Bundesstelle für Seeunfalluntersuchung
Federal Bureau of Maritime Casualty Investigation

Summary Investigation Report 6/22

Less Serious Marine Casualty

Serious accident involving a person while a mooring line was being handled on the tug ZP BOXER in the port of Hamburg on 4 January 2022

19 April 2023

This summary report within the meaning of Section 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 (Section 9(2) SUG).

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

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

Issued by:
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1 FACTUAL INFORMATION

1.1 Photograph of the ship

Figure 1: Tug ZP BOXER[1]

1.2 Ship particulars

Name of ship:	ZP Boxer
Type of ship:	Tug
Flag:	Malta
Port of registry:	Valetta
IMO number:	9597355
Call sign:	9HA3213
Owner (according to Equasis):	ZP Boxer LTD
Shipping company:	Boluda Deutschland GmbH

[1] Source: The Boluda Deutschland GmbH shipping company.

Year built:	2012
Shipyard:	Damen Shipyard, Gorinchem
Classification society:	DNV
Length overall:	24.74 m
Breadth overall:	12.63 m
Draught (max.):	6.45 m
Gross tonnage:	205
Deadweight:	99 t
Bollard pull:	70 t
Propulsion system:	Z-Peller
Engine rating:	4,200 kW
Service speed:	11.8 knots
Hull material:	Steel
Hull design:	Steel
Minimum safe manning:	3

1.3 Voyage particulars

Port of departure:	Hamburg
Port of call:	Hamburg
Type of voyage:	Merchant shipping/ national
Manning:	3
Pilot on board:	No

1.4 Marine casualty or incident information

Type of marine casualty:	Less serious marine casualty (occupational accident)
Date, time:	4 January 2022, 0908[2]
Location:	Port of Hamburg Neue Schlepperbrücke bridge, Berth 4
Latitude/Longitude:	φ 53°32'N λ 009°55'E
Ship operation and voyage segment:	Berthing
Consequences:	Right lower leg severed

Extract from Navigational Chart INT 1455, BSH[3] DE48

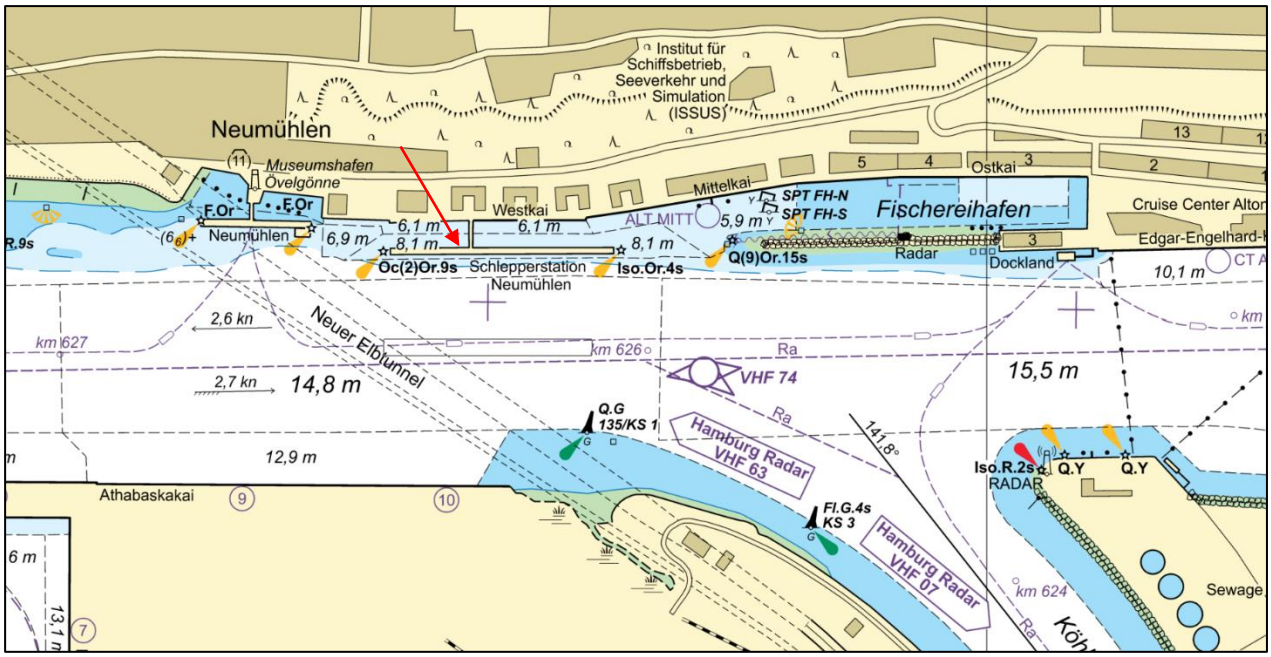

Figure 2: Scene of the accident; Neue Schlepperbrücke bridge, Hamburg[4]

