



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

Summary Investigation Report 129/20

Less Serious Marine Casualty

**Allision with lock gate
by motor vessel (MV) RIMINI
in the Alte Nordschleuse lock at Brunsbüttel
on 17 May 2020**

6 October 2020

This summary report within the meaning of Article 27(5) of the Law to improve safety of shipping by investigating marine casualties and other incidents (Maritime Safety Investigation Law – SUG) is a simplified report pursuant to the second sentence of Article 14(1) of Directive 2009/18/EC of the European Parliament and of the Council of 23 April 2009 establishing the fundamental principles governing the investigation of accidents in the maritime transport sector.

The investigation was conducted in accordance with the above legislation. According to said legislation, 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.

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1 FACTUAL INFORMATION

1.1 Photograph of the ship



Figure 1: MV RIMINI

1.2 Ship particulars

Name of ship:	RIMINI
Type of ship:	Multi-purpose vessel
Flag:	Netherlands
Port of registry:	Barendrecht
IMO number:	9421635
Call sign:	PHJC
Owner:	C.V. ms. Rimini, Amasus Shipping B.V., R. & M. Klink
Shipping company:	Amasus Shipping B.V.
Year built:	2008
Shipyard:	Hong Ha Shipyard, Vietnam
Classification society:	Bureau Veritas
Length overall:	87.27 m
Breadth overall:	11.42 m
Draught (max.):	5.85 m
Gross tonnage:	1,862
Deadweight:	2,600 t
Engine rating:	1,104 kW (1,500 bhp)
Main engine:	Anglo-Belgian Corporation, type 6DZC
Propeller:	Controllable pitch propeller (CPP), right hand
(Service) Speed:	11 kn
Hull material:	Steel
Hull design:	Double bottom
Minimum safe manning:	5

1.3 Voyage particulars

Port of departure:	Rotterdam, the Netherlands
Port of call:	Rostock, Germany
Type of voyage:	Merchant shipping/international
Cargo information:	Magnesite
Manning:	5
Draught at time of accident:	T _{fwd} = 4.26 m, T _{aft} = 4.26 m (acc. to Master) T _{fwd} = 3.80 m, T _{aft} = 4.30 m (acc. to pilot)
Pilot on board:	Yes
Canal helmsman:	No
Number of passengers:	0

1.4 Marine casualty or incident information

Type of marine casualty:	Less serious marine casualty
Date, time:	17/05/2020, 2157 ¹
Location:	Alte (also: Kleine) Nordschleuse lock, Brunsbüttel
Latitude/Longitude:	$\varphi = 53^{\circ} 53.32'N$, $\lambda = 009^{\circ} 8.51'E$
Voyage segment:	Pilotage waters
Consequences:	Considerable damage to inner lock gate (lock out of operation) and minor damage to ship's bow section above the waterline and on the forecastle deck

Extract from Navigational Chart 46 (INT 1453),
German Federal Maritime and Hydrographic Agency (BSH)

