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

BERMUDA

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Joint investigation report in accordance with
the IMO Casualty Investigation Code
(Resolution MSC.255(84))
by the flag State Bermuda
and the coastal State Federal Republic of Germany

Investigation Report 94/13

Serious Marine Casualty

Grounding
of the MV NORFOLK EXPRESS
on 18 April 2013
on the River Weser

10 April 2014

The following is a **joint report** by the German Federal Bureau of Maritime Casualty Investigation as lead investigating authority and the marine casualty investigation authority of Bermuda. The two bodies have conducted this investigation jointly and in accordance with the IMO Casualty Investigation Code (Resolution MSC.255(84)). The working language used for this joint investigation was English. The German text shall prevail in the interpretation of this report.

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, amended most recently by Article 1 of 22 November 2011, BGBl. (Federal Law Gazette) I p. 2279.

According to said Law, the sole objective of this investigation is to prevent future accidents and malfunctions. This investigation does not serve to ascertain fault, liability or claims (Article 9(2) SUG).

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

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

Issued by:
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1 Summary

In the morning of 18 April 2013, the container ship NORFOLK EXPRESS left the Stromkaje at Bremerhaven to begin her voyage to Le Havre, France. The usual tests on the main engine and steering gear carried out beforehand revealed no faults.
The rudder unexpectedly remained at hard to port just a few minutes after casting off the lines. Immediate use of the tiller[1] made it possible to regain control of the ship.
The chief and the electrician searched extensively for the fault for several minutes, but did not find it. The steering gear suddenly returned to normal and the voyage was continued. The two individuals remained in the steering gear compartment as a precaution. The NORFOLK EXPRESS accelerated to 18 kts and proceeded down the River Weser. At 0931[2], the steering control failed again and the rudder remained at 7° to port. However, the tiller had no effect this time. The ship then turned to port and sailed towards the Langlütjen breakwater in a wide arc. The engine was stopped and the port anchor dropped. Despite that, the ship continued to move forward with her bulbous bow ramming against the dam and only came to a standstill there. The damage to the NORFOLK EXPRESS was so severe that she was laid up for repairs in dry dock for weeks. Fortunately, there were neither injuries nor environmental damage.
Since the NORFOLK EXPRESS sails under the flag of Bermuda, a joint investigation was carried out.

This concluded that a ship should not continue her voyage when an unknown fault that impairs the manoeuvrability and thus safety of the ship is evident.

[1] A tiller is a small control lever that bypasses all other input/commands from the steering control and is used to steer the rudder directly
[2] All times shown in this report are local = CEST = UTC + 2 hours.

2 FACTUAL INFORMATION

2.1 Photo

Figure 1: MV NORFOLK EXPRESS

2.2 Ship particulars

Name of vessel:	NORFOLK EXPRESS
Type of vessel:	Container ship
Nationality/Flag:	Bermuda
Port of registry:	Hamilton
IMO number:	9104902
Call sign:	ZCEI6
Vessel operator:	Anglo-Eastern Ship Management
Year built:	1995
Shipyard/Yard number:	Hyundai Heavy Industries Ltd, Ulsan/929
Classification society:	Germanischer Lloyd
Length overall:	244.905 m
Breadth overall:	32.286 m
Gross tonnage:	36,606
Deadweight:	45,362 t
Draught (max.):	12.0 m
Engine rating:	32,884 kW
Main engine:	Hyundai Sulzer 8 RTA 84C
(Service) Speed:	18.3 kts
Hull material:	Steel
Hull design:	Double bottom

2.3 Voyage particulars

Port of departure:	Bremerhaven
Port of call:	Le Havre, France
Type of voyage:	Merchant shipping International
Cargo information:	1,412 Containers
Manning:	29
Draught at time of accident:	F: 8.59 m, A: 10.25 m
Pilot on board:	Yes
Canal helmsman:	No
Number of passengers:	0

2.4 Marine casualty or incident information

Type of marine casualty:	Serious marine casualty, grounding
Date, time:	18/04/2013, 0931
Location:	River Weser, Langlütjen breakwater, buoy 35/37
Latitude/Longitude:	φ 053°41.012'N λ 008°21.092'E
Ship operation and voyage segment:	Casting off/harbour mode
Place on board:	Fore section
Consequences:	No injuries or environmental damage. Severe damage to fore section

