Investigation Report

C5/2010M

MS NAJADEN (FIN), Collision with the Caland Bridge in the Port of Rotterdam, Netherlands, on 2 June 2010

Translation of the original Finnish report

Onnettomuustutkintakeskus
Olycksutredningscentralen
Safety Investigation Authority, Finland

Osoite / Address: Sörnäisten rantatie 33 C
FIN-00500 HELSINKI

Adress: Sörnäs strandväg 33 C
00500 HELSINGFORS

Puhelin / Telefon: (09) 1606 7643
Telephone: +358 9 1606 7643

Fax: (09) 1606 7811
Fax: +358 9 1606 7811

Sähköposti: turvallisuustutkinta@om.fi tai etunimi.sukunimi@om.fi
E-post: turvallisuustutkinta@om.fi eller förnamn.släktnamn@om.fi
Email: turvallisuustutkinta@om.fi or first name.last name@om.fi

Internet: www.sia.fi

Henkilöstö / Personal / Personnel:

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Hallintopäällikkö / Förvaltningsdirektör / Administrative Director	Pirjo Valkama-Joutsen
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Muut onnettomuudet / Övriga olyckor / Other accidents	
Johtava tutkija / Ledande utredare / Chief Safety Investigator	Kai Valonen

Käännös/ Translation/ Översättning Minna Bäckman

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SUMMARY

The Finnish dry cargo vessel NAJADEN and the car carrier PALMELA informed somewhat after 20.00 on 2 June 2010 to the VMC-ZWN Traffic Control Centre in south-western Holland controlling the Caland Bridge that they needed the bridge to be opened so that they could sail from the Brittanniehaven towards the Caland Canal. The PALMELA reported first, and after her the NAJADEN. The NAJADEN told that she wanted to use the same bridge opening as the PALMELA.

It can be concluded from the radar images later published by the Port of Rotterdam Authority, Division Harbourmaster that two river boats sailed under the fixed part of the bridge during the opening, one of which, the ALEXIA, sailed in the same direction as the NAJADEN and the PALMELA.

During the opening of the bridge, the bridge operator trainee, who at the moment managed the Caland Bridge, monitored the traffic situation by browsing camera pictures, which could be seen in the control table. On the basis of this information the bridge operator trainee concluded that the dry cargo vessel NAJADEN was passing beneath the bridge at a certain moment. In all probability, the bridge operator trainee mistook the river boat ALEXIA, which was passing the fixed part of the bridge, to be the NAJADEN. The bridge operator trainee waited until the ALEXIA had passed beneath the bridge and started the lowering procedure, which means that the movable part of the Caland Bridge closes down. At that moment the NAJADEN informed by VHF radiotelephone that she had not yet passed beneath the bridge. The bridge operator trainee pressed the stop button. The lift bridge stopped by a slow stop approximately six metres below its upmost position.

At 20.42 the NAJADEN reported that she had been hit by the bridge. The part of the bridge to be lifted/lowered hit the roof of the navigating bridge and destroyed almost all equipment on the roof of the navigating bridge and tore off the funnel of the vessel.

The accident had all the ingredients to become fatal with reference to the safety of human life. Personal damages were, however, only just avoided.

An investigation on the incident was carried out in Holland, and the material of this investigation was placed at the disposal of the Safety Investigation Authority, Finland. The inadequate training of the bridge operator trainee, inadequate supervision, the lack of a formal training programme and the lack of a quick, remotely-used emergency stop of the bridge constituted the causes and underlying factors of the accident.

The Safety Investigation Authority, Finland recommends that the VMC-ZWN takes actions so that a real-time, AIS-based radar image of the port area would be available, in addition to video monitoring, in the operating centre of remote-operated bridges. It is also recommended that the VMC-ZWN investigates the visibility of shipping, thereby taking into account the various camera locations and the ergonomics regarding the use of the camera images, and takes appropriate action if improvements are possible. In addition it is recommended that the VMC-ZWN draws a clear procedure requirement on the opening of the bridge and on the final notification to be given after the passing beneath the bridge has been completed. The Safety Investigation Authority, Finland recommends to the Rijkwaterstaat that it includes identifying different vessels and vessel types, goals and responsibilities of trainee and supervisor as part of the training programme and that it would be subject to the safety management system of Rijkswaterstaat.

LIST OF CONTENTS

GLOSSARY OF ABBREVIATIONS AND ACRONYMS

IMO	International Maritime Organization
ISM	International Safety Management Code
kW	Kilowatt
S-VDR	Simplified Voyage Data Recorder
VHF	Very High Frequency
VMC-ZWN	Traffic Control Centre Verkeersmanagementcentrales Zuidwest-Nederland

FOREWORD

The Safety Investigation Authority, Finland received information about the accident on 4 June 2010 and appointed Marine Safety Investigator Risto Repo to act as the investigator-in-charge and Captain Juha Sjölund as an investigator.

