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

Investigation Report 289/17

Less Serious Marine Casualty

Collision between the MV FINNSKY and the steam icebreaker STETTIN on the River Warnow on 12 August 2017

2 August 2018

The 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

At about 0955[1] on 12 August 2017, the Finnish-flagged FINNSKY, sailing inbound on the River Warnow, collided with the outbound German steam icebreaker STETTIN (a traditional vessel) at buoy 43/SM2. The FINNSKY had turned on the turning basin (position in the fairway for turning) and sailed astern on the western side of the fairway to Berth 60. The STETTIN was also sailing on the western side of the fairway and attempted to pass the oncoming FINNSKY on her port side. This manoeuvre was not discussed with the ship's command of the FINNSKY. A course alteration to port by the STETTIN with hard-over rudder was ultimately no longer sufficient to prevent the two vessels from colliding. During the collision, the starboard side of the STETTIN crashed into the FINNSKY's aft deflector (the so-called ducktail).

The STETTIN suffered a gash above the waterline of about 2 m in length and 30 cm in height level with the boiler room. The FINNSKY's ducktail at the stern was slightly deformed on the port side and had a hole of 15 cm in length and 3 cm in height.

There were ten casualties on board the STETTIN. No pollutants escaped.

[1] Unless stated otherwise, all times shown in this report are Central European Summer Time (CEST) = UTC + 2 hours.

2 FACTUAL INFORMATION

2.1 Photograph

Figure 1: Photograph of the FINNSKY

2.2 Ship particulars

Name of ship:	FINNSKY
Type of ship:	Ro-ro ferry
Nationality/Flag:	Finland
Port of registry:	Helsinki
IMO number:	9468906
Call sign:	OJOZ
Owner:	Finnlines PLC
Year built:	2012
Shipyard/Yard number:	Jinling Shipyard, Nanjing, No. 070438
Classification society:	RINA
Length overall:	188.376 m
Breadth overall:	31.90 m
Gross tonnage:	28,002
Deadweight:	10,373.47 t
Draught (max.):	7.05 m
Engine rating:	2 x 10,000 kW; controllable pitch propellers
Main engine:	2 x Wärtsilä 8L46F
Steering gear:	2 x Becker rudders
Bow thruster:	2 x 1,100 kW

(Service) Speed:	20.0 kts
Hull material:	Steel
Hull design:	Double bottom

2.3 Voyage particulars

Port of departure:	Helsinki
Port of call:	Rostock
Type of voyage:	Merchant shipping/international
Cargo information:	Unknown
Manning:	19
Draught at time of accident:	Df: 6.27 m, Dm: 6.37 m, Da: 6.48 m
Pilot on board:	No (free-runner)

2.4 Photograph

Figure 2: Photograph of the STETTIN

2.5 Ship particulars

Name of ship:	STETTIN
Type of ship:	Traditional vessel, formerly a steam icebreaker
Nationality/Flag:	Germany
Port of registry:	Hamburg
IMO number:	8882923
Call sign:	DBCR
Owner:	Dampf-Eisbrecher Stettin e.V.
Year built:	1933
Shipyard/Yard number:	Stettiner Oderwerke, new build number 769
Classification society:	DNV-GL
Length overall:	51.75 m
Breadth overall:	13.43 m
Gross tonnage:	783
Draught (max.):	5.70 m (aft at the rudder heel)
Engine rating:	At 115 r/min about 1,900 PSi
Main engine:	Triple expansion steam engine
Steering gear:	Steam steering gear, transmission via axiometer gear on deck
(Service) Speed:	10.0 kts (according to shipyard: 13 kts)
Propeller:	4 blade, d=4.20 m, right-handed
Hull material:	Riveted steel

2.6 Voyage particulars

Port of departure:	Rostock
Port of call:	Rostock
Type of voyage:	Traditional shipping, national
Cargo information:	176 guests (passengers)
Manning:	36
Draught at time of accident:	5.70 m
Pilot on board:	Yes, 1 pilot

2.7 Marine casualty or incident information

Type of marine casualty:	Less serious marine casualty, collision
Date, time:	12/08/2017, 0955
Location:	River Warnow
Latitude/Longitude:	φ 54°08.636'N λ 012°05.756'E
Ship operation and voyage segment:	Estuary trading
Place on board:	Midships and aft
Human factors:	Yes, human error
Consequences for people, ship, cargo:	Ten casualties, including three seriously injured, holes in the hulls, no harm to the environment and no pollutant discharge

Extract from Navigational Chart 3005, Sheet 11, Unterwarnow,
Federal Maritime and Hydrographic Agency (BSH)

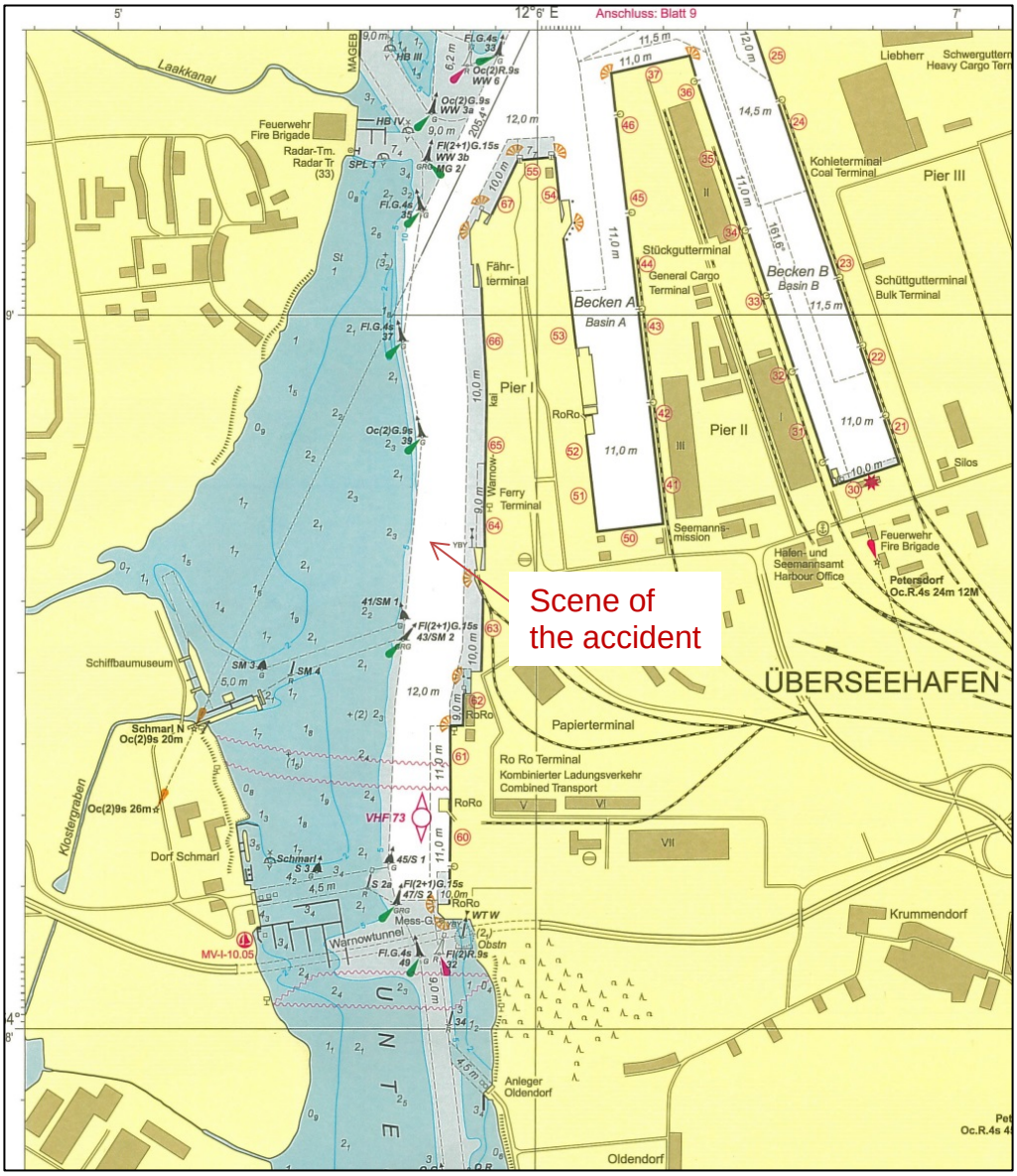


Figure 3: Navigational chart

2.8 Shore authority involvement and emergency response

Agencies involved:	Waterway Police Inspectorate (WSPI) Rostock, Vessel Traffic Service (VTS) Warnemünde
Resources used:	Waterway police (WSP) boat, ambulance
Actions taken:	Traffic control by the VTS, crew administered first aid, proceeded to emergency berth, tug assistance
Results achieved:	Emergency repairs, casualties taken to hospital

3 COURSE OF THE ACCIDENT AND INVESTIGATION

The icebreaker STETTIN and Traffic Centre Warnemünde were visited as part of the marine casualty investigation. Together with the Directorate-General for Waterways and Shipping (GDWS), Waterways and Shipping Office (WSA) Stralsund and the WSP, the River Warnow was navigated on the buoy tender RANZOW and the scene of the accident inspected. Moreover, talks were held with the masters involved, the pilot and Wismar/Rostock/Warnemünde Pilots' Association.

The following account of the course of the accident is based on the material evidence, i.e. the recordings of Traffic Centre Warnemünde and the FINNSKY's voyage data recorder (VDR). The STETTIN's AIS/ECDIS recordings were not provided to the BSU.

3.1 Course steered by the FINNSKY

The FINNSKY reported in to VTS Warnemünde on the local radio channel 73 at about 0915 as she was passing the outer jetties at Warnemünde. The FINNSKY was destined for Berth 60, directly north of the Warnow Tunnel, and exempt from the obligation to make use of on-board pilotage. At about 0925, another ship belonging to the owner, the FINNMERCHANT, casted off from Berth 60 and proceeded to sea. The passage was agreed with the FINNSKY by radio and at about 0929 the FINNSKY turned on the turning basin and sailed astern to Berth 60. The FINNMERCHANT was passed between buoys 31 and 33 at about 0943. As agreed with the FINNMERCHANT, the FINNSKY remained on the western (green) side of the fairway. The FINNSKY then sailed sternward at 5 kts and the next prearranged pass – with ELISABETH MANN BORGESE (EMB) – took place at about 0951 at buoy 37. This encounter also saw the FINNSKY keep to the western side and the EMB sailed past on the eastern side. At about 0955, the STETTIN's starboard side collided with the FINNSKY's stern on the port side. The FINNSKY was on the western side of the fairway when the collision occurred.

The following three images show that the FINNSKY's track is stable. The heading oscillations in the six minutes leading up to the collision stood at +/-2°. In contrast to the recorded speed over ground (SOG) of the GPS, the speed through water (STW) of the recorded Doppler log yielded no plausible results. Here, the SOG measured via GPS always delivers positive values in all directions. The speed measured via the Doppler log yields a negative sign when sailing astern and a positive sign when sailing ahead. The STW values should have been slightly over or about the same as the SOG values. No values were recorded for the transverse STW values. The inaccuracies in the Doppler log were probably due to the shallow water effect and the turbulence at the transducer when sailing astern, which is mounted in front of the bow thrusters under the FINNSKY's hull. Accordingly, a plausible measured deep-water current on the Unterwarnow could not be derived from the difference between the SOG and STW.

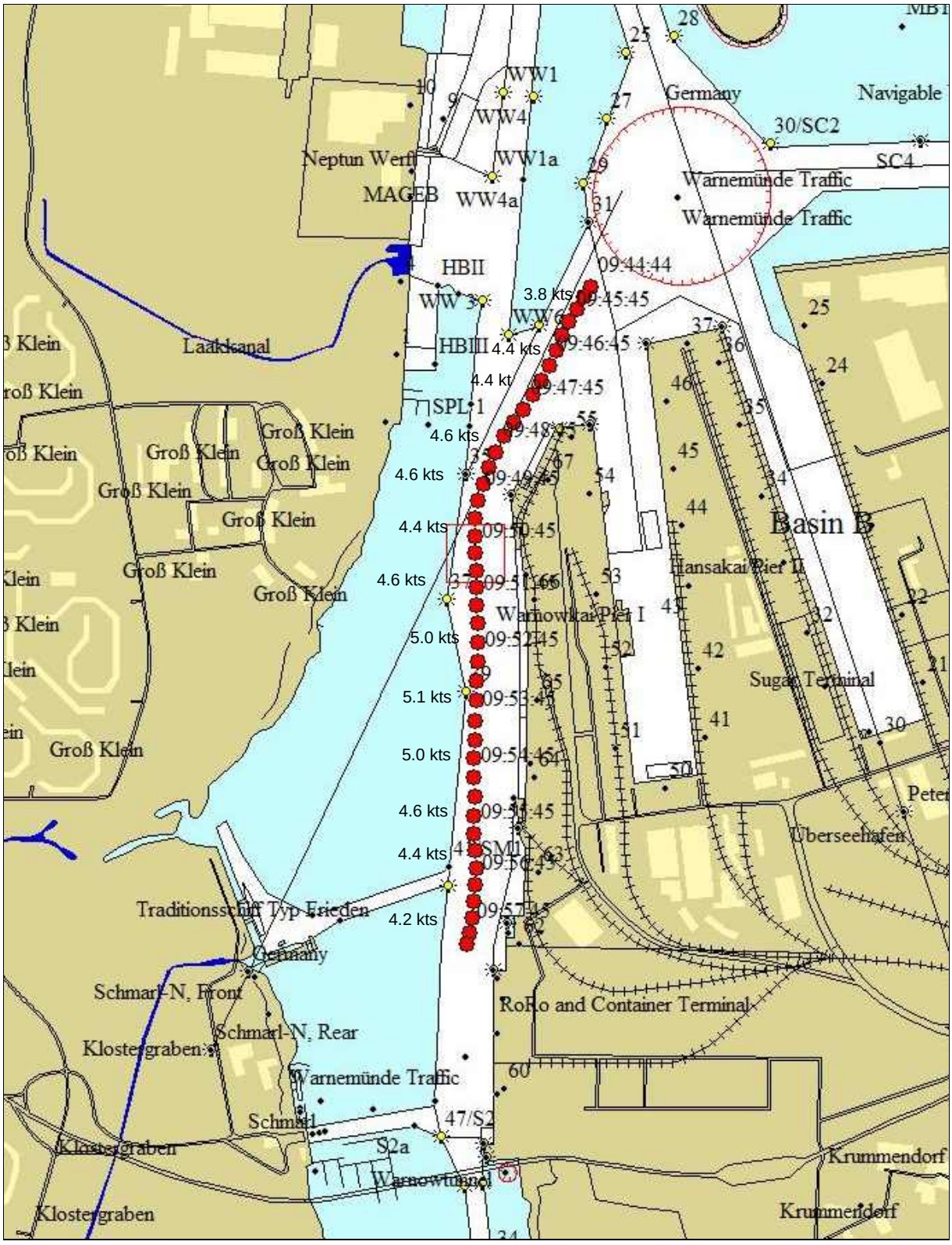


Figure 4: Course steered by the FINNSKY

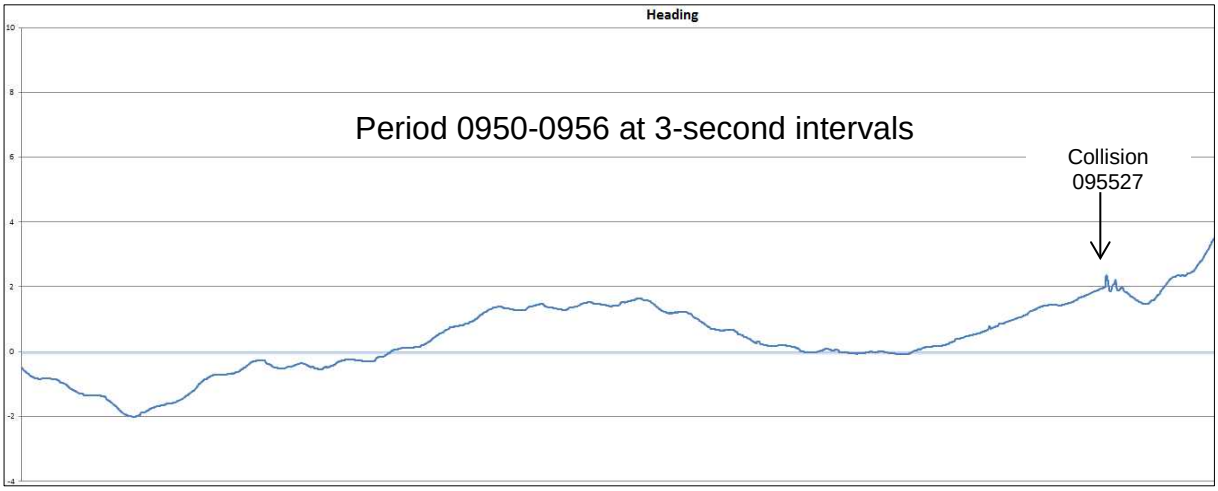


Figure 5: The FINNSKY's headings[2]

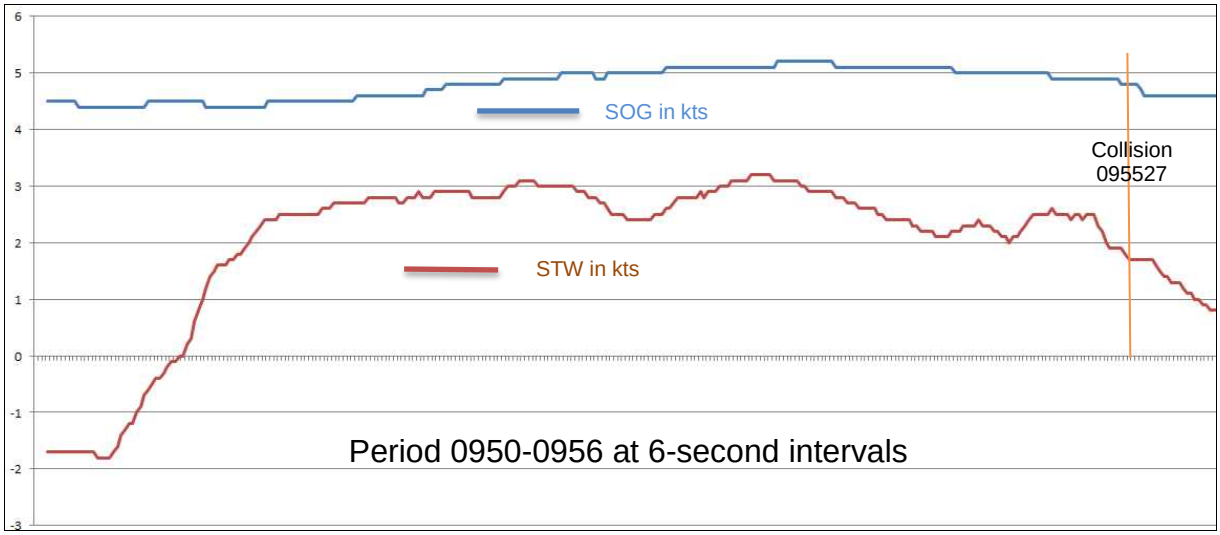


Figure 6: The FINNSKY's speeds

3.2 Course steered by the STETTIN

The STETTIN was moored on her port side at Berth 8 in Rostock's cargo and fishing port. At 0922, the pilot reported to the VTS on channel 73 that the STETTIN was casting off with the intention of proceeding to sea via the Warnow shipyard fairway. At about 0935, she casted off astern with fore spring made fast and then turned to starboard and into the inner harbour. The STETTIN then proceeded to sea on the River Warnow with other smaller vessels, which were not obliged to make use of pilotage (see Figure 12).

[2] Gyrocompass headings.

3.3 Witness testimony

3.3.1 Master of the FINNSKY

The FINNSKY was commanded by a 51-year-old Finnish master who was exempted from making use of on-board pilotage according to Section 10 of the Regulation on management and order in the Wismar/Rostock/Stralsund sea-pilotage area (Verordnung über die Verwaltung und Ordnung des Seelotsreviers Wismar/Rostock/ Stralsund – WIROST-LV). At the time of the accident, the master was commanding the ship from the starboard bridge wing, the chief officer was in the port bridge wing and monitored the traffic from there, while on the aft manoeuvring station three men were located on the starboard side and one on the port side, each with radios, from where they were observing the vessel traffic aft.

The master stated in writing that he proceeded astern to Berth 60 at a speed of about 5 kts on a heading of 180° without a tug. Shortly before the collision, he issued three audible signals twice with the tyfon to indicate that the FINNSKY was sailing astern. The master went on to state that the STETTIN made a manoeuvre that was so abrupt and unpredictable that not even the lookout aft had time to report it. The collision was no longer avoidable and the STETTIN struck the ducktail on the port side.

3.3.2 The FINNSKY's port and starboard wing control positions

In addition to the main control position, the FINNSKY has two secondary control positions with the main rudder/command elements and two screens. The ECDIS with AIS display and the manoeuvring data (conning) with rate of turn (ROT) are shown on these screens. The radar systems are only installed in the central main control position. Although a radar antenna is installed on the stern mast, it is not integrated with the existing radar equipment and serviceable.

Figure 7: Port control position, bridge wing

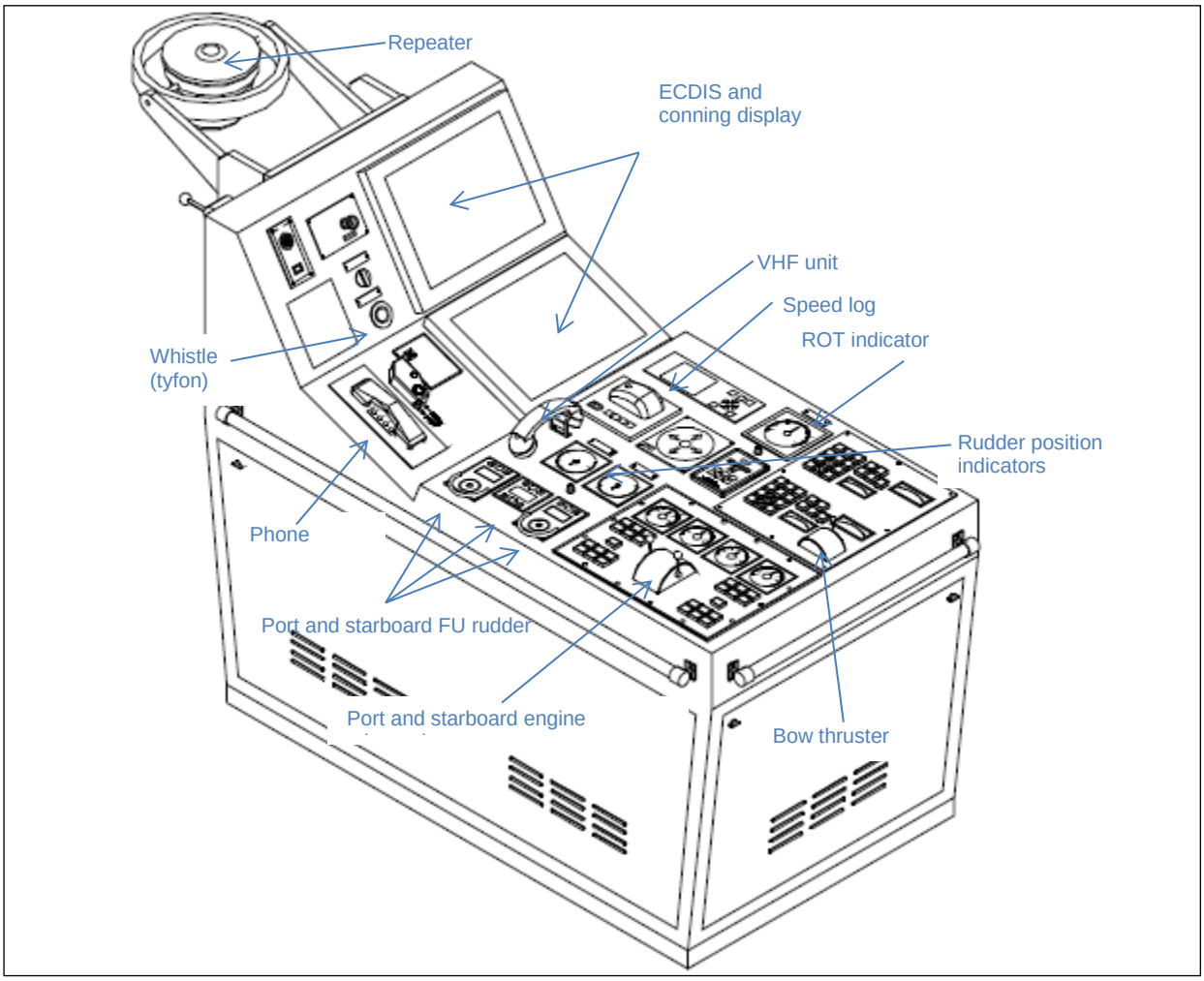


Figure 8: Control position in the starboard bridge wing

In addition to the written statement, the Finnish master was questioned on 13 March 2018 in the presence of his legal counsel. A summary of the information he provided follows:

He has called at Rostock about 100 times in three years and served as master for 15 years. He was informed about the HANSE SAIL and the heavy traffic expected. There was almost no current at the time of the accident and the wind blew from NW-W at 2-3 Bft. Radio channels 73, 10 and 16 were monitored. As is typical in such visibility and weather conditions, the vessel proceeded only by sight. The chief officer was in the other bridge wing and the two discussed the traffic.

The western side of the Unterwarnow is normally used to approach the berth. To the east the FINNSKY would have to weave from side to side to return to the middle of the current because of the ro-ro berth's location. As agreed, the FINNMERCHANT was passed on the starboard side of the FINNSKY on the turning basin.

Every seaman on the aft manoeuvring station was equipped with a radio. As the person in charge the bosun reported to the bridge. When the collision was no longer avoidable, he reported that a larger ship was approaching directly from aft. The master had already seen the STETTIN from some distance away and assumed she would pass the FINNSKY to the east.

However, he could no longer see the STETTIN just before the collision. Radar display units are not installed in the bridge wings. *Inter alia*, the wing control positions contain the conning and ECDIS displays, as well as a speed log. The heading stood at 000°, the course over ground (COG) at 180° and the SOG at 4.8 kts.

The FINNSKY's stopping track is about 370 m at 5 kts STW. The radar systems were set to ranges of 0.5 nm and 1.5 nm. The collision was reported to him by the bosun when the STETTIN was unexpectedly visible to port (even though there was more room on the starboard side). The master did not notice the collision on the bridge. The minimum speed to reach the berth is reportedly 5 kts.

Any suction effects must be ruled out, in the case of the STETTIN in particular. The traffic was clearly warned with the tyfon and it is evident from the FINNSKY's VDR recordings that she and other targets were clearly visible and could be plotted. The astern speed of 5 kts does not affect the directional stability. An advance manoeuvre could no longer have prevented the collision in the given situation and it is likely that the STETTIN's engine room would actually have been struck further aft. At this point, it was definitely too late to initiate an effective manoeuvre and a further collision warning by the bosun to the bridge would have been too late.

Moreover, the traffic on the FINNSKY's port side would have been exposed. In the initial critical phase, the bosun on the aft manoeuvring station did not realise that the STETTIN's westerly course would lead to a collision. Whether a deck officer would have assessed the situation differently to the bosun is open to speculation. The bosun was experienced and had always carried out his task on the manoeuvring station well. In retrospect, it is very difficult to deduce what the blind spot was from the bridge wings toward the stern with the associated distances to the vessels. In the given circumstances, the ship's command considered it safest to position a responsible lookout aft, as has always been done.

