



ONDERZOEKRAAD
VOOR VEILIGHEID

Fatal accident due to breaking of stern line

Lessons to be learned about
safe working and supervision



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Damsterdijk, 2 October 2019

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Cover photo: Dutch Safety Board

Dutch Safety Board

When accidents or disasters happen, the Dutch Safety Board investigates how it was possible for them to occur, with the aim of learning lessons for the future and, ultimately, improving safety in the Netherlands. The Safety Board is independent and is free to decide which occurrences to investigate. In particular, it focuses on situations in which people's personal safety is dependent on third parties, such as the government or companies. In certain cases the Board is under an obligation to carry out an investigation. Its investigations do not address issues of blame or liability.

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This report is published in both the Dutch and English language. If there is a difference in interpretation between the Dutch and English versions, the Dutch text will prevail.

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RECOMMENDATIONS

Based on the investigation of this incident, the Dutch Safety Board issues the following recommendations:

To Shipping Company Groningen:

1. Ensure that the ship is manned and equipped in such a way that all work on board can be carried out safely. This incident shows that the following conditions must be taken into account:
 - a. Bring the manning of the ship into line with the strength described in ship-specific procedures.
 - b. Ensuring that the regulative rest hours for the crew members are guaranteed.
 - c. Ensuring clear communication on board by providing a walkie-talkie for all crew members.
 - d. Ensure a clear warning method for working in and nearby a snap-back zone.
2. Promote that crew members are sufficiently safety-aware and safety-competent to prevent accidents on board and to act appropriately in the event of imminent danger. This incident shows that several methodologies are desirable to achieve effective behavioural change, such as:
 - a. Regular discussion of procedures with the crew so that they can understand them and see them as necessary. Review of procedures where these are no longer appropriate.
 - b. Discuss potential incidents (based on experience, earlier or elsewhere) which may occur on board and let the crew explore how to respond to them. This should include exercises and simulations.
 - c. Use the risky situations identified on board and discuss them during safety meetings. The goal is to address actions that do not comply with the safety agreements, and discuss these regardless of rank or seniority.
 - d. Organising specific training and exercises to further develop skills that appear to be underdeveloped.
 - e. Devote specific attention to training and supervision of trainees.

To the Minister of Infrastructure and Water Management:

3. Ensure that the manning of the ship proposed in a submitted manning plan is always checked for feasibility with regard to the work to be carried out, type of ship, safety procedures and emergency procedures. A safe manning certificate should only be issued if all conditions are met.

To the Royal Association of Netherlands Shipowners (KVNR) and to the Minister of Infrastructure and Water Management:

4. Investigate together whether the basic principle can be maintained that a crew member charged with the actual supervision of safety can also perform other duties. Apply the results when preparing manning plans and issuing safe manning certificates.

To the Royal Association of Netherlands Shipowners (KVNR):

5. Bring the lessons learned from this accident to the attention of the sector and specifically focus attention on the safe deployment of trainees and the problems mentioned in the investigation regarding manning plans and safe manning certificates.



J.R.V.A. Dijsselbloem
Chairman Dutch Safety Board



C.A.J.F. Verheij
Secretary Director

1 INTRODUCTION

On 2 October 2019 at around 09.45 hours local time, in the port of Ipswich (UK) a fatal accident took place on the Dutch cargo vessel *Damsterdijk*. While in port, the vessel had to be moved backwards over a distance of approximately 100 metres, in order to make space for another vessel. During this manoeuvre, the captain and first officer were present on the bridge. Three crew members, a cook/AB, a cadet and an AB¹ in charge, were present on the vessel's aft deck. The AB was responsible for the aft spring, while the cook/AB together with the cadet was in charge of the two stern lines.

While moving the vessel, the cook/AB was hit by a broken mooring line. The impact of the mooring line on the body of the cook/AB caused severe injury to his left leg and possibly also internal injuries. Initially the cook/AB remained conscious, but by the time the ambulance arrived after approximately 40 minutes, he was already unconscious. The cook/AB died later that day, in hospital.

The accident has been classified as a very serious accident as defined in the Casualty Investigation Code of the International Maritime Organization (IMO) and Directive 2009/18/EC of the European Parliament and the Council. This means that the Netherlands, as the flag state, bears the obligation to ensure that an investigation is carried out. This obligation to carry out an investigation is also laid down in the Safety Board Decree.

Investigation approach

The investigation was initiated one day following the accident, with the collection of information in the port of Ipswich (UK). In the framework of this investigation, two investigators from the Dutch Safety Board carried out investigations on board. Interviews were held with the crew members directly involved, with a representative of *Shipping Company Groningen* (SCG) and with other stakeholders. The Board was also given access to relevant documents and closed-circuit television (CCTV) picture material. The information available was analysed according to the TRIPOD² analysis method.

The investigation focused on the following questions.

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- 1 An able body seaman (AB) is a naval rating of the deck department with more than two years' experience at sea and considered "well acquainted with his duty"
 - 2 The TRIPOD incident analysis method assumes the failure of safety provisions or barriers. The failing 'protections/measures' are analysed for their direct causes, circumstances and underlying factors in the process or the organization.

1. How could the accident happen?
2. Which procedures were in place on board for mooring, unmooring and berth changes at the time of the accident?
3. What lessons can be learned?

Demarcation

The investigation by the Dutch Safety Board is focused on the accident on board the vessel and does not deal with the actions of the port authorities or emergency services.

2 BACKGROUND INFORMATION

The vessel

The Damsterdijk is a vessel that operates under the management of *Shipping Company Groningen (SCG)*. SCG was established in 2016 following the merger of three shipping operators: *Navigia Shipmanagement*, *Feederlines* and *Thorco Shipping Holland*. At the time of the accident, SCG had a fleet of 26 vessels, the majority of which are multi-purpose and general cargo vessels.

The Damsterdijk was built in 2007 by *Chowgule & Co. LTD. Loutulim Shipyard*, GOA in India. The Damsterdijk is equipped with a Controllable Pitch Propeller (CPP). See Appendix A for further information about the ship.

A Controllable Pitch Propeller (CPP) is a type of propeller of which the blades can be rotated around their longitudinal axis, in order to adjust the pitch of the blades. These reversible propellers can also be used to generate reverse propulsion for braking or reversing, without changing the direction of rotation of the propeller shaft. With propellers of this type, the shaft and propeller rotate continuously, the only change being the angle of the propeller blades.

The crew

According to the Minimum Safety Manning Document (MSMD) issued by the Human Environment and Transport Inspectorate (ILT), the minimum crew strength on board the Damsterdijk is at least six crew members with the following positions:

- One captain
- One first officer
- One chief engineer (HWTK)
- Two AB's with the authority to keep watch
- One AB

At the time of the accident, there were eight crew members on board.

Position	On board since	Nationality	Years of experience in position	Years employed at SCG
Captain	06-07-2019	Russian	15.5	6
First officer	28-09-2019	Ukrainian	4	3
Third officer	31-03-2019	Filipino	0.6	0.6
Chief engineer	12-09-2019	Ukrainian	7.5	7.5
Cook/AB	31-03-2019	Indonesian	13	1.5
AB	01-08-2019	Filipino	0.75	1
Ordinary seaman	15-05-2019	Filipino	0.5	0.5
Cadet	21-09-2019	Dutch	N/A	0.16

Table 1: Crew composition.

