious financial consequences for them. The SMNO gave in to this pressure and refrained from imposing appropriate sanctions on shipping companies for any contraventions. This contributed to ineffective supervision by the SMNO.

A system in which one government agency grants federal guarantees while another authority acts as the supervisory body is inherently subject to a conflict of objectives and interests. Having said that, the responsibilities of FONES and of the SMNO were clear and, in fact, appropriately separated by law; the legal basis was such that effective supervision by the SMNO would have been possible. With regard to safety, the federal guarantees granted by the Federal Office for National Economic Supply (FONES) had problematic effects on the SMNO's supervisory activities.

2.3.9 Deliberately switched-off bridge navigational watch alarm systems

The facts gathered during the investigation into the casualty of 15 October 2015 concerning SABINA only allow the conclusion that SABINA's officers of the watch did deliberately not use the bridge navigational watch alarm system, which – had it been switched on – would have prevented the accident (see section 2.2.3). The facts also suggest that the BNWAS on board SABINA was often deliberately switched off when at sea.

SABINA is not an isolated case in this respect: in various incidents that occurred in European waters in the past involving cargo ships at sea, a BNWAS was available but deliberately switched off.

2.4 Importance of the applicable regulations

The casualty concerning SABINA off the coast of Bornholm on 15 October 2015 could have been prevented by compliance with applicable regulations, or by enforcing them.

2.5 Mitigating actions taken by third parties

The crew on board the MADS JAKOBSEN rescue vessel used warning sounds, light signals and banging on the hull to attract someone's attention on the general cargo ship SABINA. By doing so, they managed to alert SABINA's fitter to the risk of a collision with Bornholm island. Although this warning did not enable the general cargo ship's crew to avert the grounding, their course alteration and the braking manoeuvre initiated substantially mitigated the severity of the grounding and its consequences.

Rønne Rescue Station, or rather the crew of the MADS JAKOBSEN rescue vessel, had been alerted by the Danish Joint Rescue Coordination Centre (JRCC), which had been informed of the situation by the Maritime Assistance Service (MAS). The MAS, in turn, had been notified of SABINA's off-course navigation by the transit pilot on duty on board KRONVIKEN.

Thanks to the attentiveness of the transit pilot on board KRONVIKEN, the effective alerting system of the Danish authorities (MAS and JRCC) and the courageous intervention of the volunteers working on board the rescue vessel MADS JAKOBSEN, the Swiss-flagged general cargo ship SABINA did not crash into the coast of Bornholm unbraked and without anyone in control of her in the night of 15/16 October 2015, but only briefly ran aground, the consequences of which were limited. It should also be noted that the crew on board MADS JAKOBSEN carried out their mission even at the cost of damaging their own vessel.

3 Conclusions

3.1 Findings

3.1.1 Background

- On 5 and 6 October 2015, SABINA was subjected to a flag state inspection conducted by the SMNO in Aalborg, Denmark.
- Shortcomings that had an impact on the casualty which occurred the following week were not found during this flag state inspection.
- On 7 October 2015, a new second officer came on board.

3.1.2 Voyage and incident

- At 03:10 UTC on 15 October 2015, SABINA cast off from Aalborg (Denmark) for her voyage to Kotka (Finland).
- At 21:00 UTC, the second officer took over the watch from the master, which was to last until 01:00 UTC on 16 October 2015.
- Shortly before, the second officer had taken some painkillers for a headache, and he felt “*very tired*” when he took over the watch.
- At the time of the watch handover, the master had not slept for at least 21 hours.
- At 21:30 UTC, the lookout on navigational watch with the second officer left the bridge after having been asked by the second officer on several occasions to do so and went to his cabin.
- From that point onwards, 21:30 UTC, the second officer was the sole person on the bridge. Sporadically, he fell asleep.
- At 22:05 UTC, SABINA passed a waypoint heading towards 096° without changing course as had been set out in the passage plan.
- During the 40 minutes that followed and before SABINA left Bornholmsgat TSS, the course was not altered.
- At 22:45 UTC, the second officer left the bridge and went to his cabin to take some more painkillers for his headache.
- Once in his cabin, the second officer experienced some kind of blackout, collapsed and remained lying on the floor.
- The bridge was unmanned from 22:45 UTC onwards.
- Meanwhile, the autopilot kept SABINA on a course of 096°, which would have ultimately resulted in a collision with the Danish island of Bornholm.
- At 22:50 UTC, the transit pilot on board a crude oil tanker attempted to make contact with SABINA after he noticed that she had strayed off course. As he did not succeed, he alerted a shore-based service of the situation, which in turn notified other shore-based services.
- Various attempts by shore-based stations to contact SABINA by radio and telephone proved unsuccessful as the bridge was unmanned.
- At 23:14 UTC, Rønne Rescue Station on Bornholm island was alerted.
- The station’s MADS JAKOBSEN rescue vessel then cast off from the port of Rønne and headed towards SABINA.

- The crew on board MADS JAKOBSEN resorted to several means to attract someone's attention on SABINA, waking the fitter in the process, who then woke the master.
- At 23:42 UTC, SABINA's master reached the bridge, set the engine control system to the 'full astern' position and put the helm hard to starboard.
- Shortly thereafter, SABINA struck the ground off the coast of Bornholm on several occasions. The shortest distance between the vessel's hull and the rocky coast was between 20 and 50 metres.
- SABINA dropped anchor nearby.
- Initially, no leaks were detected on SABINA's hull.
- The Danish authorities gave the ship clearance to continue her journey.
- At about 01:45 UTC, SABINA continued her passage to Kotka.
- Around noon on 16 October 2015, SABINA's leaks were detected for the first time.
- On 18 October 2015, SABINA arrived at the port of Kotka.
- The night of 18/19 October 2015, SABINA was transferred to Tallinn (Estonia) for repair work.
- SABINA's bridge navigational watch alarm system (BNWAS) had been switched off during the preparations for the departure from Aalborg and indeed during the remaining course of the voyage until the accident occurred.

3.1.3 Safety culture and compliance on board SABINA

- In addition to SABINA's bridge navigational watch alarm system not being switched on, other available shipboard safety and alarm systems that would have improved the safety of the watch and of navigation were also not used.
- On the passage from Aalborg to Kotka, the minimum rest period requirements were not complied with, and the officers of the watch were extremely tired.
- It was not unusual for SABINA's OOW to conduct the navigational watch by himself at night-time, i.e. without a dedicated lookout. This is contrary to international regulations and the shipping company's guidelines.
- The BNWAS on board SABINA was often deliberately switched off when at sea. This is contrary to international regulations and the shipping company's guidelines.

3.1.4 Supervision

- The SMNO, the authority responsible by law for the supervision of maritime navigation under the Swiss flag, attached greater importance to its function as a service provider agency for the shipping companies than to its function as a supervisory authority.
- The SMNO's approach to documents provided by the crews, shipping companies and classification societies did not allow for actual circumstances and was characterised by overly optimistic assumptions about the quality of these organisations' work.
- The SMNO lacked resources for effective supervision, and the expertise of the supervisory authority's staff was insufficient.

- The use of the resources available was not sufficiently focused on the priorities of effective supervision.
- For technical and operational supervision, the SMNO heavily relied on the classification societies.
- The SMNO had an inaccurate understanding of how the classification society performed the jobs it had been tasked with.
- Deficiencies identified during flag state inspections conducted by the SMNO remained without consequences.
- Technical equipment for data collection was not used during flag state inspections.

