Bundesstelle für Seeunfalluntersuchung
Federal Bureau of Maritime Casualty Investigation

Investigation Report 285/20

Serious Marine Casualty

Allision with a lock gate at Kiel-Holtenau on the Kiel Canal (NOK) by the multi-purpose vessel ELSE on 29 August 2020

26 October 2022

This investigation was conducted in conformity with the Law to improve safety of shipping by investigating marine casualties and other incidents (Maritime Safety Investigation Law – SUG). According to said Law, the sole objective of this investigation is to prevent future accidents. This investigation does not serve to ascertain fault, liability or claims (Article 9(2) SUG).

This report should not be used in court proceedings or proceedings of the Maritime Board. Reference is made to Article 34(4) SUG.

The German text shall prevail in the interpretation of this investigation report.

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1 SUMMARY

At 0507[1] on 29 August 2020, the Panama-registered multi-purpose vessel ELSE, approaching from Kiel Fjord in calm weather and good visibility, sailed head-on into the gate of the north chamber in the NOK's 'Neue Schleuse' lock at Kiel-Holtenau, which was fully closed at that time, and her bow remained trapped in the gate.

Contrary to the arrangement made with the Kiel-Holtenau pilot station, the ship had passed the Holtenau Pilot boarding point, which is situated north-east of the lock entrance on the southern edge of the Holtenau roadstead and plotted on the navigational chart, about ten minutes earlier without waiting there for the pilot to board, which was arranged for 0600. Instead, the ELSE turned into the lock entrance at about 0500 and then headed directly for the closed lock gate at a constant speed of some 5-6 kts and with minor course alterations that were undoubtedly made with the aim of entering the lock until the very last.

The watchkeeper at the pilot station and Vessel Traffic Service (VTS) NOK noticed the ELSE's dangerous course at about 0505 and called her ship's command on VHF in an attempt to make them aware of the error and turn back. Although the ship responded orally to the radio messages, she did not comply with the request to turn around and return to the pilot boarding point immediately but continued her voyage unperturbed. The ELSE's bow inevitably sailed into the lock gate two minutes later.

The gate was heavily deformed in the process but in conjunction with a stop manoeuvre carried out by the ship in the meantime was able to reduce the ELSE's speed to zero.

Neither the ELSE's crew members nor personnel on the lock facility were harmed during the accident. No pollutants were released. Two tugs were ordered to attend the scene of the accident and succeeded in freeing the ELSE from her predicament at around 1055. They then towed the still buoyant vessel to the nearby Lindenau-Werft shipyard for the investigation and damage assessment.

VTS NOK took the lock's north chamber out of service and the south chamber was used for incoming and outgoing NOK traffic in the days that followed. The damaged gate was dismantled and replaced by a spare one.

[1] Unless otherwise stated, all times shown in this report are local (CEST or UTC + 2 hours).

2 FACTUAL INFORMATION

2.1 Photograph of the ship

Figure 1: Multi-purpose vessel ELSE[2]

2.2 Ship particulars

Name of ship:	ELSE
Type of ship:	Multi-purpose vessel
Flag:	Panama
Port of registry:	Panama
IMO number:	9006320
Call sign:	3FCY6
Owner:	RIVABULK SHIPBROKERS LTD, Istanbul
Shipping company:	REGENCY SHIP MANAGEMENT SA, Istanbul
Year built:	1993
Shipyard:	Peene-Werft, Wolgast, Germany
Classification society:	Polish Register of Shipping (IACS)
Length overall:	87.86 m
Breadth overall:	12.80 m
Draught (max.):	5.47 m
Gross tonnage:	2,449
Deadweight:	3,729 t
Engine rating:	600 kW
Main engine:	Deutz MWM SBV 8 M628
(Service) speed (max.):	10 kts
Hull material:	Steel
Minimum safe manning:	8

2.3 Voyage particulars

Port of departure:	Klaipėda, Lithuania
Port of call:	Les Sables-d'Olonne, France
Type of voyage:	Merchant shipping/ international

[2] Source: Hasenpusch Photo-Productions.

Cargo information:	3,000 t ammonium nitrate (fertiliser)
Manning:	9
Draught at time of accident:	5.30 m
Pilot on board:	No
Canal helmsman:	No

2.4 Marine casualty information

Type of marine casualty:	Serious marine casualty; allision with closed lock gate
Date/Time:	29/08/2020, 0507
Location:	Kiel-Holtenau; approach channel to the north chamber in the NOK's 'Neue Schleuse' lock[3] at Kiel-Holtenau, coming from the Baltic Sea
Latitude/Longitude:	φ 54°21.9'N λ 010°08.7'E
Ship operation and voyage segment:	Fairway mode/approaching the NOK
Consequences:	Damage to the ELSE's fore section; water ingress in the forepeak; heavy damage to the outer gate of the north chamber of the NOK's 'Neue Schleuse' lock; chamber out of service for several days

Extract from the *Häfen von Kiel* [Kiel ports] Navigational Chart, BSH[4] No. 34 (INT 1365)

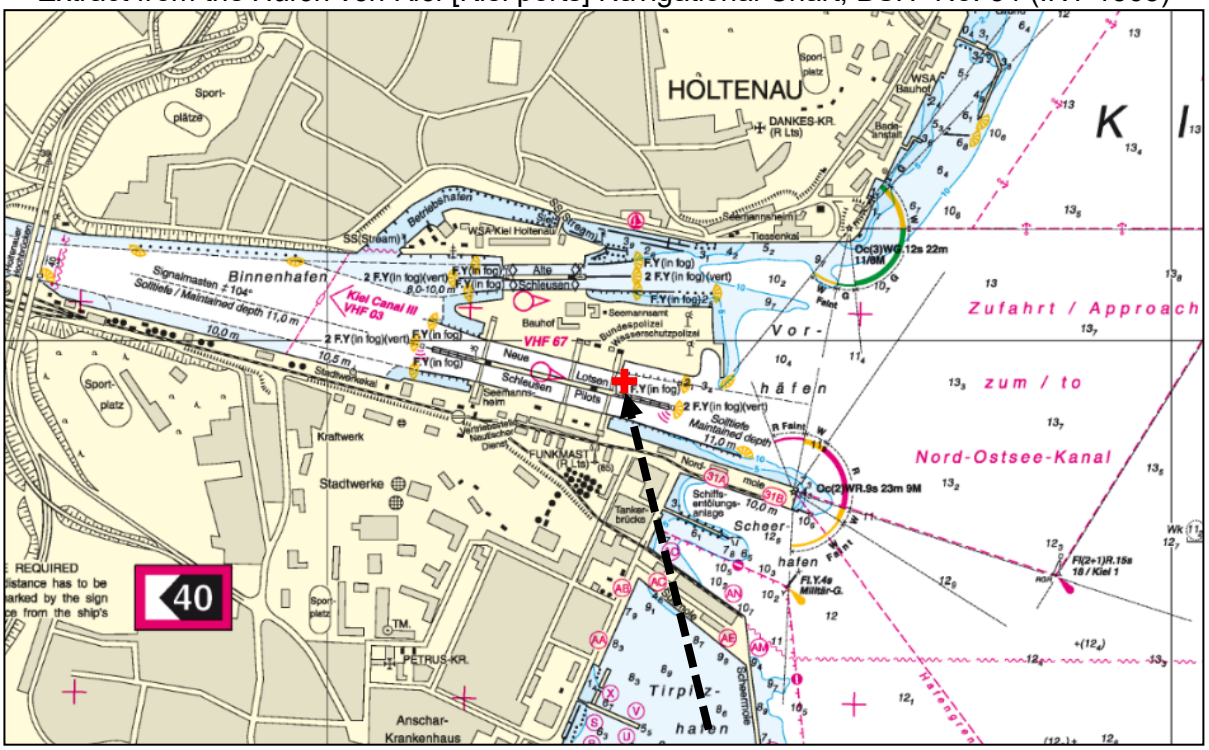


Figure 2: Scene of the accident

[3] Note: Also known as the 'Große Schleuse' lock.
[4] BSH: Federal Maritime and Hydrographic Agency.

2.5 Shore authority involvement and emergency response

Agencies involved:	Federal Waterways and Shipping Agency (GDWS), Duty Station Kiel; Federal Waterways and Shipping Office (WSA) NOK[5]; VTS NOK; Waterway Police (WSP) Kiel
Resources used:	Tugs STEIN and HOLTENAU; water pollution control vessel SCHARHÖRN (standby)
Actions taken:	The ELSE was towed to the Lindenau-Werft shipyard; affected lock chamber closed, inspection of lock gate by divers; replacement of gate

[5] Note: As part of the comprehensive reorganisation of the Federal Waterways and Shipping Administration (WSV), the Brunsbüttel and Kiel-Holtenau offices, which were responsible for providing administrative services on the NOK, were merged to form WSA NOK with effect from 22 March 2021.

3 COURSE OF THE ACCIDENT AND INVESTIGATION

3.1 Course of the accident

3.1.1 Preliminary notes

The below account of the course of the accident is based mainly on the technical recordings of VTSs Travemünde and NOK, as well as on the written and oral statements obtained from those VTSs by the BSU investigation team. Written and oral information from the pilots responsible for pilotage on Kiel Fjord and the eastern stretch[6] of the NOK (the NOK II[7] pilot association) was also taken into account.

The highly contradictory oral and written statements made by the ship's command of the ELSE to the BSU were for the most part disregarded because they cannot be reconciled with findings made in the course of the investigation. In particular, Chapters 3.3.2.3 and 3.3.6 address the statements in question.

3.1.2 Course of events prior to reaching the pilot boarding point

The multi-purpose vessel ELSE sailed out of the port of Klaipėda in Lithuania **at about 0200 LT**[8] **on 27 August 2020**. Her port of destination was Les Sables-d'Olonne on the French Atlantic coast and the voyage entailed transiting the NOK. The ship's cargo hold contained 3,000 t of ammonium nitrate[9]. There was no deck cargo on board.

The voyage across the Baltic Sea passed without any technical or other problems. About two hours before reaching the Kiel Lighthouse position, which marks the entrance to Kiel Fjord, the ELSE reported in to VTS Travemünde[10] on the designated VHF channel 67, as stipulated, so as to notify it of the forthcoming passage of Kiel Fjord and approach to the NOK (so-called pre-entry report). Accordingly, the ship passed Kiel Lighthouse as planned at about **0300** on **29 August 2020** and notified VTS Travemünde of this again.

The latter took the contact with the ELSE as an opportunity to phone the Kiel-Holtenau pilot station (located in the lock operation station at Kiel-Holtenau) and request that the ship be included in the reports available there on ships requiring pilotage.

[6] Eastern half of the NOK (section between the outer limit of the Kiel-Holtenau approach channel and the Rüsterbergen pilot transfer station at canal kilometre 55). Note: The kilometre count used for position information on the NOK begins at kilometre 1 in Brunsbüttel and ends at kilometre 97 in Kiel-Holtenau.
[7] The full name of the pilot association covering the four pilotage areas (*Kieler Förde*, *NOK II*, *Trave* and *Flensburger Förde*) is *Lotsenbrüderschaft NOK II / Kiel / Lübeck / Flensburg*.
[8] Local time (LT) in Klaipėda: Eastern European Summer Time (EEST) or UTC + 3 hours.
[9] Raw material for the production of fertiliser.
[10] See comments below in Ch. 3.3.8 with regard to VTS Travemünde's structure, organisation and area of responsibility.

In the phone call in question, the VTS also pointed out that the ELSE was sailing at a greatly reduced speed (about 6 kts) and reportedly required a pilot at 0600.

Since – contrary to usual procedures – the ELSE failed to call the Kiel-Holtenau pilot station directly on VHF afterwards to exchange information about the forthcoming NOK pilotage, the watchkeeper there called the vessel on his own initiative at about **0340** on the relevant local VHF radio channel (12). He received no reply to his call, which he repeated shortly afterwards.

On the third attempt at **0342**, the chief mate on the bridge of the ELSE, who was in command of the vessel at the time, responded to the call from the pilot station. He answered the question subsequently asked by the latter in English about the ship's current ETA[11] at Holtenau roadstead[12] (quote: *"What is your present ETA for Holtenau Roads please?"*) without hesitation that the ship would be at the "pilot station" at **0600** (quote: *"My ETA to pilot station is zero six zero zero"*[13]). The watchkeeper at the pilot station confirmed this information without explicitly repeating the time and asked the ELSE to report in again when she passed fairway buoy 9[14].

The chief mate referred to above, who had communicated with the pilot station at 0342 – a change of watch on the ELSE's bridge had evidently not taken place in the meantime[15] – complied with this request without being asked at **0441** when they passed buoy 9 (at Friedrichsort Lighthouse). During this radio contact, the pilot station requested that he continue to the pilot boarding point (quote: *"Proceed to the pilot position"*). The watchkeeper at the pilot station also stated that the pilot would board there at **0600** (quote: *"Pilot will board you there at six o'clock"*). The chief mate briefly confirmed the time (quote: *"Okay, thank you, understand, six o'clock"*). The position of the pilot transfer was not specified, nor was any other information exchanged during this radio contact.[16]

[11] ETA: Estimated time of arrival (common abbreviation used globally in maritime oral and written language for the estimated time of arrival of a ship).
[12] Note: The NOK pilot boarding point is situated on the southern edge of the Holtenau roadstead.
[13] Note: This probably refers to the pilot boarding point shown on the navigational chart (i.e. the 'Pilot Boarding Place').
[14] Note: Fairway buoy 9 (level with Friedrichsort Lighthouse) is located directly in front of the northern edge of the Holtenau roadstead. There are still some 1.3 nm from this buoy to the pilot boarding point.
[15] Note: The BSU assumes that the second officer had actually handed over the watch to the chief mate at 0300. This was probably due to the fact that ship time was one hour ahead of local time. See also the comments in Ch. 3.3.5.
[16] The position of the pilot boarding point is shown in the BA paper navigational chart used on board the ELSE (Kiel Fjord, INT 1365) with the internationally standardised navigational chart symbol.

As they were passing buoy 9, i.e. about 1.3 nm before reaching the pilot boarding point, the ELSE's chief mate, who was still in command of the ship, observed the change in direction of the fairway there. Accordingly, the vessel was put on the new general course over ground of approximately 218 degrees and then maintained this continuously (apart from making minor course adjustments). The ELSE's speed remained unchanged at about 6 kts.

3.1.3 Course of events after passing the pilot boarding point

The ELSE passed the navigational chart position of the pilot boarding point (see yellow highlighting below in **Figure 3**) abeam at about **0453** but continued her voyage without making any significant course or speed alterations and without reporting in to VTS NOK or the pilot station.

The ship then began to leave her aforementioned general course at about **0457** and turned purposefully towards the Kiel-Holtenau lock entrance, maintaining a speed of just under 6 kts (see red highlighting in **Figure 3**). It was not possible to verify whether this course alteration was carried out by a helmsman – as claimed on the ship – or the chief mate personally. However, the sources of information evaluated by the BSU indicate that the master was not on the bridge at that time.[17]

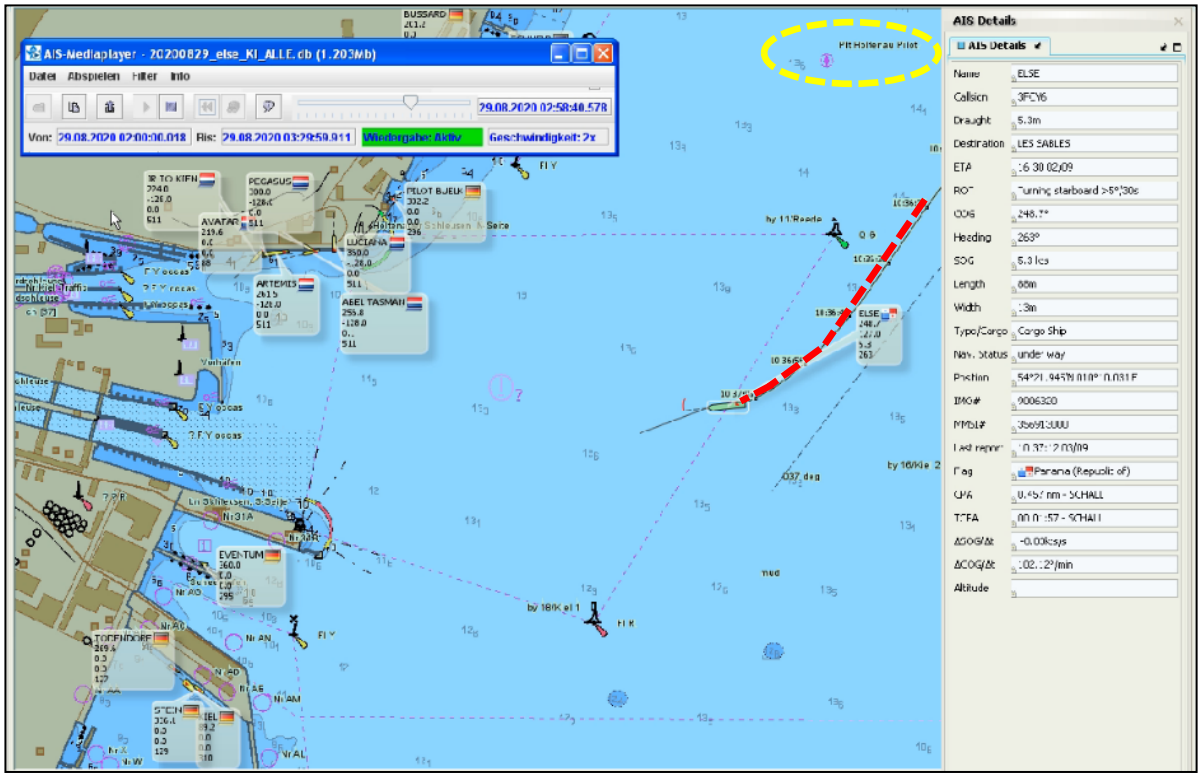


Figure 3: The MV ELSE alters course towards Kiel-Holtenau (0458)[18]

[17] See also the comments in Ch. 3.3.2.3 and 3.3.6.
[18] Source: Recording from the WSV's AIS system (*AIS Deutsche Küste* [AIS German coast]). All VTSs on the German coast are connected to this system.

At **0505**, VTS NOK (here: NOK IV = the chief lockmaster in the Kiel-Holtenau lock control station)[19], whose area of responsibility the ELSE had reached at about **0458**, called the vessel in English on VHF channel 12. Still nearing the approach to the lock chamber continuously and purposefully without reducing her speed, the ELSE was requested to proceed to the Holtenau roadstead (quote: *"Please proceed to Holtenau Roads"*). VTS NOK IV also clearly stated in the radio message that the ship was not in the waiting area but rather already in the lock's approach channel. The chief lockmaster also stated loudly and clearly that the gate was reportedly closed (quote: *"This is not the waiting area! You are in entrance of the locks right now and the gate is closed!"*).

Since there was no immediate response from ELSE, the chief lockmaster asked a few seconds later whether his message had been understood. The ELSE's chief mate then confirmed this, but only with a brief and hesitant *"Yes"* in a very insecure tone of voice. VTS NOK then clearly repeated the request that the ship return to the roadstead at Holtenau (quote: *"Then please go back to Holtenau Roads!"*). The officer on watch's reply was once more extremely brief and restricted to a very doubtful sounding: *"Holtenau Pilot"*.

Immediately after this radio contact, the Kiel-Holtenau pilot station called the ELSE on channel 12 at **0506**. The chief mate answered promptly this time and seamlessly stated the following: *"My position enter to channel"*. The watchkeeper at the pilot station then immediately requested that the officer on watch turn around and proceed to the pilot position. He forcefully stated that the ship was reportedly not permitted to enter the lock without a pilot (quote: *"Turn back to the pilot position please! You have no permission to enter the lock without pilot! Turn back!"*). The ELSE did not respond to this request. Instead, she continued her voyage towards the lock gate, which was still closed, and the inevitable allision occurred at **0507**.

According to the AIS[20] recordings evaluated by the BSU, the vessel's speed over ground (SOG) was a consistent 5-6 kts throughout the course of the voyage described above. The ELSE's speed decreased – presumably due to an emergency stopping manoeuvre – only a few seconds before the allision with the lock gate and abruptly dropped to zero immediately after the allision with the lock gate happened. The reduction in speed presumably prevented a complete breach of the lock gate.

[19] See comments below in Ch. 3.3.10 with regard to the structure, organisation and responsibilities of VTS NOK.

[20] AIS: Automatic identification system. All ships equipped with this system transmit GPS-based data, including position, course, speed and possibly other information at a standardised interval on VHF. These data can be displayed by the recipient (other traffic or VTSs, for example) on a monitor or superimposed on an electronic chart system or possibly a radar image, for example. Using commercially operated portals, it is also possible to observe AIS data, in particular ship movements, in real time via the internet and to reconstruct the course of earlier (archived) voyages.

Instead, the ELSE's bow remained trapped there (see **Figure 4 f.** below) and this condition persisted until the arrival of the tugs STEIN and HOLTENAU.

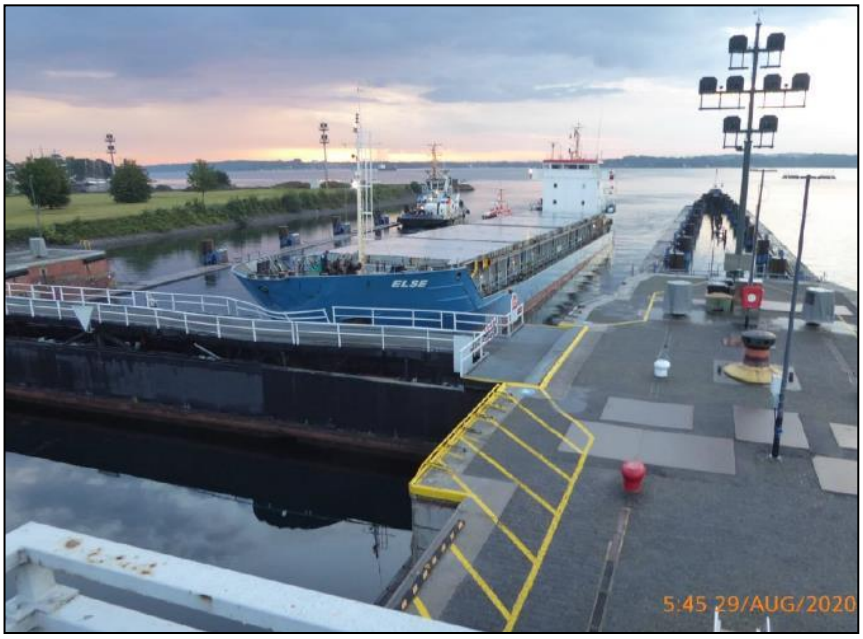


Figure 4: MV ELSE with her bow in the lock gate (1)[21]

Figure 5: MV ELSE with her bow in the lock gate (2)

The HOLTENAU had to be deployed after it became apparent that the STEIN's towing force alone would not be sufficient to free the ELSE from her predicament. The two tugs mentioned above jointly succeeded in doing this at about **1055**. They then towed the ELSE to the nearby Lindenau-Werft shipyard for damage assessment, where she moored at about **1215**.

[21] Source of this and the figure below: WSA NOK.

Divers carried out an examination there and detected a hole in the ship's forepeak tank. The corresponding repair necessitated dry-docking but since the damage had not significantly impaired the ELSE's seaworthiness, the classification society issued an interim class certificate (so-called 'Interim Cargo Ship Safety Construction Certificate'). Subject to certain conditions listed in the certificate, it granted the ship permission to call at the French port of destination to unload her cargo there. The classification society also instructed the ELSE to call at a repair yard in Brest (France) immediately afterwards to have the damage to the forepeak repaired in dry dock.

On 8 September 2020, the ELSE left her berth at the Lindenau-Werft shipyard and continued her voyage to the port of destination.

3.2 Consequences of the accident

3.2.1 Damage to the MV ELSE

The ELSE suffered damage to the fore section during the allision between her bow and the lock gate. Damage above the waterline was confined to paint abrasions and small dents in the shell plating (see **Figure 6** below). There was a roughly 180 m long and 0.40 m wide crack in the forepeak below the waterline. The ballast tank located there (capacity: 88 t) thus flooded with seawater (quantity: about 60 t) up to the waterline.[22] This damage did not result in a significant reduction in the ship's buoyancy or stability. No pollutants escaped.

Figure 6: Damage to the MV ELSE's bow above the waterline

[22] Source: Survey report by the Phoenix Register of Shipping classification society dated 3 September 2020.

3.2.2 Damage to the lock facility

The fjord-facing sliding gate 3 of the north chamber of the 'Neue Schleuse' lock, which was fully closed at the time of the accident, was severely deformed by the impact of the ELSE's bow. The ship's bulbous bow pushed forward about 2 m to the tank deck of the gate, damaging the gate's structure and the steel girders in the area of the accident (see **Figures 7 ff.** below) in the process. The gate had to be dismantled for extensive repairs and replaced by a spare one.

Figure 7: Damage to the lock gate (close-up 1)[23]

Figure 8: Damage to the lock gate (close-up 2)

[23] Source of this and the two figures below: WSA NOK.

Figure 9: Damage to the lock gate (general view)[24]

3.2.3 Injuries and environmental damage

The accident did not result in any injuries or damage to the environment.

3.3 Investigation

3.3.1 Course of events, sources and material details

VTS NOK notified the BSU's staff on call by phone immediately after the accident. The on-call investigator gained a rough idea of the course of the ELSE's voyage by means of preliminary AIS research before the investigation team began to establish the facts and causes. The initial steps consisted of a survey of the damaged vessel at her berth in the Lindenau-Werft shipyard, interviews on board with the ship's command, and a subsequent visit to the lock facility, where particular attention was given to the lock gate that had been deformed during the allision.