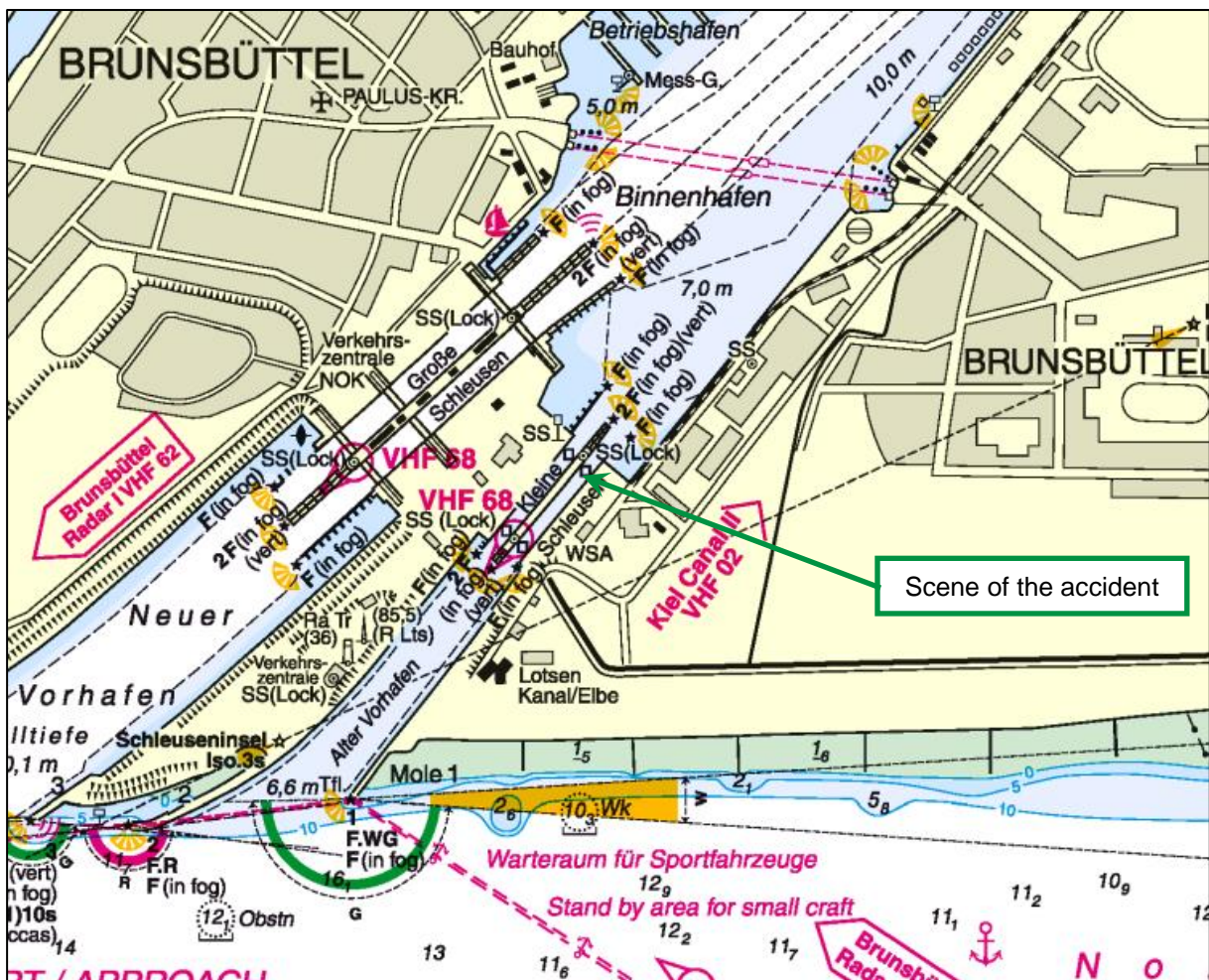


Figure 2: Scene of the accident

¹ All times in this report are local time (Central European Summer Time CEST = UTC + 2 hours).

2 SEQUENCE OF EVENTS AND INVESTIGATION

2.1 Sequence of events

On 17 May 2020 at 2154, the Dutch-flagged multi-purpose vessel RIMINI struck a lock gate in the Alte Nordschleuse lock in Brunsbüttel. The ship was carrying a cargo of magnesite from Rotterdam / Netherlands to Rostock / Germany and was about to transit the Kiel Canal.

The reconstruction of the sequence of events is based mainly on the statements of the Master, the Chief Engineer and the pilot. VDR data were not available due to the size of the ship. The vessel does not have an alarm event log. However, all statements were later verified by means of VHF recordings, AIS track data, as well as by the service and repair reports and class surveys that were issued after the accident.

According to the pilot's statement, visibility was good, dusk was falling and westerly winds (of about 4 Bft) prevailed in the evening of 17 May; the traffic situation was calm. The pilot boarded the RIMINI in the area of the Nordwest-Reede roadstead at 2137 and – as is customary – immediately requested the functionality of the CPP system to be demonstrated by switching through all propeller pitch settings (speed settings) in quick succession. No malfunction was obvious, and according to unanimous testimony the corresponding engine sounds and vibrations were clearly felt. The pilot reported the successful completion of the test to Vessel Traffic Service at 2140.

They then immediately started entering the Alte Nordschleuse lock's outer port. The Master carried out the manoeuvres himself. The approach boundary at mole 4 was passed with a speed over ground of 9.5 kn.

