Bundesstelle für Seeunfalluntersuchung
Federal Bureau of Maritime Casualty Investigation
Federal Higher Authority subordinated to the Federal Ministry
of Transport and Digital Infrastructure

Investigation Report 74/20

Less Serious Marine Casualty

Catamaran SEEWIND I suddenly pitches into a wave in the North Sea with ensuing physical injuries and damage on 3 July 2020

1 July 2021

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.

Issued by:
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1 SUMMARY

The German-flagged catamaran SEEWIND I was in Büsum on 3 July 2020. In the afternoon, 17 crew members were transported from there to various passenger ships lay at the deepwater roadstead in the German Bight. 37 crew members from the anchored passenger ships were then taken on board. They were to be transported to Bremerhaven.

The transfer from the roadstead to Bremerhaven began at 2110. The SEEWIND I entered the Weser fairway a little later. Since the waves now approached from abaft, the catamaran was able to sail at a speed of about 26 kts.

Another wave system that had not been expected by the ship's command then emerged briefly at 2158. The ship's bow initially dropped further than before in these waves. The catamaran then plunged into the crest of the next wave at undiminished speed, bringing her to a near standstill almost immediately.

The chief engineer officer was in the passenger area at this point so as to attend to the passengers. He lost his balance and suffered a serious injury when he fell[1]. A female passenger suffered a minor injury. Both were then attended to by medically trained passengers.

The SEEWIND I suffered minor damage as a result of plunging into the wave. The ship continued her voyage to Bremerhaven at reduced speed and the casualties were transferred to the rescue services there. The ship set sail for the port of departure after the classification society had surveyed her on the following day.

In the course of the investigation, the Federal Bureau of Maritime Casualty Investigation (BSU) found that the SEEWIND I sailed into the wave system of an oncoming large container ship. The shipowner's manuals available to date have not addressed this risk adequately. The investigation also revealed shortcomings in the manning of the ship and in the documentation. The shipowner will take action – also in response to the draft report – to improve the points described.

[1] Serious injury as defined in Part 1 No 2.18 of the Annex to Resolution MSC.255(84): "[…] injury [..] resulting in incapacitation […] for more than 72 hours […]."

2 FACTUAL INFORMATION

2.1 Photograph of the ship

Figure 1: SEEWIND I after the accident[2]

2.2 Ship particulars

Name of ship:	SEEWIND I
Type of ship:	High-speed craft
Flag:	Germany
Port of registry:	Pellworm
IMO number:	9227936
Call sign:	DKFT
Owner:	North Frisian Offshore GmbH
Operator:	North Frisian Offshore GmbH
Year built:	2000 (keel laid on 1 June 2000)
Shipyard:	Alushiip Technology, Gdansk and Lindstols Skips & Baatbyggeri, Risör
Classification society:	RINA
Length overall:	27.50 m
Breadth overall:	9.30 m
Draught (max.):	1.85 m
Gross tonnage:	198
Deadweight:	20 t
Engine rating:	2 x 1,050 kW
Main engine:	2x MTU 16V 2000 M70
(Service) Speed:	30 kts
Hull material:	Aluminium

[2] Source: Waterway Police (WSP) Bremerhaven.

Hull design:	Catamaran
Minimum safe manning:	4 (in the HSC passenger vessel[3] operating mode, category A)

2.3 Voyage particulars

Port of departure:	Büsum
Port of call:	Bremerhaven
Type of voyage:	Merchant shipping, national
Cargo information:	Passengers (crew members of the ships MEIN SCHIFF 1 to MEIN SCHIFF 6)
Crew:	3
Draught at time of accident:	D = 1.80 m
Pilot on board:	No
Number of passengers:	37

[3] High-speed craft passenger vessel.

2.4 Marine casualty information

Type of marine casualty:	Less serious marine casualty; physical injuries and material damage due to the wash of the sea
Date, time:	03/07/2020, 2158
Location:	North Sea, Weser approach
Latitude/Longitude:	φ 53° 51.8'N, λ 007° 51.1'E
Ship operation and voyage segment:	Estuary trading
Place on board:	In the passenger compartment and in the fore section
Consequences:	One seriously injured crew member and one injured passenger; damage to railing, lamps and other parts in the fore section

Extract from Navigational Chart 2 of the Federal Maritime and Hydrographic Agency

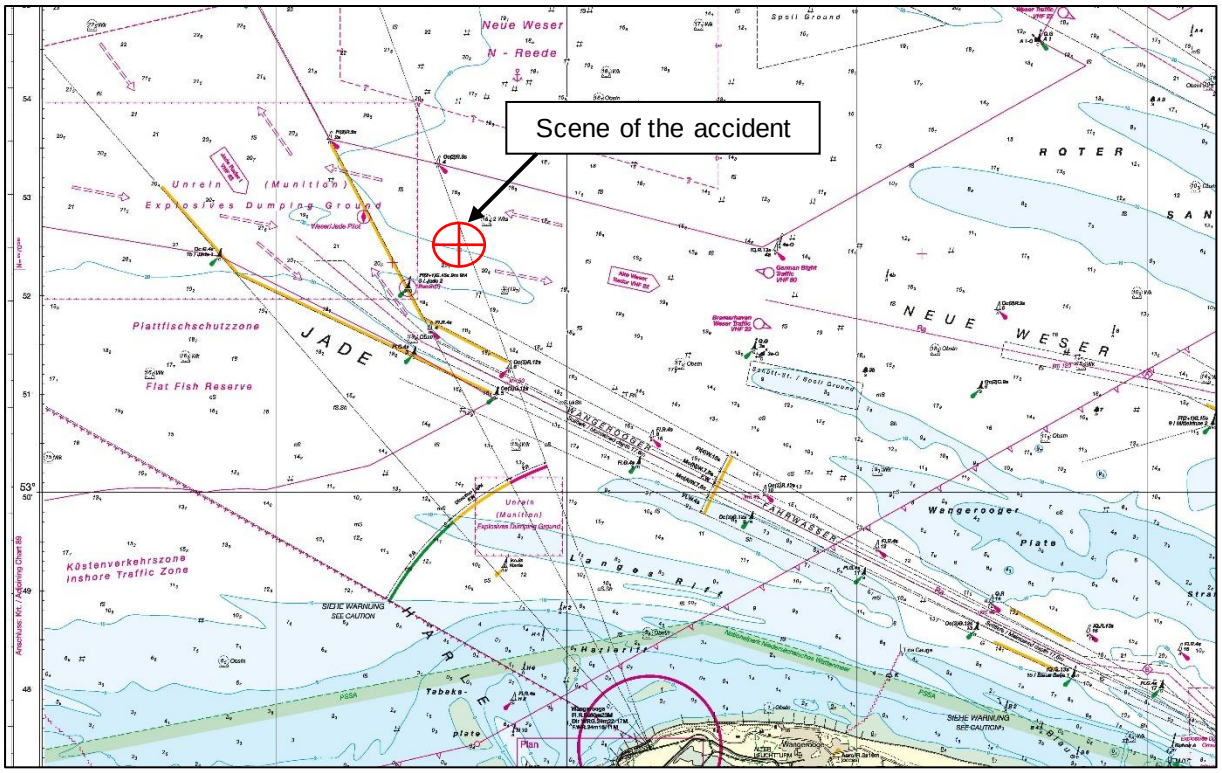

Figure 2: Navigational chart showing the scene of the accident

2.5 Shore authority involvement and emergency response

Agencies involved:	Vessel Traffic Service (VTS) Bremerhaven
Resources used:	Rescue services transport casualties to a hospital
Actions taken:	Casualties attended to on board; VTS notified; WSP notified on the following day; WSP Bremerhaven starts the investigation on 4 July 2020

3 COURSE OF THE ACCIDENT AND INVESTIGATION

3.1 Course of the accident

3.1.1 Course of the voyage

The account of the course of the voyage in this Section is based on the master's report on the course of the voyage, the master and the chief engineer officer's statements to the WSP, entries in the deck log book and a rough analysis of the course of the voyage using EMSA's[4] program for analysing AIS[5] data.

