Bundesstelle für Seeunfalluntersuchung
Federal Bureau of Maritime Casualty Investigation
Federal Higher Authority subordinated to the Ministry of Transport
and Digital Infrastructure

Investigation Report 364/14

Very Serious Marine Casualty

Fatal accident due to a rescue boat on the MTM WESTPORT falling from height during a boat manoeuvre on the Outer Elbe roadstead on 21 November 2014

20 November 2015

The investigation was conducted in conformity with the Law to improve safety of shipping by investigating marine casualties and other incidents (Maritime Safety Investigation Law – SUG) of 16 June 2002, amended most recently by Article 1 of 22 November 2011, BGBl. (Federal Law Gazette) I p. 2279.

According to said Law, the sole objective of this investigation is to prevent future accidents and malfunctions. This investigation does not serve to ascertain fault, liability or claims (Article 9(2) SUG).

This report should not be used in court proceedings or proceedings of the Maritime Board. Reference is made to Article 34(4) SUG.

The German text shall prevail in the interpretation of this investigation report.

Issued by:
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1 Summary

At about 0830[1] on 21 November 2014, the Hong Kong-flagged tanker MTM WESTPORT was laid up at anchor in the Outer Elbe roadstead waiting for a berth in the port of Hamburg. It was intended that the time spent waiting be used for boat manoeuvres. Situated on the starboard side of the superstructure, the rescue boat was lowered into the water and hoisted again several times with three crew members. On the last occasion that the davit was retracted, at about 0912, the wire rope parted and the boat fell back into the water. Two of the three crew members were recovered with serious injuries and taken to a hospital. The third crew member succumbed to his injuries at the scene of the accident.

This investigation has revealed that an undersized wire rope was used, which over the course of time had already corroded. Furthermore, the damaged limit switches had been bypassed, enabling additional forces to act on the entire system.

[1] Unless stated otherwise, all times shown in this report are local = UTC + 1 (CET).

2 FACTUAL INFORMATION

2.1 Photo

ã WSP

Figure 1: Photo of ship

2.2 Ship particulars

Name of ship:	MTM WESTPORT
Type of ship:	Tanker
Nationality/Flag:	Hong Kong
Port of registry:	Hong Kong
IMO number:	9185920
Call sign:	VRGN6
Owner:	MT Maritime Private LTD.
Year built:	2000
Shipyard/Yard number:	Shin Kurushima Dockyards Co., LTD. Hiroshima Shipyard/5010
Classification society:	Nippon Kaiji Kyokaj
Length overall:	147.83 m
Breadth overall:	24.2 m
Gross tonnage:	11,951
Deadweight:	19,997 t
Draught (max.):	9.44 m
Engine rating:	6,178 kW
Main engine:	Mitsubishi Kobe diesel engine
(Service) Speed:	14.7 kts
Hull material:	Steel
Hull design:	Double hull
Minimum safe manning:	16

2.3 Voyage particulars

Port of departure:	Rotterdam
Port of call:	Hamburg
Type of voyage:	Merchant shipping, international
Cargo information:	In ballast, gas free
Manning:	22
Draught at time of accident:	4.70 m
Pilot on board:	No
Canal helmsman:	No
Number of passengers:	0

2.4 Marine casualty or incident information

Type of marine casualty or incident:	Very serious marine casualty (and accident involving people)
Date, time:	21 November 2014, 0912
Location:	Outer Elbe roadstead
Latitude/Longitude:	φ 54°03.27'N λ 008°07.95'E
Ship operation and voyage segment:	At anchor
Place on board:	Starboard side of superstructure
Consequences (for people, ship, cargo, environment, other):	One crew member succumbed to his injuries. Two others survived but were seriously injured. The rescue boat and davit system were damaged. There was no damage to the environment