The investigators obtained for their use the S-VDR recording of the NAJADEN and statements received from the Master, the Pilot and the Officer of the Watch (OOW) on the course of the events. On the basis of these statements and the S-VDR recording it is clear that the NAJADEN had no share in the causes of the accident. On the basis of the above mentioned, the investigators chose to wait for the investigation[1] which the Dutch authorities had made and which was later sent to the Safety Investigation Authority, Finland. This investigation has been used as a source in this investigation report. Other sources include the statements given by the Master, the Pilot and the Chief Officer.

The description of the functioning of the bridge and the actions taken by the bridge operator as portrayed in Chapter 1, "Events and investigations", is based on the investigation report compiled by AdviSafe.

The final draft of this Investigation Report was sent to the Shipping Company, Bridge operator, Port of Rotterdam and Dutch Safety Board for possible comment. Parties answered with some textual suggestions, which were considered in the final version of the Report. The Shipping Company and Dutch Safety Board had the opinion of the Safety Recommendations that they are relevant.

The time used in the investigation report is local time (UTC+2h).

The sources used in the investigation are filed at the Safety Investigation Authority, Finland.

The Investigation Report has been translated into Swedish and English by Minna Bäckman.

[1] AdviSafe Incident Investigation Flying Squad, a company specialized in risk management, made an investigation on the incident on the order of Rijkswaterstaat, the executive arm of the Dutch Ministry of Infrastructure and the Environment.

1 EVENTS AND INVESTIGATIONS

1.1 The vessel

1.1.1 General information

Figure 1. MS NAJADEN. (© Rettig-Bore)

MS NAJADEN	
Type	Container/dry cargo vessel
Year of construction	1989 Sietas Hamburg
Nationality	Finland
Home port	Helsinki
Call sign	OIZB
IMO number	8806137
Class	LRS+110A1, Finnish/Swedish ice-class 1A
Length (Loa)	104.81 m
Breadth (moulded)	16.00 m
Draft, max.	5.78 m
Deadweight	4402 t
Gross tonnage	3826
Net weight	2043
Speed of ship	14 knots
Main engine	Wärtsilä 8R32D, 2960 kW
Bow thruster	300 kW
Air draft	28 m

1.1.2 The Caland Bridge

The Caland Bridge is a 1969-completed steel lift bridge in Rotterdam-Europoort harbour crossing the Caland Canal and owned by ProRail. The undercrossing of the lift bridge is 50 metres high and 60 metres wide. There are 2×2 traffic lanes, two goods railways, one pavement and one cycle path on the bridge. The passing beneath the Caland Bridge forms a connection between the port of Brittanniehaven and the Caland Canal.

The Caland Bridge has been operated remotely from the VMC-ZWN since 2008. In case of any malfunctions, the bridge can be operated both by using programme software and also mechanically in situ. There is a two year action plan (2010) to fit all bridges controlled by VMC-ZWN Traffic Control Centre with a remote emergency stop. This requires radical changes in the structures of the bridges so that serious damages to them can be avoided, especially in the case of the Caland Bridge.

All bridges served by operators of the Port of Rotterdam Auhority, are fitted with a remote emergency stop. It is not unusual to operate objects remotely. The condition for this is, however, that the loss of information caused by the lack of direct visual contact is compensated by first-class support equipment.

Figure 2. Caland Bridge. Vessels in the image are not related to this investigation. (Source: www.beeldbankvenw.nl)

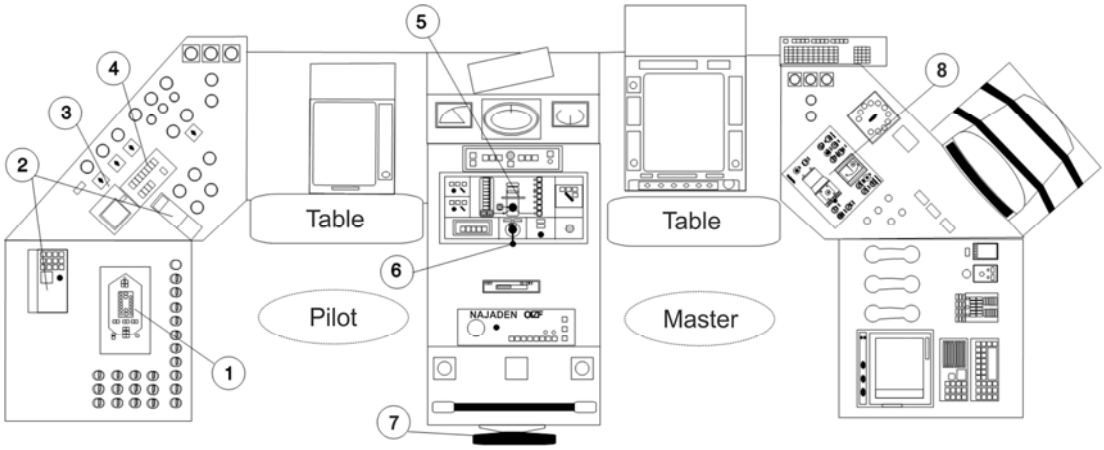
1.1.3 Manning of the control centre of the Caland Bridge at the time of the accident

The bridge operator trainee, who had operated the Caland Bridge remotely four times from the traffic control centre, had been to the Caland Bridge twice and operated it once in situ, was alone in the control centre of the Caland Bridge at the time of the accident. During the opening of the bridge, the experienced bridge operator was convinced that the bridge operator trainee was capable of opening and lowering the bridge properly, and checked this also with the trainee. At the moment when the bridge was being lowered, the experienced bridge operator had left the room for a moment.

