aibn Accident Investigation Board Norway

Issued October 2010

REPORT Mar 2010/09

REPORT ON INVESTIGATION OF MARINE ACCIDENT REGARDING FALL OVERBOARD FROM CARGO SHIP NYSAND LJIE ON DEPARTURE FROM PORT AT FORUS 24 OCTOBER 2008

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Photo of ferry on the Norwegian west coast: Bente Amandussen

TABLE OF CONTENTS

NOTIFICATION OF ACCIDENT

The Accident Investigation Board Norway (AIBN) was notified of the accident by the Rescue Coordination Centre (RCC) at 2230 hours on 24 October 2008. One person had fallen into the water from a cargo boat and died outside Forusstranda. After having obtained additional information, the AIBN decided to investigate the accident. The next day, two accident inspectors travelled from AIBN to Stavanger and Forus for technical investigation and to interview the crew.

SUMMARY

On the evening of 24 October 2008, just after 2100 hours, the crew of Nysand started to prepare the departure from Forusstranda. The unloading had not quite been completed, but the master had entered the wheel house and started the engine, while the ordinary seaman went down to the quay to let go the moorings. The motorman/mechanic was in the excavator, unloading gravel while the first mate went forward to the forecastle. The master started maneuvering the vessel away from the quay before the ordinary seaman had made it back on board. After putting away from the quay, the motorman/mechanic, still in the excavator, saw that the ordinary seaman was hanging by her arms from the railing on the ship's side. The motorman/mechanic started shouting, and the first mate and master became aware of the situation. The master started moving the vessel astern, while the first mate ran abaft to prepare the man over board boat (MOB) for launch. The motorman/mechanic saw the ordinary seaman fall into the sea. When the MOB boat had been launched and the search for the ordinary seaman had started, the master hailed RCC for assistance. Briefly after the arrival of the helicopter, the helicopter crew observed the ordinary seaman, and communicated the position to a rescue boat that had arrived. The crew of the rescue boat brought the ordinary seaman on board, and immediately attempted to resuscitate her. The ordinary seaman was declared dead at 2230 hours.

AIBN has carried out a safety investigation to map the course of events and identify any underlying causes with a view towards issuing safety recommendations which can prevent similar accidents in the future. In its investigation of the accident, AIBN has chosen to emphasize the general systems

which are essential for safe operation of ships, rather than individual elements that may have impacted the outcome of the accident negatively.

The investigation identified key deficiencies as regards safety management, work, health and safety on board, and deficient follow-up and supervision on part of the authorities in this connection. The study has also uncovered that the regulations do not define the scope for safety management systems for cargo vessels with a gross tonnage of less than 500 gross tonnes (gt).

AIBN submits two safety recommendations as a result of the investigation. These are addressed to the Norwegian Maritime Directorate.

1. FACTUAL INFORMATION

1.1 Details about the ship and the accident

Details about the ship

Shipping company	Sveholmen shipping AS
Insurance	Fraktefartøyenes Rederiforening/North Edge
ISM responsible	NA
Home port	Kopervik
Flag state	Norway
Type:	Small cargo ship. Regular general cargo
Building year	1965
Building yard	Ørskov, Frederikshavn, Denmark
Construction material	Steel
Length	48.23 m
Width	8.64 m
Draught	4.05 m
Gross tonnage	469
Machine power	720 hp (537kW)

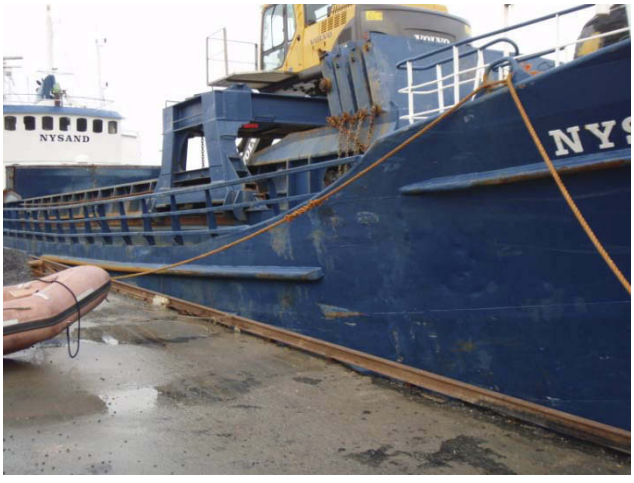


Figure 1: Nysand moored at the quay facility at Forusstranda on the day after the accident.

Details about the accident:

Time and date	24 October 2008 at approx. 2120 hours
Location of the accident	Forusstranda, Stavanger

People on board	4
Injured/dead	1 dead

1.2 Course of events

On Friday, 24 October 2008, the cargo vessel Nysand had loaded 769 tonnes of gravel at Jelsa which was to be delivered at the asphalt works at Forus. The crew consisted of the master of the vessel, the first mate, motorman/mechanic and an ordinary seaman with cooking skills.

The same evening, at 1940 hours, the vessel arrived at Forusstranda to unload the cargo. The vessel was moored with a bow line, stern line and a forward spring line. There was no boatman at the quay to catch the mooring lines, nor was a gangway set up. The unloading started immediately upon arrival, and the master himself operated the vessel's excavator during the unloading. There were lights on the excavator and on the quay, and the deck lighting on board was on.

After completing the unloading at Forusstranda, Nysand was scheduled to proceed to Forsand for loading. The master had scheduled his arrival at Forsand at 2300 hours. A different ship was expected at Forsand at 2315 hours. To avoid having to wait, Nysand had to arrive as scheduled. The distance from Forus to Forsand is approx. 16 nautical miles, and was estimated by the master to take about 90 minutes.

