Bundesstelle für Seeunfalluntersuchung
Federal Bureau of Maritime Casualty Investigation
Federal Higher Authority subordinated to the Ministry of Transport,
Building and Urban Development

Investigation Report 264/10

Serious Marine Casualty

Collision of the tug STEINBOCK with the MV MINERVA off Bremerhaven on 29 June 2010

01 August 2011

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) of 16 June 2002.

According to said act, the sole objective of this investigation is to prevent future accidents and malfunctions. This investigation does not serve to ascertain fault, liability or claims.

This report should not be used in court proceedings or proceedings of the Maritime Board. Reference is made to art. 19 para. 4 SUG.

The German text shall prevail in the interpretation of this Investigation Report.

Issued by:
Bundesstelle für Seeunfalluntersuchung - BSU
(Federal Bureau of Maritime Casualty Investigation)
Bernhard-Nocht-Str. 78
20359 Hamburg
Germany

Head: Jörg Kaufmann
Phone: +49 40 31908300 Fax: +49 40 31908340
posteingang-bsu@bsh.de www.bsu-bund.de

Table of Contents

Table of Figures

1 Summary of the marine casualty

En-route to the northern lock in Bremerhaven, the tug STEINBOCK collided with the Norwegian flagged RoRo ship MINERVA, which was travelling downstream the Weser river in the dredged channel in front of the Kaiserschleuse lock on 29 June 2010 at 0223[1]. After 6 hours of rest, the crew was awoken at 0200 and was already casting off at 0216. The master was alone on the bridge: the planned lookout was on the way to the bridge after clearing away the mooring lines. The view astern on the tug is severely restricted by the funnel. The tug deviated from her route next to the dredged channel. Unnoticed, she drew closer to the approaching MINERVA and came into her bow swell. As a result, the tug heeled severely to starboard and water entered the superstructure. There were slight personal injuries and the hull was dented. The tug was able to reach her berth and moor up under her own power after the collision. There was light material damage on the MINERVA. She tied up on the Columbus quay.

[1] Unless otherwise stated, all times shown in this report are local = Central European Summer Time = UTC + 2

2 Scene of the accident

Type of event: Serious marine accident − collision while overtaking
Date/time: 29 June 2010, 0223
Location: Bremerhaven fairway, off the lighthouse Kaiserschleuse lock
Latitude/Longitude: φ 53° 33.2'N λ 008°33.3'E

Excerpt from Nautical Chart 4, Federal Maritime and Hydrographic Agency (BSH)

Figure 1: Nautical chart

3 Ship particulars

3.1 Photo of the STEINBOCK

Figure 2: Photo of the STEINBOCK

3.2 Particulars STEINBOCK

Name of vessel:	STEINBOCK
Type of vessel:	Tug
Nationality/flag:	Germany
Port of registry:	Bremen
IMO number:	7612644
Call sign:	DEEH
Owner:	Bugsier Reederei- und Bergungs-gesellschaft mbH & Co. KG
Year built:	1977
Shipyard/yard number:	Jadewerft Wilhelmshaven GmbH / 140
Classification society:	Germanischer Lloyd
Length overall:	28.20 m
Breadth overall:	8.42 m
Gross tonnage:	213
Deadweight:	60 t
Draught at time of accident:	4.5 m
Engine rating:	1,560 kW

Main engine:	2 Deutz SBA 8M528,Twin Voith propeller
(Service) Speed:	12 kts
Hull material:	Steel
Bollard pull:	24.7 t
Number of crew:	4
Minimum safe manning:	3

3.3 Photo of the MINERVA

Figure 3: Photo of the MINERVA (TOR MINERVA)

3.4 Particulars MINERVA

Name of vessel:	MINERVA
Type of vessel:	RoRo general cargo vessel
Nationality/flag:	Norway
Port of registry:	Oslo
IMO number:	7430735
Call sign:	LAXF5
Owner:	G.H.S. Global Hanseatic Shipping GmbH & Co. KG
Year built:	1978
Shipyard/yard number:	A/B Oskarshamns Varv / 100610
Classification society:	Det Norske Veritas

Length overall:	177.4 m
Breadth overall:	24.04 m
Gross tonnage:	21215
Deadweight:	14522 t
Draught (max.):	8.5 m
Engine rating:	1,560 kW
Main engine:	Sulzer 6RND76
(Service) Speed:	10.1 kts
Hull material:	Steel
Manning:	14

3.5 Voyage particulars MINERVA

Port of departure:	Bremerhaven
Port of call:	China
Type of voyage:	Merchant navy/international
Cargo information:	Empty
Draught at time of accident:	6.1 m
Pilot on board:	Yes
Number of passengers:	None

4 Course of the accident and investigation

On 29 June 2010 at 0200, while at the berth before the entrance to the New Harbour at the old lighthouse, the tug STEINBOCK was given the job by the tug control station to proceed to the basin of the northern lock in Bremerhaven and to pick up a pilot for the sea-going ship RCL COMMANDER. This was a pure pilot movement involving no tug job. It was warm, dark, with good visibility and a light wind was blowing. With an incoming current, the high water was calculated for 0408[2] according to the tide tables of the BSH. The crew consisted of the master, chief officer, chief engineer and an ordinary seaman. At about 0210, the engine was started and power was switched from the power cable to on-board power. The VHF systems on the bridge were set to channel 8 (ship-to-ship Bremerhaven) and 12 (Bremerhaven port). The radar system was switched on, operated in standby mode and other navigation equipment activated. The gyro was running continuously. The bow and stern thrusters were checked and the position lights switched on. After the bridge was ready, the lines were unfastened and the vessel cast off at 0216 northwards.

Behind the tug there was an upcoming vessel within sight off Geestemünde that the pilot had obviously just left, as the pilot boat was already travelling in the direction of the Geeste basin. The master was alone at the starboard conning position of the bridge. The control equipment can be operated from two independently functioning conning positions. The view astern is obstructed by the funnel. From the starboard conning position there is a blind sector to port astern that is reportedly approx. 90°. From the pier, the route goes parallel to the dredged channel marked on the chart with a track of 330° to the northern lock basin. Until then, on the land side, the groyne and the construction site south of the Kaiserschleuse lock and the Columbus quay with its berths have to be passed. At the Kaiserschleuse lock, the distance to the dredged channel is approx. 130 m. The speed over ground was increased slowly to 9 kts with the helm on manual and navigating by sight. Now and again the heading was checked on the gyro. The setting for the Voith-Schneider blades was made from the wheel. The angle, which is decisive for the speed, is adjusted by two levers.

In the course of the voyage, there was a deviation to port that was noticed, but which was also useful, as it enabled more distance to the construction site to be maintained. As a result, there was no reason to counteract this deviation. The upcoming vessel was reportedly not visible. She had possibly already passed. At 0223 there was reportedly a loud crash and the tug listed heavily to starboard. Following this, a large ship was reportedly seen passing downstream with the port side at the stern of the tug. In the process, the stern of the tug was in continuous contact with the port-side hull of the other vessel. Afterwards, manoeuvres were reportedly attempted to free the tug from the hull.