The SEEWIND I had been on standby in Büsum since 28 June 2020. On 3 July 2020, the vessel was to be used to transport the crew members of various passenger ships anchored at the deepwater roadstead in the German Bight to their respective ships. Following that, other crew members on those passenger ships were to be transported to Bremerhaven.

17 passengers boarded in the afternoon. Before the voyage started, they were briefed on the conduct expected on board. The briefing was given by one of the SEEWIND I's crew members in front of the passengers.

The ship departed from Büsum at 1628 on 3 July 2020. She reached the deepwater roadstead at shortly before 1900. The six passenger ships were called at one after the other and their crew members were dropped off or picked up. This operation was completed at 2110. There were now 37 passengers on board the SEEWIND I.

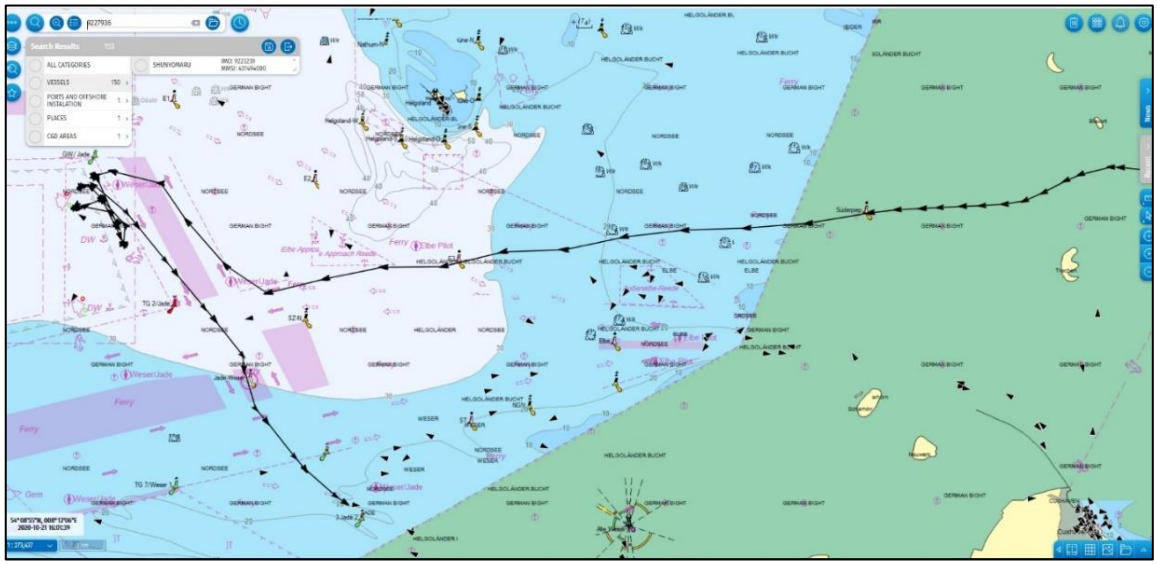

Figure 3: The complete AIS track[6]

[4] European Maritime Safety Agency.
[5] Automatic identification system.
[6] Source: EMSA.

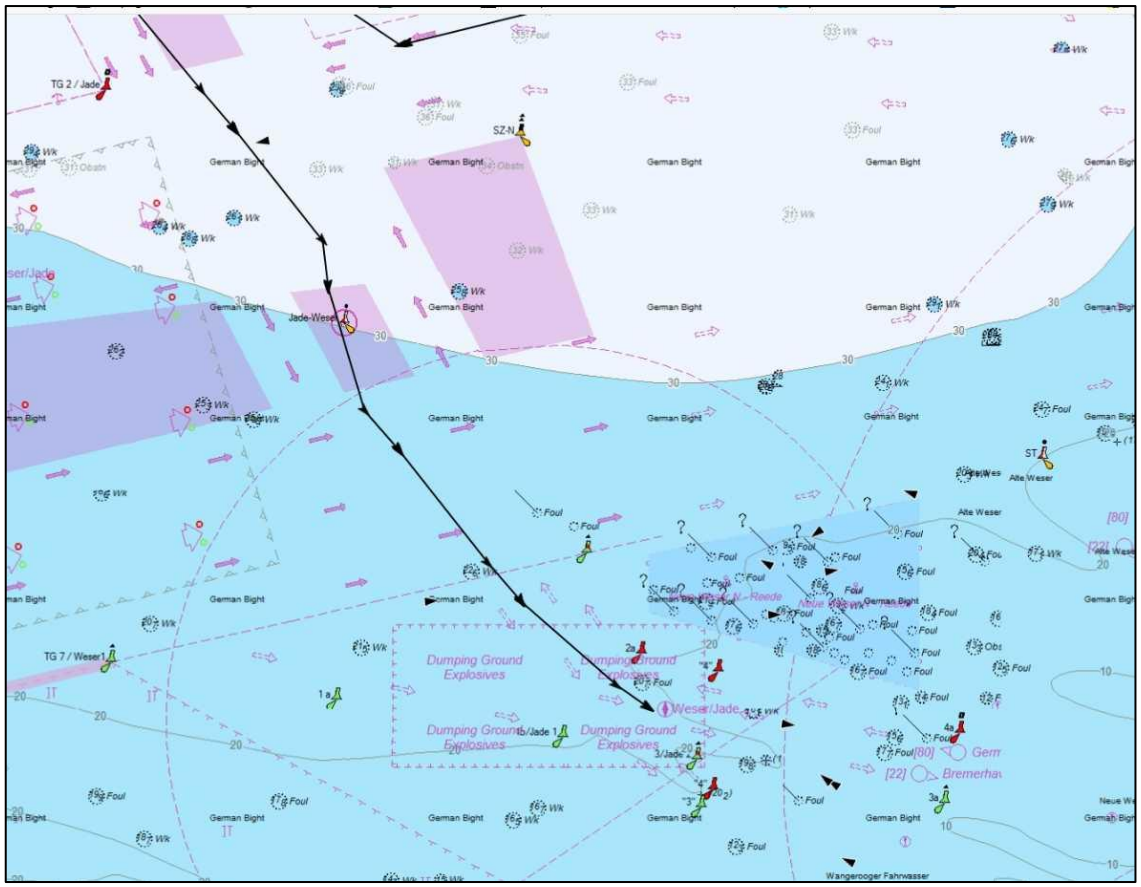

Figure 4: The AIS track from buoy TG2/Jade until about 2155[7]

Rough seas prevailed at the roadstead and during the voyage, causing some passengers to suffer from seasickness.

Buoy TG2/Jade was passed at 2120. A course alteration to 111° was made at 2145. The master stated that the ship was sailing in following seas with a height of about 1.5 m at this point. A light swell with a height of 1 m came from the west. The wind was blowing at 13 m/s from 220°. The SEEWIND I's speed was about 24 kts.

