DMAIB
DANISH MARITIME ACCIDENT INVESTIGATION BOARD

SANTA CLARA

Marine accident report on occupational accident

7 FEBRUARY 2021

MARINE ACCIDENT REPORT ON OCCUPATIONAL ACCIDENT ON SANTA CLARA ON 7 FEBRUARY 2021

published by

DMAIB
Danish Maritime Accident Investigation Board
Batterivej 9
DK-4220 Korsoer
Denmark

The report is issued on 10 May 2021

Photo: Stowed accommodation ladder on SANTA CLARA
Source: DMAIB

The investigations are carried out separately from the criminal investigation, without having used legal evidence procedures and with no other basic aim than learning about accidents with the purpose of gaining and promoting an understanding of safety. Consequently, any use of this report for other purposes may lead to erroneous or misleading interpretations.

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Introduction

Start of the investigation

In the morning of 7 February 2021, The Danish Maritime Authority notified DMAIB about a fatal accident that occurred on the Danish flagged container ship SANTA CLARA while the ship was approaching Terminal Bremerhaven, Germany. An ordinary seaman (OS) had fallen overboard as she and two other crewmembers were preparing the ship's accommodation ladder. Various ships and search and rescue units had searched the area for several hours, but the OS was not found.

At 0905 on 7 February 2021, the German police went on board SANTA CLARA and conducted an investigation into the events leading to the OS falling overboard. It was determined that the fall overboard was a result of an accident connected to the rigging of the accommodation ladder.

Due to the COVID-19 pandemic situation, it was not possible for DMAIB to visit the ship in Bremerhaven. Therefore, two investigators were deployed to the ship's next port of call, APM Terminals Rotterdam, Netherlands.

The aim of DMAIB's initial investigation was to reconstruct the course of events on SANTA CLARA prior to, during and after the accident.

Narrative

Background

SANTA CLARA was a container ship (figure 1) manned with 28 crewmembers of various nationalities operating between ports in Europe and South Africa. During early February 2021, SANTA CLARA was on the Northern European schedule when it departed London Gateway Terminal on 6 February heading for the next port, NTB North Sea Terminal Bremerhaven.

On the evening of 6 February 2021, SANTA CLARA picked up the Weser river pilot and was advised to drift off the Weser/Jade pilot station awaiting available berth in Bremerhaven. At 0045 the next day, SANTA CLARA was advised to proceed to Weser river towards Terminal Bremerhaven to pick up the harbour pilot at approximately 0400 (figure 2).

Figure 1: SANTA CLARA
Source: DMAIB

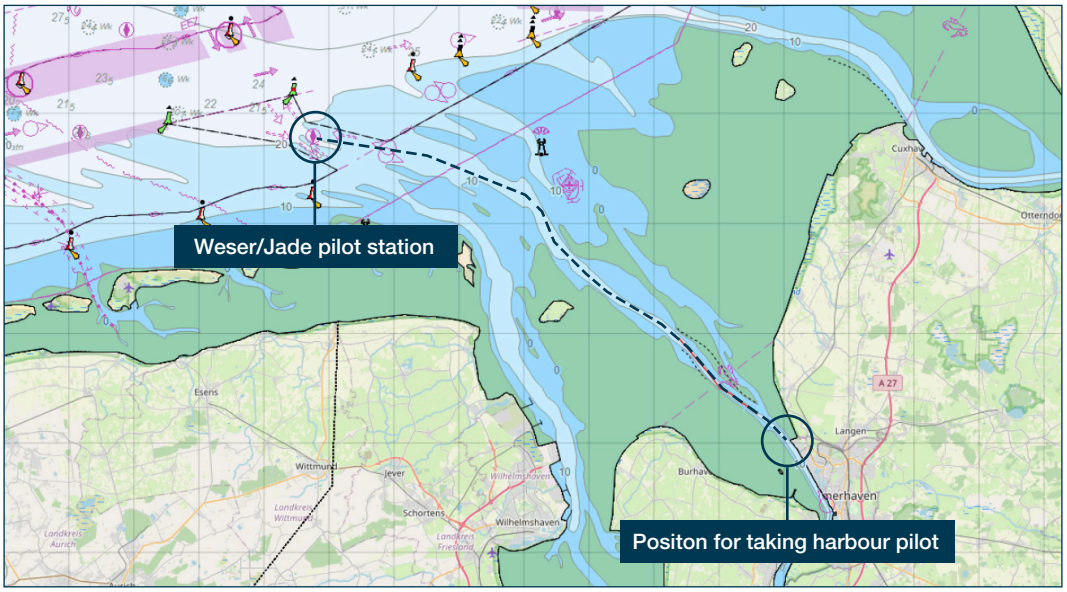

Figure 2: Intended route for Bremerhaven approach in Weser river
Source: © Made Smart Group BV 2021 © C-Map AS 2021/ DMAIB

Course of events

Reading note

The course of events is presented from the perspective of the involved persons on SANTA CLARA to give insights into how the events were perceived during the accident. The narrative is based on interviews with a selected group of crewmembers, VDR recordings, logbook records and photo documentation taken after the accident.

The course of events covers the period from 0310 on 7 February 2021 when SANTA CLARA navigated on Weser, until the ship was alongside at Terminal Bremerhaven at 0505 LT.

The accident

At 0245, the day man was woken by a call from the 2nd officer who told him to be on standby at 0330 by the pilot ladder and prepare for bringing the Bremerhaven port pilot on board (figure 3). He was asked to notify the rest of the ratings to be on standby and assign crewmembers to prepare the accommodation ladder on starboard side.

The day man called an able seaman (AB), an ordinary seaman (OS) and the deck cadet and told them to prepare the accommodation ladder. Ten minutes later, they met in the locker room and donned their working clothes and personal protective equipment, i.e. safety shoes, helmet, boiler suits and reflective jackets. It was a cold and windy morning, with a strong breeze and an air temperature of -5°C.

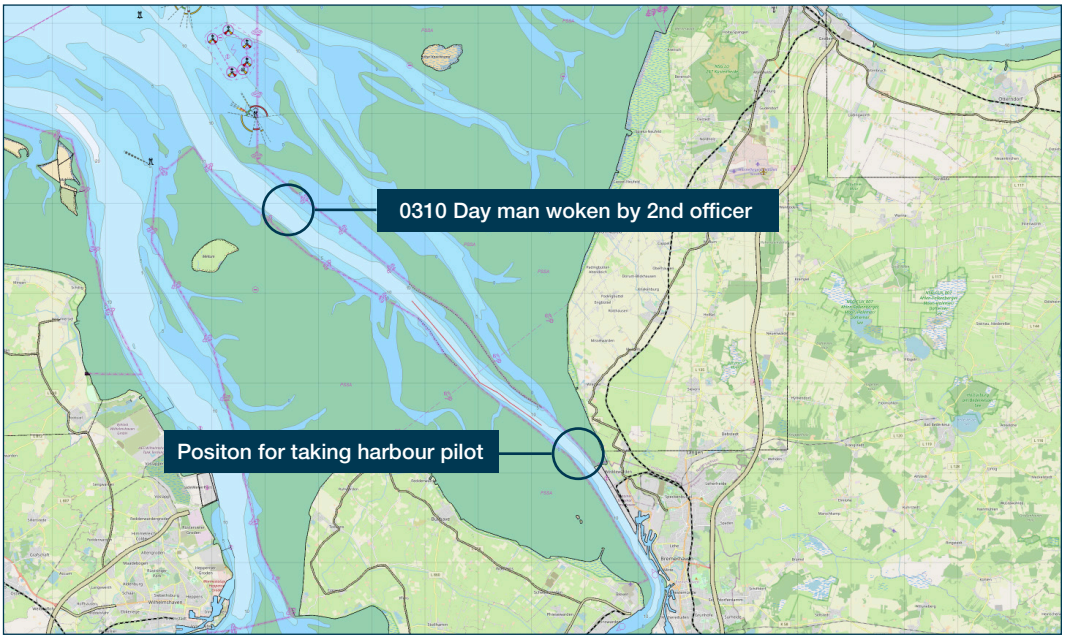

Figure 3: Ship's position when the day man was woken
Source: © Made Smart Group BV 2021 © C-Map AS 2021/ DMAIB

The AB was the most experienced of them and was therefore in charge of preparing the accommodation ladder. However, rigging the accommodation ladder was a routine job which the crewmembers were familiar with, so there was no need for the AB to give detailed advice on what to do. Once on deck, the OS and the deck cadet started to remove the hook bolts that secured the accommodation ladder (figure 4). Meanwhile, the AB went to the port side of the ship to don a safety harness and pick up a fall arrester to be used when he went outboard to rig the accommodation ladder's handrails and platform.