The victim was both cook and AB on board the Damsterdijk. He had more than 13 years of experience in this position, of which the last 1.5 years at SCG. He signed up for this period on 31 March 2019.

The captain was one of the regular captains on board the Damsterdijk. He was serving his fourth consecutive contract with SCG.

Shipping route

The Damsterdijk mainly operates in Northern Europe and the Mediterranean Sea. The last port visited prior to Ipswich (UK) was Ceuta (Spain). The Damsterdijk arrived in Ipswich (UK) on 28 September 2019, to discharge and take on cargo at the quayside.

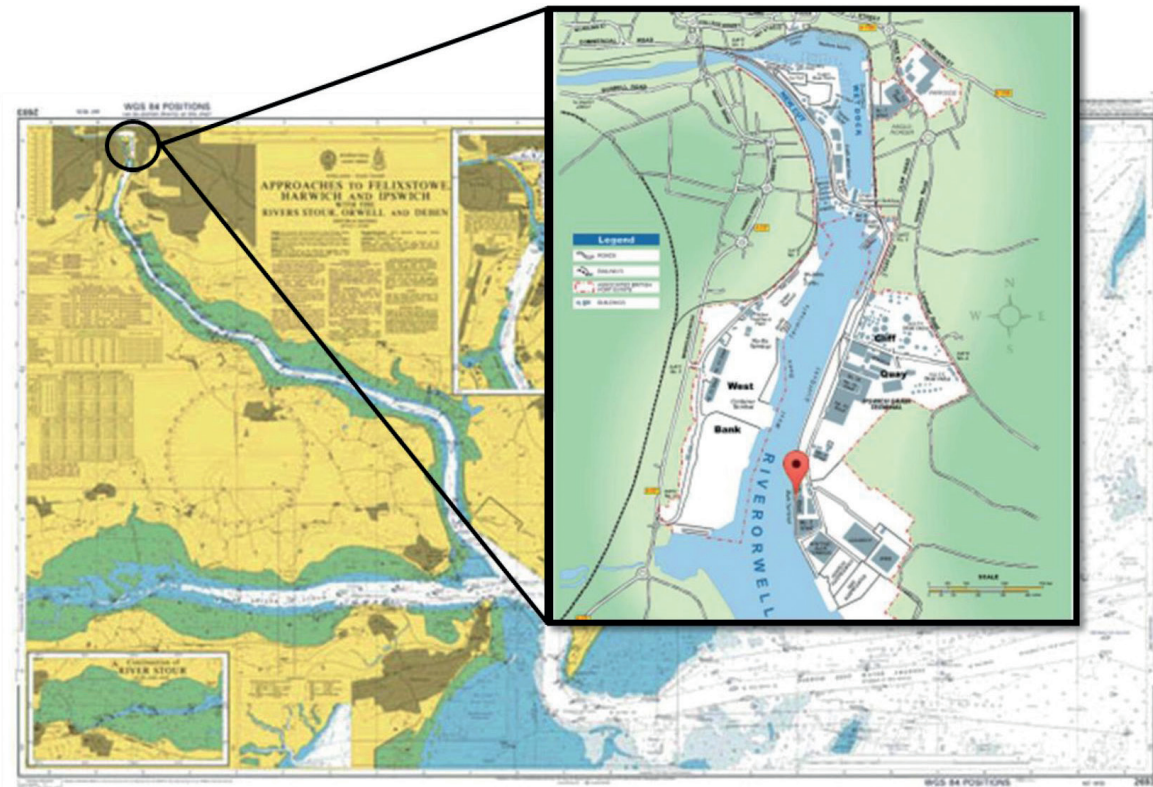


Figure 1: Berth of the Damsterdijk in the port of Ipswich, where the incident took place.
(Source: Associated British Ports)

Weather conditions

At the time of the accident, the air temperature was around 15 degrees Celsius. The port of Ipswich is sheltered; the force 3 wind was blowing from a north-westerly direction and the current was negligible. Visibility was good.

3 COURSE OF EVENTS

3.1 Accident timeline

Wednesday 2 October 2019, local time

09.20 hours	Unloading of cargo completed
09.30 hours	Start of procedure to change berth to a new mooring
09.41 hours	Aft spring secured
09.42 hours	Two stern lines paid out simultaneously
09.42 hours	Aft spring slackened
09.43 hours	Starboard stern line becomes entangled in propeller
09.44 hours	Cook/AB injured by breaking stern line
09.46 hours	First aid administered by first officer and employees of the port authority
10.26 hours	Ambulance arrived
19.15 hours	Cook/AB died

3.2 Course of events

After unloading had been completed on 2 October 2019, at the request of the Ipswich harbour master, a start was made at around 09.30 hours local time on the operation to change berth. This move was necessary in order to make space for another vessel. The manoeuvre was carried out under the command of the captain on the bridge. The captain was in direct visual contact with the first officer on the bridge wing on the starboard side. Both were able to see the crew members on the foredeck, but due to the construction of the vessel they had no direct view of the crew members on the aft deck. From the bridge wing, the first officer did have a clear view of the quayside on which the boatmen were walking.

Contact was maintained with the AB and cadet on the aft deck via walkie-talkie. The cook/AB, who was also present on the aft deck, was the only crew member not equipped with a walkie-talkie. The agreement for this manoeuvre complied with the standard procedure according to which crew members are only permitted to take action following a command from the captain. The manoeuvre was discussed with all crew members before it was started. It was a manoeuvre that was regularly carried out. The manoeuvre was not rushed and the weather conditions were good.

The AB and the cook/AB were both experienced in carrying out mooring operations and berth changes. The procedure for this operation specifies that the aft deck must be manned by two seamen. In the day prior to the accident, the cadet had been deployed on the foredeck. In the framework of his training, he was supervised by the third officer and observed by the first officer. On the day of the accident, he was stationed on the aft deck for the first time, under the command of the AB, and not in view of the bridge.