After the lines had been cleared, the chief officer and the ordinary seaman had entered the superstructure. Normally, without specific instructions, one of them would have gone to the bridge as lookout. After clearing away at the stern, the chief officer

[2] Reference point Bremerhaven, old lighthouse

reportedly went to the mess to get something to eat. He reportedly took two biscuits and spoke briefly with the chief engineer. Afterwards he was going to go outside through the galley on the starboard side and then go to the bridge. The tug reportedly heeled suddenly to port and then afterwards much more severely to starboard. In the process, water reportedly entered and the cooker reportedly slid from its mounting and jammed the door closed. Afterwards he reportedly climbed over the cooker and outside onto the deck. From the Forecastle he could reportedly see the stern of a vessel. He is then reportedly gone to the bridge and has seen hoses and mooring lines in the water being dragged along by the tug. As a result, he reportedly went astern to pull in the items. The ordinary seaman was reportedly on the way from the mess to the washroom. He wanted to get a drink of water there as there was nothing prepared to drink in the mess. In the shower he reportedly heard a thud and shortly afterwards water reportedly entered through the open porthole on the starboard side. The water soaked him from head to foot. Afterwards he reportedly went on deck to the stern and met the chief officer. He reportedly helped to clear up there. At the time of the impact, the chief engineer was reportedly on his way to the companion-way to the engine room when the tug listed heavily to starboard and water came in via the starboard entrance to the deckhouse. Afterwards he reportedly went to the engine room. No crew member reports hearing a sound signal.

Afterwards, they all met on the bridge. One crew member had a wound on the heel. The engine was working normally. Using VHF channel 7, contact was made with Bremerhaven Weser Traffic and the accident reported. Afterwards, the tug returned to her berth before the New Harbour and the damage was inspected. The shell plating, deck and bulwark were dented. The tug took on water in the quarters for the master, the chief engineer and for the crew, as well as the galley, wash room and both heads. Only a little water entered the engine room. In total, the overall costs were measured later by an assessor at € 120,000.

The tug crew was an experienced team. The master has been at sea since 1973 and holds an unlimited certificate. He has reportedly been master on tugs continuously for the last two years, including the tug STEINBOCK. The chief officer has been at sea since 2000. After his degree, he undertook two worldwide container voyages. In 2008 he changed to tugs and had a general authorisation for all tugs in the shipping company except the OCEANIC. As chief officer, he works on the deck and on the bridge when in harbour. For some operational trips he reportedly took the helm after consultation with the master. The chief engineer has been at sea since 1988. He has been working on tugs for 10 years and has been with the current shipping company since 2005. Since January 2009 he has had the position of chief engineer on the tug STEINBOCK. The ordinary seaman used as the deckhand has been at sea since 1998, including on large container vessels. He has worked on tugs since 2002 and has completed a two-year training programme at the nautical college. On the tug STEINBOCK he assisted on deck and with the engine.

All crew members had been on board since 23 June 2010. They should have been on board for 8 days and replaced on 30 June 2010. The crew had a rest period on 28 June from around 0400 to 1000. There were various trips in the afternoon. The crew were off duty from 2000 until 0200, when the next job was due. The last continuous

rest period was thus 6 hours. There is no evidence to suggest that the crew were not rested.

The navigation equipment consisted of, among other things, an ARPA Furuno 21X5-IIB radar system, a Furuno FE 700 echo-sounding system, a Furuno FA-150 AIS system, a Plath 12985 magnetic compass, a Plath Navigat XMM1 gyro, a Raytheon Anschütz autopilot SN: 610053831/1 as well as a Furuno GP 90 GPS system.

The MV MINERVA had been in the Bremerhaven fishing port since August 2009. It had been prepared for a transfer voyage to China in the previous days. At the time of the accident, she was travelling in ballast downstream with a draught of 6.10 m on an even keel. On the bridge were the master, officer on watch, helmsman and lookout as well as the pilot. The visibility was reported to be 10 km and it was calm. The radar systems on board were in operation. At the rate of speed of "half speed ahead" the speed was approx. 9 kts with a steered course of 330° on the right side of the fairway. The tug was sighted ahead. Due to the higher speed of the MV MINERVA, the vessels got closer to each other. Suddenly and unexpectedly and without sound signal and consultation, the tug reportedly altered her course to port at around 0220 and crossed the bow of the MV MINERVA at the level of buoy 59. Although the rate of speed was immediately reduced to "Dead slow ahead", the stem collided with the stern of the tug. In the process, the MV MINERVA pushed the tug on the side around the bow and she scraped along the port side until she was able to right and to free herself. A rescue cruiser was requested from Vessel Traffic Services. The MV MINERVA tied up to the Columbus quay after the accident for assessment. Light material damage was determined.

The AIS recordings with recorded electronic nautical chart, provided to the BSU by the Waterway Police in Bremerhaven, only provide a snapshot of the approximate situation of the vessels at the time in question. It must be taken into consideration that the transmission frequency of the vessels' positions etc. is dependent on the respective speeds of the vessels and that position messages of vessels are not necessarily synchronous with each other. As a result, time shifts in the images for position data for the vessels with respect to each other can occur, including likely passing distances (see Fig. 5), but also collision locations can be shown in individual images that possibly did not occur in that way. A reliable analysis is only possible with AIS plot time series of both vessels with additional interpolation of intermediate positions.

To assess the process, possible active manoeuvres of the respective ship's command that are unknown must also be taken into account. It currently seems plausible that according to the following figures, a water-level depression induced suction effect could have been the cause of the tug approaching the RoRo vessel, but the possibility that the approach of the tug was caused actively by her rudder angle cannot be ruled out.

