Bundesstelle für Seeunfalluntersuchung
Federal Bureau of Maritime Casualty Investigation
Bundesoberbehörde im Geschäftsbereich des Bundesministeriums
für Verkehr, Bau- und Wohnungswesen

Investigation Report 134/04

Very serious marine casualty

Accident involving personal injury with fatal consequence on board MV Hamburg Express on 7 June 2004 off the French Atlantic Coast

15 May 2005

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 24 June 2002.

According to this the sole objective of the investigation is to prevent future accidents and malfunctions. The investigation does not serve to ascertain fault, liability or claims.

As to the interpretation of the investigation report, the German version is prevailing.

issued by:
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Table of Contents

List of Figures

1 Summary of the marine casualty

On 7 June 2004 at 13.50 h ship's time a fatal accident during work involving a Philippine seaman occurred on board MV HAMBURG EXPRESS at position φ 47°17'N λ 006°49'W in the Bay of Biscay on a voyage from Singapore to Southampton. At 13.15 h the Philippine Second Officer and the seaman who subsequently sustained the accident were on the B-deck in order to grease the boat falls of the rescue boat. A further able bodied seaman and an ordinary seaman, both of Philippine nationality too, were on the same deck. These two seamen were engaged in greasing the hinges of the ventilator dampers of the engine room.
At about 13.50 h the boat fall was to be wound up bit by bit onto the winch again for greasing. When the Second Officer briefly actuated the electric switch of the boat winch to heave it, he heard the noise of a body falling and shortly after this saw the injured man lying on the ground next to the davit bleeding heavily from a head wound. First-aid measures were initiated immediately. The injured man was taken into the ship's hospital on a stretcher where he was given further medical treatment by the First Officer with medical advice by radio from Cuxhaven. A helicopter was requested from the French Station Cross Etel via the Maritime Rescue Coordination Centre (MRCC) Bremen. The injured man was flown to the La Cavale Blanche Hospital in Brest at 15.45 h escorted by an emergency physician. He died of his injuries during the transport.

The accident is attributable to the fact that contrary to the technical design, it was possible to operate the boat winch electrically with the crank-handle in place. As a result the injured man was hit fatally on the head by the crank-handle.
There had already been a similar accident with fatal consequence on another German container vessel on 19 May 2000.[1]

In view of the wide-spread use of the said or similarly designed blocking systems, the particular dangers emanating from crank-handles turning with the winch motor and in order to avoid accidents of this kind from the outset, the BSU issued a safety recommendation (see Section 7) already on 29 June 2004 and called for design improvements to the boat winch.

[1] Cf. here BOSeeAE 8-10/01 P. 201 ff.

Scene of the accident

Nature of the incident:	Very serious marine casualty
Date/time:	7 June 2004,13.50 h
Location:	Bay of Biscay
Latitude/Longitude:	φ 47°17'N λ 006°49'W

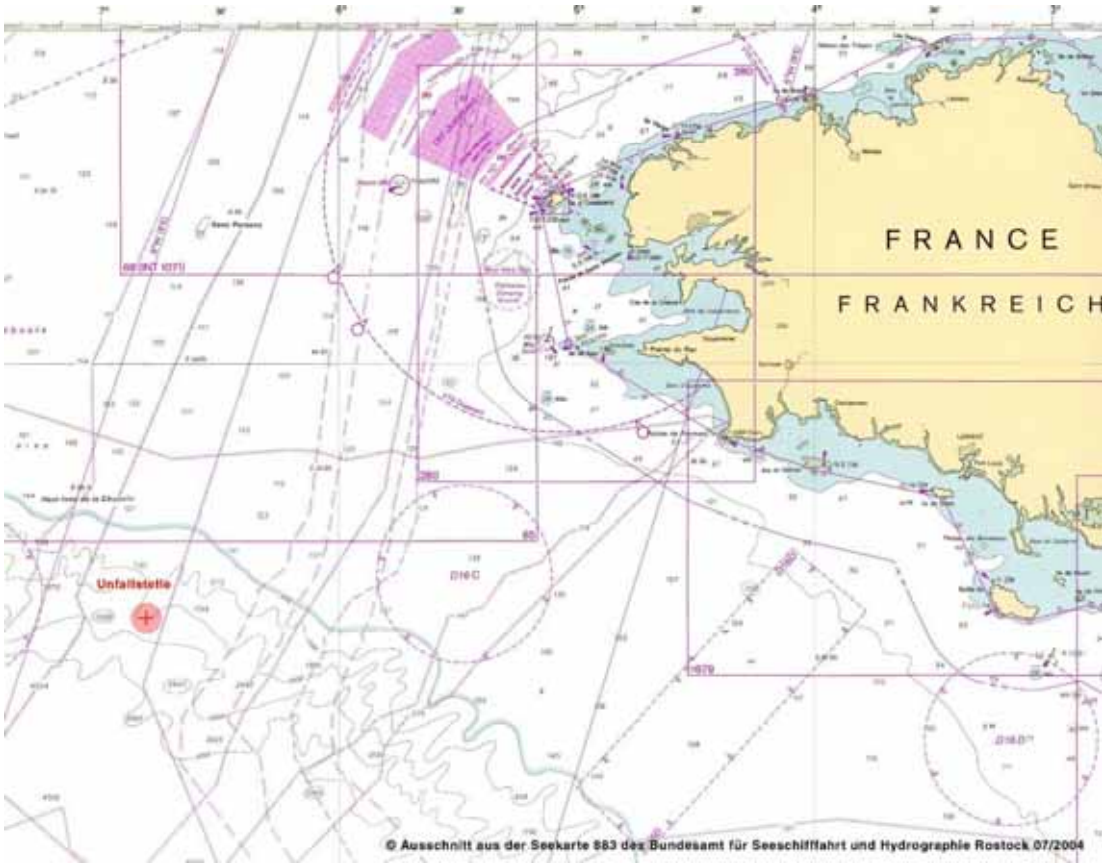


Figure 1: Sea chart

2 Vessel particulars

2.1 Photo

Figure 2: Photo of vessel

2.2 Data

Name of vessel:	HAMBURG EXPRESS
Type of vessel:	Container vessel
Nationality/Flag:	Germany
Port of registry:	Hamburg
IMO Number:	9229829
Call sign:	DGXS
Vessel operator:	Hapag Lloyd Container Linie GmbH
Year built:	2001
Building yard/hull number:	Hyundai Heavy Ind. Co. Ltd., H 1363
Classification Society	Germanischer Lloyd
Length over all:	320.58 m
Breadth over all:	42.90 m
Gross tonnage	88,493
Deadweight:	100,006 tdw
Draught:	14.5 m
Engine rating:	68640 kW
Main engine:	Diesel 12 K 98 MC Hyundai MAN
Speed:	25.3 kn
Hull material:	Steel
Crew:	26 persons
Number of passengers:	None

3 Course of the accident

On 7 June 2004 the Container Vessel HAMBURG EXPRESS was in the Bay of Biscay on a voyage from Singapore to Southampton. The vessel was heading for the traffic separation scheme of Ouessant, steering a course made good of 29° with the track control system at a speed of 23.5 kn, with winds of force 3 Bft. coming from WNW and a NW swell with a wave height of 1.5 m. Visibility was good and there were light clouds.

The only witnesses of the accident were the Second Officer and the able bodied seaman[2] V., as well as the ordinary seaman[3] C., whereby the latter were charged with other tasks and thus according to their own statements only perceived the course of the accident to a very restricted extent. As regards the description of the course of the accident, the BSU has on the one hand the written statements made by the said persons on board on the date of the accident. In addition, these persons were questioned by staff of the BSU in the port of Hamburg on 11 June within the framework of the investigation on board the vessel.
Furthermore, information on the organisation and implementation of the first aid measures were obtained from the Captain, the First Officer and the Ship Operation Officer (all of German nationality).

3.1 Statements by the Second Officer

According to the two statements made by the Second Officer that essentially coincided with each other, on the day of the accident he and the able bodied seaman[4] J. who subsequently sustained the accident had started their maintenance work on the davit at about 13.15 h. For the conservation measures to be carried out, the entire boat fall had been unwound from the drum and arranged on deck. At about 14.00 h the entire wire rope had been lying on deck. The wire rope was now to be wound back bit by bit with the aid of the winch motor. The Second Officer had gone to the control console on the starboard side of the davit where the electric switch box for heaving is located. *Prior to switching on the winch motor he had asked J. whether everything was clear and had received corresponding confirmation.*[5] Then the Second Officer had pressed the switch briefly and immediately after this heard that J. had fallen to the ground. However, from his place at the console he had been unable to see what had really happened. When he saw J. lying on the ground he had

[2] The German expression Fachkraft Deck = Engl. able bodied seaman = function on board according to the muster list = Vollmatrose.
[3] The German expression Hilfskraft Deck = Engl. ordinary seaman = function on board according to the muster list = Leichtmatrose.
[4] Cf. footnotes 1 and 2; in the following the term "seaman" is used in each case in deviation from the precise function designations in the muster list.
[5] Approximate reproduction of the statement; as regards the oral statements there are differences between the statement of 7 June and the statement to the BSU on 11 June: original wording of the statement of 07.06.04: "Before I start the button, I ask him if it is ready. He reply"
Original wording of the statement of 11.06.04: "Before I start I give warning and ask if all okey and proceed and he reply, okey."

immediately hurried down to the Board Management Center (BMC) to fetch help. Then several crewmembers had come to the scene of the accident at once to help. The injured man had then been transported into the hospital.

