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Front page: NETTO VII at the scene of the accident

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The Danish Maritime Accident Investigation Board

The Danish Maritime Accident Investigation Board is an independent unit under the Ministry of Business and Growth that carries out investigations as an impartial unit which is, organizationally and legally, independent of other parties. The board investigates maritime accidents and occupational accidents on Danish and Greenlandic merchant and fishing ships as well as accidents on foreign merchant ships in Danish and Greenlandic waters.

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

The investigations

The investigations are carried out separate from the criminal investigation without having used legal evidence procedures and with no other basic aim than learning about accidents with the purpose of preventing future accidents. Consequently, any use of this report for other purposes may lead to erroneous or misleading interpretations.
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1. INTRODUCTION

This report summarises the investigation into the circumstances of a passenger accident on board a tour boat in the Port of Copenhagen. A minor passenger was seriously injured in a common harbour manoeuvre where neither the ship’s crew nor the passengers acted differently than usually.

The report deals with the factual circumstances of the specific accident and directs attention to the safety aspects and emergency preparedness related to boat tours.

The report describes the preventive measures taken on the basis of this accident.

2. Factual information

2.1 Photo of the ship

![Photo of the ship](image)

*Figure 1: NETTO VII
Source: Netto-Bådene A/S*
2.2 Ship particulars

Name: NETTO VII
Type: Passenger ship
Nationality: Denmark
Port of registry: Copenhagen
Call sign: OU 8320
Year built: 1995
Shipyard/yard number: Havnens Skibsreparationer A/S/9
Classification society: Not in class
Length overall: 18.50 m
Breadth overall: 4.60 m
Gross tonnage: 19.3
Engine rating: 105 kW
Hull material: Stainless steel
Hull type: Single hull

2.3 Voyage particulars

Port of departure: Port of Copenhagen at the Holmens Kirke
Port of destination: Port of Copenhagen at the Holmens Kirke
Type of voyage: Boat tour with passengers
Manning: 2
Number of passengers: Approx. 40

2.4 Weather data

Wind – direction and speed: Light breeze
Wave height: 0
Visibility: Good
Light/dark: Daylight
Current: No current

2.5 Marine casualty or incident information

Type of marine casualty/incident: Personal injury
Date and time: 27 August 2014 at 15:15
Location: At the Little Mermaid, Langelinie, Port of Copenhagen
Position: 55°41’ N – 012°36’ E
Ship’s operation, voyage segment: Harbour manoeuvres
Place on board: Starboard quarter
Human factors: Yes
Consequences: Serious passenger injury

2.6 The ship’s crew

Master: 44 years old, certificate of competency as a master, STCW II/2, a seafarer since 1988, including approx. four years as a master of Netto-Bådene A/S.
Guide: 26 years old, no maritime education or training, four seasons as a guide of Netto-Bådene A/S.
2.7 Scene of the accident

Figure 2: Scene of accident at the Little Mermaid
Source: Google Earth

Figure 3: Scene of accident at the Little Mermaid
Source: Danish Geodata Agency
3. NARRATIVE

3.1 Background

Netto-Bådene A/S offers boat tours in the Port of Copenhagen on board 12 passenger ships (tour boats), some of which are open boats and some of which are partly roofed boats – among these NETTO VII. The boat tour has the form of a guided sightseeing tour, where the guide informs about the attractions passed in several languages. Each tour has a duration of approx. one hour and follows a regular route and a fixed schedule. The route has four places of call where passengers can either embark or disembark. One of these places of call is the Little Mermaid at Langelinie (figures 2 and 3). At this place of call, tour boats berth only in case of disembarking passengers or passengers waiting on the quay to embark. Time has not been allocated for passengers to disembark and watch the Little Mermaid from ashore before embarking again to proceed the boat tour.

![Figure 4: The voyage plan followed by the boat tour of the Netto-Bådene A/S](source)

The company and the boats have been certified in accordance with the ISM Code\(^1\) and are subjected to annual surveys by ship surveyors from the Danish Maritime Authority. Thus, the company’s safety organisation and the boat had been approved by the Danish Maritime Authority, and the tour boat had a valid trading permit.

Each tour boat is manned with a master and a guide.

There is another company that offers boat tours in the Port of Copenhagen according to a similar scheme.

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\(^1\) An international agreement on the safe operation of ships introduced in 1997 to enhance safety and reduce pollution in international shipping. The Code prescribes, inter alia, that the company must have safety management system in place (generally referred to as SMS – Safety Management System).
3.2 Sequence of events in the fore of the ship

In the afternoon of 27 August 2014, NETTO VII was doing boat tours in the Port of Copenhagen according to a fixed route that departed from the Holmens Kirke and had, inter alia, a place of call at the quay north of the Little Mermaid at Langelinie as a fixed point on its route.