Figure 4: Accommodation ladder system in stowed position (port side)
Source: DMAIB

When the AB came back, the hook bolts had been removed, and the accommodation ladder was ready to be lowered. The AB told the deck cadet to go to the control station and lower the accommodation ladder. By the control station, the deck cadet pressed the button for lowering the accommodation ladder. But even though the fall wire holding the accommodation ladder in place paid out, the ladder did not lower. It was stuck. The deck cadet called out to the AB that something was wrong. After the AB had made several attempts to lower the accommodation ladder, the AB concluded that the accommodation ladder was somehow stuck, and that the fall wire had become slack. The AB was worried that the slack fall wire would become entangled on the winch, so he went to clear up the slack fall wire on the winch by hand.

Afterwards he went to the forward part of the accommodation ladder to see if he could identify the problem. As he walked forward, the OS went to the winch and held the slack wire. Suddenly, the accommodation ladder was released, fell down, and the wire was tightened instantly. From the control station, the deck cadet saw the OS being forcefully hurled overboard. The deck cadet immediately shouted "man overboard!", and the AB turned around and saw that the OS was missing. The time was 0339.

The emergency response

The AB rushed to the aft deck, threw a lifebuoy with light overboard and looked for the OS in the river. He could not see any sign of her in the dark. Meanwhile, the deck cadet shouted in the radio that the OS had fallen overboard. Inside the accommodation, the day man had heard the loud bang from the accommodation ladder being released and the deck cadet shouting on the radio. The day man rushed to the deck above the accommodation ladder, located a lifebuoy and threw it overboard.

On the bridge, the master heard the message on the radio. The master shouted “man overboard” several times so everyone on the bridge was made aware of the situation, and he immediately activated the general alarm, pressed the man overboard button on the radar and made an announcement on the public address system. The ship’s speed was reduced, until it was almost stopped. The lifebuoy with smoke was deliberately not launched from the bridge wing, because it might cause confusion about the location of the OS, as the ship was no longer in the same position. The time was now 0342, three minutes after the accident.

The master told the river pilot to report the man overboard situation to the authorities. The pilot arranged for the rescue services to be informed using the VHF and told the pilot boat, which was en route to the ship with the harbour pilot, about the situation. The pilot boat immediately proceeded with a maximum speed of approximately 30 knots to the area by buoy no. 39 where the OS had fallen overboard.

The master realised that the ship started to drift towards the riverbank and was about to ground. The pilot told the master that it was not an option to stop and drop anchor, because the ship was 300 metres long, the river was only 200 metres wide, and the ship would certainly ground when swinging at the anchor. The master and pilot therefore decided to proceed to the port area assured that the rescue services had taken over the search and rescue operation.

The chief officer and some the other crewmembers had prepared the rescue boat with the intention of launching it. Once it was clear that the ship could not stop, they abandoned that plan. Instead, they mustered with the rest of the crew on the main deck keeping lookout using flashlights trying to locate the OS while the ship proceeded at low speed towards the port. The OS was nowhere to be seen.

At 0344, the rescue coordination centre logged the incident and commenced deploying resources. Within 15 minutes a pilot boat was on scene, and within an hour a tugboat, police boats and several rescue units were on site searching for the OS. However, some of the vessels were hampered by the low tide which limited their search area. The first rescue helicopter arrived at the area at 0448. Despite of an extensive search, the rescue services did not succeed in finding the OS. Only the lifebuoys, thrown overboard from SANTA CLARA, were found. The search operation was concluded in the late afternoon on 7 February at 1709.

At 0430, the harbour pilot was on board, and the ship proceeded to go alongside at Bremerhaven Terminal. At 0505, the ship was alongside.

Investigation

Scope and method description

During the preliminary investigation, it was found that the accommodation ladder was unexpectedly released to upper deck level, and the OS was forced overboard.

The scope of the investigation therefore focused on uncovering the relation between the malfunctioning accommodation ladder and the OS falling overboard. Additionally, the investigation focused on the subsequent efforts to locate the OS.

Therefore, the following was examined: The site of the accident, the accommodation ladder, the work practices related to preparing the accommodation ladder and SANTA CLARA's contingency preparedness for man overboard.

The site of the accident

The course of events showed that the crew attempted to lower the accommodation ladder, but that it remained in its stowed position, until it suddenly fell down to its horizontal position. The reconstruction of events showed that the OS stood by the fall wire winch, the deck cadet stood by the remote control box, and the AB had his back turned to the OS and deck cadet (figure 5).

OS stood by the fall wire winch, and when the accommodation ladder was released, she was forcefully hurled 76 cm vertically over the winch and approximately two meters horizontally over the accommodation ladder before falling 17 meters into the sea (figure 6 and 7). There was no handrailing by the fall wire winch, so there was no barrier between the OS and the sea, when the OS was thrusted over the ship's side (figure 8).

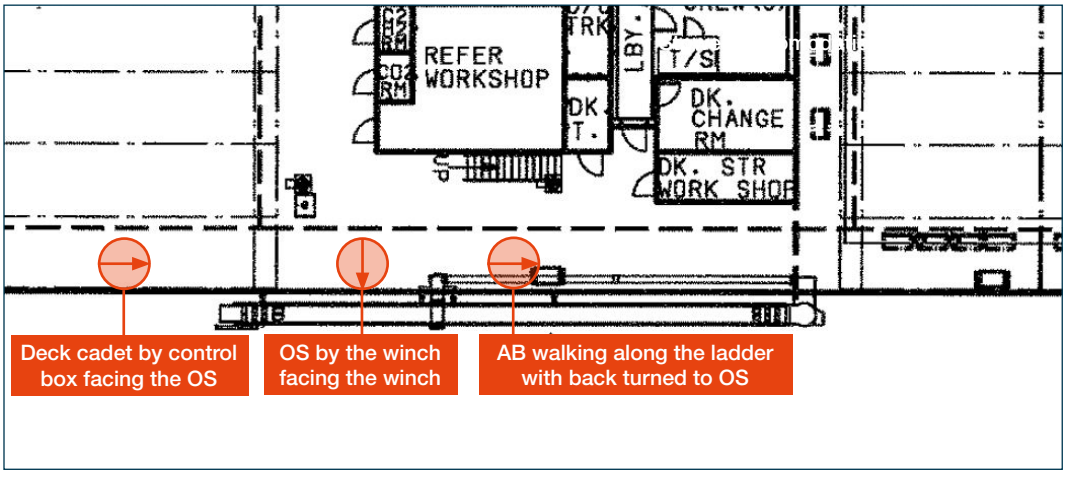

Figure 5: Location of AB, OS and deck cadet during the accident
Source: Mærsk Line/DMAIB