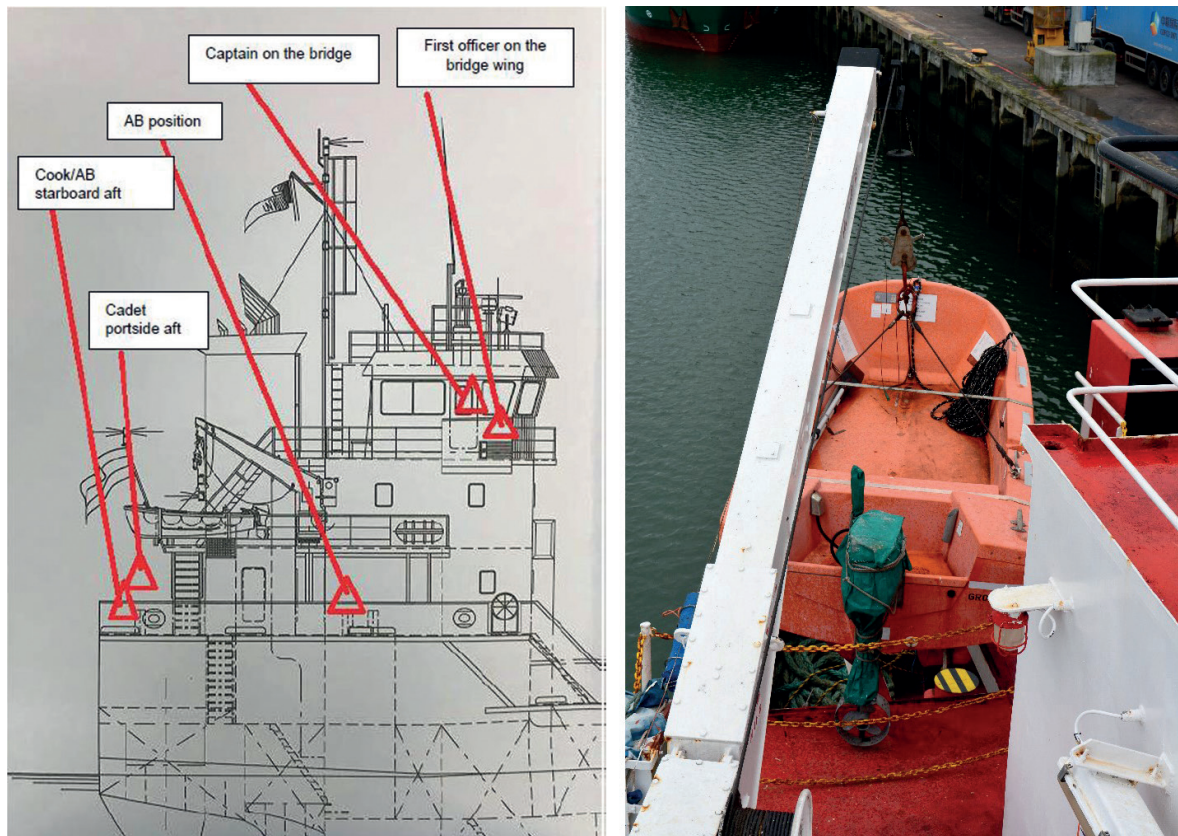


Figure 2 & 3: On the left the position of the crew on the bridge and on the aft deck and on the right the view of the first officer over the aft deck. This view was blocked by the superstructure and the ship's boat. (Source: Shipping Company Groningen)

The instruction was that the mooring lines could only be paid out following a command from the captain. A mooring line is sent ashore using a light-weight rope known as a heaving line. A heaving line is a thin, strong rope which is knotted to a heavy mooring line and is thrown ashore.

On shore, two linesmen employed by the Ipswich port authority were on duty. One at the front and one at the back of the ship. Both were equipped with a walkie-talkie. The task of the linesman was to take over the mooring lines from the crew and place them over the bollards present on the quayside.

The three crew members on the aft deck stood relatively close together, but were not in each other's field of vision. Due to the background noise caused by the engines, they were also not within hearing distance of each other. Each of them was responsible for releasing and re-securing a mooring line; the cook/AB was responsible for the stern line on the starboard side; the cadet for the stern line on the port side; and the AB for the aft spring on the starboard side. The mooring lines were not coiled around the storage drums during the manoeuvre but were placed loose on deck, because of the short distance to be covered during the berth change.

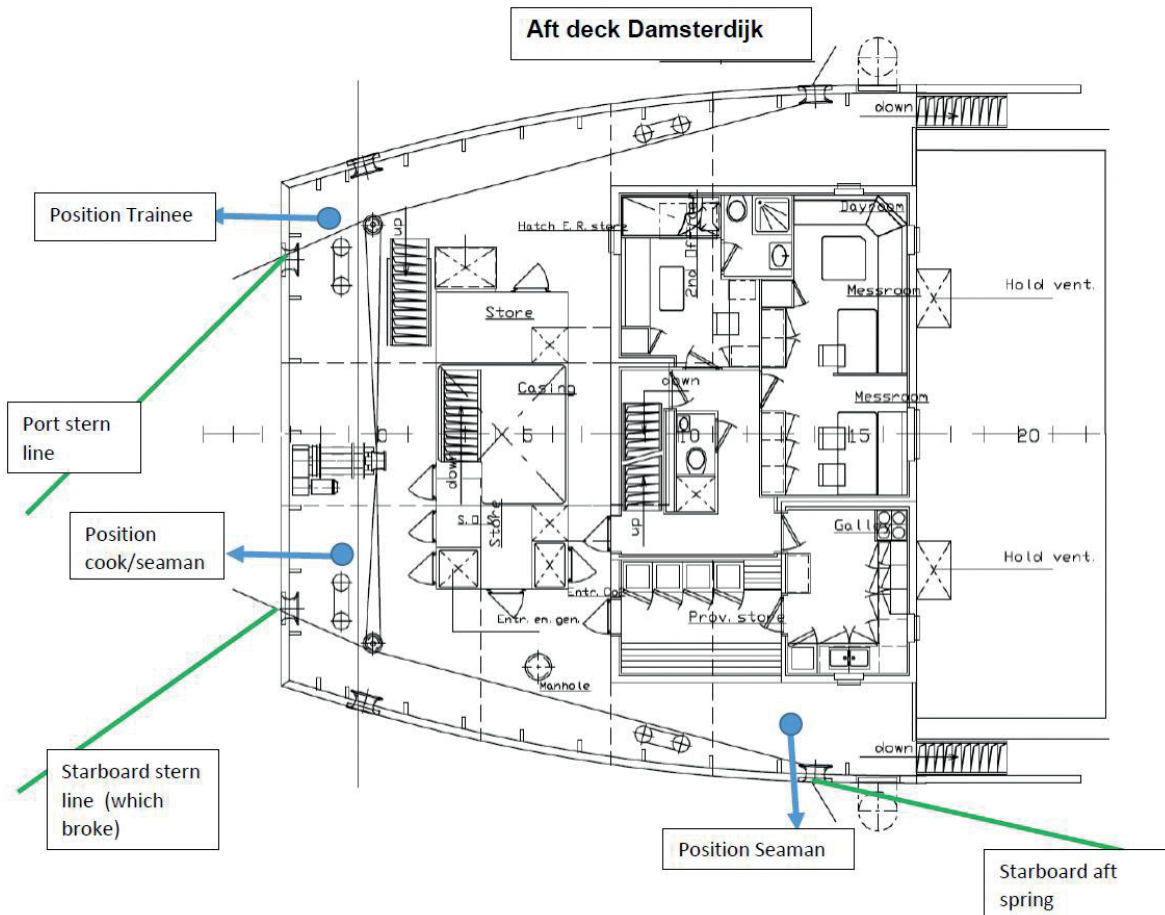


Figure 5: Positions of crew members and mooring lines on the aft deck. (Source: Shipping Company Groningen)

During the berth change of the ship, on the instructions of the captain, the first line to be paid out was the aft spring. After this had been secured by the AB, he walked to the aft deck, to assist the cadet and the cook/AB. Together they attached both stern lines to the heaving line, and laid them over the bulwark. The AB was then instructed via the walkie-talkie by the captain to slightly slacken the aft spring, to allow the vessel to reverse a further five metres.

