Danish Maritime Accident Investigation Board

SAFETY REPORT

April 2014

PACHUCA

Mooring accident on 14 December 2012

The Danish Maritime Accident Investigation Board
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This marine accident report is issued on 4 April 2014.

Case no.: 2012011094

Front page: Forward mooring station on PACHUCA. **Source:** DMAIB

The marine accident report is available from the webpage of the Danish Maritime Accident Investigation Board www.dmaib.dk.

The Danish Maritime Accident Investigation Board
The Danish Maritime Accident Investigation Board is an independent unit under the Ministry of Business and Growth that carries out investigations with a view to preventing accidents and promoting initiatives that will enhance safety at sea.

The Danish Maritime Accident Investigation Board is an impartial unit which is, organizationally and legally, independent of other parties.

Purpose
The purpose of the Danish Maritime Accident Investigation Board is to investigate maritime accidents and to make recommendations for improving safety, and it forms part of a collaboration with similar investigation bodies in other countries. The Danish Maritime Accident Investigation Board investigates maritime accidents and accidents to seafarers on Danish and Greenland merchant and fishing ships as well as accidents on foreign merchant ships in Danish and Greenland waters.

The investigations of the Danish Maritime Accident Investigation Board procure information about the actual circumstances of accidents and clarify the sequence of events and reasons leading to these accidents.

The investigations are carried out separate from the criminal investigation. The criminal and/or liability aspects of accidents are not considered.

Marine accident reports and summary reports
The Danish Maritime Accident Investigation Board investigates about 140 accidents annually. In case of very serious accidents, such as deaths and losses, or in case of other special circumstances, either a marine accident report or a safety report is published depending on the extent and complexity of the subject.

Contents

1. FACTUAL INFORMATION

1.1 Photo of the ship

Figure 1: PACHUCA
Photo: Marius Esman

1.2 Ship particulars

Name of vessel:	PACHUCA
Type of vessel:	Container ship (fully cellular)
Nationality/flag:	Antigua & Barbuda
Port of registry:	Saint John's
IMO number:	9344253
Call sign:	V2QO8
DOC company:	Harren & Partner Ship Management GmbH & Co KG
IMO company no. (DOC):	5271403
Year built:	2005
Shipyard/yard number:	Hegemann Rolandwerft GmbH & Co. KG/233
Classification society:	Germanischer Lloyd
Length overall:	139.81 m
Breadth overall:	19.40 m
Gross tonnage:	6,901
Deadweight:	9,235 t
Draught max.:	7.29 m
Engine rating:	8,402 kW
Service speed:	17.0 knots
Hull material:	Steel
Hull design:	Single hul

1.3 Voyage particulars

Port of departure:	Larvik, Norway
Port of call:	Esbjerg, Denmark
Type of voyage:	Merchant shipping, international
Cargo information:	General cargo in containers
Manning:	12
Pilot on board:	No
Number of passengers:	0

1.4 Weather data

Wind – direction and speed:	East 12 m/s
Wave height:	0.5 m
Visibility:	Good
Light/dark:	Dark
Current:	None

1.5 Marine casualty or incident information

Type of marine casualty/incident:	Accident to seafarer
IMO classification:	Serious
Date, time:	14 December 2012 at 06.25 LT
Location:	Port of Esbjerg, Denmark
Position:	55 27.78 N / 008 26.53 E
Ship's operation, voyage segment:	Alongside berth
Place on board:	Forward mooring station
Human factor data:	Yes
Consequences:	One seafarer seriously injured

1.6 Shore authority involvement and emergency response

Involved parties:	Danish police and emergency services
Resources used:	Ambulance
Speed of response:	10 minutes
Actions taken:	Injured crewmember brought to hospital in Esbjerg

1.7 Scene of the accident

Figure 2: Scene of the accident – Esbjerg harbour
Source: Google Earth

2. NARRATIVE

2.1 Events

On 14 December 2012 at 0415 local time, the container ship PACHUCA arrived in Esbjerg, Denmark from Larvik, Norway for discharging and loading general cargo in containers. The ship was moored with the port side alongside.