The master stated with regard to the accident that the ship surfed on a wave and then plunged into the next wave. In the process, the fore section was submerged and the ship was bow-heavy for a brief period.

The master had not expected this wave. Since the SEEWIND I was sailing in a following sea and overtaking the waves, he did not expect such an event based on his experience. Therefore, he had previously permitted the passengers and crew to leave their seats again.

The catamaran was brought to a near standstill almost immediately when she plunged into the wave. The chief engineer officer was in the ship's passenger area at this point. He wanted to attend to the passengers because the catamaran was now running more smoothly than before. He began his checks in the aft part of the port aisle between the

[7] Source: EMSA.

two rows of seats. He could not take hold of anything when the ship suddenly decelerated because he was carrying sickness bags. As a result, he was hurled down the aisle and seriously injured when he violently struck a small stairway at the front of the passenger area. He was subsequently attended to by medical staff who happened to be among the passengers.

A female passenger suffered a minor injury when she jumped up in the course of the incident, resulting in an injured muscle. In the case of the passengers in the front row, who could not hold on to their seats, the impact was cushioned by luggage stored in the forward part of the passenger compartment, thus preventing further casualties. All the passengers reacted calmly, even though water entered the forward part of the passenger compartment through ventilation apertures and struck passengers and luggage.

The SEEWIND I's master notified VTS German Bight Traffic[8] of the incident on VHF at 2206. Since immediate assistance was not necessary, the crew continued the voyage toward Bremerhaven at reduced speed after checking the passengers and the ship. During the onward voyage, an ambulance was ordered to proceed to the planned berth.

The Seebäderkaje quay in Bremerhaven was reached at 0030 on 4 July 2020. The two casualties were transferred to the rescue services, which then transported them to a hospital. At the hospital, it was found that the chief engineer officer had suffered two broken ribs and bruising. After treatment, none of the casualties were admitted as in-patients. The injured crew member was subsequently unable to work for more than 72 hours.

3.1.2 Subsequent events

After dropping off the passengers, the SEEWIND I shifted to Bremerhaven fishing port, where the crew moored the vessel at 0200.

One of the shipowner's employees informed WSP Bremerhaven about the incident on the morning of 4 July 2020. Police officers were then sent to the SEEWIND I to begin the investigation. The officers took photographs of the damage to the SEEWIND I caused by the wash of the sea. In addition, they secured the recordings of two cameras on board the ship. One was a kind of front camera that records part of the area ahead of the vessel and the other was a camera that records part of the passenger compartment.

The Ship Safety Division (BG Verkehr), which had been informed by the WSP, imposed a ban on setting sail. After confirmation of class compliance by the classification society (RINA), the ban on setting sail was lifted on the following day.

[8] VTS Wilhelmshaven with the traffic sectors German Bight Traffic, Jade Traffic and North Coast Traffic.

3.1.3 Damage

The SEEWIND I suffered minor damage as a result of plunging into the wave. This was mainly at the bow of the ship, where railings had buckled and some steps on the companionway between the foredeck and bridge deck had parted from their supports. Further damage occurred to another ladder and the deck lighting.

Transmission of the vessel's AIS signal stopped when the accident happened. The BSU did not investigate the cause of this, i.e. the possible failure of the AIS antenna or other technical equipment due to the pitching.

Figure 5: Damage to the SEEWIND I's fore section[9]

3.2 Investigation

WSP Wilhelmshaven notified the BSU of the incident on 20 July 2020.

The crew's statements, the recordings of the two cameras already discussed, the photographs taken during WSP Bremerhaven's survey of the damage, and the file of the public prosecutor's office in Oldenburg were available for the investigation. The course of the voyage between 2150 and 2211 and the vessels in the vicinity of the scene of the accident could also be analysed using the AIS data recorded by VTS German Bight Traffic.

[9] Source: Waterway Police (WSP) Bremerhaven.

The shipowner provided numerous items of documentation in the course of the investigation, such as certificates, time sheets, extracts from the deck log book and ship plans.

Investigators from the BSU surveyed the ship in Büsum on 9 March 2021. The delay was due to travel restrictions because of the COVID-19 pandemic. Representatives of the shipowner were available to answer questions during the survey. Members of the crew from the day of the accident were not present.

3.2.1 The SEEWIND I

The SEEWIND I is a German-flagged catamaran. The vessel originally served as a high-speed ferry in Norway. The current operator has been using the high-speed craft since 2013, also for transporting passengers. Freight could also be transported to a limited extent. One cargo hold and areas on deck are available for this. The current operator does not make use of the option to transport freight in the cargo hold, at least.

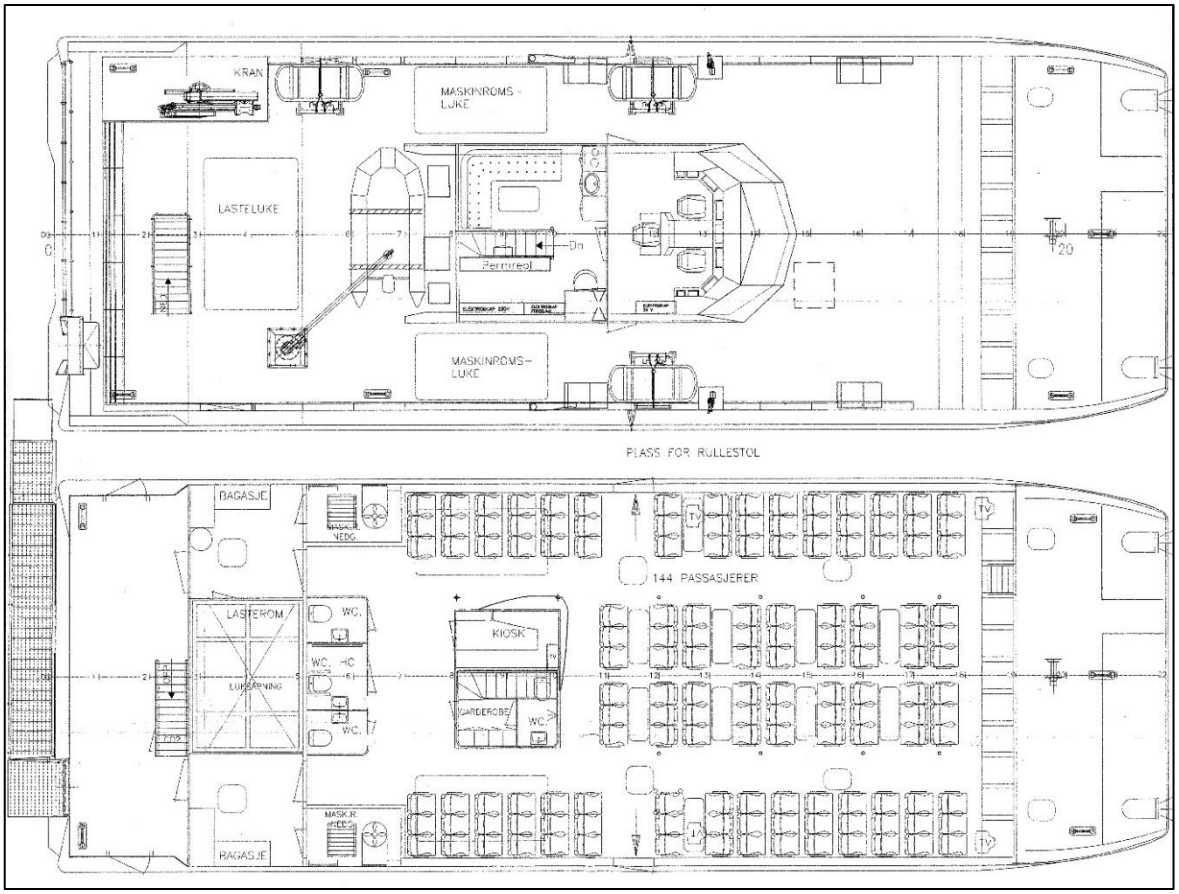

Figure 6: SEEWIND I: Top view of the bridge deck and main deck[10]

The number of seats has been reduced by the operator and therefore differs from the information in the general arrangement plan. The seats are now concentrated in the forward half of the passenger compartment. A total of 75 passenger seats are available. The seats in the front row are equipped with lap belts.