3.2 Statements by the Seaman V.

The Seaman V. has stated that on the day of the accident he had been assigned together with the Seaman C. as a team to carry out maintenance work on the ventilator doors in the area of the superstructures. At the time of the accident he and his colleague had been working on the same deck as the other group which consisted of the Second Officer and the man who subsequently suffered the accident. However, he was unable to make any statements about the actual course of the accident. He could only remember that the Second Officer and J. had unwound the boat fall of the rescue boat in order to carry out maintenance work. He had not perceived what exactly had happened then since due to his work on the ventilator door (removal of old grease) he had been standing with his back to the boat davit. After he had perceived the fall of the injured man *acoustically*, he had turned round, had hurried to J. who was lying on the ground bleeding heavily from his head, and had tried to speak to him. The first-aid measures had been initiated immediately and after further crewmembers had arrived the injured man had been taken into the hospital.

3.3 Statements by the Seaman C.

The statements by the Seaman C. coincide with those of the other witnesses. He too stated that at the time of the accident he had been standing with his back to what was happening and had been working on a ventilator door. He had noticed the accident as a result of a loud noise and had then immediately tried to speak to J. who was bleeding heavily. J. had not reacted. He had then left the scene of the accident to obtain help, had encountered the Bosun shortly after this and informed him of the accident. The Second Officer had also left the scene of the accident to organise further assistance. On C.'s return to the injured man the First Officer and the Vessel Operations Foreman (OF) had been on the spot and had been tending the injured man.

In response to questioning by staff of the BSU within the framework of reconstructing the course of the accident, C. stated that he could remember that the crank-handle had been in place on the launching device before he had left the scene of the accident, but had no longer been there on his return.

3.4 Captain's report of 7 June 2004

In his report on the course of the accident the Captain refers to the oral statements made to him by the Second Officer, so that in this respect it is possible to refer to the above statements.

The Captain had been notified of the accident at 14.00 h by the Vessel OF and had immediately proceeded to the scene of the accident. Directly after this at 14.05 h he had called for a helicopter via MRCC Bremen to pick up the injured man. At 14.15 h he had established contact with the municipal hospital Stadtkrankenhaus Cuxhaven by radio in order to obtain medical advice.
At 14.40 h the MRCC Bremen had confirmed that a helicopter from the French Station Cross Etel would pick up the injured man. The further proceedings had been discussed and agreed upon directly with the Cross Etel rescue centre. The helicopter had reached the vessel at 15.45 h, the emergency physician in the helicopter had examined the injured man and prepared him for transport. J. had been on board the helicopter at 16.08 and had been transported to the hospital in Brest.
At 16.35 h he had received notification via MRCC Bremen that J. had died of his injuries in the helicopter on the way to the hospital.

3.5 Statement by the First Officer of 7 June 2004

The First Officer made a statement in particular about the first-aid measures in which he played a major role.
At 13.55 h he had been informed by telephone by the OF that there had been an accident by the rescue boat. He had reached the scene of the accident where several crewmembers had already gathered at about 14.00 h. First of all signs of life of the injured man such as pulse and breathing had been checked. After initial treatment of the wound and subsequent transport of the injured man into the hospital, signs of life had been checked there once again. The Captain had called the radio medical advisory service of the municipal hospital Stadtkrankenhaus Cuxhaven. In the meantime the First Officer had renewed the dressing of the injured man and regularly checked his pulse. J. had been supplied with oxygen and with a salt solution intravenously in order to compensate the loss of blood. The injured man had subsequently been transported to the bridge. After the arrival of the helicopter the First Officer had assisted the physician and helped with the preparations to transport the injured man away. After this he had tried to determine the cause of the accident.

3.6 Statement by the Ship Operation Officer of 7 June 2004

The Ship Operation Officer (SOO) made a statement in particular on the first-aid measures, and here confirmed and supplemented the statements made by the other crewmembers.
At 13.52 h he had been in the Board Management Center (BMC) with the Chief, the OF and the Ship Electrical Technician when the Second Officer had arrived there and reported the accident. After this the SOO had hurried to the scene of the accident

with the Second Officer. The Second Officer had looked after the injured man and had pressed a rag on the wound provisionally in order to check the bleeding. After the VOO had collected dressing materials from the hospital, he had applied a compression dressing to the injured man at about 13.58 h and the injured man had then been transported to the hospital. At about 14.00 h J. had been placed down in the hospital and supplied with oxygen, an intravenous common salt solution and a wound dressing. The blood pressure had been measured.

At about 15.00 h the SOO was relieved in the hospital by the Second Officer. He had then proceeded to the scene of the accident with a digital camera and taken 5 to 10 pictures. At about 15.30 h J. had been transported to the bridge via the elevator and prepared for transfer to the French rescue services.

4 Investigation

A survey of the scene of the accident next to the rescue boat on the B-deck was conducted in Hamburg on 11 June 2004 (see Fig. 3).
At this time the boat fall was still partly unwound from the drum on the deck. Traces of blood had been covered with a tarpaulin. The investigating BSU team was assisted in the investigation of the scene of the accident by two experts from the Institute of Material Science and Welding Engineering (IWS) of the University of Applied Sciences Hamburg. In addition the three direct witnesses to the accident (Second Officer, Seaman C., Seaman V.), the Captain, two representatives of the vessel operator, two representatives of the manufacturer of the launch device and staff of the See-Berufsgenossenschaft (See-BG)[6] were present.
After the accident the scene of the accident had been cordoned off by instruction of the vessel's command and the vessel operator and accordingly was roughly in the condition in which it had been at the time of the accident. However, it should be noted that in connection with the rescue measures and the subsequent attempts by the ship to clarify the cause of the accident, a few changes necessarily had been made at the scene of the accident that could no longer be reconstructed. The accident was re-enacted and possible causes were investigated.

The following representation of the results of the investigation in situ is oriented to the expert's opinion issued by the IWS on behalf of the BSU and corresponds to the perceptions and findings of the BSU investigation team made in the course of the reconstruction of the course of the accident on board HAMBURG EXPRESS.

4.1 Structure of the crane; design of the winch drive

The crane used to lower the rescue boat to the water was produced by the firm Global Davit GmbH. It is a jib crane mounted on the deck of the vessel (Fig. 3). The crane has a load-bearing capacity of approx. 1 t, and for safety reasons can be operated both manually and mechanically. An electrically operated rope winch and a

[6] See-BG = German Marine Insurance and Safety Association.

hydraulically operated swivel drive are available to the jib davit for this purpose. The cable winch drive consists of an electric motor and a transmission that is connected with the cable drum. There is a disengaging coupling arranged between the electric motor and the transmission. The cable is guided from the rope drum over the davit jib. The trigger mechanism with which the boat can be released from the crane rope is located at the end of the rope. The rope drive is designed in such a way that under normal circumstances the rope can only be moved in the direction "Heave"[7]. For this purpose the winch motor is started up by means of two switches (red rotating switch = main switch; black push button = on/off switch) on the outside of the switch cabinet (Fig. 4).

Figure 3: Crane with rescue-boat (photo taken on day of accident)

[7] Seeman's expression for "Lift".

Figure 4: Switch cabinet; winch motor operating elements

The boat is slacked down[8] by gravity, whereby the coupling between the drive and the cable drum is disconnected. Even when the rope is unwound from the cable drum for maintenance purposes, it must be drawn off by hand.

If the rope is to be wound up by hand, a crank-handle is available (Fig. 5) on the side opposite the drive that is mounted on the intermediate shaft of the transmission. The part of the shaft used for this purpose is designed as a square. In order to avoid incorrect operation, the crank-handle can only be mounted when the drive is not switched on (no current is flowing). To this end a swivel type safety bar is arranged in front of the square mount for the crank-handle. This bar is secured to the load-bearing structure of the crane with a screw that also serves as a joint for the bar. By swivelling up the safety bar, the square is released for mounting the crank-handle and at the same time the lever of a limit switch that switches off the electricity is switched over. The coupling is also disconnected with the same safety bar.
The joint of the safety bar should work in such a way that the bar closes automatically (in order words it drops down and covers the square socket) when the crank-handle is drawn off (cf. Figures 6, 7, 8)

[8] Seeman's expression for "Lower".

