



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

Investigation Report 155/14

Serious Marine Casualty

**Collision between the ferry
ADLER EXPRESS
and the pier
in the port of Wittdün, Amrum
on 4 June 2014**

3 June 2015

The investigation was conducted in conformity with the Law to improve safety of shipping by investigating marine casualties and other incidents (Maritime Safety Investigation Act - SUG) of 16 June 2002, amended most recently by Article 1 of 22 November 2011, BGBl. (Federal Law Gazette) I p. 2279.

According to said Law, the sole objective of this investigation is to prevent future accidents and malfunctions. 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

At about 1052¹ on 4 June 2014, the MV ADLER EXPRESS collided with the pier during a berthing manoeuvre in the port of Wittdün, Amrum. The ship's bow section was heavily damaged above the waterline in the process. Six people sustained serious injuries and 43 minor injuries.

¹ All times shown in this report are local (UTC + 2 h)

2 FACTUAL INFORMATION

2.1 Photo

© Hasenpusch Photo-Productions



Figure 1: Photo of ship

2.2 Ship particulars

Name of ship:	ADLER EXPRESS
Type of ship:	Passenger ship
Nationality/Flag:	Germany
Port of registry:	Hörnum, Sylt
IMO number:	9703098
Call sign:	DLXA
Owner:	Adler Schiffe GmbH & Co KG
Year built:	1993
Shipyard:	Marineteknik Verkstads AB, Öregrund
Classification society:	Germanischer Lloyd
Length overall:	41.96 m
Breadth overall:	7.90 m
Gross tonnage:	334
Deadweight:	33 t
Draught (max.):	1.27 m
Engine rating:	2,520 kW
Main engine:	MTU Friedrichshafen GmbH, 12V 396
(Service) Speed:	33 kts
Hull material:	Aluminium
Propulsion:	2 propellers, water-jet propulsion
Minimum safe manning:	4

2.3 Voyage particulars

Port of departure:	Hallig Hooge
Port of call:	Wittdün, Amrum
Type of voyage:	Merchant shipping National trade
Cargo information:	None
Manning:	6
Pilot on board:	No
Number of passengers:	233

2.4 Marine casualty or incident information

Type of marine casualty or incident:	SMC, collision with pier
Date, time:	04/06/2014 at approx. 1052
Location:	In the port of Wittdün, Amrum
Latitude/Longitude:	$\phi 54^{\circ} 37.8'N \lambda 8^{\circ} 24.0'E$
Ship operation and voyage segment:	Berthing manoeuvre
Place on board:	Main deck
Human factors:	No
Consequences (for people, ship, cargo, environment, other):	Six people sustained serious injuries and 43 minor injuries.