To reduce the speed he set the control lever to zero pitch (Stop), but due to a tidal current from behind of about 2 kn only noticed after a slight delay – when the intended speed reduction did not happen – that the CPP system had not responded, i.e. that the propeller's pitch was still positive (for ahead run).

He immediately sent the Chief Engineer, who was on the afterdeck, to the engine room to reset the CPP system. The second attempt was successful, and the Master was back in control on the bridge. He immediately set the telegraph to full astern. The intended reduction in speed was successful; a turn with the stern to port, caused by the strong change of pitch, was counteracted.

The situation occurred again just before they entered the lock. When the Master intended to stop the ship completely, for safety reasons and on the recommendation of the pilot, the CPP system failed to respond and again remained on a low positive pitch setting. However, this time there was no time for another reset. Several attempts were made to reduce the speed, which now stood at 4.1 kn, with the help of various manoeuvres. The Master gave orders to drop the starboard anchor. Hard-over rudder positions prevented a collision with the pilot boats in the outer port. Immediately after, at about 2145, the anchor dropped. An attempt was made to turn to starboard and hit the wooden wall fenders (to prevent the collision with the lock gate, which already seemed inevitable). When this did not work due to the excessive ahead thrust, the

starboard forespring was passed ashore. These concerted efforts resulted in a speed reduction to 3.6 kn before the RIMINI struck the inner lock gate head-on at 2154.

2.2 Subsequent events

At about 2200, the RIMINI was properly alongside and moored (1 + 1, starboard side alongside the middle wall). Since it was soon evident that the lock chamber in question would have to be taken out of service anyway due to the damage caused, it was closed (with the outer gate on the canal side), and the ship remained there for the time being.

An immediate physical survey by the ship's command revealed that nobody was injured.

The lock gate was severely dented and thus unusable because it could no longer close tightly.



Figure 3: Dented lock gate

A light oil film – presumably from the lock gate's damaged hydraulics – was visible on the water in the immediate vicinity of the lock gate. This was subsequently contained by a single oil boom.



Source: BSU

Figure 4: The RIMINI with damaged stem and light oil film

The shell plating on the bow of the RIMINI was severely dented, and the deck plating was pushed upward on the forecastle deck. No leakage of, or other damage to, any of the RIMINI's tanks was found.



Figure 5: Deformed deck plating in way of forecastle

The waterway police came on board shortly after the incident and interviewed all parties. After establishing his identity, they dismissed the pilot at 2220.

The RIMINI's Master does not usually have a canal agent, so he instructed United Canal Agency GmbH (UCA) to carry out the necessary formalities. He also immediately requested (before any such requirement was imposed on him) a representative of the CPP system's Danish manufacturer, SeaMech A/S, to come on board.

In the morning of 18 May 2020, representatives of the Verein Hanseatischer Transportversicherer e.V. (the vessel's insurers), then the BSU, and finally the classification society (Bureau Veritas) came on board the ship.

That afternoon the RIMINI was towed stern first out of the Alte Nordschleuse lock basin, passed through the Alte Südschleuse lock (still with tug assistance), and went alongside directly inside the canal at the Südkai berth, where service repairs were carried out by SeaMech and then by (the subsequently commissioned) AAE GmbH.

Also, emergency repairs to the bow and the forecastle deck were carried out by Adolf Cornels GmbH while the vessel was still in Brunsbüttel.

The RIMINI continued her voyage to Rostock on 20 May 2020 at 0010.

The damaged lock gate is to be salvaged by the end of June. At the time this report was being written, the German Federal Waterways and Shipping Agency (WSV) assumes that the damage will amount to an estimated EUR 1,100,000 and that repair works will probably continue until the autumn of 2020.

2.3 Investigation

2.3.1 Crew

The description of the crew members' qualifications is limited to the two people directly involved in the accident (the Master and the Maritime Officer²). According to her Minimum Safe Manning Certificate, the ship operates with five crew members: the two mentioned above, a Chief Officer and two able-bodied seafarers (one of whom is also employed as cook – 'AB/Cook').

The 35-year-old Dutch Master is also one of the owners of the RIMINI. He holds a certificate of competency in navigation as defined in Regulation II/2 of the Annex to the STCW Convention (Master with no limitations of authority). He often passes through the canal with the vessel and is familiar with the characteristics of the area (including entering the locks).