Figure 5: Crank-handle next to the crane

Figure 6: Safety bar locked

Figure 7: Safety bar opened (crank-handle in place)

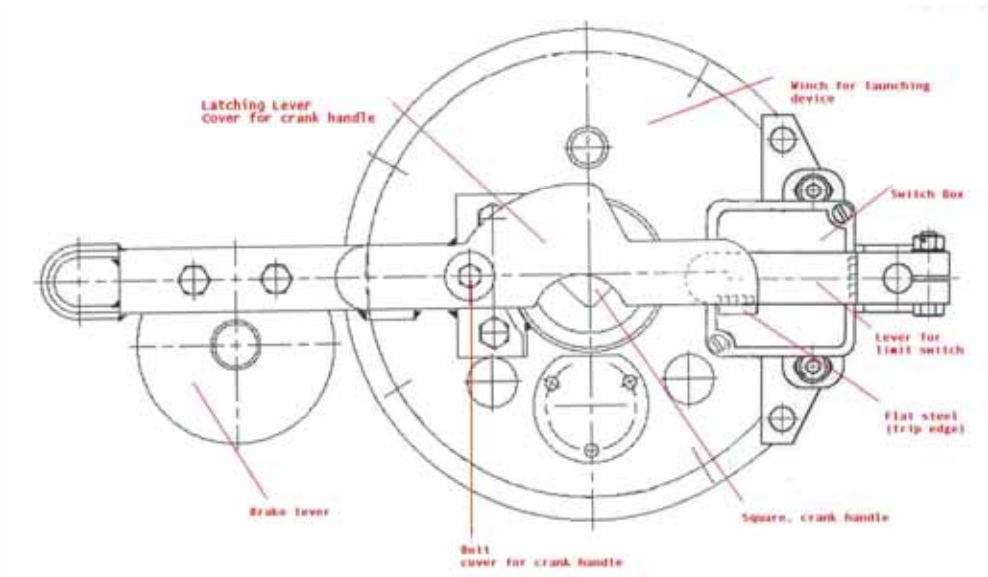


Figure 8: Schematic diagram of the bolting design

Due to the dimensions of the crane jib, the cable drum, the winch motor and the crane column carrying the switch cabinet, it is not possible to see the area in front of the opposite side of the launching device from the operator's position at the winch motor. Consequently there is a not inconsiderable dead angle here.

Accordingly, for instance, it is not possible to see from the switch cabinet whether or not the crank-handle is in place, or whether anyone is standing in this area. The dimension of this dead angle is clearly illustrated in Fig. 9.

Figure 9: Dead angle behind the operator's location

4.2 Maintenance procedure on the day of the accident

According to the statement by the Second Officer (cf. also Section 3 above) the boat fall of the rescue boat was to be greased on the day of the accident. For this purpose the Officer and J. had unwound the wire rope from the drum almost completely by hand. In addition the stop brake had been tied upwards so that the two could draw the wire rope from the drum by muscle power. The wire rope had been laid out on deck in bays with a diameter of approx. half a metre, roughly directly beneath the upper end point of the crane jib (Fig. 10, 11).

Figure 10: Cable drum

Figure 11: Boat fall unwound

After the drum, free of the cable, had been greased, the cable was to be wound back on again. To this end the work was first carried out with the crank-handle in order to wind the first wire rope turns carefully onto the winch. After this, however, to facilitate matters the rope was to be wound up with the cable winch. For this purpose the winch motor was to be started up briefly each time in order to carry out the greasing of the wire rope bit by bit and winding up properly onto the cable drum. The work steps described were to be repeated altogether three times.
J. had assumed a working position that on the one hand was admittedly necessary to monitor the winding process and to grease the relevant section of the rope. On the other hand, however, he was in the dead angle described above of the Second Officer standing by the switch panel on the opposite side of the crane column. The Second Officer actuated the black push button switch for the cable winch. The first brief starting of the winch motor then reportedly led to the serious injury of J.

During the first care and recovery of the injured man, nobody had bothered with the actual crane. The crank-handle was subsequently found lying next to the crane. Traces of blood were detected on it. The nature and form of the head injuries of the seaman involved in the accident indicate that he was hit by the crank-handle mounted and turning with the winch when the Second Officer actuated the electric winch drive.

4.3 Visual findings

The launching device was inspected on 11 June 2004 four days after the accident at the Container Terminal Altenwerder. According to the information supplied by the crew, nothing on the crane had been changed. The vessel operator and the vessel command had given instructions that the scene of the accident was to be cordoned off and left completely unchanged. However, directly after the accident a function test had been carried out on board, but this had not produced any indications of a malfunction. The crane itself was standing in the position of rest (Fig. 3). About half the rope length was unwound and lying on the deck. The crank-handle was lying at the side next to the crane (Fig. 5). The safety bar was in the operating position for electric winch operation (Fig. 6). The inspection of the safety bar revealed that the single screw securing this bar had been loosened once (Fig. 12).

Figure 12: Safety bar, fastening screw

In response to questioning it was explained that this bar had been removed once in Shanghai for maintenance purposes. The joint of the bar was moving with difficulty, the bar had not fallen back into the starting position by itself. After dismantling the bar it was ascertained that the grease in the joint had become resinous (Fig. 13)

Figure 13: Resinous joint

On raising (swivelling up) the bar, the current for the winch operation was switched off as of an angle of deflection of approx. 15° (Fig. 14), in other words well before the complete release of the square mounting necessary to mount the crank-handle.

Figure 14: Switch-off position

The final position of the safety bar is documented in Fig. 15. The triggering of the bar was repeated several times, the switch-off position was always the same. It was impossible to mount the crank handle before the switch-off position was reached.
Since the outer visual and function checks had not revealed any clues for malfunction of the system, the limit switch was subjected to a detailed inspection. The housing of the limit switch was opened. Inside there were no traces of corrosion or any other

indications of inoperability (Fig. 16). The springs returning the limit switch to the working position did not show any evident signs of faults either. Altogether, the interior of the limit switch made a very sound impression. It was not possible to turn the limit switch excessively so that electricity would have been switched on again.

Figure 15: Limit switch, end position

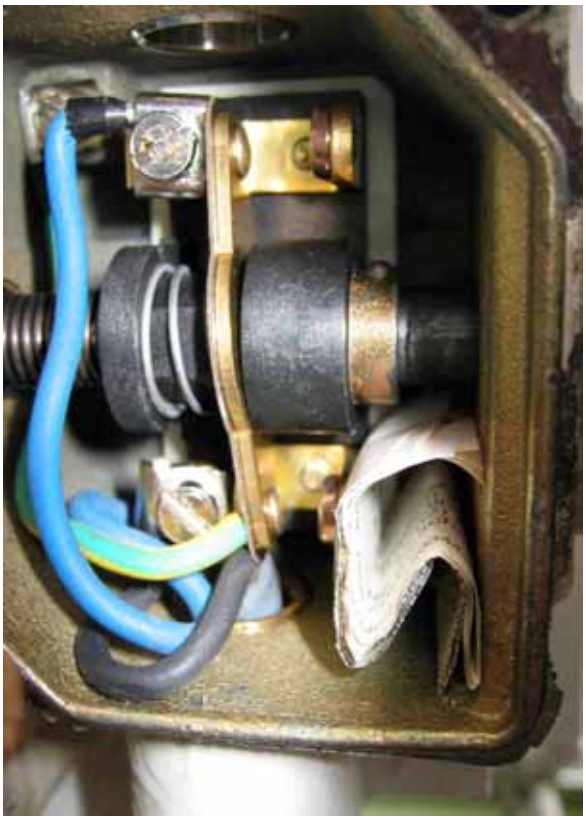


Figure 16: View of interior of limit switch

The switch cabinet and the wiring inside it were also in an excellent condition of maintenance (Fig. 17, 18). No loose cable connections or traces of corrosion were found here either.

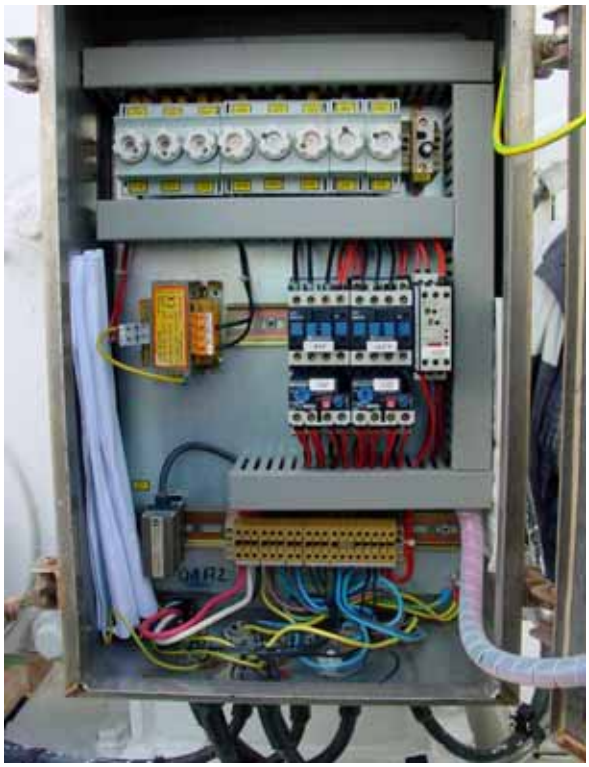


Figure 17: Switch cabinet opened

Figure 18: Inside of switch cabinet door

Finally, an attempt was made to push the limit switch behind the safety bar with the crank-handle mounted in order to close the limit switch in this way. This was possible with slight effort (Fig. 19 and 20). However, the possibility of the safety bar "being pushed past" without specific application of force from the exterior can be ruled out.