As the AB made his way to the aft spring, to slacken the spring, the two stern lines started running into the water, at high speed. The cook/AB then turned to the starboard stern line, probably with the aim of halting the mooring line. However, due to the backward movement of the ship, the mooring line had by this time become entangled in the propeller. As a result, when the cook/AB secured the starboard stern line, the

mooring line came under tremendous tension. This tension caused the mooring line to break. The cook/AB was hit by the recoiling section of the mooring line that was under tension. The injuries he suffered as a consequence proved fatal, later that day.

The alarm was sounded and first aid was administered immediately. The Ipswich operations department requested urgent ambulance assistance, and two first aiders employed by the port authority came on board immediately. In an attempt to stop the severe bleeding caused to one of the cook/AB's legs by the accident, a tourniquet was applied. By this stage the ship had been moored, and a gangway had been set out for the ambulance. The ambulance took around 40 minutes to arrive. When the ambulance arrived, the cook/AB was already unconscious. The ambulance personnel spent a considerable time carrying out resuscitation. Eventually the cook/AB was transferred to hospital. He died in hospital later that day from the injuries incurred during the accident.

4 ANALYSIS

The information available was analysed on the basis of the TRIPOD analysis method. According to this method, the direct causes, failing safety barriers, circumstances and underlying factors were all investigated. This method was developed to allow (industrial) accidents, often with serious consequences, to be analysed with the aim of preventing their recurrence in the future. This is achieved by examining the barriers that failed, and then studying the causal pathway to the underlying causes. This method assists in carrying out a more in-depth accident analysis.

The TRIPOD analysis of the accident on board the Damsterdijk made the following main observations:

- The deliberate or accidental deviation from existing and agreed working methods.
- The risk of including a cadet in the work process.
- The danger of working in or moving through a snap-back zone and the absence of a walkie-talkie which resulted in a communication risk.

This led to the following more in-depth investigation questions, each of which will be answered below.

1. How could the accident happen?
2. Which procedures were in place on board for mooring, unmooring and berth changes at the time of the accident?
 - How were the procedures drawn up and how were they assessed?
 - How could it be guaranteed that everyone understood the procedures and employed them correctly?
3. What lessons can be learned from this accident?
 - What was the situation regarding the safety culture on board and how were risks managed?
 - To what extent did the presence of the cadet on the aft deck during the mooring procedure play a role?

4.1 How could the accident happen?

On the day of the accident on board the Damsterdijk, as the ship was moved backwards to a new berth, the aft spring was the first line to be paid out. The interviews and the CCTV images show that during the procedure to move to a new berth, the vessel initially moved back slowly and subsequently reduced speed further. On the instructions of the captain, the AB secured the aft spring. At that moment, the ship appeared to be in the required position. The AB then walked to the aft deck, where he assisted the cook/AB and cadet. The CCTV images show that at 09.42 hours, both the stern line of the cook/AB and the stern line of the cadet were fastened to the same linesman's heaving line,

who stood on shore, and were placed over the bulwark. Afterwards, both the captain and the first officer stated that they had not issued an instruction to the AB to pay out the two stern lines.

The AB then received instructions by walkie-talkie from the captain to slightly slacken the aft spring, to allow the vessel to reverse a further five metres. The AB then walked to the aft spring and carried out his task. Shortly afterwards, the ship started to once again move backwards, slowly.

The cook/AB was not issued with a walkie-talkie and as a result was unable to hear the new instruction from the captain. Because the AB was carrying out his task near the aft spring, at that moment there was no overview of the aft deck and no supervision of the work.

The CCTV images show that the cook/AB was concentrating on the port stern line and on the cadet, which meant that he had his back turned to his own workstation. At that same moment, behind him, the starboard stern line entered the water, at high speed.

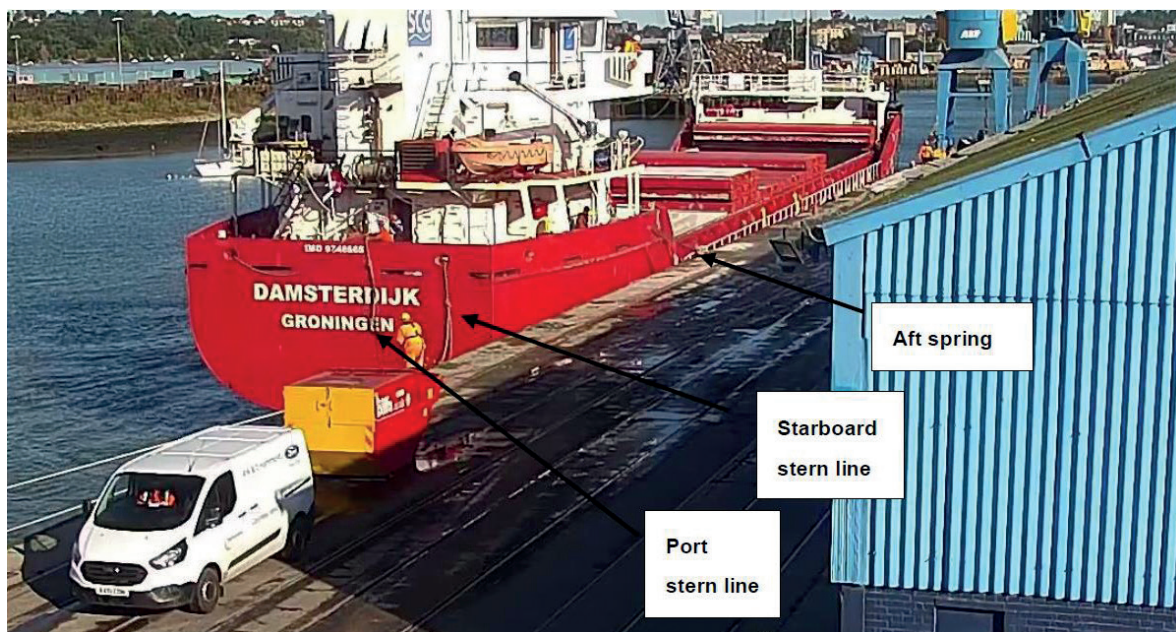


Figure 6: CCTV image at 09.42 hours showing the aft deck of the Damsterdijk from which at that moment two stern lines were being paid out, with on the starboard side the aft spring being slackened. (Source: Associated British Ports)

The fact that both stern lines went overboard simultaneously, and immediately thereafter ended up in the water at high speed, is an unusual situation that must not be allowed to occur in connection with the risk of the mooring lines becoming entangled in the propeller. The images show clearly that in both cases, too long a length of mooring line had been released too quickly. Because the mooring lines were lying loose on deck, they were able to run out unhindered.

The linesman observed the event from the shore, and saw how one of the two mooring lines was drawn under the ship by the propeller, due to the ship's backward movement. The CCTV images show him waving his arms in warning. He also shouted into his walkie-

talkie to stop immediately. It is unclear whether the captain received this instruction. However, with a Controllable Pitch Propeller, even if the pitch is in neutral, the propeller shaft rotates continuously. Although in that situation there is no further suction effect from the propeller, the rotation remains.