The bridge equipment consisted of a Furuno FEA-2107/2107-BB/22807 electronic chart system (ECS) with AIS overlay, Furuno FA-150 AIS, Furuno FAR-20x7 series (starboard) and Furuno FAR-21x7 series (port) radar systems, Furuno FAP 2000 autopilot, Furuno FE 700 echo sounder, Furuno GP 150 DGPS/GPS, Sperry Marine Navigat XMK1 gyrocompass 1&2, three VHF systems, as well as two flap rudders and two bow thrusters with 1,100 kW each. The ENC for the ECDIS was updated on 10 August 2017.

In the previous seven days, the master had worked 56 hours and was on the bridge 1.5 hours before the collision. The chief officer had worked 81 hours and was on the bridge one hour before the collision. The second officer was on night watch and resting. The chief engineer had worked 56 hours and was in the engine room two hours before the collision.

3.3.3 Ship's command of the STETTIN

The STETTIN was commanded by a 59-year-old master who held a master's certificate AG (certificate of proficiency for long-distance trade) and a recreational offshore skipper licence. The master sails the STETTIN regularly and works as a port pilot in Hamburg. The mate was a 77-year-old with a recreational offshore skipper licence and a non-renewed master's certificate AG.

The following is a summary of the joint written testimony of the master, the mate and the helmswoman:

Pilotage was requested for the voyage from Rostock to sea and back again. The pilot boarded at Berth 8 shortly before 0900 in Rostock's fishing port. After a detailed master-pilot exchange about casting off and the course of the voyage, the vessel casted off at about 0935 with fore spring made fast, sailed astern out of the inner harbour, turned to starboard and then steered into the Unterwarnow fairway via the Marienehe tributary. The speed was almost 8 kts SOG in an aft current specified at 2 kts.

The pilot advised the ship's command that according to the situation report, the larger ro-ro ferry FINNSKY would enter the international port and make fast at Berth 60 or 61 on her starboard side. At 0948, the master handed over command to the chief officer and left the bridge for the WC.

The traffic situation at this point was not critical and easy to monitor. The speed was reduced to slow ahead due to the oncoming FINNSKY. The FINNSKY was monitored further and moved at rapid speed toward the berth and in the middle of the fairway.

The chief officer plotted the speed on the radar at nearly 5 kts SOG and informed the pilot. During the approach, the pilot tried to call the FINNSKY first on radio channel 73, which was congested due to the event, and then on a different channel.

In accordance with the instructions of the pilot, the speed was then reduced to dead slow ahead, bordering on the limits of steering capability, and the course altered slightly to port. It was not possible to give way further to port because the STETTIN was being overtaken by two towed convoys with five youth cutters at this point.

The FINNSKY continued to move astern across the middle of the fairway to the western side at the same speed. This forced traffic sailing in the same direction to move into the wrong side of the fairway and oncoming vessels had to veer off to starboard out of the fairway. The pilot then requested a warning signal, which was issued, and instructed that the helm be set to hard to port. The collision occurs at about 0956 and was recorded by an entry in the engine room log.

A 51-year-old female who holds a German certificate for operating inland pleasure craft and steers the ship regularly was assigned the role of helmswoman. The helmswoman stated that the STETTIN was proceeding rather slowly and overtaken by several vessels. The FINNSKY was first sighted on the starboard side of the STETTIN and the ships sailing ahead altered course to port and passed the FINNSKY on her starboard side. The pilot issued instructions to proceed slow ahead and alter the course slightly to port. At this point, smaller vessels overtook the STETTIN on the port side. Approaching quickly, the ferry then moved even further into the middle of the fairway, while the STETTIN's engine was set to minimum ahead. The helmswoman heard the pilot call into the VHF unit repeatedly. However, he did not receive any answer and ordered hard to port immediately after. While the STETTIN was turning to port, the FINNSKY sailed astern into the starboard bow at some speed.

3.3.4 Pilot on board the STETTIN

The ship's command was required to make use of on-board pilotage due to the STETTIN's size. The Pilots' Association assigned this task to a 64-year-old pilot. This pilot was familiar with the STETTIN's manoeuvring characteristics from previous voyages and as a regulator of the magnetic compass. According to the written statement, he boarded the STETTIN at about 0910 and consulted with the master in detail.

He set the radar system to the 1.5 nm range and the shipboard VHF units to receive on channels 73 and 14 (pilot station). The VTS situation report was received at 0915 and the FINNSKY reported as inbound to Berth 60. The pilot reported in to the VTS at 0920 and requested that the STETTIN depart at 0930, which was approved.

She casted off at about 0935 and turned into the Unterwarnow fairway at buoy 57 at 0942. The northerly courses (following the fairway) were steered at varying rates of speed of between slow ahead and half ahead at a STW of 3-6 kts. Because of the draught, courses in the middle or slightly to the right of the middle of the fairway were steered. Moreover, the courses and rates of speed had to be changed repeatedly due to the heavy vessel traffic, which was mainly sailing seaward.

The helmswoman executed her task very well and in accordance with the pilot's advice, engine manoeuvres were ordered by the chief officer via telegraph and quickly acknowledged in the engine room. The wind veered toward the south-west and picked up to 3-4 Bft after the vessel casted off. A medium current of some 2 kts seaward prevailed.

The pilot watched as the FINNSKY was turned on the turning basin and advised the mate that the FINNSKY was sailing on the eastern side to make fast and that outbound shipping would pass on her port side. The speed was reduced from half ahead to slow ahead as a precaution. The pilot noticed as the approach continued that the FINNSKY was moving unusually far to the west and her sternway was much faster than usual for such berthing manoeuvres.

All this was reportedly contrary to customary manoeuvring practise. Due to the berth arrangement (berth 60 or 61), the FINNSKY had to traverse to the ro-ro quay when berthing. Accordingly, evading to starboard would have been dangerous. He then reportedly called the FINNSKY on channel 73 to establish her intention but did not receive an answer. The pilot explained this by writing that heavy congestion and interference with lacking radio discipline prevailed on this VHF channel due to the Hanse Sail.

He then called the FINNSKY on channel 16 but this also went unanswered. A radical evasion to port was not possible because two towed convoys were overtaking the STETTIN close to her port side. These towed convoys comprised two sailing motor vessels, one towing three and the other towing two youth cutters. Several other vessels were also on the port side.

While the STETTIN altered course to port in small steps, so as to 'force' the towed convoys located there to move further to port, the FINNSKY remained on the western side of the fairway. The mate stated that he had plotted the speed of the FINNSKY at nearly 5 kts SOG at this point.

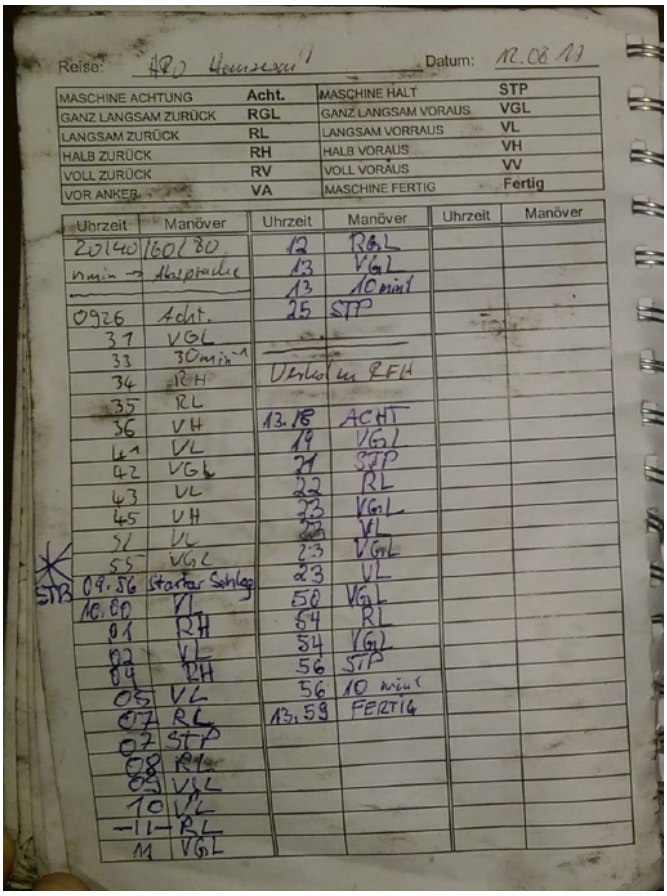
When the FINNSKY failed to initiate any manoeuvres to move eastward to the intended berth, the pilot had the speed reduced to dead slow ahead, which was bordering on the limits of steering capability. At the same time, he issued instructions to set the helm to hard to port and sounded the warning signal (one long blast) with the whistle. The STETTIN's steam whistle is extremely loud and should have been heard. Moreover, the FINNSKY's stern came even further to the west, forcing two oncoming harbour cruise ships to sail out of the fairway to the west.

The pilot ruled out an astern manoeuvre because the STETTIN would then have turned strongly to starboard and collided with the stern of the FINNSKY in the middle.

He was hopeful that the hard to port manoeuvre would enable them to sail clear of the FINNSKY's port stern and that maintaining the lowest rate of speed would reduce the speed of the approach. Still moving astern, the FINNSKY's propellers caused the STETTIN to be drawn in up to midship level with the wake ahead during this phase, however. At 0956, the starboard fore section collided with the port aft edge of the FINNSKY's stern. At this point, the rudder was set to hard to port and the rate of speed to dead slow ahead (15 propeller revolutions per minute). The STW was less than 2.5 kts. According to the pilot's written statement, the collision occurred level with Berth 63 to the west of the middle of the fairway.

3.3.5 Chief engineer of the STETTIN

The STETTIN is driven by a reversible steam engine connected directly to the propeller. Depending on the performance requirement and operating mode, the rated speed is determined via volume and throttle control of the steam supply to the engine. In manoeuvring mode, the engineer controls the throttle manually via the travelling valve, as specified through the engine telegraph on the bridge. The engineer acknowledges commands from the bridge on the engine telegraph and the necessary steam pressure is set at the travelling valve, until the required rated speed is reached. The engineer or assistant carries out the manoeuvre and immediately enters it and the time in the manoeuvre log, as requested. A heavy blow on the starboard side was noticed at 0956.



Reise: [illegible] Datum: 12.06.17

MASCHINE ACHTUNG	Acht.	MASCHINE HALT	STP
GANZ LANGSAM ZURÜCK	RGL	GANZ LANGSAM VORAUS	VGL
LANGSAM ZURÜCK	RL	LANGSAM VORRAUS	VL
HALB ZURÜCK	RH	HALB VORAUS	VH
VOLL ZURÜCK	RV	VOLL VORAUS	VV
VOR ANKER	VA	MASCHINE FERTIG	Fertig

Uhrzeit	Manöver	Uhrzeit	Manöver	Uhrzeit	Manöver
20/40	160/80	12	RGL		
n min →	Absprache	13	VGL		
		13	10 min		
0926	Acht.	25	STP		
31	VGL				
33	30 min⁻¹				
34	RH	Verholen zu [illegible]			
35	RL				
36	VH	13.18	ACHT		
41	VL	19	VGL		
42	VGL	21	STP		
43	VL	22	RL		
45	VH	23	VGL		
52	VL	23	VL		
55	VGL	23	VGL		
STB 09.56	Starker Schlag	23	VL		
10.00	VL	50	VGL		
01	RH	54	RL		
02	VL	54	VGL		
04	RH	56	STP		
05	VL	56	10 min		
07	RL	13.59	FERTIG		
07	STP				
08	RL				
09	VGL				
10	VL				
11	RL				
11	VGL				

Figure 9: Manoeuvre log

A pilot card is displayed on the bridge and a speed chart in the chart room.

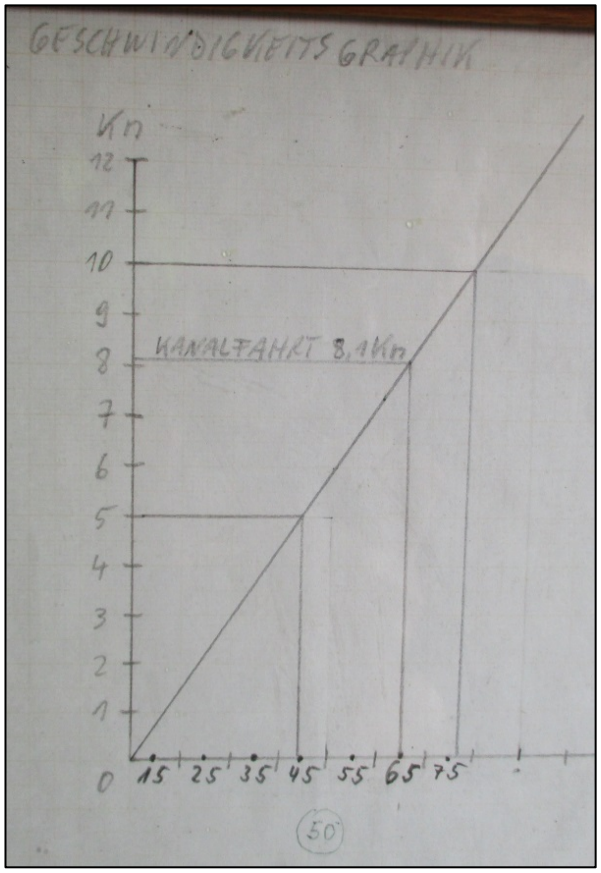
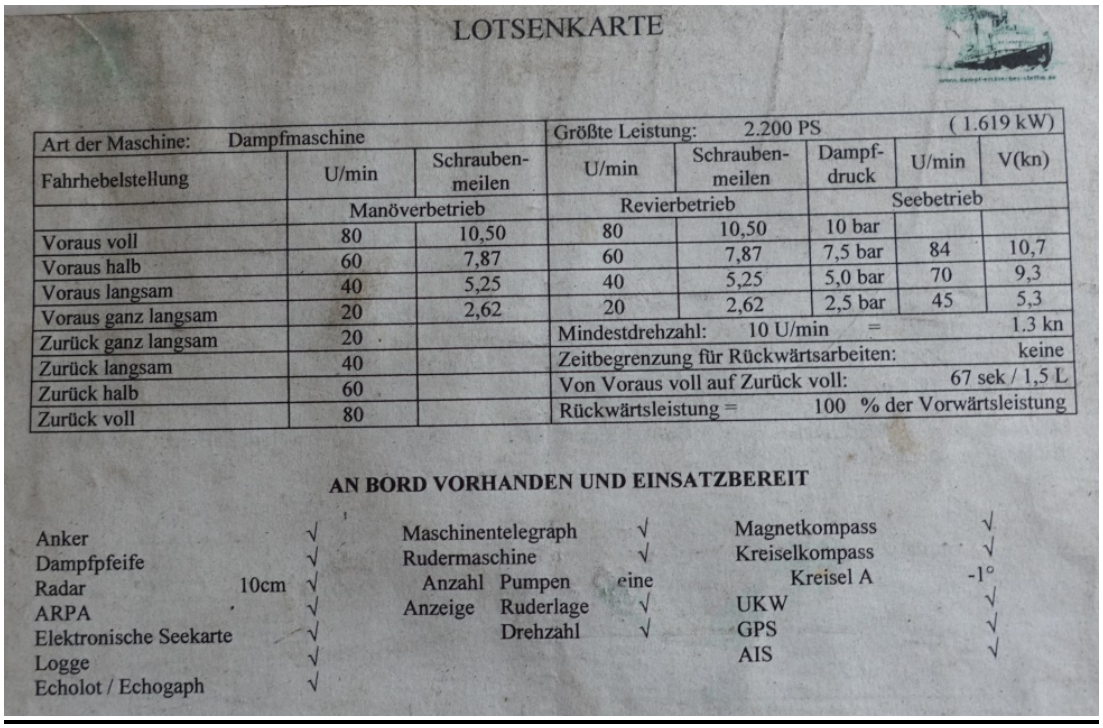


Figure 10: Speed chart



LOTSENKARTE

Art der Maschine: Dampfmaschine			Größte Leistung: 2.200 PS				(1.619 kW)
Fahrhebelstellung	U/min	Schrauben-meilen	U/min	Schrauben-meilen	Dampf-druck	U/min	V(kn)
	Manöverbetrieb		Revierbetrieb		Seebetrieb		
Voraus voll	80	10,50	80	10,50	10 bar		
Voraus halb	60	7,87	60	7,87	7,5 bar	84	10,7
Voraus langsam	40	5,25	40	5,25	5,0 bar	70	9,3
Voraus ganz langsam	20	2,62	20	2,62	2,5 bar	45	5,3
Zurück ganz langsam	20		Mindestdrehzahl: 10 U/min =				1,3 kn
Zurück langsam	40		Zeitbegrenzung für Rückwärtsarbeiten:				keine
Zurück halb	60		Von Voraus voll auf Zurück voll:				67 sek / 1,5 L
Zurück voll	80		Rückwärtsleistung =			100 % der Vorwärtsleistung	

AN BORD VORHANDEN UND EINSATZBEREIT

Anker	√	Maschinentelegraph	√	Magnetkompass	√
Dampfpfeife	√	Rudermaschine	√	Kreiselkompass	√
Radar 10cm	√	Anzahl Pumpen	eine	Kreisel A	-1°
ARPA	√	Anzeige Ruderlage	√	UKW	√
Elektronische Seekarte	√	Drehzahl	√	GPS	√
Logge	√			AIS	√
Echolot / Echogaph	√				

Figure 11: Pilot card

In the above pilot card, a speed of 5.3 kts is specified for 45 r/min (dead slow ahead), 9.3 kts for 70 r/min (slow ahead), and 10.7 kts for 84 r/min (half ahead) for the speeds in sea mode. For manoeuvring and estuary trading, propeller miles are specified at 20 r/min (dead slow ahead) for 2.62, 40 r/min (slow ahead) for 5.25, 60 r/min (half ahead) for 7.87 and 80 r/min (full ahead) for 10.50 propeller miles. The chief engineer reported that with a propeller pitch of 4.05 m, the resulting STW calculated in kts is equivalent to propeller miles. Only the four measured speeds of 10.7, 9.3, 5.3 and 1.3 kts are in the table. The BSU was unable to determine how the speed chart in the chart room came about. A comparison reveals that the two tables are inconsistent. In sea mode, the calculated slip at 10.2% is plausible only at 45 r/min. At 70 r/min, the calculated propeller miles are even greater than the measured speed. A bridge poster in accordance with IMO Res. A 601(15), as is customary in commercial shipping, is absent. This would have included turning circles and stopping manoeuvres, for example. According to the master, the STETTIN has a turning circle diameter of about 360 m to port and starboard, which is comparable with the turning circle at the Amerikahöft in Hamburg.

According to the pilot card, the minimum rated speed of 10 r/min produces a speed of 1.3 kts. It takes 67 s to get from full ahead to full astern at a distance covered of 1.5 times the ship's length.

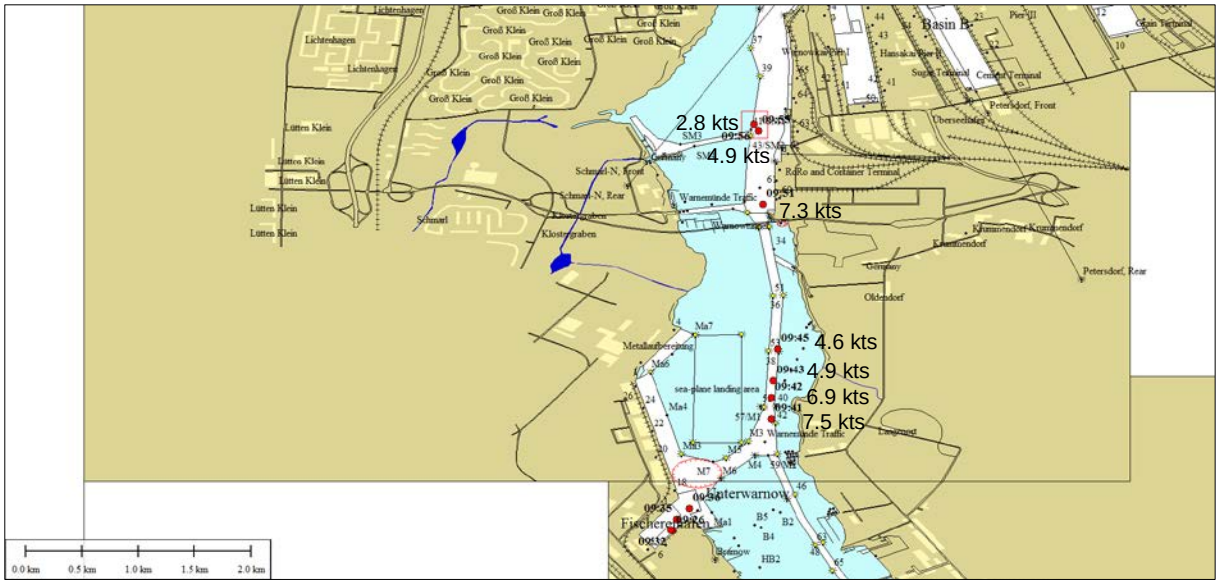


Figure 12: AIS course of the voyage by manoeuvres

After turning, the STETTIN sailed out of the fishing port rapidly seaward, reaching an average speed of 6.4 kts before the Warnow Tunnel, which is just below the area's permitted STW of 6.5 kts[3]. The maximum speed measured via AIS was 7.7 kts. In the process, she kept to the starboard side of the fairway.

3.3.6 Passenger interviews

Passenger addresses are not recorded for day trips and the addresses of only nine of the ten casualties reported were known, who could be written to. Consequently, the BSU issued a press release on 25 August 2017. This resulted in several passengers making contact and providing additional information, photographs and video recordings of relevance. A summary of the statements of the passengers on the bridge and open deck, as well as in the lounge follows:

1.) The bridge was occupied by 10-15 passengers due to the drizzly weather. About 15 passengers were on the upper free observation deck despite the weather.
2.) Up until the time of the accident a male (the mate) on the bridge spoke about the history of the icebreaker. There was no warning of the imminent collision.
3.) Several passengers in the lounge fell over (along with chairs) when the collision occurred, as it was completely unexpected.
4.) There were no handrails or the like to hold on to on the bridge and people fell against windows, walls and engine telegraphs. Other people were thrown backward to the ground and suffered severe contusions, grazes, head injuries and an arm was fractured.
5.) None of the witnesses from the FINNSKY or STETTIN heard any sound signals.

[3] Section 26 of Germany's traffic regulations for navigable maritime waterways (Seeschiffahrtsstraßen-Ordnung – SeeSchStrO).

One witness on the main deck sent an email to the WSP immediately after the accident and was later interviewed by the BSU. This witness has been sailing in Rostock since his childhood and works as an engineer for a classification society. He stated that the ferries normally sail down along the eastern side of the quay wall and was surprised that neither vessel carried out an evasion manoeuvre. He heard no signals or engine manoeuvres. Only the STETTIN's rudder was moved. The below drawing was prepared three days after the accident with the corresponding comments:

1. *This is the initial situation. The FINNSKY is approaching on a southerly course and the STETTIN on a northerly. Both vessels are heading toward one another. The towed convoy of cutters is just on the starboard bow and a little slower than the STETTIN*. *At this point we are on the starboard side level with the fire extinguishing connections below the overhang of the upper deck. I have noticed the FINNSKY at this point but not given her further consideration, as the distance still stood at an estimated 500 m.*
2. *In the prevailing situation, the towed convoy decided to move to port to pass the ferry on the port side.*

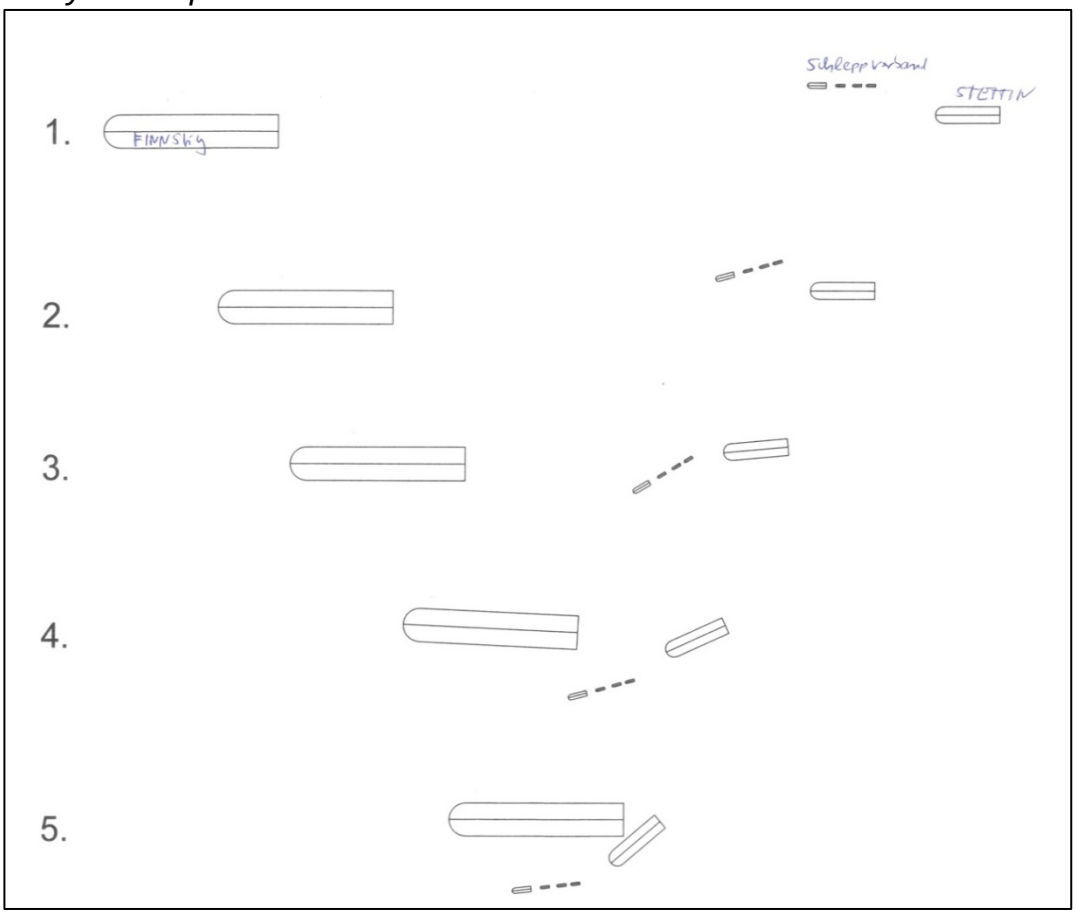


Figure 13: Drawing of the course of the collision based on witness testimony

3. *In the prevailing situation, the ships are already much closer together. The effect of the rudder can now be felt. The towed convoy has disappeared from view at this point.*

4. *In the prevailing situation, the two ships are approaching each other. It seemed to me that the FINNSKY was now faster than before and the stern was drifting to port. The hard-over rudder was now noticeable on the STETTIN. It was clear to me at this point that the collision is unavoidable and we moved quickly toward the port side of the stern to get out of the danger zone.*
5. *In the prevailing situation, the collision is described. We experienced it from the stern.*

Three other witnesses who were on the bridge provided extensive video recordings and photographic material. A summary of the account they gave to the BSU follows:

1.) There were already 10-15 passengers on the bridge, who were welcomed by the master, when we casted off. The master introduced the mate and later the helmswoman, as well as the pilot.
2.) After casting off and executing the turning manoeuvre, the master handed over command to the pilot.
3.) The pilot issued instructions directly to the helmswoman, who repeated every command. The mate did not issue any commands and only operated the engine telegraph in accordance with the pilot's instructions.
4.) The pilot did not have a radio with him and only spoke with the SANTA BARBARA ANNA once on the ship's radio.
5.) When the FINNSKY appeared on the horizon, the SANTA BARBARA ANNA and the towed cutters moved to the left. At a distance of about 40 m from the FINNSKY, the helmswoman said: *"This will be tight."* The pilot replied: *"All's well, all's well, there's enough room."* The mate continued to entertain the passengers without interruption via the ship's loudspeakers up until the collision.
6.) When the STETTIN was about 10-15 m ahead of the FINNSKY, the pilot issued the order hard to port, quickly moved to the engine telegraph on the starboard side and set it to full ahead.
7.) The master left the bridge several times and did not participate on the bridge until after the collision.