Since the ELSE is too small to be subject to VDR[25] outfitting requirements and there are no other technical recordings of the course of the voyage available on the ship, the most important objective sources for the reconstruction of the course of the ELSE's voyage were the AIS and VHF radio recordings of the WSV, which were promptly made available to the investigation team upon request.

[24] Note: The front of the lock control station is visible at the upper right edge of the image.
[25] VDR (voyage data recorder): Computerised system on board seagoing vessels that continuously records various data relating to the navigational and technical operation of a ship for the purposes of analysis in the course of marine casualty investigations, in particular.

The BSU also contacted the alderman of the 'NOK II / Kiel / Lübeck / Flensburg' pilot association, which is responsible for pilotage on the eastern part of the Kiel Canal and on Kiel Fjord. *Inter alia*, the aim here was to obtain background information as to why there was no pilot on board the ship, which had been obliged to engage a pilot at the time of the accident, and as to what arrangements had been made with the ship in this regard prior to the accident.

An extremely helpful written exchange on these specific questions, but also on fundamental aspects of pilotage on Kiel Fjord and in the NOK approach followed. This was supported by a detailed discussion between the BSU investigation team, the pilot association's alderman and his deputy. During this meeting, the investigators also surveyed the Kiel-Holtenau pilot station (call sign: Holtenau Pilot) in the control station on the middle wall of the 'Neue Schleuse' lock in Kiel-Holtenau to learn about the working conditions there.

To clarify questions about the procedures on the day of the accident and for a better general understanding of the respective working methods, the investigation team visited VTS NOK's[26] Kiel-Holtenau site (which is also located in the above control station), as well as VTS Travemünde. GDWS representatives also attended the meeting in Kiel-Holtenau, which was additionally used as an opportunity to conclusively discuss fundamental legal and organisational traffic monitoring issues concerning the VTS and the Baltic Sea approach to the NOK.

The expert report prepared by Fechner Marine Surveys on behalf of the GDWS for the purpose of clarifying civil law questions was of particular value with regard to the determination of any technical issues on board the ELSE before the allision with the lock gate. The GDWS kindly made this available to the BSU.

Another important source of information for the BSU investigation was the police investigation file, which the investigation team was given sight of.

[26] The VTS NOK headquarters and the duty station of the nautical supervisor responsible for traffic on the NOK is in the lock control station in the NOK lock facility at Brunsbüttel. The chief lockmaster, who is responsible for the operation of the lock facility in Kiel-Holtenau and in this context also for communicating with vessels that pass through it, functions in the Kiel-Holtenau lock control centre as a de facto outstation of VTS NOK. See comments in Ch. 3.3.10 for further details.

3.3.2 MV ELSE

3.3.2.1 Basic information

The Panama-registered ELSE (formerly the ILSE) is a multi-purpose vessel with a full-length cargo hold built in 1993 at the Peene-Werft shipyard in Wolgast. The coaster operates in the European North Sea and Baltic Sea areas, on the Atlantic coast, as well as in the Mediterranean and is equipped with a right-handed fixed pitch propeller, a Becker rudder and a bow thruster. Paper charts and sailing directions (BA[27] navigational charts) from the UK Hydrographic Office (UKHO) that were up to date at the time of the accident according to corresponding voyage planning advice were used on board for navigation.

The ELSE had all required certificates (apart from an expired medical certificate) at the time of the accident, including a valid DoC (document of compliance) and an approved safety management system (SMS), issued by the Phoenix Register of Shipping.

The ship was taken over in December 2019 by the Istanbul-based owners' association and the ISM[28] manager, who is also registered there.

The port State control carried out after the accident in Kiel (the first since the aforementioned change of ownership and management) identified various deficiencies that were not related to the accident, some of which were so serious that they led to a detention order. *Inter alia*, the magnetic compass, the oil filtering equipment, the fire-safety and lifeboat equipment, and the electrical systems exhibited defects and inadequate maintenance.

The EQUASIS[29] database confirmed that the above deficiencies were not an exception. Rather, deficiencies relating to such important aspects as fire-safety equipment, lifeboats and health care have repeatedly come to light on the ELSE during various port State control inspections since 2001 (apart from a deficiency-free period from 2004 to 2009). This situation did not change even after the allision with the lock gate in Kiel-Holtenau, as evidenced by the 16 and as many as 32 deficiencies found during port State control inspections in Fowey (UK) on 3 December 2021 and in Ravenna (IT) on 2 May 2022, for example.

[27] BA: British Admiralty.
[28] ISM: International Management Code for the Safe Operation of Ships and for Pollution Prevention (internationally binding set of rules governing safe ship operation, which stipulates that every shipowner (or a manager commissioned in this respect, for example) who operates a ship must draw up an SMS and monitor its proper implementation).
[29] See http://www.equasis.org: Non-commercial database launched by the EU and the maritime administrations of France, Singapore, Spain, Great Britain, Japan, and the United States Coast Guard, which is open to anyone after registering and, *inter alia*, provides an overall view of the world merchant fleet and information on the results of Port State Control inspections, for example.

3.3.2.2 Crew

A minimum crew of eight seafarers was stipulated for the ELSE according to the minimum safe manning certificate issued by the flag State (Panama). In addition to the master, the following ranks were listed on the certificate: chief mate, A.B. seaman (2), ordinary seaman (1), engineer officer (1), oiler/motorman (2).

In contrast, the ship's crew list at the time of the accident comprised nine crew members from Turkey, Ukraine and Azerbaijan. The manning (beyond legal requirements) with a second officer was implemented so as to arrange the navigational watch in the conventional three-watch rather than in the formally permissible (and simultaneously required in the case of minimum safe manning) two-watch system.[30] Accordingly, the Turkish master of the ELSE took charge of the 8-12 watch, the second officer (also Turkish) the 0-4 watch and the Ukrainian chief mate the 4-8 watch.[31]

The master had completed 20 years of seagoing service and had held a certificate of competency as a master for ten years at the time of the accident. He had already transited the NOK five times before the accident. The chief mate had never sailed through the NOK before the accident. He held a certificate of competency as a chief mate issued in 2016.

3.3.2.3 Shipboard inspection of the MV ELSE

The BSU investigation team went on board the ELSE in the morning of 31 August 2020 and was met by the master. He handed over three brief written statements prepared in advance on a PC, which he himself, the chief mate and the rating on watch who had been working on the bridge at the time of the accident had signed. The statements consisted of largely identical or slightly modified blocks of text, which were clearly coordinated in terms of content. They were confined to a few items of contradictory information, which the master repeated when speaking with the investigation team. His comments emphasised that he reportedly came to the bridge in good time before reaching the pilot boarding point and assumed command of the ship. Following that, there were reportedly sudden (but subsequently non-reproducible) problems with the engine. It was reportedly not possible to stop the engine from the bridge console in the normal manner for inexplicable reasons. The chief engineer (who had been alerted by phone) had also reportedly failed to perform the necessary manoeuvres by means of direct operation in the engine room until just before the allision with the lock gate.

[30] In the two-watch system, two deck officers or the master and one deck officer alternate the navigational watch at sea so that there is a continuous six-hour watch and six-hour period for other duties or to observe the required rest periods during the entire voyage. In a three-watch system, four hours of navigational watch are always followed by an eight-hour period for other duties or rest.
[31] 8-12 stands for the watch from 0800 to 1200 and from 2000 to 2400, etc.

When confronted with the assertion that the ship had not reported the presumed technical difficulties on VHF radio at any time before the accident, the master replied that the personnel on the bridge had directed all their efforts at dealing with the emergency situation and therefore no attention was paid to the radio traffic. The master was also unable to give a plausible explanation for the fact that the ELSE had passed the pilot boarding point without reducing speed but had then turned unerringly into the lock entrance and headed directly for the lock gate despite all the alleged technical problems.

At the request of the investigators, the master called the chief engineer to the interview. However, an interview was virtually impossible because he was (at least apparently) unable to communicate in English. The Turkish master's efforts to assist his engineer (who was also Turkish) by acting as an interpreter did not really help to provide a reliable picture of the engineer's role in the course of the accident, either.

To the extent that communication was actually possible, his information was contradictory. Firstly, he claimed that he was not in the engine room while they were in fairway mode prior to the accident. He justified this by stating that the ship was reportedly designed for watch-free engine operation and that the engine could reportedly be operated completely from the bridge. Secondly, when asked if it was not usual for the engine room to be manned by an engineer in fairway mode, the chief engineer replied that he had reportedly already been there when the ELSE approached the pilot boarding point.

At the request of the investigators, the master and the chief engineer also provided the following information:

- there is no manoeuvre/machinery fault printer or related technical recordings due to the lack of appropriate technical equipment;
- the shipping company took over the ship nine months ago;
- there have been no technical problems thus far. They are very satisfied with the ship;
- the accident did not give rise to any water ingress.[32]

Following the discussions, which did not yield any reliable findings, the investigators went to the bridge of the ship, sighted various documents and took photographs. Apart from that, the investigators asked specific questions with a view to gaining more detailed information about controlling the engine from the bridge and other technical details about the machinery and steering gear. However, the master and the chief engineer (possibly due to language barriers) were unable to provide the information requested.

[32] This information was incorrect. As the subsequent dive operation revealed, the forepeak was holed below the waterline and a ballast tank located there had filled with seawater up to the level of the waterline. Since the latter must have already been obvious to the ship's command even before the dive operation, the contradictory answer to the question is difficult to comprehend.

It remains to be noted that it was not possible to gain any helpful information about the nature and cause of the alleged technical malfunction or about the chronological sequence of events on the bridge and in the engine room during the shipboard inspection.

3.3.3 Voyage planning

3.3.3.1 Legal bases

Part A Chapter VIII Part 2 of the STCW[33] Code, which is internationally binding for merchant shipping, states that every voyage must be planned in advance, taking into consideration all pertinent information, and any course laid down shall be checked before the voyage commences. Chapter V Regulation 34(1) of the SOLAS[34] Convention, which is also binding under international law, states that prior to proceeding to sea, the intended voyage must be planned using the appropriate navigational charts and nautical publications for the area concerned, taking into account the guidelines and recommendations developed by the IMO.

The IMO has put the relevant requirements into specific form in the Guidelines for Voyage Planning[35]. According to point 2 of the Guidelines, all information related to the intended voyage should be taken into account. In addition to various other items discussed in point 2, which are or may be relevant for voyage planning, nine sub-items in point 2.1.7 contain additional information that should be considered when planning the voyage, where point 2.1.7.7 explicitly states:

"if a pilot is to be used, information relating to pilotage and embarkation and disembarkation including the exchange of information between master and pilot;"

Point 3.1 of the Guidelines states that on the basis of the information consulted and assessed, a detailed voyage or passage plan should be prepared, which covers the entire voyage or passage from berth to berth, *"including those areas where the services of a pilot will be used."*

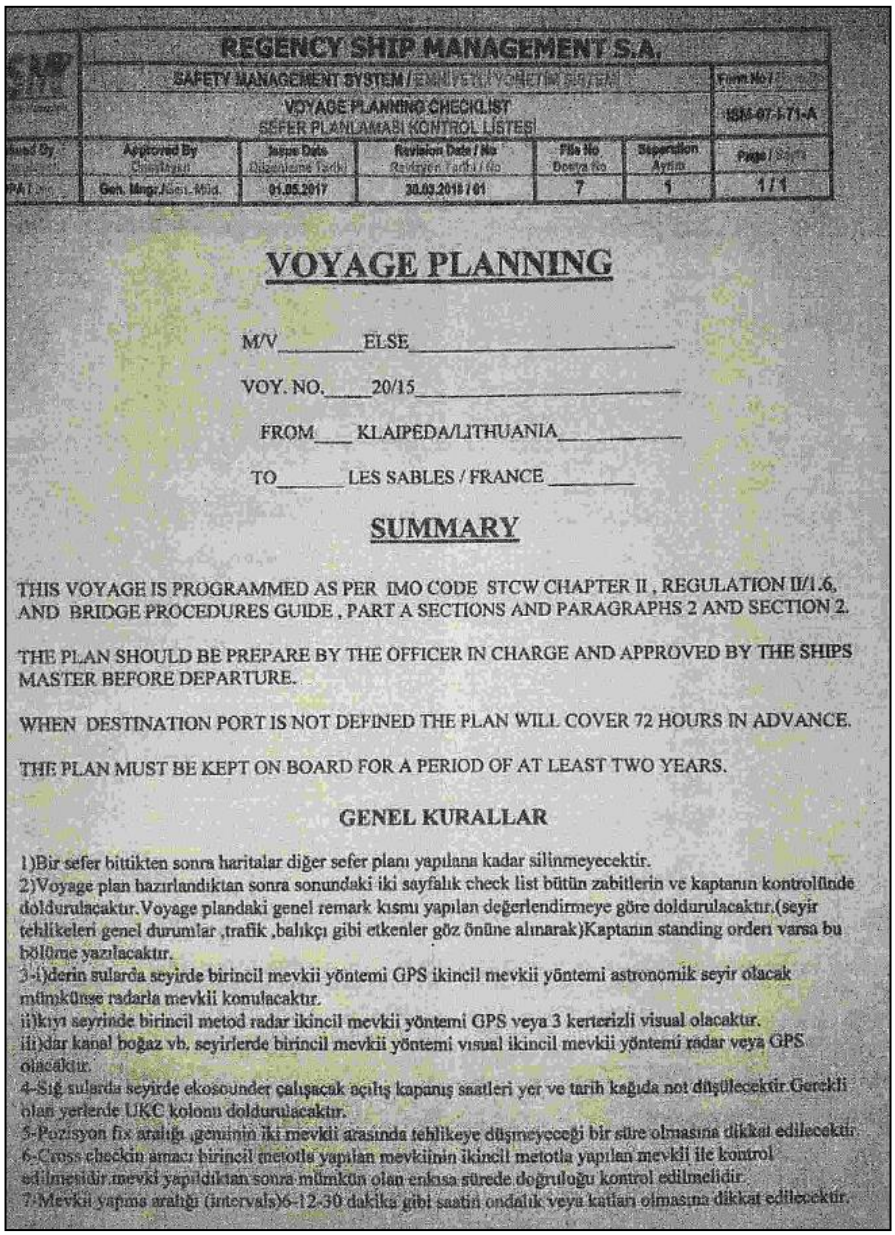
Point 3.2.2 of the Guidelines contains an explicitly non-exhaustive list of items that should form part of the voyage planning in order to ensure the safety of life at sea, the safety and efficiency of navigation and the protection of the marine environment during the intended voyage.

Points 3.3 and 3.4 of the Guidelines essentially stipulate that the details of the voyage plan should be clearly marked and recorded, as appropriate, on charts and in a voyage plan notebook or computer disk and approved by the ships' master prior to the commencement of the voyage.

[33] STCW: International Convention on Standards of Training, Certification and Watchkeeping for Seafarers.
[34] SOLAS: International Convention for the Safety of Life at Sea.
[35] IMO Resolution A.893(21), adopted on 25 November 1999, Voyage Planning Guidelines.

3.3.3.2 Document template and intended contents of the voyage planning on the MV ELSE

The ELSE had written voyage planning documentation on board for her current voyage from Klaipėda to Les Sables-d'Olonne. The second officer prepared the plan on a computer based on a document template from the SMS on 25 August 2020.



REGENCY SHIP MANAGEMENT S.A.

SAFETY MANAGEMENT SYSTEM / EMNİYET YÖNETİM SİSTEMİ — Form No / —

VOYAGE PLANNING CHECKLIST
SEFER PLANLAMASI KONTROL LİSTESİ — ISM-07-F71-A

Issued By	Approved By	Issue Date	Revision Date / No	File No	Supervision	Page
PA / —	Gen. Mngr./Gen. Müd.	01.05.2017	30.03.2018 / 01	7	1	1 / 1

VOYAGE PLANNING

M/V_____ELSE_____

VOY. NO.____20/15_____

FROM___KLAIPEDA/LITHUANIA_____

TO_____LES SABLES / FRANCE _____

SUMMARY

THIS VOYAGE IS PROGRAMMED AS PER IMO CODE STCW CHAPTER II , REGULATION II/1.6, AND BRIDGE PROCEDURES GUIDE , PART A SECTIONS AND PARAGRAPHS 2 AND SECTION 2.

THE PLAN SHOULD BE PREPARE BY THE OFFICER IN CHARGE AND APPROVED BY THE SHIPS MASTER BEFORE DEPARTURE.

WHEN DESTINATION PORT IS NOT DEFINED THE PLAN WILL COVER 72 HOURS IN ADVANCE.

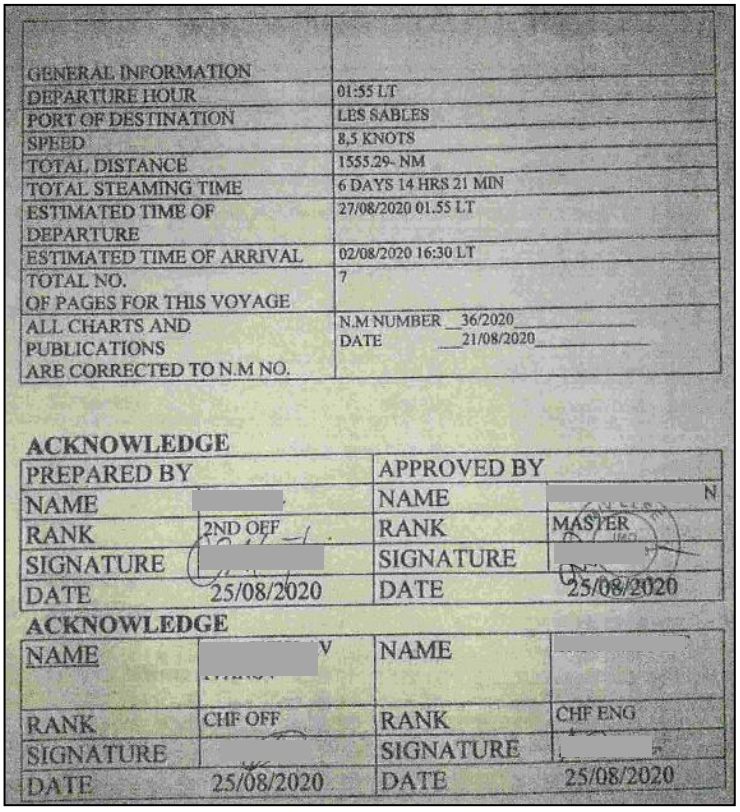
THE PLAN MUST BE KEPT ON BOARD FOR A PERIOD OF AT LEAST TWO YEARS.

GENEL KURALLAR

1)Bir sefer bittikten sonra haritalar diğer sefer planı yapılana kadar silinmeyecektir.
2)Voyage plan hazırlandıktan sonra sonundaki iki sayfalık check list bütün zabitlerin ve kaptanın kontrolünde doldurulacaktır.Voyage plandaki genel remark kısmı yapılan değerlendirmeye göre doldurulacaktır.(seyir tehlikeleri genel durumlar ,trafik ,balıkçı gibi etkenler göz önüne alınarak)Kaptanın standing orderı varsa bu bölüme yazılacaktır.
3-i)derin sularda seyirde birincil mevkii yöntemi GPS ikincil mevkii yöntemi astronomik seyir olacak mümkünse radarla mevkii konulacaktır.
ii)kıyı seyrinde birincil metod radar ikincil mevkii yöntemi GPS veya 3 kenterizli visual olacaktır.
iii)dar kanal boğaz vb. seyirlerde birincil mevkii yöntemi visual ikincil mevkii yöntemi radar veya GPS olacaktır.
4-Sığ sularda seyirde ekosounder çalışacak açılış kapanış saatleri yer ve tarih kağıda not düşülecektir.Gerekli olan yerlerde UKC kolonu doldurulacaktır.
5-Pozisyon fix aralığı ,geminin iki mevkii arasında tehlikeye düşmeyeceği bir süre olmasına dikkat edilecektir.
6-Cross checkin amacı birincil metotla yapılan mevkiinin ikincil metotla yapılan mevkii ile kontrol edilmesidir.mevki yapıldıktan sonra mümkün olan enkısa sürede doğruluğu kontrol edilmelidir.
7-Mevkii yapma aralığı (intervals)6-12-30 dakika gibi saatin ondalık veya katları olmasına dikkat edilecektir.

Figure 10: Cover sheet (p. 1) of the voyage planning documentation

The master and the chief engineer had confirmed the printed documentation, consisting of 19 A4 sheets, with their signature on the bottom half of page 2 on the same day. Pages 2 and 3 of the planning (see **Figures 11 f.** below) also contain information on the duration of the voyage, the port of destination (including ETA at the berth and tide information there), and the ELSE's draught.



GENERAL INFORMATION	
DEPARTURE HOUR	01:55 LT
PORT OF DESTINATION	LES SABLES
SPEED	8,5 KNOTS
TOTAL DISTANCE	1555.29- NM
TOTAL STEAMING TIME	6 DAYS 14 HRS 21 MIN
ESTIMATED TIME OF DEPARTURE	27/08/2020 01.55 LT
ESTIMATED TIME OF ARRIVAL	02/08/2020 16:30 LT
TOTAL NO. OF PAGES FOR THIS VOYAGE	7
ALL CHARTS AND PUBLICATIONS ARE CORRECTED TO N.M NO.	N.M NUMBER 36/2020 DATE 21/08/2020

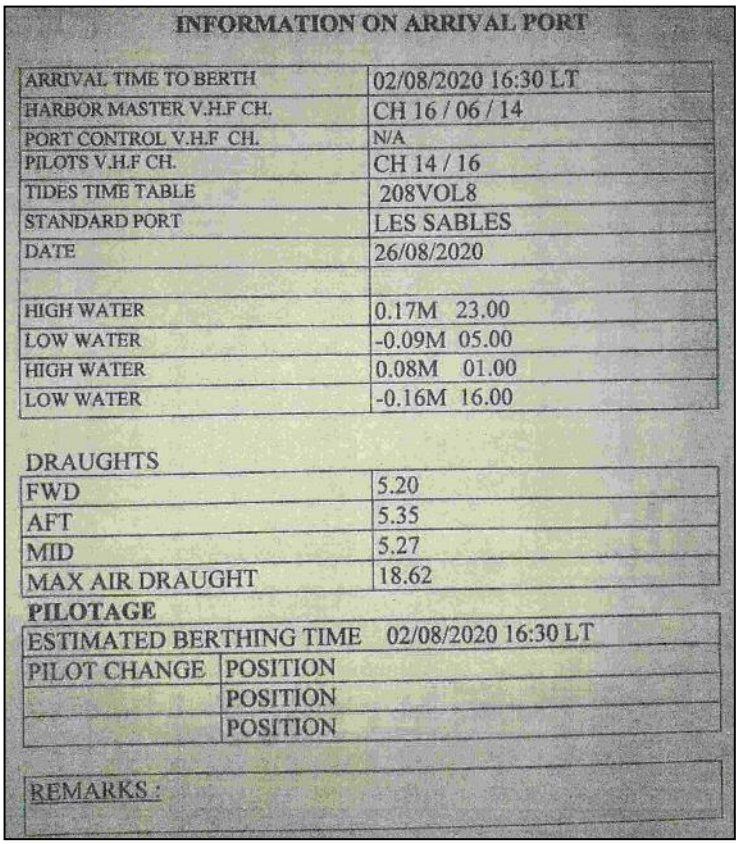
ACKNOWLEDGE

PREPARED BY		APPROVED BY	
NAME		NAME	
RANK	2ND OFF	RANK	MASTER
SIGNATURE		SIGNATURE	
DATE	25/08/2020	DATE	25/08/2020

ACKNOWLEDGE

NAME		NAME	
RANK	CHF OFF	RANK	CHF ENG
SIGNATURE		SIGNATURE	
DATE	25/08/2020	DATE	25/08/2020

Figure 11: Page 2 of the voyage planning documentation (extract)



INFORMATION ON ARRIVAL PORT

ARRIVAL TIME TO BERTH	02/08/2020 16:30 LT
HARBOR MASTER V.H.F CH.	CH 16 / 06 / 14
PORT CONTROL V.H.F CH.	N/A
PILOTS V.H.F CH.	CH 14 / 16
TIDES TIME TABLE	208VOL8
STANDARD PORT	LES SABLES
DATE	26/08/2020
HIGH WATER	0.17M 23.00
LOW WATER	-0.09M 05.00
HIGH WATER	0.08M 01.00
LOW WATER	-0.16M 16.00

DRAUGHTS

FWD	5.20
AFT	5.35
MID	5.27
MAX AIR DRAUGHT	18.62

PILOTAGE

ESTIMATED BERTHING TIME 02/08/2020 16:30 LT	
PILOT CHANGE	POSITION
	POSITION
	POSITION

REMARKS :

Figure 12: Page 3 of the voyage planning documentation (extract)

Page 4 then contains a tabular overview of seven waypoints, starting at the berth in Klaipėda and ending at the position of the port/estuary pilot's transfer after about 4.5 nm (see **Figure 13**) under the heading 'Waypoints General Information Berth to Pilot'.