Excerpt from Nautical Chart INT 1457, BSH

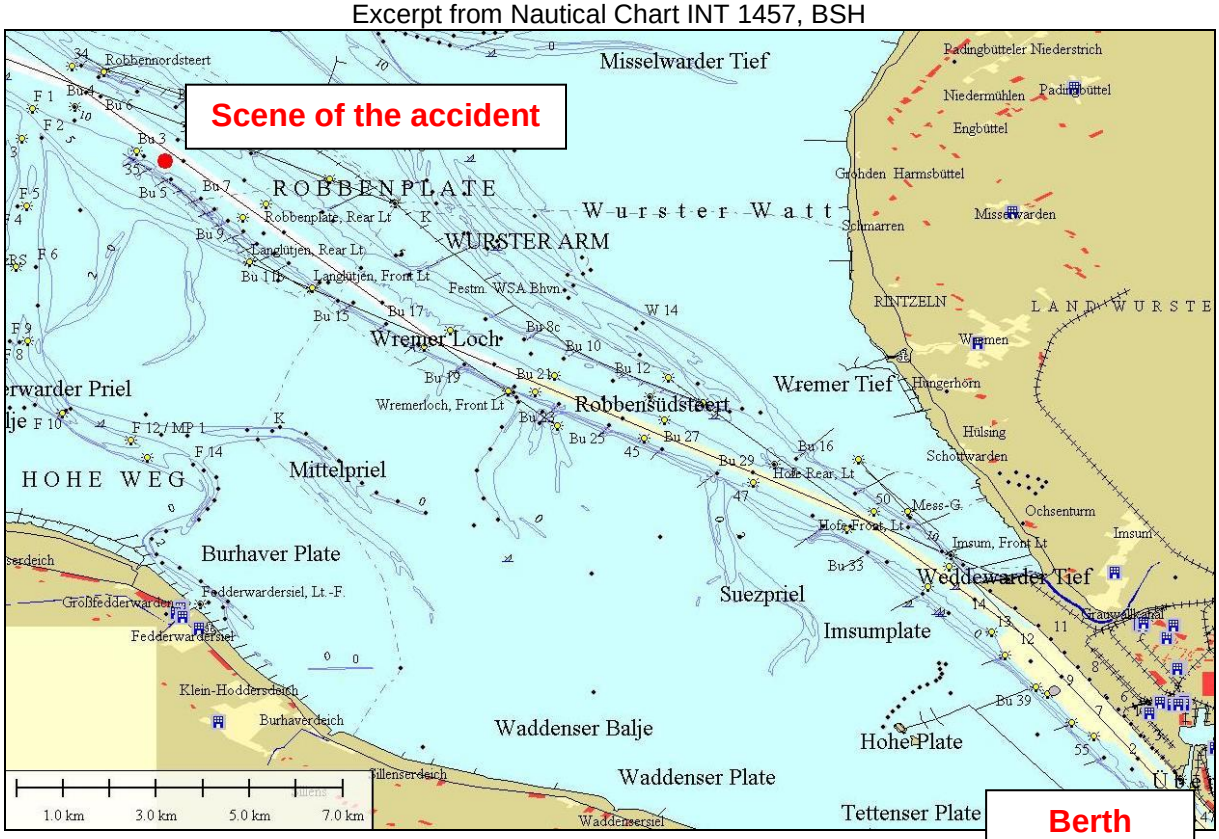

Figure 2: Nautical chart of the River Weser (overall view)

Excerpt from Nautical Chart INT 1457, BSH

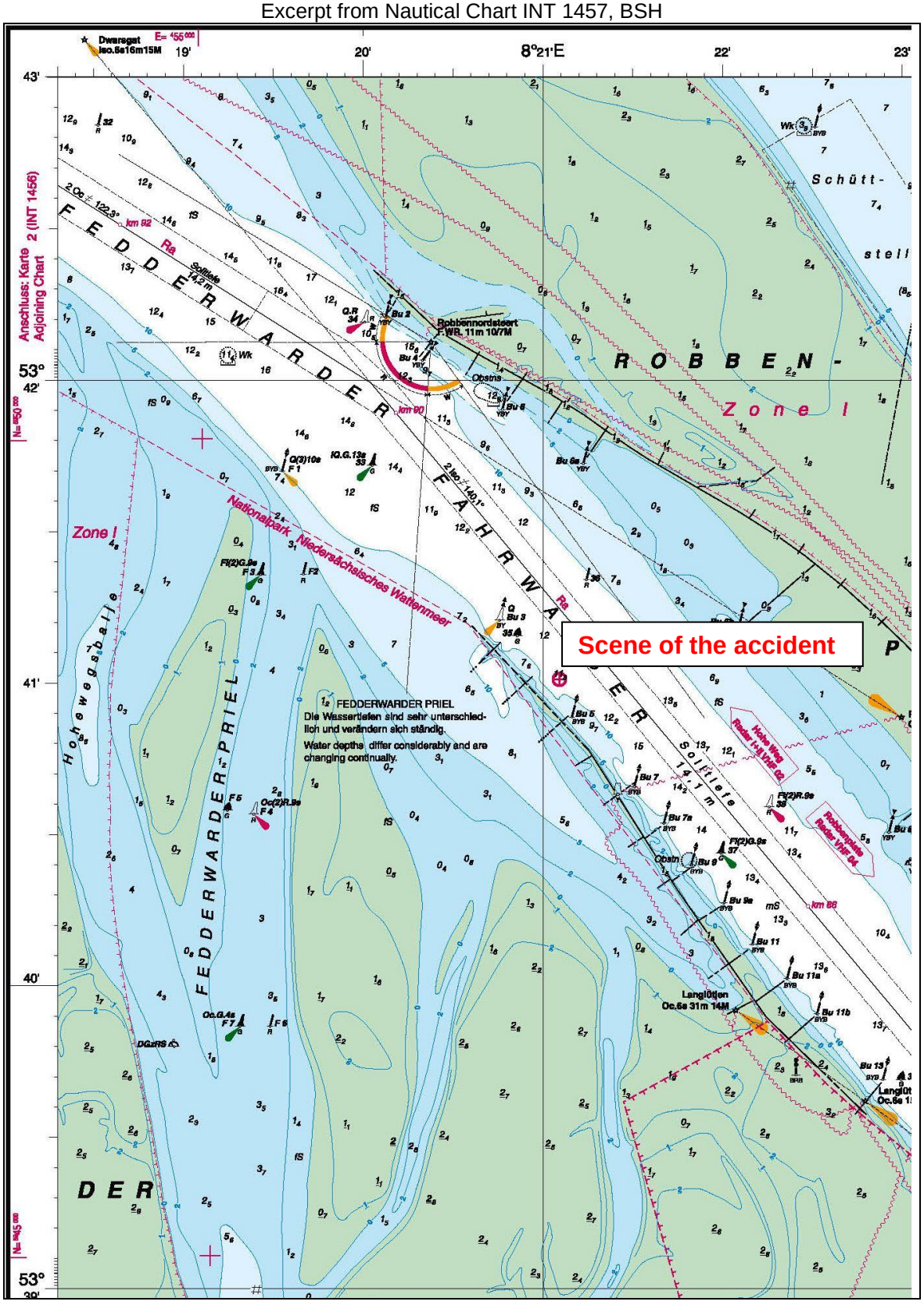

Figure 3: Detailed nautical chart showing the scene of the accident

2.5 Shore authority involvement and emergency response

Agencies involved:	CCME Cuxhaven, Vessel Traffic Services (VTS) Bremerhaven and Wilhelmshaven, Waterway Police (WSP) Bremerhaven, Federal Police, German Maritime Search and Rescue Service, and the companies Urag and Bugsier
Resources used:	Rescue cruiser HERMANN RUDOLF MEYER, water pollution control ship NEUWERK, the tugs NORDIC, ELMS, ELBE, BUGSIER 6, and GEESTE, WSP boats W3 and VISURA, buoy tender NORDERGRÜNDE, and helicopter of the Federal Police
Action taken:	The tugs ELMS, ELBE, BUGSIER 6 and GEESTE make a line connection with the NORFOLK EXPRESS, tow her free in a rising tide sternwards and then back to the Stromkaje at Bremerhaven
Results achieved:	No injuries or environmental damage. Severe damage to the fore section of the NORFOLK EXPRESS necessitates calling at a shipyard