Just after 2100 hours, 5-10 minutes before the vessel had completed the unloading, the master handed over the operation of the excavator to the motorman/mechanic for him to complete the unloading. There were about 4-5 scoops of load left in the cargo hold. The master went up to the wheel house to prepare the departure and start up the propulsion machinery. The deck lighting was now turned down. At the same time as the final scoops of gravel were unloaded, the rest of the crew started their preparations for departure. The ordinary seaman climbed over the railing and down to the quay to let go the mooring lines, while the first mate remained on board to pull them in. The ordinary seaman was wearing dark clothes, a black down vest, yellow rubber boots and a white hard hat. The stern line was loosened first, and the first mate and ordinary seaman then moved forward to take in the bow line. When the stern moorings were in the boat, the master started maneuvering against the spring to clear the stern from the quay and create a slack in the bow line to make it easier to let go. The first mate observed the ordinary seaman going forward. When the first mate arrived at the forecastle, he saw that the bow line was slack, and started hauling it in. The master saw that the ordinary seaman had moved forward, and that she was ready at the bollard to loosen the spring. When the bow line was on board, the first mate started hauling in the spring. He did not observe the ordinary seaman at this time, but assumed that she had loosened the spring as it was slack. At this time, the master had started going astern to slacken the spring.

Figure 2: View from the wheel house and down towards the quay in daylight.

The master did not receive any confirmation that the ordinary seaman was on board, and could no longer see the ordinary seaman at this time, but he assumed she was on board as the spring had been pulled on board. The master engaged the bow thruster to take the bow away from the quay. After having achieved the desired position from the vessel, the master started moving the vessel forward. According to the master, it was difficult to see the place where the ordinary seaman would come on board due to the dark, and because the view from the wheel house towards the side of the ship was partially blocked by the excavator.

Figure 3: The view from the wheel house down towards the quay at night with the ship's floodlights on.

The unloading had not been completed, and the final scoop of sand could not be dumped on the quay as the ship had moved too far from the quay. The motorman/mechanic had to swing the scoop back and dump the final scoop back into the cargo hold. He then started driving the excavator forward to park it in the correct position for a sea voyage.

Before the excavator boom was in position directly forward, the motorman/mechanic heard shouting and turned the scoop towards the starboard side. He then saw that the ordinary seaman was hanging by her arms on the outside of the railing. He started shouting to attract attention. The time was approx. 2123. The master heard the shouting, but first assumed that it was the crew communicating something in connection with the departure. When the shouting became more intense, he turned on the floodlights and observed the ordinary seaman hanging from the outside of the railing just forward of the excavator. He immediately started going astern. The motorman/mechanic saw the ordinary seaman fall into the sea. The master did not see this, and later assumed that this was due to the excavator being maneuvered in a way that made the scoop prevent a free line of sight towards the area where the ordinary seaman was hanging. The master went out on the starboard bridge wing and observed the ordinary seaman in the water on the starboard quarter. He went into the wheel house again and disengaged the propeller, and then went out on the bridge wing again. The motorman/mechanic turned the scoop to the centre line again, went down to the deck and started shouting to the master.

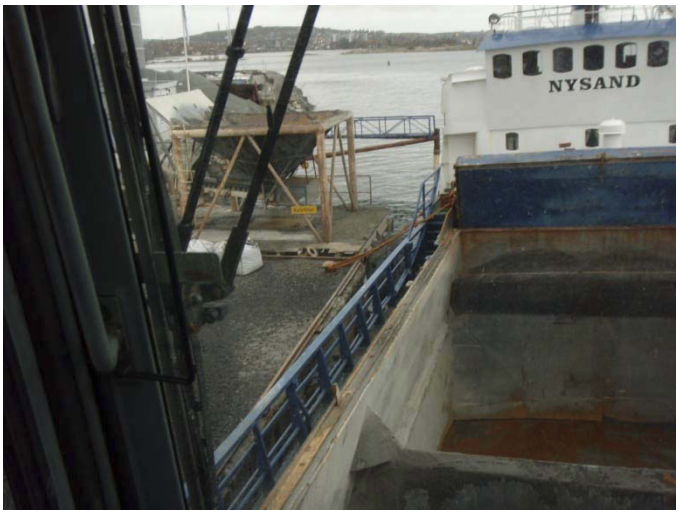


Figure 4: View from the excavator.

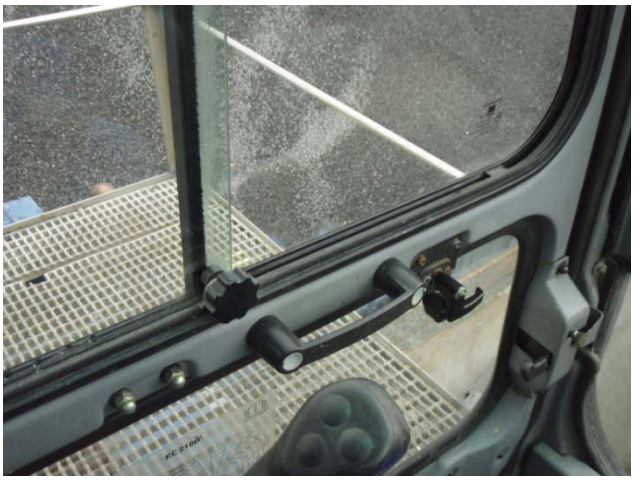


Figure 5: View from the excavator and down towards the quay.

The first mate on the forecastle could not see what had happened, but understood that the ordinary seaman had fallen into the sea. He ran astern to prepare the MOB boat. The master went down on deck and instructed the motorman/mechanic, who at the time was

visibly shocked by the events, to go along in the MOB boat. The master himself went into the wheel house to start the MOB boat crane generator. The first mate and the motorman/mechanic then went on board the MOB boat, but could not lower the boat as the self-lowering mechanism had been fastened with a rope. The master ran to fetch a knife, and gave this to the motorman/mechanic who cut the rope. After getting the MOB boat on the water, they started searching for the ordinary seaman. The master returned to the bridge and hailed RCC for assistance at 2135 hours. The two in the MOB boat started the search from the ship towards the quay. The master used the searchlight on the bridge, and observed the ordinary seaman's hard hat in the water. As the crew on board the MOB boat had no portable communications equipment, the master tried to use the searchlight to attract the attention of the two in the MOB boat. He then observed the MOB boat run aground just north of the quay. The MOB boat engine was damaged during the grounding. The crew continued the search by paddling forward. The rescue operation was characterized by confusion and lack of communication, in addition to a shock-like condition for some of the crew.

