



**Bundesstelle für Seeunfalluntersuchung**  
**Federal Bureau of Maritime Casualty Investigation**  
Federal Higher Authority subordinated to the Ministry of Transport,  
Building and Urban Development

Investigation Report 415/10

**Very Serious Marine Casualty**

**Fatal accident  
on board the MV THULE  
in Naantali, Finland  
on 22 September 2010**

2 April 2012

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 in the version applicable prior to 30 November 2011.

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

This report should not be used in court proceedings or proceedings of the Maritime Board. Reference is made to the aforementioned version of art. 19 para. 4 SUG.

The German text shall prevail in the interpretation of this Investigation Report.

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## 1 Summary

At 1030<sup>1</sup> on 22 September 2010, an ordinary seaman was found lifeless with severe head injuries on the port side catwalk after falling from the hatch coaming while the hatch cover on the MV THULE was being moved in the port of Naantali, Finland. The casualty died at the scene.

The hatch cover was to be raised with the shipboard crane while rape was being unloaded with a suction dredger. Here, one person was on the platform of the crane and the other was on the deck giving directions. The crew provided first aid and informed the emergency medical services.



Figure 1: Scene of the accident

<sup>1</sup> Unless otherwise stated, all times shown in this report are local = Central European Time = UTC + 2

## 2 SHIP PARTICULARS

### 2.1 Photo



Figure 2: Photo

### 2.2 Vessel particulars

Name of vessel:	THULE
Type of vessel:	General cargo vessel
Nationality/flag:	Germany
Port of registry:	Haren Ems
IMO number:	9129134
Call sign:	DQUG
Owner:	MS 'THULE' Schiffahrtsgesellschaft mbH & CO. KG
Year built:	1996
Shipyard/yard number:	Bodewes Scheepwerf Volharding Foxhol BV, 329
Classification society:	Bureau Veritas
Length overall:	89.72 m
Breadth overall:	13.6 m
Gross tonnage:	2,842
Deadweight:	4,123 t
Draught (max.):	5.72 m
Engine rating:	2,147 kW

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Main engine:	MaK 6M453C
(Service) Speed:	12.5 kts
Hull material:	Steel
Hull design:	Double hull
Minimum safe manning:	7

### **2.3 Voyage particulars**

Port of departure:	Kunda
Port of call:	Naantali
Type of voyage:	Merchant shipping/International
Cargo information:	Grain
Manning:	8
Draught at time of accident:	Unknown
Pilot on board:	No
Canal helmsman:	No
Number of passengers:	None

## 2.4 Marine casualty or incident information

Type of marine casualty:	Very serious marine casualty
Date, time:	22/09/2010, 1030
Location:	Port of Naantali, Finland
Latitude/Longitude:	$\phi$ 60°27.5' N $\lambda$ 022°02.7' E
Ship operation and voyage segment:	Kunda – Naantali
Place on board:	Main deck on the port side
Human factors:	Yes
Consequences:	Fatal accident

Excerpt from Nautical Chart 241, BSH



Figure 3: Nautical chart



## 2.5 Shore authority involvement and emergency response

Agencies involved:	Paramedics from Naantali, Turku Police and Department of Forensic Medicine
Resources used:	Ambulance
Actions taken:	Taken to the Turku University Hospital
Results achieved:	Death due to head injury

### **3 COURSE OF THE ACCIDENT AND INVESTIGATION**

At 1030 on 22 September 2010, the master was informed that an ordinary seaman had been found lifeless and bleeding from the head on the port side of the main deck next to the hatch. The crew provided first aid and informed the emergency medical services. The doctor from Turku and an ambulance from Naantali arrived at the scene of the accident at 1037. Attempts at resuscitation were unsuccessful. It seems that the casualty succumbed to his injuries immediately. There were contusions on his head and the right side of his skull had collapsed. He was taken to the Department of Forensic Medicine in Turku University Hospital.