1.1.4 Manning of the Najaden

The ship's crew comprised of ten persons: eight Finns and two Estonian able-bodied seamen. The Master had 41 years of seagoing experience, whereof he had served 22 years as a Master. On this particular vessel and on its sister ships he had served since 1998.

1.1.5 Navigating bridge and its equipment



1	Navigation lights	5	Autopilot Anschütz Nautopilot D
2	VHF DSC radio	6	NFU handsteering
3	Smoke detector	7	NFU handsteering for wheelman
4	Fire alarm	6	Engine control

Figure 3. The navigating bridge of the vessel.

1.1.6 Passengers and cargo

There were neither passengers nor cargo on the vessel.

1.2 The accident event

1.2.1 Weather conditions

There was light breeze and the visibility was good. The weather conditions did not affect the accident event.

1.2.2 The accident voyage and preparations for it

The NAJADEN finished discharging her cargo in Brittanniehaven berth no.5228 in Rotterdam at 19.20 on 2 June 2010. The following voyage the vessel was going to undertake, was a ballast voyage to Fowey, England. The First Officer of the vessel had drawn a route plan which included waypoints from the berth to the Pilot boarding area in Fowey. Departure draft fore was 3.1 metres and aft 4.2 metres. The Master completed the preparations for the departure according to the check-list. The Pilot boarded the vessel at approximately 20.30. The Master informed the Pilot about the vessel's tendency to turn to starboard if the engine was used to astern too quickly. The Pilot Card, which comprised detailed information of the vessel, was on a table in the navigating bridge.

While the vessel was still moored, the Pilot reported to the Traffic Centre on VHF channel 11 and to the Rozenburg area on VHF channel 65 that the vessel was ready for departure. He also informed the bridge operator on channel 22 that the air draft was 28 metres. The bridge operator reacted after a moment on channel 22 and asked whether the NAJADEN could use the same opening of the bridge as the car carrier PALMELA, which was just then being assisted towards the Caland Bridge by two tugs. The Pilot of the NAJADEN confirmed that this was okay. The Master of the NAJADEN understood this discussion even though it was carried out in the Dutch language.

The NAJADEN was let go from the quay at 20.30, and the vessel set off to follow the PALMELA as the Pilot was at the wheel. The Master stood close to the controls of the main engine. Both radars were at use. At 20.38 the NAJADEN sailed out from Brittanniehaven basin and started to head towards the Caland Bridge. The PALMELA was then still beneath the bridge. The speed of the NAJADEN was approximately 2–3 knots. The NAJADEN kept the distance between the vessels at 1.5–2 cables[2]. The Pilot noticed that the traffic lights of the bridge indicated green and red. The Pilot told the Master that the speed was not to be increased. The Pilot asked the bridge operator on VHF channel 22 whether the lights were shown to the NAJADEN in order to stop the vessel. The bridge operator stated that this was not the case and that the NAJADEN could pass beneath the bridge. At the same time the traffic lights of the bridge turned green only, and the Pilot informed the Master that it was okay to pass beneath the bridge. The speed of the NAJADEN was increased to approximately 4.8 knots for passing beneath the bridge.

[2] A cable is a unit used in seafaring; it is the tenth of a nautical mile, i.e. 185.2 metres.

1.2.3 The scene of the incident

Figure 4. Map of the incident area. The red arrow indicates the arrival course of the NAJADEN to the Caland Bridge. (Map: www.portofrotterdam.com)

1.2.4 The incident

When the car carrier PALMELA had drawn as long a distance as approximately 500 metres from the Caland Bridge, the bridge operator trainee noticed on the camera screen that another vessel was passing beneath the Caland Bridge. When the vessel, which could be seen on the screen, had passed beneath the Caland Bridge, the bridge operator trainee concluded that the other vessel which had reported for the opening of the bridge, i.e. the NAJADEN, had passed beneath the bridge.

As it happened, this was not the case, as the vessel in question was the river tanker ALEXIA (see Figure 6), which passed beneath the fixed part of the Caland Bridge, right next to the bridge pier. The bridge operator trainee thought that the fairway going under the Caland Bridge was at that particular moment free of any vessels.