WAYPOINTS GENERAL INFORMATION
BERTH TO PILOT

W.P	LAT	LONG	P.I. INFOR..	DIST TO GO	ELAPSED TIME ETA	ENG. SPEED	TRACK	TIDE CUURENT RATE	ALLOW SET	CO TO STEER GYRO	MIN. UKC	POS.FIX METHOD		FIX INTERVALS
												PRIMARY	SECON.	
1	55 42.7 N	021 07.3 E	N/A	0,08	08/26 02:00	2	0.08 NMI	LOW	179	179	15	RADAR	GPS VISUAL	5M
2	55 42.6 N	021 07.3 E	N/A	0,30	08/26 02:05	3	0.22 NMI	LOW	246	246	15	RADAR	GPS VISUAL	5M
3	55 42.5 N	021 06.9 E	N/A	1,01	08/26 02:25	3	0.71 NMI	LOW	335	335	25	RADAR	GPS VISUAL	5M
4	55 43.2 N	021 06.4 E	N/A	1,49	08/26 02:33	4	0.48 NMI	LOW	309	309	25	RADAR	GPS VISUAL	5M
5	55 43.5 N	021 05.7 E	N/A	1,92	08/26 02:39	6	0.43 NMI	LOW	296	296	25	RADAR	GPS VISUAL	5M
6	55 43.7 N	021 05.0 E	N/A	4,56	08/26 03:08	6	2.64 NMI	LOW	280	280	25	RADAR	GPS VISUAL	10M
7	55 44.2 N	021 00.4 E												

Figure 13: Page 4 of the voyage planning documentation (extract)

The list of waypoints is continued on pages 5 to 11 under the heading 'Waypoints General Information Pilot to Pilot' (see **Figures 14 f.** by way of example) and lists the pilot boarding point for the port of destination (Les Sables-d'Olonne) as the voyage's last waypoint (number 154).

WAYPOINTS GENERAL INFORMATION
PILOT TO PILOT

W.P	LAT	LONG	P.I. INFOR..	DIST TO GO	ELAPSED TIME ETA	ENG. SPEED	TRACK	TIDE CUURENT RATE	ALLOW SET	CO TO STEER GYRO	MIN. UKC	POS.FIX METHOD		FIX INTERVALS
												PRIMARY	SECON.	
26	54 25.7 N	010 13.3 E	N/A	412,99	08/29 02:35	8,5	0.99 NMI	LOW	205	205	+30	RADAR	GPS	5M
27	54 24.8 N	010 12.6 E	N/A	413,9	08/29 02:41	8,5	0.91 NMI	LOW	198	198	+30	RADAR	GPS	5M
28	54 23.9 N	010 12.1 E	N/A	414,48	08/29 02:45	8,5	0.58 NMI	LOW	188	188	+30	RADAR	GPS	5M
29	54 23.4 N	010 12.0 E	N/A	415,94	08/29 02:49	8,5	0.46 NMI	LOW	214	214	+30	RADAR	GPS	5M
30	54 23.0 N	010 11.5 E	N/A	416,37	08/29 02:59	8,5	1.43 NMI	LOW	216	216	+30	RADAR	GPS	5M
31	54 21.8 N	010 10.1 E	N/A	417,11	08/29 03:04	8,5	0.74 NMI	LOW	277	277	+30	RADAR	GPS	5M
32	54 21.9 N	010 08.8 E	N/A	417,21	08/29 03:05	8,5	0.10 NMI	LOW	281	281	+30	RADAR	GPS	5M
33	54 21.9 N	010 08.7 E	N/A	417,41	08/29 03:06	8,5	0.20 NMI	LOW	283	283	+30	RADAR	GPS	5M
34	54 22.0 N	010 08.4 E	N/A	417,64	08/29 03:08	8,5	0.23 NMI	LOW	287	287	+30	RADAR	GPS	5M
35	54 22.1 N	010 08.0 E	N/A	418,61	08/29 03:10	8,5	0.37 NMI	LOW	278	278	+30	RADAR	GPS	5M
36	54 22.1 N	010 07.4 E	N/A	418,71	08/29 03:11	8,5	0.10 NMI	LOW	282	282	+30	RADAR	GPS	5M
37	54 22.1 N	010 07.2 E	N/A	418,82	08/29 03:12	8,5	0.11 NMI	LOW	290	290	+30	RADAR	GPS	5M
38	54 22.2 N	010 07.0 E	N/A	419,36	08/29 03:16	8,5	0.54 NMI	LOW	285	285	+30	RADAR	GPS	5M
39	54 22.3 N	010 06.1 E	N/A	419,54	08/29 03:17	8,5	0.18 NMI	LOW	276	276	+30	RADAR	GPS	5M
40	54 22.3 N	010 05.8 E	N/A	419,75	08/29 03:18	8,5	0.21 NMI	LOW	263	263	+30	RADAR	GPS	5M
41	54 22.3 N	010 05.5 E	N/A	419,95	08/29 03:20	8,5	0.20 NMI	LOW	256	256	+30	RADAR	GPS	5M
42	54 22.2 N	010 05.1 E	N/A	420,23	08/29 03:22	8,5	0.28 NMI	LOW	244	244	+30	RADAR	GPS	5M
43	54 22.1 N	010 04.7 E	N/A	420,31	08/29 03:22	8,5	0.08 NMI	LOW	238	238	+30	RADAR	GPS	5M
44	54 22.1 N	010 04.6 E	N/A	420,36	08/29 03:22	8,5	0.05 NMI	LOW	230	230	+30	RADAR	GPS	5M
45	54 22.1 N	010 04.5 E	N/A	420,83	08/29 03:26	8,5	0.47 NMI	LOW	227	227	+30	RADAR	GPS	5M

Figure 14: Page 6 of the voyage planning documentation (extract)

W.P	LAT	LONG	P.I. INFOR.	DIST TO GO	ELAPSED TIME ETA	ENG. SPEED	TRACK	TIDE CUURENT RATE	ALLOW SET	CO TO STEER GYRO	MIN. UKC	POS.FIX. METHOD PRIMARY	SECON	FIX. INTERV ALS
138	53 28.2 N	004 36.9 E	N/A	660,17	08/30 07:36	8,5	19.88 NMI	LOW	203	203	+30	RADAR	GPS	30M
139	53 09.9 N	004 24.0 E	N/A	682,42	08/30 10:13	8,5	22.25 NMI	LOW	229	229	+30	RADAR	GPS	30M
140	52 55.4 N	003 56.0 E	N/A	737,53	08/30 16:42	8,5	55.11 NMI	LOW	218	218	+30	RADAR	GPS	30M
141	52 11.9 N	003 00.6 E	N/A	766,02	08/30 20:03	8,5	28.49 NMI	LOW	220	220	+30	RADAR	GPS	30M
142	51 50.0 N	002 31.0 E	N/A	798,05	08/30 23:49	8,5	32.03 NMI	LOW	223	223	+30	RADAR	GPS	30M
143	51 26.5 N	001 56.1 E	N/A	807,27	08/31 00:54	8,5	9.22 NMI	LOW	199	199	+30	RADAR	GPS	30M
144	51 17.8 N	001 51.2 E	N/A	839,2	08/31 04:39	8,5	31.93 NMI	LOW	225	225	+30	RADAR	GPS	30M
145	50 55.4 N	001 15.0 E	N/A	871,46	08/31 08:27	8,5	32.26 NMI	LOW	232	232	+30	RADAR	GPS	30M
146	50 35.5 N	000 34.9 E	N/A	991,34	08/31 22:33	8,5	119.88 NMI	LOW	255	255	+30	RADAR	GPS	30M
147	50 04.9 N	002 26.1 W	N/A	1010,97	09/01 00:52	8,5	19.63 NMI	LOW	251	251	+30	RADAR	GPS	30M
148	49 58.4 N	002 54.9 W	N/A	1140,82	09/01 16:08	8,5	129.85 NMI	LOW	240	240	+30	RADAR	GPS	30M
149	48 53.8 N	005 47.6 W	N/A	1155,46	09/01 17:52	8,5	14.64 NMI	LOW	208	208	+30	RADAR	GPS	30M
150	48 40.9 N	005 58.2 W	N/A	1167,42	09/01 19:16	8,5	11.96 NMI	LOW	164	164	+30	RADAR	GPS	30M
151	48 29.4 N	005 53.3 W	N/A	1200,55	09/01 23:10	8,5	33.13 NMI	LOW	154	154	+30	RADAR	GPS	30M
152	47 59.6 N	005 31.6 W	N/A	1374,78	09/02 20:06	8,5	177.86 NMI	LOW	123	123	+30	RADAR	GPS	30M
153	46 23.7 N	001 51.8 W	N/A	1380,24	09/02 20:44	8,5	5.46 NMI	LOW	033	033	+30	RADAR	GPS	30M
154	46 28.3 N	001 47.5 W												

Figure 15: Page 11 of the voyage planning documentation (extract)

In the above waypoint list, the following information is given for all waypoints – <u>at least according to the designation or the meaning and purpose of the respective table column</u>[36]:

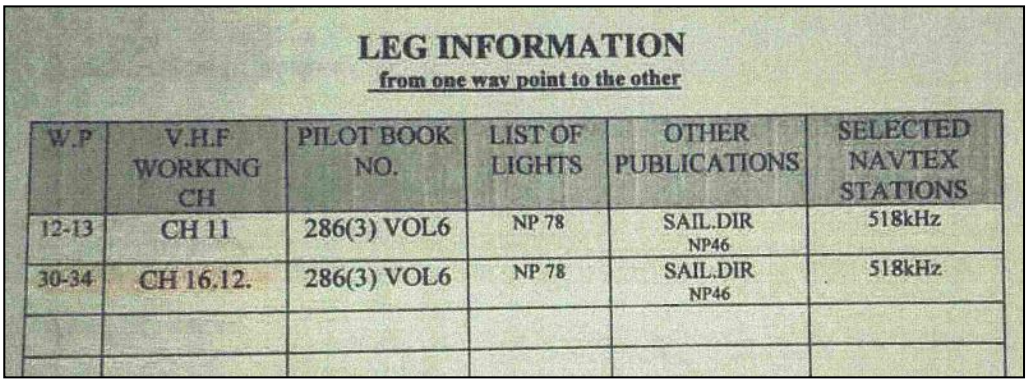
- Position according to latitude and longitude
- 'P.I. Infor.'[37]
- Distance to destination
- ETA at waypoint
- Speed of vessel
- Distance from current to following waypoint
- Tidal current
- 'Allow Set'
- Course indication from current to following waypoint
- Minimum UKC[38]
- Position fixing method
- Position fixing interval

Page 12 of the voyage planning documentation contains a non-completed waypoint list with the heading 'Waypoints General Information Pilot to Berth'.

Page 13 (see **Figure 16** below) contains a table with the heading 'Leg Information from one way point to the other'. Its content is limited to two sections of the voyage, namely information for waypoint sections 12 to 13, on the one hand, and 30 to 34, on the other.

[36] See also the comments in Ch. 3.3.3.3.
[37] The meaning of the term is unclear in the given context. This observation also applies to the term 'Allow Set' mentioned further down in the list.
[38] UKC: Under keel clearance (remaining water depth between the ship's keel and the seabed).

The information on the respective sections concerns the VHF radio channels to be used there, the nautical publications to be referred to and a reference to the frequency of the locally relevant NAVTEX[39] stations.



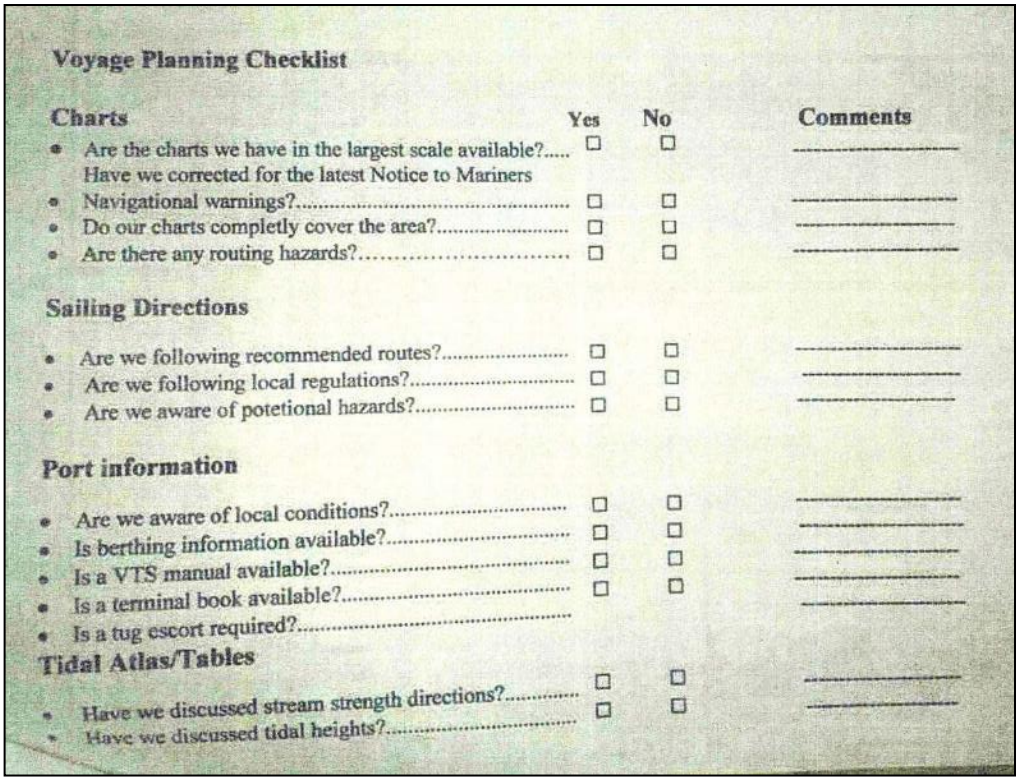
LEG INFORMATION

from one way point to the other

W.P	V.H.F WORKING CH	PILOT BOOK NO.	LIST OF LIGHTS	OTHER PUBLICATIONS	SELECTED NAVTEX STATIONS
12-13	CH 11	286(3) VOL6	NP 78	SAIL.DIR NP46	518kHz
30-34	CH 16.12.	286(3) VOL6	NP 78	SAIL.DIR NP46	518kHz

Figure 16: Page 13 of the voyage planning documentation (extract)

On pages 14-16 (see **Figures 17 ff.** below), the documentation contains checklists with various questions requiring an answer, which are of importance for the preparation of the voyage planning. Each question on the lists has a checkbox for ticking and field for notes. However, the aforementioned checklists were not completed

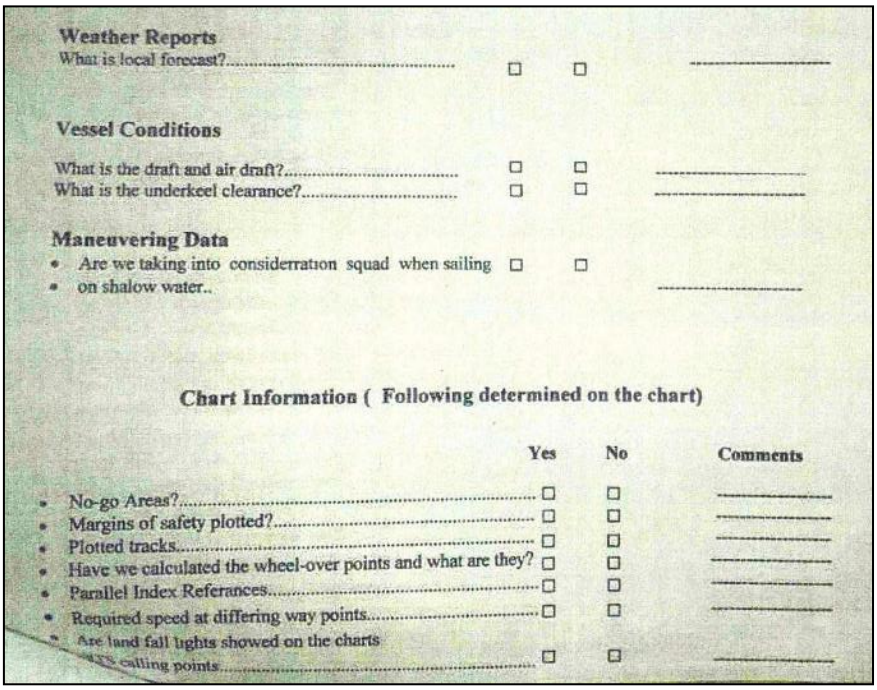


Voyage Planning Checklist

Charts	Yes	No	Comments
• Are the charts we have in the largest scale available?..... Have we corrected for the latest Notice to Mariners	☐	☐	.....
• Navigational warnings?.....	☐	☐	.....
• Do our charts completly cover the area?.....	☐	☐	.....
• Are there any routing hazards?.....	☐	☐	.....
Sailing Directions			
• Are we following recommended routes?.....	☐	☐	.....
• Are we following local regulations?.....	☐	☐	.....
• Are we aware of potetional hazards?.....	☐	☐	.....
Port information			
• Are we aware of local conditions?.....	☐	☐	.....
• Is berthing information available?.....	☐	☐	.....
• Is a VTS manual available?.....	☐	☐	.....
• Is a terminal book available?.....	☐	☐	.....
• Is a tug escort required?.....			
Tidal Atlas/Tables			
• Have we discussed stream strength directions?.....	☐	☐	.....
• Have we discussed tidal heights?.....	☐	☐	.....

Figure 17: Page 14 of the voyage planning documentation (extract)

[39] NAVTEX (navigational telex) is an international maritime messaging service for disseminating safety and weather information via radioteletype. The transmitting radio stations use different frequencies (e.g. 518 kHz or 490 kHz) based on region.



Weather Reports

What is local forecast?..... ☐ ☐ _____

Vessel Conditions

What is the draft and air draft?..... ☐ ☐ _____
What is the underkeel clearance?..... ☐ ☐ _____

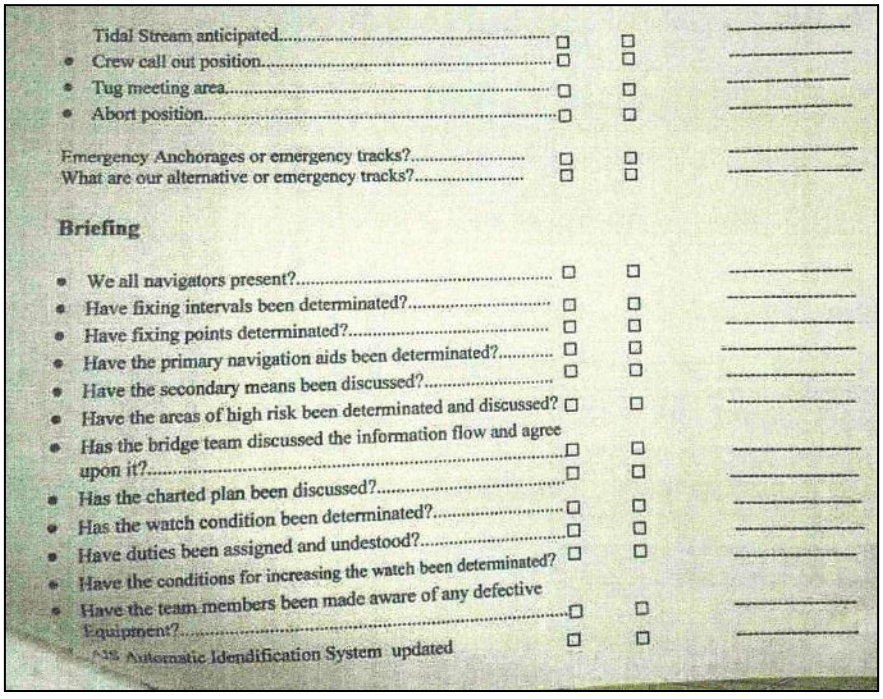
Maneuvering Data

- Are we taking into considerration squad when sailing ☐ ☐
- on shalow water.. _____

Chart Information (Following determined on the chart)

	Yes	No	Comments
• No-go Areas?.....	☐	☐	_____
• Margins of safety plotted?.....	☐	☐	_____
• Plotted tracks.....	☐	☐	_____
• Have we calculated the wheel-over points and what are they?	☐	☐	_____
• Parallel Index Referances.....	☐	☐	_____
• Required speed at differing way points.....	☐	☐	_____
• Are land fall lights showed on the charts			
...S calling points.....	☐	☐	_____

Figure 18: Page 15 of the voyage planning documentation (extract)



Tidal Stream anticipated..... ☐ ☐ _____
- Crew call out position..... ☐ ☐ _____
- Tug meeting area..... ☐ ☐ _____
- Abort position..... ☐ ☐ _____

Emergency Anchorages or emergency tracks?..... ☐ ☐ _____
What are our alternative or emergency tracks?..... ☐ ☐ _____

Briefing

- We all navigators present?..... ☐ ☐ _____
- Have fixing intervals been determinated?..... ☐ ☐ _____
- Have fixing points determinated?..... ☐ ☐ _____
- Have the primary navigation aids been determinated?..... ☐ ☐ _____
- Have the secondary means been discussed?..... ☐ ☐ _____
- Have the areas of high risk been determinated and discussed? ☐ ☐ _____
- Has the bridge team discussed the information flow and agree upon it?..... ☐ ☐ _____
- Has the charted plan been discussed?..... ☐ ☐ _____
- Has the watch condition been determinated?..... ☐ ☐ _____
- Have duties been assigned and undestood?..... ☐ ☐ _____
- Have the conditions for increasing the watch been determinated? ☐ ☐ _____
- Have the team members been made aware of any defective Equipment?..... ☐ ☐ _____
- ...S Automatic Identification System updated ☐ ☐ _____

Figure 19: Page 16 of the voyage planning documentation (extract)

Pages 17 and 18 of the voyage planning documentation contain tide information for the port of Les Sables-d'Olonne for the months of August and September 2020. Finally, the last page of the voyage planning documentation (p. 19) contains a port map of Les Sables-d'Olonne, which provides information on the location and designation of the berths and facilities there.

3.3.3.3 Deficiencies in the voyage planning

A close examination of the voyage planning documentation reveals that careless mistakes were made in various places during preparation. For example, the header at the top of each page of the document template contains a tabular overview with document information, which irrespective of the various aspects of the voyage planning remains identical from page to page up to and including the consistently used page assignment (1/1) – see **Figure 10** above and the enlarged extract below in **Figure 20** by way of example.

RSM	REGENCY SHIP MANAGEMENT S.A.					
	SAFETY MANAGEMENT SYSTEM / EMNİYETLİ YÖNETİM SİSTEMİ					Form No / Form No
	VOYAGE PLANNING CHECKLIST SEFER PLANLAMASI KONTROL LİSTESİ					ISM-07-I-71-A
Issued By	Approved By	Issue Date Düzenleme Tarihi	Revision Date / No Revizyon Tarihi / No	File No Dosya No	Seperation Ayrım	Page / Sayfa
DPA /	Gen. Mngr./Gen. Müd.	01.05.2017	30.03.2018 / 01	7	1	1 / 1

Figure 20: Header of the voyage planning document template

On page 2 of the voyage planning documentation (see **Figure 11** above), 02/08/2020 is erroneously entered as the ETA date instead of 02/09/2020 and the total number of documents belonging to the voyage planning documentation is indicated as seven, while the planning actually comprises 19 pages. The erroneous ETA date continues on page 3 (see **Figure 12**). Moreover, the time given there for reaching the berth (1630 LT) is not consistent with the time indicated in the voyage planning (2044) for reaching the waypoint for the pilot boarding point on the approach to the port of destination, Les Sables-d'Olonne.

The originator of the documentation evidently also made a mistake in the information on the total distance on page 2. The figure given there (1555.29 nm) shows a clear discrepancy with the distance given at the end of the waypoint list (1380.24 nm).

The tabular waypoint lists (pp. 4-11 of the voyage planning documentation) and the information given there also contain the following errors or inconsistencies:

- the figure in the column headed 'Distance to go' increases continuously. Accordingly, the table column in question does not list the distance from the respective waypoint to the destination (in this case the pilot boarding point for the approach to the port of destination, Les Sables-d'Olonne), but rather the distance already made good;

- the waypoints in the column referred to above have been erroneously shifted upwards by one line. Accordingly, waypoint 1 is assigned a distance to go (or correctly expressed, a distance made good) of 0.08 nm, while the distance in question was not covered until waypoint 2 was reached. That the displacement of the distance information is a continuous error becomes clear at the latest on the last page of the waypoint list (p. 11 of the voyage planning documentation, see **Figure 15** above). Distances made good of 1374.78 nm and 1380.24 nm are assigned to waypoints 152 and 153 respectively, while the difference between these two

distances (5.46 nm) actually concerns the subsequent distance between waypoints 153 and 154;

- in the column headed 'Elapsed time – ETA', 26 August 2020 was erroneously given in each case as the date on page 4 (waypoint list from the berth in the port of Klaipėda to the pilot boarding point; see **Figure 13** above), even though the ELSE was neither supposed to leave nor actually left the port until 24 hours later, notably on 27 August;

- the ETA column of the waypoint list exhibits a line displacement that continues throughout the voyage planning documentation. The ETA information noted at the respective waypoint does not refer to the current waypoint, but rather to the next one. This error is also relatively easy to identify by looking at the relevant information on waypoints 152, 153 and 154, for example (see **Figure 15**). The distance between waypoints 152 and 153 is – correctly indicated – about 178 nm, while the next (last) waypoint distance between waypoints 153 and 154 – also correctly shown – is about 5.5 nm. However, the times shown in the respective ETA row do not correspond with these very different distance indications; instead, waypoint 153 is assigned an ETA of 2044, which only differs from the ETA for waypoint 152 by 38 minutes. It is clear that the time span in question actually concerns the period between waypoints 153 and 154, which are not far apart. It follows in turn that the ETA predicted for waypoint 153 is actually the ETA for waypoint 154;

- from waypoint 8, voyage planning is based on the ship continuously sailing at a speed of 8.5 kts, without taking into account, for example, that the ELSE has to observe a maximum speed of 8.1 kts on the NOK and, for example, also that the approach and transiting of the NOK locks – regardless of the actual duration of these legs – obviously precludes a constant voyage speed from the outset;

- the continuous assumption of a low tidal current also obviously contradicts the planned route's actual conditions;

- the continuous indication of a UKC of at least 30 m from waypoint 8 does not correspond to the conditions on various legs of the voyage on the Baltic Sea and completely disregards the fact that the NOK, which forms part of the voyage, has a mean depth of 11 m, for example;

- it was not possible to clarify the meaning and purpose of the table columns headed 'P.I. Infor.' and 'Allow Set'. The column names mentioned are not self-evident. The entries in these columns (consistently 'N/A' or heading to the next waypoint, which is noted again adjacently in an appropriately headed column) do not provide any indication, either;

- the data on the primary and secondary position fixing method in the column at the right-hand edge of the waypoint lists are not credible, neither do they correspond with the planned route's actual conditions. Using radar as the primary means of position fixing from the start to the end of the voyage and only attributing secondary importance to GPS is completely unrealistic.