The hatch cover was to be moved while rape was being unloaded with a suction dredger. In the process, one ordinary seaman was reportedly on the platform of the gantry crane and the other on deck to give directions. There were no eyewitnesses. Direct visual contact did not exist between the crane's control position and the position on the catwalk in which the accident occurred. The height of the hatch coaming is 2.20 m. Both ordinary seamen were wearing overalls, helmets, safety shoes and protective gloves. Traces of blood were found on the 1.10 m high guard rail.

The MV THULE arrived in Naantali fully laden with a cargo of 3,139.4 t of rape at 2105 on 20 September after an 18-hour voyage. The casualty was assigned to the watch at sea and in port during the standard working hours of 0000 to 0400 and 1600 to 2000. According to the time sheet for September 2010, the casualty had carried out 219 hours of work up to the day of the accident of which there were 91 hours of overtime as well as 309 hours of rest. There was neither evidence of a violation of the Arbeitszeitgesetz (act regulating working hours) nor fatigue. However, there was a deviation from the standard working hours. During the days at sea, there are inconsistencies between the recorded working hours of the navigational officers and ratings; there were instances at night in which the navigational watch was not manned by a lookout.



Figure 4: Gantry crane, platform and control position



Figure 5: Cargo hold viewed from the crane platform

## 4 ANALYSIS

The injuries indicate that the casualty fell from the hatch coaming, struck the guard rail with his head and landed on the port side main deck. The injuries were fatal due to trauma caused by blunt objects. Presumably, a pontoon hatch cover was to be shifted. The hatch covers must be lifted vertically with a gantry crane. In the process, the list may not be greater than 3°-5° and the forward draught may not be more than 1.80 m higher than the after draught (1.5° trim) in order for the four hooks of the crane to be able to grasp. 148 identical vessels are said to be equipped with this system.

The type 15 kW electro-hydraulic crane of the manufacturer Coops & Nieborg B.V. is capable of hoisting hatch covers weighing 8-14 t. Its travel speed is about 20 m/min and its hoisting speed about 2 m/min. The crane runs on rails, which are mounted on the port and starboard side of the hatch coaming and span the entire length of the cargo hold. The ends are terminated with rubber buffers and buffer stops. When in motion, the crane is driven by four wheels, each with a hydraulic motor. Power is transmitted via a stainless steel chain transmission. The lifting operation is performed using two cylinders on the port and starboard side. The pontoon covers have to be opened according to a specified procedure and stacked one above the other on the hatch, e.g. first cover No. 2, then No. 4, and finally No. 3. The crane is operated using three levers with hydraulic proportional control sliders. In a sea-fast state, it can be anchored astern on the rail with four clamps and support feet.

According to the manufacturer's instructions (Safety instructions regarding good connections between lifting hooks and hatch cover), the crane hooks and connection points on the hatch covers must be marked red or yellow to make it easier to control them vertically in relation to each other. It is intended that two people participate in a lifting operation: one on the crane to operate the control lever and the other on deck to control the hoisting position. If there is uncertainty as to whether all four hooks are properly connected, another person should control on deck on the other, starboard side which can only be seen by the crane operator. Furthermore, the rails must not be obstructed. Reportedly, more than 600 cranes (as of 2003) of this type have been installed. The crane was last tested with a weight of 16 t on 20 August 2009 and its operability certified by Bureau Veritas.

Technical aids for establishing the hoisting position are not provided by the manufacturer, which points out that this is the responsibility of the operator. Due to a number of accidents involving this type of crane, the Finnish investigation authority (Accident Investigation Board Finland – ONNETTOMUUSTUTKINTAKESKUS) has published the safety study S3/2007M Hatch crane safety. Here, a precise hoisting position is crucial for safe crane operation. In eight accidents over seven years, cranes have reportedly parted from the rail and pontoon covers toppled into the hatch. This resulted in six injured and three fatally injured seamen.