As usual, the ship’s crew consisted of a master and a guide. The both had approx. four years of experience with boat tours in the same company.

There were approx. 40 passengers on board, distributed throughout the tour boat.

At approx. 15:15, the tour boat made a stop at the Little Mermaid because some passengers wanted to disembark there. The passengers had been told that, in case they wanted to disembark there, they should inform the crew. Otherwise they would not berth the ship.

The tour boat was berthed at the starboard bow so that it had an angle of 10-20° to the quay and was moored as usual by means of only one mooring line (a spring) that was permanently fitted to a bollard on the quay. Subsequently, the tour boat was moving slowly towards, and kept alongside, the quay by means of the propeller which was moving slowly ahead and the rudder which was little to port (figure 5).

Before departing from the place of call, the guide, as a matter of routine, set the sign on the quay to indicate the next scheduled departure from this place of call. At the same time, seven or eight passengers arrived who wanted to embark at Langelinie. The tour boat was lying at this place of call for a few minutes while some passengers made up their mind whether to disembark or stay on board, and subsequently some of them disembarked, while others embarked.

![Rudder position](image)

**Figure 5: Schematic diagram of NETTO VII's mooring with its starboard side along the quay**

*Source: The Danish Maritime Accident Investigation Board*

While the guide was busy setting the next time of departure on the sign, the master was selling tickets to newly embarked passengers. During the subsequent departure, the guide and the master were staying next to each other in the wheelhouse. The master was standing to the portside putting the money box and ticketing equipment aside, and the guide was standing to the starboard side of the wheelhouse. The master and guide had agreed that the guide should reverse the tour boat somewhat in order to slacken and let go of the mooring line. The guide reversed the tour boat a little and then again propelled it somewhat in order to stop its movements astern. Then, she removed the mooring line from the bollard whereafter the master would continue the boat tour.
Neither the master nor the guide became aware of anything unusual during the call or departure until a few moments after the departure when a male passenger who was accompanying a girl approached the wheelhouse and said that they had to go ashore because the girl had broken an arm. The master and the guide were both shocked about this information and the ship was berthed once again.

3.3 Sequence of events in the aft of the ship

An Italian/Danish group of four family members consisting of a father with two daughters of 10 and 15 years of age, respectively, and their cousin of 22 years of age embarked at the Holmens Kirke. The two girls did not understand Danish. The group got seated on the aftmost row of the tour boat to the starboard side so that the youngest girl was seated farthest away from the aisle. Next to her, her cousin and older sister were seated. The girl’s father was seated next to the aisle.

A quick stop was made at the Little Mermaid during the boat tour to disembark and embark some passengers. The tour boat was lying at this place of call for a few minutes while some passengers went ashore and others came aboard.

During the departure from the Little Mermaid when the tour boat had gotten approx. 1 metre away from the quay and seemed to be on its way away from the place of departure, the group of family members felt that the stern of the tour boat was moving suddenly towards the quay. In the meantime, the ten-year-old girl sitting on the aftmost row farthest away from the aisle had her right arm beyond the gunwale.

The girl’s cousin, who was sitting next to her, observed that the situation with the stern’s movement towards the quay and the girl’s location was changing suddenly and drastically so that the girl’s arm could get stuck. He got hold of the girl, but did not succeed in pulling her arm above the gunwale before the lower part of the arm got jammed between the tour boat’s rubber fender and the quay. The tour boat’s contact with the quay was felt severely by the group of family members seated aft and the tour boat hit the quay with the starboard quarter. The girl’s arm was stuck for one or a few seconds before the tour boat got clear off the quay so that the cousin could help the girl get free.

It was immediately obvious that the lower part of the girl’s right arm had become quite deformed in the jamming accident, but there were no visible details because the arm was covered in two layers of clothing. The girl’s father hurried to the wheelhouse and informed the crew that the girl had broken her arm. He was followed by the girl’s sister and cousin who were accompanying the girl to the fore of the ship.

3.4 Alarm call and transportation to the casualty ward and onwards

When the ship was at quay, the girl’s father immediately jumped ashore to look for the police or any other possibility of getting assistance. When it was not immediately possible in this manner, he ran back to the tour boat.

It was obvious that the girl’s arm had been injured, but seriousness of the injury was not clear due to the girl’s clothing that was covering the arm. In the situation, it was impossible to identify the injuries in more detail. The girl was calm and did not give any verbal expression of being violently in pain.

The girl’s father, cousin and sister accompanied her ashore, where they got seated on a bench close to the tour boat. In the meantime, the master called the company office over VHF, where the call was immediately taken by an employee. The employee asked what it was about and the master said that a passenger had had her arm jammed and that an ambulance should be sent to Langelinie.
The company employee confirmed receipt of the request from the master and called the emergency operations centre on line 112 at 15:21, which redirected the call to the AMK\textsuperscript{2} emergency operations centre. The employee said that it was from the Netto-Bådene A/S and that they had a master who said that they had a passenger whose arm had been jammed between a tour boat and the Langelinie quay.