The 'Leg Information' planning document (see **Figure 16** above) only provides information for the legs from waypoint 12 to waypoint 13 and from waypoint 30 to waypoint 34, as already explained above. The last leg referred to (on Kiel Fjord), which is about 1.8 nm in length and begins about 0.4 nm south of Friedrichsort Lighthouse and ends in the area of the Kiel-Holtenau lock approach on the Baltic Sea side is the one of significance for the investigation of the accident. As with the leg from waypoint 12 to waypoint 13, the information is limited to the specification of locally relevant VHF channels and the relevant UKHO sailing directions. In this respect, it is evident that at neither this nor any other point in the voyage planning documentation is information on the reporting obligations for proceeding in fairway mode on Kiel Fjord or the VHF channel 67 (Kiel Traffic) to be used in this regard. Moreover, apart from the aforementioned references to the relevant nautical publications, the voyage planning documentation does not contain any information on the specific procedures for the subsequent NOK passage (obligation to engage a pilot, procedure for engaging a pilot, pilot boarding point, obligations before entering and while in the locks, canal speed, relevant VHF channels, pilot transfer station), either.

The above deficiencies concern the subsequent voyage planning in its entirety. For example, no information is provided on the ship reporting systems that follow the NOK passage, including those in the German Bight, and the associated obligations of the ship's command.

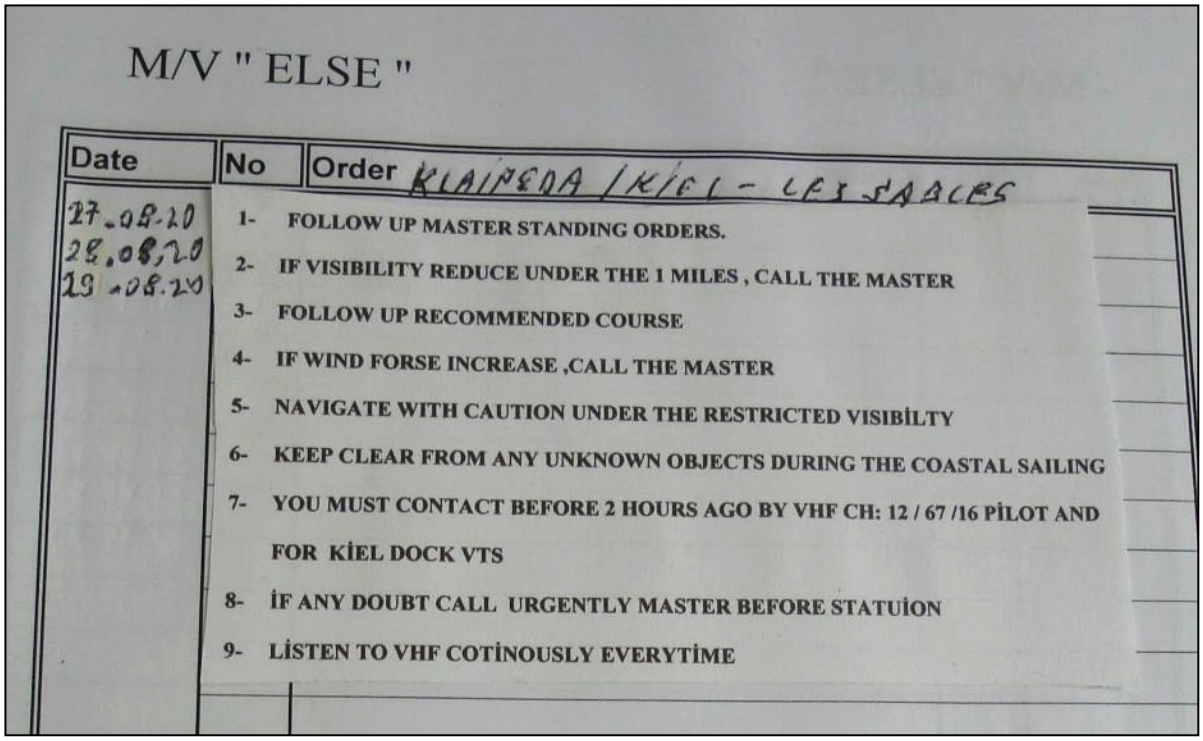
The fact that the checklists enclosed with the voyage planning documentation, which were supposed to contain information on the navigational charts used, the weather report, but also on the briefing of the bridge crew concerning the voyage planning, were not completed has already been discussed.

3.3.4 Written orders of the master

The order log on the bridge of the ELSE contained nine standing orders for watchkeeping on the bridge for – the first leg of – the voyage from Klaipėda to Les Sables-d'Olonne (see **Figure 21** below). The chief mate and second officer both acknowledged them with their signatures.

The orders included the requirement to call the master in the event of reduced visibility, increasing wind or any dubious situations. In addition, the master had stipulated that the pilot and "Kiel Dock VTS" must be contacted "before two hours"[40] on channels 12, 67 or 16.

The orders do not contain any indication of the time at which the master must be called to the bridge before the pilot boards.



M/V " ELSE "

Date	No	Order KLAIPEDA / KIEL - LES SABLES
27.08.20 28.08.20 29.08.20		1- FOLLOW UP MASTER STANDING ORDERS. 2- IF VISIBILITY REDUCE UNDER THE 1 MILES , CALL THE MASTER 3- FOLLOW UP RECOMMENDED COURSE 4- IF WIND FORSE INCREASE ,CALL THE MASTER 5- NAVIGATE WITH CAUTION UNDER THE RESTRICTED VISIBİLTY 6- KEEP CLEAR FROM ANY UNKNOWN OBJECTS DURING THE COASTAL SAILING 7- YOU MUST CONTACT BEFORE 2 HOURS AGO BY VHF CH: 12 / 67 /16 PİLOT AND FOR KİEL DOCK VTS 8- İF ANY DOUBT CALL URGENTLY MASTER BEFORE STATUİON 9- LİSTEN TO VHF COTİNOUSLY EVERYTİME

Figure 21: Written orders of the master for the deck officers of the MV ELSE

3.3.5 Time on board

According to the AIS analysis, the allision with the lock gate at Kiel-Holtenau occurred at 0507 CEST. During his radio contact with the pilot station (Holtenau Pilot) at 0342, the officer on watch on the bridge of the ELSE had stated on request that 0600 was the ETA at the pilot station. However, at the time of the announcement in question, the ELSE was only about 7.5 nm from the pilot station. There was no further reduction in speed, which at some 6 kts was already very low. There is no evidence this was planned, i.e. calculated, at the time of the radio contact in question. Therefore, the ELSE actually only needed about 75 minutes to reach the pilot boarding point and not 135 minutes, which was clearly visible to the officer on watch.

[40] Presumably, this means two hours before reaching the pilot boarding point and lock at Kiel-Holtenau.

The above circumstances unambiguously demonstrate that the officer on watch could not have based the aforementioned ETA notification on CEST (UTC + 2 h), which is relevant for Germany and the German territorial sea. Instead, his ETA prediction was based on EEST (UTC + 3 h, i.e. one hour ahead of CEST), which still applied at the port of departure (Klaipėda) and evidently also on board the ELSE. From his perspective, the radio call with the pilot station therefore did not take place at 0342, but rather at 0442. With a remaining voyage time of about 75 minutes, he therefore concluded that the ELSE would reach the pilot boarding point at about 0600.

A review of the entries in the ELSE's deck log book confirmed the suspicion that ship time, which originally corresponded to local time in Klaipėda, had not been adjusted since they left the port of departure. In the log entry for 28 August, “UTC + 3” is still noted as the time on board (see **Figure 22**).

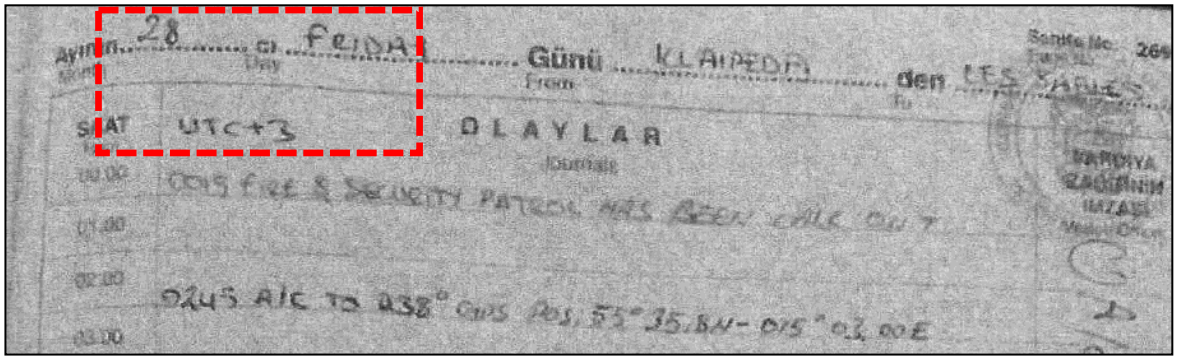


Figure 22: Extract from the MV ELSE's deck log book, 28 August 2020

In contrast, although the log entry for 29 August does contain the ship's time as “UTC + 2” (see **Figure 23** below), it must be assumed that this was only made subsequently or that it was a fatal, non-fact-based careless entry. On one hand this is supported by the fact that information on the (possibly gradual)[41] adjustment of the time zone was not entered in the log by the (respective) navigational watch on 28 or 29 August. On the other hand, and in particular, the position entry made at 0230 on 29 August and the subsequent log entries relating to the final accident indicate that the time on board was UTC + 3 hours when the accident happened (and at all times before it).

[41] Note: On ships that maintain three watches, such as the ELSE, it is normal practice to divide a one hour time difference into periods of 20 minutes each, so that each watch is uniformly extended or shortened by 20 minutes due to the required adjustment of the ship's time.

The position entry at 0230 corresponds with waypoint 21 in the voyage planning. The analysis of the radio and AIS recordings shows that the ELSE passed waypoint 29 (Friedrichsort Lighthouse), which was 20 nm away, at 0441. In the absence of any evidence to the contrary, if we assume that the ship sailed at a constant speed of about 6 kts on the legs between waypoints 21 and 29, it follows mathematically that the ELSE must have passed waypoint 21 about three hours and 20 minutes before reaching waypoint 29, i.e. at about 0120. Accordingly, the log entry with the time 0230, which deviated by more than one hour, was undoubtedly based on a time on board that was still derived from local time in Klaipėda (UTC + 3 h).

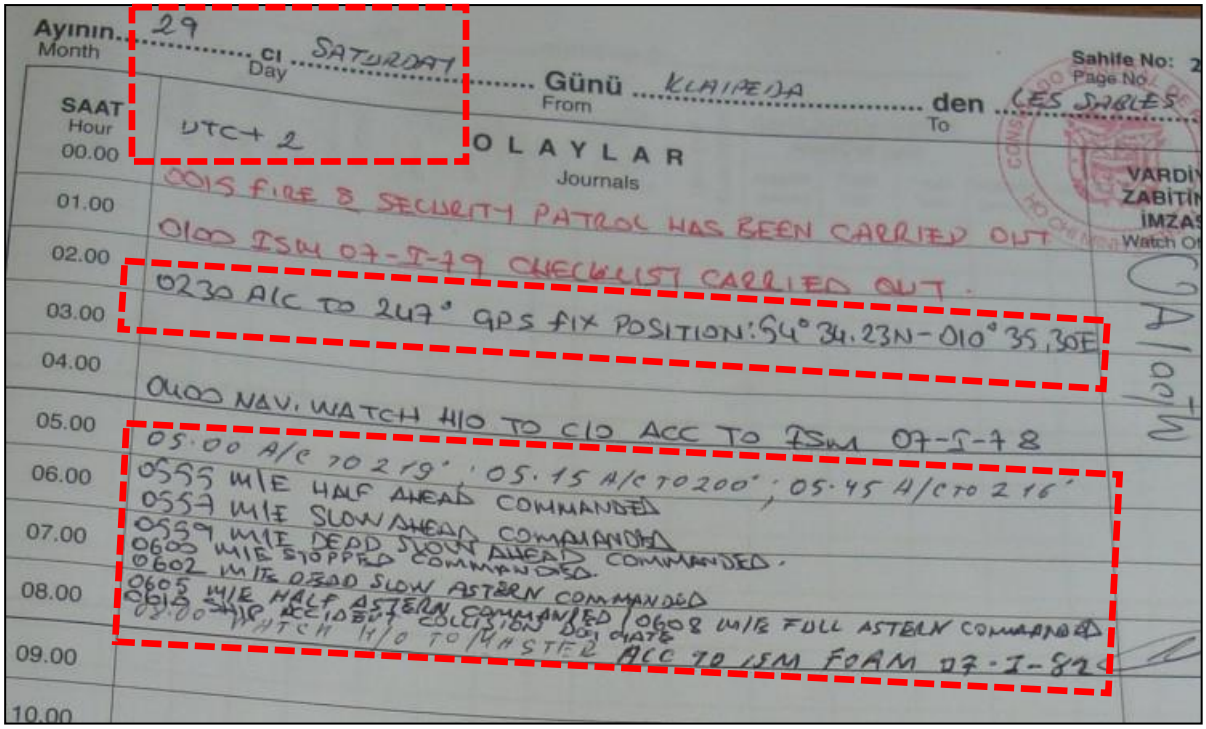
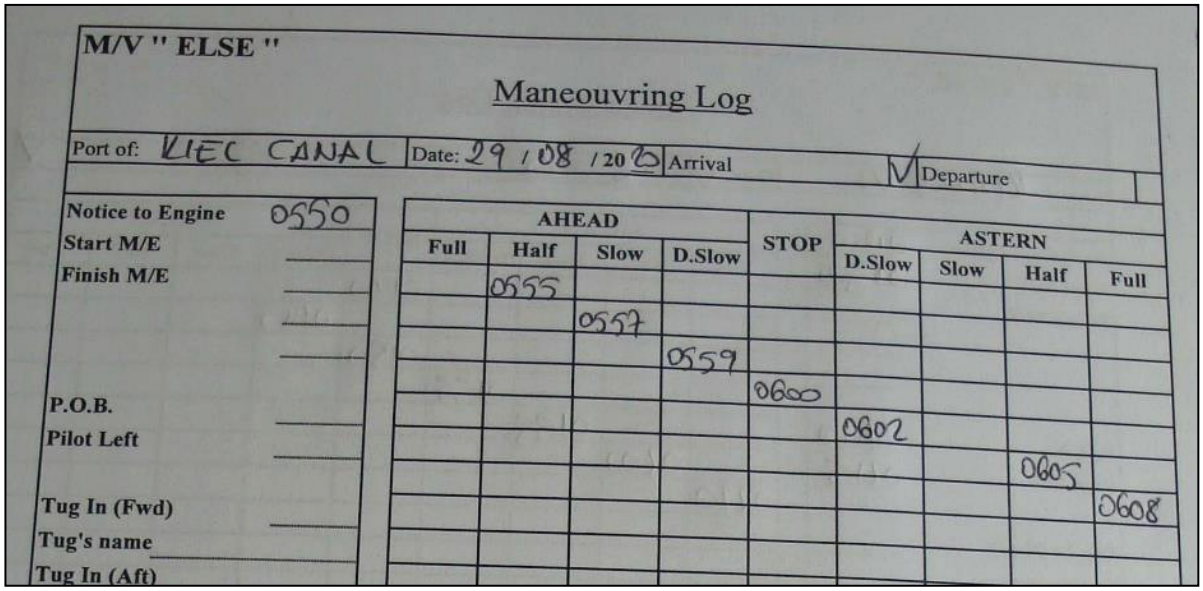


Figure 23: Extract from the MV ELSE's deck log book, 29 August 2020

The final convincing pieces of evidence showing that the time on board the ELSE differed by one hour from German local time are the entries in the deck log book and the manoeuvre log (**Figure 23** above and **Figure 24** below), in each case for engine manoeuvres that were reportedly carried out in the final minutes before the accident, as well as in the deck log book at the time of the allision. In this respect, the recordings begin at 0555 and show that the time of the accident was 0610.



M/V " ELSE "

Maneouvring Log

Port of: KIEL CANAL Date: 29 / 08 / 2020 Arrival ☑ Departure

		AHEAD			STOP	ASTERN			
	Full	Half	Slow	D.Slow		D.Slow	Slow	Half	Full
Notice to Engine 0550		0555							
Start M/E			0557						
Finish M/E				0559					
					0600				
P.O.B.						0602			
Pilot Left								0605	
Tug In (Fwd)									0608
Tug's name									
Tug In (Aft)									

Figure 24: Extract from the MV ELSE's manoeuvre log (entry dated 29 August 2020).

3.3.6 Composition of the navigational watch before the accident

Apart from the consistent information that the chief mate and a rating (helmsman) were on the bridge at the time of the accident and in the two hours leading up to it, witness statements regarding the composition of the navigational watch during the final leg of the voyage on Kiel Fjord differed considerably. The witnesses made diametrically opposed or extremely long-winded and generally unreliable statements at various times to the BSU and in the course of the police interviews.

Accordingly, the statements made in this regard were of extremely little value when attempting to clarify whether or from what point in time before the accident the master was present on the bridge and assumed command of the ship. The deck log book does not contain any entries about the master assuming command of the ship, either.

However, the overall assessment of all the circumstances surrounding the accident in conjunction with the analysis of VHF radio traffic suggests that the master probably entered the bridge immediately before the allision with the lock gate at the earliest and in any case too late to be able to prevent it.

To begin with, it should be noted that the deck log book indicates that the navigational watch on the bridge of the ELSE was handed over to the chief mate at 0400, i.e. in accordance with the roster. Since the time on board was clearly one hour ahead of German local time, the chief mate assumed command of the ship at 0300. Based on the consistent voice pattern, the ensuing VHF radio traffic from the ship to the pilot station (Holtenau Pilot) at 0342 and 0441, but also the very brief and insecure replies to the calls of VTS NOK at 0505 and of the pilot station at 0506 immediately prior to the accident were made by the same person, i.e. the chief mate. In contrast, the master attempted to contact VTS NOK personally for the first time at 0511.

Although it cannot be ruled out from the outset that the chief mate may have been responsible for radio communications even after the master had possibly appeared on the bridge and assumed command of the ship, the convincing piece of evidence showing that the master – if at all – only entered the bridge just before the accident is provided by his radio communication with VTS NOK on VHF channel 3 after the accident when the VTS asked the master at 0528 for an explanation as to why the vessel sailed for the lock despite the warnings of the VTS and contrary to the recognised obligation to engage a pilot. The master basically repeated his statements several times without contradiction and replied that the officer on watch and rating on watch were working on the bridge and reportedly manoeuvred the ship into the lock gate. He was unable to explain why the vessel was reportedly steered towards the lock without a pilot, without permission and contrary to his orders to wake him in good time before reaching the pilot boarding point.

On the other hand, the master did not say anything about possible technical problems on board in the radio call in question, even though experience has shown that irrespective of whether they actually existed, such problems are usually mentioned very quickly when identifying the cause of an accident.

Indeed, although it is theoretically possible that the master merely wanted to deny any responsibility for the accident in the radio call with VTS NOK, there is simply no plausible reason for the experienced master, who is in full possession of his faculties and familiar with the practicalities of transiting the NOK, to sail his vessel past the pilot boarding point, then alter course in precisely the direction of the lock approach and subsequently manoeuvre the ship directly into the closed lock gate.[42]

3.3.7 Course of the MV ELSE's voyage (AIS track)

The following screenshots (**Figures 25 ff.**) of the course of the ELSE's voyage are taken from the AIS recording of the WSV. They confirm that the ship (outlined in red in the below figures) initially used the buoyed fairway completely inconspicuously and in accordance with the rules and observed the course alteration points due to the course of the fairway on Kiel Fjord until she reached the pilot boarding point at the southern edge of the Holtenau roadstead. The ship's SOG was a consistent 5-6 kts throughout the voyage, until immediately before the allision with the lock gate.

[42] Note: The theory put forward by the ship's command only some time after the accident that the ship had reportedly overshot the pilot boarding point due to a technical fault and that it was reportedly not possible to stop this process is completely absurd. It is not consistent with the proven fact that the ELSE purposefully sailed on a course for the lock gate for a total of 14 minutes after passing the pilot boarding point without slowing down. See also the comments in Ch. 3.3.7 and 3.3.11.

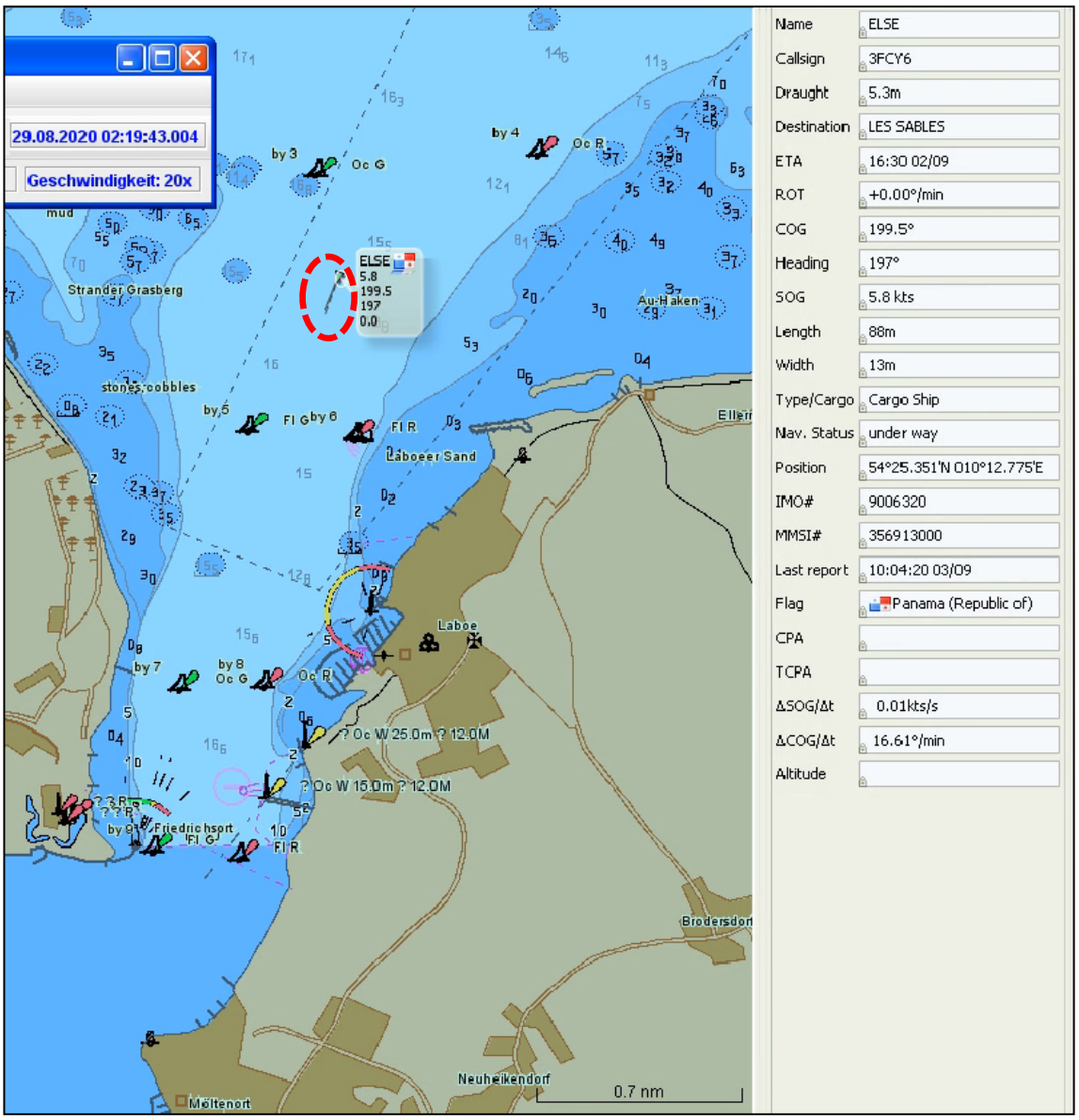


Figure 25: Position of the ELSE in the fairway between buoys 3 and 5 at 0420[43]

Shortly after passing fairway buoy 9 (level with Friedrichsort Lighthouse), the ELSE duly altered course for the Holtenau roadstead at **0442** (see **Figure 26** below).

[43] Source of this and below: Recording from the WSV's AIS system (*AIS Deutsche Küste* [AIS German coast]). The author of the report has cropped the screenshots (especially below) at the edges so as to focus on essential information and applied colour-highlighting to emphasise specific content.