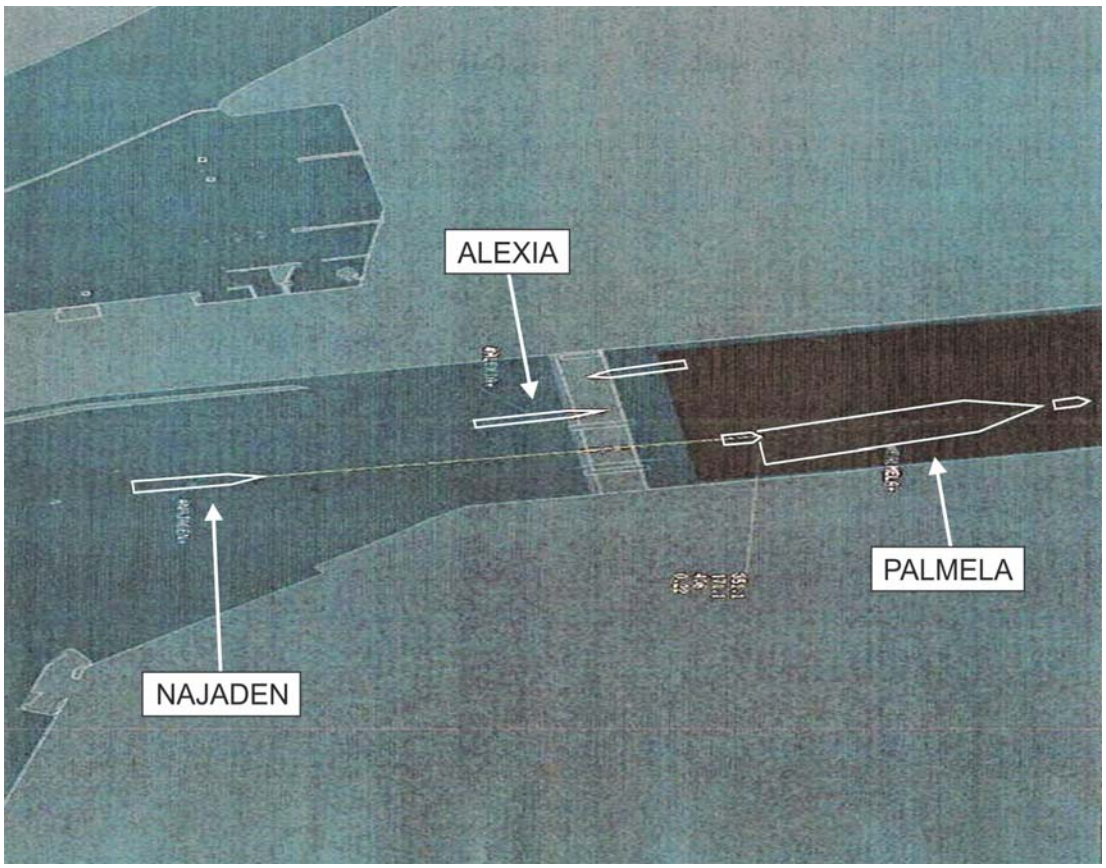


Figure 5. The radar image shows the position of the vessels at the moment when the trainee by mistake thought that the ALEXIA was the NAJADEN. There was not any radar screen in the control centre. The trainee based the observations upon the picture of a live camera. (Source: Port of Rotterdam Authority, Division Harbourmaster)

After the bridge operator trainee was convinced that the route passing beneath the Caland Bridge was free, the lowering of the bridge was commenced by using the control buttons of the programme software “svs rood” (*svs red*) and “brug neer” (*bridge down*).

When the NAJADEN was beneath the bridge, the Pilot noticed that the lift bridge was starting to come down. The Pilot tried to contact the bridge operator and informed that the NAJADEN had not yet passed beneath the bridge. The Master set the engine power on full thrust ahead so that the vessel could pass beneath the bridge before the bridge came down.

When the bridge operator trainee heard the Pilot’s announcement, he pressed the emergency button which led to a slow stop. The NAJADEN did not, however, have enough time to pass beneath the bridge, and the roof of the vessel’s navigating bridge, bridge equipment, mast and funnel hit the lift bridge.

Figure 6. The river tanker ALEXIA, the deck hatches of which were in the Dutch investigation described to be similar with those of the NAJADEN. (© Arie Jonkman)

1.2.5 Measures after the accident event

The speed of the vessel was so high that it did not stick fast to the bridge. After the accident, the main engine was still running but the rudder did not function. Most of the appliances on the navigating bridge switched off. The Chief Engineer went and turned the rudder midships by using emergency steering. During the following minutes the Pilot contacted the tugs, which were assisting the PALMELA, by using a portable radiotelephone on channel 44 and requested their assistance. The tugs reacted immediately and came to assist the NAJADEN. The Pilot asked the Master of the NAJADEN to stop the main engine in case of a possible danger of fire. The Pilot used his portable radiotelephone to contact the Pilot Service Centre and asked them to inform other authorities of the incident and that the communication equipment of the NAJADEN was broken.