The Finnish investigation authority pointed to structural risks and the safety management system (SMS) on board for operating the crane. Meanwhile, the manufacturer has offered a number of structural measures that make operating the crane safer. Upon request, a five-minute video on proper operation of the crane can be supplied. On the video, three people can be seen operating the crane.



Figure 6: Crane hooks on the starboard side

The SMS manual on board the THULE does not contain any special procedures for the loading and unloading operation or handling the crane. The manufacturer's operating manual was on board. In this accident, one ordinary seaman was at the crane's control position on the starboard side and the second one main deck on the port side.

A pontoon cover was to be shifted. To that end, the second ordinary seaman climbed onto the hatch coaming and used the guard rail for support. Presumably, he lost his footing while grasping the coaming, fell backward onto the deck and struck the guard rail with his head. He was wearing NovaTril mixed fabric gloves made by 'atg'. The category 2, size 10 glove used is made using nitrile and lined with cotton. It is reportedly durable, resistant to grease and oil and is said to have good properties vis-à-vis grip in both dry and wet conditions. It is certified according to the CE EN388 standard and has been tested for compatibility, abrasion, cut, tear and puncture resistance. Typical applications are reportedly construction and rail, the sheet metal, plastics and metal industries, waste management, forestry, agriculture and fisheries.



Figure 7: Protective glove



Figure 8: Grip surface of the protective glove

No ladder was located in the immediate vicinity of the accident and there were only three permanently installed along the whole of the hatch coaming. It would have been possible to operate safely on the hatch coaming with a ladder. An additional handhold and support possibility is offered by the rail above the ladder. The ordinary seaman would also have been protected from behind. There is no direct visual contact between the crane operator on the starboard side and the person on the port side service corridor giving directions. There was also no radio contact by means of handheld transceiver.



Figure 9: Ladder with rail

## 5 CONCLUSIONS

The accident is the result of structural defects, inappropriate protective equipment, inadequate documentation by the crane manufacturer and in the safety management system (SMS) of the THULE. Had more ladders been installed on the hatch coaming and if there was a larger selection of protective gloves on board, then it is very likely that the accident would not have happened because controlled operation with additional protection by the hand becket (in this case, a backrest on the coaming) would then have been possible.

Occupational safety, including compliance with the requirements pertaining to it, is the responsibility of the employer. The employer determines the necessary qualification requirements for occupational safety on board, is responsible for ensuring that appropriate personal protective equipment, including clothing, is made available and must implement measures to ensure the use and maintenance thereof. Within the framework of a risk assessment, the employer should define the manner in which operating areas may be entered by insured personnel. The operating areas (dangerous areas) are derived from the operating conditions, the specific tasks and the associated regulations pertaining to occupational safety and should be described in the SMS. The SMS manual on board the THULE did not contain any special procedures for the loading and unloading operation or handling the crane. The manufacturer's operating manual was referred to, which states that at least two people should handle the hatch covers and gantry crane.

Neither the SMS manual nor the operating manual and video were suitable for proper and safe operation. Because there was no ladder at the accident position, the ordinary seaman decided to climb between the guard rail and coaming as high as he needed to in order to be able to observe the progress of the unloading operation with the suction dredger. This resulted in the fatal fall. It is possible that the accident was facilitated by protective gloves which were too big and inappropriate. When assessing the gloves, the BSU found that size 10 was a very large fit and that hands could easily slip out of them. The outer side of the gloves did not have a non-slip coating, e.g. gripper dots. However, the gloves had been tested according to the CE EN388 standard. Standards for the fit and slip resistance do not exist. Sizes differ depending on the manufacturer. Only the common size (10) was available on board the THULE. There are a very wide range of protective gloves available on the market for different applications. The particular application must be considered when a risk assessment is carried out for the place of duty. A universally protective glove suitable for all activities on board does not exist because the spectrum is too wide. At any event, gloves should be the right size and fit snugly if sliding or hands slipping out of them is to be avoided.