PACHUCA was engaged in regular trade between ports in Northern Europe and called at approximately six ports a week. The master and crew had been in Esbjerg several times before and were therefore familiar with the harbour area and mooring conditions.

The port stay was planned to last a few hours. After discharging had been completed at 0445, loading commenced and was completed at 0615. Shortly after, the ship was ready for departure.

During departure the chief officer and the master were on the bridge, and on the forecastle were the bosun, one ordinary seaman (OS) and one able seaman (AB). There were four different nationalities on the ship and the primary working language was English. The chief officer and the bosun, of Turkish nationality, usually communicated in their native language.

At 0620, the crew on deck started to single up to one forward spring line. There was a strong breeze from an easterly direction that made it difficult for the master to manoeuvre the ship from the berth. He therefore turned the rudder hard to port and set the thrusters to push to starboard. He then gave the main engine a short forward order by setting the pitch propeller to 40%. The master's intention was to open the ship with the forward spring and thereby obtain a distance to the berth. He would then be able to use the propulsion to move the ship into the middle of the harbour basin.

As the distance to the berth increased, the crew on the forecastle slackened the spring line to ease the tension on the rope.

Within 10-15 seconds, the spring line was slacked until there was no mooring rope left on the winch drum. The clamp, where the mooring line was fastened, broke and the line struck the bosun.

The master saw the mooring line part from the ship. He tried to contact the bosun, but there was no reply. He realized that something was wrong and prepared to bring the ship alongside again. The AB reported from the forecastle that the bosun was seriously injured, but was still breathing.

At 0626, the chief officer contacted the port authority, informed them about the situation and requested an ambulance.

At 0635, the ship was alongside and moored again. After the gangway had been rigged, the police and a medical team were on board at 0655. After half an hour, the bosun was evacuated from the ship via a ladder from a fire truck and brought to the hospital by an ambulance.

2.2 Mooring arrangement and operations

2.2.1 Mooring arrangement

The forecastle on PACHUCA was enclosed. There was a mooring arrangement that consisted of two winches with split drums with one storage drum and one tension drum (figure 3). The winches were situated in the centre of the deck (figure 6). On the starboard side, the winch was a combined anchor and mooring winch.

Both winches had an electric drive with pole changing multispeed motors and were operated locally from the centre of the forecastle by control boxes situated between the winches (figure 4).

