Report on the investigation of

a fatal accident on board

mv Nordstrand

at Agencia Maritima Portillo, Seville, Spain

20 September 2004

Marine Accident Investigation Branch Carlton House Carlton Place Southampton United Kingdom SO15 2DZ

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Extract from

The Merchant Shipping

(Accident Reporting and Investigation)

Regulations 1999 – Regulation 4:

"The fundamental purpose of investigating an accident under the Merchant Shipping (Accident Reporting and Investigation) Regulations 1999 is to determine its circumstances and the causes with the aim of improving the safety of life at sea and the avoidance of accidents in the future. It is not the purpose to apportion liability, nor, except so far as is necessary to achieve the fundamental purpose, to apportion blame."

<u>NOTE</u>

This report is not written with liability in mind and is not intended to be used in court for the purpose of litigation. It endeavours to identify and analyse the relevant safety issues pertaining to the specific accident, and to make recommendations aimed at preventing similar accidents in the future.

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GLOSSARY OF ABBREVIATIONS AND ACRONYMS

AB	-	Able Seaman
gt	-	gross tonnage
ISM	-	International Safety Management (Code)
kW	-	kilowatt
m ³	-	cubic metres
OOW	-	Officer of the watch
SMS	-	Safety Management System
UTC	-	Universal Co-ordinated Time

SYNOPSIS

The accident occurred on board mv *Nordstrand* when a portable hold bulkhead fell over onto the hold floor, trapping and injuring two crew members, one fatally.

On 16 September 2004, the vessel arrived in Seville, Spain to discharge 3016.8 tonnes of wheat cargo. At about 1700 the following day, there were about 500 tonnes of cargo remaining onboard and it was decided to suspend the discharge until after the weekend.

Work resumed at about 0745 on Monday morning, 20 September. With the master, chief officer and third officer on deck, the two ABs opened the hold hatch covers. The master instructed the chief officer that the after portable bulkhead was to be moved from its stowage to an intermediate position, to enable accumulated cargo to be cleared from behind it. The chief officer had never been involved in moving the bulkhead before. The master neither specified when it was to be moved nor who was to be involved. The stevedores recommenced the cargo discharge at 0800.

The chief officer and the two ABs entered the hold to sweep up the cargo residue. At about 0855, the chief officer and one of the ABs prepared to jack up the portable bulkhead as part of the procedure for engaging the bulkhead wheels onto the hold hatch coaming in preparation to move it. The chief officer did not inform the master of his intentions. No one checked that the bulkhead's top two main securing bolts were in the engaged position, which was required in order to keep the bulkhead in an upright position during the jacking operation.

At 0900, the chief officer and an AB began jacking up the bulkhead. Seeing this, the master called to the chief engineer to come to the deck to assist. When the bulkhead was just clear of the bottom of the hold it began to tip forwards. The third officer and the AB shouted a warning. As the bulkhead began to fall over, the AB ran forward and just managed to avoid the bulkhead as it crashed onto the hold deck. The chief officer and the second AB, who had been sweeping the hold, were trapped under it.

Someone in the nearby stevedore's office immediately called the emergency services and they arrived on scene about 15 minutes later. Air bags were used to lift the bulkhead, enabling the casualties to be removed. The AB, who had been trapped, was pronounced dead on arrival at hospital. The chief officer survived the accident but suffered crush injuries to his chest.

Recommendations include a review of operational procedures by both manufacturers and owners; investigating a mechanism for identifying the position of securing bolts; and consideration given to designing bulkheads which do not require personnel to enter the hold during any stages of movement of the system.



Photograph Courtesy of Carisbrooke Shipping Limited

Nordstrand

Figure 1

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF NORDSTRAND AND ACCIDENT

Vessel details		
Registered owner	:	Carisbrooke Shipping Limited – Isle of Wight
Port of registry	:	Cowes, Isle of Wight, United Kingdom
Flag	:	United Kingdom
Туре	:	Combi Coaster 125/River Trader
Built	:	March 1991 by BV Scheepswerf Damen in Gorinchem, Netherlands
Classification society	:	Germanischer Lloyd
Construction	:	Steel
Length overall	:	88.3 metres
Gross tonnage	:	1970 tonnes
Engine power and/or type	:	Caterpillar 3516 STD producing 600kW to the fixed right hand propeller through a simplex gearbox
Service speed	:	10 knots
Bow thruster generators	:	Bow thruster – 232kW Caterpillar 3306 BDT 2 x 95kW Caterpillar 3340 BDT main generators 1 x 57kW harbour/emergency generator
Accident details		
Time and date	:	0710 UTC, 20 September 2004
Location of incident	:	37°22'N 005° 30'W at Agencia Maritima Portillo on the Rio Guadalquivir, Seville, Spain
Persons on board	:	7 crew and an unspecified number of stevedores
Injuries/fatalities	:	One fatality and one crush injury to the chest
Damage	:	Damage to portable bulkhead side sealing strips

1.2 DESCRIPTION AND OPERATING PATTERN OF VESSEL

1.2.1 General description

Completed in 1991, mv *Nordstrand* was originally built as the mv *Nicole. Nordstrand* is one of 28 vessels of the combi-coaster 125/river trader class constructed by BV Scheepswerf Damen at Gorinchem in the Netherlands. The current owners, Carisbrooke Shipping Limited, of Cowes in the Isle of Wight, acquired the vessel in 1993.

Nordstrand has a hold capacity of 4000m³ that can be sub-divided using two portable bulkheads. The eight hold covers are of the cantilever type. They are divided at the midships position and are lifted equally from the forward and after hold cover operating positions (**Figure 2**). A total of 158 containers can be carried, with 78 stowed in the hold and 80 on the deck.

The hydraulically operated telescopic bridge and hinged forward mast can be raised and lowered. This enables the vessel to navigate rivers that are spanned by low clearance bridges.

Originally operating under the Barbados flag, the vessel transferred to the United Kingdom flag in February 2002. *Nordstrand* is currently classed with Germanischer Lloyd.

Figure 2



After hatch cover in the open position

1.2.2 Operating pattern

Normal trading patterns stretch from the North Sea and Irish Sea down to the western Mediterranean Sea. Typical cargoes include fertilisers, grain, cement, china clay, potash, wood pulp and occasionally steel products.

Vessel chartering is managed by Soetemeer Fekkes Cargadoors BV, a subsidiary company of Carisbrooke Shipping Limited that is located in the Netherlands.

1.3 HOLD PORTABLE DIVIDING BULKHEADS

1.3.1 General description

The cargo hold is fitted with 2 x 8 tonne fabricated steel, portable dividing bulkheads (**Figure 3**) manufactured to a design by the shipbuilder. Macor Neptun GmbH (see Note below) designed and supplied the bulkhead movement equipment and associated operating instructions. The bulkheads are 6.27m high x 10.1m wide x 0.38m deep, matching the height and width of the hold. They enable the hold to be separated into three sections for cargo segregation purposes.

The lower outboard corners of the bulkhead are angled to match the profile of the hold when the bulkheads are in their stowed positions (Figure 3a). When the bulkhead is in use and is secured in intermediate positions, portable profile plates are fitted to these angled sections and any remaining gaps are filled with high expansion foam. Hinged vertical rubber sealing strips fitted to the outside edge of the bulkhead complete the cargo separation arrangements. Figure 3b shows the general arrangement and the damaged sealing strip of the fallen bulkhead after it had been raised back into the vertical position following the accident.

In the cargo separation or stowed position, three short tapered pins (Figure 3c) fitted to the base of the bulkhead, match with shallow recesses in the hold deck and help to locate the bulkhead. Lateral movement is prevented by 2 x 105mm diameter main securing bolts fitted at the top of the bulkhead. These are each fitted with an easing handle to help engage and disengage the main securing bolts and a cranked locking pin to prevent inadvertent removal, especially through vibration (Figure 3d). The easing handles also help to secure the main bolt, by fitting into the recess side plate profile.