[10] Source: Shipowner, general arrangement plan of the ship.

Figure 7: Passenger compartment, view aft to starboard[11]

Figure 8: Passenger compartment, view forward[12]

The watertight door with a small stairway to the fore section is at the forward edge on the left.

The SEEWIND I is powered by two engines that drive controllable pitch propellers. One drive is located in each of the two hulls of the ship. All the machinery can be controlled and monitored from the bridge. The controls for this are grouped around the chief engineer officer's seat, which is located on its own behind the two positions for the ship's command.

[11] Source: BSU.
[12] Source: BSU.

Important information such as radar and electronic charts can be accessed from the two seats for the ship's command. The closed-circuit television that covers various areas of the ship can be viewed from all workstations. The installed cameras are not controllable.

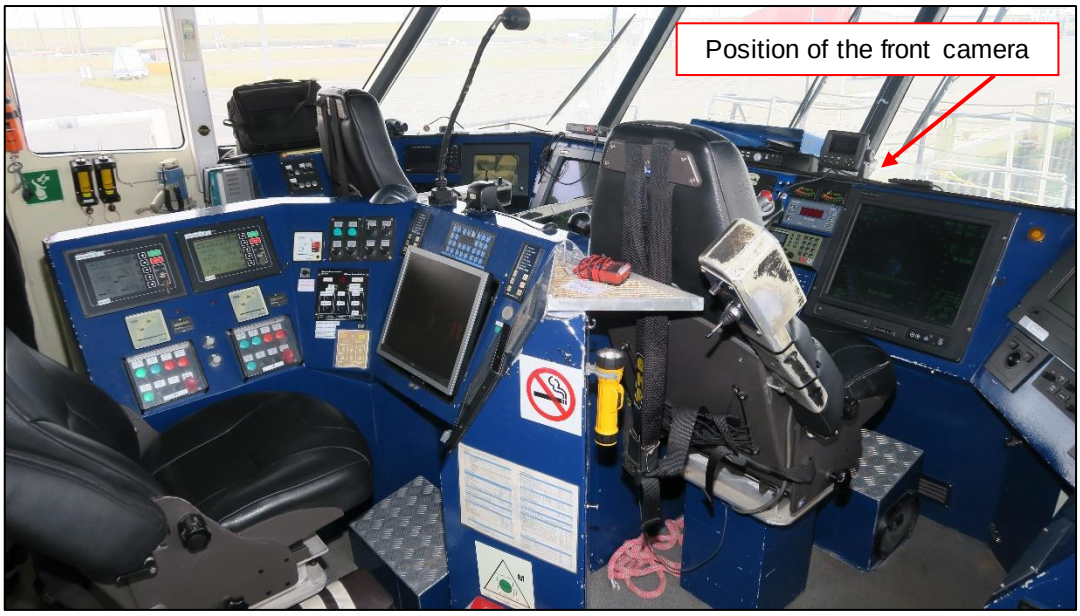

Figure 9: The SEEWIND I's bridge[13]

The workstation for monitoring the ship's propulsion system is visible on the left-hand side of the image. The two workstations for the ship's command are in the forward part of the bridge.

Due to the small size, there are no outfitting requirements for a voyage data recorder on the SEEWIND I. According to the operator, no other technical aids were installed that would have made it possible to record data on the course of the voyage. Accordingly, the only data from the ship available for analysing the course of the voyage was the stored camera data.

3.2.2 The SEEWIND I's certification

The SEEWIND I has two approvals. Firstly, the vessel can be operated as an offshore service vessel[14] [15]. This operating mode is used for transporting offshore service personnel[16] to wind farms or specific wind turbines.

[13] Source: BSU.

[14] Cargo vessel or high-speed craft used for transporting offshore service personnel not working on board; the number of people on board, including crew, shall not exceed 60 and the number of passengers who are not offshore service personnel shall not exceed 12. Annex 1a Part 6 Chapter 2 No 2.1.6 *Schiffssicherheitsverordnung (SchSV)* [Ordinance for the safety of seagoing ships].

[15] National permit to operate high-speed craft issued in accordance with the requirements of Annex 1a Part 6 SchSV.

[16] People engaged in the construction, operation and maintenance of offshore wind farms or other offshore structures. Annex 1a Part 6 Chapter 2 No 2.1.7 SchSV.

Since the gross tonnage of the SEEWIND I is ≤ 500, the HSC Code[17] – in this case as a cargo vessel – does not apply[18].

In Germany, the *Code für den Bau, die Ausrüstung und den Betrieb von Offshore-Servicefahrzeugen* [Code for the construction, equipment and operation of offshore service craft] applies to such vessels in addition to the *Schiffssicherheitsverordnung (SchSV)* [Ordinance for the safety of seagoing ships]. At the time of the accident, the SEEWIND I had a valid national permit to operate high-speed craft and a valid national safety certificate for high-speed craft.

Secondly, the SEEWIND I can be operated as a passenger vessel. This is necessary if more than 12 people are to be transported who are not offshore service personnel. To this end, the Ship Safety Division (BG Verkehr) has issued a certificate for the vessel (national permit to operate high-speed craft), which – similar to the other one – refers to Annex 1a Part 6 SchSV – offshore service craft. In the opinion of the BSU, it should actually refer to the International Code for the Safety of High-Speed Craft, 1994, given the use and date on which the keel was laid (before 1 July 2000).

The national permit to operate high-speed craft defines the area of operation as voyages to wind farms outside the German territorial sea. The maximum distance from a place of refuge may not exceed 60 nm. Operation is permitted up to a significant wave height of 2.5 m. The permit refers to a table in the certificate of class, which bases the maximum permitted speed on the significant wave height.

Due to her transport capacity of ≤ 450 passengers, the SEEWIND I is classified as a category A passenger vessel[19]. To that end, the SEEWIND I also has a valid national safety certificate for high-speed craft. According to this certificate, no more than 85 people may be on the vessel when she is underway. The certificate issued by the Ship Safety Division for that purpose also (erroneously) fails to reference the HSC Code.

3.2.3 Manning

Manning in the offshore service vessel operating mode is organised in accordance with the manning regulations for German-flagged ships that are engaged in coastal voyages and operated by a single watch. This means that a master and another person certified to form part of the navigational watch (deck rating) are required for the operation of these vessels. The minimum safe manning certificate was issued accordingly. However, the shipowner always mans the vessel with an engineer officer as well because it believes this enhances safety.

The reduced manning in this operating mode is also due to the fact that offshore service personnel receive special safety training for transportation in such service vessels. This means that the level of safety in this area is higher than for the transportation of untrained passengers.

[17] International Code for the Safety of High-Speed Craft (1994 HSC Code).
[18] 1994 HSC Code 1.3.2 in conjunction with 1.4.8.
[19] 1994 HSC Code 1.4.10.