Figure 19: Limit switch lever behind the safety bar

Figure 20: Limit switch lever beneath the safety bar (crank-handle in place)

As a result of the inspection the following summary can be drawn up:

- The safeguarding system to avoid electrical operation of the winch when the crank-handle is mounted was unrestrictedly operable at the time of the survey. (The same conclusion had been drawn on board when a first inspection of the system was carried out already shortly after the accident.)
- The launching device, especially the switch cabinet and the limit switch, was in a very good state of maintenance.
- The place where the injured man was standing before the accident cannot be seen from the winch motor operating point.
- Ventilator noises and other general ship-operating noises, head wind noise and working noise make acoustic communication difficult in the area of the scene of the accident.
- The safety bar showed signs of dismantling (see Fig. 12).
- There are two possible plausible explanations for the crank-handle turning with the motor:

    1. At the time of the accident the safety bar was dismounted.
    2. The triggering of the limit switch was suspended as it was pushed past behind the safety bar.

4.4 Record of the manufacturer Global Davit

The General Manager of the manufacturer of the launching facility and one of his staff were also present at the survey of the launching facility in Hamburg on 11 June. In a record made available to the BSU, which essentially confirms the results of the investigation by the BSU, the results of the survey as seen by the manufacturer are set out as follows[9]:

- *All safety-relevant mechanical parts of the winch were optically in sound technical condition. It was noticed that the fastening screw of the safety bar showed signs of paint damage. This indicates that the bar was removed after the last conservation treatment. According to the information provided by the crew this occurred during the period in the yard in Shanghai for maintenance purposes.*
- *The mechanical operability of the limit switch was also sound.*
- *The further inspection revealed that with the square crank-handle in place, the stop brake cannot be opened and the electric motor of the winch cannot be started.*
- *The original crank-handle could be positioned and removed easily.*
- *The checks of the switch cabinet and the limit switch did not reveal any optical and technical defects. Furthermore, no moisture was ascertained in these components. Dismantling of the limit switch did not reveal any technical defects in the components.*
- *In a further test it was ascertained that the limit switch lever can be pushed with force past the support plate of the safety flap. Visible damage to the conservation coating was sustained here. However, this damage was not present at the time of our arrival at the scene of the accident.*
- *In accordance with the statement by the technical staff of the crew these safety devices had also been checked shortly after the accident and no safety defects were found.*

[9] Abridged reproduction of the record retaining the sense.

4.5 Vessel documents

Within the framework of the inspection on board relevant ship documents were studied and evaluated. Excerpts from the contents are set out below.

4.5.1 Excerpt from the ISM-Code, areas of responsibility of First Officer

The First Officer is responsible for all matters relating to the ship's safety, especially for the advanced planning, implementation and monitoring of safety drills, training and maintenance/testing of the safety equipment and life-saving appliances within the intervals stipulated by SOLAS and in the SMM (Safety Management Manual). On passenger vessels the First Officer is supported by a Safety Officer in all matters relating to safety.

The First Officer is nominated as Ship's Safety Officer. He is responsible for implementing, organising, executing and monitoring safety measures and safety procedures on board.

The First Officer is the superior of the Bosun and the deck crew. On passenger vessels the First Officer bears responsibility for all matters of safety relevance to the crew and staff and for discipline on board.

4.5.1.1 Deputy in absence

The Captain.

4.5.1.2 Maintenance and repair

Maintenance and repairs must be carried out in agreement with the manufacturer's instructions for use, or in accordance with the instructions issued by Hapag Lloyd Container Line Ship Management. The work may only be carried out by suitable, qualified staff, especially where safety-relevant parts are concerned. An officer or engineer must instruct the execution of such work. He must supervise the work and carry out a final inspection of the work.

Each repair must be recorded in the computer-assisted maintenance and repair system, or in another relevant controlled document on board.

Each repair and maintenance work carried out must be inspected and be accepted by the engineer or nautical officer. In the case of safety-relevant repairs the First Engineer or the Captain must be drawn in for the relevant inspection.

4.5.1.3 Critical equipment

Special care must be applied for the inspection of critical/crucial equipment, whose sudden failure can lead to dangerous situations for which there are no binding specifications of the flag states, the port state controls, or the classification societies. This includes in particular equipment that is not used very often (for example emergency, rescue and safety equipment).

4.5.1.4 Regular testing and inspections

Regular inspections are conducted at pre-determined intervals in accordance with the international class, See-BG regulations, and on the advice of the manufacturer or the vessel operator.

The extent and content of such checks must be in line with the relevant manufacturer's instructions. Tests stipulated by the maintenance instructions must be executed and the test results documented. If an inspection reveals the need for corrective measures, these must be arranged in time.

4.5.2 Excerpt from the ISM-Code areas of responsibility of Second Officer

The Second Officer is responsible for safe sea and port watches. In this function he is authorised to issue instructions to other crewmembers during the watch. In his area of work he draws up reports for the Captain. He is familiar with the rescue equipment in accordance with his qualification. Furthermore, he is responsible for the vessel operation and safety at workplaces. His deputy is another officer on watch duty.

4.5.3 Work and rest periods

The sea watches are divided in the 3-watch rhythm (00.00 h to 04.00 h, 04.00 h to 08.00 h, 08.00 h to 12.00 h). The Captain does not perform any sea watch.

Working hours of the injured man J. in the 96 hours prior to the accident
(T = Day, U = Day of accident, X = Hour of work, / = 1/2 hour of work)

T	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
-4							X	/	X	X	X	X		X	X	X	X	X						
-3							X	/	X	X	X	X		X	X	X	X	X						
-2									X	X	X	X		X	X	X	X	/						
-1	X	X	X	X									X	X	X	X								
U	X	X	X	X									X	X										

Working hours of Second Officer in the 96 hours prior to the accident
T = Day, U = Day of accident, X = Hour of work, / = 1/2 hour of work)

T	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
-4									X	X	X	X		X	X						X	X	X	X
-3									X	X	X	X			X	X	X				X	X	X	X
-2									X	X	X	X		X	X						X	X	X	X
-1									X	X	X	X									X	X	X	X
U									X	X	X	X		X							X	X	X	X

Working hours of the seaman V. in the 96 hours prior to the accident
T = Day, U = Day of accident, X = Hour of work, / = 1/2 hour of work)

T	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
-4									X	X	X	X		X	X	/					X	X	X	X
-3									X	X	X	X		X	X	/					X	X	X	X
-2									X	X	X	X									X	X	X	X
-1									X	X	X	X												
U							X	/	X	X	X	X		X	X	X	X	/						

Working hours of the seaman C in the 96 hours prior to the accident
T = Day, U = Day of accident, X = Hour of work, / = 1/2 hour of work)

T	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
-4							X	/	X	X	X	X		X	X	X	X	/						
-3							X	/	X	X	X	X		X	X	X	X	/						
-2									X	X	X	X		X	X	X	X							
-1									X	X	X	X									X	X	X	X
U									X	X	X	X		X	X	X	X	/			X	X	X	X

4.5.4 Duration of employment and time at sea of the witnesses to the accident

The injured man J. had been on this vessel and employed by the vessel operator since 18 February 2004. The Second Officer worked for the vessel operator for nine months in 1997. He has been back with the vessel operator and employed on this vessel since 5 November 2003. The Seaman V. has been assigned to various vessels of the vessel operator since 1998 and has been on this vessel since 20 May 2004. The seaman C. has been employed by the vessel operator since 2002.

4.5.5 Testing and drills on board

Maintenance of Falls acc. SOLAS III R 20.4
(to be turned end for end at least in intervals of 2,5 years. Renewal at least at intervals of 5 years. If end for end-turning impossible, renewal after 4 years)

	Last renewal	Last turning end for end	
Falls Lifeboats	25.09.2001	27.02.04 Ship Yard	
		Shanghai	
Falls Rescue Boats	25.09.2001	26.02.04 Ship Yard	
		Shanghai	
Falls lifting devices Liferaft-davits	25.09.2001	26.02.04 Ship Yard	
		Shanghai	

Safety Report for Container Vessels

PART B: Inspection and Maintenance
(Send one Copy to 2820 Ship Management at the end of the Year)

WEEKLY INSPECTIONS acc. SOLAS III R 20.6

- visual inspection Survival crafts, Rescue boats & launching appliances
- engine-run-test of Lifeboats & Rescue boats
- General alarm system
- Breathing apparatus cylinders do not present leakages

have to be documented in the ship's log book and shipboard controlled documents

Life Saving Appliances, operational readiness, maintenance & inspection on board acc. SOLAS III R 20 (monthly)

	Last Check	Last Check	Last Check	Last Check	Last Check	Last Check
Lifeboat and respective equipment (LSA IV 4.4.6)	16.01.04	15.03.04	21.05.04			
	17.02.04	23.04.04				
Life saving equipment • life jackets (& lights) • inflatable life jackets • lifebuoys • immersion suits	16.01.04	16.03.04	21.05.04			
	07.02.04	02.04.04				
Liferafts (visual inspection) Liferaft-davit (inspection)	16.01.04	16.03.04	21.05.04			
	07.02.04	23.04.04				
Hydrostatic release units (visual insp. on board)	16.01.04	16.03.04	21.05.04			
	07.02.04	24.04.04				
Rescue boat & respective equipment (LSA V 6.1.2)	17.01.04	16.03.04	10.05.04			
	19.02.04	24.04.04				

Rescue Boat Drill (launched & manoeuvred in water)
acc. SOLAS R 19.3.3.6 (if possible monthly, at least once every 3 months)

Number of Drill	1	3				
	2					
Date	21.01.04	27.03.04				
	16.03.04					
Number and page of logbook	9/84	10/58				
	10/47					

4.5.5.1 Test certificate boat winch

Germanischer Lloyd

Cert. No.: 17242 BH
Bescheinigung Nr.