Excerpt from Nautical Chart BSH 3013, Sheet 7

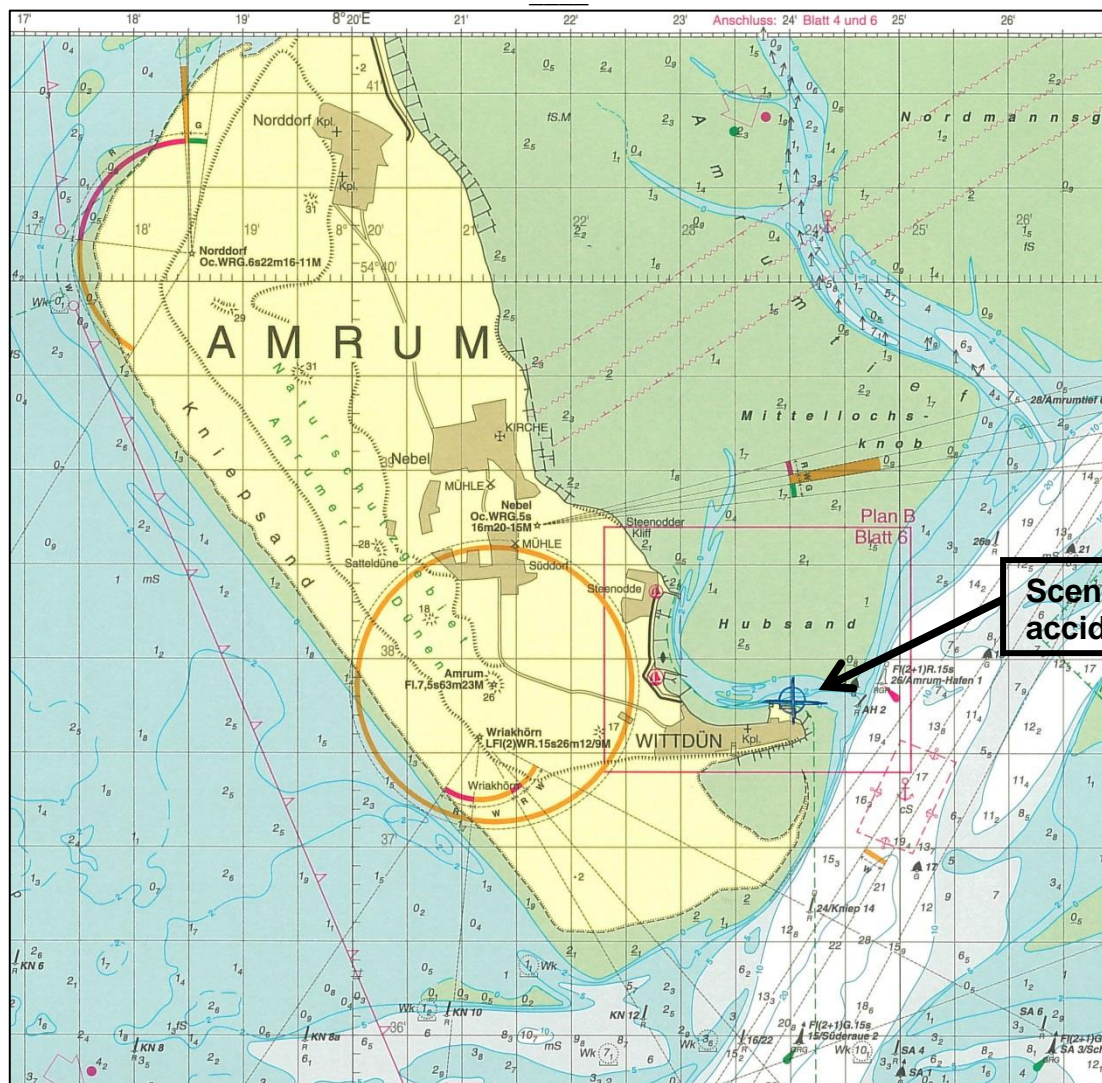


Figure 2: Nautical chart

2.5 Shore authority involvement and emergency response

Agencies involved:	Rescue helicopter, rescue vehicles, emergency physicians, hospitals, Germany's Maritime Search and Rescue Service (DGzRS), waterway police (WSP), BSU
Resources used:	All first aid measures
Actions taken:	Casualty care, first aid, transported to various hospitals

3 COURSE OF THE ACCIDENT AND INVESTIGATION

3.1 Course of the accident

The engines on board the MV ADLER EXPRESS were started up at 0900 on 4 June 2014 in the port of Strucklahnungshörn, Nordstrand. Before casting off, the steering controls on the main conning station, on the mobile conning station and the emergency steering (with disengaged main engines) for the water-jet propulsion system were run through without any problems observed. The casting off manoeuvre in the port of Strucklahnungshörn was carried out at 0915 and the pier on Hallig Hooge was called at for a short stopover at about 1000. Arrival at the port of Wittdün, Amrum, was scheduled for 1055. The speed was reduced from 20 kts to 5-6 kts at about 1045 some 300 m off the pier. Despite the jet propulsion system's control lever being set to FULL ASTERN, this manoeuvre appeared to have no effect. At this point, the ADLER EXPRESS was already about 20 m from the berthing position and the master saw that a collision with the pier was unavoidable. The impact with the sheet piling happened at a speed of about 6-7 kts and despite a previous warning by the master ("ALL HOLD TIGHT, HOLD TIGHT, HOLD TIGHT"), the passengers who had already stood up and were standing in the corridors were thrown into and on top of each other.

3.2 Investigation

The owner informed the Federal Bureau of Maritime Casualty Investigation about the accident by phone at about 1415 on the day it occurred. It was agreed in consultation with the waterway police that the ship should move to the shipyard in Husum for repairs. The first survey of the ADLER EXPRESS was made after that on 5 June 2014 in Husum. This appointment was attended by the waterway police, a surveyor from DNV GL, a master electrician from an electronics company, representatives of the owner, and the BSU.

The fore section of ADLER EXPRESS was heavily damaged. During the collision, the bow was pushed in about 50 cm and the deck torn open. The damage zone extended from the main deck to about 1.40 m below. The damage was above the water and no water ingress was reported. Moreover, the collision bulkhead remained intact during the accident. The bow visor with hydraulic cylinders and bearing brackets was deformed and it was impossible to move the visor. The harbour master did not report damage to the pier in Wittdün.



Figure 3: Damage to the fore section

3.2.1 Manning

The ADLER EXPRESS was manned sufficiently in accordance with the minimum safe manning certificate. The master and the chief officer were on the bridge at the time of the accident. The master was born in 1967 and has more than 30 years of professional experience. He has been on board the ADLER EXPRESS for three years, two of which as the master in charge. No accidents or incidents were reported during this period.

3.2.2 Ship

The ADLER EXPRESS was put into service in 1993. The ship is measured at 335 GT and approved for 420 people on board. The hull is made of aluminium and has six watertight bulkheads. The main propulsion system consists of two MTU 12 cylinder engines driving two MJP hydraulic turbines. Each engine has an output of 1,260 kW.



Figure 4: MJP water-jet propulsion

The maximum speed is 33 kts and the service speed 20 kts. Special dispensation to proceed at 24 kts was granted for intertidal areas. The ship also has a bow thruster for manoeuvring. All the control systems are duplicated, the port and starboard main engines each have a separate hydraulic pump, and emergency steering is possible by switching the control valves directly in the engine room. The bridge is fitted out as a one-man conning station.