3.3.7 Photographs and video recordings

The witnesses gave the BSU five videos and various photographs for the investigation. The following photographs illustrate the course of the accident:

Figure 14: ROSTOCKER 7 overtakes the STETTIN

Figure 15: Fairway on the STETTIN's port side

Figure 16: Collision between the FINNSKY and STETTIN

Figure 17: Fairway on the STETTIN's starboard and port side

Figure 18: Before the collision

Figure 19: Photograph taken from ashore after the collision

Figure 20: Damage to the FINNSKY's ducktail

Figure 21: Damage to the STETTIN

3.3.8 Icebreaker STETTIN

The icebreaker STETTIN was built in 1933 and handed over to the STETTIN Chamber of Commerce and Industry on 17 November 1933 following completion of the sea trials. She was last in operation as an icebreaker for WSA Hamburg until 1982 with a crew of 22 people. The class period was not renewed at that time and the STETTIN was chartered permanently by the Federal Waterways Administration, sailing as an inland waterway vessel with tonnage certificate for inland waterway vessels. On 6 December 1982, the Förderverein Eisbrecher Stettin e.V. acquired the STETTIN from the Equalisation of Burdens Bank. Re-approval as a seagoing ship for the North Sea and Baltic Sea navigation area was obtained upon class renewal in 1983 and re-designation as a traditional vessel.

The first certificate from SeeBG [now Ship Safety Division (BG Verkehr)] was issued in 1982 for 94 passengers on board up to the maritime boundary. A safety certificate covering 130 people maximum (including crew), vessel category C, operating area coastal waters, was issued on 13 June 1991. During an accident investigation by the WSP following a collision with a sailing yacht on 31 August 2002, 184 people, 54 more than permitted, were counted in Kiel's Nordhafen port. In addition to the safety certificate covering 130 people, an individual permit was granted in 2003 for a maximum of 225 people for the anniversary of the port of Hamburg, special permits were issued in 2012 and 2013 for Hanse Sail, Kiel Week, Borkum and Flensburg for a maximum of 235 people on board.

The last valid safety certificate was issued on 15 April 2014 for 130 people for operating in coastal waters (see Annex 9.1) and an additional permit for single-day voyages with a condition stipulating no more than 225 people (see Annex 9.2) on board.

3.3.9 Safety management manual (ISM) of the STETTIN

The STETTIN carries a 70-page manual with procedural instructions on board voluntarily in accordance with the guidelines for implementing safety management systems on board traditional vessels. The objective of implementing a safety management system on traditional vessels is to achieve and maintain a high standard of safety and environmental protection on board those vessels.

The Association is committed to the consistent implementation of the principles and instructions set out in the manual and requires that all crew members note and comply with the principles and instructions laid down. According to the manual, the certificate of proficiency for masters in long-distance or intermediate trade (A6, A4, AG, AM) or according to the STCW (master), possession of a valid certificate of proficiency or a recreational offshore skipper licence is the prerequisite for professional qualification to serve as a master. In addition, a certain number of voyages as a mate on the STETTIN and manoeuvres under the supervision of a master must have been made. Holders of a recreational offshore skipper licence who have not been trained as a master, i.e. according to the STCW, are not engaged as master on the STETTIN. The requirement for professional training as a master exceeds the provisions of the German Regulation on the certification of operators of recreational craft in coastal waters (Sportseeschifferscheinverordnung) with regard to the regular crew of traditional vessels. Annex 4 to Section 11(2) of this Regulation states that it would be sufficient if two holders of a recreational boating licence with an additional entry as operator (skipper) of traditional vessels are on board.

The manual is available on board as a hard copy, as well as electronically in the shipboard computer. Procedural instruction 3 of the manual (passenger safety instructions) states, *inter alia*: *"For safety reasons, the bridge cannot be visited when manoeuvres are executed during a voyage."*

Figure 22: Bridge of the STETTIN

4 Analysis

The BSU was provided with recordings from the FINNSKY's VDR and reports of WSPI Rostock. Data recorded by the VTS were also referred to. This included the recorded voice communications on VHF channel 73 (local radio channel) and channel 16, the superimposed AIS and radar data from the VTS and the analysed AIS data from the WSP. Following an appeal for witnesses by the BSU, several written statements were made and three passengers who were on the bridge at the time of the accident were interviewed. Five video recordings were provided and also helpful for the analysis. In addition to the material evidence, the written testimony of the STETTIN's crew and pilot were also analysed.

4.1.1 Analysis of radar images from the FINNSKY's VDR

Only the S-band system's recorded radar images were available to the BSU from the VDR. The images from the X-band system were not recorded. The radar sequence in the 0.5 nm range is recorded on the VDR every 15 seconds. On the radar image, the AIS signals and a prediction (predicted movement with ship symbol) are superimposed with outlines as FINNSKY symbols. The crew entered buoy symbols by hand.

The analysis of the radar images reveals that the FINNSKY is keeping to the western side of the fairway and exhibited a western movement tendency for the prediction. It can also be seen that both the SANTA BARBARA ANNA and the STETTIN did not display a radar echo, while the AIS signals are recorded. Due to the FINNSKY's long radar lobe, radar echoes precisely astern of the ship are not displayed.

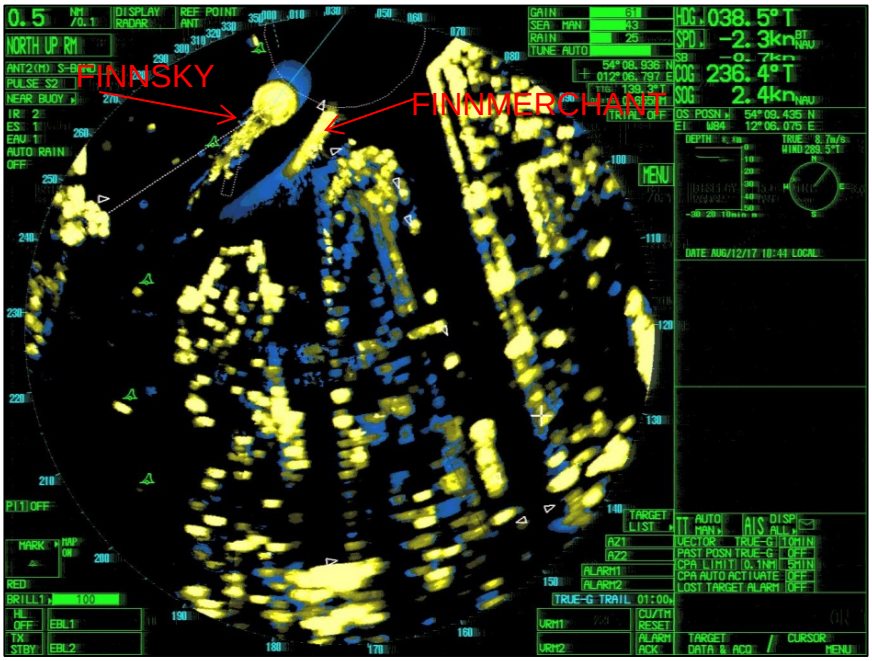


Figure 23: The FINNSKY and the FINNMERCHANT pass

0945; COG = 236.4°; SOG = -2.3 kts

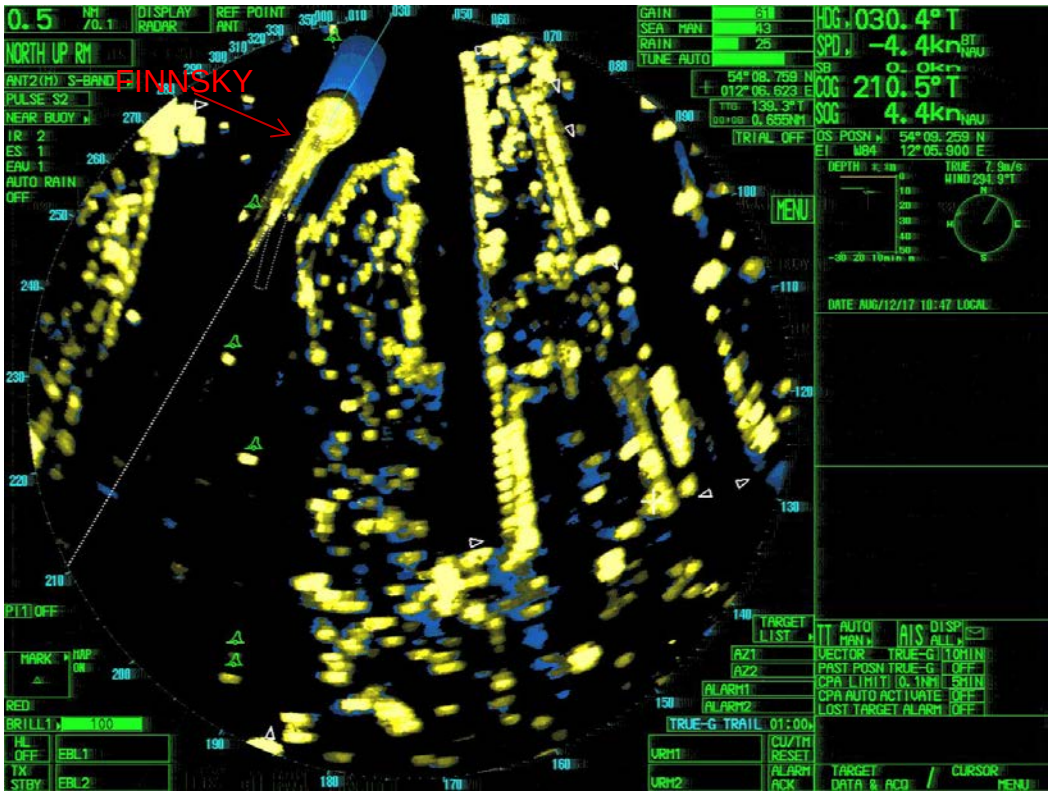


Figure 24: The FINNSKY at buoy 35

0947; COG = 210.5°; SOG = -4.4 kts

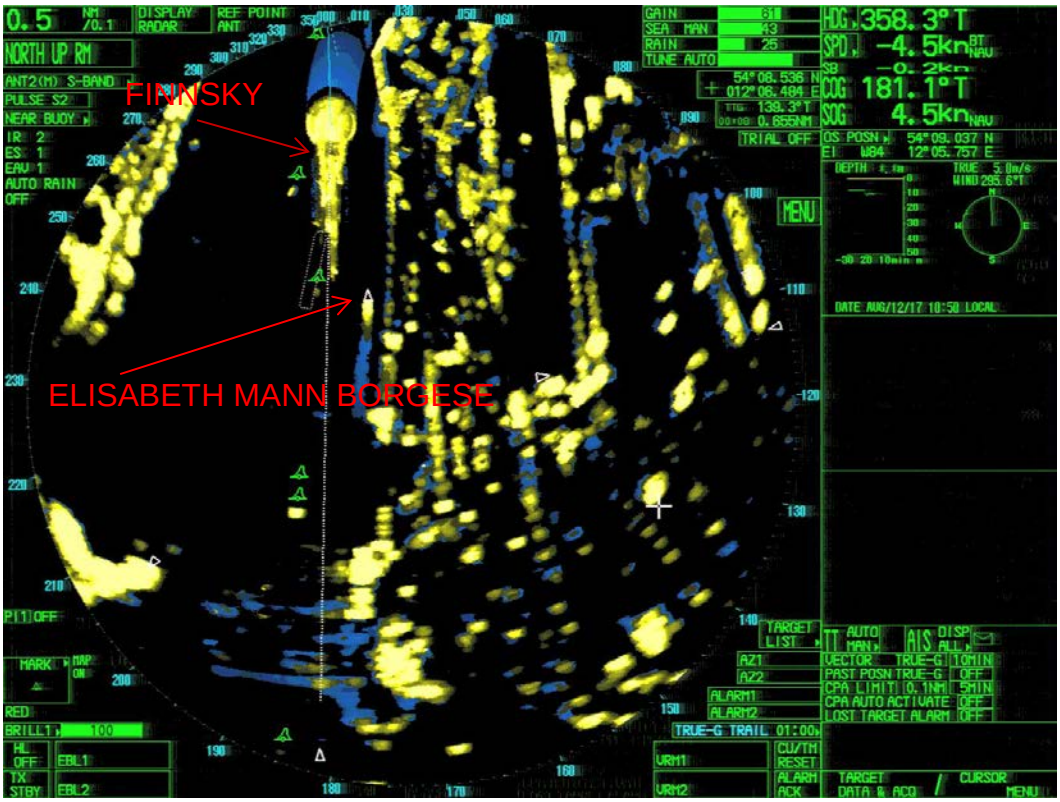


Figure 25: The ELISABETH MANN BORGESE pass begins
0950; COG = 181.0°; SOG = -4.5 kts

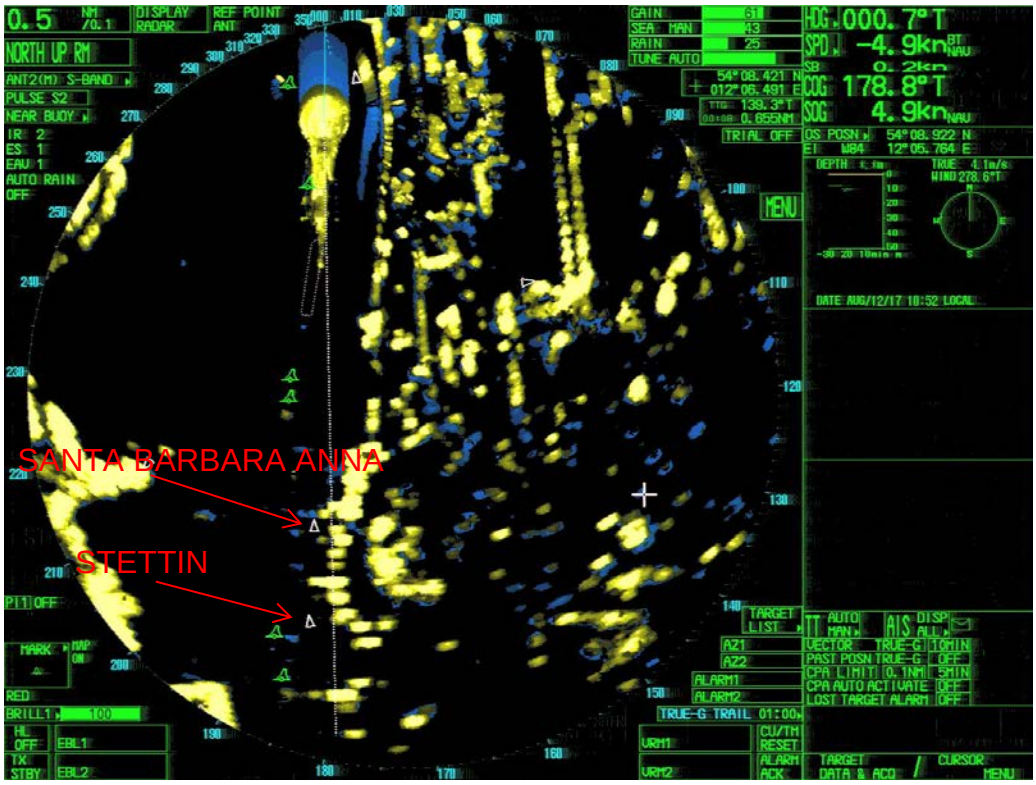


Figure 26: The ELISABETH MANN BORGESE pass ends
0952; COG = 178.8°; SOG = -4.9 kts

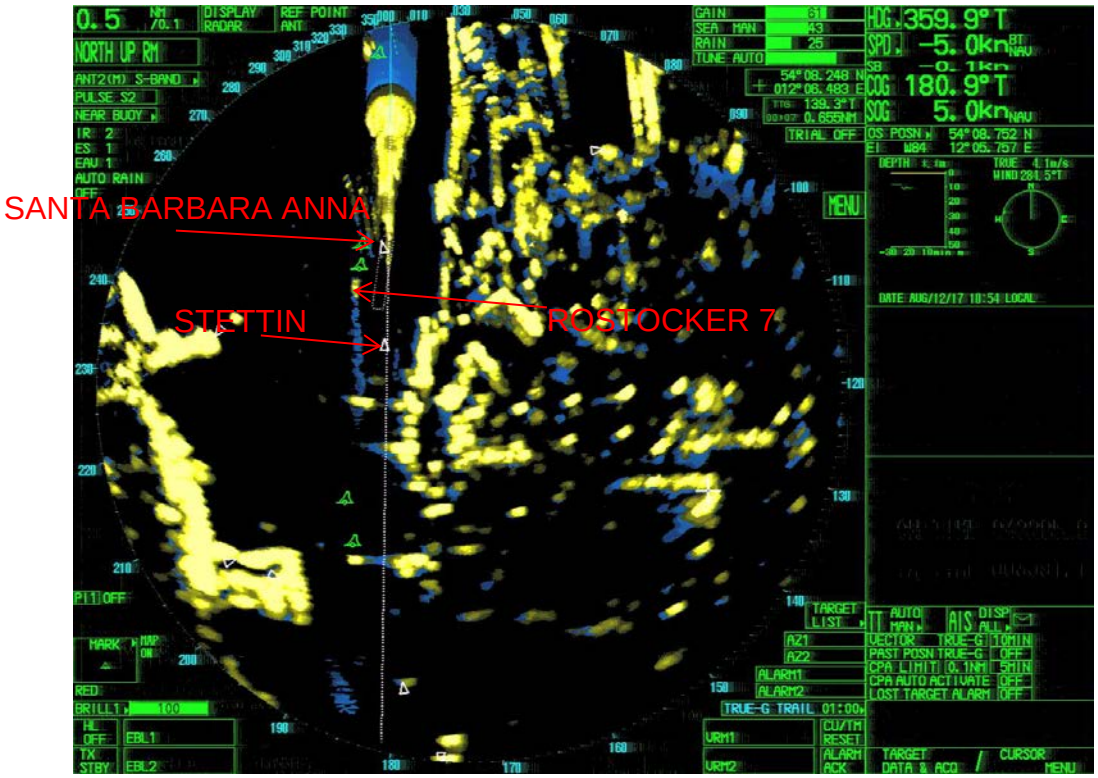


Figure 27: The FINNSKY and the SANTA BARBARA ANNA pass
0954; COG = 180.9°; SOG = -5.0 kts

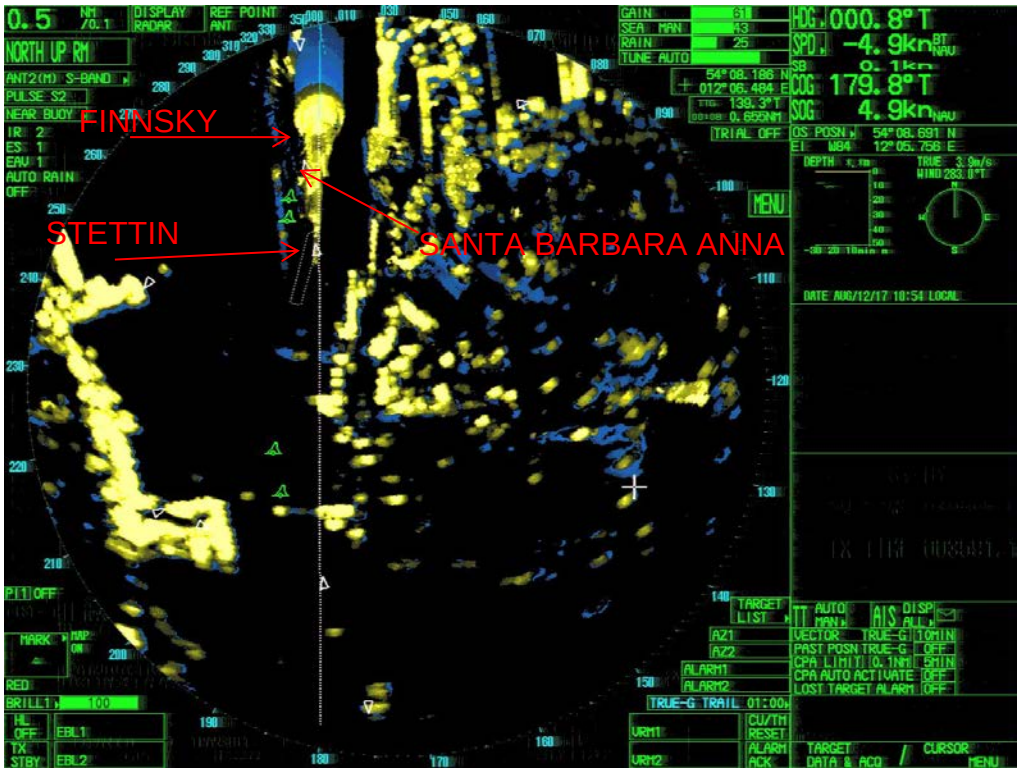


Figure 28: Just before the collision

0954; COG = 179.8°; SOG = -4.9 kts

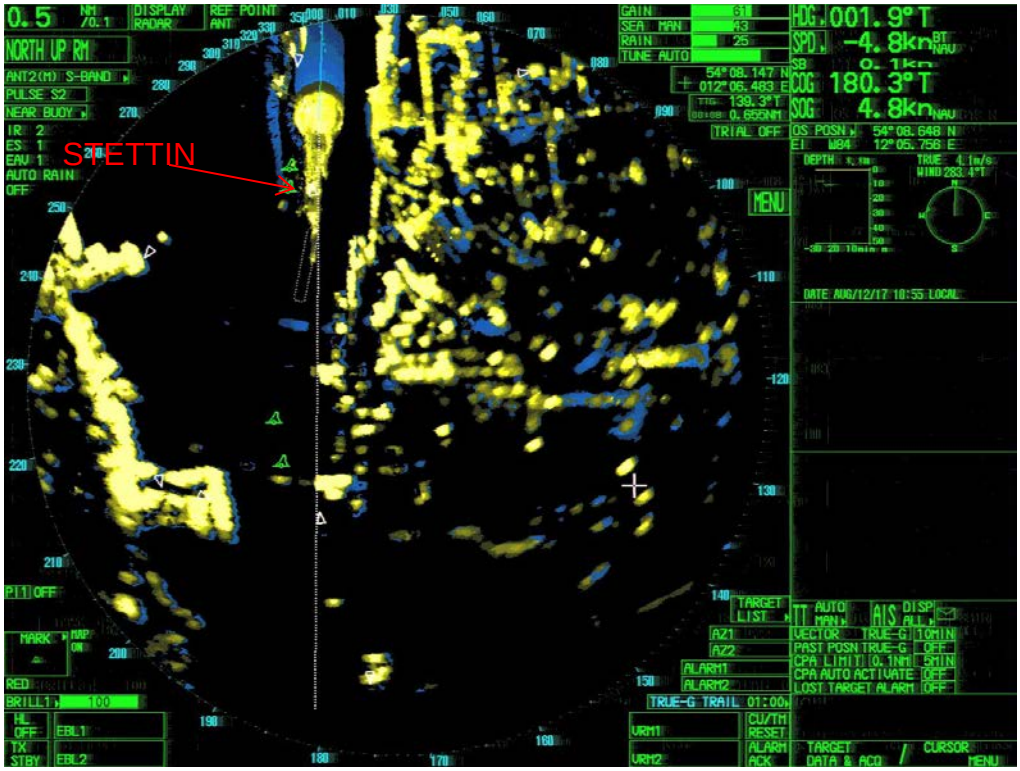


Figure 29: Collision between the FINNSKY and STETTIN

0955; COG = 180.3°; SOG = -4.8 kts

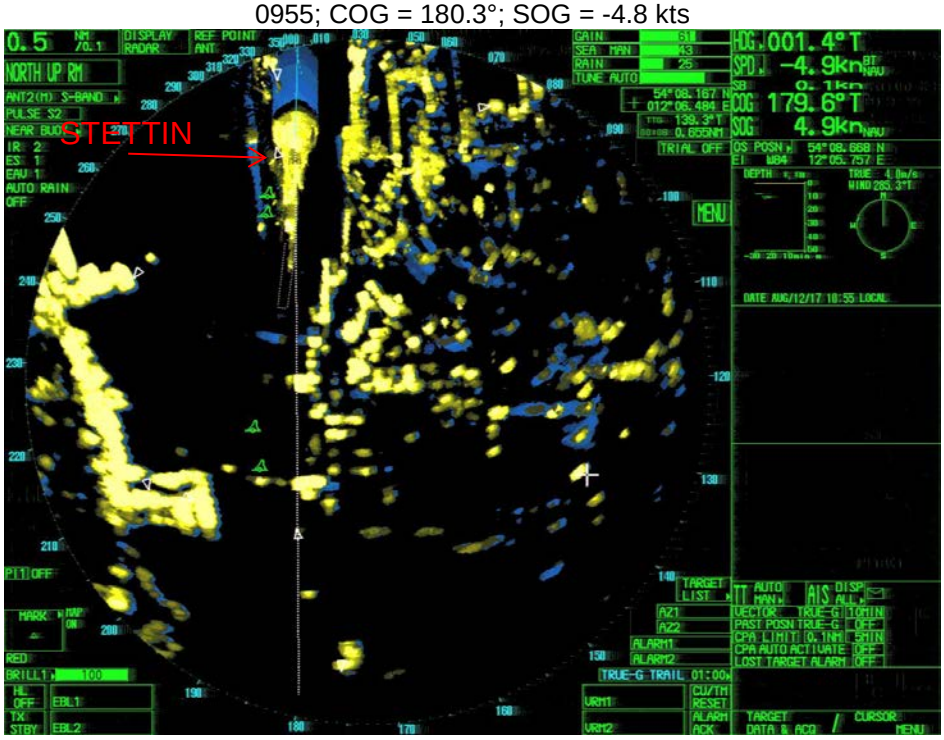


Figure 30: After the collision

0956; COG = 179.6°; SOG = -4.9 kts

4.1.2 The FINNSKY's VDR and ECS

In addition to the radar system recordings, the FINNSKY's VDR recorded the ECS with AIS (also at 15-second intervals). The ECS could be viewed at the control position in each bridge wing. Here, too, the FINNSKY is consistently on the western side of the fairway and the prediction shows a western movement tendency; the COG is stable and pointing in a southward direction. The STETTIN's AIS symbol is located on the track of the FINNSKY.