3.1.5 International standards

- In order to achieve a high level of safety, the ISM Code leaves too much room for interpretation in the area of the requirements for the shipping companies' in-house training of seafarers and in the area of the requirements for the content of shipping companies' safety management manuals.
- In order to achieve a high level of safety, the standards contained in the STCW Convention regarding the training of seafarers in human factors topics and in bridge resource management are not sufficient.
- International law lacks standards that require effective crew support and fleet monitoring.

3.2 Causes, contributing factors and risk-increasing factors

In order to achieve its objective of prevention, a safety investigation authority shall express its opinion on risks and hazards that have been identified during the investigated incident and which should be avoided in the future. In this sense, the terms and formulations used below are to be understood exclusively from the perspective of prevention. The identification of causes and contributing factors does not, therefore, in any way imply assignment of blame or the determination of administrative, civil or criminal liability. The *Code of the International Standards and Recommended Practices for a Safety Investigation into a Marine Casualty or Marine Incident (Casualty Investigation Code)*, adopted by the *Maritime Safety Committee of the International Maritime Organization* (Resolution MSC.255(84) of 16 May 2008), in its Part I, Chapter 1, as well as in its Part III, Chapter 16, states that a safety investigation should not refrain from fully reporting on the factors that led to the marine incident because fault or liability may be inferred from the findings.

3.2.1 Direct causes

The accident in which the general cargo ship SABINA ran aground off the coast of Bornholm, Denmark, at night was due to the ship sailing without someone on the bridge for a considerable period of time and the crew being unable to intervene in a timely manner.

The following aspects have been identified as the direct causes of the accident:

- The officer of the watch, who was unfit for duty, carried out his duties without a lookout and left the bridge without having previously arranged for a replacement officer.
- For a duration of approximately one hour, during which course changes would have been planned and necessary, and until shortly before grounding, the bridge was unmanned.
- The crew members, who were all asleep at the time, were not warned of the impending collision with the island of Bornholm by the bridge navigational watch alarm system or by the shipping company.

3.2.2 Directly contributing factors

The following aspects have been identified as directly contributing factors of the accident:

- Equipment available on the bridge of the general cargo ship could have been used for a safe navigation but was not used by the officers of the watch. This can be attributed to a lack of instruction; inadequate knowledge of systems; and, possibly, to a bridge navigational watch alarm system which, in terms of ergonomics, featured an unfavourable design.
- Certain crew members lacked adequate awareness concerning the limits of human performance and fatigue. This resulted in a problematic handover of the watch to the officer of the watch on duty, inadequate situational awareness, and risk-taking.
- On the occasion of the flag state inspection the week before the accident, the Swiss Maritime Navigation Office did not intervene even though rest period regulations had not been followed.

3.2.3 Systemic causes

The following aspects have been identified as the systemic causes of the accident:

- The obligation to use the BNWAS was neither enforced nor systematically monitored by the shipping company and the supervisory authority.
- As various incidents around Europe have shown, it was not unusual among cargo ships to deliberately let the BNWAS being switched off during navigation.

3.2.4 Systemically contributing factors

The following aspects have been identified as systemically contributing factors of the accident:

- Within the shipping company, a working environment debilitating safety prevailed, and the ships' crews were insufficiently supported and monitored.
- The approach to the issue of fatigue in the shipboard management system was inappropriate.
- The International Safety Management Code requirements regarding shipping companies' in-house training were loosely interpreted by the shipping company. This was accepted by the supervisory authority.
- International standards regarding the training of seafarers in topics relating to human factors and bridge resource management, the requirements a safety management manual must meet, the shipping companies' in-house training, and crew support and fleet monitoring by shipping companies were non-existent, inadequate or incomplete.

3.2.5 Risk-increasing factors

The following aspects have been identified as risk-increasing factors. Even when not or not provably having affected the development of the accident, these factors nevertheless should be remedied to reach an improvement in safety:

- The officers of the watch showed a poor handling of the master's standing orders.
- The familiarisation of new crew members with the operating procedures of the ship and the shipping company were ineffective.
- The minimum safe manning document contained sections which were not conducive to safety.
- The continuation of the sea passage following the accident was high-risk.
- A checklist for the start of the sea passage did not exist, and the content of the checklist for changing over the watch was inadequate.
- The supervision over the Swiss fleet of ocean-going cargo vessels by the supervisory authority was ineffective to a large extent, especially with regard to the flag state inspections, the understanding of the authority's own rights and responsibilities, and its business processes, all of which were consequences of lacking resources and a lack of expertise.
- With regard to safety, the impact of federal guarantees on supervision were problematic.
- The voyage data recorder had been defective for several months before the accident.

4 Safety recommendations, safety advice and measures taken since the incident

Safety recommendations

Swiss legislation stipulates the following regarding safety recommendations in the Ordinance on the Safety Investigation of Transport Incidents (OSITI, SR 742.161):

“Art. 48 Safety recommendations

¹ The STSB shall submit the safety recommendations to the competent supervisory body. If the supervisory body is a federal authority, the STSB shall also notify the competent department. In the case of urgent safety issues, it shall notify the competent department immediately.

^{1bis} It shall submit safety recommendations to foreign authorities if this is required by international agreements.

² The recipients of the safety recommendations shall report to the STSB periodically on the implementation of the recommendations or on the reasons why they have decided not to take measures.

^{2bis} If the recipient is a federal authority, it shall also report to the competent department.

^{2ter} The STSB shall respond to the federal offices' implementation reports. It may respond to the federal authorities' implementation reports for the attention of the competent department.

³ The competent department may instruct the competent federal office to implement recommendations.”

The STSB publishes the answers of the relevant federal office or foreign supervisory authorities at <https://www.sust.admin.ch> to provide an overview of the current implementation status of the relevant safety recommendation.

Safety advice

The STSB may publish safety advice in response to any safety deficit identified during the investigation. Safety advice shall be formulated if a safety recommendation does not appear to be appropriate, if it is not formally possible, or if the less prescriptive form of safety advice is likely to have a greater effect. The legal basis for STSB safety advice can be found in article 56 of the OSITI:

“Art. 56 Information on incident prevention

The STSB may compile and publish general information on incident prevention.”

All national, supranational or international bodies, all operators of ships or shipping infrastructure, and all organisations and individuals are invited to act in line with the safety recommendations and safety advice issued and to take such measures as will increase maritime safety.

4.1 Safety recommendations

4.1.1 Improving how conflicting objectives and interests created by federal guarantees are handled

4.1.1.1 Safety deficit

With regard to safety, the impact of the guarantees granted by the Swiss Confederation, or rather the Federal Office for National Economic Supply (FONES), on the supervisory activities performed by the Swiss Maritime Navigation Office (SMNO) was problematic.

The fact that the Swiss Confederation acted simultaneously as supervisory body (via the SMNO) and guarantor (via FONES) led to a constant conflict of objectives and interests. An interruption of operations ordered by the regulator due to safety issues had the potential to affect the government's financial interests – with millions of Swiss francs at stake for each ship concerned. Just the enforcement of regulations instrumental in safety, possibly through effective financial sanctions, could have caused shipping companies financial difficulties. The SMNO reported feeling constrained and that their hands were tied. They were put under pressure by senior members of the Federal Administration and by people within FONES to not take any measures against the shipping companies that would have financial consequences for them. The SMNO gave in to the pressure and refrained from imposing appropriate sanctions on shipping companies for any contraventions. This contributed to ineffective supervision by the SMNO.

A system in which one government agency grants federal guarantees while another acts as the regulator is inherently subject to a conflict of objectives and interests. Having said that, the responsibilities of FONES and of the SMNO were clear and, in fact, appropriately separated by law. In terms of safety, the situation became problematic because the SMNO felt exposed to undue pressure from other parts of the federal administration and was thereby prevented from carrying out effective supervisory activities. The SMNO's superiors, the Directorate of International Law and the Federal Department of Foreign Affairs, may not have recognised this problem, but they certainly did not mitigate it.