The shipbuilder has since modified the design of the top securing arrangements by fitting an additional bolt to prevent vertical movement of the bulkhead while in heavy seaways. The current owners fitted a further two lower main securing bolts positioned approximately 2.75 metres from the base of the bulkhead (Figure 3e), again to restrict movement of the bulkhead while at sea. Both the upper and lower main securing bolts are located into 275mm long slots (Figure 3f), which enable the bulkhead to be jacked up by a maximum 125mm as part of the manoeuvring procedure.

Note:

Macor Neptun GmbH ceased trading in July 2003. Some of the company's business transferred to Macor Marine GmbH of Bremen, Germany, which has maintained the design interest.

Position of main securing bolt easing handle



-Locking pin postition

-Main securing bolt

Figure 3d Top main securing bolt arrangement

Figure 3 General arrangement of the after portable dividing bulkhead



Figure 3e Lower main securing bolt arrangement



Figure 3a Corner profile arrangement

Figure 3f



Main securing bolts' mating elongated slots





Figure 3b Side sealing strip arrangement

Figure 3g Jack positions and arrangement

Bulkhead taper pin location



Figure 3c Tapered pin arrangement



Figure 3h Jacking pin arrangement



Figure 4a Wheels stowed in recess position

Figure 4



Dividing Bulkhead - wheel arrangement



Figure 4d Wheels connected to hold covers



Figure 4b Wheels located on hold hatch coaming

Wheel cranked securing pin



Figure 4c Wheels connected to chain block

Two recesses are fitted to the bulkhead, which allow access for hydraulic jacks to be fitted. The jacks exert pressure against internal pins, which, in turn, are forced against the hold bottom, the resultant upward force lifts the bulkhead (Figure 3g and Figure 3h).

The bulkheads are fitted with a set of double wheels in the port and starboard top edge recesses (Figure 4). When the bulkhead is to be moved and has been raised by about 85mm, the wheels are rotated from their recesses (Figure 4a) and located onto the hold hatch coaming and locked in position with a cranked pin (Figure 4b). This arrangement allows the bulkhead to be moved along the length of the hold, either manually using a chain block (Figure 4c), or by connecting them to the hatch covers and moving the covers under hydraulic power (Figure 4d).



Figure 5

If the bulkheads are not required to separate cargoes, they are fitted to their respective stowage positions at the forward and after ends of the hold. When stowed they are secured with the top, port and starboard main securing bolts only. There is no matching slot for the lower bolts when in the stowed position.

When in the forward or after stowage position, there remains a gap of about 5 -10cm between the dividing bulkhead and the end of the hold, behind which cargo can accumulate. This needs to be cleared before embarking new cargo. The forward bulkhead in its stowed position is shown at Figure 5.

Forward dividing bulkhead

Forward portable bulkhead shown in the stowed position

1.3.2 Normal operation

The three schematics at **Figure 6** illustrate the procedures followed when preparing the portable bulkhead prior to moving it to another location.

Position 1

In the normal segregation or stowed position, the bulkhead is located by the three short tapered pins at the base, and secured by the four main securing bolts. (The lower two bolts are not used in the stowed position.)

Position 2

To move the bulkhead, it is first necessary to fit the jacks in the bulkhead jacking recesses and evenly jack up the bulkhead by about 85mm so that the wheels can be rotated from their recesses and secured onto the hold hatch coaming. At this point, the bulkhead remains stable as the main securing bolts merely rise within their associated elongated slots.

Position 3

When the wheels have been fitted and locked in position, the jack hydraulic pressure is released and the jacks removed. The bulkhead will then be suspended on the wheel arrangements. The bulkhead can then be secured using pull lifts to prevent uncontrolled movement. The main securing bolts can be removed and the bulkhead moved to its new position. Once in position, the main securing bolts and associated locking pins are fitted. The jacks are used to raise the bulkhead sufficiently to remove the wheel locking pins and rotate the wheels back into their recesses before replacing the locking pins. On completion, controlled bleeding away of the jack hydraulic pressure lowers the bulkhead.



Schematic of bulkhead positions during moving and relocation

A copy of Section 5 of the manufacturer's operating instructions, which are held in the vessel's Safety Management System, is at **(Annex A)**.

1.3.3 Manning arrangements prior to and during bulkhead movements

The manning arrangements in the hold and on the deck, during preparations and whilst moving the bulkhead, have been built up through custom and practice. None of the onboard documentation specifies who should be in charge of the operation, or where individuals should be positioned for what is recognised as the most dangerous procedure onboard.

Depending on other commitments, it was normal for the chief officer and chief engineer to be positioned at the port and starboard sides of the hold covers, to locate the bulkhead wheels onto the hold hatch coaming, and for the master to operate the hatch covers, to manoeuvre the bulkhead. If the bulkhead was merely to be raised, usually only the chief officer and chief engineer were involved.

1.3.4 Procedures for cleaning behind bulkheads

Because of the small gap between the portable bulkhead and the forward or after hold bulkheads, there is a tendency for cargo, especially cement and wheat, to collect into these void spaces.

To prevent cargo cross-contamination, the cargo residues behind the stowed portable bulkhead have to be removed prior to loading a new cargo. There are two ways of doing this. The most commonly used method is to jack up the bulkhead as though it is to be moved, but instead of supporting it on the wheels, it is supported underneath the base of the bulkhead by baulks of timber. The bulkhead is then lowered onto the timber. The loose cargo behind the bulkhead can be shovelled out from under the bulkhead and washed down by hose from a position on the deck.

The second method is to move the bulkhead away from its stowed position so that the crew can more easily access any cargo that has collected behind the bulkhead. This was the procedure required by the master on the day of the accident, and it was while jacking up the bulkhead in preparation for it to be moved that the accident occurred.

1.4 BACKGROUND TO THE ACCIDENT

On 10 September 2004, *Nordstrand* loaded a cargo of 3016.8m³ of wheat in Southampton. The wheat, which was bound for Seville, Spain, was the only cargo carried, so the dividing bulkheads were not used. The bulkheads were left in their stowage positions, the after bulkhead having been last moved on 4 June 2004. The crew were unsure when the forward bulkhead had last been moved.

With the exception of some rough weather while in the Bay of Biscay, the passage to Seville was uneventful, and the vessel arrived alongside the discharge berth at 2000 (local) on Thursday 16 September. The discharge plan, agreed with the charter company, was to begin discharging the cargo the following day, suspend work over the weekend and resume and complete the discharge on 20 September.

On 17 September, the cargo was progressively moved from the after end of the hold using a "Bobcat" bulldozer, and discharged ashore using a shore grab **(Figure 7)**. When work completed on 17 September, there were approximately 500 tonnes of wheat remaining to be discharged.



Cargo discharge arrangments using a "Bobcat" bulldozer and shore grab

1.5 CREW

Nordstrand had a total crew of seven, comprising the master, chief and third officers, chief engineer, two AB deckhands and a cook. All were serving on short term renewable contracts.

The Danish master had been at sea since 1974 and held a Certificate of Equivalent Competency (No 0007692) for a master of ships less than 3000gt. He joined Carisbrooke Shipping Limited in February 2002 as the mate onboard *Nordstrand.* From March 2002, he had served as the master of *Nordstrand.*

The Lithuanian chief officer was also certificated to serve as a master of vessels of less than 3000gt. He had been serving at sea since 1996. He joined Carisbrooke Shipping Limited in 2002 and *Nordstrand* on 19 July 2004.

The Bulgarian third officer spent 3 months at sea while attending the Bulgarian naval academy. He graduated in 2002 and then served as an assistant officer onboard a coaster for 6 months before joining *Nordstrand* on 6 September 2004. He held an OOW qualification.

The Cape Verde chief engineer had served at sea for 34 years and had been employed by Carisbrooke Shipping Limited for 15 years. The last 10 years had been spent onboard *Nordstrand*. He started his current contract in January 2002. He held a second engineer's qualification.