[2] All times shown in this report are Central European Time (CET). This corresponds to Coordinated Universal Time (UTC) + 1 hour.
[3] Federal Maritime and Hydrographic Agency.
[4] Source: BSH.

2 COURSE OF THE ACCIDENT AND INVESTIGATION

On the afternoon of 4 January 2022, the German Social Accident Insurance Institution for Commercial Transport, Postal Logistics and Telecommunication (BG Verkehr), Ship Safety Division notified the BSU by phone that a crew member of the harbour tug ZP BOXER was reportedly seriously injured that morning while mooring at the berth on the pontoon tug bridge in Hamburg-Neumühlen. A mooring line had reportedly severed the seafarer's leg.

The BSU's investigators contacted the Bremen-based operator of the tug, BOLUDA Towage Germany GmbH early in the morning of 5 January 2022. Its CEO suggested that the BSU together with him personally and the expert for occupational safety appointed by the company investigate and discuss the course of the accident on board on 6 January 2022.

Figure 3: Berth of the ZP BOXER[5]

2.1 Course of the accident

At the time of the accident, the casualty – a qualified able seafarer specialising in deck operations (deckhand) and holder of a certificate of competency in navigation – was on the pier together with the tug's chief engineer officer (engineer) handling the lines (i.e. making ready the two head lines awaiting deployment). At this point, the tug was already alongside with the pier on her port side. The stern line and a breast line, as well as the fore spring had already been deployed with eyes placed over the relevant bollards by the engineer and deckhand, respectively. The tug was moving slowly

[5] Source: BSU.

ahead to take the slack out of the lines, which were already preconfigured in terms of length, before the two head lines were then to be placed over the bollard. Suddenly, the deckhand reportedly went back to the spring in order to pull the head lines that were on top of it (or rather the eyes of the head lines, which he was holding in his hands) under the spring. Without realising, he reportedly put his right foot into the eye of the fore spring, which was still lying loose on the ground (without any tension on the line) but which he had already placed over the bollard. At that very moment, the fore spring tightened, as the tug was slowly moving forward to take up her final mooring position. The eye of the spring on the bollard pulled tight instantly and severed the deckhand's foot.

Figure 4: Arrangement of lines after the accident[6]

[6] Source: BSU.

Figure 5: Situation after the accident (RECONSTRUCTED)[7]

There is no direct line of sight between the skipper's wheelhouse and the shore/ship-side area amidships in which the accident occurred because of the design. However, cameras are installed on the port and starboard sides above the wheelhouse. The image of each camera 'captures' the area in question on the respective side of the vessel and transmits it to a small flat-screen monitor (approx. 30 cm diagonal). The monitors are mounted beneath the ceiling on the port and starboard sides of the wheelhouse.

The skipper became aware of the incident due to the loud cries of the casualty and the engineer standing next to him, whom he could see through the partially closed door of the wheelhouse. He immediately stopped the forward-moving tug, which continued a short distance further due to the inertia of the mass.

One blessing in disguise was the fact that the fireboat BRANDDIREKTOR WESTPHAL was on standby at her berth at the tug bridge (diagonally opposite on the other side). Crew members there became aware of the accident due to cries, were at the scene in less than one minute and administered professional first aid. The deckhand's life had been saved and he was subsequently transported to hospital.

[7] Source: Report file of WSPK 1.

There were no problems with visibility or the weather at the time of the accident (0906; the tug was returning from assistance duties for which she had departed at about 0230). There was no haste or urgency when the berthing manoeuvre was executed in accordance with the usual procedure. The same shortened lines of unchanged length are always placed on the same bollards. Accordingly, the use of winches is not necessary.