3 COURSE OF THE ACCIDENT AND INVESTIGATION

3.1 Course of the accident

Loading work was completed on the full container ship NORFOLK EXPRESS on the morning of Thursday 18 April 2013. The ship was to leave Bremerhaven as soon as possible and head for Le Havre, France. The crew was alerted at 0545 so that the ship could be prepared for departure. Inter alia, the steering gear was tested in the usual manner at 0630. The test revealed no faults.
The harbour pilot and the sea pilot boarded at 0812. A tug made fast at the stern at 0833 and all lines were cast off at 0842.
At 0847, the rudder unexpectedly jammed at hard to port. The master immediately switched to NFU mode[3], thus regaining control of the ship.
The Chief Engineer and the Electrician tested different functions and concluded that the steering gear was working normally again. As a precaution, the master ordered both of them to remain on standby in the steering gear compartment. Two phones and a VHF transceiver were available there for communicating with the bridge.
The harbour pilot disembarked at 0900. He handed the ship over to the sea pilot in the belief that the ship's manoeuvrability was normal.
The weather was moderate and visibility good. A force 6 to 7 (gusts of 8 Bft) south-westerly wind and a north-westerly ebb stream of about 3 kts in strength prevailed.
Buoy pair 37/38 was passed at 0929. The speed of the NORFOLK EXPRESS stood at about 18.6 kts when the rudder suddenly jammed at 7° to port. Despite the efforts of the master, it was no longer possible to move it. The master ordered full astern, which was carried out by the third officer. Since the engine manoeuvre appeared to be too slow, the master pressed the main engine's emergency stop at 0930. At the same time, he ordered the bosun on the forecastle to drop the port anchor on VHF. In the meantime, the pilot advised the vessel traffic service of the situation on VHF channel 4. At 0931, the NORFOLK EXPRESS was grounded on the Langlütjen breakwater next to buoy pair 35/37.

3.2 Subsequent events

At 0934, the bosun reported from the forecastle that all ten lengths of the anchor chain had run out and pointed sternward beneath the ship. General alarm was sounded on the ship at 0939. At the same time, the main engine operated at full astern without success. While the chief mate inspected the fore section for water ingress at about 0941, the crew assembled at the muster station. Everybody was accounted for. At 0945, the ship's command activated the S-VDR on the bridge.
In the meantime, the VTS informed the WSP, which then sent their boat, WSP3, to the NORFOLK EXPRESS (arriving at 1230).

[3] NFU: Non-follow up – manual steering for as long as the tiller (small control lever) is held. The steering gear is controlled directly without using any upstream electronics.

The NORDERGRÜNDE was the first tug to arrive at the scene of the accident at 1006. The ELBE arrived at 1029. During this period, the crew of the NORFOLK EXPRESS sounded all the ballast water tanks. All the cargo holds were then inspected until about 1110. The WSP boat VISURA arrived at the NORFOLK EXPRESS at 1043.
Due to the complexity of the emergency, CCME Cuxhaven took over the rescue operation at 1045. At about 1146, a helicopter flew over the NORFOLK EXPRESS and determined the damage to the ship and environment on behalf of the CCME. Apart from the mechanical damage to the breakwater, no environmental damage was found.

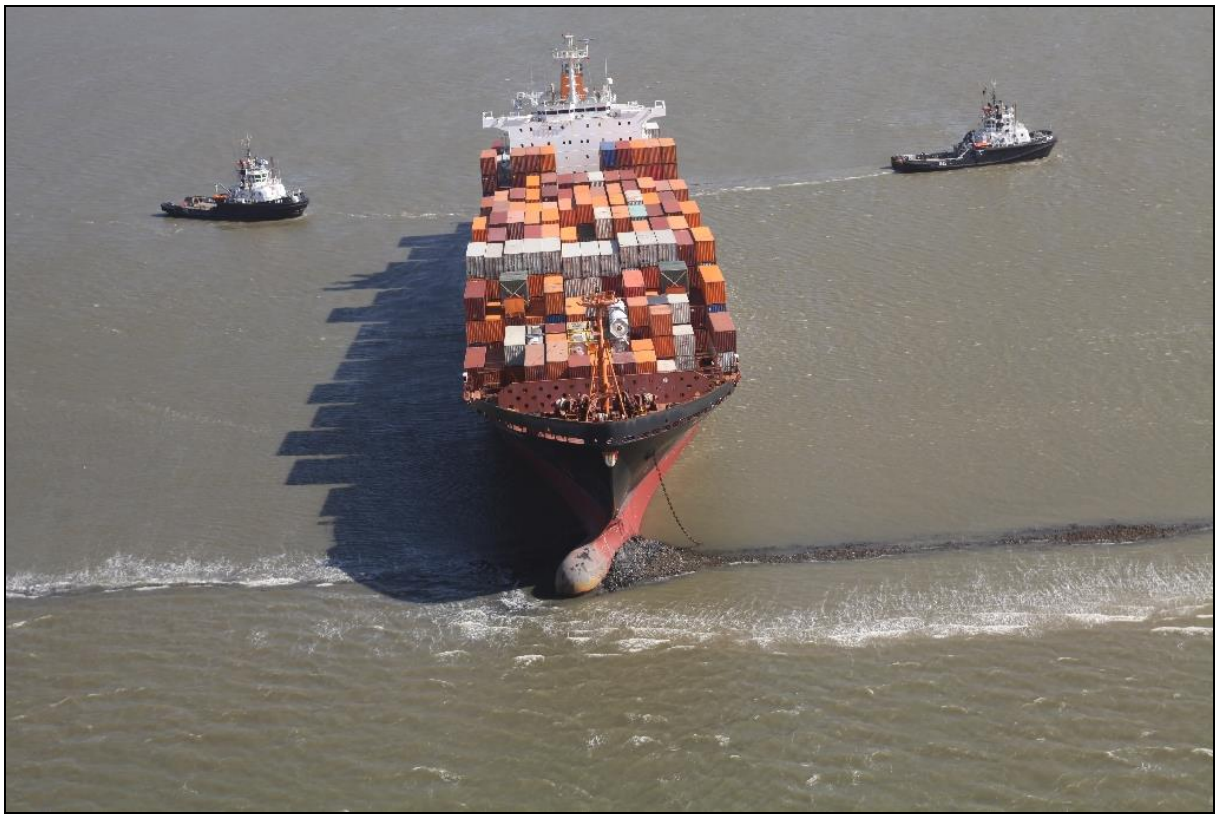

Figure 4: Photo taken from the helicopter to determine the damage

The crew of the NORFOLK EXPRESS and that of the helicopter both found damage on the bulbous bow. By closing the relevant bulkheads, it was possible to restrict the water entering there to the forepeak. The volume of water was so small that the NORFOLK EXPRESS remained buoyant.
At 1223, the BUGSIER 6 was made fast at the stern. Shortly afterwards, the EMS was made fast on the starboard side.