4.1.1.2 Safety recommendation no. 189

The Federal Department of Foreign Affairs (FDFA), which according to the Swiss Navigation Act is responsible for the "*direct supervision*" of maritime navigation under the Swiss flag, should – together with the Federal Department of Economic Affairs, Education and Research (EAER), the FDFA's Directorate of International Law, the Swiss Maritime Navigation Office (SMNO), the Federal Office for National Economic Supply (FONES) and, if necessary, other agencies dealing with maritime navigation within the Federal Administration – ensure that the authorities involved and their staff verifiably deal with the conflicting objectives and interests, i.e. economic efficiency on the one hand and safety-related supervisory activities on the other, in such a way that the SMNO can effectively supervise maritime navigation under the Swiss flag as it sees fit and in compliance with its legal mandate.

4.1.2 Improving the way maritime navigation under the Swiss flag is supervised

4.1.2.1 Safety deficit

The level of supervision of the Swiss seagoing merchant fleet by the Swiss Maritime Navigation Office (SMNO) was ineffective to a large extent. This was, at least in part, due to a lack of human resources within the supervisory authority.

4.1.2.2 Safety recommendation no. 190

The Federal Department of Foreign Affairs (FDFA) – which according to the Swiss Navigation Act is responsible for the “*direct supervision*” of maritime navigation under the Swiss flag – should systematically and continuously check that the Swiss Maritime Navigation Office’s (SMNO’s) safety-related supervisory activities are sufficiently effective in order that a high degree of maritime safety can be attained, and that the SMNO fulfils its legal mandate as set out in the Navigation Act; if necessary, the FDFA should take corrective measures, especially with regard to the human resources provided to the authority, or seek appropriate amendments to the regulations.

4.1.3 Improving the shipping company’s in-house training regarding safety culture and compliance

4.1.3.1 Safety deficit

The shipping company concerned in the marine casualty under investigation did not put its crew members through a thorough induction course to its safety culture or any proper training on safety and compliance, nor did the shipping company carry out any assessments to test the crew’s knowledge regarding this matter. In fact, the means used by the shipping company to familiarise its crews with maritime safety give the impression that the shipping company was unrealistic. To a large extent, the means used proved to be ineffective.

The requirements of the International Management Code for the Safe Operation of Ships and for Pollution Prevention (International Safety Management Code, or ISM Code) for a shipping company’s in-house training leave much room for interpretation. Above all, they allow for the interpretation that a thorough induction by the shipping company into its safety culture and its requirements regarding compliance, including assessments to check the training’s effectiveness, is not mandatory. Consequently, the shipping company did not provide its crews with such training and assessments.

4.1.3.2 Safety recommendation no. 191

The Swiss Maritime Navigation Office (SMNO), as the supervisory authority for maritime navigation under the Swiss flag, should, within the framework of its existing powers and scope of action, effectively enforce the applicable rules regarding the shipping companies’ in-house crew training relating to safety culture and compliance so that a high degree of maritime safety can be attained; the SMNO should also monitor the outcome in such a manner that it gains a realistic picture of the situation. Should the SMNO come to the conclusion that its existing powers or the existing rules in this regard are inadequate, the SMNO should present its case to the relevant national or international stakeholders and seek appropriate amendments to the regulations.

4.1.4 Improving the shipping company’s in-house training regarding technical equipment

4.1.4.1 Safety deficit

The second officer had not been instructed on the technical functionality of SABINA’s bridge navigational watch alarm system (BNWAS) between his joining SABINA and the incident. The master as well as the chief officer and second officer exhibited inadequate knowledge of the ship’s BNWAS.

Inadequate knowledge of shipboard systems is problematic for a number of reasons. It can, for example, mislead users into a false sense of security. It can also

cause scepticism about the system and lead to it being used inappropriately or not being used at all.

The requirements of the International Management Code for the Safe Operation of Ships and for Pollution Prevention (International Safety Management Code, or ISM Code) for a shipping company's in-house training leave much room for interpretation. Above all, they allow for the interpretation that a thorough and ship-specific induction into the technical equipment available, including assessments to check the training's effectiveness, is not mandatory. Consequently, the shipping company concerned in the casualty under investigation did not provide its crews with any in-depth training or assessments.

4.1.4.2 Safety recommendation no. 192

The Swiss Maritime Navigation Office (SMNO), as the supervisory authority for maritime navigation under the Swiss flag, should, within the framework of its existing powers and scope of action, effectively enforce the applicable rules regarding the shipping companies' in-house crew training relating to ship-specific technical equipment so that a high degree of maritime safety can be attained; the SMNO should also monitor the outcome in such manner that it gains a realistic picture of the situation. Should the SMNO come to the conclusion that its existing powers or the existing rules in this regard are inadequate, the SMNO should present its case to the relevant national or international stakeholders and seek appropriate amendments to the regulations.

4.1.5 Ensuring sufficient manning levels

4.1.5.1 Safety deficit

According to the internationally applicable STCW Convention, the officer in charge of the navigational watch must not hand over the watch to the relieving officer if there is reason to believe that the latter is not capable of carrying out the watch-keeping duties effectively. In such a case – according to the code – the master must be notified.

If, as in this investigated incident, the master is the officer of the watch (OOW) to be relieved and the relieving OOW is unlikely to effectively perform their watch-keeping duties, the master must or would be required to make himself aware of this fact ('hierarchical short circuit'). It is obvious here that, due to a lack of escalation options, the principle of an unbiased assessment of the problem by a third, higher-ranking person cannot be followed. It would be safety-conscious if an OOW could always turn to a third, higher-ranking person for help with problems regarding watchkeeping duties. However, by explicitly allowing the master to be involved in watchkeeping for long-distance coastal navigation, the Navigation Ordinance is exacerbating the issue of a lack of escalation options. The ordinance appears to make it impossible for the Swiss Maritime Navigation Office to enforce the availability of sufficient deck officers so that the master does not normally have to be involved in watchkeeping, for example, through an appropriately devised minimum safe manning document.

4.1.5.2 Safety recommendation no. 193

The Swiss Maritime Navigation Office (SMNO), as the supervisory authority for maritime navigation under the Swiss flag, should, within the framework of its existing powers and scope of action, effectively apply the existing rules regarding the determination of minimum safe manning so that a high level of maritime safety can be attained and monitor the outcome in such a manner that it gains a realistic picture of the situation. When determining minimum safe manning levels, the SMNO should pay particular attention to ensuring that, as a bare minimum, the master is

never scheduled as the OOW on a Swiss-flagged seagoing cargo vessel, that he is acting as the OOW only under very rare and unusual circumstances, and that crew members taking turns on navigational watch are not engaged in a watch system that is considered prone to fatigue and to failure to maintain a proper watch. Should the SMNO come to the conclusion that its existing powers or the existing rules in this regard are inadequate, the SMNO should present its case to the relevant national or international stakeholders and seek appropriate amendments to the regulations.

4.1.6 Improving the safety management manual

4.1.6.1 Safety deficit

The way the issue of fatigue was covered in the safety management manual of the shipping company concerned in the casualty under investigation was inadequate. The safety management manual itself did not put forward any strategies to prevent fatigue. Though documents referenced therein did offer strategies, the strategies recommended were unsuitable for life and work aboard an ocean-going vessel. The safety management manual did not address topics that are important to operations on board a seagoing ship, such as irregular working hours, unforeseen jobs, tight staffing levels and challenges with night watch.