Seconds later, the CCTV images show the cook/AB attempting to prevent the further running of the mooring line fallen into the water by securing the mooring line. In doing so, he found himself in the snap-back zone³. The mooring line came under tension and broke shortly afterwards. As a result of the tension on the mooring line and the subsequent breakage, the line snapped back at high speed, hitting the cook/AB in the leg, eventually with a fatal outcome.

One vital element in mooring and unmooring operations, which in and of themselves already represent a risk⁴, is that the crew members must be aware of the zones in which they are or are not permitted to be present and in which they must be particularly careful when carrying out their work. The high-risk zones on the ship must be marked clearly as so-called snap-back zones. This method is a means of guaranteeing the safety of crew members in the event that a mooring line breaks. On the Damsterdijk, these snap-back zones were not marked on the deck nor were they indicated by signals.

An equally important element is that loose-lying objects such as mooring lines, tools, cargo residues or stowage gear can cause fall and trip hazards. All such items must be tidied away. During the manoeuvre by the Damsterdijk, the decision was taken to not tidy away the mooring lines in use, but to leave them lying loose on deck. The reason for deviating from this principle was that the manoeuvre to change to a new berth was to be carried out over a short distance.

The direct cause of the accident was the entanglement of the stern line in the propeller, which caused the line to come under tension and subsequently break. This was caused by a lack of clear communication. The cook/AB was not aware that the ship was not yet in position. The two stern lines were paid out without the captain's command and at the same moment that the vessel once again started moving backwards.

There was no overview and no supervision of the various actions on the aft deck, so that no warning could be issued by the AB in charge about the hazardous situation that had arisen.

The mooring lines were lying loose on deck, which meant they could run into the water unhindered, at high speed.

3 The greatest hazard when working with mooring lines is a line breaking and the subsequent so-called snap-back of the line. This is the recoil effect of the mooring line when the (static) energy built up in the line is suddenly released, at which point the line snaps back at huge speed. Snap-back occurs in all sorts and types of mooring line.

4 Health and Safety at Work sheet for mitigating risks in respect of mooring and unmooring issued by employers, the Royal Association of Netherlands Ship Owners (KVNR) and the employees, the trade union Nautilus International.

4.2 Which procedures were in place for the mooring, unmooring and berth changes at the time of the accident?

The procedures and working methods on board are described in the Fleet Manual and the Ships Manual. Both are part of the Safety Management System (SMS).

The Safety Management System (SMS) was developed following the introduction of the International Safety Management Code (ISM code). The ISM code was established in the late 1980s following a series of serious shipping accidents, including the disaster with the Herald of Free Enterprise. These accidents were partly caused by human error, also at management level.

The ISM code describes the requirements that a ship's SMS must satisfy. The code for example describes the responsibilities of the company that manages the ship; the ship manager is required to formulate the safety policy. As part of that policy, the ship manager must guarantee the safe implementation of all ship operations and provide a safe working environment. The ship manager must also provide appropriate safety provisions for a number of the objectives specified in the ISM code. Moreover, the ship manager must ensure continuous improvement.

The SMS also describes the day-to-day operations of a ship, the working methods to be employed, how emergency exercises are carried out and the procedures in the event of an emergency.

The procedure for mooring and unmooring is described in article 5.3.9 of the Fleet Manual issued by SCG:

5.3.9 Mooring and unmooring:

- *To ensure the safe mooring and unmooring of the ship, it is the responsibility of the captain to take actions that prevent dangerous situations.*
- *The mooring plan is discussed with the crew prior to the mooring procedure.*
- *The captain issues instructions (in English) to the crew members on the foredeck and aft deck.*
- *During mooring/unmooring, it must be ensured that the correct walkie-talkie channel for communication is established between the bridge and the responsible crew members on the foredeck and aft deck.*
- *Responsible crew members at each mooring station must ensure that commands from the bridge are transmitted, received and understood by other members at the station (foredeck/aft deck).*
- *If a mooring line is sent ashore during mooring, or sent aboard during unmooring, the responsible officer must notify the captain in time.*
- *Only if the mooring line does not enter the water is it permitted to haul in or pay out the line without first notifying the captain.*
- *If the mooring line enters the water, the captain must be informed immediately.*
- *The captain must be aware of the risk that mooring lines may float towards the bow thruster or propeller. If this becomes a realistic hazard, the captain is required to halt the bow thruster or propeller (for pitch propeller = neutral position).*
- *Only once the mooring lines are not (any longer) in contact with the surface of the water can the captain safely make use of the bow thruster and the (pitch) propeller.*
- *At all times, crew members on the foredeck and aft deck are responsible for informing the captain whether the bow thruster or propeller can or cannot be used safely.*
- *During mooring and unmooring procedures, the crew members on the foredeck and aft deck must at all times closely monitor the mooring lines to ensure that no dangerous or critical situations occur.*
- *If a dangerous or critical situation does nonetheless occur, the crew members must immediately warn the captain via the VHF radio. All crew members in the immediate vicinity of the mooring lines must immediately lie down and seek protection behind the winches. The captain must immediately inform the boatmen on shore about the situation and instruct them to vacate the area as quickly as possible.*

Only crew members involved in mooring and unmooring are permitted on the aft deck and foredeck during these manoeuvres.

On board the Damsterdijk, this procedure was discussed with the crew, prior to carrying out the manoeuvre. This manoeuvre was not unusual and was therefore due to be carried out according to the standard mooring plan for this situation: first forward spring and aft spring, then, once the ship was in position and was no longer moving, the bow lines and stern lines. The distribution of crew members on the ship during the manoeuvre was as follows:

Forward mooring station:

- Manned by the third officer and the ordinary seaman
- Third officer in charge
- Third officer equipped with walkie-talkie

Aft mooring station:

- Manned by the AB, the cook/AB and the cadet
- AB in charge
- AB equipped with walkie-talkie
- Cadet equipped with walkie-talkie

Bridge:

- Manned by the captain and the first officer
- Captain and first officer both with a walkie-talkie
- Captain issues instructions and manoeuvres
- First officer on starboard wing passes on instructions to fore and aft, and is responsible for communication between linesman and captain

Shore side:

- Assistance from linesman
- Both linesman equipped with a walkie-talkie.

The manning plan on the Damsterdijk lists the tasks for mooring and unmooring, with the following instructions for the aft deck:

The task for a AB: Present on the aft deck during mooring and unmooring. Is in direct contact with the bridge. Will inform the bridge of distance to quayside and other objects. Will supervise the handling of the mooring lines. Is actively involved in handling the mooring lines. The first officer will assist if necessary.

The task for the cook/AB: Present on the aft deck during mooring and unmooring. Will work under the supervision of the AB. Is actively involved in handling the mooring lines.

For the cadet who was present during the mooring and unmooring, the manning plan offered no task description.

Three mooring lines were simultaneously paid out from the aft deck, one of which by the cadet. Because of the locations from which the mooring lines were paid out, it was not possible for the responsible AB to monitor all lines and their handling. As a result, he was unable to observe and, as laid down in the procedure, notify the captain that a mooring line was in the water, while the vessel was still moving backwards.