The three Cape Verde ratings all held watch rating certificates, and had spent their adult life at sea. AB Morais, the 55 year old deckhand who was fatally injured, had been employed by Carisbrooke Shipping Limited since 6 June 1997. He joined the vessel on 18 November 2003 and served onboard up to the time of the accident.

1.6 ENVIRONMENTAL CONDITIONS

On 20 September, just before the accident the weather conditions were good. The river was calm, there were light airs and the air temperature was about 30° C. There was no passing river traffic.

1.7 NARRATIVE OF EVENTS (ALL TIMES ARE UTC + 2 HOURS)

Preparations to remove the remaining 500 tonnes of cargo began at 0745 on 20 September 2004. The master, chief officer and third officer were on the deck as AB Soares and AB Morais opened the hold hatches to allow the Spanish stevedores access. The master and chief officer discussed the requirement to move the after portable bulkhead to clear away the wheat that had become entrapped between it and the after bulkhead of the hold. The master also instructed the chief officer that the portable bulkhead was to be replaced into its stowage position after the entrapped wheat had been removed. However, he did not specify when either of these operations were to take place, who should be involved in them, and who was to take charge of the operation.

Shortly afterwards, at about 0800, the stevedores recommenced the cargo offload using the "Bobcat" bulldozer and shore grab. The vessel was slightly trimmed by the stern, there was no discernible list. The master alerted the chief engineer that the portable bulkhead was to be moved and that he would be needed on deck when it was time to do so, again no time was stipulated.

In the meantime, the chief engineer went to the engine room to investigate a defect that had developed on the vessel's whistle electrical control circuit. The chief engineer did not instruct anyone to delay moving the bulkhead until he was on deck, fully expecting that it would not be moved until he was present, in accordance with normal custom and practice.

The cargo discharge proceeded smoothly, with most of the wheat having been moved from the after end of the hold to a position just forward of midships **(Figure 8)**. At about 0820, AB Soares entered the hold and took with him one of the jacks required to lift the bulkhead. Using a rope, the chief officer lowered a second jack into the hold, from the deck. At about 0825, the chief officer and AB Morais entered the hold and started to sweep up the remaining wheat at the after end in preparation for moving the after portable bulkhead.

Figure 8



Wheat cargo in forward hold position

At about 0855, the chief officer and AB Soares prepared to raise the bulkhead, prior to repositioning the wheels and moving it along the hold hatch coaming. The chief officer fitted a jack into the port jacking position of the bulkhead and AB Soares placed his in the starboard position.

The chief officer did not explain to AB Soares that it was intended to move the bulkhead. AB Soares was under the impression that the bulkhead was only to be lifted, because he did not notice either the master or the chief engineer on deck, which was their normal position if the bulkhead was to be moved. Nobody checked that the bulkhead securing bolts and associated locking pins were in the fully engaged position before preparing to lift the bulkhead.

Meanwhile, the master was on deck and noticed AB Morais sweeping wheat in a position about 1.5 metres forward of the base of the portable bulkhead. The chief officer and AB Soares were at the foot of the portable bulkhead adjacent to the jacking positions. The third officer was on the port side of the deck looking into the hold, having just passed down some shovels to assist with the wheat removal. The chief engineer was still in the engine room investigating the defect with the ship's whistle, and the cook was in the galley. There were also a number of Spanish stevedores onboard, predominantly at the forward end of the deck dealing with the cargo offload and operating the "Bobcat" bulldozer working in the hold.



After portable dividing bulkhead shown in the fallen position

At 0900, the port and starboard jacks were operated intermittently by the chief officer and AB Soares to ensure that the bulkhead was lifted evenly. As the bulkhead was just beginning to lift, the master made his way towards the nearby engine room hatch to call the chief engineer to the deck so that the bulkhead wheels could be fitted onto the hold hatch coaming.

When the bulkhead was lifted clear of the hold bottom it began to topple forwards. The third officer shouted a warning. AB Soares also shouted to AB Morais to run. As the bulkhead started to accelerate, the chief officer lost his balance as his feet became entangled with a shovel, and he slipped on to the deck. AB Soares ran forward and managed to scramble about 10cm clear of the bulkhead, as it slammed onto the deck of the hold, trapping the chief officer and AB Morais underneath **(Figure 9)**.

On hearing the screams from the third officer and AB Soares, the master turned around, heard the noise of the falling bulkhead and saw a large amount of dust rising from the hold. He shouted into the hold, asking if anyone was under the

bulkhead. AB Soares called back that the chief officer and AB Morais were. The master then immediately ran to the engine room hatch and informed the chief engineer of the situation. He then went to the port side of the hold hatch coaming. Hearing the voice of the chief officer from under the bulkhead, the master instructed AB Soares, who was still in the hold, to continually talk to the chief officer in an effort to keep him conscious. There was no sound from AB Morais. AB Soares spoke to the chief officer, who, although in considerable pain, was lucid and was able to communicate. He indicated that he was suffering from chest pains.

Meanwhile, a message was passed to the stevedore's office, which was located about 50 metres from the vessel's gangway. The stevedore foreman contacted the emergency services. The rescue and ambulance services arrived at approximately 0920 and proceeded immediately into the hold. The rescue service team fitted air inflation lift bags under the bulkhead and, shortly afterwards, it was successfully lifted and the chief officer and AB Morais moved from underneath.

AB Morais was pronounced dead on arrival at the Virgen del Rocio city hospital. The chief officer, who was suffering from chest crush injuries, including broken ribs and a punctured lung, was kept in hospital, but was subsequently released for repatriation to Lithuania on 23 September.

1.8 BULKHEAD EXAMINATION AND MAINTENANCE

1.8.1 Initial assessment

The MAIB investigation team arrived onboard *Nordstrand* during the evening of 20 September, 12 hours after the accident. The master and 2 technical superintendents from Carisbrooke Shipping Limited briefed them on the events leading to the accident and explained the procedures for moving the portable bulkhead. The fallen bulkhead and fittings were examined the following morning during daylight.

1.8.2 Bulkhead and associated fittings

The master had ensured that the portable bulkhead and fittings remained undisturbed following the removal of the casualties from the scene of the accident.

The portable bulkhead was found to have fallen forward onto its slab sided front, with its base coming to rest slightly forward from its stowed position (Figure 10). It was also discovered that the top 1/3 section of the port and starboard side sealing backing plates was supporting the bulkhead. This created a 23cm gap between the forward face of the bulkhead and the hold deck, just providing sufficient clearance between the hold deck and bulkhead to prevent the chief officer from sustaining fatal injuries. There was also a thin layer of wheat cargo remaining under the bulkhead (Figure 11).



Position of fallen bulkhead in relation to stowed position

Figure 11



View under fallen bulkhead showing supporting side sealing strip backing plate and remnants of the wheat cargo

The port and starboard wheel arrangements were still in their respective stowage recesses (Figure 12) and the associated cranked wheel locking pins were found in the hold, close to the fallen bulkhead. The port and starboard top main securing bolts were discovered to be in their withdrawn positions (Figures 13 and 14). The starboard main securing bolt easing handle had been broken off, but the appearance of the bolt's structure and surface corrosion suggested this had failed before the accident (Figure 15). The cranked locking pins for the port and starboard top main securing bolts could not be located, despite a thorough search of the bulkhead wheel recess areas and the hold deck. None of the crew were able to produce the locking pins or identify when they had been last seen.

The elongated slots in the longitudinal bulkheads for the upper port and starboard securing bolts were found to be in good, corrosion free condition and obstruction free. The two main lower securing bolts, and the two bulkhead jacking pins (Figure 16) were also free to operate.

With the exception of the bulkhead side sealing backing plates, neither the portable bulkhead and fittings, nor the hold structure, suffered significant damage due to the accident.