Figure 3: Forecastle deck
Source: DMAIB/PACHUCA

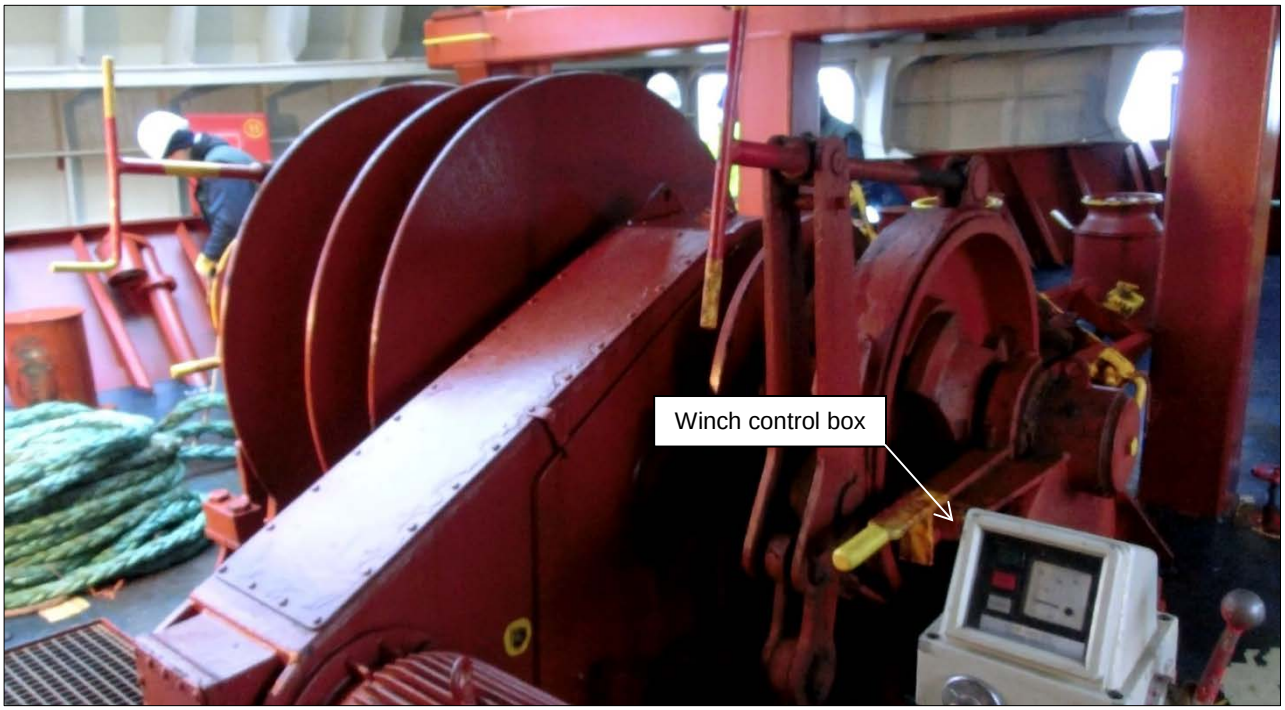

Figure 4: Approximate view from the position of the operator of the winch
Source: DMAIB