Figure 6: Site of accident
Source: DMAIB

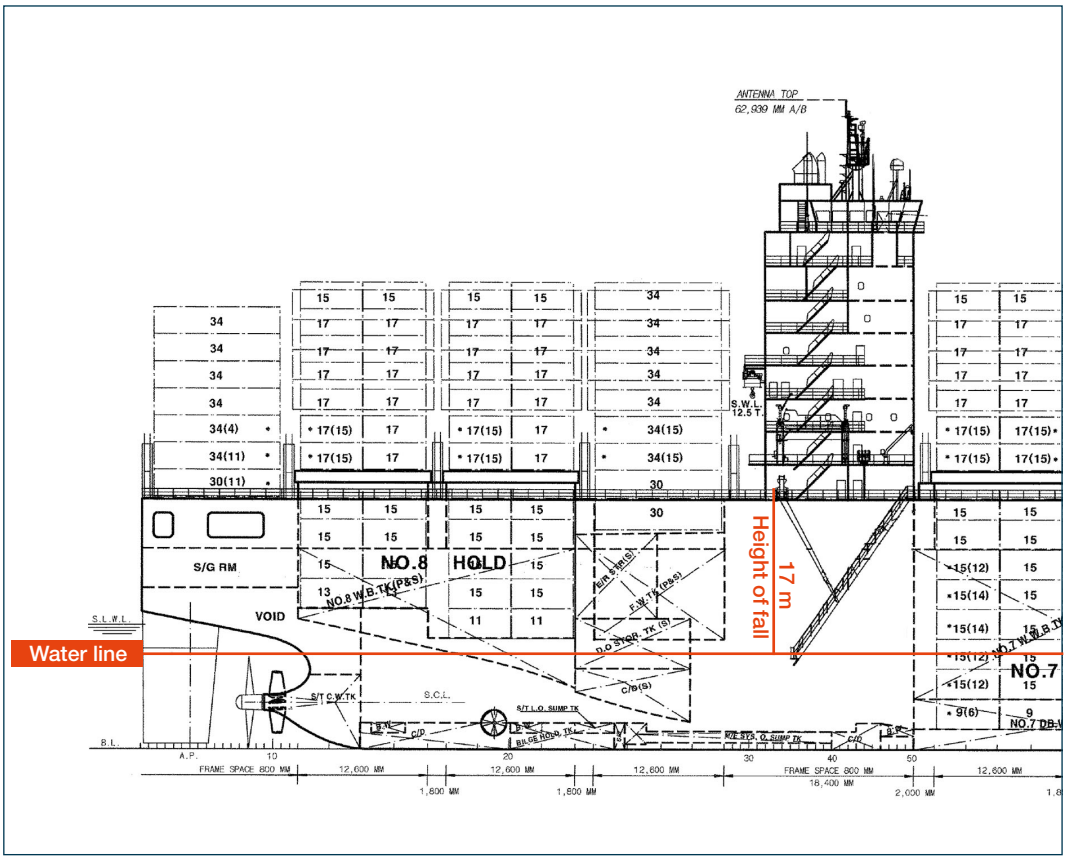

Figure 7: Height of fall
Source: DMAIB

Figure 8: Gab in handrail by fall wire winch
Source: DMAIB

The accomodation ladder

Description of the accomodation ladder system

SANTA CLARA had two fixed aluminium accommodation ladders fitted symmetrically adjacent to the accommodation on each side of the ship. Each ladder was raised and lowered by a fall wire on a winch fitted on the upper deck level and was controlled by a push-button remote control box located aft of the ladder arrangement (figure 9).

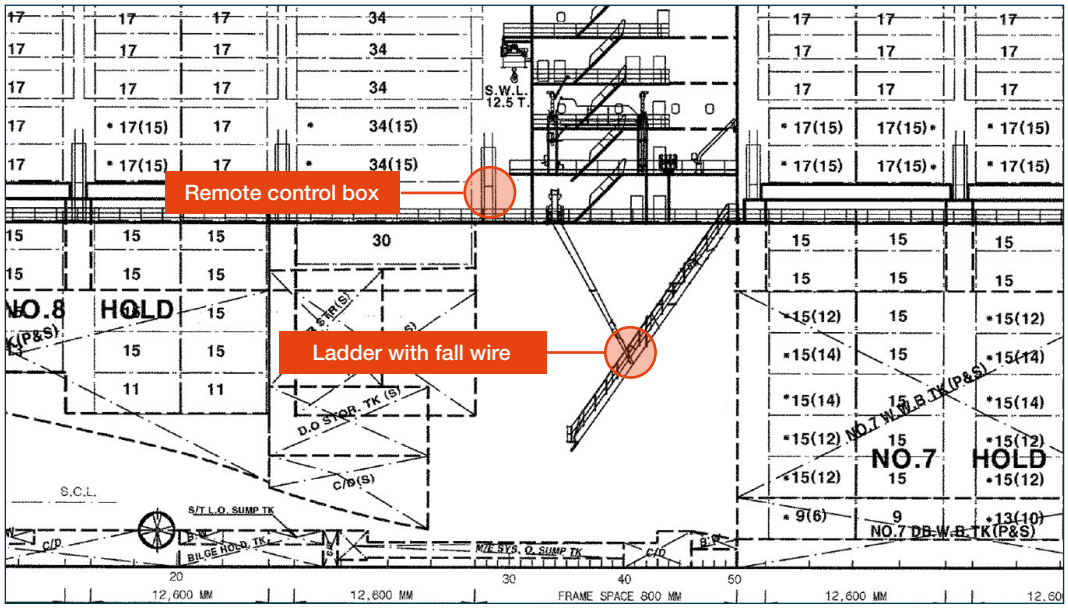

Figure 9: Extract from SANTA CLARA's general arrangement
Source: Maersk Line/DMAIB

Figure 10 shows the system for lowering the accomodation ladder. The fall wire *(a)* led from the winch via a telescopic davit *(b)* down to a sheave *(c)* at the bottom end of the lower ladder section and along the lower ladder section to an anchor point *(c)*on the upper deck. This arrangement allowed the accommodation ladder to be lowered to its maximum inclination by paying out the fall wire.

For retrieving the accommodation ladder, hoisting the fall wire would retract the ladder by lifting it fully up to the telescopic davit at upper deck level. Continued hoisting of the fall wire would then lift the ladder to a horizontal position, 90 degree to its rigged position along the ship's hull (figure 11). A limit switch was activated once the ladder was in its place, cutting power to the winch, thereby preventing over-travel of the fall wire load which could result in the fall wire parting.