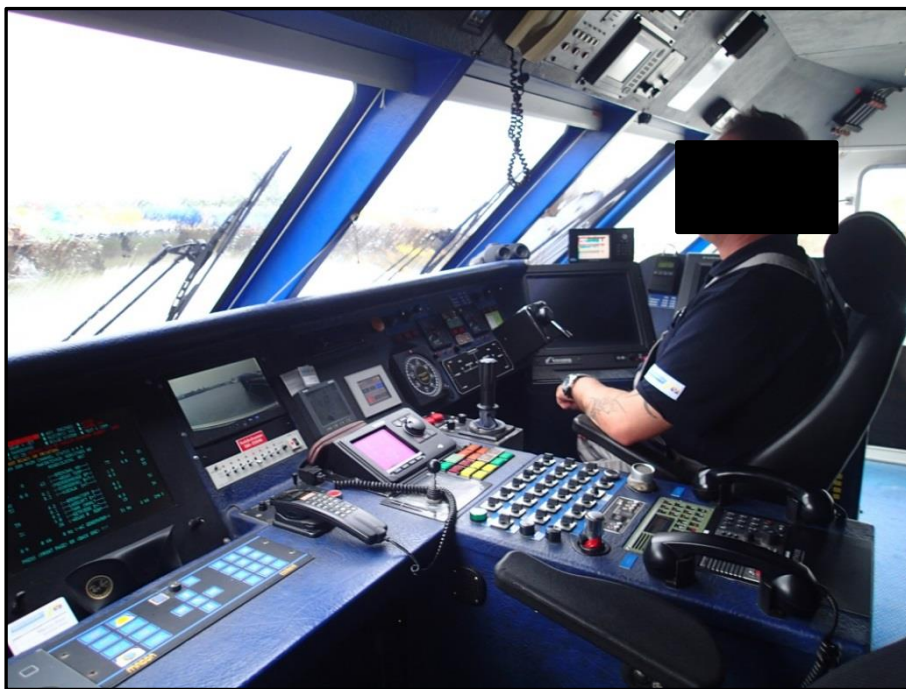


Figure 5: Main conning station

Using a permanently connected cable, the ship can also be steered from any position on the bridge after switching to a second mobile conning station .

A large manoeuvring lever (joystick) for rated speed and moving forward or astern is on the left of each conning station and on the right a steering lever for lateral movement to port or starboard.

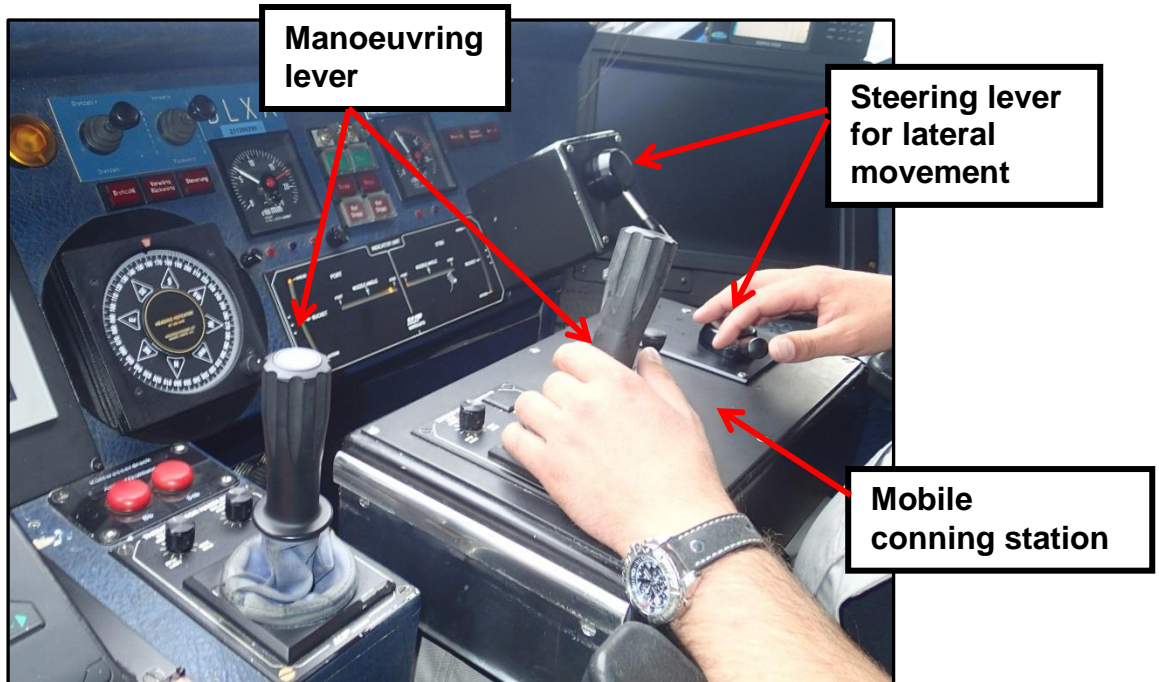


Figure 6: The two conning stations

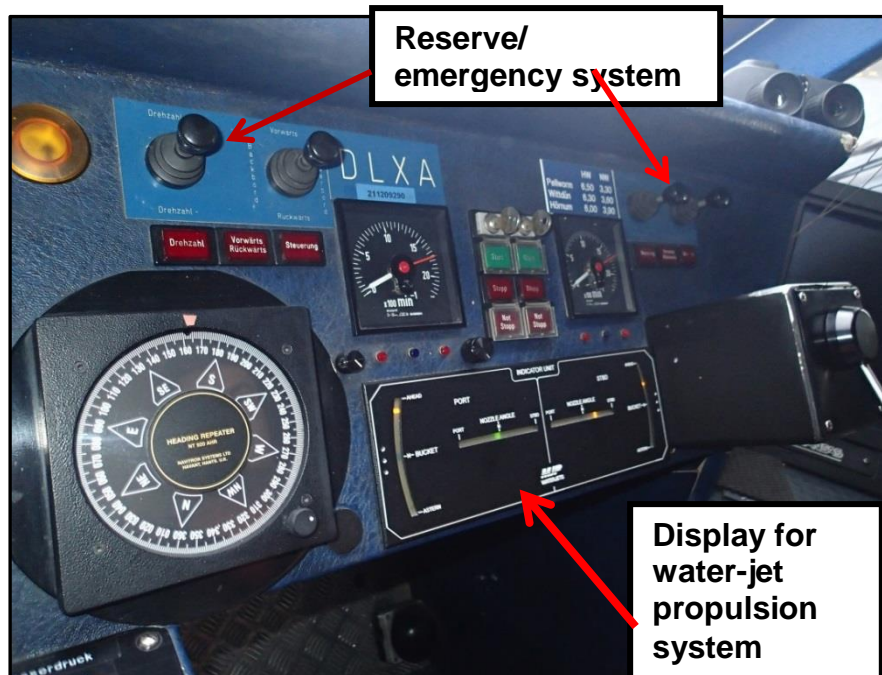


Figure 7: Display for water-jet setting

The two conning stations can be used to sail the ADLER EXPRESS in sea mode and harbour mode. It is possible to tell which mode is currently selected by the position of the manoeuvring lever.