Test certificate for Boat Winches
Prüfbescheinigung für Bootswinden

A. Identification data
Kenndaten

Type: 02 E
Typ

Factory No.: 0064A04
Fabrik-Nr.

Drive: Electric & manual
Antrieb

Rated load: 10 [kN]
Nennzugkraft

Holding load: 10 [kN]
Haltekraft

Rope: ı 10 [mm]Ø
Seil

B. Delivery Data
Lieferdaten

The boat winch is intended for: Hyundai Heavy Industries
Die Bootswinde ist bestimmt für

Supplier's designation of order: 0064A04
Auftragsbezeichnung der Lieferfirma

Purchaser's designation of order: Nb. 1366
Auftragsbezeichnung des Bestellers

C. Particulars of testing
Angaben zur Prüfung

Material test certifications: 3.1 B acc. to Rules
Werkstoffprüfbescheinigungen

Statical test force: 15 [kN]
Statische Prüfkraft

Dynamical test force: 11 [kN]
Dynamische Prüfkraft

Lowering height: 3,0 [m]
Fierhöhe

Lowering speed: 0,8 [m/s]
Fiergeschwindigkeit

Supplier: GLOBAL DAVIT GmbH
Lieferfirma

at Bassum
in

Date of test: 2002-06-04
Prüfdatum

D. Confirmation of testing
Bestätigung der Prüfung

☒ The boat winch corresponds with the drawings approved by GL with journal No.: 08706/01
Die Bootswinde entspricht den vom Germanischen Lloyd mit Tgb. Nr.: ... geprüften Zeichnungen

☒ All tests performed correspond to the Regulations of Germanischer Lloyd and IMO-Resolution A.689(17) / MSC.81(70).
Alle Prüfungen entsprechen den Vorschriften des Germanischen Lloyd und der IMO-Entschließung A.689(17) / MSC.81(70).

Herewith I certify that the described boat winch has been tested in
Hiermit bescheinige ich, daß die beschriebene Bootswinde
accordance with IMO-Resolution A.689(17) / MSC.81(70) and GL-Regulations.
nach der IMO-Entschließung A.689(17) / MSC.81(70) und den GL-Vorschriften geprüft wurde.
The tests performed did not reveal any defects.
Bei diesen Prüfungen wurden keine Mängel festgestellt.

Stamping:
Stempelung
17242 BH
6 GL 02
10 [kN]
max. load (rated load resp. holding load)
Zuglkraft (Nennzugkraft bzw. Haltekraft)

Place and date: Bremerhaven, 2002-06-04
Ort und Datum

Surveyor of Germanischer Lloyd
Beauftragter des Germanischen Lloyd

10022

4.5.5.2 Maintenance certificate

Survey Statement

Attachment to Class Certificate

Germanischer Lloyd

Statement No.: 5 Page 1 of 1

Name of Ship:	HAMBURG EXPRESS	Register No:	0130038	
Port of Registry:	Hamburg	IMO Number:	9229829	
Flag of Registry:	Federal Republic of Germany	Class Period:	2001-10-01	# 1
Place of Survey:	Chongming Island, Shanghai	Survey Date:	2004-02-22	/ 2004-02-26

The surveys listed below have been carried out. This Survey Statement is integral part of the Class Certificate for class related items.

Surveys Performed	Status	New Records
Machinery		
AUX.BOILER OIL/WASTE GAS HEATED (INT.INSP.-STATUTORY)	complete	2004-02-26
Non-Periodical Surveys		
1. non - periodical	complete	

Damage area between Frame 118 to 120, on No.3 W.B.T. STBD. side, with size about 2500mm x 1200mm on shell was cropped and renewed. The new inserted material is grade A32, size is 16.5mm thick, same like basic design, with CCS certificate: SHP02010458.

After repair, vacuum test with 0.2 bar was done, no leakage found. in order.
The concerning bulkhead on position F119 was bended, cropped and renewed with size 500mm x 1000mm, in order.

2. non - periodical complete

The Free-fall lifeboat's falls, Rescue boat's falls and Life raft's falls end to end exchange carried out in Shanghai Shipyard, Chongming Island. This work was confirmed by Surveyor and the crews were required to put in the Log Book.

Class Conditions		
Memorandum, Hull	deleted	2004-02-26

DAMAGE TO #3 W.B.T.STBD SIDE BY CONTACT OF FENDER SHACKLE DURING HARBOUR STAY IN HAMBURG: THIS LOCATION TO BE PERPETUITY REPAIRED IN NEXT DRYDOCK & THE AREA T/B INSPECTED BY SHIP OFFICER EVERY MONTH.

Confirmation of class, if endorsed or Statutory Status, if dealt with, is confined to surveys conducted and documented by this Statement according to the Rules for Classification and Construction of Germanischer Lloyd in the last edition.

Class Status	Confirmed
Statutory Status	Statutory matters without objections

CMS Hapag-Lloyd Container Linie GmbH HAMBURG EXPRESS 2004-02-26

(Captain)

GERMANISCHER LLOYD 1867 373

Surveyor(s) to Germanischer Lloyd ( )

Chongming Island, Shanghai
Place

The latest edition of the General Terms and Conditions of Germanischer Lloyd is applicable. German law applies.
Germanischer Lloyd

4.5.5.3 Operating and Maintenance Instructions

The Operating and Maintenance Instructions R-SH.0064A01/./04 Rescue Boat Crane, Type Rhs. 10/3,5, from Messrs. Global Davit GmbH, could not be presented to the BSU on board and the BSU requested a copy from the manufacturer.

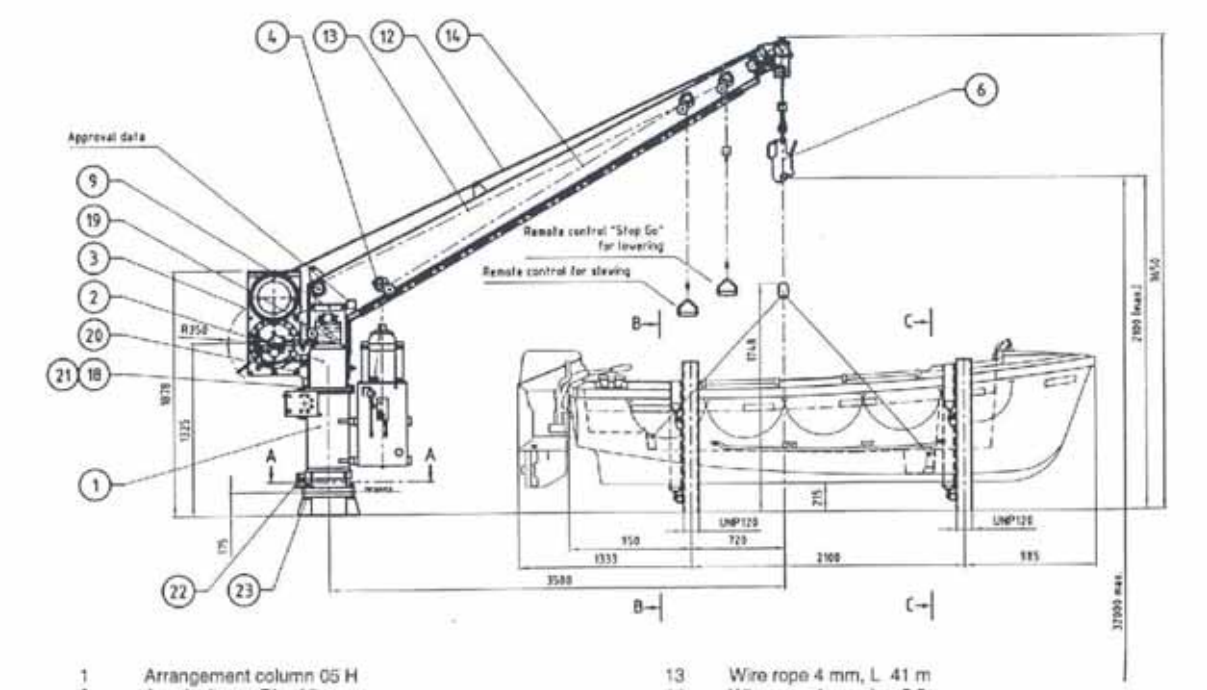
The document presented to the BSU in German describes the technical data of the overall system and the individual components (winch motor, hydraulic set), contains a description of the function, and information on the nature and frequency of the maintenance and inspection work to be carried out.