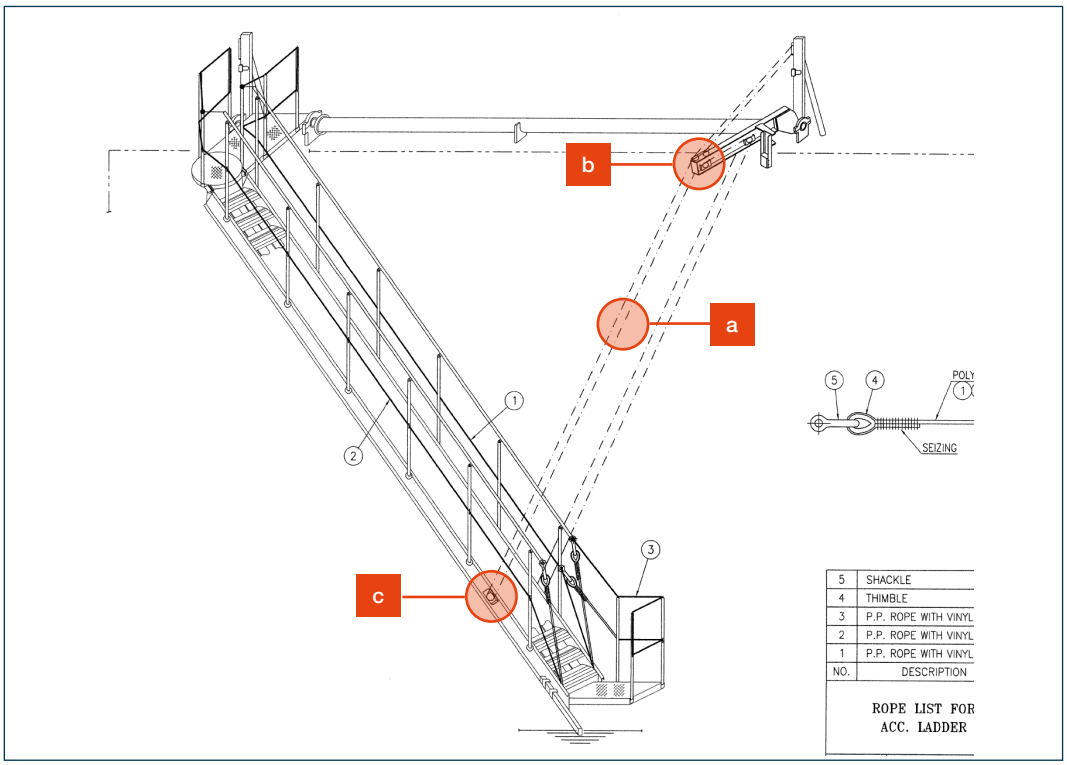

Figure 10: Accommodation ladder when lowered
Source: Mærsk Line/DMAIB

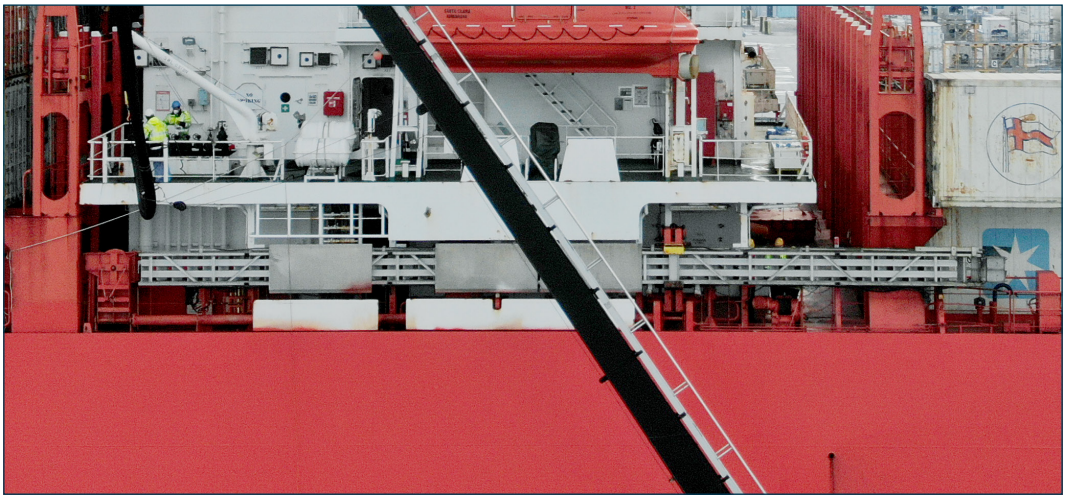

Figure 11: Accommodation ladder in stowed position
Source: DMAIB

Collapsible handrails were fitted to the upper and lower ladder sections. Portable stanchions with polypropylene man ropes were fitted around the upper and lower platforms. The collapsible handrails enabled the ladder to be stowed on its side on the upper deck. In stowed position it was lashed with bolt hooks and a cable wire securing it in place (figure 12).

When lowering the accommodation ladder, the bolt hooks and lashings were removed, and the winch control button was activated, paying out the fall wire which lowered the davit and accommodation ladder. On a steel frame holding the ladder, a spring buffer was mounted to push the ladder outwards, when the fall wire was paid out from the winch. After lowering the accommodation ladder, the handrails and the man ropes had to be manually secured in upright position by a crewmember standing outboards on the ladder.

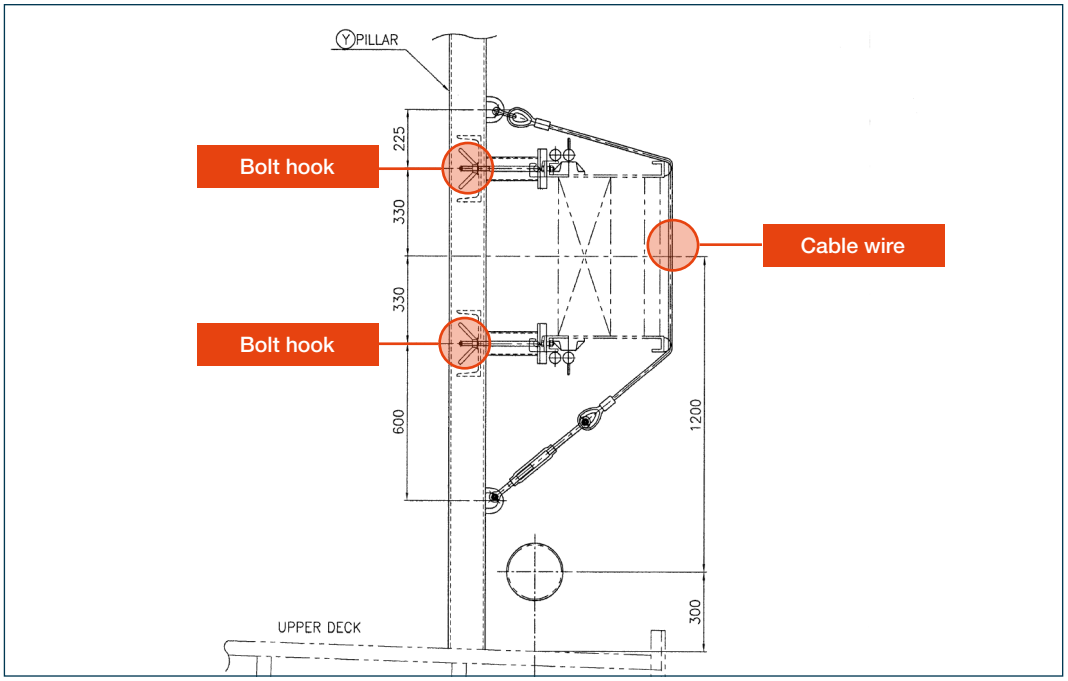

Figure 12: Accommodation ladder lashing
Source: Mærsk Line/DMAIB

The malfunctioning accommodation ladder

DMAIB reviewed reports and footage made by the German police authorities approximately four hours after SANTA CLARA was alongside at Terminal Bremerhaven and tested the accommodation ladder. It was established that the crew did not experience any abnormalities when preparing the accommodation ladder after arrival in Bremerhaven. No mechanical malfunction was observed.

When DMAIB visited the ship in Rotterdam, Netherlands, selected crewmembers were interviewed about the operation of the accommodation ladder, and the events unfolding on the upper deck on the day of the accident were reconstructed. DMAIB examined the accommodation ladder system with the aim of finding a plausible explanation for why the accommodation ladder did not move outwards, when the deck cadet activated the winch and paid out the fall wire. It was established that the crewmembers working with the accommodation ladder had not had similar experiences before, and the manual did not make any reference to the possibility of this problem occurring.

DMAIB investigated the following factors, which could impair the movement of the ladder:

- Impaired function of the spring buffer's ability to push the accommodation ladder outwards.
- The ladder safety net becoming entangled and thereby hindering the movement of the ladder.
- Bolt hooks not being fully removed and thereby accidentally holding the ladder in place.
- The fall wire slipping out of the sheave socket hindering the fall wire in moving freely.
- Cold weather conditions impairing the movement of the accommodation ladder.