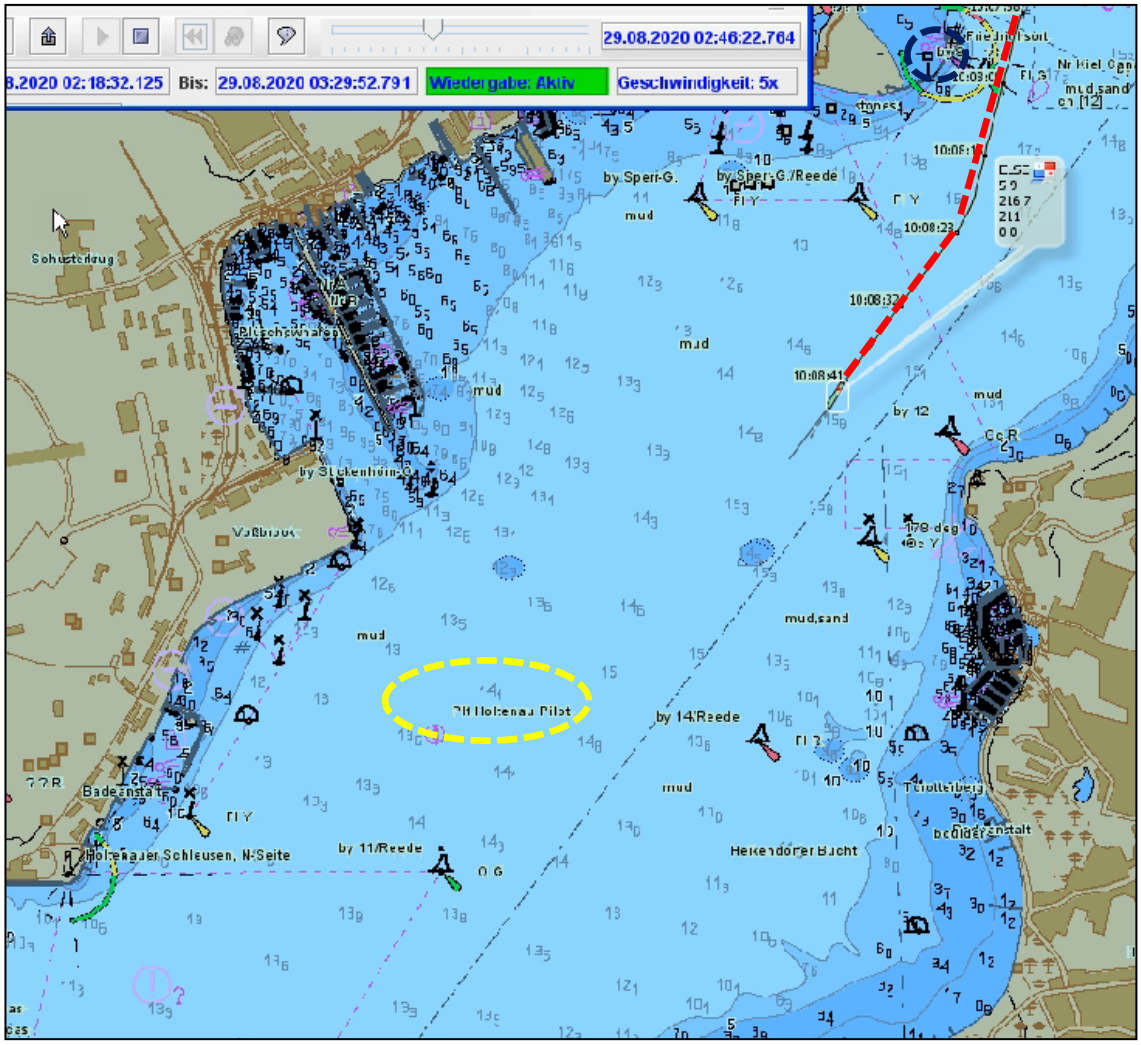


Figure 26: Course of the ELSE's voyage (red highlighting) after passing buoy 9[44]
(in this case up until 0446)

The ship then passed the Holtenau roadstead on the starboard side without any further course alterations but then passed the pilot boarding point marked on the navigational chart at about **0453** without reducing speed (see **Figure 27** below).

[44] The author of the report has marked buoy 9 at the top right of the image black and the pilot boarding point yellow here and below.

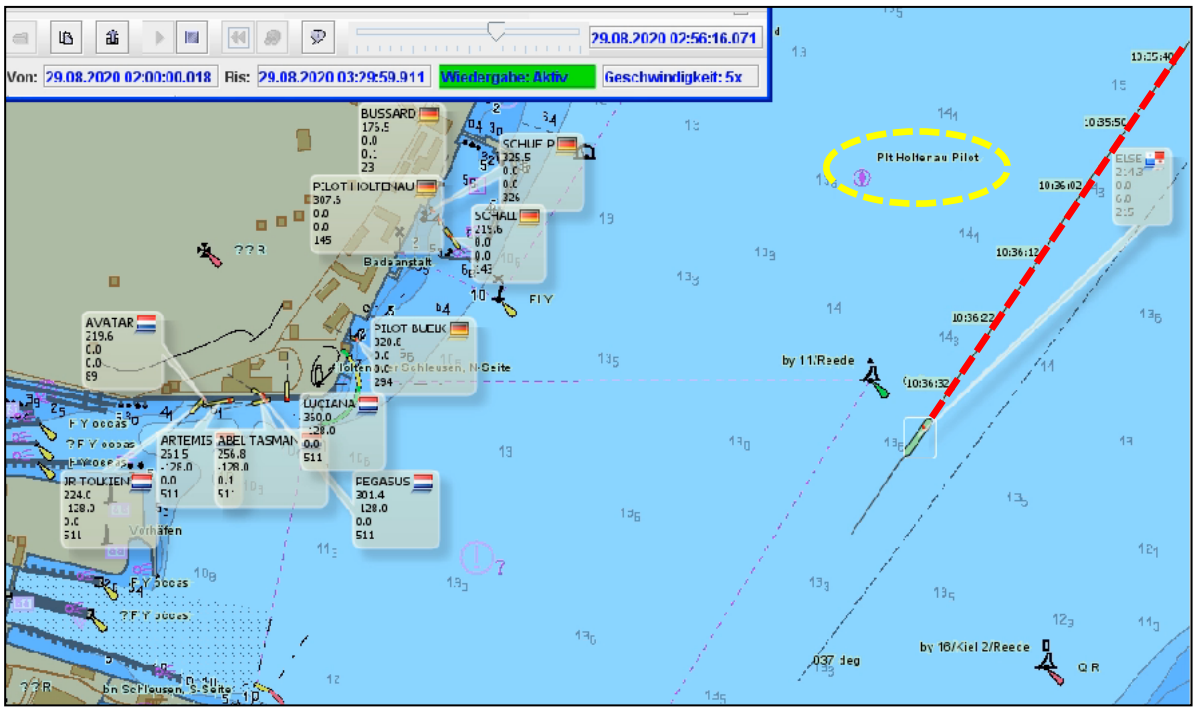


Figure 27: The ELSE sails past the pilot boarding point (track here until 0456)

Shortly afterwards (from about **045630**), the ship began to make a continuous course alteration to starboard, turning into VTS NOK's area of responsibility at about **0458** (see white boundary marking in **Figures 28 ff.**). The ELSE then maintained a more or less constant course (or rather even with minor course adjustments and at an unchanged speed) directly towards the entrance to the north chamber of the 'Neue Schleuse' lock. She inevitably sailed into the closed lock gate at **0507** (see **Figures 29 f.**).

Figure 28: The ELSE alters course towards the entrance to the lock (track here until 0500)

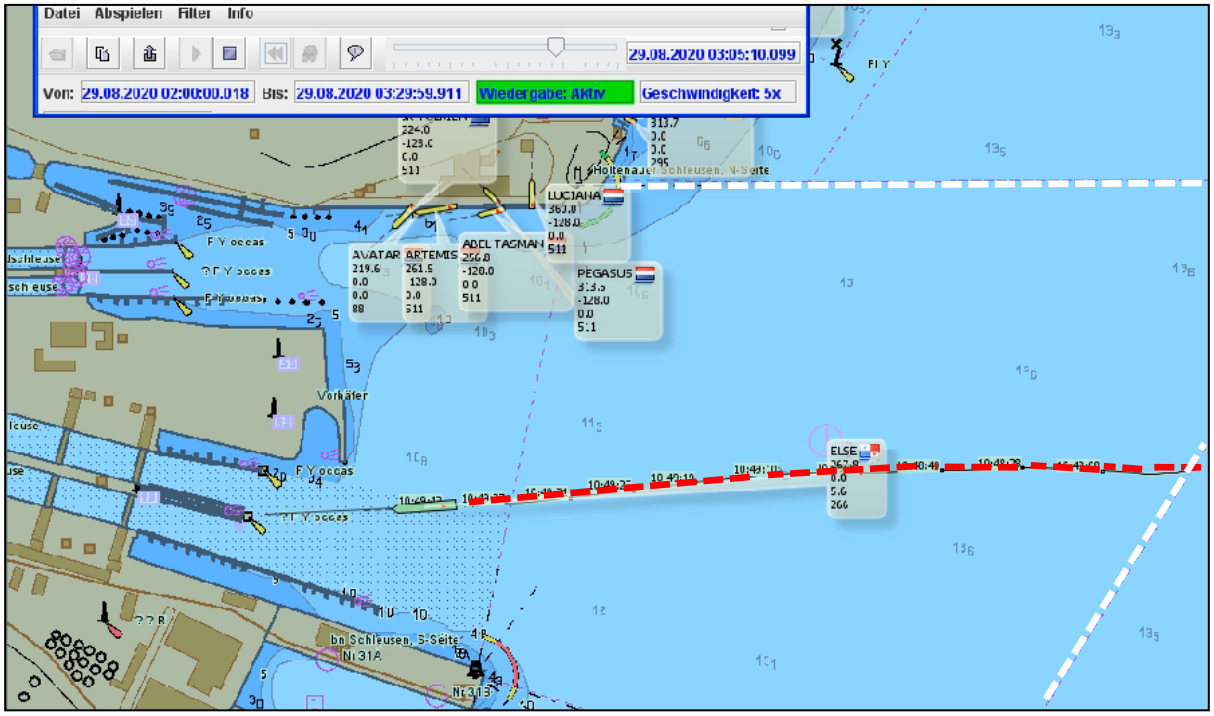


Figure 29: The ELSE approaches the lock chamber without any reduction in speed (track here until 0505)

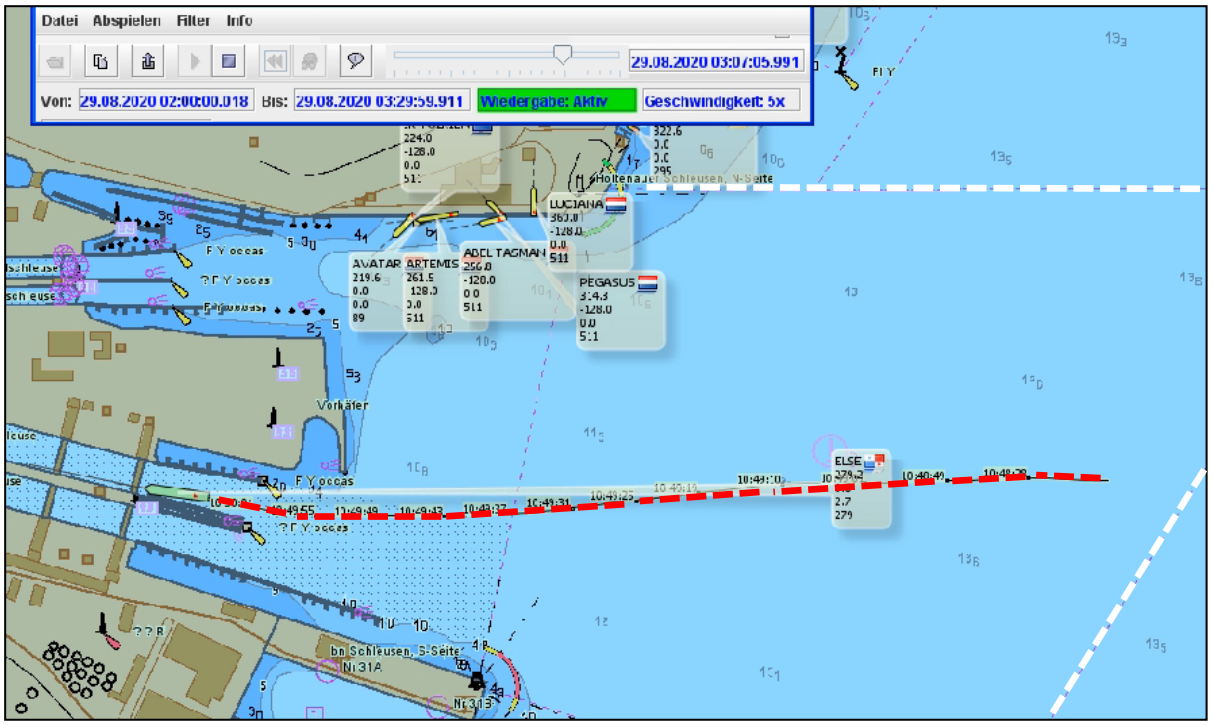


Figure 30: The ELSE just before the allision with the lock gate (0507)

The AIS recordings imply that the ELSE reduced speed immediately before the allision with the lock gate, i.e. an emergency stop manoeuvre was presumably made on board. This is probably why the gate was not breached but rather absorbed the energy of the impact and thus brought the ship to a standstill.

3.3.8 VTS Travemünde

On 8 December 2021, a meeting took place between the investigation team and head of VTS Travemünde in a conference room at the VTS's Lübeck-Travemünde site. A nautical supervisor who works at the VTS and a representative of the GDWS were also present at the meeting.[45]

On one hand, the discussion focused on the actual events leading up to and during the ELSE accident. On the other hand, and primarily, fundamental questions of organisational and practical procedures, communication, as well as shore-based competences and responsibilities relating to the entry of a seagoing vessel into VTS Travemünde's area of responsibility were addressed. Of particular interest to the BSU was the question as to how communication between the VTS and ELSE, the fjord and canal pilots (on the day of the accident and in general) and – if planned – VTS NOK (in this case in the Kiel-Holtenau lock area) actually 'functioned' on the day of the accident and in general. Another focus of the discussion was the issue of whether and, if so, what possibilities there are or could be to avoid an accident like the one involving the ELSE in the future.

The following information about the organisational procedures and other general conditions was provided by the VTS or subsequently researched/verified by the investigators:

1.) VTS Travemünde is responsible for five control areas (sectors) in the western part of Germany's Baltic Sea coast. These are the Kiel Traffic, Kiel Bight Traffic, Fehmarn Belt Traffic, Trave Traffic and Wismar Traffic sectors.

On each watch, one nautical supervisor and nautical assistants each monitor one of the above sectors from a workstation equipped with AIS/radar control screens, radio technology and a PC in a large traffic control room.

2.) The nautical supervisor has a dual function in the respective watch. On the one hand, he is in charge of all nautical assistants responsible for a sector and assists individual colleagues if problems arise in their specific sector or if navigation police orders[46] have to be issued, for example. On the other hand, the nautical supervisor also controls one of the above mentioned sectors.

The nautical assistants and nautical supervisor work at their workstations on a rotating system, i.e. they regularly (but not within the individual watch) change the control area so as to remain aware of the particular conditions in each sector.

3.) Kiel Traffic with the associated VHF radio channel 67 is the relevant sector for navigation on Kiel Fjord and thus also for the Baltic Sea approach to the NOK.

[45] In the remainder of this chapter, no distinction is made with regard to the BSU's interlocutors mentioned, but rather the term 'VTS Travemünde' or just 'VTS' is used.
[46] Navigation police orders are usually issued through instructions on VHF radio to individual ships, which are required to comply with them.

4.) Section 58(1) of the *Seeschifffahrtsstraßen-Ordnung (SeeSchStrO)* [German Traffic Regulations for Navigable Maritime Waterways] in conjunction with the following numbers of the Notices from the GDWS (Outstation North) provide the legal basis for the pre-entry and subsequent position reporting of ships during the (forthcoming) voyage on Kiel Fjord towards the NOK[47]:

- No. 29.3.3. Pre-entry report on VHF channel 67 to Kiel Traffic 120[48] minutes before passing Kiel Lighthouse

- No. 29.3.4. Position report on VHF channel 67 when passing Kiel Lighthouse

- No. 29.3.5. Position report on VHF channel 12 when passing Friedrichsort Lighthouse to VTS NOK (Kiel Canal IV)[49]

5.) Accordingly, the following responsibilities apply to the navigation police control of traffic in the approach to the NOK (coming from the Baltic Sea; see the boundaries of the area of responsibility marked in white below in **Figure 31**):

- VTS Travemünde (Kiel Traffic) is in charge of Kiel Fjord (including Holtenau-Reede roadstead and the pilot boarding point there) up to the lock entrance and past it to the east[50];

- VTS NOK (Kiel Canal IV) is in charge of the lock entrance and locks (Kiel-Holtenau)[51].

[47] Outstation North in Kiel now bears the name Duty Station Kiel. The official designation of the Notice has remained unaffected thus far.
[48] Although the GDWS Notices specify a period of 60 minutes, the period for the pre-entry report was increased to 120 minutes before passing Kiel Lighthouse in the Notice to Mariners No. 21/20; see also VTS Guide Germany, BSH, p. 74.
[49] Note: In practice, exempt vessels on Kiel Fjord call the pilot station (Holtenau Pilot) on channel 12; see comments in Ch. 3.3.9 for details on this subject.
[50] VTS Travemünde's (Kiel Traffic) area of responsibility does not end in front of the lock entrance but passes it to the east for the purpose of controlling maritime traffic in or moving from and to the port of Kiel.
[51] See comments below in Ch. 3.3.10 with regard to the responsibilities of VTS NOK.

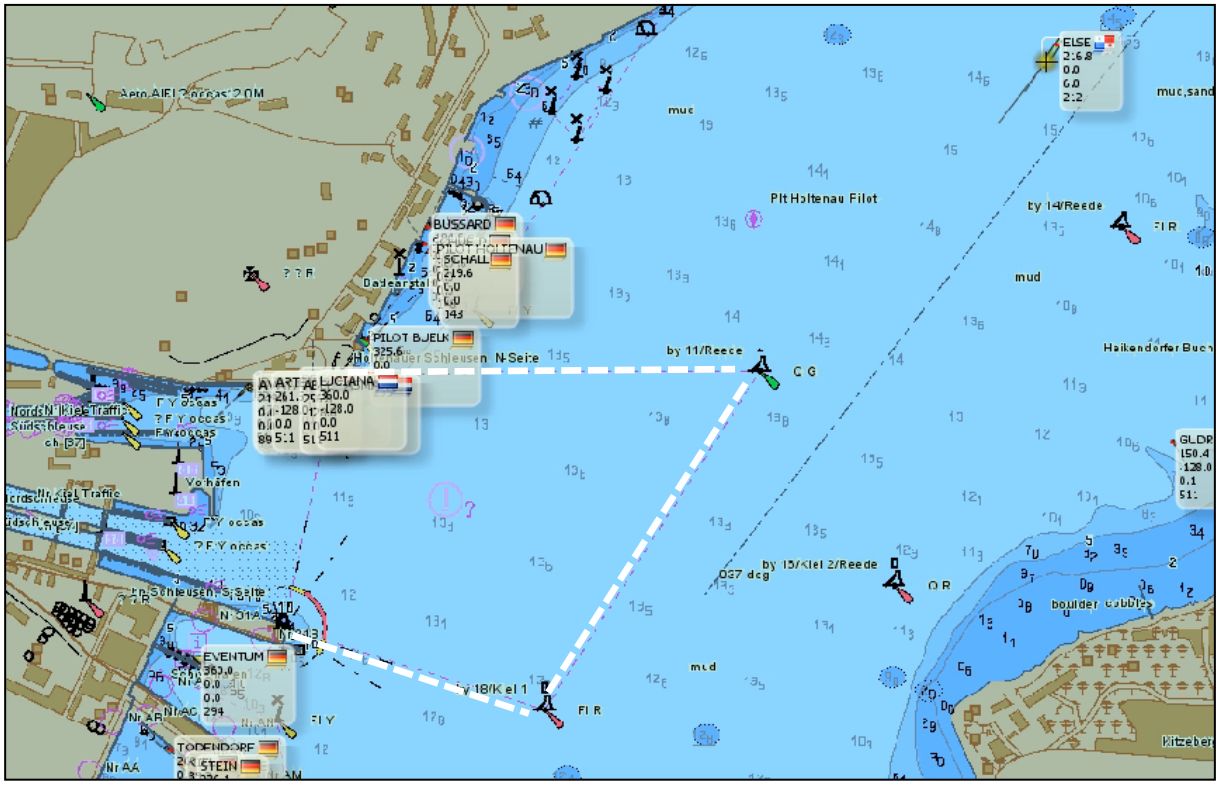


Figure 31: Entrance to the NOK lock facility at Kiel-Holtenau;
boundary of the areas of responsibility of the VTSs[52]

6.) For the purpose of illustrating the subject of the discussion (in this case the course of the ELSE's voyage in VTS Travemünde's area of responsibility on the morning of the accident), the relevant AIS/radio recording was cast on a screen by a projector. While the recordings were being played back, various questions were addressed, the contents/results of which (as well as any related comments of the BSU) are presented below.

a) The ELSE duly submitted her pre-entry report to Kiel Traffic on channel 67 two hours before reaching the Kiel Lighthouse position and then reported in to Kiel Traffic at about 0300, in accordance with regulations, when she passed Kiel Lighthouse. The reports were worded in an appropriate and unobtrusive manner in both cases. Accordingly, the nautical staff at the VTS had no evidence whatsoever to suggest that disorientation or other problems may prevail on the ELSE's bridge at that time or in the future.

b) The above position report at Kiel Lighthouse was the last contact between Kiel Traffic and the ELSE. There were no legal or de facto requirements for VTS Travemünde to address the ship while she continued towards the entrance to the NOK. The ELSE duly sailed through its area of responsibility and was not subject to any further reporting obligations to Kiel Traffic when she was approaching the NOK. This means that from the point of view of Kiel Traffic, there was no reason to contact the ELSE or to closely monitor the course of her voyage.

[52] Source: Screenshot taken from the AIS recording of the WSV; white marking on the boundary of the areas of responsibility by the author of this investigation report.

c) According to the statement/information from the watch supervisor at the Kiel-Holtenau pilot watch, he reportedly received a phone call from Kiel Traffic at about 0300 on the morning of the accident requesting that the ELSE be included in the reports available at the pilot watch. The ship was reportedly sailing at a much reduced speed and reportedly requires a NOK pilot on the Holtenau roadstead at 0600.[53] VTS Travemünde's representatives emphasised that such a phone call was not in keeping with normal practice in the German coastal area, which was reportedly that VTSs and pilot stations are electronically notified of incoming traffic beforehand via electronic ship data processing systems.

However, during the subsequent tour of the VTS, nautical staff working there explained that there were reportedly times when a ship would ask Kiel Traffic (during the pre-entry or position report) to act as an intermediary for the pilot request to the Kiel-Holtenau pilot station. One reason for this could be that the ship was having difficulty reaching the pilot station on VHF channel 12 (due to range problems, for example).

7.) A large part of the investigators' discussion with the VTS was devoted to the question as to whether/how it would have been possible to divert the ELSE from her disastrous course.

a) VTS Travemünde does not believe that it was at all negligent. During the course of the passage through Kiel Fjord (or even before that), there was reportedly no evidence to suggest to the very experienced nautical staff working on the day of the accident that the ELSE should be closely monitored or addressed. The stipulated monitoring of the communication on VHF channel 12 and the ELSE's calls via this means did not provide any reason in this regard, either, especially since the (passive) monitoring in question reportedly did not form part of VTS Travemünde's traffic monitoring duties.

b) The dangerous situation reportedly only became apparent when the ELSE began her purposeful turn into the approach to the NOK at about 0457, at the same time entering the area of responsibility of VTS NOK (Kiel Canal IV). In the opinion of VTS Travemünde, this boundary crossing, which was not planned at the time in question, should have been immediately followed by a clear, unambiguous and unmistakable message or order from VTS NOK to the ELSE to stop immediately.

8.) The then completed tour of the VTS's traffic control room provided an insight into the extremely spacious layout and modern technical equipment of the workstations of the nautical staff controlling traffic in the various sectors (see **Figure 32** below by way of example, which shows the workstation of the nautical staff responsible for Kiel Fjord).

[53] See comments in Ch. 3.3.9 below for details.