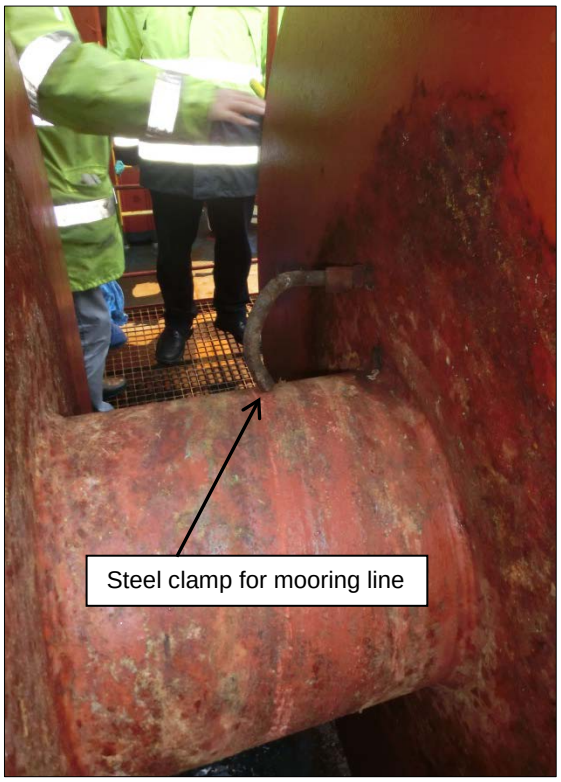

Figure 5: Storage drum and steel ring
Source: DMAIB

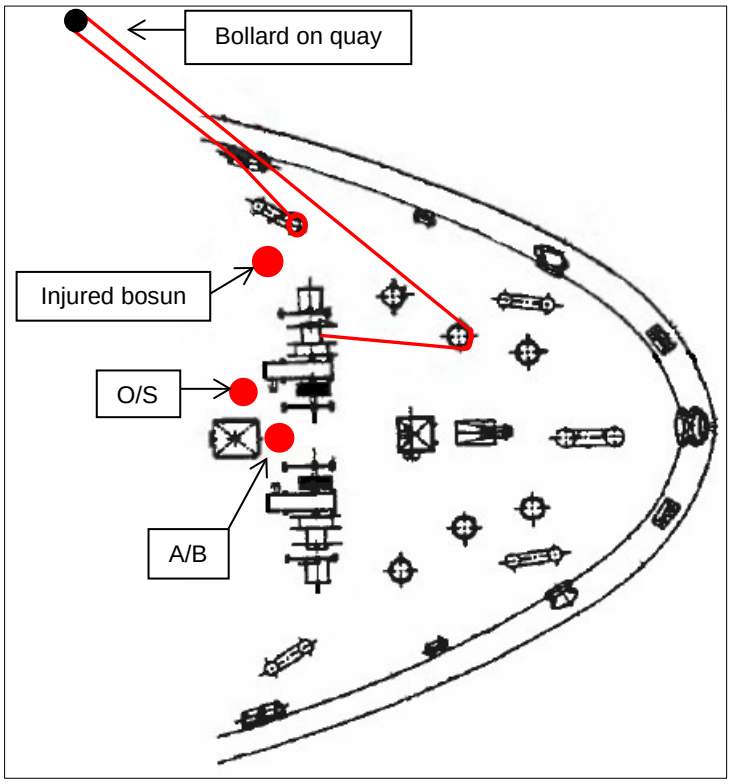

Figure 6: Forecastle deck
Source: DMAIB/PACHUCA

Aft of the winches a platform was mounted approximately 20 cm above the main deck.

Forward of the winches several bitts, pedestal bitts and bollards for emergency towing were mounted, enabling a wide variety of mooring configurations. There were roller fairleads on each side of the ship and a chock in the centre for emergency towing.

The two mooring lines were 6-strand cross lay fibre ropes with a diameter of 56 mm and a breaking strength of 652 kN. One of them was 220 metres long and the other one 80 metres long. Both ropes were certified. The mooring line was fastened to the storage drum by a steel clamp (figure 5).

2.2.2 Mooring operation

On arrival, the master usually got the ship alongside by positioning the forward part of the ship close enough to get a heaving line ashore and thereafter make the forward spring line fast. A forward momentum of the ship would then bring it alongside. At departure, it was not uncommon to use the spring line to distance the aft part of the ship from the berth.

Mooring the ship was considered a routine operation – especially because the ship had called at approximately six ports a week. The crewmembers, therefore, were experienced in mooring the ship under varying and sometimes adverse circumstances.

Usually, the ship did not use tugs during departure and arrival. The ship was considered sufficiently manoeuvrable and the crew were experienced in departing and arriving at the port of Esbjerg.

There was a limited view of the forward mooring station from the bridge (figure 7) and the master therefore relied on the effectiveness of the communication with the crewmembers on deck.