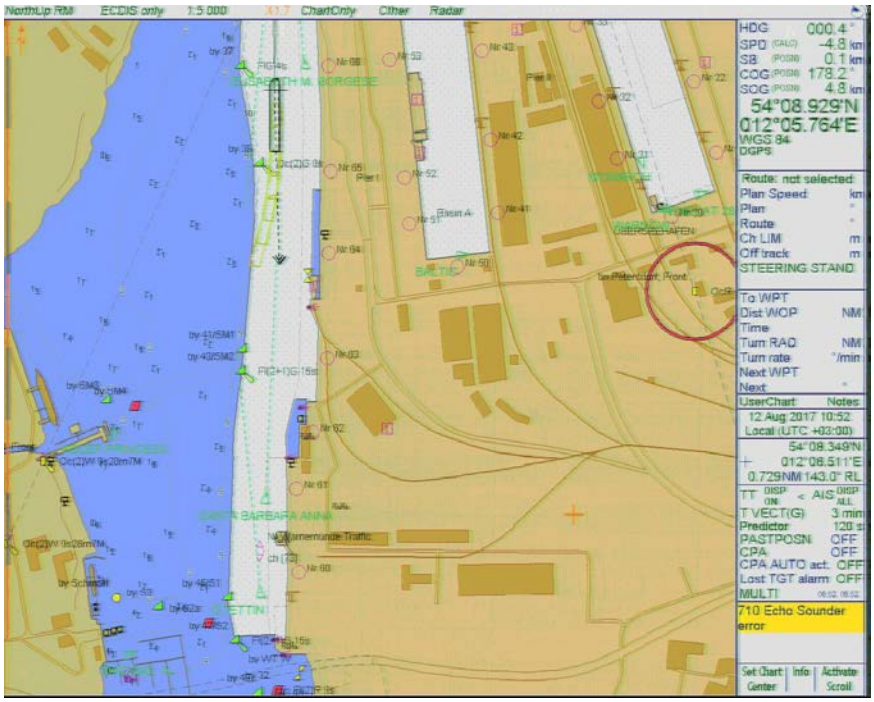


Figure 31: ECS at 0952

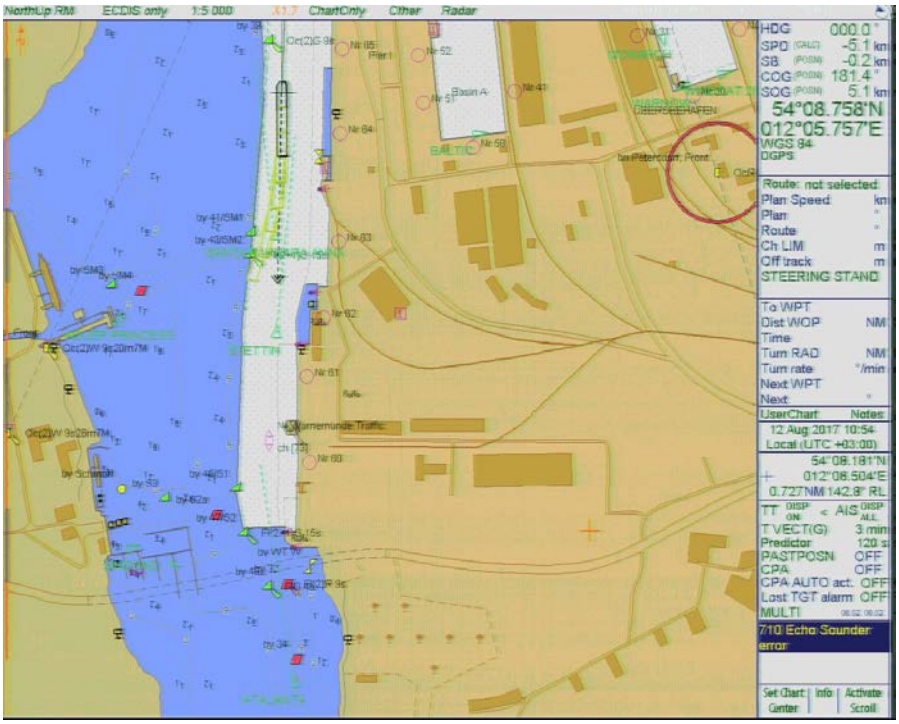


Figure 32: ECS at 0954

Figure 33: ECS at 0955

The ECS recordings show that the FINNSKY kept to the western buoy line. It also indicates that at 0954 the SANTA BARBARA ANNA intends to pass to the west on the FINNSKY's port side and that the STETTIN's vector ahead shows an eastern tendency at this point.

4.1.3 The FINNSKY's radio recordings and bridge microphones

The FINNSKY's VDR recorded radio channels 73 and 10, as well as the conversations on the bridge with microphones. The following is a summary of the radio calls made on channels 73 and 10, which the WSA provided to the BSU in the form of a transcription. It was not possible to analyse the ship's internal radio for lack of technical quality and due to strong interference. The time markers are GPS data (time) of the FINNSKY:

Radio channel 73:

091127 WAL *Warnemünde Traffic (WT), steamer WAL*
VTS *WAL, WT, good day*
WAL *Good morning, Mr (A), on board, 5.30, 0930 approximately from port A to B*
VTS *Good morning Mr (A), the WAL should get underway at 0930, draught is 5.30*
WAL *Okay, bye for now*

091400 FINNSKY *WT, FINNSKY, at jetties, good morning*
VTS *FINNSKY, the jetties*

091500 VTS *To all maritime radio stations on the Warnow maritime shipping lane. This is WT with the situation report for 0915. Good morning. Weather conditions: Visibility is good. North-westerly wind. Tendency 5 Beaufort. Strong wind warning for east of Fehmarn up to Rügen, south-west to westerly winds of 5 to 6 Beaufort with gusts of 7 Beaufort. Water-level gauge at Warnemünde 5.18 m, 5-1-8, constant. Traffic situation: The FINNSKY entering, at the station shortly, underway to Berth 60. COPENHAGEN exiting; will come from the turning basin shortly; the FINNMERCHANT exiting in about 10 to 15 minutes from Berth 60. Underway: Traditional tug WAL will soon be underway from the Marienehe fishing port and scheduled exit of the sailing ship DAR MLODZIEZY from passenger quay P 8 in Warnemünde at about 1000. Note that there will be numerous sailing ships and traditional vessels in all parts of the Warnow maritime waterway this year, too, because of the Hanse Sail. Please navigate with special care. Nothing further to report. All stations have a good watch. Warnemünde Traffic is receiving on channels 16 and 73.*

092121 SANTA BARBARA ANNA (SBA) WT for SBA
VTS *SBA, WT, good morning*
SBA *Good morning, we intend to sail out of Neptunkai quay in ten minutes*
VTS *Yes, SBA underway in ten minutes, bye for now.*
SBA *Bye for now, thank you*

092242 **STETTIN** *WT, icebreaker STETTIN, good morning.*
VTS STETTIN, WT, good morning.
STETTIN *Yes, occupied with (x), er, draught 5.70 m,* [several radio calls simultaneously]*, casting off for sea, through Warnow shipyard fairway.*
VTS *Yes, good morning Mr (x), 5.70, should be underway in ten minutes via the Warnow shipyard fairway, okay, bye for now.*

STETTIN *Thank you.*

092327 ELISABETH MANN BORGESE (EMB) *WT, EMB, ready to cast off Berth 2 for sea*

VTS *EMB, yes, you can go*

EMB *Thank you*

092530 FINNMERCHANT *WT, FINNMERCHANT, good morning*

VTS *FINNMERCHANT, WT*

FINNMERCHANT *Yes, we are nearly ready to cast off from Berth 60 for sea with a draught of 6.60 m, free-runner*

VTS *Yes, FINNMERCHANT, you are ready, 6.60, FINNSKY now entering Pinnengraben ditch*

FINNMERCHANT *Okay*

092600 FINNMERCHANT *FINNSKY, FINNMERCHANT, good morning*

FINNSKY *FINNSKY receiving*

FINNMERCHANT *Where do you want the encounter?*

FINNSKY *Turning basin, we will turn first and then you pass to our south*

FINNMERCHANT *Okay, turning basin*

092712 FINNMERCHANT *WT, FINNMERCHANT, we have casted off*

VTS *FINNMERCHANT casted off*

092900 FINNSKY *WT, FINNSKY inbound, turning basin*

VTS *FINNSKY inbound, turning basin, yes*

092930 **STETTIN** *WAL for STETTIN*

WAL *STETTIN WAL*

STETTIN *Switch to seven-seven* (switched to non-recorded radio channel 77)

093527 EMB *WT, the EMB casted off from Marienehe, entering the Unterwarnow*

VTS *Yes, EMB, entering the Unterwarnow*

093624 VTS *EMB, WT again*

EMB *Yes, EMB receiving*

VTS *Yes*, the *FINNSKY has now turned at the turning basin will proceed astern to Berth 60 shortly, yes?*

EMB *Yes, okay, then I will slow down a bit until she has made fast.*

VTS *Yes, you are still waiting a little for the FINNMERCHANT, she is exiting, encounter in the turning basin.*

EMB *Yes, okay, then I will now move forward, then I will see how to do it best, yes, then I can go completely on the green side, then she will pass easily.*

VTS *Yes, I think so too, and then on to Warnow shipyard fairway.*

EMB *Yes, that is good*

093842 FINNMERCHANT *FINNSKY FINNMERCHANT We are keeping to the green side*

FINNSKY *Yes, thank you*

093942 FINNMERCHANT *FINNSKY FINNMERCHANT We are keeping to the green side*

FINNSKY *Green side, okay*

094239 **STETTIN** *SBA STETTIN*

SBA *STETTIN, SBA*

STETTIN *Yes, hello, I just wanted to ask how fast you are going? Are you after?*
SBA *We are moving at 6.7*
STETTIN *Okay, then we will stay behind you, good, thank you.*
SBA *Bye*
094342 WAL *WT, WAL, casted off Port A*
VTS *WAL casted off*
094357 FINNMERCHANT *WT, FINNMERCHANT on the turning basin*
VTS *FINNMERCHANT on the turning basin*
094457 EMB *WT, EMB, at Berth 60, wish to continue via the Warnow shipyard fairway*
VTS *EMB Berth 60, Continue via Warnow shipyard*
EMB *Yes, we still have to speak with the FINNSKY because I would prefer to wait at 64 and can then proceed straight through.*
VTS *Yes, you can speak with her. She is just leaving the turning basin*
EMB *Okay*
094542 EMB *FINNSKY EMB FINNSKY EMB*
FINNSKY *Yes FINNSKY receiving*
EMB *Yes, passing berth number 60 and still wait on berth number 65, so that you can use the starboard side*
FINNSKY *Okay, we are coming past westerly*
EMB *Past westerly. Okay, perfect*
095000 WAL *WT, WAL Marienehe tributary*
VTS *WAL, Marienehe tributary, yes. Er, the FINNSKY er, now Berth 67, wants to proceed to Berth 60, astern, yes.*
WAL *As usual, yes, thank you*
095240 [FINNSKY three short blasts of the whistle at buoy 39 (VDR recording)]
095424 [FINNSKY three short blasts of the whistle at Berth 64 (VDR recording)]
095539 [Collision with the **STETTIN (**VDR radar unit and AIS recording)]
095639 **STETTIN** *Er WT, STETTIN*
VTS *STETTIN, WT*
STETTIN *Er WT, STETTIN*
VTS *Yes, STETTIN, WT*
095709 **STETTIN** *Yes, we have touched the FINNSKY*, did not move aside quickly enough. Er, we are going to international port for now.
VTS *STETTIN, collision with FINNSKY. Question, have any dangerous goods escaped, casualties, do you need any special assistance?*
STETTIN *No, we do not need any assistance, but we need to get to it first. I will call you later.*
VTS *Good, port, do you know your berth?*
095742 [FINNSKY One long blast of the whistle]
095812 VTS *FINNSKY, WT*
FINNSKY *FINNSKY receiving*
VTS *Yes, the steam icebreaker STETTIN has had a collision with you. Is everything okay with you otherwise?*
FINNSKY *Yes, so far. We will look at 60 anyway. Er, that is why ... wait*
VTS *Okay, you are making fast at Berth 60 first. For now, no severe damage or casualties. Thank you*

100900 FINNSKY WT, *FINNSKY made fast at Berth 60 and, er, master of the STETTIN, welcome*.
VTS *FINNSKY, made fast, yes please stand by for a moment*

Radio channel 10:

100400 **STETTIN** *Er, Rostock Port icebreaker STETTIN*
STETTIN *Rostock Port icebreaker STETTIN*
Rostock Port *STETTIN Rostock Harbour*
STETTIN *Yes, Rostock Harbour, er we want to berth here, is Berth 66 free?*
Rostock Port *66 is free at the moment, yes.*
STETTIN *Can you take our lines? We had a collision with the FINNSKY.*
Rostock Port *Er, I will just have to check to see if I have people there. Remain on standby*
STETTIN *And I have also ordered an ambulance on G.R.*
Rostock Port *Oh, do you have a casualty?*
STETTIN *Yes, a woman has broken her arm.*
Rostock Port *Okay, all right, let us see if you can approach far enough for someone to disembark.*
STETTIN *Okay*

Possible radio calls between the STETTIN and FINNSKY on channel 73 and channel 10, as well as sound signals from the STETTIN were not recorded on the FINNSKY. The FINNSKY's sound signals (manoeuvring signal *three short blasts*/I am operating astern propulsion) were recorded from the FINNSKY's bridge microphones.

4.1.4 Recordings of VTS Warnemünde

The radar images of VTS Warnemünde show that just before the collision the STETTIN's bow was crossed from starboard to port by only one cutter convoy and only one cutter convoy is visible. No calls by the STETTIN or FINNSKY were recorded on the recorded radio channel 16.

The radar images recorded just before the collision follow:

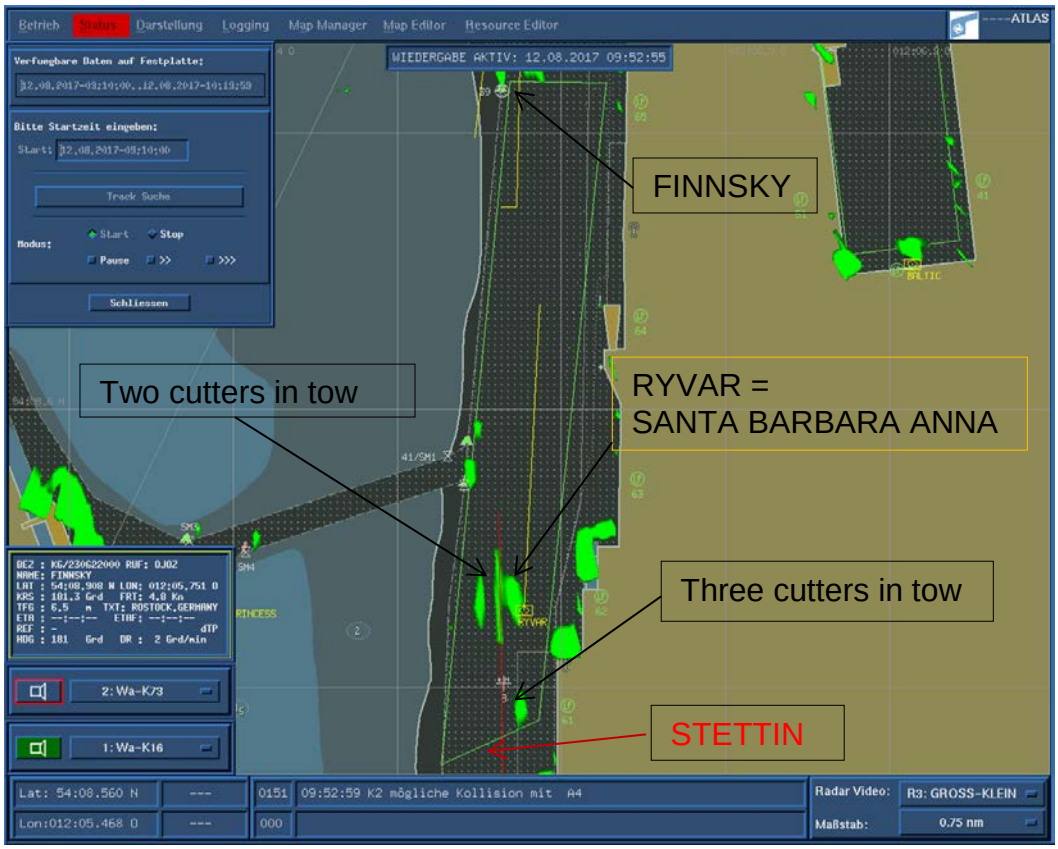


Figure 34: FINNSKY 181.3°; 4.8 kts; 095259

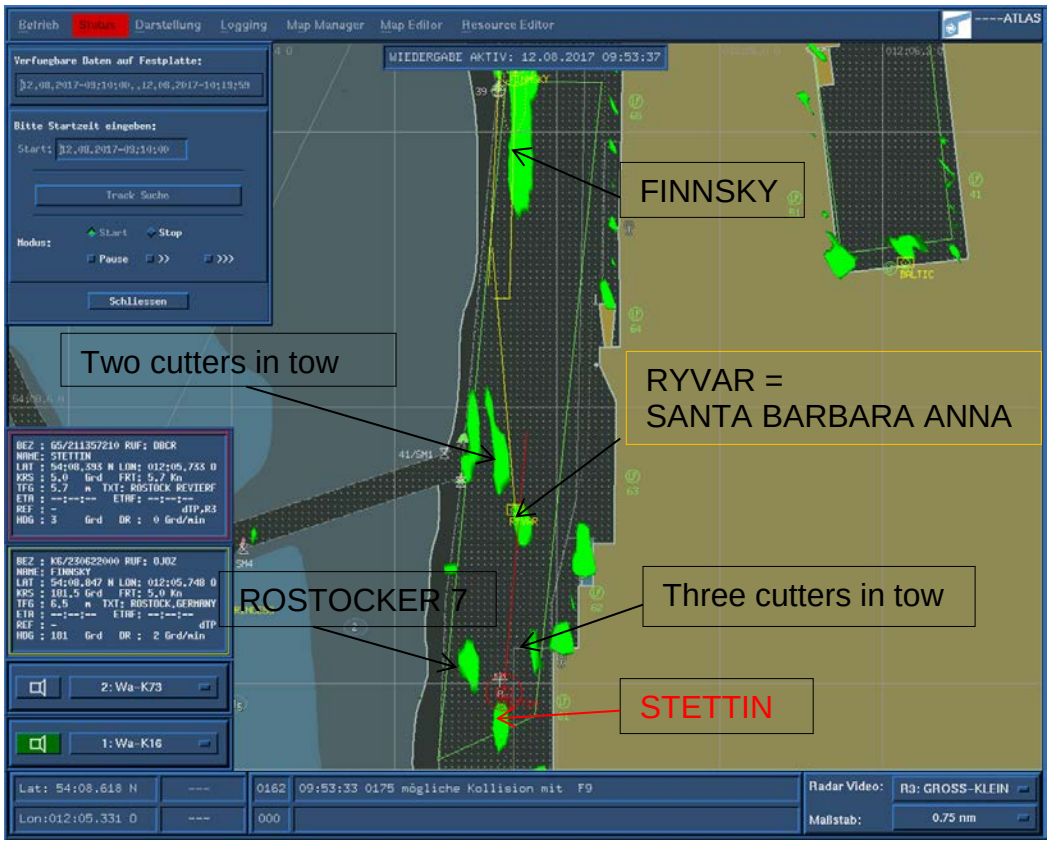


Figure 35: FINNSKY 181.5°; 5 kts; STETTIN 5°; 5.7 kts; 095333

Figure 36: FINNSKY 180.0°; 5.0 kts; STETTIN 6°; 5.3 kts; 095415

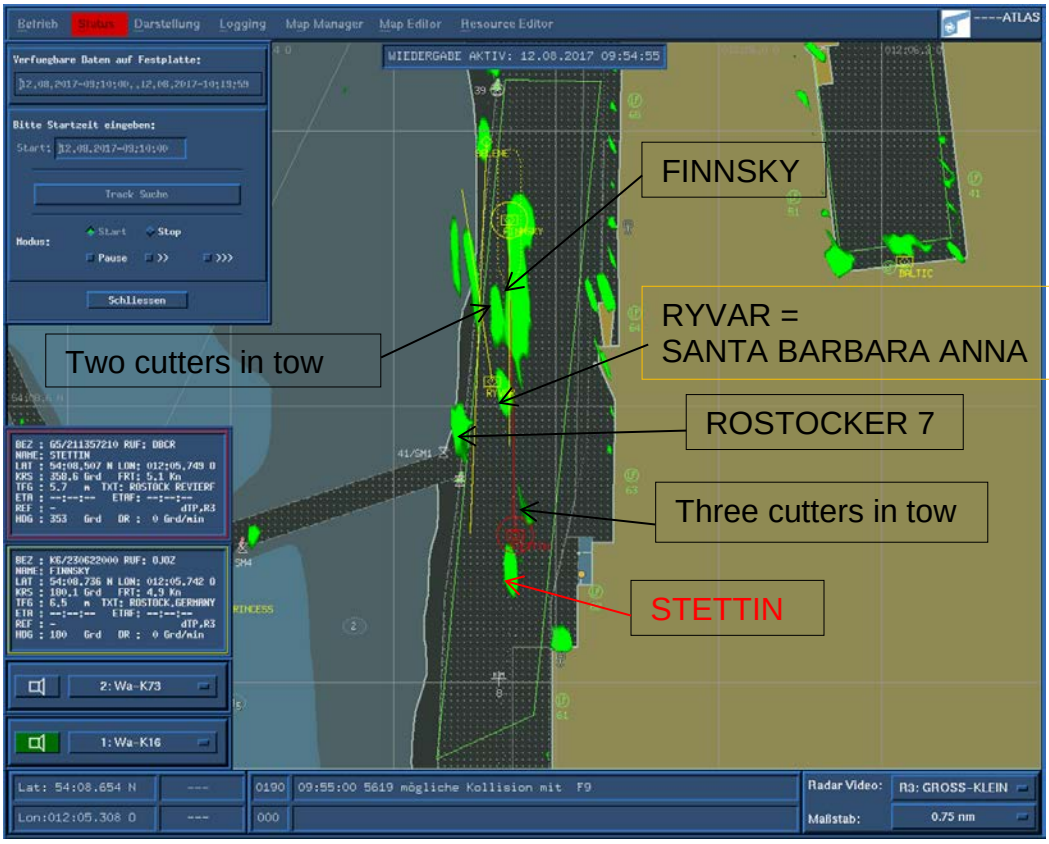


Figure 37: FINNSKY 180.1°; 4.9 kts; STETTIN 358.6°; 5.1 kts; 095500

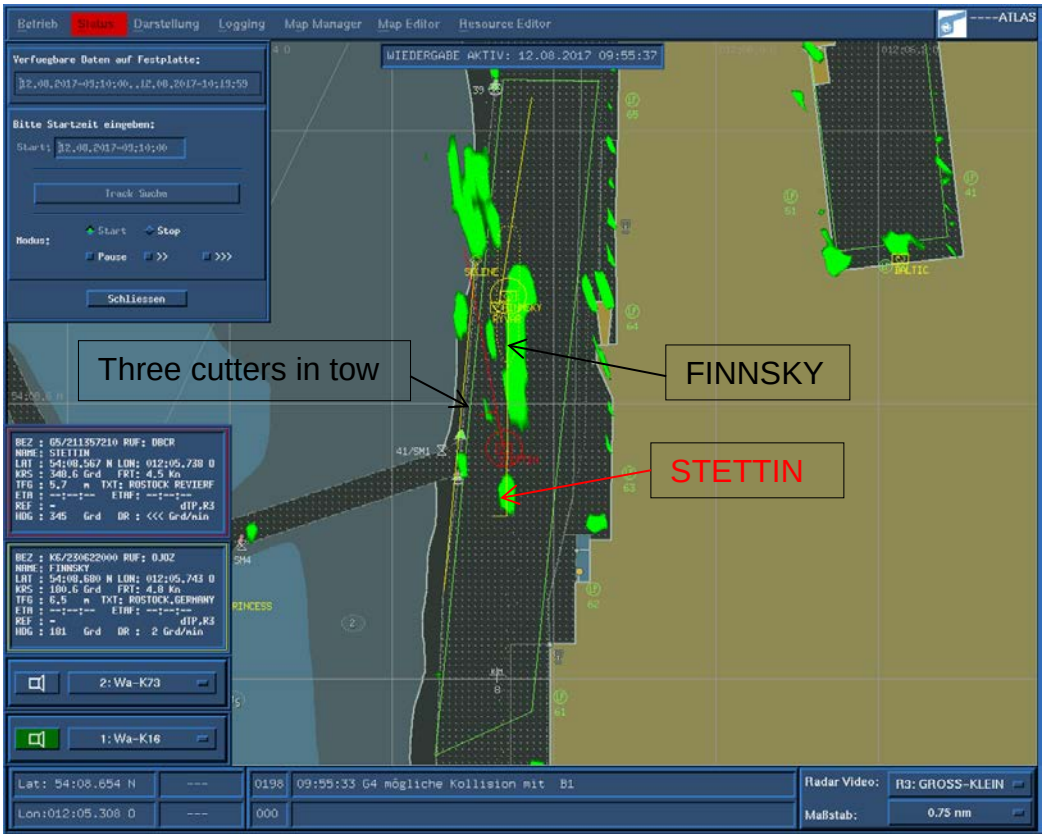


Figure 38: FINNSKY 180.6°; 4.8 kts; STETTIN 348.6°; 4.5 kts; 095533

4.1.5 VTS Warnemünde and the WSP

VTS Warnemünde is an organisational unit of WSA Stralsund. Its central task is maritime traffic control. The VTS predominantly carries out shipping police duties (order of vessel traffic) in the sea area between the Polish border, the Danish border,

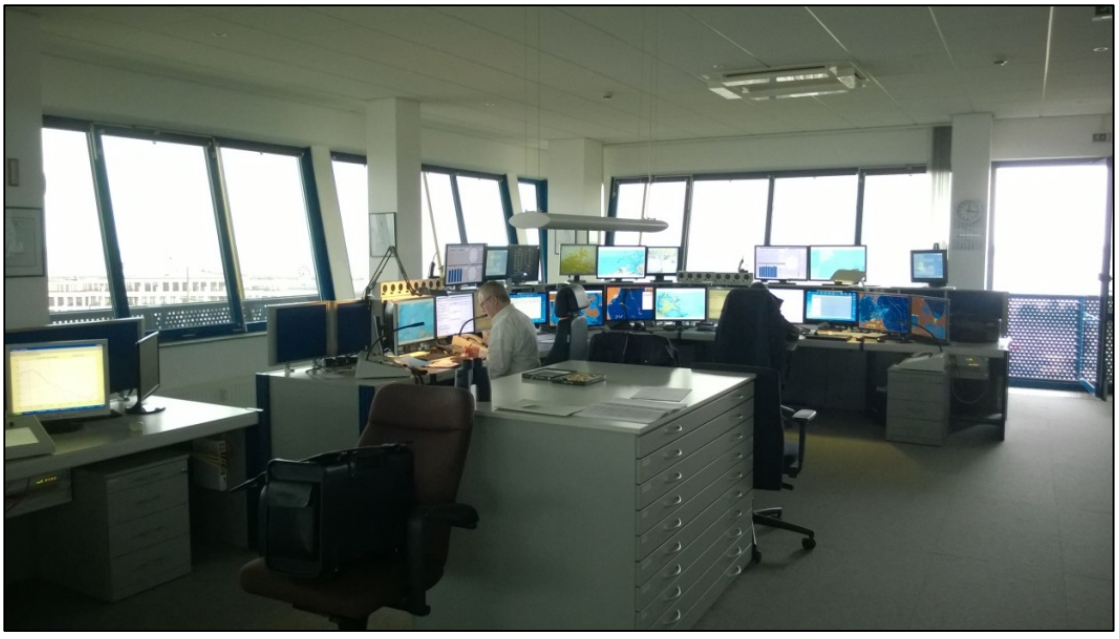


Figure 39: VTS Warnemünde

the Buk beacon and neighbouring areas. This includes traffic information (e.g. situation reports), traffic assistance (advice and warnings to shipping), as well as traffic control (shipping police activities).

The VTS is staffed by four people continuously around the clock. Staff members monitor the entrances to Warnemünde/Rostock, Stralsund, Wolgast and Sassnitz. In particular, this involves them making use of AIS data transmitted by shipping, as well as radar surveillance in Rostock and Stralsund East/Wolgast. Continuous contact is maintained with ship's commands by means of voice communications on VHF. Workstations in the VTS are equipped with an extensive information system. Most of the data relevant to obtaining a picture of the traffic situation, such as water levels, water depths, visibility and the state of many fixed navigation marks are transmitted via radio-relay systems. Current measurements are not available.

WSPI Rostock was also on duty during the HANSE SAIL with the coastal patrol boat WARNOW, a type PB 125 patrol boat and three inflatables.

4.2 Weather report by the DWD

The Maritime Division of Germany's National Meteorological Service (DWD) was requested to prepare an official report on the weather and sea conditions in the sea area for the period of the accident.

Weather situation

A 1005 hPa low-pressure system, which tracked north-east as the day progressed, prevailed in the southern Baltic Sea on 12 August 2017. At the same time, an extensive storm depression (963 hPa) prevailed over the Norwegian Sea with fringes stretching over southern Norway to the North Sea and into northern France. The scene of the accident was between these two formations in temporarily calm weather. Maritime Weather Service Hamburg issued a strong wind warning for the sea area east of Fehmarn to Rügen.