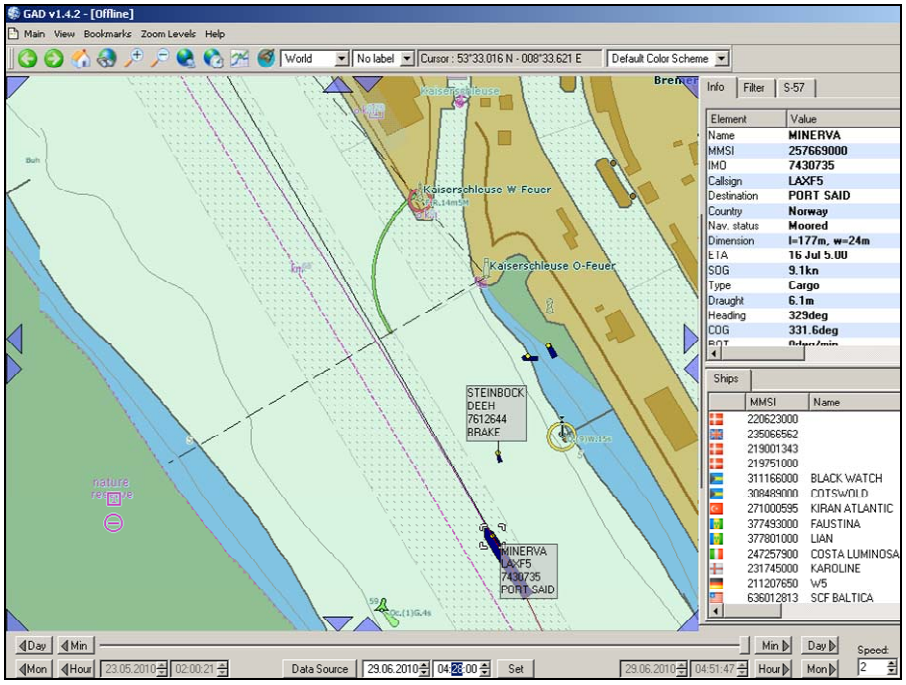

Figure 4: Waterway Police Bremerhaven 015147

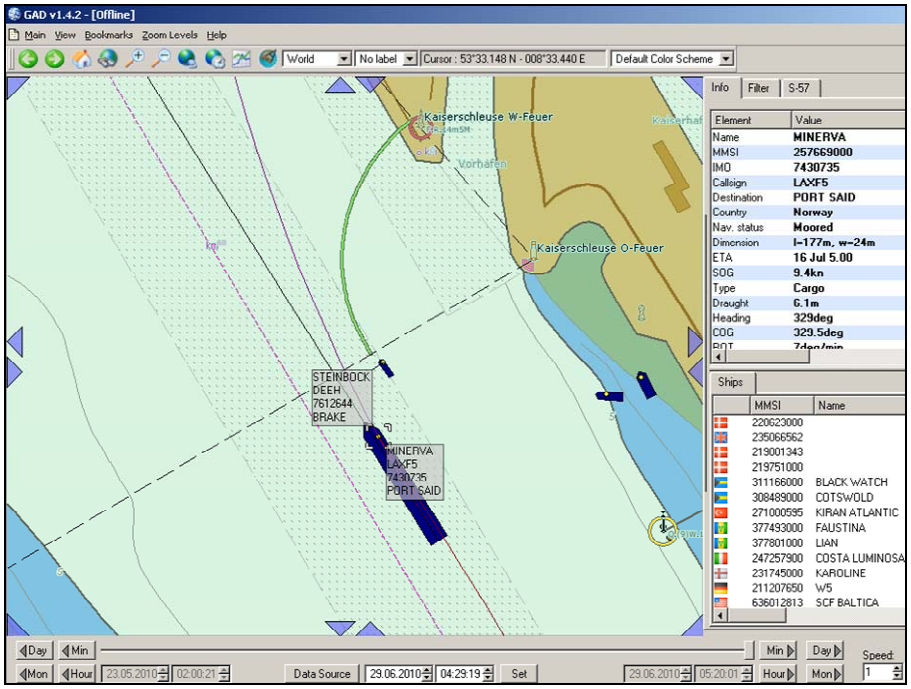

Figure 5: Waterway Police Bremerhaven 022001

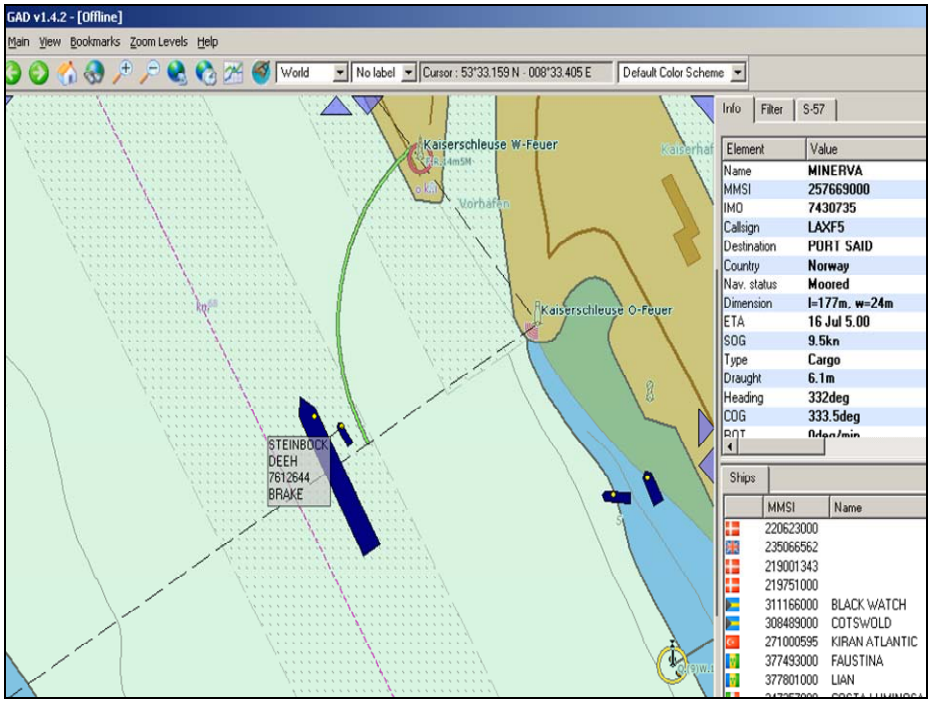

Figure 6: Waterway Police Bremerhaven, time unknown

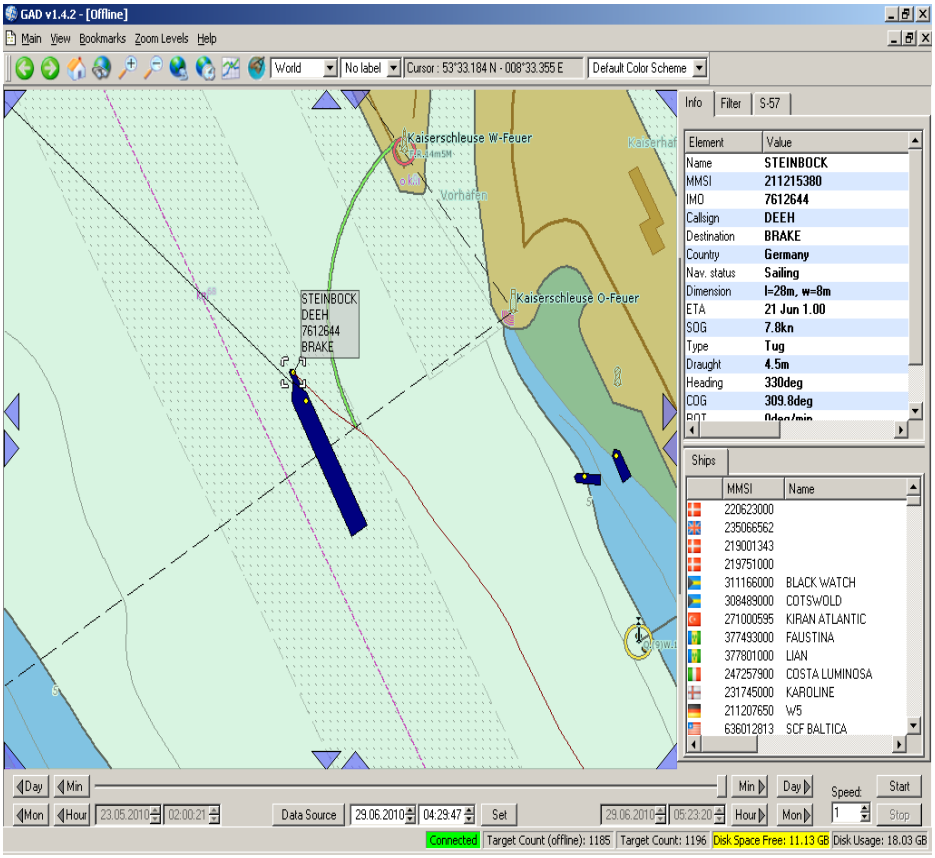

Figure 7: Waterway Police Bremerhaven 022320

For these reasons, the BSU has asked the Federal Waterways Engineering and Research Institute in Hamburg (BAW DH) to analyse and validate the AIS data:

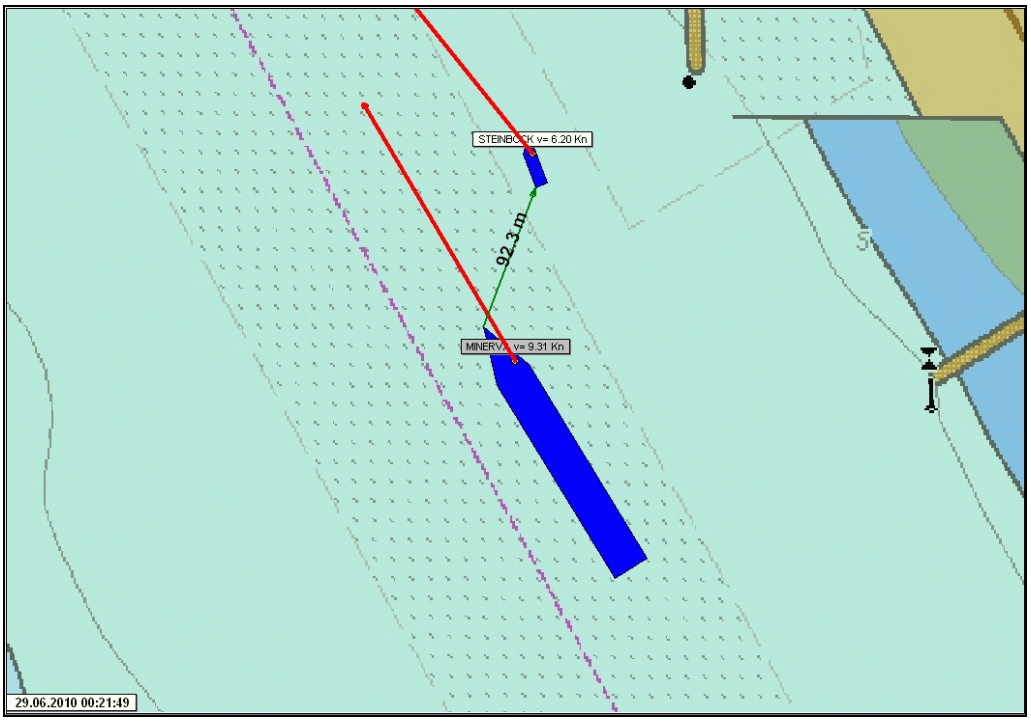

Figure 8: BAW Hamburg 022149

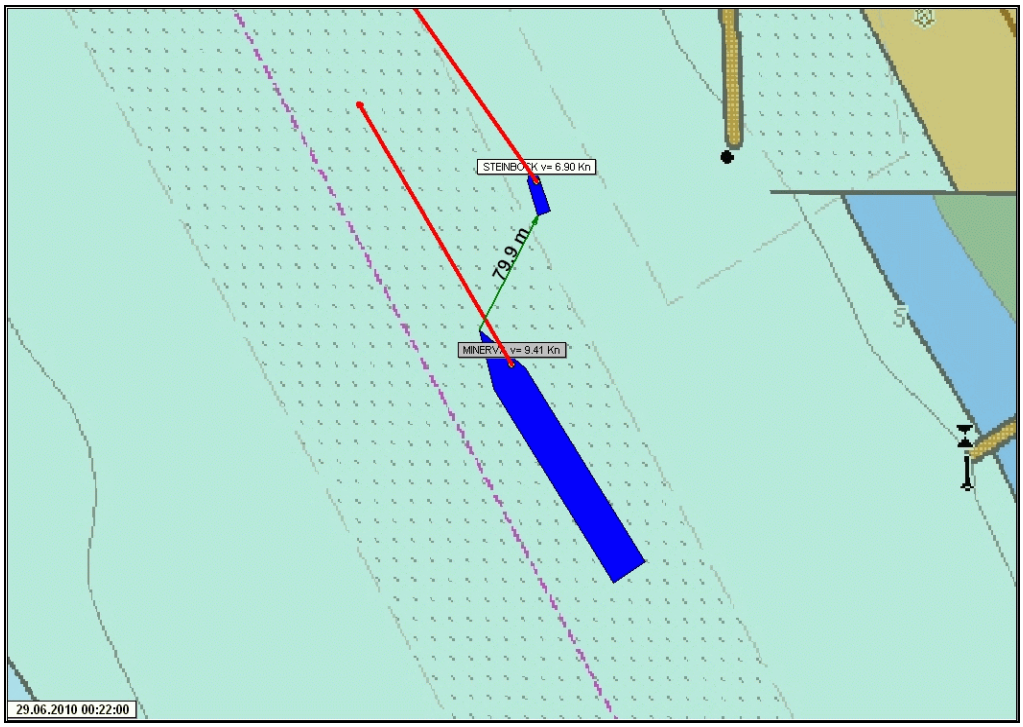

Figure 9: BAW Hamburg 022200

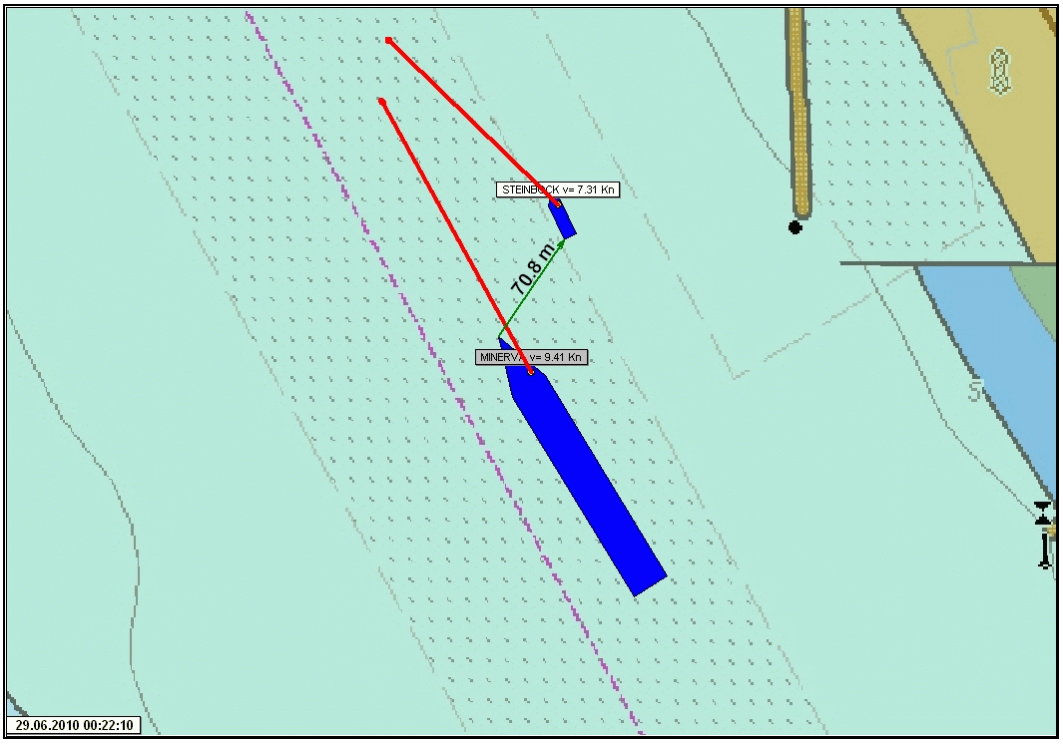

Figure 10: BAW Hamburg 022210

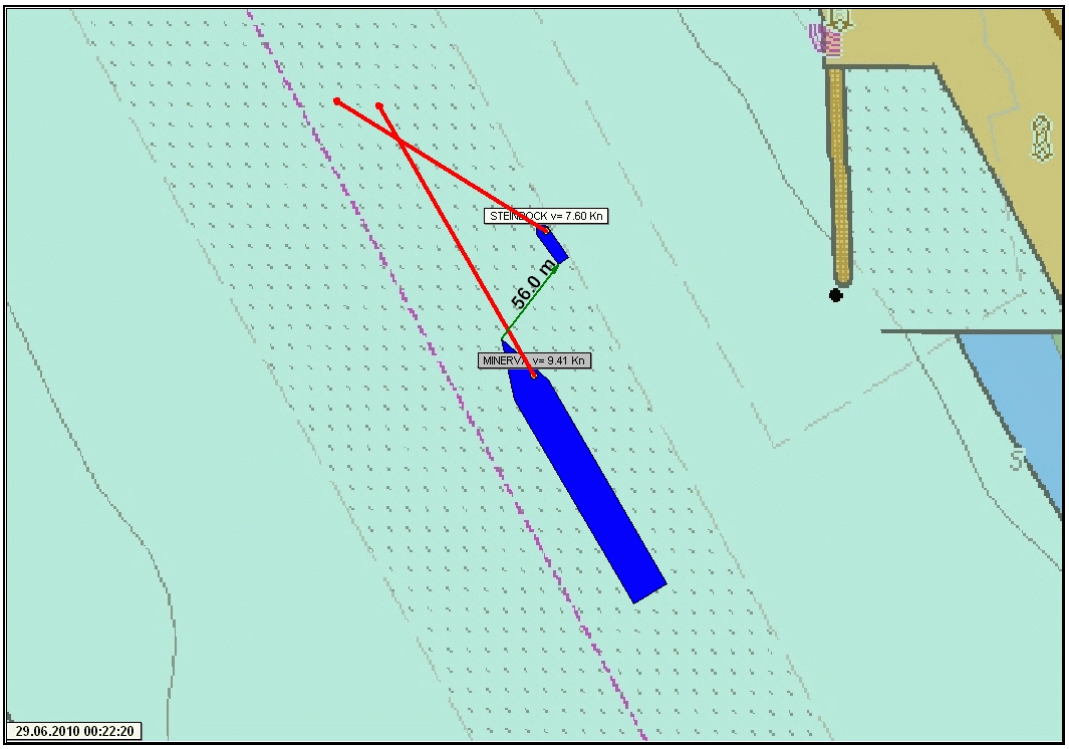

Figure 11: BAW Hamburg 022220

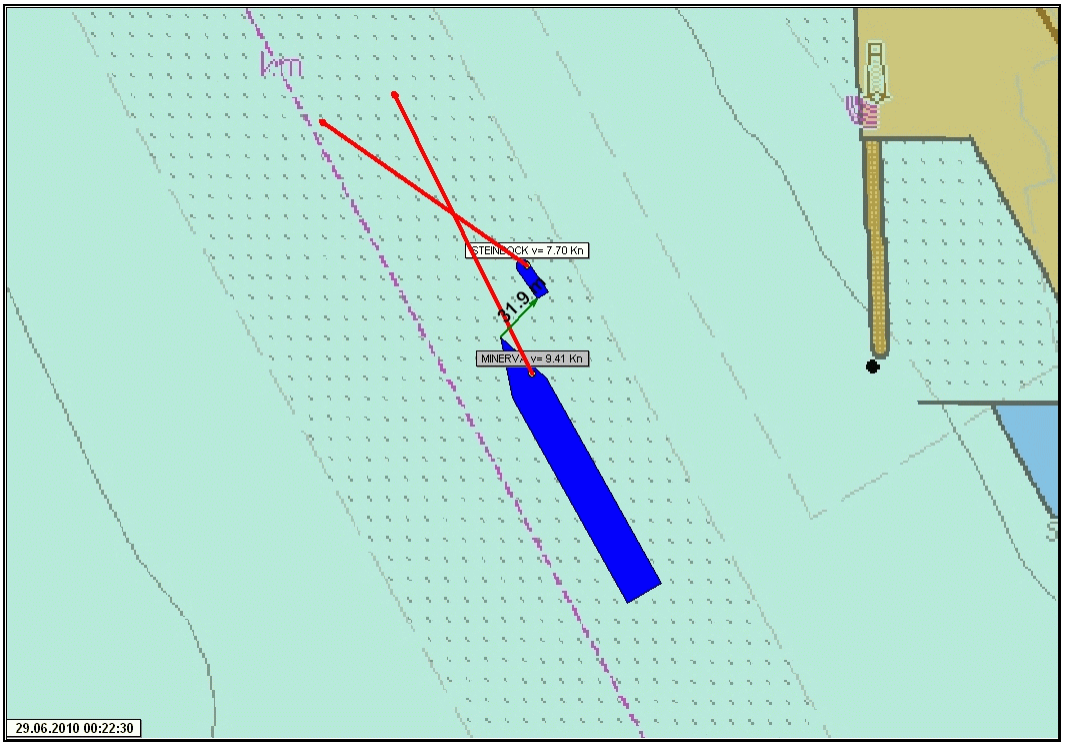

Figure 12: BAW Hamburg 022230

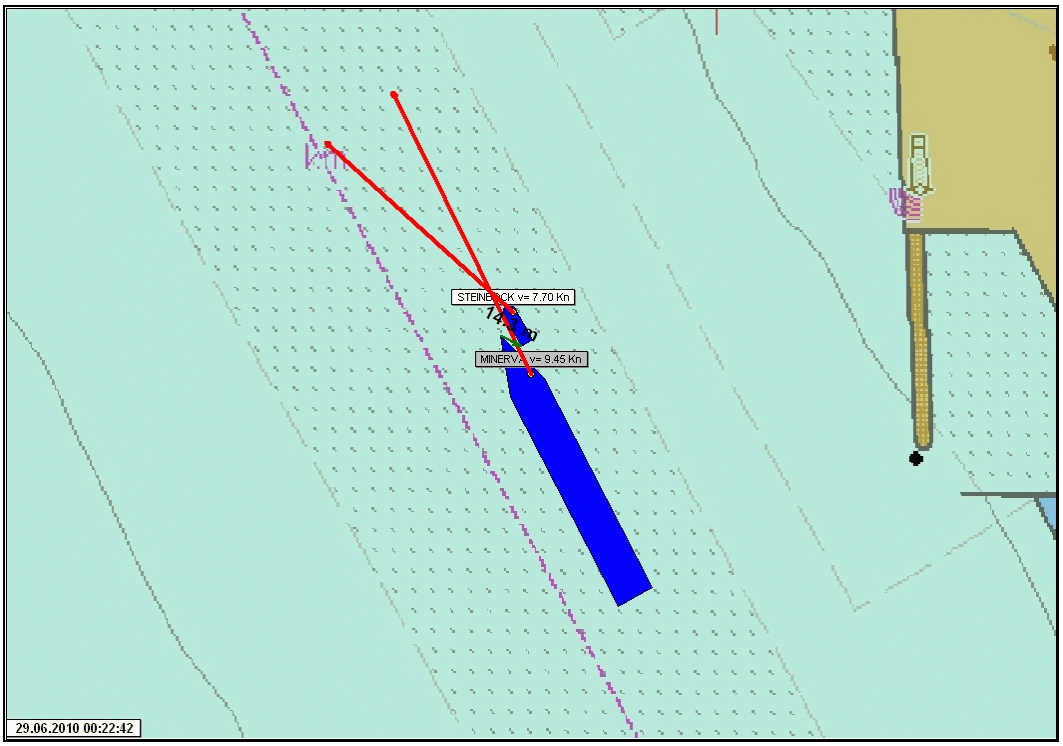

Figure 13: BAW Hamburg 022242 collision

From the BAW technical paper it can be seen that the actual sequence of the collision can be traced to the manoeuvring of the tug and not to the suction effect of the overtaking vessel, because the tug was continuously abeam ahead of the bow of the overtaking vessel. The red vectors refer to the antenna positions of the AIS

signals received, and show the course over ground (COG). The speed over ground was 9.4 kts for the MINERVA and for the tug STEINBOCK 6-8 kts. The track in the approx. 200 m wide dredged channel is 330° (leading light Hofe 330.8°). The currents in the area of the dredged channel run parallel (see Fig. 14).