The initial focus was on the spring buffer, installed for the purpose of pushing the accommodation ladder outwards. On figure 13 below, the accommodation ladder is shown in its horizontal position, and the spring buffer can be seen on the upright frame (figure 14).

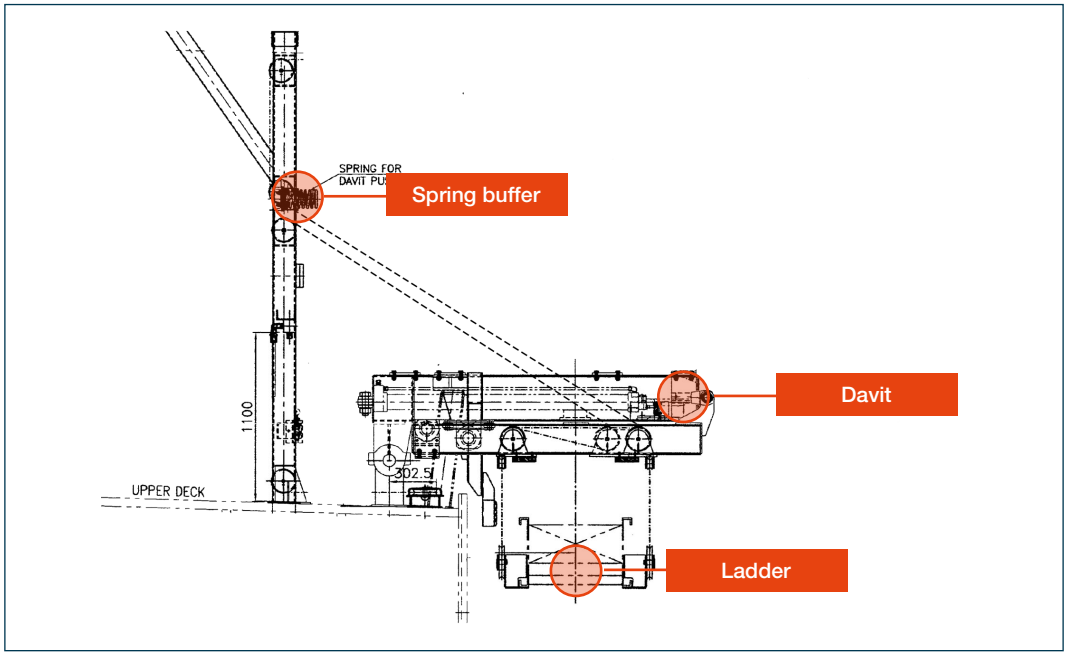

Figure 13: Buffer spring and accommodation ladder davit
Source: Mærsk Line/DMAIB

Figure 14: Buffer spring for davit
Source: DMAIB

The buffer spring was inspected, and no cracks or debris were found which would prevent it from functioning as intended. Measurements of the spring were compared with the values stated in the accommodation ladder system manual, and no discrepancies were found. Thus, the buffer spring was found to work as intended. Additionally, it was found that the ship was not listing to an extent that hindered the spring in pushing the ladder far enough out to be lowered.

The accommodation ladder was permanently fitted with a safety net wrapped around the ladder and handrails (figure 15). The net could at times become entangled with the ladder frame, the bolt hooks, lashings, etc. It is, however, unlikely that the slack safety net could hold the weight of the ladder and counter the force of the spring buffer without the ladder moving.

The bolt hooks were removed by the AB, OS and deck cadet before the fall wire winch for the accommodation ladder was activated. If one of the bolt hooks had not been fully removed, it could have held the ladder in its position. After the attempt to lower the accommodation ladder, the AB inspected the ladder to verify that all the bolt hooks were loosened and removed. It was readily visible for the AB to establish this, because the bolt hooks would hang as seen on figure 16 next page. The crew did not notice any of the hooks not having been loosened. During DMAIB's visit on the ship in Rotterdam, the wire fall and sheaves (figure 17) were inspected for signs of the fall wire slipping out of the sheave sockets. No part of the fall wire showed any abnormality nor did the sheaves.

During the previous day, the temperature had been approximately -4°C, and on the night of the accident the temperature was -5°C. The cold weather could have affected the moving parts of the accommodation ladder system, e.g., spring, sheaves, bearings, etc. Or frozen water could accumulate between the contact surfaces between the accommodation ladder and the upright frame thereby hindering the release of the accommodation ladder. However, neither the German police nor the crew observed or mentioned during interviews patches of ice forming on the ship's equipment which makes this scenario less likely. Additionally, the ship normally operated in these temperatures during winter which indicated that something else had to have contributed to the malfunctioning of the accommodation ladder system. On that basis there is no available data to suggest that the cold weather conditions contributed to the accommodation ladder malfunction.

The DMAIB examination of the malfunction of the accommodation ladder concluded that the system did not have any apparent mechanical defects. It could thus not be established what prevented the ladder from lowering as intended on the day of the accident.