The VISURA handed over to Boat 3 of the WSP at about 1240 and was stood down by the CCME. At 1330, three officers from the WSP boarded to start the initial investigation.
The crew and support personnel systematically prepared as for the pilot's recommendation to tow the ship free during the next high tide at about 1600. At 1556, the fourth tug, the GEESTE, was made fast at the stern.

All the tugs started to pull at 1630 and the NORFOLK EXPRESS was afloat at 1640. The tugs stopped shortly afterwards to enable the anchor chain to be hauled in. At 1644, the EMS was released from the starboard side to enable her to make fast at the bow soon after so as to assist the NORFOLK EXPRESS in turning from there. At 1732, the anchor was hauled in without visible damage.
The harbour pilot boarded at 1809 and took charge of mooring at the Stromkaje, where the NORFOLK EXPRESS was finally made fast at 1900.

3.3 Investigation

The safety investigation was jointly conducted with the marine casualty investigation authority of the flag State Bermuda. After consultation, the BSU assumed the role of lead investigating state within the meaning of the Casualty Investigation Code of the International Maritime Organisation (IMO)[4] and the German Maritime Safety Investigation Law (SUG)[5].

3.3.1 MV NORFOLK EXPRESS

The NORFOLK EXPRESS is a full container ship propelled by a right-handed fixed pitch propeller and steered by a semi-balanced rudder. The last performance test on the steering gear took place at about 0630. There were no complications.
The bridge is equipped, inter alia, with two radar systems, two GPS devices, one ECDIS system and a depth sounder. These devices are made by Furuno.
The manoeuvre characteristics displayed on the bridge state the following as regards stopping the ship in normal conditions:

Speed	Time	Distance
Full ahead (sea)	6 min. 25 sec.	1.14 nm
Full ahead (harbour)	5 min. 35 sec.	1.00 nm
Half ahead	4 min. 03 sec.	0.66 nm
Dead slow ahead	2 min. 32 sec.	0.64 nm

It appears that the values for laden conditions were not recorded.

The turning circle recordings for a hard to port rudder angle when the ship is laden indicate that the NORFOLK EXPRESS requires maximum sea space of 0.4 nm on her port side to steer a full circle at 15.52 kts.

3.3.2 Accident damage

There were neither injuries nor environmental damage. Material damage to the NORFOLK EXPRESS proved considerable.

[4] See Part II, Chapter 7 of the 'Code of the International Standards and Recommended Practices for a Safety Investigation into a Marine Casualty or Marine Incident' (Casualty Investigation Code) of 16 May 2008, Annex to Resolution MSC.255(84).

[5] See Article 16 of the Law to improve safety of shipping by investigating marine casualties and other incidents (German Maritime Safety Investigation Law) of 16 June 2002, as amended 22 November 2011.

Starting at the collision bulkhead, the bulbous bow was severely bent to starboard. This was replaced in dry dock at Bremerhaven from 6 May 2013 onwards.
As can be seen in Figure 6, the repair work was almost completed on 4 June 2013.

Both steering gear telemotors were sent for a complete overhaul. All the hydraulic valves were cleaned and the system's oil was replaced. The electric control units were examined carefully. It took four days to determine that a defective rectifier was the cause of the malfunction on the starboard telemotor control unit.