Excerpt from Nautical Chart 1452, BSH

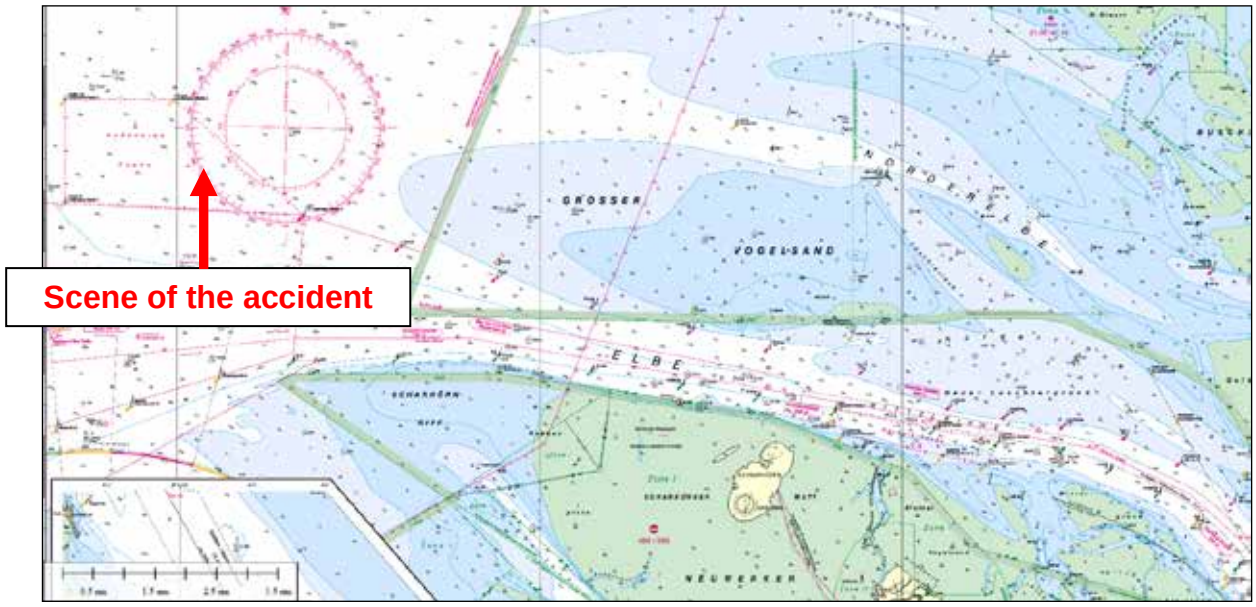


Figure 2: Nautical chart showing the scene of the accident

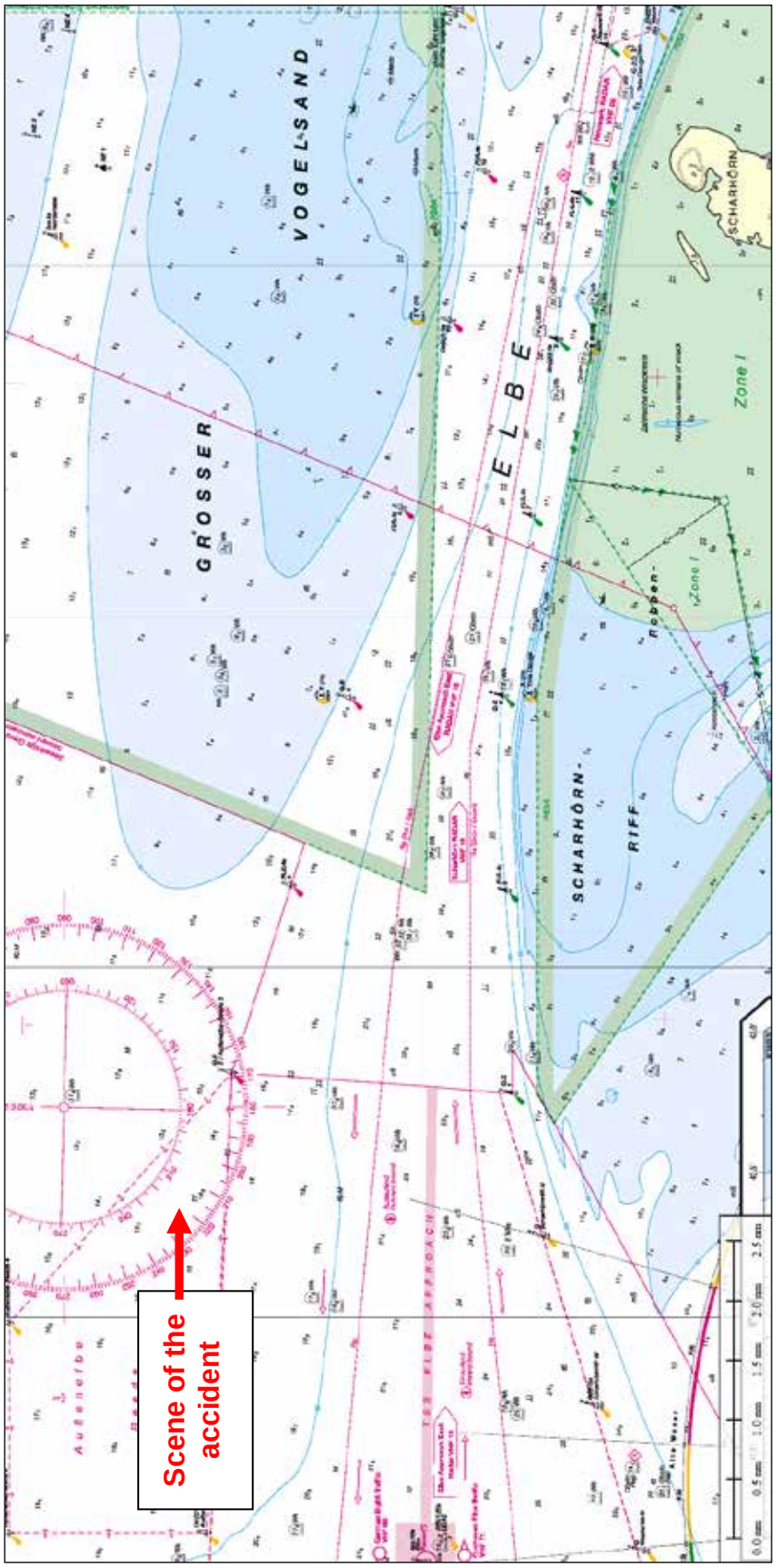


Figure 3: Nautical chart (detail)

2.5 Shore authority involvement and emergency response

Agencies involved:	German Maritime Search and Rescue Service, Vessel Traffic Service (VTS) Wilhelmshaven, hospital in Wilhelmshaven
Resources used:	Helicopter and rescue cruiser
Actions taken:	The three casualties were collected, first aid administered, and transport to hospital
Results achieved:	One fatality, two seriously injured

3 COURSE OF THE ACCIDENT AND INVESTIGATION

The Hong Kong-flagged tanker MTM WESTPORT was on a ballast voyage from Rotterdam to Hamburg. Since the berth was still not available, the ship anchored on the Outer Elbe roadstead. The ship's command intended to spend the time practising required manoeuvres with the rescue boat.

3.1 Course of the accident

The manoeuvres started at about 0800 on 21 November 2014. The davit system for launching and recovering the rescue boat was on the starboard side. One member of the crew took photographs during the drills. The boat was launched and recovered using the davit system several times before the accident occurred.

The boat was manned by the following three people when the accident occurred:

- P1: second engineer
- P2: mechanic
- P3: chief officer

All three crew members were wearing a survival suit and lifejacket. They were sitting on the inner bottom. The rescue boat had the painter attached.
Standing at the winch, the davit system is lowered by operating the winch brake lever and then hoisted again using the electrical pushbutton. Witness testimony indicates that the electrician[2] carried out this task cautiously.
As part of the exercise, the boat was swung out with the davit system. This operation is made possible only by opening the winch gravity brake. At the same time, two spring-loaded cylinders draw the davit system with boat to the outermost position and the boat is then lowered to the water surface.
Floating in the water, the boat was not separated from the davit falls (the subsequently parted wire rope) on the morning in question. Instead, the operator at the electrical pushbutton hoisted her to the buffer on the davit head using electrical winch power. Once the hook on the davit head is reached, the davit is swung in – against the cylindrical forces – using the electrical winch (see Figures 4-7).

[2] The electrician is responsible on board for the operation and maintenance of all the electrical equipment

Figure 4: Start of manoeuvre; davit system still retracted

Figure 5: Boat lowered to the water

Figure 6: Boat is hoisted out of the water until the davit head is reached

Figure 7: Davit system retracted with the boat

At about 0912, the last time the davit was hoisted, the wire rope parted suddenly between the two upper guide pulleys at a point that is about 700 mm from the top edge of the hook. Since the hook rested on the upper jaw of the davit head, the boat did not drop immediately. The davit head released the hook and the boat dropped down to the surface of the water only after the spring-loaded cylinders had extended the davit completely.

Allowing for the ballast draught, the height of the fall from the stowage deck to the waterline is about 13 m.
The boat remained buoyant. Any water taken on ran out of the self-draining openings on the boat, meaning only very little water remained in her. The hook fell into the boat with the end of the parted cable because it was connected to her bridle. The outboard engine assembly broke and the engine sank. The boat was pulled forward from the crew side using the painter. Two crew members climbed down to the boat to assist.
P2 jumped out of the boat and fell into the water away from her when she was extended/dropped out of control. The crew of the SAR helicopter hoisted him from the water about 400 m aft of the ship at about 0952 in a harness. He was not wearing a lifejacket and his survival suit was open at the collar. He was flown to a hospital in Wilhelmshaven with symptoms of hypothermia.
P1 also managed to jump out of the boat. He was hauled back into the rescue boat by P3. Two crew members of the German Maritime Search and Rescue Service's tender VERENA, which had arrived in the meantime, found him there shortly after lying on his back unconscious and showing no signs of life. Immediately initiated attempts at resuscitation were unsuccessful, as were further efforts on the VERENA and in the rescue cruiser HERMANN MARWEDE's medical room. The SAR helicopter flew a doctor from the ship CEOMA AMAZON, which was in the vicinity, to the HERMANN MARWEDE and this doctor pronounced P1 dead at 1130.
P3 fell in a sitting position with the boat onto the surface of the water. He then removed his survival suit, put the lifejacket back on, and attracted attention after P1 was recovered. He complained of back pain. He was collected from the rescue boat by the SC FALCON, then winched up by the SAR helicopter and also flown to a hospital in Wilhelmshaven.

Figure 8: Evacuation of the casualties by the SAR helicopter

Figure 9: Rescue cruiser HERMANN MARWEDE

3.2 Investigation

The BSU commissioned expert Dipl.-Ing. Jan Hatecke[3] with the production of an opinion to determine the cause of the accident. This opinion was considered in the BSU's report.

3.2.1 Description of boat and davit system

The data were taken from the following certificates: the layout drawing '(General Arrangement SA 1.5/MOB 17LV(FME 3.3) Shin Kurushima' dated 11 May 1999 and the instruction manual.