Port wheel arrangement still in its recess on the fallen bulkhead



Port top main securing bolt in the disengaged position





Starboard top main securing bolt in the disengaged position



Fractured starboard top main securing bolt easing handle



Figure 16

Blukhead jacking pin

1.8.3 Bulkhead maintenance

The wheel mechanisms, including pivot pins and wheel bushes, were found to be contaminated with solidified cement powder. There was no evidence or records of any recent maintenance having been undertaken on the wheels, securing bolts or locking pin arrangements. Ship's staff demonstrated the operation of the portable bulkhead to the MAIB investigation team (see Section 1.8.4). It was found that the wheel assembly pivot pins were partially seized and these had to be forcibly hammered from their recessed stowage position on to the hatch coamings before the wheel locking pins could be inserted.

All the original wheel locking pins were in a poor, corroded condition and the attached securing chains were either broken or missing (Figure 17).

The steel plate at the base of the bulkhead that supports the centre line tapered locating pin had areas of deep corrosion. One side of the plate weld had fractured. The condition of the fractured surfaces suggests that this failure predated the accident (Figure 18).

1.8.4 After portable bulkhead movement demonstration

A demonstration of the procedures followed by ship's staff when moving the after portable bulkhead was arranged. The bulkhead was lifted by a shore crane and secured in the vertical position using the two upper and lower main securing bolts. The bulkhead was then jacked up, the wheels were positioned on to the hold hatch coaming, and the bulkhead moved hydraulically using the hold hatch covers and also manually using a chain block.

With the exception of the need to use a hammer to move the wheel assemblies from their recessed stowage position on to the hatch coaming, the bulkhead movement arrangements functioned as designed.

1.8.5 Forward portable bulkhead

The forward portable bulkhead port upper main securing bolt had an original cranked locking pin fitted. However, this pin was found to be located underneath the main securing bolt and could not be easily seen from above, rendering routine security checks difficult. It appears that the main bolt might have been turned using the easing handle after the locking pin had been fitted, or the main securing bolt might have vibrated around to end up in that position. The port and starboard main bolt easing handles were also too short to have rested onto the recess side plate profiles, which helps to secure the bolt when the wheels are in the stowed position (Figure 19). In the case of the port upper main securing bolt, the original cranked locking pin was missing and had been replaced with a conventional nut and bolt arrangement (Figure 20).

Figure 17



Corroded wheel locking pin with broken securing chain



Figure 18

Tapered pin supporting plate showing corrosion and weld fracture



View of forward portable dividing bulkhead starboard top main securing bolt locking pin



View of forward portable dividing bulkhead port top main securing bolt, nut and bolt substitute for locking pin

1.9 ISM CODE

1.9.1 Requirements and certification

The International Safety Management Code for the Safe Operation of Ships and for Pollution Prevention (ISM Code) came into force on 1 July 2002. The Code requires companies to document and implement clear procedures, standards and instructions for safety management onboard. It also requires companies to provide safe working practices and identify risks.

The Safety Management Certificate **(Annex B)** and Document of Compliance **(Annex C)** were issued by the Technical Consistency Branch of the MCA's HQ on 12 June 2002 and 28 March 2003 respectively.

To satisfy the requirements of the ISM Code, Carisbrooke Shipping Limited has produced a Safety Management System Manual. Section 6.7 **(Annex D)** of the manual provides generic guidance to all the company's vessels on "Moving of Bulkheads and Tweendecks".

1.9.2 Risk assessment

A supporting risk assessment **(Annex E)** for the operation of the portable bulkheads was conducted on 4 June 2004. The assessment was recorded by the previous Russian chief officer and reviewed by the master. English is not the first language of either of these officers, and the meaning of some aspects of the assessment is unclear. This is discussed further in Section 2 of this report.

1.10 INSPECTIONS

1.10.1 MCA

Nordstrand's Certificate of British Registry was issued on 31 January 2002, and remains valid until 30 January 2007. The last MCA inspection was conducted on 29 March 2004.

1.10.2 Germanischer Lloyd (Certificate of Class)

Nordstrand is classed with Germanischer Lloyd. The vessel was last surveyed at Kings Lynn in March 2001 and the period of class remains valid until 31 March 2006.

1.11 SIMILAR ACCIDENTS

Of the 28 vessels of the class built by BV Scheepswerf Damen, 27 remain in service. With the exception of *Nordstrand*, none of the current owners or managers have reported any significant accidents relating either to the design or operation of the portable bulkheads.

SECTION 2 - ANALYSIS

2.1 AIM

The purpose of the analysis is to determine the contributory causes and circumstances of the accident as a basis for making recommendations to prevent similar accidents occurring in the future.

2.2 CAUSE OF THE ACCIDENT

One man died and another was injured while undertaking, what should have been, a routine operation of moving the after portable dividing bulkhead to clear wheat cargo that had accumulated behind it.

The bulkhead fell because it was jacked up without having been properly secured by the upper two main securing bolts. The chief officer, who assumed responsibility for the operation, was unaware of the need to check that these bolts and their associated locking pins were in the fully engaged position before jacking up the bulkhead.

2.3 MAIN SECURING BOLTS AND LOCKING PINS

2.3.1 Why the bulkhead was unsecured

The bulkhead was last moved on 4 June 2004. Despite assurances by the chief engineer that the upper two securing bolts and locking pins had been fitted, there was no evidence that the bolts had been secured, and none of the locking pins could be found. Further, there was no procedure to periodically check the integrity of either the main securing bolts or locking pins. Thus no one onboard could identify the last time the securing arrangements were observed to be in place. It is likely that the main securing bolts were in place on 4 June, but not the locking pins. If the securing bolts had not been located, the bulkhead would probably have fallen at some point during cargo offload during the intervening period as it would not have been adequately secured.

The chief officer did not check the main securing bolts on the day of the accident. However, a few days before the accident, he recalls seeing, by chance, what he believes was the port upper main securing bolt fitted into its mating slot. He did not notice if its locking pin was in place, and was unable to state how far the securing bolt might have been in its slot. The view of the bolt from the deck is not clear. Thus, by merely looking down at it, it would be very difficult to verify its true position; the securing bolt could easily have been adjacent to, or only just inside its mating slot.

The chief officer did not notice the position of the bulkhead starboard upper main securing bolt, or whether or not its respective locking pin was in position.

Post-accident examination revealed that the starboard upper main securing bolt was found to be in the disengaged position. Dimensional checks of the exposed section of the port top main securing bolt and comparison against the manufacturers drawings, suggests that there was, at most, 10-15mm of the securing bolt within its mating slot. Even with 15mm of engagement, effective security of the bulkhead would have been most unlikely because of the shift in its position while it was jacked up.

There is no evidence that any of the crew moved the top securing bolts from their engaged positions. Indeed, it would have been extremely difficult to have done so, with the weight of the bulkhead and cargo acting against them. The most likely reason for the bolts becoming disengaged was progressive movement through vibration, or because they had not been fully engaged after the last bulkhead movement on 4 June. The flat surface of the base of the bulkhead, together with the slight trim by the stern and the possibility of the 10mm of engagement of the port securing bolt in its mating slot, would have helped to support it while the cargo forward of the bulkhead was cleared. It would not have been until the bulkhead was jacked up, and was canted, that the state of equilibrium was disturbed and the bulkhead fell.

2.3.2 Ergonomics

It is essential for the safe operation of the bulkhead that the true positions of securing devices can be readily and accurately defined. This is especially important for operators unfamiliar with the configuration. The use of standard nuts and bolts, as in this case, instead of the designed cranked locking pins, can easily lead to confusion because they cannot be readily identified as being correctly secured, and at best should be seen as a temporary measure.

Other than the locking pins being in their correct position, there is no visual indication that the main securing bolts are fully engaged. A method of positively identifying that the locking pins had been engaged would have been extremely helpful. In addition, if the locking pins were coated with hi-visibility paint, this would have assisted with routine integrity checks.