According to the minimum safe manning certificate issued by the Ship Safety Division, the SEEWIND I must be manned by a master, a chief mate, a chief engineer officer and a deck rating certified to form part of the navigational watch when she is in the HSC passenger vessel operating mode. The certificate valid at the time of the accident did not contain any exemptions.

3.2.4 Mode of operation at the time of the accident

During the voyage from Büsum to the deepwater roadstead in the German Bight on the day of the accident, 17 crew members from the passenger ships anchored there were on board the SEEWIND I. This meant that more than 12 passengers who were not offshore service personnel were on board. Therefore, this voyage could only take place in the HSC passenger vessel operating mode. This also applied to the voyage from the roadstead to Bremerhaven, where 37 crew members of the passenger vessels had been taken on board.

3.2.5 Manning at the time of the accident

Operation of the SEEWIND I was ensured by three crew members on the day in question. The master, the chief mate and the chief engineer officer were on board for this purpose.

The master and the chief mate were on the bridge at the time of the accident. They thus fulfilled the requirement under 18.1.3.6 of the 1994 HSC Code that two deck officers, one being the master of the ship, stand watch on the bridge while the ship is underway.

The SEEWIND I was commanded by a German master. He held a valid certificate of competency as a master at the time of the accident. He had been serving on this ship in the capacity of master for four years.

At the time of the accident, the navigational watchkeeping officer was qualified as a chief mate. It was his first voyage on this ship.

In addition to his technical duties, the chief engineer officer performed the passenger-related tasks. This included giving the passengers a safety briefing and supervising them.

3.2.6 Analysis of the deck log book

As part of the investigation, the investigators sighted the entries in the deck log book from 22 June 2020 to 4 July 2020. The following findings were made in the process:

- passenger voyages were carried out on four days during the period under review. The number of people transported ranged from two to 75;

- during one of these voyages, the number of passengers was not entered in the deck log book (24 June 2020). The BSU is therefore certain that at least two voyages were carried out in the HSC passenger vessel operating mode (23 June 2020 and 3 July 2020);

- it was not possible to establish from the entries in the deck log book whether the manning level met requirements for the transportation of more than 12 passengers, as the skipper employed during these periods did not make any entries in this regard (23 June 2020 and possibly 24 June 2020);

- the operating mode was changed in the course of the day on at least two days. At no time was the change of operating mode entered in the deck log book;

- voyages with offshore service personnel were carried out on five days during the period referred to;

- voyages were not carried out on five days during the period due to the weather, and

- it was not possible to find any entries on pre-voyage safety briefings.

There was little information on the course of the voyage on the day of the accident. The deck log book showed the time of departure in Büsum, the crew transfer on the Weser Road [sic] with a GPS position, the time of departure from the deepwater roadstead with Bremerhaven as the destination, the position of the accident, as well as the times of arrival in Bremerhaven and manoeuvres there. The deck log book did not contain any information about the courses taken, speeds or waypoints passed. Only the heading at the time of the accident was logged.

However, the master's report on the course of the voyage contained specific courses, course alterations with times, speeds and waypoints passed. The investigators were unable to trace the records this information was based on. The ship's operator could not provide any technical records, such as the course of the voyage on the electronic chart.

The deck log book did not contain any information about weather data or forecasts obtained prior to the start of the voyage. Weather observations were entered at two-hour intervals from 1500 onwards. The wave height was recorded only once (2 m at the time of the accident).

3.2.7 Other documents

The HSC Code requires that operators provide additional documents[20]. These include a training manual and a maintenance manual. As part of the investigation, the investigators sighted the operation handbook [sic][21] and the voyage handbook [sic][22]. The documents discussed here apply to the operation of the catamaran as a HSC passenger vessel, in particular.

In the operation handbook (written in English), the investigators noted the requirement that records be kept to demonstrate to the Administration that:

- the vessel operated within the specific parameters;
- a known number of passengers were on board, and
- any legislation applicable to the vessel had been complied with.

In the voyage handbook (also written in English), the investigators discovered the requirement that the restrictions for operating the ship at certain water depths, swell heights and wind strengths must be observed.

The investigators also discovered that the voyage handbook contained advice on route selection and keeping watch when underway. This also included a point on navigation in confined and busy areas. There was no reference to the hazards that passing the wave systems of other ships pose.

3.2.8 Camera recordings

3.2.8.1 Bridge

The recording of the front camera used for the accident investigation has a total duration of ten minutes and 33 seconds. The recording starts at the time shown (215549).

The camera's angle of view is about 74°. About 48° are covered in the area from ahead to starboard. The angle of view to port is therefore 26°.

It is evident that the SEEWIND I is sailing with the sea coming from abaft the starboard beam and yawing in the process. Due to her own high speed, the ship is sailing relatively smoothly during this period.

At the start of the recording, another vessel is visible far ahead on the port bow (Figure 10). This vessel moves outside the field of view of the front camera from time to time due to the yawing of the SEEWIND I. However, she always remains in the field of vision of the ship's command.

[20] 1994 HSC Code, 18.2.
[21] 1994 HSC Code, 18.2.1 – Craft Operating Manual.
[22] 1994 HSC Code 18.2.2 – Route Operational Manual.

Figure 10: Front camera screenshot at 215555[23]

As this vessel is approached, it later becomes apparent that she is an oncoming large laden container vessel and her superstructure is amidships (Figures 11 and 12).

During the course of the investigation, this vessel was identified as the COSCO PHILIPPINES.

Figure 11: Front camera screenshot at 215710

[23] Note: The flagstaff is not mounted in the middle of the vessel.

The oncoming vessel moves outside the camera's field of vision at 215715. She then reappears at a closer distance at 215802. This is due to the course alteration to port carried out by the SEEWIND I in the meantime. After eight seconds, this vessel moves to the left and outside the camera's field of vision again.

Figure 12: Front camera screenshot at 215802

At 215950, the SEEWIND I entered a wave system that had not occurred previously. This appeared to be longer and steeper. As a result, the bow initially dropped further and had not yet risen again when the vessel sailed into the next wave crest (Figures 13, 14 and 15). The SEEWIND I then sailed into this subsequent wave hard at almost 26 kts and stopped abruptly.

Figure 13: Front camera screenshot at 215950

The bow drops further than usual (see also Figure 12).

Figure 14: Front camera screenshot at 215802

The SEEWIND I sails into the next wave crest.

Figure 15: Front camera screenshot at 215952

Figure 16: Front camera screenshot at 220000

Visible damage to the bow rail and other components is marked by yellow ovals. See also the previous condition in Figure 13.

It seems that the voyage was not continued before the end of the recording at 220555.

3.2.8.2 Passenger compartment

The total duration of the recording of events in the passenger compartment is one minute and 34 seconds. Figure 17 shows the situation in the passenger compartment shortly before the vessel pitched. The passenger in the first row in the centre of the image is not wearing a seat belt. Several pieces of luggage are located on and below the seats and in the forward area of the passenger compartment.

Figure 17: Passenger compartment screenshot at 215859

Situation in the passenger compartment before the accident

According to the time on the recording, the vessel pitched into the wave at 215951. The associated events can be seen in Figure 18. The passenger in the front row lifts off his seat. Passengers with a backrest in front of them have the opportunity use it for support. The crew member in the port aisle cannot counteract the forces he is exposed to and starts to fall forward.