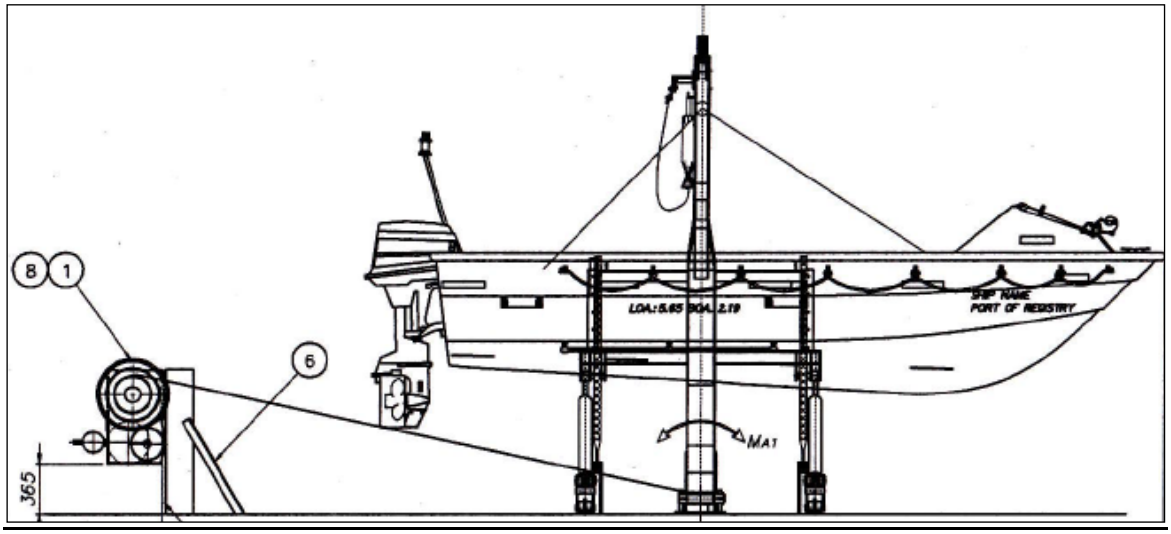


Figure 10: Side view of the davit, boat, and winch

[3] Publicly appointed and sworn expert (IHK Stade for the Elbe-Weser region) Subject life saving equipment and rescue equipment on board of ships

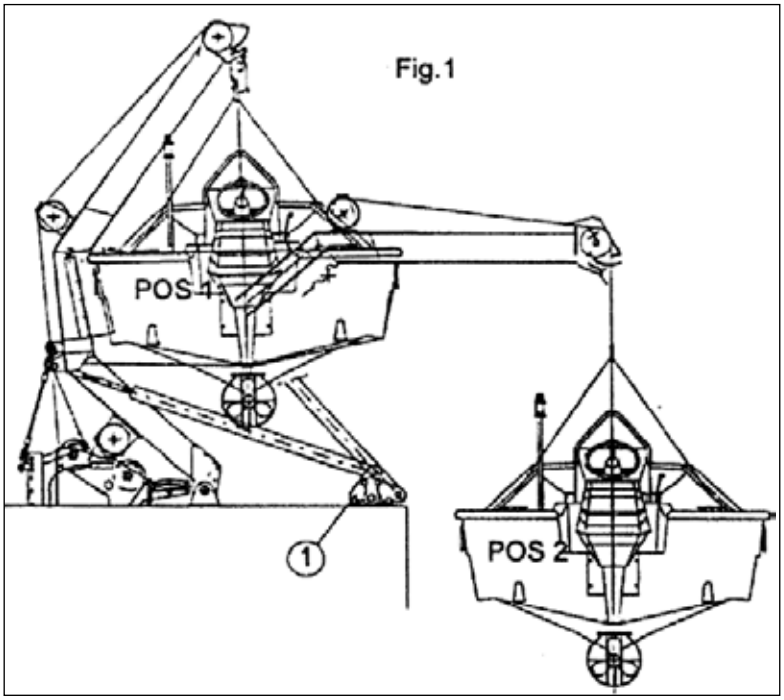


Figure 11: Mirror view: retracted and extended

3.2.1.1 Boat

Manufacturer:	Umoe Schat-Harding AS (now HARDING SAFETY)
Type:	MOB 17LV
Year built:	09/1999
Length:	5.30 m
Breadth:	2.10 m
Weight equipped:	783 kg
Weight with three people: (of 82.5 kg each)	1,030 kg
Weight with six people: (of 82.5 kg each)	1,278 kg
Inspected by:	ClassNK in accordance with the LSA Code (MSC.48(66))
Certificate no.:	184 074 #2

3.2.1.2 Davit

Manufacturer:	Umoe Schat-Harding AS (now HARDING SAFETY)
Type:	SAI.5/N-526
Year built:	06/1999
SWL:	1,500 kg
Inspected by:	ClassNK in accordance with the LSA Code (MSC.48(66))
Certificate no.:	99LNM047/2

3.2.1.3 Davit winch

Manufacturer:	Umoe Schat-Harding AS (now HARDING SAFETY)
Type:	FME 3.3 H SA
Year built:	06/1999
Maximum torque:	3.30 kN (electric)
Electrical system:	440 V/60 Hz
Performance:	6.5 kW, s2-10 min.
Electric engine type:	112M 04
Hoisting speed:	0.35 m/sec (electric)
Lowering speed:	0.88 m/sec (gravity)
Inspected by:	ClassNK in accordance with the LSA Code (MSC.48(66))
Certificate no.:	OL 9087-3 HK

3.2.1.4 Davit hook

Manufacturer:	Umoe Schat-Harding AS (now HARDING SAFETY)
Type:	RH 1.5
Year built:	06/1999
Release:	only off-load
SWL:	14.72 kN
Inspected by:	ClassNK in accordance with the LSA Code (MSC.48(66))
Certificate no.:	OL 9087-4 HK

3.2.1.5 Davit falls

Type:	ø 12 mm
Strength:	2,160 N/mm²
Minimum breaking load:	136 kN
Length:	35 m

3.2.2 Inspection of the davit system

The expert and an investigator from the BSU inspected the MTM WESTPORT during the period 1000 to 1300 on 23 November 2014 in Hamburg. The ship's command gave its full support.

The davit system was found on board in a fully swung out position on the starboard side of the first superstructure deck. The davit system's wire rope was reeved through the guide pulleys only partially. WSP Husum had already seized the parted wire rope that was connected to the davit. The same applies to the parted cable and hook on the boat. The expert later took charge of these two items.

Figure 12: Extended davit system

Figure 13: Winch marked with the last cable replacement

Damage was not found on the steel structure of the davit system or base. The two spring-loaded cylinders operated as expected.
This inspection revealed the following irregularities relevant to the cause of the accident.

3.2.2.1 Grease on the wire rope

An exceptionally large amount of grease had been applied to the wire rope. The grease was resinous in places. The guide pulleys in the housing were also coated with grease. In some instances, the cable sheaves were very difficult to rotate. A large amount of grease had also been applied to the cable on the winch drum (see Figures 8 and 9).

3.2.2.2 Limit switches on the davit system

The davit system was equipped with an electrical limit switch, which switches off the winch's electrical system shortly before the limit is reached when the davit system is being retracted to prevent the cable, winch, and possibly steel structure from being overloaded. This limit switch was out of order. The rubber seal was damaged, the internal contacts corroded, and there was water in the switch. A second switch of the same type integrated with the system on the winch for shutting off the electrical system when a winch crank is inserted was also damp inside and had a defective seal (see Figures 16 and 17).