BIG Arbeitsschutz GmbH, a distributor of the nitrile gloves used on board, which are manufactured by ATG Lanka Private Ltd., was kind enough to provide the BSU with exemplary pairs of the protective gloves, all of which were classified according to the CE EN388 standard. In terms of fit and slip resistance, all the size 10 samples were better than the nitrile gloves without gripper dots. In this regard, it should be noted that all the gloves had gripper dots on the inner side and that nitrile gloves with gripper dots are also available on the market. In the case of the fatal accident on the MV THULE, it was noted that only the same type had been made available in size 10 for all the shipboard activities. This type (see Fig. 10, top right) is very large and did not fit any of the employees of the BSU. In the testing standards, there are no criteria for fit, size designation, application or non-slip properties. In the opinion of the distributor, it is likely that additional standards would complicate the distribution of protective gloves. Basically, every seaman should check that his gloves are fit for purpose and try them on.



Figure 10: A comparison of the gloves

The Finnish investigation authority ONNETTOMUUSTUTKINTAKESKUS pointed to the risks of hatch systems with a gantry crane in a study brought about by a number of accidents in which gantry cranes toppled over and hatch covers had fallen into the cargo hold. Meanwhile, for older systems the manufacturer has reportedly recommended structural changes and improved the operating manual.

The manufacturer, Coops & Nieborg B.V., does not provide detailed procedures in its publication, for example, as to how the crane driver and person giving directions should be positioned in order for the hatch cover to be attached securely. Here, it must be remembered that there is no direct visual contact between the operating personnel. Technical aids are not described, either. For example, in order for the crane operator and person giving directions to be able to communicate without visual contact, handheld transceivers would be useful for handling on board. In the interest of positioning the crane precisely, monitoring by closed circuit TV would also be conceivable. Here, the manufacturer points to the responsibility of the company and the measures it should initiate on board.

## 6 SAFETY RECOMMENDATIONS

### 6.1 Operator

The BSU recommends that the owner of the MV THULE describe in more detail the handling procedures for moving hatch covers with the gantry crane during loading/unloading operations in the SMS manuals, arrange for more ladders to be mounted permanently on the hatch coaming, equip the crew with portable transceivers, and keep a selection of protective gloves that are appropriate to the requirements of the place of duty available on board in different sizes.

### 6.2 Crane manufacturer and shipyard

The BSU recommends that the crane manufacturer, Coops & Nieborg B.V., account for the Finnish investigation authority's (ONNETTOMUUSTUTKINTAKESKUS) findings from the study 'Investigation report S3/2007M, Hatch crane safety' and describe the procedures for working with the crane in more detail with particular regard to the human factor.

It is recommended that the shipyard Bodewes Scheepwerf Volharding Foxhol B.V. include more ladders on the coaming in the design of the Coops & Nieborg hatch and crane system and with regard to positioning the gantry crane also consider monitoring by closed circuit TV so that the crane operator can see the side passageways.

## 7 SOURCES

- Findings of the investigation authority Accident Investigation Board Finland (ONNETTOMUUSTUTKINTAKESKUS), Turku Police and the BSU
  
- Written statements
  - Ship's command
  - Owner
  
- Reports/expert opinion
  - Investigation Report B1/2006M, SINGELDIEP, fatal accident in Kotka, Finland port on 11 January 2006, ONNETTOMUUSTUTKINTAKESKUS
  - Investigation Report D8/2007M, GRACHTBORG, hatch crane accident in the port of Kokkolaon, Finland on 11 August 2007, ONNETTOMUUSTUTKINTAKESKUS
  - Investigation report S3/2007M, Hatch crane safety, study ONNETTOMUUSTUTKINTAKESKUS ONNETTOMUUSTUTKINTAKESKUS
  - BIG Arbeitsschutz GmbH, 21244 Buchholz, Germany
  
- Nautical charts and vessel particulars, Federal Maritime and Hydrographic Agency (BSH)
  
- Ship Safety Division (BG Verkehr)
  - Accident Prevention Regulations for Shipping Enterprises and other applicable documents