At this time, the ambulance had arrived. The master maneuvered the vessel to the quay and moored. In the meantime, a rescue helicopter and rescue boats arrived and took over the search for the missing person. The master contacted the helicopter to indicate the area in which he believed the search should be concentrated. About 40 minutes after the ordinary seaman fell in the water, at 2206 hours, she was observed from the rescue helicopter approx. 100 meters in front of Nysand's bow. The rescue boat from Viking maneuvered over to the ordinary seaman, who was floating face-down in the water. Divers from the rescue boat went into the water and managed to get the ordinary seaman on board the rescue boat at 2210 hours. Resuscitation began immediately. The ordinary seaman had then been in the sea for about 45-50 minutes.

Figure 6: The quay facility at Forus with ship at the quay. The white arrow indicates the area where the deceased was found. Source: Norwegian Coastal Administration

The ordinary seaman was brought ashore and transported to Rogaland Central Hospital in an ambulance. The two who manned the MOB boat had at the time arrived on board, and the master informed them that the ordinary seaman had been found and taken to hospital in an ambulance. She was declared dead at 2230 hours. It was later established that the cause of death was drowning.

1.3 Shipping company and vessel

Nysand is owned by Sveholmen Shipping AS, where the master owns all shares. Nysand was acquired by the shipping company in 1990. The shipping company owns two ships, in addition to two ships where the shipping company is a part-owner.

Nysand is a cargo ship of 800 tonnes dead weight, and had a valid operational certificate for cargo ships at the time of the accident. The vessel is 48.23 meters long, 8.64 meters wide and has a draft of 4.05 meters. The vessel was built in 1965 at Ørskov shipyard in Frederikshavn, Denmark. The vessel is certified for coastal trade, and is a self-discharger with a Volvo excavator from 2006 on board. The excavator scoop holds 1.9 m3.

1.3.1 The crew

According to the Safe Manning Certificate issued by the Norwegian Maritime Directorate on 10.August 2007, the minimum crew was master and chief officer with category D5, unskilled cook/ordinary seaman and mechanic/ordinary seaman in continuous 24-hour operation. The Safe Manning Certificate allows for operating without a chief officer if the ship is operated in the daytime only. On the night of the accident, the crew on board consisted of 4 people. They were the master, first mate, motorman/mechanic and the ordinary seaman.

Master of the vessel: Norwegian male, age 56. He was both the owner and master of Nysand and held a Category 3 (D3) deck officer certificate. He has worked in cargo trade along the coast since 1968. He acquired Nysand in 1990, and sailed as master on board.

First mate: Norwegian male, age 73, has sailed since 1960 in fishing vessels, supply vessels and in cargo trade along the coast. He retired in 1996, and has since worked as a stand-in for the shipping company. The first mate has worked on board Nysand on several occasions. He had a First mate certificate, Category 2, in accordance with the old scheme, but this expired in 2002.

Motorman/mechanic: Polish male, age 55, qualified mechanic, has sailed since 1977 and on Nysand since 1998.

Ordinary seaman: Polish female, age 51. Had sailed since 2005, and had been on board Nysand since April 2007.

1.3.2 Operation of the vessel and organisation of the work on board

Due to irregular and frequent arrivals, the working hours were split into several segments, and the crew rested or slept between calling at ports when the chance presented itself. There were no fixed working hours. No resting time forms were kept to document when the crew rested. During the interviews with the crew, statements differed as to whether

they had had sufficient rest or not, but no one considered lack of rest to have been a contributing factor to the accident.

The master normally piloted the vessel. He also operated the excavator most frequently. The first mate relieved the master at the bridge as required, and also helped with mooring, maintenance and cooking. The motorman/mechanic was responsible for the machinery, performed maintenance and operated the excavator as required. The ordinary seaman performed maintenance, was responsible for cooking and participated in the mooring. Before departure, the ordinary seaman normally went down to the quay to let go the mooring lines on signal from the master. There were no job descriptions for the individual positions. According to the shipping company, the tasks varied according to the individual employee's expertise. The individual employee received training through being assigned various tasks on board.

There was no gangway on board in spite of the requirement in Section 9 of the Regulations relating to Safety Measures, and repeated orders from the Norwegian Maritime Directorate to acquire this. There was also no gate or similar in the railing where a gangway could be placed. It was stated that they did not use a gangway due to large rolling movements in the vessel when using the vessel's own excavator during unloading.

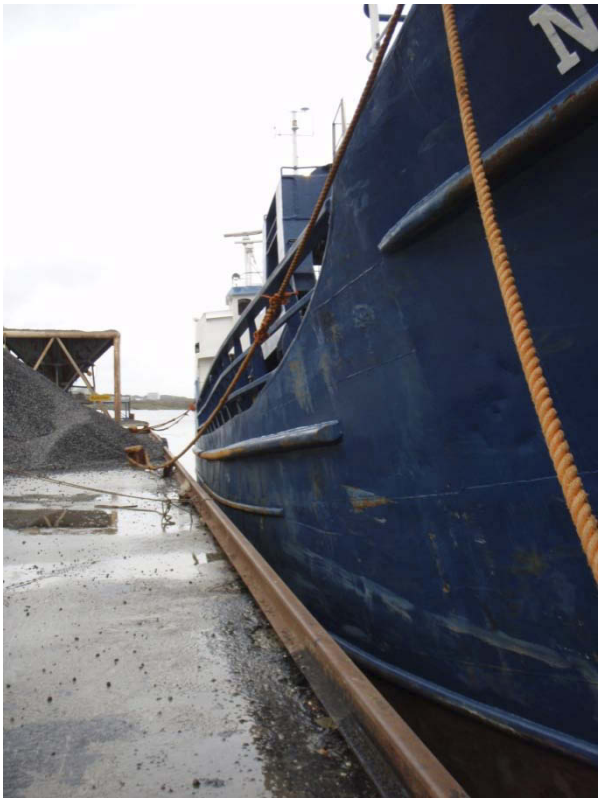


Figure 7: There was no gate in the railing and no gangway was used.