Figure 14: Grease on cable, guide pulley, and in the housing

Figure 15: Winch with heavily greased cable

Figure 16: Corroded limit switch with defective seal

Figure 17: Corroded switch on the winch

3.2.2.3 Electrical system

Moreover, the two limit switches discussed above and the electrical hoist/emergency shutdown pushbutton had been bypassed in the control panel for the electrics (labelled 'RESCUE BOAT STARTER BOX'), which is located on the poop deck in the entrance corridor to the engine room, using a cable bridge. When the master switch on the control panel for the electrics was set to ON, the winch started to rotate at hoisting speed immediately. The emergency shutdown pushbutton on the first superstructure deck next to the davit system was out of order. This was also bypassed in the control panel for the electrics using a cable bridge. The electrician claimed to have produced these bypasses only after the accident. It should be noted that although the operator of the electrical hoist/emergency shutdown pushbutton can see the davit system, he cannot see the surface of the water.

Figure 18: Control panel for the electrics on the poop deck

Figure 19: Electrical hoist/emergency shutdown pushbutton next to the davit system

3.2.2.4 Service history

A service company in Bremerhaven carried out the davit system's five-year inspection on 18 February 2010. According to the documentation available, the cable and the two limit switches on the davit system, respectively, winch were replaced and an overload test carried out at 1,870 kg. The ship's command submitted certificate no. 142320 for a replaced cable. This certificate is dated 2 February 2010 and documents a minimum breaking load of 102 kN for the new cable.
An annual service was carried out on the davit system (including winch, hook and boat) in accordance with the IMO's MSC.1/Circ. 1206/Rev.1 at the Shanghai Shipyard on 3 June 2013. The corresponding report (SV/080/13) does not state that the service company replaced the cable. As shown in Figure 13, the date marked on the winch is 3 June 2013 ('Tested and wire renewed').
A Japanese service company carried out an annual service on the davit system (including winch, hook, cable and boat) in accordance with the IMO's MSC.1/Circ. 1206 in Santo Domingo on 31 May 2014. Inspection report no. 13-0347 confirms that operation of the cable and the hook may be continued without any reservations. The final report does not comment on the limit switches.

3.2.3 Inspection of the boat (type MOB 17LV)

The rescue boat was inspected on the main deck below the pump station. Structural GRP-related damage was not found. The outboard engine was absent and only the retaining bolts were still in place. The rear light holder was torn off. The foundations of the single-point bridle suspension system (where the boat is suspended on the hook) did not exhibit any damage.

Figure 20: Rescue boat – view from fore

Figure 21: Rescue boat – view from aft with absent outboard engine

3.2.4 Inspection of the off-load hook (type RH 1.5)

The WSP seized the RH 1.5 off-load hook, including the two parted wire rope ends. The cable parted about 700 mm above the hook. That the cable was passed through the hook improperly is particularly striking. It was not passed through the hook centrally, as intended, but rather laterally towards the inner cable pocket. Both the piece of cable diagonally inserted and the piece of cable exiting from the cable pocket at the same position are secured with a cable clamp. Pressure marks, which vary by about 36° inwardly from the perpendicular of the cable actually intended, are visible on the hook's two lateral supporting bolts. Apart from proving that the cable was attached incorrectly for an extended period, these pressure marks also demonstrate that a high pressure must have acted on the davit head hook.

According to the WSP, the ship's crew removed the parted end of the cable from the hook immediately after the accident with the intention of continuing to use the hook on board. However, the WSP's officers at the scene noticed this quickly enough, seized the hook on 23 November 2014 on the ship, and had the cable reconnected as it was before. The photographs taken on the day of the test also confirm that the cable was attached to the hook improperly. Analysis of the photographs revealed that the measured hook attachment point of 36° vertically on the davit head also seems credible. The hook and the two points of failure on the cable were sent to the Institut für Werkstoffkunde und Schweißtechnik Service GmbH (*Institute of Materials Science and Welding Technology*) for further investigation.

Figure 22: Hook with parted cable end

Figure 23: Inclined cable clamp

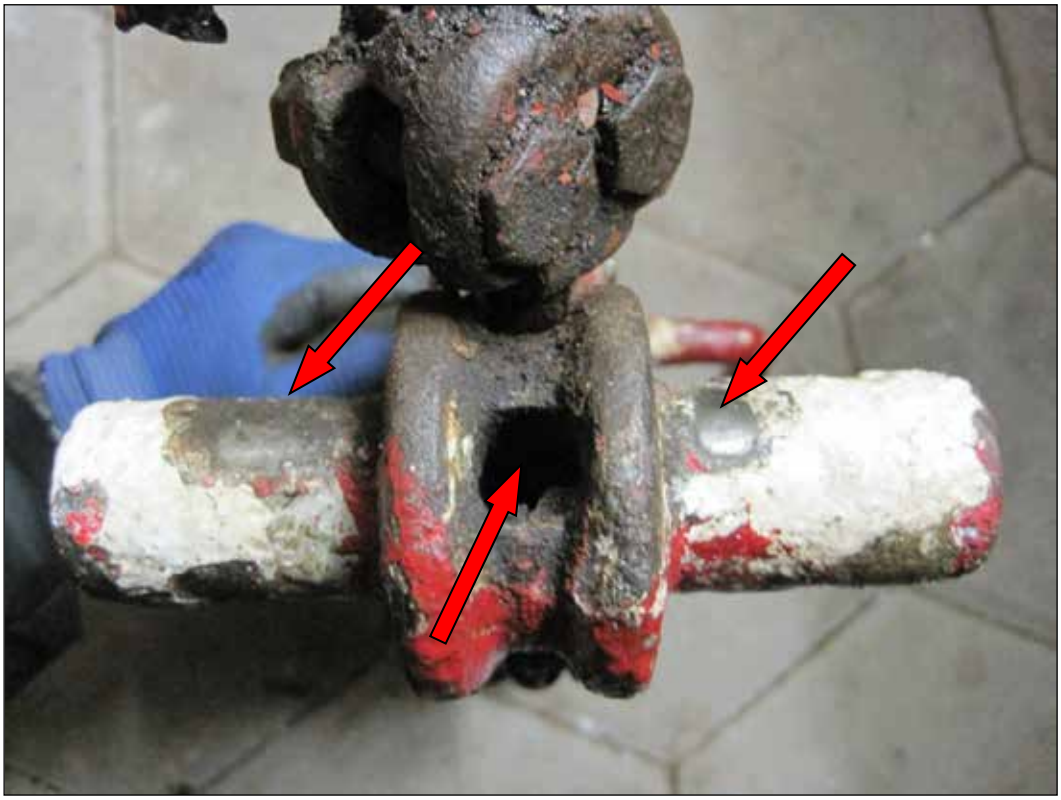


Figure 24: Cable mounted improperly on the hook. The 12-mm diameter cable should have been passed through the middle hole in the hook. Laterally, the pressure marks are visible under 36° from the vertical plane

Figure 25: Photograph taken by the crew before the accident. That the cable was mounted improperly on the hook is confirmed here. Analysis of the photographs revealed that the attachment point of 36° on the davit head also seems credible

3.2.5 Temporal sequence of the photographs

While viewing the photographs provided by the crew, it was noted that the camera's time and date were set incorrectly. Based on the reported times of arrival at the scene of the SAR helicopter and the rescue cruiser HERMANN MARWEDE, CET has been assigned to the photographs assessed here.