The procedure described in the Fleet Manual and the task description in the manning plan state that the responsible crew member must provide supervision and is responsible for the correct passing on of the commands and the communication with the captain in the event of paid-out mooring lines or dangerous situations. However, because this crew member himself was also actively handling a line at a distance from the other crew members for whom he was responsible, it was not possible to maintain an overview, to supervise or to ensure clear communication.

This dual task allocated to the AB was described as such in the manning plan that was submitted to ILT, together with the application for the safe manning certificate. In addition to this described dual task, the crew members on the aft deck were also additionally charged with advising and supervising the cadet.

The manning plan contained a task description for a crew consisting of nine persons. On the basis of this manning plan, the Inspectorate mistakenly issued its approval for a manning certificate with a minimum of six authorized crew members. Due to an omission, no proper assessment was made. And according to the Human Environment and Transport Inspectorate (ILT), this minimal crewing requirement was based on the running of the ship and did not relate to the content of the procedures. ILT saw no reason to reject the manning plan because of the combined set of tasks allocated to the AB.

A manning plan is a proposal from the ship manager for a minimum crew composition on which basis he wishes to crew the ship. The plan includes a description of the navigation area, the number of crew members and the positions of the crew members.

The Human Environment and Transport Inspectorate (ILT) explained that it examines and assesses a manning plan in respect of such elements as rest periods, crew composition, equipment of the ship, vessel type, emergency procedures, sailing areas, etc.

The safe manning certificate is then issued on the basis of the manning plan. The safe manning certificate lists the minimum number of officers and crew members who must be on board, based on the operation of the ship and not the content of the procedures.

Taking account of the minimum number of crew members listed on the safe manning certificate, the ship manager must crew the ship in such a way that all tasks on board can be carried out. He must also take account of the applicable work and rest periods, the risk of fatigue, the risks at sea and the risks inherent in the cargo. The work must be

carried out without risks to the seafarers, the ship, the cargo, the environment and shipping traffic.

It can be concluded that given the distribution of tasks at the moment of the accident both on the foredeck and on the aft deck, there were no crew members available to focus exclusively on physical supervision in general and supervising and advising the cadet in learning to handle mooring lines during mooring and unmooring in particular.

It is also a given fact that the above mentioned manning plan specifies a mooring and unmooring procedure which assumes more crew members than eventually applied for and, due to an omission, approved by ILT. In the procedure as laid down in the manning plan, there was an officer available who was tasked exclusively with a supervisory task, who could therefore have taken responsibility for the cadet.

Burdening an individual with multiple tasks simultaneously is viewed by the Dutch Safety Board as undesirable and risky if at least one of those tasks is a safety task. Reference is also made to this situation in the report about the accident on board the RN Privodino⁵. At the same time, maintaining physical supervision as a safety task is also considered important, as described in the theme section of Shipping Occurrences Report no. 9⁶.

This was the reason why ILT was asked, also with regard to this aspect, about the way in which manning plans are assessed. At the same time, ILT was asked why applications for crew compositions are approved if those same applications contain on-board working procedures which assume more crew members than the number actually applied for.

The responses so far from ILT reveal that to ensure a thorough analysis of the complex system of identifying safe manning levels, more information and investigation are needed. The accident on board the Damsterdijk cannot be seen in isolation, but could be included in such an investigation. For that reason, we will not discuss this particular issue in detail in this report.

The procedure specifies that the responsible crew member must provide supervision, a task which itself conflicts with being required to simultaneously carry out actions himself.

The cadet who according to the described procedure had no formal position during mooring and unmooring on the aft deck was also responsible for handling one of the paid-out mooring lines.

5 <https://www.onderzoeksraad.nl/en/page/17800/brekende-tros-met-fatale-afloop---lessen-uit-het-ongeval-aan-boord>

6 https://www.onderzoeksraad.nl/nl/media/attachment/2019/10/29/rapportage_ongevallen_scheepvaart_nov_2018_mei_2019-6108281.pdf

The manning plan submitted to the Human Environment and Transport Inspectorate (ILT) by the ship manager included a mooring and unmooring procedure which assumed more crew members than applied for by the ship manager for the accompanying safe manning certificate. Due to an omission this was permitted by ILT.

4.3 What lessons can be learned from this accident?

What was the situation regarding the safety culture on board?

During this berth changing manoeuvre, the procedure was deviated from by placing the cadet on the aft deck without duly adjusting the working method and agreements. This led to a change in the role of the AB and of the cook/AB in terms of supervision and being in charge. In addition, the three previously used mooring lines were laid loose on deck, rather than being wound around a drum or placed in a hawser locker, as a result of which the aft deck was not a clean/tidy workplace.

Safety management

The Damsterdijk and the *Shipping Company Groningen* (SCG) operate a Safety Management System (SMS) which is certified according to the International Safety Management Code (ISM code). Regular internal audits of the SMS are carried out. The SMS included a Fleet Manual and a Ship Manual, in which day-to-day operations and emergency procedures are described. Compulsory safety exercises were held on board and, as specified, regular safety meetings were organized, during which the crew members discussed the risks on board.

According to the ISM code, based on his responsibility on board, the captain is required to periodically assess the Safety Management System (SMS) and to duly inform the Quality Assurance department (QA department) of SCG of any shortcomings observed.

Internal audits on board the entire fleet, in line with the ISM code, are planned and carried out each year by the QA department at SCG. External audits are carried out by approved organizations (classification societies) to check for example whether the ship manager and the ship still satisfy the statutory requirements laid down in the ISM code.

In addition, vessels are regularly inspected by government bodies during Port State Control (PSC) inspections. These inspections are carried out over and above the annual inspections and audits by approved organizations in the framework of international conventions.

During the audits and safety meetings, the impossibility of the AB carrying out of the double role had not previously been recognized as conflicting. The same applies to the impossibility of carrying out the method as described in the manning plan.

The procedure was deviated from by adding the cadet to the team on the aft deck without adjusting the work method and the agreements. The tasks on the aft deck were new for the inexperienced cadet, so that in addition to carrying out his own work, the cook/AB was actively responsible for issuing instructions, a task which is not included in his set of tasks. In addition, over and above his supervisory role, the AB was also given an additional task.

The crew was wearing the personal protective equipment specified by the operator. This equipment consisted of an overall, gloves, safety shoes and a helmet. Walkie-talkies were only issued to the crew members in charge⁷ on the foredeck and aft deck and to the cadet, as part of his training. Because the cook/AB was not issued with a walkie-talkie, the AB on the aft deck had to pass on any orders issued, verbally. As a result of the distance between them, the background noise and the nature of the work, these commands were shouted.

The handing out of walkie-talkies, based on the decision to only equip the crew members in charge and the cadet with a walkie-talkie, contributed to the communication difficulties on the aft deck.

According to the documentation in the SMS on board, the first officer had carried out a risk analysis for the ship operations mooring and unmooring and berth changes on 11 March 2019. The aim of the risk analysis was to identify the dangers and the existing risk management measures for these tasks and to decide whether or not the risks were acceptable. This risk analysis identified a number of different potential dangers.

1. Insufficient coordination / insufficient communication
2. Fatigue
3. Manual operation of winches and mooring lines
4. Shortcomings in the mooring plan / overloading of the mooring lines and/or winches
5. Personal injury due to broken mooring line

In respect of the first three identified dangers, although it was determined that they do occur, it was decided that the risk was not on such a scale that further immediate action was deemed necessary. With respect to dangers number four and five, it was concluded that these risks are not to be tolerated and that action should be taken.