The 21-year-old Dutch Maritime Officer holds, *inter alia*, a combined navigational/technical certificate of competency as defined in Regulation VII/2 of the Annex to the STCW Convention (Maritime Officer without limitations).

2.3.2 MV RIMINI

The RIMINI is a multi-purpose vessel with her own gantry crane for moving her nine pontoon-type hatch covers. The ship has one cargo hold, which can be divided by two bulkheads. The tank top is reinforced for a load of 12.0 t/m² for the transport of heavy cargo; the hatch covers can bear loads of 1.6 t/m².

The four-stroke, six-cylinder engine drives a CPP via a reduction gear. Electricity is generated by a shaft generator, as well as by an auxiliary and an emergency (or port) diesel generator.

12 of these so-called 'Eems 2600 tons' type vessels were built for the shipping company Amasus Shipping.

2.3.3 Interview with the ship's command

The RIMINI's ship's command was extremely cooperative on the BSU's first visit at about 1230 on 18 May 2020. All the requested certificates were provided, and the investigators were able to gain an impression of the engine room (e.g. the reset procedure, or the possibility of manual operation of the proportional valve, which was not feasible due to time restrictions). The statements by the Master and the Maritime Officer were presented in written form.

However, the ship's command proved increasingly uncooperative in the aftermath of the accident. The nature and extent of the repairs and servicing were not communicated, and the BSU's inquiries into these things were met with irritation. The

² The Maritime Officer (or Marof) is a navigational watchkeeper in addition to his role as Chief Engineer (with shore-based assistance), and is unique to Dutch coastal carriers. His potential areas of employment were examined in 2009 in cooperation with Dutch research institute TNO (with the help of the RIMINI, among other vessels) to compensate for the disadvantages of the two-watch system on small ships.

only way to obtain information was by contacting the agency. Even though the BSU's neutrality and focus during this investigation had been explained to him on several occasions, the Master seemed to believe that the BSU assumed some kind of negligence or culpable conduct on his side (which is never subject of BSU investigations).

2.3.4 External recordings

VHF and AIS data recorded between 2130 and 2230 on the night of the accident were obtained from the WSV. Their analysis confirmed the statements of crew and pilot.

2.3.5 Service reports

2.3.5.1 SeaMech A/S

First, the service technician from SeaMech A/S (the CPP system's manufacturer) measured the proportional valve (hydraulic control valve that regulates the propeller's blade positions and thus the direction of its thrust). Both the supply voltage and the control signal (also a voltage) were within the normal range.

However, since the accident meant that a technical issue must have existed, the valve was removed and a defective solder joint (for the "astern" direction signal) found on the circuit board, which was repaired. A system test was carried out after reinstallation and did not reveal any anomalies.

Nevertheless, the decision was made to replace the proportional valve with a new one, which the Master immediately ordered by overnight delivery.

2.3.5.2 AEE GmbH

After the service for the electronic and control components of the controllable pitch propeller system, the RIMINI's command additionally hired a technician from AEE GmbH to examine the electrical components. He found that the cable that transmitted the "astern" control signal to the proportional valve was brittle and replaced it together with the corresponding plug.

The service report assumes that there was a loose contact in the signal connection to the valve due to this cable.

2.3.5.3 Adolf Cornels GmbH

Welders from Adolf Cornels GmbH ground and welded the cracks on deck. Below deck the cracks were exposed, welded together, and reinforced with a doubling plate. The area's plate stiffness was almost restored using profiles, according to the service report.

2.3.6 Surveys by the classification society

The RIMINI is classified by Bureau Veritas (BV). Past objections were not recorded, and the planned maintenance system was evidently always processed early and completely.

2.3.6.1 Intermediate survey

BV carried out an intermediate survey in Dordrecht / Netherlands on 13 May 2020, only four days before the accident. Among other things, the machinery and automation system were surveyed and there were no observations. There were no observations or anomalies in any other area, either. Accordingly, no Recommendations were issued.

2.3.6.2 Non-periodical class surveys (after the accident)

Due to the damage to the bow and problems with the CPP system, BV carried out two non-periodical class surveys (one for hull and one for machinery) after completion of the service works and preliminary repairs to the bow. The class was confirmed in both areas without any objections.

The one Recommendation that was issued was that the damage to the bow must be repaired definitely within a specified period, which ends on 29 January 2021.