At 20.52 the tugs SD SEAL and RT SPIRIT were fastened to the NAJADEN and they kept the vessel still while it was waiting for berth. The Master stopped the main engine immediately after the tugs had been fastened. At 20.55 the Pilot Service Centre informed that the vessel could proceed to Caland jetty number 3, to which the vessel moored at 22.20.

1.2.6 Injuries to persons

There were no physical injuries to persons.

1.2.7 Damages to the vessel

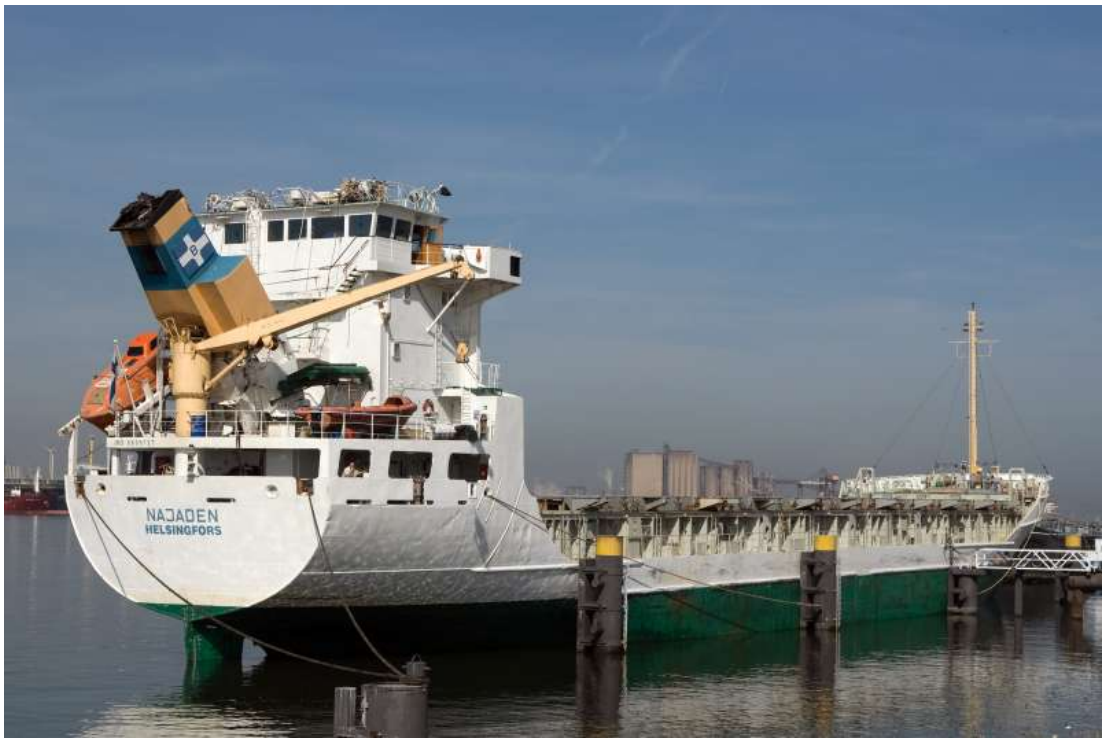


Figure 7. The NAJADEN moored to the Caland jetty number 3.

Figure 8. Damages to the vessel were rather extensive.

The lowering speed of the bridge is illustrated by the fact that the magnetic compass located in the fore part of the navigating bridge remained intact whereas the structures located more aft were swept away.

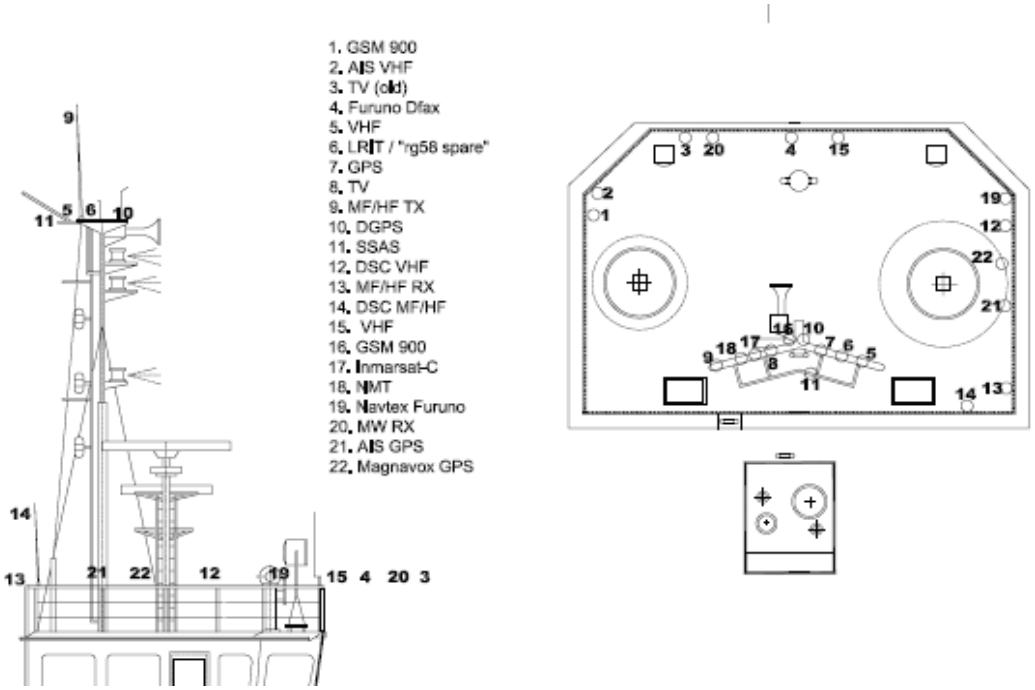


Figure 9. The equipment located on the roof of the navigating bridge.