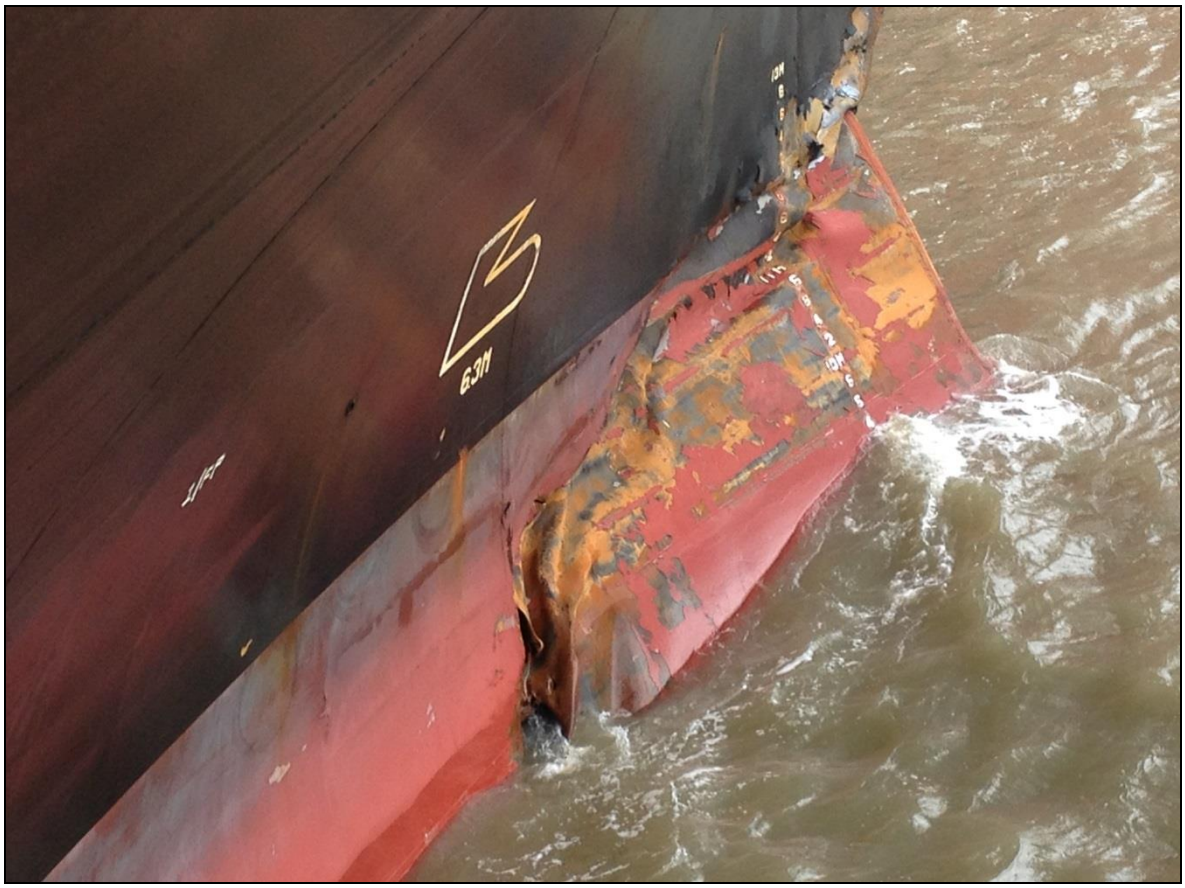

Figure 5: Damage to the bow

Figure 6: Repaired bow

3.3.3 Ship's crew

A total of 28 crew members were on board. All were Indian nationals. A German harbour pilot and a German sea pilot were on board during the casting off manoeuvre. An English pilot was also on board for the English Channel.
The master was 34 years old at the time of the accident. He has commanded the ship since 25 January 2013. This was his fourth ship in the role of master since January 2011.
His rest period started at 2000 on the previous evening.
The third officer and the helmsman had their rest period from 0000 to 0600 before the ship cast off.
The chief engineer has been employed in seagoing service since 1999. He has worked on board the NORFOLK EXPRESS since 29 March 2013.
The electrician was 60 years old at the time of the accident and had been on board since 12 November 2012.

3.3.4 VDR

A Furuno type VR-3000S S-VDR was on board. Due to its design, it did not record data that would have made it possible to trace helm commands and engine manoeuvres. However, recorded radar images could be used to illustrate the course of the accident.
Figure 7 shows the initial situation when the rudder blocks and the ship starts to turn away to port. Her speed stood at 18.6 kts.