Figure no.	Camera no.	Description	Camera time	CET (approx.)
4	0503	Boat in stowed position on the davit system	0523	**0813**
5	0510	Boat in the water	0529	**0819**
6	**0514**	**Boat is hoisted**	**0621**	**0911**
8	0520	SAR helicopter at the scene of the accident	0705	**0955**
9	0522	HERMANN MARWEDE at the scene of the accident	0709	**0959**

Figure 6 constitutes the key photograph. This must have been taken shortly before the accident because the next photograph in the sequence shows the helicopter. Accordingly, the time of the accident can be set at about 0912.

3.2.6 Investigation of the wire rope

The parted end of the cable with hook, the parted end of the cable connected to the davit, and a piece of cable from the vicinity of the winch drum were sent to the Institut für Werkstoffkunde und Schweißtechnik Service GmbH for further evaluation and analysis of the cable's points of failure on 15 December 2014. A tensile test was also carried out. The Institut für Werkstoffkunde und Schweißtechnik Service GmbH took charge of both investigations and recorded the findings in the test report (no. G932-2014). These findings can be summarised as follows.

A. As regards their specifications, the investigated wire rope segments comply with the certificate of the manufacturer. According to the investigation and certificate, the cable has the following data:

Wire rope according to DIN EN 12385-4

Rated diameter:	12 mm
Design:	35x7, Z-laid, no core
Strength class:	1,960 N/mm²
Minimum breaking load:	102 kN

B. Tensile test to determine what the cable's effective tensile strength actually is.
The test's force/displacement diagram shows the cable's point of failure in two stages. The primary failure of the cable happened on the outer strands at a load of 92.2 kN. The secondary failure of the inner strands happened on the opposite end of the sample at a load of 70 kN.
The tensile strength of the cable determined is below the minimum breaking load of the strength class according to the certificate.

C. The load-bearing residual cross section failed as a result of ductile (deformed), forced ruptures. The cable's strands are heavily corroded in the vicinity of the failure. In addition to the outer strands, the corrosion is also visible on the inner strands at higher magnification. Based on the advanced corrosion, the condition of the wire rope in the vicinity of the failure could certainly be classified as fit for disposal according to DIN ISO 4309. It is possible that the load on the cable was increased due to the poor attachment of the hook. The attachment pressure point at the base of the hook was measured at 36°.

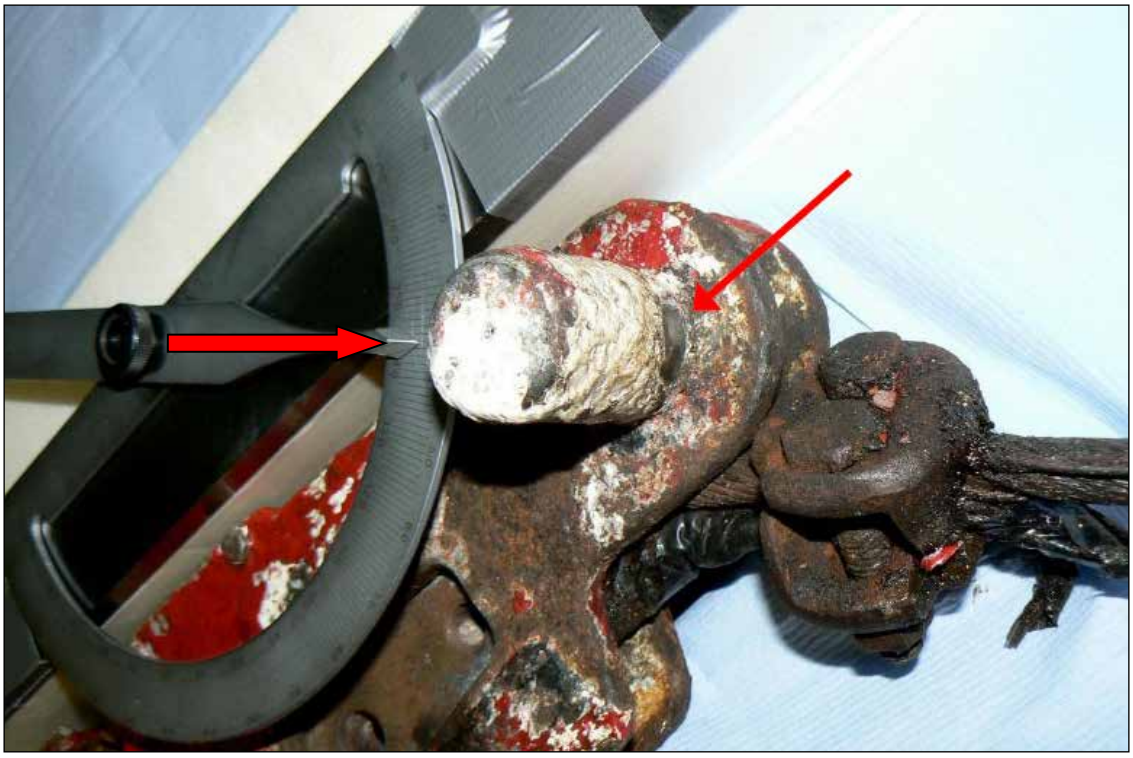


Figure 26: Determination of the angle of the attachment pressure points of the hook on the davit head of 36°

Figure 27: Corroded surface of the cable after being cleaned with kerosene

3.2.7 Description of the cause of the accident

The ductile, sudden failure of the davit system's corroded wire rope between the two upper guide pulleys caused the rescue boat to fall from a height of some 13 m to the surface of the water.

Figure 28: Approximate position of the cable failure immediately before the accident

Figure 29: Position of the cable failure 700 mm above the hook

3.2.7.1 Wire rope responsible for the accident

As regards the parted wire rope, the following particulars of the cause of the accident can be concluded from the above facts.
According to the davit layout drawing of the manufacturer (Umoe Schat-Harding), this wire rope must have a minimum breaking load of **136 kN**. Based on the davit system's strength analysis data of Umoe Schat-Harding AS, the expert checked the maximum theoretical rated tractive force necessary to retract the davit system. This check confirmed the wire rope's required minimum breaking load of 136 kN.
According to certificate no. 142320, which was confirmed by test report no. 932-2014, the failed wire rope only has a theoretical breaking load of **102 kN**, meaning it does **not** meet the required safety factor of **6*SWL** (safe weight load) (LSA Code, Chapter VI, 6.1.1.6).
Signs of heavy corrosion were found in the vicinity of the cable failure, which reduced the structural strength of the cable cross section. The strength test of the cable revealed initial signs of failure at a load of **70 kN**. The cable sample used for this tensile test was taken from the protected winch drum, however. The area of the rope failure responsible for the accident is located at the top of the davit system. This area is difficult to see and not readily accessible for applying grease properly or checking the cable in the stowed position. Furthermore, the wire rope is exposed and highly vulnerable to environmental influence at this point. Based on the documented signs of corrosion in the area in which the wire cable failed, it is reasonable to assume that the actual breaking load in this failed part of the cable on the top edge of the davit system was much lower. This means that the cable's safety factor was reduced even further at the time of the accident.

The signs of corrosion found on the cable and the records for the annual and five-year servicing permit the conclusion that this wire cable was installed for the first time on 18 February 2010 with the certificate no. 142320 in the course of the davit system's five-year service. According to the inspection report made at the time, the ship ordered this cable and the owner purchased it with an insufficient permissible breaking load.
There is an indication on the winch that the cable was renewed on 3 June 2013 (see Figure 13), which is confirmed by neither the service report of the same date nor by evidence of a corresponding cable certificate on board. It is possible that the wire rope was not replaced on 3 June 2013 but only turned. Turning a davit system's cable after 2.5 years was common practise in the maritime industry. The SOLAS CONSOLIDATED Edition 2009 altered this practice to the effect that the cable must be replaced after five years. Service providers are required to observe the annual maintenance instructions provided in the IMO's MSC.1/Circ. 1206 Rev.1. This means the service company should have carried out the following inspections on the cable as part of the annual service on 31 May 2014:

- inspection of the rope and sheaves for possible damage, such as kinks and corrosion;
- are ropes, sheaves and moving parts lubricated/greased properly?