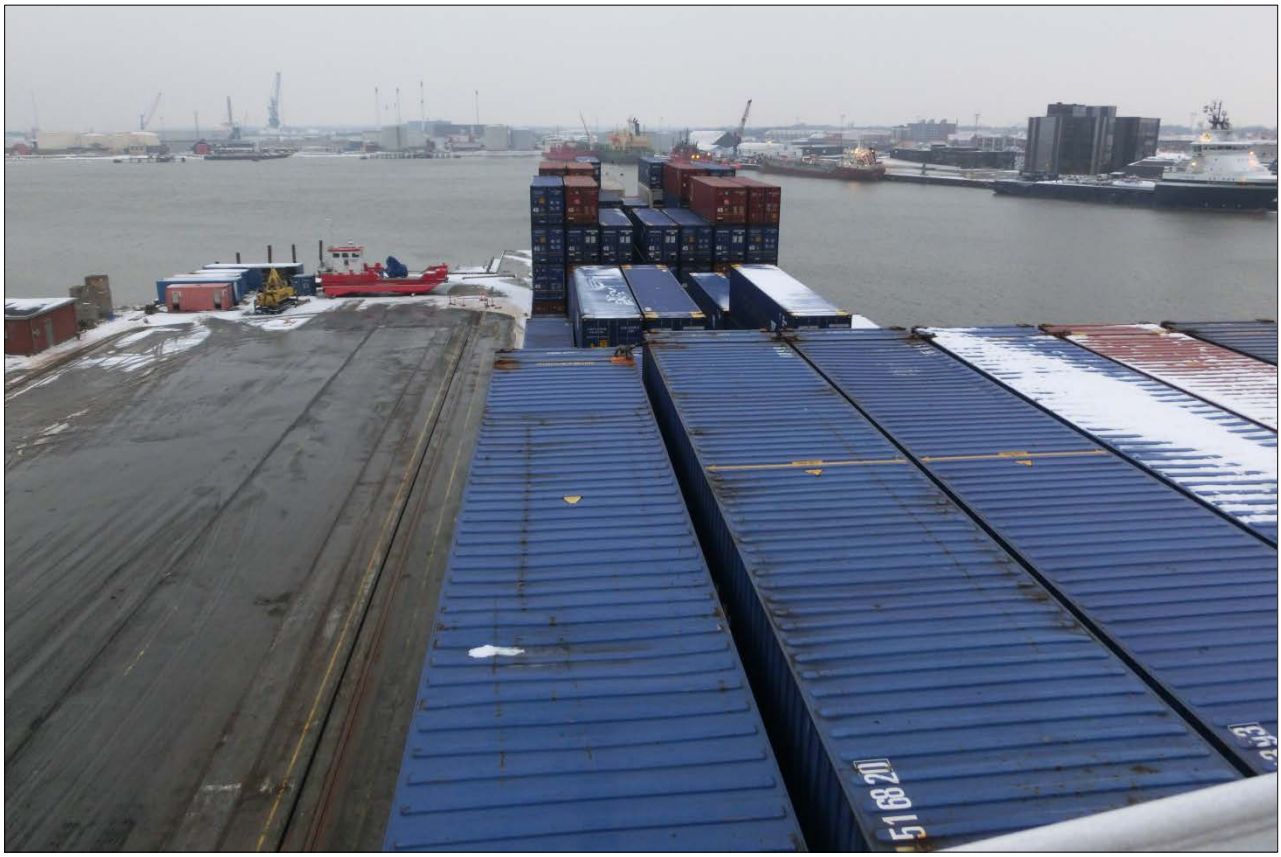

Figure 7: View from bridge on the day of the accident
Source: DMAIB

For mooring operations there were usually three crewmembers on the forecastle. On the day of the accident there were two of Turkish nationality and one Ukrainian. The working language on the ship was English and it was pointed out on posters that English should be used to promote a common understanding of working procedures and to develop the crewmembers' language skills.

The position of the control box gave little or no view of the deck area in front of the winch and to the port side of the winch or of the mooring line on the winch drums (figure 4). Furthermore, the fairlead that was typically used for the spring lines was not visible. Therefore, the operator of the winches relied on communication and signalling from the other crewmembers when determining when to heave or slack the mooring line.

The operator of the winch had difficulty judging the tension applied on the mooring line, as the distance from the winch to the pedestal bitt in front of the winch (figure 6) was short, approximately 2-3 metres, and thus offered little slack on the rope.
The crewmembers had a limited overview of the operation from their positions on the forward deck (figure 6). Therefore none of them had the realization that the mooring line was slackened until there was no rope left on the drum.

On the day of the accident, the forward mooring of the spring line was configured as seen in figure 6. The line was brought from the working drum on the port winch onto a pedestal fairlead and from there out through the shipside fairlead. From the bollard on the quay, the mooring line was fastened in a loop and brought back through the shipside fairlead and fastened on a bitt on the portside of the forecastle.

There are at least three possible reasons why the spring line was put on the bollard on the quay in a loop: Firstly, if the mooring line is a loop, then the crew on the ship do not depend on the shore side personnel to let the line go.