1.3.3 Safety and environmental work

No safety delegate had been appointed and no protection environment committee had been established on board, and no systematic training in safe work practices had been given. According to the applicable regulations at the time of the accident, a general annual report concerning the protection and environmental work on board must be

submitted to the Norwegian Maritime Directorate. The Norwegian Maritime Directorate states that it has not received any such report from the vessel, at least since 1994.

To a large degree, the protection and environmental work took place in the form of the individual employee considering the use of personal protective equipment. The ordinary seaman wore a hard hat during the mooring operation, whereas other suitable personal protective equipment such as protective shoes and working life vest was available, but not used. The task of letting go the mooring lines on the quay was not considered by the crew to be especially risky, and no risk assessments were prepared or any other measures taken considered to reduce the risk to ensure that this operation was performed safely. The same applied for the conditions concerning going ashore and on board without a gangway.

1.4 The quay facility

The quay facility at Forusstranda is owned by Lemminkainen AS. NorStone AS leases the quay facility, and it is in practice operated by both companies in cooperation.

The quay is a concrete quay most recently modified in 1995. It is 30 meters long, and the depth at the quay is 6-7 meters. There was a small difference in height between the quay and the deck of Nysand, estimated to 0.5 meter. A railway rail had been fitted along the quay, and two light pylons, one at each end. The quay was also equipped with a life buoy. The loading tower with conveyor belt which Nysand had unloaded to was situated at the north end of the quay. There was no ladder from the sea and up to the quay. The water below and to the side of the quay is shallow enough to get ashore that way.

There was a large pile of gravel on the quay. This had been left by a vessel which had unloaded directly onto the quay. The passage between the gravel pile and the edge of the quay was very narrow in places. In one area, the gravel was right up against the railway rail. Section19 of the Regulations relating to Port Work, states that the passage along the edge of the quay shall be sufficiently wide and orderly and free of loads and other obstacles.

Operation of quay facilities is regulated by the Harbor Act. However, there are no provisions in the act regulating the use of a boatman, so any provisions relating to the use of a boatman when mooring ships are issued by municipalities, operators or quay facility owners.

There were no written procedures relating to assistance upon mooring of ships upon the quay facility at Forusstranda, but the practice was that workers on the quay could help with the moorings upon request from the vessel both when arriving and departing. This would take place to the extent it did not interfere with other tasks on the quay. Nysand had made no request for mooring assistance on the night in question.

After the accident, NorStone and Lemminkainen held a meeting reviewing factors relating to the accident. One of the results of the meeting was a decision to prepare guidelines for mooring assistance. After the accident, the quay owner has installed a ladder on the quay facility.

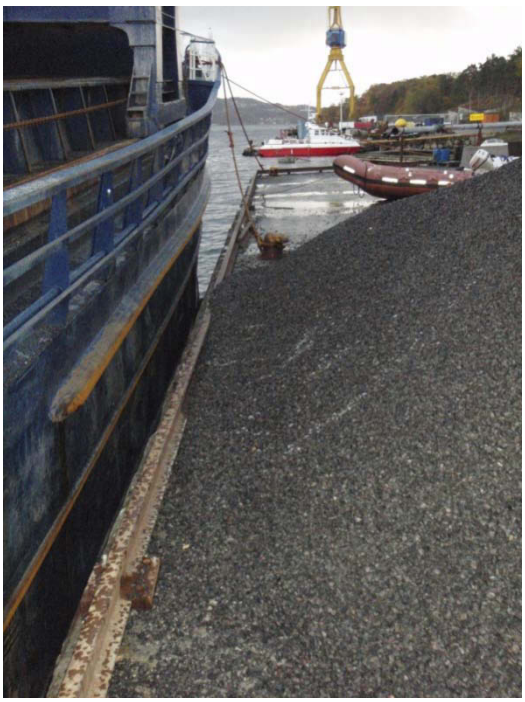
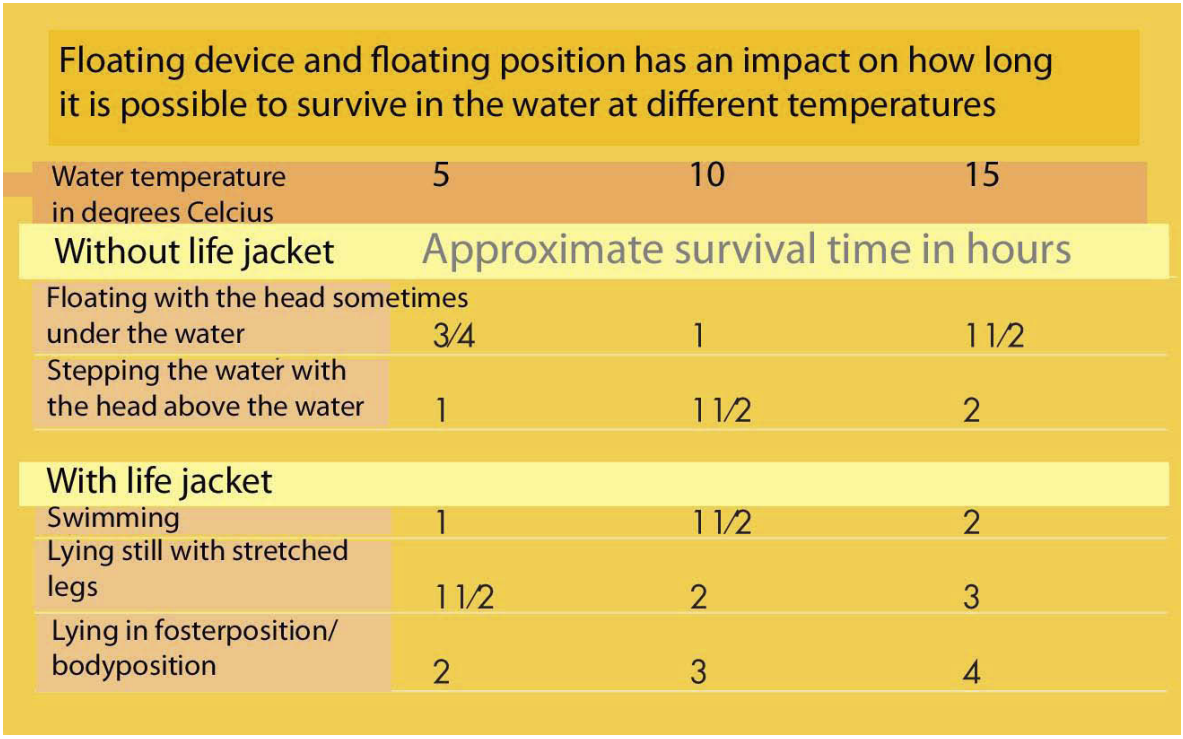