When this lever is set to the neutral position, the water-jet propulsion system does not produce any forward thrust and the engines switch to idling speed automatically.

Sea mode is set by positioning the manoeuvring lever in exactly the forward or aft direction. This increases the rated speed of the main engines to its maximum and the two water-jet propulsion systems operate synchronously. Using the steering lever for lateral movement, the two water-jet propulsion systems are simultaneously (when moving forward or astern) steered to port or starboard according to the direction selected. To all intents and purposes, the steering lever for lateral movement works like a rudder.

Harbour mode is set in exactly the same way as sea mode by putting the manoeuvring lever back to the neutral position and then moving it to port or starboard. The lever and thus the water-jet propulsion system can be set to any possible position in this mode. The steering lever for lateral movement can be used in addition to the manoeuvring lever.

A display that shows the position and output of the water-jet propulsion systems is located at the main conning station. Moreover, an emergency steering (or reserve manoeuvring) system is installed at the console, which is completely separate for each side of the propulsion system.

3.2.3 Course of the voyage according to statements given by the master

The ADLER EXPRESS moors and casts off about 12 times a day. There were no problems steering the ship prior to the accident. The master planned to moor in Wittdün on the port side. The jet steering system was switched to harbour mode prior to the berthing manoeuvre. This improves the steerability and manoeuvrability. The master intended to turn the ADLER EXPRESS to starboard and reduce her speed when she was still about 100-150 m away from the pier. Despite operating the correct control lever, the ship turned to port rather than starboard.

Once the master had noticed this malfunction, he attempted to stop the ADLER EXPRESS by switching the steering lever to sea mode with synchronously working jet propulsion systems and full astern. The distance to the pier was about 20-30 m when this helm command was made; however, the water-jet propulsion system's control flaps switched to ahead and the rated speed to idling. At a distance of less than 20 m, the speed stood at about 6 kts and a collision was no longer avoidable. The master then announced on the public address system: "All hold tight, hold tight, hold tight." The impact with the pier followed at about 1050 at a speed of some 6-7 kts.

The master then switched both engines to emergency steering, as the starboard engine was set to ahead and this was the only possible means of shutting it down. The emergency steering worked properly, meaning the engines were able to hold the ADLER EXPRESS at the pier at minimum rated speed so as to evacuate the casualties via the bow door.

Source: DPA



Figure 8: Evacuation of the casualties at the pier

3.2.4 Medical response

The master alerted the rescue services immediately by phone on the number 112 and they arrived about eight minutes after the accident.

Several injured people were flown to hospitals in the vicinity.

As a result of the accident, six people suffered serious injuries that were not life-threatening and 43 minor internal injuries, fractures, and contusions. There were 233 passengers and six crew members on board.

3.2.5 Investigation into the causes of the accident

Situated at the main conning station, the master reconstructed the manoeuvres on the day of the accident at the shipyard pier in Husum in the presence of a DNV GL surveyor. With the exception of the disengaged pumps of the water-jet propulsion system, the propulsion plant was activated. All the functions of the steering system, including feedback signals, the position of the control flaps and the associated rated speeds of the drive motors for the water-jet pumps were shown on the displays at the control lever.

It was found that when the manoeuvring lever (joystick) was set to full astern quickly (lever as far as it would go) at the main conning station, the engine rpm dropped to its lowest idling speed and the water-jet propulsion system's control flaps remained in the preceding position. In addition, a steering error alert was displayed on the monitoring system. It was also possible to read the above error message from the error history stored on the day of the accident, meaning this malfunction must have also occurred on the day of the accident.

For control purposes, the manoeuvre was also run through using the mobile conning station ; however, the error did not occur this time.

Following that, the manoeuvring levers from the main conning station and the mobile conning station were dismantled and examined.