The health professional examining officer at the emergency operations centre asked about the seriousness of the accident – in order to know whether to send a lying carriage van. The employee at the company office did not know this since she was not himself present at the scene of the accident and, therefore, could not assess this. The employee called the master once again over VHF and asked about the seriousness of the accident. The employee was holding the telephone so that the master’s message could be heard directly by the health professional examining officer at the emergency operations centre. The master answered and the employee passed on the message to the health professional examining officer that his immediate impression was that the arm was broken.

The emergency operations centre informed that an ambulance would not be dispatched if the injured person could be carried in a seated position. The employee at the company office could not answer whether this was the case, but the master had said that they needed an ambulance. The emergency operations centre said that, at the moment, the waiting time for ambulances was long. When the employee asked for an elaboration on this, she was told that it would be half an hour or more in cases that were not life-threatening and the health professional examining officer at the emergency operations centre did not consider the case at hand of this nature.

The employee and the master quickly discussed over VHF what had been informed by the emergency operations centre. The discussion was heard over the telephone by the health professional examining officer at the emergency operations centre and, against this background, the health professional examining officer said that an ambulance without the sirens on would be dispatched. It was added that – in case some other solution was found – they would like to be informed so that the ambulance call could be cancelled.

The employee at the company office wanted to know to which hospital the injured passenger should be brought if the family chose to see to the transportation by itself and whether they should call the emergency service doctor in this case. The emergency operations centre said that – in that case – they should call the help line 1813, but that it could be complicated for a foreign family. An ambulance would arrive at the scene as soon as possible. However, the employee at the company office perceived the conversation as a suggestion to arrange for the transportation to the trauma centre by themselves and contacted the help line 1813.

Subsequently, the office employee called the master again over VHF and told him that an ambulance had been sent for, but that at least half an hour’s waiting time should be expected and that the emergency operations centre had suggested calling the help line 1813 in order to be referred to a trauma centre that could be reached by taxi. The master told the father that at least half an hour’s waiting time should be expected for an ambulance and that – instead – a taxi could be taken to a pointed out trauma centre. The master commented that the latter alternative might be the fastest way of getting treatment and that it might, consequently, be preferable. The father said that he would rather take a taxi than wait for at least half an hour and the master, thus, concluded – in consultation with the father – that this solution with taxi transportation to a trauma centre would be preferable.

The master told the office employee to call the help line 1813 since the injured person and her companions would take a taxi to the trauma centre.

\textsuperscript{2} Acute Medical Coordination Centre (AMK), the operative acute emergency preparedness, Capital Region of Denmark.
Then, the office employee called the help line 1813 at 15:29, where she was initially asked for the injured person’s central national registration number (CPR number). The employee did not have this, but instead she briefly said what it was about. The help line 1813 informed that – without a name and date of birth – it was not possible to make an appointment at the trauma centre. Following a further brief elaboration of the case, the health professional examining officer at the help line 1813 constructed a CPR number for the injured girl. The health professional examining officer said that the girl should be brought to the trauma centre at Amager Hospital which had the shortest waiting time.

The employee called the master over VHF to pass on the message from the help line 1813 and asked the master whether he wanted the employee to call for a taxi. He did want this and the employee called for a taxi for the Langelinie Quay. It was said that the taxi would arrive instantly, and the employee informed the master about this.

At the same time – and on the basis of the message previously passed on from the master to the injured girl’s family that at least half an hour’s waiting time should be expected and that it was proposed to take a taxi to a hospital – the girl’s cousin had found a taxi on the Langelinie Quay close to The Little Mermaid. When the employee at the company office told the master that a taxi was on its way, the master could inform that the injured girl had just gotten into another taxi to drive to Amager Hospital and that they were leaving at that instant.

Then at 15:36, the office employee called the emergency operations centre to cancel the ambulance. The emergency operations centre thanked for the message and said that an ambulance was on its way, but that it would be called back so that it did not go there in vain. Then, the employee called the taxi company to cancel the taxi that had been called for shortly before.

After approx. 30 minutes’ drive by taxi from the Langelinie to Amager Hospital, the injured girl was immediately received at the trauma centre. At 16:55, Amager Hospital requested an ambulance with the sirens on to bring the injured girl to the trauma centre at the National Hospital of Denmark since there was a risk that the injured part of the arm could not be saved.

Following initial treatment at the trauma centre of the National Hospital of Denmark, the girl was transferred by helicopter and arrived at Odense University Hospital at approx. 22:15. The lesion led to amputation of the lower part of the arm.