The inspection of the cable and this davit system's cable sheaves was marked ***'GOOD'*** in the service company's inspection report no. 13-0347. Lubrication of the cables is not inquired about in this report. Since this annual service was less than six months before the accident happened, the professional competence of the service staff and method of investigation merit scrutiny.
According to information given by the manufacturer, HARDING SAFETY, the service company was not an authorised service provider for HARDING SAFETY (formerly UMOE SCHAT-HARDING) products. Therefore, it is reasonable to assume that the staff were not trained to service these products specifically, either.

It is impossible to determine the cable's tensile strength at the point of failure when the accident occurred with accuracy. The following additional factors may have led to peak loads at the wire rope's point of failure.

3.2.7.2 Limit switche on the davit system

The limit switch on the davit system is defective and corroded. It cannot turn off the davit system before the limit is reached. The limit switch is intentionally bypassed in the control panel for the electrics, otherwise the electrics would have short circuited and it would have been impossible for the winch to work electrically.

Normally, the last swinging in process should be done manually using the winch's hand crank. If the winch is moved to its limit at full power, then this tensile force acts on every part of the wire rope, i.e. also in the vicinity of the point of failure, in static condition.

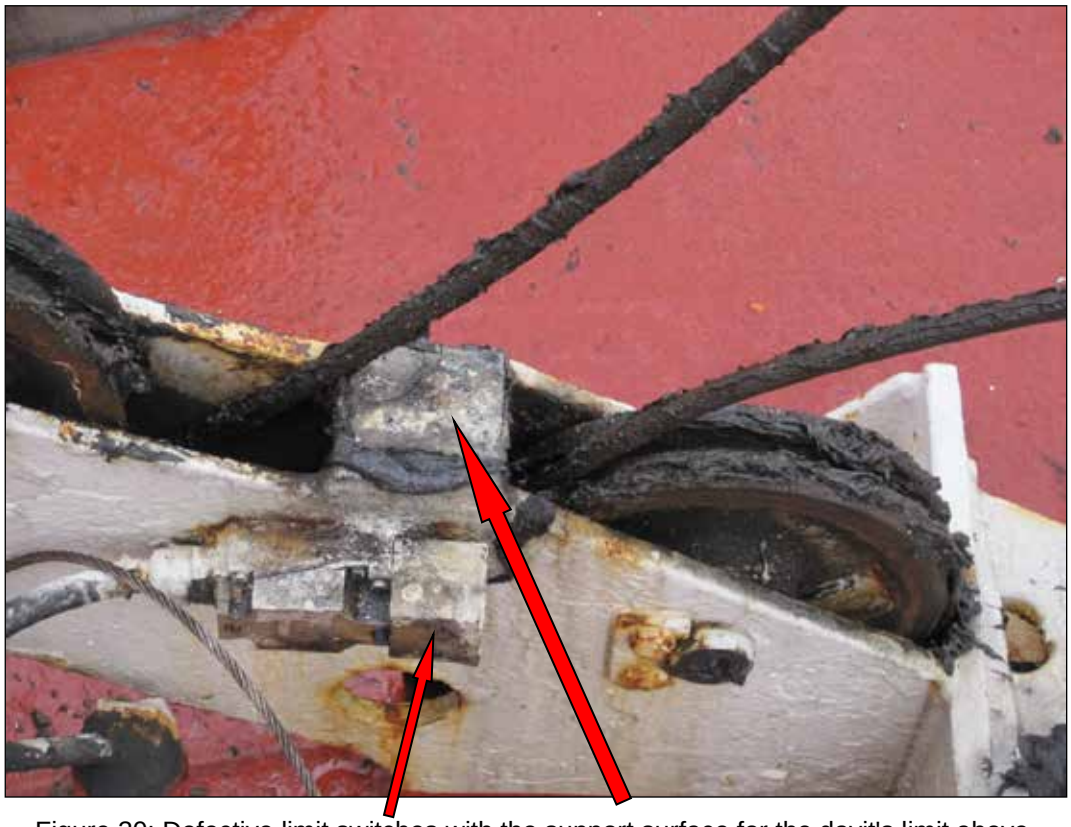


Figure 30: Defective limit switches with the support surface for the davit's limit above. The grease has been completely forced out here

Figure 31: Limit switch's companion part with the support surface for the davit's limit next to it

The winch has a rated tensile load of **about 27.98 kN** according to the manufacturer's winch analysis. According to the data sheet for a type 112M04, 5.5-6.5 kW, s2-10 min electric engine, the maximum torque (see Figure 32) could be **220%** higher than the rated value at 440 V/60 Hz operation. This situation arises when retracting to the limit.

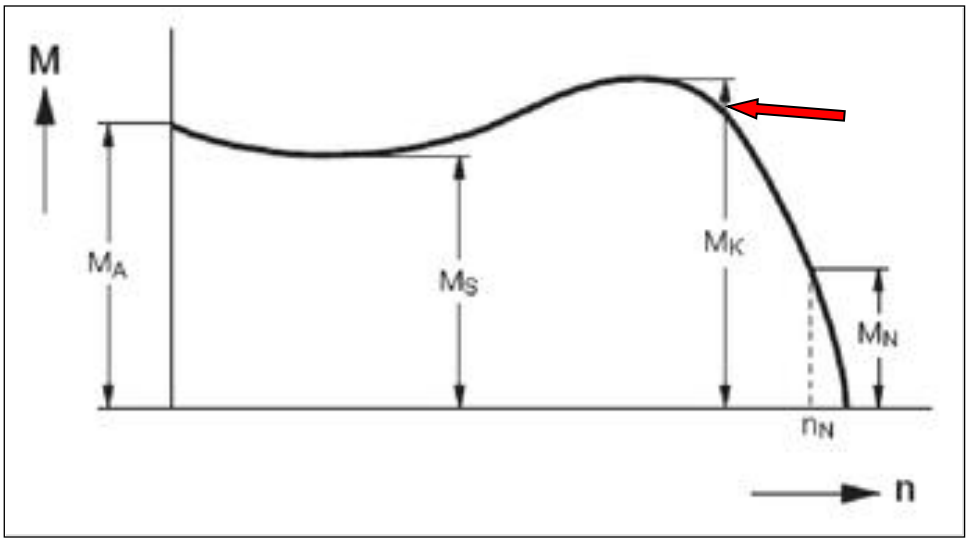


Figure 32: Typical moment diagram for a 112M04, 5.5-6.5 kW series electric engine

Mk can reach a value of 220% of Mn.