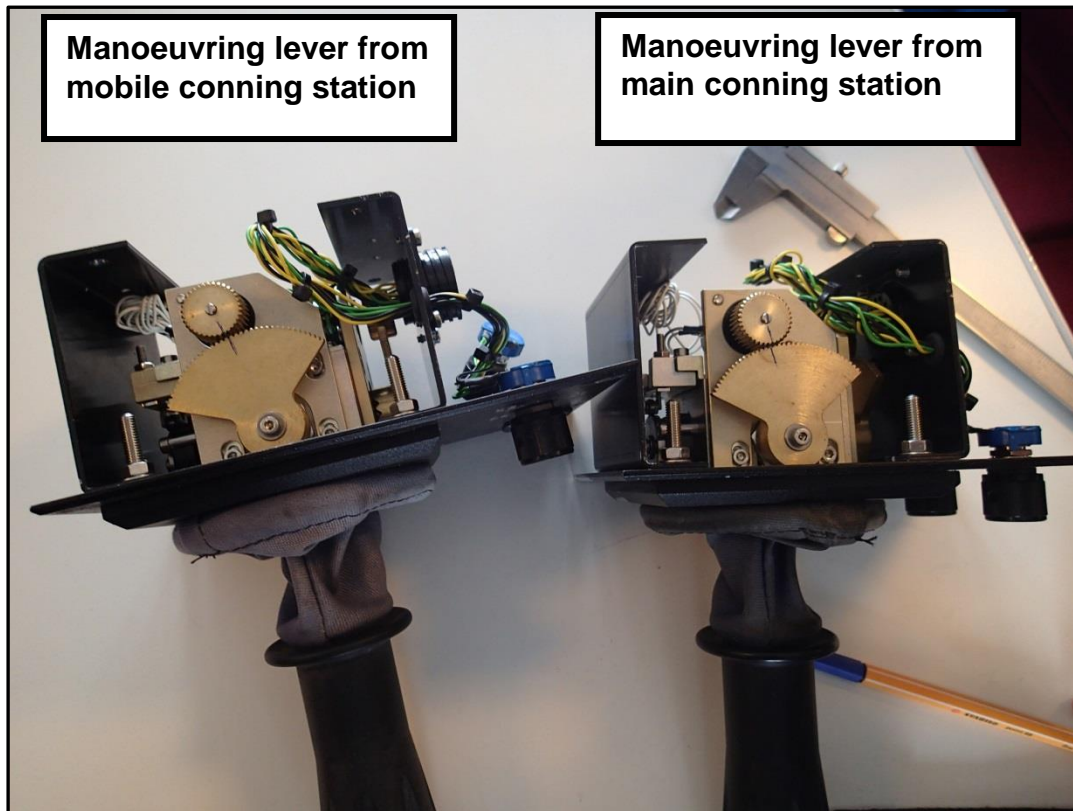


Figure 9: Manoeuvring levers

Using the lever, the engine speed control is transmitted through a brass segment to a cogwheel located on the shaft of a signal potentiometer. The resistance measurement on the potentiometer revealed an infinite value for the speed control in the full astern position. As a result of this incorrect value, the rated speed dropped to idling speed and thrust as per the manoeuvring lever was therefore absent. Further investigation revealed that a locking screw on the potentiometer shaft's cogwheel had loosened and because of that, the steering signal transmitted did not match the sailing mode.

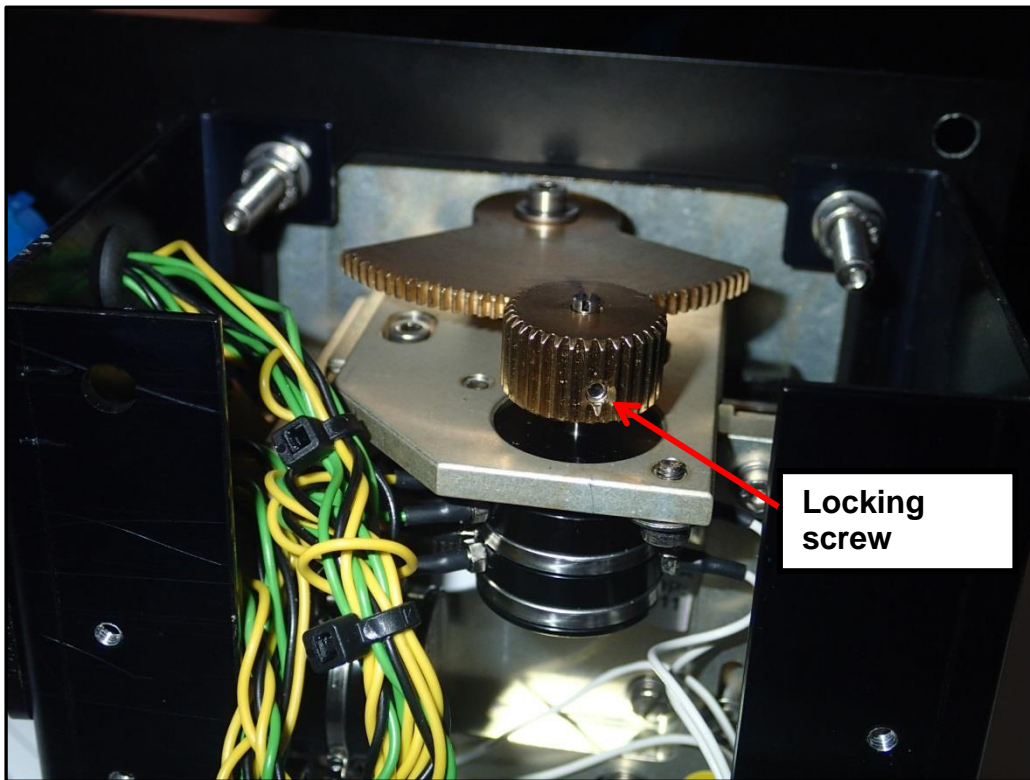


Figure 10: Potentiometer and cogwheel

4 ANALYSIS

4.1 Weather report

The Maritime Division of Germany's National Meteorological Service (DWD) was requested to prepare an official report on the wind and sea conditions in the vicinity of the port of Wittdün, Amrum, for the period 0500 to 1200 CEST.

Weather situation

There were only faint differences in atmospheric pressure over Amrum on 4 June 2014. A complex storm front of 1003 hPa was situated over the east coast of England, which slowly moved towards the North Sea while gaining moderately in intensity. Sunshine prevailed and there was no precipitation during the period under consideration.

Wind and swell

Throughout the period, an easterly wind of 8-10 kts (2-3 Bft) prevailed initially. The wind subsequently turned towards the south-east, increasing slightly to 10-15 kts (4 Bft) until 1200. There were no significant gusts due to the stable stratification. Wave height was less than one metre and a clear wave direction off Amrum was not evident.

Temperature

Air temperature stood at 10 degrees at 0500 and climbed up to 21 degrees as the morning progressed. Moreover, water temperatures of 15 degrees were measured.

Tide

There was still a low ebb current at the time of the accident. Low tide was scheduled for 1232.

4.2 AIS recordings during the course of the voyage

AIS data recorded on shore were referred to for the investigation into the accident involving the ADLER EXPRESS.