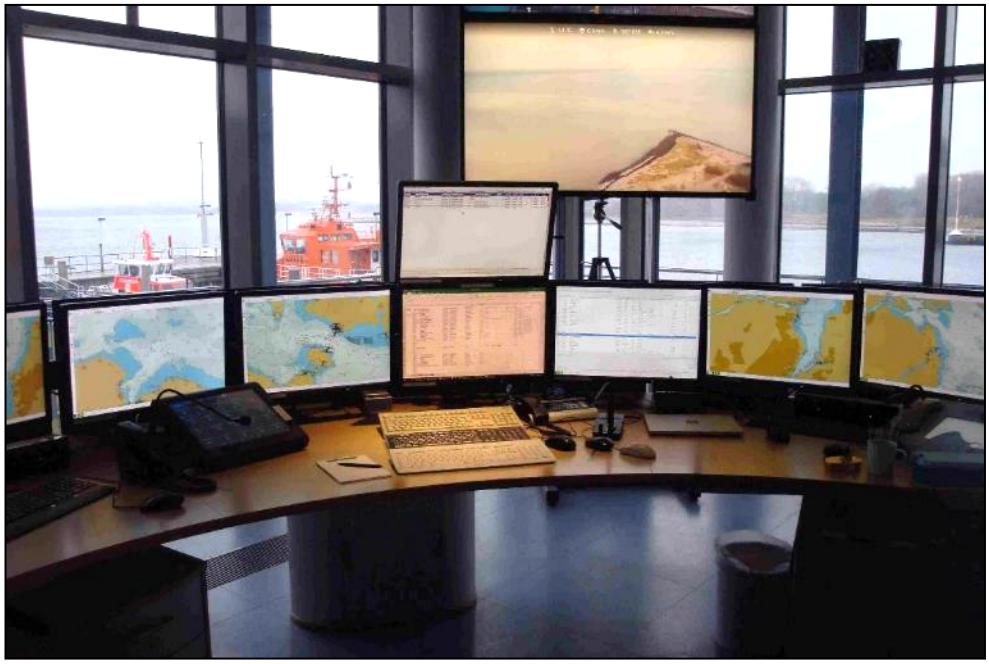


Figure 32: Kiel Traffic workstation at VTS Travemünde

a) When asked what would happen if a ship ignored a reporting point, the nautical supervisor on duty there at that time explained that this did indeed happen from time to time and that the nautical staff at the VTS would then actively address such a ship.

b) Particular attention was given to the survey of the workstation of the nautical staff responsible for Kiel Fjord (see **Figure 32** above). The nautical staff on duty at that time provided information about his work and in this context explained that although he is usually aware of whether a vessel destined for the NOK has already requested a pilot via the information on his screen, which is linked to the ship data processing system, VTS Travemünde would not normally pay any particular attention to this question because direct contact between the pilot station and respective vessel is reportedly provided for.

3.3.9 NOK II pilot association

On 21 October 2021, there was a meeting between the investigation team, the alderman of the NOK II pilot association and his deputy (referred to below as 'the pilot association') in the pilot association's administration building on the lock island at Kiel-Holtenau (see yellow highlighting in **Figure 33** below). The meeting finished with a visit to the Kiel-Holtenau pilot station (also known as pilot watch; call sign: Holtenau Pilot), which is within walking distance in the control station on the middle wall of the 'Neue Schleuse' lock (red highlighting in **Figure 33**).

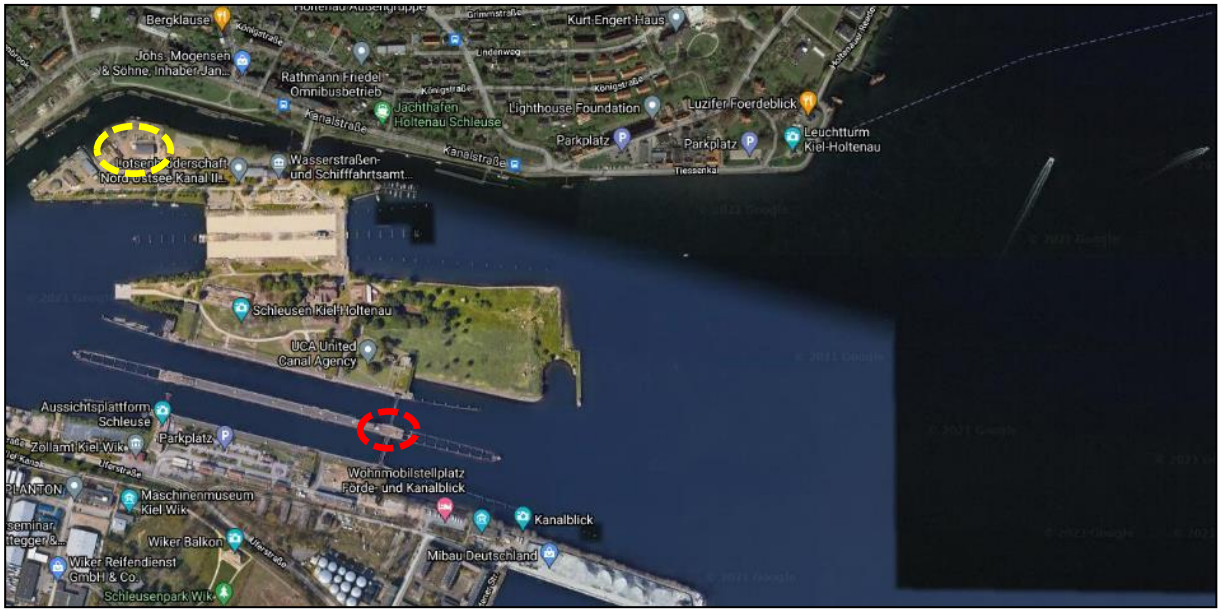


Figure 33: Location of the administration building and the pilot watch on the grounds of the Kiel-Holtenau lock facility[54]

On one hand, the discussion focused on the actual events affecting the ELSE leading up to and during the accident. On the other hand, and primarily, fundamental questions of procedure, communication, as well as shore-based competences and responsibilities relating to the approach of a seagoing vessel requiring pilotage to the pilot boarding point in the southern part of the Holtenau roadstead and the subsequent entry into the NOK lock were addressed.

The following information about the background of the ELSE's (non-executed) pilotage, the associated general and actual organisational procedures and the other general conditions of the pilotage was provided by the pilot association or subsequently ascertained and verified by the BSU:

1.) Ships (subject to pilotage) from a length of 90 m or breadth of 13 m or above or draught of 8 m or above intending to transit the NOK and all tankers must take a pilot on board at the latest in the Kiel Fjord pilotage area (see Section 6(1) NOK-LV[55]). After entering the NOK lock, the fjord pilot is then relieved by the NOK pilot.

The pilot boarding point for fjord pilots is at the entrance of Kiel Fjord near Kiel Lighthouse. Ships below the size laid down in Section 6(1) NOK-LV – such as the ELSE – are not obliged to engage a pilot while sailing on Kiel Fjord. The pilot boarding point for pilotage during the NOK passage, which is also mandatory for these ships, is situated at the outer limit of the NOK lock entrance in Kiel-Holtenau (southern edge of the Holtenau roadstead; distance from Kiel Lighthouse about 9 nm).

[54] Source: Google Earth.
[55] NOK-LV: *Verordnung über die Verwaltung und Ordnung der Seelotsreviere Nord-Ostsee-Kanal I und Nord-Ostsee-Kanal II/Kieler Förde/Trave/Flensburger Förde* [Regulation on management and order in the Nord-Ostsee-Kanal I and Nord-Ostsee-Kanal II/Kieler Förde/Trave/Flensburger Förde sea-pilotage areas] of 8 April 2003.

2.) The Kiel-Holtenau pilot station has two watch stations, one on the Kiel Lighthouse site at the Baltic Sea entrance to the Kiel Fjord and one on the NOK lock island in Kiel-Holtenau. The Kiel Lighthouse watch station with the associated pilot boarding point in the vicinity has the call sign 'Kiel Pilot' and uses VHF channel 14. It coordinates the deployment of pilots who already board for the passage of Kiel Fjord. On the other hand, the watch station on the lock island with the call sign 'Holtenau Pilot' is responsible for the deployment of NOK pilots who must be taken on board at the pilot boarding point in the Holtenau roadstead (or the NOK lock if they are relieving a fjord pilot). VHF channel 12 is used for radio communication with Holtenau Pilot.

3.) The first sentence of Section 5(1) NOK-LV states that the ship's command must request a pilot from the pilot station in good time. According to point 2 of Annex 1 to the above regulation, the request must be made at the Kiel Lighthouse watch station in both the aforementioned cases. The first report must be made at least 12 hours before reaching the respective pilot boarding point (so-called 12-hour report). The ship's command is also required to send confirmation to the Kiel Lighthouse watch station two hours before arrival at the respective pilot boarding point (so-called 2-hour report).[56]

4.) From the discussions with the pilot association, it became clear that there are evidently differences between the actual procedure for requesting an NOK pilot at the Holtenau roadstead pilot boarding point and that described above. The practice here in such a case is that both the 12-hour report and the 2-hour report are not made to Kiel Pilot but rather to Holtenau Pilot.[57] However, the pilot association emphasised that this practical deviation would reportedly not have any adverse effects because Kiel Pilot would also respond as a matter of course if a ship made a report concerning the Holtenau roadstead boarding position.

5.) With regard to the manner in which the pilot request was made, the pilot association advised that the 12-hour report was usually made via an agency or by the actual ship by email. For the 2-hour report, VHF channel 14 (for the fjord pilots) or channel 12 (for the pilots embarking at the Holtenau roadstead boarding point) is then regularly used.

6.) When reviewing the various sources of information on the reporting procedure and contact details to be used for pilot requests, it was noted in each case that different phone and fax numbers and also different email addresses were published for the Kiel Lighthouse and Kiel-Holtenau pilot watch stations in the aforementioned Annex 1 to the NOK-LV, in the VTS Guide Germany published by the BSH and in the tabular overview on the website of the pilot association.

[56] This is repeated on p. 76 of VTS Guide Germany, which is consistent with the NOK-LV.
[57] See https://www.kielpilot.com/Pilot-Order/Kiel-Pilot-Districts/ (retrieved on 23 June 2022).

7.) According to the pilot association, the pilot request of the ELSE was not registered by an agency. The 12-hour report was not made from the ship, either. Therefore, the pilot station (Holtenau Pilot) had no prior knowledge of the ship's forthcoming canal passage.

8.) In this regard, the pilot association explained that in practice the 12-hour reports were often omitted. This would normally be overlooked in the event of a timely 2-hour report on VHF. One of the main reasons for the omission of 12-hour reports is that ships are often very spontaneous in their decision for or against a NOK passage (e.g. depending on the weather conditions).

9.) As already discussed in Ch. 3.1.2 above, the ELSE's pilot request was made in an atypical manner. It was preceded – which is neither usual nor necessary – by a phone call from VTS Travemünde (Kiel Traffic) to the Kiel-Holtenau pilot station. In this phone call, the time and content of which could not be exactly reproduced in every detail, Kiel Traffic informed the pilot station that the ELSE had reportedly passed the Kiel Lighthouse position at about 0300 and while making her position report there on VHF channel 67 reportedly stated that she reportedly required a pilot for the NOK passage at 0600.

Following receipt of the notification of the ship by phone from VTS Travemünde and since the ELSE did not subsequently contact the pilot station, the latter started to call her at 0340 on VHF channel 12. The officer on watch on the bridge of the ship responded on the third attempt at 0342. In the very brief conversation that followed, they communicated directly with each other for the first time about the ELSE's forthcoming pilotage on the NOK. However, this communication consisted merely of the pilot station asking for the ETA at the pilot boarding point and receiving the answer without further discussion that the ETA was reportedly 0600. Accordingly, the actual pilot engagement was not discussed in the radio call in question, but rather both parties assumed it had been tacitly arranged even though no direct agreement on this had been made beforehand.

10.) As a general rule, NOK pilots make contact with VTS NOK on VHF channel 12 (in this case Kiel Canal IV, lockmaster) as soon as they board the vessel at the Holtenau roadstead boarding point and discuss the procedures for the forthcoming lock passage.

11.) On the other hand, if a fjord pilot embarks at Kiel Lighthouse, then he makes contact with the lockmaster (VTS NOK Kiel Canal IV) for the first time at this point for the exchange of information on the aforementioned VHF channel. The second call is then made when passing Friedrichsort Lighthouse, which is some 7 nm away from Kiel Lighthouse, in order to obtain information about the situation in the locks and distribution of the berths there.

12.) The following findings were made regarding the organisation of the watch at the Kiel-Holtenau pilot watch station:

a. The offices in question (or corresponding pilot coordination centre) are located at the seaward forward edge of the control station on the middle wall of the 'Neue Schleuse' lock at Kiel-Holtenau (**Figure 34**).

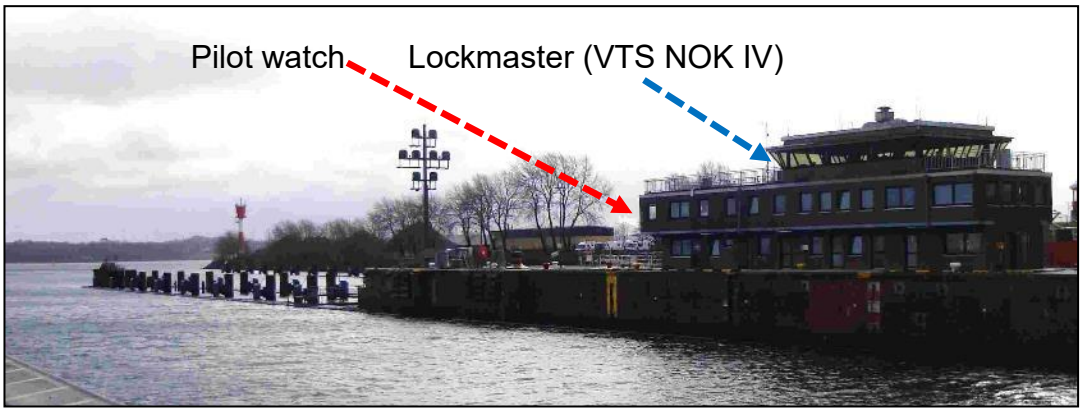


Figure 34: Lock control station on the middle wall of the lock in Kiel-Holtenau

There are two rooms. The pilots use one of the rooms as a lounge or waiting area before or after their assignment on board. The room is equipped with a 55-inch screen and additionally with a PC system with four 27-inch monitors. The above equipment displays the traffic situation in the locks or in their entrance area in real time graphically in the form of an electronic nautical chart with AIS information and in tabular form and acts as a source of information for the pilots before they go on board.

The second room contains the watch station (see **Figure 35** below). The room has window fronts on three sides, which allow for a reasonably good view of the lock entrance area (and with certain restrictions also of the actual lock chambers and walls). There are also two large monitors above the forward window front. They map the traffic situation in the lock entrance area and in the area of Kiel Lighthouse/Fjord.

Figure 35: Workstations of the watch supervisor and his assistant (Kiel-Holtenau pilot watch)

b. The two members of the pilot association that form the watch (supervisor and assistant), who organise pilotage from the watch room, each also have three flat PC screens at their workstation on which they can display the navigational and traffic planning information required for organising pilotage in graphic and/or tabular form.

c. The division of responsibilities between the watch supervisor and his assistant is organised as follows:

- Watch supervisor

communication with ships requiring pilotage services (including the receipt of pilot orders) and with VTS Travemünde or the lockmaster when manning ships with a pilot;

- Assistant

establish contact and communication with pilots when they (are about to) go on duty; assisting the watch supervisor in his aforementioned organisational tasks.

d. Both pilots and people without a pilot's licence are employed as watch supervisor.[58]

e. Employed watch supervisors and assistants do not need to have a professional background in the maritime sector but do need a VHF radiotelephone certificate for their duties. In addition, watch supervisors are usually prepared for their future role through previous service as an assistant.

f. From a procedural point of view, the duties of the watch in the pilot station are limited to the above activities. Traffic monitoring by the watch is not included, in particular as the employees in the watch (just like pilots on board) do not have any navigation police powers and in the past it is even said that the WSV viewed the intervention of pilots rather critically, including in complicated traffic situations. Pilots, watch supervisors and assistants are therefore urged not to intervene in the traffic situation until the immediate boarding process.[59]

g. If a watch supervisor works as a shipboard pilot in addition to this activity, his professional skills and experience naturally afford him a better sense of how to use the equipment available in the station to identify critical traffic situations and – in the event of an emergency – he may also intervene by radio (possibly without regard to the absence of formal authority). However, he has no obligations in this respect.

[58] In the latter case, the pilot at No.1. of the Börtordnung (operational planning), is always available for queries.
[59] The pilot association believes that similar requirements apply in the other German pilotage areas.

h. The watch supervisor on duty at the time of the ELSE accident did not have a pilot's licence. However, he has worked as a watch supervisor for many years and is very reliable and experienced in the performance of the associated duties.

i. The pilot watch and VTS NOK IV (lockmaster) have their offices on adjacent floors of the control station (see **Figure 34** above). 'Barrier-free' communication, as would be possible if they were in the same room (or an open-plan room), is therefore out of the question.[60]

j. The exchange of information between the lockmaster and pilot station is either passive (by listening in) on VHF channel 12 or active via phone or intercom.

k. On the day of the accident, the watch supervisor reportedly noticed that the ELSE had crossed the pilot boarding point and (at the same time) waiting position contrary to agreements made. He then reportedly notified the lockmaster of this by phone. Following the above call, the latter reportedly addressed the ELSE on VHF channel 12.

3.3.10 VTS NOK

On 25 January 2022, the investigation team met with representatives of VTS NOK (supervisor, lock personnel) and the GDWS (collectively referred to below as 'VTS NOK' or 'VTS NOK IV') on the grounds of the NOK lock facility in Kiel-Holtenau.

The actual events leading up to and during the ELSE accident were the topic of conversation here, too. Primarily, fundamental questions of organisational and practical procedures, communication, as well as shore-based competences and responsibilities relating to the entry of a seagoing vessel into VTS NOK's Baltic Sea area of responsibility were once more addressed. Of particular interest to the BSU was the question as to how communication between VTS NOK and ELSE, the canal pilots (specifically and in general) and (possibly) with VTS Travemünde (Kiel Traffic) actually 'functioned' specifically and in general. Another focus of the discussion was once more the question of whether or what possibilities there are or could be to avoid an accident like the one involving the ELSE in the future.

The meeting began with a survey of the lock facility's control station and a conversation with the lock personnel on duty at that time. This was followed by a discussion in a WSV office building near the lock facility.

<u>The tour of the lock facility, the discussions held and the additional research of the investigators delivered the following findings:</u>

1.) The Kiel-Holtenau lock area (call sign: Kiel Canal IV, alternative designation: NOK IV) is one of four areas of responsibility of VTS NOK. The other three areas are the Brunsbüttel lock area (Kiel Canal I), the Brunsbüttel – Breiholz section (Kiel Canal II) and the Breiholz – Kiel-Holtenau section (Kiel Canal III).

[60] Spatial separation (even in different buildings and locations on the grounds of the lock facility) also prevails in Brunsbüttel. Moreover, it is the normal case as far as the workstations of a VTS on the one hand and the pilot stations on the other are concerned.

2.) VTS NOK has its headquarters in the control station of the lock facility in Brunsbüttel and an outstation in the control station of the lock facility in Kiel-Holtenau. The nautical supervisor is responsible for watch operations for the entire NOK from the headquarters in Brunsbüttel, where he is supported by two nautical assistants. The latter are primarily responsible for traffic monitoring and traffic flow control on the aforementioned Brunsbüttel – Breiholz and Breiholz – Kiel-Holtenau sections.

3.) The lockmasters primarily responsible for operating the Brunsbüttel and Kiel-Holtenau locks also report to the nautical supervisor. With regard to the locks in Brunsbüttel, 'barrier-free' cooperation and communication between the nautical supervisor (or his assistants) and lockmasters there is possible because they all work in the same room. In contrast, the lockmaster in the control room on the middle wall of the lock in Kiel-Holtenau naturally works at a considerable distance from the nautical supervisor. The nautical supervisor (or his nautical assistants) and the lockmaster in Kiel-Holtenau exchange information via the computerised ship data processing system and possibly by phone. Any exchanges with VTS Travemünde also take place by phone.

4.) Within the scope of their lock operation duties, the lockmasters are also responsible for communicating with ships before they enter the locks and for monitoring the related traffic situation. They issue the necessary permits to enter the locks and manage departure from the locks. This takes place on VHF (Kiel-Holtenau on VHF channel 12) and additionally by means of light signal installations.

5.) Since the lockmasters are not 'only' responsible for the technical operation of the locks but also manage and monitor the traffic in the entrance to and within the locks, they require a certificate of competency in navigation to perform their duties. Accordingly, they are also familiar with standard English nautical vocabulary and able to communicate with ships in English.

6.) The duties of VTS NOK are not limited to traffic information, traffic monitoring and traffic orders, they also consist of further traffic flow control on the NOK.[61]

However, the traffic flow control only concerns traffic on the NOK but not in the approach to the canal. In the seaward approach to the locks, which is subject to monitoring by the lockmasters, only the other aforementioned tasks incumbent on each VTS (depending on requirements) are carried out.

[61] See Section 55a SeeSchStrO.

7.) The duties of the lockmaster are carried out in Brunsbüttel and in Kiel-Holtenau by a chief lockmaster who is supported by an assistant (head lockmaster). The chief lockmaster is responsible for organising lock operations and in particular for controlling (opening/closing) the lock gates. He determines the order in which ships enter and leave the lock chambers, as well as the mooring positions in the chamber. The chief lockmaster communicates with ships on VHF in order to carry out these duties. The head lockmaster assists him by performing various administrative tasks with regard to a ship's stay in the lock.

8.) The question posed by the investigators during the meeting as to whether the chief lockmaster in Kiel-Holtenau can, if necessary, act on his own responsibility by issuing navigation police orders to vessels (if they do not behave in accordance with the rules, for example) was not answered clearly.

On one hand it was stated that the lockmaster could make direct declarations to a ship but on the other hand it was explained that he would contact the nautical supervisor so that the latter could issue a navigation police order if necessary.

9.) VTS NOK stressed that the traffic monitoring carried out by the lockmasters in the seaward area of the locks was of greater practical importance in Brunsbüttel than in Kiel-Holtenau. Due to the tidal flow conditions on the River Elbe, *inter alia*, there was a much greater need to communicate with ships approaching the locks in Brunsbüttel and to point out possible navigational hazards.

10.) One important point in the discussion with VTS NOK was that according to the BSU's findings, it is actually the case (generally and also in the ELSE case) that vessels destined for the NOK which are exempt from pilotage in the fjord would report to the Kiel-Holtenau pilot station when passing the Friedrichsort Lighthouse reporting point but not to VTS NOK (Kiel Canal IV). However, the latter requirement is provided in the relevant Notice issued by GDWS Outstation North regarding the SeeSchStrO (see point 29.3.5 therein) for all vessels approaching the NOK (i.e. not only – as seems to be the case in practice – for those with a pilot already on board).

The VTS NOK representatives commented that both the Kiel-Holtenau pilot station and the lockmaster would use VHF channel 12 in the area in question. In practical terms, this would mean that the lockmaster would at least briefly intervene in the radio contact between pilot station and ship when the reporting point was being passed and would in turn acknowledge receipt of the report.

However, this statement contradicts events on the day of the accident. The investigation team carefully listened to the recording of the radio traffic on channel 12 during the relevant period. This indicated that there was no radio contact between the lockmaster and ELSE when the Friedrichsort Lighthouse reporting point was passed. Moreover, in the discussions between the BSU, the pilot association and VTS Travemünde, both parties stated that position reports of vessels exempt from pilotage in the fjord when passing Friedrichsort Lighthouse would be handled by the pilot station exclusively.

11.) The representatives of VTS NOK confirmed the information that the lock personnel in Kiel-Holtenau reportedly only became aware of the ELSE's inexplicable behaviour on the day of the accident due to a warning from the pilot station one floor below made by phone.

12.) During the survey of the lockmaster's workroom, the investigation team was able to view its spacious layout and modern equipment. The room takes up the entire top floor of the control station and has window fronts on all four sides (see **Figure 34** above). These allow for a panoramic view of the lock facility.

However, the view of the approach to the canal on the Baltic Sea side is significantly restricted by Kiel Fjord's western shore area in the vicinity of Holtenau. A direct view of the pilot boarding point at a distance of 1 nm to the north-east or even of the area of Kiel Fjord situated to the north of it is impossible due to the geographical conditions (see the headland highlighted red below in **Figure 36**, which prevents the view of the pilot boarding point and course of Kiel Fjord there).

Figure 36: View from the lock control station in Kiel-Holtenau towards Kiel Fjord

13. During the examination of the visual conditions in the direction of the lock entrance, the head of the VTS told the investigation team that some vessels destined for the NOK would initially sail past the lock entrance so as to take up a waiting position to the south of it or to turn into the lock entrance from there. This is reportedly normal behaviour and in accordance with the rules.

14. The workstations of the chief lockmaster and his assistant are equipped with various screens. One monitor shows the traffic situation on the fjord on an electronic chart, thus providing an overview of the vessels in the approach. The other screens illustrate the traffic in the canal (in the form of a distance-time diagram), the lock approach (in tabular form, canal- and sea-side), the lock signals (lights) and the occupancy of the lock chambers (see **Figure 37**).