After the casting off manoeuvre, all mooring lines are laid on the port side rubbing strake and the short breast line on the bulwark of the tug in preparation for the berthing manoeuvre. As soon as the deckhand and the engineer have stepped over onto the pier, they can grasp the line eyes and take them to the bollards. The procedure is always the same: the engineer grasps the eye of the stern line and places it on the relevant aft bollard. He then takes the eye of the breast line from the bulwark and places that on one (painted yellow, aft) head of the double bollard level with the middle of the tug. At about the same time as the stern line, the deckhand takes the eye of the fore spring from the bulwark and lays it over the second (painted red, forward) head of the double bollard level with amidships. The deckhand then takes hold of the two eyes of the head lines laid out on the rubbing strake. The two seafarers would then – normally – step back from the double bollard and wait until the ship finishes 'bouncing in' the fore spring by moving ahead slightly. Only then does the deckhand complete the berthing manoeuvre by placing the two head line eyes over the forward bollards.

With regard to the question as to when/whether the deckhand took hold of the head line eyes after stepping onto the pier, possibly simultaneously with the spring, in preparation for the next work steps, the skipper and then the engineer's subsequent comments differed in points of detail. This may be due to the different viewing angles of the two people, as well as to differences in the way they interpreted the situation.

At any event, and as already discussed above, it was stated that the deckhand suddenly noticed that the two head lines were laid over the spring and that their proper direction of pull would be impaired. To prevent this, the deckhand went back to the double bollard with the two head line eyes, which were undoubtedly in his hands at that time, and wanted to pull them under the fore spring, which was initially still slack, in the immediate vicinity of the double bollard. While doing so, he inadvertently stepped into the eye of the spring with the disastrous outcome that his right foot was severed.

2.2 Investigation on board

The local conditions, the technical equipment in general and the questioning of potential witnesses were the main items of the investigation on board the tug. Furthermore, discussions as to which measures should be taken to avoid such an accident in the future were also planned.

In addition to two investigators from the BSU, this meeting was attended by the operations manager and the port captain Germany/nautical superintendent from the shipping company, the skipper, the engineer, and the expert for occupational safety from Messrs Redell Arbeitssicherheit GmbH.

The following factual information was taken down or established:

- the tug ZP BOXER always uses the (identical) berth in question as her base;
- the crew comprises three people: skipper, engineer, deckhand;
- the four tugs stationed at the tug bridge in question in Hamburg are all of identical build;
- crews are usually (also in the current case) employed on the respective tug in the capacity of a regular crew but may have to work on another tug in the event of sickness/leave, for example. Since the vessels are essentially of identical build, this does not pose any problems;
- the tugs are not ISM-certified (any longer) – this is not a requirement for vessels of less than 500 GT – but are monitored by means of the shipping company's own internal quality and safety management system. *Inter alia*, this also includes computer-assisted accident analysis;
- the shipping company has appointed an external service provider to perform the function of expert for occupational safety;
- when making fast and casting off, the skipper and crew members communicate by means of hand signals. VHF devices are not used;
- all three crew members adhered to working and rest periods under EU Directive 1999/95/EC;
- all mooring lines on board were in perfect condition;
- lines are exchanged at the latest after a fixed number of tasks have been carried out, regardless of whether they are still in good condition;
- damaged lines are/have always been exchanged.

The skipper's statement that the scene of the accident was not visible to the naked eye from the bridge for reasons of design but rather 'illuminated' by a camera, which neither includes a video recording nor an image zoom function, was confirmed during the survey of the bridge.

That the monitors have an extremely small screen diagonal by today's standards (about 30 cm max.) and that the image is difficult to see in glaring/bright lighting conditions, as was the case on the day of the survey (but not on the day of the accident) merits criticism. Figure 7 shows the investigators' view.

Figure 6: View of one of the two monitors on the bridge[8]