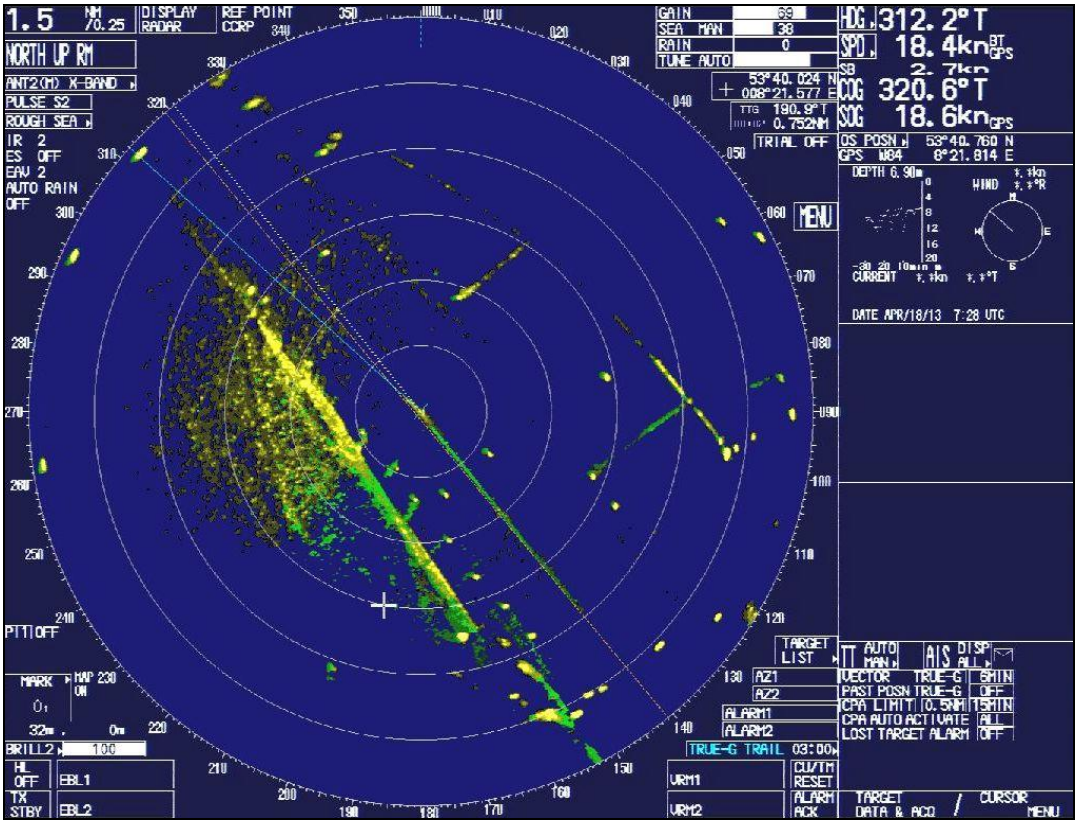

Figure 7: Radar image at 092900 – rudder blocks

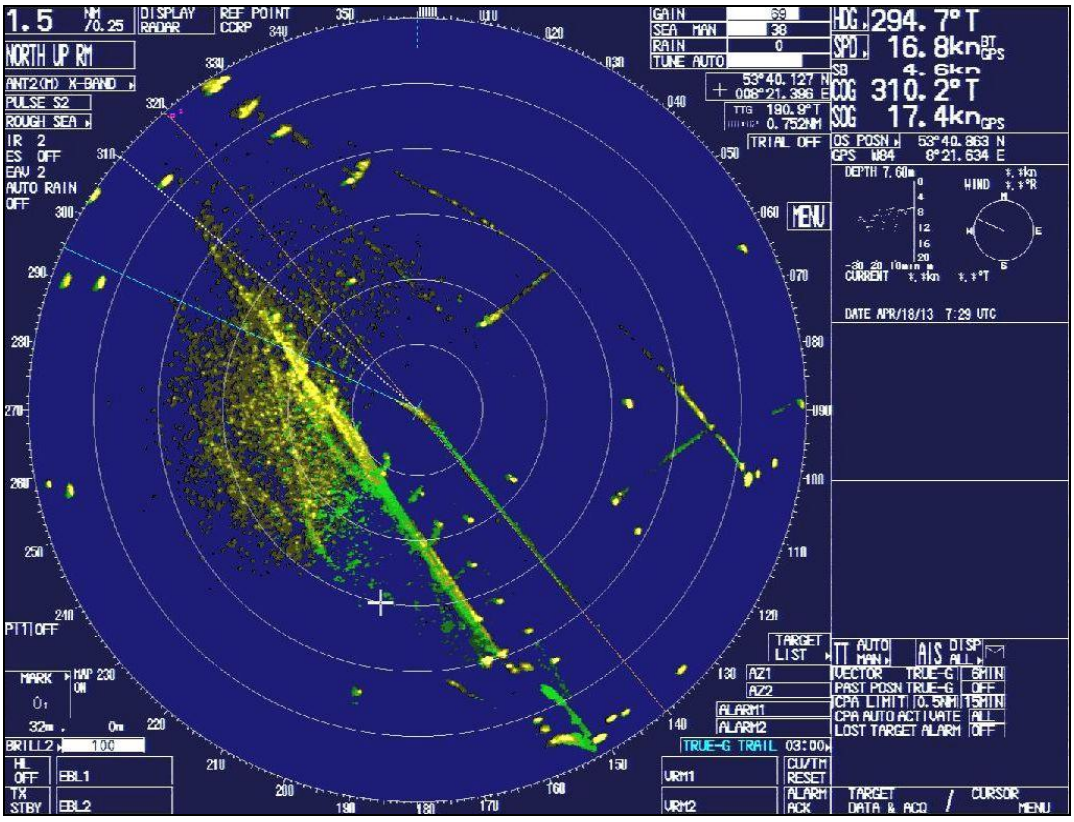

Figure 8: Radar image at 092929 – anchor is dropped

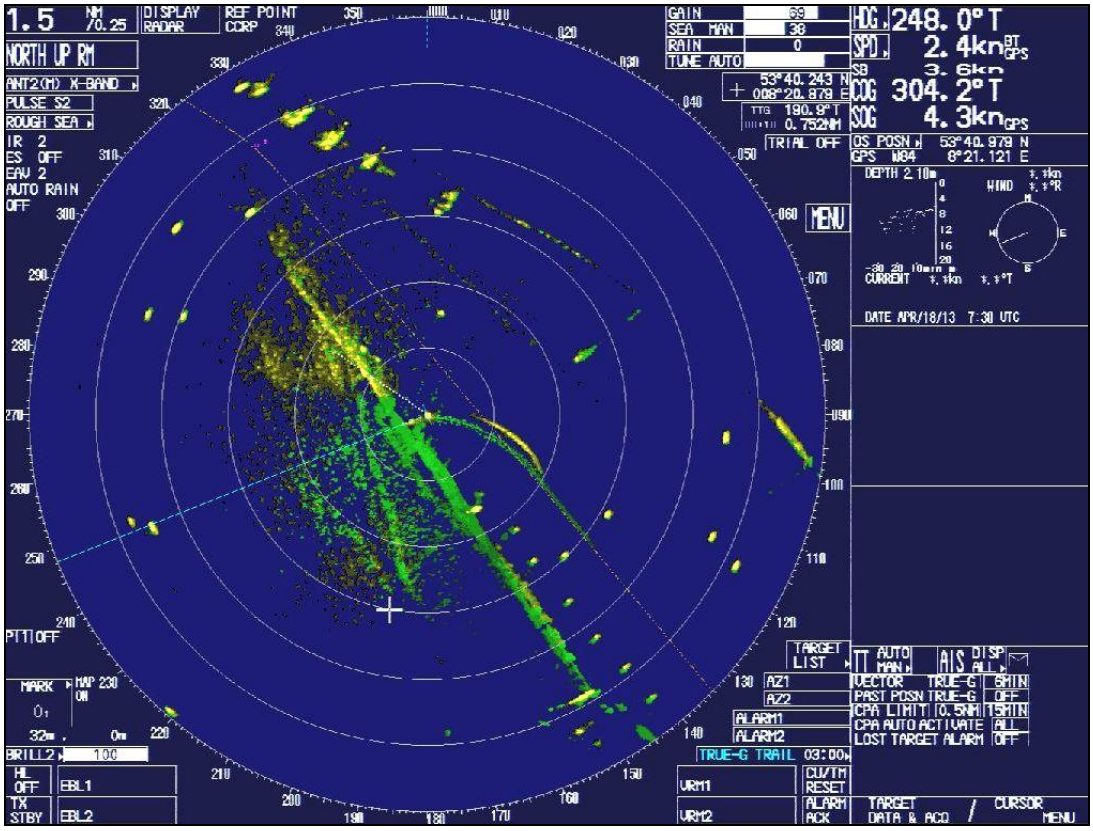

Figure 9: Radar image at 093100 – grounded

Figure 8 shows the time at which the anchor was dropped according to the VDR audio recording. Finally, Figure 9 shows how the NORFOLK EXPRESS is grounded from 0931.

3.3.5 Steering gear

A firm specialising in such hydraulic systems was commissioned by the vessel operator to find and correct the fault. The specialists needed four working days to determine that a rectifier was defective. However, this fault was intermittent, meaning it was hard to identify. These rectifiers transmit an electronic signal to a solenoid valve. This then enables hydraulic control of the steering gear: the hydraulic oil actuates the direction valves of the steering gear, which move the rudder via long lever arms. The fault was on the starboard control unit; a second control unit exists on the port side. The ship's command could have switched to this control unit; however, this did not happen.

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Figure 10: Open electronic switch box

© BSU

Figure 11: Switch cabinets for the steering gear

© BSU

Figure 12: The hydraulic motor for the steering control is located on the floor below the switch cabinets

The option to bypass all the electronic and hydraulic systems and move the rudder blade by means of a hand wheel is provided for emergencies. To do this, the bolt that holds the steering rods together has to be released and engaged differently. This takes several minutes.