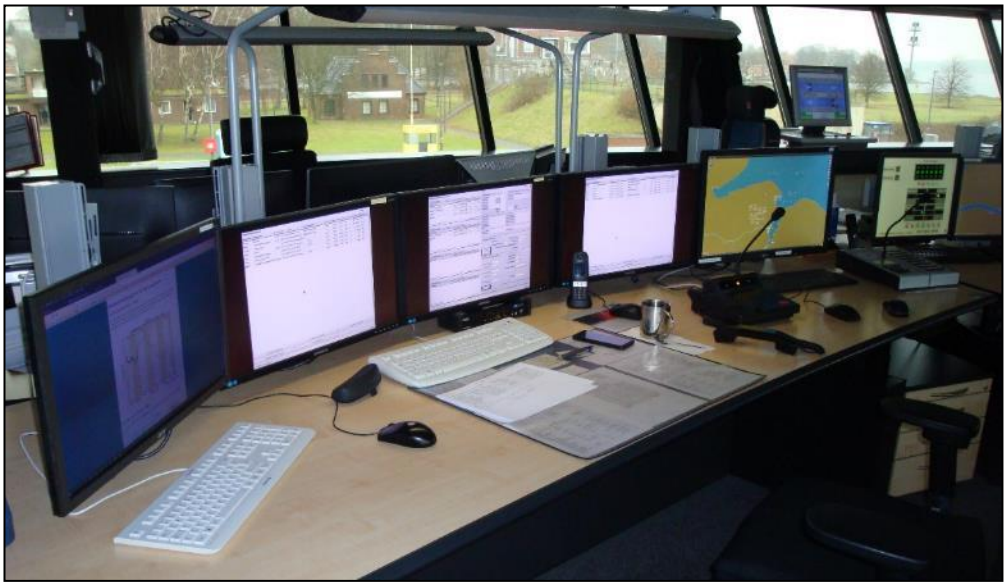


Figure 37: Chief lockmaster's workstation in the lock control station at Kiel-Holtenau

15. The main instrument for the planning work of the chief lockmaster, which can also be viewed and processed by means of a monitor, is the ship data processing system. This system replaced the analogue traffic planning system in (or for) the canal some 20 years ago. The system is supplied with information from various bodies, such as the adjacent VTSs, agencies, pilots and pilot stations. These bodies have different read and write permissions, depending on their duties and areas of responsibility. In this respect, the data input by VTS Travemünde (Kiel Traffic) is of particular importance for inbound traffic. Due to the processing of the pre-entry reports received there two hours before reaching Kiel Lighthouse, the Kiel-Holtenau lock is informed about ships approaching it and any special requirements in this respect in good time.

16. The ship data processing system is currently being converted to the 'NOK Web' portal (accompanied by various legal and technical challenges, the process has been underway for about ten years). Trial operation is scheduled to begin in 2023. The future application will be a modernised version of the ship data processing system, which will be equipped with interfaces to the (IT-supported) ship data reconciliation (SDA) system covering the entire coastal area, i.e. a component of the SDA. The SDA system is already in operation – apart from the still outstanding integration of the NOK, Bremen, Warnemünde and Ems VTSs – and is intended to guarantee the uninterrupted transfer of the maritime traffic to be monitored and all associated ship particulars across all German VTS areas of responsibility. There are also different read and write permissions in the SDA system, depending on tasks and responsibilities.

17. Electronic/automatic monitoring/warning functions are not implemented in the SDA system, at least not according to the understanding of the WSV representatives present. This is probably also difficult to implement because the AIS information of ships that could be used for such functions (e.g. the port of destination) has so far only been transmitted optionally and may contain incorrect information, for example.

3.3.11 Technical assessment of the ELSE by an expert

An expert from the Fechner Marine Surveys inspection agency carried out a technical assessment of the ELSE on behalf of the GDWS on 31 August 2020. The GDWS provided the BSU with the expert report (dated 30 September 2020; ref.: EB No. 056-01-2020), which was prepared in English.

Extracts from the expert report[62]:

Finding

The vessel was powered by one conventional eight-cylinder four-stroke diesel engine brand Deutz MWM with reverse reduction gearbox type Reintjes WAF 1940, right hand fixed propeller and ram type steering gear with Becker rudder.

Steering Gear
Ship's crew demonstrated functioning of vessel's steering gear. The electro hydraulic steering gear operated without objections. The rudder turned gently and evenly from Full PS to Full SB as well as from Full SB to Full PS.

The steering time was measured as follows:
From Full PS to Full SB: approx. 20 sec.
From Full SB to Full PS: approx. 23 sec.

The steering gear was otherwise in good visual state, clean and free of noteworthy leakages. Tiller, rams, tubes, ball valves, linkages, e-motors, solenoid valves etc. appeared properly fitted and well preserved.

[62] Quoted literally.

Main Propulsion
Ship's crew demonstrated proper functioning of vessel's propulsion system incl. remote control without objection. The Main Engine started immediately at manual control. The engine speed remained constant without noteworthy fluctuation after changing to remote control on the bridge console. The gear clutched in quickly in both 'ahead' and 'astern' directions and the engine speed followed the command signal of the bridge control console inconspicuously.

The propeller wash was well visible in ahead and astern direction. The propeller thrust appeared normal as could be seen. As expected, the vessel gradually moved ahead/astern and the tension of vessel's mooring lines changed accordingly.

During test run, the Main Engine maintained stable speeds at idle mode, and during Dead Slow Ahead and Dead Slow Astern manoeuvres Alarms, failures, malfunctions and/or operational problems were not stated. The propulsion system run smoothly without excessive vibration.

Otherwise, Main Engine and gearbox appeared in good visual state without considerable oil, fuel, air and exhaust gas leakages as could be seen.

Aux. Machinery
Ship's crew demonstrated functioning of vessel's transverse thruster Schottel STT-170LK and diesel generators without objection. The electric powered bow thruster which had been tested at the selected speed ranges 1 to 3 PS/SB created transversal thrust in either direction, with evidence of the forward mooring line tension and turning of ship`s bow.

Others
…
Master and Chief Engineer of M/V "ELSE" advised that vessel's alarm and monitoring system was not provided with alarm and/or manoeuvring printer, event log, VDR, SVDR or other suit-able means to record events.

Conclusion
While manoeuvring alongside the jetty, malfunction, failures and/or alarms of vessel's main propulsion and steering systems, auxiliary machinery and bow thruster unit, considerable vibration of the propeller or abnormal operating behaviour were not stated. The machinery incl. Main Engine, gearbox and control system appeared in good working condition. There was no indication or evidence at all for an alleged component failure or latent defect of vessel's main propulsion unit, remote control system and/or essential aux. machinery.

Ship's crew seemed familiar with operation and handling of the main and aux. machinery on board.

3.3.12 Weather report

The BSU requested an official report on the weather data in the vicinity of Kiel-Holtenau at the time of the accident from Germany's National Meteorological Service (DWD).[63]

Inter alia, the report contains the following information on the weather and visibility:

Weather and visibility
The infrared satellite image exhibited largely closed cloud cover with a few drops of rain falling from time to time. Significant rainfall was not recorded, however. A thunderstorm with heavy rain reached the west coast at 0300, weakening rapidly as it moved eastwards. Kiel-Holtenau was only affected by some drizzle when the accident happened at 0510. […]

Mean wind/gusts (at a height of 10 m above the water surface)
At the time of the accident, a weak westerly wind (mean average of 10 kts (3 Bft)) initially prevailed, which subsequently turned to the south and dropped to 4 kts; no gusts were recorded.

The overview taken from the official report (see **Figure 38** below) contains the ground weather reports from the Kiel-Holtenau weather station on the day of the accident for the period 0000 to 0600 UTC. It also shows that the weather conditions were benign. In particular, good visibility prevailed at the time of the accident (see the red underlined row in the overview with visibility figures in km).

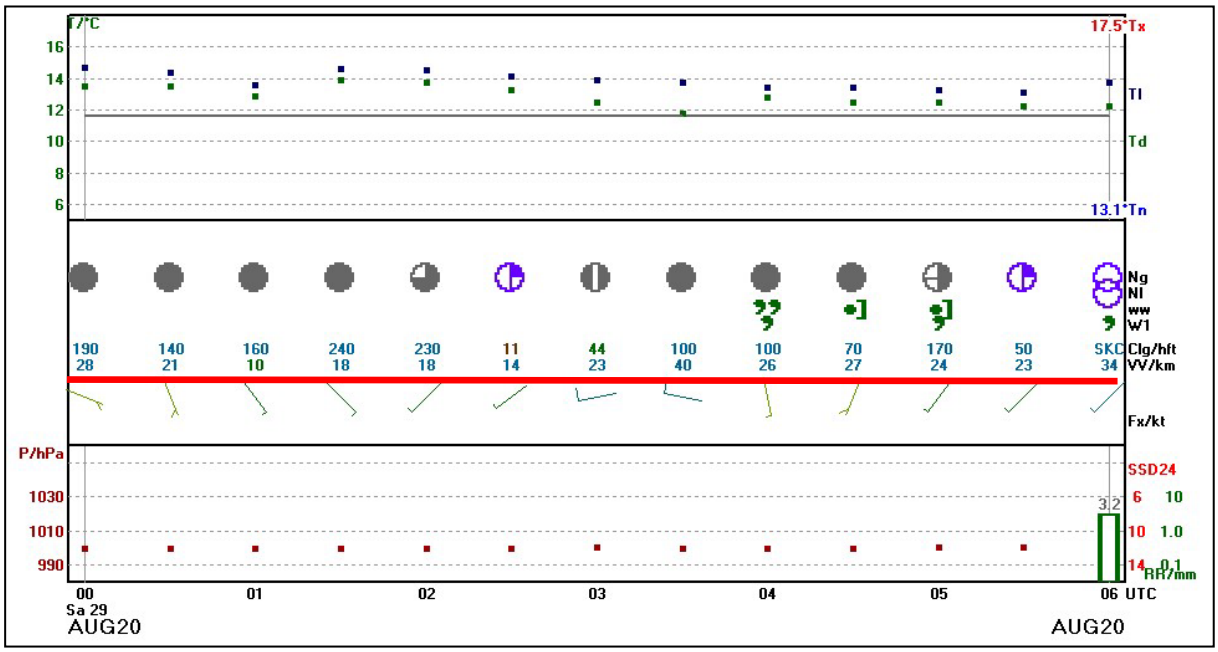


Figure 38: Ground weather reports for Kiel-Holtenau on 29 August 2020 (DWD)

[63] Official report on the weather data for Kiel-Holtenau (NOK lock) at about 0510 on 29 August 2020 dated 13 August 2021; Weather Forecast Division of the DWD, Hamburg.

3.3.13 Visibility

The accident occurred at 0507. Morning nautical twilight[64] began at 0457 on that day and lasted until 0545. Morning civil twilight[65] then set in and sunrise was at 0623.[66]

Due to darkness, the visibility of the closed lock gate's contours was therefore significantly impaired before the accident, i.e. shortly before daybreak, even without weather-related constraints.

3.3.14 Light signals in the NOK lock area

At the end of the lock island on the Baltic Sea side and on the middle wall of the 'Neue Schleuse' lock, light signal installations point in the direction of the Baltic Sea. These signals are legally binding and indicate whether entry into the approach to the 'Neue Schleuse' lock facility or entry into its lock chambers is permitted or prohibited (see red or purple highlighting of the signal installations below in **Figure 39**). The meaning of the signals displayed is explained in nautical publications concerning the NOK (for example, see the information on Navigational Chart INT 1366 (NOK); relevant extract below in **Figure 40**) and can also be understood intuitively, at least as far as a single red light is displayed to prohibit entry.

Figure 39: Signal installations (entries into the approach channel and the Neue Schleuse)

[64] Morning nautical twilight: The sun is 12° below the horizon at the beginning of morning nautical twilight and just becoming visible.
[65] Morning civil twilight: The sun is 6° below the horizon at the beginning of morning civil twilight. Visibility is already good enough that reading outdoors is possible in normal conditions without an artificial light source.
[66] Source: https://www.sunrise-and-sunset.com/de/sun/deutschland/kiel/2020/august/29.

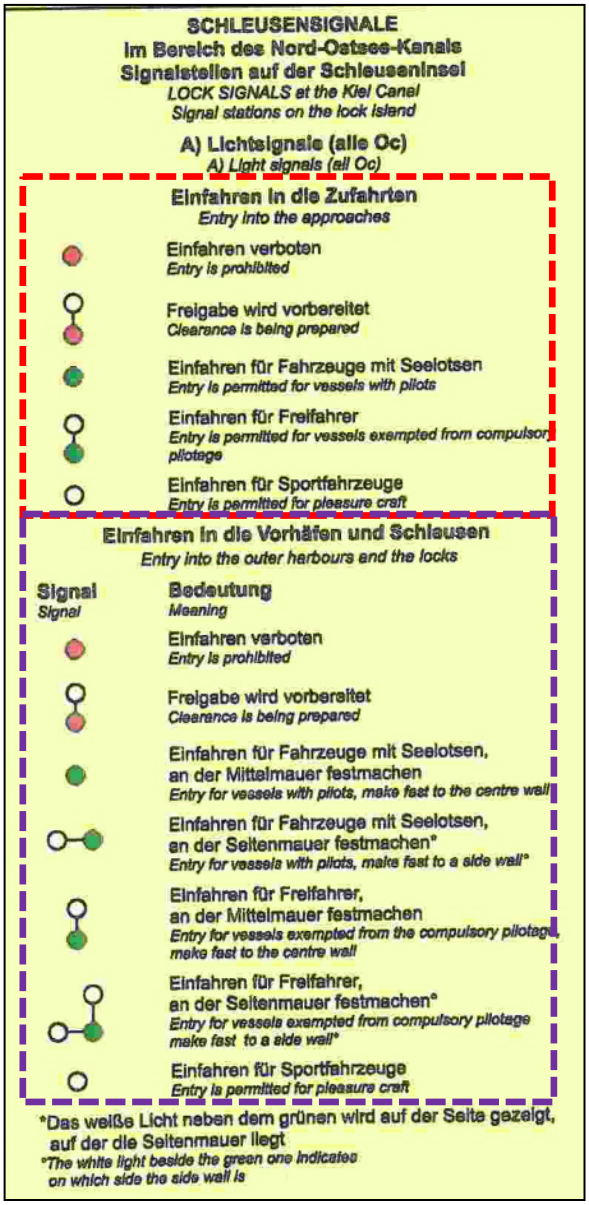


Figure 40: Meaning of the lock signals[67]

In addition to the traffic control signal installations, three large red warning lamps are mounted on the upper edge of the respective lock gate on its right-hand side, in the middle and on the left-hand side (left and right in the form of a rectangle in vertical format and in the middle in the form of a triangle; see **Figures 41 f.**). This warning system informs ship's commands and pilots clearly and unambiguously that the lock gate is closed if, for example, the above-mentioned signal installations have failed and/or the closed gate's contours cannot be clearly identified in the dark or due to other visual restrictions.

[67] Extract from Navigational Chart INT 1366 (NOK), BSH; red and purple highlighting by the author of this report.

Figure 41: MV ELSE in front of the closed lock gate
(red illuminating warning lamps visible)[68]

Figure 42: Position of the three warning lamps at the top edge of the closed lock gate

3.3.15 Fatigue, alcohol, drugs

The BSU found no evidence to suggest that the ELSE's bridge team was fatigued at the time of the accident or exposed to excessive physical or mental stress in the hours before it. After calling at a port, which did not involve exceptional stresses for the crew, the ship had already been on a calm sea voyage for more than 48 hours. The cargo did not require any special attention during the sea voyage. Above all, the fact that the navigational watch was arranged in a three-watch system (beyond legal requirements) suggests that the officer on watch, rating on watch, but also the master and chief engineer were in good physical and mental condition on the voyage from the port of departure towards the NOK.

[68] Source: WSP Schleswig-Holstein. The photograph was taken from on board a WSP boat shortly after the accident. The warning light on the port side of the gate is concealed by the ELSE's hull.

The WSP arranged for alcohol and drug tests for the bridge team after the accident. The results were negative.

The staff of VTS Travemünde, VTS NOK and the pilot station (Holtenau Pilot) work in an extremely well organised shift system and were not burdened or distracted by other unusual events in the period before or during the accident. In this respect, too, it can thus be ruled out that the attention of the parties involved could have been impaired by fatigue or other adverse influences.

4 ANALYSIS

4.1 Cause of the accident

The analysis of the AIS track and the radio traffic, the results of the ELSE's technical assessment and the examination of the extremely contradictory statements of the ship's crew members involved in the accident lead to the conclusion that the main cause of the accident was probably that the officer on watch had reached the limits of his competence when carrying out his duties on the last section in fairway mode.

Given the situation at hand, it must be assumed that the master had not properly informed the officer on watch (at least with regard to important questions of detail), who had no experience with transiting the NOK, about the procedure to be followed for engaging a pilot and entry into the NOK lock, as well as about the time for waking the master or that there had been significant linguistic or other misunderstandings in this respect. There is no other explanation for the fact that the officer on watch sailed the ship past the pilot boarding point without slowing down and then purposefully set a course for the approach to the lock chamber.

By contrast, that a technical malfunction was responsible for the disastrous final course of the ship's voyage, which has been proven beyond doubt, is completely absurd. On the one hand, the results of the technical assessment of the machinery and steering gear oppose this theory. On the other hand, and in particular, this does not come close to explaining why one could have purposefully set a course for the lock in such an out-of-control ship and without any distress call after sailing past the pilot boarding point without slowing down due to an alleged malfunction.

The assumption or assertion in the meantime that the master had reportedly taken over the ship's command at (or at least shortly before or after) the pilot boarding point is not consistent with the course of the accident, either. In contrast to his officer on watch, the master was familiar with the NOK's specific circumstances and requirements. That or why he nevertheless steered the ship towards the closed lock gate cannot be plausibly explained. The entire course of events and fact that – if at all – an emergency stop manoeuvre was initiated only a few seconds before the allision suggests that the master only entered the bridge when the allision was imminent.

One material factor that may have played a major role in the officer on watch's decision to simply pass the pilot boarding point and then steer for the lock was the 'time error' on board the ELSE. In all communications with the pilot station, the officer on watch assumed the time was one hour ahead of local time. Accordingly, at 0342 (CEST) he stated that 0600 was the ETA at the pilot boarding point, even though he would obviously reach and actually did reach it in less than 90 minutes, i.e. at about 0500 (or even a little earlier based on German local time).

In this context, the question as to whether the officer on watch was actually aware that the (agreed) boarding point for the NOK pilot was on the southern edge of the Holtenau roadstead went unanswered. Although he could have recognised this at the latest by taking a careful look at the navigational chart, where the position in question is marked with the standardised symbol, it cannot be ruled out that the officer on watch assumed the pilot would not embark until they were in the lock (either because of a basic lack of knowledge or because the pilot was not at the boarding point at 0600 (ship time) in accordance with the officer on watch's presumed agreement).

The investigation team finds it difficult to comprehend how neither the red lights of the signal installations nor the red warning signals mounted on the lock gate, which were visible from afar and clearly indicated the gate was closed, prevented the officer on watch from approaching the lock chamber. It must be assumed that he was not aware of the meaning of the signals. On the other hand, he may have assumed that the conspicuous red warning signals on the lock gate indicated the rear end of the open lock chamber.

4.2 Factors contributing to the accident

4.2.1 Voyage planning

The BSU investigation revealed that the voyage planning contained various errors. The document template provided by the shipping company for the planning, which the BSU believes was basically well suited for proper planning and documentation, was not completed with the necessary care. For example, the second officer tasked with planning the voyage made a number of careless mistakes, some of which were quite obvious. However, more serious is the fact that essential information or aspects that would have been important for the voyage planning were not but certainly should have been included in the written documentation.

With regard to navigating Kiel Fjord and the subsequent NOK passage, the planning lacks any reference to the relevant reporting points and the VHF radio channels of VTS Travemünde (Kiel Traffic), the pilot stations (Kiel Pilot and Holtenau Pilot) and VTS NOK. The procedure for requesting the NOK pilot, the relevant pilot boarding point and, for example, information on lock operation are not addressed at any point in the planning, either. Moreover, with regard to the further course of the voyage towards the French port of destination, no information is given on the required ship reporting systems or, for example, on the procedures if pilotage is required when approaching the French port of destination.

All in all, the written voyage planning documentation gives the impression that this – at least as far as its information goes beyond the listing of waypoints – was merely intended to satisfy a formal obligation on board the ELSE, but that its actual meaning and purpose had not been internalised and therefore the necessary care had not been taken during its preparation.

The various errors and shortcomings in the planning do not permit any other conclusion, especially as it had been authorised by the master of the ship, as well as acknowledged by the chief mate and chief engineer without any amendments.

4.2.2 Orders of the master

The master's written orders for the voyage towards the NOK also lacked information that would have been important for the proper performance of the navigational watch by the officers on watch in the run-up to the NOK passage. Against the backdrop that the chief mate was commanding a ship proceeding to the NOK for the first time in his function as an officer, it would have been all the more important to formulate a written order that clearly stated how to request the pilot and when the master should be called to the bridge. The course of events also suggests that there were no oral agreements on the above questions that supplemented the written orders. If there had been, it must be assumed that there had been misunderstandings for linguistic or other reasons.

4.2.3 Time on board

Another particularly disastrous factor accompanying the accident was that the time on board the ELSE, which corresponded to local time on departure from Klaipėda, had not been changed back by one hour to the time applicable in Germany's territorial sea (CEST) punctually before entering Kiel Fjord. The chief mate and the Kiel-Holtenau pilot station inevitably talked at cross-purposes when agreeing on the time at which the NOK pilot would embark based on the officer on watch's ETA of 0600 for that time. Based on CEST, this meant that rather than reaching the pilot boarding point at 0600, the ELSE would already be there at 0500.

However, since the pilot station was not expecting the ELSE to arrive until an hour later at this point, a pilot boat had not yet been dispatched to the ship. It cannot be ruled out that the officer on watch on the bridge of the ELSE began to assume that the pilot would not board until they were in the lock for this very reason, i.e. because no pilot boat could be seen far and wide when they reached the boarding point.

4.2.4 Self-perception of safe ship operation

The fact that the navigational watch on board the ELSE was arranged in the conventional three-watch system is worthy of recognition. The BSU believes that operation in a two-watch system, which is formally permissible according to the current minimum safe manning certificate, always represents a – avoidable – safety risk in the operation of seagoing ships against the background of the inevitably associated physical and mental stress a bridge team is then exposed to.

On the other hand, the inadequate voyage planning and especially the fact that the ELSE exhibited a wide variety of deficiencies in formal and practical terms during the Port State Control inspection carried out after the accident and during subsequent control inspections is an indication that the ship's command, but also the ISM manager in particular, did not pay due attention to the safe operation of the ship in all areas. The deficiencies in question constitute a factor that should not be underestimated and that contributed to the accident.

4.2.5 Traffic monitoring

Aspects of traffic monitoring and its interplay with the organisation of pilotage on Kiel Fjord and with regard to the subsequent NOK pilotage played a large role in the investigation.

4.2.5.1 Change of responsibility of the VTSs/reporting obligations

One aspect relevant to the actual course of the accident has turned out to be the fact that when nearing the NOK approach channel, vessels destined for the NOK sail 'sideways' out of the area of responsibility of VTS Travemünde (Kiel Traffic), which is responsible for maritime traffic control on Kiel Fjord, and turn into that of VTS NOK (NOK IV)[69] at the same time, but only shortly before reaching the NOK approach channel.

This inevitably creates a de facto gap or grey area with regard to the monitoring of maritime traffic destined for the NOK. As soon as Kiel Traffic becomes aware of the fact that a ship is destined for the NOK and appears to comply with the traffic rules and regulations on the fjord (additionally with a moderate traffic volume and benign weather conditions), it is understandable that there is no longer any particular need to closely monitor her final leg of the voyage before entering the area of responsibility of VTS NOK IV. This is also quite understandable because a further position report to Kiel Traffic is no longer required after Kiel Lighthouse has been passed and (after passing Friedrichsort Lighthouse at the latest) the ship is in fact and usually without any complications in the hands of the Kiel-Holtenau pilot station and VTS NOK IV.

[69] Insofar as VTS NOK's Kiel-Holtenau outstation and its area of responsibility (lock facility and seaward approach) is referred to below, the abbreviated designation 'NOK IV' will be used.

Conversely, it is equally understandable that VTS NOK IV usually has no reason to closely monitor the course of a vessel destined for the NOK when she is (outside its own area of responsibility) still on Kiel Fjord and either already has or is about to have a pilot on board.

The aforementioned issue is exacerbated by the fact that vessels exempt from pilotage, i.e. precisely those whose course should naturally be monitored most closely by the VTS in cases of doubt, do not send their mandatory position report to VTS NOK IV (Kiel Canal IV) when they pass the Friedrichsort Lighthouse reporting point in practice (contrary to the corresponding reporting obligation[70]), but rather to the pilot station (Holtenau Pilot). Although both stations use VHF radio channel 12, even if Kiel Canal IV should take note of the position report in question, at least passively (listening in), it is nevertheless human nature that the content and scope of information addressed first and foremost to a third party is not usually heeded with the same concentration as that which is expressly intended for oneself and must also be actively confirmed.

The facts of the accident support this consideration. The ELSE's brief position report expressly addressed to Holtenau Pilot when passing the Friedrichsort Lighthouse reporting point at 0441 was acknowledged by the Kiel-Holtenau pilot station with the advice that the ship should continue in the direction of the pilot boarding point and that the pilot would embark there at 0600. Since VTS NOK IV did not conduct this exchange of information itself and apparently did not listen in to it passively with particular attention, the fact that the ELSE would reach the pilot boarding point in about 15 minutes but the pilot would not board for another 80 minutes or so inevitably went unnoticed.

Although it is not unusual for ships to have to wait a while for the NOK pilot to board after they reach the boarding point, the misunderstanding about the time at which the pilot should board due to the discrepancy between ship's time and local time might have been noticed early enough following the intended first direct communication between the ELSE's officer on watch and VTS NOK IV at the reporting point in question.

A reliable answer to the question as to whether the officer on watch, who was evidently completely overwhelmed with the situation on the ELSE's bridge, could still have been dissuaded from his dangerous conduct when the ship passed the pilot boarding point and turned into VTS NOK IV's area of responsibility shortly afterwards is no longer possible ex post.