The following remarks concern the maintenance/preservation of the wire ropes:

"11.3. MAINTENANCE GROUP 3, QUARTERLY
...
11.3.3. WIRE ROPES (grease)
The wire ropes must be greased at the above intervals. The grease should be warmed slightly for this.
...
11.4. MAINTENANCE GROUP 4, ANNUAL
...
11.4.4. CHANGING THE WIRE ROPES
Special attention should be paid that the wire ropes run on the drum from the right side. This must be ensured before the ropes are unwound. If wedge pockets are used to join the wire ropes, the wire rope under tension must form a single line with one side of the wedge pocket.
The rope windings on the drum must lie close to one another in layers, they should not lie on top of one another.
It is advisable to unwind these ropes once a year and to turn them before they are wound back again (if possible)."

The instructions do not contain any further description regarding the procedure or implementation of the preservation work or any safety instructions to be observed in this connection.

4.5.5.4 Construction drawing of davit with rescue boat [10]



1	Arrangement column 05 H	13	Wire rope 4 mm, L 41 m
2	Arr. davit arm Rhs.05	14	Wire rope 4 mm; L = 5,5 m
3	Arrangement winch 02E.01	18	Hex screw M20x55
4	Arr. remote control 05/20/H-SG	19	Hex screw M20x30
6	Rescue boat hook Simplex 1.1	20	Hex nut M 20
9	Board instr. plate Rescue stored power	21	Washer 21
12	Wire rope 10 mm, 35x7, Tensile grade 1960 N/mm² Minimum breaking load 75,5 kN Non rotating, galvanised, greased One side pressed thimble acc. K2/2,5", L = 40 m	22	Slewing angle limiter 05
		23	Hex bolt M20x120

5 Legal Regulations

5.1 SOLAS

According to SOLAS[11] Chapter III Rescue Equipment and Devices Rule 20 No. 4.1 the ends of the falls used for launching must be changed round at intervals of at most 30 months and, if necessary, in the case of wear, or at the latest every 5 years, if this period is shorter must be renewed. According to No. 6, weekly checks and inspections are to be carried out. All survival craft, rescue boats and launching devices must be inspected optically in order to ensure that they are ready for use. Rule 36 specifies that maintenance guides that are easily understandable and illustrated as far as possible must be on board. If appropriate, maintenance and repair instructions, plans for regular maintenance and lubrication plans with the recommended lubricants must be on board for each item of equipment.

[10] Source: Global Davit GmbH.

[11] Cf. Annex to the International Convention of 1974 on protection of human life at sea amended by the Protocol of 1988 (SOLAS 74/88); see Ship Safety Manual of the German safety organisation See-Berufsgenossenschaft.

5.2 International Life-Saving Appliances (LSA) Code[12]

According to the International Life-Saving Appliance (LSA) Code Chapter VI – Launching and Embarkation Equipment, No. 6.1.1.4, each launching device must be built in such a way that only very little running maintenance is required. All parts that have to be maintained regularly by the ship's crew must be easily accessible and easy to keep maintained.
Effective manual operation must be possible for hauling in each survival craft and rescue boat. The crank-handles or hand-wheels may not turn with the moving parts of the winch when the survival craft or rescue boat is slacked down or heaved up by power drive (cf. Chapter 6 No. 6.1.2.6).

[12] Cf. announcement by the International Life-Saving Appliance (LSA) Code of 4 June 1998; Federal Gazette No. 118a of 1 July 1998.

6 Analysis

The communications between the four crewmembers present on the B-deck of the rescue boat station at the time of the accident was made difficult by the arrangement of the engine room ventilation doors and the sound level caused by this. There was no direct visibility contact between the two working groups. The winch and the switch box are on opposite sides of the rescue boat crane. Consequently, the Second Officer had no direct eye contact with the man who sustained the injury when the accident occurred. According to his own words, he asked before the accident whether he could switch on the winch. The injured man reportedly affirmed this.

To grease the boat fall it is necessary to unwind the wire rope from the winch by hand. For this the brake lever of the stop brake was tied upwards with a working line in order to release the brake. The wire rope could now be drawn off and arranged on the deck by the two persons engaged in maintenance. During greasing of the wire rope the crank-handle was used for the first layer. According to statements by witnesses and the discribed pattern of injuries it is certain that the crank-handle was mounted at the time of the accident and that the fact that it turned with the winch motor led to the head injury causing the death of the seaman.

The survey on 11 June 2004 four days after the accident showed that apart from the grease becoming resinous in the joint of the safety bar, there were no technical defects on the davit. The joint of the bar was difficult to move as a result, and after drawing off the crank-handle the bar did not automatically drop down into its original position. (However, indirectly this created a further "safety mechanism", since in addition to drawing off the crank-handle it was now necessary to press the safety bar down by hand in order to move the limit switch over for winch operation.)
All the specified maintenance intervals, tests and inspections were observed and documented. In the Survey Statement of 26 February 2004 it was certified that the boat fall was changed over (end to end change).

According to the information supplied by the crew nothing had been changed on the crane after the accident. Only a function test had been carried out that did not reveal any indications of malfunctioning. The survey of the safety bar on 11 June 2004 revealed that the bolt for fastening the bar had been detached. In this connection the ship's command and the vessel operator refer to the maintenance work conducted in Shanghai on 26 February 2004.

In the on-board organisation, according to the ISM-Code the First Officer is responsible for all matters relating to ship's safety, especially for the maintenance and inspection of the safety equipment and life saving appliances, and is known as the Safety Officer. All maintenance work must accordingly be carried out in agreement with the manufacturer's instructions for use, and be supervised and accepted by an engineer or a nautical officer.

In the case under review here the officer himself joined in the performance of the maintenance work and could therefore only carry out his primary duty of supervising

to a limited extent. A third crewmember carrying out the maintenance work would not only have simplified matters, but also have served safety at work.
The provisional tying up of the stop brake could have been dispensed with. The fact that communication was only possible to a very limited extent due to the dead angle of the switch box, and was rendered even more difficult by the noise of the head wind, the ventilators and the working of the second work group at the scene, could have been substantially alleviated by the assignment of an additional man.

SOLAS Chapter III Rule 36 specifies instructions for maintenance on board. If required, maintenance and repair instructions as well as greasing plans with the recommended lubricants must be available on board for each item of equipment. The manufacturer's Operating and Maintenance Instructions R-SH.0064A01/./04 could not be presented to the investigation team of the BSU on board. These instructions only outline the work procedure for greasing the boat fall, however. Safety instructions regarding the maintenance work to be carried out, such as a warning against unauthorised dismantling of the safety bar, are not contained in the instructions.[13]

According to Chapter VI No. 6.1.2.6 LSA-Code, crank-handles or hand-wheels may not turn with the moving parts of the winch when the rescue boat is slacked down or heaved up by power drive. This requirement was basically satisfied in a practice-driven manner by the design used here. Despite this, due to the fact that the mounted crank-handle turned with the motor, there was a very serious accident.
Since technical failure of the bar system can largely be ruled out as a result of the investigations on board, it is to be assumed that the safety mechanism was in all probability put out of order with the maintenance work carried out on board.
The actions here were evidently performed in ignorance of the risks triggered by a crank-handle turning with the motor. The questioning of the Second Officer and the other two Philippine crewmembers who were, however, not primarily involved in the accident occurrence, has revealed that they were evidently not informed at all, or only inadequately, about the function and mode of operation of the safety bar. The technical background why operation of the winch motor should be impossible when the crank-handle was mounted was not known.
This ignorance is also supported by the statement by the Second Officer that he did not know whether the crank-handle was mounted at the time he actuated the winch motor. If he had been aware of the principle of action of the safety system, he would necessarily have had to ensure before switching on the winch whether the crank-handle had been drawn off. The injured man in turn would not have said okay if one assumes that he had known the mode of functioning of the latch system, and the Second Officer had actually warned him prior to switching on the winch; but instead he would have drawn attention to the fact that the crank-handle was still mounted.

[13] The maintenance instructions simply contain a warning about monitoring the winch brake. According to this the maintenance personnel must under all circumstances make sure before appropriate checks that no load or life-saving appliance is suspended in the wire ropes.

It should be noted independently of the afore mentioned considerations that technical safety devices basically only serve their purpose to the full extent if they cannot easily be put out of operation. This is of particular importance if their mode of operation and possible dangers are not immediately recognizable by the operator at any rate.

Ultimately two roughly probable chronologies enter into consideration as possible scenarios for dealing with the safety system. For both scenarios the technical barriers to realisation may be considered as low and evidence as to whether one of the two scenarios did in fact occur on board cannot ultimately be furnished.

Scenario a

The safety bar was dismounted at the time of the accident.
The traces of dismounting on the screw fitting of the bar speak in favour of this.
One plausible reason for such a measure could be economy of labour aspects. According to the statements by witnesses, because of the necessary tensile force and because it is technically not possible to pay out the wire rope with engine assistance with the system used on board, the Second Officer and J. had drawn off the wire rope together and laid it out on deck. For this it was necessary to loosen the stop brake. This was effected by tying up the brake lever with a work line, since an additional hand was not available.
After the wire was lying on deck the first turns were to be wound back on the winch drum. According to the statement by witnesses, first of all work was carried out with the crank-handle. However, mounting of the crank-handle is prevented by the safety bar as long as the brake lever of the stop brake is not in the horizontal operating position.
There were thus two possibilities for being able to mount the crank-handle. Either the stop brake was brought back to the horizontal operation position, or the safety bar was unscrewed. Both measures require roughly the same time input. However, it is to be taken into account that the entire operation of unwinding and winding up the boat fall again was to be repeated three times according to the statements by witnesses. Against this background, for pure economy of labour reasons, the once only removal of the "interfering" safety bar appears to be more plausible than the repeated tying up and subsequent loosening of the stop brake.