### 3.5 Reconstruction of the manoeuvring and the ship/quay contact

The Danish Maritime Accident Investigation Board has arranged for a reconstruction of the boat tour at The Little Mermaid using the same tour boat and crew, but without any passengers on board. Several calls and departures were made. During the reconstruction, variations were identified as regards the tour boat’s movements, which were a natural and expected part of the ship’s manoeuvring and during which risks of jamming accidents could occur. The reconstruction was based on the conditions on the day of the accident, when the guide was manoeuvring to take the mooring line, while the master was standing diagonally behind the guide.

Harbour manoeuvres may, also for tour boats, lead to rough berthing, contact during bridge passages, varied ship movements due to too hard or too weak turns of the rudder or inadvertent propeller revolutions. Though it is attempted to avoid this through cautious manoeuvres as well as through knowledge about and experience with the ships’ manœuvrability, varying contact with fixed installations will occur.
It was not unusual for the guide to perform a few manoeuvres before the master – a few moments later – took over the navigation as such since it is an integral part of the guide’s functions to be able to manoeuvre the ship. The distribution of the work at the time of the accident was caused by the guide and the master’s mutual location in relation to the ship’s control desk since the guide was closest to the control desk. The decision to let the guide set out was made by the master, based upon his personal knowledge about the guide’s experience manoeuvring the tour boat concerned as well as on an assessment that the conditions for letting the guide perform the manoeuvre were favourable.

3.6 Risk of injury in case of ship/quay contact

The tour boat was arranged with passenger seats all the way to the gunwale. A part of the tour boat had a cover made of polycarbonate capable of being pushed all the way to the roof or all the way down to the gunwale depending on the passenger wishes in consideration of the visibility and weather conditions. On the gunwale of the non-roofed part of the tour boat, there was a 30 cm high railing with sceptres of stainless steel (figures 6 and 7). The remotest part of the gunwale had a fixed fender list of hard rubber. The breadth of the gunwale and the fender list was 30 cm. It was possible to place an arm beyond the gunwale and the fender list. At the tour boat’s aftmost row of passenger seats and above the tour boat’s stern, the gunwale was flat and did not have any vertical band. The upper part of the gunwale in the passenger section was fitted with a vertical band of approx. 3 cm (figures 6, 7 and 8).
Figure 6: NETTO VII, aftmost starboard passenger section
Source: The Danish Maritime Accident Investigation Board

Figure 7: NETTO VII, aftmost starboard passenger section
Source: The Danish Maritime Accident Investigation Board
3.7 Trading permit

NETTO VII has been approved for voyages in the Port of Copenhagen within the piers at a maximum wind speed of 12 m/sec. The maximum number of passengers to be carried depends on the season. From 1 April to 30 September, there must be a maximum of 145 passengers on board, and from 1 October to 30 March, there must be a maximum of 122 passengers on board.

3.8 Minimum safe manning document from the Danish Maritime Authority

According to the ship’s minimum safe manning document from the Danish Maritime Authority, the ship must be manned as follows:

- A master holding a certificate of competency as a mate (STCW regulation) and a valid radio certificate in GMDSS (ROC), who must have acquired at least six months’ service as a mate on board sea-going ships.

- A person of age holding a health certificate for seafarers and fishermen without any restrictions in the work area of the service on board. This person must have been instructed on board in the operation of the vessel’s life-saving appliances and fire-fighting equipment and have been instructed in manoeuvring the vessel.

At least one crew member must hold a certificate of proficiency in motor operation.

The company’s approved safety management system contains detailed regulations on and the management of the master’s and the guides’ internal education, instruction and training, including on the guides being taught to moor and manoeuvre the tour boat so that it can be stopped in a safe place in case the master is incapacitated.
3.9 Tasks at places of call
At the places of call, the master manoeuvres the tour boat to and from the quay and the guide moors the tour boat and places the railing on the gangway. Depending on the situation, which may vary a lot with different passenger segments and other conditions, the guide and the master help each other perform the tasks, such as being attentive to and assisting the passengers during embarkation and disembarkation, the ticketing of the passengers and setting the time of the next departure on a sign on the quay.

3.10 Safety instructions
The company’s SMS manual prescribed, inter alia, that before passing bridges the master should warn the guide so that he could request the passengers to remain seated before the passage and keep an eye on their observance of this request. Specifically for passages of the Stormbroen, the SMS manual prescribed that – prior to the passage – the guide should tell all the passengers to be seated and keep their hands inboard due to the very narrow space and observe that they actually observed these instructions.

During the relevant boat tour on 27 August 2014, no instructions were given about the precautions to be taken against jamming or about the use of lifejackets, in accordance with common practice and the SMS regulations in force. But the passengers were instructed to not stand on the seats and to remain seated during passages of bridges. There were no pictograms or text ordering the passengers to keep their bodies within the tour boat during the tour and any manoeuvres. Pictograms located in a few places on board instructed about the use of lifejackets.