Figure 8: There was a lot of gravel on the quay, and only a very narrow passage along the edge of the quay.

1.5 Weather conditions and the survival aspect

At the time of the accident, there was a southerly breeze of 5 m/s and smooth sea. There was no precipitation, dark, but with good visibility. The air temperature was 3 degrees Celsius. The closest measurement of the sea temperature showed 9-10 degrees Celsius in the sea west of Stavanger.

The ordinary seaman was found after having been in the water for about 45-50 minutes. The cause of death was later established to be drowning. The survival time in water at the relevant sea temperature (10 degrees C.) is normally about one hour, depending on factors such as floating position, clothing and winds. The ordinary seaman could swim and was in normal good shape, but this was not sufficient to prevent drowning. Use of a floating device would have increase the chance of surviving considerably, see figure 9.



Floating device and floating position has an impact on how long it is possible to survive in the water at different temperatures

Water temperature in degrees Celcius	5	10	15
Without life jacket	Approximate survival time in hours		
Floating with the head sometimes under the water	3/4	1	1 1/2
Stepping the water with the head above the water	1	1 1/2	2
With life jacket			
Swimming	1	1 1/2	2
Lying still with stretched legs	1 1/2	2	3
Lying in fosterposition/ bodyposition	2	3	4

Figure 9: Source: The Norwegian Maritime Directorate, unofficial translation

The initial period after somebody falling into the water is critical, both as regards finding the person and succeeding with resuscitation attempts. The ordinary seaman drowned, indicating that the time aspect was even more urgent than would have been the case if hypothermia had been the cause of death.

1.6 Relevant regulations

1.6.1 The Ship Safety and Security Act

The Act of 16 February 2007 No. 09 relating to ship safety and security (the Ship Safety and Security Act) is the general act regulating the operation of Norwegian ships. The act applies to all Norwegian and foreign ships with the exception of ships shorter than 24 meters used for non-commercial purposes. The purpose of the act includes safeguarding life and health by facilitating proper ship safety and security and safety management, ensuring a good working environment and safe working conditions on board ships, as well as good and timely supervision.

Section 7 states that ”the company shall *ensure that a Safety Management System which can be documented and verified is established, implemented and developed in the company’ s organization and on the individual ships in order to identify and control the risk and also to ensure compliance with requirements laid down in or pursuant to a statute or in the actual Safety Management System The contents, scope and documentation of the Safety Management System shall be adapted to the needs of the company and its activities.”*

No safety management system had been established on board Nysand. The Norwegian Maritime Directorate does not have any routines for verifying whether safety management systems have been established on cargo ship of less than 500 gt.

1.6.2 The ASH regulations

The regulations of 1 January 2005 No. 8 concerning the working environment, health and safety of workers on board ship (the ASH regulations) govern safety and environmental work on board. The regulations apply to workers on Norwegian ships, unless the person only works on board while the ship is in port or only performs inspections on board.

One of the purposes of the ASH regulations is to ensure that the work on board is facilitated and organized in a manner which safeguards the safety and physical health of the workers. Planning and assessment of the working environment, and implementation of the necessary measures, shall take place in cooperation with the workers. Every individual worker shall also receive the necessary training to be able to carry out his work in a safe and proper manner.

Hazards on board shall be identified. When the hazard has been identified, an assessment shall be made. Such risk assessment shall be made on a regular basis, and the results of the risk assessment shall be documented in writing. If a risk to the safety and health of workers is identified, the necessary measures shall be taken to eliminate or reduce the hazards. If a risk cannot be avoided in any other way, appropriate personal protective equipment shall be made available and shall be used.

The regulations stipulate that for vessels which are not subject to a Safety Management System in line with applicable regulations, the company should prepare a uniform, overall plan to ensure that the requirements laid down in the ASH regulations are complied with.

In 2009, the Norwegian Maritime Directorate distributed a circular letter, RSR 08-2009, containing information relating to changes in the ASH regulations which entailed that annual safety and environmental reports should no longer be routinely submitted to the Norwegian Maritime Directorate. However, the reports would still have to be prepared and retained for future verification, or possibly be submitted to the Norwegian Maritime Directorate upon request. The Norwegian Maritime Directorate states that the background for this change was inadequate resources and systems to follow up the reports. Missing reports therefore had limited consequences for those involved, as systems had not been established to verify whether the reports had been submitted. Nor were there any resources to follow up whether the safety and environmental work had been performed in a satisfactory manner. The Norwegian Maritime Directorate expects the new scheme to free up resources to follow up the reports in a more practical manner. The directorate will have the option of requesting to see the reports during inspections and thus map how the ASH regulations are followed up.