2.3.7 Survey report „WSV Alte Nordschleuse Brunsbüttel“

A consultation phase prior to publication is not required for a summary report. Nevertheless this was allowed for in this case, in order to give interested parties the opportunity to comment on the report after the completion of a first version.

The GDWS Nord (German Federal Waterways and Shipping Agency, Northern Region) responded with a survey, commissioned by them from Brand Marine Consultants GmbH. The BSU has studied this report in detail, but has arrived at different conclusions regarding two decisive points.

The survey report states that, at the time of the second failure of the controllable pitch propeller system, the main engine of the RIMINI failed, allegedly according to the ship's command. This could not be fully explained, but the report assumes that the Marof – contrary to his statement – did not perform a second reset, but operated the pitch propeller's proportional valve manually. This is said to have caused an abrupt, too rapid change in main engine load, which consequently led to its failure (overload).

The BSU still assumes, however, that the main engine did not fail at that point. The statements of both members of the ship's command – verbally to the BSU investigators as well as in their written statements – were clear: At no time was there any talk of a total failure of the main engine. There is a certain measure of uncertainty regarding this matter in the survey report ("It is the understanding of the undersigned..." etc.). The report does not provide any evidence of an engine failure. The BSU therefore sees no reason to doubt the crew statements. The captain even expressly told the BSU that the possibility of manual operation existed, but that there was not enough time (e.g. for creating the required communication links). In light of these considerations, the BSU

maintains that there was no total failure of the main engine, and that the problem was exclusively one of controllable pitch propeller control.

The survey report also recommends that circuit boards of electronic components that are susceptible to vibrations should be replaced regularly as a preventive measure. It is of course true that a timely replacement of the problematic circuit board (with the defective solder joint and the brittle signal cable) would have prevented the accident. However, the BSU is of the opinion that such a comprehensive approach – if thought through to its logical end – is not feasible. There is simply no way to distinguish the "important" circuit boards that would have to be replaced as a preventive measure from the many others that are also installed on a modern ship. Likewise it would be neither logistically feasible nor financially reasonable to replace all circuit boards regularly. Ultimately it is not even possible to say with certainty whether the problem was a systematic one that would justify a preventive approach on this scale.

The BSU therefore stands by its assessment that this case is not suitable for deriving universally valid safety recommendations from it.

3 CONCLUSIONS

The RIMINI's crew and shipping company have always adhered to maintenance plans, class specifications etc. The classification society extended her class without any objections only days before. Moreover, the proper functioning of the CPP system had been demonstrated just a few moments before the problems first occurred on the evening of the accident. It is more than justified that they assumed their vessel to be fully operational.

The BSU has come to the conclusion that the loose contact assumed by AEE GmbH is the most likely explanation for the temporary “astern” signal loss. The two problems found (defective solder joint in the proportional valve, and brittle control signal cable) were both related to the CPP controls for “astern” thrust. A loose contact would also explain why a negative pitch was temporarily possible before control was lost again.

When the problem first occurred, the ship's command had the presence of mind to order an immediate system reset. On the second occasion, they resorted to navigational manoeuvres with the same presence of mind (and appropriate to the now very different time frame) in an attempt to reduce the ship's momentum as much as possible and prevent an allision with the lock gate.

The BSU has come to the conclusion that the ship's command could not have acted differently, especially in view of the time constraints. This was a technical problem which was not immediately obvious, and which could occur any time in a ship that is no longer completely new, even if every effort is made to ensure that it remains operational – as is the case with the RIMINI. The timing of the very first occurrence of this problem was therefore extremely unfavourable.

Since no safety recommendations can be derived from this case, the report format of a Summary Report was used.

4 SOURCES

- <https://de.wikipedia.org/wiki/Eems-2600tons-Typ> [in German], retrieved 28 May 2020
- Equasis and MarineTraffic online databases
- Service reports on the work carried out and repairs after the accident
- Survey reports of the classification society
- Ship's documents
- Statements of the ship's command
- Pilot statement
- Recorded VHF and AIS data
- TNO report TNO-DV 2011 C060, 'Safety consequences onboard shortsea ships due to a new way of working', published March 2011
- IMO Circular STCW.2/Circ.20 (Equivalent arrangements accepted under article IX; Communication received from the Government of the Netherlands)