To make it possible to compare the course of the voyage on the day of the accident with other voyages, comparable days that had similar tidal conditions were analysed. Here, the voyages of 2 June, 3 June, 17 June, 18 June and 19 June 2014 were compared with the course of the voyage on the day of the accident. In terms of the speed of the approach and deceleration, there was no significant change in handling before or after the accident. The handling on the day of the accident differs from the other voyages in that there was a course alteration to port with a simultaneous increase in speed.

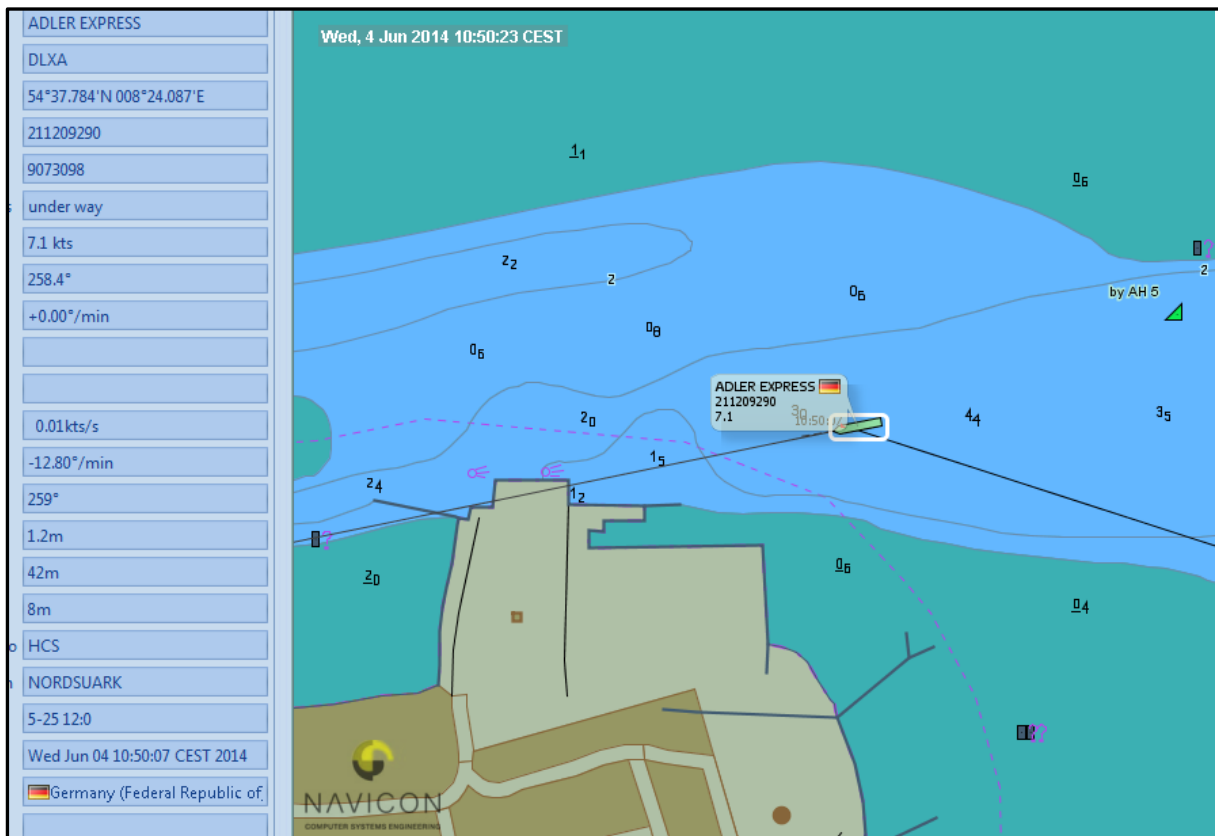


Figure 11: AIS recording at 105023

The above image shows the normal course alteration to port at 7.1 kts.