Wind

Stable stratification of the atmosphere close to ground level with westerly winds (280-290 degrees) of 10-17 kts (force 3-5 Bft) prevailed. No significant gusts were observed.

Weather and visibility

It was mostly overcast. Rain was not measured at the scene of the accident. Visibility at the time of the accident stood at between 22 and 28 kilometres.

Temperature

Water temperatures stood at 19 °C. Air temperatures at a height of 2 m above the water surface fluctuated around 15 °C.

4.3 Opinion of the Federal Waterways Engineering and Research Institute (BAW)

Since current measurements of the VTS were not available for the time and the scene of the accident, the BAW was requested to make statements about the current on the River Warnow. The current was calculated based on a hydrodynamic-numerical model of the Unterwarnow, which is essentially used by the Federal Waterways and Shipping

Administration when required. The bathymetric data in the calculation grid of the Unterwarnow's numerical model are based on the sounding data of the BSH up until 2015 and the WSV for the years 2016 and 2017. The time series of the water level of the gauge at Warnemünde, as well as a mean headwater of 12 m³/s over the Mühlendamm weir, were applied as boundary values for the calculation at the time of the accident. The Rostock Mühlendamm water-level gauge was used as an additional reference value for validation. The wind, air pressure and air temperature data of the Rostock-Warnemünde measuring station appropriate to the period are considered.

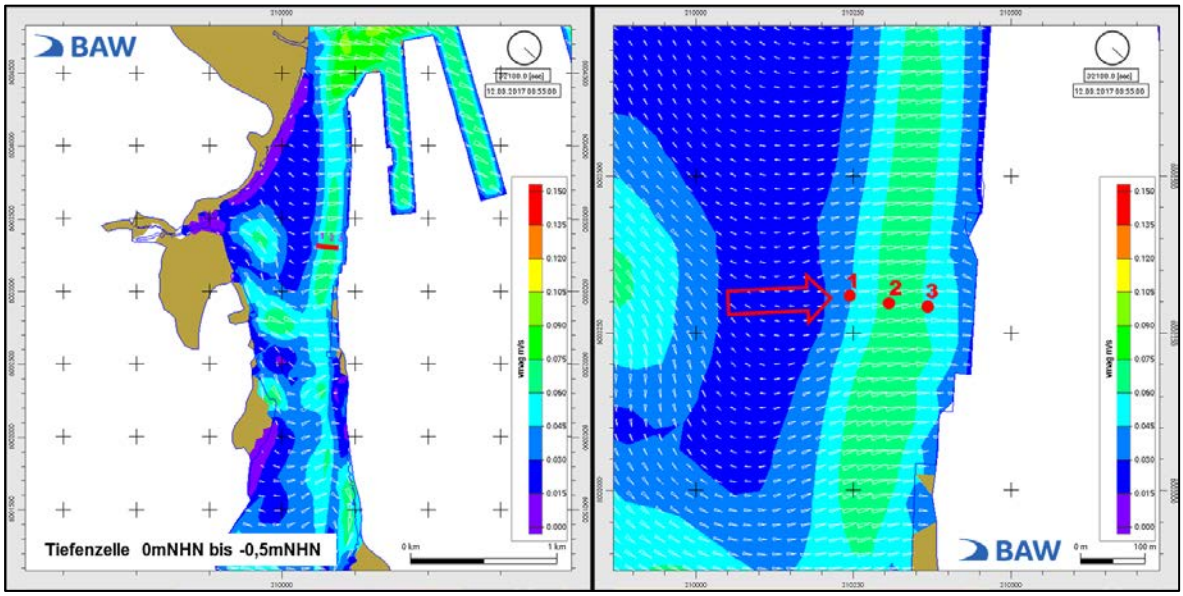


Figure 40: Surface current data

The near-surface current velocities in the deep cell layer surface up to -0.5 m AMSL calculated in Figure 40 indicate an eastern current direction (ESE to E) over a water depth of approximately 0.7 m, which was excited at about 8 m/s by the WNW wind and

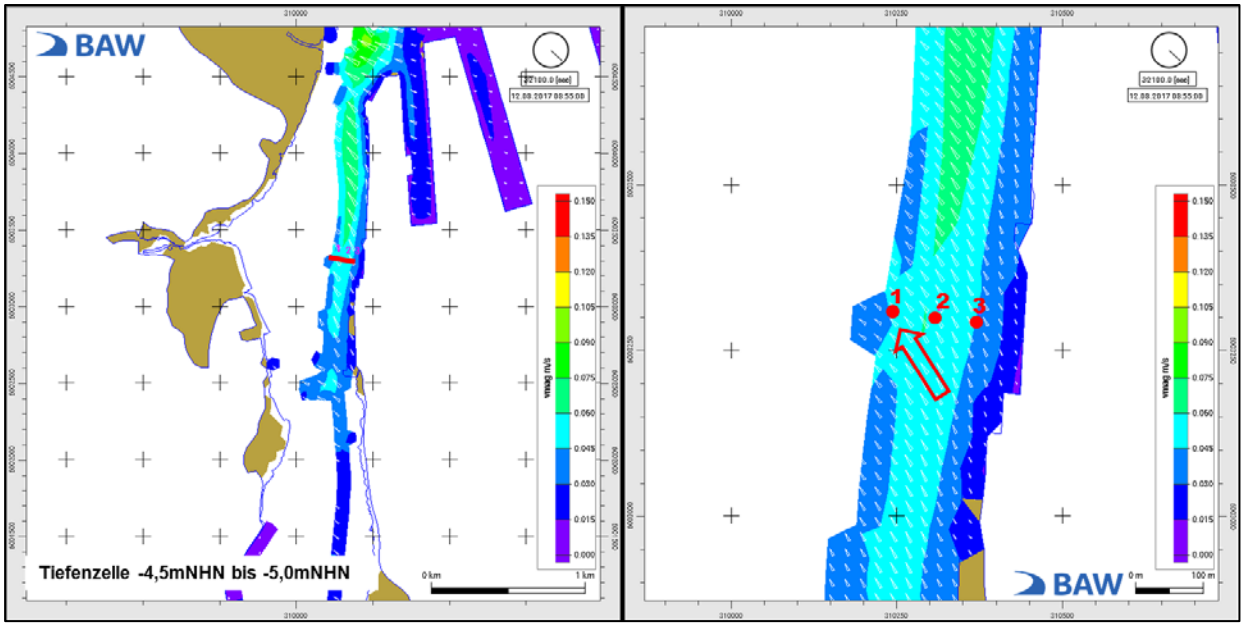


Figure 41: Deep fairway current data

influenced by local bathymetric effects. In addition to the area-related white arrows, the direction of current at the scene of the accident was illustrated by an optically averaged direction of current with colour highlighting, e.g. at Pos1.

The area-related current in the deep fairway calculated of -4.5 m to -5.0 m AMSL (Figure 41) is approximately v = 0.05 m/s lower at the scene of the accident than the surface current according to Figure 40, but with a direction of current that is almost opposite to the wind-induced surface conditions. This depth level is chosen as an example to show the return flow of the wind-induced surface current.

Berechnete Strömungsgeschwindigkeit 12.08.2017 9:55 Uhr (Betrag und Richtung nach UNTRIM)			
Warnow	OF bis 0m (v m/s)	OF bis 0m (v kn)	OF bis 0m (Richtung °)
Pos1	0,09	0,18	104,9
Pos2	0,11	0,20	100,9
Pos3	0,10	0,20	101,8
	0 bis -0,5m (v m/s)	0 bis -0,5m (v kn)	0 bis -0,5m (Richtung °)
Pos1	0,05	0,09	84,7
Pos2	0,06	0,12	84,7
Pos3	0,06	0,11	86,4
	-4,5 bis -5m (v m/s)	-4,5 bis -5m (v kn)	-4,5 bis -5m (Richtung °)
Pos1	0,05	0,09	315,2
Pos2	0,06	0,12	327,7
Pos3	0,05	0,09	333,6
	-9 bis -10m (v m/s)	- 9 bis -10m (v kn)	-9 bis -10m (Richtung °)
Pos1	0,00	0,00	234,3
Pos2	0,01	0,02	205,1
Pos3	0,01	0,02	194,9

BAW

Figure 42: Current values by sum and direction

To summarise, it can be said that the mean wind at the time of collision blew from a direction of 300° (WNW-NW) with a strength of about 8 m/s (according to the DWD's Rostock-Warnemünde station). The wind-induced eastward surface current, as calculated using the three-dimensional numerical modelling technique, reached values of approximately v = 0.1 m/s (about 0.2 kts) in the area of the collision.

The difference in the direction of current calculated at the time of the collision of about +240° between the surface and about half the depth of the fairway is due to the circulating flow excited by the wind.

The depth-averaged current velocity calculated in the fairway at the scene and time of the collision was less than v < 0.05 m/s (about 0.1 knot).

The hydrodynamic conditions show no significant changes in direction at the time of or shortly before the collision.

4.4 Hanse Sail organisation

Held annually in August, the Hanse Sail is organised by the Hanseatic City of Rostock. Every year the Tourist Centre/Hanse Sail Office issues a 'Captain's Handbook' to participating ships. Section 3 (see Annex 9.4) of this handbook (Nautical information) reads that ships not obliged to notify are recommended to keep a listening watch on VHF channel 73, that attention should be paid to ferry traffic in the area and that AIS be switched on to facilitate locating ships.

Departure traditionally starts at 1000 at the discretion of the ships as a non-formal and escorted cruise. The BSU's marine casualty database indicates that 43 marine casualties involving ships participating in the Hanse Sail were reported during the period 2007-2017. No merchant ships were involved in these accidents and 35 collisions, six groundings and two other types of incident were recorded. There are 4-5 accidents each year on average, while fewer accidents were reported at other major events like the anniversary of the port of Hamburg or Kiel Week. More organisation goes into the arrival and departure parades at these events than is the case with the HANSE SAIL and they are escorted by more support vessels in order to improve traffic safety.

4.5 Legal framework and assessment of the traffic situation

In accordance with point 29.6 of the Notices of the GDWS, Outstation North, vessels of more than 30 m in the area of the Warnow are required to give continuous reports on the local radio channel (VHF channel 73) to VTS Warnemünde:

Pre-entry report (inbound) 30 minutes before sailing on the Rostock fairway. This report should also indicate the berth to which the vessel's continued passage will lead.

Continuous passage reports:

- after pilot embarkation and when starting the voyage;
- buoys 1 and 2 or when entering the Rostock fairway;
- the jetties;
- turning basin (Wendeplatte) with notice of starting and finishing the turning manoeuvre;
- Berth 60 in the international port;
- Marienehe fairway, and
- when leaving the fairway and after mooring.

In practise, it is reasonable to assume that under normal circumstances the VTS will confirm notification of the turning manoeuvre on the turning basin, taking into account the remaining traffic situation or will draw attention to other vessels and, if necessary, give special instructions, e.g. wait for an encounter with an outbound vessel, etc. The start of a turn on the turning basin signifies the beginning of berthing within the meaning of the second sentence of Section 33(1) SeeSchStrO.

Inter alia, the notification of the intended passage of the ships in the area helps to provide information about the traffic situation within the meaning of traffic information/advice and warnings in the context of maritime traffic control (Section 2(1) points 22 and 23 SeeSchStrO).

Section 2 SeeSchStrO: "Definitions

(1) The definitions given in Rules 3, 21, and 32 of the International Regulations for Preventing Collisions at Sea, 1972, as amended, shall also apply for the purposes of the present Ordinance; moreover, the definitions given hereunder shall apply for the purposes of the Ordinance:

22. the term 'maritime traffic control' comprises the whole complex of traffic information and traffic assistance provided, and any restraints for the control and regulation of traffic issued or imposed, by a VTS centre for preventing collisions and groundings, for controlling the traffic flow, or for preventing hazards to the marine environment as may arise from shipping;

23. the term 'traffic information' denotes navigational warnings and other information as may be provided by a VTS centre at pre-determined times, or at regular intervals, or upon request of individual vessels, and which may cover such aspects as fairway, weather and tidal conditions or the prevailing traffic situation;

24. the term 'traffic assistance' denotes advice and warnings as may be provided to the shipping community by a VTS centre as well as recommendations provided through a VTS centre by sea pilots advising ships under the provisions of Section 23(1) of the Sea Pilotage Act as per Official Notice of 13 September 1984 (promulgated in the Federal Law Gazette I, p 1213) and last modified by Article 3 of the Act of 17 July 1997 (promulgated in the Federal Law Gazette I, p 1832); such advice, warnings, and recommendations being provided in restricted visibility, or upon request, or when a VTS centre, upon assessment of its observation of traffic, deems it necessary to provide them; they may cover such aspects as the positions kept, the courses steered, the speeds attained and the manoeuvres made by specific vessels as well as the times of given vessels passing given points (as fairway, weather and tidal conditions or the prevailing traffic situation may require);

25. the term 'traffic instructions' denotes injunctions as may be imposed, on a case-by-case basis, by a VTS centre acting in its capacity as shipping police authority; such traffic instructions may cover right-of-way, overtaking, or head-on situations, minimum and maximum speeds, or may specify details to be observed by vessels proceeding on a given navigable waterway (as fairway, weather and tidal conditions or the prevailing traffic situation may require);"

The traffic regulations of the SeeSchStrO and the International Regulations for Preventing Collisions at Sea, 1972 (COLREGs) apply fully. Nautical supervisors are required to monitor and assess the entire area continuously in the VTS to ensure that a general overview within the port prevails. They may assist traffic or issue actual traffic instructions, which must be complied with immediately, by way of police orders.

At the Hanse Sail in Rostock, there was no special protection in the area, e.g. by a police boat sailing ahead while the FINNSKY was proceeding astern from the turning basin to Berth 60 on the River Warnow. Since this annual maritime event attracts a large number of vessels, merchant traffic encounters traditional and recreational vessels in an extremely confined space. Apart from the assignment of berths by the local port authority, a supervisor (contact person with the documents necessary for the respective crew of participating ships) and a rough timetable, no specific measures were taken for maritime traffic. For example, vessels were able to berth and cast off at their own discretion as with any other day. There was no organised timing that took regular merchant traffic into account. For example, the EMB and the STETTIN could have waited longer at the berth for the FINNSKY to finish berthing. The BSU was unable to ascertain why the STETTIN communicated only once with the VTS before casting off and not at all with the FINNSKY. In the case of the EMB, the pass in consultation with the VTS and the FINNSKY at Berth 65 on the starboard side of the fairway was successful.

4.5.1 Statements of the parties involved

The GDWS, the Wismar-Rostock-Stralsund Pilots' Association, the pilot and the ship's command of the STETTIN, and the master of the FINNSKY had different assessments of the behaviour according to the SeeSchStrO. This essentially concerned the interpretation of Sections 25 and 33, as well as the obligations to give way.

Section 25 Right of way of ships in a fairway

(1) In derogation of the provisions of Rules 9(b) to (d), 15, and 18(a) to (c) of the International Regulations for Preventing Collisions at Sea, 1972, as amended, the regulations contained in the following paragraphs shall apply to vessels navigating in a fairway.

(2) A vessel proceeding along the course of the fairway channel, irrespective of whether or not she can safely navigate only within the fairway channel, shall have the right of way over vessels

1. ***entering that fairway,***
2. ***crossing that fairway,***
3. ***making turns in that fairway,***
4. ***leaving their anchoring or mooring grounds.***

(3) Where a sailing vessel is not clearly proceeding along the course of the fairway channel, her conduct towards other sailing vessels shall be governed by the provisions of the International Regulations for Preventing Collisions at Sea, 1972, as amended, always provided that none of the vessels will impede or endanger any vessel having the right of way.

(4) A vessel navigating in a fairway, whether or not she is actually proceeding along the course of the fairway channel, shall have the right of way over vessels entering that fairway from a fairway branching off or joining it.

(5) When vessels are approaching, from both directions, a narrow channel where it is doubtful if there is sufficient clearance for more than one vessel to pass at a time, or when such vessels are approaching a point in a fairway that is marked by the visual sign described under Item A.2 of Annex I to the present Ordinance,

1. ***in the case of tidal waters as well as of non-tidal waters where a current prevails, the right of way shall be deemed to pertain to the one vessel riding with the current, respectively, the one vessel having ridden against the current when there is no current prevailing at the time in question;***
2. ***in the case of non-tidal waters where no current prevails, the right of way shall be deemed to pertain to the one vessel obliged by applicable rules to use the starboard side of the fairway.***
   The vessel having no right of way shall wait outside the narrow channel for as long as until the other vessel is well past and clear.

(6) A vessel having to yield the right of way shall, in good time, demonstrate through her conduct that she has the intention to wait. Passage shall not be resumed until the person in command of her is in a position to verify that he or she can do so without affecting the safety of other vessels in the vicinity.

Section 33 Berthing and mooring

(1) No vessel shall impede any other vessel through her anchoring or mooring. Once a vessel has begun with a berthing manoeuvre, all other vessels shall take this fact into account and shall navigate with the appropriate care and diligence.

(2) Berthing and mooring shall be prohibited

1. ***at flood barriers, riverside buildings, guiding racks, level-gauging posts, floating and fixed aids to navigation;***
2. ***at banks or embankments where the soil is liable to break away into the water;***
3. ***at locations where anchoring is prohibited under the provisions of Section 32(1)(Item 1 or 5) above;***
4. ***along stretches of waterways where anchoring is prohibited under the provisions of Section 32(1) (Item 6) above;***
5. ***at such locations as have been made known by a Notice or Notices under the provisions of Section 60(1) below.***

(3) Whenever possible, each vessel moored alongside another vessel shall be adequately tied up by both ends to the bank or embankment.

(4) No vessel, when moored, shall turn her propeller except

1. ***for trial purposes, but then only with the least power possible applied,***
2. ***immediately before setting off and,***
3. ***in either case, when other vessels or installations will not be put at any risk.***

GDWS

Section 25(2) SeeSchStrO deals with the relationship between vessels proceeding along the course of the fairway and vessels entering that fairway, crossing that fairway, making turns in that fairway and leaving their anchoring or mooring grounds. Section 25 SeeSchStrO refers only generally to turns in the fairway, e.g. by a dredger or a vessel intending to enter a fairway which branches off, and not to berthing manoeuvres explicitly.

The behaviour of traffic participants during berthing manoeuvres is dealt with in Section 33, which takes precedence over Section 25 SeeSchStrO because at the start of the berthing manoeuvre other shipping has to take this fact into account and navigate with the appropriate care and diligence. The FINNSKY already turned on the turning basin and had thus began the berthing operation. She sailed astern to Berth 60, as assigned to her by the port authority. The STETTIN should have taken this fact into account. Accordingly, she would have had to navigate with the appropriate care and diligence.

According to the purpose and objectives of the second sentence of Section 33(1) SeeSchStrO, appropriate care and diligence must be interpreted as the avoidance of collisions or dangerous traffic situations. This can be accomplished by a variety of measures, such as reduced speed and waiting for the completion of a berthing manoeuvre, timely and safe evasion, etc. In the event of doubt as to the interpretation of the traffic situation and the obligation to evade, good seamanship would imply liaising with the other traffic user directly. This normally takes place on VHF or by means of sound signals if necessary. In case of doubt, the intervention of the VTS is also an option. None of these measures could be identified on the audio recordings of the VTS or VDR of the FINNSKY.

It is almost customary for pilots and the Pilots' Association to connect the assignment of the berth with an expectation of sailing southward on the Warnow fairway's eastern side. This situation did not arise, however, and much more attention should have been given to observing the applicable rules of the SeeSchStrO. Apart from that, shipping was aware of the FINNSKY's track through the communications with the VTS on VHF channel 73 and the reporting points plotted on the navigational chart. Bearing that in mind, the STETTIN's voyage planning was wrong from the outset, as the pilot evidently did not advise the master on the actual traffic situation but rather with regard to the FINNSKY's probable behaviour. In cases of doubt, all traffic participants should seek to liaise orally on VHF. If a traffic participant cannot be reached, then contact should be made via the VTS.

Pilots' Association

Ferries definitely do not begin the berthing manoeuvre for the ro-ro terminal on the turning basin. The turn on the turning basin and subsequently proceeding astern/ traversing is subject to Part 4 of the SeeSchStrO (Sailing rules). Section 25 of these provisions has particular relevance in that it states that ferries turning, subsequently proceeding astern and crossing the fairway are required to give way.

Section 33 belongs to Part 5 of the SeeSchStrO, however (Stationary traffic). A ship only begins to participate in *stationary traffic* through berthing/mooring once she has sailed to her berth and begins with berthing and mooring in the immediate vicinity thereof.

Accordingly, it may be determined in the case of ferries that they are subject to Section 25 SeeSchStrO when they turn and then sail astern/traverse to their berth. Section 33 becomes applicable when the ferry's participation in *sailing* traffic changes to *stationary*, i.e. upon starting the actual berthing manoeuvre. The Pilots' Association and the supervisory authority do not disagree on the interpretation of the traffic situation in this regard.

Through the assignment of the berth at the Stromkaje quay, permission to sail southward on the Warnow fairway's eastern side, where the ro-ro ships have to place their stern gate on the ramp, is granted automatically.

Pilot of the STETTIN

The FINNSKY is at Berth 60 or 61 once a week. The FINNSKY is exempted from pilotage and normally sails relatively close to the eastern edge of the quay and then places her stern gate on the ro-ro ramp in a practised manner. These ships only keep to the middle of the fairway in stormy westerly winds. The STETTIN's mate was advised that the FINNSKY would remain on the eastern side, so as to make fast there, and that outbound shipping must pass on her port side. Inasmuch, the pilot opted for the western side of the River Warnow when passing the FINNSKY from the outset in the voyage planning based on his experience, even though the actual traffic situation had yet to materialise.

Legal counsel of the ship's command of the STETTIN

INITIAL SITUATION

1. The FINNSKY was required to give way to transiting vessels from the point at which she turned on the turning basin until she made fast at the ro-ro pier. This is evident first from Section 25 (Part 4 'Sailing rules') and then from Section 33 (Part 5 'Stationary traffic') SeeSchStrO.

2. This opinion is also held by the Arbeitskreis Recht (law study group) standing committee of the Deutsche Nautische Verein (German nautical association).

3. The FINNSKY was inbound from the sea and destined for the ro-ro pier on the eastern bank of the Unterwarnow (Berth 60). As with all ferries destined for the ro-ro pier, the FINNSKY followed the usual practise in the area for an approach, first turning at the turning basin and then traversing astern/laterally to the ro-ro pier.

THE FINNSKY'S OBLIGATION TO GIVE WAY UNDER SECTION 25 SEESCHSTRO

4. It is clear from traffic legislation that ferries are subject to the obligation to give way under Section 25(2) SeeSchStrO upon turning on the turning plate. Ferries remain subject to this regulation on giving way when sailing astern subsequently and crossing the fairway (from the middle of the fairway to the eastern side). At the beginning of the berthing manoeuvre, ferries are subject to the obligation to give way under Section 33(1) SeeSchStrO. In both phases (under Section 25 and subsequently under Section 33) ferries are required to give way to transiting shipping. Merely secondarily in the final stage of berthing must transiting shipping navigate with the appropriate care and diligence (second sentence of Section 33(1)).

5. The STETTIN was the vessel having right of way over the FINNSKY. Pursuant to Section 25(2) SeeSchStrO, the STETTIN (on a northerly course) was "A vessel proceeding along the course of the fairway channel, [...]." Accordingly, in relation to the FINNSKY, which was turning and traversing astern/laterally, she was to be classified as transiting traffic. After the FINNSKY had started the berthing manoeuvre (which was evidently not the case at the time of the collision), she was subject to the obligation to give way pursuant to the first sentence of Section 33(1) SeeSchStrO.

THE FINNSKY'S OBLIGATION TO GIVE WAY UNDER SECTION 33 SEESCHSTRO

6. Even if the beginning of the FINNSKY's berthing was shifted a considerable way forward (which seems doubtful in view of the legal system, which classifies berthing and Section 33 to *Stationary traffic*), the FINNSKY's obligation to give way remains indisputable. The first sentence of Section 33(1) SeeSchStrO clearly stipulates that berthing vessels must give way to the shipping: "No vessel shall impede any other vessel through her anchoring or mooring."

7. The second sentence of Section 33 (1) SeeSchStrO does not invalidate or restrict the FINNSKY's obligation to give way while she was berthing. It is merely supplemented by the requirement of appropriate care and diligence (Section 3(1)), which is perfectly consistent with the ordinary practise of seaman: "Once a vessel has begun with a berthing manoeuvre, all other vessels shall take this fact into account and shall navigate with the appropriate care and diligence." A restriction or even reversal of the FINNSKY's obligation

to give way cannot be inferred from this. The second sentence merely provides an obligation to take certain circumstances into account. Consequently, the second sentence of Section 33(1) SeeSchStrO merely clarifies Rules 17(a)(ii) and 17(b) COLREGs, as well as the general obligation of appropriate care and diligence under Section 3(1) SeeSchStrO. The FINNSKY also remained continuously obliged to give way to the STETTIN according to the second sentence of Section 33(1) SeeSchStrO. The FINNSKY failed to comply with this requirement.

8. On the other hand, the STETTIN was merely obliged to take into account the fact that the FINNSKY was about to approach her berth and to navigate with the appropriate care and diligence. She fully complied with this obligation of appropriate care and diligence. In particular, she took all measures at her disposal to enable the FINNSKY to berth without any problems and to prevent the collision.

THE STETTIN'S OBLIGATION OF APPROPRIATE CARE AND DILIGENCE

9. The STETTIN's port manoeuvre into the western part of the fairway was initially the only measure that could in fact be carried out (see below for details). Furthermore, it was this very manoeuvre that was appropriate and necessary to satisfy the obligation of care and diligence. The objective was to keep clear of the area of water needed for the FINNSKY to traverse eastward and berth at the ro-ro pier. During the meeting with the BSU on 19 April 2018, the master once more confirmed convincingly and with navigational expertise: Proper navigational practise generally requires (not only in Rostock) that the area of water to the berth is kept clear if a vessel is berthing. In keeping with navigation practise, all the vessel traffic thus moved into the western part of the fairway in due form.

10. Rather than being an exception, the navigation practise of the EMB confirms that mentioned above. After the first communication between the EMB and the VTS, the EMB was to pass the FINNSKY to the west (green side), which was also the STETTIN's intention. Only after the FINNSKY had turned and was much further to the west of the fairway than presumably expected did the EMB correctly reassess the passing scenario. It is in this scenario that it was explicitly agreed on VHF that the EMB would pass east of the FINNSKY, contrary to standard practise.

11. Moreover, at this point the FINNSKY was still much further downstream and away from her berth than during the subsequent approach with the STETTIN. Accordingly, the manoeuvring behaviour of the STETTIN cannot be evaluated on the basis of that of the EMB. The encounter situation of each vessel with the FINNSKY is significantly different.
    The EMB passed the FINNSKY under incomparable circumstances, i.e. much earlier and at another part of the fairway.