⁷ In the report published by the Dutch Safety Board about the fatal accident on board the Fortunagracht, attention was also focused on the problem of insufficient walkie-talkies. The recommendation was: 'Make the carrying of a walkie-talkie compulsory and organize the personal issuing of walkie-talkies.' (<https://www.onderzoeksraad.nl/en/page/17166/fall-from-height---fatal-accident-on-board-fortunagracht>)

The existing risk control measures (RCM) for these dangers were:

1. Machines on deck may only be operated by well-trained/competent personnel; and
2. Follow the 'keep out of snap-back zones' rule and clearly mark snap-back zones on the deck.

The conclusion from the risk analysis was that these measures had to be improved or updated. The investigation was unable to indicate how this analysis was followed up. It was visible that at the time of the accident, there were no warning marks for snap-back zones on board the *Damsterdijk*. It was also clear that the cadet, as part of his training, was deployed for tasks on the aft deck during a manoeuvre whereby the AB responsible for supervising the cadet was in fact unable to fulfil that task, because he had no clear view of the cadet.

In accordance with the agreements from the SMS, the first officer had carried out a risk analysis. This analysis identified risks for mooring and unmooring and safety management measures had been proposed. At the time of the accident, six months later, the proposed safety management measures had not yet been implemented.

The cadet deployed for the work was not competent to carry out the tasks during the manoeuvre, which could not be expected at this stage of his training.

There were no warning markings for snap-back zones on board the *Damsterdijk*.

Work and rest periods

The documents obtained revealed no non-conformities in the work and rest period records of the cook/AB, the cadet, the ordinary AB, the captain, the chief engineer or the first officer. There were violations of the rest periods for the third officer and the AB.

Due to the tasks entrusted to him, the AB had not taken the compulsory number of rest hours⁸. The day before the accident, he had kept the watch between 09.00 and 17.00, at 19.00 hours he had assisted in a manoeuvre and between 23.00 and 05.00 hours he had once again kept the watch. From 06.00 to 07.45 hours he was called up to assist in the unloading work. At 09.00 hours, he was once again called up to assist in the berth change manoeuvre.

8 a. The maximum number of working hours may not exceed: 14 hours in any period of 24 hours; and 72 hours in any period of seven days; or
b. The minimum number of rest hours may not be less than: 10 hours in any period of 24 hours; and 77 hours in any period of seven days.

The AB had not taken sufficient rest hours prior to the incident. Having taken insufficient rest hours could have influenced the implementation of tasks, such as implementing the supervisory task during the manoeuvre to change berth.

Equipment

According to the maintenance record, the winch on the aft deck was correctly maintained. The equipment required for the mooring and unmooring procedure on the aft deck was all in working order without clear defects. The mooring lines were in good condition and certified. However, during this manoeuvre, the three mooring lines previously used were laid loose on deck, rather than wound around a drum or placed in a hawser locker, as a result of which the aft deck was not a clean/tidy workplace.

How are new (deck) personnel trained on board?

In addition to the training requirements that are an integral part of the certificates of competency of the crew, crew members also receive a compulsory familiarization tour when they come on board. This familiarization tour is a requirement imposed by the operator and is also compulsory pursuant to the Seafarers Act. As part of this tour, all safety issues and house rules on the ship were discussed, and the position to be adopted during mooring and unmooring was pointed out. The familiarization procedure is described in Chapter 3.3 *STCW Familiarization Training of the Fleet Manual*. The registration of the familiarization forms, obtained via the SMS, revealed no shortcomings. The cadet received the familiarization training on 23 September 2019 and the cook/AB on 4 March 2019.

As part of his training on deck, the cadet was supervised by the first officer and in the engine room by the chief engineer. On the day of the accident, the cadet had only been on board ten days and had mainly been involved in maintenance of the hatch crane, painting and cleaning. The port of Ipswich was the first port entered since he signed up on board. During previous mooring and unmooring manoeuvres, he had above all observed on the foredeck and assisted on the winch, under the guidance of the third officer. The cadet's first introduction to the tasks during mooring and unmooring on the aft deck was this berth change manoeuvre, during which the cook/AB was killed.

To what extent did the presence of the cadet on the aft deck during the mooring procedure play a role?

The standard procedure for mooring and unmooring and berth changing on the aft deck was that these tasks would be carried out jointly by the AB and the cook/AB, whereby the AB was in charge and supervised the actions of the cook/AB. Both were experienced and were in possession of the necessary certificates. This manoeuvre was carried out with some regularity.

For the cadet, this was the first occasion on which he was deployed on the aft deck; he was supervised by the AB, unlike in the previous situation on the foredeck in which he was supervised by the third officer and could be observed by the first officer. In addition, the standard procedure was deviated from, in that the cadet was given an operational task during the manoeuvre.

The AB was entrusted with a supervisory task and was in charge of the operation, but at the same time was required to carry out his own tasks on the starboard aft spring, whereby he lost sight of the cadet and the cook/AB. As a result, it became the task of the cook/AB to issue instructions to the cadet, although this is not the standard working method and is not part of his set of tasks. The cook/AB had divided his attention between his own work, handling the starboard stern line, and the work that had been entrusted to the cadet, namely handling the port stern line. Moreover, the cook/AB was not issued with a walkie-talkie because it was assigned to the cadet for training purposes. As a consequence, he was unable to follow the communication regarding the manoeuvre.

As a consequence of deploying an inexperienced cadet to work on the aft deck, under the command of a AB who was unable to actually see the cadet, the cook/AB was required to issue instructions to the cadet. This meant that the cook/AB was forced to divide his attention between his own duties and the additional task of issuing instructions. The consequence of this situation was that the cook/AB was working with his back to the normal working position and to the mooring line he was handling. As a result of the location of the responsible AB, it was impossible for the responsible AB to supervise the work. Communication with the cook/AB was also impossible because the cook/AB had not been issued with a walkie-talkie.

Internal investigation by the ship manager

Following the fatal accident on board the Damsterdijk, the ship manager launched an internal investigation. During the visit by the Dutch Safety Board to the Damsterdijk in Ipswich (UK), a member of staff of SCG was also on board the ship in the framework of this internal investigation. The recommendations issued by the ship manager in response to the internal investigation included:

- A newsletter drawing attention to the risks of mooring and unmooring, emphasizing the fact that safety is not only achieved through rules and procedures but is also the consequence of the physical actions of the individuals involved.
- Distributing copies of the investigation across the fleet, in a circular, as a learning aid and organizing discussions in the Safety Committee on board.
- The procedure for mooring must be improved in the Fleet Manual.
- Clear warning signs or painted markings must be applied to the deck, indicating that the entire zone is subject to the danger of snap back and that extra preventive measures must be taken for crew members present or working in the zone.
- Only one mooring line may be handled at a time.
- Clarification throughout the fleet regarding the training of cadets during work with a high potential risk, such as mooring and unmooring.
- The use of risk assessments must be improved in general and for mooring and unmooring in particular. The crew must periodically receive refresher training from the senior officers in charge about safe working during mooring and unmooring and about the related risks.