3.11 Emergency preparedness on board and in the company
The SMS manual, which covers all the company’s tour boats, contains overall measures to be taken by the tour boat’s crew in situations such as “man over board”, fire, collision, steering failure, threat of terror and evacuation of passengers. Each individual tour boat is, according to regulations, fitted with lifejackets, fire extinguishers as well as lifebuoys. Instructions in the use of lifejackets are evident from signposting on board.

Tour boats operating in the Port of Copenhagen are, in case of a crisis or an emergency, not “resourceful” as regards the crew and equipment to the same degree as commercial ships engaged on voyages in open waters. An emergency on board is presumed to be solved by trying to get close to shore quickly and by being assisted from the outside.

As an element of the internal emergency preparedness, all company tour boats are in constant VHF contact during the tour with an employee at the company’s shore-based office. According to the tour boat’s SMS manual, any accidents must be reported to the relevant employee ashore as soon as possible, who will subsequently call for the assistance needed. The SMS manual contains the relevant telephone numbers of the police, the emergency operations centre, the port authorities and the Danish Maritime Authority. This arrangement is to ensure that the crew can give a report to a person at the company fast and then has “free hands” to do what is immediately necessary on board – such as rescuing a person who has fallen over board, manoeuvring the ship or the like. In case a person has fallen over board, the SMS prescribes, for example, that a lifebuoy with a light should be thrown to the person in the water, who will then be helped on board the tour boat again. If it is not possible to lift the person aboard, the person should be held against the tour boat by means of ropes and lines and the tour boat should proceed to the quay where it is possible to get the person ashore and call for assistance. Realistic man-over-board drills are not held.
This type of tour boats are not required, inter alia, to carry liferafts and to count and register the passengers. This is based on the tour boats’ trading area in the Port of Copenhagen as well as on the fact that they are referred to as “non-sinkable”. This manner of describing the tour boats probably originates from the approved stability information that describes that each individual tour boat is fitted with built-in means of buoyancy ensuring that it will remain afloat with a reduced freeboard after having been flooded as a consequence of damage.

3.12 External emergency preparedness

In a crisis or emergency, the emergency preparedness in the tour boats operating in the Port of Copenhagen is based on external assistance – in general, primarily from the Copenhagen Fire Brigade.

In connection with operations in the harbour and the rescue of persons from the surface of the water, the emergency preparedness of the Copenhagen Fire Brigade consists of flexible units at the Main Fire Station and at Christianshavn Fire Station. The emergency preparedness is general and not specifically adjusted to major emergencies with tour boats in the Port of Copenhagen.

At each of these fire stations, the emergency preparedness consists of eight firemen (one team leader and seven firemen, two of whom function as surface rescuers who can take part in other operations). In special situations, it will be possible to insert more surface rescuers since all personnel at the Christianshavn Fire Station and the Main Fire Station have been trained as surface rescuers.

Furthermore, an emergency team of divers is located at the special service at the Main Fire Station. In general, this emergency team consists of ten firemen (two team leaders and eight firemen, two of whom are trained as divers) on duty. These can perform both surface rescuing and diving operations in foundered ships or the like as well as search and rescue operations, etc. As in the case of the surface emergency preparedness, it will be possible in special situations to insert more divers since all personnel at the special service have been trained as divers.

At the special service at the Main Fire Station, a RIB\(^3\) is located on a trailer. It is possible to launch the rescue boat almost anywhere in the Port of Copenhagen, either by driving to slipways or by launching it by means of a crane/turnable ladder.

In addition, the Copenhagen Fire Brigade has concluded cooperation agreements with the CMP\(^4\), the By og Havn\(^5\) (“City and Port”) and Svitzer A/S about access to boats and assistance in connection with rescue operations. In certain situations, the Copenhagen Fire Brigade can also draw on the emergency preparedness from Copenhagen Airport with the airport’s special rescue boat as well as the Naval Home Guard in Dragør.

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\(^3\) RIB: Rigid Inflatable Boat, fast-going rescue boat.

\(^4\) CMP: Copenhagen Malmö Port.

\(^5\) Development and operational company for the Port of Copenhagen.
4. ANALYSIS

4.1 The accident

The jamming accident occurred when a ten-year-old passenger held one arm beyond the gunwale as the tour boat was pulling the starboard quarter towards the edge of the quay in connection with a brief reversing manoeuvre and hit the edge of the quay at the exact spot where her arm was stretching beyond the gunwale and the fender list.

Immediately prior to the accident, the attention of the passenger was directed towards the coming adventures of the tour as the stern of the tour boat, where she and her companions were seated, had moved away from the quay. Thus, she was not attentive of the risk of her arm being jammed.