The following force could have been produced in this operating condition:
27.98 x 2.2 = **61.6 kN**

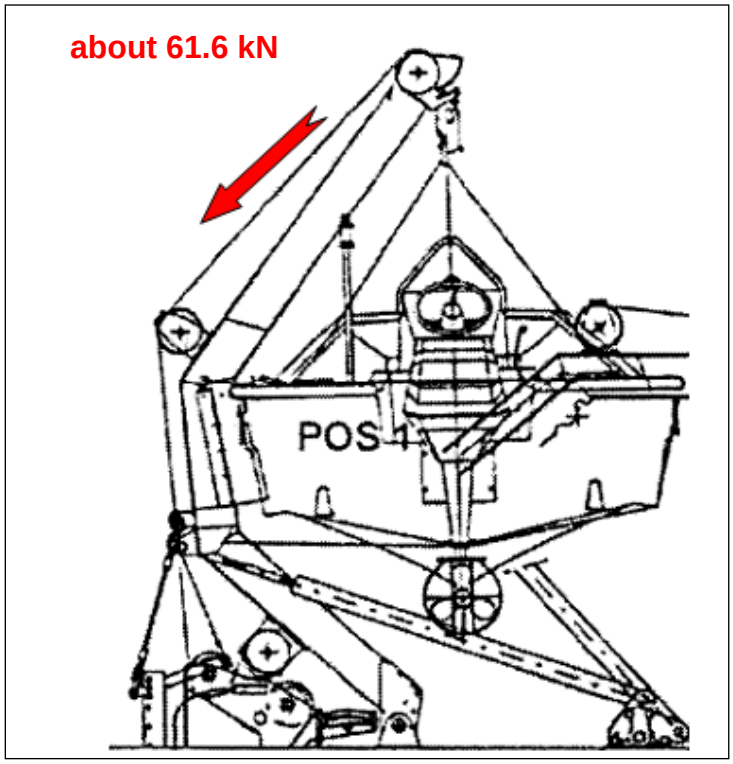


Figure 33: Drawing that shows how the forces act

This load factor is in the vicinity of the breaking load of the corroded point of failure on the davit system's parted cable. This scenario is also supported by the fact that the grease was forced out from the limit's supporting surface (see Figure 30). The injured P2's testimony that the winch was not running during the accident underpins this cable overload scenario.

Notes to the annual service on 31 May 2014:
There are no checkpoints regarding limit switches in the checklist.
The service provider would have had to test the functioning of the limit switches to comply with the service instructions provided in the IMO's MSC.1/Circ. 1206/Rev.1.
It must be noted that the maintenance checklist used here is not applicable to this type of davit. For example, the slewing hydraulic motor question is marked ***GOOD***. This davit system does not have a hydraulic drive, however.
It can therefore be concluded that the service company did not carry out the annual service on 31 May 2014 in accordance with the IMO's MSC.1/Circ. 1206/Rev.1.

3.2.7.3 Off-load hook

The type RH 1.5 off-load hook was not attached to the davit system's wire rope properly at the time of the accident. Based on this investigation, the BSU concludes that the crew of the ship reattached the hook improperly most recently when the wire rope was turned on 3 June 2013. Due to the cable being improperly attached in this manner, the hook does not hang vertically but is always slightly inclined, as the load-bearing cable is passed through the hook laterally (see Figures 23-25). Page E 7/16 of the INSTRUCTION MANUAL SA 1.5 Davit shows the correct assembly. A further consequence of this improper assembly is that the cable clamp integrated with the lateral cable exit rests against the cable sheave when the davit system is retracted. This means that the hook cannot slip inwards on the davit head, as provided for in the design. The measured angle at which the hook meets the davit head of about 36° is also determined in the theoretical reconstruction of the interaction between the davit head and hook and thus credible. The documented dents on the hook attachment points are indicative of considerable pressure.

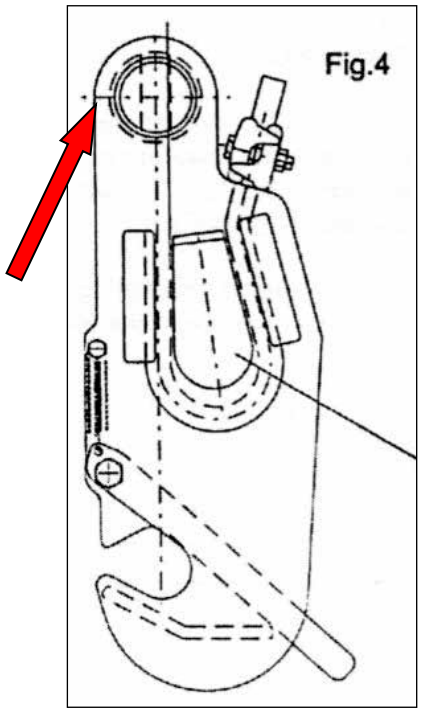


Figure 34: Page E7/16 of the manual – drawing shows the correct assembly of the rope attachment in the hook

Figure 35: Immediately before the accident – the hook cannot retract further because the cable clamp is resting against the upper guide pulley

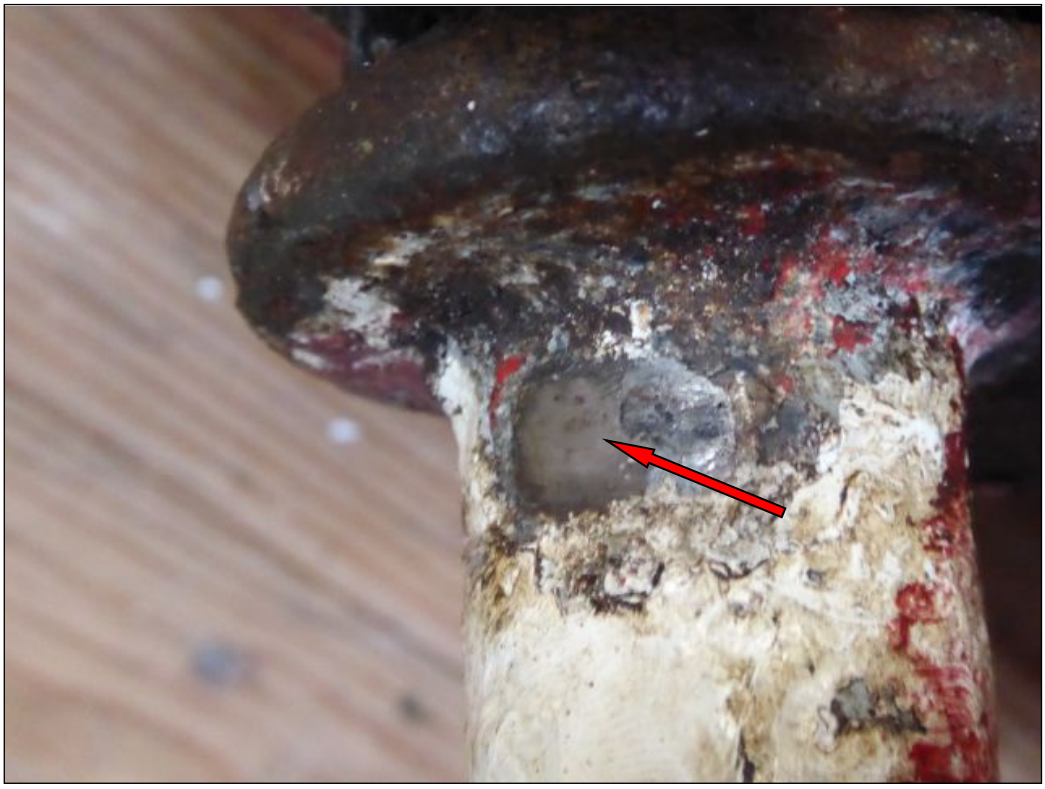
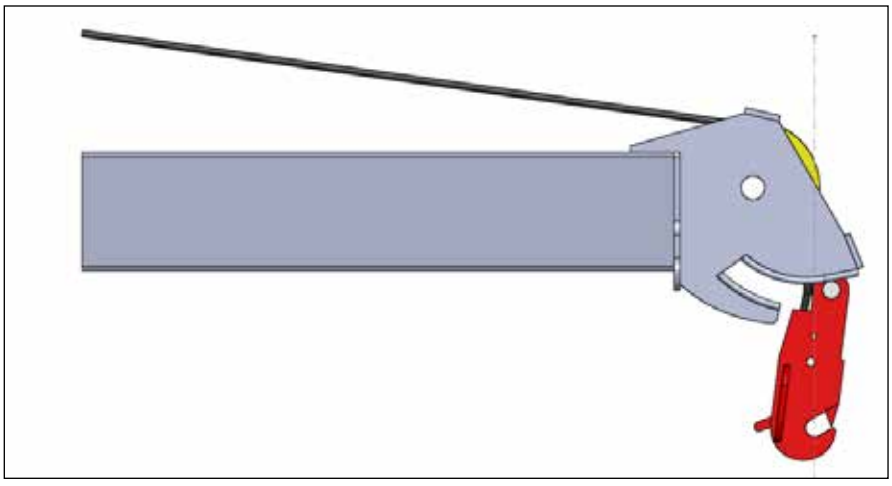