However, the following aspects can be set out against the assumption that the safety bar was in fact dismounted:

- Both the Second Officer and the German crewmembers who tried to investigate the cause of the accident after it had occurred have stated that the safety bar was not dismounted.
- In reply to the deliberately inconspicuously asked question as to whether and what tools were used for the maintenance work, the Second Officer replied that apart from the necessary utensils for greasing the wire rope, no special tools had been available at the scene of the accident (these would have been indispensable to unscrew the bar).
- The vessel operator has provided photos of the scene of the accident. According to this altogether 13 photos were taken by a digital camera, two series on the date of the accident and one two days later. The first series (5 photos) was taken on

the date of the accident between 13.45 h and 13.48 h camera time[14] according to the electronic time stamp, in other words probably less than 1 hour after the accident. On close inspection, the mounted safety bar is evident on one of these photos of the first series.

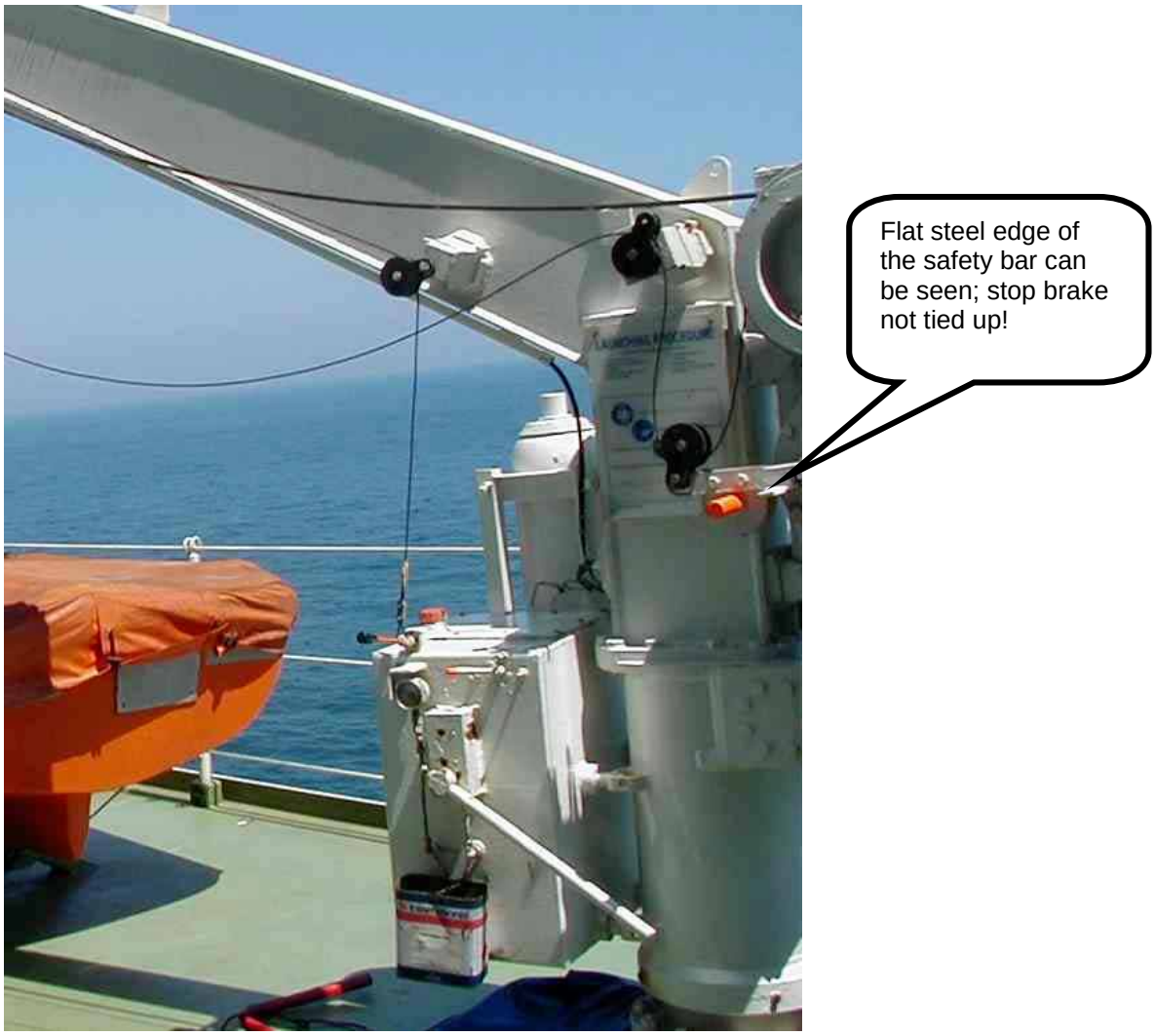


Figure 21: Mounted safety bar shortly after the accident

Scenario b

The limit switch was pushed past the safety bar by low force (cf. Fig. 19, 20).
There is a plausible possible explanation for such a procedure, especially if one assumes again that the purpose and operating function of the latch system was unknown to the persons involved. The following action sequence is conceivable:
After greasing the wire rope drum, work was commenced on winding up the rope again with the crank-handle, but this is a very slow and tiring job. It was therefore

[14] According to credible statements by witnesses the Ship's Operations Officer took the photos at about 15.00 h ship time (cf. Section 3.6 above), i.e. directly after first aid to the injured man that will certainly have been the chief focus of all the efforts on board; accordingly there is probably a time shift of about one hour between the "camera time" and the ship's time.

planned to wind up the rope onto the drum with the assistance of the electric winch. Since the crank-handle had not been drawn off, the first attempt to start up the winch motor failed due to the interference of the latch system. Ignorant of the threatening dangers, J. could now have tried to eliminate the "fault". For this he might then have pressed the limit switch down past the safety latch. The winch then started up at once.

However, factors speaking against this scenario are the witness statements and the fact that clear traces of scratches on the bar were only caused during the reconstruction attempt in the port of Hamburg on 11 June.
However, the photo series speaking against the scenario a described above does not provide any indications for or against the assumption that J. pushed the limit switch lever behind the safety bar. The first photo series made available that must be classified as the most informative since it was taken so close to the time of the accident regrettably does not contain any complete photos of the safety bar.

Summary

Except for the conceivable infringements against industrial safety set out in scenarios a and b, the following marginal conditions at least promoted the accident:

- execution of the maintenance work by only 2 persons, consequently:
  - supervisory function of the officer is limited
  - communication due to the constructive peculiarities of the launching device (missing intervisibility) and the noise exposure at the work place (ventilator noises, fair wind) additionally complicated respectively partly impossible
- lack of operating and maintenance instructions on board[14]
- safety system easily superable
- inadequate knowledge of the safety system among the Philippine crewmembers questioned

The rest and work times of all persons present at the accident were in line with the valid industrial safety provisions. Safety clothing was worn for the maintenance work. The work location did not make any special requirements regarding personal safety equipment.
It is to be stressed that the first aid measures initiated and the transport of the seaman who sustained the accident by helicopter and emergency physician were objectively correct and organised and implemented in exemplary manner by the vessel command.
Finally it shall be pointed out that the operator of the vessel as well as the manufacturer of the launching device have supported the Federal Bureau of Maritime Casualty Investigation on ascertaining the causes of the accident in a constructive manner.
Moreover the operator has informed the BSU that due to the lack of the operation and maintenance instruction they have promptly taken appropriate measures.

[14] Note: This case had only a conditional promotive effect thus the significant manufacturer documents only roughly describe the maintenance work and no warning notices, which could have prevented the accident were contained.