Ref.: 155/14

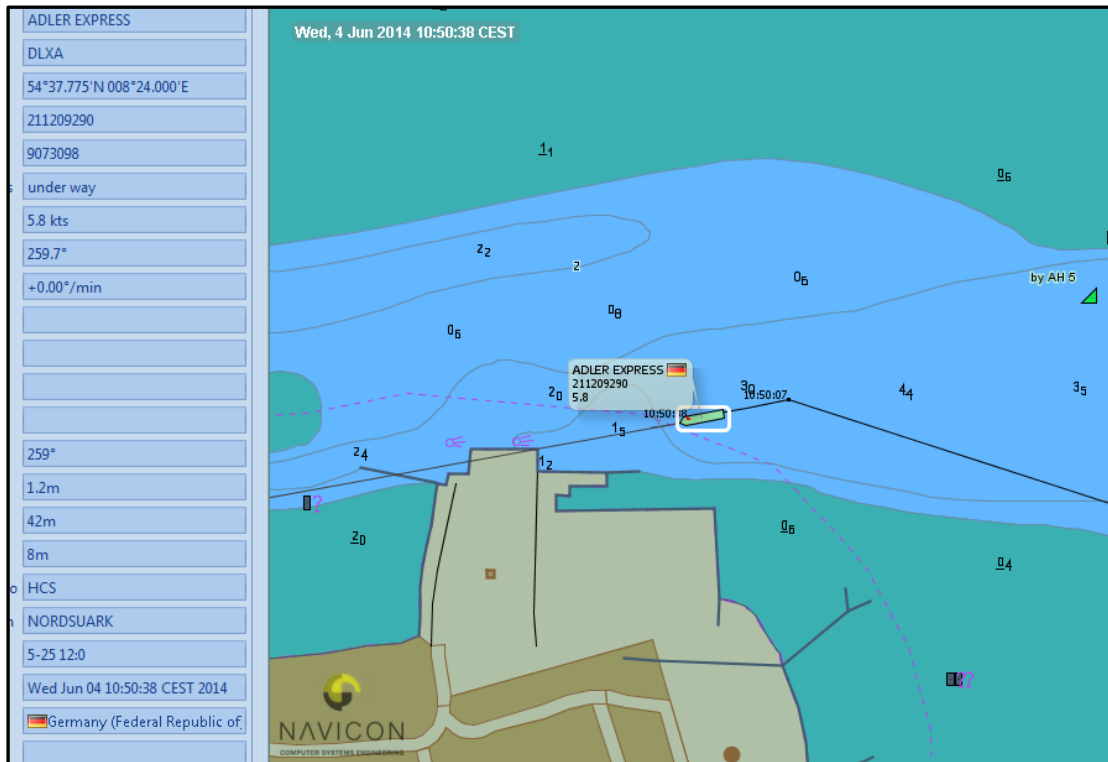


Figure 12: AIS recording at 105038

The course is unchanged and the speed reduced to 5.8 kts.

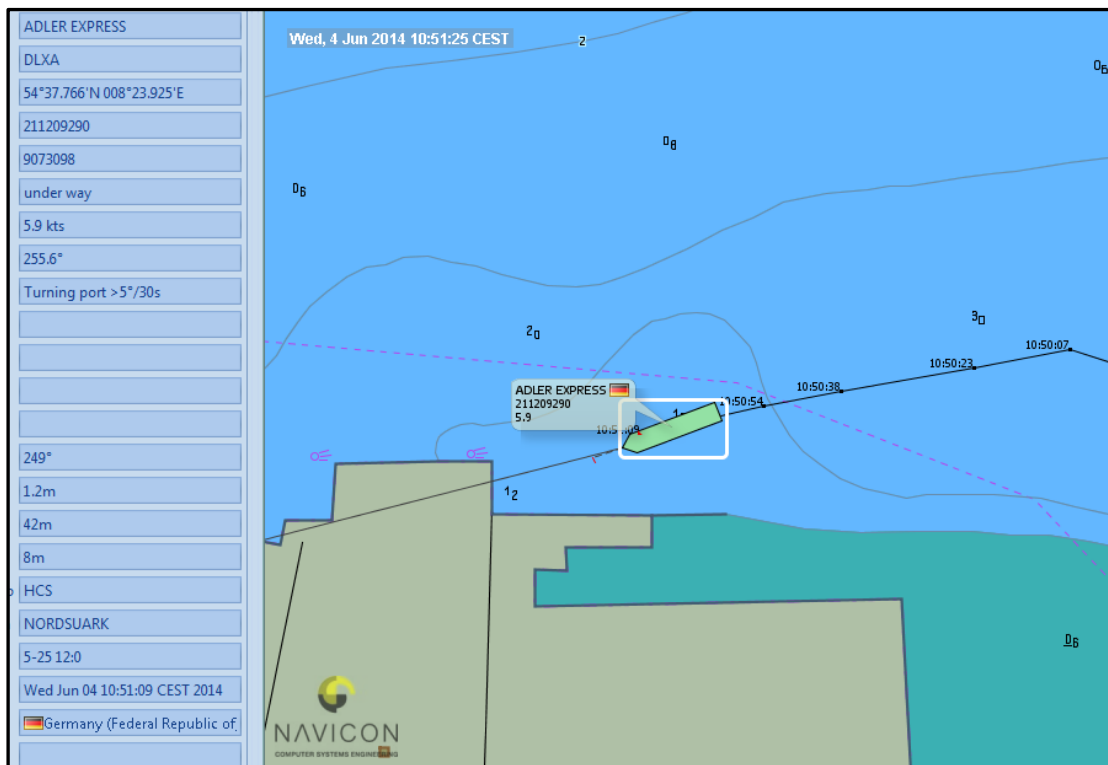


Figure 13: AIS recording at 105125

There is a course alteration to port and an increase in speed at 105110.