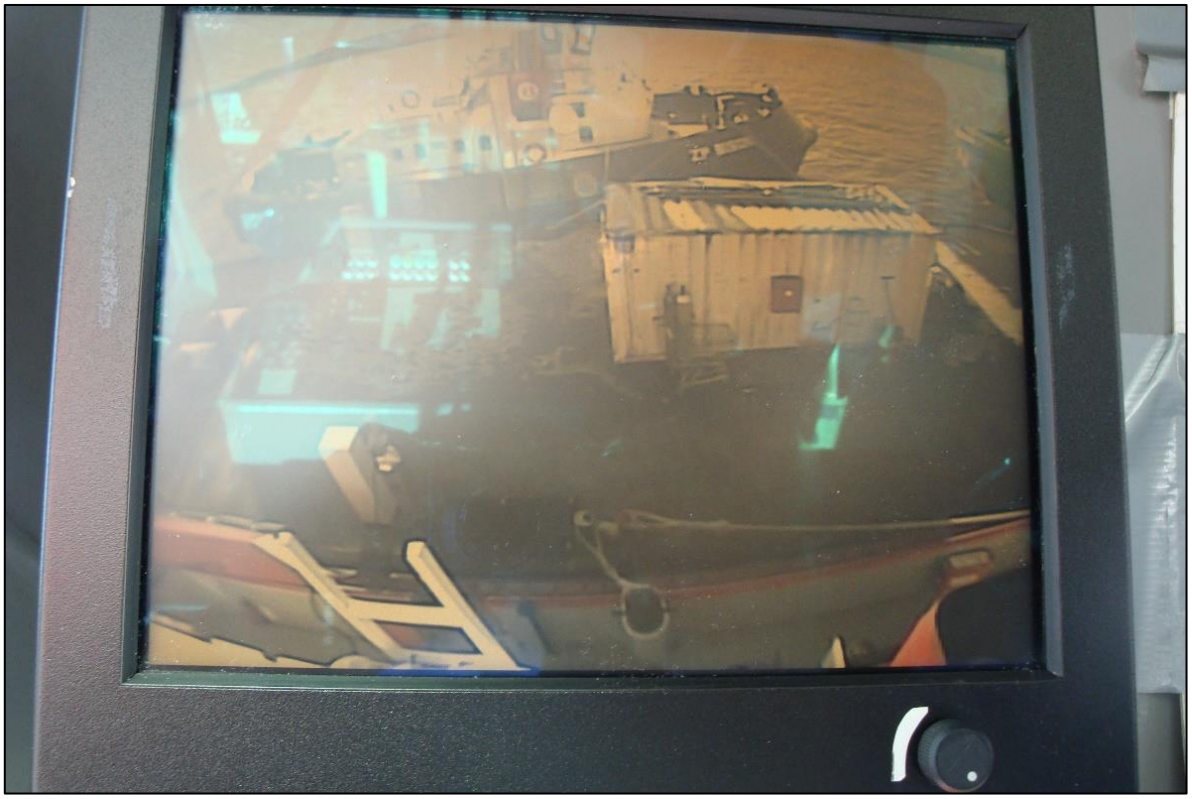

Figure 7: Close-up of a monitor (switched on)[9]

[8] Source: BSU.
[9] Source: BSU.

After the survey of the bridge, which did not bring any other information of relevance to light, the BSU's investigators went onto the pier. The engineer joined them and gave a detailed account of the course of the accident. He confirmed the information already discussed at length above and provided clarity with regard to the deckhand's line handling. Accordingly, it was probably the case that the latter initially only grasped the fore spring (i.e. not the three lines he was responsible for at the same time), laid it over the bollard, and only then took hold of the two head lines (eyes). Following that, he reportedly stepped back from the double bollard in the usual and intended manner together with the engineer, and reportedly then suddenly went back to it to pull the head lines in the immediate vicinity of the bollard under the initially slack spring line. At this moment, the tug reportedly started to shift slowly ahead. The deckhand had no opportunity to pull his foot out of the spring's relatively small and tightening eye lying over the bollard – which he had inadvertently stepped into when approaching the bollard – in time and thus avoid the disastrous consequences.

The following image shows the engineer during a reconstruction of the casualty's posture while handling the lines as described above. At the same time, the right foot was inside the eye of the spring line, which was laid loosely over the (red) bollard at the time of the accident and under tension (only) in the photograph.

Figure 8: Working position and line position; scene reconstructed[10]

[10] Source: BSU.