1.6.3 Regulations relating to safety management

Regulations of 14 March 2008 No. 306 relating to safety management systems on Norwegian ships and mobile facilities apply to cargo ships with a gross tonnage exceeding 500, passenger ships with more than 100 passengers, ro-ro passenger ships with more than 12 passengers and mobile facilities. The regulations require all shipping companies to have a safety management system in its organization and on the individual

ship or mobile facility in accordance with the ISM Code.[1]. These regulations did not apply to Nysand as the vessel has a gross tonnage of less than 500, but AIBN has nevertheless chosen to refer to this as it is necessary to highlight the totality of the analysis.

1.7 The authorities' supervision

For cargo ships of less than 500 gt, there is a requirement for inspections in connection with renewal of the operational certificate, as well as an intermediate inspection between the second and third year in the certificate period (five-year period). In addition, the authorities can conduct unannounced inspections to the extent they consider expedient.

The authorities' control of cargo ships of less than 500 gt is to a large extent directed towards technical requirements, fire and safety equipment, staffing, qualifications and resting time. Nysand had a valid trade certificate at the time of the accident. The trade certificate for cargo ships was renewed in 2007, and the certificate was issued by the Norwegian Maritime Directorate following an inspection. A number of deficiencies were issued in connection with the certificate renewal. The Norwegian Maritime Directorate does not practice holding ships back, but can issue deficiencies with a deadline for compliance prior to sailing (A deficiency). An A deficiency is a deficiency relating to significant faults or deficiencies which affect the seaworthiness of a vessel, and compliance with such deficiencies must be confirmed by an inspector of the Norwegian Maritime Directorate before the deficiency can be revoked. A deficiency with a deadline for compliance prior to sailing can also be issued if several less serious deficiencies are identified that, together, pose a safety risk that makes sailing imprudent. This was not done in connection with the renewal of Nysand's certificate.

The Norwegian Maritime Directorate can issue temporary certificates if the certificate period expires and the orders have not been sufficiently complied with to warrant issuing a final certificate. Nysand had two temporary certificates issued before being issued with a regular certificate.

In January 2008, the Norwegian Maritime Directorate received reports, in writing and over the telephone, from a person worried about safety deficiencies on board. On this basis, the Norwegian Maritime Directorate conducted an unannounced inspection of the vessel on 6 February 2008. This inspection resulted in several deficiencies with a deadline for compliance before sailing, an inspection order and a demand for withdrawal of the trading certificate due to major steel work having been initiated without requesting an inspection. The Norwegian Maritime Directorate can hold back ships in connection with unannounced audits. The Norwegian Maritime Directorate repeated its demand after a week as they had not received the certificate. On 11 February, the shipping company submitted a request for inspection of the vessel to the Norwegian Maritime Directorate.

On 7 March 2008, the Norwegian Maritime Directorate conducted another unannounced inspection, resulting in new deficiencies with a deadline for compliance prior to sailing.

After the accident, the Norwegian Maritime Directorate routinely conducted an unannounced inspection. This resulted in 20 deficiencies with a deadline for compliance

[1] The international code for safety management for operation of ships and prevention of pollution; International Safety Management Code.

before sailing. One of these deficiencies was to comply with the deficiencies issued on 7 March 2008.

Most of the deficiencies issued in connection with the inspections were of a technical nature, and identical deficiencies had been issued several times. Checklists used during the inspections documented technical deficiencies and faults. Inspections and deficiencies in relation to compliance with the ASH regulations do not emerge to the same extent.

At present, no systematic audits take place in connection with the ASH regulations for cargo ships of less than 500 gt. The Norwegian Maritime Directorate has no specific checklist used to verify compliance with the ASH regulations for this type of ship, nor have any other checklists been prepared.

A checklist has been prepared to check if the shipping company safeguards the working and living conditions of the seamen. This checklist includes checking several provisions pursuant to the ASH regulations. This checklist was not used during inspections on board Nysand, as it is only used for ISM audits.

1.7.1 Implemented measures

Immediately after the accident, the shipping company introduced new routines in connection with arrival and departure. The new routines require i.a. always wearing an inflatable life jacket during mooring operations which can result in falling into the sea. The company has also implemented a safety management system on board based on the ISM Code. AIBN has not reviewed the extent and quality of the safety management system nor the new routines, but have chosen not to address any safety recommendations to the shipping company based on the already implemented measures.

2. ANALYSIS

2.1 Introduction

The general purpose of the analysis is to clarify safety factors and examine factors of significance to prevent accidents and improve marine safety.

AIBN has seen the need for an analysis of the course of events to identify the contributing factors to the accident, and on this basis consider to what extent the authorities and the shipping company facilitated safe operation. The analysis seeks to clarify which safety-related framework conditions had been set by the authorities and the shipping company and the safety level in force at the time of the accident.

The analysis includes an evaluation of shipping company's procedures and routines as regards safeguarding the safety in various working operations on board. The analysis also deals with the relevant regulations and supervision of the vessel.

2.2 Operation of the vessel

The accident took place as the vessel was leaving the quay and the ordinary seaman was reboarding after having let go the mooring lines.

No boatman was used to let go the mooring lines. The hazards that the ordinary seaman was exposed to would have been avoided had a boatman been used.

AIBN believes that if a choice is made to let go the mooring lines without using a boatman, it is even more important to consider the hazards and take precautions to reduce the risk of the operation. There were several measures available that could have reduced the risk of the operation, but which were not used:

- It was never considered to moor by doubling the spring lines back to the ship. This would have made it possible for the crew to let go the mooring without going down on the quay.

- The crew on board was aware that no lines should be let go before the master gave the order, and the routines for when to go down on the quay to be ready was based on experience. However, there were no routines for reporting to the master that the crew member on the quay to let go the mooring lines had made it safely back on board. There was portable radio equipment on board, but this was not used.

- The vessel was scheduled to proceed to Forsand for loading, and was dependent on getting there within a set time to avoid having to wait for another vessel. The fact that the unloading had not been completed at the time of departure caused rolling movements in the vessel, making it harder for the ordinary seaman to get back on board. This also indicates that demands for efficiency impacted negatively on making a safe and controlled departure. In addition, the scoop and arm of the excavator prevented a free line of sight from the wheel house and down towards the quay and side of the ship.