It seems quite reasonable to doubt this because the distance between the failure to stop (or failure to notice this fact ashore) in the area of the pilot boarding point (passed at 0453 according to the VTS recording) and the start of the purposeful turn into the mouth of the lock area was only about 0.5 nm, i.e. a distance which the ELSE covered in just five minutes even at a speed of a little under 6 kts (as confirmed by the relevant AIS recordings).

[70] See point 29.3.5 of the Notice issued by GDWS Outstation North regarding the SeeSchStrO.

The complete turn into the entrance area then took until shortly after 0500. The ship had only just actually entered VTS NOK IV's area of responsibility at this point formally and was only about 0.5 nm away from the lock gate.

However, another five minutes passed before VTS NOK IV and then the pilot station contacted the ELSE and drew attention to her wrongdoing.

The fact that there was obviously complete disorientation on the ELSE's bridge for the entire time suggests that even if VTS NOK IV had addressed the ship eight to ten minutes earlier, the officer on watch would not have been persuaded to abort the approach to the closed lock gate successfully in good time. However, that the accident would have been prevented under such circumstances cannot be ruled out.

4.2.5.2 Powers of VTS NOK IV

As explained above, it is not possible to reliably answer the question as to whether the accident could still have been prevented if VTS NOK IV had intervened at the moment the ELSE entered its area of responsibility.

Irrespective of this, the BSU believes that the separation between the location of the nautical supervisor at the VTS headquarters in Brunsbüttel and that of the chief lockmaster at the lock control station in Kiel-Holtenau, who is responsible not 'only' for lock operation in Kiel-Holtenau but also for traffic monitoring in the Baltic Sea approach to the lock facility, is not ideal as far as the management of developing emergencies arising from navigational errors is concerned. This is all the truer when we consider that the duties of the chief lockmaster and his assistant (the head lockmaster) primarily consist of – as the job titles already make clear – the organisation and management of safe lock operations.

This can be countered by the fact that ships not familiar with the area normally approach the locks with a pilot on board and that the approach in question does not present any particular navigational difficulties for either piloted vessels or those exempt from pilotage. Accordingly, in VTS NOK IV's Baltic Sea area of responsibility in particular, close traffic monitoring or the need for navigation police interventions are usually unnecessary.

However, the course of the ELSE's accident demonstrates that situations can arise – albeit very rarely – in which forceful intervention may be necessary for maritime traffic control. In such cases, it must be ensured in both formal and purely practical terms that lock personnel can set the necessary measures in motion without any delay and in particular that the necessary orders can be issued clearly and directly to the respective ship's command.

4.2.5.3 Exchange of information between VTS Travemünde, VTS NOK and the Kiel-Holtenau pilot station

The BSU investigation has shown that VTS Travemünde, VTS NOK and the Kiel-Holtenau pilot station use different communication channels to exchange information on the maritime traffic of relevance to these three bodies. Of particular practical importance is the electronic ship data processing system for the NOK, which is currently being upgraded and will be implemented in the SDA[71] system covering the entire German coast in 2023 according to current plans.

From the BSU's point of view, a cross-area, database-driven exchange of information between the German VTSs, the pilots and other bodies with an important role in the organisation of maritime traffic around the German coast will undoubtedly contribute to further increasing the safety of maritime traffic, especially in the approach to German ports and the NOK.

However, a more extensive and possibly alert-triggering functionality of the electronic information network is not yet part of the system concept according to the GDWS. The BSU believes that this could possibly consist of the automated, real-time identification of a ship that does not adhere to the course of the voyage agreed with a VTS or the pilots and recorded in the database, for example due to misunderstandings, errors or technical problems, and thus becoming a hazard.

4.2.6 Pilotage on Kiel Fjord and in the NOK

4.2.6.1 Formal requirements versus common practice

The system of pilotage established for Kiel Fjord and the NOK ensures that the ship's commands of vessels destined for the NOK can or – if there are no exceptional circumstances – must make use of high-quality and reliable pilotage advice on the fjord (depending on size and type), but at the latest before entering the NOK locks.

With regard to the procedure for requesting pilotage, the BSU investigation has shown that formal requirements and common practice differ in respect of the binding nature of required time limits (12-hour report, 2-hour report) and the pilot watch responsible (Kiel Pilot on channel 14, Holtenau Pilot on channel 12). This generally has no effect on the functionality of pilotage operations and the associated safety of shipping.

[71] SDA = [Schiffsdatenabgleich] = ship data reconciliation.

However, the ELSE accident demonstrates that there may be scenarios in which ship's commands who are not familiar with the area or specific procedures may have neglected to become conversant with the rules for pilotage in the approach to the NOK during the voyage planning stage, but at the latest before switching to fairway mode. Such differences between theory and practice that an officer on watch may encounter after switching to fairway mode can lead to additional confusion.

Another point of criticism, which is also irrelevant in the ELSE accident, is that the contact details (phone numbers, email addresses) specified for the two pilot watch stations differ from publication to publication. Under certain circumstances, this could also impair a ship's ability to contact the stations and request a pilot in good time.

4.2.6.2 Actions of the Kiel-Holtenau pilot watch

With regard to the pilot request, the ELSE accident was marked by the atypical scenario that the first contact with the Kiel-Holtenau pilot station (Holtenau Pilot) was not initiated by the ship or her agency (contrary to the normal procedure), but rather VTS Travemünde acted as an intermediary.

During the subsequent first direct contact with the ELSE at 0342, which was made by the pilot watch, her officer on watch advised (upon express request) that 0600 reportedly was the ETA at the pilot boarding point.

The pilot station's watch supervisor took note of this statement without critical verification. On closer inspection, he would have been able to see that based on the ship's current position and her already very slow speed, the ELSE should actually reach the pilot boarding point roughly an hour earlier, i.e. at about 0500.

The position report sent by the ELSE's officer on watch in the next radio contact at 0441 (passing buoy 9 at Friedrichsort Lighthouse), which obviously contradicted the ETA forecast transmitted in the previous call and which was already objectively incorrect there, did not bother the pilot station's watch supervisor, either. This message merely prompted him to request that the ship continue to the pilot boarding point and state that the pilot would board there at 0600.

Irrespective of the above circumstances, which due consideration of the course of the ELSE's voyage would have revealed, it is important to stress that traffic monitoring or even influencing the flow of traffic are not among the formal duties of the pilot watch station. Furthermore, the ELSE was known on the NOK, as she had recently transited it several times. The pilot station was therefore entitled to assume that the ship was familiar with the standard procedures and would therefore comply with the rules. Accordingly, the watch supervisor evidently handled the radio communication with the ELSE as a matter of routine, without paying attention to the indications of a 'time error' on board the ship.

As regards the content of the two radio calls between the pilot station and the ELSE, the question arises as to whether a watch supervisor with a certificate of competency in navigation or ideally a pilot licence for Kiel Fjord would have intuitively recognised the contradiction in time between the ELSE's position data and the ETA forecast.

At the Kiel-Holtenau pilot station, the position in question is performed partly by qualified pilots and partly (as on the day of the accident) by employed persons who do not have any nautical qualifications. The latter may even perform their duties more adeptly as a result of careful training and previous assignments as a watch assistant, as they work exclusively in the watch station and are involved in organising and coordinating pilotage operations every day. Of course, the employed watch supervisors do not have the eye and understanding of nautical procedures and conditions in the pilotage area that have been trained over many years, nor do they have the tried and tested 'know-how' needed to draw the attention of a ship's command to navigational errors with the particular powers of persuasion that may be required.

On the other hand, if one considers that the duties in the pilot station are neither formally nor actually geared to influencing the navigational decisions of a ship's command, it is questionable whether pilots or navigators with knowledge of the area should actually be deployed primarily or even exclusively for their activities relating to the coordination and organisation of pilotage operations.

5 CONCLUSIONS

5.1 Preliminary notes

The accident involving the ELSE, i.e. a vessel approaching a closed lock gate on the NOK without slowing down for reasons other than a technical problem, was – at least as far as the BSU can see – an absolutely unique event that had never occurred before. As is always the case when investigating unique or extremely rare accident scenarios, the question as to whether it is appropriate or even possible to draw general, transferable conclusions or lessons from them therefore arises.

Nevertheless, it should be noted that it is also conceivable that the ship's command on the bridge of a vessel coming from the sea and destined for the NOK could – for whatever reason – become disorientated and approach a closed lock gate or a lock chamber that is open but not yet open for entry without having been authorised to do so at some point in the future. Depending on the traffic and cargo situation, this can lead to extremely serious accidents. The ELSE was laden with highly explosive cargo on the day of the accident, meaning the allision with the lock gate could have had devastating consequences for the ship and the entire lock facility under certain circumstances.

Moreover, the attendant circumstances identified in the course of the investigation could also facilitate the accident in completely different cases. Accordingly, the below conclusions and the safety recommendations derived from them are not only of importance for the safe operation of the ELSE but also, and in particular, concern the organisation of traffic monitoring on Kiel Fjord in the approach to the NOK, as well as aspects of pilotage operations there.

5.2 Ship's command of the MV ELSE

From the BSU's point of view, the following factors were the primary cause of sailing past the Holtenau roadstead pilot boarding point and the allision with the closed lock gate:

- inadequate voyage planning on board the ELSE;
- lack of written orders and at least inadequate oral briefing of the chief mate on tasks required in connection with the forthcoming NOK passage and the regulations to be observed in this respect;
- failure to adjust the time on board to local time, the observance of which was required at the latest from the approach to the NOK and for the communication with shore-based stations.

Safety recommendations addressed to the ship's command involved to counteract the aforementioned risk factors in the future are not an option, as they no longer work for the ELSE's shipping company.

5.3 Shipping company and safety management (ISM)

The various deficiencies found in the formal, operational and technical areas of ship operation on the ELSE during Port State Control inspections immediately after the accident and also in the period thereafter demonstrate that the ship's SMS is in need of improvement in a wide variety of areas. Examples of this are the inadequate voyage planning, which was significant for the accident, and the failure to adjust the time on board.

Since the crew was replaced after the accident and subsequent Port State Control inspections nevertheless revealed a wide variety of safety deficiencies, there are strong indications that the causes of these deficiencies in the implementation of the safety system are not (only) to be found on board with the respective ship's command, but rather (also) ashore.

By their very nature, a lack of care and an inadequate standard of safe ship operation at the shore-based safety management level will inevitably have a detrimental effect on the quality of the operational procedures and safety awareness on board.

The ELSE's ISM manager is responsible for the careful revision of the SMS of the ship and the rest of the fleet under his care, in particular so as to ensure effective monitoring of the implementation of and compliance with required measures and procedures. In this context, there is also a need for the General Management of the ELSE to sensitise ship's commands to the risk factors mentioned in Ch. 5.2 and to improve their professional skills and safety awareness in this respect, if necessary through training and briefings.

5.4 Traffic monitoring by VTSs Travemünde and NOK

5.4.1 Local conditions and responsibilities; position report when approaching the Holtenau roadstead pilot boarding point

It proved to be disastrous that the Holtenau roadstead pilot boarding point, which was ignored by the ELSE and still within the area of responsibility of VTS Travemünde (Kiel Traffic), the subsequent course alteration point for the purposeful approach to the lock entrance, which was also still within Kiel Traffic's area of responsibility, and the transfer of the local responsibilities of traffic monitoring to VTS NOK IV, which took place very shortly afterwards, were so close to each other geographically. This inevitably increases the risk that VTS Travemünde (Kiel Traffic) will no longer pay too much attention to traffic destined for the NOK from a certain point in time onwards, while at the same time VTS NOK IV generally has no reason to closely observe the course of a ship destined for the NOK.

In addition, contrary to the legal requirements it is common practice that vessels destined for the NOK which are exempt from pilotage on Kiel Fjord make their only mandatory position report[72] immediately before the approach to the pilot boarding point to the Kiel-Holtenau pilot watch station rather than to VTS NOK IV (Kiel Canal IV).

The idea behind this, i.e. that the vessels in question – as a result of direct consultation – first take the NOK pilot on board at the southern edge of the Holtenau roadstead and that the pilot then immediately takes over further communication with VTS NOK IV, is indeed easy to understand from an operational perspective and proven in practice without any issues. However, the ELSE case vividly demonstrates that by dispensing with direct contact with a vessel destined for the NOK early on, VTS NOK IV relinquishes the opportunity to verify that the inbound ship knows and will observe its obligations in connection with the forthcoming pilotage and canal passage.

The close proximity of the pilot boarding point, the course alteration point for the lock approach and the transfer of responsibility between VTSs Travemünde and NOK, as discussed above, which had a disastrous effect on the accident, is virtually impossible to change without a major effort due to the local conditions.

Although extending VTS NOK IV's area of responsibility to the east and north would make it necessary to monitor traffic destined for the NOK more closely and earlier from there, the inevitable curtailment of the responsibility of VTS Travemünde (Kiel Traffic) is not practicable insofar and for as long as the latter remains responsible for monitoring traffic movements that pass the lock entrance to the NOK to and from Kiel.

The BSU is aware of the fact that the current local organisation of traffic monitoring in the approach to the NOK does not normally affect the safety of shipping and that it is proven in practice. Nevertheless, the system of reporting, which is so important precisely because of the specific local conditions discussed above, should be brought back into line with legal requirements. In the opinion of the BSU, early and direct communication between VTS NOK IV and vessels destined for the NOK is an indispensable safety feature that facilitates timely identification and responses to any hazards that might arise in certain cases from the local and organisational conditions in the approach to the NOK in conjunction with ship-based problems.

[72] This refers to the position report at Friedrichsort Lighthouse (buoy 9).

5.4.2 Operations at VTS NOK (at the Kiel-Holtenau site, in particular)

VTS NOK operates from two different sites. The nautical supervisor, who is responsible for monitoring all the traffic on the NOK, including the lock approaches from the North Sea and the Baltic Sea, works from the VTS's headquarters in Brunsbüttel. The chief lockmaster in Kiel-Holtenau who reports to him is not 'only' responsible for the primary lock operation. He is also in charge of traffic monitoring in the last section of the Baltic Sea approach to the NOK at the VTS's outstation in Kiel-Holtenau. Although he has an assistant there to help him cope with his duties and access to modern technical aids in a spacious environment, the organisational separation of the duties of the nautical supervisor and the chief lockmaster may have contributed to the ELSE accident.

It is in the nature of things that responses to an emergency are easier and, most importantly, faster if the personnel available for coping with it can discuss and build on proposed solutions and options for intervention spontaneously and directly, i.e. if they are not confined to means of remote communication.

Due to the undemanding navigational conditions in the Kiel-Holtenau approach area, which are usually handled by ship's commands familiar with the area or with pilot support, it is probably excessive to increase the personnel available for traffic monitoring at the VTS NOK's Kiel-Holtenau site. However, with regard to the management of exceptional traffic situations in the lock approach, which can never be completely ruled out for a wide variety of reasons, the BSU believes that it is advisable to develop or optimise procedures for concerted action by the nautical supervisor and chief lockmaster in this respect. Such scenarios should become part of the training and further education programme for the staff of VTS NOK.

5.4.3 Technical options for traffic monitoring

The WSV has been working continuously in the course of technical progress over many years to improve the ship reporting system around the whole of the German coast and to standardise and merge the relevant data processing systems of the various local areas of responsibility technically, for example. The measures in question facilitate inter-area communication between the various VTSs, connected pilot associations and other agencies that may be involved in the data exchange.

In the BSU's view, the resulting improvement in safety could be further increased. On the basis of reliable and comprehensive ship data reconciliation, it should be possible in the future to develop a computerised traffic monitoring system that is able to automatically identify deviations from the planned traffic flows or those agreed with the VTS and pilot stations and to generate related alerts.

5.5 Pilotage on Kiel Fjord in the approach to the NOK

5.5.1 Extension of compulsory pilotage

The accident involving the ELSE was affected by disorientation on the ship. In addition to the deficient voyage planning, this was caused by the inadequate briefing of the officer on watch on board and his insufficient knowledge of the underlying navigational, organisational and legal conditions relevant to the forthcoming NOK passage.

The accident would certainly not have occurred if the ELSE had been obliged to take a pilot on board for the passage of Kiel Fjord. Even if there were communication problems when engaging the pilot, it is reasonable to assume that these would definitely not have led to an accident.

Accordingly, we cannot help but think that the obligation to engage a pilot for navigation on Kiel Fjord should be extended to vessels with a length of less than 90 m. This would increase traffic safety on the fjord not only because it would exclude accidents such as those involving the ELSE. Such a measure would also help to increase safety for another reason. In accordance with the minimum requirements of the international manning regulations, there are usually only very few navigational personnel on board small seagoing vessels that have been exempt from pilotage on Kiel Fjord, in particular. Particularly in the North Sea and Baltic Sea, where there is often a very rapid succession of labour-intensive lay-up times in port and navigationally challenging periods in fairway mode, these personnel are constantly exposed to enormous physical and mental stress. Having a pilot on board is naturally a valuable support for the ship's command, even if the latter remains responsible for the safe navigation of the ship, of course.

The NOK II pilot association, which is responsible for pilotage on Kiel Fjord and in the eastern stretch of the NOK, welcomed the aforementioned considerations in discussions with the BSU investigation team in principle. The association believes that the additional personnel requirement as a result of extending compulsory pilotage on Kiel Fjord could be filled by new pilot candidate admissions in a period of some two to three years.

In contrast, the representatives of the GDWS, which is responsible for amending the NOK-LV in this regard, have stressed to the BSU investigation team that the uniqueness of the ELSE accident would not provide sufficient justification for burdening the entire coastal shipping industry with the additional costs of extended compulsory pilotage. This reasoning is also understandable.

Even though an extension of compulsory pilotage on Kiel Fjord would undoubtedly improve safety for the reasons already discussed, the BSU is refraining from recommending such a measure. In addition to being necessary and practicable to implement, safety recommendations must also be proportionate to the cause of the accident. In the BSU's view, this would not be the case here.

5.5.2 Pilot request, responsible pilot station and contact details

The BSU investigation has not only brought to light discrepancies between theory and practice with regard to the addressing of position reports when passing Friedrichsort Lighthouse. With regard to requests for a NOK pilot and the report times and recipients to be observed in this respect, there are also some differences between the specifications in relevant nautical publications and the actual procedures regularly implemented. In addition, the contact details (email addresses, phone numbers) differ depending on the publication date of individual sources of information.

The differences in question are minor and generally do not have a detrimental effect in practice. For example, a ship's NOK pilot request addressed to Holtenau Pilot on VHF channel 12 in accordance with information published by the NOK II pilot association on the internet instead of to Kiel Pilot on VHF channel 14, as specified in the NOK-LV and the VTS Guide, is given equal attention by both pilot watches in any case and it is ensured internally that the message in question is processed promptly and properly. With regard to the ELSE accident, it can thus be ruled out that the aforementioned problem could have had a facilitating effect.

Nevertheless, the BSU believes it is advisable to check the existing discrepancies in the various sources of information and publications concerning reporting addresses, times and contact details relating to the system of pilotage on the NOK for inconsistencies and practicability, so as to rule out any confusion arising from this for ship's commands not familiar with the area.

5.5.3 Watch operation at the Kiel-Holtenau pilot station

Although it is important to emphasise that monitoring traffic in the approach to the NOK locks is not a formal duty of the Kiel-Holtenau pilot watch station, the particular local, organisational and de facto conditions discussed above (transfer of responsibility of the VTSs in the vicinity of the pilot boarding point, receipt of position reports at Friedrichsort Lighthouse for ships exempt from pilotage by the pilot watch, operation of VTS NOK IV as an outstation) mean that the Kiel-Holtenau pilot watch station actually has a special role within the safety concept in the approach to the lock facility there.

This fact becomes very clear when one considers the course of events leading up to and during the accident involving the ELSE. The pilot station not only conducted the radio communication with the ship (on the basis of which the time error on the ship could have been identified) but was also the first to notice that the ELSE had passed the pilot boarding point without stopping, contrary to agreements made. The watch supervisor at the pilot station notified VTS NOK IV of this. After their unsuccessful attempts on VHF channel 12 to make the ELSE turn back, he even tried to influence the ship himself by radio.

The BSU can only speculate as to whether the ELSE accident could have been avoided if a watch supervisor with nautical qualifications had monitored the ELSE's activities. Irrespective of the specific event, it is obvious that shore-based radio communication by a pilot or nautical officer with knowledge of the area with a ship concerning forthcoming pilotage can reduce the risk of misunderstandings arising from the arrangements in question or such misunderstandings going undetected.

Although the compulsory employment of pilots or other nautical personnel with experience of the area as watch supervisor at the Kiel-Holtenau pilot station would increase the safety of shipping in the approach to the NOK, it would then have to include the authority to advise ships remotely and – at least if a dangerous situation is identified – to intervene in the traffic flow.

A fundamental realignment of the qualification requirements for the pilot watch personnel is opposed by the fact that the previous system has proven itself in practice and that the ELSE accident was an absolute exception.

Given the above considerations, the BSU is refraining from recommending special nautical qualification requirements for new watch supervisors to be employed at the Kiel-Holtenau pilot station in the future but suggests that the NOK II pilot association discuss this issue internally, also with the GDWS (which supervises pilotage) if necessary.

6 ACTIONS TAKEN

The draft of the investigation report included, inter alia, the following safety recommendation addressed to the pilot association NOK II (Kiel Canal II) / Kiel / Lübeck / Flensburg (pilot association NOK II):

"Publications on the notification procedures for the NOK pilots
The various publications on the procedures for requesting an NOK pilot (addressees, contact details, radio channels) should be reviewed in dialogue with the respective publishers of the information (GDWS, BSH) to ensure that they are up to date and consistent, and in the event of discrepancies, necessary corrections should be suggested."

In this regard, GDWS communicated the following on the occasion of its statement on the draft investigation report:

"The pilot association has already amended the notification points and procedures on it's website, the required amendments in the publications were conveyed to the GDWS and the BSH, respectively."

The safety recommendation in question has thus become obsolete.

Furthermore, the GDWS stated in it's comment with regard to chapter 5.4.1 („Local conditions and responsibilities; position reports on the occasion of the approach to the pilot transfer point Holtenau-anchorage) of the investigation report, "*that the position report at the light house Friedrichsort to Kiel Canal IV will be followed with greater attention in the future and, if necessary, actively demanded. A separate request to the lock masters Kiel Holtenau has already been made*."

7 SAFETY RECOMMENDATIONS

The following safety recommendations of the BSU do not constitute a presumption of blame or liability in respect of type, number or sequence.

7.1 The MV ELSE's shipping company

The BSU makes the following recommendations to REGENCY SHIP MANAGEMENT SA, which is responsible for the ship's ISM system:

7.1.1 ISM manual

The ISM manual of the ELSE and the other ships managed by the shipping company, as well as the related internal procedures of the shipping company for monitoring the proper implementation of processes laid down therein (e.g. for communication on board, for voyage planning and for adjusting ship's time to local time) should be carefully reviewed and improved as necessary.

7.1.2 Voyage planning

Ship's commands of the fleet managed by the shipping company should be made aware of the importance of proper and careful voyage planning in briefings and training courses.

7.2 Federal Waterways and Shipping Agency (GDWS)

The BSU makes the following recommendation to the GDWS:

7.2.1 Position report at Friedrichsort Lighthouse

The GDWS should review the system of reporting on Kiel Fjord in the approach to the NOK in consultation with VTS NOK (which the GDWS supervises) and with the involvement of the NOK II pilot association and either consider fundamental changes or harmonise current practice and legal requirements.

7.2.2 Implementation of automated traffic flow control in the SDA system

The SDA system currently being implemented around the coast and across the various districts should be extended to include computerised control or be linked to such control. The application should be designed to detect discrepancies between a ship's planned (or reported to the VTS and pilot stations) movements and the actual course of her voyage in real time based on AIS data and to generate related alerts.

7.3 NOK II / Kiel / Lübeck / Flensburg pilot association (NOK II pilot association)

The BSU makes the following recommendations to the NOK II pilot association:

7.3.1 Reporting times for a pilot request

The current reporting time system (12-hour report and 2-hour report) in connection with the request for an NOK pilot should be reviewed for practicability. Discrepancies between formal requirements and practical procedures should be examined internally. It is recommended that the pilot association then discuss with its supervising GDWS any need for amendment of the NOK-LV identified as expedient in order to harmonise formal requirements (which may need to be amended) and practical processes (which may need to be amended).

7.3.2 Qualification requirements for newly employed watch supervisors at the Kiel-Holtenau pilot station

The BSU recommends that the NOK II pilot association carry out an internal review of the advantages and disadvantages of revising the qualification requirements for future watch supervisors to be employed at the Kiel-Holtenau pilot station and discuss any need for change with the supervising GDWS.

8 SOURCES

- Written and oral statements
- Ship's command of the MV ELSE
- NOK II pilot association
- VTS Travemünde
- VTS NOK
- Federal Waterways and Shipping Agency (GDWS)
- Documents inspected on board the MV ELSE
- Radio and AIS recordings of the WSV
- Photographs of WSA NOK
- Investigations and photographs of WSP Kiel
- VTS Guide Germany, BSH, Hamburg and Rostock 2020
- EQUASIS database search
- MarineTraffic AIS research
- Research on twilight and sunrise times at the scene of the accident: https://www.sunrise-and-sunset.com/
- PRELIMINARY SURVEY REPORT (EB No. 056-01-2020) on the inspection of the MV ELSE's propulsion system on behalf of the GDWS on 30 September 2020; Fechner Marine Surveys, Hamburg
- Phoenix Register of Shipping survey records
- Official report on the weather data for Kiel-Holtenau (NOK lock) at about 0510 on 29 August 2020 dated 13 August 2021; Weather Forecast Division of the DWD, Hamburg
- Photograph of the MV ELSE, Hasenpusch Photo-Productions, Hamburg