The requirements of the International Management Code for the Safe Operation of Ships and for Pollution Prevention (International Safety Management Code, or ISM Code) for a shipping company's safety management manual leave much room for interpretation. Above all, they allow for the interpretation that it is not mandatory to cover the issue of fatigue and address topics which are important to operations on board a seagoing vessel, such as irregular working hours, unforeseen jobs, tight staffing levels, challenges with night watch or similar issues. Consequently, the shipping company did not properly cover the issue of fatigue in its safety management manual, which was accepted by the SMNO.

4.1.6.2 Safety recommendation no. 194

The Swiss Maritime Navigation Office (SMNO), as the supervisory authority for maritime navigation under the Swiss flag, should, within the framework of its existing powers and scope of action, effectively enforce the applicable rules regarding the shipping companies' preparation and maintenance of their own safety management manual, ensuring that such a manual covers all aspects essential for a high degree of maritime safety, and the SMNO should then monitor the outcome in such a manner that it gains a realistic picture of the situation. Should the SMNO come to the conclusion that its existing powers or the existing rules in this regard are inadequate, the SMNO should present its case to the relevant national or international stakeholders and seek appropriate amendments to the regulations.

4.1.7 Improving the use of the bridge navigational watch alarm system on Swiss seagoing cargo vessels

4.1.7.1 Safety deficit

SABINA's crew members who were sleeping in their cabins were not alerted to the unmanned bridge by the bridge navigational watch alarm system (BNWAS).

The BNWAS could not perform its alarm function because during the voyage concerned, it was switched off at least up to the time of the accident. An activated BNWAS would have woken the master and chief officer by emitting an audible alarm in their cabins no later than 12 minutes and 30 seconds after the second officer, the officer of the watch (OOW), had left the bridge. Had the BNWAS been switched on, the master and the chief officer would have been able to avert the

imminent collision with Bornholm island at 22:58 UTC by altering the ship's course. At that time, SABINA was still at a safe distance of about 10 nautical miles off the island of Bornholm.

On 9 September 2015, about five weeks before the accident, SABINA's then chief officer was appointed master. As part of his appointment, the shipping company sent him an email reminding him that the BNWAS must be in operation whenever the ship is underway at sea.

The master stated that he forgot to turn on the BNWAS when casting off from Aalborg. This is difficult to understand given that turning on the BNWAS was an explicit item on the departure checklist. According to the entry in the deck logbook, this checklist had been completed on departure.

On the morning of 15 October 2015 (the day of the accident), the shipping company sent another email, requesting once again that the BNWAS be switched on at all times.

On the day of the accident and in the hours beforehand, the master and nautical officers were therefore fully aware of the requirement for the BNWAS to be switched on – this was not merely 'at the back of their minds' as they had just been reminded by the shipping company that very day.

There were also several navigational watch changes between casting off from the port of Aalborg at 03:10 UTC and the handover of the watch at 21:00 UTC, during which the officers concerned should have noticed that the BNWAS had not been switched on. The checklist for changing over the watch requires the relieving OOW to ensure that all navigational and safety equipment that will be used or is likely to be used during the watch is operational. The master had ordered the use of this checklist in writing. According to the records in the deck logbook, the checklist had in fact been completed on several occasions prior to the accident.

The facts presented draw the conclusion that SABINA's officers of the watch deliberately failed to use the BNWAS, which – had it been switched on – would have prevented the accident. This constitutes a reckless violation of an established and safety-relevant rule of maritime navigation.

All this – together with the fact that even eight months after the casualty off the coast of Bornholm, SABINA's BNWAS was still switched off during large parts of a sea passage even though the ship was navigated by a different crew – suggests that the BNWAS on board SABINA was often deliberately switched off when at sea. That the shipping company felt compelled to send a reminder to its crews regarding the operation of the BNWAS – even before the casualty off the coast of Bornholm concerning SABINA – indicates that compliance with the BNWAS rules left much to be desired, not only on board SABINA, but also on other vessels in Enzian's fleet.

4.1.7.2 Safety recommendation no. 195

The Swiss Maritime Navigation Office (SMNO), as the supervisory authority for maritime navigation under the Swiss flag, should, within the framework of its existing powers and scope of action, effectively enforce the applicable rules regarding the use of the bridge navigational watch alarm system so that a high level of maritime safety can be attained on Swiss seagoing cargo vessels. The Office should then monitor the outcome in such a manner that it gains a realistic picture of the situation – for example, via a requirement for shipping companies to systematically and broadly analyse the data of ship data recorders by (i.e. to perform voyage operations quality assurance – VOQA) in conjunction with corresponding monitoring by the SMNO, or through random evaluations of ship data recorder data on the occasion of flag state inspections by the SMNO itself or by a commissioned service

provider, each combined with strict enforcement and effective sanctioning. Should the SMNO come to the conclusion that its existing powers or the existing rules in this regard are inadequate, the SMNO should present its case to the relevant national or international stakeholders and seek appropriate amendments to the regulations.

4.1.8 Improving the use of the bridge navigational watch alarm system on a global scale

4.1.8.1 Safety deficit

SABINA's crew members who were sleeping in their cabins were not alerted to the unmanned bridge by the bridge navigational watch alarm system (BNWAS).

The BNWAS could not perform its alarm function because it was switched off during the voyage concerned. An activated BNWAS would have woken the master and chief officer by emitting an audible alarm in their cabins no later than 12 minutes and 30 seconds after the second officer, the officer of the watch (OOW), had left the bridge. Had the BNWAS been switched on, the master and the chief officer would have been able to avert the imminent collision with Bornholm island at 22:58 UTC by altering the ship's course. At that time, SABINA was still at a safe distance of about 10 nautical miles off the island of Bornholm.

The facts gathered during the investigation only allow the conclusion that SABINA's OOWs deliberately failed to use the BNWAS, which – had it been switched on – would certainly have prevented the accident. The facts also suggest that the BNWAS on board SABINA was often deliberately switched off when at sea.

SABINA is not an isolated case in this respect: in various incidents that occurred in European waters in the past involving cargo ships at sea, a BNWAS was available but (in some instances deliberately) switched off.

4.1.8.2 Safety recommendation no. 196

The International Maritime Organization (IMO) should conduct or task an appropriate organisation with conducting a study to further investigate why it is not uncommon for crews to go to sea with their bridge navigational watch alarm system (BNWAS) turned off. In particular, the study should look into the seafarers' views on or possible reasons for their reluctance to use the equipment in terms of the system's ergonomic design. Based on the study's results, appropriate changes should be made to the international standards regarding BNWAS design requirements.

4.1.9 Improvements in the area of minimum safe manning

4.1.9.1 Safety deficit

SABINA's minimum safe manning document issued by the Swiss Maritime Navigation Office (SMNO) had a comment under the heading 'Exceptional circumstances' which explained what should be done if the minimum number of crew required as set out in the minimum safe manning document could not be met due to unforeseen and unavoidable circumstances. However, this comment contains contradictions. On the one hand, it clearly states that the crew must be completed at the first opportunity. On the other hand, it says that a formal statement from the master must be submitted to the SMNO either before departure or immediately after arrival. In this section, the SMNO implied that a voyage that has not yet begun may still be started with an incomplete crew. This represents a regulation with a focus on commercial trading aspects, which is not conducive to safety. A comparison with a minimum safe manning document from another Swiss-flagged ocean-going cargo vessel showed that this regulation was also present on that document.

SABINA's minimum safe manning document permitted the ship's trading area to be worldwide and stated that SABINA was considered "*safely manned*" worldwide if manned by at least the crew complement as defined in this document. The minimum number of crew required according to this document included, in particular, two deck officers (chief officer and second officer) in addition to a master. However, the Swiss Navigation Ordinance indicates that three teams must alternate for watch duty at sea and that, apart from on long-distance coastal navigation, the master must not be involved in watchkeeping. Complying with this rule for worldwide voyages and navigation on the high seas would therefore indeed have required three deck officers in addition to the master: a chief officer, second officer and third officer. Thus, the permission contained in SABINA's minimum safe manning document stood in contrast with a safety-related provision set out in the Swiss Navigation Ordinance.