1.2.8 Other damages

The Caland Bridge did not suffer any serious damages. The lives of the persons who were on the navigating bridge were in danger. If the coming down of the Caland Bridge had occurred even a little earlier, the consequences would have been very serious.

1.2.9 Fire

No fire.

1.2.10 Registration equipment

In the vessel there was a S-VDR, which recorded the VHF traffic.

1.2.11 Operation of the VTS and supervision systems

The local VTS traffic control system VMC-ZWN took care of operating the Caland Bridge by using remote control. It was possible to open the bridge by the remote control and to emergency stop it by a *slow* stop. A quick stop can only be activated on the bridge itself.

1.2.12 The port and port equipment and fairway equipment

Operating the Caland Bridge

The operator who works remotely must familiarize himself/herself with remote control. One part of this is to learn to know the object in question in situ. Each object, in this case a bridge, is different. The operating system of the bridge is fundamentally similar in every bridge, but the local traffic varies from one bridge to another.

The bridge operator has a big screen in front of him/her. Pictures transmitted by several cameras can be seen on this screen. Some of these pictures can be zoomed in separately and, when the cameras are movable, used actively (e.g. to monitor a certain vessel).

A quick stop places strong forces on the mechanical parts of the bridge thus causing possible wear-and-tear. According to the operating instructions[3] of the bridge machinery, an emergency button must be available for the bridge operator to enable a slow stop.

The operating instructions were revised after the accident, and according to the new instructions the bridge operator should have an emergency button available for a quick stop.

There was a two-year realization plan to change all the remotely-operated VMC-ZWN bridges. Thus it was not possible at the VMC-ZWN to quickly emergency stop the Caland Bridge remotely.

1.3 Rescue activities

1.3.1 Alerting activities

The Pilot took care of alerting different authorities immediately after the accident by using his portable radiotelephone. The communication equipment of the NAJADEN was broken in the accident.

1.3.2 Initialising rescue activities

The tugs were in vicinity and it only took them a couple of minutes to get control of the NAJADEN. This meant that it was possible to avoid further damages, which could have resulted from the vessel drifting away from the fairway.

1.3.3 Evacuating passengers

No evacuation.

[3] The operating instructions were in force when the Caland Bridge was changed into a remotely-used bridge (2004/2005).

1.3.4 Rescuing the vessel

The personnel of the vessel and the tugs, which were in vicinity, got the situation under control so there were no further damages.

1.4 Completed special investigations

1.4.1 Investigations on the accident vessel and at the scene of the event

AdviSafe investigated the actions of the bridge operator trainee during the accident and inquired into the shortcomings related to the incident. The investigations showed that the personnel of the NAJADEN did not play any part in causing the accident.

1.4.2 Technical investigations

AdviSafe questioned persons who were directly or indirectly involved with the accident. Before the analysis and after it they visited the VMC-ZWN and especially the control centre of the Caland Bridge.

1.4.3 The bridge operator's actions

The bridge operator trainee had an opportunity, under the supervision of an experienced bridge operator, to open the bridge, because getting familiar with using the Caland Bridge was a logical part of the training programme. The trainee remote operated the bridge for the fifth time. This way of working is a training method, which provides the operator trainee with an opportunity to under supervision gain experience of the bridge, which he/she is not yet quite familiar with.

1.4.4 Organization and management

The vessel traffic of south-western Holland is monitored by VMC-ZWN and only the Caland Bridge is remote-operated at the VMC-ZWN.

The other bridges are operated by Port of Rotterdam Authority, Division Harbourmaster.

1.4.5 Other investigations

The camera pictures transmitted for the operating of the bridges are not recorded. Only when the Port of Rotterdam Authority, Division Harbourmaster handed over the radar images on the incident (see Figure 5) did the bridge operator trainee in question realise what exactly had occurred in connection with the Caland Bridge incident.

These radar images are only used as a means to define which vessels sail there and what their speeds are. The actual opening of the bridge takes place on the basis of camera pictures, not on the basis of radar images as they are not available on the bridge operators control desk.

1.5 Rules and regulations guiding the operations

1.5.1 National legislation, administrative orders and instructions

There are agreements commonly in force drawn for the communication taking place between traffic stations/traffic centres and the masters of the vessels, the pilots, etc. The vessels wanting a bridge opening to take place must according to a certain procedure notify about it on a VHF channel suitable for the purpose. There are **not any** formal regulations on the final notification after passing beneath the bridge has been completed.