- The vessel had no gate or other opening in the railing, making it more difficult to get on board.

- There was a lot of gravel on the quay, and only a small passage between the heap of gravel and the edge of the quay. This made it more difficult for the ordinary seaman to walk along the edge of the quay, and had a negative impact on the working conditions.

- The crew rarely used inflatable work vests during work which could result in falling into the sea, and no vest was used in this case.

The shipping company had not established routines to review the safety level on board, or to identify hazards or risks, nor had any systematic risk assessments been prepared. Personal protective equipment was available on board, but was not used to a sufficient degree.

The shipping company also lacked an overview of the requirements pursuant to the regulations, hazards on board and which measures were necessary to reduce or remove risks.
There was no efficient safety and environment work on board, and the employees had little involvement in the assessment and planning of the working environment.

The task of letting go the moorings on the quay was not considered very risky. This was an everyday operation where there had been no serious incidents earlier. However, during the investigation it emerged that some of the crew had experienced departures as unpleasant due to time pressure, resulting in stress and poor coordination in the departure phase. In one case, a crew member had been left on the quay after having let go the mooring lines and not having had time to get back on board. Stress can also lead to tunnel vision, which can lead to a lack of overview of the situation you are in.

The training on board was based on the needs considered necessary at the time, and there was little focus on safety and accident-prevention measures in the work operations. The worked was performed on the basis of experience and routines which had always been used, and was based more on a desire for efficiency rather than awareness concerning safety and any hazards related to the work operations.

AIBN understands that some of the individual work operations on board entailing some risk. However, it is important to emphasise that this cannot simply be accepted without considering whether it is possible to reduce or remove risks. Awareness of the operations which were carried out and involvement of the crew in discussions concerning risks and risk-reducing measures will increase the probability of a positive effect in the form of improved safety. Risk assessment of operations is a valuable tool to identify hazards and implement risk-reducing measures. It is important that such tools are used actively and with involvement of all affected personnel, so that previous experience can contribute to mapping and the desired effect. If the risk assessments are carried out without involvement from those who actually do the work, the probability of the whole assessment remaining a formality creating a false sense of safety will be far greater.

No regular safety drills had been held on board for a long time, and there was no systematic safety training of the crew. These factors had also been pointed out by the Norwegian Maritime Directorate after inspections on board. The rescue operation was characterized by chance, lack of coordination and poor communication. Some of this can be explained by the fact that some of the crew entered a shock-like state, but regular and relevant training can to some extent compensate for this.

Both actual conditions on board at time of the accident, the authorities' deficiencies following inspections on board, as well as factors which emerged in interviews with the crew show that there were several areas for improvement in the vessel's operation.

AIBN believes that there were a number of deficiencies in the operation of the ship at the time of the accident. This applies to factors relating to work, health and safety as well as fundamental principles relating to safety management systems.

After the accident, the shipping company has chosen to introduce ISM on Nysand. After some problems with the implementation of ISM at the shipping company's other ship, where the shipping company had entered into an agreement with another company to handle conditions relating to ISM on behalf of the shipping company, the shipping company chose to initiate the work to obtain an approval certificate itself. They realized that they to create a sense of ownership to the system, and thus better adaptation and compliance, they had to familiarize themselves with the requirements resulting from the certification and design the safety management system themselves. It is this system which has been implemented on Nysand, and the shipping company states that they now

consider such a system to be completely crucial to achieve safe operations, provided that the system is adapted to their own organization.

2.3 Regulations

The Ship Safety and Security Act applies to all Norwegian ships, but Nysand, at 469 gt is not covered by the regulations relating to safety management systems. The Ship Safety and Security Act therefore set the requirements related to safety management system for the shipping company and for the operation of Nysand, although the requirements in the ISM Codes have not been made applicable. At present, there are no regulations specifying the scope for a safety management system for vessels of Nysand's size and type.

In the comments to the individual sections relating to new ship safety and security legislation[2] it is stated that the term 'safety management system' shall generally be understood in the same way as in the ISM Code, but that it may have a different meaning for ships not covered by the code where the requirements to the systems are less onerous than in the code. Furthermore, it is stated that the safety management system must be set out in a written document or in another suitable and satisfactory manner, and that it must be possible to verify that the system actually meets the requirements stipulated by laws or regulations. It is also noted that it is not sufficient for the shipping company's management to draw up a system in theory only, but that the system must be implemented both at the shipping company main office and on the individual ship.

In the preparatory work for the new ship safety and security legislation, the ministry emphasized the importance of establishing the safety and environmental work in the shipping companies in a structured, systematic and documentable manner. The ministry's assessment states that *"the draft law does not aim to introduce the ISM Code for all ships as such, but the general application of the main principles underlying the ISM Code*." Furthermore, the ministry states "[*for smaller ships, there is hardly any need to develop bulky manuals and documents, but rather brief descriptions with simple checklists, etc. For ships which now have no requirements for safety management systems, it will be natural with a step-by-step introduction over time, and development of requirements for the scope of the system in cooperation between the authorities and the industry.*" [3]

There are currently no regulations defining the content, scope and documentation of the safety management system for Nysand and similar vessels or shipping companies operating cargo ships of less than 500 gt. AIBN is of the opinion that defining this scope is necessary to make it clearer for the shipping companies which principles form the basis for the safe operation of the vessel. AIBN considers it especially important that the safety management system is adapted to the operation of the shipping company and ship, which the ministry also emphasizes.

As very little time has elapsed since the changes in the regulations were introduced, the Norwegian Maritime Directorate states that it is too early to conclude whether the introduction of ISM on cargo ships in domestic traffic has reduced the number and scope

[2] Odelting Proposition No. 87 (2005-2006) On the Act relating to ship safety and security (the Ship Safety and Security Act), p109
[3] Odelsting Proposition No. 87 (2005-2006) On the Act relating to ship safety and security (the Ship Safety and Security Act), p53

of accidents. However, during audits of these ships it has been experienced that a safety management system is necessary to maintain an overview of the regulations and improve the conditions for safe operation.