STARBOARD MANOEUVRE OF THE STETTIN IMPOSSIBLE

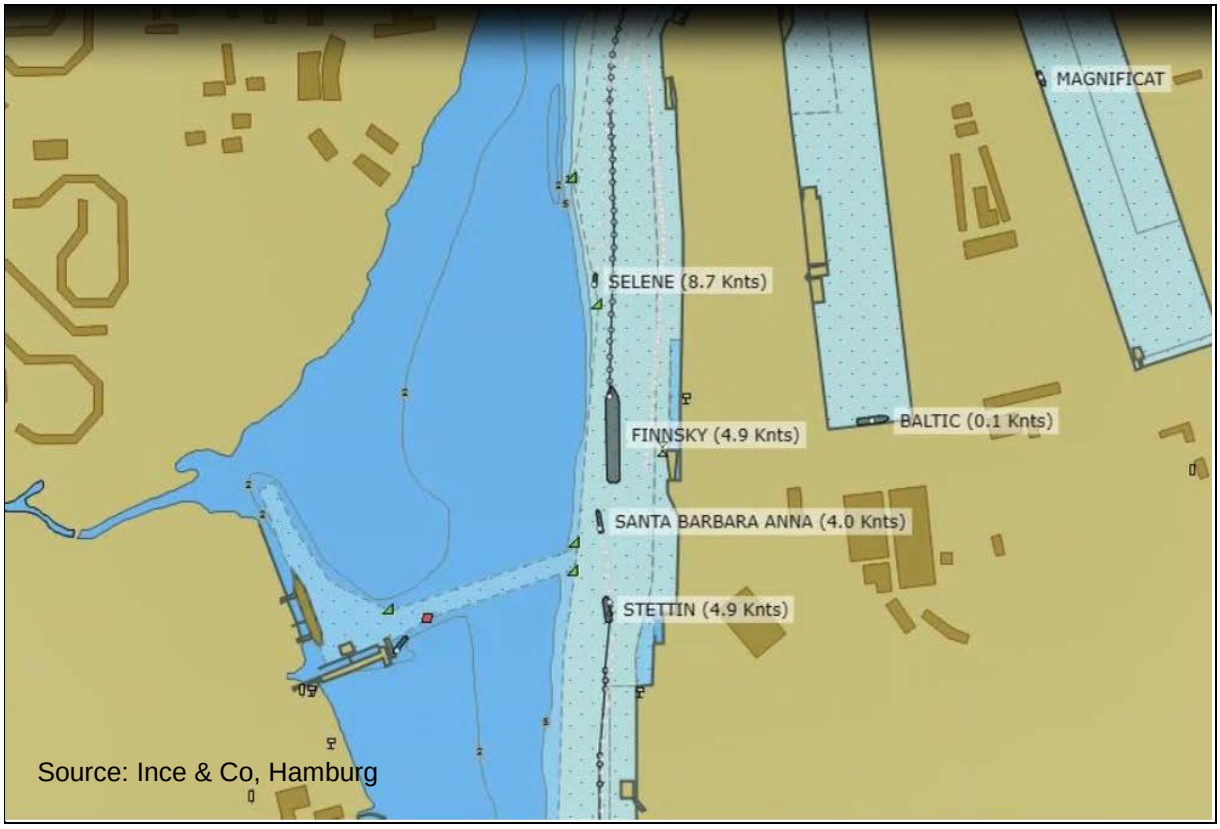


Figure 43: Image 1: AIS/ECDIS shortly before the collision

12. Based on the initial situation described above and the customary manoeuvring practise, it was out of the question for the STETTIN to give way to starboard. Moreover, it was virtually impossible for the STETTIN to give way to starboard. Image 1 shows the positions of the FINNSKY, the SANTA BARBARA ANNA and the STETTIN shortly before the collision.

13. Image 2 shows a photograph that roughly corresponds to the time shown in Image 1. Other vessels are visible there. These are not shown in Image 1, as they do not have their own AIS transponder.

Figure 44: Image 2: Photograph from the bridge of the STETTIN

14. The photograph was taken from the bridge of the STETTIN. In particular, it shows a towed convoy to starboard (in addition to other vessels), which is crossing the STETTIN from starboard to port. It is obvious that the STETTIN could not possibly turn to starboard at this point in time.

15. Image 3 shows another photograph. This was taken a few minutes earlier, also from the bridge of the STETTIN.

16. It shows two relevant items of information on the starboard side of the STETTIN. Firstly, one of the ro-ro terminals is shown there. This projects westwards into the Unterwarnow. It is obvious that the STETTIN could not possibly go to starboard before passing this terminal. Furthermore, Image 3 shows the towed convoy already seen in Image 2. This is already on the starboard side of the STETTIN's bow. Viewed together, Images 2 and 3 thus clearly indicate that this towed convoy sailed on starboard side just ahead of the STETTIN during the entire approach. Because of this towed convoy and the ro-ro terminal projecting into the Unterwarnow, at no time was it possible for the STETTIN to give way to the FINNSKY to starboard.

Figure 45: Image 3: Photograph from the bridge of the STETTIN

17. It is also worth taking a closer look at the FINNSKY in this photograph. Her course (in relation to the green buoy line, in particular) clearly shows that the FINNSKY is already traversing to the east at this point.

PORT MANOEUVRE BY THE STETTIN ONLY POSSIBLE AFTER A PROLONGED PERIOD

18. Images 2 and 3 also show an important aspect for assessing the situation on the port side of the STETTIN. Three towed convoys can be seen ahead of the SANTA BARABARA ANNA in Image 2 (taken later). Image 3 (taken earlier) shows only one of these three towed convoys (apart from the one to starboard already discussed), however. The two other towed convoys cannot (yet) be seen in Image 3 for the following reason: They have not yet passed the SANTA BARBARA ANNA in Image 3. Rather, they are still on the STETTIN's port side. Only at the point in time depicted in Image 2 have the somewhat faster towed convoys overtaken the SANTA BARBARA ANNA. This must result in the following: The water area on the STETTIN's port side, too, was blocked until shortly before the collision. Consequently, she was not able to initiate the port manoeuvre until after a prolonged period. She actually only had one option to begin with, which was to reduce her speed until bordering on the limits of steering capability. This is exactly what the STETTIN's pilot and ship's command did.

INTERIM CONCLUSION

19. To take due care (once again, even though she had right of way), the ship's command and pilot of the STETTIN took the only measure open to them in this situation. Having knowledge of the local area, the pilot knew the FINNSKY was destined for the ro-ro pier. He is also familiar with the usual manoeuvring practises (as described above). Accordingly, he assisted with the necessary crossing of the fairway to the eastern side and the berthing of the FINNSKY pursuant to Section 3(2) and the second sentence of Section 33(1). He reduced the STETTIN's speed to the minimum (limits of steering capability). At the same time, he recommended that the STETTIN steer further to port and not sail on the water area required by the FINNSKY for traversing eastward and berthing at the ro-ro pier. Given these manoeuvres, the STETTIN fully satisfied her obligation of appropriate care and diligence vis-à-vis the FINNSKY.

TRAFFIC CONTROL

20. The above remarks have illustrated just how dangerous the traffic situation during the Hanse Sail was on 12 August 2017. Heavy traffic prevailed on the Unterwarnow. In addition to traditional vessels and ferries, numerous recreational craft also took part in the parade of ships sailing downstream toward the sea. It is reasonable to assume that not every skipper of a recreational craft had the training and experience necessary to operate their vessel safely in the heavy traffic. This was vividly demonstrated by the navigation practises of the towed convoys.

21. Extremely large in relation to the area, the FINNSKY was coming from the sea and sailing astern quickly into this parade of ships. At the same time, the view to aft of the ship's command on the bridge, positioned at the front, was obstructed because of the design (high stern ramp). This means that the ship's command of the FINNSKY could not see many of the oncoming vessels sailing downstream. Most of them could not be detected with AIS, either. Consequentially, the ship's command of the FINNSKY only had the radio reports of the deck crew positioned aft for their manoeuvring decisions.

22. The hazardous situation described above should have been precluded with urgency by preventive traffic control measures. Preventive measures are obvious and common practise in other seaports, e.g. Hamburg and Bremerhaven. In particular, monitoring and traffic control on the Unterwarnow by the WSP would have been appropriate in the present case.

SPEEDS AND PREVAILING CURRENT

23. The FINNSKY and STETTIN's SOGs have been determined using the AIS recordings on hand. For the determination of the speed relevant to manoeuvring, i.e. the STW, the AIS recordings must be adjusted to account for the prevailing current on the River Warnow at the time of relevance. This flows continuously seaward to the north at a speed of some 2 kts. The current flows in the opposite direction extremely rarely and this did not occur on the day of the collision.[4]

24. The FINNSKY's speed astern against the current is recorded at some 5 kts SOG. This is equivalent to a STW of about 7 kts. The situation in the case of the STETTIN is the other way around. The speed with the current is recorded at about 5 kts SOG. This is equivalent to a STW of about 3 kts. Accordingly, she was just above the limits of steering capability. The FINNSKY maintained her course and speed up until the collision. The STETTIN (with her relatively short and compact hull) could not reduce her speed any further without jeopardising her ability to steer.

25. During the meeting on 19 April 2018, the master explained the speed at which ro-ro ferries of the same type as the FINNSKY can be manoeuvred astern safely convincingly and with navigational expertise. He demonstrated in the process that manoeuvrability when moving astern is maintained up to a maximum STW of about 3.5 kts. The reason for this is that bow and stern thrusters can only be used effectively up to this speed.

THE STETTIN'S LAST-MINUTE AVOIDING ACTION

26. The STETTIN was prohibited from giving way to starboard for several reasons. To begin with, this was not appropriate due to the obligation of due care under the second sentence of Section 33(1) SeeSchStrO. The STETTIN would have had to navigate the free water areas needed by the FINNSKY for crossing the fairway and berthing. Furthermore, it was virtually impossible to give way to starboard. The STETTIN was overtaken on her starboard side by one of the towed convoys in breach of the regulations. As regards the details, the signatories refer to the above remarks.

[4] Note by the BSU: The STETTIN is not equipped with a speed log that measures the STW. To that extent, it was not possible to calculate the current's velocity but only to estimate the surface current based on the swirl visible at the buoys.

27. Giving way to port was not possible to begin with, either, because of the recreational craft situated there. As regards the details, the signatories refer to the above remarks here, too.

28. The only option in the given situation was to minimise the speed, taking into account the ability to steer, and sail just clear of the FINNSKY's port stern after passing the recreational craft. In the final instance and in view of the risk of collision, a hard-over rudder to port was applied, which mitigated the collision significantly.

29. An astern manoeuvre by the STETTIN was impossible. The STETTIN is equipped with a very large right-handed fixed pitch propeller. In an astern manoeuvre, she would have responded with a rapid and (due to the rudder) uncontrollable starboard turn. This would have entailed the risk of being struck on the side by the FINNSKY, which was sailing astern rapidly. This would have involved catastrophic risks.

THE FINNSKY'S LAST-MINUTE AVOIDING ACTION

30. The FINNSKY maintained her course and speed up until the collision. This is remarkable in the context of the high traffic density at the Hanse Sail. Added to this is the fact that several people on the stern of the FINNSKY near the loading ramp had observed the approach and they were presumably in contact with the ship's command on the FINNSKY's bridge via transceiver. Despite that, no measures were taken to prevent the collision. A brief and simple kick ahead, thus stopping the astern movement, would have been easily possible for the FINNSKY while maintaining complete manoeuvrability. Moreover, as a result of the wake caused by this manoeuvre, the FINNSKY would have pushed the STETTIN away from her stern. This would definitely have prevented the collision.

WARNINGS AND RADIO CONTACT

31. It has been established that the FINNSKY did not do anything to address her rapid approach to the vessel traffic located astern on VHF. That the STETTIN issued a warning signal with her tyfon is indisputable. It remains open whether the FINNSKY issued a tyfon signal – nobody on the STETTIN heard one, at any event. Taking into account the technical conditions and the master's assessment (also on 19 April 2018), which was convincing and demonstrated navigational expertise, it must be assumed that the FINNSKY's tyfon (on the bow and directed forward) was not audible aft. The ship's command of the FINNSKY should have been aware of this fact.

32. The STETTIN issued a warning signal (long blast with her tyfon). This follows clearly from the testimony of the master and the pilot. The ship's command and the pilot also tried to contact the FINNSKY on channels 73 and 16. In both cases unsuccessfully. The technical details of possible interference were discussed in the meeting of 19 April 2018. The signatories once more refer to the unintelligible radio messages in the radio recordings.

CONCLUSIONS

33. In assessing the overall circumstances, it must be concluded that the ship's command of the STETTIN, under pilotage, clearly did not behave incorrectly. During the approach of both ships, the basic scenario in terms of giving way was clear. The FINNSKY was the give-way vessel. Based on our assessment, the STETTIN's navigation practises were also correct in respect of her secondary obligations (due care and last-minute avoiding action). Ultimately, there was no reasonable alternative to her navigation practises. The breaches of obligation by numerous other traffic participants – the FINNSKY, in particular – placed the STETTIN in a hopeless situation and reduced her room to manoeuvre to zero. Accordingly, the cause of the collision is to be found in the FINNSKY's considerable breaches of obligation.

<u>Master of the FINNSKY's legal counsel</u>

The legal position is clear in respect of the relevant traffic regulations:

Even if the FINNSKY had already started the berthing manoeuvre at the turning basin, she is not open to reproach in this regard. She sailed clearly on her side of the fairway toward the berth, reporting this accordingly on VHF.

On the other hand, the STETTIN failed to observe the traffic with the requisite care, meaning she also failed to navigate with due care within the meaning of Section 33(1) SeeSchStrO. This was the only reason for the STETTIN's sudden alteration of course, which put her directly onto the FINNSKY's heading.

There is more evidence to suggest that after turning at the turning basin and continuing her voyage astern toward the berth, the FINNSKY was a vessel following the fairway, as defined by Section 25(2) SeeSchStrO. She observed the requirement to keep to the starboard side, had reported precisely that on VHF, the speed was moderate and the FINNSKY's overall course was clearly visible.

On the other hand, the STETTIN initially opted for a course in the middle of the fairway and – more pertinent within the meaning of the second point in Section 25(2) SeeSchStrO – began to cross the western half of the fairway, on which the FINNSKY was clearly sailing, immediately before the accident. Accordingly, the FINNSKY had right of way.

4.6 Legal assessment of certificates and possible consequences

A safety certificate for traditional vessels was issued for the STETTIN by the Ship Safety Division (BG Verkehr) on 15 April 2014 in accordance with section 1.1 of the Safety Directive for Traditional Vessels. This bilingual certificate allows her to carry up to 130 people and travel in coastal waters. The certificate is valid until 14 April 2019. Also on 15 April 2014, the STETTIN was granted an additional certificate for a period of five years according to which the STETTIN is permitted to carry out day trips of no longer than 10 hours with up to 225 persons on board in the months of May to September at wind speeds of up to 5 Bft on waters up to the maritime border. In the course of the investigation, the Ship Safety Division (BG Verkehr) was asked to comment on the recognition of the STETTIN as a traditional vessel and the associated issue of a safety certificate for traditional vessels, including the additional certificate.

4.6.1 Statement of the Ship Safety Division (BG Verkehr) on the certificate as a traditional vessel for the coastal waters of all seas up to 30 nm for 130/225 passengers (abstract)

The licence allowing the STETTIN to sail as a traditional vessel or ‘museum ship’ was granted on the basis of the Safety Directive for Traditional Vessels in accordance with section 9 (3) and section 6 (1) No. 3 Ordinance for the Safety of Seagoing Ships (Ship Safety Ordinance – SchSV) or the then ‘guidelines in accordance with section 6 of the Ordinance for the Safety of Seagoing Ships to improve the safety of traditional vessels’. In accordance with the provisions of this ordinance, the ship was certified to meet the prescribed safety requirements for traditional vessels. Under German law, only vessels that do not fall within the scope of Directive 2009/45/EC on safety rules and standards for passenger ships or the former Directive 98/18/EC are certified as traditional vessels. The exception provided for in Article 3 (2) (a) (v) (original, and individual replicas of historical passenger ships designed before 1965, built predominantly with the original materials) of the Directive was applied to the STETTIN.

Historical ships designed before 1965 and built predominantly with original materials are also covered by the exemption provided for in Article 3 (2) (a) (v) of Directive 2009/45/EC, even if they were not originally used as passenger ships, since the concept of passenger ships is not linked to their structural characteristics but only to the number of passengers carried (or authorised for carriage). The term ‘historical passenger ship’ can therefore be applied to historical ships that were only used to carry passengers after 1965, even if they are structurally unchanged. The special regulations for traditional vessels take the structural and operational characteristics of traditional vessels into account, so that the regulations applicable to modern passenger ships do not apply to this type of ship.

Directive (EU) 2017/2108 of the European Parliament and of the Council of 15 November 2017, which amended Directive 2009/45/EC, OJ L 315/40 and is applicable by EU Member States as of 21 December 2019, amended Article 3 (2) of Directive 2009/45/EC as follows: "This directive does not apply to vi) traditional vessels"; the following point was added to Article 2 of Directive 2009/45/EC: "zc) 'traditional vessel' means any kind of historical passenger ship designed before 1965 and their replicas built predominantly with the original materials, including those designed to encourage and promote traditional skills and seamanship, that together serve as living cultural monuments, operated according to traditional principles of seamanship and technique"; recital (7) of Directive (EU) 2017/2018 states the following: "With a view to increasing legal clarity and consistency, and thereby increasing the level of safety, a number of definitions and references should be updated and further aligned with the related international or Union rules. In doing so, special care should be taken not to alter the existing scope of Directive 2009/45/EC. In particular, the definition of 'traditional vessel' should be better aligned with Directive 2002/59/EC of the European Parliament and of the Council, while preserving the current criteria of the year of built and type of material".

The safety certificate issued for traditional vessels defines the area of operation as "sailing in coastal waters", i.e. "sailing in the coastal waters of all seas up to 30 nm from the coast and the sea areas of the North and Baltic Seas, the English Channel, the Bristol Channel, the Irish and Scottish Seas, the Mediterranean Sea and the Black Sea". The operation of the STETTIN as a traditional Class C vessel within the meaning of the directive for a voyage beyond the limits of navigation in coastal waters and/or for a worldwide voyage was not expressly permitted under the national safety certificate for traditional vessels that was issued; however, according to the relevant regulations, her operation abroad was also not excluded, but in individual cases was subject to the approval of the respective port state (cf. also Administrative Court Hamburg judgment 5 K 2846/14 of 21 March 2017 "Roald Amundsen"). The requirements for certification of the STETTIN as a passenger ship according to SOLAS were not relevant here. The international SOLAS Convention is in principle not applicable to traditional vessels on "national voyages". The Safety Directive for Traditional Vessels does not contain any statement on the permitted number of persons. Here an additional permit or special permit for day trips (for up to 5 major maritime events) was granted with the secondary provision that sufficient life-saving appliances are available for all persons (225 on the national voyage) and, according to a professional assessment, a "**protected space**" on board. The number of persons was calculated on the basis of the rescue equipment and the evacuation plan. This basically means that an adequate space in a closed room, which serves as an emergency station, must be guaranteed. If comparable protection is guaranteed in individual cases, alternative solutions may also be approved. The accident prevention regulations apply exclusively in commercial shipping and do not include traditional vessels.

An English translation of the national certificate for traditional vessels has no legal effect. The translation into English is used for controls in foreign ports, for example under the German/Danish Agreement for Traditional Vessels on the Flensburg Fjord (Flensburg Fjord Agreement) or the London Memorandum of Understanding (London MoU). Since the German safety certificates for traditional vessels are national certificates, the respective foreign port state is not obliged to recognise Germany's national certificates in the absence of international or European regulations for traditional vessels on international voyages. However, it is precisely the mutual recognition of national certificates for traditional vessels that is subject of the Flensburg Fjord Agreement and the London MoU.

Compliance with the International Safety Management System (ISM) is generally voluntary on traditional vessels; the Safety Directive for Traditional Vessels do not expressly provide for this. Considering the background of Denmark's requirements, the recommendation to comply with the ISM system has been implemented since 2010. At the time, the ISM system was voluntarily introduced and updated on board the STETTIN and has since been regularly audited by the Ship Safety Division (BG Verkehr). In this regard, we also refer to the announcement of the Ship Safety Division (BG Verkehr) on the implementation and further development of systems for the organisation of safety measures (operational safety measures) on board of traditional vessels, Transport Sector Gazette AT No. 123, Issue 15 – 2016, 533-536. The guideline for the implementation of operational safety measures on board traditional vessels is intended to support the operators of traditional vessels in the formulation, implementation and further development of a suitable and "tailor-made" system for the organisation of safety measures (operational safety system) on the basis of the ISM Code. The aim of implementing an operational safety system on traditional vessels is to achieve and maintain a high level of safety and environmental protection on board the ships. Deviations from modern technology should also be replaced by organisational measures in order to achieve an equivalent level of safety without impairing the historical character of the vessel.

The STETTIN was inspected by Ship Safety Division inspectors at regular intervals in accordance with the standards of the Safety Directive for Traditional Vessels. The subject of the inspection is the checklist according to the Safety Directive for Traditional Vessels. Documentation with regard to the vessel's stability is not required under the Safety Directive for Traditional Vessels.

According to the **Decree WS 25/6234.3/3-SR-Trad issued on 3 July 2013** by the Federal Ministry of Transport and Digital Infrastructure (then Federal Ministry of Transport, Building and Urban Development), which is the supervisory authority of the Ship Safety Division (BG Verkehr), historical vessels within the meaning of the Safety Directive for Traditional Vessels are mainly ships built with the original materials which are worth preserving due to their design, construction, their former intended use or their rarity and which essentially correspond to the original condition at the time of their construction or a later condition which is important for the vehicle during its economic period of use.

Conversions or changes due to compliance with technical requirements or regulations are not taken into account. As a rule, every voyage of a traditional vessel must focus on imparting maritime or historico-cultural knowledge. Guests should be encouraged to participate in on-board operations and to experience the special features of the operations and/or the design and construction of the historic vehicle. This principle must be clearly reflected in all aspects, but especially in the entire external presentation of the vessel. Voyages catering primarily to tourism are not permitted. The same applies to voyages for purposes that do not primarily serve to impart maritime-historical knowledge (e.g. weddings and family celebrations, burial at sea, incentive trips, etc.). Therefore, the operator must ensure that a sufficient number of qualified members of the regular crew are on board in any case. This does not apply to participation in major maritime events, which may not, however, make up the major part of the ship's operations.

4.6.2 Legal opinion of the operator of the Stettin (abstract)

The **operator** also commented on the legality of issuing the ship safety certificate and the additional permit, endorsing the opinion of the Ship Safety Division (BG Verkehr). In his view, the certificate and permit had been granted lawfully and he further makes the following arguments in addition to those already mentioned above:

- All ships built before 1965 are subject to the exception of Article 3 (2) (a) (v) of Directive 2009/45/EC, as the term "passenger ship" in its current definition was not introduced in the EU until 2009 and internationally until 1974 (SOLAS). Ships built before that time would not have been able to comply with these regulations, as the relevant regulations did not yet exist.
- In its decision, the Hamburg Higher Administrative Court expressly left open the question as to whether the exception can also be applied to ships that were not built or designed as passenger ships before 1965. It is not up to the Federal Bureau of Maritime Casualty Investigation (BSU) to decide on this matter under European law.

4.6.3 BSU assessment with regard to the classification of the STETTIN as a traditional vessel and the issue of the certificates issued

The BSU cannot endorse the above-mentioned legal opinions of the Ship Safety Division (BG Verkehr) and the operator.

4.6.3.1 Directive 2009/45/EC of the European Parliament and of the Council of 6 May 2009 on safety rules and standards on passenger ships[5]

In this case, Directive 2009/45/EC applies directly via section 5 (2) Ordinance for the Safety of Seagoing Ships (SchSV) and Annex I D No. 12. The steam icebreaker STETTIN carries passengers within the meaning of Directive 2009/45/EC and is therefore a passenger ship as defined in Article 2 (e) and (k) of that Directive. According to letter e), a passenger ship is a ship carrying more than 12 passengers, according to letter k) a passenger is any person except the master, members of the crew (in the broadest sense) or children under one year. Both conditions are undoubtedly fulfilled, so that the STETTIN must be assumed to be a passenger ship covered by the directive, unless there is an exception under Article 3 (2) of Directive 2009/45/EC. The only exception that could be considered would be point (a) (v), which exempts *"historical passenger ships designed before 1965 and built mainly using the original materials, either as originals or as individual replicas"*.

However, the STETTIN cannot be subsumed in this category, since she is not a historical passenger ship that was built before 1965 or one that was at least operated as a passenger ship, but rather an icebreaker built in 1933 that was merely re-designated as a passenger ship at the beginning of the 1980s without conversions. The view of the Ship Safety Division (BG Verkehr) and the operator that this regulation may also apply to all other ships that were not built or used as passenger ships cannot be followed. This is already shown by the choice of words in the relevant passage and in Directive 2009/45/EC as a whole. Each article specifies the types of vessels to be covered, in particular article 3, and there is no reason to derogate from them because of a single exception. On the other hand, it would also be absurd. Directive 2009/45/EC serves to increase the safety standard. The operator's argument that all ships built before 1965 could never have complied with a directive that was not yet in force and that it could therefore not apply cannot be convincing. The meaning is obviously another one. International ship safety regulations and the still valid definition for passenger ships have existed since 1914 and/or 1929 (first and second SOLAS Convention). Ships built as passenger ships before 1965 thus at least met the safety standard for passenger ships at that time, which was significantly higher than, for example, that of merchant ships. This standard should at least be maintained. If merchant ships built before 1965 were also allowed now, there would even be a minus in terms of safety standards, because these were not even subject to the safety regulations for passenger ships in force before 1965.

The view outlined here is supported by the decision of the Higher Administrative Court (OVG) Hamburg of 8 October 2009 – 1 Bs 174/09, although the decision, as correctly explained by the Ship Safety Division (BG Verkehr), first and foremost concerns another case, namely the conversion of a merchant ship into a passenger ship, while the STETTIN was merely re-designated without major conversion measures. The Court also expressly leaves open the question as to whether this exception also applies to ships, which were not built or designed as passenger ships before 1965.

[5] Last amended by Directive (EU) 2017/2108, hereinafter only referred to as Directive 2009/45/EC

However, the decisive question here as to whether the exception could also be applied to STETTIN is answered in the negative. The court makes it clear that the design and construction or conversion of a ship as a passenger ship should in any event have taken place before 1965, i.e. that it should have been a passenger ship at least at that time. This cannot be said for the STETTIN, because she was designed and built as an icebreaker and not converted into a passenger ship and operated accordingly until the beginning of the 1980s. She can therefore not be subsumed under the exception. The resulting legal consequences are more than clearly stated in official guideline No. 2: "A seagoing ship to be classified as a passenger ship within the meaning of Directive 2009/45/EC of 6 May 2009 shall not be subject to the Safety Directive for Traditional Vessels [...]. A safety certificate for traditional vessels cannot be issued to such a vessel. Here, the wording of the official guideline already makes it clear that this is not an individual case decision, but a decision of principle.

In the opinion of the BSU, the STETTIN must therefore be treated as a passenger ship and is subject to Directive 2009/45/EC in conjunction with section 5 (2) of the Ordinance for the Safety of Seagoing Ships (SchSV) and Annex I D No. 12 to the Ship Safety Act (SchSG).[6] As Directive 2009/45/EC applies to both national and international voyages, it is relevant both for the safety certificate for traditional vessels and for the additional permit.

This assessment is not changed either by the amendment of Directive 2009/45/EC by Directive (EU) 2017/2108 after the date of the accident, which introduces the traditional vessel as an exception, but maintains the previous definition of the historic passenger ship. Furthermore, recital 7 states that the amendments do not change the scope of application of Directive 2009/45/EC.

4.6.3.2 Safety Directive for Traditional Vessels

Neither can this classification change the Safety Directive for Traditional Vessels[7] applicable at the time of the accident. Traditional vessels are to be used as historical vessels *"for the preservation of maritime traditions, for social or comparable purposes as seagoing ships"* in accordance with No. 1 1.1, sub-item 4 of the Safety Directive. The desirable preservation of maritime traditions is taken into account by the national legislator/regulator by granting traditional vessels significant relief from equipment and structural requirements in comparison to professional ships in order to preserve their historicity.

[7] The regulation amending the maritime safety rules for the construction and equipment of traditional and other ships not subject to international ship safety rules, which entered into force on 7 March 2018, does not change the findings and assessments of the BSU.

However, this relief is only justified and permissible if the vessel in question is actually operated in such a way that it can be used at least in accordance with its traditional purpose. It is obvious that at the time of its construction (1933) and in the following decades, a steam icebreaker was never designed to carry passengers, nor to carry far more than 100 people. The "additional permit" almost doubles the number of persons permitted on board from an already very high level. However, there are not enough seats on board for either the approved 130 or 225 persons. In terms of protected areas, only the mess room, the manager's room, the bar and the corridors could be considered as areas where the passengers would have to stay in case of storms, for example. The cargo space should not be misused as a protected space. This doubling at the latest contradicts the purpose of classifying the icebreaker STETTIN as a traditional vessel.