7 Safety recommendation(s)

7.1 Safety recommendation of 29 June 2004

The BSU issued a safety recommendation already shortly after the accident due to the particular danger in delaying in order to prevent future accidents attributable to the same or a similar cause. Even after completion of the investigation this recommendation still applies in full and is therefore repeated here:

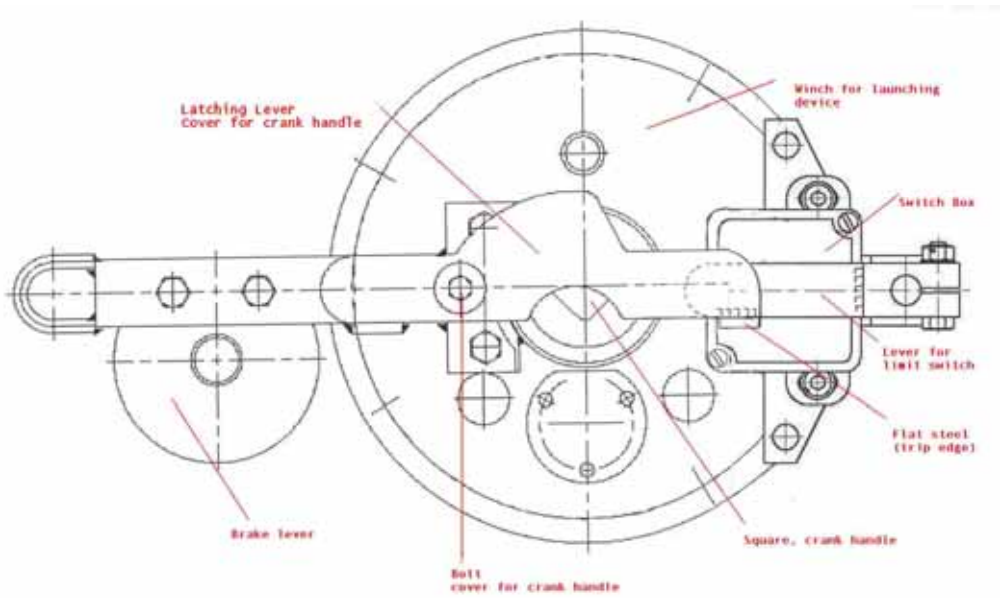
"The Federal Bureau of Maritime Casualty Investigation (BSU) issues the following safety recommendation in accordance with § 9 Para. 2 No. 2; § 15 Para. 1 and 10 of the Maritime Safety Investigation Law (SUG) of 16 June 2002 in conjunction with § 19 of the Law Relating to the Investigation into Accidents and Incidents Associated with the Operation of Civil Aircraft (FIUUG) of 26 August 1998:

The BSU is investigating the death of a Philippine seaman who sustained fatal injuries on 7 June 2004 while performing maintenance work on the launching device for the rescue boat on board the German container vessel H. The investigation proceedings have not yet been completed. However, it is certain that a second crew member had briefly started the electrically operated winch motor when the victim of the accident fell to the ground with a serious head injury. The BSU currently assumes that when the motor was switched on, the seaman must have been hit on the head with great force by the mounted crank handle turning with the motor. A similar fatal accident had already occurred on another German container vessel on 19 May 2000.

In both cases the fatal consequences of the accidents are in all probability attributable to the fact that it was possible to start up the winch motor despite the crank handle being in place. The rotating crank handle thus became an uncontrollable striking tool.
According to Chapter VI No. 6.1.2.6 of the International Life Saving Appliances (LSA) Code, it is stipulated for launching and embarking devices that crank handles and hand wheels may not rotate with moving parts of the winch when heaving down or heaving up with (electrical) power drive. The launching device used on the vessel H. basically satisfies these design requirements. In the launching device used the heaving down movement is blocked with the aid of a latching lever. This lever must be moved by hand (upwards). This operation alone releases the square mounting onto which crank handle can be fitted and blocks the heaving down movement. By drawing up the latching lever over a trip edge at its bottom side (flat steel), a second lever is activated that triggers a limit switch. This ensures that the electricity supply to the winch motor is interrupted (see attached sketch). During trial operation on board the vessel the entire system functioned without any problem.

The blocking system described above is installed on many vessels in this or a similar version and has basically proved successful in practice. The system is

not known to be susceptible to any particular malfunctions. Despite this a second fatal accident has occurred because the winch motor started despite the fact that the crank handle was in place. It is not yet clear in detail how the accident currently being investigated could occur and why the blocking system failed. However, within the framework of the investigation to date it has been generally ascertained that although the safety system used functions soundly and is suitable for use in practice in every respect, there is at any rate a theoretical possibility that the safety mechanism can be switched off relatively simply – for whatever reasons and possibly in ignorance of the accompanying dangers. On the one hand it is possible to unscrew the latching lever quite easily – it is only secured to the housing box by a bolt. In addition it is possible by using a little force to push the lever of the limit switch past the trip edge of the latching lever and press it downwards, thus cancelling the current interruption to the limit switch.



In view of the widespread use of these blocking systems or those of similar design and the special dangers emanating from crank handles turning with the motor, and in order to preclude accidents of this type from the outset, the BSU addresses the manufacturers of boat launching devices, (repair) shipyards, and owners, operators, vessel commands and supervisory organs to draw their attention to the following:

On all vessels whose boat launching systems have a mechanism corresponding or similar to that shown in the sketch for blocking the electric winch when a crank handle is mounted, the latching lever should be secured especially, for example by the use of a bolt with a split pin, in order to raise the inhibition level for thoughtless, negligent dismounting by simply loosening the only screw. In addition it is recommended that the flat steel beneath the latching lever (trip edge) be extended in order to make it impossible to force the limit switch lever past the latching lever.

In addition a weatherproof, permanent warning (sticker or the like) should be affixed both in the area of the crank and close to the winch switch drawing attention to the fact that winch operation with the crank handle in place can involve the risk of fatal injury and is strictly prohibited."

7.2 Further recommendations

1. It is recommended that **manufacturers of launching devices** for boats should reconsider their safety mechanisms for boat winches for new installations, and if appropriate develop higher design barriers to make it more difficult to make the safety system used inoperable.

2. It is recommended that **manufacturers of launching devices** for boats (repair) **shipyards, owners** and **operators of sea-going vessels,** should replace existing crank-handles by hand-wheels for manual operation as a simple measure to increase safety, so that blows by crank-handles turning uncontrolled, such as have evidently already occurred in other installations, are avoided. When new installations are designed it should be considered installing a clutch separating the drive from the transmission during manual operation.

3. The **See-Berufsgenossenschaft**[15] is called upon to check possibilities of modifying the relevant regulations (especially the LSA Code) with a view to generally replacing the use of crank-handles on vessels by the use of hand-wheels and ensuring a safe separation between manual and motor operation.

4. If the testing recommended under No. 3 reveals that the use of hand-wheels is generally to be preferred to the use of crank-handles in the area of launching devices for boats, it is recommended that the **Federal Ministry of Transport, Building and Housing** should promote appropriate modification of the LSA-Code in dealings with the International Maritime Organisation (IMO) in order to raise the safety standard internationally too.

5. The **manufacturers of launching devices** must ensure that the maintenance and operating instructions for the equipment they bring into traffic provides information in the necessary detail and in easily understandable manner about the nature, frequency and procedure of maintenance work. This also includes clear indications of particular dangers and risks in connection with the work to be carried out.

6. The **owners** and **operators of sea-going vessels** and the **vessel commands** are called upon to ensure that the relevant operating and maintenance instructions at least in English and possibly in German are available on board and are kept up with the technical status of the equipment.

[15] See-BG = German Marine Insurance and Safety Association.

7. The **addressees named under No. 6** must ensure that persons carrying out maintenance work on board and/or operating the launching equipments as well as other equipment and installations involving danger are informed about their mode of operation of these and of dangers and risks to an adequate extent and are trained appropriately. This applies especially for those crewmembers who are to supervise and direct such activities.

8. **Training facilities that carry out ships safety courses,** especially training to acquire rescue boat certificates, are called upon to point out specifically the particular dangers in launching devices caused by crank-handles turning with the winches.

8 Sources

- Survey on board on 11 June 2004; in attendance:
  - See-Berufsgenossenschaft (See-BG)
  - Crane manufacturer Global Davit GmbH, Bassum
  - Ship's management Hapag-Lloyd Container Linie GmbH, Hamburg
  - Crew of Hamburg Express
  - Expert from the Institute for Material Science and Welding Engineering (IWS) of the University of Applied Science Hamburg
  - Inspection Team of the BSU

- Survey Report: Institute for material science and welding technology Hamburg (IWS) ; Test Report No. K 489-2004 of 3 August 2004; Prof. Dr. Jochen Happ

- Statement by the Seeamt Bremerhaven of 30.01.2001 – DI 43/00 B "Work accident of the seaman P. on 19.05.2000 on the boat's deck on board CMV "Nyland" with fatal consequence in September 2000; BOSeeAE 8-10/01, S. 201

- Lifeboat Winch Handle Injures Crewman, Marine Accident Investigation Branch (MAIB) Southampton, Safety Digest 2/2004

- Written statements/photos/comments/records
  - See-BG
  - Global Davit GmbH
  - Hapag-Lloyd Container Linie GmbH, Hamburg
  - Crew of Hamburg Express

- Sea chart and vessel particulars
  - Bundesamt für Seeschifffahrt und Hydrographie Hamburg (Federal Maritime and Hydrographic Agency (BSH))

- Documents
  - Accident Prevention Regulations (UVV-See); directives and leaflets (See-BG)
  - Safety of Life at Sea (SOLAS)
  - Publications of the International Life-Saving Appliance Code (LSA) Code
  - Classification and Building Regulations of Germanischer Lloyd
  - Operating and Maintenance Instructions R-SH.0064A01/./04, rescue boat crane, Type Rhs.10/3,5; Global Davit GmbH
  - Vessel:
    - Working Time Sheets
    - ISM Position Responsibilities
    - Maintenance and Test Certificates
    - Safety Report for Container Vessels, Maintenance of Falls
    - Rescue Boat Drill
    - Excerpts from the logbook