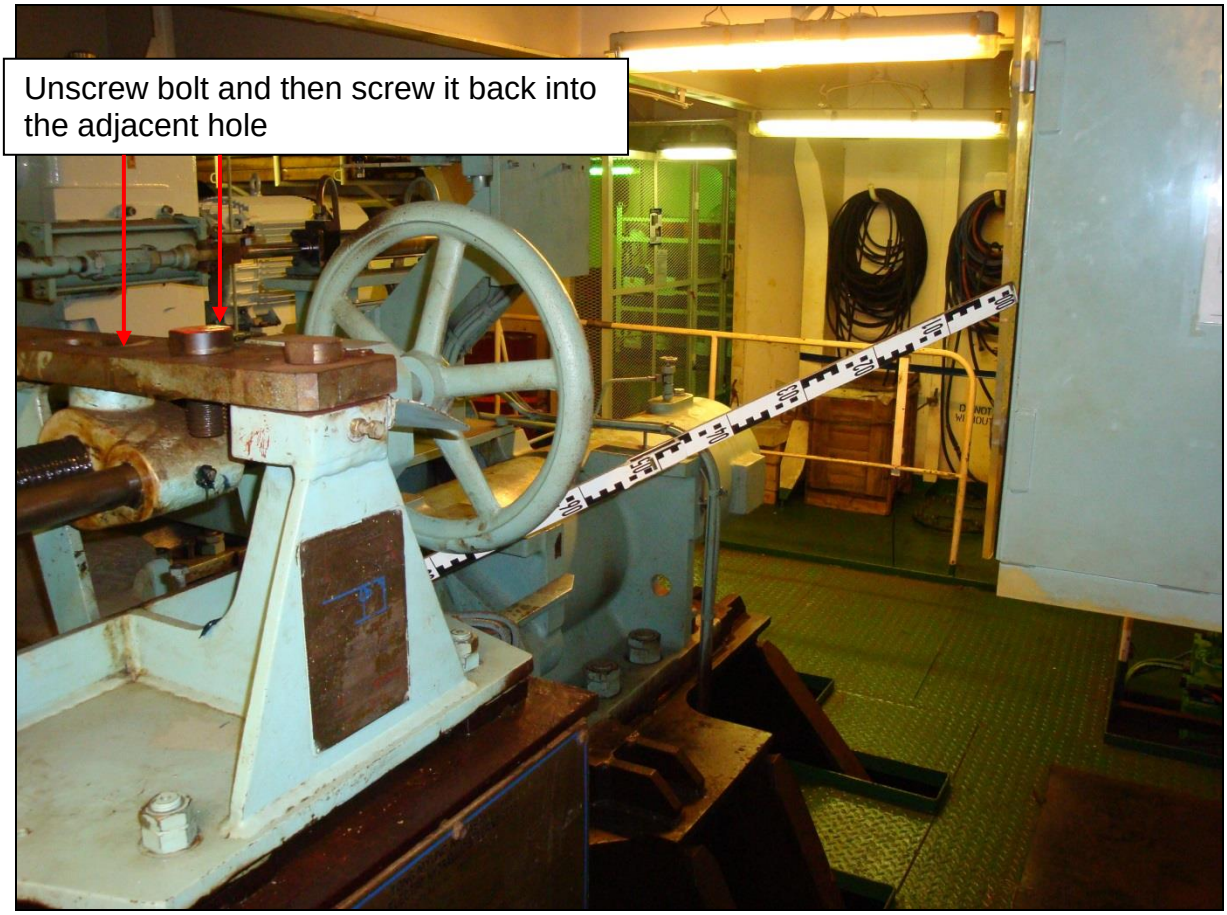

Figure 13: Switching to manual emergency operation

The steering gear compartment is not directly next to the main engine room. The advantage of this is that noise from the main engine room does not enter the steering gear compartment. The noise emitted by the running steering gear was so low that a VHF transceiver could be used during the survey.

A half-open phone box is located in the immediate vicinity of the steering gear. The two existing phones were tested in the presence of the BSU personnel. The cable is long enough to reach the hand wheel for the emergency rudder system. This means that it is quite possible for a crew member to use a handset and implement helm commands from the bridge on the hand wheel. This phone was not used in connection with the accident. Instead, witness statements confirmed that a handheld VHF transceiver was used.

Figure 14: Distance from the phone to the hand wheel for operating the emergency rudder system

3.3.6 Weather conditions

Germany's National Meteorological Service has hourly measurements and observations from the surrounding onshore and offshore stations (Alte Weser lighthouse, Wangerland, Bremerhaven, Nordholz, and Cuxhaven) at its disposal for the Weser estuary sea area. Weather reports on the open sea often only have limited temporal and spatial resolution; however, existing reports from ships and measuring buoys in the Weser estuary sea area were considered. Analyses of Germany's National Meteorological Service in Offenbach and the American global GFS (global forecast system) model were used to map the weather conditions. The forecasts of the ECMWF's (European Centre for Medium Range Weather Forecast, Reading, England) global weather forecast model, the German National Meteorological Service's GME global weather forecast model, the COSMO-EU and COSMO-DE regional weather forecast models of Germany's National Meteorological Service, and the GWAM and EWAM sea state models derived from that were considered. Satellite images and rawinsondes were also analysed. The forecasts for the weather at sea and warnings for this period of the competent German National Meteorological Service were analysed.

Wind

The force 5 Bft southerly wind (from about 170 to 180 degrees) turned south-west between 0600 and 0700 CEST (from about 230 degrees) and dropped slightly by about 2 knots in the process. In the hitherto stable stratification, the strong upper

wind could not to be mixed towards ground level. Therefore, it is very likely that gusts did not exceed 6 Bft.
From about 0800 CEST, the south-west wind increased to force 6 Bft. Air stratification was destabilised in the lowest 1,500 metres and gusts reached force 8 Bft.
The wind started to increase at about 1100 CEST and reached its maximum value of force 8 Bft at about 1400 CEST. Due to the unstable air stratification close to the ground, the 45 to 60-knot upper winds at a height of 500 to 1,500 metres could be mixed towards ground level without any extreme weather events (such as rain, shower, storm, etc.); single gusts of force 10 Bft (about 50 knots) were very likely.
Up until 1600 CEST, the wind temporarily turned towards west-south-west (from about 260 degrees) and dropped to wind force 7 Bft (about 30 knots). It is very likely that force 9 to 10 Bft gusts (45 to 50 knots) occurred (measurements at the surrounding coastal stations confirm that).
The wind then turned back towards the south-west (from about 230 degrees) and steadily dropped up until 2400 CEST to an initial wind force 6 (at 23 knots with gusts of force 8 Bft) from about 2100 CEST and wind force 5 (at 19 knots with gusts of force 7 Bft) from about 2300 CEST.

Significant sea state

The wave heights of the swell, which approached from different directions, did not exceed 0.5 m. With short waves and quite steep, the significant wind sea initially increased from 0.5 m to 1.5 m until the early afternoon. It then dropped slightly to 1 m.

Weather and visibility

Up until about 0700 CEST, cloud cover stood at 75-100% with medium to high clouds. Immediately after the cold front passage between 0700 and 0900 CEST, the cloud base dropped to 1,500-2,000 m over ground. It brightened up between 0900 and 1100 CEST. Occasional cloud fields, which were more dense, with lower limits of about 2,000 m over ground only started to pass through again from about 1900 CEST. There was no rainfall throughout the day. Visibility generally fluctuated between a good 10 to 20 km. However, due to the stable conditions with relatively warm air above cold water directly over the water surface, and intermittent cloudiness caused by sand and dust particles or the like becoming airborne onshore, it is very likely that visibility occasionally dropped to mean values of between 5 and 10 km.