Related investigation by the Dutch Safety Board

Over the past year, the Dutch Safety Board also investigated another fatal accident caused by the breaking of a mooring line.

On 28 June 2018, the RN Privodino entered the Noordersluis lock at IJmuiden. Shortly after the port forward spring had been paid out, it unexpectedly came under severe tension. There was no more time to react and the mooring line broke. Part of the mooring line snapped back, killing a crew member.

Points for attention from this investigation that demonstrated similarities with the fatal accident on board the Damsterdijk:

- Ensure that whenever agreements are reached about the distribution of tasks during manoeuvres, these agreements do not conflict with the formal role and responsibility of the various persons involved according to their own discipline.
- Ensure that during mooring line handling, crew members only undertake tasks after they have been issued with the appropriate instructions by a superior.
- Ensure that crew members who are expected to physically supervise the safety of crew members are always able to give priority to this task
- The danger of working inside and outside the snapback zones and the way in which they are marked.

5 CONCLUSIONS

The accident and the direct causal factors

On 2 October 2019 at around 09.45 hours local time, in the port of Ipswich (UK) a fatal accident took place on the Dutch cargo vessel *Damsterdijk*. While in port, the vessel had to be moved backwards over a distance of approximately 100 metres, in order to make space for another vessel. While the ship was being moved, the stern line ended up in the propeller.

As a result, the line came under tension and broke. Part of the line snapped back, hitting the cook/AB at high speed. The cook/AB was seriously injured and later that day died as a result of those injuries.

The underlying factors that contributed to the accident

A number of underlying factors contributed to the occurrence of the accident.

Combination of tasks and roles

The mooring and unmooring procedure specifies a crew composition for the aft deck, whereby the responsible AB is required to supervise the other crew members, their work, the correct passing on of commands and the communication with the captain. The procedure also states that the AB himself is actively involved in handling the mooring lines. As a consequence of this combination of tasks, it was not possible for the AB to maintain an overview and ensure supervision; moreover, he was unable to issue a timely warning when the unsafe situation arose.

This same combination of tasks applied to the cook/AB because he combined his own work with giving instructions to the inexperienced cadet. The standard working method was deviated from when the cadet was added to the team on the aft deck, as part of his training. The work on the aft deck was new to the cadet.

A safety management system can only actively contribute to increasing safety if it is in line with the practice on board and if the crew members are sufficiently safety-aware and safety-competent. A crew member charged with supervising safety cannot perform other duties in addition.

Communication

The stern line became entangled in the ship's propeller due to lack of clear communication. The cook/AB was not issued with a walkie-talkie, and the AB in charge was beyond his field of vision and out of hearing.

Rest hours

The AB had not taken sufficient rest hours prior to the incident. This may have influenced his actions and his supervisory role.

Clean work space

The decision was taken to leave the mooring lines loose on deck. As a result, the working deck was not clean and the mooring lines were able to enter the water unhindered, at high speed.

Snap-back zone

The cook/AB came in the snap-back zone when he tried to stop the starboard stern line from going overboard. This zone was not marked as such, or clearly indicated with signals.

Manning plan

The manning plan submitted to the Human Environment and Transport Inspectorate (ILT) by the ship manager included a mooring and unmooring procedure which assumed more crew members than the number applied for by the ship manager for the accompanying safe manning certificate. Further investigation at the ILT has revealed an omission, as a result of which a proper assessment of the manning plan was not made before the safe manning certificate was issued. The working method in the manning plan, based on nine crew members, could not be carried out by the crew members actually present.

Safety deficiencies underlie the aforementioned underlying causes. In order to learn from them, the Dutch Safety Board makes various recommendations.

6 RECOMMENDATIONS

Based on the investigation of this accident, the Dutch Safety Board comes to the following recommendations:

To Shipping Company Groningen:

1. Ensure that the ship is manned and equipped in such a way that all work on board can be carried out safely. This incident shows that the following conditions must be taken into account:
 - a. Bring the crew into line with the strength described in ship-specific procedures.
 - b. Ensuring that the regulative rest hours for the crew members are guaranteed.
 - c. Ensuring clear communication on board by requiring a walkie-talkie for all crew members.
 - d. Ensure a clear warning method for working in and near a snap-back zone.
2. Promote that crew members are sufficiently safety-aware and safety-competent to prevent accidents on board and to act appropriately in the event of imminent danger. This incident shows that several methodologies are desirable to achieve effective behavioural change, such as:
 - a. Regular discussion of procedures with the crew so that they understand them and see them as necessary. Review of procedures where they are no longer appropriate.
 - b. Talk through potential incidents (based on experience, earlier or elsewhere) which may occur on board and have the crew explore how to respond to them. This should include exercises and simulations.
 - c. Use the risky situations identified on board and discuss them during safety meetings. The premise is to call each other to account for actions that do not comply with the safety agreements, regardless of rank or seniority.
 - d. Organising specific training and exercises to further develop skills that appear to be underdeveloped.
 - e. Devote specific attention to training and supervision of trainees.

To the Minister of Infrastructure and Water Management:

3. Ensure that the manning proposed in a submitted manning plan is always checked for feasibility with regard to the work to be carried out, type of ship, safety procedures and emergency procedures. A safe manning certificate should only be issued if all conditions are met.

To the Royal Association of Netherlands Shipowners and to the Minister of Infrastructure and Water Management:

4. Investigate together whether the basic principle can be maintained that a crew member charged with the physical supervision of safety can also perform other duties. Apply the results when drawing up manning plans and issuing safe manning certificates.

To the Royal Association of Netherlands Shipowners:

5. Bring the lessons learned from this accident to the attention of the sector and specifically focus attention on the safe deployment of trainees and the problems mentioned in the investigation regarding manning plans and safe manning certificates.

Vessel Data Damsterdijk

Vessel data	Damsterdijk
Foto:	
<i>(Source: A. Van Beem)</i>	
Call letters:	PHKS
IMO number:	9346665
Flag State:	The Netherlands
Home port:	Groningen
Type of ship:	General cargo
Classification society:	DNV GL
Year of construction:	2007
Shipyard:	Chowgule
Length overall (Loa):	89.95 m.
Length between perpendiculars (LPP):	84.94 m.
Breadth:	14.40 m.
Actual draught:	6.22 m.
Gross Tonnage:	2984
Engines:	Caterpillar
Propulsion:	1 pitch propeller, 1 bow thruster
Maximum propulsion capacity:	1980 kW
Maximum speed:	11.5 knots
Vessel certificates:	All valid

COMMENTS ON DRAFT REPORT

A draft version of this report, with the exception of the consideration and recommendations, was submitted to the parties directly involved. These parties were requested to check the report for any factual inaccuracies and ambiguities. The draft report was submitted to the following parties:

- Shipping Company Groningen (SCG)
- Ministry of Infrastructure and Water Management
- Associated British Ports

The Board has taken note of the responses received. The responses and explanations are listed in a table which is available on our website www.safetyboard.nl.

All comments that were considered relevant by the Board, have been incorporated in the report. Comments that have not been incorporated in the report are also listed in the aforementioned table together with an explanation on the Board's decision.

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