Figure 18: The SEEWIND I's passenger compartment at 215951

Situation in the passenger compartment when the vessel pitches into the wave. The crew member is in the middle of the aisle on the port side.

Figure 19 shows water entering the passenger compartment through the ventilation apertures. However, the passengers directly affected respond calmly and leave the affected area. The passenger previously seated in the front row has fallen between the items of luggage. Shortly after the time shown, passengers start to attend to the injured crew member.

Figure 19: The SEEWIND I's passenger compartment at 215957

Water enters the passenger compartment through the forward side windows.

3.2.9 Course of the voyage based on AIS data

As already discussed, the course of the voyage has been analysed using the AIS data recorded by the Shipping Administration. The data of all vessels present in this sea area during the period in question were fed into playback software and a video file was then created. This video file covers the ship movements from 215000 to 221140.

During the investigation, the BSU obtained screenshots from this file.

The entire sea area is shown in the original representation in Figure 20.

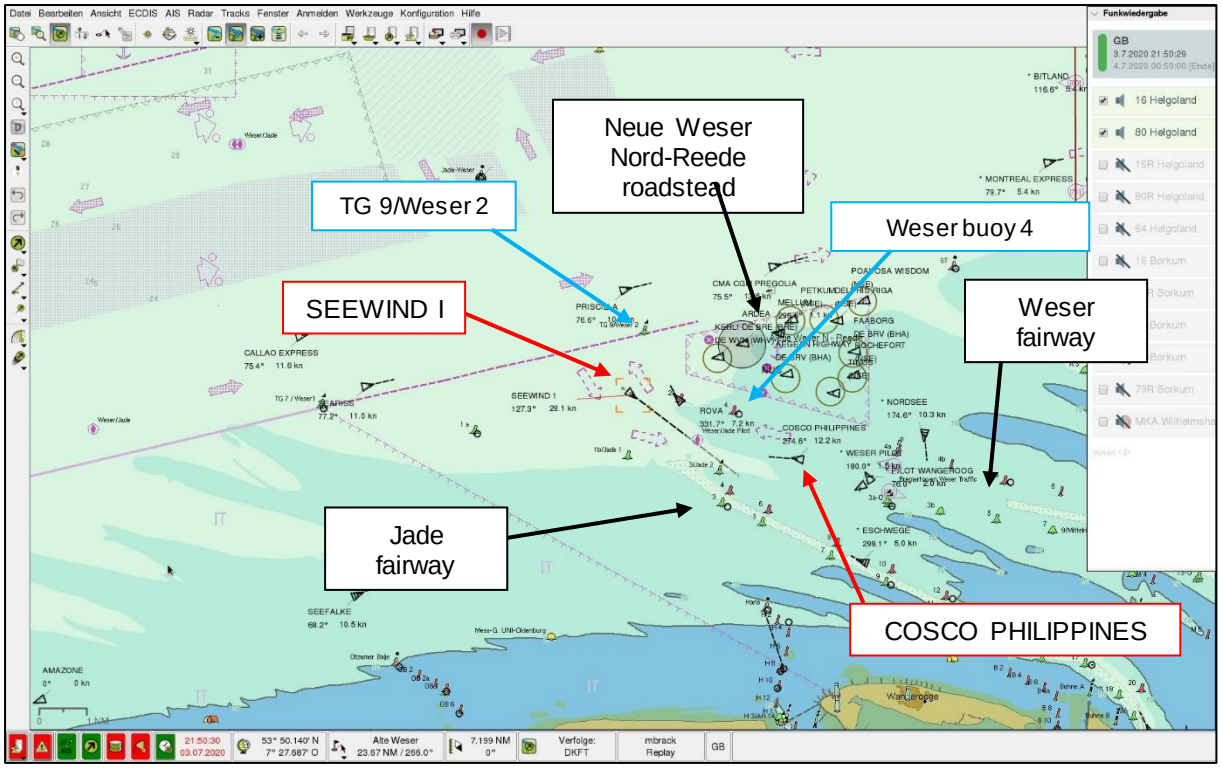

Figure 20: Screenshot at 215030

For the sake of clarity, only image sections are shown in the following figures. The times shown in Figures 20 to 31 refer to the time displayed at the bottom of the image.

The COSCO PHILIPPINES dropped off the Weser pilot near buoy 4a. The speed was then increased again to 13.1 kts. She then reduced her speed again when she was level with buoy 4 on the Weser fairway so as to safely cross the traffic heading east toward the River Elbe in a northerly direction.

The SEEWIND I had passed the TG 9/Weser 2 buoy at a wide distance and then turned into the Weser fairway in several steps. As she turned in, the wind and the sea came more from astern. There was a tidal current.

Figure 21: Screenshot at 215030

Note: The SEEWIND I's movement data visible in the field marked by way of example on the left in Figure 21 together with the associated connection line to the ship are generated by the AIS data playback software. This also applies to all the other vessels visible from Figure 21 to Figure 31.