VTS Communication Regulation, Port of Rotterdam Authority
Extract from the Chapter 4.2
All vessels wishing to pass beneath a bridge or through a lock must submit request (Via designated VHF channels) that these structures be operated, as described in Appendix 1 "Communication channels".(Caland Bridge VHF channel 22). The same applies to vessels submitting request for information (to the bridge master or lock keeper in question) about the order of passage.

Some vessels are obliged to report (e.g. due to their size, because they transport dangerous goods, etc.). In this way the bridge operator is able to identify the vessels which have reported from the dynamic port chart and monitor how they proceed. Other vessels do not have any obligation to report. As moving targets they do not have any special features visible on the screen.

Persons who have seafaring experience and/or NAUTOP 2[4] qualification are sought to work as bridge operators at the VMC-ZWN. In practice it has proved to be difficult to find persons who fulfil these requirements, and such persons are taken on who on the basis of the training programme get familiarized with using the bridge under the guidance of experienced bridge operators who themselves have the NAUTOP 2 qualification.

The required training does not include practical modules related to actual operational activities, nor does it include familiarization with identifying different vessel types.

1.5.2 The operator's orders

The NAJADEN has a Safety Management System in accordance with the ISM Code.

1.5.3 International agreements and recommendations

According to the investigators' understanding, there are not any international agreements or recommendations on this kind of matter.

[4] The *Ministerie van Verkeer en Waterstaat* has made (on 15 April 2003) an inventory on all operations, which have to be included in NAUTOP, as an implementation of Article 5 on the decision including rules on the authority to issue traffic information and traffic advice and to answer to them in proper form and on the requirements on authorized persons. These operations have been grouped in three competency groups, i.e. NAUTOP 1, 2 and 3, in which attention is paid on the difficulty and nature of the work. The tasks of a bridge operator belong to NAUTOP 2 group.

1.5.4 Quality systems

It has been informed that the VMC-ZWN follows the ISO-9001 quality system.

2 ANALYSIS

2.1 The training of bridge operators

The operator who works remotely must familiarize himself/herself with the remote control of the bridge. One part of this is to learn to know the object in question in situ. Each object, in this case a bridge, is different. The operating system of the bridge is fundamentally similar in every bridge, but the local traffic varies from one bridge to another. In this case the bridge operator trainee had operated the Caland Bridge remotely as many as four times from the traffic control centre and been to the Caland Bridge twice and operated it once in situ. How familiar the bridge is partly defines how the camera pictures, on the basis of which the remote operating takes place, are interpreted.

If the object is familiar, it is easier to interpret the pictures which the cameras transmit from the object in question. The bridge-specific training of working with camera provided pictures is part of the training of an operator. The bridge operator has a big screen in front of him/her. Pictures transmitted by several cameras can be seen on this screen. Some of these pictures can be zoomed in separately and, when the cameras are movable, be used actively (e.g. to monitor a certain vessel).

During the training period the bridge operator learns which camera number corresponds with which picture; he/she learns to estimate better the passage time of vessels, to interpret and discern different types of vessels also in various light conditions, e.g. in the evening, and to make an estimate on the overall picture generated by the camera pictures in the correct context.

The bridge operator trainee had completed a two-month training period for the Spijkenissebrug Bridge, and he was now gaining experience from using the Caland Bridge.

The training of a bridge operator thus takes place at the place of work, especially with reference to the mode of operating, and it is performed by experienced bridge operators. There was not any formal training programme with reference to this[5]. The training usually consists of using one or several defined objects for the duration of two months and under the guidance of one permanent mentor until both the mentor and the trainee can be convinced that the trainee “masters” the use of the object in question and can perform it independently. Any clear, objective criteria have, however, not been developed for this purpose. When the trainee has made himself/herself familiar with one or several bridges, information about the training with reference to the bridge(s) in question is entered into the training programme. This step means that the trainee “is let” to operate the bridge independently.

In this way both the bridge operator trainee and the mentor lacked any structural framework for the training. The trainer (the mentor) had not received any separate training for the tuition of the trainee.

[5] After the incident the applied programme A for road traffic operators has been brought into use at the traffic control centre.

The training on the place of work partly depends on the available opportunities. In the case of the accident of the NAJADEN, the bridge operator trainee sat at the control table of the Spijkenisse Bridge (which is known to be a "difficult" bridge because of current and traffic, and because the bridge has two parts). When the requests to open the Caland Bridge were received, the bridge operator trainee got an opportunity to open this bridge under the supervision of an experienced bridge operator. Training to use the Caland Bridge was part of the training programme. The trainee remote-operated the bridge for the fifth time.