4.1.9.2 Safety recommendation no. 197

The Swiss Maritime Navigation Office (SMNO), as the supervisory authority for maritime navigation under the Swiss flag, should review its minimum safe manning document and any existing templates, processes and practices within this context so that a high degree of maritime safety can be attained, and ensure that these documents, templates, processes and practices comply with the legal requirements. The SMNO should effectively communicate any changes made to the affected shipping companies and crews and enforce those changes.

4.1.10 Improving the understanding of the SMNO's role

4.1.10.1 Safety deficit

The supervisory authority's understanding of its own rights and responsibilities was inappropriate in several respects. For instance, the Swiss Maritime Navigation Office (SMNO) saw itself more as a service provider for the shipping companies (it was meant to supervise) than as a supervisory authority. However, this perception is not consistent with the role assigned to the SMNO by the Navigation Act. Furthermore, for technical and operational supervision, the SMNO heavily relied on the classification societies. Even if it is understandable that authorities outsource or delegate certain tasks or work due to a lack of resources, the outsourcing authority should at the very least ensure that the organisation mandated with the job actually carries out the work in line with the outsourcing authority's expectations. This was not the case here: the outsourcing agency, the SMNO, had an inaccurate grasp of how the classification society performed the jobs it had been tasked with.

The SMNO's objectives of the few flag state inspections conducted were not appropriate for an effective supervision. The SMNO did not consider its primary role to be checking and enforcing the applicable rules on the ships, but rather as a helper and partner of the shipping companies to assist them in passing port state controls. Trust was of greater importance to the SMNO than policing. Any deficiencies found remained without consequences even though legal instruments were available to address them. For instance, written records that experience has shown are sometimes whitewashed were not examined thoroughly by the SMNO. Safety-relevant aspects for which there would have been reason for scrutiny and for which reliable information and data were available were not checked by the SMNO. Technical equipment for data collection was not used during flag state inspections. All of this is indicative of an incorrect understanding within the SMNO of its proper role and responsibilities as a supervisory authority.

Although "*criminal offences against the safety of the ship and of navigation*" or "*against the rules of order in Swiss navigation*" are liable to punishment under the criminal law provisions set out in the Navigation Act, and although the SMNO, as

the “*authority reporting*”, is required by law to report the violations it has identified, at least in the years from 2010 to 2017, the SMNO did not report any such contraventions. In fact, the SMNO did not report any contraventions to the competent prosecuting authority after its flag state inspection on board SABINA on 5 and 6 October 2015, when the SMNO found that minimum rest periods had not been complied with. It also did not report any contraventions after the accident on 15 October 2015 concerning SABINA, even though the ship and navigation had been put at risk when the second officer left his post and when various safety-related navigation rules had been violated. Sanctioning mistakes that happen despite all precautions is usually not conducive to improving safety. However, even from the perspective of safety, behaviour that jeopardises safety and is not tolerated should be consistently punished.

4.1.10.2 Safety recommendation no. 198

The Swiss Maritime Navigation Office (SMNO), as the supervisory authority for maritime navigation under the Swiss flag, should consistently fulfil its role as a rule-enforcing authority as stipulated in the Swiss Navigation Act to attain a high degree of maritime safety – in particular as regards to its flag state inspections and concerning sanctions.

4.1.11 Improvements in the area of business processes

4.1.11.1 Safety deficit

Business processes crucial for safety-relevant supervisory activities of the Swiss Maritime Navigation Office (SMNO) were not defined, were defined insufficiently or inappropriately or were not implemented.

4.1.11.2 Safety recommendation no. 199

In order to reach a high level of safety for the Swiss merchant fleet, the Swiss Maritime Navigation Office (SMNO), as the supervisory authority for maritime navigation under the Swiss flag, should develop and define its safety-related business process, for example in terms of recruitment and employee training, in such way that they systematically and effectively help fulfil the SMNO’s supervisory responsibilities as defined by Switzerland’s Navigation Act. Examples include the following:

- The SMNO should increase the quality of its flag state inspections in such manner that the SMNO’s own objectives and, in combination with the SMNO’s other supervisory activities, the internationally recognised objectives regarding supervision by the flag state. Raising the quality of inspections should entail the increased and systematic use of technical equipment to obtain and analyse retrospective and reliable data. In order to identify discrepancies in flag state inspection reports or inadequately conducted flag state inspections, appropriate quality control or review processes should be implemented.
- As part of its process of issuing minimum safe manning documents, the SMNO in its relevant application forms should collect the information that should be taken into account according to the relevant IMO resolution.
- The SMNO should systematise and strengthen its governance of the classification societies acting “*under the authority of the Government of the Swiss Confederation*” in such a manner that it gains a realistic picture of the services provided by the classification societies under its supervision and/or authority. Furthermore, the SMNO should adapt and specify the powers granted to the classification societies in such a way that a high degree of safety for maritime navigation under the Swiss flag can be attained. The processes for the supervision

of classification societies, as required by the IMO and the SOLAS Convention, should be implemented.

- The SMNO should systematically collect safety-related findings obtained from marine accident investigations worldwide and take them into account for its supervisory activities.
- The SMNO should make greater use of modern technologies if this is conducive to increasing maritime safety for Swiss-flagged vessels.

4.1.12 Improvements to international standards

4.1.12.1 Safety deficit

The safety investigation into the accident of 15 October 2015 concerning SABINA revealed that certain international conventions, in particular the STCW Convention and the SOLAS Convention, are not sufficient to ensure a high level of maritime safety. In particular, these conventions lack the following:

- Requirements regarding the shipping companies' in-house training of their crews, specifically relating to safety culture and compliance as well as ship-specific technical equipment;
- Requirements regarding the shipping companies' preparation and provision of their own safety management manual which covers all aspects essential to achieving high safety standards;
- Requirements for the training of seafarers in topics relating to human factors:
 - Regular refresher courses for seafarers with designated safety duties on the topic of personal safety and social responsibilities;
 - Inclusion of training on topics relating to human factors, in particular assessing one's own fitness for duty, assessing the fitness for duty of other crew members on navigational watch, notifying the master in the event of incapacity or suspected incapacity of the OOW or any other issues that might jeopardise safety, and the concept and culture of 'speaking up' in the training of ratings forming part of a navigational watch;
 - Regular refresher courses in topics relating to human factors for masters and deck officers, regardless of their level of experience;
- Requirement for shipping companies to support their crews on board seagoing cargo vessels in decisions that are instrumental to safety (crew support);
- Requirement for shipping companies to monitor ocean-going cargo vessels continuously and in real time (fleet monitoring);
- Requirements for the training of seafarers in bridge resource management:
 - Training for deck officers on the best possible use of the equipment and alarm systems available for effective watchkeeping and maximum situational awareness;
 - Regular refresher courses for deck officers on the best possible use of the equipment and alarm systems available for effective watchkeeping and maximum situational awareness.

4.1.12.2 Safety recommendation no. 200

The Swiss Maritime Navigation Office (SMNO) should lobby the International Maritime Organization (IMO) in favour of a high safety standard for maritime navigation

and encourage the relevant international conventions, in particular the STCW Convention and the SOLAS Convention, to be amended with additional requirements as follows.