Passengers on boat tours cannot be expected to have knowledge about or experience with the movements of a boat in connection with harbour manoeuvres. When the boat seems to be sailing away from the quay, it is thus not strange – in the absence of effective, structural, symbolic and operational barriers – that a passenger is sitting with her arm lying on the gunwale on in any other way has her arm beyond the gunwale without thinking of the risk of jamming between the tour boat and the quay.

In connection with the departure from The Little Mermaid, the master and the guide were, as usually, situated in the wheelhouse where they were busy manoeuvring and preparing for the onwards tour. They were, first and foremost, focused on the setting out manoeuvre and not on what was happening to the aft of the tour boat. At the same time, the design with a superstructure and the distance of approx. 15 metres from the wheelhouse to the aftmost row of passenger seats and the presence of other passengers made it impossible to have an overview of the entire situation aft (figures 9, 10 and 11).

Figure 9: NETTO VII
Source: The Danish Maritime Accident Investigation Board
Figure 10: NETTO VII, vision to the aft from the guide’s usual position, seen over the superstructure
Source: The Danish Maritime Accident Investigation Board

Figure 11: NETTO VII without passengers, vision to the aft from the guide’s usual position, seen under the superstructure
Source: The Danish Maritime Accident Investigation Board
Though the contact between the tour boat’s quarter and the edge of the quay caused the girl’s arm to be seriously injured, the incident was noticed neither by the master nor by the guide to the front in the wheelhouse. The guide could not see it, and the master did not notice it, inter alia because contact between the tour boat and the quay occurs now and then and because his attention was focused on the wheelhouse and forwards. Thus, in a usual operational situation on board, a serious passenger accident could occur without the crew noticing it.

4.2 The manoeuvre and the stern movement during the accident

At the time of the accident, the tour boat’s manoeuvres were carried out by the guide. Usually, the master would be manoeuvring the tour boat. However, the actual distribution of work was not unusual, inter alia because of the maintenance of the guide’s required manoeuvring skills.

During harbour manoeuvres, tour boats can have varying movement that may also involve contact with the quay. It must be considered a natural part of the manoeuvring of this type of boat and is not necessarily related to the person manoeuvring the boat.

4.3 Barriers against accidents

Human behaviour holds the potential of accidents, also for passengers of tour boats who are in an unaccustomed environment where various risks are not immediately recognised unless they are communicated in an easily intelligible manner.

Barriers against accidents on board can consist in the following:

- Structural barriers such as shielding and protection against falling over board or jamming between the tour boat and the quay/bridge. Appropriate rails at stairs.

- Symbolic barriers such as pictograms and other signs containing guidance and orders about appropriate and safe behaviour.

- Operative barriers such as oral instructions from the boat’s crew about appropriate and safe behaviour.

- The tour boat’s crew being attentive of the passengers’ behaviour and risks that may arise during the tour and embarkation/disembarkation.

Furthermore, the crew’s composition, education and training as well as the company’s organisation and SMS system are important factors.

NETTO VII was not fitted with any structural barriers or symbolic barriers with the purpose of managing the passengers’ behaviour in such a manner that they would become aware of the danger of having their arms and hands outboard or of standing upright when passing low bridges.

In connection with the introduction to the tour through the Port of Copenhagen, no oral instructions were given and the passengers were in no other manner instructed to always and unconditionally keep their arms and hands inside the tour boat.

However, since the tour boats carry passengers of many different nationalities, oral instructions can be presumed to be only partly effective due to the passengers’ possible lacking linguistic understanding or because they may be preoccupied with sightseeing and conversation with other passengers.
4.4 The alarm call

The alarm call from the tour boat followed usual practice, which was also described in the SMS manual. The indirect sequence of events contained a possibility of misunderstandings and loss of important information from the place of injury to the health professional examining officers at the emergency operations centre, and the alarm call was not effective. In the last instance, this meant that the injured passenger’s transportation to Odense University Hospital became indirect and that the introductory medical treatment, thus, took place later than in the case of an effective alarm call.

The indirect communication between the tour boat and the health professional examining officer at the emergency operations centre made it difficult to understand the accident as such because the health professional examining officer did not have any possibility of asking for and getting exact information about the injury. At first, the health professional examining officer categorised the incident as “not life-threatening”, which meant that the employee at the company office was informed and passed on the message to the master, who in his turn passed it on to the injured person’s relatives, that they should expect to wait for an ambulance for half an hour or longer.

Though the health professional examining officer at the emergency operations centre said later in the conversation that an ambulance would be dispatched immediately after all, the office employee still had the impression that they would have to wait for an ambulance for half an hour or longer. This caused the employee to call the help line 1813 in order for the injured passenger be referred to a trauma centre and, at the same time, caused the passenger’s relatives to find a taxi by themselves for the transportation to the trauma centre.