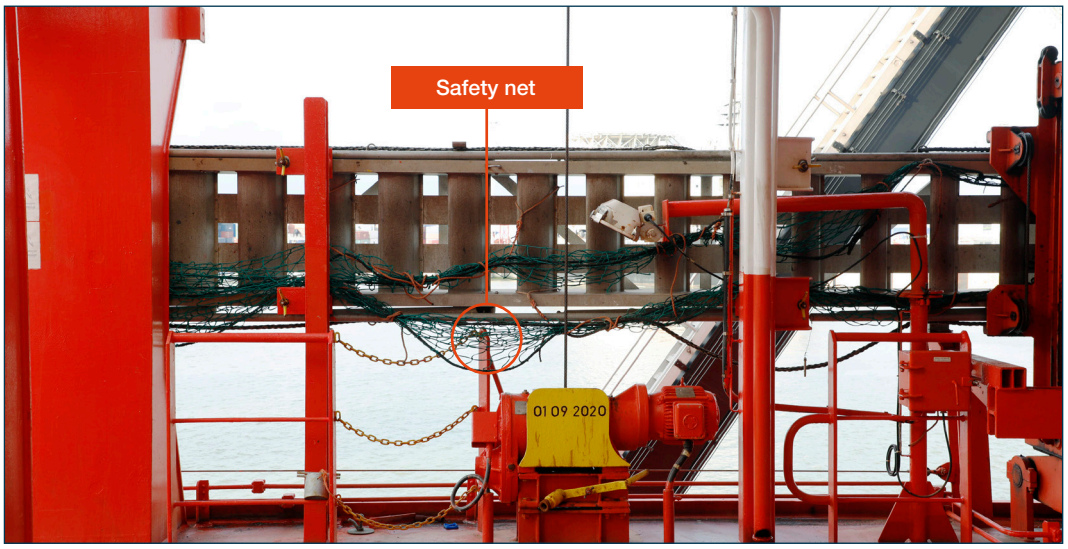

Figure 15: Safety net on accommodation ladder
Source: DMAIB

Figure 16: Loose bolt hooks
Source: DMAIB

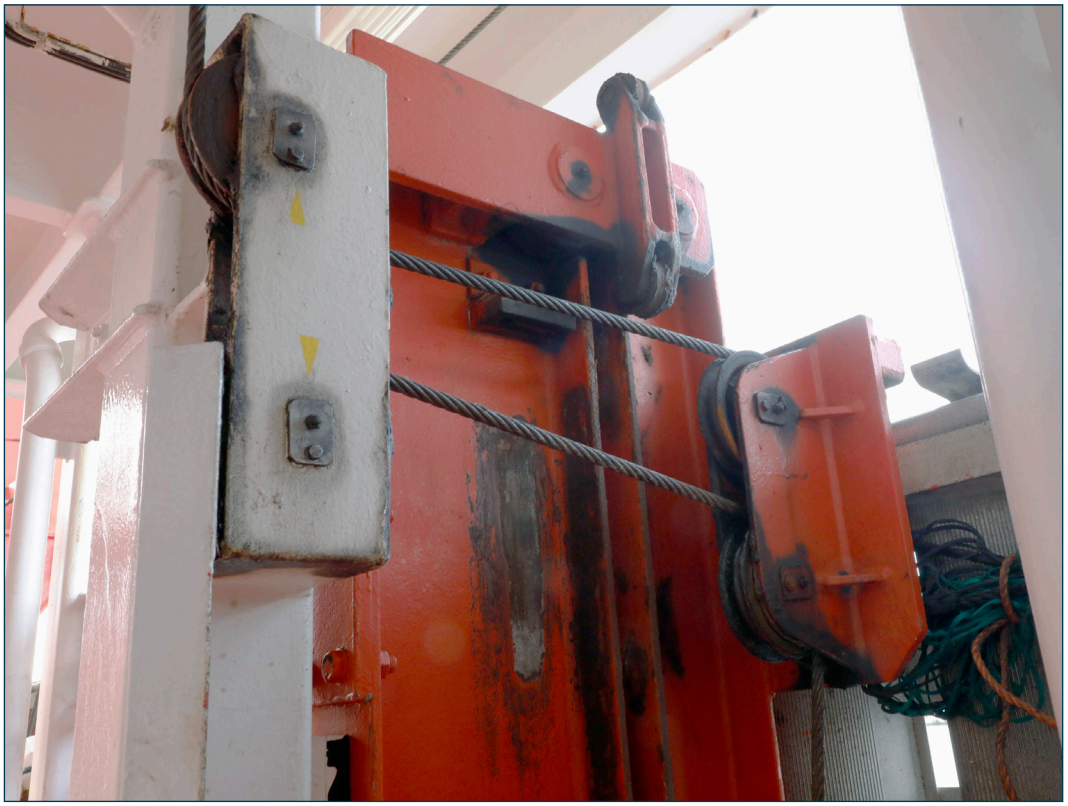

Figure 17: Fall wire and sheaves
Source: DMAIB

Accomodation ladder work practises

The malfunctioning accommodation ladder did not in or of itself cause the OS to fall overboard. Therefore, it was considered relevant to examine the crewmembers' work practices of preparing the accommodation ladder and the way the crew went about resolving the problem of the slack fall wire.

When SANTA CLARA approached the port, the ABs were responsible for making the deck ready which comprised e.g. rigging the pilot ladder, fastening tugs, preparing the mooring lines and the accommodation ladder. The work was divided among the ABs who also acted as supervisors of the OS and cadet who participated in the work as subordinates.

Making the deck ready for arrival was a repetitive work routine for the deck crew for which they did not need detailed instruction or elaborate procedures, because it was part of their core competence. Gaining competence in the various aspects of the deck work was achieved by on-the-job training and by knowledge sharing between the ratings.

On-signers who had not been on the ship before completed a familiarisation process and reviewed the work descriptions relevant for the particular position. The preparation of the accommodation ladder was mentioned in the onboard familiarisation checklist and was also described in the crewmembers' job descriptions.

The OS had received familiarisation on 13 November 2020 when she signed on SANTA CLARA and completed the remaining familiarisation on 26 November 2020, approximately 2½ months prior to the accident. The familiarisation consisted of a checklist which was to be completed in stages. Some items on the familiarisation list had to be completed before departure and other items within 14 days. The item related to rigging the pilot ladder and accommodation ladder was to be completed within 14 days (figure 18).

The familiarisation checklist did not contain a description of what the familiarisation of the accommodation ladder entailed. Presumably, the familiarisation was not to be considered actual training but merely an introduction by a colleague on how work with the accommodation ladder was usually carried out on board.

To be completed within 14 days of sign-on date

All Deck Officers and Deck Crew			
No.	Tasks	Y or N/A	Remarks (Date of Completion as applicable)
1.	Duties/ Responsibility Areas.	Y	
2.	Location of Lifting Appliances onboard (e.g. deck cranes, provision/ bunker crane, mono-rail crane).	Y	
	a. Location of local power supply.	Y	
	b. Emergency Stops and Limit Switches.	Y	
	c. Visual check of equipment and last inspection date.	Y	
	d. Competent to Operate On-Board Lifting Appliances (Ref. Form ID: 010 & GLSM - P103).	Y	
3.	Mooring Winches and Windlass operation.	Y	
4.	Pilot ladder/Pilot hatch or doors operation/ Accommodation ladder operation(as applicable).	Y	
5.	Location and use of Safety harness, Safety vest and fall arrestors.	Y	
6.	Operation of Hatch Cover closing arrangement(if applicable)	Y	
7.	Location of Cargo Securing Equipment and Manual.	Y	
8.	Location & Operation of portable gas detection equipment.	Y	

Figure 18: OS familiarisation checklist
Source: SANTA CLARA

The OS' job description stipulated that the OS was an understudy of the ABs and described in general terms the crewmembers' responsibilities including a short description of their work tasks. Rigging the accommodation ladders was listed together with the pilot ladders (figure 19).

The job description combined the accommodation ladders and pilot ladders as the familiarisation checklist did. Preparing the accommodation ladder consisted of several individual tasks which entailed different hazards and thus required different levels of experience, e.g. removing and lowering the accommodation ladder using the control station did not require much experience, but climbing on the ladder preparing the handrails entailed some degree of experience. These tasks were performed by the ABs who had the required experience.

The safety aspects of preparing the accommodation ladder were described in a risk assessment and a safety brief. However, none of those documents described the hazards related to lowering the accommodation ladder, but focused on the hazards related to working outboards on the ladder once it was lowered. Lowering the accommodation ladder was done by activating the fall wire winch from the control station which was located at a distance from the ladder and was behind the ship's railing. Working on the upper deck was generally not considered to be related to risk of falling overboard, and the general practice was thus that the crewmembers did not don fall arresters and/or life jackets when working inboard.

2.2 At Sea

- Assist in navigational watchkeeping lookout, whenever required, and report to the OOW as soon as vessels, navigational objects are sighted or heard.
- To be an understudy of the A/B and to undertake assigned tasks under relevant supervision considering safety and applicable skills requirements.
- To perform the function as helmsman under supervision of A/B when required and provided being familiar with the vessel's steering characteristics.
- To carry out any work assigned by the Chief Officer or OOW in the maintenance of the vessel and its equipment, good housekeeping and cleaning of the deck areas, accommodation and Engine Room, or other duties as requested and relevant to the job role and the ship's safety.
- Perform repair and maintenance work on deck and accommodation using power tools and hand tools.
- Perform maintenance of lashing equipment as directed by the Chief officer.
- Carry out mooring / unmooring operations including operation of winches, windlass and handling of mooring ropes.
- Rigging of gangways and pilot ladders.
- Carry out cargo lashing checks under Chief Officer instructions.

Figure 19: OS job description
Source: SANTA CLARA

Emergency preparedness

SANTA CLARA's safety management system included a requirement for conducting three monthly man overboard drills and an emergency procedure for managing man overboard and search and rescue situations. The procedure contained a flow chart showing the required actions to be initiated (figure 20).

The flow chart was a checklist reminding the officers on the bridge of which actions to take immediately, and which actions were to be taken by other crewmembers. Some items on the list referred to specific actions to be taken, e.g. release the MOB buoy, whereas another item referred to wide-ranging actions, e.g. search and rescue actions according to the content of the IAMSAR manual (Vol III), which is a 250 page manual. When reviewing the content of the checklist, it is noticeable that the checklist is aimed at managing not only one person falling overboard, but also the retrieval of other persons from the sea.