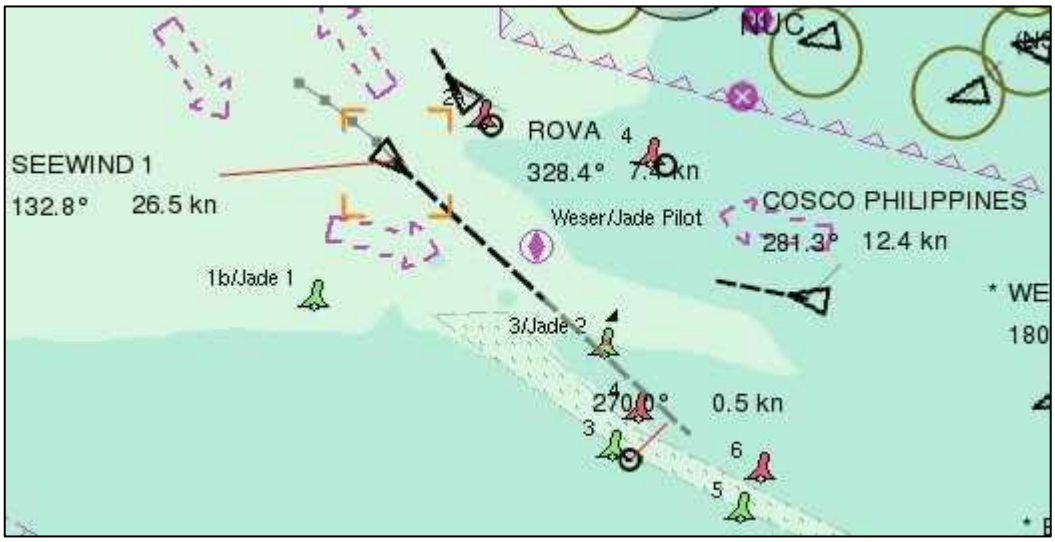

Figure 22: Screenshot at 215200

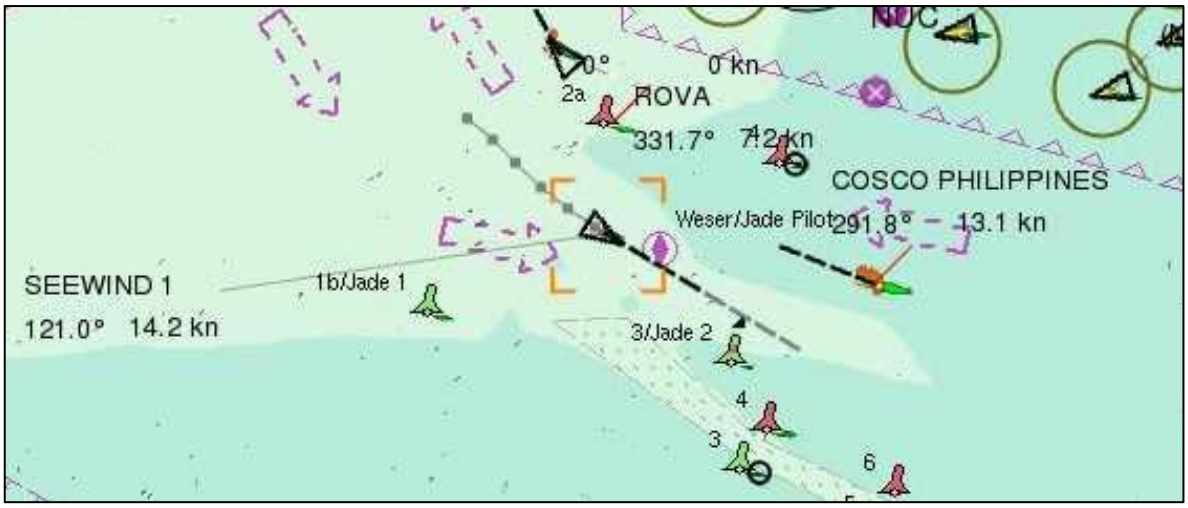

Figure 23: Screenshot at 215400

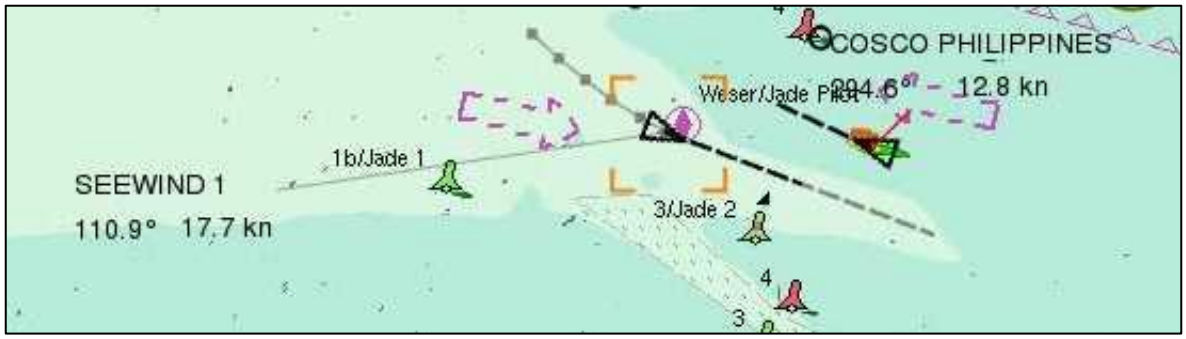

Figure 24: Screenshot at 215500

Course alteration to port toward the COSCO PHILIPPINES and the Weser fairway completed.

Figure 25: Screenshot at 215600

Further course alteration to port to follow the fairway.

Figure 26: Screenshot at 215700

The closest point of approach (CPA) between the vessels is about 4 cbl.

The investigators consider it likely that the COSCO PHILLIPINES last appeared in the field of vision of the SEEWIND I's front camera at between 2156 and 2157 (Figures 25 and 26 – see Figure 12; time on front camera: 215802). This would result in a time lag of at least one minute between the time superimposed on the front camera image and the time of the AIS data playback. Since no other references are available, this cannot be resolved further. The time of the AIS display is used for the time of the accident.

Figure 27: Screenshot at 215800

Further course alteration to port. This may be to increase the CPA to the group of vessels near buoy 3a.

Figure 28: Screenshot at 215829

As can be seen in this Figure, the SEEWIND I's speed begins to drop at 215829 at the latest. The investigators attribute the fact that the speed does not drop immediately to the linearity of the speed measurement and smoothing of the values possibly used in the GPS system (Figures 29 and 30). It is also likely that the SEEWIND I continued to move due to the incoming tidal current and the wind. The BSU investigators assume that the accident thus occurred between 215800 and 215829.

Figure 29: Screenshot at 215900

The speed continues to drop.

Figure 30: Screenshot at 215930

It can be seen subsequently in the replay that the SEEWIND I continued her voyage toward Bremerhaven at around 2201 (time of the AIS display; no image).

3.2.10 Further investigations

Based on the recording of the front camera, the BSU investigators believed it was possible that the SEEWIND I had sailed into the wave system (bow and stern wave) caused by the COSCO PHILIPPINES. Both vessels had moved close to one another in the course of the encounter in the fairway.

3.2.10.1 Wave systems on a ship

A ship has two wave systems. The primary wave system is the one surrounding the ship, i.e. the wave crests at the bow and stern, and the dip at the middle section of the hull.

In this case, the secondary wave system is of importance. This wave system is produced by the ship's form drag. It is a wave system comprising several waves (diagonal and transverse waves) that overlaps with the primary wave system. To simplify further considerations, a bow and stern wave is assumed below. In open water, i.e. with sufficient water depth (subcritical flow range), the propagation angle of this wave system is an almost constant 19.47° on each side (see Figure 31). The rate of propagation of the wave system is equal to the speed of the ship[24,25].

According to the ship's command, the draught of the COSCO PHILIPPINES was 13 m. At the time of the accident, the water depth near buoy 4 was about 22 m. The investigators therefore assume that the Froude depth number (Fr) was thus Fr < 1, meaning that the propagation angle was not influenced by shallow water.

3.2.10.2 Entering the wave system of the container ship

Figures 23 to 28 show that the course of the COSCO PHILIPPINES was about 292° when she and the SEEWIND I were converging.

Figure 31 shows how the SEEWIND I enters the container ship's wave system. The exact time of entry cannot be determined due to the rough representation of the AIS data.

[24] Oebius, H.: *Charakterisierung der Einflussgrößen Schiffsumströmung und Propellerstrahl auf die Wasserstraßen.* [Characterisation of the influence of ship flow and propeller wash on navigable waterways.] In: BAW Newsletter No. 82 (2000), p. 7 ff.

[25] Abdel-Maksoud, A.; Rieck, Karsten (1996): *Wellensystem eines Schiffes bei stationärem Fahrtzustand*. [Wave system of a ship in stationary conditions.] In: Dresden University of Technology, Institute of Hydraulic Engineering and Technical Hydromechanics (ed.): Waves. Dresden Hydraulic Engineering Reports 9. Dresden: Dresden University of Technology, Institute of Hydraulic Engineering and Technical Hydromechanics. Pages 55–74. CC BY 4.0.