The sequence of events shows how an approved safety management system (SMS) intended to ensure efficient handling of an emergency can, in reality, lock and limit the actions of the involved persons.

An intuitive and more efficient handling of the emergency and the alarm call by the master and the guide was not considered because there was a system with precautions to be observed, which was followed.

4.5 Remarks from the Capital Region of Denmark to the alarm call procedure

The Capital Region of Copenhagen has informed that for the AMK emergency operations centre indirect alarm calls – as in this case – constitute a problem that involves a risk of not acquiring sufficient and relevant information about the injury mechanism and the seriousness of the trauma (i.e. the real extent of the injury is not recognised during the alarm call). Indirect alarm calls mean that the person making the call\(^6\) does not have a possibility of acquiring supplementary information for the emergency operations centre (in this case, for example by cutting the sleeve and describing the arm). This is a considerable risk since this information is necessary to ensure that the help line 112 AMK emergency operations centre can make a correct examination, i.e. respond correctly. At the same time, indirect alarm calls mean that the help line 112 AMK emergency operations centre does not have the same possibility of giving the person making the emergency call first aid advice until the ambulance arrives at the scene of the accident.

The Capital Region of Copenhagen recommends changing any procedures for calling the emergency operations centre and help lines 112 and 1813 so that frontline personnel are authorised to make alarm calls and the person making the call is a person positioned close to the patient who is capable of answering any questions about the injury mechanism and the seriousness of the injury.

\(^6\) The person making a call on help line 112 or help line 1813.
From a health professional point of view, it is important that the person making the alarm call is positioned close to the injured person. Thus, it would be preferable if the master asks another person to make the alarm call – for example a fellow passenger – rather than person makes the call who would – due to the distance – not be able to answer the questions asked by the emergency operations centre.

This problem is also known from other large organisations where it has been formalised that alarm calls are made via a central office. Thus, it would be preferable if the change is made for regulations or instructions related to transportation in both the Port of Copenhagen and ashore.

4.6 Safety view and emergency preparedness in connection with tour boats

In several connections, boat tours are not considered ordinary voyages, inter alia because they are not considered as being as risky as voyages in open waters. The company has a more theoretical approach to safety on board tour boats than what is typically considered and expected in connection with passenger transportation in open waters. This means that the creation of safety is based on imagined scenarios and precautions rather than on more realistic operational drills.

This risk and safety view seems to have developed due to tour boats’ limited trade area, the fact that so far no tour boats in the Port of Copenhagen have been involved in major accidents and the fact that the boats are referred to as “unsinkable”, which is an unofficial and popular description of the individual tour boats’ estimated buoyancy. Consequently, these boats are not fitted with the usual life-saving appliances and they have a crew where only the master is presumed to have maritime competences. The crewmembers have limited possibilities of acting independently in emergencies.

Each individual ship was not resourceful in any way in case of an emergency, but completely dependent on assistance from the outside. The crew was minimal, safety instructions for the passengers were limited to caution during bridge passages, the life-saving appliances were limited to lifejackets, lifebuoys and VHF installations, information about the use of the lifejackets was only evident from signs on board, there was no exact knowledge about the number of persons carried and the tour boats’ approved SMS manual prescribed an indirect and thus, in some cases, not very efficient alarm calling procedure in emergencies.

However, the term “unsinkable” is not an adequate description of the tour boat’s ability to secure the passengers’ safety in case of water ingress. The boat’s stability information is as follows: “After flooding, the boat’s ability to remain upright is limited and it is, thus, of the greatest importance that the passengers carried are distributed evenly and that they keep calm, i.e. remain seated.” It must be considered a theoretical scenario that, in the case of water ingress, the passengers will keep calm and remain seated if water is running into the boat, and it must be presumed that the passengers will attempt to save themselves and, thereby, create turmoil in the boat. In such cases, the crew’s instructions and authority will be challenged in the face of passengers of random composition whose pattern of reaction cannot be expected to be controllable for a crew without any training in this type of scenario.

Thus, in an emergency, the preparedness is dependent on efficient alarm calls since the emergency preparedness in tour boats in the Port of Copenhagen is based on external assistance – in generally primarily from the Copenhagen Fire Brigade.

The accident on 27 August 2014 shows that the approved alarming procedure was inefficient because it prescribed indirect communication.
5. CONCLUSIONS

The accident on 27 August 2014 occurred in an everyday situation where the tour boat NETTO VII inadvertently during harbour manoeuvres hit the quarter towards the edge of the quay where a minor passenger had one of her arms located so that it got jammed between the ship and the quay. In the situation in question, the passenger and her companions were not prepared for the ship to move towards the quay. Neither structural barriers in the form of an approved rail with sceptres fitted above the gunwale nor symbolic or operative barriers could prevent the passenger’s arm being placed so that it could be jammed. And neither the passenger nor the companions were attentive of the risk of having the arm placed beyond the side.