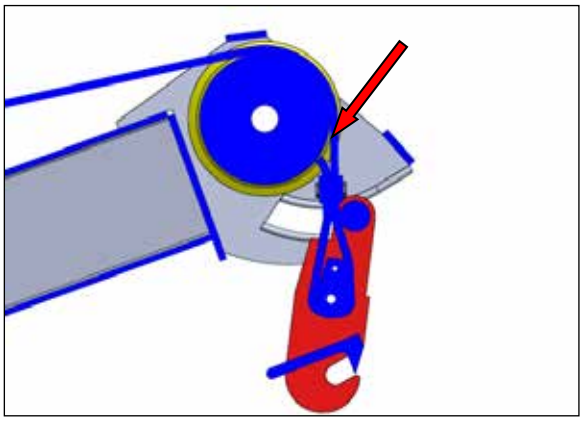
Figure 36: Dents on the attachment points on the hook

This fact is illustrated here:

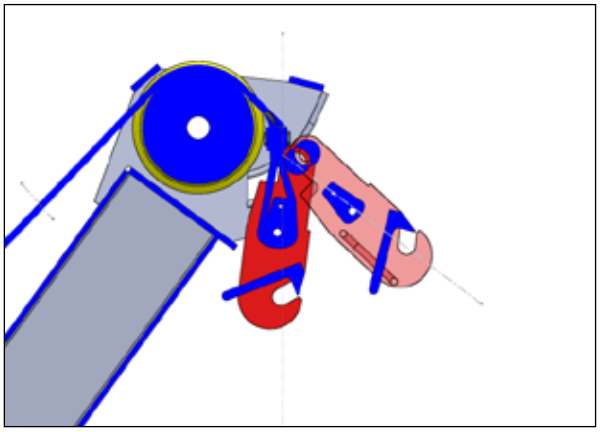
1. End of the hoisting process in the 'Davit fully extended' position (90°):



2. Turning in of the davit system until the cable clamp is resting on the upper cable sheave at about 70°:



3. Further turning in of the davit system up to the maximum limit (about 36°). At the same time, the boat turns the hook around the cable clamp's attachment point on the guide pulley. It is possible that a further load was produced by moment and necessary cable extension.



It is not possible to prove that an increase or transfer of force resulted from the fact that the hook was attached improperly. It can be concluded with certainty that the hook was not attached properly. Consequently, it is possible that the attachment of the cable clamp/cable on the guide pulley caused damage to the cable earlier.
According to the service company's inspection report no. 13-0347, an inspection of this hook and hook attachment was carried out on 31 May 2014 and also marked ***'GOOD'***. Accordingly, the improper cable attachment shown here was inspected incorrectly.
The service provider would have had to test the hook fastening to comply with the corresponding service instructions provided in the IMO's MSC.1/Circ. 1206/Rev.1.
It can therefore be concluded that the annual service on 31 May 2014 was not carried out in accordance with the IMO's MSC.1/Circ. 1206/Rev.1.

4 ANALYSIS

The accident happened at about 0912 on 21 November 2014 in the Outer Elbe roadstead on the chemical tanker MTM WESTPORT. The rescue boat was manned by three people and fell down to the water surface from a height of approximately 13 m. This investigation has arrived at the following conclusion:

The davit system's wire rope parted when the davit was retracted with the manned boat. Therefore, the davit system was re-extended with boat by the pre-tensioned spring cylinder. Upon reaching the fully extended position, the davit head released the hook, which was connected to the boat, and the boat fell. The following is responsible for the wire rope parting:

- Ø the parted wire rope's tensile strength was not 136 kN, as required by the davit system's manufacturer;

- Ø the wire rope was corroded in the area of the failure, meaning strength was reduced further;

- Ø the limit switch for automatic shutdown of the winch before reaching the davit system's limit was defective and could not prevent a potential overload of the wire rope when the limit was reached;

- Ø when operated at the limit, the winch could produce a force that was in the vicinity of the determined tensile strength of the failed wire rope, and

- Ø as the connecting element between rescue boat and davit system, the off-load hook was improperly attached to the davit system's wire rope. It is possible that this caused damage to the cable earlier.

The most recent annual service of the davit system and the off-load hook on 31 May 2014 was not carried out in accordance with the IMO's MSC.1/Circ. 1206/Rev.1. The service company was not an authorised service provider for HARDING SAFETY (formerly UMOE SCHAT-HARDING AS) products at the time of the service.

5 CONCLUSIONS

The use of an undersized wire rope for lowering and hoisting the rescue boat was responsible for the accident. The failure of the cable was facilitated by corrosion and the non-functioning limit switches on the davit system. Furthermore, the hook was not attached to the wire rope in accordance with the manufacturer's specifications. The accident would not have been possible if the periodic inspection of the entire system was carried out in accordance with the specifications, as the defects would have been noticed and remedied.

6 SAFETY RECOMMENDATIONS

The following safety recommendations do not constitute a presumption of blame or liability.

6.1 The owner, MT Maritime Private LTD.

The Federal Bureau of Maritime Casualty Investigation recommends that MT Maritime Private LTD. only provide wire ropes that conform to the manufacturer's specifications. Furthermore, the crew should be trained in corrosion protection and the replacement of wire ropes regularly.

6.2 Ship's command (wire ropes)

The Federal Bureau of Maritime Casualty Investigation recommends that the ship's command of the MTM WESTPORT verify that every wire rope is fit for purpose prior to use. Furthermore, the crew should be instructed in corrosion protection and the replacement of running rigging regularly.

6.3 Ship's command (limit switches)

The Federal Bureau of Maritime Casualty Investigation recommends that the ship's command of the MTM WESTPORT permit the bypassing of limit switches under no circumstances whatsoever. They constitute an indispensable safeguard.

7 SOURCES

- Enquiries of the WSP
- Written statements
  - Ship's command
  - Owner
  - Classification society
- Witness testimony
- Opinion of Sachverständigenbüro Dipl.-Ing. Jan Hatecke, including test report of the Institut für Werkstoffkunde und Schweißtechnik Service GmbH
- Nautical charts and ship particulars, Federal Maritime and Hydrographic Agency (BSH)
- Technical documents of Messrs Umoe Schat-Harding BV
- Documents, Ship Safety Division (BG Verkehr)
  - Accident Prevention Regulations (UVV See)
  - Guidelines and codes of practice
  - Ship files