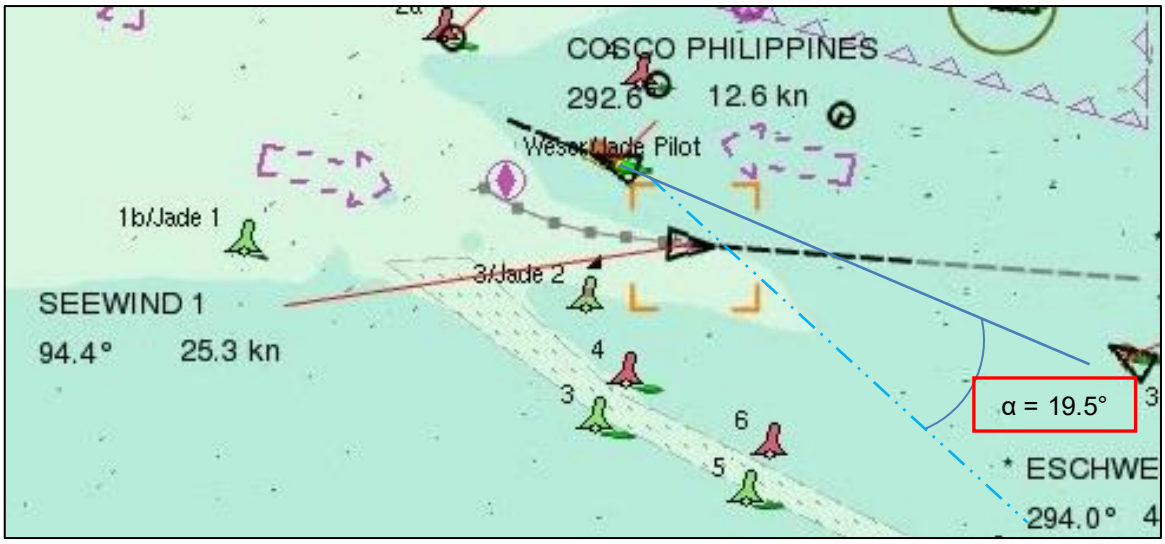

Figure 31: Screenshot at 215800

Course of the COSCO PHILIPPINES is 292.6°, angle of the bow and stern wave on the port side about 312°.

4 ANALYSIS

4.1 Manning as a HSC passenger vessel

The voyage from Büsum to the deepwater roadstead and from there to Bremerhaven was carried out in the HSC passenger vessel operating mode. Since the deck rating certified to form part of the navigational watch required in the HSC passenger vessel operating mode was not on board, the SEEWIND I was not adequately manned for this. This means that neither the shipowner nor the master complied with the requirement in the *Schiffsbesetzungsverordnung (SchBesV)* [Ordinance on safe manning] that the ship be manned according to the minimum safe manning certificate[26].

When the BSU analysed the deck log book, it was unable to establish with certainty whether the manning was sufficient on the other voyage shown to have been made in this operating mode during the period under investigation (23 June 2020). The reason for this is that the skipper responsible for the two voyages did not make any entries regarding the manning level. This is not true of the day of the accident.

It is possible that another voyage was carried out as a passenger vessel. However, this could not be clarified further because only the voyage but not the number of passengers or crew members was entered in the deck log book.

4.2 Analysis of the deck log book

The investigators found when they analysed the deck log book that the requirements of Section 13(2)(13) SchSV had not been met. This stipulates that on vessels for which ship safety certificates have been issued for various purposes, any change in the purpose of the vessel shall be entered in the deck log book at the beginning of each voyage.

4.3 Analysis of other documents

In the further analysis of the entries in the deck log book, the requirements of the operation handbook were taken into account (see point 3.2.7).

The entries in the deck log book did not indicate whether the vessel operated within the specific parameters, i.e. there were no entries on the expected significant wave heights. However, it should also be noted that the wind forces did not exceed 4 Bft in the period under consideration (except for the day of the accident), meaning no impairments were likely on those days.

On the day of the accident, when according to the deck log book the wind force was 6 Bft from 1700, no entries were made on the strength of the wind sea, however. The height of the swell was recorded as 2 m only for the time of the accident.

The other deficiencies in keeping the log already discussed in Section 4.1 make it clear that it was not possible to retrospectively confirm compliance with the applicable legal provisions by the crew.

[26] Section 2(2)(1) SchBesV and Section 3(1) SchBesV apply to the shipowner and to the master, respectively.

4.4 Entering the wave system of the container ship

To the extent that the quality permitted, it was not apparent that the divergent wave system was particularly evident beforehand from the bridge camera video recording. In that respect, it surprised the ship's command.

The ship's command of the SEEWIND I could see the approaching COSCO PHILIPPINES with the naked eye for a sufficient period beforehand in the prevailing daylight. Her size, load condition and the resulting approximate draught and speed could also have been determined without difficulty. The CPA between the vessels was about 4 cbl.

Within the scope of the investigation, it was not possible to determine the extent to which entering the wave systems of other ships had previously been part of any training that the ship's command of the SEEWIND I had attended. However, the investigators assume that this would at least have formed part of the skipper's many years of experience, which should have prompted precautionary measures such as a reduction in speed and/or course alteration.

Although the documents handed over by the shipowner (the voyage handbook, in particular) pointed to the various hazards during a voyage, the risks posed by entering the wave system of another ship at high speed were not addressed.

The investigation did not consider whether the consequences of the accident could have been reduced by a timely and marked reduction in the catamaran's speed.

5 CONCLUSIONS

5.1 Manning as a HSC passenger vessel

The investigation revealed deficiencies in the required manning of the ship in the HSC passenger vessel operating mode.

The absence of the deck rating had no impact on the occurrence of the accident or its subsequent course.

The BSU believes that the shipowner's safety standards for the operation of the SEEWIND I are generally high. This is also evident in the fact that an additional engineer officer serves on board when the catamaran operates as an offshore service vessel.

5.2 Analysis of the deck log book and other documents

In the context of the investigation, it was noted that certain legally required entries were repeatedly not made in the deck log book.

It was also found that other entries – which the BSU understood were a requirement of the operation handbook or the voyage handbook – had also not been made in the deck log book or other documents. In the opinion of the investigators, entries regarding expected significant wave heights with data source would at least have been necessary. In the BSU's view, this also applied to the expected wind forces. That practically no entries were made for the wave heights on precisely the day of the accident, when higher wind forces were present, was also striking. However, such entries are made so that it is possible to establish that the vessel is or was operated within the permitted parameters.

Furthermore, the BSU is of the opinion that the number of passengers and safety briefings given to passengers should have been recorded for each voyage so as to demonstrate compliance with the legal provisions.

The deficiencies in the entries did not affect the accident.

5.3 Entering other wave systems

Based on its analysis of the accident, the BSU believes that a description of the dangers arising from entering the wave system of another ship should be added to the shipowner's manuals. Moreover, the ship's commands of such high-speed craft should be reminded of these dangers in an appropriate manner or trained in this respect.

In the opinion of the investigators, the accident was caused by non-observance of the wave system of the COSCO PHILIPPINES.

6 ACTIONS TAKEN

The draft report drawn up at the end of the investigation contained two safety recommendations for the shipowner. In its comments on the draft report, the shipowner, referencing the recommendations, stated that

- it would specify the data and facts to be entered in the deck log book as part of the revision of the safety management manual. This revision should take place in the autumn of 2021. A review of the entries should then also become part of the internal audits within the safety management system[27];

- in future there will be a description of the hazards that arise when entering the wave system of another ship and they will also be implemented in the safety management manual. In addition, the shipowner intends to clarify these dangers and the findings of the BSU's investigation in a fleet circular for the ship's commands and in so doing raise their awareness. The fleet circular will be issued as soon as the final version of the marine casualty report is published.

Due to the shipowner's planned measures, the BSU has dispensed with issuing any safety recommendations for this accident in the investigation report.

[27] For further explanations, see https://www.deutsche-flagge.de/de/sicherheit/ism-code (retrieved on 29 June 2021).

7 SOURCES

- Investigations by WSP Bremerhaven and Wilhelmshaven
- Witness statements from the file of the public prosecutor's office in Oldenburg
- Written explanations/submissions
  - Ship's command
  - Shipowner
- Various manuals and other documents from the shipowner
- AIS recordings from VTS German Bight Traffic and EMSA