2.4 BULKHEAD FUNCTIONALITY

Moving the bulkhead was a routine and necessary operation to ensure the hold was thoroughly clean before the next cargo was loaded.

The post-accident functionality test of securing the bulkhead in an intermediate position, and then moving it to its stowage position against the hold after bulkhead, proved successful. Although the wheel arrangements were stiff and poorly maintained, and the base of the bulkhead was corroded and had suffered weld failure, these factors did not contribute to the events leading to the accident.

2.5 ROLE OF THE CHIEF OFFICER

In the absence of any clear direction, the chief officer, assisted by the two ABs, took it upon himself to take charge of the operation to move the bulkhead. In assuming the responsibility, he needed to ensure that the portable bulkhead was properly secured and safe to jack up before moving it from its stowed position.

However, the chief officer was unfamiliar with this type of bulkhead and its securing arrangements, and he had not been given any clear guidance on how to operate the bulkhead safely. His predecessor's handover was brief and unclear and a demonstration of how to move the bulkhead safely had not been given to him.

The chief officer had read the manufacturer's operating instructions and company guidance. However, the instructions were ambiguous. They did not refer to this particular type of bulkhead's securing arrangement, and did not clearly explain how the bulkhead could be moved safely. For example, the instructions did not identify the need to ensure that the main securing bolts were fully engaged before jacking up the bulkhead.

Established manning requirements for the safe movement of bulkheads, which involved the master and the chief engineer, had developed through custom and practice. However, these were not documented and the chief officer was unaware of them.

2.6 PLANNING

Planning, for what is considered to be the most dangerous operation onboard, and one which requires close co-ordination, was incomplete and the management of it, was, at best, disjointed.

The chief engineer had served onboard *Nordstrand* for 10 years and the master recognised him as the most experienced person in moving the bulkhead. It was usual for the chief engineer to take the lead and co-ordinate the procedure.

However, it was the master's responsibility to ensure that the chief engineer clearly understood when he had to take charge of the operation. To function safely and efficiently, crews need sufficient time to plan their work schedule. To achieve this, proper consultation is required between those undertaking the work. In this case, any planning and consultation that might have taken place was ineffective. The master did not specify when the bulkhead was to be moved; neither did he clearly allocate the individual roles and responsibilities.

Knowing that the operation was to take place, the chief engineer was prepared to be on the deck to oversee it, but he was not told when the operation was to start. His additional work in the engine room prevented him from waiting on the deck, and he fully expected to be called when he was needed. Unfortunately the chief officer did not inform the master that he was about to jack up the bulkhead. The master noticed the bulkhead moving by chance. By the time he had moved to the engine room hatch to alert the chief engineer, the accident had already occurred.

2.7 BULKHEAD DESIGN

The design of the portable bulkhead and movement arrangements relies on the crew entering the hold to prepare the bulkhead to be moved. This particular design does not have any safety interlocks fitted, so crew safety will be severely compromised if the operating instructions are inadequate or if the operating procedures are not followed stringently.

Wherever possible, equipment designers should endeavour to ensure that personnel are not required to enter the hold at any stage that the portable bulkhead needs to be lifted or moved.

Converting the existing design to one which would enable the bulkhead to be jacked up remotely from the hold would require considerable structural change and is likely to be cost prohibitive. However, this is the only significant accident reported by the current owner's or managers relating to the design or operation of bulkheads, and it is one which could have been avoided had the correct procedures been followed. It is therefore not considered appropriate to recommend redesigning in-service bulkheads.

2.8 SAFETY MANAGEMENT SYSTEM

The Safety Management System (SMS) operated onboard was endorsed by the ISM certification. It includes generic instructions for moving the portable bulkheads.

2.8.1 SMS Manual

The owner's general guidance in the SMS manual includes preparations for moving the bulkheads, such as ensuring that the list and trim are within limits, the use of safety harnesses, and the need to ensure that locating and securing devices are in place. The guidance does not specify the operating procedures for securing and unsecuring the bulkhead.

2.8.2 Manufacturer's operating instructions

Also included as part of the SMS are the manufacturer's operating instructions for the hatch covers and the bulkhead. Section 5 refers to bulkhead operation. Because of omissions and ambiguity, the instructions could, if explicitly followed, result in the bulkhead being moved in an unsafe manner. For example:

 The instructions do not advise the need to ensure that the upper main securing bolts and their locking pins are in place before jacking up the bulkhead.

- There is reference to bulkhead mid-locking bolts, which do not exist on this particular bulkhead.
- There is no reference to ensuring that the upper main securing bolts and locking pins are fitted once the bulkhead is in its new position.

2.8.3 Risk assessment

The obligation to carry out risk assessments is contained in Regulation 7 of the Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations (Statutory Instrument 2962 of 1997). The Code of Safe Working Practices for Merchant Seamen provides practical guidance on the principles and conduct of risk assessments.

The ISM Code also requires the crew to undertake a risk assessment on safety critical operations. Risk assessments help determine control measures necessary to ensure safe operation, accounting for different skill levels, knowledge and language.

Risks are allocated a severity level of "minor", "major" or "critical". The likelihood of an accident occurring is defined as "highly unlikely, unlikely or likely". From the severity level and likelihood table an increasing risk factor of "trivial, tolerable, moderate, substantial or intolerable" is determined. Risk factors above moderate require that a control measure is put in place to reduce the risk.

A risk assessment covering the movement of the hold portable bulkheads was undertaken in June 2004, about 10 weeks before the accident **(Annex E)**.

The owners of *Nordstrand* require that personnel with detailed knowledge and experience of the particular activity conduct risk assessments. In this case, the risk assessment specifically covered the related risks when moving the bulkhead, and was undertaken by the previous chief officer and endorsed by the present master.

The current chief officer had not seen the risk assessment.

The risk assessment relating to the portable bulkheads is vague and unrealistic in the following areas:

- The risk of a falling bulkhead has not been properly addressed.
- The hazard descriptions have not been explicitly stated.
- No 1 hazard identifier is confusing in that it states "Risk of bulkhead follow training instructions". It is allocated a "substantial" risk factor and a control measure requiring "ensure proper instructions – training – communication". The hazard is allocated the highest risk factor on the sheet, yet its meaning is unclear.

 No 4 hazard identified risk of injury and damage due to stowage and security of the bulkhead. The hazard was judged as "highly unlikely" and with an associated severity factor of "major". This should have resulted in a "tolerable" risk factor assessment, but is reflected as "moderate". Even so, a "moderate" risk factor does not require control measures to be put in place, despite the risk of injury and damage.

Movement of the bulkheads is a particularly dangerous hazard, and a thorough risk assessment of the hazard should have been diligently conducted. It would have been more appropriate to assess the severity as "critical", with a likelihood assessment of "unlikely". This would have resulted in a risk factor defined as "substantial" which would have required control measures to be put in place.

An essential ingredient of an effective Safety Management System is management's continual monitoring of the ship's operations. In this case, given the diverse nationality of the crew, it is particularly important that management ensures that a robust regime of risk assessment and effective operational procedures are in place on board its vessels and are being correctly followed by ship's staff.

2.9 FATIGUE

The crew were well rested throughout the weekend immediately prior to the accident occurring on Monday 20 September 2004. Fatigue was not identified as a contributory factor in this accident.