- Requirements regarding the shipping companies' in-house training of their crews, specifically relating to safety culture and compliance as well as ship-specific technical equipment;
- Requirements regarding the shipping companies' preparation and provision of their own safety management manual which covers all aspects essential to achieving high safety standards;
- Requirements for the training of seafarers in topics relating to human factors:
 - Regular refresher courses for seafarers with designated safety duties on the topic of personal safety and social responsibilities;
 - Inclusion of training on topics relating to human factors, in particular assessing one's own fitness for duty, assessing the fitness for duty of other crew members on navigational watch, notifying the master in the event of incapacity or suspected incapacity of the OOW or any other issues that might jeopardise safety, and the concept and culture of 'speaking up' in the training of ratings forming part of a navigational watch;
 - Regular refresher courses in topics relating to human factors for masters and deck officers, regardless of their level of experience;
- Requirement for shipping companies to support their crews on board seagoing cargo vessels in decisions that are instrumental to safety (crew support);
- Requirement for shipping companies to monitor ocean-going cargo vessels continuously and in real time (fleet monitoring);
- Requirements for the training of seafarers in bridge resource management:
 - Training for deck officers on the best possible use of the equipment and alarm systems available for effective watchkeeping and maximum situational awareness;
 - Regular refresher courses for deck officers on the best possible use of the equipment and alarm systems available for effective watchkeeping and maximum situational awareness.

4.1.12.3 Safety recommendation no. 201

The International Maritime Organization (IMO) should, for a high level of maritime safety, amend the relevant international conventions, in particular the STCW Convention and the SOLAS Convention, with the following additional requirements:

- Requirements regarding the shipping companies' in-house training of their crews, specifically relating to safety culture and compliance as well as ship-specific technical equipment;
- Requirements regarding the shipping companies' preparation and provision of their own safety management manual which covers all aspects essential to achieving high safety standards;
- Requirements for the training of seafarers in topics relating to human factors:
 - Regular refresher courses for seafarers with designated safety duties on the topic of personal safety and social responsibilities;
 - Inclusion of training on topics relating to human factors, in particular assessing one's own fitness for duty, assessing the fitness for duty of other

crew members on navigational watch, notifying the master in the event of incapacity or suspected incapacity of the OOW or any other issues that might jeopardise safety, and the concept and culture of 'speaking up' in the training of ratings forming part of a navigational watch;

- Regular refresher courses in topics relating to human factors for masters and deck officers, regardless of their level of experience;
- Requirement for shipping companies to support their crews on board seagoing cargo vessels in decisions that are instrumental to safety (crew support);
- Requirement for shipping companies to monitor ocean-going cargo vessels continuously and in real time (fleet monitoring);
- Requirements for the training of seafarers in bridge resource management:
 - Training for deck officers on the best possible use of the equipment and alarm systems available for effective watchkeeping and maximum situational awareness;
 - Regular refresher courses for deck officers on the best possible use of the equipment and alarm systems available for effective watchkeeping and maximum situational awareness.

4.2 Safety advice

4.2.1 Improving the shipping company's in-house training

4.2.1.1 Safety deficit

The crew members involved in the accident under investigation had inadequate knowledge in several areas. This partly contributed to the occurrence of the accident under investigation. All these areas of inadequate knowledge must be viewed as risk-increasing.

4.2.1.2 Safety advice no. 45

Swiss shipping companies should train their crew members by implementing in particular the following:

- Comprehensive induction courses to familiarise their crews with the company's safety culture and compliance requirements (these courses should also include assessments to check the training's effectiveness);
- Comprehensive introduction courses to ship-specific technical equipment (these courses should also include assessments to check the training's effectiveness);
- Increased training of seafarers in topics relating to human factors:
 - Regular refresher courses for seafarers with designated safety duties on the topic of personal safety and social responsibilities;
 - Inclusion of training on topics relating to human factors, in particular assessing one's own fitness for duty, assessing the fitness for duty of other crew members on navigational watch, notifying the master in the event of incapacity or suspected incapacity of the OOW or any other issues that might jeopardise safety, and the concept and culture of 'speaking up' in the training of ratings forming part of a navigational watch;
 - Regular refresher courses in topics relating to human factors for masters and deck officers, regardless of their recent navigation experience;
- Increased training in bridge resource management, especially:

- Initial training for deck officers on the best possible use of the equipment and alarm systems available for effective watchkeeping and maximum situational awareness;
- Regular refresher courses for deck officers on the best possible use of the equipment and alarm systems available for effective watchkeeping and maximum situational awareness.

4.2.2 Ensuring sufficient manning levels

4.2.2.1 Safety deficit

According to the internationally applicable STCW Convention, the officer in charge of the navigational watch must not hand over the watch to the relieving officer if there is reason to believe that the latter is not capable of carrying out the watchkeeping duties effectively. In such a case – according to the STCW Convention – the master must be notified.

If, as in this investigated incident, the master is the officer of the watch (OOW) to be relieved, and the relieving OOW is unlikely to effectively perform their watchkeeping duties, the master must or would be required to make himself aware of this fact ('hierarchical short circuit'). It is obvious here that, due to a lack of escalation options, the principle of an unbiased assessment of the problem by a third, higher-ranking person cannot be followed. It would be safety-conscious if an OOW could always turn to a third, higher-ranking person for help with problems regarding navigational watch duties.

4.2.2.2 Safety advice no. 46

When determining minimum safe manning levels, Swiss shipping companies should pay attention to ensuring that, as a bare minimum, the master is never scheduled to act as the OOW (or is scheduled to do so only under very rare and unusual circumstances) and that deck officers taking turns on navigational watch should not be engaged in a watch system that is considered prone to fatigue and to failure to maintain a proper watch.

4.2.3 Improving the safety management manual

4.2.3.1 Safety deficit

The way the issue of fatigue was covered in the safety management manual of the shipping company concerned in the casualty under investigation was inadequate. The safety management manual itself did not put forward any strategies to prevent fatigue. Though documents referenced therein did, the strategies recommended were unsuitable for life and work aboard an ocean-going vessel. The safety management manual did not address topics that are important to operations on board a seagoing ship, such as irregular working hours, unforeseen jobs, tight staffing levels and challenges with night watch or similar issues.

The requirements of the International Management Code for the Safe Operation of Ships and for Pollution Prevention (International Safety Management Code, or ISM Code) for a shipping company's safety management manual leave much room for interpretation. Above all, they allow for the interpretation that it is not mandatory to cover the issue of fatigue and address topics which are important to operations on board a seagoing vessel, such as irregular working hours, unforeseen jobs, tight staffing levels and challenges with night watch or similar issues. Consequently, the shipping company did not properly cover the issue of fatigue in its safety management manual, which was accepted by the competent classification society and by the Swiss Maritime Navigation Office.

4.2.3.2 Safety advice no. 47

When preparing and providing their safety management manual, Swiss shipping companies should ensure that they cover all aspects essential to achieving high safety standards.

4.2.4 Shipping companies should put in place crew support and fleet monitoring

4.2.4.1 Safety deficit

The shipping company was not able to intervene when SABINA followed a course that was not in line with the passage plan and the intended port of arrival, and that led directly to the island of Bornholm.

Until the shore-based services informed the shipping company about the situation (shortly before the collision), the company was unaware that one of its own vessels was about to crash into Bornholm island. This was because the shipping company did not operate a system to monitor its fleet.

For safety reasons, it is a failing that relatively simple technological means or organisational systems which would improve the fleet's safety are not used.

4.2.4.2 Safety advice no. 48

Swiss shipping companies should systematically support their crews in decisions that are instrumental to safety (crew support) and continuously monitor their ocean-going cargo vessels (fleet monitoring) – this work can be outsourced or conducted in-house.