Secondly, there is the perception that a loop constitutes a stronger mooring than when the line is fastened on the bollard by the eye of the rope. Thirdly, the shipboard main manual stated that the *"Mooring ropes should never be left on the winch drums (in port) for the purpose of securing the vessel as they are not designed for same. Only mooring bitts should be used".*

In the shipboard main manual, there was a section describing how to go about various tasks related to deck operations, including mooring operation. The manual had not been made specifically for PACHUCA and had sections related to tankers and non-tankers. In the manual, a variety of risk factors concerning mooring operations were listed – some of which were applicable for the crew on PACHUCA and some not. In addition, there were listed different conditions that were to be fulfilled before the mooring operation could begin – e.g. that the *"OCIMF[1] publication on "Effective Mooring" to be closely complied with"* and that *"if the mooring equipment appears faulty its use is to be discontinued until senior staff on board check, rectify and test for continued use".* No snap-back zones were painted on the forecastle, just as no reference was made to them in the manual.

3. ANALYSIS AND CONCLUSIONS

This accident occurred as a result of several factors that coincided during a normal work routine for crewmembers that were experienced in carrying out mooring operations.

On the day of the accident, there was a strong breeze pushing the ship alongside. The master attempted to increase the distance between the ship and the berth by moving the ship forward. On the forecastle the crewmembers were basically facing the choice between holding the spring line, while the ship had a forward momentum, thereby risking the line breaking, or slacking the spring line which could result in the ship colliding with the quay. Furthermore, the crew had to slack the line sufficiently to get the rope off the bitt on deck.

As the line was slacked, they ran out of rope on the drum, it parted from the clamp on the drum and hit the bosun. It has not been established with certainty how the snap-back from the rope managed to come in contact with the bosun.

Even though the crewmembers knew that the mooring line was considerably shorter than the nominal 220 metres, they might not have recognized this fact in a stressful situation.

It is not an uncommon scenario that crewmembers are in a situation where they need to negotiate conflicting goals. In this situation the crewmembers slacked the mooring line to ease the tension on the rope. As none of the crewmembers had a clear view of the mooring drum, they were not aware that there was no rope left on the drum.

That the chief officer and bosun communicated in their native language and not in the ship's working language was not found to be contributing to the accidental circumstances.

Mooring operations are dynamic operations where the crewmembers are constantly responding to a changing situation. The crewmembers are exposed to different risks as they are move about on the deck area. It is, however, not predictable where the hazards will arise and the defined snap-back zones are only applicable in certain scenarios, e.g. if the mooring line breaks in the fairlead or on the pedestal roller. In fact, it is inherently difficult to predict where the rope will part in a dynamic mooring situation and, although the snap-back zones are useful in some circumstances, the areas outside the snap-back zones are not necessarily to be considered safe areas.

As PACHUCA arrived in six different ports a week, it used a variety of mooring configurations. It would therefore not promote safety to paint snap-back zones applicable for all situations on a relatively small deck area, because it would entail that the zones would be overlapping and contribute to confusion as to establish safe and unsafe areas.

The section in the Shipboard Main Manual about mooring stated a series of both specific risk factors and conditions for mooring. None of the described risk factors addressed the

[1] OCIMF: Oil Companies International Marine Forum.

specific situation the crew found themselves in on the day of the accident.

The winch control was positioned in such a way that the operator of the winch had little or no overview of the mooring situation. Therefore, any response to the changing circumstances would be delayed because the information was passed on between several crewmembers.

Overall the crewmembers were challenged by the basic design of the mooring arrangement i.e. lack of overview, small working area and exposure to ropes under tension. Within that work place environment, and the goal conflicts and changing operational circumstances, the accident happened.

The Danish Maritime Accident Investigation Board is currently investigating mooring accidents on ATAIR J and TORM REPUBLICAN that in further detail address the issue of the unpredictable path of parting ropes and the conflicting goals crewmembers are negotiating.