Figure 9: View of the scene of the accident from the bridge[11]

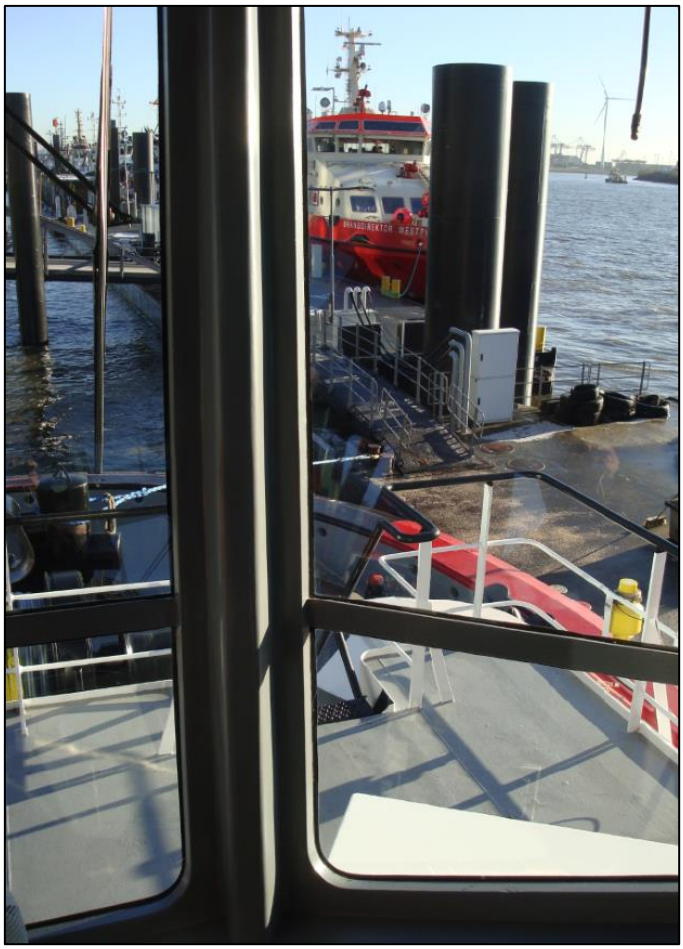

Figure 10: View of the stern line from the bridge[12]

[11] Source: BSU.
[12] Source: BSU.

2.2.1 Information about the crew

Skipper:
German, born in 1983, many years of experience as a tug skipper, *inter alia*.

Holds the following valid certificates:
- certificate of competency as a master, less than 500 GT on near-coastal voyages;
- certificate of competency as an officer in charge of the navigational watch;
- general [radio] operators certificate;
- certificate of proficiency as a member of the navigational and engineering watch.

Deckhand/casualty:
deckhand, German, born in 1964, about 25 years of professional experience as a trained able seafarer (able seafarer of the merchant fleet, specialised in deck operations).

Holds the following valid certificates:
- certificate of competency as a master, less than 500 GT on near-coastal voyages (the seafarer previously held a certificate of competency as a master on domestic voyages);
- general radio operators certificate;
- engine operator, less than 750 kW;
- certificate of proficiency as a member of the navigational watch.

Engineer:
German, born in 1974, experienced.

Holds the following valid certificates:
- certificate of competency as a chief engineer officer;
- certificate of proficiency as a member of the navigational watch.

There were no language barriers within the crew.

2.2.2 Interview with the deckhand injured during the accident

The interview resp. conversation with the casualty took place on 21 April 2022 at the BG medical facility in Hamburg. Based on his recollection of the accident, he gave the following account. He himself had sailed the tug until shortly before the start of the berthing manoeuvre[13] and then swapped positions with the skipper. He then went down to the engineer and they both went onto the pier together. After that, both of them – as always – placed the fixed eyes of the respective lines from their stations on the bollards. He and the engineer were conversing when he suddenly stepped forward to arrange the two head lines properly. The skipper moved the vessel further forward at almost the same time. He realised that he had inadvertently put his right foot into the eye of the fore spring line laying on the ground at the very moment at which the lines pulled tight. Unfortunately, the attempt to pull his foot out of the tightening eye failed. According to his recollection, his efforts failed because of his work shoe, which had

[13] The experience of seagoing service for obtaining the certificate of competency with master's powers was gained on this tug. After obtaining the certificate, he continued to serve as a deckhand for personal reasons.

trapped him. The casualty had, regrettably, laced his shoe so tightly that he could not pull his foot out of it.

Parts of the casualty's account were absent due to shock. It was only possible to broadly reproduce and thus confirm the course of events after submission of the details given by the engineer.

The question as to what was different than usual could not be answered. Reportedly, everything was the same as always. The casualty surmised that the conversation with the engineer and simultaneous performance of work had reportedly distracted him and that he had been careless as a result of that. An excessive workload due to a busier schedule after the turn of the year was denied, as was fatigue.