Result: The safety certificate for traditional vessels issued to the icebreaker STETTIN and the associated "additional permit" that was granted contradict the regulations under national and European law and a classification of the vessel as a traditional vessel and should not have been issued. The certificate issued and the additional permit should therefore be revoked pursuant to section 48 of the Law on Administrative Proceedings (VwVfG).

4.6.3.3 International voyages/SOLAS

With regard to the area of operation specified in the safety certificate (= sailing in coastal waters), the following note is formulated in a footnote:

"No internationally valid certificate. International voyages only with the consent of the port state."

According to SOLAS Chapter I, Part A, Rule 2, letter d), the following is binding under international law: *"The term 'international voyage' means a voyage from a state to which this convention applies to a port outside that state or vice versa"*.

When used for operations abroad, various internationally binding requirements with regard to various aspects of ship safety are defined, partly differentiated according to vehicle category and/or certain other criteria. The Contracting States (flag administrations) have the fundamental non-discretionary obligation to check compliance with the requirements for ships flying their flag and to issue the necessary certificates accordingly.

The only[8] exception – but not relevant here – from the responsibility of the flag state is the possibility of a "partial transfer" of flag state obligations to another state pursuant to SOLAS Chapter I Part A Rule 13:

"Issue and confirmation of certificates by another government

[8] If, in principle, one Contracting Government could delegate its obligations to another, Rule 13 would be superfluous.

A contracting government may, at the request of the administration, arrange for the inspection of a ship and, if it is satisfied that the requirements of these rules have been complied with, issue certificates or have them issued in accordance with these rules and, where appropriate, confirm the certificates on board the ship or have them confirmed. Each such certificate shall state that it was issued at the request of the government of the state whose flag the ship is entitled to fly and shall have the same validity as a certificate issued under regulation 12 and shall be recognised as such".

The footnote in the safety certificate cited above implies that the German administration has no objections to the use of the icebreaker STETTIN for a voyage abroad as soon as the port state agrees to the voyage abroad (at the latest on arrival at the foreign port, i.e. possibly several weeks after the start of the voyage with all the dangers in the meantime).

In the opinion of the BSU, such an approach, i.e. the possibility of decoupling the German (traditional) ship embarking on a voyage abroad from the fundamental and inevitable international obligations arising for the ship's operator, but also and in particular for the administration, solely on the basis of the consent of another state, requires a legal basis – at least in the form undertaken here.

At best, section 5a of the Ordinance for the Safety of Seagoing Ships (SchSV), "international ship-related safety standards in special cases", could be considered, which permits exceptions for ships that are subject to section 5 (1) of the Ordinance for the Safety of Seagoing Ships (SchSV) and thus to the SOLAS rules in accordance with Annex A I to the Ship Safety Act. If one assumes, that the German administration is authorised to exempt the STETTIN as a traditional vessel according to Sect. 5 a of the Ordinance for the Safety of Seagoing Ships (SchSV) from the requirements of SOLAS Chapter II-1, it must be pointed out that such an exemption would have been granted on the basis of an error in law. This is because the exception of the relevant **20-mile limit** mentioned in SOLAS Chapter II-1 Part A Rule 1 No. 4 conflicts with the fact that the ice-breaker STETTIN had been granted an area of operations "in coastal waters" in the safety certificate. According to Annex 1, section 2.2 of the Safety Directive for Traditional Vessels, a voyage in coastal waters is defined as "a voyage in coastal waters of all seas **up to 30 nm from the coast and in the sea areas of the North and Baltic Seas, the English Channel, the Bristol Channel, the Irish Sea, the Scottish Sea, the Mediterranean Sea and the Black Sea**" and thus goes far beyond what is permitted for exceptions under SOLAS. The area of operations, in which SOLAS Chapter II-1 may be suspended for individual ships or classes of ships is thus clearly extended by national law than would be permitted by internationally binding requirements. Such an exception is therefore a violation of SOLAS and is illegal.

In No. 1 1.2 of the Safety Directive for Traditional Vessels, analogous to the wording in section 6 (1) sentence 1 of the Ordinance for the Safety of Seagoing Ships (SchSV) and in accordance with Germany's obligations under international law (including those arising from the SOLAS Convention), it is expressly stipulated that (German) traditional vessels are subject to the (national) *directive, insofar as they are not subject to international ship safety regulations.*

Nor does the multilateral "Memorandum of Understanding on the mutual recognition of certificates for the safe operation of traditional vessels in European waters and of certificates of competency for crews on traditional vessels of 8 September 2008" permit operators of vessels on international voyages or their competent administrations to deviate from the internationally binding SOLAS obligations to be complied with on international voyages. Consequently, section 4.1 of the aforementioned MoU also states: *"Rights and obligations arising from international conventions and agreements shall remain unaffected"*.

Due to the binding nature of the SOLAS rules under international law and the lack of a legal basis for setting aside these obligations through bilateral or multilateral agreements, it is legally inadmissible to waive the issue of a SOLAS certificate for a vessel operating on a voyage abroad and the upstream inspections required in this respect and to leave it to the administration of the contracting government of a foreign port of destination instead to decide whether it recognises a vessel – without any inspection – (fictitiously) as SOLAS-compliant and/or exempts a vessel from SOLAS obligations – without this being possible under SOLAS.

As soon as the icebreaker STETTIN embarks for a foreign port, i.e. makes a voyage abroad, it is subject to SOLAS rules. Since the STETTIN is flying the German flag, the German administration is responsible for carrying out the necessary inspections and issuing the necessary international certificates. With regard to the SOLAS Convention, the following rules, **among others**, are of compelling importance for the STETTIN:

1.) At the moment when, in addition to the master, the crew and children under one year of age, other persons are admitted on board a ship, these persons are passengers within the meaning of SOLAS Chapter I Part A Regulation 2 e).

2.) If more than 12 passengers are admitted, the ship shall automatically be considered a passenger ship. (SOLAS Chapter I Part A Regulation 2 f).

3.) Passenger ships shall be inspected and surveyed by or on behalf of the administration of the flag state in accordance with SOLAS Chapter I, Part B, Rules 6 f.

4.) Passenger ships are issued a safety certificate for passenger ships in accordance with SOLAS Chapter I, Part B, regulation 12 (a), point (i). This presupposes that the vessel complies with the SOLAS safety regulations relevant to passenger ships (among others with regard to stability, cf. SOLAS Chapter II-1).

4.6.4 Calculations of the Hatecke inspection agency

According to the BSU's interpretation of the law, the STETTIN is classified to Class B under Article 4 of Directive 2009/45/EC, at least. The expert has been requested by the BSU to assess the STETTIN as a Class B passenger ship with 130 people engaged in voyages in sheltered waters in accordance with Directive 2009/45/EC on the following points:

Chapter II-1, Part B.1: Intact stability (IMO A.749(18)/MSC.267(85)),

Part B.2.-21: Damaged stability (as per these provisions and SOLAS 1960, Chapter II, Part B)

Chapter III: Life-saving appliances

Four load cases were considered for the intact and damage stability:

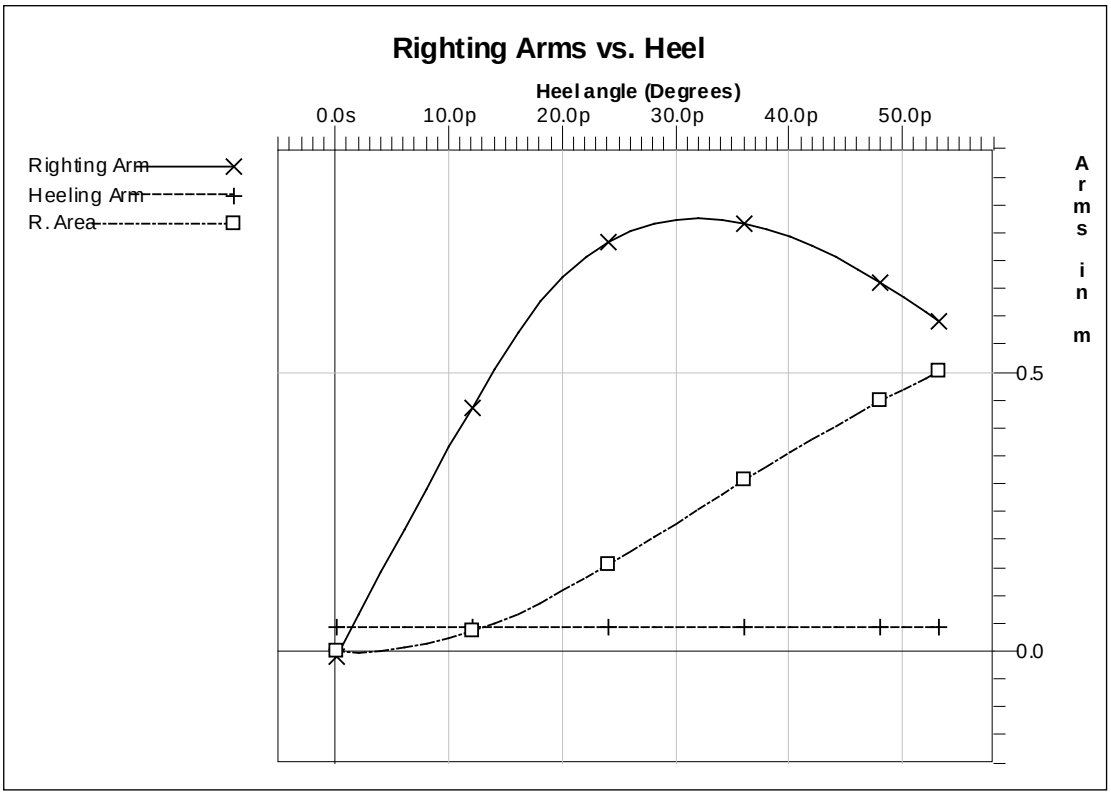
1. Ship with 130 people on board, 100% supplies and full ballast water tanks.
2. Ship with 130 people on board, 10% supplies and full ballast water tanks.
3. Ship with 130 people on board, 100% supplies and empty ballast water tanks.
4. Ship with 130 people on board, 10% supplies and empty ballast water tanks.

The following statements can be made in summary based on the results of this appraisal:

Intact stability

Taking into account the analysis of an inclining test made on 15 April 1994 and the assumptions made here, the results of this calculation confirm that the STETTIN complies with the intact stability requirements of Directive 2009/45/EC (as last amended by Directive (EU) 2017/2108). The stability criteria are met in all the load cases required for a passenger ship. The ship displays extremely high initial stability GM´ of more than 1.86 m and has high maximum lever arms of more than GZ` = 0.77 m. The range of stability is greater than 60°.

Note: The flooding point is the opening of the accommodation's aft ventilation.



Load case 1: Righting lever curve

Provision	Required	Load case 1	Load case 2	Load case 3	Load case 4	Pass ?
IMO RES A.749, 3.3.a(i)	>0.0550 m-R	0.253 m-R	0.259 m-R	0.257 m-R	0.259 m-R	Yes
IMO RES A.749, 3.3.a(ii)	>0.0900 m-R	0.387 m-R	0.420 m-R	0.400 m-R	0.429 m-R	Yes
	>40.00 deg	53.11°	64.53°	61.68°	73.08°	Yes
IMO RES A.749, 3.3.a(iii)	>0.0300 m-R	0.134 m-R	0.162 m-R	0.143 m-R	0.171 m-R	Yes
IMO RES A.749, 3.3.b	>0.200 m	0.777 m	0.938 m	0.823 m	1.003 m	Yes
IMO RES A.749, 3.3.c	>30.00 deg	32.00°	38.00°	33.61°	40.00°	Yes
IMO RES A.749, 3.3.d	>0.150 m	2.191 m	1.967 m	2.140m	1.886 m	Yes
IMO RES A.749, 3.1.2.6	<10.00 deg	1.37°	1.59°	1.44°	1.69°	Yes
IMO RES A.749, 3.2	>1.00 Ratio	3.530	4.340	3.781	4.734	Yes
IMO MSC.267(85), 3.1.1	<10.00 deg	1.32°	1.65°	1.40°	1.78°	Yes

Figure 46: Load cases 1-4 assessment

Damage stability

Taking into account the Part B results for intact stability and the assumptions made here, the results of this calculation and assessment confirm that the STETTIN does **not** comply with the damaged stability requirements of Directive 2009/45/EC (as last amended by Directive (EU) 2017/2108).

This finding also applies to Chapter II, Part B of the international SOLAS 1960 provisions and to the possible alternative calculation as per IMO Resolution A.265.

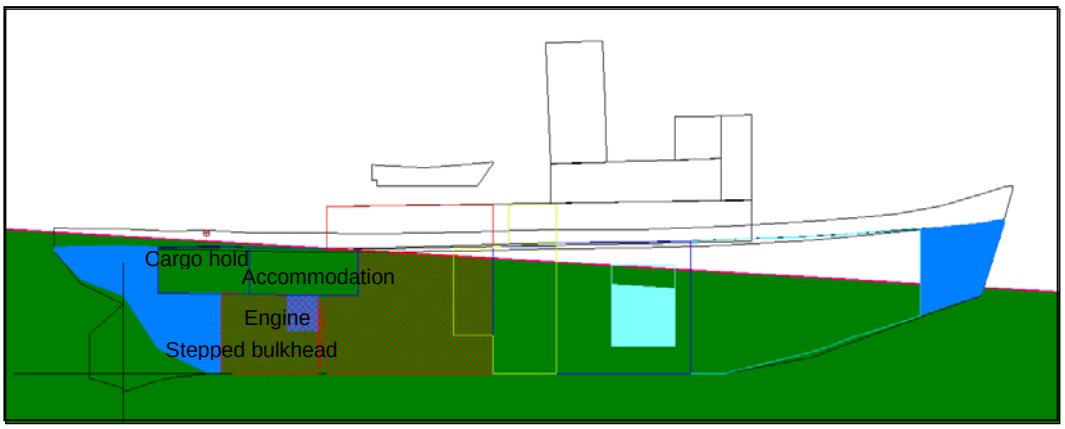


Figure 47: Load case 1: Damage stability calculation

The STETTIN does not survive the required scenario of collective flooding with integrated stepped bulkhead of the accommodation or the cargo hold with the engine room below the main deck (bulkhead deck). Contrary to the requirements of the Directive, in considering a consistent 1-compartment status when only one compartment in each of the four load cases is flooded, the ship would always remain buoyant and comply with the stability criteria specified here, too.

Load case 1: Flooding of the engine room and the accommodation or cargo hold under the main deck (bulkhead deck).

Note: The lowest possible flooding point for the aft compartment cargo hold is located above the deep immersion water line in the flooded engine room [sic].

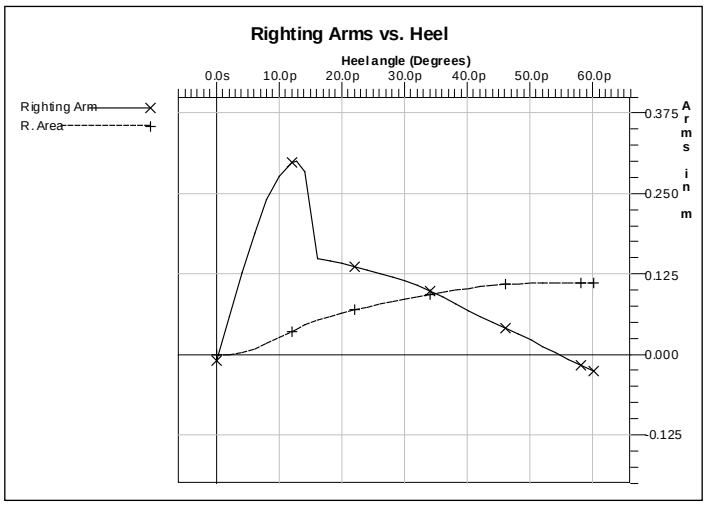


Figure 48: Righting lever curve damaged stability calculation

The ship does **not** comply with the following conditions of Chapter II-1, Part B of the Directive:

> 8.7-8.8 No stability information on board. This should be prepared on the basis of a recent inclining test with analysis.
>
> 8.10 No stability computer or other tool for calculating stability on board.
>
> 9.8 Stern gland must be located in a separate watertight compartment.
>
> 10.1.1 No double bottom in the area between the engine room and the forepeak bulkhead.
>
> 19. No damage control plans on board.
>
> 21. The watertight door in the engine room should be regularly inspected and marked accordingly.

Life-saving appliances

The STETTIN does **not** comply with the life-saving appliance requirements of Chapter III of Directive 2009/45/EC for the following reasons:

- The boats available cannot be classified as lifeboats or rescue boats. Neither the boats nor the associated davit equipment have a proof of compliance with the requirements of the LSA Code or Directive 2014/90/EU.

- Accordingly, there is no rescue boat with associated davit system with a hoisting speed of 18 m/min available on the ship in accordance with the requirements of the LSA Code.

- Due to the fact that the boats are not lifeboats in accordance with the LSA Code, a liferaft capacity of three people is absent in the event of the failure of a liferaft.

- The aft liferaft is positioned in the immediate vicinity of the propeller.

- The lifejackets were manufactured in 1993. A MED mark is missing and thus the proof of compliance with the requirements of the LSA Code and Directive 2014/90/EU. Accordingly, the lifejackets do not comply with the LSA Code (2010).

- There is no information regarding points 2.7, 2.9, 5.3, 3, 4, 11, 12 and 13 of Chapter III, meaning it is not possible to make any statements on compliance with these provisions.

Notes

- Directive 2009/45/EC does not require an investigation into compliance with the International Convention on Load Lines (1966/88), meaning one such has not been carried out within the scope of this appraisal.

- Chapters II-1, Parts C, D and E and II-2 (fire protection) of Directive 2009/45/EC have not been evaluated in this appraisal.

- The authority did not specify the definition *SHELTERED SPACE* for people on board referred to in the Safety Certificate for Traditional Vessel further upon request. The spaces should be listed in the emergency plan and assigned during the emergency evacuation exercise.

- This appraisal is limited to only an evaluation of the relevant provisions. Measures for the rectification of non-compliance are not identified in this report.

Additional remarks of the BSU on the statement of the Ship Safety Division (BG Verkehr)

The additional permission for the safety certificates for traditional vessels includes the following condition: "*Sheltered space under deck is available for each person on board.*" The statement of the Ship Safety Division (BG Verkehr) advises that in accordance with the professional opinion of the BG surveyor, this sheltered space and its areas are defined on board but not documented. In his calculations (Annex 9.3), the expert acting on behalf of the STETTIN arrives at a total of 1224 people (BG Verkehr 225 people) for whom a sheltered space exists. In making these calculations, the expert identifies the area on the boat deck beneath the awning as a sheltered space, despite the fact that this area is not below deck.

Figure 49: Sheltered space and handrails?

It would seem urgently necessary for the Ship Safety Division (BG Verkehr) to define and specify precisely what constitutes a sheltered space and, as suggested by the expert Jan Hatecke, that such spaces be included in the emergency plan.

The Ship Safety Division (BG Verkehr) advises in its statement that the Accident Prevention Regulations apply only to merchant shipping, not to traditional vessels. Following the re-designation of a once commercially used passenger ship to a traditional vessel, the operator can assume that all the requirements of the Accident Prevention Regulations have been complied with in respect of structural equipment. The situation is different in the case of former tugs, icebreakers, lightships, etc., which are used for passenger transport upon re-designation to traditional vessel. Such vessels have not undergone testing in accordance with the Accident Prevention Regulations, e.g. in respect of handrails on the superstructures, in the passages and on the bridge. According to the Ship Safety Division (BG Verkehr), there are virtually no regulations for the safety of passengers on board such ships.

5 CONCLUSIONS

5.1 Cause of the accident

The collision between the ro-ro ferry FINNSKY and the steam icebreaker STETTIN, which was carrying 176 passengers and is approved as a traditional vessel, is attributable to incorrect voyage planning on the western side of the River Warnow in the area of the Stromkaje quay and inadequate recognition of the actual traffic situation of the STETTIN, absent traffic control by police boats in the area, as well as the FINNSKY sailing astern dangerously for some 1.5 nm at a speed of 4-5 kts from the turning basin to her berth (60) in heavy traffic without an officer on watch at the aft manoeuvring station, which was the result of a lack of radio communication and clear arrangements with the FINNSKY and VTS.

The STETTIN sailed under pilotage. Shortly after casting off, the master handed over command to his mate, who executed the pilot's engine commands and controlled the manual steering. Prior to the collision, various rates of speed were applied with an average SOG of 6.4 kts on the River Warnow. This speed also corresponds to the STW, as there was almost no current at different water depths according to the BAW report. The position of the fairway buoys on the figures (see Figure 17, *inter alia*) does not indicate any significant surface current, either.

Neither the STETTIN nor the FINNSKY heard the sound signals issued by the other party using the whistle. The FINNSKY sounded three short blasts twice (I am going astern), which were not heard by the crew of the STETTIN, possibly because the FINNSKY's whistle was directed forward. These signals were recorded by the VDR. A knowledgeable witness on the main deck and the witnesses on the bridge were neither able to confirm the STETTIN's general warning signal (one long blast issued with the steam pipe) nor the signals issued by the FINNSKY. There was no evidence of the STETTIN's signal on the FINNSKY's VDR, either.

Prior to the collision and contrary to the STETTIN's safety management manual, some 10-15 passengers were permanently on the bridge and the mate provided information about the voyage at times over the intercom, while the master left the bridge. The pilot was prevented from concentrating on the traffic situation by these surrounding conditions, which made it virtually impossible to monitor the area radio channel efficiently, to observe the vessels in the area by sight and to plot them on the radar system with superimposed ECS. The pilot was not carrying his own radio but monitored the two radios on the port side. There is a possibility that this also gave rise to omissions in reporting to the VTS at the reporting points plotted on the navigational chart or recognising that the FINNSKY was proceeding astern to her berth (60) on the western side of the fairway via voice communications.

The BSU could not ascertain why the pilot's attempts at calling the FINNSKY were not recorded or led to success.

The STETTIN's voyage planning should have been reconsidered at this point at the latest, as it was planned from the outset to pass the FINNSKY on the western side of the fairway because the pilot believed that the ro-ro ferries would mainly use the eastern side of the fairway and sail astern when berthing. The traffic situation would have been defused if the STETTIN had stopped and waited behind the small craft in good time (see Figures 32 ff.). This scenario would also have made it easy to give way to starboard in consultation with the FINNSKY and VTS. The STETTIN's vector ahead already revealed a starboard tendency in Figures 32 and 33.

All in all, at about 5-6 kts and in heavy traffic, the vessels in the area of the FINNSKY sailed rapidly. This was complicated further by the fact that just before the collision the ship's command of the STETTIN was influenced in its decision making by a cutter convoy crossing in front of her bow, in breach of the regulations. In the given situation, only a resolute hard to starboard manoeuvre would actually have helped to avoid the collision, as a rapid turn to port within a confined space with a turning circle diameter of 360 m would not have been possible because the STETTIN would have run aground beforehand. By contrast, a starboard manoeuvre would have enabled the STETTIN to turn quickly out of the danger zone. She would then have turned to starboard in a confined space in front of the quay walls with appropriate astern manoeuvres, as the STETTIN only turns to starboard when going astern with her large right-handed fixed pitch propellers. Moreover, the speed was reduced from slow ahead to dead slow ahead just before the collision, additionally reducing the response to the helm. A full astern manoeuvre alone would have resulted in a disaster, as this would have caused the STETTIN to veer sideways behind the FINNSKY. No vessels were on the port side of the STETTIN (the passenger ship ROSTOCKER 7 had already overtaken her). However, it was already too late for a successful port manoeuvre at this point, as the accident showed. At about 10 kts relative speed to the FINNSKY, the STETTIN had ten casualties because of the collision and there was no warning on the ship's loudspeaker system when the collision was no longer avoidable. The high relative speed greatly reduced the response time and increased the risk of a collision. The BSU rates a possible suction effect caused by the FINNSKY as low. The STETTIN suffered a gash of about 2 m in length and 30 cm in height above the waterline on the starboard side of her boiler room. No pollutants escaped. The pilot responded quickly and prudently in the given situation. He organised the nearest berth (66), linesmen and requested on VHF radio channel 10 (Rostock Port) the attendance of an emergency physician and ambulances. The FINNSKY suffered a small tear on her ducktail (stern platform), which could be repaired at her intended berth (60). The gash on the STETTIN was later sealed by welding on a steel plate.

That WSP boats failed to provide additional traffic control on the Unterwarnow in this precarious situation was unfortunate. The organiser of HANSE SAIL knew that large shipping and small craft would encounter one another. Despite that, in the run-up to HANSE SAIL the organisers, the enforcement authorities and the WSA did not make any general arrangements in respect of this risk. As the WSV's enforcement authority, the WSP is the regulatory body of the VTS on the ground, among other things. In its capacity as shipping police authority's representative, the VTS may issue enforcement

orders to the WSP. However, due to its limited capacity the WSP must prioritise at its own discretion in the event of several orders. Special instructions from the VTS to vessel traffic when berthing or casting off are made at the discretion of the nautical supervisor, who arrives at decisions based on the level of danger and provides additional information on the traffic situation, if necessary. For example, the ELISABETH MANN BORGESE revised her voyage planning at short notice after setting sail when she waited on the starboard side of the FINNSKY at Berth 65 and not on the green side until mooring, as was originally planned. However, she could also have waited at her berth from the outset but the VTS did not provide timely information for this to happen when casting off. The FINNMERCHANT and the ELISABETH MANN BORGESE were the only vessels to liaise directly with the FINNSKY with regard to passing. Heading seaward, the small craft kept to the western side, possibly to avoid subsequently crossing the fairway so as to better access the Warnow shipyard fairway before the sandbank where the fairways part.

The FINNSKY continued sternward on 180° and at 4-5 kts on the western side of the fairway. To remain on a stable track the aft course had to be corrected several times using the bow thrusters while going astern. There were heading oscillations of up to +/- 2° in the final six minutes before the collision (see Figure 5). This may have been a cause of irritation for nearby traffic because the COG was relatively stable but visible, unlike the course steered (see Figure 13 – drawing by knowledgeable witness who observed a movement of the stern to the west shortly before the collision. Moreover, he stated that the ferries normally sail down on the eastern side along the quay wall and was surprised that neither ship had taken any evasive action). In west-north-west winds of initially 4 Bft at the turning basin, later decreasing to 3 Bft, sailing astern at 4-5 kts with no officer on watch at the aft manoeuvring station, who may have been more resolute in warning of the risk of collision with a recommendation to kick ahead or slow down than the bosun acting as lookout, merit criticism. The STETTIN may then have sailed clear. In making this assessment, it is important to take into account the fact that at no time did the officers on watch on the FINNSKY or STETTIN recognise the risk of a collision on their bridges and for the part of the FINNSKY, the STETTIN executed an unpredictable manoeuvre to port instead of using the clear area on her starboard side. Nevertheless, an officer on watch at the aft manoeuvring station, which was a long way away from the bridge, could have made a more qualified assessment of the traffic situation.

The BSU estimates the vertical dead field of vision aft from the bridge wings on the FINNSKY to be up to 500 m at minimally changing headings and with obstructing funnel, ramp and deck cargo. Virtually no current was measured on the FINNSKY, meaning SOG and STW were about the same. The depth-averaged current velocity in the fairway at the scene and time of the collision calculated by the BAW was less than $v < 0.05$ m/s (or some 0.1 kts).

One fact that did stand out was that the watch officers, both of whom were in the wings, were unable to observe the two radar systems because the side control positions only showed the ECS. The traffic could have been better observed at the radar systems. Instead, four seamen were positioned at the aft manoeuvring station, who made preparations for berthing and at the same time acted as lookout. All the seamen were in contact and communicated via internal radio. The BSU was not able to evaluate the ship's internal traffic. An aft-mounted radar system was not installed. This would have yielded better resolution of the targets when sailing astern.