AIBN is of the opinion that the introduction of a safety management system could not be expected of the shipping company on board Nysand, in spite of the requirement in the Ship Safety and Security Act. When the new regulations relating to safety management of ships was issued in 2008, one of the changes was the introduction of a requirement for ISM on cargo ships above 500 gt in domestic traffic. This resulted in the shipping company being issued with requirements relating to safety management system on one of its other ships, and in that case the shipping company had to relate to both a set of regulations and guidelines from the Norwegian Maritime Directorate. To expect the shipping company to possess in-depth knowledge of the individual provisions in the Ship Safety and Security Act for factors that the Norwegian Maritime Directorate had not pointed out during its inspections on board, is considered by AIBN to be unreasonable.

In its assessments in relation to the new Ship Safety and Security Act, the ministry writes that it will be natural with a step-by-step phasing in of safety management systems over time. AIBN agrees that this is a sensible approach, but is somewhat surprised at the order of the steps chosen by the Norwegian Maritime Directorate. It may be mentioned here that in the regulations relating to operation of passenger vessels with 12 passengers or less, which will come into force on 1 January 2011, Section 4 requires the establishment of a safety management system, and the scope is described. There are no such regulations for passenger vessels with between 12 and 100 passengers. The Norwegian Maritime Directorate is also working on the introduction of ISM requirements on larger fishing vessels, and requirements relating to safety management systems on fishing vessels in general.

AIBN will in this connection issue a safety recommendation.

2.4 Supervision

Cargo ships of less than 500 gt are mostly covered by the same regulations as ships of more than 500 gt, but the solving of the tasks set by the regulations is to a greater extent left to the individual shipping company. Without requirements to a systematic approach to the operation of the ship, and without the supervision possessing the right tools and systems to verify compliance, there is a risk of more random operation rather than systematic operations which to a far greater extent can handle all aspects of a comprehensive set of regulations related to safe operation of the vessel.

The Norwegian Maritime Directorate does not verify whether safety management systems have been established and implemented on these vessels. When a plan or system has not been established, this makes it harder for both the shipping company and the crew to maintain an overview of the regulations, the safety environmental work to be performed on board and the authorities' verification tasks on board.

During the period 2007-2008, the Norwegian Maritime Directorate conducted a number of unannounced audits on board, without this having any other consequences for the shipping company's operation than having to remedy the deficiencies uncovered. There was little or no control of the safety and environmental work or matters in relation to the

ASH regulations. AIBN is of the opinion that this is extremely important for the overall safety on board, and that the authorities must follow up this.

A safety recommendation is issued in this connection

3. CONCLUSION

AIBN will summarize the investigation into the accident on board Nysand with the following conclusions:

3.1 Contributing factors and the survival aspect

The accident took place as the vessel was leaving the quay and the ordinary seaman was reboarding after having let go the mooring lines.

No boatman was used to let the mooring lines go. There were several possible measures for reducing the risk of the operation, but these were not implemented. If the ordinary seaman had used an inflatable work vest, her survival time would have increased significantly.

The time pressure to get to the next port caused stress and a lack of overview and coordination in the departure phase.

A number of key factors related to the safe operation of the ship were missing. This primarily applies to a number of factors related to work, health and safety. The shipping company had not established the necessary preconditions for safe operation of the cargo ship.

3.2 The regulations

The Ship Safety and Security Act sets requirements for a safety management system also for cargo ships of less than 500 gt, although the requirements of the ISM Code have not been applied. The scope of the safety management system is therefore not defined for ships of this size. AIBN is of the opinion that defining this scope is necessary to make it clearer for the shipping companies which principles form the basis for the safe operation of the vessel.

3.3 Supervision

Cargo ships of less than 500 gt are mostly covered by the same regulations as ships of more than 500 gt, but the solving of the tasks set by the regulations is to a greater extent left to the individual shipping company. Without requirements to a systematic approach to the operation of the ship, and without the supervision possessing the right tools and systems to verify compliance, there is a risk of more random operation rather than systematic operations which to a far greater extent can handle all aspects of a comprehensive set of regulations related to safe operation of the vessel.

There was no efficient safety and environment work on board, and the employees had little involvement in the assessment and planning of the working environment. The authorities have conducted several inspections in recent years, but these have had little

focus on the requirements described in the ASH regulations. The Norwegian Maritime Directorate does not have any routines for verifying compliance with the ASH regulations or whether safety management systems have been established on cargo ship of less than 500 gt.

4. SAFETY RECOMMENDATIONS

The investigation into this maritime accident revealed six areas where the AIBN finds it necessary to make safety recommendations for the purpose of improving maritime safety.[4]

Safety recommendation Marine no. 2010/24T

No safety management system had been established on board Nysand.
The Ship Safety and Security Act requires the shipping company to establish a safety management system for the operation of ships, but there are currently no specifications for the scope of safety management systems for cargo ships of less than 500 gt. AIBN recommends that the Norwegian Maritime Directorate should prepare a specification for the scope of safety management systems for cargo ships of less than 500 gt.

Safety recommendation Marine no. 2010/25T

The Ship Safety and Security Act require supervision of Norwegian ships and safety management systems. The Norwegian Maritime Directorate does not conduct systematic audits of ships of less than 500 gt as regards the ASH regulations or of safety management systems. Key deficiencies with the shipping companies as regards the ASH regulations are not identified during audits. AIBN recommends that the Norwegian Maritime Directorate should introduce systematic supervision to verify compliance with safety management systems and the ASH regulations for cargo ship of less than 500 gt.

Accident Investigation Board Norway
Lillestrøm, 20 October 2010

[4] The investigation report will be submitted to the Ministry of Trade and Industry, which will implement the necessary measures to ensure that the safety recommendations are taken into due consideration.