Conditions on the bridge were also discussed during the conversation, the two flat-screen monitors, in particular. These relatively small black and white monitors are mounted on the starboard and port sides above the bridge entrances. The resolution of the monitors can be described as rather low and their picture is even worse in unfavourable light conditions. At this point, it should be explicitly mentioned again that the design and arrangement of the monitors was not relevant to or responsible for the accident.

The casualty mentioned several times during the conversation that he did not hold the master or the engineer responsible for the accident.

2.3 Investigation of the accident by the shipping company

Immediately after the accident, the shipping company instructed its expert for occupational safety from Redell Arbeitssicherheit GmbH to conduct an internal investigation of the accident. The conclusion of this investigation was that there had reportedly been no violation of existing work procedures or work instructions. The investigation identified two measures to prevent such an accident in the future. When making fast, only one person should climb onto the pontoon and the second person should hand over the appropriate lines from aboard in the correct order. Furthermore, the expert for occupational safety and the shipping company encouraged the use of radio equipment. Since handling would not be ideal during this task – it is necessary to have both hands free when handling lines – it was agreed that this measure would not be implemented. The use of a headset is out of the question for various reasons.

2.4 Investigation of the accident by the BG Verkehr

The findings of the investigation coincide with those of the expert for occupational safety appointed by the shipping company. The new measure implemented by the shipping company involving the use of lines with an (even) smaller eye is welcomed but not considered to be absolutely necessary. The BG Verkehr usually recommends such lines for inland waterway vessels, but not for tugs. This is due to the resulting new source of danger in terms of hand injuries, which is likely to entail injuries of comparable severity.

A violation of procedural instructions could not be identified.

2.5 Investigation by Waterway Police Hamburg

The officers of Waterway Police Hamburg's WSPK 1 office were at the scene immediately after the accident and assessed conditions on the ground. Various photographs were taken of the scene of the accident. Moreover, based on the witness testimony, an account of the course of the accident was drawn up in the form of a report file.

2.6 Actions taken

In cooperation with the expert for occupational safety appointed by the shipping company, the procedure for berthing (or making fast) was changed immediately after the accident to the effect that the skipper still remains on the bridge, a second person takes up a position on deck and the third person goes ashore. The lines previously laid out in front of the bulwark are passed to the third person ashore by the person who remains on board and no longer pulled from the pier as before. Furthermore, the lines on board were exchanged for lines with a smaller eye so as to prevent people from stepping into one inadvertently.

3 CONCLUSIONS

All the agencies entrusted with the investigation, including the BSU, have concluded that there was no violation of existing working procedures by any of the people on board. Inattentiveness during the routine sequence of operations very likely contributed to the accident in this particular case. In the opinion of the investigators, the post-accident measures taken by the shipping company, in particular the use of lines with a smaller eye, would have prevented the accident. At the same time, the BG Verkehr (Prevention Department) believes that the risk of hand injuries is generally increased, however. In conjunction with the work organisation measures introduced, the BSU believes that the overall response to the potential hazards was appropriate.

It is reasonable to assume that the skipper would have had a better view of the pier had the monitors been larger and suitable for changing light conditions. However, it is doubtful that this would have enabled him to prevent this or a similar accident because the deckhand stepped into the eye of the line almost simultaneously with the tug's short and slow forward movement and it all occurred in fractions of a second.

Finally, the reflections of the casualty are reproduced here, which are advocated by the BSU's investigators:

- when making fast, only discuss matters relevant to this operation;

- the main focus should always be on the task at hand and potential hazards pointed out repeatedly. No matter how experienced or seasoned a seafarer is, awareness of potential hazards must always be heightened.

In the view of the BSU, the conclusions drawn by the vessel operator from the internal investigation of the accident and countermeasures installed on that basis are well suited to preventing future accidents. Accordingly, the BSU sees no reason to issue safety recommendations. Due to the general information drawn from this accident, the BSU will be publishing associated lessons learned.

4 SOURCES

- Redell Arbeitssicherheit GmbH
- Documents from the Boluda Towage Germany BV shipping company
- Testimony of the skipper and the engineer from the Boluda Towage Germany BV shipping company
- Information given by the deckhand injured during the accident
- Agency for Justice and Consumer Protection – Occupational Safety and Health Administration
- BG Verkehr – Regional Department of Prevention, Hamburg
- BSH – Section S12/Certification of Mariners