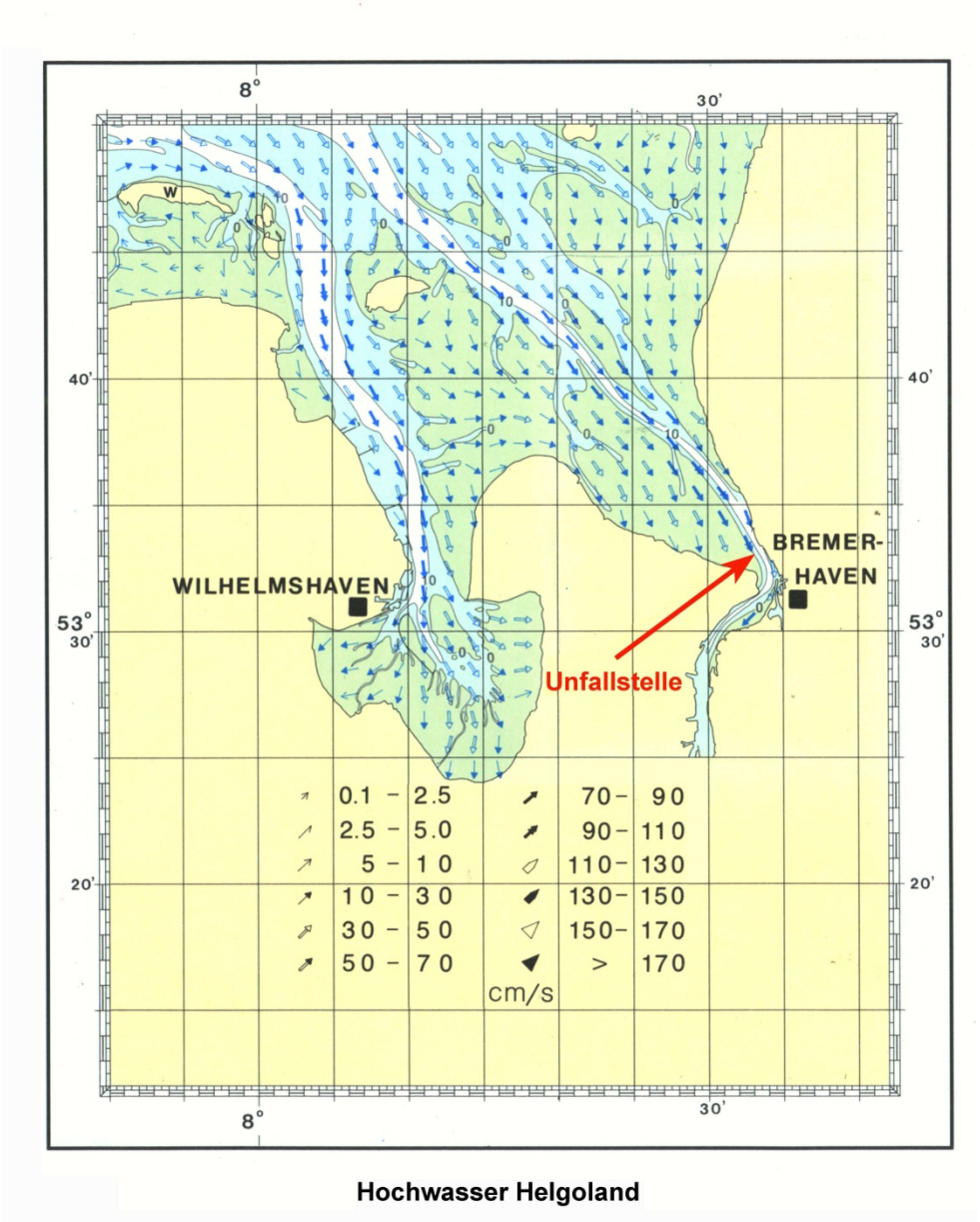

Figure 14: BSH, tidal currents high water 0228[3]

[3] Reference point Helgoland

5 Evaluation of BAW Hamburg

Table interpolated in 1 s increments, speeds in knots, distances measured between bow of MINERVA and port stern of STEINBOCK

STEINBOCK				MINERVA			Dist.
CEST	HDG	COG	SOG	HDG	COG	SOG	m
02:20:00	340	320.6	6.12	335	337.5	8.59	264.5
02:20:01	340	320.8	6.12	335	337.4	8.59	262.6
02:20:02	340	321.1	6.10	335	337.2	8.59	260.8
02:20:03	340	321.3	6.10	335	337.0	8.59	259.0
02:20:04	340	321.5	6.08	334	336.9	8.59	257.6
02:20:05	340	321.7	6.08	334	336.7	8.59	255.9
02:20:06	341	321.9	6.06	334	336.5	8.59	254.2
02:20:07	341	322.1	6.05	334	336.4	8.59	252.5
02:20:08	341	322.2	6.05	334	336.2	8.59	250.8
02:20:09	341	322.4	6.03	334	336.3	8.61	249.4
02:20:10	342	322.6	6.03	334	336.4	8.61	248.1
02:20:11	342	322.8	6.01	334	336.6	8.63	246.8
02:20:12	342	323.0	6.01	334	336.7	8.63	245.4
02:20:13	342	323.2	5.99	334	336.8	8.65	244.2
02:20:14	342	323.5	5.99	334	336.9	8.65	243.0
02:20:15	343	323.7	5.97	334	337.0	8.67	241.9
02:20:16	343	324.0	5.97	334	337.2	8.67	240.7
02:20:17	343	324.2	5.95	334	337.3	8.69	239.5
02:20:18	343	324.4	5.95	334	337.4	8.71	238.3
02:20:19	343	324.7	5.93	334	337.2	8.71	236.7
02:20:20	344	324.9	5.93	334	337.1	8.73	235.2
02:20:21	344	325.2	5.91	334	336.9	8.75	233.6
02:20:22	344	325.4	5.89	334	336.8	8.77	232.0
02:20:23	344	325.8	5.89	334	336.6	8.79	230.5
02:20:24	344	326.2	5.87	334	336.5	8.81	229.0
02:20:25	345	326.6	5.87	334	336.3	8.83	227.5
02:20:26	345	327.0	5.85	334	336.1	8.83	226.0
02:20:27	345	327.4	5.85	334	336.0	8.84	224.5
02:20:28	345	327.7	5.83	334	335.8	8.86	223.0
02:20:29	345	328.1	5.83	334	335.7	8.88	221.5
02:20:30	346	328.5	5.81	334	335.5	8.90	220.0
02:20:31	346	328.9	5.81	334	335.5	8.90	218.4
02:20:32	346	329.3	5.79	334	335.4	8.92	216.8
02:20:33	346	329.2	5.81	334	335.4	8.94	215.2
02:20:34	346	329.2	5.81	334	335.4	8.94	213.6
02:20:35	346	329.1	5.83	333	335.3	8.96	212.3
02:20:36	346	329.1	5.83	333	335.3	8.96	210.7
02:20:37	346	329.0	5.85	333	335.3	8.98	209.1
02:20:38	345	329.0	5.85	333	335.2	8.98	207.5
02:20:39	345	328.9	5.87	333	335.2	9.00	205.9
02:20:40	345	328.9	5.87	333	334.9	9.00	203.6
02:20:41	345	328.8	5.89	333	334.6	9.00	201.4
02:20:42	345	328.8	5.89	332	334.2	9.00	199.5
02:20:43	345	328.7	5.89	332	333.9	9.00	197.3
02:20:44	345	328.8	5.89	332	333.6	9.00	195.4
02:20:45	345	328.9	5.89	332	333.3	9.00	193.4
02:20:46	346	329.0	5.89	331	332.9	9.00	191.9
02:20:47	346	329.1	5.89	331	332.6	9.00	189.9
02:20:48	346	329.2	5.89	331	332.5	9.00	188.6
02:20:49	346	329.3	5.89	331	332.4	9.02	187.4
02:20:50	347	329.4	5.89	330	332.3	9.02	186.4
02:20:51	347	329.5	5.89	330	332.2	9.04	185.2
02:20:52	347	329.6	5.89	330	332.1	9.04	183.9
02:20:53	347	329.9	5.89	330	332.1	9.06	182.1
02:20:54	347	330.2	5.89	330	332.0	9.06	180.3
02:20:55	347	330.5	5.87	330	331.9	9.08	178.5
02:20:56	347	330.8	5.87	329	331.8	9.08	177.1
02:20:57	347	331.1	5.85	329	331.7	9.10	175.3
02:20:58	348	331.4	5.85	329	331.6	9.10	173.6
02:20:59	348	331.7	5.83	329	331.5	9.10	171.9
02:21:00	348	332.0	5.83	329	331.3	9.10	170.2
02:21:01	348	332.3	5.81	329	331.2	9.10	168.6
02:21:02	348	332.6	5.81	329	331.1	9.10	166.9
02:21:03	348	332.9	5.79	329	331.0	9.10	165.3
02:21:04	347	332.4	5.79	329	330.8	9.10	163.8
02:21:05	346	331.9	5.79	329	330.7	9.10	162.3
02:21:06	345	331.3	5.79	329	330.6	9.10	160.8
02:21:07	344	330.8	5.79	329	330.4	9.10	159.4
02:21:08	344	330.3	5.79	329	330.3	9.10	157.9
02:21:09	343	329.8	5.79	329	330.4	9.12	156.7
02:21:10	342	329.2	5.79	329	330.5	9.12	155.6
02:21:11	341	328.7	5.79	329	330.6	9.14	154.4
02:21:12	340	328.2	5.79	329	330.7	9.14	153.3
02:21:13	340	327.5	5.79	329	330.8	9.16	151.9
02:21:14	339	326.8	5.79	329	330.9	9.16	150.6
02:21:15	339	326.1	5.79	329	331.0	9.18	149.3
02:21:16	338	325.3	5.79	329	331.1	9.18	148.0
02:21:17	338	324.6	5.79	329	331.2	9.19	146.6
02:21:18	337	323.9	5.79	329	331.3	9.19	145.4
02:21:19	337	323.2	5.79	329	331.2	9.19	143.7
02:21:20	337	322.6	5.79	329	331.1	9.19	141.8
02:21:21	336	321.9	5.79	329	331.1	9.19	140.0
02:21:22	336	321.3	5.79	329	331.0	9.19	138.2
02:21:23	336	320.8	5.79	329	330.9	9.19	136.4
02:21:24	335	320.3	5.79	329	330.8	9.19	134.8
02:21:25	335	319.8	5.79	329	330.7	9.19	133.0
02:21:26	335	319.5	5.79	329	330.6	9.19	131.3