On 7 February 2021, the crew on the bridge used the flow chart and considered it useful, but they also realised that the flow chart did not offer the appropriate action to the situation at hand – namely that the ship was not in open sea, but was navigating on a river under pilotage. Therefore, some of the proposed actions on the flow chart were relevant

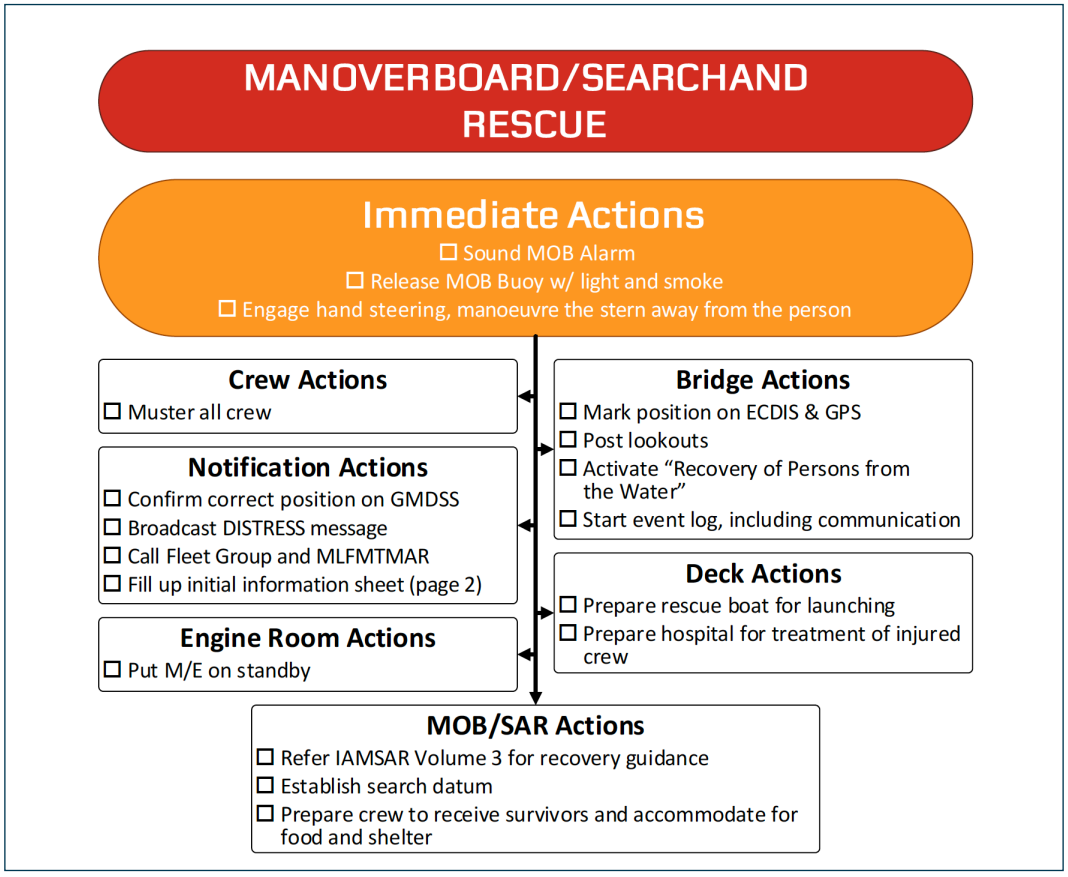

Figure 20: Extract from man overboard flow chart
Source: SANTA CLARA

for the situation unfolding, and some were not. The use of the flow chart and the prescribed actions should therefore be seen in the context of the events of 7 February 2021.

When the accident happened, the ship was en route on river Weser which was approximately 200 meters wide. At 0339, when the OS went overboard, the ship was proceeding at approximately 14 knots and within six minutes the ship had reduced the speed to approximately 7 knots. At this time the ship had travelled 1,800 meters and was positioned towards the southern limit of the channel (figure 21).

Six minutes after the accident, once the master realised that it would not be possible to hold the ship in place and that it was about to ground, it was decided to proceed towards Terminal Bremerhaven. In those six minutes, the master had to take the appropriate actions according to the flow chart while negotiating the conflict between stopping the ship and launching the rescue boat and grounding the ship. If the ship went aground, then the crew would be confronted with an additional emergency which would preoccupy the crew and rescue services, making it difficult to continue the search. Additionally, the operation of the rescue boat depended on being in the vicinity of SANTA CLARA, and it relied on the crew on SANTA CLARA keeping lookout and directing the rescue boat regarding where to go and look for the OS.

Under those circumstances, neither the design of the flow chart nor the planned operation of the rescue boat according to the drills could aid in resolving the situation at hand. The flowchart was made in line with industry standards and thus highlights how large merchant ships depend on shore-based rescue services when navigating in confined coastal waters.

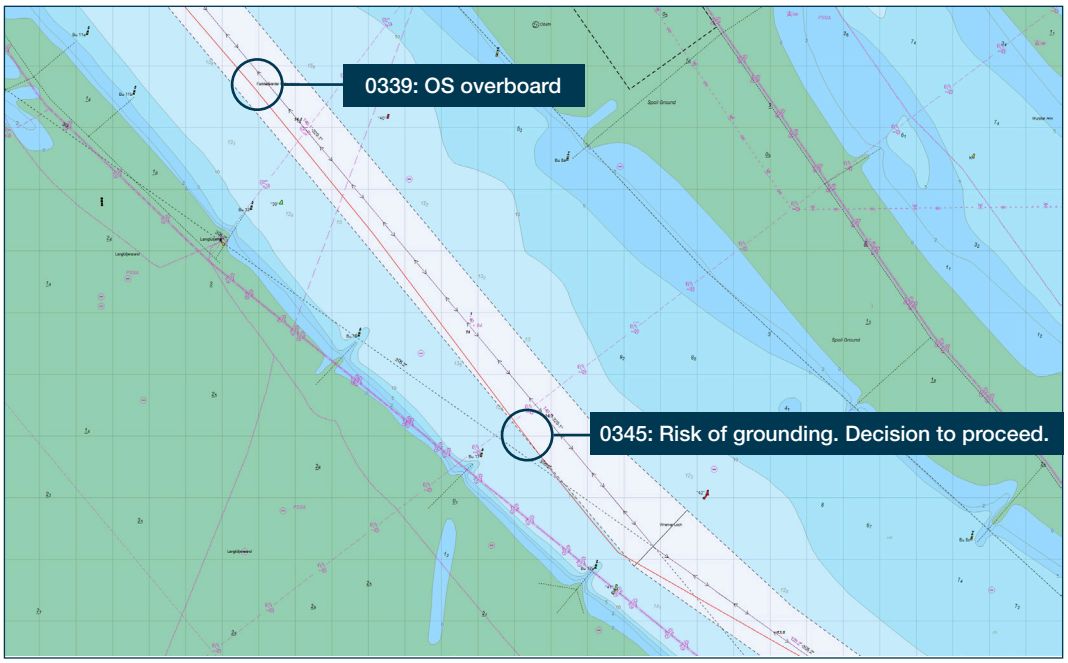

Figure 21: SANTA CLARA's position during the accident.
Source: © Made Smart Group BV 2021 © C-Map AS 2021

Analysis & conclusion

Understanding the accident

DMAIB's investigation focused on establishing the connection between the malfunctioning accommodation ladder and the OS being thrust overboard. Additionally, the investigation focused on the subsequent efforts to locate the OS.

DMAIB's investigation was not able to establish with certainty why the accommodation ladder did not lower, when the deck cadet activated the winch and paid out the fall wire, or how the OS interacted with the fall wire prior to when she was thrust overboard.