Three short blasts were sounded twice to warn oncoming vessels that she was sailing astern. In contrast, the STETTIN was not called directly on VHF radio, since no risk of colliding with the STETTIN was recognised on the FINNSKY and/or the STETTIN was not recognised as a large vessel in the crowd of recreational craft sailing out and giving way. The high relative speed of some 10 kts meant there was hardly any room for manoeuvre. Even though her manoeuvrability was excellent when sailing astern due to the two controllable pitch propellers and two bow thrusters, which also proved effective at 5 kts STW, it was no longer possible to avoid the collision effectively on the FINNSKY because of her size and manoeuvrability. At the same time, the track was relatively stable (see Figures 4-6). This would also have been possible at a much lower speed and in light crosswinds, however. This would have significantly reduced the risk of collision in heavy traffic.

5.2 The BSU's legal assessment with regard to the traffic on the River Warnow

In contrast to the Pilots' Association, the GDWS confirmed that the FINNSKY started her berthing manoeuvre and was in manoeuvring mode when she entered the turning basin and turned. This means that only Section 33 SeeSchStrO (Berthing and mooring) would have been applicable and that in accordance with the second sentence of Section 33(1): "[...] all other vessels shall take this fact into account and shall navigate with the appropriate care and diligence."

As the voyage continued, the FINNSKY followed the fairway, kept to the western green buoy line and did not cross the middle of the fairway. Inasmuch, the FINNSKY also behaved properly according to Section 25 (Right of way of ships in a fairway). The FINNSKY had started a berthing manoeuvre according to Section 33 and followed the fairway on the *correct* side according to Section 25. Moreover, and in contrast with the opinion of the STETTIN's legal counsel, according to Sections 33 and 25, the FINNSKY was not subject to an obligation to give way under Section 25(2) SeeSchStrO. Section 22 SeeSchStrO does not provide for any exemptions from the requirement to keep to the starboard side for the River Warnow area. Furthermore, Rule 9(a) COLREGs applies, which reads: "A vessel proceeding along the course of a narrow channel or fairway shall keep as near to the outer limit of the channel or fairway which lies on her starboard side as is safe and practicable." The FINNSKY complied with this legal requirement.

The opinion of the Pilots' Association that ro-ro ships always sail toward the berth on the eastern side of the fairway and that existing rules governing right of way are disregarded under customary law has been addressed by the GDWS in discussions with the Pilots' Association. The GDWS's legal interpretation was reaffirmed in the process. Of significance is that the FINNSKY actually behaved properly in the case in question, also announcing her intention to proceed to the right ("coming past westerly"), and the corresponding legal position, not what has been executed without any accidents previously following arrangements made by radio. That Section 33 is in Part 5 of the SeeSchStrO (interpretation of the Pilots' Association) does not mean that the berthing/berthing manoeuvre constitutes stationary traffic. Section 33 deals mainly with moored vessels, which is probably why it is classified to Part 5.

However, this does not mean the vessel concerned is classified as stationary traffic during a berthing manoeuvre. Rule 3(i) COLREGs is clear in this regard, stating: "The word 'underway' means that a vessel is not at anchor, or made fast to the shore, or aground." Accordingly, a vessel is *underway* during the berthing manoeuvre and not *stationary traffic*. It is also not apparent why classification of Section 33 SeeSchStrO to Part 5 infers that the berthing manoeuvre must begin immediately before the berth.

It is also important to note that had the FINNSKY sailed to Berth 60 on the eastern red buoy line, then this would have meant that Section 33(2) would also apply, as vessels with right of way within the meaning of Section 25(2), here vessels sailing out on the *correct* eastern side, could no longer have enforced their right of way. The legislator has recognised that it may be necessary, when vessels meet in the narrow waters of the River Warnow and especially when vessels are in berthing and mooring mode, to permit a pass only if the skippers or masters involved accept the encounter and the wind does not exceed 6 Bft.[9]

In contrast to the pass between the ELISABETH MANN BORGESE and FINNSKY, the STETTIN/FINNSKY pass was not arranged. Sections 22 and 25 SeeSchStrO do not explicitly state or imply that the provision on keeping to the starboard side and the right of way of vessels following the fairway also includes vessels sailing astern. In this respect, both sections compete with the definition of an overtaking vessel under Rule 13 COLREGs or the overtaking procedure under Section 23 SeeSchStrO. According to Rule 13(b): "A vessel shall be deemed to be overtaking when coming up with another vessel from a direction more than 22.5 degrees abaft her beam, [...]."

[9] Specific requirements for navigation on the River Warnow – 14.10.2 – according to Section 30(3) SeeSchStrO.

This means that the STETTIN would have been the overtaking vessel and have had to make a clear arrangement on VHF radio (if merely to ensure it was safe to overtake through the co-operation of the vessel being overtaken). Due to the competing sections in the SeeSchStrO, only Section 33 SeeSchStrO would remain after the legal assessment and this would have to be consistently applied in the given situation. It is with this in mind that the BSU concurs with the GDWS's legal assessment.

The STETTIN sailed mainly on the starboard side of the fairway at varying speeds and courses, did not report to the VTS at the reporting points and did not call the FINNSKY. A course on the western side of the River Warnow was steered after buoy 47 to allow the FINNSKY to pass to the east. In an attempt to avoid a collision, the speed was reduced too late, the helm was set too late and they virtually hoped the FINNSKY would evade. This is not consistent with good seamanship, which requires that any action taken to avoid collision shall be positive, made in ample time, and result in passing at a safe distance if the circumstances of the case admit. Wherever possible, alterations in course and/or speed made during evasion manoeuvres must be large enough for the other vessel to recognise them quickly. The purpose of the STETTIN's manoeuvres was not clear to the FINNSKY, which prompted the master to signal with three short blasts (I am operating astern propulsion).

It seems that the differing legal opinion with regard to the rules governing right of way in connection with the hitherto practise of berthing ro-ro ships makes it necessary to seriously consider the use of right of way in connection with displaying the visual sign for vessels restricted in their ability to manoeuvre according to the COLREGs and to publish this accordingly in the Notices in accordance with Section 2(1)(13 a and b) SeeSchStrO. This reasoning should be seen in the context of

> the practical requirements and circumstances contradicting the rules governing right of way and statutory law not being consistent with customary law in practise;
>
> the arrangements made individually between ship's commands not being effective;
>
> sailing against the general rules being absolutely necessary because an obligation to wait or give way cannot be sufficiently complied with due to the particular morphological and/or weather conditions (strong wind pressure), for example, and
>
> shipping police control not being possible or desired.

5.3 Arrangements by radio

Clear arrangements made with the FINNSKY on VHF radio with regard to the pass could have prevented the accident with ten casualties.

In contrast to the STETTIN, the inbound FINNSKY and outbound ELISABETH MANN BORGESE adhered to the stipulated entry notification and regular position reports. Using these reports, the nautical supervisor was able to give additional instructions for the pass. The STETTIN, under pilotage, merely reported to the traffic centre before leaving the berth while still made fast.

The position reports required when she set sail, left the Marienehe fairway[10] and passed Berth 60 at the international port[11] were omitted. Additional advice from the VTS's nautical supervisor with regard to the FINNSKY being inbound and that a pass should be arranged, as with the ELISABETH MANN BORGESE, could not be made because of the STETTIN's failure to report. Contrary to the statements of the ship's command and pilot of the STETTIN, there was no evidence of any communication between the STETTIN and either the FINNSKY or the traffic centre in the recordings of VHF channels 10, 16 and 73.

During the analysis of the voice communications, the BSU also found that there is no standardised radio procedure for passes in the area. For example, the wording "remain green side" or "sail past green side" is used in calls. Such wording could be referring to the starboard side of the ship (green sidelights) or of the fairway. A geographical designation such as "remain east" would be clearer and more unambiguous.

5.4 Legal assessment of the certificates and their effect

In the context of the Safety Directive for Traditional Vessels of 2003, the Ship Safety Division (BG Verkehr) issued certificates for 130/225 people for the STETTIN. These also apply to international voyages if recognised by a foreign port State. However, the BSU takes the view that rather than being subject to the Safety Directive for Traditional Vessels, the STETTIN is a passenger ship and therefore subject to the EU's Directive 2009/45/EC on passenger ships, and on international voyages to the rules of SOLAS. The BSU takes the view that these certificates should not have been issued.

Without exception, the Safety Directive for Traditional Vessels may only apply nationally and, if appropriate, with special permits, as it is ultimately a substandard taken from existing contracts. However, there is no standardised testing for substandards. Consequently, the BSU has set Directive 2009/45/EC and SOLAS 1960 as its standard, as the STETTIN is a passenger ship operating on international voyages by virtue of the certificates issued to her by the Ship Safety Division (BG Verkehr). However, a former icebreaker, last used as an inland waterway vessel for the Federal Waterways and Shipping Administration and re-designated as a traditional vessel, cannot satisfy the standards for a passenger ship.

In particular, the damaged stability calculations have shown that the STETTIN does not comply with the construction requirements for passenger ships. The life-saving appliances available on board (lifeboats, lifejackets, non-existing rescue boat) do not

[10] An additional reminder of the Marienehe fairway reporting point is also given in the navigational chart.
[11] An additional reminder of the Berth 60 international port reporting point is also given in the navigational chart.

comply with Directive 2009/45/EC, either. Consequently, formulating detailed safety recommendations, which are based on substandards, is of no use for the BSU because ultimately its task is identifying gaps in safety and improving standards. The BSU has identified safety gaps in ship operation, at the Wismar/Rostock/Stralsund Pilots' Association, in the traffic control at HANSE SAIL, at VTS Warnemünde, as well as at the Ship Safety Division (BG Verkehr) and defined them in this report. Moreover, action has already been taken to improve safety. It should also be borne in mind that the STETTIN mainly consists of recreational crews who work on a voluntary basis for the preservation of this icebreaker. The operating mode should be revised, however.

6 Actions taken by the GDWS and WSA Stralsund

In its capacity as supervisory authority for the Pilots' Association, the GDWS will amend and reinforce the SeeSchStrO Notices to the effect that each passing operation carried out during a berthing manoeuvre must be discussed between the traffic participants concerned. If it is not possible to contact one another or arrive at an agreement on the pass, then VTS Warnemünde must be consulted without undue delay and will then intervene with instructions for traffic control and specifications for an unambiguous passing manoeuvre. This approach will be explicitly included in the training of the Pilots' Association and communicated to traffic participants seeking pilot exemption within the framework of piloted voyages. Pending the entry into force of an amendment to the Notice, WSA Stralsund issued a general order with a direction for immediate enforcement on 13 July 2018, which was published as a notification to mariners (T) 64/18.

WSA Stralsund and the BSU co-operated during the assessment of the collision between the historic icebreaker STETTIN and the FINNSKY. This gave rise to the following measures, which aim to increase safety in the area of the federal waterway during the Hanse Sail further:

Radio traffic

While investigating the collision between the steam icebreaker STETTIN and ro-ro ferry FINNSKY, the BSU found that the information on geographic/visual reference points in the VHF voice communications between the VTS and shipping needs to be defined more precisely. With due regard to shipping as a whole, generally understandable navigation terms should be used. Formulations specific to the area, which are not accessible to all traffic participants, should be avoided. Consequently, future VHF traffic will explicitly refer to the green or red fairway side and/or the western or eastern fairway side. Formulations containing only *the red side* or *the green side* shall no longer be used. A corresponding watch order was issued to the staff of VTS Warnemünde on 10 April 2018.

Deployment of day vessels from WSA Stralsund at the Hanse Sail

The WSP deployed all available units on the water during the Hanse Sail. On the one hand, they are responsible for enforcement duties, on the other hand, they escort ferries in regular service and exceptionally large vessels to protect them against obstruction by heavy traffic during the Hanse Sail. The WSA is responsible for averting hazards in a shipping police capacity. The WSA's water craft bear the inscription 'Schifffahrtspolizei' (shipping police). Shipping police tasks are assigned to the skipper. To reinforce the WSP, three day vessels from WSA Stralsund will maintain order at the 28th Hanse Sail.

Plans have been made to use each of the three day vessels in day service from Friday to Sunday. The deployment includes maintaining a presence and monitoring, as well as escorting large inbound and outbound vessels. The WSP plans to deploy law enforcement officers on WSA's day vessels. This will help to integrate the day vessels into the duties of the WSP. The deployment will also assist in carrying out police enforcement duties on the federal waterway.

Deployment of a law enforcement officer in the VTS

The co-ordination of vessel traffic at the Hanse Sail will require close co-operation between VTS Warnemünde and the WSP (as police enforcement authority) on the ground. This will require close communication between the VTS and WSP, in particular their patrol boats. To assist with communication between the VTS and WSP, the WSP will second a liaison officer to the VTS. The officer will be on day duty and maintain permanent contact between the WSP and VTS. The deployment is planned from Friday to Sunday.

Since the gaps in safety identified by the BSU in these areas are thus largely closed, the publication of safety recommendations may be dispensed with in this regard.

7 Safety recommendations

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

7.1 German Social Accident Insurance Institution for Commercial Transport, Postal Logistics and Telecommunication (BG Verkehr).

The Federal Bureau of Maritime Casualty Investigation recommends that the Ship Safety Division (BG Verkehr) withdraw the Safety Certificate for Traditional Vessels issued for the STETTIN.

7.2 Förderverein Eisbrecher Stettin e.V.

The Federal Bureau of Maritime Casualty Investigation recommends that the Förderverein Eisbrecher STETTIN e.V. amend its operating strategy for the STETTIN to the effect that Directive 2009/45/EC be complied with.

7.3 Owner and operator of the FINNSKY

The Federal Bureau of Maritime Casualty Investigation recommends that the owner and operator equip the ferries operating on the River Warnow with a radar system installed aft to make monitoring traffic easier when sailing astern.

7.4 Ship's command of the FINNSKY

The Federal Bureau of Maritime Casualty Investigation recommends that the ship's command deploy a deck officer on the aft manoeuvring station when berthing and sailing astern on the River Warnow.

8 SOURCES

- Investigations of WSPI Rostock

- Navigational charts and ship particulars, BSH
  - Radar recordings of VTS Warnemünde
  - The FINNSKY's VDR
  - Testimony of the crews and witnesses

- Documents from the Ship Safety Division (BG Verkehr)

- Technical paper, GDWS Kiel office
  - WSA Stralsund
  - Pihl Expert GmbH, Hamburg
  - Ship Safety Division (BG Verkehr), Hamburg
  - Ince & Co, Hamburg
  - CMS Hasche Sigle, Hamburg

- Opinion of expert Dipl.-Ing. Jan Hatecke, publicly appointed and sworn expert (Stade Chamber of Commerce and Industry for the Elbe-Weser Region)

9 Annexes

9.1 The STETTIN's safety certificate for 130 people

Bundesrepublik Deutschland
Federal Republic of Germany

SICHERHEITSZEUGNIS FÜR TRADITIONSSCHIFFE[1)]
Safety Certificate for Traditional Vessels[1)]

Ausgestellt im Namen der Regierung der
BUNDESREPUPLIK DEUTSCHLAND durch die
BERUFSGENOSSENSCHAFT FÜR TRANSPORT UND VERKEHRSWIRTSCHAFT
nach den Vorschriften der
SCHIFFSSICHERHEITSVERORDNUNG (SCHSV - 1998)

Issued under the authority of the Government of the
FEDERAL REPUBLIC of GERMANY by
BERUFSGENOSSENSCHAFT FÜR TRANSPORT UND VERKEHRSWIRTSCHAFT
under the provisions of the
ORDINANCE FOR THE SAFETY OF SEAGOING SHIPS - 1998

Dieses Zeugnis ist durch ein Ausrüstungsverzeichnis und eine Prüfliste aus dem Leitfaden für die praktische Anwendung des Sicherheitskonzeptes für Traditionsschiffe ergänzt.
This certificate is supplemented by a record of equipment and a checklist published in the guide to handle the safety concept for traditional vessels in praxis.

Name des Fahrzeugs ..... **STETTIN**
Name of vessel

Unterscheidungssignal ..... **D B C R**
Distinctive number or letters

Rumpflänge in Metern ..... **51,60 m**
Hull length in metres

Baujahr **1933**
Year of construction

Zugelassene Personenzahl **130**
Number of persons the vessel is certified to carry

Fahrzeugart ..... **Dampfschiff**
Type of vessel *Steam vessel*

Fahrzeuggruppe ..... **C**
Category of vessel

Fahrtgebiet [2)] ..... **Fahrt in küstennahen Seegewässern**
Range of trade [2)] *Trade in near coastal waters*

1) gemäß Absatz 1.1 der Sicherheitsrichtlinie für Traditionsschiffe
according to paragraph 1.1 of the Safety Directive for Traditional Vessels
2) Kein international gültiges Zeugnis. Auslandfahrt nur mit Zustimmung des Hafenstaates
Certificate not internationally valid. International voyages only with approval of Port State

Safety Certificate for Traditional Vessels 10/2012

9.2 The STETTIN's additional permission for 225 people

ZUSÄTZLICHE GENEHMIGUNG ZUM SICHERHEITSZEUGNIS FÜR TRADITIONSSCHIFFE

Additional Permission to the Safety Certificate for Traditional Vessels

Diese zusätzliche Genehmigung gilt nur in Verbindung mit dem Sicherheitszeugnis für Traditionsschiffe ausgestellt am 15.04.2014 für
This additional permission is only valid in relation to the Safety Certificate for Traditional Vessels dated 15.04.2014 for

Name des Fahrzeugs ..... **STETTIN**
Name of vessel

Unterscheidungssignal ..... **D B C R**
Distinctive number or letters

In den Monaten Mai bis September dürfen bei Windstärken von 5 Bft. Tagesfahrten von höchstens 10 Stunden Dauer mit bis zu 225 Personen an Bord auf Revieren bis zur Seegrenze durchgeführt werden.
Bei aufkommendem Starkwind oder bei Sturm- oder Starkwindwarnung muß unverzüglich der nächste Hafen angelaufen werden.
From 1st of May till 30th of September trips of max. 10 hours duration are permitted with winds not exceeding windforce 5 bft. with up to 225 persons on board in channel or river areas within the borders of the sea.
When stronger winds are arising or a warning of stronger winds is circulated the nearest haven has to be made for immediately.

Bedingungen:
- Es findet sich unter Deck für jede Person ein geschützter Aufenthalt,
- für jede Person an Bord wird eine Rettungsweste plus 10 v.H. Reserve mitgeführt,
- für jede Person an Bord ist ein Platz in einem Rettungsfloß vorgesehen.

Conditions:
- *Sheltered space under deck is available for each person on board,*
- *a life jacket is provided for each person on board and, in addition, a number of life jackets for not less than 10 % of the total number of persons on board,*
- *the liferafts carried on board have the capacity to accommodate the total number of persons on board.*

Diese Genehmigung gilt bis 14.04.2019.
This Permission is valid until

Diese Zusätzliche Genehmigung ersetzt die Zusätzliche Genehmigung vom 29.12.2004.
This Additional Permission replaces the Additional Permission dated 29.12.2004.

Ausgestellt in Hamburg **am 15.04.2014**
Issued at *the*

(Siegel)
(Seal)

BERUFSGENOSSENSCHAFT FÜR TRANSPORT UND VERKEHRSWIRTSCHAFT
- Dienststelle Schiffssicherheit -

9.3 Calculation of persons on board

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g.pihl@pihl-expert.de

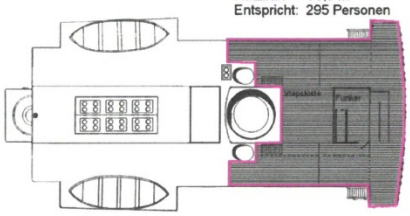
Document Name – Date Rev. – Author (filename)	Reference	Page
STETTIN-Personenanzahl-geschützter-Aufenthalt-rev02-20170829lz.docx	STETTIN	1 of 1

STETTIN Personenanzahl - geschützter Aufenthalt
(gemäß Zusätzliche und Ausnahme Genehmigung zum Sicherheitszeugnis)

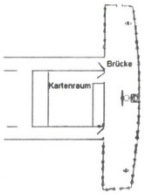
Kriterium zu Berechnung: 4 Personen / m² nutzbare geschützte Aufenthalte
Berechnete Anzahl 1224 Personen

Die Flächen der geschützten Aufenthalte (schraffiert grau dargestellt) werden aufgrund der Ausrüstung und Einrichtung rechnerisch mit Füllgraden reduziert. Die so ermittelte nutzbare Fläche beträgt 306,1 m². Die Personenanzahl ergibt sich durch Multiplikation der nutzbaren Fläche mit dem Wert des oben benannten Kriteriums.

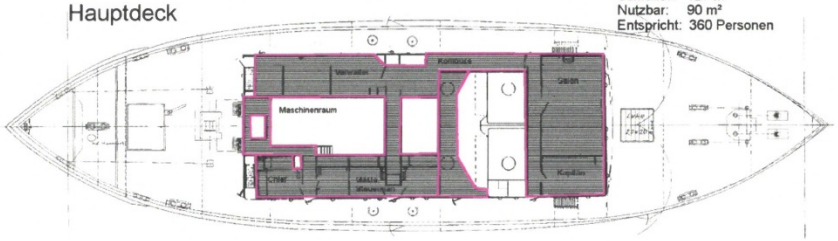
Bootsdeck
Schraffur: 88,8 m²
Nutzbar: 73,8 m²
Entspricht: 295 Personen



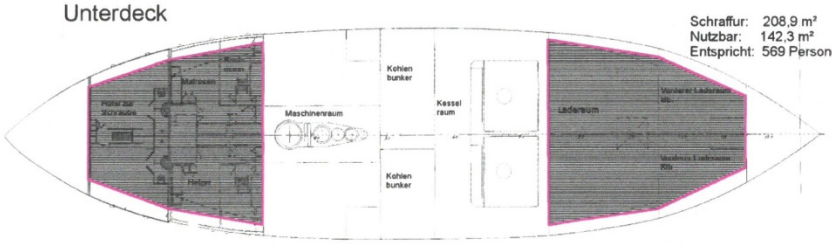
Brücke



Hauptdeck
Schraffur: 127 m²
Nutzbar: 90 m²
Entspricht: 360 Personen



Unterdeck
Schraffur: 208,9 m²
Nutzbar: 142,3 m²
Entspricht: 569 Personen



9.4 Nautical information for Hanse Sail

CAPTAIN'S HANDBOOK

3 Nautische Informationen

(1) Revier
Rostock-Warnemünde liegt an der Mündung der Warnow. Das Fahrwasser zum Stadthafen Rostock ist die Bundeswasserstraße Unterwarnow – Breitling, an der folgende Hafengebiete liegen:
- Hafengebiet Warnemünde mit Yachthafen und Passagierkai
- Seehafen Rostock
- Rostocker Fracht- und Fischereihafen (RFH) Marienehe
- Stadthafen Rostock mit Museumshafen (Haedge-Hafen).

Die an der Hanse Sail 2017 teilnehmenden Schiffe erhalten ihre Liegeplätze im Stadthafen Rostock, im Fischereihafen Marienehe oder in Warnemünde und im Yachthafen Hohe Düne.

(2) Lotsen
Lotsenpflicht besteht für folgende Schiffe zum Seehafen:
- Schiffe > 100 m Länge über Alles oder
- Schiffe > 15 m Breite oder
- Schiffe > 7,50 m Tiefgang

Lotsenpflicht besteht für folgende Schiffe zum Stadthafen:
- Schiffe > 60 m Länge oder
- Schiffe > 10 m Breite oder
- Schiffe > 5 m Tiefgang

Die Schiffe, die einen Lotsen nehmen, müssen ihre ETA-Meldung mindestens drei Stunden vor Eintreffen auf der Lotsenversetzposition an Warnemünde Pilot (UKW-Kanal 14) oder Telefon (0381) 206 03 50 / Telefax (0381) 206 03 51 abgeben.

(3) Meldepflicht
Entsprechend SeeSchStrO unterliegen alle Fahrzeuge sowie Schub- und Schleppverbände, deren Länge ü. A. mehr als 30 Meter beträgt und die das Rostocker Fahrwasser einschließlich Warnow befahren, der Meldepflicht. Die erforderlichen Angaben zur Meldung sind rechtzeitig an „Warnemünde Traffic" (UKW-Kanal 73) zu richten. Die zuständige Ordnungsbehörde für den in der Hafennutzungsordnung der Hansestadt Rostock definierten Geltungsbereich ist das Hafen- und Seemannsamt Rostock, hörbereit von 7 bis 21 Uhr unter dem Ruf „Rostock Port Stadt" auf VHF Kanal 10. Die Einweisung auf die Liegeplätze erfolgt durch die Hafenmeister des Stadthafens, Telefon (0381) 45 52 66 bzw. über Kanal 10, oder im Fischereihafen durch den Hafendispatcher unter Telefon (0381) 811 24 40.

(4) Hörbereitschaft
Nicht meldepflichtigen Fahrzeugen wird ebenfalls Hörbereitschaft auf UKW-Kanal 73 empfohlen, da in regelmäßigen Abständen Informationen über Verkehrslage, Schifffahrtshindernisse, Änderungen an der Betonnung, Pegelstand und Wettermeldungen gegeben werden.

Sendezeiten: 05.15 bis 21.15 Uhr alle 2 Stunden
21.15 bis 05.15 Uhr alle 4 Stunden

Achtung!
Bitte nehmen Sie Rücksicht auf den Fährverkehr im Revier!

Bitte während der Hanse Sail AIS einschalten, damit die Ortung der Position der Schiffe möglich ist.

3 Nautical information

(1) Sailing area
Rostock-Warnemünde is situated at the mouth of the river Warnow. The fairway to the City habour of Rostock is the "Bundeswasserstraße Unterwarnow – Breitling" with following ports:
- Port of Warnemünde with Yacht harbour and Passenger terminal
- Sea port of Rostock
- Fishing port of Marienehe
- City harbour of Rostock with Museum harbour (Haedge-Hafen)

Ships, participating in the Hanse Sail 2017, will have their berths in the City harbour of Rostock, in the Fishing port of Marienehe or in Warnemünde and in the Yachthafen Hohe Düne.

(2) Pilots
Pilot assistance is compulsory to the Sea port of Rostock:
- Ships of more than 100 m (328 ft) L.o.a. or
- Ships of more than 15 m (49 ft) beam or
- Ships of more than 7,50 (24.5 ft) m draught

Pilot assistance is compulsory to the City harbour Rostock:
- Ships of more than 60 m (197 ft) L.o.a. or
- Ships of more than 10 m (32.5 ft) beam or
- Ships of more than 5 m (16.4 ft) draught

All vessels taking a pilot aboard will have to transmit their note of estimated arrival at least three hours before arriving at the pilot boarding station. Call VHF channel 14 for "Warnemünde Pilot" or phone: (0381) 206 03 50 / fax (0381) 206 03 51.

(3) Obligation of announce
In accordance with SeeSchStrO all vessels and pushed or towed convoys with an overall length exceeding 30 metres entering the Rostock fairway (including the Warnow) have to announce their arrival. Necessary statements have to be communicated to "Warnemünde Traffic" on VHF channel 73. The Hafen- and Seemannsamt Rostock is the regulatory body for the areas defined in Port Traffic Regulations issued by the Hanseatic City of Rostock and can be contacted on VHF channel 10.
The admission on the berths takes place through the harbourmaster in the City harbour, telephone (0381) 45 52 66 as well as at channel 10 VHF, in the Fishing port by the harbour dispatcher, telephone (0381) 811 24 40.

(4) Watch
Ships which are not required to announce their sailing are requested to stand by on VHF 73. Information about traffic, navigational warnings, weather forecasts, alterations to buoys and other important news will be given regularly.

Transmitting: 05.15 a.m. – 09.15 p.m. every two hours
09.15 p.m. – 05.15 a.m. every four hours

Attention!
Please pay special attention to ferry traffic!

During the Hanse Sail please activate the AIS for the purpose of locating the ships.