02:21:27	335	319.2	5.79	329	330.6	9.19	129.5
02:21:28	335	318.8	5.79	329	330.5	9.19	127.7
02:21:29	335	318.5	5.79	329	330.4	9.19	125.9
02:21:30	335	318.3	5.79	329	330.3	9.19	124.2
02:21:31	335	318.1	5.79	329	330.2	9.21	122.0
02:21:32	335	317.9	5.79	329	330.2	9.23	119.8
02:21:33	335	317.6	5.79	329	330.1	9.23	117.6
02:21:34	335	317.4	5.79	329	330.0	9.25	115.3
02:21:35	335	317.1	5.79	329	329.9	9.27	113.1
02:21:36	335	316.9	5.79	329	329.9	9.29	110.9
02:21:37	335	316.7	5.79	329	329.8	9.29	108.8
02:21:38	335	316.5	5.79	329	329.7	9.29	107.2
02:21:39	335	316.3	5.79	329	329.6	9.29	105.6
02:21:40	335	316.3	5.79	329	329.5	9.29	104.1
02:21:41	336	316.4	5.79	329	329.4	9.29	102.5
02:21:42	336	316.4	5.79	329	329.3	9.29	101.1
02:21:43	336	316.4	5.79	328	329.1	9.29	100.1
02:21:44	336	316.6	5.87	328	329.0	9.29	98.7
02:21:45	337	316.8	5.93	328	328.9	9.29	97.1
02:21:46	337	317.0	6.01	328	328.8	9.29	95.7
02:21:47	338	317.3	6.06	328	328.7	9.29	94.5
02:21:48	338	317.6	6.12	328	328.7	9.31	93.5
02:21:49	339	317.9	6.20	328	328.6	9.31	92.3
02:21:50	340	318.2	6.26	328	328.6	9.33	91.1
02:21:51	340	318.5	6.34	328	328.6	9.33	90.0
02:21:52	341	318.8	6.40	328	328.5	9.35	88.8
02:21:53	341	319.1	6.45	327	328.5	9.35	88.0
02:21:54	341	319.4	6.53	327	328.4	9.37	86.8
02:21:55	341	319.7	6.59	327	328.4	9.37	85.6
02:21:56	341	320.0	6.65	327	328.4	9.39	84.4
02:21:57	341	320.3	6.73	327	328.3	9.39	83.2
02:21:58	341	320.5	6.78	327	328.3	9.41	82.0
02:21:59	341	320.8	6.84	327	328.3	9.41	81.0
02:22:00	341	321.1	6.90	327	328.2	9.41	79.9
02:22:01	341	321.4	6.98	327	328.2	9.41	78.8
02:22:02	341	321.7	7.04	327	328.1	9.41	77.8
02:22:03	341	322.0	7.10	328	328.1	9.41	76.3
02:22:04	340	321.6	7.13	328	328.1	9.41	75.4
02:22:05	339	321.1	7.15	328	328.0	9.41	74.6
02:22:06	338	320.7	7.19	328	328.0	9.41	73.8
02:22:07	337	320.3	7.21	328	327.9	9.41	73.0
02:22:08	336	319.9	7.25	328	327.9	9.41	72.2
02:22:09	335	319.4	7.27	328	328.1	9.41	71.5
02:22:10	334	319.0	7.31	328	328.2	9.41	70.8
02:22:11	333	318.2	7.35	328	328.4	9.41	69.8
02:22:12	332	317.3	7.41	328	328.5	9.41	68.7
02:22:13	331	316.3	7.43	329	328.7	9.41	66.9
02:22:14	330	315.4	7.44	329	328.9	9.41	65.6
02:22:15	328	314.4	7.48	329	329.0	9.41	64.6
02:22:16	327	313.4	7.50	329	329.2	9.41	63.3
02:22:17	326	312.3	7.54	329	329.3	9.41	61.7
02:22:18	325	311.2	7.56	329	329.5	9.41	60.0
02:22:19	324	310.1	7.60	329	329.4	9.41	58.2
02:22:20	324	309.1	7.60	329	329.4	9.41	56.0
02:22:21	323	308.0	7.60	329	329.3	9.41	54.1
02:22:22	323	307.0	7.60	329	329.3	9.41	51.8
02:22:23	323	306.4	7.62	330	329.2	9.41	49.1
02:22:24	323	305.8	7.66	330	329.2	9.41	46.9
02:22:25	323	305.2	7.68	330	329.1	9.41	44.7
02:22:26	323	304.6	7.70	330	329.1	9.41	42.6
02:22:27	324	304.3	7.70	330	329.0	9.41	39.7
02:22:28	324	303.9	7.70	330	329.3	9.41	36.8
02:22:29	324	303.9	7.70	330	329.5	9.41	34.5
02:22:30	325	303.8	7.70	330	329.8	9.41	31.9
02:22:31	325	303.8	7.70	330	330.0	9.41	29.8
02:22:32	325	303.7	7.70	331	330.3	9.41	27.4
02:22:33	326	304.0	7.70	331	330.6	9.41	25.1
02:22:34	326	304.2	7.70	331	330.8	9.41	23.3
02:22:35	327	304.5	7.70	331	331.1	9.41	21.3
02:22:36	327	304.7	7.70	331	331.3	9.41	19.8
02:22:37	328	305.2	7.70	331	331.6	9.41	18.3
02:22:38	328	305.6	7.70	331	331.8	9.41	17.2
02:22:39	329	306.1	7.70	331	332.0	9.43	16.0
02:22:40	329	306.6	7.70	331	332.2	9.43	15.4
02:22:41	330	307.1	7.70	331	332.4	9.45	14.7
02:22:42	330	307.5	7.70	332	332.6	9.45	14.3
02:22:43	330	308.0	7.70	332	332.7	9.47	14.5
02:22:44	330	308.5	7.72	332	332.9	9.47	14.7
02:22:45	330	308.9	7.76	332	333.1	9.49	15.2
02:22:46	330	309.4	7.78	332	333.3	9.49	15.8
02:22:47	330	309.8	7.79	332	333.5	9.51	16.6
02:22:48	329	310.1	7.83	332	333.2	9.47	16.4
02:22:49	327	310.5	7.87	332	333.0	9.45	16.4
02:22:50	326	310.8	7.91	332	332.7	9.41	16.3
02:22:51	324	311.2	7.95	332	332.5	9.39	16.3
02:22:52	323	311.5	8.01	332	332.2	9.37	16.4
02:22:53	321	308.4	7.70	331	332.0	9.33	20.1
02:22:54	319	305.2	7.41	331	331.7	9.31	23.9
02:22:55	317	302.1	7.10	331	331.5	9.27	27.8
02:22:56	315	299.0	6.80	331	331.2	9.25	31.6
02:22:57	313	295.9	6.49	331	331.0	9.23	35.4
02:22:58	312	292.7	6.20	331	330.7	9.19	39.3
02:22:59	310	289.6	5.89	331	330.4	9.18	42.4
02:23:00	308	286.5	5.60	331	330.2	9.14	45.6