SECTION 3 - CONCLUSIONS

3.1 SAFETY ISSUES

- 1. The following safety issues have been identified by the investigation. They are not listed in order of priority:
- 2. The bulkhead fell because it was not properly secured with the upper port and starboard main securing bolts and locking pins. [2.2]
- 3. The chief officer was unaware of the need to check the upper main securing bolts and locking pins before jacking up the bulkhead. [2.2]
- 4. There was no established procedure for periodically checking that the main securing bolts and associated locking pins were fully engaged. [2.3.1]
- 5. With the exception of the position of the locking pins, there was no easy way of establishing if the main securing bolts were fully engaged. [2.3.2]
- 6. The use of standard nuts and bolts can easily lead to confusion because they cannot be readily identified as being correctly secured. [2.3.2]
- 7. Established manning requirements for the safe movement of bulkheads, which involved the master and the chief engineer, had developed through custom and practice. However, these were not documented and the chief officer was unaware of them. [2.5]
- 8. The design of the portable bulkhead and movement arrangements relies on the crew entering the hold [2.7]
- 9. The owner's and manufacturer's bulkhead operating instructions are ambiguous and do not accurately reflect the bulkhead arrangements fitted to *Nordstrand*. [2.5, 2.8.1, 2.8.2]
- 10. Planning for the movement of the bulkhead was incomplete and disjointed. [2.6]
- 11. The ISM risk assessment for the movement of bulkheads is vague and unrealistic. [2.8.3]
- 12. Shore management needs to ensure that a robust regime of Safety Management System and risk assessment is in place, and that effective operational procedures are being correctly followed by ship's staff. [2.8.3]

SECTION 4 - ACTION TAKEN

4.1 CARISBROOKE SHIPPING LIMITED

Carisbrooke Shipping Limited has issued:

- Revised operating instructions for moving the hold portable bulkheads pending the outcome of the MAIB's investigation and recommendations. The new instruction "Protocol - Bulkhead Movement MV *Nordstrand*" is at (Annex F) and introduces fitting safety wires to the bulkhead before crew enter the hold.
- A memorandum entitled "Shipboard Instructions for Hatch Cover and Bulkhead/Tween Deck Operations" dated 4 November 2004 (Annex G). The memorandum provides guidance for the safe operation of hatch covers, bulkheads and tween decks. It also requires individual masters to review their specific operating instructions that will in turn be reviewed by the company's superintendents.
- 3. Draft changes to the Company's "Shipboard Familiarisation Form, which now incorporates a section on "Hatches, Moveable Bulkheads and Tweendecks".
- 4. Draft changes to the Company's SMS Manual. These include changes to the following sections regarding the operation of the portable bulkheads:
 - Section 3 "Training Familiarisation, Instructions and Drills
 - Section 5 "Risk Assessments"
 - Section 6 "Cargo Hatch, Bulkhead and Tweendeck Operation Instructions".

SECTION 5 - RECOMMENDATIONS

Carisbrooke Shipping Limited is recommended to:

- 2005/143 Review the following procedures related to the safe movement of portable bulkheads:
 - authorisation for the movement of bulkheads which follow the principles of a "Permit to Work",
 - manning levels and responsibilities,
 - training requirements.
- 2005/144 Conduct a full review of the Safety Management System and associated specific risk assessment relating to the movement of portable bulkheads, and ensure that these are followed and monitored by the shore management.
- 2005/145 Implement a system of periodical checks to verify the positions of the portable bulkhead main securing bolts and locking pins.

2005/146 Adopt a system that will:

- readily indicate the engaged and disengaged positions of the portable bulkhead main securing bolts, and
- clearly indicate that the associated locking pins are in place.

Macor Marine GmbH is recommended to:

2005/147 Improve the presentation, content and clarity of Macor Marine's operating instructions - Section 5 of "Operation of the Grain Bulkheads by Folding Covers" and promulgate revised instructions to the owners of vessels fitted with the *Nordstrand* type portable bulkheads.

International Chamber of Shipping is recommended to:

- 2005/148 Alert its owners and managers operating vessels equipped with moveable hold segregation equipment of the need to formulate, and ensure ships' staff adhere to approved instructions designed to minimise the risk to the crew when moving hold partitions, especially with respect to personnel working in the hold.
- 2005/149 Emphasise to its owners and managers the importance of ensuring that new hold segregation systems are designed to obviate the need for crew to enter the hold during any stages of movement of the system.

Maritime and Coastguard Agency is recommended to:

2005/150 Review risk assessments relating to the movement of portable bulkheads when conducting the periodic 2½ yearly audit of ship's Safety Management Certificate.

Marine Accident Investigation Branch April 2005

Safety recommendations shall in no case create a presumption of blame or liability

Manufacturer's (Macor Neptun GmbH) Bulkhead Operating Instructions

Betriebsanleitung Operating Instructions



MEMBER OF NEPTUN INDUSTRIE



MC 3375-78 3411/12 3419

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Instruction for operation

5.	OPERATION OF THE GRAIN BULKHEADS BY FOLDING COVERS
5.1	Raising of a grain bulkhead to operating position
	1. Place lifting cylinders under the brackets.
	2. Lift grain bulkhead to operating position.
	To achieve this
	 pull out the mid locking bolts in the bulkhead on port and starboard
	 lift bulkhead parallely by the two lifting cylinders on both sides for about 85 mm using a hand pump.
	 Tilt the trolleys at the top edges of the bulk- head upwards on port and starboard.
	To achieve this
	 pull out locking bolts for securing of the trolleys,
	 tilt the trolleys upwards,
	 secure trolleys in this position with locking bolts.
	 Lower the two lifting cylinders at the bottom edge of the bulkhead
	until the wheels of the trolleys rest on the longitudinal coaming.
	5. Remove the lifting cylinders.
1	 Secure bulkhead in this position against uncon- trolled movement (see drawing No. 0432 111.0.A)
	 by fixing pull lifts at the end of the coaming on port and starboard.
	 Pull out top and bottom locking bolts at the bulkhead on port and starboard.



Continued

5. Operation of the grain bulkheads

MC 3375-78

3411/12 3419

5.2	Lowering	of	а	grain	bulkhead	
			_		the second se	

Lowering of a bulkhead is possible

- in stowed position
- in the respective position of serving as bulkhead
- Move top and bottom locking bolts at the grain bulkhead to securing position on ps. and stb.
- Disconnect pull lifts and connecting rods respectively on ps. and stb.
- 3. Raise the grain bulkhead.
 - To achieve this
 - place lifting cylinders under the brackets on port and starboard
 - lift bulkhead by the two lifting cylinders on both sides for about 85 mm using a hand pump.
- Tilt the trolleys at the top edges of the bulkhead downwards on port and starboard.

To achieve this

- pull out locking bolts for securing the trolleys
- tilt the trolleys downwards
- secure trolleys in this position with locking bolts.
- Lower the two lifting cylinders at the bottom edge of the bulkhead

until the bulkhead rests on the double bottom.

- 6. Remove lifting cylinders.
- Move the mid locking bolts in the grain bulkhead on port and starboard to securing position.



Continue 5. Ope:	ed ration	of the grain bulkheads MC 3375-78 3411/12 3419
5.3	Ope cov	ration of the grain bulkheads by the folding ers at a reduced speed
5.3.1	Mov	ing from stowed position on fore-end or aft-end
	1.	Lifting to operating position as described under item 5.1.
	2.	Start only one pump of the twin pump unit at the switch cabinet (pump 1 or pump 2).
	3.	Close block ball valves V1 and V2. Thus the operating speed is reduced to half of normal speed.
	4.	Move grain bulkhead with pull lifts on port and starboard about 500 mm away from the transversal coaming (See drawing No. 0432 111.20A).
	5.	Attach port and starboard connecting rods with locking bolts to the trolley and to the trailing folding pair.
	6.	Disconnect pull lifts from trolleys on ps. and stb.
	7.	Close double folding pair on fore- or aft-end
		until the grain bulkhead has reached the required working position in which it can be lowered. (Closing operation as described under item 4.1.2).
		Attention:
		The leading pair must not be closed completely.
	8.	Lower grain bulkhead to working position as described under item 5.2.