Low tide at Bremerhaven – 'Alter Leuchtturm': 18/04/2013, 0102 CEST
High tide at Bremerhaven – 'Alter Leuchtturm': 18/04/2013, 0739 CEST
Low tide at Bremerhaven – 'Alter Leuchtturm': 18/04/2013, 1321 UTC
High tide at Bremerhaven – 'Alter Leuchtturm': 18/04/2013, 2000 CEST

A north-westerly ebb stream of about 3 kts prevailed at the time of the accident.

4 ANALYSIS

The technical cause of this marine casualty was determined. The failure of the electronic component must be considered a random event because the electronics in the steering gear are not equipped with a self-control function that could indicate an imminent failure in this assembly.

However, the procedures on board, which began with the first rudder failure at 0847, are regarded as jointly responsible for the events. The intention to detect and rectify the fault was quite correct. The necessary conclusion, i.e. interrupting the voyage until the fault was detected and rectified, was not drawn when the chief and the electrician's efforts to do that were unsuccessful.
The steering gear suddenly started to work again. Even though nobody knew the cause of the failure, only insufficient action was taken to mitigate the potential consequences of the steering gear failing one more time. The most obvious approach would have been to switch the steering control from the circuit used hitherto to the other. During the investigation, it was found that the ship's command was not aware of this option at the time of the accident.
The chief and the electrician were at least put on standby to respond to a further loss of the rudder as soon as possible directly at the steering gear. Apparently, neither of them prompted the ship's command to switch the control circuit. Theoretically, it would have even been possible to switch to hand operation manually. However, this is not practicable when in harbour mode.

The issue of communication was examined in detail. The chief was equipped with a handheld VHF transceiver so as to receive information and instructions from the bridge by the fastest means. That he passed this device on to the electrician when he had to deal with something in the engine room is not open to criticism. However, the ship's command was not advised of this and the master believed he was addressing the chief when he reported the second rudder failure on the VHF transceiver at about 0929. Had the electrician received anything, then it appears he did not understand that he was being addressed. According to the audio recording of the VDR and statement of the master, he did not issue any helm commands to the chief, either. Instead, the master focused on stopping the ship and dropping the anchor.

With regard to the phones located in the steering gear compartment, no room for improvement is discernible.

That the ship's speed was not reduced to a necessary minimum in spite of the first rudder failure is noteworthy. Instead, the NORFOLK EXPRESS accelerated to 18.6 kts. The reaction time and distance of the ship decrease considerably at this speed. According to the manoeuvre characteristics of the ship, the advance distance almost doubles when moving at full ahead instead of slow ahead (see page 13). A lower speed could have reduced the consequences of the accident significantly.

There was not enough space next to the fairway to resolve the issue with a full circle or other helm manoeuvres.
The engine telegraph printout confirms indirectly that the reaction time was too low. Full ahead was ordered at 0904 and the maximum rated speed of 66 revolutions per minute (rpm) was already reached at 0906. In response to the rudder failure, the engine was stopped at 0929 and a few seconds after set to slow astern, half astern, and finally full astern. However, the main engine's direction of rotation only changed two minutes later at 0931. Consequently, this had no active effect because the NORFOLK EXPRESS had just run aground.

Finally, it should be mentioned that wind and current increased the speed of the NORFOLK EXPRESS further and accelerated the unintended turn to port.

5 CONCLUSIONS

It appears that the risks after the first steering gear failure were wrongly assessed. The sequence of events shows that only a few minutes were used to check the steering gear and plan the further course of the voyage. At this critical point, two pilots were on board. The ship was relatively safe and could have had tugs on standby to give the crew more time for the risk analysis.
The cause of the first rudder failure was not found. The ship's command did not realise the problem still existed at this point. Therefore, no relevant action was taken.
There was apparently no discussion between the master, the chief engineer and the vessel operator before making the decision to depart from the port having experienced an unknown, and random steering gear failure.

The following action would have been possible:

1. switch to the steering gear's control circuit on the port side;
2. safely bypass all electrical controls using the manual emergency rudder system;
3. abort the departure, anchor, and find the cause of the technical fault;
4. were the voyage to be continued, then at least the ship's speed should have been reduced, and
5. careful establishment of reliable communication channels to the steering gear;
6. the immediate use of the second anchor (starboard anchor) to assist reduce the ships forward momentum.

Once again, it is to be concluded that a ship should not be permitted to depart when an unknown fault that impairs the manoeuvrability and thus directly the safety of the ship is evident.

The BSU would like to thank the ship's command, the vessel operator, and the marine casualty investigation authority of Bermuda for their excellent cooperation during the review of the incident. It means that this report will certainly contribute to the prevention of such incidents in the future.

6 SAFETY RECOMMENDATIONS

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

6.1 Anglo-Eastern Ship Management (vessel operator)

The Federal Bureau of Maritime Casualty Investigation and the Bermuda Maritime Administration recommend jointly that the vessel operator, Anglo-Eastern Ship Management, urge its ship's commands to comply with the procedures defined by the vessel operator and the ISM Code by not taking any risks.

6.2 Anglo-Eastern Ship Management (vessel operator)

The Federal Bureau of Maritime Casualty Investigation and the Bermuda Maritime Administration recommend that jointly the vessel operator, Anglo-Eastern Ship Management, train its ship's commands in the use of the emergency systems regularly. In particular, a ship's command should be aware of how to change the steering gear's control system.

6.3 Ship's command of the MV NORFOLK EXPRESS

The Federal Bureau of Maritime Casualty Investigation and the Bermuda Maritime Administration recommend jointly that the ship's command of the MV NORFOLK EXPRESS desist from taking risks and give absolute priority to the safety of the ship. Amongst other things, that includes a safe speed and anticipatory navigation.

6.4 Anglo-Eastern Ship Management (vessel operator)

The Federal Bureau of Maritime Casualty Investigation and the Bermuda Maritime Administration recommend jointly that the vessel operator, Anglo-Eastern Ship Management, advises other ships, in particular sister ships of the fleet, of the above incident and take precautions in order to prevent future accidents.

7 SOURCES

- Enquiries by the waterway police (WSP)
- Written statements
  - Ship's command
  - Vessel operator
- Witness accounts
- Nautical charts and ship particulars, Federal Maritime and Hydrographic Agency (BSH)
- Official weather report by Germany's National Meteorological Service (DWD)
- Radar recordings, ship safety services/vessel traffic services (VTS)