The witness testimonies suggested that the sudden release of the accommodation ladder was closely related to the OS being thrust overboard. The OS stood by the fall wire winch, apparently trying to tighten the fall wire, ensuring it was reeled on the drum correctly. It is uncertain whether the OS was holding the fall wire or got caught by the slack wire as it suddenly tightened. Even though there was a direct causal relation between the malfunctioning accommodation ladder and the accident, it does not in or of itself explain why the OS was thrust overboard. There were other circumstantial factors which explicate why none of the crewmembers recognised the hazards of untangling the fall wire under the given circumstances.

Once the accommodation ladder system malfunctioned, the crewmembers found themselves in a unique situation, and there was thus no procedure or risk assessment to turn to. None of the three crewmembers had any experience in neither fault finding nor manual operation of the accommodation ladder, because the automated lowering system did usually not require any manual intervention. This led them to improvise to understand and solve the problem at hand. The AB did not report the malfunction to the bridge, because he was still in the early stages of fault finding and suspected that the problem could be immediately solved. Meanwhile, the OS tried to avoid additional problems by apparently keeping the fall wire untangled on the winch which was a known problem for the crewmembers, and one they knew how to solve. None of the crewmembers had reason to think that the malfunction of the accommodation ladder would resolve itself spontaneously causing it to be released. This accident was thereby the result of a partly automated system which performed in an unexpected way, and the crew did not have the experience or system knowledge to immediately recognise the hazard it entailed when solving the immediate problem of the entangled wire.

The result was that the force of the falling accommodation ladder was transferred to the wire and the OS, forcing her overboard. There was no railing mounted on the ship's side by the winch, which meant that only the winch stood between the OS and the edge of the upper deck. She fell 17 meters into the sea which had a temperature of 2°C. Under those circumstances, the OS's survivability was time critical.

The ship's emergency planning, drills and exercises were based on the condition that the ship was in open waters which hindered an effective shipboard response to the situation, because the ship was manoeuvering in the confined waters of river Weser. Once the master realised that the shipboard emergency contingency measures were not designed to enable them to respond to the given situation, it became a matter for the coastal authorities to locate and retrieve the OS.

Preventive measures

Actions taken by MAERSK A/S

DMAIB received information that MAERSK A/S has initiated following preventive actions as a response to the accident:

- *The accommodation ladder installation on the Santa Class has been assessed resulting in extension of the railing design. Modification has been initiated for the vessel class (10 vessels in total).*
- *Decision has been taken to upgrade the on board personal protective equipment.*
- *Inflatable life jackets will be applied with personal locator (AIS) beacons.*
- *Test of light immersion suits for cold areas has been initiated and will be implemented for use in cold areas while working with high risk of falling over board e.g. when preparing the accommodation ladder.*
- *Emergency Flowchart (P822) for Man Overboard / Search & Rescue will undergo a review*
- *PMS activity for gangway check being reviewed – ensuring free movement of gangway.*

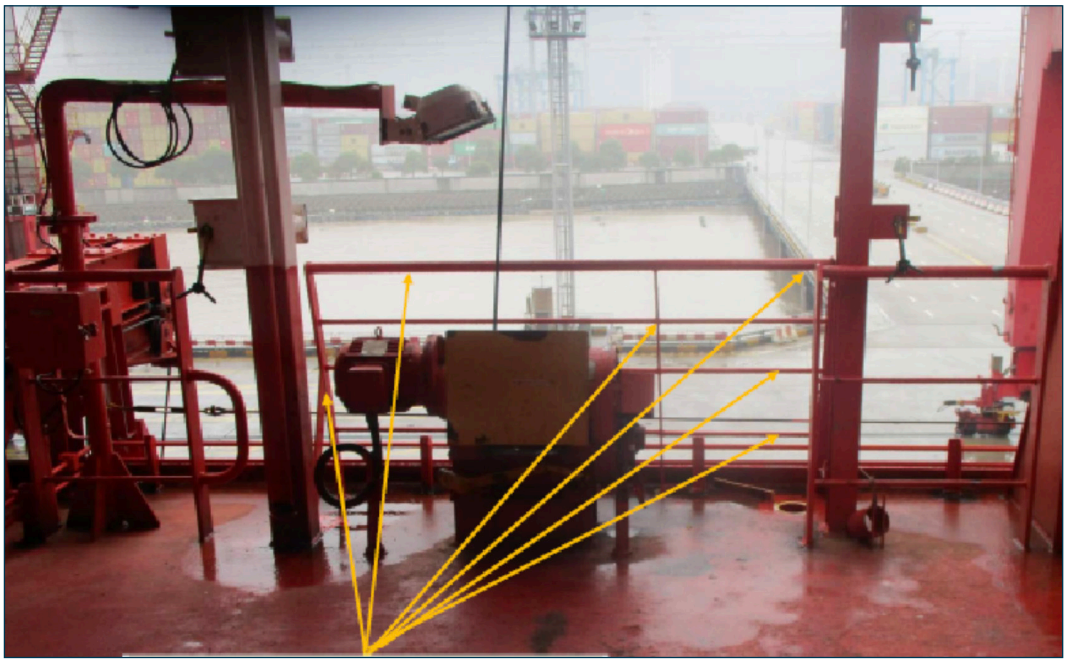

Figure 22: Railing installed after the accident
Source: MAERSK A/S

Appendix

SHIP PARTICULARS

Name of vessel:	SANTA CLARA
Type of vessel:	Container ship
Nationality/flag:	Denmark
Port of registry:	Copenhagen
Call sign:	OXVI2
IMO no.:	9444716
DOC company:	Maersk A/S
Classification society:	American Bureau of Shipping – ABS
Year built:	2010
Shipyard/yard number:	Daewoo Shipbuilding & Marine Engineering/1035
Length overall:	299.95 m
Breadth overall:	42.92 m
Draught max.:	13.52 m
Gross tonnage:	85,676
Engine rating:	45,760 kW
Servicefart:	22.5 knots
Hull material:	Steel
Hull design:	Single hull

VOYAGE DATA

Port of departure:	London-Gateway, United Kingdom
Port of call:	NTB North Sea Terminal Bremerhaven, Germany
Voyage type:	International
Cargo information:	General cargo in containers
Manning:	28
Pilot on board:	Yes
Number of passengers:	0

WEATHER DATA

Wind – speed, direction:	BF 6 - E (Weser)
Wave - height:	0.3 m
Visibility:	Good
Weather conditions:	Cloudy
Light/dark:	Dark

MARINE CASUALTY INFORMATION

Type of marine casualty:	Occupational accident
IMO classification:	Very serious
Date and time:	7 February 2021 0339 LT
Location:	River Weser, Germany
Position:	53°39.829 N 008°23.023 E
Ship's operation:	Arrival
Place on board:	Main deck
Human factor data:	Yes
Consequences:	Ordinary seaman perished

SHORE AUTHORITY INVOLVEMENT AND EMERGENCY RESPONSE

Involved parties:	Pilot boat FRYA Pilot boat WANGEROOG SVITZER HEIMDAL NORTHERN RESCUE 01 SAR BORKUM Rescue ship HERMANN RUDOLF MEYER Rescue ship EMIL ZIMMERMAN Police boat VISURA BREMEN MEY/CHRISTIAN Two rescue helicopters
Speed of response:	Pilot boat FRYA on scene 13 minutes
Actions taken:	Search and rescue
Results achieved:	OS was not found

RELEVANT CREW

Master:	37 years old. Had been with the company for approximately six years and with the ship for four months.
AB:	40 years old. Had been with the company for 12 years and with the ship for 25 days.
OS:	24 years old. Had been three months with company and ship.
Deck cadet:	21 years old. Been with the company and the ship for approximately six months.