Figure 15: Table BAW Hamburg

The table shows that in the last 40 seconds before the collision, the COG of the tug was backing from 322°. The closest approach between the vessels was at 022242. The measured transverse distance between the vessels is 14 m. The difference between the heading (HDG) and COG in the last 3 minutes is more or less 15-20°. The SOG increased steadily in the minutes before the collision from 6 to 8 kts. Here at the latest there should have been manoeuvres initiated by the tug to avoid the collision.

6 Conclusions

The last job for the crew ended the previous day at 2000. The time (notice) between waking at 0200 and casting off at 0216 was a quarter of an hour. The collision between the tug STEINBOCK and the RoRo vessel MINERVA took place only 7 minutes later at 0223 as the tug deviated from her course between the dredged channel and landing lights and ran across the bow of the MINERVA. The sequence of the collision can be traced back to the manoeuvring of the tug and not to the suction effect of the overtaking vessel. The tug was abeam throughout before the collision at a sufficient distance from the overtaking vessel. The tug master was alone on the bridge up to the collision. At the time of the collision, the chief officer was on the way from the mess to the bridge to take on the duties of the lookout. Before this he was busy with the ordinary seaman releasing the shore connection and casting off the mooring lines and clearing up. The chief engineer started the engines and prepared for sea. The master was on the bridge and made the bridge ready to depart.

After waking and beginning sea operation, apart from the master the crew visited the mess on multiple occasions. After their sleep, the seamen were clearly thirsty and hungry. According to the statements made, no drinks or food had been prepared for the night shift. As a result, and due to clearing up the mooring lines, the lookout only set off for the bridge 7 minutes after casting off. These minutes were decisive for monitoring the traffic situation. It was not possible for structural reasons for the master alone to have an all-round view from the helm. The funnel covered a significant part of the view astern. The sea-room can only be completely observed visually jointly from the port and starboard sides of the bridge. It must therefore be ensured that in this area the bridge is continuously manned by at least two persons. There was the additional detrimental effect that the autopilot was not switched on. The helmsman is therefore tied to his position at the conning position, but can also view the radar picture as well as the control equipment. However, the radar system was only in standby mode. The master possibly did not reckon with being left so long alone. On the other hand, he did not request assistance.

According to the applicable tariff conditions (MTV-See §16 (2)) the crew has the right to "night-time provisions" when work is done at night time. Adherence to the tariff regulations is the responsibility of the master. In this concrete case, the master had received an on-board cash box for this purpose and was also responsible for purchasing provisions and for provisioning the crew.

Before an approaching job, the tugs in Bremerhaven are informed in principle by UMTS using the so-called "TUG Client". The message from the control station is sent at least 2 hours before the planned job. The message is confirmed electronically by the master on board. In addition, the control station calls the tug one hour before the job. The last message is called "Reedemeldung" (“roadstead message”) in Bremerhaven. As this was not, however, originally a tug job but a pilot transfer, this procedure was not followed. The master received the job via the marine channel at around 0200 to fetch a pilot from the northern lock and to transfer him to the RCL COMMANDER.

The shipping company has a certified quality management system in accordance with ISO 9001 for their tugs. It is monitored by Germanischer Lloyd. The last audit was on 25 March 2010. Furthermore, the shipping company has a certificate of adherence to the regulations of the International Management Code for the Safe Operation of Ships and for Pollution Prevention (ISM Code) and is audited annually. Both documents are valid until 1 April 2013.

The management handbook includes procedural instructions on how to manage the ship operations. Among others, it must be ensured that the lookout is manned at all times during the voyage, available navigation equipment and the autopilot must also be used if the traffic situation allows it. It is particularly noted that the traffic situation is to be continuously monitored, sufficient passing distances to other vessels maintained and radar information evaluated exactly.

According to the quality requirements and procedural instructions of the shipping company, as well as the procedures in Bremerhaven for tug operation, there would have been sufficient time to organise the operation better with a 4-man crew. If there had been an earlier notification by the control station, the crew would have been able to eat and drink before casting off, the chief engineer start the engine, the chief office and ordinary seaman detach the shore connection and prepare the mooring lines, and the master make the bridge ready. Casting off could then have been supported by the chief officer on the bridge and the chief engineer on the deck and they could have ensured a watertight integrity. In this way, it may have been possible to prevent the dangerous approach right into the bow bow swell and the collision with the MINERVA as well as the inrush of water.

The master and the chief officer, as his deputy and delegate, are responsible for the strict adherence to the system named in the handbook as the integrated management system (IMS) on board and must ensure the functioning of the quality management system together with the company management representative, the quality management representative and the designated person from the shipping company so that it can be practised in reality. In the functional description, the active and critical cooperation in the implementation and further development of the system is specifically required.

The certification for ISO 9001 and ISM Code is a voluntary commitment by the tug STEINBOCK and other vessels in the shipping company. It is intended to be a support for the implementation of a safe ship operation for the ship's command. Under no circumstances are the provisions in the operating procedures to limit the freedom of decision of the master.

On the part of the shipping company, the following measures were taken after the damage, and also before it:

a. The crew was thoroughly questioned and, including the master, once again specifically instructed on how they are to behave in such a situation in the future.

b. Personnel measures have been taken by the human resources department, which are subject to confidentiality.

c. The incident was thoroughly discussed in the Occupational Safety Committee, which is composed of works council members, occupational safety representatives, company doctor, and employer representatives, and led by the president of the Expert for Occupational Safety (FASI).

d Furthermore, the incident was reported in the quarterly report of FASI.

e. The incident has also been included in the company training management, which is run in close cooperation with ma-co (maritimes competenzcentrum − Maritime Competence Centre) and MTC (Marine Training Center Hamburg). In individual training seminars, particularly those to do with the quality management system as well as with the organisation on-board and tug techniques, this case is used to once again deal with the topics such as "making the bridge ready", lookout, using the navigational aids, creating a watertight integrity, provisions and planning for jobs.

f. A circular was also sent by the inspection and FASI to all tugs in which the watertight integrity was particularly addressed.

Due to these measures already carried out, the BSU sees no reason to develop further safety recommendations. Training, implementation and continuation of the quality management system on board remain decisive.

7 Sources

- Investigations by Waterway Police (WSP) Bremerhaven

- Written statements
  - ship's command, pilot
  - Bugsier-, Reederei- und Bergungsgesellschaft

- Witness accounts of the crews

- Technical contribution
  - Federal Waterways Engineering and Research Institute in Hamburg, Dr.- Ing. Klemens Uliczka, Dipl. Ing. Martin Wezel

- Nautical charts, tide tables, current data and vessel particulars, Federal Maritime and Hydrographic Agency (BSH)

- AIS recordings WSP Bremerhaven and Water and Shipping Directorate North

- Photos Hasenpusch, Schenefeld