2.2 The bridge operator trainee's actions

The impression based on the camera pictures that the passage under the Caland Bridge was free of any vessel traffic, was not correct. When the car carrier PALMELA had drawn as long a distance as approximately 500 metres from the Caland Bridge, the bridge operator trainee noticed from the camera picture that another vessel was passing beneath the Caland Bridge. When the vessel, which could be seen on the screen, had passed beneath the Caland Bridge, the bridge operator trainee concluded that the other vessel which had reported for the opening of the bridge, the NAJADEN, had passed beneath the bridge.

As it happened, this was not the case, as the vessel in question was the river tanker ALEXIA, which passed beneath the fixed part of the Caland Bridge, right next to the bridge pier. If the trainee had received adequate training to interpret camera pictures, it might have been possible to avoid the incorrect impression (see Figure 5). The experienced operator who supervised the operator trainee's work left the scene for an instant at a critical moment. Therefore it was not possible to notice that the trainee had interpreted the picture in an incorrect way.

The river boat ALEXIA is a tanker. Its superstructure is clearly different from the superstructure on the dry cargo/container vessel NAJADEN. The operator trainees do not get enough training in identifying different vessel types in their schooling.

Only when the Rotterdam Port Authority, Division Harbourmaster handed over the radar images on the incident (see Figure 5) did the persons in question realise what exactly had happened in connection with the Caland Bridge incident. The radar images are only used as a means to define which vessels sail there and what their speeds are. The actual opening of the bridge takes place on the basis of camera pictures, not on the basis of radar images.

The PALMELA and the NAJADEN had reported for the opening of the bridge in the situation connected to this incident. In addition, two river vessels could be seen on the screen. They were sailing beneath the fixed part of the Caland Bridge. These low vessels had not reported to the bridge operator because there is no need to open the bridge for them. The dynamic port map is not meant to support the bridge operating procedure but solely to provide information on the vessels which are in the proximity of the bridge.

2.3 The point of time for using the “Bridge down” button

When the bridge operator concludes that the vessels which have reported for the opening of the bridge have passed beneath the bridge, the software push button “Bridge down” is being used. There are differing opinions on the exact point of time when this operation is to be carried out. In some cases this happens when the vessel in question has passed beneath the bridge, in other cases when the vessel is still under the bridge, when it is deemed that it is safe to start lowering the bridge.

Vessels are not required to make any final notification after passing beneath the bridge. Making a final notification would be a procedure, which would ascertain that the vessel and the bridge operator share a correct, mutual view of the situation.

3 CONCLUSIONS

The accident was very dangerous with reference to human life and vessel safety, and personal damages were only just avoided. This accident also showed that a bridge operator holds a very responsible task and requires more efficient training.

The direct cause of the accident can be considered to be inadequate experience in interpreting camera pictures and in identifying vessel types. Insufficient training, the operator trainee acting without the supervision of the experienced bridge operator, the lack of a formal training programme and the absence of the remote-use of a quick emergency stop constituted the contributing factors.

The fact that there is no final notification procedure can be regarded as a missing safety procedure.

Whether the Caland Bridge is operated safely has not been assessed thoroughly enough, because the result has been that the bridge is remote-used without any possibility to use a quick emergency stop.

4 IMPLEMENTED MEASURES

The following has been presented in the report drawn by the Flying Squad:

A careful assessment on whether a trainee is capable of operating a bridge independently shall be included in the training programme of bridge operators.

5 SAFETY RECOMMENDATIONS

This accident proves that if the current method is used, it is possible to make mistakes when interpreting the passing beneath the bridge.

1. *It is recommended that the VMC-ZWN takes actions so that a real-time, AIS-based radar image of the port area would be available, in addition to video monitoring, in the operating centre of remote-operated bridges.*

2. *It is recommended to the Rijkwaterstaat that it includes identifying different vessels and vessel types, goals and responsibilities of trainee and supervisor as part of the training programme and that it would be subject to the safety management system of Rijkswaterstaat.*

For a not (yet) trained bridge operator, the various images of the bridge could be confusing, especially if the images change, e.g. one screen or part of the screen shows alternating images of separate viewpoints. Also of importance for a good view on the bridge is the location of the camera's. Figure 2 -like view could be possible one for the operator in case.

3. *It is recommended that the bridge operator VMC-ZWN investigates the visibility of shipping, thereby taking into account the various camera locations and the ergonomics regarding the use of the camera images, and takes appropriate action if improvements are possible.*

According to the instructions, a before-hand agreement must be made on the opening of the bridge, but after the passing beneath the bridge has taken place, no final notification is required. A final notification would be an additional safety measure of vital importance.

4. *It is recommended that the VMC-ZWN draws a clear procedure requirement on the opening of the bridge and on the final notification to be given after the passing beneath the bridge has been completed.*

Helsinki, 12 April 2012

Risto Repo Juha Sjölund

LIST OF SOURCES

The following sources are filed at the Safety Investigation Authority, Finland:

1. The Master’s report on the accident.
2. The Pilot’s report on the accident.
3. The Chief Officer’s report on the accident.
4. Investigation report compiled by AdviSafe.
5. Photographs and other material obtained from the shipping company of the NAJADEN.