4.2.5 Improved use of bridge navigational watch alarm systems

4.2.5.1 Safety deficit

SABINA's crew members who were sleeping in their cabins were not alerted to the unmanned bridge by the bridge navigational watch alarm system (BNWAS).

The BNWAS could not perform its alarm function because it was switched off during the voyage concerned. An activated BNWAS would have woken the master and chief officer by emitting an audible alarm in their cabins no later than 12 minutes and 30 seconds after the second officer, the officer of the watch (OOW), had left the bridge. Had the BNWAS been switched on, the master and the chief officer would have been able to avert the imminent collision with Bornholm island at 22:58 UTC by altering the ship's course. At that time, SABINA was still at a safe distance of about 10 nautical miles off the island of Bornholm.

On 9 September 2015, about five weeks before the accident, SABINA's then chief officer was appointed master. As part of his appointment, the shipping company sent him an email, reminding him that the BNWAS must be in operation whenever the ship is underway at sea.

The master stated that he forgot to turn on the BNWAS when casting off from Aalborg. This is difficult to understand given that turning on the BNWAS was an explicit item on the departure checklist. According to the entry in the deck logbook, this checklist had been completed on departure.

On the morning before the accident, the morning of 15 October 2015, the shipping company sent another reminder via email, requesting once again that the BNWAS be switched on at all times.

On the day of the accident and in the hours beforehand, the master and nautical officers were therefore fully aware of the requirement for the BNWAS to be

switched on – this was not merely ‘at the back of their minds’ as they had just been reminded by the shipping company that very day.

There were several navigational watch changes between casting off from the port of Aalborg at 03:10 UTC and the handover of the watch at 21:00 UTC during which the officers concerned should have noticed that the BNWAS had not been switched on. The checklist for changing over the watch requires the relieving OOW to ensure that all navigational and safety equipment that will be used or is likely to be used during the watch is operational. The master had ordered the use of this checklist in writing. According to the records in the deck logbook, the checklist had in fact been completed on several occasions prior to the accident.

The facts gathered during the investigation only allow the conclusion that SABINA’s officers of the watch deliberately neglected to use the BNWAS, which – had it been switched on – would have prevented the accident. This constitutes a reckless violation of an established and safety-relevant rule of maritime navigation.

All this – together with the fact that even eight months after the casualty off the coast of Bornholm, SABINA’s BNWAS was still switched off during large parts of a sea passage even though the ship was navigated by a different crew – suggests that the BNWAS on board SABINA was often deliberately switched off when at sea. That the shipping company felt compelled to send a reminder to its crews regarding the operation of the BNWAS – even before the casualty off the coast of Bornholm concerning SABINA – indicates that compliance with the BNWAS rules left much to be desired, not only on board SABINA, but also on other vessels of the shipping company’s fleet.

4.2.5.2 Safety advice no. 49

For reaching a high level of maritime safety, Swiss shipping companies should effectively enforce the use of the bridge navigational watch alarm systems on board their ocean-going cargo ships and monitor the use of these systems in such a manner that allows them to gain a realistic picture of the situation – for example, by systematically analysing a wide range of VDR data (i.e. performing voyage operations quality assurance).

4.3 Measures taken since the incident

The measures known to the STSB are listed below without comment.

In December 2022, at the request of the STSB, the Directorate of International Law of the Federal Department of Foreign Affairs and the Swiss Maritime Navigation Office named the following measures that had been taken since the accident on October 15, 2015.

- There is now a so-called “*cooperation agreement*” between the SMNO and the FONES. This agreement, in its version dated 1 December 2022, establishes the different roles of SMNO and FONES.
- Additional inspections are being carried out on Swiss ocean-going cargo ships. These inspections – carried out on behalf of the SMNO by an external service provider – concern ships calling at a port in the Paris Memorandum of Understanding (Paris MoU) area.
- At the beginning of 2022, an inspection regime was established, according to which all ships should be inspected by the SMNO or by third parties at least once a year. In 2022, a total of 15 ships sailed under the Swiss flag, and 18 inspections were carried out.

- In its communication with shipping companies, the SMNO focuses on safety.
- The SMNO maintains an on-call service since 1 April 2021 which ensures permanent availability and prompt treatment of accidents.
- The SMNO has been allocated an additional 1.2 full-time positions since 2015.
- As part of the development of the maritime strategy and the renewal of shipping legislation, a practical sanctioning system is being sought.
- The technical nautical knowledge in the SMNO was temporarily increased from 2019 to 2022 by a nautical expert as head of the office.

This final report has been approved by the Swiss Transportation Safety Investigation Board (article 10(h) of the Ordinance on the Safety Investigation of Transport Incidents of 17 December 2014).

Bern, 21 January 2025

Swiss Transportation Safety Investigation Board

Appendix

21 November 2009: Casualty concerning S. GABRIEL

Vessel	101-metre general cargo ship gross tonnage: 4,454
Investigating authority	Federal Bureau of Maritime Casualty Investigation of the Federal Republic of Germany
Location of incident	Off the south coast of the Azores island of São Miguel in the Atlantic Ocean
Time of day	04:59 (local time)
Course of events	After a course alteration was carried out too late, S. GA- BRIEL ran aground.
Officer of the watch	The OOW was fatigued, and his ability to concentrate was impaired while on navigational watch. It is possible that he fell asleep in the wheelhouse.
Lookout	There was no lookout posted on the bridge.
BNWAS	Installed and turned off.
Damage to vessel	Total loss
Date of report publication	1 November 2010

3 August 2011: Incident concerning KARIN SCHEPERS

Vessel	141-metre container ship gross tonnage: 7,852
Investigating authority	Marine Accident Investigation Branch of the United Kingdom
Location of the incident	Off Pendeen in the UK, in the Land's End traffic separation scheme in the Celtic Sea
Time of day	03:36 (local time)
Course of events	After the vessel's course had not been altered at a way-point as intended in the passage plan, KARIN SCHEPERS entered the Land's End traffic separation scheme in a lane facing the opposite direction of traffic flow and then ran aground.
Officer of the watch	The OOW, who according to the plan was supposed to be on navigational watch, had unexpectedly been relieved and ordered from the bridge by the master. Exacerbated by fatigue and alcohol consumption, the master fell asleep in the wheelhouse shortly afterwards, whereupon KARIN SCHEPERS sailed for more than two hours virtually without anyone in control of her, crossing a TSS traffic lane in the wrong direction and then running aground.
Lookout	There was no lookout posted on the bridge.
BNWAS	Installed and turned off. The use of the BNWAS was not required by the master, and it had not been used for several months at the time of the casualty. The failure to use the BNWAS was attributed to the ineffective implementation of the shipping company's safety management system on board KARIN SCHEPERS and to insufficient scope of the company's audits.
Damage to vessel	None
Date of report publication	May 2012

12 December 2012: Casualty concerning BEAUMONT

Vessel	90-metre general cargo ship gross tonnage: 2,545
Investigating authority	Marine Accident Investigation Branch of the United Kingdom
Location of incident	Off Cabo Negro on the Spanish Atlantic coast
Time of day	04:08 (local time)
Course of events	After the vessel had drifted off from its intended route, which went undetected, and BEAUMONT's course was not corrected, the ship ran aground.
Officer of the watch	Exacerbated by fatigue, the OOW fell asleep in the wheelhouse while on navigational watch. He slept for roughly one hour and until the ship ran aground.
Lookout	There was no lookout posted on the bridge. He had been sent off the bridge by the OOW.
BNWAS	Installed and turned off. The BEAUMONT's BNWAS had rarely, if ever, been used. The reason given for not switching it on was that the system was not yet mandatory on board BEAUMONT at the time of the casualty and its use was not explicitly required by the shipping company.
Damage to vessel	Plate and frame damage
Date of report publication	June 2013