At the time of the accident, the tour boat’s crew – a master and a guide – were busy manoeuvring the boat from the wheelhouse at the opposite end of the boat. These activities and their physical location prevented them from being attentive to an unusual tour boat manoeuvre, and an inadvertent, but not unusual contact between the ship and the quay resulted in an accident.

The injured passenger was quickly brought ashore and away from the tour boat, and the seriousness of the lesion was not identified by the master and, therefore, not established during the subsequent alarm call.

The alarm call from the tour boat about the accident was not efficient because the crew followed a prescribed and approved procedure that was inappropriate. The alarm call procedure reduced the possibility of establishing a common understanding and effective action plan between the health professional examining officer at the emergency operations centre, the employee at the company office and the master at the scene of the accident. The non-efficient alarm call resulted in a prolonged transportation time for the injured passenger to the final hospital. This indirect alarm calling method is also problematic in relation to the general emergency preparedness.

6. PREVENTIVE MEASURES

6.1 The company

Immediately after this accident, the company started revising its SMS manual with a view to impression caution on the crew during the call procedure, following a requirement made by the Danish Maritime Authority.

Another requirement from the Danish Maritime Authority led to the following: In tour boats that were not already fitted with shields of polycarbonate on the gunwale, such plates were fitted to ensure that the passengers could not accidentally get jammed between the bulwarks and the fender list/tour boat. And on board the tour boats, pictograms have been posted warning against placing one’s arms and hands outboard during the tour.

6.2 The Danish Maritime Authority

Immediately after this accident, the Danish Maritime Authority held a control survey on board NETTO VII and made the following requirements of the company:

- "The procedure in connection with calls at quay installations with passengers on board must be impressed on the crew so as to minimise the risk of injury to the passengers.
- The procedure in connection with departures from quay installations with passengers on board must be impressed on the crew so as to minimise the risk of injury to the passengers."
The Netto-bådene A/S are hereby ordered to make a technical solution so as to minimise the risk of jamming limbs between fender lists/the boat’s side and the bulwark/quay/other in the future."

The Danish Maritime Authority has carried out independent trips with various tour boats and different crews from both this and another company that also offers boat tours in the Port of Copenhagen and ordered the necessary scrutiny and upgrading as regards the following:

- Distinct signposting/pictograms stating that the passengers must not be standing up during the tour and warning against the risk of jamming accidents.

- Message over the tour boat’s PA (public address) system upon arrival, departure and during bridge passages stating that the passengers must not be standing up during the tour (the procedure must be evident from the company’s safety management system).

- Shielding on board the tour boats so that the passengers cannot unintentionally have their limbs (arms, hands, fingers, head, legs and feet) jammed between the boat and the quay/bridge/other ships when seated in their seats. The technical solution must not prevent the possibility of rescuing a person who has fallen over board.

- Alarm calls for assistance in emergencies, for example through calls to unnecessary intermediate links so as not to result in any unnecessary delay and loss of important information (the procedure must be evident from the company’s safety management system).

- Counting and recording of the number of children carried since the number of children must not exceed the number of child lifejackets carried on board.

In addition, the Danish Maritime Authority has after the accident had a meeting with the company about any preventive measures. Some measures were launched immediately, inter alia related to the prevention of jamming accidents. As regards other measures, it was decided to await the report of the Danish Maritime Accident Investigation Board. Therefore, it has been decided that the Danish Maritime Authority will contact the company with a view to upgrading the alarm calling procedure and the emergency preparedness on the basis of the information contained in the report of the Danish Maritime Accident Investigation Board. Other companies where similar conditions prevail will also be contacted.

In 2014, the Danish Maritime Authority has developed its surveys of passenger ships and boats so that great emphasis is placed on the interaction between the ship, the equipment, the procedures and the crew’s handling in connection with accidents.

6.3 The Capital Region of Denmark

The incident was reported by a relative to the injured passenger to the Danish Patient Safety Database, which is the health services’ database of reported unintentional incidents.

The Capital Region of Denmark is carrying out an in-depth patient safety analysis of the incident within the framework of the Region. The patient safety system of the regions is based on provisions in the health legislation and on a sanction-free reporting system with a view to acquiring systemic learning and improvements.

The quality and patient safety organisation of the Region facilitates the analysis of the incident and the analysis is carried out with the participation of the involved companies in the Region, i.e. the Pre-hospital Services, including the emergency operations centre/AMK help lines 112 and 1813, Amager Hospital and the National Hospital of Denmark. The analysis focuses on learning from the prolonged inappropriate patient course of events. The analysis has not yet been finalised and approved in the Region.