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Continue	he	+	MC 3375-78
5.3 Operating		g of grain bulkheads	2411/12
by	toldi	ng covers	3411/12
			3419
5.3.2	Mov tra	ing from working position to stowed pos insversal coaming on fore- or aft-end a	sition at the ta reduced speed
	1.	Raising to operating position as desc under item 5.1.	ribed
	2.	Start <u>only one</u> pump of the twin pump the switch cabinet (pump 1 or pump 2)	unit at • .
	3.	Close block ball valves V1 and V2. (I Thus the operating speed is reduced t	mportant!) o half speed.
	4.	Open and secure double folding pair a under item 4.1.1. Thereby the grain b moved up to a position of approx. 500 of the transversal coaming.	s described ulkhead is mm in front
	5.	Attach pull lifts to the trolleys.	
	6.	Release connecting rod from trailing grain bulkhead on port and starboard.	pair and
	7.	Draw grain bulkhead into stowing posi the transversal coaming. (See drawing No. 0432 111.0.A)	tion at
	8.	Lower the grain bulkhead as described	under

Safety Management Certifiate dated 12 June 2002

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SAFETY MANAGEMENT CERTIFICATE

Issued under the provisions of the International Convention for the Safety of Life at Sea, 1974, as amended

Under the Authority of the Government of the United Kingdom of Great Britain and Northern Ireland by the Maritime and Coastguard Agency

PARTICULARS OF SHIP

Name of Ship		NORDSTRAND		
Distinctive Number or Letters		905278		
Port of Registry	ort of Registry COWES			
Type of Ship ¹ OTHER CARGO SHIP				
Gross Tonnage	1970			
IMO Number	9031260			
Name of Company ²	CARISBROOKE SHIPP	ING Ltd		
Address ²	10 Mill Hill Road			
	COWES, ISLE of WIGH	нт		
^o stcode	PO31 7EA	Country UK		

HIS IS TO CERTIFY

hat the Safety Management System of the ship has been audited and that it complies with the requirements of the nternational Management Code for the Safe Operation of Ships and for Pollution Prevention (ISM Code), 3 pllowing verification that the Document of Compliance for the Company is applicable to this type of ship.

his Safety Manag	il C	09/06/07	subject to periodical verification	
nd the validity of	the Document of Compliance	ce.		F ND CBASTGUA
lace of Issue	SOUTHAMPTON	Signed		The second secon
	(Place of issue of the document)	Signa	nure of duly authorised	official issuing the document
ate of Issue	12 JUNE 2002	Name		SOUTHANDTON
				L

As per annex to the International Convention for the Safety of Life at Sea 1974 Chapter IX Regulation 2.

As appears on the Document of Compliance

Adopted by the Organisation by Resolution A.741(18)

MSF 1901/ REV 0302

ISM Document of Compliance dated 28 March 2003



DOCUMENT OF COMPLIANCE

Issued under the provisions of the International Convention for the Safety of Life at Sea, 1974, as amended

Under the Authority of the Government of the United Kingdom of Great Britain and Northern Ireland by the Maritime and Coastguard Agency



1 COMPANY¹

Name	. CARISBROOKE SHIPPING LIMITED -			
Address 10 Mill Hill Road, Co				
		Isle of Wight		
Postcode	PO31 7EA	Country	UK	

THIS IS TO CERTIFY

That the Safety Management System of the Company has been audited and that it complies with the requirements of the International management Code for the Safe Operation of Ships and for Pollution Prevention (ISM Code²) for the types of ships listed below:-

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2 TYPE OF SHIP(S) COVERED BY THIS DOCUMENT

Pa	ssenger-ship	Chemical-Tanker
Pe	ssenger-High-Speed-Graft	Gas Garrier
G	argo High Speed Craft	Mobile Offshore Drilling Unit-
B	ulk-Carrier	Other Cargo Ship
0	il-Tanker	
This Documen Completion da	at of Compliance is valid until	26 March 2008 subject to periodical verification. ertificate is based 27 March 2003 Signed Signed
Date of Issue	(Place of issue of the document) 28 March 2003	

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ANNEX D

Safety Management System Manual – Section 6.7 "Moving of Bulkhead and Tweendecks" – dated February 2004

Carisbrooke Shipping Ltd

Safety Management System Manual

SMS MANUAL COPY NO		CS46-Nordstrand	
Section	6	Approved By	
Issue No	1	Amendment No	1
Issue Date	10 - 2002	Amendment Date	02 - 2004

6.6 OPENING AND CLOSING OF HATCHES

Prior to opening and closing hatches the following checks must be made, dependent upon which hatch transporting system is in place (pontoon hatches and gantry crane or hydraulic operated system):

- · All cleats, wedges and any other securing devices are released and cleared
- Well or stowage space is clear to accept the hatch lids (when opening)
- Hatch coamings are free of obstructions
- All major hydraulic components (rams, piping/hoses, etc) have been checked (general condition, clear of obstructions, etc).

Once these checks have been completed the operators will:

- Warn all persons in the vicinity that operations are beginning
- · Execute the opening or closing operation of the hatches in a controlled manner
- Continuously monitor the operation
- Raise pontoons only sufficiently to clear the coamings and other pontoons
- · Secure the hatch covers in their designated spaces when in the open position on all occasions
- Ensure persons do not stand on moving hatch lids

When closing hatches, ships must ensure complete water tightness of the holds. When expansion foam has been used, extreme care must be taken to remove all foam residues before loading any edible cargo. This foam poses a danger to human life when digested, thus cannot be used when carrying any such cargoes. The ship must clean any surfaces previously covered by expansion foam prior to loading edible cargo.

6.7 MOVING OF BULKHEADS AND TWEENDECKS

Prior to and during the process of moving bulkheads and/or tweendecks the following shall be observed:

- Trim and list of the vessel have to be within tolerance
- Inspection of lifting gear has been carried out (entry in Deck Logbook)
- Ensure hooks and shackles have been attached securely
- Required securing devices are prepared and ready for use
- Access ladders and equipment have been secured
- All personnel working on top of the coaming or bulkhead must wear a safety harness, which is properly secured to the ship
- · Ensure all locating and securing devices are properly in place before removing lifting equipment

Once the bulkheads are in their allocated position for dividing the holds, proper segregation must be established. Pipe insulation material (normally used on heating systems) has proven to be an effective material, due to its pliable nature. Masters are to ensure that a sufficient amount of suitable material is kept on board at all times. Masters must take every suitable care possible to ensure that effective isolation is obtained.

In addition, the purpose-fitted magnetic strips for hold segregation should be used. In those instances where the magnetic properties are no longer sufficient to keep the strips in position, they should be suspended from a rope carrying the weight of the strips, leaving the magnetic force to be used for isolation assurance only.

Risk Assessment for "Moving Bulkheads" dated 4 June 2004

RISK ASSESSMENT FORM

The following process must be carried out by staff with detailed knowledge of and experience in the activity (Master, C/E, C/O).

Activity		
Description: MOVUNG BU	uck Heads.	-
Sta	reft-DemedieHazards	
Description of Hazards:		
1 RISK OF BULKHOAD	FOLLOW TRANING INSTRUCTIONS	
2 - do - indures d	on Persons things delling drom coming	S ETC
3 Under of Tropt &	timers etc.	
4 wary I damage	due to stowage (seerily	
A Sta	pez-Calculate (he Risks	
The Risk Factor is describ	bed as being the severity \mathbf{x} the likelihood of the hazard	
Severity Likelihood	verint verification verificatio	
Mino	VIAL TOLERABLE MODERAT	E.
Major TOLER	RABLE MODERATE	(AL
Grifen MODE	RATE INTOLERA	BLE
The Risk Factor of the haza	ard concerned is the resulting position in the above table	
Stage 34	Decide Acceptability of Risks	
Hazard:	Risk Fa	actor:
Critical onlinity	- Substa	oticl
Critical onlikity	c 6	
Major onlikely m	Modera	te
Major Heylin milital	Woole-c	te
place to reduce the risk factor as per the f	ale" level. If they do exceed this level, then controls must be p following	out in
Stave 4 - Controls	Maggires and Draged tracks action Dial	and the second second
This stage is to determine what measure	res would reduce the risk factor of a particular hazard hal	ow the
"moderate" level. These measures can	range from using additional safety equipment or using h	ow the
systems to implementing a standard pro	ocedure for a certain task.	ack up
Dosume Proper Indle	bions - Training - complete is	1
Corrent Prover ingthe	suchtime SOFTH ANDE FOR THOSE	
RISK OF FINGERS AN	WAREA COMMUNICATION	
Care must be taken not to crea	the new dangers by the implementation of control measures!	
Singe St. Review th	e Risks & Develop Emergency Procedures	
With the control measures taken into ac	ccount, recalculate the risk factors and review the final o	utcome
MAJOR HIGHTLY	ONLINE TOLERAP	DLF
	- 00-	
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	-do-	
	- do -	_
When reviewing the risks involved, the adeq	quacy and practicality of the control measures should be consid	dered.
n other words: Is it still feasible to execute	the work or procedure with the added controls in place?	
Cont	innetion of RUS vassessment	alle 1
Risk Assessment undertaken by:	Reviewed by Master:	
Name / Rank: CH odd.	Signature:	
Signature:	Date: oil / oc / 20 oll	
All and the second seco	Date: 04 / 06 / 2007	