26 February 2013: Casualty concerning DOUWENT

Vessel	80-metre general cargo ship gross tonnage: 1,311
Investigating authority	Marine Accident Investigation Branch of the United Kingdom
Location of incident	Haisborough Sands in the North Sea
Time of day	02:56 (local time)
Course of events	After a deviation from the intended route due to an incorrectly programmed navigation device that had not been detected and the vessel's course was not corrected, DOUWENT ran aground.
Officer of the watch	It is understood that the OOW fell asleep in the wheelhouse while on navigational watch.
Lookout	There was no lookout posted on the bridge. He had been sent off the bridge by the OOW.
BNWAS	A bridge watch alarm of unknown standardisation and design was installed and switched off.
Damage to vessel	Lost rudder
Date of report publication	January 2014

16 March 2013: Casualty concerning DANIO

Vessel	80-metre general cargo ship gross tonnage: 1,499
Investigating authority	Marine Accident Investigation Branch of the United Kingdom
Location of incident	Off the north-east coast of England
Time of day	03:30 (local time)
Course of events	After intentionally deviating from the original and safe planned route and failing to recognise the land mass ahead of the ship, DANIO ran aground.
Officer of the watch	Exacerbated by fatigue, the OOW fell asleep in the wheelhouse while on navigational watch. He slept until the ship ran aground.
Lookout	There was no lookout posted on the bridge.
BNWAS	Installed and turned off. Installation and operation of a BNWAS was not yet mandatory on board DANIO at the time of the casualty. The shipping company had not suggested the use of a BNWAS, and its use was not mandated by the vessel's safety management system. The master and the OOW at the time of the accident were not fully aware of the benefits of a BNWAS, were not familiar with the unit installed on board DANIO, and indeed had never used the system.
Damage to vessel	Frame and plate damage, as well as damage to propulsion and steering system
Date of report publication	April 2014

14 June 2013: Casualty concerning FRI OCEAN

Vessel	90-metre general cargo ship gross tonnage: 2,218
Investigating authority	Marine Accident Investigation Branch of the United Kingdom
Location of incident	In the Sound of Mull on the west coast of Scotland
Time of day	01:22 (local time)
Course of events	After the vessel's course was not altered at a waypoint as intended in the passage plan and the braking manoeuvre initiated at the last second was too late to take effect, FRI OCEAN ran aground.
Officer of the watch	While on navigational watch, the OOW fell asleep in the wheelhouse for about 15 minutes and did not wake up until seconds before the grounding.
Lookout	There was no lookout posted on the bridge. Shortly before midnight, the master had decided that the night watch from midnight to 04:00 would not require a lookout. He therefore relieved the designated AB from his lookout duties.
BNWAS	Installed and turned off. The BNWAS on board FRI OCEAN had not always been switched on. At the time of the accident, there was no requirement for a BNWAS to be fitted and used on board FRI OCEAN. The shipping company's safety management system did not stipulate its use. The master and OOW at the time of the accident were not fully aware of the benefits of a BNWAS.
Damage to vessel	Plate and frame damage
Date of report publication	December 2013

8 March 2014: Casualty concerning YUSUF CEPNIOGLU

Vessel	116-metre container ship gross tonnage: 4,984
Investigating authority	Hellenic Bureau for Marine Casualties Investigation
Location of incident	Off the Greek island of Mykonos in the Mediterranean Sea
Time of day	05:30 (local time)
Course of events	After the course had not been altered at a waypoint as intended in the passage plan, YUSUF CEPNIOGLU ran aground.
Officer of the watch	Exacerbated by fatigue, the OOW fell asleep in the wheelhouse while on navigational watch.
Lookout	There was no lookout posted on the bridge.
BNWAS	Installed and turned off.
Damage to vessel	Total loss
Date of report publication	March 2015 (interim report, which contains all of the information presented above)

5 September 2014: Casualty concerning INCE INEBOLU

Vessel	183-metre bulk carrier gross tonnage: 30,011
Investigating authority	Hellenic Bureau for Marine Casualties Investigation
Location of incident	Off the Greek island of Astypalaia in the Mediterranean Sea
Time of day	04:05 (local time)
Course of events	After an attempt to return to the vessel's charted course (having encountered drift) had not been completed, INCE INEBOLU ran aground.
Officer of the watch	Exacerbated by fatigue, the OOW fell asleep in the wheel-house while on navigational watch. He slept for over two hours and until the ship ran aground. The decision of the OOW to undertake the watch despite fatigue was associated with his relatively limited experience as an officer (11 months), his young age (25 years), relatively short time on board INCE INEBOLU (barely five months) and a self-imposed pressure (wanting to show a can-do attitude).
Lookout	There was no lookout posted on the bridge. The lookout scheduled for the navigational watch – an AB – had been relieved of his lookout duties. The reason was that he was engaged with cleaning work in the cargo holds, which had to be carried out the day before and the day after by all ABs. The master's focus on the trading aspects of the vessel at the expense of safety was associated with the fact that he had only been with the shipping company for a short time and that he had attached too much importance to the vessel's trading targets set by the company.
BNWAS	Installed and turned off. The BNWAS on board INCE INEBOLU was not equipped with motion sensors, and the dormant period had to be reset manually each time via a reset push button. Two days earlier, during the passage through the Suez Canal, the BNWAS had been switched off because the bridge team and the pilot felt that the system was disturbing their navigational work. After the ship passed the Suez Canal, the BNWAS remained switched off. The bridge checklist for the handover of the watch, which could have revealed that the BNWAS was switched off, did not explicitly request for this system to be switched on. In its accident investigation report, the Hellenic Bureau for Marine Casualties Investigation suggested explicitly mentioning the BNWAS in the checklist concerning the handover of the watch to ensure that the system's operation would be checked at each handover.
Damage to vessel	Plate and frame damage
Date of report publication	December 2015

18 February 2015: Casualty concerning LYSBLINK SEAWAYS

Vessel	129-metre general cargo ship gross tonnage: 7,407
Investigating authority	Marine Accident Investigation Branch of the United Kingdom
Location of incident	In the Sound of Mull on the west coast of Scotland
Time of day	01:32 (local time)
Course of events	After a failure to alter the course at several waypoints as intended in the passage plan, LYSBLINK SEAWAYS ran aground.
Officer of the watch	The OOW had been on the bridge but had lost situational awareness due to his consumption of alcohol.
Lookout	There was no lookout posted on the bridge.
BNWAS	Installed and turned off. It was normal practice on board LYSBLINK SEAWAYS to use the radar watch alarm instead of the BNWAS, a practice assumed to be a clever hack. The reason for this assumption was that the reset push button of the radar watch alarm could be conveniently pressed without having to leave the wheelhouse chair, even by a fatigued officer. The reset push button of the BNWAS, in contrast, was installed further away.
Damage to vessel	Total loss
Date of report publication	November 2015

7 August 2015: Near miss concerning MUSKETIER

Vessel	90-metre general cargo ship gross tonnage: 2,545
Investigating authority	Marine Accident Investigation Office of the Government of Gibraltar
Location of incident	In the Dover Strait traffic separation scheme, English Channel
Time of day	20:35 UTC
Course of events	MUSKETIER entered the traffic separation scheme's wrong lane and sailed against the general traffic flow for more than one and a half hours.
Officer of the watch	Overcome by the consumption of alcohol and medication, the master had left the wheelhouse while on navigational watch and fallen asleep in his cabin.
Lookout	There was no lookout posted on the bridge.
BNWAS	Installed and switched off. The master had turned off the BNWAS when he left the wheelhouse.
Damage to vessel	None
Date of report publication	May 2016