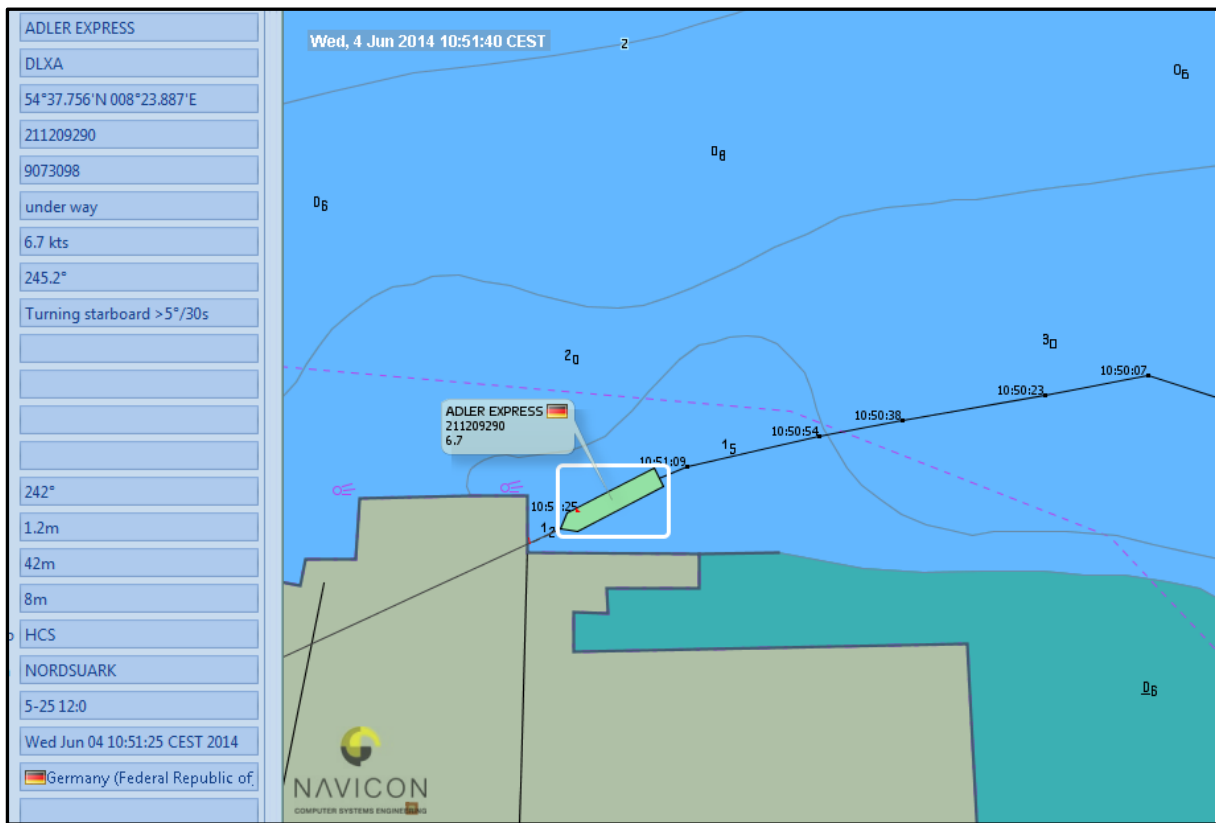


Figure 14: AIS recording at 6.7 kts

Another increase in speed is evident at 105140 and the ADLER EXPRESS collides with the pier at about 105141. 31 seconds passed between the last unexpected course alteration with increase in speed at 105110 and the collision. A reduction in speed is seen on this track on all the other days considered before or after that of the accident.

5 CONCLUSIONS

5.1 Safety measures taken after the accident

5.1.1 Ship Safety Division (BG Verkehr)

On 27 July 2014, the Ship Safety Division (BG Verkehr) advised on safety precautions on board passenger ships and issued appropriate recommendations for ensuring safe operation of ships in a circular (Annex).

5.1.2 Owner and crew

The BSU was present during a voyage on the ADLER EXPRESS on 8 April 2015. Here, the same route was sailed as on the day of the accident.

All the control systems were run through and tested prior to casting off in Strucklahnungshörn. The casting off and berthing manoeuvres were carried out in a professional manner.

Prior to berthing, passengers were firmly requested to remain seated and keep corridors and stairways clear until the ship was made fast. Furthermore, the owner has installed the following highly prominent signs on every deck:



Figure 15: Additional signs²

The manoeuvring lever is replaced after 2,000 hours of operation or at least once a year. The manufacturer has used thread locking compound to additionally secure the locking screw on the potentiometer's cogwheel against unintentional loosening due to vibration.

MJP (manufacturer) has issued an instruction leaflet stating that the voyage must be stopped immediately and finished using only the emergency steering if certain alerts are shown on the monitoring display. In the case of certain visible alerts, the option to switch to the mobile conning station and finish the voyage using this steering control also exists.

5.2 Conclusion

The accident was caused by an unpredictable technical defect on the manoeuvring lever at the ADLER EXPRESS's main steering position.

²

+++ ATTENTION +++

Please remain seated or in a secure position throughout the berthing manoeuvre.
Please keep stairways and passageways clear throughout the berthing manoeuvre.

The publication of safety recommendations is dispensed with given the circular of the Ship Safety Division (BG Verkehr) dated 27 July 2014 (see Annex) and the additional action taken by the owner, as stated above.

6 SOURCES

- Enquiries by the waterway police
- Written statements
 - Ship's command
 - Owner
- Witness accounts
- Opinion of electronics company
- Survey of the damage by DNV GL
- Nautical charts and ship particulars, Federal Maritime and Hydrographic Agency (BSH)
- Official weather report by Germany's National Meteorological Service (DWD)
- Documentation, Ship Safety Division (BG Verkehr)
 - Accident Prevention Regulations (UVV See)
 - Guidelines and codes of practice
 - Ship files

7 ANNEXES

Circular of the Ship Safety Division (BG Verkehr) dated 27 July 2014

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Datum: 27.06.2014

Vorbeugende Sicherheitsmaßnahmen an Bord von Fahrgastschiffen

Sehr geehrte Damen und Herren,

aus aktuellem Anlass möchten wir Sie bitten, Ihre Vorkehrungen zur Gewährleistung eines sicheren Schiffsbetriebes hinsichtlich der folgenden Empfehlungen zu überprüfen:

Anweisungen für Fahrgäste

Fahrgäste sollten durch Ansagen und/oder Aushänge darauf hingewiesen werden, dass

1. vor dem Anlegemanöver die Sitzplätze eingenommen werden oder ein sicherer Halt gesucht wird,
2. während des Anlegemanövers das Stehen auf Treppen oder Betriebsgängen zu vermeiden ist und
3. die Fahrgäste die Ausgänge erst aufsuchen, nachdem das Schiff sicher im Hafen oder an der Anlegestelle festgemacht hat.

Umsteuereinrichtung der Antriebsanlage

Die Umsteuereinrichtung für die Antriebsanlage des Schiffes sollte regelmäßig überprüft werden, insbesondere sollte die Umsteuereinrichtung vor dem Beginn des Anlegemanövers getestet werden. Falls notwendig, sollten vorbeugende Wartungsmaßnahmen für Teile der Umsteuereinrichtung im Wartungsplan vorgesehen werden.

Für Rückfragen stehen wir Ihnen gerne zur Verfügung.

Mit freundlichen Grüßen
Dienststelle Schiffssicherheit

(Dieses Schreiben ist auch ohne Unterschrift gültig.)

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