THIS FORM IS TO BE KEPT ON BOARD AND A COPY POSTED NEAR THE LOCATION OF THE ACTIVITY

Carisbrooke Shipping Limited's "Protocol - Bulkhead Movement MV Nordstrand"

## Protocol Bulkhead Movement M.V. Nordstrand

No attempt is to be made to move the bulkhead, without the specific orders from the master.

The chief officer shall be responsible for all safety procedures during the movement, with the assistance from the chief engineer.

Chief Officer, on opening the hold, will inspect the bulkhead retaining pins, and that the safety locks are in position.

No crewmember shall enter the hold until these safety checks are made, and reported to be in order.

### Bulkhead Repositioning Protocol

- 1. Prior to moving, chief officer to inspect retaining pins positions, and ensure that, they are locked in place.
- 2. Bulkhead wheels are rotated out of their pockets and rested on the combings.
- 3. Safety wires fitted, and checked by the chief officer.
- 4. Chief Engineer will take station at the bulkhead wheel position the opposite side of the vessel from the Chief Officer
- 5. Crew members instructed to enter hold and engage lifting jacks.
- 6. Chief Officer, with assistance from Chief Engineer, shall instruct the crew of the jacking heights, to enable the wheel locking pins to engage.
- When the Chief Officer is satisfied that all is in order, the crew can be instructed to lower the bulkhead down onto its wheels. Crewmembers shall then retire to a safe distance from the bulkhead.
- 8. Safety wires can then be removed, and the bulkhead retaining pins removed from their slots
- 9. The bulkhead then is attached by means of wire stops to the hatch cover. The master shall operate the hydraulics in conjunction with the chief officer, and chief engineer who will monitor the movement to the required station.



## Wheels locked in place on coaming





## Bulkhead safety wires fitted



Carisbrooke Shipping Limited's memorandum "Shipboard Instructions for Hatch Cover and Bulkhead/Tween Deck Operations" dated 4 November 2004

#### Carisbrooke Shipping Memorandum

То	:	All Masters
From	:	ISM Department
Date	:	04 November 2004
Subject	:	Shipboard Instructions for Hatch Cover and Bulkhead / Tween Deck
	Opera	tions
Approved by	:	Deputy DPA / CSO

Following the memorandum from Senior Technical Operations Manager and DPA, dated 25 September, we have now received your instructions you use on board regarding the various operations (opening, closing, moving, etc) concerning hatch covers, bulkheads and tween decks.

We have reviewed every instruction issued and note that all of you have individual instructions in place, varying in detail and complexity. They also vary in content, in the sense that some focus more on the technical details of the instructions/operations itself, as found in the instruction manuals on board, where others highlight the precautions and other factors to be taken into account when performing such operations.

Rather than this office trying to issue a set of instructions that amalgamates all individual instructions, we feel it is better to highlight some points of importance and let you amend and improve your own instructions accordingly. In addition, there other procedures we wish to implement to further diminish the likelihood of a similar accident occurring. Please take due note of the following and implement this on board your vessels:

- 1 Given the significance of any of these operations we want the instructions you have on board to contain the following:
  - * Instructions must be both concise and detailed at the same time, allowing for easy reading and understanding. We envision a "muster list" styled set up, clearly indicating which crewmember (rank) is responsible for which part of the operation.
  - * In principle, the Master must be in overall command of the operation, as these are key operations to the ship. Where normal hatch cover opening and closing procedures are concerned, it would not be necessary for him to be physically present to oversee the operation. Whenever bulkheads or tweendecks are moved, the Master should be directly overseeing the operation himself, as these operations are far more hazardous and take place less often. He would also be the one to take into account all factors influencing the operation (weather, traffic, etc).
  - * Prior to every operation, all crew involved must be informed and instructed through a brief meeting beforehand, explaining exactly what needs to happen, review the risk assessment concerned, complete a SWP, ensure all crew involved know their specific responsibilities.
  - * Checking of all equipment involved (cradles, jacks, hand tools, steel wire strops and electric chain blocks, PPE, handheld radios, etc) prior to the operation commencing.
  - * Listing of all precautions to be taken (zero or near-zero list/trim, nobody present in hold, no unauthorised crew/stevedores/visitors near the area of operation, etc)
  - * Listing of all other factors influencing the operation (weather conditions and sea state, shipping traffic expected, etc)

* With nearly all ships equipped with a digital camera and printer, we recommend to make photographs of key points in the operation, to further clarify the procedure when reading these instructions

All in all, these instructions would normally end up the size of about 4-5 A4 pages on average, depending on the style and layout used. This is a guideline only. What is certain is that single page instructions are definitely insufficient and so are 20 page documents, as their size would not encourage people to read them.

- 2 With the above recommendations incorporated in your instructions, the Superintendents will review these when they visit your vessel to verify the instructions are of an acceptable standard.
- 3 To draw attention to or to clarify the position of a particularly essential component used during the operations, Masters must mark these elements using a bright contrasting colour to their surroundings. (E.g. the securing pins of the bulkheads to be painted yellow) Master may furthermore decide to paint of warning or attention signs, elevating awareness of the critical importance of this component.
- 4 We note that some ships have made slight amendments to certain steps in some of these operations (E.g. where a cradle and "portable" electric hoist is supposed to be used for the removal of the bulkhead securing pin, some ships have started using rope ladders instead). It is difficult for us to judge whether altering the procedure is justified. With regards to the example given, it seems to us that the use of a cradle is normally a safer option than a rope ladder. So, we wish to make one thing absolutely clear: <u>It should be done in the SAFEST METHOD POSSIBLE possible</u>. NEVER should you SACRIFICE <u>SAFETY to perhaps a speedier or -at first glance- easier option</u>. We realise you often feel the pressure from other interested parties (charterers, agents, stevedores, etc) to complete hatch or bulkhead operations as quickly as possible. Ultimately, this should never stand in the way of the personal safety of all crew. Our Superintendents will discuss the method used during their review of your instructions, when they come to visit your vessel.
- 5 Every ship will need to make the explanation of these operations in essence part of their familiarisation tour, when new crewmembers join.
- 6 In addition, every ship will need to do an instruction on these operations once every 3 months. These instructions must be recorded in the IL and ETRB (yellow books) as required under SMS procedures. The instructions must be done in as much a practical manner as is possible. The SMS Manual will be amended in due course to reflect this and the previous requirement.

WE CANNOT OVEREMPHASISE THE IMPORTANCE OF THE ABOVE. SADLY A LIFE WAS LOST ON ONE OF OUR SHIPS. LET'S ALL MAKE ABSOLUTELY SURE THIS NEVER HAPPENS AGAIN. IT IS FAR TOO HIGH A PRICE TO PAY ....